MicroShade®

An industry perspective on daylight calculations

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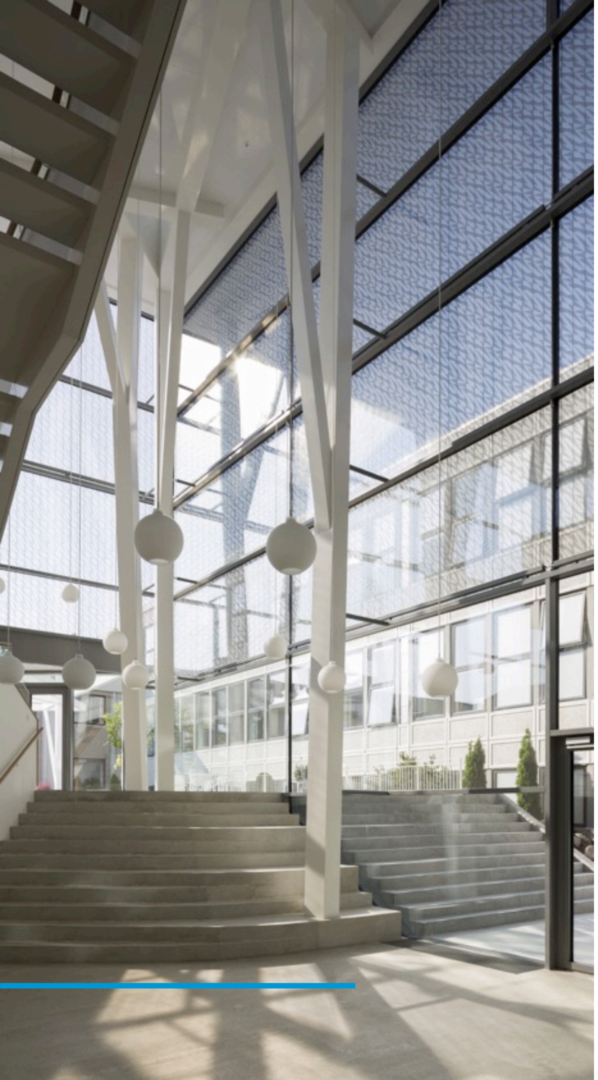
Technical Support Manager



MicroShade A/S
Introduction

Spin-off from Danish Technology Institute in 2003

- Venture company since 2008
- Commercial for 10 years

Business overview

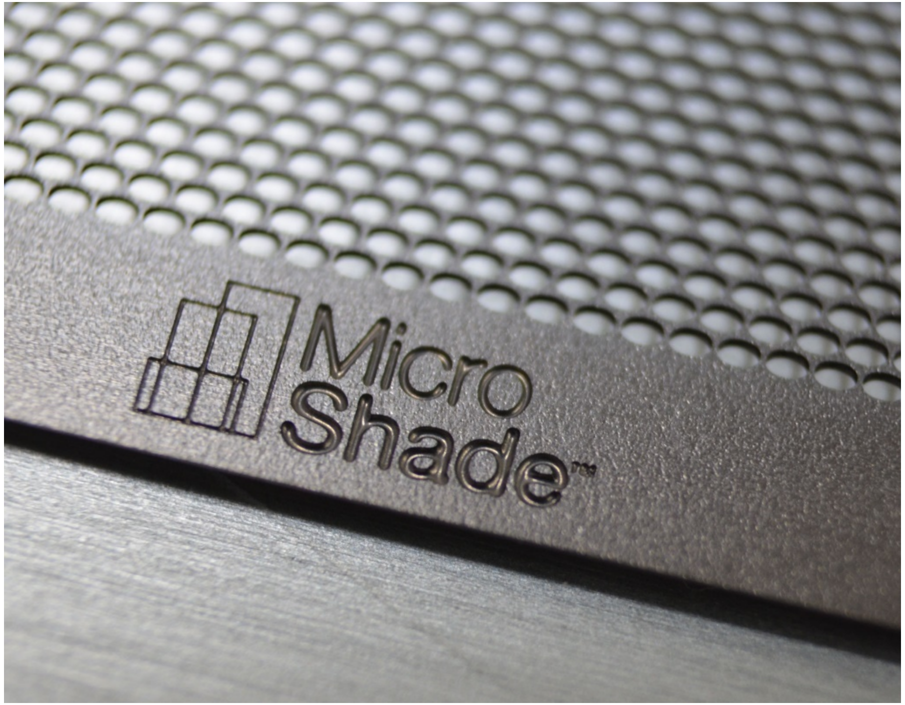
- Work with the major glass manufactures
- >100 Projects in Europa, start-up in middle east and Australia
- Projects with known architects

Partners

Pilkington, Saint-Gobain, Viridian, Arnold Glas, Niels Juel Pedersen A/S, Ventana, idealcombi, hansen facadeentreprenøren, Snoer, Karl E, VELFAC

What is MicroShade®

- A high-end solar shading product
- Consisting of a thin (0,175 mm) steel membrane with microlamellas
- Build into the glazing – complex fenestration system (CFS)



How does it work?

Progressive g-value

g-value, summer = 0.10

g-value, winter = 0.35

Stabil and smooth daylight

LT_0 0.50

$sDA_{300,50}$ more than 50%

Excellent colour rendering, Ra > 96%

Free view out

Always transparent

Removal of direct sunlight

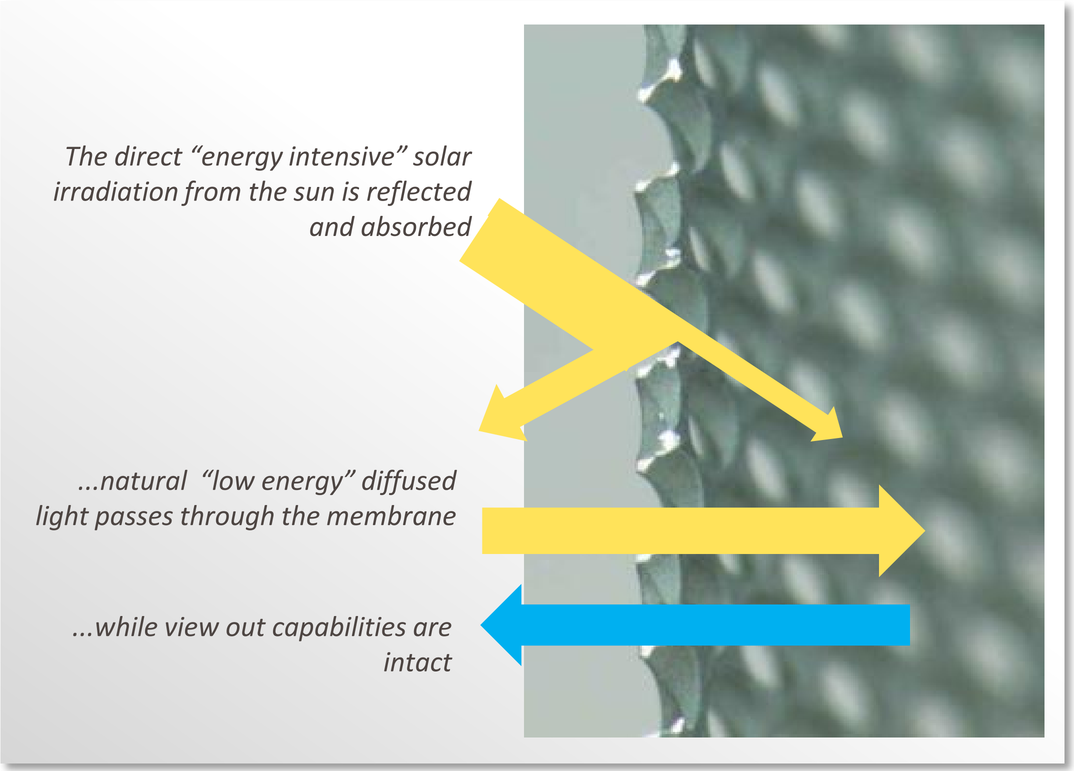
Partial shadow

Passive technology

No user interaction

Predictable and efficient

No maintenance

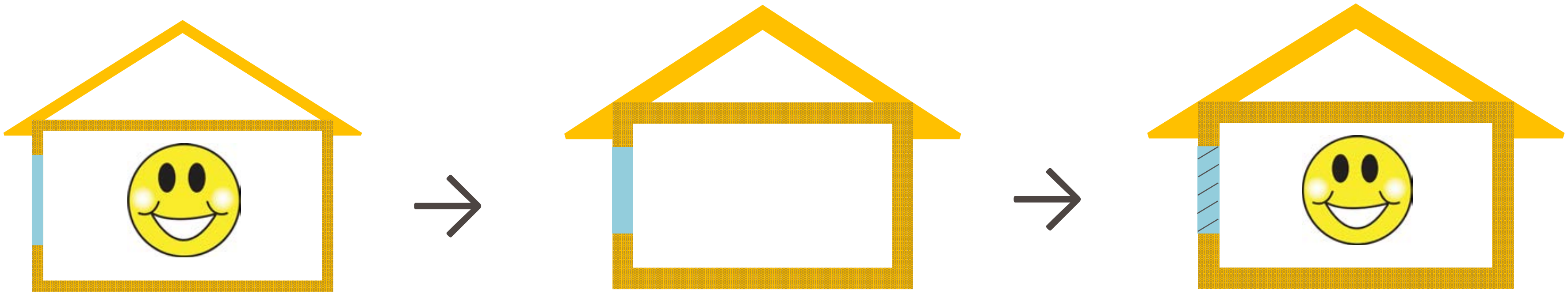


Consequences of the EU EPBD Directive

Typical existing buildings (EU)

Typical buildings in existing building codes 2018 (EU)

Future buildings (EU) ZEB



Typical existing buildings (EU)

- Low level of insulation
- Single or 2-layer glazings
- High air leakage

Typical buildings in existing building codes 2018 (EU)

- High level of insulation
- Low-e glazings (2- or 3-layer)
- Low air leakage
- Solar irradiation needs to be minimized in summer
- Some solar irradiation can be accepted in winter

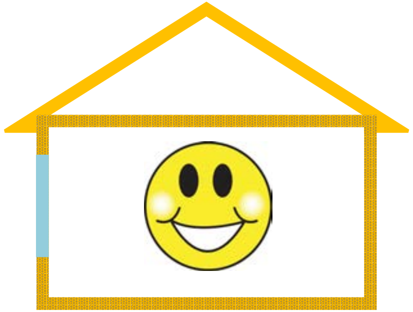
Future buildings (EU) ZEB

- Highly insulated windows
- Increased demand for progressive, movable or switchable solar shadings
- Optimized designs and orientations
- Daylighting

Source: OECD/IEA 2013 Technology Road Map – energy efficient building envelope

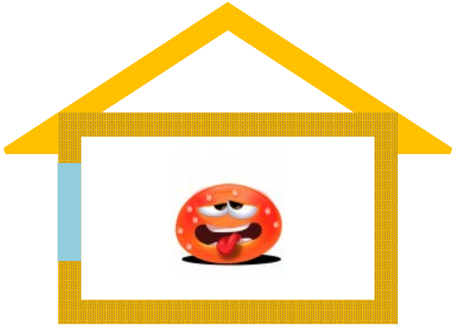
Calculations by the advisors

Typical existing buildings (EU)



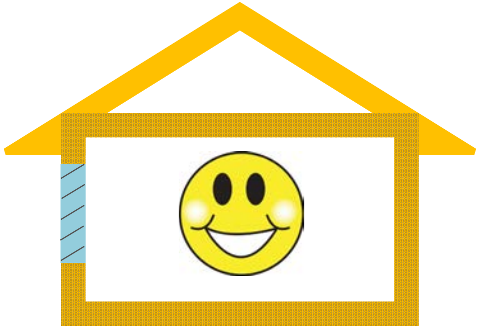
- Stationary heat transfer calculations
- No or simple daylight calculations

Typical buildings in existing building codes 2018 (EU)

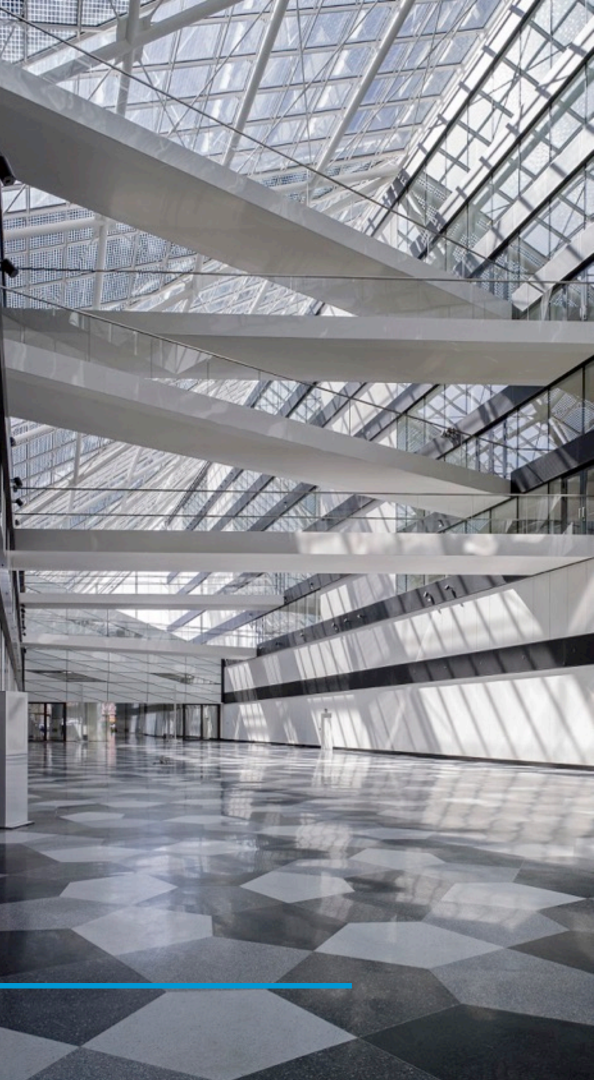


- Dynamic/climate based energy and indoor climate calculations
- Simple daylight calculations
  - DF
  - WFR

Future buildings (EU) ZEB



- Dynamic/climate based energy and indoor climate calculations
- Climate based daylight calculations
- **Coupled indoor climate and daylight calculations based on the same assumptions**



Daylight

Legislation & standards

- Demand in the market for CBDM is driven by
  - legislation
  - standards
  - building certification schemes (only high-end)
  - time

- Climate based metrics are moving into legislation and standards, e.g.
  - LEED (sDA)
  - BREEAM (sDA)
  - New EN 17037 Daylight standard (sDA)
  - Danish building regulation (BR18) as already adopted EN17037 - before it was voted through

Challenges

Climate Based Daylight Modelling (CBDM)

MicroShade®

- Simulation software for advisors
  - Requires expert skills
  - Radiance parameters are difficult to choose
  - Shading devices are difficult to model
  - Long simulation time

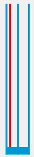
- Need for **easy to use** and **fast** simulation software

Example

Comparison of facade systems

Static shading solutions

Low energy glazing (LowE)

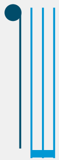


CoolLite Xtreme 60/28 (CLX)
Saint Gobain

MicroShade® MS-A (MS-A)
MicroShade A/S

Dynamic shading solutions

External lamellas generic
Tilt of lamellas 30°

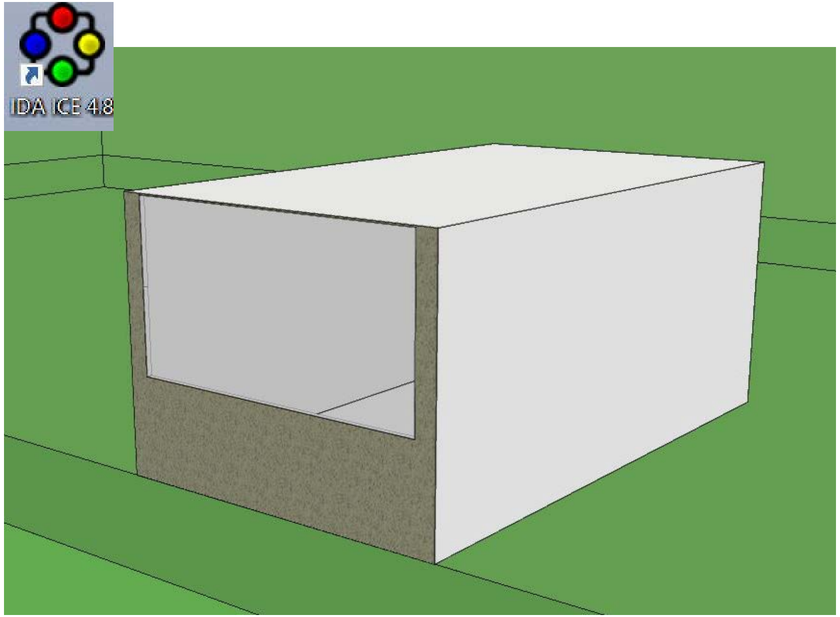


External roller blind generic
Transmittance 0,15

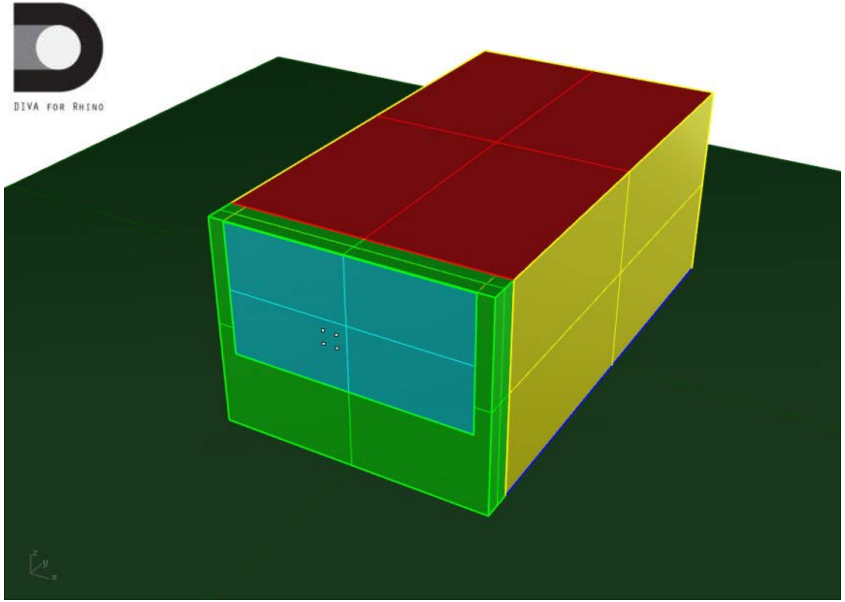
Integrated blinds generic
Tilt of lamellas 30°

Example
Choise of software(s)

Indoor climate simulations in IDA ICE



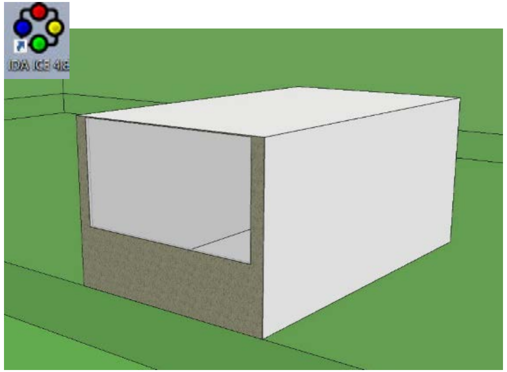
Daylight simulations in DIVA for Rhino

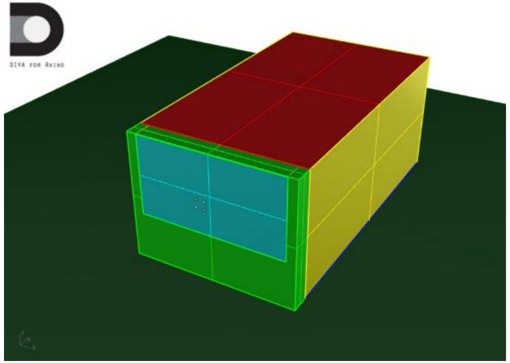


Example

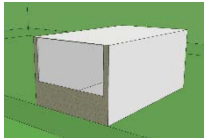
Experiences

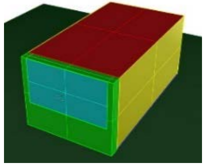
- Model export was difficult, didn't succeed → time consuming
- Building two models were faster (simple model)
- Window and shading description was very different in the two softwares
  - IDA ICE – spectral glazing data, generic shadings in library
  - DIVA – transmissivity of the glazing, shadings needed to be modelled physically
- Shading control is done differently in the two software
  - IDA ICE – W/m^2 irradiation on the facade
  - DIVA – lux level inside the room





Example
Data handling





IDA ICE control was used on DIVA raw-data

Thermal Indoor Climate
Hours above 26°C

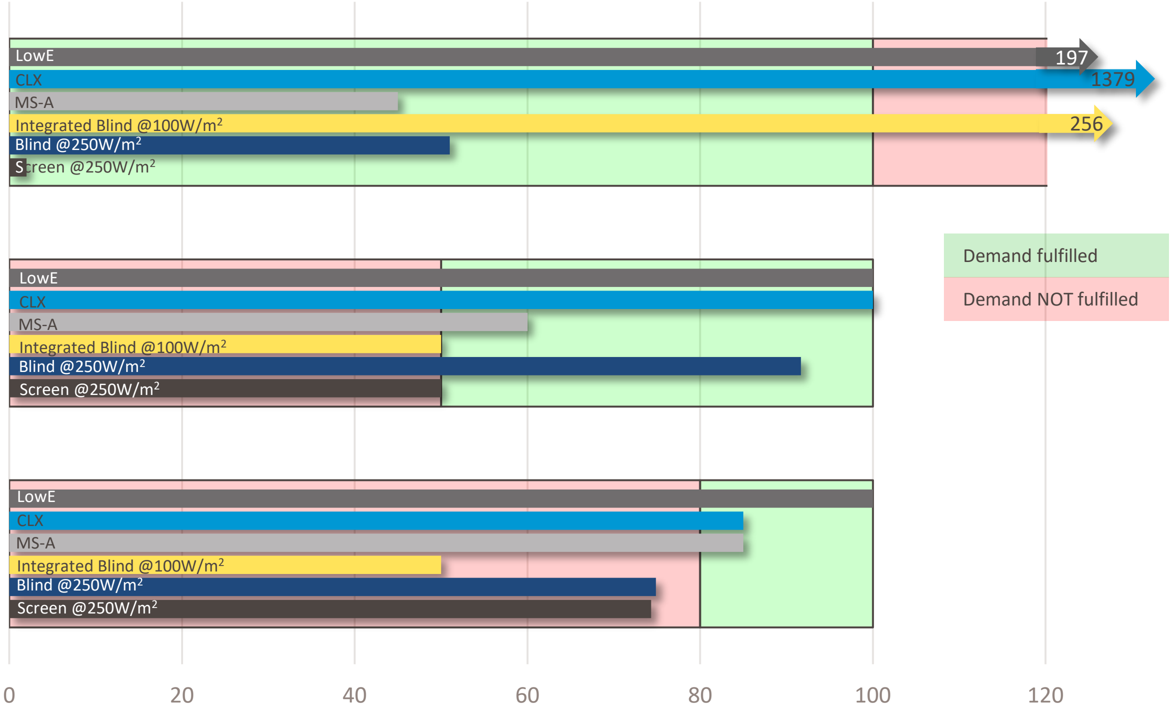
Demand acc. to EN15251
Max. 100 hours >26°C

Daylight
Percentage of area with min. 300 lux in 50% of daylight hours

Demand acc. To EN17037
Min. 50% $sDA_{300,50}$

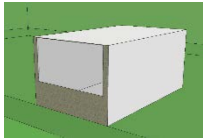
Weighted View Out
Percentage of workhours with a view out (weighted acc. to EN14501)

Danish guidance:
Min. 80% weighted view out



Example

Control strategies for dynamic shadings



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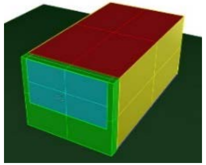

DIVA control was used

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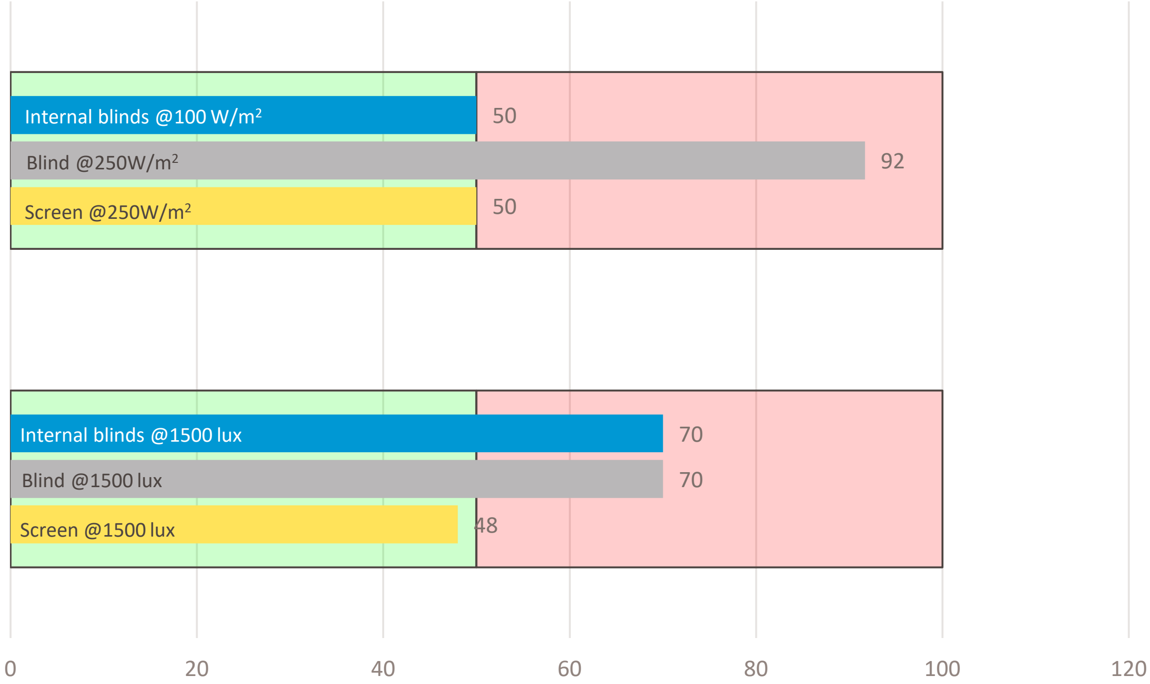


Challenges

Combined indoor climate and CBDM

- Very few simulation software are able to do **both** indoor climate and CBDM
  - Model exports are often difficult and time consuming
  - Building two models take twice the time
  - Window and shading description is not shared between software
  - Shading control is not shared between software
  - Weatherdata requires specific format for each software
  - Often two separate advisors are doing indoor climate and daylight/CBDB and assumptions get lost

- Need for simulation software that can do;
  - both indoor climate and daylight/CBDM
  - using the same window and shading description
  - using the same shading control

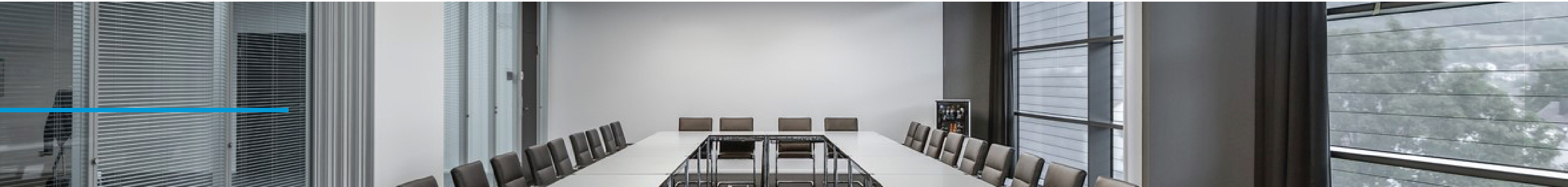
Conclusions

Designers

- Solar shading **must** be taken into account when evaluating daylight in future low energy buildings

- The **same control of shading** must be used in both indoor climate and daylight simulations

- Evaluate the view out with the planned solution



Conclusion

Software developers

We need your help to make CBDM

easy to use

faster

combinable with indoor climate simulations