

**Lecrion Topic 1.6 Main principles and  
methods of defense against hazard impact  
and harmful agents**

# Questions

- 1. Illumination**
- 2. Vibration. Vibration sickness**
- 3. Noise**
- 4. Electric current**
- 5. Occupational Safety and Health**

# **1. Illumination**

- **Is one of the main parameter of hygienic characteristic.**
- **Luxmeter, (lx)**
- **Vision adaptation. This term describes the processes by which the visual system alters its properties in response to changes in the environment, e.g. in response to change of brightening**
- **Dark adaptation takes about 5-6 minutes, full adaptation from light to darkness, however, is longer and takes 30 minutes. light adaptation of eyes takes about 2 minutes.**
- **Stroboscope effect is an optical illusion of apparent motion or absence of motion of object. Stroboscope effect occurs when flashing light source illuminates a moving object. This effect, created by the flickering, it is harmful to the vision and causes discomfort, visual fatigue and headaches.**

## Common Light Levels Outdoors from Natural Sources

Common light levels outdoor at day and night can be found in the table below:

<b>Condition Illumination</b>	<b>Lux</b>
<b>Sunlight</b>	<b>100 000</b>
<b>Overcast day</b>	<b>1.075</b>
<b>Deep Twilight</b>	<b>1.0</b>
<b>Full moon</b>	<b>0.1</b>
<b>Starlight</b>	<b>0.001</b>

- **Natural illumination**
- **Artificial illumination**
- **Mixed illumination. Additional lighting equipment is often necessary to compensate the low levels of light.**
- **Earlier it was common with light levels in the range 100 - 300 lux for normal activities. Today the light level is more common in the range 500 - 1000 lux - depending on activity. For precision and detailed works, the light level may even approach 1500 - 2000 lux.**

### Recommended light level in different workspaces

Activity	Lux
Easy Office Work, Classes	250
Normal Office Work, PC Work, Study Library, Groceries, Show Rooms, Laboratories	500
Normal Drawing Work, Detailed Mechanical Workshops, Operation Theatres	1,000
Detailed Drawing Work, Very Detailed Mechanical Works	1500 - 2000

## **2. Vibration. Vibration sickness**

**Is s the oscillatory motion of objects.**

**Vibration, in the general sense, occurs as periodic oscillation, as random motion, or as transient motion, the latter more normally being referred to as shock when the transient is large in amplitude and brief in duration.**

**Vibration:**

- **-Transport vibration**
- **-Technological vibration**
- **-Outer vibration**

### **Vibration sickness**

**Vibration induced health conditions progress slowly. In the beginning it usually starts as a pain. As the vibration exposure continues, the pain may develop into an injury or disease. Pain is the first health condition that is noticed and should be addressed in order to stop the injury**



## Occupational exposure to vibration



Hand-arm vibration (HAV)



Whole-Body vibration (WBV)



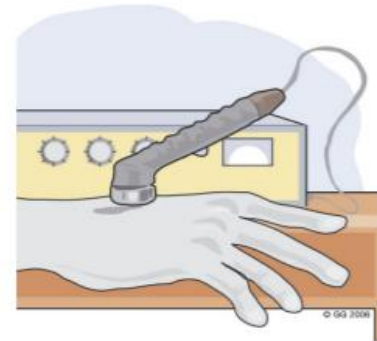
## Examples of a HAV exposure

**Chain saw**

**Straight grinder**

**Dental High-Speed Drill**

**Ultrasonic Therapy Device**



## **Hand-arm vibration**

- 1. long term exposure from using hand held tools, causes a range of conditions and diseases, including:**
- 2. White finger (also known as "dead finger" ) - damage to hands causing whiteness and pain in the fingers;**
- 3. Carpel tunnel syndrome (and other symptoms similar to occupational overuse syndrome);**
- 4. Sensory nerve damage;**
- 5. Muscle and joint damage in the hands and arms**

## **WHOLE BODY VIBRATION (WBV)**

- 1. caused by poorly designed or poorly maintained vehicles, platforms, health effects of WBV:**
- 2. Lower back pain (damage to vertebrae and discs, ligaments loosened from shaking)**
- 3. Motion sickness**
- 4. Bone damage**
- 5. Varicose veins/heart conditions (variation in blood pressure from vibration);**
- 6. Stomach and digestive conditions;**
- 7. respiratory, endocrine and metabolic changes;**
- 8. impairment of vision;**
- 9. reproductive organ damage.**
- 10. The longer a worker is exposed to WBV, the greater the risk of health effects and muscular disorders.**

## **3. Noise**

**unwanted or excessive sound that can have deleterious effects on human health**

**In physics, sound is a vibration that typically propagates as an audible wave of pressure, through a transmission medium such as a gas, liquid or solid.**

**Humans can only hear sound waves as distinct pitches when the frequency lies between about 20 Hz and 20 kHz. Sound waves above 20 kHz are known as ultrasound and are not perceptible by humans. Sound waves below 20 Hz are known as infrasound.**

**Noise is measured in Decibel (dB). The average noise level of 50 dB allowed for residential areas by WHO, sounds between 120 dB and 140 dB causing pain (pain threshold).**

## **4. Electric current**



**Electric current is electric charge in motion. It can take the form of a sudden discharge of static electricity, such as a lightning bolt or a spark between your finger and a ground light switch plate.**

**More commonly, though, when we speak of electric current, we mean the more controlled form of electricity from generators, batteries, solar cells or fuel cells.**

### **Effects of electric current on the human body**

**Electrical injury is a physiological reaction caused by electric current passing through the body.**

**The human body is a good conductor of electricity. This means that electric current can easily travel through it. When current travels through someone's body accidentally, this is known as an electric shock or electrocution.**

**Classification of electric injuries generally focus on the power source (lightning or electricity), voltage (high or low) and type of current (alternating or direct)**

**Electric current is capable of producing deep and severe burns in the body.**

***Tetanus* is the condition where muscles involuntarily contract due to the passage of external electric current through the body.**

**Diaphragm and heart muscles are similarly affected by electric current. Even currents too small to induce tetanus can be strong enough to interfere with the heart's pacemaker neurons, causing the heart to flutter instead of strongly beat.**

**Direct current (DC) is more likely to cause muscle tetanus than alternating current (AC), making DC more likely to "freeze" a victim in a shock scenario. However, AC is more likely to cause a victim's heart to fibrillate, which is a more dangerous condition for the victim after the shocking current has been halted.**

## **First aid in the case of electric shock**



**The danger from an electrical shock depends on the type of current, how high the voltage is, how the current traveled through the body, the person's overall health and how quickly the person is treated.**

**An electrical shock may cause burns, or it may leave no visible mark on the skin. In either case, an electrical current passing through the body can cause internal damage, cardiac arrest or other injury. Under certain circumstances, even a small amount of electricity can be fatal.**

- 1. Don't touch the injured person if he or she is still in contact with the electrical current**
- 2. Turn off the source of electricity, if possible. If not, move the source away from you and the person, using a dry, nonconducting object made of cardboard, plastic or wood. Don't touch the exposed skin of victim.**
- 3. Begin CPR if the person shows no signs of circulation, such as breathing, coughing or movement.**

## **5. Occupational Safety and Health**

**State regulatory requirements for labor protection establish rules, procedures and criteria aimed at preserving the life and health of workers in the process of work.**

**In accordance with Russian legislation (Article 212 of the Labor Code of the Russian Federation), responsibilities for ensuring safe conditions and occupational safety are assigned to the employer, specifically to the first person of the enterprise.**

**Every employee is obliged (Article 214 of the Labor Code of the Russian Federation):**

- Comply with OT requirements;**
- Correctly use personal and collective protective equipment;**
- Undergo training in safe methods and techniques for performing work, occupational safety instructions, on-the-job training and testing of knowledge of occupational safety requirements;**
- Immediately notify your immediate supervisor about any situation that threatens the life and health of people, about every accident that occurs at work, or about a deterioration in your health, including the manifestation of signs of an acute occupational disease or poisoning;**
- Undergo mandatory preliminary and periodic medical examinations.**

**In addition to duties, each employee has rights and guarantees of the right to safe and healthy working conditions, which are formulated in Russian legislation.**

**Guarantees of the employee's right to work in conditions that meet labor safety requirements consist, in particular, in the following:**

- The state guarantees workers the protection of their right to work in conditions that meet labor safety requirements;**
- Working conditions under the employment contract must comply with labor safety requirements;**
- During the suspension of work due to violation of labor safety requirements through no fault of the employee, his place of work and average earnings are retained;**
- If an employee refuses to perform work when a danger to his life and health arises, the employer is obliged to provide the employee with another job while such danger is eliminated. If providing other work is impossible, downtime is paid in accordance with current legislation;**
- If the employee is not provided with protective equipment in accordance with the standards, the employer does not have the right to require the employee to perform work duties and is obliged to pay for downtime;**
- An employee's refusal to perform work due to a danger to his life and health, or from heavy work and work with harmful or dangerous working conditions not provided for in the employment contract, does not entail bringing him to disciplinary liability;**
- In the event of harm to the life and health of an employee during the performance of work duties, compensation for said harm is carried out in accordance with current legislation;**

## **Responsibility for violation of labor protection requirements**

**Persons guilty of violating labor protection requirements, failure to fulfill labor protection obligations stipulated by contracts and agreements, employment agreements (contracts), or interfering with the activities of representatives of state supervision bodies and control over compliance with labor protection requirements, as well as public control bodies, are subject to disciplinary, administrative, civil and criminal liability in accordance with the legislation of the Russian Federation.**

**The following types of disciplinary sanctions are distinguished:  Note;  Reprimand;  Dismissal for appropriate reasons. 9Administrative penalties for violation of labor protection requirements include an administrative fine and disqualification.**

**Criminal liability for violation of labor protection requirements provides for the following types of punishment:**

- fine;**
- deprivation of the right to hold certain positions and engage in certain activities;**
- correctional work;**
- imprisonment for a certain period.**

## **Industrial accidents**

- 1. The person injured as a result of an industrial accident is an employee or other person participating in the production activities of the employer (Parts 1, 2 of Article 227 of the Labor Code of the Russian Federation)**
- 2. The event that occurred is indicated in the list of events that qualify as accidents (Part 3 of Article 227 of the Labor Code of the Russian Federation)**
- 3. The circumstances of the event (time, place, etc.) correspond to the circumstances listed in Part 3 of Art. 227 Labor Code of the Russian Federation**

**Industrial accidents that occurred with workers or other persons directly involved in the production process, provided that they occurred during the performance of their labor functions or instructions of the manager (his authorized representatives). This point also includes industrial accidents that occurred during the period when employees or other persons performed other actions determined by legal relations with the employer or performed in his interests.**

**Accidents at work, as a result of which the victims received injuries and mutilations (burns, bruises, fractures, bites, heat strokes, etc.), provided that this happened on the territory of the employer, the employee's workplace or in period of working time (including during overtime work and work on days that are weekends/holidays). This also includes accidents that occurred during the time allotted for breaks, or during the period specified in the internal labor regulations as allocated for preparing the workplace, or upon completion of work.**

**Industrial accidents that occurred while traveling to or from the workplace. Moreover, in this situation, it does not matter whether the employees were transported by the employer's transport or using personal transport, if the labor relations between the employee and the employer provide for its use for official/production purposes. This item also includes the time during which an employee, on behalf of the employer, gets to the place of work and back by public/office transport or on foot (including when traveling on a business trip and back).**

**Accidents that occurred when a worker was traveling to the place of his work as a shift worker during the rest period between shifts. This may concern, for example, replacement drivers, conductors or shift workers. 5. Injuries/mutilations received in other situations in the event of employees performing actions provided for by their employment relationship with the employer or carried out on behalf of the latter (including when they were directed).**



**If an accident occurs at work, the employer is obliged to:**

- 1. Immediately organize first aid for the victim and, if necessary, transport him to a medical facility**
- 2. Take quick measures to manage the development of the current emergency situation and the impact of various traumatic factors on persons in the area**
- 3. Before the investigation of the accident begins, preserve the situation that existed at the time of the incident; if this is not possible, record the current situation (drawing diagrams, taking photographs)**
- 4. Immediately inform the victim's relatives**
- 5. Create a commission to investigate the accident and issue an order to begin its work**
- 6. Send reports of a group accident, serious accident, fatal accident to higher authorities**