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COURSE BROCHURE

Pipeline Wall Thickness and Stress Design Calculations Training Course

22 August – 2 September 2027
Manama

Pipeline Wall Thickness and Stress Design Calculations Training Course

Ref: 2877_109892 **Date:** 22 August – 2 September 2027 **Location:** Manama **Fees:** 8000 GBP

Pipeline Wall Thickness and Stress Design Calculations is a 2-week training course for pipeline design engineers who size, check and document liquid and gas lines, and who leave with a pipeline design basis and calculation pack. Operators now expect every wall, bend and crossing to be traceable to a stated pressure, temperature and location assumption. Jupiter Prime Training sets these calculations in the wider picture of safety, cost and constructability.

Why Pipeline Wall Thickness and Stress Design Matters Now

Three forces shape pipeline sizing today: higher operating pressures on long transmission lines, denser development along existing corridors, and owners who want design decisions they can defend at audit and during later integrity work. A line designed with honest margins carries product safely for decades and accepts future uprating; one designed on loose assumptions wastes steel or, worse, leaves too little margin where people live and work. The course rests on the pipeline design codes used for liquid and gas transmission, applied through hoop stress, combined stress and location-based design factors.

Who Gains Most from Pipeline Wall Thickness and Stress Design

- Engineers who calculate wall thickness and select pipe grades for new lines
- Engineers who run flexibility and restraint checks on buried and above-ground sections
- Engineers who design road, river and utility crossings
- Engineers who lay out valve sites, launchers and station piping
- Engineers who check contractor calculations before approval

A design office that sends its line, crossing and station engineers together gains most, because they leave with one shared set of design assumptions.

Pipeline Wall Thickness and Stress Design Capabilities

Participants move from the pressure and temperature envelope to checked wall thicknesses, stress results and documented crossings.

- Calculate required wall thickness from design pressure, yield strength and design factor — pipe procurement
- Assign location classes and design factors along a route — safety reviewers
- Assess hoop, longitudinal and combined stress for restrained and unrestrained sections — design approval
- Design cased and uncased crossings under external loads — crossing permits
- Specify valve spacing, station piping and anchor arrangements — operations and maintenance teams
- Build a design basis and calculation pack that an independent checker can follow — project leadership

Key Pipeline Wall Thickness and Stress Design Terms

- Design factor — the fraction of specified minimum yield strength allowed as hoop stress at a given location.
- Location class — a grouping of route sections by nearby population density that sets the design factor for gas lines.
- Hoop stress — circumferential stress in the pipe wall caused by internal pressure, set by diameter, pressure and thickness.
- Restrained pipe — buried pipe held by soil friction so that thermal and pressure strains create longitudinal stress.
- Corrosion allowance — extra wall thickness added above the pressure requirement to cover expected metal loss over design life.
- Design basis — the document recording the pressures, temperatures, fluids, loads and factors every calculation uses.

Pipeline Wall Thickness and Stress Design Day by Day

Day 1: Design Envelope and Fluid Service

- Design Pressure and Maximum Operating Pressure — Margin Above Normal Operation
- Design Temperature Range — Thermal Expansion and Material Toughness Limits
- Liquid Versus Gas Service Rules — Which Design Code Path Applies
- Surge and Transient Pressure Allowance — Protection Set Points
- Design Life and Corrosion Allowance — Long-Term Wall Margin

Day 2: Line Pipe Materials and Grades

- Specified Minimum Yield Strength by Grade — Steel Selection Trade-Offs
- Seam Type and Joint Factor — Accepted Manufacturing Routes
- Temperature Derating Factor — Hot Service Strength Reduction
- Fracture Toughness and Arrest Requirements — Gas Line Crack Control
- Mill Tolerance and Under-Thickness — Ordered Versus Nominal Wall

Day 3: Wall Thickness Calculation

- Thin-Wall Hoop Stress Formula — Pressure Design Wall Thickness
- Design Factor Selection for Liquid Lines — Allowable Stress Level
- Diameter-to-Thickness Ratio Limits — Handling and Ovality Checks
- Standard Wall Selection From Pipe Schedules — Procurement Rounding
- Hydrostatic Test Pressure Check — Test Stress Against Yield

Day 4: Location Classes for Gas Lines

- Building Count Along Class Sliding Units — Route Classification Method
- Design Factors by Location Class — Heavier Wall Near Dwellings
- Places of Assembly and Special Sites — Local Factor Upgrades
- Class Change Over Design Life — Future Development Allowance
- Wall Thickness Schedule Along Route — Material Take-Off Accuracy

Day 5: Longitudinal and Combined Stress

- Pressure-Induced Axial Strain in Restrained Pipe — Longitudinal Pressure Stress
- Thermal Stress From Installation Temperature — Hot and Cold Cases
- Equivalent Stress Combination Methods — Allowable Combined Stress Limit
- Virtual Anchor Length — Transition From Restrained to Free Pipe
- Bending Stress From Elastic Bends — Minimum Natural Bend Curvature

Day 6: Flexibility and Above-Ground Sections

- Expansion at Buried to Above-Ground Transitions — Anchor Block Sizing
- Expansion Loops and Offsets — Displacement Stress Range
- Support Spacing and Sag — Span Limits for Elevated Pipe
- Soil Spring Modelling for Buried Bends — Friction and Bearing Inputs
- Stress Analysis Model Checking — Boundary Conditions and Load Cases

Day 7: Crossings and External Loads

- Earth Load and Live Traffic Load — Cover Depth at Road Crossings
- Cased Versus Uncased Crossings — Corrosion and Inspection Access
- Cyclic Stress Under Railway Loading — Fatigue at Rail Crossings
- Buoyancy Control at River and Wetland Crossings — Concrete Coating and Weights
- Horizontal Directional Drilling Pull Loads — Installation Stress Check

Day 8: Valves, Fittings and Station Piping

- Sectionalising Valve Spacing — Release Volume and Response Time
- Pressure Rating of Flanges and Fittings — Class Matching to Line Pressure
- Branch Connection Reinforcement — Area Replacement Calculation
- Launcher and Receiver Layout — Pigging Access and Isolation
- Station Piping Design Factors — Tighter Limits Inside Facilities

Day 9: Design Basis and Calculation Checking

- Design Basis Document Structure — Single Source of Assumptions
- Calculation Sheet Layout and Traceability — Independent Checker Review
- Sensitivity to Pressure, Grade and Temperature — Where Margin Is Thin
- Deviation and Query Register — Recording Departures From Code Rules
- Design Review Gate Questions — Approval for Issue to Construction

Day 10: Practising the Pipeline Design Basis and Calculation Pack

- Route Wall Schedule Using Location Classes — Applying Days 3 and 4
- Combined Stress Check for a Hot Line — Applying Days 5 and 6
- Road and River Crossing Calculations — Applying Day 7
- Valve Site and Branch Reinforcement Sheet — Applying Day 8
- Pipeline Design Basis and Calculation Pack — Issue for Peer Check

Applying Pipeline Wall Thickness and Stress Design After the Course

- Rebuild the wall thickness schedule of a current line with location classes and design factors, and record every assumption in the design basis.
- Run a combined stress and crossing check on one live project and log any departures in a deviation register for the lead engineer.

Pipeline Wall Thickness and Stress Design Questions FAQ

What is pipeline wall thickness and stress design and why does it matter now?

It is the set of calculations that fixes pipe wall, grade and stress margins for a line. It matters now because owners expect higher pressures, crowded corridors and decisions that remain defensible across decades of operation and later integrity assessment.

Which roles gain most from pipeline wall thickness and stress design?

Line, crossing and station design engineers gain most. Engineers who check contractor calculations also benefit, because they learn to trace each result back to a design basis and spot thin margins quickly.

How does pipeline wall thickness and stress design differ from a pipeline route and construction course?

It focuses on calculations rather than field work. Route and construction courses cover alignment, right of way and installation activities, while this one covers wall sizing, stress checks, crossings and station piping as engineering decisions.

What do you bring back from pipeline wall thickness and stress design?

You bring back a structured design basis and calculation pack. It holds a wall schedule by location, combined stress checks, crossing calculations and valve site sheets that a checker can follow line by line.

Pipeline Wall Thickness and Stress Design: The Way Forward

The pipeline design basis and calculation pack first informs the pipe order: grade and wall by route section. Lead engineers, independent checkers and procurement teams use it to approve material, and integrity engineers later rely on it for uprating studies. After first use, revisit the location class assumptions, because development along the route changes the margins the design depends on.