Lighting Design Suggestion and Experimental Set Up

Ulrika Wänström Lindh

Lighting Design Research in Public Space

Lighting design suggestion and experimental set up | UWL
Lighting design suggestion and experimental setup for ‘Kyrkoplan’; a research project in collaboration with ‘Lights in Alingsås’ 2010

Project summary
At the same time as ‘Lights in Alingsås’ 2010, a research project about lighting design and its impact on our spatial interpretations is planned to take place at a central public space, ‘Kyrkoplan’. In this complex real-life context Ulrika Wänström Lindh, doctoral student at School of Design and Crafts (HDK) at the University of Gothenburg, wish to evaluate how the scale in luminary heights as well as directions of light and placement in relation to trees and facades, affect the space’s size and shape. Moreover, the created atmosphere is studied in relation to spatiality and security.

Lighting designers do frequently use test lighting as a work tool, but has seldom opportunity to test the effect of a complete lighting design suggestion in a whole urban space and are not so often able to evaluate the project by asking users about their observations. However, in this project the effect of the lighting design is planned to be studied through interviews and inquiries as well as focus groups.

The project installation will be temporal during the five weeks that ‘Lights in Alingsås’ lasts. The research installation will be used also for educational reasons and workshops. The realization of this research project is dependent on sponsorships which still are under negotiations.

About the project intentions
This project implies different agendas: to evaluate research questions, and simultaneously to do a test lighting of a hypothesis in reality, and at the same time the purpose additionally can be to illustrate a phenomena, as well as to make a lighting design suggestion that contribute to the whole spatial context.

The research project consists of several parts there different issues are studied:

- The scale of street lighting according to the experience of the spatial whole, the spatial distinctness and to the atmosphere of security.
- Tree-lighting in relation to the street lighting, to see how lit trees can contribute to complement the street light, to create a spatial lit wall of trees that delimits the room either towards the park or the street. Perhaps lit trees have larger impact on the atmosphere of security than a higher luminary placement.
- The use of the church facade as a spatial wall, to study the effect and amount of distance between lit fields.
- A study of light directions, asymmetry and symmetry in the portal close to ‘Östra Kyrkogatan’.
- A study of in-directed or out-directed light at pedestrian paths.
- Path entrances with low light and special designed reflectors for a study of a welcoming and inviting atmosphere.
- Atmosphere studies there light can inspire to associations to characters like private-public, sacred and mysterious light.
- To highlight architectonic details and for the place characteristic objects to complement the whole spatial context.

The spatial context – study opportunities
The choice of the experimental site is made out of several aspects. The spatial context should be a whole real-life urban space with complexity. ‘Kyrkoplan’, this urban space is both a public place, and a park surrounded by the official City Council ‘Rådhuset’, private apartments and streets, with car- as well as pedestrian traffic. The space is not too large, not too small to work with. The sight of all facades is good since the green park inhabit trees but no bushes. Another advantage is that the space can be considered as both closed and defined, yet it opens up. It is important that there are light coloured walls beneficial for light reflections. The closeness to the main square, ‘Stora torget’, makes the access to the light festivals walking tours easy. That the four streets surrounding the park are similar in their character, building heights and colours are also an important precondition for a comparable experimental space.

Existing lighting and problem areas
The existing lighting of the place is in many parts according to the principles I usually should have suggested, with street light oriented in close relation to the facades and with a luminary height that is suitable to the architectonic scale, in this case rather low. However, I see that the existing lighting is not planned with a deep and a sensitive feeling for the whole spatial context. Another obvious problem is the use of different luminaries and lamp pole heights that not contribute to a whole spatial context; instead it divides.

The lighting that we can see today is, according to my knowledge, merely something that just has become a result of coincident. The varying luminary height and luminary placements is due to that different streets have been planned in different times and that the street luminaries have different designs is related to a test lighting that was done twenty years ago and was left there, forgotten. Moreover, the existing mercury lamps need to be replaced with new light sources in a short future.
according to the EU-, and Swedish law directives. Shortly, this situation seems very common and the same conditions are probably easy to find at other places, and in other towns.

I have identified some problems with the existing lighting where a change should benefit the spatial context. First, that the street luminaries at ‘Drottninggatan’ are turned towards the street, with their back to the park, leaving an impression that it is the street and not the park that is important here. Instead of emphasizing the street, wall hanged luminaries could contribute to visualize the fourth wall of the space, marking a pause in the street rhythm and show the street user that here happens something – a space that invites. In the research project, practical reasons (described below) thus make it difficult to work with changes of the luminary placement at ‘Drottninggatan’ as a temporal solution, so this will just be a suggestion to the Alingsås municipality for the future.

The existing light at the church is old and just lights it up with two large parabolic-shaped spotlights carrying high-pressure sodium lamps which do not highlight any three-dimensionality, any architectonic details, building material or colours. Today the park is rather dark compared to the streets. Seven old iron luminaries with clear glass and incandescent light are spread out in the park, they are important as historical references, but this light do not reach so far. These luminaries will not be changed during the festival.

**Lighting design vision and main research questions**

How is the interpretation of this urban space affected when the lighting changes?

The effect of different light directions, up-light and down-light will be tested, as well as variations in symmetric–asymmetric placements and the impact of the luminary height.

Furthermore, the street light will be studied in relation to lit trees. Convex and concave shapes will be used to study the atmosphere concept of “inviting”.

1) How will these factors affect the experience of spatial depth, width and size?
2) How will the spatial experience according to the distinctness of the room, its delimitation and enclosedness be affected?
3) How will the experienced atmosphere characters, like the feeling of security, be affected?

**Street light – the scale of light**

At three similar streets the luminary height will be varied between two levels, a lower level at 4-5 meters and a higher level of 6-8 meters. The street lighting will also be studied in relation to lit trees. This study will both focus on experienced differences in spatial size and distinctness but also on the atmosphere as being more or less private and public.
Here are today 13 lamp poles with varying heights, between 4.0-5.5 meters. Ten of these could be used with the same foundation placement like today. The poles will temporarily be changed to new with double mounted luminaries at each pole, one at a lower height and one at a higher height. A lower light placement height is preferable and suitable to this architectonic space. Nevertheless, many other urban spaces in other towns do often have a way to high luminary placements height according to the spatial scale. With this experiment we show the importance of awareness about the scale of light.

The first choice is to be able to vary between these luminary heights by light control equipment (DALI), so they are lit 15-30 minutes a time. Discharge lamps need at least 15 minutes to recharge. Another opportunity could be to let luminaries at one height be lit half the month and then rebuilt the installation for the second half of the month. But it will then be difficult to evaluate the effect with the same test persons, and furthermore difficult for them to remember and compare with their earlier impression. If inhabitants around the park and staff at the City council are used as test persons they may still be able to see all light scenario variations.

The lower luminary will naturally partly throw a shadow at ground, a fact that hopefully will not disturb the total impression too much. This solution is chosen because it seems more realisable to use the same base placement and distance between the luminaries, than to change this. Another consequence of the two varying heights will be that the light level and light spread will be different if identical light fittings and light sources are used at both heights. The light from the lower luminary will not spread as broad and will be experienced as stronger towards the ground surface that comes closer the light source. These differences must be considered in the complex experiment situation when judging the observations. If possible, a luminary that is adjustable for both these heights with different intensity/effect at the light sources would be preferable. At a normal lighting design project the distances between the lamp poles would be changed, to be closer with more luminaries for a lower luminary height than for a higher one. However, this seems hard to arrange for this temporal test installation.

The choice of luminary design is much dependent on which sponsors that will be tied to the project. With regard to the inhabitants around and a risk for light emitting into their windows, a more or less opaque, non-transparent, luminary would be most suitable. Yet, this luminary could let a contrast-softening light falling as a gradient at the luminary hood, and make it more visible and comfortable to view, like the light of the Louis Poulsen’s luminary ‘Icon’. The light sources could be LED, but can also be for example ceramic metal halide, that seems to be the first alternative for the future light source change, according to Alingsås municipality. If LED-lamps will be used, in the research project, they
may be able to decrease in intensity for the lower placement to better correspond to the level and distribution of the higher placed light. After 21.00 the lighting will not be changed anymore for research purpose and the lower luminaries will continue to shine during night.

Another solution, a compromise, should be to have five lamp poles with luminaries at the lower height and five poles with luminaries at the higher placement. They could be compared if the observer moves around. However, this will not display the whole room in the same way and the ability to compare, that is the important issue here, can be questioned. The existing lighting is already varying in height without catching special attention to the fact. Yet, if the height would change along one and the same street/façade, the difference should be more noticeable and invite to a discussion. The solution, with different heights at different streets, should be less expensive and we could easier use luminaries from two different manufacturers, if just the luminary light distribution and the luminous intensity are corresponding. Perhaps this solution could make it possible to use closer distances between the lower luminaries.

On the ‘Drottninggatan’, the only street around the park without luminaries close to the facade, the walking path is too tight to place temporal lamp poles to change the light to the other side of the street. Therefore this part of the street light will be excluded from the project, and the light switched off.

**Tree lighting – as spatial delimitation**
The street light is studied in relation to lit trees.
The spatial impact of lighting trees is also studied by changing the tree light so that the trees either are lit from the inside or the outside. Lit trees will in this case constitute a more or less open delimitation of the park and the space. It will be very interesting to see the differences in spatiality when the tree light ‘turns’ towards the street instead of the park.

The portal to the yard at ‘Östra kyrkogatan’ – light from above or below, centred or asymmetric

Light directions in entrances can have large impact on the feeling of security and recognition of faces. In this portal there is a great opportunity to study the effect of changing the existing centred light from above to one side of the ceiling, both sides of the ceiling, from one side below or both sides below. These light-changes could either be controlled by time schedule or controlled with a button panel so the users self can choose the light they prefer. In every light scenario shadows and light on some faces should be documented. In this portal not only security and distinctness can be studied but also how the space constituted by the portal changes in experienced size and shape according to the light.

<table>
<thead>
<tr>
<th>A face with light primarily from the side</th>
<th>A face with light from above</th>
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Paths’ entrances – a study of an inviting and welcoming atmosphere.

The first idea was to mark the path entrances with bollards, low enough to indicate the scale of a pedestrian. However, this seemed not practical since the installation is temporal and the possibility to dig deep for foundations therefore is limited. Instead ground-spotlights can be used together with special designed reflectors, bent in a curve to contribute to visual guidance. This low placed light, not
higher than 30 cm, may in itself contribute to a relaxed feeling, without exposing the walkers and bicyclers.

The effect of lit concave or convex shaped reflectors, that in a way will constitute bollards, will be studied in relation to an inviting and welcoming atmosphere. Different entrances can be lit in different ways with either convex or concave reflectors, without any light control. The visitors can be asked to go the entrance they find most inviting and motivate their answers, for the research inquiry.

In this part, it is not only about light that will be studied, but also the effect of a special designed reflector as a convex or concave shape in metal. The reflector can be easily made in warm coloured corten rusted steel and/or constitute of expanded metal (in Swedish, ‘streckmetall’), that catches the sparkling light. The reflectors can be lit from ground spotlights.

**Lit walking paths – to see or being exposed to be seen.**

The paths itself can be used to test the effect of light coming in to the path or directed out from the path. This may affect the atmosphere related to see clearly or feeling exposed /being seen. It will also be interesting to see if this difference in direction can have effect on the walking speed.

Since there are two different paths in the park, though with slightly different width and material, they can be lit in two contrasting ways - one with incoming- and one with out-directed light.

They can be lit either with short bollards that can direct light, like Noral’s “U-bik” luminaire, or with ground mounted spotlights with directed light.

| Paths with incoming light, to expose | Paths with outcoming light, to see |

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The church façade as a background - effect on deepness, spatial shape and size.

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<tbody>
<tr>
<td>A1</td>
<td>The church façade with five wall fields lit.</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>The church façade with three wall fields lit.</td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>The church façade with two wall fields lit.</td>
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</tbody>
</table>
The church façade has five larger wall parts between the windows that are suitable to light in order to study the distances between them and how the amount of lit field/light beams effect the experienced width, height and depth of the space. Three scenarios will be varied, as follow; 1) all five wall fields lit, 2) the fields on the corners and the middle one is lit while the other two are dark, and 3) with only the corner fields are lit and non in the middle.

The church façade can lit by five ground mounted spotlights connected to the light control system. The primarily intention with this church facade lighting is to use the façade as an important spatial wall in the exterior room – a background for a study of the above mentioned phenomenon. However, the aim of lighting should be to create a soft light and sensitive light that at the same time can be appreciated. With a contrasting bluish-whiter colour temperature on the outside, a warm glowing light from the inside will be more visible.

**Church windows – sacred atmosphere, glowing and radiating from within**

The church has already been lit very successfully in earlier workshops so I have no intention to repeat that. However, to supplement the experimental façade light with a warm glowing, radiating light from the windows and glass parts next to the church doors should make the whole spatial context more complete. The church is a very important object in this space and I wish to visualize the treasure within the church as a symbol of light, spilling out a sacred atmosphere like a treasure box in the park. Since the glass parts and windows on the church have characteristic shapes that prominently contribute to the architectural experience, they should be lit with extra care.

The bell tower should also attain more attention, and be lit with a light that focus the opening made of green copper.

**Benches lit in various ways – creating a private and intimate atmosphere**

The park has three benches that can be lit in various ways, from below, the ground, beneath the seat, from the side or from the back, all in order to study which of these lighting designs that most affect the atmosphere of privacy and intimacy.
Graves and monuments - focus with a mysterious atmosphere light

In the park there are one prominent grave next to the Church – “the presumed grave” of the famous explorer Jonas Ahlströmer that brought the potato to Sweden three hundred years ago. Another memorable stone is additionally placed here in memory of an appreciated school teacher. Both monuments should be lit to be more visible, yet in a careful way, which also can include a mysterious atmosphere. Mysterious light could, in this case, be light rich of shadows from below, a low light placement and a light that comes close by making the texture of the stones visible. The light level should be low just enough to make the stones visible and with its texture materialized. The iron fence can be lit beautiful with a small amount of light directed with precision so every vertical element receives three-dimensionality. Colour filters could add an extra dimension, but should not be too contrasting.

The ‘Rådhus’ façade (City council façade) – comparing the effect of up- respectively down directed light

The pink wooden façade at the ‘Rådhuset’ connected to the yellow brick façade at ‘old fire station’ (‘Väktargården’) do not have street light poles placed next to the facade like the other streets surrounding the park. Instead an existing façade illumination with horizontal light lists above the windows is an important contribution to the space as a lit wall that defines the room. I do not wish to make a new lighting design suggestion for the façade since this works well, but I think that the three white half colons constitute an interesting opportunity for an experiment of up- respectively down-directed light. This light could be either used together with the existing façade light or when the existing illumination is switched off. With the light control system there could be a possibility to change between up-light or down-light and to study the effect on the appearance of the buildings height and width as well as any experienced changes in spatial depth, height and width.
Similarly, spotlights on both sides of the entrance to the old fire station could be tested with down- or up-directed light instead of the existing glaring transparent globe luminaries of clear glass that today does not help to visualize faces and façade details distinctly enough.

Other façade details to highlight with light – for a whole coherent spatial context
To receive a complete lighting design suggestion with a whole spatial context where a reasonable amount of architectonic details becomes visible also in night time, some additionally architectural details are here suggested to be lit. This includes light at the characteristic brick ornaments at the old fire station as well as spotlights at the red fire post standing in front of the façade. The beautiful wooden lace ornament beneath the roof edge at the light blue wooden house is another interesting façade element that could “lift” the place and connect to historical references.

The bridge between the ‘Rådhuset’ and the old fire station is another object that could be modelled with light to expose the activity and movement within the City Council building. In connection to this the concrete wall and the gates beneath the bridge could be sculpted by light. The empty wall could connect to the park with a leaf gobo throwing a lace of shadows and light glimpses creating a lit wall that gives stability and visual guidance into the inner yard.

Light control system – to make comparable situations in the complex urban space
Between 19.00 and 21.00 every evening the light will be changed according to the following criteria:

Schedule of light control

<table>
<thead>
<tr>
<th>Luminary height</th>
<th>Trees lit from inside the park</th>
<th>Trees lit from outside the street</th>
<th>No lit trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>High 8 meters</td>
<td>X1</td>
<td>X2</td>
<td>X3</td>
</tr>
<tr>
<td>Low 5 meters</td>
<td>X4</td>
<td>X5</td>
<td>X6</td>
</tr>
<tr>
<td>No street light</td>
<td>X7</td>
<td>X8</td>
<td>-</td>
</tr>
</tbody>
</table>
The varying combinations of street and tree light above should change with help of a DALI-system every 15-30 minutes.

Additionally every 2 minutes the light at the Church wall, in the portal at the ‘Östra kyrkogatan’ and the up- or down directed light at the ‘Rådhus’ façade will be changed within the same control system (below).

| Luminaries that change every 2th minute. |  |
|----------------------------------------|  |
| Church façade                          | A1 – Five fields lit | A2 – Three fields lit | A3 – Two fields lit |
| ‘Rådhus’ façade                        | B1 – Up light | B2 - down light |
| Yard portal                            | C1-Down, a centred row | C2- Down, 2 symmetric rows | C3- Down, 1 asymmetric row | C4- Up, 1 asymmetric row | C5- Up, 2 Symmetric rows |

Test persons will answer a questionnaire with picture where they can relate to and mark which light combinations that was observed at the time they answered the inquiry or interviews.

**Conclusion – luminary specification**

**Experimental light connected to the light control system:**
- 10 lamp poles with luminaries at both 6 meters and 8 meters height.
- 12-14 trees lit from the inside varied with light from the outside, in total 14-26 spotlights placed at ground.
- 5 spotlights light up 5 wall fields at the church, from the ground.
- The portal into the inner yard at ‘Östra kyrkogatan’ lit in five different ways, by 12 luminaries: 6 in the ceiling and 6 on the ground.
- Half colons at the ‘Rådhus’ (City Council) lit from below or above, with 6 spotlights.
- Entrance light at ‘the old firestation’, 2x2 spotlights from below varied with light from above, or wall mounted luminaries with two openings that can be covered (like Simes ‘slot’-luminary).

**Experimental light not connected to the light control system:**
- Entrance light to the pathways, 4-5 entrances with two ground spotlights each and a special built, but plain, concave-convex reflector in metal.
- Pathways lit from the inside-out or outside-in, on two different paths. This light could come from low wattage halogen spotlights placed on soil sticks. At least 4 luminaries at each of the two principles.
- Three benches lit in different ways (from below, from behind and from the side).

**Environmental light-architectural details not connected to the light-control system:**
- 4 large trees lit with 3 spotlights each, with colour filters.
- Façade details on ‘Rådhuset’, ‘the old fire station’ and the light-blue corner house. Approximately 9 spotlights.
• Church windows lit with warm glowing light from the inside, and with a single light source in the bell tower. With colour filter.
• The bridge between ‘Rådhuset’ and ‘the fire station’ would be nice to light both from within and the outside to create a certain atmosphere that interfere the urban space. 2-3 spotlights might be enough.
• The two graveyards/stones should be lit to be seen with a little mysterious light. 2 Spotlights from beneath and some light directed close by the fences.

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All sketches and photos are by the author.