

The aesthetics of lighting

Abstract. The article presents reflections about connections between lighting and aesthetics. It presents the authors' vision of the problem taken from their own experiences and knowledge in the field of lighting technology and general knowledge about aesthetics. Three aspects of the problem in question were identified in the article: aesthetics of illuminated objects and lighting equipment while it is switched on and off. One of the particularly important matters of aesthetics is equipment while it's turning on, because, so far, this problem was not clearly discernible.

Streszczenie. Artykuł przedstawia rozważania autorów na temat związku estetyki i oświetlenia. Pokazano spojrzenie autorów wypracowane na bazie doświadczenia z zakresu techniki świetlnej i ogólnej wiedzy z zakresu estetyki. Dostrzeżono trzy aspekty problemu: estetyka obiektu w następstwie oświetlenia, estetyka opraw oświetleniowych przed i po załączeniu. Ważna jest również nie zauważana dotychczas kwestia estetyki włączników instalacyjnych. (**Estetyka oświetlenia**)

Keywords: lighting technology, aesthetic of lighting.

Słowa kluczowe: technika świetlna, estetyka oświetlenia.

Introduction

Electric lighting is regarded as a technical activity, which, depending on the object of the application, must meet certain technical requirements and be non-fatiguing for the eyes. This technical-ergonomic look at lightning is more frequently replenished with an aesthetic quality assessment, as the light significantly affects the aesthetic experience, creates the mood, stimulates, motivates and calms. Today, electric lightning has either practical and aesthetic function at the same time or only one of them. It has a practical function, if it properly illuminates the object, making it visible at the appropriate level. When it comes to aesthetic function, it means that the lightning serves only to create a particular effect or mood. The concept of aesthetic lighting can also refer to the used lighting equipment such as luminaires, which when shone, can cause positive experiences by their appearance and a characteristic distribution of luminance. On the other hand, when extinguished, they have a function of an attractive element of an interior thanks to their interesting forms.

De gustibus non disputandum est

It appears to be impossible to unequivocally state whether the lighting is nice, because everyone likes something different. It is widely believed that sodium lighting is unattractive, because it narrows the reception of natural colours - especially green[6]. However, some argue that this type of lighting creates a warm ambience. It is obvious that in every society there are tendencies towards certain tastes. They are conditioned by the culture, traditions, advertising, trends and the mass media. Nevertheless, the final assessment is always individual. It is well known that is easier for people to determine something that they do not like, for example because it is unpleasant to look at. Another example is glaring light which will be uncomfortable even in the most beautiful lamp. If it comes to relaxation time, it is obvious that nobody can do it in the bedroom which is too much illuminated. Contrarily, insufficient light in the workplace makes it difficult to perform particular actions, affects a visual fatigue and causes discomfort. People also do not like when the paintings at art galleries are too hard or too poorly lit, because it interferes with their perception of art.

There is an opinion that circulates among the lighting industry. It says that an aesthetic lighting is one that gives the effect, but whose source cannot be seen. However, this is a relatively simplified thinking about the aesthetics of lighting. The aesthetic effect must be guaranteed, even if you cannot see the source of light, because one of its

major functions is the induction of emotions. It seems, that the most appropriate way to characterize what the aesthetics of the lighting is, is to look at the issue through the prism of generally understood aesthetics. .

The aesthetics of lighting - general features

In accordance to the theoretical definition of the term 'aesthetics', it is understood as the preservation of proportion, moderation, relevance, usefulness and harmony[4]. The meaning of this term is sometimes described in short – aesthetics is the truth and good [5]. The issue of aesthetic lighting should be analysed in two different categories: an aesthetic effect (the object's appearance as a consequence of lighting) and aesthetics of a device (lighting – fixture, lenses, placing). While assessing the aesthetics in automotive lighting, the attention should be paid to the aesthetics of hardware. The effect of an automotive lighting is difficult to predict, because it depends not only on the characteristic of a reflector but also on the course of the road and its ambient. In the illumination of various objects, one has to put more attention to the effect of the illumination rather than to aesthetics of the object itself. When it comes to an illumination of the interiors, both categories of the aesthetics of lighting are equally important.

Bearing in mind the general definition of aesthetics and its importance in the sphere of the electric lighting, it should be understood as the combination of certain characteristics such as:

- the ratio of luminance (gentle and uniform luminance distribution),
- the harmony of colours, luminance distribution and the arrangement of lighting fixtures,
- the moderation of the levels of lighting: the luminance, the number of luminaires and the number of lighting accents,
- the appropriateness (the relevance of the choice of different solutions and characteristics),
- the utility (serving a specific function).

Having right proportions in lighting means:

- having a ratio between the brightness of certain accents and the brightness of general lighting,
- having a ratio between the luminance of the luminaires and the ceiling,
- having a ratio between the luminance of the working surface and the brightness of the walls and the ceiling,
- having a ratio between the size of luminaries and the size of the interior,

- having a ratio between the size of the shadows and illumination.

The harmony in lighting can be expressed by:

- the harmony in the arrangement and the distribution of colours used for lighting,
- the harmony in the luminance distribution (avoiding strong contrasts and unreadable "designs" of the spots of light and shadows, the use of regularity, repeatability, predictability),
- the harmony in the arrangement of luminaires (regularity, accuracy, rhythm of light, etc.).

The balance means avoiding:

- too high lighting levels,
- excessively high luminance of the certain parts of luminaires,
- too many points of light source,
- too rich variety of the saturation of the coloured light.

Appropriateness means:

- selecting the right type of lighting (general and localized in the corners),
- selecting the direction of the light,
- using the proper class of lighting,
- using the right colours of light,
- using the lighting accents wherever they are needed and allowed,
- conscious and controlled use of illumination,
- matching geometric shape of the luminaires with the shape of the interior,
- conscious and rational use of the energy efficient light sources (avoiding unconditional submitting to trends and fashion).

Utility means:

- fulfilling the lighting functions as intended,
- the usability of hardware (i.e. the use of equipment wherever it is justified),
- using luminaires suitable for the purpose (waterproof outdoor lighting, dust-proof and flameproof lighting in the mines).

Deadly sins in the area of lighting aesthetics:

- glare,
- disharmony,
- distortion of colours and shapes, lack of consistency,
- freedom of using coloured lighting,
- shoddiness and carelessness (bare light sources suspended on a cable, incidental replacement of light sources and luminaires).

In conclusion, in every society there appears to be different preferences in the area of lighting aesthetics. The light which intensity can be moderated is more popular than the lighting that is exaggerated. This means that it should adjust to the surrounding. It appears to be better to receive a warm light than a high colour temperature light. Most people like the lighting which is not intensive, quiet, consistent and uniform. However, there are always exceptions, because the final assessment is individual.

Aesthetic requirements for individual areas of lighting

The aesthetics of street lighting is mainly conditioned by a collection of lit lanterns, which should be identical - equal height, neatly arranged, equal spaces between them and from the curb. After fulfilling these conditions, they form a perfect picture – the points of light create a line, which is parallel to the course of the road. Aesthetics of the street lighting also include the selection of the forms of light (the pole and housing), which is adapted to the architecture of the nearest street environment. In the historic areas, the lit lanterns should be stylish and should look nice when they are switched off, which is not inconsistent with the need of carrying out a specific photometric solid. Street lighting will

be considered aesthetically pleasing, if the luminance distribution surface is uniform, without shadows cast by the trees and without dark spots resulting from improper distribution of luminance on the road (Figure 1). An installation which generates an excessive glare is considered as unaesthetic, because it acts on the emotions..



Fig.1. Geometrically structured, regular line of the points of light (optical arrangement) and high uniformity of illumination of the road determine the aesthetics of street lighting to the greatest extent.

The aesthetics of automotive lighting

The aesthetics of automotive lighting is mainly the headlamp and signal lamps, noticed during the day and at night. In this area of illumination, the street lighting is so important anymore. It is significant, to form the headlamp in a way which is aligned with the line of the body of a car.



Fig. 2. Aesthetics of the automotive lighting should be judged solely on the basis of the look of the headlamps and signal lamps, both in daylight and after switching.

In previous years, an arrangement in which the line of the body of a car was smoothly joined with the line of a lens reflector was considered as a determinant of automotive lighting aesthetics. Nowadays, the engineers are trying to create the new category in this area of aesthetics. Headlamps are more distinctive and unique (usually applies to DRL). Particular brands can be identified by the characteristic line of lights (oval, curved etc.).

The aesthetics of automotive lighting is also evaluated based on the image of the back signal light when switched on. Signal lamps are the objects of observation for the drivers. The luminance distribution of the signal lamp cannot be accidental, even from the point of view of the requirements for photometric. The luminaires must meet all the formal requirements. It is expected that the image of the shade will present the planned figure with regularly distributed points of light (scattering macrostructure, reflector, matrix of LED-s, attractive light-line system, uniformly bright and shiny surface of the output lens etc.

In the area of the aesthetics of illumination

In the area of the aesthetics of illumination the general look of the equipment is less important than the effect of the whole illumination. Since, by definition, it should be invisible (the principle of hiding the reflectors and floodlights [1], [2]). So it is totally different than in the automotive lighting. In the illumination, the effect of lighting that complies with the principles of illumination is considered as aesthetic. What is more, one should bear in mind the level of the light expressed in the value of an average luminance of the

object, as well as local accents (keeping proportions). It is said that the skilful use of lights and shadows can give the effect of positive emotions while looking at the illuminated objects. If it comes to too aligned illumination, where the object and all the details are equally clear and 'flat' at the same time, it is described as unaesthetic. (Figure 3)



Fig. 3. The illumination is considered as aesthetic in such projects, where both – light and shadow are used at equal level (on the left). The object which is fully illuminated frontally is considered as unaesthetic (on the right).

In frontal illumination, the objects lose their plasticity. Situations, in which the shadows coming from the details are too deep and cover a substantial part of the facade are also not welcomed. In addition, too much usage of coloured light, especially with the high saturation and multiplicity of shades are not good either. They are not creating the proper associations with the nature and the function of the object. Taking care of details and paying attention to all the technical details and conditions of the light sources used in the illumination is also of high importance. A single not functioning reflector may destroy the order and the consistency of the illuminated object and cause distortion.



Fig. 4. Appropriateness in lighting also means the suitable connection between both – aesthetic and technical characteristics used to illuminate the object or space.

Lighting in public spaces

Lighting in public spaces, as well as in interiors, is the largest area of the application of the artificial light (electric light). It seems that the effect of illumination and the form of lighting equipment are of equal importance. In large public places, it is necessary to have many points of light or, alternatively, a big chandelier. It appears that this feature of public places shows a whole range of implications directly related to aesthetics: the regularity of the distribution of the points of light, equal authentication, light distribution and colour of light. In the area of lighting effects, it seems that apart from ergonomics, aesthetic lighting implements some psychological effects: adequate saturation of light in the room, spaciousness, clarity, pleasure, relaxation etc. These effects are the result of the implementation of the appropriate levels and proportions of luminance in the interior. Aesthetic lighting in the interiors of the public places is also a balance between the specular light and diffuse light. The result of this is a balance between the need of visibility of certain details and the general lightening of the entire interior. We can also improve the aesthetics of lighting by bearing human preferences in mind, such as

selection the colour of light and adaptation the level of lighting to the rhythm of the day.

The aesthetics of interior lighting

First of all, the decision about which colour of light will be the most suitable for a certain interior should be conscious, not accidental. Secondly, the colours of lighting in all the rooms in one interior/building should be consistently and skilfully combined to form a coherent whole. The main mistake in the area of lighting the interiors is the wrong choice of the color temperature of light and inadvertent use of the light sources which have different shades of white in one room – it gives the effects of imbalance and negative perception of the space. The best light to perceive in the interiors is warm white, which technically, can be specified as 3000K color temperature. The use of light with higher colour temperature, and thus colder shade of white, is reasonable in the rooms such as the bathroom. In this way, it will look more like a sterile place. A cold shade of white is also suitable for harsh and minimalist designs. It appears to be difficult to describe all the dependencies, especially because of the fact, that the owner of the place or object is making the final decision.

Aesthetic lighting is designed in accordance with its intended purpose. The first step should be to decide how the general lighting should look like. It should evenly illuminate the entire room. What is more, the light concentrated on the ceiling (notably in larger areas) can form a sufficiently high uniformity. This form of lighting can be achieved by using ceiling recessed or suspended luminaires. It is important for the light sources to have wide beam light distribution. If it comes to complementary form of general lighting, one can use the corner lighting, which means lighting selected areas such as workplace, reading space or a place in front of the mirror.

The intensity of the distribution of lighting is this parameter which, undoubtedly, affects the aesthetic perception of the room. However, one cannot generalize and say that non-uniform lighting of spaces is unaesthetic. What is significant here is the idea about some kind of uniformity of the light spots. The lighting which causes irregular so-called light spots, caused by a poor selection of a beam angle, its placement and direction, is described as a dissonance.

To reduce the luminance levels and unpleasant or disturbing glare, the light sources should be adequately hide, so that the surface which is emitting the light does not cause it. The luminance of the lenses should also be moderated. The luminance distribution should be uniform and adapted to its geometric shape. Considering the issue of aesthetics of lighting, the aspect of design and art should also be considered.

Lighting fixtures are the most subjective criterion of the aesthetic of the interior lighting. We can now describe the technical and decorative luminaires. The former ones, can be determined by their appearance in the relation to its function: waterproof mesh in the bathroom, vandal-resistant wall lights in the stairwells, the dustproof luminaires in the factories etc.. In the case of the latter ones, which are the part of the design and sometimes serve the main element of the interior, it is not possible to determine the aesthetic guidelines. Currently, we have a huge variety of styles used in the interior design and each of them is characterized by the taste of the designer and investor. Therefore, there can be as many views and votes for the aesthetic luminaires as there are interior design projects.

However, there are some aspects that in some way define the aesthetics of the fittings:

- luminaires should be aesthetic in both situations - when they are not illuminated and also after switching,

- luminaires should match the style and the function of the interior in which they are used,
- luminaires should have the suitable length of the cables,
- the size of the luminaires should adequately correspond to the size of the room.

Summary

This article is one of the first attempts to answer the question about the aesthetics of the electric lighting. The ergonomic criteria of the correct lighting and the safety criteria are already known and developed. The problem of the aesthetics of light and the lighting was so far left somewhat aloof.

The light is an integral part of the architecture from its beginnings. Thanks to the sun rays, fire and electric light sources, we are able to receive the architecture through the sense of the sight [3]. One can assume that it is impossible to understand the aesthetics of lighting without the knowledge of the architecture, the history of styles and the purpose of having the certain buildings. It is all followed by another feature of the aesthetics of lighting, which makes it impossible to determine the rigid framework of the level of lighting according to the architectural style. Moreover, it appears to be an individual matter, conditioned by the period of the uprising, geographical location, application etc.

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