

### **Production factors and their classification. Dangerous and harmful factors.**

*GOST 12.0.003-2015 Occupational safety standards system.*

*Dangerous and harmful working factors. Classification.*

**Occupational Safety and Health** - a system for preserving the life and health of workers in the process of working, including legal, socio-economic, organizational and technical, sanitary and hygienic, treatment and prophylactic, rehabilitation and other measures.

In the process of labor, a worker is affected by various negative factors of the working environment and the labor process. **Working conditions** - a set of factors of the working environment and the labor process that affect the performance and health of a person.

**Safe working conditions** - working conditions under which the impact on workers of harmful and (or) hazardous production factors is excluded or the levels of their impact do not exceed the established standards.

**The purpose of labor protection** - to minimize the likelihood of injury or illness of working personnel at maximum labor productivity.

A person is exposed to hazards in his work activities. This activity takes place in a space called the **work environment**.

By the type of impact on the employee, factors of the working environment are divided into hazardous and harmful production factors.

**Hazardous production factor** (OPF) is called such a production factor, the impact of which on the employee can lead to injury. OPF includes all types of energy impact (kinetic, potential, electrical, thermal, chemical, etc.). Sources of

manifestation of such factors, in particular, moving machines, primarily moving rolling stock, moving parts of production equipment, various lifting vehicles, electric current, flying particles of the processed material, heated and incandescent products and blanks, active toxic and aggressive chemicals etc.

**Harmful production factor (HFF)** - such a production factor, the impact of which on the employee can lead to his illness or reduced disability. Diseases arising under the influence of harmful production factors are called *occupational*. **Occupational diseases** are subdivided into: *acute* occupational diseases that have arisen after a single (within no more than one work shift) exposure to harmful occupational factors; *chronic* occupational diseases that have arisen after repeated exposure to harmful production factors (increased concentration of harmful substances in the air of the working area, increased noise, vibration, etc.). HFFs include increased noise and vibration levels, increased or decreased air temperature of the working area, dustiness and gas contamination of the air in the working area, etc.

**Safety** - the state of working conditions, in which the impact on working OPF and HMF is excluded.

**Industrial sanitation** - This is the organization of a system of measures and technical means, preventing or reducing the impact on the working harmful production factors (HPF).

**Safety engineering** - organization of a system of measures and technical means to prevent exposure to operating OPF.

**Harmful working conditions** are working conditions characterized by the presence of harmful production factors that exceed hygienic standards and have an adverse effect on the body of the worker and (or) his offspring.

All dangerous and harmful production factors in accordance with *GOST 12.0.003-2015* are divided into 4 large groups: *physical, chemical, biological and psychophysiological*.

| Factors   | <i>GOST</i>   |
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| <p><b>Physical factors include:</b></p> <ul style="list-style-type: none"> <li>• Moving machines and mechanisms,</li> <li>• Moving parts of trade and technological equipment, moving goods, containers,</li> <li>• Sharp edges, burrs on equipment, tools</li> <li>• Collapsing stacks of stored materials;</li> <li>• The location of the workplace at a significant height relative to the surface of the earth (floor);</li> <li>• Increased dust and gas content in the air in the working area;</li> <li>• Increased or decreased temperature of surfaces of equipment, materials</li> <li>• Increased / decreased air temperature of the working area;</li> <li>• Increased level of noise,</li> <li>• Increased level of vibration,</li> <li>• Increased / decreased air humidity in the workplace;</li> <li>• Increased / decreased air mobility;</li> <li>• Increased voltage in an electrical circuit, the closure of which can pass through the human body;</li> <li>• Increased levels of electromagnetic radiation;</li> <li>• Lack or lack of natural light, insufficient illumination</li> <li>• Increased brightness of light;</li> <li>• Reduced contrast;</li> <li>• Direct and reflected gloss</li> <li>• increased pressure of vapors or gases in vessels</li> <li>• electromagnetic fields</li> <li>• ionizing radiation</li> </ul> | <p><i>GOST 12.2.003-91</i> Occupational safety standards system. Industrial equipment. General safety requirements;</p> <p><i>GOST 12.1.003-2014</i> Occupational safety standards system. Noise. General safety requirements;</p> <p><i>SP 51.13330.2011</i> Sound protection</p> <p><i>SanPiN 2.2.1/2.1.1.1278-03</i> Hygienic requirements for natural, artificial and mixed lighting of residential and public buildings;</p> <p><i>SanPiN 2.2.4.1329-03</i> Requirements for protection of personnel from the impact of impulse electromagnetic fields;</p> <p><i>GOST 12.1.019-2017</i> Electrical safety. General requirements and nomenclature of types of protection;</p> <p><i>GOST 12.4.011-89</i> Means of protection. General requirements and classification;</p> <p><i>GOST 12.2.061-81</i> Industrial equipment. General safety requirements to working places;</p> <p><i>GOST 12.1.005-88</i> General sanitary requirements for working zone air;</p> <p><i>GOST 12.1.030-81</i> Electric safety. Protective conductive earth, neutralling.</p> <p><i>GOST 12.1.012-90</i> Vibrational safety. General requirements;</p> |
| <p><b>Chemical factors</b> are substances harmful to the human body in various states. <b>Can be in different state of aggregation:</b> liquid, solid, dust, vapors and gases.</p> <p>Subdivided by the <b>nature of the effect:</b></p> <ul style="list-style-type: none"> <li>• <i>toxic</i> (cause poisoning of the whole organism: carbon monoxide (CO), lead (Pb),</li> </ul>  | <p><i>GOST 12.1.007-76</i></p> <p>Occupational safety standards system. Noxious substances. Classification and general safety requirements;</p>   |

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| <p>mercury (Hg), arsenic (As) and its compounds, benzene compounds);</p> <ul style="list-style-type: none"> <li>• <i>irritating</i> (cause irritation of the mucous membranes of the respiratory tract and other mucous membranes of the body: chlorine (Cl), ammonia (NH<sub>3</sub>), acetone vapor, nitrogen oxides, ozone and a number of other substances);</li> <li>• <i>sensitizing</i> (act like allergens, i.e. cause allergies in humans: formaldehyde; various nitro compounds, hexachlorane);</li> <li>• <i>carcinogenic</i> (lead to the emergence and development of malignant tumors: chromium oxides, 3,4-benzopyrene, beryllium and its compounds, asbestos, etc);</li> <li>• <i>mutagenic</i> (cause changes in hereditary information: radioactive substances, lead, manganese, etc.);</li> <li>• <i>affecting the reproductive (reproductive) function of the human body</i> (mercury, lead, styrene, manganese, a number of radioactive substances, etc.).</li> </ul> <p>The way of <b>penetration</b> into the human body:</p> <ul style="list-style-type: none"> <li>• <i>respiratory organs</i> (through the respiratory system. It is necessary to protect these organs with respirators of the appropriate brand or a gas mask.</li> <li>• <i>skin and mucous membranes</i> (through the skin. In this case, it is necessary to use protective equipment, the meaning of which is to cover their surface with special clothing, shoes, gloves or mittens. Through the organs of vision. Protection in the form of glasses or special shields is assumed);</li> <li>• <i>gastrointestinal tract</i> (Through food and water. In the manufacturing area, eating places should always be located in a separate room. Food substances have the property of absorbing harmful substances contained in the air of the working area).</li> </ul> |  |
| <p><b>Biological factors</b> include the following biological objects:</p>  | <p>GOST 12.1.008-76<br/>Occupational safety standards system.<br/>Biological safety. General requirements;</p> |

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| <ul style="list-style-type: none"> <li>• pathogenic microorganisms (bacteria, viruses, rickettsia, spirochetes, fungi, protozoa) and</li> <li>• products of their vital activity;</li> <li>• microorganisms (plants and animals).</li> </ul>   |  |
| <p><b>Psychophysiological factors</b> these are</p> <ul style="list-style-type: none"> <li>• physical overload (static - long-term preservation of a certain posture and dynamic - increased motor activity);</li> <li>• emotional overload;</li> <li>• mental overstrain;</li> <li>• overstrain of analyzers (<i>hearing</i> - typical for working specialties employed in mechanical equipment, <i>vision</i> - typical for workers involved in working with personal computers and videographers);</li> <li>• monotony of work</li> </ul> | <p><i>GOST 9241-4-2009</i><br/>Ergonomic requirements for office work with visual display terminals (VDT). Part 4. Keyboard requirements;</p> <p><i>GOST 9241-4-2009</i> Ergonomic requirements for office work with visual display terminals (VDTs). Part 5. Workstation layout and postural requirements;</p> <p><i>GOST 9241-4-2007</i> Ergonomic requirements for office work with visual display terminals (VDTs). Part 1. General introduction</p> |

**The impact of hazardous and harmful production factors** on a person can be weakened or eliminated by the normal organization of workplaces, improvement of technological processes, the use of collective and (or) individual protective equipment, etc.

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

**The maximum permissible value of the harmful production factor** - this is the limiting value of the magnitude of a harmful production factor, the effect of which, with a daily regulated duration throughout the entire length of service, does not lead to a decrease in working capacity and illness both during the period of labor activity and to a disease in the subsequent period of life, and also does not have an adverse effect on health offspring.

**Factors contributing to labor safety.** There are several diverse measures, the implementation of which will ensure safe working conditions.

1. *Organizational*, consisting in the conduct of a rational workflow in the direction of labor protection issues. It often happens that the head of an enterprise is not able to cover all areas of his control. Therefore, for high-quality and timely work to ensure the safe life of workers, the director can hire a specialist, and also distribute responsibilities between the heads of the department.
2. *Design activities are*: In the correct design of buildings and structures of the enterprise. In the competent conduct of design work regarding the processed raw materials and the finished product or products.
3. *Technological*, the meaning of which lies in the rational compilation and fulfillment of the requirements of the main production document of the enterprise - technological regulations.
4. *Operational imply correct*, in accordance with the instructions, operation: Mechanisms, Equipment, Vehicle.
5. *The essence of sanitary and hygienic measures* is to provide workers with: Personal protective equipment, devices, footwear and overalls. A room for heating and eating. A toilet and, if necessary, a shower.
6. *Psychophysiological factors include conducting*: Timely technological breaks. Lunch breaks. Regular production charging.