# ENERGY AND BUILDINGS

## 2021 – 2022

## OpenStudio

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# Practical info

Installation guidelines file

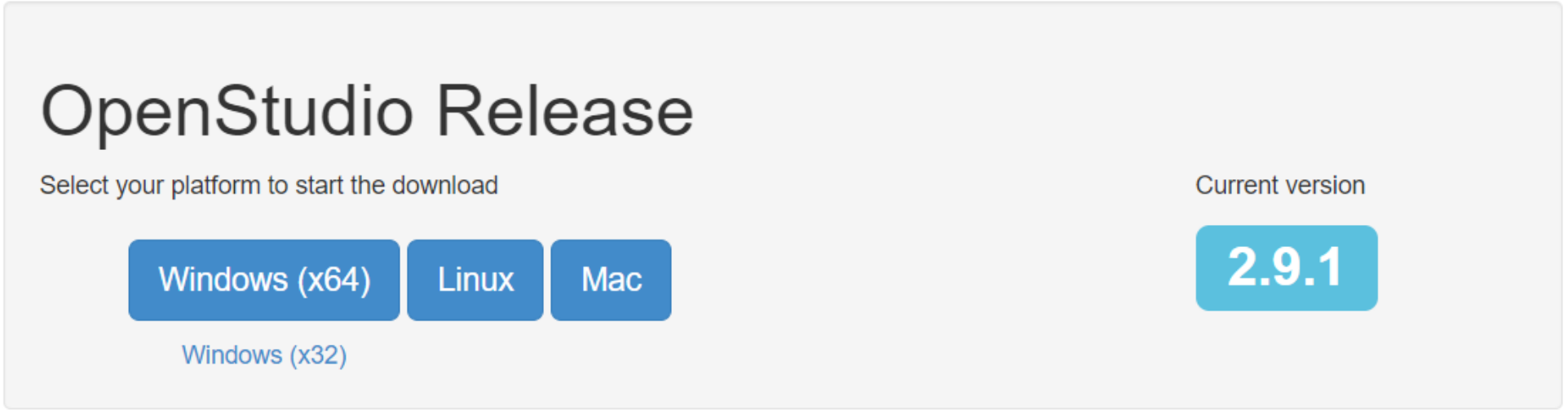
Google doc for questions
https://docs.google.com/document/d/1PrbHYNKNaYRuopPOKa5YK-MYZ2CjoabTDx8nm5rcyZY/edit

Questions and answer meeting on Thursday 14:30, Seminar room (ex Fisica Tecnica)

Information about the report in moodle. After the practical lectures there will an in-depth explanation of the report.

# OpenStudio

**Link:** https://github.com/NREL/OpenStudio/releases/tag/v2.9.1



# Design of the model

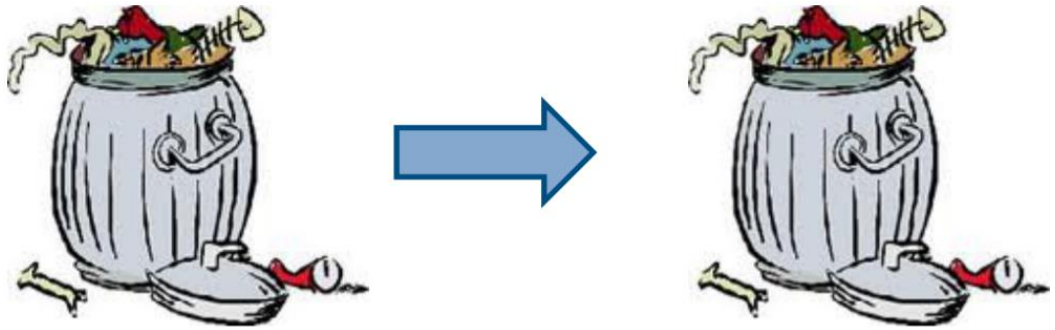
1 - Geometry definition

2 – Input definition

3 - Output definition & Simulation

4 - Analysis of the results

# 2. Input definition
## Weather data
## Materials
## Internal loads and setpoints



GARBAGE IN

GARBAGE OUT

# Weather File

https://energyplus.net/weather-region/europe_wmo_region_6/ITA%20%20

**Choose the location which is closer to your place**
**Later you will use Degree Days method to scale the energy demand**

**Use *YourLocation.epw* as TRY file (hourly data for the entire year)**

# Materials and constructions

- Compile materials in the **Constructions/Materials** tab in openstudio: thickness, conductivity, density, specific heat, (use default values for other data)
- After creating the materials, move to **Constructions/Constructions** tab and create each structure. Drag and Drop the materials from the Model panel, on the right side of the window. Start from the outside layer
- To model internal ceilings you have to create two opposite constructions (above floor and below ceiling). Similar for internal walls.
- Windows can be modelled using the **simple glazing system window material**. Use U-value and SHGC.
- Optionally: move to the **Constructions/Construction sets** and create a construction set to associate the materials to all your surfaces.
- Check your constructions in SketchUp, using the Construction Rendering option

# Materials and constructions

Information and data on your house's structures can be found within **technical reports** (*Legge 10* for recent Italian buildings, or energy certificates) or assumed looking at the typical constructions of the related age class.

**In any case, provide your data sources and describe your assumptions in the report!**

# Internal loads

## Electric appliances:

The **electric power is not the internal heat gain**!!
Depending on the appliance, the fraction of electric power that is released as heat load in the zone can be different (e.g. lights almost entirelly heat load, washing machine very low)

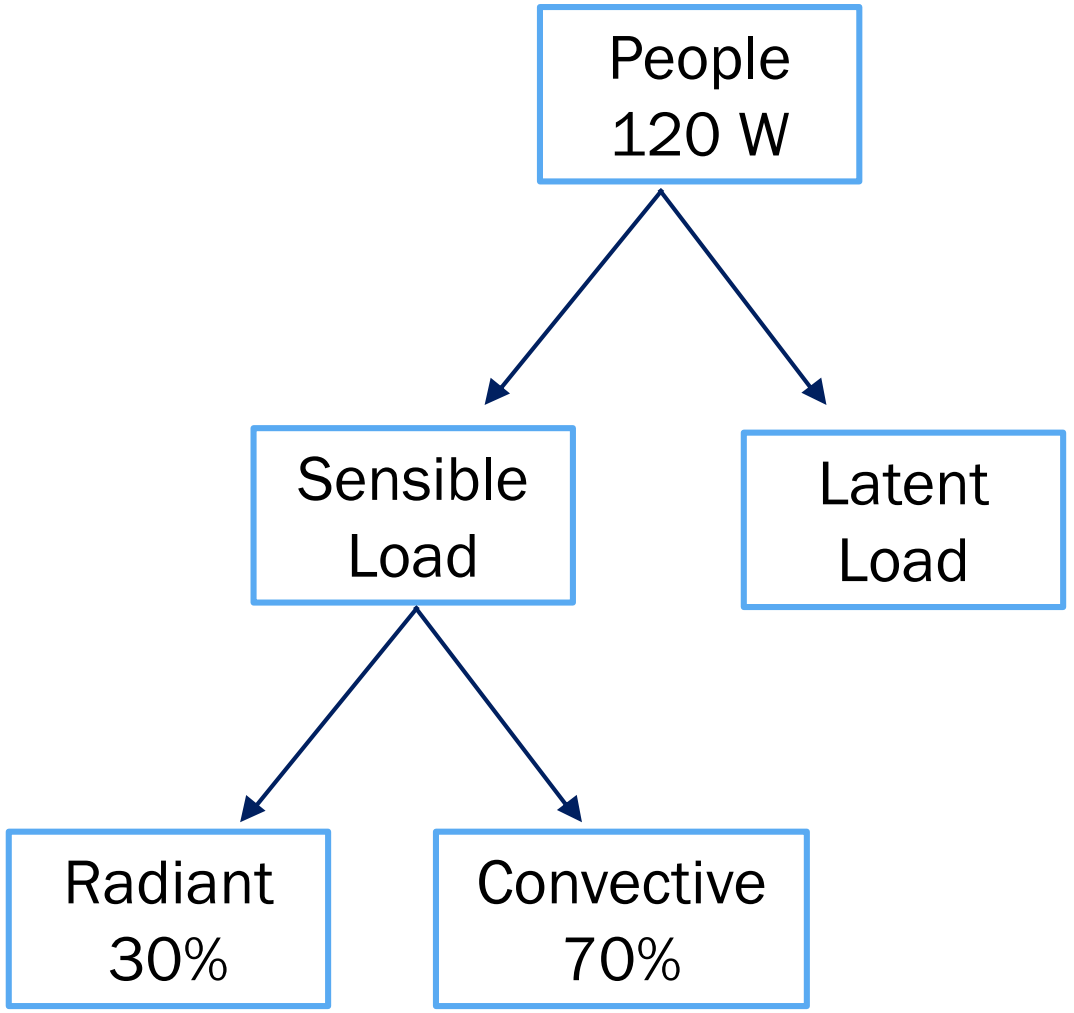
1. Create the electric equipment load in the Internal Heat Gains tab
2. Create an usage schedule (type ***Fractional***) to associate it

Tip:
Consider only your main appliances, those you use the most (screens, lights, PCs, fridges)
You can use total energy released from all appliances and then use a single schedule for each thermal zone

# Internal loads

**People:**
Usually a resonable heat flow is around 120 W/px (58 % sensible, 42% latent). Sensible load is split in convective and radiant.

1. Create the people load in the Internal Heat Gains tab
2. Create an occupancy schedule (type ***Fractional***)
3. Create a schedule to define the heat load of a person (constant 120 W, ***ActivityLevel*** type)



# Schedule definition

- Go to schedules/schedules tab
- Create a new schedule (green + button, on the bottom left side of the window)
- Select the schedule type and press enter
- Change name
- Change the daily trend: move your mouse on the black line and enter a numeric value to change it. The black line can be divide in multiple segments double-clicking on it.
- Select your schedule within the left panel and add new priorities using the green button.

## Typical errors

1. Check the order of the envelope stratigraphy!
2. Verify that Internal floor and ceiling have the same stratigraphy, but reverse order (Inside vs Outside layer) in the Constructions Label
3. Check surfaces' boundary conditions
4. Schedules assignments
5. Activity Level missing
6. Check Priority definition in the schedules
7. Did you associate Spaces and Thermal Zones?
8. Double check that each construction is correctly assigned to the correspoding surface/sub-surface

# OpenStudio – TIPS and Useful Info

http://nrel.github.io/OpenStudio-user-documentation/getting_started/getting_started/#introductory-tutorial