Tatale Campus
Building for Sustainable Construction

Daylight and Shading

MiH, SR, IT
21.12.2021

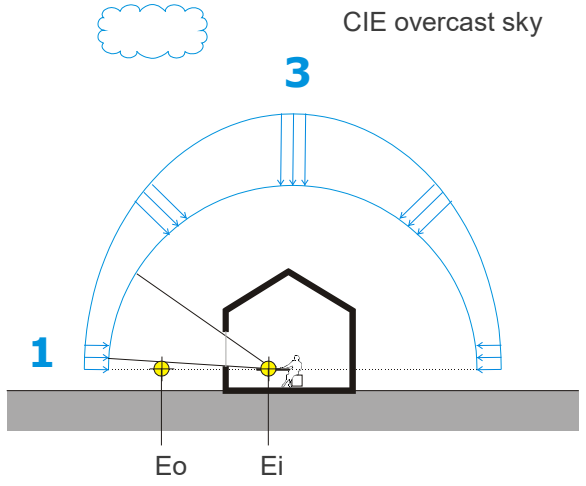
Daylight factor

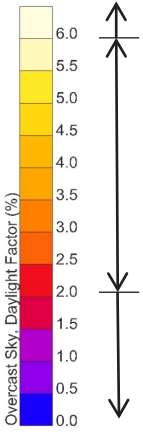
Daylight factor is a metric used to quantify the amount of diffuse daylight (under overcast sky) that comes into a space. It is the ratio of internal light level compared to external light level . It is defined as follows:
DF = (Ei / Eo) x 100% where,

Ei = illuminance due to daylight at a point on the indoors working plane,
Eo = simultaneous outdoor illuminance on a horizontal plane from an unobstructed hemisphere or overcast sky (CIE sky)

It does not say anything about building orientation or direct radiation, it indicates where the natural illumination will be sufficient and where always artificial lighting will be needed.

Sky luminance distribution models have been recommended by the International Commission on Illumination (CIE) for the design of daylighting schemes.

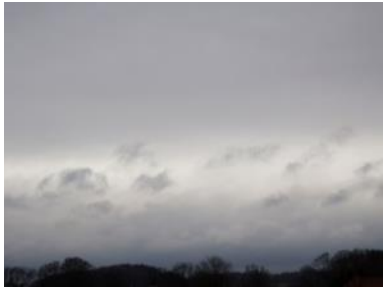




Greater than 6%
Bright appearance, risk of overheating and glare

Between 2%-6%
Good illumination, little to no artificial lighting required during the daytime
Good balance between daylight and thermal aspects

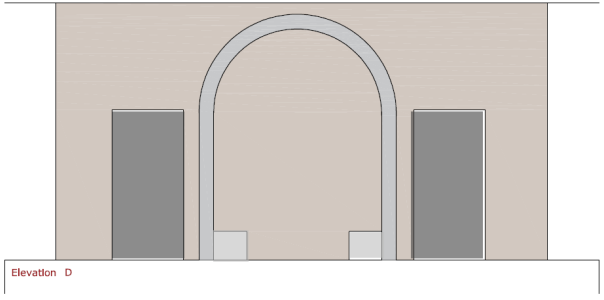
Less than 2%
Dark appearance, electrical lighting needed most of the day

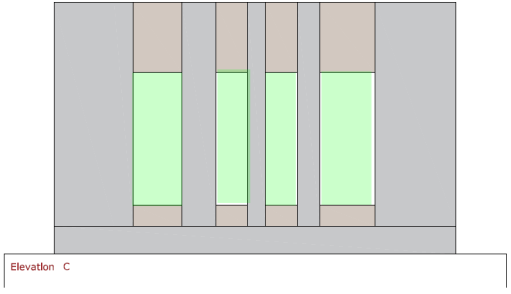


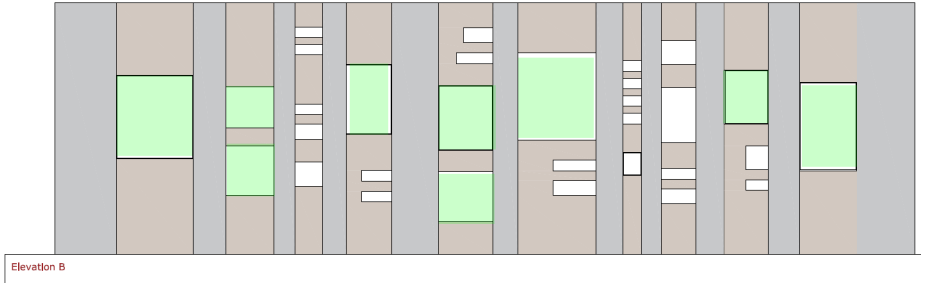
Overcast sky

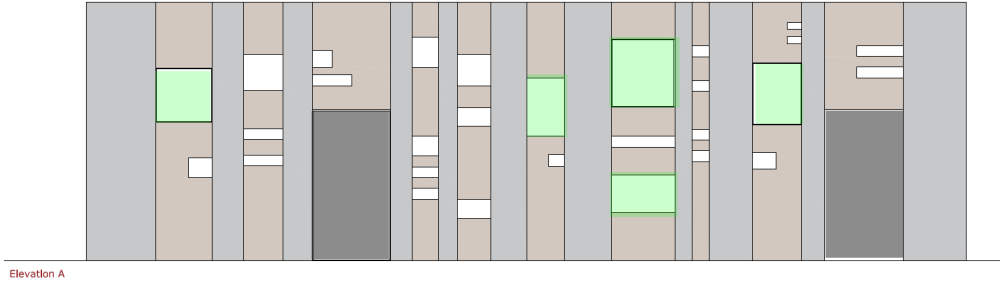
Boundary conditions

Openings









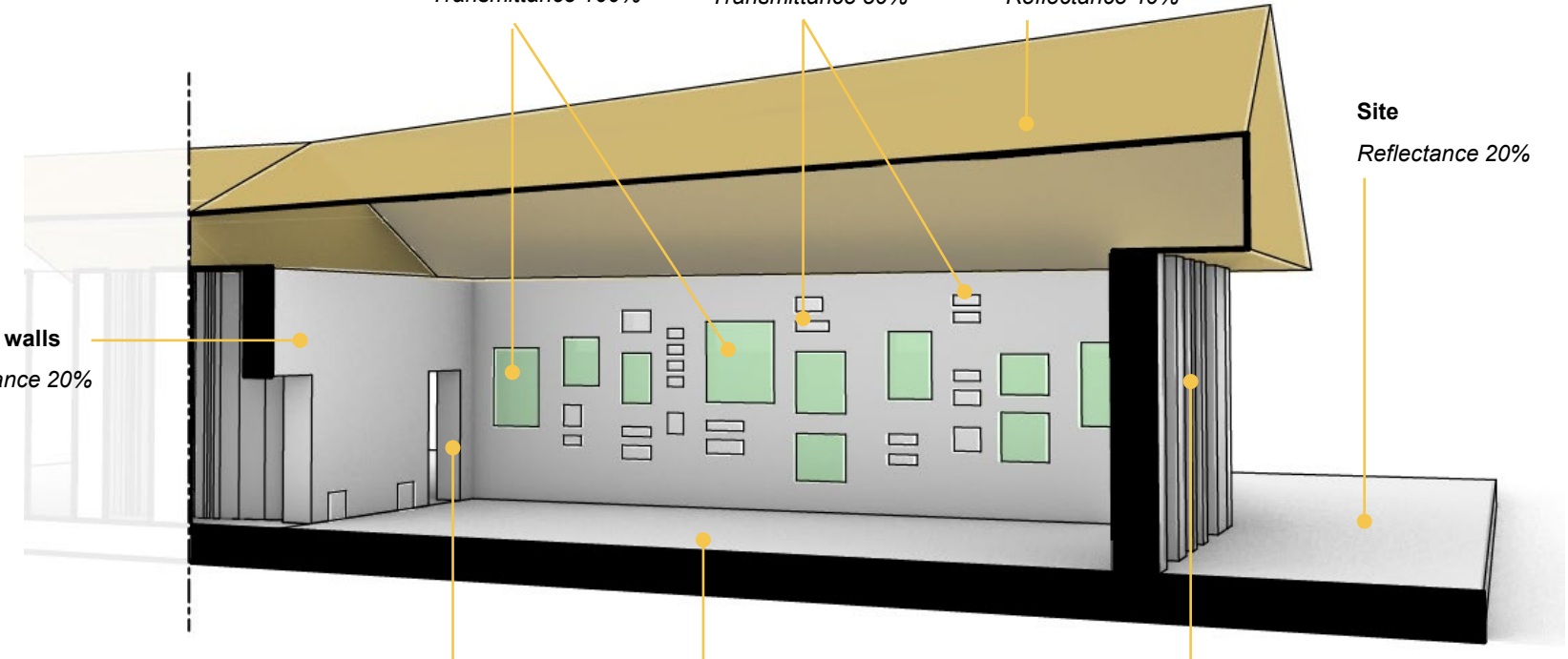
Door, 0% or 100% Tvis

Big opening, 100% light transmission

Small opening, 50% light transmission (mosquito net)

Daylight Simulation

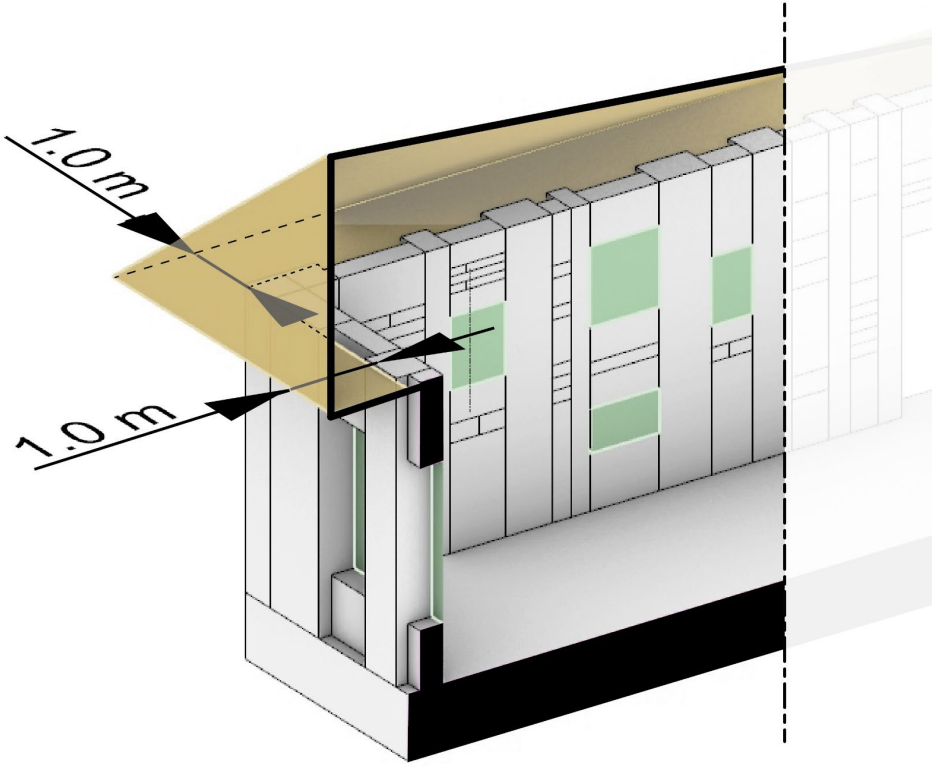
Boundary Conditions for the Daylight Simulation



Daylight Simulation

Roof overhang dimensions

* For the analysis, a roof overhang with 1.0 m depth was considered, in all sides of the classroom



Classroom: Daylight Factor

Doors closed, no context

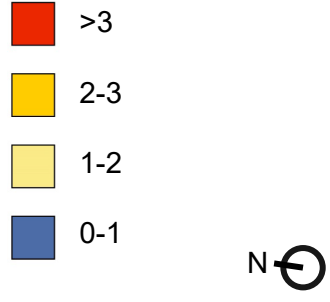
For Tatale, good daylight quality would be > 1%.

Daylight Factor > 1% for 79% of the room

Classroom

*total area of the room: 69.4m²

DF	Area m²	Area %
< 0 to 1%	14.4	21%
< 1 to 2%	163	33%
< 2 to 3%	15.5	22%
> 3	16.5	24%



Classroom: Daylight Factor

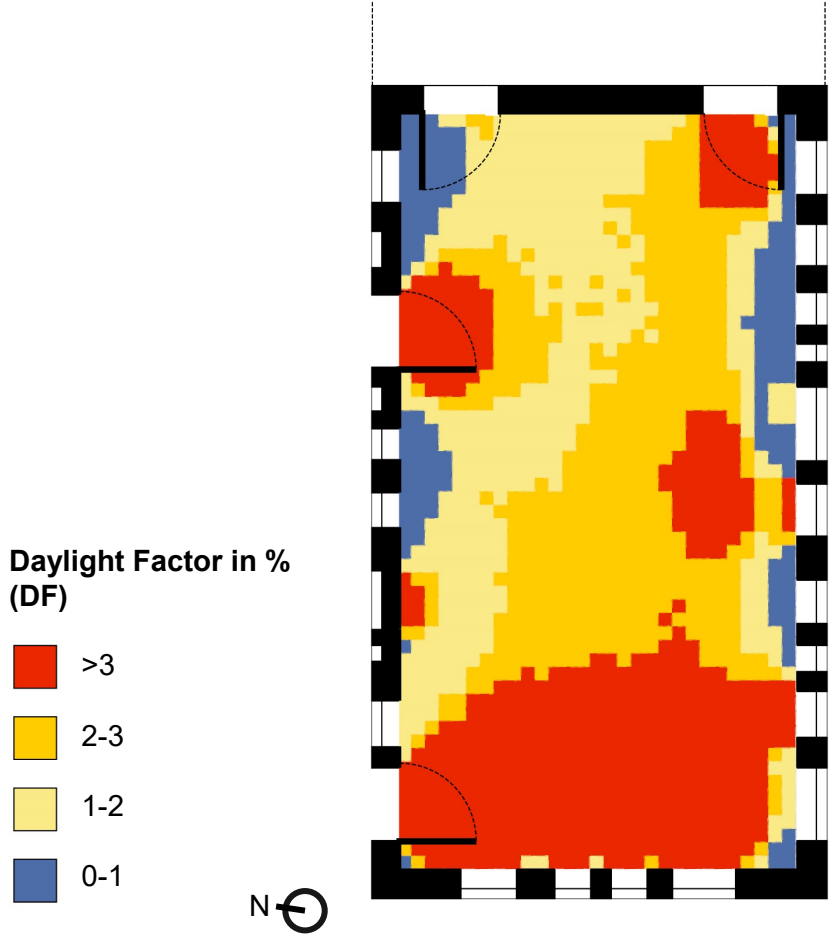
Doors open, no context

Good daylight quality

Daylight Factor > 1% for 91% of the room

***total area of the room: 69.4m²**

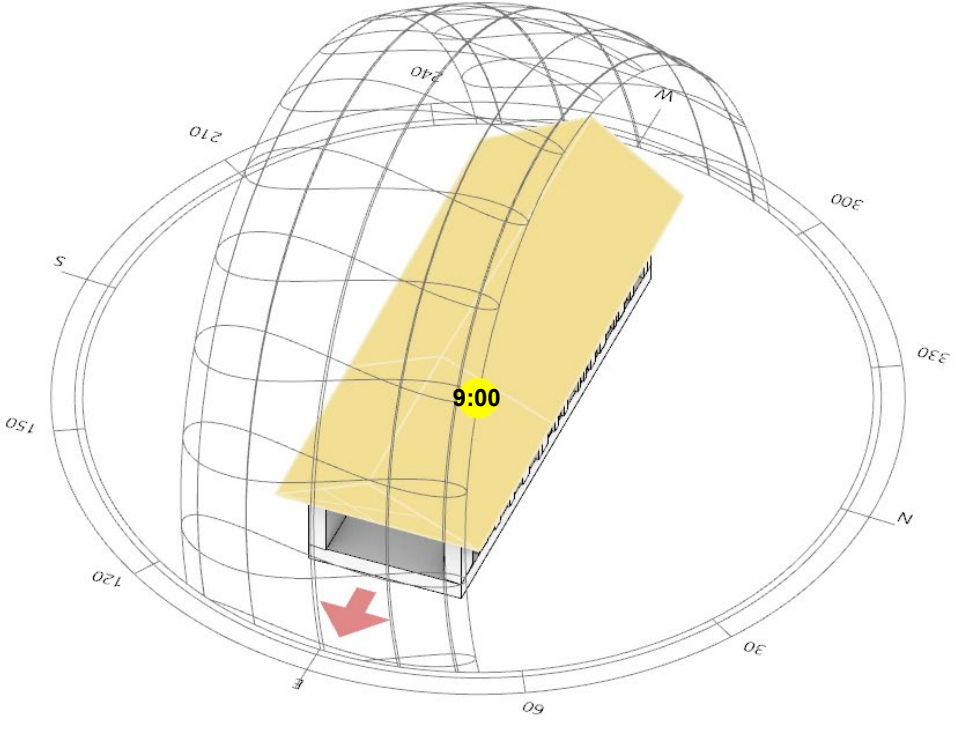
DF	Area m²	Area %
< 0 to 1%	6.5	9%
< 1 to 2%	18	26%
< 2 to 3%	21.5	31%
> 3	23.4	34%

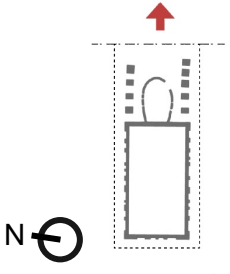


Classroom: View from the Sun

June 21st / Summer solstice

***study hour: 9:00h**

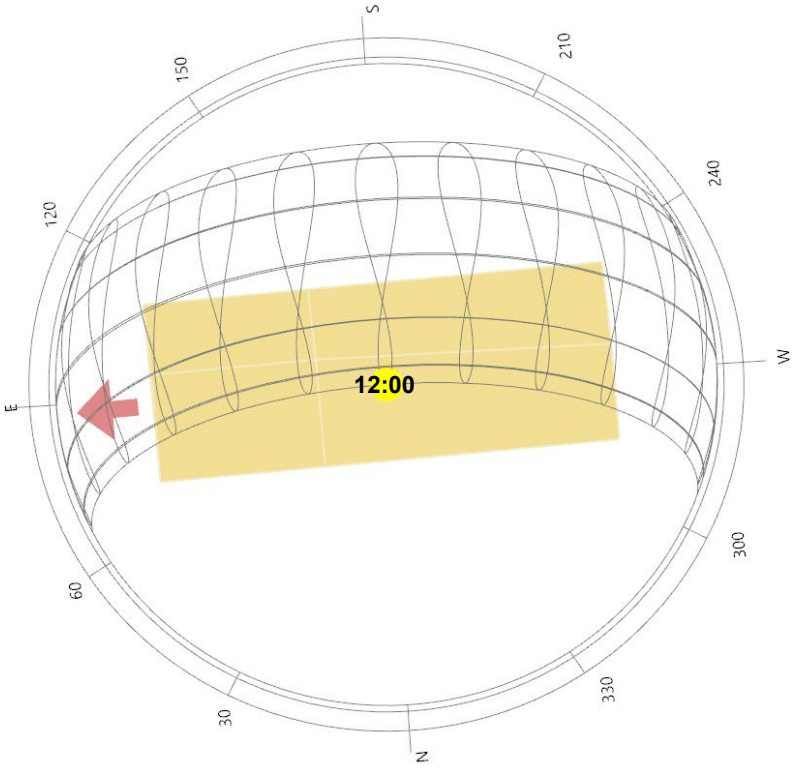


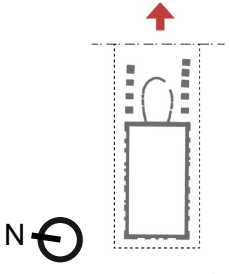


Classroom: View from the Sun

June 21st / Summer solstice

***study hour: 12:00h**

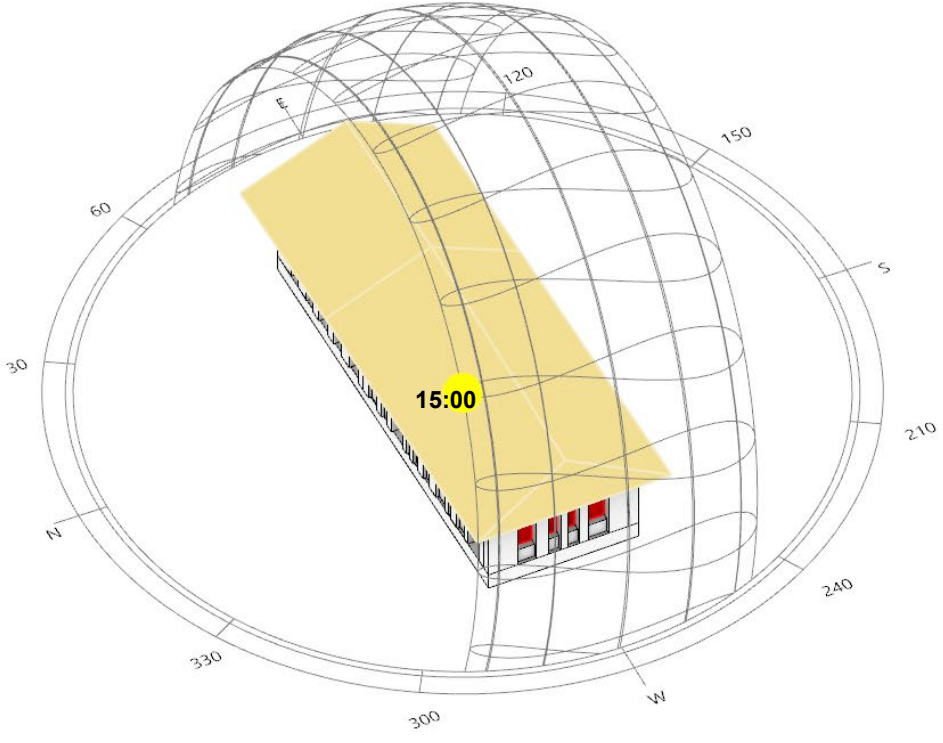


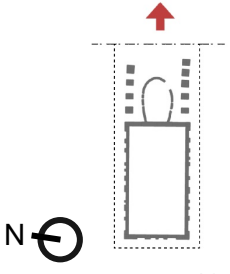


Classroom: View from the Sun

June 21st / Summer solstice

***study hour: 15:00h**

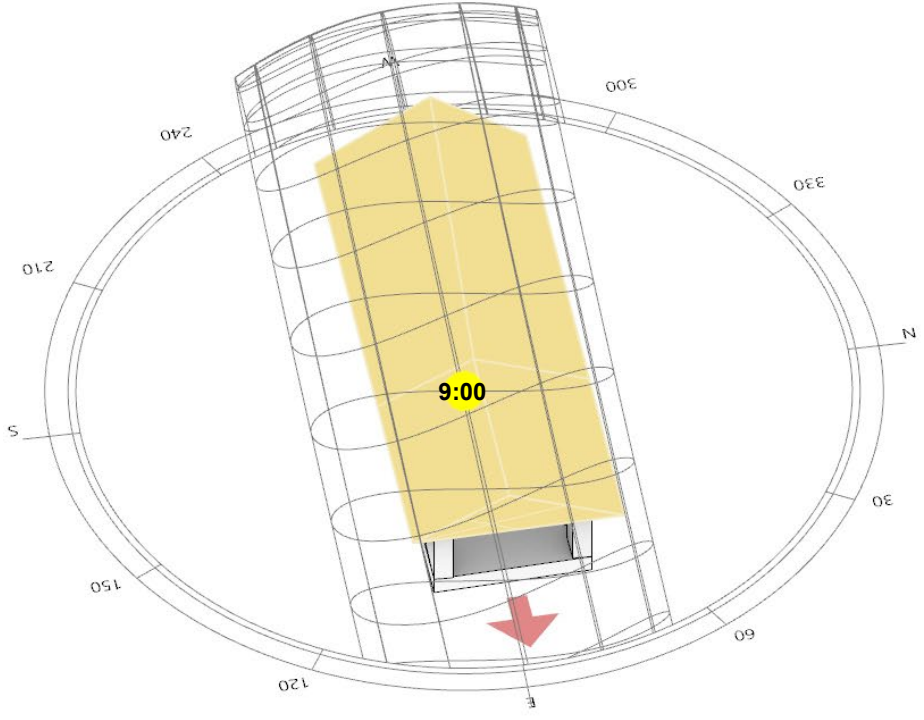


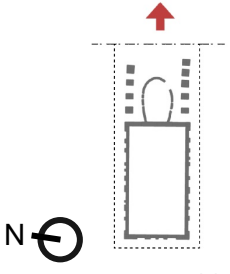


Classroom: View from the Sun

September 21st / Autumn Equinox

***study hour: 9:00h**





Classroom: View from the Sun

September 21st / Autumn Equinox

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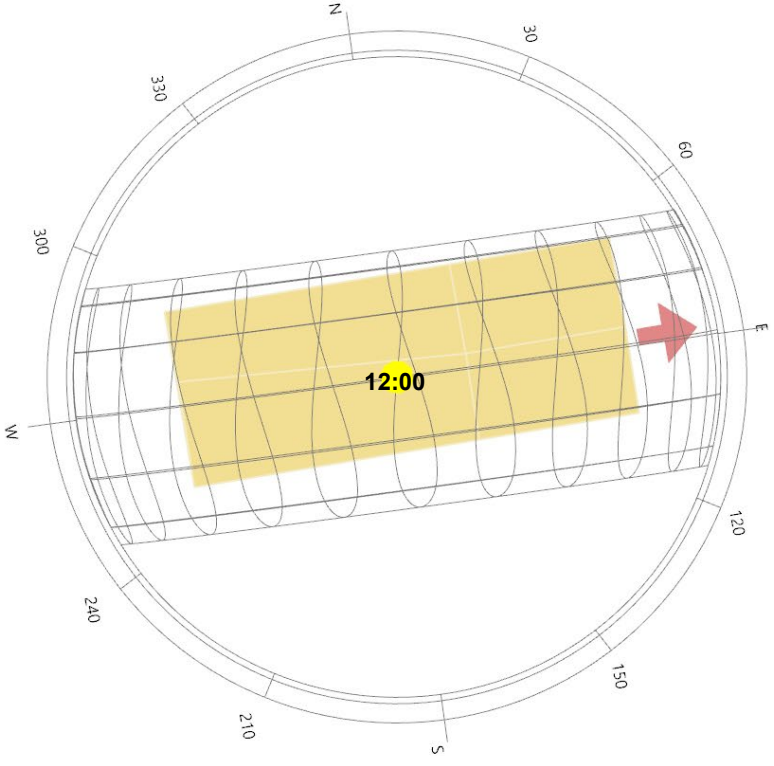

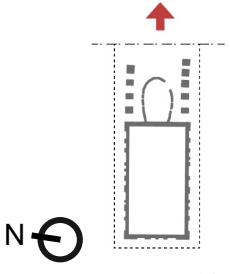

Classroom: View from the Sun

September 21st / Autumn Equinox

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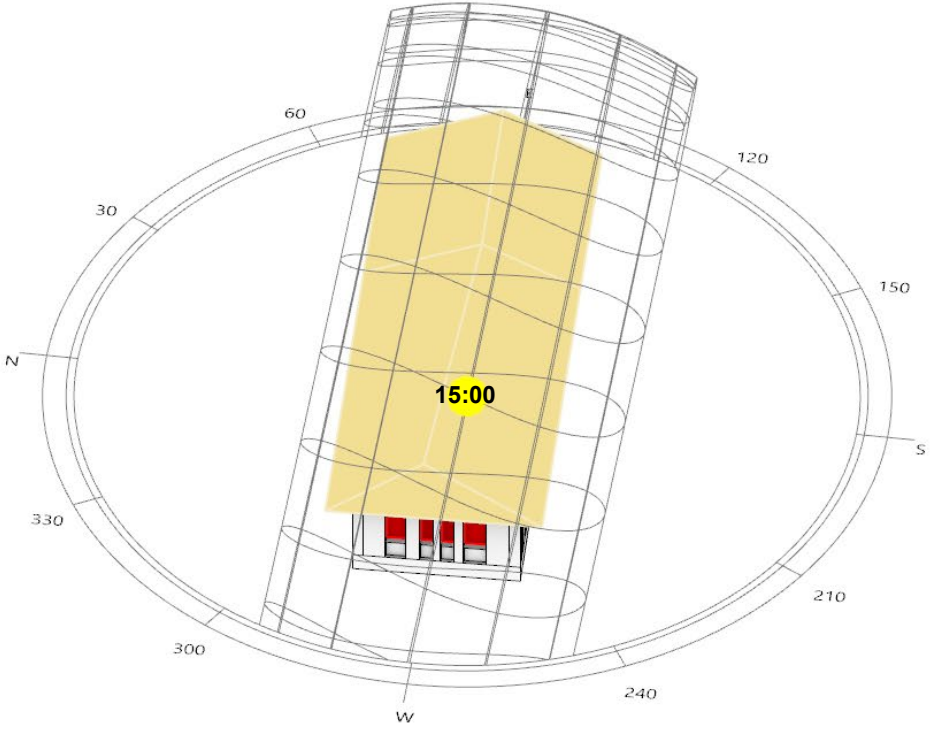
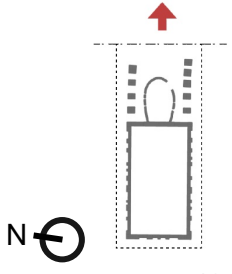
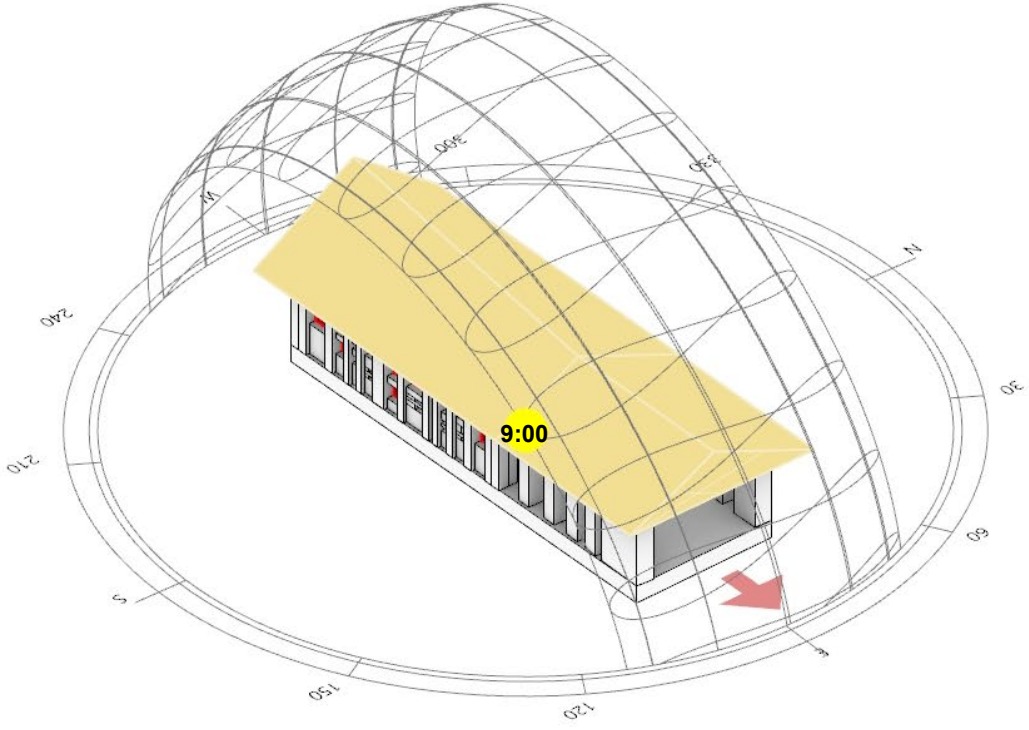


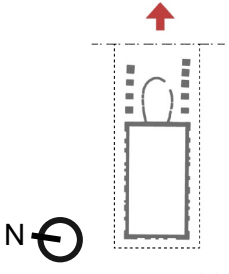


Classroom: View from the Sun

December 21st / Winter Solstice

***study hour: 9:00h**

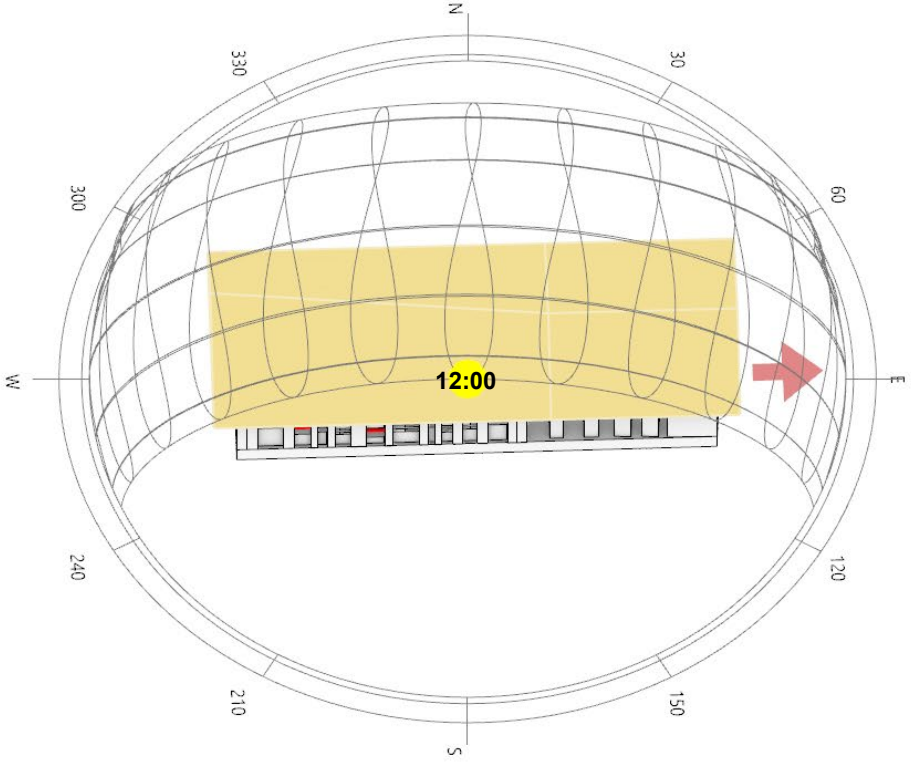


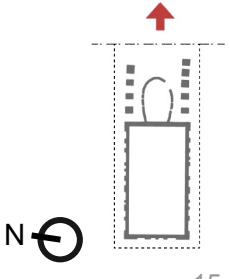


Classroom: View from the Sun

December 21st / Winter Solstice

***study hour: 12:00h**





Classroom: View from the Sun

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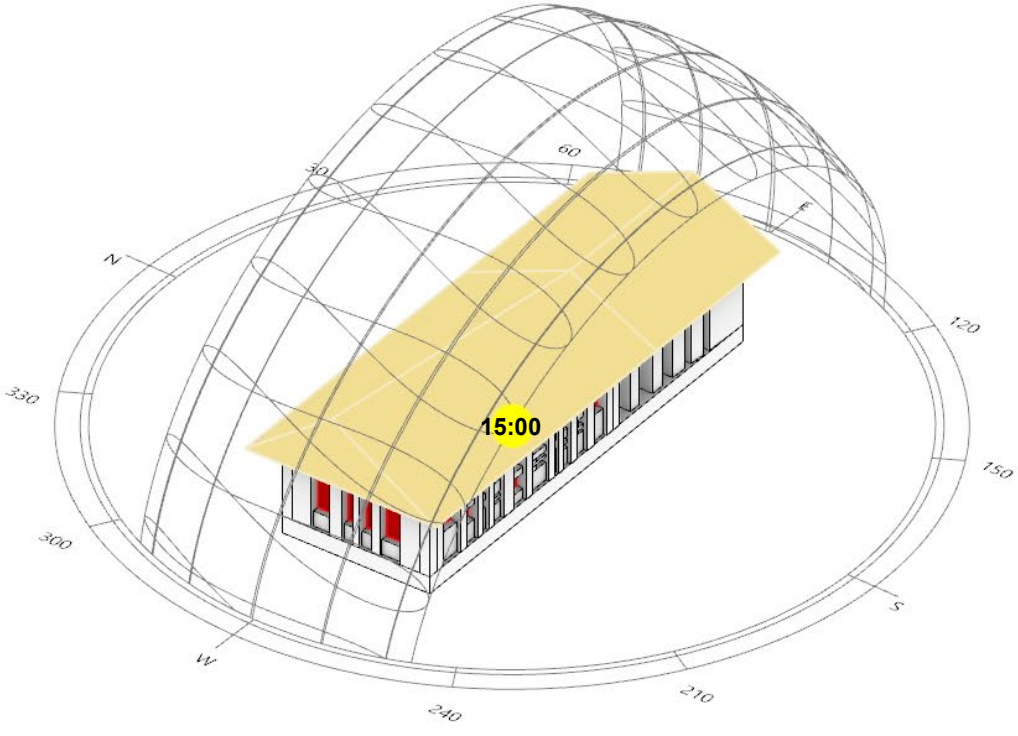
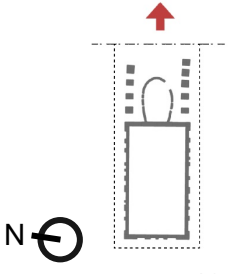




Classroom: View from the Sun

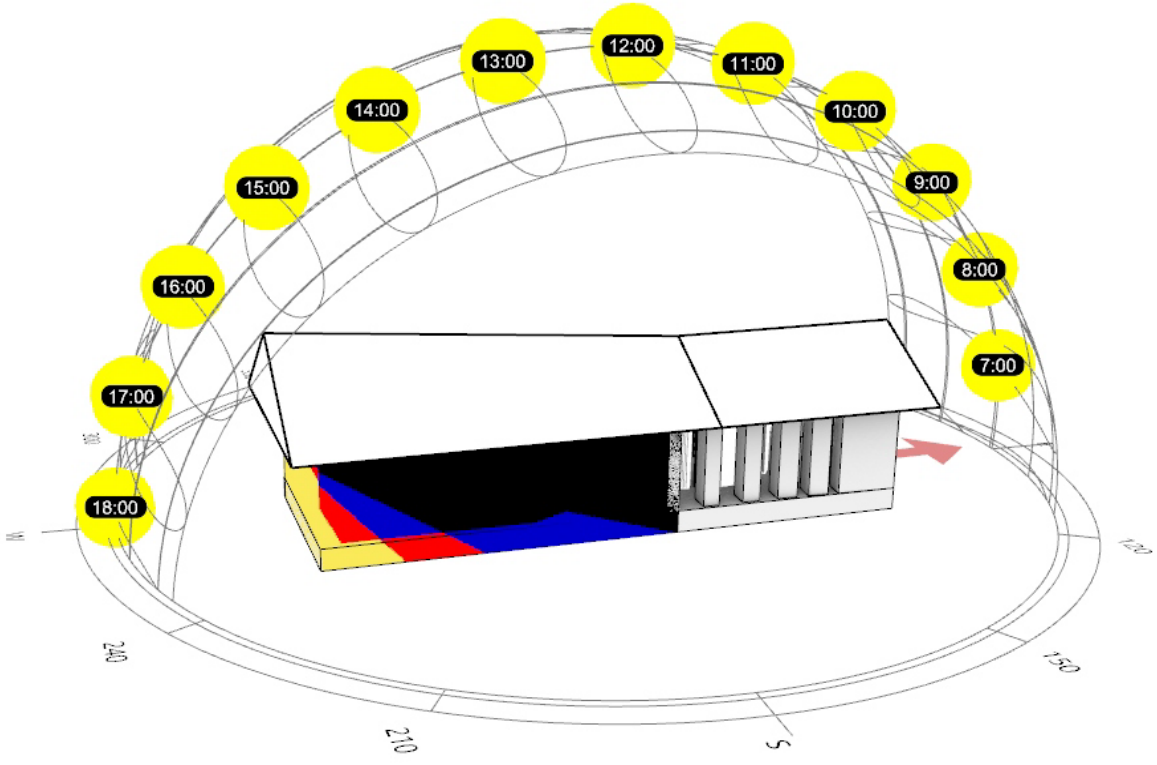
Resumee

- The north façade is well shaded
- The east façade is shaded by the attached construction
- The south façade is well shaded in June and March/September, but receives direct sun in December
- The west façade often gets direct sun, additional shading by trees would be helpful

Classroom: Sunlight Hours

September 21st / Autumn Equinox

Sunlight hours	
> 4h	*very high*
>3h - 4h	*high*
>1.5h - 3h	*medium*
< 1.5h	*low*

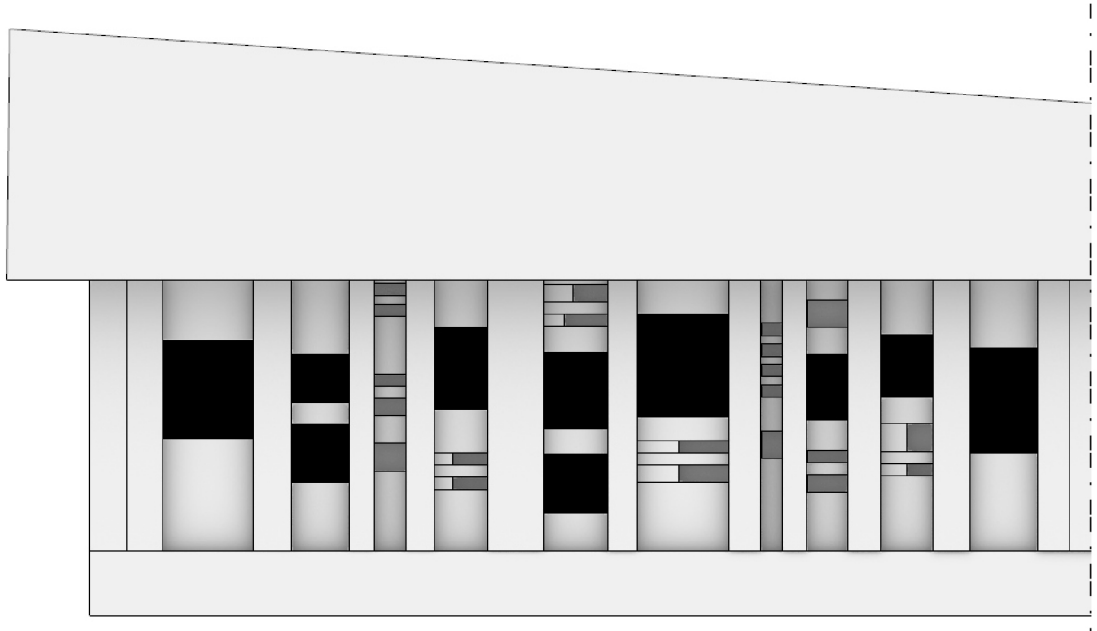


Classroom: Sunlight Hours

September 21st / Autumn Equinox

Sunlight hours

> 4h	*very high*
>3h - 4h	*high*
>1.5h - 3h	*medium*
< 1.5h	*low*



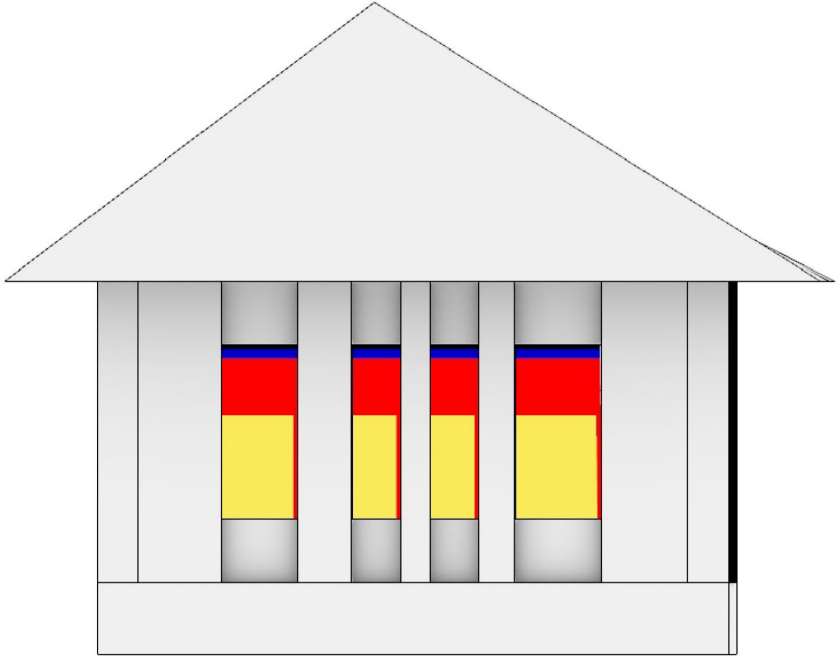
South

Classroom: Sunlight Hours

September 21st / Autumn Equinox

Sunlight hours

> 4h	*very high*
>3h - 4h	*high*
>1.5h - 3h	*medium*
< 1.5h	*low*



West

Classroom: Sunlight Hours

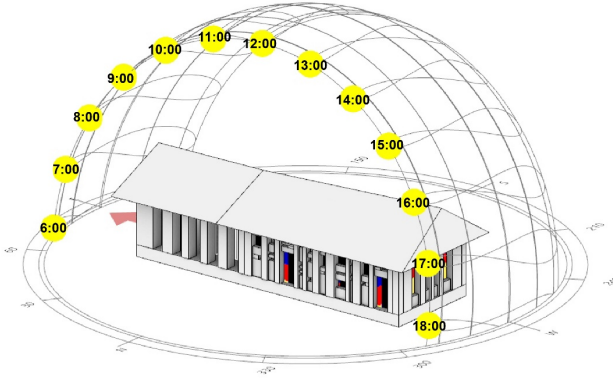
September 21st / Autumn Equinox

Sunlight hours		
	> 4h	*very high*
	>3h - 4h	*high*
	>1.5h - 3h	*medium*
	< 1.5h	*low*

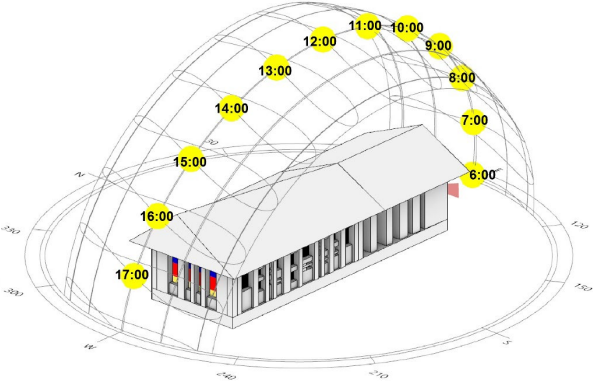
Classroom: Sunlight Hours

For all design days

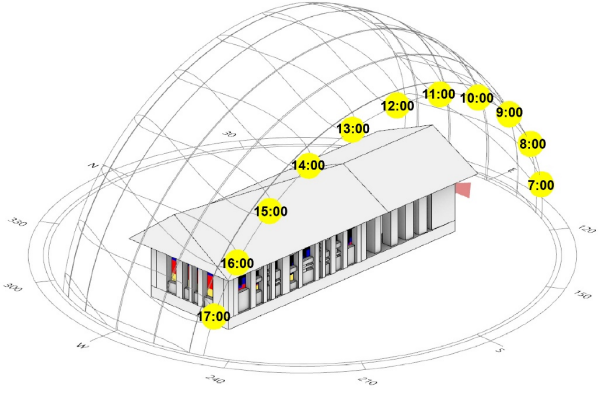
Sunlight hours		
> 4h	*very high*
>3h - 4h	*high*
>1.5h - 3h	*medium*
< 1.5h	*low*



21st June



21st Sept



21st Dec

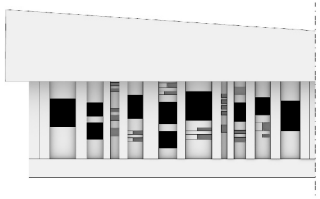
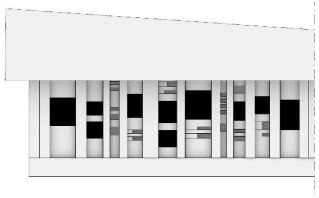
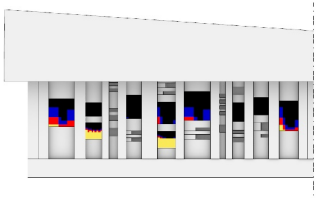
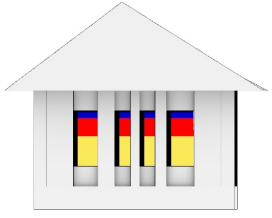
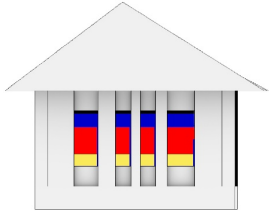
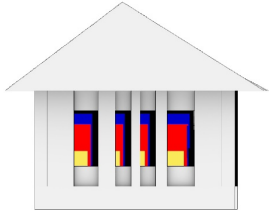
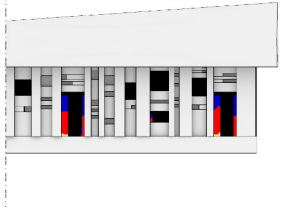
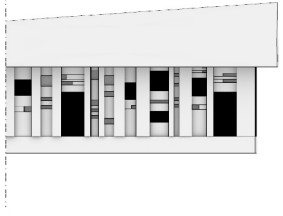
Classroom: Sunlight Hours

For all design days

Sunlight hours

> 4h	*very high*
>3h - 4h	*high*
>1.5h - 3h	*medium*
< 1.5h	*low*

TRANS SOLAR

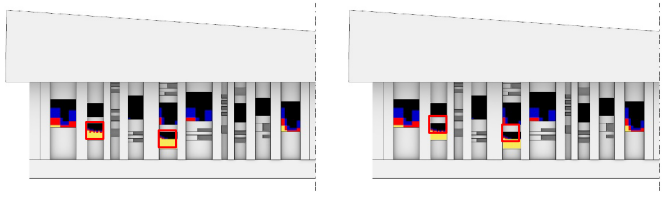
	21st June	21st Sept	21st Dec
South			
West			
North			

Classroom: Sunlight Hours

Resumee

- West façade needs additional shading (for example trees planted in front)
- Lower windows at south façade

  should move upwards



  or transmission should be reduced (for example adding mosquito net)