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DETERMINING THE IMPACT OF QUANTITY AND QUALITY INDICATORS OF ARTIFICIAL LIGHTING AT WORK PLACES ON HUMAN HEALTH

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Abstract
This article presents the results of measurements “Determination of quantitative and qualitative indicators of artificial lighting at workplaces” according to SHNQ 2.01.05-24 “Urban Planning Norms and Rules of Natural and Artificial Lighting.”

Keywords: artificial lighting, luxmeter UT383, lux.

Introduction

Creating an optimal lighting environment in workplaces is one of the priority conditions for increasing labor productivity and protecting the visual health of workers. Artificial lighting systems are crucial in conditions where natural light sources are limited or there are night shifts.

The fundamental task of artificial lighting is to minimize eye strain and create comfortable visual conditions during visual analysis, taking into account the dimensions of objects and parts in the workspace. Although artificial sources are economically more expensive than natural light, they possess extensive technical capabilities in managing light flows and ensuring stability.

Lighting systems at industrial and service facilities are organized using the following three structural methods:

1. General lighting: Provides uniform illumination of the entire working surface of the room.

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2. Local lighting: Directly aimed at ensuring a standard level of illumination at a specific workplace.
3. Mixed lighting: A combination of general and local methods, which is considered the most effective method. This system softens sharp light differences (contrasts) on surfaces, facilitates the eye's adaptation process, and ensures occupational safety.
4. **Emergency lighting**: Depending on the purpose of the lighting, in addition to working and control types, there are two more types that serve in emergency situations. They are called emergency and evacuation light

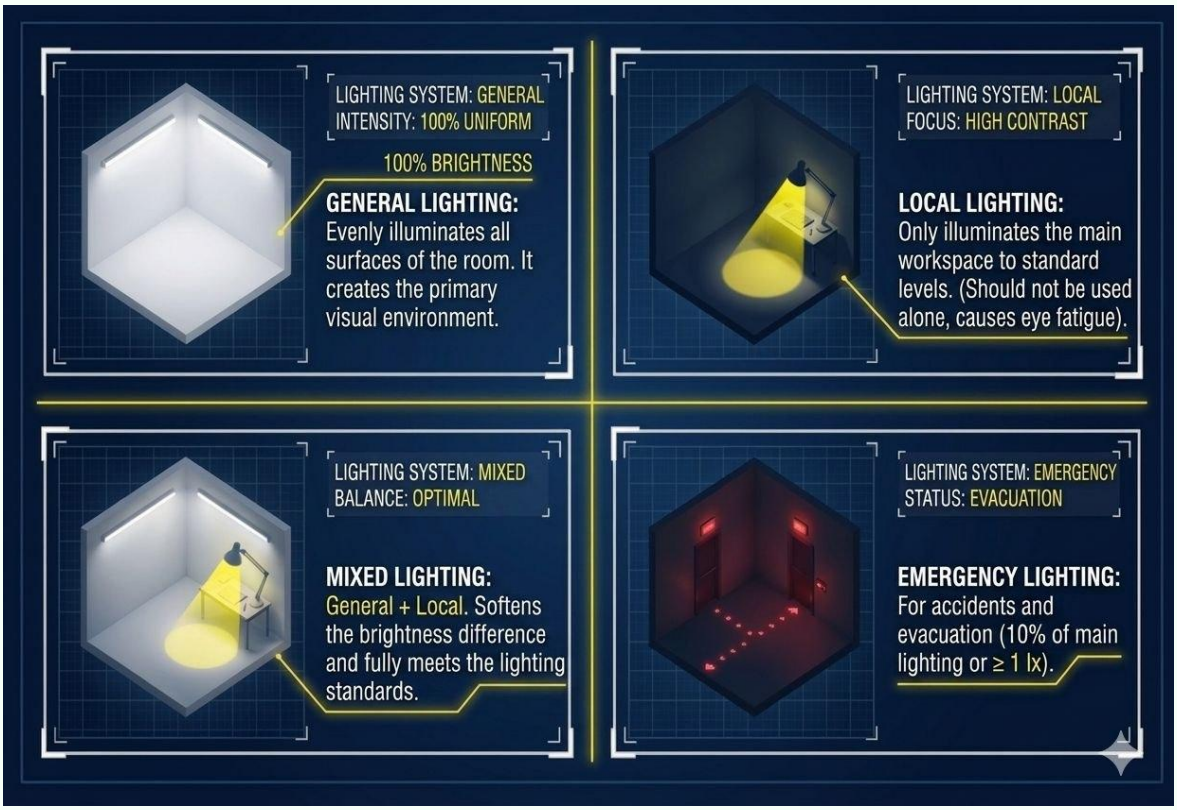

Figure 1. Types of artificial lighting.

The function of working lighting is to create the possibility of light vision in the workplace without strain on the eyes as a result of observing objects during the work process.

The control type of illuminance should not exceed 2 lux in value and primarily serves to control an environment or boundary in the dark of night.

The emergency type of lighting is designed as a backup, to ensure that the electrical network of emergency main working lighting does not cease operations in the event of a failure, or for the purpose of promptly performing repair work on the network. In

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this case, the illuminance must be at least 10% of the primary illuminance or at least 1 lux on the floor surface.

The difference between the minimum illuminance of workstations and the standard average illuminance of the room must not exceed 10 percent in accordance with SanPiN 0146-04.

Standard illuminance values in lx should be adopted according to the following scales: 20, 30, 40, 50, 75, 100, 125, 200, 300, 400, 500, 600, 750, 1000, 1250, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000.

Familiarization with the UT383 luxmeter and bringing it into working condition

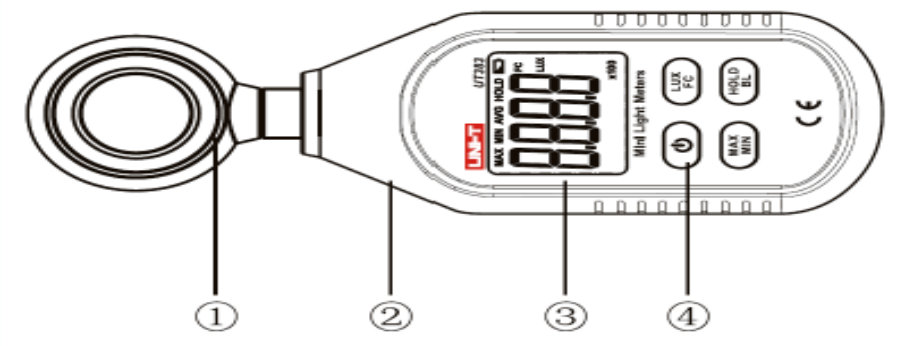

Figure 2. General design of the UT383 luxmeter. 1 - light sensor, 2 - microphone, 3 - device body, 4 - display, 5 - control buttons.

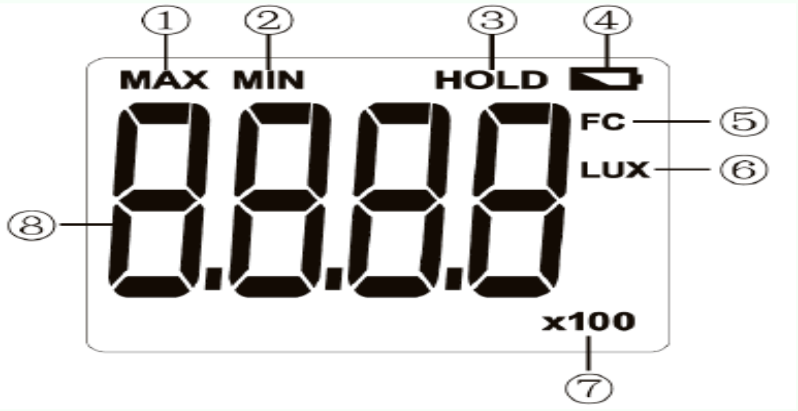

Figure 3. Information displayed on the Luxmeter UT383 display.
1-highest indicator, 2-lowest indicator, 3-stop indicator, 4-battery indicator, 5-light candela, 6-light lux, 7-10 or multiplied by 100;
Indicator 8.

Environmental requirements during device operation:

- In buildings - measured inside structures;
- Operating conditions up to 2000 m above sea level;
- Pollution level;
- Working temperature and humidity: up to 80% at 0-40 °C;

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-Storage temperature and humidity -20...+60 °C, up to 80%;

To bring the device into working order, the batteries are installed on it, and the functionality of all buttons is checked. When used, it must comply with environmental requirements.

1. Measurement of artificial lighting at workplaces;

Measurements of artificial lighting at workplaces are performed according to the regulatory document of urban planning norms and rules SHNK 2.01.05-24 "Natural and Artificial Lighting," and the results are compared with paragraph 25 of Table 1 of APPENDIX 9.

2. Processing of measured results;

Since light is a rapidly changing value, the obtained calculations are processed using the "Uncertainty Method."

To determine the quantity and quality indicators of artificial lighting at workstations under laboratory conditions, I, Mukhriddin Fakhriddin ugli Sulaymonov, performed calculations based on measurement and measurement work for the blackboard in room 210k of the Faculty of "Road Engineering." Based on this, I obtained the luminosity values from 5 points on the board.

Results received:

Table 1.

Board 1th angle	Board 2th angle	Through the middle of the board	Board 4th angle	Board 5th angle
408	432,5	320,5	334	357,5

1) The average value of the obtained counts is determined:

$$E = \frac{1}{n}\sum_{i=1}^{n} E_i \qquad [1.1]$$

$$E = \frac{408+432,5+320,5+334+357,5}{5} = 370,5 \text{ lyuks}$$

2) Determines the deviation from the mean:

$$u_A(E) = \sqrt{\frac{\sum_{i=1}^{n}(E_i-E)^2}{n(n-1)}} \qquad [1.2]$$

$$u_A(E) = \sqrt{\frac{\sum_{i=1}^{n}(E_i-E)^2}{n(n-1)}} = \sqrt{\frac{(408-370.5)^2+(432.5-370.5)^2+(320.5-370.5)^2+(334-370.5)^2+(357-370.5)^2}{5(5-1)}} =$$

=21,56 lyuks

$$21,56\ lyuks = \frac{21,56}{370.5} = 0.06\ \%$$

3) Deviation of the device from the actual value:

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$$u_B(\text{A})=\frac{\Delta E}{\sqrt{3}}=\frac{370.5*0.06}{\sqrt{3}}=12{,}84 \text{ yoki } \frac{12.84}{370.5}=0.03*100=3\ \%, \quad [1.3]$$

4) Total standard deviations:

$$U_C(\text{E})=\sqrt{u_A(E)^2+u_B(\text{A})^2}=\sqrt{21.56^2+12.84^2}=25.09 \text{ yoki } \frac{25.09}{370.5}=0.07, [1.4]$$

5) The confidence probability of the obtained counts is determined as follows:

$$U(\text{E})=k*U_C(\text{E}) \quad [1.5]$$

$$U=2*25.09=50.18 \text{ lyuks}$$

For the confidence probability (clutch probability) R=0.95 (recommended for uncertainty calculation), I calculated the measurement uncertainty at k=2.

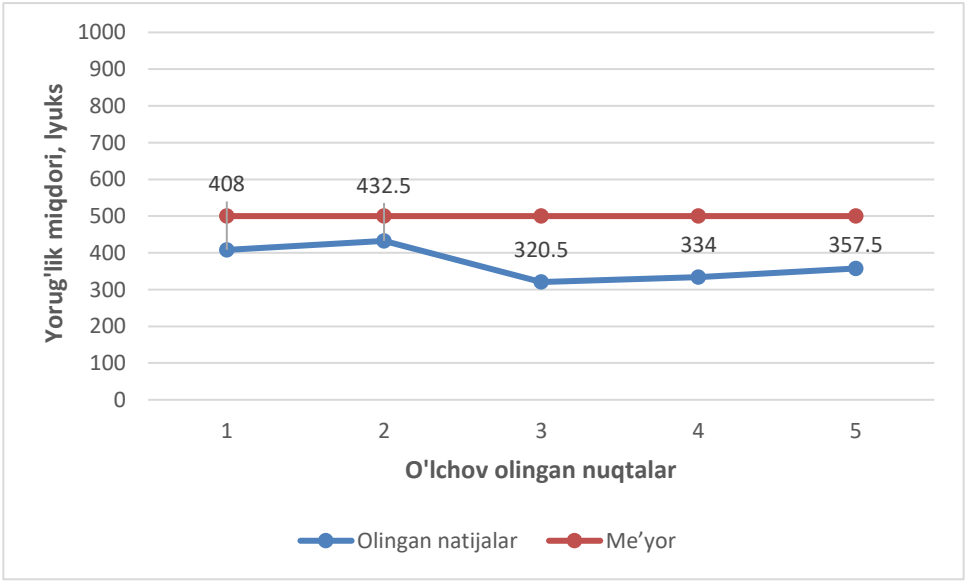

Figure 4. Graph constructed based on results obtained using the Luxmeter UT383 device.

Conclusions And Recommendations

Research indicates that the proper design of artificial lighting systems in an industrial environment is a fundamental factor not only in increasing labor productivity but also in protecting the psychophysiological health of workers. Rationally organized lighting enhances concentration by reducing eye strain and minimizes the likelihood of safety violations. The introduction of modern energy-saving technologies, particularly LED lighting and automated control systems, improves the quality of the light environment (intensity, color temperature, uniformity) on the one hand, and ensures the economic efficiency of the enterprise on the other. Consequently, strict adherence to lighting standards must remain an integral part of the occupational safety strategy. The research process was conducted in accordance with the regulatory document SHNK 2.01.05-24 ("Natural and Artificial Lighting"). According to this

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standard, the minimum illumination level established for a reading board must be 500 lx. When comparing the obtained results with this indicator, it was determined that the actual illumination level at the facility does not comply with the established requirements.

References

1. ShNK 2.01.05-24 Urban planning norms and rules "Natural and artificial lighting."
2. SanPiN 0146-04 "Sanitary Rules and Norms for the Design of Residential Premises in the Climatic Conditions of Uzbekistan."
3. https://ixbt.online/live/images/original/08/11/28/2020/08/13/1e87a2fcd6.jp
4. https://en.m.wikipedia.org/wiki/Lux