



**Analysis of engineer's harmful working conditions**  
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**Abstract**

The paper deals with some harmful and dangerous factors of work. It is known that organizations voluntarily take additional measures to improve the quality of workers' lives. In this paper the author identifies and analyses harmful and dangerous factors of labor, determines the necessary measures to protect working personnel from them, assesses working conditions, microclimate environment and provides recommendations for creating optimal working conditions. The work of the engineer is closely connected with computer equipment, so there are additional factors that significantly reduce labor productivity. There are too many norms and safety rules. To ensure safety is the main task of the employer.

*Keywords:* Social responsibility, harmful factors, occupational noise, electrical safety, ionizing radiation;

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**1. Introduction**

Social responsibility is the conscious attitude of any subject of social activity to the requirements of social necessity, social values, norms, tasks and rules, as well as civic duty, understanding by the subject of the consequences of the activities carried out for certain social groups and individuals, for social progress of society [5].

Social responsibility is divided into corporate and individual ones. Corporate social responsibility bases on organization activities where the organization takes into account the interests of society and assumes responsibility for the impact of its activities on the company and other stakeholders of modern society. According to this concept, organizations voluntarily take additional measures to improve the quality of workers' lives, their families, as well as the local community and society as a whole. At the same time, corporations receive numerous advantages as they do the work for the long run than their own short-term profits. Among the social issues of production, a special place is occupied by occupational safety and health activity, environment protection [1] and environment protection in case of emergency [4].

**2. Occupation safety**

The purpose of this paper is to identify and analyse harmful and dangerous factors of labor, to determine the necessary measures to protect working personnel from them, to assess working conditions, microclimate environment and to provide recommendations for creating optimal working conditions. Questions of safety engineering are considered.

### *2.1. Analysis of dangerous and harmful operational factors*

As the work at the computer is an intellectual work, during the working hours the main pressure on the user of the computer falls on the central nervous system. In this regard, the conditions in which work takes place affect the activity of the brain. Long and intensive work at the computer can become a source of serious occupational diseases.

The work of the engineer is closely connected with computer equipment, so there are additional factors that significantly reduce labor productivity. Such factors include exposure of harmful radiations from the monitor and computer, exposure of electromagnetic radiation, improper illumination, unregulated noise level, uncomfortable meteorological conditions, high voltage, and others [8].

Let us look at some facts in detail:

#### 1) Occupational noise.

Among the unfavorable factors for the work carried out by an engineer is noise. Prolonged influence on the human body caused by noise causes a decrease of visual acuity, hearing, an increase of blood pressure, an attention decrease, etc. [5]. The main source of occupational noise in the room is a centrifugal fan launched during the experiments and the noise of computers, power supplies and other technical elements. In accordance with GOST 12.1.003-83[2], an acceptable sound level is 50 dBA in the rooms where designers, accountants, programmers work. Noisy equipment that have the exceeded noise level should be placed out of the room with a bunch of computers in it. If the existing noise level in the room exceeds the permissible level, then to create favorable conditions it is not recommended to work on a computer while experiments are conducting in the room. The noise level in the room when the operator works at the research stand should not exceed 75 dBA, which meets the requirement of GOST 12.1.003-83 [2].

#### 2) Electromagnetic and electrostatic fields.

When working with personal computers, electromagnetic fields (EMF) arise. The sources of EMF are video terminals (VDT) on cathode-ray tubes [3].

The electromagnetic field has biological, specific heat influence on the human body. The consequences of prolonged exposure of the electromagnetic fields can be the following: increased fatigue, headache, drowsiness, pain in the heart area, hypertension, violation of conditioned reflex activity, changes in interneuron connections [3]. These phenomena may be mild, moderate, or pronounced [5].

According to SanPiN (sanitary regulations and standards) 2.2.2 / 2.4.1340-03 [7], the EMF intensity at a distance of 50 cm around the VDT for the electrical component should be no more than:

- 5Hz - 2kHz in the low frequency range (25 V / m);
- 2 - 400 kHz in the high frequency range (2.5 V / m).

All computers in the room support the international safety standard TSE (technical security equipment) 95. The amount of radiation from a monitor due to this standard is no more than:

- 5Hz - 2kHz in the low frequency range (10 V / m);
- 2 - 400 kHz in the high frequency range (1 V / m), so the level of tension does not exceed the established norms.

The electrostatic field arises because of irradiation of the screen caused by the flow of charged particles. The troubles caused by it are associated with the dust accumulated in electrostatically charged screens, which flies to the operator during his/her work at the computer. This can cause

skin diseases, damage of contact lenses. Experts believe that low-voltage electromagnetic discharge is able to change and interrupt cellular development.

Surface electrostatic potential should not exceed 500V [3].

### 3) Ionizing radiation.

Radiation is one of the harmful factors for software engineers. The source of ionizing radiation is the display. The ionizing radiation can lead to the braking functions of the hematopoietic organs, disruption of normal blood clotting and fragility increase of blood vessels, decrease of body's resistance to infectious diseases [6].

While displays are operating, the side effects appear: generation of x-rays from the screen and reflection. To eliminate the latter, all displays are placed along the walls. Direct X-ray radiation is reduced due to a special internal coating of the monitor screen and installation of an additional protective filter.

## 3. Conclusion

The paper analyses harmful and dangerous labor factors, develops measures of protection against them, assesses the working and microclimate conditions of the work environment. Questions of safety engineering are considered and recommendations for creating optimal working conditions are given.

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