

7th WEEK'S SUBMISSION

1. PROVIDE A SUMMARY OF THE MAIN CONCEPTS THAT WENT THROUGH ABOUT SOLAR RADIATION (FORMULAS ARE NOT NEEDED)

Solar radiation is electromagnetic energy emitted by sun.

We have two kind of solar radiation:

- Direct
- Diffuse

We can have different ways on how this radiation is received by a body:

- Dispersion: when a molecule receive radiation and reject this.
- Absorbition: when a molecule receive radiation and became hot and give back the heat.

The radiation is effect of changing the air mass.

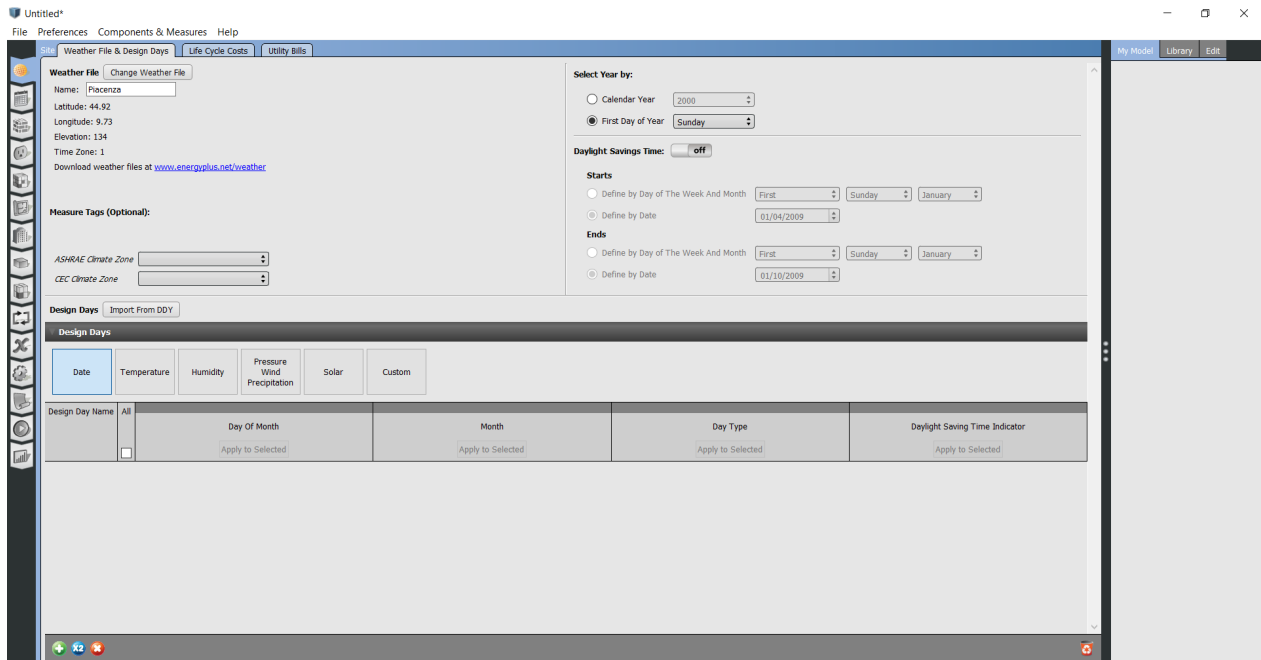
In other words the radiation receives by the soil depends on how much air the solar radiation has to cross. When the sun is perpendicular to the plan of the horizon, it crosses the minimum thickness of the atmosphere.

The solar radiation depends on:

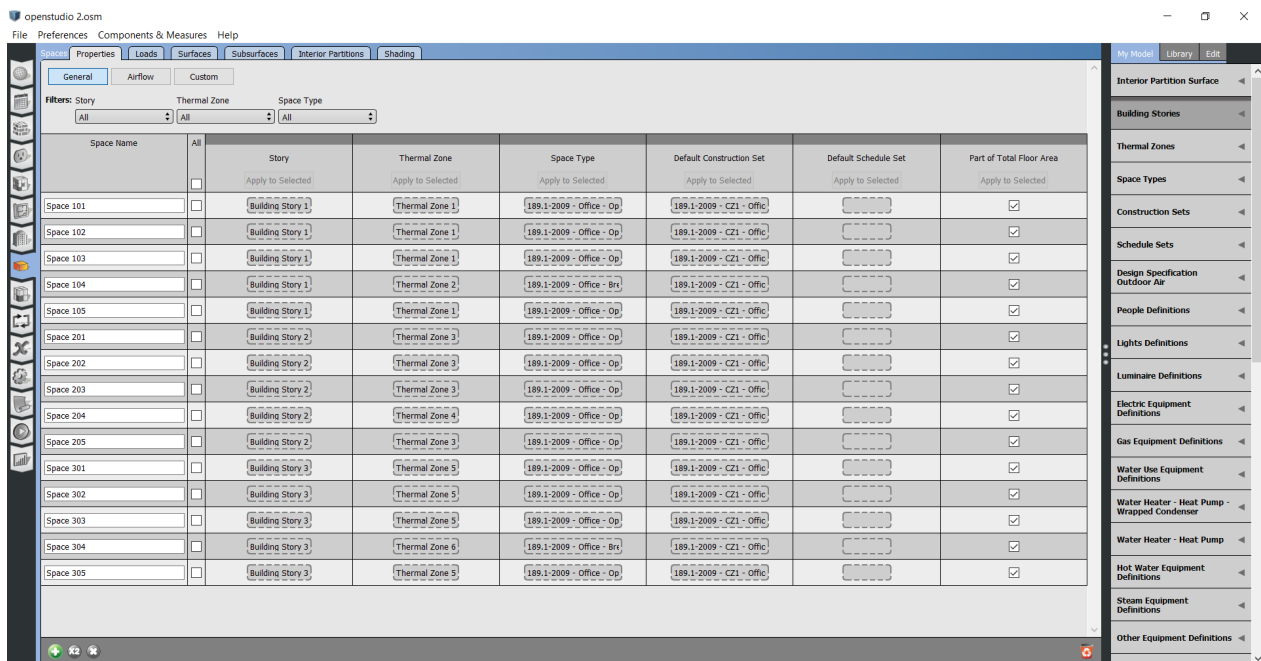
- the sun position in the sky (altitude and azimuth angles), which changes daily and seasonally
- the weather conditions
- the site altitude over the sea level
- sunshine hours

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

Let's open the openstudio file we created last time. Let's reset the "design days" related to the Piacenza area. Within the site "energy plus weather file" we can find climatic information about any location.



Within this screen we can go to set different "construction set" and "schedule set" in each place of the building. We will then go into more detail on how to manage the settings of these two elements.



These are the data relative to the simulation of the last time with parameters of default.

openstudio 2.0sm
File Preferences Components & Measures Help

Results Summary

Reports: **EnergyPlus Results** Refresh Open O'view for Detailed Reports

Program Version: **EnergyPlus, Version 9.1.0-08d2e308bb, YMD=2019.11.06 13:22**

Tabular Output Report in Format: **HTML**

Building: **Building 1**

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

Simulation Timestamp: **2019-11-06 13:22:46**

Report: **Annual Building Utility Performance Summary**

For: **Entire Facility**

Timestamp: **2019-11-06 13:22:46**

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	2107.46	585.41	585.41
Net Site Energy	2107.46	585.41	585.41
Total Source Energy	5579.41	1549.84	1549.84
Net Source Energy	5579.41	1549.84	1549.84

Site to Source Energy Conversion Factors

	Site to Source Conversion Factor
Electricity	3.167
Natural Gas	1.084
District Cooling	1.056
District Heating	3.613
Steam	0.300
Gasoline	1.050

In the section “constuction set” we can create the combination of roofs, interior walls, floors, exterior walls best suited to our needs and those of the building.

openstudio definitivo 11.6.0sm*
File Preferences Components & Measures Help

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

Name: 189.1-2009 - CZ1 - Office

Exterior Surface Constructions

Walls: ASHRAE 189.1-2009 ExtWall

Floors: ExtSlabCarpi 4in ClimateZone

Roofs: ASHRAE 189.1-2009 ExtRoof

Interior Surface Constructions

Walls: Interior Wall

Floors: Interior Floor

Ceilings: Interior Ceiling

Ground Contact Surface Constructions

Walls: ExtSlabCarpi 4in ClimateZone

Floors: ExtSlabCarpi 4in ClimateZone

Ceilings: ExtSlabCarpi 4in ClimateZone

Exterior Sub Surface Constructions

Fixed Windows: ASHRAE 189.1-2009 ExtWindow

Operable Windows: ASHRAE 189.1-2009 ExtWindow

Doors: Exterior Door

Glass Doors: Drag From Library

Overhead Doors: Drag From Library

Skylights: Drag From Library

Tubular Daylight Domes: Interior Window

Tubular Daylight Diffusers: Interior Window

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

ASHRAE 189.1-2009 ExtWall Mass ClimateZone 6

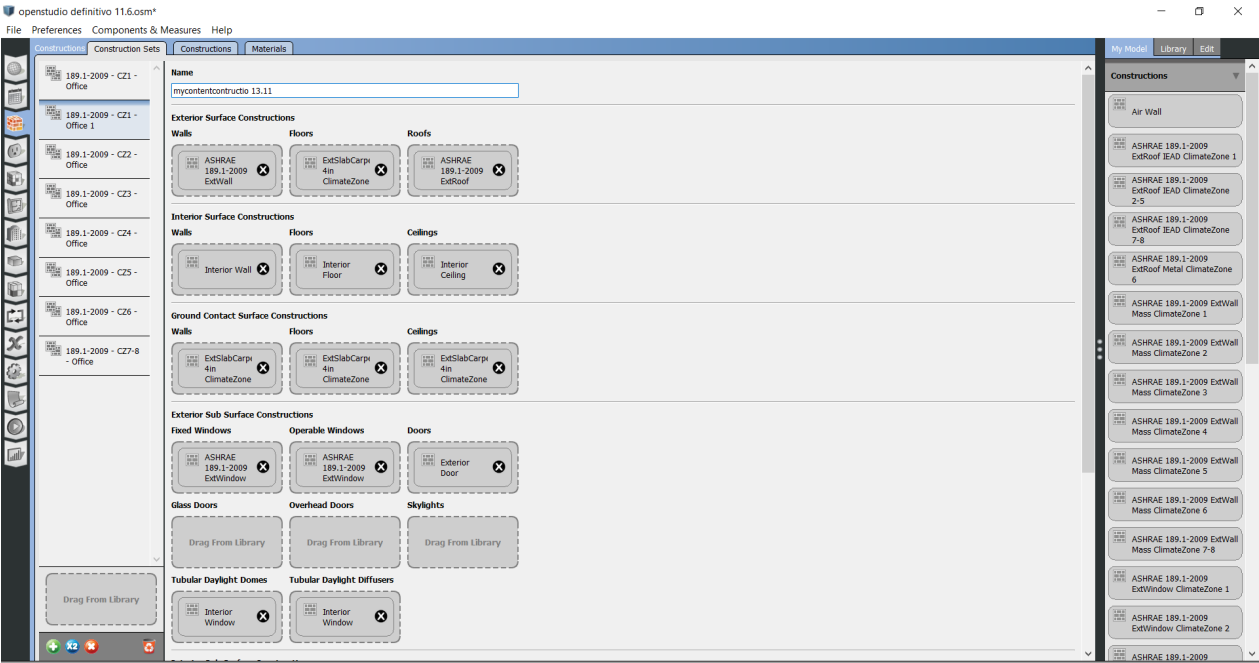
ASHRAE 189.1-2009 ExtWall Mass ClimateZone 7-8

ASHRAE 189.1-2009 ExtWindow ClimateZone 1

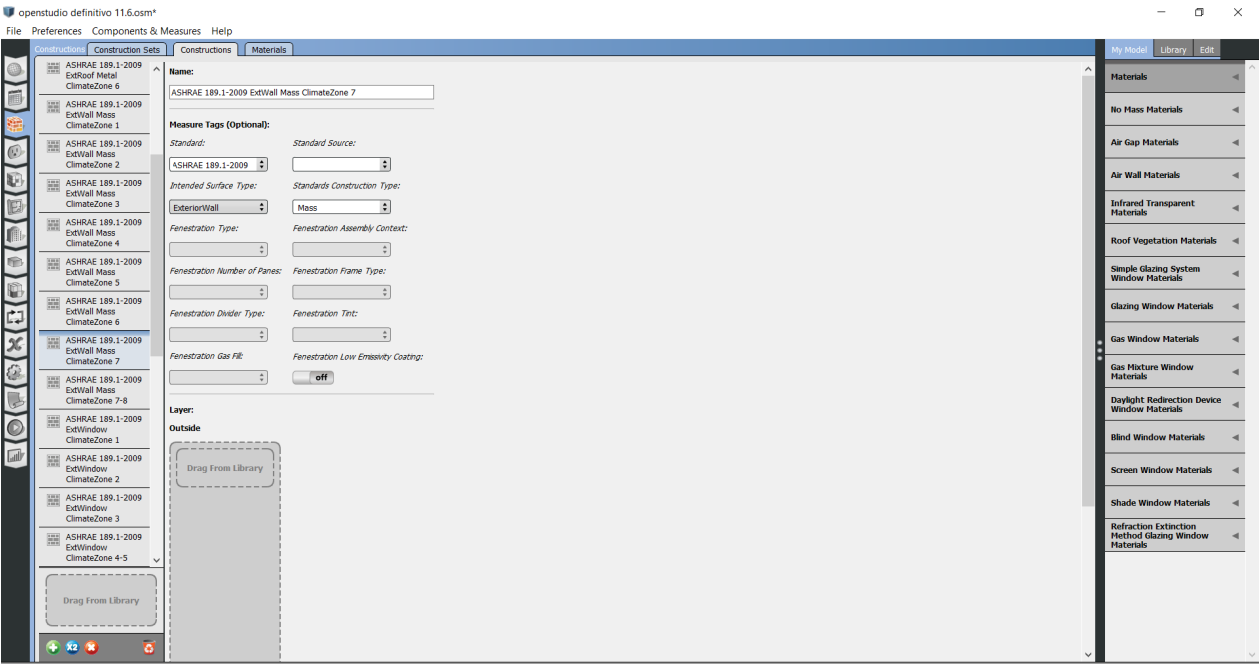
ASHRAE 189.1-2009 ExtWindow ClimateZone 2

ASHRAE 189.1-2009

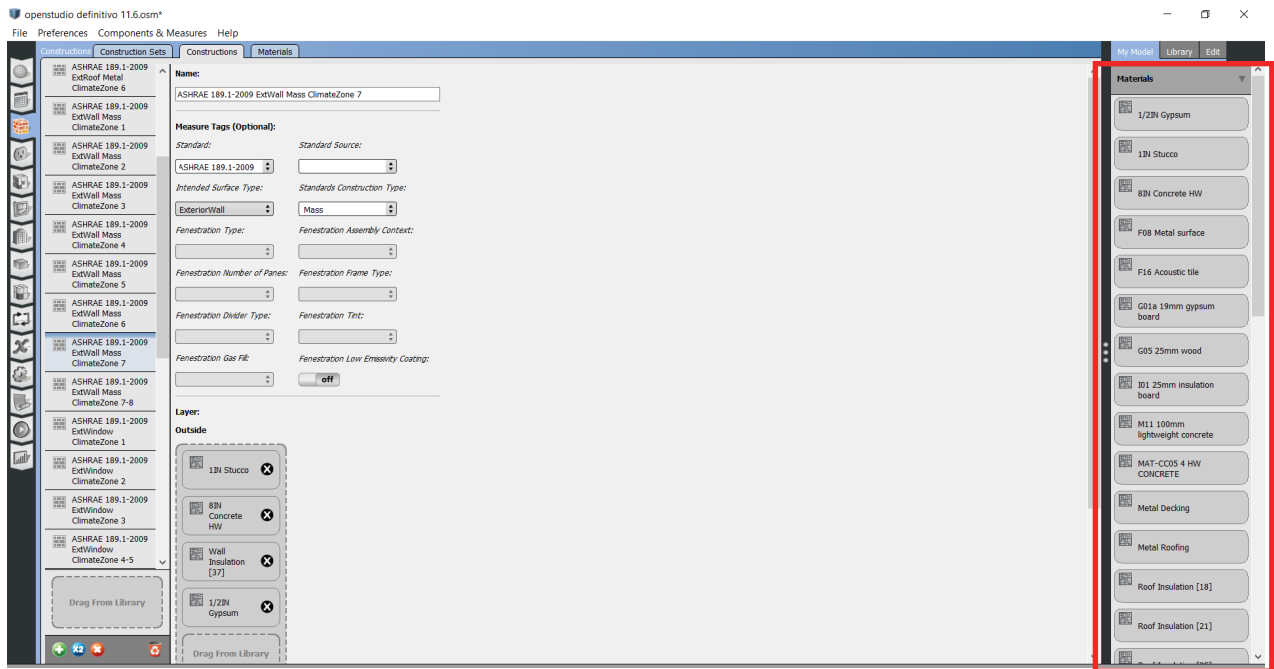
Let's rename one of these settings as "mycontentconstuction 13.11" so that we can recognize it with respect to the others.



Now in the construction section we can deal with a specific wall.

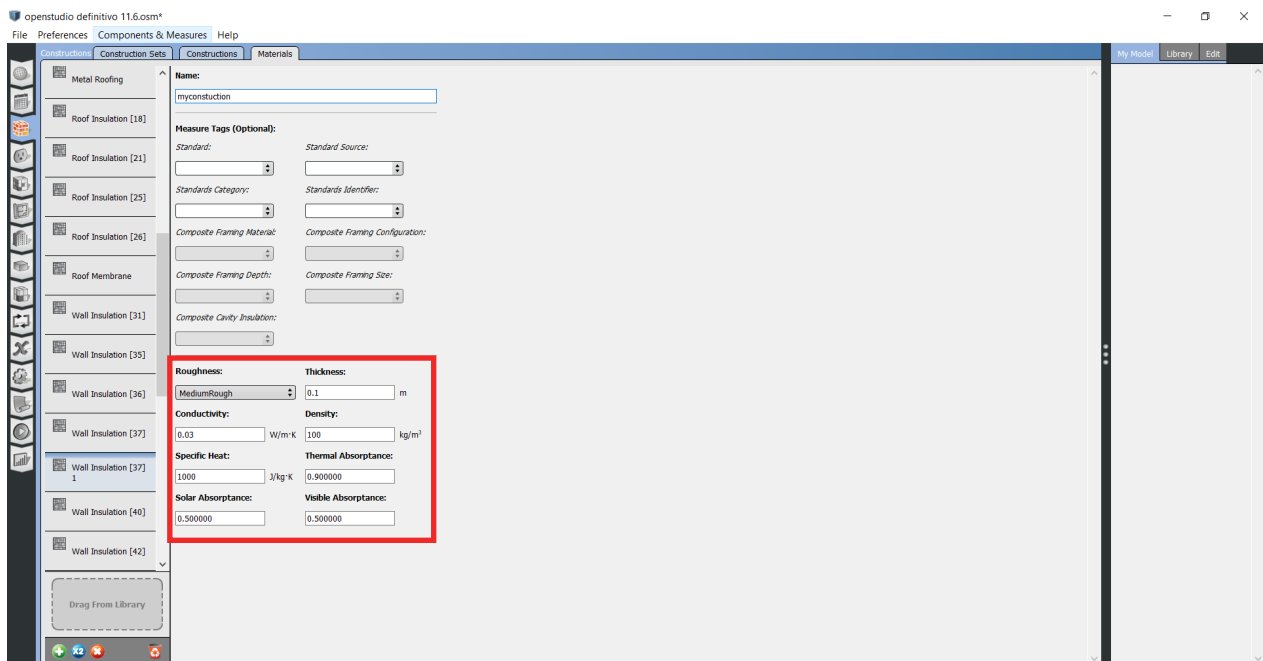


We can see that some materials have already been defined in the “layer” section. We remove them, insert the materials we prefer (from the section on the right “materials”) and rename the wall as “myconstruction wall”.

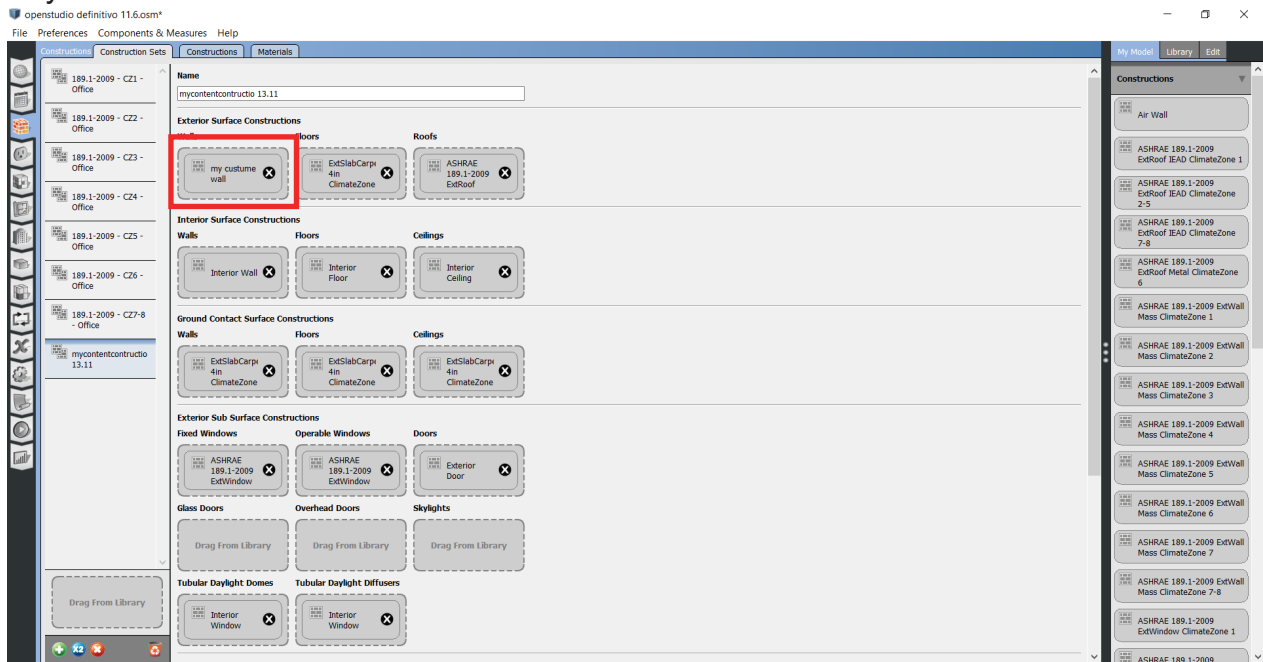


Now let's go down more specifically, going to change the values of: conductivity, thickness, density, etc..

Also this time we rename the material as “myconstruction”.



Now let's retrace the path done so far in the opposite direction, that is, inserting the material created "myconstuction" within the layers of "myconstructionwall" and finally inserting the latter in the card that manages all the structural components of the building "mycontentconstruction 13.11".



Let's go back to the screen where you can change the "construction sets".

openstudio definitivo 11.6.osm*

File Preferences Components & Measures Help

Space Properties Loads Surfaces Subsurfaces Interior Partitions Shading

General Airflow Custom

Filters: Story Thermal Zone Space Type

All All All

Space Name	Story	Thermal Zone	Space Type	Default Construction Set	Default Schedule Set	Part of Total Floor Area
Space 101	Building Story 1	Thermal Zone 1	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 102	Building Story 1	Thermal Zone 1	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 103	Building Story 1	Thermal Zone 1	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 104	Building Story 1	Thermal Zone 2	189.1-2009 - Office - Br	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 105	Building Story 1	Thermal Zone 1	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 201	Building Story 2	Thermal Zone 3	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 202	Building Story 2	Thermal Zone 3	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 203	Building Story 2	Thermal Zone 3	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 204	Building Story 2	Thermal Zone 4	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 205	Building Story 2	Thermal Zone 3	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 301	Building Story 3	Thermal Zone 5	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 302	Building Story 3	Thermal Zone 5	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 303	Building Story 3	Thermal Zone 5	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 304	Building Story 3	Thermal Zone 6	189.1-2009 - Office - Br	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>
Space 305	Building Story 3	Thermal Zone 5	189.1-2009 - Office - Op	189.1-2009 - CZ1 - Office		<input checked="" type="checkbox"/>

Interior Partition Surface

Building Stories

Thermal Zones

Space Types

Construction Sets

Schedule Sets

Design Specification Outdoor Air

People Definitions

Lights Definitions

Luminaire Definitions

Electric Equipment Definitions

Gas Equipment Definitions

Water Use Equipment Definitions

Water Heater - Heat Pump - Wrapped Condenser

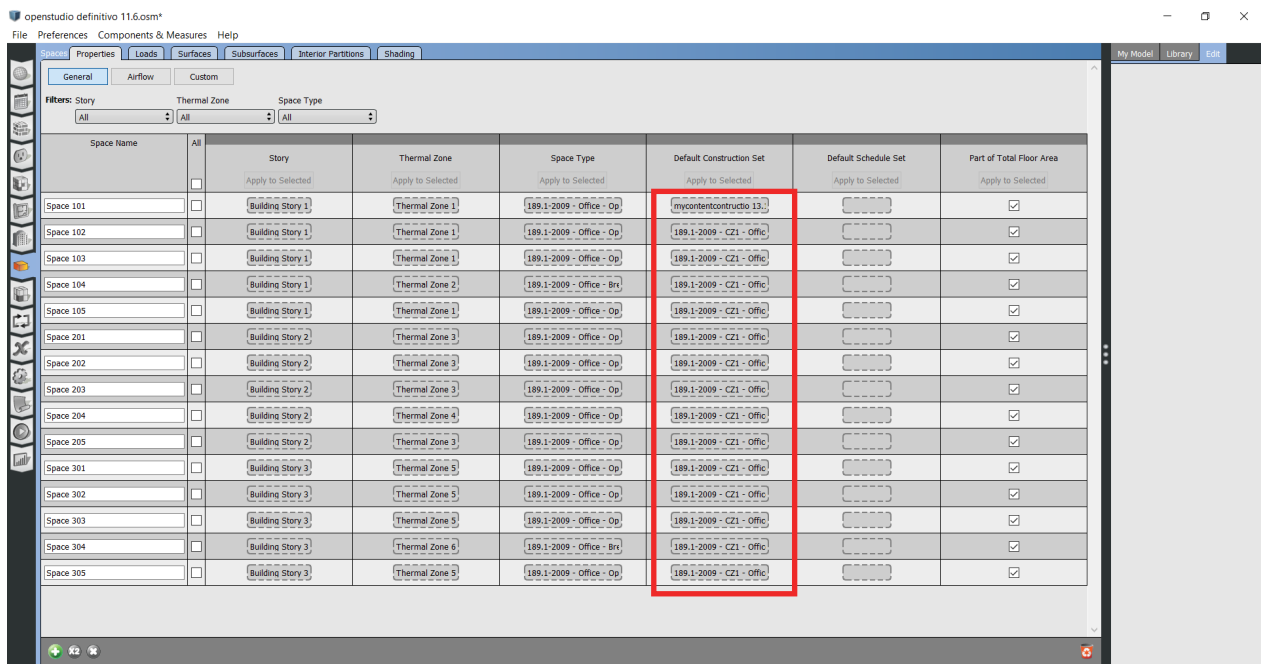
Water Heater - Heat Pump

Hot Water Equipment Definitions

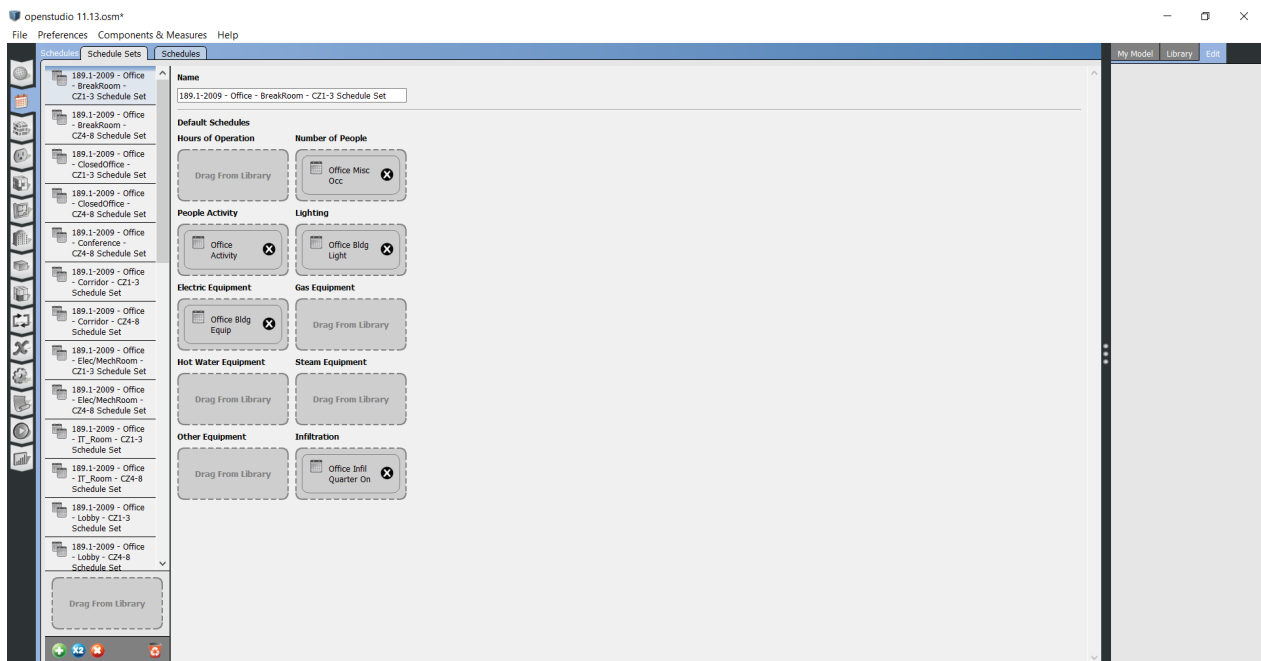
Steam Equipment Definitions

Other Equipment Definitions

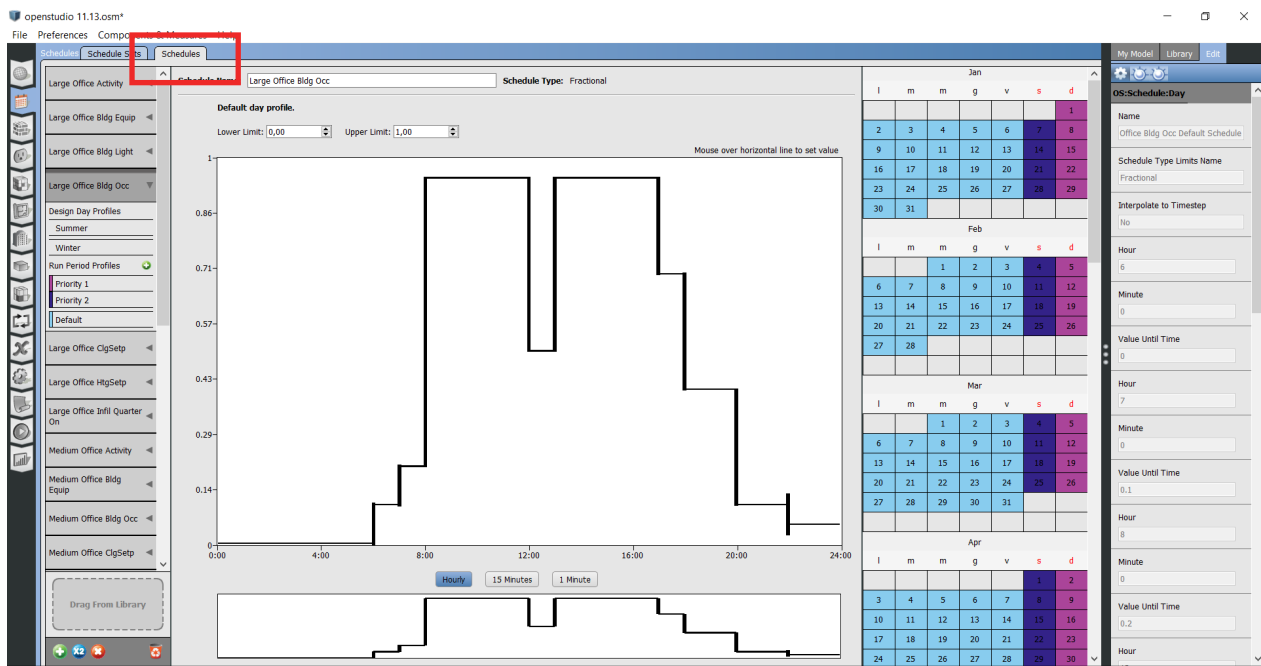
Now let's replace the default construction set with the one we created previously and copy it for any room in the building.



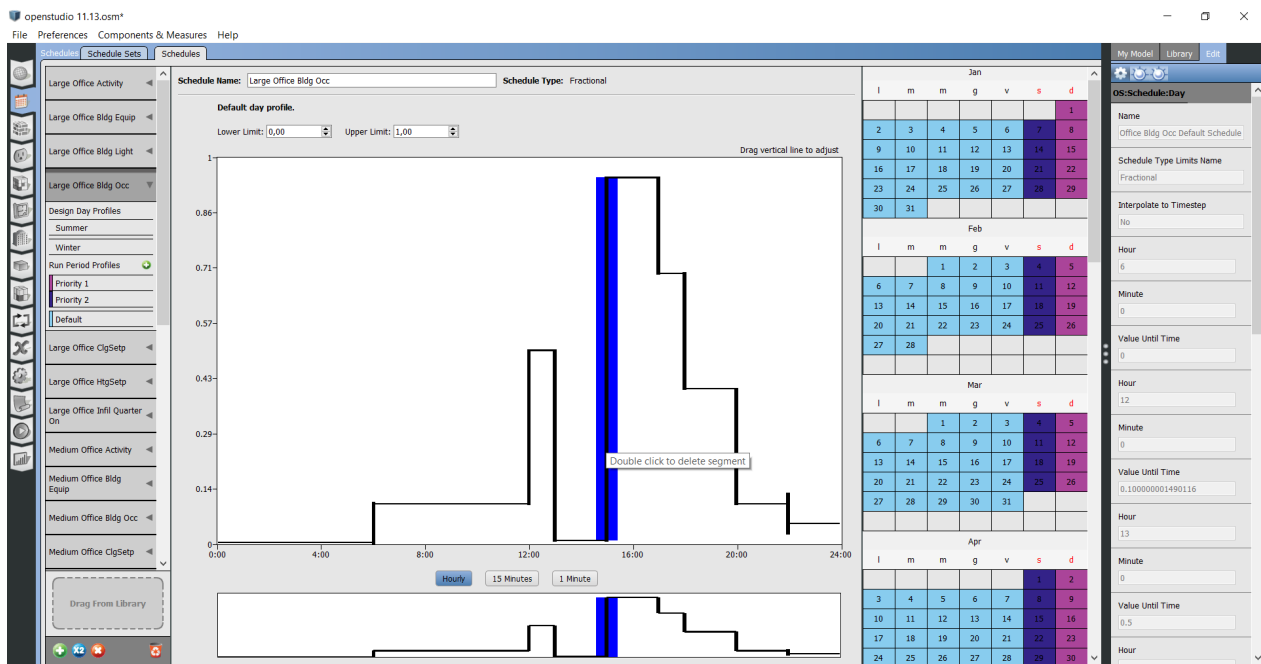
Now we can move on to the schedule definition in the “schedule set” section. We deal with those related to the “number of people” related to the Breakroom.



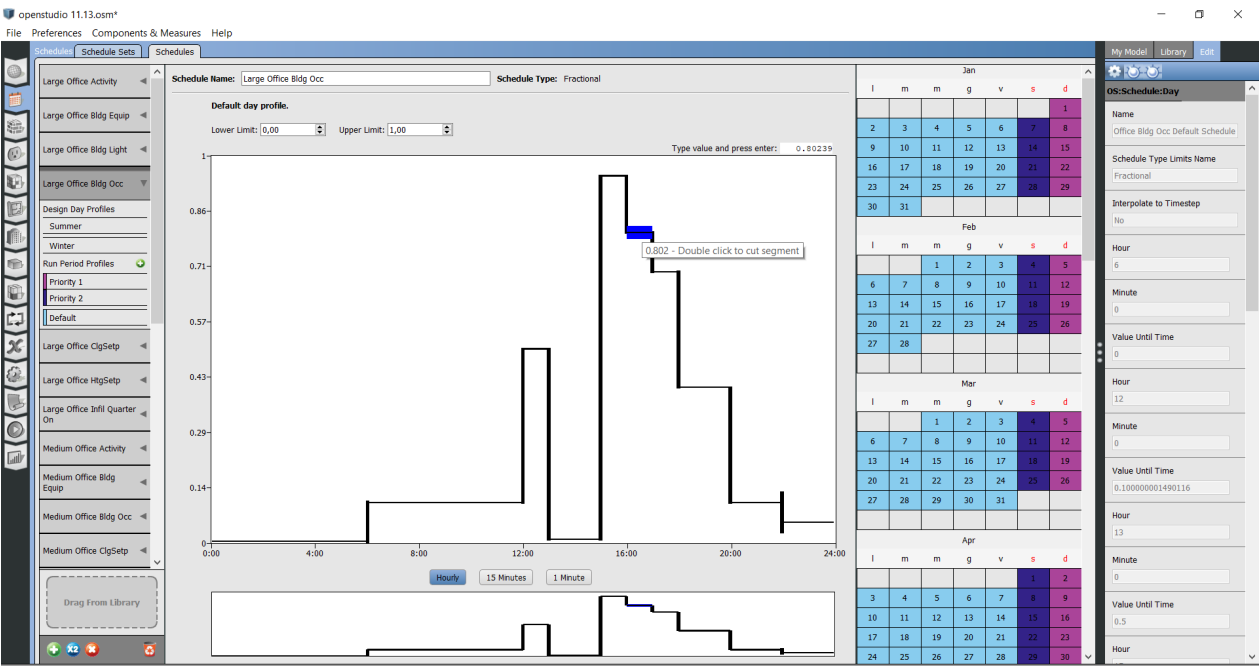
In the “schedules” window we can modify the time and quantity values of people.



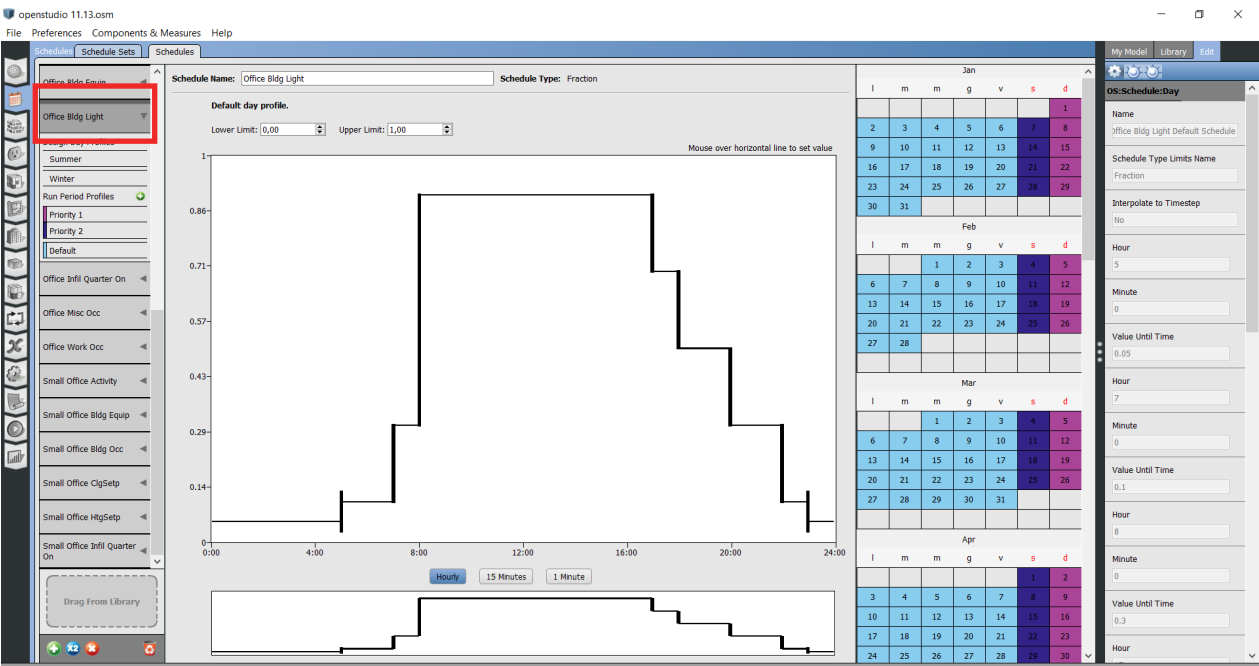
With a double click we can eliminate the vertical segment.



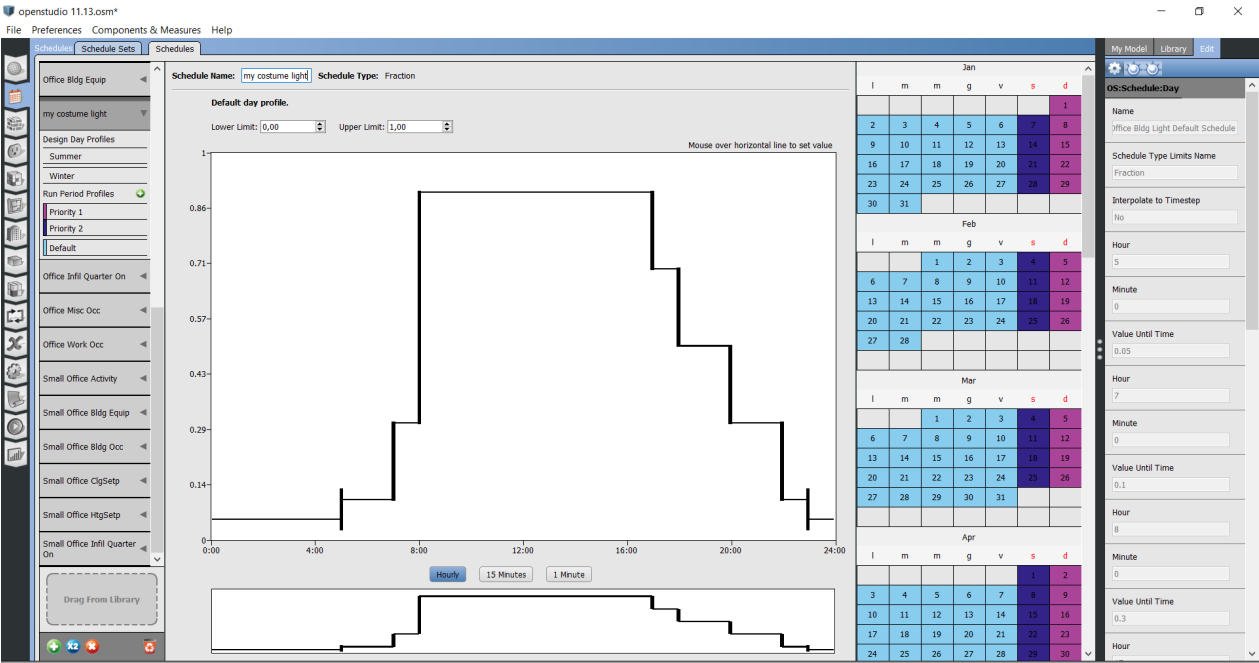
With a double click we can divide the horizontal segment



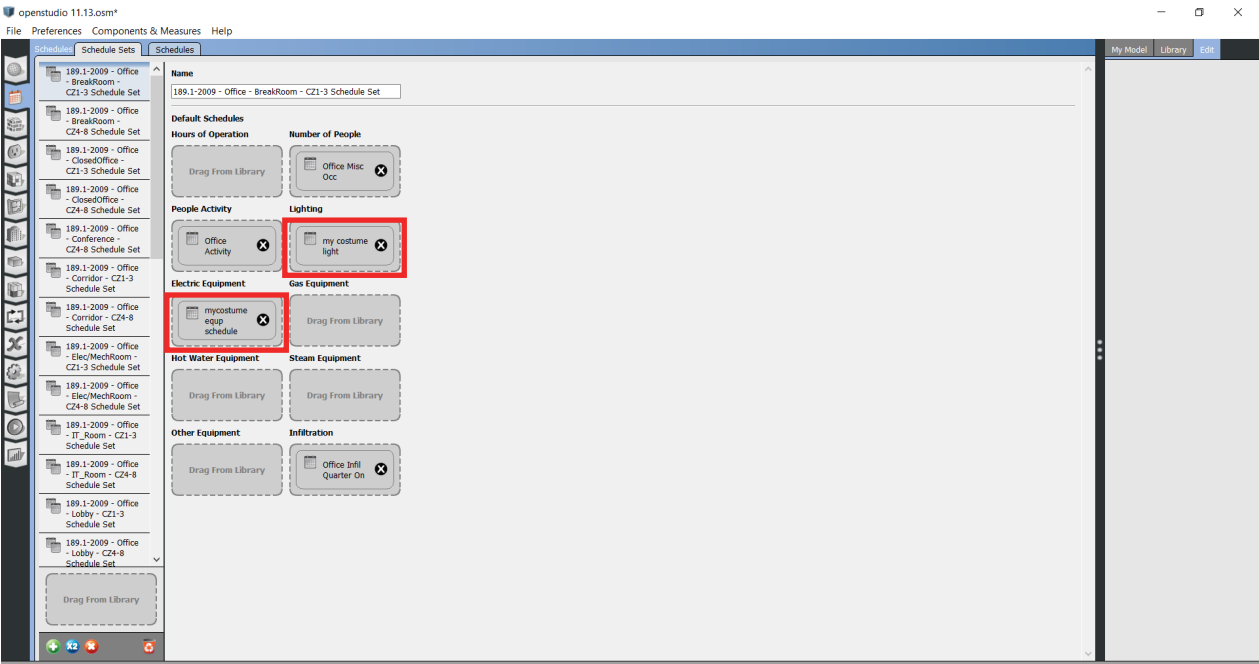
We can also repeat the same operations for the building's lights.



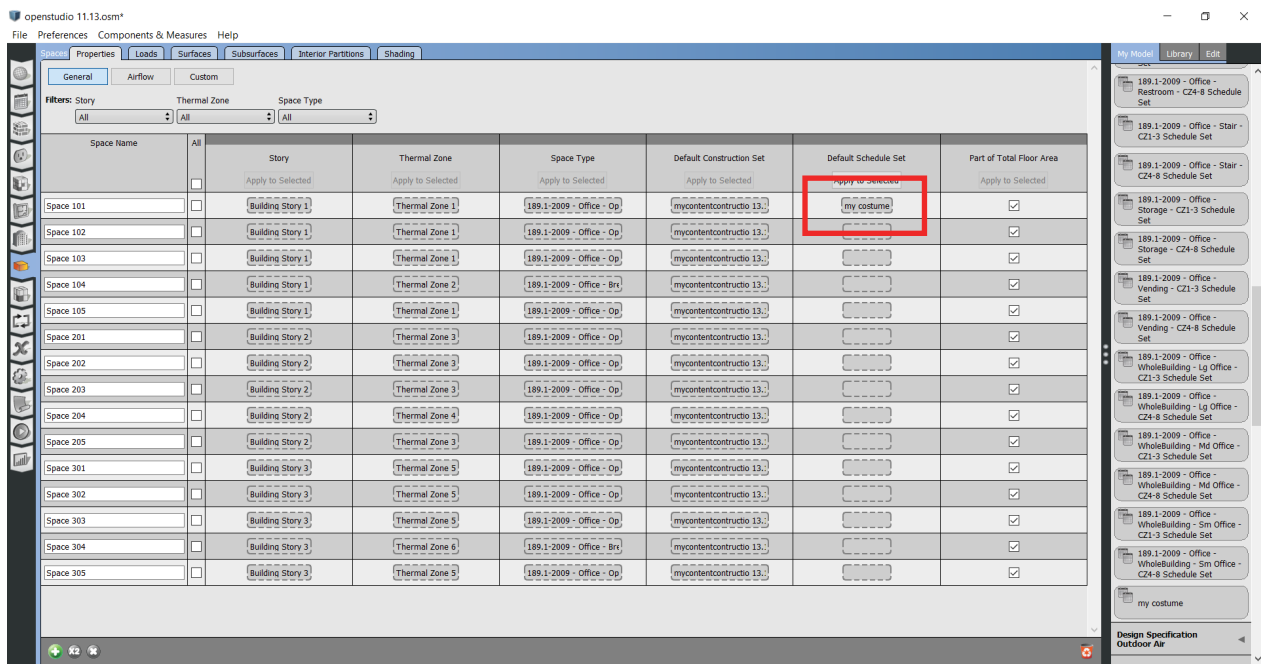
Let's renamed Schdule as “my costume light”.



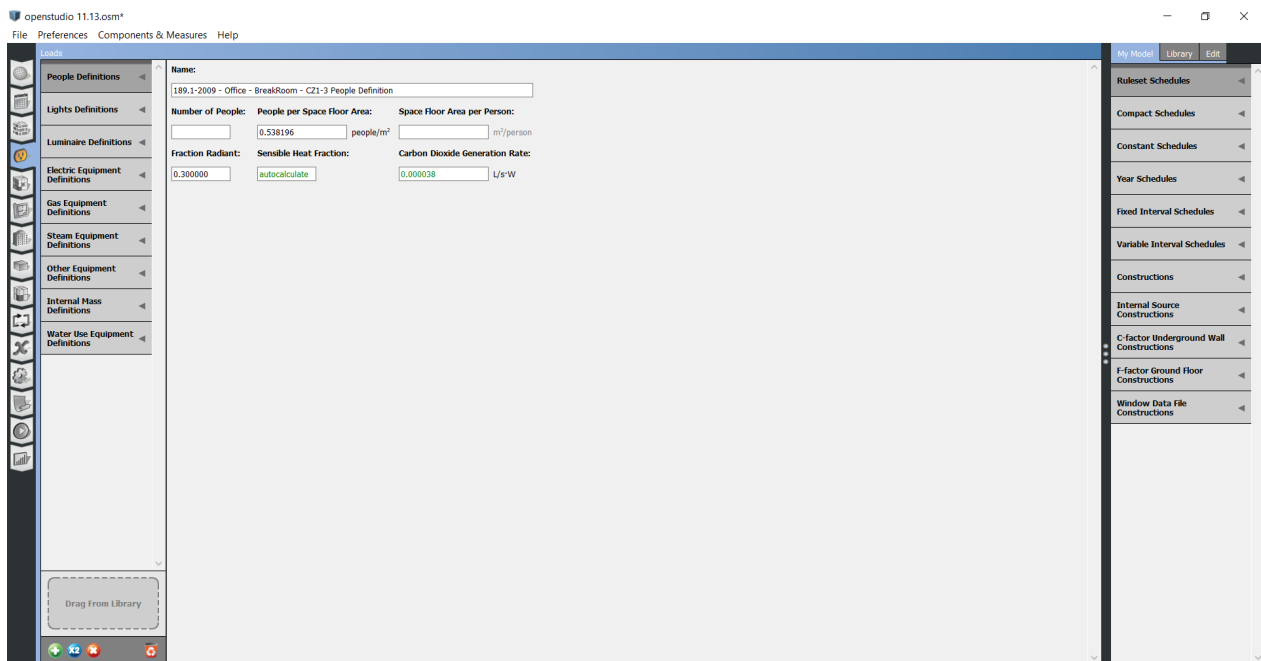
Also this time we repeat the path backwards and add in the section that manages all the schedules our “my costume light” and “my costume equip schedule”.



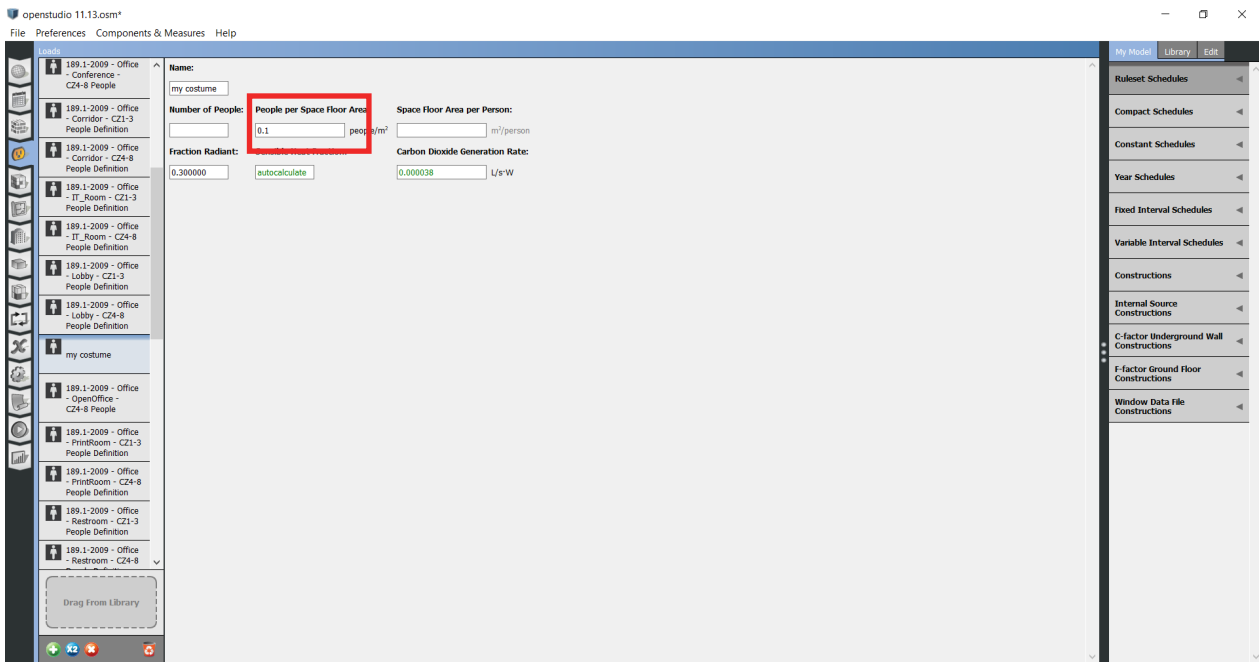
Now we replace the default schedule set with the one we created previously and we copy it for any room in the building.



Last but not least, we can set some power and crowding values for both lights and people.



1



2

