



**NATIONAL UNIVERSITY OF LIFE AND
ENVIRONMENTAL SCIENCES OF
UKRAINE**

L. PISKUNOVA, T. ZUBOK, I. PRYIMACHENKO

SAFETY OF WORK AND LIFE

**Training manual
for the discipline « Safety of work and Life»
for students majoring in 291 "International
Relations, Public Communications and Regional
Studies"**

Kyiv - 2023

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Educational and methodical manual graduate students and teaching staff, developed on the basis of the program (tentative), approved at a meeting of scientific Methodical Council of the Scientific and Methodological Center "Agrosvita" of the Ministry of Education and Science of Ukraine dated 22.06.2016, № 6.

The main sections and topics are defined by the order of study of normative disciplines on life safety, labor protection and civil protection provided by the current Law of Ukraine "On labor protection" (21.11.2002 № 229-IV), Article 18 and regulations of Ukraine: Code of Civil Protection of Ukraine, and also normative-legal act on labor protection NPAOP 0.00-4.12-05 "Standard provision on the procedure for training and testing of knowledge on labor protection", p.2; Regulations on the procedure for training and testing of knowledge on health and safety in institutions, establishments, organizations.

The proposed textbook should help teachers and students in the study of this discipline, to form a preventive direction of thinking and professional activity of the future specialist.

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FOREWORD

At the turn of the millennium, there was an understanding of the need for knowledge and education in the field of occupational safety and human life. Socio-economic and environmental crisis in society, which has led to a catastrophic decline in living standards is growing. In recent years, there has been a steady trend of deteriorating health in Ukraine; every year the number of factors that negatively affect a person increases. This leads to an increase in the number of people, especially young people, with functional diseases and hereditary pathologies. This situation requires the immediate recovery the health of children, improving the culture of the individual, taking into account the importance of the behavioral component in the formation of health, which is consistent with the strategic program of the World Health Organization "Health for All in the XXI Century".

The importance of a systematic solution to issues in the field of labor protection is objectively determined by the general low level of labor safety in Ukraine. Effectively integrated management of labor protection and industrial safety is a necessary condition for solving these issues, because the study and solution of problems related to ensuring healthy and safe conditions, in which human labor takes place, is one of the most important tasks in developing new technologies and production systems [1].

Research and identification of possible causes of industrial accidents, occupational diseases, explosions, fires, and the development of measures and requirements aimed at eliminating these causes can create safe and favorable conditions for human labor. Comfortable and safe working conditions are one of the main factors that affect productivity and safety, health of workers.

The transformation of Ukrainian society through the development of production and the growth of economic activity, lead to increased man-made pressure on the environment and imbalance in the natural environment. In the last two decades, negative processes and phenomena have intensified, in particular landslides, mudslides, river banks are being destroyed, and the number of man-made accidents and catastrophes is growing. In the vast majority of regions of Ukraine, the provision of drinking water to the population is deteriorating. The concentration of some pollutants in many rivers, lakes and other bodies of water often exceeds the maximum allowable tens and hundreds of times.

The amount of pollutants entering the air from stationary sources tends to decrease, while the amount of pollution from road transport is growing rapidly. Over the past 5-6 years, it has become the largest polluter in large cities. Moreover, its contribution to total emissions into the atmosphere is

constantly growing. Industrial emissions from the chemical, petrochemical, oil refining and metallurgical industries, areas contaminated with radionuclides and pesticides have a negative impact on the health of the population, including children and, consequently, future generations.

In areas of chemical production, the incidence of the population is too high, as well as the number of complications during pregnancy and childbirth, congenital malformations, stillbirths and so on. The incidence of malignant neoplasms is constantly growing among the inhabitants of radiation and chemically contaminated areas. At the same time, the mere statement of the dangers posed by pollution and waste for present and future generations does not make it possible to eliminate the causes of the deep ecological crisis that has engulfed almost the entire territory of Ukraine.

A fundamentally new ecological and economic thinking must be formed. Without the approval of such thinking among managers at all levels, in fact, it is impossible to count on the creation in our country of a highly efficient, socially oriented and environmentally safe structure and model of the economic complex. According to the current legislation, ensuring security on the territory of Ukraine is a direct responsibility of both public administration structures and each citizen individually, including those engaged in private business. The Constitution of Ukraine stipulates, in particular, that everyone not only "has the right to a safe environment for life and health and for compensation for damage caused by violation of this right" (Article 50), but also "is obliged not to harm nature, to compensate losses "(Article 66) [9.10].

The proposed textbook is developed on the basis of the program (indicative), approved at the meeting of the scientific-methodical council of the Scientific-methodical center "Agrosvita" of the Ministry of Education and Science of Ukraine from 22.06.2016, №6 and on the basis of the Standard program approved by the scientific-methodical commission.

The textbook presents the main sections of the theoretical material of occupational safety and life, which correspond to the specified programs of the discipline. The main methods of determination are collected, which allow to practically master the course of occupational safety and life, as a set of relationships in the ergot system "man-machine - living environment" of different levels. Considerable attention is paid to man, his physiological and psychological characteristics, medical, biological and social health problems, dangerous and harmful working conditions, safety, measures to prevent occupational injuries and diseases and the normalization of working conditions; a systematic approach for creating an effective labor protection management system (LPMS).

The textbook includes, after each section, practical and laboratory classes, which are aimed at in-depth study of occupational safety and health for students to acquire knowledge, skills and abilities (competencies) to effectively solve professional problems with mandatory consideration of occupational safety and health preservation and efficiency of employees in various fields of professional activity.

The textbook was written by:

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The authors will be grateful for all comments and suggestions for improving the content and structure of the textbook in future editions.

1. General principles of occupational safety and life safety

1.1. Categorical-conceptual apparatus for life safety, taxonomy of dangers

1.1.1. Scientific principles of creating life safety

According to modern ideas, *life safety* is a field of knowledge that studies the dangers that threaten a person in everyday life (at home, on the street, at work, on vacation) and in emergencies (accidents, man-made and natural disasters, etc.) and methods of protection from them[1].

As a complex category, it covers human life and activities in interaction with the environment (natural and artificial). Undoubtedly, the safety of life today is a multifaceted object of understanding and perception of reality, which requires the integration of different strategies, areas, aspects, forms and levels of knowledge. The components of this field are various security sciences that have a worldview and professional nature:

- humanities (philosophy, theology, linguistics);
- natural sciences (mathematics, physics, chemistry, biology);
- engineering sciences (resistance of materials, engineering, electronics);

- human sciences (medicine, psychology, ergonomics, pedagogy);
- social sciences (sociology, economics, law).

LS accumulates those achievements that allow an individual to realize their potential without harming himself or herself, the environment or society.

The purpose of LS education is to prepare a person for active participation in ensuring a long and full life in a dynamically changing society. According to the main tasks of such education are:

- formation of human culture concerning security, its moral values, views, behavior, etc;
- ensuring a certain state of individual security through the formation and development of those qualities of a person that contribute to the development of security, as well as the necessary knowledge and skills;
- intensification of methodical, scientific and other forms of educational work in the direction of BJD both in educational institutions and outside them;
- assistance in improving the efficiency of the state system for public safety by educating and preparing people for their adequate interaction, active position on improving the state system, including the legislative sphere;
- improving the management of education of all segments of the population according to the criteria of the direction of BJD.

The object of the educational direction of BJD is considered to be the safety of the person as a phenomenon, and *the subject* - safety models. Thus, such education prepares a person for a full life with active participation in ensuring the level of security that depends on the environment (environment, life, transport, leisure, production, social relations, etc.); the state system of support of human security (fire protection, law enforcement agencies, civil defense, labor protection, health protection, etc.) and individual protection of the person (psychological state, motivation, skills, individual means of protection, etc.).

1.2. Fundamentals of labor protection legislation

1.2.1. The concept, purpose and objectives of labor protection

The Verkhovna Rada of Ukraine adopted the Law of Ukraine “On Labor Protection” (as amended by Law № 229-IV of November 21, 2002 - BBP. -2003. - № 2. - Article 10). [9,10].

This Law defines the basic provisions for the implementation of the constitutional right of employees to have a protection of their life and health in the process of work, appropriate, safe and healthy working conditions, regulates with the participation of relevant public authorities relations between employer and employee on safety, occupational health and production environment and establishes a single procedure for the organization of labor protection in Ukraine.

According to Art. 1 of the Law of Ukraine "On labor protection" there are certain concepts and terms.

Occupational Health – it is a system of legal, socio-economic, organizational-technical, sanitary-hygienic, treatment-and-prophylactic measures and means aimed at preserving human life, health and ability to work in the process of labor activity.

Employer – the owner of the enterprise, institution, organization or its authorized body, regardless of ownership, type of activity, management, and an individual who uses hired labor.

Employee – a person who works at an enterprise, organization, institution and performs duties or functions in accordance with the employment agreement (contract).

This Law applies to all legal entities and individuals who use hired labor in accordance with the law, and to all employees.

Legislation on labor protection consists of the Law "On labor protection", the Labor Code of Ukraine, the Law of Ukraine "On compulsory state social insurance against accidents at work and occupational diseases that caused disability" and adopted in accordance with their regulations. legal acts.

Labor protection contains three main components: legal norms of labor legislation in this area, industrial sanitation, hygiene and safety of production processes, as well as fire protection.

The purpose of labor protection – ensuring safe, harmless and favorable working conditions through the solution of many complex problems, the main of which are:

- design of enterprises, technological processes and design of equipment with mandatory compliance of labor protection requirements;
- finding the optimal ratio between the various factors of the production environment, which allows to ensure a minimum of adverse effects on the health of workers;
- establishment, legislative registration of certain norms of each of the unfavorable or dangerous factors, systematic control over their application;

- development of specific measures to improve working conditions and ensure their safety through the use in production of the latest advances in science and technology;

- the use of rational means of protection of workers from the effects of adverse factors of the production environment, as well as the implementation of organizational measures that neutralize or reduce the degree of their impact on the human body;

- development and application of methods and means of assessing the effectiveness of occupational safety measures, which are planned and implemented.

Successful solution of these problems involves the use of advances in science and technology, which directly or indirectly provide labor protection, in addition to socio-legal disciplines, and economics, technical aesthetics, engineering and social psychology, physiology. Assimilation of safety rules is based on deep knowledge of machines, mechanisms, production processes used in the tourist complex. Modern production requires that labor protection be based on scientific and technical basis. Increasing the level of mechanization and application of automation of production processes, which are the main means of technical progress, have not only economic but also social significance and meet the interests of workers. They greatly facilitate the work of workers, make it comfortable. To do this, the enterprises of municipal economy, energy, hotel and tourist complex and construction companies have great opportunities and reserves. The methodological basis of labor protection is a scientific analysis of working conditions, production and technological processes, production equipment, in terms of the possibility of dangerous harmful production factors. Based on this analysis, organizational, technical, sanitary, hygienic, socio-economic and other measures to prevent the effects of these factors on workers are developed[1,4].

1.2.2. Basic legislative acts on labor protection

The state policy of Ukraine on labor protection is based on the constitutional right of every citizen to appropriate safe and healthy working conditions and the priority of life and health of the employee in relation to the results of production activities. The implementation of this policy should ensure continuous improvement of working conditions and safety, reduction of injury and occupational diseases.

Ukraine has adopted and is implementing the National Program for Improving Occupational Safety, Health and the Working Environment, which was approved by the Cabinet of Ministers on October 10, 2001 (Order

№ 1320), on the basis of which sectoral and regional programs for improving occupational safety were developed.

On October 22, 2001, the Concept of Labor Protection Management № 432 was approved and implemented by the order of the Ministry of Labor, which defines the ways to reform the management of labor protection in Ukraine.

Ukraine has laws that define the rights and responsibilities of its residents, as well as the organizational structure of government and industry. The Constitution, the basic law of the state, was adopted by the Verkhovna Rada of Ukraine on June 28, 1996. It declares equal rights and freedoms to all residents of the country: free choice of work that meets safe and healthy conditions, rest, social protection in the case of disability and old age, and some others. All laws and regulations must be consistent, based on and consistent with the articles of the Constitution.

In the basic law of Ukraine - the Constitution, three articles are devoted to the issues of labor protection: 43, 45 and 46.

Article 43 of the Constitution declares, that everyone has the right to work, which includes the opportunity to earn a living by work which a person freely chooses or freely agrees to. Everyone has the right to safe and healthy working conditions, to a salary not lower than that prescribed by law. It is also emphasized that the use of women and adolescents in work which is dangerous to their health is prohibited.

Article 45 of the Constitution guarantees that employees have the right to rest by establishing annual basic and additional leave, providing mandatory weekly rest days, reduced working hours in hazardous conditions and night time

In the text of Article 46 of the Constitution it is about the right of citizens for social protection in case of complete or temporary disability, loss of breadwinner, unemployment, old age and other cases provided by law.

These articles of the Constitution are specified by the relevant legislative acts.

The general laws of Ukraine, which determine the basic provisions of labor protection are:

The Labour Code (LC)

Law of Ukraine "On labor protection" from 01.01.2003

The legal framework in the field of labor protection also includes the Laws of Ukraine:

"On compulsory state social insurance against accidents at work and occupational diseases that have caused disability",

"On compulsory social insurance in connection with temporary disability and expenses due to birth and burial",

"On health care",
"On fire safety",
"On the use of nuclear energy and radiation safety",
"On ensuring the sanitary and epidemic well-being of the population",
"On traffic"

1.2.3. Basic principles of state policy in the field of labor protection

The basic legislative document in the field of labor protection is the Law of Ukraine "On labor protection". It formulates the basic principles of state policy in the field of labor protection. They are as follows:

- Priority of life and health of employees in relation to the results of production activities;
- Full responsibility of the employer for creating appropriate safe and healthy working conditions;
- Improving the level of industrial safety by ensuring continuous technical control over the state of production, technology and products;
- Mandatory social protection of workers, full compensation for losses of victims of accidents at work or occupational diseases;
- Use of economic methods of labor protection management;
- Comprehensive solution of labor protection problems on the basis of national, sectoral and regional programs on this issue, taking into account economic and social policy, using the achievements of science and technology;
- Establishment of uniform standards for labor protection for all enterprises, regardless of ownership and activities;
- Informing the population, conducting training, professional training and advanced training of occupational safety specialists;
- Cooperation and consultations between employers and employees in making decisions on health and safety;
- International cooperation in the field of labor protection, use of world experience of work organization to improve working conditions and increase labor safety.

In practice, the principles of state policy in the field of labor protection are implemented by the relevant state bodies:

- National Council for Safe Living at the Cabinet of Ministers;
- State Labor Service of Ukraine and its territorial bodies, Expert and Technical Centers;
- Social Accident Insurance Fund;

- National Research Institute of Occupational Safety and Training and Methodological Centers;
- Relevant subdivisions in local executive bodies[1-4].

1.2.4. Regulations on labor protection

Special legislative acts are state intersectoral and sectoral regulations on labor protection:

- State regulations on labor protection (DNAOP), developed by the State Committee for Labor Protection Supervision
- Legal acts on labor protection (NPAOP), developed by Derzhgirpromnahlyad (now the State Labor Service of Ukraine);
- Interstate standards of the system of labor safety standards (GOST SSBP);
- State Standards of Ukraine (DSTU);
- Sanitary norms (SN);
- Sanitary norms and rules (DsanPiN, LTO);
- State building codes (SniP, DBN);
- Rules of construction of electrical installations (PBE - PUE);
- Rules of technical operation of consumer electrical installations (PTE);
- Safety rules for the operation of electrical installations (PTB);
- Radiation safety standards (NRB);
- Safety rules for the use of gases;
- other documents that give effect to legal norms that are mandatory for all institutions and employees of Ukraine.

In Ukraine, there is a provision on the creation of state regulations on labor protection - DNAOP. Now they are called normative legal acts on labor protection (NPAOP). These are rules, norms, instructions, regulations, provisions, standards and other types of state normative acts on labor protection, obligatory for execution and observance by the enterprises and establishments to which it extends scope of these acts.

NPAOP can be intersectoral and sectoral.

Intersectoral legal act on labor protection is an act of national use, the effect of which extends to all institutions and organizations, regardless of ownership or industry affiliation.

Sectoral regulatory act on labor protection is an act of national use, the effect of which extends to all institutions and organizations, regardless of ownership within a particular industry

Developed under the guidance and with the participation of specialists of the State Labor Service of Ukraine (State Labor) (formerly

Derzhgirpromnahlyad) by various institutions and organizations (on behalf of). Methodical guidance and coordination of this work is provided by the National Research Institute of Labor Protection.

Regulations on labor protection are coded in order to systematize accounting and machining. The block diagram of coding NPAOP is as follows:

NPAOP (abbreviated name) – A.AA – B.BB - CC

Where AAA - type of economic activity (group and class) according to the state qualifier DK-009-96 (NACE code) SQEA

B.BB - type of legal document and its serial number (within this type), and each type of document is assigned its own number (1 - rules, 2- lists, 3- norms, 4- provisions, 5- instructions, 6- orders, 7 - another type)

CC - the year of approval of the act

Approved state regulations are entered into the State Register of DNAOP, which is issued by the State Labor Service of Ukraine (State Labor) (formerly Derzhgirpromnahlyad). The register of regulations in force in Ukraine is constantly updated.

Among the normative legal acts on labor protection, the state standards of the labor safety system of the former USSR occupy an important place, which in accordance with the agreement between the CIS countries remained the Interstate Standards of SSBT. They allow to coordinate the legislation in the field of LP.

The current SSBT standards have a system code (12) and are divided into 5 groups, which are given the following code (subsystem code):

1. Organizational and methodological standards - 0.
2. Standards of requirements and norms by types of dangerous and harmful production factors - 1.
3. Standards of safety requirements for production equipment - 2.
4. Standards of safety requirements for production processes - 3.
5. Standards of requirements for means of protection of workers - 4.

Example of designation of the interstate standard: GOST 12.1.005-88 SSBT "General sanitary and hygienic requirements to air of a working zone", where GOST - State All-Union Standard (due to the fact that the standards were not translated into Ukrainian, the Russian abbreviation is used);

12 - labor safety standards;

1 - subsystem code;

005 - serial number of the standard in the subsystem;

88 - year of approval or revision and name of the standard.

Standards of SSBT subsystems "0,2,3,4" can be state, branch and republican, and subsystems "0" also standards of the enterprises

(associations). Industry and national standards establish requirements, norms and rules in accordance with state standards, taking into account the peculiarities of occupational safety in the industry or in the republic. Standards of subsystem "1", as a rule, should be state.

At the same time, state standards of Ukraine (DSTU) are gradually being developed in Ukraine. The following standards already apply in the field of labor protection: DSTU 2293-99 "Labor protection. Terms and definitions of basic concepts"; DSTU 2272-93 "Fire safety. Terms and definitions"; DSTU 3038-95 "Hygiene. Terms and definitions of basic concepts" and some others that are gradually replacing the still partially valid interstate standards "Systems of labor safety standards (SSBT)" (rus), which were developed during the Soviet era. They contain requirements, norms and rules aimed at ensuring safety, health and ability to work at work.

In addition to DSTU, GOST and DNAOP, in Ukraine there are: sanitary norms (SN), which contain requirements for industrial sanitation and occupational health; building norms and rules DBN (state building norms) or SNiP - (building norms and rules - the Russian abbreviation is applied) where requirements to buildings and constructions depending on their purpose and fire danger are stated. When considering fire safety, there may be references to ONTP - industry standards of technological design (in Russian) or ISO - international standards in force in Ukraine in accordance with the Agreement on International Cooperation of the CIS in matters of labor protection. The industry of Ukraine is coded according to the established codes.

1.3. State management of labor protection. Powers of the State Labor Service of Ukraine

According to Article 31 of the Law of Ukraine[9]. on labor protection, the state management of labor protection in Ukraine is carried out by the following bodies:

- Cabinet of Ministers of Ukraine. It is the highest state body that manages the OP;
- State Labor Service of Ukraine (State Labor Service) - the central executive body of Ukraine;
- Ministries and other central executive bodies;
- Local state administration, local councils of people's deputies and local self-government bodies.

The law contains rules of direct action that define the rights, responsibilities and powers of each body.

Cabinet of Ministers of Ukraine:

- Ensures the implementation of state policy in the field of labor protection;
- Submits to the Verkhovna Rada for approval a national program to improve security;
- Coordinates the work of ministries and other central bodies;
- Establishes unified statistical reporting on OP issues.

State Service of Ukraine for Labor (State Labor) formed in accordance with the requirements of the resolution of the Cabinet of Ministers of September 10, 2014 № 442 "On optimization of the system of central executive bodies", as a result of reorganization by merging the State Service for Mining Supervision and Industrial Safety and the State Labor Inspectorate, as well as the transfer of the State Sanitary and Epidemiological Service to implement state policy in occupational health . The activity of the State Labor Service is directed and coordinated by the Cabinet of Ministers of Ukraine through the Minister of Social Policy. The Regulation on the State Labor Service of Ukraine was approved on February 11, 2015.

The State Labor Office exercises its powers through the territorial bodies formed in accordance with the established procedure. Resolution of February 11, 2015.

The State Labor Service is headed by the Chairman, who is appointed and dismissed by the Cabinet of Ministers of Ukraine on the proposal of the Prime Minister of Ukraine, submitted on the basis of proposals from the Minister of Social Policy.

State Labor Service of Ukraine (State Labor):

- implements state policy in the areas of industrial safety, labor protection, occupational health, handling of explosives, state mining supervision, as well as on supervision and control over compliance with labor legislation, employment, compulsory state social insurance in terms of purpose , accrual and payment of benefits, compensations, provision of social services and other types of material support in order to comply with the rights and guarantees of insured persons;
- carries out comprehensive management of labor protection and industrial safety at the state level;
- carries out state regulation and control in the field of activities related to high-risk facilities;
- organizes and carries out state supervision (control) in the field of functioning of the natural gas market in terms of maintaining the proper
- implements state policy in the areas of industrial safety, labor protection, occupational health, handling of explosives, state mining supervision, as well as on supervision

and control over compliance with labor legislation, employment, compulsory state social insurance in terms of purpose , accrual and payment of benefits, compensations, provision of social services and other types of material support in order to comply with the rights and guarantees of insured persons;

- carries out comprehensive management of labor protection and industrial safety at the state level;
- carries out state regulation and control in the field of activities related to high-risk facilities;
- organizes and carries out state supervision (control) in the field of functioning of the natural gas market in terms of maintaining the proper technical condition of natural gas metering systems, units and devices at its production facilities and ensuring safe and reliable operation of the Unified Gas Transmission System.
- technical condition of natural gas metering systems, units and devices at its production facilities and ensuring safe and reliable operation of the Unified Gas Transmission System.

The main functions of the Department of Labor at the State Labor Service of Ukraine (State Labor):

- participation in integrated labor protection management;
- participation in exercising control over the performance of the functions of state management of labor protection by executive authorities and local self-government bodies;
- improvement of the regulatory framework for labor protection, including the functioning of the labor protection management system;
- participation in the implementation of state supervision and control over compliance with legislation in the field of labor protection, including the organization of training (including special) and testing of knowledge on labor protection;
- control over the implementation of tasks and measures of the National Social Program for Improving Safety, Occupational Health and the Working Environment, sectoral and targeted regional programs for improving safety, occupational health and the working environment, as well as occupational safety measures as part of socio-economic and cultural development programs regions.

Decisions of the State Labor in the field of labor protection, adopted within its competence, are binding on all executive bodies, legal entities and individuals who use hired labor.

To implement its tasks, the State Labor Service forms its territorial departments in the regions. The functions of expert assessment and training in the field of OP are performed by the ETC on OP issues

1.3.1. State supervision and public control over labor protection

According to the Law of Ukraine on labor protection (Article 38) the state supervision over observance of legislative and other regulations on labor protection is carried out by:

- The State Labor Service of Ukraine as a specially authorized body of executive power to supervise labor protection;
- State Committee of Ukraine for Nuclear and Radiation Safety
- Bodies of state fire supervision of the fire department of the Ministry of Emergencies (MOE);
- Bodies and institutions of the sanitary-epidemiological service of the Ministry of Health;

Higher supervision over the observance and correct application of labor protection legislation is exercised by the Prosecutor General's Office and its subordinate prosecutors.

Officials of the state supervision of labor protection (inspectors) *have the right to:*

- *Unobstructedly visit controlled* enterprises (facilities), productions with hired labor, and in the presence of the employer or his representative to check compliance with the legislation on safety
- *Receive written and oral explanations*, materials, information, expert opinions, audits, reports on the status of preventive work, the causes of violations of the law, etc. from the employer, officials.
- *To issue in the prescribed manner to employers*, heads of enterprises and institutions, officials mandatory instructions to eliminate violations and shortcomings in the field of labor protection
- *Prohibit, suspend, restrict the operation of industries*, shops, sites, workplaces, perform certain work to eliminate violations and deficiencies that endanger the lives and health of workers, revoke and terminate issued permits and licenses
- *Bring to administrative responsibility employees* who are guilty of violating the law on LP
- *Involve fines of legal entities or individuals* for violating the legislation on safety in terms of safe conduct of work and for failure to comply with the orders of officials of the State Labor Service

• Send to employers and heads of enterprises and institutions complaints about the incompatibility of officials to the position held, submit to the prosecutor's office materials on bringing these people to justice
In the system of control over labor protection, in addition to state supervision, public control plays an important role

According to the Law on LP (Article 41), public control is exercised by:

- labor collectives through their authorized representatives;
- trade unions represented by their elected bodies and representatives (central, regional, local and trade union committees);
- a public labor inspector, who is usually elected by the trade union.

The activity of the commissioner from the labor collective on labor protection is carried out on the basis of a standard regulation, which is approved by the general meeting of the labor collective. The commissioners are elected at the general meeting from among experienced and competent employees for the term of the elected body of the labor collective meeting. Their number is determined depending on the specific conditions of production.

The commissioners perform their duties without interruption from the main work, report on the work at least once a year at the general meeting of the team.

The commissioners exercise control over:

- compliance with the requirements of the legislation on OP;
- providing employees with instructions, regulations on OP;
- providing employees with overalls and PPE;
- timely and correct investigation and documentation of accidents and occupational diseases;
- using the OP fund for its intended purpose.

The Commissioners are involved in the development of the provisions of the section "Labor protection" of the collective agreement.

Authorized persons (controllers) must be trained in labor protection and labor legislation. For the period of training and control, they are released from their direct duties with the preservation of the average wage, which is specified in the collective agreement.

The authorized representatives of the labor collective have the right to:

- freely check the condition of TB and occupational health, compliance by employees of NPAOP;
- enter in a special journal mandatory for consideration by the employer proposals to eliminate violations;
- require officials to eliminate the threat and stop working in case of threat to life or health;

- make proposals to bring to justice those guilty of violating the law on security.

Due to the special nature of the responsibilities of the Commissioner for Security, guarantees for him on dismissal, prosecution should be provided in the collective agreement.

Powers and rights of trade unions in monitoring compliance with labor protection legislation.

The Law of Ukraine on Labor Protection imposes many powers on trade unions:

- Participate in the development of sectoral, state, regional programs on OP;

- Participate in the development of regulations on security issues;

- in the development of comprehensive measures by the employer to achieve the established standards for OP;

- in the investigation of accidents;

- in the development of proposals for the inclusion of issues of OP in the collective bargaining agreement;

- in the organization of social insurance against accidents and occupational diseases in the manner and under the conditions provided by law and the collective agreement;

- in the determination by the Cabinet of Ministers of the procedure for revision of tariffs for social insurance against accidents at work;

- Participate in the work of commissions on labor protection at the enterprise, certification of officials, acceptance of objects into production, in the work of commissions on certification of jobs.

The powers and rights of trade unions and the ombudsman are often similar, but trade unions have greater rights. Thus, the trade union committee has the right (according to Article 45 of the Law on Labor) to seek termination of the employment contract with the head who signed the collective agreement and violates labor legislation and labor protection legislation[9,10].

1.4. Occupational safety training

Training and systematic improvement of knowledge not only of workers but of the entire population of Ukraine on labor protection is one of the main principles of state policy in the field of labor protection, the fundamental basis of industrial safety and sanitation, a necessary condition for improving labor protection management and ensuring effective preventive work. on the prevention of accidents, occupational diseases and accidents at work.

The main normative document that establishes the procedure and types of training and testing of knowledge on labor protection is the Standard Regulation on the procedure for training and testing of knowledge on labor protection, approved by the order of the State Labor Inspectorate of 26.01.2005 № 15. This procedure is aimed at implementation in Ukraine systems of continuous training on labor protection.

The default position defines the order:

- study of the basics of labor protection in educational institutions and during the professional training of employees at the enterprise;
- organization of training and testing of knowledge on occupational safety at the enterprise;
- special training and testing of knowledge on occupational safety;
- training and testing of knowledge on occupational safety of officials;
- organization of briefings on labor protection;
- internships, duplication and admission of employees to work.

In vocational schools it is obligatory to study the subject "Labor protection", and in higher educational institutions the disciplines "Fundamentals of labor protection" and "Labor protection in the industry" are studied. This training is conducted according to standard curricula and programs approved by the Ministry of Education in coordination with Derzhgirpromnahlyad (Gosnadzor).

Some specific issues of labor protection are studied in courses of special and general technical disciplines.

During the professional training of employees at the enterprise the theoretical part of the subject "Occupational Safety" is studied in the amount of not less than 10 hours, and during retraining and advanced training - not less than 8 hours.

Employees who are involved in high-risk work are trained only in educational institutions. The theoretical part of the subject "Occupational Safety" is studied for at least 30 hours, and during retraining and advanced training - at least 15 hours. Specific issues of labor protection for specific professions are studied in courses of special and general technical disciplines.

At the enterprises on the basis of the Standard position taking into account specificity of production and requirements of NPAOP, the corresponding provisions of the enterprises on training on labor protection are developed and approved, plans-schedules of training and check of knowledge on labor protection are formed.

Employees are hired and periodically in the process of work, and pupils and students during the educational process are trained and tested knowledge of occupational safety, first aid to victims of accidents, rules of

conduct in case of accident, as well as appropriate instructions. Those who combine professions receive training and instruction in occupational safety both in their main professions and in part-time professions. Admission to work (performance of educational practical tasks) without training and testing of knowledge on occupational safety is prohibited.

The responsibility for the organization and implementation of training and testing of knowledge of employees on occupational safety rests with the employer.

Officials and employees engaged in high-hazard work and in work where there is a need for professional selection undergo annual special training and testing of knowledge of the relevant NPAOP.

There are the following forms of training on occupational safety and health:

- *Course training* for engineers and technicians, sometimes scheduled and unscheduled.

- *Special training* for workers engaged in high-hazard work.

After these types of training, employees take an exam and receive a certificate

- *Instructional training*

Employees at enterprises of all forms of ownership are instructed, trained and tested on occupational safety, first aid to victims, rules of conduct in emergency situations when hiring and during work. Without such training, employees are not allowed to work

At the enterprises depending on their specificity and on the basis of "standard position" the provisions on training, training programs and plans-schedules of its carrying out are formed. The head of the enterprise is responsible for carrying out this work, and in divisions - their heads.

As a rule, the organization of training is carried out by employees of the personnel service and labor protection.

To test knowledge, a commission is created, chaired by the head or his deputy for production. The commission consists of employees of the labor protection service, legal, production, technical services, the labor protection commissioner, and a representative of the state supervision body may also be involved.

Before testing the knowledge of employees, training is organized in the form of lectures, seminars, consultations. The inspection is carried out in accordance with the regulations that are necessary for the employee to work. The results of the inspection are recorded in protocols.

Employees who have passed the exam receive a certificate. If the results of the exam are unsatisfactory, the employee must undergo re-training within a month and is not allowed to work.

For engineering and technical workers who are included in the "List of officials who must pass a preliminary and periodic examination of knowledge on labor protection", before entering the job and then at least 1 time in 3 years is a course training

Heads of enterprises and their deputies on labor protection, specialists of labor protection services, heads of departments and teachers of labor protection of universities, regional and branch training centers on labor protection, and other executives are trained and tested in the Main Training Center of the State Committee for Industrial safety, labor protection and mining supervision of the Ministry of Emergencies.

Officials of district state administrations on labor protection, specialists of design and development research, production and technological departments are trained in institutions that have received a permit from the State Labor Service.

Tuition is paid, payment is provided by the owner of the enterprise, or at the expense of the budget for the budgetary organization.

Course training can be scheduled or unscheduled. Scheduled training and testing - once every three years on schedule. Unscheduled - in two cases:

- if the official moves to another position that requires additional knowledge

- in case of an accident or man-made disaster at the enterprise, the relevant officials must undergo special training and testing of knowledge on labor protection within a month.

Officials and employees engaged in high-risk work, during employment and periodically but at least once a year undergo **special training** and testing of knowledge on occupational safety in relation to specific production conditions.

Pupils and students are trained in occupational safety, regardless of the level of the institution and its subordination and forms of ownership. The content and scope of the training program is approved by the Ministry of Education in coordination with the State Labor Service.

Vocational school students study the discipline "Occupational Safety", universities - a set of disciplines "Life Safety", "Fundamentals of Occupational Safety" and "Occupational Safety in the industry". The scope of the program and the number of hours for its study cannot be reduced without the consent of the State Labor Office. The form of final control of knowledge is an exam, diploma projects and works of graduates must provide a section of labor protection.

Another form of occupational safety training is instruction.

By nature and time, they are divided into *introductory, primary, repeated, unscheduled and targeted*:

- *The introductory* briefing is conducted by a specialist of the OH service or, in the absence of the OH service, by another employee appointed by the order, who has passed the relevant training and knowledge test.

Such instruction is conducted for those who enter the work, employees on other enterprises who came to perform work, with pupils and students who came for internships, in the case of a tour of the company, with all pupils and students upon admission to study.

Instruction is conducted in the office of the OH or other special room. At the same time the newcomers get acquainted with:

- Rules of labor regulations
- Rules of conduct on the territory
- Dangerous and harmful production factors
- Fire prevention
- The work of gas rescue and radiation service
- Rules of first aid for victims

The briefing is recorded in the logbook of briefings signed by the instructor and the instructor.

- *Promary training* is conducted before the start of work directly at the workplace with the employee: newly hired, or when transferred to another job, or when entrusting a new job, as well as with an employee who is sent from another company to participate in the production process. Initial instruction is also conducted with pupils, students and cadets before the beginning of labor and professional training and before performance of each educational task with use of mechanisms and the equipment.

- *Re-instruction, repeted instruction* is carried out within the time limits set by the regulations of the industry, taking into account specific working conditions, but at least once every three months for high-risk work and once every six months - for the rest of the work.

- *Unscheduled briefing* is conducted with employees at the workplace or in the office of labor protection in the following cases: the introduction of new or revision of existing regulations, changes in technology, modernization and replacement of equipment, raw materials and materials, violations by employees of NPAOP, which have led to injuries and accidents, at a break in work of the executor more than 30 days on a place with the increased danger and more than 60 days on other workplaces

The scope and content of unscheduled briefings are determined in each case depending on the reason for its conduct and the nature of violations. Targeted briefing is conducted with employees in the following cases: in the elimination of accidents and natural disasters, in carrying out work for which the law is issued a permit.

Initial, repeated, unscheduled and targeted briefings are conducted by the supervisor individually or with a group of employees according to the instructions on labor protection in force at the enterprise. The briefings are completed by checking the knowledge of the instructed in the form of an oral interview, or by automatic means of verification. In case of unsatisfactory results of testing knowledge, skills and abilities of safe work within 10 days after the initial, repeated, unscheduled briefings, additional briefing and re-testing of knowledge is carried out. If the knowledge of the target instruction is unsatisfactory, the employee is not allowed to perform the work. The briefing is recorded in the journal of registration of briefings on occupational safety at the workplace under the signature of the instructor and the instructed. The pages of the magazine should be bound, numbered and sealed.

By the decision of the employer, some employees whose work is not directly related to the operation of the equipment may be exempted from re-instruction, which is fixed in the approved list of professions and positions that are not subject to re-instruction.

1.5. Classification of sources of danger

1.5.1. Classification of sources of danger, affecting factors

Danger is seen as an objectively existing reality in the relationship between society and technology, the human environment. According to the Committee on Risk Perception and the National Research Council, the risk is "an action or phenomenon that causes potential harm to people or objects." According to the American researcher Wilhelm Marshall (1934-1996), this is a natural or man-made phenomenon, which can result in phenomena or processes that can affect people, cause material damage, destroy the environment and more[1,6].

Danger - 1) a negative property of living and inanimate matter, which can harm the matter itself: people, the environment, material values. **2)** it is a condition or situation that exists in the environment and can lead to unwanted release of energy, which can cause physical harm, injury and damage.

Dangers are identified with regard to the principle of "everything affects everything": the source can be all living and non-living, danger also threatens all living and non-living.

The science that deals with the classification of hazards is called taxonomy. Depending on the specific needs, hazard classifications are used according to different criteria:

- time of action (impulsive and cumulative);
- by localization (related to litho-, hydro, atmosphere and space);
- by consequences (disease, mortality, reduction of life expectancy, destabilization of society);
- by scale (global, state, regional, local);
- by sphere of manifestation (household, sports, industrial);
- by structure (simple and derivative);
- by origin (natural, man-made, socio-political, combined).

Most often used classification of sources of danger by origin. *Natural sources of danger* include natural objects, natural phenomena and natural disasters that threaten human life or health (earthquakes, landslides, volcanoes, storms, hurricanes, fogs, lightning, asteroids). *Man-made sources of danger* are associated with the use of vehicles, technical equipment, the use of combustible, flammable substances, various types of radiation. *Social sources of danger* include those caused by low spiritual and cultural levels: vagrancy, prostitution, alcoholism. *The sources of political dangers* are conflicts at the international level, political terrorism, and wars. *Combined sources* of danger are divided into the following subgroups:

- ✚ natural - man-made (smog, acid rain, reduced soil fertility);
- ✚ natural - social (drug addiction, epidemics, infectious diseases, sexually transmitted diseases);
- ✚ socially - technogenic (occupational diseases, occupational injuries)

All dangers are to some extent caused by striking (negative) factors. Depending on the effects of specific affecting factors on the human body, they are in some cases divided into harmful and dangerous.

Dangerous situation - an event in which there is a real opportunity manifestation of danger or danger is manifested

Dangerous factors - environmental factors that lead to injuries, burns, frostbite, other damage to the body or its individual organs and even sudden death.

Harmful factors - environmental factors that lead to deterioration of health, reduced efficiency, disease and more.

According to the nature and energy that they have, all factors are divided into the following groups: *physical; chemical; biological; psychophysiological.*

In addition to the above groups of harmful and dangerous factors, there is a *group of passive - active factors* - their action is manifested by human energy (sharp fixed objects; uneven or smooth surfaces, etc.); and a group of passive factors that affect a person indirectly through the degradation of the properties of materials (manifested in destruction, explosions, etc.).

Based on the approved State Sanitary Norms and Rules "Hygienic classification of labor on the indicators of harmfulness and danger of factors of the production environment, the severity and intensity of the labor process" (Order of 08.04.2014 № 248):

- dangerous production factor - a factor of the environment and labor process, which can cause acute illness (poisoning), sudden deterioration of health or death;

- harmful production factor - an environmental factor or labor process, the impact of which on the employee under certain conditions (intensity, duration of action, etc.) can cause occupational or industrial disease, temporary or permanent decline in efficiency, increase the frequency of somatic and infectious diseases, lead to health problems both the employee and his descendants;

- harmful working conditions - a state of working conditions in which the level of influence of one or more factors of the production environment and / or labor process exceeds the allowable.

1.5.2. Physical factors

The likelihood of avoiding harm to health increases dramatically if a person knows the specifics of the effects of dangerous and harmful physical factors on the body[5].

Physical impact factors – *these are environmental factors that can cause damage to the body, which can be caused by noise, vibration and other vibrations, non-ionizing and ionizing radiation, climatic parameters (temperature, humidity, air velocity, atmospheric pressure), insufficient light, high static electricity, etc. .*

All of them have a certain supply of energy, which is transmitted to man during interaction. The body is able to absorb energy only in the form of food. Other types of energy can be harmful. Despite the significant specificity of the action of various factors on the human body, it is believed that for the vast majority of them there is a certain threshold of insensitivity to the action of a factor.

Physical affecting factors are divided into subgroups: mechanical; thermal; electric; electromagnetic; nuclear.

Mechanical factors. They have a supply of kinetic or potential energy (all moving objects or moving elements of machines; objects and their elements that are above the ground, etc.), the transfer of which to the body causes injuries - fractures, tears, soft tissues, vascular. For example, when a person falls from a high-rise building, it is believed that he can physiologically withstand an impact at speeds up to 40 km / h.

Thermal factors. They are characterized by a certain reserve of thermal energy and anomalous temperature (heated and cooled objects, fire, climate and microclimate parameters, etc.). When transmitted to the human body, these objects and phenomena cause thermal burns to varying degrees.

When the skin is heated to a temperature of 44 °C, it is damaged and there are painful sensations, and when heated to a temperature of 77 °C, it is instantly destroyed. Harm to the body significantly depends on the area of the affected area of the body. According to this parameter, thermal burns are divided into three groups: mild, moderate, severe.

Electrical factors. They have a supply of electric energy (electric current, electric field, electric charge, etc.). Electric current, passing through the human body, causes biological, electrochemical, thermal and mechanical effects.

The biological effect of electric current is manifested in the irritation and excitation of body tissues and is accompanied by convulsive muscle contraction and complete cardiac arrest. *Electrochemical action* determines the electrolysis (decomposition) of liquids, including blood, violating its composition. *Thermal action* leads to varying degrees of burns to certain parts of the body. *Mechanical* - to the stratification of tissues, as well as the separation of individual parts of the body. Electrical injuries are grouped into three groups: local, general, and mixed.

Electromagnetic factors. They are characterized by the energy reserve of electromagnetic waves, the magnitude of which depends on the length of the electromagnetic wave:

$$E = hv = hc \lambda \quad (1.1)$$

where h is the Planck constant; v and λ – frequency and wavelength; c- speed of light.

Electromagnetic radiation is divided into 3 bands: radio frequency range (radio waves), optical (visible light, ultraviolet, infrared, laser), ionizing radiation range (X-ray and γ -radiation);

The degree of influence of electromagnetic radiation on the human body depends on the frequency range, intensity of exposure to relevant factors, duration of irradiation, nature of radiation, irradiation regime, size of the surface of the irradiated body and individual characteristics.

The main measures of protection against the effects of different types of radiation are: reduction of radiation at the source (introduction of new technologies); optimal placement of radiation sources (distance protection); reduction of stay time (protection by time); shielding of radiation sources; use of personal protective equipment.

Nuclear factors. These include natural and artificial radionuclides that have a supply of nuclear energy. Arbitrary decomposition of radionuclides is accompanied by corpuscular and photon radiation. The corpuscular radiation includes: α -, β - particles, neutrons, protons, etc. Photon radiation consists of γ - rays.

Due to the action of ionizing radiation on the human body, complex physical and biological processes can occur in tissues. Ionization of living tissue results in the rupture of molecular bonds and changes in the chemical structure of various compounds, which in turn leads to cell death.

Under the action of ionizing radiation on water, which is 60-70% of the mass of biological tissue, free radicals H and OH are formed, and in the presence of oxygen also free radical hydroperoxide (HO₂) and hydrogen peroxide (H₂O₂), which are strong oxidants. The products of radiolysis enter into chemical reactions with tissue molecules, forming compounds that are not inherent in a healthy body. This leads to dysfunction of systems and vital functions of the body as a whole.

The intensity of chemical reactions induced by free radicals increases and they involve many hundreds and thousands of molecules that have not been exposed to radiation. This is the specificity of the action of ionizing radiation on biological objects, ie the effect created by radiation is due not so much to the amount of energy absorbed in the irradiated object, but to the form in which this energy is transmitted. No other type of energy (thermal, electrical, etc.) absorbed by a biological object in the same amount causes such changes that cause ionizing radiation.

Disorders of biological processes can be either reversible, when the normal functioning of the cells of irradiated tissue is completely restored, or irreversible, leading to damage to individual organs or the whole organism and the emergence of *radiation sickness*.

There are two forms of radiation sickness - *acute* and *chronic*.

The acute form occurs as a result of exposure to large doses in a short period of time. At doses of about an order of thousands of tips, the body's damage can be instantaneous ("death under the beam"). Acute radiation sickness can also occur when large amounts of radionuclides enter the body.

Chronic lesions develop as a result of systematic exposure to doses exceeding the maximum allowable (MRL). Changes in health are called *somatic effects* if they occur directly in an irradiated person, and *hereditary effects* if they occur in his offspring.

Radiation safety depends primarily on the small doses that accompany the practical use of nuclear energy. Therefore, in radiation safety standards, a unit of time is usually used per year, operating on the concept of "annual radiation dose" Adverse effects in the range of "small doses", little depends on the radiation. The effect is determined by the total accumulated dose, regardless of whether it was received in one day, in one second or during 50 years. Therefore, the effects of chronic radiation accumulate in the body over time.

It is impossible to refuse the use of radioactive substances in industry, science, medicine, technology, agriculture for objective reasons. Therefore, it is necessary to guarantee radiation safety, ie a state of the environment in which human radiation damage is virtually absent.

1.5.3. Chemical factors

In the process of life, a person is constantly exposed to a large number of chemical harmful factors that can cause various diseases, health disorders, injuries both in the process of contact and over a period of time. Approximately one million chemicals and compounds are known, of which 60 thousand are used in human activities. Between 500 and 1,000 new chemical compounds and mixtures appear on the international market each year[5].

Chemical hazards – factors that have a high chemical affinity with human tissues and environmental substances (corrosive, toxic, explosive, etc.) and can cause harm to the human body.

Chemical elements, substances and compounds can be in solid, gaseous and liquid physical states. Therefore, chemicals enter the human body through the respiratory system, through the gastrointestinal tract, skin and mucous membranes. The degree of damage to chemicals depends on their toxicity, selective action, duration, as well as their physicochemical properties.

Poisoning can be acute or chronic. In any form of poisoning, the intensity of the harmful substance is determined by the degree of its physiological activity - toxicity.

Toxicity (*Greek toxikon - poison*) - the property of some chemical elements, compounds and nutrients to adversely affect living organisms (plants, animals, fungi, microorganisms) and human health.

According to the toxicity of toxic substances are divided into the following types:

- neuro-paralytic action (sarin - SV, soman-SD) - bronchospasm, asthma, paralysis;

- general toxic action (hydrocyanic acid, chlorine cyanide) - edema, coma, paralysis, convulsions, rapid heartbeat;

- irritating effect (ammonia, acid vapors) - irritation of the mucous membranes of the nose, mouth;

- skin rash (mustard gas) - local inflammation and necrotic changes in combination with general toxic phenomena.

The following groups of toxic substances are distinguished by the selectivity of action:

- cardiac, having a cardiotoxic effect (drugs, plant poisons, salts of barium, potassium, cobalt, cadmium);
- nervous, which lead to dysfunction of the nervous system (carbon monoxide, ammonia, carbohydrates, organophosphorus compounds, alcohol, drugs, sleeping pills, etc.);
- hepatic, causing liver damage (chlorinated hydrocarbons, aldehydes, phenols, phosphorus, selenium, etc.);
- renal, which negatively affect the kidneys (heavy metal compounds, ethylene glycols, oxalic acid, etc.);
- blood, change the activity of blood enzymes (derivatives of aniline, aniline, nitrites);
- pulmonary, leading to lung damage (nitrogen oxides, ozone, phosgene).

Depending on the practical use, chemicals are classified into:

- *industrial poisons* used in production (organic solvents, dyes) and are a source of danger of acute and chronic intoxications in violation of safety rules;
- *pesticides* used in agriculture to control weeds, rodents, insects, etc .;
- *drugs*

- *household chemicals* used as food additives, sanitary products, cosmetics;
- *biological poisons*: plant and animal, which are contained in plants and fungi, animals and insects;
- *toxic substances*: sarin, mustard gas, phosgene.

By the nature of the action of chemicals are divided into the following groups:

- toxic, which cause poisoning of the human body or affect its individual systems (eg, hematopoiesis, central nervous system)
- narcotic drugs that act on the central nervous system (alcohols, aromatic carbohydrates);
- irritants (acid vapors, alkalis), which cause irritation of mucous membranes, respiratory tract, eyes, lungs, skin;
- suffocating (carbon monoxide, nitrogen oxides), leading to toxic pulmonary edema;
- sensitizing (solvents, formalin) - substances that act as allergens;
- carcinogenic (aromatic hydrocarbons, cyclic amines, nickel, chromium), which lead to malignant tumors;
- mutagenic (lead, radioactive substances), which lead to a violation of the genetic code, change the hereditary information;
- those that affect reproductive function (radioactive isotopes, mercury, lead).

It is important to study the toxicity of any component of the environment to study its physicochemical properties, which allows certain formulas to calculate the parameters that characterize the toxicity of the substance and can be used in developing methods and means of protection against harmful substances.

1.5.4. Biological factors

Humans, animals and the natural environment in general may be threatened by biological factors, both at work and at home. Therefore, preventing them from being affected is a very important task[4].

Biological (Greek bios - life and logos - word, doctrine) risk factors - factors caused by the action of various living organisms.

These include microorganisms (plants and animals) and pathogenic microorganisms, pathogens of infectious diseases (bacteria, viruses, fungi, rickettsiae, spirochetes, protozoa).

Macroorganisms (poisonous plants and animals). Toxic substances of poisonous plants are various compounds that belong mainly to alkaloids, glucosides, acids, resins, hydrocarbons, etc. (Table 1.2).

Table 1.2

Characteristics of the effects of poisonous plants on the human body

The name of a poisonous plant	Action start time	Characteristics of action on the human body
Hemlock	After 5 minutes	Frequent vomiting, severe salivation, dizziness, pale skin, severe cramps
Mushrooms	from 15 minutes up to 2-3 days	Unbearable chest pain, constant vomiting, blood clotting, convulsions, deaths
Bleached black	After 30-40 minutes	Redness of the face and neck, agitation, cramps in the arms and legs, hallucinations, salivation, and subsequent dry mouth.

Among animal organisms, poisonous forms are more common than among plants. Poisons produced by animals are chemical factors involved in interspecific interactions. Representatives of the fauna of all stages of evolutionary development use chemicals to attack or defend (Table 1.3).

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Table 1.3

Characteristics of the effects of poisonous animals on the human body

The name of the animal organism	Effect on the human body
Spider (Tarantula)	Extreme pain, headache, weakness, loss of consciousness, convulsions, tachycardia, hypertension, fatalities
Pincers	Bites, redness, itching, general poisoning
Insects (wasps, bees, ants, beetles)	Allergic reactions, anaphylactic shock, inflammation, pain, death
Fish (stingrays, sea dragons, scorpions)	Injections, weakness, sometimes loss of consciousness, diarrhea, convulsions, respiratory distress, hypotension, fatalities
Reptiles (cobras, snakes)	Paralysis of skeletal and respiratory muscles, suppression of emergency functions, lethargy, apathy, inhibition of reflexes, abnormal sleep, fatalities

Among animal organisms, poisonous forms are more common than among plants. Poisons produced by animals are chemical factors involved in interspecific interactions. Representatives of the fauna of all stages of evolutionary development use chemicals to attack or defend (Table 1.3).

Pathogenic microorganisms.

Features of the action of microorganisms are:

- high efficiency of human infection;
- the ability to cause disease due to contact of a healthy person with a sick person or with certain infected objects;
- the presence of a certain incubation period, ie from the moment of infection to the onset of complete disease (from several hours to tens of days);
- certain difficulties with the identification of certain types of pathogens;
- ability to penetrate unsealed premises, engineering structures and infect people in them.

Pathogens of infectious diseases are carriers of certain properties, the most important of which are pathogenicity; virulence; environmental resilience; variability and specificity.

Pathogenicity - the ability of living beings (usually microorganisms), as well as the products of their activities to cause disease in other organisms.

Depending on the size of the structure and properties of pathogenic organisms are divided into bacteria, viruses, rickettsiae, fungi and more.

Virulence - aggressive properties of microorganisms against animals and humans. The virulence of different strains of microorganisms is not the same. Its measure is the minimum number of living microorganisms that can cause death of experimental animals (minimum lethal dose). More often use the average lethal dose, which causes 50% of animal deaths.

According to the stability in the environment, ie the ability to resist its effects, microorganisms are classified into *low-resistant*, *medium-resistant* and *resistant*.

Variability - the ability of living organisms to acquire new features, different from those inherent in the ancestors, in the process of individual development. It provides the appearance of certain features, due to which new species are formed and the historical development of the biosphere takes place.

An important property of pathogenic microorganisms is the *specificity*, which is manifested in the fact that each species acts differently on the body, causing a specific disease and immunological resistance of the organism. Therefore, infectious diseases have characterising symptoms.

The causative agents of infectious diseases include various types of microorganisms - bacteria, viruses, fungi and more. Infections caused by them can spread over large areas, leading to epidemics that affect a significant number of the population.

Components of the epidemic process are the sources of infection (humans, animals, plants), the ways of its transmission and the susceptibility of the population. Infectious diseases are spread mainly by contact (touch, cut on the skin, through the mouth or sexually) and breathing. The most risky direct contact with the patient's blood or secretions. Infections can also be transmitted through objects contaminated with blood or secretions of the patient, and through vectors (indirect contact) - mosquitoes, lice, flies, etc ..

The relationship that arose in the process of evolution between organisms and the biological host is manifested in different ways (commensalism, mutualism, symbiosis, parasitism).

Variety of pathogenic microorganisms, different pathogenicity and virulence, penetration into the body in different quantities, different resistance are manifested in different courses of infection. Therefore, take into account the manifestations of not only typical but also asymptomatic (hidden) forms. The degree of manifestation of the infectious process, namely, the interaction between the pathogen and the human body, is divided into three types: 1) a typical form of infection; 2) atypical form; 3) hidden form. The first type of infectious process covers typical forms of the disease.

Isolation of significant properties of a typical infection, or a change in the intensity of its manifestation is defined as an atypical course (outpatient, abortive form). The group of latent infections should include all forms in which there is no clinical manifestation of the disease (latent, dormant, etc.). From an epidemiological point of view, it is important that regardless of the degree of infection, its carrier poses a threat to others.

We are protected from infectious diseases by the skin and *the immune system* - immunity to infectious diseases. It can be natural and artificial, passive and actively acquired.

Groups of infectious diseases. Depending on the general characteristics of infectious diseases associated with the localization of the pathogen in the human body and the mechanism of infection, all infectious diseases are divided into four main groups (Table 1.4).

Table 1.4

Groups of infectious diseases

Groups of infectious diseases	Disease	Localization of the pathogen	Ways of transmission of infection
Respiratory tract infections	Acute respiratory - viral diseases (influenza, parainfluenza, adenoviral infection, etc.), sore throat, diphtheria, measles, whooping cough, tuberculosis	Upper respiratory tract	Air - drip
Intestinal infections	Dysentery, typhoid fever, paratyphoid fever, cholera, viral hepatitis, polio	Intestine	Through food, water, land, household items, flies
Blood infections	Malaria, typhus and recurrent typhus, tick-borne encephalitis	Circulatory system	Due to the bites of vectors - mosquitoes, ticks, fleas, lice, mosquitoes, etc ..
Infections of the outer coverings	Scabies, tetanus	Skin, mucous membranes	Contact

Infectious diseases and invasions that occur in the agricultural complex are classified by their causative agent:

bacterial: tuberculosis, brucellosis, salmonellosis, leptospirosis, anthrax, listeriosis, erysipeloid, plague, tularemia;

viral: rabies, ornithosis, cholera;

rickettsiosis: fever;

fungi: actinomycosis, blastomycosis, candidiasis, coccidioidosis, cryptococcosis, microsporia, triphophytia, histoplasmosis, epidermophytia;

the simplest: echinococcosis, teniosis, trichinosis.

Prevention of infectious diseases. Prevention of infectious diseases. It involves exposure to the sources of infection, the routes of transmission, and the person in contact with the infectious patient. Prevention measures include: immunization, early, active and complete detection of patients, their timely isolation, hospitalization and treatment, disinfection measures at the site of infection, etc.

The main method of infection prevention is immunization - the introduction of weakened pathogens or toxins into the body to gain immunity.

To successfully combat infectious diseases, even in peacetime, in many cases it is necessary to carry out mass vaccinations in a very short time.

Nowadays, there are a large number of diseases whose pathogens can be used by the enemy as bacterial agents. It is impossible to vaccinate against all these diseases, because no one can withstand so many vaccinations. In these cases, especially to establish the type of pathogen used, resort to antibiotics and other special drugs. They kill the virus in the unprotected body, and also help the vaccinated body to cope better with the pathogens. Bacteriophages and therapeutic sera are also used for treatment.

Bacteriophages cause the dissolution of disease-causing microbes in the human body and prevent the development of the disease or provide a therapeutic effect. Serums are characterized by rapid creation in the body of artificial non-perception of an infectious disease.

To protect against the penetration of infections into the human body, the same means are used as for protection against radioactive and chemical toxic substances. These remedies are divided into:

- ◆ individual (gas masks, protective masks and skin protection);
- ◆ collective (specially equipped engineering structures).

Disinfection, disinsection and deratization are mandatory components in the complex of measures aimed at biological protection.

If the fact of mass infectious diseases is established, *quarantine* is introduced - a set of regime, administrative and sanitary anti-epidemic measures aimed at preventing the spread of infectious diseases and eliminating the lesion. *Observation* is a set of measures aimed at enhanced medical surveillance of the source of infection. *Disinfection* - a set of special measures aimed at destroying pathogens of infectious diseases in the environment. Types of disinfection are:

disinsection - destruction of insects - vectors of infectious diseases;

deratization - extermination of rodents, dangerous in epidemic terms.

These measures are carried out to prevent the transmission of the pathogen from sick to healthy people.

There are preventive disinfection, current, final. For disinfection people use physical, chemical and combined methods, in which physical and chemical methods of disinfection are applied simultaneously (for example, washing clothes in hot soapy water).

- **Physical methods of disinfection are carried out using mechanical, thermal and radiation means.**

- *Mechanical means* provide removal, but not destruction of microorganisms. These are cleaning, wiping, washing, shaking, sweeping, airing. When using drones up to 98% of microorganisms are removed. Ventilation is effective enough when its duration is not less than 30-60 minutes.

- *Thermal agents* are based on the use of high and low temperatures, namely: hot air, steam, boiling, pasteurization, incineration, freezing, drying. Ironing is a disinfectant, but it is mostly superficial. Freezing does not cause the death of microorganisms, but over time leads to a decrease in their number.

Drying for a long time leads to the death of a large number of microbes.

- *Radiation disinfectants* are the use of sunlight, ultraviolet rays, and radioactive radiation. Direct sunlight has a detrimental effect on many pathogens of infectious diseases. However, this method depends on the season, weather and it is used as an auxiliary.

Ultraviolet irradiation for air disinfection in operating, procedural, etc. To do this, people use germicidal lamps. Radioactive radiation acts on all types of microorganisms and their spores. Most often, ionizing radiation in the factory sterilizes disposable instruments. In some cases, ultrasound is used for disinfection.

Chemical methods of disinfection are widely used in practice. They are based on the use of various chemicals that kill microorganisms. Chemicals have different effects on microorganisms:

- bactericidal - the ability to kill bacteria;
- bacteriostatic - suppress their vital functions;
- virulicidal - the ability to kill viruses;
- fungicide - the ability to kill fungi.

Among the chemical disinfectants are *soft disinfectants*, which are used to disinfect the skin of hands, clothes, linen and *strong disinfectants*, which are used to disinfect highly contaminated materials (feces, shoes, toilets, etc.).

Chemical disinfectants include:

- chlorine and its compounds (solutions of chlorinated lime, chloramine....)
- halogens (alcohol, iodonate, Lugol's solution....)
- oxidizers (hydrogen peroxide, potassium permanganate....)
- phenols (phenol, lysol)
- alcohols (ethyl, methyl)
- aldehydes (formalin, formaldehyde)
- acids, alkalis, dyes, salts of heavy metals and others.

Antisepsis. *Methods of antiseptics* (Greek anti - against and septikos - purulent) - a set of measures aimed at destroying microbes in the wound, in the pathological focus or the body in general - can avoid the negative impact of biological damaging factors.

There are physical, mechanical, chemical and biological methods of antiseptics.

Physical methods allow to create in the wound unfavorable conditions for the development of bacteria and the absorption of toxins and decomposition products. This is ensured by external drainage of the infected wound with tampons, drainage and drying of wounds by light and thermal procedures (irradiation with Solux, quartz).

Mechanical methods include techniques that are aimed at the fastest (in the first hours) removal from the wound of necrotic tissue, blood clots, foreign bodies and with them microorganisms.

Chemical methods provide the destruction of microbes in the wound with the help of various antiseptics. Antiseptics should be bactericidal or bacteriostatic and should not damage tissues.

Biological methods (antiseptics) are aimed at increasing the body's defenses and creating unfavorable conditions for the development of microorganisms. Biological agents include: antibiotics, enzymes, immune sera.

Restriction of contact and an infectious agent also contributes to compliance with the rules of personal hygiene and patient care.

1.5.5. Hygienic assessment of working conditions in the case of biological factors

The degree of harmfulness of working conditions under the influence of factors of biological origin is established in accordance with Annex 1 to the Hygienic Classification of Labor.

Hygienic assessment of working conditions in the presence of two or more harmful factors of biological origin in the air of the working area at the same time (microorganisms - producers, preparations containing living cells and spores of microorganisms, protein preparations) or in the presence of risk of professional contact with pathogenic microorganisms carried out according to the highest class and degree of harmfulness.

The biological factor in the overall assessment of working conditions by the degree of harmfulness or danger, regardless of the number of harmful factors of biological origin is taken into account as one independent factor[6].

1.5.6. Psychophysiological factors

The work activity of a person and his body is influenced by the volume of perception and processing of information; physical, neuropsychological, mental, emotional overload; rhythm and pace of work; monotony of labor. Their evaluation allows to determine the degree and nature of workload, compliance of the workplace and means of work with anatomical and physiological features of man, to establish rational modes of work and rest, to arrange workplaces, to establish professional selection and career guidance, etc.

Every profession has certain requirements for the mental properties and health of employees. They pay attention to their temperament, character, attentiveness, perception, memory, thinking, emotions, psychomotor skills, education, experience, upbringing and health, which determine abilities, regulate relationships between people and directly control actions and deeds.

Psychophysiological risk factors - factors caused by the peculiarities of physiology and psychology of man, which can harm him in certain circumstances.

They include:

- Deficiencies of the senses (defects of vision, hearing, etc.);

- disruption of connections between sensory and motor centers, as a result of which a person is unable to respond adequately to changes perceived by the senses;

- defects in coordination of movements (especially complex movements and operations, techniques, etc.);

- increased emotionality; fatigue;

- emotional phenomena (conflict situations, stress related to family, friends, management);

- carelessness, which can lead to the lesions not only of the individual but also of the team;

- lack of motivation to work (lack of interest in achieving goals, dissatisfaction with wages, monotony of work, lack of cognitive moment, ie uninteresting work);

- lack of experience (mistakes, wrong actions, stress of the nervous and mental system); fears of making a mistake increase the likelihood of an accident.

Dangerous and harmful psychophysiological production factors, depending on the nature of the action are divided into the following groups:

- physical overload (static, dynamic);

- neuropsychiatric overload (mental overload, analyzer overload, monotony of work, emotional overload, hypodynamics, hypokinesia, fatigue, drowsiness).

Hypodynamia (from the Greek. Hypo - under and dynamis - strength) - dysfunction of the body (musculoskeletal system, circulation, respiration, digestion) due to limited motor activity, decreased muscle contraction. The causes of hypodynamics can be physical, physiological and social factors (reduction of the load on the musculoskeletal system, immobilization, being in small closed rooms, sedentary lifestyle, etc.). Most people around the world suffer from lack of physical activity. A sedentary lifestyle can lead to the development of many cardiovascular diseases. Almost 2 million people die from hypodynamia every year (the number is predicted to grow).

Doctors have calculated that physical activity for half an hour a day can significantly reduce the risk of many common non-communicable diseases: hypertension, diabetes, etc., because they are often caused by hypodynamics. Mechanization and automation have minimized physical activity, their absence has become a real "disease of civilization." Hypodynamia reduces the blood supply to tissues, in addition, lack of physical activity has a negative effect on metabolism and energy in the body, deteriorating oxygen supply to tissues and organs, nutrient intake decreases.

Hypokinesia (Greek *hypo* - decrease, decrease, insufficiency, and *kinesis* - movement) - a painful condition of the body due to insufficient motor activity. Sometimes this condition leads to hypodynamics.

Monotony is a mental state of a person caused by the monotony of perceptions or actions.

Accordingly, there are:

- o monotony caused by information overload of nerve centers due to the receipt of a large amount of identical signals with repeated repetition (for example, work on conveyors with small operations);

- o monotony caused by uniformity of perception (for example, long-term observation of instrument panels in anticipation of an important signal).

Thus, common features for monotony are information overload during the performance of work or, conversely, its lack, which affects the functional state of man: the worker (operator) loses interest in their activities, he has a state called "production boredom"; a similar condition in drivers of vehicles - "road hypnosis". Monotonous work can lead to a reassessment of working hours (the shift seems much longer), the worker is looking forward to the end of the shift.

Monotony has a negative impact on efficiency: deteriorating economic performance, increasing injuries and accidents, increasing staff turnover.

Fatigue - the process of reducing efficiency, a temporary decline in strength that occurs when performing certain physical or mental work. This is an objective phenomenon that disappears after rest.

There are rapidly developing fatigue (primary fatigue) and slowly developing fatigue (re-fatigue). Primary fatigue occurs as a result of work that requires significant physical effort or considerable stress. The decline in strength is the result of a violation of central coordination, the emergence of emergency centers of inhibition due to the mismatch of the work task to the functional characteristics of the organism. The main sign of primary fatigue is a fairly rapid recovery of body functions. Slow-growing fatigue is characterized by a gradual decline in performance as a result of habitual but excessively long or monotonous work. It occurs more often when a person lacks work skills.

Physiological rationalization, in particular the optimal organization of work and rest, rational organization of the labor process, effective training in order to quickly master work skills allows to prevent fatigue and increase efficiency. Criteria for the effectiveness of the mode of activity are considered to be increased productivity, the presence of a stable dynamic working stereotype, accepted production and physiological indicators.

Fatigue is a subjective mental phenomenon that is accompanied by feelings of weakness and unwillingness to work.

Doctors have found that about 1/5 of patients complain of fatigue, and a third of teenagers experience fatigue at least four days a week. Women and men describe fatigue differently: men usually complain of fatigue, and women experience depression or anxiety.

Fatigue is classified as secondary (due to a specific disease), which can last a month or longer, but generally less than six months; physiological (occurs due to an imbalance in routine exercise, sleep, diet or other activity that is not caused by any disease and passes after rest); chronic fatigue (lasts more than six months and does not disappear after rest).

Drowsiness - a violation of the normal mechanism of awakening, which is embodied in constant attempts to fall asleep. People who suffer from it, under the influence of any activity, temporarily wake up. After a short sleep, they feel better, and patients with fatigue complain of lack of energy, mental exhaustion, muscle weakness, slow recovery of strength after exercise and fatigue after sleep.

Human mental states are important in injury prevention and accident prevention. Neuropsychological overloads occur, as a rule, on the way to the realization of vital interests, in situations that prevent (sometimes, conversely, suddenly contribute) to this implementation. They are manifested in critical states: stress, frustration, conflict, crises, trance, ecstasy, paraxism.

Psychogenic mood swings last from a few minutes to several months. They occur for the following reasons:

- unsatisfactory nature of activity (heavy physical activity, high pace, analyzer overvoltage, nervous overstrain, etc.). The result is complete exhaustion, weakening of the psyche, weakening of accuracy, speed of orientation, attention, etc .;
- death of loved ones, shock, conflict situation. The consequences are similar to the previous paragraph. Self-control is lost;
- state of affect (explosion of emotions) as a result of unexpected luck (or vice versa), resentment, etc .; accompanied by sharp aggressive movements, dulling the sense of danger and sense of responsibility. In this state, a person, without thinking, will take risks and lead people. Affected individuals cannot be commanders and leaders;
- use of special drugs:
 - light stimulants (tea, coffee) that help to overcome drowsiness, lethargy; their effect is short-lived; they do not affect coordination, speed of movement, reaction.
 - tranquilizers that relieve psychological activity, slow down the reaction, cause drowsiness, apathy. Their use can cause injuries and danger to life;

- alcohol, drugs that make it impossible to further assess the situation, dull the sense of danger, disrupt coordination and reaction, etc., ie are extremely dangerous.

One of a person's emotional reactions to danger is anxiety. A person who is in this state is prone to mistakes or dangerous actions. Anxiety can manifest itself as a feeling of helplessness, self-doubt, helplessness in the face of external factors. In situations of threat there is a feeling of fear and its shades: fear, fright, horror. Awareness of danger causes a reaction of fear, which manifests itself in inappropriate actions or, conversely, there is a sense of caution. Such a form of fear as panic has a negative effect on human activity.

Thus, psychophysiological factors permanently or temporarily increase the possibility of dangers, but this does not mean that their presence always leads to a dangerous situation. Such risk factors directly affect the physical and physiological processes, performance, mood, productivity, life in general.

1.6. Risks in human life

1.6.1. Application of risk-oriented approach for construction of probabilistic structural-logical models of emergency occurrence and development

Danger in any field of activity has a quantitative characteristic and dependence on many factors that are constantly changing over time. One of the most common manifestations of danger is risk. The risk of action or the risk of inaction is present in 90% of the causes of accidents at work.

The concept of "risk" does not have an unambiguous definition. There is no generally accepted system of terms in risk assessment. The concepts of "danger" and "risk" are most often used. Interpretations of these terms are inconsistent, so it is important to give a precise definition that reflects the relationships and contradictions between society, the environment and the latest technology. The source of danger and risk to human health can be society, environment and technology together or each of these factors separately, ie it is possible to identify sources of danger and risk of natural, social or natural-social genesis (development).

In the broadest interpretation, risk is understood as an act that is carried out in conditions of uncertainty, but the risk can be passivity, inaction. As a rule, a person takes risks to achieve the desired goal. Or avoid physical

danger. Thus, risk can be regarded as a dangerous condition and as an act (dangerous human action as an element of the system).

Risk - the statistical frequency of the probability of hazards, ie adverse circumstances that may occur in an adverse event; quantitative characterization of hazards.

The consequences or quantification of damage caused by the hazard depend on many factors, such as the number of people in the hazardous area, the quantity and quality of the affected property, natural resources, the prospects of the area, and so on.

In the structure of substantive activity, risk performs various psychological functions. It can be the goal of human activity, and its motive, if it seeks thrills. Psychologists believe that everyone has a need for risk.

In Ukraine, the only state system for preventing and responding to emergencies is still focused mainly on responding and overcoming the consequences of dangers. This negatively affects the opportunities, effectiveness of measures, reduction of losses and reduction of risks. The experience of developed countries confirms that the protection of population and territories should be based on the management of risks of natural and man-made nature through the application of preventive measures, the introduction of new quantitative methods for assessing man-made and natural risks. It is necessary to gradually change the reflective management model and move to a strategy focused on preventing the consequences of emergencies and minimizing them. Therefore, it is important to introduce a risk-oriented approach to reduce the risk of crises and develop government programs to prevent and eliminate adverse events[7].

A risk-based approach is a set of organizational measures that involves monitoring, analyzing, and assessing the risk of any business entity based on a probabilistic safety analysis to prevent emergencies and manage risk in general.

1.6.2. Environmental risk

The concept of "environmental risk" is now interpreted differently. Many authors consider its components not only the risk to public health, but also other types of risk, such as: risks of destruction of natural systems, public health, failure of man-made systems at specific enterprises, natural resource management, natural disasters, the impact of regional military conflicts, the risk of environmental terrorism (S. Pirozhkov)

Within environmental and environmental research, there is also a different understanding of risk assessment. Some scientists link environmental risk to certain environmental factors and study the risk to

individual health (the likelihood of specific adverse environmental effects), others — consider risk as a concept defined at the population level[7].

Ecological risk — the probability of negative changes in the environment caused by anthropogenic or other influences: causing damage to the environment in the form of possible losses over time.

1.6.3. Man-made risk

The most intensive and powerful source of generating new types of risks is *the technosphere*. The number and consequences of major industrial catastrophes today indicate a tendency to a constant increase in man-made risks.

Man-made risk - risk to the population, social and natural objects caused by negative events of man-made origin.

Protecting itself from man-made accidents, society uses various legal, organizational, managerial, technical, scientific and methodological tools. However, such catastrophes continue to threaten stable development and can significantly affect the state of national security and vital functions of the state.

The term "technogenic safety" refers to almost all dangerous objects of the technosphere, including military, agricultural, artificial space objects, etc., accidents in which pose a threat to the population and the environment.

Man-made safety - the degree (level) of protection of vital interests of the person, society and the state from technogenic emergencies on potentially dangerous objects.

In the preventive sense, technological security should be considered in two dimensions: strategic and tactical. The first concerns aspects of the development of new domestic technologies and the import of foreign technologies to Ukraine, as well as the implementation of the "principle of protection against the implementation of potentially dangerous technological projects." The second is the management of technological safety of existing technological complexes at potentially dangerous facilities (PDF).

1.6.4. Social risks and ways of their state provision

Ukraine's path to integration with the European Union and achieving the standard of living of European countries takes place in difficult socio-economic conditions. Reforming the financial, economic, humanitarian, social and other spheres of life requires the state to make decisive and radical changes, which will take place in a regime of limited budget resources and austerity. In addition, a new challenge for Ukraine was social protection and support for fundamentally new vulnerable categories of citizens: people who were forced to leave their homes due to hostilities and their usual way of life. But under any circumstances, all social policy measures, without exception, to support the already "familiar" and "new" vulnerable categories of the population must now be not only appropriate, timely, balanced, but, above all, effective. And, as international experience shows, this is best facilitated by monitoring and evaluation - tools for successful management.

In Ukraine, over the last year, preserving the welfare of the population, reducing the risk of poverty and preventing its spread has once again come to the forefront of social policy and social protection. In Ukraine, the system of state social assistance is represented by a wide range of cash and non-cash benefits, which cover the poorest and most vulnerable and guarantee them a level of income not lower than the statutory minimum, or do not exceed certain types of expenditures (such as housing and communal services) over the established for this case part of the income. As of 2013, there were about ten major state social support programs in the country (five of which apply only to families with children), as well as preferential provision for about 80 categories of citizens. The principle underlying their provision is categorical or targeted. In contrast to developed countries, where state monitoring and evaluation of the effectiveness of social programs is an integral part of public administration in the social sphere, in Ukraine until recently this component of social support management did not receive due attention from the state. Monitoring and evaluation of the effectiveness of the programs was mostly performed by the approved Ministry of Social Policy. And only in 2012 the relevant legal documents were adopted, which regulate the system of monitoring, evaluation, analysis and audit of the four main social support programs on a permanent basis since 2014. Among the monitoring indicators of social support programs, special attention is paid to evaluation their impact on the poverty situation in the country and among the target contingents.

Social risk - events in a person's life in which there is a danger of losing material resources to meet its primary (basic) needs that are

necessary to preserve and reproduce a full life as a member of human society.

The Universal Declaration of Human Rights proclaims the right of everyone "to such a standard of living, including food, clothing, shelter, and medical care as is necessary for the maintenance of the health and well-being of himself and of his family." similar in content social standard is enshrined in the ILO Convention "On the basic objectives and norms of social policy" №117 1962. Taking into account the content of the concept of "standard of living", the primary (basic) needs include the needs for food, clothing, housing, medical care and social services[4,7].

1.7. Social insurance against accidents and occupational diseases at work

Social insurance against accidents at work and occupational diseases is carried out in accordance with the Law of Ukraine "On Compulsory State Social Insurance against Accidents at Work and Occupational Diseases That Caused Disability" (hereinafter the Law)

This Law applies to persons working under an employment agreement (contract) at enterprises, institutions, organizations, regardless of their forms of ownership and management (hereinafter - enterprises), individuals, persons who provide themselves with work independently, and citizens - business entities.

The state guarantees all insured citizens the right to insurance against accidents at work and occupational diseases.

Legislation on accident insurance consists of the Fundamentals of the legislation of Ukraine on compulsory state social insurance, the Law "On compulsory state social insurance against accidents at work and occupational diseases that caused disability", the Labor Code of Ukraine, the Law Ukraine "On labor protection" and other regulations.

The tasks of accident insurance are:

carrying out preventive measures aimed at eliminating harmful and dangerous production factors, prevention of accidents at work, occupational diseases and other cases of threat to the health of the insured caused by working conditions; restoration of health and working capacity of victims at work from accidents or occupational diseases; compensation for damage related to the loss of insured persons' wages or the relevant part of it during the performance of their duties, the provision of social services in connection with damage to health, as well as in the event of their death insurance payments to disabled members of their families.

The main principles of accident insurance are:

- parity of the state, representatives of insured persons and employers in the management of accident insurance;
- timely and full compensation of damage by the insurer;
- compulsory insurance against accidents of persons working under an employment contract and other grounds provided by labor legislation, as well as the voluntary nature of such insurance for self-employed persons and citizens - business entities; providing state guarantees for the realization of their rights by insured citizens;
- obligatory payment of insurance premiums by the insured;
- formation and spending of insurance funds on a joint and several basis;
- differentiation of the insurance rate taking into account the conditions and state of occupational safety, occupational injuries and occupational diseases at each enterprise;
- economic interest of insurance entities in improving working conditions and safety;
- targeted use of accident insurance funds.

1.7.1. Subjects and objects of accident insurance

The subjects of accident insurance are insured citizens, and in some cases - members of their families and others, policyholders and the insurer.

The insured is an individual in whose favor the insurance is provided (hereinafter - the employee).

Insurers are employers, and in some cases – insured persons.

Insurer - Social Insurance Fund for Accidents at Work and Occupational Diseases of Ukraine (hereinafter - the Social Insurance Fund for Accidents).

The object of accident insurance is the life of the insured, his health and ability to work.

According to the Law, the employer is considered to be:

- the owner of the enterprise or the body authorized by him and an individual who uses hired labor;
- the owner of a foreign enterprise, institution, organization (including international ones), branch or representative office located in Ukraine, who uses hired labor, unless otherwise provided by an international agreement, the binding nature of which has been approved by the Verkhovna Rada of Ukraine.

Compulsory accident insurance is subject to:

- 1) persons working on the terms of an employment agreement (contract) or on other grounds provided by labor legislation;

2) pupils and students of educational institutions, clinical residents, graduate students, doctoral students involved in any work during, before or after classes; during classes, when they acquire professional skills; during the internship (internship), work at enterprises;

3) persons who are detained in correctional, medical-labor, educational-labor institutions and are involved in labor activity at the production of these institutions or at other enterprises under special agreements.

The consent of the employee is not required to insure against an accident at work. Insurance is provided in an impersonal form.

All persons listed in Article 8 of the Law are considered insured with the moment of entry into force of this Law, regardless of the actual fulfillment by insurers of their obligations to pay insurance premiums.

All insured are members of the Social Accident Insurance Fund.

The following can be insured against an accident voluntarily:

1) persons who provide themselves with work independently - are engaged in advocacy, notarial, creative and other activities related to the receipt of income directly from this activity, members of the farm, personal farm, if they are not employees;

2) citizens - business entities.

Persons subject to accident insurance are issued a certificate of compulsory state social insurance, which is the same for all types of insurance and is a document of strict reporting.

1.7.2. Insurance risk and insured event

Insurance risk - the circumstances in which an insured event may occur.

An insured event is an accident at work or an occupational disease that caused the insured professionally caused physical or mental injury in the circumstances specified in Article 14 of the Law, which gives rise to the insured person's right to receive material support and / or social services.

An occupational disease is also an insured event if it is established or detected during a period when the victim was not in an employment relationship with the enterprise where he fell ill.

An accident or occupational disease that occurred as a result of a violation of labor protection regulations by the insured is also an insured event.

Violation of labor protection rules by the insured, which caused an accident or occupational disease, does not release the insurer from the obligations to the victim.

The fact of an accident at work or an occupational disease is investigated in accordance with the procedure approved by the Cabinet of

Ministers of Ukraine, in accordance with the Law of Ukraine "On labor protection". The basis for payment to the victim of medical expenses, medical, professional and social rehabilitation, as well as insurance payments is an act of accident investigation or an act of investigation of an occupational disease (poisoning) in the prescribed forms.

1.7.3. Accident at work and occupational disease

An accident is a time-limited event or sudden exposure of an employee to a hazardous production factor or environment that occurs in the course of his or her duties, resulting in injury health or death.

The list of circumstances under which the insured event occurs is determined by the Cabinet of Ministers of Ukraine upon submission of a specially authorized central body of executive power.

In some cases, if there are grounds, the Social Accident Insurance Fund may recognize an insurance accident that occurred in circumstances not specified in the list provided for in part two of this article.

An occupational disease is a disease that has arisen as a result of the insured's professional activity and is caused exclusively or mainly by the influence of harmful substances and certain types of work and other factors related to work.

The list of occupational diseases is approved by the Cabinet of Ministers of Ukraine upon the submission of a specially authorized central executive body.

In some cases, the Social Accident Insurance Fund may recognize as an insured event a disease not included in the list of occupational diseases provided for in part five of Article 14 of the law, if at the time of the decision medical science has new information that gives grounds to consider the disease occupational.

1.7.4. Social Accident Insurance Fund

Accident insurance is carried out by *Fund of social insurance* against accidents – the non-profit self-governing organization operating on the basis of the charter which is approved by its board.

The Social Accident Insurance Fund is a legal entity, has a seal with the image of the State Emblem of Ukraine and its name, as well as an emblem, which is approved by its board.

Management of the Social Accident Insurance Fund is carried out on a parity basis by the state, representatives of insured persons and employers.

The Social Accident Insurance Fund is directly managed by its board and executive directorate.

The Board of the Social Accident Insurance Fund includes representatives of three representative parties:

- states;
- insured persons;
- employers.

From each of the three representative parties is appointed and elected (delegated) 15 members of the Board of the Social Accident Insurance Fund with a casting vote and 5 of their backups, who in the temporary absence of board members by decision of the Chairman of the Board.

The Board of the Social Accident Insurance Fund is established for a period of six years. Board of the Social Accident Insurance Fund:

1) elects from among its members for a term of two years the Chairman of the Board of the Fund and his two deputies. This provides alternate representation in these positions of each of the three representative parties;

2) directs and controls the activities of the executive directorate of the Fund and its working bodies; annually, and if necessary, hears the reports of the director of the executive directorate of the Fund on its activities;

3) creates on a parity basis to address the most important tasks of the Fund permanent and temporary commissions on accident prevention, budget execution, pensions, etc .;

4) annually prepares and submits in the prescribed manner proposals for sectoral tariffs for social insurance contributions against accidents;

5) appoint the director of the executive directorate of the Social Accident Insurance Fund and his deputies;

6) approves:

- the charter of the Social Accident Insurance Fund, changes to it;
- regulations of the board of the Social Accident Insurance Fund; annual budgets of the Fund and reports on their implementation, the procedure for using the budget and reserve funds of the Fund;

- Regulations on the Executive Directorate of the Social Accident Insurance Fund;

- structure of the Fund's bodies, maximum number of employees, schemes of their official salaries, expenses for administrative and economic expenses of the Fund;

- annual work programs and reports on their implementation;

- Regulations on the service of insurance experts on labor protection, prevention of accidents at work and occupational diseases;

- Regulations on the procedure for the use of funds by medical and preventive, educational and other institutions that provide social services to the Fund, and control over their intended use;

- The order of appointment, transfer and carrying out of insurance payments;

7) performs other functions provided by the charter of the Social Accident Insurance Fund;

Decisions of the Board of the Fund, which have a normative character and relate to the rights and obligations of policyholders and insured persons, are subject to mandatory state registration in the manner prescribed for registration of regulations of executive authorities.

The Executive Directorate of the Social Accident Insurance Fund is a permanent executive body of the Fund.

The Executive Directorate is accountable to the Board of the Fund, conducts its activities on behalf of the Fund within the limits and in the manner prescribed by its charter and Regulations on the Executive Board of the Social Accident Insurance Fund, organizes and enforces decisions of the Fund.

The Executive Directorate of the Social Accident Insurance Fund provides logistical support for the work of the Supervisory Board and the Board of the Fund.

The Director of the Executive Directorate of the Social Accident Insurance Fund is a member of the Board of the Fund with the right of an advisory vote.

Insurance experts on labor protection

The performance of statutory functions and responsibilities of the Social Accident Insurance Fund for the prevention of accidents is entrusted to *occupational safety insurance experts*.

Insurance experts on labor protection may be persons with higher special education in the specialty of labor protection specialist or persons with higher technical or medical education who have experience of practical work at the enterprise not less than three years and the relevant certificate issued by a specially authorized central executive body.

Occupational safety insurance experts have the right to:

1) to visit enterprises without hindrance and at any time to check the condition of working conditions and safety and to carry out preventive work on these issues;

2) as a member of the relevant commissions to participate in the investigation of accidents at work and occupational diseases, as well as in testing the knowledge of labor protection of employees of enterprises;

- 3) receive explanations and information from employers, including in writing, on the state of labor protection and types of activities;
- 4) participate in the work of commissions on labor protection of enterprises;
- 5) make mandatory for employers to comply with the submission of violations of labor protection legislation;
- 6) draw up protocols on administrative offenses in cases provided by law;
- 7) participate as independent experts in the work of commissions for testing and commissioning of production facilities, means of production and personal protection, equipment and control devices.

Occupational safety insurance experts conduct their activities in accordance with the Regulations on the Service of Occupational Safety and Health Insurance Experts, Prevention of Accidents at Work and Occupational Diseases[4].

1.7.6. Rights and obligations of the insured and the insured

The Insured has the right to:

- 1) participate on an elective basis in the management of accident insurance;
- 2) be an authorized representative of the insured workers and demand from the Social Accident Insurance Fund to fulfill its responsibilities for the social protection of victims;
- 3) participate in the investigation of the insured event, including with the participation of a representative of the trade union body or his proxy;
- 4) in the event of an insured event to receive from the Social Accident Insurance Fund payments and social services provided for in Article 21 of the Law;
- 5) for medical rehabilitation services;
- 6) for vocational rehabilitation services, including job retention, training or retraining, if the total duration of vocational rehabilitation does not exceed two years;
- 7) to reimburse the costs of medical and professional rehabilitation for travel to the place of treatment or training and back, the cost of housing and meals, transportation of luggage, travel of the person accompanying him;
- 8) for social rehabilitation services, including the purchase of a car, prostheses, assistance in housekeeping, provided in accordance with the law;
- 9) receive free of charge from the Social Accident Insurance Fund explanations on social insurance against accidents.

In the event of the victim's death, his family members are entitled to receive from the Social Insurance Fund against accidents insurance payments (one-time assistance, survivor's pension) and services related to the burial of the deceased.

The Insured is obliged to:

1) know and comply with the requirements of legislative and other regulations on labor protection relating to the insured, as well as comply with the obligations on labor protection provided by the collective agreement (agreement, employment contract, contract) and the rules of internal labor regulations of the enterprise;

2) in case of an accident or occupational disease:

a) to be treated in medical and preventive institutions or by medical workers with whom the Social Accident Insurance Fund has concluded agreements on medical care;

b) follow the rules of conduct and treatment regimens defined by doctors who treat him;

c) not to evade professional rehabilitation and implementation of instructions aimed at his return to work as soon as possible;

d) timely inform the working body of the executive directorate of the Social Insurance Fund against accidents about the circumstances that lead to changes in the amount of material support, the composition of social services and the procedure for their provision (changes in the state of incapacity for work, family composition, dismissal from work, employment, departure from the state, etc.).

The employer as an insured has the right to:

1) participate on an elective basis in the management of accident insurance;

2) require the Social Accident Insurance Fund to fulfill the Fund's responsibilities for the organization of accident prevention and occupational diseases and social protection of victims;

3) to appeal against the decisions of the employees of the Social Accident Insurance Fund in special commissions for resolving disputes at the executive directorate of the Fund and its working bodies;

4) protect their rights and legitimate interests, as well as the rights and legitimate interests of the insured, including in court.

The employer as an insured is obliged to inform the working body of the executive directorate of the Social Accident Insurance Fund:

1) about each accident or occupational disease at the enterprise;

2) on the change of technology of works or type of activity of the enterprise for

transfer it to the appropriate class of occupational risk;

3) submit to the working body of the executive directorate of the Social Accident Insurance Fund information on the annual actual volume of sold products (works, services), the number of accidents and occupational diseases at the enterprise for the previous calendar year;

4) free of charge to create all necessary conditions for work at the enterprise of representatives of the Social Accident Insurance Fund;

5) inform the employees of the enterprise of the address and telephone numbers of the working body of the executive directorate of the Social Accident Insurance Fund, as well as medical and preventive institutions and doctors who serve the enterprise under agreements with this Fund;

6) submit reports to the working body of the executive directorate of the Social Accident Insurance Fund within the time limits, in the manner and according to the form established by this Fund.

The Social Accident Insurance Fund is liable in accordance with the law for damage caused to insured persons as a result of non-compliance, late or improper compliance with the insurance conditions established by law.

Employees of the Social Accident Insurance Fund are liable in accordance with the legislation of Ukraine for violations of legislative or other normative legal acts on accident insurance.

Health care institutions, vocational rehabilitation institutions and citizens who provide social services to insured persons are civilly liable for damage caused to insured persons or the Social Accident Insurance Fund due to falsification of data on the volume and quality of services provided.

The Insured shall be liable for damage caused to the Insured or the Social Accident Insurance Fund as a result of failure to fulfill its accident insurance obligations, in accordance with the law.

Practical classes and tasks for section 1

Topic. Social and psychological risk factors. *Practical lesson №1.*
Calculation of social risk

Objective. To become familiar with the general concepts of risk - quantitative assessment of risks; learn to identify the different types, levels and categories of risk, as well as statistical evaluation of dangerous and harmful factors for human life.

Task:

1. Defining the types, levels, various categories of risk situations (part 1).

2. Statistical evaluation of dangerous and harmful factors for human life (part 2).

Part 1.

General provisions

1.1.General assessment and characteristics of hazards

The result of a display of the dangers are the accidents, disasters. They are accompanied by deaths, reduced life expectancy, damage to human health or the environment, etc.

Consequences or quantification of damages, caused by the danger, depend on many factors, such as the number of people, located in the danger zone, the quantity and quality of material values placed there, natural resources, perspective areas, etc.

In order to standardize any consequences are defined as damage. Each individual kind of damage has its own quantitative determination. For example, the number of dead, wounded or diseased, the area of infected territory, the area of forest that had burned, the cost of destroyed buildings, etc. The most versatile method of quantitative determination of an injury is valuable; hence, its establishment in monetary equivalent.

Another, not less important characteristic of a danger, more specifically, the level of possible hazard, is the frequency with which it can occur, or the **risk**:

Risk (R) is defined as the ratio of the number of events with undesirable consequences (n) to the maximum of their number (N) for a specific period of time

$$R = \frac{n}{N}$$

The given formula allows you to calculate the size of the total and group risk. While assessing the **total risk**, value N determines the maximum number of the events, and while assessing **group risk** - the maximum number of events in a particular group, selected from the total number according to a particular feature. In particular, the group may include people belonging to the same profession, age and sex; group can comprise of vehicles of the same type; one class of economic activity [1].

Tasks for independent work.

Example 1: *The town is a residence to 40 thousand of people. There operates a chemical plant, which employs 15,000 people. An accident occurred - 37 people wounded; 4 - died; poisoned by the chemical vapor 120 residents. Calculate the total and the group risk of the affected people.*

Example 2. In the farm, which owns 800 hectares of forest, a fire occurred. 45 hectares of forest were burned. Calculate the total and group risk of the occurred event. (Total forest area in Ukraine - 9.6 million ha; in the Kyiv region - 800 thousand ha).

1.2. Levels and categories of hazards

To determine the seriousness of the hazards, there are different criteria. Categories of the hazards' seriousness presented in Table 1.1, establish a quantitative value of the relative seriousness of the possible consequences of hazardous conditions. The application of categories of the hazards' is very useful for determining the relative importance of taking preventive measures to ensure life safety. For example, a situation, belonging to the category I (catastrophic hazard), requires more attention than those, categorized IV (minor hazard).

1.1. Criteria for hazards' seriousness

Type of hazard	Category	Description of an accident
Catastrophic	I	Death or destruction of the system
Critical	II	Serious injury, sustained disease
Limited	III	Minor trauma, shorttime disease
Insignificant	IV	Less significant injuries, disease than those categorized III

1.2. Levels of hazard probability

Type	Level	Description of the consequences
Frequent	A	High chances are that the event will be held
Probable	B	It may happen several times during a lifetime
Probable	C	Sometimes it can occur during a lifetime
Remoted	D	It is an unlikely, but possible event
Impossible	E	So much unlikely that it can be assumed that the hazard will never occur

The levels of hazard probability is a qualitative reflection of the relative probability that undesired event, which is a result of uneliminated or uncontrollable hazard. Based on the high probability of hazard of any

system, we can come to a conclusion concerning specific types of activity. Therefore, using both methodologies for determining the likelihood and seriousness of the hazard, the hazards can be determined, assigned to a certain class and solved, as based on the seriousness of the hazards' potentially possible consequences, if any occur.

1.3. The concept of reasonable (acceptable) risk

According to the degree of risk acceptability is rejected, affordable, maximum allowable and excessive.

1. Rejected risk level is so small that it is within the tolerance of the natural (background) level.

2. An acceptable risk is considered the one that society can accept (allow, permit), including technical, economic and social opportunities at this stage of development.

3. Maximum allowable risk is a maximum risk, which should not be exceeded despite the expected result.

4. Excessive risk is characterized by exceptionally high level, which in most cases leads to negative consequences. Rejected risk today is also impossible to be provided due to the lack of technical and economic prerequisites for this. Therefore, modern life safety concept is based on achieving a reasonable (acceptable) risk.

It is easy to see that a serious hazard may be acceptable if its probability is very low, as well as the probable event can be proved that its result is insignificant. These considerations give reasons to believe that the probability of the hazard risk is inversely proportional to its seriousness.

1.3. Risk Assessment Matrix

The frequency with which an event occurs	Hazard category			
	I. Catastrophic	II. Critical	III. Limited	IV. Insignificant
(A) Often	1A	2A	3A	4A
(B) Probably	1B	2B	3B	4B
(C) From time to time	1C	2C	3C	4C
(D) Remoted	1D	2D	3D	4D
(E) Impossible	1E	2E	3E	4E
Hazard risk index				
Risk classification 1A, 1B, 1C, 2A, 2B, 3A 1D, 2C, 2D, 3B, 3C 1E, 2E, 3D, 3E, 4A, 4B 4C, 4D, 4E	Risk criteria Unacceptable (excessive) Undesirable (the maximum allowable) The permissible with verification (acceptable) The permissible without verification (neglected)			

Table 1.3 shows an example of the hazard risk matrix, which includes elements of tables 1.1 and 1.2 in order to provide an effective tool for approximating the acceptable and unacceptable levels of risk or probability for each category of seriousness and probability, to deeper classify and assess the risk according to its degree. The use of this matrix facilitates the assessment of risk.

Tasks for independent work.

Example 1. Carbon monoxide caused three people poisoned. Owing to the timely assistance provided people could be rescued. Determine the category of seriousness of hazard.

Example 2. The collision of aircrafts in the air. Identify classification and criteria for this event according to the hazards risk.

Example 3. Define the risk level of person's crossing the road on a red light.

Example 4. Identify risk from lightning hitting a person.

Example 5. Car accident on the road. 2 people died, 3 injured. Calculate the total and group risk and identify the classification and criteria of the event according to the hazards risk index (based on the statistics, in 2010 4,7 thousand people died, 40 thousand were injured on the roads of Ukraine).

Example 6. Calculate the numerical value of the total risk of household accidents with fatal consequences. According to the statistics, in 2010 73111 people died in the domestic sphere in Ukraine. Identify classification and criteria of this dangerous situation according to the hazards risk index.

Part 2

Task. On the basis of sociological approach, conduct statistical evaluation of hazards to human life, using a point scale system.

Students are offered to assess the hazard to a life of a resident of Ukraine of 35 factors listed in Table 1.4, according to the following scale: the most dangerous factor (according to the students' opinion) is estimated at 35 points, and then 34, 33, 32 and until the last one, which is considered the least dangerous – 1 point.

Of course, having unequal life experiences, students assess the hazard of a factor differently, hence, the obtained results should be statistically processed. Each factor is calculated with the number of points provided by the students, that amount is divided by the number of students surveyed and

the obtained value is the average rating of a danger factor: the higher it is, the more dangerous the factor is. Central hazard assessment of j- factor of \hat{S}_j is defined by the formula

$$\hat{S}_j = \frac{\sum_{i=1}^n S_{ij}}{n},$$

where S_{ij} are individual assessments of the students for j factor, n - the number of students surveyed. If we assume that the factors listed include all dhazards to a human life, we can also assess the relative proportion (percentage) of each factor q_j in the total number of undesirable consequences according to the formula

$$q_j = \frac{S_{ij}}{630} \times 100 = \frac{\hat{S}_j}{6,30}, \%$$

The results are put in Table 1.4.

1.4. Statistical evaluation of hazards and harmful factors for human life

#	Factors	Individual assessment, S_i	The average assessment, S_j	The relative share q_j
1	2	3	4	5
1	Air transport			
2	Automobile transport			
3	Nuclear energy			
4	Unemployment			
5	Consumption of alcoholic drinks			
6	Industrial injuries			
7	The use of low-quality food			
8	Lack of necessary food products			
9	Killings and intentional injury			
10	Ponds (swimming, rest)			
11	Diagnostic radiation			
12	Electric current			
13	Railway transport			
14	Infections			
15	Smoking			
16	Medicines			
17	Narcotic substances			
18	National conflicts			
19	The presence of radioactive substances in the air, water, soil			
20	The presence of radioactive substances in food products			

21	The presence of chemicals in air, water, soil			
22	The presence of chemicals in food products			
23	Domestic injury			
24	Increase of prices			
25	Fires			
26	Suicide			
27	AIDS			
28	Sports and mass events			
29	Natural disasters			
30	Personal issues and concerns			
31	Terrorism			
32	Food poisoning			
33	Surgery			
34	Diseases associated with the presence of radioactive substances in the environment			
35	Diseases associated with the presence of chemicals in the environment			

To sum up, we note that the accuracy of this assessment increases with the number of respondents, depending on occupation, age and gender of the person.

Forecast of possible increase of life expectancy under the conditions of elimination of certain causes of death makes it possible to identify the most dangerous factors for life. According to the forecast of scientists, the elimination of the key cardio - vascular and renal diseases will increase life expectancy to 10.9 years, heart disease - 5.9 years, malignancies - 2.3 years, accidents (excluding automobile accidents) - 0.6 years, automobile accidents - 0.6 years, infectious diseases - 0.2 years, tuberculosis - 0.1 years.

It is important to note that the awareness of the existence of dangerous and harmful factors for human life is only the first step to a secure life. It is necessary to establish the conditions under which these factors cause unwanted effects and avert the possibility of these conditions.

Questions.

1. What is the essence of life safety? On the achievement of which basic sciences is it based?
2. Indicate the basic principles of human life.
3. Define the terms: "life" and "activity".
4. Name the main problems of livelihood.
5. Identify and classify hazardous factors.
6. Name the subgroups of physical hazards.
7. What are chemical hazards.
8. Describe the biological hazards.
9. Provide a classification of psychophysiological risk factors.
10. What is the risk to life safety?
11. Name the types of environmental risk.
12. Define man-made risk.
13. What is social risk?
14. What is the calculation of social risk?
15. Name the structural features of social risk.
16. What is subjective risk?
17. What are the types of risk tolerance?
18. What is a qualitative risk characterization?
19. What is the statistical assessment of dangerous factors?
20. What is labor protection?
21. Name the causes of fatal industrial injuries.
22. What benefits are assigned by the Law of Ukraine "On labor protection" to women, minors, disabled workers.?
23. What are industry regulations on labor protection?
24. For whom are intersectoral legislation developed?
25. Is the liquidation of the labor protection service allowed?
26. Name the responsibilities of employees to comply with health and safety requirements
27. Which document is the main normative document that establishes the procedure and types of training and testing of knowledge on labor protection?
28. What are the basic principles of accident insurance?

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2. Physiological factors of provision human security

2.1. Structural - functional organization of man in terms of interaction with the environment

Everyone is a living organism, a complex bioenergetic system, the vital activity of which is ensured at the physiological, mental and social levels.

The body is an open biological self-regulating system that exchanges matter and energy with the environment, reproduces itself and adapts to changes in environmental conditions.

Like all living organisms, man uses nutrients and oxygen, and also releases into the environment the products of metabolism, water and carbon.

The human biological system has different levels - molecular, supramolecular (cell organelles), cellular, tissue, organ, organism. They are all interconnected and interact.

The basic structural and functional unit of an organism is a *cell*. Homogeneous cells, united by a common function, structure and origin, form *tissues*. Epithelial, connective, muscular and nervous tissues are distinguished in the human body by their morphofunctional properties. The complex of tissues united by a common function, structure and development, form an *organ* - a part of the body that performs a specific, unique function. Sets of organs form *organ systems*. There are the following systems: musculoskeletal, circulatory, respiratory, food, nervous, urogenital, endocrine (endocrine glands). Organ systems make up the *body*.

In the human and animal body, the interconnected work of all organs and physiological systems is provided by neurohumoral regulation, which is carried out through the influence of the nervous system and active biological substances contained in the blood, lymph, tissue fluid.

Man, like all natural beings, has a body formed from subsystems of organs that form a single structural and functional system. It provides metabolism and energy with the natural environment through numerous connections and processes[3].

The basis of human life is metabolism (metabolism), due to two opposite processes: assimilation - the assimilation of substances from the environment, and the formation of complex compounds from simpler, which become part of biological structures or deposited in the form of reserves; dissimilation - the decomposition of complex organic compounds into simpler ones.

The source of energy in cells and tissues in general is the oxidation of proteins, fats and carbohydrates to inorganic and simple organic compounds (water, carbon dioxide, urea).

Homeostasis (Greek homoios - similar and stasis - standing) - the relative stability of the internal environment of the human body (blood, lymph, tissue fluid) and the stability of basic physiological functions (blood circulation, respiration, thermoregulation, metabolism).

Fluctuations in a large number of indicators of homeostasis in a certain range indicate that a living organism is a dynamic system capable of adapting to specific living conditions. The possibilities of adaptation are limited by certain parameters (for example, body temperature - 36 - 37, glucose content 3.3 - 3.5 mol / l). Deviations of the main indicators of homeostasis from the norm indicate a serious illness.

Blood, lymph and tissue fluid wash the tissues and cells of the body. Blood has a liquid consistency, so it can move freely through blood vessels and performs transport, protective, respiratory, thermoregulatory, trophic, excretory functions.

Blood consists of a liquid part - plasma (about 58% of volume) and shaped elements - cells (42%): erythrocytes, thrombocytes, leukocytes. The total amount of blood in the body of an adult is normally 6 - 8% of body weight (approximately 4.5 - 6 liters).

The volume of circulating blood is 40 - 45% of the total blood volume, the last part of the blood is in the blood depot: liver, spleen, tissues. Loss of 1/2 - 1/3 of blood volume is life threatening. A small blood loss (up to 0.5 l) is compensated by the body itself due to the release of blood into the vascular bed from the spleen and the transfer of water from the tissues into the bloodstream.

Reactivity (Latin re - reversibility of action and activus - active) - the body's ability to respond appropriately to environmental influences.

There are individual and group reactivity. Individual reactivity is due to hereditary factors. It depends on the conditions in which the body develops, the nature of nutrition, climate zone, oxygen content in the air. Reactivity depends on gender (women are more resistant to hypoxia, blood loss, starvation), age. Early childhood is characterized by low reactivity. The highest reactivity in adulthood, the lowest - in old age. According to the forms of manifestation, there are increased (hyperergy), decreased (hypoergia), modified (desertion) reactivity.

Resistance (Latin resistens - counteracting) - the body's resistance to pathogenic factors.

Reactivity and resistance are closely related. Together they reproduce the basic properties of a living organism. If the impact of the environment

is significant or prolonged, it can break the functional system (there will be structural and physiological disorders), and as a result, a person will get sick or it will change heredity.

Thus, man, like every living thing, is a natural organism that acts and develops according to biological laws.

The body's reactions are the only objective criterion for the environment's impact on it. Adaptive reactions of the organism make it possible to maintain its relative stability in conditions of significant fluctuations in environmental parameters. As long as the human body is able to use these reactions to ensure stable functioning, its health is safe. If the intensity of environmental factors exceeds the adaptive capacity of man, then there are dangers to normal life. Thus, the safety of human life to some extent depends on the body's response to external stimuli, its ability to avoid environmental hazards and adapt to changing environmental conditions.

Human analyzers and their role in the assessment of environmental hazards. A person is constantly exposed to a continuous flow of external stimuli, as well as a variety of information about the processes occurring inside and outside the body. Perceive this information and properly respond to it personality allows its senses: eyes, ears, tongue (as an organ of taste), nose (as an organ of smell) and so on. Each of these organs is designed to respond to certain environmental phenomena, converts signals from the outside world (sound, light, smell, mechanical stimuli) into signals from the nervous system - nerve impulses.

The brain receives these signals, processes them and sends an "order" to the executive: the person stops when he sees a red light; hurries to the kitchen, smelling burnt food; picks up the phone when the phone rings. The senses work constantly, they direct actions and control them.

Each type of receptor perceives only one type of stimulus. Just a few quanta of light are enough to create a visual sensation; auditory receptors begin to send signals to the brain when the eardrum is displaced at a distance ten times smaller than the hydrogen atom; 2-3 molecules of fragrant substance are enough to smell.

The human analyzer consists of a *receptor, conductive nerve pathways and a brain ending*. The receptor converts the energy of the stimulus into a nervous process. Leading pathways transmit nerve impulses *to the cerebral cortex*.

The cerebral end of the analyzer consists of a nucleus and elements scattered throughout the cerebral cortex. Scattered elements provide neural connections between different analyzers. There is a two-way connection between the receptors and the brain end, which provides self-regulation of the analyzer. A feature of human analyzers is their parity, which ensures

high reliability of their work due to partial duplication of signals and dynamic ambiguous functional asymmetry.

Thus, the receptors, the pathways by which excitation is transmitted, and the special areas of the cerebral cortex form a single system where sensation is born and stimuli are distinguished. This system IP Pavlov called the *analyzer*.

Analyzers - a set of interacting entities of the peripheral and central nervous system, which carry out the perception and analysis of information about the phenomena that occur both in the environment and inside the body.

In modern physiology, given the anatomical unity and commonality of functions, there are eight analyzers. However, in the system of human interaction with the environment, the main or dominant in the detection of danger are still visual, auditory and skin analyzers(Fig 2.1).

Types of analyzers in humans:

Main: visual, auditory, tactile

Additional: motor, gustatory, olfactory, vestibular, visceral

There are the following types of receptors:

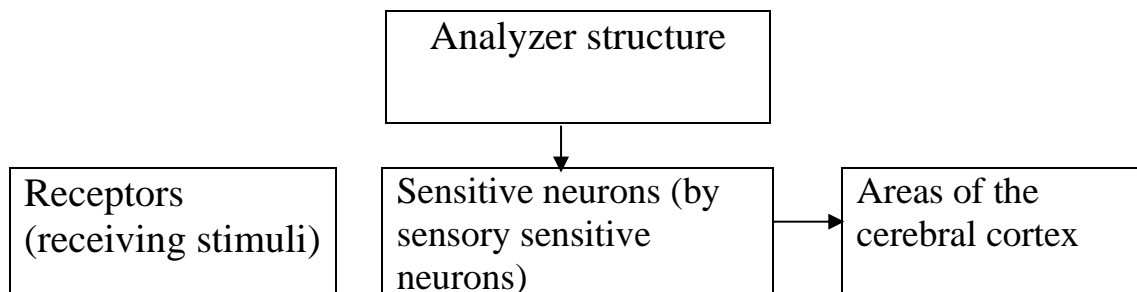


Fig 2.1. functional structure of the analyzer

There are the following types of receptors:

Mechanoreceptors that perceive mechanical energy. For example: auditory, vestibular, motor, partially visceral.

Chemoreceptors - olfactory, gustatory.

Thermoreceptors - skin.

Interreceptors - visceral.

Photoreceptors - visual

Analyzer properties:

- extremely high sensitivity to adequate stimuli;
- ability to adapt (analyzers are able to adjust the level of their sensitivity to the intensity of the stimulus - adaptation, due to which at high intensity of active stimuli sensitivity decreases and, conversely, at low - increases;
- ability to train (both in increasing sensitivity and in accelerating adaptation processes);
- the ability to maintain a feeling for some time after the cessation of the stimulus;
- analyzers under the condition of normal functioning are in constant interaction (vicarage - interchangeability, people are deprived of some, sometimes even several analyzers, live a full life, perceiving the world around in all variety of its displays);

the presence of absolute, differential and operational limit of sensitivity to the stimulus (absolute limit of sensitivity can be lower - - the minimum value of the stimulus that causes sensitivity, and the upper - the maximum allowable value of the stimulus that does not cause pain. Differential limit is determined by the smallest value of the stimulus. The operational limit of sensitivity is the magnitude of the signal at which the accuracy and speed of its distinction reach a maximum.

The minimum difference in the strength of two similar stimuli required to change the intensity of sensation is called the threshold of distinction. The lower and upper absolute thresholds of sensations (absolute sensitivity) and the thresholds of distinction (relative sensitivity) characterize the limits of human sensitivity.

The presence of absolute and differential limits of sensitivity was introduced by the German physiologist Weber and quantitatively described by the German physicist Fechner

The basic psychophysiological law of Weber-Fechner physiology.

The intensity of sensation is proportional to the logarithm of the intensity of the stimulus:

$$S = C \ln I \quad (2.1)$$

where S is the intensity (or strength) of sensation,
 I - the magnitude of the stimulus;
 C - is the coefficient of proportionality.

2.2. Typical models of psychophysiological reactions of people in case of extreme situations

The main mental processes of a person in terms of life safety include memory, attention, thinking, will, emotions and more.

There are many human properties, they can be classified according to three main features:

attributes are integral properties without which a person cannot be imagined and without which he cannot exist (gender, age, temperament, language);

traits - are persistent features of behavior that are repeated in different situations. They significantly affect human life and security (intelligence, perseverance, courage, tenderness, independence);

qualities are those properties that are manifested differently depending on conditions, situations (abilities, perception, memory, thinking).

Memory. This is one of the most important functions of the human brain. If perception is the initial stage of the cognitive process, the reflection of objective reality that acts on the senses at the present time, then memory is the reproduction of events in the past.

Memory is a person's ability to record, store and reproduce information, experience (knowledge, skills, abilities, habits).

Human memory contains two types of information: genetic (species) and acquired (lifelong). Depending on the objects of memorization and

reproduction, the following types of memory are distinguished: genetic; acquired (motor; visual; auditory; emotional; symbolic. In terms of duration, there are instantaneous, short-term, long-term memory.

Only a small part of the information coming from the senses is stored in the memory. Most of it a person forgets. This protects the brain, which has a certain information capacity, from overload. Comparing the amount of information needed to learn a language (4×10^8 bits) with the number of neurons in the speech centers of the temporal lobe (3×10^8 bits), we can calculate that to save one bit (a unit of information equal to 7 characters) requires approximately 10 neurons. If we translate this data into the cerebral cortex, we obtain the value of the total information capacity of the brain, which is approximately equal to 3×10^8 bits. Such a capacity is enough to constantly store about 1% of the total flow of information that passes through our consciousness. It is also estimated that under any circumstances, the amount of information that is perceived consciously by all analyzers does not exceed 50 bits per second. Thus, when reading quietly, the flow of information is 40 bits / s, with mental calculations - 12 bits per second. If we assume that the average flow of information is 20 bits / s, then for 70 years of life expectancy with an active activity of 16 hours a day, our brain will receive 3×10^8 bits. This is 100 times the information capacity of the brain. Of all the information that enters the brain, only 1% is stored in long-term memory.

In long-term memory, it is better to store information in a condensed form in the form of laws, generalizations, concepts. But the brain selects in *long-term memory* the information that is needed. This extremely important work is performed by the motivational system, which determines which information is most important. In the process of learning the transition of the required information into *long-term memory* is facilitated by the repetition of the material.

Memory capacity is the amount of information that can be reproduced immediately after a single presentation. *Reproduction accuracy* - the degree of conformity of the assimilated material to the reproduced.

The development and quality of memory is influenced by the physical and mental state of a person, his training, profession, age. A person who is engaged in mental work is more receptive to information, especially related to production activities. In this case, it is a professional memory.

By the age of 20-25, memory improves and by the age of 30-40 it remains at the same level. Then the ability to remember and recall gradually deteriorates. Professional memory is preserved in old age.

A person will be better able to memorize material if he knows the factors that affect memory performance and some general rules of its

improvement and training. It is better to repeat the study material more often and in parts than less often and a lot. Every 40 minutes you need to take a break for 10 - 15 minutes. It is desirable to reproduce the studied material the next day. It should be repeated in 2-3 hours, not again and again. It is more effective to read the text twice carefully than 10 times inattentively. In order to better remember the material, it is necessary to single out the main ones, carefully study the illustrations, make a plan, scheme, table. It is very important to alternate complex material with more accessible, interesting with less interesting. When learning something new, it is recommended to use all types of memory, for which you can write down, take notes, repeat about yourself, and even better aloud. Self-repetition aloud is always more effective than mechanical, even repeated reading of the material. It is useful to repeat complex material at bedtime, as it helps to consolidate the results of memorization.

The success of memorization and learning depends on such features of a person as the motives of learning, his interests, the emotionality of the inner world. If the material is interesting, it is easier to remember and assimilate, and to stimulate interest, you need to change the motives of the activity.

Forgetting protects the memory from redundant information, but the necessary material is also forgotten. The main remedy against forgetting is repetition.

Attention. It is an important mental process of man.

Attention is the concentration of consciousness on any object or activity while distracting from everything else.

Attention is related to the will, which distinguishes between passive and active attention. Passive attention occurs without conscious volitional effort under the influence of external stimuli (loud sound, bright light, etc.) and lasts as long as they act. Passive attention of the worker arises at change of noise in the well-known working mechanism. Active attention is conscious attention that arises from volitional effort and is always aimed at the perception of objects and phenomena, with a predetermined goal.

Passive and active attention interact and complement each other. Active attention requires willpower, nervous tension and therefore tires a person.

There are also **externally directed and internally directed attention**. The operator, looking at the dashboard, strains his external attention, and the objects of the internal are thoughts, experiences and memories. When they are related to the tasks that arise in the process of monitoring the device, it has a positive meaning. However, internal experiences that are not related

to the operator's activities can distract from the perception of instrument readings and cause errors.

The amount of attention is determined by the number of objects that can be perceived simultaneously and quite brightly. Under normal circumstances, a person covers six to eight objects at a glance. As a rule, when a person performs a certain job, he can look at no more than two or three objects at a time.

Distribution of attention - the ability of a person to focus on several objects or perform two or more actions simultaneously, achieving a successful result. This is possible when the skill to perform at least one of the actions is brought to automatism.

Attention switching speed - the ability to quickly change the objects of attention and move from one activity to another. Improving these skills in the process of professional activity, which allows experienced workers to concentrate in a timely manner, quickly interrupt the actions taken or change them to the opposite, to adequately respond to unexpected critical situations.

The intensity of attention is the degree of its tension in the perception of the object. As the intensity of attention increases, perception becomes clearer.

Stability of attention - compliance with the required intensity of attention for a long time. It depends on a person's fitness. Studies have shown that 40 minutes of intense attention can be maintained (arbitrarily) without noticeable weakening, which justifies the duration of the training hour.

There are professions that require one of these qualities of attention, and there are those that require different types of attention. The driver's work, for example, in monotonous road conditions requires stability of attention, on a slippery road - its intensity, and at high speeds - a quick switch of attention.

One of the causes of errors is *inattention*. Most often, attention is reduced in case of fatigue.

The necessary aspects of attention are produced during training and in the process of professional activity. However, purposeful conscious training can accelerate their formation. In case of insufficient stability of attention, one should practice the ability to ignore external stimuli and train oneself to work productively in any conditions. To develop attention, it is necessary to systematically develop the skills to focus at any time on certain objects or activities. The formation of the necessary qualities of attention requires constant willpower, discipline, determination, perseverance.

Thinking. It is possible to know the phenomena of the surrounding world only through thinking.

Thinking is the highest form of reflection of reality, conscious human activity aimed at mediation, abstract generalization of knowledge of the phenomena of the world, their essence and relationships.

All mental activity consists of the following operations:

Analysis is a mental division of an object, a phenomenon into its constituent parts, features, properties and selection of these components; synthesis - a mental combination into a single whole of individual parts, features, properties of objects, phenomena or concepts; generalization - selection on the basis of comparison of the main thing, which is characteristic of a certain phenomenon, object, object; abstraction - the selection of essential features of a group of objects, phenomena or concepts; concretization - the transition from general to partial, the connection of theory with practice, the transition to concrete reality, to sensory experience.

The depth of human thinking is characterized by the ability to penetrate into the essence of cognitive phenomena, to reveal their causes, to find their foundations, to comprehensively clarify their connections, to predict the course of events. The opposite is the superficiality of thinking, which consists in the fact that a person is satisfied with a partial clarification of the connections of certain phenomena, insufficiently differentiates between clear and vague, clear and incomprehensible, proven and unproven.

Independent thinking is the ability of a person to ask new questions, find new approaches to clarifying them, to show initiative. This is a necessary prerequisite for innovative human activity in science and technology.

Critical thinking is the ability to revise views, theories that have already formed, to change them if they contradict the new data of science and practice.

Important individual features of thinking are *flexibility and speed*. *Flexibility of thinking* shows a person's ability to change the way a problem is solved. The opposite feature of flexibility is the inertia of thinking, its backwardness. *Speed* is characterized by the time during which people cope with cognitive tasks. The speed of correct, reasonable solution of problems is a valuable feature necessary in all areas of human activity.

To practice such characteristics of thinking as ingenuity, intelligence, speed of decision-making, speed and precise actions in the event of a sudden change of circumstances, special training is useful not only in real conditions, but also by modeling complex situations or their individual elements using simulators and special stands.

Will. Memory, attention, thinking are closely related to the will.

Will is a person's ability to control his actions and deeds.

It is expressed in motivated actions aimed at achieving a conscious goal. In a voluntary act, the implementation of the decision is of paramount importance. The main volitional qualities are discipline, self-control, determination and perseverance.

Discipline - compliance with the requirements of public duty, conscientious performance of official duties. For example, worker discipline in occupational safety is embodied in the strict implementation of occupational safety instructions and standards.

Indiscipline - a deliberate violation of established rules, instructions and safety requirements. The reason for the indiscipline of young inexperienced workers is the overestimation of their capabilities.

Self-control is the ability to control one's mental activity, feelings and actions in any conditions. It is expressed in the ability not to succumb to insurance in dangerous, critical situations. A brave person knows about the danger, but soberly assesses it.

Determination - the ability to quickly assess the situation, make decisions and without hesitation to implement them. It is an important condition for human activity in an emergency situation, especially in times of shortage. Fluctuations indicate indecision, which leads to confusion. This condition most often occurs in inexperienced and indecisive workers.

Persistence - the ability to work long and hard to implement the decision.

Emotions. Volitional qualities can be developed and nurtured. However, the education of the will must be accompanied by the education of feelings that depend on the worldview of man, his morals and spirituality, emotional state.

Emotions (Latin *emovere* – to excite, excite) - a manifestation of a person's subjective attitude to the world around him and to himself

There are the following emotional states of a person: *mood, affect and stress*. *Mood* is the most stable emotional state caused by weak and prolonged arousal, which reflects a person's attitude to the world around him. A mentally healthy person is dominated by a cheerful, optimistic worldview. *Affect* is an impulsive, poorly controlled state that occurs in extreme conditions, when a person loses control over his actions due to the darkening of consciousness. *Stress* is a set of protective physiological reactions that occur in the human body in response to adverse external factors. During stress, hormones are released, the mode of operation of many organs and systems changes (heart rate, heart rate, etc.). The stress response can be active (efficiency increases) and passive (efficiency decreases sharply).

There are the following emotions: *primary* (fear, anxiety, joy), with which a person is born; *secondary* (resentment, guilt, envy), formed as a

result of socialization and awareness of one's own "I"; *positive* (inspiration, success, confidence); *negative* (anger, fear, fear)

Each emotion serves a specific need, prompting the actions necessary to satisfy it. If the needs are met, then there are positive emotions, if the needs are not met - negative.

Communication is a multifaceted phenomenon, and contains a set of components, including: *sociability* - the ability to enjoy the process of communication; *social kinship* - the desire to be in society, among other people; *altruistic tendencies* - the desire to give joy to people.

Sensorimotor reactions are human reactions to any sensations perceived by the senses. In any sensorimotor reaction there is a latent (hidden) and motor period. The time from the moment of the signal to the beginning of the movement is called the latent period, and the time of the movement - the motor.

In addition, the reaction is characterized by *correctness, accuracy and timeliness* (ie, you can react in time, and the actions are wrong). The reaction time increases with age. Sometimes experience in the ability to predict the situation compensates for the reaction, but this is not always possible. If we take the profession of a driver as an example, then experiments show that on all routes a growing increase in reaction time was observed after 4 hours of work. This is due to the increasing fatigue of drivers, as well as the complexity of the route.

A person's *reliability* is also determined by the level of his sensorimotor coordination, ie the ability to timely perceive and correctly assess a rapidly changing situation and to ensure safety by adequate leading actions. Given that the work of a driver is always associated with critical situations where sensorimotor reactions play a significant role, we will analyze some parameters. At present, there is no generally accepted value of reaction time, exceeding which would be considered untimely actions of the driver. Therefore, different countries have adopted different normative values of such reactions.

For example, in Switzerland, the reaction time for calculations related to traffic in the city is 0.75 seconds, in suburban conditions - 2.5 seconds. In our country it is noted that at braking reaction time makes at excellent drivers to 1,16 sec., At good - 1,16 - 1,60 sec., At mediocre - more than 1,60 sec. The reaction time also depends on the intensity of the driver's attention, ie on the degree of stress in the perception of the road conditions. In urban traffic, when the intensity of attention is high enough, the reaction time is much shorter.

Checking the reaction time of the driver when braking, their training can be carried out in the safety rooms of motor transport companies.

However, this requires their equipment with appropriate devices, stands and car simulators.

Temperament and its properties

Individual psychological differences between people depend on the dynamic features of their psyche - the level of intensity of mental processes and states, the speed of their flow. These differences are manifested in the general activity of man, his motility, emotionality and are marked by sufficient consistency.

Temperament (*Latin temperamentum - structure, consistency*) - a set of individual characteristics that characterize the dynamic and emotional aspects of human behavior, activities and communication ..

Temperament depends on the type of higher nervous activity. The type of higher nervous activity is an alloy of innate and individually acquired properties of the processes of excitation and inhibition. Such properties of nervous processes are strength, balance and mobility. *The strength of the nervous process* - the property of nerve cells to maintain normal performance at high voltage excitation and inhibition - is the ratio of their strength. *The mobility of nervous processes* is characterized by the speed of their occurrence and change to the opposite process. Depending on the combination of the noted properties, Ivan Pavlov (1849–1936) singled out *four types of higher nervous activity*, which are the physiological basis of temperament. Choleric temperament corresponds to a strong unbalanced type of nervous activity; strong balanced mobile - sanguine; strong balanced inert - phlegmatic; weak - melancholic.

A person with a choleric temperament is energetic, unbalanced, prone to violent emotions, rapid movements, sudden mood swings, passionate at work, capable of leadership. Sanguine is characterized by high mental activity, balance, rapid change of impressions, ease and flexibility in communication. Phlegmatics is characterized by slowness, inertia, stable mood, consistency and depth of feelings, measured actions and speech, seriousness, persistence in work. Melancholic is characterized by slowness of movement, restraint in speech, low level of mental activity, propensity for deep feelings, isolation, incommunicability.

Properties of temperament are extraversion - introversion; emotional stability - neuroticism. Extraversion is manifested in the predominant focus of human activity on the world around, introversion - on the phenomena of their own inner world, on their thoughts and experiences. Depending on these properties, there are extroverts and introverts.

Extrovert - a person focused on the world around him, direct, active, open in emotional manifestations, impulsive, sociable, flexible in behavior, optimistic, determined.

An introvert is a person who is focused on his own feelings, restrained, closed, and has difficulty coming into contact with other people. When making decisions is serious, not susceptible to emotions.

In labor, the peculiarities of the temperament of workers are manifested in activity, emotionality, motility. Activity is characterized by the level of energy with which the employee achieves goals, overcomes difficulties. Emotionality is manifested in emotional reactions, in the speed of change from one emotional state to another. Features of motility are manifested in speed, rhythm, amplitude and accuracy of movements during work.

Each type of temperament has positive and negative features. Choleric is able to concentrate considerable efforts in a short time, but with long work he lacks endurance. Sanguine is characterized by high efficiency, quick response, but he quickly loses interest in work. A phlegmatic person can work hard, but does not know how to quickly switch to other tasks. The melancholic is characterized by great endurance, although he is slowly involved in the work. For strong mobile types is characterized by a rapid pace of work with insufficient attention to the preparatory and control actions. Inert people perform tasks more successfully where slow movements are required; they are punctual, plan their actions in advance. Features of temperament are manifested in mental activity, determining the ways and means of work, without determining, however, the level of achievement. Human mental capabilities create the conditions to compensate for the shortcomings of temperament. However, in some activities, the properties of temperament may depend not only on the course of their implementation, but also the result. In those types of work that place high demands on the pace or intensity of action, the individual characteristics of the dynamic manifestations of the psyche may be a factor in the suitability or unsuitability of a person for activity.

In most professions, the properties of temperament do not affect the final performance. Their influence can be manifested in extreme situations, when too mobile people react quickly (often inadequately), and inert people can get confused and unresponsive, as well as in individual activities of increased complexity. Yes, employees with pronounced extroversion, plasticity, emotionality, impulsiveness successfully perform work related to the rapid perception and processing of information, decision-making. Employees who are characterized by introversion, rigidity, anxiety, unemotionality, inhibition, more effectively perform regulated activities with a fixed algorithm, monotonous work and algorithm, monotonous work and work that requires precision of movements and actions. Insufficient

mental activity is compensated by increased accuracy, clarity and accuracy in work.

Typologically characterized qualities of different types are manifested in other living conditions, which should be taken into account when caring for safety in various domestic situations. The presence of different typological structures in the team contributes to more efficient work, provided that the tasks are distributed taking into account their characteristics.

Character structure

Features of temperament as a dynamic side of the psyche is one of the prerequisites for the formation and development of those basic personality traits that constitute human character.

Character is a set of stable individual personality traits that are formed and manifested in activities and communication, determining the typical individual behaviors.

Acting on the basis of common interests, the same views, motives, people show individual characteristics in behavior. They can be compliant or steadfast, determined or reluctant, confident or confused, remarks can be made in a friendly or rude manner, and so on.

Individual features that form a person's character relate primarily to his will, mind, feelings. These traits do not exist, do not exist in isolation, but are in regular dependence. For example, if a person is cowardly, then there is reason to believe that he will not show initiative, determination, will be careful.

Some traits are the main and determine the general direction of manifestations, others - secondary. They may be caused by the main features or not harmonize with them. As a result, a person cannot be holistic or contradictory.

In the structure of character can be divided into four subsystems of properties, or groups, which determine the attitude of the individual to various aspects of reality:

1) traits that are manifested in the activity (initiative, diligence, perseverance, purposefulness, responsibility, consistency, rationality, determination or alternative traits);

2) traits that are manifested in relationships with other people (tact - tactlessness, compassion - indifference, etc.);

3) traits that are manifested in her attitude to herself (self-criticism - inflated self-esteem, self-esteem - humiliation; altruism - selfishness);

4) traits that determine a person's attitude to things (neatness - slovenliness, generosity - stinginess, etc.).

In work, character traits are a motivating, motivating force, especially in stressful situations, when it is necessary to make a choice of actions, to overcome significant difficulties. One of these traits is the motivation to achieve, ie the need to succeed in business.

A person can take risks, show initiative, persistence, etc. Another strategy of behavior is possible, when a person does not try to succeed, but tries to avoid failure. In this case, it will avoid risky actions, will not show initiative, will not interfere in difficult situations with an uncertain outcome.

A person's character is manifested in how he communicates with other people. In communicative contacts such character traits as dominance - not dominance are most clearly revealed; mobility - rigidity; extraversion - introversion.

An integral characteristic of a person's personality appears as an alloy of traits of temperament and character, the physiological basis of which is the type of nervous activity. Yes, phlegmatics are harder than choleric or sanguine to form initiative and determination. For a melancholic the problem is overcoming indecision and anxiety, for a sanguine - to form a habit of patiently doing uninteresting work, for a choleric - to develop restraint and self-criticism. However, the character is due not only to the dynamic characteristics of temperament, but is also the result of socialization of the individual, his upbringing and self-education. The ability of a person in extreme situations to assess the circumstances, to counteract them, to overcome internal fluctuations indicates the enormous potential of its development[1.2].

2.3. Injuries and occupational diseases in the industry. Accident investigation

Working conditions - a set of factors of the production environment and labor process that affect the health and efficiency of man in the process of his professional activity.

Industrial trauma -violation of the anatomical integrity of the human body or its functions due to the influence of production factors.

Accident at work -sudden impact on the employee of a dangerous production factor or environment, resulting in damage to health or death.

Occupational disease -pathological condition of a person caused by work and associated with excessive stress on the body or the adverse effects of harmful production factors.

People, tools, environment and tasks to be solved in the process of work, are a dynamic system in which the change of any of the components

leads to the change of others, and the resulting impact on safety is sometimes difficult to assess in advance[14].

2.3.1. The purpose and objectives of accident investigation

According to Article 22 of the Law of Ukraine "On Labor Protection", the employer must organize investigations and keep records of accidents, occupational diseases and accidents in accordance with the regulations approved by the Cabinet of Ministers of Ukraine in coordination with all-Ukrainian trade unions. As a result of the investigation, the employer is obliged to draw up a relevant act, one copy of which must be issued to the victim or other interested person no later than three days after the end of the investigation.

Currently in Ukraine there is a Procedure for investigation and accounting of accidents, occupational diseases and accidents at work, approved by the Resolution of the Cabinet of Ministers of Ukraine of November 30, 2011 № 1232.

This Procedure determines the procedure for investigating and keeping records of accidents, occupational diseases and accidents that occurred to employees at enterprises, institutions and organizations, regardless of ownership or in their branches, representative offices and other separate units (hereinafter - enterprises).

This Procedure applies to:

1) owners of enterprises or their authorized bodies (hereinafter — employers);

2) employees, including foreigners and stateless persons, who, in accordance with the legislation, have concluded an employment agreement (contract) with the employer or are actually admitted to work by the employer;

3) individuals — entrepreneurs;

4) members of the farm, members of the personal peasant economy, persons working under a contract concluded in accordance with the legislation (hereinafter — persons self-employed).

This Procedure also applies to employees of the diplomatic service while working in a foreign diplomatic mission of Ukraine and persons who, in accordance with labor legislation, work under an employment contract (contract) in military units (subdivisions) or at enterprises, institutions and organizations owned by to the sphere of management of the Ministry of Defense, the Ministry of Internal Affairs, the State Special Transport Service, the Security Service, the Foreign Intelligence Service, the State Border Guard Service Administration, the State Tax Service, the Ministry of

Emergencies, the State Special Communications Service, the State Technological Security Service. Occupational injuries and occupational diseases (poisoning) are an undesirable consequence of human interaction with the production environment.

Accidents lead to injuries, which are sudden (unexpected) events caused by external factors and causing harm to humans. Sometimes, at the household level, these two concepts - accident and injury - are identified, but in labor protection, each of them has its own meaning.

Injuries include bruises on the body, cuts, wounds, bone fractures, burns, frostbite, drowning, electric shock, lightning and ionizing radiation, the effects of contact with flora and fauna, and so on.

Accidents are divided into:

- *by the number of victims* for those that occurred with one employee, and group accidents that occurred simultaneously with two or more employees;

- *according to the degree of severity of damage to health* - without loss of ability to work, with loss of ability to work for 1 working day or more, with severe consequences, with permanent loss of ability to work (injury) and fatal (lethal);

- *in connection with production* - for those that are related to production and not related to production.

Accidents related to production that occurred to employees during the performance of work duties, including business trips, as well as those that occurred during the period of:

- stay at the workplace, on the territory of the enterprise or in another place of work during working hours;

- putting in order the tools of production, means of protection, clothing before and after work, the implementation of personal hygiene measures;

- travel to or from work on the vehicle of the enterprise;

- use of own vehicle in the interests of the enterprise with the permission or on behalf of the employer;

- carrying out actions in the interests of the enterprise;

- liquidation of accidents, fires and consequences of natural disasters;

- providing patronage by the enterprise;

- stay in the vehicle or in its parking lot, on the territory of the shift settlement, including during shift rest, if the cause of the accident is related to the performance of labor (official) duties by the victim or the action of dangerous or harmful production factors on him or environment;

- sending the employee to (between) the service facility (s) on the approved routes or to any facility on behalf of the employer;

- going to the place of business trip and in the opposite direction in accordance with the task of business trip.

Cases related to production are also recognized:

- sudden deterioration of the employee's health or death due to acute cardiovascular failure during underground work or after bringing the employee to the surface with signs of acute cardiovascular failure;

- suicide by an employee of the fleet in case of exceeding the term of the flight stipulated by the collective agreement or his death during the flight due to the influence of psychophysiological, dangerous or harmful production factors.

Accidents related to production are not recognized with employees:

- at the place of permanent residence on the territory of field and shift settlements;

- when they use for personal purposes vehicles, machines, mechanisms, equipment, tools owned or used by the enterprise (except in cases that occurred due to their failure);

- due to poisoning by alcohol, drugs, toxic or poisonous substances, if it is not related to the use of such substances in production processes or violation of safety requirements for their storage and transportation or if the victim was in an alcoholic, toxic or narcotic state. to the accident was suspended from work in accordance with the requirements of the rules of internal labor regulations of the enterprise or collective agreement;

- in case of alcoholic, toxic or narcotic intoxication, not caused by the production process;

- during the commission of a crime established by a conviction court;

- in case of death or suicide (except in the cases mentioned above).

An Accident at Work (Form H-1) is drawn up for accidents that occurred to employees during the performance of their duties and which are recognized as related to production.

Occupational disease is caused by exposure to harmful substances, certain types of work and other production factors.

The cause of an occupational disease can be: dust or gassiness of the air in the work area with harmful substances; increased and decreased surface temperatures of equipment, materials, air of the working area; increased noise, vibration, infrasonic vibration, ultrasound, electromagnetic radiation; ionizing radiation; increased or decreased level of barometric pressure, humidity and air mobility; contact with sources of infectious diseases; level of physical overload; other production factors according to the hygienic classification of labor.

Occupational diseases occur in circumstances of non-compliance with the rules of the production process; violations of the mode of operation of technological equipment, devices, working tools; emergency situations; absence, inefficiency of work or damage of protective means and mechanisms, systems of ventilation, shielding, the alarm system, lighting, air conditioning; violation of the rules of industrial safety, occupational health; due to lack (non-use) of personal protective equipment; imperfection of technology, mechanisms, working tools; lack of rescue measures and means, etc.

In some industries, due to the use of monotonous, often repetitive movements and physical activity, there is an increase in the incidence of the nervous system. In addition, new diseases have emerged in recent years due to the widespread use of computer technology.

Occupational diseases caused by inhalation of toxic chemicals, their absorption through the skin or entering the body through the gastrointestinal tract, are called occupational poisoning.

Occupational diseases and poisonings that occur over a short period of time (one shift or day) are called *acute*, and those that require a long period of time are called *chronic*.

The primary documents that contain complete information about each occupational disease are occupational disease records on the P-5 form, which are compiled by the institutions of the State Sanitary and Epidemiological Service on the basis of accident investigation (in case of acute occupational diseases) and on the basis of occupational disease investigation (in the case of chronic diseases).

One of the important causes of occupational injuries and occupational diseases are *accidents* - dangerous man-made events that pose a threat to life and health of people on the site, territory or water area and lead to the destruction of buildings, structures, equipment and vehicles. means, disruption of the production process or cause damage to the environment.

Accidents are divided into two categories.

Category I includes accidents that result in:

- 5 or 10 people were killed or injured;
- there was a release of toxic, radioactive and dangerous substances outside the sanitary protection zone of the enterprise;
- increased concentration of pollutants in the environment more than 10 times;
- buildings, structures or main structures of the object were destroyed, which endangered the life and health of a significant number of employees of the enterprise or the population.

Category II includes accidents resulting in:

- up to 5 people were killed or 4 to 10 people were injured;
- buildings, structures or main structures of the facility were destroyed, which endangered the life and health of the workers of the shop, the site with the number of employees of 100 people and more.

Industrial facilities where one or more hazardous substances or categories of substances are used, manufactured, processed, stored or transported in quantities equal to or exceeding the normatively established threshold masses, as well as other facilities that are a real threat of an emergency man-made and natural nature, are called *objects of increased danger*[13-15].

2.3.2. Organization of investigation and accounting of accidents at enterprises

Sudden deterioration of health, injuries, traumas, including injuries resulting from bodily injuries caused by another person, acute illnesses and acute poisonings, heat strokes, burns, frostbite, drowning, electric shock, lightning and ionizing radiation, and other radiation are subject to investigation. injuries resulting from accidents, fires, natural disasters, contact with animals, insects, etc., which led to the loss of the worker's ability to work for one working day or more or to the need to transfer the victim to another (lighter) job for at least one working day, as well as deaths at the enterprise (hereinafter - accidents).

Every accident, witness, employee who found it, or the victim himself must immediately notify the immediate supervisor or other authorized person of the enterprise and take measures to provide the necessary assistance.

The supervisor (authorized person) in turn is obliged to:

- urgently organize the provision of medical care to the victim, if necessary, take him to a medical institution;
- report the incident to the employer, the relevant trade union organization;
- to keep the situation at the workplace and equipment in the condition in which they were at the time of the event (unless it endangers the lives and health of other employees and does not lead to more serious consequences), and to take measures to prevention of such cases.

The treatment-and-prophylactic institution must notify the victim of each appeal of the victim with reference to an accident at work without referral to the enterprise within 24 hours in the prescribed form:

- the enterprise where the victim works;

- the relevant working body of the executive directorate of the FSSNV;

- appropriate institution (medical institution) - in case of detection of acute occupational disease (poisoning).

The employer, having received a report of an accident, except in cases of fatal, group, severe, natural death or disappearance of the employee while working:

- notifies the relevant working body of the executive directorate of the FSSNV about the accident; if the victim is an employee of another enterprise, it is an enterprise; in case of an accident caused by a fire - the relevant state fire protection authorities, and in case of detection of an acute occupational disease (poisoning) - the relevant institutions (establishments) of the state SES;

- forms the commission of the enterprise on investigation of accident.

The employer is obliged to immediately notify the employer about the group accident, the accident with a serious or fatal consequence, the case of death at the enterprise, as well as the disappearance of the employee during the performance of his / her duties in the prescribed form:

- territorial body of the State Labor Service;

- the prosecutor's office at the scene of the accident;

- the relevant working body of the executive directorate of the FSSNV;

- the body to the sphere of management of which the enterprise belongs (in its absence - to the relevant local state administration);

- appropriate SES in case of acute occupational diseases (poisonings);

- a trade union organization of which the victim is a member;

- the relevant body for the protection of the population and territories from emergencies and other bodies (if necessary).

Such accidents are subject to special investigation.

Accident investigation by the commission of the enterprise

The commission established by the order of the employer includes:

- the head (specialist) of the labor protection service or an official who performs the functions of a labor protection specialist (chairman of this commission);

- the head of the structural unit in which the case occurred;

- FSSNV expert (with his consent);

- a representative of a trade union of which the victim is a member, or a representative of the labor collective on labor protection, if the victim is not a member of a trade union;

- other persons, based on the circumstances of the accident.

The foreman, who is directly responsible for occupational safety at the scene of the accident, is not included in the commission.

In case of detection of an acute occupational disease (poisoning), a specialist of a medical institution is also included in the commission.

The victim or his / her proxy is not included in the commission, but has the right to participate in the investigation.

In the event of an accident with a self-employed person, subject to voluntary payment of contributions to the state social insurance against accidents at work, the investigation is organized by the relevant working body of the executive directorate of the FSSNV. The chairman of the commission of inquiry is appointed by a representative of the relevant working body of the executive directorate of the FSSNV, and the commission includes the victim or his representative, a labor protection specialist of the relevant local state administration or local government, a representative of the trade union of which the victim is a member.

The commission of inquiry is obliged within three days:

- inspect the scene of the accident, interview witnesses and persons involved in it, and obtain an explanation from the victim, if possible;

- to determine the compliance of working conditions and safety with the requirements of NPAOP;

- find out the circumstances and causes that led to the accident;

- determine whether or not this case is related to production;

- to identify persons who have committed violations of the NPAOP, as well as to develop measures to prevent such accidents;

- draw up an act of investigation of the accident on the form H-5 in triplicate, as well as an act on the form H-1 (if the accident is related to production) or an act on the form of NPV (if the accident is not related

with production) in six copies and submit it for approval to the employer;

- in the case of acute occupational disease (poisoning), in addition to the act on the form H-1, is also a map of occupational disease (poisoning) on the form P-5.

The first copy of the act of investigation on the form H-5, which is stored at the enterprise, is accompanied by the act on the form H-1 or NPV, map form P-5, explanations of witnesses, the victim, extracts from operational documentation, diagrams, photographs and other documents characterize the condition of the workplace (equipment, machinery, equipment, etc.), and if necessary, a medical opinion on the presence in the body of the victim of alcohol, poisonous or narcotic substances.

Two other copies of the act of investigation on the form H-5 together with the act of the form H-1 (or NPV), a copy of the map of the form P-5 within three days are sent to the victim and to FSSNV.

In addition, a copy of the act form H-1 within three days is sent:

- the head of the structural unit of the enterprise where the accident occurred, to take measures to prevent such cases;
- territorial body of the State Labor Service;
- a trade union organization of which the victim is a member or a person authorized by the employees.

At the request of the victim, the chairman of the commission is obliged to acquaint the victim or his proxy with the materials of the investigation.

A copy of the act on the form H-1 is sent to the body to whose sphere of management the enterprise belongs. In case of detection of an acute occupational disease, a copy of the act on the form H-1 and the map of the acute occupational disease on the form P-5 is also sent to the SES.

Accidents for which acts are drawn up in the form of H-1 or NPV are taken into account and registered by the employer in a special journal. Acts of accident investigation (form H-5), acts on form H-1 or NPV together with materials of investigation are subject to storage within 45 years at the enterprise which employee is (was) the victim and in FSSNV.

At the end of the period of temporary incapacity for work or in case of death of the victim, the employer who takes into account the accident, draws up a report on the consequences of the accident on form H-2 and within ten days sends it to organizations and officials to whom the act was sent on form H-1 or NPV. The notification of the consequences of the accident must be attached to the act on the form H-1 or NPV and must be stored with it.

In case of refusal of the employer to draw up or approve the relevant acts or disagreement of the victim with the content of these acts, receipt of complaints or disagreement with the conclusions of the investigation or concealment of the accident, the State Labor official has the right to issue an order -5, H-1, NPV, recognition or non-recognition of an accident related to production.

A special accident investigation is carried out in the event of a group accident, an accident with a serious or fatal consequence, a death in the enterprise, as well as the disappearance of an employee while performing his duties.

The investigation is conducted by a commission of special investigation (special commission), which is appointed by order of the head of the territorial body of the State Labor Service in coordination with the

bodies whose representatives are members of this commission. The employer (if the employer himself is injured - the body to which the company belongs, and in his absence - the relevant local state administration) is obliged to provide appropriate conditions and facilitate the work of a special commission.

The special commission includes: an official (inspector) of the State Labor - the chairman of the commission, a representative of the FSSNV, a representative of the body to which the company belongs, and in his absence - the relevant local state administration or executive body of local government, head (specialist) of the security service labor enterprise, a representative of a trade union organization of which the victim is a member, a representative of a higher trade union body or a labor protection representative, if the victim is not a member of a trade union, and in case of investigation of acute occupational diseases (poisoning) also a specialist SES.

Depending on the specific conditions (number of deaths, nature and possible consequences of the accident, etc.), the special commission may include specialists of the relevant body for protection of the population and territories from emergencies, representatives of health authorities and other bodies. In special cases, a special commission to investigate the accident is created by the Cabinet of Ministers of Ukraine.

A special investigation is conducted within 10 working days. If necessary, the term of the special investigation may be extended by the body that appointed the special commission.

Based on the results of the investigation, a special investigation report on the H-5 form is drawn up, as well as other materials provided by the Investigation Procedure, including an occupational disease (poisoning) record card for each victim on the P-5 form, if the accident is related to an acute occupational disease (poisoning).

The act of special investigation shall be signed by the chairman and all members of the commission of special investigation. In case of disagreement with the content of the act, the member of the commission shall state his / her separate opinion in writing.

An act in the form of H-1 or NPV is drawn up in accordance with the act of special investigation for each victim.

To establish the causes of accidents and develop measures to prevent such cases, the commission of special investigation has the right to require the employer to form an expert commission with the involvement of

its work at the expense of the enterprise of experts - specialists of research, design and other organizations, executive bodies and state supervision over labor protection.

Medical institutions, forensic medical examinations, prosecutor's offices and internal affairs bodies and other bodies are obliged by law to provide free of charge, upon request, officials of the State Labor Service or the FSNV, who are members of the commission of special investigation, relevant materials and conclusions on the accident.

During the investigation, the employer is obliged to:

- if necessary, take photographs of the accident site, damaged object, equipment, tools, as well as provide technical documentation and other necessary materials;

- to create appropriate conditions for the work of the special commission, to provide it with vehicles, means of communication, office premises;

- to organize in case of investigation of cases of detection of an acute occupational disease (poisoning) carrying out of medical inspection of workers of the corresponding site of the enterprise;

- to ensure the necessary laboratory tests and trials, technical calculations and other work;

- to organize printing, reproduction and registration in the necessary quantity of materials of special investigation.

The employer, whose employee is the victim, reimburses the costs associated with the activities of the commission of special investigation and the specialists involved in its work. The employer within five days from the moment of signing the act of special investigation of the accident or receiving the order of the official of the State Labor Inspectorate to register the accident is obliged to consider these materials and issue an order to implement the proposed measures to prevent such cases and prosecute employees. who violated the legislation on labor protection.

The first copy of the investigation materials remains with the company. The victim or members of his family (proxy) are sent an approved act on the form H-1 or NPV together with a copy of the act of special investigation of the accident.

Reporting and information about accidents, analysis of their causes. The employer on the basis of acts on the form H-1 prepares the state statistical reporting on victims according to the form approved by Derzhkomstat, and submits it in the established order to the corresponding organizations, and also bears responsibility for its reliability.

The employer is obliged to analyze the causes of accidents in the quarter, half-year and year and to develop and implement measures to prevent such accidents.

Bodies under the management of enterprises, local state administrations, executive bodies of local self-government are obliged to

analyze the circumstances and causes of accidents in the first half of the year, to bring the results of this analysis to the attention of enterprises belonging to their management, take measures to prevent such cases.

Bodies of public administration, state supervision over labor protection, FSNV and trade unions within their competence check the effectiveness of accident prevention, take measures to identify and eliminate violations.

Enterprises, bodies, the sphere of management of which includes enterprises, and the FSNV keep records of all work-related accidents[11].

2.4. Prevention of occupational injuries and occupational diseases

The initial methodological basis of labor protection as a scientific discipline is the concept of *activity*. *Activity* - a specific, inherent in man, a form of active attitude to the world. Every activity consists of a goal, means, result and the actual process of activity. Activity is the real driving force of social progress and the guarantee of society's existence[14,15].

In the historical aspect of the development of human labor can be divided into three main stages of labor: manual, mechanized and automated. These types of work differ in the amount of physical activity and emotional stress, which affect the physical and mental capabilities of man.

It is important from the point of view of labor physiology to study the course of mental and physiological processes during human labor activity, which can be divided into physical and mental.

Physical activity is determined mainly by the work of muscles, to which in the process of labor increased blood flow, ensuring the supply of oxygen and removal of oxidation products. This is facilitated by the active work of the heart and respiratory organs. This consumes energy.

Human mental activity is determined mainly by participation in the labor process of the central nervous system and senses. Despite the significant differences, the division of labor into physical and mental is very conditional. With the development of science and technology, automation and mechanization of labor processes, the boundary between them is getting closer.

During intensive and long-term work, fatigue can occur. *Fatigue* is understood as a set of temporary changes in the physiological and psychological state of man. It is important that fatigue, accumulating, does not turn into overfatigue, because it is possible pathological changes in the human body and the development of diseases of the central nervous system.

In accordance with the State sanitary norms and rules

"Hygienic classification of labor on the indicators of harmfulness and danger of factors of the production environment, severity and intensity of the labor process" (Order of the Ministry of Health of Ukraine from 08.04.2014 № 248) physiological features of the labor process depend on:

- *Occupational safety* is a state of working conditions in which the action of operating hazardous and harmful production factors is excluded (DSTU 2293-99).

- *The severity (severity) of work* - a characteristic of the labor process that reflects the level of total energy consumption, the predominant load on the musculoskeletal system, cardiovascular, respiratory and other systems.

The severity of work is characterized by the level of total energy expenditure of the body or physical dynamic load, the mass of the load being lifted and moved, the total number of stereotyped working movements, the amount of static load, working posture, movement in space.

Categories of work by severity: light, medium, heavy, very heavy.

Labor intensity - a characteristic of the labor process, which reflects the load mainly on the central nervous system, senses, the emotional sphere of the employee.

Indicators that characterize the intensity of work include: intellectual, sensory, emotional loads, the degree of monotony of loads, mode of operation.

2.4.1. Working conditions and nature.

Based on the principles of Hygienic Classification, work or production activities (working conditions) are divided into 4 classes:

Class 1 (optimal working conditions) - conditions that not only preserve the health of employees, but also create the conditions for maintaining a high level of efficiency.

Optimal hygienic standards of production factors are set for the microclimate and indicators of the severity of the labor process. For other factors, the optimal conditional conditions are those in which unfavorable factors of the production environment do not exceed the levels considered safe for the population.

Class 2 (permissible working conditions) - conditions characterized by such levels of factors of the production environment and labor process that do not exceed the established hygienic standards (and possible changes in the functional state of the body are restored during the regulated rest or before the next change) and should not adversely impact on the health of workers and their descendants in the near and distant periods.

Class 3 (harmful working conditions) - conditions characterized by such levels of harmful production factors that exceed hygienic standards and can adversely affect the body of the employee and / or his descendants.

Grade 3 (harmful working conditions) according to the level of exceeding hygienic standards and the severity of possible changes in the body of workers is divided into 4 degrees:

1 degree (3.1) - working conditions characterized by such levels of harmful factors of the production environment and labor process that cause functional changes that go beyond physiological fluctuations (the latter are restored at longer than the beginning of the next change, break contact with harmful factors) and increase the risk of deteriorating health, including the occurrence of occupational diseases;

Grade 2 (3.2) - working conditions characterized by such levels of harmful factors of the production environment and labor process, which can cause persistent functional disorders, lead in most cases to an increase in production-related morbidity and individual cases of occupational diseases that occur after prolonged exposure;

Grade 3 (3.3) - working conditions characterized by such levels of harmful factors of the production environment and labor process, which, in addition to the growth of chronic morbidity (industrial and morbidity with temporary disability), lead to the development of occupational diseases;

Grade 4 (3.4) - working conditions characterized by such levels of harmful factors of the production environment and labor process, which can lead to a significant increase in chronic pathology and morbidity with temporary disability, as well as the development of severe occupational diseases;

Grade 4 (hazardous working conditions) - conditions characterized by such levels of harmful factors of the production environment and labor process, the impact of which during the work shift (or part of it) poses a threat to life, high risk of acute occupational injuries, including severe .

1.2. Particularly harmful working conditions - the state of working conditions and / or levels of production load, which in accordance with paragraph 1.1 of this section belong to class 3, 3, 4 degrees of harm and 2, 3 degrees of severity (tension).

1.3. The special nature of work - work performed with a high level of neuro-emotional and intellectual load, in special natural geographical and geological conditions and conditions of increased health risk.

Hygienic assessment of working conditions by severity and intensity of the labor process

The severity and intensity of the labor process are determined and assessed according to the indicators given in *Annexes 2,3,4* to this Hygienic Classification of Labor.

The severity and intensity of work are determined by the main and auxiliary indicators that are specific to a particular workplace.

The main indicators of the severity of work are: physical dynamic load, stereotyped work movements, static load, movement in space.

The main indicators of work intensity are: the duration of concentration or the density of signals, the degree of risk to their own lives and the lives of others or the degree of responsibility for the lives of others, variability at work only at night.

Hygienic assessment of the severity and intensity of work is carried out by adding the ratio of measured or calculated indicators to their allowable levels, multiplied by the coefficient of significance of the indicator (1.0 - for the main indicators, 0.15 - for the auxiliary).

The class and degree of difficulty and intensity of work are determined in accordance with the calculated points (the sum of the ratios of basic and auxiliary indicators to their normative levels, multiplied by the appropriate factor) in accordance with Annex 3 to this Hygienic classification of work.

The highest class and degree by factors of "difficulty" or "intensity" of the labor process - 3rd grade, 3rd degree (especially hard or particularly hard work).

The norms for lifting and moving heavy objects by minors are established in accordance with the Limit norms for lifting and moving heavy objects by minors, approved by the order of the Ministry of Health of Ukraine of March 22, 1996 № 59, registered with the Ministry of Justice of Ukraine on April 16, 1996 № 183/1208.

The list of heavy work and work with harmful and dangerous working conditions, in which the employment of minors is prohibited, was approved by the order of the Ministry of Health of Ukraine dated March 31, 1994 № 46, registered in the Ministry of Justice of Ukraine on July 28, 1994 under № 176/385.

The potential or imminent threat of harm to the health of workers with a special nature of work is not a regulated factor of the production environment or labor process.

According to the Hygienic classification, the assessment of the difficulty of work in the certification of jobs is carried out according to the following criteria:

- *dynamics of work:*
- *static load, kg · s;*

- *working posture (being in an inclined position, % of duration changes);*
- *body inclinations (number of times per shift);*
- *movement in space (km per shift).*

The intensity of work in the certification of jobs is assessed by the following factors:

- *attention (duration of concentration, %; density of signals for 1 hour);*
- *intensity of analyzer functions (vision, hearing);*
- *emotional and intellectual tension;*
- *monotony;*
- *variability.*

Depending on the assessment, ie comparable to the criteria of the Hygienic Classification of work or working conditions in terms of severity and intensity are assigned to a particular class.

General hygienic assessment of working conditions

1. If the actual values of the levels of harmful factors in the workplace are within the optimal or permissible levels, the working conditions in this workplace meet the hygienic requirements and are classified in accordance with 1 or 2 class.

If the level of at least one factor exceeds the allowable value, the working conditions in such a workplace (depending on the size of the excess and in accordance with the hygienic criteria of this Hygienic classification of labor) both for a single factor and their combined action can be attributed to 1- 4 degrees of 3 class of harmful or 4 class of dangerous working conditions.

2. Attribution of factors to a particular class is determined by the actually measured parameters of the production environment and labor process.

To establish the class of working conditions exceeding the MPC, **GDR** can be set within one day (change), typical (s) for a particular process.

In case of atypical or episodic exposure (during certain days, weeks, months), the hygienic assessment of working conditions is performed according to the equivalent exposure and / or the maximum level of the factor, depending on the purpose of the research.

3. Hygienic assessment of working conditions, taking into account the combined and connecting action of production factors:

Based on the measurement results, working conditions for individual factors are estimated according to the Hygienic Classification of Labor, which takes into account the effects of summation and potentiation in the combined action of chemicals, biological factors, different frequency ranges

of electromagnetic radiation, etc. The results of the hygienic assessment of harmful factors of the production environment and the labor process are included in *Annex 5* to this Hygienic Classification of Labor;

the general hygienic assessment of working conditions according to the degree of harmfulness and danger is established according to the highest class and degree of harmfulness.

4. By reducing the time of contact with harmful factors (protection over time), the use of effective personal protective equipment, the level of occupational risk of health is reduced, as a result of which working conditions can be assessed as less harmful (according to PPE), but not lower degree 3.1 class 3.

5. In complex cases, the working conditions of employees are assessed taking into account the indicators of occupational morbidity, functional status of the body and morbidity according to the medical records of the employee.

The results of the preliminary (periodic) medical examination (s) of employees are entered in the Card of the employee subject to the preliminary (periodic) medical examination, given in *Annex 7* to the Procedure for medical examinations of certain categories, approved by the order of the Ministry of Health of Ukraine from 21 May 2007 № 246, registered with the Ministry of Justice of Ukraine on July 23, 2007 under № 846/14113, and the form of primary accounting documentation № 025 / o "Medical card of an outpatient № ___", approved by the order of the Ministry of Health of Ukraine dated February 14 2012 № 110, registered in the Ministry of Justice of Ukraine on April 28, 2012 for № 661/20974.

Complex cases include:

- special forms of work organization (shift duration more than 8 or 9 hours, shift method, etc.);
- work related mainly to the movement and impact on the employee of factors that vary in intensity, duration and nature;
- works that worsen the functional state of the employee and require the provision of special personal protective equipment;
- complex combinations of factors of the production environment and labor process (including the combined effect of several factors).

2.5. General sanitary and hygienic requirements for enterprises, production facilities and work organization in the workplace

2.5.1. Requirements for location and planning of the enterprise

Location of the enterprise. According to the requirements of SN245-71 ("Sanitary design standards of industrial enterprises") and SSN 173-96 ("State sanitary rules of planning and development of settlements") enterprises are located in settlements in specially designated industrial areas or outside settlements at some distance from them (depending on the emission of harmful substances).

A sanitary protection zone is created between the enterprise and the residential area, ie the area between the places of release of industrial hazards into the atmosphere and residential or public buildings, the width of which depends on the class of enterprises, industries and facilities.

Sanitary norms establish five classes of enterprises, productions and facilities depending on the capacity of the enterprise, the conditions of the technological process, the nature and amount of emissions into the environment of harmful substances and substances that have an unpleasant odor or harmful physical effects, as well as taking into account the proposed measures to reduce their adverse environmental impact.

The first class, for example, includes powerful industries related to the smelting of iron, steel, non-ferrous metals and foundries.

To the second class - less powerful metallurgical and foundry productions, production of lead accumulators; to the third class - low-power metallurgical and foundry productions, production of cable, plastics, building materials; the fourth class - production of the metalworking industry and devices of the electrical industry and the fifth class includes the production of devices for the electrical industry, building materials, compressed and liquefied air separation products, etc.

Within the sanitary protection zone it is allowed to place less harmful industrial enterprises, as well as fire depots, sanitary enterprises, garages, warehouses and more. The territory of the sanitary protection zone must be landscaped.

Industrial enterprises that emit industrial hazards (gases, smoke, soot, dust, odors, noise) are not allowed to be located in relation to the residential area on the windward side for winds of the predominant direction.

Planning of the territory of enterprises. General plans of industrial enterprises are developed in accordance with the sanitary and hygienic requirements and the requirements of labor safety and fire safety. Factors

such as natural ventilation and lighting are taken into account. The site of an industrial enterprise must have a relatively flat surface and a slope of up to 0.002% for surface water runoff.

According to the functional purpose of the site of the enterprise is divided into zones: in front of the factory (outside the fence or conditional boundaries of the enterprise), production, auxiliary and storage.

The width of the sanitary protection zone, depending on the class of production is: I class - 1000 m; II class - 500 m; III class - 300 m; IV class - 100 m; V class - 50 m.

The construction of an industrial site can be continuous or separately located buildings, single- or multi-storey. It is forbidden to build continuously with a closed courtyard, because in this case the ventilation and natural lighting of buildings deteriorates.

Sanitary gaps between buildings, which are illuminated through window openings, are taken not less than the highest height to the top of the cornice of buildings located opposite.

Production and storage facilities can have any shape and size due to production requirements, but based on sanitary and hygienic conditions (lighting, ventilation), the most appropriate buildings have the shape of a rectangle. The design of industrial buildings, the number of floors and the area are determined by technological processes, the category of explosion and fire hazard, the presence of harmful and dangerous factors.

The central entrance to the enterprise should be provided by the main approach or the entrance of employees. The territory of the enterprise must have well-maintained footpaths (sidewalks) from the central and additional checkpoints to all buildings and structures. The entire length of buildings and structures should be accessible to fire trucks. The buildings must be supplied with electricity, water supply and sewerage networks.

The territory of the enterprise must be landscaped, the area of these plots must be at least 10% of the area of the enterprise.

Water supply. Depending on the purpose of the building and production technology provide external and internal water supply systems. Depending on the requirements of the technological process, the following technological water supply systems are used: recyclable, reusable, chilled, distilled, softened water, etc. To reduce water consumption for technological needs, reusable and reversible water supply systems should be used.

Drinking water supply devices (fountains) are recommended to be placed in the aisles of industrial premises, lobbies, recreation rooms, in open areas of the enterprise and, as an exception, in production shops.

Domestic drinking water supply networks should be separated from non-drinking water supply networks.

The norms of water consumption for household and drinking needs are 45 liters in hot shops and 25 liters per worker per shift in ordinary shops.

Sewerage. Sewerage for sewage, is divided into industrial, fecal and drainage. Sewage systems consist of receiving devices (trays, sinks), sewer networks, pumping station, treatment facilities and auxiliary devices.

It is forbidden to discharge sewage and industrial wastewater into drainage wells to prevent contamination of aquifers.

If possible, a reversible water supply system is considered appropriate, in which contaminated industrial water after treatment is re-supplied for the needs of technological processes. Discharge of uncontaminated industrial wastewater (for example, from the cooling system) is allowed into the storm sewer, which is designed to drain precipitation.

For many enterprises, the discharge of wastewater containing harmful substances is allowed, after appropriate treatment, into the municipal sewerage network, if the concentration of harmful substances in the mixture of wastewater of the enterprise and urban wastewater does not exceed the established norms[11,13].

2.5.2. Organization of work at the workplace

The organization of work in the workplace is a set of measures that ensure the labor process and the effective use of tools and objects of labor.

A workplace is an area that is equipped with technical means and in which the work of an employee or group of employees takes place.

The organization of work in the workplace is to choose a working posture and system of work movements, determine the size of the work area and placement in it controls, tools, workpieces, materials, devices, etc., as well as choosing the optimal mode of work and rest.

Working posture. Properly chosen working posture helps to reduce fatigue and preserve the efficiency of the employee. The working posture can be free or set.

Free out of work means the ability to work alternately sitting and standing. This is the most comfortable position, because it allows you to alternate muscle loading and reduces overall fatigue.

Working posture "sitting" is the most comfortable, it can be used for work with little physical effort, at a moderate pace, requiring high accuracy. "Standing" posture is the most difficult, because it requires energy to perform work and support the body in an upright or inclined position, which causes rapid fatigue.

The system of labor movements. The main principle when choosing a system of labor movements is the principle of "economy of movements", which helps to increase productivity and, at the same time, reduce fatigue, errors and injuries.

The principles of "economy of movements" are as follows: both hands must begin and end the movement at the same time; hands should not be inactive, except during periods of rest; hand movements should be performed simultaneously in opposite and symmetrical directions;

The best is the sequence of actions that contains the least number of elementary movements; hands should be exempt from any work that can be successfully performed with the feet or other parts of the body; if possible, the object of work should be secured with special devices so that the hands are free to perform operations.

The work should be organized in such a way that the rhythm of work operations is as clear and natural as possible, and the sequence of movements is such that one movement easily passes into another. The movement is less tiring if it occurs in a direction that coincides with the direction of gravity. Abrupt fluctuations in speed and short breaks should be avoided.

A number of provisions regarding the speed of a person's hands should also be taken into account: where a quick reaction is required, self-movement should be used; the speed of movement from left to right for the right hand is greater than in the opposite direction; rotational movements 1.5 times faster than translational; smooth curvilinear movements of hands are faster, than rectilinear with instant change of the direction; large-scale movements are faster; movements oriented by mechanisms are faster than movements oriented "by eye"; movements should be restricted by restraints wherever possible.

Movements aimed at accurate manual installation, such as the coincidence of two micrometer strokes, should also be avoided; free unstressed movements are performed faster, easier and more accurately than forced movements determined by certain limiters; precise movements are better performed sitting than standing. The maximum frequency of arm movements (when bending and unbending) - about 80; feet - 45, body - 30 times per minute, and fingers - 6 times and palms - 3 times per second.

Workplace equipment. Equipment and workplace equipment depends on the work performed (technological operations), the nature of work (mental, physical, heavy, monotonous) and working conditions (comfortable, normal, unfavorable).

Topic. Accident investigation.

Practical lesson №2. *Procedure for investigating accidents during the educational process in educational institutions*

Goal. *Get acquainted with the investigation of accidents, their accounting.*

Task:

1. Write reports on accidents, their investigation.
2. To draw up a log of accidents that happened to pupils, students and graduate students.
3. Draw up an act of special investigation of a group accident or fatal accident.

Загальні положення

2.1. Area of application

Regulations on the "Procedure of the investigation of accidents that occurred during the educational process in educational institutions" developed in accordance with the Laws of Ukraine

"On education", "On labor protection", the Procedure of investigation and accounting of accidents, occupational diseases and accidents at work. It was approved by the Resolution of the Cabinet of Ministers of Ukraine of August 25, 2004 №1112, and applies to higher, vocational, secondary, preschool, out-of-school educational institutions, postgraduate education institutions, regardless of ownership and subordination.

The Regulation establishes a single procedure for investigating and accounting for accidents that occurred to pupils, students, cadets, students, graduate students during the educational process in educational institutions in Ukraine.

The educational process is a system of organization of educational, training and production activities, defined by educational, scientific, educational plans, rest time between classes, training practice, classes on labor, vocational training and vocational guidance, industrial practice, work in labor associations, research and development work, hiking, excursions, sports competitions, transportation or transitions to the venue, etc.

Accidents that occurred with persons working under an employment contract or involved in work in educational institutions are subject to investigation and accounting in accordance with the Procedure for Investigation and Accounting of Accidents, Occupational Diseases and Accidents at Work, approved by the Cabinet of Ministers of Ukraine on 25 August 2004 № 1112.

Terms

Accidents that happened to pupils, students, cadets, listeners, graduate students and led to deterioration of health (disability) for at least one day according to a medical report, namely: sudden deterioration of health, are

subject to investigation. , injuries, including injuries due to bodily injuries inflicted by another person, poisoning, heat stroke, burns, frostbite, drowning, electric shock, lightning, injuries resulting from accidents, fires, natural disasters, contact with animals, etc.

Accidents that occur are subject to investigation:

- during training sessions, including lectures, lessons, pre-service training classes, laboratory classes, sports, group, extracurricular, extracurricular, extracurricular activities, other classes and in between between them in accordance with educational, production and scientific plans;

- during extracurricular, extracurricular, extracurricular and other activities on weekends, holidays and vacations, if these activities are carried out under the direct supervision of an employee of the educational institution (teacher, tutor, educator, class teacher, master of industrial training, etc.) or a person which is appointed by order of the head of the educational institution with his consent;

- during classes on labor and professional training, conducting professional, research and development work, production and training practice, which are carried out in accordance with the curricula in educational institutions or at sites belonging to them;

- during the stay in student groups, labor and recreation camps (health), school forestry, on educational and research sites, etc .;

- during sports competitions, trainings, improving actions, excursions, campaigns, expeditions, organized by educational institution in accordance with the established procedure;

- during transportation of pupils, pupils, students, cadets, listeners, postgraduate students to the place of carrying out of actions and back, and also in case of their organized direction to the planned action by transport or on foot.

Deterioration of health as a result of an accident is established and certified by a medical institution.

Based on the results of the investigation of the accident during the educational process, an act is drawn up in the form of **H-H (Annex 2.1)**.

The head of the educational institution is responsible for the correct and timely investigation and accounting of accidents, drawing up an act in the form of **H-H**, development and implementation of measures to eliminate the causes of the accident.

In cases of refusal of the administration of the educational institution to draw up an act on the **H-H** form, as well as in case of disagreement of the victim with the content of the **H-H** form, the conflict is considered by the

higher education management body within ten days of submitting a written application.

The treatment-and-prophylactic institution, where the pupil of the victim was taken as a result of an accident that occurred during the educational process, is obliged to issue a medical opinion on the nature of the injuries at the request of the head of the educational institution.

After the expiration of the victim's treatment, the head of the educational institution sends to the education management body, another executive body, the founder, who owns the educational institution, a notice of the consequences of the accident (Appendix 2).

Accidents that occurred with pupils, students, cadets, students, graduate students in everyday life and in cases not specified in paragraph 2.2, are investigated and registered in accordance with the Procedure for investigation and accounting of non-productive accidents approved by the Cabinet of Ministers of Ukraine of March 22, 2001 p. № 270.

Persons who have violated or failed to comply with the requirements of this Regulation shall be held liable in accordance with the law.

2.2. Accident reports, investigations and records

Every accident that happened to a pupil, student, graduate student, victim or witness of the accident immediately notifies directly the head of the educational institution, who must:

- urgently organize first aid to the victim, if necessary - his referral to a medical institution;
- until the arrival of the commission of inquiry to keep the situation in the state in which it was at the time of the event (unless it threatens the life and health of others and does not lead to more serious consequences).

An accident that occurred during long hikes, excursions or other activities outside the district (city), the head of the event, is also immediately notified by the education authority at the scene.

The head of the educational institution is obliged to immediately take measures to eliminate the causes of the accident, to inform the victim's parents (the person representing his interests) and to request a conclusion from the medical institution about the nature and severity of the victim's injury.

The head of the educational institution, having received the notification of the accident, appoints by order the commission of inquiry in the following composition:

- chairman-deputy of the head of the educational institution;
- a representative of the labor protection service of the educational institution or a person to whom these duties are assigned by the order of the

head;

- representatives of the relevant trade union body or authorized representatives of the labor collective, if the victim is not a member of the trade union.

The investigating the accident commission is obliged to: within three days to investigate the accident, find out the circumstances and causes, develop measures to eliminate the causes of the accident, to determine the persons responsible for it;

- identify and interrogate witnesses and persons who have violated regulations, get an explanation from the victim;

- draw up a report on the accident on the form **N-N** (Annex 2.1) in five copies and send for approval to the head of the educational institution.

The act is accompanied by explanations of witnesses, the victim and other documents characterizing the condition of the place where the accident occurred, the presence of harmful and dangerous factors, medical conclusion on the state of health of the victim as a result of the accident, etc.

The head of the educational institution within 3 days after the end of the investigation approves the acts of the **HH** form, of which one copy is sent:

- to the victim or a person representing his interests;
- to the unit where the accident occurred;
- to the head of the labor protection service or the person entrusted with these responsibilities (responsible);
- to the archive of the educational institution;
- to the education management body at the place of study of the victim (copy - to the ministry, founder, to the sphere of management of which the educational institution belongs).

The act of the **HH** form is subject to storage in the archives of the education management body, educational institution for 55 years. Other copies of the act and its copies shall be kept until the implementation of all planned activities, but not less than five years.

An accident, about which the victim did not inform the head of the educational institution in the absence of witnesses or the consequences of which were not immediately apparent, is investigated within a month from the date of receipt of the written statement of the victim.

An accident, that occurred at the enterprise, institution, organization with pupils, students, graduate students during their internship or work at the enterprise, in the institution under the direction of its officials, is investigated together with a representative of the educational institution in accordance with the Procedure accounting for accidents, occupational diseases and

accidents at work, approved by the resolution of the Cabinet of Ministers of Ukraine of August 25, 2004 № 1112.

An accident that has occurred at an enterprise, institution, organization with pupils, students and graduate students of educational institutions who are practicing or performing work under the guidance of a teacher is investigated by the education authority to which the educational institution is subordinated or by the founder of the educational institution together with representative of the enterprise, institution, organization, is made out by the act on the form N-N and is taken into account by management body of education, educational institution. One copy of the approved act of the HH form is sent to the place of study of the victim, the second - by subordination to the education management body or the founder (owner) of the educational institution.

An accident that occurred during long hikes, excursions, expeditions is investigated by the commission of the education management body on the territory of which the accident occurred. The materials of the investigation are sent to the education management body at the location of the educational institution or to the founder of the educational institution.

According to the results of the investigation, acts in the form of HH are not drawn up and accidents that occurred with fosterlings, pupils, students, cadets, listeners, graduate students are not taken into account:

- due to the use of alcohol, narcotic or other psychotropic substances, as well as due to their action in the presence of a medical opinion, if it is not caused by the use of these substances in the educational process or violation of safety requirements for their storage and transportation, or if the victim state of alcohol or drug intoxication, was suspended from work, study;
 - during the commission of thefts or other crimes, if these actions are recorded and there is an official opinion of the court or prosecutor's office;
- in case of natural death or suicide.

2.3. Special investigation of accidents

The following accidents are subject to special investigation:

- group (simultaneously with two or more victims);
- with a fatal consequence. The head of the educational institution is obliged to immediately inform about the group accident, fatal accident:
 - the victim's parents or a person representing his interests;
 - medical and preventive institution at the place where the accident occurred;
- education management body and other central executive body,

founder, to which the educational institution is subordinated;

- the prosecutor's office, the body of internal affairs at the place where the accident occurred.

About every group accident, as well as a fatal accident, the education management body at the location of the educational institution notifies the Ministry of Education and Science of Ukraine within 24 hours and sends the materials of the special investigation within 3 days after the investigation. The message is transmitted by telegraph, telephone or other means of communication.

A special investigation of an accident in which 1 to 4 people died or up to 10 were injured is conducted by a special investigation commission appointed by order of the head of the education management body at the location of the educational institution, with the participation of a representative of the Ministry of Education and Science.

A special investigation of an accident in which 5 or more people were killed or 10 or more people were injured shall be conducted by a special investigation commission recognized by an order of the Ministry of Education and Science of Ukraine.

Accidents with particularly severe consequences (in case of death of 5 or more persons or injury of 10 and more persons) are considered at a meeting of the board of the Ministry of Education and Science of Ukraine.

The commission for the special investigation of a group accident and a fatal case includes:

- chairman - head (deputy) of the education management body (in case of death of 5 or more persons or injury of 10 and more persons) or head (deputy) of the educational institution (in case of death of 1 to 4 persons or injury of up to 10 persons);

- members - the head (deputy) of the educational institution, the head (employee) of the labor protection service, a representative of the teaching staff, a representative of the Ministry of Education and Science of Ukraine, a representative of the trade union whose members are victims.

Depending on the specific conditions, the commission may include representatives of the bodies of state supervision over labor protection, fire supervision, health care bodies, etc.

Members of the commission of special investigation have the right to receive written and oral explanations from employees of the educational institution and witnesses of the event or to conduct their interviews.

Members of the commission of special investigation must meet with victims or members of their families, consider and resolve social issues on the spot or make proposals for their resolution to the relevant authorities, and explain to victims (families) their rights under the law.

The commission on special investigation within 10 days, investigates accident and makes the act of special investigation, makes out other necessary documents and materials. Copies of acts of special investigation and forms of HH (for each victim separately) and the order of the head of the educational institution based on the results of the accident investigation are sent to the education management body under the authority, which is obliged to send one copy to the Ministry of Education and Science of Ukraine. executive power, the founder to whom the educational institution is subordinated.

The materials of the special investigation include: a copy of the order on the establishment of a commission of special investigation; act of special investigation; a copy of the act in the form of HH for each victim separately; plans, diagrams and photographs of the scene; protocols of interviews, explanations of witnesses of the accident and other persons involved, as well as officials responsible for compliance with the rules and regulations on labor protection; extract from the journal on the victims' training and briefings on labor protection, life safety; medical opinion on the nature and severity of injuries caused to the victim or the cause of his death; conclusion of the expert commission on the causes of the accident, results of laboratory and other researches, experiments, analyzes, etc.

At the request of the commission of special investigation, the administration is obliged to:

- to invite experts to participate in the investigation of the accident, from which an expert commission may be formed;
- take photographs of the damaged object, the place of the accident and submit other necessary documents;
- to carry out technical calculations, laboratory researches, tests and other works;
- provide the vehicles and means of communication necessary for the work of the commission of inquiry;
- to provide printing, reproduction in the necessary quantity of materials of special investigation.

The expert commission is created by the order of the chairman of the commission on special investigation. Questions that require an expert opinion and materials with the conclusions of the expert commission are drawn up in writing.

The educational institution where the accident occurred reimburses the costs associated with the activities of the commission and the involvement of specialists in its work. Reimbursement of travel expenses of employees

who are members of the commission or involved in its work, the educational institution carries out in accordance with the law.

The chairman of the commission that conducted the special investigation of the accident shall, within five days after its completion, send the materials to the prosecutor's office at the place where the group accident or fatal accident occurred.

The head of the educational institution is obliged to consider the materials of the special accident investigation within five days and issue an order to take the measures proposed by the special investigation commission to prevent such cases, as well as to bring to justice those who violated labor protection laws and regulations. , safety requirements for the educational process.

The head of the educational institution shall notify in writing the education management body about the implementation of these measures.

Information on all accidents at the end of the year, issued by acts on the form H-N, summarized in the report and with an explanatory note sent by the educational institution to the local education authority (initial report), another central executive body, the founder who owns the educational institution; local education authorities compile a consolidated report, which is sent to education authorities under their authority.

The head of the educational institution is responsible for the accuracy of the information specified in the report in accordance with the law.

The educational institution, the Ministry of Education and Science of Ukraine, other central executive bodies, education management bodies, the founder to whom the educational institution is subordinated, analyze the causes of accidents, develop measures to prevent them, hear at board meetings, meetings participants in the educational process.

The Ministry of Education and Science of Ukraine and other central executive bodies control the correct and timely investigation and accounting of accidents that occurred to pupils, pupils, students, graduate students during the educational process, as well as the implementation of measures to eliminate the causes of accidents. , local education authorities, founders (owners) to whom educational institutions are subordinated.

The Ministry of Education and Science of Ukraine carries out operational accounting of the total number of victims, including during group accidents and fatal accidents.

Appendix 2.1

Form HH

APPROVED BY
(position, initials, surname of the head of the educational institution)
(signature) 20__.

ACT №

about an accident that happened to a pupil, fosterling, student, cadet, listener, graduate student of an educational institution (consists of five copies)

1. Surname, name and patronymic of the victim
2. Gender: male, female
3. Year of birth
4. Educational institution, class, group where the victim is educated
5. Subordination (belonging) of an educational institution (ministry, other central executive body, education management body, founder / owner / to which the educational institution is subordinated).
6. Postal code and address of the educational institution
7. The place where the accident occurred
8. Surname, name and patronymic of the educator, teacher, lecturer, head of the educational institution in the class (group) of which the accident occurred
9. Date of the briefing, training on labor protection, life safety:
 introductory instruction
 initial instruction
10. Date and time of the accident
 (hour, date, month, year)
11. Circumstances under which the accident occurred
12. The event that led to the accident
13. Causes of the accident
14. Consequences of an accident (fatal or non-fatal)
15. The victim is in a state of alcohol or drug intoxication
16. Measures to eliminate the consequences of the accident:

N s / n	The content of the event	Deadline	Executor (position, last name, initials)	Mark of performance

17. Persons who have violated legislative and other normative acts on labor protection (surname, name, patronymic, profession, position, educational institution, articles, paragraphs, items of violated legislative and other normative acts)

18. Witnesses of the accident (surname, name, patronymic, year of birth)

19. Conclusions of the treatment and prevention institution

Diagnosis by reference Medical institution	Released from learning	Number of days unvisited

Act drawn up

Chairman of the commission Members of the commission (position)

(position)

(date, month, year)

(SIGNATURE, initials, surname) (signature, initials, surname)

Appendix 2.2

Notification of the consequences of the accident that happened to the victim (surname, name and patronymic) who is studying, is being brought up

(educational institution) (class, group) FROM «» according to the act of the form H-H №

Consequences of the accident (according to paragraph 19 of the act on the form H-H): the victim recovered, established disability of I, II, III groups, died (emphasis added)

Diagnosis on the basis of a medical institution	Exempted from studying (visiting) in an educational institution	Number of days of non-attendance at the school

Head of educational institution (signature) (initials, surname) « »

Appendix 2.3

Journal of accidents with pupils, students and postgraduate students

(name of educational institution)

N s / n	Date of the event	Surname, name and patronymic of the victim, year of birth	Class (group)	Venue (audience, class, company, venue, etc.)	Brief circumstances and causes of the accident	Date of compilation, number of the act on the HH form	Diagnosis and consequences unfortunate case	Note
1	2	3	4	5	6	7	8	9

Appendix 2.4

Accident report

Date and time of the accident

Name of educational institution, its founder

The place where the accident occurred (audience, laboratory, class, workshop, enterprise, out-of-school educational institution, place of the event, etc.), and its brief description

Data on the victim (victims): surname, name, patronymic, year of birth, class (group)

In the case of group accidents - the nature of the injuries in the victims.

Circumstances and possible causes of the accident

Date, time of transmission of information and surname of the person who transmitted it

Note. The Ministry of Education and Science of Ukraine receives a report of an accident by subordination during the day (by fax, telegraph, telephone, etc.).

Appendix 2.5

Act of special investigation of a group accident

fatal accident or accident,

which happened " " at ___ hours _____ minutes (full name of the educational institution, its founder / owner /, the name of the body to which the educational institution belongs)

(date of drawing up the act) (place of drawing up the act: village, district, city, region)

The commission appointed by the order (instruction) from № _ (name of the body to which the commission is appointed) as a part:

head of Commission

(surname, name, patronymic) (position, place of work)

members of the commission:

(surname, name, patronymic) (position, place of work) conducted a special investigation of the accident that occurred during the period from "" to ""

(indicate the place of the event and the number of victims, including fatal)

2.5.3. Information about the victim (victims)

Surname, name, patronymic, year of birth, class, group, educational institution, time of training, instruction, testing of knowledge on labor protection, life safety.

If a group accident is being investigated, then section 1 of the special investigation report shall contain information on each victim separately.

2.5.4. Circumstances of the accident

The accident occurred during (the event) All events that took place and the work that took place before the accident are described. It is noted how the educational process took place, who managed this process, what happened to the victim. The sequence of events is set out, dangerous and harmful factors that could affect the victim are given, the actions of the victim and other persons involved in the accident are described. The nature of the injury, its severity, preliminary diagnosis and measures taken to provide first aid to the victim are indicated.

2.5.5. Causes of the accident

The main technical and organizational causes of the accident are given, including exceeding the maximum allowable norms of dangerous and harmful factors, if they affected the event (admission to work of untrained or uninstructed persons, malfunction of equipment, machines, mechanisms, lack of guidance, supervision of the educational process). After each reason, indicate what specific requirements of legislation and regulations on labor protection, instructions for safe work, job descriptions were violated (with reference to the relevant articles, sections, paragraphs).

The generalized results of the inspection of the state of labor protection in the institution are indicated.

2.5.6. Measures to eliminate the causes of the accident

The measures proposed by the commission should consist of:

- measures to eliminate the consequences of the event (if necessary);
- measures to eliminate the immediate causes of injuries and prevent similar cases in the future.

They can be presented in the form of a table or listed in the text, indicating the content of measures, deadlines for their implementation and officials responsible for their implementation.

2.5.7. Conclusion of the commission

This section lists the persons, including the victim, whose actions or omissions led to the accident. After setting out the content of the violation, the articles, sections, paragraphs of legislative and regulatory acts on labor protection, job descriptions that have been violated are indicated. At the end of the section, measures are proposed to bring to justice those who are responsible for the accident.

After the conclusion, the act records that the commission had meetings with victims or parents (persons representing their interests), considered on the spot the issue of providing social and material assistance, explained their rights in accordance with applicable law.

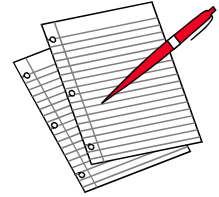
Head of Commission _____

Members of the commission

A separate page provides a list of attached materials.

The whole case (the act of special investigation and the attached materials) brochured.

Questions. Task



1. What is the essence of physiological reliability of man?
2. What is an analyzer?
3. What are the types of analyzers?
4. Name the common properties of analyzers.
5. What are receptors?
6. Name the main human analyzers.
7. Name the main properties of the visual analyzer.
8. Describe the main mechanism of perception of space, light and color
9. Describe the effect of colors on the nervous system.
10. What is the latency period?
11. Define the psychodiagnostic method.
12. Name the main psychophysiological properties of man and their impact on the human body.
13. What is memory, what are the types of memory?
14. What is attention, what are the characteristics of attention?
15. What are the reflexes?
16. Describe conditioned and unconditioned reflexes?
17. Specify the main characteristics of the human body.
18. Define homeostasis. Give examples of homeostasis.
19. Specify the types of reactivity.
20. Describe physical, mental, spiritual and social health.
21. On what assumptions is based on a balanced diet?
22. Define xenobiotics.
23. Name the task of investigating accidents at work.
24. How is the organization of investigation and accounting of accidents?
25. What is the prevention of injuries and occupational diseases.
26. The main causes of occupational injuries and occupational diseases.

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3. Life safety in natural and man-made environments

3.1. The natural environment of human life

Man as a natural being is an element of the natural environment - a source of resources to sustain life. Its safety directly depends on the conditions in which it interacts with nature.

The natural environment of life –is the part of the earth's nature, with which society interacts directly, obtaining resources for life and development.

The natural environment was formed as a result of the long evolution of the planet Earth and the influence of human activity.

Components of the environment of human life. The biosphere comprises part of the atmosphere, hydrosphere, and upper lithosphere, which are interconnected by complex biogeochemical cycles of migration of matter and energy.

Atmosphere. It is the gas shell of the Earth that rotates with it. The atmosphere is formed by nitrogen (70%), oxygen (21%) and inert gases (2%).

By the nature of changes in various parameters, the Earth's atmosphere is divided into the following layers: troposphere (9-18 km), where the air is suitable for respiration; stratosphere (50-55 km), where the air is thin, and the temperature in the lower part is 55 °C, in the upper - 0 °C; mesosphere (80-90 km), in which the temperature decreases and reaches - 80-90 °C; thermosphere (90 to 800-1000 km), where the temperature rises to 1000 °C, and the exosphere (above 800-1000 km), in which the air is completely rarefied.

The ozonosphere roughly coincides with the stratosphere and has a maximum concentration of ozone at an altitude of 20-25 km.

The main components of air that affect human life are:

1) atmospheric oxygen (O₂), necessary for respiration of humans, animals, most plants and microorganisms. The source of its formation is the photosynthesis of green plants (almost 70 billion tons of oxygen per year). Approximately 80% of oxygen is produced by marine phytoplankton, 20% by terrestrial vegetation. Oxygen is also formed from water vapor, which in the upper atmosphere under the influence of UV radiation decomposes into H + and O-;

2) carbon dioxide, which is a mandatory component of plant photosynthesis. It enters the atmosphere due to volcanic eruptions, decay of

organic matter, respiration of living organisms, vapors from the surface of the oceans;

3) water vapor. Its content in the atmosphere is determined by the ratio of evaporation, condensation and horizontal transfer. In the surface part, the concentration of steam is from 0.1-0.2% in the polar latitudes, to 3% - in the equatorial. Water vapor is a source of clouds, fog, precipitation, in combination with carbon dioxide (CO₂) protects the earth's surface from excessive cooling, providing a greenhouse effect. If there were no atmosphere, the average temperature of the Earth's surface would not be + 15 °C, but - 23 °C.

The atmosphere regulates the Earth's heat exchange with outer space, affects its radiation and water balances. The interaction of the atmosphere with the ocean, the processes of gas and heat exchange between them significantly affect the Earth's climate.

Hydrosphere. It is the water shell of the Earth. The aboveground part of the hydrosphere, which covers 70% of the Earth's surface, includes oceans, seas, lakes, rivers, and glaciers in which water is in a solid state. The high polarity of water molecules causes a strong ability to dissolve other substances, including polar (salts). Therefore, there is no chemically pure water in nature. Depending on the amount of dissolved substances, natural waters are divided into: fresh (with a salt content of up to 1 g per 1 liter of water); brackish (with a salt content of 1 to 25 g per 1 liter of water); salty (with a salt content of 25 to 50 g per 1 liter of water); brine (with a salt content of more than 50 g per 1 liter of water).

Only fresh water is suitable for living organisms. Its reserves (almost 70%) are contained in glaciers and snow, only 0.75% of water reserves are available to living organisms. The total amount of water in the surface shells of the Earth, the earth's crust is 1 trillion 600 million tons. The period of complete circulation of all water in the processes of formation of living matter reaches 2 million years.

The chemical composition of sea water is close to human blood, so the main hypothesis of the emergence of man states that life originated in water.

Lithosphere. It is the outer hard shell of the Earth, which covers the earth's crust with part of the upper mantle and consists of sedimentary, erupted and metamorphic rocks. The lithosphere contains all mineral resources and is one of the main subjects of human anthropogenic activity. Soils are located in the upper part of the continental crust. Within the lithosphere, modern physical and geographical processes (landslides, villages, landslides, erosion) periodically occur, which affect the ecological situation in different regions.

Biosphere. It is the Earth's crust, formed by living organisms, or a collection of living beings that inhabit the Earth, a zone of organic life that covers the sphere of interaction of the atmosphere, lithosphere and hydrosphere.

The modern interpretation of the biosphere was proposed by V. Vernadsky: "The biosphere is the shell of life, the sphere of existence of living matter."

The most important function of the biosphere is to sustain life. The fundamental condition for this function is the physiological diversity of living organisms[3{cp2}].

3.2. Hygienic characteristics of environmental factors

Hygienically important environmental factors include: radiation, air, fresh water, soil.

Solar radiation. It affects all physiological processes in the human body, changing metabolism, overall tone and performance. Under the action of ultraviolet rays in the body are formed biologically active substances that stimulate the physiological processes of the body.

The most biologically active is the ultraviolet part of the spectrum of solar radiation. Ultraviolet radiation with wavelengths ranging from 180 to 275 nanometers (nm) damages biological tissue and is harmful to microorganisms. It does not reach the Earth's surface, but is absorbed by ozone molecules in the stratosphere. Ultraviolet rays in the wave range from 275 to 320 nm have a slight bactericidal effect and enter into photochemical reactions of vitamin D synthesis. Rays with a wavelength of more than 290 nm reach the Earth's surface, providing natural remediation of air, water and soil. Ultraviolet radiation in the wavelength range from 320 to 400nm causes skin tanning.

Lack of sunlight is often manifested in the violation of physiological balance in the body and the development of pathological phenomena - sunlight or light ("ultraviolet") starvation. The body of a developing child suffers especially from the lack of sunlight, because vitamin D is not produced, which leads to the development of rickets. Sunlight has a positive effect on emotional interaction, psychophysical, anti-rickets, immunological action, increases the body's resistance to external conditions, accelerates the processes of self-cleaning that occur in the air.

Under the influence of UV - radiation enhances enzymatic processes, the formation and absorption of physiologically active substances (including vitamin D), normalizes metabolism, increases the immunological reactivity of the body, the tone of the nervous and muscular systems.

The air does not contain pathogenic microflora, because it quickly dies under the action of direct sunlight (especially tubercle bacillus). Indoors for 3-4 hours. Continuous sunlight kills almost all bacteria.

Visible light (wavelength range from 400 to 760 nm) has a general biological effect. Although the physiological level of vision is individual, it always depends on the intensity of natural light, so its provision in the premises is hygienically important. The greatest productivity, in particular mental, is caused by sufficient natural (instead of artificial) lighting. Appropriate hygienic standards are set in accordance with the physiological characteristics of visual functions. Light also affects the functional state of the central nervous system.

Infrared radiation with wavelengths from 760 to 25000nm causes only thermal action, which is largely determined by the absorption of rays by the skin. The shorter the wavelength, the more radiation penetrates the fabric. A specific reaction of the body at high intensity infrared radiation can be a sunstroke caused by overheating of the cortex of the cerebral hemispheres.

Air. Its hygienic role is determined by such properties as temperature, humidity, speed, atmospheric pressure, electrical condition, chemical and bacteriological composition, the presence of aerosols.

Temperature significantly affects life processes due to changes in the rate of biochemical reactions. According to Vant-Goff's rule, the rate of all chemical reactions increases with increasing temperature. To maintain thermal homeostasis, a person uses a thermoregulatory mechanism that provides a stable body temperature with significant fluctuations in air temperature.

The body receives heat as a result of metabolic processes (oxidation of nutrients) and the release of heat during exercise, and from the surrounding warm objects (warm air, hot food, solar radiation). The intensity of metabolic processes is decisive in the accumulation of heat in the body. The body gives off heat by convection, radiation and evaporation in quantities that depend on external conditions. In a state of rest and thermal comfort, convection accounts for 15%, radiation - 56%, evaporation - 29% of heat. The intensity of heat transfer through convection increases with increasing temperature difference between the body and air, air velocity and surface area of the human body. From high air temperatures (above 35 ° C) most of the excess heat is released due to the evaporation of sweat, along with which salts and water-soluble vitamins are excreted from the body.

Humidity also affects the body's heat transfer. The degree of saturation of air with water vapor, ie relative humidity, is of hygienic importance. High relative humidity (over 90%) inhibits sweat evaporation and can contribute to overheating at high temperatures. In the case of low humidity, intense heat transfer due to evaporation of sweat leads to cooling of the body. Therefore, a person tolerates high temperatures more easily if the air is dry. However, excessive dryness of the

air (less than 20%) is also undesirable because it dries the mucous membranes of the nose, pharynx and mouth, which causes the formation of cracks that are easily infected. The relative humidity is in the range of 40-60%.

With increasing *air velocity*, heat transfer increases due to convection and sweating, so a person can tolerate low temperatures more easily in calm weather. Strong wind disrupts the rhythm of breathing, and long - even depresses a person. Outdoors in summer are the most favorable air velocities in the range of 1-5 m / s.

Atmospheric pressure at sea level is $1.01 \cdot 10^5$ PA, presses on the entire surface of the human body (with an average area of 1.6 m²) with a force of approximately $1.6 \cdot 10^5$ N (equivalent to the force with which the object acts on a person weighing 16 tons). Man does not feel it, because this external pressure is completely balanced by the internal pressure in the cells and tissues of the body. Typical changes in atmospheric pressure in the range $(0.5-1.3) \cdot 10^3$ PA (in the range of 4 - 10 mm Hg) healthy people do not notice, but sharp fluctuations due to atmospheric fronts can lead to adverse changes in the body, especially in ill patients. As altitude increases, atmospheric pressure decreases, while the oxygen content decreases. At sharp rise up there is an oxygen starvation of fabrics. The supply of oxygen in the body does not exceed 0.9 liters, which is enough for 5-6 minutes. life. After that, the phenomenon of oxygen deficiency develops. The first symptoms of oxygen deficiency are detected at an altitude of 3 km.

The electrical state of the atmosphere is characterized by ionization of air, the presence of electric and magnetic fields of the Earth and natural radioactivity.

Air gases have different meanings for living matter on Earth. Reducing the amount of oxygen in the air to 14% is critical, up to 8% - incompatible with life. An increase in the oxygen content in the air (over 28%) leads to the development of pathological processes in the body, in particular to a decrease in lung capacity and pneumonia.

Nitrogen and inert gases are indifferent to living organisms and to solar radiation. However, an increase in nitrogen content to 93% is fatal due to a decrease in oxygen content. Air nitrogen is assimilated only by individual soil bacteria and blue-green algae.

Carbon dioxide plays a very important role in the processes of photosynthesis and respiration, reduces heat transfer to the Earth due to the adsorption of radiation coming from the earth's surface. The share of carbon dioxide, neon, helium and all other gases present in the air in microquantities is only slightly more than 0.04%. In the bottom layers of the atmosphere, especially in cities, the composition of the air changes. An important variable in the atmosphere is carbon dioxide. 100 years ago, the content of carbon dioxide in the air was 0.0298%, and now - 0.0318%, and in cities even higher. Interestingly, the acceleration - the enhanced growth of children - some scientists explain the high content of carbon dioxide in the air.

As a result of increasing the content of carbon dioxide in the indoor air to 4% there is a headache, tinnitus, rapid heartbeat, and its accumulation up to 8% is incompatible with life due to acute poisoning. Adverse effects of carbon dioxide (deterioration of health) can be traced when increasing its content to 0.1%. This value is accepted as the maximum allowable concentration when calculating the ventilation of the premises.

Ozone is a gas that protects living organisms from the harmful effects of harsh ultraviolet radiation from the Sun, absorbing it at altitudes ranging from 18 to 26 km. It is formed due to the interaction of ultraviolet radiation with a wavelength of less than 200 nm with oxygen. In the lower atmosphere, in the human respiratory zone, ozone adversely affects health, causing lung and eye disease.

Aerosols of natural and anthropogenic origin are constantly in the air. Hygienically significant parameter of aerosols is dispersion, particles smaller than 0.1 mcm do not settle and are constantly in the air. Particles larger than 5 mcm are trapped in the upper respiratory tract, causing mucosal irritation and chronic inflammation. Particles smaller than 5 mcm are the most dangerous, as they can enter the lungs, infecting lung tissue, causing chronic poisoning by lead, manganese, arsenic dust and malignancies in the case of inhalation of a carcinogenic substance - benzopyrene. In addition to mineral suspended particles in the air there are constantly spores of fungi, bacteria, plant pollen, which can cause allergic reactions.

Water. Its physiological significance for humans is due to the fact that it is part of all body tissues: from tooth enamel with a content of 0.2% to the vitreous (99%). The average water content in the body is 60-70%, the loss of a third of it is fatal. Water is the main part of the blood, secretions and excretions of the body. One of its important functions is the transport function: the delivery of nutrients to cells and the removal of toxins and toxic substances from the body with sweat, urine and saliva. Water plays a significant role in the body's thermoregulation by evaporating sweat.

Under normal conditions, the body's daily need for water is 1-1.5 liters as a liquid and 1-1.2 liters as a part of food. One of the mechanisms of regulating the flow of water into the body is thirst, the occurrence of which is associated with water-electrolyte balance and due to a violation of osmotic pressure. However, the main role in regulating water-electrolyte balance belongs to the nervous system. The subjective feeling of thirst quickly persists for a long time, a person may consume excess water, which is disturbing. Excess water content that may occur does not cause a mechanism of self-regulation.

Water is also of hygienic importance. The amount of water that one person uses per day is one of the most important indicators of the sanitary well-being of the population. Water is needed to keep the body clean, tempering, cleaning, cooking, washing dishes, washing clothes and more. For such purposes, the city dweller uses up to 250-350 liters of water per day.

However, water is a favorable environment for the reproduction of many pathogenic microorganisms and one of the ways of spreading infectious diseases, so epidemiological monitoring of drinking water is important.

Soils. They significantly affect the quantity and quality of food of both plant and animal origin, as well as an environment for the development of pathogenic bacteria, viruses, helminth eggs. The mineral basis of soils contains almost all chemical elements, but in different amounts. The uneven distribution of them in accordance with the peculiarities of geological and soil-forming factors, causes a change in the mineral composition of groundwater and many plants, which affects the flow of minerals into the human body. Soils are important epidemiologically because they contain pathogens of many infectious diseases (intestinal infections, polio, Botkin's disease, anthrax, whooping cough, brucellosis, tuberculosis, botulism, tetanus, gangrene), eggs and larvae of helminths that enter directly or indirectly organism.

Clean, uncontaminated soils are unfavorable for pathogenic non-spore microorganisms. In contaminated soils, especially organic matter, these microorganisms retain their activity for a long time, some of them up to a year or more. As for spore-bearing microorganisms, they remain viable in soils for decades.

Soils are characterized by a unique property - self-cleaning. Which is that bacteria, viruses and helminth eggs that get into the soil with organic matter are partially retained and as they move, their number decreases. Under the influence of mechanical, physicochemical, biological and biochemical ability of soils, sewage discolors, loses odor, toxicity and other properties. The destruction of bacteria is facilitated by competition from saprophytes, the influence of mechanical factors, the bactericidal action of solar radiation. However, the possibilities of self-cleaning of soils are limited. Significant pollution can even cause the death of all beneficial microflora. One of the indicators of soil contamination is the sanitary number, which is defined as the ratio of nitrogen content in humus to total nitrogen content in soil. In the process of self-cleaning, this figure approaches one.

Thus, the impact of the atmosphere, water resources, soils on the safety of human life is of great importance.

3.3. Natural threats and the nature of their manifestations and effects on humans, animals, plants, objects of the economy

Emergencies of natural origin in Ukraine are divided into geological, meteorological, hydrological, natural fires. Their emergence is facilitated by

the peculiarities of geographical location, atmospheric processes, the presence of mountains, the proximity of warm seas, and others. Natural disasters are caused by a variety of climatic conditions: from excessive moisture in Western Polissya to arid in the southern steppe zone. Exceptional climatic conditions on the southern coast of Crimea, in the mountains of the Ukrainian Carpathians and Crimea.

As a rule, natural phenomena are caused by endogenous, exogenous and hydrometeorological factors.

Natural disasters are classified into simple, having one element (eg, strong wind, landslide, earthquake) and complex, formed by several processes (negative atmospheric and geodynamic exogenous processes, endogenous, exogenous and hydrometeorological processes in combination with man-made).

Geologically dangerous phenomena. These include earthquakes, volcanoes, villages, karsts, landslides, talus, abrasion and more.

Earthquake is the oscillations of the earth's crust, which occurs due to explosions in the depths of the earth, fractures of the earth's crust, active volcanic activity. An earthquake causes elastic oscillations of the earth (seismic waves) that propagate in all directions. The part of the earth from which the earthquake waves come is called its center, and the epicenter located on the surface.

The intensity of the earthquake is measured in points on the Richter scale or on a 12-point international scale MZK-64. It decreases to the periphery of the disaster zone. The epicenters are located at a depth of 30-60 km, sometimes - up to 700 km. Depending on the causes and location of earthquakes are divided into tectonic, volcanic, landslides and earthquakes.

Earthquakes cover large areas and are accompanied by:

1. destruction of buildings and structures, the wreckage of which people fall, the emergence of mass fires and industrial accidents;
2. flooding of settlements and entire areas;
3. gas poisoning during volcanic eruptions;
4. defeat of people and destruction of buildings by fragments of rocks;
5. damage to people and the emergence of fires in settlements from volcanic lava;
6. failure of settlements during landslides;
7. destruction and washing away of settlements by tsunami waves;
8. negative psychological effect.

Seismic zones surround Ukraine in the southwest and south: Transcarpathian, Crimean-Black Sea and South Azov. Dangerous are Zakarpattia, Ivano-Frankivsk, Chernivtsi, Odessa regions and the

Autonomous Republic of Crimea.

It is still impossible to prevent earthquakes, forecasts are confirmed only in 80% of cases. According to UNESCO, earthquakes rank first in the world in terms of economic damage and death toll.

Volcanism is a set of phenomena caused by the penetration of magma from the depths of the earth to its surface. The processes of mud volcanism are localized in the southern part of Ukraine, on the Kerch Peninsula and the adjacent waters of the Sea of Azov, in the west and south of Sevastopol in the Black Sea. Material losses from eruptions of mud volcanoes are significant - they destroy buildings and parts of the village. Active volcanoes produce mercury vapor, which leads to geochemical anomalies that are harmful to human health. Activation of mud volcanoes in the area of the South Azov fault can worsen navigation conditions.

The causes of mudslides are almost always heavy rains, intense melting of snow and ice, breaking of dams, earthquakes and volcanic eruptions, as well as anthropogenic factors (deforestation and soil degradation on mountain slopes, rock explosions when laying roads, work in carts era, improper organization of landslides and elevations, air pollution, which is detrimental to soil and vegetation). Mud flow, suddenly formed due to a sharp rise in water levels in mountain riverbeds. It is a continuous stream of rock, mud and water moving at a speed of 2 to 10 m / s. The volume of the mudflow can reach hundreds of thousands and even millions of cubic meters, and the size of the fragments - up to 3-4 m in diameter and weighing almost 100-200 tons. Currently, from 3 to 25% of the territory of Ukraine is affected.

Karst process is a phenomenon associated with the dissolution of rocks by natural waters. In some regions of Ukraine the degree of karst damage reaches 60-100% of the territory. Particularly dangerous areas of open karst development (funnels, wells, abysses), which make up 27% of the total area of karst formation. The most developed open karst in the Volyn region covers an area of 594 km², Rivne region - 214 km², Khmelnytsky region - 4235 km².

Landslide - a downward displacement under the action of gravitational forces of large soil masses that form the slopes of mountains, rivers, lakes and sea terraces. This phenomenon can be caused by both natural and artificial (anthropogenic) causes. The natural ones include: increasing the steepness of the slopes, washing away their bases by sea or river water, seismic shocks. Artificial causes are: destruction of slopes by road ditches, excessive soil removal, deforestation, incorrect choice of agricultural machinery for agricultural land on the slopes. Up to 80% of modern landslides have been caused by human activity. The shear speed is

from 0.06 m / year (up to 3 m / s).

The area of landslide processes has increased fivefold in the last 30 years. They are distributed in almost half of the territory of Ukraine, in particular in Zakarpattia, Ivano-Frankivsk, Chernivtsi, Mykolaiv, Odesa, Kharkiv regions and Crimea. The most common are landslides (up to 5 km) and landslides.

Rockslides are the separation and catastrophic fall of large masses of rocks, their crushing and rolling down cliffs, precipices and slopes. They are observed in the mountains, on the shores of the seas, on the cliffs of river valleys due to the weakening of the cohesion of rocks under the action of weathering, washing, dissolution and gravity. their emergence is facilitated by the geological structure of the area, the presence of cracks on the slopes and areas of fragmentation of rocks. However, most often (up to 80%) modern landslides are caused by anthropogenic factors. They occur mainly during improper work, construction and mining.

Rash - accumulation of gravel or soil at the foot of the slopes. In the Carpathian and Crimean mountains, some scree led to human losses.

Abrasion - the process of destruction by surf waves of shores, lakes and reservoirs. This process is common on the Black Sea coast. In the coastal zone of Crimea, 22 hectares of coastline disappear annually, between the Danube Delta and Crimea - 24 hectares, in the northern part of the Sea of Azov 19 hectares. Up to 60% of the shores of the Azov and 30% of the Black Seas are subject to abrasion. Its speed averages 1.3-4.2 m / year.

Meteorological and dangerous phenomena. Over the last decade, approximately 240 cases of catastrophic natural phenomena of meteorological origin with significant material damage have been recorded in Ukraine. These include: heavy rains (Carpathian and Crimean mountains); hail (throughout Ukraine); heat (steppe zone); dry winds, droughts (steppe and eastern forest-steppe zones); hurricanes, tornadoes (most of the territory); dust storms (southeast of the steppe zone); heavy fogs (southeast of the steppe zone); blizzards (southeast of the steppe zone); snow drifts (Carpathians); significant ice (steppe zone); severe frost (north of Polissya and east of the forest-steppe zone).

Along the coast and in the waters of the Black and Azov Seas there are *storms, hurricanes, tornadoes, downpours, icing of buildings and vessels, heavy fogs, blizzards, ice*. The steppe zone suffers the most from the influence of natural meteorological phenomena, where they are observed both in the warm period of the year (strong heat, dust storms, dry winds, forest fires), and in the cold (frosts, ice).

The Ukrainian Carpathians are characterized by *heavy rains* (causing mudslides and downpours), *hail, winds, fogs, blizzards, and heavy snowfalls*.

The coasts of the Black and Azov Seas are in the zone of influence of atmospheric phenomena inherent in the marine climate.

The most common natural disaster is *heavy rains* (showers). They are observed annually and cover large areas, especially in the Carpathians and the Crimean mountains. In the warm period of the year, heavy rains are accompanied by hail, which damages crops. In the steppe zone, strong heat (more than 40 ° C) is especially common.

In Ukraine, *intense dry winds* are winds with high temperature and low relative humidity. They cause wilting and death of plants. Most dry winds affect the steppe zone, partly - the forest-steppe zone.

Droughts reduce soil moisture reserves, impair plant growth, and sometimes lead to their death. They most often occur in the south of the steppe zone.

A *hurricane* is a wind of 12 on the Beaufort scale. In most parts of Ukraine, winds with a speed of over 25 m / s occur almost annually. Most often - in the Carpathians, Crimean mountains and Donbass.

Cyclone - vortex motion of the atmosphere with decreasing pressure from the periphery to the center. In terms of properties, origin and consequences, they are similar to tropical hurricanes. In the Sea of Azov, cyclones often lead to storms.

Gusts - a sharp short-term increase in wind, sometimes up to 30-70 m / s with a change in its direction. This phenomenon is most often observed during a thunderstorm. A hazardous situation can occur throughout Ukraine.

Atmospheric vortex, which occurs in a storm cloud and spreads in the form of a dark sleeve or trunk (often several) towards the surface of land or sea, is called a *tornado*. The destructive effects of this element can be compared to the effects of a shock wave of nuclear weapons, but tornadoes are rare.

Dust storms are complex atmospheric phenomena that are accompanied by the transfer of dust and sand by strong and prolonged winds, which destroy the soil surface, causing particularly great damage to agriculture.

Frosts, blizzards, ice are probable on the whole territory of Ukraine. *Fogs* impair visibility on roads, create obstacles for various modes of transport, contribute to air pollution.

Hydrological and dangerous phenomena. These include dangerous rises and falls in sea level, floods (in river basins), mudflow (in the Carpathian and Crimean mountains), low water.

Sea level rises and falls occur (along the coast and in the Black and Azov Seas). For almost 20 years, the shores of the Saxon-Evpatoria system have been destroyed at a speed of 3.5 km every year due to man-made

factors. During the year, more than 100 hectares of coastal areas are irretrievably lost, the beach strip is reduced, and the biological productivity of the sea is reduced. The material values located in the coastal zone are under constant threat of destruction.

The main reasons for the increasing rate of destruction of sea shores are both natural factors associated with tectonic submergence (lowering) of the North Priazovye, and anthropogenic, which include over-regulation of solid runoff, pollution of water basins and reduced productivity, unsystematic coastal development and spit, construction of shore protection structures that do not meet hydrodynamic processes, use of inefficient or even harmful shore protection measures and structures during "self-construction", deviations from design decisions, uncontrolled sand removal, violation of landslide regime when building terraces and other harmful economic activities on the coast.

A significant amount of money and material resources is spent annually to eliminate the effects of *floods* on the rivers of Ukraine. They occur during prolonged downpours and due to melting snow, wind gusts of water, congestion and flooding. The zones of possible floods on the territory of Ukraine are the basins of the Dnieper, Pripyat, Desna, Dniester, Tisza, Prut, Western Bug, Seversky Donets, Psal, Vorskla, Sula, Dnieper, Danube, Southern Bug and their tributaries. Floods (flooding) last from 7 to 20 days or more. It is possible to flood not only 10-70% of agricultural land, but also a large number of man-made objects.

Low water - the period (phase) of the hydrological regime of a water body, during which there is a decrease in its water content (20% more than normal), resulting in deteriorating needs of the population and the economy.

Natural fires. Every year in dry, hot weather the danger of forest and peat fires increases sharply. They arise from human fault and due to the action of certain natural factors. The fire can spread quickly and, picked up by the wind, destroy settlements, people, pets, property. The most dangerous are hot and dry summer days with a relative humidity of 30-40%. Depending on the nature of the fire, the speed of the fire and the extent of damage to the forest, there are four categories of forest fires: *lowland*, *upperland (mass)*, *underground (peat or soil)*, *hollow tree fires*.

Grassland fires occur most often (almost 80% of all cases), in which coniferous undergrowth, living above-ground cover, ie plants and plant remains, burn. Upper forest fires develop from the lower ones, and not only the above-ground cover burns, but also the lower tiers of trees and the crowns of poles. Underground fires often occur in late summer as a continuation of the lower or upper. They cover huge areas, they are difficult to extinguish.

Thus, the emergence of emergencies of natural origin in Ukraine is facilitated by geographical location, atmospheric processes, climate, and especially human activity. Man-caused load on the environment is 5-6 times higher than in developed countries, so natural-man-made hazards associated with the operation of dams, reservoirs, land reclamation, mining are likely. Natural disasters can affect various industrial facilities, structures, etc., lead to fires, explosions, emissions of hazardous substances, flooding, radioactive contamination, traffic accidents, accidents in power plants[7].

3.4. Man-made environment of human life. Typology of accidents at potentially dangerous objects

"I decided to stop practicing
study of inanimate nature and
I'll try to understand why
it happens that a person knows that well,
and does what gives the opposite result "
Socrates

Man is constantly transforming nature, building factories, cities, canals, roads, mining and more. As a result of such activities on the planet formed a man-made environment.

The technogenic environment – the part of the biosphere transformed by the person by means of direct and indirect influence for the purpose of satisfaction of the needs.

Human economic and household activities have reached such proportions that they have begun to affect even global natural phenomena, threatening safe living.

Man-made hazards and their consequences

Five thousand years ago, when the first urban settlements appeared, elements of the technosphere began to form - a sphere that includes artificial structures on Earth. It was formed in the era of the industrial revolution, when steam and electricity have repeatedly strengthened man's technical capabilities, allowed him to move quickly on the earth's surface, create a world economy, delve into the earth's crust and oceans, rise into the atmosphere, create many new substances. There are processes that are not inherent in the biosphere: the production of metals and other elements, energy production at nuclear power plants, the synthesis of organic matter that does not exist in the biosphere.

A powerful man-made process is the combustion of fossil fuels. Due to the use of significant energy capacity, people concentrate energy in small areas, often within cities and towns. There is also a spatial concentration of

synthetic chemical compounds (their number reached 400 thousand), most of which are toxic. As a result, environmental pollution, deforestation, desertification, and the number of people dying in industrial and transport accidents have risen sharply.

Accidents caused by disruption of technical facilities became catastrophic in scale in the 20s and 30s of the XX century. their influence sometimes extends to entire regions. The unfavorable environmental situation caused by accidents can last from several days to many years, and the elimination of the consequences requires large funds and the involvement of many specialists.

Accident - failure of machines, mechanisms, devices, communications, structures due to violations of production technology, rules of operation and safety, errors in the design of construction, as well as due to natural disasters.

The source of accidents can be vehicles, factories, power plants, nuclear power plants, etc. This is usually due to improper operation or failure of obsolete equipment.

According to the size and damage, there are light, medium, severe and especially severe accidents that lead to significant damage and casualties. The most common types of accidents are:

- o accidents with leakage of highly toxic substances (HTS), such as ammonia, chlorine, sulfuric and nitric acids, carbon monoxide, sulfur dioxide, etc .;

- o accidents involving the release of radioactive substances into the environment;

- o fires and explosions;

- o traffic accidents, etc.

Particularly severe accidents can lead to disaster.

Catastrophe -a large-scale accident that causes particularly severe consequences for humans, animals and plants by changing environmental conditions.

Global catastrophes cover continents, their development threatens the entire biosphere.

Accidents with the release of radioactive substances into the environment. The catastrophe of global scale was the accident that occurred in 1986 at the Chernobyl nuclear power plant. As a result of gross violations of the rules of operation and erroneous actions, huge areas, water bodies were contaminated with radiation, and the health of millions of people was damaged.

According to experts from different countries, the total radioactive contamination is equivalent to the loss of radioactive substances from the explosion of several dozen such atomic bombs, which were dropped over Jeroshima. Long-term exposure to small doses of ionizing radiation due to the entry into the body of radioactive substances contained in food and water, leads to the development of pathological processes. According to current data, the Chernobyl disaster in Ukraine affected almost 3.23 million people, of whom 2.35 million have lived for 12 years in the contaminated area, more than 358 thousand participated in the aftermath of the accident, 130 thousand were evacuated in 1986 or later resettled. In Ukraine, more than 1.1 million children need priority medical care. The structure of the disease is dominated by diseases of the endocrine system, immune disorders, diseases of the digestive system, respiratory and nervous systems.

Accidents with leakage of highly toxic substances. They occur in the chemical, oil refining, pulp and paper and food industries, in water and sewage treatment plants, as well as during the transportation of highly toxic substances. A feature of chemical accidents (unlike other industrial disasters) is their ability to spread over a large area, where large areas of dangerous environmental pollution can occur. Air currents, which contain gases, vaporous toxic components, aerosols and other particles, become a source of damage to living organisms not only in the center of the disaster, but also in the surrounding areas. The main sources of chemical accidents and catastrophes include:

- emissions and leaks of hazardous chemicals;
- ignition of various materials, equipment, building structures that lead to environmental pollution;
- accidents on transport during transportation of dangerous chemicals, explosive and fire-hazardous cargoes.

The immediate causes of these accidents are: violation of safety and transportation rules, non-compliance with safety regulations, failure of units, mechanisms, pipelines, damage to tanks, etc. For example, phosgene is used to make many polymers (foam rubber, polyfoam, polyurethane, etc.), which are used in various sectors of the economy; for synthetic rubbers, faux fur, plexiglass - hydrocyanic acid; chlorine - for water disinfection, in the production of cellulose. Very toxic ammonia, hydrogen fluoride, formaldehyde and other substances that are used in large quantities in chemical synthesis and many technological processes. An accident at the chemical plant of the American multinational corporation Union Carbide in the Indian city of Bhopal in 1984 resulted in the release of several tens of tons of gaseous component - methyl isocyanate, which is a strong poison that causes damage to the eyes, respiratory system, brain and others vital human

organs. More than 2,500 people died, 500,000 were poisoned, and 70,000 of them caused long-term illnesses. The damage from the man-made disaster is estimated at \$ 3 billion. USA.

There are 877 chemically dangerous objects on the territory of Ukraine and 287 thousand objects are used in the production of them or their derivatives (in 140 cities and 46 settlements). The increase in chemical production has also led to an increase in the amount of industrial waste that poses a danger to the environment and people. Toxic waste alone in Ukraine has accumulated more than 4 billion tons, with an average annual generation of 103 million tons[4,5].

Accidents on motor transport. Vehicles promote development of economy of the country, create convenience and comfort for people. However, the development of transport also has negative consequences, in particular the high level of vehicle accidents and road accidents. Any vehicle is a source of increased danger, as accidents, catastrophes and accidents of trains, planes, sea, river vehicles, injuries when boarding or exiting vehicles or during their movement are possible. In the world, 250,000 people die every year as a result of road accidents and about 30 times more are injured.

The Law of Ukraine "On Road Traffic" defines the legal and social foundations of road traffic in order to protect the lives and health of citizens, create safe and comfortable conditions for road users and protect the environment. In particular, officials responsible for the operation and technical condition of vehicles are obliged to:

- ensure the selection, training and professional level of drivers, monitor their health and compliance with the regime of work and rest;
- ensure the proper technical condition of vehicles and compliance with environmental requirements for their operation;
- not to allow to drive vehicles persons who do not have the right to drive a vehicle of the relevant category, have not passed the medical examination within the established period, are in a state of alcohol or drug intoxication or in a sick state, or under the influence of drugs that reduce them reaction and attention;
- not to put on the line vehicles whose technical condition does not meet the requirements of state standards, traffic rules, as well as if they are not registered in the prescribed manner, re-equipped in violation of the law or have not passed the state technical inspection.

Everyone should take care of personal safety. For example, a pedestrian is obliged to: walk on sidewalks, pedestrian or bicycle paths, roadsides, and in their absence - the edge of the carriageway or street; to cross the carriageway, streets with pedestrian crossings, in their absence - at intersections along sidewalks and roadsides; be guided by the signals of the

regulator and traffic lights in places where traffic is regulated; not to linger and not to stop unnecessarily on the carriageway, street and railway crossing; not to cross the carriageway of roads, streets, railway crossings directly in front of oncoming vehicles, outside pedestrian crossings in the presence of a separate lane, as well as in places where pedestrian or road barriers are installed; do not cross the roadway when approaching a vehicle with a flashing beacon and a special sound signal; not to enter the carriageway due to a stationary vehicle or other obstacle that limits visibility without making sure that there are no approaching vehicles.

The passenger, ie a person who uses the vehicle, but is not involved in driving it, must comply with the following rules: board only from a special platform, and in its absence - from the sidewalk or roadside; to carry out boarding and disembarking only after the complete cessation of movement of the vehicle; not to distract the driver from driving; when driving a car equipped with seat belts, be fastened, on a motorcycle - in a fastened helmet.

An important role in accidents is played by psychological factors, in particular emotional stress, which usually occurs in people who do not know what to do in case of an accident. It is necessary that everyone in order to increase personal road safety know how to act in case of potential accidents, be able to use the means of individual and collective protection available in the vehicle. During the impact, the passenger next to the driver should lift his legs and rest them on the front panel, tilt his head on his chest and cover his face with his hands so that it does not suffer from possible fragments. Other passengers should rest their feet on the floor or lower part of the front seats, raise their arms forward and rest their backs on the front seat, tense their muscles and group themselves. Passengers and drivers who are aware of the rules of conduct are more likely to save their lives than those who are unaware.

It is impossible to predict all the factors that affect road safety, however, in compliance with current laws and regulations, it is possible to protect road users.

Accidents on air transport. Failures of engines during flights almost always lead to catastrophic consequences. On average, there are up to 60 plane crashes in the world each year, 35 of which kill all passengers and crew. Almost 300,000 people die on the roads every year, and up to 2,000 in plane crashes.

The chance of survival in plane crashes on flights on large jets is much higher than on small planes. If you follow certain recommendations, the chances of passengers to escape increase: clothing and footwear for such trips should be made of non flammable material; safer are the places located near the exit, closer to the middle or tail of the aircraft; when taking off and

landing, the seat belt must fit snugly against the thighs. After boarding the plane, it is advisable to determine where the main and emergency exits are located and how they open. If there is a fire during the flight, you should cover yourself as much as possible with clothes and try to breathe less smoky air; when the aircraft has made an emergency landing, it should be left quickly, then if possible to provide assistance to other passengers.

Accidents on railway transport. Areas of increased danger on railway transport are: railway tracks, crossings, landing platforms and cars. The constant danger is the power supply system, the possibility of accidents, collisions, the resulting combustion products. Night fires are especially dangerous during long races when passengers are asleep. Adherence to the following safety rules for both passengers and drivers, as well as pedestrians, significantly reduces the risk of emergencies:

- when driving along the railway track it is not allowed to approach closer than 5 m to the extreme rail;
- on electrified sections of the railway track it is not allowed to climb on the supports, touch the descent that extends from the support to the rails, wires lying on the ground;
- railway tracks are allowed to cross only in the established places (pedestrian bridges, crossings, etc.); before crossing the tracks it is necessary to make sure that there is no train or locomotive;
- when approaching the crossing, you need to carefully monitor the light and sound alarms and the barrier; it is possible to cross tracks only at an open barrier, and in its absence - if the train is not visible;
- it is forbidden to run on the station platform along the arriving or departing train;
- when passing the train without stopping it is forbidden to stand closer than 2 m from the edge of the platform;
- it is allowed to approach the car only after a complete stop of the train;
- boarding and exiting the car is recommended only on the side of the platform, be careful not to stumble and get into the gap between the landing pad of the car and the platform;
- during the train it is not allowed to open the outer doors of the vestibules, to stand on the steps and transitions, to protrude from the windows of the cars; at train stops at races to leave cars;
- it is forbidden to use open fire in cars and to use household appliances that work from the car network (kettles, irons, etc.);
- flammable and explosive materials may not be transported in wagons;

- in case of emergency evacuation from the car it is necessary to keep calm, to take away only the most necessary, to leave big things; provide assistance in evacuation to passengers with children, the elderly, the disabled, etc .;

- When exiting through side doors and emergency exits, be careful not to fall under the oncoming train.

Accidents on sea transport. The risk to human life on sea vehicles is higher than on air and rail, but lower than on cars. In the world maritime transport, more than 8,000 ships crash every year, as a result of which 6,000 people are endangered, of which up to 2,000 die. The main causes of shipwrecks are landing on reefs, collisions, overturning, fires, violations of operating rules and safety rules, erroneous functional actions of the team, etc.

In case of threat of death of the ship it is necessary to evacuate passengers. This poses a risk to human life, especially in storms. The greatest danger arises when devices fail. Passengers risk their lives when rescue vehicles are launched: in the event of a boat capsizing, hitting the ship, hitting the boat on the water, and so on. Improper use of life jackets, jumping from a height of 6-15 m from the ship is dangerous.

Prolonged stay in the water can cause death (hypothermia) and exhaustion. To slow down the body's hypothermia and increase the chances of survival at low temperatures, it is necessary to keep the head as high as possible over water, because more than 50% of all body heat consumption is in this part of the body. It is necessary to stay on the surface of the water so as to spend minimal physical effort. In the case of prolonged stay of passengers on boats or rafts, life-threatening may occur due to depletion of the body in the absence of water and food. One must try to overcome panic, confusion, self-control and faith in salvation. Such behavior in extreme situations increases the chances of survival.

Fires and explosions. They often occur at facilities that produce explosives and chemicals. The combustion of many materials produces highly toxic substances, from the action of which people die more often than from fire. Previously, carbon monoxide was dangerous during fires, but in recent decades, many substances of artificial origin are burning: polystyrene, polyurethane, vinyl, nylon, foam. This leads to the release into the air of hydrocyanic, hydrochloric and formic acids, methanol, formaldehyde and other highly toxic substances. The most explosive and flammable mixtures with air are formed in the case of leakage of gaseous and liquefied hydrocarbon products of methane, propane, butane, ethylene, propylene, etc.

One-third to one-half of all industrial accidents are related to explosions of technological systems and equipment: reactors, tanks,

pipelines, etc. Fires in enterprises can also occur due to damage to electrical wiring and live machines, heating systems.

More than 63% of industrial fires are caused by human error or incompetence. When the company reduces the staff and budget of emergency services, their efficiency decreases, the risk of fires and explosions increases sharply, as well as the level of human and material losses.

Dangerous situations of both natural and man-made origin are factors that to some extent destabilize the situation. The most important thing in reducing this destabilizing effect is to protect the population from their harmful effects.

3.5. Electrical safety

As a direction of scientific research and engineering, electrical safety was introduced in the second half of the XIX century, when electricity was quickly introduced into various spheres of society.

Electrical safety - a system of organizational and technical measures and means that protect people from the harmful and dangerous effects of electric current, electric arc, electromagnetic field and static electricity.

3.5.1. The effect of electric current on the human body. Types of electrical injuries

Flowing through the human body, electric current causes thermal, electrolytic, mechanical (dynamic), biological action.

These physicochemical processes are inherent in living and inanimate matter. At the same time, the electric current has a biological effect, which is a specific process inherent only in living tissue.

The thermal effect of the current is manifested through burns of certain parts of the body, heating of blood vessels, nerves, heart, brain and other organs that cause irreversible phenomena (functional changes).

The electrolytic action of current is characterized by the decomposition of organic liquid into components, in particular, which is accompanied by a significant violation of their physicochemical composition.

Mechanical (dynamic) action is the exfoliation, rupture and other mechanical damage to body tissues, including muscle tissue, blood vessel walls, pulmonary vascular tissue due to the electrodynamic effect, as well as the instantaneous explosive formation of vapor from superheated tissue fluid and blood.

The biological effect of current is manifested through irritation and excitation of living tissues of the body, as well as through the disruption of internal biological processes occurring in the body and closely related to its vital functions.

The irritating effect of the current can be direct and reflex.

Types of electrical injuries

The variety of effects of electric current on the human body leads to electrical injuries, which are divided *into two types*:

- local electrical injuries, which mean local damage to the body;
- general electrical injuries (electric shocks), when the whole organism is damaged (or there is a threat of damage) due to violation of the norms of vital organs and systems.

According to statistics, the approximate distribution of HB due to the action of electric current is as follows:

- local electrical injuries - 20%;
- general electrical injuries (electric shocks) - 25%;
- mixed injuries (both local electric injuries and electric shocks) - 55%.

Local electrical injuries

Local electrical injuries are clearly defined violations of the density of body tissues, in particular bones, caused by electric current or electric arc. Local electrical injuries are healed and the victim's ability to work is fully or partially restored. However, with severe burns a person dies.

Typical local electrical injuries - electric burns, electrical marks or signs, metallization of the skin, electrophthalmia, mechanical damage.

Electric burns are damage to the surface of the body by an electric arc or large currents. There are three types of burns:

- current, when current flows through the human body;
- arcs that occur under the action of an electric arc (temperature 3500-15000 oC);
- mixed (90% fatal).

Small burns - I, II degree; significant III, IV degree.

Electrical marks are seals on human skin of oval or round shape with a diameter of 1-5 mm of gray or pale yellow color. There are two points: current input and output. Electrical signs are painless and heal over time.

Metallization of skin - penetration into the skin of metal particles due to its spraying and evaporation under the action of an electric arc. The affected area of the body has a hard surface. Metallization of the skin is observed in 10% of victims of electric shock.

Electrophthalmia is an inflammation of the outer membranes of the eyes due to the action of ultraviolet radiation of an electric arc, which

develops 4-8 hours after ultraviolet radiation. At the same time there is tearing, sharp pain in the eyes. It heals in a few days.

Mechanical injuries are convulsive contractions of human muscles under the action of an electric current. As a result, there may be ruptures of tendons, skin, blood vessels, nervous tissue and even bone fractures, dislocations of the joints.

Mechanical damage occurs during operation in installations with voltage up to $U < 1000$ V during prolonged exposure to voltage.

General electrical injuries

Electric shock (general electrical injury) is the excitation of living tissue by an electric current, accompanied by convulsive muscle contractions. Such a stroke can lead to disruption and even complete cessation of lung and heart function.

Depending on the outcome of the injury, electric shocks can be divided into five stages:

- convulsive, barely noticeable muscle contractions;
- convulsive muscle contractions, accompanied by severe pain that is barely tolerated without loss of consciousness (see a doctor);
- convulsive muscle contraction with loss of consciousness, but with preservation of respiration and heart function;
- convulsive muscle contraction with loss of consciousness and disturbance of cardiac activity or respiration (or both);
- clinical death, ie lack of respiration and blood circulation, lasts in a healthy young person for 5-7 minutes, the brain can function during this time without oxygen. Later, the cells of the cerebral cortex begin to decompose.

Clinical "imaginary" death is a transitional process from life to death, which occurs from the moment of cessation of heart and lung activity.

Biological (real) death is an irreversible phenomenon. The stage of biological death can be determined only by a doctor and it occurs after clinical death.

Causes of death from electric shock

Causes of death from electric shock can be: *cardiac arrest; respiratory arrest (paralysis); electric shock*. Two or three causes can work at the same time.

Cessation of cardiac activity from the action of electric current is the most dangerous. The effect of the current on the heart muscle can be direct, when the current flows directly in the heart area, and reflex, ie through the central nervous system, when the current path lies outside this area. In both cases, cardiac arrest or fibrillation may occur.

Heart fibrillation is a chaotic movement of the heart muscle (fibrils) in which the heart is unable to move blood through the vessels.

Cessation of breathing is due to the direct effect of current on the chest muscles involved in breathing. The person experiences difficulty breathing already under the action of a current of 20-25 mA with a frequency of $f = 50$ Hz. Prolonged exposure to current leads to asphyxia (lack of oxygen and excess CO₂).

Electric shock - a kind of severe nervous reflex reaction of the body to electric shock (circulatory, respiratory, metabolic disorders). Electric shock is conventionally divided into three stages: the stage of excitation; inhibition or damping of all vital functions; exit from a state of shock or death.

The state of shock lasts from several tens of minutes to days. This can be followed by death due to complete loss of vital functions, or recovery due to timely active medical intervention.

3.5.2. Causes of electric injuries. First aid measures in case of electric shock

Electric injuries can be the result of technical, organizational and technical, organizational and organizational and social reasons.

Technical reasons include:

- imperfection of the design of electrical installations and means of protection;
- shortcomings in the manufacture, installation and repair of the installation;
- violation of the rules of arrangement, technical operation and TV of electrical installations.

In addition to the above, the technical causes of electrical injuries may be malfunctions of electrical installations that occur during their operation, malfunction of protective equipment, the use of electrical protective equipment with an expired date of the next test.

The organizational and technical reasons include:

- non-compliance with the requirements of current regulations to control the parameters of the technical condition of electrical installations;
- errors in the removal of voltage from electrical installations when performing work in them without checking the absence of voltage in the electrical installation where people work;
- lack of temporary fencing of electrical work places or non-compliance of construction and placement with the requirements of current regulations and lack of marking, safety posters, blocking, and warning and prohibitory inscriptions; errors in the installation and removal of portable grounding, or their absence.

- The main organizational causes of electric injuries include:
- absence (non-appointment by order) at the enterprise of the person responsible for electricity or non-compliance of the qualification of this person with the current requirements;
- Insufficient staffing of the electrical service with employees of appropriate qualifications;
- lack of job descriptions for electrical personnel and instructions for safe maintenance and operation of electrical installations at the enterprise;
- Insufficient training of personnel on electrical safety, untimely testing of knowledge, inconsistency of the electrical safety team of personnel with the nature of the work performed;
- non-compliance with the requirements for safe performance of work in electrical installations according to orders-permits, orders and in the order of current operation;
- ineffective supervision, departmental and public control over compliance with safety requirements when performing work in electrical installations and their operation.

The main organizational and social causes of electric injuries include:

- forced execution not on the specialty of electrohazardous works;
- negative attitude to the work performed due to social factors;
- involvement of employees in overtime work;
- violation of production discipline;
- employment of persons under 18 years of age.
- These reasons can be grouped by the following factors:
- contact with non-insulated live parts of electrical installations that are under voltage, or with insulated ones with actually damaged insulation - 55%;
- contact with non-conductive parts of electrical installations or electrically connected metal structures, which were energized as a result of insulation damage - 23%;
- the appearance of voltage on the disconnected live parts, on which people work, due to incorrectly switched on electrical installations;
- lack of reliable protective devices.
- step voltage action - 2.5%;
- damage due to electric arc - 1.2%;
- other reasons - less than 20% [1].

3.6. First aid measures in case of electric shock

First aid measures are divided into two stages:

1 stage. The victims are freed from the action of electric current in any way: the electrical installation is switched off, the wires are cut, dry clothes are pulled away, a board is substituted, > 1000 V - boots, gloves, insulated rods, pliers are used, electric transmission lines are shortened. Determine the condition of the person.

Stage 2. Victims are provided with pre-medical care and artificial respiration.

According to PBE and PTE - three methods of providing artificial respiration:

- *Schaeffer's method* - one person provides help. The victim is placed on the abdomen - pressed on the back at the location of the lungs - with 900-1100 ml of air enters the lungs of the victim (head turned sideways).

- *Sylvester's method* - two people help. The victim is placed on his back, a roller is placed under his neck and care is taken to prevent the tongue from falling. The first makes hand movements, and the second presses on a thorax. This method is not very effective. The victim receives 500-600 ml of air.

- *The method of "mouth to mouth" or "mouth to nose"* is best done through gauze, bandage. The victim is on his back during artificial respiration. Simultaneously with artificial respiration, if necessary, perform a closed heart massage - after each injection, make five pushes on the chest.

3.7. Fire Security

3.7.1. Theoretical foundations of the combustion process

Combustion is an exothermic oxidation reaction, which is accompanied by the release of large amounts of heat, light and smoke (this is not only a compound, but also the decomposition of substances)

Three factors are necessary for combustion to occur:

- combustible substances (hydrocarbon-containing substances: gasoline, kerosene, alcohol, etc.);

- oxidant (oxygen, chlorine, bromine, iodine, nitrogen oxides);

- ignition sources (pulse), (heated surfaces; open fire; spark).

Depending on the properties of the burned mixtures, combustion can be homogeneous and heterogeneous.

In homogeneous combustion, the substances have the same physical state, such as gas-gas or liquid-liquid.

Heterogeneous combustion - substances are in different physical states (solid - liquid, liquid - gas).

There are two types of complete and incomplete combustion.

Complete combustion occurs with sufficient or excess oxidant.

This produces non-toxic substances - carbon dioxide, hydrochloric acid, water, nitrogen, sulfur dioxide, etc., which are unable to burn.

Incomplete combustion occurs with insufficient oxidant. This produces toxic substances that are further suitable for combustion (soot, carbon monoxide, aldehydes, alcohols, resins, hydrogen sulfide, ammonia).

According to the speed of propagation of the combustion flame is divided into:

- deflagration (normal) - flame propagation velocity 0.01-1 m / s;
- explosion - an extremely rapid chemical transformation, accompanied by the release of energy and the formation of compressed gases capable of performing mechanical work, the propagation speed of which is 1 - 1000 m / s;

- detonation is a chemical reaction in which a shock wave is formed (condition of detonation), the speed of wave propagation is 1000-7000 m / s.

Combustion is divided into the following types: flash, ignition, spontaneous combustion, kindling, self-ignition, auto-ignition, decay.

A flash is a rapid combustion of a combustible mixture (<5 s), without the formation of compressed gases, which does not turn into a stable combustion under the action of the combustion source.

Flash point is the lowest temperature of a combustible substance at which vapors or gases are formed above its surface, capable of igniting from an ignition source, but the rate of their formation is still insufficient for stable combustion.

Ignition - the occurrence of combustion under the influence of an ignition source.

Ignition temperature is the lowest temperature of a combustible substance at which it emits flammable vapors and gases at such a rate that after their ignition there is a stable combustion (> 5 s).

Kindling - A fire that is accompanied by the appearance of a flame.

Self-ignition - the beginning of combustion without the influence of the ignition source.

Auto-ignition is an auto-ignition that is accompanied by the appearance of a flame.

Auto-ignition temperature is the lowest temperature of a substance at which there is a sharp increase in the rate of exothermic reaction, which leads to flaming combustion.

Decay - burning without light radiation, which is usually recognized with the appearance of smoke.

Depending on the internal impulse, the process of spontaneous combustion (self-ignition) is divided into: thermal, microbiological and chemical.

Thermal spontaneous combustion - occurs due to the action of external heating of a substance at a certain distance (sunlight, open flame, etc.).

Microbiological spontaneous combustion occurs due to self-heating, which is caused by the activity of microorganisms in the mass of matter. Substances of plant origin - hay, grain, sawdust, peat (mostly not dried) are prone to such spontaneous combustion.

Chemical spontaneous combustion - occurs due to the action of air, water, as well as the interaction of substances. For example, substances that can self-ignite when interacting with water include potassium, sodium, cesium, calcium and alkali metal carbides, and the like. These substances emit flammable gases, which are heated by the heat of reaction and are able to ignite. Compressed oxygen causes spontaneous combustion of mineral oils that do not ignite spontaneously in air.

Indicators of fire, explosion hazard of substances and materials.

In accordance with the requirements of DBN B.1.1.-7-2002, the assessment of fire and explosion hazard of all substances and materials is carried out depending on the physical state: gas; liquid; solid (dust is allocated to a separate group).

First of all, determine the flammability group of this substance. According to this indicator, all substances and materials are divided into non-combustible, flame-retardant and combustible.

Non-combustible - substances and materials that are not capable of combustion in air of normal composition and in the area of the combustion source. These are inorganic materials, metals, gypsum structures.

Heavy combustibles are substances and materials that can ignite in the air from an ignition source. However, after its removal is not capable of self-combustion. They contain combustible and non-combustible components (asphalt concrete, fibrolite).

Combustibles - substances and materials that are capable of spontaneous combustion, as well as ignition from the ignition source and self-combustion after its extraction (all organic materials).

Combustible materials and substances are divided into: easily flammable, which are engaged from a source of ignition of low energy

(match, spark, etc.), and hardly flammable, which are engaged from more powerful sources of ignition.

Flammable liquids

All flammable liquids are more dangerous than solid materials and substances. They ignite more easily, burn more intensely and form vapor and gas-explosive mixtures.

According to GOST 12.1.004-85 according to the flash point there are:

- flammable liquids (FL) - liquids whose flash point does not exceed 61 0C in a closed crucible or 66 0C - in an open crucible (gasoline, acetone, ethyl alcohol);

- combustible liquids (CL) - flash point > 61 0C-in a closed crucible or 66 0C- in an open crucible (mineral oils, fuel oil, formalin).

Rules of construction of electrical installations - give such classification of FL and CL.

- FL - are explosive liquids;

- CL - refer to flammable liquids.

Important indicators of the explosive properties of gases, liquids and dust are the concentration limits of flame propagation (ignition).

The lower (LCL) and upper (UCL) concentration limits of flame propagation are the minimum and maximum volume (mass) fraction of a combustible substance in a mixture with a given oxidant, at which ignition (ignition) of the mixture from the ignition source is possible with subsequent propagation. flames at any distance from the ignition source. Below LCL and above UCL mixes cannot burn.

There are also lower (LTL) and upper (UTL) temperature limits for the spread of flame gases and vapors in the air. LTL and UTL are such temperatures of the substance at which its saturated vapor forms in a given oxidizing medium concentrations equal to LCL and UCL, respectively.

Solids and materials

The susceptibility of solids and materials to ignition is determined in the following ways:

1. *Visual.* This method is the basis for the classification of solid materials and substances by ignition. According to this method, all solid materials and substances are divided into: combustible; flame retardant; non-combustible.

Combustible materials are materials whose sample burns in the area of the source and continues to burn without a source of ignition.

Highly flammable are materials that burn only in the area of the ignition source.

Non-combustible materials are materials that do not burn in the area of the ignition source.

2. *Calorimetric*. This method consists in placing the sample in a calorimeter, heating it, and compiling the heat balance and calculating the ignition coefficient of sample K.

If $K < 0,1$ is a combustible material, $K = 0,1-0,2$ is a heavy combustible material, if $K > 0,2$ is a non-combustible material.

Fire and explosive dust

Industrial dust is of two types: aerosols, aerogels.

Aerosols are suspended dust particles that are in the air and form an explosive mixture.

Aerogels are dust that has settled on the equipment and is flammable.

Explosive dust is characterized by a lower and upper concentration limit of flame propagation (LCL and UCL).

Flammable dust is characterized by LCL and autoignition temperature.

All dust is divided into four classes: I and II classes are explosive, and III and IV classes are flammable dust.

Class I - the most explosive dust of LCL which up to 15 g / m³ (dust of sulfur, sugar, rosin, magnesium, aluminum, milk powder, titanium).

Class II - explosive dust of LCL which is in the range of 15 - 65 g / m³ (dust of coffee, tea, flour, coal).

Class III is the most flammable dust of LCL > 65 g / m³, and the autoignition temperature is up to 250 0C (dust of tobacco, zinc, coal).

Class IV is fire-hazardous dust LTL > 65 g / m³, and auto-ignition temperature > 250 0C (wood dust, high-ash coal dust).

3.7.2. Dangerous factors of fire. Causes of fires.

A fire is an uncontrolled burning outside a special hearth, which spreads in time and space, threatens human life and health, the environment and causes material damage.

Fire hazard - the possibility of the occurrence or development of fire in any substance, process or condition.

When a person is in the area affected by fire, he may be exposed to the following dangerous and harmful factors: toxic combustion products; fire; smoke; elevated ambient temperature; lack of oxygen; destruction of building structures; explosions, leakage of hazardous substances due to fire; panic.

Toxic combustion products pose the greatest danger to human life, especially in building fires. Synthetic materials are the main source of toxic combustion products. Thus, the combustion of polyurethane and

kapron produces hydrogen cyanide (hydrocyanic acid), the combustion of vinyl - hydrogen chloride and carbon monoxide, the combustion of linoleum - hydrogen sulfide and sulfur dioxide, and so on.

Flame is an extremely dangerous factor in fire (flame temperature - 1200-1400 ° C), causing burns and pain. The minimum distance in meters at which a person can still be from the flame is $1.6 \cdot H$, where H is the average height of the flame torch in meters.

Elevated ambient temperature - the danger is that inhalation of heated air together with combustion products can lead to respiratory damage and death. (60 ° C is already life-threatening).

Smoke is a large number of the smallest solid or liquid particles of substances that have not burned. It irritates the respiratory system and mucous membranes and reduces visibility indoors.

Oxygen deficiency is caused by chemical oxidation reactions of combustible substances and materials during combustion. A situation when the oxygen content decreases to 14% (norm 21%) is considered dangerous for human life. At the same time coordination of movements is lost, there is a weakness, dizziness, consciousness is slowed down.

Explosions, leaks of hazardous substances are caused by heating and depressurization of tanks and pipelines with hazardous liquids and gases. Explosions increase the area of combustion.

The destruction of building structures occurs due to the loss of their load-bearing capacity under the influence of temperatures and explosions. At destruction the person can receive mechanical injuries, to appear under fragments of the overwhelmed designs that complicates evacuation.

Panic is caused by rapid changes in the mental state of a person, depressed in an extreme situation (fire).

The action of fire factors exceeds the psychophysiological capabilities of man, and man panics. At the same time she\he loses the ability to think calmly, her\his actions become uncontrollable. Panic can lead to mass deaths.

The main causes of fires and explosions. The phenomenon, or circumstances that directly cause the fire, is called the cause of the fire. Analyzing the occurrence of fires in industries, institutions, organizations, we can conditionally identify the causes of non-electrical and electrical nature.

Causes of non-electrical nature

- violation of the technological process (depressurization) - 33%;
- problems with production equipment - 16%;
- poor preparation of equipment - 13%;
- spontaneous combustion of industrial materials - 10%;

- non-compliance with the schedule of scheduled repairs - 8%;
- careless and negligent handling of fire (open flame, heating of parts, determination of gas output by fire, smoking);
- ignition from a spark at electric and gas welding works - 4%;
- structural problems of the equipment - 7%;
- repair of equipment during operation - 2%;
- improper installation and operation of heating systems - 7%;
- problems with ventilation systems;

Causes of an electrical nature

- short circuit in the electrical network, equipment;
- problems or overload of equipment and electrical network;
- sparking and electric arc;
- ignition of materials due to lightning and static electricity;
- large transitional supports at the joints, branches in the contacts of electrical machines and devices that cause local overheating.

Fire work (open flame) is an important production operation using open fire. Fire works include: gas and electric welding, gas cutting, soldering, heating of bitumen and resin, machining of metal with the formation of sparks, various furnaces.

Responsibility for fire safety measures during welding and other fire works is assigned to the heads of shops and enterprises. Permanent places of fire work are determined by the order of the heads of enterprises, and temporary - with the written permission of the head of the unit.

Executors of fire works must be instructed on fire safety measures by the relevant persons.

Fire places must be at a distance of at least 5 m from combustible materials.

Before carrying out fire works, fire safety measures are developed, responsible persons are appointed, after that the owner issues an order for carrying out works (for 1 shift). After the work is performed, the place of work is checked for two hours.

3.7.3. Categories of premises by explosion and fire hazard

Requirements for structural and planning decisions of industrial facilities, as well as other issues of ensuring their fire and explosion safety are largely determined by the category of premises and buildings for explosion and fire hazard.

Determining the category of premises is carried out taking into account the indicators of explosion and fire hazard of substances and materials that are there (used) and their quantity. According to the norms of

technological design of ONTD 24 - 86 premises for explosion and fire hazard are divided into five categories (A, B, C, D, E).

Table 3.1

Categories of premises on explosion and fire danger according to ONTD 24 - 86

Room category	Characteristics of substances and materials in the room
A Explosive	Flammable gases, flammable liquids with a flash point not exceeding 28 ° C, in such quantities that may form explosive vapor-gas-air mixtures, the ignition of which produces a calculated excess pressure of the explosion in the room, which exceeds 5 kPa. Substances and materials that can explode and burn in contact with water, oxygen or each other in such quantities that the estimated excess pressure of the explosion in the room exceeds 5 kPa
B Explosive and flammable	Combustible dust or fibers, flammable liquids with a flash point greater than 28 ° C and less than 61 ° C, flammable liquids in such quantities that may form explosive dust-air or vapor-air mixtures, the ignition of which develops excess explosion pressure in the room exceeding 5 kPa
C Fire-hazardous	Combustible and flame-retardant liquids (flash point above 61 ° C), solid combustible and flame-retardant substances and materials which, when interacting with water, oxygen or each other, are only flammable provided that the rooms in which they are located do not belong to categories A and B.
D	Non-combustible substances and materials in hot or molten state, the processing of which is accompanied by the release of radiant heat, sparks and flames; combustible gases, liquids and solids that are burned or disposed of as fuel
E	Non-combustible substances and materials in the cold state

The calculation method for determining the categories of explosion and fire hazards of industrial premises is based on the energy approach, which consists in assessing the calculated excess pressure of the explosion compared to the allowable.

The category of the room and the class of the zone according to RCEI must be marked on the front door of the room.

Classification of explosion- and fire-hazardous premises (zones) according to RCEI

The main measure to prevent fires and explosions from electrical equipment is the correct selection and operation of equipment in explosive and flammable performance in explosive and flammable areas.

According to RCEI, the premises are divided into explosive and flammable zones:

Explosive zones (EZ) is the space in which explosive mixtures are present or may occur:

For gases or vapors - 0, 1, 2;

On the saw - 20, 21, 22.

Class 0 explosive zone - a space in which an explosive atmosphere is present constantly or for a long time.

Class 1 explosive zone is a space in which an explosive atmosphere may be formed during normal operation.

Class 2 explosive zone - a space in which an explosive environment under normal operating conditions is absent, and if it occurs, it rarely lasts long. In these cases, accidents and catastrophes are possible.

Class 20 explosive zone - a space in which during normal operation explosive dust in the form of a cloud is present constantly or often in an amount sufficient to form a dangerous concentration of air mixture, and (or) space where typical layers of predicted or excessive thickness can be formed. Preferably, this takes place in the middle of the equipment, where dust can form explosive mixtures frequently and for a long time.

Explosive zone of class 21 - a space in which during normal operation may appear dust in the form of clouds in an amount sufficient to form a mixture with air of explosive concentration. This zone may combine the space near the place of powder filling or settling and the space where during normal operation typical layers are likely to appear, which may form a dangerous concentration of explosive dust-air mixture.

A Class 22 explosive zone is a space in which explosive dust in a suspended state may occur infrequently and for a short time, or in which layers of explosive dust may exist and form explosive mixtures in the event of an accident.

Fire-hazardous zones (FHZ) is a space where combustible substances can be found, both in the normal technological process and in case of its possible violations (P - I, P - II, P - IIa, P - III).

Class P - I - zones of premises in which combustible liquids with flash point ≥ 61 °C are used or stored.

Class P - II - areas of premises where combustible dust or fibers with LCL flame spread ≥ 65 g / m³ of air volume, or explosive dust, the content of which in the indoor air does not reach explosive concentrations.

Class P – IIa - zones of premises in which there are solid or fibrous combustible substances. Combustible dust and fibers are not released into the air (closed warehouses).

Class P – III - outdoor installations where GHGs with flash point ≥ 61 0C are used or stored, as well as solid combustible substances.

According to RCEI in fire-hazardous zones the electric equipment of the closed type which internal space is separated from external environment by a cover is used. Control and protection equipment, luminaires are recommended for use in dustproof design. All electrical wiring must have reliable insulation. Explosion-proof equipment manufactured in accordance with GOST 12.2.020 - 76 must be used in explosion-hazardous areas and outdoor installations. Starting equipment, magnetic starters for classes 0 and 20 must be taken outside explosive rooms with remote control. Wires in explosive atmospheres must be laid in metal pipes. An armored cable can be used. Luminaires for classes 0, 1, 20, 21 must be explosion-proof.

Fire resistance of buildings and structures

The spread of fire in buildings and structures is significantly affected by the ability of individual building elements to resist the effects of heat, ie their *fire resistance*.

Fire resistance - the ability of individual building elements and structures to maintain their load-bearing capacity, as well as to resist heating to a critical temperature, the formation of through cracks and the spread of fire. The normalized characteristic of fire resistance of the main building designs is called degree of fire resistance. The degree of fire resistance of buildings and structures depends on the limits of fire resistance of building structures and the limits of fire spread on them.

The limit of fire resistance is an indicator of fire resistance of a structure, which is determined by time (in hours) from the beginning of fire standard testing of samples to the occurrence of one of the limit states of elements and structures (loss of load-bearing and heat-insulating capacity, density). The limits of fire resistance and the maximum limits of fire propagation are determined by research in special furnaces under the appropriate load (ranges from 0.25 to 2.5 hours).

The limit of fire propagation is the maximum size of damage in cm, which is considered to be charring or burning of the material, which is determined visually, as well as melting of thermoplastic materials (0 - 40 cm).

A building may belong to one or another degree of fire resistance, if the value of fire resistance limits and fire propagation limits of all structures does not exceed the values of the requirements of DBN B. 1.1.- 7-2002,

according to which there are eight degrees of fire resistance of buildings and structures: I, II, III , IIIa, IIIb, IV, IVa, B.

The buildings are arranged:

- division by fire-prevention overlappings (fire compartments);
- division by fire partitions into sections;
- fire barriers to limit the spread of fire on structures, combustible materials (ridges, sides, roofs, belts);
- fire doors and gates;
- fire breaks between buildings.

To prevent the spread of fire and combustion products from the premises or fire compartment with the fire to other premises, create fire barriers. A fire barrier is a building structure, engineering structure or technical device that has a standardized limit of fire resistance and prevents the spread of fire. The structure is made in the form of a wall, partition (firewall) 60 cm above the roof, if the roof and attic are made of combustible materials, and 30 cm if the roof and attic are made of non-combustible materials. Ventilation and smoke ducts can be laid in fire walls so that the limit of fire resistance of the fire wall on each side of the canal was not less than 2.5 hours.

Obstacles that limit the spread of fire and combustion products can create safe areas or rooms for long-term or short-term stay of people, which contributes to the successful conduct of rescue operations in case of fire. Types of fire barriers and their minimum limits of fire resistance are given in DBN B. 1.1-7-2001. The same document and other regulations define the concepts, nature, conditions of use, quantitative parameters of other methods and means of preventing the spread and development of fire

One of the most common measures in construction to prevent the possibility of fire spreading to neighboring buildings and structures are fire distances, which, in addition, create favorable conditions for maneuvering, installation, deployment of firefighting equipment and fire departments.

3.7.4. Means and methods of fire extinguishing

In the set of measures used in the fire protection system, it is important to choose the most rational methods and means of extinguishing various combustible substances and materials in accordance with DBN B. 2.5-13-98 "Fire automation of buildings and structures".

Combustion stops:

- during the cooling of the combustible substance to a temperature lower than its ignition temperature (cooling, heat removal from the combustion zone);

- when reducing the concentration of oxygen in the air in the combustion zone;
- at the termination of receipt of evaporations, gases of combustible substances in a combustion zone;
- when diluting the combustible substance with a non-combustible substance;
- when isolating the combustion zone from the interaction of the substance.

Ways to extinguish a fire.

There are the following main ways to stop the combustion process: physical and chemical.

Physical methods:

1. Cooling combustible substances or (heat removal from the combustion zone) is carried out:

- irrigation of combustible substances;
- mixing layers of combustible substances;
- evacuation of combustible substances and materials.

The method of cooling is based on the fact that the combustion of the substance is possible only when the temperature of its upper layer is higher than the temperature of its ignition. If heat is removed from the surface of the combustible substance, ie cooled below the ignition temperature, combustion stops.

2. Rarefaction:

- volumetric dilution of the oxidant with inert gases and steam;
- volumetric liquefaction of combustible substances with inert gases and steam (increasing the heat capacity of the combustible system).

The method of dilution is based on the ability of the substance to burn when the oxygen content in the atmosphere is more than 14-16% by volume. With a decrease in oxygen in the air below the specified value, the flaming combustion stops, and then the decay stops due to a decrease in the oxidation rate. Reduction of oxygen concentration is achieved by introducing inert gases and vapors into the air from the outside or by diluting oxygen with combustion products (in isolated rooms).

3. Isolation (shutdown of the ignition mechanism) is carried out:

- insulation of combustible surfaces with water, foam, asbestos fabric (blanket);
- removal of combustible substances from the combustion zone.

The method of insulation is based on stopping the flow of oxygen to the combustible substance. To do this, use various insulating fire extinguishing agents (chemical foam, powder, etc.).

4. Mechanical methods (shutdown of the ignition mechanism) are carried out:

- mechanical separation of the flame by an air shock wave or a strong jet of water, powder or gas;
- the method of fire prevention is based on the creation of conditions under which the flame does not propagate through narrow channels, the cross section of which is less than the critical

Chemical methods.

- volumetric liquefaction of combustible dust, gas and air systems with phlegmatizing substances (fire extinguishing powders, halogen hydrocarbons);
- irrigation of combustible materials with phlegmatizing substances - inhibitors that slow down the reaction.

The method of chemical inhibition of combustion reactions is the introduction into the combustion zone of halogen-derived substances (methyl and ethyl bromides, freon, etc.), which when exposed to flames decompose and combine with active centers, stopping the exothermic reaction, ie heat. As a result, the combustion process stops ..

Fire extinguishers.

The success of a rapid localization of a fire at the beginning of the fire depends on the availability of fire extinguishers, the ability to use them, as well as fire communication and signaling means to call the fire brigade and put into operation automatic and primary fire extinguishers.

Cessation of combustion is achieved by means of fire extinguishing agents:

- water (in the form of a jet or in a sprayed form);
- non-combustible (inert) gases, carbon dioxide, nitrogen, etc .;
- chemicals (in the form of foam or liquid);
- powdered dry mixtures (mixtures of sand with flux);
- fire blankets made of tarpaulin and asbestos.

The choice of certain methods and means of extinguishing fires and extinguishing agents depends on the scale of fires, fire parameters (area, intensity, combustion temperature, etc.), type of fire (indoor or outdoor), burning characteristics of substances and materials, extinguishing ability to extinguish specific substances and materials, the effectiveness of the method of extinguishing the fire.

Water is the cheapest and most affordable extinguishing agent. It has the highest heat capacity compared to other extinguishing agents and thermal stability (1700 0C). To evaporate 1 liter of water requires 2684 kJ of heat, thus forming 1725 liters of steam. Water is used in the form of compact and spray jets, and as steam. The jet of water quenches solid GR; rain and water

dust - solid, fibrous, bulk substances, as well as alcohols, transformer and solar oils.

Water can not be extinguished (!!!!) - CL (gasoline, kerosene, because water accumulates at the bottom of these substances and increases the area of the combustible surface), as well as alkali metals (Na, K, Mg), live electrical equipment, securities and equipment.

Water vapor is used to extinguish fires indoors up to 500 m³ and small fires in open installations. The fire-extinguishing concentration of steam in the air is 35%.

Aqueous salt solutions are used to extinguish substances that are poorly wetted with water (cotton, wood, peat). Surfactants are added to the water: foaming agents, sulfanols, etc.

Inert and non-flammable gases.

Carbon dioxide (CO₂) at a pressure of 36 atmospheres is converted into carbon dioxide. Cools and insulates the combustion zone. Evaporation in air of 1 kg of liquid carbon dioxide produces 506 liters of carbon dioxide (snow). Carbon dioxide is used to extinguish FL and CL in tanks, as well as to extinguish burning electrical equipment.

Nitrogen. Dilutes and cools the reactants (liquid nitrogen temperature $t = -250$ 0C) and isolates the combustion zone.

Foam is a colloidal dispersed system consisting of cells - gas bubbles. The walls of the bubbles are formed from solutions of surfactants and stabilizers. Foams are divided into chemical and air-mechanical.

Chemical foam is obtained by the interaction of alkaline and acidic solutions in the presence of a foaming agent. This foam consists of 80% CO₂, 19.7% water and 0.3 foaming agent. It is formed in foam generators of the FG - 50 and FG - 100 type at interaction of the foam generator powder with water. The foam cools the top layer, and in particular the combustion zone, reducing the ability of combustible substances to evaporate. Multiplicity of chemical foam 5-8, stability - up to 50 minutes.

Air-mechanical foam is one of the most effective means of fire extinguishing, and is formed by mechanical mixing of air (90%), water (9.4-9.8%) and foaming agent (0.2-0.6%). Multiplicity of air-mechanical foam 10-200, resistance to - 20 minutes.

Foaming agent type PO-1 consists of kerosene contact, joiner's glue and ethyl alcohol. Air - mechanical foam is formed as a result of intensive mixing of an aqueous solution of the foaming agent with air, which is carried out in a foam generator.

Foam generators of GVP - 200, GVP - 600 and GVP - 2000 types have productivity of 200 - 2000 l / s of foam, multiplicity of 100.

Foams are used to extinguish flammable liquids

Fire extinguishing powders.

These are finely ground mineral salts with various additives that counteract caking and lump formation. They are characterized by high fire-fighting capacity and versatility in the field of application.

The choice of extinguishing agent depends on the class of fire. The table shows the classification of fires in accordance with ISO № 3941-77 and GOST 27331-87, as well as the recommended extinguishing agents.

Table 3.2

Classification of fires and recommended extinguishing agents

Fire class	Characteristics of combustible substances and materials or a burning object	Recommended extinguishing agents
A	Solids, mainly of organic origin, the combustion of which is accompanied by decay (wood, textiles, paper, etc.)	All types of extinguishing agents (first of all)
B	Combustible liquids or solids that melt (petroleum products, alcohols, stearin, rubber, some synthetic materials, etc.)	Sprayed water, all kinds of foams, powders, substances based on halides
C	Combustible gases (hydrogen, acetylene, hydrocarbons, etc.)	Powders; halogenated hydrocarbons, inert gases (nitrogen, CO ₂); water (for cooling)
D	Metals and their alloys (potassium, sodium, aluminum, magnesium, etc.)	Powders (at quiet giving on a burning surface)
(E)	Equipment under voltage	CO ₂ , refrigerants, powders

Primary fire extinguishers

Primary fire extinguishers are designed to eliminate small areas of fires, as well as to extinguish fires at an early stage of their development. These include fire extinguishers, fire equipment (water barrels, fire buckets, sandboxes, shovels, blankets made of non-combustible insulation, coarse wool or felt) and fire tools (hooks, crowbars, axes, etc.). Fire equipment and tools, fire extinguishers are placed on special fire shields at the rate of one shield per area of 5000 m² in visible and accessible places.

Fire extinguishers. According to the method of transporting the extinguishing agent, fire extinguishers are available in two types: portable

(volume 1 - 20 liters, weight not more than 20 kg) and mobile on special devices with wheels.

Manual carbon dioxide. VVK - 2, VVK-5, VVK - 8 are intended for extinguishing small fires of all types of fires. They are actuated by opening the valve. When carbon dioxide is transferred from the liquid phase to the gaseous phase, its volume increases 500 times. The temperature drops to -70 °C. Useful length of the fire extinguisher jet is up to 4 m, duration of action is 30 - 60 s. The fire extinguisher must be held by the handle to avoid frostbite, kept away from heat, to prevent self-discharge. Carbon dioxide can extinguish live electrical equipment.

Do not extinguish alcohol and acetone, which are soluble in carbon dioxide, as well as photographic film, celluloid, which burn without access to air.

Mobile carbon dioxide fire extinguishers BB-25, BB-80.

Carbon dioxide-bromoethyl fire extinguishers of the VVB-7 type (7 l). The composition (97% ethyl bromide and 3% liquid carbon dioxide) is under compressed air pressure. Extinguishing agent in the form of a foggy cloud. Action time - 40 s. The length of the jet is up to 5 m. It is intended for extinguishing solid and liquid combustible substances, as well as live electrical installations.

Powder fire extinguishers VP - 1, VP - 2, VP - 5, VP - 10, VP - 100 are filled with dry powder (calcium or bicarbonate of soda, potash, etc.), in addition, they are filled with inert gas (nitrogen, argon) under pressure \approx to 15 MPa. The Air Force-10 also has a compressed nitrogen cylinder at the base of the hull. Duration of action - up to 30 seconds. They can extinguish, unlike other types of fire extinguishers, alkali and alkaline earth metals and their carbides, as well as live electrical installations.

Foam fire extinguishers.

Hand-held chemical fire extinguisher VHP - 10 consists of alkaline and acid parts. When mixing, carbon dioxide is formed, which when mixed with the foaming agent, under the action of pressure comes out of the fire extinguisher in the form of foam. Action time - up to 60 s, jet length - up to 8 m, quenching area - 1 m².

Manual air-foam extinguishers VPP-5, VPP-10 and mobile runway-100 are filled with 5% solution of PO-1 foaming agent (joiner's glue, ethyl alcohol, kerosene contact).

Fire extinguishers of this type have two cylinders - 5 and 10 liters and an additional one, which contains compressed carbon dioxide (CO₂). Action time - up to 20 s, jet length - up to 4 m.

Halogenated hydrocarbons (freons).

Refrigerant (aerosol) fire extinguishers (VAH-3, VVB-3A, VH-7) are designed for extinguishing fires in electrical installations with voltage up to 380 V, various combustible solids and liquids, except for alkali and alkaline earth metals and their carbides, as well as substances capable of burning without access of air. Halogenated hydrocarbons (ethyl bromide, freon 114B2, tetrafluorodibromoethane, etc.) are used as extinguishing agents in refrigerant fire extinguishers, which create a jet of fine droplets when leaving the extinguisher. Therefore, in contrast to carbon dioxide, halogenated hydrocarbons can extinguish incandescent materials (cotton, textiles, insulation materials). In addition, they do not freeze when leaving the shut-off device and require a much lower (0.9 MPa) pressure in the cylinder, which allows the use of thin-walled cylinders, the weight of which is small.

Hladon fire extinguishers are cylindrical steel thin-walled cylinders, in the necks of which shut-off and starting devices are installed. To create excess pressure, due to which the extinguishing agent comes out of the spray nozzle, compressed air is pumped into the cylinder.

The choice of type and calculation of the required number of fire extinguishers is based on the recommendations of ONTP 24-86 depending on their fire extinguishing capacity, limit area, class of fire in the room or object in need of protection

The maximum allowable distance from a possible fire to the location of the fire extinguisher should be: 20 m - for public buildings and structures, 30 m - for premises of categories A, B, C (combustible gases and liquids); 40 m - for premises of category B and D; 70 m - for premises of category D.

Premises equipped with stationary automatic fire extinguishing systems are equipped with fire extinguishers for 50% of their estimated number

3.7.5. Responsibilities of the employer to ensure fire safety.

Ensuring fire safety is an integral part of production and other activities of officials, employees of enterprises, institutions and organizations. According to the current legislation, ensuring fire safety of enterprises, institutions and organizations is entrusted to their owners (managers) and their authorized persons, unless otherwise provided by the relevant agreement.

Ensuring fire safety in residential premises of state, public housing, housing cooperatives is entrusted to tenants and owners, and in residential buildings and other buildings, cottages and gardens - on their owners or tenants, if it is stipulated by the contract hiring

Owners of enterprises, institutions and organizations or their authorized bodies (hereinafter - the owners), as well as tenants are obliged to:

- in accordance with the regulations on fire safety to develop and approve regulations, instructions, other regulations in force within the enterprise, to exercise constant control over their observance;

- in the absence of regulations necessary to ensure fire safety, take appropriate measures, coordinating them with state supervisory authorities;

- ensure compliance with fire safety requirements of standards, norms, rules, as well as compliance with the requirements of regulations and resolutions of the state fire supervision;

- to develop comprehensive measures to ensure fire safety, to implement advanced scientific achievements;

- organize training of employees in fire safety rules and promotion of measures to ensure them;

- to keep in good condition means of fire protection and communication, firefighting equipment, equipment and inventory, not to allow their misuse;

- to create, if necessary, in accordance with the established procedure, fire protection units and the material and technical base necessary for their functioning;

- submit at the request of the state fire protection information and documents on the state of fire safety of facilities and products produced by them;

- to take measures to introduce automatic means of detecting and extinguishing fires and using industrial automation for this purpose;

- timely inform the fire brigade about the malfunction of fire equipment, fire protection systems, water supply, as well as the closure of roads and passages on its territory;

- to conduct an official investigation of fires.

According to Article 6 of the Law of Ukraine "On Fire Safety", citizens of Ukraine, foreign citizens and stateless persons who are on the territory of Ukraine are obliged to:

- comply with fire safety rules, provide buildings owned by them with the right of personal property, primary means of extinguishing fires and firefighting equipment, to educate children in the ability to handle fire carefully;

- inform the fire brigade about the occurrence of the fire and take measures to eliminate it, rescue people and property.

3.8. Chemical safety

3.8.1. Maximum allowable concentrations harmful substances

The concept of "quality of the natural environment" is used to determine the impact of harmful substances on humans, plant and animal organisms, the degree of environmental pollution, as well as to conduct ecological examinations of the state of the environment or individual objects or areas in the world. Quality standards are expressed in maximum permissible concentrations (MPC) of harmful substances (pollutants), maximum permissible levels (MPL), maximum permissible emissions (MPE), maximum permissible environmental loads (MPEL), temporarily agreed emissions (TAE) and approximate safe levels of exposure (ASLE) of pollutants in different environments.

The purpose of quality standards is to ensure a scientifically sound combination of environmental and economic interests as the basis of social progress. It is a forced compromise that helps to develop industry while protecting human life and well-being.

Maximum allowable concentration (MPC) - the amount of harmful substance in the environment, which in constant contact or interaction for a certain period of time does not affect human health and does not cause adverse effects in future generations

Maximum permissible concentration (MPC), (рос. предельно допустимая концентрация (ПДК), engl: maximum allowable concentration, maximum permissible concentration; German: höchst zulässige Konzentration f, Toleranzkonzentration f) is an indicator of a safe level of harmful substances in the environment. Corresponds to the maximum amount of harmful substance per unit volume or mass, which when exposed daily for an unlimited time does not cause any changes in the human body and adverse hereditary changes in the offspring, and does not lead to disruption of the normal reproduction of the ecological system 'object[12].

MPC establish the main sanitary inspections in the legislative order or recommend the relevant institutions, commissions based on the results of comprehensive research, laboratory experiments, as well as information obtained during and after various industrial accidents, hostilities, natural disasters using lengthy medical examinations. harmful industries (chemical plants, nuclear power plants, mines, quarries, foundries).

High-sensitivity tests are used to calculate the maximum single MPC, which detects the minimal effects of pollutants on human health in the case

of short-term contact (measurements of brain biopotentials, eye response, etc.).

When determining the long-term effects of pollutants (toxicants), animal experiments are performed, observational data are used during epidemics and accidents, adding a stock factor to a certain threshold effect, which reduces the effect several times.

The more harmful the substances, the more complex, large-scale and significant efforts to protect the air. There are two standards for each substance in Ukraine: maximum single and average daily maximum concentration limits.

The maximum single maximum concentration limit is set to prevent reflex reactions in humans due to irritation of respiratory receptors (perception of odors, sneezing, allergic reactions, changes in bioelectrical activity of the brain, global eye sensitivity, etc.) with short-term exposure (up to 20 minutes).

Due to the fact that the concentrations of air pollutants are not constant over time and vary depending on meteorological conditions, terrain, nature of emissions, type and intensity of construction and other reasons, single samples, in accordance with the standards must be taken regularly several times a day for a short period of time (20 ... 30 minutes).

The average daily maximum concentration limit is set to prevent general toxic, carcinogenic, mutagenic and other direct or indirect harmful effects on humans in the conditions of long long round-the-clock inhalation.

The daily average concentration is defined as the arithmetic mean of the single concentrations for which the sampling period is specified, or as the average content of harmful impurities in ambient air samples taken within 24 hours without a break or at regular intervals between samplings.

In order to limit the impact on the environment of harmful types of anthropogenic activities regulate the amount of harmful substances released into the air, soil, water by all types of pollutants, constantly monitor emissions of various objects, forecasting the environment and taking appropriate sanctions and decisions on violators of nature protection laws .

In Ukraine, the state of the environment is controlled by several agencies: the main control is exercised by the Ministry of Health, the Department of Sanitary and Epidemiological Service, etc .; environmental control and environmental regulation - services of the Ministries of Public Utilities, Fisheries, Geology, Society for Nature Protection, "green services" of the Department of Environmental Monitoring of the Ministry of Environmental Protection.

3.8.2. Hygienic assessment of working conditions in case of chemical factor

The class of working conditions is established according to the maximum single concentrations of harmful substances (as well as the average variable in the presence of the average variable concentration approved by the Ministry of Health of Ukraine) in accordance with *Annex 5* to this Hygienic Classification of Labor. If the class of working conditions at maximum and average variable concentrations does not match, the final grade is considered to be the final one.

At simultaneous presence in air of a working zone of several harmful substances of unidirectional action proceed from calculation of the sum of relations of actual concentrations of each of them to their maximum concentration limits. If the amount does not exceed one, the working conditions are acceptable. If the amount exceeds one and the substances belong to one group according to the features of biological action in accordance with *Annex 1* to this Hygienic Classification of Labor, the working conditions are determined for this group as for one separate factor. If substances belong to different classification groups according to the peculiarities of biological action, the assessment is carried out for a substance of a higher degree (class).

If there are two or more harmful substances of different action in the air of the working area, the hygienic assessment is carried out as follows:

under simultaneous action, each chemical present in the air is evaluated as a separate factor, with:

- any number of substances with exposure levels equal to grade 3.1, or two substances with an exposure level equal to grade 3.2, do not increase the overall assessment of the harmfulness of working conditions;
- three or more substances with exposure levels corresponding to grade 3.2 translate working conditions to grade 3.3 and are assessed as one factor;
- two or more substances with exposure levels corresponding to grade 3.3 increase the degree of harmfulness to grade 3.4 and are assessed as one factor;
- with the simultaneous action of two or more chemicals at levels corresponding to degree 3.4, if these substances belong to 1, 2 hazard classes or are capable of causing acute poisoning (substances with an acute mechanism of action or classified as irritants), - working conditions are assessed by 4th class (dangerous). In other cases, working conditions are assessed as 4 degree 3 class;
- under the consistent action of chemicals, working conditions are evaluated according to the following algorithm[6,11].

First, the degree of harmfulness for each substance is determined separately by calculating the ratio of the actual concentration to its maximum concentration limit and assessing the class and degree of harmfulness in accordance with *Annex 6* to this Hygienic Classification of Labor.

If the concentration of several substances is classified as class 3, the degree of harmfulness of working conditions (C) per shift is determined by the formula:

$$C = \frac{C_1 t_1 + C_2 t_2 + \dots + C_n t_n}{T}, \quad (3.1)$$

where $C_1, C_2 \dots C_n$ -degree of harm;

$t_1, t_2 \dots t_n$ -duration of action of harmful substances, min .;

T -duration of work shift, min.

The duration of the work shift is based on an 8-hour work shift (480 minutes).

The calculated value determines the degree of harm per change according to the criteria given in *Annex 7* to this Hygienic Classification of Labor. Consistent action of several chemicals is evaluated as one factor.

If one substance has several specific effects (carcinogenic, allergenic, fibrogenic, acute mechanism of action, etc.), the hygienic assessment of working conditions is carried out on the one that corresponds to the highest degree and class of harmfulness (for example, if the concentration of harmful substance that is carcinogenic, and allergen, exceeding the MPC by 1.1-3.0 times, working conditions should be classified as grade 3.2, based on the allergenic properties of the substance).

When working with substances that can enter the body through the skin and have the appropriate hygienic standard - the maximum allowable level, the class of working conditions is set in accordance with *Annex 7* to this Hygienic Classification of Work on the lines "Harmful substances mainly of general toxicity 1, 2 hazard classes" and " Harmful substances are mainly of general toxic action 3, 4 hazard classes. Hygienic assessment of the combined action of substances by inhalation and percutaneous administration (simultaneous or sequential action) is performed according to formula (3.1).

Working conditions when working with anticancer drugs, hormones (estrogens) and narcotic analgesics in the case of joint (simultaneous or sequential) action with other chemicals are evaluated according to formula

(3.1).

Working conditions when working with substances, according to which the value of the approximate safe level of exposure (ASLE) is approved, are assessed according to the criteria of the MPC groups "Harmful substances mainly of general toxic action of 1, 2 and 3, 4 hazard classes".

3.8.3. Classification of hazardous chemicals

Accidents with leakage of highly toxic substances and contamination of the environment occur in the chemical, oil refining, pulp and paper and food industries, water supply and sewage treatment plants, as well as during the transportation of highly toxic substances.

The main feature of chemical accidents (unlike other industrial catastrophes) is their ability to spread over large areas, where large areas of dangerous environmental pollution can occur.

Air currents, which contain gases, toxic vapors, aerosols and other particles, become a source of damage to living organisms not only in the disaster area, but also in the surrounding areas.

Among the gaseous compounds dangerous to human health that pollute the atmosphere during chemical accidents and catastrophes include: Cb, HCl, HF, HCN, SO₃, SO₂, CS₂, CO, CO₂, NH₃, SOCl₂, nitrogen oxides and others.

Potent toxic substances are chemical compounds that in certain quantities, exceeding the MPC, adversely affect people,

farm animals, plants and cause damage to them to varying degrees.

Potent toxic substances can be elements of the technological process (ammonia, chlorine, sulfuric and nitric acids, hydrogen fluoride, etc.) and can be formed by fires in the economy (carbon monoxide, oxides of nitrogen and sulfur, hydrogen chloride).

Substances of general toxic action are divided into two subgroups: blood poisons (carbon monoxide, nitrogen oxides) and tissue poisons (hydrocyanic acid, cyanides, hydrogen sulfide and others). PTS of this group is characterized by the ability to interact with the biochemical structures of the body and disrupt energy processes, which, in turn, leads to his death.

Carbon monoxide (CO). Colorless gas, with a faint garlic odor. Density to air 0,967. Practically does not collect activated carbon (therefore the usual gas mask is inefficient). The concentration of 1.7 - 2.3 mg / l is dangerous after exposure for 1 hour, 4.6 mg / l and above - death at exposure -1-10 minutes. Newborns are more resistant to CO and can survive at lethal doses for adults. The clinical picture is dominated by phenomena that indicate dysfunction of the central nervous system and circulatory and respiratory systems. In most cases, the picture of poisoning can be divided into stage C.

Prussic acid. Colorless liquid, with the smell of bitter almonds. Boiling point -26°C . The density of steam in air -0.93 . Lethal toxodosis $1.5-2.0\text{ mg-min} / \text{l}$, when ingested lethal dose $-1\text{ mg} / \text{kg}$.

Absorption of hydrocyanic acid occurs very quickly through the mucous membranes of the respiratory tract, gastrointestinal tract and a little slower through the skin.

In the slow form of intoxication occurs gradually: patients complain of a bitter taste in the mouth, general weakness, numbness of the mucous membrane. Then there is nausea, tinnitus, shortness of breath, heart pain.

If you do not stop the flow of poison into the body, there is a smell of bitter almonds, a metallic taste in the mouth, numbness of the oral mucosa. Pulse frequent, stethoresis breathing (short breath, prolonged heavy exhalation). Pupils dilated. Then - loss of consciousness, convulsions, paralytic stage, muscle tone decreases, reflexes are absent, blood pressure is sharply reduced, pulse is filiform, arrhythmic respiration. The result is death.

Substances of suffocating and general action.

Hydrogen sulfide. Colorless gas with the smell of rotten eggs, boiling point 70°C . When exposed to low concentrations - there are symptoms of conjunctival irritation, runny nose, nausea, shortness of breath, cough, chest pain, tachycardia, weakness. At a concentration of $1\text{ mg-min} / \text{l}$ and above - loss of consciousness, convulsions, death (apoplexy).

Neurotropic poisons act on the conduction and transmission of nerve impulses. A typical representative of this group are organophosphorus compounds. Including:

- organophosphorus insecticides (OPPI);
- organophosphorus drugs (OPPD);
- organophosphorus poisons (OPPP);

Mild lesions occur 30-60 minutes after inhalation of vapors in small concentrations. Complaints of squeezing, chest pain, shortness of breath, impaired vision ("fog", "mesh" in the eyes, decreased visual acuity), pain in the eyeballs, dizziness, nausea, anxiety, fear, memory loss. Objectively: skin moisture, muscle fibrillation, conjunctival hyperemia, accommodation myospasm, frequent breathing, moderate tachycardia and hypertension. These symptoms last for days.

Moderate poisoning is characterized by a more rapid development of intoxication. The described symptoms are accompanied by respiratory disorders, circulatory disorders, central nervous system (CNS) functions. Objectively: frequent breathing with noise, asthma attacks, cough with sputum, salivation, cyanosis of the skin, sweating, fibrillation of the muscles of the face, torso, extremities.

Severe is characterized by rapid manifestations of damage to the respiratory and cardiovascular systems, the development of convulsive syndrome and coma. Seizures are seizures, the patient loses consciousness, breathing becomes arrhythmic, shallow, saliva and mucus begins to secrete, cyanotic skin covered with cold sticky sweat, arrhythmic pulse, AT - first increased, then drops sharply. Paralysis is replaced by convulsions, death occurs from damage to the respiratory center.

Substances that have the properties of suffocating and neurotropic action.

Ammonia. Colorless gas with a sharp suffocating odor of ammonia. Boiling point 33 ° C. Lighter than air, so it spreads in the upper atmosphere. The center is stable in winter and unstable in summer. Validity up to 1 hour. Ammonia is used in the meat and dairy industry. Action: affects the nervous and respiratory systems. Local action on the epithelium of the mucous membranes in the first minutes can cause reflex respiratory spasm, reflex depression of the respiratory center, heart failure. Death occurs from acute respiratory and cardiovascular failure.

Toxic technical liquids

Antifreeze. This group consists of chemical compounds that do not freeze at low temperatures and are used as substances that prevent freezing of liquid in engine cooling systems. Acute poisoning is possible due to the intake of the substance. Inhalation of vapors is not dangerous. 100-200 ml of ethylene glycol (representative of antifreeze) causes death.

Action: short-term euphoria immediately after taking. From 2 to 12 hours latency. Then - headache, general weakness, dizziness, nausea, vomiting. This is a mild degree of severity. In a few days - complete recovery. Intermediate degree. After the latent period, the CNS is affected. Severe headache, dizziness, agitation or drowsiness, numbness in the fingers, hearing loss, dilation of the pupils with a sluggish reaction to light. Severe. Suffers memory, a person gets confusion, poor orientation in the environment. Then loss of consciousness, the appearance of pathological reflexes. Symptoms from the cardiovascular and respiratory systems, pathological phenomena in the gastrointestinal tract to the "acute abdomen" are added. Death in 24-48 hours.

Tetraethyl lead (TEL). Used as an anti-knock in engines. The main property - very volatile, can evaporate even at temperatures below 0 ° C. It has no irritating effect on the mucous membrane and skin, so a person does not notice how it enters the body.

TEL enters through intact skin, respiratory organs, less often - the gastrointestinal tract. Acute form: latent period from several hours to 10 days. Early signs are manifested in autonomic disorders (increased sweating,

salivation, hypotension, hypothermia, bradycardia), nausea, vomiting, fatigue, weakness, dizziness, loss of appetite, sleep disturbances, headache. There are psychopathological phenomena - fear, bad mood, bad sleep, psychomotor agitation, CNS damage (speech disorder, shaky gait, lack of criticism of their behavior).

Chronic form. The disease develops slowly, sometimes there are toxic phenomena. The same symptoms without a tendency to progress.

Mercury. The metal is silvery-white, 13.5 times heavier than water. Under normal conditions, the fluid is easily mobile, which when struck is divided into small balls. Melting point - + 38.9 ° C.

The maximum permissible concentration of mercury vapor: for residential, preschool, educational and working premises - 0.0003 mg / m³; for production facilities - 0.0017 mg / m³. Mercury vapor is very toxic.

Signs of chronic poisoning are decreased performance, fatigue, memory loss, headache, bleeding gums, upset stomach, apathy and emotional instability.

If the mercury thermometer is broken in the room, all people should be taken out of the room; open all windows; protect the respiratory system with a damp gauze bandage; immediately start collecting mercury with a syringe and drop the balls into the solution (1 g of potassium permanganate per 1 liter of water). The use of a vacuum cleaner is prohibited; wash contaminated areas with soap and soda solution (400 g of soap, 500 g of baking soda per 10 liters of water). If more mercury is spilled than in the thermometer — turn off electricity and gas, leave the house; to call workers who will carry out demercurization.

Methyl alcohol (wood alcohol, methanol). Colorless liquid with the smell of alcohol. Used as a solvent in the manufacture of varnishes, paints, mastics, polishes and more. Toxicity depends on the individual characteristics of the organism. If the substance enters the body, nausea and vomiting occur. Then the latency period from 30 minutes to 3-4 days. Then there are complaints of headache, nausea, repeated vomiting, general weakness, vision loss, impaired respiratory function. The first three days are the most dangerous[1,3].

3.9. The impact of household microclimate on human safety

Optimal living conditions are ensured by compliance with certain parameters of the following factors: household microclimate (temperature, air movement, humidity, ventilation and ionization, ozonation, thermal insulation), lighting, noise, radiation (ultraviolet, infrared, electromagnetic

waves of the radio frequency range).

The main place of residence of a person, as a rule, is the room where he lives and works. Due to this, the microclimate has a great impact on her health. Provide comfort in the room temperature, movement, humidity and more. They affect the body's heat exchange with the environment and provide a functional thermal state.

Microclimatic conditions also affect DNA repair, heat shock gene activity.

Influence of temperature on the human condition. In the apartment the optimal temperature parameters vary from 20 to 22 ° C in cold and temperate climates; from 23 to 25 ° C in hot climates. Deviation of temperature more than 3 ° C from the optimum (increase or decrease) can lead to cooling of the extremities and reflex changes in the temperature of the upper respiratory tract. It is especially important to ensure this standard in the northern regions. These parameters of indoor air temperature meet hygienic requirements only if the surface temperature of the walls is less than the room air temperature by no more than 2-3 ° C. The lower temperature of the walls and surrounding objects, even at normal air temperature, increases the radiant heat loss, which causes discomfort.

An increase in air temperature requires a corresponding decrease in humidity, and vice versa, because at high temperatures and humidity, the possibility of heat transfer decreases.

Prolonged action of uncomfortable conditions causes a shift in thermal balance and stress of the thermoregulatory apparatus, weakening of the general and specific resistance of the body, immunity, increasing the likelihood of catarrh of the upper respiratory tract, sore throat, rheumatism, neuralgia, cardiovascular complications[3].

The influence of air movement on the human condition. This movement affects a person both physically and physiologically. Light movement blows away saturated vapors and overheated layers of air, stimulating reflex processes of thermoregulation, but excessive movement of air, especially in the case of cooling, increases heat loss due to evaporation convection. The optimal air movement (depending on the room temperature) is 0.1-0.25 m / s.

The influence of humidity on the human condition. Humidity is of great importance for human heat transfer. The relative humidity of 40-60% is considered optimal. Humid air is characterized by high thermal conductivity and heat capacity, which increase heat transfer to the body, especially in winter. This can lead to tonsillitis, sore throat, catarrh of the upper respiratory tract. Increased humidity is caused by insufficient heating, overcrowding, washing and drying clothes, cooking with insufficient

ventilation. The use of moisture-resistant building materials, viscous solutions, no or insufficient waterproofing, defects of the roof and gutters, the location of the structure in the hollow, which is poorly lit and ventilated, also contribute to the appearance of moisture.

High humidity in the room worsens living conditions and adversely affects the human body. Mold appears on walls, wallpaper, furniture, floors, bacteria and fungi develop, which have an unpleasant odor, destroy wooden parts of buildings, furniture, and cause various diseases.

As a result of violation of thermoregulation there are rheumatism, radiculitis, neuralgia, exacerbation of tuberculosis. Cooling is especially dangerous for a person who sleeps in a room with high humidity.

Regulation of the microclimate. The parameters of the microclimate at a certain time of day must change, ie pulsate. However, a person should not provide greenhouse conditions, fluctuations in parameters, which causes purposeful thermoregulation, increases the adaptive properties of the organism. It is important to regulate the microclimate in winter and summer with heating and air conditioning systems.

Allergies and asthma can be caused by the atmosphere of the apartment, oversaturated with harmful substances, fumes of household chemicals, synthetic materials, furniture, and if the humidity in the rooms is high, then the spores of mold and fungi. There are many tools and techniques for regulating the condition and quality of air.

In SNIP 2.04.05-91 "Heating, ventilation and air conditioning" the recommended volume of fresh air in residential buildings is 3 m³ per hour per m² of living space. In MGSN 3.01-96 "Dwelling houses" - 30 m³ per hour of fresh air per person. Experts believe that it is better to follow the norm of 60 m³ of fresh air per hour.

Window ventilation (climate) valves are designed to create a flow of fresh air when the window is closed. On average, their capacity is 3-10 m³ per hour and is regulated depending on wind speed, outdoor temperature and humidity level in the apartment. Such devices are mounted directly in the frame.

An important element in the system of natural ventilation are the ventilation boxes located in the kitchen and bathroom. Air exchange with their help occurs due to the difference between internal and external temperatures, pressure changes depending on the height and wind speed. However, ventilation ducts are a breeding ground for mold, pathogenic microorganisms, and a source of pathogens that enter the apartment. Due to this, the ventilation boxes should be cleaned regularly.

The comfort of a person indoors is affected by the electrical state of the air. In the case of inhalation of ionized air with certain parameters

increases the body's resistance to hypoxia, cold, exposure to toxic substances, exercise. In the process of air ionization, in addition to ions, ozone and nitrogen oxides are generated. The biological effect of ionization is provided by the influence of ozone, nitrogen oxides and electric field, but in combination they can cause mutations in somatic cells of the body.

The main sources of ionization indoors are cosmic rays, radioactive radiation from the earth, building materials, including Radon-222. The ionization rate is determined by the dose rate of ionized radiation, temperature, atmospheric pressure and humidity. Ionized air contains light and heavy ions. As the number of light ions (charged ozone molecules due to their absorption during respiration) decreases, the physiological and chemical activity of air decreases. At high humidity and dust, ionization leads to the accumulation of heavy ions (due to the ionization of the products of human metabolism). The content of dust in ionized dusty air increases sharply, is delayed in the respiratory tract in large quantities. Therefore, ionization is not a universal remedy for air healing.

If regular ventilation is not possible, artificial ventilation and air conditioning systems are used. Such devices can heat the air, cool, humidify, clean from dust with filters. However, the air loses negatively charged ions, which have a beneficial effect on human health. Instead of filtration, ozonators are used to remove gaseous impurities, which create ozone by means of electric discharges. Ozonizer simulates natural processes, removes odors, giving the air freshness. Ozone is a strong natural oxidant that destroys most volatile organic compounds, reduces the number of bacteria, fungi and mold by disinfecting the air. Within about half an hour, ozone is converted to ordinary oxygen.

Modern air conditioning systems not only regulate the air temperature, but also clean and dry it.

In regions with a humid climate it is expedient to use special dehumidifiers (productivity of household and semi-industrial models makes from 12 to 300 l / days). Household humidifiers are designed to increase humidity. Traditional systems remove air from the room and expel it through wet filters, while cleaning it from dust. Modern ultrasonic humidifiers turn water into a microscopic fog with the help of high-frequency oscillations.

The microclimate of the room depends on the materials used in construction. Thermal insulation not only retains heat, but also affects other parameters of the microclimate.

Moisture conductivity - the ability of materials to transmit water vapor. This process is constant, especially active in winter. Moisture in living spaces accumulates constantly, a person in the process of breathing

and sweating emits up to one liter of water per day. If moisture is not provided in time, dampness, mold and fungus will appear in the room.

Harmful effects of allergens. The air in industrial premises can contain dozens and hundreds of different chemicals, many of which are powerful allergens. In particular, most organic solvents, varnishes, dyes and polishing mixtures, polymers, pesticides, chromium compounds, cobalt and other substances have allergenic properties. Industrial allergens include grain and flour dust, wood, tobacco, cotton, some antibiotics and microorganisms, essential oils and other components of perfumes and cosmetics, natural silk, wool, skin particles, down and animal feathers. Therefore, contraindicated (undesirable) for people prone to allergic reactions (especially patients with bronchial asthma) are chemical industries (synthesis and processing of chemicals), any other industries whose technological processes involve the likelihood of environmental contamination by chemical allergens, pharmaceutical, flour milling, tobacco, leather, woodworking, spinning, microbiological industries. They should not work in chemical-analytical laboratories and repair shops, where they use varnishes, polishing materials, in archives, libraries, hairdressers, beauty salons, zoo shops, which process animal skin, on livestock farms. Veterinary care, professional cleaning, disinfection and deratization of premises, dry cleaning of clothes and other similar types of work are also associated with the use of chemicals or other substances that have allergenic properties.

Numerous allergens of animal, plant and artificial origin are also in contact with people in everyday life, not related to professional activities. Household allergens include: dust from premises, dust from clothes and shoes, bedding, carpets, pets, their secretions (urine), microscopic mites (in 1 gram of dust from mattresses they were found up to 1500 - 2000), hair, particles of fur products, deodorants, detergents, cleaners, disinfectants, antiparasitic and paint products, combustion products of gas burners, some odorous substances released into the air during heat treatment of food, formaldehyde, other chemical components from new furniture, building materials, smoking products, etc. Allergic reactions can be caused by certain medications, such as antibiotics, aspirin, contraceptives, beta-blockers, and so on.

To reduce contact with allergens in the home should maintain cleanliness of the living space (do daily wet cleaning, mandatory ventilation, vacuum carpets), use bed linen and other bedding that can withstand temperatures below 60 ° C, furniture with easily washable coatings. When working with a vacuum cleaner, wear a mask that traps dust particles larger than 0.5 microns. It is better to use vacuum cleaners with

replaceable filters, store paper in closed boxes, folders; books - in closed cabinets, periodically wipe them; household chemicals - tightly closed containers; clothes - plastic bags. Air conditioner filters should be changed periodically.

Workplace lighting. Lighting requirements for the visual perception of information by users (from a PC screen and paper media) are different. Too low level of illumination impairs the perception of information when reading documents, and too high reduces the contrast of the characters on the screen. With a 10% reduction in lighting, efficiency is reduced by 1%. The light can vary from 300 to 700 lx. The optimal lighting of the premises for working with the video terminal is from 300 to 500 lx. Workplace lighting should be mixed - natural and artificial.

Natural lighting is provided by side windows, in accordance with sanitary norms according to SNIP 11-4-79 «Natural and artificial lighting. Design standards».

Sunscreens reduce the brightness differences between the natural light and the glow of the computer screen: films with a metallic coating or blinds with adjustable vertical slats and a reflection coefficient of 0.5-0.7.

The workplace behind the computer is placed so that windows or lighting fixtures do not come into view. It is recommended to use lamps with a spectral composition close to sunlight.

Artificial lighting in the room is provided by a combined system with the use of fluorescent sources in general lighting fixtures, evenly spaced above the work surfaces in a rectangular order. The pulsation of fluorescent lamps should not exceed 10%. The even illumination of the workplace is facilitated by the reflected or diffused light distribution of glare from the keyboard, screen and other parts of the video terminal on both sides.

3.10. Microclimate of industrial premises

The microclimate is one of the most important physical factors that affect the body of the worker during his stay in the production room. The employer must create working conditions at the workplace in each structural unit in accordance with regulations, ensure the rights of workers in the field of labor protection, eliminate dangerous and harmful production factors. This is provided by Article 13 of the Law of Ukraine "On labor protection" of 14.10.1992 № 2694-XII. Requirements to the microclimate of industrial premises are prescribed in the State sanitary norms of microclimate of industrial premises (SSN 3.3.6.042-99), approved by the resolution of the Chief State Sanitary Doctor of Ukraine dated 01.12.1999 № 42.

Production room - an enclosed space in specially designed buildings

and structures, in which constantly (in shifts) or periodically (during part of the working day) is the work of people.

Microclimate of industrial premises - the conditions of the internal environment of these premises, affecting the heat exchange of workers with the environment by convection, conduction, thermal radiation and evaporation of moisture. These conditions are determined by a combination of temperature, relative humidity and air velocity, the temperature of the surrounding surfaces and the intensity of thermal (infrared) radiation.

Optimal microclimatic conditions - a combination of microclimate parameters, which with prolonged and systematic exposure to humans provide the preservation of the normal thermal state of the body without activation of thermoregulatory mechanisms. They provide a feeling of thermal comfort and create the conditions for a high level of efficiency.

Warm period of the year - a period of the year, which is characterized by the average daily ambient temperature above + 10°C.

Cold period of the year - a period of the year, which is characterized by the average daily outside air temperature of + 10°C and below.

Average daily outside air temperature - the average value of outside air temperature, measured at certain hours of the day at regular intervals. It is accepted according to the meteorological service.

Category of work - the delimitation of work by severity on the basis of total energy expenditure of the body. *Light physical work* (category I) covers activities in which energy consumption is 105-140 W (90-120 kcal / h) - category Ia and 141-175 W (121-150 kcal / h) - category Ib. Category Ia includes work performed sitting and does not require physical exertion. Category I includes work performed sitting, standing or climbing and accompanied by some physical stress. *Physical work of medium severity* (category II) covers activities in which energy consumption is 176-232 W (151-200 kcal / h) - category IIa and 233 - 290 W (201-250 kcal / h) - category IIb. Category IIa includes work related to walking, moving small (up to 1 kg) products or objects in a standing or sitting position and require some physical exertion. Category IIb includes work performed standing, associated with walking, moving small (up to 10 kg) loads and accompanied by moderate physical exertion. *Heavy physical work* (category III) covers activities in which the gain energy is 291-349 W (300 kcal / h). Category III includes work associated with constant movement, transfer of significant (over 10 kg) loads that require great physical effort.

Sanitary norms apply to the conditions of the microclimate within the working area of production facilities of enterprises, institutions, institutions, regardless of their form of ownership and subordination. underground and mining products, mobile vehicles, livestock and farm farms, storage facilities

for agricultural products, refrigerators, warehouses, etc., as well as premises in which the parameters of the microclimate are set in accordance with technological requirements.

3.11. Working with personal computers

Computers are used in all sectors of the economy, as well as for personal use. Common e-mail and data transmission over global electronic networks. Modern diagnostic and medical equipment is equipped with electronic computers (ultrasound, computed tomography, etc.).

Personal electronic computers (PCs) consist of a system unit, information input systems (keyboard, scanner, etc.) and its output (monitor, printer, etc.). The operator receives the most information from the monitor. The size of the diagonal of the monitor screen can be 14, 15, 17, 21 inches or more. Depending on the technology used, there are monitors based on a cathode ray tube (CRT), liquid crystals (LCD) and plasma (PD). LCD and PD have flat displays, convenient for placement in the room, which simplifies the ergonomic design of workplaces (also produce flat CRT), light weight, clear image due to no changes in light flux over time (no flicker and no image distortion). Adverse factors are electromagnetic fields generated by CRT-based monitors, but developers and consumers are already abandoning such devices.

The use of a computer is accompanied by mental creativity, eyestrain, concentration on the background of nervous and emotional stress, general hypodynamics.

People who work with modern computer technology may experience asthenopia - subjective visual symptoms, emotional discomfort, which is the result of visual activity. Its symptoms are: a veil before the eyes, diplopia, blinking, eye fatigue and pain, fever, burning, redness, fatigue, headache and others. People with visual impairments are more sensitive to asthenopia. In computer users, its symptoms are more pronounced after 60 minutes of work on the screen at a regeneration frequency of 30 Hz than after working for the same time at a regeneration frequency of 60 Hz, which provides a stable image. Focusing defects and blurry symbols on the screen exacerbate **asthenopia**. Visual discomfort is more likely to occur when there is a large difference between the brightness of the screen and the paper document. There is evidence of the possibility of cataracts in individuals who have worked with CRT-based monitors.

Operators who worked with the display with green signs on a dark background can then see white objects in pink (McGalloch effect) during the day and longer. The frequency of such violations varies from 5 - 8% to

63 - 90% depending on the type of work.

In 80% of workers with intense visual work, the ability to work decreases after 45 - 60 minutes, which gradually leads to fatigue, disorders of the central nervous and other body systems. In the afternoon (sometimes earlier) there is general fatigue, headache, eye pain. The latent period of visual and acoustic-motor reactions until the end of the shift is extended by 14 and 20%, respectively; the speed of information processing is reduced by 25-34%, the stability of clear vision - by 40-52%. At the end of the working day, heart rate increases and systolic and diastolic blood pressure rises.

Forced working posture and performing small stereotypical movements lead to musculoskeletal discomfort: bone pain, muscle stiffness, fatigue, seizures, numbness and trembling of the hands. According to the WHO, people who spend a long time at the computer, as a result of stress, even mental disorders: anxiety, irritability and depression in 25-70% of users, insomnia, loss of appetite; psychosomatic symptoms (palpitations, chest pain, constipation and other disorders of the lower gastrointestinal tract) in 15-50%.

In Ukraine, the State Sanitary Rules and Norms of Work with Visual Display Terminals of Electronic Computers have been developed and are in force since December 10, 1998 № 7 (DSanSHN 3.3.2007-98). These rules, in particular, state that the premises in which people with computers work must be located in the northern or northeastern part of the building. The area of one workplace must be at least 6 m², the volume - not less than 20 m³, the distance between the desks - not less than 2.5 m in a row and 1.2 m between rows. The walls of the premises are painted in pastel tones with a reflection coefficient of 0.5-0.6.

Modern software is equipped with interfaces that can be customized: the color scheme of the interface, icons, visible toolbars (their composition and location on the monitor screen) allow you to automate the execution of monotonous operations, increase ease of access to menu items. Improvements promote optimization, reduce the number of actions performed by users, evoke positive emotions, which increases productivity.

The optimal size of alphanumeric characters is 16-20', complex characters - 35-40'. The optimal ratios of the parameters of letters and numbers are as follows: the width of the sign is 0.75 of its height; line thickness at inverse contrast - $1/6 - 1/8$; distance between characters - 0,25 - 0,5 height of a sign, between words - 0,75-1, between lines - 0,5-1.

To prevent general fatigue and the visual analyzer should be properly organized work and rest. The total length of the working day should not exceed 8 hours. The frequency and duration of breaks depend on the type

and intensity of work performed. When working with heavy loads, breaks of 10-15 minutes are recommended. every hour, and for non-intensive and monotonous work - 10-15 minutes every two hours. The number of micropauses (up to a minute) must be adjusted individually. Regulated breaks can be different: industrial gymnastics (eye exercises, gymnastics aimed at correcting forced posture, improving venous circulation, partial dysfunction of motor activity), alternative support work, eating, etc.

In rooms where there are computers, natural and general artificial lighting, optimal values of microclimate parameters, temperature, relative humidity and air mobility in accordance with GOST 12.1.005-88 should be provided. The user's place is placed so that windows and lighting fixtures do not fall into the field of view (monitors - at an angle of 90-105 ° to the windows and at a distance of 2.5-4 m from walls and window openings), as well as light-reflecting surfaces. The table covering should be matte with a reflection coefficient of 0.25-0.4.

There are the following contraindications for working with a PC: visual acuity with correction of not less than 0.5 diopters (D) in one eye and 0.2 D - in the other; myopia over 6.0 D; hyperopia greater than 4.0 D; astigmatism - 3.0 D; lack of binocular vision; accommodation below the age norms; chronic diseases of the anterior segment of the eye; diseases of the optic nerve, retina; glaucoma[1,3].

3.11.1. The impact of computers on human health

Computer technology is now widely used in office work, industry, science, education, but if safety requirements are not met, it can cause significant harm to workers.

The peculiarity of the negative impact of computer technology on performance and human health is the complex simultaneous action of several harmful factors, with a significant intensity of which is the accumulation and accumulation of their impact, causing significant changes in the human body, dysfunction of individual organs and systems.

The main negative factors include: radiation of different ranges of the electromagnetic spectrum (X-ray and optical radiation, high-frequency and low-frequency EMF, EMF with too low frequencies, electrostatic fields), noise at the source of VDT, psychosocial factors of the production environment, nervous and emotional stress and others.

The operation of computers and VDT leads to changes in the background concentration of air ions. Thus, after about 5 minutes of operation of the monitor, the concentration of light negative ions decreases by 5-10 times (background value of this indicator is 350-620 ions / cm³),

and after 3 hours of operation, their concentration approaches zero. The concentration of medium and heavy negative ions also decreases, while the concentration of positively charged ions increases sharply, which has a very negative effect on gas exchange in the lungs, the general human feeling. A significant number of positive ions, especially heavy, leads to increased blood pressure, tachycardia, pain in the heart, difficulty breathing, accelerated erythrocyte sedimentation rate, central nervous system dysfunction (irritability, headache, sleep disturbances, muscle tone, etc. .), digestive disorders.

The optimal level of air ionization in the workplace is the content of light ions from 150 to 5000 in 1 cm³ of air (Sanitary and hygienic standards of permissible levels of air ionization of industrial and public premises №2152-80).

Normalization the ionic composition of the air of the production area can be reached in different ways: mechanical ventilation, the use of ionizers, grounded protective screens and more.

The dose of X-rays in front of the monitor screen at a distance of 50 cm from its surface is safe, it does not reach the permissible level (50 µR / h), but the effect of these rays in combination with other computer-generated people on a person who does not speak relatively safe action.

According to the WHO, electromagnetic radiation causes the development of cataracts. Potentially contribute to the development of cataracts ionizing, ultraviolet - A, infrared and microwave radiation.

Noise from the work of electronic computers has a negative effect on human performance and well-being. At the same time long action of noise leads to decrease in mental working capacity by 10-15%, fast visual fatigue, weakening of attention, disturbance of psychophysiological processes. Exposure to VDT noise is one of the causes of stress, mood swings, sensory overload, changes in the blood supply to tissues and organs due to capillary spasms.

The professional activity of an employee on VDT is the cause of functional changes in the neuromuscular system and blood supply to the eye, which lead to the development of astheno-optical complaints. It has been found that women more often than men complain of visual discomfort. It is noted that in most cases the frequency of atropia increases with increasing duration of work on VDT.

Astheno-optical complaints are also related to workplace lighting, screen glare, image flicker and flicker, dry air, and more. It was found that 72% of VDT users have complaints of eye pain. The result of intense long-term visual work on a computer can be not only specific visual discomfort, but also the occurrence of headaches.

Stress, which develops during long-term hard work on the computer, is one of the causes of somatic, physiological, psychological changes in the body.

Physiological disorders are accompanied by disorders of the gastrointestinal tract, cardiovascular system, skeletal muscles, endocrine glands, skin, genital system. It is established that these disorders are more common in workers with high and medium duration of work on a computer.

Psychological and behavioral disorders include: aggression, frustration, nervousness, irritability, sleep disturbances, rapid development of fatigue and more.

Changes in the somatic, physiological, psychological and behavioral levels of employees on computers and video display terminals are associated with high workload, high emotional and psychological stress and the impact of negative production factors.

3.11.2. Hygienic requirements for production facilities with computers

Working conditions of persons working with computers must meet 1 or 2 class in accordance with the Hygienic qualification of work in terms of hazard.

Adequate lighting must be provided in production facilities equipped with computers. Natural and artificial lighting must comply with DBN B.2.5-28-2006 "Natural and artificial lighting. Normalization".

Natural light should be lateral, oriented, as a rule, to the north or northeast and provide a coefficient of natural light of not less than 1.5%. In case of production needs it is allowed to operate computers in premises without natural lighting in coordination with the bodies of Derzhpromgirnadzor and bodies and institutions of the sanitary-epidemiological service.

The windows of the premises must have adjusting devices for opening, as well as blinds, curtains, etc. Artificial lighting of premises with workplaces equipped with video display terminals for general and personal use must be comprehensive and uniform. In the case when work with documents prevails, combined lighting is allowed (in addition to general lighting, local lighting fixtures are installed).

Luminaires are placed on the side of the workplace (mostly to the left), or locally above the workplace (with the location of computer video terminals around the perimeter of the room).

Fluorescent lamps are usually used as a light source in artificial lighting. Incandescent lamps may be used in local lighting fixtures. The level

of illumination in the workplace should be 300-500 lux. When using combined lighting, glare on the screen surface and increase in screen brightness above 300 lux is not allowed.

An important condition for the safety of the person in front of the screen is the correct choice of visual parameters of the display and lighting conditions of the workplace. Working with displays with the wrong choice of brightness and brightness of the screen, contrast of signs, their colors, in the presence of glare on the screen, flickering of the image leads to visual fatigue, headache, significant psychophysiological load, visual impairment.

The noise level should not exceed: in places where programmers and computer operators work - 55 dBA, in laboratories where algorithms are compiled and work with documentation is carried out - 60 dBA, in the engine room - 65 dBA, in rooms where loud computer units - 75 dBA . Noise absorbers (non-combustible special perforated plates, mineral wool, suspended ceilings, etc.) are used to protect against noise in the production room and workplaces.

Vibration levels during the period of computer work in the production premises should not exceed the permissible values specified by the State sanitary norms of industrial general and local vibration (SSN 3.3.6-039-99). Vibration mats should be placed under dot matrix printers to dampen vibration and noise.

Table 3.6

Optimal values of microclimate parameters for rooms with VDT and PC in accordance with SSN 3.3.6.042-99 "Sanitary norms of microclimate of industrial premises"

Period of the year	Category of works	Temperature , °C	Relative humidity ,%	Air velocity, m / s
Cold	Easy, 1a	22 – 24	40 – 60	Not > 0,1
Warm	Easy, 1a	23 – 25	40 – 60	Not > 0,1

Levels of electromagnetic radiation and magnetic fields must meet the requirements of GOST 12.1.006-84 "SSBT. Electromagnetic fields of radio frequencies. Permissible levels at workplaces and requirements for control ", SN 3206-85" Maximum permissible levels of magnetic fields with a frequency of 50 Hz "and DSanPiN 3.3.2.007-98. For long and medium waves, the rate of tension in the workplace is not more than 5 V / m. For short and ultrashort waves, the energy flux density during the working day is not more than 10 W / cm², and at room temperature above 28 ° C - 1 W / cm².

3.11.3. Organization of workplaces and requirements for computer placement

The organization of the workplace of the user of the video terminal must ensure compliance of all elements of the workplace and their location to the ergonomic requirements, nature and features of work. The area of one workplace must be at least 6 m² and the volume at least 20 m³. The following requirements must be observed when placing jobs:

- natural light should fall from the side, mainly from the left;
- the distance from the workplace to the walls with light slots must be at least 1 m;
- the distance between the side surfaces of the video terminals must be at least 1.2 m;
- the distance between the rear surface of one video terminal and the screen of another should not be less than 2.5 m, and the passage between rows of workplaces - not less than one meter.

The height of the working surface of the table for the video terminal should be within 68-80 cm, and the width should provide the possibility of using operations within reach of the motor field (recommended table dimensions: height - 72.5 cm, width - 60-140 cm, depth - 80 -100 cm).

The computer's working seat (seat, chair, chair) should be lift-and-turn, flat, rounded at the front, and fixed or replaceable armrests to eliminate static tension in the arm muscles.

The screen of the video terminal and the keyboard should be located at the optimal distance from the employee's eyes, but not closer than 60 cm, taking into account the size of alphanumeric characters and symbols.

If you need a high concentration of attention when performing work with a high level of tension, combined workstations with video terminals and personal computers must be separated from each other by partitions 1.5-2 m high.

The organization of the workplace with a computer for the management of technological equipment should include:

- a) sufficient space for the human operator; free reach of manual controls in the motor field: distance in height - up to 133 cm, depth - 40-50 cm;
- b) the location of the video terminal screen in the work area, which provided
- c) the convenience of visual observation in the vertical plane at an angle of plus or minus 30 ° from the line of sight of the operator;
- d) the ability to rotate the screen of the video terminal around the horizontal and vertical axes.

Safety requirements during operation, maintenance, repair and adjustment of computers.

Computers and other electronic machinery and equipment must be serviceable and tested in accordance with applicable regulations.

After work, the computer is disconnected from the mains. The same should be done in the event of an emergency during operation.

During the operation of computers it is forbidden to repair and adjust them at the workplace, work on damaged equipment, clutter the workplace with materials that are not used for current work.

Maintenance, repair and debugged computers, other operations in this regard should be carried out only when the power is completely turned off. In cases where repair and other operations cannot be performed with the power off, it is necessary that the equipment, accessories and appliances are grounded, the work is performed by two or more workers using tools with insulated handles, and there are dielectric mats on the floor.

Repair of VDT without a case, as well as all types of work with an open tube should be carried out in goggles or a mask.

When soldering, washing, degreasing parts, blocks and boards, fire safety must be observed. These works are performed in specially equipped premises.

The mode of work and rest of employees of electronic computers is determined by DSANiP 3.3.2-007-98. Every 40-50 minutes work should be done 3-5 - minute breaks for rest. The total duration of work per day should not exceed 4 hours, and per week - 20 hours.

Employees over the age of 18 who have undergone previous special training, have the appropriate certificate, have no medical contraindications, have been instructed in labor protection and fire safety are allowed to work on preventive maintenance, adjustment and repair of computers.

All employees are subject to mandatory medical examination in accordance with the Regulations on medical examination of certain categories of employees.

3.11.4. Mode of work and rest of computer workers

The mode of work and rest of employees is determined by the state sanitary rules and norms of work with visual display terminals of the computer - DsanPiN 3.3.2-007-98. This takes into account the saturation and intensity of work, type and category of work.

The load on the body during labor, which requires mainly physical effort and appropriate energy supply, associated mainly with the intensive work of the brain, is classified as labor intensity.

Work with a computer is divided into 3 groups:

- group A - reading information (dialog mode);
- group B - input of information;
- group C - creative work in the mode of dialogue with the computer (translation and editing of texts, etc.).

Working with VDT depending on the intensity is divided into three categories: in groups A and B, the first and second categories are determined by the total number of reduced or entered information; in group B, category 3, for the total working time per shift.

The duration of work on computers without a regulated break should not exceed 2 hours. At an 8-hour working day the regulated break needs to be established:

- for 1 category of works - in 2 hours from the beginning of change and after a lunch break lasting on 10 minutes.

- for 2 categories of work - in 2 hours from the beginning of change lasting 15 minutes and in 1,5 and 2,5 hours after a lunch break lasting 15 and 10 minutes accordingly or for 5-10 minutes in each hour of work, depending on character of technological process;

- for 3 categories of works - in 2 hours from the beginning of change and in 1,5 and 2,5 hours after a lunch break lasting 20 min each or duration 5-15 min in each hour of work, depending on character of technological process.

The load per shift during the operation of the computer should not exceed for group A - 60,000 characters, for group B - 45,000 characters, for group B - 6 hours.

When working on a computer in the night shift, regardless of the group and category of work, the duration of regulated breaks increases by 60 minutes.

During the regulated breaks you should use active recreation - a set of special preventive and rehabilitation exercises, being in the fresh air.

The duration of work of teachers of universities, colleges, lyceums, school teachers working in display classes should not exceed 4 hours a day; the maximum class time for junior students is 2 hours a day, and for senior students - 3 hours.

For students, the duration of classes in display classes should not exceed 10-15 minutes in elementary school, and for students in grades 8-9 - 25 minutes.

In order to prevent diseases when working with VDT it is necessary to adhere to the daily routine, reasonably alternate work and rest, skillfully use exercise, environmental factors to increase the body's resistance, expand the rate of reaction[7].

3.12. Radiation safety

3.12.1. Ionizing radiation and its influence on human body

A special threat to human health and the existence of natural biocenoses is pollution of the biosphere by radioactive substances that are dangerous to its ionizing radiation. Distinguish ionizing radiation of natural and artificial origin. To the middle of the twentieth century. The main source of ionizing radiation was natural sources - space, rocks and volcanic activity. In different regions of the Earth, the level of natural radiation varies greatly, increasing tens and hundreds of times in areas of uranium ores, radioactive shale, etc. The zones of increased radioactivity in Ukraine include yellow water, Kirovograd region, Khmelnyk, Mironovka, Polissya, and others. The value of average annual effective doses of exposure of the population of Ukraine at the expense of natural sources is 6.0 mSv per year: internal β (beta)-irradiation (potassium - 40), 0.2 mSv, 3%; space environment, 0.3 mSv, 5%; Natural G (gamma) -phone, 0.15 mSv, 2%; Natural radionuclide in drinking water, 0.17 mSv, 3%; Radioactivity of building materials, 0.26 mSv, 4%; Radon-220 (Thoron) in the air of residential premises, 1.14 mSv, 19%; Radon-222 in the air of residential premises, 3.8 mSv, 64%

Today, the main sources of radioactive contamination of the biosphere are sources of anthropogenic origin: testing of nuclear weapons, accidents at nuclear power plants, submarines and production of radioactive materials, etc.

There are *several types of ionizing radiation*. During the radioactive decay, α (alpha) -, β (beta) - and γ (gamma) -parts are formed. α -emission is a flow of positive charged helium nuclei, β -radiation - a flow of negatively charged fast electrons and γ -emission - short-wave radiation of electromagnetic nature. α -emission penetrates a distance from several centimeters in the air and several millimeters - in tissues, γ - radiation - at a distance to hundreds of meters (Fig. 3.12).

Radiation is a flow of different types of radiation that are formed in the process of radioactive decay and interact with the surrounding environment.

Each type of radionuclides decomposes with a certain speed characterized by a half-life-time period during which the number of atoms of this radionuclide decreases. To measure the degree of radiation hazard, such indicators are used: exposure dose, absorbed dose and equivalent dose, which are measured by certain units.

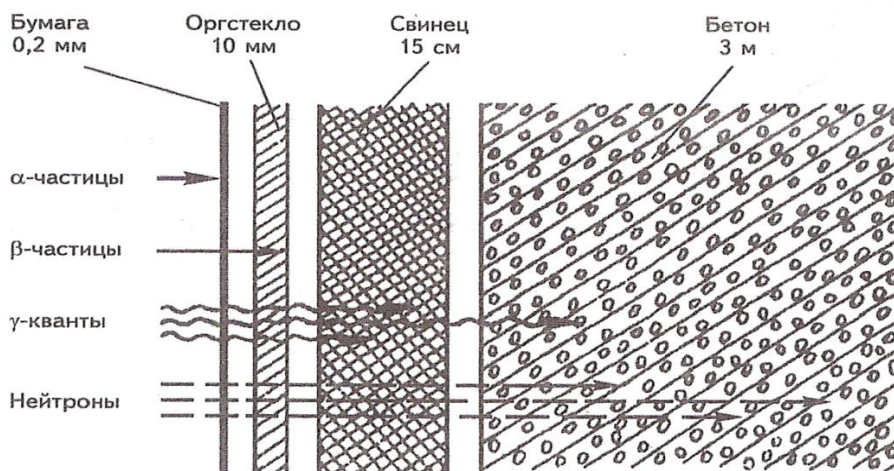


Fig. 3.12. Characteristics of penetrating the ability of different types of ionizing radiation

The absorbed dose of ionizing radiation absorbed by body (body tissues), based on a unit of mass. Measured in the SI system in Gray (GR). It should be noted that this value does not take into account that with the same absorbed dose of α -radiation is more dangerous than G-or β -radiation.

An equivalent dose-absorbed dose multiplied by a coefficient that reflects the ability of this type of radiation to damage the body tissues. Measured in the SI system in units - sievert (sv). Sievert - a unit of equivalent dose in SI. Corresponds to an absorbed dose in 1 J / kg (for X-ray, G - and β -emission).

It should be borne in mind that some parts of the body (organs, tissues) are more sensitive than others: for example, with the same equivalent dose of radiation of cancer in the lungs is more likely than in the thyroid gland, and irradiation of sex glands is especially dangerous due to the risk of genetic damage. Therefore, doses of irradiation of organs and tissues should also be taken into account with different coefficients. If multiplying the equivalent doses on the corresponding coefficients and add amounts on all organs and tissues, we obtain an effective equivalent dose that reflects the total exposure effect for the body and is measured in reentrations.

The most common units and their connection with the SI system: Curie (Ci), unit of activity of isotope: $1c = 3,700 \times 10^{10}BC$; Rad - a unit of absorbed dose of radiation: $1 \text{ rad} = 0.01 \text{ Gr}$; Rem - roentgen equivalent man: $1 \text{ Rem} = 0.01 \text{ 3B}$. X-ray (P) is an extra-case unit of the exposition dose of X-ray and G-emission.

Ber - biological equivalent of X-ray - dose of any kind of ionizing radiation, which has the same biological effect as the dose of X-ray or G-romens in 1r. The level of radioactive isotopes in the body depends on their concentration in the environment. The permissible content of radioactive

substances in the body (i.e., such quantity, in the presence of a dose of a critical body exceeding the EPD) depends on the degree of safety of radioactive elements in the case of entering into the case and determined by their radio tissue.

Radio toxicity is the property of radioactive isotopes to cause Pathological changes in case of their entry into the body.

The main ways of receipt of radioactive substances to the human body are: respiratory tract, intestine-gastric tract and skin. The most dangerous is the falling of radioactive isotopes through the upper respiratory tract, from where they fall into the stomach and in the lungs.

Due to the intact skin resorption in 200-300 times less than through the digestive tract, and does not play a significant role, with the exception of the isotope of hydrogen - tritium, which is easy to fall through the skin. Additional internal irradiation is possible in case of radioactive substances during the consumption of contaminated food products.

Prevention of radioactive environmental pollution, ensuring the protection of living organisms, and primarily a person, from the action of ionizing radiation due to scientifically substantiated technical, hygienic and organizational measures that provide developed on the basis of the materials of the International Radiation Protection Commission (IRPC) and set by national The Commission for Radiation Protection of Ukraine (CRPU) Sanitary and hygienic standards for the boundaries of external and internal exposure to the population and personnel involved in radiation-nuclear facilities, emissions and discharges of radioactive substances into the environment, permissible levels of radionuclide content in separate objects Environment, products of agriculture and forestry, food and drinking water - the main purpose of radiation safety.

Radiation safety is to comply with the permissible limits of radiation impact on personnel, population and the environment established by norms, rules and safety standards.

In the implementation of its tasks, radiation security is guided by ALARA (Alara Principle: AS LOW AS Reasonable Achievable - so little, as smartly can be achieved). According to it, with the use of sources of ionizing radiation, the maximum decrease in irradiation doses should be achieved by a low level, taking into account economic and social factors[2,3].

3.12.2. Characteristics of medical protective anti-radiation measures

In order to reduce the damage to the body an absorbed exposure dose, medical means of anti-radiation protection are used, which are divided into: radio protectors (radio protectors); means of prevention and termination of the primary radiation reaction.

Radioprotectors - substances mainly synthetic origin, the introduction of which in the body before irradiation reduces the impressive effect of ionizing radiation, which leads to a decrease in the severity of the radiation lesion. The use of radioprotectors after irradiation of a practical effect does not give. Designed for individual protection of the body from external irradiation in emergencies (emergency, military conditions).

Radioprotectors belong to the most diverse classes of chemical compounds, so the classification of their pharmacological action is highly difficult. In this regard, in radiobiology, there is a separation of protective means depending on the duration of their actions and the timing of the development of the radio-protective effect.

Radio protectors of short-term action: (cystamine, cysteine, antioxidants (ascorbic acid, vitamin E, etc.)), cyanides, nitrites, serotonin, hexamine, etc.

Radio protectors prolonged action (RPA) are effective in prolonged and fractional irradiation, their action is aimed at increasing the resistance of the body and continues from one to several days. The RPA group includes: estrogens, heparin, polysaccharides, nucleic acids;

Antioxidant and anti-radical agents

Antioxidants are natural or identical to natural, substances that take part in different metabolic types, synthesis and transformation of biologically active metabolites capable of binding free radicals (active oxygen forms) and slowing oxidation-reduction processes.

Antioxidants with regular arrival in the body create a "barrier" for free radicals. They are inhibiting unmanaged processes of oxidation reaction, reducing the activity of non-domestic electrons. The most effective antioxidants with long-term radiation levels are: flavonoids, polyphenols, alpha-tocopherol, adaptogens[2].

Additional nutrients that strengthen the body to radiation action

Food, biological and energy value of food products is determined by proteins, fats, carbohydrates, mineral elements, vitamins, organic acids, taste and aromatic substances.

Proteins are the main structural material for all cells and tissues of the organism, they participate in the processes of updating the cytoplasm and

nuclei in cells. Proteins are part of enzymes, hormones, uniform elements of blood, immune bodies. With proteins, regulation of pH of tissues and colloid-osmotic pressure are connected. They affect the excitability of cerebral cortex, stimulate conditionally reflex reactions and functions of endocrine glands, increase immunobiological properties of the body and have protective, antitoxic action, provide processes of reproduction, growth, muscle contraction. Rates of nutrition containing an elevated amount of protein (24 and 40% by energy value), enhance the radio stability of the body, reduce the absorption of radionuclides of cesium and strontium.

Proteins, partly oxidizing in the body, are involved in the exchange of energy.

Proteins are the main component of any diet. They can not be excluded or replaced by any other nutrient, for example, fats or carbohydrates that do not contain nitrogen.

The most important components of the protein and most often deficient in daily rations are such irreplaceable amino acids as lysine, tryptophan, methionine, threonine, valine, which, in addition to other functions, reduce the accumulation of cesium radionuclides and strontium in the body, increase its resistance to ionizing radiation - improve blood parameters .

Lysin is closely linked to the processes of hematopoiesis, it plays a significant role in the processes of hemoglobin formation, increasing the permeability of capillaries, delay calcium in bones.

The whole lysine is contained in raw fish, meat, horos. In wheat, products of its processing (flour, bread bakery products), in most groats, lysine deficiency is marked.

Tryptophan participates in the formation of hemoglobin and serum proteins, necessary for the synthesis of nicotinic acid (vitamin PP). Its main sources are cheese, solid cheese, eggs, meat, fish, meat of marine invertebrates. In large numbers contain its soybean proteins and peas.

Methionine is irreplaceable for humans and animals Sulfur-containing monoaminoodicarboxylic acid. Participates in the biosynthesis of creatine, choline, adrenaline and other biologically active substances, as well as in the disposal of various toxic metabolites, regulates variable processes, primarily lipids.

From methionine in the body, cysteine, which has an important biological value, can be synthesized, since the need for an organism in cysteine can be implemented almost completely due to methionine.

The main sources of methionine for humans are cheeses, lactic acid products, chicken eggs, meat of different animals, beans, chips.

Rations containing excess methionine reduce delay in the Caesium-137 and strontium-90.

Fat - complex organic compounds (triglycerides) consisting of three-fat alcohol glycerol and various fatty acids. Individual properties of fats depends primarily on fatty acids that are part of their composition. Fats are diverse and very complex physiological effects.

In the nutrition of residents of radioactive contaminated areas 1/5 of all fat should be vegetable origin, that is, 15-17 g per day. From animal fats it is necessary to use fresh pork fat, which is not inferior to the biological properties, and sometimes it exceeds it (for example, in the content of polyunsaturated fatty acids). Butter, margarine improves the taste of food, but they should be used moderately - no more than 15-20g per day.

In terms of removing radioactive substances from the body, very important components of carbohydrates containing pectin, cellulose (fiber). They are not digested in the stomach and intestines and can not serve as a source of energy, but their role in human nutrition is very significant.

Cellulose and hemicellulose play a primary role in the formation of feces of germs, carry out a pronounced irritation effect on the mucous membrane mucosa, stimulating peristalsis and adjusting their motor function. They also normalize the motor function of biliary channels, stimulate the production processes of bile. All listed contributes to the elimination of radionuclides from the body.

In the diet of the population, it follows a sufficient number of different plant products (bran, bread of gross grinding, cereals, vegetables, fruits and berries) containing cellulose and hemicellulose (daily need for 20-25 g).

In the long-term receipt of radionuclides with food, it is necessary to increase the content of products containing non-starch hydrocarbons in the diet (i.e., alginates, pectin substances).

Pectin substances are contained in fruits, vegetables, root crops and other products of plant origin in the amount of 0.5-2.5%. The most rich pectins table table, carrots, radishes, sweet peppers, peas green, apples, black currants, cranberries, peaches, plums, apricots, grapes, crude barley, rice, peas, beans, checker. In industry, a pure pectin is produced in the form of a powder of beet pulp, apple and grapevines.

Alginates are produced from brown seaweed containing 20-35% of alginic acid. In products from marine cabbage - alginate laminaria accounts for 15-20%.

Unlike alginate, pectins do not have a selectivity, that is, they can derive from the body as harmful substances (heavy metals salts, radionuclides strontium, baria, radium, to a lesser extent of cesium), and

useful organism macro- and trace elements, vitamins. Therefore, it does not follow them to abuse.

Daily dose of pectins should not exceed for adults - 20g, for children 1-2 g. Alps unlike pectins primarily bind barium, radia, strontium, practically not affecting the exchange of calcium, magnesium and microelements.

Vitamins are complex organic compounds having high biological activity and contained in food products in very small quantities. In the human body, most of them are not synthesized, or synthesized, but in insufficient quantities. Therefore, vitamins are indispensable substances. The lack of vitamins in nutrition in radioactive contamination reduces the stability of the body to ionizing radiation. Therefore, vitamins should get into the body constantly and in the right quantities.

Ascorbic acid (vitamin C) accepts an active part in oxidation-reducing processes and cellular breathing, various types of metabolism, strengthens the walls of capillaries. Ascorbic acid stimulates the action of the immune system, reduces the radio sensitivity of the cells in the irradiation. Rich vegetables, fruits, berries (especially fruits of hips, black currants, black-colored mountain ash), wild greens, sea cabbage, panel of garden plants.

Thiamine (vitamin B1) contains a sulfur regulating the carbohydrate (promotes oxidation of milk and pyruvic acids), protein and fat metabolism; takes an active part in the functioning of the nervous system; enhances acetylcholine activity; normalizes the disturbance of the secretory function of the stomach.

Riboflavin (vitamin B2) participates in cellular respiration, affects the operation of the central nervous system, the activity of the bone marrow, participates in the exchange of carbohydrates and proteins.

It is contained both products of animal and vegetable origin. Him rich beer and bakery yeast, liver, kidneys, heart, meat, ham, eggs, milk whey, cheese, solid cheese, bran, beans, cereals, rye bread, rose, mushrooms, spinach.

Retinol (vitamin A) provides the processes of growth and development of the organism, maintains the normal condition of the skin epithelium, mucous membranes of the eyes, upper respiratory, bile and urinary tract; In the active state, retinol is only in products of animal origin. Him rich fish oil, marine perch liver, Paltus, chips, fat fish (herring, etc.), caviar, beef and pork liver, egg yolk, butter, cream, sour cream. In products of plant origin (carrots, tomatoes, red pepper, rose, apricots, spinach, green onion) contains a carotene pigment - provitamin A, which is converted into an active retinol.

Cyanocobalamine (vitamin B12) is involved in the synthesis of nucleic acids. Cyanocobalamine has anti-anemic action. In children,

stimulates growth and causes an improvement in general condition. The lack of vitamin B12 and iron leads to the development of anemia, which are often found in children living in contaminated radionuclides in territories. The main sources of vitamin B12 is the liver of fish, liver and kidneys of cattle, pork liver, mackerel, stavrida, herring atlantic.

Mineral substances - inorganic compounds that fall into the body with food and water. They also relate to indispensable substances of food processes. Every day, a person with metabolism produces about 26 g of mineral substances. Mineral substances are divided into macro- and trace elements.

Macroelements in turn are divided into elements of alkaline (calcium, magnesium, sodium, potassium) and acid (phosphorus, sulfur, chlorine) character. Mineral substances are carried out in the body complex and various functions.

Calcium is the main structural element of bone tissue, strengthens the walls of blood vessels, reduces their insight. It is directly related to the exchange of proteins, phosphorus and vitamin D. The excess amount of calcium (1.5-2 times higher than normal) contributes to reducing the suction of strontium and an increase in radionuclide derivation by 20-30%. The need for adult calcium is 800 mg / day. The main sources of calcium - milk and dairy products. To ensure a person's daily demand it is necessary at least 500 ml of cow's milk. To provide a calcium body, it is necessary to consume legume (beans, peas, beans).

Phosphorus is a structural element of bone tissue; Accepts an active part in the exchange of proteins, fats and carbohydrates; It is part of the cells (especially nervous and muscle tissues) and intercellular fluid.

As an excess, and the lack of phosphorus in the diet affects the exchange of a radistration. The double rule of phosphorus in the diet reduces the accumulation of strontium-90, which came with a diet throughout the life of animals, by 50%. In the deficiency of phosphorus in the diet increases the removal of strontium with urine, but there may be softening bones. Daily need for adults - 1200 milligrams, children - 1500-1800 milligrams. The ratio of calcium and phosphorus should be 1: 1.5.

Potassium is widely presented in products as vegetable and animal origin. With a daily need for an adult 2.5-5.0 g / day in normal life, a potassium deficiency in the diet is rarely. The lack of potassium in the diet leads to an increased accumulation in the body as its antagonist - sodium, and an analogue - cesium. Excessive inflow of potassium in the body serves as an effective means of output sodium with urine and in a very small extent - cesium. Potassium contains in grainheads, vegetables, fruits (peaches, apricots, plums,

apples, Uryuk, prunes), berries (grapes, currant, raisins) of tea, natural coffee. Dry milk, egg powder, bread, brims, oat meat meat, fish.

Selenium. In recent years, a radio-protective role of selenium is established. Small doses of selenium improves immunological reactivity, increase nonspecific resistance to ionizing radiation, normalize the weight of the body of irradiated animals, reduce the frequency of breast tumors, pituitary gland, and others.

Daily need - 0.5 mg / day.

A well-known role of microelements in the development and functioning of the organism. The deficiency of manganese, cobalt, copper, iron leads to a number of diseases, including anemia, reducing immunity, growth retardation and development.

Copper - the most important after iron, a hematopathical biomelement involved in key oxidation-reducing processes. In addition, it has the ability to bind microbial toxins and enhance antibiotics. Copper participates in immunogenesis. The need for preschool children in copper is 1.6-1.8 mg / day. Rich liver and kidneys of animals, it is also contained in cereals, meat, fish, potatoes, black currant, strawberries, pears, cherries, hips.

Topic. man-made hazards. *Practical lesson№3.* Assessment of the level of air pollution by stationary sources.

Goal. Ability to assess and learn to determine the amount of compensation for excessive emissions of harmful substances into the atmosphere.

Task:

1. Determine compensation for excessive levels of air pollution by stationary sources.

Terms

As a result of economic activity, anthropogenic impurities enter the air basin of modern industrial zones and large cities. – NO₂, SO₂, CO₂, CO, NH₃, H₂S, CL₂, Br₂, HF, AsH₃, organohalogen compounds, organic acids, esters, aldehydes, alcohols, ketones, nitro compounds, aromatic carbohydrates, etc. For most of them the norms of maximum permissible concentrations (MPC) are set, which fluctuate in a wide range - from 3 mg/m³ (CO) to 0,001 mg/m³ (PH₃) and much less.

Significant air pollution in industrial cities leads to the fact that diseases typical of industrial workers occur among some groups of the urban population. There is a strong link between smoky city air and the development of lung cancer. The reason for this is the presence of smoke, regardless of the type of fuel, carcinogenic hydrocarbons such as benz (á)

pyrene and some others. Statistics show that the incidence of lung cancer is higher in urban than in rural areas, and in industrial - prevails over non-industrial settlements. Atmospheric air pollution can lead to a significant deterioration in the health of the population.

1. Determination of compensation for emissions of harmful substances into the atmosphere by stationary sources

For enterprises that have established emission limit values (MPE), the amount of payments for the normalized emission of harmful substances into the atmosphere is determined by the formula

$$P_n = K_i C_n \sum M_n A_{ji}$$

$$P_n = K \Pi_n (M_1 A_{j1} + M_2 A_{j2} + \dots + M_n A_{jn}),$$

where P_n – amount of payments for normalized emission, UAH.;

K_i – indicator of the relative environmental hazard of the enterprise;

C_n – the rate of payments for the normatively permissible emission (may be UAH 75 per conditional ton);

M_n – normatively permissible mass of gross emissions of the J-th impurity, within the established GDV, t / per year;

A_j – indicator of relative aggressiveness of the J-th impurity;

N – the amount of harmful substances emitted by the enterprise into the atmosphere.

2. The amount of compensation for excessive emissions of harmful substances into the atmosphere

$$P_{p.n} = K_i (C_n \sum M_n A_{ji} + \Pi_{п.н.} \sum M_{п.н.} A_j)$$

$C_{p.n.}$ - rate of payments for excess emissions, which may be equal to UAH 200;

$M_{p.n.}$ – excess mass of gross emissions of the j-th impurity by the enterprise, t / year.

3.1. Task options for calculating compensation for emissions exceeding the GWP of pollutants into the atmosphere

№ option	Type of impurities	Ki,	Actual emission, t / year	Emission rate set, t / year	Cn, UAH / t / year	Cp.n, UAH / t / year	Aj	Pn
1	Wood dust	2,79	42,0	22,4	75	200	0,95	
2	Foundry dust	2,79	645,0	550,0	75	200	1,80	
3	Dust is non-toxic	2,79	548,0	480,0	75	200	0,70	
4	Sulfur dust	2,79	284,0	130,0	75	200	1,0	
5	Nitrogen dust	2,79	75,0	35,0	75	200	3,1	
6	Hydrocarbons	2,79	190,0	85,0	75	200	0,50	
7	Acetone	2,79	15,0	5,0	75	200	0,40	
8	Formaldehyde	2,79	40,0	20,0	75	200	1,80	
9	Hydrocarbons	2,79	190,0	85,0	75	200	0,50	
10	Sulfur dust	2,79	384,0	130,0	75	200	1,0	
12	Nitrogen dust	2,79	175,0	35,0	75	200	3,1	
13	Hydrocarbons	2,79	240,0	85,0	75	200	0,50	
14	Wood dust	2,79	132,0	22,4	75	200	0,95	
15	Foundry dust	2,79	725,0	550,0	75	200	1,80	
16	Dust is non-toxic	2,79	644,0	480,0	75	200	0,70	

Example of calculations: Calculate compensation for emissions not exceeding the GHG of pollutants into the atmosphere under the conditions:

Impurity - wood dust

Ki – 2,79

Actual release – 22,0 t / year

Emission rate set – 22,4 t / year

Cp – 75 UAH / t / year

Aj -0,95

$P_n = 2,79 \cdot 75 \text{ UAH / t / year} \cdot 22 \text{ t / year} \cdot 0,95$ $P_n = 4373,32$

Question. Task

1. What is a man-made environment?
2. Name the main elements of the man-made environment.
3. Describe meteorological factors.
4. What factors characterize household microclimate?
5. What role does regulation of microclimate play?
6. What are allergens? How do they affect the microclimate?
7. Name the basic recommendations aimed at reducing contact with allergens in domestic conditions.
8. Describe the requirements for the lighting of the workplace.
9. What is noise?
10. Provide the characteristics of the zones and the level of noise pollution in the cities.
11. Name the main characteristics of working with a personal computer?
12. Name prevention measures when working with PC.
13. According to fire safety rules in Ukraine What are the main organizational measures to ensure fire safety?
14. What are the main directions of work of persons responsible for fire safety?
15. What is fire safety system?
16. What is the fire safety of an object?
17. What is the main protection against fire sources?
18. What is chemical safety?
19. To which countermeasures include limitation of agricultural activity, temporary population settlement, limited use of radioactive contaminated water and food products?
20. Which organization regulates rules for working with radioactive substances at the national level?
21. Which organization regulates rules for working with radioactive substances at the international level?
22. To which type of radiobiological effects is the formation of malignant tumors in the body?
23. To which type of radiobiological effects is a radial disease?
24. Indicate the normative document based on the following principles: the principle of optimization, the principle of non-extraction, the principle of justification?

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4. Influence of socio-political environment on life safety

4.1. Social environment and man[3,9]

In the process of life, people surround other people, interactions between which form a human community, the so-called social environment (society). Society is a system of divisions and spheres of social life, the harmonious interaction of which causes conflicts and deformations. The sphere of social life includes: material, socio-political, spiritual and cultural and domestic.

Under the social environment, they understand part of the life of life, which characterizes the achievement of a person in the creation of socio-political, spiritual and intellectual (information) values that form the worldview of a person, lead to behavior in the field of relations with the environment.

Man is a social creature. It can only develop in the environment of themselves similar, to live and act only in society, communicate and unifying their efforts with others. Her life and activity are conditioned not only by natural, but also a social factor, which is the regulator of the functioning of human society, which passed through disaster, a lesson of history on bitter experience of understanding. That the most valuable is not political ideas, not technological achievements. Not utopian ideas of Ecumenical happiness. And simple survival and safe existence. People are more clearly aware that without complying with certain rules and regulations among themselves. Techniques and nature they may disappear forever. Society must be responsible for its existence on earth. Therefore, the life of people should be balanced, deeply meaningful, and activity - oriented not only on a fleeting present, but also aimed at the future. This is largely due to the level of society's culture, which is a condition for the formation of the worldviews of people regarding their safe existence.

The features of the Third Millennium Society can be considered: globalization of the economy, large capital flows, moving masses of people, the emergence of transnational crime, infectious diseases, etc.

Every person in the process of life acquires certain habits.

The habits are the form of behavior of people that appears during the training of Ibagatorasova repetition in different life situations, which are accompanied by automatically.

The psychophysiological basis of habits is a dynamic stereotype, that is, well-assimilated and secured by temporary bonds. Regarding human health and a way of life, habits can be useful and harmful.

Healthy Lifestyle. Modern ideas of world science in relation to the phenomenon of human health are based on the new understanding of the topicality of the survival of mankind in general.

At the end of the twentieth century, the leaders of world science healed the problem of health to the collapse of global problems, which determines the fact of the further existence of mankind as a biological species on the planet Earth.

Currently, in the scientific circulation there was a new definition - anthropological disaster, the essence of which is that, according to the basic biological law, each biological species extends if the conditions of existence, to which it was adapted by millennia during evolution. By the last stage of the development of mankind (by the beginning of the twentieth century), the conditions for its existence formed nature, and it is to these conditions of the human body and adapted biologically during the previous evolutionary period. But since the person embraced almost the entire planet (twentieth century), it began to significantly change the conditions of life, which was adapted in its historical and biological development.

These changes in the last quarter of a century, as evidenced by objective studies, acquired a catastrophic scale. According to the medical statistics, the increase in the incidence and mortality is observed precisely from the second half of the twentieth century, and some scientists are associated with the fact that negative processes have become planetary scope.

The limitations of a purely medical approach that defines health as a lack of illness are revealed. According to modern ideas, health is considered not as purely medical, but as a comprehensive problem, complex phenomenon of global value. That is, health is defined as philosophical, social, economic, biological, medical category, as an object of consumption, capital deposit, individual and public value, a systematic phenomenon, dynamic, constantly interacting with the environment. The state of the own health system of health determines only about 10% of the entire impact complex. The remaining 90% falls on the ecology (about 20%), heredity (about 20%), and most - on the condition and lifestyle (about 50%).

Hence, it is generally accepted in the international community definition of health, set out in the preamble of the WHO Statute (1948): *"Health is a state of full physical, spiritual and social well-being, and not just the absence of illnesses or physical defects."*

Currently, everything is more established by the point of view, according to which health is determined by the interaction of biological and social factors, that is, external influences are mediated by the features of the functions of the body and their regulatory systems. There is a definition of

health as a state of optimal human life. The discussion on determining the concept of health is still ongoing, but it is important to recognize that human health is not reduced to physical condition, but provides for psychoemotional balance, spiritual and social health.

World science has developed a holistic view of health as a phenomenon that integrates at least four of its spheres or components - physical, mental (mental), social (social) and spiritual.

The sphere of physical health includes such factors as individual features of the anatomical structure of the body, the course of physiological functions of the body under different conditions of peace, movement, environment, genetic heritage, level of physical development of bodies and systems of the organism.

The sphere of mental health attribute the individual peculiarities of the mental processes and properties of a person, such as excitement, emotionality, sensitivity. The psychic life of the individual consists of needs, interests, motives, incentives, installations, goals, feelings, etc. Mental health is associated with the peculiarities of thinking, character, abilities. All these components and factors determine the peculiarities of individual reactions to the same life situations, the likelihood of stresses, affects.

Spiritual health depends on the spiritual world of personality, in particular components of the spiritual culture of mankind - education, science, art, religion, morals, ethics. Consciousness of a person, her mentality, life self-identification, attitude towards the meaning of life, an assessment of the realization of their own abilities and opportunities in the context of their own ideals and outlook - all this causes the state of spiritual health of the individual.

Social health is associated with economic factors, relations with the individual with the structural units of society - the family, organizations that are created by social bonds, labor, rest, life, social protection, health protection, existence safety, etc. Affect interethnic relations, weight differences in profits of various social strata of society, level of material production, technology and technologies, their controversial influence on health in general. These factors and components create a sense of social security (or insecurity), which significantly affects human health. In general, social health is determined character and level of development of major spheres of social life in a certain environment - economic, political, social, spiritual.

It is clear that in real life, all four components are social, spiritual, physical, mental, and acts simultaneously and their integrated influence determines the state of health of a person as a holistic complex phenomenon.

The concept of a healthy lifestyle. From the standpoint of the above understanding of the human health, the determination of the concept of a healthy lifestyle (CHL): this is all in human activities relating to the preservation and strengthening of health, all that contributes to the human functions through the activities of the improvement of living conditions - labor, rest, everyday life.

Components of CHL contain various elements relating to all health spheres - physical, mental, social and spiritual. The most important of them - food (including the consumption of high-quality drinking water, the required number of vitamins, trace elements, proteins, fats, carbohydrates, special products and nutritional supplements), life (housing quality, conditions for passive and active recreation, level of mental and physical safety), working conditions (safety not only in physical, but also mental aspect, the presence of incentives and conditions of professional development), motor activity (physical culture and sports, use of means of various recovery systems aimed at raising the level of physical development, supporting it, restoring forces after physical and mental loads).

For awareness of the CHL important knowledge and possibility of access to special preventive procedures, which must slow down the natural process of aging, the presence of appropriate environmental conditions, other components of the CHL, which relate mostly not only physical and mental, as well as social and spiritual health.

The problem of forming a healthy lifestyle is very carefully covered in many socio-philosophical, pedagogical, sociological, medical works. Particular actualization this problem has acquired in the second half of the twentieth century as in the world as a whole, as well as in Ukraine.

Indicators of physical health. In accordance with the content of physical health (individual peculiarities of the anatomical structure of the body, the course of physiological functions of the body in different conditions of calm, movement, environment, genetic heritage, the level of physical development of organs and systems of the organism), indicators of growth and weight, as they reflect (with certain restrictions) defects (or their absence) of anatomical construction of the body and (also with certain restrictions) the quality of genetic heredity.

Regarding the performance indicators of the physiological functions of the body under different conditions of calm, movement, the environment and the level of physical development of bodies and systems of the organism, they can not be determined by the toolkar of sociological survey because the laboratory physiological testing of the organism systems that provide motor actions (muscle, nervous, power supply). Therefore, indicators were selected that indirectly indirectly indicate the nature of the body's reaction to

physical activity and are available for objective determination in the survey: injury indicators, as well as the fact and capacity of physical activity, typical of conventional motor activity. These indicators can be considered (with certain restrictions) as readiness indicators for loading, that is, as mediated indicators of physical health.

Indicators of mental health. According to the content of this health (individual peculiarities of mental processes and properties - excitement, emotionality, sensitivity, tendency to stress, affects, features of thinking, character, abilities, needs, interests, motives, incentives, installations, goals, feelings, etc.) Relevant indicators were selected: the presence of communication problems, a sense of comfort of staying in the team, the nature of relations with close environment, the ability to manage its mental state, the degree of stress, the degree of self-satisfaction, that is, indicators that reflect the individual characteristics of the mental processes and properties of man. Direct dimension of such properties of the psyche as excitability, mental stability, level of emotionality, the purpose of sensitivity, stability of incentives, involvement in a certain psychotype, etc., was not carried out because it is impossible to carry out means of a sociological survey.

This requires special psychophysiological studies of each individual in laboratory conditions using the appropriate equipment. That is why the choice of indicators was sufficiently diverse to maximize the scope of mental health by those means that are possible in a sociological survey.

Indicators of spiritual health. In accordance with the content of this area of health (attitude towards education, science, art, religion, morals, ethics; consciousness, mentality, life self-identification, assessment of their own abilities and opportunities), were chosen indicators that indicate anxiety (or its absence). The state of the factors of spirituality are generally accepted in society: religious, cultural, patriotic. The spiritual inquiries indicate the indicators of the choice of leisure content.

Involvement in the Institute of Education reflects the indicators of education, the nature of communication with educators. Naturally, the list of indicators did not include those directly directed to determining the level of consciousness of respondents or the degree of commitment to the generally accepted ethical code of mankind, as it is not possible to obtain objective information on such indicators.

Indicators of social health, related to economic factors, relations with the individual with structural units of society, were determined by such indicators, as characteristics of the nearest environment and interactions in it, social status, social well-being, availability (absence) of safety in society, degree of satisfaction with everyday conditions of life, self-esteem of

welfare, profits, opportunities and cost structure, housing conditions, opportunities.

Possibilities of realizing a healthy lifestyle. The question of the possibility (impossibility) to conduct a healthy lifestyle is extremely subjective, because it is primarily determined by the degree of awareness of the importance of action in this direction. Even in the absence of some objective conditions (comfortable housing, proper nutrition, sufficient income, etc.) of a high level of consciousness in relation to a healthy lifestyle seek to act for its own health.

Conversely, for quite objective conditions, the lack of personal incentives makes it impossible to be healthy.

On the other hand, there is a certain minimum of objective living conditions, which determines the possibility of implementing a healthy lifestyle. This welfare of the family, which indirectly characterizes the potential opportunity to realize a healthy lifestyle; The attitude of the nearest environment for health values is also a certain indicator of such an opportunity, because it is difficult to lead a healthy lifestyle with a negative attitude of friends and acquaintances; The degree of permanent stress and morbidity - a patient or a constantly mentally tense person is limited to the realization of healthy actions.

To objective languages include even the presence of shoes and clothes for exercising. It is due not to the fact that the possibility of physical culture and sports depends on the availability of equipment, but by the fact that young people need a fairly fashionable equipment, in order not to appear worse than peers.

Certain information about the subjective assessment of young people of existing restrictions on the possibilities of a healthy lifestyle give an indicator of concerns with physical education and sports, awareness of a healthy lifestyle, the state of the environment.

Possible means of influencing the formation of a healthy lifestyle. Given the need to implement health policy in a youth environment, issues of this implementation are one of the main ones. Consequently, the main components or components of health and healthy lifestyle are considered. But they are not equivalent.

In addition, there is no concept of quantitative measurement of "health" as a complex integral indicator. If informative methods are used to assess a person's physical health, which, depending on age, sex, physical condition, functional capabilities of the body, level of preparedness allow to assign each individual to one of the five levels of physical development, then for mental, spiritual and social health methods of quantitative estimates are still being developed.

Socio-political environment. Social and political dangers caused by life problems are very complex in nature. The essence of this nature is the accumulation of the consequences of constant, conflict, stress and other negative situations. In most cases, the danger is expressed in the ratio of the number of people involved in conflicts and separated from society in relation to the size of society itself.

Political dangers arise as a result of the development of various types of political conflicts. In the history of different countries, conflicts at the interethnic and interstate levels most often occur as a result of spiritual oppression, political terrorism, ideological, inter-party and armed conflicts, and wars.

Fundamentals of criminological security.

Ensuring the security of economic activity requires:

- clear legislation;
- establishment of appropriate mechanisms for the implementation of this legislation;
- use of experience of consequences of "work" of this legislation for maintenance of its improvement;
- creation of the appropriate infrastructure for its functioning and implementation of state policy "on the ground".

Thus, the danger factor characterizes the state of society, on the one hand, and on the other - is the content of the reason for its transition to a state with negative consequences.

Criminological criminal activity in the field of economics is most interconnected with many other types of criminal activity, so the most important today is the problem of economic security.

Criminological threat to the security of the economy - is a set of factors and

conditions that pose a danger to the normal functioning of any objects of the economy.

Subjects of criminological threats to the security of economic objects are:

- special services of foreign states, whose activity is the extraction of valuable information, the implementation of subversive actions against the objects of the economy;
- non-governmental organizations and individuals specializing in industrial espionage;
 - organized crime;
 - individuals who perform illegal and other destructive intentions against the objects of the economy.

Criminological security provides protection of the main objects from encroachments of organized crime and industrial espionage.

The main subject of ensuring the safety of citizens, public organizations, associations, objects of the economy is the state, its legislative, executive, judicial authorities.

The main objects of criminological security:

- personality, its rights and freedoms;
- society, its material and spiritual values;
- the state, its constitutional system, sovereignty and territorial integrity.

Modern economic security of any country is a nationwide set of measures aimed at the sustainable development and improvement of the country's economy, which necessarily provides a mechanism for counteracting the criminological threats of criminal structures.

Economic security is a state of protection of vital interests of a person, a business entity, a country, the ability to choose ways and forms of economic development and implement them without outside interference.

***Economic security** is a universal concept that concerns the protection of business entities at all levels - from the state to every citizen. Therefore, increasing the number of enterprises with a high level of economic security, its resilience to possible threats will help strengthen the economic security of Ukraine.*

Transformational transformations in the economy of Ukraine are accompanied not only by the formation of new production opportunities, but also by changes in relations in other spheres of life. The transition to market relations is characterized by political, economic and social crises.

As a result, as a rule, negative phenomena took place in the economy: unfair competition spread, crime increased, and the share of the criminal-shadow sector of the economy increased. Under these circumstances, businesses are increasingly subject to various threats. Therefore, it is objectively necessary to protect business, aimed at counteracting such threats.

Economic threat - the possibility of intentional or unintentional action, which violates the functioning of the enterprise (firm), causes material or moral damage, removes from a state of stable equilibrium

Such threats are realized in the form of corruption, fraud, unfair competition, use of inefficient production technologies and so on. Physical threats are manifested in theft, robbery, breakdowns, equipment failure; intellectual - in the disclosure or misuse of information, discrediting the company, as well as various socio-psychological conflicts around banking institutions or in them.

Business security is closely linked to risks, which are an integral part of the market economy and a potential source of profit or expense.

Business security is aimed at eliminating or reducing the risk of economic losses. The source of threats to entrepreneurship can be tangible and intangible assets, finance, information, personnel.

According to the areas of threat, there are certain types of security:

1) material and technological security (MTS) - protection against possible losses due to theft of real estate from possible losses due to theft of real estate, equipment, products, inventions, programs, etc., possible losses due to accidents, disasters due to obsolete equipment, low qualification and irresponsibility of employees ;

2) financial security (FS) - protection against possible financial losses and prevention of bankruptcy. It is leading and decisive;

3) information security (IS) - protection of confidential information, prevention of its leakage, protection of software products;

4) personnel security (PS) - prevention and reduction of the danger of negative impact on economic security due to the actions of insufficiently qualified employees, inefficient business management, protection of individuals (life and health) from criminal encroachments.

In practice, all these types of security are carried out by the security service (security), which organizes the access regime, protection of buildings, structures, premises, equipment, protects information from unauthorized access, ensures the confidentiality of documents and materials.

A special place in the structure of entrepreneurial activity is occupied by banking, which is increasingly under the influence of criminal structures. With the introduction of market relations, it becomes a central link in the field of financial and economic relations. However, in addition to legal commodity and financial flows, capital is "laundered" through the banking system, it is the main executor of the issue of non-cash payments of fictitiously generated funds.

The following factors contribute to the commission of mercenary crimes in the field of banking:

- socio-economic (disruption of economic ties between deeply integrated enterprises, imbalance of the financial system, the crisis of payments, etc.);

- organizational and managerial (lack of specialists in the field of methodology development, organization of banking activities in the new economic conditions, uncertainty of the concept of structural construction of the control system, relations of commercial banks with the NBU, law enforcement and other regulatory authorities);

- normative-legal (imperfection of the current legislation and departmental normative-legal acts on the issues of regulation of the sphere of banking activity).

Business security issues in countries with developed market economies are considered one of the main, and security measures in commercial structures spend from 10 to 15% of profits.

A prerequisite for effective protection of business activity from criminal encroachment is the identification and study of the circumstances and conditions that precede the commission of crimes. Only a comprehensive and multifunctional approach can identify and develop targeted measures to prevent the criminalization of the economy.

Extreme situations of criminogenic nature and ways to avoid them.

Global crime is another social problem of our time. The number of crimes registered in the world is growing by an average of 5% every year. But recently, the share of those who belong to the category of serious (murder, violence, etc.) is growing especially fast.

According to statistics, crime in Ukraine has become widespread. In conditions of economic crisis, uneven social development, a sharp decline in living standards, significant gaps in legislation and other negative factors, the number of people prone to crime is increasing.

Given the difficult criminogenic situation in Ukraine, everyone should be able to defend themselves in situations involving violence.

The cheapest and most affordable means of self-defense is a gas canister. No permission is required to purchase it.

To purchase, store and carry gas pistols and revolvers, as well as ammunition for them, you must have a special permit from the police.

Pneumatic weapons can be a means of self-defense, but they are still cumbersome and most importantly - there are no laws governing its use as a means of self-defense.

Autonomous signaling devices are a very effective means of self-defense. Their application is very simple: you pull out a dart - a keychain. A bag or a diplomat starts making such loud and piercing noises that any intruder will be afraid to deal with you further, without attracting public attention.

If a person is unable to purchase a weapon for self-defense or is unable to use it, you can use simple daily advice on personal safety:

- Keep money and valuables with you; briefcases, handbags should not be left unattended;
- in a cafe or bar, before hanging a coat on a hanger or back of a chair, take money and documents;

- carry a bag on a belt over his shoulder, pressing it to himself;
- do not open the door to strangers (or keep them on a chain); to check service certificates for officials;
- returning home late in the evening, walk down a lighted and crowded street; in the evening be careful in transport, driveway, elevator;
- avoid situations that threaten violence (dispute with drunks);
- do not get in the car to strangers.

In the event of an attack, you should shout as loudly as possible or break the glass of the nearest apartment or shop.

The strictest punishments under the Criminal Code of Ukraine are for murder and rape. Sexual crimes due to severe physical and psychological consequences for victims are particularly serious. For some types of rape, Article 152 of the Criminal Code of Ukraine provides for imprisonment for up to 15 years. However, victims usually do not report the police because they do not want publicity, the experience of an unpleasant investigation and trial. According to the results of sample research, for each rape under investigation there are 6-8 crimes that go unpunished. To reduce the risk of rape, follow these rules:

- not to provoke violence by your appearance and behavior;
- avoid remote beaches, places for country rest, etc., do not walk in the evenings through yards, parks and squares.
- Avoid places where adolescents gather, as rapes committed under the influence of alcohol or drugs by minors are particularly brutal.
- Try to establish contact with the criminal, that is, make him think of a woman as a person, not a sexual object; use tricks to try to lure the rapist to a place where there is potential protection;
- in case of an attack, you can use physical resistance - to strike painful places (groin, face, eyes). Beat with the knee or elbow;
- Shout loudly (it is better to shout "fire" than "rape").

In the case of an attempted rape, the victim may tell the perpetrator that he or she has a sexually transmitted disease (AIDS, syphilis, gonorrhea, etc.).

Therefore, extreme criminogenic situations can be avoided or their risk minimized by following personal safety rules.

Personality manipulation

Man is not only a natural, biological being, but also a spiritual person with a complex inner world. She or he is endowed with reason, abstract thinking and language. All complex systems can be influenced by programming human behavior through manipulation.

Manipulation (lat manipulus - a handful) - the impact on a person (usually hidden) in order to achieve actions that meet the goals of the manipulator, give him certain advantages and benefits.

Such influence can be exerted both on large communities and on the individual. To influence the public consciousness, certain technologies have been developed that are used in various fields, and most often in politics and advertising.

Manipulative influence in the processes of business communication. First of all, manipulations in communication are based on such a mental process as decision making. This is the choice of available alternatives. The peculiarity of this process is that it always compares something represented by consciousness, not what is outside it.

If the task is to control consciousness, then the person is offered the arguments that are needed by the suggestor, that is, who will try to manipulate in the form of suggestion.

Different approaches to suggestions are known.

Psychoanalytically-oriented approaches:

Our consciousness is programmed laterally, ie indirectly (lateral - transverse, horizontal, lateral, secondary, one that is on the side). This mechanism is widely used both in the practice of ideological influence and in the practice of business communication. It is called the mechanism of lateral programming of the psyche. Strong reflection in the memory of "obvious" things is the essence of lateral programming of the psyche. When a person is confidently told what seems self-evident, which does not require proof of fact, he often loses the ability to critically assess the situation. Lateral programming affects a person's behavior directly, ie both his consciousness and his will. The main thing in laterally constructed expressions always remains as if from the side and is perceived by people as something obvious. There is allegedly a second or double meaning in the statements, which is practically not perceived and realized, it is not prone to reflection, while the main topic of conversation a person is subjective, agreeing or disagreeing with the interlocutor.

Hypnotic approach: Suggestion is a process of action on the human psyche, associated with a decrease in consciousness and critical perception of the content, which is perceived as if it does not require a detailed personal analysis or assessment of the motivation for certain

actions. The essence of suggestion is to act on a person's feelings, and through them - on his will and mind. It should be borne in mind that different people have different degrees of suggestion. Psychologists say that suggestibility depends on a number of factors, which include:

- uncertainty;
- timidity;
- low level of self-esteem;
- vulnerability;
- weakness of logical analysis.

Suggestion techniques are the specificity and imagery of keywords. The use of words whose meaning is specific, the meaning of which is easy to imagine, significantly increases the effect of suggestion. Abstract concepts dramatically reduce the power of suggestion.

One of the strongest means of suggestion is language dynamics. The main techniques of speech dynamics that can increase the suggestion of language:

- softness and strength of voice;
- richness of intonations;
- pauses;
- high rate of speech.

It is believed that the impact of this tool is higher on people with a high level of intelligence and, accordingly, cause more confidence. According to the observations of psychologists, during business communication with a large audience, a person who will use a male voice, especially a low, "velvet" one, will take a more advantageous position.

The ability to purposefully influence a person, his emotions with the help of certain words and phrases have been known since ancient times. Some of them are able to evoke not only certain emotions, but also subconsciously perceived in the form of psychological images.

There are many techniques for inducing a trance, which are used both in general in the management process and during business communication: showing trance behavior; age regression; use of natural trance states; overload of consciousness; pattern break; use of complete uncertainty, unpredictability; use of artificial or non-existent words; scattering technique; perseveration; appeal to authority and more.

Thus, manipulative influence can threaten a person both in domestic relations and in public life.

4.2. Religious sects

Since 1991, when Ukraine received very liberal religious legislation, we have had a fairly large number of new communities of believers, incomprehensible to the general public. Scholars tend to call such formations the newest religious movements, and public opinion "destructive religious cults."

Sectarianism or **Sects** - religious associations that differ in teaching and rites from the dominant religious and church organizations. Sects consist mostly of former members of the main church, who, leaving it, are often in sharp opposition to it.

The term "sect" was used in tsarist Russia by the official Orthodox Church to marginalize both the new Christian churches and currents and the truly harmful immoral groups that destroyed and persecuted the Russian Orthodox Church's monopoly.

The history of modern Ukraine has given some reason to fear the negative influence of certain religious organizations. In the early 90's we started the famous "White Brotherhood". Almost immediately, its organizers began to be reasonably suspected of extorting money and property from their "parishioners." In 1993, fraternity activists seized St. Sophia Cathedral in Kyiv, seeking to commit mass suicide there. The leaders of the organization have been imprisoned, but are now trying to register the White Brotherhood, at least as a non-governmental organization.

There are other religious movements in Ukraine, which are distrusted even by officials of the relevant State Committee for Nationalities and Religions. For example, they do not register the Church of Scientology or the Moon Church without giving them the benefits that religious organizations have in Ukraine. By the way, the main advantage is the right provided by the law "On Freedom of Conscience and Religious Organizations" not to pay taxes on all financial and property donations that this community receives.

In Ukraine, one can see an exaggeration of the importance of individual examples and their spread to all the latest religious movements, regardless of what and how they do. The completely neutral word "sect" in our country, as in many other countries, has been compromised. Although this is no more than one stage in the development of a particular religion. Among the characteristics of the sect (Latin word sounds neutral and means only "image of thoughts", "doctrine", "direction"), religious scholars name the claim of its representatives to their exclusivity, desire for religious reforms, special commitment to charismatic leaders around whom and similar religious organizations are being built[7].

Instead, the church (in the broadest sense) differs from the sect precisely by the presence of a clear structure, doctrine, tradition. It turns out that many of the organizations we tend to think of as sects are actually churches, because they have a structure, a doctrine, and a system for working with believers. It is also worth noting that almost every religion, in particular Christianity, was once a sect, fighting for the reform of a particular religious system. That is why the talk about the destructiveness of all the latest religious movements is too bold a generalization.

New religious movements, of course, do not dominate in Ukraine. However, the rapid development, for example, of the latest Protestant movements can not be overlooked. Today we have a wide variety of neo-Christian, Orientalist (those based on Eastern teachings), theosophical, neo-pagan, and so on. According to the State Committee for National Religion, there are several hundred communities of new Christian movements in Ukraine today, almost 40 communities of the Krishna Consciousness Society, more than 100 neo-pagan communities, and so on. What unites such organizations, in addition to activity, is the distrust of the general public, especially the representatives of traditional religions. And this distrust often has no basis.

Society must learn to work with this phenomenon, it is necessary to monitor whether it helps a person or, conversely, hinders. New religious movements in Ukraine are not always perceived correctly. The main stereotype about them is that any new religious organization is a totalitarian sect aimed at making as much profit as possible through zombies, involvement, and robbery. On the one hand, it is clear that traditional religious denominations, which are very important for the history and modernity of Ukraine, must be protected from the influences that may be. However, Ukrainian legislation even excludes the possibility of the existence of a dominant religious tradition.

And it is possible to resist the activities of a religious organization by law only if it threatens public safety and order, life, health, morals, rights and freedoms of other citizens. Most of these organizations are not engaged in such activities.

4.3. Poverty, vagrancy, homelessness, unemployment as social threats to human security

The social situation of the population and the social policy pursued by the authorities are evidenced by the levels of poverty, homelessness and vagrancy.

Poverty as a social threat. The main cause of poverty is low income. A person is considered poor if he does not have enough funds for adequate food, housing and services, living in the social group to which he belongs.

Poverty - social relations characterized by the lack of the necessary material means to lead a "normal" (according to the norms accepted by society) life, such as the inability to feed their families, educate children or provide the family with quality medical care.

In Ukraine, poverty has specific features:

- 1) low living standards of the population as a whole;
- 2) psychological rejection of economic inequality;
- 3) high proportion of people who consider themselves poor;
- 4) the prevalence of poverty among the working population.

The concept of absolute poverty is now used, according to which the subsistence level is the main criterion for assessing need. It is calculated for the entire population, able-bodied men and women, retirees and children. The minimum consumer budget of the high wealth is also used as an indicator of living standards. According to the concept of absolute poverty, 32% of the population with an average income below the subsistence level can be considered poor. Among them - public sector employees (medical, social workers, cultural workers, educators), large families, single parents, the disabled, retirees, students. The use of the subsistence level as a criterion for assessing poverty implies that the costs of education, health care, housing are signs of prosperity.

Poverty is not only a characteristic of objective living conditions, but also a subjective state, so there is a relative poverty due to the significant stratification of society and the subjective experiences associated with this stratification.

The main causes of poverty in our country are inefficient employment and low efficiency of economic management. Inefficient employment is evidenced by a significant number of workers who receive wages below the subsistence level. A large percentage of part-time employees, as well as those who are on administrative leave, allows to increase the number of vacancies in enterprises with wages below the subsistence level. Inefficient employment plays a dual role: it benefits the state because it maintains a certain level of employment and provides a minimum income for a large part of the population, but employment restrains the growth of production and wages and a sharp change in the economic situation threatens to become stagnant structural unemployment. be huge.

Inefficient employment leads to loss of skills, competitiveness, low self-esteem. This problem is especially relevant for small towns and rural

settlements with a mono-economic structure, where employment alternatives are limited.

The strategy for overcoming poverty must be based on the recognition that this goal cannot be achieved solely by supporting the disadvantaged. An integrated approach is needed, targeting both the poor and the relatively well-off. The state's efforts to raise the living standards of all segments of the population, regardless of their financial situation, should be based on ensuring sustainable economic growth, comprehensive development and the fullest use of the country's labor potential, and improving the labor market situation.

The practice of regulating wages only by raising the minimum wage should be abandoned. It cannot stimulate effective work, creative activity, because it has actually become a means of social support for employees of public sector industries.

However, economic growth as such does not solve social problems. It is necessary to introduce flexible tax policy, rational social transfers, stimulate small and medium-sized businesses, protect the rights of small shareholders, and reform the pension system.

The system of social support for vulnerable groups should be focused on the truly needy. It is necessary to approve the official criteria and limits of poverty, to develop mechanisms for state support of the poor. The goal of social support should be the fullest possible coverage of all those who need help.

Wandering and homelessness. According to the state report on the situation of children in Ukraine in 2013, the number of children who wander and beg, detained by police, is growing: 36 thousand - in 2001, 37 thousand - in 2005, 41 thousand - in 2012.

Wandering - a lifestyle characterized by the desire to avoid social control, to distance themselves from social relations, to be free, independent in choosing their own environment and way of life.

The tendency to wander is determined by macrosocial, microsocial and individual psychological factors. Macrosocial factors include the deterioration of the socio-economic and political situation in the country, natural disasters, environmental and housing problems. Microsocial factors include adverse factors related to the family and children's institutions, the existence of certain "street" traditions in the community of peers and the willingness of the street company to accept a child. Individual psychological factors include life attitudes, emotional instability, the presence of accentuations of character, deviations in mental development.

It is important to develop a program of psychoprophylactic care for adolescents at risk in order to prevent escapes from home and to develop

training seminars to train psychologists and teachers in the system of postgraduate pedagogical education to work with adolescents prone to vagrancy.

There are many public organizations in Ukraine that take care of "street children". One of the most well-known international organizations, which pays great attention to the study of neglected and homeless children, is the United Nations Children's Fund (UNICEF). The Center for Social Guardianship of the Child of the International Charitable Foundation "Father's House", the Charitable Foundation "Samaritan", the All-Ukrainian Charitable Foundation of Hope and Good and others operate in the interests of this category of children. However, the capacity of public organizations is insufficient. It is necessary to unite the efforts of the state and the public to protect the rights of these children; to look for new effective forms of work with children, using the positive experience of the past, proven methods of prevention of vagrancy, measures aimed at improving the situation of children in Ukraine.

Homelessness - a social condition characterized by: a) lack of permanent residence; severance of relations with parents, relatives, teachers; alienation from all institutions of socialization of the individual; lack of employment in socially useful work.

Children's homelessness is a threat to the normal development not only of the individual and the state in general. Various forms of deviant behavior are widespread among the homeless: alcoholism, drug addiction, substance abuse, and early sexual intercourse. Having no means of subsistence, they engage in begging, theft, and are often involved in organized groups, where they become objects of sexual and criminal exploitation. The prevalence of homelessness is associated with social phenomena of various levels, primarily processes that change the traditional way of life of large sections of the population, increase tensions, increase the level of deadadaptation. Such processes include urbanization, migration, wars, revolutions, periods of large-scale social reforms.

Unemployment. It is a source of numerous threats to normal human life.

Unemployment – idleness of part of the economically active population in economic activity.

To the economically active population engaged in socially useful activities that bring profit. Employed are persons aged 17 to 70 who have worked at least one hour during the week (at least 30 hours in agriculture), regardless of whether the work is permanent or temporary.

The causes of unemployment are: structural changes in the economy, embodied in the introduction of new technologies, the curtailment of

production in traditional industries, the closure of technically backward enterprises (this leads to a reduction in excess labor); economic downturn or depression, forcing employers to reduce the need for all resources, including labor; economic competition, in particular in the labor market; government policy in the field of wages: raising the minimum wage increases production costs and thus reduces the demand for labor.; seasonal changes in the level of production in certain sectors of the economy; changes in the demographic structure of the population, in particular the growth of the working age population increases the demand for labor and, consequently, increases the likelihood of unemployment.

The problem of unemployment is a key issue in a market economy, and without solving it it is impossible to establish efficient economic activity.

Особливо гостро проблема безробіття постає зараз перед Україною, що не дивно, тому що стан економіки України зараз обтяжуючий. Величезний економічний спад, розваливши промисловість, не міг не торкнутися ринок праці. Отже бідність, бродяжництво, безпритульність, безробіття є основними соціальними проблемами суспільства і становлять загрозу безпеці людини[3,4].

4.4. System of state bodies of management and supervision over life safety

State management of life safety in Ukraine is carried out in accordance with current legislation. According to it, national tasks and management functions are assigned to state bodies of general, special and sectoral competence. These include the Verkhovna Rada, the Cabinet of Ministers, executive committees of local councils of people's deputies, local administrations. State management of labor protection in Ukraine is carried out by: the Cabinet of Ministers of Ukraine; Ministry of Labor and Social Policy of Ukraine; ministries and other central bodies of state executive power; local state administration, local councils of people's deputies. The implementation of the state health policy is entrusted to the state executive authorities. The specially authorized central body of the state executive power in the field of health care is the Ministry of Health of Ukraine, the competence of which is determined by the regulations approved by the Cabinet of Ministers of Ukraine. Management of the civil defense of Ukraine in accordance with its construction is entrusted to the Cabinet of Ministers of Ukraine, ministries, local state administrations, heads of enterprises, institutions and organizations, regardless of ownership and subordination.

The National Council for Life Safety has been established under the Cabinet of Ministers of Ukraine.

The National Council solves the following main tasks:

- o development and implementation of measures to build an integrated system of public safety management;
- o organization and control over the implementation of legislative acts and decisions of the Government of Ukraine;
- o development of the National program and bills related to the implementation of state policy in the field of safety of life;
- o coordination of activities of central and local bodies of state executive power in the field of life protection, etc.

The State Committee of Ukraine for Labor Protection Supervision implements the state policy in the field of labor protection. The Ministry of Health of Ukraine is a specially authorized body of executive power that manages, supervises and controls the implementation of sanitary legislation and ensuring health and epidemic population.

The Ministry of Labor of Ukraine carries out the state examination of working conditions, control over quality of certification of workplaces, establishes their conformity to operating regulations on labor protection. The Ministry of Internal Affairs of Ukraine carries out state management in the field of fire, and also traffic safety within the powers. Environment and Nuclear Safety is a specially authorized state governing body in the field of nuclear safety.

The Ministry of Emergencies and Protection of the Population from the Consequences of the Chernobyl Accident implements the state policy in the field of prevention of emergencies and protection of the population in the conditions of development of troubles, natural disasters, etc.

The Prosecutor's Office of Ukraine supervises the observance and correct application of the laws on life safety.

In other ministries and central bodies of state executive power, relevant departments, divisions or services are created and operate, which carry out state management of labor protection at the sectoral level.

Ukraine is implementing a regional policy in the field of life safety management, which provides for:

- establishing security by creating structures at all levels of state administrations and enterprises;
- finding out the factors that shape the policy of the region;
- determining the content and development of interactions in accordance with the factors that shape the policy of the region;
- reproduction of the relationship between the regional departments and the state safety management system;
- interaction between the subject (regional state administration) and the object (enterprises) of management.

Regional policy in the field of life safety is aimed at overcoming the problems of social governance at the regional level. The content of the policy gives a focused, concentrated idea of the likely use of ways and opportunities of the region, its resources, human and scientific potential, while using modern management methods, technologies, solutions, actions to implement certain opportunities in social governance.

The establishment of an appropriate regional policy in the field of life safety management is a recognized need to move to the formation of market relations, which requires the implementation of measures adequate to the current situation in the formation of institutions of power and entrepreneurship. The basis of regional policy is the development, establishment of current tasks and accounting for the forecast of further development of regional safety management in accordance with the development of entrepreneurial activity in general in the region and directly in the areas that are components of security.

According to the Law of Ukraine "On labor protection" and other legal acts, the tasks of life safety management at the regional level are assigned to local state administrations and councils of people's deputies, which:

- implement state policy in the field of life safety;
- develop regional policy in the field of life safety within their competence in accordance with state policy in these areas;
- form with the participation of trade unions programs of measures on safety, occupational health and the working environment, which have intersectoral significance;
- organize, if necessary, regional emergency rescue formations;
- exercise control over the implementation of regulations on life safety;

In order to perform management functions, local authorities create appropriate structural units - services of labor protection, environmental safety, civil defense, insurance fund, etc. in local state administrations and city executive councils. The Life Safety Service is a structural subdivision of a local executive body formed by order of the head of the state administration.

These services direct their activities to work with enterprises, institutions and organizations located within the relevant territories, but, above all, with those belonging to the sphere of management of public administration, non-state-owned enterprises.

Coordination of the work of these services, regional, city Kyiv State Administration is carried out by the relevant structural units of the supervisory authorities and the Ministry, of which they are a part. Accordingly, these services of the regional city of Kyiv State Administration

provide methodological guidance to the services - district state administrations, consider the submission and approval of the appointment of heads of these services, consider the formation of regional funds.

Scientific councils and commissions may be established within the framework of the above-mentioned services to consider scientific recommendations and proposals in the field of life safety, public health and prevention of non-productive injuries. The composition of such councils and commissions and their regulations shall be approved by the state administration.

In order to coordinate all work to ensure the safety of the population of the regions, regional councils on safe living of the population have been established under the regional state administrations. When resolving all issues related to the management of life safety in the region, the relevant structural units independently, as necessary, interact with other units of the state administration. Thus, the safe living of the population in the region is managed and supervised.

At the regional level, they include the regional territorial department of the State Labor Inspectorate, expert technical centers of the State Labor Inspectorate, the regional state fire inspection, the regional sanitary-epidemiological station, the regional state traffic inspectorate, the regional department of environmental safety, the state examination of working conditions, the regional inspection of the state supervision over the condition of cars, the regional statistical department of social protection of the population, the center of standardization and metrology, the rescue diving station, the regional council of the trade union[6,7].

4.5. How the EU improved workers' rights and working conditions

Find out how the EU is improving workers' rights and working conditions across Europe, from working hours and parental leave to health and safety at work.

The EU has put in place a set of labour rules to ensure strong social protection. They include minimum requirements on working conditions - such as wages, working time, part-time work, workers' rights - to information about important aspects of their employment and the posting of workers. They have become one of the cornerstones of Europe's social policies.

Working conditions

The EU has introduced minimum common standards on working hours applicable to all member states. EU legislation in the field of working time establishes individual rights for all workers, with a maximum working

week of 48 hours, paid annual leave of at least four weeks per year, rest periods and rules on night work, shift work and patterns of work.

Protection for new forms of employment

Over the years, Europe has witnessed significant changes in the labour market, including digitalisation and the development of new technologies, growing flexibility and fragmentation of work. These developments have generated new forms of employment, with an increase in temporary positions and non-standard jobs.

To protect all workers in the EU and improve the rights of the most vulnerable employees on atypical contracts, MEPs adopted in 2019 new rules introducing minimum rights on working conditions.

The legislation sets protective measures such as:

- limiting the length of the probationary period to six months
- introducing free mandatory training and
- banning restrictive contracts

MEPs are currently working on a directive to improve the conditions for workers of digital platforms, such as Uber and Deliveroo. The proposed rules aim to correctly determine the employment status of platform workers so that their working rights are protected..

Teleworking

Although teleworking has increased efficiency and flexibility for employers and employees, it has also blurred the distinction between work and private life. To ensure that the extended use of digital tools do not hamper employees' rights, Parliament has been calling for an EU-wide law allowing them to disconnect from work during non-work hours without consequences. MEPs also want minimum standards for remote work.

Minimum wages

In 2017, the EU confirmed its commitment to ensuring a fair income for all workers. In September 2022, MEPs adopted the first EU legislation for adequate minimum wages.

Countries may use different criteria to assess whether wages are adequate - for example, they may compare wages to a national basket of goods and services, or compare them to widely-used reference values such as 60% of the gross median wage or 50% of the gross average wage. The rules also aim to promote collective bargaining and enforce workers' rights.

Workers' health and safety

The EU adopts legislation in the field of health and safety at work to complement and support the activities of member states.

The European Framework Directive on Safety and Health at Work sets general principles related to minimum health and safety requirements. It

applies to nearly all sectors of public and private activity and defines obligations for employers and employees.

Additionally, there are specific rules covering exposure to dangerous substances, groups of workers such as pregnant women and young workers, specific tasks such as the manual handling of loads and workplaces such as fishing vessels.

For example, the directive on the protection of workers from the risks related to carcinogens or mutagens at work is updated regularly, setting exposure limits for specific substances. In 2022, MEPs succeeded in including substances that are harmful to reproductive health in the latest update to the directive.

EU countries are free to set more stringent standards when transposing EU directives into national law.

With an ageing workforce, the risk of developing health problems has increased. In 2018, MEPs adopted a report proposing measures to facilitate people's return to the workplace after Long-term sick leave and to better include people who are chronically sick or have a disability in the workforce.

In July 2022, amidst an increase in mental health problems in the EU, Parliament called on EU institutions and countries to recognise the high level of work-related mental health problems and find ways to help prevent mental health problems.

Helping recovering people back into the job market 01:10

Helping recovering people back into the job market

Work-life balance and gender equality

The European Parliament has always been a strong defender of gender equality. To provide more equal opportunities for men and women and to encourage a better sharing of caring responsibilities, MEPs adopted in 2019 a set of new rules to allow parents and workers taking care of relatives with serious medical conditions so they could establish a better work-life balance.

The directive sets a minimum of 10 days of paternity leave, a minimum of four months' parental leave per parent (of which two are not transferable) and five days of carers' leave per year and provides for more flexible working arrangements.

Maternity rights are defined in the Pregnant Workers Directive, setting the minimum period for maternity leave at 14 weeks, with two weeks' compulsory leave before and/or after confinement.

Parliament is also continuously pushing for more measures to combat the gender pay gap, narrow the pension gap and has called for EU rules to tackle mobbing and sexual harassment.

New rules agreed by Parliament and Council in December 2022 will force companies to disclose pay information, which should make it easier for workers to compare salaries and expose gender pay gaps.

Workers' mobility within the EU

EU rules on the coordination of member states' social security systems guarantee that people can fully benefit from their right to move to another EU country to study, work or settle whilst getting the social and health benefits they are entitled to. EU legislation covers sickness, maternity/paternity leave, family, unemployment and similar benefits and is currently under review.

In 2019 MEPs approved plans to create a new EU agency, the European Labour Authority, to assist member states and the European Commission in applying and enforcing EU law in the field of labour mobility and coordinating social security systems. Employees can be sent by their companies to another EU country on a temporary basis to carry out specific tasks. In 2018, EU rules on the posting of workers were overhauled to ensure the principle of equal pay for equal work at the same place.

To tackle unemployment and better match labour market supply and demand across Europe, Parliament approved a new law to revamp the European Jobs Network (Eures) with an EU-wide database of job seekers and vacancies in 2016

Making the EU a better place to work

Social dialogue

The social partners - trade unions and employers' organisations - are involved in the shaping of European social and employment policies via the so-called social dialogue, through consultations and opinions, and can also negotiate framework agreements on specific matters.

The EU also wants workers to be involved in their company's decision-making and has established a general framework for the rights of workers to be informed and consulted. EU rules require that in the event of mass redundancies employers must negotiate with workers' representatives.

At transnational level, employees are represented by European Works Councils. Through these bodies, workers are informed and consulted by management on any significant decision at EU level that could affect employment or working conditions. MEPs want an update of the rules to strengthen the role of the European Works Councils.

- **[New EU rules will improve the rights of the most vulnerable workers and ensure better working conditions.**

On 16 April MEPs adopted new rules introducing minimum rights for all employees. This legislation grants new rights for the most vulnerable

employees on atypical contracts and in non-standard jobs, such as gig economy workers.

The new rules include measures to protect workers by ensuring more transparent and predictable working conditions, such as free mandatory training and limits on working hours and the length of the probationary period.

The rules would also prevent employers from stopping a worker from taking up another job outside of working hours and require that all new employees get key information on their responsibilities and working conditions within a week. It is an important step in the EU's social policy.

Protection for workers on flexible contracts

Non-standards jobs have become more prevalent due to changes in the world of work, such as increasing digitalisation and the creation of new business models. In the so-called gig economy temporary positions and short-term contracts with independent workers are common.

In 2016, one out of four employment contracts was for atypical forms of work. The labour market requires flexible work contracts, but flexibility must be combined with minimum protection.

The new rules would apply to anyone being paid to work at least 12 hours per four weeks on average, including domestic , on-demand,, intermittent, voucher based- and, platform workers as well as trainees and apprentices.

However, genuinely self-employed workers would not be covered by the legislation.

EU ministers will still have to approve the rules before they can enter into force. After that EU countries will have three years to bring their national legislation in line with the directive.

EU does for workers' rights

The EU is working steadily on improving working conditions. In 2019, MEPs backed new rules to help working parents and carers better reconcile career and family life. They also adopted a reform of rules regarding posted workers in order to better protect them.

The EU has also set rules regarding working time, health and safety at work and social security when working in another EU country.

New forms of work: deal on measures boosting workers' rights

EP negotiators struck a deal with EU ministers on minimum rights for workers with on-demand, voucher-based or platform jobs, such as Uber or Deliveroo.

Every person who has an employment contract or employment relationship as defined by law, collective agreements or practice in force in

each member state should be covered by these new rights. The case law of the Court of Justice, stating that a worker performs services for a certain time for and under the direction of another person in return for remuneration, should be also taken into account.

This would mean that workers in casual or short-term employment, on-demand workers, intermittent workers, voucher-based workers, platform workers, as well as paid trainees and apprentices, deserve a set of minimum rights, as long as they meet these criteria and pass the threshold of working 3 hours per week and 12 hours per 4 weeks on average.

Genuinely self-employed workers would be excluded from the new rules.

Increased transparency

According to the approved text, all workers need to be informed from day one as a general principle, and no later than seven days where justified, of the essential aspects of their employment contract, such as a description of duties, a starting date, the duration, remuneration, standard working day or reference hours for those with unpredictable work schedules.

MEPs successfully pushed for a maximal coverage of workers across the EU on the basis of common EU case law, not excluding major groups due to varying national definitions. MEPs also strongly pushed for providing key information to be shared once work starts.

Better protection for new forms of employment

To cover new forms of employment, the agreement defines a specific set of rights.

- Predictable working hours and deadline for cancellation: workers under on-demand contracts or similar forms of employment should benefit from a minimum level of predictability such as predetermined reference hours and reference days. Workers should be able to refuse, without consequences, an assignment outside predetermined hours or be compensated if the assignment was not cancelled in time.

- Member states shall adopt measures to prevent abusive practices in on-demand or similar employment contracts. Such measures can include limits to the use and duration of the contract, a rebuttable presumption on the existence of an employment contract with a minimum amount of paid hours, based on the average hours worked during a given period, or other measures with an equivalent effect. Such measures will need to be communicated to the Commission.

- More than one job: the employer should not prohibit, penalise or hinder workers from taking jobs with other companies if this falls outside the work schedule established with that employer.

New rules for probationary period and training

Probationary periods should be no longer than six months or proportionate to the expected duration of the contract in case of fixed-term employment. A renewed contract for the same function should not result in a new probationary period.

Mandatory training foreseen in European and national legislation should be provided free of charge by the employer and count as working time. When possible, such training should be completed within working hours.

Parliament has been calling for EU measures to secure a decent income for all workers for a number of years. In-work poverty in the EU has increased over the past decade and economic downturns, like the one experienced globally during the Covid 19 crisis, show adequate minimum wages have an important role in protecting low-wage workers, as they are more vulnerable.

In September, MEPs adopted new rules to improve the adequacy of minimum wages. They expect this will lead EU countries to achieve real wage growth and avoid competition on labour costs in the single market, as well as help reduce the gender pay gap, as nearly 60% of minimum wage earners in the EU are women.

What does the new EU legislation on minimum wages entail?

EU countries will have to make sure their national statutory minimum wage allows for a decent standard of living. To determine how much that represents, they may use instruments such as:

- A national basket of goods and services at real prices, which could include cultural, educational and social activities
- Comparison of the minimum wage with reference values commonly used internationally, such as 60% of the gross median wage or 50% of the gross average wage
- The comparison of the net minimum wage with the poverty threshold
- The purchasing power of minimum wages

Other measures national governments will have to take include:

- Promote collective bargaining on wage setting
- Update statutory minimum wages at least every two years, or at most every four years for those countries that use an automatic indexation mechanism
- Enforce labour inspections to ensure compliance and address abusive working conditions
- Ensure that workers have access to dispute resolution and a right to redress

Will all EU countries have the same minimum wage?

No. Each country will set the level of the minimum wage based on socio-economic conditions, purchasing power, productivity levels and national developments.

Countries in which salaries are set exclusively through collective agreements - see below - will not be obliged to introduce a statutory minimum wage.

Why is a law on a minimum wage needed at EU level?

The minimum wage is the lowest remuneration that employees should receive for their work. Even though all EU countries have some form of minimum wage, in most member states this remuneration often does not cover all living costs. About seven out of ten minimum wage workers in the EU found it difficult to make ends meet in 2018.

Minimum wages in the EU now

Monthly minimum wages vary widely across the EU in 2022, ranging from €332 in Bulgaria to €2,256 in Luxembourg. One of the major factors for the gap is the difference in the cost of living.

There are two forms of minimum wage in EU countries:

- Statutory minimum wages: regulated by statutes or formal laws. Most member states have such rules.
- Collectively agreed minimum wages: in six EU countries - Austria, Cyprus, Denmark, Finland, Italy, and Sweden - wages are determined through collective agreements between trade unions and employers, including in certain cases minimum wages. .

Health and safety at work

Improving health and safety at work has been an important issue for the EU since the 1980s. The introduction of legislation at European level set minimum standards for the protection of workers, while allowing Member States to maintain or introduce more stringent measures. When the Lisbon Treaty entered into force, the Charter of Fundamental Rights of the European Union became legally binding, making health and safety policy an even more important area of EU legislation.

Objectives

On the basis of Article 153 TFEU, the EU is able to adopt legislation (directives) on health and safety at work in order to support and complement the activities of the Member States. To this end, minimum requirements are laid down at EU level allowing Member States to introduce a higher level of protection at national level if they so wish. The Treaty also stipulates that the directives adopted must not impose administrative, financial or legal constraints that would hold back the creation and development of SMEs.

Achievements

A. Institutional development

Under the auspices of the European Coal and Steel Community (ECSC), various research programmes were carried out in the field of occupational safety and health (OSH). The need for a global approach to the matter became manifest with the establishment of the European Economic Community (EEC) in 1957. The Advisory Committee on Safety, Hygiene and Health Protection at Work was set up in 1974 to assist the Commission (Council Decision 74/325/EEC). Minimum OSH requirements were needed in order to complete the European single market. A number of directives were therefore adopted, such as Directive 82/605/EEC (replaced by Directive 98/24/EC) on protection against the risks associated with metallic lead, Directive 83/477/EEC (last amended by Directive 2009/148/EC) on asbestos, and Directive 86/188/EEC (last amended by Directive 2003/10/EC) on noise.

1. Single European Act

The adoption of the Single European Act in 1987 brought health and safety at work into the EEC Treaty for the first time, in an article laying down minimum requirements and allowing the Council to adopt occupational health and safety directives by qualified majority. The aims were: to improve workers' health and safety at work; to harmonise conditions in the working environment; to prevent 'social dumping' as completion of the internal market progressed; and to prevent companies from moving to areas with a lower level of protection in order to gain a competitive edge.

2. Treaty of Amsterdam (1997)

The Amsterdam Treaty strengthened the status of employment issues by introducing the title on employment and the Social Agreement. For the first time, directives setting out minimum requirements in the field of health and safety at work and working conditions were adopted by both Parliament and the Council by means of the codecision procedure.

3. Contribution of the Lisbon Treaty (2007)

The Lisbon Treaty contains a 'social clause' under which social requirements must be taken into account in the EU's policies. Upon the entry into force of the Lisbon Treaty, the Charter of Fundamental Rights of the European Union became legally binding on the Member States when they apply EU law.

4. European Pillar of Social Rights (2017)

The European Pillar of Social Rights, signed by the Council, the Commission and Parliament in November 2017, sets out 20 rights and principles, including the right, enshrined in Article 31 of the Charter of Fundamental Rights, to working conditions which respect workers' health,

safety and dignity. According to principle 10 of the Pillar, workers have the right to a high level of protection of their health and safety at work, as well as the right to a working environment adapted to their professional needs and which enables them to prolong their participation in the labour market. Though not legally binding in itself, the pillar is a package of legislative and soft-law measures that aims to drive upward convergence in living and working conditions in the EU.

B. Milestones: Directives and European Agency for Occupational Health and Safety

1. Framework Directive 89/391/EEC and individual directives

Article 137 of the Treaty of Nice (now Article 153 TFEU) formed the basis for EU efforts to improve the working environment with a view to protecting workers' health and safety. The adoption of Framework Directive 89/391/EEC, with its specific focus on the culture of prevention, was a milestone. It provided for preventive measures, information, consultation, balanced participation and training for workers and their representatives, in the public and the private sector. The framework directive forms the basis for 25 individual directives in different areas and for Council Regulation (EC) No 2062/94 establishing a European Agency for Safety and Health at Work. It has also had an impact on other legislative acts relating to temporary agency workers and aspects of working time in various directives.

The individual directives include the following:

- Health and safety requirements for the workplace (89/654/EEC) and the provision of safety and/or health signs at work (92/58/EEC);
- The use of work equipment (89/655/EEC amended by Directive 2001/45/EC and Directive 2009/104/EC); of personal protective equipment (89/656/EEC) and work with display screen equipment (90/270/EEC) and manual handling (90/269/EEC);
- Sectors: temporary or mobile construction sites (92/57/EEC); mineral-extracting industries (drilling) (92/91/EEC; 92/104/EEC) and fishing vessels (93/103/EC);
- Groups: pregnant workers (92/85/EEC) and protection of young people at work (94/33/EC);
- Agents: exposure to carcinogens (90/394/EEC), and the Directive on protection of workers from the risks related to exposure to carcinogens or mutagens at work (2004/37/EC); chemical agents (98/24/EC amended by Directive 2000/39/EC and Directive 009/161/EU); biological agents at work (2000/54/EC) and protection against ionising radiation (Directive 2013/59/Euratom repealing previous related directives); protection of workers potentially at risk from explosive atmospheres (99/92/EC); exposure of workers to the risks arising from physical agents

(vibration) (2002/44/EC), noise (2003/10/EC), electromagnetic fields (2004/40/EC amended by Directive 2013/35/EU) and artificial optical radiation (2006/25/EC);

- Substances: alignment of several directives on classification, labelling and packing of substances and mixtures (Directive 2014/27/EU).

Updating Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work is an ongoing process which will continue in the future: a first batch of 13 substances was covered in a proposal in May 2016, adopted in December 2017 (Directive (EU) 2017/2398). A second proposal in January 2017 reviewing limits for a further seven substances was adopted in January 2019 as Directive (EU) 2019/130 after Parliament succeeded in getting an occupational exposure limit value for diesel engine exhaust included in the scope. A third proposal in April 2018, covering a further five substances used in metallurgy, electroplating, mining, recycling, laboratories and healthcare, was adopted in June 2019 as Directive (EU) 2019/983. A fourth revision of the directive, with new or revised limit values for three cancer-causing substances (acrylonitrile, nickel compounds and benzene) was adopted in March 2022 as Directive (EU) 2022/431. The directive is one of the first measures under the Europe's Beating Cancer Plan.

Social partner agreements concluded within the social dialogue are another way to initiate social legislation (2.3.7). In December 2016, the Council adopted Directive (EU) 2017/159, implementing the social partners' agreement on improving working conditions in the fisheries sector concluded in 2013. However, a similar agreement for the hairdressing sector was not adopted in the form of a directive.

2. European Agency for Safety and Health at Work (EU-OSHA)

The European Agency for Safety and Health at Work, a tripartite agency based in Bilbao, was set up in 1996. Its aim is to foster the sharing of knowledge and information in order to promote a culture of risk prevention. It has developed the web-based platform for Online interactive Risk Assessment (OiRA), which contains SME-friendly sectoral risk assessment tools in all languages, and the Dangerous Substances e-tool, which provides company-specific advice on dangerous substances and chemical products and how to apply good practice and protective measures. Its European Risk Observatory monitors and forecasts new and emerging risks in order to enable preventive action. In 2004, 2009 and 2019, EU-OSHA conducted a survey among companies on new risks – ESENER (European Survey of Enterprises on New and Emerging Risks). In 2016, it completed a pilot project on the health and safety of older workers, initiated by the Commission at the request of the European Parliament. Furthermore, since

2000, the agency has run annual ‘healthy workplaces’ awareness-raising campaigns on various health and safety subjects. The 2020-2022 campaign focused on the prevention of work-related musculoskeletal disorders, while the 2023-2025 campaign will seek to raise awareness about the impact of new technologies on work and the associated challenges and opportunities around OSH.

C. Community action programmes and strategies on health and safety at work

Between 1951 and 1997, ECSC research programmes operated in the field of health and safety at work. The European Social Agenda, adopted in 2000, contributed to a more strategic approach to the matter at EU level. Subsequently, the 2002-2006 Community strategy on health and safety at work adopted a global approach to well-being in the workplace. The Community strategy for 2007-2012 focused on prevention. Its aim was to achieve a continuous reduction in occupational accidents and diseases in the EU, in particular through the definition and implementation of national strategies, the improvement and simplification of existing legislation, and better implementation of that legislation through the exchange of good practices, awareness-raising and improved information and training. The next strategy, the EU Strategic Framework on Health and Safety at Work 2014-2020, aimed to tackle three major challenges: improving and simplifying existing rules, strengthening the prevention of work-related diseases, including new risks, and taking account of the ageing workforce. Particular attention was paid to the needs of micro- and small businesses. Furthermore, the Commission’s communication of 2017 on safer and healthier work focused on modernisation of the EU OSH legislation and policy.

As part of the European Pillar of Social Rights Action Plan, the Commission brought forward a new EU Strategic Framework on Health and Safety at Work for 2021-2027. It focuses on anticipating and managing change in the new world of work, improving the prevention of workplace accidents and illnesses, and increasing preparedness for any potential future health crises. Like the previous strategies, this new framework is expected to trigger the adoption or revision of national OSH strategies and lead to coordinated action at different levels, involving the Member States, social partners and other key stakeholders.

Since the COVID-19 pandemic, the Commission has taken measures to protect the health and safety of workers. Notably, in June 2020, the Biological Agents Directive (2000/54/EC) was updated to include SARS-CoV-2 in the list of biological agents to account for the new risks in the workplace. The Commission encouraged employers to assess the risks and

take preventive and protective measures to minimise harm, especially for those working in direct contact with the virus. In April 2020, the Commission issued guidance on coming back to work after lockdown, and developed a practical online tool to help employers with risk assessment during the pandemic. In May 2022, Member States, workers, employers and the EU Advisory Committee on Safety and Health at Work reached an agreement on recognising COVID-19 as an occupational disease in health, social care and domiciliary assistance. Furthermore, given the developments in the use of digital technologies at work, the Commission will, among other initiatives, review the Workplace Directive and the Display Screen Equipment Directive, and has presented a proposal for a regulation laying down harmonised rules on artificial intelligence (the Artificial Intelligence Act) and a proposal for a regulation on machinery products, all of which take OSH aspects into account.

Future work planned in this area includes proposing specific limit values for asbestos in the Asbestos at Work Directive, on lead and diisocyanates in the Chemical Agents Directive, and on cobalt in the Carcinogens and Mutagens Directive. Furthermore, the Commission is due to present an action plan with new or revised occupational exposure limits for at least 25 additional substances in the Carcinogens and Mutagens Directive.

Role of the European Parliament

Parliament has frequently emphasised the need for optimal protection of workers' health and safety. It has adopted resolutions calling for all aspects directly or indirectly affecting the physical or mental well-being of workers to be covered by EU legislation. Parliament has also had a significant influence on directives that improve working conditions. It supports the Commission in its efforts to improve the provision of information to SMEs. It takes the view that work must be adapted to people's abilities and needs, and not vice versa, and that working environments should take greater account of the special needs of vulnerable workers.

Parliament has urged the Commission to investigate emerging risks that are not covered by current legislation, e.g. exposure to nanoparticles, stress, burnout and violence and harassment in the workplace. In particular, Parliament has been instrumental in the adoption of a framework agreement on prevention from sharp injuries in the hospital and healthcare sector signed by the EU social partners, which was implemented by Council Directive 2010/32/EU. It has also called for improvements to the existing legislation on the protection of pregnant workers and protection of workers from musculoskeletal disorders. Further key requests include establishing a directive laying down minimum standards for the recognition

of occupational diseases, and extending the scope of Framework Directive 89/391/EEC to include certain groups of workers (such as the armed forces, self-employed people, domestic workers and home workers).

In June 2010, Parliament rejected the Commission's proposal to amend the directive on the working time of mobile road transport workers, because it did not agree that self-employed workers should be excluded from the scope of the directive. As a result, the Commission withdrew its proposal. In September 2018, Parliament adopted a resolution on pathways for the reintegration of workers recovering from injury and illness into quality employment, based on three pillars: prevention and early intervention; return to work; and changing attitudes towards the reintegration of workers. In October 2021, Parliament adopted a resolution with recommendations to the Commission on protecting workers from asbestos. It proposes developing a comprehensive European strategy for the removal of all asbestos in order to safely remove the substance from the built environment once and for all and thus better protect workers and citizens. It also proposes updating Directive 2009/148/EC on asbestos, and calls for a legislative proposal on the recognition of occupational diseases and minimum standards for the compensation of victims of asbestos-related occupational diseases.

Beyond amending proposed legislation and monitoring and encouraging the Commission's other work in the field of health and safety, Parliament also approaches the subject in a forward-looking manner, looking into new risks associated with technological innovation and related changes in work organisation. On 10 March 2022, Parliament adopted a resolution on a new EU strategic framework on health and safety at work post 2020. In the resolution, it makes a series of demands, including for more ambitious action on work-related cancer, a broader and more comprehensive directive on musculoskeletal disorders and rheumatic diseases, and for the gender dimension to be mainstreamed in all occupational health and safety measures. It also calls for the right to disconnect to be included in the strategic framework and for a directive to be proposed on the prevention of psychosocial risks. On 5 July 2022, Parliament adopted a resolution on mental health in the digital world of work, recognising the impact of the COVID-19 pandemic on the organisation of work and the mental health of workers. In the resolution, Parliament calls on the Commission to propose legislative initiatives on the management of psychosocial risks and well-being at work and to put forward an EU mental health strategy and a European care strategy.

Parliament calls for action to protect mental health

An increase in mental health problems mean that this could be the next health crisis, which is why MEPs want action

Covid-19's impact on mental health

The Covid-19 pandemic and the subsequent economic crisis have placed a huge strain on everyone's mental health and well-being, which has led to an increase of work-related psychosocial risks and higher rates of stress, anxiety and depression. However, mental health is not treated as a priority in the same way as physical health, says the Parliament in a resolution on mental health in the digital world of work adopted on 5 July 2022.

The report on mental health in the digital world of work points out that 64% of young people between 18 and 34 were at risk of depression in 2021, due to a lack of employment and financial and educational prospects, as well as loneliness and social isolation.

Preventing work-related mental health issues

The resolution calls on the EU institutions and countries to recognise the high level of work-related mental health problems and to find ways to help prevent mental health problems. It also underlines the need to eradicate violence, discrimination and harassment at work.

The committee also calls for legislation establishing minimum requirements for telework across the EU, without undermining the working conditions of teleworkers. It could cover working conditions, such as ensuring it is voluntary and that the rights, work-life balance, workload and performance standards of teleworkers are equivalent to those in the place of work. It also calls for flexible work hours to help mitigate work-related stress, education on mental health and training for employers. Parliament proposes that 2023 is the EU Year of Good Mental Health to highlight the issue.

The latest report underlines the Parliament's concern with mental health. In a resolution on the EU's public health strategy post Covid-19 adopted in July 2020, Parliament recognised mental health as a fundamental human right and called for an EU action plan on mental health.

In 2021 MEPs called for the right to disconnect from work outside working hours with no negative consequences.

Workers' right to information, consultation and participation

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The European Union complements the Member States' activities with regard to the right of workers to information and consultation by adopting minimum requirements by means of directives or through measures designed to encourage cooperation between the Member States.

The right of workers to information, consultation and participation has been a key theme in European debate since the first Social Action Programme was adopted in 1974. The 1989 Community Charter of the

Fundamental Social Rights of Workers (retained in Article 151 TFEU) stressed the desirability of promoting employee participation. However, the Commission's proposals in this area often encounter resistance. A proper legal basis for Community legislation did not exist until the Agreement on Social Policy was incorporated into the Treaty of Amsterdam in 1997. In 2009, the Charter of Fundamental Rights of the European Union was incorporated into Article 6(1) TEU. Article 27 of the Charter recognises workers' right to information and consultation.

As regards employee involvement, Article 153 TFEU entrusts Parliament and the Council with the power to adopt:

- Measures designed to encourage cooperation between Member States;
- Directives setting out minimum requirements for gradual implementation.

The ordinary legislative procedure applies, with prior consultation of the European Economic and Social Committee and the European Committee of the Regions.

B. Legislation in force

A first group of directives deals with the right of workers to be informed of conditions applicable to the contract or employment relationship and the right to be informed and consulted on redundancies or transfers:

- Council Directive 75/129/EEC on collective redundancies, as amended by Council Directives 92/56/EEC and 98/59/EC, requires employers to enter into negotiations with workers in the event of mass redundancy, with a view to identifying ways of avoiding collective redundancies or reducing the number of workers affected;
- Council Directive 2001/23/EC on the safeguarding of employees' rights in the event of transfers of undertakings, businesses or parts of undertakings or businesses (consolidating Council Directives 77/187/EEC and 98/50/EC) stipulates that workers must be informed of the reasons for any transfer and its consequences; it also contains material provisions on safeguarding employees' jobs and rights in the event of transfer;
- Directive 2002/14/EC establishing a general framework for informing and consulting employees in the European Community lays down minimum procedural standards protecting the rights of workers to be informed and consulted on the economic and employment situation affecting their workplace;
- Directive (EU) 2019/1152 on transparent and predictable working conditions in the European Union. This directive establishes new rights (e.g. advance information on work schedules) for all workers in all

forms of work, including those in non-standard and new forms of work such as platform work.

The Commission carried out a fitness check in 2013, which concluded that the directives are broadly fit for purpose and their benefits outweigh the costs, but that some gaps remain – notably their application to public service workers, seafarers and SMEs. A recast of the information and consultation directives was contemplated in 2015 and the Commission launched a public consultation, but there has been no follow-up since.

In January 2018, a Council directive transposing an agreement between social partners in the maritime transport sector was adopted, putting an end to the exclusion of seafaring workers from the directives on information and consultation of workers.

As regards public sector workers, none of the directives concerning the right of workers to be informed and consulted applies to public administrations (see Court of Justice of the European Union Cases C-583/10, Nolan and C-108/10, Scattolon). When negotiating the General Framework Directive in 2001, Parliament tried to have the scope extended to the public sector, but the Council rejected this. In December 2015, the Sectoral Social Dialogue Committee for Central Government Administrations signed a sectoral agreement on common minimum standards of information and consultation rights for central administration workers and requested implementation by way of a Council directive. On 5 March 2018, the Commission informed the social partners that it would not propose this agreement to Council for implementation. Following legal action by the European Public Service Union (EPSU), the Court of Justice of the European Union ruled on 24 October 2019 that the Commission's right of initiative entitled it to decide whether or not to make social partner agreements legally binding in all EU Member States. The EPSU appealed but the appeal was dismissed in September 2021.

A second group of directives encompasses the rights of workers to be informed and consulted insituations with a transnational component:

- Council Directive 94/45/EC, as revised by Directive 2009/38/EC on the introduction of European Works Councils(EWCs). EWCs bring together central management and employee representatives across Europe to discuss matters such as a company's performance, prospects and employment, restructuring and human resources policies. Workers have also been granted certain rights to information and consultation with regard to the working environment. EWC legislation covers multinational companies with at least 1 000 workers in the EU/EEA and at least 150 staff in two or more Member States. A dedicated database,

maintained by the European Trade Union Institute (ETUI), provides data on EWCs;

- Directive 2004/25/EC on takeover bids, under which the employees of the companies concerned, or their representatives, should be given an opportunity to state their views on the foreseeable effects of such a bid on employment; the usual rules on informing and consulting employees also apply;

- Directive (EU) 2017/1132 on certain aspects of company law, amended by Directive (EU) 2019/2121 as regards cross-border conversions, mergers and divisions. The provisions on cross-border mergers were updated and provisions and conditions were added concerning cross-border conversions and divisions of limited liability companies. The amended directive strengthens the position of employees and their representatives in terms of information, consultation and rights to participation prior to a cross-border conversion. It places a duty on management to respond to the results of employee consultations and establishes the right of trade unions and national employee representatives to analyse the management's report on the effects of the planned conversion.

On 14 May 2018, the Commission published a REFIT evaluation of the European Works Council Directive and concluded that information for workers has improved in terms of quality and scope, but the directive has not increased the number of new EWCs.

A third group of directives aims to lay down rules applicable to situations with a transnational component, granting partial rights to participation in decision-making:

- Council Directive 2001/86/EC supplementing the Statute for a European company with regard to the involvement of employees establishes rules on worker participation in decisions on the strategic development of the company. Not only are employees informed and consulted through a body similar to a European Works Council, but provision is made for board-level employee participation where this form of participation was applied in the national founding companies (the so-called 'before-and-after' principle);

- Council Directive 2003/72/EC supplementing the Statute for a European Cooperative Society with regard to the involvement of employees ensures that employee representatives can exercise influence over the running of European Cooperative Societies;

- Directive (EU) 2019/2121 amending Directive (EU) 2017/1132 as regards cross-border conversions, mergers and divisions requires the rules of the destination state to be applied to employee participation, i.e. the company resulting from the cross-border merger is subject to the rules in

force concerning employee participation, if any, in the Member State where it has its registered office.

The fourth group consists of: two cross-sectoral agreements between social partners (implemented by Council Directive 97/81/EC on part-time work and Council Directive 1999/70/EC on fixed-term work), Directive 2008/104/EC on temporary agency work, the Framework Agreement on Digitalisation (2020), and several health and safety directives, all of which contain implicit information and consultation provisions.

C. Other initiatives

Companies and workers' representatives have begun concluding transnational company agreements (TCAs), a form of social dialogue in multinational companies, against the background of the growing internationalisation of companies. TCAs take various forms and are drawn up jointly for application in more than one Member State by company representatives and workers' organisations. However, this kind of practice can raise legal and political issues regarding the relationship between the different vertical levels of social dialogue (international, European and national) and the horizontal spheres of application (cross-sectoral, sector-specific and company-level). Furthermore, TCAs may clash with national norms and references, and few dispute resolution mechanisms are in place.

The Commission stated its intention to accompany and monitor the development of transnational company agreements by supporting exchanges of experience and research. It maintains a database on transnational company agreements.

Role of the European Parliament

Parliament has adopted a number of resolutions calling for workers to have the right to be involved in company decision-making and for this right to apply in both national and transnational companies, irrespective of their legal status. Back in 2009, Parliament called in its resolution of 19 February on the implementation of Directive 2002/14/EC: informing and consulting employees in the European Community for public-sector workers to be included in the scope of the information and consultation directives.

In its resolution of 19 January 2017 on a European Pillar of Social Rights, Parliament recalled the value of involving workers in decision-making and company management and pointed to social economy enterprises, such as cooperatives, as a good example in terms of creating quality employment, supporting social inclusion and promoting a participatory economy. In its resolution of 22 October 2020 on the employment and social policies of the euro area 2020, Parliament stressed that successful implementation of the EU Recovery Plan requires proper social dialogue at all levels with effective involvement of the social partners.

It underlined the importance of strengthening workers' and trade union rights, as well as collective bargaining and workers' participation, which are fundamental tools for democracy and inclusion.

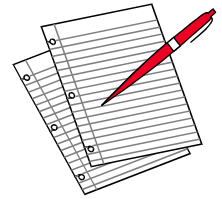
In its resolution of 17 December 2020 on a strong social Europe for Just Transitions, Parliament called on the Commission to introduce a new framework directive on workers' information, consultation and participation for European company forms, including subcontracting chains and franchises. It also called for the revision of the European Works Council Directive. The European Parliament's Committee on Employment and Social Affairs is currently working on an own-initiative legislative report on the revision of the European Works Councils Directive.

In its resolution of 17 December 2020 on sustainable corporate governance, Parliament underlined the need for greater employee involvement in company decision-making processes in order to better integrate long-term objectives and impacts. It again invited the Commission to consider revising the European Works Council Directive and to establish a new framework for informing, consulting and involving employees in European companies. In another resolution of 10 March 2021 on corporate due diligence and corporate accountability, Parliament called for the information and consultation directives to be used to guarantee rights for trade unions and workers' representatives to be involved in establishing and implementing due diligence strategies in their companies.

In its resolution of 16 December 2021 on democracy at work: a European framework for employees' participation rights and revision of the European Works Council Directive, Parliament highlighted the importance of workers' participation at the workplace and insisted that before management decisions are made, workers' representatives should have access to adequate information in order to assess the implications of such decisions. Parliament also called for the introduction of a new framework directive on workers' information, consultation and participation for European companies in their various forms.

Questions.

1. What is economic security?
2. Name the types of economic security.
3. What is national security?
4. Name the objects of national security.
5. Name the subjects of national security.
6. Name the basic principles of national security.
7. Describe the priorities of national interests of Ukraine.
8. Name the main real and potential threats to national security in the environmental sphere.
9. Name the main real and potential threats to national security in the social and humanitarian spheres.
10. Indicate the main functions of the subjects of national security.
11. Describe the structure of life safety management bodies at the regional level.
12. Name the order of rescue operations in case of emergencies.
13. Describe the implementation of sanitary and anti-epidemic measures.
14. How are non-productive accidents investigated?



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