

Submission 7 - Technical Environmental Systems

1. **Provide a summary of the main concepts about solar radiation.**
2. Solar radiation refers to the energy emitted by the sun in the form of electromagnetic waves, comprising of visible light, ultraviolet and infrared rays (Wavelength range: 0.3-2.5 μm) . The maximum yearly average solar radiation density is $1367 \frac{\text{W}}{\text{m}^2}$ out of the Earth's atmosphere (extraterrestrial solar irradiance) and $1000 \frac{\text{W}}{\text{m}^2}$ on the Earth's surface. The solar radiation reaching the Earth's surface is attenuated due to dispersion and absorption phenomena.

Dispersion of Solar Radiation:

Diffuse radiation is a main effect of dispersion of solar radiation, characterised by the appearance of radiation deflected in all directions. A part of the incident radiation is also reflected back by the atmosphere (albedo), while the radiation that is not intercepted by molecules maintains its direction, referred to as **direct solar radiation**.

Absorption:

Components in the atmosphere, such as ozone, water, carbon dioxide, etc. absorb incident radiation in specific wavelength bands, modifying its energetic spectrum. For example, the ozone layer absorbs almost the entire UV component of incident solar radiation.

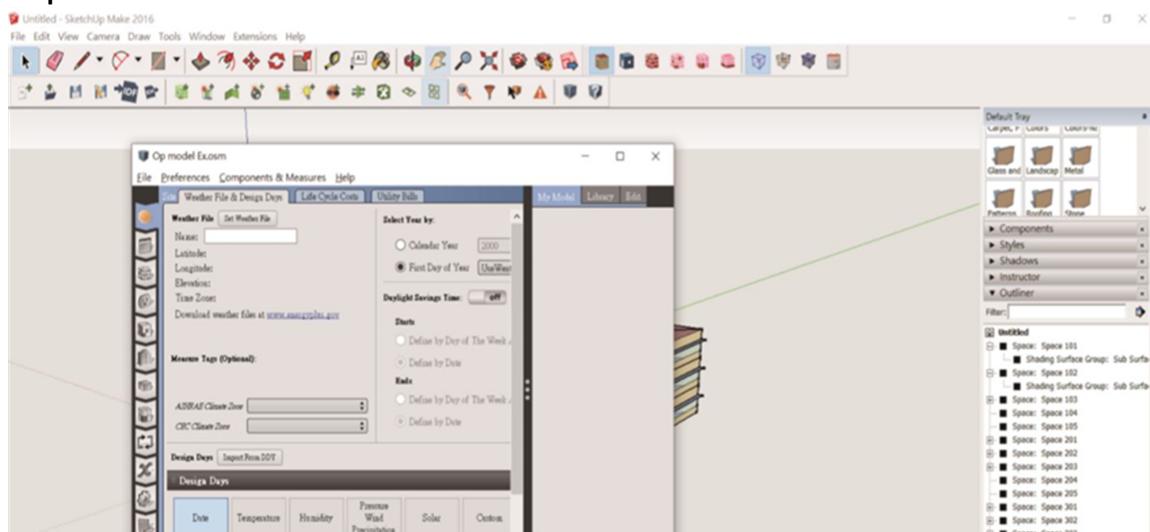
Air Mass:

The position of the Sun with respect to the location on the Earth impacts the solar radiation received. The Sun to the zenith crosses the least thickness of the atmosphere, while the Sun at an elevated zenith angle passes through a larger thickness of the Earth's atmosphere

The amount of solar energy available for conversion on the Earth's surface depends on the position of the Sun, the atmospheric conditions, the altitude of the site with respect to the sea level, and the duration of sunshine. Some of the instruments used to measure the total solar irradiance are: Pyranometer, Pyranometer with shadow band, Normal Pyrheliometer, etc.

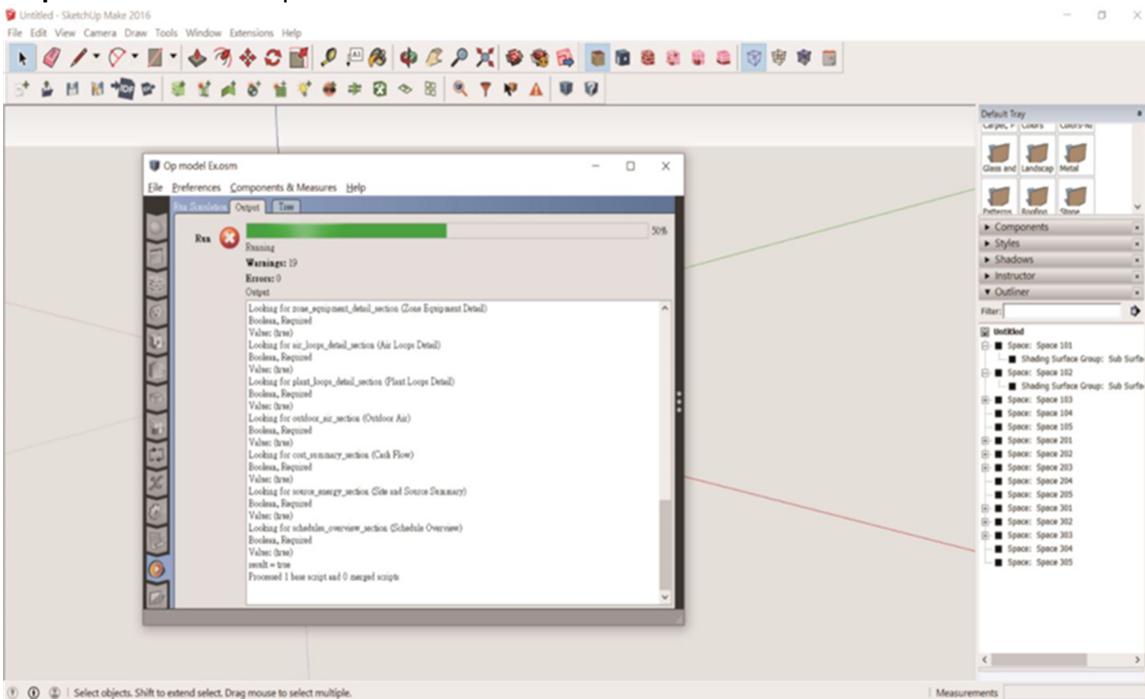
1. **Create a pdf file with screenshots of all of the steps we went through in the second lesson on Open Studio and explain briefly, the reason behind the use of each step.**

Step 1: Add the climatic data of Piacenza.

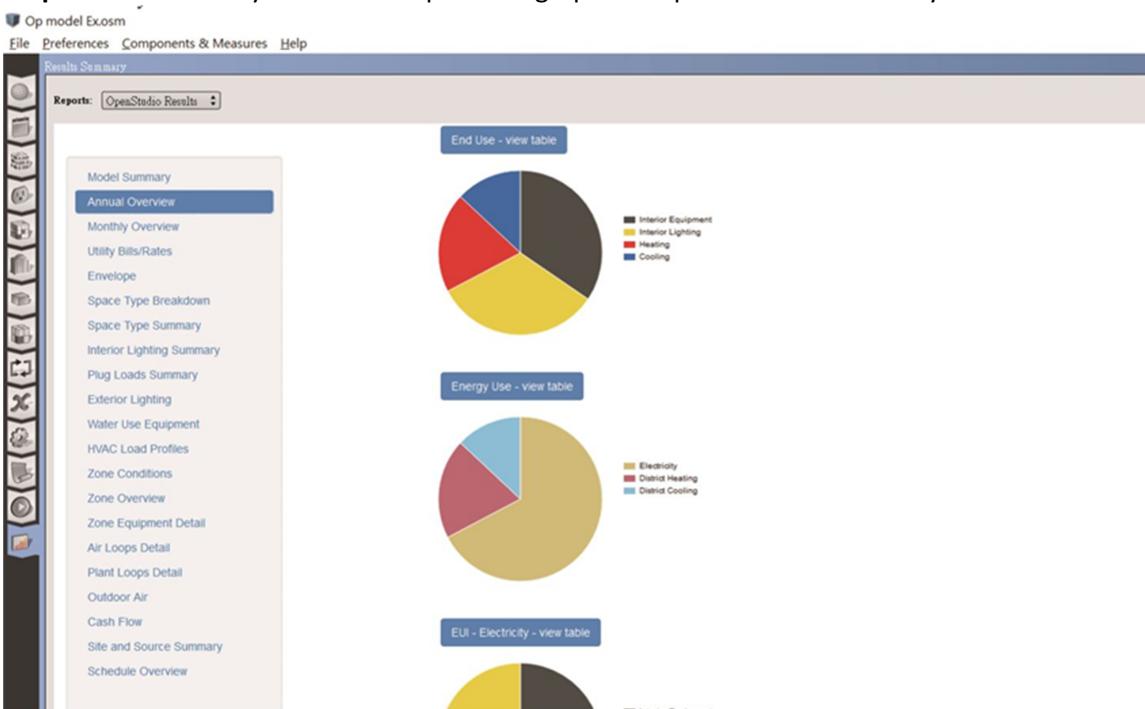




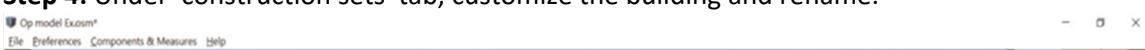
Step 2: 'Run' the data uploaded to the model

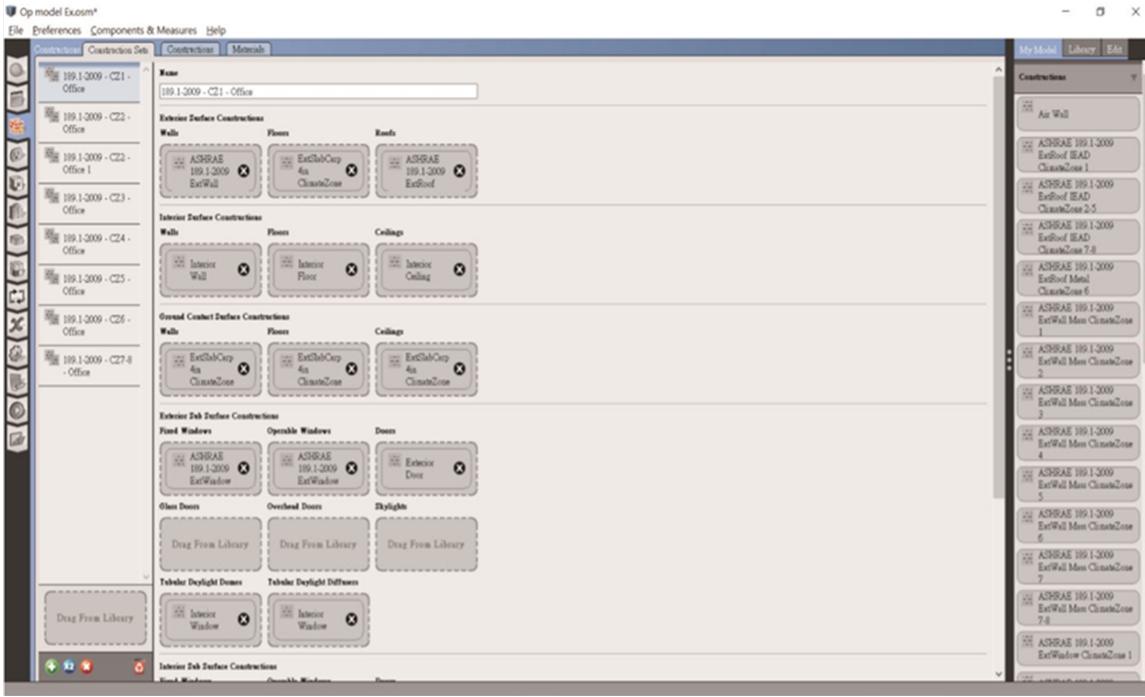


Step 3: The tab 'Analysis Overview' provides graphs and pie charts of the Analysis.

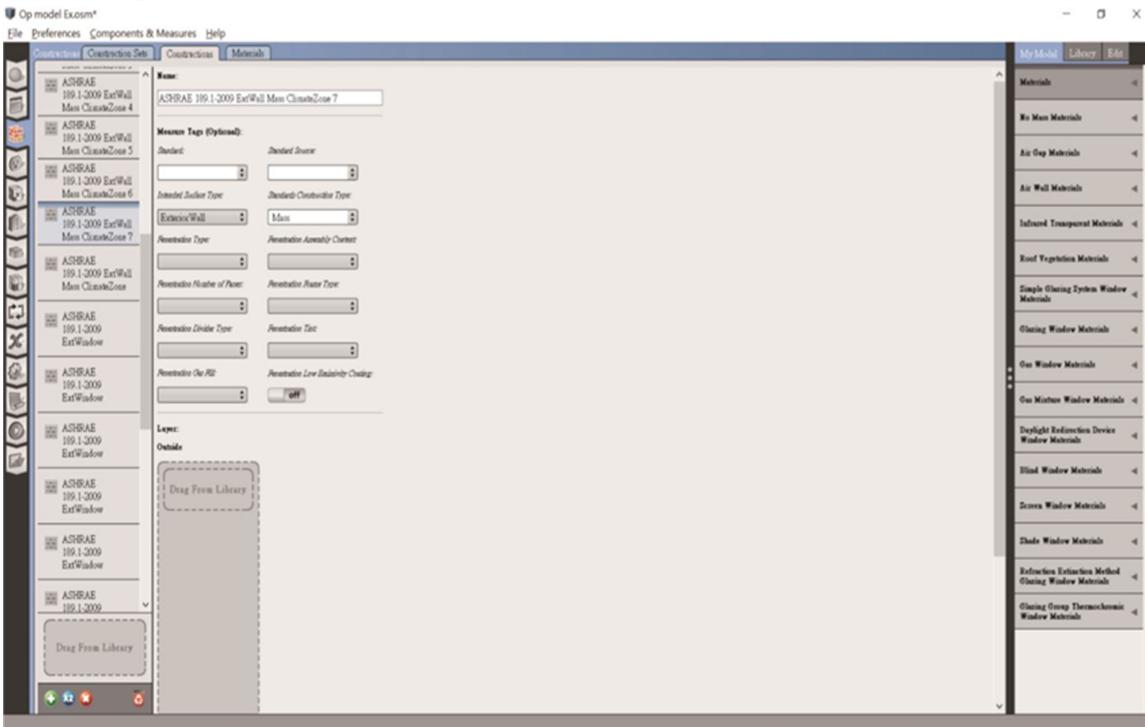


Step 4: Under 'construction sets' tab, customize the building and rename.

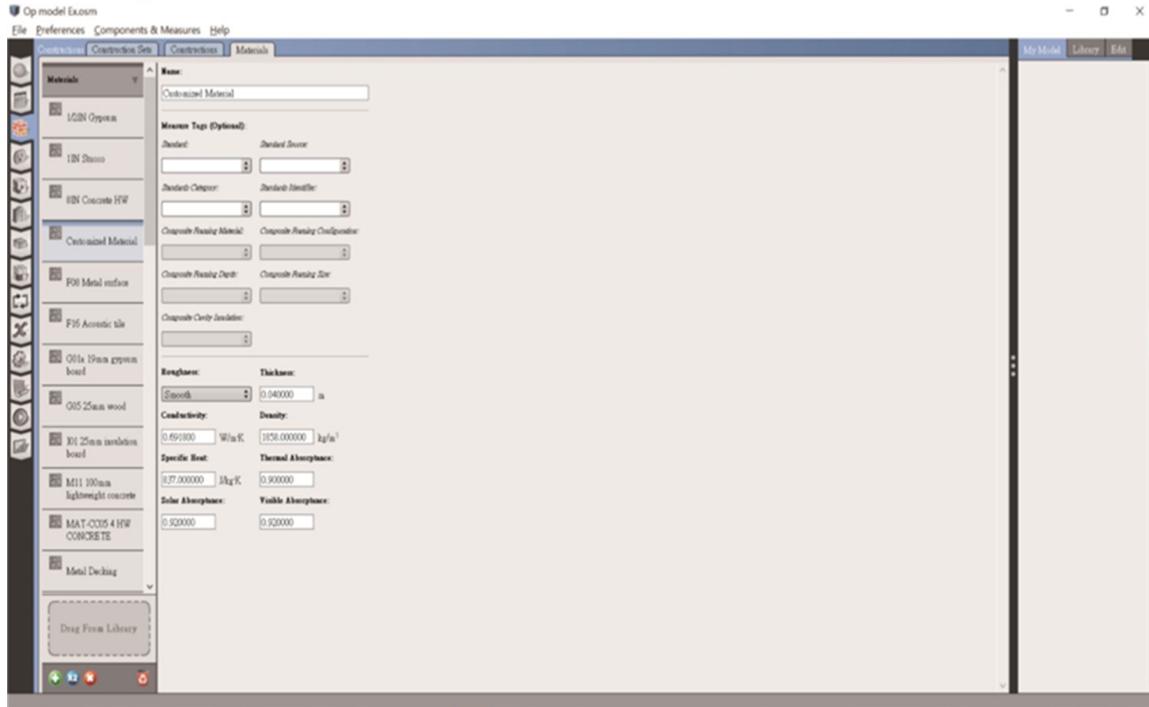




Step 5: Under 'construction sets' tab, customize the wall package.



Step 6: Add materials to the walls



Step 7: By using the materials tab, the properties of the existing materials could be altered, or a new material could be created by duplicating existing options.

