



Health, Safety and Environment (HSE) in Industrial Installations

**Target: 2nd Year Engineering
Students**

Instructor: Dr. GRINE Wassila

A photograph of two industrial workers in a factory setting. They are wearing yellow hard hats, safety glasses, and white face masks. They are also wearing orange high-visibility safety vests over blue long-sleeved shirts. The worker on the right is holding a walkie-talkie to his mouth, while the worker on the left is holding a smartphone. They appear to be in the middle of a safety check or communication. The background shows industrial structures and large windows.

Chapter 1: Risk Assessment and Accident Analysis

Description: Introduction to Safety Systems for

Industrial Engineering

Five-Session Roadmap

- **Session 1:** Introduction to HSE & Fundamental Concepts
- **Session 2:** Prevention Stakeholders & Safety Performance Indicators
- **Session 3:** Risk Analysis Methodology
- **Session 4:** Root Cause Analysis Methods
- **Session 5:** Risk Families & Integrated Case Study



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SESSION 5: Risk Families & Integrated Case Study

Date: 19/11/2025

18H00-19H30



Objectives

Learning Objectives of the Session

Learning Objective:

- ❑ Classify risks into their main families.
- ❑ Apply a comprehensive risk assessment process in a simulated work environment.
- ❑ Analyze the relationship between different types of risks and their interconnected impact on the work environment.
- ❑ Develop a comprehensive risk control plan using the SIRP hierarchy (Substitution, Engineering Controls, Administrative Controls, Personal Protective Equipment).

What are Risk Families?

Definition:

Classifying risks into cohesive groups based on the nature of the harmful energy or hazard source.

Benefits:

- ▶ Facilitates the risk identification process.
- ▶ Improves risk management effectiveness.
- ▶ Enhances safety culture.



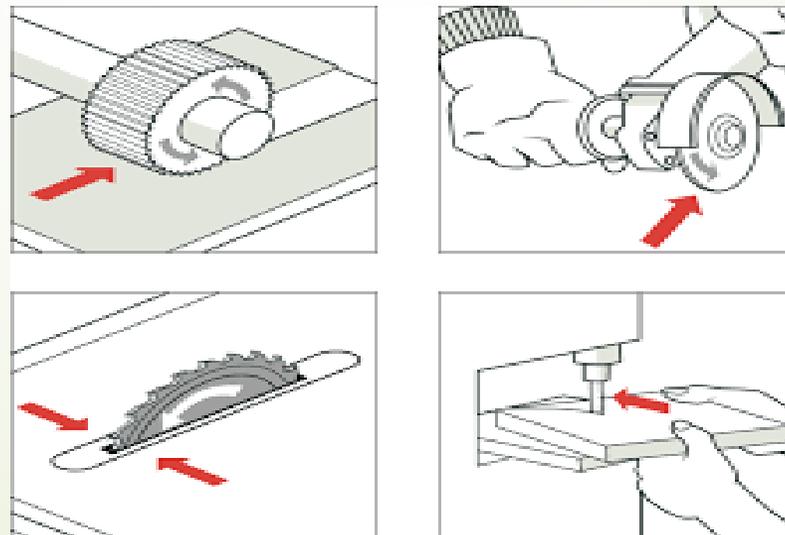
Mechanical Risk Family

Source: Mechanical energy, moving parts.

Potential Effects:

- Cutting or wounding.
- Crushing.
- Entanglement or impact.

Examples: Saws, fans, pulleys.



Electrical Risk Family

Source: Electric current.

Potential Effects:

- ❑ Electrocution.
- ❑ Burns (from Arc Flash).
- ❑ Fires.

Cause: Direct or indirect contact with live parts.



Chemical Risk Family

Exposure Routes: Inhalation, skin contact, ingestion.

Potential Effects:

- ❑ Poisoning.
- ❑ Chemical burns.
- ❑ Skin or respiratory allergies.

Identification Tool: Globally Harmonized System (GHS) pictograms.



<https://youtu.be/i0KvgPxdUS4?si=v0dzVcDmFgthbXi>

Common Chemical Hazards in the Workplace

Acids and Solvents



Cleaning Agents

Chlorine Bleach
Cleaners
Sanitizers
Disinfectants



Glues and Paints



Heavy Metals

Mercury
Lead
Arsenic
Cadmium
Chromium
Beryllium



Pesticides



Other Toxic Materials

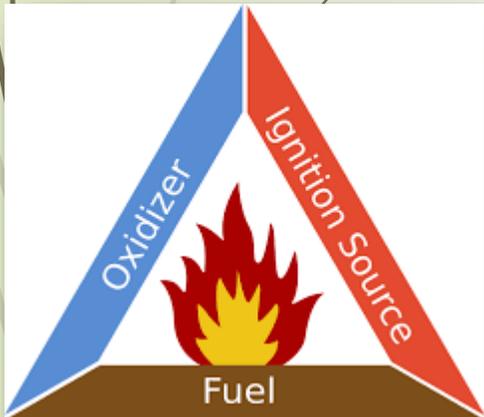


Fire & Explosion Risk Family

Fire Triangle Theory:

- Oxidizer (Oxygen).
- Fuel (Wood, gasoline, gas).
- Ignition Source (Spark, flame).

Prevention: Removing one side of the triangle.



Fall Risk Family

1. Same-Level Falls:

Causes: Slippery floors, congested walkways.

2. Falls from Height:

Causes: Working on roofs, unstable scaffolds.

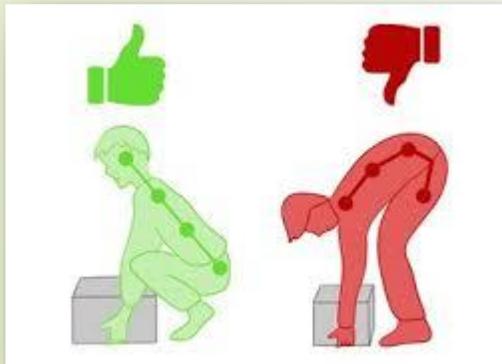


Ergonomics Risk Family

Effects: Musculoskeletal disorders, back injuries.

Causes:

- Manual handling of heavy loads.
- Incorrect body postures.
- Repetitive movements.
- **Exemple:** A person lifting a heavy box with incorrect posture.



Psychosocial Risk Family



Source: Work environment and organizational culture.

Manifestations:

- Work-related stress.
- Burnout.
- Harassment and bullying.
- **Consequences:** Deteriorating mental health, decreased productivity.



Practical Activity - HSE Consultant Simulation

- ▶ **Scenario:** The company "FabricPlus" hires you as HSE Consultants.
- ▶ **Task:** Conduct a preliminary risk assessment in the packaging workshop.
- ▶ **Time:** 45 minutes.
- ▶ **Format:** Group work (3-4 individuals).

Group Tasks

1. **Identification:** Identify at least 5 hazards and classify them into the appropriate families.
2. **Assessment:** Use the Risk Assessment Matrix (Likelihood x Severity).
3. **Prevention:** Propose preventive actions using the SIRP hierarchy.
4. **Presentation:** Prepare a 3-minute summary.



Session 5 Summary

Key Points Covered:

1. Systematic classification of risks into 7 main families
2. In-depth analysis of each family's characteristics and risks
3. Practical application through packaging workshop risk assessment simulation
4. Concept integration linking to the "from hazard to action" chain

Key Takeaways for Trainees:

- ✓ Systematic understanding of risk nature and classifications
- ✓ Practical tool for risk assessment in various work environments
- ✓ Analytical skill to connect risks and study their mutual impact
- ✓ Planning capability to develop integrated control plans

Core Message:

"Risk management is not just about identifying hazards, but rather an integrated system that starts with proper classification and ends with effective control plans, coupled with a deep understanding of the interrelationships between different risk types."

Next Step:

Apply this knowledge in the final project of Chapter One, where all concepts from the five sessions will be integrated into a comprehensive case study.

Chapter One Summary: From Hazard to Action

Risk Management Pathway:

1. Hazard Identification.
2. Risk Assessment.
3. Analysis (Cause and Effect Diagram).
4. Prevention Measures (SIRP).

Tools: Indicators, Matrices, Diagrams.

Philosophy: Safety is a culture and a process of continuous improvement.



«From Theory to Application.»

من النظرية إلى التطبيق.

Thank you all for your attention

