



**MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION  
BRANCH OF THE FEDERAL STATE AUTONOMOUS EDUCATIONAL  
INSTITUTION OF HIGHER EDUCATION  
« National Research Technological University "MISiS" in the city of Almalyk**

**TRAINING AND METODOLOGY COMPLEX  
in the discipline "Life safety"**

Direction of preparation:      **05/21/04 - "Mining"**  
   **03/22/02 - " Metallurgy ";**  
   **15.03.04 - "Automation of technological  
processes and productions".**

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The educational and methodological complex for the discipline "Life Safety" was compiled in accordance with the requirements of the educational standards of NUST "MISiS" on the basis of curricula in the relevant areas of training and is a presentation of the issues of identifying dangerous and harmful factors in the "human - environment" system, preventing exposure negative factors on the human body, the basics of eliminating the consequences of their impact on the body in the domestic, industrial environment in peacetime and in case of emergencies.

For students of universities of mining and metallurgical specialties.

# 1 PLANNED LEARNING OUTCOMES IN THE DISCIPLINE

## 1.1. The purpose and objectives of the discipline

The discipline "Life Safety" refers to the compulsory discipline of the basic part of the professional cycle of disciplines and is mandatory when mastering the BEP in the areas of training.

**The purpose of the discipline** : - the formation of an idea of the inseparable unity of effective professional activity with the requirements for the safety and security of a person; - preparation for participation in the implementation of a scientifically based system of measures to create safe and comfortable working conditions; - the formation of students' skills in the safe organization of work and training of personnel in labor protection in mining and metallurgical enterprises

### **Discipline tasks:**

Objectives of the discipline: - to master the theoretical analysis and development of identification methods (recognition and quantitative assessment) of dangerous and harmful factors generated by the elements of the environment (technical means, technological processes, materials, buildings and structures, elements of the technosphere, natural phenomena); to study a comprehensive assessment of the multifactorial impact of negative living conditions on human performance; - master the development of methods to mitigate and eliminate the possible consequences of hazards; - get acquainted with the organization of work on labor protection in mining and metallurgical enterprises.

## 1.2. Planned learning outcomes

The discipline "Life Safety" refers to the basic part of the professional cycle of disciplines and is mandatory for the development of the BEP in the specialty "Mineral Processing", "Metallurgy", "Mining", "Automation"

As a result of mastering the discipline, graduates will:

### **Know:**

- safety criteria;
- legal and normative-technical foundations of security management;
- economic consequences and material costs for ensuring life safety.
- perform calculations of the safest parameters of technological processes;
- choose safe equipment and tooling for technological production;
- plan and evaluate the costs of technological production, taking into account the costs of safe working conditions;
- a method of developing methodological and regulatory materials that meet safety requirements.

### **Be able to:**

- to organize safe working conditions at the production sites of enterprises;
- conduct instructions on safe working conditions;
- determine the working conditions according to the harmful and dangerous production factors available in the workplace;
- develop measures to prevent accidents at work;

- study scientific and technical information, domestic and foreign experience in the field of labor safety.

**Own:**

- practical skills for solving problems and implementing projects in the field corresponding to the profile of training specialists in technosphere safety;
- knowledge and requirements of life safety, environmental safety;
- knowledge of economic, organizational and management issues to ensure life safety;
- methods and means of health promotion, maintain a certain level of physical fitness to ensure full-fledged social and professional activities of workers.
- first aid techniques for victims of accidents, man-made or natural emergencies;
- knowledge of the main methods of protecting the population in emergency situations.

### **1.3 Competences formed by the discipline**

The study of the discipline "Life Safety" is aimed at the formation of professional competencies among students, the possession of which can be identified on the basis of students' manifestation of abilities:

- possession of knowledge in the field of technosphere safety , goals and objectives of safe working conditions in the workplace;
- willingness to cooperate with colleagues, work in a team; knowledge of the principles and methods of safe organization and management of production; the ability to find organizational and managerial solutions in case of arising production situations;
- the ability to apply methods and means of knowledge, training and self-control for professional development in the field of life safety, raising the cultural level, professional competence, maintaining people's health in any life situations, in emergency situations;
- the ability to analyze the work of safe living conditions;
- ability to monitor safe working conditions;
- the ability to protect working personnel from the impact of hazardous and harmful production factors;
- the ability to draw up instructions for the safe operation of equipment, safety instructions

## **2. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF THE EDUCATIONAL PROGRAM**

### **3.**

The discipline "Life safety" is included in the variable part of block 1 "Disciplines (modules)" as a mandatory discipline.

The course "Life Safety" is the base for other special disciplines in the processing of minerals. The course has a practical focus and provides the acquisition of skills to act in emergency situations and safe working methods in the workplace.

## **3. VOLUME OF DISCIPLINE AND TYPES OF EDUCATIONAL WORK**

The total labor intensity of mastering the discipline "Life Safety" is **108** hours.

54 hours are allocated for contact work (classroom studies) of students with a teacher, including 18 hours for lectures, 18 hours for practical classes and 18 hours for laboratory classes. 54 hours are provided for independent work of students.

The program provides for one independent work, 2 tests (intermediate control) and a final test with an assessment.

## **4. CONTENT OF THE DISCIPLINE BY TYPE OF ACTIVITIES**

### **4.1 Lectures**

1. **The subject of the BJD course. Basic concepts and definitions** : Purpose, object, tasks and subject of the course. Risk and sustainable development Hazardous and harmful production factors in mining and metallurgical enterprises

2. **The relationship of the biosphere with the technosphere:** Subsystem "biosphere-technosphere". The growth of the earth's population. Consumption of natural resources. Resources of mineral raw materials and fuels. Land resources. Water resources. Forest resources. Biosphere pollution.

3. **Types of human habitat:** Industrial habitat. Injuries and occupational diseases. injury rate. Injury severity rate. Urban habitat. Domestic environment. social environment. Standard of living. Fertility. Marriage and divorce. Mortality and life expectancy. demographic load. Deterioration of public health.

4. **Technogenic and natural emergencies (ES):** Basic concepts and definitions. Emergencies caused by explosions. Explosion prevention. Explosion protection. Fire - caused emergencies . Fire barriers. Actions in case of fire. Emergencies caused by the release of hazardous chemical accidents. Emergencies caused by radiation accidents. Actions in case of radiation accidents. Earthquake. Classification of buildings and structures according to the degree of impact of an earthquake. Destruction of buildings and structures at different magnitude earthquakes. Earthquake action. Floods. natural fires.

5. **Emergencies of a social and military nature:** Classification of social dangers. Threats to the security of the individual, society and the state. Economic security. Information Security. Food security. Dangerous situations of a criminogenic nature. Health hazards. Emergencies caused by terrorist acts. Modern ammunition. Nuclear weapon. Chemical weapon. Bacteriological weapon. New types of weapons of mass destruction. Terrorist threats. The actions of people who were held hostage.

6. **Labor protection (OT) and safety measures. Legal basis of labor protection:** Basic concepts. Scientific base of security and safety. Legal and regulatory framework of OT. OT issues in the labor code. Obligations of workers in the field of labor protection. Ensuring the rights of employees to labor protection. Providing employees with PPE. Delivery of milk and BOB.

7. **Organization of labor protection at the enterprise. Types of briefings:** OT service. OT training. OT instructions. Induction training. Primary instruction. Periodic instruction. Extraordinary instruction. current instruction. Target coaching. Three-stage control on OT.

8. **Negative factors of the working environment.** industrial dust. Noise. Vibration. Ventilation. Illumination of workplaces.

9. **Organization of first aid to victims:** Organization of first aid in the affected areas. The defeat of people in emergency situations. Types of injuries. Types of wounds. Bleeding. First medical aid (PMP) for wounds. PMP for bleeding. PMP in trauma. Fractures and their types. PMP for fractures. Spinal injury. Rib fractures. Fracture of the pelvis.

#### 4.2 Practical exercises

No.	Topic name	Hours allotted
one	Safety when familiarizing with production in mining and metallurgical enterprises	2
2	Analysis of dangerous and harmful factors at mining and metallurgical enterprises	2
3	Actions of the population during emergencies-earthquakes and floods	2
four	Emergencies of peacetime and wartime	2
5	Procedure for investigating and recording industrial accidents	2
6	Types and procedure for conducting safety briefings at work	2
7	Organization of three-stage control on labor protection in production	2
eight	Organization of training and knowledge testing on labor protection of employees at the enterprise	2
9	First aid for victims at work	2
Total hours		<b>eighteen</b>

#### 4.3 Laboratory work

No. LR	Topic name	Hours allotted
1.	Safety in laboratory work	2
2.	Vibration	four
3.	Study of the resistance of the human body to electric current	four

4.	Study of sound insulation and sound absorption	four
5.	Protection against microwave radiation	four
Total hours		<b>eighteen</b>

#### **4.4 Topics for independent work**

1. Culture of life safety
2. Technogenic accidents
3. Negative factors of the domestic environment
4. Dangerous situations of a criminogenic nature
5. Health hazards
6. Hazardous production factors
7. Modern weapons of mass destruction
8. Safe recreation and tourism
9. Obligations of employees in the field of labor protection
10. Harmful factors of the working environment
11. Natural emergencies
12. Civil Defense
13. Aviation accident: causes and consequences
14. Safety on the road and in public transport
15. Occupational health and safety in production
16. Causes and classification of fires
17. Electromagnetic radiation and safety measures
18. Providing first aid to the injured
19. Negative factors of the urban environment
20. Mass infectious diseases of people
21. Social emergencies
22. Ways to extinguish fires. Types of fire extinguishers
23. Social dangers and protection against them
24. Terrorism in the Modern Era
25. Accidents on communal systems
26. Mass infectious diseases of animals
27. Legislation of the Republic of Uzbekistan on fire safety
28. Criminal dangers and protection against them
29. Legislation of the Republic of Uzbekistan on labor protection
30. Healthy lifestyle and its components

#### **4.5. Requirements for independent work (abstract) of students**

*By design :*

1. Contents of the abstract: title page, table of contents, introduction, text of the abstract, literature, applications.

2. The volume of the abstract is at least 15 pages of A4 format, Times New Roman font, size 12 pt, single line spacing, text alignment - in width, page numbering in the footer.

3. The title page indicates: the title of the abstract, full name. performer, faculty, specialty, course, group and academic degree, full name of the teacher

4. List of sources used - at least 3, full indication of the output data for books and periodicals, addresses of sites from which the material is borrowed, references to sources should be included in the text of the abstract;

*By content:*

1. The abstract must contain reliable and relevant information at a sufficient scientific level;

2. The abstract, in addition to the text (.doc or .pdf format ) , must additionally contain: illustrations, drawings and other materials that qualitatively complement the main part of the abstract.

## **5 EDUCATIONAL AND INFORMATION SUPPORT OF THE DISCIPLINE (MODULE)**

### **5.1 Main literature:**

1. B.S. Mastryukov and others. Life safety. -M., "Academy", 2012.
2. S.V. Belov. Life safety. Textbook for universities. –M., Yurayt Publishing House, 2010.
3. I.A. Ekimova. Life safety. Textbook for technical universities. –M., Content, 2012.

### **5.2. Additional literature:**

1. V.A. Akimov Life safety. Safety in emergency situations of natural and man-made nature. -M., Higher school, 2008.
2. Yu.D. Sibikin Labor protection and electrical safety. -M., RadioSoft, 2011.
3. Regulatory and technical documents in the field of labor protection of the Republic of Uzbekistan

### **5.3 Logistics of discipline**

The following are used in the educational process: - classrooms for conducting lecture and seminar-type classes, group and individual consultations, current control and intermediate certification, a set of multimedia equipment, including a multimedia projector screen, a computer for demonstrating presentations; educational visual aids providing thematic illustrations and classroom furniture (tables, chairs, classroom board); - the library for independent work is equipped with computer tables, chairs, classroom board, computer equipment with the ability to connect to the Internet and provide access to the university's electronic information and educational environment.

## **6. AN EVALUATION FUND FOR INTERIM ATTESTATION**

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The system for assessing students' knowledge pursues the following tasks:  
- organization of systematic and timely assimilation of the subject;

- regular assessment of students' progress;
- objective and accurate assessment of students' knowledge;
- regular notification of students and analysis of assessment results.

### 6.1. Types and forms of the rating system

Assessment of student progress in the subject is carried out regularly and is achieved by the following types of control:

- current control (TC);
- intermediate control (PC);
- performance of independent work (SR);
- final control.

**Current control** provides for the assessment of knowledge and practical skills on each topic of the discipline and is carried out in practical and laboratory classes.

**Intermediate control** assesses the theoretical knowledge of students after classes in 8 (PC-1) and 17 (PC-2) weeks and determines the student's ability to answer questions on the topics covered by the discipline. PC form - written test.

student draws up **independent work in the form of an abstract in accordance with the established requirements and submits it within the specified time.**

**The final control** is carried out throughout the course of the subject at the end of the semester.

The evaluation fund is formed on a 100-point scale. 100 points are distributed as follows:

- current control 36 points
- intermediate control (PC-1 + PC-2) 24 points
- doing independent work 10 points
- final control 30 points

The following typical criteria for assessing students' knowledge are taken into account:

score	Grade	Student knowledge level
86-100	Excellent (5)	<ul style="list-style-type: none"> <li>- decision making and conclusions;</li> <li>- the ability to think creatively;</li> <li>- independent thinking</li> <li>- the ability to apply the acquired knowledge in practice;</li> <li>- the concept of the essence of the issue, knowledge and ability to express;</li> <li>- have an idea about the subject being studied.</li> </ul>
71-85	Good (4)	<ul style="list-style-type: none"> <li>- independent thinking</li> <li>- the ability to apply the acquired knowledge in practice;</li> <li>- the concept of the essence of the issue;</li> <li>- the ability to express the acquired knowledge</li> </ul>
55-70	Satisfactory (3)	<ul style="list-style-type: none"> <li>- the concept of the essence of the issue;</li> <li>- the ability to express the acquired knowledge;</li> </ul>

		- to have an idea about the subject being studied.
0-54	Unsatisfactory	- not having an accurate representation; - lack of discipline

### **6.2 The procedure for assessing students' knowledge:**

- **delivery of work in practical and laboratory classes** (description of work and its defense) - the maximum is estimated up to 2 points for 1 lesson (maximum 18 + 18 = 36 points per semester);
- **performance of independent work** in the form of an abstract and defense - the maximum value is 10 points per semester;
- **intermediate control work** (written) - each PC is estimated at a maximum of 12 points. During the semester, two intermediate tests are carried out (PC-1 and PC-2) at 8 and 17 weeks - the maximum you can score is 24 points;
- **final control work** - written work is estimated at a maximum of 30 points.

## **7. METHODOLOGICAL INSTRUCTIONS FOR STUDENTS ON MASTERING THE DISCIPLINE**

The organization of classes in the discipline "Life Safety" is possible both according to the usual technology by type of work (lectures, practical classes, laboratory workshop, current control) according to the schedule, and via distance learning through the NUST MISIS AF platform.

When presenting theoretical material, multimedia illustrative materials are used. Laboratory classes are conducted using laboratory equipment.

For independent work, educational and methodological materials prepared by teachers are used.

Training is organized in accordance with this program. Independent work of students is organized and evaluated by the teacher. Protection by students of practical and laboratory classes is carried out during these works or out of class time. Three tests are carried out in writing during practical or laboratory work.

For independent work, students are provided with computer classes of the AF NUST MISiS. In the process of independent work, students use the computer classes of the AF NUST MISiS.

## **8. INFORMATION TECHNOLOGIES USED IN THE IMPLEMENTATION OF EDUCATIONAL ACTIVITIES IN THE DISCIPLINE**

Lectures and practical classes are conducted using multimedia tools. Laboratory classes are held in laboratory classes in compliance with safety requirements. The current certification involves the delivery of topics of practical and laboratory classes.

## 9. LOGISTICS OF THE DISCIPLINE

9.1. Specialized laboratories and classes, main installations and stands

9.2. Means of ensuring the development of discipline (module)

### 10 LECTURES

#### Section 1. INTRODUCTION TO THE BJD COURSE

#### Lecture number 1. SUBJECT OF THE COURSE BZD. BASIC CONCEPTS AND DEFINITIONS

*Purpose, object, tasks and subject of the course. Vitality. Negative environmental factors. Dangers. Classification of hazards. Means of collective protection. Individual protection means. Axioms of the BJD. Risk. Types of risk. Culture of life safety. Dangerous and harmful production factors in mining and metallurgical enterprises.*

#### 1.1 Preface

The problem of protecting a person from dangers in various conditions of his habitat arose simultaneously with the appearance of our ancestors on Earth. At the dawn of mankind, people were threatened by dangerous natural phenomena, representatives of the biological world.

Currently, a person suffers most from the hazards themselves (traffic accidents, deaths at work, deaths from alcohol, etc.)

Statistics show that people are dying, becoming disabled or sick from natural, man-made, anthropogenic, biological, environmental and social hazards.

The development of mankind at all times, and especially in the last two centuries, was largely determined by scientific and technological progress associated with the creation of new technologies of material production aimed at satisfying human needs, which are increasing as they reach new levels of material well-being.

Technogenic danger and damage caused by technogenic emergencies have become commensurate with natural disasters, and at present, safety in the natural and technogenic sphere has become a global problem for mankind. Planning for a safe life at the individual, collective, social and planetary levels is becoming the main concern of mankind.

However, the understanding that one of the main factors of safe sustainable development, reduction of natural and man-made hazards is the level of professional training of scientists, specialists and managers (decision makers) has not yet been formed in the public mind.

*Life safety* is a field of scientific knowledge that studies the dangers and ways to protect a person from them in any conditions of existence. A special role in the Belarusian Railway is occupied by a person who acts here in a trinity of functions:

- firstly, it is an object of protection (along with the environment);
- secondly, it is a source of danger (due to mistakes, fatigue, emotional imbalance);
- thirdly, it is a security specialist.

**The purpose of the BZD** is to protect a person from external negative impacts of anthropogenic, man-made and natural origin

**Objects of science about BJD** - a person, groups of people

**The subject of the study of the science of BJ** is dangers and their combination, as well as methods and means of protection against dangers.

**Basic concepts and definitions**

**Vital activity** is a way of human existence, including daily activities and all types of recreation.

In the life process, a person is inextricably linked with his *environment*, which is understood as the environment surrounding a person, due to a combination of factors (physical, chemical, biological, informational, social, etc.) that have a direct or indirect, immediate or remote impact on life man, his health and his descendants.

The habitat of modern man is the *technosphere* - a part of the biosphere, in the past transformed by people with the help of direct or indirect impact of technical means in order to meet their socio-economic needs.

**Biosphere** - the area of distribution of life on Earth, covering the lower layers of the atmosphere and the upper layers of the hydrosphere and lithosphere.

**Noxology** is the science of the dangers of the material world of the Universe.

**The noxosphere** is a space in which dangers constantly exist or spontaneously arise.

call the **homosphere**, the space in which a person is located.

**The following types of habitats are distinguished:** domestic, industrial, urban, agricultural, transport, etc. Each habitat has both positive and negative impacts on humans and the natural environment.

**Negative environmental factors** are divided into physical, chemical, biological and psychophysiological.

**Physical factors** - moving parts of the machine and mechanisms, increased levels of electromagnetic and ionizing radiation, noise and vibration, insufficient lighting, increased voltage in electrical networks, etc.

**Chemical factors** - substances and compounds of different aggregate state that have a toxic, irritating, carcinogenic and mutagenic effect on the human body and affect its reproductive function.

**Biological factors** - pathogenic microorganisms (bacteria, viruses, etc.) and their metabolic products, as well as plants and animals.

**Psychophysiological factors** - physical (static and dynamic) and neuropsychic overloads (mental overstrain, overstrain of analyzers, monotony of work, emotional overloads).

Each environment has its own set of negative factors. Examples of a work environment are a factory, a farm, an office, a student auditorium, etc.

Characteristic negative factors of the industrial (factory) production environment are noise, vibration, static electricity, electromagnetic fields, moving machines and mechanisms, dust and gas contamination of the working area, cutting fluids, physical overload, etc.

The office is characterized by neuropsychic overload, insufficient lighting, the

negative effects of a computer, monotony of work, etc.

Agricultural work is characterized by physical overload, suboptimal meteorological and climatic conditions, various biological factors, etc.

The urban environment is characterized by noise and vibration from moving vehicles, electromagnetic fields, thermal pollution, dust and gas content in the air from motor vehicle exhausts and emissions from thermal power plants, and pockets of radioactive contamination.

In a domestic environment, a person is affected by electromagnetic fields of household appliances and electrical wiring, increased noise and vibration, pesticides in the form of detergents, poor quality water and food, polluted air, etc.

Life safety is a universal discipline. Everyone should know it, from schoolchildren to the highest leaders. Every profession has its own safety rules. Every employee of any enterprise, factory, plant, office must attend a course on life safety. Knowing the elementary safety rules, we can save our own and others' lives. No wonder it was decided to introduce life safety into the school curriculum. The sooner everyone realizes the importance of the science of life safety, the more it will be possible to prevent situations that harm health and take a person's life.

**Danger** is a negative property of living and inanimate matter, capable of causing harm to matter itself.

*Sources of danger are understood as conditions and factors that potentially conceal and under* certain conditions, by themselves or in various combinations, reveal hostile intentions, harmful properties, destructive nature.

## 1.2 Hazard classifications

### A) Hazard classifications

#### 1 . Origin :

natural (hurricanes, earthquakes, volcanic eruptions, etc.);

anthropogenic (*social* - terrorism, famine, etc., *man -made* - dangers from machines and technologies).

#### 2. By type of flow :

mass (harmful emissions from the atmosphere, flooding, etc.);

energy (infrared, radioactive radiation, noise, etc.);

informational (neuro-linguistic programming, overstrain of sensory systems, etc.).

#### 3. According to the intensity of exposure :

permissible (levels within the limits (MPC, MPD, etc.);

dangerous (levels above the standards, cause health problems);

extremely dangerous (threatened with a fatal outcome, more often characteristic of emergency situations).

#### 4. According to the duration of exposure :

permanent (associated with staying in industrial or amenity premises);

variables (noise in the airport area, storm, etc.);

impulse (lightning discharge, explosion, etc.).

#### 5. According to the characteristics of the impact zone :

a) by type of zone (industrial, residential, urban, emergency zones, etc.);

b) by the size of the zone (local, regional, transboundary, global).

*B) Classification of hazards according to the impact on the object of protection*

1. According to the ability of human identification :

distinguishable (vibration, heating, noise, visible light, etc.);

indistinguishable (radioactive radiation, infrasound, electromagnetic fields, etc.).

2 . By level of impact (degree of impact):

harmful factors - negative impacts that lead to a deterioration in well-being or illness;

dangerous (traumatic, traumatic) factors - a negative impact that leads to injury or death.

3. By the number of persons at risk (scale of impact) :

individual (personal);

group (collective);

massive.

Security *means* are a constructive, organizational, material embodiment, a concrete implementation of the principles and methods of ensuring security.

*Collective protective equipment (SKZ) and personal protective equipment (PPE) are used.*

*Collective protective equipment (SKZ)* - are classified depending on the type of hazardous and harmful factors: means of protection against noise, vibration, dust, electrostatic charges, etc. According to the technical design, SKZ are divided into fences, blockings, sound and light alarms, safety devices, safety devices, signal colors, safety signs, automatic control devices, remote control, grounding and zeroing, ventilation, heating, lighting, insulating, sealing means, etc. .

*Personal protective equipment (PPE)* - designed to protect individual organs or the human body as a whole from exposure to dangerous and harmful factors. PPE includes gas masks, self-rescuers, respirators, masks, overalls, shoes, mittens, gloves, hard hats, helmets, anti-noise helmets, goggles, liners, safety belts, etc.

### **1.3 Axioms of BJD**

1. Any activity (inactivity) is potentially dangerous.

2. For each type of activity there are comfortable conditions that contribute to its maximum efficiency.

3. All natural processes, anthropogenic activities and objects of activity have a tendency to spontaneous loss of stability or to a long-term negative impact on humans and their environment, i.e. have residual risk.

4. Residual risk is the root cause of potential negative impacts on humans and the biosphere.

5. Safety is real if the negative impacts on a person do not exceed the maximum permissible values, taking into account their complex impact.

6. Environmental friendliness is real if the negative impacts on the biosphere do not exceed the maximum allowable values, taking into account their complex impact.

7. Permissible values of technogenic negative impacts are ensured by compliance with environmental and safety requirements for technical systems, technologies, as well as applications of ecobioprotection systems (ecobioprotective equipment).

#### **1.4 Risk and types of risks**

A measure of danger is *risk* - a value that takes into account the likelihood of a hazard and the damage it causes.

1) Individual risk - the probability of the realization of a hazard with an impact on an individual.

Individual risk factors are, for example, disease, death in a transport accident, injury in a work accident, etc.

2) Social (collective) risk - the likelihood of a hazard with an impact on a group of people (population, production team).

Examples of social risk factors: settlement of people in a zone of possible flooding; the use of weapons of mass destruction; living in a village where there is no medical facility, etc.

3) Environmental risk - the probability of destruction of natural objects from the realization of any danger

Examples of environmental risk factors : pollution of the water area with oil products, destruction of the ecosystem by plowing land, death of organisms due to pollution of a reservoir, etc.

4) Technical risk - the probability of failure of technical devices with consequences of a certain level (class) for a certain period of operation of a hazardous production facility.

Examples of technogenic risk factors: collapse of a tower crane, explosion of a pressure vessel, failure of the NPP reactor cooling system, etc.

#### **1.5 Life safety culture**

The modern lifestyle of the planet's population is associated with an unacceptable level of consumption of natural resources, the result of which is the depletion of some of the Earth's non-renewable natural resources in the very near future and the release of substances that pollute the environment.

*Life safety culture* (hereinafter KBZH) is a certain level of development of a person and society, characterized by knowledge of safe behavior in everyday life and in dangerous and emergency situations, the degree of protection from threats and dangers in all spheres of life. The lack of a safety culture can lead to big troubles: illnesses, accidents, disasters, etc.

KBZH needs to be practiced from the moment of birth until the end of life, KBZH is formed by parents, teachers, society and the state. But now, everyday life is characterized by alcohol, drugs, the absence of an unhealthy lifestyle. The Internet and some other information technologies promote violence, cruelty, etc. in users. Many teenagers and young people lack knowledge and a clear understanding of what is good and what is bad. Many people have no idea about what to do in an emergency. Lack of

knowledge of the elementary conditions of the KBJ can lead, for example, to death in a traffic accident, an accident at work, alcohol poisoning or drug overdose, suicide, various diseases from smoking, malnutrition or due to an unfavorable environment, etc. . All this indicates the absence of KBZH.

It is necessary to take into account the human factor, which initiates the occurrence of up to 80-90 % of all man-made and up to 30-40% of natural emergencies. Taking into account the human factor in the process of ensuring the safety of life is not limited to the formation of a certain set of knowledge and skills in people. It is important that this process be a priority goal and an internal need of a person, society, civilization. This can be achieved through the development of a new worldview, a system of ideals and values , norms and traditions of safe behavior, i.e. the formation of a whole *culture of life safety* .

*The main directions of the formation of the KBJ:*

- *improving the organization of training of the younger generation in the field of life style in educational institutions;*
- *development of educational and methodical literature, multimedia manuals, computer training programs;*
- *patriotic and moral education of youth (in the family, in society);*
- *protection of the population from emergency situations (formation of civil defense, training of the population in emergency situations, etc.)*
- *training of specialists in the field of life safety.*

*You can name the following elements of KBZH:*

- *at the individual level* - this is a worldview, norms of behavior, individual values and preparedness of a person in the field of life safety;
- *at the collective level*, *the* formation of the KBZH should include the establishment of life safety as one of the highest values of the organization, the creation of an atmosphere of psychological disposition for safety, the development of a sense of personal responsibility in employees in matters of safety, the necessary selection, education and training of personnel that affects safety , moral and material incentives for their activities aimed at reducing the risks of dangerous situations and accidents, monitoring compliance with labor and technological discipline, and labor protection.

*On the public - state level* - implementation of the state policy in the field of safety, legal framework, training in educational institutions, social advertising of safety, state incentives in the field of life safety, insurance mechanisms for ensuring safety, etc.

## **1.6 Hazardous and harmful production factors in mining and metallurgical enterprises**

A number of dangerous and harmful factors affect workers of mining and metallurgical enterprises, leading to occupational diseases, injuries, and sometimes deaths. This leads to large losses in the working capacity of the population, and subsequently to economic losses. In this regard, the issue of increasing the level of labor protection at enterprises and reducing the number of jobs with harmful and dangerous working conditions becomes relevant.

Harmful factors can lead to a deterioration in well-being, increased fatigue, decreased performance or the development of a disease (noise, vibration, electromagnetic radiation, etc.)

Hazardous factors can lead to injury or a sharp deterioration in health (mechanical hazards, explosions, poisons, etc.)

Hazardous and harmful working conditions in GM enterprises include:

1. Physical factors - moving and rotating parts of the equipment, high surface temperature, hot metal, electric current, sharp metal edges, the possibility of ignition of fuels and lubricants, inconsistency of the microclimate to the norm, noise, vibration, inconsistency of illumination of working places, etc.
2. Chemical factors - vapors, gases, chemical liquids, dust, aerosols, etc.
3. Psychophysiological factors - high intensity of the process, shift work, physical activity, fatigue, etc.

### test questions

1. Define life safety.
2. What is a habitat? Give examples.
3. What is the technosphere?
4. Give examples of negative environmental factors.
5. How do you understand the terms "safety" and "danger"?
6. What types of life safety axioms do you know?
7. How do you understand the term "risk"?
8. What types of risk do you know?
9. What is a culture of life safety?
10. What types of life safety culture exist?
11. What is a harmful factor?
12. What is a risk factor?
13. What to treat physical harmful and dangerous factors?
14. What dangerous and harmful production factors exist in mining and metallurgical enterprises?

## Section 2. HUMAN AND TECHNOSPHERE

### Lecture number 2. INTERRELATION OF THE BIOSPHERE WITH THE TECHNOSPHERE

*Biosphere. Technosphere. Subsystem "biosphere-technosphere". The growth of the earth's population. Consumption of natural resources. Resources of mineral raw materials and fuels. Land resources. Water resources. Forest resources. Biosphere pollution*

#### 2.1 Biosphere and technosphere

*The biosphere is the shell of the Earth inhabited by living organisms and transformed by them. The biosphere began to form no later than 3.8 billion years ago, when the first organisms began to emerge on our planet . It penetrates the entire*

hydrosphere, the upper part of the lithosphere and the lower part of the atmosphere, that is, it inhabits the ecosphere (the habitat of living organisms). The biosphere is the totality of all living organisms. It is home to over 3,000,000 species of plants, animals, fungi and bacteria. Man is also a part of the biosphere, his activity surpasses many natural processes.

Biosphere - the area of distribution of life on Earth, including the lower layer of the atmosphere, 12-15 km high, the entire aquatic environment of the planet (hydrosphere) and the upper part of the earth's crust (lithosphere 2-3 km deep). The upper boundary of the biosphere is located at an altitude of 15-20 km from the Earth's surface. Active technogenic human activity has led to the destruction of the biosphere in many regions of the planet and the creation of a new type of habitat - the technosphere.

The technosphere is a region of the biosphere in the past, transformed by people into technical and man-made objects (mechanisms, buildings, structures, mine workings, roads, etc.). The development of the technosphere in the twentieth century had exceptionally high rates compared with previous centuries. This led to two diametrically opposite consequences. On the one hand, outstanding results were achieved in science and various industries, which had a positive impact on all spheres of life. On the other hand, previously unprecedented potential and real threats to man, the objects he created and the environment were created. Human activity leads to changes in the biosphere (global pollution of water, air and soil, desertification of the planet, pollution of the oceans, an increase in the temperature of the Earth's surface, destruction of the ozone layer).

Historically, the technosphere is formed in several stages, which differ significantly from each other. Human impact on the environment, according to the laws of physics, causes counteractions of all its components. The human body painlessly endures certain influences as long as they do not exceed the limits of adaptation.

Man and environment are constantly in interaction, forming a constantly operating system "man - environment". In the process of evolutionary development of the World, the components of this system were continuously changing. Man improved, the population of the Earth and the level of its urbanization increased, the social structure and the social basis of society changed. The habitat also changed: the territory of the Earth's surface and its bowels, mastered by man, increased; the natural environment experienced the ever-increasing influence of the human community, there appeared artificially created by man domestic, urban and industrial environments. As a result of the active transformational activity of man, he created a new type of habitat - the technosphere.

The purpose of creating the technosphere by man is the desire to improve the comfort of life, to provide protection from external natural influences. At the same time, technospheric conditions, along with positive ones, also have a negative impact on humans and the natural environment. The complex of negative factors associated with the creation and development of the technosphere includes: chemical pollution - an increase in the content of harmful chemicals in the air, water, soil, food; physical pollution - a change in the physical parameters of the habitat (increase in temperature,

noise level, radiation and electromagnetic background); biological pollution - an increase in the content of pathogens, an increase in morbidity, the emergence of new dangerous infections; negative social and psychological factors caused by social and informational stress, leading to an increase in psychosomatic diseases ( *these are* diseases caused by mental disorders ), an increase in crime, drug addiction, and suicides.

The negative factor of the technosphere is the ability of any element of the technosphere to cause damage to human health, material and cultural values or the natural environment.

## **2.2 The main negative factors of the technosphere are:**

Harmful, hard, strenuous work associated with human activity in a production environment with dangerous and harmful factors (work with chemicals, work with sources of noise, vibration, electromagnetic and ionizing radiation, work in hot shops, work at height, in mines, moving loads manually, working in confined spaces, working in a fixed position, evaluating and processing a large amount of information, etc.).

- Polluted air, water, soil and food with harmful and hazardous chemicals caused by the release of toxic emissions and discharges from enterprises, as well as industrial and domestic waste into the environment.

- Human exposure to noise, vibration, thermal, electromagnetic and ionizing radiation caused by the operation of industrial facilities and technical systems.

- High risk of death or damage to health as a result of man-made accidents and disasters in transport, energy facilities and industry.

In most industrial enterprises, workers work in unfavorable working conditions (dust, gas, noise, vibration, etc.). As a result, there is a high level of occupational diseases and acute poisoning, as well as a high level of injuries. The largest number of accidents occur in construction and in the production of building materials, in housing and communal services and public services, urban transport, communications, and also in the defense industry. In terms of fatal injuries at work, Russia is ahead of the developed countries of the world. The number of deaths in industry per 1,000 workers for Russia is almost an order of magnitude higher than in the USA, Finland, Japan, and Great Britain. In addition, production is the main polluter of the environment. In the conditions of the technosphere, negative impacts are caused by elements of the technosphere (machines, structures, etc.) and human actions.

## **2.3 Subsystem "biosphere-technosphere"**

The modern world economic strategy potentially contains the threat of a global crisis, the causes of which are the preservation of mutual stimulation of human growth and the consumption of natural resources. The totality of living organisms of the planet - *biota* , being a resource for itself, is an important source of resources for humanity. It supplies us with the most important substances, materials and energy.

The interaction of the technosphere and the biosphere at the global level is that:

-The technosphere withdraws natural resources from the biosphere (biomass, minerals, ores, oil, gas, coal, fresh water, air oxygen for fuel combustion, air nitrogen for fertilizer synthesis, etc.);

- The technosphere occupies the territory necessary for the biosphere to carry out the biotic regulation of environmental parameters;

- The technosphere emits waste into the biosphere (in the broadest sense of the word: it emits gases and dust into the atmosphere, discharges oil products, dissolved and suspended substances into water bodies, and places solid waste on the soil).

*The biosphere existed and can exist without the technosphere, but the technosphere cannot exist without the biosphere - the resources of production and the living conditions of people.*

The modern economy depends on 25% of the modern resources of the biosphere and another 60% on the products of past biospheres: fossil fuels and minerals. For primary needs, people are 90% dependent on the resources of the modern biosphere.

The attack of the technosphere on the biosphere continues. Growth dynamics of the technosphere in the 20th century presented in table 2.1.

Table 2.1 - Growth dynamics of the technosphere in the 20th century

Indicators	Early 20th	End of XX
Gross world product, USD billion/year	60	20 000
Population, billion people	one	6
Fresh water consumption, km <sup>3</sup> / year	360	4000
Consumption of annual biomass growth of biosphere producers, %	one	40
Energy consumption, MW	1x10 <sup>6</sup>	10x10 <sup>6</sup>

Table 2.2 - Territory of the Earth disturbed by economic activity

Continent	Territory,%	
	Undisturbed	Completely broken
All land	51.9	36.3
Europe	15.6	6.9
Asia	43.5	29.5
Africa	48.9	15.4
North America	56.3	29.4
South America	62.5	15.1
Australia	62.3	12.0

Antarctica	100.0	0
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*The development of the technosphere* is carried out due to the destruction of the natural environment and the displacement of the natural ecosystems of the biosphere. Table data. 2.2 show that there are few territories left on the planet with undisturbed natural ecosystems.

*Among the numerous areas of interaction between the technosphere and the biosphere, the main ones are:*

- population growth;
- consumption of natural resources;
- pollution of the biosphere.

## 2.4 Population growth

For the past 150 years, the world's population has grown and continues to grow at a phenomenal, explosive rate, as evidenced by the data below.

Population doubling time:

0 - 900 AD - 160 - 320 million	900 years
900-1700 AD - 320 - 600 million	800 years
1700-1850 AD - 600-1 200 million	150 years
1850-1950 AD - 1 200 -2 500 million	100 years
1950-1990 AD - 2,500 -5,000 million	40 years

The annual population growth is 1.7%. UN experts predict that, barring a world nuclear war or widespread famine or pestilence, the population will reach 10.4 billion by 2100, twice what it was in 1990. Most of the population growth is in developing countries . countries. More than half of the world's population in the modern era is concentrated in Asia - 57.9%; Europe (with Russia) - 17.2%; Africa - 10.2; North America - 8.6; South America - 5.6; Australia and Oceania - 0.5%.

One of the main reasons for the growth of the population of individual countries and on the planet as a whole is an increase in the average life expectancy of people and a simultaneous increase in the average age (aging) of the population, depending on the gross domestic product (GDP is a macroeconomic indicator that reflects the market value of all final goods and services (then there are intended for direct consumption, use or application), produced per year in all sectors of the economy on the territory of the state ) of the country (Table 2.3).

The increase in the world's population creates significant problems. A person needs a place to live, a place to work. But most importantly, billions of people need a huge amount of food.

Every day on our planet 110 thousand people. die prematurely from hunger, malnutrition, and poverty-related diseases.

Table 2.3 - Dependence of life expectancy on the country's GDP

Country	Life expectancy, years	Real GDP per capita, thousand dollars
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Japan	80	24.7
USA	76.4	29.01
Sweden	78.5	19.79
Mexico	72.7	8.37
Colombia	70.4	6.8
Russia	66.6	4.37
Nigeria	50.1	0.920
Rwanda	40.5	0.660
Sierra Leone	37.2	0.410

Recently, migration processes have intensified in the world due to inefficient political power, economic backwardness, and environmental degradation. Most of the migrant population settles in cities, increasing the rate of urbanization of the world's population.

### 2.5 Consumption of natural resources

To ensure his life, a person is forced to use the resources of the biosphere, thereby causing significant damage to it.

*Resources of mineral raw materials and fuels.* At least 300 billion tons of mineral raw materials are extracted annually from the bowels of the Earth, and at the same time, the mass of soil and rocks is moved by an order of magnitude more. Every year, approximately 400 thousand hectares of the land surface are disturbed during the extraction of minerals, of which about 60% is excavation, 37% is occupied by areas for the placement of overburden and waste rock, and 3% is land subsidence and other disturbances associated with underground work . .

Data on world reserves, production levels and projected periods of depletion of the main minerals are presented in Table. 2.4.

Table 2.4 - World reserves and level of extraction of the main minerals

Useful fossil	World probable geological - reserves, bn t	Modern world level of production,	Countries with the largest reserves	Forecast-runnable term availability,
Hard and brown coal	5000	4.5	USA, China, Russia	400
Oil	132.7	3.1	Persian Gulf, Gulf of - Mexico,	45

Natural gas	144 trillion m <sup>3</sup>	2.2 trillion m <sup>3</sup>	Russia, Western Asia, Northern Africa	71
Iron ore	600	1.0	Brazil, Australia, Canada	250

bauxites	fifty	0.08	Australia, Guinea, Brazil	250
Copper ore	0.86	0.008	India, Zimbabwe, Zambia	55
Gold	-	0.0022	South Africa,	-

*Land resources.* Of the total surface area of the Earth (510 million km<sup>2</sup>), 149 million km<sup>2</sup> fall on land, and the rest is occupied by seas and oceans. The total area of the world's land fund (land area minus the area of the ice deserts of the Arctic and Antarctic) is 134 million km<sup>2</sup>.

In the structure of the world land fund (out of 134 million km<sup>2</sup>) - 11% falls on cultivated land (arable land, orchards, vineyards); 23% - to meadows and pastures; 30% - for forests; 3% - on anthropogenic landscapes (settlements, industrial zones, transport lines); 33% - on unproductive lands (deserts, swamps and extreme areas with low temperatures or in the mountains).

In the world deterioration, or degradation, of the earths is noted. Thus, due to erosion, 6-7 million hectares are annually taken out of agricultural circulation, and bogging and salinization take another 1.5 million hectares out of land use.

A serious threat to the land fund in 60 countries of the world is the desertification of previously cultivated lands, which covered an area of 9 million km<sup>2</sup>.

*Water resources.* The total water reserves on Earth are 1,386 million km<sup>3</sup>, but 96.5% of the planet's water resources are in the salt waters of the World Ocean and 1% in salty groundwater. Fresh water accounts for only 2.5% of the total volume of the hydrosphere, and if we exclude from the calculation the polar ice, which is still practically not used, then only 0.3% of the total amount of water on earth remains at the disposal of mankind.

World water consumption is growing every year. Rivers remain the main source of fresh water, with an annual resource of 47,000 km<sup>3</sup>, and less than half of this amount can actually be used.

The main consumers of water in the world are agriculture (69%), industry (21%), utilities (6%) and reservoirs. In Russia, the structure of water consumption differs markedly from the world average: industry is in first place (55%), agriculture,

including irrigation (20%), is in second place, and utilities are in third place (19% of total consumption).

*Forest Resources* . The forested areas all over the world reach 40.1 million km<sup>2</sup> . Over the past 200 years, the area of forests on earth has been reduced by about half. Despite seemingly huge timber reserves in Russia, North America, Northern Europe and South America, the possibilities for extensive exploitation of forest resources are now close to being exhausted.

## 2.6 Pollution of the biosphere

*Pollution* is the entry into the environment of any solid, liquid and gaseous substances, microorganisms or energies (in the form of sounds, noise, radiation) in quantities that are harmful to human health, animals, the state of plants and ecosystems.

Sources of pollution can be natural (dust storms, volcanic activity, mudflows, etc.) and anthropogenic. Sources of anthropogenic pollution, the most dangerous for populations of any organisms, including the human population itself, are industrial enterprises (chemical, metallurgical, pulp and paper, building materials, etc.), thermal power engineering, transport, agricultural production and other technologies.

*Anthropogenic* ( environmental impact caused by human activity) *Atmospheric pollution* is caused by the burning of all types of natural fuels, the activities of metallurgical and chemical enterprises. For example , currently about 20 billion tons of carbon dioxide, 150 million tons of sulfur oxide (36 million tons due to natural sources), up to 53 million tons of nitrogen oxides (30 million tons - natural intake), millions of tons of fluorine compounds, mercury, freons and other toxic and harmful substances.

*Troposphere pollution* affects the *ozone layer*, which protects the Earth from the powerful effects of ultraviolet rays . It is noted that every 10 years the thickness of the ozone layer decreases by 2%. According to a number of environmental scientists, by 2030 in Russia, if the current rate of ozone depletion continues, an additional 6 million people will develop skin cancer.

A serious problem is *acid rain* ( all types of meteorological precipitation - snow, rain, hail, fog, rain with snow - in which there is a decrease in the pH value of rainfall due to air pollution with acid oxides) , formed as a result of emissions into atmosphere of nitrogen oxides, sulfur and other chemical compounds. Their effect on human health is indirect, since the toxic compounds of acid rain can be absorbed by plants and soil organisms, which, in turn, can already come into direct contact with humans.

All substances *polluting the hydrosphere* are divided into the following groups: organic substances from agriculture, domestic and industrial wastewater; pathogens and viruses in poorly treated effluents from cities and livestock farms; nitrogen and phosphorus from domestic and agricultural effluents, which increase the content of nitrates and nitrites in water bodies; heavy metals, petroleum products, pesticides, detergents, phenols.

Oil pollution occurs due to the discharge of oil products into the ocean waters - up to 6 million tons/year, which are accidental during the transportation and production

of oil in the seas. Oil also enters sea waters with river runoff. As a result, 2...4% of the surface of the Pacific and Atlantic oceans are covered with an oil film.

Every year, up to 6 billion tons of various industrial wastes are taken out on ships and dumped into ocean waters: sewage sludge, construction waste, old explosives, liquid radioactive and chemical waste. With municipal and industrial wastes (drainage), bacterially contaminated waters are thrown into the waters of the seas, which leads to biological pollution of coastal waters; heavy metals, arsenic, mercury, etc. are emitted with industrial effluents.

*The surface layers of soils* are heavily polluted with various chemical - compounds (toxicants) that adversely affect the vital activity of soil organisms and have a negative impact on humans, flora and fauna.

Population growth in the 20th century. demanded an increase in food production. Since the limit of the biological productivity of the soil was reached, a further increase in productivity became possible only if a large amount of mineral fertilizers was applied. Currently, about 50 million tons of mineral fertilizers and about 3 million tons of various pesticides are stored in the soils of the world, which are washed away by surface waters, carried by the wind and, as a result, create geochemical anomalies. As a result, such environmental disturbances as the accumulation of nitrates in food products, animal feed, destruction of food chains, etc. are observed.

One of the most acute environmental problems is environmental *pollution by production and consumption waste* . Waste is a source of pollution of atmospheric air, ground and surface waters, soils and vegetation. They are divided into domestic and industrial (industrial) and can be in a solid, liquid and, less often, in a gaseous state. Hazardous waste is understood as waste containing in its composition substances that have one of the dangerous properties (toxicity, explosiveness, infectiousness, fire hazard, etc.) and are present in an amount dangerous to human health and the environment. The greatest threat to humans and the entire biota is posed by hazardous wastes containing radioactive isotopes, dioxins, pesticides, benzopyrene, and some other substances.

The foregoing is an illustration of the fact that the formation of the technosphere occurs at the expense of the biosphere in accordance with the law of systems development: "Any system can develop only through the use of the material, energy and informational capabilities of the environment. Absolutely isolated self-development is impossible." (Reimers N.F., 1992).

The whole experience of the development of civilization indicates that the regions of the technosphere are expanding at a high rate due to the destruction, and in many cases due to the replacement of biota.

### **Test questions:**

1. What is the biosphere?
2. What is the technosphere?
3. What are the main negative factors of the technosphere do you know?
4. Can the technosphere exist without the biosphere?

5. What are the main areas of interaction between the technosphere and the biosphere do you know?
6. What problems are created with the increase in the population of the Earth?
7. What environmental violations does the development of mineral raw materials lead to?
8. What are the consequences of breaking the ozone layer in the troposphere?
9. What environmental hazard does production waste create?
10. What is soil pollution?

### **Lecture number 3. HUMAN ENVIRONMENT TYPES**

*Production environment. Injuries and occupational diseases. injury rate. Injury severity rate. Urban habitat. Domestic environment. Social Habitat . Standard of living. Fertility. Marriage and divorce. Population aging. Mortality and life expectancy. demographic load. Deterioration of public health.*

Human activity is carried out in the system "man - environment".

*The human environment* is the environment surrounding a person, determined at the moment by a combination of factors (physical, chemical, biological, social) that can have a direct or indirect, immediate or long-term impact on human activity, health and offspring.

Security problems in the "man - environment" system are very complex. These problems are the basis for the emergence of the science "Life Safety".

A person and his environment (natural, industrial, urban, domestic, etc.) constantly interact with each other in the process of life.

#### **3.1 Work environment**

*The working environment* is the environment in which the employee conducts his professional activities or the set of conditions in which work is performed. *The production environment* is a part of the technosphere with an increased concentration of negative factors. Their main carriers are technical devices (for example, machines, equipment, etc.), chemically and biologically active objects of labor, energy sources, unregulated actions of workers, violations of regimes and organization of activities, as well as deviations from the norms of the parameters of the working area.

Real production conditions are characterized by a combination of negative factors. These factors differ in the level of impact on the employee and are divided into harmful, dangerous and especially dangerous.

*Particularly dangerous work* in industrial enterprises, which are carried out on the basis of a work permit, includes the following:

1. Installation and dismantling of equipment weighing more than 500 kg;
2. Transportation of compressed gas cylinders, acids, alkaline materials and other dangerous substances;

3. Repair and construction work and installation work at a height of more than 1.5 m using devices (ladders, portable platforms, etc.), as well as work on the roof;
4. Earthworks in the area of energy networks;
5. Works in wells, tunnels, trenches, chimneys, melting and heating furnaces, bunkers, shafts and chambers;
6. Installation, dismantling and repair of cranes and crane runways, rigging for the movement of heavy and bulky items in the absence of cranes;
7. Hydraulic and pneumatic tests of vessels and products;
8. Cleaning and repair of boilers, flues, cyclones and other equipment of boiler plants, as well as a number of other works.

The working environment is characterized by an increased concentration of negative factors, the main of which are given in Table. 3.1.

Table 3.1 - Negative factors of the working environment

Group factors	Factors	Sources
Physical	Vibration	Vibrating tools, control levers of transport machines, presses, construction machines and tools, etc.
	Noise	Crushing and screening equipment, rolling mills, process equipment
	Electromagnetic radiation	Power lines, transformers, electric arc furnaces, displays, antennas, etc.
	infrared radiation	Hot surfaces, molten substances, flame radiation
	ultraviolet radiation	Welding, plasma processing
	Ionizing radiation	Nuclear reactors and nuclear installations, x-ray installations, isotope devices, etc.
	Electric current	Electrical networks, electrical installations, electric drive, etc.
	moving cars	Industrial transport, conveyors, lifting mechanisms, moving parts of machine tools, etc.
	Increased or reduced pressure	Tanks with compressed gases, pipelines, pneumatic transport, vacuum installations
	Height, falling objects	Construction and installation works, gantry and overhead cranes

	sharp edges	Cutting and piercing tools, burrs, metal chips, fragments
	Increased or reduced temperature	Steam pipelines, gas pipelines, cryogenic installations, refrigeration equipment, heating and melting furnaces, melts, meteorological conditions in the working area
Chemical	dustiness	Bulk materials, dust, air suspension
	Gas contamination	Toxic gases and vapors, emissions, spray painting, welding and plasma processing
	Hazardous - chemicals	Chemical and petrochemical equipment, electroplating, aluminum production, etc.
Biological	Lubricating and cooling fluids (coolants)	Cooling systems in industrial plants, material handling, material handling with emulsion
Psychophysiological	Physical overload	Lifting and moving heavy objects, manual labor, awkward posture, prolonged work with monitors, non-ergonomic equipment
	Neuropsychic overload: mental strain	The work of scientists, teachers, students, office workers, air traffic controllers, operators of technical systems, work with displays

*Harmful and dangerous factors* of the production environment, affecting a person, cause occupational diseases, lead to industrial injuries, as well as death.

*Occupational diseases* are diseases resulting from the impact of a harmful production factor on an employee .

*Trauma* is damage to organs and tissues of the human body resulting from external influences. There are injuries: *mechanical* (bruises, fractures, etc.), *thermal* (frostbite burns), *chemical*, *electrical*, *combined*.

To assess the level of injury risk of the production environment, *the injury frequency coefficient K<sub>f</sub> and the injury severity coefficient K<sub>t</sub> are used*.

*Injury frequency coefficient K<sub>f</sub>*, expressing the number of industrial accidents per 1000 employees, is determined by the formula:

$$K_H = (T \times 1000) / P, \quad (3.1)$$

where T is the total number of victims for a certain period of time (usually for 1 year), regardless of whether the temporary disability ended in this period; P - the average number of employees of the enterprise for this period of time.

A similar formula is used to estimate the level of fatal injuries :

$$K_{h.sm.} = (T_{cm} \times 1000) / R. \quad (3.2)$$

The injury severity coefficient, which expresses the number of days of disability per injury, is determined by the formula:

$$K_T = D/T, \quad (3.3),$$

where  $D$  is the number of days of temporary disability caused by accidents at work (lists of disability are closed);  $T$  - the number of accidents (injuries)

In the world, about 6.3 thousand people die every day from injuries and diseases received at work, and 2.3 million people die in a year. The economic damage from lost working days, treatment costs and compensation payments, according to the International Labor Organization (ILO), annually amounts to 4% of the world's gross domestic product (GDP).

According to the ILO in Russia, the working conditions of 49.3% of workers do not meet sanitary and hygienic standards, 190 thousand people. Every year they die due to work in dangerous conditions, of which 15 thousand - as a result of accidents. In addition, 180 thousand people. forced to take early retirement due to accidents at work and occupational diseases. At the same time, Russian official statistics register less than 4,000 industrial accidents and occupational diseases per year. One reason is that the current reporting system does not take into account small and medium enterprises and the informal economy. According to the ILO, in Russia and the countries of the former Soviet Union, *no more than 20% of cases of injuries* at work, including fatal ones, fall into the official statistics.

### 3.2 Urban habitat

The emergence of industrial-urban ecosystems (and, accordingly, the urban habitat) was caused mainly by the processes of urbanization. In table. 3.2 shows the UN data on the population living in the cities of the world in different years.

Table 3.2 - The rate of urbanization of the world's population

Year	1880	1950	1970	2008	2018
Urban population, %	1.7	13.1	17	fifty	55

At the beginning of 2016, the largest city in the world is Shanghai (population - 24,256,800 people), Moscow with a population of 12,197,596 people. ranks 11th. The total area of the Earth's urbanized territories in 1980 amounted to 4.69 million km<sup>2</sup> and by 2007 it reached 19 million km<sup>2</sup> - 12.8% of the entire and more than 20% of the life-sustainable land area. The population density in large cities is from several thousand to several tens of thousands of people per square kilometer, and in Hong Kong - 1,500,000 people / km<sup>2</sup>.

As the city develops, its functional zones are more and more differentiated (separation): *industrial, residential, forest park*. *Industrial zones* are areas of concentration of various industrial facilities. They are the main sources of environmental pollution. *Residential zones* are areas of concentration of residential buildings, administrative buildings, objects of culture, education, etc. *A forest park zone* is a green zone around the city, cultivated by man, i.e. adapted for mass recreation, sports, entertainment. Inside cities, this role is played by city parks - tree plantations in the city.

*Like the industrial environment, the urban environment is characterized by an increased concentration of negative factors.* A large city changes almost all components of the natural environment: the atmosphere, vegetation, soil, topography, soils, groundwater, and even climate.

Cities give 80% of all atmospheric emissions and 3/4 of the total pollution; all cities in the world annually emit up to 3 billion tons of solid waste, over 500 billion m<sup>3</sup> of industrial and domestic wastewater, about 1 billion tons of aerosols ( *the smallest particles of solid and liquid matter* ); the polluting and thermal effects of large cities can be traced at a distance of about 50 km; cities change natural landscapes (general view of the area), forming an anthropogenic landscape.

*air* pollutants in cities are vehicles (40 ... 50%, in Moscow - up to 80%), combined heat and power plants (10%) and industrial enterprises. About 58 million people live in Russian cities with a high level of air pollution. Among the capitals of the world, Moscow ranks 14th in terms of air pollution.

*Drinking water pollution* is a big problem for cities . According to the Research Institute of Human Ecology, only 1% of domestic tap water in Russia meets international standards, the rest of the water can be drunk only after boiling and deep cleaning.

Among the 184 studied cities in Russia, St. Petersburg ranks first in congenital anomalies, metabolic diseases, and second in oncological diseases. More than half of St. Petersburg schoolchildren suffer from gastritis. The main reason is dirty drinking water.

No less urgent problem for the urban habitat is *soil pollution*. The sources of chemical pollution of soils in the conditions of the city are extremely diverse. Among the largest of them are: pollution falling with atmospheric precipitation; storage facilities for raw materials and waste from industrial enterprises; dumps of power plants and mines; leaks from engineering networks and networks of housing and communal services; landfills and landfills for industrial and domestic waste.

A huge problem of large cities is the accumulation of municipal solid waste (MSW). These are solid waste and other substances that are not utilized in human household activities, which are formed as a result of depreciation of household items and people's life itself, including the solid phase of wastewater.

In connection with the intensive demolition of buildings, the reconstruction of buildings and structures, the main component of urban landfills is construction waste. In some cases, the morphological composition of construction waste today is 50% or more represented by synthetic polymeric materials based on polystyrene, PVC, etc. These materials are practically not recyclable and are the main problem in the disposal of construction waste.

One of the sources of adverse environmental impact of solid waste landfills is biogas, which is formed as a result of the decomposition of the organic part of the waste. The main components of biogas are: methane (40...70%) and carbon dioxide (30...45%).

No less dangerous are deviations from the norm of the physical parameters of the environment.

*These are noise, vibration, thermal pollution, electromagnetic, radiation fields - which cause the degradation of ecosystems.*

*Noise* in an urban environment is one of the forms of physical (wave) pollution, adaptation to which is impossible. Strong noise (more than 90 dB) causes neuropsychic stress and hearing impairment, up to complete deafness.

According to expert estimates, due to noise pollution, 70 - 80% of citizens live in conditions of acoustic discomfort. In houses located on the main thoroughfares of large cities, noise levels reach 65 - 85 dB (with a norm of no more than 50 dB).

As a result of air pollution by *aerosols*, the average annual, monthly and daily temperatures in cities are several degrees higher than in the surrounding area. The so-called light hunger develops, which causes beriberi *D*, accompanied by fatigue, deterioration of well-being, decreased performance, resistance to infectious diseases.

High density, contact of the population contribute to the rapid *spread of infectious diseases*.

### 3.3 Living environment

The living environment is a space outside the labor activity of a person. At least half of the time a person spends at home. Without disputing the validity of the proverb “My house is my fortress”, a person must pose dangers to the domestic environment, the main of which are given in Table. 3.3.

*Air pollution* in apartments occurs due to both external and internal sources. The external source is urban atmospheric air; internal sources are: polymer building and finishing materials; ventilation and garbage disposal systems; household dust; combustion products of household gas and thermal processing of products; home care products (furniture care products, cosmetics, etc.); old feather and woolen featherbeds, carpets; televisions, microwave ovens, personal computers, air conditioners, etc.

The dust contained in the apartment air is much more dangerous than street dust, since it is the strongest allergen containing 35% minerals; 20% - scales of human skin; 20% - microspores, fungi, micromites adsorbed on the surface of dust particles; 15% - paper and textile fibers; 7% - pollen of flowers; 3% - particles of soot and smoke.

Table 3.3 - Main hazards of the domestic environment

Group factors	Factors	Sources
Physical	Noise	City transport, elevator, neighbors
	electromagnetic radiation	Personal computers, household appliances, mobile communications
	ionizing radiation	Personal computers, televisions
	Electricity	Wiring, household appliances

Chemical	dustiness	Dust
	Gas contamination	gas stoves
	Hazardous chemicals	New furniture, tap water, household chemicals
Psychophysiological	neuro-psychic overload	

New furniture and synthetic finishing materials are a source of highly toxic components such as phenol ( *irritates the mucous membranes of the eyes, respiratory tract, skin, causing chemical burns* ), formaldehyde ( *leads to lethargy, frequent headaches, sleep difficulties* ), ammonia ( *in acute poisoning, ammonia affects the eyes and respiratory tract; at high concentrations, death is possible* ). Ammonia, hydrogen sulfide ( *Very toxic. Inhalation of air with a low content of hydrogen sulfide causes dizziness, headache, nausea, and with a significant concentration leads to coma, convulsions, pulmonary edema and even death* ) and formaldehyde.

Tobacco smoke contains over 4,000 chemicals, most of which adversely affect the organs and systems of the human body. The greatest harm to our health is caused by nicotine, tar, carbon monoxide.

*Drinking water* is also a source of danger in the domestic environment . The World Health Organization has concluded that water-borne diseases are the most common.

The use of *household chemicals* at home is in many cases dangerous to health. Surfactants (surfactants), chlorine, carbon dioxide, nitrogen oxides, phenol, formaldehyde, acetone, ammonia, bleaches, abrasives, fragrances - this is not a complete list of chemicals contained in commonly used household chemicals (washing powders, for cleaning clothes, home textiles, dishes, bathrooms, etc.) and perfumes (air fresheners, scented candles, etc.). Almost all of them are *strong allergens* .

Most washing powders contain polyphosphates, which are harmful not only to health, but also to the environment.

The use of pesticides in the household is especially dangerous. To combat insects, we widely use products such as Raptor, Fumitox, containing chlorpyrifos, which affects the nervous system of not only insects, but also humans, causing headache, nausea, sensory disturbance, paralysis, and in some cases death. .

Of particular note is *the energy pollution* of the domestic environment. The main sources of *electromagnetic radiation* (EMR) are: electric transport (trams, trolleybuses, trains); power lines (city lighting, high-voltage lines); electrical wiring (inside buildings, telecommunications); household electrical appliances; personal computers.

All household appliances that operate using electric current are sources of electromagnetic fields. The most powerful should be recognized as microwave ovens, air grills, refrigerators , kitchen hoods, electric stoves, televisions. 3

*Noise* , unlike other factors, comes into the apartment from the outside. Experts believe that noise reduces a person's life expectancy by 8-12 years.

Children are especially affected by noise; it makes them irritable, aggressive, greatly reduces the susceptibility to learning.

Table 3.4 - Some examples of noise levels

Source	Noise level, dBA
hearing threshold	0
Cooking on the stove	35...42
Elevator moving	34...42
calm conversation	65
baby crying	78
Music Center	80
Heavy traffic	100
Noise of a jet airliner taking off	120...140

Table 1 gives an idea of noise levels in various areas of human life. 3.4.

Even at night, the noise of vehicles on city highways does not decrease below 70 dBA.

### 3.4 Social habitat

*Social environment* - a set of material, economic, social, political and spiritual conditions of existence, formation and activity of individuals and social groups.

In society (society) interacts with a huge number of people who have different ideas about the world around them. In order for the system "man - social environment" to function effectively and not threaten human security, it is necessary to ensure the compatibility of each of its characteristics: energy, information, social, moral, psychological, etc.

A special place in human security is occupied by such social factors as *the level of well-being, general culture, culture of service, living conditions, customs, mores, behavioral preferences, moral and emotional characteristics* . The social and political environment is also of great importance for its security.

*The standard of living* is an economic category and a social standard that characterizes the degree to which the physical and social needs of people are met. *The main components of the standard of living are:* health, nutrition, incomes of the population, housing conditions, household property, paid services, the cultural level of the population, working and rest conditions, as well as social guarantees and social protection of the most vulnerable category of citizens.

The UN evaluates the standard of living according to the Human Development Index (HDI), which it cites in its annual Human Development Report. At the end of 2019, Norway is in 1st place, Switzerland is in 2nd, Ireland is in 3rd, the United States is in 15th, Russia is in 49th, and Uzbekistan is in 108th.

In Russia, the population has been continuously declining in recent years. For the period 1992 - 2005. the natural decline in the population of Russia amounted to 11.2 million people. If the current levels of births and deaths are maintained, the population may decline by 2025 from today's 142.7 million people. up to 122 million people

root cause of demographic trouble is the crisis of the family institution and, to some extent, the difficult socio-economic situation of the population, which led to the development of negative demographic processes, expressed by the following trends.

*Fertility.* A decrease in the number of births is observed in 78 constituent entities of the Russian Federation. The total fertility rate (TFR), which represents the number of children born on average per woman, has been holding at 1.34-1.35 in recent years, although this ratio should be at least 2.1 to ensure simple reproduction.

An aggravating factor in the demographic decline is the unprecedentedly high extramarital birth rate for Russia (30% of the total number of births) and the high number of abortions (in 2009, the number of abortions exceeded the number of births by 150,000 people).

*Marriage and divorce.* Statistical data convincingly testify to a consistent reduction in the number of marriages.

A mirror image of the destruction of family values is the dynamics of divorce. About 600,000-700,000 registered marriages are terminated annually, of which more than 30% are young married couples who have been married for up to five years.

*Mortality and life expectancy.* In terms of the average life expectancy of men, Russia today ranks 136th in the world, and in terms of the life expectancy of women, it is 91st. At the same time, there is a colossal gap in the life expectancy of men (58.8 years) and women (72 years) - 13.2 years.

There is no such huge difference in any country in the world, which is evidence of not only demographic, but also social disadvantage. During the period of so-called reforms (1985-2003), life expectancy for men in Russia decreased by 4.1 years, and for women - by 1.6 years.

The main reasons for the decline in life expectancy in Russia are: a decrease in GDP per capita; worsening medical care; environmental degradation; non-compliance with the norms of a healthy lifestyle; decrease in the level of safety in the production environment.

Up to 80% of deaths in Russia are due to cardiovascular diseases, malignant neoplasms, alcohol poisoning and injuries.

*Deterioration of public health.* The demographic potential of the state to a large extent depends on the qualitative characteristics of the population, of which the most important is its health. The high mortality rate, the backwardness of health care and a number of other negative circumstances make this statement especially relevant for Russia.

An important role in the deterioration of the health of Russians, including those of reproductive age, is played by excessive alcohol consumption. It is with this reason that the high level of mortality from diseases of the circulatory system, which occupy a leading place in the structure of Russian mortality, is closely related.

Smoking continues to have an extremely negative impact on the health of Russians, which affects about 70% of men and 30% of women. Experts assess the situation in this area as unfavorable, while reporting that 52% of all cancers are associated with smoking.

Other factors that worsen the health of Russians and, in one way or another, negatively affect the demographic situation, include: drug addiction, promiscuity, overload of negative information, a high level of traumatic incidents, poor nutrition, limited mobility, nervous tension, etc.

### **test questions**

1. What do you understand by personal security?
2. Define the term trauma
3. What parameters determine the level of injuries in the working environment?
4. Name dangerous and harmful production factors
5. What is urbanization and what does it entail?
6. What is the main source of urban pollution?
7. What types of environmental pollution are typical for cities?
8. What characterizes municipal solid waste?
9. How does noise affect the human body in an urban environment and what is its hygienic norm for a person?
10. What are the sources of air pollution in apartments?
11. What is the danger of dust contained in the apartment air?
12. What is the role of household chemicals in indoor air pollution?
13. What characterizes the standard of living of the population?
14. What is the cause of the deterioration in public health?

## **Section 3. EMERGENCIES AND METHODS OF PROTECTION FROM THEM**

### **Lecture number 4. MAN-MADE AND NATURAL EMERGENCIES**

*Basic concepts, emergencies caused by fires and explosions, chemical accident, radiation accident, hydrodynamic accident, transport accidents, ice, snow drift, drought, snow avalanche, lightning, flood, landslide, fires in forests and peat bogs, hurricane, storm, tornado, earthquake*

The economic development of the world is accompanied by a steady upward trend in the number of the most destructive emergency situations (ES) for economic systems and the economic damage they cause, and the growth rate of damage exceeds the growth rate of the world's gross domestic product.

For example, in the Russian Federation, emergency situations (an accident at the Sayano-Shushenskaya hydroelectric power station on August 17, 2009<sup>3</sup> killed 75 people; a methane explosion at the Rapsadskaya mine - May 2010, killed 91 people; a

fire in the nightclub "Lame Horse - December 5, 2009, 156 people died, etc.), led to great material and human losses.

#### **4.1 Basic concepts**

An emergency situation is a state in which, as a result of the occurrence of a source of an emergency situation at an object, a certain territory or water area, the normal conditions of life and activity of people are violated, their life and health are threatened, property of the population, economic facilities and the environment are damaged.

Source of emergency (ES) - a dangerous natural phenomenon, an accident or a dangerous man-made incident, a widespread infectious disease of people, farm animals and plants, as well as the use of modern means of destruction, as a result of which an emergency has occurred or may occur.

*In accordance with the type of source, the following emergencies are distinguished:*

- natural (earthquakes, floods, forest fires, etc.);
- technogenic (explosions, fires, chemical and radiation accidents, hydrotechnical accidents, etc.);
- biological and social (infectious diseases of people and animals, locust invasion, socio-political conflicts, terrorist attacks, etc.);
- environmental (soil degradation; pollution of the atmosphere, hydrosphere and lithosphere, etc.);
- military (military conflicts with the use of weapons of mass destruction, etc.).

#### **4.2 Man-made emergencies**

Technogenic include emergencies caused by explosions, fires, chemical, radiation, transport, hydrodynamic accidents, etc. Since the scenarios of their development, dangerous and harmful factors, methods of protection differ significantly, we will consider them separately.

##### *Emergencies caused by fires and explosions*

The most common sources of man-made emergencies are fires and explosions that occur:

- at industrial facilities;
- at the objects of production, storage and processing of flammable, combustible and explosive substances;
- on transport;
- in mines, mine workings, subways;
- in buildings and structures for residential, social and cultural purposes.

*A fire* is an out-of-control combustion process that destroys material values and poses a threat to human life and health. Hundreds of thousands of people die every year from fires around the world.

The main causes of fire are: malfunctions in electrical networks, violation of the technological regime and fire safety measures (smoking, open fire, use of faulty equipment, etc.).

The main dangerous fire factors are thermal radiation, high temperature, the poisoning effect of smoke (combustion products: carbon monoxide, etc.) and reduced visibility during smoke.

*An explosion* is a combustion accompanied by the release of a large amount of energy in a limited volume in a short period of time. The explosion leads to the formation and propagation of an explosive shock wave at supersonic speed (with an overpressure of more than 5 kPa), which has a mechanical impact on the surrounding objects.

The main damaging factors of the explosion are an air shock wave and fragmentation fields formed by flying fragments of various kinds of objects, technological equipment, explosive devices.

#### *How to act in case of fire and explosion*

If a fire is detected, respond to the fire quickly, using all available means to extinguish the fire (sand, water, fire extinguishers, etc.). If it is impossible to put out the fire in the shortest possible time, call the fire department of the enterprise (if any) or the city (by phone 01).

When evacuating burning rooms and smoky places, pass quickly, holding your breath, protecting your nose and mouth with a damp dense cloth. In a heavily smoky room, move by crawling or crouching - in the space adjacent to the floor, clean air lasts longer.

When looking for victims, call them. If a person's clothes catch fire, help throw them off or throw any blanket over the burning one and press it tightly. If air access is limited, combustion will quickly stop. Don't let the person with the burning clothes run. Do not approach explosive objects and do not touch them. If there is a threat of an explosion, lie down on your stomach, protecting your head with your hands, away from windows, glazed doors, passages, stairs. If an explosion occurs, take measures to prevent fire and panic, provide first aid to the victims.

If a building is damaged by fire or explosion, enter it carefully, making sure that there are no significant damages to ceilings, walls, electric, gas and water supply lines, gas leaks, fires.

If you live near an explosive facility, be careful. Sirens and intermittent beeps of enterprises (vehicles) mean the signal "Attention everyone!". When you hear it, turn on your loudspeaker, radio, or TV immediately. Listen to the information message about the emergency and act according to the instructions of the territorial EMERCOM.

### **4.3 Chemical accident**

A chemical accident is a violation of technological processes in production, damage to pipelines, tanks, storage facilities, vehicles, leading to the release of emergency chemically hazardous substances (AHOV) into the atmosphere in quantities that pose a threat to human life and health, the functioning of the biosphere.

Chemical, pulp and paper and processing plants, mineral fertilizer plants, ferrous and non-ferrous metallurgy plants, as well as cold storage plants, breweries, confectionery factories, vegetable stores and waterworks.

The danger of a chemical accident for humans and animals lies in the disruption of the normal functioning of the body and the possibility of long-term genetic consequences, and under certain circumstances, death if hazardous chemicals enter the body through the respiratory system, skin, mucous membranes, wounds and along with food.

#### *How to deal with a chemical accident*

At the signal "Attention everyone!" turn on the radio and TV for reliable information about the accident and recommended actions.

Close windows, turn off appliances and gas. Put on rubber boots, a raincoat, take documents, necessary warm clothes, a 3-day supply of non-perishable food, notify your neighbors and quickly, but without panic, leave the zone of possible infection perpendicular to the direction of the wind, at a distance of at least 1.5 km from the previous place of stay. To protect the respiratory organs, use a gas mask, and in its absence, a cotton-gauze bandage or improvised fabric items soaked in water, a 2-5% solution of baking soda (to protect against chlorine), a 2% solution of lemon or acetic acids (to protect against ammonia).

If it is not possible to leave the contaminated area, close doors, windows, vents and chimneys tightly. Seal the gaps in them with paper or tape. Do not hide on the first floors of buildings, in basements and semi-basements.

In case of accidents on railways and highways associated with the transportation of hazardous chemicals, a dangerous zone is established within a radius of 200 m from the accident site. Approaching this zone and entering it is strictly prohibited.

#### *How to act after a chemical accident*

If you suspect a AHOV lesion, exclude any physical activity, take plenty of fluids (milk, tea) and consult a doctor immediately. Entrance to buildings is allowed only after a control check of the content of AHOV in them. If you are directly affected by AHOV, take a shower as soon as possible. Wash contaminated clothing, and if it is impossible to wash, throw it away. Carry out a thorough wet cleaning of the room. Refrain from drinking tap (well) water, fruits and vegetables from the garden, livestock and poultry meat slaughtered after the accident, until an official conclusion about their safety.

### **4.4 Radiation accident**

*A radiation accident* is a violation of the rules for the safe operation of a nuclear power plant, equipment or device, which resulted in the release of radioactive products or ionizing radiation beyond the limits of their safe operation provided for by the design, leading to public exposure and environmental pollution. The main damaging factors of such accidents are radiation exposure and radioactive contamination. Accidents can be accompanied by explosions and fires.

Radiation impact on a person consists in the violation of the vital functions of various organs (mainly the organs of the nervous system, the gastrointestinal tract) and the development of radiation sickness under the influence of ionizing radiation.

Radioactive contamination is caused by exposure to alpha, beta and gamma ionizing radiation and is caused by the release of unreacted elements and fission

products of a nuclear reaction (radioactive slag, dust, fragments of a nuclear product) during an accident, as well as the formation of various radioactive materials and objects (for example, soil) as a result of their exposure

#### *How to act in case of notification of a radiation accident*

While outside, immediately protect your respiratory organs with a handkerchief (scarf) and hurry to take cover indoors. Once in the shelter, take off your outer clothing and shoes, place them in a plastic bag, and take a shower. Close windows and doors. Turn on the TV and radio for more information about the accident and directions from local authorities. Seal ventilation openings, cracks in windows (doors) and do not approach them unnecessarily. Stock up on water in sealed containers. Wrap open products in plastic wrap and place in the refrigerator (cupboard).

For respiratory protection, use a respirator, cotton-gauze bandage or improvised fabric items moistened with water to increase their filtering properties.

When instructed through the media, carry out iodine prophylaxis by taking one tablet (0.125 g) of potassium iodide for 7 days, and for children under 2 years old -  $\frac{1}{4}$  of the tablet (0.04 g). In the absence of potassium iodide, use an iodide solution: three to five drops of a 5% iodine solution in a glass of water, for children under 2 years old - one to two drops.

#### *How to act in a radioactively contaminated area*

To prevent or reduce the effects of radioactive substances on the body:

- leave the room only if necessary and for a short time, while using a respirator, raincoat, rubber boots and gloves;
- do not undress in open areas, do not sit on the ground and do not smoke, exclude swimming in open water and picking wild berries and mushrooms;
- periodically moisten the area near the house, and carry out a thorough wet cleaning in the room daily using detergents;
- before entering the room, wash your shoes, shake out and clean outer clothing with a damp brush;
- drink water only from trusted sources, and food - purchased in stores;
- wash your hands thoroughly before eating and rinse your mouth with a 0.5% solution of baking soda,

Compliance with these recommendations will help to avoid radiation sickness.

#### *How to act during an evacuation*

In preparation for the evacuation, prepare personal protective equipment, including improvised ones (capes, raincoats made of film, rubber boots, gloves), put clothes and shoes for the season in a suitcase or backpack, a one-day supply of food, underwear, documents, money and other necessary things. Wrap the suitcase (backpack) with plastic wrap.

When leaving the apartment during the evacuation, turn off all electrical and gas appliances, take out quickly perishable products into the garbage bin, and attach the announcement "There is no one in apartment No. \_\_\_" on the door. When boarding a transport or forming a pedestrian column, register with a representative of the evacuation commission. Upon arriving in a safe area, take a shower and change your underwear and shoes to uncontaminated ones.

## 4.5 Hydrodynamic accident

*A hydrodynamic accident* is an emergency event associated with the failure (destruction) of a hydraulic structure or part of it, and the uncontrolled movement of large masses of water, causing destruction and flooding of vast areas. The main potentially dangerous hydraulic structures include dams, tailings of enrichment plants, water intake and water collection facilities (locks).

Destruction (breakthrough) of hydraulic structures occurs as a result of the action of natural forces (earthquakes, hurricanes, erosion of dams) or human impact (strike with nuclear or conventional weapons on hydraulic structures, large natural dams, acts of sabotage), as well as due to structural defects or errors design.

*The consequences of hydrodynamic accidents are:*

- damage and destruction of waterworks and short-term or long-term termination of their functions;
- defeat of people and destruction of structures by a breakthrough wave formed as a result of the destruction of a hydraulic structure, having a height of 2 to 12 m and a speed of 3 to 25 km/h (for mountainous areas - up to 100 km/h);
- catastrophic flooding of vast areas with a layer of water from 0.5 to 10 m or more.

*How to deal with the threat of a hydrodynamic accident*

Upon receipt of information about the threat of flooding and evacuation, immediately, in accordance with the established procedure, exit (leave) the danger zone to the designated safe area or to elevated areas of the terrain. Take with you documents, valuables, essentials and a supply of food for 2-3 days. Move the part of the property that you want to keep from flooding, but cannot take with you, to the attic, the upper floors of the building, trees, etc.

Before leaving the house, turn off the electricity and gas, tightly close windows, doors, ventilation and other openings.

*How to deal with flooding in hydrodynamic accidents*

In case of sudden flooding, to save yourself from the impact of a breakthrough wave, immediately take the nearest elevated place, climb a large tree or the top floor of a stable building. In the case of being in water, when a breakthrough wave approaches, dive into the depth at the base of the wave.

Once in the water, swim or use improvised means to get out to a dry place, preferably on a road or dam, along which you can get to an unflooded area.

If your house is flooded, turn off its power supply, give a signal about the presence of people in the house (apartment) by hanging a flag made of bright fabric from the window during the day, and a lantern at night. Use a self-powered radio for information. Move the most valuable property to the upper floors and attics. Organize the accounting of food and drinking water, their protection from the effects of incoming water and economical use.

In preparation for a possible evacuation by water, take documents, essentials, clothes and shoes with water-repellent properties, improvised rescue equipment (air mattresses, pillows).

Do not attempt to evacuate yourself. This is possible only if there is a clear view of the unflooded territory, the threat of a deterioration in the situation, the need for

medical care, the consumption of food and the absence of prospects for receiving outside help.

#### **4.6 Transport accidents**

Currently, any type of transport poses a potential threat to human health and life. Technological progress, along with comfort and speed of movement, has also brought a significant degree of threat. Depending on the type of transport accident, it is possible to receive multiple injuries and burns, including life-threatening ones.

##### *Railway accidents*

The main causes of accidents and disasters in railway transport are malfunctions of the track, rolling stock, signaling, centralization and blocking means, dispatcher errors, inattention and negligence of drivers.

Most often, rolling stock derails, collisions, collisions with obstacles at crossings, fires and explosions directly in the cars occur. However, traveling by train is about three times safer than traveling by plane and 10 times safer than traveling by car.

##### *Accidents in road transport*

About 75% of all accidents in road transport occur due to violations of traffic rules by drivers. The most dangerous types of violations still remain speeding, ignoring road signs, driving into oncoming traffic and driving while intoxicated. Very often, bad roads (mostly slippery), malfunctions of cars (in the first place - brakes, in the second - steering, in the third - wheels and tires) lead to accidents.

A feature of car accidents is that 80% of the wounded die in the first three hours due to heavy blood loss.

##### *How to act after an accident*

Decide where in the car, and in what position you are, whether the car is on fire and whether gasoline is leaking (especially when overturning). If the doors are jammed, leave the car interior through the windows by opening them or breaking them with heavy improvised objects. After getting out of the car, move away from it as far as possible - an explosion is possible

#### **4.7 Natural emergencies**

Natural emergencies arise as a result of natural hazards or natural disasters. A natural disaster is a phenomenon that does not depend on the will of a person, is not related to his activities, and occurs as a result of sudden changes in the parameters of the natural environment. Each region of the country has its own climatic and geographical conditions. Consequently, emergency situations in different regions will have their own specifics.

##### *Ice*

Ice is a layer of dense ice formed on the surface of the earth, sidewalks, the carriageway of the street and on objects (trees, wires, etc.) during the freezing of supercooled rain and drizzle (fog). Ice is usually observed at air temperatures from 0°C to minus 3°C. The crust of frozen ice can reach several centimeters.

##### *How to act during ice*

If the weather forecast indicates ice, take steps to reduce the chance of injury. Prepare non-slip shoes, attach metal heels or foam rubber to the heels, and stick adhesive plaster or insulating tape on dry soles, you can rub the soles with sand (sandpaper).

Move carefully, slowly, stepping on the entire sole. In this case, the legs should be slightly relaxed, hands free. Older people are advised to use a cane with a rubber tip or a special stick with pointed spikes. If you slip, crouch down to lower your fall. At the time of the fall, try to group up, and, rolling, soften the blow to the ground.

#### *Snow drift*

Snow drift is a hydrometeorological disaster associated with heavy snowfall, with a wind speed of more than 15 m / s and a snowfall duration of more than 12 hours.

A blizzard is the transport of snow by the wind in the ground layer of air. Distinguish between low and general blizzard. During a blowing snowstorm, the previously fallen snow is redistributed; during a general snowstorm, along with redistribution, snow falls from the clouds. Their danger to the population lies in drifts of roads, settlements and individual buildings. The skid height can be more than 1 m, and in mountainous areas up to 5-6 m. Visibility on the roads may decrease to 20-50 m, as well as partial destruction of light buildings and roofs, breakage of overhead power lines and communications.

#### *What to do after a heavy snowstorm*

If you find yourself blocked indoors in conditions of strong drifts, carefully, without panic, find out if it is possible to get out from under the drifts on your own (using the available tools and available means). Inform the Civil Defense and Emergency Department or the administration of the locality about the nature of drifts and the possibility of their self-disassembly. If it is not possible to dismantle the snow drift on your own, try to establish contact with the rescue units. Turn on the radio broadcast receiver (TV) and follow the instructions of local authorities. Take steps to keep warm and save food supplies.

#### *Drought*

Drought is a prolonged and significant lack of precipitation, often at elevated temperatures and low air humidity.

Extreme heat - characterized by an excess of the average positive ambient temperature by 10 degrees or more for several days.

The danger lies in the thermal overheating of a person, i.e. the threat of an increase in his body temperature above 37.1 \* C or a heat disorder - the approach of body temperature to 38.8 'C. A thermal emergency occurs when prolonged and/or severe overheating can lead to heat stroke or cardiac dysfunction. Symptoms of overheating are: redness of the skin, dry mucous membranes, intense thirst. In the future, loss of consciousness, cardiac and respiratory arrest is possible.

#### *How to act during a drought (in case of intense heat)*

Avoid exposure to elevated temperatures. Wear light-colored, breathable clothing (preferably cotton) with a hat. Remember that burned skin stops sweating and cooling. Move slowly, try to be in the shade more often. Do not drink beer and other alcoholic beverages, this will lead to a deterioration in the general condition of the

body. Check with your doctor if you need extra salt during the heat. For heat damage, immediately move to shade, wind or shower, drink plenty of water slowly. Try to cool your body down to avoid heat stroke. In case of loss of consciousness by someone from those around you, carry out resuscitation measures (do a heart massage and artificial respiration). Remember that during a drought, the likelihood of fires increases.

### *Snow avalanche*

A snow avalanche is a mass of snow falling or moving at a speed of 20-30 m/s. The fall of an avalanche is accompanied by the formation of an air pre-avalanche wave, which produces the greatest destruction.

The causes of an avalanche are: prolonged snowfall, intense snowmelt, earthquake, explosions and other types of human activity that cause shaking of mountain slopes and fluctuations in the air environment. "Coming down" snow avalanches can cause destruction of buildings, engineering structures, cover roads and mountain paths with compacted snow. Residents of mountain villages, tourists, climbers, geologists, border guards and other categories of the population captured by an avalanche may be injured and find themselves under a layer of snow.

### *Lightning*

Lightning is a spark discharge of the electrostatic charge of a cumulus cloud, accompanied by a blinding flash and a sharp sound (thunder).

Danger. Lightning discharge is characterized by high currents, and its temperature reaches 300,000 degrees. A tree, when struck by lightning, splits and can even catch fire. Wood splitting occurs as a result of an internal explosion due to the instantaneous evaporation of the internal moisture of the wood.

A direct lightning strike for a person is usually fatal. About 3,000 people die from lightning every year worldwide.

Where does lightning strike? The discharge of static electricity usually takes the path of least electrical resistance. Since the distance between the highest object, among similar ones, and the cumulus cloud is smaller, the electrical resistance is also smaller. Therefore, lightning will first of all strike a tall object (mast, tree, etc.).

### *Preventive measures*

To reduce the risk of lightning damage to economic facilities, buildings and structures, lightning protection is arranged in the form of grounded metal masts and wires stretched high above the facilities of the facility.

Check the weather forecast before your trip. If a thunderstorm is predicted, then reschedule the trip to another day. If you notice a thunderstorm front, then first of all, determine the approximate distance to it by the delay time of the first roll of thunder, the first flash of lightning, and also evaluate whether the front is approaching or receding.

### *How to act during a thunderstorm*

Lightning is dangerous when a flash of thunder follows. In this case, take immediate precautions.

If you are in a rural area: Close windows, doors, chimneys and vents. Do not fire up the stove because the high temperature gases coming out of the stovepipe have low

resistance. Do not talk on the phone: lightning sometimes hits wires stretched between poles.

During lightning strikes, do not come close to electrical wiring, lightning rods, roof drains, antennas, do not stand near the window, if possible, turn off the TV, radio and other electrical appliances.

If a thunderstorm overtook you while playing sports, then immediately stop them. Put metal objects (motorcycle, bicycle, ice ax, etc.) aside, move away from them by 20-30 m.

If a thunderstorm caught you in the car, do not leave it, while closing the windows and lower the radio antenna.

### *Flood*

Flooding is a significant flooding of the area as a result of a rise in the water level in a river, lake or sea during the period of snowmelt, heavy rains, wind surges of water, during traffic jams, blockages, etc. Floods caused by wind surge of water in the mouths of rivers are of a special type. Floods lead to the destruction of bridges, roads, buildings, structures, cause significant material damage, and at high water speeds (more than 4 m/s) and high water rise (more than 2 m) cause death of people and animals. The main cause of destruction is the impact on buildings and structures of hydraulic shocks of water masses, ice floes floating at high speed, various debris, etc. Floods can occur suddenly and last from a few hours to 2-3 weeks.

### *How to act during a flood*

At the warning signal of the threat of flooding and evacuation, immediately, in accordance with the established procedure, leave (leave) the danger zone of possible catastrophic flooding to the designated safe area or to elevated areas of the area, taking with you documents, valuables, necessary things and a two-day supply of non-perishable food. Register at the final evacuation point.

Before leaving the house, turn off the electricity and gas, put out the fire in the heating stoves, secure all floating objects that are outside the buildings, or place them in utility rooms. If time permits, move valuable household items to the upper floors or to the attic of a residential building. Close the windows and doors, if necessary and have time, board the windows and doors of the first floors from the outside with boards (shields). In the absence of an organized evacuation, stay on the upper floors and roofs of buildings, on trees or other towering objects until help arrives or the water subsides. At the same time, constantly give a distress signal: during the day - by hanging or waving a clearly visible panel lined with a pole, and in the dark - by a light signal and periodically by voice. When the rescuers approach, calmly, without panic and fuss, in compliance with the precautionary measures, go to the swimming facility. At the same time, strictly follow the requirements of the rescuers, do not overload the boats. During the movement, do not leave the assigned places, do not board the sides, strictly follow the requirements of the crew. It is recommended to get out of the flooded area on your own only if there are such serious reasons as the need to provide medical assistance to the victims, the continuing rise in the water level with the threat of flooding of the upper floors (attic). In this case, it is necessary to have a reliable swimming facility and

know the direction of movement. During self-advance, do not stop giving a distress signal.

#### *What to do after a flood*

Before entering a building, check to see if it is in danger of collapsing or falling. Ventilate the building (to remove accumulated gases). Do not turn on electric lighting, do not use open flames, do not light matches until the room is completely ventilated and the gas supply system is checked for proper operation. Check the serviceability of the electrical wiring, gas supply pipelines, water supply and sewerage. Do not use them until you have verified that they are working properly with the help of specialists. To dry the premises, open all doors and windows, remove dirt from the floor and walls, pump out water from the basements. Do not eat food that has been in contact with water. Organize the cleaning of wells from the applied dirt and remove water from them.

#### *Landslide*

A landslide is a sliding displacement (sliding) of soil and rock masses down the slopes of mountains and ravines, steep coasts of seas, lakes and rivers under the influence of gravity. The causes of a landslide are most often the erosion of the slope, its waterlogging by heavy rainfall, earthquakes or human activity (blasting, etc.). The volume of soil during a landslide can reach tens and hundreds of thousands of cubic meters, and in some cases even more. The displacement speed of a landslide ranges from several meters per year to several meters per second. The greatest displacement velocity of a landslide is observed during an earthquake. The sliding of soil masses can cause destruction and blockages of residential and industrial buildings, engineering and road structures, main pipelines and power lines, as well as injury and death of people.

#### *How to deal with a landslide*

When receiving signals of the threat of a landslide, turn off electrical appliances, gas appliances and water supply, prepare for immediate evacuation according to pre-developed plans. Depending on the landslide displacement speed detected by the landslide station, act according to the threat. With a low displacement rate (meters per month), act according to your capabilities (move buildings to a predetermined place, take out furniture, things, etc.). If the landslide displacement speed is more than 0.5-1.0 m per day, evacuate in accordance with a previously worked out plan. When evacuating, take documents, valuables with you, and, depending on the situation and instructions from the administration, warm clothes and food. Urgently evacuate to a safe place and, if necessary, help the rescuers in digging, extracting victims from the collapse and rendering assistance to them.

### **4.8 Fires in forests and peatlands**

Mass fires in forests and peat bogs can occur in hot and dry weather from lightning strikes, careless handling of fire, cleaning the earth's surface by burning dry grass, and other causes. Fires can cause fires in buildings in settlements, wooden bridges, power lines and communications on wooden poles, warehouses for oil products and other combustible materials, as well as damage to people and farm animals. Most often, ground fires occur in forests, during which the forest litter,

undergrowth and undergrowth, grass and shrub cover, deadwood, tree rhizomes, etc. burn out. In the dry period, wind can cause crown fires, in which the fire also spreads along the crowns of trees, mainly coniferous species. The speed of propagation of a ground fire is from 0.1 to 3 meters per minute, and that of a crown fire is up to 100 m per minute in the direction of the wind.

When burning peat and plant roots, underground fires can occur, spreading in different directions. Peat can spontaneously ignite and burn without access to air and even under water. Above burning peatlands, the formation of “columnar swirls” of hot ash and burning peat dust is possible, which can be transported over long distances in strong winds and cause new fires or burns in people and animals.

To protect the population and reduce damage during massive fires, measures are taken in advance to lay and clear clearings and dirt strips 5-10 meters wide in continuous forests and up to 50 meters in coniferous forests. In settlements, ponds and reservoirs are arranged, the capacity of which is taken at the rate of at least 30 cubic meters per 1 hectare of the area of a settlement or settlement.

The flame of small ground fires can be knocked down by sweeping it with hardwood branches, flooding it with water, throwing it with wet soil, trampling it with your feet. Peat fires are extinguished by digging up burning peat with watering. When extinguishing a fire, act prudently, do not go far from roads and clearings, do not lose sight of other participants, maintain visual and audio communication with them. When extinguishing a peat fire, keep in mind that deep funnels can form in the burning zone, so you should move carefully, after checking the depth of the burnt layer.

### **test questions**

1. What is an emergency?
2. What emergencies are man-made?
3. How to act in case of fire and explosion?
4. What should be done in case of chemical accidents?
5. How should one act in case of radiation accidents?
6. How are hydrodynamic accidents formed?
7. What are the consequences of traffic accidents?
8. How to act during ice?
9. How are snowdrifts formed?
10. What is the danger of lightning?
11. What should be done during a flood?
12. Define the terms tornado, storm and hurricane

### **Lecture number 5. SOCIAL AND MILITARY EMERGENCIES**

*Social emergencies. Hazards associated with exposure to humans. Health hazards. social diseases. Mental disorder. Hazards associated with exposure to groups of people. Economics-social dangers. Military emergencies. Emergencies caused by terrorist acts. Modern ammunition. Nuclear weapon. Chemical weapon.*

*Bacteriological weapon. New types of weapons of mass destruction. Terrorist threats. The actions of people who were held hostage.*

### 5.1 social emergencies

An emergency of a social nature is a situation in a certain territory that has developed as a result of the emergence of dangerous contradictions and conflicts in the sphere of social relations that may or have caused loss of life, damage to human health or the environment.

In the life of modern society, a significant place is occupied by social emergencies: wars, terrorist attacks, hostage-taking, theft, fraud, gambling, rape, bad and dangerous habits, social diseases, etc. Their total number, variety, scale of consequences are constantly growing. A specific feature of social emergencies is that they all arise in the sphere of relationships between people and depend on a person, they are consciously planned, prepared, carried out by people who try to solve their political, national, religious, criminal, financial, personal tasks with their help. .

The reason for the emergence of a social emergency is usually religious, political or other social contradictions that have developed in a certain territory. Such contradictions can result in clashes, armed conflicts, riots and other situations that can lead to the death of people, a threat to their health, and material damage.

Emergencies of a social nature can cause damage to the environment, the ecological situation, and lead to a disruption in the life of the population.

#### *Classification of social hazards*

Social emergencies							
Emergencies associated with human exposure		Emergencies associated with a violation of human health			Emergencies associated with exposure to a group of people		
Mental effects on a person	Physical effects on a person	The use of substances that destroy organs	social diseases	mental disorder	Economic and social emergencies	Political and social emergencies - conflicts	Demographic and social emergencies
- blackmail -fraud	-terror - robbery - banditry -rape - pledge - nothing-you	- narcotics - alcoholism	-AIDS - tuberculosis -venereal diseases	-suicide -zombies consciousness	- unemployment -poverty - lack of food	-ethnic -religious -political Economic	-associated with changes in the borders and policies of states -associated with changes in natural conditions

### *Human Exposure Hazards*

#### *a) Events with a mental impact on a person:*

*theft* - secret theft of someone else's property;

*robbery* - open theft of someone else's property (sometimes with the use of violence, not dangerous to life or health, or with the threat of use);

*fraud* - theft of someone else's property or the acquisition of the right to someone else's property by deceit or breach of trust;

*blackmail* - the threat of dissemination of information disgracing the victim or his relatives, or other information that may cause significant harm to the rights or legitimate interests of the victim or his relatives;

*extortion* - a crime against property, which consists in demanding the transfer of property (or the right to property) under the threat of violence against the person in charge or under the protection of which this property is located, or over his relatives, as well as under the threat of publishing disgraceful information about them or destroying their property ;

*deception* - deliberately misleading another person for selfish purposes; consists in the communication of false information about the state of affairs or in the distortion of true facts;

*quackery* is a pseudo-scientific, pseudo-medical activity aimed at obtaining benefits from misleading people. At present, quackery is a kind of deception.

#### *b) Events with physical impact or threat of physical impact:*

*robbery* - an attack for the purpose of stealing someone else's property, committed with the use of violence dangerous to life and health, or with the threat of using such violence;

*banditry* - one of the most serious crimes encroaching on public safety. Art. 209 of the Criminal Code establishes responsibility for the creation, leadership of a gang, participation in it and in the attacks it commits.

*gangster attack* is an aggressive unlawful act, accompanied by the use of physical or mental violence in the form of a threat of physical violence;

*rape* - a type of sexual violence, a sexual act committed with a victim in a helpless state (unconsciousness, severe alcohol intoxication, mental disorder, young age), using physical violence or the threat of its use, to psychological pressure, economic, psychological or other dependence victims;

*terror* (lat. terror - fear, horror) - the intimidation of one's political opponents or the population, expressed in physical violence, up to destruction. Terror is also called the threat of physical violence for political or any other motives, or intimidation with the threat of violence or murder;

*hostage* - holding a person by force in order to force someone (relatives of the hostage, representatives of the authorities, etc.) to perform certain actions, fulfill certain obligations or refrain from committing undesirable actions under the threat of killing or harming his health.

### *Health hazards*

#### *a) The use of substances that destroy the body*

*Alcoholism* is a disease, a kind of substance abuse, characterized by an addiction to alcohol (ethyl alcohol), with mental and physical dependence on it. Alcoholism is characterized by a loss of control over the amount of alcohol consumed, an increase in alcohol tolerance (an increase in the doses of alcohol required to achieve satisfaction), an abstinence syndrome (hangover), toxic damage to organs, as well as memory lapses for individual events that occurred during intoxication. Manifested mental and social degradation, pathology of internal organs, metabolism, central and peripheral nervous system. Often there are alcoholic psychoses. A large number of accidents and accidents are associated with the use of alcoholic beverages.

*Smoking* - pyrolytic inhalation (smoke inhalation) of preparations, mainly of plant origin, smoldering in the inhaled air stream, in order to saturate the body with the active substances contained in them by sublimation and subsequent absorption in the lungs and respiratory tract. As a rule, it is used for the use of smoking mixtures with narcotic properties (tobacco, marijuana, etc.) due to the rapid flow of blood saturated with psychoactive substances into the brain. The psychological and physical addiction to tobacco smoking is called nicotine addiction. Smoking negatively affects the health of the smoker and the people around him, contributes to the development of diseases of the heart, blood vessels, stomach, and lungs. Tobacco smoke contains carcinogens.

*Addiction* (from the Greek *nárke* - numbness and mania) - a disease that is expressed in the fact that the vital activity of the body is maintained at a certain level only under the condition of constant intake of a narcotic substance, and leads to a deep depletion of physical and mental functions. Abrupt cessation of drug use causes a violation of many body functions - withdrawal. One of the clear signs of drug addiction is an irresistible craving for intoxication, euphoria, achieved through the use of a narcotic substance, which served as the basis for the name of the disease. With the course of the disease, the ability to experience euphoric sensations decreases and the desire is determined only by the need for the drug as a necessary condition for a satisfactory physical and mental state. The spread of drug addiction is facilitated by an unhealthy microsocial environment, the lack of intellectual and socially positive attitudes in a person. At all times, drug addiction was pursued.

## **5.2 Social diseases**

Diseases caused mainly by socio-economic conditions, causing damage to society and requiring social protection of a person.

*Tuberculosis* - a serious infectious disease transmitted by airborne droplets. The social nature of tuberculosis has long been known. Even at the very beginning of the 20th century, this disease was called the "sister of poverty", the "proletarian disease". Since 1991, after many years of decline, the incidence of tuberculosis in our country began to grow rapidly. Tuberculosis has become widespread among socially disadvantaged strata of the population: among the homeless, prisoners.

*Venereal diseases* are infectious diseases transmitted mainly through sexual contact. The social danger of venereal diseases is determined by their wide distribution, severe consequences for the sick and the danger to society. Modern means allow you to completely cure sexually transmitted diseases with timely seeking medical help.

*AIDS* - in an unusually short time, this disease has become the number one problem for the World Health Organization and the United Nations, pushing cancer and cardiovascular disease into second place. Effective treatments for HIV infection have not yet been found. At present, at best, it is only possible to delay the fatal denouement. Particular efforts should be focused on infection prevention. The main ways of transmission are sexual and through the blood. An important role in the fight against the spread of AIDS is played by the identification of those infected (especially among donors of blood, plasma, sperm, organs and tissues, as well as homosexuals, prostitutes, drug addicts and other risk groups).

### *Mental disorders*

*Suicide, suicide* - deliberate deprivation of one's life, as a rule, independent and voluntary. However, there are always circumstances that lead a person to suicide. According to the WHO, more than 500 thousand suicides and about 7 million attempts are committed annually in the world. In the Russian Federation, the frequency of suicides is about 40 per 100,000 population. The mentally ill make up to 27%, alcoholics - 17% of the number of suicides.

An obstacle to committing suicide can be anti-suicidal personality factors that devalue suicide as a way to solve problems (unrealized creative plans, awareness of the senselessness of suicide, fear of causing mental pain to relatives and friends, uncertainty about the reliability of the chosen method of suicide, as well as religious and social taboos associated with the problem death and suicide). For some individuals, the very act of suicide can be a sign of weakness.

Mind Control - Zombification, brainwashing, forced persuasion, mind control, indoctrination - the use of manipulative methods in an attempt to change a person's thinking, behavior, beliefs, emotions, or decision-making process against their will and desire.

In societies where the government maintains tight control over the media and the education system, and uses this control to carry out propaganda on a large scale, the manipulation of mass consciousness can be a powerful result.

This is especially effective when appealing to nationalistic or religious feelings, in conditions of low education of the population and limited access to independent media.

### *Hazards associated with exposure to groups of people*

#### *Economic and social dangers*

*Unemployment* - the presence in the country of people who make up part of the economically active population, who are able and willing to work for hire, but cannot find work. According to the definition of the International Labor Organization, a person aged 10-72 years (in Russia - 15-72 years old) is recognized as unemployed if, during the critical week of the survey of the population on employment problems, he simultaneously: had no job; looking for a job; was ready to get to work. 5

*Unemployment rate* - quantitative indicator, which is calculated as the ratio of the number of unemployed to the total number of economically active population or to

the number of the population group of interest (unemployment among women, youth, rural population, etc.). Most often expressed as a percentage.

*There are the following types of unemployment:*

*Involuntary* (waiting unemployment) - occurs when a worker is able and willing to work at a given wage level, but cannot find a job. The reason is the imbalance in the labor market due to the inflexibility of wages (due to minimum wage laws, the work of trade unions, raising wages to improve the quality of work, etc.). When the real wage is above the level corresponding to the equilibrium of supply and demand, the supply in the labor market exceeds the demand for it.

*Varieties of involuntary unemployment:*

*Cyclic* - caused by recurring declines in production in a country or region . Represents the difference between the unemployment rate at the current moment of the economic cycle and the natural rate of unemployment;

*Seasonal* - depends on fluctuations in the level of economic activity during the year, characteristic of some sectors of the economy;

*technological* - unemployment associated with the mechanization and automation of production, as a result of which part of the workforce becomes redundant, or needs a higher level of qualification.

- *Voluntary* - associated with the unwillingness of people to work, for example, in conditions of lower wages. Also, in the economy there is the concept of "unemployment trap", when a person's income, regardless of whether he works or not, differ slightly, which reduces a person's interest in starting work.

- *Structural* - due to changes in the structure of demand for labor, when a structural mismatch is formed between the qualifications of the unemployed and the demand for vacant jobs.

*institutional* - Unemployment arising from the intervention of the state or trade unions in the establishment of wage rates that are different from those that could be formed in a natural market economy.

*Unstable* - caused by temporary reasons (for example, when employees voluntarily change jobs or are fired in seasonal industries).

*Frictional* - during a voluntary search by an employee for a new job that suits him to a greater extent than the previous job.

*Marginal* - Unemployment of poorly protected sections of the population (youth, women, the disabled) and the social lower classes.

*youth unemployment* - among the group of people aged 18-25.

*Registered* - the unemployed population engaged in job search and officially registered.

*Poverty* - a characteristic of the economic situation of an individual or a social group, in which they cannot satisfy a certain range of minimum needs necessary for life, preservation of working capacity, procreation.

*Causes of poverty:*

*economic* (unemployment, low wages, low labor productivity, uncompetitiveness of the industry),

*socio-medical* (disability, old age, illness),  
*demographic* (single-parent families, a large number of dependents in the family),  
*educational qualification* (low level of education, insufficient professional training),  
*political* (military conflicts, forced migration),  
regional-geographical (uneven development of regions).

*There are three main concepts for defining poverty:*

*absolute concept of poverty* is closely related to the concept of the poverty line. The poverty line is the level of disposable income, gross income, or consumption below which a person is considered poor. Absolute poverty is often defined as the number of people or households whose consumption or income is below the poverty line.

*The relative concept of poverty* is based on a comparative assessment of the income levels of the population. The concept of relative poverty is part of the concept of inequality. In the case when the real incomes of the entire population grow, and their distribution does not change, relative poverty remains the same.

*Subjective concept of poverty* is the concept of poverty, based on the belief that only the individual can determine whether he is poor. To determine the level of subjective poverty, there are many approaches: you can find out how many people consider themselves poor, or consider their friends poor.

The historical experience of mankind shows that the neglect of social dangers, ignoring them leads to the fact that they become poorly managed, develop into emergency situations of social genesis, many times greater in their consequences than emergencies of a different origin.

At the heart of the emergence and development of emergencies of a social nature is *a violation due to various reasons of the balance of social relations* - economic, political, interethnic, confessional, causing serious contradictions, conflicts and wars.

Catalysts for emergencies can be various circumstances that *cause social tension* - unemployment, corruption, crime, riots, acts of terrorism, government crises, inflation, food problems, social disorder, everyday nationalism, localism and others.

Prolonged exposure to these factors leads to chronic physiological and psychological fatigue of people, to severe extreme conditions such as deprivation, depression, suicide, etc., to attempts to sublimate the accumulated negative energy into social processes by active participation in socio-political and military conflicts.

An external manifestation of a social emergency is often various forms of social protest: rallies, demonstrations, picketing, civil disobedience campaign, strikes, hunger strikes and so on

### **5.3 Military emergencies**

Wartime emergencies can be created by the use of weapons of mass destruction (WMD), i.e. weapons of great lethality. The existing types of WMD include modern munitions, nuclear, chemical, bacteriological and new types of WMD (geophysical, radiation, radiological, radio frequency, infrasound, etc.).

*Nuclear weapon*

5

*Nuclear weapons* are based on the use of internal energy released in chain reactions of fission of heavy nuclei or in thermonuclear fusion reactions.

*There are the following types of nuclear weapons :*

*atomic bomb* (release of energy as a result of a chain reaction of fission of isotopes of uranium or plutonium). Critical mass is formed after the connection of isolated parts of isotopes with a conventional explosive device. The critical mass for uranium is 24 kg, while the minimum dimensions of the bomb can be less than 50 kg. The critical mass for plutonium is 8 kg, which at a density of 18.7 g/cm<sup>3</sup> is approximately the volume of a tennis ball;

*hydrogen bomb* (release of energy due to the transformation of light nuclei into heavier ones during the fusion reaction). To start the reaction, a temperature of 10 million C is required, which is achieved during the explosion of a conventional atomic bomb;

*neutron weapons* (increased neutron radiation is achieved due to the greater energy consumption (approximately 5 - 10 times compared to an atomic bomb) for the creation of penetrating radiation).

The damaging factors of a nuclear explosion are the baric effect of a shock wave, the thermal effect of light radiation, the radiation effect of penetrating radiation, radioactive contamination, and an electromagnetic pulse.

#### *Chemical weapon*

The basis of *chemical weapons* is poisonous substances that affect people and animals, contaminate the air, soil, water sources, buildings and structures, means of transport, food and animal feed. Poisonous substances in the form of vapor, aerosols or drops affect the human body when it comes into contact with the skin and eyes, through the respiratory system and the gastrointestinal tract. During the explosion of chemical munitions, part of the toxic substances settles on the ground in the form of drops and, upon evaporation, forms a secondary cloud of contaminated air, which, moving with the wind, creates an extensive zone of distribution of toxic substances vapors.

The main protection against chemical weapons is the means of individual protection of the respiratory organs and skin.

### **5.4 Bacteriological weapons**

*bacteriological ( biological ) weapon* is a weapon whose destructive effect is based on the use of microbes that cause infectious diseases in humans, animals or plants.

Depending on the size of microbial cells and their biological characteristics, they are divided into:

- *bacteria* (single-celled microorganisms of plant nature);

- *viruses* (microorganisms living in living cells);

- *rickettsiae* (microorganisms occupying an intermediate position between bacteria and viruses);

*fungi* (unicellular or multicellular microorganisms of plant origin).

Due to their bacteriological characteristics, some types of microbes cause diseases only in humans (cholera, typhoid fever, smallpox), others only in animals (rinderpest, swine cholera), and others in humans and animals (brucellosis, Siberian ulcer), the fourth -

only in plants (stem rust of rye, wheat). Severe poisoning in humans can also occur as a result of the action of microbial toxins, i.e. waste products of certain types of bacteria.

In addition to bacterial agents and toxins, insects (Colorado potato beetle, locust, Hessian fly) can also be used, which cause great material damage, destroying crops over a large area.

The most probable types of bacterial agents for infecting people are the causative agents of plague, tularemia, anthrax, cholera, typhus, smallpox, yellow fever, etc.

### **5.5 New types of weapons of mass destruction**

*Geophysical weapon* is a term widely used abroad, denoting a set of various means that make it possible to use the destructive forces of nature for military purposes by artificially induced changes in the physical properties and processes occurring in the atmosphere, hydrosphere and lithosphere of the Earth

The striking factors of geophysical weapons are the catastrophic consequences of provoked hazardous natural phenomena.

*Meteorological ( atmospheric ) weapons* are the impact on macrophysical processes in the atmosphere in order to change the local energy balance. By spraying certain chemicals into "warm" (consisting of water droplets) and "cold" (consisting of ice crystals) clouds, one can either disperse them or produce artificial rain. Quantitative precipitation can be increased up to 200...300 mm, which is a great danger for low-lying and humid areas. In 1963, during the three days of a meteorological war, the level of precipitation in one of the regions of Vietnam amounted to 858 mm, which led to the breakthrough of dams and the flooding of large areas of agricultural land. By "seeding" a thundercloud with silver iodide or dropping the smallest metal needles into the cloud, one can cause lightning discharges that serve as a tactical weapon to defeat people.

*An ecological weapon* is a set of measures carried out on a large scale, aimed at violating the natural conditions of life. Sputtering in the upper layers of the atmosphere of substances that absorb solar energy or the heat of the Earth can cause a sharp local cooling or overheating of the Earth's surface. Directed nuclear explosions in geological formations, on the continental shelf, by, for example, the collapse of glaciers, can cause artificial earthquakes, storm surges ( *lithospheric* and *hydrospheric weapons* ), etc.

*Genetic weapons* are new forms of harmful bacteria created by genetic engineering. When introduced into a foreign organism, these bacteria secrete substances that change the structure of genes, causing the emergence of new pathogenic bacteria.

### **5.5 Terrorist emergencies**

Currently, international and domestic terrorism poses a great threat to many countries, the rapid growth of which brings suffering and death to a large number of people.

*Particularly dangerous threats of a terrorist nature include:*

- *explosions in crowded places ;*

- *seizure of aircraft* and other vehicles for transporting people, kidnapping, hostage-taking;
- *attack on objects* that are potentially dangerous for the life of the population in case of their destruction or violation of the technological regime;
- *poisoning of water supply systems*, food products, artificial spread of pathogens of infectious diseases;
- *Penetration into information networks* and telecommunication systems in order to disrupt their work, up to their failure.

In recent years, a new type of terrorism has emerged that is aimed at committing large-scale terrorist acts against civilians: the tragedy of September 11, 2001 in the United States, the hostage-taking in the theater center in Moscow (October 2002), the seizure of a school in Beslan (September 1, 2004 d.), explosions in London (July 7, 2005) and many others.

Terrorism threatens *social security*, harming the life and health of citizens - victims of terrorist acts, creating a state of tension, uncertainty and insecurity in society. Wedged into the stable functioning of enterprises, institutions, commercial associations, terrorist manifestations negatively affect the *economic security* of the country.

*Computer terrorism* poses a serious threat to *information security*.

The threat of man-made terrorist acts that could cause significant damage to *the industrial and environmental security* of the country is quite real.

Terrorist acts provoke the emergence of conflict situations in relations with foreign countries, thereby negatively affecting the sphere of *international relations*.

By the nature of the objects of terrorist influence, *selective (selective) terrorism is distinguished*, directed against state and public figures, officials; *mass (blind) terrorism in public places against people* who happened to be in this place; *concentrated random terrorism* in places of accumulation of opposition-minded opponents; *technological terrorism* against vital industrial facilities (nuclear, chemical industries, military facilities, hydroelectric power plants, etc.).

acts carried out by lone terrorists (in many cases suicide bombers) are becoming a widespread social phenomenon. Their danger lies in the fact that they are often committed by mentally vulnerable persons. The terrorist activity of such individuals is a sharp reaction to the social state, a protest against society or a symbol of a kind of "victory" of the justice of the social structure, and sometimes just a fit of aggression. Due to the desire of individuals to self-affirmation through the violent implementation of their own or firmly assimilated foreign ideas and plans of a political, religious, ideological or other nature, these "idealists", absorbed in a fanatical adherence to their convictions and, as it seems to them, impeccable constructions, can be extremely dangerous. . If such lone terrorists have access to high technology, their actions can be very destructive and dangerous.

#### *Behavior of people held hostage*

If you are a hostage:

- pull yourself together, calm down and do not panic;
- prepare physically, morally and emotionally for a possible difficult test;

- Speak in a calm voice. Avoid defiant, hostile tone;
- do not allow actions that can provoke attackers to use weapons and lead to human casualties (do not run, do not rush at a terrorist, do not fight, do not snatch weapons from him; do not try to make peace with a terrorist, persuade him, do not beg, do not call tears for his kindness);
- endure deprivation, insults and humiliation, do not look into the eyes of criminals, do not behave defiantly;
- to maintain strength, eat everything that is given to you, even if you do not like the food;
- if necessary, follow the requirements of the criminals (especially the first half hour), do not contradict them, do not risk the lives of others and your own, try not to allow tantrums and panic;
- to perform any actions (sit down, stand up, drink, go to the toilet), ask permission;
- if you are injured, try not to move, this will reduce blood loss. - try to bandage the wound with a handkerchief, torn T-shirt or shirt;
- remember: your goal is to stay alive. Be careful, try to remember the signs of criminals, the distinctive features of their faces, clothes, names, nicknames, the presence of scars and tattoos, features of speech and demeanor, topics of conversation, etc.;
- remember that, having received a message about your capture, the special services have already begun to act and will do everything necessary for your release.

### **Test questions:**

1. What are the risks associated with social emergencies?
2. What events are related to the dangers associated with mental impact on a person?
3. What events are related to the hazards associated with physical impact on a person?
4. Why is alcoholism dangerous?
5. How does smoking affect human health?
6. What is the effect of drug addiction on human life?
7. What diseases are social diseases?
8. What are the consequences of a mental disorder?
9. What is "unemployment"?
10. What is "poverty"?
11. What are the risks associated with military emergencies?
12. Why are chemical weapons dangerous?
13. What is the basis of the damaging effect of bacterial weapons?
14. What types of terrorist threats do you know?
15. How should one act when being held hostage by terrorists?

### **Lecture number 6. HEALTH AND SAFETY. LEGAL BASIS FROM**

*Basic concepts. Difference between OT and TB. Legislation of the Republic of*

*Uzbekistan on labor protection. State policy in the field of labor protection. Training of labor protection specialists. retraining of specialists for work in the labor protection system. Financing of labor protection. Nomenclature measures for labor protection. Responsibility for violations of the rules and norms of labor protection. Classification of working conditions. Occupational safety in work with unfavorable working conditions. The procedure for issuing milk and free medical and preventive nutrition. Providing employees with personal protective equipment. Occupational health and safety obligations of the employer. Responsibility of the head of the workshop, foreman and employee in matters of labor protection. Organization of three-stage control on labor protection in production.*

In the process of work, a person faces many dangers, since the working environment is characterized by the use of high-energy equipment, hazardous substances and energies. Practice shows that not all environmental hazards are realized, since there is a *system for ensuring human safety in production* - labor protection.

### **6.1 Basic concepts**

*Occupational Safety and Health* - a system of legal, socio-economic, organizational, technical, sanitary and hygienic, medical and preventive, rehabilitation and other measures aimed at ensuring safety, preserving the life and health of people.

*Safety precautions* - a system of organizational measures, technical means and methods that prevent the impact on workers of hazardous production factors

*Workplace* - the place where the employee must be or where he needs to arrive in connection with his work and which is directly or indirectly under the control of the employer.

*Labor protection requirements* – state regulatory requirements for labor protection, established by the rules and instructions for labor protection.

*Certification of workplaces according to working conditions* – assessment of working conditions at workplaces in order to identify harmful and dangerous production factors and take measures to bring working conditions in line with state regulatory requirements for labor protection.

*Injury* - (from the Greek τραῦμα - wound) - physical damage to the body under the influence of external factors.

People often confuse the concepts of "safety" and "labor protection". *The main and only difference between labor protection and safety is that safety is only a small part of labor protection. If safety measures are aimed only at protecting an employee from physical injuries, for example, protection from a brick falling on his head, then labor protection aims to preserve human life and health. For example, protection from harmful substances.*

*Occupational safety refers to such areas of work as industrial sanitation, occupational health, electrical safety, fire safety, life safety and, in fact, safety engineering.*

*The main task of labor protection is to ensure safe work in the workplace.*

*Through what activities does this happen?*

First of all - certification of workplaces.

The second is medical examination.

The third is personal protective equipment.

Fourth - briefings and training in labor protection and safety .

## **6.2 Legislation of the Republic of Uzbekistan on labor protection**

The legislation of the Republic of Uzbekistan on labor protection is based primarily on the Constitution of the Republic of Uzbekistan.

Article 37 of the Constitution of the Republic of Uzbekistan enshrines the right of citizens to safe working conditions in the course of their labor activity at all enterprises, regardless of their forms of ownership and methods of production.

Based on the Constitutional requirements and in order to protect the health and labor of citizens, on May 6, 1993, the Law of the Republic of Uzbekistan “On labor protection” was adopted, which established a unified procedure for organizing labor protection, regardless of the methods of production, forms of ownership.

The next legislative act regulating labor legislation, including labor protection, is the Labor Code of the Republic of Uzbekistan adopted on April 1, 1996.

The adopted Labor Code specifically reflects the regulation of labor relations of women, adolescents, and the disabled. It also established requirements and standards for overtime work, the establishment and provision of benefits and compensation for unfavorable working conditions and other issues of labor protection.

A number of significant obligations to compensate for harm caused to the life and health of an employee at work are enshrined in the Civil Code of Uzbekistan.

Issues of responsibility for violation of the rules and norms of labor protection are reflected in the Code of the Republic of Uzbekistan on administrative responsibility.

In addition to the listed laws, Codes, the legislation of the Republic of Uzbekistan on labor protection consists of regulatory legal acts, which include resolutions of the Oliy Majlis of the Republic of Uzbekistan, Decrees and Resolutions of the President of the Republic of Uzbekistan, Government Resolutions, acts of ministries, departments, state committees, decisions on labor protection of representative and executive bodies of state power, adopted within their competence.

## **6.3 State policy in the field of labor protection**

The main provisions of the state policy in the field of protection are enshrined in the law "On labor protection" of the Republic of Uzbekistan and are based on the following principles:

- the priority of the life and health of the employee in relation to the results of the production activities of the enterprise;
- coordination of activities in the field of labor protection with other areas of economic and social policy;
- establishing uniform requirements in the field of labor protection for all enterprises, regardless of the form of ownership and management;

- ensuring environmentally safe working conditions and systematic monitoring of the state of the environment in the workplace;
- implementation of supervision and control over the widespread implementation of labor protection requirements at enterprises;
- participation of the state in the financing of labor protection;
- training of labor protection specialists in higher and secondary specialized educational institutions;
- stimulating the development and implementation of safe equipment, technology and means of protecting workers;
- wide use of the achievements of science, technology and advanced domestic and foreign experience in labor protection;
- free provision of employees with special clothing and footwear, personal protective equipment, therapeutic and preventive nutrition;
- pursuing a tax policy that promotes the creation of healthy and safe working conditions at enterprises;
- the obligation to investigate and record each accident at work and each occupational disease and, on this basis, inform the population about the levels of occupational injuries and occupational morbidity;
- social protection of the interests of employees who have suffered from accidents at work or who have received occupational diseases;
- all possible support for the activities of trade unions and other public - associations, enterprises and individuals aimed at ensuring labor protection;
- international cooperation in solving problems of labor protection.

### **6.3 Training of labor protection specialists**

According to the law “On labor protection”, the state and enterprises in the Republic of Uzbekistan provide training in higher and secondary specialized educational institutions for specialists to work in the labor protection services of enterprises.

Higher and secondary specialized educational institutions must organize the obligatory study of a course on labor protection by students and pupils, taking into account the specifics of the production of various sectors of the national economy.

Ministries, departments, concerns, associations and other economic management bodies must ensure the retraining of specialists to work in the labor protection system.

### **6.5 Health and safety financing**

The Law "On labor protection" provides for the financing of labor protection by the state, as well as through voluntary contributions from public associations and enterprises, regardless of ownership.

Budget allocations for labor protection (republican and local) allocated in the respective budgets as a separate line are used to maintain management, supervision and control bodies, finance research work, and implement state targeted programs on labor protection.

Each enterprise must allocate the necessary funds for labor protection in the

amount determined by the collective agreement. Employees of enterprises do not bear any additional costs for these purposes.

Enterprises have the right to create centralized labor protection funds at the expense of profits (revenues) from their economic, commercial, foreign economic and other activities, as well as other sources.

Funds for labor protection cannot be used for other purposes.

### **6.6 Nomenclature measures for labor protection**

The employer is responsible for creating working conditions that meet occupational safety and health, and that obliges to develop nomenclature measures for labor protection.

*Nomenclature measures for labor protection can be mainly divided into 3 groups:*

- *measures for the prevention of accidents* - the installation of additional fences, interlocks, as well as the use of automated systems and control devices from distances, alarm systems, mechanization issues and more;
- *measures to reduce occupational diseases in the workplace* - installation of special devices to prevent harmful effects or their purchase, a high-quality optimal ventilation system for working air, equipment for controlling atmospheric air;
- *an event that provides a general improvement in working conditions* - the organization of better lighting, improving the condition of sanitary and hygienic rooms, timely and high-quality repair of overalls and safety shoes, offices, corners and exhibitions for labor protection, and more.

*Responsibility for violations of the rules and norms of labor protection.*

Officials guilty of violating labor legislation, rules and norms of labor protection, including those that led to accidents at work in accordance with the legislation of the Republic of Uzbekistan, may be subject to disciplinary, administrative and criminal liability.

*The following persons have the right to apply administrative penalties for violation of labor legislation and labor protection:*

- state legal labor inspectors - for violation of labor legislation;
- state technical inspectors - for violation of labor protection rules;
- officials of the state examination of working conditions - for violation of the norms and rules of working conditions.

According to Article 49 of the Code of the Republic of Uzbekistan "On Administrative Responsibility", violation by an official of the legislation on labor and labor protection - entails the imposition of a fine from two to five times the minimum wage.

According to article 257 of the Criminal Code of the Republic of Uzbekistan, violation of safety rules, industrial sanitation or other labor protection rules by a person responsible for their observance, resulting in moderate or severe bodily injury, is punishable by a fine of twenty-five to fifty minimum monthly wages or deprivation certain right up to three years, and whether by corrective labor up to three years or imprisonment up to three years.

A person responsible for compliance with safety regulations, sanitary standards

and other labor protection rules and who violated them, which led to serious damage to health or death of an employee at work, is punished with imprisonment from three to five years with deprivation of a certain right.

According to Article 176 of the Labor Code, the fulfillment of labor protection requirements is the responsibility of the employee, and therefore, for non-compliance with these requirements, the employer may apply disciplinary measures to the employee in accordance with Article 181 of the Labor Code, which provide for:

1. Rebuke.
2. A fine of not more than thirty percent of the average monthly earnings.

The internal labor regulations may provide for the imposition of a fine on an employee in the amount of not more than fifty percent of the average monthly earnings. The deduction of a fine from the employee's wages is made by the employer in compliance with the requirements of Article 164 of the Labor Code, namely for each payment of wages, the total amount of deductions cannot exceed fifty percent of the wages due to the employee.

3. Termination of an employment contract.

### **6.7 Classification of working conditions**

Working conditions according to the degree of harmfulness and (or) danger are divided into four classes - optimal, permissible, harmful and dangerous working conditions.

*Optimal working conditions* are working conditions under which the impact on the employee of harmful factors is minimal and prerequisites are created to maintain a high level of efficiency and safety of the employee.

*Permissible working conditions* are working conditions under which the employee is exposed to harmful and (or) dangerous production factors, the levels of exposure to which do not exceed the levels established by the standards of working conditions, and the altered functional state of the employee's body is restored during regulated rest or by the beginning of the next working day (shifts).

*Harmful working conditions* are working conditions under which the levels of exposure to harmful and (or) hazardous production factors exceed the levels established by the standards (hygienic standards) of working conditions, levels, the effects of which can cause persistent functional changes in the worker's body, leading to the emergence and development of initial forms occupational diseases arising after prolonged work

Harmful working conditions according to the degree of exceeding the standards are divided into 4 degrees of harmfulness:



1st degree - characterized by such deviations from acceptable norms, in which reversible functional changes occur and there is a risk of developing the disease;

2nd degree - characterized by levels of harmful factors that can cause persistent functional disorders, an increase in morbidity with temporary disability, the appearance of initial signs of occupational diseases;

3rd degree - characterized by such levels of harmful factors, in which, as a rule, occupational diseases develop in mild forms during the period of employment;

4th degree - conditions of the working environment under which pronounced forms of occupational diseases can occur, high levels of morbidity with temporary disability are noted.

*Hazardous working conditions* are working conditions under which the employee is exposed to harmful and (or) hazardous production factors, the levels of exposure to which during the whole working day (shift) or part of it can endanger the life of the employee, and the consequences of exposure to these factors cause a high risk of development occupational disease during employment or death.

#### *Labor protection in work with unfavorable working conditions*

In accordance with Article 137 of the Labor Code of the Republic of Uzbekistan, annual additional leave for work with unfavorable working conditions is provided to employees exposed, in the course of work, to physical, chemical, biological and other production factors harmful to health. The minimum duration of additional leave for work in special working conditions, as well as for work in especially harmful and especially difficult working conditions, is 12 days.

The reduced working hours for employees exposed to physical, chemical, biological and other production factors harmful to health in the course of work, according to the Labor Code, is no more than 36 hours per week.

When working with unfavorable conditions, it is also provided for the issuance of free milk, therapeutic and preventive nutrition, benefits upon retirement, etc.

### **6.8 How to distribute free milk**

In accordance with the Law “On Labor Protection” and the Labor Code, workers employed in jobs with unfavorable working conditions must be provided with milk or other equivalent food products free of charge, according to established standards.

The legislation provides for the daily allocation of milk or products replacing it, and monetary compensation, in case of non-availability, is prohibited.

The daily milk dispensing rate is 0.5 liters on the days when employees actually perform work in production, workshops, and at the site ax and in other subdivisions with harmful working conditions and provided that they are employed in them for at least 80 percent of the working day (shift).

Lists of jobs, professions that give the right to workers and employees to receive (free milk) are determined by the employer in agreement with the trade union organization on the basis of Medical indications for the free distribution of milk or other equivalent products to workers and employees directly engaged in work with harmful working conditions, approved by the Ministry of Health Republic of Uzbekistan March 19, 1996.

#### *The procedure for issuing free medical and preventive nutrition*

Free provision of therapeutic and preventive nutrition, in accordance with the law "On labor protection", the Labor Code, is provided mainly to workers employed in jobs with especially harmful and especially difficult working conditions in order to improve their health and prevent occupational diseases.

The list of works, the procedure for issuing and the conditions for providing medical and preventive nutrition are established by agreements, collective agreements, and if they are not concluded, they are determined by the employer in agreement with the trade union organization

Rations of therapeutic and preventive nutrition are approved by the health authorities.

#### *Providing workers with personal protective equipment*

In accordance with Article 13 of the Law "On Labor Protection" in industries with harmful and dangerous working conditions, as well as in work performed in special temperature conditions and regimes or associated with pollution, workers are issued, free of charge according to the standards established by government bodies , special clothing, footwear and other personal protective equipment, detergents and disinfectants.

The norms for issuing, the procedure for providing are established by agreements, collective agreements, and if they are not concluded, they are determined by the employer in agreement with the trade union organization. Special clothing, special footwear and other personal protective equipment issued free of charge to workers and employees are considered the property of the enterprise and are subject to mandatory return upon dismissal, when transferred to another job in the same enterprise for which the issued protective equipment is not provided for by the standards, as well as upon completion wear time.

Overalls, special footwear and other protective equipment should be stored in specially equipped premises (cloakrooms) at the enterprises. Only in some cases, when, according to the working conditions, it is impossible to organize the storage of personal protective equipment in the specified order, they can remain with the employee, which should be stipulated in the collective agreement or internal labor regulations. In these cases, the employees themselves are responsible for the safety of protective equipment.

## **6.9 Occupational safety obligations of the employer**

The first manager is responsible for the state of labor protection and safety at enterprises. The employer's responsibilities include:

- organizing the development and approval, in the prescribed manner, of the relevant regulatory documents, instructions, training programs and other labor protection standards;
- conducting investigations of accidents and occupational diseases at work, the implementation of social protection of persons injured at work or families and other dependents of those who died at work;
- provision of benefits and compensation for harmful and unfavorable working conditions;
- provision of workers with special footwear, means of individual and collective protection;
- control of training and testing of knowledge on labor protection of employees;
- organization of development and implementation of labor protection measures;
- control over the timely and full financing of measures related to ensuring safety at work;
- development and approval, in the prescribed manner, of the Internal Labor Regulations;
- organizing labor protection rooms and equipping them with the necessary manuals, teaching aids, etc.;
- organization of preliminary and periodic medical examinations of workers in a number of professions and industries;
  - taking measures to increase the responsibility of employees for compliance with safety regulations and labor protection;
  - ensuring the timely implementation of the planned measures for labor protection, instructions of state and public control bodies issued in the prescribed manner.

## **6.10 Responsibility of the head of the workshop in matters of labor protection**

The head of the workshop, being a responsible leader, bears full responsibility for compliance with labor protection requirements in accordance with the law in the structural unit of the enterprise he manages.

The head of the department must be assigned a number of functional responsibilities, including:

- organization of production in accordance with the rules and norms of labor protection;
- ensuring the good condition and safe operation of equipment , protective and safety devices;
- fulfillment of orders and instructions, instructions and requirements of state supervision bodies, employees of labor protection and safety services in a timely manner;
- determination of the need and provision of working clothes, safety shoes and

other personal protective equipment, soap, special milk, as well as the organization of timely washing and repair of workwear and safety shoes, according to the norms and rules;

- carrying out the second stage of control on OT;
- information to the management of the enterprise about the state of working conditions at the facilities;
- organizing and conducting timely and high-quality training of workers and foremen in safe working methods;
- development of instructions for the safe conduct of work for each profession and type of work;
- development of a program of briefings for workers and questionnaires to test workers' knowledge of labor protection;
- approval of the schedule for checking the knowledge of workers, carrying out a test of knowledge of workers, processing the results;
- development of measures to improve and improve working conditions;
- report (immediately) to the management of the enterprise, the health and safety service and the trade union committee about the accident

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### **6.11 Responsibility of the production foreman for labor protection**

The foreman of the enterprise is closest to the worker according to the "employer - worker" scheme, and in terms of production duties, he is closest to the process of the "man - machine" chain. These features include:

- ensuring the correct and safe organization of work, operation of equipment and maintenance of workplaces in proper condition;
- personal management of complex and dangerous work according to a previously developed plan, work organization project or along with;
- ensuring compliance by workers with labor and production discipline, rules and instructions for the safe conduct of work, technological regimes, and where provided by the rules - the mandatory use of personal protective equipment;
- constant monitoring of the good condition and proper operation of the equipment, the presence and good condition of protective devices;
- carrying out the first stage of control on labor protection;
- carrying out all types of briefings with registration in the Journal of registration of briefings at the workplace;
- implementation of constant monitoring of the internship of new workers and verification, at the end of the internship, the assimilation by workers of safe working methods and knowledge of instructions;
- the ability to provide first aid to the victim and send him to a medical facility, immediately notify the foreman of the accident and take measures to maintain the situation at the workplace and the state of the equipment as they were at the time of the incident (if this does not threaten the life and health of others workers and will not cause an accident).

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### **6.12 Worker's labor organization for labor protection**

When organizing the work of an employee for labor protection, it is

necessary to provide for the following:

- organization of the workplace in accordance with the rules, norms and instructions for labor protection;
- compliance with the requirements of labor legislation, internal labor regulations, production and labor discipline;
- ability to use means of individual and collective protection;
- obligatory passage of training, instruction, testing of knowledge within the time limits established for his profession;
- knowledge of the rules and practical skills for first aid in case of accidents;
- the ability to make promptly correct decisions in any situation that poses a threat to the life and health of employees related to working conditions and safety;
- immediate notification of their immediate supervisor about emergencies that threaten the life and health of employees, as well as about any accident.

### **6.13 Investigation and record of damage and accidents**

"Regulations on the investigation and recording of accidents and other injuries to health at work " establishes a unified procedure for investigating and recording accidents and other injuries to the health of workers that occurred in connection with labor activities at enterprises of the Republic of Uzbekistan.

In accordance with the Regulations, the following labor injuries received by employees are subject to investigation and accounting:

- injuries, poisoning, thermal shocks, explosions, accidents, destruction of - buildings, structures and structures, burns, frostbite, drowning, electric shock and lightning, damage as a result of contact with animals, insects and reptiles, as well as other damage to health during natural disasters ( earthquakes, landslides, floods, hurricanes, etc.) that occurred while performing work duties (as well as on business trips) on the territory of the enterprise and beyond;
- when performing any actions in the interests of the enterprise, although without instructions from employers;
- in case of a traffic accident, on railway, air, electric transport;
- on the way to work or from work on the transport of an enterprise of a third-party organization that provided it in accordance with the contract (application);
- during working hours by personal transport, if there is an order from the employer to grant the right to use it for business trips;
- during working hours on transport or along the route on foot with an employee, on the instructions of the employer, as well as with an employee whose activities are related to movement between service facilities:
- when holding a community work day (Sunday), regardless of the venue, providing patronage assistance to enterprises;
- during working hours, infliction of bodily harm by another person in the performance of labor duties;

According to the Regulations , cases of natural death, suicide, intentional damage to their health by the victims themselves, as well as injuries received by the victims during the commission of a crime, *are not subject to investigation and accounting* .

The employer is obliged to compensate in full the damage caused to the health of

the employee in the performance of his labor duties by a source of increased danger, unless he proves that the damage arose as a result of force majeure or the intent of the victim.

### **test questions**

1. What is the difference between occupational health and safety?
2. What measures are taken to ensure safe work at work?
3. What regulatory and legislative documents do you know about OT?
4. What is the state policy in the field of OT?
5. Where are OT professionals trained?
6. How is OT funded?
7. What nomenclature measures do you know from OT?
8. What measures are taken for violation of the rules and requirements of OT?
9. In what cases are employees provided with free milk and therapeutic and preventive nutrition?
10. When is personal protective equipment issued?
11. What are the responsibilities of an HSE manager?
12. What are the responsibilities of the HSE shop manager?
13. What are the responsibilities of the OT shift foreman?
14. What are the responsibilities of an OT worker?
15. What accidents at work are investigated and accounted for

## **Lecture number 7. ORGANIZATION FROM IN THE ENTERPRISE. TYPES OF INSTRUCTIONS**

*OT organization. OT service. The main tasks of the OT service. Why is safety in the workplace important? Who is responsible for the safety of workers? Responsibilities of the OT Service. Monitoring the state of OT in enterprises. Instructions from OT service specialists . When to introduce the position of an occupational safety engineer in enterprises? Who controls the work of health and safety services at enterprises? OT training. OT instructions. Induction training. Primary instruction. Periodic instruction. Extraordinary instruction. current instruction. Targeted coaching*

### **7.1 Organization of labor protection**

- State management of labor protection is carried out by the Government of the country directly or on its behalf by the executive authority for labor and other executive authorities.
- In order to ensure compliance with labor protection requirements, to monitor their implementation in each organization carrying out production activities, with more than 50 employees, a labor protection service is created or a position of a labor protection specialist is introduced.

- In an organization with 50 employees or less, the decision to create a labor protection service or introduce the position of a labor protection specialist is made by the employer, taking into account the specifics of the activity of this organization.

- The structure of the labor protection service in the organization and the number of employees of the labor protection service are determined by the employer, taking into account the recommendations of the executive authority for labor.

- Committees (commissions) on labor protection are created in organizations at the initiative of the employer and (or) at the initiative of employees or their representative body. Their composition on a parity basis includes representatives of employers, trade unions or other representative body authorized by employees.

- Committee (commission) on labor protection organizes joint actions of the employer and employees to ensure labor protection requirements, prevent industrial injuries and occupational diseases, and also organizes inspections of working conditions and labor protection at workplaces and informing employees about the results of these inspections, collecting proposals for section of the collective agreement (agreement) on labor protection.

## 7.2 Labor protection service

*Occupational safety service* - as a rule, an independent structural unit of the enterprise, consisting of a staff of labor protection specialists headed by the head of the service. Works in cooperation with other divisions of the enterprise, the commission and authorized persons for labor protection, the labor protection service of a higher organization, as well as with the country's executive authorities in the field of labor protection, state supervision and control over compliance with labor protection requirements and public control bodies.

*Occupational health and safety at the enterprise* is a set of measures necessary to protect workers during the performance of tasks assigned by the employer.

*The main tasks of the OT service* are divided into:

- ensuring the safety of electrical equipment, cable lines, power lines, lightning protection;

- protection against fires, fires and smoke;

- safe organization of all categories of work;

- Maintenance of equipment serviceability (verification, repair, timely replacement);

- maintenance in proper condition of buildings for various purposes, structures, structures, as well as the territory;

- neutralization of impact on workers of noise, dust content, vibration and other harmful factors;

- protection of people who work in hazardous conditions: at height, underground, under conditions of high or low temperatures, various radiation, contact with hot or moving objects and their parts, etc.;

- training of workers, students, management personnel (instructions on labor protection and safety, special courses, posters, diagrams, drawings, etc.);

- monitoring of employees' health indicators (preliminary, pre-shift, annual, extraordinary medical examinations and examinations), organization of sanatorium

treatment, distribution of therapeutic and preventive nutrition, milk;  
•public monitoring of the organization of labor protection and safety at the enterprise:  
the work of occupational health and safety representatives, trade unions, and other  
public associations.

Taking into account the requirements of the regulatory documentation that regulates the activities of specific organizations, they develop their own OSMS standards. All information necessary for employees on the safe conduct of work is set out in the instructions for labor protection and safety for specific professions or the performance of certain work (loading and unloading, fire, etc.).

*Why is safety in the workplace important?*

The answer is obvious: "To avoid injury." But there are other reasons too:

1. To keep the employee alive, healthy and not become disabled. Think about it, for example, about 2,000 people a year die at Russian enterprises and about 4,000 people a year become disabled!

2. Causing damage to the health of other employees. For causing harm to the health of citizens, administrative liability is provided.

3. Failure to provide various benefits and guarantees not provided for by the collective agreement. So, at many enterprises the 13th salary is not paid to violators of labor discipline.

4. Decreased quality of products and services.

5. Dismissal at the initiative of the employer. The administration of the enterprise has the full right to terminate the employment contract for repeated violation of safety regulations or for a single gross violation of safety regulations

*Who is responsible for the safety of workers?*

Among workers who are superficially familiar with the requirements of OT, there is an opinion that an engineer for safety and labor protection is responsible for their safety. Actually it is not.

*The immediate supervisor is responsible for the safety of specific employees .* The heads of enterprises, divisions, departments, etc., are generally responsible for labor protection and safety at work.

Responsibility for fulfilling the requirements of labor protection and safety at the enterprise is also divided according to the areas of supervision and is assigned to employees of the relevant competence. For example, the employees of the energy service appointed by orders are responsible for electrical safety, for the organization of a system of briefings on labor protection and safety at workplaces and its high-quality functioning - the direct supervisors of the work.

*workers themselves are obliged to take care of their own safety .* This is a requirement not only of common sense, but of the Labor Code of the country . To stay healthy and productive, workers need to:

- clearly know and constantly comply with the requirements of safety and labor protection instructions;
- timely undergo training and medical examinations;
- use PPE;
- be able to provide first aid;

- carefully observe the environment, analyze production situations and immediately inform the work manager about a possible or existing danger.

For the duration of the training, medical examination, stoppage of work due to the created dangerous situation, the workers retain their average earnings. If he evades responsibility for his own health - he does not attend occupational health and safety briefings, does not undergo medical examinations, regularly violates the requirements of OT - the employer's representatives have the right to remove him from work in the appropriate manner. At the same time, wages are not charged during this time.

### **7.3 Responsibilities of the OT service (OT engineer)**

The area of responsibility of the OT service, which even a single engineer can represent, is the organization of labor protection and safety in the enterprise. Representatives of this service are obliged:

1. Organize an investigation, accounting for NA, PZ, analysis of the causes of their occurrence, development of preventive measures;
2. Create and implement programs, activities to improve the quality of working conditions;
3. Provide organizational and methodological support to departments in the field of labor protection: help develop safety and labor protection instructions, store their control copies, provide departments and senior employees with instructions, magazines, cards, other documentation on labor protection, visual aids, rules, regulations;
4. Participate in testing the knowledge of workers based on the results of the OSH training conducted by the enterprise;
5. Help prepare any documents related to labor protection and safety at work: a collective agreement, various agreements, orders for calls to work on weekends, schedule changes, etc.;
6. Help make lists for:
  - passage of pre-shift, preliminary and annual medical examinations;
  - receipt of milk, special nutrition;
  - issuance of overalls and PPE;
  - receipt of compensations (preferential pension provision, additional leave);
7. Prepare and submit reports on labor protection;
8. Keep OT documentation;
9. Organize OSH training for employees and managers;
10. Regularly check the state of OT in the departments;
11. Conduct introductory briefings on labor protection and safety.

### **7.4 Checking the status of OT in enterprises**

In order to qualitatively monitor compliance with occupational health and safety requirements at work, occupational safety specialists can at any time:

- inspect machinery, equipment, premises;
- check health and safety documentation (keeping journals, familiarizing employees with labor protection and safety instructions, maintaining records of workwear and

PPE, issuing work permits, etc.), availability of PPE and their actual use;

- supervise the use by workers of safe practices and methods of work.

In order to successfully fulfill the tasks assigned to them, occupational safety specialists cooperate with other departments of the enterprise (human resources, power engineers, mechanics, first-aid post, etc.), as well as the occupational health commission, occupational health and safety representatives of the labor collective, and the trade union.

#### *Instructions from OT specialists*

The labor protection service controls the safety of all types of work carried out at the enterprise. Occupational safety engineers have the right to stop any work that is carried out in violation of the requirements of safety and labor protection instructions. At the same time, they issue instructions that reflect the essence of violations and indicate the timing of their elimination. Ignoring the requirements of these instructions by the persons to whom they were issued entails disciplinary, financial, and in especially severe cases - criminal liability.

*The order shall include:*

- the essence of the revealed violations of the requirements of the rules, instructions for safety and labor protection;
- references to normative documentation, the requirements of which have been violated;
- terms within which it is necessary to eliminate violations;
- Responsible for the elimination of identified violations of the person.

The prescription is drawn up for the head of work and is drawn up in 2 copies, one of which is issued to him against his signature. If the work manager refuses to accept the order, an act is drawn up about this or a note "Refused to accept the order" is made on the order. In case of refusal to accept the order, work is still stopped, and the identified violations must be eliminated. The inspector may insist on an unscheduled briefing on occupational health and safety instructions, the requirements of which have been violated.

As soon as the violations are eliminated, the responsible person informs the OT service in writing. After the OHS engineer checks that the necessary measures have been taken and makes an appropriate note (+ date, signature) in the prescription, work can continue. Prescriptions are stored in the OT service. The order of their storage in the divisions of the organization is established independently. For example, you can enter information about issued instructions (the essence of violations, deadlines for elimination, responsible persons) in the logs of OT checks.

#### *When to introduce the position of an occupational safety engineer in enterprises?*

The Labor Code obliges an employer to create an occupational safety engineer or an entire service if his company has 50 or more employees. If there are fewer, the employer is allowed to:

- introduce the position of an engineer for safety and labor protection or create an appropriate service;
- do this work yourself;
- assign these duties to another employee (the employee must have an education in

labor protection in accordance with the professional standard ) ;  
• involve a third-party specialist.

At the same time, the employer determines the amount of time allotted to the OT engineer to perform his work and fixes it in the staffing table. Therefore, it is not forbidden to work part-time, part-time or part-time as an engineer for safety and labor protection. To optimize the calculations of the load that is planned to be placed on one person, it is advisable to use the developed intersectoral standards for the number of workers in the OT service. This is a recommendation document. OT service specialists are subordinate to the head of the organization or his deputy, therefore, third-party organizations are needed for professional quality control in the performance of their duties

### **7.5 Organizations of state control over labor protection and public control**

In accordance with Article 9 of the Labor Code of the Republic of Uzbekistan, state supervision and control over compliance with labor legislation and labor protection rules is carried out by specially authorized responsible bodies:

- State Technical Labor Inspectorate of the Ministry of Employment and Labor Relations of the Republic of Uzbekistan;
- State technical expertise of working conditions by the Ministry of Employment and Labor Relations of the Republic of Uzbekistan;
- State Committee of the Republic of Uzbekistan for industrial safety ;
- State Inspectorate "Uzenergonazorat";
- State sanitary supervision;
- State fire supervision of the Ministry of Internal Affairs of the Republic of Uzbekistan.

Bodies of state power and administration exercise control over compliance with labor protection legislation in the manner prescribed by law;

Supervision over the exact and uniform implementation of labor laws in the territory of the Republic of Uzbekistan is carried out by the Prosecutor General of the Republic of Uzbekistan and prosecutors subordinate to him.

Public control over observance of norms and rules on labor protection in accordance with Article 223 of the Labor Code is carried out by trade unions. Public control is also carried out by trade union committees of enterprises, organizations and their labor protection commissions.

In accordance with the legislation, trade union committees, in order to exercise their powers of public control over labor protection, have the right to elect commissioners for labor protection, empowering them with the appropriate powers provided for by the Law on Labor Protection.

#### *Labor protection training*

Managers and specialists study the issues of labor protection while training in their specialty at a university.

Upon taking office within a month, they undergo special training on labor protection issues within their competence. Further training is carried out at least once every

three years in organizations licensed for this activity. The training ends with a knowledge test and the issuance of a certificate.

*An extraordinary test of knowledge on labor protection* for these persons is carried out:

- when changing normative documents on labor protection;
- when introducing new technological equipment;
- when transferring a specialist to another job;
- at the request of officials of the labor inspectorate, the employer in case of violations of labor protection, insufficient knowledge in the field of labor protection;
- after accidents and incidents;
- when there is a break in work for more than one year.

Workers of working professions study the issues of labor protection through a system of briefings.

## **7.6 Occupational safety briefings**

*Briefings on labor protection according to the nature and time of conduct are divided into* introductory and at the workplace. Share in the workplace:

- primary;
- repeated;
- unscheduled;
- current;
- target

*Introductory briefing* - briefing on labor protection, which is carried out with all newly hired persons, regardless of their education, length of service, as well as with temporary workers, business travelers, students and students who have arrived for industrial training or practice, with students in educational institutions before the beginning of laboratory and practical work in educational laboratories, workshops, at sites and ranges.

- In the organization, the briefing is carried out by an occupational safety engineer or a person who is assigned these duties by order of the organization. At large enterprises, relevant specialists (from the fire, medical, and other services) can be involved in various parts of the briefing.
- In the register of introductory briefing on labor protection and in the employment document or on the control sheet, an entry is made about the briefing with the obligatory signature of the one who received the briefing.
- Briefing should be carried out according to the program developed by the labor protection service (engineer) and approved by the head (chief engineer) of the organization .

### *Primary briefing*

carried out at the workplace before the start of production activities:

- with all newly admitted to the organization;
- transferred from other divisions of the organization;
- workers before performing new work for them;

- builders performing construction and installation works on the territory of the organization;
- The immediate supervisor of the work conducts briefing with each employee individually (or with a group of persons serving the same type of equipment and within the limits of a common workplace). At the same time, it is necessary to demonstrate safe methods and methods of work.
- All employees after the initial briefing at the workplace must, during the first 2-14 shifts (depending on the nature of work, qualifications), undergo an internship under the guidance of persons appointed by order for the workshop (section).

#### *Periodic briefing*

all employees, with the exception of persons exempted from primary briefing, regardless of their qualifications, work experience and education, undergo at least 1 time per six months under the primary briefing program at the workplace in full.

- Organizations, in agreement with trade union committees and relevant local authorities of state supervision and control, for some categories of workers may establish a longer (up to 1 year) period for re-briefing.
- Repeated briefing is carried out individually or with a group of workers serving the same type of equipment within a common workplace.

#### *Unscheduled briefing*

carry out:

- when new or revised standards, labor protection rules and labor protection instructions are put into effect;
- change in the technological process, replacement (or modernization) of equipment, fixtures and tools, raw materials, materials and other factors;
- violation of labor protection requirements by employees, which may lead (or has led) to work injury, poisoning, accident, explosion, fire;
- breaks in work: for work for which additional (increased) labor protection requirements are imposed - for more than 30 days, for other works - 60 days;
- at the request of the supervisory and control authorities.

Instruction is carried out individually or with a group of workers of the same profession. The scope and content of the briefing is determined depending on the reasons and circumstances that necessitated its implementation.

#### *Current briefing*

is carried out each time at the work site with all the workers included in the work order.

During the briefing, the main attention is paid to the conditions in which the work will be carried out, and to the dangerous factors that arise at this workplace. The person who conducted the current briefing makes an appropriate entry about this in the task log.

#### *Targeted coaching*

carry out:

- when performing one-time work not related to direct duties in the specialty (loading, unloading, cleaning the territory, any work outside the organization, shop, etc.);

- liquidation of the consequences of accidents, natural disasters and catastrophes;
- during the performance of work for which a work permit, permit and other documents are issued (they make a record of the briefing).

### **test questions**

1. How is OSH work organized in enterprises?
2. What are the main tasks of the OT service of enterprises?
3. Who is responsible for the safety of workers in enterprises?
4. What are the responsibilities of an enterprise HSE engineer?
5. How is an order issued by OT specialists?
6. When is the position of an HSE engineer introduced at enterprises?
7. What state bodies control the state of labor protection at enterprises?
8. What types of OT briefings are divided into?
9. How is the initial briefing on OT carried out?
10. What is the purpose of the periodic OSH briefing?
11. In what cases is an extraordinary briefing on OT carried out?
12. When is targeted training given?

## **Lecture number 8. HARMFUL AND DANGEROUS PRODUCTION FACTORS IN MINING AND METALLURGICAL ENTERPRISES**

*Features of mining and metallurgical enterprises in terms of labor safety. Dangerous and harmful production factors. Occupational diseases. industrial dust. Physical properties of industrial dust. Diseases caused by dust. PPE and KSZ from dust. Dust control in production. industrial noise. noise characteristics. Effects of noise on the body. Vibration. Vibration classification. Impact on the body of vibration. Ventilation. Vibration classification. Industrial lighting.*

### **8.1 Features of mining and metallurgical enterprises**

Enterprises of the mining and metallurgical industries largely determine the economic performance of developed countries. A number of dangerous and harmful factors affect workers in this industry, leading to occupational diseases and injuries, and sometimes deaths. According to statistics, the largest part of accidents at work is associated with the activities of mining and metallurgical enterprises. This leads to large losses of the working population, which in turn brings direct and indirect economic losses. In mining and metallurgical production, workers are affected by a whole range of harmful factors, which individually may not exceed the standard values, but in combination with each other can lead to adverse effects. Therefore, the problem of creating healthy working conditions, taking measures to prevent occupational diseases at most enterprises remains very relevant.

Among the permanent harmful factors in mining and metallurgical enterprises are dust, vibration, noise, poor lighting, excess concentration of hazardous substances in the air. In terms of the degree of danger, other types of work that involve full-time employment in underground work are comparable to the profession of a miner, such

as, for example, the construction of mines, mines, and various underground structures. Mining operations that involve working on the surface are also among the most dangerous, as well as the work of those employed in mining and processing plants, in metallurgical production (blast furnace, steelmaking, ferroalloy, coke production, workshops for the preparation of compositions and repair of metallurgical furnaces, dolomite factories, rolling and pipe production).

Per person in the process labor activity can be affected by **dangerous** (causing injuries) and *harmful* (causing diseases) production factors that are divided into four groups: physical, chemical, biological and psychophysiological.

*Hazardous physical production factors* include moving machines and mechanisms; work at height, various lifting and transport devices and transportable goods; unprotected moving elements of production equipment (drive and transmission mechanisms, cutting tools, rotating and moving devices, etc.); flying particles of the processed material and tool, electric current, elevated temperature of the surfaces of equipment and processed materials, etc.

*Harmful physical production factors* are increased or decreased air temperature of the working area; high humidity and air velocity; increased levels of noise, vibration, ultrasound and various radiations - thermal, ionizing, electromagnetic, infrared, etc. Harmful physical factors also include dust and gas content in the air of the working area; insufficient illumination of workplaces, passages and driveways; increased brightness of light and pulsation of the light flux.

*A harmful production factor has the insidious property of "accumulation", i.e. a person may not notice the harmful effects of these production factors for a long time*

There is a certain relationship between harmful and dangerous production factors. In many cases, the presence of harmful factors contributes to the manifestation of hazardous factors - for example, an excessive increase in the maximum permissible concentration of harmful substances in the air can lead to severe, sometimes fatal outcomes (hazardous factor).

The levels of impact on workers of harmful production factors are normalized by maximum permissible levels, the values of which are indicated in the relevant standards of the system of labor safety standards and sanitary and hygienic rules.

*The maximum permissible value of a harmful production factor* is the maximum value of the magnitude of a harmful production factor, the impact of which, with a daily regulated duration throughout the entire length of service, does not lead to a decrease in working capacity and illness both during labor activity and to illness in the subsequent period of life, as well as does not adversely affect the health of offspring.

The space in which exposure to hazardous and / or harmful production factors is possible is called *the danger zone*.

As a result of exposure to harmful production factors, workers develop *occupational diseases* - diseases caused by exposure to harmful working conditions.

*Occupational diseases are divided into:*

- *acute occupational diseases* that have arisen after a single (during no more than one work shift) exposure to harmful occupational factors;

- *chronic occupational diseases that have arisen after repeated exposure to harmful production factors (increased concentration of harmful substances in the air of the working area, increased noise, vibration, etc.).*

The choice of methods and means of ensuring safety should be based on the identification of harmful and dangerous factors inherent in a particular production equipment or technological process. It is very important to be able to detect a hazard and determine its characteristics.

*Protection from harmful and hazardous production factors is provided by reducing their level at the source and by applying preventive and protective measures. At the same time, the competence of people in the field of industrial hazards and methods of protection against them is a necessary condition for ensuring their safety.*

The following are the main types of harmful production factors affecting the employees of mining and metallurgical enterprises leading the extraction of minerals and its processing.

## **8.1 Industrial dust**

Sources of dust generation at mining and metallurgical enterprises are drilling and blasting and excavation and loading operations, ore transportation, self-propelled equipment, etc. During the production of mining operations during the execution of various technological processes, air pollution occurs with dust. Dust, getting into the upper respiratory tract with inhaled air, leads to diseases of the human respiratory system united in the group of pneumoconiosis.

*Industrial dust* is a collection of finely dispersed solid particles formed during the production process and suspended in the air for a long time. According to the terminology of colloidal chemistry, dust is an aerosol, i.e. a dispersed system, the dispersed phase of which is a solid, and the dispersed medium is air.

### *Dust classification*

By origin, dust is divided into:

- *organic*, plant and animal origin (grain, cotton, wood, bone, etc.);
- *inorganic* - mineral and metal (asbestos, fireclay, cement, diamond, magnesium, etc.);
- *mixed*.

### *Physical properties of industrial dust*

Dust is a factor of physical and chemical nature. The properties of dust are determined by both the chemical composition and the physical characteristics of the dust.

• *Dispersion*. The dispersion of industrial dusts varies from  $10^{-3}$  to  $10^{-10}$  m (1000 ... 0.0001 microns). Many of its properties depend on the dispersion of dust: the settling rate, the behavior of dust particles in the body, and the fibrogenic (toxic) effect.

• *Structure and molecular structure*. Many minerals have several modifications. So, silica ( $\text{SiO}_2$ ) has amorphous varieties (quartz glass, silica gel) and crystalline (quartz, cristobalite, tridymite). The fibrogenic effect of crystalline modifications of silica is 3...4 times greater than the effect of amorphous varieties.

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• *Density defines two important hygienic properties of dust* :

- the denser the substance, the faster its dust settles;

- the denser the substance, the less its fibrogenic effect. For example, of the two modifications of carbon, graphite (density 2.2) has a greater fibrogenic effect than diamond (density 3.5).

• **The shape of the particles** affects the stability of the aerosol in the air and the deposition of dust particles in the respiratory system:

- spherical ones fall out of the air faster, more easily penetrate into the respiratory organs and are absorbed by phagocytes (cells of the body);

- fibrous, needle-like, radiant particles are kept in the air for a longer time, are more easily retained in the upper respiratory tract, but are hardly excreted from the body and can injure the mucous membranes.

• **Solubility.** Rapidly soluble dusts have a toxic effect immediately upon entry into the body; the greater the solubility of aerosols, the more dangerous they are. The dissolution rate also depends on the dispersion of dust particles.

#### *Diseases caused by dust*

Most often under the influence of dust, respiratory diseases occur.

1) *Bronchitis of dust etiology* - atrophic changes in the bronchial tree (bronchial system), accompanied by emphysema (respiratory disease) of the lungs and respiratory failure.

#### *2) Diseases of the lungs.*

Diseases of the lungs that develop under the influence of dust are grouped together under the name pneumoconiosis. They occur during long-term (5 ... 20 years) work in conditions where the dust content in the air exceeds hygienic standards.

• *Silicosis* is caused by exposure to dust containing free silica. It is a nodular fibrosis with a progressive course, often complicated by tuberculosis.

• *Silicosis* - pneumoconiosis under the influence of silicic acid salts (silicates).

• *Carboniosis* - a disease that occurs during prolonged contact with carbon-containing dust (soot, graphite dust, etc.). Carboniosis developed under the influence of coal dust is called **anthracosis**.

• *Pneumoconiosis* from organic dusts: amylosis (flour dust), tabacosis (tobacco dust), bagatosis (cane dust), byssinosis (cotton dust), etc.

3) *Bronchial asthma* is an allergic disease that develops under the influence of aerosols of compounds of beryllium, nickel, chromium, plant dust, wool dust, rosin, mother-of-pearl, etc.

#### *Dust protection*

##### *Personal protection*

• observance of personal hygiene by employees - obligatory shower after work, washing, cleaning, dust removal and disinfection of overalls;

• use of personal protective equipment.

##### *Individual protection means:*

• overalls, aprons, gloves (mittens);

• skin protection products from chemicals - special soaps, pastes, ointments and creams for cleaning and protecting the skin from reactive substances

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• means of eye and face protection - masks and goggles against the action of sprayed and splashed substances;

- means of respiratory protection:
- filtering - from specific types of toxic substances, a person breathes filtered atmospheric air (cotton-gauze bandage, respirator, filtering gas mask;

#### *Collective remedies*

The most effective method of protection is the hygienic rationalization of the technological process to reduce the release of harmful substances and dust:

- replacement of toxic substances with harmless ones;
- production of a dusty product in the form of granules, pastes, shots, pellets, etc.;
- use of "wet" technologies (injection of water into the coal seam, irrigation of the face, "wet" grinding, hydro mining, hydro cleaning of castings, etc.);
- sealing equipment and removing air from under the shelter to prevent the spread of the substance in the working area, etc.

#### *Organizational practices include:*

- the establishment of a shorter working week, additional leave and an earlier retirement age for a number of professional groups working in dusty and chemically polluted environments.

#### *Medical and preventive protection measures*

- *Preliminary medical examination* – carried out upon admission of a person to work to determine whether the employee has contraindications to work in conditions of chemical pollution and dustiness;
- *periodic medical examination* - carried out to establish the initial stages of chronic poisoning and occupational pathology;
- *special nutrition* - assigned to certain categories of workers whose professional activities are associated with the use of toxic agents. As a special food, milk and dairy products are used in the amount of 0.5 liters per employee per shift.

#### *Industrial dust control*

Measures to combat dust in the workplace and its harmful effects on the human body should be carried out in the following areas:

- 1) radical rationalization of the technological process, completely eliminating the formation of dust;
- 2) maximum sealing of apparatus, equipment, elevators, conveyors, screws, etc.;
- 3) mechanization of manual processes of crushing, grinding, screening, packing, loading, etc.;
- 4) replacement of works using dry materials with works using wetted materials;
- 5) the device of special dust-removing ventilation from places of dust formation;
- 6) isolation of especially dusty equipment from areas of other work;
- 7) thorough systematic cleaning of the premises with a wet method or with the use of vacuum cleaners;
- 8) providing workers with anti-dust overalls, respirators, helmets and goggles;
- 9) creation of conditions at enterprises for the performance of personal hygiene measures by employees (arrangement of dressing rooms, washrooms, showers, rooms for dedusting overalls, respiratory, hygiene rooms, etc.);

- 10) professional selection of persons for work in workshops where there is air dusting, preliminary and periodic medical examinations of them;
- 11) establishment of a special regime of work and rest (shortened working day, additional leave, etc.).

## 8.2 Industrial noise

The use of various types of drilling rigs, loaders, electric locomotives, vehicles and other equipment at mining and metallurgical enterprises determines high levels of noise and vibration in the workplace. For drillers with hand-held perforators, the excess noise averaged from 34 to 39 dB, and over the entire spectrum from 20 to 32 dB. During the operation of drilling rigs, the noise excess at all frequencies ranged on average from 15 to 36 dB. High noise levels were also noted during the operation of rope scraper winches, loading machines, and electric locomotives.

Noise sources at mining and metallurgical enterprises are machines, units, pipelines, means of transport, etc. The impact of noise on the human body can lead to hearing loss, and then deafness. Also constant exposure to noise can lead to noise sickness.

### *Noise Characteristics*

Sound has the following characteristics:

- *frequency*, which reflects the number of complete oscillations in 1s. It is measured in hertz (Hz). The set of frequencies makes up the noise spectrum;
- *sound power* is the amount of sound energy emitted by the source per unit time into the environment, (W);
- *strength (intensity) of sound* is the energy of a sound wave per 1 m<sup>2</sup> of the surface area located perpendicular to the wave, W/m<sup>2</sup>.
- Sound with a sound pressure level of 51 dB is twice as loud as sound with a sound pressure level of 50 dB and has a sound pressure level 10 times greater.

### *Classification of noise by origin*

Depending on the nature of the processes that result in the formation of a sound wave, noise is divided into:

- mechanical,
- aerodynamic,
- hydromechanical,
- electromagnetic.

*According to the spectral composition, noise is divided into:*

- a) low-frequency (16 ... 500 Hz);
- b) mid-frequency (500 ... 1000 Hz);
- c) high-frequency (1000 ... 20000 Hz).

### *Effects of noise on the body*

"Noise disease" is a general disease of the body with a primary lesion of the hearing organs, the central nervous and cardiovascular systems as a result of prolonged exposure to intense noise.

Clinical manifestations are divided into:

- specific, which occur in the peripheral part of the auditory analyzer and manifest themselves in hearing pathology;
- non-specific, arising in various organs and systems.
- Often the first (with work experience up to 7 years) appear nonspecific symptoms in the form of vegetoasthenic syndrome and neurocirculatory dystonia.
- With an experience of 10 years, hearing impairments and functional disorders of the central nervous system are equally common.
- With an experience of 10...15 years, the number of people with pathology of the hearing organ (cochlear neuritis, hearing loss) increases significantly.
- In addition to complaints of hearing impairment, subjective complaints of irritability, headache, drowsiness, poor night sleep, increased fatigue, dizziness are presented; in later stages - pain in the stomach and gallbladder.
- Examination of the function of hearing is carried out by the method of tone audiometry. The thresholds of auditory function are determined in the range of speech frequencies (500...2000 Hz) and the loss of auditory perception at a frequency of 4000 Hz. Occupational hearing loss is diagnosed if the arithmetic mean of hearing loss in the speech range is more than 11 dB.

#### *Noise protection*

*The method of reducing noise in the source of formation* is the most effective, based on a change in the technological process or the design of the source (replacement of stamping by pressing, riveting by welding, stumps by milling). Noise from equipment can be reduced by improving the balance of rotating parts, reducing the shaft speed, using special lubricants, etc.

• *Interruption of noise propagation paths:*

- a) architectural and planning methods - the rational location of noisy workshops, highways, the creation of noise protection zones;
- b) acoustic treatment of premises - lining surfaces with sound-absorbing materials, as well as installation of sound absorbers;
- c) change in the direction of noise emission in relation to workplaces. For example, the opening of the air intake ventilation shaft should be positioned so that sound waves propagate in the opposite direction from the workplaces;
- d) soundproofing of sources - the use of casings, cabins, screens, fences with the use of sound-absorbing materials;
- e) the use of silencers (active and reactive) - to reduce the level of aerodynamic noise.

If the use of collective methods fails to reduce the level of sound pressure in the working area to standard values, use *personal protective equipment for workers*:

- *headphones* - effective in protecting against high-frequency noise, there are independent modifications and modifications built into the headgear;
- *liners* - these can be soft tampons made of ultra-thin fiber or hard ones - made of rubber or ebonite. The latter are not comfortable and can injure the skin of the ear canal. Rigid liners, cast according to individual casts from the human ear canal, are deprived of this drawback. Efficiency - 5 ... 20 dB;

- *helmets* - used for intense noise (more than 120 dB), when the noise acts directly on the brain.

### 8.3 Vibration

Workers servicing mining machines are also exposed to local or general vibration, the levels of which exceed the standard values. Consequently, during the performance of mining operations, the persons of the main professional groups are exposed to the combined effects of noise and vibration at the same time.

These are small mechanical vibrations that occur in elastic bodies. It is a complex oscillatory process, which is characterized by:

- frequencies and frequency spectrum (Hz);
- kinematic parameters – vibration velocity ( $V$ , m/s) and vibration acceleration ( $a$ , m/s<sup>2</sup>).

#### *Vibration classification*

1. In accordance with the method of transmitting vibration to the body:

- *general vibration* (vibration of the workplace) is transmitted through the supporting surfaces to the body of a sitting or standing person; Sources of general vibration are motors, gearboxes, compressors, blowers, crushers, screens, etc.
- *local vibration* is transmitted to the hands, forearms lying on the surface of the table, to the feet standing on the pedals, etc.

2. In accordance with the direction of impact along the orthogonal coordinate axes:

- *vertical* - along the  $Z_0$  axis, perpendicular to the supporting surface;
- *horizontal* - along the axes  $X_0$ ,  $Y_0$ , parallel to the supporting surface.

3. According to the prevailing frequencies:

Depending on the prevailing frequencies in the spectrum, the total vibration is considered as:

- low-frequency – 1...4 Hz;
- medium frequency - 8...16 Hz;
- high frequency - 31.5...63 Hz

4. Classification depending on the source:

The total vibration, depending on the source of vibration, is considered as:

- *transport* - is formed at the workplace of mobile machines and vehicles when moving across the terrain, agricultural background, roads (and during their construction) (tractor, harvester, car, bulldozer, scraper, snow plow, self-propelled rail transport, etc.);
- *transport and technological* - takes place at the workplaces of machines with limited mobility when moving on a specially prepared surface (excavator, construction cranes, open-hearth furnace loading machine, mining machine, self-propelled drilling machine, asphalt paver, floor industrial transport, etc.);
- *technological* - affects the worker, servicing stationary machines (metal and woodworking machines, forging and pressing equipment, foundry machines, pumping units, etc.)

Local vibration according to this principle of classification is subdivided into vibration:

- from manual machines with engines or from manual mechanized tools (polishing, grinding, chipping machines, perforators, lawn mowers, etc.);
- from manual non-mechanized tools.

*Impact on the body of general vibration*

Vibration is a factor of great biological activity. The severity of reactions depends on the characteristics of the impact, as well as the biomechanical properties of the human body as a complex oscillatory system. There is no linear relationship between reactions and exposure level due to the resonance effect.

- Vibration is perceived by the mechanoreceptors of muscles and tendons, as well as by the vestibular apparatus located in the inner ear. Intense vibration impact leads to various shifts in the functioning of organs:
  - CNS - dizziness, incoordination, a symptom of motion sickness. Visual impairment - narrowing of the field of vision, decreased acuity (up to 40%), darkening in the eyes. Decreased pain, tactile and vibration sensitivity;
  - cardiovascular system - changes in hemodynamics and reduced blood supply to the vessels of the brain, difficulty in venous outflow;
  - metabolism - changes in protein, carbohydrate, cholesterol, mineral metabolism. Violation of redox processes, changes in biochemical parameters of blood clotting.
- With intense long-term exposure to vibration, workers develop an occupational disease - vibration disease. It is diagnosed in drivers of transport and operators of transport and technological machines. The symptoms depend on the frequency characteristics of the vibration. So, excavators, under the influence of low-frequency vibration (for car drivers, bulldozer drivers), there are changes in the lumbosacral spine, pain in the lumbar region and limbs, and in the stomach. When exposed to mid-frequency vibration, vegetative disorders with peripheral disorders in the limbs, a decrease in vascular tone and sensitivity are observed.

*Impact on the body of local vibration*

The term "local vibration" is arbitrary, since even with local application, due to the elastic joints of the body, mechanical vibrations are transmitted to the entire body. Local vibration causes vibration disease under the influence of local vibration with symptoms:

- in analyzers - temporary or permanent decrease in vibration, pain and temperature sensitivity;
- neurovascular disorders - changes in the blood supply to the vessels of the hands, atony (with low-frequency) and vasospasm (with high-frequency vibration), changes in the vessels of the brain;
- in the musculoskeletal system - a decrease in muscle strength and endurance, dystrophic changes in the muscles;
- violations of the functions of the higher parts of the nervous system, the endocrine system, all types of metabolism. The timing of the development of disorders depends on the equivalent vibration level during the shift, the time of continuous contact and the total time of exposure. In drillers, straighteners, under the influence of medium-frequency vibration, pathology develops after 8 ... 10 years. The maintenance of impact mechanisms (riveting, stump) leads to the development of the disease in 12-15 years.

*Several environmental factors exacerbate the harmful effects of vibration:*

- excessive muscular load;
- unfavorable microclimate (cooling, with high humidity);
- high-intensity noise (summation or even potentiation of effects);
- psycho-emotional stress.

*Vibration protection*

1. Means of collective protection:

- improvement of vibration characteristics of the equipment by changing the design of the source, the nature of the driving forces, balancing individual elements;
- interruption of vibration propagation paths by the following methods:
  - dynamic vibration damping - the use of means (spring, pendulum, eccentric, hydraulic), acting in antiphase to the oscillatory system, and installing the unit on a massive foundation;
  - vibration isolation - is to reduce the transmission of vibrations from the source to the person by introducing an additional elastic connection (vibration isolator);
  - vibration damping - reducing the level of vibration by converting the energy of mechanical vibrations into thermal energy by overcoming the force of internal friction in materials with a large loss factor.

2. Personal protective equipment (reduce the level of exposure by 5 - 7 dB):

- for hands - insulating gloves, mittens, liners, pads;
- for feet - vibration-damping shoes, soles, knee pads, rugs;
- for the whole body - bibs, belts, special suits.
- In case of high humidity it is necessary to wear waterproof shoes and provide conditions for drying work clothes and shoes.

Therapeutic and preventive measures.

- medical examinations (preliminary and periodic);
- prophylactic examination of persons with initial symptoms of vibrational pathology, their temporary or permanent transfer to another job, sanatorium treatment;
- thermal procedures for hands;
- industrial gymnastics;
- during the cold period of the year, ultraviolet irradiation daily for 1-2 months;
- vitaminization (vitamins of group B, C, undevit).

## **8.4 Ventilation**

Ventilation - air exchange systems in rooms to remove excess heat, moisture, harmful and other substances in order to ensure acceptable meteorological conditions and air purity.

Classification

*1. According to the method of air movement:*

- a) natural;
- b) artificial (mechanical).

*2. According to the method of organizing air exchange:*

- a) general exchange;
- b) local (local);

c) mixed (general exchange + local).

3. *In the direction of air movement:*

a) supply;

b) exhaust;

c) supply and exhaust.

#### *Natural ventilation (EV)*

• EU is carried out due to the pressure difference outside and inside the building due to:

a) thermal head - as a result of the temperature difference;

b) wind pressure.

• EV classification:

a) *unorganized EV* (infiltration, natural ventilation) - through leaks in building structures. It is not regulated, it is 0.5 ... 0.75 of the volume of the room per hour in residential buildings, 1 ... 1.5 of the volume - in industrial buildings;

b) *organized EU (aeration)* - through special devices: - channelless EU - through windows, transoms, aeration lamps; - channel (deflector) EV - through special air ducts (channels and shafts) passing through all floors. Deflectors are placed on the roof at the exit from the mines, which increase the draft when blown by the wind.

• Advantages of EV - provide a large air exchange without energy costs, cheap, easy to perform and operate.

• Disadvantages of the EU - the impossibility of preliminary preparation of the supply air and purification of the exhaust air. Efficiency decreases in the warm season.

#### *Artificial (mechanical) ventilation (IV)*

IV is carried out with the help of special mechanical stimulators (axial and centrifugal fans).

• Supply air intake - outdoor air intake with a fan, if necessary - air preparation (heating, humidification, etc.), supply to the room. Excess air leaves the room through windows, doors, leaks in structures. It is used in industries where the penetration of unprepared air from the outside is undesirable.

• Exhaust VI - removes air from the room with the help of a fan, cleaning it before being released into the atmosphere. Fresh air intake - through windows, transoms, doors. It is often used in industries where possible harmful agents (substances, microorganisms) should not enter the external environment.

• Supply and exhaust IV - consists of supply and exhaust systems that operate simultaneously. To reduce costs, for example, for heating the supply air, systems with recirculation are used - fresh air is only 10 ... 20% of the supplied air. Recirculation is prohibited in cases where the air contains pathogenic microorganisms, harmful substances of hazard classes 1 ... 3 or there are odors.

#### *Local ventilation (MV)*

Exhaust MW is used to localize and remove harmful substances and excess heat from the source of their release.

• Fume hoods - operate with natural and mechanical exhaust to remove contaminated air from the work area.

- Exhaust hoods - devices for capturing flows with a lower density than the surrounding air (eg convective flows from ovens). The larger the umbrella, the lower above the source it is located, the more effective.

- Onboard suction - used to remove harmful emissions from the surface of solutions (for example, from galvanic baths), if it is not possible to completely cover the source.

*Supply MW in production is used for various purposes.*

- Air shower - to normalize the thermal state of workers in hot shops. A jet of air with standard temperature is directed to the worker's body. For greater efficiency, finely sprayed water is supplied in the jet.

- Air oasis - a device that creates improved air conditions in a limited space of a production facility. It is a part of the room, separated by partitions (about 2 m high), open from above, into which outside air is pumped through a network of air ducts, which, as a rule, has undergone cleaning and heat and moisture treatment. The air is always supplied at a lower temperature than the room temperature.

- Air and air-thermal curtains are used during cold periods to exclude the access of outside air masses to the premises through doors or technological openings that are open for a long time.

*Artificial ventilation (IV)*

- Emergency ventilation (AV) - is provided in industrial premises where a sudden release of a large amount of harmful or explosive substances is possible. The performance of the AV, together with the main ventilation, should provide at least 8 air changes per hour. It turns on automatically when the concentration of the substance is equal to the MPC or when the main ventilation is stopped.

- Air conditioning is the most advanced form of ventilation. It consists in automatic air processing in order to maintain the specified meteorological conditions in the premises. With full air conditioning, all parameters are controlled - temperature, humidity, speed and air frequency. It is possible to give the air special properties - ozonization, ionization, deodorization.

## **8.5 Industrial lighting**

*Production is called a special type of lighting*, which serves to create optimal working conditions for people. The main task is to provide such illumination of the working room, workshop, which will best correspond to the nature of the work performed.

*High-quality lighting of industrial premises performs several functions:*

Lighting in production is designed to make the work of specialists convenient and safe.

Professionally organized lighting of the workplace has a positive effect on the psyche of people, tones up and creates a good mood, which affects productivity and labor safety.

CIE (International Commission on Lighting) published data on the results of its study, according to which, well-organized lighting of industrial premises can increase the efficiency of the work of staff by an average of 10%. The performance of employees

is increased, and injuries are reduced. These facts are a clear confirmation of the importance of quality industrial lighting.

*Lighting of industrial premises, workshops: main types*

To organize the lighting system in production, various light sources can be used. According to this criterion, there are several types of lighting for industrial buildings:

1. Natural lighting. The working room is illuminated only by the light of the sky (direct or reflected). Natural lighting is classified into the following types:

upper (the building is illuminated through the openings available in the areas of the difference in the height of the building);

lateral (light penetrates through openings in the outer walls);

combined (a combination of the first two types).

The main factor hindering the widespread use of natural lighting is its volatility.

2. Artificial lighting. Only sources of artificial indoor lighting of industrial buildings are used (for example, industrial LED lamps).

Allocate:

- working;
- emergency;
- security;
- emergency lighting (used only during non-working hours).

Emergency lighting can also be divided into types.

Safety lighting is used when the probability of an emergency situation is very high when the working lights are turned off.

3. Combined lighting of production halls and other working premises implies the use of industrial lamps in addition to daylight.

*Industrial lighting: the main requirements for the organization*

Industrial lighting systems for workspaces must be designed and installed in accordance with certain standards. Only in this case, the working conditions at the enterprise will be comfortable and safe, and the requirements of the legislation will be fully met.

The main recommendations contain the norms and rules 23-05-95 "Natural and artificial lighting". In accordance with the provisions of this document, eight so-called visual discharges are established, with the criterion being the size of the smallest distinguishable object. The level of illumination of the room must correspond to the category to which the work performed in it belongs.

**test questions**

1. What harmful and dangerous factors exist in mining and metallurgical enterprises?
2. What is the maximum permissible value of a harmful production factor?
3. What types of occupational diseases exist?
4. How is industrial dust formed?
5. What are the physical properties of industrial dust?
6. What diseases are caused by exposure to dust?
7. What are the ways to protect against dust?

8. What about medical and preventive measures to protect against dust?
9. How is dust control organized in the workplace?
10. What is the source of noise in an industrial environment?
11. What types of noise exist by origin?
12. What are the ways to protect against noise?
13. What are the types of vibration?
14. What is the danger of vibration on the human body?
15. What types of vibration protection do you know?
16. What types of ventilation exist?
17. How does the illumination of the workplace affect human performance?

## **Section 5. FIRST AID**

### **Lecture number 9. PROVIDING FIRST AID TO INJURED AT WORK**

*A set of organizational and methodological measures . Potential hazards and risks of injury in the workplace . Availability of qualified medical assistance to victims . Personnel providing first aid to the injured . Medical center at the enterprise . Direct provision of first aid to victims at work . First aid for wounds and bleeding . Artificial respiration . Indirect cardiac massage . First aid for dislocations and fractures . First aid for electric shock. First aid for animal bites, including snakes and insects. Help*

The first aid to victims of accidents and sudden illnesses is a set of urgent measures aimed at eliminating the effect of a damaging factor and a threat to life, at alleviating the suffering of the victim and preparing him for sending to a medical institution. *First aid* is the simplest medical actions performed as soon as possible directly at the scene of the incident by the production personnel who happened to be close at that moment, who underwent special training and who owns elementary methods of providing medical care.

#### **9.1 A set of organizational and methodological measures**

First of all, we will consider the main factors that determine the necessary minimum funds for providing first aid at the workplaces of enterprises and organizations. These factors are primarily the nature of occupational risk and the availability of qualified medical care. Indeed, the assistance provided for injuries caused by an electric saw is, of course, different from those measures that are taken when inhaling vapors of harmful chemicals.

The organization of measures to provide first aid to victims requires an integrated approach. When providing assistance, workers, equipment, supply and technical support services, protection systems and mechanisms that ensure the transportation of victims, as well as the rest of the personnel of the enterprise from the scene, should be involved. An important role is played by the involvement of the workers themselves in the organization of first aid: often they are the probable cause of various accidents.

The sequence of actions to be taken in the event of unforeseen events, regardless of the nature of the first aid medical provision in each case, should be determined in advance. In doing so, careful consideration should be given to existing and potential, incidental and non-accidental risks and hazards, as well as the availability of immediate and adequate assistance. When organizing first aid activities, it is necessary to take into account such key indicators as the nature of work and the level of occupational risk, potential hazards, the size of the enterprise and its location, the availability of medical institutions, and so on.

#### *Potential hazards and risks of injury in the workplace*

Very often, work-related injuries occur even in those enterprises where the necessary measures are taken to maintain order and ensure labor safety. Serious injuries can be caused by falls, hitting various objects, contact with sharp edges of objects, or moving parts of appliances. Specific requirements for first aid measures depend on which of the following events (incidents) occurred at the enterprise:

- fall and bruise of the body, head and limbs;
- serious cuts, fractures of the limbs;
- crushing of tissues and getting parts of the body into moving mechanisms;
- thermal burns and damage as a result of fire and (or) explosion;
- poisoning (burns) when working with chemicals;
- electric shock;
- exposure to high or low temperatures;
- lack of oxygen;
- exposure to infectious factors, animal bites, etc.

#### *Availability of qualified medical care for victims*

The proximity of the enterprise (organization) to health care facilities and interaction with them determines the level of the training system for personnel providing first aid. The complexity of the organizational structure of such a system is determined mainly by the adoption of adequate support measures. Immediate transportation of the victim to a medical facility or immediate call for an ambulance may be more effective for the subsequent rehabilitation of the victim than any medical intervention at the scene. The first aid program in the workplace should be formulated taking into account the characteristics of the medical institution providing the final treatment of victims, and be an integral part of the activities of this medical institution.

In some cases, large enterprises and enterprises with a complex structure themselves organize communication systems and transport victims to a medical institution. In small and medium-sized enterprises, for example, public transport, an ambulance service, a taxi, etc. can be used for transportation. It is necessary to organize reserve or alternative systems for the transportation of victims.

#### *First aid personnel*

The list of personnel providing first aid to victims should include employees who are well aware of the specifics of working conditions at the enterprise. These workers may not have medical training, however, they must receive special training necessary to perform very specific activities. Not every employee of the enterprise can be trained in first aid measures. Personnel providing first aid to victims must be selected carefully, taking into account such personal qualities as experience, medical education and / or training, reliability, ability to contact people in crisis situations. The degree of training

of personnel is the most important factor in determining the effectiveness of the first aid system. Training programs should correspond to the conditions of production, take into account the characteristics of the profession and the risks associated with it.

### **9.2 Medical point at the enterprise**

The enterprise must have a room or part of the room adapted for first aid, equipped with a minimum set of first aid equipment. The first aid room should be:

- accessible for bringing in the victim on a stretcher and equipped with communication for transmitting information (for example, to an ambulance station) about the need to transport the patient to a medical institution;
- large enough to fit a couch and around it people assisting the victim;
- clean, well ventilated, adequately lit and properly maintained;
- used only for its intended purpose - to provide first aid to victims;
- clearly identifiable as a first aid room (indicated by a special sign);
- equipped with taps with clean running (cold and hot) water and (or) containers with clean water for the primary treatment of wounds;
- provided with towels, pillows, blankets and clean clothes intended for first aid personnel, as well as a waste container.

### **9.3 Direct provision of first aid to victims at work**

A set of measures to provide first aid to workers provides for the immediate termination of external damaging factors or the removal of the victim from the area that threatens his life; elimination of the threat to the life of the victim (restoration of breathing and cardiac activity - artificial respiration and indirect heart massage, as well as stopping bleeding); prevention of complications (wound dressing, immobilization of the injured limb, anesthesia, as well as other assistance); life support until the arrival of qualified medical assistance and delivery of the victim to a medical institution.

The main task of first aid, first of all, is the prevention of dangerous consequences of injuries, effective pain relief, the fight against bleeding, infection and shock. When establishing signs of life of the victim, it is necessary to start resuscitation of the victim.

In medical practice, signs of life include:

- the presence of a heartbeat (determined by hand or by ear to the left below the nipple);
- the presence of a pulse (determined on the neck - on the carotid artery, or on the inside of the forearm);
- the presence of external respiration (determined by the movement of the chest, by moistening the mirror attached to the nose of the victim, by the movement of cotton wool brought to the nasal openings, etc.).

First aid should be provided very quickly, but in such a way that the actions of the person providing assistance do not damage the health of the victim.

### **9.4 First aid for wounds and bleeding**

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Bleeding by nature is capillary, arterial and mixed. When workers are injured, damage to bones, joints, nerves, and internal organs often occurs. Frequent

complications of trauma are bleeding, development of shock, inflammation. The list of first aid measures, first of all, includes stopping bleeding, protecting wounds from possible contamination, and relieving pain shock.

If severe bleeding occurs above the wound, a special hemostatic tourniquet is applied to the injured limb, which is tightened until the bleeding stops. A note should be placed under the tourniquet, in which the time of applying the tourniquet should be indicated (in summer it is allowed to keep the tourniquet for no more than two hours, in winter - no more than one and a half hours). A sterile dressing is applied to the wound previously treated with iodine or alcohol. It is forbidden for non-specialists to wash wounds and remove foreign bodies.

### **9.5 CPR**

The event is carried out immediately in case of respiratory arrest, with improper breathing (rare or irregular breathing movements), with weak breathing. During artificial respiration, the victim is placed on his back on a hard surface (board, floor, shield, etc.). With one hand they pinch the nose of the victim, and with the other, by pressing on the lower jaw, they open his mouth. Having drawn air into the lungs, the assisting person presses his lips to the victim's mouth, makes an energetic exhalation, observing the victim's chest. The frequency of artificial respiration is 16-20 breaths per minute.

In the absence of a pulse after three to five breaths, chest compressions begin. Artificial respiration is carried out until the victim's breathing is restored, the doctor arrives or the victim is delivered to a medical institution, and clear signs of death are established.

### **9.6 Chest compressions**

When a person is struck by an electric current and in other cases, blood circulation may stop when the heart does not provide blood circulation through the vessels. In this case, one artificial respiration in first aid is not enough, since oxygen from the lungs cannot be carried by blood to other organs and tissues. Therefore, it is necessary to resume blood circulation artificially.

The human heart is located in the chest between the sternum and the spine. The sternum is a movable flat bone. In the position of a person on his back (on a hard surface), the spine is a rigid fixed base. If you press on the sternum, the heart will be compressed between the sternum and the spine and the blood from its cavities will be squeezed into the vessels. If you press on the sternum with jerky movements, then the blood will be pushed out of the cavities of the heart in much the same way as it happens during its natural contraction. This is called an external (indirect, closed) heart massage, in which blood circulation is artificially restored. Thus, when artificial respiration is combined with external heart massage, the functions of respiration and blood circulation are imitated. The complex of these measures is called resuscitation (that is, revival), and the activities are called resuscitation.

An indication for resuscitation is cardiac arrest, which is characterized by a combination of the following symptoms: the appearance of pallor or cyanosis of the skin, loss of consciousness, and the absence of a pulse in the carotid arteries. Cessation

of breathing or convulsive irregular sighs. In case of cardiac arrest, without wasting a second, the victim must be laid on a flat, rigid base: a bench, floor, in extreme cases, put a board under his back (no rollers can be placed under the shoulders and neck).

If one person provides assistance, then it is located on the side of the victim. Leaning over, he makes two quick vigorous blows (according to the mouth-to-mouth or mouth-to-nose method), then rises, remaining on the same side of the victim, and puts the palm of one hand on the lower half of the sternum (stepping back two finger above from its lower edge), and lifts the fingers. The palm of the second hand lays on top of the first across or along and presses, helping by tilting its body. When pressing, the arms should be straightened at the elbow joints. Pressing should be done with quick jerks, so as to shift the sternum down by 4-5 cm, the duration of the pressure is not more than 0.5 seconds, the interval between individual pressures is 0.5 seconds. During pauses, the hands are not removed from the sternum, the fingers remain straight, the arms are fully extended at the elbow joints.

If resuscitation is carried out by one person, then for every two blows, he produces 15 pressures on the sternum. For 1 minute, it is necessary to make at least 60 pressures and 12 blows, that is, perform 72 manipulations, so the pace of resuscitation should be high. Experience shows that the greatest amount of time is lost when artificial respiration is performed: the blowing should not be delayed - as soon as the victim's chest has expanded, the blowing is stopped.

With the participation of two people in resuscitation, the ratio "breathing - massage" is 1:5. During the artificial exhalation of the victim, the one who massages the heart does not apply pressure, since the forces developed with pressure are much greater than with blowing (pressure during blowing leads to the ineffectiveness of artificial respiration, and, consequently, resuscitation measures).

### **9.7 First aid for dislocations and fractures**

A dislocation is a special type of limb injury that usually occurs during a fall. The victim feels severe pain and the impossibility of movement in the joint. First aid measures consist in immobilization (immobilization) of the injured limb, taking painkillers by the injured. The victim is then sent to a medical facility.

A fracture is a complete or partial violation of the integrity of the bone under the influence of a traumatic factor. In medical practice, there are open and closed fractures. With an open fracture, the skin is broken, and with a closed one, it is not broken. First aid for limb fractures is aimed at reducing pain and resting the injured limb. With an open fracture, bleeding should be stopped and infection should be prevented. A sterile dressing is applied to the wound. With arterial bleeding, a hemostatic tourniquet is applied. For immobilization (immobilization), a standard tire or improvised material is used - sticks, boards, etc.

In this case, it is important to observe the following rules:

- it is necessary to immobilize two joints - above and below the fracture site;
- under the bone protrusions that are determined under the skin, put cotton wool or soft tissue;
- the immobilizing agent must be durable and soft;

- it is necessary to fix the tires with a bandage, belt, twine, etc.

### **9.8 First aid for electric shock**

Electric current causes changes in the activity of the nervous system, removes the susceptibility of nerve endings or leads to paralysis. The most common causes of death from electric shock are sudden cardiac arrest (or ventricular fibrillation) - 80%; cerebral edema - 15%; spasm of the respiratory muscles and asphyxia (suffocation) - 4%; damage to internal organs, bleeding, burns - about 1%.

From the impact of electric current, convulsive muscle spasms occur, primarily the respiratory muscle of the heart, which leads to its stop. The condition of a person at the time of an electrical injury can be so severe that he outwardly differs little from the deceased: the skin is pale, the pupils are dilated, they do not react to light, breathing and pulse are absent. Only careful listening to heart sounds will allow you to establish signs of life.

The result of electric shock are fainting, dizziness, general weakness, nervous shock. When struck by lightning, the symptoms are similar. Spots of dark blue color are visible on the skin, resembling branched trees (signs of lightning). In these cases, dumbness, deafness, paralysis, and cardiac arrest may develop. Electric shock may cause loss of consciousness. The most dangerous for a person is an alternating current with a power of 0.1 A at a voltage of 1000 V. If no assistance is provided within two minutes, death may occur.

When providing first aid, first of all, you should free the victim from the action of electric current (turn off the switch, cut each wire separately with a tool with an insulating handle, discard it with a special bar, use dielectric gloves), pull the victim away from the electric wire, taking him by dry clothes. If the victim convulsively grabbed an electrical wire that is energized, then it is necessary to unclench the victim's hands, successively bending his fingers (in this case, the assisting person must be in dielectric gloves and be on a base insulating from the ground), interrupt the current. You can not unclench your hands, but separate the victim from the ground - put a dry shield, boards, etc. under him, observing safety measures.

If the victim is still breathing, he should be taken to a level place, put dry clothes under him, unfasten the collar, waist belt, give a sniff of ammonia and sprinkle with water. The victim must be at rest. The final decision on the state of his health must be made by the doctor. If necessary, artificial respiration is done.

### **9.10 First aid for foreign bodies in the eyes, respiratory tract and esophagus**

Grains of dust, soot, insects can get into the eyes of the victim. Therefore, do not rub your eyes. This can contribute to additional irritation and pain. If a foreign body has fallen under the upper eyelid, it is necessary to pull the eyelashes of the upper eyelid downwards. In this case, the victim should look down. To remove a foreign body from the lower eyelid, pull the eyelid down and carefully remove the mote with a moistened corner of a clean handkerchief. In this case, the victim should look up. 9

If glass, a piece of metal, etc. gets into the eye, in no case should it be removed, but a bandage should be applied, the victim should be calmed and sent to a medical

institution. It is considered very dangerous for a foreign body to enter the respiratory tract. Airway obstruction and suffocation may occur. If coughing does not help, then three or four quick blows with the palm between the shoulder blades should be applied to the victim, holding him in an inclined position.

### **9.11 First aid for thermal and chemical burns**

The most common type of damage to the skin of workers in accidents is thermal burns. The most common burns are from exposure to flames, hot liquids, steam, and also from contact with hot objects. Such patients are contraindicated for any manipulations on burn wounds. As soon as possible, the burned surface of the skin should be covered with a dry sterile aseptic bandage. It is necessary to give the victim to drink tea, alkaline mineral water.

If solutions of acids or alkalis, as well as other chemically active substances, get on the skin or mucous membranes of an employee, a chemical burn occurs. When providing first aid, it is necessary to remove the chemical agent from the skin as soon as possible, rinse the affected area with running water. In case of burns with acids / alkalis, the surface is washed with weak solutions of alkalis (0.01% sodium bicarbonate solution) / acids (1-2% acetic acid solution). After neutralizing the affected surface, it should be poured abundantly with running water, but not with a stream.

### **9.12 First aid for animal bites, including snakes and insects**

*Animal bites.* If the victim was bitten by a healthy domestic dog or cat and the wound is small, then it is washed and a sterile bandage is applied. Extensive wounds are packed with sterile napkins. If bites are received from an unknown dog or cat or other animal, it is necessary to contact a medical institution, because the bite of rabid animals is a great danger to life. It is necessary to introduce tetanus toxoid as soon as possible and vaccinate against rabies

*Bites of snakes .* According to the mechanism of action, snake venoms are divided into three groups:

- poisons that coagulate blood, causing local swelling and tissue death (poisons of muzzle, common viper, gyurza, etc.);
- poisons that act on the nervous system, causing muscle paralysis, respiratory depression and cardiac activity (poisons of sea snakes of tropical waters, cobras, etc.);
- poisons that act simultaneously on blood clotting and the nervous system, causing local swelling and tissue death (poisons of Australian asps, rattlesnakes).

*Insect bites .* Multiple stings of bees and wasps can be dangerous to humans. Tissue swelling occurs, the temperature rises, a sharp headache appears, convulsions are possible. When providing first aid to the victim, it is necessary to apply a cold compress to the bite site, give a glass of sweet tea, 1 gram of acetylsalicylic acid, an antihistamine tablet to drink, then consult a doctor.

### **test questions**

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1. What is first aid for victims of accidents or sudden illnesses?
2. What are the risks of injury in the workplace?

3. What factors determine the effectiveness of first aid to victims at work?
4. What tasks are assigned to personnel providing first aid to victims?
5. What are the requirements for a medical center in enterprises?
6. How is first aid provided for wounds and bleeding?
7. How is artificial respiration performed?
8. How is an indirect heart massage performed?
9. How to conduct first aid for electrical injuries?
10. What is first aid for animal bites?

## **11. Practical exercises**

### **Practical lesson №1 SAFETY DURING ACQUAINTANCE WITH PRODUCTION IN MINING AND METALLURGICAL ENTERPRISES**

*Objective:* Familiarization with the procedure for passing the excursion and practice at the factory

*Plan:*

1. General organizational questions on practice
2. Responsibilities of trainees

#### **1.1 General provisions**

1.1. Ensuring the safe conditions of students during the period of internship is entrusted to the administration of the enterprise to which they are sent;

1.2. Before being sent to the enterprise, trainees must undergo a preliminary medical examination;

1.3. Before the start of the production practice, students must undergo preliminary training in labor safety at the place of study in the scope of the programs existing at the enterprise, followed by passing an exam;

1.4. For the period of internship at the workplace, students must be provided with instructions on labor protection (hereinafter OT) for workers of the relevant profession, personal protective equipment (hereinafter PPE), taking into account working conditions, in accordance with established standards and are required to use them;

1.5. For the period of practice, by order of the educational institution, teachers of special disciplines responsible for its implementation should be appointed;

1.6. The person responsible for the practice submits a program at the place of practice approved by the head of the educational institution, scheduled by the hour, an order on the number of trainees;

1.7. Responsibility for the safe and high-quality practice at the enterprise rests with the head of the enterprise. The head of the enterprise, by order of the enterprise, assigns trainees to a specialist or a skilled worker to manage the practice.

1.8. *Every day before the start of the work by the trainee, the head of the practice should:*

- instruct him directly at the workplace on safe working methods;

- during work, monitor compliance with the requirements of the rules and norms of labor protection, the correctness of labor methods;

- monitor the serviceability of the equipment, tools and PPE used by the trainee;

1.9. If a danger is detected or the trainee uses incorrect methods of work, the head of the practice is obliged to take appropriate measures, and, if necessary, stop work.

1.10. *The trainee must:*

- comply with the OSH instructions for workers in the relevant profession;

- during training, perform all work only under the direct supervision of the head of practice, to whom he is assigned;

- do not enter workshops, production facilities and facilities that are not related to the internship, without the permission of the head of the internship;

- in the event of a dangerous and emergency situation at the workplace, immediately leave it, inform the work manager (foreman, foreman) about this and act in accordance with the accident elimination plan.

1.11. If the trainee repeatedly fails to comply with the labor safety requirement, the issue of further internship is decided by the management of the administration of the enterprise and educational institution;

1.12. Extraordinary briefing of trainees should be carried out in cases of violation by the trainee of the requirements, norms and rules of OT

## **1.2 Conducting work experience for university students**

- Training of working professions for interns of universities should be carried out in accordance with the program of practice on an individual basis under the guidance of the head of practice

Interns who received a work qualification during a previous internship, as well as worked before studying at enterprises and have documents for the right to perform the relevant work, must undergo a 10-day internship in this specialty with experienced workers before starting independent work to consolidate production skills and familiarize themselves with the conditions work.

During the period of pre-diploma practice, the student is assigned to the head of the practice from among the managers or specialists of the enterprise.

University students during the period of undergraduate practice can hold positions in accordance with the requirements of the safety rules in force in the industry.

## **1.3 Conducting study tours for students**

Excursion of students in the divisions of the mining and metallurgical enterprises are carried out on the basis of contracts concluded for the calendar year and the order of the plant. In the case when the excursion is of a one-time nature, it is allowed without an agreement, on the basis of a letter of appeal and an order for the plant.

The educational institution notifies the enterprise in writing of the arrival of a group of excursionists, represented by the deputy director for personnel, at least two weeks before the appointed time. The letter should indicate the size and composition

of the group, the purpose of the excursion, the leader of the group from the educational institution. A group of tourists is completed with no more than 15 people.

The division of the plant, on the basis of the order for the plant and the direction of the training center, issues an order to accept the group on an excursion indicating the time, route and persons responsible for the safety of the excursionists.

Upon arrival at the enterprise, in the safety department for the excursionists and the tour leader from the educational institution, an introductory briefing on safety and the order of the excursion is carried out with registration in the introductory briefing log, after which they are given the necessary PPE: protective helmets, gowns, respirators, etc. according to established order. If this condition is not met, the group is not allowed into the workshops, the tour is limited to an overview lecture in the training class of the enterprise.

During the tour, at least two people must always be with the group: the group leader from the educational institution and the tour leader from the enterprise.

In the event of an accident with excursionists of an educational institution, the tour leader immediately informs the heads of the enterprise and educational institution and takes measures to provide first aid

### **Test questions:**

1. Who is responsible for ensuring safe working conditions for trainees during their work experience?
2. What should trainees be provided with for the period of their work experience?
3. What is the procedure for studying and passing the exam before starting work experience?
4. Duties of the practice leader before the daily start of work
5. Obligations of an intern during work
6. When is an extraordinary safety briefing given to trainees?
7. Who can be allowed to work independently during practice?
8. How is the excursion to the manufacturing plant?

### **Practical work №2. ANALYSIS OF DANGEROUS AND HARMFUL PRODUCTION FACTORS**

*The purpose of the work* : Acquaintance with the negative factors affecting the performance and health of a person at mining and metallurgical enterprises, and their analysis.

*Plan* :

1. Basic concepts.
2. Harmful production factors.
3. Hazardous production factors.

*Occupational safety* - a system of legal, socio-economic, organizational, technical, sanitary and hygienic, medical and preventive, rehabilitation measures and means to ensure safety, preserve life and health, human performance in the process of work.

*Safety precautions* - a system of organizational and technical measures that ensure the safe performance of work in production.

*A harmful production factor* is an impact on a worker that leads to a deterioration in his well-being or health.

*Hazardous production factor* - the impact on the worker, which leads to damage to the body - injury or sudden death.

*Maximum allowable concentration (hereinafter - MPC)* - this is the concentration that, during daily (except weekends) work during the entire working experience, cannot cause diseases or deviations in the state of health.

*Harmful working conditions* are production factors that exceed the permissible hygienic standards (MAC, maximum permissible levels - hereinafter referred to as MPS) and lead to a deterioration in human health or have a negative effect on offspring.

*Danger* - a property of living and inanimate matter that can cause damage to humans, the natural environment and material values.

*Dangerous* is a condition in which the influencing factors have a negative impact on human health, causing occupational diseases with prolonged exposure.

*Vibration* is mechanical vibrations of elastic bodies or oscillatory movements of mechanical systems transmitted to the human body or its individual sections.

*Noise* - this is a combination of sounds of various frequencies and intensities that adversely affects a person, randomly changing over time.

*The microclimate* is the climate of the internal environment of the room, which combines such parameters of the air environment as temperature, relative humidity and air velocity.

*According to the factors of the working environment, working conditions are divided into four classes:*

- 1st class - *optimal working conditions* - conditions under which not only the health of workers is preserved, but also conditions are created for high efficiency. Optimal standards are set only for climatic parameters (temperature, humidity, air mobility);

- 2nd class - *permissible working conditions* - are characterized by such levels of environmental factors that do not exceed the established hygienic standards for workplaces, while possible changes in the functional state of the body pass during breaks for rest or by the beginning of the next shift and do not adversely affect the health of workers and their offspring;

- 3rd grade - *harmful working conditions* - characterized by the presence of factors that exceed hygienic standards and affect the body of the worker and (or) his offspring;

Harmful working conditions according to the degree of exceeding the standards are divided into 4 degrees of harmfulness:

*1st degree* - characterized by such deviations from acceptable norms, in which reversible functional changes occur and there is a risk of developing the disease;

*2nd degree* - characterized by levels of harmful factors that can cause persistent functional disorders, an increase in morbidity with temporary disability, the appearance of initial signs of occupational diseases;

*3rd degree* - characterized by such levels of harmful factors, in which, as a rule, occupational diseases develop in mild forms during the period of employment;

*4th degree* - conditions of the working environment under which pronounced forms of occupational diseases can occur, high levels of morbidity with temporary disability are noted.

- *4th class - dangerous working conditions* - working conditions under which the levels of exposure to hazardous and harmful factors during the entire working day (shift) or part of it can endanger the life of an employee, and the consequences of exposure to these factors cause a high risk of developing an acute occupational disease during the period labor activity.

The class and subclass of working conditions are established based on the results of a special assessment of working conditions (attestation of workplaces).

Harmful working conditions in which employees work must be compensated by increased wages. Employers should take into account that this is not the only compensation for difficult working conditions - other compensations are also provided to employees:

- for employees, reduced hours of work in hazardous working conditions should be established (if employees work at work that has a 3 or 4 level of harmfulness);
- employees working in difficult conditions must be provided with additional paid leave (this applies to employees who work in jobs that have more than 2 levels of hazard);
- the employer must provide employees with free therapeutic and preventive nutrition ( milk m);
- if necessary, the employer must provide workers with overalls, footwear and other means for performing work.

In the mining and metallurgical industry, about 70% of workers work in jobs with unfavorable working conditions. This industry has the highest level of occupational morbidity and accidents.

At some enterprises, the concentration of dust is dozens of times higher than the maximum permissible concentrations, which is explained by the presence of outdated and worn-out equipment, the absence or low efficiency of technical means to combat industrial dust.

At mining enterprises using self-propelled equipment with a diesel drive, the air of working areas is polluted not only with dust, but also with nitrogen oxides, the content of which is up to 60% in the total volume of engine exhaust and is 3-5 times higher than the MPC. The use of various types of high-energy metallurgical and mining equipment at enterprises determines high levels of noise and vibration in the workplace.

So, for drillers using hand-held perforators, the excess noise at speech frequencies is up to 40 dB, and over the entire frequency spectrum - up to 30 dB. When servicing metallurgical equipment and units, workers are exposed to local or general vibration, the levels of which are often higher than the standard values. In the performance of many types of work, workers in the main occupational groups are exposed to the combined effects of noise and vibration at the same time.

When performing work at mining and metallurgical enterprises, one of the main adverse factors affecting the workplace is the production microclimate, the parameters of which depend on many reasons and often do not correspond to standard values, especially when performing work in open areas.

The work of workers at these enterprises according to the main indicators is assessed by the values of energy costs (for workers of the main professional groups - from 4.4 to 6.4 kcal / min.) As heavy.

Comprehensive hygienic studies of the levels of factors of the production environment and the labor process when performing work at mining and metallurgical enterprises have shown that the working conditions of workers in the main professions, in terms of the degree of harmfulness and danger, according to the severity of the action of individual factors of the production environment, belong to class 3 of harmful working conditions. But taking into account their combined and combined action, the overall assessment of working conditions for workers in the main professions corresponds to subclasses 3.3 and 3.4 of harmful working conditions, which determines a high level of occupational risk of damage to their health.

*A number of hazardous and harmful factors affect workers of mining and metallurgical enterprises*, leading to occupational diseases, injuries, and, sometimes, deaths. This leads to large losses in the working capacity of the population, and, as a result, to economic losses. In this regard, the issue of increasing the level of labor protection at enterprises and reducing the number of jobs with harmful and dangerous working conditions becomes relevant.

*Dangerous and harmful conditions at mining and metallurgical enterprises include :*

1. *Physical factors* - moving, rotating parts of equipment, high surface temperature, hot metal, electric current, sharp metal edges, working at height, the possibility of fire, explosion hazard, microclimate parameters mismatch, heat radiation, noise, vibration, ultrasound, electromagnetic radiation, non-compliance lighting standards, etc.

2. *Chemical factors* - vapors, gases, chemical liquids, dust, aerosols, etc.

3. *Psychophysiological factors* - high intensity of the process, neuropsychic stress.

To save the life and health of workers, an integrated approach to assessing the existing factors is required. One of the conditions for the prevention of possible occupational diseases is high-quality medical care for employees, regular medical examinations, spa treatment, healthy nutrition and rest.

*Measures to reduce the impact of dangerous and harmful factors:*

1. Guards, screens, and warning signs must be installed to protect workers *from moving equipment, heated surfaces, and splashes of hot metal*. Guards must completely prevent people from entering the danger zone, the possibility of catching clothes and other foreign objects.

2. Warning signs must be used to prevent *electric shock*. Electrical wiring nodes must be closed and access to them must be possible only for qualified personnel.

*microclimate* in the workplace . Temperature fluctuations must be prevented by organizing local exhaust ventilation, drafts are strictly prohibited . The air temperature should be such that you can work in light, comfortable clothing. The relative air velocity should be about 0.5 m/s, the relative air humidity should be at least 60%.

4. Technological processes in metallurgy are associated with exposure of workers to *high temperatures* . To reduce the effect of thermal radiation, shielding, air showering, and personal protective equipment (PPE) are used. The surface temperature of the equipment should not exceed 45 degrees. To do this, heated surfaces are blown with cold air or water is sprayed over them, and recreation areas are equipped not far from the workplace. PPE consists of devices to protect the eyes, face and surface of the body. Workers in hot shops must be supplied with drinking salted or carbonated water at the rate of 4-5 liters per shift.

5. *Noise control* consists of the following activities:

- reduction of noise in sources of formation (timely repair, lubrication, improvement of equipment design);
- installation of anti-noise and sound-absorbing devices (casings, seals, sound insulation, etc.);
- introduction of automatic remote control systems;
- rational mode of work and rest;
- use of PPE (headphones, earplugs).

6. The presence of *dust* , *gases* in the processes must be constantly monitored. To reduce the harm from these factors, general and local supply and exhaust ventilation is used, and in cases of high concentration, it is necessary to use PPE - respirators. It is also effective to limit the time of exposure to these factors.

7. *Psychological factors* adversely affect the performance and health of workers. Neuro-psychic overloads are manifested in the form of mental overstrain of the monotony of work, emotional overloads. In addition, general fatigue leads to inattention or non-compliance with TB, which increases the risk of injury.

*Measures to reduce physical fatigue:*

- improving the organization of the workplace;
- increasing the level of mechanization and automation of labor-intensive processes;
- the use of transport to move heavy loads.

*To reduce neuropsychological tension, the following measures are recommended:*

- alternation of work requiring the participation of different analyzers (hearing, vision, etc.)
- alternation of work of varying complexity, as well as requiring mental stress with physical work;
- work according to the schedule with a load reduced by 10-15% during the first and last hours of work;
- extensive use of the computer.

A very important factor is the duration and pattern of shift rotation.

To effectively improve conditions, it is necessary to control the parameters of the workplace, assess working conditions, which allows one to qualify dangerous and harmful factors and take measures to eliminate or reduce their influence.

#### **test questions**

1. Define the concepts of labor protection, safety precautions.
2. Define the terms vibration, noise, microclimate.
3. What is MPC (Maximum Permissible Concentration)?
4. Define the concepts of harmful and dangerous production factors.
5. What is "danger"?
6. What classes are the working conditions divided into by the factors of the working environment?
7. What hazards exist at mining and smelting enterprises?
8. List physical hazards and harmful factors.
9. List chemical hazards and harmful factors.
10. Methods for the prevention of occupational diseases.
11. What measures are aimed at reducing the impact of dangerous and harmful factors on workers?

### **Practical work No. 3 ACTIONS OF THE POPULATION DURING EARTHQUAKES AND FLOODS**

**The purpose of the work:** Familiarization with the actions of the population in emergency situations of a natural nature

#### **Plan:**

1. earthquakes
2. floods

*An emergency situation* is a state in which, as a result of the occurrence of a source of an emergency situation at an object, a certain territory, the normal conditions of life and activity of people are violated, there is a threat to their life and health, damage to the property of the population, economic facilities and the natural environment.

*Natural emergencies* (natural disasters) include earthquakes, floods, natural fires, hurricanes and tornadoes, tsunamis, mudflows, landslides, etc.

#### **3.1 Earthquakes**

*Earthquake* - tremors and vibrations of the earth's surface. According to modern views, earthquakes reflect the process of the geological transformation of the planet. It is believed that the primary cause of the earthquake is global geological and tectonic forces, but at present their nature is not entirely clear. Earthquake sources occur in the earth's crust at a depth of 30 to 300 km .

*The most common cause of earthquakes is the transition of potential energy (energy of interaction of bodies) accumulated during elastic deformations of the rock into kinetic energy (energy of motion) during destruction (fault), which initiates seismic waves in the soil.*

The assessment of an earthquake by the magnitude and power of the source is carried out according to the *magnitude* ( $M$ ), which is understood as a dimensionless value that characterizes the total energy of elastic vibrations caused by an earthquake ( $1 < M < 9$ ).

The *magnitude*  $M$  can be determined through the amplitude of the surface wave  $Z_m$ ,  $\mu\text{m}$  and the distance to the earthquake epicenter  $R$ ,  $\text{km}$ , by the formula

$$M \approx \lg Z_m + 1.32 R$$

*Earthquake intensity*  $J$  on the earth's surface, depending on the magnitude  $M$ , the distance to the epicenter  $R$ ,  $\text{km}$ , and the depth of the earthquake source  $H$ ,  $\text{km}$ , is determined by the formula:

$$J \approx 3 + 1.5M - 3.5 (R^2 + H^2)$$

The strength of an earthquake is measured in points, and usually either the Richter scale is used, using the magnitude value ( $1 < M < 9$ ), or the international MSK scale, using the magnitude of the earthquake intensity ( $1 < J < 12$ ).

*All buildings and structures according to the degree of consequences of the impact of an earthquake are classified into three types:*

*A* - buildings made of torn stone, rural buildings, houses made of raw brick, adobe houses;

*B* - buildings made of brick, large panels, natural hewn stone;

*B* - panel-type buildings, reinforced concrete frame buildings, well-built wooden houses.

*The degrees of damage to buildings and structures are taken as follows:*

*1 degree* - light damage (thin cracks in the plaster, chipping of small pieces of plaster);

*2* - moderate damage (small cracks in the walls, chipping of plaster, falling roofing tiles, cracks in chimneys);

*Grade 3* - severe damage (deep and through cracks in the walls, falling chimneys);

*4 degree* - destruction (collapse of internal walls, breaches in the walls, collapse of parts of buildings, disruption of connections between individual parts of the building);

*5 degree* - collapses (complete destruction of buildings).

*different intensity of earthquakes:*

*6 points.* Damage of the 1st degree in separate buildings of type B, in separate buildings of type A - damage of the 2nd degree. Cracks up to 1 cm wide in damp soils, in mountainous areas there are isolated cases of landslides. Partial damage to life support systems;

*7 points.* Many type B buildings have 1st degree damage, type A - 3rd degree damage, and in some buildings - 4th degree damage. Cracks in stone walls. Cracks in the roads, violation of the joints of pipelines. Change in the flow rate of water sources.

Isolated cases of landslides on sandy or gravelly river banks. Significant destruction of life support systems;

*8 points.* Severe damage to buildings. In many buildings of type *B*, damage is of the 2nd degree, type *B* - of the 3rd degree, type *A* - of the 4th and 5th degrees. For a long time, life support systems were practically paralyzed. Cracks in the soil reach several centimeters, small landslides on the slopes of bulk roads. The formation of new reservoirs is possible, in many cases the flow rate of springs and the water level in wells change;

*9 points.* General damage to buildings. Monuments and columns overturn. Significant damage to the banks of artificial reservoirs, breaks in parts of underground pipelines. In some cases - the curvature of the rails and damage to the carriageway. Cracks in the soil reach 10 *cm*. Large waves on the surface of the water;

*10 points.* General destruction of buildings. Dangerous destruction of dams and dams. Serious damage to bridges. Ruptures and distortions of underground pipelines. Road surfaces form an undulating surface. Cracks in the ground - tens of centimeters. Landslides are possible on the banks of rivers and seas. The emergence of new lakes;

*11 points.* Catastrophe (*major accident, destruction*);

*12 points.* Relief change.

The reaction of people during earthquakes, according to available statistics, is as follows. With a magnitude 6 earthquake, many people in buildings get scared and run out into the street, some lose their balance. At 7 points, many people find it difficult to stay on their feet. At 8 points - fear and panic. At 9 points, there is general panic. It should be noted that earthquakes are often accompanied by secondary effects in the form of explosions, fires, etc.

#### *Actions in case of an earthquake*

During an earthquake, you must act as follows:

- Feeling the vibrations of the building, seeing the swinging of lamps, falling objects, hearing the growing rumble and the sound of breaking glass, do not panic (from the moment you felt the first tremors to vibrations dangerous for the building, you have 15-20 *with* );

- Get out of the building quickly. When leaving the room, go down the stairs, not the elevator. Once outside, stay there, but do not stand near buildings, but move to an open space;

- if you were forced to stay indoors, then stand in a safe place: at the inner wall, in the corner, in the inner wall (door) opening or at the load-bearing wall. Stay away from windows and heavy furniture. If you have children with you, cover them with yourself;

- stay away from overhanging balconies, cornices, parapets, beware of broken wires;

- if you are in a car, stay out in the open, but do not leave the car until the jolts stop. Be prepared to help save others.

*After the earthquake ends, do the following:*

- Provide first aid to those in need. Free those caught in easily removable blockages. Be careful! Ensure the safety of children, the sick, the elderly. Comfort them;

- turn on the radio broadcast (in the absence of electricity - radio, this is the only way to alert the population in the premises). Obey the instructions of the local authorities, the headquarters for the elimination of the consequences of a natural disaster;

- Check for damage to the electrical wiring. Fix the problem or turn off the electricity in the apartment. Remember that in case of a strong earthquake, the electricity in the city is turned off automatically;

- when going down the stairs, be careful, make sure it is strong. Do not approach obviously damaged buildings, do not enter them;

- be prepared for strong aftershocks, as the most dangerous are the first 2-3 *hours* after the earthquake. Do not enter buildings unless absolutely necessary;

- if you find yourself in a blockage, assess the situation. Try to establish contact with people outside the blockage (voice, knock). Save your strength. A person can go without food for more than a crescent.

### 3.2 Floods

*Flooding* is a significant flooding of a certain area of the earth as a result of a rise in the water level in a river, lake, reservoir or sea, causing material damage to the economy, social environment and natural environment. In terms of frequency, distribution area, and total average annual damage, floods rank first in Russia among dangerous hydrological phenomena and processes. In terms of the number of human casualties and damage per unit area of damage, they rank second after earthquakes.

The main causes of floods are precipitation in the form of rain, snowmelt, tsunamis, typhoons, accidents at hydraulic structures.

The damaging effect of the flood is expressed in the flooding of dwellings, industrial and agricultural facilities, the destruction of buildings and structures, the reduction of their capital value, damage and damage to the equipment of enterprises, the destruction of hydraulic structures and communications, and the death of people.

*The action of the population during the flood.*

The most effective way to protect against flooding is *evacuation*. Before evacuation:

- turn off water, gas, electricity;

- transfer valuables to the upper floors (attics);

- close (hammer if necessary) windows and doors of the first floors of houses with boards or plywood;

- collect and take with you the necessary documents, money and valuables, a first-aid kit, a set of outerwear and shoes, toiletries, a supply of food for several days.

*In the event of a flash flood:*

- take the nearest elevated place as soon as possible and be ready for an organized evacuation;

- do not panic, do not lose your temper;

- take measures to enable rescuers to timely detect the presence of people in need of assistance;

-beware of sagging electrical wires until the water subsides.

*After the water subsides, the following rules must be observed:*

- beware of sagging and torn wires;

- it is strictly forbidden to use food that has fallen into the water, and to use water without appropriate sanitization;

- before entering the dwelling, open windows and doors for ventilation;

- it is forbidden to use electricity until the serviceability of electrical networks is checked.

### **test questions**

1. Define the concept of an emergency

2. What about natural emergencies?

3. How is the strength of an earthquake measured?

4. Tell the types of building according to the degree of consequences of the impact of an earthquake

5. What are the reactions of people during earthquakes?

6. What should be done in case of an earthquake?

7. What should be done after the earthquake?

8. Define flood

9. Tell the main causes of floods

10. Tell what to do in case of floods

### **Practical lesson - seminar No. 4 EMERGENCY SITUATIONS IN PEACE AND WAR TIME**

*The purpose of the lesson* : to develop students' information communication skills, the ability to conduct a discussion, defend and argue their position, analyze and synthesize the material being studied, and present it to the audience. The result of this seminar are presentations (in Power Point ) and a mini-report of students on the topics of abstracts issued and worked out in advance. Discussion of reports takes place in the interactive mode between students, student and teacher.

After introductory lectures, which indicate the content of the discipline, its problems and practical significance, students are given possible topics for abstracts within the problem field of the discipline.

Students prepare a presentation version of the abstract, make a presentation on it (in Power Point ) and report to classmates (upload to the platform when studying online). The quality of the abstract (structure, completeness, novelty, the amount of literature used, independence in writing, the degree of originality and innovativeness of the proposed solution, generalization and conclusions), as well as the level of the report (emphasis, consistency, persuasiveness, use of special terminology) are taken into account when evaluating the work.

The volume of abstract work is 10-12 pages of typewritten text. Based on the abstract, a mini-report is made with a volume of no more than 2 pages of typewritten text, 4-5 minutes in time.

### **Topics of presentation works (abstracts)**

1. Occupational health and safety in production
2. Civil defense
3. Healthy lifestyle and its components
4. Dangerous situations of a criminogenic nature
5. Health hazards
6. Hazardous production factors
7. Legislation of the Republic of Uzbekistan on labor protection
8. Safe recreation and tourism
9. Obligations of employees in the field of labor protection
10. Harmful factors of the working environment
11. Natural emergencies
12. Man-made accidents
13. Aviation accident: causes and consequences
14. Safety on the road and in public transport
15. Culture of life safety.
16. Causes and classification of fires
17. Electromagnetic radiation and safety measures
18. Providing first aid to the injured
19. Negative factors of the urban environment
20. Mass infectious diseases of people
21. Social emergencies
22. Ways to extinguish fires. Types of fire extinguishers
23. Social dangers and protection against them
24. Terrorism in the Modern Era
25. Accidents on communal systems
26. Mass infectious diseases of animals
27. Legislation of the Republic of Uzbekistan on fire safety
28. Criminal dangers and protection against them
29. Modern weapons of mass destruction
30. Negative factors of the domestic environment

### **Practical work No. 5 INVESTIGATION AND RECORDING OF ACCIDENTS OF WORKERS AT THE PRODUCTION**

**The purpose of the work :** Familiarization with the methodology for investigating industrial accidents

**Plan :**

1. Types of accidents at work
2. Procedure for investigating an accident with a mild outcome

### 3. Special accident investigation

*Accident at work* - a case of traumatic damage to the health of the victim, which occurred due to a reason related to his work activity, or during work.

*Accidents at work are divided into the following types:*

- with an easy outcome;
- with a severe outcome;
- fatal;
- group.

The severity of the accident is determined by the medical report. *Group* is considered when two or more employees were injured as a result of an accident, regardless of the severity of the damage to health.

*The following accidents are subject to investigation and accounting:*

- injuries, poisoning, heat strokes, explosions, accidents, destruction of buildings, structures and structures, burns, frostbite, drowning, electric shock and lightning, damage as a result of contact with animals, insects and reptiles, terrorist acts, as well as other damage to health during natural disasters (earthquakes, landslides, floods, hurricanes, etc.) that occurred while performing work duties (as well as on business trips) on the territory of the enterprise and beyond;

- when performing any actions in the interests of the enterprise, although without the instructions of the employer, to fulfill their functional duties, as well as to prevent accidents, death of people and preserve the property of the enterprise;

- in case of a traffic accident, on railway, air, sea and river transport, electric transport - while the employee is on a business trip or performing his functional duties;

- on the way to work or from work on transport intended for the transport of people, specially allocated by order of the employer for the transport of employees from home to work and / or from work home, as well as on transport of a third-party organization, provided for these purposes according to the contract (application) ;

- during working hours by personal transport in the presence of a written order of the employer on permission to use it for business trips;

- during working hours on transport or along the route on foot with an employee moving to fulfill the task of the employer, as well as with an employee whose activities are related to movement between service facilities;

- when conducting subbotnik (Sunday), civil defense exercises, competitions of voluntary fire protection, when engaging in agricultural work, providing patronage assistance by the enterprise on the written order of the employer, regardless of the place of the event or the performance of work;

Cases of natural death, suicide, deliberate damage to one's health by the victim, as well as injuries received by the victim in the course of committing a crime (according to the conclusion of a forensic medical examination or certificate from the investigating authorities) *are not subject to investigation and accounting* .

*An accident at work that caused the employee to lose his ability to work for at least one day or the need to transfer him to another lighter job in accordance with a medical report is documented by an act of form H-1.*

The employer, no later than 3 days after the end of the investigation, is obliged to issue to the victim or a person representing his interests an act of form H-1 on the accident, drawn up in the state or other acceptable language.

The employer is responsible for the correct and timely investigation and accounting of industrial accidents, drawing up acts of the H-1 form, development and implementation of measures to eliminate the causes of the accident.

Disagreements between the employer and the state technical labor inspector are resolved by the chief state technical labor inspector.

*The victim or eyewitness must immediately inform the head of the unit (workshop) about each accident at work, and the latter must:*

- urgently provide first aid to the victim and organize his delivery to the medical unit or to another medical institution;

- to keep the situation at the workplace and the condition of the equipment as it was at the time of the incident until the start of the work of the investigation commission (if this does not threaten the life and health of the surrounding workers and does not lead to an accident);

- immediately report the incident to the employer, the trade union committee or other representative body of the employees of the enterprise.

To investigate an accident with *a mild outcome*, by order of the employer, a commission is created consisting of representatives of the employer and the trade union committee or other representative body of employees.

The head directly responsible for labor safety at work is not involved in the investigation.

*The commission must:*

- within three days, conduct an investigation of the accident, identify and interview eyewitnesses and persons who committed violations of labor protection rules, labor safety standards, and, if possible, obtain an explanation from the victim;

- draw up an act of form H-1 in three copies indicating measures to eliminate the causes of the accident and, having signed, transfer to the employer for approval.

*The employer takes measures to eliminate the causes of the accident at work, within three days after the end of the investigation, approves the acts of form H-1 and sends:*

- to the victim or a person representing his interests, the head of the labor protection service (engineer, specialist) of the enterprise with the materials of the investigation, the state technical labor inspector.

Accidents drawn up by an act of form H-1 are taken into account by the enterprise and recorded in a journal.

The employer is also obliged to send copies of the act form H-1 to the trade union committee, the representative of the State Committee of the Republic of Uzbekistan on industrial safety.

An act of form H-1 is drawn up and approved in four copies. An act of form H-1 with investigation materials sent to the head of the labor protection service (engineer, specialist) is subject to storage for 45 years. *An accident that happened to pupils, students* undergoing industrial practice or performing work under the guidance of the enterprise's personnel is investigated by the enterprise together with a representative of the educational institution and taken into account by the enterprise.

*Subject to special investigation:*

- group accidents that occurred simultaneously with two or more employees, regardless of the severity of health injuries; - fatal accidents;

- severe accidents.

*A medical opinion on the severity of damage to health is given by a medical<sup>1</sup> institution*

*The employer is obliged to immediately report the group, fatal and severe accident according to the scheme to the following authorities:*

- state technical labor inspector;
- a higher economic body;
- To the Ministry of employment and labor relations of the Republic of Karakalpakstan, the main department of employment and labor relations of the population of the region (Tashkent)
- to the territorial body of internal affairs at the place where the accident occurred;
- to the organization that sent the worker with whom the accident occurred;
- Ministry of Employment and Labor Relations of the Republic of Uzbekistan;
- local authorities of the State Committee of the Republic of Uzbekistan on industrial safety.

*A group, fatal and severe accident is being investigated by a commission established on the basis of the order of the Ministry of Employment and Labor Relations of the Republic of Karakalpakstan, the main department of employment and labor relations of the region.*

In the event of group, fatal and severe accidents, an act of form H-1 is drawn up by a commission established by order of the employer consisting of representatives of the employer and the trade union committee or other representative body of employees within 24 hours after the commission draws up an act of a special investigation in accordance with the conclusions of the commission.

A special investigation of a group accident, in which *two to four people died*, is carried out on the basis of an order of the Ministry of Employment and Labor Relations of the Republic of Uzbekistan

An investigation into an accident in which *five or more people died* is conducted by a commission established by a resolution of the Cabinet of Ministers of the Republic of Uzbekistan.

The Special Investigation Commission investigates the accident within 15 days, organizes inspections of the state of labor protection at the enterprise (subdivision, workshop), if necessary, at other enterprises in the industry, draws up a special investigation report and draws up other materials

Members of the commission organize meetings with the victims or members of their families, if necessary, make proposals to the relevant authorities or resolve issues of social assistance on the spot, explain to the victim or family members of the deceased their rights.

*The materials of the special investigation should include:*

- act of special investigation;
- an act of form H-1, drawn up for each victim individually;
- plans, diagrams, protocol of inspection and photographs of the scene of the accident;
- a diagram of the place of the traffic accident;
- minutes of interviews, explanations of the victim and eyewitnesses of the accident and other persons involved, as well as officials responsible for labor protection;
- extracts from the registration logs on the passage by the victims of training and safety instructions;
- a medical report on the nature and severity of the injury caused to the victim, the causes of his death;
- the conclusion of the expert group (if necessary) on the causes of the accident, the results of laboratory and other studies, experiments, analyzes, etc.;
- certificate of material damage in connection with the accident;

- an order or resolution on the formation of a special investigation commission;
- extracts from instructions, regulations, orders and other acts establishing labor safety standards and responsible persons;
- an act of the special investigation commission on checking the state of labor protection at the enterprise (subdivision, workshop);

After the end of the special investigation, within 15 days, the (chief) state technical labor inspector sends: - materials of the investigation to the territorial body of internal affairs at the place where a group, fatal or accident with a serious outcome occurred

The employer of the enterprise where the accident occurred is obliged to immediately consider the materials of a special investigation, issue an order on the implementation of the measures proposed by the commission to eliminate the causes of the accident, to hold accountable persons who have failed to fulfill (violation) of official and professional duties on labor protection and safety .

The employer informs in writing about the implementation of the measures proposed by the special investigation commission, the (chief) state technical labor inspector who led the special investigation, as well as local bodies of the State Committee of the Republic of Uzbekistan on industrial safety.

Those guilty of violating the Regulations of the Republic of Uzbekistan "On the investigation and registration of accidents and other damage to the health of workers at work" are held accountable in accordance with the current legislation.

#### ***Test questions:***

1. What accidents are subject to investigation and accounting?
2. What accidents are not subject to investigation and accounting?
3. For what accidents is an act of form H-1 issued?
4. Who is responsible for investigating and recording accidents?
5. What is the procedure for investigating an accident?
6. How is an accident recorded and how long is it kept?
7. Which accidents are subject to special investigation?
8. How is an accident investigated in which two or more people died?
9. What is included in the materials of the special investigation?

### **Practical lesson No. 6 TYPES AND PROCEDURE FOR INSTRUCTING WORKERS ON LABOR SAFETY**

**The purpose of the lesson:** familiarization with the types and procedure for conducting safety briefings

#### **Plan:**

1. Induction training
2. Workplace coaching
3. Target and current briefings

*briefing* - type of training, explanation of the task; in labor protection is accompanied by a subsequent check of what has been learned and registration in a special journal.

Briefings for workers are divided into: *introductory and briefing at the workplace.*

## **6.1 Introductory briefing**

Introductory briefing on labor safety is carried out on the first working day: with all persons hired; with employees seconded to the organization; with workers of third-party organizations performing work on the territory of the enterprise; with interns, etc. Conducting an introductory briefing on labor safety is assigned to an occupational safety specialist or an employee appointed by order of the head.

During the introductory briefing, workers learn: the main provisions of the legislation related to labor protection; rules of conduct at work; PPE; information about enterprises; the procedure for admission to independent work, etc.

Briefing on the provision of first aid to victims, fire safety and other special issues is carried out by relevant specialists.

Introductory briefing should be carried out in the labor protection office using modern technical training aids, visual aids and literature that correspond to the specific content of the training material and production conditions. Introductory briefing can be carried out both with a group of workers and with individual workers. The size of the group, as a rule, should not exceed 10 people.

The induction briefing should be recorded in the introductory briefing registration log and the corresponding marks in the worker's acceptance note.

## **6.2 Instruction at the workplace**

Briefing at the workplace, in turn, is divided into: *primary, periodic, target, current and extraordinary*.

All workers, except for introductory briefing, must undergo on-the-job briefing.

*The purpose of on-the -job training* is to teach each worker the correct and safe working practices and techniques. In the process of briefing, the worker should be familiarized with the equipment, mechanisms, devices, their characteristics and design features, possible hazards and safe methods and techniques of work and the procedure for preparing the workplace.

The briefing at the workplace is entrusted to the foreman, in whose direct subordination the worker is sent. In necessary cases, briefing is carried out with the participation of relevant specialists (mechanics, power engineers, technologists, workers, instructor shifts, etc.).

Instruction and assignment of a qualification group for electrical safety to non-electrotechnical personnel is carried out by an employee of the chief power engineer's service.

Instruction directly at the workplace is carried out according to the programs approved by the chief engineer of the enterprise, developed by the heads of workshops on the basis of the rules and instructions for labor protection. Such instructions and their list are approved by the chief engineer of the enterprise together with the trade union committee. The development of labor protection instructions and the provision of them to workers and jobs are assigned to the heads of workshops.

*Primary briefing* with practical training (internship) directly at the workplace should be carried out before the admission of workers to independent work, when transferring to another job or area with a different nature of work (when working conditions change).

*Practical training* (internship) entering the enterprise must take place with *an experienced skilled worker*. The assignment of a worker for an internship is formalized by a written order of the head of the workshop indicating the duration of the training and the responsible person (foreman) who is obliged to constantly monitor the training.

The initial briefing is recorded in the briefing log at the workplace.

All workers, each time before receiving an assignment to perform especially dangerous work, must be instructed by the responsible work manager with a mandatory entry about this in the briefing log listing the safety measures taken.

*periodic safety briefings at least every 6 months of work .*

*The purpose of the periodic briefing* is to update and supplement the worker's knowledge of the safe performance of the main and other most frequently performed jobs over a certain period.

Periodic briefing can be individual or group (for homogeneous professions and certain types of work) and should be carried out according to programs in the form of a conversation with a detailed analysis of specific examples from the practice of a workshop or enterprise.

Workers who, for any reason (vacation, illness, business trip, etc.) were not instructed at the set time, must be instructed on the day they start work.

*Periodic briefings must be recorded in the briefing log at the workplace.*

*Extraordinary briefing* of workers on labor protection should be carried out:

- when changing the production process,
- replacement of one type of equipment with another, etc., as a result of which working conditions change;
- when an accident or an accident occurred in the workshop, on the site, in the brigade;
- if necessary, bringing to the attention of employees additional requirements caused by the introduction of new rules and instructions on labor protection;
- in the case when violations of the rules and instructions, production discipline are revealed, regardless of the measures taken.

In case of an extraordinary briefing, only that part of the initial briefing program with which the reason for the briefing is directly related should be considered.

Extraordinary briefing of workers should be carried out in the same way as primary and periodic briefings by the immediate supervisors of the work (foremen).

An extraordinary briefing is recorded in the briefing log in the same way as primary and periodic briefings, but with an indication of the reasons.

*The current briefing* is carried out each time at the work site with all the workers included in the work order. During the briefing, the main attention is paid to the conditions in which the work will be carried out, and to the dangerous factors that arise at this workplace. The person who conducted the current briefing makes an appropriate entry about this in the task log.

*Targeted briefing* should be carried out in cases where the employee is assigned to perform one-time work that is not related to the direct labor duties of the employee in his main specialty (loading and unloading, cleaning the territory, performing one-time work outside the territory of this legal entity).

A similar briefing should be carried out with employees if they are entrusted with the performance of work to eliminate the consequences of accidents, natural disasters and catastrophes, the performance of work for which it is necessary to issue a work permit, a special permit and other documents, as well as in other cases provided for by labor protection rules .

### test questions

1. What are the types of safety training for workers?
2. Who conducts induction training and for which personnel?
3. What questions are covered in the introductory briefing?
4. What are the types of on-the-job training?
5. What is the purpose and what issues are considered during the briefing at the workplace?
6. When is the initial OT briefing?
7. What is the purpose and frequency of periodic OSH briefings?
8. When is a periodic briefing for workers who were on vacation, on a business trip or on sick leave at the time of the briefing?
9. In what cases is an extraordinary briefing on OT carried out?
10. When is the current briefing?
11. When is the targeted training?

### **Practical lesson No. 7 METHODOLOGY FOR CARRYING OUT THE THREE-STAGE CONTROL OF THE STATE OF LABOR PROTECTION**

*The purpose of the work* : familiarization with the conduct of three-stage control on labor protection at enterprises

*Plan:*

1. The order of the first stage of control on OT
2. The procedure for the second stage of control on OT
3. The procedure for conducting the third stage of control for labor protection

Monitoring the state of labor protection is an important function of labor protection management.

*Three-stage - administrative and public control* in the system of labor protection management is the main form of control of the administration and committees of the trade union of enterprises. *The three-stage control checks the* state of working conditions and safety at workplaces, production sites, workshops, compliance by all services, officials and employees with the requirements of legislation, labor safety standards, rules, norms, instructions and other normative and technical documents on labor protection.

*Depending on the specifics of production, the structure of the enterprise and the scale of its divisions, a three-stage control over the state of labor protection is carried out:*

- *at the first stage* - at the site of the workshop, in a shift or a team (hereinafter referred to as the site);
- *at the second stage* - in the workshop, on the site of the enterprise (hereinafter referred to as the workshop);
- *at the third stage* - at the enterprise as a whole.

The assignment of production units to the objects of three-stage control is carried out by the administration and the trade union committee of the enterprise by issuing an order.

The organization of three-stage control is managed by the head of the enterprise and the chairman of the trade union committee.

### **7.1 First stage of three-stage control**

The first stage of control is carried out by the head of the relevant section (foreman, head of the section, head of the shift) and the commissioner for labor protection daily at the beginning of the working day (shift), and if necessary (work with increased danger, etc.) - and during the working day (shift).

*At the first stage of the three-stage control, the following is checked:*

- implementation of measures to eliminate violations identified by the previous audit;
- the state and correctness of the organization of workplaces (location and availability of the necessary tools, fixtures, blanks, etc.);
- condition of passages, passages, driveways;
- safety of technological equipment, lifting and transport vehicles;
- observance by workers of the rules of electrical safety when working on electrical installations and with power tools;
- compliance with the rules of storage of blanks and finished products;
- serviceability of supply and exhaust ventilation, local suction, dust and gas trapping devices;
- compliance with safety rules when working with hazardous and fire-and-explosive substances and materials;
- Availability and observance by workers of instructions on labor protection;
- the availability and correct use of personal protective equipment by workers;
- the presence of working safety certificates, work permits for performing work with increased danger

The results of the inspection are recorded in the log of the first stage of control, which must be kept by the head of the site.

*According to the violations and deficiencies identified during the audit, measures are planned to eliminate them, the terms and those responsible for execution are determined. Correction of identified violations, as a rule, should be carried out immediately under the direct supervision of the site manager.*

### **7.2 Second stage of the three-stage control**

The second stage of control is carried out by a commission headed by the head of the workshop and the senior authorized representative for labor protection of the workshop, at least twice a month. The commission includes the heads of technical

services of the workshop, an engineer of the labor protection department of the enterprise and a medical worker assigned to the workshop.

A schedule is drawn up for the qualitative inspection of the second stage of control. The schedule of inspections is agreed upon by the authorized representative for labor protection of the workshop, approved by the head of the workshop and issued to the heads of all sections.

*At the second stage of the three-stage control, the following is checked:*

- organization and results of the work of the first stage of control;
- implementation of measures planned as a result of the second and third stages of control;
- execution of orders and instructions of the head of the enterprise and the head of the workshop, decisions of the trade union committee, proposals of public inspectors on labor protection issues;
- implementation of measures in accordance with the instructions and instructions of the supervisory and control bodies;
- implementation of measures based on the materials of the investigation of accidents;
- serviceability and compliance of the production equipment of vehicles, and technological processes with the requirements of labor safety standards and other normative and technical documentation on labor protection
- observance by workers of the rules of electrical safety when working on electrical installations and with power tools;
- status of transitions and galleries;
- the condition of safety corners, the presence and condition of labor protection posters, signal colors and safety signs;
- availability and condition of protective, signaling and fire-fighting equipment and devices, instrumentation;
- timeliness and quality of instructing employees on labor safety;
- the availability and correct use of personal protective equipment by workers;
- providing workers with therapeutic and preventive nutrition, milk and other preventive means;
- the state of sanitary facilities and devices;
- observance of the established regime and rest, labor discipline.

The results of the check are recorded in the journal of the second stage of control, which must be kept by the head of the shop

*The head of the workshop must organize the implementation of measures to eliminate the shortcomings and violations of labor protection identified by the commission of the second stage of control. The engineer of the labor protection department and the senior authorized representative for labor protection of the workshop supervise the implementation of these measures.*

### **7.3 Third stage of the three-stage control** **1**

The third stage of control is carried out by a commission headed by the head or chief engineer of the enterprise and the chairman of the trade union committee, at least

once a quarter. The commission includes the head of the labor protection service, heads of the technical services of the enterprise. It is recommended to involve labor protection representatives in the control.

The inspection schedule is coordinated with the trade union committee, approved by the head of the enterprise and issued to the heads of all workshops. The commission of the third stage of control can be divided into a number of subcommittees under the leadership of chief specialists to conduct inspections on individual objects of the shop.

*At the third stage of the three-stage control, the following is checked:*

- organization and results of the work of the first and second stages of control;
- implementation of measures planned as a result of the third stage of control;
- execution of orders and orders of higher economic organizations, instructions and instructions of supervisory and control bodies, orders of the head of the enterprise and decisions of the trade union committee on labor protection;
- implementation of measures provided for by comprehensive plans, collective agreements, agreements on labor protection and other documents;
- implementation of measures based on the materials of the investigation of severe and group accidents and accidents;
- technical condition and maintenance of buildings, structures, workshop premises and adjacent territories in accordance with the requirements of normative and technical documentation on labor protection, the condition of the carriageway and pedestrian parts of the road, tunnels, passages and galleries;
- compliance of technological, lifting, transport, energy and other equipment with the requirements of labor safety standards
- efficiency of supply and exhaust ventilation, dust and gas trapping devices;
- implementation of scheduled preventive maintenance of production equipment;
- provision of workers with overalls, footwear and other personal protective equipment, the correctness of their issuance, storage, organization of washing, cleaning and repair;
- provision of employees with sanitary facilities and devices;
- organization of treatment and preventive care for employees;
- condition of labor protection cabinets;
- organization and quality of training and briefings for employees on labor safety;
- readiness of the workshop personnel to work in emergency conditions;
- observance of the established regime of work and rest, labor discipline.

*The results of the audit must be documented in an act and discussed within a week at meetings with the head of the enterprise with the participation of trade union activists. All heads of workshops and sections should be present at the meeting with the head of the enterprise.*

At the meeting, the heads of those sections (workshops) where an unsatisfactory state of working conditions are revealed, violations of the rules and norms of labor protection are allowed.

It is recommended to draw up the meeting in a protocol indicating measures to eliminate the identified shortcomings, and violations of the deadlines and responsible persons. In necessary cases, the head of the enterprise issues an order.

#### **test questions**

1. What is a three-stage OT control and what stages does it consist of?
2. Who conducts the first stage of OT?
3. What is checked at the first stage of OT control?
4. How are comments on the first stage of OHS control formalized?
5. Who conducts the second stage of OT?
6. What is checked on the second level of control for OT?
7. How are comments on the second stage of OHS control formalized?
8. Who conducts the third stage of OT?
9. What is checked at the third level of OT control?
10. How are comments on the third stage of OHS control formalized?

### **Practical lesson No. 8 TRAINING AND TESTING THE KNOWLEDGE ON LABOR SAFETY OF WORKERS AND SPECIALISTS AT PRODUCTION**

*The purpose of the lesson:* Familiarization with the procedure for training and testing the knowledge of workers in production

*Plan:*

1. Employee training procedure
2. Types of knowledge testing

#### **8.1 Training and testing of workers**

After the initial briefing and internship (before admission to independent work or when transferring from one job to another), workers must pass a test of knowledge of the rules and instructions for labor protection. *Knowledge testing is divided into primary, periodic and extraordinary.*

*Knowledge testing is carried out by a commission appointed by the management of the enterprise, chaired by one of the shop managers. If necessary, based on specific conditions, mechanics, power engineers or other specialists may be included in the commissions.*

In necessary cases, along with checking the knowledge of the rules and instructions for the main work, the knowledge of other rules should also be checked for the worker (for example, when working with cranes, the rules for cranes, etc.).

After the initial test of knowledge, the worker *is issued a certificate* of knowledge test of a single form with the appropriate design. Knowledge testing is carried out according to questionnaires developed by the heads of workshops, specialists on the basis of instructing programs at the workplace.

*All workers after each year of work* (according to the schedule) must undergo a periodic knowledge test. Schedules are compiled annually by foremen and approved by the heads of workshops

*Extraordinary knowledge testing is carried out* : when changing the production process, introducing new types of equipment and mechanisms, as well as introducing new rules and instructions;

in case of violation of rules and regulations; at the request or order of the heads of the enterprise, state supervision bodies in case of detection of insufficient knowledge of the rules and instructions.

The results of knowledge checks are recorded in the register of personnel knowledge checks and are simultaneously reflected in the certificate. In addition to assessing the knowledge of the person being tested (good, satisfactory, unsatisfactory), a conclusion is given on the possibility of admitting the worker to independent work.

If a worker during the test showed *unsatisfactory knowledge* , then he is not allowed to work independently and is subjected to a second test no later than two weeks. Failure to appear for a re-test of knowledge or unpreparedness for testing without good reason is considered a violation of labor discipline. Workers who have committed these violations may be subject to disciplinary measures provided for by the internal labor regulations.

## **8.2 Training and knowledge testing of managers and specialists**

To improve the level of knowledge on labor protection of managers and specialists in government bodies and enterprises, courses, seminars, lectures, consultations are organized, with the involvement of specialists from state supervision bodies and the Ministry of Employment

*When appointed to a position, employees must be familiarized by a higher official:*

- with the state of conditions and labor protection in the production entrusted to him (site, object, enterprise, association);

- on the means used to protect workers and employees from the effects of hazardous and harmful production factors;

- with an analysis of industrial injuries and occupational diseases;

- with a list of necessary measures to improve working conditions and labor protection, as well as guidance materials and job responsibilities for labor protection.

*The knowledge of managers and specialists* on labor protection issues is tested by permanent examination commissions of government bodies, enterprises and regional departments of labor protection in accordance with the List of positions of managers and specialists who are required to undergo a knowledge test on labor protection. The composition of the commission is approved by the heads of the above organizations.

Examination commissions of governing bodies and enterprises are headed by their heads.

In enterprises with a large number of employees whose knowledge is to be tested, there may be several examination boards. In such cases, the chief heads of labor protection and deputy heads of these enterprises are appointed as their chairmen.

*The organization and conduct of examinations are entrusted to the heads of government bodies, enterprises and chairmen of examination commissions. Exams are held according to the approved schedule. The schedule must be sent to all members of the examining committees one month before the start of the exams. The examinee must be notified of the date and place of the examinations no later than 15 days in advance.*

It is not allowed to conduct examinations by a commission of less than three people.

Managers and specialists of enterprises included in the examination commissions can take part in their work only after passing exams in the commissions of the governing bodies or commissions created under the Ministry of Labor and Social Protection of the Population of the Republic of Karakalpakstan, regional and Tashkent city main departments for labor and social protection population.

*Examination commissions check the knowledge of managers and specialists:*

- Law of the Republic of Uzbekistan "On labor protection", the Labor Code of the Republic of Uzbekistan, and other legislative and regulatory acts;
- systems of labor safety standards;
- basic requirements for the prevention of electrical injuries;
- fire safety.
- ways and means of preventing fires, explosions, accidents;
- actions of personnel in the event of natural disasters;
- basic requirements of industrial sanitation and personal hygiene;
- Regulations on state, departmental supervision and public control over the state of labor protection;
- provisions on the investigation and accounting of accidents and other damage to the health of workers at work;
- job descriptions, passports, schemes and technological regulations that ensure compliance with the technological regime and safe conduct of production processes;
- appointment and use of personal protective equipment (PPE), the procedure and norms for issuing PPE, the timing of their wear;
- employment contract, working hours and rest time, labor protection for women and persons under 18 years of age, benefits and compensations;
- how to provide first aid to the injured.

*Examination tickets are developed taking into account the peculiarities of production, qualification requirements for managers and specialists, local conditions and are approved by the chairmen of the permanent examination commissions.*

*The following types of testing knowledge on labor protection are established: primary, periodic, extraordinary.*

*Not later than one month from the date of taking office, they are required to undergo an initial test of knowledge on labor protection in the relevant examination committee.*

*Periodic knowledge checks are carried out at least once every three years.*

Managers and specialists are required to undergo *an extraordinary examination of knowledge on labor protection* in the following cases:

- when new or revised normative documents on labor protection are put into effect;
- when commissioning new equipment or introducing new technological processes;
- when transferring an employee to another place of work or assigning him to another position that requires additional knowledge of labor protection;
- in case of accidents - group, fatal or disabled, as well as in case of accidents, explosion, fire or poisoning;
- at the request of the state supervision and control bodies;
- with a break in work for more than one year.

An extraordinary knowledge test can be carried out within the requirements of individual documents, the list of which is determined by the authority that gives the order for this test.

The results of the knowledge test are documented in a protocol signed by the chairman and members of the examination committee. Knowledge testing protocols are kept for at least 6 years in the labor protection service or in the personnel department.

In management bodies and at enterprises with increased production hazards, certificates are issued to persons who have passed exams on labor protection rules, which are signed by the chairman (deputy chairman) and a member of the examination commission - an inspector of the State Supervision and Control Body. The presence of a certificate of passing exams on labor protection does not exempt the manager and specialist from a selective test of his knowledge

A person who has shown *unsatisfactory knowledge* in the labor protection exam may be left in the position of the head and specialist of the enterprise, provided that the exams are retaken no later than one month.

*In relation to persons who have not re-passed the exam on labor protection, the materials are transferred to the certification commission of the enterprise to resolve issues in accordance with their position.*

Control over the organization and conduct of knowledge checks on labor protection is assigned to the heads and labor protection services of the governing bodies, as well as the regulatory authorities. Managers and specialists who avoid testing knowledge on labor protection are suspended from work, and the issue of compliance with the position will be resolved

### **test questions**

1. What types of knowledge testing do you know
2. Who is on the commission to test the knowledge of workers?
3. How long does it take to periodically check the knowledge of workers?
4. In what cases is an extraordinary test of knowledge of workers carried out?
5. How is unpreparedness for knowledge testing assessed?

6. When appointed to a position, what documents should a specialist familiarize himself with?
7. What is the procedure for passing the test of knowledge on OT from specialists?
8. What knowledge of managers and specialists is checked by the examination committee?
9. What is the frequency of primary and periodic testing of knowledge of managers and specialists?
10. In what cases is an extraordinary test of knowledge of specialists and managers carried out?
11. What measures are taken for managers and specialists in case of receiving an unsatisfactory mark in the exam?

### **Practice #9 FIRST AID IN OCCUPATIONAL ACCIDENTS**

*The purpose of the lesson:* familiarization with first aid techniques for victims

*Plan:*

1. The main task of first aid
2. Basic types of first aid

A set of measures to provide first aid to workers provides for the immediate termination of external damaging factors or the removal of the victim from the area that threatens his life; elimination of the threat to the life of the victim (restoration of breathing and cardiac activity - artificial respiration and indirect heart massage, as well as stopping bleeding); prevention of complications (wound dressing, immobilization of the injured limb, anesthesia, as well as other assistance); life support until the arrival of qualified medical assistance and delivery of the victim to a medical institution.

The main task of first aid, first of all, is the prevention of dangerous consequences of injuries, effective pain relief, the fight against bleeding, infection and shock. When establishing signs of life of the victim, it is necessary to start resuscitation of the victim.

*In medical practice, signs of life include:*

- the presence of a heartbeat (determined by hand or by ear to the left below the nipple);
- the presence of a pulse (determined on the neck - on the carotid artery, or on the inside of the forearm);
- the presence of external respiration (determined by the movement of the chest, by moistening the mirror attached to the nose of the victim, by the movement of cotton wool brought to the nasal openings, etc.).

First aid should be provided very quickly, but in such a way that the actions of the person providing assistance do not damage the health of the victim.

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#### **9.1 Basic first aid for various injuries and conditions**

*Wounds*

If the wound is bleeding heavily, then the bleeding must first be stopped. Cover the wound from above with clean gauze, bandage the entire wound with a bandage. If tincture of iodine, ethyl alcohol is available, then first wipe the skin around the wound twice or thrice with gauze or cotton wool moistened with this solution.

#### *bruises*

In case of a bruise, it is necessary to apply a pressure bandage, cold (a handkerchief moistened with cold water, snow or ice in a plastic bag) on the bruised place.

#### *dislocations*

In case of dislocation, it is necessary to create maximum rest for the limbs. Only a medical professional should correct the dislocations.

#### *fractures*

In case of fractures, apply a splint (for example, from a board, plywood, sticks, cardboard), fix the two nearest joints. For open fractures, before applying a splint, it is necessary to apply a sterile bandage to the wound. Even if a fracture is suspected, fixation of the limb is mandatory.

#### *burns*

In case of a *thermal burn*, it is necessary to eliminate the cause that caused the burn, wash the burn site with cold water (in case of a burn without violating the integrity of the burn blisters), apply a sterile bandage, and, if possible, put snow, ice or other cold for 15-20 minutes.

In case of a *chemical burn*, it is necessary to wash the burn area with plenty of cold water or milk, urine, soapy water, a weak solution of baking soda.

#### *Frostbite*

With frostbite, it is necessary to slowly and gradually warm the victim (transfer to a warm room), apply bandages, drink plenty of warm water (tea, coffee), and force him to move.

#### *electrical injury*

In case of electrical injury, it is necessary, observing personal safety measures, to stop the current on the body (for example, turn off the switch, unscrew the safety plugs on the shield, pull the wire with a dry wooden stick, dry rope, or pull the victim away using dielectric gloves or improvised insulating means: dry rope, stick, board, rubberized raincoat, rubber mat). Apply a dry bandage to the burn area, provide the victim with complete rest and call a doctor.

If the victim has no breathing and pulse, it is necessary to unfasten the clothes, start artificial ventilation of the lungs and external heart massage until spontaneous breathing and heartbeat are restored.

#### *Fainting*

In case of fainting, it is necessary to lay the victim in a horizontal position, raise her legs, unfasten tight clothes, provide access to fresh air, sprinkle her face with cold water, smell ammonia or vinegar on a cotton swab, rub whiskey with these agents, press a sore point under the nose or massage it.

#### *Heat (sun)stroke*

In case of heat (solar) stroke, move the victim to the shade, unfasten clothes and lay him down with his head raised, put a cold compress on his head, give him cold water to drink. Apply a cold wrap (such as a wet sheet). If necessary, conduct an external heart massage and artificial ventilation of the lungs.

#### *poisoning*

In case of *food poisoning, poisoning with various poisons* , it is necessary to remove the substances that caused the poisoning (gastric lavage, drinking plenty of water, induce vomiting by irritating the back of the throat with your fingers).

In case of *alcohol poisoning* , clean the mouth from vomit. Remove the remnants of alcohol from the stomach (washing the stomach with water until the vomit no longer smells like alcohol, induce vomiting by irritating the back of the throat with a finger), drink plenty of water.

#### *Carbon monoxide poisoning*

In case of carbon monoxide poisoning, it is necessary, observing personal safety measures and using personal respiratory protection equipment (for example, a handkerchief moistened with water), stop exposure to the gas, provide fresh air, cold dousing the head, inhaling ammonia . In case of loss of consciousness and violation of cardiac activity, carry out artificial ventilation of the lungs and external heart massage.

#### *bites*

When bitten by snakes, insects, rabid animals, it is necessary to lay the victim with a raised limb, give plenty of fluids, urgently deliver to the nearest medical facility for special measures.

#### *Stop bleeding*

To stop bleeding during *venous bleeding* , it is necessary to raise the limb of the victim, apply a pressure bandage to the wound (individual dressing bag or bandage, cotton wool, gauze).

To stop *arterial bleeding* (without removing clothes) either by pressing the artery with a finger to the bone on the limb above the injury site (on the neck and head by pressing below the wound or the wound itself), or by applying a hemostatic tourniquet (handkerchief, belt) or a pressure bandage above the wound over the shirt, trousers. Before applying the tourniquet, the injured limb should be kept in an elevated position. Put a note under the tourniquet about the time it was applied. The time for which a tourniquet can be applied should not exceed 2 hours in summer and 1-1.5 hours in winter.

#### *Eye blockage*

If the eye is clogged, it should be immediately rinsed with water or a 2% solution of boric acid. The head of the victim is placed on the side opposite to the clogged eye and a stream of water or solution is directed from the outer corner of the clogged eye to the nose, cover the eye with a sterile bandage. Rubbing the eyes is prohibited.

*After providing first aid to the victim at work, he should be sent to the nearest medical and preventive institution* . The decision on the further performance of labor duties by the injured employee can only be made by a doctor.

1. What is the main task of first aid?
2. How are the signs of life of the victims determined?
3. How to provide first aid for wounds?
4. How to provide first aid for fractures?
5. How to deal with burns and frostbite?
6. How to deal with electrical injuries?
7. How to provide first aid for poisoning?
8. What should be done to stop bleeding?

## 12 LABORATORY WORKS

### Laboratory work No. 1 SAFETY RULES FOR LABORATORY WORKS ON BD

#### 1.1 General requirements

1. All students associated with work in the laboratory are required to be instructed in the safe performance of work, which is signed in the safety briefing log, to study the procedure for performing laboratory work.
2. Work on the operation of electrical installations up to 1000  $V$  (installation, lighting, technical training aids and electrical machines) is allowed for persons who have undergone a medical examination and instructed in labor protection. Non-electrical personnel operating electrical installations up to 1000  $V$ , who have been instructed and tested on electrical safety, are assigned qualification group I of admission (*Assignment of 1 electrical safety group is mandatory for non-electrical personnel performing work that may cause a risk of electric shock, It is assigned by electrical personnel having at least group 3 EB*) with registration in the journal of the established form with the obligatory signature of the inspector and the verifiable.
3. All persons associated with work in the laboratory must comply with the internal labor regulations, established work and rest regimes.
4. When working in a laboratory and operating laboratory facilities, workers may be exposed to the following hazardous production factors:
  - electric shock when touching live parts;
  - injury from rotating or moving parts of the equipment
5. When operating electrical installations up to 1000  $V$  the following personal protective equipment should be used in the laboratory: a voltage indicator (*Voltage meters are portable devices designed to check the presence or absence of voltage on live parts*), a tool with insulated handles.
6. Persons operating laboratory facilities are required to strictly comply with fire safety rules, know the location of primary fire extinguishing equipment, as well as disconnecting devices (knife switches) to relieve voltage.
7. The victim or eyewitness of the accident must immediately inform the teacher about each accident. In the event of a malfunction of the electrical installation, stop work, remove voltage from it and inform the teacher.
8. During the operation of laboratory facilities, students must comply with

the rules for the use of personal protective equipment, observe the rules of personal hygiene, and keep the workplace clean.

9. Equipment, installations, devices, tools must be used only for their intended purpose.

10. Only those types of work that correspond to the work plan of the laboratory should be carried out in the laboratory. It is forbidden to carry out other types of work.

11. Persons who have failed to comply with or violate the instructions on labor protection are subject to disciplinary liability in accordance with the internal labor regulations and, if necessary, are subjected to an extraordinary examination of knowledge of the norms and rules of labor protection.

### **1.2 Safety requirements before starting work**

1. Familiarize yourself with the safety instructions at the workplace and receive additional briefing, about which an appropriate entry is made in the safety briefing log.

2. Tidy up your work clothes.

3. Check the lighting of the workplace - it should be sufficient, the light should not blind the eyes.

4. Check the absence of external damage to the electrical installation, the presence and serviceability of control, measuring and signaling devices, toggle switches, switches, etc.

5. Make sure that the covers of electrical sockets and switches, the electrical plug and the electrical supply cable are intact.

6. Make sure that the grounding conductor of the electrical installation housing is present and intact.

7. Check the availability and serviceability of personal protective equipment, the absence of external damage.

8. Carefully inspect the workplace and put it in order, remove foreign objects.

9. It is forbidden:

- carry out the work of the installation without the permission of the head;
- turn on power and lighting switches without the permission of the head;
- enter the power and engine compartments without the special permission of the work manager;

- turn on a live circuit without prior verification and without the permission of the manager;

- work with ungrounded equipment. Disconnect and break the protective earth wires;

- remove and hang warning and prohibition posters.

### **1.3 Safety requirements during work**

1. Before connecting the electrical installation to the electrical network, if necessary, stand on a dielectric mat (if the floor covering is made of conductive

material).

2. Do not connect the electrical installation to the electrical network with wet and damp hands.
3. Observe the rules for operating the electrical installation, do not expose it to mechanical shocks, and prevent falls.
4. Do not touch wires and other live parts that are energized without personal protective equipment.
5. Unnecessary movement within the laboratory is prohibited.
6. It is forbidden to be in the laboratory in outer clothing, as well as hang it on laboratory equipment.
7. All laboratory workers are required to take good care of the equipment.
8. Monitor the correct operation of the electrical installation, the integrity of the insulation and grounding.
9. It is not allowed to work on electrical installations in case of their malfunction: sparks, insulation and grounding failures.

#### **1.4 Safety requirements in emergency situations**

1. In the event of a malfunction in the operation of the electrical installation, sparking, broken wire insulation or grounding, stop work, turn off the general switch and close all valves and taps. Tell your teacher what happened. Work should only be continued after the fault has been rectified by an electrician.
2. If you find a broken electrical wire hanging or touching the floor (ground), do not approach it, immediately inform the administration of the institution, stay in place yourself and warn other people about the danger.
3. In case of ignition of the electrical installation, immediately disconnect it from the electrical network, and extinguish the flame only with sand, carbon dioxide or powder fire extinguisher.
4. In case of electric shock, turn off the voltage immediately; in the absence of breathing and pulse in the victim, give him artificial respiration or conduct an indirect heart massage until breathing and pulse are restored, report the accident to the administration of the institution, if necessary, send the victim to the nearest medical institution.
5. After an accident, find out the causes of the accident and how to eliminate it.

#### **1.5 Safety requirements after completion of work**

1. Disconnect the electrical installation from the electrical network. When disconnecting from the electrical outlet, do not pull on the electrical cord (cable).
2. Close all water taps and valves.
3. Tidy up your workspace.

#### **test questions**

1. What is the procedure for admitting students to perform laboratory work on electrical installations up to 1000 V?

2. What are the hazardous production factors in the operation of laboratory electrical installations up to 1000 V
3. What personal protective equipment is used in the laboratory?
4. What should a student do in case of an accident?
5. What should be done before starting the lab setup?
6. What are the safety requirements during laboratory work?
7. What are the safety requirements at the end of laboratory work?
8. What are the actions of students in case of fire of electrical equipment?
9. . What are the actions of students in case of electric shock?

## **Lab #2 VIBRATION**

Vibration as a factor in the working environment is found in the metalworking, mining, metallurgical, machine-building, construction, aircraft and shipbuilding industries, in agriculture, transport and other sectors of the economy.

*Vibration* is the mechanical vibrations of machines, mechanisms and their elements. Industrial vibration has a harmful effect on the machines themselves, intensifying wear, reducing their reliability and durability. Spreading through the structures and the ground, *the vibration affects on other objects* , causing the destruction of building structures and worsening the operation of instruments and precision machines. Finally, the most important thing: *a person's contact with vibrating surfaces* worsens his health and performance: fatigue increases, productivity and labor quality decrease, an occupational disease develops - *vibration disease* .

*Causes of vibration* : unbalanced force effects arising from the operation of machines and units with reciprocating movement of parts, with unbalanced rotating masses, with impact mechanisms, the movement of vehicles along an uneven path, etc. Vibration occurs in a wide variety of technical devices due to the imperfection of their design, improper operation, and external conditions.

*The main parameters characterizing the vibration are:* oscillation frequency ( $f$ ); the magnitude of the displacement amplitude of the points ( $A$ ); point movement speed (vibration velocity) ( $v$ ); acceleration with which there is an increase and decrease in vibration velocity (vibration acceleration) ( $a$ ).

According to the method of transmission, the following types of vibration are distinguished:

- *general vibration* transmitted through the supporting surfaces to the body of a seated or standing person;

- *local vibration* transmitted through the hands or feet of a person, as well as through the forearms in contact with vibrating surfaces.

According to the source of occurrence, the general vibration is divided into three categories: transport, transport-technological, technological.

The *sources of transport vibration* include: agricultural and industrial tractors, trucks, etc.

The *sources of transport and technological vibration* include: excavators, industrial and construction cranes, mine loaders, self-propelled drilling carriages, etc.

The *sources of technological vibration include*: metal and woodworking machines, forging and pressing equipment, foundry machines, crushing and grinding equipment of processing plants, etc.

*The influence of vibrations on the human body.*

When studying the effect of vibration on the human body, one must take into account that oscillatory processes are inherent in a living organism, primarily because they constantly occur in it. Internal organs can be considered as oscillatory systems with elastic connections. Their natural frequencies lie in the range of 3–6 Hz . When a person is exposed to external vibrations of such frequencies, *resonance phenomena* occur ( *an increase in the amplitude of vibrations*) in internal organs that can cause injury, rupture of arteries, and death. Natural body vibration frequencies in the prone position are 3-6 Hz , standing - 5-12 Hz , chest - 5-8 Hz . The impact on a person of vibrations of such frequencies depresses the central nervous system, causing a feeling of anxiety and fear.

*Local vibration* is one of the most common occupational factors. Its sources are hand-held machines (or hand-held power tools), machine and equipment controls (handles, steering wheels, pedals), non-mechanized hand tools and devices (for example, various hammers), as well as workpieces that workers hold in their hands. Working with this equipment is associated with the impact on the human body of vibration transmitted through the hands, feet or other parts of the body.

The action of local vibration on the body causes various changes in the activity of the central and peripheral nervous systems, as well as vascular disorders.

With prolonged exposure to *general vibration* , traumatization (damage) of the intervertebral discs and bone tissue, displacement of the abdominal organs, changes in the motility of the smooth muscles of the stomach and intestines, pain in the lumbar region, decreased visual acuity, impaired color perception, narrowing of the boundaries of the field of view, impaired coordination movements. Workers in vibration-dangerous professions with a long experience develop neuritis (inflammation of the nerves) of the auditory nerves, with severe stages of the disease, hearing loss is observed.

All these violations are exacerbated when working in workshops with low air temperatures. Effective treatment of vibration disease is possible only in the early stages of its occurrence. With a long course of the disease in the body, irreversible changes can occur, leading to disability.

*Hygienic regulation of vibration*

The basis of hygienic regulation of vibration is the criteria for human health when exposed to vibration, taking into account the intensity and severity of labor. The main purpose of vibration regulation at workplaces is to establish the permissible values of vibration characteristics, which, with daily systematic exposure throughout the working day and for many years, cannot cause significant diseases of the human body and do not interfere with its normal work activity.

1

The main document regulating the level of vibration at workplaces is SN 2.2.4/2.1.8.566-96 “Industrial vibration, vibration in residential and public buildings”.

This document gives the maximum allowable values of vibrational speed, vibrational acceleration and their frequency levels for local and general vibration, depending on the source of occurrence, direction of action.

To measure vibration, specialized vibrometers , vibroscopes are used. and universal noise-vibrometers.

#### *Vibration Protection Methods*

Vibration control methods include reducing vibration at the source (improving the design of machines, static and dynamic balancing of rotating parts of machines), vibration damping (increasing the effective mass by attaching the machine to the foundation), vibration isolation (using spring, hydraulic, pneumatic, rubber vibration isolators, etc.). ) vibration damping (the use of materials with high internal friction), the rational placement of operating equipment and workshops, the removal of vibrating (noisy) units and devices from places of work and residence of people, remote control of equipment, the use of personal protective equipment (vibration-proof shoes, gloves with special elastic damping elements that absorb vibration)

#### *Vibration reduction methods*

##### *a) Collective means of protection against vibration.*

The basis for the *prevention of vibration disease* is the use of equipment and tools with vibration parameters that do not exceed sanitary standards, as well as the introduction of advanced technology that excludes the impact of industrial vibration on workers. When developing new, modernizing and repairing equipment in operation, tools, devices that create vibration during operation, measures are taken to reduce it to the maximum both at the source of formation (*design and design solutions*) and along the path of vibration propagation (*using vibration protection means*).

*Structural design solutions* . When designing machines to ensure vibration safety, the following methods are used to reduce vibration parameters by acting on the excitation source: replacing cam and crank mechanisms with rotating ones; replacement of spur gears with chevron ones; the use of plain bearings instead of rolling bearings; careful balancing of rotating masses; except for resonant operating modes, etc.

*The use of vibration protection means* is vibration damping, vibration damping and vibration isolation.

*Vibration damping* is the reduction of vibrations by transferring the energy of mechanical vibrations into other types of energy, most often into heat. To do this, materials with high internal friction can be used in structures, for example, plastics, wood, rubber, textolite, nylon, etc. In low-speed gearboxes, gears are also used from nylon, textolite. The use of these materials leads to a decrease in the vibrations of the bases of the foundations of machines, i.e., to a decrease in the vibrations of workplaces. Another way is to use vibration-damping coatings characterized by large losses due to internal friction. The action of the coatings is based on the fluctuation of vibrations by converting vibrational energy into thermal energy when the coatings are deformed. For the manufacture of such coatings, soft plastics, rubber, foam and various mastics can be used.

*Vibration damping* is a reduction in the level of vibrations of machines and units by installing them on vibration-isolating foundations. The mass of the foundation is selected so that the amplitude of oscillations of the base of the foundation does not exceed 0.1-0.2 mm .

*Vibration isolation* is a method of reducing vibration from an excitation source to another object by means of devices placed between them. Three types of vibration isolators can be used as such a device : rubber, spring and combined. Each has its own benefits. Thus, spring vibration isolators retain constant elastic properties over time longer, resist the action of weight and temperature forces, and are small in size. Rubber vibration isolators must be protected from oils. For the possibility of deformation in the horizontal plane, they are made in the form of perforated plates. Combined vibration isolators have high operational reliability and are therefore the most efficient.

#### *b) Personal protective equipment against vibrations*

Personal protective equipment against vibrations is divided into protective equipment for the hands, feet and body of the operator. As means of protection for hands, mittens, gloves, inserts and gaskets are used (GOST 12.4.002-74). Given the unfavorable additional effect of cold on the development of vibration disease, workers are given warm gloves in winter. When working in conditions of general vibration, special footwear is used. Vibration-protective shoes according to GOST are used in conditions of general vibration.

#### *Organizational anti-vibration measures*

To work with vibrating equipment, it is recommended to set a special operating mode. So, when working with manual machines, the total time of work with vibrations should not exceed 2/3 of the work shift. At the same time, the duration of one session of work, including technological micropauses, should not exceed 15-20 minutes. Lunch break should be at least 40 minutes; there are two regulated breaks for outdoor activities: for 20 minutes 1-2 hours after the start of the shift and for 30 minutes 2 hours after lunch. When working with vibrating equipment, it is recommended to include in the working cycle technological operations that are not related to the impact of vibrations.

#### *Prevention measures*

Measures to prevent the adverse effects of vibration and related factors when working with vibrating tools include:

-technical (constructive) measures to reduce vibration, -change in tool body weight, heated handles, etc.;

- Properly organized mode of work and rest of workers . When working in open areas during the cold season, rooms for heating should be equipped, hot meals should be organized;

- Mandatory use of personal protective equipment;

- conducting preliminary and periodic medical examinations at least once every 2 years with the participation of a neurologist, otorhinolaryngologist, ophthalmologist, surgeon, dermatovenereologist;

- physiotherapeutic measures; vitamin prophylaxis; spa treatment, etc.

If signs of vibration disease are detected, the worker must be temporarily (until the decision of the medical and social examination) transferred to another job that is not associated with vibration, significant muscle tension, or cooling of the hands.

### test questions

1. What is vibration?
2. How does vibration affect human health?
3. Causes of vibration
4. What parameters characterize vibration?
5. What is the difference between local vibration and general vibration?
6. What symptoms of vibration do you know?
7. What is included in the prevention of vibration disease?
8. What methods of reducing vibration in the design of machines do you know?
9. What are the collective methods of protection against vibration?
10. What are individual vibration protection methods?
11. How should work be organized using a vibration tool?

### Laboratory work No. 3 STUDY OF HUMAN RESISTANCE ON AC

Electric energy is used in all spheres of human activity, as it is convenient to transport and use. With all the advantages of using electricity, its danger to humans cannot be ignored. The main cause of human injury and the occurrence of electrical injuries is the closure of an electrical circuit through the human body, which begins with touching live parts that are energized: bare wires, structural parts of the network and electrical equipment if the insulation is damaged.

The main factors determining the outcome of the lesion are the resistance of the human body and the magnitude of the voltage applied to it. The magnitude of the current flowing through a person is usually defined as the ratio of the applied voltage to the resistance of the human body, i.e., according to Ohm's law:

$$I \approx U / R, \text{ V / Ohm} \quad \text{or} \quad R \approx U / I, \text{ V / A}$$

In calculations, the resistance of the body is taken as an active constant resistance equal to  $1000 \Omega$ . At the same time, human resistance is a variable value that depends on many factors (skin condition, magnitude of applied voltage, psychophysical state of a person, etc.). It was found that the human body has an electrical resistance that is fundamentally different from the electrical resistance of metal conductors, electrolytes. With an increase in voltage, the resistance of the human body decreases sharply, while the human resistance depends on the frequency of the current and the duration of the voltage application, and the resistance value decreases with time.

The human body is a conductor of electric current, at the same time it has electrical resistance, but the value of this resistance is different for different people. And also different parts of the human body has different resistance values. The greatest

resistance to electric current is provided by the skin, therefore the resistance of the human body is determined mainly by the resistance of the skin. The electrical resistance of the human body is the sum of the resistance of the skin and the resistance of internal tissues. The skin, or rather its upper layer, called *the epidermis*, having a thickness of up to 0.2 mm and consisting mainly of dead keratinized (non-renewable) cells, has great resistance, which determines the overall resistance of the human body.

The resistance of human internal tissues is insignificant and amounts to 300-500 ohms. With dry, clean and intact skin, the resistance of the human body ranges from 2 thousand to 2 million ohms. When the skin is moistened and contaminated, as well as when the skin is damaged (under the contacts), the resistance of the body is significantly reduced - 5 to 500 Ohm, i.e., it reaches a value equal to the resistance of the internal tissues of the body.

Working with electrical installations with wet hands or in conditions that cause moisture to the skin, as well as at elevated temperatures that cause increased sweating, exacerbates the risk of electric shock to a person. Contamination of the skin with harmful substances that conduct electricity well (dust, scale, etc.) leads to a decrease in its resistance.

Experiments show that at low voltages (up to 20-30 V) in 1-2 minutes, the resistance usually decreases by 10-40% (on average by 25%), and sometimes more. With an increase in voltage, and, consequently, with an increase in current, the resistance of the body decreases faster, which is apparently explained by the more intense effect of a larger current on the skin. The resistance of the body is influenced by *the area of contacts*, as well as the place of contact, since in the same person the resistance of the skin is not the same in different parts of the body. The skin of the face, neck, hands in the area above the palms and, in particular, on the side facing the torso, armpits, back of the hand, etc., has the least resistance. The skin of the palms and soles has a resistance many times greater than the resistance of the skin of other parts of the body.

The difference in skin resistance values in different areas of the body is due to a number of factors, including:

- *different thickness of the stratum corneum of the skin;*
- *uneven distribution of sweat glands on the surface of the body;*
- *unequal degree of blood filling of skin vessels.*

The resistance of the human body depends on the sex and age of people: in women this resistance is less, in men in men, in children it is less than in adults, in young people it is less than in the elderly. This is explained by the thickness and degree of coarsening of the upper layer of the skin.

An increase in the current passing through the human body is accompanied by an increase in local heating of the skin and an irritating effect on tissues.

Thus, a number of factors affect the outcome of electrocution: the magnitude of the applied voltage, the place of application, the type of current flowing through the human body, the frequency of the current (for alternating current), polarity<sup>1</sup>(for direct current), non-electrical factors: temperature, pressure, humidity, individual characteristics of a person and the conditions of his work. It is not possible to study all

these factors in one laboratory work. If the applied voltage is constant, the outcome of the electric shock will be affected primarily by the resistance of the human body, which, in turn, depends on the frequency of the applied voltage, the state of the person (skin) and the area of contact.

*The purpose of the work:* to get acquainted with the methodology for studying the electrical parameters of the human body. To study the dependence of the resistance of the human body on the frequency, applied voltage and area of contact with the current-carrying part.

#### *Preparation of the stand for work*

Perform a visual inspection of the product and check the completeness of the delivery.

Prepare the product for work in the specified sequence.

Plug the power cable into a 3x380V, 50Hz electrical outlet.

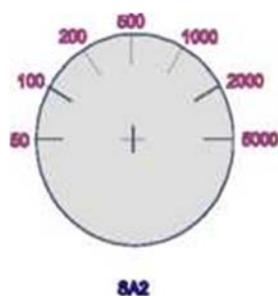
Check the initial positions of the toggle switches and automata on the stand panel: SA 1 - down ("Off"); SA 3 - "Off"; key switches - "Off"; SA 4 - down ("Off"); QF 2 - down ("Off");

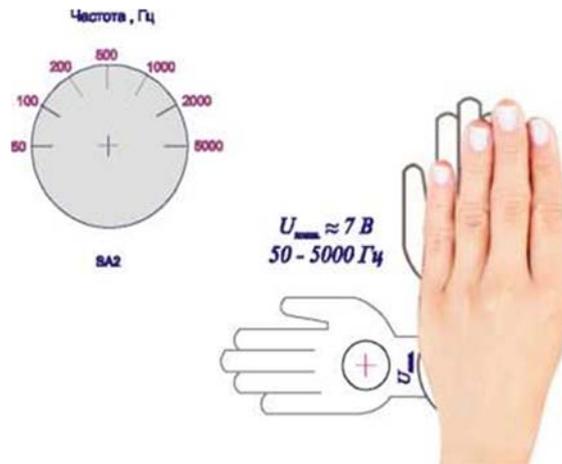
QF 3 - down ("Off"); SA 7 - "that"; SA 8 - "0"; SA 10, SA 11 - middle position; SA 14 - down ("Off"); SA 15 - down ("Off").

Having collected the necessary electrical circuit for laboratory work using jumpers (if necessary), turn on the circuit breaker QF 1 "Network".

Apply power to the desired lab unit using the appropriate switch.

Check the initial position of the stand controls. Turn on the stand with the automatic QF 1 "Network". Set the LFO frequency to "50 Hz" with a jack switch. Turn on the toggle switch SA 1 "On LFO" (up). For research with a contact area of 250 mm.kv. firmly attach the left (right) hand to the two lower electrodes (of different diameters) connected by a symbolic pattern of a yellow -orange palm (see Fig. 1). Without changing the position of the palm, change the frequency with the SA 2 switch and record the current readings on indicator A1 for each frequency value (50Hz -100Hz -200Hz -500Hz -1000Hz -5000Hz). Enter the data in table 1.





Based on the results of measurements, calculate the resistance of the human body for each experiment and plot the dependences of the body resistance on the frequency of the current. In the calculations, the contact (contact) voltage is taken equal to 9 V. Make a conclusion about the effect of the current frequency on the skin resistance, determine whether there is a dependence of the skin resistance on the contact area.

Table 1.

Square contact,	Frequency, Hz	Current, mA	Resistance, Ohm
250	fifty		
	100		
	200		
	500		
	1000		
	2000		
	5000		
500	fifty		
	100		
	200		
	500		
	1000		
	2000		
	5000		

### test questions

1. What causes electrical shocks?
2. How is the amount of current flowing through the human body determined?
3. What is the main factor in electric shock?
4. On what factors does a person's resistance to electric current depend?
5. What is the peculiarity of different human bodies to resistance to electricity?

6. How does the contact area and various human bodies affect a person's resistance to electric current?
7. Which part of the human body has the least resistance?
8. What factors influence the outcome of electric shock?
9. What is the purpose of this lab?
10. Based on the measurement results (take the data from the presented video material), fill in the table, calculate the resistance of the human body for each experiment, write it down in the table and *plot the dependences of the body resistance on the current frequency*. In calculations, the voltage of contact (contact) is taken equal to 9 V. *Units of measurement are brought into one system*
11. Make *a conclusion* about the effect of the current frequency on the skin resistance, determine whether there is a dependence of the skin resistance on the contact area.

#### **Laboratory work No. 4 STUDY OF SOUND INSULATION AND SOUND ABSORPTION**

##### *Noise and its characteristics*

*Noise* is a random combination of sounds of varying intensity and frequency, which adversely affects the human body. Noise is one of the most common unfavorable physical factors of the environment, acquiring important social and hygienic significance in connection with urbanization, as well as the mechanization and automation of technological processes, and the further development of aviation and transport.

*The unit of sound level* in acoustics is the decibel ( *dB* ). For example, when starting aircraft jet engines, the noise level ranges from 120 to 140 *dB* , riveting and cutting sheet steel - from 118 to 130 *dB* , woodworking machines - from 100 to 120 *dB* , looms - up to 105 *dB* ; household noise associated with the life of people is 45 ... 60 *dB* .

Sound vibrations propagate from the source in the form of waves that carry energy in space. Basic parameters of sound waves: *sound intensity*  $I$  ,  $W / m^2$  - the amount of energy carried by the wave per unit time, related to the unit area; *wavelength*  $\lambda$  ,  $m$  - the distance between two points of the sound field in the same phases; *the oscillation period*  $T$  ,  $s$  is the time interval through which the oscillation is repeated; *oscillation frequency*  $f$  ,  $Hz$  - the reciprocal of the period, determined by the number of oscillations per second.

The audible range of sounds is divided into low-frequency (16 ... 400 *Hz* ), mid-frequency (400 ... 1000 *Hz* ), high-frequency (over 1,000 *Hz* ).

*The sound level* is the measured noise value, corrected to approximate the sensitivity of the human ear (according to the *A scale of the noise meter*), measured in *dBA* .

A person, working with noise, gets used to it, but prolonged exposure to strong noise (above 80 *dB* ) causes general fatigue, can lead to hearing impairment, and sometimes to deafness, the digestion process is disturbed, changes in the volume of

internal organs occur. Hearing loss is accompanied by damage to the central and autonomic nervous system, an increase in blood pressure, deterioration of attention, memory, and a decrease in working capacity.

Influencing the cerebral cortex, noise has an irritating effect, accelerates the process of fatigue, weakens attention and slows down mental reactions. For these reasons, strong noise in production conditions can contribute to the occurrence of -injuries, since against the background of this noise, the signals of transport, forklifts and other machines are not heard. These harmful effects of noise are more pronounced, the stronger the noise and the longer it lasts. Under the influence of noise at very high levels (more than 145 *dB*), a rupture of the eardrum is possible.

Oscillations in the frequency range of 16 Hz ... 20 *kHz* can be perceived by the human ear as sounds. Oscillations with a frequency of less than 16 *Hz* - *infrasounds*, and with a frequency of more than 20 *kHz* - *ultrasounds* are not perceived by the ear, but can also have an adverse effect on the human body.

According to the conditions of occurrence, industrial noise can be of *mechanical, aerodynamic, electromagnetic and hydrodynamic origin*.

*Noise of mechanical origin* - noise arising from the vibration of the surfaces of machines and equipment, as well as single or periodic shocks in the articulation of parts, assembly units or the structure as a whole.

*Noise of aerodynamic origin* - noise resulting from stationary or non-stationary processes in gases (for example, the outflow of air or gas from a hole)

*Noise of electromagnetic origin* - noise arising from the vibration of elements of electromechanical devices under the influence of variable magnetic forces (for example, oscillations of the rotor and stator of electrical machines)

*Noise of hydrodynamic origin* - noise resulting from stationary and non-stationary processes in a liquid (for example, hydraulic shocks)

In most cases (more than 90%) man-made noise is of mechanical origin.

*Sound levels must not exceed :*

- in the premises of design bureaus, laboratories - 50 *dB(A)*;
- in control rooms, working rooms - 60 *dB(A)*;
- in remote control cabinets - 65 - 70 *dB(A)*;
- in experimental laboratories - 75 *dB(A)*;
- at permanent workplaces in the production room 80 *dB(A)*.

Studies of the effect of noise on the human body have shown that at a level of 110 *dB* or more it can cause unpleasant subjective sensations, as well as changes in the central nervous, cardiovascular and respiratory systems. *Human reaction to noise* : headaches, nausea, decreased visual acuity, fatigue, anxiety, a feeling of fear appear. The normalized characteristics of noise at workplaces are sound pressure levels in decibels, the value of which should not exceed 110 *dB*.

*Noise measurements at workplaces are made* at a level of 1.5 m from the floor or at the level of at least 2/3 of the units of technological equipment installed in the room. This turns on more powerful sources of noise. The measured sound levels in each octave frequency band must be below the standard values. If there are excesses, then measures are taken to improve noise sources.

*Noise control methods and means :*

- methods for reducing noise at the source of its formation;
- methods for reducing noise along the path of its propagation;
- means of personal protection against noise.

*Noise reduction at the source of its formation is* achieved by constructive changes in the source. This is the replacement of reciprocating motion by rotational. Improving the quality of balancing rotating parts. Improved lubrication and frequency class of rubbing surfaces. Replacing gears with hydraulic ones.

*Methods for reducing noise along the path of its propagation include:* - *acoustic treatment of premises;* - *isolation of noise sources or premises from noise penetrating from the outside;* - *the use of silencers.* Under the *acoustic treatment of premises* is meant the lining of a part of the inner surfaces of the fences with sound-absorbing materials, as well as the placement of piece absorbers in the room, as well as the placement of piece absorbers in the room - these are freely suspended three-dimensional absorbing bodies of various shapes. Sound-absorbing facings are placed on the ceiling, in the upper parts of the walls with a room height of not more than 6/8 *m* so that the acoustically treated surface is at least 60% of the area of the surfaces limiting the room. Additional piece absorbers are suspended near the noise source if the area of the room is small.

*Isolation of noise sources* includes such means as soundproof casings, fences, screens. Soundproof barriers allow you to isolate the source of noise or the room from noise penetrating from the outside by creating an airtight barrier to the propagation of airborne noise for each active frequency band. On automated lines, where it is impossible to isolate a person from a noise source for a long time, soundproof booths are installed. If it is not possible to completely isolate either the noise source or the person using cabins, then acoustic screens are installed along the path of noise propagation. Flat screens are effective in the area of direct sound, starting from a frequency of 500 *Hz*. Concave screens of various shapes are also effective in the area of reflected sounds, starting from a frequency of 250 *Hz* . The dimensions and location of the screen are determined depending on the excess of the noise spectrum at the calculated points over the standard values.

are used for air intake and exhaust in air ducts, diesel and compressor installations . According to the principle of operation, silencers are divided into active (dissipative) type and reactive (reflecting) type silencers. In active type silencers, noise reduction is carried out by converting sound energy into heat energy in a sound-absorbing material placed on the internal cavities. In reactive silencers, noise is reduced by reflecting the energy of sound waves in a system of expanded and resonant chambers, interconnected not by the volume of the air duct using pipes and holes. The chambers can be lined with sound-absorbing material inside, then they work as reflectors in the low-frequency region, and as noise absorbers (combined mufflers) in the high-frequency region. The type and dimensions of silencers are selected depending on the amount of noise reduction required, taking into account its frequency from the acoustic efficiency tabular data.

*The third method of combating noise is the use of personal protective equipment* : - an insert - these are soft tampons inserted into the auditory canal made of ultra-thin fiber impregnated with a mixture of wax and paraffin and hard inserts (ebonite, rubber) in the shape of a cone. These are the cheapest, but quite effective and convenient means (noise reduction by 5/20 dB ); - headphones - tightly fit the auricles and are held by an arcuate spring. Effective at high frequencies; - helmets - are used when exposed to noise levels of more than 120 dB , when the noise acts directly on the human brain, and earbuds and headphones do not provide the required protection.

#### **test questions**

1. What is noise?
2. What are the characteristics of sound waves?
3. What are the types of audible sounds?
4. What units are used to measure sound level?
5. What are the negative effects of industrial noise?
6. What is ultrasound and infrasound?
7. What types of industrial noise do you know?
8. How does mechanical noise occur?
9. What are the symptoms of illness from noise when the maximum permissible limit is exceeded?
10. How is noise measured in the workplace?
11. What noise control methods do you know?
12. What is noise isolation?
13. What PPE do you know about noise?

### **Laboratory work #5 PROTECTION AGAINST VERY HIGH FREQUENCY (MW) RADIATION**

In the human environment, electromagnetic fields (EMFs) of natural and artificial origin are constantly present. The main sources of natural electromagnetic fields are atmospheric electricity, the constant magnetic field of the Earth. Any technical device that uses or generates electrical energy is a source of man-made EMF.

Around us there are constantly many sources of electromagnetic radiation (electrical appliances, power lines, mobile communications, etc.) that emit electromagnetic waves dangerous to humans into space. It is almost impossible to list them all, so let's consider the most global and popular examples of sources of electromagnetic radiation:

*High voltage power lines.* These sources have a powerful level of electromagnetic radiation and high voltage. If a residential building is located less than 1,000 meters from such lines, then the risks of oncological diseases increase among the residents of such houses.

*Electric transport.* This includes metro and electric trains, trolleybuses and trams, as well as ordinary elevators in houses and shopping centers.

*Radio and television towers* . Electromagnetic radiation from such towers is extremely dangerous for human health. Especially dangerous are those that are not installed in accordance with sanitary standards.

*Appliances*. These include microwave ovens, TV, computer, energy-saving lamps, hair dryers, chargers and others.

*Cell phones*. Electromagnetic radiation from the phone has a negative effect on general well-being and has a bad effect on the human brain.

*Medical equipment* . X-ray, CT scanner, MRI have strong radiation. We will all continue to use these devices. At the same time, it is important to minimize the negative impact that sources of electromagnetic radiation have.

*Electromagnetic radiation is characterized by the frequency of oscillations* , showing the number of complete cycles of oscillations per second. Currently, EMF sources of various frequencies are used in industry and everyday life: *low-frequency* (from 0 to 60 Hz); *mid-frequency* (from 60 Hz to 10 kHz); *high-frequency* (from 10 kHz to 300 MHz); microwave (from 300 MHz to 300 GHz).

The intensity of EMF sources by bands is characterized by the following values (in the range from 0 to 300 MHz): electric field strength  $E$ , V/m; magnetic field strength  $H$ , A/m; magnetic induction  $V$ , Tl (tesla). In the frequency range from 300 MHz to 300 GHz, the EMF intensity is estimated by the power flux density (PFL) of radiation, which has the dimension of  $W/m^2$  .

#### *Impact of electromagnetic radiation on human health*

A person does not see and does not feel electromagnetic fields, and that is why he is not always warned against the dangerous effects of these fields. Electromagnetic radiation has a harmful effect on the human body. In the blood, which is an electrolyte, under the influence of electromagnetic radiation, ion currents arise, causing tissue heating. At a certain intensity of radiation, called the thermal threshold, the body may not be able to cope with the resulting heat.

Heating is especially dangerous for organs with an underdeveloped vascular system with low blood circulation (eyes, brain, stomach, gallbladder and bladder , etc.). If the eyes are exposed to radiation for several days, the lens may become cloudy, which can cause cataracts. In addition to thermal effects, electromagnetic radiation has an adverse effect on the nervous system, causing dysfunction of the cardiovascular system, metabolism.

*The biological effects* of EMR exposure can manifest themselves in various forms: from minor functional changes to disorders that indicate the development of an obvious pathology. The reason for the biological effect of EMR on the body is the absorption of electromagnetic wave energy by tissues.

With equal EMR characteristics, the absorption coefficient in tissues with a high water content is about 60 times higher than in tissues with a low content.

The degree and nature of the impact of EMR on the human body is determined by *the frequency of radiation, the duration of exposure, the intensity of the EMF, the size of the irradiated surface, and the individual characteristics of a person*.

For long-term exposure to EMR of various frequency ranges at moderate intensity (above the MPC) , the development of functional disorders in the central

nervous system with not pronounced shifts in endocrine-metabolic processes and blood composition is considered characteristic. In this regard, headaches, a decrease or increase in blood pressure, neuropsychiatric disorders, and the rapid development of fatigue may appear. Possible hair loss, brittle nails, weight loss. At an early stage, the changes are reversible; with continued exposure to EMR, a persistent decrease in performance occurs.

Within the radio wave range, the highest activity of the microwave field has been proven compared to HF and UHF.

#### *Rationing of electromagnetic radiation*

The normalized parameters of the remote control of the impact are the intensity indicators in the frequency range up to 30 kHz :

1. Electric field strength: - for a full working day -500 V/m ; - exposure up to 2 hours per working day -1000 V/m.

2. Magnetic field strength: - for a full working day -50 A/m ; - impact up to 2 hours per working day – 100 A/m.

#### *Protection against electromagnetic radiation:*

##### *a) Collective methods of protection*

*Time protection.* This type of protection involves limiting the time spent in the electromagnetic field and the regulation of time intervals during which a person leaves the danger zone. This ensures both not exceeding the permissible dose, and the involvement of the body's natural resources, which, in the absence of radiation, restore the functions of the body. However, the individual sensitivity of a given organism to EMF is not taken into account, and therefore the individual risk is not reduced. This method of protection can be considered traditional.

*Distance protection.* In this case, the removal of the EMP source at a certain distance is provided, which is determined based on the standards for the field strength or energy flux density. This protection method is used both on stationary objects (radio, television, stationary transmitters) and on mobile ones. The use of an external antenna or an external handset increases the distance between the user and the cell phone antenna. This reduces the energy absorbed by the body. In addition, distance protection includes the allocation of sanitary protection zones and zones of development restrictions near power lines and powerful radio stations.

*Shielding protection.* When there is not enough time and distance protection, or when it is impossible to apply these types of protection, it is necessary to shield radiation sources, using the ability of conductors to change the configuration of the electromagnetic field, limiting its propagation or changing the direction of propagation. This method of protection should be considered universal, since its use allows to reduce EMP levels to any predetermined values.

*Blocking protection.* In this case, we are talking about the use of medications that block the effects of EMR exposure. The use of radioprotective drugs is permissible only when the consequences of using these drugs turn out to be less dangerous than the actual effect of EMR.

##### *b) Individual protection of a person.*

When working in hazardous electromagnetic conditions, they are used as additional personal protective equipment. When designing personal protective equipment, it should be remembered that a person must not only be in them, but also perform his job duties. Those. personal protective equipment should be comfortable to work in them.

*EMP personal protective equipment includes: field indicators, portable screens, absorbent covers .*

*Field indicators* are designed to control the level of EMF. Such devices are created according to a simplified scheme and perform alarm functions. Sound and light indicators are triggered when the EMP reaches a critical value. These devices are small and fit in your pocket or on your belt. Their use allows a person to choose the least dangerous areas when moving, for example, when servicing electrical networks.

*Portable screens* are used during repair and maintenance work. The choice of their locations is determined by production requirements and the situation.

*Metallic suits, raincoats, overalls, goggles, helmets* provide additional protection. This workwear also provides electrical safety. For example, when working on high-voltage lines, a grounded suit with a metallized thread is used, which protects the worker from the electric field and from electric shock.

Therapeutic and preventive measures are aimed primarily, for early detection of violations in the state of health of employees through periodic medical examinations of employees and their sanatorium treatment

#### **test questions**

1. What are the sources of natural electromagnetic fields?
2. List the sources of man-made electromagnetic fields (EMF)
3. What are the values of the EMF intensity?
4. How does electromagnetic radiation (EMR) affect human health?
5. What determines the degree and nature of the impact of EMR on the human body?
6. What functional changes occur when exposed to electromagnetic radiation, the value of which is higher than the MPC?
7. What are the types of collective methods of protection against electromagnetic radiation?
8. What do you understand by time protection from EMP?
9. What are personal protective equipment against EMP?
10. What is the purpose of field indicators?
11. What is included in the treatment and preventive measures against exposure to EMR?

### **13. GLOSSIARIES ON BDZ**

**Accident** - destruction of structures and (or) technical devices used at a production facility; uncontrolled explosion and (or) release of hazardous substances; a dangerous man-made incident that creates a threat to human life and health at an object, a certain territory or water area and leads to the destruction of buildings, structures,

equipment and vehicles, disruption of the production or transport process, as well as damage to the natural environment.

**Adaptation** (from Latin ad-apto - to adapt, adjust, arrange) - adaptation of the body to changing environmental conditions, which occurs without any irreversible disturbances of the biological system; a systemic category denoting the form of relations in the system environment - a living being, representing the advanced ability of the organism to ensure the reduction of the tectological hostility of the environment to a safe level.

**Antigen** (from Greek anti - against, genos - genus, origin) - any substance foreign to the body that can cause immunological reactions in the form of the formation of antibodies to this antigen, or increase the activity of specific blood cells, for example, macrophages that can capture and neutralize the antigen .

**Security** is the state of protection of the vital interests of the individual, society and the state from internal and external threats.

**Safety in emergency situations** - the state of protection of the population, objects of the national economy and the natural environment from dangers in emergency situations.

**Life safety** is a field of scientific knowledge that studies the dangers that threaten a person, the state, public and other organizations and develops appropriate methods of protection against them.

**Biosphere** - the area of distribution of life on Earth, including the lower layer of the atmosphere, the hydrosphere and the upper layer of the lithosphere, which have not experienced technogenic impact.

**disease** is a certain state of the body in which one or more programs are implemented that have arisen at a certain stage in the evolution of processes, accompanied by a decrease in its adaptive resource (synonymous with nosology).

**An explosion** is a fast-flowing process of physical and chemical transformations of substances, accompanied by the release of a significant amount of energy in a limited volume, as a result of which a shock wave is formed and propagates in the surrounding space, capable of causing or leading to a man-made emergency.

**The homosphere** is the human environment.

**Civil defense** is a system of defense, engineering, technical and organizational measures carried out in order to protect the civilian population and objects of the national economy from the dangers arising from the conduct of hostilities or as a result of these actions, as well as in the event of natural and man-made emergencies.

**Civil liability** is one of the types of legal liability that occurs in case of non-fulfillment or improper fulfillment of obligations under contracts, when a number of other civil offenses are committed. It is expressed in the property impact on the offender by compensating them for the harm or compensation for losses.

**Detector** - a perceptive element of a dosimetric device that converts the energy of ionizing radiation into another form of energy that is convenient for registration (electric current, charge, electrical impulses).

1

**Radiation dose** is a measure of the impact of ionizing radiation on living organisms.

**Absorbed dose** - the amount of energy of any type of ionizing radiation absorbed by a unit mass of a substance, related to this mass.

**Dosimetry** is an area of applied nuclear physics in which physical quantities are studied that characterize the effect of ionizing radiation on various objects.

**Security in emergency situations** is a state in which the negative consequences of the emergence of potential hazards in emergency situations for the population, national economy facilities and the natural environment are prevented, overcome or extremely reduced.

**A disaster zone** is a part of an emergency zone that needs additional and immediately provided assistance and material resources to eliminate emergency situations.

**Emergency zone** - a territory or water area where an emergency occurred as a result of the occurrence of a source of emergency situations or the spread of its consequences from other areas.

**Hazard identification** is the process of ascertaining the existence of a hazard and determining its characteristics.

**Individual risk** - the probability of damaging effects of a certain type (death, injury, illness) that occurs when certain hazards are realized at a certain point in space (where an individual may be).

**Ionizing radiation** - types of radiation, the sources of which are the decaying nuclei of atoms; when interacting with a substance, they lead to the formation of electrically charged particles.

**The source of an emergency** is a dangerous natural phenomenon, an accident or a dangerous man-made incident, a widespread infectious disease of people, farm animals and plants, as well as the use of modern means of destruction, as a result of which an emergency has occurred or may arise.

**Quarantine** is a system of anti-epidemic and regime measures aimed at the complete isolation of the source of infection and the elimination of infectious diseases in it.

**A catastrophe** is a sudden disaster, an incident in a technical system or natural environment, accompanied by tragic consequences - the death or loss of people, the destruction of buildings, structures, the destruction of material values.

**Fire suppression** - actions aimed at the final cessation of combustion, as well as to exclude the possibility of its re-occurrence

**Fire containment** - actions aimed at preventing the possibility of further spread of combustion and creating conditions for its successful elimination by the available forces and means.

**Social tension** is an indicator of the state of society and a complex characteristic of the degree of socio-psychological adaptation of various categories of the population to difficulties (decrease in living standards and social changes), which manifests itself in a sharp increase in discontent, distrust of the authorities, conflict in society, anxiety, economic and psychological depression, rush demand, worsening demographic situation, aggression, etc. Social tension arises at the socio-psychological level and is one of the most important indicators of a social crisis, conflict.

**An accident (AC)** is an event that results in death, ill health, injury, damage or other loss.

**The noxosphere** is a space in which dangers constantly exist or periodically arise.

**NS household** - an accident that occurred in everyday life (at home) or while being in an organization after hours.

**NS at work** - an accident that occurred with a worker on the territory of the organization and outside it when performing work on the instructions of the employer, going to work and from work on the transport of the organization, as well as when accompanying goods due to the impact of a harmful or dangerous production factor.

**Hazardous natural phenomenon** is a spontaneous event of natural origin, which, due to its intensity, scale of distribution and duration, can cause negative consequences for human life, the economy and the natural environment.

**Danger** is an objectively existing possibility of a negative impact on an object or process, as a result of which any damage or harm may be caused, worsening the state, giving development undesirable dynamics or parameters.

**Natural hazard** - the probability of occurrence in a certain period of time in a given territory of hazardous natural processes or phenomena.

**Technogenic hazard** is a state inherent in a technical system, industrial or transport facility, realized in the form of damaging effects of a source of technogenic danger on a person and the environment when it occurs, or in the form of direct or indirect damage to a person and the environment during the normal operation of these objects.

**Occupational safety** is a system for preserving the life and health of employees in the course of their work, including legal, socio-economic, organizational and technical, sanitary and hygienic, medical and preventive, rehabilitation and other measures.

**The focus of destruction** is a limited area within which, as a result of the impact of modern means of destruction, mass death or injury of people, agricultural animals and plants occurred, buildings and structures were destroyed and damaged, as well as elements of the natural environment.

**A fire** is an uncontrolled burning process, accompanied by the destruction of material values and creating a danger to human life.

**Fire safety of an object** is the state of an object, in which, with a regulated probability, the possibility of the occurrence and development of a fire and the impact on people of dangerous fire factors is excluded, and the protection of material assets is also ensured.

**Fire prevention** is a set of organizational and technical measures aimed at ensuring the safety of people, preventing fire, limiting its spread, as well as creating conditions for successful fire extinguishing.

**Affected in an emergency** - a person who falls ill, injured or injured as a result of the damaging effects of an emergency source.

1

**A victim in an emergency** is a person who has been injured or suffered material losses as a result of an emergency.

**The maximum permissible concentration of a hazardous substance** is the maximum amount of hazardous substances in soil, air or water, food, food raw materials and feed, measured in a unit of volume or mass, which, with constant contact with a person or when exposed to him for a certain period of time, practically does not affect on human health and does not cause adverse effects.

**Occupational injury** (labor injury) is a consequence of the action on the body of various harmful and (or) dangerous production factors.

**Industrial injuries** - a set of NA in the workplace (enterprise).

**Occupational disease** - a chronic or acute illness of an employee, which is the result of exposure to harmful or dangerous production factors, resulting in a temporary or permanent loss of his professional ability to work.

**Prevention** is a set of measures aimed at preserving and strengthening health and including the formation of a healthy lifestyle, prevention of the occurrence and (or) spread of diseases, their early detection, identification of the causes and conditions for their occurrence and development, as well as aimed at eliminating the harmful effects on human health environmental factors.

**Radioactive contamination** - contamination of the surface of the earth, atmosphere, water or food, food raw materials, feed and various items with radioactive substances in quantities exceeding the level established by radiation safety standards.

**Radioactive substances** are substances whose atomic nuclei are capable of spontaneous decay.

**Risk** - the potential danger of obtaining undesirable (negative) results; the probability of causing harm to the life or health of citizens, property of individuals or legal entities, the environment, taking into account the severity of this harm.

**Consciousness** is one of the basic concepts of philosophy, sociology and psychology, denoting the ability to ideally reproduce reality, as well as the specific mechanisms and forms of such reproduction at its different levels; acts in two forms: individual (personal) and public.

**Means of protection** - means (industrial products, structures, etc.) designed or adapted to prevent, eliminate or reduce the impact on people of dangerous and harmful factors of the environment (natural or industrial) environment, as well as combat weapons.

**disaster** is a catastrophic natural phenomenon (process) that can cause numerous casualties, significant material damage and other severe consequences.

**Terrorism** is the commission of actions that create a danger of death of people, causing significant property damage or the onset of other socially dangerous consequences, if these actions are committed in order to violate public safety, intimidate the population or influence decision-making by authorities, as well as the threat of these actions in those the same purposes.

**Technosphere** - a region of the biosphere in the past, transformed by people with the help of direct or indirect impact of technical means in order to best suit their material and socio-economic needs.

**Toxic substances** (from the Greek toxicon - poison) are substances capable of causing disease or death when they enter the human or animal body.

**Trauma** is a violation of the anatomical integrity or physiological functions of human tissues or organs, caused by a sudden external influence.

**Shelter** - a protective structure in which conditions are provided for sheltering people for a certain time in order to protect them from modern weapons, damaging factors and the effects of hazardous chemical and radioactive substances.

**Damage** - the result of a change in the state of objects, expressed in violation of their integrity or deterioration of other properties; actual or possible economic and social losses (deviation of a person's health from the average value, i.e. his illness or death; disruption of the process of normal economic activity; loss of one or another type of property; deterioration of the natural environment, etc.) resulting from some events, phenomena, actions; total or partial loss of health or death of a person, loss of property or other material, cultural, historical or natural values.

**A chemically hazardous facility** is a facility where hazardous chemicals are produced, processed, stored or transported, in the event of an accident or destruction at which air, terrain and objects located on it can be contaminated, which poses a danger to people, animals and plants.

**Chemical weapons** are one of the types of weapons of mass destruction, the action of which is based on the use of military toxic chemicals.

**An emergency situation (ES)** is a condition in which the normal conditions of life and activity of people are violated at an object, a certain territory or water area, a threat to their life and health arises, damage is caused to the property of the population, the national economy and the natural environment.

**Environmental risk** is the probability of environmental degradation or its transition to an unstable state as a result of current or planned economic activity.

**Emotions** (from Latin emoveo - shake, excite) - subjective reactions of humans and animals to the impact of internal and external stimuli, manifested in the form of pleasure or displeasure, joy, fear, etc.

**Entropy** (from the Greek entropia - rotation, transformation) - a measure of the probability of a system being in a given state; a measure of disorder in a system. Entropy taken with the opposite sign is called negentropy.

An epidemic situation is the state of the prevalence of an infectious disease of people in a specific area in a certain period of time.

**An epidemic** is a mass spread of an infectious disease of people that progresses in time and space within a certain region, significantly exceeding the incidence rate usually recorded in a given territory.

**Epizootics** (from the Greek epi - location above something, on top of something, inside something and zoon - animal) - the incidence of animals with an infectious disease, significantly exceeding the usual level of incidence in a given territory.

1

**Epiphytotic** (from the Greek epi - location above something, on top of something, inside something and phyton - plant, shoot) - the incidence of plants with

an infectious disease, significantly exceeding the usual level of its incidence in a given area.

**Ergonomics** (from the Greek ergon - work and nomos - law) is the science of adapting workplaces, objects and objects of labor, based on the physical and mental characteristics of the human body, for the safest and most efficient work of an employee and optimizing the overall performance of the system.

**Erosion** (from Latin erosio - corrosive) - destruction, erosion of rocks and soils by flowing waters.

## 14 BJD TESTS

1. Define the concept of "Life safety"

- A. Life safety is a field of scientific knowledge that studies the dangers and ways to protect a person from them in any conditions of existence.
- B. Life safety is a field of scientific knowledge that studies the issues of labor safety.
- B. Life safety is the science of hazards and methods of protection against them.
- D. Life safety is a field of scientific knowledge that studies the human environment

2. What is a habitat

- A. Habitat is the environment surrounding a person, determined by a combination of factors (physical, chemical, biological, informational, social, etc.) that have a direct or indirect, immediate or long-term impact on human life, the health of him and his descendants.
- B. Habitat is the environment surrounding a person, determined by a combination of factors (production) that have a direct or indirect, immediate or long-term impact on the life of a person, the health of him and his descendants.
- C. Habitat is the environment surrounding a person, determined by a combination of factors (technogenic) that have a direct or indirect, immediate or long-term impact on the life of a person, the health of him and his descendants.
- D. Habitat is the environment surrounding a person, determined by a combination of material factors that have a direct or indirect, immediate or long-term impact on the life of a person, the health of him and his descendants.

3. What is the technosphere?

- A. Technosphere - a part of the biosphere, in the past transformed by people with the help of direct or indirect impact of technical means in order to meet their socio-economic needs.
- B. Technosphere - a part of the lithosphere, in the past transformed by people with the help of direct or indirect impact of technical means in order to meet their socio-economic needs.
- B. Technosphere - a part of the biosphere, in the past transformed by people with the help of direct or indirect impact of technical means in order to change nature
- D. Technosphere - a part of the biosphere, in the past transformed by people with the help of direct or indirect impact on the environment in order to meet their socio-economic needs.

4. What is a harmful factor?

- A. Harmful factors can lead to a deterioration in well-being, increased fatigue, decreased performance or the development of a disease
- B. Harmful factors can lead to a deterioration in well-being, increased fatigue, and a decrease in knowledge in the field of labor safety
- C. Harmful factors can lead to a deterioration in well-being, increased fatigue, and a decrease in performance.
- D. Harmful factors can lead to a deterioration in well-being, increased fatigue, and a decrease in labor productivity.

5. What is a hazard?

- A. Hazardous factors can lead to injury or a sharp deterioration in health, up to death
- B. Dangerous factors can lead to deterioration of health, increased fatigue, decreased performance
- B. Hazards can cause injury or dizziness
- D. Hazards can lead to a decrease in the performance of workers

6. How do you understand the term "risk"?

- A. The measure of hazard is risk - a value that takes into account the likelihood of a hazard and the damage it causes
- B. Risk is the potential hazard created by the environment.
- B. A measure of danger is risk - a value that takes into account the likelihood of a hazard in emergency situations
- D. Risk is a possible danger created by anthropogenic factors.

7. How do you understand the term "Individual risk"?

- A. Individual risk - the probability of the realization of a hazard with an impact on an individual person.
- B. Individual risk - the probability of a hazard realizing with an impact on a group of people
- B. Individual risk is the totality of possible hazards.
- D. Individual risk - the probability of the implementation of hazardous production factors per person.

eight. How do you understand the terms "danger"?

- A. Danger - a negative property of living and inanimate matter, capable of harming matter itself
- B. Danger - a negative property of the human environment
- B. Hazard - a negative property of the industrial environment
- D. Danger - a negative property of living and natural matter, capable of harming matter itself

9. What is the purpose of the discipline "Life Safety"

- A. The purpose of the BZD is to protect a person from external negative impacts of anthropogenic, technogenic and natural origin
- B. The purpose of the BZD is to protect people from emergencies
- B. Purpose of the BZD is to study the issues of environmental safety
- G. The purpose of the BZD is to protect a person from external negative influences in industry

10. What is the biosphere?

- A. Biosphere - the area of distribution of life on Earth, covering the lower layers of the atmosphere and the upper layers of the hydrosphere and lithosphere.
- B. Biosphere - the area of distribution of life on Earth, covering the lower layers of the noxosphere and the upper layers of the hydrosphere and lithosphere.
- B. Biosphere - the area of distribution of life on Earth, covering the lower layers of the atmosphere and lithosphere.
- D. Biosphere - the area of distribution of life on Earth, covering the upper layers of the hydrosphere and lithosphere.

11. What do you understand by the culture of life safety?

- A. Culture of life safety is a certain level of development of a person and society, characterized by knowledge of safe behavior in everyday life and in dangerous and emergency situations, the degree of protection from threats and dangers in all spheres of life.
- B. Culture of life safety is a certain level of development of a person and society, characterized by knowledge of safe behavior in production
- B. Life safety culture is the degree of protection against threats and dangers in all areas of life
- D. Life safety culture is the knowledge of safe behavior in everyday life and in hazardous and emergency situations

12. What are the main negative factors of the technosphere do you know

- A. Harmful, hard, strenuous work associated with human activity in the production environment; environmental pollution from enterprise emissions and their impact on humans; high risk of death or damage to human health at work
- B. Harmful, hard, strenuous work associated with human activity in the urban environment; environmental pollution from enterprise emissions and their impact on humans; high risk of death or damage to human health at work
- AT. Harmful, hard, strenuous work associated with human activities in the domestic environment; environmental pollution from enterprise emissions and their impact on humans; high risk of death or damage to human health at work
- G. Harmful, hard, strenuous work associated with human activity in the production environment; environmental pollution from enterprise emissions and their impact on humans; high risk of death or damage to human health in transport

13. Can the technosphere exist without the biosphere?

BUT. The biosphere existed and can exist without the technosphere, but the technosphere cannot exist without the biosphere - the resources of production and the living conditions of people.

B. The biosphere did not exist and cannot exist without the technosphere, but the technosphere cannot exist without the biosphere - the resources of production and the living conditions of people.

B. The biosphere existed and can exist without the technosphere, but the technosphere can exist without the biosphere - the resources of production and the living conditions of people.

G. Maybe

14. How is the development of the technosphere carried out?

A. The development of the technosphere is carried out due to the destruction of the natural environment and the displacement of natural ecosystems of the biosphere

B. The development of the technosphere is carried out due to the destruction of the industrial environment and the displacement of natural ecosystems of the biosphere

C. The development of the technosphere is carried out due to the destruction of the natural environment and the displacement of natural ecosystems of the lithosphere

D. The development of the technosphere is carried out due to the destruction of the natural environment and the displacement of the natural ecosystems of the noxosphere

15. What is the main among the numerous areas of interaction between the technosphere and the biosphere?

A. - population growth;  
- consumption of natural resources;  
- pollution of the biosphere.

B. - population growth;  
- consumption of energy resources;  
- pollution of the biosphere.

V. - population growth;  
- consumption of natural resources;  
- urban pollution.

G. - the growth of industry;  
- consumption of natural resources;  
- pollution of the biosphere.

16. What is the problem of increasing world population?

A. The increase in the world's population creates significant problems. A person needs a place to live, a place to work. But most importantly, billions of people need a huge amount of food.

B. The increase in the population of the planet does not create significant problems.

C. The increase in the world's population creates significant problems. A person needs a place to live, a place to work. But most importantly, billions of people need a huge number of vehicles.

D. The increase in the world's population creates significant problems. A person needs a job. But most importantly, billions of people need a huge amount of food.

17. What is the reason for the deterioration (degradation) of the earth on a global scale?

A. The world is experiencing deterioration, or degradation, of land. Thus, due to erosion, 6-7 million hectares are annually taken out of agricultural circulation, and bogging and salinization take another 1.5 million hectares out of land use.

B. There is no deterioration, or degradation, of land in the world.

C. There is deterioration, or degradation, of land in the world. This is due to the use of chemical mineral fertilizers.

D. The world is experiencing deterioration, or degradation, of land and due to the irrational use of natural resources

18. How do you understand the pollution of the biosphere?

A. *Pollution* is the entry into the environment of any solid, liquid and gaseous substances, microorganisms or energies (in the form of sounds, noise, radiation) in quantities harmful to human health, animals, the state of plants and ecosystems

B. *Pollution* is the entry into the environment of any household waste or energy (in the form of sounds, noise, radiation) in quantities that are harmful to human health, animals, the state of plants and ecosystems

C. *Pollution* is the entry into the environment of any solid, liquid and gaseous substances, microorganisms or energies (in the form of sounds, noise, radiation) in quantities that are not harmful to human health, animals, the state of plants and ecosystems

G. *I don't know*

19. What is anthropogenic pollution of the atmosphere?

A. Anthropogenic ( environmental impact caused by human activities)

*Atmospheric pollution* is caused by the burning of all types of natural fuels, the activities of metallurgical and chemical enterprises.

B. Anthropogenic ( environmental impact caused by human activities) *air pollution* is caused by the use of road transport

B. Anthropogenic *pollution of the atmosphere* is caused by the combustion of all types of natural fuels, the activities of woodworking enterprises

G. Anthropogenic ( environmental impact caused by human activity) *air pollution* due to urban environment

20. What is acid rain?

A. *Acid rain* is all types of meteorological precipitation - snow, rain, hail, fog, sleet - in which there is a decrease in the pH value of rainfall due to acid oxide air pollution , resulting from emissions of oxides into the atmosphere nitrogen, sulfur and other chemical compounds.

B. *Acid rain* is all types of meteorological precipitation - snow, rain, hail, fog, sleet - in which there is a decrease in the oxygen index (pH) of rainfall due to acid oxide air

pollution, resulting from emissions of oxides into the atmosphere nitrogen, sulfur and other chemical compounds

B. *Acid rain* is all types of meteorological precipitation - snow, rain, hail, fog, sleet - in which there is a decrease in the pH value (p N) of rainfall due to air pollution by acid oxides formed as a result of emissions into the atmosphere oxides of nitrogen, sulfur and other chemical compounds

G. *I don't know*

21. What is a work environment?

A. *The working environment* is the environment in which the employee conducts his professional activities or the set of conditions in which work is performed.

B. *The working environment* is a workplace within which an employee conducts his professional activities or a set of conditions in which work is performed.

B. *The working environment* is the premises within which the employee conducts his professional activities or the set of conditions in which work is performed.

D. *The working environment* is part of the technosphere

22. What are the carriers of negative factors of the working environment?

A. The main carriers of negative factors of the production environment are technical devices (for example, machines, equipment, etc.), chemically and biologically active objects of labor, energy sources, unregulated actions of workers, violations of regimes and organization of activities, as well as deviations from the norms of parameters working area.

B. The main carriers of negative factors of the production environment are transport devices, chemically and biologically active objects of labor, energy sources, unregulated actions of workers, violations of regimes and organization of activities, as well as deviations from the norms of the parameters of the working area.

C. The main carriers of negative factors of the production environment are equipment, biologically active objects of labor, energy sources, unregulated actions of workers, violations of regimes and organization of activities, as well as deviations from the norms of the parameters of the working area.

D. The main carriers of negative factors of the production environment are technical devices (for example, machines, equipment, etc.), chemically and biologically active objects of labor, energy sources, regulated actions of workers, violations of regimes and organization of activities, as well as deviations from the norms of parameters working area.

23. Define the term "occupational disease"

A. Occupational diseases are diseases resulting from the impact of a harmful production factor on an employee.

B. Occupational diseases are diseases resulting from the impact of a negative factor on an employee.

- C. Occupational diseases are diseases resulting from exposure to a chemical factor on an employee.
- D. Occupational diseases are diseases resulting from the exposure of a worker to dust and vibration.

24. Define the concept of "Trauma"

- A. Trauma - damage to organs and tissues of the human body resulting from external influences.
- B. Trauma - damage to organs and tissues of the human body resulting from external impact with sharp objects
- B. Trauma - damage to organs and tissues of the human body resulting from exposure to current
- D. Injury - damage to organs and tissues of the human body resulting from the impact of rotating parts of equipment

25. What formula is used to determine the injury frequency coefficient  $K_f$  at work

- A.  $K_H \cdot (T \times 1000) / P$
- B.  $K_H \cdot (T \times 1000) / F$
- V.  $K_H \cdot (T \times 1000) / C$
- G.  $K_H \cdot (T \times 1000) / A$

26. What formula is used to determine the injury frequency coefficient  $K_t$  at work

- A.  $K_T = D/T$
- B.  $K_T = D/A$
- B.  $K_T \cdot A / T$
- G.  $K_p \cdot D / T$

27. Define the concept of "Industrial zones"

- A. *Industrial zones* are territories where various industrial facilities are concentrated. They are the main sources of environmental pollution
- B. *Industrial zones* are territories where various urban facilities are concentrated. They are the main sources of environmental pollution
- B. *Industrial zones* are territories where various industrial equipment is concentrated.
- D. *Industrial zones* are territories where various industrial facilities are concentrated. They are not the main sources of environmental pollution

28. What are the functional zones of the urban habitat?

- A. As the city develops, its functional zones are more and more differentiated (separation): industrial, residential, forest park.
- B. As the city develops, its functional zones are more and more differentiated (separation): industrial, residential, residential.
- C. As the city develops, its functional zones are increasingly differentiated (separation): industrial, transport, forest park

D. As the city develops, its functional zones are more and more differentiated (separation): industrial, cultural, forest park

29. Define the concept of "domestic habitat"

A. Living environment - space outside the labor activity of a person

B. Domestic habitat - the space where human labor activity is carried out

B. Living environment - a space associated with human cultural activities

D. Living environment - space associated with human recreation

30. Why is the dust contained in the apartment air dangerous?

A. The dust contained in the apartment air is much more dangerous than street dust, since it is the strongest allergen containing 35% minerals; 20% - scales of human skin; 20% - microspores, fungi, micromites adsorbed on the surface of dust particles; 15% - paper and textile fibers; 7% - pollen of flowers; 3% - particles of soot and smoke.

B. The dust contained in the apartment air is much more dangerous than street dust, since it is not the strongest allergen containing 35% minerals; 20% - scales of human skin; 20% - microspores, fungi, micromites adsorbed on the surface of dust particles; 15% - paper and textile fibers; 7% - pollen of flowers; 3% - particles of soot and smoke.

B. Dust contained in indoor air, compared to outdoor air, is not hazardous.

D. The dust contained in the apartment air does not contain harmful substances.

31. What social factors have a special place in human security?

A. The level of well-being, general culture, service culture, living conditions, customs, mores, behavioral preferences, moral and emotional characteristics

B. Level of service culture development, living conditions, customs, mores, behavioral preferences, moral and emotional characteristics

B. The level of well-being, general culture, service culture, living conditions, customs, mores, weddings.

D. The level of well-being, general culture, service culture, living conditions, customs, mores, climatic conditions

32. What is an emergency?

A. An emergency situation is a state in which, as a result of the occurrence of a source of an emergency situation at an object, a certain territory or water area, the normal conditions of life and activity of people are violated, their life and health are threatened, property of the population, economic facilities and the natural environment are damaged.

B. An emergency situation is a state in which, as a result of the occurrence of a source of an emergency situation at an object, a certain territory or water area, the normal conditions of life and activity of people are not violated, there is a threat to their life and health, damage is caused to property of the population, economic facilities and the natural environment

C. An emergency situation is a condition in which, as a result of the occurrence of a source of an emergency situation at an object, a certain territory or water area, the normal conditions of life and activity of people are violated, there is no threat to their

life and health, damage is caused to property of the population, economic facilities and the natural environment

D. An emergency situation is a state in which, as a result of the occurrence of a source of an emergency situation at an object, a certain territory or water area, the normal conditions of life and activity of people are violated, there is a threat to their life and health, but there is no damage to the property of the population, objects of the economy and the environment natural environment

33. What is the source of emergency

A. Source of emergency (ES) - a dangerous natural phenomenon, an accident or a dangerous man-made incident, a widespread infectious disease of people, farm animals and plants, as well as the use of modern means of destruction, as a result of which an emergency has occurred or may occur.

B. Source of emergency (CHS) - a dangerous natural phenomenon, an accident or a dangerous man-made incident, widespread customs of people, as well as the use of modern means of destruction, as a result of which an emergency has occurred or may occur

C. Source of emergency (ES) - a widespread infectious disease of people, farm animals and plants, as a result of which an emergency has occurred or may occur

D. Source of emergency (ES) - a dangerous natural phenomenon, an accident or a dangerous man-made incident, as well as the use of modern means of destruction, as a result of which an emergency has occurred or may occur

34. What types of emergency situations are divided into?

A. natural, man-made, biological and social, environmental, military

B. natural, man-made, biological, socio-political, environmental, military

B. natural, man-made, biological and social, economic, military

D. technogenic, biological and social, environmental, military

35. What emergencies are man-made?

A. Technogenic include emergencies caused by explosions, fires, chemical, radiation, transport, hydrodynamic accidents, etc.

B. Technogenic include emergencies caused by explosions, fires, chemical, social, transport, hydrodynamic accidents, etc.

C. Technogenic include emergencies caused by equipment failures in industrial enterprises, etc.

D. Man-caused emergencies include emergencies not caused by explosions, fires, chemical, radiation, transport, hydrodynamic accidents, etc.

36. What is a fire?

A. A fire is an out of control burning process that destroys material values and poses a threat to human life and health.

B. A fire is an out-of-control combustion process that does not destroy material values and does not pose a threat to human life and health.

AT. A fire is a process of burning the material values of people that has gone out of control.

D. A fire is a burning process that has not gone out of control, does not destroy material values and poses a threat to human life and health.

37. Define the term "Chemical accident"

A. A chemical accident is a violation of technological processes in production, damage to pipelines, tanks, storage facilities, vehicles, leading to the release of emergency chemically hazardous substances (AHOV) into the atmosphere in quantities that pose a threat to human life and health, the functioning of the biosphere

B. A chemical accident is a violation of the technological regime that poses a danger to human life and health, the functioning of the biosphere

C. A chemical accident is a violation of technological processes in production, leading to a disruption in the functioning of the biosphere

G. A chemical accident is an explosion of containers, storages, vehicles, leading to the release of emergency chemically hazardous substances (AHOV) into the atmosphere

38. What is a hydrodynamic accident?

A. A hydrodynamic accident is an emergency event associated with the failure (destruction) of a hydraulic structure or part of it, and the uncontrolled movement of large masses of water, causing destruction and flooding of vast areas.

B. A hydrodynamic accident is an emergency event associated with the failure (destruction) of a hydraulic structure or part of it, and the uncontrolled movement of large masses of water, causing destruction and flooding of agricultural areas.

C. A hydrodynamic accident is an emergency event associated with the failure (destruction) of an agrotechnical structure or part of it, and the uncontrolled movement of large masses of water, causing destruction and flooding of vast areas.

D. A hydrodynamic accident is an emergency event associated with the failure (destruction) of a hydraulic structure or part of it, and the uncontrolled movement of large masses of soil, causing destruction and flooding of vast areas.

39. What type of transport is the safest?

A. Traveling by train is about three times safer than traveling by plane and 10 times safer than traveling by car

B. Traveling in a car is about three times safer than traveling by plane and 10 times safer than traveling by train

B. Air transport

G. Automotive

40. Define the concept of " Natural disaster"?

A. A natural disaster is a phenomenon that does not depend on the will of a person, is not related to his activities, and occurs as a result of sudden changes in the parameters of the natural environment.

B. A natural disaster is a phenomenon that depends on the will of a person, not related to his activities, occurring as a result of sudden changes in the parameters of the natural environment.

B. A natural disaster is a phenomenon that does not depend on the will of a person, is not related to his activities, and occurs as a result of abrupt changes in the parameters of the urban environment.

D. A natural disaster is a phenomenon that does not depend on the will of a person, is not related to his activities, and occurs as a result of sudden changes in the parameters of the surrounding household environment.

41. What is a flood?

A. Flooding is a significant flooding of the area as a result of a rise in the water level in a river, lake or sea during the period of snowmelt, heavy rains, wind surges of water, during traffic jams, blockages, hydraulic accidents, etc.

B. Flooding is a significant flooding of industrial enterprises as a result of a rise in the water level in a river, lake or sea during the period of snowmelt, heavy rains, wind surges of water, during traffic jams, blockages, etc.

C. Flooding is a significant flooding of agricultural areas as a result of a rise in the water level in a river, lake or sea during the period of snowmelt, heavy rains, wind surges of water, during traffic jams, ice dams, etc.

D. Flooding is a significant flooding of an area as a result of a rise in the water level in a river, lake or sea.

42. What is an earthquake?

A. Earthquakes are tremors and vibrations of the earth's surface, resulting from sudden displacements and ruptures in the earth's crust or upper mantle and transmitted over long distances in the form of elastic vibrations.

B. An earthquake is an earth tremor and vibration of the earth's surface, resulting from sudden displacements and ruptures in the lithosphere or upper mantle and transmitted over long distances in the form of elastic vibrations.

B. An earthquake is an earth tremor and vibration in nature, resulting from sudden displacements and ruptures in the earth and transmitted over long distances in the form of elastic vibrations.

D. An earthquake is an earth tremor and vibration of the earth's surface, and is transmitted over long distances in the form of elastic deformation.

43. What should be provided to trainees for the period of work experience?

A. For the period of internship at the workplace, students must be provided with instructions on labor protection for workers of the relevant profession, personal protective equipment

B. For the period of practical training at the workplace, students must be provided with instructions on labor protection) for workers of the corresponding profession, food coupons

- C. For the period of internship at the workplace, students must be provided with personal protective equipment
- D. For the period of internship at the workplace, students must be provided with instructions for the internship, personal protective equipment

44. What is labor protection?

- A. Occupational safety - a system of legal, socio-economic, organizational, technical, sanitary and hygienic, medical and preventive, rehabilitation measures and means to ensure safety, preserve life and health, and work capacity of a person in the process of work.
- B. Occupational safety - a system of legal, socio-ecological, organizational, technical, sanitary and hygienic, medical, preventive, rehabilitation measures and means to ensure safety, preserve life and health, and human performance in the labor process.
- C. Occupational safety - a system of legal, socio-economic, organizational, technical, sanitary and hygienic, medical and preventive, rehabilitation measures and means aimed at the safe performance of work in production
- D. Occupational safety - a system of legal, socio-economic, organizational, household, sanitary-hygienic, treatment-and-prophylactic, rehabilitation measures and means to ensure the working capacity of a person in the labor process.

45. What is the maximum allowable concentration (MAC)?

- A. The maximum permissible concentration is the concentration of harmful substances, which, during daily (except weekends) work throughout the entire working experience, cannot cause diseases or deviations in the state of health
- B. The maximum allowable concentration is the concentration that, during daily work during the entire work experience, cannot cause employee fatigue.
- AT. The maximum allowable concentration is the concentration that, during daily (except weekends) work throughout the entire working experience, cannot cause injuries in the process of work.
- D. The maximum allowable concentration is the concentration that, during daily work throughout the working day, cannot cause human diseases.

46. What parameters characterize the microclimate of workplaces?

- A. Microclimate is the climate of the internal environment of the room, which combines such parameters of the air environment as temperature, relative humidity and air speed
- B. Microclimate is the climate of the internal environment of the room, which combines such parameters of the air environment as temperature, relative humidity and dust movement speed
- C. Microclimate is the climate of the internal environment of the room, which combines such parameters of the air environment as temperature, relative radiation level and air velocity

D. Microclimate is the climate of the internal environment of the room, which combines such parameters of the air environment as temperature, vibration and air speed

47. According to the factors of the working environment, working conditions are divided into what classes?

A. optimal working conditions, permissible working conditions, harmful working conditions, dangerous working conditions

B. optimal working conditions, acceptable working conditions, harmful working conditions, difficult working conditions

B. optimal working conditions, harmful working conditions, dangerous working conditions

D. optimal working conditions, harmful working conditions, dangerous working conditions

48. What types of physical negative production factors do you know?

A. moving, rotating parts of equipment, high surface temperature, hot metal, electric current, sharp metal edges, working at height, the possibility of fire, explosion hazard, microclimate mismatch, heat radiation, noise, vibration, ultrasound, electromagnetic radiation, non-compliance with lighting standards and etc.

B. moving, rotating parts of equipment, high surface temperature, hot metal, electric current, sharp metal edges, working at height, the possibility of fire, explosiveness, microclimate mismatch, heat radiation, noise, vibration, ultrasound, chemical fluids, non-compliance with lighting standards and etc.

B. moving, rotating parts of equipment, high surface temperature, hot metal, electric current, sharp metal edges, neuropsychic stress

D. moving, rotating parts of equipment, high surface temperature, hot metal, electric current, sharp metal edges, working at height, dust, heat radiation, noise, vibration, ultrasound, electromagnetic radiation, non-compliance with lighting standards, etc.

49. What measures should be taken to protect against moving and rotating parts of equipment in production?

A. Guards and warning signs should be installed to protect workers from moving and rotating parts of equipment. Guards must completely prevent people from entering the danger zone, the possibility of catching clothes and other foreign objects.

B. Posters and warning signs should be posted to protect workers from moving and rotating parts of equipment.

C. To protect workers from moving and rotating parts of the equipment, it is necessary to instruct

D. To protect workers from moving and rotating parts of the equipment, a barrier and warning signs should be installed.

1

50. What explains the difference in skin resistance values in different parts of the human body?

- A. - different thickness of the stratum corneum of the skin;
- uneven distribution of sweat glands on the surface of the body;
- unequal degree of filling with blood vessels of the skin.
- B. - different thickness of the stratum corneum of the skin;
- uneven distribution of sweat glands on the surface of the body;
  
- V. - different thickness of the stratum corneum of the skin;
- unequal degree of filling with blood vessels of the skin.
- G. - different thickness of the stratum corneum of the skin;
- uneven distribution of sweat glands on the surface of the body;
- human mood

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