CONCEPT

Bridge Inspection, Load Rating and Rehabilitation of Highway Structures

16 – 27 August 2027
Dubai - Five-star CBD venue



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Ref: 496_16698 **Date:** 16 – 27 August 2027 **Location:** Dubai - Five-star CBD venue **Fees:** 35100 SAR

Introduction:

Bridge inspection programmes often record defects without linking them to load capacity, so owners discover posting needs, bearing seizure or scour exposure only after a structure has lost margin. This two-week Core Concept course takes bridge, structural and highway asset engineers from bridge forms and load paths through inspection, testing and deterioration diagnosis to load rating, rehabilitation and strengthening design, bearing and joint replacement, viaduct upkeep and bridge stock prioritisation. Participants produce a Bridge Inspection Report and Rehabilitation Plan for a case bridge.

Course Objectives:

- Plan bridge inspections by type and interval, matching access methods and inspection effort to the structural form and its critical members
- Diagnose deterioration of concrete, prestressed and steel bridge elements, including scour at piers and abutments, from inspection evidence and test data
- Specify non-destructive testing and load testing programmes that answer a defined capacity or condition question
- Evaluate the load-carrying capacity of a deteriorated bridge using load rating principles and decide on posting or permit restrictions
- Select rehabilitation and strengthening methods, bearing and joint replacements and traffic arrangements for bridge and viaduct works
- Prioritise interventions across a bridge stock using condition data, risk and life-cycle cost within a bridge management system

Target Audience:

- Bridge engineers who manage inspection programmes and approve remedial works on highway and urban structures
- Structural engineers who assess the capacity of existing bridges and design strengthening schemes
- Highway asset engineers accountable for bridge, viaduct and elevated road condition and maintenance budgets
- Inspection team leads who plan access, supervise testing and sign off bridge inspection records
- Rehabilitation contractors' engineering managers who plan bearing, joint and deck works under live traffic

Course Outline:

Day 1: Bridge Forms, Load Paths and Components

- Bridge Structural Forms: Slab, Beam-and-Girder, Box Girder, Arch, Truss, Cable-Stayed and Suspension
- Load Path Tracing from Deck through Girders, Bearings and Piers to Foundations
- Deck Systems: Cast-in-Place Slabs, Precast Beams, Orthotropic Steel Decks and Wearing Surfaces
- Bearing and Expansion Joint Types: Elastomeric, Pot and Sliding Bearings, Strip Seal and Modular Joints
- Substructure Elements: Piers, Abutments, Wing Walls, Pile Caps and Deep Foundations

Day 2: Inspection Types, Intervals and Condition Rating

- Inspection Types: Inventory, Routine, In-Depth, Damage, Special and Underwater Inspections
- Inspection Interval Setting by Bridge Age, Condition, Redundancy and Traffic
- Fracture-Critical and Nonredundant Steel Tension Member Inspection
- Component Condition Ratings Versus Element-Level Condition States
- Inspection Access Planning: Under-Bridge Units, Rope Access, Drones and Confined Box Girders

Day 3: Deterioration of Concrete, Prestressed and Steel Bridge Elements

- Chloride-Induced Corrosion at Leaking Deck Joints, Pier Heads and Splash Zones
- Carbonation and Alkali-Silica Reaction Cracking in Bridge Piers and Crossheads
- Prestressing Tendon Corrosion, Duct Grout Voids and Anchorage Defects
- Steel Girder Corrosion, Section Loss and Protective Coating Breakdown
- Fatigue Cracking at Welded Details, Cover Plate Ends and Web Gaps

Day 4: Scour, Non-Destructive Testing and Bridge Investigation Tools

- Contraction, Local and Degradation Scour at Piers and Abutments
- Scour Evaluation and HEC-23 Countermeasures: Riprap, Gabions and Guide Banks
- Cover Meter and Half-Cell Potential Surveys on Bridge Decks and Soffits
- Ground Penetrating Radar Deck Scanning for Delamination and Reinforcement Mapping
- Ultrasonic Testing and Magnetic Particle Inspection of Steel Welds and Pins

Day 5: Load Testing and Week-One Inspection Walkthrough

- Diagnostic Versus Proof Load Testing: Strain Gauges, Deflection Targets and Test Vehicles
- Structural Health Monitoring Sensors on Long-Span and Critical Bridges
- Inspection Walkthrough: Prestressed Concrete Overpass Defect Photo Set
- Inspection Walkthrough: Steel Plate Girder River Crossing Defect File
- Condition State Scoring Exercise and Inspection Findings Log

Day 6: Bridge Load Rating Principles

- Load Rating Levels: Inventory, Operating and Legal Load Ratings
- Load and Resistance Factor Rating Approach at Overview: Rating Factor Equation and Load Factors
- Section Loss and Deterioration Inputs into Member Resistance
- Permit Vehicles, Overweight Loads and Load Posting Decisions
- Refined Analysis for Rating: Grillage and Finite Element Bridge Models

Day 7: Bridge Rehabilitation and Strengthening Methods

- Bridge Deck Repair: Hydrodemolition, Patch Repair and Bonded Overlays
- FRP Flexural and Shear Strengthening of Bridge Girders and Slabs
- Pier and Column Jacketing: Reinforced Concrete, Steel Shell and FRP Confinement
- External Post-Tensioning for Girder Strengthening and Deflection Control
- Deck Replacement with Precast Full-Depth Panels and Accelerated Bridge Construction

Day 8: Bearings, Joints, Viaducts and Traffic Management During Works

- Bearing Replacement: Jacking Plans, Temporary Supports and Lift Limits
- Expansion Joint Replacement and Joint Drainage Trough Repair
- Elevated Road and Viaduct Upkeep: Crossheads, Drainage Downpipes, Parapets and Soffit Access
- Traffic Management During Bridge Works: Lane Closures, Contraflow and Weight Restrictions
- Closure Communication Plan for Road Users, Utility Owners and Emergency Services

Day 9: Bridge Management Systems and Life-Cycle Prioritisation

- Bridge Management System Modules: Inventory, Inspection Records, Deterioration and Work Planning
- Element Deterioration Curves and Remaining Service Life Estimates
- Life-Cycle Cost Comparison of Repair, Strengthen and Replace Options
- Risk-Based Ranking of a Bridge Stock: Criticality, Vulnerability and Consequence
- Bridge Stock KPIs: Condition Index, Rehabilitation Backlog and Posted Bridge Count

Day 10: Capstone: Bridge Inspection Report and Rehabilitation Plan

- Case Bridge Data Pack Review: Drawings, Inspection History and Test Results
- Bridge Inspection Report Drafting: Findings, Condition States and Photographic Record
- Rehabilitation Plan Build: Intervention Scope, Staging and Traffic Arrangements
- Rehabilitation Cost Estimate and Life-Cycle Justification
- Report and Plan Presentation to a Peer Review Panel

Skills You Will Gain:

- Bridge Inspection Planning
- Bridge Defect Diagnosis
- Scour Risk Evaluation
- Bridge NDT Programme Specification
- Load Rating Evaluation
- Strengthening Scheme Selection
- Bearing and Joint Replacement Planning
- Bridge Stock Prioritisation

Why Attend This Course:

- Leave with a Bridge Inspection Report and Rehabilitation Plan for a case bridge that follows the method used on your own structures
- Connect inspection findings directly to capacity so posting and strengthening decisions rest on evidence
- Gain a second week that goes beyond inspection into load rating, strengthening, bearing and joint works and viaduct upkeep
- Defend bridge rehabilitation budgets with risk ranking and life-cycle cost comparisons across a bridge stock

Conclusion:

A bridge stays safe in service only when inspection, testing and capacity assessment feed the decision to repair, strengthen or replace. Week one covers bridge forms, load paths, inspection regimes, deterioration, scour, testing and load tests. Week two adds load rating, strengthening methods, bearing and joint replacement, viaduct upkeep, works traffic management and bridge management systems. The final day turns a case bridge's data into a Bridge Inspection Report and Rehabilitation Plan ready for an asset owner's review.