HYGIENIC ASSESSMENT OF NATURAL AND ARTIFICIAL LIGHTING OF PREMISES

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Summary: Light is a vital environmental factor. It influences many physiological processes of the human body: it is a specific irritant of the organ of vision, activates metabolic processes, increases the tone of the central nervous system, enhances the processes of growth and development of the body, increases resistance to adverse environmental factors, and establishes the rhythm of the physiological functions of the body. A high level of illumination allows you to perform visual work with less fatigue and better results, and, on the contrary, low lighting leads to rapid fatigue, inhibitory phenomena in the central nervous system, impaired vision and other unfavorable changes in the body.
Keywords: hygiene, assessment, natural lighting, artificial lighting, premises, lighting hygiene

The main visual functions are visual acuity, contrast sensitivity, speed of discrimination, as well as stability of clear vision, color discrimination, light and dark adaptation, accommodation, critical flicker frequency, etc.

Visual acuity is the maximum ability of the eye to distinguish the smallest details of an object (dots, lines, circles) as separate from each other. It is determined by the smallest angle at which two adjacent points are seen as separate. Conventionally, it is believed that visual acuity is equal to unity if the resolving angle is equal to 1 minute, which corresponds to the conditions for viewing a part measuring 1.45 mm at a distance of 5 m. With an increase in illumination to 100–150 lux, it quickly increases; with a further increase, this growth slows down .

Contrast sensitivity is the ability of the eye to distinguish the minimum difference in brightness of the object (detail) in question and the background or two adjacent surfaces. The dependence of contrast sensitivity on the lighting conditions of the object in question and the brightness to which the eye has adapted to the maximum has been established. The optimal brightness of working surfaces is several hundred cd/m2 (≈500), and the brightness of the objects in question is much higher. If the working surface reflects no more than 30-40% of the incident light, then contrast sensitivity is highest at illumination levels of 1000–2500 lux.

The speed of discrimination or the speed of visual perception is the least time required to distinguish the details of an object. It increases noticeably with increasing illumination to 100-150 lux, then its growth slows down (but does not stop) to 1000 lux and above.

All three of these functions are closely interrelated and determine the integral function of the visual analyzer. They are also used in hygienic lighting standards.

For visual work, not only the quantitative side of lighting - the amount of illumination - is essential, but also the quality of lighting, i.e. uniformity of illumination on the working surface and surrounding space (distribution of brightness), contrast between the object in question and

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the background, presence of gloss, direction and spectral composition of the light flux. These patterns served as the basis for hygienic requirements for the regulation of illumination and the organization of rational lighting in premises of various types, depending on the work performed with different levels of accuracy.

Illumination is not a constant value, it depends on many factors: the geographical latitude of the area, time of day and year, terrain, weather conditions (cloudiness), as well as the features of the building layout, orientation, window shape, nature and cleanliness of window glass, wall coloring , ceiling, etc. For example, tulle curtains absorb up to 40%, curtains - 80% of the incident light, dirty windows - up to 50%, and frozen windows - 80% of the light.

The radiant energy that causes the sensation of light is called optical radiation, and the power of such radiation is called luminous flux.

The visible part of solar radiation at the earth's surface is 40% and in the spectrum of its electromagnetic radiation occupies a narrow wave range (from 400 to 760 nm). The eye is most sensitive to the middle part of the visible spectrum and has maximum sensitivity at a wavelength of 555 nm (transitional yellow-green part of the spectrum). This sensitivity is taken as unity. As you approach the red and blue-violet parts of the spectrum, the sensitivity of the eye sharply decreases. The relative sensitivity of the eye to different parts of the spectrum is called relative visibility.

Luminous flux (F) is the power of radiant energy, assessed by the eye by the light sensation it produces. Unit of luminous flux - lumen (lm) - luminous flux emitted by a point source at a luminous intensity of 1 candela (cd) in a solid angle of 1 steradian (sr); steradian - a solid spatial angle with its apex at the center of the sphere, cutting out on the surface of the sphere an area equal to the area of a square with a side whose length is equal to the radius of the sphere.

Luminous intensity (J) is the spatial density of the luminous flux (part of the luminous flux) from a light source in a given direction within a certain solid angle. The unit of luminous intensity is the candela (cd) - the luminous intensity emitted in a perpendicular direction from the source (an absolute black body with an area of 1/600,000 m2 at the solidification temperature of platinum).

Illumination (E) – surface density of luminous flux F incident on surface S, determined by the formula: E = F / S. Illumination unit – lux (lx) – illumination of a surface with an area of 1 m2 with a luminous flux of 1 lm incident on it.

The light flux incident on the illuminated surface is not always completely reflected from it towards the eye. The decisive role in the process of vision belongs to that part of the light flux that, reflected from the illuminated surface, hits the light-receiving elements of the eye, which causes the visual sensation. Therefore, from the point of view of the physiology of visual perception, it is not the incident light flux that is important, but the light reflected from the illuminated surface - brightness. Brightness (L) is the amount of light flux reflected by the illuminated or luminous surface towards the eye. The unit of brightness is candela per square meter (cd/m2) - the brightness of a uniformly luminous flat surface with an area of 1 m2, emitting a luminous intensity equal to 1 candela in a direction perpendicular to it. Brightness is determined by special devices - brightness meters. The brightness of a luminous surface depends on the luminous intensity emitted by it, the angle at which an object or surface is viewed and on its light properties, since the light flux incident on the surface is partially transmitted and absorbed by the body, and partially reflected. With constant illumination, the brightness of the background or object is greater, the greater its reflectivity, i.e. lightness.

The reflectivity of the objects around us is not the same. The optimal brightness level for visual work is considered to be 500 cd/m2. Excessively high brightness, causing visual discomfort - glare, is called glare. A distinction is made between direct gloss (created by light sources and lighting devices - lamps, windows), peripheral (from luminous surfaces located far from the direction of vision), reflected (from mirror surfaces) when working with metal, glass, plastic, etc. Reflection coefficient - ratio reflected light flux (Fref) to the incident one (Fpad), determined by the formula: b = Fref/ Fpad. Reflection coefficients depend on the color of the surface and are taken as follows: white color - 0.7-0.8; light beige, yellow – 0.5; natural wood color – 0.4; greenish blue – 0.3; blue – 0.25; light brown, blood color – 0.15; brown, blue, purple – 0.1.

Light transmittance (T) is the ratio of the luminous flux passed through the medium (Fprop) to the incident luminous flux (Fpad): T = Fprop/ Fpad. This coefficient allows you to evaluate the quality and cleanliness of window glass and lighting fixtures.

The illuminance pulsation coefficient characterizes the time fluctuations of the light flux incident on a unit surface. The illumination pulsation coefficient is determined by the ratio of the amplitude of illumination fluctuations to their average value and is calculated by the formula:

$$Kn = \frac{Емакс - Емин}{2Еср} \bullet 100\% \quad (1)$$

where Emax is the maximum value of illumination for the period of its fluctuation, Emin is the minimum value of illumination for the period of its fluctuation, Ecp is the average value of illumination for the same period, lux.

The stroboscopic effect is a phenomenon of distortion of visual perception of rotating, moving or changing objects in flickering light. It occurs when the frequency characteristics of the movement of objects coincide with the change in the luminous flux over time in lighting installations with gas-discharge light sources powered by alternating current.

Hygienic assessment of natural lighting in premises.

Natural lighting in industrial premises can be side, top, or combined. To evaluate it, two types of indicators are used:

- lighting technology (direct method)
- geometric (indirect).

Direct method.

Suggests the use of an objective lux meter (type Yu-16, Yu-116). The principle of the lux meter is based on the conversion of luminous flux into electric current, measured by a galvometer. There is a direct relationship between the resulting photocurrent and illumination, which makes it possible to determine the illumination of the surface in lux based on the magnitude of the current.

An objective lux meter consists of two parts: a selenium photocell inserted into a frame, and a sensitive pointer galvanometer, the scale of which is graduated in lux. The device operates in three subranges: up to 25 lux, up to 100 lux, up to 500 lux. To measure greater illumination, a light absorber attachment is used (the absorption strength of which is 100). The photocell is installed at the workplace and on the galvanometer scale, taking into account the sub-range used and the light absorber attachment, the number of divisions at which the arrow stops is noted.

Indirect method.

It offers the use of several indicators: natural illumination coefficient (KEO), light coefficient (LC), depth coefficient (KGZ), angle of the opening in the eye and angle of incidence, and some additional indicators.

The natural illumination coefficient (NLC) is standardized and, therefore, is of a legislative nature. KEO is determined using a lux meter and is the ratio of the horizontal illumination indoors at the workplace to the simultaneously measured horizontal illumination under the open sky (with diffused light), expressed in %. KEO (with side lighting) - in schools, reading rooms - at least 1.5%, in residential premises - at least 1%.

The luminous coefficient (LC) is advisory (not legislative) in nature. SC is expressed as a fraction, the numerator of which is one, and the denominator is the quotient of dividing the area of the room by the surface area of the glass (glazed surface of the windows).

In the premises of educational institutions, standardized KEO values are provided in accordance with the hygienic requirements for natural, artificial, and combined lighting of residential and public buildings. With one-way side natural lighting, the KEO on the working surface of the desks at the point of the room furthest from the windows should be at least 1.5%. With two-way side natural lighting, the KEO indicator is calculated on the middle rows and should be 1.5%. The light coefficient should be at least 1:6. The windows of classrooms should be oriented towards the southern, southeastern and eastern sides of the horizon. The windows of drawing and painting rooms, as well as the kitchen room, can be oriented towards the northern sides of the horizon. The orientation of computer science classrooms is to the north, northeast. It is recommended to use curtains made of light-colored fabrics that have a sufficient degree of light transmission and good light-scattering properties, which should not reduce the level of natural light. For the rational use of daylight and uniform illumination of classrooms, you should not paint over the window glass; do not place flowers on the window sills; they are placed in portable flower boxes 65 - 70 cm high from the floor or hanging flower pots in the walls between the windows; clean and wash the glass as it gets dirty , but at least 2 times a year (autumn and spring).

References:

1. Guidelines from the International Commission on Non-Ionizing Radiation Protection (ICNIRP).
2. Publications of the World Health Organization (WHO) on non-ionizing radiation.
3. National Institute for Occupational Safety and Health (NIOSH) Guidelines
4. European Union Directive on the protection of workers against risks arising from electromagnetic fields.
5. IEEE Standard on Safety Levels for Human Exposure to Radio Frequency Electromagnetic Fields
6. Olimova DV Differential diagnostic methods galvanosa and glossodinia in ambulatory conditions. // Galaxy international interdisciplinary research journal (GIIRJ) ISSN (E): 2347-6915 Vol. 10, Issue 1, Jan. (2022). – P. 524-526

7. Olimova DV A complex approach to glossalgia treatment based on the current data on the specificity of its etiopathogenesis . // “ Bilig – ilmiy faoliyat ” nashri http://bilig.academiascience.or - B. 141-146
8. Olimova DV Clinical Efficacy of Pharmacologic Al Therapy in Patients with Burning Mouth Syndrome //European multidisciplinary journal of modern science, https://emjms.academicjournal.io / index.php / Volume: 4 P. – 804-808
9. Vohidovna , O. D. (2022). Medical and Social Significance of Water Supply, Sanitation and Hygiene in Human Activities. Vital Annex: International Journal of Novel Research in Advanced Sciences , 1 (1), 8-12.
10. Sharipova G. I. The effect of dental treatment-profilactics on the condition of oral cavity organs in children with traumatic stomatitis // Тиббиётда янги кун. Бухара. – 2022. – № 5 (43). – С. 103-106. (14.00.00; № 22)
11. Шарипова Г. И. Эрта ёшдаги болалар травматик стоматитлар билан оғриганда оғиз бўшлиғи микрофлорасининг иммуно-микробиологик жиҳатлари // Биология ва тиббиёт муаммолари. Самарқанд. – 2022. – № 2 (136). – С. 296-298. (14.00.00; № 19)
12. Sharipova G. I. Light and laser radiation in medicine // European journal of modern medicine and practice. Belgium. – 2022. – Т. 2. – №. 1. – С. 36-41. (Impact factor: 5.71)
13. Sharipova G. I. The use of flavonoid based medications in the treatment of inflammatory diseases in oral mucus //Asian journal of Pharmaceutical and biological research. India. – 2022. – Т. 11. – №. 1. – С. 2231-2218. (Impact factor: 4.465)
14. Sharipova G. I.Changes in the content of trace elements in the saliva of patients in the treatment of patients with traumatic stomatitis with flavonoid-based drugs // Journal of research in health science. Iran. – 2022. – Т. 6. – № 1-2. – С. 23-26. (Scopus)
15. Sharipova G. I. Paediatric Lazer Dentistry //International Journal of Culture and Modernity. Spain. – 2022. – Т. 12. – С. 33-37.
16. Sharipova G. I. The effectiveness of the use of magnetic-infrared-laser therapy in traumatic injuries of oral tissues in preschool children //Journal of Academic Leadership. India. – 2022. – Т. 21. – №. 1.
17. Sharipova G. I. Discussion of results of personal studies in the use of mil therapy in the treatment of trauma to the oral mucosa //European journal of molecular medicine. Germany. – 2022. – Т. 2. – №. 2. – С. 17-21.
18. Sharipova G. I. Peculiarities of the morphological structure of the oral mucosa in young children // International journal of conference series on education and social sciences. (Online) May. Turkey. – 2022. – С. 36-37.
19. Sharipova G. I. Dynamics of cytological changes in the state of periodontal tissue under the influence of dental treatment prophylactic complex in young children with traumatic stomatitis // Multidiscipline Proceedings of digital fashion conference April. Korea. – 2022. – С. 103-105.
20. Шарипова Г.И. Травматик стоматит билан оғриган болаларда стоматологик касалликларни комплекс стоматологик даволаш ва уларнинг олдини олишни баҳолаш // Ўзбекистонда миллий тадқиқотлар: даврий анжуманлар: 18-қисм. Тошкент. –2021. – С. 14-15.

21. Шарипова Г.И. Мактабгача ёшдаги болаларда оғиз бўшлиғи юмшоқ тўқималарининг шикастланишларини комплекс даволашда магнит-инфрақизил-лазер терапиясини қўллаш самарадорлиги // Услубий тавсиянома. Бухоро. – 2022. – 21 б. м