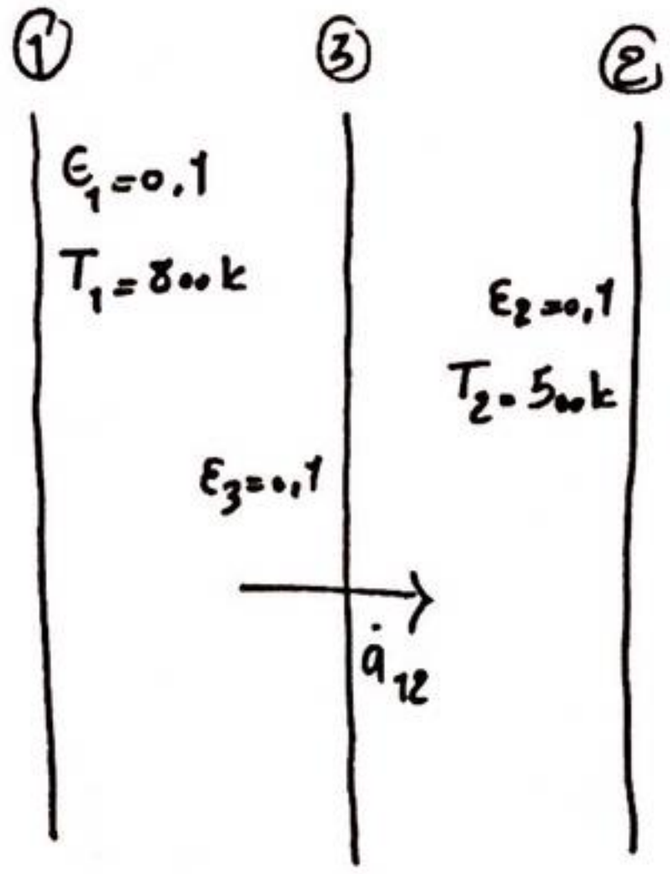
$$\dot{q}_{net\ 1-2} = \frac{\dot{Q}_{net\ 1-2}}{A} = \frac{\sigma A(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} \div A$$

$$= \frac{\sigma(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} = \frac{(5.67 \times 10^{-8}) \times (800^4 - 500^4)}{\frac{1}{0,1} + \frac{1}{0,1} - 1}$$



$$\dot{q}_{net\ 1-2} = \dot{q}_{net\ 1-2,n\ shields} = \frac{1}{100} \times \dot{q}_{net\ 1-2}$$

$$\dot{q}_{net\ 1-2,n\ shields} = \frac{\dot{Q}_{net\ 1-2,n\ shields}}{A}$$

$$= \frac{\sigma A(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + \left(\frac{1}{\epsilon_{3,1}} + \frac{1}{\epsilon_{3,2}} - 1\right) \cdots \left(\frac{1}{\epsilon_{n,1}} + \frac{1}{\epsilon_{n,2}} - 1\right)} \div A$$

$$= \frac{\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + \left(\frac{1}{\epsilon_{3,1}} + \frac{1}{\epsilon_{3,2}} - 1\right) \cdots \left(\frac{1}{\epsilon_{n,1}} + \frac{1}{\epsilon_{n,2}} - 1\right)}$$

$$\epsilon_1 = \epsilon_2 = \epsilon_3 = \cdots \epsilon_n = 0,1 \quad \rightarrow \epsilon = 0,1$$

$$\dot{q}_{net\ 1-2,n\ shields} = \frac{\sigma(T_2^4 - T_1^4)}{(n+1) \times \left(\frac{1}{\epsilon} + \frac{1}{\epsilon} - 1\right)} =$$

$$= \frac{1}{n+1} \times \frac{\sigma(T_2^4 - T_1^4)}{\frac{1}{\epsilon} + \frac{1}{\epsilon} - 1}$$

$$\dot{q}_{net\ 1-2} = \dot{q}_{net\ 1-2,n\ shield} = \frac{1}{100} \times \dot{q}_{net\ 1-2} = \frac{1}{100} \times \frac{\sigma(T_2^4 - T_1^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} = \frac{1}{100} \times \frac{\sigma(T_2^4 - T_1^4)}{\frac{1}{\epsilon} + \frac{1}{\epsilon} - 1}$$

$$\frac{1}{n+1} \times \frac{\sigma(T_2^4 - T_1^4)}{\frac{1}{\epsilon} + \frac{1}{\epsilon} - 1} = \frac{1}{100} \times \frac{\sigma(T_2^4 - T_1^4)}{\frac{1}{\epsilon} + \frac{1}{\epsilon} - 1}$$

$$\boxed{n = 99}$$

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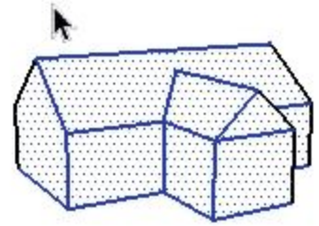
File Edit View Camera Draw Tools Window Extensions Help

Top

Default Tray

- Entity Info
- Materials
- Components
- Styles
- Shadows
- Instructor



Select Tool

Select entities to modify when using other tools or commands.

Tool Operation

1. Click on an entity.

Modifier Keys

Ctrl = Add an entity to set of selected entities
Shift+Ctrl = Subtract an entity from set of selected entities
Shift = Toggle whether an entity is within set of selected entities

Select objects. Shift to extend select. Drag mouse to select multiple.

Measurements

Type here to search

ENG 10:01 PM 11/12/2019

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File Edit View Camera Draw Tools Window Extensions Help

OpenStudio
OpenStudio User Scripts

About OpenStudio
Preferences
Help
Check For Update
Launch Openstudio
File
Import
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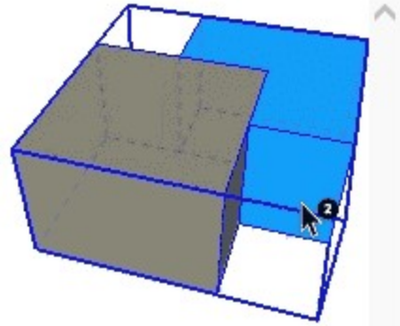
Make New Object
Modify Model
Inspect Model
Rendering
SketchUp Tools

Surface Matching
Set Attributes for Selected Spaces
Create Spaces From Diagram
Project Loose Geometry

Default Tray
Shadows
Instructor



Outer Shell Tool

Combine all selected solids into a single solid and remove all interior entities.

Tool Operation

1. Select first solid.
2. Select second solid.
3. Select next solid or [ESC] to complete.

Click to learn about more advanced operations...

Create Spaces From Diagram

Measurements

Type here to search

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File Edit View Camera Draw Tools Window Extensions Help

Default Tray

Shadows

Instructor

Surface Matching

Intersect and Divide Inter-Zone Surfaces (help)

Intersect in Entire Model | Intersect in Selection

Surface Matching (help)

Match in Entire Model | Match in Selection

Unmatch in Entire Model | Unmatch in Selection

Last Report | Cancel

selected entities
Shift+Ctrl = Subtract an entity from set of selected entities
Shift = Toggle whether an entity is within set of selected entities
Ctrl+A = Select all visible entities in model

Select objects. Shift to extend select. Drag mouse to select multiple.

Measurements

Type here to search

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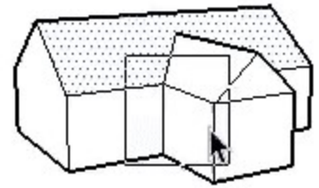
1 - SketchUp Make 2016

File Edit View Camera Draw Tools Window Extensions Help

Default Tray

Shadows

Instructor



Select Tool

Select entities to modify when using other tools or commands.

Tool Operation

1. Click on an entity.

Modifier Keys

Ctrl = Add an entity to set of selected entities
Shift+Ctrl = Subtract an entity from set of selected entities
Shift = Toggle whether an entity is within set of selected entities
Ctrl+A = Select all visible entities in model

Select objects. Shift to extend select. Drag mouse to select multiple.

Measurements

Type here to search

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File Edit View Camera Draw Tools Window Extensions Help

Surface Search

Surface Search (help)

Class:

Name:

Type:

Construction:

Outside Boundary Condition:

Sun Exposure:

Wind Exposure:

Surface Orientation: from 90 to 270 (Clockwise) - North is 0 degrees

Exclude Horizontal Surfaces

Only Show Non-Convex Surfaces

Only Show Surfaces With More Than 4 Vertices

Search Entire Model | Search Selection | Unhide All | Last Report | Cancel

Select objects. Shift to extend select. Drag mouse to select multiple.

Measurements

Type here to search

ENG 11:05 PM 11/12/2019

thermal zone.osm

File Preferences Components & Measures Help

Run Simulation | Output | Tree

Run

62%

Running

Warnings: 0

Errors: 0

Output

```
Looking for zone_equipment_detail_section (Zone Equipment Detail)
Boolean, Required
Value: (true)
Looking for air_loops_detail_section (Air Loops Detail)
Boolean, Required
Value: (true)
Looking for plant_loops_detail_section (Plant Loops Detail)
Boolean, Required
Value: (true)
Looking for outdoor_air_section (Outdoor Air)
Boolean, Required
Value: (true)
Looking for cost_summary_section (Cash Flow)
Boolean, Required
Value: (true)
Looking for source_energy_section (Site and Source Summary)
Boolean, Required
Value: (true)
Looking for schedules_overview_section (Schedule Overview)
Boolean, Required
Value: (true)
result = true
Processed 1 base script and 0 merged scripts
EnergyPlus Starting
EnergyPlus, Version 8.5.0-c87e61b44b, YMD=2019.11.12 23:27
Processing Data Dictionary
Processing Input File
Initializing Simulation
Reporting Surfaces
Beginning Primary Simulation
Initializing New Environment Parameters
Warming up {1}
Warming up {2}
Warming up {3}
Warming up {4}
Warming up {5}
Warming up {6}
Starting Simulation at 01/01 for RUN PERIOD 1
```

Type here to search

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thermal zone.osm*

File Preferences Components & Measures Help

Results Summary

Reports: OpenStudio Results

Open ResultsViewer for Detailed Reports

- Model Summary
- Annual Overview
- Monthly Overview
- Utility Bills/Rates
- Envelope
- Space Type Breakdown
- Space Type Summary
- Interior Lighting Summary
- Plug Loads Summary
- Exterior Lighting
- Water Use Equipment
- HVAC Load Profiles
- Zone Conditions
- Zone Overview
- Zone Equipment Detail
- Air Loops Detail

Temperature (Table values represent hours spent in each temperature range)

Zone	Unmet Htg (hr)	Unmet Htg - Occ (hr)	< 56 (F)	56-61 (F)	61-66 (F)	66-68 (F)	68-70 (F)	70-72 (F)	72-74 (F)	74-76 (F)	76-78 (F)	78-83 (F)	>= 88 (F)	Unmet Clg (hr)	Unmet Clg - Occ (hr)	Mean Temp (F)
THERMAL ZONE 1	0	0	0	1704	853	386	2565	928	647	1625	43	9	0	0	0	68.5 (F)
THERMAL ZONE 2	0	0	0	1709	852	377	2570	918	648	1631	46	9	0	0	0	68.5 (F)
THERMAL ZONE 3	0	0	0	1712	842	375	2562	915	627	1670	45	12	0	0	0	68.5 (F)

Humidity (Table values represent hours spent in each Humidity range)

Zone	< 30 (%)	30-35 (%)	35-40 (%)	40-45 (%)	45-50 (%)	50-55 (%)	55-60 (%)	60-65 (%)	65-70 (%)	70-75 (%)	>= 80 (%)	Mean Relative Humidity (%)
THERMAL ZONE 1	1228	889	755	702	891	806	867	946	681	472	234	49.5 (%)
THERMAL ZONE 2	1227	890	756	706	897	820	858	943	688	457	229	49.5 (%)

Type here to search

ENG 11:32 PM 11/12/2019