

Guideline to simulations in VELUX Daylight Visualizer with MicroShade®

This is a guideline to daylight simulations with MicroShade® in VELUX Daylight Visualizer version 3.1.03 or later. VELUX Daylight Visualizer is a lighting simulation tool for analysis of daylight conditions in buildings. VELUX Daylight Visualizer can quantify the daylight autonomy, the useful daylight illuminance and total annual illumination, as well as the luminance, illuminance and daylight factor of a building interior and create different visualizations of the daylight conditions, including 3D renderings.

This guideline is intended for simulations with MicroShade® in VELUX Daylight Visualizer. For further questions regarding VELUX Daylight Visualizer please contact VELUX. For questions regarding MicroShade® please contact us at support@microshade.com

Simulation of MicroShade® in VELUX Daylight Visualizer

About MicroShade®

MicroShade® is a highly effective shading product consisting of an almost invisible film combining UV and IR coatings with a structured micro-lamella. The shading efficiency depends on the incidence angle of the sun on the lamellas. When the sun is high in the sky during the summer, MicroShade® provides the strongest shading and during winter when the sun is low more heat is allowed into the building. Similarly, the shading efficiency also varies during the course of the day due to the different positions of the sun morning, noon and evening.

For façade applications¹ MicroShade® is commonly combined with either a low energy coating or an extra low energy coating. An extra low energy coating provides a stronger shading, whilst a low energy coating allows more daylight inside. For roof applications an extra low energy coating is typically used, and for even stronger shading it is possible to combine MicroShade® with a hard coated solar control coating (SCH) on the front glass. For more information on selection of MicroShade® type please see our selection guidelines on www.microshade.com

Daylight metrics

VELUX Daylight Visualizer calculates the spatial daylight autonomy, the useful daylight illuminance and the total annual illumination with climate-based calculations, as well as daylight factor, the illuminance or the luminance level at one point in time. The climate-based daylight metrics give an overall evaluation of the varying daylight conditions that users will experience. However, VELUX Daylight Visualizer still offers a procedure that will allow you to evaluate your results against EN17037 based on daylight factor. Please notice that movable shading devices are NOT considered with the daylight factor method and results for these solutions are misleading.

IMPORTANT: Versions previous to the 3.1.03 VELUX Daylight Visualizer cannot perform annual daylight simulations.

MicroShade® BSDF files

A BSDF (Bi-directional-Scattering-Distribution-Function) file of MicroShade® is needed for a VELUX Daylight Visualizer simulation with MicroShade®. Different types of MicroShade® are available for selection.

To download a BSDF file, click on the appropriate MicroShade® type below.

- 2-layer MS-F 60/14 for facade
- 3-layer MS-F 60/14 for facade
- 2-layer MS-F 60/14 for roof
- 3-layer MS-F 60/14 for roof

In case you cannot find the variation you are looking for, a custom BSDF can be made following the [Guideline to daylight simulations with MicroShade®](#), otherwise feel free to contact us at support@microshade.com

Usage

It is possible to import 3D models from CAD software into VELUX Daylight Visualizer. The supported file types are .OBJ, .skp and .dwg/.dxf. In order to simulate MicroShade® in VELUX Daylight Visualizer a BSDF file, describing the complete construction of the window, is needed. Remember to assign a unique material to each surface. If multiple surfaces are of the same type, the same material can be applied. The geometry from the 3D CAD software should then be imported into VELUX Daylight Visualizer and the BSDF containing the window with MicroShade® should be assigned to the window layer.

If using SketchUp remember to save the model to one of the previous versions, e.g. version 2020, as problems are, often, experienced on the supporting of latest formats. This can be changed in the drop down menu when clicking "save as".

IMPORTANT: The quality of the rendering affects the precision of the daylight calculation in VELUX Daylight Visualizer – not just the quality of the rendered picture. We therefore recommend that calculations are performed with a high quality as the MicroShade® structure is complex.

The focus of this guide is exclusively on how to use MicroShade® in VELUX Daylight Visualizer by importing a 3D CAD model. This guide is therefore not a general guide on how to use VELUX Daylight Visualizer or SketchUp.



Importing a CAD model and a BSDF file into VELUX Daylight Visualizer

Importing the CAD model with a MicroShade® glazing

1. Open VELUX Daylight Visualizer and select "Import project" and select the CAD file you want to import.
2. Go to the "Surfaces" menu. In the "Define surfaces" tab, assign the appropriate material from the "Surface" menu to each surface in the "Element" menu. The element names correspond to the material names that was given to the surfaces in the CAD software used to create the 3D model. If an appropriate material can't be found, create your own custom material by clicking the "User defined..." tab with user defined properties.
3. For the window, select "BSDF" in the "Material" menu and then click on "User defined...". Navigate to the destination of the BSDF file of the window with MicroShade® on your computer and select the MicroShade® BSDF file.

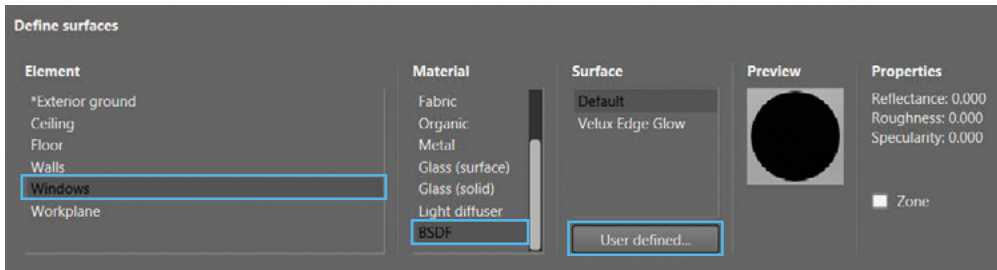


Figure 1. Step 3: Selecting the MicroShade® BSDF file for the MicroShade® element.

4. MircoShade® has now been successfully assigned to all surfaces with the MicroShade® material in your VELUX Daylight Visualizer project. Define parameters for "Location", "Camera" and "Render" and a simulation can be performed.

IMPORTANT: The quality of the rendering affects the precision of the daylight calculation in VELUX Daylight Visualizer – not just the quality of the rendered picture. We therefore recommend that calculations are performed with a high quality as the MicroShade® structure is complex.



Evaluating daylight conditions against EN17037 using sDA

1. Import the EPW weather file by clicking on the "Import EPW" under the "Location/Weather" tab. Alternatively, the location can be selected manually. Chose the desired location or create a "Custom" location by entering the longitude and latitude. The orientation can be changed by adding an angle value for the rotation of the compass. Additionally, this can be done by clicking on the floor plan tab and then by rotating the arrowhead of the compass.
2. Perform the simulation by clicking on the "Annual Simulation". Specify the "Resolution". We recommend to use a high resolution, since the resolution not only affects the resolution of the image, but also the precision of the daylight calculation. Choose "Zones" under render before starting the calculation by clicking "Simulate".

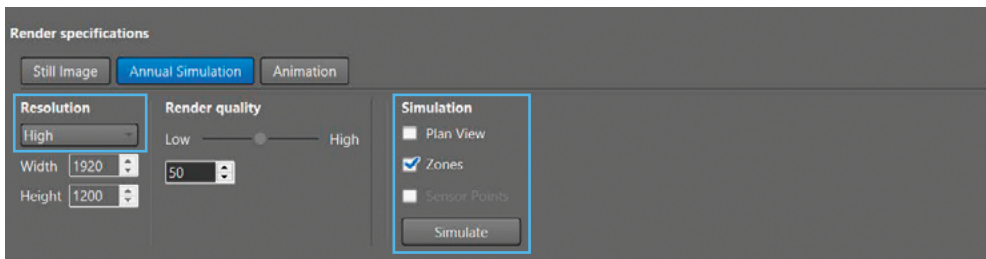


Figure 2. Step 2: The "Annual Simulation" tab

3. Select the "DA" daylight metric and the occupancy schedule. Click "Save" to generate the report.

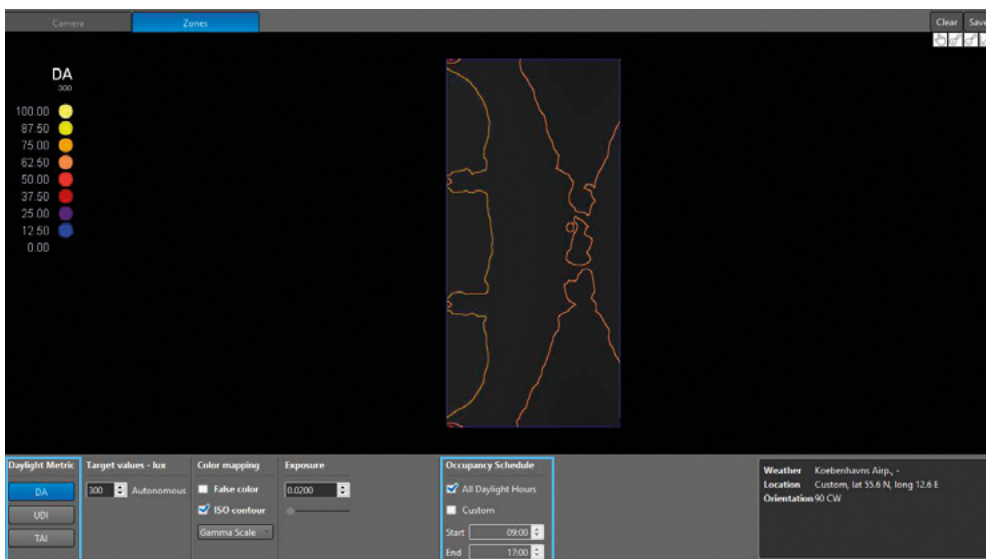


Figure 3. Step 3: Save report



- Open the report in a browser and check off the box "EN17037" under Report Options. A text below the check box will appear, specifying the requirements. Scroll down and check the results under "EN17037" below the rendering with contours.

Daylight Visualizer

Calculation on zones

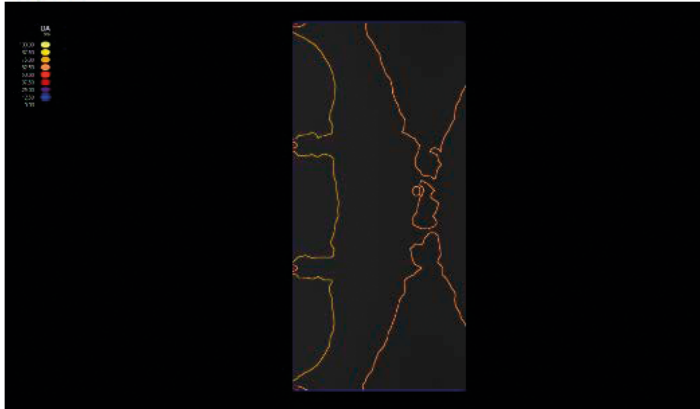
Project name: Velux updated
 Simulation type: Daylight Autonomy 300
 Daylight Visualizer version: 3.1

Select Report Options

- EN17037
- Active House
- Fractions of Work Planes
- Percentiles

EN17037 The target daylight autonomy is 50% for 300lux (DA_{300,T}), 500lux (DA_{500,T}) and 750lux (DA_{750,T}). The minimum target daylight autonomy is 50% for 100lux (DA_{100,TM}). The standard is available for purchase from the National Standardization Body in your country.

Workplane



Average	DA ₃₀₀	66.74%
Median	DA ₃₀₀	66.16%
Minimum	DA ₃₀₀	33.61%
Maximum	DA ₃₀₀	80.33%
Uniformity 1	DA _{min} /DA _{avg}	0.5036
Uniformity 2	DA _{min} /DA _{max}	0.4181

EN17037

F _{plane,t} ≥ DA _{100,TM}	100%	Pass (≥95%)
F _{plane,t} ≥ DA _{300,T}	100%	Pass (≥50%)
F _{plane,t} ≥ DA _{500,T}	27%	Fail (<50%)
F _{plane,t} ≥ DA _{750,T}	0%	Fail (<50%)

Figure 4. Step 4: Evaluate result against EN17037

IMPORTANT: The quality of the rendering affects the precision of the daylight calculation in VELUX Daylight Visualizer – not just the quality of the rendered picture. We therefore recommend that calculations are performed with a high quality as the MicroShade® structure is complex.



Evaluating daylight conditions against EN17037 using DF

1. To generate a report for evaluating the daylight requirements against EN17037 using the daylight factor method, the model should contain workplanes. These workplanes should be made together with the geometry, and is defined as a workplane in VELUX Daylight Visualizer by checking off the box "Zone" when defining surface properties.

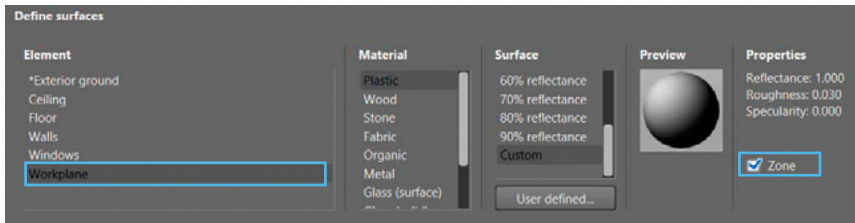


Figure 5. Step 1: Defining zone in VELUX Daylight Visualizer

2. Perform the rendering, make sure that the "Render type" is set to "Daylight factor", Specify the "Resolution". We recommend to use a high resolution, since the resolution not only affects the resolution of the image, but also the precision of the daylight calculation. Choose "Zones" under render before starting the calculation by clicking "Render".

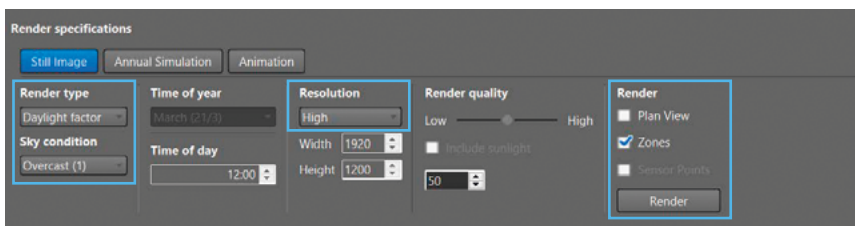


Figure 6. Step 2: The menu "Render specifications"

3. When the calculation has finished click "Save" on the right upper. Type the desired name, choose location for the report and click "Save".

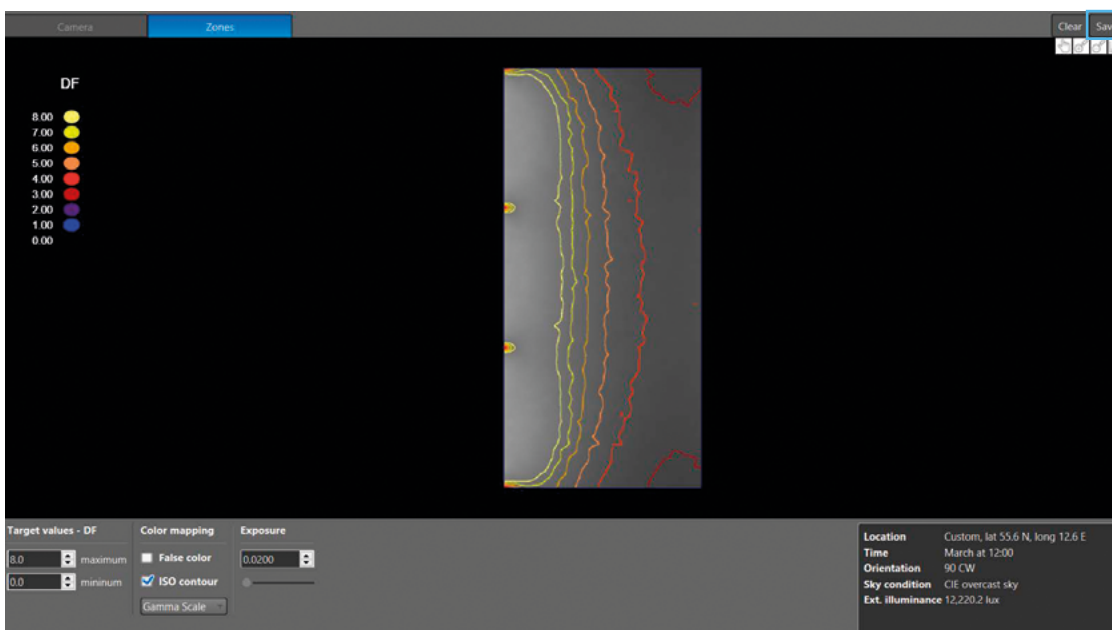


Figure 7. Step 3: Save report



- Open the report in a browser. Select the country and check off the box "EN17037" under Report Options. A text below the check box will appear, specifying the requirements of the selected country. Scroll down and check the results under "EN17037" below the rendering with contours.

Daylight Visualizer

Calculation on zones

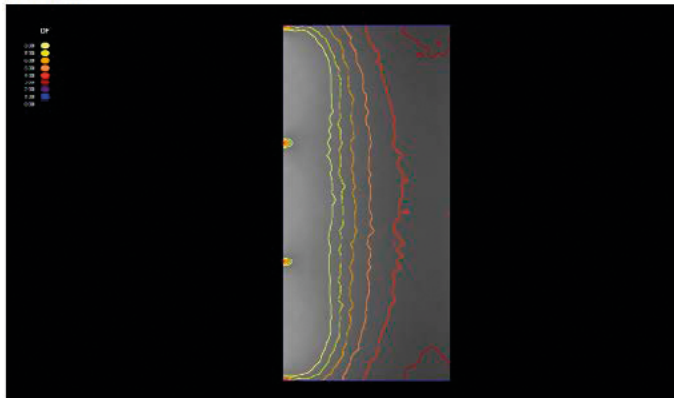
Project name: velux updated
 Simulation type: Daylight Factor
 Daylight Visualizer version: 3.1

Select Country
 Denmark

Select Report Options
 EN17037
 Fractional Hours
 Fractions of Work Planes
 Percentiles

EN17037 For Denmark the target daylight factors (D_T) are 2.1% (300 lux), 3.5% (500 lux) and 5.3% (750 lux). The minimum daylight factor target (D_{TM}) is 0.7% (100 lux). The standard is available for purchase from the National Standardization Body in your country.

Workplane



Average	D	6.23%
Median	D	4.81%
Minimum	D	1.98%
Maximum	D	14.77%
Uniformity 1	D_{min}/D_{avg}	0.3173
Uniformity 2	D_{min}/D_{max}	0.1338

EN17037			
Eplane, %	≥ 0.7% D_{TM}	100%	Pass (≥95%)
Eplane, %	≥ 2.1% D_T	100%	Pass (≥50%)
Eplane, %	≥ 3.5% D_T	84%	Pass (≥50%)
Eplane, %	≥ 5.3% D_T	45%	Fail (<50%)

Figure 8 Step 4: Evaluate result against EN17037



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