

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
Null	Indicator that no value is provided. Only used in combination with other data types, e.g., 'Number/Null'.	null	null

FloorAreaBasis

Enumerator	Description	Notes
CENTER	Center line of the wall	
NEAR_SIDE	Near side of the wall	
FAR_SIDE	Far side of the wall	

ConditioningType

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

SpaceFunctionType

Enumerator	Description	Notes
LABORATORY	Laboratory	
KITCHEN	Kitchen	
OTHER	Other	

SurfaceClassificationType

Enumerator	Description	Notes
INTERIOR_WALL	Interior Wall	
INTERIOR_FLOOR	Interior Floor	
INTERIOR_CEILING	Interior Ceiling	
EXTERIOR_WALL	Exterior Wall	
EXTERIOR_FLOOR	Exterior Floor	
EXTERIOR_CEILING	Exterior Ceiling	
UNDERGROUND_WALL	Underground Wall	
UNDERGROUND_FLOOR	Underground Floor	
UNDERGROUND_CEILING	Underground Ceiling	

SurfaceAdjacentTo

Enumerator	Description	Notes
AMBIENT	Exterior wall or roof which is adjacent to the exterior ambient environments.	
GROUND	Slab-on-grad or below grade surface if adjacent to ground.	
INTERIOR	Interior surface if adjacent to another thermal block.	

SurfaceConstructionInputOptions

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

FenestrationClassificationType

Enumerator	Description	Notes
WINDOW	Window	
SKYLIGHT	Skylight	
DOOR	Door	
PLASTIC_PANEL	Plastic panel	
CLERESTORIES	Clerestories	
ROOF_MONITOR	Roof monitor	
GLASS_BLOCK	Glass block	

TransformerType

Enumerator	Description	Notes
DRY_TYPE	Dry Type	
FLUID_FILLED	Fluid Filled	
OTHER	Other	

TransformerPhase

Enumerator	Description	Notes
SINGLE_PHASE	Single Phase	
THREE_PHASE	Three Phase	

DayOfWeek

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

ServiceWaterHeatingEnteringWaterTemperatureInputOptions

Enumerator	Description	Notes
ANNUAL_MAIN	Annual main entering water temperature option	
MONTHLY_MAIN	Monthly main entering water temperature option	
ANNUAL_GROUND	Annual ground entering water temperature option	
MONTHLY_GROUND	Monthly ground entering water temperature option	

FuelTypeOptions

Enumerator	Description	Notes
ELECTRICITY	Electricity	
NATURAL_GAS	Natural gas	

ASHRAE229

Name	Description	Data Type	Units	Range	Req	Notes
<code>transformers</code>	Electrical transformers at the building site	<code>[{Transformer}]</code>				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.
<code>buildings</code>	Buildings on the site	<code>[{Building}]</code>				Contains a list of buildings on the site (often just one).
<code>calendar</code>	Information on the calendar used with the simulation.	<code>{Calendar}</code>				
<code>schedules</code>	Schedules for internal loads, thermostats, equipment operation and control, and any other need.	<code>[{Schedule}]</code>				Contains a list of schedules used in model.
<code>weather</code>	Information on the local weather conditions used with the simulation.	<code>{Weather}</code>				
<code>overall_simulation_outputs</code>	Outputs from the simulation summed for all buildings in the simulation.	<code>{OverallSimulationOutputs}</code>				
<code>building_rotation_angles</code>	A list of angles that building simulations are performed and results are provided.	<code>[Numeric]</code>	degrees			

Building

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
name	Name of the Building	String			✓	
number_of_floors	Number of floors	Numeric		≥0		
building_segments	Large portions of a building that share a building area type	[{BuildingSegment}]				Contains a list of building segments in the building.
is_new	Indicates whether building is a new construction (true) or existing (false). Projects that include additions will be modeled as two buildings - one new and one existing, as curtain rules such as baseline fenestration area will apply differently to each portion	Boolean				
compliance_path	Indicates the chosen compliance path if the ruleset has multiple compliance paths such as 90.1 Appendix G has code compliance and beyond code	<CompliancePathType2019ASHRAE901>				
elevators	Elevators	[{Elevator}]				Contains a list of elevators in the building.
refrigeration_components	Refrigeration	[{Refrigeration}]				Contains a list of refrigeration components in the building.
open_time	Time that the building opens.	Numeric		≥1, ≤24		The general time that the building is first opened during normal weekdays from 1 to 24

Name	Description	Data Type	Units	Range	Req	Notes
close_time	Time that the building closes.	Numeric		≥1, ≤24		The general time that the building is closed during normal weekdays from 1 to 24

BuildingSegment

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
thermal_blocks	Thermal blocks in the building	[{ThermalBlock}]				Contains a list of thermal blocks in the building.
heating_ventilation_air_conditioning_systems	HVAC systems in the building	[{HeatingVentilationAirConditioningSystem}]				Contains a list of HVAC systems in the building.
service_water_heating_systems	Service water heating systems in the building	[{ServiceWaterHeatingSystem}]				Contains a list of service water heating systems in the building.
area_type_vertical_fenestration	Building area classification used for vertical fenestration	<VerticalFenestrationBuildingAreaType2019ASHRAE901>				The enumeration is based on the standard used.

ThermalBlock

Name	Description	Data Type	Units	Range	Req	Notes
zones	Zones in the building	[{Zone}]				Contains a list of zones in the building.
served_by_heating_ventilation_air_conditioning_systems	HVAC systems serving the thermal block	[String]				Contains a list of IDs of the HVAC systems serving the thermal block - from Unique Identification Number in HeatingVentilationAirConditioningSystem.

Zone

Name	Description	Data Type	Units	Range	Req	Notes
spaces	Spaces in the building	[{Space}]				Contains a list of spaces in the building.

Space

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
name	Name fo the Space	String			✓	
surfaces	Surfaces surrounding the space	[{Surface}]				Contains a list of surfaces that define the space.
floor_area	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.	Numeric	m2	≥0		
floor_to_ceiling_height	The height from the floor of the space to the ceiling	Numeric	m	≥0		
floor_area_basis_for_exterior	The basis of the measurement location related to floor area for exterior walls.	<FloorAreaBasis>				
floor_area_basis_for_interior	The basis of the measurement location related to floor area for interior walls.	<FloorAreaBasis>				
conditioning_type	Space conditioning category	<ConditioningType>				
space_function	Generic function for the space.	<SpaceFunctionType>				The enumeration is based on the standard used.
lighting_space_type	Lighting space type classification	(<LightingSpaceType2019ASHRAE901T951>, <LightingSpaceType2019ASHRAE901T961>)				The enumeration is based on the standard used.
ventilations_space_type	Ventilation space type classification	<VentilationSpaceType2019ASHRAE901>				The enumeration is based on the standard used.
service_water_heating_space_type	Service water heating space type classification	<ServiceWaterHeatingSpaceType2019ASHRAE901>				The enumeration is based on the standard used.
infiltration_modeling_method	The software methodology chosen for modeling infiltration	String				

Name	Description	Data Type	Units	Range	Req	Notes
<code>infiltration_equivalent_full_load_hours</code>	Annual sum of hourly fractions of infiltration schedule	Numeric	hr	≥ 0		
<code>receptacle_control_credit_taken</code>	The receptacle control credit was taken	Boolean				
<code>receptacle_baseline_exception_taken</code>	The exception that receptacle power or schedule can be different in the baseline has been taken.	Boolean				
<code>receptacle_power</code>	Peak power consumed by the receptacles.	Numeric	W			
<code>receptacle_schedule_name</code>	Receptacle schedule name	String				
<code>receptacle_control_credit</code>	A multiplier for the fraction of space plug load power applied to the receptacle controlled credit.	Numeric		≥ 0		

Surface

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
name	Name fo the Space	String			✓	
fenestration_subsurfaces	Fenestration subsurfaces that are on the surface	[{Fenestration}]				Contains a list of surfaces that define the space.
classification	Classification for the surface.	<SurfaceClassificationType>				Options for surface being interior or exterior wall, floor, or ceiling.
tilt	Angle between vertical and the surface outward normal	Numeric	degrees			Example value would be 0 = roof, 90 = wall, 180 = downward facing surface (exterior floor)
azimuth	Clockwise angle between North and the horizontal projection of the wall's outward normal.	Numeric	degrees	≥0		Example values would be 0 = north, 90 = East, 180 = South, 270 = West
adjacent_to	Used to classify the conditions on the surface.	<SurfaceAdjacentTo>				Determines whether this is an (a) exterior surface if adjacent to ambient, (b) slab-on-grade or below grade surface if adjacent to ground, or (c) interior surface if adjacent to another thermal block.
adjacent_space_id	ID of the adjacent space for interior surface	String				
does_cast_shade	Determines whether the surface is modeled as casting shade on other exterior surfaces	Boolean				
surface_construction_input_option	Identifies whether construction is entered layer-by-layer or simplified (R-value)	<SurfaceConstructionInputOptions>				
area	area of the surface	Numeric	m2	≥0		
layers	List of names of layer descriptions starting from the outside surface	[String]				
insulation_location	The location of the insulation related to the surface	String				
u_factor	surface U-factor	Numeric	W/m2-K	≥0		
c_factor	surface C-factor	Numeric	W/m2-K	≥0		
f_factor	surface F-factor	Numeric	W/m-K	≥0		
r_value	r-value of the insulation for the surface	Numeric	K-m2/W	≥0		
reflectance	Reflectance	Numeric		≥0		

Name	Description	Data Type	Units	Range	Req	Notes
emittance	Emittance	Numeric		≥0		
reflectivity	Reflectivity	Numeric		≥0		

Fenestration

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
name	Name of the fenestration subsurface	String			✓	
classification	Classification for the fenestration being window, skylight, door.	<FenestrationClassificationType>				
area	Area of fenestration including glass and framing	Numeric	m2	≥0		
international_glazing_database_id	International Glazing Database ID Number	Numeric		≥0		See http://windows.lbl.gov/software/igdb for ID numbers
u_factor	Fenestration U-factor	Numeric	W/m2-K	≥0		
solar_heat_gain_coefficient	Fenestration SHGC	Numeric		≥0		
visible_transmittance	Fenestration VT	Numeric		≥0		
light_to_solar_gain_ratio	Fenestration LSG	Numeric		≥0		
depth_of_overhang	Distance from the edge of the overhang to the fenestration surface.	Numeric	m	≥0		
has_shading_projections	Identifies whether fenestration has side fins, overhangs or not flush with wall	Boolean				
has_manual_interior_shades	Are there manually-operated interior shading such as blinds, curtains or shades	Boolean				
has_automatic_shades	Are there automatic interior shading such as blinds, curtains or shades	Boolean				

Transformer

Name	Description	Data Type	Units	Range	Req	Notes
name	Transformer Name	String			✓	
type	The type of transformer	<TransformerType>				
phase	The number of electrical phases	<TransformerPhase>				
efficiency	Transformer efficiency	Numeric		≥0		
capacity	Rated Capacity of the Transformer	Numeric	Va	≥0		
peak_load	Annual Peak electric load on the transformer	Numeric	W	≥0		
capacity_ratio	Annual Peak electric load of the transformer divided by the capacity	Numeric		≥0		

Schedule

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
name	Name of the Schedule	String			✓	
purpose	The purpose of schedule	String				Describe the purpose of the schedule and how it can be used. Not an enumerations. The purpose assigned by BEM tool should match across RMRs. Examples include thermostat, multiplier for lighting, availability for equipment.
values	Hourly Values of Schedule	[Numeric] [1..8760]				Can also use functions like EFLH(), MAX(), MIN() to determine overall characteristics for the list of schedule values.
units_of_values	The units associated with the values of the schedule	String				For certain schedule purposes, the values may be represented by units such as C for temperature or W for power.
modified_from_library	True if any schedule values have changed from what appears in the schedule library	Boolean				

Calendar

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
day_of_week_for_january_1	Day of the week for January 1	<DayOfWeek>				
is_leap_year	The schedules assume it is a leap year	Boolean				
is_daylight_savings_time	The schedules adjust for daylight Savings Time	Boolean				

Weather

Name	Description	Data Type	Units	Range	Req	Notes
monthly_ground_temperature	Modeled monthly ground temperatures	[Numeric] [1..12]	C			
climate_zone	The designation of the climate zone where the building is located	<ClimateZone2019ASHRAE90I>			✓	The enumeration is based on the standard used.

Elevator

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
name	Name of the elevator	String			✓	
motor_power	Elevator peak motor power	Numeric	W			
cab_counterweight	Elevator car counterweight	Numeric	kg			
cab_weight	Weight of elevator car	Numeric	kg			
design_elevator_load	Elevator load at which to operate	Numeric	kg			
speed	Design speed of the elevator	Numeric	m/s			
cab_area	Floor area of elevator cab	Numeric	m ²			
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_schedule	Elevator motor operation schedule name	String				
cab_ventilation_fan_schedule	Elevator ventilation fan operation schedule name	String				
cab_lighting_schedule	Elevator lighting schedule name	String				
cab_motor_schedule_equivalent_full_load_hours	Elevator motor operation schedule equivalent full load hours	Numeric	hr	≥0, ≤8760		
cab_ventilation_fan_schedule_equivalent_full_load_hours	Elevator ventfan operation schedule equivalent full load hours	Numeric	hr	≥0, ≤8760		
cab_lighting_schedule_equivalent_full_load_hours	Elevator lighting schedule equivalent full load hours	Numeric	hr	≥0, ≤8760		

HeatingVentilationAirConditioningSystem

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
sensible_cool_output_capacity	Result from the simulation of the sensible cooling capacity	[Numeric]	W/m2	≥0		
heat_output_capacity	Result from the simulation of the heating capacity	[Numeric]	W/m2	≥0		

ServiceWaterHeatingSystem

Name	Description	Data Type	Units	Range	Req	Notes
loop_name	Name of service water heating system loop	String				
area_type	Service Water Heating Loop Area Type	<ServiceWaterHeatingSpaceType2019ASHRAE901>				The enumeration is based on the standard used.
design_flow	Design Flowrate of service water heating loop	Numeric	L/s			
supply_temperature	Design supply temperature setpoint of service water heating loop	Numeric	C			
flow_schedule	service water heating Loop flow schedule name	String				
annual_entering_water_temperature	Annual service main or annual ground temperature used for service water heating calculations entering water temperature degrees	Numeric	C			
monthly_entering_water_temperature	Monthly service main or ground temperatures used for service water heating entering water temperature degrees	[Numeric][1..12]	C			Arrayed variable with 12 values for monthly entering water temperature
entering_water_temperature_type	Method of determining service water heating entering water temperature	<ServiceWaterHeatingEnteringWaterTemperatureInputOptions>				
heater_name	Service water heating heater name	String				
heater_fuel_type	Service water heating heater fuel type	<FuelTypeOptions>				
heater_efficiency	Service water heating heater efficiency	Numeric		≥0		

InteriorLighting

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique ID assigned to each interior lighting fixture(s) reported in an RMR	Numeric		>0		
name	Interior lighting fixture name	String				
type	The type of interior lighting fixture	<LightingSpaceType2019ASHRAE901>				
nominal_wattage	Nominal capacity of interior lighting fixtures	Numeric	W			
power	Total power of all fixtures in a specific functional area	Numeric	W			
designed_power	Total designed power of all fixtures in a specific functional area	Numeric	W			
with_occupancy_sensor	The flag for occ sensor is modeled with interior lighting	Boolean				
with_auto_controls	The flag for automatic lighting control is modeled with interior lighting none	Boolean				
with_manual_on_sensor	The flag for manual-on automatic lighting control for interior lighting	Boolean				
with_partial_auto_on_sensor	The flag for partial-auto-on automatic lighting control for interior lighting	Boolean				
multiplier	Multiplier for interior lighting specifications	Numeric		>0		
area	Space area for interior lighting	Numeric	m2	>0		
with_other_auto_controls	Automatic interior lighting controls other than occupancy sensor	Boolean				

ExteriorLighting

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique ID assigned to each exterior lighting fixture(s) reported in an RMR	Numeric		>0		
name	Exterior lighting fixture name	String				
type	The type of exterior lighting fixture none	<ExteriorLightingAreas2019ASHRAE901TableG36>				
area	Area of the exterior functional space.	Numeric	m2	>0		
nominal_wattage	Nominal capacity of exterior lighting fixtures	Numeric	W	>0		
fixture_height	Installation height of exterior fixture	Numeric	m	>0		
power	Total exterior lighting power of all fixtures in a specific functional area	Numeric	W	>0		
designed_power	Total designed exterior lighting power of all fixtures in a specific functional area	Numeric	W	>0		
trade_light_power	Exterior Lighting power for tradable surface	Numeric	W	≥0		
non_trade_light_power	Exterior Lighting power for non-tradable surface	Numeric	W	≥0		
site_zone_type	Site zone type for Sec 9.4.2	<ExteriorLightingZones2019ASHRAE901>				
parking_area	Area of exterior parking space	Numeric	m2	≥0		
tradable_surface_type	Type of tradable surfaces for exterior lighting	<ExteriorLightingAreas2019ASHRAE901TableG36>				
tradable_surface_area	Area of tradable surface	Numeric	m2	≥0		
tradable_surface_linear_footage	Linear feet of tradable surface	Numeric	m	≥0		
has_walkway	If the building has an exterior walkway	Boolean				
tradable_walkway_width_footage	Width of the exterior walkway	Numeric	m	≥0		
tradable_opening_width_footage	Width of an exterior opening	Numeric	m	≥0		
multiplier	Multiplier for exterior lighting specifications	Numeric		>0		

Refrigeration

Name	Description	Data Type	Units	Range	Req	Notes
id	Unique Identification Number	Numeric			✓	
name	Name of the refrigeration component	String			✓	
type	Refrigeration equipment type	<RefrigerationType2019ASHRAE901>				
equipment_class	Equipment Class from referenced standard	<RefrigerationClass2019ASHRAE901>				
energy_per_day	Rated electrical energy use per day	Numeric	kWh			
case_volume	volume of a refrigerated case in cubic meters	Numeric	m3			
total_display_area	display area of a refrigerated case in square meters	Numeric	m2			

OverallSimulationOutputs

Name	Description	Data Type	Units	Range	Req	Notes
refrigeration_energy_enduse	Annual refrigeration energy end use from simulation output	Numeric	kWh			
service_water_heating_annual_enduse_electricity	Annual electricity energy end_use for SWH loops	Numeric	kWh	≥0		
service_water_heating_annual_enduse_fossilfuel	Annual fossil fuel energy end_use for SWH loops	Numeric	J	≥0		