Task 1 Provide a summary of the main concepts that went through about solar radiation

Solar radiation

The solar radiation is electromagnetic energy emitted by the Sun, its wavelength field goes from 0,3 to 2,5 micrometer with a maximum of 2,5 micrometer. The solar radiation is propagated everywhere and some radiation hits the earth surface. The maximum yearly average solar radiation power density (expressed by the letter G_{SG}) is the solar radiation by unit of receiving surface placed out of the atmosphere and perpendicular to the Sun-Earth ray. The value of this measure out of the Earth's atmosphere is 1367 W/m^2. Instead the value on the Earth's surface is lower, 1000 W/m^2. That's why the atmosphere works like barrier an part of the solar radiation is absorbed by the atmosphere itself. The solar radiation is modified both in spectral distribution and in total irradiance. That is due to dispersion and absorption phenomena.

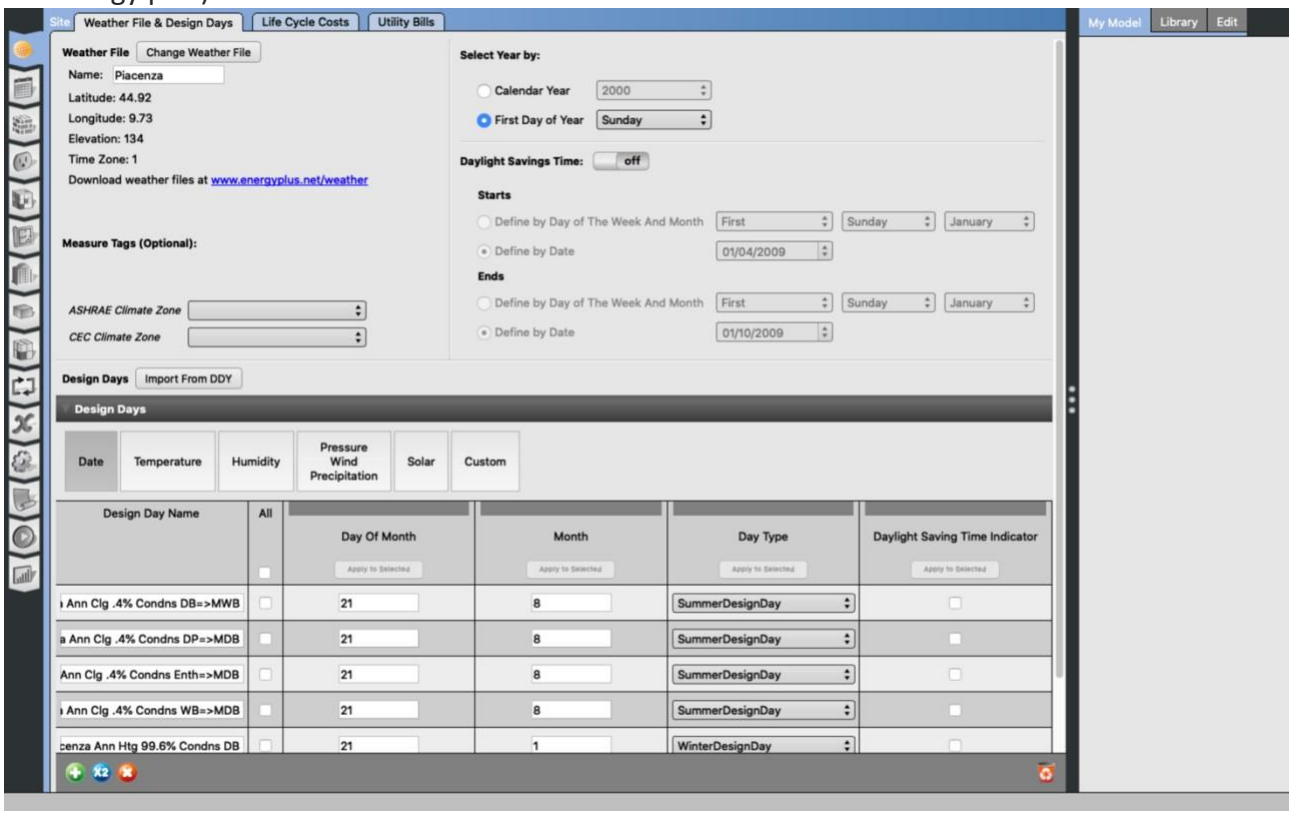
The dispersion is composed by two types: on is the direct radiation and the other one is the diffuse radiation. The first one is the radiation that is not intercepted by molecules instead maintains the incidence direction as the unique direction. The second one is a black reflection of part of the incident radiation on the atmosphere and the radiation deflected in all directions. The sum of the direct and diffuse direction is the global solar radiation.

The solar radiation absorption is when the atmosphere absorbs some of the incident radiation in specific wavelength band and this is due to some atmospheric components like ozone, water and carbon. The ozone for example absorbs most of the ultraviolet component, that is very dangerous for human being.

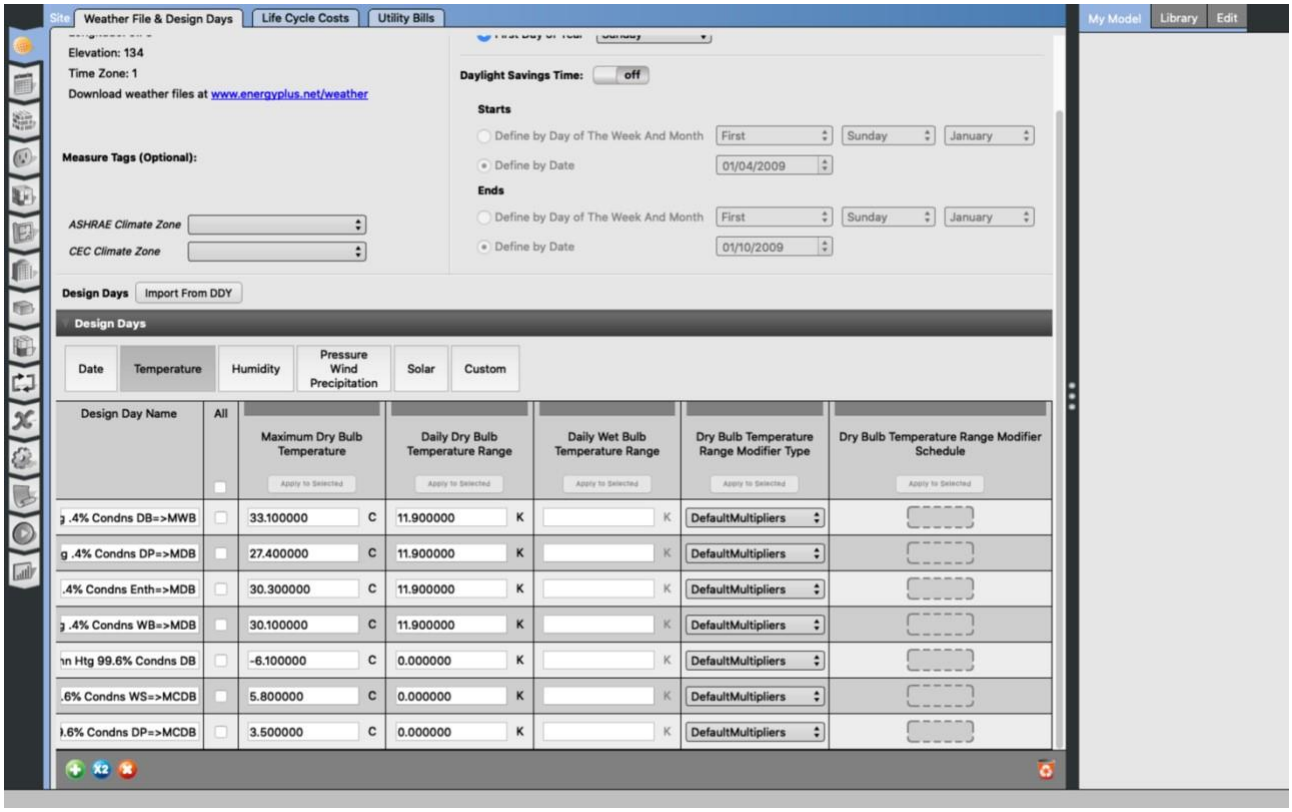
The solar radiation available on the Erath's surface depend on many factors like the Sun position in the sky, which changes daily and seasonally, the weather condition, the day length and the site altitude over the see level.

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

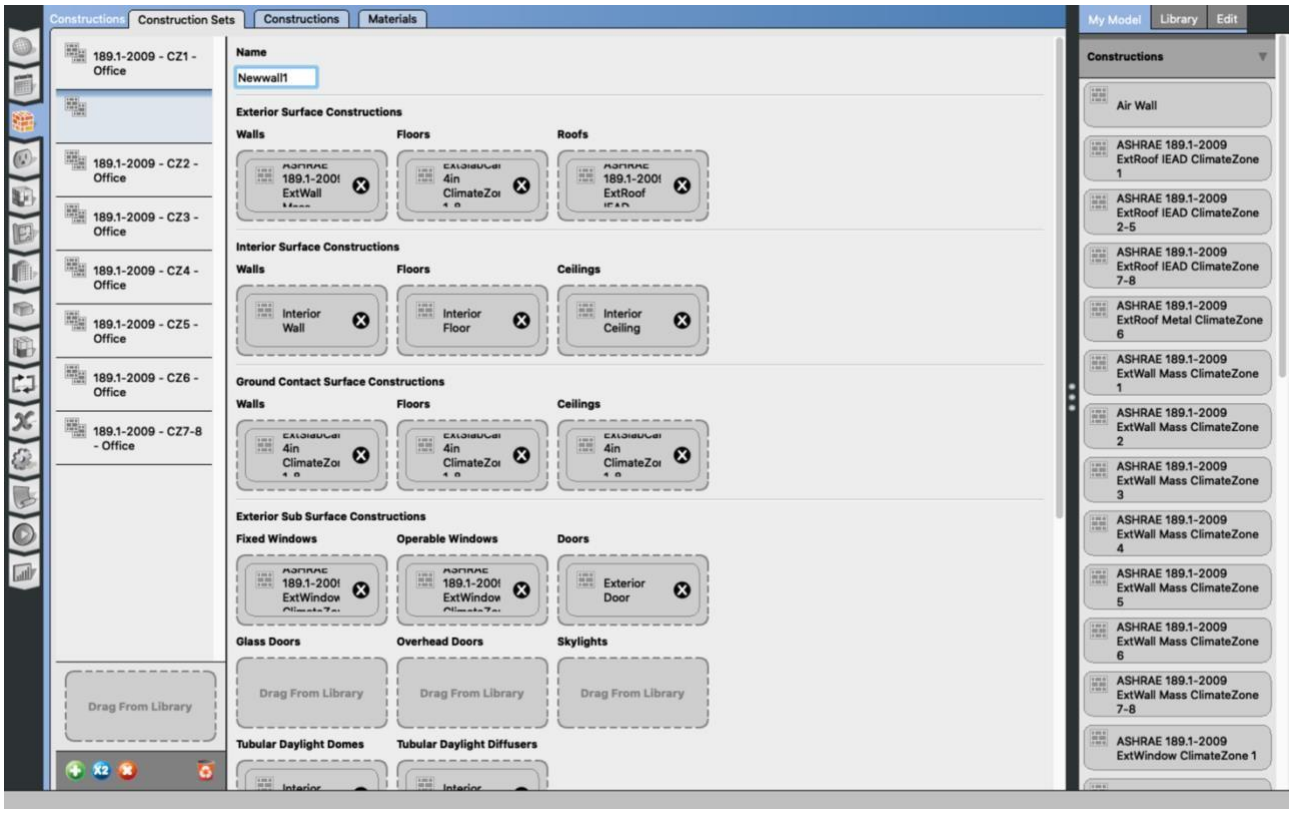
Adding weather data of Piacenza using the file .ddy and .epw (to find new data goes to the network of energy plus)



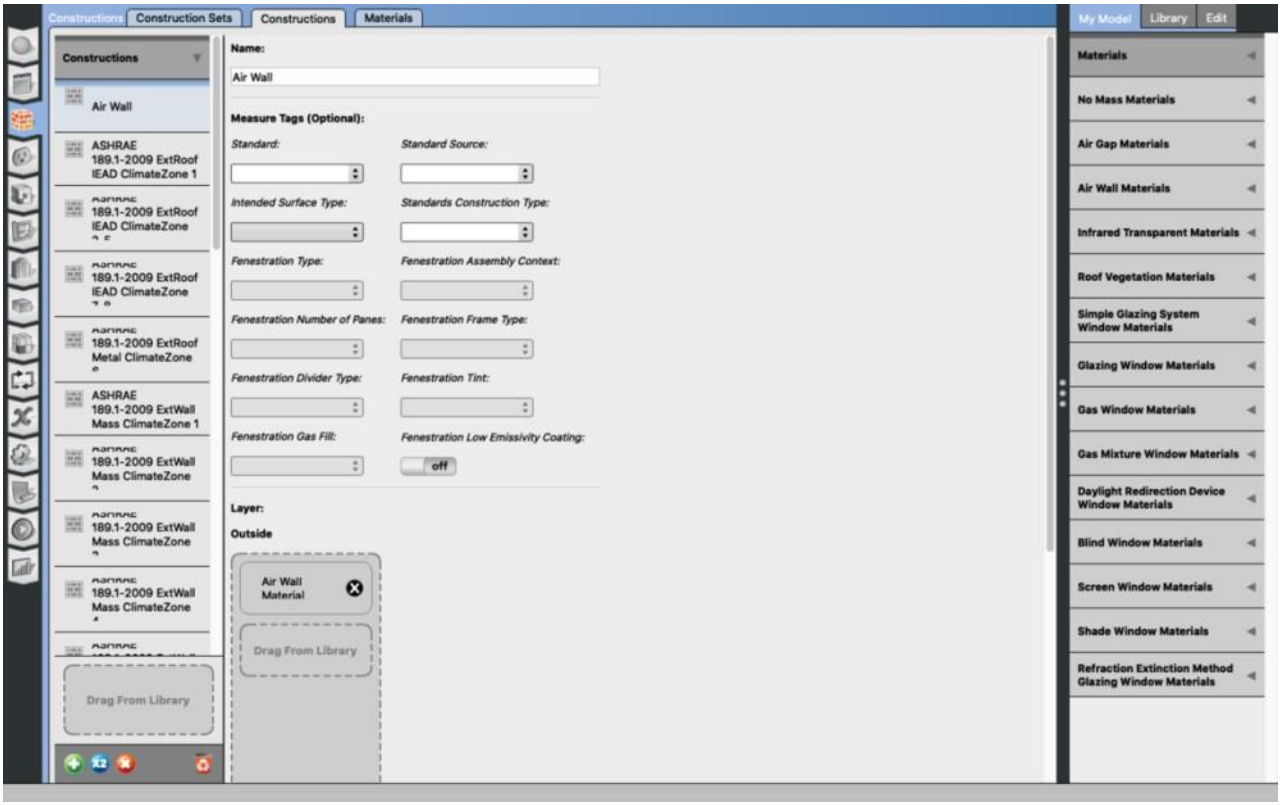
We can see in the “design days” some aspect related to the data of the weather in Piacenza, especially the temperature

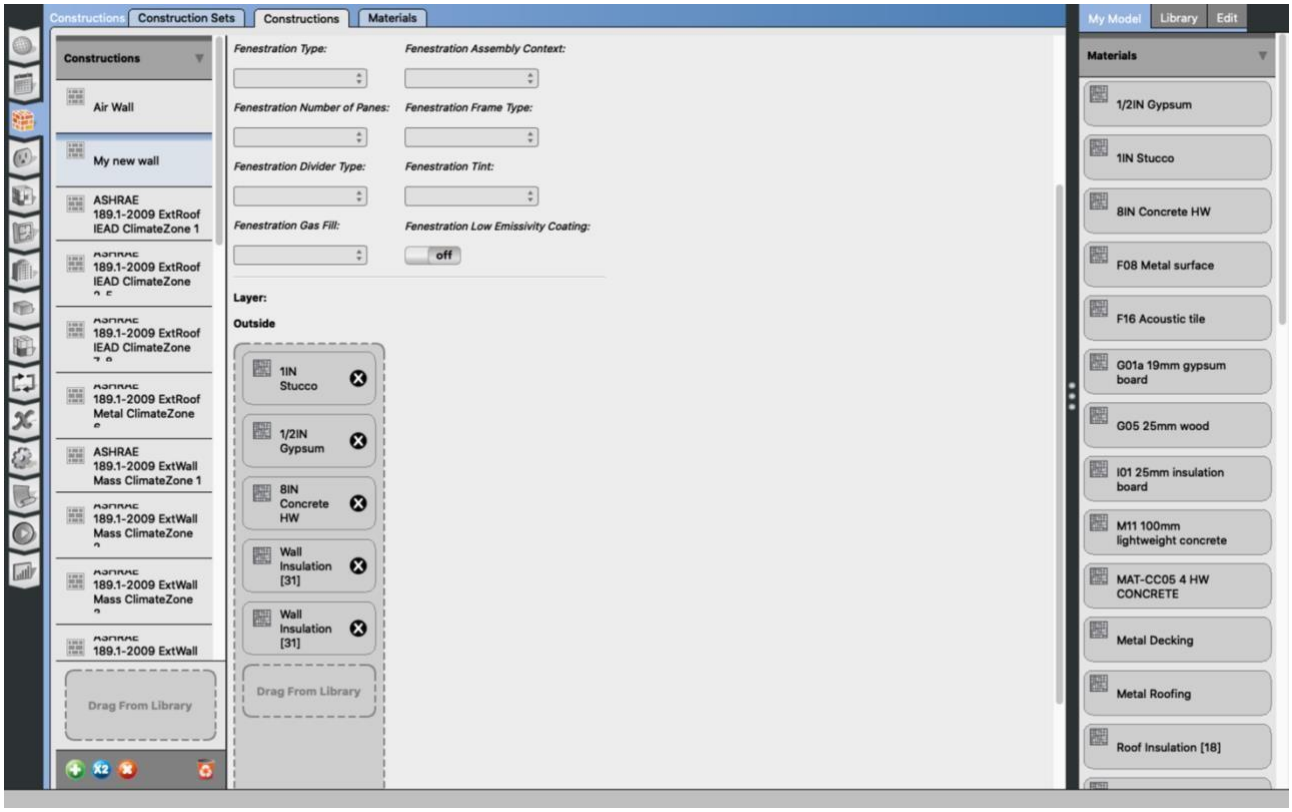


After that we can go to the third tub and set the “construction set”. The construction set is referred to the whole type of structure there are in the buildings (floors, windows, walls,…). After the selection of the elements we need to duplicate the data.

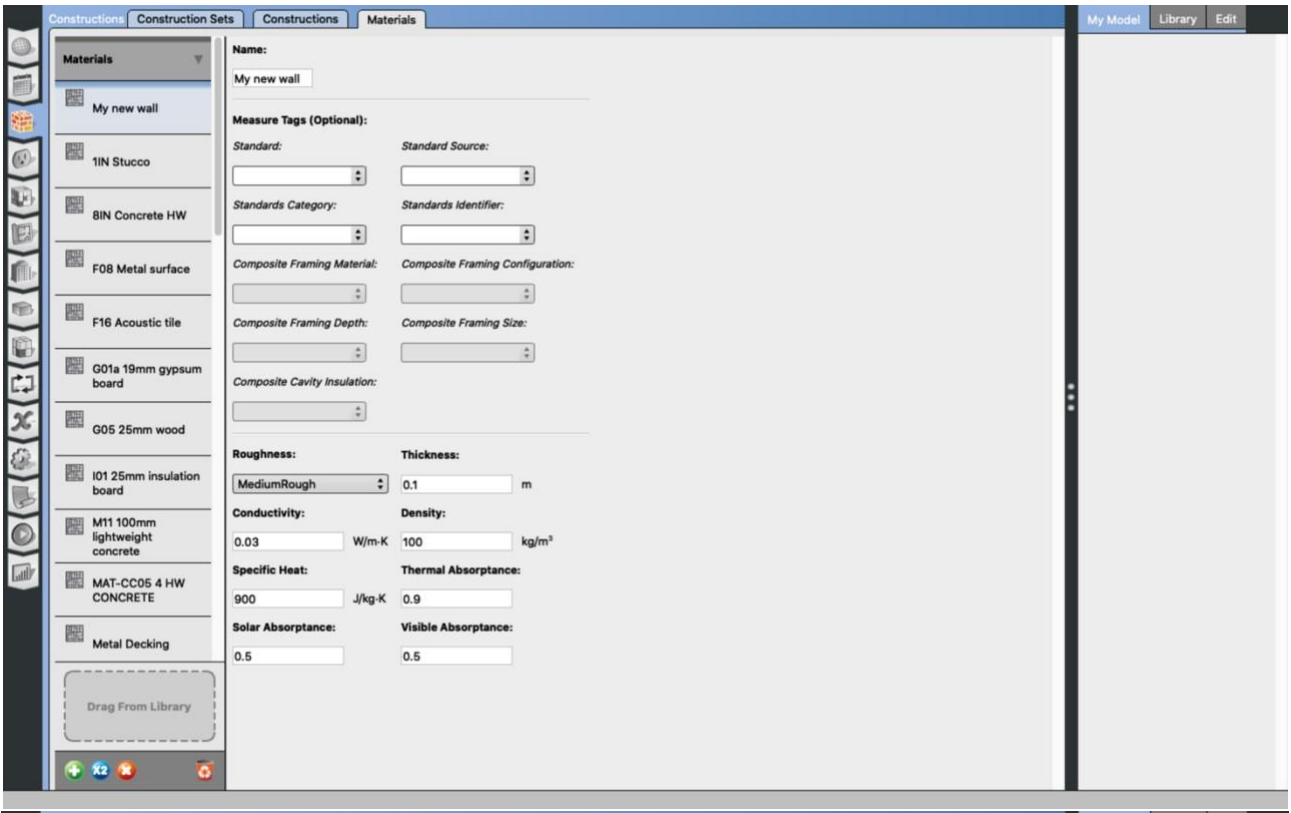


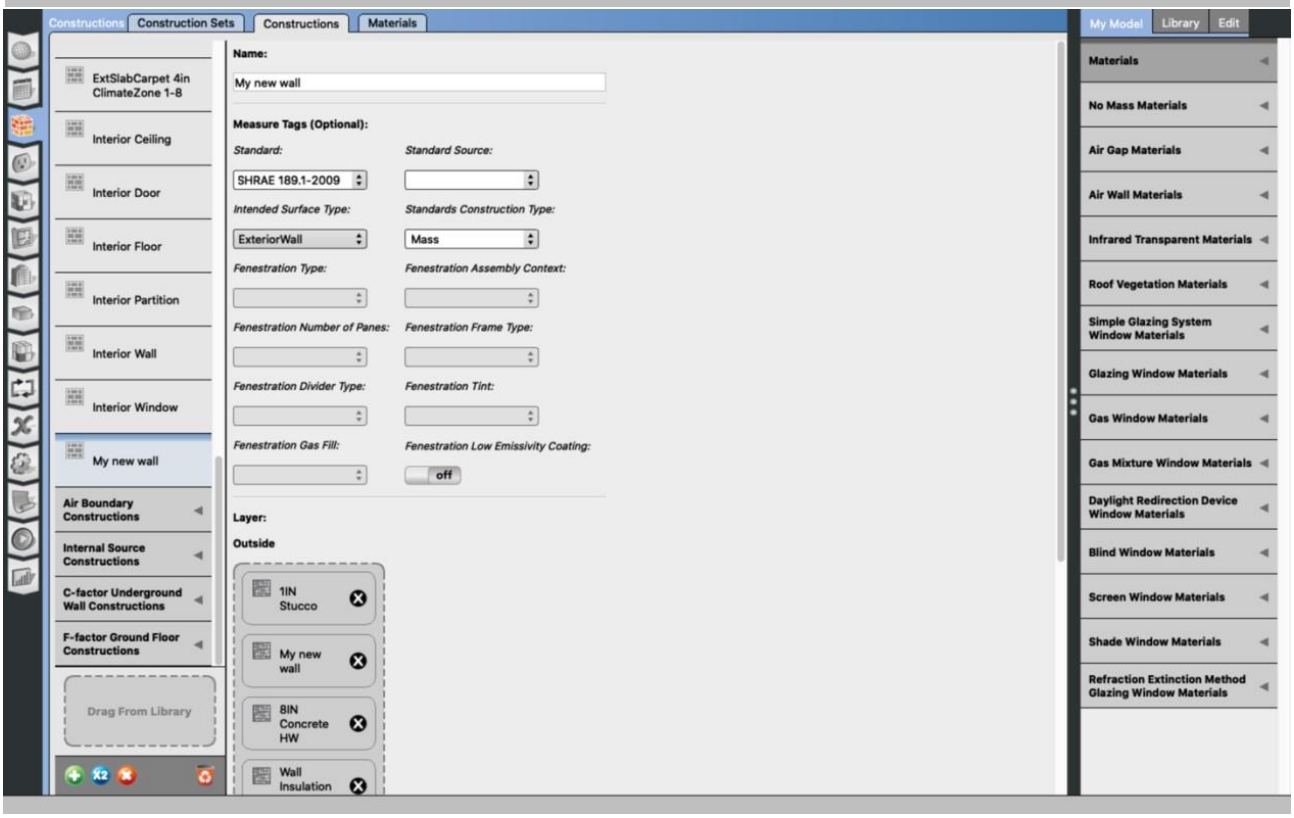
Then we need to define a new type of wall, after the duplication of the existing walls and we have to rename it and change the material. To change the material the only thing is to drag the material from the right list under materials.



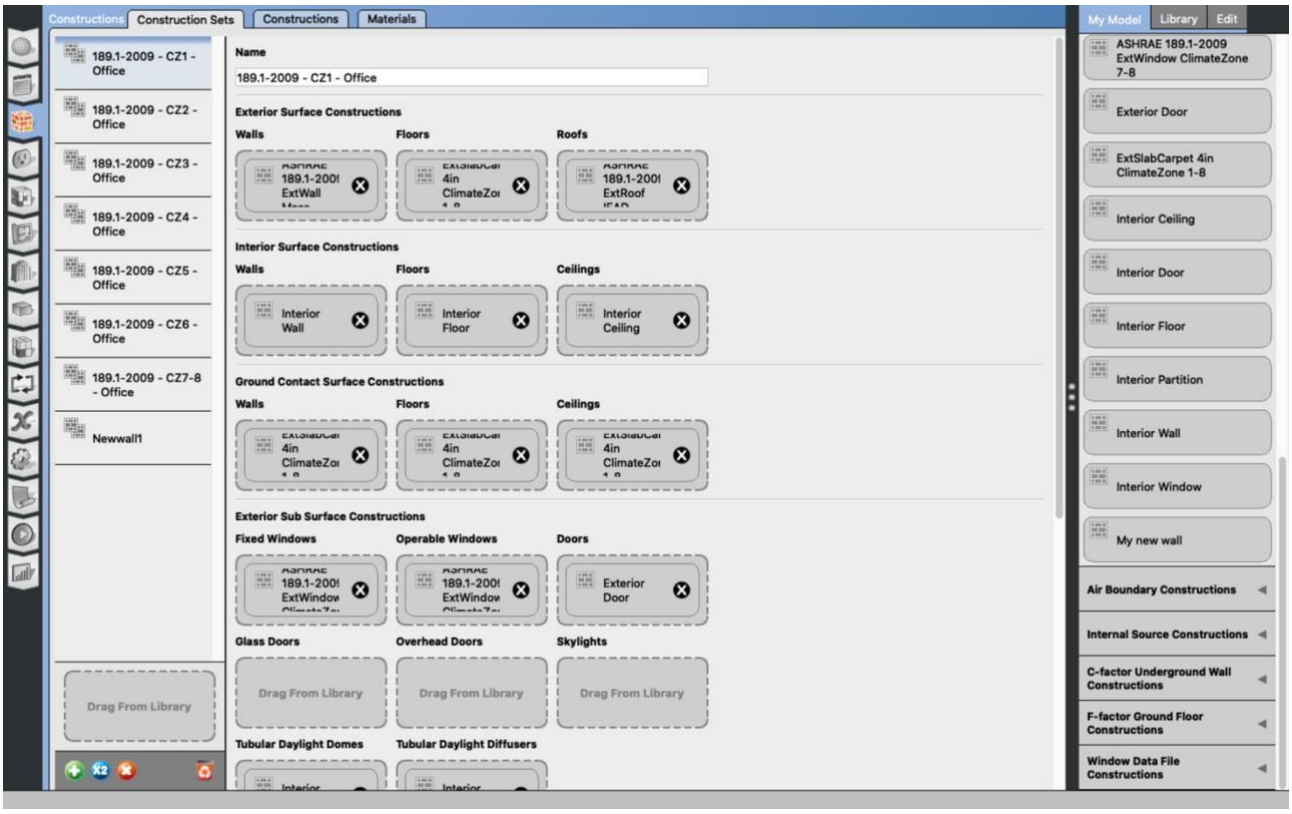


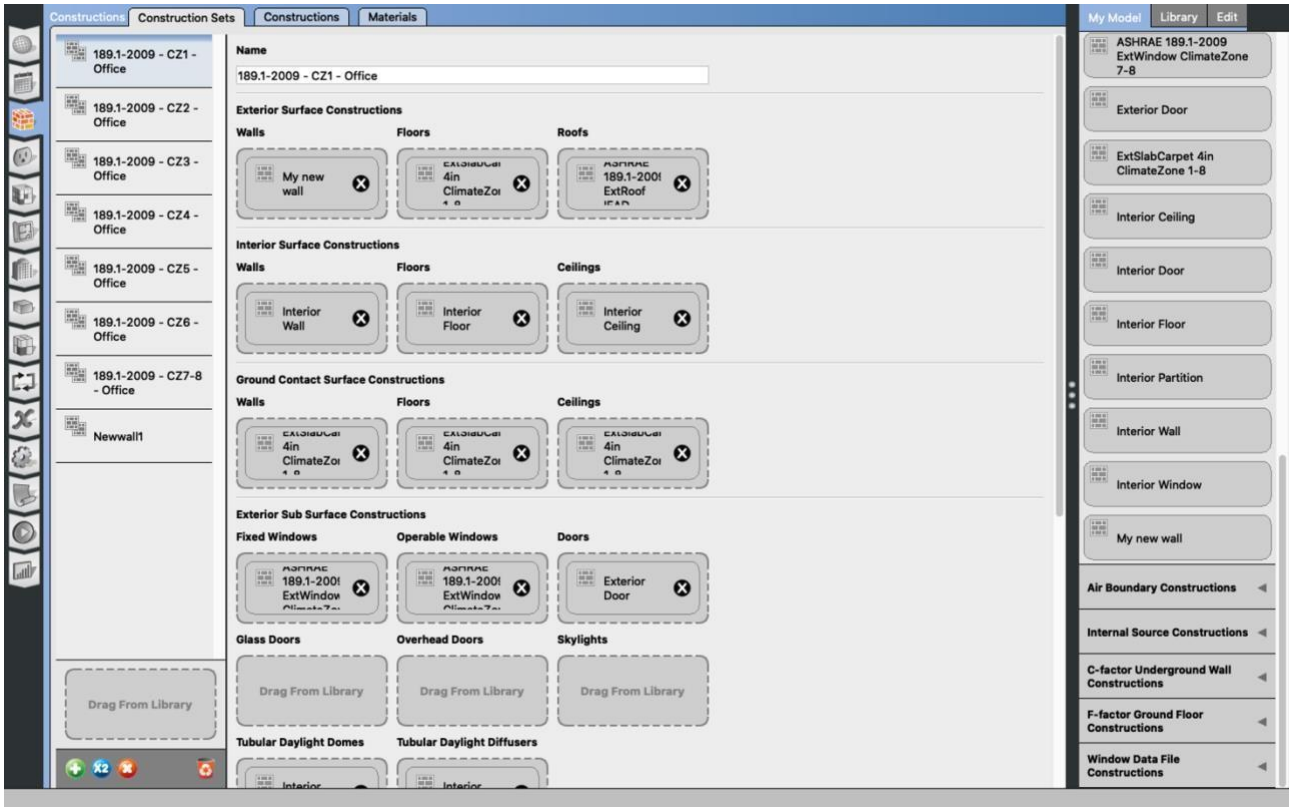
Define the material and insultation putting these values: thickness 0,1 ; conductivity 0,3; density 100; specific heat 900.



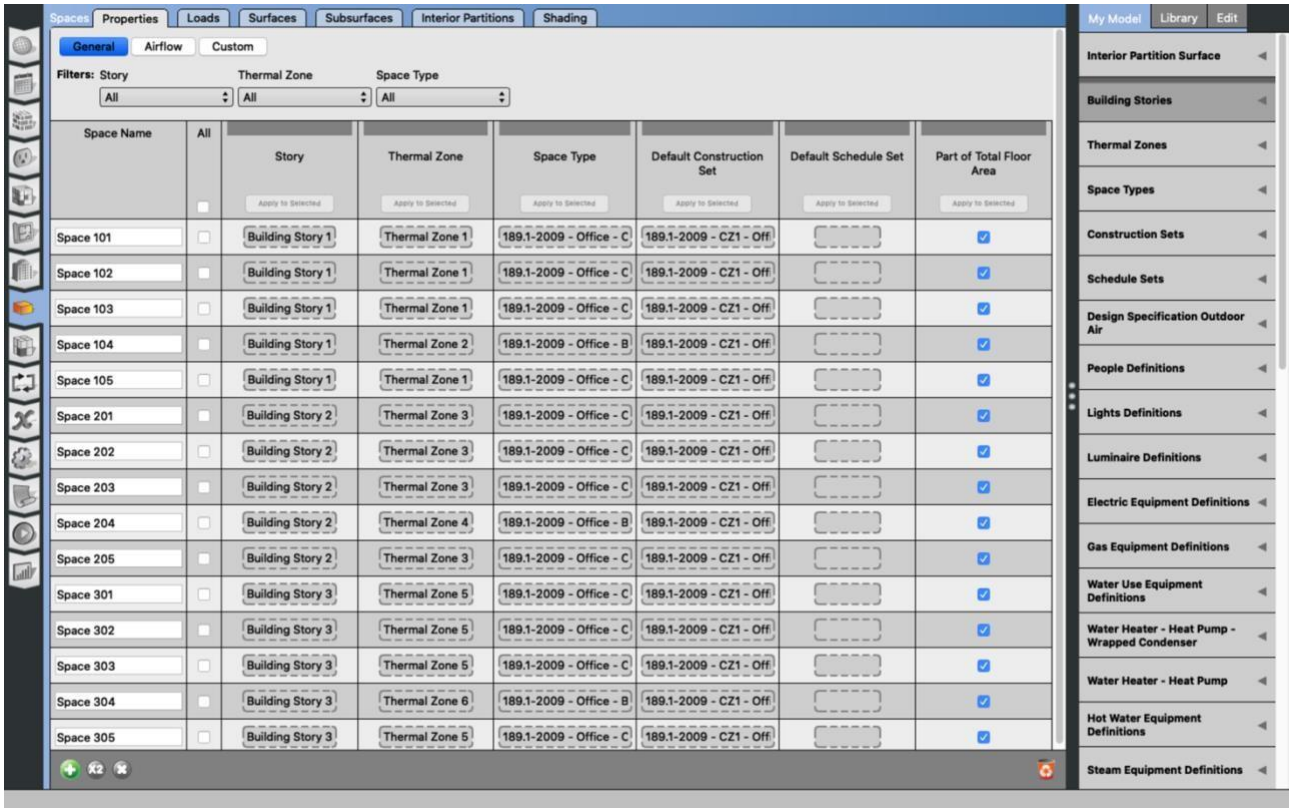


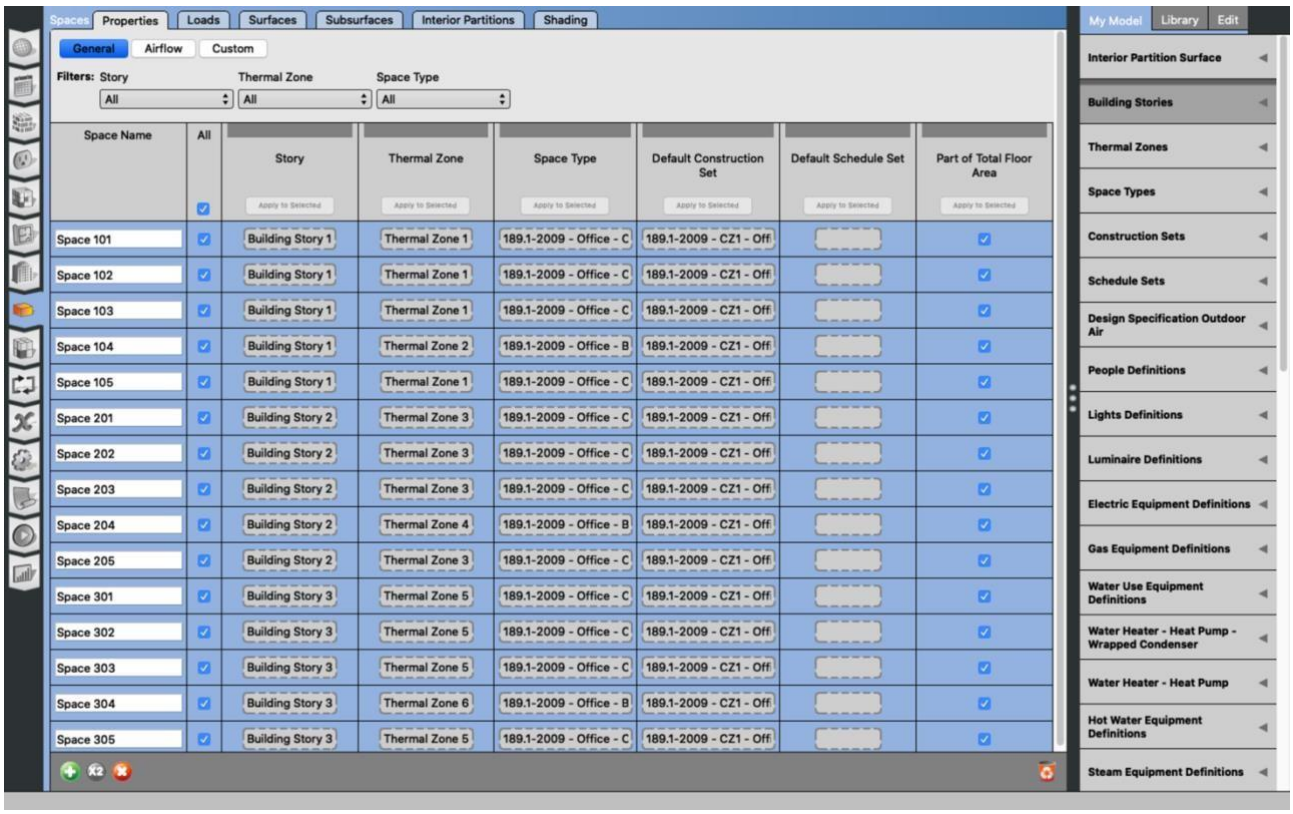
Return to the construction set and find the new wall with the new material and then replace and add it with the old material from the list on the materials in the right

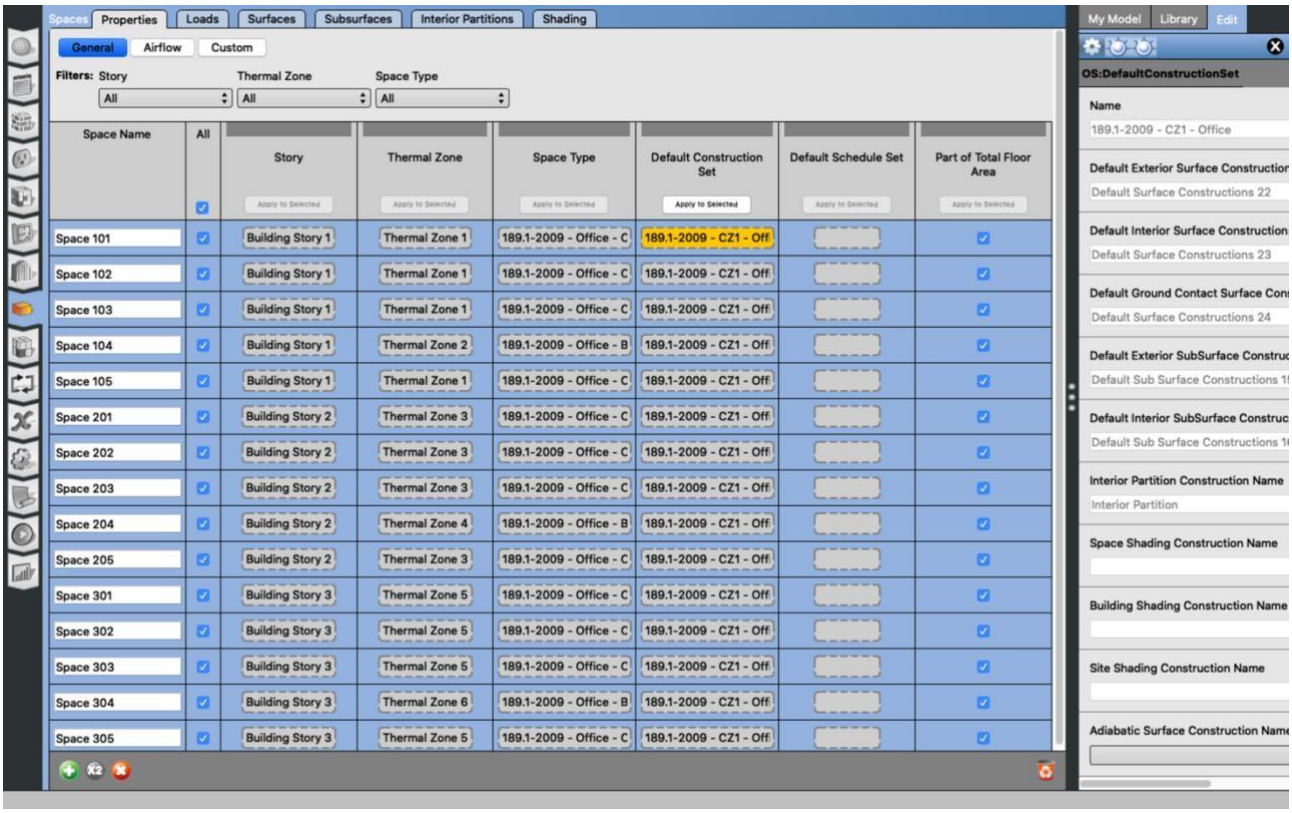


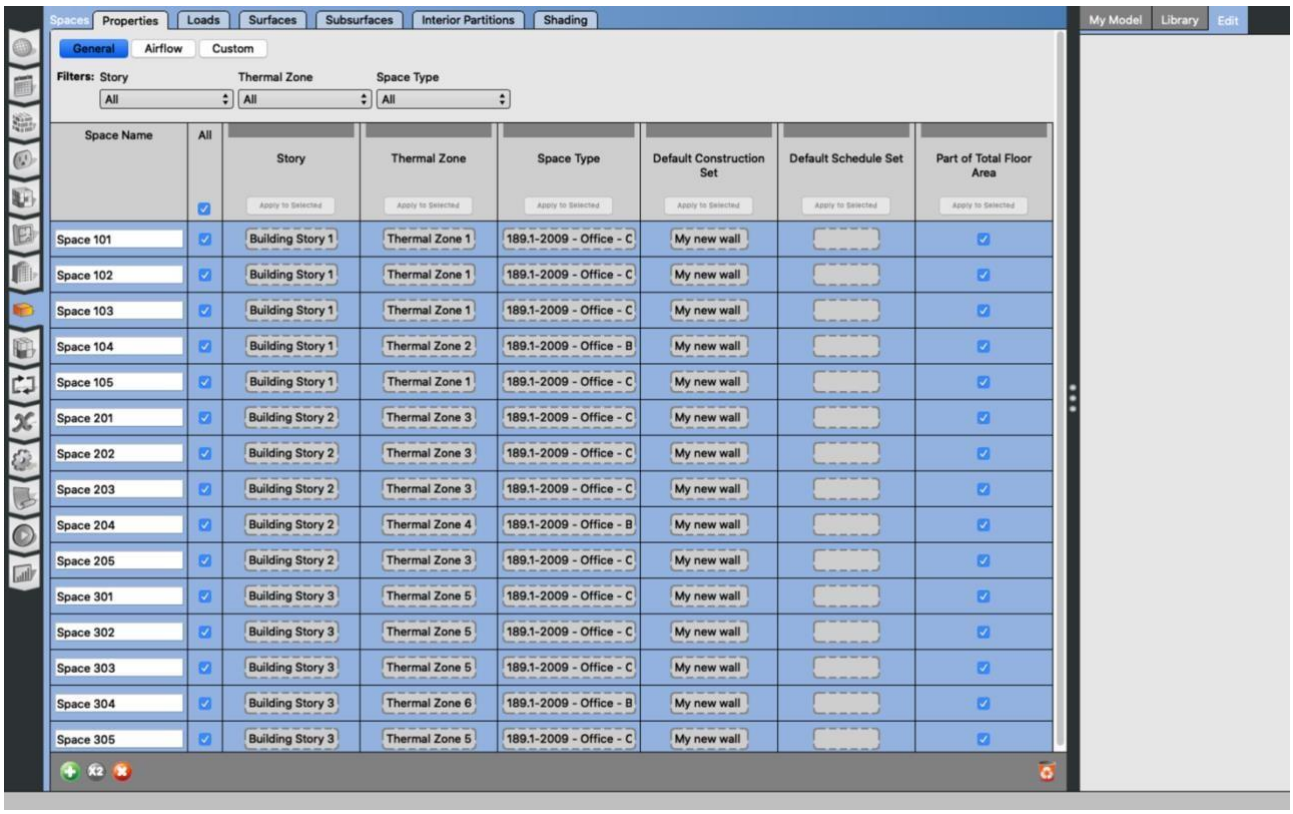


The next step is to change the material in the skp model with the new material that we created before. Select “spaces tub”, after “properties” and then “general”. Select all and go to the “default construction set” and apply to selected

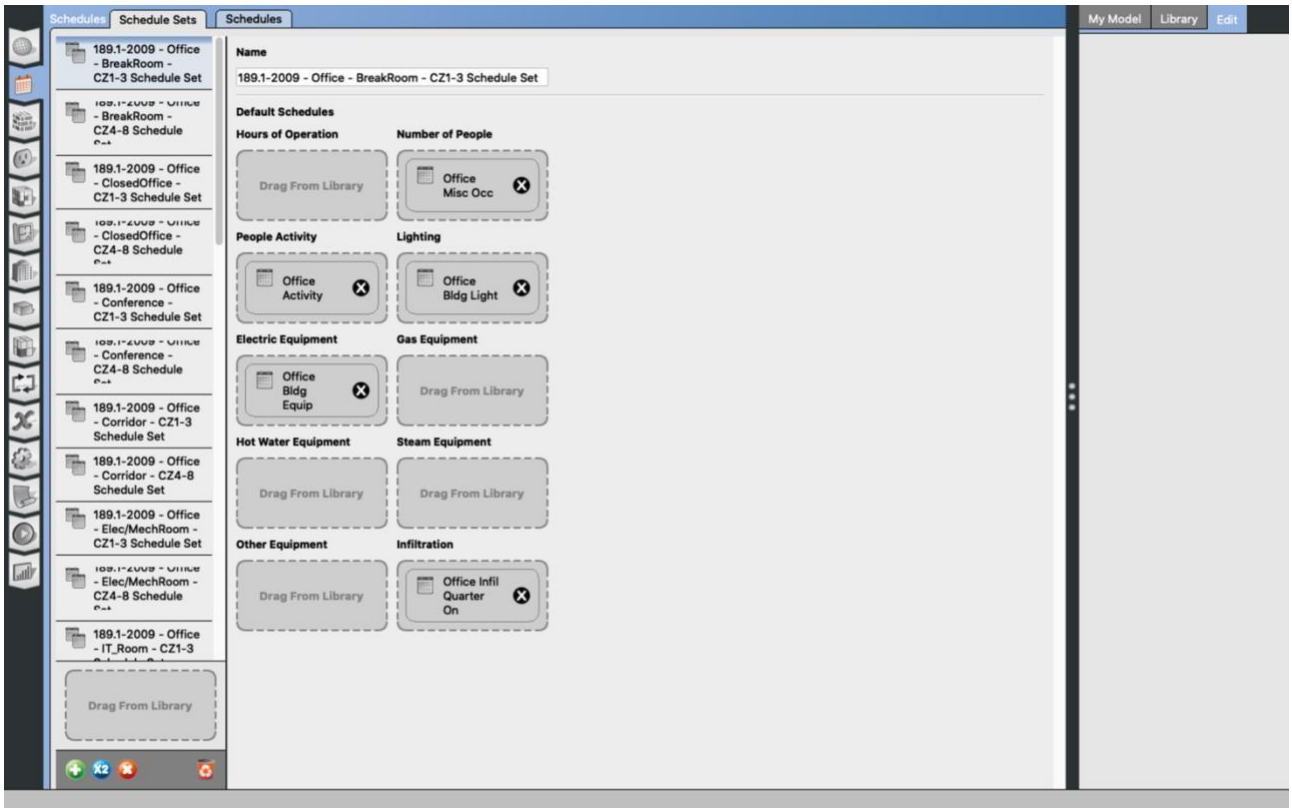





Spaces
Properties
Loads
Surfaces
Subsurfaces
Interior Partitions
Shading
General
Airflow
Custom
Filters: Story
Thermal Zone
Space Type
All
Space Name
All
Story
Thermal Zone
Space Type
Default Construction Set
Default Schedule Set
Part of Total Floor Area
Apply to Selected
Space 101 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 102 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 103 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 104 Building Story 1 Thermal Zone 2 189.1-2009 - Office - B 189.1-2009 - CZ1 - Off
Space 105 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 201 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 202 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 203 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 204 Building Story 2 Thermal Zone 4 189.1-2009 - Office - B 189.1-2009 - CZ1 - Off
Space 205 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 301 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 302 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 303 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
Space 304 Building Story 3 Thermal Zone 6 189.1-2009 - Office - B 189.1-2009 - CZ1 - Off
Space 305 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C 189.1-2009 - CZ1 - Off
My Model
Library
Edit
OS:DefaultConstructionSet
Name
189.1-2009 - CZ1 - Office
Default Exterior Surface Construction
Default Surface Constructions 22
Default Interior Surface Construction
Default Surface Constructions 23
Default Ground Contact Surface Con
Default Surface Constructions 24
Default Exterior SubSurface Construc
Default Interior SubSurface Construc
Interior Partition Construction Name
Interior Partition
Space Shading Construction Name
Building Shading Construction Name
Site Shading Construction Name
Adiabatic Surface Construction Name


Spaces
Properties
Loads
Surfaces
Subsurfaces
Interior Partitions
Shading
General
Airflow
Custom
Filters: Story
Thermal Zone
Space Type
All
Space Name
All
Story
Thermal Zone
Space Type
Default Construction Set
Default Schedule Set
Part of Total Floor Area
Apply to Selected
Space 101 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C My new wall
Space 102 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C My new wall
Space 103 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C My new wall
Space 104 Building Story 1 Thermal Zone 2 189.1-2009 - Office - B My new wall
Space 105 Building Story 1 Thermal Zone 1 189.1-2009 - Office - C My new wall
Space 201 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C My new wall
Space 202 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C My new wall
Space 203 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C My new wall
Space 204 Building Story 2 Thermal Zone 4 189.1-2009 - Office - B My new wall
Space 205 Building Story 2 Thermal Zone 3 189.1-2009 - Office - C My new wall
Space 301 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C My new wall
Space 302 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C My new wall
Space 303 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C My new wall
Space 304 Building Story 3 Thermal Zone 6 189.1-2009 - Office - B My new wall
Space 305 Building Story 3 Thermal Zone 5 189.1-2009 - Office - C My new wall
My Model
Library
Edit

Go to “schedule tub” to define the indoor temperature of the office building



Define the worst scenario that could happen for this building. So in the winter time consider none inside to help the room to stay warmer and in the summer time a lot of people inside.