

**Introduction to
Process Piping in Accordance with
ASME B31.3
Design, Construction, and Mechanical Integrity**

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Workshop Objectives

The aim of this workshop is to provide the participants with an overview of the area of Piping Technology with an emphasis on process piping. The workshop 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 workshop 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.

Who Should Attend

Engineers, senior designers, maintenance, quality assurance, inspection and manufacturing personnel who work with process piping (e.g., in the chemical, petroleum, plastic processing, pulp and paper fields) will find it a time-saving means to broaden and update their knowledge of piping.

Workshop Contents

The workshop will review the basic requirements of the ASME B31 Code for Pressure Piping with emphasis on B31.3, Process Piping. General topics in the workshop 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. Applications of these concepts, including simple hand analysis methods and computer-based analysis methods, will be demonstrated. Included will be comparisons between ASME B31.3 and ASME B31.1, Power Piping. Inspection and maintenance (mechanical integrity) of existing piping systems will be covered, as provided in API 570, Piping Inspection Code.

Each session will be conducted in a lecture/discussion/problem solving format designed to provide intensive instruction and guidance on understanding Code requirements. The instructors will be available following each day's session to provide participants with further opportunity for discussion and consideration of specific problems.

ABOUT THE INSTRUCTOR

Don Frikken is an internationally recognized authority in piping design. Now employed by Becht Engineering, Don had been with Solutia, Inc. and Monsanto Company for 34 years; working on a wide range of activities including piping and mechanical design, project engineering, and engineering standards. However, Don's principal specialty is piping design, including design of complex piping systems, piping flexibility analysis, selection of piping components including valves, development of piping standards and specifications, and developing and teaching numerous piping seminars and workshops.

He is an ASME Fellow and has been active on various ASME standards committees. He is past Chair of the ASME B31.3 Process Piping Code committee, Chair of the B31 Standards Committee, which oversees all B31 Piping Code committees, member of the B16 Standards Committee, member of the Board on Pressure Technology Codes and Standards, member of the Codes and Standards Board of Directors, which oversees the development and

maintenance of six hundred ASME codes and standards, and recently completed a three year term as an ASME Senior Vice President.

Don has received a number of awards, and recently was awarded the ASME Melvin R. Green Codes and Standards Medal, which recognizes outstanding contributions to the development of documents used in ASME programs of technical codification, standardization and certification. Don graduated with a B.S.M.E. from Kansas State University and has a master's degree in civil engineering from the University of Missouri-Rolla.

B31.3 Workshop Outline

Section	Title	Topics Covered
1	Introduction	<ul style="list-style-type: none"> ➤ General Definitions ➤ Piping Development Process ➤ Piping System Standards ➤ B31.3 Scope ➤ Organization of the Code ➤ Fluid Service Definitions
2	Metallic Pipe & Fitting Selection	<ul style="list-style-type: none"> ➤ Piping System Failure ➤ Bases for Selection ➤ Listed versus Unlisted Piping Components ➤ Fluid Service Requirements ➤ Pipe ➤ Fittings ➤ Branch Connections ➤ Flanges ➤ Gaskets ➤ Bolting ➤ Flanged Joints
3	Materials	<ul style="list-style-type: none"> ➤ Strength of Materials ➤ Bases for Design Stresses ➤ B31.3 Material Requirements <ul style="list-style-type: none"> ▪ Listed and Unlisted Materials ▪ Temperature Limits ▪ Toughness Requirements ▪ Deterioration in Service
4	Pressure Design (metallic)	<ul style="list-style-type: none"> ➤ Design Pressure & Temperature ➤ Quality Factors ➤ Weld Joint Strength Factor ➤ Pressure Design of Components <ul style="list-style-type: none"> ▪ Four Methods ▪ Straight Pipe ▪ Fittings ▪ Fabricated Branch Connections ▪ Flanges and Blanks ▪ Other Components ➤ Piping Material Specifications

Section	Title	Topics Covered
5	Valve Selection	<ul style="list-style-type: none"> ➤ Code Requirements ➤ Selection by Valve Type <ul style="list-style-type: none"> ▪ Gate ▪ Globe ▪ Check ▪ Butterfly ▪ Ball ▪ Plug
6	Introduction to Flexibility Analysis	<ul style="list-style-type: none"> ➤ What are we trying to achieve? ➤ Flexibility Analysis Example
7	Layout and Support	<ul style="list-style-type: none"> ➤ General Considerations ➤ Support Spacing ➤ Support Locations ➤ Support Elements
8	Flexibility	<ul style="list-style-type: none"> ➤ General Considerations ➤ Friction ➤ Stress Intensification ➤ Thermal Expansion ➤ Spring Hangers ➤ The Displacement Load Analysis
9	Reactions	<ul style="list-style-type: none"> ➤ General Considerations ➤ Fabricated Equipment ➤ Rotating Equipment ➤ Supports ➤ Cold Spring
10	Flexibility Analysis	<ul style="list-style-type: none"> ➤ When to Perform a Detailed Analysis ➤ Considerations
11	Designing with Expansion Joints	<ul style="list-style-type: none"> ➤ Types of Expansion Joints ➤ Pressure Thrust ➤ Installation of Expansion Joints ➤ Metal Bellows Expansion Joints
12	Fabrication and Installation	<ul style="list-style-type: none"> ➤ Welder/Brazer Qualification ➤ Welding Processes ➤ Weld Preparation ➤ Typical Welds ➤ Preheating & Heat Treatment ➤ Typical Owner Added Requirements ➤ Installation ➤ Flange Joints
13	Inspection, Examination and Testing	<ul style="list-style-type: none"> ➤ Inspection ➤ Examination <ul style="list-style-type: none"> ▪ Methods ▪ Requirements ▪ Acceptance Criteria ➤ Leak Testing <ul style="list-style-type: none"> ▪ Methods ▪ Requirements

Section	Title	Topics Covered
15	Nonmetallic Piping Systems	<ul style="list-style-type: none"> ➤ General ➤ Design, Fabrication and Installation for <ul style="list-style-type: none"> ○ Thermoplastics ○ Reinforced thermosetting resins ○ Reinforced concrete ○ Vitrified clay ○ Borosilicate glass ○ Piping lined with nonmetals ➤ Limitations
16	Category M Fluid Service	<ul style="list-style-type: none"> ➤ General ➤ B31.3 Requirements <ul style="list-style-type: none"> ○ Design ○ Fabrication ○ Examination ○ Testing ➤ Typical Owner Added Requirements
17	High Pressure Piping	<ul style="list-style-type: none"> ➤ General ➤ Materials ➤ Pressure Design ➤ Limitations ➤ Fabrication ➤ Examination ➤ Testing
18	In-service Piping - Inspection, Repair, Alteration and Rerating	<ul style="list-style-type: none"> ➤ API 570 Piping Inspection Code ➤ Responsibilities ➤ What to Inspect ➤ Types of Inspection ➤ Inspection Practices ➤ Frequency and Extent of Inspection ➤ Remaining Life Calculation ➤ Repairs and Alterations ➤ Rerating
19	What's Different in B31.1	<ul style="list-style-type: none"> ➤ Scope ➤ Organization of the Code ➤ Fluid Service Requirements ➤ Bases for Allowable Stresses ➤ Material Requirements ➤ Pressure Design Requirements ➤ Valve Requirements ➤ Fabrication and Installation ➤ Inspection, Examination and Testing