Guideline to daylight simulations with DIVA

This is a guideline to daylight simulations with MicroShade® in DIVA. DIVA is a daylighting analysis software that calculates the annual daylight availability in buildings based on the Radiance backwards raytracer and the DAYSIM daylighting analysis software. DIVA has been developed at the Graduate School of Design at Harvard University and is now distributed and developed by Solemma LLC. Please note, that DIVA is now replaced by ClimateStudio.

This guideline shows how to use MicroShade® in DIVA for simulation of daylight. For further questions regarding DIVA simulations, please contact Solemma LCC. For questions regarding MicroShade®, please contact us on support@microshade.com

Daylight metrics

DIVA calculates a series of climate-based daylight metrics including daylight autonomy (DA), useful daylight illuminance (UDI), spatial daylight autonomy (sDA) and annual sun exposure (ASE). Furthermore DIVA can calculate the daylight glare probability (DGP) for glare assessments. DIVA can also calculate the simpler daylight factor (DF). DIVA can be integrated with Grasshopper for parametric optimizations and includes an energy simulation component as well.

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.

Selection of glazing with MicroShade®

For façade applications[1] 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/for-building-professionals

Rotation of MicroShade®

A rotation of MicroShade® can be done to optimize the g-value. For vertical facades MicroShade® are never rotated, while MicroShade® in roof windows can be rotated depending on the orientation and tilt of roof. Rotation should be considered for orientations between northeast (45˚) and northwest (315˚) for roof windows at tilts between 25˚ and 70˚. The rotation angle is always 90˚. Please contact MicroShade A/S at support@microshade.com to confirm if rotation is beneficial.

[1] Facade application means glazing mounted in a near vertical position.

Usage

The MicroShade® model is a description of only the MicroShade® layer. In order to model MicroShade® in a window two polygons are needed; the outer polygon is the MicroShade® layer and the inner polygon is the glazing. The two polygons together model the MicroShade® window. The surface normal of the polygon representing MicroShade® should face the exterior, see Figure 1. In Rhino 6.0 this can be tested by selecting the relevant surface and using the command "dir". This will show the orientation of the surface. If the surface normal faces the interior, click on the surface to flip it.

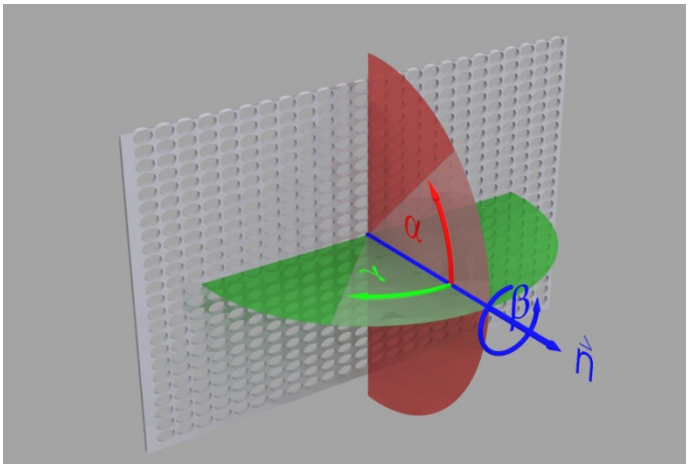

Figure 1. The surface normal should face the exterior.

The material description for the glazing is the same as without MicroShade®.

The material description for MicroShade® is enclosed in the following files:

- Microshade_f.cal which should be stored in **C:\DIVA\Radiance\lib**
- Microshade_mat.rad whose text has to be copied into the material.rad in **C:\DIVA\Daylight**

MicroShade_mat.rad file contains the following:

```
void glass microshade_air
0
0
4 1 1 1 1

void plastic microshade_metal
0
0
5 0.1 0.1 0.1 0.017 0.005

void mixfunc microshade_f_mat
4 microshade_air microshade_metal trans microshade_f.cal
0
1 0
```

→ Edit for rotation angle: 0˚ - no rotation, 90˚ - rotation counterclockwise.

A rotation of MicroShade® is normally done to optimize the g-value. For vertical facades MicroShade® is never rotated, while MicroShade® in roof windows can be rotated 90˚ depending on the orientation and tilt of roof. Rotation should be considered for orientations between northeast (45˚) and northwest (315˚) for all roof windows with inclinations between 25˚ and 75˚. Please contact MicroShade A/S at support@microshade.com in these cases.

Simulation parameters should minimum be set to "–ab 7 –ad 1500 –as 100 –ar 300 –aa 0.1", as MicroShade® can be compared to venetian blinds in complexity.

Simulations with DIVA

DIVA offers several kinds of daylight simulations; Useful Daylight Illuminance (UDI), Daylight Autonomy (DA), Continuous Daylight Autonomy (CDA), Annual Sun Exposure (ASE), Daylight Factor (DF) and Spatial Daylight Autonomy (sDA) according to LEED, which is based on occupied hours. In Europe it is recommended to use the spatial daylight autonomy based on daylit hours as described in EN 17037, which means further data processing is required.
The UDI, DA, CDA, sDA and ASE are calculated with the chosen weather data file, while the daylight factor (DF) is calculated with a CIE standard overcast sky as default.

The daylight factor is a very simple daylight assessment method and it is therefore recommended also to use the daylight autonomy and/or useful daylight illuminance as a supplement to the daylight factor assessment.
If you have any questions regarding daylight simulation with MicroShade® you are welcome to contact MicroShade A/S. If you are a first time user of DIVA please see our tutorial on daylight simulations in DIVA on our website www.microshade.com under downloads.