

Heating/Cooling System Efficiency

Course 378: Heating/Cooling System Efficiency

Covers the measurement of various environmental factors and their effect on human comfort. Introduces the concept of zones. Covers ventilation requirements and savings possible by reducing airflow. Examines energy waste vs. conservation measures relating to furnaces, boilers, air conditioners, and refrigeration equipment.

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



Lesson 1: Conditioning the Air

Topics

Human Comfort; Environmental Factors Affecting Human Comfort; Heat Generated Within a Building; Thermal Zones; The Basic All-Air HVAC System; Types of All-Air HVAC Systems; Single-path Systems; Multiple-Path Systems; General Energy Conservation; Guidelines for HVAC

Objectives

- Explain the various environmental factors affecting human comfort.
- Interpret the ASHRAE comfort chart.
- Differentiate between sensible and latent heat.
- Explain the operation of the components in a basic all-air HVAC system.
- Name the different kinds of single-path and multiple-path HVAC systems, tell how each operates, and list ways to conserve energy in each type.

Lesson 2: Managing Airflow in HVAC Systems

Topics

Measuring Air Velocity and Volume Flow Rate; Air Pressure Within a Duct System; The Pitot Tube; Other Airflow Measuring Devices; Building Ventilation Requirements; Determining Ventilation Requirements; The Cost of Using Outside Air; Heat Recovery Systems; Exhaust Systems; Conserving Energy in Exhaust Systems; Maintaining System Components

Objectives

- Compare and contrast static pressure, velocity pressure, and total pressure.
- Define ventilation air and tell how to determine ventilation air requirements.
- Calculate the amount of energy needed to heat or cool outside air.
- Name four types of heat recovery systems and explain how each works.
- Explain where and why exhaust systems are used and how they may be installed.

Lesson 3: Conserving Energy in Heating Systems

Topics

Heating Units; Warm Air Furnaces; Boilers; Furnace and Boiler Maintenance; Energy Conservation in Furnaces and Boilers; Stack Gas Analysis; Purchased Steam and Hot Water; Metering Steam and Hot Water; Steam Traps; Steam Trap Maintenance; Humidifiers; Heating Controls Maintenance; Domestic Hot Water

Objectives

- Explain why good furnaces and boiler maintenance is an important part of an energy conservation program.
- Detail the types of maintenance required on various types of furnaces.
- Tell how to locate and correct energy waste in steam and hot water distribution systems.
- Explain the importance of steam traps and describe their operation and maintenance.
- List ways energy may be saved in humidification systems.

Lesson 4: Conserving Energy in Cooling Systems

Topics

Types of Refrigeration Equipment; Mechanical Compression Systems; The Vapor-Compression Cycle; Absorption Refrigeration Systems; The Absorption Refrigeration Cycle; External Refrigeration Controls; Internal Controls—Checking System Operation; Evaporator Temperatures; Condenser Temperatures; Equipment for Cooling Condensers; Cooling Towers; Evaporative Condensers; Air-Cooled Condensers; Water-Cooled Condensers; Self-Contained Air Conditioning Units; Heat Pumps; The Direct Use of Evaporative Cooling Systems; Refrigerators and Freezers

Objectives

- Compare and contrast the operation of a mechanical compression system and an absorption system.
- Define external and internal controls for refrigeration and give examples of each.
- Explain how evaporator and condenser temperatures influence energy consumption.
- Name several different methods for cooling condensers.
- Describe the basic operation of a heat pump and tell how it differs from other air conditioning systems.

Lesson 5: Reducing Losses in Distribution Systems

Topics

The Nature of Fluid Flow; Reducing Distribution System Losses; Reducing Resistance to Air Movement; Fans; Insulating Air Ducting; Fluid Flow in Piping Systems; Balancing Hydronic Systems; Insulating Piping Systems; Centrifugal Pumps; Maintaining Centrifugal Pumps; Strainers in Hydronic Systems; Control Valves; Three-Way Control Valves; Maintaining Control Valves

Objectives

- Define the term fluid and discuss the importance of reducing a fluid's resistance to flow.
- List several ways to reduce flow resistance in air distribution systems.
- Discuss the purpose of insulating air ducting and tell how insulation is applied.
- Explain how flow resistance can be reduced in piping systems.
- Name several types of control valves, tell where each is used, and explain the importance of good valve maintenance.