NAME: JUI HALVADIA 19-11-2019

EXAMPLE AND SUMMARY

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

Solar radiation is an energy radiated from the sun in the form of electromagnetic waves, including visible and ultraviolet light and infrared radiation. The spectrum of solar radiation is close to that of a black body with a temp. of about 5800 K. the energy that comes to the earth is modified due to the phenomenon of dispersion and absorption.

Scattering is when solar radiation passes through and some of the wavelengths are deflected in all directions by gas molecules, particles, and water vapor. When these particles are suspended, they act like prisms and display a variety of colors. A wonderful example of this is the display of colors during the sunset.

Atmospheric absorption

The absorption of solar radiation is due to the atmospheric components, in particular ozone, water and carbon dioxide, which absorb the incident radiation in absorption bands, consequently modifying its energy spectrum. The stratospheric ozone absorbs almost all the ultraviolet component of solar radiation.

Dispersion

When the sun's rays are not perpendicular to the surface of earth, the energy becomes dispersed or spread out over a greater area. If the available energy reaching the atmosphere is constant and is dispersed over a greater area, the amount of energy at any given point within the area decreases and therefore the temperature is lower. Dispersion of insolation in the atmosphere is caused by the radiation of earth.

Air mass

The sun to the zenith crosses the minimum thickness of the atmosphere, the sun with an elevated zenith angle crosses a large thickness of the atmosphere.

The solar radiation density

The maximum yearly average solar radiation density is the solar constant, which is the solar irradiance, its value is 1367 W/m^2.

Solar energy – Availability

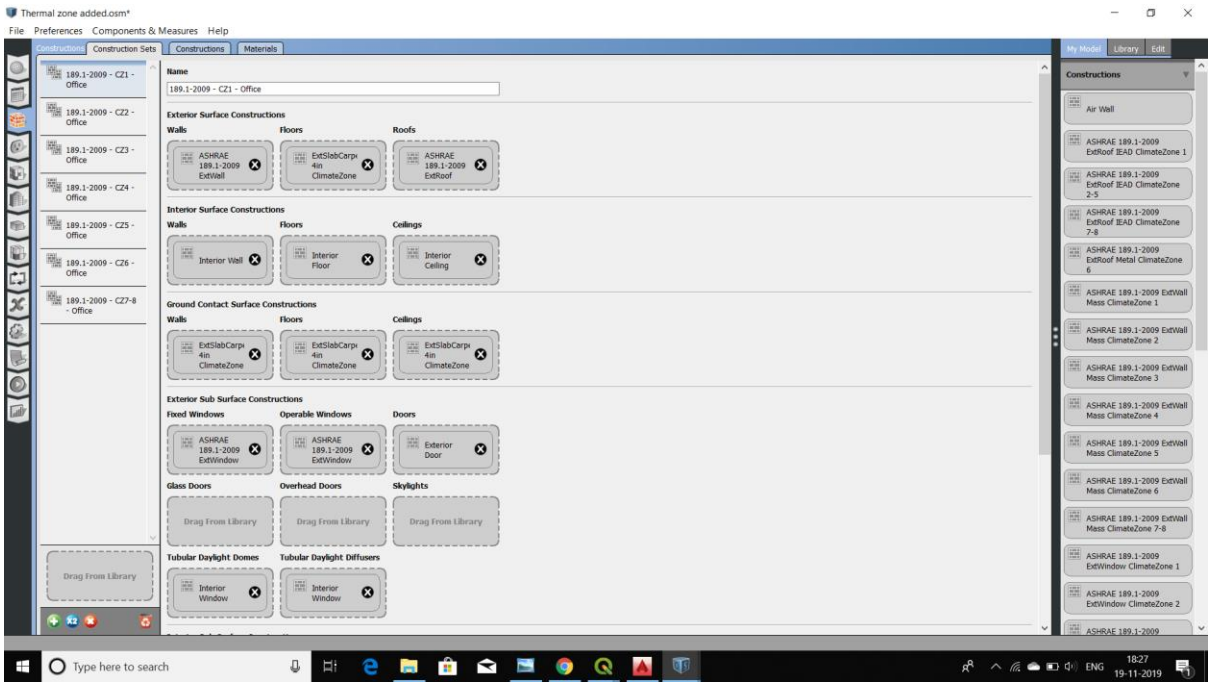
The sun position in the sky, which changes daily and seasonally

The weather conditions

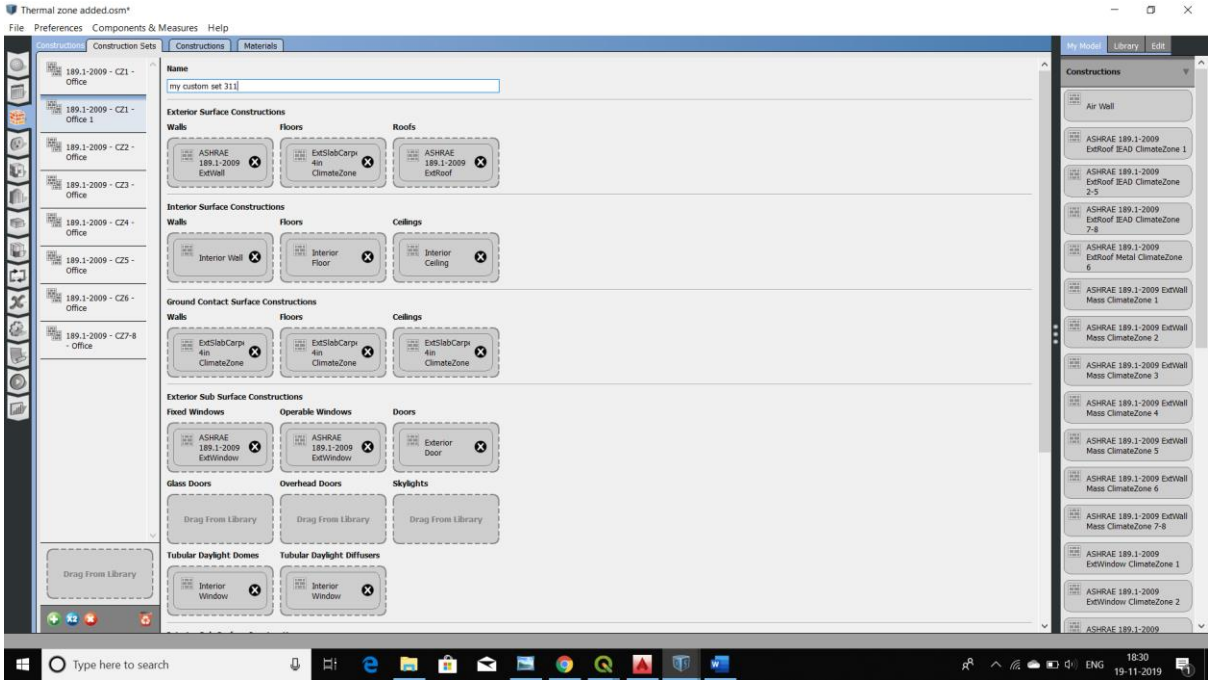
The site altitude over the sea level and sunshine hours

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!)

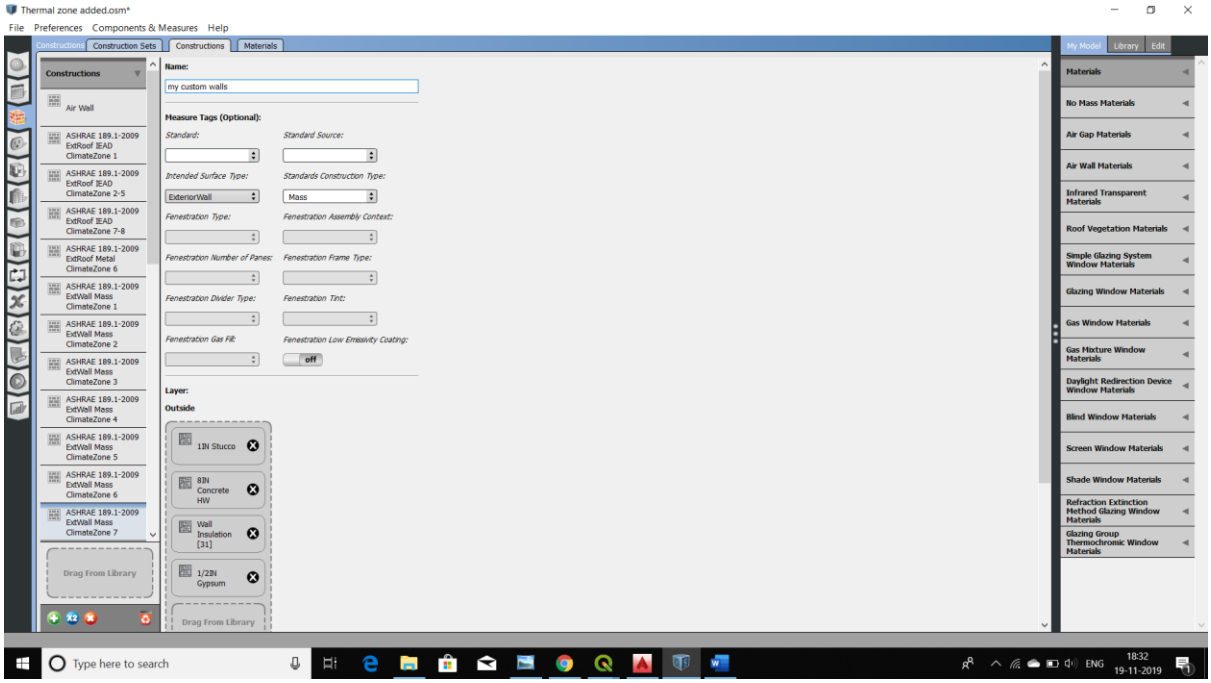
Step 1: Open “open studio” and go to construction sets tab to create a customised construction set.



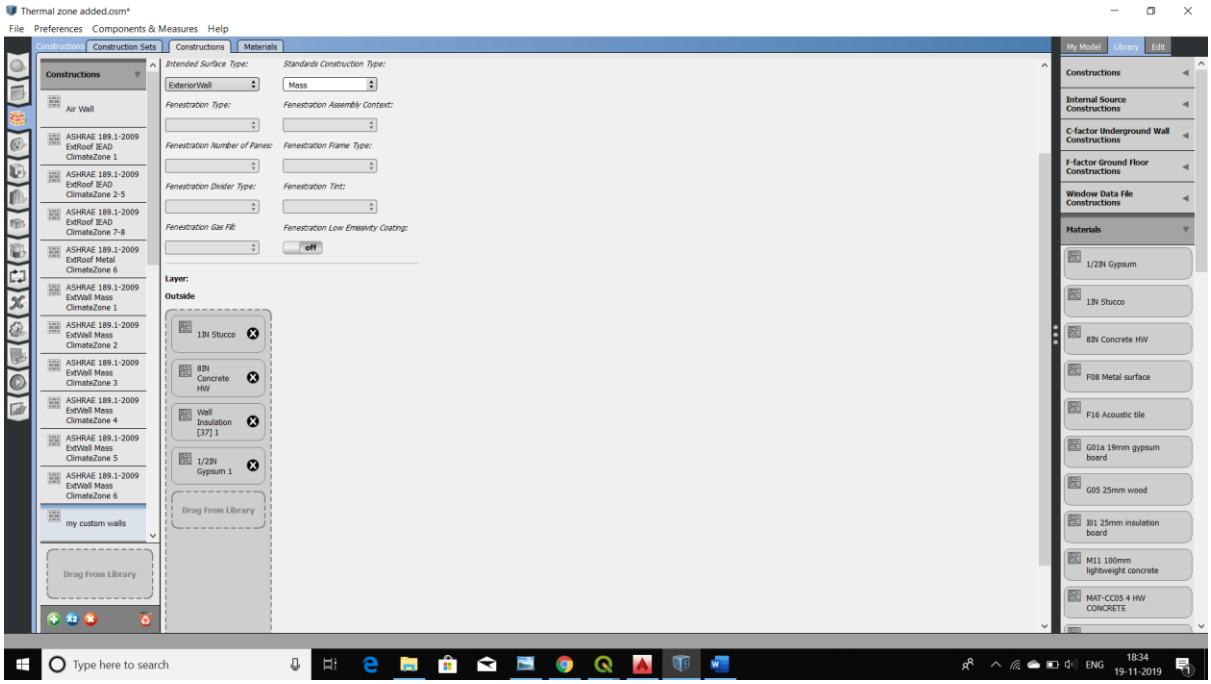
Step 2: With the help of X2 button, a copy of the construction set to be created in order to have a customised detail.



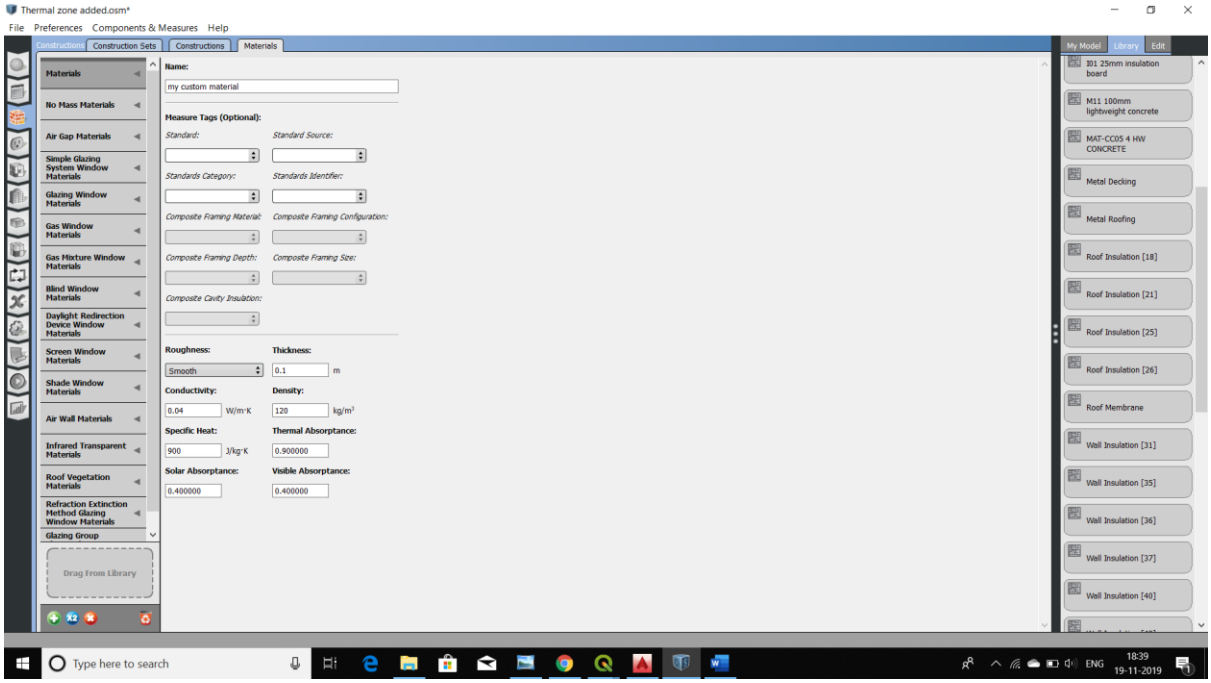
Step 3: From Constructions tab, a customized layer of wall can be created.



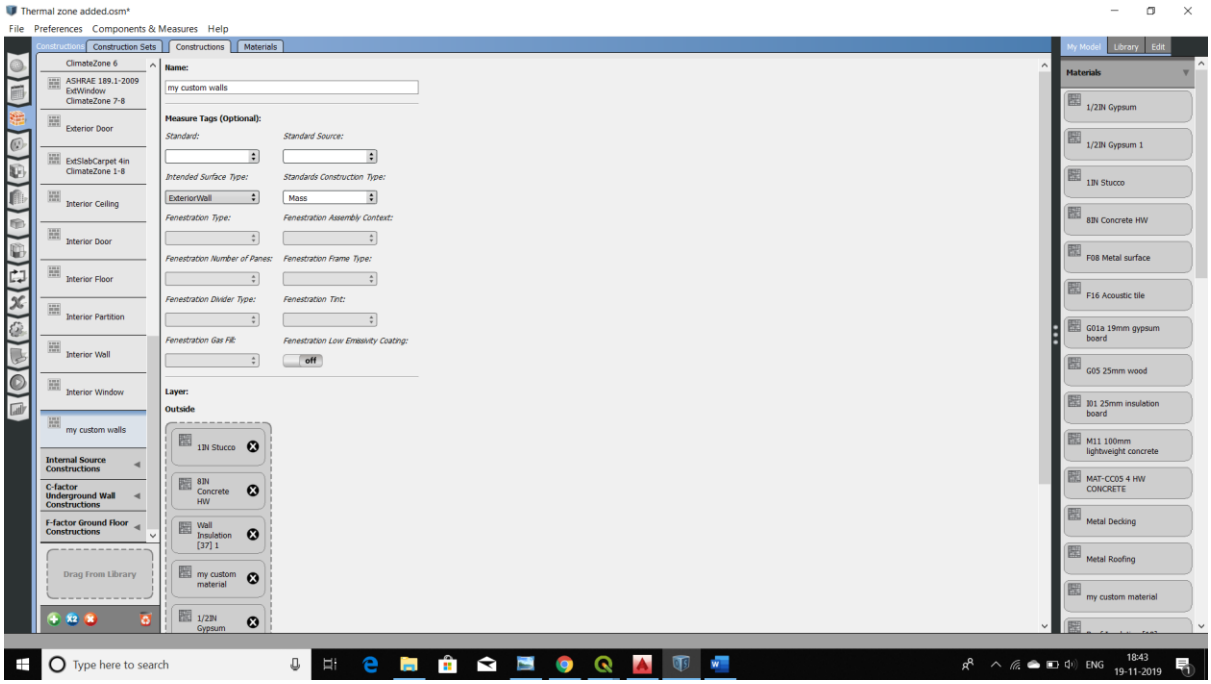
Step 4: Adding wall material by dragging it from the library on the right side column.



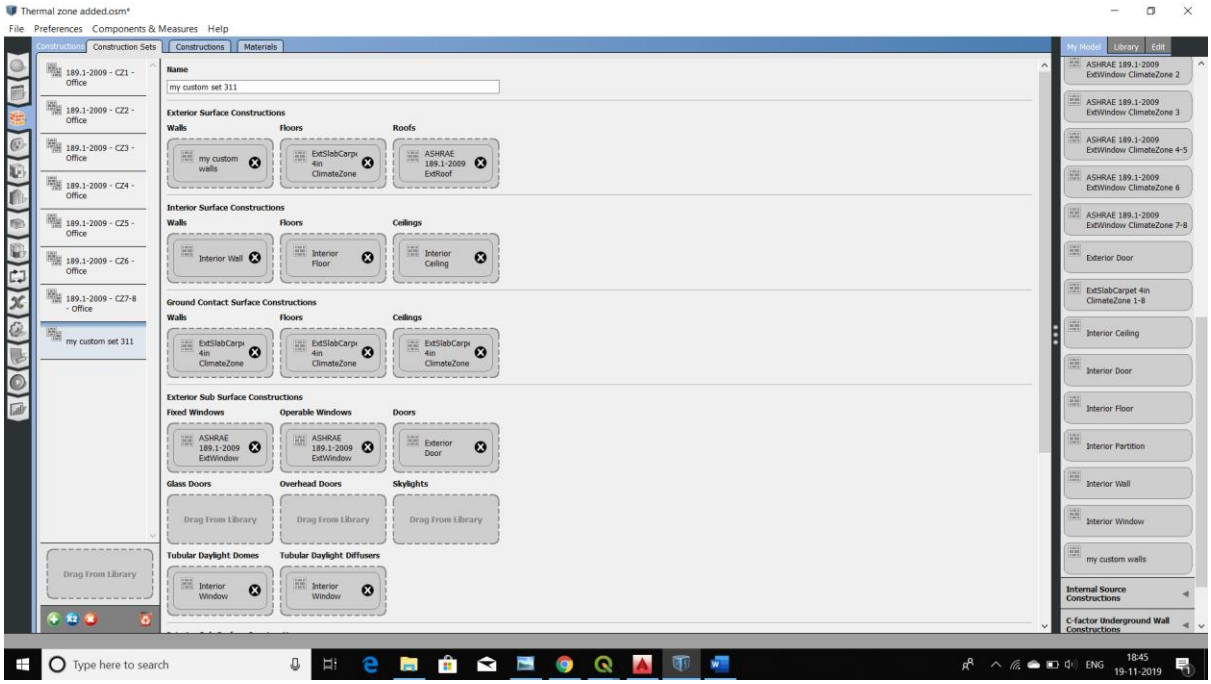
Step 5: Creating customised material by coping the existing one from the left column itself and change the value according to particular weather condition.



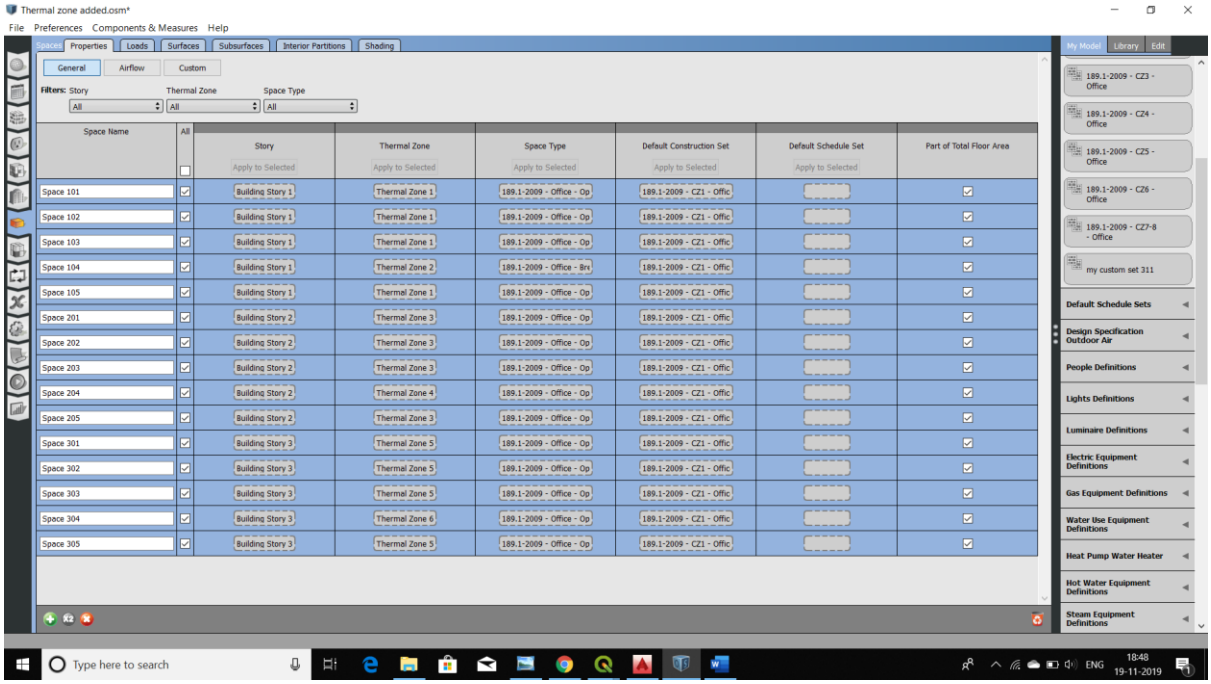
Step 6: Adding a customised material into customised wall layer.

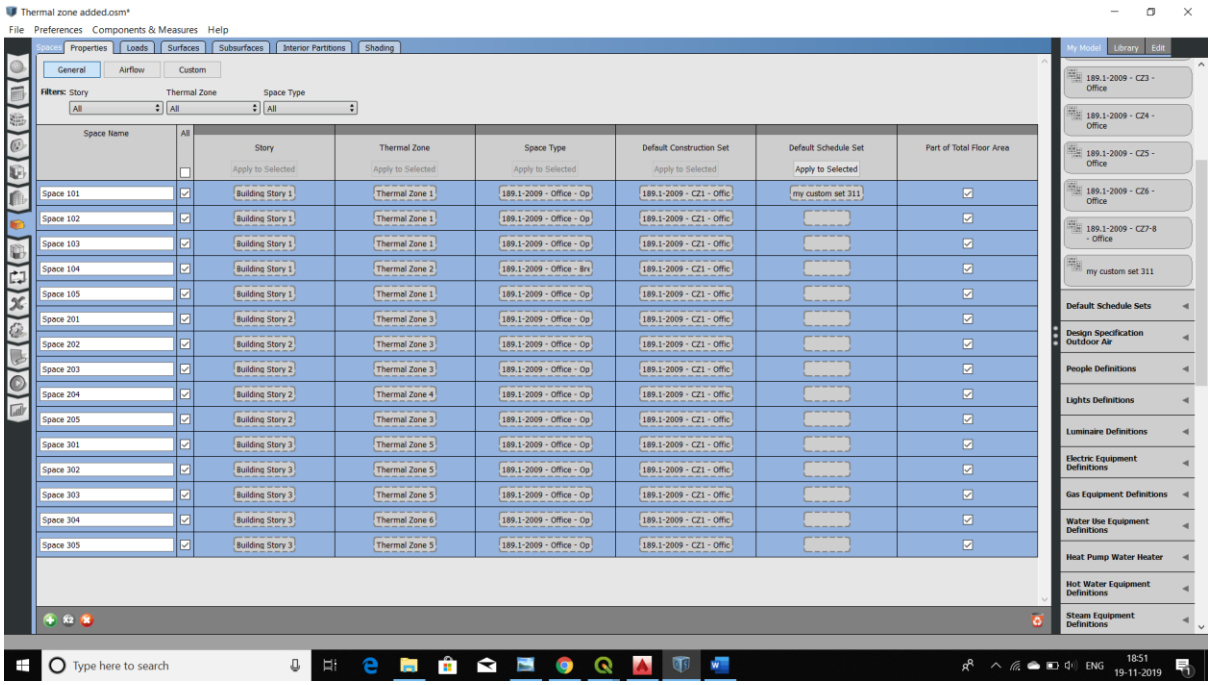


Step 7: Adding a customised wall layer into customised construction set.

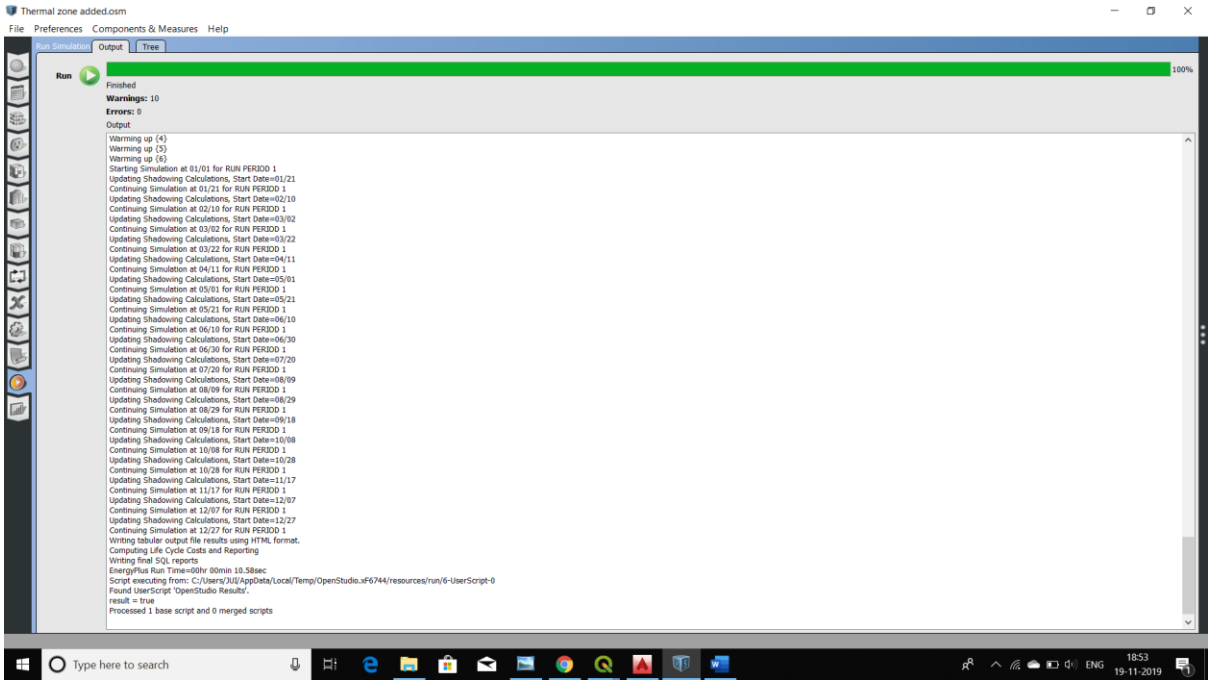


Step 8: From shapes tab, selecting every space of the building in order to apply customised construction set to those particular areas.

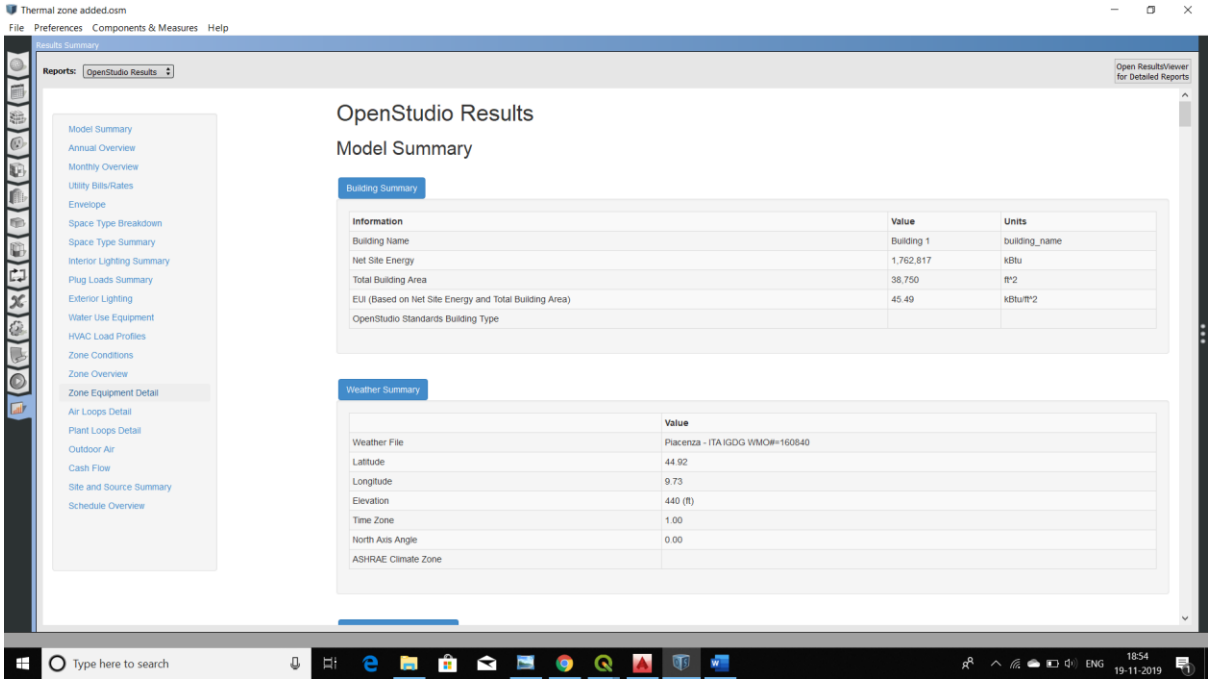




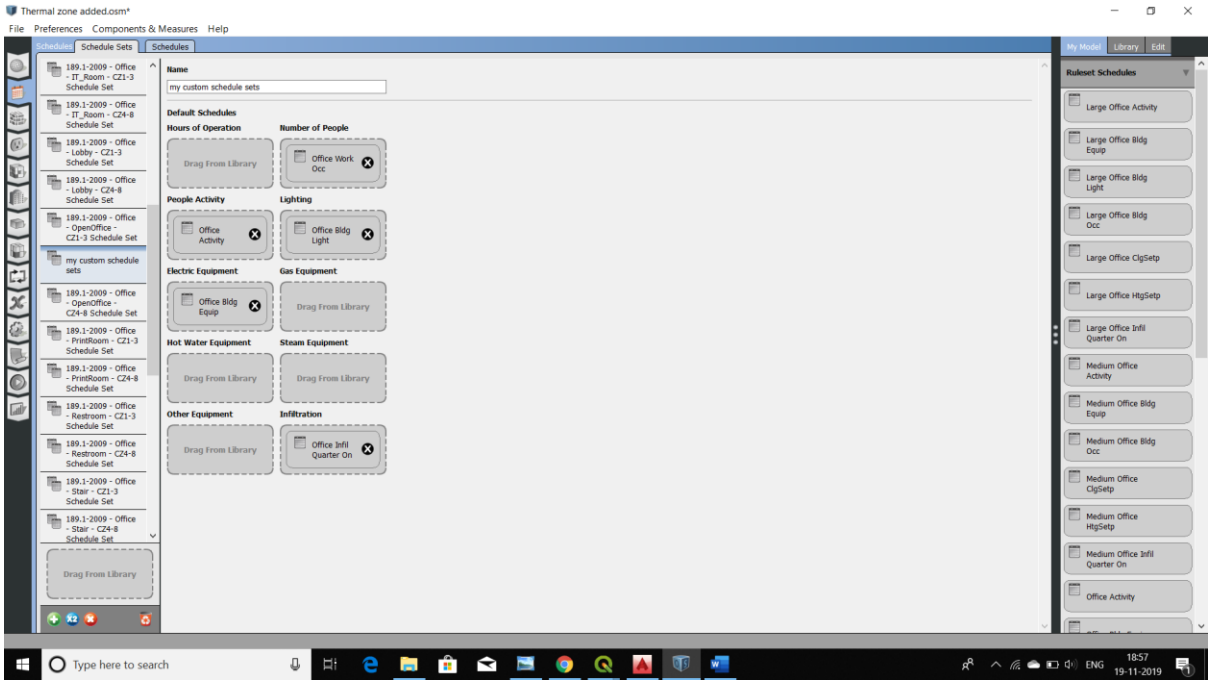
Step 9: Run the stimulation result.



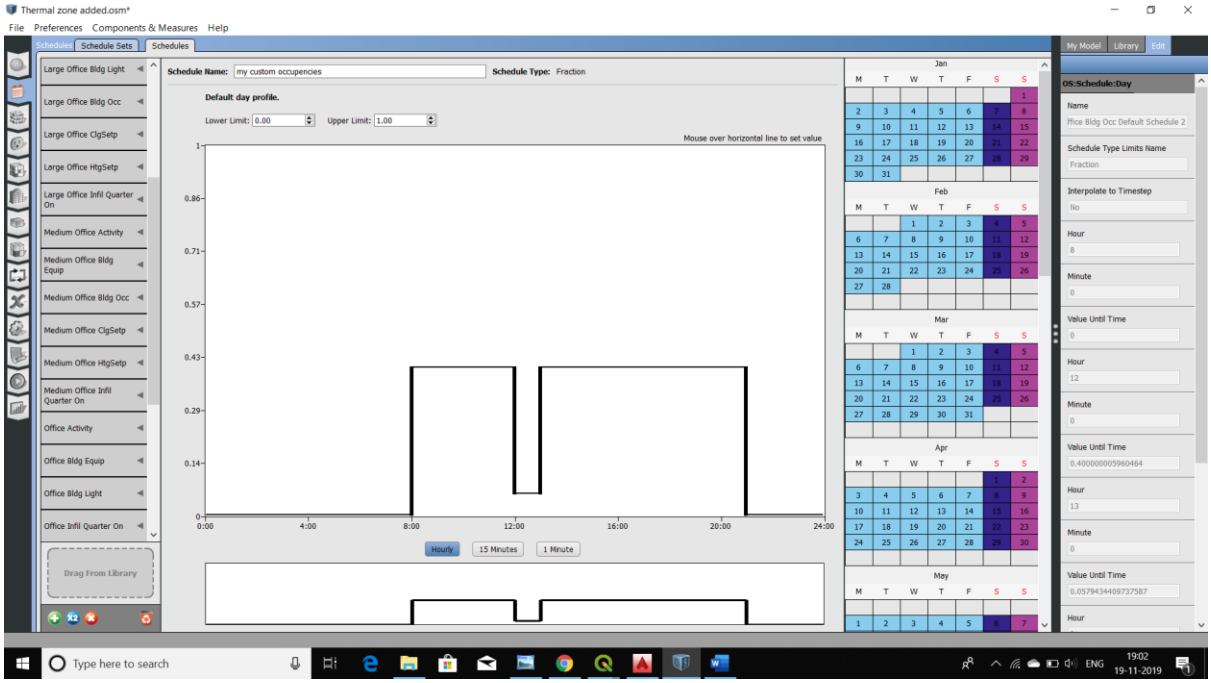
Step 10: Summary.



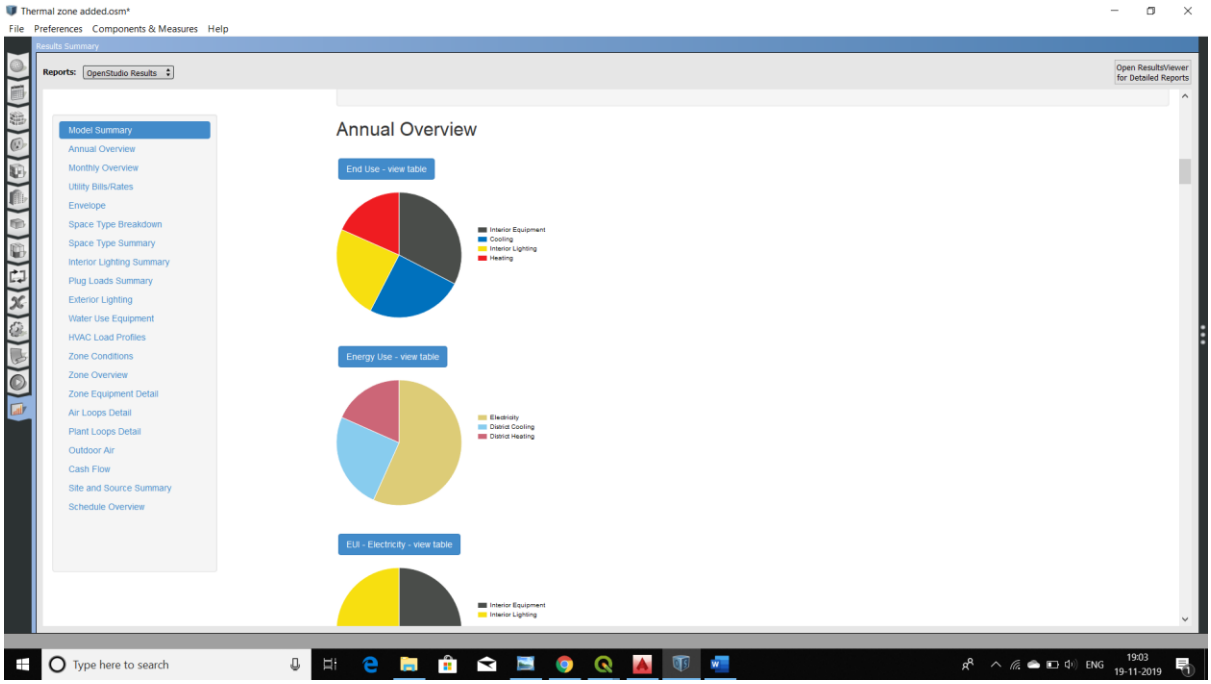
Step 11: start making custom schedule set.

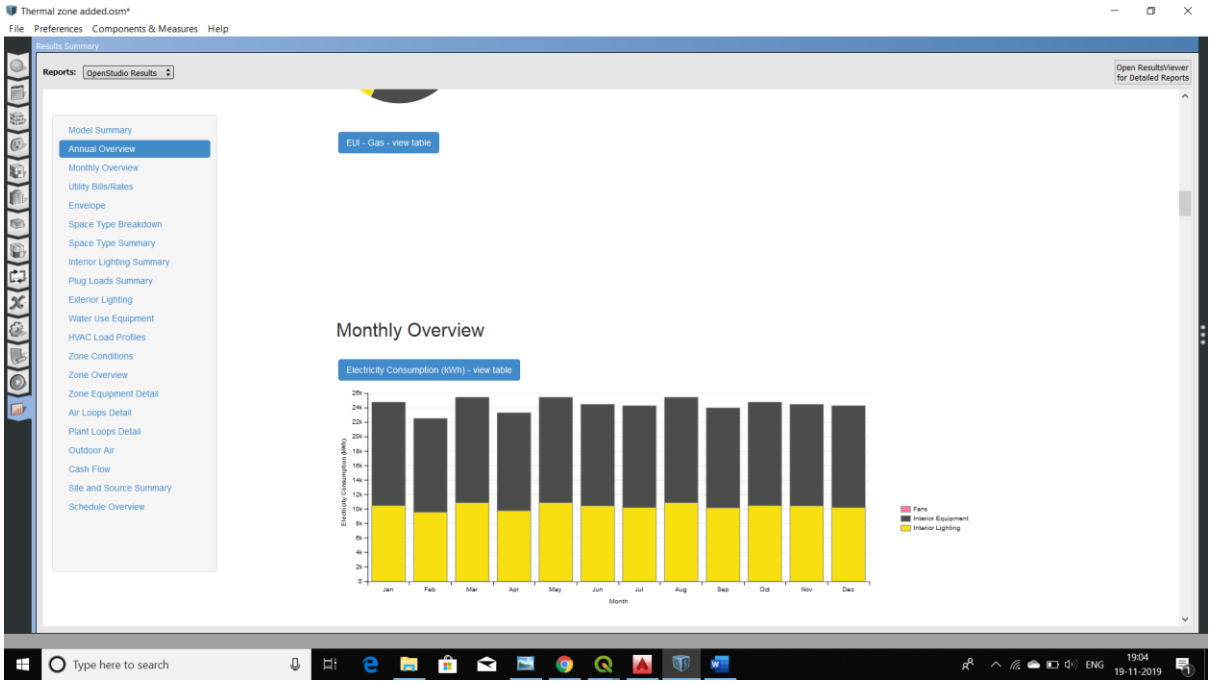


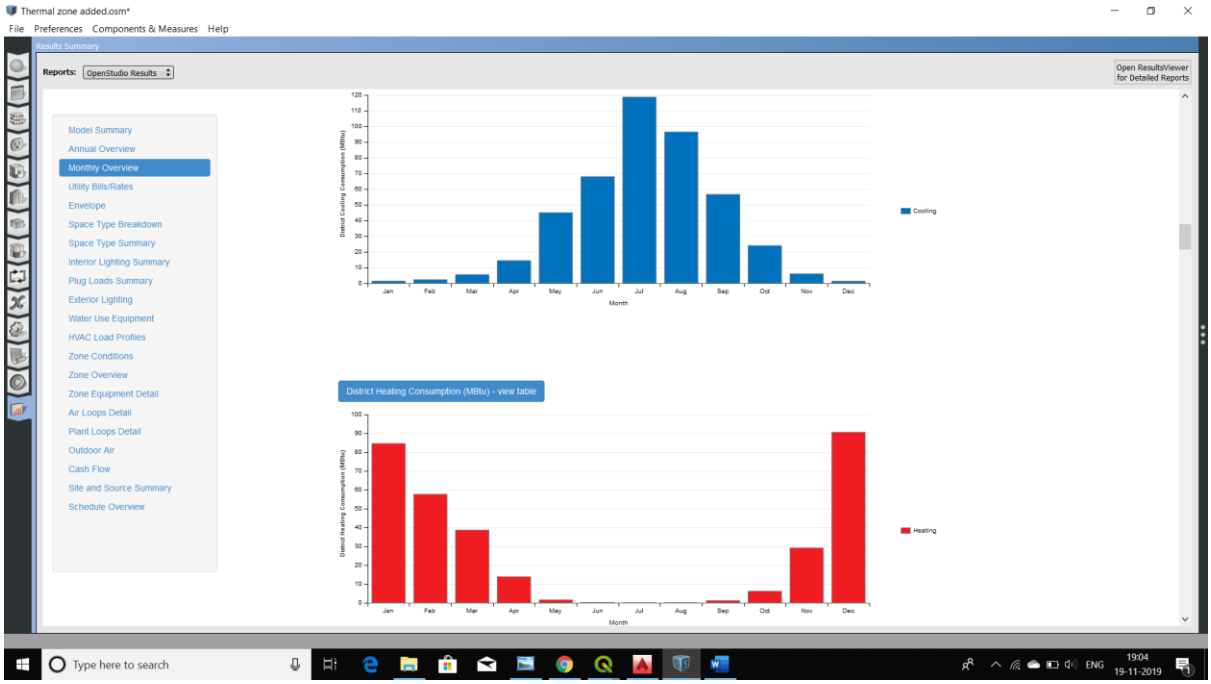
Step 12: Changing the graph according to the data of a particular place and culture in schedule set.



Step 13: Final report of an annual overview.






Thermal zone added.osm*
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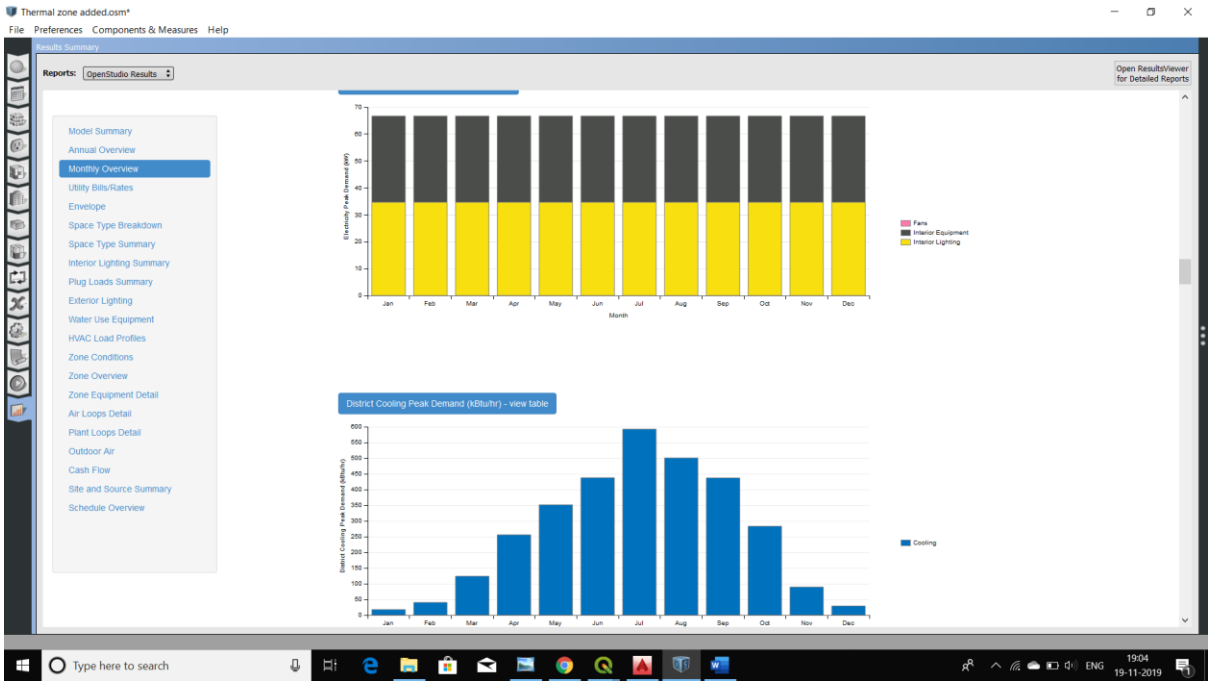
District Cooling Consumption (MBtu)
Cooling
Month
District Heating Consumption (MBtu) - view table
District Heating Consumption (MBtu)
Heating
Month
Type here to search
ENG
19:04
19-11-2019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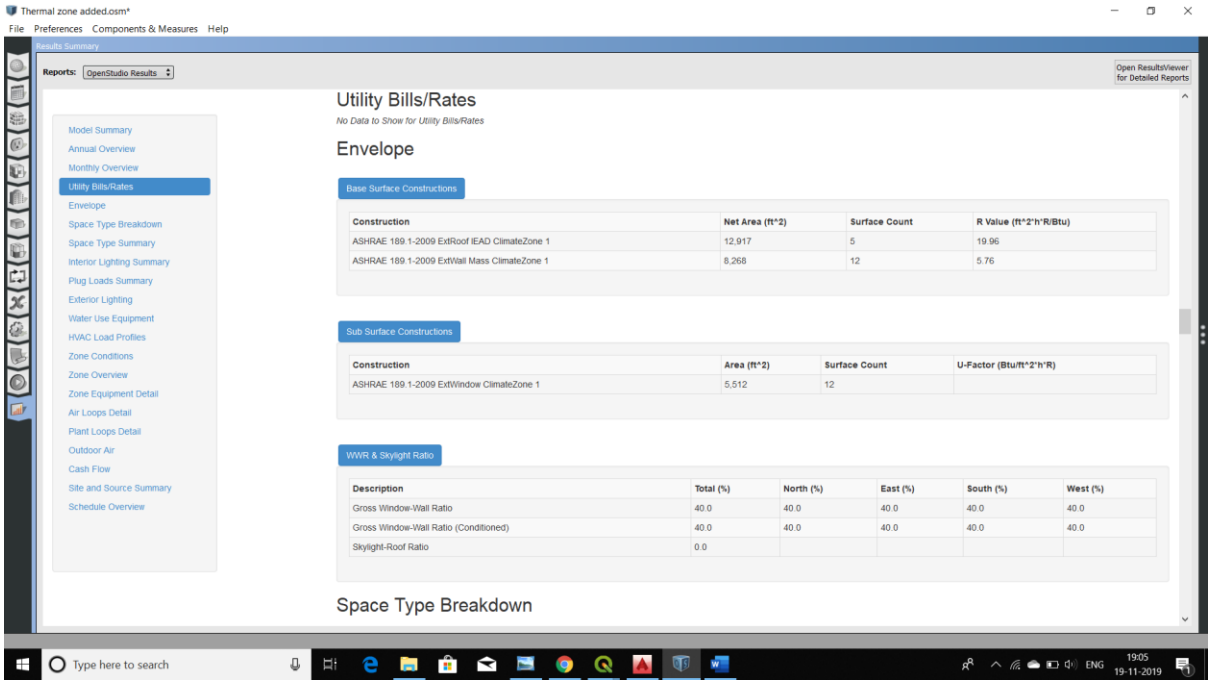
Fans
Interior Equipment
Interior Lighting
Month
District Cooling Peak Demand (kBtu/hr) - view table
District Cooling Peak Demand (kBtu/hr)
Cooling
Type here to search
ENG
19:04
19-11-2019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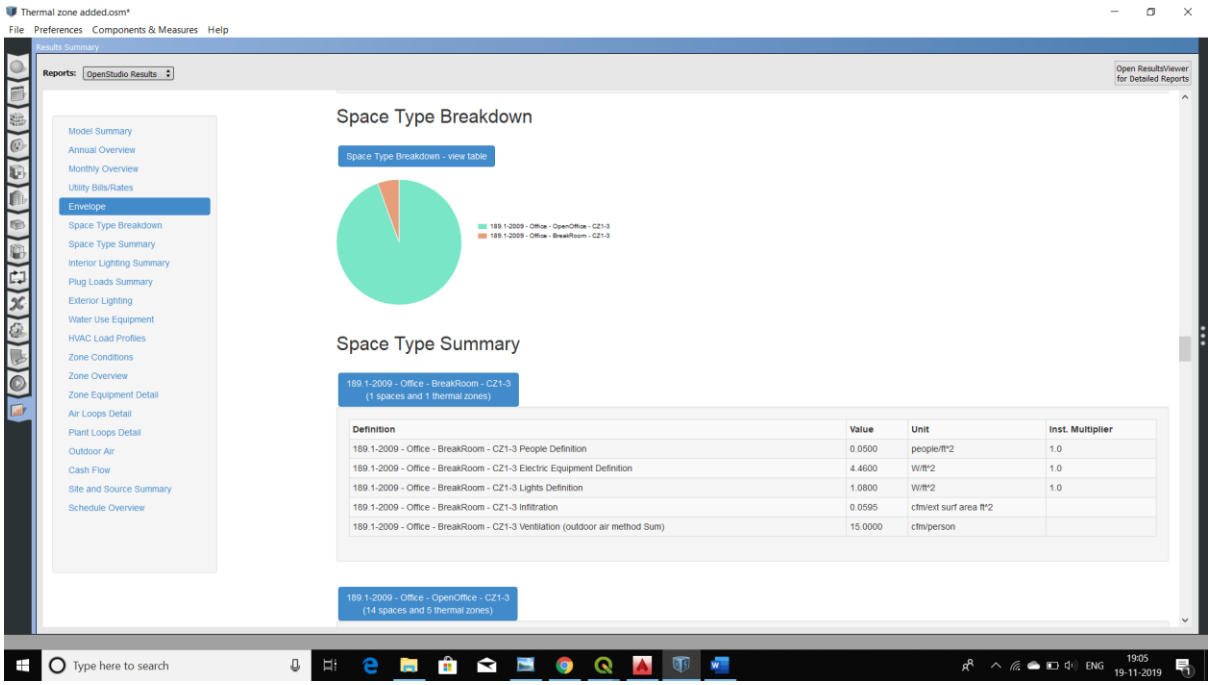
No Data to Show for Utility Bills/Rates
Envelope
Base Surface Constructions
Construction | Net Area (ft^2) | Surface Count | R Value (ft^2*h*R/Btu)
ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1 | 12,917 | 5 | 19.96
ASHRAE 189.1-2009 ExtWall Mass ClimateZone 1 | 8,268 | 12 | 5.76
Sub Surface Constructions
Construction | Area (ft^2) | Surface Count | U-Factor (Btu/ft^2*h*R)
ASHRAE 189.1-2009 ExtWindow ClimateZone 1 | 5,512 | 12
WWR & Skylight Ratio
Description | Total (%) | North (%) | East (%) | South (%) | West (%)
Gross Window-Wall Ratio | 40.0 | 40.0 | 40.0 | 40.0 | 40.0
Gross Window-Wall Ratio (Conditioned) | 40.0 | 40.0 | 40.0 | 40.0 | 40.0
Skylight-Roof Ratio | 0.0
Space Type Breakdown
Type here to search
ENG
19:05
19-11-2019


Thermal zone added.osm*
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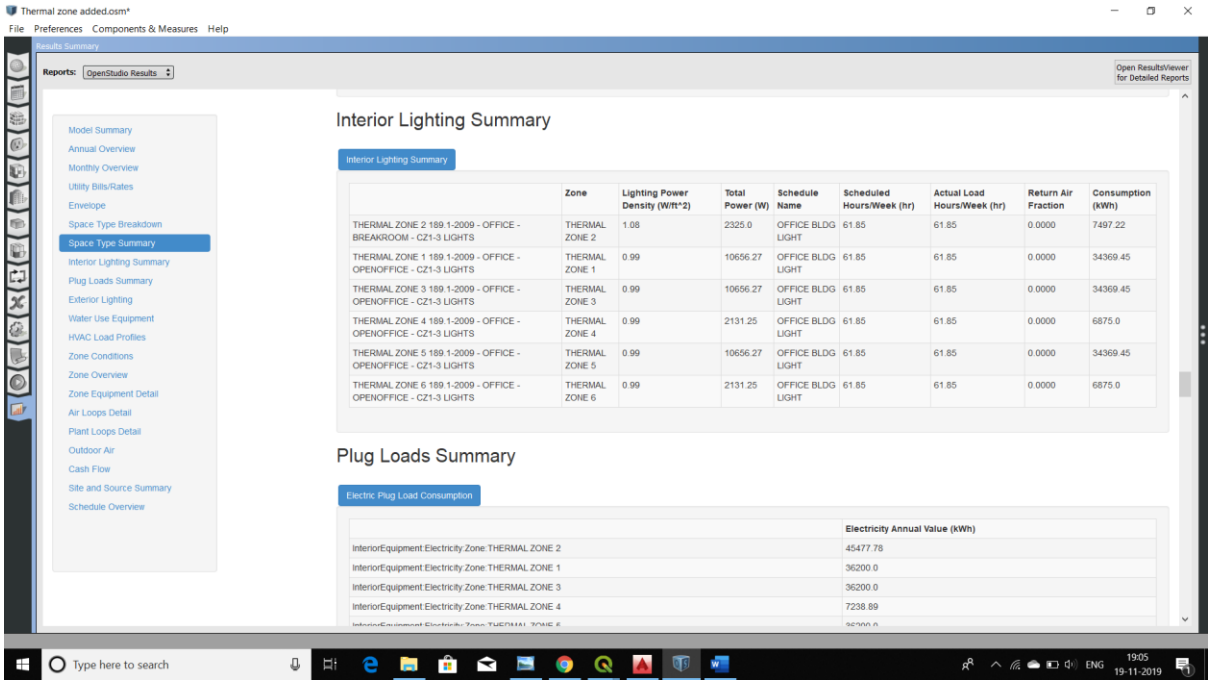
Space Type Breakdown
Space Type Breakdown - view table
189.1-2009 - Office - OpenOffice - CZ1-3
189.1-2009 - Office - BreakRoom - CZ1-3
Space Type Summary
189.1-2009 - Office - BreakRoom - CZ1-3
(1 spaces and 1 thermal zones)
Definition | Value | Unit | Inst. Multiplier
189.1-2009 - Office - BreakRoom - CZ1-3 People Definition | 0.0500 | people/ft^2 | 1.0
189.1-2009 - Office - BreakRoom - CZ1-3 Electric Equipment Definition | 4.4600 | W/ft^2 | 1.0
189.1-2009 - Office - BreakRoom - CZ1-3 Lights Definition | 1.0800 | W/ft^2 | 1.0
189.1-2009 - Office - BreakRoom - CZ1-3 Infiltration | 0.0595 | cfm/ext surf area ft^2
189.1-2009 - Office - BreakRoom - CZ1-3 Ventilation (outdoor air method Sum) | 15.0000 | cfm/person
189.1-2009 - Office - OpenOffice - CZ1-3
(14 spaces and 5 thermal zones)
Type here to search
ENG
19:05
19-11-2019


Thermal zone added.osm*
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Interior Lighting Summary
Zone
Lighting Power Density (W/ft^2)
Total Power (W)
Schedule Name
Scheduled Hours/Week (hr)
Actual Load Hours/Week (hr)
Return Air Fraction
Consumption (kWh)
THERMAL ZONE 2 189.1-2009 - OFFICE - BREAKROOM - CZ1-3 LIGHTS
THERMAL ZONE 2
1.08
2325.0
OFFICE BLDG LIGHT
61.85
61.85
0.0000
7497.22
THERMAL ZONE 1 189.1-2009 - OFFICE - OPENOFFICE - CZ1-3 LIGHTS
THERMAL ZONE 1
0.99
10656.27
OFFICE BLDG LIGHT
61.85
61.85
0.0000
34369.45
THERMAL ZONE 3 189.1-2009 - OFFICE - OPENOFFICE - CZ1-3 LIGHTS
THERMAL ZONE 3
0.99
10656.27
OFFICE BLDG LIGHT
61.85
61.85
0.0000
34369.45
THERMAL ZONE 4 189.1-2009 - OFFICE - OPENOFFICE - CZ1-3 LIGHTS
THERMAL ZONE 4
0.99
2131.25
OFFICE BLDG LIGHT
61.85
61.85
0.0000
6875.0
THERMAL ZONE 5 189.1-2009 - OFFICE - OPENOFFICE - CZ1-3 LIGHTS
THERMAL ZONE 5
0.99
10656.27
OFFICE BLDG LIGHT
61.85
61.85
0.0000
34369.45
THERMAL ZONE 6 189.1-2009 - OFFICE - OPENOFFICE - CZ1-3 LIGHTS
THERMAL ZONE 6
0.99
2131.25
OFFICE BLDG LIGHT
61.85
61.85
0.0000
6875.0
Plug Loads Summary
Electric Plug Load Consumption
Electricity Annual Value (kWh)
InteriorEquipment:Electricity:Zone:THERMAL ZONE 2
45477.78
InteriorEquipment:Electricity:Zone:THERMAL ZONE 1
36200.0
InteriorEquipment:Electricity:Zone:THERMAL ZONE 3
36200.0
InteriorEquipment:Electricity:Zone:THERMAL ZONE 4
7238.89
Type here to search
ENG
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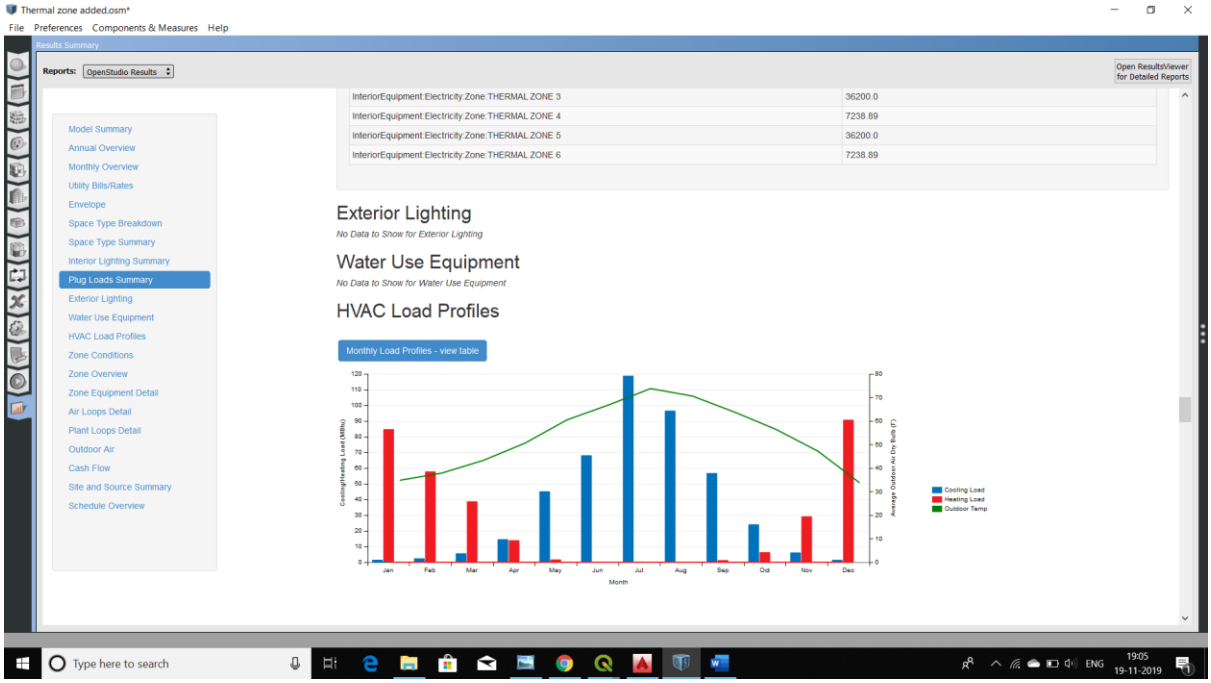
19-11-2019


Thermal zone added.osm*
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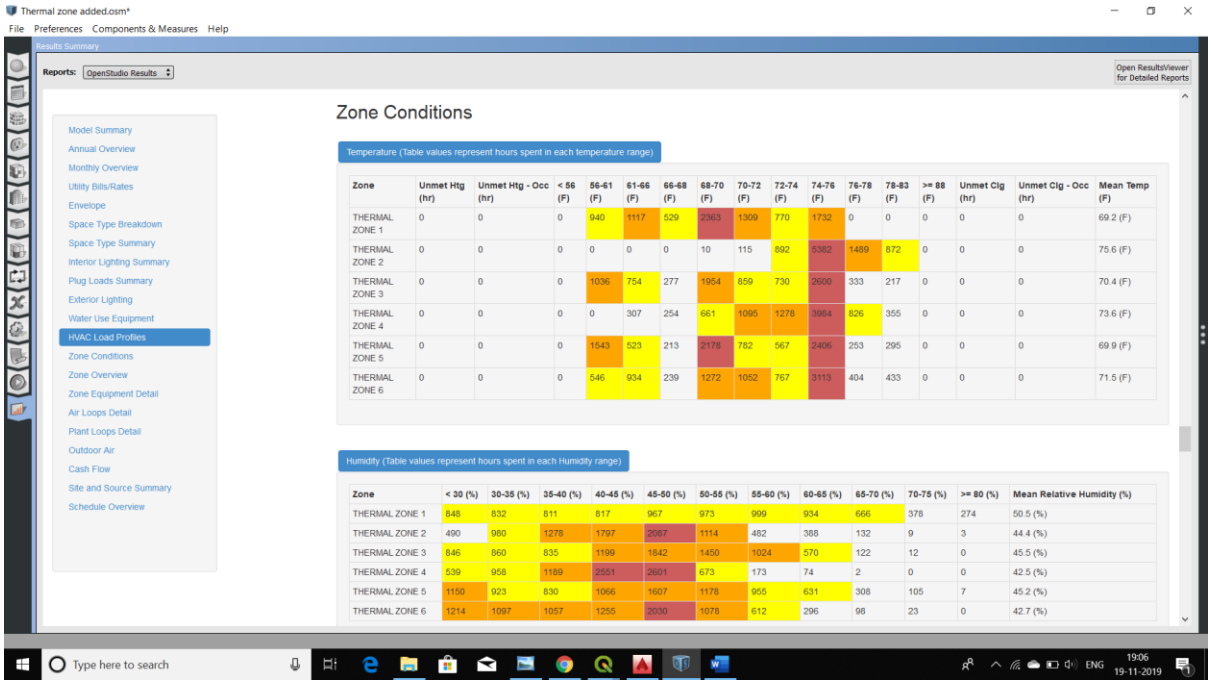
InteriorEquipment:Electricity:Zone:THERMAL ZONE 3
36200.0
InteriorEquipment:Electricity:Zone:THERMAL ZONE 4
7238.89
InteriorEquipment:Electricity:Zone:THERMAL ZONE 5
36200.0
InteriorEquipment:Electricity:Zone:THERMAL ZONE 6
7238.89
Exterior Lighting
No Data to Show for Exterior Lighting
Water Use Equipment
No Data to Show for Water Use Equipment
HVAC Load Profiles
Monthly Load Profiles - view table
Cooling/Heating Load (MWh)
Average Outdoor Air Dry Bulb (F)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Cooling Load
Heating Load
Outdoor Temp
Type here to search
ENG
19:05
19-11-2019


Thermal zone added.osm*
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Zone Conditions
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 | 940 | 1117 | 529 | 2363 | 1309 | 770 | 1732 | 0 | 0 | 0 | 0 | 0 | 69.2 (F)
THERMAL ZONE 2 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 115 | 892 | 5382 | 1489 | 872 | 0 | 0 | 0 | 75.6 (F)
THERMAL ZONE 3 | 0 | 0 | 0 | 1036 | 754 | 277 | 1954 | 859 | 730 | 2600 | 333 | 217 | 0 | 0 | 0 | 70.4 (F)
THERMAL ZONE 4 | 0 | 0 | 0 | 0 | 307 | 254 | 661 | 1095 | 1278 | 3984 | 826 | 355 | 0 | 0 | 0 | 73.6 (F)
THERMAL ZONE 5 | 0 | 0 | 0 | 1543 | 523 | 213 | 2178 | 782 | 567 | 2406 | 253 | 295 | 0 | 0 | 0 | 69.9 (F)
THERMAL ZONE 6 | 0 | 0 | 0 | 546 | 934 | 239 | 1272 | 1052 | 767 | 3113 | 404 | 433 | 0 | 0 | 0 | 71.5 (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 | 848 | 832 | 811 | 817 | 967 | 973 | 999 | 934 | 666 | 378 | 274 | 50.5 (%)
THERMAL ZONE 2 | 490 | 980 | 1278 | 1797 | 2087 | 1114 | 482 | 388 | 132 | 9 | 3 | 44.4 (%)
THERMAL ZONE 3 | 846 | 860 | 835 | 1199 | 1842 | 1450 | 1024 | 570 | 122 | 12 | 0 | 45.5 (%)
THERMAL ZONE 4 | 539 | 958 | 1189 | 2551 | 2601 | 673 | 173 | 74 | 2 | 0 | 0 | 42.5 (%)
THERMAL ZONE 5 | 1150 | 923 | 830 | 1066 | 1607 | 1178 | 955 | 631 | 308 | 105 | 7 | 45.2 (%)
THERMAL ZONE 6 | 1214 | 1097 | 1057 | 1255 | 2030 | 1078 | 612 | 296 | 98 | 23 | 0 | 42.7 (%)
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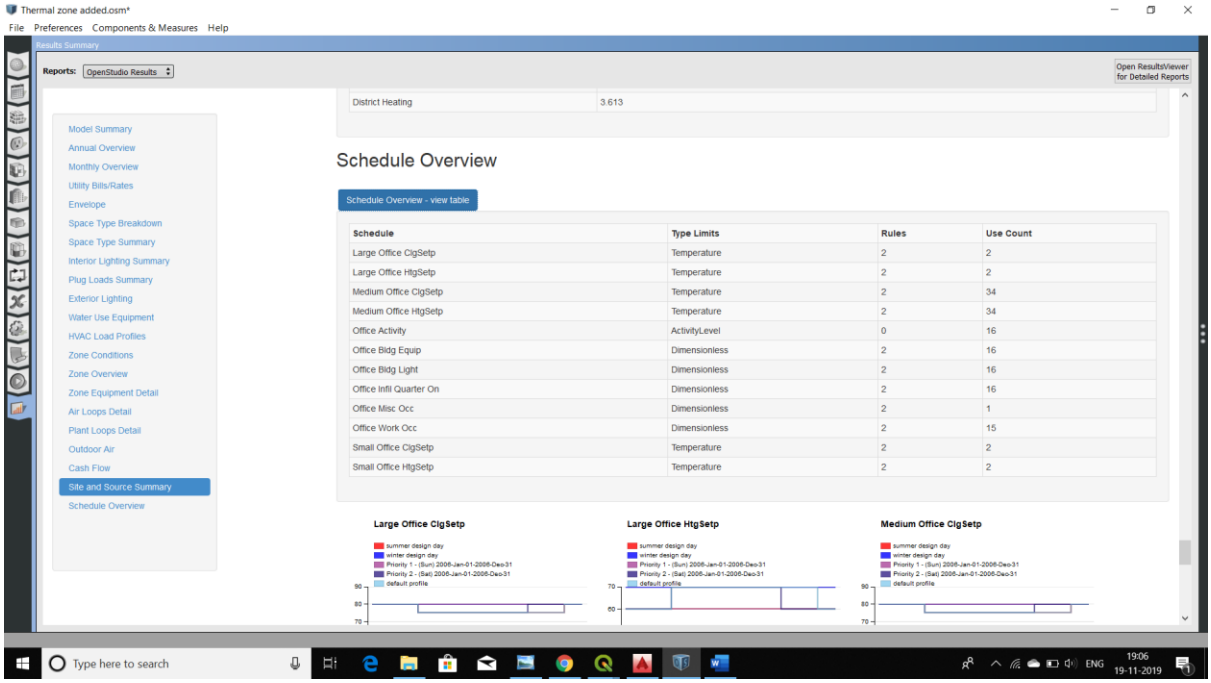
19-11-2019


Thermal zone added.osm*
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District Heating | 3.613
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Schedule Overview
Schedule Overview
Schedule Overview - view table
Schedule | Type Limits | Rules | Use Count
Large Office ClgSetp | Temperature | 2 | 2
Large Office HtgSetp | Temperature | 2 | 2
Medium Office ClgSetp | Temperature | 2 | 34
Medium Office HtgSetp | Temperature | 2 | 34
Office Activity | ActivityLevel | 0 | 16
Office Bldg Equip | Dimensionless | 2 | 16
Office Bldg Light | Dimensionless | 2 | 16
Office Infil Quarter On | Dimensionless | 2 | 16
Office Misc Occ | Dimensionless | 2 | 1
Office Work Occ | Dimensionless | 2 | 15
Small Office ClgSetp | Temperature | 2 | 2
Small Office HtgSetp | Temperature | 2 | 2
Large Office ClgSetp
Large Office HtgSetp
Medium Office ClgSetp
Type here to search
ENG
19:06
19-11-2019