CONCEPT

Onshore Pipeline Design and Construction: Route, Welding, Hydrotest and Commissioning

14 – 25 November 2027
Riyadh - KAFD district five-star



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Introduction:

Onshore pipeline design and construction projects slip by months when the route, wall thickness and crossing details reach the spread unfinished, or when weld, lowering-in and hydrotest records are rejected at handover. This Core Concept course follows a new buried transmission line from its premise under ASME B31.4 and ASME B31.8, through corridor and location class, line pipe grade, hydraulics and pump or compressor facilities, to spread mobilisation, API 1104 welding, HDD crossings, hydrotesting, drying and first fill. Participants produce an Engineering Summary and Build-and-Hydrotest Programme for a worked corridor.

Course Objectives:

- Write a premise document for a new buried line that fixes fluid, throughput, maximum operating conditions and the governing ASME B31.4 or ASME B31.8 code
- Choose the corridor, location class, design factor, wall thickness and line pipe grade and record them in a calculation file
- Size liquid and natural gas lines hydraulically and set pump or compressor facility spacing, surge protection and overpressure devices
- Sequence a construction spread from right-of-way clearing and stringing through field bending, welding, joint coating, lowering-in and backfill
- Witness spread work, API 1104 welds, radiography and ultrasonic results and HDD crossings against specifications, safety rules and environmental conditions
- Programme hydrotesting, cleaning, gauging, drying, pre-commissioning and first fill and compile the handover dossier for a new line

Target Audience:

- Pipeline engineers who fix wall thickness, hydraulic sizing and crossing details for new transmission lines
- Project engineers who own scope, contractor interfaces, construction schedules and deliverable registers on pipeline projects
- Construction engineers and spread supervisors who run right-of-way, mainline and tie-in crews
- Field quality and construction surveillance staff who witness welding, coating, lowering-in, backfill and pressure testing
- Welding and NDT coordinators who qualify procedures, test welders and accept mainline girth welds
- Commissioning engineers who organise test sections, dewatering, drying and first fill of new lines

Course Outline:

Day 1: Onshore Pipeline Design Premise and Code Scope

- Pipeline Project Life Cycle: Concept, FEED, Detailed Engineering, Construction and Handover
- Premise Memorandum: Fluid, Throughput, Maximum Operating Pressure and Temperature
- ASME B31.4 Liquid and Slurry Pipeline Scope and Requirements
- ASME B31.8 Location Classes and Design Factors for Transmission Lines
- Engineering Deliverables Register: Alignment Sheets, Datasheets and Calculation Files

Day 2: Corridor Routing, Location Class and Line Pipe Specification

- Corridor Routing Study: Desktop Options, Terrain Scoring and Construction Access
- Location Class Survey and Building Count Along the Corridor
- Barlow Wall Thickness Calculation With Design Factor and Longitudinal Joint Factor
- Line Pipe Grade, Seam Type and Fracture Toughness Specification for Buried Service
- Depth of Cover, Mainline Valve Spacing and Burial Protection Such as Rockshield and Sand Padding

Day 3: Liquid and Natural Gas Line Hydraulic Sizing

- Liquid Line Friction Loss, Hydraulic Gradient and Elevation Profile Plot
- Natural Gas Flow Equations, Compressibility and Diameter Iterations
- Diameter Versus Throughput Trade-Off Using Steel Tonnage and Energy Cost
- Surge Screening, Relief Paths and Overpressure Protection Philosophy
- Regulating and Metering Skid Arrangements at Delivery Points

Day 4: Pump and Compressor Facilities, Crossings, CP and Coating Choice

- Pump and Compressor Facility Plot Layout and Spacing Along the Route
- Road, Rail and Wadi Crossing Details: Casing, Open Cut and Auger Boring
- Foreign Pipeline and Utility Crossing Separation and Protection Details
- Cathodic Protection Concept: Impressed Current and Galvanic Anode Options
- Mainline Coating Choice: Three-Layer Polyolefin and Fusion-Bonded Epoxy Systems

Day 5: Week-One Guided Exercise: Worked Corridor Engineering Package

- Worked Corridor Data Pack: Throughput, Terrain Profile and Crossing Inventory
- Team Routing and Location Class Proposal With Alignment Sheet Markup
- Wall Thickness and Grade Worksheet for the Worked Corridor
- Hydraulic Profile and Pump or Compressor Count Check
- Engineering Review Panel: Crossing Details, Coating and CP Concept Defence

Day 6: Construction Spread Mobilisation and Mainline Sequence

- Spread Organisation, Crew Sequence and Daily Footage Targets
- Right-of-Way Staking, Clearing, Grading and Trenching Methods
- Pipe Handling, Stringing and Cold Field Bending Limits
- Field Joint Coating Application, Holiday Detection and Repair
- Lowering-In, Padding, Backfill and Right-of-Way Reinstatement

Day 7: Construction Surveillance Duties, Safety and Environmental Care

- API 1169 Knowledge Areas: General Construction Inspection and Inspector Responsibilities
- Inspection and Test Plan Hold Points and Daily Field Report Writing
- Spread Safety: Excavation, Lifting, Sidebooms and Trench Entry Hazards
- Environmental and Pollution Prevention: Topsoil Stripping, Spill Kits and Waste Handling
- Nonconformance Reports, Punch Lists and Construction Quality Records

Day 8: API 1104 Girth Welding, NDT and HDD Crossing Execution

- API 1104 Welding Procedure Specification and Procedure Qualification Testing
- Welder Qualification Tests and Mainline Welding Parameter Monitoring
- Radiography and Automated Ultrasonic Testing With Girth Weld Acceptance Criteria
- Tie-In Welds, Weld Repairs and Golden Weld Treatment
- HDD Crossing Execution: Pilot Hole, Reaming, Pullback and Drilling Fluid Management

Day 9: Hydrotesting, Dewatering, Drying and First Fill

- Hydrotest Section Breakdown, Test Pressure and Hold Period Setting
- Test Water Sourcing, Filling, Pressure-Temperature Charts and Acceptance
- Cleaning Runs, Gauging Plate Runs and Caliper Pig Verification of New Pipe
- Dewatering and Drying Methods: Dry Air, Vacuum Drying and Dew Point Checks
- Pre-Commissioning Checklists, Nitrogen Purging, First Fill and Handover Dossier

Day 10: Capstone: Engineering Summary and Build-and-Hydrotest Programme

- Capstone Brief: Worked Corridor Scope, Constraints and Contract Interfaces
- Engineering Summary Drafting: Code, Corridor, Wall Thickness, Hydraulics and Crossings
- Construction Sequence and Spread Resource Schedule for the Worked Corridor
- Welding, Surveillance, Hydrotest and Commissioning Programme With Record Formats
- Programme Presentation and Peer Technical Challenge Session

Skills You Will Gain:

- Pipeline Premise Definition
- Location Class Assessment
- Line Pipe Wall Thickness Calculation
- Hydraulic Line Sizing
- Construction Spread Sequencing
- Girth Weld Acceptance
- Hydrotest and Drying Programming
- Handover Dossier Compilation

Why Attend This Course:

- Leave with an Engineering Summary and Build-and-Hydrotest Programme for a worked corridor that mirrors your own project
- Trace how a choice of route, wall thickness or crossing method changes spread cost, welding workload and hydrotest sections
- Practise the field checks made on welding, coating, lowering-in and backfill before a trench is closed
- Compare construction practice with engineers from crude, natural gas, water and refined product line projects

Conclusion:

A new onshore line reaches service on time when its premise, corridor, pipe specification, hydraulics and crossings are settled before the spread mobilises, and when weld, coating, lowering-in and hydrotest records are complete at handover. Week one builds the engineering package under ASME B31.4 and ASME B31.8 and ends with a guided review. Week two moves to the right-of-way: spread sequencing, field surveillance, API 1104 girth welding, HDD crossings, hydrotesting, drying and first fill, finishing with an Engineering Summary and Build-and-Hydrotest Programme.