

## LUMINAIRES DESIGNED FOR INTERIOR LIGHTING OF PUBLIC AND CONSTRUCTION BUILDINGS

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### ABSTRACT

Determining the applications of different types of light sources in different areas of public buildings is a huge, constantly changing process. The emergence of new light sources and the improvement of traditional light sources necessitate their redistribution into more appropriate and effective areas of use.

### Key words

Visual task, visual strain, illumination level, light distribution, illumination unevenness.

Public buildings (PBU) include buildings and structures intended to house organizations, institutions and enterprises, administrative buildings, educational, health and recreational buildings, buildings of commercial institutions, hotels, multifunctional buildings and complexes. Depending on the purpose and nature of the equipment, the power of lighting equipment is at least 25% of the total electrical load, and in some cases much higher.

**Characteristic groups of premises.** The premises of public buildings (public buildings) are divided into four characteristic groups according to their intended purpose. Group I premises include work areas with intense visual work and a line of sight fixed to the working surface. These are work spaces, offices, classrooms, laboratories and others. The working premises of many consumer service workshops essentially belong to group I premises, but their lighting equipment (lighting equipment) is regulated by industrial lighting standards.

Group II rooms include rooms in which the task of vision is to isolate an object from the scenery of the environment. These are shopping malls, kitchen canteens, museums, conference rooms and meeting rooms, gyms, group rooms in kindergartens, playrooms, dormitories and others.

Enhancing the environment is the main visual task of Group III premises (auditoriums, foyers, huts, winter gardens, halls, lobbies, etc.).

In modern health facilities, large areas are occupied by corridors and staircases, rooms with bathrooms, in which conditions for people to stay must be provided (rooms of group IV).

It should be noted that the inclusion of healthcare facilities in one group or another has a certain convention. For example, in premises of group II there are often workplaces with intensive visual work, characteristic of premises in group I (for example, cashiers' places in trading floors); lobbies (rooms of group III) are often used as exhibition rooms (group II); corridors (group IV) serve as recreation areas (group III) for visitors.

**Sources of light.** Determining the areas of application of different types of luminaires (light sources) in different rooms of the healthcare facility is a huge, constantly changing process. The emergence of new OPs (lighting devices) and the improvement of traditional OPs necessitate their redistribution into more appropriate and effective areas of use. For example, FLs (fluorescent lamps) are still the main source of light in most indoor premises; the luminous flux they generate is about

90% of the total luminous flux of the OP (lighting devices). In indoor premises, as a rule, LLs with a general color rendering index of at least 80 and a color temperature of 3000-4000 K are used. LLs with a power of 18, 36 and 58 W are widely used. The introduction of energy-efficient LL 75 tubes with a diameter of 16 mm is considered more promising. Premises with increased requirements for color separation (exhibition halls, showrooms, meeting rooms of republican significance) must have an overall color value of at least 90. They are illuminated using LL with a transmittance and a color temperature of 3000, 4000 or 6500 K.

In the premises where events broadcast on color television are held, the Russian Federation is subject to special requirements, first of all, to the spectral composition of radio frequency radiation. This mainly applies to theaters and sports facilities.

The comfort of the light environment can be significantly increased and a more natural perception of the color of the interior and a person's face can be achieved by using luminaires with improved color rendering.

To increase the comfort of lighting in the OZ, it is important to eliminate the dawn effect. Outside of large rooms (theatres, concert halls, museums and exhibitions) with multi-lamp artistic chandeliers or special decorative lighting in the rooms, external lighting should not be visible. The situation with reducing gloss rebound is a little more complicated. On work tables with a surface covered with glazed or sheets of organic and silicate glass, a bright image of pendant or ceiling lamps is formed, which worsens the working conditions of vision. In the case of large-sized LL YoP or the LL YoP line, it is difficult to avoid the harmful effects of reflected glare by changing the position and direction of view of the work lamp. This factor must not be ignored during the NPC design process.

In DB, a trend can be observed in the increasing use of dynamic lighting, which corresponds to the natural change in lighting conditions throughout the day. The development of electronic control systems makes it possible to change the intensity, color and direction of lighting at the request of operators of intelligent lighting devices.

**Lighting accessories.** The selection of lighting devices (lighting devices) is made taking into account their lighting parameters, aesthetic characteristics, design solutions, appearance, and economic efficiency.

To ensure a more pleasant distribution of brightness in rooms with light ceilings, part of the luminous flux YoP (at least 15%) should be directed to the upper hemisphere. In work areas, it would be more appropriate to use direct or diffused light lamps with L-type LED bulbs in the lower hemisphere. Architectural lighting devices often use reflected light lamps. In the general system of uniform lighting, a high level of illumination in the vertical plane is provided by ЁП to ЁКЭЧ types D and M.

Vertical illumination increases when using YoP with multiply reflected light. In this case, the type of YKECH in the upper hemisphere will not matter. For accent lighting, a large concentration of luminous flux is required (types K and G YoKECH).

The appearance of the YoP and its aesthetic parameters are of great, sometimes decisive, importance. However, issues of economy should play a leading role when choosing IOP for lighting the main premises. Choosing YoP based on appearance over the economic aspect can be justified only for some luxury premises or premises with special requirements.

The main premises of the database are classified as normal premises in terms of environmental conditions, which determines the possibility of using a YoP with a low level of protection.

In modern practice, outdoor LL lamps are used to illuminate most of the DB premises. They are mainly used in architectural lighting devices (light-colored ceiling panels), as well as in rooms with coffered ceilings, where the necessary protective corners are formed by building elements. Such

lamps can be used in a group of premises where the level of discomfort is not regulated (halls, locker rooms, stairs, elevator halls, corridors, passages, toilets, etc.).

LL OBD lighting fixtures can be used with either electronic or electromagnetic ballasts. The share of electronic devices in LL lamps is constantly growing due to their great advantages over electromagnetic devices. The use of electronic devices makes it possible to increase the light output of luminaires, extend their service life, reduce power losses, eliminate pulsation of the light flux, and increase the power factor.

LL must be individually compensated for reactive power. According to the rules and operating conditions, the power factor should not be less than 0.85 for single-lamp lamps and 0.9 for multi-lamp lamps.

In two- and four-lamp lamps with electromagnetic ballast, by connecting half of the OM according to a direct current circuit, the second half - according to a delayed current circuit, compliance with the standard values of the pulsation coefficient is guaranteed in premises of any purpose. If only inductive ballasts are used, the LL should be connected to different phases of the feeder network.

Noteworthy is the increasingly widespread use of long hollow light paths for illuminating traffic control rooms. Considerable experience has been accumulated in using such devices at metropolitan train stations, exhibition pavilions, department store sales areas, swimming pools, as well as in built-in lighting devices. The use of these new modern lighting technologies, which have a number of important advances, allows architects and lighting engineers to obtain radically new solutions in the field of lighting design.

For decorative lighting, lighting devices with fiber optic light guides are widely used. In such devices, low-voltage halogen incandescent lamps and short-arc MGLs are used as MOS. Various light scenes and effects can be created using various decorative and optical attachments.

In the database, illuminators with different ILL power are increasingly being used. These devices, with one or two vertical or horizontal ILs and deep glass reflectors, have round or square outlets, which are often covered with various shielding rods or rings, as well as decorative elements.

The use of prismatic optics, lamps with "secondary" reflectors, fully reflected light lamps, fiber optics and YNDs has expanded significantly. YoP with YoND are increasingly used in lighting applications in public buildings. Currently, such YoPs are used on a par with traditional YoMs.

An important element of evacuation lighting are light signs indicating the direction of exit from a room or building or the exit routes themselves. Light indicators should be installed in the following cases: at exits from premises where more than 100 people are present at the same time; to evacuation routes from conference rooms, auditoriums, showrooms, exhibition or museum halls, assembly halls; if it is possible for more than 50 people to stay simultaneously in rooms adjacent to the corridor - in corridors and staircases leading to exits from the building in hotels, administrative buildings, medical institutions, consumer service enterprises; To trading floors with an area of 180 m<sup>2</sup> or more, in self-service stores - to exits from stores with areas of 110 m<sup>2</sup> or more.

Light indicators are mounted on the wall or ceiling above or next to the doors so that they can be seen from anywhere in the room or corridor. If it is difficult to fulfill this requirement, then in the necessary places (for example, at sidewalk turns) additional IOPs with a sign or arrow indicating the direction leading to the exit are installed.

In addition to evacuation route signs, the database also uses fire hydrants, house signs, information and advertising signs, and lights of high-rise buildings.

YoND as YoM would be appropriate to use for light indicators and light barriers.

Illumination values and nuclear quality indicators are adopted in accordance with SP 52.13330.2011. Lighting calculations are performed using programs on a personal computer. Estimation calculations can be made using power density data.

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