# Railway RAMS and Safety Assurance: Hazard Logs, Safety Cases and Urban Rail Commissioning

21 February – 4 March 2027
Jeddah - Corniche four-star



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## Introduction:

Railway RAMS and safety assurance on new metro, LRT and mainline schemes often slips because reliability targets are set late, hazard logs stall at design stage, safety cases are assembled only for approval and testing begins before interfaces are closed. This Core Concept course gives rail engineers, project managers and assurance staff one working method from the V-model lifecycle, EN 50126 RAMS targets and hazard analysis to safety case types, independent assessment, urban rail delivery choices, commissioning and handover. Participants produce a Metro Line Safety Case Structure, Hazard Log Extract and Commissioning Plan.

## Course Objectives:

- Plan RAMS activities across the V-model lifecycle of a rail system and set apportioned reliability, availability and maintainability targets
- Model reliability and availability of rail subsystems with FMECA, reliability block diagrams and fault trees
- Run hazard identification, maintain a hazard log and apply risk acceptance principles to decide when a hazard is controlled
- Derive safety requirements, apportion SIL levels and specify the safety evidence expected under EN 50128 and EN 50129
- Structure generic product, generic application and specific application safety cases and prepare them for independent safety assessment
- Choose route, system, rolling stock and delivery model options for an urban rail line and plan testing, trial running and operational readiness

## Target Audience:

- Rail systems engineering functions accountable for reliability, availability and maintainability of rolling stock, power and fixed equipment
- Project delivery functions that manage metro, LRT or mainline contracts from design to handover
- Safety assurance functions that own hazard logs, safety cases and approval submissions
- Systems integration and interface management functions coordinating civil, systems and rolling stock packages
- Testing and commissioning functions that plan integrated tests, trial running and entry into revenue service
- Client and owner engineering functions that review contractor RAMS and safety deliverables

## Course Outline:

### Day 1: Railway System Lifecycle and Assurance Foundations

- V-Model Lifecycle Phases for Metro, LRT and Mainline Systems From Concept to Decommissioning
- System Definition and Operating Context Statement for a New Rail Line
- Assurance Roles: Designer, Integrator, Operator, Independent Assessor and Approval Body
- Reliability, Availability, Maintainability and Safety Definitions and Their Trade-Offs
- Rail Accident Precursors: Derailment, Collision, Platform-Train Interface and Tunnel Fire Scenarios

### Day 2: EN 50126 RAMS Targets and Apportionment

- EN 50126 RAMS Lifecycle Tasks and Phase Deliverables
- RAMS Policy and RAMS Plan Structure for a Rail Contract
- Service-Level Availability Targets Derived From Operator Requirements
- Top-Down Apportionment of Reliability Targets to Rolling Stock, Traction Power and Civil Subsystems
- Maintainability Requirements: Mean Time to Restore, Access Provisions and Spares Holdings

### Day 3: Reliability and Availability Modelling for Rail Systems

- FMECA Worksheet for a Traction and Braking Subsystem
- Reliability Block Diagrams for Redundant Power Supply and Platform Screen Door Chains
- Fault Tree Analysis of a Service-Affecting Top Event
- MTBF, MTTR and Inherent Versus Operational Availability Calculation Worksheet
- Reliability Growth Tracking With a Failure Reporting, Analysis and Corrective Action System FRACAS

### Day 4: Hazard Identification, Hazard Logs and Risk Acceptance

- Preliminary Hazard Analysis and HAZID Workshops With Rail Prompt Lists
- Hazard Log Structure: Causes, Consequences, Controls, Owners and Closure Status
- Risk Matrix Calibration: Frequency and Severity Bands for Passengers, Staff and Public
- Risk Acceptance Principles: Codes of Practice, Reference System Comparison and Explicit Risk Estimation
- Exported Constraints and Hazard Transfer Across Contract Boundaries

### Day 5: Safety Requirements, SIL Apportionment and a Guided LRT Case

- Safety Requirement Specification Derived From Hazard Log Controls
- Tolerable Hazard Rate Allocation and SIL 1 to SIL 4 Apportionment to Safety Functions
- Software Safety Evidence Under EN 50128 at Overview: Lifecycle, Verification and Tool Qualification
- Safety-Related Electronic Equipment Evidence Under EN 50129 at Overview
- Guided LRT Extension Case: Hazard Log, Availability Model and Safety Requirement Review

## Day 6: Safety Case Types, Independent Assessment and Approvals

- Safety Argument Structure With Goal Structuring Notation: Claims, Arguments and Evidence
- Generic Product, Generic Application and Specific Application Safety Cases
- Safety-Related Application Conditions and Their Transfer to the Operator
- Independent Safety Assessor Scope, Assessment Plan and Findings Closure
- Approval Submissions, Conditional Acceptance and Safety Case Upkeep After Design Changes

## Day 7: System Integration, Interface Management and Assurance Gates

- Interface Register and Interface Control Documents Across Civil, Systems and Rolling Stock Packages
- Integration Hazards at Platform-Train, Traction Power and Depot Boundaries
- Verification and Validation Matrix Tracing Requirements to Test Evidence
- Configuration Management and Engineering Change Board Decisions
- Assurance Gate Criteria: Design Freeze, Readiness for Installation and Readiness for Testing

## Day 8: Urban Rail Project Development: Route, System and Delivery Choices

- Demand Evidence and Alignment Options: Elevated, At-Grade and Underground Sections
- Cut-and-Cover Versus Bored Tunnel Trade-Offs for Running Tunnels and Station Boxes
- Rolling Stock Specification: Train Length, Car Count, Passenger Capacity and Automation Grade
- Delivery Models Compared: Design-Build, DBOM and Public-Private Partnership Risk Allocation
- Land Value Capture, Utility Diversions and Third-Party Stakeholder Agreements

## Day 9: Depots, Stations, Testing, Commissioning and Operational Readiness

- Depot Layout Interfaces: Stabling Sidings, Heavy Maintenance Workshop, Wash Plant and Test Track
- Station Interfaces: Step-Free Access, Platform Screen Doors, Tunnel Ventilation and Fire Life Safety
- Testing and Commissioning Stages: Factory, Site, Integrated and Dynamic Tests
- Trial Running and Shadow Running Exit Criteria Based on Availability and Reliability Measures
- Operational Readiness: Staff Competence, Rule Book, Maintenance Contracts and Handover to Revenue Service

## Day 10: Capstone: Metro Line Safety Case, Hazard Log and Commissioning Plan

- Case Metro Line Brief: Scope, Operating Concept and Delivery Model Confirmation
- Safety Case Structure Build With a GSN Top Claim and Evidence Map
- Hazard Log Extract With Priority Hazards, Controls, Owners and Verification Evidence
- Testing, Commissioning and Trial Running Plan With Entry and Exit Criteria
- Capstone Defence Before a Mock Independent Safety Assessor Panel

## Skills You Will Gain:

- RAMS Target Apportionment
- Reliability Block Diagram Modelling
- Fault Tree Analysis
- Hazard Log Management
- SIL Allocation
- Safety Case Argumentation
- Rail Interface Management
- Commissioning and Trial Running Planning

## Why Attend This Course:

- Return with a Metro Line Safety Case Structure, Hazard Log Extract and Commissioning Plan tested before a mock assessor panel
- Question contractor availability figures and SIL claims with your own reliability models and hazard evidence
- Avoid late approval surprises by knowing what an independent safety assessor expects at each assurance gate
- Compare assurance and delivery practice with peers from metro, light rail, mainline and consultancy organisations

## Conclusion:

Rail systems reach revenue service on time when RAMS targets, hazard control and safety evidence are managed from the first lifecycle phase, not assembled at the end. Week one builds that assurance chain: lifecycle, EN 50126 targets, reliability and availability models, hazard logs, risk acceptance, SIL apportionment and safety evidence. Week two adds safety case types, independent assessment, interface management, urban rail route, system and delivery choices, depots, stations, testing, trial running and operational readiness. The final day produces the Metro Line Safety Case Structure, Hazard Log Extract and Commissioning Plan.