HVACR Apprenticeship

General Education Training Flow Chart

*Training may not follow this exact flow chart*

●5 Years of job-related education

● 2 courses per semester

● 2 Semesters per year

● 18 weeks per course

●180 weeks of Training

● 1,080 hours of class time in a five year period

● Work during the day & attend classes at night

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| EARN WHILE You Learn |

*(Prototypical 5 Year Class Schedule)*

**Year one course description**

**- Electrical Theory I Lecture (18 Weeks) -** Concepts of electrical principles used in AC and refrigeration are explored; to include meters, circuits, contactors, relays, thermostats, pressure switches, motors, overloads, circuitry and troubleshooting. Safe electrical practices are stressed.

**- Mechanical Systems I Lecture/Lab (36 Weeks) -** The design, assembly and operation of compression systems to include basic liquid and vapor control, metering devices, design and construction of system piping, including techniques of leak detection, dehydration of systems, charging methods, recovery and troubleshooting will be mastered.

**- Brazing & Soldering I Lecture/Lab (18 Weeks) -** Safety torch techniques, cutting, fitting and brazing of various copper projects will be explored. Further, the techniques for isometric drawing and pipe symbols for soldering and brazing will be practiced.

**Year 2 course description**

**- Electrical Controls II Lecture/Lab (36 Weeks) -** Will use a sequential approach to exploring basic series and parallel circuits related to A/C and refrigeration. Motors, relays, contactors, thermostats, pressure switches and overloads are examined and wired. The concluding projects are basic A/C and Refrigeration systems. Special emphasis will be placed on electrical circuits diagnosis and troubleshooting.

**- Customer Relations/Safety II Lecture (9 Weeks) -** To gain a full appreciation of the value of effective relationships with customers. The course starts with an evaluation of self and the importance of this knowledge in the relationship arena and proceeds on to video and case studies exploring the importance of effective relationships and what means can be used to help us all in promoting ourselves and our companies.

**- Safety for Service and Benefits II (9 Weeks) -** This course will cover safety as it pertains to the HVAC-R industry. Preparing students to work safely in areas of the trade that can be dangerous and harmful will be the main objective of this course. Introduction to the benefits of being a union member and a short course on union heritage will also be covered.

**- Installation II Lecture/Lab (18 Weeks) -** This course will explore the various elements of installation as it relates the air conditioning and refrigeration field. Pipe fitting, layout, gas and arc welding, rigging, pipe threading, anchoring systems and tools and cutting torch procedures will be taught using various hands-on projects. Job safety will be stressed throughout the course.

**Year 3 course description**

- **DDC III Lecture/Lab (18 Weeks)** - This course will cover Direct Digital Controls pertaining to the Air Conditioning and Refrigeration industry: including topics such as transducers, sensors and power supplies, and the techniques of reading input and output voltages. Students will also learn how to make the correct decisions when repairing controls.

-**Electrical Controls III Lecture/Lab (18 Weeks)** - This course will cover advanced electrical controls with special emphasis on trouble shooting and repair. Covered will be proportional controls, economizers, and VAV controls. Motor starting techniques will be discussed including Variable Frequency Drives with safety procedures being stressed.

- **Thermodynamics III Lecture/Lab (18 Weeks)** - Principles of air conditioning and refrigeration will be analyzed through the use of Mollier diagrams to determine COP (Coefficient of Performance), EER (Energy Efficiency Rating), CFH (Cubic Feet per Hour), BTUH (British Thermal Units per Hour) and KW (Kilowatt). The psychometric chart will be explored to measure topics such as Specific Volume, Density, Heat, Sensible and Latent Heat Formulas, Enthalpy and Humidity. Air mixtures will be examined.

- **Compressors III Lecture/Lab (18 Weeks) -** The class will include reciprocating compressor disassembly and assembly while developing a working knowledge of compressor function, troubleshooting, alignment, and performance. Unloaders, oils, starters, and start-up procedures will be explored. Prominent Trane and Carrier compressors will be examined.

**Year 4 course description**

- **Market Applications IV Lecture/Lab (18 Weeks)** - Students will read floor plans, refrigeration schedules and piping diagrams in conjunction with laying out undergrounds and overheads in a typical market. Understanding all aspects of component operation and location including; compressors, evaporators, condensers, refrigerated cases, walk-ins, heat reclaim, and connecting peripherals; i.e.: valves, driers, etc. will be mastered.

- **Pneumatics IV Lecture/Lab(18 Weeks)**- Investigate and recognize the operation of direct and reverse acting pneumatic controls, air compressors, sizing of valves and dampers, thermostats, auxiliary devices, transmitters and receiver controllers. This sequential pattern is reinforced with various lab experiments. Students will also explore Direct Digital Controls, (DDC). This will include system structure and basic programming of two different types of DDC systems. Market refrigeration training aids will be used in lecture and lab projects.

- **HVAC Systems IV Lecture/Lab (18 Weeks)** - Systems IV is intended to provide an overview of commercial air conditioning systems currently in use today and the methods for servicing these systems. Topics covered will be system types and servicing practices. Introduction to steam, chillers, desiccants, hydronics, thermal storage, geothermal, indirect and direct evaporative cooling will be discussed. HVAC systems for market refrigeration will be included in subject matter.

- **Heat Loads & Air Distribution IV Lecture (18 Weeks)** - Heat load factors and charts will be explored, developed, and applied to the heat loss and gain of a residential and commercial building. Investigate air measurement and air distribution through study of duct design of residential and commercial buildings.

**Year Five course description**

**- Start Test Balance V Lecture (18 Weeks) -** Specialized techniques and procedures used in commissioning new and retrofit supermarket installations will be taught. Proper procedures for start, test, and balance of air conditioning systems, utilizing basic principles of air and water flow, will be explored. Other topics explored are fan laws, air movement, pumps, piping, air and water measurement.

**- Advanced Troubleshooting V Lecture/Lab (18 Weeks) -** Will cover advanced troubleshooting techniques used in diagnosing system operation.

**- Water Chillers V Lecture/Lab (18 Weeks**) - Understand the proper operating principles of the single-stage, two-stage and direct-fluid absorption chillers. Understand the proper operating principles of the low pressure and high pressure centrifugal water chillers. Have thorough knowledge of the screw type water chiller operation.

**- Variable Frequency Drives V Lecture/Lab (9 Weeks) -** Introduction to VFDs, applications of use, limited troubleshooting. Parameterization for startup, open loop, closed loop, floating point and preset speed profiles.

**- Hydronics V (9 weeks) -** This class will cover hydronic piping and pumping systems used in hydronic systems. The use of troubleshooting methods with field measurement techniques to find and correct hydronic problems will also be addressed. Also included and explained in the course will be the maintenance and cleaning of hydronic systems.