

Managing Physical Hazards

Lecture 1 : Foundation of Physical Hazards and Legal Duties

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Undergraduate Diploma in
Occupational Health and Safety

Lecture Overview

- Introduction to Occupational Health & Safety (OHS)
- Understanding physical hazards in workplaces
- Legal duties under EU and Maltese law
- Focus on prevention and risk control



Learning Objectives

- **Identify key physical hazards**
Learn to recognise workplace dangers such as machinery, noise, electricity, and environmental risks that may cause injury or health problems.
- **Understand employer legal duties**
Explain employer responsibilities under EU and Maltese law, including risk assessment, training provision, safe equipment maintenance, and hazard control measures.
- **Recognise worker rights and obligations**
Outline employee rights to information, training, and protection, alongside duties to follow procedures, use equipment correctly, and report workplace hazards.
- **Apply hazard identification in practice**
Develop practical skills to observe workplaces, identify unsafe conditions, assess risks, and recommend appropriate control measures to reduce potential harm



What are Physical Hazards

- **Environmental or operational factors causing harm**
Physical hazards arise from workplace surroundings, equipment, or processes that can directly affect safety, such as noise, machinery movement, electricity, temperature extremes, or poor layout, increasing the likelihood of accidents.
- **Can lead to Injuries or Long-term ill Health**
Exposure to uncontrolled physical hazards may cause immediate injuries like cuts, falls, or burns, and long-term conditions including hearing and eyesight loss, musculoskeletal disorders, fatigue, or chronic stress affecting worker wellbeing.
- **Common across many industries**
Physical hazards exist in construction, manufacturing, offices, healthcare, hospitality, and transport sectors. Although environments differ, risks such as slips, manual handling, noise, and machinery hazards are widely encountered by workers.
- **Require systematic risk management**
Managing hazards involves structured processes including hazard identification, risk assessment, implementation of control measures, monitoring effectiveness, and continuous improvement to ensure compliance with legal duties and maintain a safe workplace.



The Importance of Controlling Physical Hazards

1. Prevent workplace injuries and accidents

Controlling hazards reduces risks of slips, falls, machinery incidents, and other events that cause serious worker harm.

2. Protect long-term employee health

Managing noise, vibration, and ergonomic risks helps prevent chronic illnesses, musculoskeletal disorders, and permanent occupational health conditions.

3. Ensure legal compliance

Employers must follow EU and Maltese OHS laws requiring risk assessments, safe systems of work, and hazard control.

4. Reduce financial losses

Fewer accidents mean lower compensation claims, reduced downtime, decreased insurance costs, and improved overall business productivity.

5. Improve workplace productivity

Safe environments increase worker confidence, reduce stress, minimise disruptions, and allow tasks to be completed more efficiently.

6. Promote positive safety culture

Controlling hazards shows commitment to safety, encouraging workers to follow procedures, report risks, and actively support prevention efforts.



Categories Physical Hazards

Slips, Trips and Falls

Wet floors, uneven surfaces, obstacles, poor housekeeping, inadequate lighting.

Work at Height

Ladders, scaffolding, roofs, platforms, unprotected edges, falling objects.

Machinery and Moving Parts

Conveyors, rotating equipment, cutting tools, entanglement or crushing hazards.

Electrical Hazards

Live wires, faulty equipment, poor grounding, overloaded circuits, static electricity.

Noise

Loud machinery, construction activities, prolonged exposure to high sound levels.

Vibration

Hand-arm vibration from tools, whole-body vibration from vehicles or heavy equipment.

Radiation

Ionising radiation (X-rays) and non-ionising radiation (UV, lasers, RF sources).

Categories Physical Hazards

Thermal Hazards

Heat stress, cold environments, hot surfaces, extreme weather, high winds.

Ergonomic Hazards

Poor workstation design, repetitive tasks, awkward postures, prolonged sitting or standing.

Manual Handling Risks

Heavy lifting, pushing, pulling, carrying loads, repetitive physical strain.

Lighting Hazards

Insufficient lighting, glare, flickering lights causing eye strain or accidents.

Pressure Systems

Compressed gases, steam systems, pressurised containers with explosion risks.

Vehicle and Mobile Equipment Hazards

Forklifts, trucks, traffic movement, collision risks within workplaces.

Confined Spaces (Physical Conditions)

Restricted access, limited movement, poor ventilation contributing to physical risks.



Slips Trips and Falls

- **Slips, Trips and Falls – OHS Explanation**

Slips, trips, and falls are among the most common workplace physical hazards. They occur when workers lose balance due to wet or uneven surfaces, obstacles, poor housekeeping, loose cables, or inadequate lighting. These incidents can cause injuries ranging from minor bruises to serious fractures or head injuries. Effective OHS management includes regular inspections, good housekeeping practices, proper footwear, clear walkways, and prompt cleaning of spills to reduce risks.

- **Real Workplace Scenario**

In a food preparation area, a worker carries supplies across a tiled floor where water has spilled from a sink. No warning sign is placed, and the floor remains wet during busy operations. The worker slips, falls backward, and suffers a wrist fracture. An investigation shows poor cleaning procedures, lack of hazard signage, and inadequate staff awareness. After the incident, the employer introduces non-slip flooring, spill response training, and routine inspections to prevent recurrence.



Work at Height

- **Work at Height – OHS Explanation**

Work at height refers to any task performed where a person could fall and suffer injury, such as working on ladders, scaffolding, rooftops, or elevated platforms. Falls from height are one of the leading causes of serious and fatal workplace accidents. Effective OHS control measures include proper planning, risk assessment, use of suitable access equipment, guardrails, fall arrest systems, and ensuring workers are trained and supervised. The aim is always to avoid working at height where possible or minimise fall risk through safe systems of work.

- **Real Workplace Scenario**

A maintenance worker is asked to change lighting fixtures in a warehouse using a portable ladder. The ladder is not secured, and the worker overreaches to access a fitting. The ladder becomes unstable, causing the worker to fall and sustain a back injury. Investigation reveals inadequate planning and lack of suitable equipment. The employer later introduces mobile elevated work platforms, ladder safety training, and a permit-to-work system for tasks performed at height.



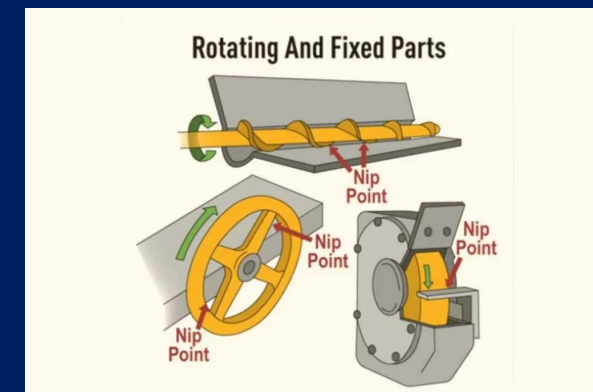
Machinery Moving Parts

- **Machinery and Moving Parts – OHS Explanation**

Machinery and moving parts present serious physical hazards due to the risk of entanglement, crushing, cutting, or impact injuries. Examples include conveyors, rotating shafts, gears, cutting blades, and automated equipment. Injuries often occur when guards are missing, maintenance is performed without isolation, or workers wear loose clothing near moving components. OHS controls include machine guarding, emergency stop systems, lockout/tagout procedures, regular maintenance, and proper training to ensure workers operate equipment safely.

- **Real Workplace Scenario**

In a manufacturing workshop, a worker attempts to clear a jammed conveyor belt without shutting down the machine. The worker's glove becomes caught in a rotating roller, resulting in a serious hand injury. An investigation finds that safety guards were removed for quicker access and no lockout procedure was followed. Following the incident, the employer reinstates fixed guards, introduces lockout/tagout training, and implements stricter supervision to prevent unsafe interaction with moving machinery.



Electrical Hazards

- **Electrical Hazards – OHS Explanation**

- **Definition:**

Electrical hazards are any dangerous conditions where workers are at risk of electric shock, burns, fire, or explosions due to the use or presence of electricity. They are one of the leading causes of serious workplace injuries.

- **Common Types of Electrical Hazards:**

- **Electric Shock:** When a person comes into contact with live electrical parts.
- **Arc Flash/Blast:** A sudden release of electrical energy through the air, causing burns, hearing loss, or blindness.
- **Electrical Burns:** Can occur from contact with live wires or faulty equipment.
- **Fires and Explosions:** Caused by faulty wiring, overloaded circuits, or sparks near flammable materials.
- **Electrocution:** Fatal exposure to high voltage.



Electrical Hazards

Workplace Scenario: Electrical Hazard

Industry: Manufacturing / Factory

Situation:

A factory worker is tasked with repairing a packaging machine that has suddenly stopped working. The worker notices a loose wire inside the motor compartment. In a rush to get the machine running again, he does **not switch off the main power supply** or follow the proper **lockout/tagout procedure**.

Hazard Occurs:

When he touches the exposed wire, he receives a **severe electric shock**. Sparks fly, causing minor burns and startling other workers nearby. The machine also trips the main circuit breaker, stopping production temporarily.



Noise

- **Noise Hazard**

A noise hazard occurs when workers are exposed to excessive sound levels that can cause temporary or permanent hearing loss, stress, or reduced concentration. Prolonged exposure to loud machinery, power tools, or industrial processes can damage the delicate structures in the inner ear. Noise can also contribute to accidents by masking warning signals or alarms. Occupational Health and Safety (OHS) standards require monitoring sound levels, providing hearing protection, implementing engineering controls to reduce noise at the source, and conducting regular hearing tests to prevent long-term auditory damage and maintain workplace safety.

- **Real Workplace Scenario**

In a metal fabrication workshop, workers operate grinders, drills, and presses continuously without ear protection. Over time, several employees report ringing in the ears (tinnitus) and difficulty hearing instructions, which leads to miscommunication and a near-miss incident with a moving crane. Management introduces mandatory earplugs, noise barriers, and regular noise monitoring, significantly reducing the risk of hearing damage and improving overall safety.



Vibration

- **Vibration Hazard**

A vibration hazard arises when workers are exposed to mechanical vibrations from tools, machinery, or vehicles. Prolonged exposure to hand-arm or whole-body vibration can cause musculoskeletal disorders, nerve damage, reduced circulation, and conditions like hand-arm vibration syndrome (HAVS) or lower back pain. Whole-body vibration is common in operators of heavy machinery, forklifts, or trucks. OHS guidelines recommend assessing vibration exposure, limiting duration of use, providing vibration-dampening equipment, and using proper ergonomic techniques. Reducing vibration exposure protects workers' long-term health, prevents chronic injuries, and maintains productivity and workplace safety.

- **Real Workplace Scenario**

A construction worker uses a jackhammer for several hours daily without vibration-dampening gloves. Over months, he develops numbness and tingling in his fingers and reduced grip strength, diagnosed as hand-arm vibration syndrome. The company responds by introducing anti-vibration gloves, rotating tasks, and limiting jackhammer use, preventing further injuries and promoting compliance with OHS standards.



Radiation

- **Radiation Hazard**

Radiation hazards occur when workers are exposed to ionizing or non-ionizing radiation, which can damage tissues, DNA, or organs. **Ionizing radiation** (e.g., X-rays, gamma rays) can cause cancer, burns, or radiation sickness, while non-ionizing radiation (e.g., UV, microwaves) can cause skin burns or eye damage. OHS measures include limiting exposure time, maintaining safe distances, using shielding (lead aprons, barriers), wearing personal protective equipment, and monitoring radiation levels. Regular training, warning signs, and compliance with safety regulations ensure worker protection while minimizing long-term health risks in environments where radiation is present.

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- **Real Workplace Scenario**

In a medical imaging center, a radiology technician routinely operates an X-ray machine. Initially, the technician neglects using the lead apron and thyroid shield. Over time, exposure to scattered X-rays increases the risk of tissue damage. After implementing proper PPE, lead barriers, and timed exposure limits, radiation exposure is minimized, protecting staff health while maintaining safe diagnostic procedures.



Thermal Hazards

- **Thermal Hazard**

Thermal hazards occur when workers are exposed to extreme temperatures—either hot or cold—that can cause burns, heat stress, heat stroke, frostbite, or hypothermia. Hot surfaces, molten materials, steam, or open flames can result in severe burns, while working in freezing conditions without proper protection can lead to frostbite or loss of dexterity. OHS measures include providing protective clothing, gloves, and footwear, implementing engineering controls like barriers or insulation, maintaining hydration and breaks, and training workers on recognizing early signs of thermal stress to prevent injuries and ensure a safe working environment.

- **Real Workplace Scenario (Cold/Hot)**

A worker in a frozen food warehouse spends several hours in a cold storage room at -20°C without proper insulated clothing. Over time, their fingers and toes become numb, and they begin to shiver uncontrollably, showing early signs of frostbite and hypothermia.

A construction worker is laying asphalt on a road on a hot summer day. The worker is exposed to extreme heat from the sun and molten asphalt while wearing only standard work clothes. After a few hours, he begins to experience dizziness, heavy sweating, and nausea, showing early signs of heat exhaustion.



Ergonomic Hazards

- **Ergonomic Hazards – Explanation**

Ergonomic hazards arise when a worker's tasks, tools, or work environment do not match their physical capabilities, leading to strain or injury. Common causes include repetitive motions, awkward postures, excessive force, or prolonged static positions, which can result in musculoskeletal disorders (MSDs) such as back pain, tendonitis, or carpal tunnel syndrome. Poorly designed workstations, improper lifting techniques, and inadequate equipment can increase these risks. Occupational Health and Safety (OHS) measures focus on workstation design, proper tools, worker training, task rotation, and use of mechanical aids to reduce physical strain and prevent long-term injuries.

- **Real Workplace Scenario – Paragraph Form**

At a warehouse, a worker spends hours lifting heavy boxes and stacking them on high shelves while twisting and reaching overhead. Over weeks, he develops lower back pain and shoulder strain due to poor posture and repetitive lifting. The company addresses this by providing lifting aids, adjustable shelving, training on safe lifting techniques, and rotating tasks among workers, significantly reducing the risk of musculoskeletal injuries and improving overall workplace safety.



Manual Handling (Ergonomics)

- **Manual Handling**

Manual handling involves lifting, carrying, pushing, pulling, or moving objects by hand or bodily force. Poor manual handling practices are a leading cause of workplace injuries, especially musculoskeletal disorders (MSDs) like back strains, shoulder injuries, and hernias. OHS principles emphasize assessing the task for risks, using mechanical aids, maintaining proper posture, and limiting the weight or duration of lifting. Worker training, team lifting for heavy items, and workstation design adjustments are critical. Employers must implement safe manual handling procedures to reduce injuries, ensure compliance with safety regulations, and maintain a healthy, productive workforce.

- **Real Workplace Scenario**

In a warehouse, a worker is tasked with moving heavy pallets of stock without a pallet jack or lifting aid. He lifts each pallet alone, twisting and bending repeatedly to fit them into storage racks. After a few days, he develops acute lower back pain, making it difficult to continue work safely. Following the incident, the company introduces mechanical lifting aids, team-lifting procedures, and staff training on proper lifting techniques, significantly reducing the risk of injury. Task rotations and regular breaks are also implemented to minimize strain, promoting worker health and compliance with OHS standards.



Lighting

- **Lighting Hazard**

Lighting hazards occur when inadequate, excessive, or poorly positioned light affects workers' ability to see clearly, leading to eye strain, headaches, fatigue, and increased risk of accidents. In an OHS context, proper lighting is essential to ensure visual comfort, safety, and productivity. Hazards can arise from flickering lights, glare, or shadows in work areas. Employers must provide adequate illumination, proper placement of light sources, and regular maintenance to minimise risk and support a safe, efficient workplace.

- **Real Workplace Scenario**

In an open-plan office, employees complain of eye strain and headaches due to a combination of dim overhead lighting and glare from computer screens near windows. Staff frequently squint or lean forward, causing poor posture and neck pain. After an OHS assessment, the company installs adjustable desk lamps, anti-glare screens, and proper overhead lighting, and arranges desks to minimize direct sunlight exposure. This reduces visual discomfort, prevents fatigue, and creates a safer, more productive office environment.



Pressure Systems

- **Pressure Systems**

Pressure systems include boilers, compressed air tanks, gas cylinders, and hydraulic systems that operate under high pressure. Improper operation, poor maintenance, or faulty components can lead to explosions, equipment failure, or projectiles, causing severe injuries or fatalities. OHS guidelines require regular inspections, pressure relief devices, proper training, and adherence to operational limits. Safe handling, secure storage, and emergency procedures are essential to prevent accidents, ensuring workers' safety and compliance with workplace regulations.

- **Real Workplace Scenario**

In a manufacturing plant, a worker is filling a compressed gas cylinder without checking the pressure gauge or using a safety valve. The cylinder bursts, causing flying debris and minor injuries to the worker and nearby colleagues. After the incident, the company implements strict inspection procedures, safety training, and pressure-relief devices on all cylinders. Staff are instructed to follow operating limits and proper handling protocols, preventing future accidents and ensuring compliance with OHS standards.



Vehicle and Mobile Equipment

- **Vehicle and Mobile Equipment Hazards**

Vehicle and mobile equipment hazards occur when workers are exposed to forklifts, trucks, cranes, or other moving machinery in the workplace. Risks include collisions, rollovers, being struck by moving equipment, or run-over injuries. OHS measures include operator training, regular maintenance, clear traffic management, use of warning signs, and personal protective equipment (PPE). Proper workplace layout, designated pathways, and adherence to safe operating procedures are essential to prevent accidents, injuries, and fatalities.

- **Real Workplace Scenario**

At a warehouse, a forklift operator is transporting pallets along a busy aisle. A worker walking through the area is not visible due to blind spots, and the forklift nearly collides with them. After the near-miss, the company implements clearly marked pedestrian pathways, mirrors at blind spots, speed limits, and forklift safety training for operators. These measures reduce the risk of collisions, ensure pedestrian safety, and align with OHS vehicle and mobile equipment safety standards.



Confined Spaces

- **Confined Spaces**

Confined spaces are areas not designed for continuous occupancy, with limited entry or exit, such as tanks, silos, sewers, or tunnels. They pose hazards like oxygen deficiency, toxic gases, fire, flooding, and entrapment. From an OHS perspective, confined spaces require risk assessments, permits, trained personnel, monitoring of air quality, ventilation, and emergency rescue plans. Workers must use appropriate personal protective equipment (PPE), including respirators and harnesses, and follow strict safety protocols. Proper planning and supervision are essential to prevent accidents, injuries, or fatalities in these high-risk environments.

- **Real Workplace Scenario**

In a wastewater treatment plant, a worker enters a sewage tank to perform maintenance without checking gas levels. The worker quickly experiences dizziness from hydrogen sulfide exposure and collapses. Fortunately, colleagues follow emergency procedures and rescue him using safety harnesses and breathing apparatus. Following the incident, the company enforces strict confined space entry permits, continuous gas monitoring, PPE requirements, and worker training, significantly reducing the risk of future confined space incidents and ensuring compliance with OHS standards.



Link

<https://oshwiki.osha.europa.eu/en/themes/physical-agents>



Introduction to Legal Framework (Physical Hazards)

EU Framework Directive 89/391/EEC & Health & Safety at Work Act XXXIII of 2024 Cpt 646, establishes the basic duties for protecting workers' safety and health across the EU. It requires employers to take a preventive approach by integrating safety into all work activities, with responsibility for workplace risks remaining primarily with the employer.

General principles of prevention require employers to avoid risks where possible, assess unavoidable risks, and control hazards at their source. Work must be adapted to the individual through ergonomic design and safe organisation, while dangerous processes should be replaced with safer alternatives. Collective protective measures (such as guards or engineering controls) must be prioritised over individual protection like PPE, and workers must receive clear information and training.



Introduction to Legal Framework (Physical Hazards)

Risk assessment requirements are central to the Directive. Employers must identify hazards, evaluate risks to workers, and implement suitable control measures. Assessments must be documented, regularly reviewed, and updated when workplace conditions change. Risk management should follow a continuous cycle of hazard identification, evaluation, control implementation, and monitoring.

Employer responsibility for physical hazards includes managing risks such as noise, vibration, radiation, extreme temperatures, unsafe machinery, and manual handling. Employers must provide safe equipment, maintain safe workplaces, introduce preventive organisational measures, and ensure training and supervision. Even when external safety specialists are used, the employer retains full legal responsibility for ensuring worker protection.



EU Directive 89/391/EEC – Key Principles

1. **Avoid risks** wherever possible by eliminating hazards at the planning stage.
2. **Evaluate unavoidable risks** through systematic risk assessment.
3. **Combat risks at source** by using engineering or organisational controls.
4. **Adapt work to the individual**, including ergonomic workplace and task design.
5. **Adapt to technical progress** by improving equipment and safety methods.
6. **Replace dangerous processes or substances** with safer alternatives where feasible.
7. **Develop a coherent overall prevention policy** integrating technology, organisation and working conditions.
8. **Prioritise collective protection over individual protection** and provide clear instructions and training to workers.



Maltese Legal Framework (Physical Hazards)

The Health and Safety at Work Act

S.L. 646.11 - General Provisions for Health and Safety at Workplaces Regulations

S.L. 646.07 - Minimum Health and Safety Requirements for Work with Display Screen Equipment Regulations

S.L. 646.08 - Work Place (Minimum Health and Safety Requirements) Regulations

S.L. 646.10 - Protection against Risks of Back Injury at Workplaces Regulations

S.L. 646.19 - Work Place (Minimum Requirements for Work) (Confined Spaces and Spaces having Explosive Atmospheres) Regulations



Maltese Legal Framework (Physical Hazards)

S.L. 646.20 - Work Place (Minimum Health and Safety Requirements for the Protection of Workers from Risks resulting from Exposure to Noise) Regulations

S.L. 646.21 - Work Place (Minimum Health and Safety Requirements for the Protection of Workers from Risks resulting from Exposure to Vibration) Regulations

S.L. 646.22 - Work Place (Minimum Health and Safety Requirements for the Protection of Workers from Risks resulting from Exposure to Artificial Optical Radiation) Regulations

S.L. 646.23 - Work Place (Minimum Health and Safety Requirements for the Protection of Workers from Risks resulting from Exposure to Electromagnetic Fields) Regulations

S.L. 646.24 - Work Equipment (Minimum Safety and Health Requirements) Regulations



Employers Duties (Physical Hazards)

Under EU Directive 89/391/EEC & HASWA Act, employers have a primary duty to protect workers from physical hazards at the workplace, including noise, vibration, extreme temperatures, radiation, dangerous machinery, and manual handling risks. They must ensure that work equipment, workplaces, and systems of work are safe and do not pose avoidable harm. This includes maintaining facilities, providing suitable tools, and organising tasks in a way that reduces exposure to physical risks.

Employers are required to carry out suitable and sufficient risk assessments to identify physical hazards and evaluate the level of risk to workers. Where risks cannot be eliminated, employers must implement preventive measures following the hierarchy of control, prioritising engineering and collective protections such as machine guarding, ventilation, or workplace redesign before relying on personal protective equipment. Risk assessments must be documented, regularly reviewed, and updated when changes occur.

In addition, employers must provide workers with information, instruction, training, and appropriate supervision to ensure safe working practices. They must consider workers' physical capabilities, prepare emergency procedures, and monitor the effectiveness of control measures. Even when external experts are consulted, the employer retains full legal responsibility for managing physical hazards and ensuring a safe and healthy working environment.



Workers Duties (Physical Hazards)

Workers also have important duties under EU Directive 89/391/EEC and HASWA Act, to help reduce risks from physical hazards in the workplace. They must take reasonable care of their own health and safety and that of others who may be affected by their actions. This includes correctly using machinery, tools, vehicles, and protective equipment provided by the employer, and following safety instructions and training related to hazards such as noise, vibration, extreme temperatures, radiation, or manual handling. Workers should not misuse or interfere with safety devices, guards, or control systems designed to reduce exposure to physical risks.

In addition, workers have a duty to cooperate with the employer in implementing preventive measures and complying with workplace safety procedures. They must promptly report defects in equipment, unsafe conditions, or any situation that presents a serious danger so that corrective action can be taken. Participation in training, risk control measures, and emergency procedures is also required to maintain a safe working environment. While employers carry the main legal responsibility for managing risks, workers play a key role by acting responsibly, following established controls, and contributing to a culture of safety that helps minimise physical hazards at the workplace.



Practical Activity – Scenario Overview

- Mixed-use workplace example
- Identify multiple physical hazards
- Consider different work areas
- Discuss potential risks





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