

### Course 436: Piping

Examines piping system materials and sizing. Includes coverage of codes, valves and fittings, and the cutting and joining of piping and tubing. Explains the function and unique requirements of the discharge line, liquid line, and suction line. Concludes with a lesson on piping system maintenance, including handling dirt and scale, expansion, vibration, corrosion, and leaks.

TPC Training is accredited by IACET to offer **0.5 CEU** for this program.



#### Lesson 1: Piping Materials and Fittings

##### Topics

The Refrigeration Piping System; Compatibility of Materials; Sizing Refrigeration Piping; Oil Migration in Refrigeration Piping; Pipe vs. Tubing; Pipe Materials; Standard Pipe Sizes; Pipe Schedules and Codes; Valves and Pipe Fittings; Cutting Pipe Accurately; Methods of Joining Pipe; Uses for Tubing in Refrigeration; Tubing Material and Sizes; Advantages of Tubing; Cutting Tubing; Flaring Tubing; Bending Tubing; Fittings for Tubing; Soldering Tubing Fittings; Brazing Tubing Fittings; Safety in Soldering and Brazing

##### Objectives

- Name the three main lines of piping in a refrigeration system.
- Explain why air conditioning and refrigeration piping must be sized correctly.
- Contrast pipe and tubing and explain why tubing is often preferred over piping.
- Explain how pipe is classified according to schedule.
- Name three methods of joining steel pipe.
- Explain how tubing is cut, flared, bent, and joined.
- Describe the step-by-step procedure for making a brazed joint.

#### Lesson 2: Discharge Line

##### Topics

Functions of the Discharge Line; Condition of the Refrigerant at Discharge; Pressure Drop in Refrigerant Piping; Effects of Pressure Drop on System Operation; Oil Circulation in the Discharge Line; Sizing the Discharge Line; Discharge Piping Layout; Refrigerant Migration on Off-Cycle; Discharge-Line Accessories; Complex Refrigeration Systems; Hot-Gas Bypass Piping; Line Selection Based on Refrigerant Type

##### Objectives

- List the four functions of the discharge line in a refrigeration piping system.
- Explain the importance of pressure drop in piping and its effects on system operation.
- Define the term entrainment and explain why entrainment of oil is important.
- State the flow velocity needed for refrigerant vapor to entrain oil in horizontal piping and in vertical risers.
- Name some practical steps you can take to assure a good flow of refrigerant in horizontal piping.
- Describe ways of preventing refrigerant and oil migration to the compressor.
- Name and explain the purposes of three discharge-line accessories.

#### Lesson 3: Liquid Line

##### Topics

Functions of the Liquid Line; State of Refrigerant in the Liquid Line; Effects of Pressure Drop on System Operation; Oil Circulation in the Liquid Line; Sizing the Liquid Line; Liquid-Line Layout; The Liquid Receiver; Liquid-Line Components and Accessories; Insulating the Liquid Line; Pressure Relief for Closed Containers

##### Objectives

- Name the functions of the liquid line.
- Explain why it is desirable to have subcooling in the liquid line.
- Describe the effects of pressure drop in the liquid line on the operation of a refrigerant system.
- Describe the effects of flash gas formation on the performance of the system.
- Explain the purpose of a liquid receiver.
- Explain why each of the following devices is used in the liquid line: sight glass, solenoid valve, check valve.

#### Lesson 4: Suction Line

##### Topics

Functions of the Suction Line; Lubricating Oil in the Suction Line; Pressure Drop in the Suction Line; Suction-Line Accumulators; Suction-Line Heat Exchanger; Suction-Line Controls; Suction-Line Valves; Suction-Line Filters; Vibration Eliminators; Suction-Line Insulation; Suction Lines for Multiple Compressors; Suction Lines for Multiple Evaporators

##### Objectives

- Describe the functions of the suction line, its structural demands, and special design features.
- Explain why suction lines are pitched down toward the compressor.
- Explain how a double suction riser moves oil along with the refrigerant.
- Explain the function of an accumulator and a heat exchanger in a suction line.
- Describe the basic differences between evaporator pressure regulators and crankcase pressure regulators.
- Explain why it is necessary to insulate the suction line.
- Explain how a suction line for multiple compressors differs from a suction line for a single compressor.

**Lesson 5: Piping Systems Maintenance***Topics*

Causes of Piping Problems; Dirt and Scale in Piping; Allowing for Piping Expansion; Support for Refrigeration Piping; Protecting Piping from Vibration; Corrosion in Piping; Piping Leaks; Protecting Piping from Freezing; Eliminating Liquid Hammer; Thermal Insulation for Piping; Troubleshooting the Liquid Line; Troubleshooting Moisture Indicators; Troubleshooting the Suction Line

*Objectives*

- Name at least four factors that cause piping problems and can lead to operating problems.
- Explain why cleanliness is essential when assembling refrigeration piping.
- Name at least three ways to allow for the expansion of piping.
- Describe the various ways of supporting horizontal and vertical pipe runs.
- Describe the damage that can be caused by vibration and tell how to protect piping from it.
- Define corrosion and explain how it can be prevented in refrigerant and water piping.
- Explain the importance of thermal insulation for refrigeration system piping.