ASME B31.3, Process Piping Design, Construction & Mechanical Integrity (ASME B31.3 & API 570)

Course Description

The course provides comprehensive coverage of the ASME B31.3, Process Piping Code requirements. It has been completely revised, reorganized and updated, and includes descriptions of important new requirements in the 2008 edition of ASME B31.3, including the philosophy behind the changes.

The course will review the basic requirements of the ASME B31 Code for Pressure Piping with emphasis on B31.3, Process Piping. General topics in the course include: Code organization and intent, pressure design, design for sustained loads including support design, flexibility analysis, equipment loads, expansion joints, supports and restraints, materials, fabrication, examination, testing, and, for existing piping systems: mechanical integrity. Applications of these concepts, including simple hand analysis methods and computer-based analysis methods using CAESAR II, will be demonstrated. Examples of the required analysis and sources of further information will be provided. Inspection and maintenance (mechanical integrity) of existing piping systems will also be covered, as provided in API 570, Piping Inspection Code.

The course covers design, fabrication, examination and testing requirements of ASME B31.3. It covers Code requirements from design through start-up of new piping systems, as well as standards for inspection and repair of piping systems that have been in service, as provided in API 570, Piping Inspection Code.

This course provides a working knowledge of the Code, how it is organized, its intent, the basis for requirements, including both design and construction (fabrication, erection and testing) aspects. It provides a foundation of knowledge necessary for those responsible for assuring the mechanical integrity of existing piping systems, as well as those responsible for designing and constructing new piping systems.

Upon the successful completion of this course, the participant will gain an understanding of the physical phenomena which affect the design of piping systems: the ASME Code formulas and other methods by which these phenomena can be analyzed to determine resulting stresses, evaluation of those stresses relative to ASME Code limitations, the methods by which piping systems are fabricated, inspected and tested.

Each session will be conducted in a lecture/discussion format designed to provide intensive instruction and guidance on understanding Code requirements, and also on developing an awareness of other considerations in the design, analysis, fabrication and installation of piping which is not covered by the Codes. There will also be a demonstration of computer software that can be used to assist in piping analysis. The faculty will be available following each day's session to provide participants with further opportunity for discussion and consideration of specific problems.

Participants should bring calculators for working sample problems. Participants may wish to bring a copy of ASME B31.3 if they have a copy available, but the course is designed such that it is not necessary for the students to have copies of the Code for reference.

Course Objectives

Upon the successful completion of the course, participants will be able to:

- ✓ Have a very good background on the scope & definition of ASME B31.3, process piping design, construction & mechanical integrity
- ✓ Understand metallic pipe and fitting selection including its system failure, bases for selection and method requirements
- ✓ Identify the strengths of materials including its requirements and be able to identify the bases for design stresses
- ✓ Determine the components of pressure design and be able to know the concepts of weld joint strength factor and design pressure & temperature
- ✓ Know the process of valve selection and be able to list the requirements needed for the selection process
- ✓ Become familiar with the design of flanged joints and be able to describe its features & functions
- ✓ Introduce flexibility & flexibility analysis and able to explain the general considerations for the layout and support of pipes , Learn the various types and designs of expansion joints and be able to describe their components and use
- ✓ Understand the fabrication and installation methods of pipings and be able to list the requirements and guidelines needed in the inspection, examination and testing of pipes
- ✓ Heighten awareness with the concept of instrument piping and pressure relieving systems and learn how these systems can be designed
- ✓ Know the design, fabrication, installation, inspection, examination and testing methods for nonmetallic piping systems, category M Fluid service & high pressure piping
- ✓ Review the concept of API 570 including its inspection, repair, alteration and rerating of in-service piping

Training Methodology

This interactive training course includes the following training methodologies as a percentage of total tuition hours:-

50% Lectures
30% Courses, Group Work & Practical Exercises
20% Videos & Software

Who Should Attend

This course provides an overview of all significant aspects and considerations of piping for those who are involved in the design, analysis, fabrication, installation, maintenance or ownership of piping systems.

Engineers, Senior Draftsmen, maintenance, quality assurance, and manufacturing personnel who work in the chemical, petroleum, utility, plastic processing, pulp and paper, and manufacturing, fields will find it a time-saving means to broaden and update their knowledge of piping. Those who must comply with Code requirements will benefit from the practical approach presented in this course in obtaining satisfactory and economical piping systems.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day – 1

Welcome & Introduction

Introduction: General Definitions, Piping Design Method, Piping System Standards, B31 Committee Organization, B31.3 Scope, Organization of the Code, Fluid Service Definitions

Metallic Pipe and Fitting Selection: Piping System Failure, Bases for Selection, Listed versus Unlisted Piping Components, Fluid Service Requirements, Pipe, Joining Method, Fittings, Branch Connections, Flanges, Gaskets, Bolting

Day – 2

Materials : Strength of Materials, Bases for Design Stresses, B31.3 Material Requirements

Pressure Design: Design Pressure and Temperature, Quality Factors, Weld Joint Strength Factor, Pressure Design of Components

Valves Selection: Code Requirements, Selection by Valve Type

Flanged Joints: Design, Bolt-Up

Day – 3

Introduction to Flexibility Analysis: What are we trying to achieve?, Sustained loads, Displacement Loads, Reaction Design Criteria, Flexibility Analysis Example

Layout & Support: General Considerations, Support Spacing, Support Locations, Support Elements, Fixing Problems

Flexibility: General Considerations, Friction, Stress Intensification, Elbow Flexibility, Thermal Expansion, Spring Hangers, The Displacement Load Analysis, Elastic Follow-Up, Fixing Problems, Cautions

Day – 4

Reactions: General Considerations, Fabricated Equipment, Rotating Equipment, Supports, Flanged Joints, Cold Spring

Flexibility Analysis: When to Perform a Detailed Analysis, Computer Program Attributes, Considerations, Solving Problems, Typical Errors, Sample Computer Flexibility Analysis

Designing with Expansion Joints: Types of Expansion Joints, Pressure Thrust, Installation of Expansion Joints, Metal Bellows Expansion Joints, Other Considerations

Fabrication & Installation: Welder/Brazer Qualification, Welding Processes, Weld Preparation, Typical Welds, Preheating and Heat Treatment, Bending and Forming, Typical Owner Added Requirements, Installation

Inspection, Examination, Testing

Day – 5

Instrument Piping & Pressure Relieving Systems: What must be protected, How systems can be designed

Non metallic Piping Systems: Design, Fabrication and Installation, Inspection, Examination and Testing

Category M Fluid Service: Design, Fabrication and Installation, Inspection, Examination and Testing

High Pressure Piping: Design, Fabrication and Installation, Inspection, Examination and Testing

API -570- Inspection, Repair, Alteration and Rerating of In – Service Piping Systems: Responsibilities, General Considerations, Frequency and Extent of Inspections, Remaining Life, MAWP, Repairs and Alterations, Rerating

Summary, Open Forum, Closure

About the Course Instructor

MOHAMMMED KAMAL UDDIN AHMED

Bachelor of Engineering in Mechanical Engineering from Osmania University, Hyderabad, India in the year
1998.

• Piping Specialist since 1998, administered many courses in Piping Engineering, Onshore Pipeline Design &
Construction, Pipe Stress Analysis, ASME B31.3, and API 570 Piping Inspection Examination Training & HVAC.

Piping & Pipeline Engineering Specialist

Profile at a glance:

Fourteen years of Progressive experience in projects management, design & maintenance engineering including piping
material specifications, pipe stress analysis, mechanical systems, pipe support design, valves specifications and piping
specialty items. It includes Design, evaluation, testing, fabrication interpretation, & modification of piping systems. Lead major
projects for piping discipline with the world's most recognized design and owner companies.

• Currently engaged as Engineering Manager - Piping for M/S IPEBS, a engineering firm, based in Hyderabad, India into
design and stress analysis of piping and pipeline systems and leading provider of technical trainings globally.

• Special interests include projects management for detailed engineering and mechanical integrity of piping and pipeline
systems and Technical Trainings.

M/S IPEBS, Hyderabad, India Engineering Manager- Piping (July 2007 - Present)

Currently engaged as Engineering Manager of M/S IPEBS, an engineering firm based in Hyderabad, India, into engineering
design of piping and pipeline systems and technical trainings.

M/S IPEBS was founded and incorporated in 2007, in Hyderabad, India. Today, the company consists of twenty-five executive,
managerial, technical and administrative employees who manage, coordinate and execute projects successfully.