

VELUX Daylight Visualizer Readme

Version 3.1.03

About

VELUX Daylight Visualizer is a free daylighting simulation tool made for architects and engineers, and is intended for the analysis of daylight conditions in the design phase of building projects.

Create or import 3D models

The 3D modeler in Daylight Visualizer permits quick and easy generation of 3D models in which façade and roof windows are freely inserted. Most of the operations usually required to create a 3D model are automated within the modeler functionalities, such as the insertion of windows which is simply performed by dragging a window icon to a desired location in the model.

*The embedded 3D modeler does not support complex shapes (fx. curved walls) and multi-storey buildings.

The 3D Importer makes it possible to import 3D models generated by most CAD applications to permit the evaluation of a wide range of building designs without limitations to the complexity of geometry or scale of the building. Supported formats are .OBJ, .DWG, .DXF, and .SKP.

*Note that the latest formats are sometimes not supported, in which case you should save the model to one of the previous format available, e.g. SKP2020.

Simulation output

Climate-based annual simulations:

Daylight autonomy (DA): Daylight autonomy (DA) is a daylight availability metric that corresponds to the percentage of the occupied time when the target illuminance at a point in a space is met by daylight. A target illuminance of 300 lux and a threshold DA of 50%, means that 50% of the time daylight levels are above the target illuminance.

Useful daylight illuminance (UDI): Useful daylight illuminance (UDI) is a daylight availability metric that corresponds to the percentage of the occupied time when a target range of illuminances at a point in a space is met by daylight. Daylight illuminances in the range 100 to 300 lux are considered effective either as the sole source of illumination or in conjunction with artificial lighting. Daylight illuminances in the range 300 to around 3 000 lux are often perceived as desirable.

Total annual illumination (TAI): Total annual illumination (TAI) is a measure of all the visible daylight energy incident on a surface during the year, or occupancy period evaluated.

Single point in time simulations:

Daylight factor (DF): Daylight factor is a daylight availability metric that expresses as a percentage the amount of daylight available inside a room (on a work plane) compared to the amount of unobstructed daylight available outside under overcast sky conditions.

Illuminance: Illuminance is the measure of the amount of light received on the surface. It is typically expressed in lux (lm/m²).

Luminance: Luminance is the measure of the amount of light reflected or emitted from a surface. It is typically expressed in cd/m².

*Daylight Visualizer can be used to perform single point in time simulations (specific time of day/year defined by the user) under a wide range of CIE sky conditions.

Note on window “glass” materials and BSDF support

VELUX Daylight Visualizer has 2 types of glass material: glass (surface) and glass (solid).

It is important to know the difference between those 2 materials as it can have a big influence on daylight calculation results.

Glass (surface): This material type applies the transmittance value to every polygon light travels through in the model. For example, if you have modelled a glass pane as a solid object with a thickness you will have two layers of polygon – and a transmittance value 0.8 will result in a light transmittance of 0.64 for the glass pane.

Glass (solid): This material type applies the transmittance value to a solid object where light travels through two layers of polygon. For example, if you have modelled a glass pane as a solid object with a thickness you will have two layers of polygon – and a transmittance value 0.8 will result in a light transmittance of 0.8 for the glass pane.

Light diffuser: This material type applies the transmittance value to every polygon light travels through in the model – and has an isotropic diffuse light output. We highly recommend applying this material to window panes modeled with only one layer of polygon.

BSDF: Daylight Visualizer supports the use of BSDF materials which can be used to simulate complex fenestration systems. BSDF can be used when working with imported 3D models.

Video tutorials

Video tutorials showing how to use Daylight Visualizer can be found on our YouTube channel [VELUX Building Simulation Tools](#).

- How to import models from SketchUp:
<https://www.youtube.com/watch?v=uv2KfmDHDos>
- How to evaluate daylight requirements from EN17037:
<https://www.youtube.com/watch?v=SE8A4xQxAyo&t=61s> (imported models)
https://www.youtube.com/watch?v=0_vva2cCygo&t=402s
- How to use zones in calculations:
<https://www.youtube.com/watch?v=yKqOSNfNjg8>
- How to use sensor points:
<https://www.youtube.com/watch?v=22VcQwsypEc>

How to perform annual simulations?

We will soon have a new video tutorial showing how to perform annual simulations in Daylight Visualizer. In the meantime you can follow these instructions.

1. Import or create a 3D model as you would usually do (see tutorials on YouTube if needed).
2. Under the “location/weather” tab in Daylight Visualizer, click on the button “Import EPW”.
 - a. You can download EPW files here <https://energyplus.net/weather>
3. Under the “render” tab in Daylight Visualizer, select “annual simulations”.

- a. You can choose between calculations for – Plan view – Zones – and Sensor points.
- b. Zones and Sensor points will only be available if you have zones in your model, or have loaded sensor points (refer to previous tutorials on YouTube if needed).
- c. Zones and Sensor points calculations are faster since they have less values to calculate.

Validation reports

Simulation results have been validated by ENTPE (National School of State Public Works) against test cases dedicated to natural lighting in CIE 171:2006 Test Cases to Assess the Accuracy of Lighting Computer Programs.

<https://velcdn.azureedge.net/~media/com/corp/visualizers/viz/daylightvisualizercievalidationreport.pdf.pdf>

Simulation results have been validated in the investigation – Daylight Calculations in Practice SBI 2013:26 - which looked into the ability of nine daylight simulation programs to calculate daylight factor levels in five typical rooms.

<https://sbi.dk/Assets/Daylight-calculations-in-practice/daylight-calculations-in-practice.pdf>

*We will be publishing a new report in the start of 2023 for the validation of climate-based annual simulations in Daylight Visualizer.

Simulation engine

The simulation engine of VELUX Daylight Visualizer is using state-of-the-art bi-directional ray tracing with photon mapping algorithms. It is developed by [Luxion](#) in collaboration with the VELUX Group.

Contact and support

You can contact us for support and enquiries at daylight.visualizer@velux.com.