

## THE WORK ENVIRONMENT MANAGEMENT IN THE ASPECT OF THE SAFETY SHAPING AT THE ADMINISTRATION AND OFFICE WORKPLACE

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**Abstract:** The management of the work environment aims at shaping all elements of the work environment, also in the aspect of safety. All activities in the field of planning, organizing, conducting and controlling individual elements of the work environment are aimed at optimizing the working conditions. In office and administrative work many factors affect the level of occupational health and safety. In the paper, the selected physical factors of the work environment - lighting, noise and microclimate - at the office and administration position in order to shape a safe, ergonomic and optimal workplace have been analyzed. The article uses measurement methods using devices - noise, lighting and microclimate meters

**Keywords:** work environment, health and safety, management, physical factors, work environment

### 1. INTRODUCTION

Administrative and office employees perform their work in conditions of exposure to many different factors. Factors that occur in the work environment can have different intensity, which can affect the employees and their safety. The most common factors that are potential threats in the administrative and office environment include: electric current, moving parts of office equipment, chemicals, temperature, humidity and movement of air molecules, lighting, sound exposure level, physical and psycho-mental strains (Griffiths et al., 2011).

Office work only seemingly does not carry risks. to the risks associated with administrative and office work should be included (Szabó and Németh, 2019):

- migraines, frequent headaches, fatigue, tiredness due to eye strain,
- pain and back problems,
- slow blood circulation in the legs, caused by a long-term sitting position,
- occupational diseases, e.g. carpal tunnel syndrome,

- stress, weariness and frustration caused by, for example, poor work organization.

Ergonomic factors associated with the adjustment of, for example, machines, devices, or seats to the needs, capabilities and limitations of the employee, can be provided at the stage of the workplace creating concept (Carlson et al., 2019; Kogi et al., 2019). However, in the work environment there are also factors that can change, depending on the time of the day or the year, but also on the working conditions that affect human behavior. Appropriate management of individual factors, especially physical ones, in the work environment helps to shape optimal (safe and ergonomic) working conditions. In the light of available reports, only 2% of workplaces in Polish offices meet the requirements of ergonomics, they are suitably equipped and adapted to the needs of employees (<http://kulturabezpieczenstwa.pl/ergonomia>). Just over half of the administration employees work in conditions that meet the requirements of ergonomics only partially. About 46% of administrative employees work in very bad conditions according to the Ergotest Report. Administrative and office work is related to the energy expenditure corresponding to the so-called small activity, in the dominant sitting position, at the level of  $70 \text{ W/m}^2$  of the human body surface area (which corresponds to 1.2 Met) (Mantzari et al., 2019; Speck and Schmitz, 2011). Administrative and office workers most often complain about musculoskeletal disorders which arise from poorly designed, non-ergonomic work places, or the lack of preventive activities of mentioned musculoskeletal system (Pereira et al., 2019). In the light of the study of the European Agency for Safety and Health at Work, every fourth European worker complains of backache (Arezes and Serranheira, 2016). On the other hand lack of awareness about the effect of the work environment on the health and human body could result in more frequent accidents, or health problems of employees (Niciejewska and Klimecka-Tatar, 2018; Klimecka-Tatar and Niciejewska, 2016).

The physical conditions, such as lighting, noise and microclimate, also affect the well-being and potential ailments in administrative and office work (Aleksandrova, 2005; Igram et al., 2018; Katz, 2017; Radosz and Pleban, 2018). The optimization of these factors is aimed at shaping such values of their parameters, so that human working conditions are ergonomic, do not cause dysfunction of the organism and thus do not reduce the quality and efficiency of its work. It is necessary to manage individual elements of the work environment in order to achieve optimal working conditions (Costa-Font and Ljunge, 2018). We have to remember that good conditions of work means motivated employees (Dziuba, Ingaldi, 2016).

## 2. METHODOLOGY OF RESEARCH

The paper presents the results of measurements of the sound level, microclimate and lighting at the office and administration position in a closed room, in accordance with the requirements contained in the relevant standards. A diagnosis of the requirements for the office space in terms of the cubature of the room, the free space for the employee and the unoccupied floor surface, has also been made. In the study of sound level intensity in the office and administration position, dosimetric measurements has been used, the basic sound level values has been evaluated with the DM-50 dosimeter. The dosimeter is a personal (employee-worn) sound exposure meter designed to measure the amount of noise that an employee receives during a certain time (e.g. working day). The noise dosimeter meets the requirements of the

Polish standard PN-EN 61252:2000, is a class 2 sound level meter that meets the requirements of the standard PN-EN 61672:2014-03. The dosimeter consists of the MK-401 (Sonopan) microphone and the display. In addition, it is equipped with a Class 2 KA-10 acoustic calibrator. The measuring range of the dosimeter is from 75 dB to 135 dB and can be carried out in temperature conditions from 0°C to 400°C.

The measurement of the basic microclimate values has been carried out with the MM-01 meter, which enables simultaneous determination of the thermal comfort of the worker in the examined closed room. This device consists of the sensors series integrated with a central unit, equipped with a module that converts the obtained values. The liquid crystal display enables real-time monitoring of measured values. The microclimate was measured by air temperature, air humidity. The indicators determine the presence of an employee in or outside the thermal comfort zone (Predicted Mean Vote - average thermal comfort rating) and PPD (percentage of people dissatisfied with the prevailing microclimatic conditions) in accordance with the requirements of the Polish standard PN-EN ISO 7730:2006. Measurement of lighting intensity in administrative and office work has been carried out using a lux meter - Sonopan L-100, consisting of a measuring head (equipped with a photovoltaic cell) and a photoelectric current meter with an amplifier. To properly carry out the measurement of illuminance at the office position (including computer work), the principles contained in Polish standard PN-EN 12464-1:2012 have been applied. In addition, prior to the measurement of the light intensity, the following activities have been carried out:

- Before the measurement of the light intensity, the light-sensitive surface of the lux meter was illuminated for a few minutes with light of the intensity prevailing during the measurements - such a procedure helped to prevent the decrease of the photoelectric current in the first minutes of the measurement.
- During the measurement, attention was paid not to cover the photosensitive surface from the light coming directly from the light sources and the light reflected from the walls and ceiling - the clothing of the person was dark.
- The temperature was 23°C.

All recorded measurements has been performed through a comparative analysis, made on the basis of values considered as optimal, in a closed room at the office and administration position.

### 3. RESULTS AND DUSCUSSION

The employers' obligation is taking care of the employees' work space, keeping them clean and tidy and ensuring periodic repairs and maintenance. They should have parameters that ensure compliance with occupational safety and health requirements, taking into account the type of work performed, the technologies used and the time spent in the employees. Physical factors of the work environment, such as noise, lighting or microclimate, should be adapted by the employer to the requirements, possibilities and limitations of employees. The purpose of shaping the working conditions is their safety and ergonomics. Nowadays, almost everything is managed, people, sometimes, capital. It is therefore possible to manage also elements of the work environment in such a way as to make them optimal for a human being. Measurements made in one of the offices of Polish public administration are summarized in the following Tables (1-2).

In Table 1 the results noise intensity measurements have been presented. Measurement have been carried out during business hours characterized by the highest work intensity, while servicing the applicants (10.00-14.00). The study assumes that the basis for determining the result identifying noise will be three times measurements in an office room.

According to the established principles, the thermal comfort has been measured taking into account the microclimate parameters, as well as the energy expenditure and heat resistance of the clothing. It should be noted that the survey has been carried out during the summer. The results are shown in Table 2

Table 1

Measurements of noise in a closed office of an administrative and office character -  $L_{Aeq}$  is the result of elementary measurement, the equivalent sound level corrected by the frequency characteristic A, dB

Parameter	Measurement 1	Measurement 2	Measurement 3	averagevalue
$L_{Aeq}$ , dB	77.6	77.6	77.9	77.5
$L_{Smax}$ , dB	78.1	78.1	76.6	77.6
$L_{Smin}$ , dB	77.1	77.1	76.8	77.1

Source: own study

Table 2

Results of the microclimate parameters measurement in a closed office of an administrative and office character

Clothesheat protection [clo]	Energy expenditure [Met]	Airtemperature [°C]	Airhumidity [%]	Movement of air molecules [m/s]	Indicator PMV	Indicator PPD
0.75	1.2	23	58	0.01	0.49	9.9

Source: own study

Subsequently, the intensity of the lighting has been tested, taking into account the requirements for the operational illuminance at the workplace with the computer. It is generally assumed that for a standard computer work, it should be at least 500 lux. However, if it requires more precise activities than just reading or writing, it should be higher. It is also allowed to lower the required level of illumination in the immediate vicinity of the workplace, but with the appropriate proportions between the lighting in the task field and the immediate surroundings. Otherwise, there will be a phenomenon of glare, which causes a feeling of unpleasantness and discomfort, as well as a decrease in the ability to recognize details or objects. Such a phenomenon can also cause an accident. Due to the fact that lighting is considered only as a nuisance, light intensity measurement does not have to be performed by certified laboratories. The employer can do it on his own, if only has the right meter. In the examined room, the operational lighting in the task area was 570 lx, and 380 lx in the direct surroundings. The results are consistent with the requirements and create optimal conditions for administrative and office work. The information obtained after conducting comprehensive tests in the field of noise, lighting and thermal comfort in the office and administration room prove safe, optimal and ergonomic working conditions. In addition, the analysis of the computer station in terms of compliance with ergonomic requirements confirmed that the individual elements creating the office and

administration work are tailored to the needs, capabilities and limitations of employees. Additionally, in the office there is one disabled person moving in a wheelchair, to which - the limitations, needs and possibilities - the workplace has been adapted.

#### 4. CONCLUSION

Effective management of individual elements in the work environment is very important for shaping safe and ergonomic working conditions. This process does not deviate from the standard one. Planning for safe working conditions, organizing individual components that create a work environment and implementing them in accordance with ergonomic and safe guidelines is the part of managing individual elements of the work environment that is verified by human capital. As a result, human capital is motivated to safely use all elements of the work environment. The whole process is completed by controlling the relationship between man, the technical environment and the organization. The result is continuous improvement of all stages of management. The main elements of the administrative and office work environment, which are shaped in terms of security, include the administrative and office position mentioned in the article (seat, desk, computer) as well as selected physical factors of the work environment such as noise, microclimate and lighting. Appropriate shaping of a safe workplace consists in managing these elements of the work environment in such a way that the person embedded in them can safely and ergonomically work. The research results of selected elements of the work environment - noise, lighting, microclimate - presented in the article indicate proper management of the physical environment of administrative and office work in the aspect of safety and ergonomics.

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