

Heating System Equipment

Course 443: Heating System Equipment

Covers the hardware associated with heating systems, including gas and oil furnaces, electric systems, solid-fuel and hydronic systems, and finally some alternative systems—solar heating, heat pumps, and fuel cells. Includes a discussion of furnace performance criteria, return air systems, and the importance of filters.

TPC Training is accredited by IACET to offer **0.6 CEU** for this program.



Lesson 1: Gas Heating Equipment

Topics

Gas Heating Basics; Gaseous Fuels; Combustion Air; Furnace Categories; Furnace Components for Heat Production; Furnace Ignition Systems; Furnace Components for Venting; Conditioned Air System; Heating System Controls; Service Procedures

Objectives

- Describe the main parts of the furnace system, both those that produce the heat and those that distribute the heated air, and describe the four basic furnace configurations.
- Discuss the differences between natural gas and liquefied petroleum gas (LPG), the hazards associated with each fuel, and the heating rates of each fuel.
- Discuss the purposes of the primary and secondary air supplies to the combustion chamber and compare the characteristics of category I, III, and IV gas furnaces.
- Describe how the gas is introduced, mixed with the air, and burned in the heat-producing components of the furnace.
- Describe several burner ignition methods and safety shutdown measures in case of flame failure.
- Discuss the basic sequence of furnace operation and the controls required.
- Describe common service procedures for gas heating systems and discuss safety.

Lesson 2: Oil Heating Equipment

Topics

Oil Heating Basics; Fuel Oils; Oil Burner Components; Fuel Oil Pumps; Nozzles; Blowers; Electrodes; Transformer and Controls; Fuel Supply; Heat Exchangers and Combustion Chamber; Combustion Efficiency; Service Procedures

Objectives

- Discuss the similarities and differences between oil furnaces and gas furnaces.
- Name two common fuel oils and discuss the relationships between grades of fuel, viscosity, and temperature.
- Compare the requirements and operation of oil burner systems having the storage tank above the furnace to those having the tank below the furnace.
- Explain the reason for atomizing fuel oil and describe nozzle action and spray patterns.
- Describe the function of blower components that provide combustion air.
- Explain the purpose of the electrodes, transformer, and controls in an oil burner system.
- Discuss various ways of testing for combustion efficiency and describe common servicing procedures for oil burner systems.

Lesson 3: Electric Heating Systems

Topics

Electrical Heating Basics; Advantages and Disadvantages of Electric Heating; Electric Heating System Applications; Electric Baseboard Heating; Radiant Ceiling Heating Panels; Electrically Heated Walls; Electrically Heated Floors; Forced-Air Electric Furnaces; Forced-Air Control System; Service Tips

Objectives

- Describe the characteristics of the electric wire used for resistance heating elements.
- Discuss the advantages and disadvantages of electric heating systems.
- Explain how electric baseboard heating is applied to smaller facilities.
- Describe basic designs for radiant systems and discuss heating element safety.
- Describe the function of each main component in an electric forced-air furnace.
- Follow a wiring diagram to discuss the operation of an electric furnace including startup, shutdown, and safety features.

Lesson 4: Solid-Fuel Furnaces and Furnace Performance Criteria

Topics

Coal Furnaces; Stoker Classifications; Coal Furnace Control Systems; Wood Furnaces; Dual-Fuel Furnaces; Furnace Performance Criteria

Objectives

- Explain why coal is in decline as a heating fuel and describe the layout of a coal furnace.
- Compare various kinds of mechanical stokers and explain why each kind is used.
- Describe the functions of furnace safety and operating controls.
- Discuss the basic requirements of wood-burning furnaces.
- Discuss the benefits and function of dual-fuel furnaces.
- Explain how to use furnace efficiency formulas, including the AFUE system.

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Lesson 5: Hydronic Systems

Topics

Hydronic Basics; Thermal System; Hydraulic System; Distribution Systems; Additional System Components; Radiant Panel Systems; Heating/Cooling Systems; Control Methods; Domestic Water Heating; MTW and HTW Systems; Freeze Protection; Altitude Considerations; Air Elimination

Objectives

- Discuss how water can be used in residential and light commercial buildings to provide heating and cooling.
- Discuss the relationships between the five basic components of hydronic systems and describe the functions of the expansion tank and centrifugal pump.
- Compare the layouts and uses of series (one-pipe) and parallel (two-pipe and four-pipe) distribution systems.
- Discuss the use of radiant panels, heating/cooling systems, and domestic water heating.
- Name characteristics that make MTW and HTW systems economical for large commercial and industrial systems and explain why the simpler LTW systems are used for residences and small commercial buildings.
- Explain how to provide freeze protection, how to adjust for high altitude, and how to eliminate air from the system.

Lesson 6: Other Heating System Equipment

Topics

Fireplaces; Other In-Space Heaters; Solar Heating; Heat Pump Systems; Fuel Cells; Return Air Systems; Filters

Objectives

- Describe various kinds of fireplaces and the resulting level of efficiency.
- Discuss the three flue-venting arrangements in newer fireplaces.
- Discuss various kinds of in-space heaters and their use in residences and commercial and industrial facilities.
- Discuss the basics of solar heating and describe various kinds of solar heaters used for building cooling and heating.
- Discuss the emerging technology of fuel cells for heating and electric power generation.
- Explain why certain locations are preferred for supply and return vents in forced-air heating systems.
- Discuss today's filtration systems and IAQ concerns.