Politechnico di Milano

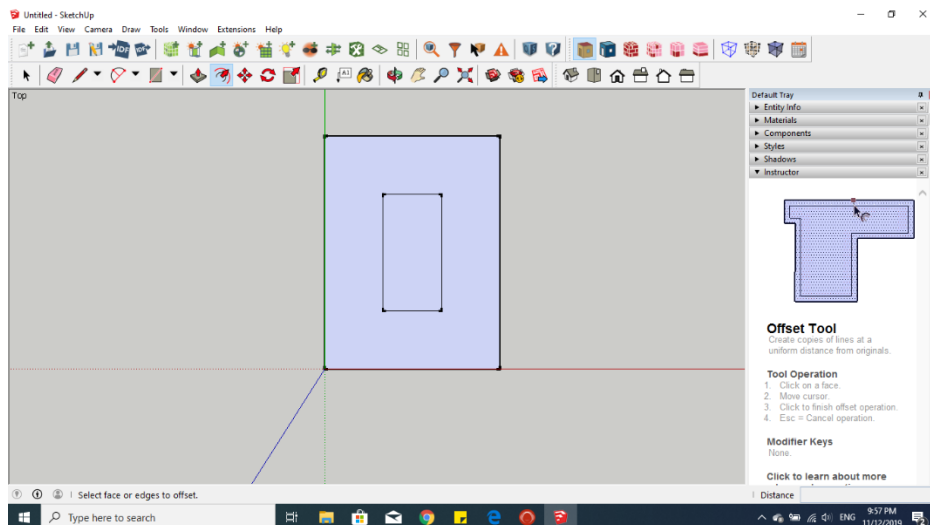Pedram Abedini Arabani

Question number 1
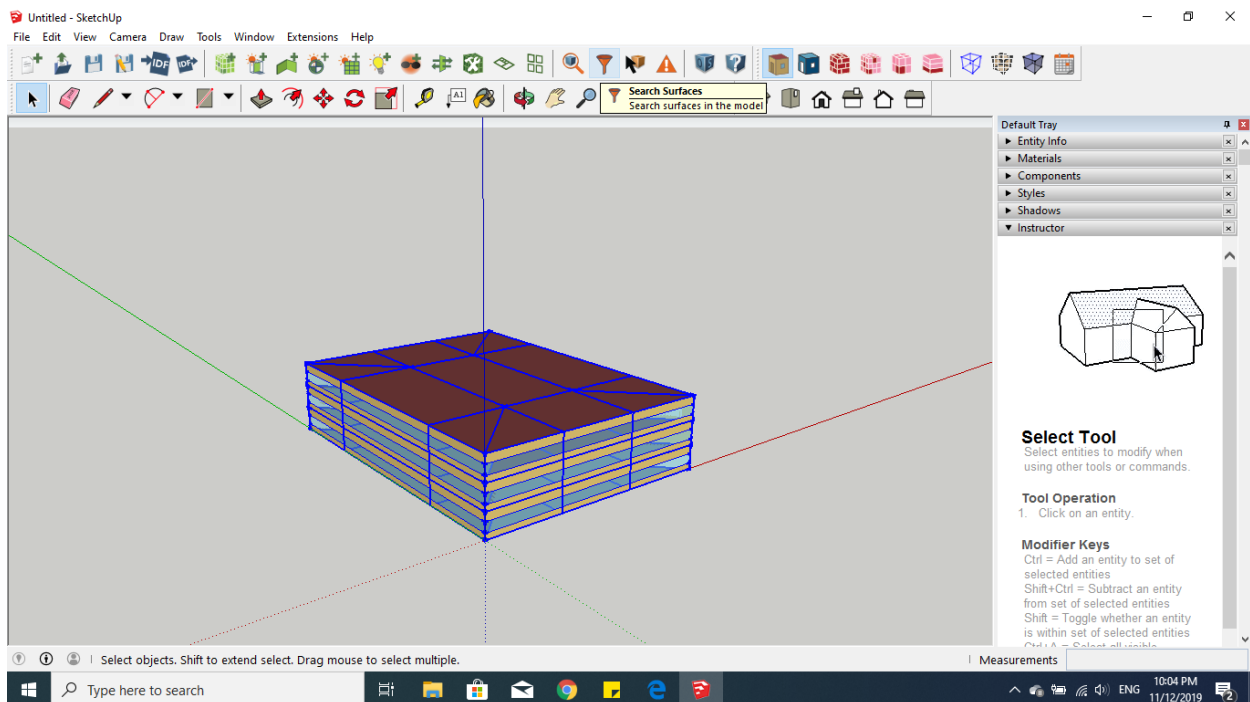
From lecture in the class

$$\dot{Q}_{12,\,N\text{ shields}} = \frac{A\sigma(T_1^4 - T_2^4)}{\left(\dfrac{1}{\varepsilon_1} + \dfrac{1}{\varepsilon_2} - 1\right) + \left(\dfrac{1}{\varepsilon_{3,1}} + \dfrac{1}{\varepsilon_{3,2}} - 1\right) + \cdots + \left(\dfrac{1}{\varepsilon_{N,1}} + \dfrac{1}{\varepsilon_{N,2}} - 1\right)}$$
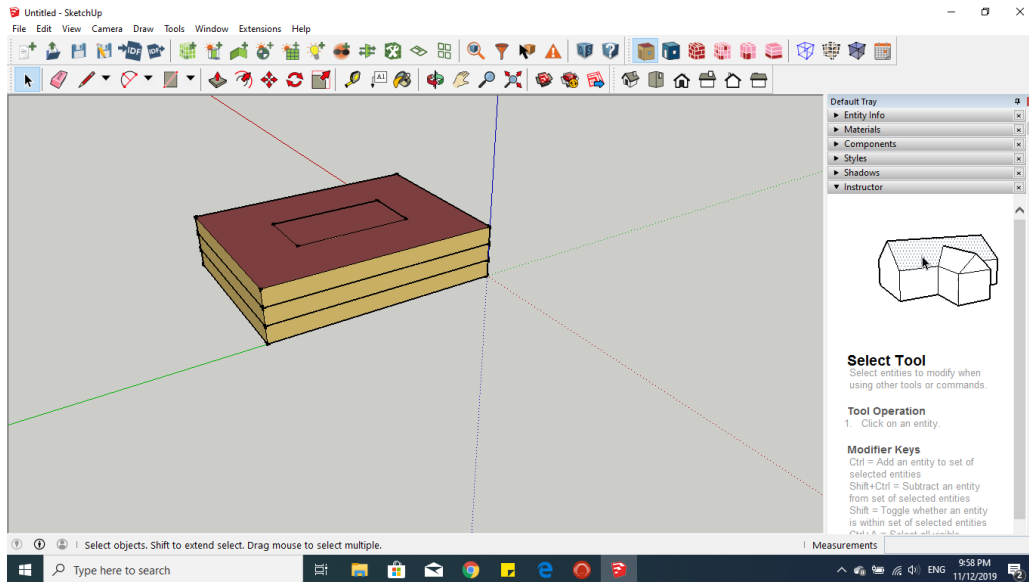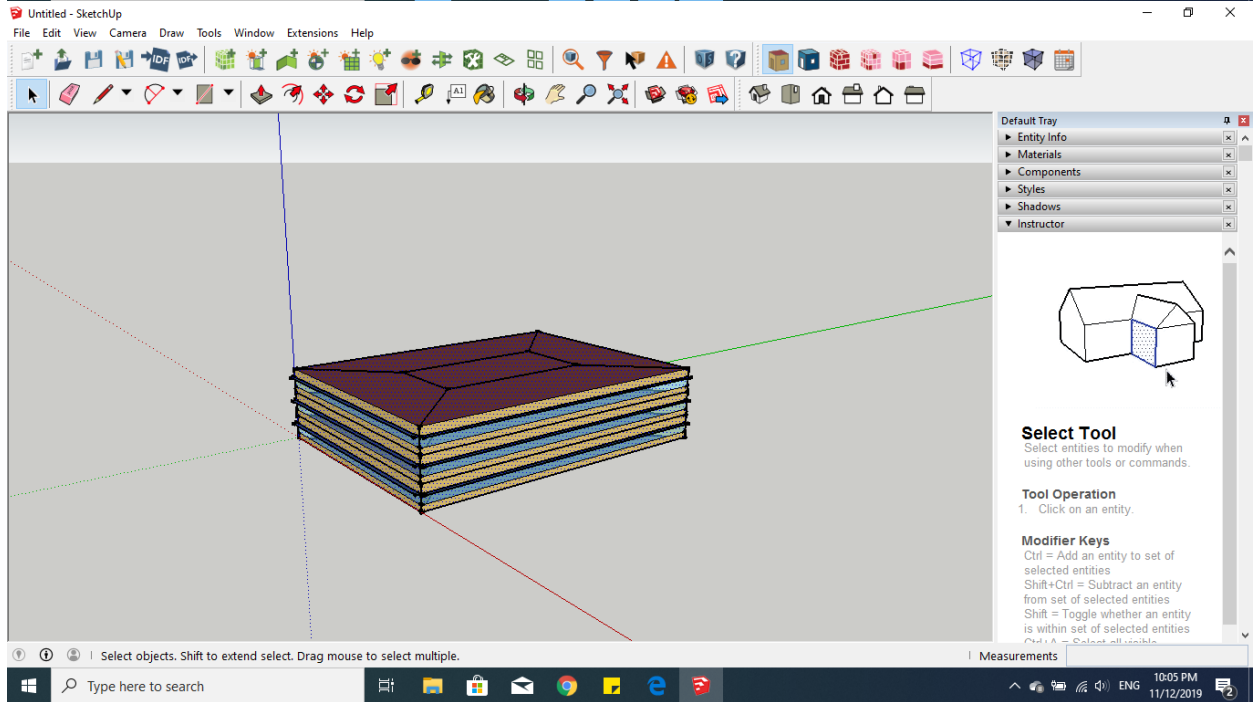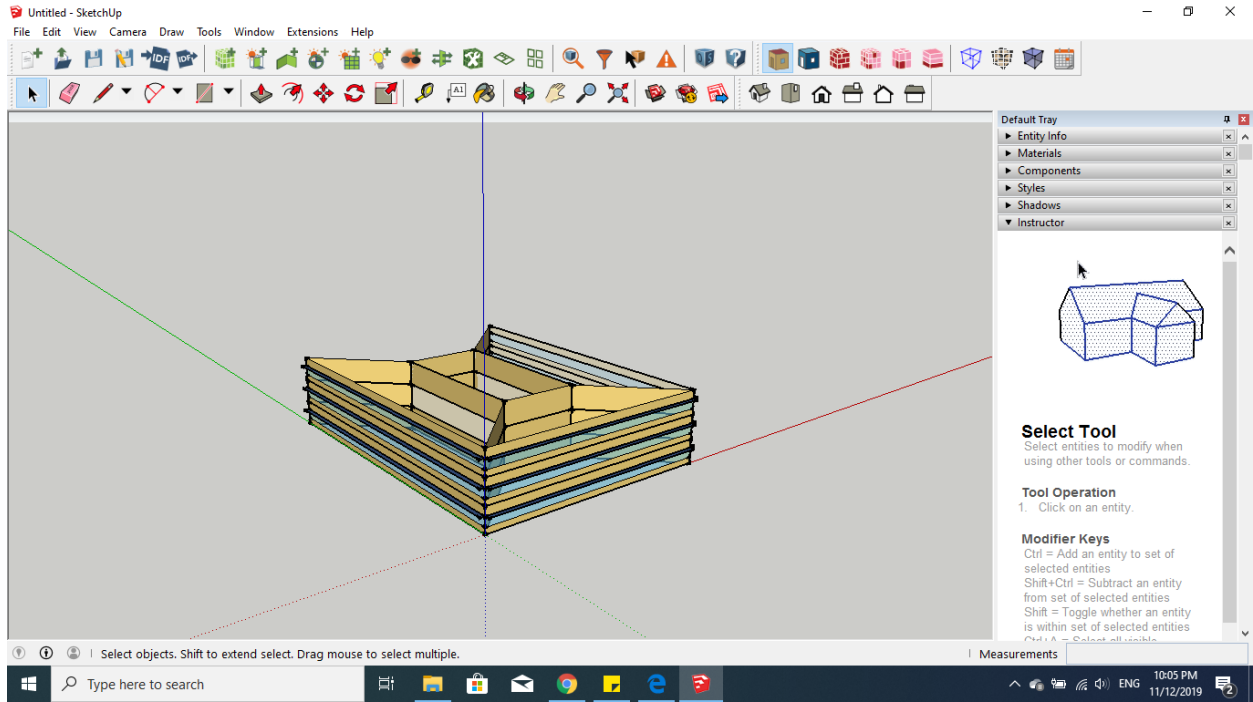
$$\dot{Q}_{12,\,N\text{ shields}} = \frac{A\sigma(T_1^4 - T_2^4)}{(N+1)\left(\dfrac{1}{\varepsilon} + \dfrac{1}{\varepsilon} - 1\right)} = \frac{1}{N+1}\,\dot{Q}_{12,\,\text{no shield}}$$
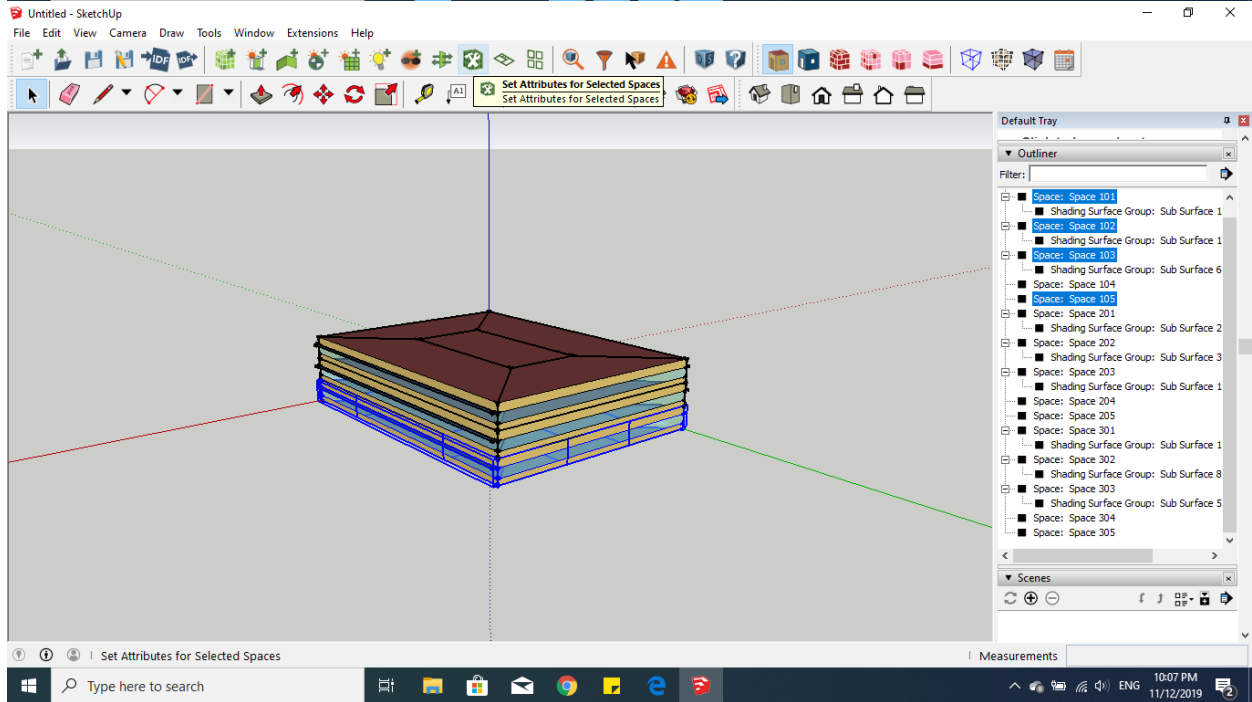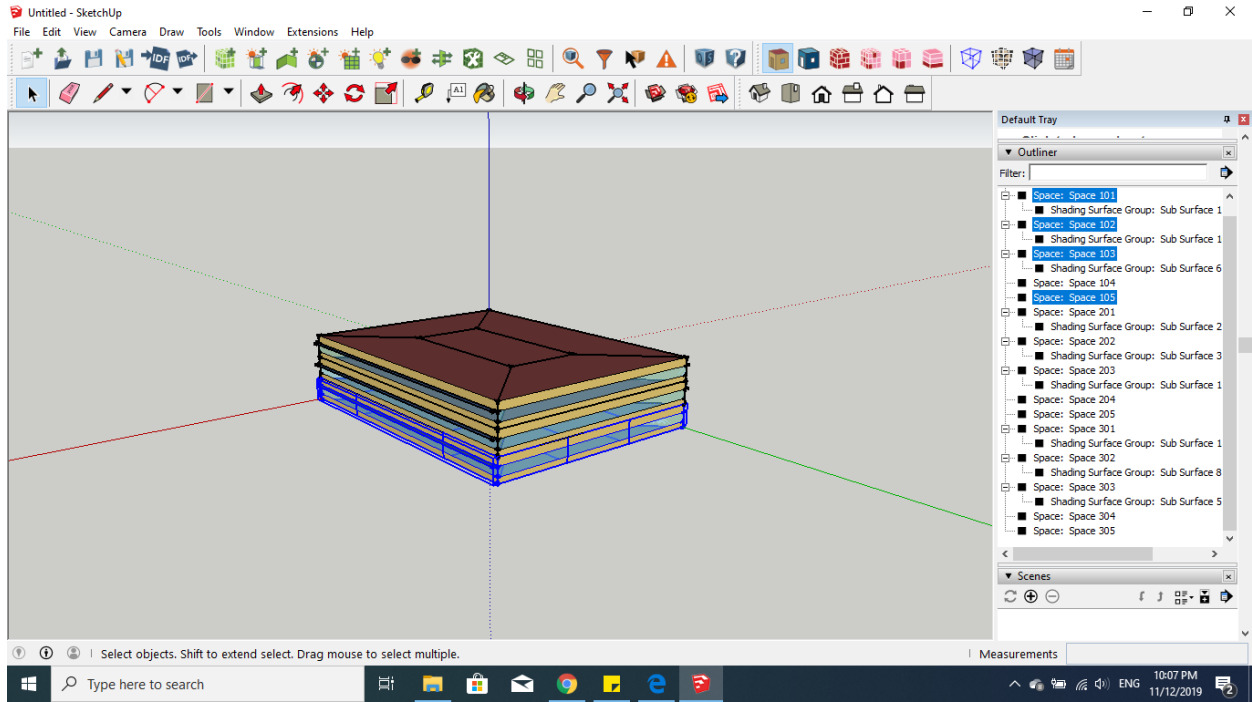
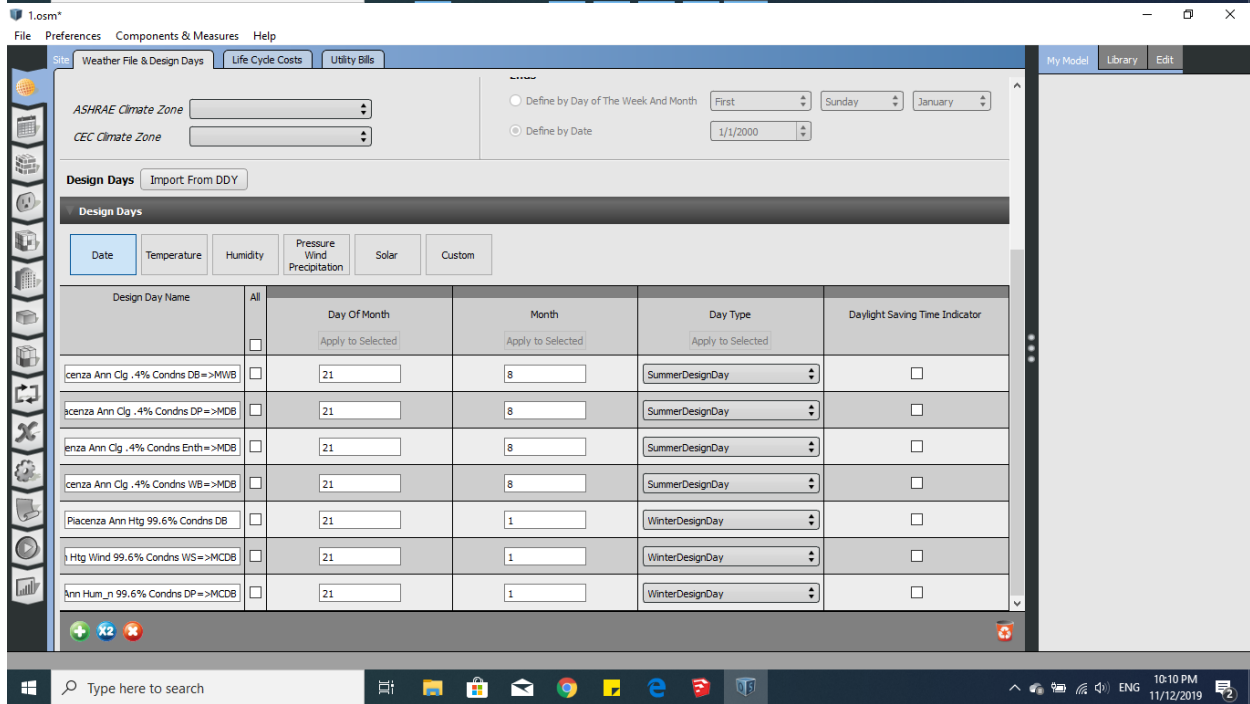$Q_{12,\,N\text{ ShIELD}} = 1/100\; Q_{12,\text{NO SHIELD}} = (N+1)=100 \quad n= 99$

Question Number 2

Window 1 (Top)

1.osm*

Open DDY File

TES › Exercise › Weather Data

Search Weather Data

Organize ▾   New folder

- This PC
  - 3D Objects
  - A360 Drive
  - Desktop
  - Documents
  - Downloads
  - Music
  - Pictures
  - Videos
  - Local Disk (C:)
  - Programe (D:)
  - Project (E:)

Name	Date modified	Type
ITA_Milano-Linate.160800_IGDG.ddy	6/13/2016 6:34 PM	DDY File
ITA_Piacenza.160840_IGDG.ddy	6/13/2016 6:33 PM	DDY File

My Model **Library** **Edit**

off

		Week And Month	First	Sunday	January
			1/1/2000		
		Week And Month	First	Sunday	January
			1/1/2000		

File name: ITA_Piacenza.160840_IGDG.ddy   Files (*.ddy)

Open   **Cancel**

Date	Temperature	Humidity	Pressure Wind Precipitation	Solar	Custom

Design Day Name	All	Day Of Month	Month	Day Type	Daylight Saving Time Indicator
		Apply to Selected	Apply to Selected	Apply to Selected	

10:10 PM 11/12/2019 ENG

Window 2 (Bottom)

1.osm*

File Preferences Components & Measures Help

Site **Weather File & Design Days** Life Cycle Costs Utility Bills

My Model **Library** **Edit**

ASHRAE Climate Zone

CEC Climate Zone

○ 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	Month	Day Type	Daylight Saving Time Indicator
		Apply to Selected	Apply to Selected	Apply to Selected	
cenza Ann Clg .4% Condns DB=>MWB	☐	21	8	SummerDesignDay	☐
scenza Ann Clg .4% Condns DP=>MDB	☐	21	8	SummerDesignDay	☐
enza Ann Clg .4% Condns Enth=>MDB	☐	21	8	SummerDesignDay	☐
cenza Ann Clg .4% Condns WB=>MDB	☐	21	8	SummerDesignDay	☐
Piacenza Ann Htg 99.6% Condns DB	☐	21	1	WinterDesignDay	☐
Htg Wind 99.6% Condns WS=>MCDB	☐	21	1	WinterDesignDay	☐
Ann Hum_n 99.6% Condns DP=>TACDB	☐	21	1	WinterDesignDay	☐

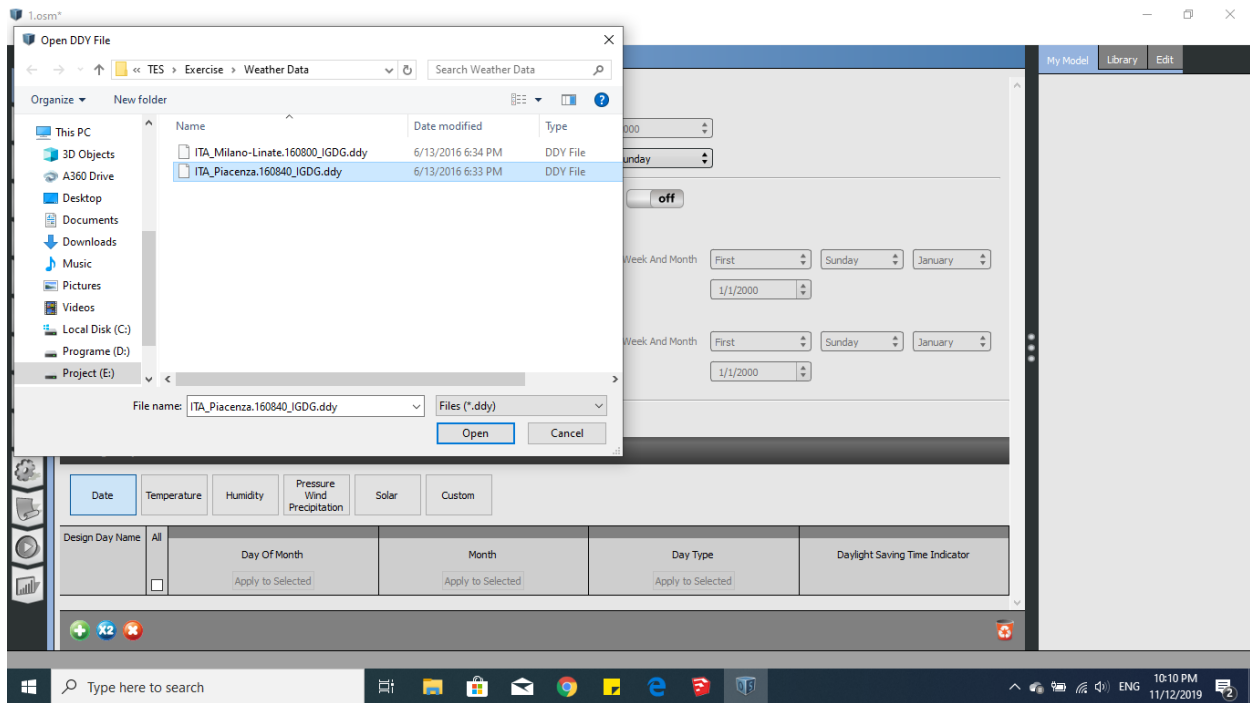10:10 PM 11/12/2019 ENG

Type here to search

Screenshot 1 (top):

1.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

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	357,801	kBtu
Total Building Area	10,764	ft^2
EUI (Based on Net Site Energy and Total Building Area)	33.24	kBtu/ft^2
OpenStudio Standards Building Type		

Weather Summary

	Value
Weather File	Piacenza - ITA IGDG WMO#=160840
Latitude	44.92
Longitude	9.73
Elevation	440 (ft)

Type here to search

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Screenshot 2 (bottom):

1.osm

File   Preferences   Components & Measures   Help

Results Summary

Reports: OpenStudio Results

Open ResultsViewer for Detailed Reports

Model Summary
Annual Overview
Monthly Overview
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Space Type Summary
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Exterior Lighting
Water Use Equipment
HVAC Load Profiles
Zone Conditions
Zone Overview
Zone Equipment Detail
Air Loops Detail

Weather Summary

	Value
Weather File	Piacenza - ITA IGDG WMO#=160840
Latitude	44.92
Longitude	9.73
Elevation	440 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

Sizing Period Design Days

	Maximum Dry Bulb (F)	Daily Temperature Range (R)	Humidity Value	Humidity Type	Wind Speed (mph)	Wind Direction
PIACENZA ANN CLG .4% CONDNS	91.58	21.42	72.86	Wetbulb	5.14	90.0

Type here to search

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1.osm

File Preferences Components & Measures Help

Results Summary

Reports: OpenStudio Results

Open ResultsViewer for Detailed Reports

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- Monthly Overview
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- HVAC Load Profiles
- Zone Conditions
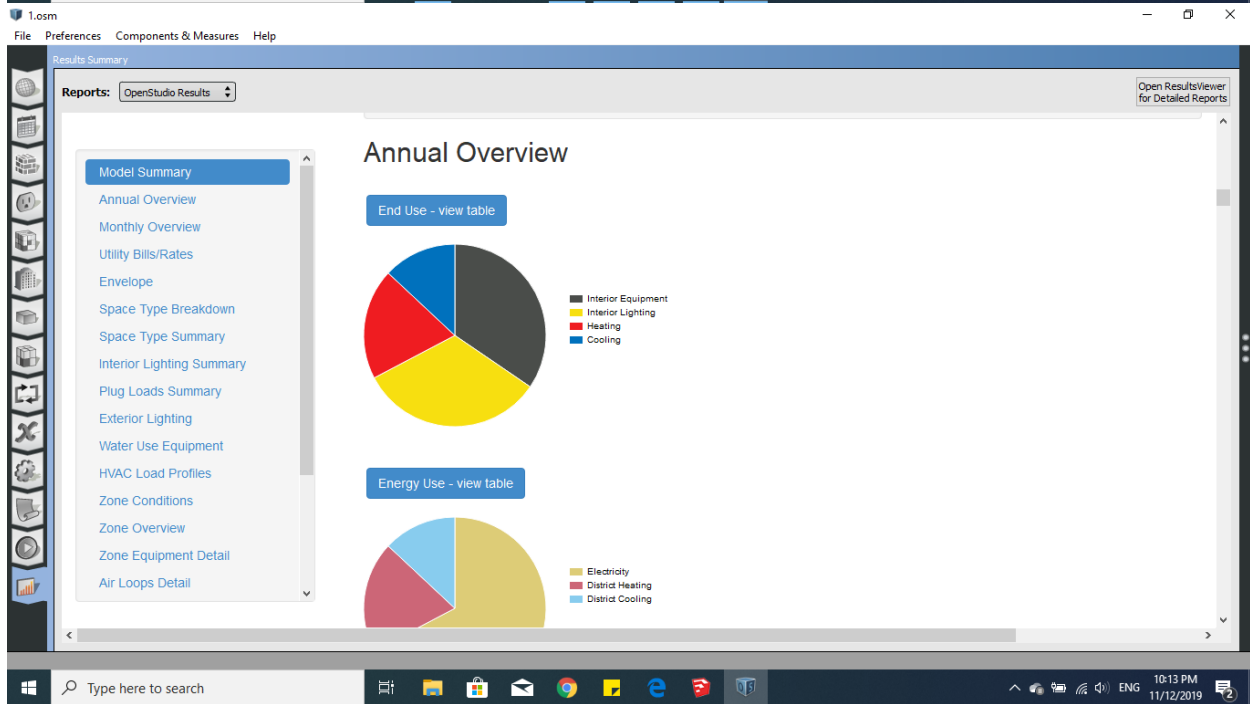- Zone Overview
- Zone Equipment Detail
- Air Loops Detail

Sizing Period Design Days

	Maximum Dry Bulb (F)	Daily Temperature Range (R)	Humidity Value	Humidity Type	Wind Speed (mph)	Wind Direction
PIACENZA ANN CLG .4% CONDNS DB=>MWB	91.58	21.42	72.86	Wetbulb [F]	5.14	90.0
PIACENZA ANN CLG .4% CONDNS DP=>MDB	81.32	21.42	73.4	Dewpoint [F]	5.14	90.0
PIACENZA ANN CLG .4% CONDNS ENTH=>MDB	86.54	21.42	32.2	Enthalpy [Btu/lb]	5.14	90.0
PIACENZA ANN CLG .4% CONDNS WB=>MDB	86.18	21.42	76.28	Wetbulb [F]	5.14	90.0
PIACENZA ANN HTG 99.6% CONDNS DB	21.02	0.0	21.02	Wetbulb [F]	4.47	250.0
PIACENZA ANN HTG WIND 99.6% CONDNS WS=>MCDB	42.44	0.0	42.44	Wetbulb [F]	19.91	250.0
PIACENZA ANN HUM_N 99.6% CONDNS DP=>MCDB	38.3	0.0	11.66	Dewpoint [F]	4.47	250.0

Type here to search

ENG 10:12 PM 11/12/2019

1.osm

File Preferences Components & Measures Help

Results Summary

Reports: OpenStudio Results

Open ResultsViewer for Detailed Reports

- Model Summary
- Annual Overview
- Monthly Overview
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- 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
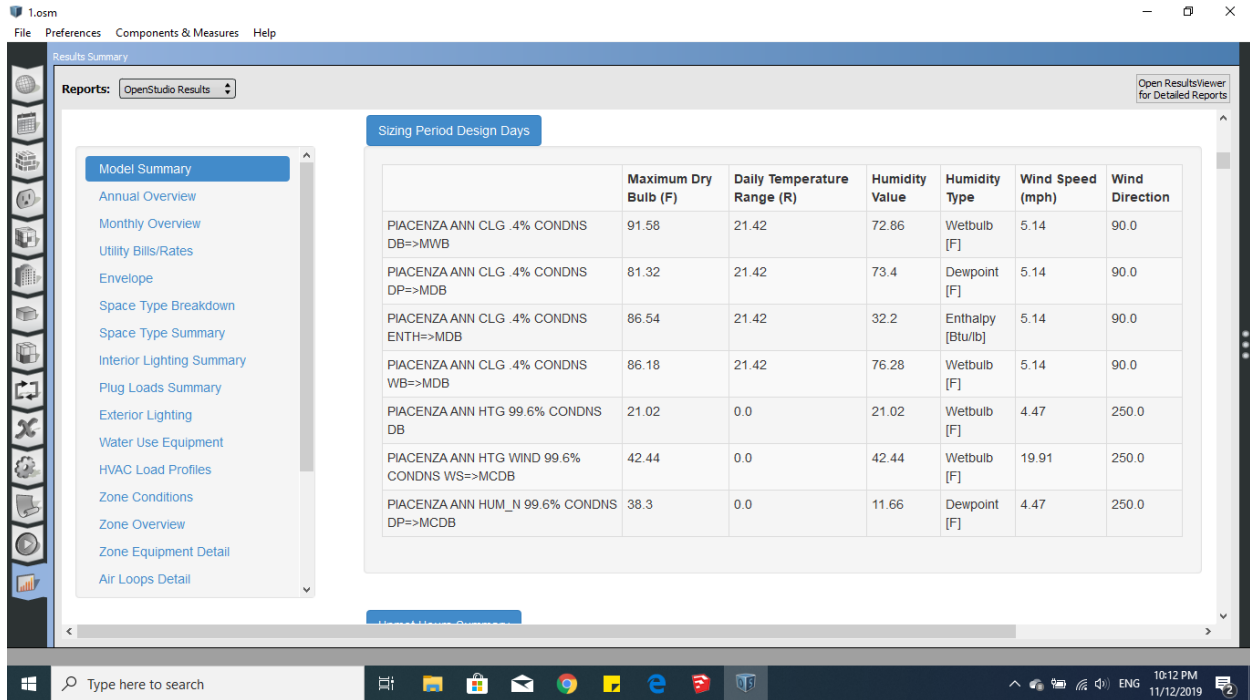- Zone Equipment Detail
- Air Loops Detail

Annual Overview
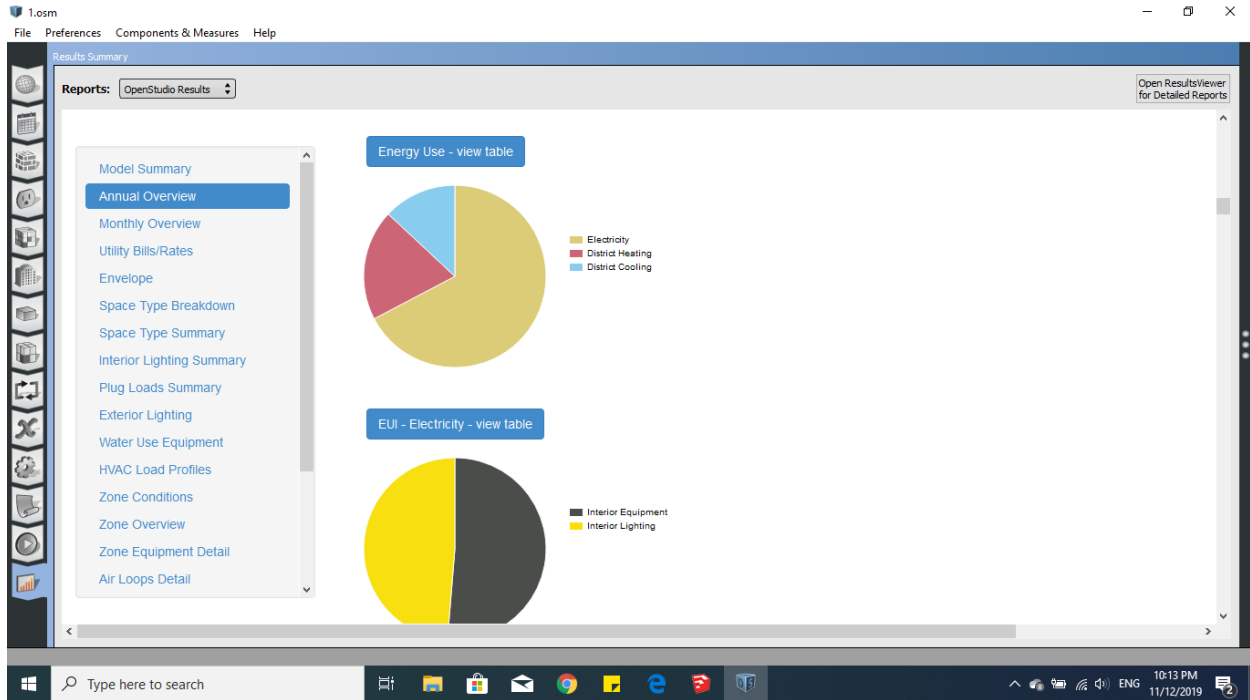
End Use - view table

- Interior Equipment
- Interior Lighting
- Heating
- Cooling

Energy Use - view table

- Electricity
- District Heating
- District Cooling

Type here to search

ENG 10:13 PM 11/12/2019

Window 1 (top)

1.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

Energy Use - view table

- Electricity
- District Heating
- District Cooling

EUI - Electricity - view table

- Interior Equipment
- Interior Lighting

Type here to search

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Window 2 (bottom)

1.osm

File　Preferences　Components & Measures　Help

Results Summary

Reports: EnergyPlus Results ▾

Open ResultsViewer for Detailed Reports

Program Version:**EnergyPlus, Version 8.5.0-c87e61b44b, YMD=2019.11.12 22:10**　　　Table of Contents

Tabular Output Report in Format: **HTML**

Building: **Building 1**

Environment: **RUN PERIOD 1 ** Piacenza - ITA IGDG WMO#=160840**

Simulation Timestamp: **2019-11-12 22:10:48**

Report: **Annual Building Utility Performance Summary**　　　Table of Contents

For: **Entire Facility**

Timestamp: **2019-11-12 22:10:48**

Values gathered over 8760.00 hours

Site and Source Energy

	Total Energy [GJ]	Energy Per Total Building Area [MJ/m2]	Energy Per Conditioned Building Area [MJ/m2]
Total Site Energy	377.50	377.50	377.50
Net Site Energy	377.50	377.50	377.50
Total Source Energy	1124.80	1124.80	1124.80

Type here to search

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File   Preferences   Components & Measures   Help

Results Summary

Reports: EnergyPlus Results

Open ResultsViewer
for Detailed Reports

	Total Energy [GJ]	Energy Per Total Building Area [MJ/m2]	Energy Per Conditioned Building Area [MJ/m2]
Total Site Energy	377.50	377.50	377.50
Net Site Energy	377.50	377.50	377.50
Total Source Energy	1124.80	1124.80	1124.80
Net Source Energy	1124.80	1124.80	1124.80

Site to Source Energy Conversion Factors

	Site=>Source Conversion Factor
Electricity	3.167
Natural Gas	1.084
District Cooling	1.056
District Heating	3.613
Steam	0.300
Gasoline	1.050
Diesel	1.050
Coal	1.050
Fuel Oil #1	1.050

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