

## UPGRADE OF LIGHTING IN HALL 277 OF THE STATE HERMITAGE

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### ABSTRACT

This article outlines the experience associated with the reconstruction of lighting of Museum Hall No. 277 located in the historical interiors of the Winter Palace of the State Hermitage. This work is aimed to create a harmonious light environment in the Museum Hall, favourable for the general perception of the architecture and interior of the hall, and to provide conditions for the full perception of the exhibited items. Identified difficulties are:

- Non-classical dimensions of the Hall, which is part of the French enfilade;
- Polychrome painting and stucco on walls and ceiling;
- Venerable age (darkening of the paint layer) and uniqueness of the paintings, as well as large dimensions of the frames.

The general parameters of the lighting system consisting of two parts – the general lighting of the Hall and the lighting of exhibited items – are determined. The system shall provide a joint combined operation of two independently flux-controlled diffused (reflected from the ceiling) and directional (direct) light components. The system should be adjustable (to an extent) to possible exhibition changes. The system should not have a negative impact on the exhibited items and the interior. The system influencing technical parameters, such as types of light sources, their correlated colour temperatures, levels of general and special colour rendering indexes, the types of lighting devices and their location, approximate illumination levels in paintings and walls, the approximate ratio be-

tween illumination, and direct and scattered light in paintings, are selected.

The performed construction and installation works, as well as the adjustment, have shown that the updated lighting installation meets the set tasks and complies with the requirements of quality perception and safety of exhibited items and interior of the hall.

**Keywords:** museum lighting, exhibition lighting, lighting of museums in historical buildings

In preparation for the 1<sup>st</sup> International Scientific and Practical Conference “Light in the Museum” our company, which is a part of BOOS LIGHTING GROUP International Lighting Corporation, performed the works on the illumination modernization of Hall No. 277 of the State Hermitage Museum in St. Petersburg, dedicated to the 17<sup>th</sup> century French fine arts. The Hall exhibition presents five paintings of medium size and one large-sized painting. 300–400-year-old paintings of different artists due to the very dark background and under the existing lighting were hard to perceive by the viewers. Before the modernization, the lighting installation of the hall consisted exclusively of cornice lighting devices – the light fixtures with 3,000 K fluorescent lamps are installed on the cornice in the vault impost and focused on the ceiling; the light reflected from the vault illuminate both the walls and the paintings on the walls. The illumination on paintings (and walls) in the evening was no more than (25–38) lx. The luminous flux falling on the paintings was only scattered. The second component for a good perception of paintings – the direct light – at night time was absent at all. Thus, with almost the

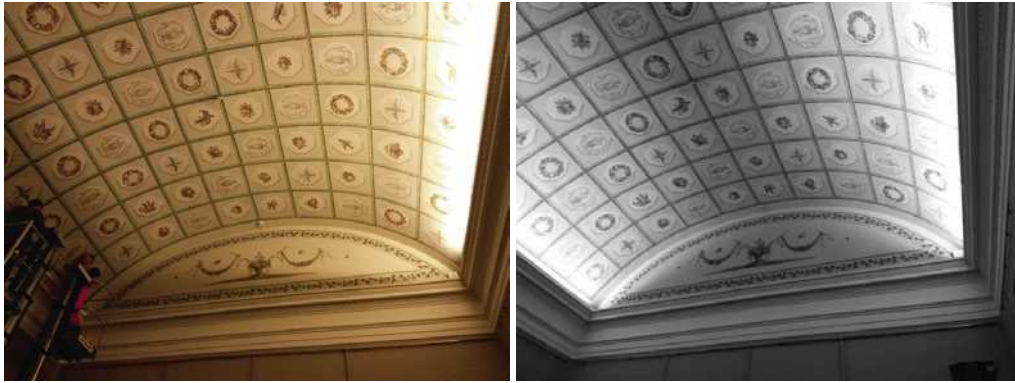


Fig. 1. The vault illuminated by fluorescent lamps (old lighting installation) (left) and LEDs (new lighting installation) (right); in the right photo, the ceiling shape is better read



Fig. 2. Photo of Valentin Lefebvre's painting "Esther before Ahasuerus", taken during lighting with high  $R_a$  and  $R_g$  LEDs (new lighting installation). The amazing palette of the artist revealed, and the plot became not threatening, but positive – the pointing hand of Ahasuerus with the rod saving Esther is clearly visible

same illuminance from scattered light on mostly dark paintings and quite bright walls, the paintings could not attract the attention of visitors.

Relatively small Hall No.277 (slightly more than 40 m<sup>2</sup>) has the same height as the adjacent halls of the French enfilade: the cornice top is more than 5 m from the floor and the top of the cylindrical vault is in about 7 m away. That is, the ratio of the height of the possible mounting point of the bus bar (the cornice top) and the linear dimensions of the hall is not quite convenient for lighting fixtures installed on the bus bar. In order to ensure the proposed angles of light falling on the paintings (within (45–75) ° to horizontal) at

high level of bus bar suspension, it is necessary to sufficiently distance the bus bar from the wall with paintings. At the same time, the enfilade arrangement of the halls imposed the restrictions on the installation of the bus bar with light fixtures. In order to minimize the possible blinding of the visitors when looking along the axis of the enfilade, it was necessary to exclude the appearance of the blind lamp in the enfilade, that is, to bring the bus bar closer to the wall with paintings. With such counter directed geometric requirements, the large frames of paintings proved to be an additional complicating factor. However, it was necessary to help visitors to see the paint-

**Table. Technical Data of Aphrodite and Vega Lighting Devices by GALAD**

Device Name	Power, W	Correlated colour temperature, K	Full angle of radiation at 0.5 degrees	Place of device installation
Aphrodite	6, 13	2,860–3,040	12, 24, 52	On the bus bar
Vega	20	4,000	22 x 90	On the cornice



Fig. 3. Photographs of Valentin de Boulogne's picture "Expulsion of the Money-Changes from the Temple" (central painting of the hall), taken during lighting with fluorescent lamps (old installation) (left) and LEDs (new installation) (right); in the right photo the leading characters look more expressive

ings of hall No. 277 better, because there was actually no special lighting of the paintings in the hall.

Moreover, it was necessary to show the shape of the ceiling and its beautiful paintings, to preserve the usual image of the hall, and therefore, the cornice lighting. Therefore, the updated lighting installation of the hall was to consist of general lighting (reflected light) and lighting of paintings (directional light). It was also necessary to bring the lighting system to one type of light source, and precisely to the one with better spectral characteristics for lighting the canvases – the modern LEDs with high general colour rendering  $R_a$  index and high special colour rendering  $R_9 - R_{14}$  indexes (for saturated colours).

Therefore, it was necessary to replace the cornice lighting devices with LED devices, capable to reduce the brightness in the base of the vault and stretch the illuminated part of the vault in height, and having a group control (Fig. 1). To illuminate the paintings, LED devices of several types by luminous intensity distribution, independently flux-controlled, were required. The Vega (cornice lighting) and Aphrodite (painting lighting) devices by GALAD were chosen.

The light fixtures for installation on Aphrodite's bus bar are designed for 48V, which not only visually minimizes the installation by dimensions, but

also allows manually controlling the flux (in situ, for each lamp), without using the automated control system, which cannot be installed without damaging the interior in such a miniature hall.

Installation works and targeting of luminaires were performed in a short time.

The work results are presented in the photographs taken during the installation (Fig. 2, 3). Even with low quality of photos, the accents appeared which were not noticeable earlier. Since the general colour rendering  $R_a$  index of Aphrodite LEDs is 98 % and the red  $R_9$  index is also 98 %, the colours of paintings look more saturated than in lighting by fluorescent lamps. The paintings have become more expressive.

Correlated colour temperature of Aphrodite LEDs is about (2,900–3,000) K, Vega LEDs is about 4,000 K. Thus, the joint action of the two types of lighting provides a correlated colour temperature about 3,200 K to the light falling on the paintings, which also positively influenced the artistic expression; the important areas of paintings, inconspicuous under the previous lighting, were displayed (Fig. 3).

In our opinion, at the adjustment the best ratio of the general lighting for evening perception from the cornice (25–30) lx and the lighting from the bus bar (40–120) lx was set (Fig. 4). And, the light fixtures on the cornice operate in 20 % of their maxi-



Fig. 4. View of Hall No. 277 with updated lighting

imum luminous flux. The bus bar luminaires are set at (40–60)% of their maximum luminous flux. If, over time, there is a need to shift the semantic accents or to hang the paintings somewhere else, by changing the luminous flux of Vega's lamps, controlled in a group manner, and Aphrodite's lamps, controlled individually, it is possible to set not only new values of illumination, but also, in small limits, the ratio of cold-white and warm-white light in the paintings.

Earlier, the evening illumination in the paintings was no more than (25–38) lx, whereas in the new

installation the illumination in the paintings from two types of lighting was no more than 150 lx, of which about 25 lx is from the general lighting.

Technical data of the lighting devices used to modernize the lighting of the Hall No. 277 are presented in the Table.

International Lighting Engineering Corporation BL GROUP appreciates the cooperation and assistance of the State Hermitage Museum staff, who contributed to the installation works on lighting the hall No. 277 in a short time.



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engineer, graduated from the Moscow Power Engineering Institute with a degree in Lighting and Light Sources in the 1976. At present, she is a Chief specialist in lighting solutions of SvetoProekt, LLC and member of the Russian Designers Association. Her professional interests are design of architectural and landscape illumination, internal electric lighting of public facilities, lighting of museums and exposition lighting