

WEEK 7 - POJER

Task 1

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

Mean Radiant temperature

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.

Operative temperature

The operative temperature of a given surface is the virtual ambient temperature with which the sum of the radiative thermal and convective (incarnized) flow is exchanged which exchanges with the air and all the other surfaces.

Convection

Convection resistance of the surface: thermal resistance of the surface against heat convection

Direct (Beam) and diffuse Radiation

The scattering macroscopic effect is:

- \rightarrow back reflection (ALBEDO) of part of the incident radiation on the atmosphere forward Sideral space;
- the appearance of radiation deflected in all directions, denoted as diffuse Solar radiation or diffuse irradiance, G_d (W/m^2)

Radiation not intercepted by molecules instead maintains the incidence direction as the unique direction and it is denoted as direct solar radiation or beam radiation G_b (W/m^2)

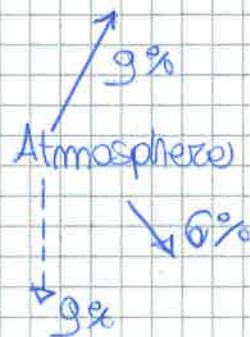
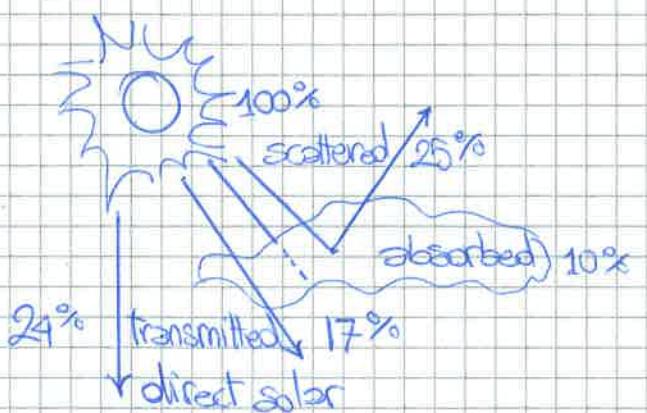
SOLAR RADIATION characteristics

Solar radiation is electromagnetic energy emitted by the Sun.

Solar radiation wavelength field: from 0,3 to 2,5 micrometer max for 0,5 μm

The S. radiation is modified both in spectral distribution and in total irradiance.

That is due to dispersion and absorption phenomena.



Atmosphere absorption

- Water vapor has important absorption bands in the infrared field, centred at 1,0; 1,4; 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 also considering that, for 2,725 μm the energy content in the extraterrestrial solar radiation spectrum is less than 5% of the total.

Air mass

(It's a volume of air defined by its temperature and water vapor content, in meteorology).

Concerning solar energy, air mass is a coefficient, that defines the direct optical path length through the Earth's atmosphere, expressed as a ratio relative to the length of the path vertically upwards

This coefficient is used to characterize the solar spectrum;

AVAILABILITY - Solar energy

The availability of the solar energy on the surface depends on:

Earth's

- the sun position : altitude δ_s ; azimuth angles γ_s
- the weather condition
- altitude
- sunshine hours

The solar height angle δ_s is the complementary angle to the solar zenithal angle θ_z

$$\delta_s = 90^\circ - \theta_z$$

The hour angle ω is the angle between the sun ray and the local meridian, 15° each hour, positive to West, negative to East

Measurement instruments

PYRANOMETER measures the total solar irradiance (direct + diffuse) G_{TOT}

PYRANOMETER WITH SHADOW BAND only measure diffuse irradiance G_d

NORMAL PYRHELIOMETER only sees the sun disk image so only the normal direct radiation G_{bn}

Solar irradiance on a generic surface on a generic surface arrived:

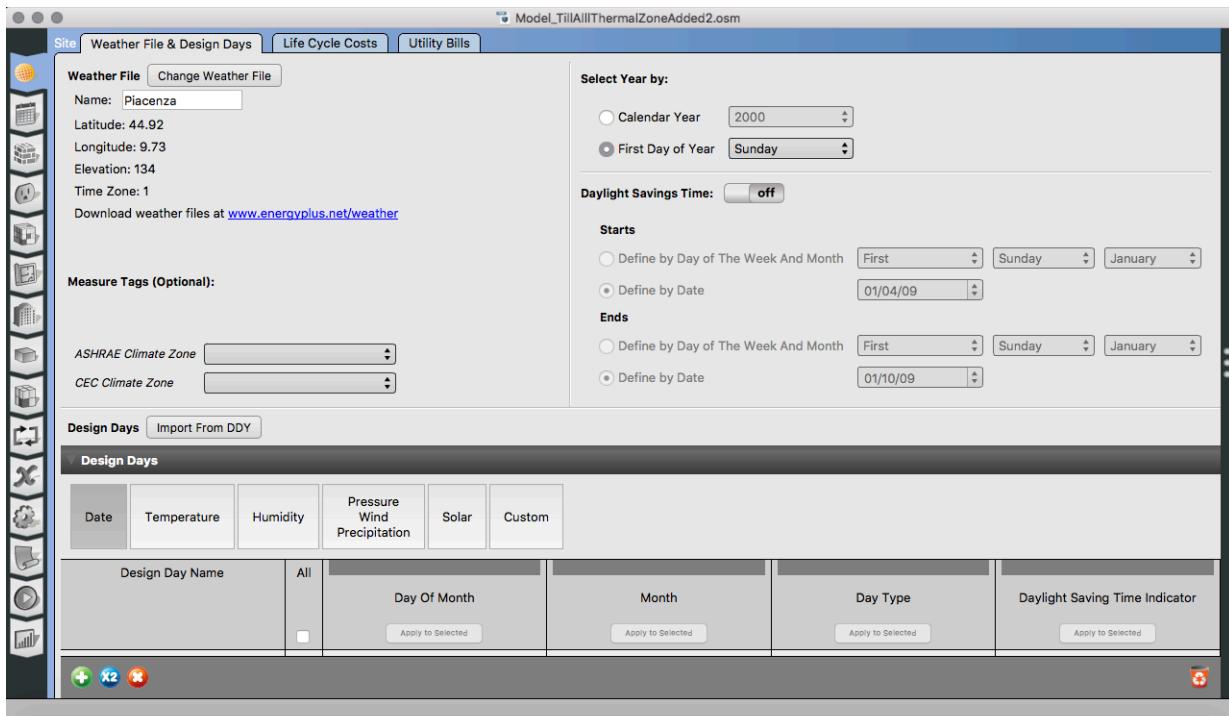
- solar normal direct irradiance G_{bn}
- solar diffuse irradiance coming from the sky $G_{d,sky}$
- ground reflected solar diffuse irradiance $G_{d,ground}$

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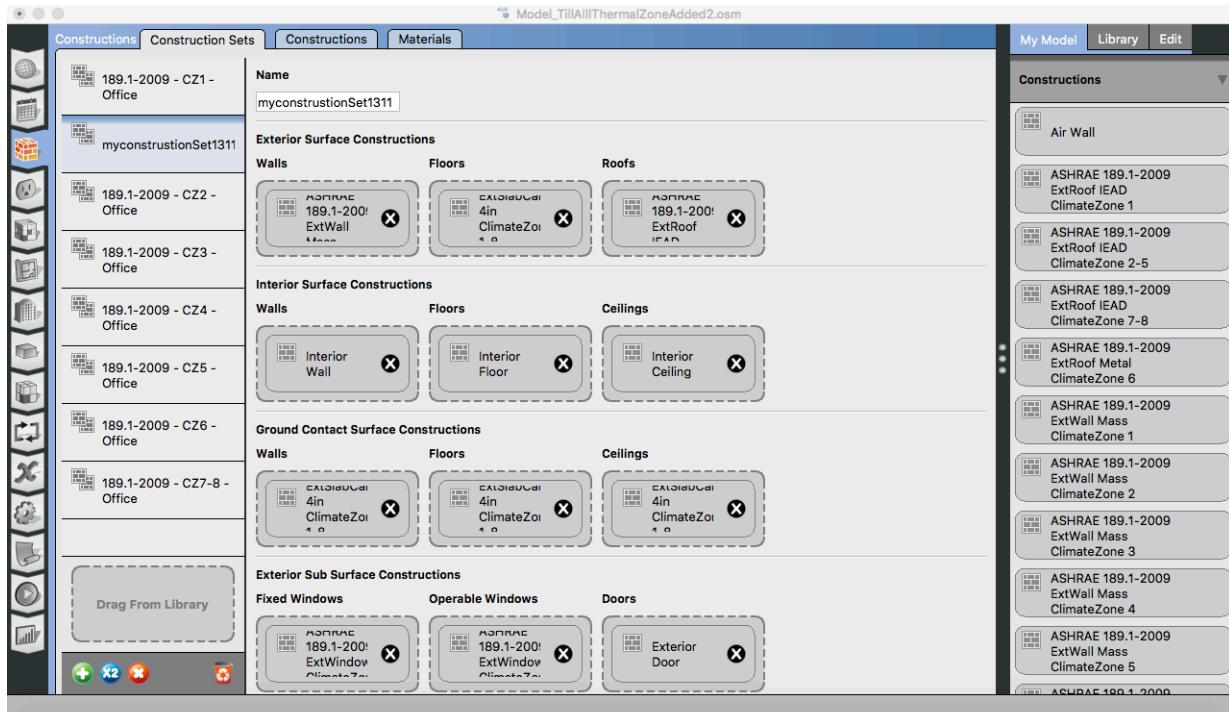
TASK 2

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 (in your own words)

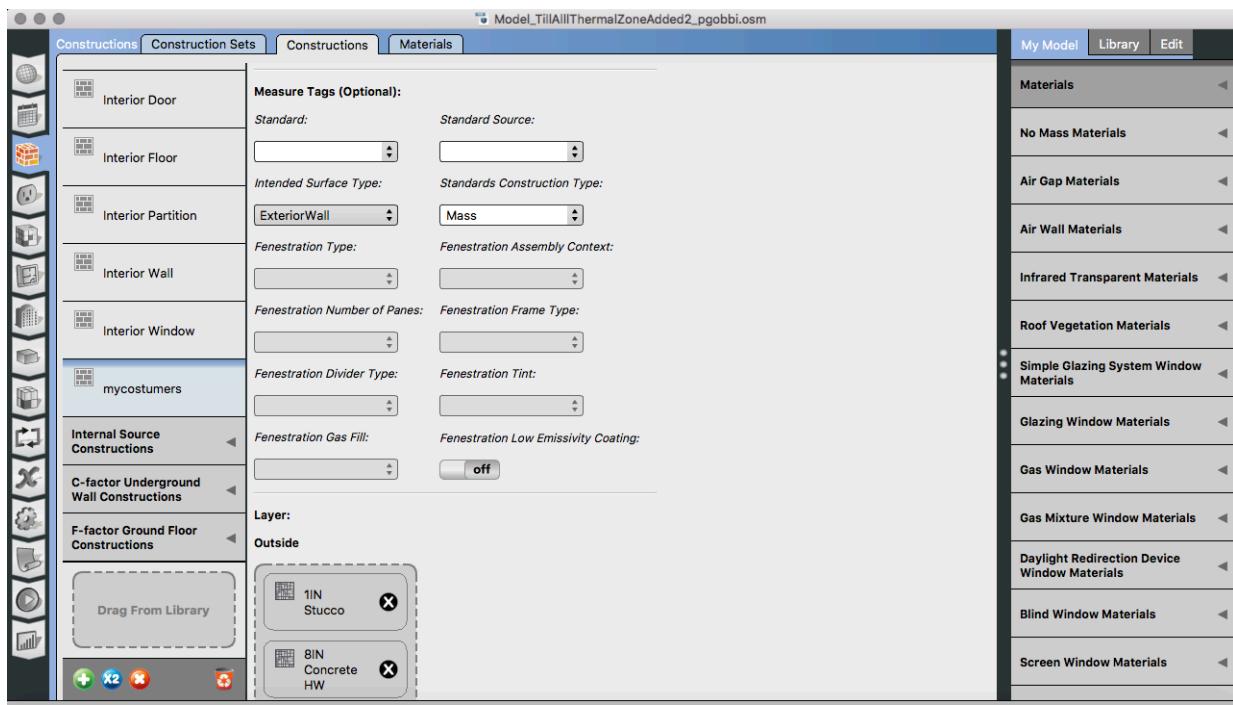
We insert the climate data of Piacenza in OpenOffice.



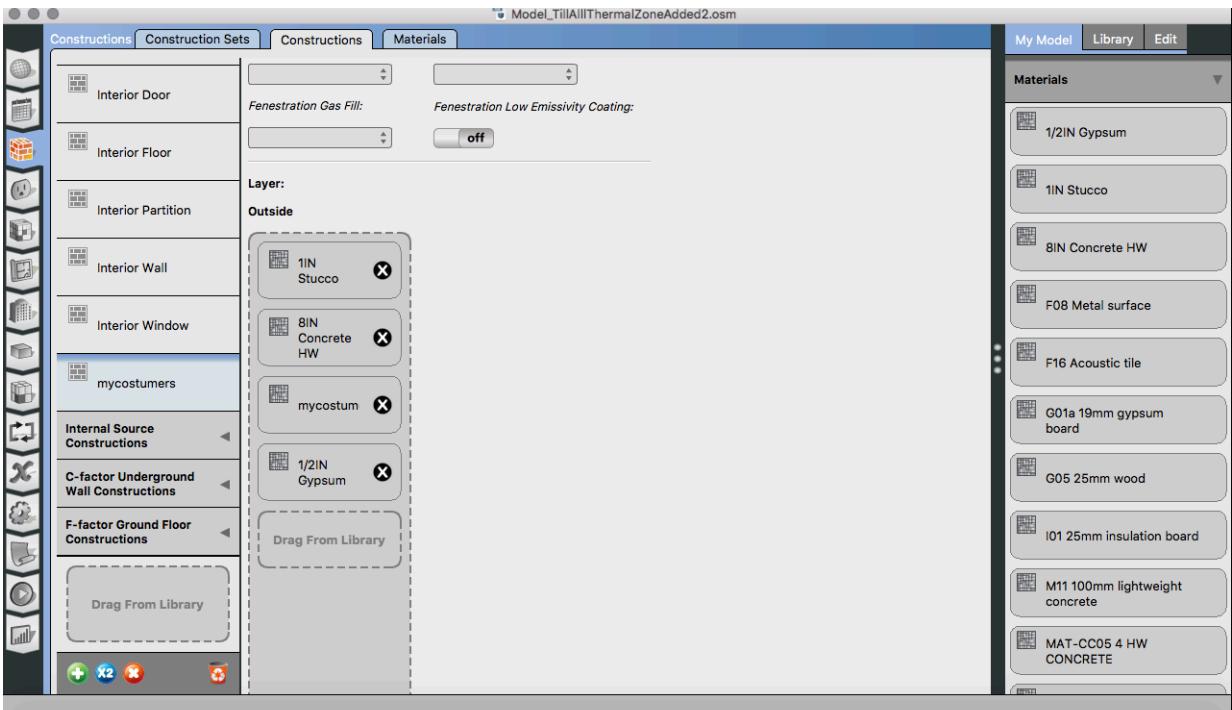
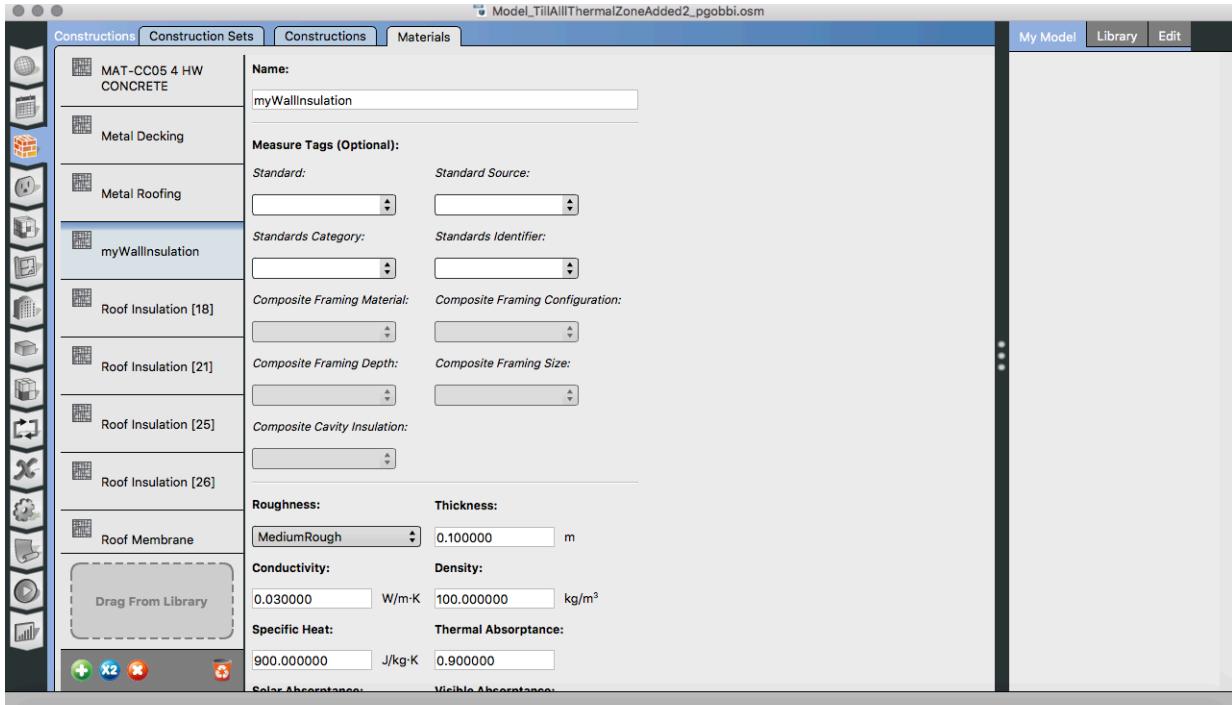
We choose “construction” to define the building.



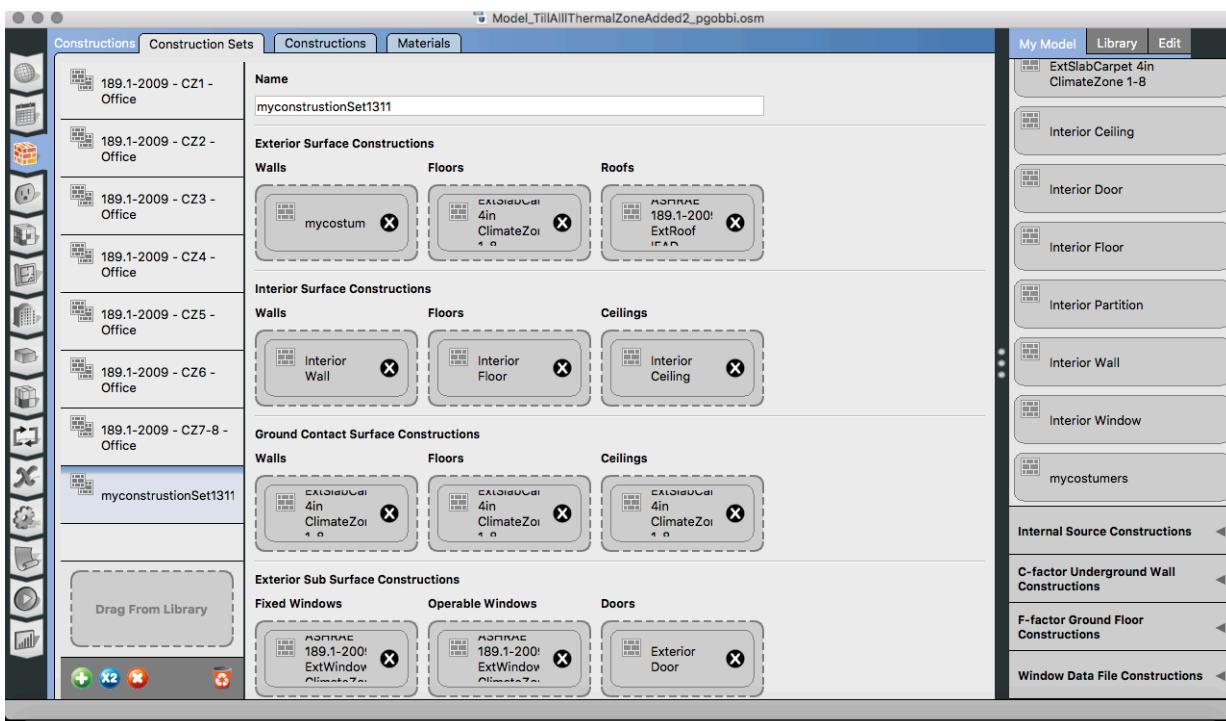
Using “construction sets” we can customize the wall package



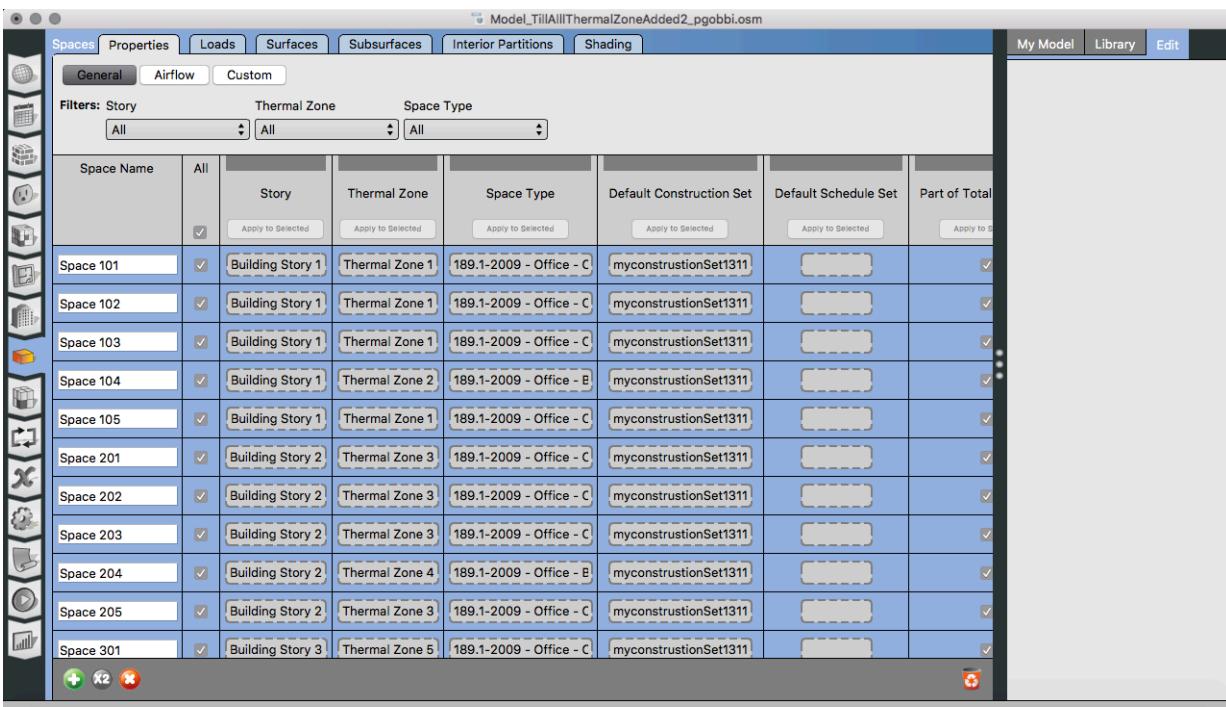
We choose the type of wall insulation to use it in the package.



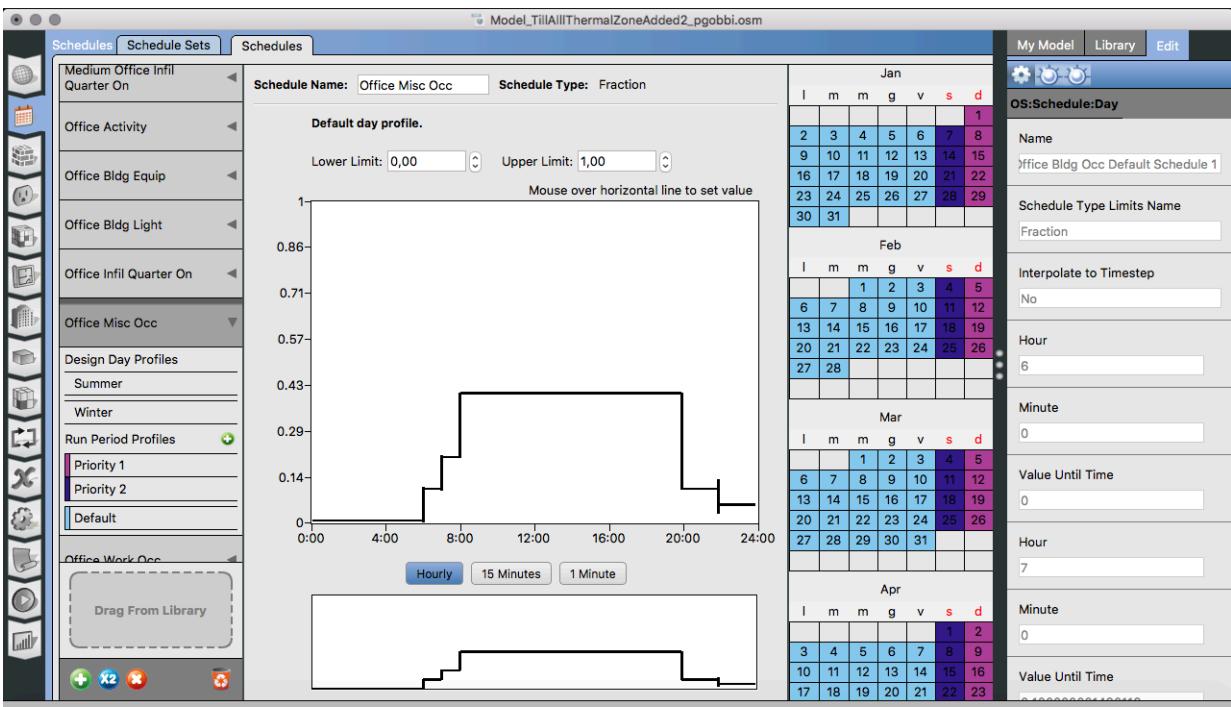
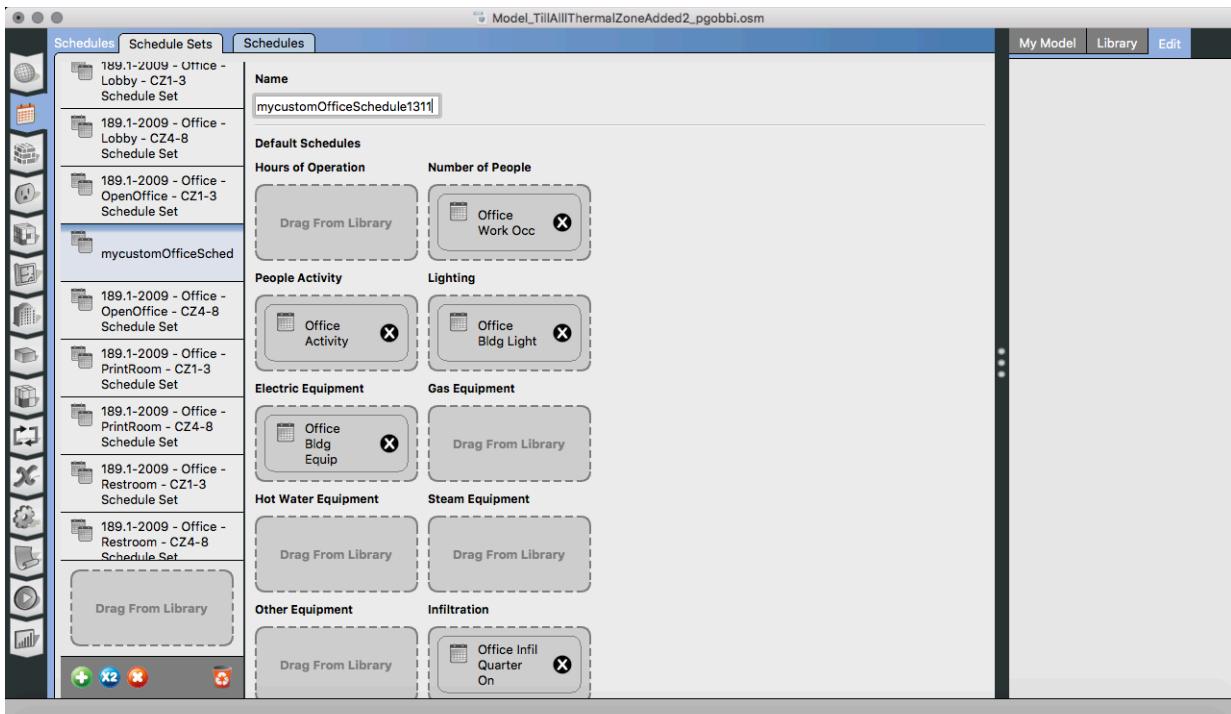
We insert the wall in the building data.



We put the project layer to “space”



We insert information regarding activities and equipments in “schedule sets”



The tool “loads” permits us to specify other information: people, light, energy and so on.

Loads

189.1-2009 - Office - IT_Room - CZ1-3 People Definition	Name: 189.1-2009 - Office - OpenOffice - CZ1-3 People Definition 1
189.1-2009 - Office - IT_Room - CZ4-8 People Definition	Number of People: People per Space Floor Area: Space Floor Area per Person: <input type="text"/> 0.056511 people/m ² <input type="text"/> m ² /person
189.1-2009 - Office - Lobby - CZ1-3 People Definition	Fraction Radiant: Sensible Heat Fraction: Carbon Dioxide Generation Rate: <input type="text"/> 0.300000 <input type="button" value="autocalculate"/> <input type="text"/> 0.000038 L/s·W
189.1-2009 - Office - Lobby - CZ4-8 People Definition	
189.1-2009 - Office - OpenOffice - CZ1-3 People Definition	
189.1-2009 - Office - OpenOffice - CZ1-3 People Definition 1	
189.1-2009 - Office - OpenOffice - CZ4-8 People Definition	
189.1-2009 - Office - PrintRoom - CZ1-3 People Definition	
189.1-2009 - Office - PrintRoom - CZ4-8 People Definition	
Drag From Library	
<input style="color: green; font-weight: bold; font-size: 1em; margin-right: 10px;" type="button" value="+"/> <input style="color: blue; font-weight: bold; font-size: 1em; margin-right: 10px;" type="button" value="x2"/> <input style="color: red; font-weight: bold; font-size: 1em; margin-right: 10px;" type="button" value="x"/> <input style="color: black; font-weight: bold; font-size: 1em;" type="button" value="Delete"/>	

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

Loads

189.1-2009 - Office - WholeBuilding - Md Office - CZ1-3 Electric Equipment Definition	Name: 1mycostumElectricEquipment
189.1-2009 - Office - WholeBuilding - Md Office - CZ4-8 Electric Equipment	Design Level: Watts Per Space Floor Area: Watts Per Person: <input type="text"/> W 10.000000 W/m ² <input type="text"/> W/person
189.1-2009 - Office - WholeBuilding - Sm Office - CZ1-3 Electric Equipment Definition	Fraction Latent: Fraction Radiant: <input type="text"/> 0.000000 <input type="text"/> 0.000000
189.1-2009 - Office - WholeBuilding - Sm Office - CZ4-8 Electric Equipment	Fraction Lost: <input type="text"/> 0.000000
1mycostumElectricEqu	
Gas Equipment Definitions	
Steam Equipment Definitions	
Other Equipment Definitions	
Drag From Library	
<input style="color: green; font-weight: bold; font-size: 1em; margin-right: 10px;" type="button" value="+"/> <input style="color: blue; font-weight: bold; font-size: 1em; margin-right: 10px;" type="button" value="x2"/> <input style="color: red; font-weight: bold; font-size: 1em; margin-right: 10px;" type="button" value="x"/> <input style="color: black; font-weight: bold; font-size: 1em;" type="button" value="Delete"/>	

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