

# From demands to design – the birth of a luminaire

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## Target and Process

In a new design project, it is vital to define the target and the best way to get there. If there is a clear target, the process is often quite straightforward. If it is unclear where to find the solution, the process has to be more open. In many cases, you will find yourself somewhere in between. However, in the process of developing the SPACE luminaire, we were definitely at the tricky end of the line. Both due to our many demands and ideas about the product, and – not least – due to a high level of ambition.

## SPACE – new luminaire

AART Designers and Focus-Lighting have developed a number of exterior park and street lighting luminaires together. Different luminaires with their own field of function – from parks and squares to local roads and highways. One common point, however, is high standards in respect to lighting quality, sustainability, and design. The latest product in the row is SPACE. It should meet a growing demand, home and abroad, for an efficient, somewhat voluminous, rotation-symmetrical park luminaire with an appealing visual appearance. A luminaire to bridge the span between low and high poles, ie. light point heights from three to six meters.

When darkness falls, light is turned on in towns and cities. This has been the case for a long time and by means of electricity for more than a hundred years. Often we hardly notice. The light is there, and we count on it. However, this illuminating and guiding ambient light has a long history with many technological developments and new, innovative efforts. Among the latest is the design process of the SPACE luminaire, which is the topic of this article.

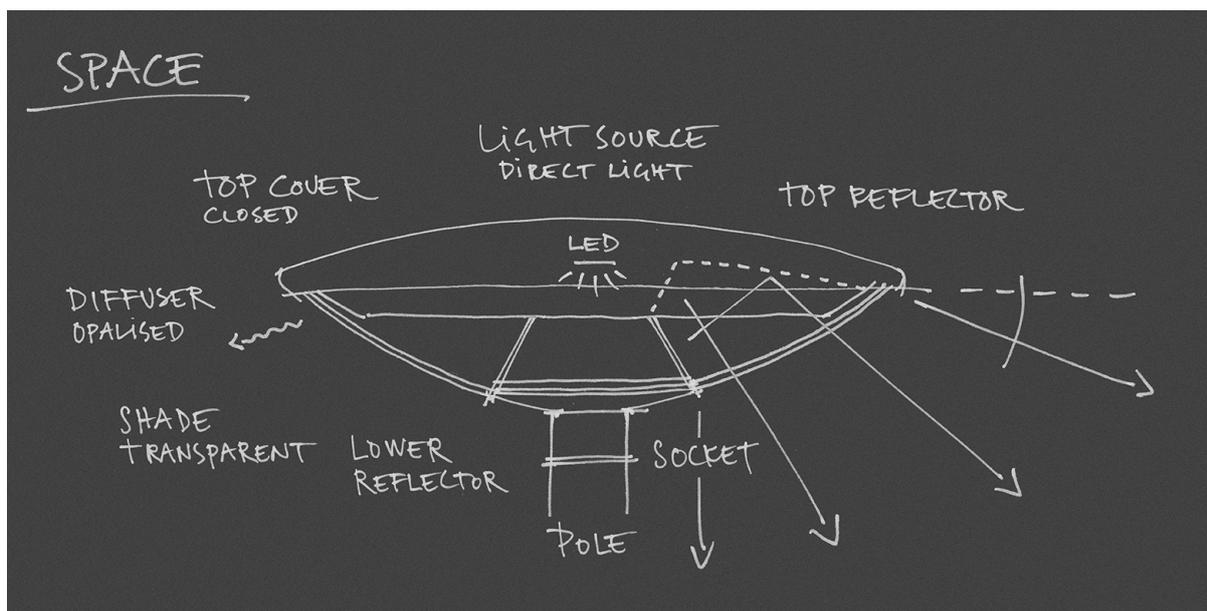


Fig. 1: An important aspect in the development of SPACE was to take the LED technology a step further and increase the small lighting point to a large and more comfortable lighting area. This was achieved by combining direct, indirect, and shaded light.

These heights offer possibilities of rather wide light distributions, which is essential for the distance between poles. It opens up for planning and optimising the number of light points. Finally, the number of light points influences the project economy directly, which is often a decisive factor.

### **Lighting Quality**

As mentioned, another decisive factor is the lighting quality, which is highly influenced by the lighting distribution. Focus is often on a uniform distribution of light on the ground or other surfaces. In principle, street lighting requires uniform light with as seamless transitions between light points as possible. Calculating uniformity will involve the light distribution properties as well as light point height and distance between poles.

### **Lighting Comfort**

In general, you could say that the closer the luminaire is to the ground and consequently the line of sight, the more attention should be allocated to lighting comfort. The perceived discomfort glare can be a challenge in many ways. Apart from being unpleasant to perceive, discomfort glare can be very dangerous in traffic. Thus it is highly relevant to look at this issue; an issue which has been not less intensified by the LED technology.

### **LED and Glaring**

The strong force of LEDs compared with previous light sources, is particularly their low energy consumption. As is often the case when turning to new technology, there are new challenges to handle, and in the case of LED, discomfort glare is one of them. LEDs are extremely bright due to their small size and powerful light. A really hard contrast on the eye. To control and tame LEDs in order to make them less glaring can be a difficult but nevertheless essential and consequently rather exiting challenge to handle.

A well-known historical example of working with the glare issue are the PH-lamps by Danish designer Poul Henningsen. In these designs, the light source is almost completely shaded, and primarily reflected light is being emitted. This results in a very comfortable and friendly light to the eye. An attitude towards light which may be particularly recognised in the Nordic countries and the Scandinavian design tradition. The disadvantage is the influence on the efficiency, due to the fact that the direct light is stopped and loses efficiency in the reflections. If you want to work with some kind of reflection and shading, it is important to find the balance where the relation between energy consumption and efficiency is still acceptable.

### **Light Pollution**

The wish to experience "Dark Sky" and be able to see the stars has put growing focus on light pollution. This has given rise to guide lines for the emission of light into the sky instead of onto the ground. In this context we focused on shading the light and using energy "in the right direction". Fundamentally, the luminaire should direct as much light as possible downwards to the ground; or at least in the direction where light is required.

### **Smart City**

Considering energy consumption and securing a future-proof solution, we wanted to implement Smart City functions in the luminaire. Both technologically and physically it was essential to develop a good and feasible platform for this purpose. This involves wireless networks and sensors for lighting control, data logging etc.

### **Sustainability**

Last, but not least we wanted to develop a sustainable product design in regard to materials, construction, and cost. An optimised use of materials, units that are separable for re-use or re-cycling, but most of all – and a central point in sustainability - a clever and robust design to last for many years.



SPACE at 4 meter poles. Movement sensors are mounted on the sockets, and on the top cover the sensor-ready base for remote control data logging can be seen. Photo: Jesper Blæsild

**Facts on the SPACE luminaire:**

- Symmetrical or asymmetrical light distribution
- Luminous power: 1000-6000 lumen
- Colour temperatures: 2700, 3000, or 4000 K
- Colour rendering: min. 80 Ra
- Ø60 or Ø76 mm poles
- Option for Smart City sockets up/down



SPACE is designed with symmetrical or asymmetrical light, and the two variants are nearly identical – both with and without light turned on. Rendering: Focus Lighting AS

### **New Lighting Principle**

Considering all the demands, parameters, and ambitions mentioned, we decided to develop a completely new lighting principle for SPACE. We attempted to take the LED technology a step further and challenge the glare issue, among others. Our target was to increase the small lighting point to a large and more comfortable lighting area by combining direct, indirect, and shaded light. An ambitious target, which made us continue the developing process in the more open way described in the beginning of this article.

### **Inside and out**

It is fair to say that until now, the process was primarily an "inside and out design". We looked at performance and how to achieve it technically. In my opinion, luminaire design is very special and fascinating due to the fact that a large part of the product is not the physical design, but the resulting light.

However, things belong to one another and cannot be separated. It is important that they interact and support each other in order to function in the best way. Light must be controlled and handled to obtain the distribution required. Furthermore, light is not always turned on, and the luminaire must be pleasing to the eye also with light turned off.

### **Outside and in**

Consequently we turned the process and looked at the luminaire as an "outside and in design". Seen from outside with the light turned on - like at night, and with the light turned off - like during the day. Rather different expressions depending on time of day and night as well as time of the year.

## **Design and Shape**

We began alternating the design process between the outer shape and the inner lighting geometry. The lower part of the shade being transparent, it clearly reveals the inner lighting geometry. Thus, our task was to shape all elements to interact in harmony in an appealing design, along with ensuring the best lighting properties. We made adjustments during the entire process and tested their effect on the different, interacting parameters. Often in a mixture of visualisations, lighting simulations, and physical tests in our lighting lab. We gained new knowledge and made new adjustments, until finally we reached our goal.

A large bowl of demands, reflections, and interrelated influencing and bindings, which should end up in a single, integrated and effective design.

## **Design Expression**

The solution is a design expression consisting of a number of more or less illuminated rings and circular elements which interact to broaden out the light. An interrelated constellation with an elegant and dynamic expression of several layers and experiences – both during day and night. And everything encapsulated in a minimalistic, precise and harmonious main shape.

## **Classic and Contemporary**

A main shape that will be recognised in well-known historic references along with adding new aspects pointing forward. If you step backwards or see the luminaire from a distance, it will fit quietly and naturally into both classic and modern environments. The primary function of the luminaire being to illuminate the surroundings, without necessarily attracting attention to itself, this is an important parameter. For the same reason the design will allow many repetitions after each other, as for instance along streets and roads.

## **Flexibility via Form**

Furthermore, the main form is shaped due to the size of the luminaire. We attempted to make a design suitable for a relatively large span of pole heights, without it being perceived too big on low poles or too small on high poles. Due to the horizontal, lens-like main shape, the luminaire will look slim and light on low poles where the angle of sight is low. On high poles the luminaire will appear rather circular and more voluminous because of the open angle of sight. This results in a large degree of flexibility also in complex lighting projects, requiring the same design expression. Moreover, the fact that one single luminaire has such a wide span, high and low, makes it highly sustainable in the simplified and optimised production, procurement, and operation processes.

## **One Design**

The ability to keep the same design expression in lighting projects is supported by the possibility of selecting different lumen packages, i.e. the lighting power of the luminaire. You can use the same luminaire and design even with various demands for lighting power in the same project. The same applies to the design of the recent SPACE variants with asymmetrical light. They are nearly identical to the original SPACE with symmetrical light. This has been an important part of reaching the goal of a strong design identity across functions and demands.

## **Vision**

All in all a vision to develop illumination of high quality and comfort, supporting and enriching human life and activity, as well as contributing to safe traffic and creating attractive and comfortable city spaces – hence the name SPACE.