

Risk Management in Practice

Lecture Title:
Control Measures and Hierarchy of Control

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Undergraduate Diploma in
Occupational Health and Safety

Welcome and Objectives

Examines control strategies and the hierarchy of controls used to mitigate risks.

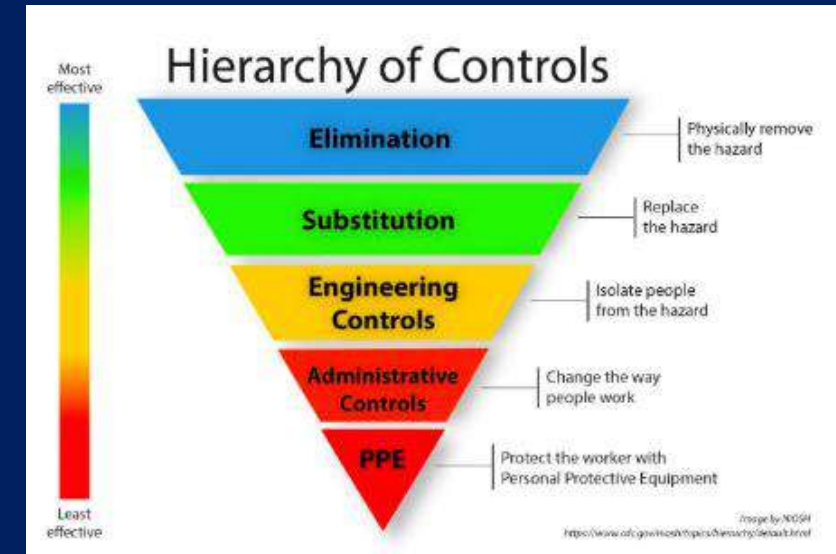
- Understand the hierarchy of controls.
- Evaluate effectiveness of different control measures.
- Implement appropriate controls in workplace settings



Hierarchy of Control

What comes to mind?

The Hierarchy of Control is a system used to minimize or eliminate exposure to hazards. It ranks control measures from most effective to least effective.



Where Does the Hierarchy of Control Fit Within Risk Management Systems?

The Hierarchy of Control is a core tool used during the risk management process, particularly in the risk control phase. It helps safety professionals select the most effective measures to mitigate identified hazards.

Why it fits Risk Management?



1. Prioritizes Effectiveness

- It ranks control measures from most effective (Elimination) to least effective (PPE), ensuring hazards are addressed at the source whenever possible.

2. Supports Decision-Making

- Safety professionals use it to select controls that reduce risk to the lowest practicable level, rather than relying on quick fixes.

3. Aligns with Legal and Best Practice Standards

- Many regulations and international standards (ISO 45001, OSHA) require applying the hierarchy when implementing controls.

4. Prevents Over-Reliance on PPE

- Without the hierarchy, organizations often default to PPE, which is the least effective and most dependent on human behavior.

5. Promotes Proactive Risk Reduction

- By focusing on elimination and engineering controls first, it tackles hazards before they can cause harm.

Risk Management Stage	Role of Hierarchy of Control
Hazard Identification	Sets the foundation for deciding which controls are needed once hazards are known.
Risk Assessment	Helps evaluate the severity and likelihood of risks to determine the level of control required.
Risk Control (Mitigation)	Primary stage where the hierarchy is applied to select the most effective control measures.
Implementation of Controls	Ensures controls follow the hierarchy — starting from elimination down to PPE.
Monitoring & Review	Used to assess whether controls are effective and if higher-level controls can be introduced.

Using the Hierarchy of Control within a risk management system promotes systematic risk reduction, prevents reliance on less effective controls, supports compliance with legal and best practice standards, and enhances safety culture by prioritizing proactive measures

What Are Control Measures?

Definition of Control Measures

Control measures are strategies to eliminate or reduce workplace hazards and risks effectively.

Legal and Regulatory Context

Control measures are mandated by the EU Framework Directive and national safety legislation.

Role in Risk Management

Implementing control measures is key to proactive risk management and accident prevention.

Promoting Safety Culture

Control measures foster a culture of safety and ensure worker protection in organizations.



Examples of Control Measures

Elimination of Hazard

Elimination removes the hazard entirely, making it the most effective control measure.

Substitution with Safer Alternatives

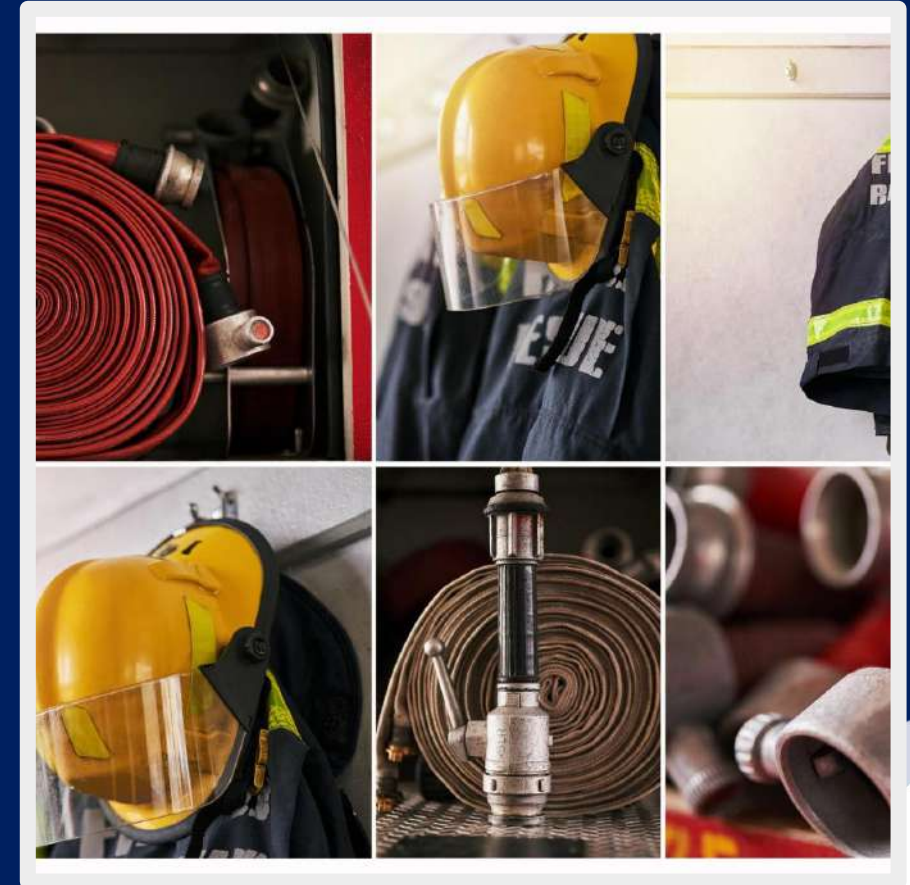
Substitution replaces hazardous substances or processes with less dangerous ones.

Engineering Controls

Engineering controls isolate people physically from hazards using guards or ventilation.

Administrative Controls and PPE

Administrative controls involve training and procedures; PPE is the last defense.



Overview of the Hierarchy

Hierarchy Levels

The hierarchy consists of five levels prioritizing hazard control effectiveness systematically.

Most Effective Control

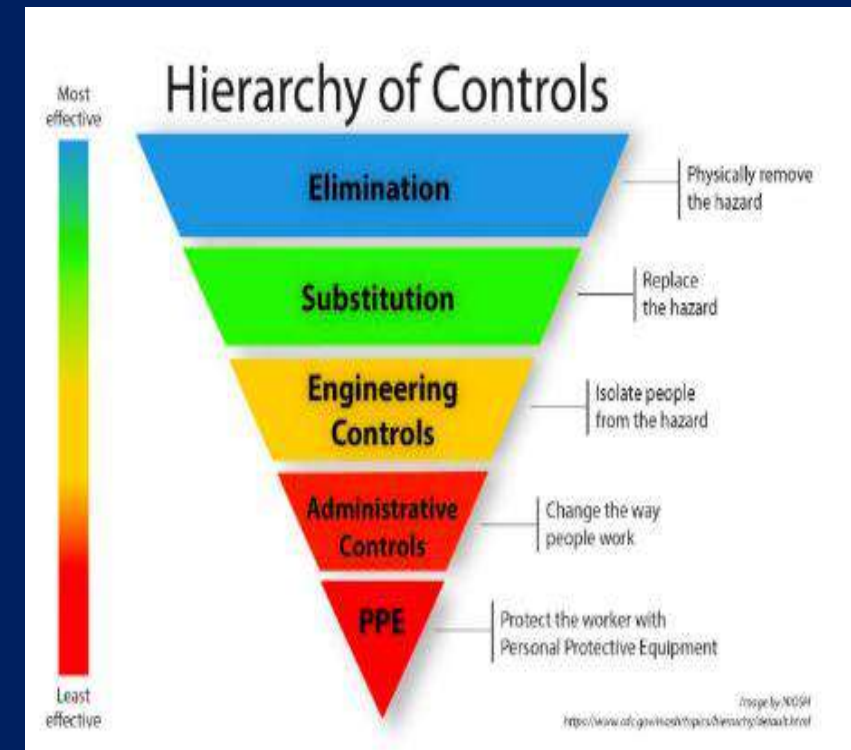
Elimination removes the hazard entirely and is the most effective control measure.

Least Effective Control

Personal Protective Equipment depends on individual compliance and is least effective.

Purpose of Hierarchy

It guides safety professionals in selecting appropriate and sustainable control measures.



Implementing and Evaluating Controls

Control Implementation Steps

Effective implementation requires planning, stakeholder engagement, resource allocation, and progress monitoring.

Role of Safety Culture

Strong leadership and a positive safety culture are essential for successful control application.

Evaluating Control Effectiveness

Use KPIs, audits, inspections, and incident analysis to assess control performance.

Continuous Improvement Approach

Regular review and enhancement ensure controls remain effective and up to date.



Factors Influencing Control Selection

Cost and Feasibility

Budget constraints and operational feasibility shape control measure choices effectively.

Legal Requirements

Compliance with health and safety laws is essential for control selection.

Worker Involvement

Engaging workers in decisions improves acceptance and control effectiveness.

Balanced Decision-Making

A balanced approach considers both practical constraints and regulatory needs.



Implementing Controls

Planning Implementation

Develop a clear, detailed implementation plan for control measures with defined steps.

Employee Training

Train employees effectively to ensure understanding and correct application of controls.

Communication Strategies

Use clear communication to ensure stakeholders understand controls and responsibilities.

Monitoring and Feedback

Establish systems to monitor controls and use feedback for continuous improvement.



Legal Framework

ASPECT	EU DIRECTIVES	OHSA MALTA	ISO 45001
Legal Status	Binding on MS	National law	Voluntary standard
Control Hierarchy	Embedded in General Principles of Prevention	Explicit in legislation	Structured in Clause 8.1
Enforcement	National authorities	OHSA	Internal audits & certification

EU DIRECTIVE: Directive 89/391/EEC

Core Prevention Principles

The directive promotes avoiding, evaluating, and combating risks at their source to ensure safety.

Adaptation and Substitution

Work should be adapted to individuals and dangerous substances replaced with safer alternatives.

Collective Protection Priority

Collective protective measures are prioritized over individual protection to enhance safety.

Employer Obligations and Worker Involvement

Employers must conduct risk assessments and workers should participate in safety training.



Supporting EU Directives

Construction Site Safety

Directive 92/57/EEC mandates specific control measures in high-risk construction environments.

Chemical Agents Control

Directive 98/24/EC requires risk assessments and controls to minimize chemical exposure.

Biological Agents Protection

Directive 2000/54/EC enforces protective measures based on biological hazard severity.

Hierarchy of Controls

Directives prioritize elimination and substitution before engineering controls and PPE use.



Maltese Legislation

Hierarchy of Control in Maltese Legislation



In Malta, the requirement to apply the Hierarchy of Control in health and safety comes from the Health and Safety at Work Act (Chapter 646 of the Laws of Malta) and its subsidiary legislation.

This Act transposes EU Directive 89/391/EEC into Maltese law and embeds the General Principles of Prevention (GPP), which reflect the hierarchy of control.



Where in Maltese Legislation?

- Health and Safety at Work Act (Cap. 646)
 - Employers must identify hazards, assess risks, and implement measures based on the General Principles of Prevention.
 - These principles include:
 - Avoiding risks (Elimination)
 - Combating risks at source (Engineering controls)
 - Replacing dangerous substances with less dangerous ones (Substitution)
 - Prioritizing collective measures over individual measures (Engineering/Admin before PPE)
- Subsidiary Legislation S.L. 646.11 – General Provisions for Health and Safety at Workplaces Regulations
 - Explicitly requires employers to apply preventive measures according to the hierarchy of control when managing workplace risks.



Where in Maltese Legislation?

Link to Hierarchy of Control

1. The General Principles of Prevention in Maltese law mirror the hierarchy of control:
2. Eliminate hazards → Remove risk entirely.
3. Combat risks at source → Engineering solutions.
4. Replace dangerous with less dangerous → Substitution.
5. Collective measures before individual measures → Engineering/Admin before PPE.



ISO 45001 Framework

Clause 8.1 Operational Control

Hierarchy of Controls

The clause requires applying controls from elimination to PPE to reduce safety risks effectively.

Risk Assessment Process

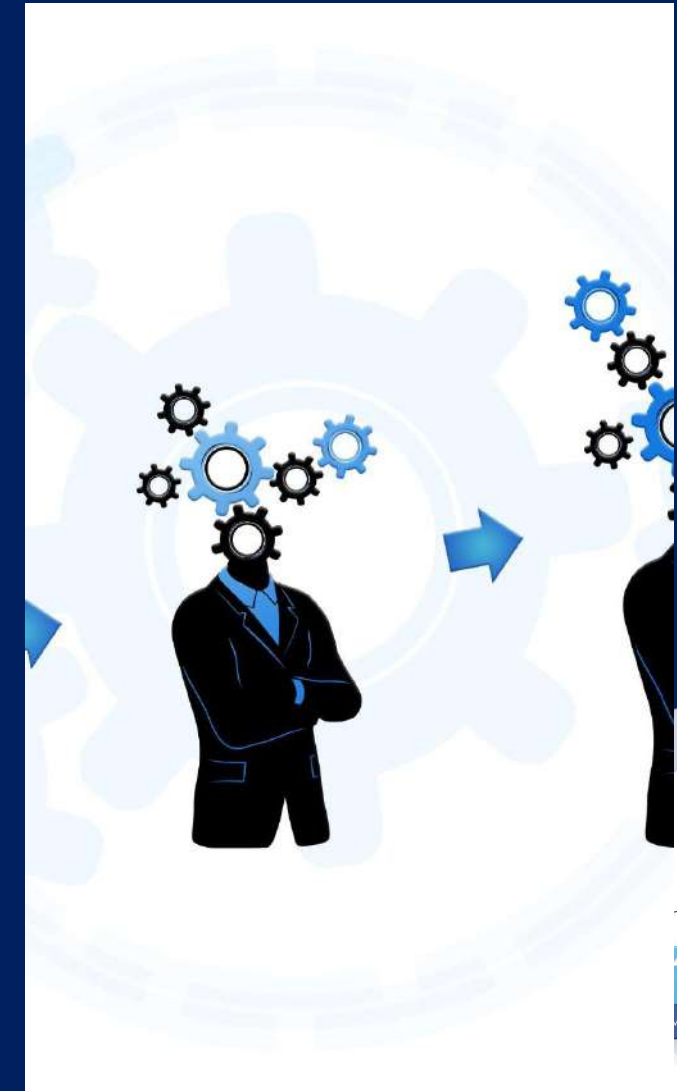
Organizations must identify hazards and evaluate risks to determine appropriate control measures.

Documentation and Communication

Control measures must be documented and communicated to all workers to ensure awareness and compliance.

Operational Integration

Safety is integrated into management of change, procurement, and contractor oversight processes.



Practical Integration of Controls

Risk Assessment and Hazard Identification

Begin with thorough risk assessments to identify hazards and evaluate current controls accurately.

Hierarchy of Controls Prioritization

Prioritize controls by aiming to eliminate hazards and preferring substitution and engineering controls.

Control Documentation and Review

Document, communicate, and regularly review controls to ensure ongoing effectiveness and compliance.

Training and Performance Monitoring

Implement training programs and monitor performance to foster a safety culture and reduce incidents.



Conclusion

Legal Frameworks Overview

EU directives, OHSA Malta legislation, and ISO 45001 reinforce occupational health safety principles.

Priority of Controls

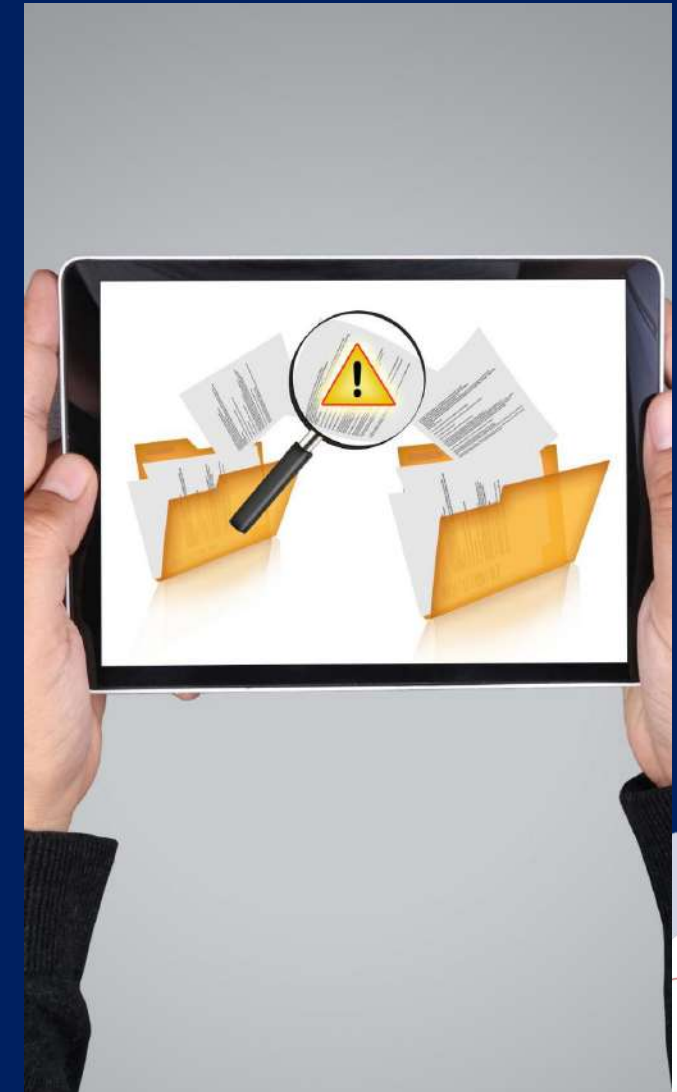
Frameworks promote elimination and substitution as top priority controls for hazard management.

Integrated Safety Measures

Combining multiple standards ensures comprehensive and compliant safety practices in organizations.

Proactive Safety Culture

Applying these principles fosters safety culture, reduces incidents, and enhances employee well-being.



1. What's the most unusual "control measure" you've ever seen or heard of in a workplace?
2. If you could eliminate one workplace hazard with a magic wand, what would it be?
3. Which control measure do you think is most often overlooked in practice?
4. Have you ever seen a control measure backfire or cause a new hazard?

5. Which control measure would you trust most to protect your workforce?
6. Which control measure would you choose if budget wasn't a constraint?
7. What's the most common excuse you've heard for not wearing PPE?
8. Which control measure do you think is most dependent on human behavior?



9. What's a control measure that looks good on paper but fails in practice?
10. Have you ever seen a workplace where PPE was used as the first line of defense?
11. What's one control measure that's often misunderstood by workers?
12. What's the biggest challenge in implementing elimination as a control measure?



13. Can you think of a time when elimination of a hazard wasn't possible? What was done instead?
14. Which level of the hierarchy do you think is most commonly used in your industry? Why?
15. Have you ever seen a substitution that made things worse instead of better?
16. Why do you think PPE is often the most visible control measure, even though it's the last resort?

17. Which control measure would you say requires the most ongoing maintenance or monitoring?
18. Can you think of a situation where administrative controls were the only feasible option?
19. What's the biggest challenge in applying the hierarchy of control in small businesses?
20. If you had to rank the hierarchy of control from easiest to hardest to implement, how would you order them?



21. What's one reason why substitution might be resisted by workers or management?
22. How would you explain the hierarchy of control to someone with no safety background?
23. Which control measure do you think is most influenced by company culture?
24. What's a common misconception about engineering controls?



25. What's one control measure that could benefit from better communication strategies?
26. Which control measure would you say is most influenced by leadership commitment?•
27. What's a control measure that's often resisted by workers, and why?



Elimination

Most Effective Control

Elimination completely removes hazards, preventing any risk of harm at the source.

Example of Elimination

Replacing noisy machines with quieter technology eliminates hearing risks effectively.

Design Phase Importance

Elimination is best applied during design to prevent hazards before introduction.

Feasibility Considerations

Operational limits and costs can restrict elimination despite its high effectiveness.



Removing Hazards Completely

Elimination as Best Control

Elimination removes hazards completely to prevent any risk of exposure to workers. It is the most effective control measure.

Methods of Elimination

Elimination can be done by redesigning processes, ~~automating tasks, or substituting materials to remove~~ hazards.

Benefits of Elimination

This strategy addresses the root cause of hazards and ensures workers are protected from dangers.

Limitations of Elimination

Elimination may not always be feasible due to operational or cost constraints but remains a priority.



Substitution

Definition of Substitution

Replacing hazardous substances or equipment with safer alternatives reduces risk effectively.

Example of Safer Alternatives

Using water-based paints instead of solvent-based reduces harmful VOC exposure significantly.

Proactive Risk Reduction

Substitution requires evaluation to avoid introducing new hazards, ensuring safer outcomes.

Implementation Considerations

Assess feasibility, cost, and productivity impact to ensure sustainable substitution solutions.



Replacing Hazards with Safer Alternatives

Definition of Substitution

Replacing hazardous substances with less dangerous alternatives improves safety and reduces risks.

Evaluation for New Hazards

Careful assessment ensures substitutes do not introduce new safety threats or operational issues.

Benefits of Substitution

Leads to improved safety, less reliance on protective gear, supports sustainability and compliance.

Continuous Review Process

Regularly review operations to identify new substitution opportunities with emerging technologies.



Engineering Controls

Physical Hazard Isolation

Engineering controls isolate workers from hazards using physical barriers and systems.

Examples of Controls

Controls include ventilation systems, machine guards, and soundproof enclosures to reduce risks.

Long-Term Benefits

Engineering controls provide lasting safety improvements and operational efficiency with upfront investment.

Reliability Over Behavior

These controls reduce reliance on worker actions, offering more consistent hazard protection.



Isolating People from Hazards

Purpose of Engineering Controls

Engineering controls isolate workers from hazards with physical workplace modifications. They provide moderate effectiveness in hazard reduction.

Common Engineering Examples

Examples include ventilation systems, machine guards, and ergonomic workstations to reduce airborne and physical hazards.

Benefits and Costs

Engineering controls have high initial costs but lower incidents and insurance premiums over time with improved morale.

Design and Maintenance

These controls are implemented during design or retrofitted and do not depend on worker behavior for consistent protection.



Administrative Controls

Definition of Administrative Controls

Administrative controls change work practices to reduce hazard exposure and risk.

Examples of Controls

Includes worker rotation, safety training, standard procedures, and safety audits.

Reliance on Compliance

Effectiveness depends on worker compliance and management oversight for safety.

Cost and Protection Trade-Off

Administrative controls are easier and cheaper but offer less protection than engineering.



Changing Work Practices

Role of Administrative Controls

Administrative controls change work practices to reduce hazard exposure through behavior modification.

Examples of Controls

Examples include safety training, standard procedures, exposure scheduling, and warning signs.

Limitations of Controls

These controls rely on human compliance and are less effective than engineering solutions.

Enhancing Safety Culture

Continuous training, supervision, audits, and feedback improve control effectiveness and safety culture.



Personal Protective Equipment (PPE)

Role of PPE

PPE serves as the last line of defense against hazards in the workplace. It protects workers when hazards cannot be eliminated or controlled by other methods.

Types of PPE

Typical PPE includes gloves, safety goggles, respirators, hard hats, and protective clothing to shield from various hazards.

Proper Use and Training

Correct selection, use, and maintenance of PPE are essential, requiring worker training on proper application and understanding limitations.

PPE Maintenance and Inspection

Regular inspections ensure PPE remains in good condition and fits properly, maximizing its protective effectiveness.



Protecting Workers with Equipment

Role of PPE

PPE is the last line of defense and does not remove hazards but provides essential protection.

Proper Use and Fit

Effective PPE must fit correctly and be used consistently to provide protection.

Training and Maintenance

Training on proper use, storage, and disposal of PPE is crucial for safety.

PPE in Risk Management

PPE is vital but should be part of a broader strategy including hazard assessment.



Limitations and Risks of Relying on PPE

REASON	EXPLANATION
Does not eliminate hazard	PPE only protects the user; the hazard remains present in the environment.
Human compliance required	Effectiveness depends on correct and consistent usage by individuals.
Limited protection	PPE may not fully protect against severe or unexpected exposures.
Comfort and productivity	Discomfort can lead to non-compliance and reduced efficiency.
Risk of failure	Damaged or improperly maintained PPE can fail to protect.

Main Challenges in Practice

Feasibility of Higher Controls

Elimination and substitution often require major process changes and significant planning.

Cost and Resource Limitations

Engineering controls are effective but costly, challenging especially for small businesses.

Over-reliance on Lower Controls

Using PPE alone can provide false security and does not remove hazard sources.

Maintenance and Sustainability

Safety controls need ongoing monitoring and upkeep to remain effective over time.



Common Challenges

Budget Constraints: Limited budgets restrict the implementation of comprehensive control measures effectively.

Resistance to Change: Fear and unfamiliarity cause delays in adopting substitution and new safety practices.

Maintenance Issues: Engineering controls require continuous upkeep to maintain their effectiveness and safety.

Reliance on PPE: Small businesses often depend heavily on personal protective equipment due to scarce resources



Summary of Key takeaways

Structured Framework

Hierarchy of controls offers a clear structure for managing workplace hazards effectively.

Effective Hazard Elimination

Elimination is the most effective control and should be prioritized when feasible.

Practical Application

Applying hierarchy levels and overcoming challenges ensures sustainable safety interventions.



Leadership & Worker Involvement in Hierarchy of Controls: Role of Leadership

Leadership Commitment

Leaders prioritize safety by allocating resources and time to protective measures. Visible commitment enhances safety culture.

Strategic Decision-Making

Safety decisions are based on thorough risk assessments, not just convenience or cost. This ensures effective control measures.

Policy and Accountability

Leaders establish clear safety policies and hold managers accountable to enforce effective controls consistently.

Empowering Safety Champions

Leadership supports middle managers to innovate and continuously improve hazard elimination strategies and safety culture.



Leadership & Worker Involvement in Hierarchy of Controls: Role of worker involvement

Hazard Identification by Workers

Workers recognize risks early through daily task familiarity, enabling effective hazard identification.

Feedback on Control Measures

Workers provide feedback that helps refine and improve safety control measures in practice.

Participation in Safety Committees

Involvement in safety committees fosters shared responsibility and enhances safety initiatives.

Training and Education Importance

Training ensures workers understand how and why control measures are used, promoting compliance.



Leadership & Worker Involvement in Hierarchy of Controls: Synergy Between Leadership and Workers

Collaborative Safety Strategy

Leadership and workers collaborate to implement effective and sustainable safety controls.

Proactive Safety Culture

Partnership fosters prevention by addressing hazards before incidents occur.

Continuous Improvement

Feedback loops between workers and leaders drive ongoing safety enhancements.

Enhanced Communication and Trust

Synergy builds trust and empowers all to take ownership of safety outcomes.



Persuasive Statement

Using the Hierarchy of Control is not just best practice—it's the most effective way to protect workers, comply with regulations, and build a sustainable safety culture. Unlike PPE or administrative controls, which only reduce risk partially and rely on human compliance, the hierarchy ensures hazards are addressed at their root, delivering long-term safety and cost benefits.



Next: Lecture 5: Legal & Ethical Responsibilities in Risk Management

Summary: Discusses legal frameworks and ethical considerations in managing occupational risks.

Learning Objectives:

- Identify key legal obligations related to OHS.
- Understand ethical principles in risk management.
- Apply legal and ethical standards to workplace scenarios.

