



Drawing in architectural lighting design

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Drawing: Peter Zumthor.

Drawing is an important tool for lighting designers. Not only as a means of visual communication but also to aid visual thinking. As a process and product, drawing is a constituent part of the overall lighting design process, from concept to realisation. The emphasis is usually placed on drawing as a presentation medium, a means to communicate ideas, either elaborating on technical aspects of the design or revealing the envisaged visual impression.

This article will address other less visible roles: the drawing as a means for analysis and exploration in architectural lighting design.

Daylight has always been a source of inspiration for the development of architectural design, providing character and meaning to space and vice versa. Through construction and materials architecture provides input for lighting design solutions. For example, consideration of the inherent light qualities of a piece of architecture results in the placement of the building in relation to the horizon, and determines the architect's decision to design an open or closed architectural structure. The way that light relates to different activities influences orientation and architectural composition, while the character of the space required results in the mode of construction, choice of materials, and colours.

In this process of design, drawing is an essential tool, in addition to other media offered by modern-day technology. Fish and Scrivener (1990) explain that in the early stages the designer may wish to maintain many visual options, but software's incapability to represent implicitly may force detailed decisions

to be made prematurely, which can be harmful to invention. This creates the imperative need to study the "invisible mental processes that result in the visible activity of sketching" (Fish and Scrivener, 1990). Research has been done in different design domains, revealing a renewed interest in the value and instrumental role of drawing. To what extent is drawing an appropriate tool for lighting designers?

Drawing in architectural lighting design

Architectural lighting design is about understanding, graphically representing, and realising the light design concept in architecture. Graphic representation, and in particular drawing, is essential in the understanding and 'construction' of lit environments, not only to support visual thinking and visual communication in the design process, but also because it addresses the dialogue between the conceptual (planning) and perceptual (constructed reality) space (Nijhuis, 2009). Drawing facilitates the dialogue between idea and reality. The designer conceives a particular architectural lighting effect, which is later realised. Observa-

tion of the actual construction of the lighting scheme through a drawing allows the designer to gain new understanding. In this neverending interplay the drawing is the vehicle for recording and analysis.

Historically, from the Italian Renaissance onwards, drawing has become a significant tool, a geometric instrument in the architectural design process. This cannot be said of light in drawings. In the beginning light was a complement to drawing through the presence of shadow. For instance, Alberti (1404 – 1472), although creating a mechanism for constructing perspectives, did not associate the projection of shadows with the principles of optics. Da Vinci (1452 – 1519) and Durer (1471 – 1528) invented a method for shadow projection but did not discriminate between shadows cast by the sun or by a point source. The first to fully systematize shadow projection by the sun was Desargues (1591 – 1661).

In modern times, due to scientific developments (light as a photon), new technologies (glass, steel) and the aspirations of modern thinkers towards light, light has become a key subject in both art and architec-

ture. At the same time, the architect has lost control over the building process, and drawing has acquired an important role in conveying instructions to those responsible for the construction. Changes occurring over the last couple of decades have had an impact on the qualities of the realised design. Digital media dominate the design process, while new technologies and regulations in the field of lighting design indicate a second approach when facing a design problem. This has led to a focus on the quantitative control of light as opposed to the perception of space.

Within the framework of a perceptual approach to light, Liljefors (1999) suggests a method for assessing a lit situation based on two levels:

⇒ impressions of space with regard to the overall visual experience of the given environment: space (spatiality, atmosphere, visibility), form, surface, texture, colour and light
⇒ visual impressions related to the light in the space: brightness, spatial distribution of brightness, shadows, reflections, glare, luminous colour, and colour of surfaces.

Given the plethora of digital media that can make the job of a lighting

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Figure 1: analytical sketch.
Sverre Fehn.

designer a lot easier, it might seem obsolete to talk about drawing. It is very easy to put forward the argument that lighting design software allows designers to generate realistic models showing the design of the overall space, or to calculate light in a space using specific data. However, we need to consider that lighting design is not only about accurate data or deceptive renderings, but also about original ideas that incorporate space and light in a unique way. The use of software may constrain this potential, depriving designers from developing conceptual skills when working with light.

The design process and the role of drawing

Considering drawing as a tool for architectural lighting design the question is: what benefits does this imply throughout the design process. Case study research has been carried out on architects active from the 1900s onwards, where light plays a dominant role in their work: Jørn Utzon, Sverre Fehn, Steven Holl, Campo Baeza, and Peter Zumthor. The case studies were examined based on five premises related to drawing and architectural

lighting: the composition of the image, the drawing itself, the purpose/intention of the drawing, the intended effect of the light, and a comparison with the light in the realised building. If, according to Lawson (1980), the design process can be seen as "an iterative cycle involving the three activities of analysis, synthesis and evaluation, and as a reasoning path connecting various separate pieces of information for the 'evolution to the solution state and a redefinition of the problem'", the aim of this study was to understand the role of drawing in the different steps in the architectural lighting design process.

Analysis

Analysis according to Lawson (1980) "is the ordering and structuring of the problem". Research shows that at this stage drawing is instrumental for light in two ways: analysis and exploration. Every architect creates his response to a specific problem with a focus on either external or internal constraints, and in line with his own personal approach.

With his sketch "The sun and the stone" (Fig. 1) for the Norwegian Glacier Museum, for instance, Sverre Fehn explores the museum's relation to landscape (external constraints). He edges around the given problem by stripping it to its most basic state – using an abstract sketch, simple lines and forms, and an opaque cubic volume placed firmly on the earth like a stone that has rolled down the mountains and come to a standstill.

As mentioned before, light constructs the visual impression of space through rich information that takes into account an impression of space, colour and light. It is possible to work with few layers only, emphasizing what is important in each case. Fehn works with space and form, and materials, which react with light in architecture. In the sketch light expresses a confrontation with nature: the architect has drawn a primal form under the sun and light that affects its exterior only by casting solid shadows onto the earth.

In contrast, at analysis stage, Jørn Utzon develops the concept with the aid of drawings that focus on the visual impression of space as experi-

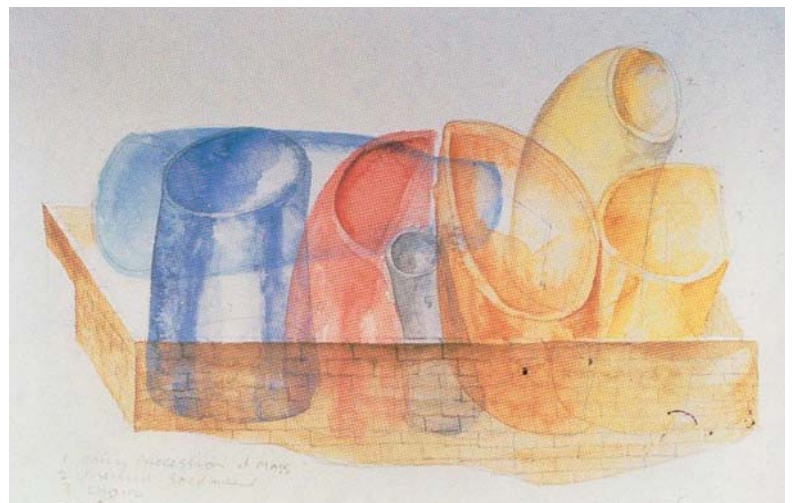
enced from within, by setting a scene and adding light that matches the activities taking place. His abstract sketch for the Bagsvaerd Community Church project (Fig. 2), expresses a vision for the lighting concept of the church. He uses pastel colours in a one-point perspective drawing, creating an outdoor scene where the clouds form a natural ceiling and light pours down on the worshippers congregating before the altar. This conceptual sketch acts as a guide for the development of the project, and for achieving the conceived atmosphere inside the church.

In a similar case, Steven Holl (the Chapel of St. Ignatius) approached



Figure 2: analytical sketch for the
Bagsvaerd Community Church.
Jørn Utzon.

Figure 3: analytical sketch for the
Chapel St. Ignatius. Steven Holl.



the design problem with a focus on the building programme. Drawing explorations resulted in the concept of "different bottles of light in a stone box" (Fig. 3), which relate to different parts of the worship rituals. This watercolour sketch was designed to drive the development of the project, resulting in the morphology of the structure, the lighting solutions, materials to be applied, and colours that matched the concept.

Synthesis

According to Lawson (1980), synthesis "is characterized by an attempt to move forward and create a response to the problem – the generation of solutions." The research undertaken shows that architects use drawing at this stage to transform ideas into architecture.

When it comes to lighting concepts, drawings explore or analyse ideas in different ways, depicting: light as a principle, diagrams that give an overview of different light effects or situations over the course of time, paths of light, or architecture designed to generate specific light effects and atmospheres, construction and materials, and the visual impression of an effect.

For the Thermal Baths in Vals, for example, Zumthor uses drawings in the design process as described above. Light in his works is a quality that results from elaboration on many different levels. He studies plan as an abstract composition of solid and hollow structures, openness and compactness. Materials, surfaces, textures interact and reinforce the concept. Colours support the desired impression in the first

stages; a sequence of sections indicate the future activities in the building and how light can enhance them and shape the architecture (Fig. 4). For Zumthor, developing the design process through drawing is a fluctuation between rational and sensorial aspects, a continuous transformational synthesis. He uses different projections, plans and sections on different scales, with an emphasis either on the impression or on the lighting principle (Fig. 5). The technique used in all projects is similar: pastel crayons and pencils. The architect develops a colour code for each project to communicate his abstract compositions and depict an impression of the materials envisaged.

A further example can be found in the Main Library Universidad de Alicante by Campo Baeza. Freehand pencil drawings explore the light distribution in the reading rooms (Fig. 6). In this case Baeza uses the technique of framing: the reading room is set apart to be studied and a

geometric system is added to allow the creation of different versions on the same scale. The resulting sequence of sections depicts the process of development of spatial forms, whereby the main consideration is the position of daylight openings to achieve a uniform illumination of the reading desks.

Evaluation

To quote Lawson (1980) again: the process of evaluation "involves the critical evaluation of suggested solutions against objectives identified in the analysis phase". Research shows that drawing is used for analysis in order to evaluate the proposed design, or for presentation to others (team or client) in order to communicate the visual impression of the envisaged final result.

When Steven Holl designs, he is primarily concerned with how one experiences space when walking through or from the street, rather than what the ground plan looks like. In this sense, he uses drawings

to study the interior before or at the same time the exterior is formed (Fig. 7). His approach to architecture is to create the uniqueness of a place by interweaving form, space and light. The type of drawing used in this case often comprises a two-point perspective that embraces the viewer, imitating the visual field of someone experiencing the space. Water colours are suitable for expressing abstract atmospheres, since they enable all the parameters of the visual impression to be depicted without forcing the designer to take specific metric decisions in the preliminary design stage.

Baeza, on the other hand, when designing Casa Garcia Marcos, applied a less illustrative technique, producing rough drawings using black and coloured pencils. Here the architect combined plan and sectional drawings to evaluate the quality of light in the solution proposed. In particular, the drawings enabled him to analyze the light distribution in the entrance situations (Fig. 8).

In another case study – Caja General de Ahorros savings bank – the same architect used a drawing to communicate the visual impression of the interior. This was specifically for presentation purposes (Fig. 9). Perspective drawings are suitable for this, since they embrace the viewer, allowing him to experience space as in reality. In comparison, illustrative techniques are highly expressive. With regard to the quality of the light in the space, the information depicted in the drawing takes into account practically all parameters that make up a visual impression, with the exception of colour. The drawing is nevertheless an exaggeration of reality. The aim was rather to communicate a vision, maybe seduce the client, rather than portray the exact result.

Conclusion

The three tasks that drawing fulfils – to support exploration, analysis and presentation – prove that drawing is a constituent, albeit underused, part

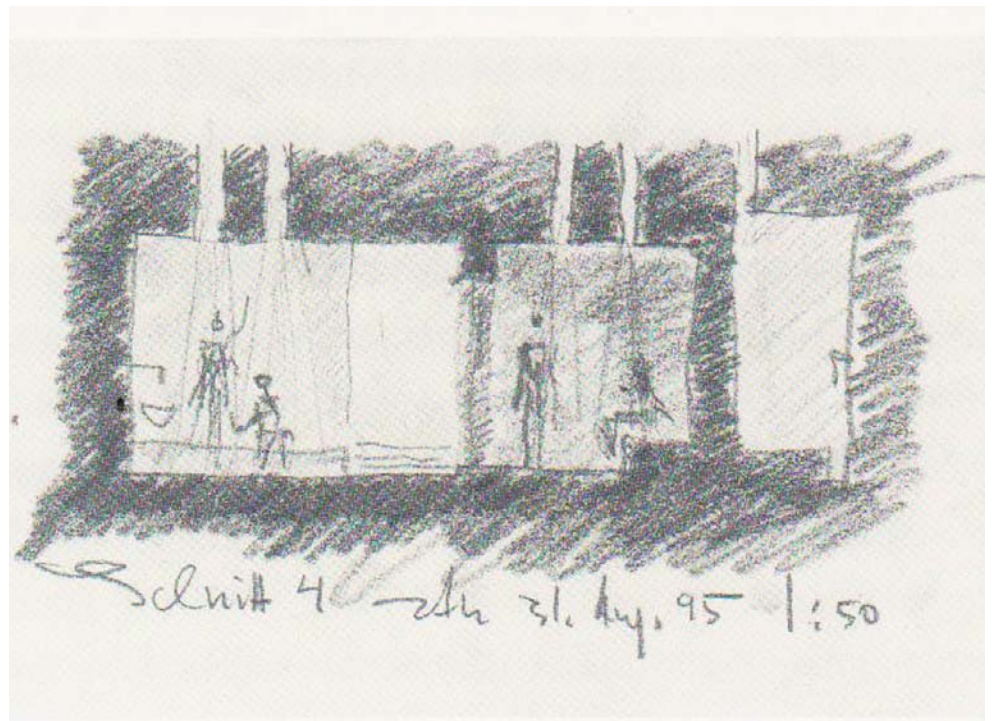
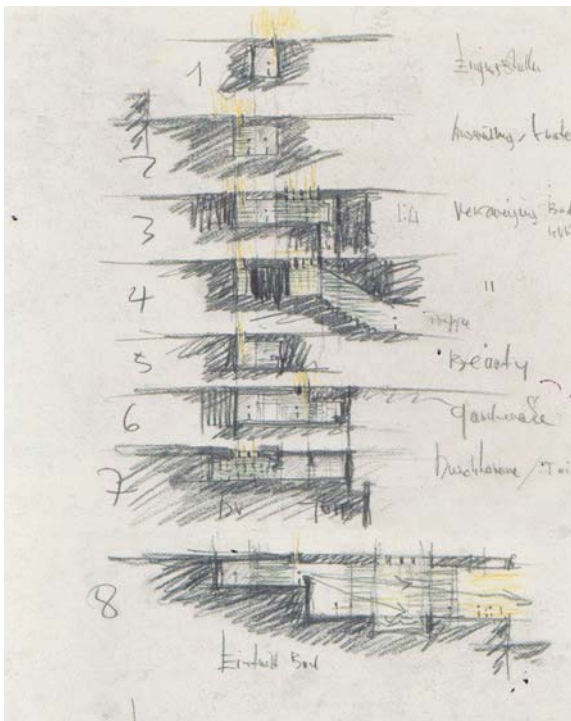


Figure 4 and 5: synthetical sketch for Thermal Vals/CH. Peter Zumthor.

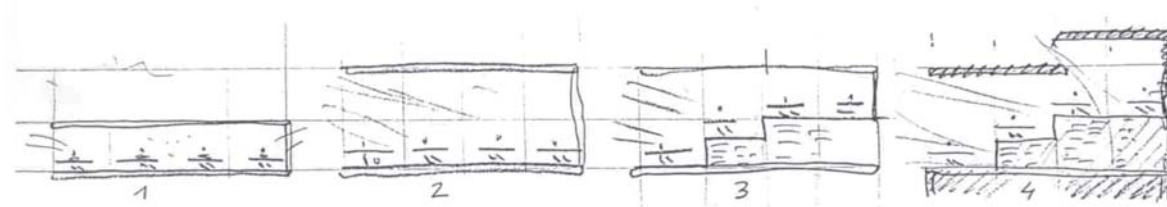


Figure 6: synthetical sketch: light that moulds architectural form. Sketch for the Main Library Universidad de Alicante/E. Alberto Campo Baeza.

of the design process. In this day and age, digital media dominate the profession. Greater emphasis on the use of drawing in the early stages of an architectural lighting design project will most certainly have a positive impact on the generation of ideas that embody space and light, and touch upon all aspects of visual impression. The challenge is finding a way to combine hand drawing and digital visualisation. Typically, every medium has its strong and weak points. Research shows that hand drawings are important in those stages of the design process that demand visual thinking. Lighting design software can be used to facilitate analysis and evaluation, since it can provide support to lighting designers in the sense of specific data. Finally, we also need to consider recent technological developments that promote the combination of hand drawing and digital media, such as pen tablet drawing tools, which can take the possibilities of hand drawing to new dimensions.

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Figure 7: evaluating sketch: analyzing the experience of light in space.
Sketch for the Museum of Contemporary Art in Helsinki/FIN. Steven Holl.

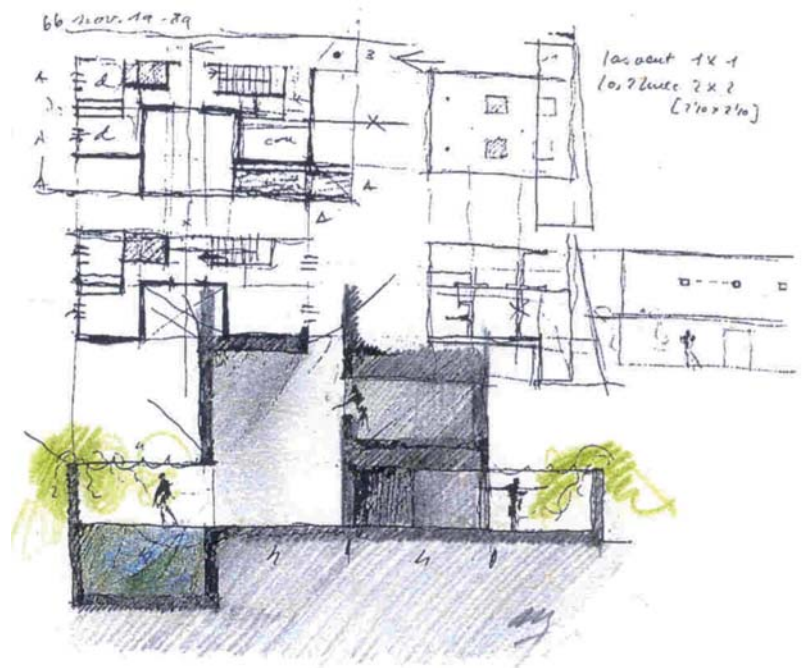


Figure 8: evaluating sketch: analyzing light distribution in the solution proposed.
Sketch for Garcia Marcos House. Alberto Campo Baeza.

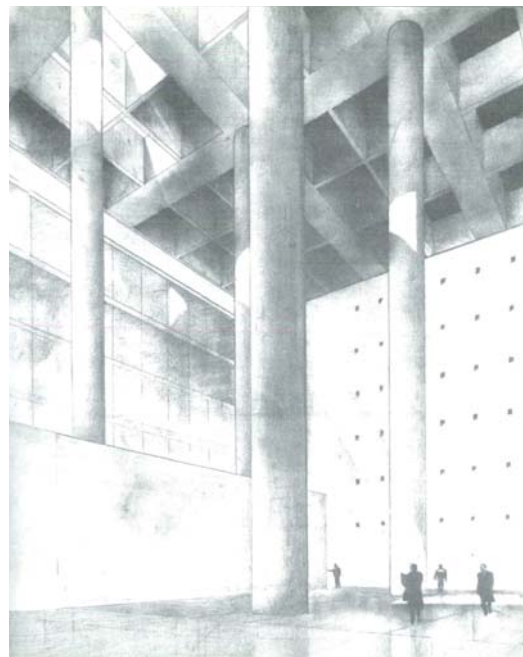


Figure 9: evaluating sketch: representing the light impression in illustrative technique.
Sketch for Caja General de Ahorros/E. Alberto Campo Baeza.