



## ASME B31.3, Process Piping Design Code

### Course Description

ASME B31.3 for Pressure process piping for the design, materials examination, testing and nonmetallic piping. This training course further provides an introduction to the different parts of the ASME B31.3 Standard and will cover all requirements for safe design, construction, inspection, testing, operation and maintenance of liquid pipeline systems. The ASME B31.3 Code focuses on the requirements for process piping related to the design, construction, fabrication, inspection, examination in a safe and economical piping system

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**



## MOHAMMMED KAMAL UDDIN AHMED

### Core Skills

*Process Equipment, Process pipeline*

*Rotating Equipments – Pumps  
Compressors Gas Turbines*

*Process Piping Systems*

*Cross – Country Pipelines*

*API 570 & API 510 Inspections*

*Pipe Stress Analysis*

*Mechanical Maintenance – Pumping  
Equipment, Piping, Pipeline, Safety  
Relief Valves etc.*

### Mechanical Software Skills

*AUTO CAD, PipeNET, PipeFlow*

*Valve Sizing Softwares.PDMS,  
CAESAR - II*

### Codes & Standards

*API & ASME Standards including  
API 520,521,526,527 – Safety  
Relief Valves.*

*API 570 – Pipework Repair.*

*API 510 – Pressure Vessels*

*API 610 – Centrifugal Pumps*

*API 617 – Centrifugal Compressors*

*API 650 – Storage Tanks*

*ASME PCC -2 – Repair Of  
Pressure Equipment & Piping  
API 598 – Valve Inspection &  
Testing*

*API 574 – Inspection of Piping  
Components*

*ASME B31.3 – Process Piping*

*ASME B 31.4 & ASME B 31.8*

*Saudi Aramco Standards*

### **Pipeline & Pumping Systems Operation, Design, Construction, Inspection, Mechanical Integrity & Maintenance Specialist**

#### **Profile at a glance:**

Twenty years of Progressive experience in design, construction, inspection & mechanical maintenance engineering including maintenance engineering for rotary equipments – pumps and compressors, & stationary equipments inclusive of Pipe work, Pressure Vessels, Valves etc

Pipeline Design, Construction, Maintenance (**ASME B 31.4 / ASME B31.8**)

Pipeline Systems, Detailed Design, evaluation, testing, fabrication interpretation, assembly & erection of Process equipments & Piping Systems & modification of piping systems. Extensive experience in API 510 pressure vessels, API 570 In Service Pipe work inspection, repair & maintenance including valves & pumps.

#### Educational Qualification

- Bachelor of Engineering in Mechanical Engineering from Osmania University, Hyderabad, India in the year 1998.
- Professional Member ASME – American Society of Mechanical Engineers.
- Saudi Aramco Certified Mechanical QA/QC Engineer

#### Work Experience

Has worked with various international organizations including Arabian Bemco, KSA, Saudi Aramco KSA, GSWS Co. KSA , ADNOC UAE, Reliance Refinery – Jamnagar, India.

#### Work Experience

\* Reliance Industries Jamnagar Refinery, India – Technical Advisor Plant Maintenance for Pipeline & Pumps Repair, Maintenance & Troubleshooting

\* **GSWS Co. Power plant Riyadh KSA – Technical Advisor Plant Maintenance** – Pumps , Compressors & Gas Turbines

\* **ADNOC – Lead Major Piping Projects in UAE .**

\* **ARABIAN Bemco, Jeddah, KSA** – Major Piping Projects – Steel Plants & Bulk Plants

\* **Saudi Aramco KSA** – Lead Major Piping Projects & Mechanical Maintenance of Process Pumps, Compressors, Valves & Pipeline Systems including

- Rastanura Refinery
- Rastanura Terminal
- Juyamah Gas Plant
- Rastanura Community Services
- Dhahran Pipeline
- East and West Pipeline

- Dhahran Community Maintenance Services
- Abqaiq Plants
- Shedgum Shop ( Southern Area Shop )
- Riyadh Refinery
- SSSP Riyadh
- Tanajeeb Maintenance
- Safaniyah Maintenance
- Merjan Fields
- Jeddah Refinery
- Jeddah Bulk Plant
- Yanbu Refinery
- Rabiag Refinery.

### Trainings Delivered

#### **Major Technical Trainings Delivered:**

<b>Training</b>	<b>Company/Client</b>
Hydraulic Design of Liquid Piping & Pumping Systems	Infotech Enterprises – Marine Dept. – Ship Piping Systems, Hyderabad, India.
Pumps Application, Operation, Maintenance and Troubleshooting	<b>Pertronas, Malaysia</b> , IDC Training House, Selangor.
Pumps Application, Operation, Maintenance and Troubleshooting	<b>ORYX GTL Doha Qatar.</b>
Pumps Application, Operation, Maintenance and Troubleshooting	BHEL , Bhopal India.
<u>Piping Engineering</u>	<b>Intergraph Inc. USA.</b>
<u>Piping Material Specifications</u>	<b>Intergraph Inc. USA.</b>
<u>Piping Design &amp; Engineering</u>	<b>Qatar Petroleum, Qatar</b>
<b>Process Piping Design, Construction &amp; Mechanical Integrity- ASME B 31.3 and API 570.</b>	<b>Qatar Petroleum, Qatar</b>
API 570 Piping Inspector Examination Preparatory Course	<b>Qatar Petroleum, Qatar.</b>
Safety Relief Valves Repair, Maintenance & Trouble Shooting	<b>Qatar Petroleum , Qatar</b>
<b>ASME B 31.3 Process Piping</b>	<b>IDC Training House, Selangor, Malaysia</b>
<b>ASME B 31.3 Process Piping</b>	<b>Fleming Gulf UAE</b>
<b>ASME B 31.3 – Process Piping</b>	<b>Petro Vietnam Refinery – Vietnam.</b>
<b>Pipe Stress Analysis &amp; CAESAR II</b>	BHEL Bhopal, India.
<b>ASME B 31.4 – Liquid Pipeline Systems</b>	ICB Tecnimont , India & Italy
Safety Relief Valves Repair, Maintenance & Trouble Shooting	<b>QAFCO, Qatar</b>
API 570 Process Piping	<b>MLNG Plant Petronas, Malaysia</b>
<b>API 510 Pressure Vessels</b>	<b>Petronas Malaysia</b>
<b>Process Equipments</b>	<b>Petronas Malaysia</b>
<b>ASME B 31.3 Process Piping</b>	<b>Qatar Petroleum</b>
<b>Piping Fundamentals</b>	<b>Rasgas, Qatar</b>

& many more corporate trainings in India.

#### **Countries Travelled for Major Projects & Trainings:**

- Kingdom of Saudi Arabia
- United Arab Emirates
- **Qatar**
- Sudan
- Malaysia
- Vietnam
- Azerbaijan

#### **Personal Information**

- Date of Birth : 29<sup>th</sup> Sep 1977.
- Languages Known : English, Telugu, Hindi & Arabic