

1. Toolbox: Open Studio Plug-In for Google SketchUp

1.1. Description of the tool

Open Studio is a free plug-in for the 3D drawing program Google SketchUp. By means of Open Studio it is feasible to save the designed and arranged building geometry in the program Energy Plus. Thereby, it enables to mix the Energy Plus simulation content with the designing content such as landscaping and architectural finish details of SketchUp – all within one SketchUp model.

EnergyPlus is a whole building energy simulation program for engineers, architects and researchers to model the energy and water use in buildings. This comprises models of heating, cooling, lightning, ventilation, other energy flows and water use. Furthermore, the tool includes various innovative simulation capabilities like multizone air flow, thermal comfort, natural ventilation, internal heat gain, solar heat gain and photovoltaic systems.

Modeling the building performance with EnergyPlus enables building professionals to optimize the building design to use less energy and water.

By means of Open Studio it is now possible to add these energy simulation capabilities of EnergyPlus to the SketchUp environment.

The highlights of the Open Studio plug-in include the ability to:

- Create and edit EnergyPlus zones and surfaces
- Launch EnergyPlus and view the results without leaving SketchUp
- Match interzone surface boundary conditions
- Search for surfaces and subsurfaces by object name
- Add internal gains and simple outdoor air for load calculations
- Add ideal HVAC system for load calculations
- Set and change default constructions
- Add daylighting controls and illuminance map
- Get help from tutorials and documentation

Summing up, the plug-in makes it easier to work with EnergyPlus because the output can be directly linked to and displayed in a SketchUp design.

1.2. Outcomes of the tool

Calculation and illustration of energy and water use of buildings, for example

- Solar heat gain
- Internal heat gain
- Solar gain of Photovoltaic panels
- Glazing heat gain

1.3. Assessment of the tool

1.3.1. Advantages / Disadvantages

Advantages

- Combines the energy simulation capabilities of Energy Plus with the surface of SketchUp
- Enables building professionals to optimize building designs regarding to less energy and water usage
- Free-ware
- Plug-inn can be combined with SketchUp and SketchUp Professional

Disadvantages

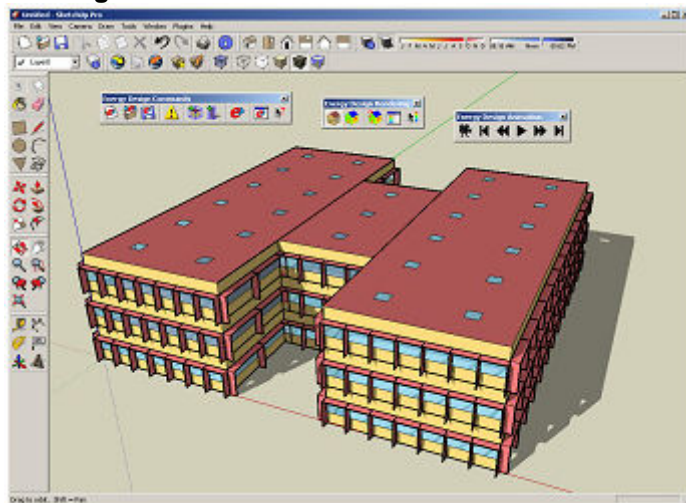
- The plugin is not a full-featured interface for EnergyPlus (it will not help the user to create non-geometry EnergyPlus objects such as materials, constructions, etc.)
- Expertise in using EnergyPlus at the text level is highly recommended (not appropriate for laymen)
- Uncertainty about use for whole urban design

1.3.2. Improvements

- Simplification of the EnergyPlus application

1.4. Examples

Shadings



Calculates shadings and makes them visible in the SketchUp design

1.5. Literature

- Website U.S. Department of Energy
Building Energy Software Tools Directory
<http://apps1.eere.energy.gov/buildings/energyplus/openstudio.cfm>
- Website Designbuilder
http://www.designbuilder.co.uk/programhelp/calculation_of_designbuilder_output_from_energyplus_report_variables.htm
- Griffith, B.T.; Ellis, P.T. (2004): Photovoltaic and Solar Thermal Modeling with EnergyPlus Calculation Engine. National Renewable Energy Laboratory. Colorado. United States