Process Piping Systems: ASME B31.3 Design, Materials and Integrity

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



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Introduction:

Process piping systems connect every vessel, pump and exchanger in a plant, yet leaks and ruptures often trace back to a wrong material, an under-thickness spool, a missed weld examination, a restrained line that cracks a nozzle or a corroded circuit nobody measured. This Core Concept course follows process piping through its life under ASME B31.3: components and materials, pressure design, supports and flexibility, fabrication, examination and leak testing, then in-service inspection, repair and fitness-for-service thinking. Participants assemble a Piping Circuit Design and Integrity Dossier for one line from their own plant.

Course Objectives:

- Classify a process piping system by fluid service and confirm which ASME B31.3 requirements apply to it
- Specify pipe, fittings, flanges, gaskets and valves in a piping material class suited to pressure, temperature and fluid
- Check required wall thickness, corrosion allowance and pressure-temperature ratings for straight pipe and branch connections
- Review support spacing, anchors and flexibility of a line for sustained, thermal and occasional loads
- Plan welding, heat treatment, examination and hydrostatic or pneumatic leak testing for new and repaired piping
- Set up circuit-based inspection, thickness monitoring and remaining life estimates for in-service piping in line with API 570

Target Audience:

- Mechanical and piping engineers who specify, design and approve process piping lines
- Piping inspectors who examine, measure and record the condition of in-service piping circuits
- Integrity and static equipment engineers who set inspection intervals and judge whether damaged piping stays in service
- Construction and fabrication engineers who supervise spool fabrication, welding and erection
- Quality control and NDE staff who plan examinations and witness leak tests
- Maintenance engineers who plan piping repairs, alterations and replacements during turnarounds

Course Outline:

Day 1: Process Piping Fundamentals and the Current Line Condition

- ASME B31 Code Family: B31.1, B31.3, B31.4, B31.8 and B31.12 Scope Boundaries
- ASME B31.3 Organisation: Design, Materials, Fabrication, Examination and Testing Chapters
- Fluid Service Categories and Owner, Designer and Inspector Responsibilities
- Line List, Isometric Drawing and Piping and Instrumentation Diagram Reading
- Existing Line Records Gap Check: Material Class, Test Records and Thickness History

Day 2: Piping Components, Materials and Material Classes

- Pipe Schedules, Seamless and Welded Pipe and Listed Component Specifications
- Fittings, Branch Connections and Flange Types With Pressure-Temperature Ratings
- Gasket Selection, Bolting and Flanged Joint Tightness
- Valve Types at Overview: Gate, Globe, Ball, Check and Butterfly Duties
- Carbon Steel, Stainless Steel and Chrome-Moly Selection and Impact Testing Needs

Day 3: Pressure Design, Supports and Flexibility Checks

- Straight Pipe Wall Thickness, Mill Tolerance and Corrosion Allowance Worksheet
- Branch Reinforcement and Unlisted Component Design Basis
- Pipe Support Types: Shoes, Guides, Anchors, Spring Hangers and Span Tables
- Thermal Expansion, Flexibility Factors and Expansion Loop Layout
- Sustained, Operating and Occasional Load Cases Including Wind and Water Hammer

Day 4: Fabrication, Examination, Testing and In-Service Degradation

- Welding Procedure and Welder Qualification Records and Preheat and Heat Treatment
- Examination Methods: Visual, Radiography, Ultrasonic, Magnetic Particle and Penetrant
- Hydrostatic and Pneumatic Leak Test Planning, Test Pressure and Safety Exclusion Zones
- Piping Failure Mechanisms: Internal Thinning, Corrosion Under Insulation, Fatigue and Dead Legs
- API 570 Inspection, Repair and Alteration Principles and Fitness-for-Service Concepts

Day 5: Inspection Walkthrough and the Piping Circuit Design and Integrity Dossier

- Walkthrough Case: Hydrocarbon Transfer Line Supports, Flanges and Small-Bore Connections
- Walkthrough Case: Cooling Water and Steam Line Condition Monitoring Locations
- Thickness Data Review, Corrosion Rate and Remaining Life Calculation Exercise
- Repair Package Drafting: Weld Procedure, Examination Scope and Leak Test Plan
- Piping Circuit Design and Integrity Dossier Peer Review

Skills You Will Gain:

- Piping Material Class Specification
- Wall Thickness Calculation
- Pipe Support and Flexibility Review
- Weld Examination Planning
- Leak Test Planning
- Piping Circuit Inspection
- Remaining Life Estimation
- Piping Damage Mechanism Recognition

Why Attend This Course:

- Take home a Piping Circuit Design and Integrity Dossier for a line from your own plant
- Catch wrong materials, thin spools and poorly supported lines before they reach commissioning or cause a leak
- Justify inspection intervals and repair decisions with measured thickness data and clear code references
- Compare piping practice with engineers from refining, petrochemicals, power, pharmaceuticals and gas processing

Conclusion:

Process piping stays safe only when its material, thickness, supports, welds, tests and inspection records agree with the service it carries today. The course moves from ASME B31.3 scope and responsibilities, through components, materials, pressure design and flexibility, to fabrication, examination, leak testing, damage mechanisms and in-service inspection under API 570. The final day applies these checks on walkthrough cases and completes a Piping Circuit Design and Integrity Dossier ready for a design review, repair plan or turnaround scope.