

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ  
«ХАРКІВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»

**МЕТОДИЧНІ ВКАЗІВКИ**

**до виконання самостійної роботи**

**«Контрольні запитання з лекційного матеріалу для виміру якості  
навчання»**

**з курсу «Основи охорони праці»**

**для студентів, що вивчають предмет на іноземній мові**

**METHODICAL INSTRUCTIONS**

**for independent work**

**«Control questions on the lecture material to determine the quality of  
learning »**

**on the course «Basics of labor protection»**

**for students who are studying the subject in English**

Харків 2018

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Укладачі: В. В. Березуцький  
Г. Ю. Бахарєва  
І. М. Любченко  
О. Я. Пітак

Рецензент: О. Г. Янчик

Кафедра охорони праці та навколишнього середовища

## **INTRODUCTION**

The aim of discipline «Basics Labor Protection» is to provide future engineers of theoretical knowledge and practical skills necessary to address issues related to ensuring safe and healthy environment in the development and use of new technology and processes, production organization, which exclude the negative effects on man and environment.

The scientific content of the course are both theoretical and practical bases of the OSH management in terms of production, methods of prevention and protection of workers from dangerous and hazardous working conditions.

Questions of the lecture material of the subject «Labor Protection» for students knowledge self-control, obtained on the lectures, are driven at the methodical indications. Also, the answers on the proposed questions are driven in chaotic order. Its necessary that to invoke of the students thinking about correct answers, answering to the questions.

# 1 QUESTIONS

## Lecture 1

1. What are the aim and tasks of the discipline “Labor protection”?
2. What is the structural logic of the course and its place in the general system of sciences of the life safety?
3. What are the main structural elements of OSH management system?
4. What are the main objectives of the OSH management at the regional level?

## Lecture 2

1. What is a production traumatism? Types of trauma (injury) and production traumatism (injuries)
2. Classification of accidents
3. Categories of failures
4. What are the methods for analysis of production traumatism? The main provisions of topographical and monographic methods.

## Lecture 3

1. What are the basic parameters of meteorological terms?
2. What are the main categories of works? Their characteristics
3. What are the optimal and admissible meteorological conditions?
4. Special clothes and individual protective facilities

## Lecture 4

1. What is the ventilation?

2. What are the types of ventilation?
3. What are the general technical and sanitary requirements for ventilation?
4. What is the air conditioning?

### **Lecture 5**

1. What are the main illumination units?
2. What is the natural illumination? Coefficient of natural luminosity
3. What are the main illumination types? Characteristics of general and local illumination
4. What are the lamps? Types of lamps.

### **Lecture 6**

1. What are the Organizational measures on providing of safe condition of labour?
2. What is the performer of works responsible for?
  3. The guard of labour of workers, busy on works with an enhanceable danger
4. What is necessary for safe exploitation of container?

### **Lecture 7**

1. What are the types of electricity action on the man?
2. What is the touch voltage? Its main characteristics
3. What is the step voltage? Its main characteristics
4. What are the basic technical measures of defense are in electrical units?

## **Lecture 8**

- 1.** What is the self-ignition of matters?
- 2.** What are the main requirements for evacuation of people?
- 3.** What is the system of warning of fire?
- 4.** What are the duties of proprietors and lessee for fire safety?

## 2 ANSWERS

Find the correct answers to questions

1.

- - Ensure the implementation of state policy in the field of labor;
- - Formed with the participation of trade unions of the program of activities on safety, hygiene and working environment, which are inter-  
importance;
- - Organize the appropriate regional emergency - rescue units;
- - Monitor compliance with the regulations of labor protection;
- - Create the necessary funds of labor protection.

2. Aim of the discipline:

The aim of discipline "Labor Protection" is to provide future engineers of theoretical knowledge and practical skills necessary to address issues related to ensuring safe and healthy environment in the development and Use of new technology and processes, production organization, which exclude the Negative effects on man and environment.

The scientific content of the course are both theoretical and practical bases of the OSH management in terms of production, methods of prevention and protection of workers from dangerous and hazardous working conditions.

Tasks of the discipline

As a result of studying the course "Labor protection" a student should know:

- ✓ legislative and regulatory documents on protection of labor;
- ✓ concept of occupational safety in the country and in the workplace;

- ✓ duties and responsibilities of heads of enterprises (organizations) and their departments to ensure healthy and safe working conditions;

- ✓ major international instruments for the protection of labor;

- ✓ methods and tools to ensure regulatory parameters of dangerous and harmful factors.

As a result of studying the course "Labor protection" student should be able to:

- ✓ organize the issues of occupational safety in the workplace (the organization);

- ✓ use regulations and ensure a safe and friendly environment in the workplace;

- ✓ identify hazardous and harmful factors that accompany the workplace;

- ✓ organize and participate in the investigation of accidents and accidents at work.

**3.** - Facility management, a system of safety at a particular enterprise or association, in the region, in Ukraine as a whole;

- Controls, which include the control of the object, development of managerial action and their implementation, monitoring of management action, analysis of such objects, the formation of job safety, comparisons.

In addition to administrative actions, the state occupational safety and health affect different perturbing effects that stem from real political and socio-economic processes and are often random, unpredictable, and sometimes can be predicted in advance. Prior to such influences, for example, are structural changes in the economy, the processes of privatization, the creation of new forms and methods of farming, the development of small and medium business, introducing a system of social insurance against accidents and occupational diseases in the workplace and the like. This allows using the appropriate management decisions to avoid

negative impacts or enhance the positive effect of the disturbing influence, which experienced facility management.

4. The study course "Labor protection" must begin with awareness of it among other disciplines, which also is dealt with issues of human security in the workplace. Structural logic is the basis for compiling the software discipline and appropriate textbooks or manuals. "Labor protection" refers to a scientific field of "Health and Safety", which also include discipline, subject to review (study), which is a security man and nature, as well as those elements of the environment of human existence that may constitute a threat to their lives and health. "Health and Safety," Occupational Safety "," Safety in the industry, "Ecology," "Civil Defense" - these disciplines belong to the above mentioned direction. They have common themes, which may be a greater or lesser extent, reflected programs. The main task of the departments who deliver these courses is the most complete and best program aimed at rational and effective use of allocated instructional time. Therefore, it is necessary to minimize repetition, duplication of those already established disciplines. In presenting the material should be use the knowledge gained by students in high school and previous courses, and on this basis to develop them further.

- But keep in mind the fact that these subject matters are reading at different proficiency levels, which should ensure that appropriate for this level of quality of knowledge. Thus, at the level of bachelor's study of "Ecology", "to security of life" and "occupational safety", and at the level of specialist (Master), "Labor Protection in the industry" and "civil defense".

5.

- The statistical method
- deep static analysis
- The group method
- The topographical method

- A monographic method
- An economic method
- The method of physical and mathematical design
- Method of scientific prognostication of safety of labor

A topographical method consists of study of reasons of accidents at the place of their incident, which are systematic inflicted conventional signs on the plans of area, workshop, enterprise. A method is given by the evident picture of hearths of traumatism without the study of situation and causality, causing an accident.

The statistical methods of research give the general picture of the state of traumatism, set his dynamics, expose certain dependences, but here terms an accident happened in which are not studied deeply.

A monographic method is included by the detailed research of all of complex of terms an accident happened in which: processes, equipment, materials, protective facilities, terms of production situation et cetera Not only reasons of accidents but also hidden (potential) dangerous and harmful factors which can result to in traumatism come to light as a result of research.

**6.** A traumatism is name any violation of normal vital functions of organism.

A production traumatism\_is the phenomenon, characterizing the aggregate of work accidents.

A work accident\_is a trauma, got working on a production and caused a failure to observe of requirements of safety of labor.

To traumatism on a production take:

- Accidents;

- Professional diseases;
- Professional poisonings.

An industrial accident is the event or sudden affecting limited in time worker of dangerous production factor or environment, happening in the process of implementation by him labor duties or tasks of leader of works, because of which harm is caused to the health or death came.

As a result of accident there are traumas. A trauma (injury) (in a translation from Greek is a wound) is a damage of fabrics and organs of man in by violations of their integrity and functions, caused the action of factors of external environment.

In dependence here character of damages they are classified (subdivide) on:

In dependence here character of damages they are classified (subdivide) on:

- Mechanical (injuries, breaks, cuts et cetera);
- Thermal (burns, frost-bites, sun shots);
- Chemical (sharp poisonings, burns by acids, lyes);
- Electric (electric shots, electric traumas);
- Ray (burns, damage of fabrics, blood of productive organs);
- Nervously and Psychical (fright, shock);
- Combined.

7. Failures are divided into two categories:

- I - failures because of which:

5 perished or 10 is trauma and more persons;

The troop landing of poisonings, radio-active, biologically dangerous and other contaminants for the scopes of sanitary-hygienic area of enterprise happened;

· The concentration of contaminants was increased in a natural environment more as in 10 times;

· Building, buildings or basic constructions of the object is blasted, that created a threat for life and health and far of workers of enterprise or population.

II - failures because of which:

Perished to 5 or from 4 to 10 persons are trauma;

· Buildings, buildings or basic constructions of object are blasted, that created a threat for life and health of workers of workshop, area with the quantity of workings 100 persons and anymore.

Cases of violation of technological processes, works of equipment, temporal areas of production because of wearing-out of the automatic protective blocking and other local violations in-process workshops of areas etc. does not belong to the categories of failures, investigated in obedience to the requirements of Inquiry of failures with accidents is prosecuted an in obedience to Statute, without accidents by the courts of inquiry, which are created:

In the case of failures I categories - by the order of central organ executive power or order of local state administration (for example, areas) on a concordance with Ministry of emergency measures and proper organs of the State supervision after a labor protection;

In the case of failures II categories - by the order of leader of organ, to the sphere of management of which an enterprise (for example, ministry) belongs, or by the order of district state Administration or executive branch of local self-government (concordances are analogical).

**8.** The sharp poisonings are attributed to the accidents.

On weight of consequences accidents are classified as follows:

- Shallow traumatism ( without the loss of ability to work, makes all of 70-80% accidents);

- Easy (loss of ability to work not above 3th days, I.e. with the temporal loss of ability to work);

- Protracted (loss of ability to work from 4 days to 4 months);
- Accidents with a heavy end (complete or partial loss of ability to work, I.e. complete or partial disability). On one accident with a heavy end there are 17 ordinary accidents and 120 cases of microtraumatism.
- Group (happenings simultaneously with 2 and more by workers regardless of weight of bodily harms);
- Mortal.

On the types of responsibility accidents are classified:

- Through fault of employer;
- Through fault of injured person;
- Through fault of other enterprise or worker of other enterprise;
- Extraneous person;
- Mixed;
- As a result of natural calamities (insurance, payment worker from the first day of disability).

In dependence here it, the sum of payments is determined (sum of damage to the person).

At the place and to time of incident ( on connection with implementation of labor duties) accidents can be divided into two groups: accidents of unproductive and production character. On connection with production activity the last are classified: related to the production and unrelated with a production. Order of their investigation and registration, setting and payment of manuals on temporal disability, damages to the person different.

**9.** Special clothes and individual protective facilities serve for prevention of organism from overheat or super cooling.

The overall of workings hot workshops is made from a smooth woolen cloth, tarpaulin, linen fabrics and also from a synfil, chemically treated with a fireproof impregnation and other For protecting of chairman

from an overheat and burns apply hat with the wide fields from a thick felt, felt or rudely woolen cloth.

For defense of feet apply the special shoe sole of which chromic tanning (but not rubber) and ribbed.

For defense of hands utilize tarpaulin mittens.

For defense of eye and person utilize corymbs from organic glass, metallic net and combined.

In winter for workings on opened air weddings' trousers, weddings' jackets and felt boots, are foreseen.

In premises from a meteorological complex by cooling protecting of premises from a blast carried out the device of platforms, thermal curtains, heating, heating of apartment, facilities of individual defense - FID, by a rational overall.

**10.** Temperature of air ( $t$ ,  $^{\circ}\text{C}$ ) it is one of basic parameters which characterize him the thermal state (degree of heating) that is kinetic energy of molecular motions.

- Content of humidity in air. In a production apartment estimated relative humidity (70 %) which is attitude of absolute humidity toward maximally possible at this temperature.

- Under atmospheric pressure ( $P$ ) the module of size which characterizes intensity of forces conditioned mass of the higher located post of air on unit of surface is understood. It is accepted normal to count pressure, even 1013,25 GPa.

- Speed (mobility) of air. ( $V$ , m/s) estimated the vector of middle speed of moving of currents (streamed) of air under the action of different forces which induce.

**11. Optimal.** Meteorological conditions are combinations of parameters of microclimate, which at the protracted and systematic influence on a man provide the maintenance of the normal functional and thermal state of organism without tension of reactions of thermo adjusting. They provide feeling of thermal comfort and create pre-conditions for the high level of capacity.

Admissible meteorological terms are combinations of parameters of microclimate, which at the protracted and systematic influence on a man can cause coming, that and the changes of the functional and thermal state of organism and tension of reaction are quickly normalized thermo adjusting which keep indoors outside physiology adaptation possibilities. Thus there are not damages or violations of the state of health but can be observed discomfort warmly feeling, worsening of feel and decline of capacity.

**12. Categories of works.** The parameters of favorable meteorological terms are different for the different levels of the physiology loading of organism. All of works subdivide on the charges of energy on the followings three categories:

A. Easy physical works (categories of Ia, Ib).

Ia is easy physical work at which the charges of energy do not exceed 139 W.

Ib is easy physical work at which an charges of energy is 140...174 W

B. Physical works of middle-weight. (Categories of IIa, IIb) - engulf the types of activity at which an expense of energy is 175...232 W (category of IIa) and 233...290 W (category II b).

Works, related to the permanent walking fall into the category of IIa, with moving of shallow (to 1 kg) wares which are executed sitting or upright, need the proper physical tension but moving of weight does not

require (mechanical frame-clamping premises of machine-building enterprises, spinning - weaving production but other)

Works, related to walking and which are accompanied transferences of small ( to 10 kg) weight with physical tension moderate, fall into the category of IIb (blacksmith's, thermal, welding premises of machine-building plants and metallurgical enterprises is mechanized).

V. Category physical fags. (Category III) - engulfs the types of activity at which the expense of energy exceeds 290 W.

To the category III works, related to systematic physical tension, belong, and also with permanent movements and transference of considerable ( over 10 kg) weight (basic processes martin, rental, blacksmith's - with the hand forging, thermal production but other).

**13.** Air conditioning is the creation and automatic maintenance of temperature, relative humidity and air velocity for setting optimal microclimate parameters (favorable conditions) or parameters required by process, which are impossible to be created by means of conventional ventilation.

By way of preparation and distribution of air conditioners are divided into central and local.

The design involves preparation of central air conditioners air service outside the building and its distribution through the duct system. Central air conditioners are used in large workshops.

In the preparation of local air conditioners air passes directly into the serving areas. Air is distributed without ductwork (air conditioners are installed in window openings). Local air conditioning is used in small spaces (laboratories, offices, etc.)

**14.** Ventilation is one of the most important hygiene measures to ensure proper air environment indoors. Effective ventilation system also

contributes to solving the problem of protecting air. According SNIP 2.04.05-92 / 1 / in all production facilities ventilation must be provided.

Ventilation — an organized, is given by calculating and regulation, ventilation in buildings (residential, industrial and public buildings).

Unorganized finding and removal of air goes through the pore density and external protections (infiltration) through windows, vents, openings (ventilation).

Ventilation problem is in ensuring clean air environment and microclimate parameters by the set of norms.

Questions related to determining the number of air fed inside, choice of place and its ways of serving, so the decision is the simplest and most economical, is the essence of ventilation as a science, based on the overall aerodynamics. Aerodynamic ventilation essence lies in the internal solution (flow of air through pipes and canals) and external (radiation patterns of distribution of free jets in a room and absorption spectra, and the wind flow around building).

Ventilation is achieved by removing contaminated or heated air from a room and feed it with fresh air.

**15.** Number of forced air  $L_{pr}$ , m<sup>3</sup>/hour, must meet, usually, the number of ejected  $L_{vyd}$ , m<sup>3</sup>/hour:

$$L_{pr} = L_{vyd} \quad (2. 1)$$

In some cases, it is required that  $L_{pr}$  is more or less than  $L_{vyd}$ . For example, with ventilation of two adjacent buildings, one of which is evaporating harmful substances, to prevent the penetration of these substances in the second vacuum space created, ensuring  $L_{pr} \geq L_{vyd}$ .

Purge air should be submitted in those parts of premises where quantity of evaporating pollutants is minimal (clean area), and remove from the zone of maximum concentration of pollutants and excess heat

(contaminated area). Location "clean zone" defines the place of supplying the purged air — in a working, upper and lower zone's space.

Place of fresh air intake is selected considering wind direction, with windward side relative to sources of emissions, far from pollution.

Ventilation system should not create noise in the workplace, which exceeds the maximum permissible level.

**16. By functionality:**

- Working;
- Emergency (during production problems and accidents).
- By way of moving air:
  - Natural;
  - With mechanical instruments;
  - Mixed.
- Local action (building coverage):
  - Mutual Exchange;
  - Local;
  - Combined.

**17. LAMPS** are sources of light, celled in an armature, intended for the correct distributing of light stream and defense of eyes from the surplus brightness of this source of light. An armature protects the source of light from mechanical damages, and also from smoke, dust, soot, moisture, provides fastening and connecting to the source of feed.

- After distributing of light stream in spacious lamps divide into such groups:
  - 1) lamps of direct light, that from 50 to 90 % all of light stream send in a lower semi-sphere;
  - 2) lamps of the reflected light with a radiation in an overhead semi-sphere from 55 to 90 % light stream;
  - 3) lamps of the dissipated light.

Such division is based on the relation of light stream, radiated in a lower sphere, to the complete light stream of lamp.

Depending on structural implementation distinguish lamps:

- - opened;
- - closed;
- - dust impenetrable, dust-proof (air-tight from a dust);
- - mostly protective; what do not skip moisture;
- - explosion-proof;
- - explosion-proof, increased reliability in relation to an explosion.

Lamps are on purpose: for general and local illumination.

Lamps can be chosen depending on description circumferential environments.

It should be noted that efficiency of lighting options can go down in the process of exploitation, that is why a systematic supervision is needed after their state, timely cleaning of armature and glass surfaces and lamps from a dust, soot, painting of equipment, wall, ceiling.

By the proper placing of lamps the system of illumination is created in the volume of working apartment.

## **18.**

- Luminosity
- Brightness
- An index of dazzling
- Visibility
- Contrast
- Background

## **19. - General illumination**

- Local illumination
- Emergency illumination

- Evacuation illumination

- Protective illumination

General illumination is illumination, at what light fixtures take a place in the overhead area of apartment evenly without the account of location of workplaces (general even illumination) or equipped with depending on the location of equipment of workplaces (general illumination).

The general even placing of lamps (in a rectangular or chess order) for creation of rational luminosity is applied at implementation of the same type works in all of apartment, at the high-slay of workplaces (frame-clamping workshops in default of conveyer, tree Cutting but other).

General illumination is foreseen for providing on the row of workplaces of luminosity in this area (thermal stove, forge hammer and others like that), when near each of them equip an additional lamp (for example, obliquely light), and also at implementation on the areas of workshop of different after character works or at presence of shading an equipment.

Local illumination is additional to general and created lamps which concentrate a light stream directly in the workplace.

Local illumination is stationary and portable (tension 12-36 V) and serves for illumination only of workplaces.

Application of one local illumination in a shopfloor shut out sanitary norms, as one local illumination does not provide sufficient evenness of illumination of nearby areas.

It is thus needed to mean that luminosity of working surface, created the lamps of general illumination, at the system of the combined illumination the guilty is 10 % from a norm, but not less than 150 lk at the use of gas-unloading lamps and 50 lk at incandescent lamps.

**20.** Natural illumination is illumination of apartments by light of sky (to the lines or reflected) which penetrates through light cuts in external protective constructions.

Natural illumination is created the natural sources of light - direct sunbeams (80 %) and diffusive light of sky (20 %, that other sunbeams, dissipated an atmosphere).

Natural illumination - it biologically the most valuable type of illumination which the eye of man is maximally adjusted to. His action is determined high intensity of light stream and favorable spectral composition which combines the even distributing of energy in the area of visible, ultraviolet and infra-red types of radiations. Natural illumination is a factor which determines the level of luminosity and condition of visibility not only, but yet and positively psycho physiological influences on a man due to direct connection with outward things through light cuts.

Luminosity created the dissipated daylight in the opened place is different for different breadths, time of year and daypart, that is why natural illumination can not be in number estimated a value luminosity. For the estimation of natural illumination a relative size - coefficient of natural luminosity is accepted (CNL).

CNL is a relation of natural luminosity of  $E_{out}$ , set area created in some point into the apartment of sky (direct or reflected) light, to the simultaneous value of external horizontal luminosity of  $E_t$ , created light of the fully opened firmament. CNL is expressed in percents and determined after a formula

$$CNL = \frac{E_{out}}{E_t} 100\%. \quad (2. 2)$$

**21.** It is necessary for safe exploitation of production container:

- to retain a container in the in good condition state;
- to move it load by liftings faucets in accordance with the requirements of Rules of structure and safe exploitation of load by liftings faucets and PUE;

- to move a container by other facilities of mechanization in accordance with the requirements of ГOCT 12.3.010-82 and IIYE;
- to organize and conduct technical examination of container with the conduct of the proper magazine;
- to conduct control of the state of grounds for banking of container;
- to appoint persons, accountable for safe exploitation of container and providing of fire safety.

**22.** For the safe leadthrough of works it is necessary to execute the followings organizational measures:

- to appoint workers, accountable for a safe lead through works;
- to give out a dress or order;
- to give out permission on preparation of workplaces;
- to prepare workplaces;
- to carry out admitting to works;
- to organize a supervision at implementation of work;
- to organize passing to other workplace;
- to design dwells and its completions.

Thus accountable for the safe leadthrough of works is:

- worker which gives out a dress or order;
- worker which accords permission on preparation of workplace and on admittance;
- worker which prepares a workplace;
- worker which admits to work;
- leader of works;
- performer of works;
- worker which carries out a supervision after safe implementation of works;
- member of brigade.

**23.** Public servants and specialists, the direct leadthrough of works of enhanceable danger (HIIAOP 0.00-8.02-93) and works which require a professional selection (HIIAOP 0.03-8.06-94) is included in the official duties of which, at a hire for job, except for the set procedures of studies from the guard of labor, pass the previous special studies and verification of knowledge on questions of guard labors which touch concrete production terms, and farther are periodic verifications of knowledges in terms, set the proper of a particular branch normative acts from a labor protection, but not rarer once on a year.

Workers the functional duties of which are related to providing of accident-free work of important and difficult economic potentially dangerous objects or with a production on separate potentially dangerous objects (nuclear power and thermal plants, mining, chemical and metallurgical enterprises and others like that, violation of the technological modes of which makes a threat for workers and environment), to beginning of independent work must pass procedure of internship and duplication in the workplace with the obligatory working off skills from liquidation of failures and fires in accordance with the plan of liquidation of failures. List of positions and professions of workers, which must pass internship (duplication), and also its duration determined the leader of enterprise depending on experience, character of work and qualification of specialist. For completion of internship (duplication) the order of leader of enterprise a worker is admitted to independent work.

**24.** The performer of works is responsible for the following:

- implementation of safety measures, foreseen a dress or order, and for their sufficientness;
- observance by it and by the members of brigade of requirements of instructions from a labor and implementation of safety measures, certain a dress, projects of leadthrough of works, technological processes and its protection;

- clearness and plenitude to instructing and pointing, that he gives the members of brigade directly in the workplace;
- presence, fitness and rightness of application of facilities of defense of instrument, to the inventory and devices in the process of leadthrough of works;
- the state of maintenance of the protections, signs of safety, locking devices, set in the workplace is during a shiftwork.

After dresses and orders appoint the workers of subsections of enterprise and by contract organizations which have qualification not below of the IV digit the performers of works. At repair of ancillaries setting of works of workers which have the III digit is assumed performers. Attendant or worker from composition operatively production workers, that prepares a workplace, responsible for correct and exact implementation of the measures marked in a dress (order) for preparation of workplace.

**25.** Principal reasons of accidents are from the action of electric current:

- casual touch, approaching on dangerous distance to conductive parts which are under the voltage;
- appearance of touch voltage on metallic structural parts electro-equipment (corps, sheepskin coats and others like that) as a result of damage of isolation and other reasons;
- appearance of tension on a power-off current leading parts which people work on, as a result of the erroneous including of setting;
- origin of step voltage on-the-spot earth as a result of earth-fault of wire.

The basic measures of protecting from a defeat an electric current is:

- providing of inaccessibility is a current of leading parts which are under voltage, for a casual touch;
- electric division of network;

- removal of danger of defeat is with appearance of tension on corps, sheepskin coats and other parts of electrical equipment, which is arrived at the protective grounding, neutralizing, protective disconnecting; application of small voltages; protecting from a casual touch to current of leading parts by application of sheepskin coats, protections, double isolation; protecting from a danger in transition tension from a higher side to more low;
- control and prophylaxis of damages of isolation;
- indemnification of capacity constituent of current of earth-fault; application of the special electro- protective facilities - portable devices and fail-safes; organization of safe exploitation electro- equipment.

**26.** An electric current which passes through a living organism does a thermal, electrolytic and biological action. A thermal and electrolytic action is incident to any explorers, and biological - only to living fabric.

The thermal (thermal) action of current appears in the burns of separate areas of body, heating to the high temperature of blood vessels, nerves, heart, brain and other organs, which are on the way of flowing of current which causes serious functional disorders of these organs and organism on the whole.

The electrolytic (chemical) action of current is expressed in the curriculum (electrolysis) of organic liquids, including blood which is accompanied considerable violations them physical and chemical composition.

The biological action of current appears in an irritation and excitation of living fabrics of organism, and also in violation of internal bioelectric processes which flow in a to normally operating organism and closely related to his vital organs.

**27. Step voltage.** A man, who is in the field of spreading of grounding appears under tension of step, if its feet are in points with different potentials. Fig.3 is distributing of potentials is rotined in the field of spreading of the single grounding. Step voltage is determined as a difference of potentials between points A and B

$$U_{\kappa} = \phi_A - \phi_B \quad (2.3)$$

$$\phi_A = \frac{I_c \rho}{2\pi x} \quad (2.4)$$

$$\phi_B = \frac{I_c \rho}{2\pi(x+a)} \quad (2.5)$$

**28. Touch voltage.** For a man, who stands on soil and touches the earthed corps which is under tension, touch voltage can be certain thus:

$$U_t = \phi_h - \phi_f \quad (2.6)$$

As a man touches a corps, potential of hand  $\phi_h$  is potential of corps, or tension in relation to earth

$$\phi_h = U_c = \frac{I_c \rho}{2\pi x_c} \quad (2.7)$$

Feet of man are in a point A, and potential of feet of  $\phi_f$  and will make:

$$\phi_f = U_A = \frac{I_c \rho}{2\pi x_c} \quad (2.8)$$

To define touch voltage of corps from tension in relation to earth to take away potential of point of soil which a man stands on. For a man, who stands above grounding, touch voltage is zero, because potentials of hands and feet are identical and equal potential of corps. With a removal from grounding tension of touch grows, and near the last - third corps is equals voltage in relation to earth, as a man stands on earths and potential of its feet of  $\phi_f$  equals a zero, have:

$$U_t = U_c - 0 \quad (2.9)$$

**29.** To develop complex measures for supply of fire safety;

in obedience to normative acts on fire safety to develop and assert position, instructions, other normative acts, operating within the limits of enterprises, carry out permanent control after their observance;

to supply observance of fire hazard requirements of standards, norms, rules, and also execution of requirements of rules and decisions of organs of state fire control; to organize the studies of workers the rules of fire-prevention defense and connection, fire technique, equipment and inventory, to shut out their use not for need; to create in the case of necessity of subsections of fire prevention and necessary for their need material and technical base;

to take for requirements of state fire prevention of report and documents on the state of fire safety objects and produced of products;

to carry out measures on introduction of automatic facilities of exposure and extinguishing of fires;

in good time to inform fire prevention on disrepairs of fire technique, systems of fire-prevention defense, water-supply, etc.

to prosecute official inquiries of cases of fires.

**30.** A reaction of oxidization is exothermal (that takes a place with the selection of heat) and at certain terms can accelerated. This process the acceleration of reaction of oxidization with passing of it to burning is called by a self-ignition.

Temperature of self-ignition of combustibles is very different. In one it exceeds 5000s, in other is within the limits of temperature circumferential environments, that temperature of air, which in average it is possible to accept even 0.500s.

On the basis of temperature all of combustibles de bene esse divide a self-ignition into two groups: matters, temperature self-ignition of which higher than temperature of environment they of which are circumferential,

and matters, temperature self-ignition of which below than temperature of environment they of which are circumferential. The matters of the first group are able to burn only as a result of heating of them higher temperatures circumferential environments. The matters of the second group can burn without heating, because circumferential an environment already warmed them to the temperature self-ignition. Such matters make a large fire hazard. And named inflammable, and process them heating to the origin of burning - by a self-ignition.

**31.** The system of warning of fire is a complex of organizational measures and hardware, directed on the exception of terms of origin of fire (ДСТУ 2272-93).

Basic principle of this system is position that burning (fire) possible only at certain terms. Such condition is a presence of three factors: combustible, oxidant and source of self-ignition. In addition, it is necessary, that a combustible was heated to the necessary temperature and was in the proper correlation with an oxidant, and the source of self-ignition had necessary energy for an initial impulse (self-ignition).

To the oxidants belong chlorine, nitrogen and other oxides, however from the practical point of view most interest presents the study of process of burning, arising up at oxidization of combustible oxygen of air. With diminishing of maintenance of oxygen in mid air speed of burning is decreased, and at maintenance of oxygen less a 14% (norm 21%) burning of most matters becomes impossible. An oxidant together with a combustible forms the so-called combustible environment.

The system of warning of fire includes two basic directions foremost: warning of forming of combustible environment and origin in this environment of source of self-ignition.

**32.** In all of buildings and buildings in case of fire must be evacuation of people is foreseen and well-to-do from apartments which burn through

the so-called evacuation outputs. Outputs consider evacuation, if they conduct from apartments:

- a) ground floor outside directly or through a corridor, stair cage;
- b) any floor, except for the first, in a corridor which conducts on a stair cage, in a that number through a hall. In this case stair cages must have an output outside directly or through hall, dissociated from adjoining corridors partitions with doors;
- c) in a nearby apartment thereon floor, that is provided with outputs, indicated in points, but also.

Evacuation outputs must be disposed it is dispersed. Minimum distance between most remote one from an apartment determined one evacuation exits after a formula:

$$l = 1,5 \sqrt{P}, \text{ m}$$

P – perimeter of apartment, m

Amount of evacuation exits from buildings, from every floor and apartments it is necessary to accept concordantly ДБН В.1.1-7-2002. It should be noted that there is a row of exceptions, when one evacuation output or use is assumed as the second output of other adaptations for evacuation, in particular, external fire metallic pellet.

Distance from the remotest workplace to the nearest evacuation exit from an apartment directly outside or on a stair cage must not exceed values which are regulated ДБН В.1.1-7-2002

## **Conclusions**

The methodical indications are developed for the foreign students, whom learning subject «Labor Protection» in English.

Also, the methodical indications are aimed for more deep learning of the lecture material with help of the self-control method.

The questions and answers, which driven in these methodical indications, are at the limits of the lecture material only.

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## **Методичні вказівки**

до виконання самостійної роботи

«Контрольні запитання з лекційного матеріалу для виміру якості  
навчання»

з курсу «Основи охорони праці»

для студентів, що вивчають предмет на іноземній мові

Укладачі: БЕРЕЗУЦЬКИЙ Вячеслав Володимирович

БАХАРСВА Ганна Юріївна

ЛЮБЧЕНКО Ірина Миколаївна

ПІТАК Олег Ярославович

Відповідальний за випуск проф. Березуцький В. В.

Роботу до видання рекомендувала проф. Пономаренко О. І.

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