The role of light in underground stations

The majority of stations do not have any lighting design strategy to enhance architecture and key features. Light is usually too uniform. Identity is also forgotten. They look very similar with their typical linear fluorescent fixtures mounted on the ceiling above the platform.

The main question at the beginning of the author’s research was: why is the experience of everyday commuters and travelers generally so stressful and unpleasant? And consequently, how can this situation be improved, if not from the architecture or design aspects, at least from a lighting design perspective?

Before searching for answers, it is important to understand what kind of light is required in underground stations to address architectural elements, design features, and functionality. The first role of light in underground stations is to provide general illumination but in accordance to the different zones within the overall space:

- railway track and signalling
- circulation areas
- ticket sales and retail space
- entrances and exits / parking

For each zone there are guidelines for illuminance levels in order to keep the environment safe and legible for the users. However, if one wants to achieve a refined aesthetic and functional approach, one must go beyond the norms, creating at the same time – through light – a functional and an attractive space. A good lighting design concept in underground stations also requires a sound understanding of the architecture and design elements.

There are two important levels of luminous intensity in underground stations: brightly lit core areas and less brightly lit platform areas (Edwards, 1997). However, the most important factor here is to work with lamps with lower wattages, in order to achieve a uniform level of light at the platform, instead of fewer lighting fixtures. Ticket offices, entrances and intersections (escalators, turnstiles) in general should be considered as brighter areas, but again considering the uniformity of light within the overall space.

Ideally, good lighting in stations would be a balance of daylight and artificial light wherever possible. In both cases the lighting designer needs to be aware of the light reflection values (LVR) of the materials in the space in order to preserve the right scutibility and facilitate light and dark adaption of the eye. The lighter the surface, the brighter the eye perceives the surface to be. Brightness perception is not only related to luminance levels, but to the relation between surfaces of different brightness (Griffen, 2004). Vertical luminance is therefore another important component for spatial perception. The best examples of comfort and a perception of security are stations that feature vertical illumination.

That said, the role of light can go beyond a purely support function in architecture and become a predominate feature in the design of the space in its own right. This refers to the ability of light to render architecture. Luminaires can play different roles here: they can be part of the architecture, allowing the light itself to play the greater role, or they can be considered as lighting objects, elements that provide light but are distinguished from the architecture. Consequently, it is not only the position, but also the design of the luminaires that contributes to and determines the overall atmosphere in the space as well as supporting its identity.

Here we find two different layers and it is necessary that we get the light right for both. The first layer comprises general illumination and light for orientation, helping passengers move from the entrance to the platform. The second layer consists of ambient light, which catches the attention of the passengers and invites them to contemplate the space. This second layer allows passengers to have a break for a few minutes in a nice atmosphere while waiting for the train. The second layer can lend

Lighting the way beyond the requirements.

Text: Magna Ferreira Schulz

Underground stations today are more than transit systems designed to transport city dwellers and visitors across town in the fastest, safest way possible and relieve road traffic. They also contribute to the status and identity of the city and its inhabitants. Design has begun to play an increasingly important role when planning stations. A lighting designer must go beyond standard requirements and create a customized solution for that particular station that will facilitate wayfinding but also please users aesthetically. Light can help to create this kind of attraction and a sense of uniqueness for the environment. A valuable and indirectly sustainable side effect is the increased interest in using public transportation. The number of good design projects for stations is growing, although there are not so many sources of reference for this sector of the lighting design industry.

THEORY

Light in underground stations

Stadelhofen station in Zurich, Switzerland – Architect: Santiago Calatrava.


Sketch showing the different layers of an underground station.
The artificial sky and the artificial sun in the light laboratory at Wismar University were used. The pictures show the process of building the model and the first trials.

Daylight underground

Daylight in underground stations can do much more than just illuminate the space (a condition that is necessary but not sufficient); they can also provide orientation and information. When considering how to bring comfort and an attractive lighting atmosphere into an underground station, the author found it impossible to exclude daylight as part of the concept. The main focus was comfort: how the eye is not only able to see, but can also differentiate between the structures, the station, and the flows of movement, architecture and design.

A waved steel structure installed along the entire length of the platform fulfills two main functions: to reflect light entering through the skylights to the ceiling and to enable lighting fixtures to be integrated within the lamellas mounted below the steel structure. The artificial daylight in underground stations was composed by laying of layers of light, so that all the necessary conditions for building a station as well as safety and layout are provided. The artificial sky and the artificial sun in the light laboratory at Wismar University were used. The pictures show the process of building the model and the first trials.

Conclusion

A good lighting design for underground stations is composed by layers of light, so that all the necessary conditions for building a station as well as safety and layout are provided. The artificial sky and the artificial sun in the light laboratory at Wismar University were used. The pictures show the process of building the model and the first trials.
A play of brilliants can evoke magic in the space. Since light is ephemeral matter, it makes sense to make empirical study part of the concept development. Experiments and personal observations can help simulated concept ideas to become suitable solutions. Experiments with models, especially with daylight models, can contribute important information to the project.

There are no fixed guidelines for creating a remarkable lighting design for an underground station, since stations can differ according to site, guidelines and regulations. Each project will have its own restrictions and scope. Once the lighting designer has acquired sufficient information about the station and understands the lighting tools available, the ability to deliver an attractive, safe space relies on finding a way to match creativity to the requirements.

Bibliography
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The light effect on the ceiling is greater because of the double coloured reflection effect: from surfaces of the coloured skylights and from the upper surface of the coloured lamellas. At platform level, the effect is softer. Light from the skylights passes through the gaps between the lamellas, reflecting both white and coloured light. The picture does not render red reflections properly. In reality the reflected red light on the ceiling is softer than shown in the picture.