

<p><b>KLM Technology Group</b></p> <p>Practical Engineering Guidelines for Processing Plant Solutions</p>	<table border="1"><tr><td data-bbox="548 128 800 247"></td><td data-bbox="800 128 1133 247"><b>Technology Group</b></td></tr></table> <p><b>Engineering Solutions Consulting, Guidelines, and Training</b></p> <p><a href="http://www.klmtechgroup.com">www.klmtechgroup.com</a></p>		<b>Technology Group</b>	<p>Page 1 of 11</p> <p>Rev 1.1</p>
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## **ASME B31.3 - Process Piping, Design, Construction, Mechanical Integrity and Troubleshooting Training Course**

### **Introduction**

The success of every company depends on each employee's understanding of the key business components. Employee training and development will unlock the companies' profitability and reliability. When people, processes, and technology work together as a team developing practical solutions, companies can maximize profitability and assets in a sustainable manner. Training and development are an investment in future success - give yourself and your employees the keys to success.

It is strategically important that your team understands the fundamentals of Process Piping, Design, Construction, Mechanical Integrity and Troubleshooting concepts. This is the difference between being in the best quartile of operational ability and being in the last quartile. There is vast difference in the operational ability of operating companies and most benchmarking studies have confirmed this gap in operational abilities.

Whether you have a team of new or seasoned employees, an introduction or review of these concepts are very beneficial in closing the gap if you are not in the best quartile or maintaining a leadership position. Most studies show that a continuous reinforcement of best practices in operational principles is the most effective way to obtain the desired results. Training and learning should be an ongoing continuous lifelong goal.

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## Course Objective

This course will guide the participants to develop key concepts and techniques for Process Piping, Design, Construction, Mechanical Integrity and Troubleshooting Operations. These key concepts can be utilized to make operating decisions that can improve your unit's performance.

Many aspects of Process Piping, Design, Construction, Mechanical Integrity and Troubleshooting management can be improved including project design, management, energy utilization, and safety. This cannot be achieved without first an understanding of basic fundamental principles of design and operation. These principles need to be understood in advance of operating and trouble shooting a process unit operation for the manager or problem solving to be effective.

This seminar focuses on the core building blocks of the Process Piping, Design, Construction, Mechanical Integrity and Troubleshooting systems, equipment, and economics. This program will emphasize the process unit operation fundamentals, safe utilization of these fundamentals by operations, engineering, maintenance, and support personnel.

General topics in the course include code organization and intent, pressure design, design for sustained loads including support design, flexibility analysis, equipment loads, flanges, expansion joints, supports and restraints, materials, fabrication, examination, testing, and, for existing piping systems, mechanical integrity.

- Identify what issues to take into consideration when designing process piping.
- Explain the pressure design of piping and piping components.
- Analyze piping flexibility and gauge the limitations of piping and piping components.
- Identify pipe supports, leak testing, piping failures and their causes.

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## Syllabus

### Introduction

- Overview of the Chemical Processing Industry

### Review of Process Incidents

- Safety for the Chemical Processing Industry

### Process Equipment Troubleshooting

- Troubleshooting concepts and techniques
- Typical Problems
- Interaction of Process and Equipment
- Case Study

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### Project Management Overview

- INITIATING - authorizing the project or phase of the work
- PLANNING - devising and maintaining a workable scheme to accomplish the business need for the project
- EXECUTING - coordinating people and other resources to undertake the plan
- CONTROLLING - ensuring project objectives are met by monitoring and measuring progress and taking action as needed
- CLOSING - formalizing acceptance of the project or phase of work and bringing it to an orderly end.

### Introduction to Piping Systems

- General Definitions
- Piping Development Process
- Piping Codes
- Fluid Service Definitions
- Safety in Piping Networks

### Piping design conditions

- Required service information.
- Design Pressure
- Design temperature
- Weight & Thermal effects
- Environmental loads

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#### Metallic Pipe & Fitting Selection

- Piping System Failure
- Bases for Selection
- Listed versus Unlisted Piping Components
- Fluid Service Requirements
- Piping components

#### Materials

- Strength of Materials
- Bases for Design Stresses
- Material Requirements
- Deterioration in Service

#### Pressure Design (metallic)

- Design Pressure & Temperature
- Quality & Weld Joint Strength Factors
- Pressure Design of Components
- Piping Material Specifications
- Lower Temperature Limits.
- Impact Testing Methods and Acceptance Criteria.

#### Valve Selection

- Code Requirements
- Selection by Valve Type

#### Introduction to Flexibility Analysis

- Goals
- Sustained loads
- Displacement Loads
- Reaction Design Criteria
- Stress Intensification

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### Flexibility

- General Considerations
- Friction
- Elbow Flexibility
- Thermal Expansion
- Spring Hangers
- The Displacement Load Analysis
- High Cycle Fatigue
- Elastic follow-up
- Fixing Problems

### Layout and Support

- General Considerations
- Support Spacing
- Support Locations
- Support Elements
- The Sustained Load Analysis
- Fixing Problems

### Reactions

- General Considerations
- Fabricated Equipment
- Rotating Equipment
- Supports
- Flanged Joints
- Cold Spring

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### Designing with Expansion Joints

- Types of Expansion Joints
- Pressure Thrust
- Installation of Expansion Joints
- Metal Bellows Expansion Joints
- Safety Case Study

### Fabrication and Installation

- Welder/Brazer Qualification
- Welding Processes
- Weld Preparation
- Typical Welds
- Preheating & Heat Treatment
- Bending & Forming
- Typical Owner Added Requirements
- Installation
- Flange Joints

### Inspection, Examination and Testing

- Responsibility and qualifications for Inspection
- Radiographic and Ultrasonic Testing
- Hydrostatic Leak Test.
- Pneumatic Leak Test.

### Systems

- Instrument Piping
- Pressure Relieving Systems

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### Nonmetallic Piping Systems

- General
- Thermoplastics
- Reinforced thermosetting resins
- Concrete and glass
- Piping lined with nonmetals
- Limitations

### Category M Fluid Service

- General
- Design
- Fabrication
- Examination and Testing
- Typical Owner Added Requirements

### High Pressure Piping

- General
- Materials
- Pressure Design
- Limitations
- Flexibility Analysis
- Fabrication
- Examination and Testing
- Overpressure Protection



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#### In-service Piping – Inspection, Repair, Alteration and Rerating

- Piping Inspection Code
- What to Inspect
- Types of Inspection
- Inspection Practices
- Frequency and Extent of Inspection
- Remaining Life Calculation
- Repairs and Alterations
- Rerating

#### Introduction to Piping Vibration

- Single Degree of Freedom System
- Damping
- Screening Criteria
- Determining the Cause
- Solving the Problem

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### Who Should Attend:

- People who are making day to day decisions regarding operation, design, and economics of piping systems.
  1. 1<sup>st</sup> Line Operations personnel,
  2. Operation Supervisors,
  3. 1<sup>st</sup> Line Maintenance personnel,
  4. Maintenance Supervisors,
  5. Senior Plant Supervisors,
  6. Operations Engineers
  7. Process Support Engineers,
  8. Design Engineers,
  9. Cost Engineers
  10. Environmental Engineers
  11. Piping Engineers
  12. Mechanical Engineers
  13. Designers and Drafters
  14. Inspectors and Quality Control Professionals
  15. Project Managers
  16. Anyone involved in process piping design, construction, or maintenance.
  
- Ideal for veterans and those with only a few years of experience who want to review or broaden their understanding in piping systems.
  
- Other professionals who desire a better understanding of subject matter

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### What you can expect to gain:

- Greater knowledge of methods used to assess and calculate the main design parameters of a system for the transport of the given fluid for the given application
- Improved familiarity with all aspects of the piping systems encountered in everyday industrial practices
- A clear understanding of guidelines for selection and sizing the piping systems
- Identify what issues to take into consideration when designing process piping.
- Explain the pressure design of piping and piping components.
- Analyze piping flexibility and gauge the limitations of piping and piping components.
- Identify pipe supports, leak testing, piping failures and their causes.
- Readiness to implement the best practices for efficient operation, improved reliability, maintenance, and problem troubleshooting
- Understand common operational problems and their troubleshooting Techniques
- Gain an insight to improve process optimization and strategies