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► Methods of protection in OSH

Collective protection and personal protective equipment

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► The importance of protective measures in occupational safety and health

Occupational safety and health is a fundamental requirement to protect the health of employees and to ensure a safe working environment. In this context, the protective measures taken are of vital importance in preventing accidents and occupational diseases.



► Collective protection methods

► What is collective protection?

Collective protection consists of methods aimed at protecting all employees simultaneously by controlling risks at their source.

The importance of collective protection may be explained as follows:

- 1 Collective protection methods are measures aimed at protecting the maximum possible number of employees simultaneously and controlling risks at their source.
- 2 They are more comprehensive and more effective compared to individual protection methods (such as personal protective equipment).
- 3 Collective protection measures are more economical in the long term.
- 4 Collective protection measures not only provide broader protection but also offer a comfortable and continuous level of safety without restricting the mobility of employees.
- 5 Collective protection measures are more effective in preventing occupational accidents and occupational diseases.
- 6 Collective protection measures protect not only employees but also the environment.

More
comprehensive
than individual
protection methods.

Collective
protection
measures

Less dependent on
human error.

More economical
in the long run.

Provide continuous protection.





► Why shall collective protection measures be applied as a priority?

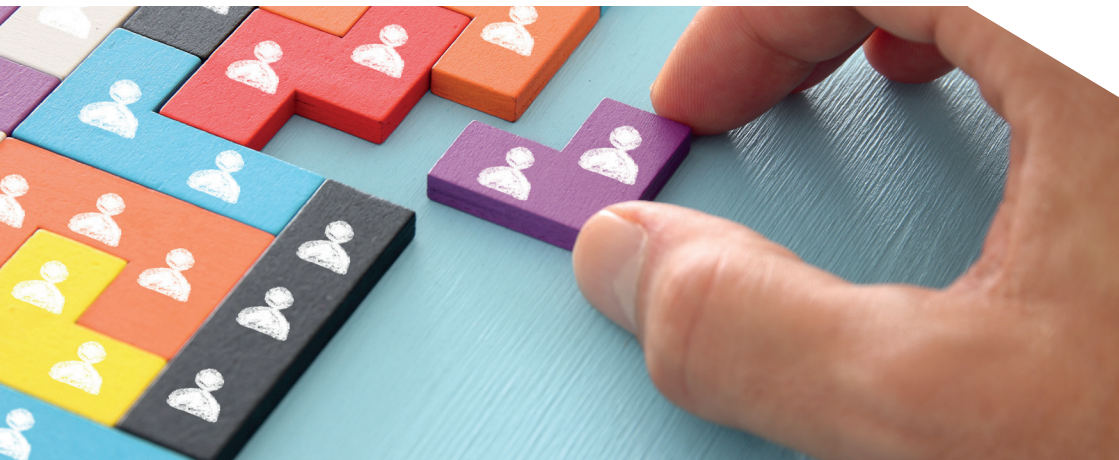
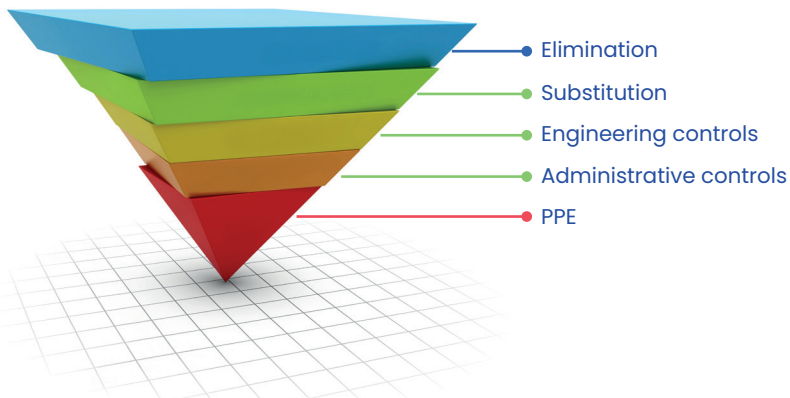
The hierarchy of controls is a method used to determine the measures to be taken against risks that employees may face and to prioritize these measures. Measures are arranged from the most effective to the least effective, comprising the steps of elimination, substitution, engineering controls, administrative controls, and personal protective equipment. To ensure the highest level of protection for employees, it is often necessary to combine control methods.

- 1 **Elimination (removal)** ensures that the hazard is no longer present.
- 2 **Substitution** refers to reducing the hazard by replacing a hazardous element (material or process) with a less hazardous or non-hazardous one.
- 3 **Engineering controls** manage the hazard by preventing it from coming into contact with employees.
- 4 **Administrative controls** modify the way the work is carried out or provide employees with additional information through relevant pro-

cedures, training, or warnings. Examples of administrative controls include procedures such as equipment inspections, planned preventive maintenance, checklists, lockout/tagout/tryout, control practices, modification of work schedules, pre- and post-task inspections, and worker rotation.

- 5 Personal protective equipment (PPE):** The correct selection of personal protective equipment and its proper and effective use by the employee are of vital importance for occupational safety and health. Therefore, training of employees is also of great importance to ensure the correct use of the equipment. It may not always be possible to eliminate all risks through measures at the higher levels of the hierarchy; therefore, the use of personal protective equipment may be required in conjunction with other safety measures.

Hierarchy of controls





► Collective protection practices implemented in different activities carried out in workplaces

► Collective protection measures in workplaces where chemical substances are used

The implementation of safety measures in work involving chemical substances is of critical importance both for the protection of employee health and for the prevention of environmental risks. Failure to take appropriate control measures in work involving chemical substances, which constitute a potential source of hazard, may lead to serious health problems and occupational diseases.

Examples of collective protection practices in work involving chemical substances are presented in the table.

Ventilation systems	► General ventilation ► Local ventilation (e.g. hoods, extractor fans) ► Suitable filtration systems against explosive and harmful gases
Closed systems and automation	► Closed production systems ► Automatic dosing and conveying systems to prevent direct contact by employees

Chemical storage and handling measures	▶ Chemical-resistant containers ▶ Separate areas for interactive chemicals ▶ Leak-proof and durable chemical storage cabinets ▶ Spill trays and leak control systems
Control of chemical exposure	▶ Monitoring and measurement of occupational exposure limit values for chemical substances in the workplace ▶ Replacement of highly hazardous substances with less hazardous chemicals based on a chemical risk assessment
Fire and explosion prevention measures	▶ ATEX-compliant systems for flammable and explosive chemicals ▶ Grounding and antistatic equipment to reduce the risk of static electricity ▶ Fire extinguishing systems
Personal hygiene and decontamination areas	▶ Showers and eyewash stations where employees can decontaminate after contact with chemicals ▶ Handwashing stations and appropriate disinfectants in areas where there is a risk of chemical contamination
Training and emergency plans	▶ Training for employees on the risks associated with chemical substances, safe handling methods, and emergency procedures ▶ Training of employees in the use of emergency response kits required for chemical spills
Warning and labeling systems	▶ GHS-compliant labeling on chemical containers and drums (Globally Harmonized System) ▶ Warning signs and safety signs in areas where hazardous chemicals are used

► Collective protection measures in dusty environments

Dust refers to particles that are dispersed in workplace air or have the potential to become airborne.

Examples of collective protection measures for dusty environments are presented in the table.

Closed systems and automation	► Enclosed systems for dust-generating processes ► Automatic conveying and loading systems instead of manual operations
Ventilation and dust extraction systems	► General ventilation ► Local ventilation ► Filtered ventilation systems that capture dust particles
Measures against explosive and hazardous dusts	► ATEX-compliant equipment in areas where flammable or explosive dust is present ► Grounding systems and antistatic equipment against static electricity ► Spark detection and extinguishing systems with metal detectors in enclosed pipeline systems
Regular cleaning and waste management	► Industrial vacuum cleaners ► Wet cleaning methods for dust accumulated on the floor ► Regular cleaning and waste management of areas where dust-generating materials are stored
Humidification and dust suppression methods	► Water spray systems ► Chemical dust binding systems
Dust source reduction measures	► Raw materials in granular or liquid form instead of bulk materials ► Dust-preventing coatings or enclosed conveying systems during material handling



► Collective protection measures in work at height

Any work carried out in areas with a level difference where there is a risk of injury due to falling is considered work at height.

Examples of collective protection measures in work at height are presented in the table.

Guardrails and barriers	Safe ladders and access routes
Safe working platforms and scaffolds	Fall arrest nets and catch systems
Protection against falling objects	Work-at-height plan and training programs





► Machine guards and collective protection measures

The concept of machine guarding, contrary to common belief, refers to equipment used to protect workers against the risks that may be caused by machinery, rather than to protect the machine itself. In other words, the primary purpose of machine guards is to protect the person, not the machine.

Examples of collective protection practices in machine guards are presented in the table.

Mechanical guards and barriers	► Fixed, adjustable or movable guards ► Barriers preventing physical access to hazardous areas
Automated systems	► Robotic or automatic loading and unloading systems ► Automatic and remote control systems
Sensors and safety devices	► Light curtains, laser barriers ► Safety doors and locking systems
Protection against noise, dust, and hazardous substances	► Sound insulation and noise-reducing panels ► Ventilation and filtration systems
Emergency stop systems	► Pull-cord stop systems ► Emergency stop buttons

► Collective protection measures in work in explosive atmospheres

In workplaces where explosive, flammable, and combustible gases, dusts, and vapors are used or processed, the most primary and fundamental measure to be taken is the prevention of the formation of an explosive atmosphere.

Examples of collective protection practices in work in explosive atmospheres are presented in the table.

Explosion protection document	► Hazardous area classification (in accordance with ATEX Directive 137 and EN 60079 standards) ► An up-to-date explosion protection document specific to the workplace
Explosion pressure relief measures	► Explosion venting panels or pressure relief systems ► Explosion suppression covers and silencers to reduce explosion severity
Measures to avoid explosive atmospheres	► Reduction of the use of flammable substances or the use of alternative, less hazardous substances ► Ventilation systems preventing the accumulation of explosive gases or dusts ► Gas detectors and alarm systems for continuous monitoring
Control of ignition sources	► Grounding and equipotential bonding to prevent the accumulation of static electricity ► Use of EX-proof electrical systems and equipment





► Collective protection measures in noisy environments

Exposure to noise in the workplace may lead to occupational accidents by causing communication failures, and it also brings various risks such as hearing loss and reduced productivity. Prolonged exposure to noise may also cause psychosocial problems in employees.

Examples of collective protection practices for reducing risks arising from noise are presented in the table.

Reduction of noise sources	► Selection of equipment with the lowest noise level ► Ensuring that machine maintenance is not neglected ► Coatings providing vibration and sound insulation
Measures against ambient noise	► Noise barriers ► Use of sound-insulating materials on ceilings and walls to reduce noise ► Maximizing the distance between the noise source and employees as far as possible ► Reducing employee exposure by enclosing noise sources in closed cabins
Health surveillance and monitoring	► Regular monitoring of employees for symptoms of noise-induced diseases ► Immediate action shall be taken when signs of hearing loss are observed
Control through work organization	► Limiting the duration of employees' exposure to high noise levels ► Regular rest breaks for employees working in noisy environments

► Collective protection measures in environments with vibration

The basic engineering approaches to eliminate or reduce vibration exposure are reduction at the source, reduction of transmission, and implementation of process modification.

Examples of collective protection practices for reducing risks arising from vibration are presented in the table.

Reduction of vibration sources	► Selection of machines and hand tools that produce less vibration ► Addition of dampers, absorbers, and spring systems to machinery and equipment ► Regular inspection and maintenance of machines, motors, and hand tools ► Use of tools with user-friendly, ergonomic, and vibration-reducing handles
Control through work organization	► Reducing exposure time by decreasing working duration ► Assigning employees to vibration and non-vibration tasks on a rotational basis ► Providing regular breaks to allow the musculoskeletal system to rest
Health surveillance and monitoring	► Regular monitoring of employees for symptoms of vibration-related diseases ► Immediate action shall be taken when signs of circulatory disorders and musculoskeletal system diseases are observed
Reduction of vibration exposure in the environment	► Covering the floor on which employees work with vibration-absorbing materials ► Placing vibrating machines on special floors that do not transmit vibration



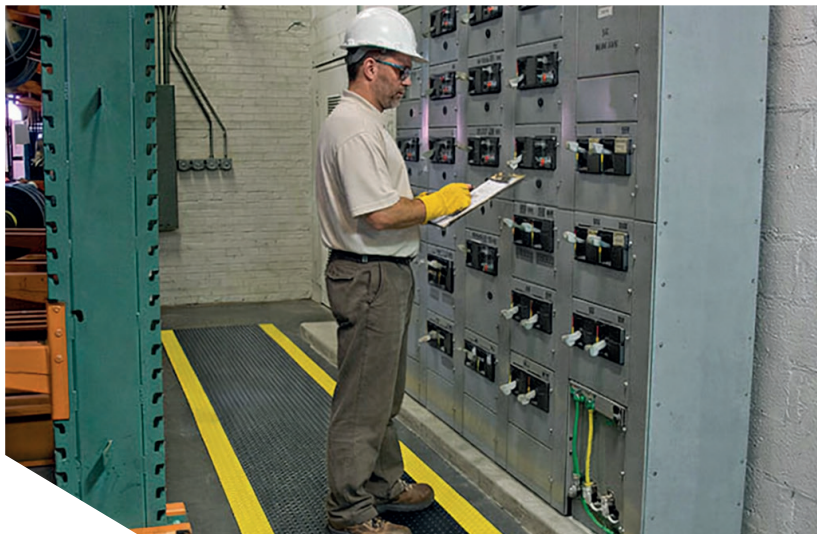
► Collective protection measures in electrical work

Since electrical accidents may lead to serious injuries and fatalities, various collective protection measures such as engineering controls, organizational measures, and training shall be implemented to protect employees.

Examples of collective protection practices in electrical work are presented in the table.

Control measures at the electrical source

- Use of low-voltage or safe-voltage systems where possible
- Proper grounding of all electrical installations, machinery, and hand tools
- Use of devices such as residual current devices (RCDs) that detect electrical leakage and cut off the current
- Use of insulated cables and equipment in electrical installations
- Use of systems preventing the accumulation of static electricity in environments where flammable substances are handled



Control measures in the working environment	► Clear marking of electrical cables and panels and installation of safety signs ► Use of lockout and tagout systems (LOTO) to prevent accidental energization during maintenance and repair work ► Use of water-resistant electrical installations, machinery, and sockets ► Access to electrical distribution panels shall be restricted to authorized personnel only ► Use of non-sparking and explosion-proof equipment in environments where flammable and explosive substances are present
Control through work organization	► All electrical work shall be carried out only by authorized and trained electricians. ► A permit-to-work system (PTW) shall be used for high-risk electrical work. ► Systems capable of rapidly isolating electrical power in an emergency shall be maintained in operational condition, and employees shall be informed about evacuation plans.
Training and awareness-raising of employees	► Teaching all employees the safety rules to be observed when working with electricity ► Providing fire safety training to employees so that they can respond to electrical fires ► Training employees on how to respond to a person who has suffered an electric shock

► Fire protection measures

Fire is not limited only to damage caused by flames. Smoke, toxic gases, and heat generated during a fire also pose significant risks. Therefore, fire safety shall be ensured through both structural measures and response systems.

Passive fire protection measures

Passive fire protection measures are determined at the building design stage and provide continuous protection. These measures are implemented to prevent the spread of fire and to ensure safe evacuation.

Main passive fire protection measures:

- Rapid removal of toxic gases and smoke in the event of a fire
- Clear designation of escape routes, stairways, and assembly areas
- Use of fire-resistant materials
- Isolation of specific sections of the building against fire
- Fire-resistant structural systems capable of withstanding high temperatures





- ▶ Fire compartments
- ▶ Fire-resistant doors and staircases
- ▶ Smoke extraction and ventilation systems
- ▶ Emergency guidance and lighting systems
- ▶ Firefighting elevators
- ▶ Lightning protection systems
- ▶ Public address and warning signs

Active fire protection measures

Active fire protection measures encompass systems that are activated during a fire. They are used to detect fire, prevent its spread, and ensure safe evacuation.

Main active fire protection measures:

- ▶ Fire detection and alarm systems
- ▶ Smoke control systems
- ▶ Automatic fire suppression systems
- ▶ Elements and systems enabling rapid access for the fire brigade

When passive and active measures are used together, fire risks are minimized and they help ensure a safe working environment.

► Personal protective equipment (PPE)

These are equipment used individually in situations where collective protection measures cannot be implemented or are insufficient. Personal protective equipment (PPE), used to protect the health and safety of employees, comes into use in cases where risks cannot be completely eliminated at their source. It is used to protect the employee in working environments where the risk cannot be completely eliminated. Therefore, although it is used in cases where collective protection measures cannot be implemented or are insufficient, it should be noted that personal protective equipment constitutes the last line of defense between the employee and the hazard.

When should it be used?

- If, due to environmental conditions and the level of hazard, it is not possible to control the risk at its source
- If the risk remains high despite all other preventive measures having been taken

Employer responsibilities regarding PPE

- Providing PPE to employees free of charge
- Carrying out maintenance and repairs in accordance with the manufacturer's instructions
- Ensuring periodic controls
- Replacing necessary parts
- Storing under hygienic conditions and keeping ready for use
- Taking all necessary measures to ensure that employees use personal protective equipment properly





The correct use of personal protective equipment (PPE) is of vital importance in preventing occupational accidents and occupational diseases!



- ▶ **Protective clothing:** Clothing resistant to heat, chemicals, and physical hazards, etc.
- ▶ **Hand and arm protectors:** Protective gloves against chemical substances, cuts, and thermal risks, etc.
- ▶ **Head protectors:** Helmets, caps, etc.
- ▶ **Foot and leg protectors:** Footwear such as shoes, boots, and rubber boots with features such as slip resistance, toe protection, antistatic properties, and thermal resistance, as well as gaiters and covers, etc.
- ▶ **Eye and face protectors:** Safety goggles, welding masks, visors, etc.
- ▶ **Respiratory protection:** Dust masks, gas masks, supplied-air systems, etc.
- ▶ **Hearing protectors:** Earplugs, earmuffs, etc.
- ▶ **Protectors against falls from height:** Full-body harnesses, energy absorbers, fall arrest systems, etc.

► Conclusion

In occupational safety and health practices, priority should be given to collective protection methods that aim to eliminate risks at their source. However, in cases where the risk cannot be completely eliminated, personal protective equipment should be used. This approach supports the sustainability and efficiency of work processes while protecting the health of employees.

The information provided in this booklet presents a basic framework regarding collective protection and personal protection methods and equipment; these methods and equipment may vary and be expanded depending on the specific conditions of the workplace, the needs of employees, and similar factors.



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