

# Piping Systems

## Course 306: Piping Systems

Covers piping and tubing systems used for fluid transport in the plant: hydraulic fluids, steam, liquefied product, refrigerant, and water. Shows typical metallic and nonmetallic piping systems, pipe-joining methods, and how tubing and hoses differ from piping. Covers valves, pipe fittings, hangers, supports, and insulation. Shows how tubing is sized, fitted, bent, and joined. Explains uses of traps, filters, and strainers.

TPC Training is accredited by IACET to offer **1.0 CEU** for this program.



### Lesson 1: Introduction to Piping Systems

#### Topics

Piping Systems; Fluids; Protecting Steam Lines; Keeping Fluids Clean and Moving; Piping Systems Maintenance; Valves and Fittings; Pipe Hangers and Supports; Temperature Effects; Piping Insulation; Typical Piping Systems; Maintenance Considerations

#### Objectives

- Describe what typical piping systems consist of, and explain their importance to plant operations.
- Identify common valves and fittings, pipe hangers and supports.
- Describe the effects of temperature on piping system components, and explain the need for insulation.
- List routine maintenance considerations for piping systems.

### Lesson 2: Metal Piping

#### Topics

Pipes; Pipe Schedules; Other Pipe Codes; Types of Systems; Characteristics of Metals; Pipe-Manufacturing Methods; Behavior of Fluids in Piping; Piping Applications; Steam Piping; Water Piping; Maintenance Considerations; Joining Pipes

#### Objectives

- Explain how metal pipes are sized and designated according to standard codes and schedules.
- Identify the characteristics of metals that make them suitable for a variety of piping applications.
- Describe the different methods of connecting sections of metal pipe, including bell-and-spigot joints, welded, soldered, or brazed joints, screwed or threaded joints, and flanged joints.
- Discuss the major considerations involved in the maintenance of metal piping.

### Lesson 3: Nonmetallic Piping

#### Topics

Nonmetallic Piping Materials; Clay Pipe; Concrete Pipe; Asbestos-Cement Pipe; Plastic Pipe; Limitations of Plastic Pipe; Joining Plastic Pipe; Maintaining Plastic Pipe; Glass Pipe; Other Piping Materials; Maintenance Requirements

#### Objectives

- Name the basic nonmetallic piping materials, and discuss the advantages and disadvantages of each.
- Identify the different forms of clay pipe and concrete pipe.
- Explain the difference between thermoplastic and thermosetting plastic pipe.
- Discuss the limitations of plastic pipe.
- Describe how to join sections of nonmetallic pipe, and how to maintain them.

### Lesson 4: Tubing

#### Topics

Tubing; Advantages of Tubing; Tube Joining; Types of Tubing; Tubing Applications; Plastic Tubing; Other Applications; Tubing Maintenance

#### Objectives

- Compare piping and tubing, and list the major advantages of tubing.
- Describe the methods of cutting, bending, and joining sections of tubing.
- List the main types of metal tubing, and describe the kinds of industrial applications in which they are used.
- List the main types of plastic tubing, and describe the kinds of industrial applications in which they are used.

### Lesson 5: Hoses

#### Topics

Hoses; Codes and Sizes; Hose Classifications; Hose Terminology; Reinforced Nonmetallic Hose; Nonmetallic Hose; Metallic Hose; Hose Couplings; Maintenance

#### Objectives

- Explain how hoses are sized, classified, and constructed.
- Define basic hose terminology.
- Discuss the respective advantages of metallic hose, nonmetallic hose, and reinforced nonmetallic hose.
- Describe the common types of hose couplings used in industrial service.
- List the primary maintenance requirements of hoses.

### Lesson 6: Fittings

#### Topics

Functions of Fittings; Screwed Connections; Flanged Connections; Other Fittings; Welded Connections; Tube Fittings; Drawing Symbols

#### Objectives

- Discuss the main functions of fittings.
- Identify common pipe and tube fittings.
- Contrast screwed, flanged, and welded connections, and tell why one type of joint may be preferred for a given application.
- Explain how expansion joints and vibration dampeners work.
- Demonstrate a knowledge of the symbols used to represent joints and fittings on schematic drawings of piping systems.

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## Lesson 7: Common Valves

### Topics

Valves; Valve Construction; Valve Sizes and Functions; Types of Industrial Valves; Gate Valves; Globe Valves; Needle Valves; Ball Valves; Butterfly Valves; Plug Valves; Check Valves; Quick-Opening Valves; Valve Maintenance; Valve Connections

### Objectives

- Explain the various ways in which valves control fluid flow in piping systems.
- Identify gate, globe, needle, ball, butterfly, plug, and check valves, and tell what each is used for.
- Explain how and why quick-opening valves are used in industrial piping applications.
- Describe routine inspection, lubrication, and maintenance procedures for common valves.

## Lesson 8: Special Valves

### Topics

Constructions and Materials; Diaphragm Valves; Blowoff Valves; Pressure-Regulating Valves; Temperature-Regulating Valves; Safety Valves; Relief Valves; Reducing Valves; Valve Operators; Magnetic Operators; Pneumatic and Hydraulic Operators; Remote Control

### Objectives

- Explain how diaphragm valves work.
- Describe the functions of the three main types of blowoff valves.
- Tell how regulating valves, relief valves, and reducing valves are used in industrial piping systems.
- Describe how different kinds of actuators open and close valves in response to pneumatic, hydraulic, or electrical signals.

## Lesson 9: Strainers, Filters, and Traps

### Topics

General Applications; Strainers; Filters; Steam; Traps; Vent Valves; Trap Maintenance; Typical Piping System

### Objectives

- Discuss the protective uses of strainers and filters in piping systems.
- Explain how the relationship between pressure and temperature affects steam lines, and creates the need for steam traps.
- Describe proper steam trap maintenance.
- Explain how and why air-vent and water-drain valves are used.
- Describe how a heat exchanger works in a fluid system.

## Lesson 10: Accessories

### Topics

Pressure Gauges; Temperature Gauges; Rotary Pressure Joints; Vacuum Breakers; Accumulators; Receivers; Actuators and Intensifiers; Pneumatic Pressure Line Accessories; Heat Exchangers; Wrenches; Maintenance

### Objectives

- Describe how different types of gauges are used to measure pressure and temperature in piping systems.
- Explain why rotary pressure joints are necessary in some applications.
- Describe the functions of accumulators and receivers.
- Tell how actuators and intensifiers are used in fluid-power systems.
- Discuss the principles of preventive maintenance and repair maintenance as they apply to piping systems.