WEEK_7

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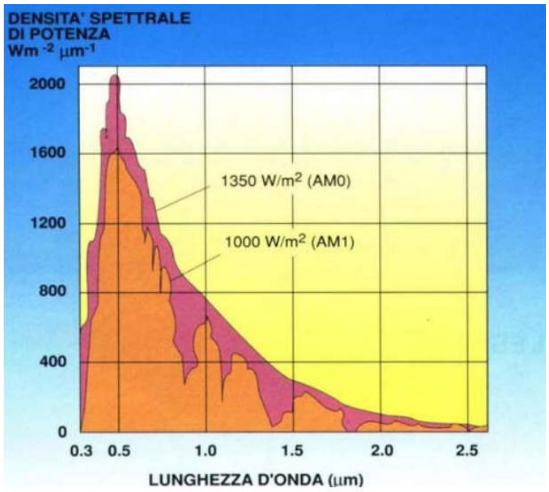
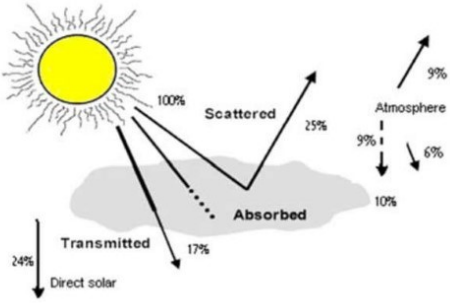
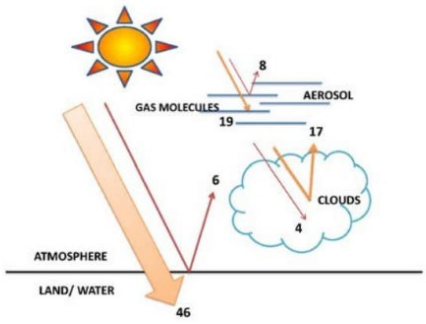
SOLAR RADIATION



The graph shows the solar radiation emitted by the sun. The orange area defines the part of the solar radiation that is received on earth. The rest, shown in red, remains before the atmosphere. This means that specific wavelenghts are notably reduced or stopped by the atmosphere. In fact, part of their heat is absorbed and part of it is scattered.





When scattering occurs, the radiation is spread and divided from one to multiple directions.
When absorpition occurs, the solar radiation of shortwaves is converted to internal energy and given back to longwaves. This is due to the different components of the atmosphere, for example, the ultraviolet is absorbed by ozon layer and the infrared is absorbed by water and CO^2.

When we consider a wall or a window we'll then have two terms of radiation incoming: the direct one (coming directly from the sun) and the diffuse one (coming from the atmosphere).
Now we can undestand why, for example, when a window is completely shaded, and therefore there is no direct radiation incoming, we still have diffuse radiation to take into consideration.

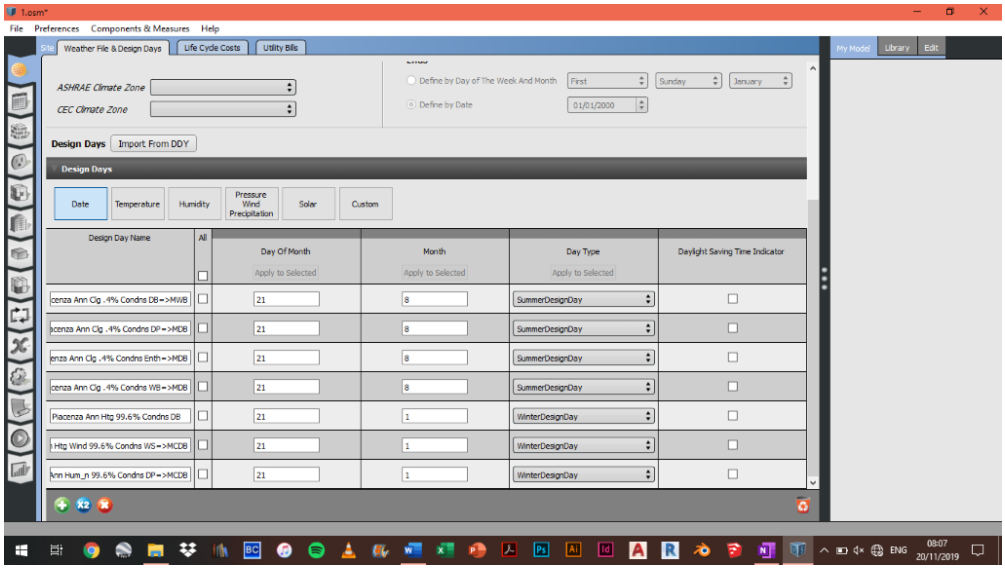
The air mass is the thickness of the atmosphere that a radiation coming from a given direction has to cross. It depends on time and location.
The most important parameters that affect the radiation incoming towards a wall, for example, are the orientation of the wall, the latitude and altitude of the location in which the building is, the season, the specific microclima/weather of the location, the amount of hours of sun during the 24h.

Moreover, an horizontal surface will receive only direct and diffuse radiation, while a vertical surface will receive direct, diffuse, and reflected radiation.

The pyramometer is the most common instrument to relevate radiation. It normally calculates both the direct and diffuse radiation but if put in shadow it will obviously give just the amount of diffuse radiation.

OPEN STUDIO

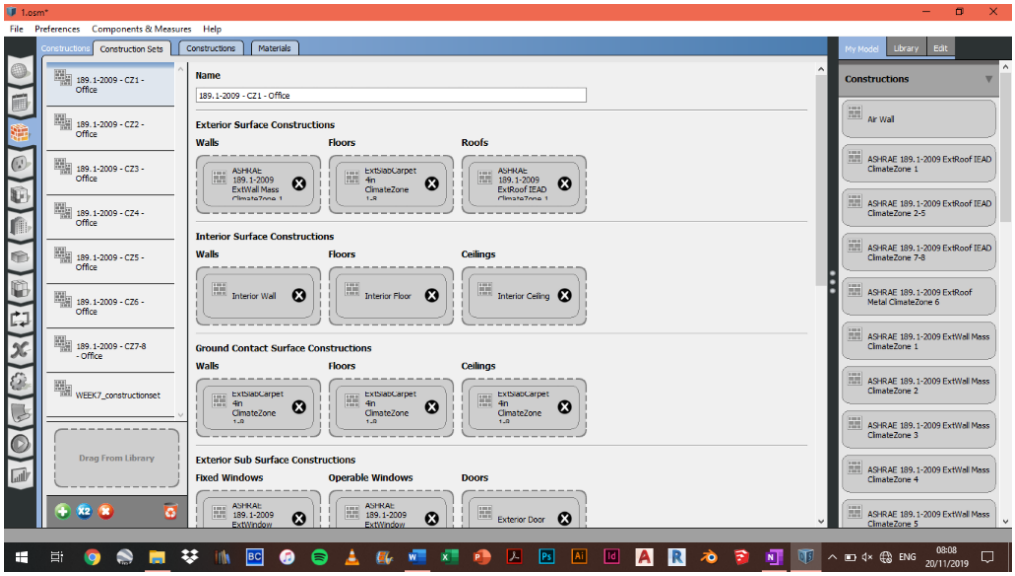
In the second lecture about Open Studio software, we started by specifying once again that the design days file (.ddy) takes into consideration the worst case scenario both for winter and summer. It will therefore consider for the calculation the hottest and the coldest day of the year in the defined location.



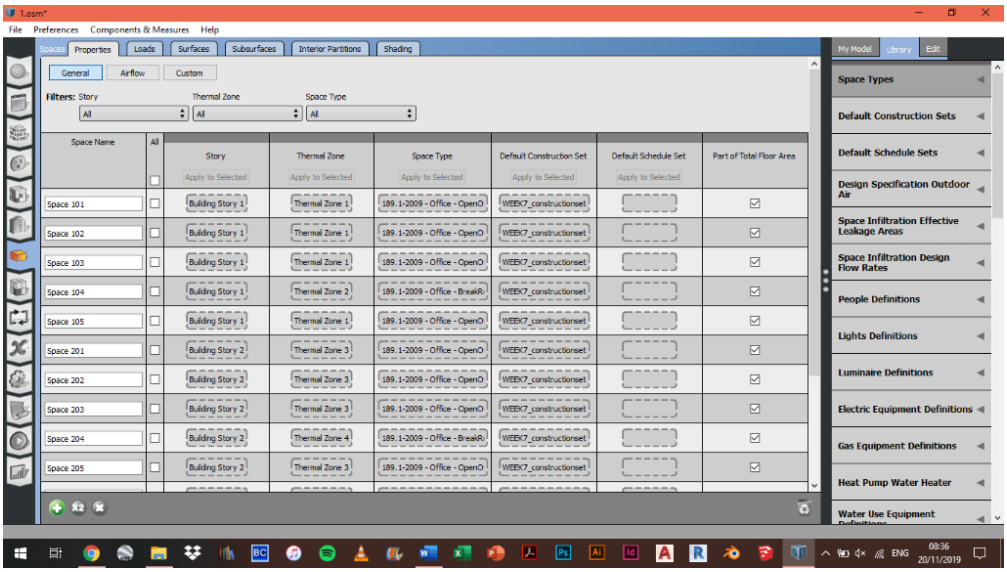
We stated then that to have a general idea about the overall consumption of the building, it is completely fine to use the default settings of the software. In fact they categorize the spaces in predefined typologies and they provide for each of them average datas about common construction element and average schedule.

In case we want to obtain a more detailed and precise calculation, we can change the settings and the specifications of each space of our building. We can customize characteristics, datas and timings about the walls, the schedule, the lighting, the loads and the space type.

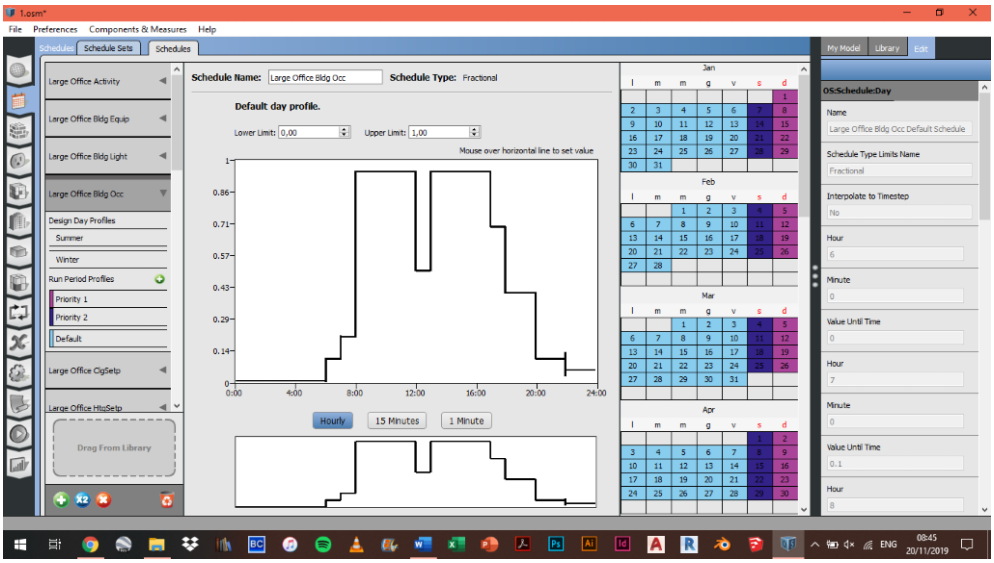
The procedure for the customization of the construction packages is the same for each of them. For example by going on the *constructions* tab we can modify the characteristics of our walls. We want first of all to choose a predefined wall element that is somehow similar to what we want. Then after modifying its composition and materials and thicknesses of each layer, we can substitute it in the general construction set.



As we previously said, this procedure can be repeated for each building element of each space. To choose and apply different construction sets to different spaces we go to the *spaces* tab.



In the *schedule* tab we can customize the hours of activity of our building. The number of people, the occupation, the lighting and the equipment datas can be changed and varied in different hours of the day.



In the loads tab we can define the characteristics, typologies and quantity of people, lighting and equipment. However for this tab, the default settings are used most of the times.

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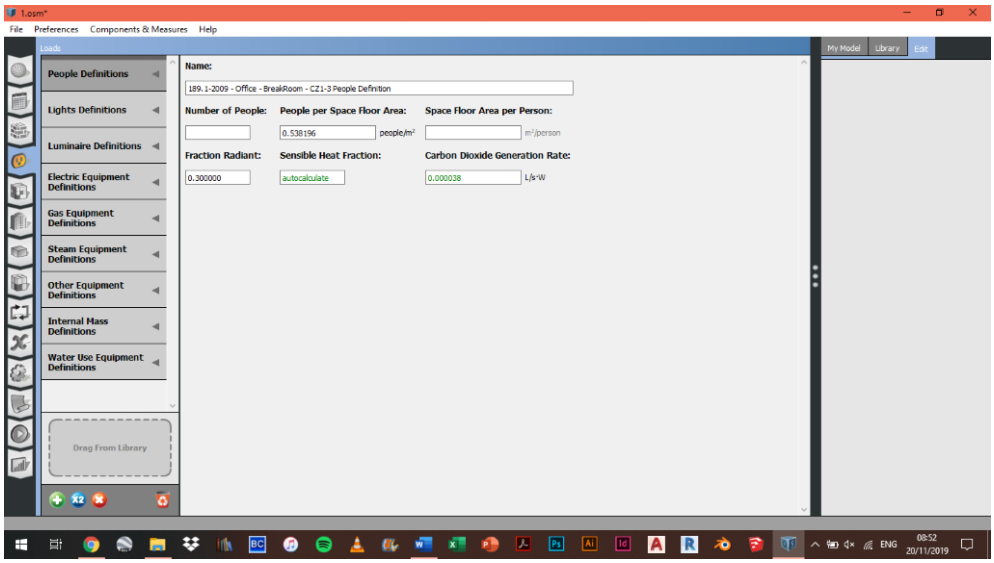

If we run now the project, all the modifications and customizations will be automatically applied.