



## Course 438: Air-Handling Systems

Covers airflow basics, including how air moves, types of airflow, and pressure relationships. Compares and contrasts various fans and fan motors. Examines types of ducts, fittings, connections, insulation, and terminal devices. Covers methods of cleaning and filtering air, as well as balancing and troubleshooting the air-handling system. Concludes with a lesson on indoor air quality and sick building syndrome.

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



### Lesson 1: Air Movement and Distribution

#### Topics

The Air-Handling System; Comfort Air Conditioning; Process Air Conditioning; Heat and Moisture Transport; How Air Moves; Types of Airflow; Pressure Relationships; Controlling Ventilation and Pressurization; Dual-Duct Systems; System Velocity

#### Objectives

- List the variables controlled by an air-handling system.
- Define comfort and explain how to predict whether or not people in a space will be comfortable.
- Define the following terms: laminar flow, turbulent flow, streamlining, and eddy currents.
- Differentiate between static pressure, velocity pressure, and total pressure in an air-distribution system.
- Compare a dual-duct system to a single-duct system in both structure and operation.

### Lesson 2: Fans and Fan Motors

#### Topics

Fan Construction; Centrifugal Fans; Axial-Flow Fans; Fan Performance Curves; System Characteristics; Preventive Maintenance for Fans; Impeller Maintenance; Belts and Drive-Train Maintenance; Bearing Maintenance and Replacement; Fan Motor Problems; Troubleshooting a Noisy Fan

#### Objectives

- Describe the two basic types of fans used in air-conditioning systems.
- Define the terms system characteristic and point of operation.
- Explain why a knowledge of fan laws and performance curves is necessary when altering an air-handling system.
- Describe preventive-maintenance procedures for typical fans.
- Explain how to replace the bearings in a centrifugal fan.

### Lesson 3: Ductwork Types, Fabrication, and Repair

#### Topics

Types of Ducts; Duct Designations; Duct Systems; Duct Fittings and Connections; Insulation; Diffusers and Other Terminal Devices; Fabricating Sheet Metal Ducts; Duct Reinforcement; Duct Maintenance

#### Objectives

- Define the term aspect ratio.
- Compare and contrast a radial duct system and an extended plenum system.
- Describe the structure and purpose of dampers and turning vanes.
- Identify a variety of fittings and connections used in a sheet metal ductwork system.
- Explain how and why ducts are insulated and reinforced.
- Identify common types of sheet metal seams and describe how each is fashioned.
- Explain the basic servicing and inspection procedures for ductwork systems.

### Lesson 4: Air Filtration

#### Topics

The Process of Air Filtration; Mechanical Air Filters; Establishing a Service Schedule; Servicing Impingement Filters; Replacing Dry Media Filters; Installing HEPA Filters; Selecting Replacement Air Filters; Electronic Air Cleaners; Maintaining Electronic Air Cleaners

#### Objectives

- Explain the function of an air filter.
- Describe the two main types of mechanical air filters.
- Explain how to establish a service schedule for air filters.
- Explain how to clean and/or replace the filters in your HVAC system.
- Explain the operation of electronic air cleaners and tell how they are serviced.

### Lesson 5: Air System Balancing and Troubleshooting

#### Topics

A Systematic Procedure; Measuring Instruments; Auxiliary Instruments; Pretest Data Collection; Preparing the System; Measuring and Adjusting the Main Airflow; Measuring and Adjusting Branch Ducts; Adjusting Registers and Diffusers; Troubleshooting Air-Handling Systems

#### Objectives

- Explain why air-handling systems need to be balanced.
- Describe the instruments used to test and balance an air-handling system.
- Demonstrate how to measure velocity pressure and show how airflow rates are calculated from these pressure readings.
- Describe a pitot-tube traverse.
- Explain in step-by-step fashion how to test and balance an air-handling system.
- Name common complaints related to air-handling systems and give common causes.

### Lesson 6: Indoor Air Quality and Sick Building Syndrome

#### Topics

Sick Building Syndrome (SBS) Characteristics; Investigating a Potential SBS Problem; Internal SBS Contributors; External SBS Contributors; HVAC Systems as Contaminant Sources; Particulates and IAQ; Pollutant Pathways; Odors and Contamination; Building-Related Illness (BRI)

#### Objectives

- Discuss the characteristics of sick building syndrome (SBS).
- Describe the process for investigating an SBS complaint and explain how to conduct a facility site review.
- Discuss ways a facility can minimize the probability of perceived SBS problems.
- Discuss internal and external SBS contributors, including HVAC systems, and discuss ways to eliminate or reduce the problems.
- Describe specific ways to control particulates, odors, and other contaminants.
- Define the abbreviations SBS, IAQ, BRI, VOC, and MCS.