Process Piping Design, Inspection, and Maintenance Training Course



21 - 25 Dec 2026

Boston

7500 € (Per Person)

Ref: #INM1918_112902

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of the entire lifecycle of process piping systems, from initial design concepts to long-term maintenance and integrity management. In industries where safety, reliability, and efficiency are paramount, a thorough understanding of piping systems is not just beneficial but essential. This program delves into the critical principles governed by leading international codes and standards, such as ASME B31.3 for process piping. Participants will gain a robust foundation in piping design, material selection, stress analysis, and layout engineering. The course further extends into the practical aspects of inspection, drawing heavily on methodologies outlined in API 570, and covers a wide range of non-destructive testing (NDT) techniques. As noted by industry expert E. Shashi Menon in his authoritative text, "Piping Calculations Manual", mastering these calculations and principles is fundamental to preventing failures. BIG BEN Training Center has structured this course to bridge the gap between theoretical knowledge and real-world application, equipping professionals with the skills to ensure the operational integrity, safety, and longevity of critical piping assets, thereby minimizing downtime and mitigating operational risks effectively.

Target Audience / This training course is suitable for:

- Piping Engineers and Designers.
- Mechanical Engineers.
- Project Engineers.
- Inspection Engineers and Technicians.
- Maintenance and Reliability Professionals.
- Plant Engineers and Managers.
- Asset Integrity Engineers.
- Quality Assurance and Control Inspectors.
- Operations Personnel.

Target Sectors and Industries:

- Oil and Gas (Upstream, Midstream, and Downstream).
- Petrochemical and Chemical Processing.
- Power Generation (Fossil Fuel, Nuclear, and Renewables).
- Pharmaceutical and Biotechnology.
- Water and Wastewater Treatment.
- Pulp and Paper Manufacturing.
- Food and Beverage Processing.
- Governmental bodies and regulatory agencies.

Target Organizations Departments:

- Engineering and Design.
- Maintenance and Reliability.
- Inspection and Non-Destructive Testing (NDT).
- Operations and Production.
- Project Management.
- Asset Integrity Management.
- Health, Safety, and Environment (HSE).
- Quality Assurance and Quality Control (QA/QC).

Course Offerings:

By the end of this course, the participants will have able to:

- Apply the fundamental principles of piping design according to ASME B31.3.
- Interpret Piping and Instrumentation Diagrams (P&IDs) and isometric drawings accurately.
- Select appropriate piping materials for various service conditions and fluids.
- Perform basic pipe stress analysis to account for thermal expansion and other loads.
- Develop comprehensive inspection plans based on API 570 and risk-based inspection (RBI) principles.
- Identify and select suitable non-destructive testing (NDT) methods for piping inspection.
- Diagnose common piping failure mechanisms, including corrosion and mechanical damage.
- Implement effective maintenance and repair strategies for process piping systems.
- Ensure compliance with industry codes, standards, and safety regulations.
- Manage piping integrity throughout the asset lifecycle.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a dynamic and engaging learning environment that maximizes knowledge retention and practical application. This course moves beyond traditional lectures by integrating a blended learning approach. Theoretical sessions will establish a strong foundation in piping codes, design principles, and inspection standards. These concepts are then reinforced through interactive discussions, detailed case studies drawn from real-world industrial scenarios, and collaborative group exercises. Participants will analyze complex piping problems, brainstorm solutions, and present their findings, simulating the decision-making processes they face in their professional roles. The curriculum incorporates high-quality visual aids, including videos of inspection techniques and design software demonstrations. A significant emphasis is placed on practical problem-solving and the direct application of learned concepts. Our expert instructors facilitate an open and supportive atmosphere, encouraging questions and knowledge sharing among participants, ensuring that every individual can connect the course content to their specific operational challenges and return to their workplace with actionable skills and enhanced confidence.

Course Agenda (Course Units):

Unit One: Fundamentals of Process Piping Systems and Codes

- Introduction to process piping terminology and components.
- Overview of major piping codes and standards (ASME B31.3, B31.1).
- Understanding piping specifications and classifications.
- Piping materials selection and properties.
- Manufacturing methods for pipes, fittings, and flanges.
- Types and functions of valves in piping systems.
- Introduction to piping drawings: P&IDs, isometrics, and general arrangements.

Unit Two: Process Piping Design and Engineering

- Principles of plant layout and piping routing.
- Calculating pipe wall thickness and pressure design.
- Understanding pipe flexibility and thermal expansion.
- Introduction to pipe stress analysis and its importance.
- Design of piping supports, guides, and anchors.
- Branch connection design and reinforcement requirements.
- Design considerations for underground piping systems.

Unit Three: Piping Fabrication, Assembly, and Testing

- Piping fabrication processes and shop versus field fabrication.
- Welding processes applicable to piping (SMAW, GTAW, GMAW).
- Fundamentals of welding inspection and weld defect identification.
- Piping assembly, alignment, and flange management techniques.
- Requirements for pre-heating and post-weld heat treatment (PWHT).
- Hydrostatic and pneumatic pressure testing procedures and safety.
- Piping system cleaning, flushing, and reinstatement.

Unit Four: Piping Inspection, Examination, and NDT

- Introduction to API 570 Piping Inspection Code.
- Developing risk-based inspection (RBI) plans for piping circuits.
- Visual inspection techniques for in-service piping.
- Principles and applications of Non-Destructive Testing (NDT).
- Ultrasonic Testing (UT) for thickness measurement and flaw detection.
- Radiographic Testing (RT), Magnetic Particle Testing (MT), and Liquid Penetrant Testing (PT).
- Inspection for specific damage mechanisms like corrosion under insulation (CUI).

Unit Five: Piping Maintenance, Repair, and Integrity Management

- Common piping degradation and failure mechanisms.
- Corrosion monitoring and mitigation strategies.
- Fitness-For-Service (FFS) assessments based on API 579.
- Temporary and permanent piping repair techniques (welded sleeves, composite wraps).
- Hot tapping and line stopping procedures.
- Developing a comprehensive piping integrity management program.
- Documentation, record-keeping, and management of change (MOC).

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

How might the integration of AI and digital twin technology revolutionize traditional approaches to piping integrity management and predictive maintenance?

What unique qualities does this course offer compared to other courses?

This training course distinguishes itself through its holistic, lifecycle-based approach to process piping systems. Unlike narrowly focused programs, it seamlessly integrates the distinct yet interconnected disciplines of design, inspection, and maintenance into a single, cohesive curriculum. Participants gain a unique 360-degree perspective, understanding how design decisions impact future inspect ability and how maintenance data can inform more robust future designs. The course places a strong emphasis on the practical application of international codes like ASME B31.3 and API 570, moving beyond mere theory to explore how these standards are implemented in complex, real-world scenarios. Through a series of carefully selected case studies, participants grapple with actual industry challenges, from preventing corrosion under insulation (CUI) to conducting fitness-for-service assessments. This problem-solving focus ensures that learning is not just academic but directly applicable. Furthermore, the curriculum is forward-looking, introducing concepts like risk-based inspection (RBI) and asset integrity management, equipping professionals not just for their current roles but for the future challenges of the industry. The result is a more competent, well-rounded professional capable of ensuring the safety, reliability, and efficiency of critical piping assets.