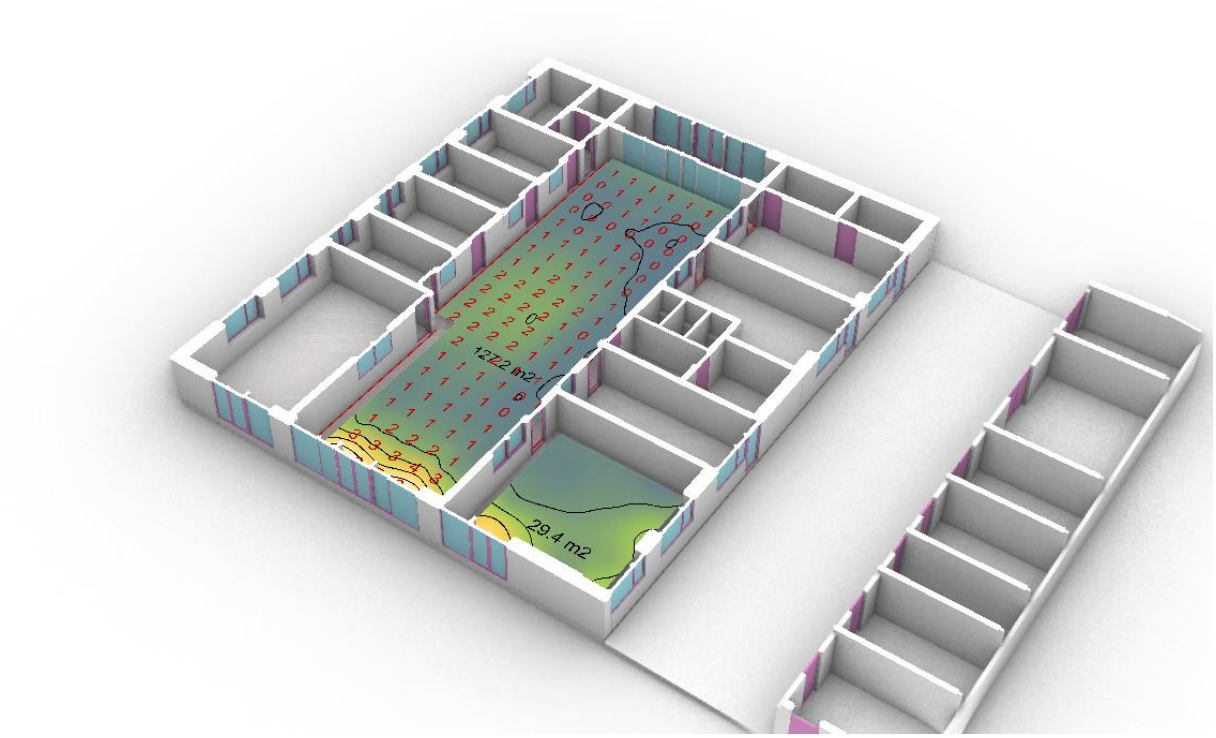
Tutorial on how to use a grasshopper script to calculate daylight metrics



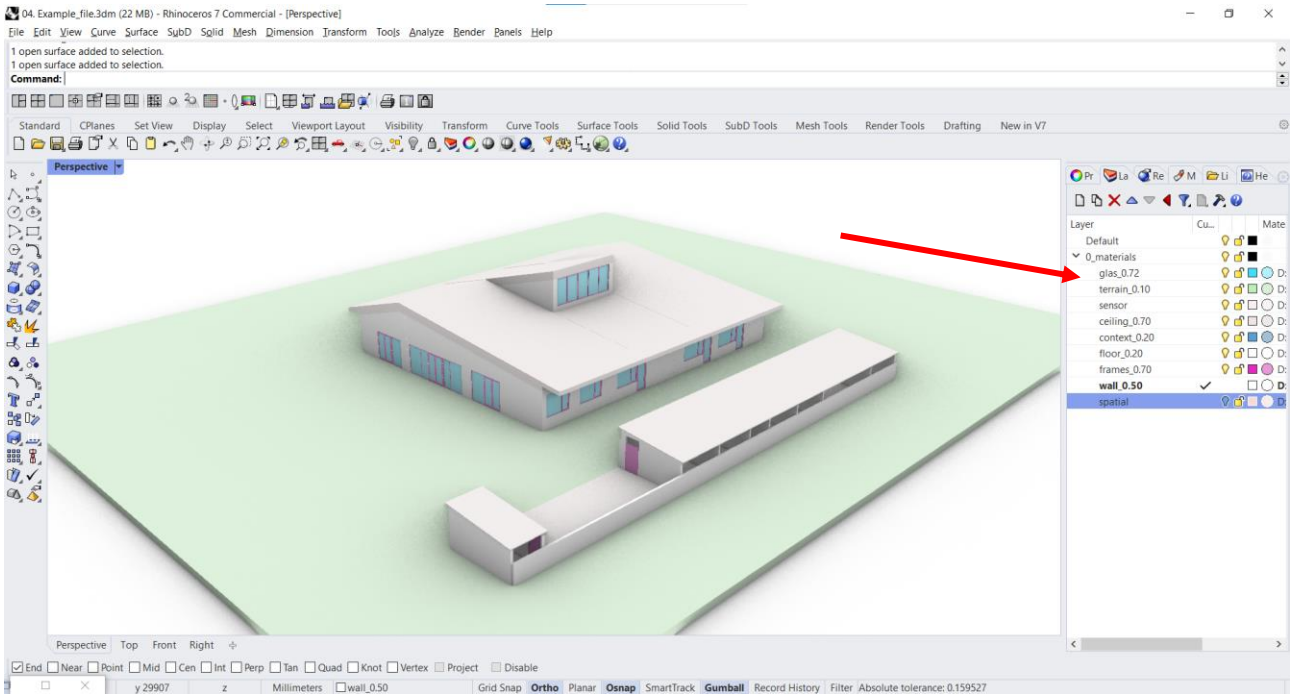
Quantitative and qualitative feedback regarding daylight from 3D models are valuable in the design processes involved in designing modern buildings.

This Grasshopper 3d script is used at Tegnestuen Vandkunsten, to make quantitative daylight analysis. Experience with grasshopper is not necessary, but it is recommended. The script must be used in conjunction with the 3D modeling tool Rhino or Rhino.inside.Revit (which opens Rhino inside Revit environment). The script can be customized to fit your own projects and the scope of this tutorial is only to show how it can be used in a simple situation.

All the necessary add-ins can be downloaded from the website or github (https://github.com/vandkunsten/Daylight_VK-01), just follow install instructions on github . Remember to right click the zipped folder and “unblock” before unzipping files.

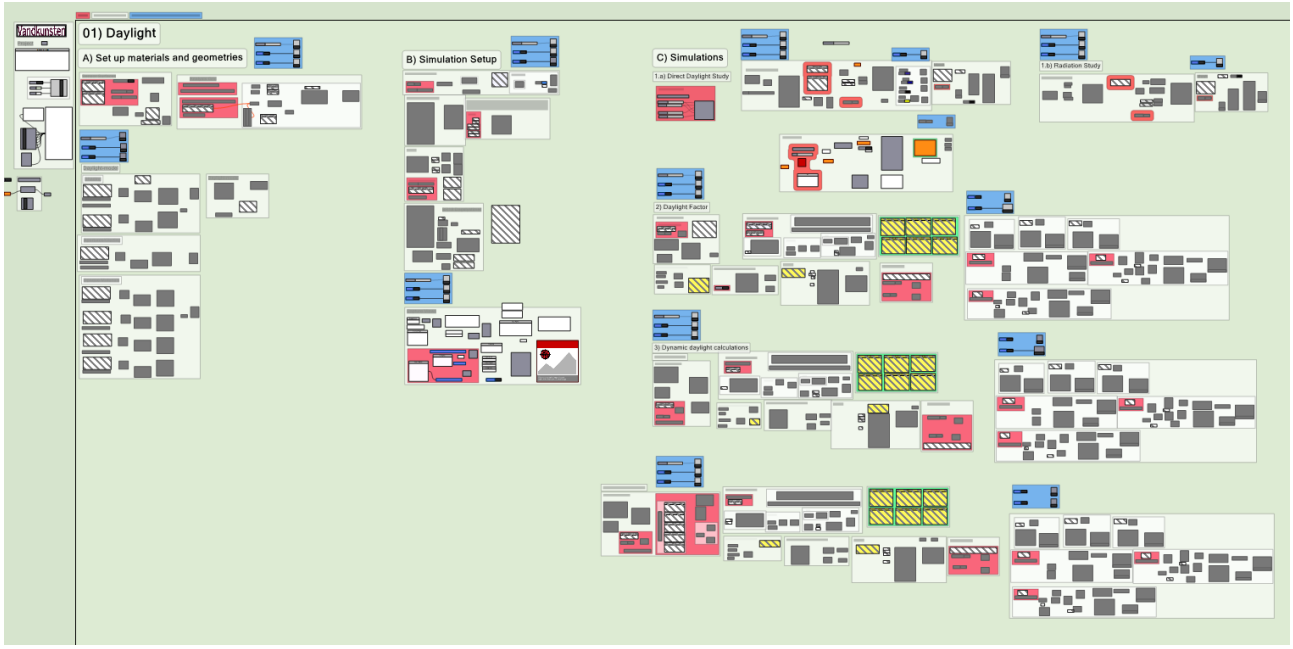
1) Open 04.Example_file.3dm in Rhino 3d or Rhino.inside.

   a) The model should look as below, with all geometries in designated layers.



2) Open Grasshopper 03. VK_DaylightMetrics_script.

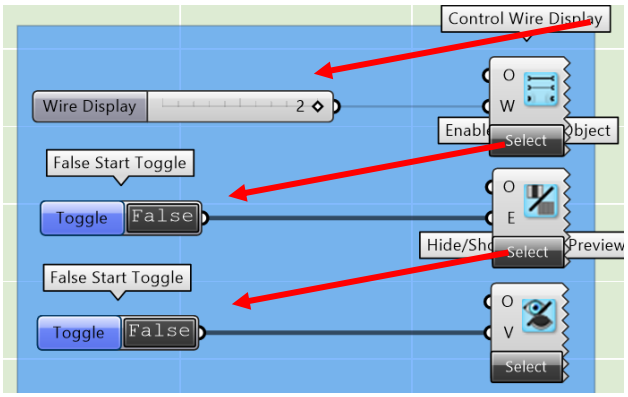
   a) Script should look as below. The script is quite large but has been subdivided into several smaller functional units (white blue and red).



3) Introduction to script logic/rules

a) In the top left corner, there is an explanation for the color convention. The blue colored areas are for controlling (1) wires, (2) previews and (3) if components should be turned on or off. For each subdivision of the script ther are control toggles.

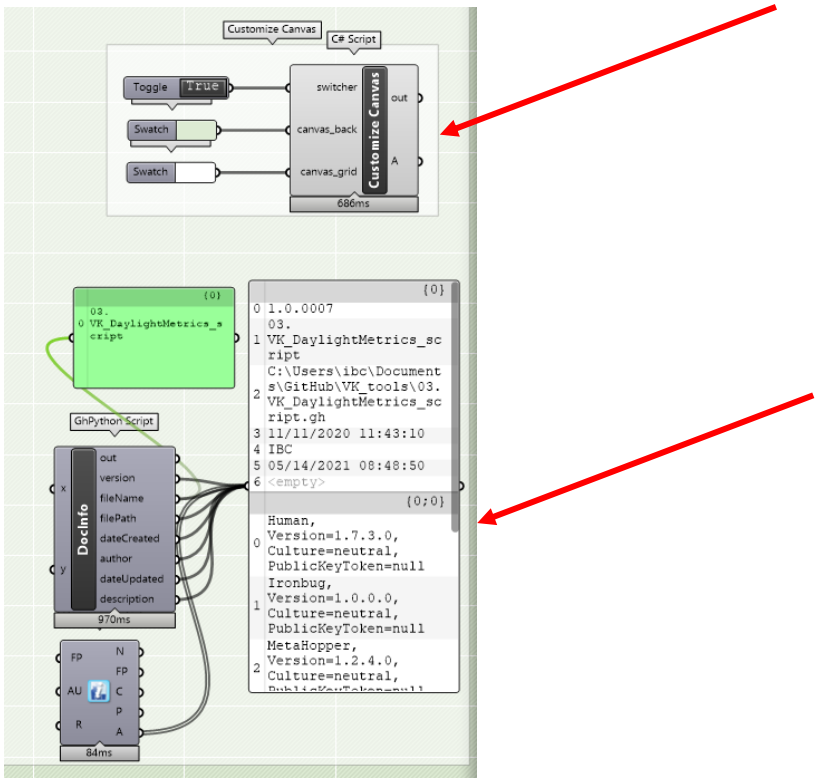
b) The controls are used by either doubling clicking on “false start toggle”-component or dragging “number slider”-component.



4) Project info

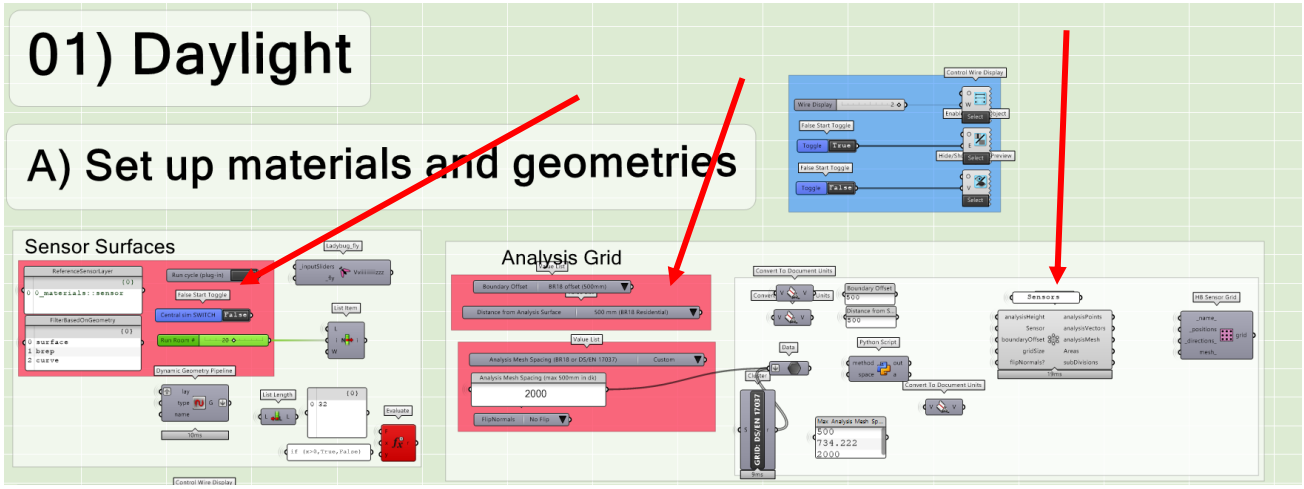
a) In the left part of canvas, the project can be given a name.

b) Furthermore, the canvas colors can be controlled (canvas is the name for the Grasshopper interface) and different info about the document can be obtained.

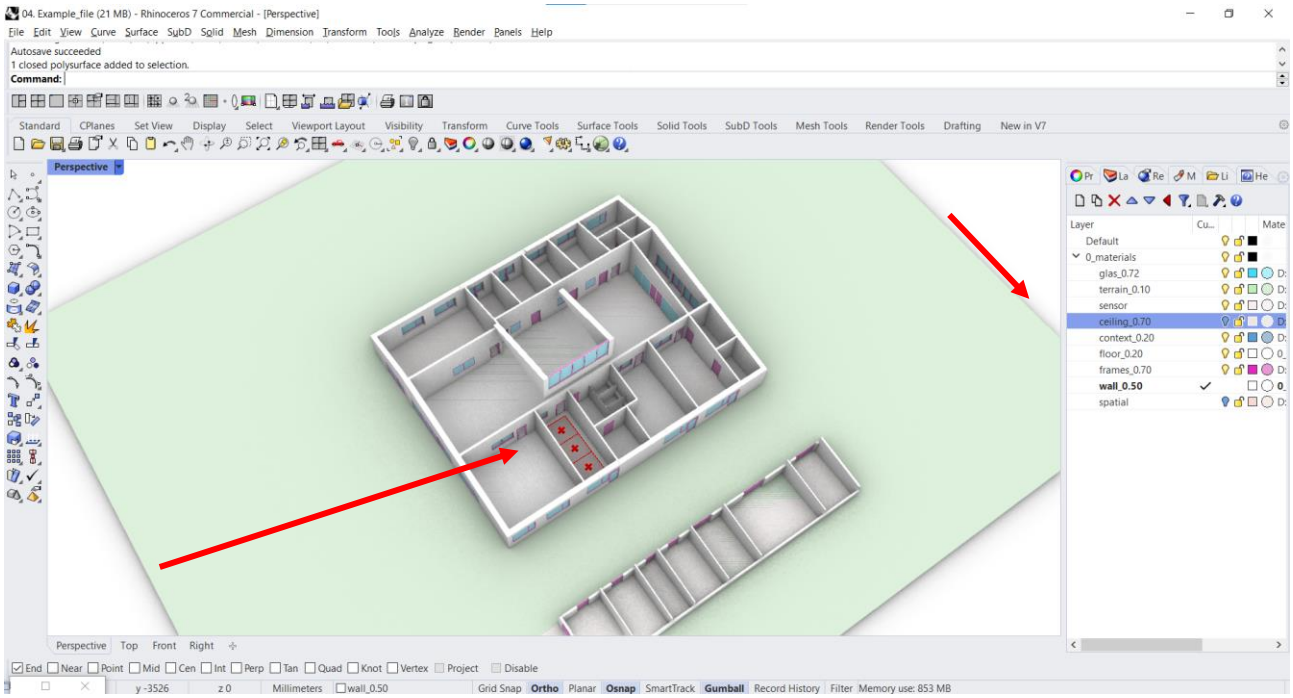


5) Referencing a sensor geometry (they have been created from Revit zones, more on that in another script).

a) Double click “false start toggle”-component to enable the part of script down below. The script will automatically reference all the surfaces from the “sensor”-layer in Rhino and will create an analysis grid based on the input from the user. It is possible to drag the green highlighted “number slider”-component, to switch between surfaces.

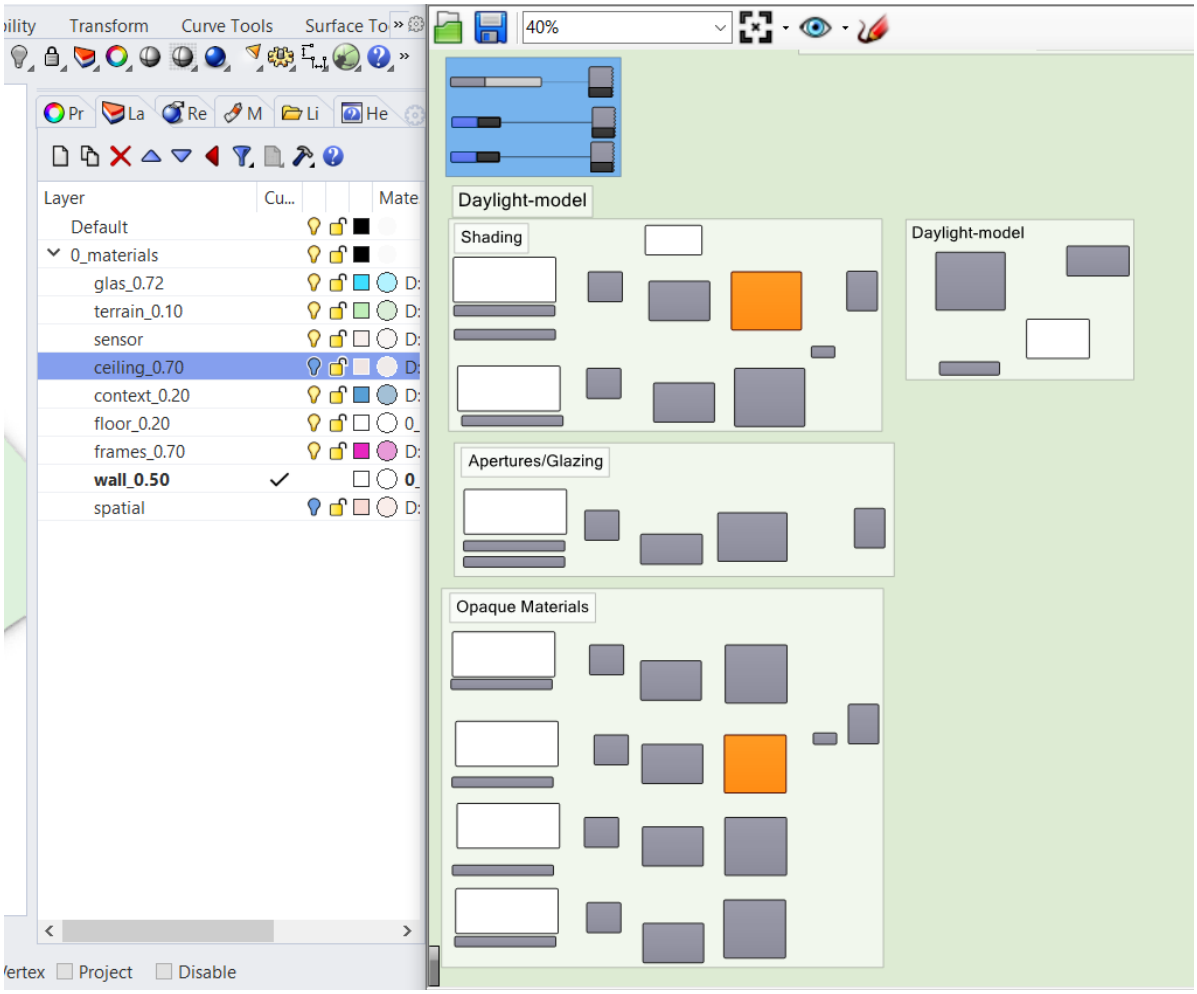


b) Your Rhino interface should look like this, depending on which sensor surface you have chosen in Grasshopper. (i.e. use number slider

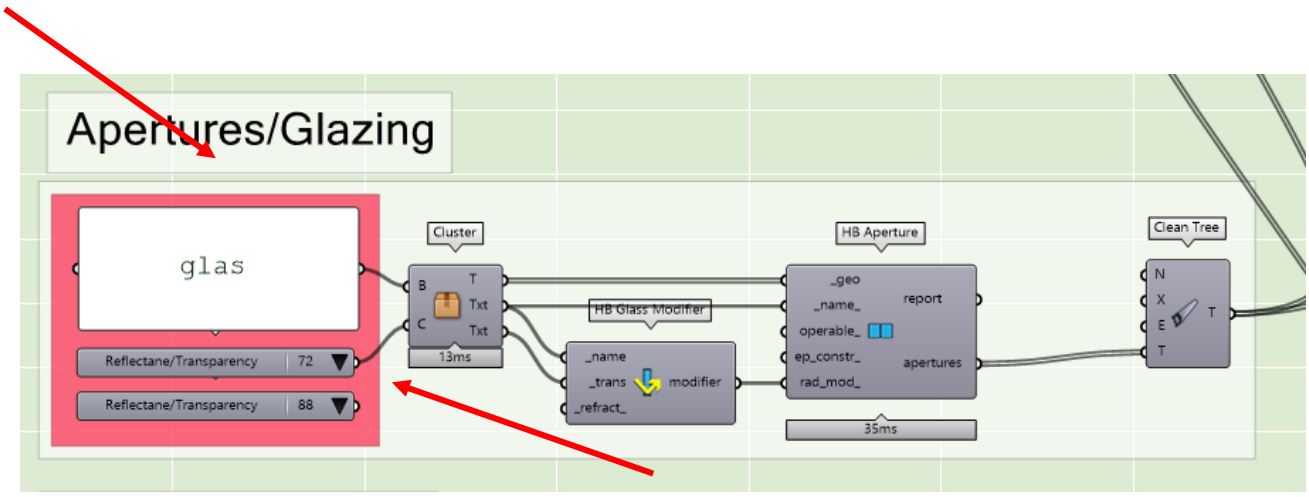


6) Making daylight model

a) This part of the script references the material layer by name. This means you can create your own layers, using the same naming convention as in the model (*eg. Material_0.45).* Based on the name of the layer the referenced geometry will be given material information (either reflectance or transmittance). Only layers that are turned on will be referenced.

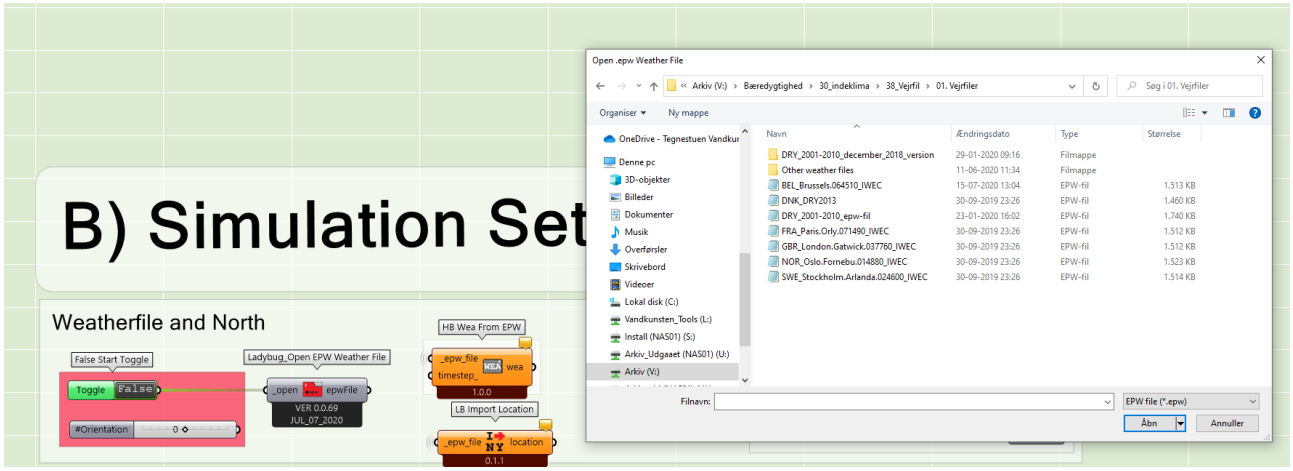


b) Here is a close of apertures/glazing as an example of assigning geometries and materials. The layer glas_0.72 will be referenced here. You can create new materials in new layers, and they will be referenced automatically. NB! For very big models, this process can take some time



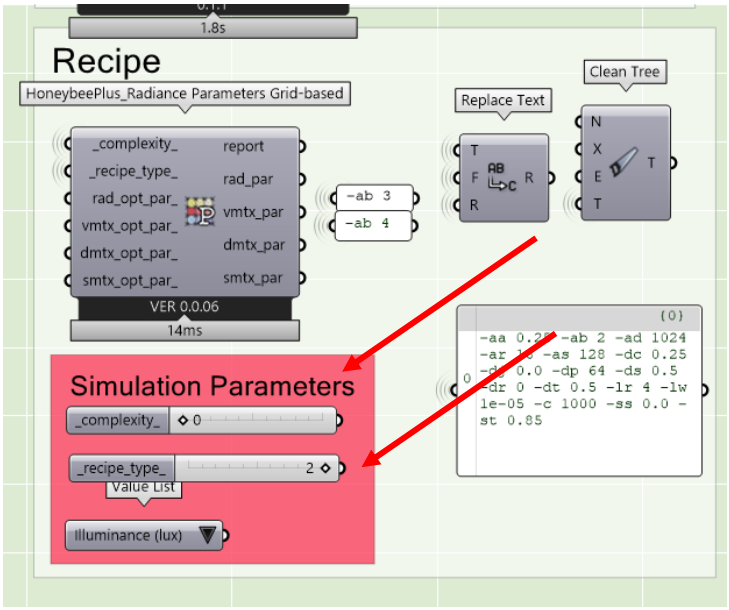
7) Setting weatherfile

a) Double click the “false start toggle” and browse to the weatherfile you wish to use and click open. For Denmark use the file: “DRY_2001-2010_epw-fil” . Set north on the slider below.



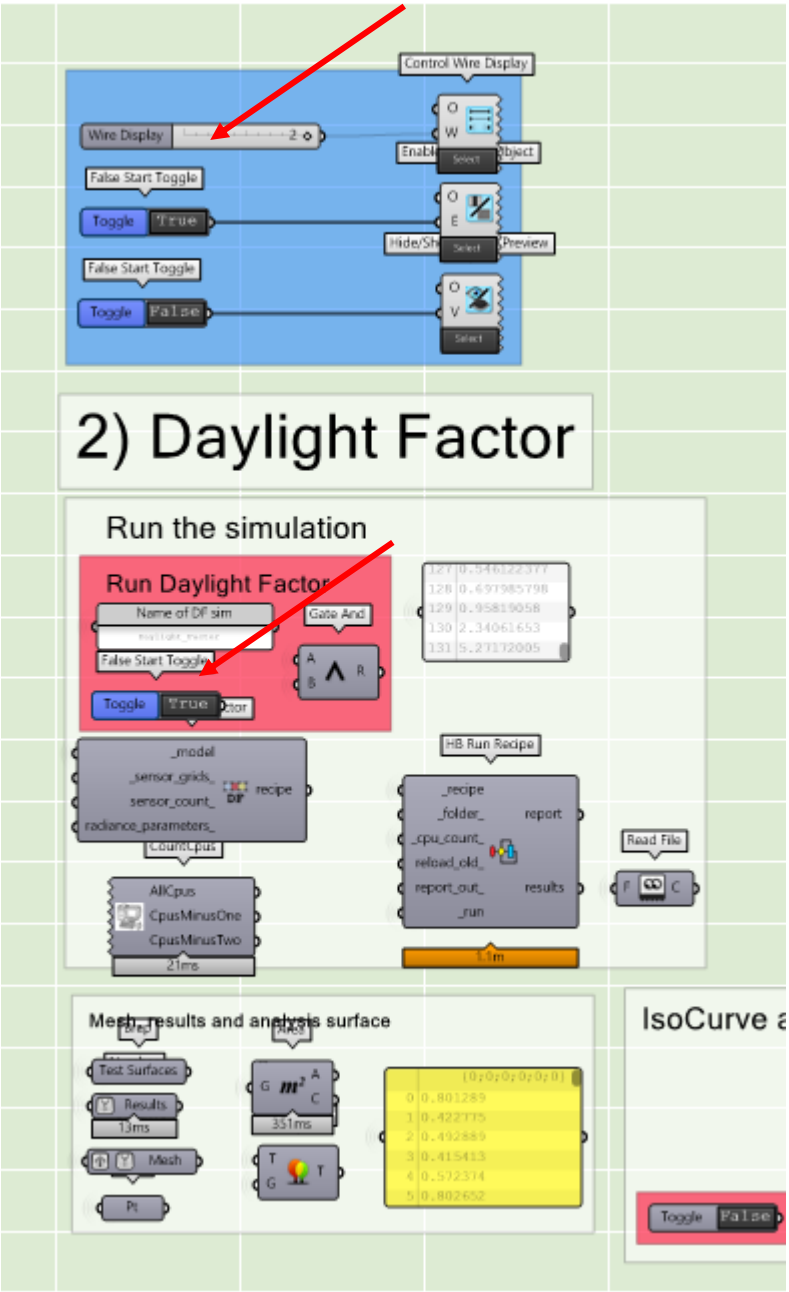
8) Setting Simulation Recipe

a) Set the complexity level for simulation which roughly correspond to these phases: 0=testing, 1 = most design situations, 2 = detailed design. Recipe type is dependent on whether you wish to run for example “point-in-time” daylight factor simulations or dynamic daylight autonomy simulations.



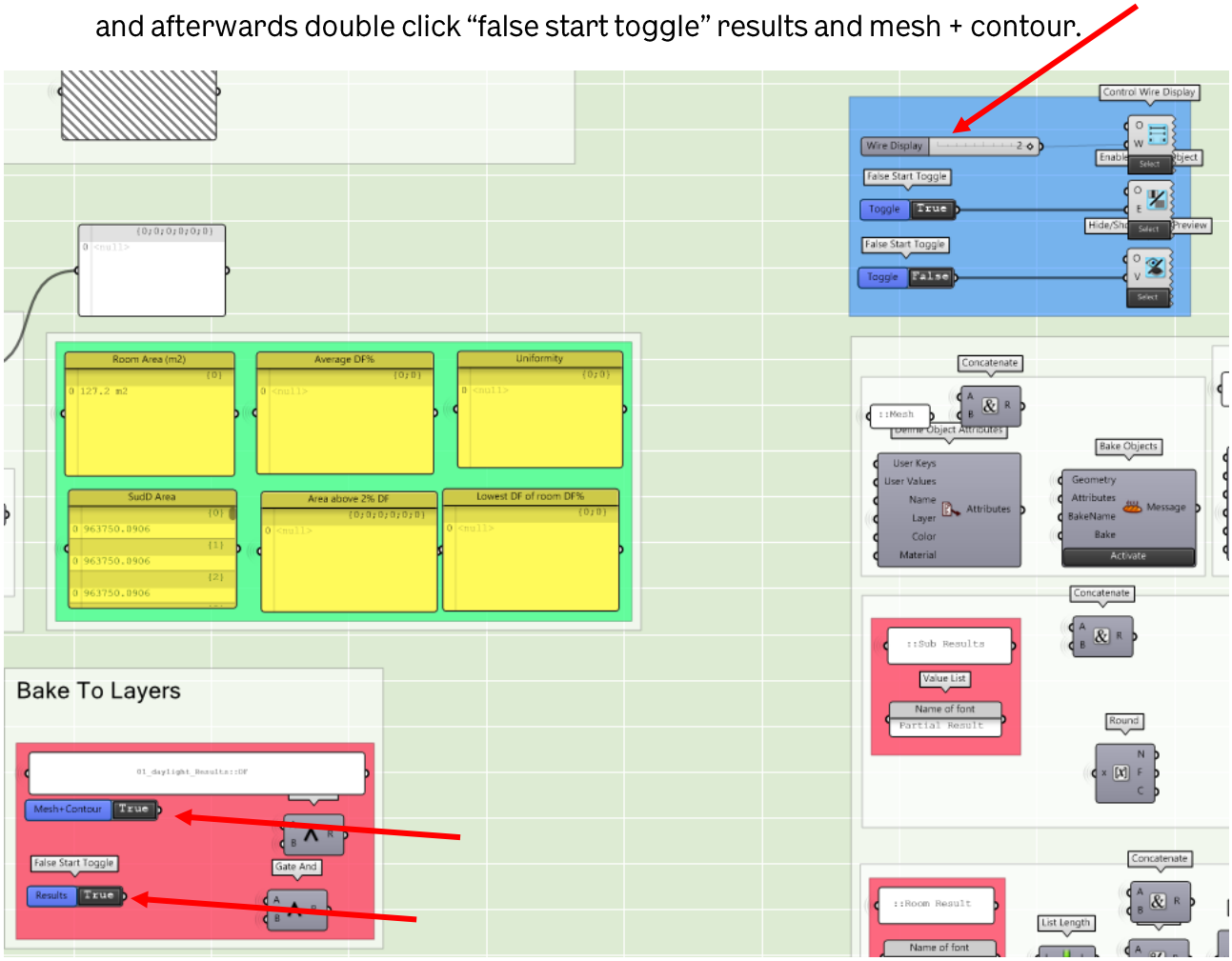
9) Running simulation.

a) Enable components by double clicking “false start toggle” inside blue area and run simulation using “false start toggle” inside red area.



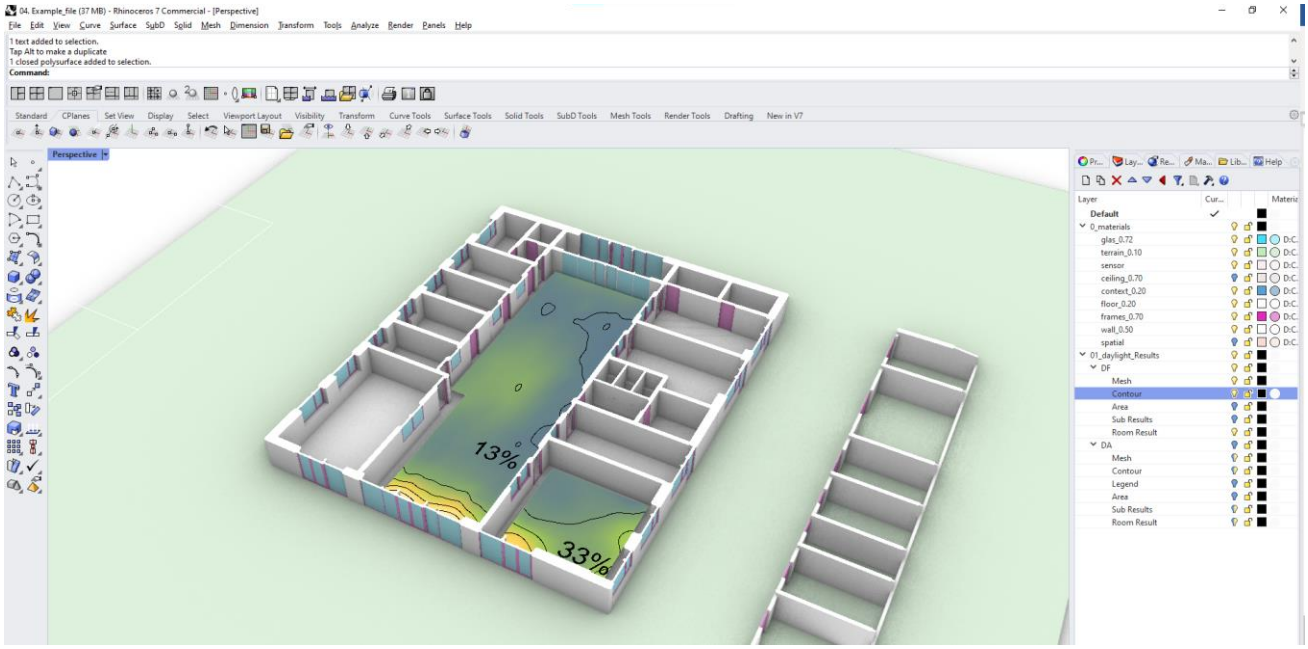
10) Bake results to Rhino scene.

a) Enable bake components by double clicking “false start toggle” at the top right arrow and afterwards double click “false start toggle” results and mesh + contour.



11) Document analysis results.

a) Your Rhino screen should look something like this



b) Use capture view area to make screen shots and save the to a folder after your own wishes or to the folder where the simulation results reside (recommended).