

Digital Services

November 2021

Visual Comfort



LINK Arkitektur / **LINK** IO

“We see daylight as a resource that we as designers are given the privilege of distributing. Good daylight conditions create healthier environments.”

Daylight in architecture

We offer an integrated daylight design service, because we believe that good daylight conditions are essential in any architectural project and excellent light conditions go hand in hand with architectural quality. The architecture shapes the daylight, and the daylight gives shape to the architecture.

At LINK Arkitektur we have a large track record of health care buildings, and we are following related research closely. Recent decades of research show that daylight is so much more than it’s visual attributes. Studies show that employees are more efficient and less ill, patients are recovering faster, seasonal depressions are lowered, and students learn faster when exposed to good natural light.

We see daylight as a resource that we as designers are given the privilege of distributing. If the project is in a dense context or in extreme climates, this resource can be sparse and requires extra attention.

Focus on early phase design and documentation

Our sustainability experts perform daylight simulations worldwide with a special emphasis on the unique daylight conditions in Scandinavia. We focus on all phases of a project – from the first design proposals to the documentation of daylight conditions in relation to the approval of a building project.

Our team of experts in LINK IO has put a great effort into building digital toolbox for integrated daylight design. Energy usage, Indoor climate, glass type selection and glare mitigations are all intertwined and designing with daylight ensures that this is coordinated across of disciplines.

Whether you want to create a vibrant workspace to attract talent or want a building that cares for its patients, daylight is one of the key aspects to focus on.



What do we offer?

Early Phase Design

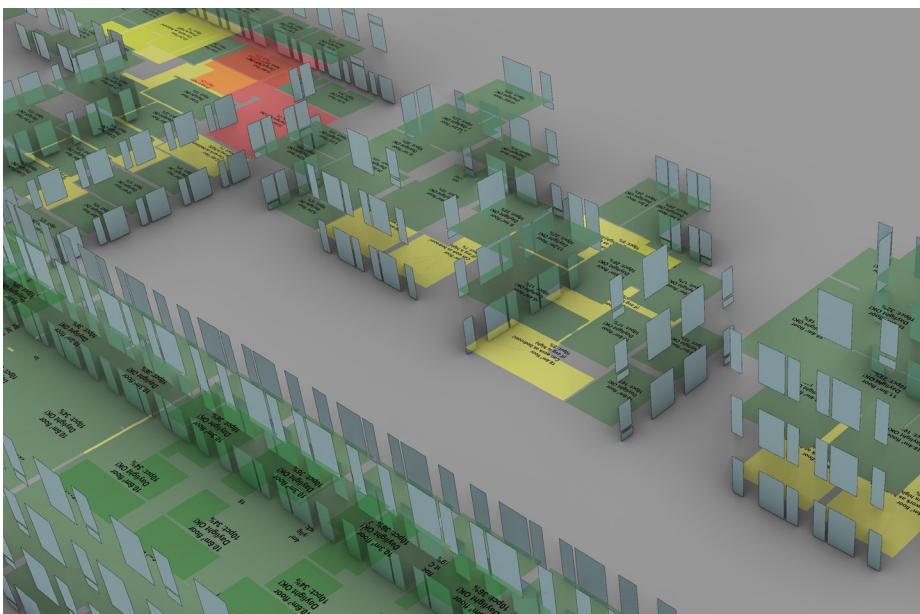
- **Volume - Prioritizing aspects in the concept phase**
Daylight is just one of many aspects when shaping the buildings and masterplans. Plan regulations, energy usage, reflections, views out, traffic noise, outdoor comfort are just selected aspects. Our daylight experts are used to engaging in a cross disciplinary holistic design process.
- **Plan - Aligning expectations in building program**
Differentiated daylight requirements for different room types? What "kind" of daylight is needed? Reflected, direct, diffuse, in the morning, afternoon, or from north? This will affect how we distribute rooms in the building.
- **Façade - Cross disciplinary technical and aesthetical collaboration**
We engage facade workshops and help align expectations to daylight, glare, view out and solar shadings.
- **Set goals and prove them**
We like to provide numbers to prove that we met our targets. The goals can be evaluated both in design phases where we can simulate, or in construction phase where we can measure.
- **Reflect and Learn**
We always reflect over the process together with our clients and other consultants. We like to compare our late phase results with our early phase predictions. Was there something we didn't foresee and how can we mitigate this for the next project in order to deliver the best possible service.

Documentation (later phases)

- **Daylight documentation**
Daylight compliance documentation according to the specifications according to Swedish, Norwegian and Danish building law.

Following the entire design process

We always reflect over the process together with our clients and consultants. We like to compare our late phase results with our early phase predictions. Was there something we didn't foresee and how can we mitigate this for the next project in order to deliver the best possible service.



10% Rules (Denmark/Norway/Sweden)

Avoid skyrocketing costs in later stages caused by the neglect of daylight simulation in early phases. By integrating daylight simulations in early phase, we can deliver rational and high-performance buildings alongside a good financial return.

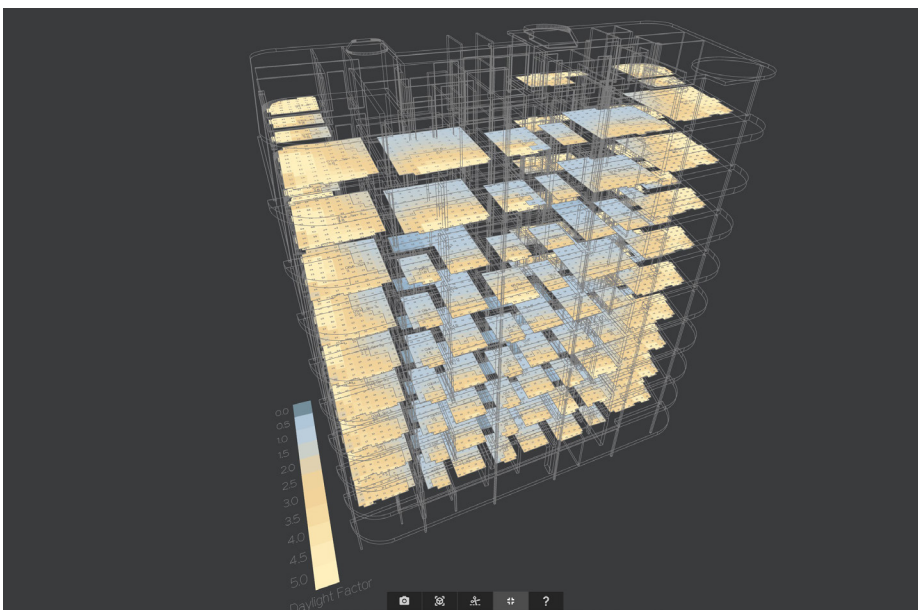
Sustainability Certifications

Going for the extra credit in DGNB, BREEAM, LEED, WELL, Miljöbyggnad or Svanen? Our daylight specialists are capable for calculating all the industry standard simulations.

Daylight simulation metrics

To show that spaces are well lit and not too bright we use a selection of industry standard metrics. Unless specified, we will offer project specific guidance which metric is most suitable for your project. The metrics include but are not limited to:

- **Daylight Autonomy (50% of floor area is compliant with DA,300lux,50%)**
Shows which areas of your building receive more than 300 lux in the working hours. 300 lux is what it takes for a 50+ year old person to read a book. A typical requirement here is that half of your floor area should receive 300 lux in more than half of the working hours. Typically the working hours can be 8-18 or office opening hours.
- **EN17037 Daylight Autonomy (50% of floor area is compliant with DA,300lux,50%)**
The new European standard, EN17037, is being adopted in many EU countries. Where it differs from a regular daylight autonomy, is that instead of looking at office hours, it uses a schedule that is based on which hours of the year is brighter. So it is simulating longer summer days and shorter winter days in the Nordics. This metric is the compliance requirement in Denmark and Germany.



Daylight Analysis results delivered in 3D web viewer for better collaboration.

- **Daylight Factor (DFavg > 2.0% or DFm > 1%, or 50% of floor area is compliant with DF 2.0%)**

The daylight factor is a well-established metric that has been used for decades in Northern Europe. It shows how bright the work zones are on overcast days and thus show a minimum performance on dark winter days. The factor is the relationship between the illuminances [lux] measured outside and inside in a desk height. It is recommended to have at least a daylight factor of 1.5-2.0% on desktops. In Norway the rooms should have an average daylight factor of at least 2.0%. In Denmark historically the rooms should have half of the floor area above daylight factor 2%. In Sweden the rooms should present a point Daylight Factor (DFp) or a median Daylight factor (DFm) of 1%.

- **Spatial Daylight Autonomy (LEED: 40% of floor area is compliant with sDA,300lux,50% - WELL: 55% of floor area is compliant with sDA,300lux,50%)**

The spatial Daylight Autonomy is the standard of LEED as well as WELL compliant projects. Where it differs from the regular Daylight Autonomy is that it must include glare mitigations. This helps designers pick the best compromise between a lot of glass and the time aspect of how often your roller blinds are in use. However, the controls of the blinds in the simulation are not too great, as they assume that roller blinds are in use whenever more than 2% of your floor area receives direct daylight. This is a quality in some latitudes and in some types of projects, but not in all.

- **Annual sunlight exposure (LEED, WELL: max 10% of the area is compliant with ASE1000,250)**

The annual sunlight exposure is the second parameter (after sDA) checked for LEED and WELL compliant projects. This metric is used as an early indicator for visual discomfort (glare) by measuring the percentage of the horizontal work area which surpasses a certain direct sunlight illuminance threshold for more than a specific time period while having all the operable shading systems fully open (IES LM-83-12).

- **Daylight Glare Probability (DGP)**

To get an indication of issues with glare from daylight, we render a full year video in selected desk positions. Then hour-by-hour we can calculate if there is too high luminance or too much contrast. This will give us a precise indicator of eventual glare issues from sun penetrating, reflections internally or reflections from neighboring buildings.

- **10% Rules (Denmark/Norway/Sweden)**

Denmark, Norway and Sweden have "rule of thumb" calculations for daylight compliance. While we believe that we can be more precise than that, these methods allow us to get very fast feedback in early phases. Thus, we tend to enable in house developed tools that have automated these. The Norwegian rule is simple and checks for access to the sky at 45° vertical angle but can only be used for residential. The Swedish rule suggests a minimum window glass area of 10% out of the floor area and, similarly to the Norwegian rule, mainly refers to residential buildings. The Danish rule can be used for all typologies but is more complex as it

Don't hesitate to get in touch with our design and simulations experts to discuss the best strategy for your project. Remember, the sooner we get involved, the better the result.

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