Safety Case Development: Major Accident Hazards, Bow-Tie and ALARP Demonstration

1 – 5 February 2027
Dubai - Five-star CBD venue



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Introduction:

Safety case development often stalls at a thick binder of hazard studies that never proves, in one readable argument, that major accident risk is controlled. Reviewers then find gaps between hazards, barriers, performance standards and the management system that is meant to keep them working. This Core Concept course equips process safety, HSE and engineering leads to build a safety case as a structured argument: identifying major accident hazards, testing tolerability, demonstrating ALARP, mapping bow-tie barriers and linking every claim to evidence. Participants produce a Safety Case Argument and Evidence Map for one major accident hazard.

Course Objectives:

- Define the purpose, scope and structure of a facility safety case and set the boundary between the case and its supporting studies
- Compile a major accident hazard register and screen scenarios against risk tolerability criteria
- Demonstrate ALARP for a major accident hazard using good practice, option review and the gross disproportion test
- Build bow-tie diagrams that link threats, consequences, prevention and mitigation barriers and escalation factors to safety-critical elements and performance standards
- Write a claims-argument-evidence safety case argument, including the management system and emergency arrangements it relies on
- Maintain the safety case through operations and change and prepare it for independent review and submission

Target Audience:

- Process safety leads accountable for major accident hazard registers and the facility safety case
- HSE managers who own the safety management system described in the case
- Technical safety and loss prevention engineers responsible for barrier and performance standard definition
- Engineering and asset integrity leads responsible for safety-critical elements and their assurance
- Operations and emergency response leads who own the arrangements the case depends on
- Project and design leads preparing safety cases for new facilities or major modifications

Course Outline:

Day 1: Safety Case Purpose, Scope and Current-State Review

- Safety Case Definition: Claims, Arguments and Evidence
- Prescriptive Versus Goal-Setting Regimes and the Role of the Safety Case
- Safety Case Document Architecture: Facility Description to Conclusions
- Case Boundary Setting: What the Case Argues and What Supporting Studies Show
- Existing Safety Case Gap Review Against a Readability and Traceability Checklist

Day 2: Major Accident Hazards, Tolerability and ALARP Frameworks

- Major Accident Hazard Identification and Register Structure
- Consequence Screening for Fire, Explosion, Toxic Release and Structural Failure
- Tolerability of Risk Framework: Unacceptable, Tolerable and Broadly Acceptable Regions
- Individual and Societal Risk Criteria and FN Curve Interpretation
- ALARP Demonstration: Good Practice, Option Identification and Gross Disproportion Test

Day 3: Bow-Tie Analysis, Safety-Critical Elements and Performance Standards

- Bow-Tie Construction: Hazard, Top Event, Threats and Consequences
- Prevention and Mitigation Barrier Qualification and Escalation Factors
- Safety-Critical Element Identification From the Bow-Tie Barrier Set
- Performance Standard Writing: Functionality, Availability, Reliability and Survivability
- Barrier Assurance Tasks and Verification Scheme Linkage

Day 4: Management System, Emergency Arrangements and Argument Quality

- Safety Management System Description Mapped to Major Accident Barriers
- Emergency Arrangements in the Case: Escape, Evacuation, Rescue and Recovery Analysis
- Goal Structuring Notation for Claims, Strategies, Context and Solutions
- Weak Argument Patterns: Unsupported Claims, Circular Evidence and Stale Studies
- Safety Case Maintenance Triggers, Change Impact Review and Revision Control

Day 5: Case Work: Safety Case Argument and Evidence Map

- Gas Processing Case: Loss of Containment Bow-Tie and ALARP Record
- Storage Terminal Case: Emergency Arrangements Claim and Evidence Test
- Independent Review Simulation: Reviewer Questions on a Draft Safety Case
- Submission Readiness Checklist and Regulator Dialogue Planning in General Terms
- Safety Case Argument and Evidence Map Presentation and Peer Challenge

Skills You Will Gain:

- Safety Case Structuring
- Major Accident Hazard Registration
- Risk Tolerability Assessment
- ALARP Justification
- Bow-Tie Barrier Mapping
- Performance Standard Definition
- Safety Argument Writing
- Safety Case Lifecycle Management

Why Attend This Course:

- Return with a Safety Case Argument and Evidence Map for a major accident hazard at your own facility
- Turn a pile of hazard studies into one argument a reviewer can follow from claim to evidence
- Defend ALARP decisions with a documented option review instead of assertion
- Test your case against peers from oil and gas, chemicals, storage terminals and power generation

Conclusion:

A safety case earns trust when every claim about major accident risk can be traced to a barrier, a performance standard and current evidence. The course moves from safety case purpose and structure, through major accident hazard identification, tolerability criteria and ALARP demonstration, to bow-tie barriers, safety-critical elements and performance standards, then the management system, emergency arrangements, argument quality and upkeep through change. The final day applies this to guided cases and produces a Safety Case Argument and Evidence Map ready for internal review.