

# Shape and configuration





## What is the purpose of architecture?

The Roman architect Vitruvius answered this question with "firmitas – utilitas – venustas", which can be translated into strength, utility and beauty.

The building envelope serves to protect people from cold, wind, and rain (firmitas), to give people a comfortable and healthy indoor environment (utilitas), and to enrich people's sensual perception (venustas). Furthermore, the building envelope interacts closely with the light and energy of the sun, and with people living in the house, an aspect that has become increasingly important in modern societies as we spend up to 90% of our lives inside buildings.

---

Shape and configuration



# Shape and apertures

As the building scheme is being created, daylighting design influences and is influenced by basic decisions about the building's shape, proportions and its apertures. The geometry of a building influences its capacity to deliver adequate levels of daylight to the interior.



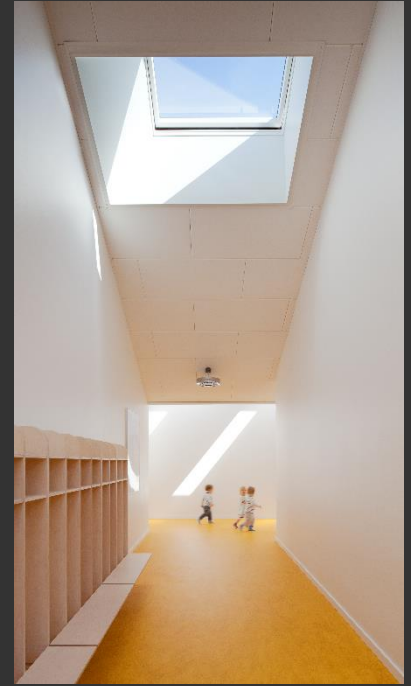
VELUX Sunlighthouse, HEIN-TROY architects  
Picture: Adam Mork



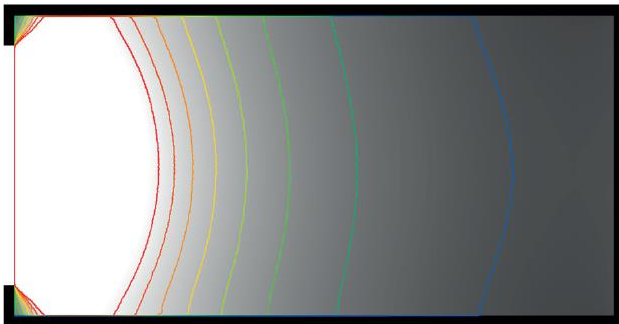
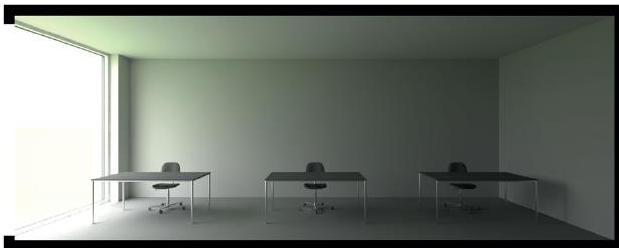
Shape and configuration



Solhuset - Lions Active House, Dk  
Picture: Adam Mork



Shape and configuration



## Deep buildings

The geometry of a building influences its capacity to deliver adequate levels of daylight to the interior. When the building is deep, daylighting solely by facade windows has its limitations. No matter how much glass there is in the facade, it will only be possible to achieve an adequate daylight distribution ( $DF > 2\%$ ) a few meters from the façade as shown on the example on this page.

Measures like light shelves and reflective ceilings can improve the light distribution from the facade slightly, but these solutions are often associated with visual discomfort. The most effective way to bring daylight into the deeper part of the building is to use light from the room.

# Daylight performance

**Example:** Daylight in deep buildings Daylighting solely by façade windows has its limitations. No matter how much glass there is in the facade, it will only be possible to achieve an adequate daylight distribution (DF > 2%) a few metres from the facade. Measures like light shelves and reflective ceilings can improve the light distribution from the facade slightly, but these solutions are often associated with visual discomfort. The most effective way to bring daylight deeper into buildings is to use light from the roof.

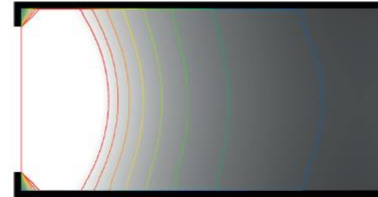
The simulations to the right demonstrate the daylight performance of a deep room with three different window configurations installed.

Luminance and daylight factor simulations  
Room dimensions: 8m (d) x 4m (w) x 3m (h)  
Pane visual transmittance (tv): 0.78  
Surface reflectance: 0.35 (floor), 0.66 (wall), 0.90 (ceiling)

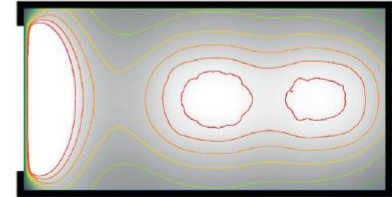
**Scenario 1**  
with 10% glazing  
to floor are ratio  
(Facade window only)



**Scenario 1**  
with 30% glazing  
to floor are ratio  
(Facade window only)



**Scenario 3**  
with 20% glazing  
to floor are ratio  
(Facade window only)

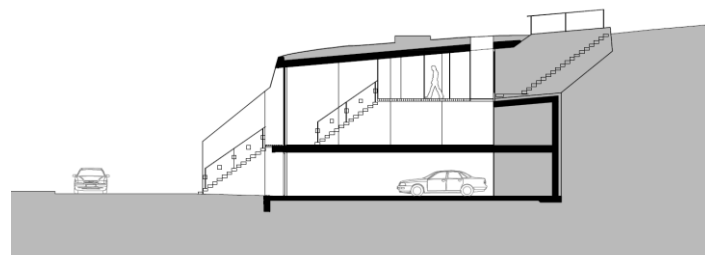


## Shape and configuration



architectural office Daniel Fügenschuh, A  
© Christian Flatscher

## Daylight in deep buildings



© architectural office Daniel Fügenschuh, A

Shape and configuration

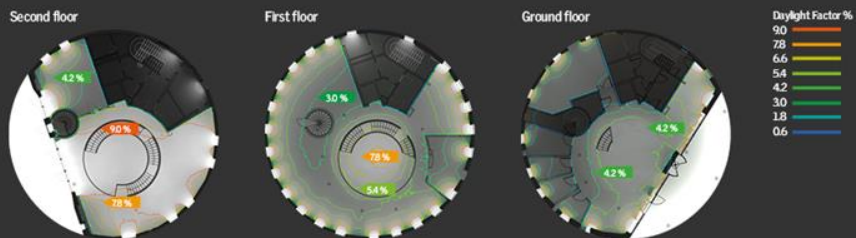




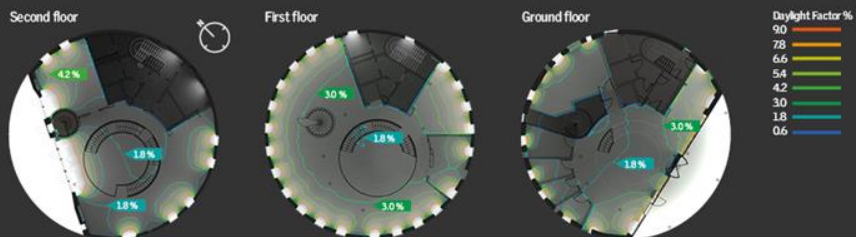
Daylight in deep buildings



### Daylight performance, with roof windows



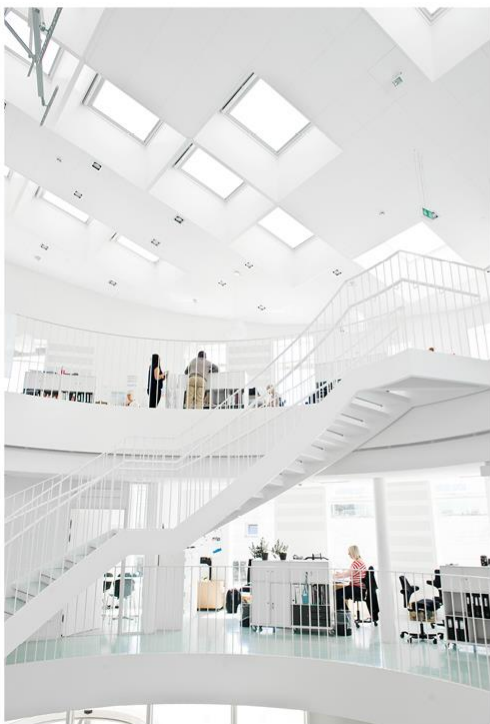
### Daylight performance, without roof windows



Shape and configuration

## Daylight in deep buildings

Green Lighthouse has been designed as a deep circular house with an internal passage of light, which fetches light down into the building from a huge glass covered hole at the top. It provides lots of daylight, creates natural ventilation and lets the hot air out. The stairs utilize the room to its full extent and creates a good, open and clear flow in the house. In that way the architectonic and sustainable solutions will be combined.



Shape and configuration



ReThink  
Daylight

Initiated by the VELUX Group

**VELUX®**