

LUMINAIRES AND LIGHTING STRIPS FOR INTERIOR LIGHTING OF INDUSTRIAL PREMISES

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Abstract

Lighting conditions have a significant impact on productivity and quality of work. The more complex the lighting task, the greater the impact of lighting on its results. The choice of SP Light panels of LED luminaires for lighting industrial enterprises is carried out taking into account many conditions.

Key words

Illumination level, light distribution, comparison with EOS (Electrical light illumination), illumination unevenness.

Introduction

Industrial CO (lighting networks) are powered by transformers; the transformer buses maintain a constant voltage level required for electrical equipment and lighting networks used in the operating room must comply with environmental conditions, ensure explosion, electrical and fire safety, and, if necessary, have protection from mechanical breakdowns. The lighting control system should be easy to use.

Main part

Lighting conditions have a significant impact on productivity and quality of work. The more complex the lighting work, the greater the influence of lighting on its results. Tables 1 and 2 show the impact of lighting on labor productivity and the number of accidents, as well as the number of occupational accidents for certain types of activities.

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Table 1

Type of work	Light level		Increased visual performance, %	Reduction in disability, %
	Before renewal	After renewal		
Camera assembly	370	1000	7	-
Leather embossing	350	1000	8	-
Collection workshop	100	1000	30	18
Final assembly	500	1500	28	-
Metallurgical industry	300	2000	16	29
A comprehensive vision of work in the	500	1600-2500	18	20

metallurgical industry				
Miniature collection	500-1000	4000	-	90
Textile factory	250	1000	7	-

Evidence of a reduction in the number of accidents after increasing light levels in the metallurgical industry

Table 2

Nature of work with vision	Light level		Reduction in the number of accidents, %
	Before increase	after increase	
Usually	300	2000	52
Difficulty with vision	500	1600-2500	50

Lighting systems. Sources of light. When choosing a lighting system, the accuracy of the visual work performed, the nature and characteristics of production equipment, and natural lighting conditions are of paramount importance. When choosing lighting systems, it is necessary to take into account that combined lighting has lower capital investments and operating costs than general lighting.

Basic recommendations for choosing light sources for lighting fixtures can be found in artificial lighting network standards. Lighting conditions have a significant impact on productivity and quality of work. The more complex the lighting job, the more strongly the illumination affects its results. If there are no such requirements, you can use SDL (light holder lamp) and YBNL, otherwise, depending on the required level of color rendering, it is necessary to use LL, MGL of the appropriate color.

Lighting selection of SP (light panels) and methods of their placement. The choice of SP (light panels) LED lamps for lighting industrial enterprises is carried out taking into account many conditions. An important lighting parameter of the SP (light panels) is its EOS (ELECTRICAL LIGHT ILLUMINATION) as well as its efficiency. The economics of general lighting of industrial premises will largely depend on the correct selection of light panels (light panels) for light distribution. The use of inefficient light panels (light panels) with the existing suspension height and the adopted layout leads to excessive energy consumption by 30-25%.

In design practice, an approximate verification of the effectiveness of selecting SP (light panels) for light distribution (for CO (lighting network), with overall uniform illumination) is carried out using a simplified criterion for the effectiveness of SP (light panels) - assessing the ratio of the distance l between adjacent lamps (or their rows) to the installation height of the SP (light panels) from the calculated surface h (height), and the obtained values for each type can be carried out by comparison with EOS (ELECTRICAL LIGHT ILLUMINATION) (illuminance of electric lamps) recommended for (Table 3).

If it is necessary to create lighting in the horizontal plane, it is more advisable to use SP (light panels) of direct lighting of the P-class, and in rooms with light ceilings and walls - also SP (light

panels) of direct lighting of the H-class. The higher the room and the greater the standardized illumination, the higher the concentration of EOS (ELECTRIC LIGHT ILLUMINATION) (lighting intensity with electric lamps) should be. For high rooms, SP (light panels) with EOS (ELECTRIC LIGHT ILLUMINATION) type K (electric lighting power lamps) are more useful, and when the height decreases, SP (light panels) with EOS (ELECTRIC LIGHT ILLUMINATION) type G and D (electric lamps lighting power).

In rooms where the working surfaces are located in vertical planes, it is advisable to use SP (light panels) of diffused light of the P-class with semi-wide EOS (ELECTRIC LIGHT ILLUMINATION) (lighting power electric lights) type L or SP (light panels) of the M-type with uniform light. If vertical working surfaces are located on one side of a row of SP (light panels) (for example, assembly lines in car factories), then SP (light panels) are used that distribute light in one direction (inclined light SP (light panels) or EOS (ELECTRIC LIGHTING) type G or D, SP (light panels) are installed.

Recommended and maximum permissible values of 1/h, ensuring uniform illumination.

Tabel 3

According to GOST R 54350 – 2011 type EOS (Electric light illumination)	Values 1/h	
	recommended	The largest allowed
K	0,3-0,8	0,9
G	0,8-1,2	1,4
D	1,2-1,8	2,1
L	1,8-2,6	2,4
M	1,4-2,0	2,3

Using long light paths with slots can give good results. If it is necessary to create illumination both in the horizontal plane and in inclined and vertical planes of arbitrary orientation, then they try to make the illumination levels in different planes as close as possible. In such cases, when choosing a light source, it should be taken into account that the ratio of vertical illumination to horizontal illumination is minimal for light sources with LED lamps of type K and increases for LED lamps of type M and L.

Selection of SP (light panels) for structural development. The possibilities of using heat exchangers in specific operating conditions are determined by the category of climate development and the location of the heat exchangers.

The constructive operation of the SP (light panels) must also ensure fire safety, explosion safety when installed in rooms and open areas with the risk of explosion, electrical safety, reliability, long service life, stability of technical characteristics in given environmental conditions, ease of replacement and maintenance. Level of protection from environmental influences SP (light panels) is adopted in accordance with GOST R IEC 60598-1-2011 and GOST 14254-96, and for rooms and areas with the danger of explosion and fire, in addition, in accordance with Chapters 7.3 and 7.4 of the rules and operating conditions. Design and operational parameters (basic diagram, working group, type of material, level of protection) are indicated in catalogs and information materials of manufacturing companies.

Placement of SP (light panels). When placing light panels (light panels) in industrial premises, the following basic conditions must be taken into account. Create adjustable lighting in the most cost-effective way possible; compliance with lighting quality requirements (uniformity, direction of light, limiting shadows, limiting light pulsation, limiting the brightness of direct and reflected light); the ability to provide safe and convenient service; shortest length of the group network and ease of installation; Reliability of fixation of SP (light panels).

To increase the efficiency of the lighting network, you can use uniform and uneven layouts of lighting panels (light panels). In a span, when the light panels (light panels) have three or more rows, sparse layouts in the central rows are preferable. If the SP (light panels) is made of SP (light panels) with LL lamps and SP (light panels) are placed in the middle rows with breaks, then the SP (light panels) in the outer rows should be located without breaks. This makes it possible to reduce illumination unevenness and provide moderate illumination at lower installed powers.

When choosing the location and method of installing light panels, it is necessary to take into account the design features of the premises, their height, the presence of cranes and transport equipment. In many rooms of industrial buildings there are overhead cranes that block the light of the light panels installed above them, which leads to a decrease in illumination in the room where the crane is located. In such cases, it is necessary to install SP (light panels), powered by the crane's electrical network, under the crane bridge.

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According to the standards, in industrial premises with insufficient or no natural light, devices with ultraviolet erythema radiation of long or short-term exposure are provided, depending on the need.

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