Krzysztof SKARŻYŃSKI

Warsaw University of Technology, Institute of Electrical Power Engineering, Department of Lighting Technology

doi:10.15199/48.2015.08.38

Possible ways of floodlighting the baroque-style Zamoyski Palace in Kozlowka

Streszczenie. *Artykuł przedstawia możliwości kształtowania nocnego wizerunku Pałacu Zamoyskich w Kozłówce za pomocą różnych sposobów jego oświetlenia. Praca zawiera krótki opis historyczny i architektoniczny obiektu, a także cztery koncepcje jego iluminacji, przedstawione w postaci wizualizacji komputerowych. Ta najbardziej odpowiednia została przez autora scharakteryzowana przez podanie danych projektowych w postaci charakterystyki sprzętu oświetleniowego, jego rozmieszczenia i uzyskanego rozkładu luminancji.*

Abstract. *This article is about the possible ways of creating a night view of Zamoyski Palace by the use of different floodlighting concepts. The article contains a short historical and architectural specification of this object and four visualizations of the four concepts of floodlighting. For the most appropriate concept, the technical parameters of the project have been shown, such as luminance distribution on the front elevation, and the location and specification of luminaries. (**Możliwości iluminacji barokowego Pałacu Zamoyskich w Kozlówce**).*

Słowa kluczowe: technika świetlna, projektowanie oświetlenia, iluminacja obiektów, wizualizacja komputerowa oświetlenia
Keywords: lighting technology, lighting design, floodlighting, computer visualization of lighting

Introduction

The illumination of objects is a relatively recent field of Lighting Technology. This term can be defined as “the effect of operations, which, by means of artificial lighting and other activities, expose an object at night time, especially visually” [1]. As the practice of lighting design shows, floodlighting is, in most cases, designed for those objects and buildings which are of historical significance and/or those which are distinguished from their surroundings by their sophisticated architectural structure. Zamoyski Palace in Kozlowka is definitely one of the latter objects. The aim of this article is to present the architectural and historical specifications of the Palace. It also aims to present the possibilities of illuminating this object by means of a modern method of lighting design – the computer visualization of lighting.

Fig. 1. Front elevation of Zamoyski Palace during the daytime

Specifications of the object

Zamoyski Palace is located in south-east Poland, in the northern part of the District of Lubelskie, near the town of Lubartow and the village of Kamionka. It is a noble residence, surrounded by a large garden. It was built in the first half of the XVIIIth century, in the period dating from 1735 to 1742 [2]. It is most likely that, in its first form, it was designed by an Italian artist named Joseph Fontana II, who designed it to order for one of the Polish nobles, Michał Beliński. In 1799, Franciszek Beliński sold the residence to the Zamoyski Family. Thanks to them, the palace was in use until 1944. After World War II, it was requisitioned by the Polish government and in 1979 it was transformed into a museum because of its perfectly preserved interiors, which are unsurpassed anywhere else in Europe. In 1992, it was transformed into the Museum of the Zamoyski Family in Kozlowka. The building is very important in terms of Polish heritage, and, because of this, in 2007 it was classified in the list of national historical monuments [2]. Also in the grounds of the palace are the Museum of Polish Socio-Realism and an antique carriage house.

The structure of Zamoyski Palace is based on the plan of the Palace of Versailles, which in plan-view is similar to a letter “U”. Just as is the case with its French prototype, the palace is located within a courtyard, with a main gate at the front of the residence, and a garden. On the pediment on the front elevation is the symbol of the Zamoyski Family – known as the Jelita crest. A beautiful and extensive garden in the French style lies at the back of the palace. The contemporary look of the palace is classified as baroque style. On the front elevation there is an arcade, with a main entrance leading to the interior of the building. Above that there is a wide balcony with two rows of Corinthian columns, which are topped by a tympanum. Along the walls of the palace are two lines of richly-decorated windows. The roof is high and is constructed of red tiles. There are six chimneys and two small balconies, which are decorated with floral motifs. On both sides of the palace are two symmetrically located towers, whose domes are made from green metal plate. Each of them has a tall spire and a large clock with golden hands. On the towers there are motifs of shells and pearls, which are typical of the baroque style.

Directions of observation and analysis of the actual lighting of the object

The object is in a remote location, but lies only a short distance from main roads. This fact means that hundreds of tourists per day visit it during the summer season, when it is open to the public. Its historical dignity, architectural beauty and current function make it a perfect choice as an object for the design of an illumination. The main direction of observation was defined. It was chosen as the one from the main gate to the front elevation (fig. 1). The factor of the distance of the observer was also taken into account. In this case it was classified as close, because, from the main direction of observation, “the observer can see the details and can define the components of the elevations and select particular architectural details” [3].

Both the area around the Zamyoski Palace and the palace itself have hardly any lighting. (There are a few points of light, for which proper lighting parameters cannot be provided). The environment of the palace is very dark. For the purposes of the project it was agreed that the average luminance of the front elevation was 1 cd/m^2. Therefore, it was decided that the illumination would be designed for a level of luminance of about 6 cd/m^2 [4].

Fig. 2. Computer visualization of actual floodlighting of the object

Concepts of illumination

The first concept for the illumination of Zamoyski Palace was based on the assumption of flooding surfaces of an object with artificial light [5]. It gives the greatest consistency to the final visualization. What is more, to avoid the effect of a negative, flattened image it incorporates the idea of asymmetrical shadows. This means that luminaries (of power 250 W and 400 W and a luminous flux of 20 000 lm) are located at a distance of 30 m from the object and are directed at a narrow angle to the front elevation. Metal halide lamps with a colour temperature of 4000 K are used. This effect of illumination is shown in figure 3.

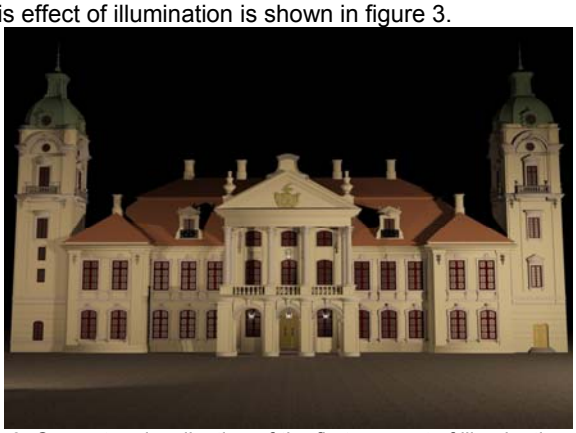

Fig. 3. Computer visualization of the first concept of illumination

The second concept of illumination allows for the possibility of the clear accenting of particular regions of the front elevation by specific separation (fig. 4). It was achieved by the use of different colour temperatures of light. The surfaces of the arcades, the balcony and the towers are illuminated by luminaries of 35 W and 70 W sodium lamps with a colour temperature of 2000-2500 K. Both sides of the front elevation, the pediment and the domes are illuminated by cold light (colour temperature of 5000 K) from luminaries with metal halide lamps.

The next proposal of a night exposure of Zamoyski Palace is the possibility of an accent specific “rhythm of elevation” of such baroque objects (fig. 5). This term refers to a certain pattern of repeatability of elements and other architectural details on the main elevation. It makes them appear in an orderly, cyclical array. The object was illuminated by luminaries of high power (250 W and 400 W) located at quite a long distance away. Each of them includes metal halide lamps with the colour temperature of daylight (approximately 6500 K). The rhythm of elevation was highlighted using the technology of light emitting diodes (LED’s). This allowed for the miniaturization of the lighting equipment. This was done by illuminating the edges of the windows with small LED luminaries (3 W, luminous flux 126 lm). Their colour temperature of 2500 K was created in a virtual way. In fact, in a real setting, it could be achieved by using colour filters or RGB technology.

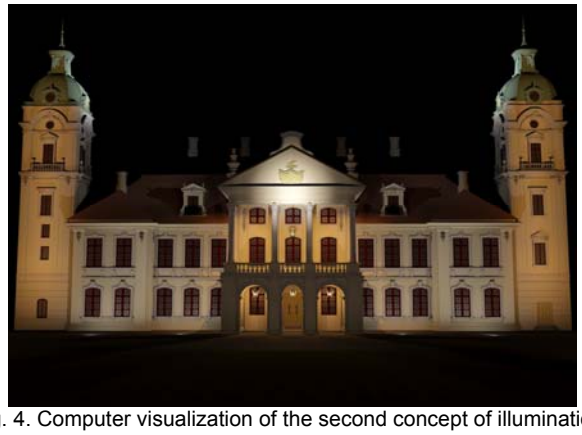

Fig. 4. Computer visualization of the second concept of illumination

The next concept highlights the baroque style of the palace (fig. 6). The lighting was designed to accent, in a natural way, the characteristic properties of this style. Linear luminaries with LED’s were used. Their task is to expose the horizontality of the object and the fact that it is very wide. They are arranged along the main roof surfaces and also above the tympanum. The wings on the front elevation are illuminated by asymmetrical luminaries with metal halide lamps of 35W. Additionally, there are lighting accents on the pilasters. This is achieved by using ground-recessed rotationally symmetrical luminaries with 35 W lamps. The lower parts of the towers and domes are illuminated from a distance by 70 W luminaries. This concept is also used to achieve the illumination of the arcades and balconies. To do this, the existing large external chandeliers are used, with additional 35 W asymmetrical luminaries. Existing sources have also been exchanged for new ones with a colour temperature of 4000 K as in the other lighting equipment [5]. Moreover, to emphasize the dynamic of the baroque style [6], there are lighting accents on the edges of the windows, on the small balconies located on the towers and on the sculptures on the tympanum. The front surfaces of the arcades are also illuminated by two rows of rotationally symmetrical luminaries.

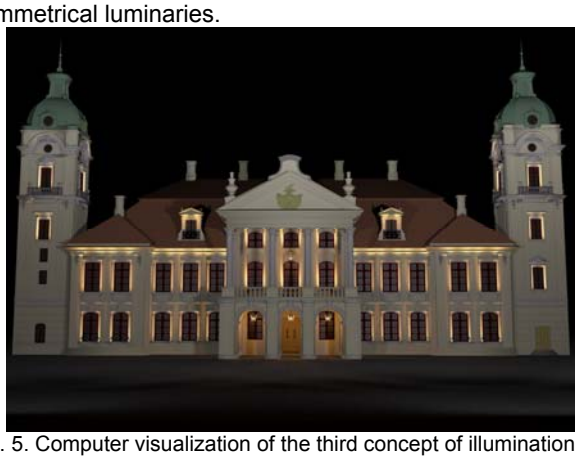

Fig. 5. Computer visualization of the third concept of illumination

Verification of the research and technical parameters of the project

The first concept of the illumination of Zamoyski Palace in Kozlowka is characterized by the most consistent image (fig. 3). The lighting is very regular, which is definitely the advantage of this method of illumination. It can also be interpreted as rather boring and monotonous. This is because the wealth of architectural detail cannot be satisfactorily highlighted by flooding surfaces with light.

Fig. 6. Computer visualization of the fourth concept of illumination

The second concept (fig. 4) of illumination, based on separation of regions of elevations by using different colour temperature, is more ordered than the previous one. The different colours do not distract the observer, because of following standard procedure – the same or similar regions are illuminated in the same way. However, this image is not very consistent; there is too wide a separation of regions.

The third concept is connected to the rhythm of the elevation (fig. 5). It is undeniable proof that by using specific lighting a different atmosphere can be created. The image of the object creates a mood of sadness and melancholy. The most problematic issue in this variant is that it is impossible to hide all of the luminaries from the sight of the observer. There are a lot of luminaries, two on the edge of every window. This is a rather negative feature.

Table 1. Summary of lighting equipment used by the chosen concept of illumination

No.	Designation	Amount of luminaries	Site of installation	I_{max} [cd]	$\delta_{1/2}$ [°]	Type of light source	T [K]	Φ [lm]	P [W]
1	A	27	top part of the roof	3868	C0: 10 C90:97	LED	4000	1652	36
2	B	12	cornice below tympanum	775	C0: 10 C90: 97	LED	4000	331	8
3	C	34	cornice below lower part of the roof	2320	C0: 10 C90: 97	LED	4000	991	24
4	D	4	on the ground	25780	C0: 60 C90:85	MH	4000	3300	42
5	E	4	on the ground	1542	C0: 10 C90:10	MH	4000	3200	39
6	F	14	near border of windows	4140	C0: 8 C90: 8	LED	4000	126	4
7	G	2	along beam below pediment	1775	C0:43 C90:68	MH	4000	3300	48
8	H	4	on tympanum	1125	C0:7 C90:7	LED	4000	420	8
9	I	2	on roof behind pediment	142249	C0:7 C90:7	MH	4000	6600	88
10	J	2	30 m from the tower	23530	C0:7 C90:65	MH	4000	6600	88
11	K	4	on the ground	2875	C0:25 C90:25	MH	4000	1600	23
12	L	4	cornice below columns	6385	C0:26 C90: 26	MH	4000	3300	18
	TOTAL:	113						TOTAL:	2908

The last concept of illumination creates an image of the palace which is very consistent and ordered (fig. 6). This concept enables the luminaries to be hidden. It is characterized by a corresponding gain in depth and height. The edges of confluent surfaces are highlighted in an appropriate way. One can also emphasize the richness of the baroque style. The illumination is designed in such a way that it links architecture and lighting through accented vertical and horizontal divisions of elevation and architectural details with the dynamic of the baroque style. It seems to achieve the most appropriate concept of illumination. Table 1 and Figures 7 and 8, show the technical parameters of this method of illumination of Zamoyski Palace.

Conclusions

This work presents a project for the illumination of Zamoyski Palace in Kozlowka. It describes the historical background of that object and a short architectural description of the style in which it is built. The location and current lighting of the surrounding area is also commented on. Zamoyski Palace was selected as an appropriate object for the design of an illumination, because of its history and status. This new illumination had to highlight the importance of the building. In this work, four possibilities for the creation of a night image of the palace are described. Each of them has been detailed and remarked on. Finally, the author has verified his design work and selected the most appropriate concept for the achievement of the illumination. The technical parameters of the chosen concept are given; a summary of the lighting equipment and its luminance distribution (obtained using a virtual method) is also given.

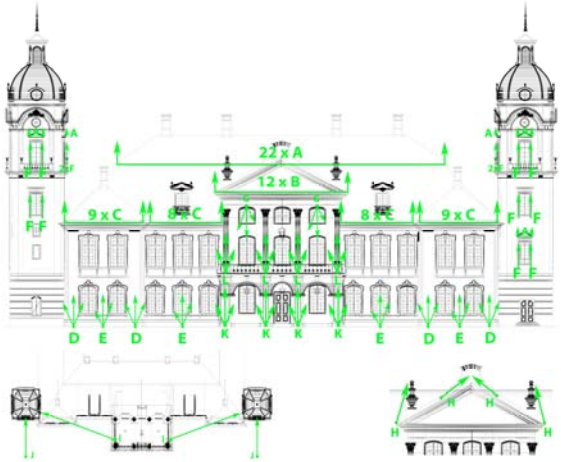

Fig. 7. Location and direction of the luminaries according to the chosen concept of illumination

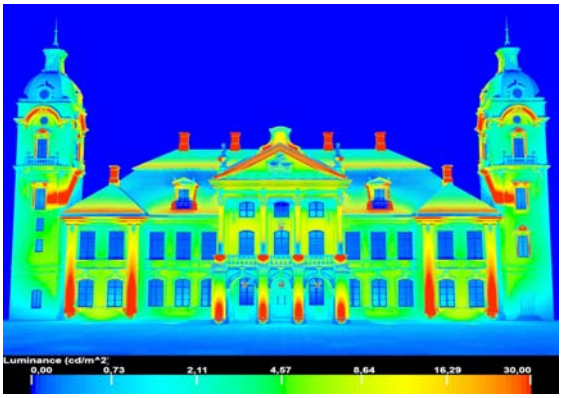

Fig. 8. Luminance distribution connected to chosen concept of illumination

REFERENCES

1 Żagan W., Iluminacja Obiektów, Warszawa, Oficyna Wydawnicza Politechniki Warszawskiej, 2003,
2 www.muzeumzamoyskich.pl
3 Kołodziej M., Iluminacja neogotyckich obiektów architektury sakralnej, rozprawa doktorska, Warszawa, Politechnika Warszawska, 2007
4 CIE 094 – 1993, Guide for Floodlighting
5 Skarżyński K., Studium iluminacji obiektów barokowych na przykładzie Pałacu Zamoyskich w Kozłówce, praca magisterska, Warszawa, Politechnika Warszawska, 2014
6 Broniewski T., Architektura renesansu i baroku, Wrocław, Zakład Narodowy im. Ossolińskich – Wydawnictwo, 1966

Author: *Krzysztof Skarżyński, MSc, Warsaw University of Technology, Institute of Electrical Power Engineering Department of Lighting Technology, e-mail: krzysztof.skarzynski@ien.pw.edu.pl*