



## **CURRICULUM FOR HVAC LEVEL - 1**

### **For Northern Ohio Chapter, ABC, Inc. Training Program**

#### **OSHA 10 Hour Training**

**Core** – Covers basic safety, construction math, hand and power tools, blueprint reading, basic rigging, and communication & employability skills.

**Introduction to HVAC** – Covers the basic principles of heating, ventilating, and air conditioning and career opportunities in HVAC, training, and apprenticeship programs.

**Trade Mathematics** – Explains how to solve problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature, along with, scientific notation, powers, roots, and basic algebra and geometry.

**Basic Electricity** – Teaches power generation and distribution, electrical components, DC circuits, and electrical safety.

**Introduction to Heating** – Covers heating fundamentals, types and designs of furnaces and their components, and basic procedures for installing and servicing furnaces.

**Introduction to Cooling** – Covers basic principles of heat transfer, refrigeration, and pressure-temperature relationships and describes the components and accessories used in air conditioning systems.

**Air Distribution Systems** – Describes air distribution systems and their components, air flow measurement, ductwork installation principles, and the use of instruments for measuring temperature, humidity, pressure, and velocity.

**Basic Copper and Plastic Piping Practices** – Covers the selection, preparation, joining, and support of copper and plastic piping and fittings.

**Soldering and Brazing** – Covers tools, materials, and safety precautions and depicts step-by-step procedures for soldering and brazing piping.

**Basic Carbon Steel Piping Practices** – Explains how to identify various carbon steel piping materials and fittings. The joining and installation of threaded and grooved carbon steel piping systems is covered, with detailed coverage of threading and grooving techniques included.

**Total Hours Level 1: Minimum of 192.5 Hours of Related Technical Instruction**



## CURRICULUM FOR HVAC LEVEL - 2

### For Northern Ohio Chapter, ABC, Inc. Training Program

**Alternating Current** – Covers transformers, single phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components. Also reviews electrical safety.

**Compressors** – Explains the operating principles of the different types of compressors used in the comfort air conditioning and refrigeration systems, along with basic installation, service, and repair procedures.

**Refrigerants and Oils** – Discusses the refrigerants and oils used in modern refrigeration and air conditioning systems including new handling and service requirements.

**Leak Detection, Evacuation, Recovery, and Charging** – Covers the entire basic refrigerant handling and equipment servicing procedures that a technician must know in order to service HVAC systems in a manner that is safe for the environment.

**Metering Devices** - Covers the operating principles, applications, installation, and adjustment of the various types of fixed and adjustable expansion devices used in air conditioning equipment

**Heat Pumps** – Principles of reverse cycle heating, describes the operation of the various types of heat pumps, and helps the trainee learn how to analyze heat pump control circuits. Includes heat pump installation and service procedures

**Basic Maintenance** – Describes common tasks associated with basic maintenance. Specific tasks, such as lubricants, and belt installation are reviewed in detailed. Provides detailed coverage on maintenance inspections of gas furnaces and common cooling/heat pump systems.

**Chimneys, Vents and Flues** – Principles of furnace venting of fossil-fuel furnaces & the proper methods for selecting & installing vent systems for gas-fired heating equipment.

**Sheet Metal Duct Systems** – Covers layout, fabrication, installation, and insulating sheet metal ductwork. Also includes selection of registers, diffusers, dampers, and other duct accessories.

**Fiberglass and Flexible Duct Systems** – Reviews application and methods of fabricating fiberglass duct systems. Installation guidelines and methods to repair damaged components. Concludes with fabric based duct systems.

**Commercial Airside Systems** – Describes the systems, equipment, and operating sequences used in a variety of commercial airside system configurations, such as constant volume single-zone and multi-zone, VVT, VAV, and dual-duct VAV.

**Air Quality Equipment** – Introduces the factors related to indoor air quality and human comfort. Equipment used to control humidity is present in detail. Also cover air filtration materials and the introduction of outside air into the indoor environment.

**Introduction to Hydronic Systems** – Introduces hot water heating systems, focusing on safe operation of low pressure boilers and piping systems commonly used in residential applications.

**Basic Electronics** – Explains the theory of solid-state electronics, as well as the operation, use, and testing of the various electronic components used in HVAC equipment.

**Total Hours Level 2: Minimum of 157.5 Hours of Related Technical Instruction**



## CURRICULUM FOR HVAC LEVEL - 3

### For Northern Ohio Chapter, ABC, Inc. Training Program

**Fasteners, Hardware, and Wiring**- Terminations Covers a variety of fasteners, hardware, and wiring terminations used in HVAC systems including the installation of these components.

**Control Circuit and Motor Troubleshooting** – Provides information and skills to troubleshoot control circuits and electric motors found in heating and cooling equipment..

**Troubleshooting Cooling** – Provides guidance related to troubleshooting cooling equipment.

**Troubleshooting Heat Pumps** – Reviews heat pump operation and heat pump control circuits, including how to isolate and correct faults in the heating, cooling, auxiliary heat, and defrost functions of heat pumps

**Troubleshooting Gas Heating** – Covers tools and instruments used in troubleshooting gas heating appliances and offers trainees the opportunity to isolate and correct faults

**Troubleshooting Oil Heating** – Covers how to identify the common causes of problems in oil furnaces and offers hands-on experience is isolating and correcting oil furnace malfunctions.

**Troubleshooting Accessories** – Provides hands-on lab sessions, to teach how to troubleshoot humidifiers, electronic air cleaners, economizers, zone controls, and heat recovery ventilators.

**Zoning, Ductless, and Variable Refrigerant Flow Systems** - Introduces the information and skills needed to troubleshoot and repair zoned, ductless, and variable refrigerant flow systems.

**Commercial Hydronic Systems** – Reviews basic properties of water and describes how water pressure is related to the movement of water through piping systems. Describes various types and components of commercial hot-water heating and chilled-water cooling systems, and examines how those systems function.

**Steam Systems** – Focuses on the use of steam for storing and moving energy in HVAC systems. Reviews the fundamentals of water that relate to steam and describes the basic steam system cycle. Discusses a steam system's operational components—steam boilers and their accessories and controls; steam system loads, including heat exchangers/converters and terminal devices. Steam system valves and piping are covered in detail, including common types of piping arrangements, the components of a condensate return/feedwater system, steam and condensate pipe sizing; and pressure-reducing valves and thermostatic valves.

**Retail Refrigeration Systems** – Introduces the product refrigeration components and systems, such as the reach in coolers and freezers commonly used in markets.

**Customer Relations** - Presents the importance of establishing good relations with customers and provides guidance on how to achieve that goal. Focuses on ways for a technician to make a good first impression and describes how to communicate in a positive manner with customers. The elements of a service call and dealing with different types of problem customers are also covered.

**Total Hours Level 3: Minimum of 157.5 Hours of Related Technical Instruction**



## **CURRICULUM FOR HVAC LEVEL - 4**

### **For Northern Ohio Chapter, ABC, Inc. Training Program**

**Water Treatment** – Covers the kinds of water problems encountered in heating and cooling systems and identifies various water treatment methods and equipment.

**Indoor Air Quality** – Introduces indoor air quality and its effect on the health and comfort of building occupants. Provides guidelines for performing a building IAQ survey and identifies equipment and methods used to test for and achieve good indoor air quality.

**Energy Conservation Equipment** – Covers the various heat recovery/reclaim devices, along with other energy recovery equipment used to reduce energy consumption in HVAC systems.

**Building Management Systems** – Explains how computers and microprocessor controls are used to manage zoned HVAC systems in residential and commercial buildings.

**System Air Balancing** – Covers air properties and gas laws, as well as the use of psychrometric charts. It covers the tools, instruments, and methods used in balancing an air distribution system.

**System Startup and Shutdown** – Covers the procedures for the startup of hot water and steam heating systems, chilled water systems, and forced air distribution systems. Emphasis is on startup after initial equipment installation or after an extended period of shutdown also includes procedures to prepare the same kinds of systems for extended period of shutdown.

**Construction Drawings and Specifications** – Covers how to interpret the various drawings used in commercial construction, including mechanical drawings, specifications, shop drawings, and as-built and to perform takeoff procedures for equipment, fittings, ductwork and other components.

**Heating and Cooling System Design** – Explains the factors that affect the heating and cooling loads of a building, describes the process by which the heating and cooling loads are calculated, and shows how load information is used to select heating and cooling equipment also covers types of duct systems and their selection, sizing, and installation.

**Commercial and Industrial Refrigeration Systems** – This module expands the study of product and process refrigeration begun in Level 3. It deals with the type of systems used in cold storage and food processing facilities, as well as transportation refrigeration.

**Alternative Heating and Cooling Equipment** – Covers the variety of alternative devices that are used to reduce energy consumption.

**Fundamentals for the Crew Leader** – Along with the principles of project planning, scheduling, estimating, and management, teaches the basic skills required for supervising personnel.

**Total Hours Level 4: Minimum of 160 Hours of Related Technical Instruction**