Week7_MelissaMartinoli

martedì 19 novembre 2019 22:47

01.Concept of solar radiation

Solar radiation is radiant energy emitted by the sun from a nuclear fusion reaction that creates electromagnetic energy. The spectrum of solar radiation is close to that of a black body with a temperature of about 5800 K. About half of the radiation is in the visible short-wave part of the electromagnetic spectrum. The other half is mostly in the near-infrared part, with some in the ultraviolet part of the spectrum. The units of measure are Watts per square meter.

The mean radiant temperature of a given surface is the temperature of the equivalent black enclosure with which it would exchange the same radiative flux exchanged with all the other surfaces. The operative temperature is the virtual ambient temperature with which the sum of the radiative thermal and convective linearized flow is exchanged which exchanges with the air and all the other surfaces.

The solar constant GSC is a flux density measuring mean solar electromagnetic radiation (solar irradiance) per unit area. The solar "constant" is not a physical constant, is an average of a varying value. Its value is 1367 W/m^2. Solar radiation absorption is due to some atmospheric components, especially ozone, water and carbon dioxide. Stratospheric ozone absorbs almost all the ultraviolet component of the solar radiation for wavelength less than 0.29 µm, water vapor has important absorption bands in the infrared field, centered at 1.0, 1.4, and 1.8 µm. Over 2.5 µm the atmosphere becomes practically opaque to solar radiation for the strong absorption due to water and carbon dioxide.

About 25%t of the incoming solar radiation is scattered or diffused by the atmosphere. Scattering is a phenomenon that occurs when solar radiation passes through the air and some of the wavelengths are deflected in all directions by molecules of gases, suspended particles, and water vapor. These suspended particles then act like a prism and produce a variety of colours. Various wavelengths and particle sizes result
in complex scattering affects that produce the blue sky. Scattering is also responsible for the red Sun at sunset, varying cloud colours at sunrise and sunset, and a variety of optical phenomena. Scattering always occurs in the atmosphere, but does not always produce dramatic settings.
Under certain radiation wavelength and particle size conditions all that can be seen are white clouds and a whitish haze. This occurs when there is a high moisture content (large particle size) in the air and is called diffuse reflection. About two thirds of the normally scattered radiation reaches earth as diffuse sky radiation. Diffuse sky radiation may account for almost 100% of the radiation received by polar stations
during winter.

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 rotation of Earth.

Reflection is the process whereby a surface turns a portion of the incident back into the medium through which the radiation came. A substance reflects some insolation. This means that the electromagnetic waves simply bounce back into space. Earth reflects an average of 36%t of the insolation. The percent of reflectivity of all wavelengths on a surface is known as its albedo.

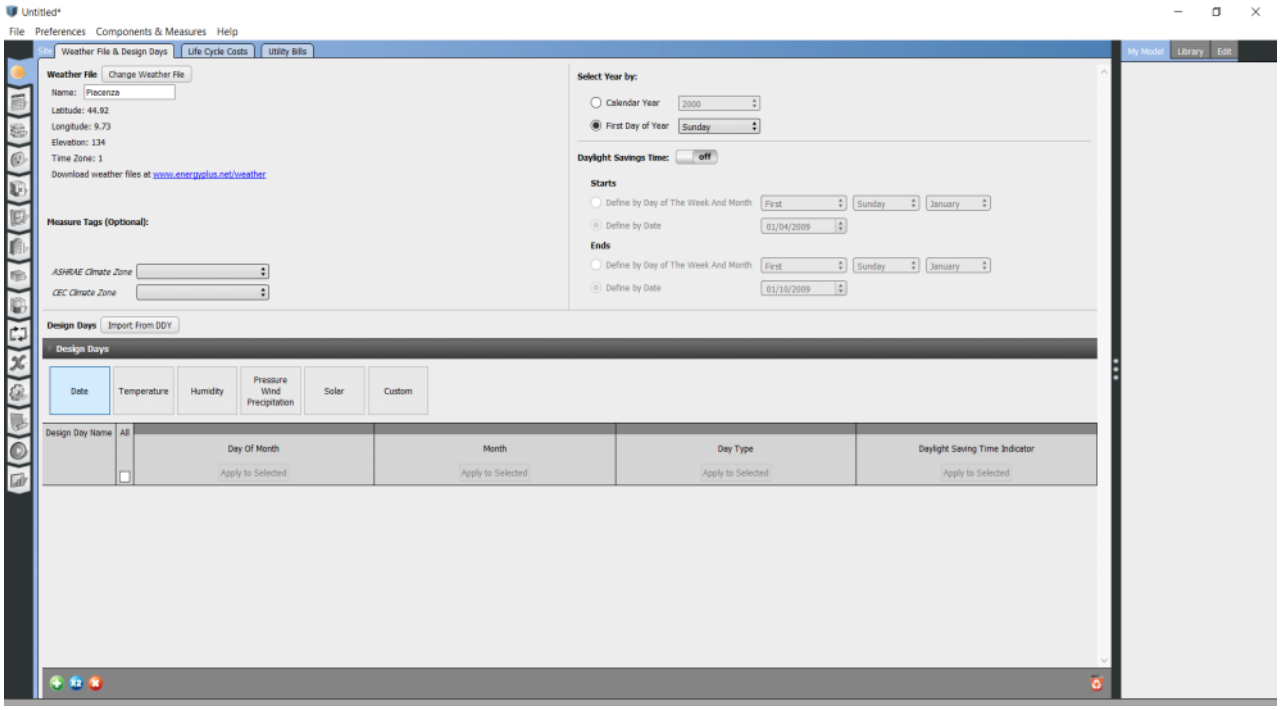
The sun to the zenith crosses the minimum thickness of the atmosphere, the sun with an elevated zenith angle crosses a large thickness of the atmosphere.

Solar radiation depends on:

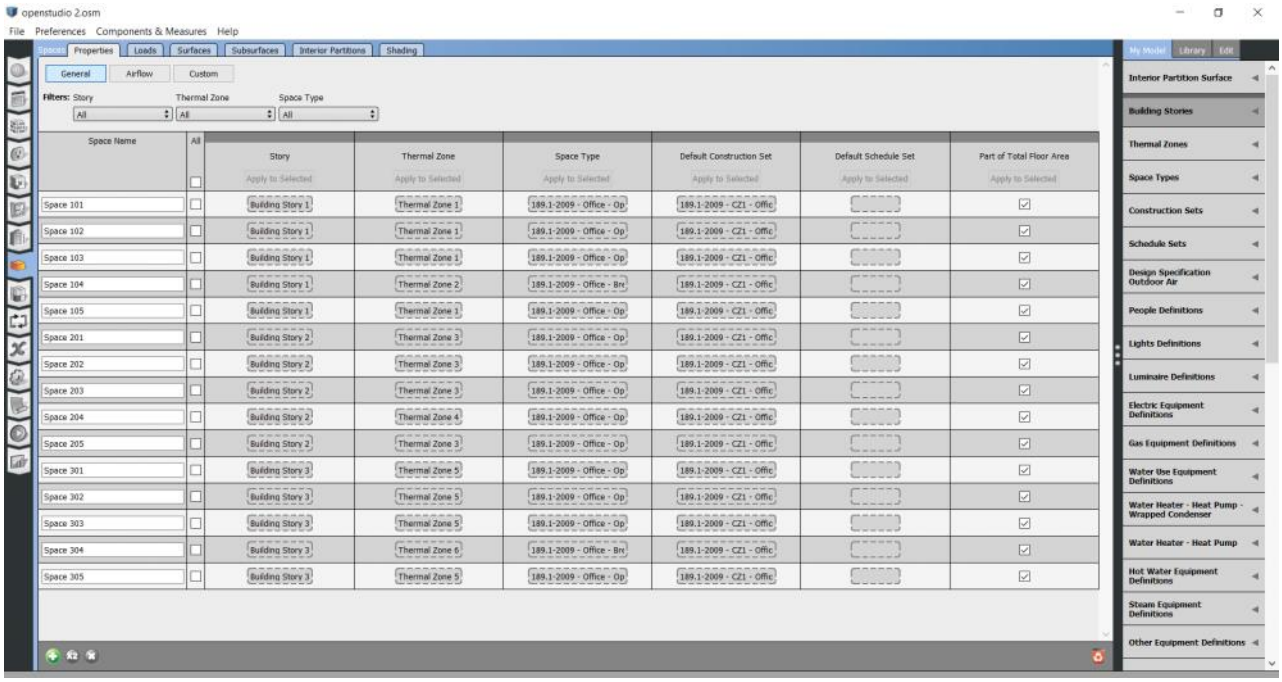
- the sun position in the sky (altitude and azimuth angles)
- the weather condition
- the site altitude over the sea level
- sunshine hours

02.Screenshots of the steps followed in class

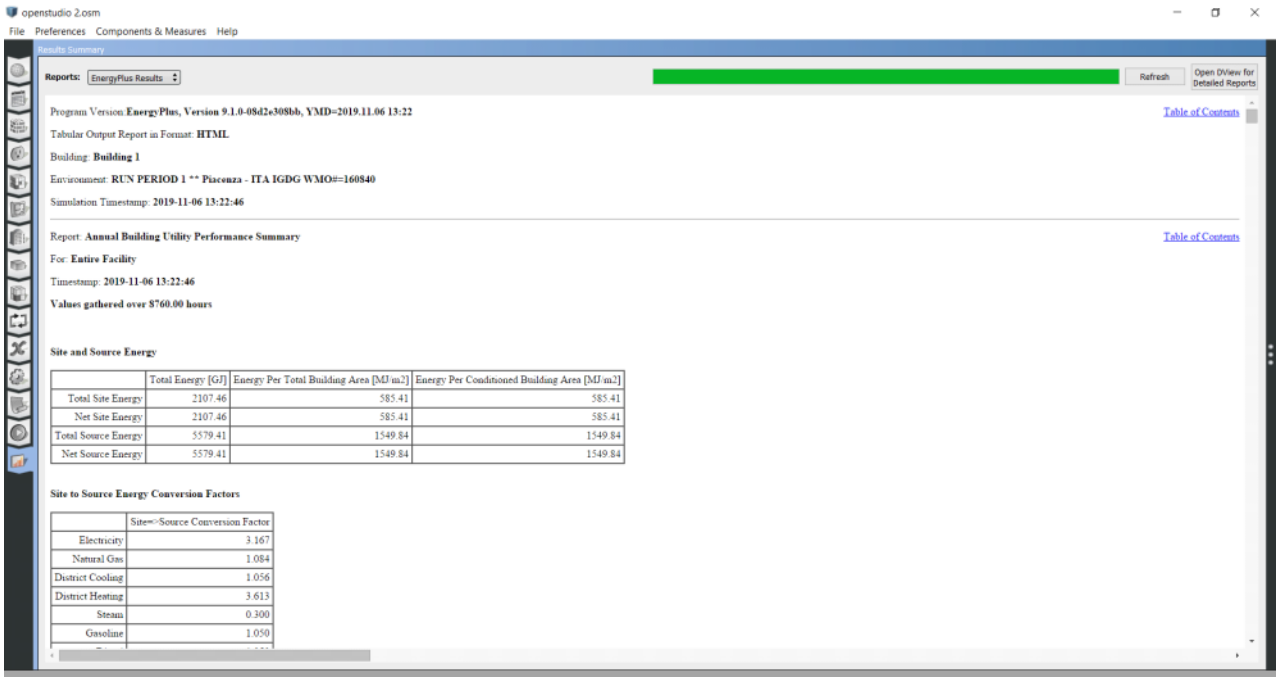
Let's open the openstudio file we created last time. Let's reset the "design days" related to the Piacenza area. Within the site "energy plus weather file" we can find climatic information about any location.



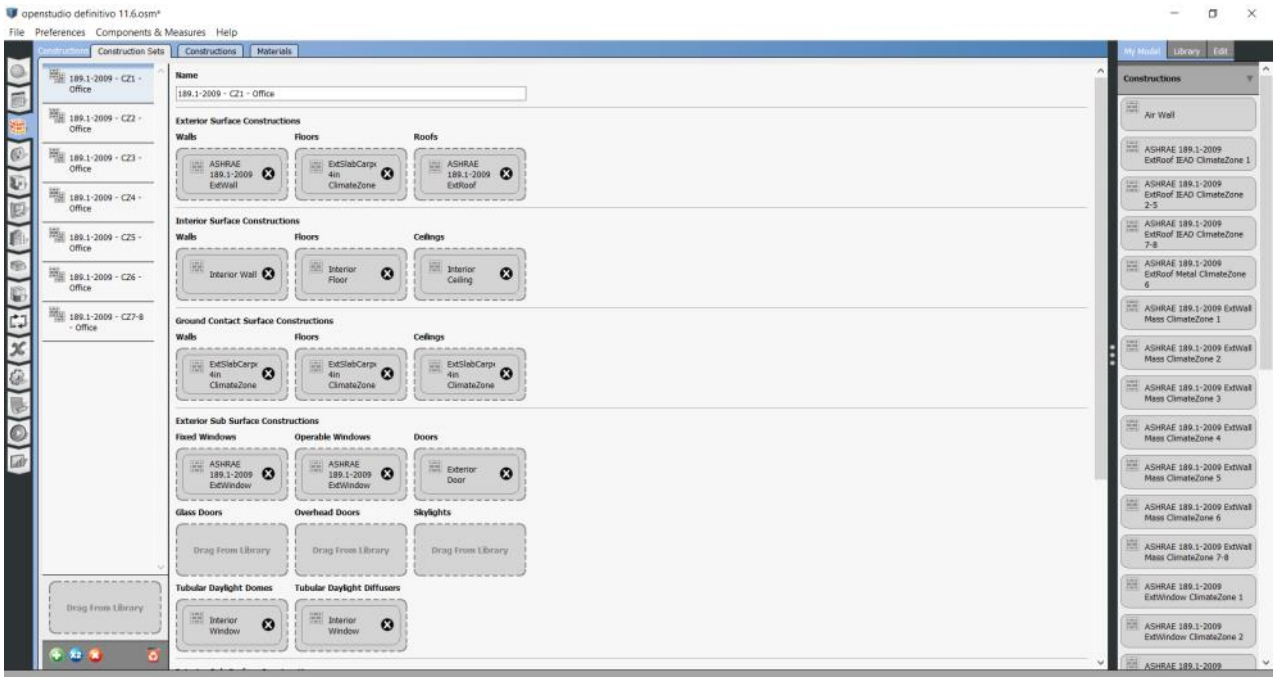
Within this screen we can go to set different "construction set" and "schedule set" in each place of the building. We will then go into more detail on how to manage the settings of these two elements.



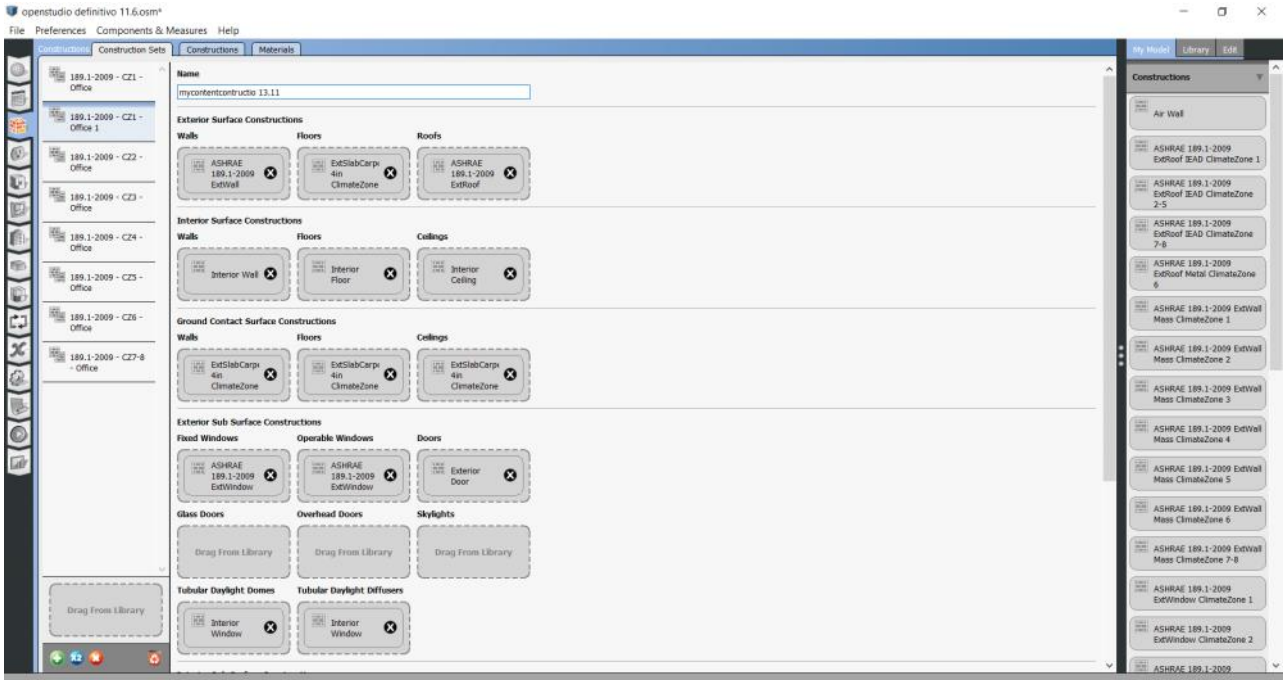
These are the data relative to the simulation of the last time with parameters of default.



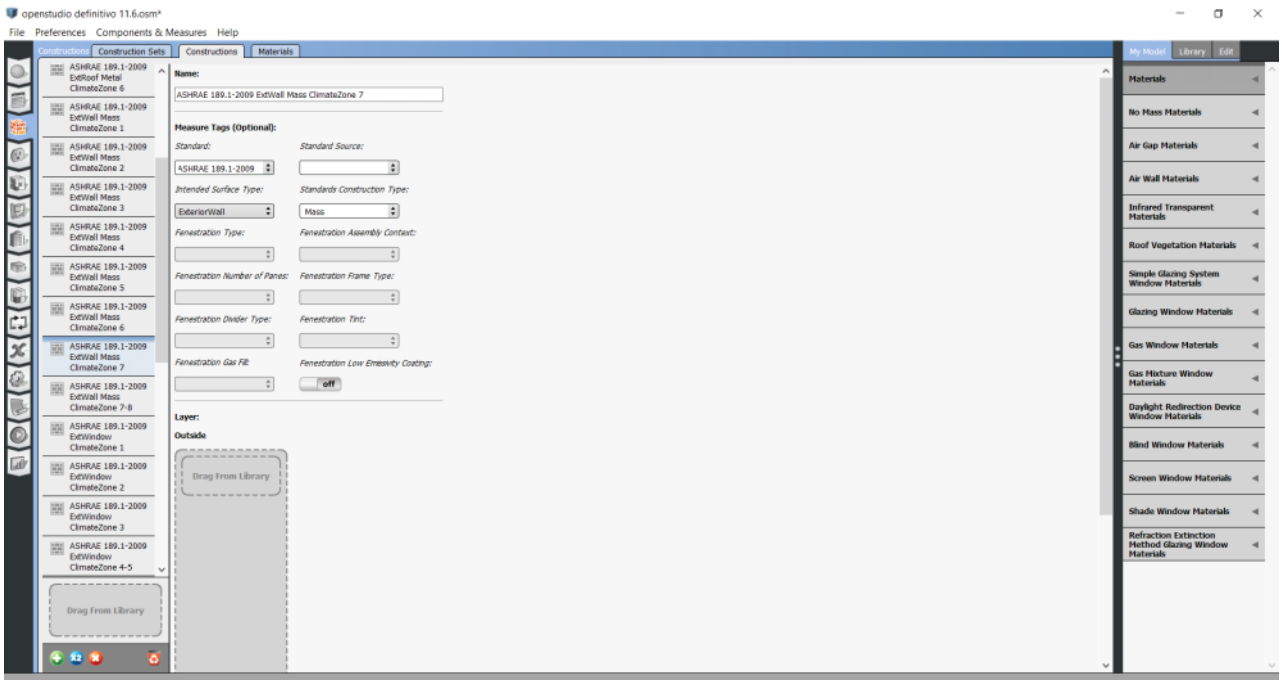
In the section “construction set” we can create the combination of roofs, interior walls, floors, exterior walls best suited to our needs and those of the building.



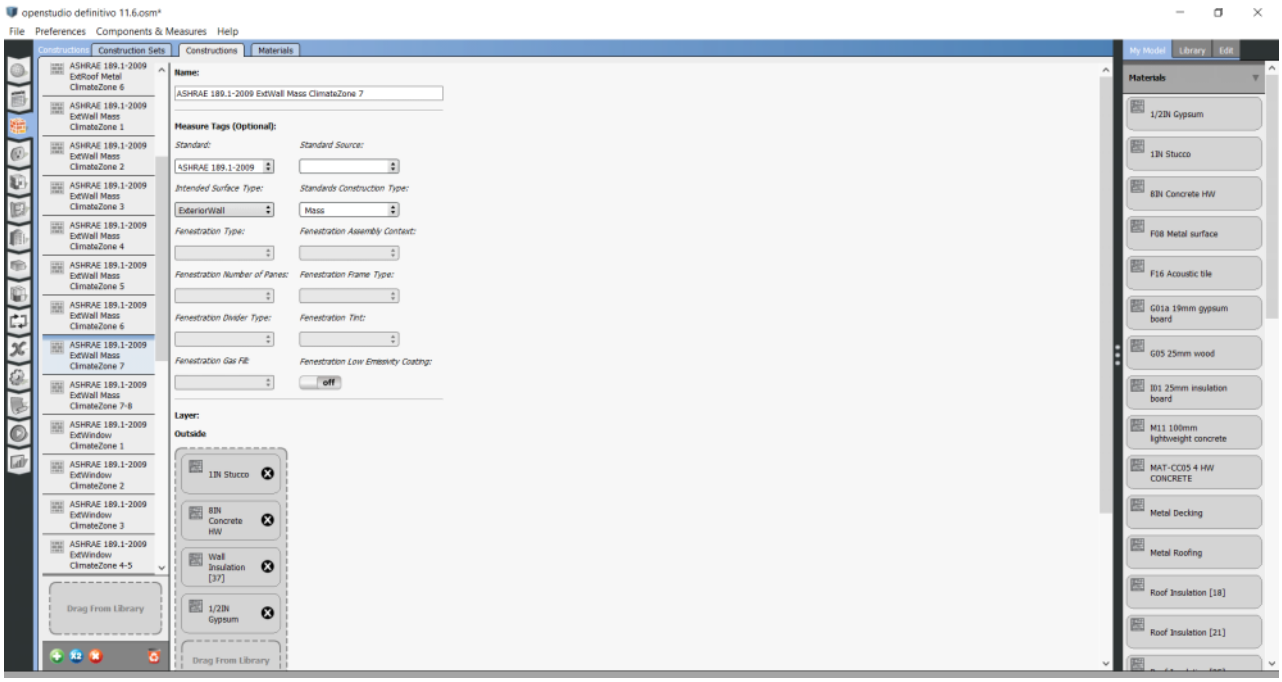
Let’s rename one of these settings as “mycontentconstuction 13.11” so that we can recognize it with respect to the others.



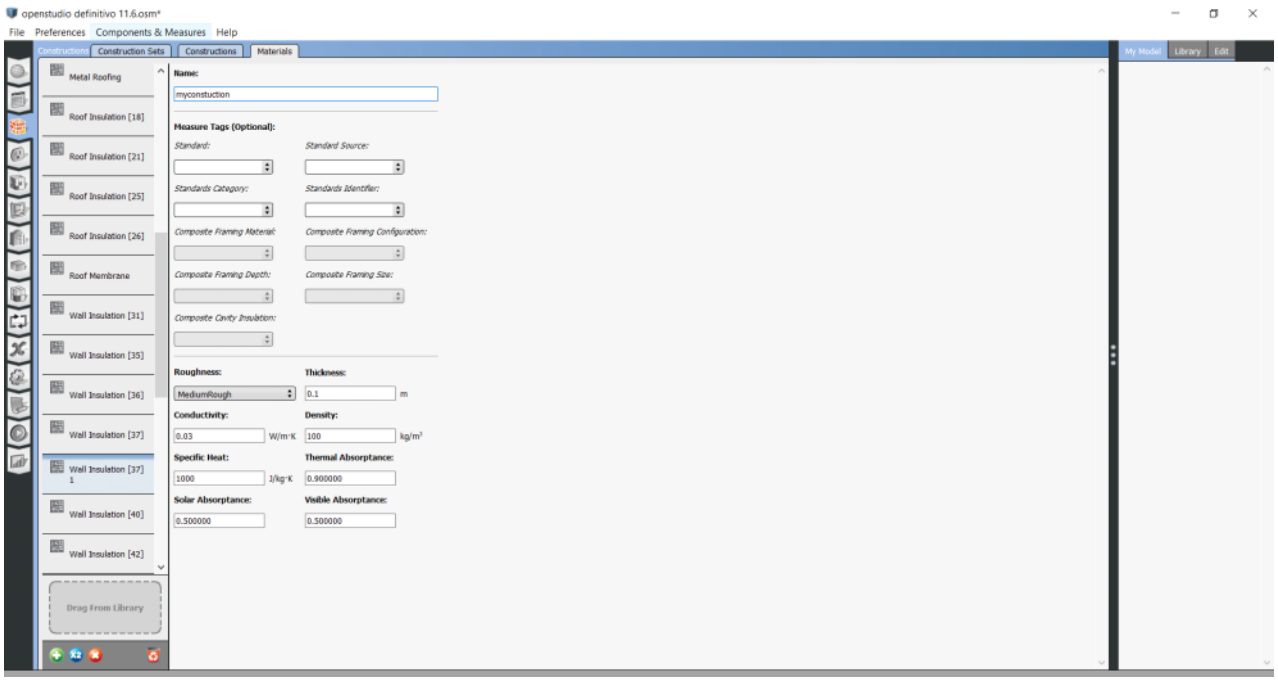
Now in the construction section we can deal with a specific wall.



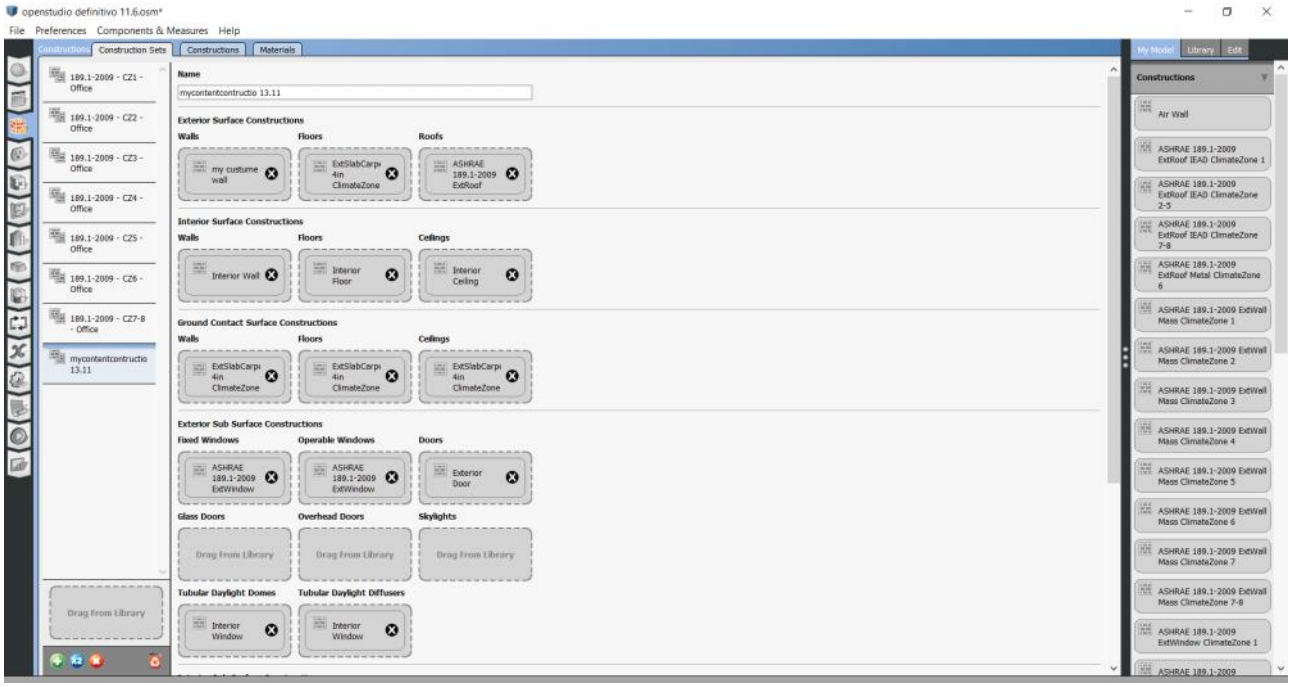
We can see that some materials have already been defined in the “layer” section. We remove them, insert the materials we prefer (from the section on the right “materials”) and rename the wall as “myconstruction wall”.



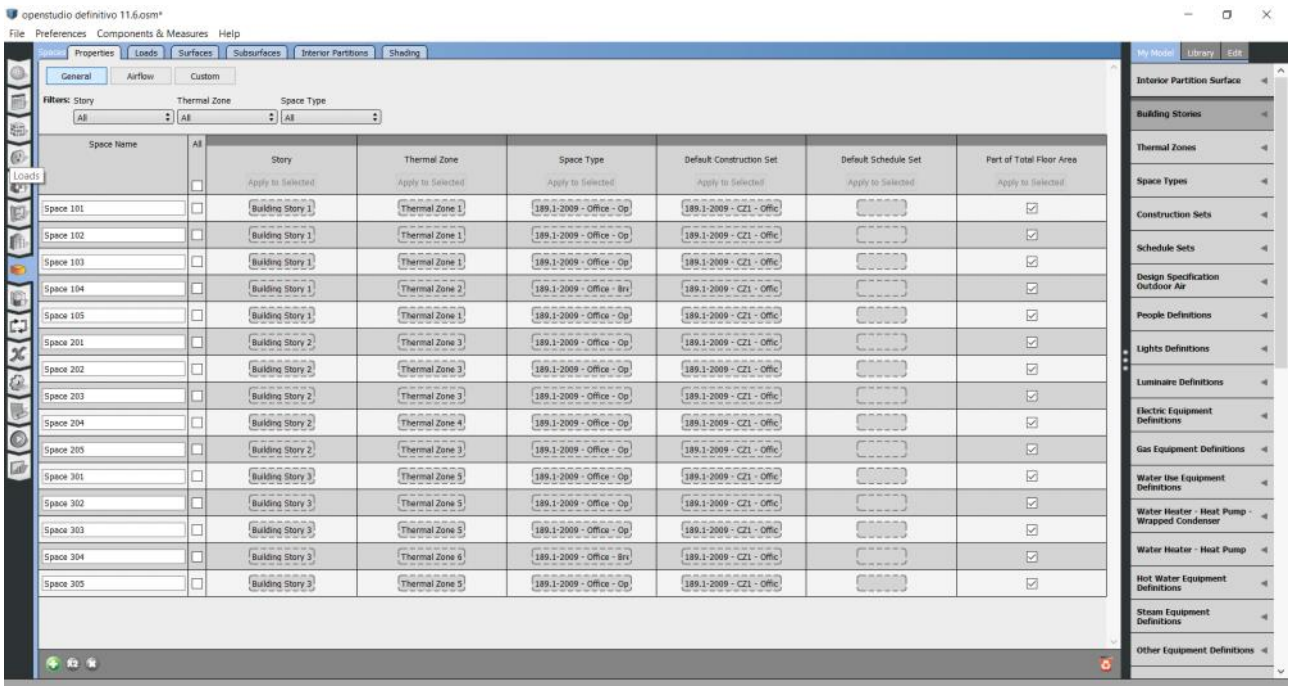
Now let’s go down more specifically, going to change the values of: condudditivity, thickness, density, etc.. Also this time we rename the material as “myconstuction”.



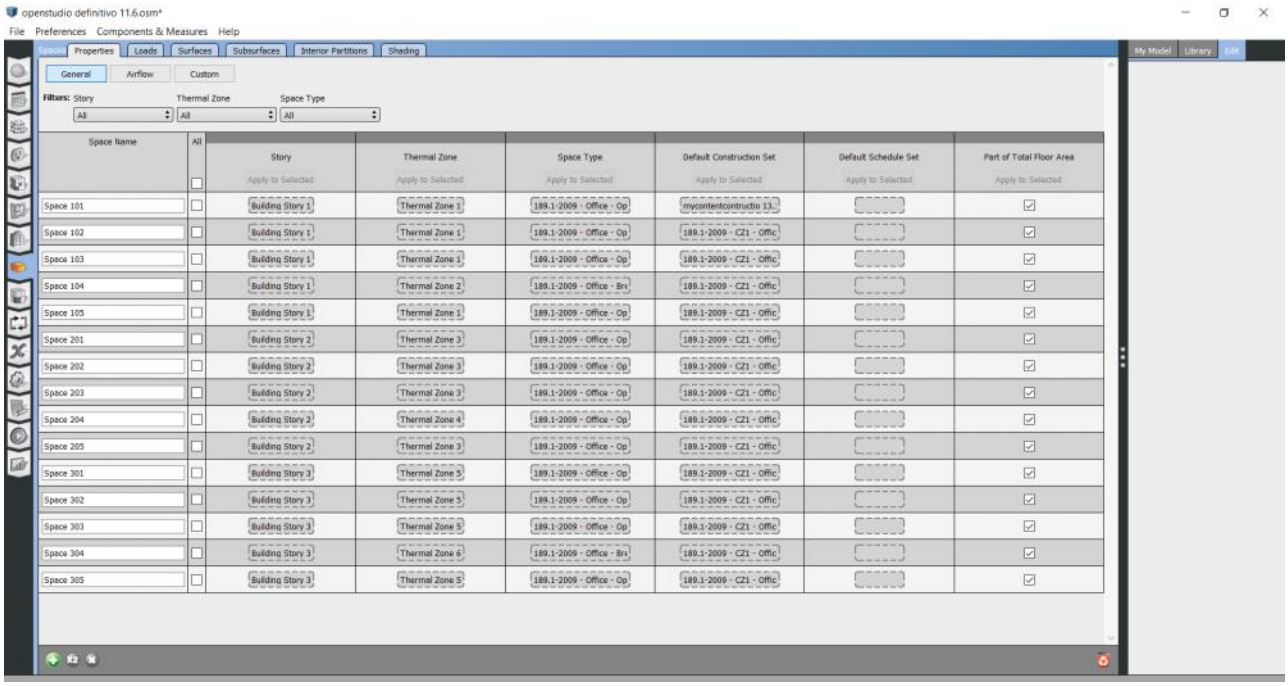
Now let’s retrace the path done so far in the opposite direction, that is, inserting the material created “myconstuction” within the layers of “myconstructionwall” and finally inserting the latter in the card that manages all the structural components of the building “mycontentconstruction 13.11”.



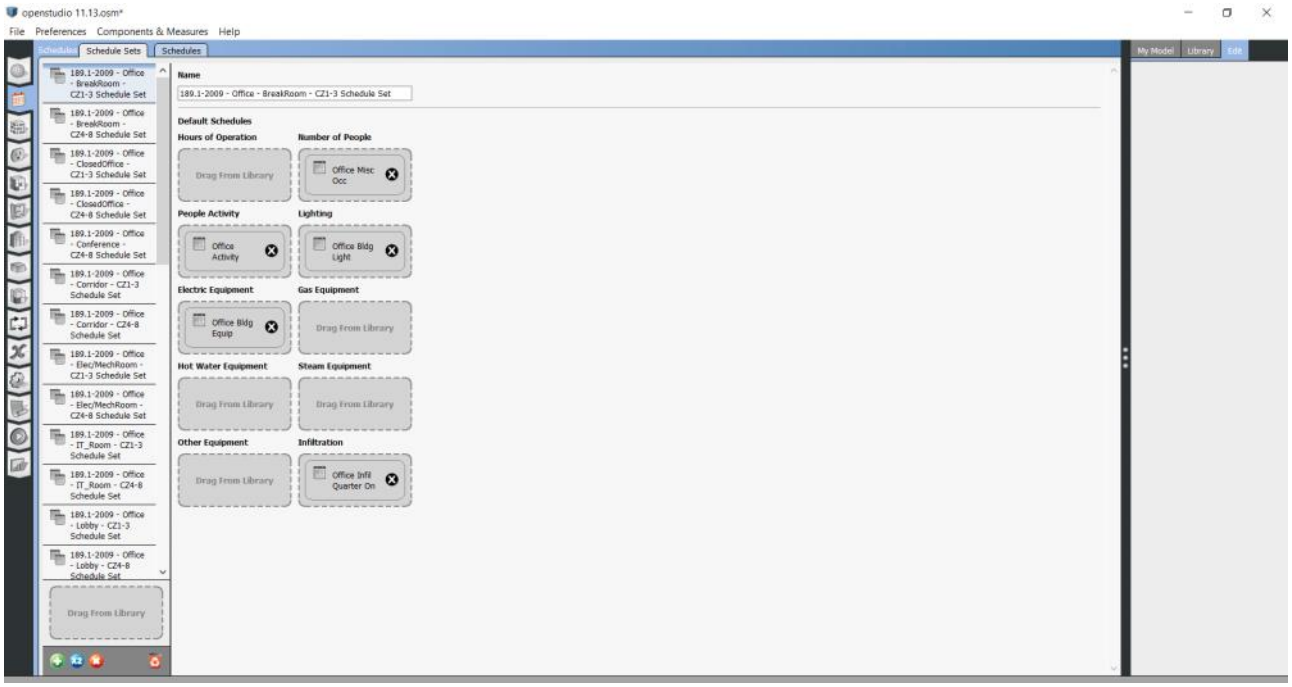
Let’s go back to the screen where you can change the “construction sets”.



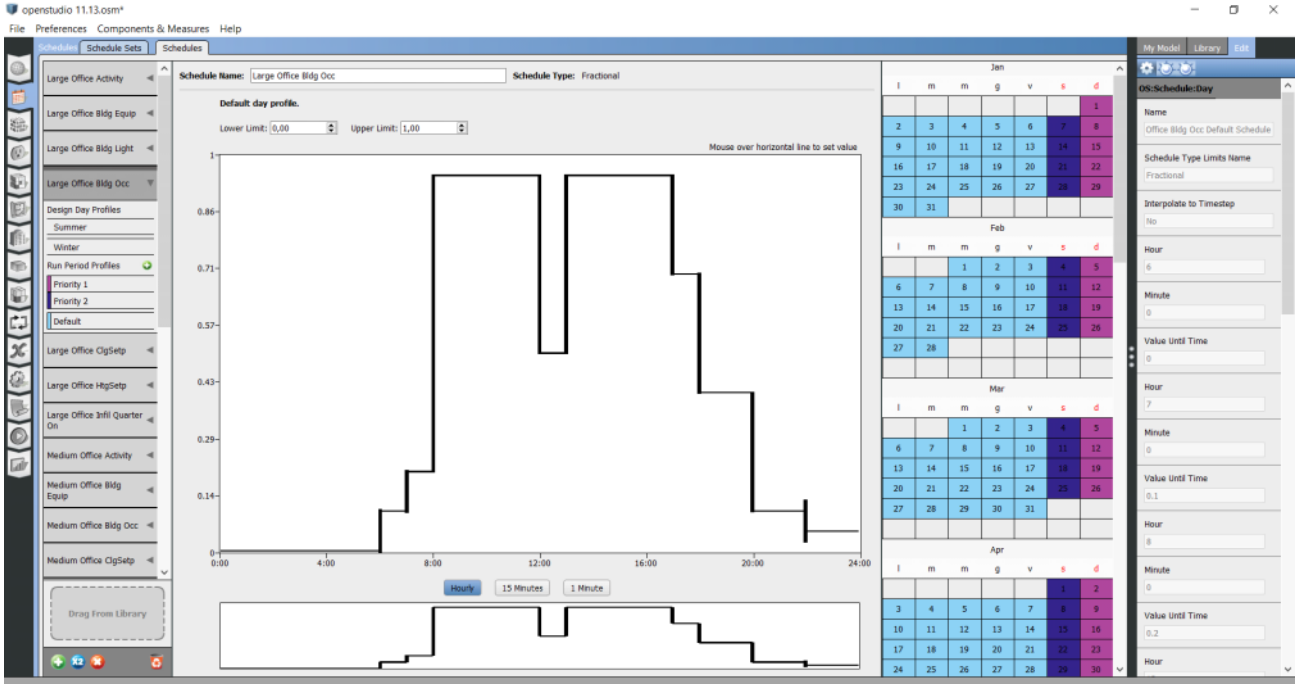
Now let’s replace the default construction set with the one we created previously and copy it for any room in the building.



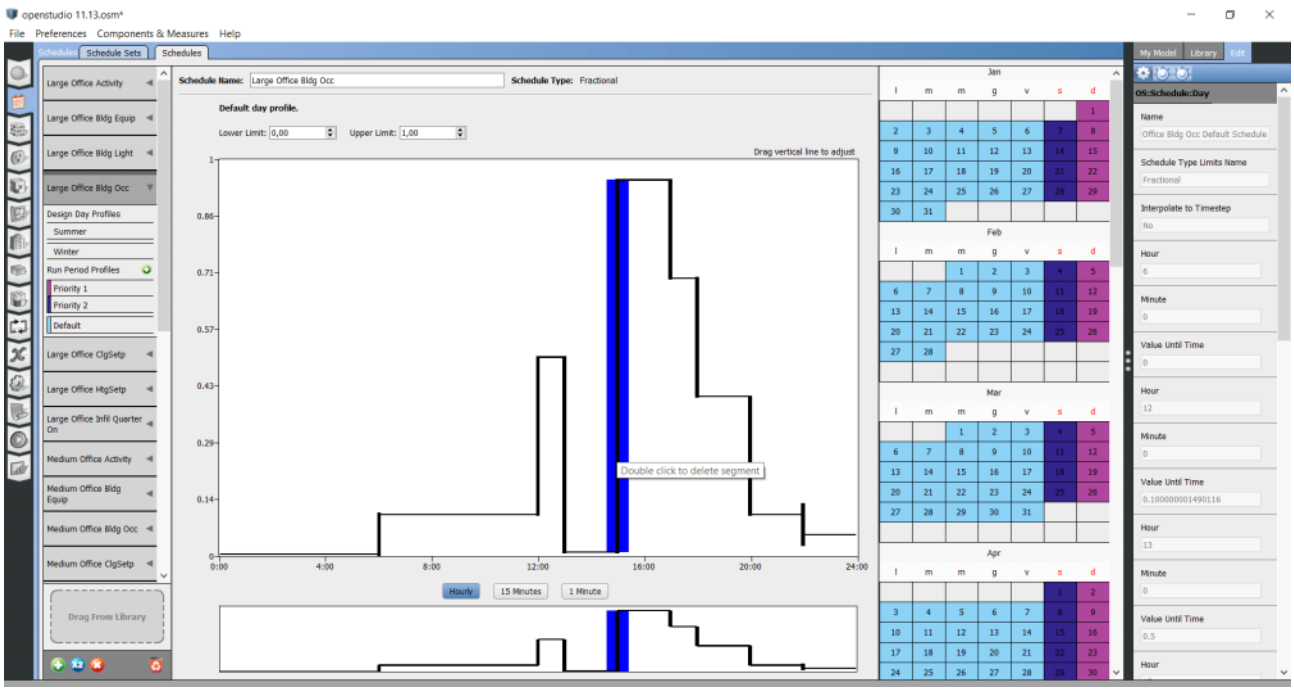
Now we can move on to the schedule definition in the “schedule set” section. We deal with those related to the “number of people” related to the Breakroom.



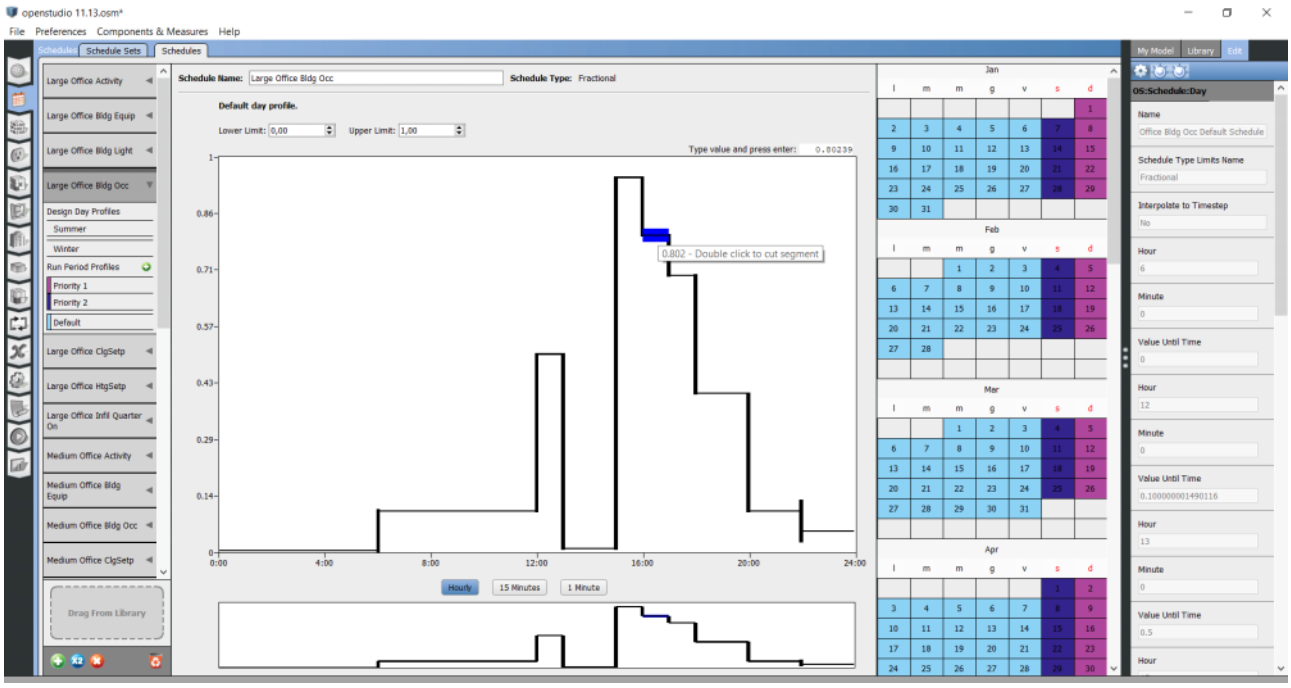
In the “schedules” window we can modify the time and quantity values of people.



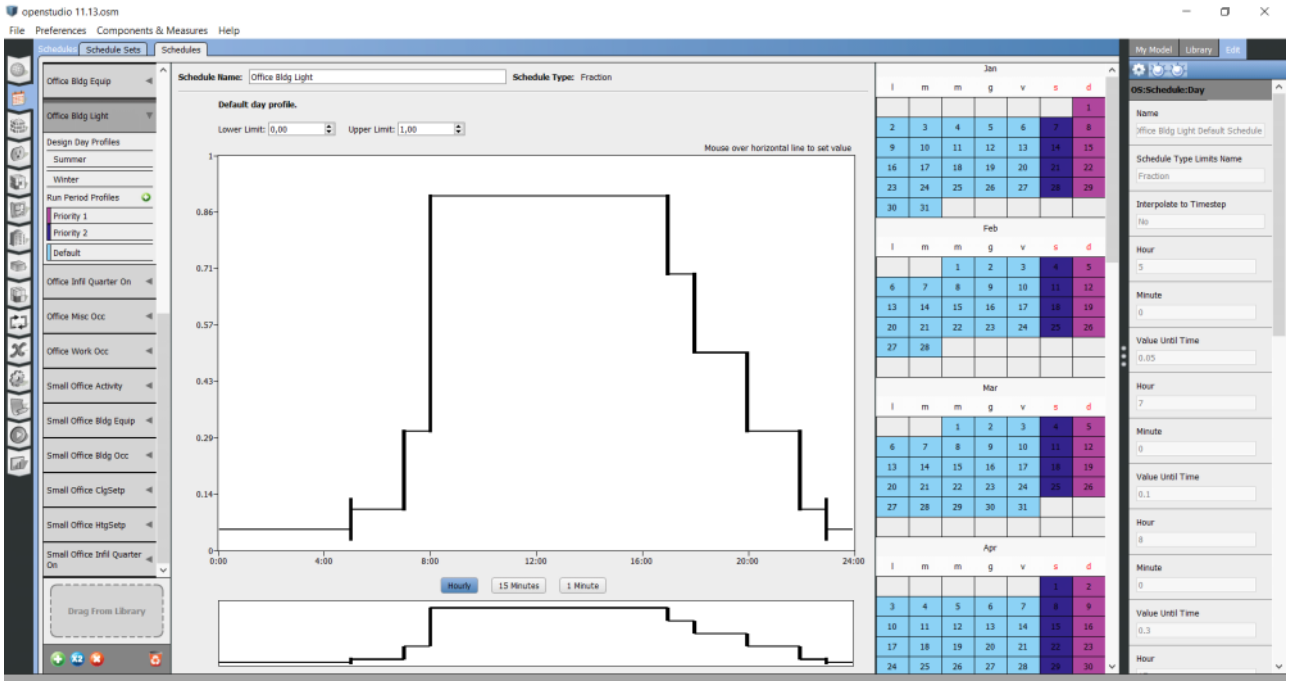
With a double click we can eliminate the vertical segment.



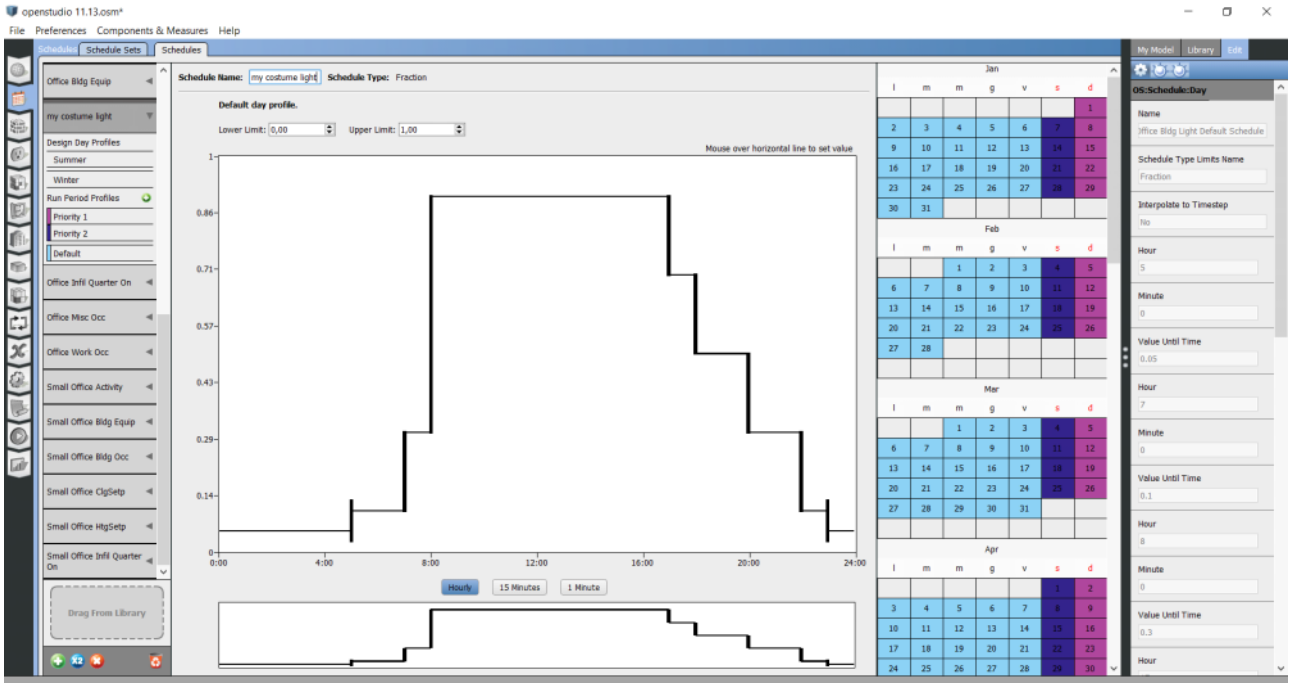
With a double click we can divide the horizontal segment.



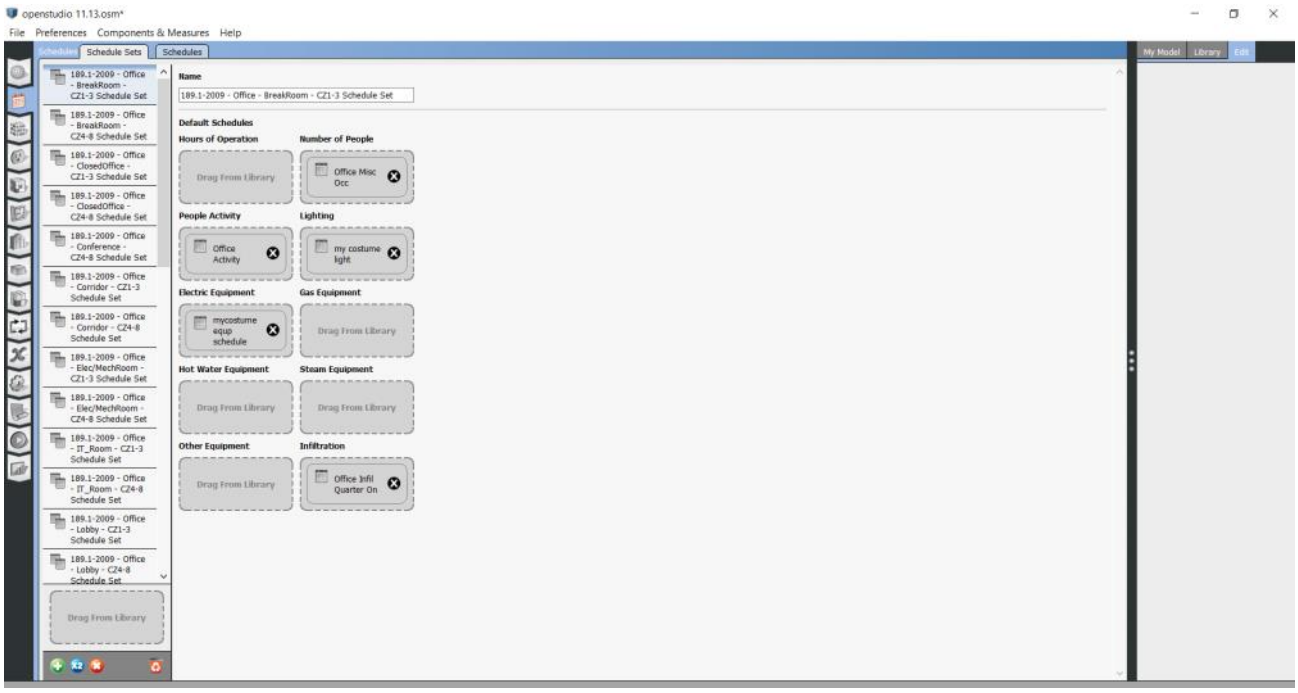
We can also repeat the same operations for the building's lights.



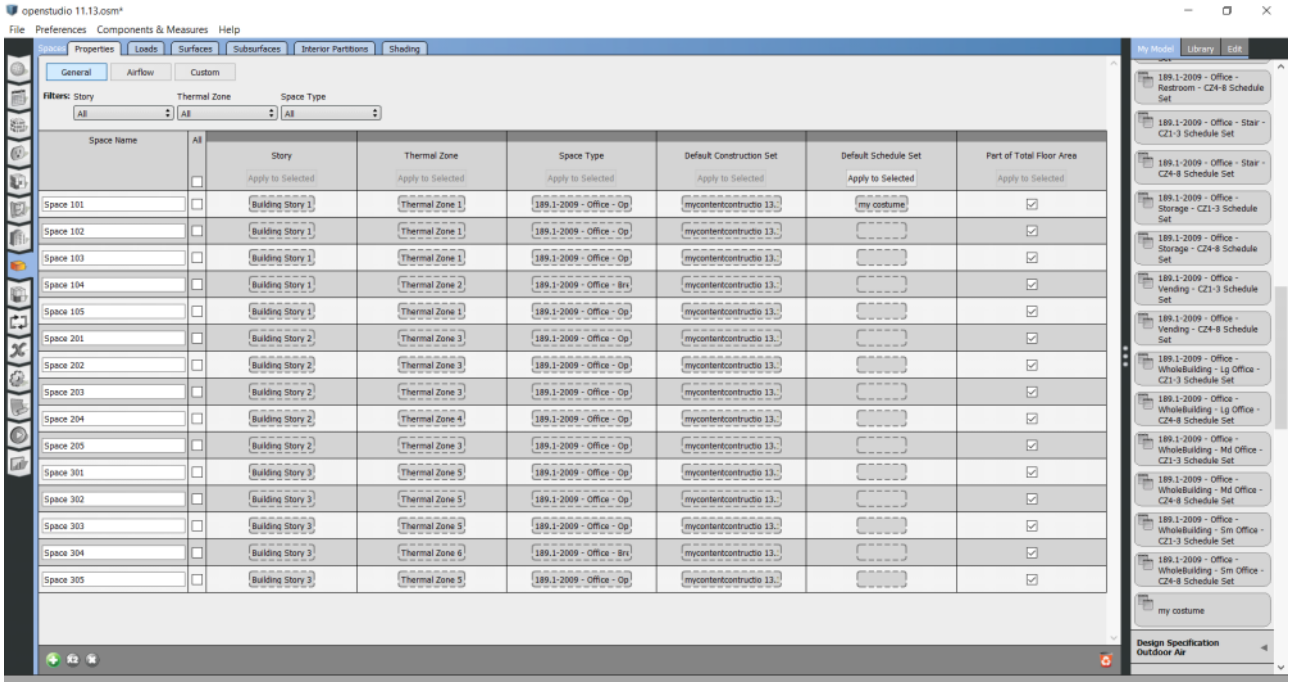
Let’s renamed Schedule as “my costume light”.



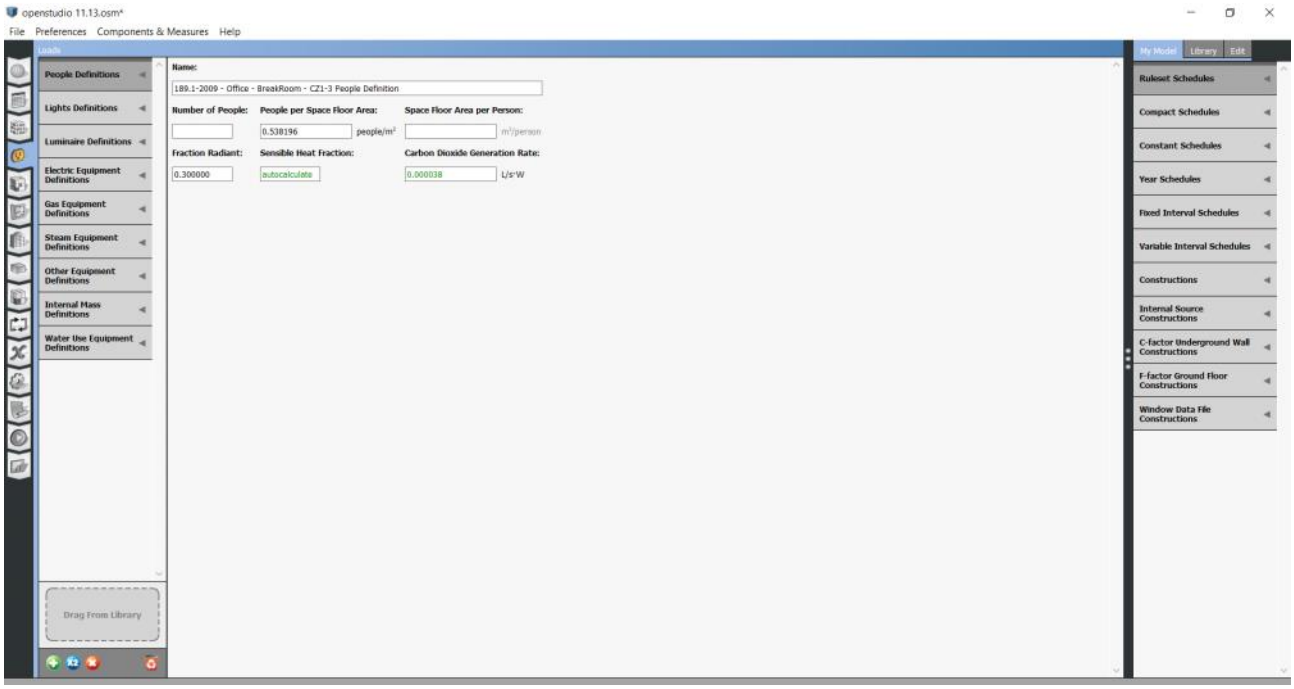
Also this time we repeat the path backwards and add in the section that manages all the schedules our “my costume light” and “my costume equip schedule”.

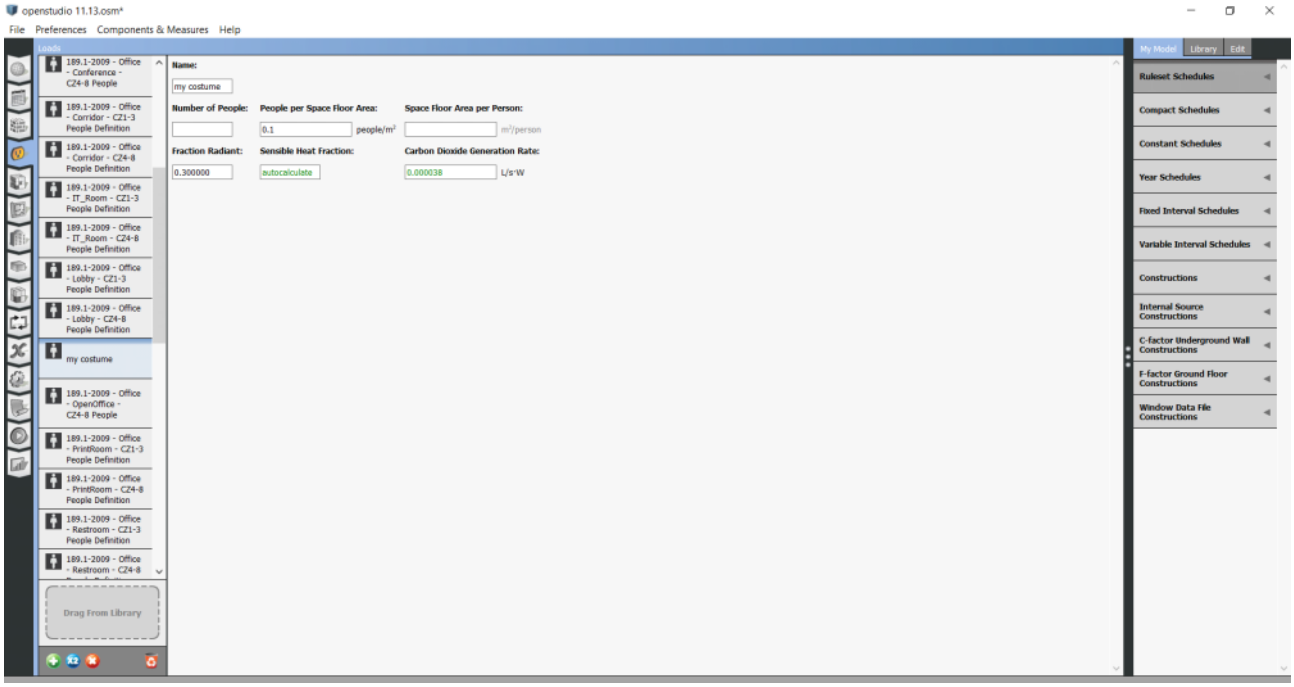


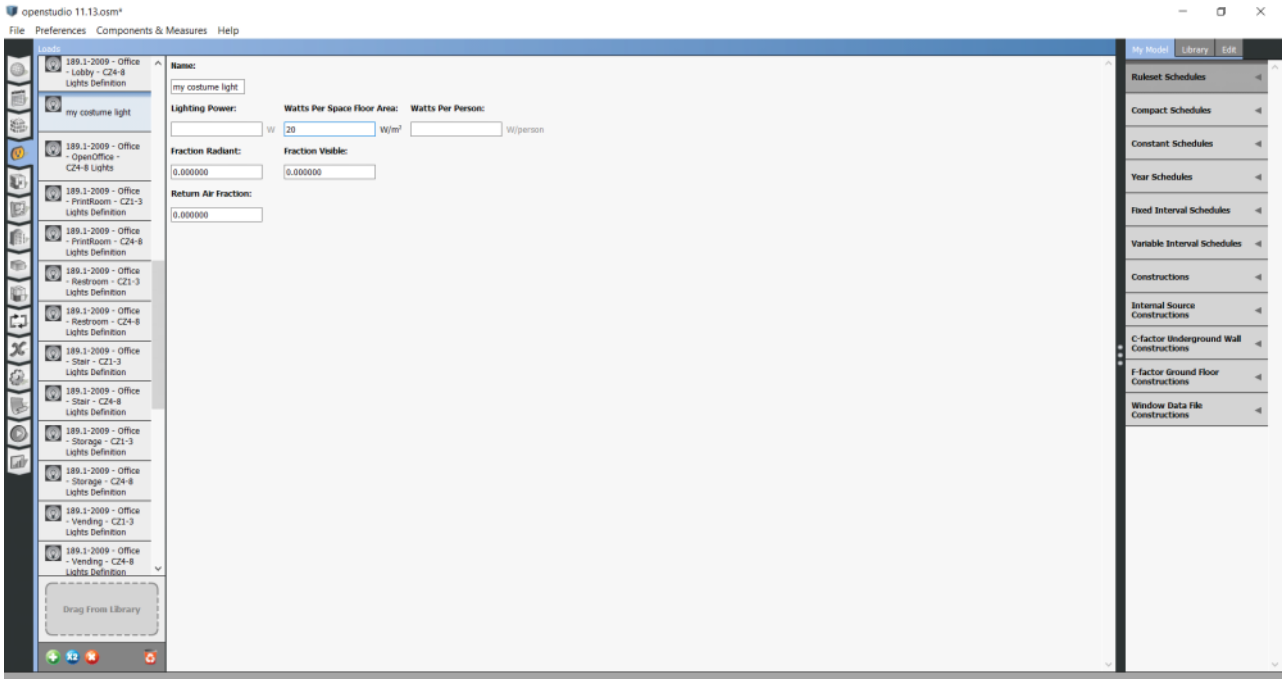
Now we replace the default schedule set with the one we created previously and we copy it for any room in the building.



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




openstudio 11.13.osm*
File Preferences Components & Measures Help
Loads
189.1-2009 - Office - Conference - CZ4-8 People
189.1-2009 - Office - Corridor - CZ1-3 People Definition
189.1-2009 - Office - Corridor - CZ4-8 People Definition
189.1-2009 - Office - IT_Room - CZ1-3 People Definition
189.1-2009 - Office - IT_Room - CZ4-8 People Definition
189.1-2009 - Office - Lobby - CZ1-3 People Definition
189.1-2009 - Office - Lobby - CZ4-8 People Definition
my costume
189.1-2009 - Office - OpenOffice - CZ4-8 People
189.1-2009 - Office - PrintRoom - CZ1-3 People Definition
189.1-2009 - Office - PrintRoom - CZ4-8 People Definition
189.1-2009 - Office - Restroom - CZ1-3 People Definition
189.1-2009 - Office - Restroom - CZ4-8
Drag From Library
Name:
my costume
Number of People:
People per Space Floor Area:
0.1
people/m²
Space Floor Area per Person:
m²/person
Fraction Radiant:
0.300000
Sensible Heat Fraction:
autocalculate
Carbon Dioxide Generation Rate:
0.000038
L/s·W
My Model
Library
Edit
Ruleset Schedules
Compact Schedules
Constant Schedules
Year Schedules
Fixed Interval Schedules
Variable Interval Schedules
Constructions
Internal Source Constructions
C-factor Underground Wall Constructions
F-factor Ground Floor Constructions
Window Data File Constructions


openstudio 11.13.osm*
File Preferences Components & Measures Help
Loads
189.1-2009 - Office - Lobby - CZ4-8 Lights Definition
my costume light
189.1-2009 - Office - OpenOffice - CZ4-8 Lights
189.1-2009 - Office - PrintRoom - CZ1-3 Lights Definition
189.1-2009 - Office - PrintRoom - CZ4-8 Lights Definition
189.1-2009 - Office - Restroom - CZ1-3 Lights Definition
189.1-2009 - Office - Restroom - CZ4-8 Lights Definition
189.1-2009 - Office - Stair - CZ1-3 Lights Definition
189.1-2009 - Office - Stair - CZ4-8 Lights Definition
189.1-2009 - Office - Storage - CZ1-3 Lights Definition
189.1-2009 - Office - Storage - CZ4-8 Lights Definition
189.1-2009 - Office - Vending - CZ1-3 Lights Definition
189.1-2009 - Office - Vending - CZ4-8 Lights Definition
Drag From Library
Name:
my costume light
Lighting Power:
W
Watts Per Space Floor Area:
20
W/m²
Watts Per Person:
W/person
Fraction Radiant:
0.000000
Fraction Visible:
0.000000
Return Air Fraction:
0.000000
My Model
Library
Edit
Ruleset Schedules
Compact Schedules
Constant Schedules
Year Schedules
Fixed Interval Schedules
Variable Interval Schedules
Constructions
Internal Source Constructions
C-factor Underground Wall Constructions
F-factor Ground Floor Constructions
Window Data File Constructions