

Managing Physical Hazards

Lecture Title: Integrated Physical Hazard Management & Continuous Improvement

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**Undergraduate Diploma in
Occupational Health and Safety**

“Why do serious incidents still happen...
even when everything appears
compliant?”



Welcome and Objectives

The final lecture integrates physical hazard management into broader OHS programs, including exposure monitoring, trend analysis, documentation, health surveillance, KPIs, audits, and management reviews. Students learn how to build improvement cycles and apply performance indicators to track and enhance physical hazard controls.



Welcome, Module Roadmap & Transition from Risk Management

Lecture 1 — Introduction to Physical Hazards & Regulatory Frameworks

Lecture 2 — Measurement & Monitoring Techniques for Physical Hazards

Lecture 3 — Noise & Vibration Hazards: Exposure, Measurement & Control

Lecture 4 — Thermal Hazards: Heat Stress, Cold Stress, and Thermal Comfort

Lecture 5 — Radiation Hazards: Ionising and Non-Ionising

Lecture 6 — Lighting, Visibility, and Workplace Ergonomics

Lecture 7 — Machinery, Mechanical Hazards & Machine Safeguarding

Lecture 8 — Workplace Environment Hazards: Slips, Trips, Falls, and Confined Spaces

Lecture 9 — Physical Hazard Control Strategies: Engineering, Administrative & PPE

Lecture 10 — Integrated Physical Hazard Management & Continuous Improvement 18th May

This module focuses on physical agents and their technical, physiological, and legal considerations



Integrated Physical Hazard Management

1. From controls to systems
Managing risk through integrated, structured approaches
2. From implementation to performance
Focus on how controls actually work in practice
3. From one-off actions to continuous improvement
Ongoing monitoring, review, and learning



Why This Lecture Matters

1. Many workplaces appear compliant but still experience incidents
2. Typical gaps observed in practice:
 - Controls installed but not maintained
 - PPE issued but not consistently used
 - Monitoring performed once but not repeated
 - Limited follow-up on risk assessments
3. Safety failures often occur after implementation
 - The issue is not lack of knowledge
 - It is weak system management





Workplace Reality

In real workplaces:

1. Noise levels increase gradually due to poor maintenance
2. Machine guards may be bypassed for operational efficiency
3. PPE use declines without supervision or reinforcement
4. Slips and trips continue despite procedures

Important:

Systems may appear compliant...But risk exposure continues in practice



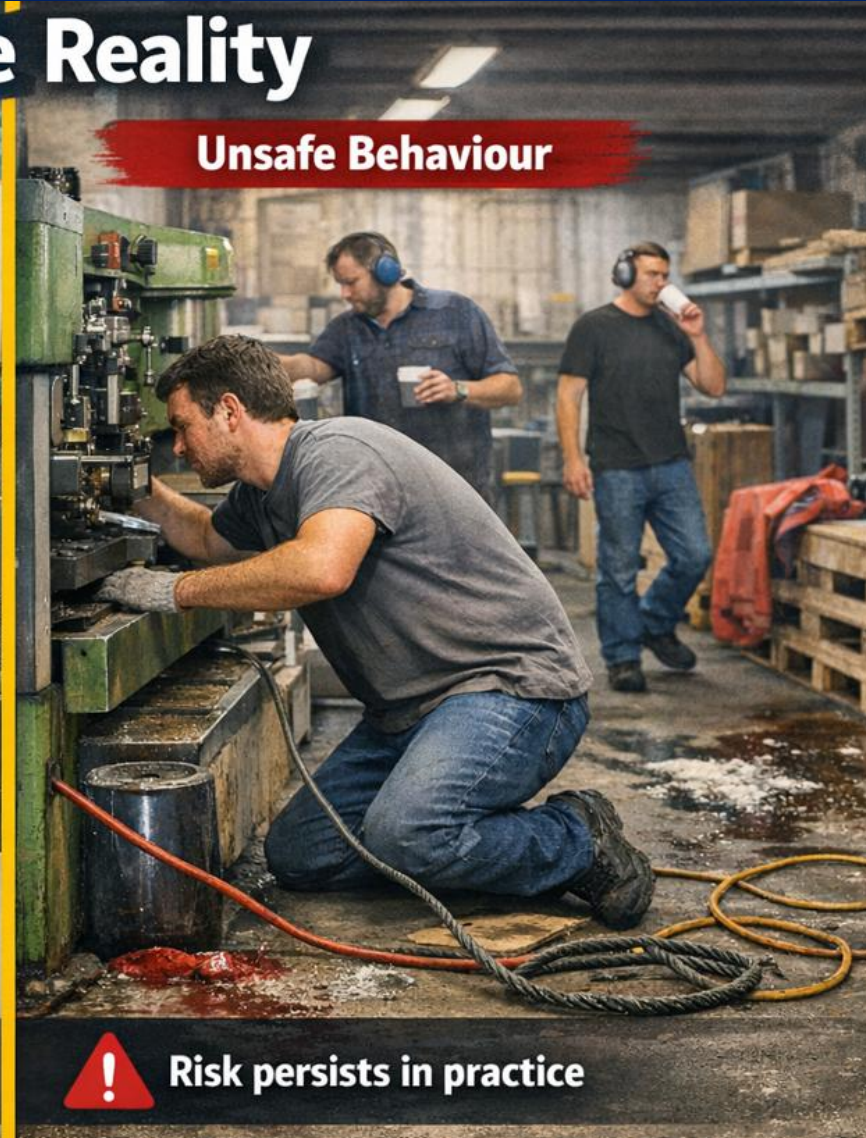
Workplace Reality

Safe & Compliant



Systems look compliant

Unsafe Behaviour



Risk persists in practice

What We Have Built So Far

Through this module:

1. Established legal obligations and employer duties
2. Learned hazard identification and risk assessment
3. Applied measurement techniques for physical hazards
4. Understood hazard-specific risks
5. Applied the hierarchy of controls

We integrate these into a complete system



Legal Foundations

1. Maltese OHS legislation requires employers to:
 - Identify hazards
 - Assess risks
 - Implement controls
 - Ensure continuous effectiveness
2. Legal compliance requires ongoing verification
 - Not a one-time obligation
 - Continuous responsibility

Measurement & Monitoring

We measure:

1. Noise levels
(dB, action values)
1. Heat stress (WBGT)
2. Vibration exposure
3. Lighting levels
4. Radiation levels

Measurement provides:

1. Objective data
2. Verification of exposure
3. Evidence for decisions

Types of Noise Measurement Instruments



Sound Level Meter



Dosimeter

Key Hazard Insights

1. Noise: cumulative and permanent damage
2. Heat: varies by individual and conditions
3. Radiation: invisible but high-risk
4. Ergonomics: gradual and often ignored

- Many hazards do not cause immediate injury
- Effects develop over time

High-Risk Conditions

1. Machinery: high severity, catastrophic risk
2. Slips/Trips: frequent, often underestimated
3. Confined Spaces: immediate and fatal risks

Systems must manage:

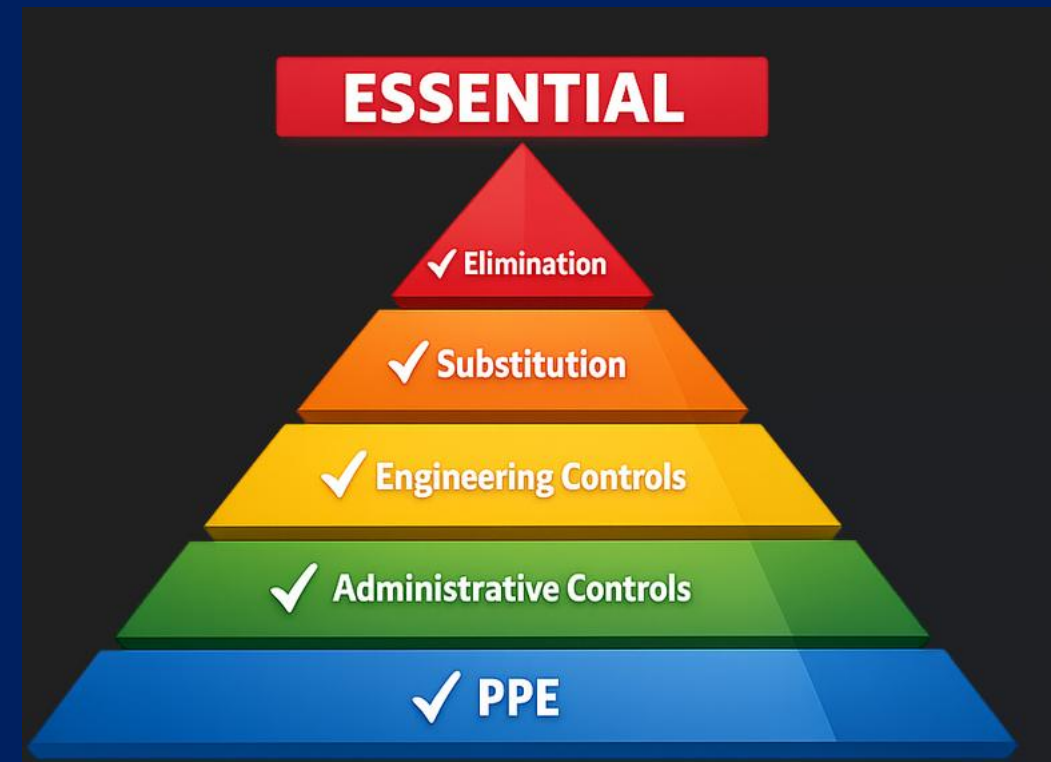
1. High severity + high frequency hazards





Control Hierarchy

1. Elimination
2. Substitution
3. Engineering controls
4. Administrative controls
5. PPE



Key principle:

Controls dependent on behaviour are less reliable

What is Integrated Management?

A system that:

1. Links hazard identification and control
2. Includes monitoring and measurement
3. Uses data for analysis

Drives continuous improvement
Not static — evolves over time
Visual: Simple system diagram



Key Principle

1. Workplaces change
2. Risks evolve
3. Equipment deteriorates
4. Human behaviour varies

Therefore: Risk must be actively managed over time



From Tasks to Systems

Traditional:

- Risk assessment completed once
- Control implemented

Integrated:

- Ongoing monitoring
- Data analysis
- Continuous improvement



Old vs New Thinking

Old:

- Reactive
- Compliance-driven

New:

- Proactive
- Performance-driven

Focus shifts to prevention

System Thinking

A control must:

1. Be installed correctly
2. Be used consistently
3. Be maintained properly
4. Be verified regularly

Weakness in any stage = system failure



Management Cycle

1. Identify hazards
2. Assess risks
3. Implement controls
4. Analyse data
5. Monitor exposure
6. Review performance
7. Improve



Continuous Nature

1. Safety has no endpoint
2. Controls degrade
3. Environments change
4. Behaviour adapts

- Without monitoring → risk returns
- Safety performance depends on how well the system works in practice — not how good it looks on paper



Core Components



Exposure Monitoring

1. Planned and structured measurement
2. Confirms effectiveness of controls
3. Must be repeated periodically
4. Should focus on high-risk areas

Key function: verify exposure

Why Monitoring Matters

1. Detects hidden risks
2. Identifies control failures
3. Tracks changes over time
4. Supports compliance

Enables early intervention



When to Monitor

1. Periodically (planned schedule)
2. After changes in process or equipment
3. After incidents or complaints
4. After implementing controls

Monitoring must be proactive

Practical Examples

1. Noise surveys in production
2. Heat stress checks in summer
3. Lighting assessments
4. Vibration monitoring tools

Measurements must reflect real working conditions



Data & Trends

1. Single data point = snapshot
2. Multiple data = trend
3. Trends show real performance

Focus on patterns over time



Why Trends Matter

1. Identify gradual risk increases
2. Detect recurring issues
3. Predict future problems

Prevention becomes possible



Examples of Trends

1. Increase in slips in wet conditions
2. Rising noise from equipment wear
3. Increased thermal complaints

Trends provide early warning

Leading Indicators

1. Inspections completed
2. Monitoring conducted
3. Actions closed
4. Maintenance performed



Focus on preventing incidents

Leading vs Lagging Indicators

❖ Leading indicators = proactive

- Prevent incidents before they occur
- Focus on system activity and performance

❖ Lagging indicators = reactive

- Measure outcomes after failure

Strong systems:

1. Use leading indicators for control
2. Use lagging indicators for learning
3. Best practice = combination of both

KPIs in Hazard Management

1. KPIs = measurable indicators of system performance
2. Translate safety into quantifiable metrics
3. Provide visibility of:
 - System effectiveness
 - Compliance level
 - Areas of weakness
4. Enable:
 - Tracking of improvement
 - Accountability across departments



KPI Examples (Leading Focus)

1. Examples of leading KPIs:

- % of exposure monitoring completed on schedule
- % of risk assessments reviewed within timeframe
- % of corrective actions closed on time
- % of engineering controls verified

- ❖ These show how well the system is functioning
- ❖ Focus on activities that prevent harm



KPI Examples (Lagging Focus)

1. Examples of lagging KPIs:
 - Number of noise-related complaints
 - Number of slip/trip incidents
 - Recorded cases of occupational illness
 - Exposure exceedances recorded
- ❖ Important for:
 1. Identifying failures
 2. Understanding consequences
 3. But not sufficient on their own



Documentation as a System Tool

1. Documentation is not just compliance:

- It provides evidence
- It supports decision-making
- It enables historical tracking

2. Key functions:

- Demonstrate control implementation
- Record monitoring results
- Track corrective actions

Essential for audits and inspections



Types of Documentation

1. Risk assessments
2. Monitoring and measurement reports
3. Inspection checklists
4. Maintenance logs
5. Training records
6. Incident reports

Together they form the evidence base of the system



Documentation Limitations

1. Documentation alone does NOT ensure safety:
2. Procedures may not be followed
3. Records may not reflect reality
4. Paper compliance can mask real risk

Key message: Documents must reflect actual practice



Health Surveillance

1. Medical monitoring linked to specific hazards
2. Detects early signs of occupational harm
3. Confirms whether controls are effective
4. Examples:
 - Audiometry (noise exposure)
 - HAVS screening (vibration)
5. Provides feedback on system performance



Role of Health Surveillance

Acts as:

- Early warning system
- Last line of defence
- Identifies control failure before severe harm occurs

Important:

- Does NOT replace control measures
- Supports risk management



Key Message

- Health surveillance reveals the consequences of system failure not its causes
- Must always be linked back to controls



Assurance & Governance



Workplace Inspections

1. Focus on identifying:
 - Physical conditions
 - Visible hazards
 - Unsafe acts
2. Typically conducted:
 - Daily / weekly
 - By supervisors or safety reps
 - Provide immediate corrective actions



Safety Audits

1. Systematic review of:

- Processes
- Procedures
- System effectiveness

2. Evaluate:

- Whether controls are working
- Whether systems are followed
- More structured and formal than inspections



Inspection vs Audit

1. Inspection:

- Focus on what is visible
- Short-term correction

2. Audit:

- Focus on system performance
- Long-term effectiveness

3. Both are essential but serve different purposes



Practical Example

1. Machine guard installed → inspection OK
2. Guard bypassed during operation → audit failure

Key lesson: Presence of control ≠ effectiveness

Management Review

1. Senior management evaluates:

- System performance
- Risk exposure
- Resource allocation

2. Ensures alignment between:

- Safety objectives
- Operational priorities

Critical for continuous improvement



Inputs to Review

1. KPI trends
2. Monitoring data
3. Audit findings
4. Incident reports
5. Health surveillance data

Data-driven decision-making

Continuous Improvement



Why Continuous Improvement

1. Systems naturally degrade over time
2. Equipment wears and fails
3. Work conditions change
4. Human behaviour drifts

Without improvement: Risk increases



PDCA Cycle

1. Plan: identify issues and actions
2. Do: implement controls
3. Check: monitor effectiveness
4. Act: adjust and standardise

Structured improvement approach



Practical Application

Example: Noise control programme

1. Plan → identify high exposure areas
2. Do → install engineering controls
3. Check → measure exposure
4. Act → refine and expand

Continuous optimisation



Common System Failures

1. Lack of follow-up
2. Weak monitoring systems
3. Actions not closed
4. Over-reliance on PPE
5. Poor communication

Often management issues, not technical failures



Scenario 1 — Noise

1. Initial assessment completed
2. No periodic monitoring
3. Exposure gradually increases
4. Workers develop hearing loss

Failure: Lack of review and monitoring

Scenario 2 — Machinery

1. Guard installed initially
2. Maintenance neglected
3. Guard becomes ineffective
4. Serious injury occurs

Failure: Lack of maintenance and verification



Scenario 3 — PPE

1. PPE issued to workers
2. No supervision or enforcement
3. Workers stop using PPE
4. Exposure continues

Failure: Over-reliance on behaviour



Lessons Learned

1. Most incidents occur:
 - After controls are implemented
2. Root cause:
 - Poor system management

Key principle: Controls must be actively managed



Integrated System Model

1. Hazard identification
2. Risk assessment
3. Control implementation
4. Exposure monitoring
5. Data analysis
6. Management review
7. Continuous improvement

All connected in one system



Big Picture

1. Safety is not:
 - Policies
 - Procedures
 - Documentation

2. Safety is: How well the system performs over time



Applying Integrated Management to Physical Hazards

1. Slips → friction monitoring + trend analysis
2. Noise → exposure monitoring + health surveillance
3. Confined spaces → permit system + verification + audit
4. Machinery → guarding + inspection + behavioural risk

Key Takeaways

1. Compliance is the starting point
2. Monitoring is essential
3. Data drives decisions
4. Systems must be maintained
5. Improvement must be continuous

Strong systems prevent failure



Closing

1. Managing physical hazards is continuous
2. Systems require constant attention
3. Improvement never ends
4. Final thought:

“A safe workplace is not achieved BUT it is maintained”





