Risk Management in Practice

Lecture Title:
Risk Management in High-Risk Industries

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Undergraduate Diploma in Occupational Health and Safety

Welcome and Objectives

Summary

Examines risk management practices in industries such as construction, pharmaceutical and healthcare.

Learning objectives:

- Identify unique risks in high-risk industries
- Apply industry – specific risk controls
- Evaluate effectiveness of safety programs

What are High-Risk Industries?

1. **Nature of High-Risk Industries**

High-risk industries inherently involve complex operations and hazardous conditions increasing accident likelihood.

2. **Types of Hazards**

Hazards include exposure to harmful substances, heavy equipment use, and unpredictable environmental factors.

3. **Importance of Risk Management**

Robust and proactive risk management strategies are critical to prevent catastrophic failures in these industries.

The Deepwater Horizon Oil Rig

Why Risk Management Matters in High-Risk Industries

Critical Nature of Risk Management

High-risk industries require strict risk management to protect workers and prevent serious accidents and injuries.

Beyond Compliance

Risk management goes beyond legal compliance to safeguard lives, ensure operations, and protect reputation.

Challenges in High-Risk Sectors

Tight deadlines and resource limits increase risks, making proactive risk management essential.

Building Resilient Systems

Integrating risk management daily helps anticipate hazards and create adaptive, resilient safety systems.

Key Characteristics of High-Risk Industries?

1. **Nature of Work and Frequent Exposure**
   - **Hazardous Materials**: Frequent handling of chemicals, toxic substances, or radioactive materials (e.g., chemical manufacturing, mining).
   - **Physical Hazards**: Exposure to noise, vibration, extreme temperatures, or radiation.
   - **Biological Hazards**: Risk of infection or disease (e.g., healthcare, agriculture).

2. **Complexity and Environment –** *require constant vigilance & adaptation*
   - **Unstable or Extreme Conditions**: Work in confined spaces, underwater, at heights, or in remote locations.
   - **Dynamic Environments**: Constantly changing conditions, such as construction sites or offshore oil rigs.

Key Characteristics of High-Risk Industries?

3. Equipment and Technology – *Critical Operations*

- **Heavy Machinery Use**: Increased risk of mechanical failure or operator error.
- **High-Energy Systems**: Electrical, hydraulic, or pressurized systems that can cause catastrophic accidents

4. Human Factors

- **Manual Handling:** High physical strain, repetitive tasks, or awkward postures.
- **Fatigue and Stress:** Long shifts, high-pressure decision-making, or mental load.

Key Characteristics of High-Risk Industries?

5. Regulatory and Compliance Complexity

- Industries with strict legal requirements (aviation, nuclear, pharmaceuticals) often indicate higher inherent risks because of the potential consequences of non-compliance.

6. Historical Data and Incident Rates

- Accident Frequency and Severity: Industries with higher rates of fatalities, injuries, or occupational diseases are considered high-risk (e.g., mining, construction, maritime).

What are “inherent” risks?

Inherent risk is **the level of risk that exists in an activity, process, or environment before any controls or mitigation measures are applied**. It represents the “natural” exposure to hazards due to the nature of the work, materials, or conditions involved.

High-risk industries—such as oil & gas, mining, aviation, chemical manufacturing, construction, and nuclear power—are characterized by:

1. Complex operations involving hazardous substances or extreme conditions.
2. High energy processes (e.g., drilling, refining, flying).
3. Potential for catastrophic consequences (explosions, structural collapse, environmental disasters).
4. Limited ability to eliminate hazards completely—controls can reduce risk but not remove it entirely.

Because these industries deal with inherently dangerous tasks, their baseline (inherent) risk is much higher compared to low-risk sectors like office work

Example of “inherent” risks

1. Oil & Gas Industry

- Drilling operations: risk of blowouts and fires due to high-pressure hydrocarbons.
- Transporting crude oil: risk of spills and environmental contamination

2. Mining

Underground mining: risk of cave-ins and exposure to toxic gases.

Handling explosives: risk of accidental detonation.

3. Aviation

Flying at high altitudes: risk of engine failure or severe weather impact.

Fuel handling: risk of fire or explosion.

4. Chemical Manufacturing

Working with corrosive or toxic chemicals: risk of burns, poisoning, or leaks.

High-temperature reactions: risk of thermal runaway.

Which industry do you think has the highest fatality rate in Malta?

1. **Construction sector** remains the most dangerous, accounting for **over 50% of all workplace fatalities**
2. Non-Fatal Accidents:
   Manufacturing and Construction 13.9%

NSO Malta - Producing high-quality statistics and analysis for better decision making in Malta

Which industry do you think has the highest fatality rate globally?

Highest Fatality Rates Globally

1.Mining and Quarrying
- Extremely high fatality rates due to cave-ins, explosions, and exposure to toxic gases.

2.Construction
- Leading cause of workplace deaths worldwide, mainly from falls, electrocution, and struck-by incidents.

3.Fishing and Maritime
- Very high fatality rates due to harsh weather, drowning, and equipment hazards.

Highest Non-Fatal Accident Rates

1. **Manufacturing**
   - High incidence of cuts, burns, and musculoskeletal injuries.
2. **Healthcare and Social Work**
   - Frequent injuries from lifting patients, slips, and exposure to biological hazards.
   - High rates of musculoskeletal disorders and needlestick injuries.
3. **Agriculture**
   - from machinery, animals, and chemical exposure.

Examples of High-Risk Industries

INDUSTRY	PRIMARY RISKS
Construction	Falls from height, struck-by hazards, heavy equipment accidents
Pharmaceutical	Chemical exposure, contamination, ergonomic risks
Healthcare	Biological hazards, patient handling injuries, stress and fatigue
Oil & Gas	Explosive materials, confined spaces, remote locations
Aviation	Human error, technical failures, high reliance on precision

Catastrophic Consequences in High-Risk Industries

High-risk industries face failures that can lead to catastrophic outcomes, impacting lives, the environment, and economies.

Why catastrophic?

1. Operations involve hazardous materials, high energy processes, and complex systems.
2. Failures often result in chain reactions with severe consequences.

Catastrophic Consequences in High-Risk Industries

Key Consequences:

1. Multiple fatalities and injuries.
2. Environmental disasters (oil spills, radiation leaks).
3. Massive financial and reputational losses.

Real-World Examples:

1. Deepwater Horizon oil spill (Oil & Gas).
2. Chernobyl nuclear disaster (Energy).
3. Major aviation crashes (Aviation).

Deepwater Horizon oil spill—environmental damage, loss of life, billions in fines

1. **Fatalities:** 11 workers died in the initial explosion on April 20, 2010.
2. **Injuries:** 17 others were seriously injured.
3. **Environmental Impact:** It became the largest marine oil spill in history, releasing millions of barrels of oil into the Gulf of Mexico.
4. **Economic & Social Impact:** Massive damage to marine ecosystems, fishing industries, and coastal communities.
5. This incident is often cited as a prime example of how failures in high-risk industries can lead to **catastrophic consequences**—both human and environmental.

Deepwater Horizon explosion - Wikipedia

Deepwater Horizon oil spill—environmental damage, loss of life, billions in fines

Key Root Causes

1. **Well Design and Cementing Issues**
   - Inadequate cement barrier between casing layers allowed hydrocarbons to enter the wellbore.
   - Poor cement integrity tests were misinterpreted or ignored. [resilience.org]
2. **Blowout Preventer (BOP) Failure**
   - The BOP, designed as the last line of defense, failed to seal the well due to mechanical problems and pipe buckling. [csb.gov]
3. **Risk Management and Decision-Making Failures**
   - BP's management process did not adequately identify or address risks created by late changes to well design and procedures.
   - Time and cost-saving decisions compromised safety margins. [erm-strategies.com]

Tenerife 1977: A Turning Point in Aviation Risk Management

What Happened

1. Heavy fog and a congested runway at Los Rodeos Airport (Tenerife, Canary Islands) created poor visibility.
2. A **miscommunication between air traffic control and the KLM crew**, combined with **ambiguous phraseology**, led the KLM aircraft to begin takeoff while the Pan Am aircraft was still taxiing on the same runway.
3. The two planes collided on the runway.

Tenerife 1977: A Turning Point in Aviation Risk Management

Consequences

1. **Fatalities:** 583 people died.
2. **Survivors:** 61 passengers from the Pan Am aircraft survived.
3. It remains the worst accident in aviation history in terms of fatalities.

Root Causes

1. **Communication Failures:** Ambiguous language and lack of standardized phraseology.
2. **Human Factors:** Pressure to depart, misinterpretation of ATC clearance.
3. **Environmental Conditions:** Dense fog reduced visibility.

Tenerife 1977: A Turning Point in Aviation Risk Management

Lessons Learned

1. Introduction of **Crew Resource Management (CRM)** training worldwide.
2. Standardization of **aviation phraseology** (e.g., “cleared for takeoff”).
3. Emphasis on **human factors and decision-making** in aviation safety.

Tenerife airport disaster - Wikipedia

Beyond Safety Programs: What Drives High Fatality Rates?

1. **Inherent Hazards**
   - Petrochemical: Explosive materials, confined spaces, toxic chemicals
   - Construction: Working at heights, heavy machinery, dynamic environments
   - Transportation: Long hours, fatigue, high-speed operations

2. **Complex Work Environments**
   - Multiple contractors, changing conditions, remote locations
   - Difficult to maintain consistent safety standards across all sites

3. **Human Factors**
   - Fatigue, stress, and behavioral shortcuts under pressure
   - High reliance on manual tasks in some sectors

Beyond Safety Programs: What Drives High Fatality Rates?

4. **Resource Constraints & Production Pressure**
   - Tight deadlines and cost-cutting can lead to risk-taking
   - Safety sometimes seen as secondary to productivity

5. **Regulatory Gaps or Enforcement Issues**
   - In some regions, weak enforcement of safety laws
   - Lack of training and competency programs

6. **Safety Culture Challenges**
   - If safety is treated as compliance only, not a core value
   - Poor reporting culture (near misses ignored)

So even with a safety program, if it's not robust, enforced, and embedded into the culture, fatalities can remain high.

A strong program needs **engineering controls, training, monitoring, and leadership commitment**.

What's the biggest risk you've faced in your industry?

Comparison Table: High-Risk vs Low-Risk Industries

Criteria	High-Risk Industries	Low-Risk Industries
Nature of Work	Involves hazardous materials, heavy machinery, extreme conditions	Primarily office-based, minimal physical hazards
Common Hazards	Chemical exposure, falls from height, confined spaces, biological risks	Ergonomic issues, minor slips/trips, screen fatigue
Incident Severity	High potential for fatalities or severe injuries	Mostly minor injuries or health complaints
Regulatory Complexity	Strict compliance with safety standards and legal frameworks	Basic compliance requirements
Work Environment	Dynamic, unpredictable, often outdoors or remote	Controlled, stable, indoor environments
Examples	Oil & Gas, Mining, Construction, Aviation, Healthcare	IT Services, Finance, Education, Consulting
Training Requirements	Extensive safety training, emergency preparedness	Basic health & safety induction
Personal Protective Equipment (PPE)	Mandatory and specialized (respirators, harnesses, etc.)	Minimal (e.g., office ergonomics)

High-Risk vs Low-Risk Industries: Mitigation Strategies

Criteria	High-Risk Industries	Mitigation Strategies	Low-Risk Industries	Mitigation Strategies
Nature of Work	Hazardous materials, heavy machinery, extreme conditions	Engineering controls, automation, strict SOPs, PPE, substitution of hazardous materials	Office-based, minimal hazards	Ergonomic workstation setup, regular breaks
Common Hazards	Chemical exposure, falls, confined spaces, biological risks	Hazard elimination, ventilation systems, fall protection, biological containment	Ergonomic issues, minor slips/trips	Anti-slip mats, ergonomic chairs, awareness training
Incident Severity	High potential for fatalities or severe injuries	Emergency response plans, fail-safe systems, redundancy, drills	Mostly minor injuries or health complaints	First aid kits, basic safety training
Regulatory Complexity	Strict compliance with safety standards	Compliance audits, dedicated HSE teams, digital compliance tracking	Basic compliance requirements	Periodic checks, simple documentation
Work Environment	Dynamic, unpredictable, often outdoors or remote	Real-time monitoring, weather alerts, remote communication systems	Controlled, stable, indoor environments	Fire drills, HVAC maintenance
Training Requirements	Extensive safety training, emergency preparedness	Competency-based training, refresher courses, simulation exercises	Basic health & safety induction	Annual refresher training
PPE Requirements	Mandatory and specialized (respirators, harnesses)	PPE audits, proper fit testing, maintenance schedules	Minimal (e.g., office ergonomics)	Awareness on posture and screen time

KPIs That Define High-Risk Industries

1. Lost Time Injury Frequency Rate

- **Why it matters:** Indicates how often serious injuries occur that cause workers to miss work.
- **High-risk benchmark:** Industries like mining or construction often have LTIFR > 3.0.

KPIs That Define High-Risk Industries

2. Fatality Rate

- **Metric:** Number of fatalities per 100,000 workers.
- **Why it matters:** Direct indicator of extreme risk.
- **High-risk benchmark:** Mining and logging have some of the highest fatality rates globally

KPIs That Define High-Risk Industries

3. Severity Rate

- **Metric:**

$$\text{Severity Rate} = \frac{\text{Total Lost Workdays} \times 1{,}000}{\text{Total Hours Worked}}$$

- **Why it matters:** Shows how severe incidents are (not just how frequent).

Industry	LTIFR	TRIR	Fatality Rate
Mining	3.5	4.2	25/100k
Construction	2.8	3.5	10/100k
Finance	0.1	0.2	<1/100k

KPIs That Define High-Risk Industries

4. **Exposure to High-Hazard Tasks**
   - **Metric:** % of workforce exposed to hazardous chemicals, confined spaces, heights, etc.
   - **Why it matters:** Higher exposure = higher inherent risk.

KPIs That Define High-Risk Industries

5. **Regulatory Non-Compliance Rate**
   - **Metric:** Number of violations per audit or per year.
   - **Why it matters:** Non-compliance often correlates with higher risk.

6. **Near-Miss Reporting Rate**
   - **Metric:** Near misses per 100 employees.
   - **Why it matters:** High near-miss frequency signals underlying hazards

Evaluating Safety Programs

Key Metrics and Indicators

Lagging Indicators

Lagging indicators measure past safety performance through incident rates, injury frequency, and severity rates.

Leading Indicators

Leading indicators track proactive safety efforts such as safety audits, training sessions, and hazard reports submitted.

Compliance and Benchmarking

Compliance with regulations and benchmarking against industry standards provide critical insight into safety program effectiveness.

Balanced Evaluation Approach

Combining leading and lagging indicators ensures comprehensive evaluation and resource allocation for safety performance.

Beyond Safety Programs: What Drives High Accident Rates?

High accident and fatality rates in High Risk Industries does NOT automatically mean companies don't care—it's usually a combination of inherent hazards, systemic challenges, and human factors.

Root Causes of a High Risk

1. **Inherent Nature of Work**
   - Operations involve hazardous materials, extreme environments, and complex processes.
   - Risks like falls, explosions, chemical exposure, and biological hazards are difficult to eliminate completely.

2. **Complexity of Operations**
   - Large-scale projects with multiple contractors and dynamic conditions.
   - Remote or harsh environments increase emergency response challenge

Root Causes of a High Risk

3. Equipment & Technology Limitations

- Heavy machinery and specialized tools introduce mechanical risks.
- In some regions, outdated equipment persists due to cost constraints.

4. Human Factors

Fatigue from long shifts, inadequate training, and poor supervision.
Behavioral shortcuts and non-compliance under production pressure.

Root Causes of a High Risk

5. Economic Pressures

Tight deadlines and cost-cutting often conflict with safety priorities.
Smaller operators may lack resources for advanced safety systems.

6. Regulatory & Enforcement Gaps

Weak enforcement or inconsistent audits in some jurisdictions.
Cultural attitudes prioritizing production over safety.

Contributing Factors

1. Unpredictable conditions (e.g., sudden equipment failure, chemical leaks).
2. Remote locations with limited medical access.
3. Supply chain delays for PPE or spare parts.

Does This Mean Companies Don't Care?

Not necessarily.
Many organizations invest heavily in safety (automation, sensors, training).
However: Risk cannot be fully eliminated due to the nature of operations and
Smaller operators or those in regions with weak regulation often struggle to maintain high standards.

How Leading Companies Address This

- **Automation & Remote Operations**: Reduce human exposure to hazards.
- **Real-Time Monitoring**: Sensors for gas detection, equipment health, and environmental conditions.
- **Behavioral Safety Programs**: Training workers to recognize hazards and report near misses.
- **Strict Safety KPIs**: Linking leadership performance to safety outcomes.

Comprehensive Safety Framework for High-Risk Sectors

Pillar 1: Hazard Elimination & Engineering Controls

Actions:

- Replace hazardous processes with safer alternatives.
- Implement automation and remote operations.
- Install fail-safe systems and redundancy.

KPIs:

- % of tasks automated.
- Reduction in human exposure hours.

Example:
Rio Tinto uses **autonomous haul trucks** to reduce driver fatalities.

Rio Tinto

Rio Tinto is one of the world's largest mining and metals companies, headquartered in London and Melbourne.

They operate globally, extracting and processing minerals like iron ore, aluminum, copper, and diamonds. They are known for pioneering automation and remote operations in mining, such as using autonomous haul trucks and robotic drilling systems to reduce human exposure to hazardous environments and improve safety.

Rio Tinto's autonomous haul trucks achieve one billion tonne milestone - Australasian Mining Review

Comprehensive Safety Framework for High-Risk Sectors

Pillar 2: Advanced Risk Assessment & Monitoring

Actions:

- Use predictive analytics and AI for hazard detection.
- Deploy IoT sensors for real-time monitoring (gas, vibration, temperature).
- Implement geotechnical monitoring for ground stability.

KPIs:

- Number of predictive alerts vs actual incidents.
- Response time to critical alarms.

Example:
Mining companies use **ground movement sensors** to prevent cave-ins.

Smart Sensors for Mine Stability Monitoring

Underground tunnel with mining truck and blue-lit sensors for stability monitoring

Comprehensive Safety Framework for High-Risk Sectors

Pillar 3: Competency & Behavioral Safety

Actions:

- Mandatory competency-based training.
- VR simulations for emergency scenarios.
- Behavioral observation programs (BBS).

KPIs:

- % workforce certified for high-risk tasks.
- Near-miss reporting rate.

Example:
Nuclear plants use **VR drills** for reactor emergency response.

VR allows personnel to practice emergency procedures (e.g., coolant leaks, radiation exposure, station blackout) without real-world danger

Examples of VR Applications

1. **Emergency Preparedness Drills**
   Simulate **loss-of-coolant accidents**, **radiation leaks**, and **fire scenarios** in a controlled environment.
2. **Control Room Training**
   Operators practice critical steps like valve alignment and reactor shutdown using VR simulators.
3. **Maintenance & Decommissioning**
   VR helps rehearse complex tasks like fuel movement and dismantling without exposure to hazards.

Inside the Reactor: The Role of VR in Nuclear Power Workforce Development

Comprehensive Safety Framework for High-Risk Sectors

Pillar 4: Emergency Preparedness & Response

Actions:

- Develop site-specific emergency plans.
- Conduct quarterly evacuation and rescue drills.
- Ensure rapid medical response capability.

KPIs:

- Drill success rate.
- Average response time during incidents.

Example:
Offshore rigs conduct frequent drills. Frequency: Weekly muster drills and monthly full-scale evacuation exercises are common practice, as recommended by the International Maritime Organization (IMO) and OSHA.

Why are these drills done?

- Offshore oil and gas platforms are **isolated and high-risk environments** with hazards like fire, explosion, and blowouts.
- Drills typically involve **lifeboat launching, muster station assembly, and helicopter evacuation simulations**.

Benefits

- Reduces panic during real emergencies.
- Identifies gaps in emergency plans.
- Improves coordination between crew and emergency response teams

Comprehensive Safety Framework for High-Risk Sectors

Pillar 5: Governance, Culture & Accountability

Actions:

- Link executive bonuses to safety KPIs.
- Implement transparent incident reporting.
- Foster a “Safety First” culture through leadership engagement.

KPIs:

- Safety performance in annual reviews.
- Employee perception surveys on safety culture.

Example:
Global mining firms publish annual safety performance reports.

The Most Stringent Safety Framework: Aviation Industry

1. Global Regulatory Framework

- **ICAO (International Civil Aviation Organization)** and national authorities (FAA, EASA).
- Uniform standards across countries ensure consistency.

2. Mandatory Safety Management Systems (SMS)

- Airlines and airports must implement SMS, focusing on proactive hazard identification and continuous improvement.

3. Rigorous Certification & Maintenance

- Aircraft design, manufacturing, and maintenance undergo strict certification processes.
- Scheduled inspections and preventive maintenance are non-negotiable.

The Most Stringent Safety Framework: Aviation Industry

4. **Pilot Training & Competency**
   - Extensive initial and recurrent training, including simulator checks and emergency drills.

5. **Data-Driven Safety**
   - Use of **Flight Data Monitoring**, **predictive analytics**, and **reporting systems** to prevent incidents before they occur.

6. **Culture of Zero Tolerance**
   - Aviation enforces strict compliance—any deviation can ground operations immediately.

Summary and Key Takeaways

Why It Fits Well

1. **Contextual Understanding**
   High-risk industries (like construction, mining, oil & gas, aviation, healthcare, etc.) provide concrete examples where risk management is critical.
2. **Application of Theory**
   Methodologies like risk assessment, hazard identification, and hierarchy of controls are applied in environments with severe consequences for failure.
3. **Regulatory & Ethical Dimensions**
   These industries often have stringent legal frameworks and ethical considerations, which align with other topics you're covering.

Comparison with Other High-Risk Industries

1. **Oil & Gas**: Strong standards, but enforcement varies by region.
2. **Healthcare**: High standards for infection control, but human factors and resource constraints create variability.
3. **Construction**: Safety programs exist, but compliance often depends on contractor practices.

COMAH Overview
Control of Major Accidents Hazards
https://ohsa.mt/literature/COMAH

Purpose and Scope of COMAH

COMAH Regulatory Purpose

COMAH aims to prevent major accidents and minimize their consequences involving hazardous substances.

Scope of Application

COMAH covers high-risk industries like chemical plants, fuel depots, and energy facilities handling dangerous substances.

Operator Responsibilities

Operators must notify authorities, prepare prevention policies, and submit safety reports for compliance.

Legal and Safety Integration

COMAH enforces legal standards promoting proactive safety and risk management in operations.

Legal Framework and Compliance Requirements

Regulatory Framework in Malta

COMAH regulations in Malta are implemented via Subsidiary Legislation S.L. 646.12, aligning with the EU Seveso III Directive.

Competent Authorities

The Occupational Health and Safety Authority, Environment and Resources Authority, and Civil Protection Department enforce COMAH regulations collaboratively.

Operator Compliance Requirements

Operators must notify authorities, develop a Major Accident Prevention Policy, and submit safety reports for upper-tier sites.

Purpose of Regulations

These regulations ensure high protection levels for workers, the public, and the environment in high-risk industries.

COMAH Regs_ S.L. 646.12

1. Scope of COMAH

COMAH applies to establishments that store or process dangerous substances above certain threshold quantities. These substances include toxic chemicals, flammable liquids, and explosive materials.

2) **Industries Covered**

- Chemical & Petrochemical Plants(Production and storage of hazardous chemicals)
- Oil & Gas Facilities (Refineries, fuel depots, LNG terminals)
- Energy Sector(Power stations using hazardous substances)
- Large Manufacturing Sites(Handling dangerous chemicals in bulk
- Storage Terminals(Bulk storage of fuels or chemicals)

COMAH Regs - S.L. 646.12

Why These Are High-Risk

- Potential for **major accidents**: explosions, fires, toxic releases.
- Severe consequences for **human health, environment, and economy**

In Malta, COMAH is enforced under **Subsidiary Legislation S.L. 646.12**, which transposes the **EU Seveso III Directive**.

It classifies sites as:

- **Lower Tier**: Basic obligations (notification, prevention policy).
- **Upper Tier**: Full safety report, emergency planning, and audits.

Safety Report Requirements in Malta (Upper Tier Sites)

1. **Details of the Establishment**
   - Site layout, installations, and storage facilities.
   - Dangerous substances present (types, quantities).

2. **Major Accident Scenarios & Risk Analysis**
   - Identification of hazards.
   - Assessment of likelihood and consequences.

3. **Preventive & Mitigation Measures**
   - Technical and organizational measures.
   - Safety barriers and maintenance programs.

4. **Safety Management System**
   - Roles, responsibilities, training, and competence.
   - Procedures for monitoring and auditing.

5. **Emergency Planning**
   - On-site emergency plan.
   - Coordination with Civil Protection for off-site plans.

6. **Environmental Protection Measures**
   - Assessment of potential impacts.
   - Recovery measures.

7. **Demonstration of Compliance**
   - Evidence that design, construction, operation, and maintenance meet safety and reliability standards

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Establishments which are classified under the Control Of Major Accident Hazards (COMAH) Regulations L.N. 179/2015 [S.L. 646.12]

	Establishment	Location	Dangerous Substances	Classification of Establishment	Activity	Last COMAH Inspection
1	Electrogas Malta Ltd Delimara Power Station	Marsaxlokk	LNG	Upper Tier	LNG Storage & Power generation	November 2024
2	Enemalta plc Delimara Power Station	Marsaxlokk	Petroleum products	Upper Tier	Fuel Storage & Power generation	April 2025
3	Enemed Co. Ltd Ras Saptan	Hal Ghaxaq	Petroleum products	Upper Tier	Fuel storage & distribution	June 2025
4	Enemed Co. Ltd Ras Hanzir	Fuel Wharf I/o Paola	Petroleum products	Upper Tier	Fuel storage & distribution	April 2025
5	EVOS Malta Ltd	Birżebbuġa	Petroleum products	Upper Tier	Fuel storage & handling	May 2025
6	GASCO Energy Ltd	Birżebbuġa	LPG	Upper Tier	LPG storage & distribution	October 2024
7	Mediterranean Offshore Co. Ltd (MOBC)	Marsa	Petroleum products	Upper Tier	Fuel storage, bunkering & distribution	September 2024
8	EasyGas Malta Ltd	Luqa	LPG	Lower Tier	LPG storage & distribution	December 2024
9	Enemed Co. Ltd Luqa Airport Installation	Luqa	Petroleum products	Lower Tier	Fuel storage & distribution	September 2024
10	Waste Oils Co. Ltd	Marsa	Petroleum products	Lower Tier	Fuel storage, distribution & collection of waste oils	May 2025

Updated 31/07/2025

1. Which industries do you think qualify as “high-risk”?
2. Why do you think these industries are classified as high-risk?
3. Which high-risk industry do you believe has the most stringent safety standards?
4. What’s the biggest operational challenge in high-risk industries?

5. Why do you think downtime in high-risk industries is so costly?
6. Which high-risk industry do you think faces the most pressure from environmental regulations?
7. Can you name one major disaster in a high-risk industry and its impact?
8. Why do you think lessons from past disasters are sometimes ignored?

9. Which industry do you think learned the most from past accidents?

10. How is technology transforming high-risk industries today?

11. Do you think robotics will eliminate human exposure to hazards in high-risk industries?

12. Which emerging technology do you think will have the biggest impact on safety?

13. Which region of the world do you think faces the greatest challenges in managing high-risk industries?
14. Why do you think some countries have stricter safety laws than others?
15. How do global supply chains affect risk in high-risk industries?
16. Do you think high-risk industries can ever achieve zero accidents?

17. What's one emerging risk in high-risk industries today?

18. How do you think climate change will impact high-risk industries?

19. Who do you think bears the greatest responsibility for safety in high-risk industries?

20. Why do you think ethical considerations are critical in high-risk industries?

Unique Risks in High-Risk Industries

Construction Industry Risks

Fall Hazards

Falls from heights are a leading cause of injuries, requiring effective fall protection on scaffolds and ladders.

Struck-by Hazards

Workers are at risk of being struck by moving vehicles, falling tools, or materials on the site.

Heavy Equipment Risks

Operating heavy machinery poses risks of crushing injuries and equipment failures that require careful monitoring.

Additional Safety Hazards

Electrical hazards, confined spaces, noise exposure, and extreme weather further complicate construction site safety.

Pharmaceutical Industry Risks

Chemical Exposure Hazards

Handling toxic or carcinogenic active pharmaceutical ingredients poses significant chemical risks to workers.

Contamination Risks

Improper handling can compromise product safety and integrity, risking patient health.

Ergonomic Hazards

Repetitive tasks and awkward postures increase risk of musculoskeletal disorders among workers.

Regulatory Compliance Importance

Adhering to GMP and SOPs is critical to prevent errors, recalls, and protect employees and consumers.

Healthcare Industry Risks

Biological Hazard Exposure

Healthcare workers face daily risks from infectious diseases and bloodborne pathogens during patient care.

Patient Handling Injuries

Improper lifting or repositioning of patients can cause musculoskeletal injuries among healthcare staff.

Stress and Fatigue

Long shifts and emotional demands lead to stress and fatigue, increasing risk of errors.

Risk Management Strategies

Training, ergonomic interventions, and infection control measures are essential to reduce risks.

Industry-Specific Risk Controls

Controls in Construction

Engineering Controls

Engineering controls involve physical safety measures like guardrails, safety nets, and barriers to reduce fall and struck-by hazards.

Administrative Controls

Administrative controls include safe work procedures, safety training, and site inspections to manage construction risks effectively.

Personal Protective Equipment

PPE such as helmets, harnesses, and high-visibility clothing provides the last line of defense for worker safety.

Technology and Safety Systems

Advanced technology like proximity sensors and wearable devices alert workers to hazards and improve safety management.

Controls in Pharmaceutical Industry

Engineering Controls

Engineering controls like fume hoods and containment systems reduce hazardous substance exposure in pharmaceutical settings.

Administrative Controls

Strict SOP adherence, regular audits, and GMP compliance ensure safe pharmaceutical manufacturing processes.

Personal Protective Equipment

Gloves, lab coats, and respirators provide critical protection against chemical and biological hazards.

Ergonomics and Training

Adjustable workstations and training programs prevent injuries and promote safe handling techniques.

Controls in Healthcare

Infection Control Protocols

Hand hygiene, sterilization, and isolation are key to preventing disease transmission in healthcare settings.

Personal Protective Equipment

Gloves, masks, gowns, and face shields protect staff and patients from biological and chemical hazards.

Safe Patient Handling

Mechanical lifts and transfer devices reduce musculoskeletal injuries among caregivers.

Administrative and Chemical Safety

Staff training, workload management, and safe chemical handling ensure ongoing safety compliance.

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