

Week-6

**** Task 1****

Provide a summary of the main concepts that went through about solar radiation (formulas are not needed)

Solar radiation is an important source of energy which is transmitted by radiative thermal transfer from the space to the surface of earth. Solar radiation is distributed by 2 phenomenon called dispersion and absorption.

Through dispersion sun rays diffused in different directions and through absorption sunrays absorbed by existing elements and particles in the air such as H₂O, CO₂, and ozone.

The amount of energy and quality of solar radiation, depends on:

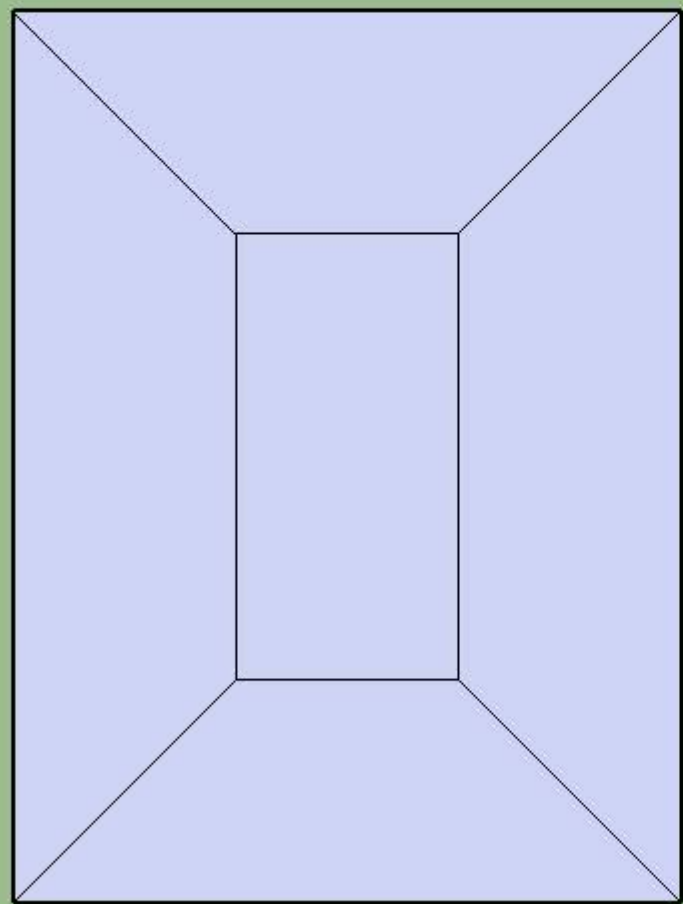
- the Sun position in the sky (altitude α and azimuth θ), which changes daily and seasonally ;
- the weather condition, both continental and microclimatic (atmosphere clearness);
- the site altitude over the sea level;
- sunshine hours (day length).

**** Task 2****

create a pdf file with screenshots of all of the steps we went through in the second lesson on openStudio and explain briefly the reason behind the use of each step (in your own words!)



Top



Default Tray

► Entity Info

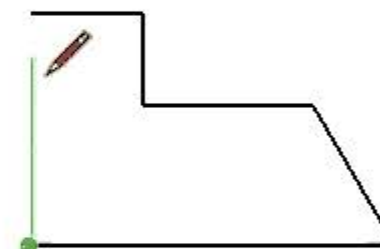
► Materials

► Components

► Styles

► Shadows

▼ Instructor



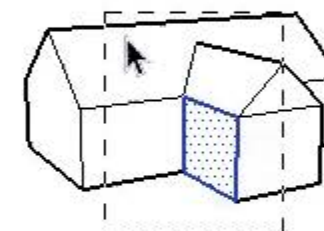
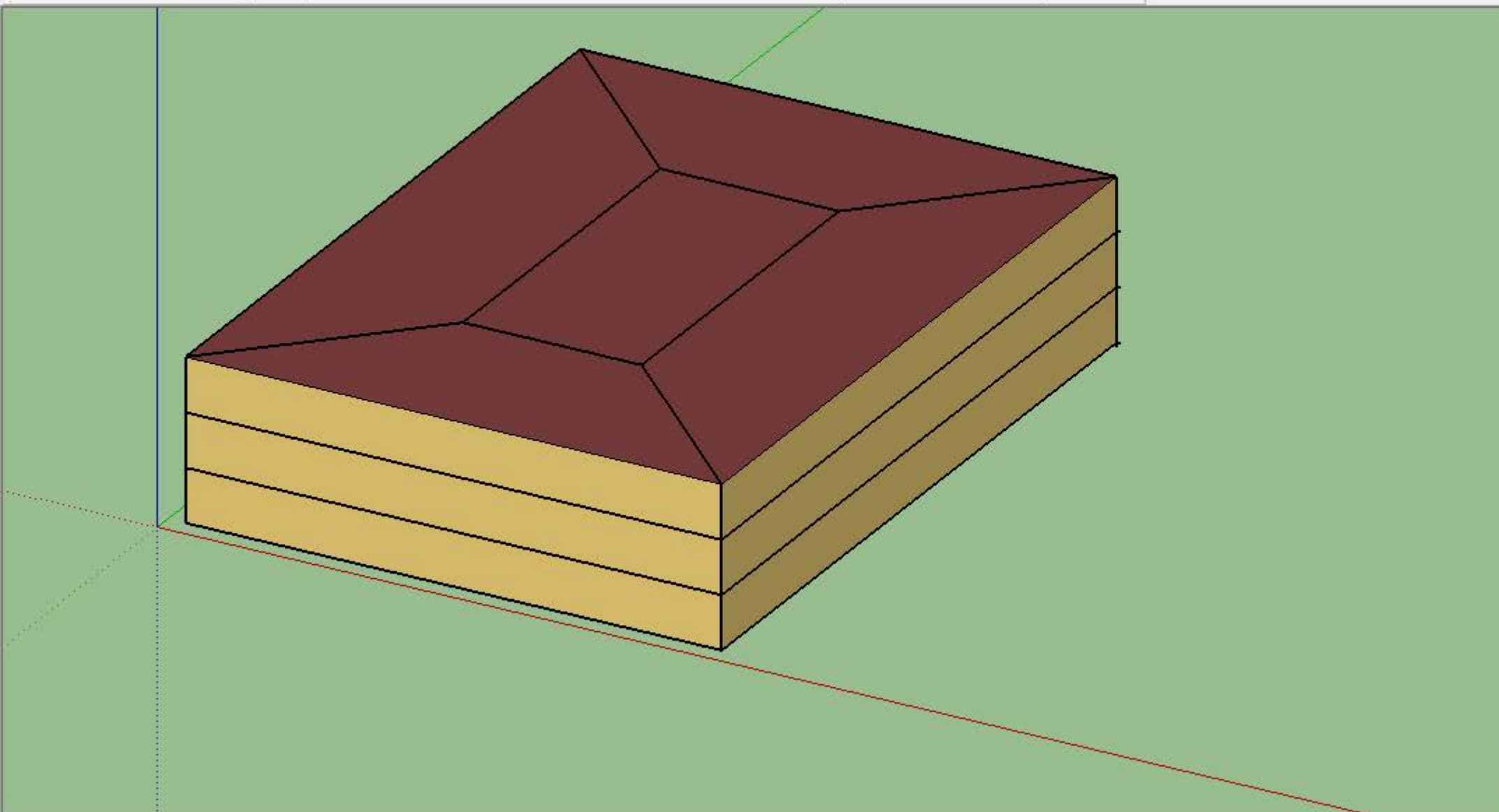
Line Tool

Draw edges or Line entities.

Tool Operation

1. Click at starting point of line.
2. Move cursor.
3. Click at ending point of line.
4. (optional) Move cursor.
5. (optional) Click to create connected line.
6. (optional) Repeat step 4 to create connected lines, or return to starting point of first line to create a face.

Activate Windows
Go to Settings to activate Windows.



Select Tool

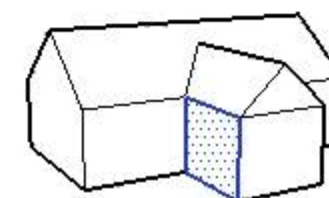
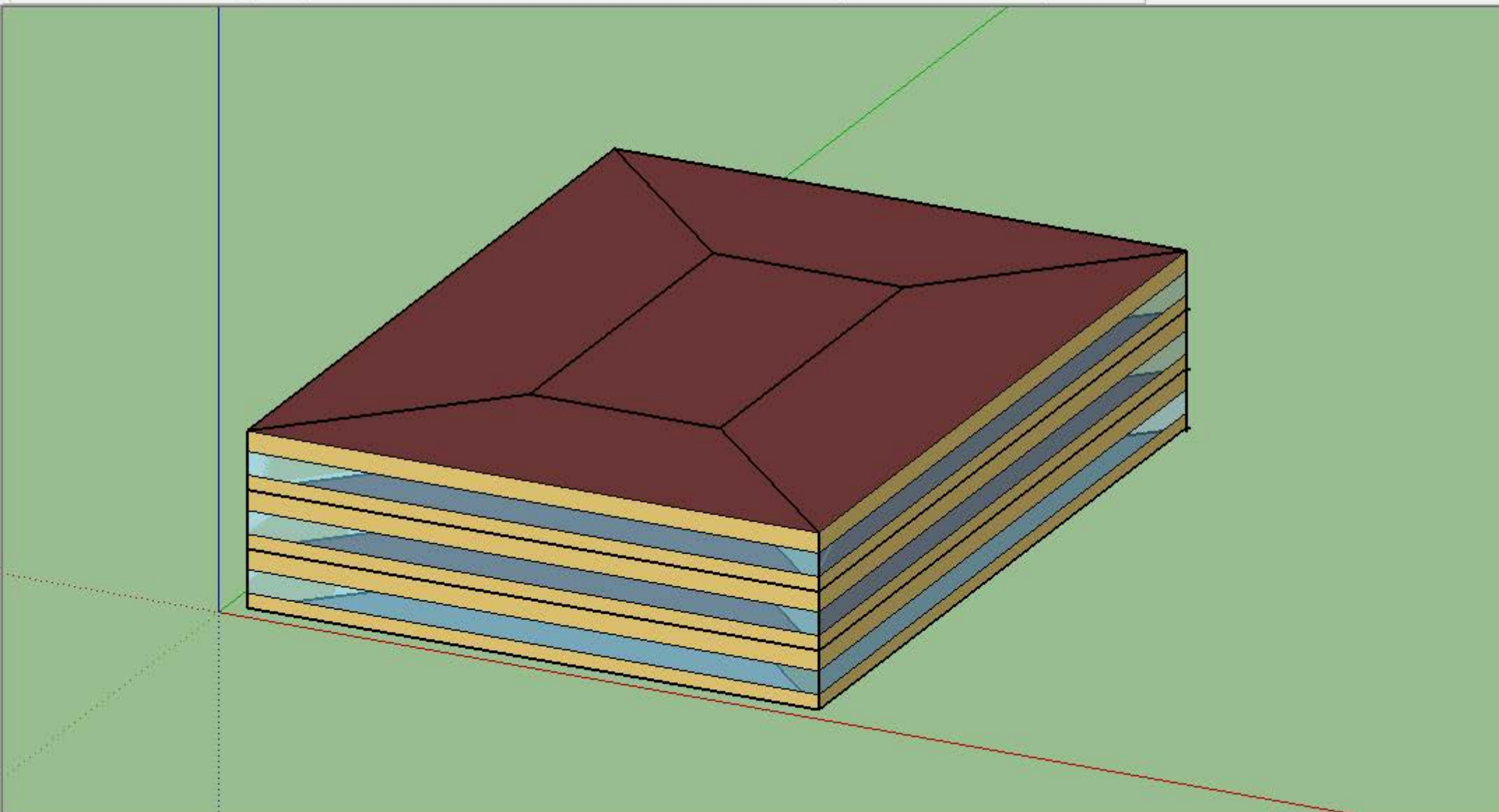
Select entities to modify when using other tools or commands.

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



Select Tool

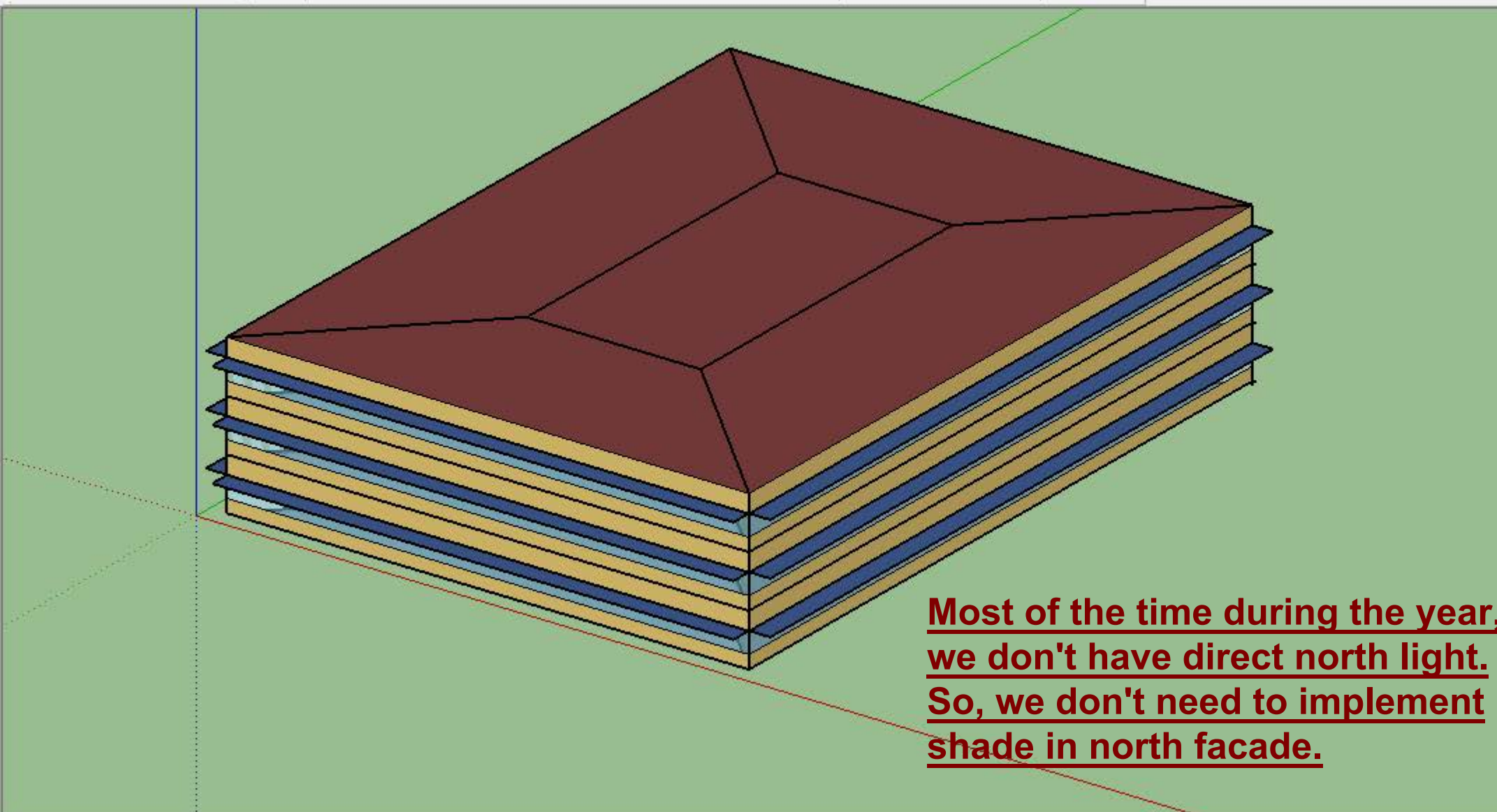
Select entities to modify when using other tools or commands.

Tool Operation

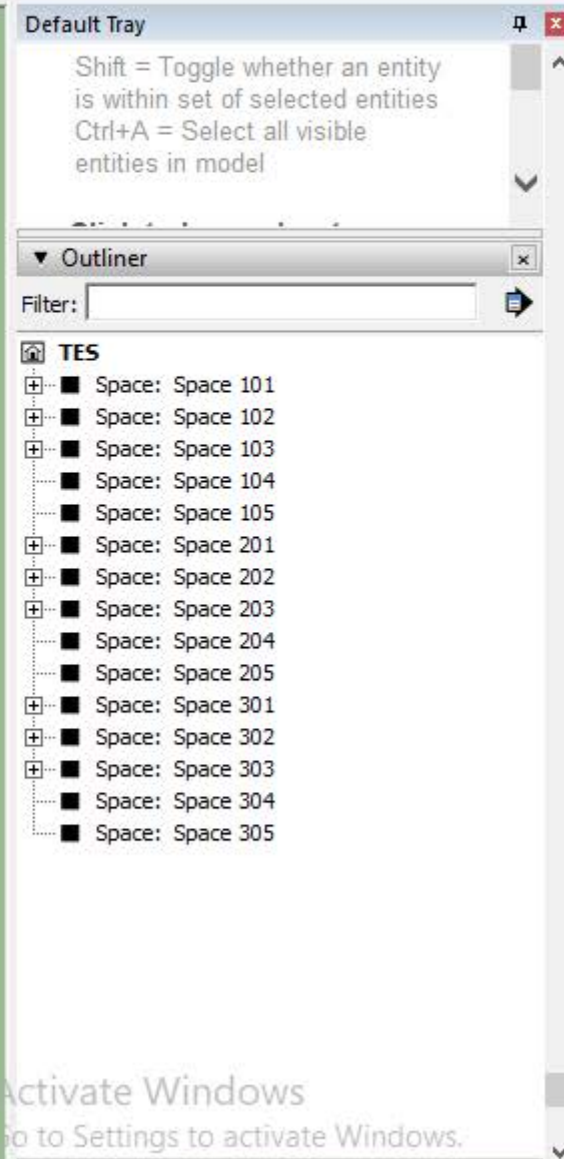
1. Click on an entity.

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



Most of the time during the year,
we don't have direct north light.
So, we don't need to implement
shade in north facade.





Set Attributes for Selected Spaces

| | |
|--|---|
| Space Type | 189.1-2009 - Office - OpenOffice - CZ1-3 |
| Building Story | Building Story 1 |
| Construction Set | 189.1-2009 - CZ1 - Office |
| Thermal Zone | <new thermal zone> |
| Set Parent Thermal Zone's - Ideal Air Loads Status | Yes |
| Set Parent Thermal Zone's - Thermostat | 189.1-2009 - Office - OpenOffice - CZ1-3 Thermostat |

OK Cancel

Default Tray

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

▼ Outliner

Filter:

TES

- Space: Space 101
- Space: Space 102
- Space: Space 103
- Space: Space 104
- Space: Space 105
- Space: Space 201
- Space: Space 202
- Space: Space 203
- Space: Space 204
- Space: Space 205
- Space: Space 301
- Space: Space 302
- Space: Space 303
- Space: Space 304
- Space: Space 305

These parameters, effect on the thermal conditions and active and passive strategies

Weather File

Change Weather File

Name: Piacenza

Latitude: 44.92

Longitude: 9.73

Elevation: 134

Time Zone: 1

Download weather files at www.energyplus.gov

Measure Tags (Optional):

ASHRAE Climate Zone

CEC Climate Zone

Select Year by:

☐ Calendar Year

2000

☒ First Day of Year

Sunday

Daylight Savings Time:

off

Starts

☐ Define by Day of The Week And Month

First

Sunday

January

☐ Define by Date

1/1/2000

Ends

☐ Define by Day of The Week And Month

First

Sunday

January

☐ Define by Date

1/1/2000

Design Days

Import From DDY

Design Days

Date

Temperature

Humidity

Pressure
Wind
Precipitation

Solar

Custom

Design Day Name

All

Day Of Month

Apply to Selected

Month

Apply to Selected

Day Type

Apply to Selected

Daylight Saving Time Indicator

Run Simulation

Output

Tree

Run



Finished

Warnings: 10**Errors:** 0

Output

Updating Shadowing Calculations, Start Date=03/22
Continuing Simulation at 03/22 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=04/11
Continuing Simulation at 04/11 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=05/01
Continuing Simulation at 05/01 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=05/21
Continuing Simulation at 05/21 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=06/10
Continuing Simulation at 06/10 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=06/30
Continuing Simulation at 06/30 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=07/20
Continuing Simulation at 07/20 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=08/09
Continuing Simulation at 08/09 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=08/29
Continuing Simulation at 08/29 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=09/18
Continuing Simulation at 09/18 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=10/08
Continuing Simulation at 10/08 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=10/28
Continuing Simulation at 10/28 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=11/17
Continuing Simulation at 11/17 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=12/07
Continuing Simulation at 12/07 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=12/27
Continuing Simulation at 12/27 for RUN PERIOD 1
Writing tabular output file results using HTML format.
Computing Life Cycle Costs and Reporting
Writing final SQL reports
EnergyPlus Run Time=00hr 00min 20.19sec
Script executing from: C:/Users/utente/AppData/Local/Temp/OpenStudio.a09876/resources/run/6-UserScript-0
Found UserScript 'OpenStudio Results'.
result = true
Processed 1 base script and 0 merged scripts

100%

**Run the model to in open studio
to analyze and have analytical
report.**

Reports: OpenStudio Results

Open ResultsViewer
for Detailed Reports

Model Summary

The report of building analysis

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

Building Summary

| Information | Value | Units |
|--|------------|---------------|
| Building Name | Building 1 | building_name |
| Net Site Energy | 2,113,120 | kBtu |
| Total Building Area | 38,750 | ft^2 |
| EUI (Based on Net Site Energy and Total Building Area) | 54.53 | kBtu/ft^2 |
| OpenStudio Standards Building Type | | |

Weather Summary

| | Value |
|--------------|---------------------------------|
| Weather File | Piacenza - ITA IGDG WMO#=160840 |
| Latitude | 44.92 |
| Longitude | 9.73 |

Activate Windows

Go to Settings to activate Windows.

ConstructionsConstruction SetsConstructionsMaterials

189.1-2009 - CZ1 - Office

189.1-2009 - CZ2 - Office

189.1-2009 - CZ3 - Office

189.1-2009 - CZ4 - Office

189.1-2009 - CZ5 - Office

189.1-2009 - CZ6 - Office

189.1-2009 - CZ7-8 - Office

N-constructionset1311

Drag From Library

+

x2

x

Name

N-constructionset1311

Exterior Surface Constructions

Walls

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 1

Floors

ExtSlabCarpet 4in ClimateZone 1-8

Roofs

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1

Interior Surface Constructions

Walls

Interior Wall

Floors

Interior Floor

Ceilings

Interior Ceiling

Ground Contact Surface Constructions

Walls

ExtSlabCarpet 4in ClimateZone 1-8

Floors

ExtSlabCarpet 4in ClimateZone 1-8

Ceilings

ExtSlabCarpet 4in ClimateZone 1-8

Exterior Sub Surface Constructions

Fixed Windows

ASHRAE 189.1-2009 ExtWindow

Operable Windows

ASHRAE 189.1-2009 ExtWindow

Doors

Exterior Door

My ModelLibraryEdit

Constructions

Air Wall

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 2-5

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 7-8

ASHRAE 189.1-2009 ExtRoof Metal ClimateZone 6

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 1

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 2

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 3

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 4

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 5

Activate Windows

Go to Settings to activate Windows.

ConstructionsConstruction SetsConstructionsMaterials

189.1-2009 - CZ1 - Office

189.1-2009 - CZ2 - Office

189.1-2009 - CZ3 - Office

189.1-2009 - CZ4 - Office

189.1-2009 - CZ5 - Office

189.1-2009 - CZ6 - Office

189.1-2009 - CZ7-8 - Office

N-constructionset1311

Drag From Library

Name

N-constructionset1311

Exterior Surface Constructions

Walls

Floors

Roofs

Interior Surface Constructions

Walls

Floors

Ceilings

Ground Contact Surface Constructions

Walls

Floors

Ceilings

Exterior Sub Surface Constructions

Fixed Windows

Operable Windows

Doors

My ModelLibraryEdit

Air Wall

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 2-5

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 7-8

ASHRAE 189.1-2009 ExtRoof Metal ClimateZone 6

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 1

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 2

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 3

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 4

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 5

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 7

We can create our custom construction set by modification

Activate Windows

Go to Settings to activate Windows

Constructions

Construction Sets

Constructions

Materials

Interior Door

Interior Floor

Interior Partition

Interior Wall

Interior Window

N-wall

Internal Source Constructions

C-factor Underground Wall Constructions

F-factor Ground Floor Constructions

Drag From Library

1/2IN Gypsum

8IN Concrete HW

N-insulation

1/2IN Gypsum

Drag From Library

Fenestration Divider Type:

Fenestration Tint:

Fenestration Gas Fill:

Fenestration Low Emissivity Coating:

off

Layer:

Outside

My Model

Library

Edit

Materials

No Mass Materials

Air Gap Materials

Air Wall Materials

Infrared Transparent Materials

Roof Vegetation Materials

Simple Glazing System Window Materials

Glazing Window Materials

Gas Window Materials

Gas Mixture Window Materials

Daylight Redirection Device Window Materials

Blind Window Materials

Screen Window Materials

Constructions Construction Sets Constructions Materials

Interior Door
Interior Floor
Interior Partition
Interior Wall
Interior Window
N-wall
TES-wall 1
Internal Source Constructions
C-factor Underground

Drag From Library

Layer:
Outside

Fenestration Divider Type: Fenestration Tint:
Fenestration Gas Fill: Fenestration Low Emissivity Coating: off

1IN Stucco
M11 100mm lightweight concrete
Wall Insulation [31]
F16 Acoustic tile
1/2IN Gypsum

Drag From Library

Materials

1/2 IN Gypsum
1IN Stucco
8IN Concrete HW
F08 Metal surface
F 16 Acoustic tile
G01a 19mm gypsum board
G05 25mm wood
I01 25mm insulation board
M11 100mm lightweight concrete
MAT-CG05 4 F1W CONCRETE

We can create our custom constructions like walls and roofs by modification

Activate Windows
Go to Settings to activate Windows

Constructions Construction Sets Constructions Materials

My Model Library Edit

Materials

- 1/2IN Gypsum
- 1IN Stucco
- TES-1IN Stucco 1**
- 8IN Concrete HW
- F08 Metal surface
- F16 Acoustic tile
- G01a 19mm gypsum board

Drag From Library

Name:

TES-1IN Stucco 1

Measure Tags (Optional):

Standard: *Standard Source:*

Standards Category: *Standards Identifier:*

Composite Framing Material: *Composite Framing Configuration:*

Composite Framing Depth: *Composite Framing Size:*

Composite Cavity Insulation:

Roughness: Smooth **Thickness:** 0.04 m

Conductivity: 0.691800 W/m·K **Density:** 1858.000000 kg/m³

Specific Heat: 837.000000 J/kg·K **Thermal Absorptance:** 0.900000

We can create our custom materials with different thickness and parameters value by modification

Activate Windows
Go to Settings to activate Windows.

Constructions

Construction Sets

Constructions

Materials

189.1-2009 - CZ1 - Office

189.1-2009 - CZ2 - Office

189.1-2009 - CZ3 - Office

189.1-2009 - CZ4 - Office

189.1-2009 - CZ5 - Office

189.1-2009 - CZ6 - Office

189.1-2009 - CZ7-8 - Office

N-constructionset1311

Drag From Library

+

X2

×

♻️

Name

189.1-2009 - CZ1 - Office

Exterior Surface Constructions

Walls

Floors

Roofs

TES-wall 1

ExtSlabCarpet 4in ClimateZone 1-8

ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1

Interior Surface Constructions

Walls

Floors

Ceilings

Interior Wall

Interior Floor

Interior Ceiling

Ground Contact Surface Constructions

Walls

Floors

Ceilings

ExtSlabCarpet 4in ClimateZone 1-8

ExtSlabCarpet 4in ClimateZone 1-8

ExtSlabCarpet 4in ClimateZone 1-8

Exterior Sub Surface Constructions

Fixed Windows

Operable Windows

Doors

ASHRAE 189.1-2009 ExtWindow

ASHRAE 189.1-2009 ExtWindow

Exterior Door

My Model

Library

Edit

ExtSlabCarpet 4in ClimateZone 1-8

Interior Ceiling

Interior Door

Interior Floor

Interior Partition

Interior Wall

Interior Window

N-wall

TES-wall 1

Internal Source Constructions

C-factor Underground Wall Constructions

We can define our different constructions