

Tables with Site Data

Site

Attribute	Format	Comments
name	Required Unique Syntax Max 50 characters	Recommended to be the M&V Program Management Identifier without personally identifiable information
city	Required Syntax Max 60 characters	The name of the city or town in which the site is located.
state	Required ForeignKey State.name	The two-character state abbreviation in which the site is located.
description	Optional Syntax Text field	An optional field for additional information and/or comments.
application	Required Syntax Max 60 characters	Typically used to denote whether renewable thermal system is for new construction or retrofit.
uuid	Required Syntax RFC 4122 uuid4() automatically generated	Automatically generated universal unique identifier for the site.
thermal_load	Optional ForeignKey thermal_load.name	Reference to entry in thermal_load table describing the overall heating and cooling loads for the site.
weather_station	Required ForeignKey weather_station.nws_id	Four-character code for National Weather Service station to be used for site weather data.

Equipment

Attribute	Format	Comments
name	<p>Required</p> <p>Unique</p> <p>Recommended format [site.name]_thermal-load</p> <p>Syntax Max 40 characters</p>	<p>Name for the thermal load table entry. This is useful when assigning a thermal load to a site.</p> <p>In the initial release, a site can only have one thermal load table entry</p>
description	<p>Optional</p> <p>Syntax Text field</p>	<p>An optional field for additional information and/or comments.</p>
conditioned_area	<p>Required</p> <p>Syntax Float field</p> <p>Units = 'Sq Ft'</p>	<p>The total floor area of the conditioned space served by the renewable thermal system. Future releases may include zones.</p>
heating_design_load	<p>Required</p> <p>Syntax Float field</p> <p>Units = 'MBtuH'</p>	<p>The peak heating load required to meet the indoor design temperature when the outdoor temperature is the heating_design_oat. Typically determined from an ACCA Manual J analysis.</p>
cooling_design_load	<p>Required</p> <p>Syntax Float field,</p> <p>Units: 'MBtuH'</p>	<p>The peak cooling load required to meet the indoor design temperature when the outdoor temperature is the cooling_design_oat. Typically determined from an ACCA Manual J analysis.</p>
heating_design_oat	<p>Required</p> <p>Syntax Float field</p> <p>Units: 'Degrees F'</p>	<p>The outdoor air temperature for which the peak heating load is designed. Typically determined for the location from ASHRAE table.</p>
cooling_design_oat	<p>Required</p> <p>Syntax Float field</p> <p>Units: 'Degrees F'</p>	<p>The outdoor air temperature for which the peak cooling load is designed. Typically determined for the location from ASHRAE table.</p>
uuid	<p>Required</p> <p>Syntax RFC 4122 uuid4() automatically generated</p>	<p>Automatically generated universal unique identifier for the thermal load table entry.</p>

Equipment Monitoring System Specification

Maps a pre-defined monitoring system to an existing piece of renewable thermal equipment.

Attribute	Format	Comments
equip_id	Required ForeignKey equipment.id	ID for the equipment that has a monitoring system attached.
monitoring_system_spec	Required ForeignKey monitoring_system_spec	id for the monitoring system that is attached to equipment. More than one monitoring system may be associated with a piece of equipment
start_date	Optional Syntax DateField	date that the monitoring system went into operation
end_date	Optional Syntax DateField	date that the monitoring system was no longer installed or operating. If a change is made to a monitoring system, the change would be recorded with a new monitoring system with a new start date.

Equipment Maintenance History

Attribute	Format	Comments
equip_id	Required ForeignKey equipment.id	ID for the equipment that is serviced
description	Required Syntax Text field	description of service done
service_date	Required Syntax DateField	date that the equipment was serviced
contractor	Optional Syntax Max 50 characters	The name of the contracting company that performed the service.
technician	Optional Syntax Max 50 characters	The name or initials of the technician(s) that performed the service.

Source

Attribute	Format	Comments
name	Required Unique Recommended format [site.name]_[source.type] Syntax Max 50 characters	Name for a thermal source located at a site and associated with one or more pieces of equipment. A site must have at least one thermal source and can have more than one.
description	Optional Syntax Text field	An optional field for additional information and/or comments.
type	Required ForeignKey source.type	The type of thermal source, e.g. vertical borehole heat exchanger.
spec	Required ForeignKey source.spec	The specifications of the thermal source, based on type.

Source Specification

Attribute	Format	Comments
uuid	Required Syntax RFC 4122 uuid4() automatically generated	Automatically generated universal unique identifier for the site.
name	Required Unique Syntax Max 50 characters	The name of the source specification for the site. While a source spec can be used for multiple site, it is most often specific to a site.
description	Optional Syntax Text field	An optional field for additional information and/or comments.
type	Required ForeignKey source.type	The type of thermal source, e.g. vertical borehole heat exchanger.

Vertical Loop Specification (Source subclass)

Attribute	Format	Comments
formation_conductivity	Optional Syntax Float field	The formation thermal conductivity in units of Btu/hr-ft-F.
grout_conductivity	Optional Syntax Float field	The grout thermal conductivity in units of Btu/hr-ft-F.
grout_type	Optional Syntax Max 50 characters	The of grout used in the borehole heat exchanger
freeze_protection	Optional Syntax Float	The lowest temperature at which antifreeze will prevent freezing. Report in degrees F.
formation_type	Optional Syntax Max 50 characters	The type of geologic material in which the heat exchanger is installed.
ghex_pipe_spec	Optional Foreign Key ghex_pipe_specification	Mapping to the table with the ground heat exchanger pipe specification.

Air Source Spec

Attribute	Format	Comments
compressor_location	Optional Syntax Max 25 characters	An optional field to describe the location of the air-source heat pump compressor. For example, ground-mount, wall-mount, roof, etc.
duct_configuration	Optional Syntax Max 35 characters	An optional field to describe the duct configuration of the air-source heat pump. For example., 'single-zone ducted', etc.

Thermal Load

Attribute	Format	Comments
name	<p>Required</p> <p>Unique</p> <p>Recommended format [site.name]_thermal-load</p> <p>Syntax Max 40 characters</p>	<p>Name for the thermal load table entry. This is useful when assigning a thermal load to a site.</p> <p>In the initial release, a site can only have one thermal load table entry</p>
description	<p>Optional</p> <p>Syntax Text field</p>	<p>An optional field for additional information and/or comments.</p>
conditioned_area	<p>Required</p> <p>Syntax Float field</p> <p>Units = 'Sq Ft'</p>	<p>The total floor area of the conditioned space served by the renewable thermal system. Future releases may include zones.</p>
heating_design_load	<p>Required</p> <p>Syntax Float field</p> <p>Units = 'MBtuH'</p>	<p>The peak heating load required to meet the indoor design temperature when the outdoor temperature is the heating_design_oat. Typically determined from an ACCA Manual J analysis.</p>
cooling_design_load	<p>Required</p> <p>Syntax Float field,</p> <p>Units: 'MBtuH'</p>	<p>The peak cooling load required to meet the indoor design temperature when the outdoor temperature is the cooling_design_oat. Typically determined from an ACCA Manual J analysis.</p>
heating_design_oat	<p>Required</p> <p>Syntax Float field</p> <p>Units: 'Degrees F'</p>	<p>The outdoor air temperature for which the peak heating load is designed. Typically determined for the location from ASHRAE table.</p>
cooling_design_oat	<p>Required</p> <p>Syntax Float field</p> <p>Units: 'Degrees F'</p>	<p>The outdoor air temperature for which the peak cooling load is designed. Typically determined for the location from ASHRAE table.</p>
uuid	<p>Required</p> <p>Syntax RFC 4122 uuid4() automatically generated</p>	<p>Automatically generated universal unique identifier for the thermal load table entry.</p>

Multiple Site Tables

Equipment Type

Attribute	Format	Comments
name	Required Unique Syntax Max 20 characters	The type of equipment provided by manufacturer. These are general classes of equipment, such as ASHP, GSHP, etc.
description	Optional Syntax Text field	An optional field for additional information and/or comments.

GHEX Pipe Specification

Attribute	Format	Comments
uuid	Required Syntax RFC 4122 uuid4() automatically generated	Automatically generated universal unique identifier for the thermal load table entry.
name	Required Unique Syntax Max 50 characters	A descriptive name of the GHEX pipe specification so that it may be reused on multiple sites.
dimension_ratio	Optional Syntax Max 50 characters	The of ratio of the outer pipe diameter to the minimum wall thickness. For example, DR11.
no_flowmeter_flowrate	Optional Syntax Float field	The ground loop flow rate (in gallons per minute) for fixed flow systems without an installed flowmeter.
n_pipes_in_circuit	Optional Syntax Integer field	The number of pipes in individual circuits. For a single u-tube, the value is 1.
n_circuits	Optional Syntax Integer field	The number of circuits in the ground loop. For example, for 2 boreholes with split flow, enter 2.
total_pipe_length	Optional Syntax Float	Enter value in units of feet. For a single u-tube in a 200 foot bore, the total pipe length would be 400 feet.

Manufacturer

Attribute	Format	Comments
name	Required Unique Syntax Max 20 characters	Name of the equipment manufacturer. This will typically include manufacturers of renewable thermal equipment and associated monitoring systems. For manufacturers that provide both heat pumps and monitoring systems, enter a separate record for each (e.g. Waterfurnace_hp and Waterfurnace_ms)
description	Optional Syntax Text field	An optional field for additional information and/or comments.
equipment_type	Required Foreign Key equipment_type	The type of equipment provided by manufacturer. Separate records are required for manufacturers that provide multiple types of equipment

Measurement Location

Attribute	Format	Comments
name	Required Unique Syntax Max 20 characters Examples <ul style="list-style-type: none">▪ 'in-pipe'▪ 'heat pump'▪ 'service panel'	Name of the measurement location for a specific sensor of a monitoring system. For example, an electrical measurement may be made in the electrical panel or in the heat pump. Temperature measurements may be made with in-pipe sensors or on-pipe sensor affixed the exterior of a pipe. equipment manufacturer.
Description	Optional Syntax Text field	An optional field for additional information and/or comments.

Measurement Specification

Attribute	Format	Comments
name	<p>Required</p> <p>Unique</p> <p>Syntax Max 30 characters</p> <p>Examples See comments</p>	Name of the measurement for a specific sensor of a monitoring system. This name should be informative so that when a measurement specification is added to a monitoring system, the correct measurement specification can be identified from a list of options. For example, a measure of leaving water temperature made on metal pipe in units of Celsius with an accuracy of 0.1C may be 'LWT OMP 0.1 C'
description	<p>Optional</p> <p>Syntax Text field</p>	An optional field for additional information and/or comments.
type	<p>Required</p> <p>Foreign Key measurement_type</p>	Mapping of measurement spec to obtain oTherm name, possible MSP names, units.
accuracy	<p>Recommended</p> <p>Syntax Decimal Field 10 digits, 5 decimal</p>	When available, numeric accuracy should be reported. If a % of reading value, the accuracy_pct attribute should be set to TRUE. Otherwise, accuracy will be interpreted as sensor error in units of measurement_type.
accuracy_pct	<p>Recommended</p> <p>Syntax Boolean</p>	Denotes whether accuracy is reported as a percent of reading (TRUE) or in units of measurement_type (FALSE)
meas_bias_abs	<p>Required</p> <p>Syntax Float field</p>	Measurement bias, other than sensor bias. This may due to an incorrect monitoring system setting. Default = 0.0 Reported as absolute or percent.
meas_bias_pct	<p>Required</p> <p>Syntax Float field</p>	Measurement bias, other than sensor bias. This may due to an incorrect monitoring system setting. Default = 0.0 Reported as absolute or percent.
location	<p>Optional</p> <p>Foreign Key measurement_location.location</p>	Th location of a measurement.

Measurement Type

Attribute	Format	Comments
name	Required Unique Syntax Max 20 characters Examples <ul style="list-style-type: none">▪ 'heatpump_power'▪ 'heatpump_aux'▪ 'source_supplytemp'	oTherm measurement type name for a specific sensor of a monitoring system. These should coincide with names in Table 3 of the Device Level Data Dictionary.
description	Optional Syntax Text field	An optional field for additional information and/or comments.
msp_columns	Optional Syntax Array field	An optional list of coinciding column names for data provided by monitoring system provider (msp).
unit	Required Foreign Key Measurement_unit.name	The abbreviation of measurement unit, such as "C" for Celsius, "W" for Watts, etc.

Measurement Unit

Attribute	Format	Comments
name	Required Unique Syntax Max 10 characters Examples <ul style="list-style-type: none">▪ 'C', 'F', 'W', 'gpm', etc.'	Measurement unit abbreviation
description	Optional Syntax Text field	An optional field for additional information and/or comments.

Model

Attribute	Format	Comments
name	Required Unique Syntax Max 20 characters	Name of the equipment manufacturer. This will typically include manufacturers of renewable thermal equipment and associated monitoring systems. For manufacturers that provide both heat pumps and monitoring systems, enter a separate record for each (e.g. Waterfurnace_hp and Waterfurnace_ms)
description	Optional Syntax Text field	An optional field for additional information and/or comments.
equipment_type	Required Foreign Key equipment_type	The type of equipment provided by manufacturer. Separate records are required for manufacturers that provide multiple types of equipment

Monitoring System

Attribute	Format	Comments
name	Required Unique Syntax Max 40 characters	Name of the monitoring system should be sufficient so that user can select correct one when associating a monitoring system with a piece of equipment.
description	Optional Syntax Text field	An optional field for additional information and/or comments. Notes on known measurement bias should be included here.
manufacturer	Required Foreign Key manufacturer	The manufacturer of the monitoring system.

Source Type

Attribute	Format	Comments
name	Required Unique Syntax Max 50 characters	The name of the general type of thermal source, for example, air source, ground source, district, etc.
description	Optional Syntax Text field	An optional field for additional information and/or comments.

Weather Station

Attribute	Format	Comments
nws_id	Required Unique Syntax Max 30 characters Example 'KPSM' for Portsmouth NH	The National Weather Service station identifier that is most representative of weather conditions at the site.
description	Optional Syntax Text field	An optional field for additional information and/or comments.
lat	Required Syntax Float field Units: Decimal Degrees	The latitude of the NWS station.
lon	Required Syntax Float field Units: Decimal Degrees	The longitude of the NWS station. For North America, typically reported in negative degrees relative to the prime meridian.