

Heating, Ventilation and Air Conditioning

Program Length:

900 Total Hours
200 Lecture Hours
500 Shop Hours
200 Externship Hours

Program Description:

This twenty-six (26) week, 900-hour program is designed to help students build a comprehensive, industry-ready foundation in Heating, Ventilation, Air Conditioning, and Refrigeration — preparing them for a confident and successful transition into the HVACR workforce. Students will begin by exploring HVACR career pathways, certification requirements, licensing, and professional job search strategies including resume writing and interview skills. They will gain a thorough understanding of workplace safety, personal protective equipment, safe work practices, and the tools and supplies used every day in the field. They will also be taught about refrigeration fundamentals, in order to handle jobs that require safe and precise refrigerant service in compliance with EPA standards. They will also be taught about electrical systems, including basic electricity, electric motors, control systems, and electrical troubleshooting fundamentals, and that will make them capable of handling complex wiring, diagnostics, and motor service across residential, commercial, and industrial HVACR systems. Students will further develop expertise in domestic refrigerators and freezers, air-conditioning systems, indoor air quality, and heating systems, and that will make them capable of handling the full spectrum of residential and light commercial HVACR installation, service, and repair calls independently. They will also learn about energy management and conversion, advance through three progressive levels of commercial refrigeration that will make them capable of handling the full complexity of commercial refrigeration systems found in food service, retail, and cold storage environments.

Upon graduation, students will possess the technical knowledge, hands-on skills, professional certifications, and workplace readiness needed to pursue a wide range of rewarding career opportunities — including residential and commercial HVACR technician, refrigeration specialist, energy management technician, and commercial refrigeration systems designer — and build a lasting, successful career in one of the nation's most essential and in-demand skilled trades.

Heating, Ventilation and Air Conditioning Program

Course/Number		<u>Clock</u>	<u>Hours</u>	Total Hours
Lesson	Title	Lecture	Shop	
HVC001	Introduction to HVAC	21	13	34
HVC002	Refrigeration Fundamentals	34	34	68
HVC003	Electricity in HVAC	28	40	68
HVC004	Domestic Refrigerators & Freezers	7	41	48
HVC005	AC Systems	21	81	102
HVC006	Indoor Air Fundamentals	14	40	54
HVC007	Heating Systems	21	47	68

HVC008	Energy Management & Conservation	14	20	34
HVC009	Commercial Refrigeration Systems 1: Basics	21	47	68
HVC010	Commercial Refrigeration Systems 2: Installation	7	95	102
HVC011	Commercial Refrigeration Systems 3: Design	10	24	34
HVC012	Job Application Skills	2	18	20
HVC013	Externship	0	200	200
Total:		200	700	900

Program Subjects:

1. Introduction to HVAC
2. Refrigeration Fundamentals
3. Electricity in HVAC
4. Domestic Refrigerators & Freezers
5. AC Systems
6. Indoor Air Fundamentals
7. Heating Systems
8. Energy Management & Conservation
9. Commercial Refrigeration Systems 1: Basics
10. Commercial Refrigeration Systems 2: Installation
11. Commercial Refrigeration Systems 3: Design
12. Job Application Skills
13. Externship

Certification:

A diploma will be given to each student upon completing the Program. This diploma will be used to show a perspective employer evidence of program completion and the skills attained for successful work in the Steam, Sprinkler and Pipe Fitting industry.

EPA section 608 certification, Type I

Classes will be provided for students in this program at no cost (HVC 002). A successful candidate would also achieve the EPA section 608 certification while all students would be able to take the test once during their training in PTTI.

OSHA 30:

Classes will be provided for students in this program at no cost (HVC 001). Certification will be granted and issued at completion of the program.

Course Descriptions - Heating, Ventilation and Air Conditioning

HVC001 - Introduction to HVAC

In this course, students will explore the fundamentals of HVAC, gaining an understanding of Careers and Certification, safety, service calls, tools, and supplies. Students will explore HVACR career pathways, certification requirements, licensing, and professional job search strategies including resume writing and interview skills. They will identify workplace hazards, properly use personal protective equipment, and apply safe work practices including ladder safety, fall protection, and first aid. Students will develop professional customer service skills, prepare service estimates, manage contracts, and apply systematic troubleshooting methods to diagnose HVACR system issues efficiently. They will gain hands-on experience with hand tools, power tools, and precision instruments such as multimeters and manometers. Students will also learn to cut, bend, and connect refrigerant and non-refrigerant tubing and piping using industry-standard methods. The knowledge and skills gained in this course

will help them confidently enter the HVACR workforce and build a lasting, rewarding career in the industry. The safety portion of this course will help the students achieve an OSHA 30 certificate.

Pre-requisites: None

HVC002 – Refrigeration Fundamentals

This course will teach students about Introduction to Refrigerants, gaining an understanding of energy and matter, gases, basic compression refrigeration and air-conditioning systems, system components, refrigerant handling, and service equipment. They will be guided through calibrating thermometers, measuring heat and heat transfer, calculating pressures, identifying refrigeration system lines and evaporator coils, identifying refrigerants and lubricants, connecting and disconnecting a gauge manifold, and measuring system performance and superheat. The knowledge and skills gained in this course will help them to work safely and effectively with refrigerants and refrigeration systems in a professional HVACR setting. Students will be equipped to diagnose system performance, handle refrigerants in compliance with EPA standards, operate service instruments with precision, and apply thermodynamic principles to real-world systems — preparing them to advance toward EPA 608 Type I certification and build a strong, rewarding career as a skilled HVACR technician.

Pre-requisites: HVC 001

HVC003 - Electricity in HVAC

Throughout this course, students will develop an understanding of Electricity in HVAC and basic electricity, electrical power, basic electronics, electric motors, electrical control systems, electrical troubleshooting fundamentals, and servicing electric motors and controls. They will be guided through testing low-voltage transformers, wiring parallel loads, alternating current principles, checking thermistors and temperature switches, multispeed PSC motor wiring, testing relays, contactors, and transformers, and checking capacitors. The knowledge and skills gained in this course will help them to safely test, wire, and troubleshoot electrical circuits, motors, and control systems with confidence and precision. Students will be equipped to identify and resolve electrical faults efficiently, interpret wiring diagrams and schematics, and service electric motors and controls found in residential, commercial, and industrial HVACR systems — preparing them to perform complex service calls independently and build a specialized, rewarding career as a professional HVACR technician.

Pre-requisites: HVC 001

HVC004 - Domestic Refrigerators & Freezers

In this course, students will learn Domestic Refrigerators and Freezers, gaining an understanding of the overview, installation, and service of domestic refrigeration systems. They will be guided through domestic refrigeration familiarization, troubleshooting domestic refrigerators and freezers, and servicing domestic refrigerators and freezers. Students will develop a thorough understanding of how residential refrigeration systems operate, including the refrigeration cycle and key components such as compressors, condensers, evaporators, and controls. They will learn to identify common faults, apply structured diagnostic procedures, and carry out professional repairs and component replacements with confidence. The knowledge and skills gained in this course will help them to confidently install, diagnose, service, and repair a wide range of domestic refrigerators and freezers —

preparing them to respond to service calls independently, meet industry standards, and build a strong, rewarding career as a professional residential refrigeration technician.

Pre-Requisites: HVC 003

HVC005 - AC Systems

This course is going to help students to understand AC Systems, gaining an understanding of self-contained air-conditioning systems, residential split systems, humidity control, commercial air-conditioning systems and controls, and absorption and evaporative cooling systems. They will be guided through programming thermostats, troubleshooting and replacing a TXV, replacing filter-driers, sizing and installing ductless and multi-split systems, replacing air-conditioning compressors, testing and replacing single-phase contactors, calculating outdoor air and damper adjustments, adjusting belt-driven blower speed, and servicing evaporative and absorption cooling systems. The knowledge and skills gained in this course will help them to professionally install, troubleshoot, and service a full range of residential and commercial air-conditioning systems with confidence and precision — equipping them to meet employer expectations, respond to complex service calls independently, pursue advanced HVACR certifications, and build a highly skilled and rewarding career as a professional air-conditioning and HVACR systems technician.

Pre-Requisites: HVC 003

HVC006 - Indoor Air Fundamentals

In this program, students will gain hands-on experience with Indoor Air systems, gaining an understanding of air movement and measurement, air quality, air distribution, ventilation system service, and heating and cooling loads. They will be guided through measuring humidity, psychrometer and comfort levels, UV light installation, air quality maintenance, whole house humidifier installation, recovery ventilation systems, residential ductwork fabrication, making rectangular ducts, plenum boxes, starting collars, tee fittings, measuring static pressure, and heating and cooling load basics. The knowledge and skills gained in this course will help them to professionally assess, design, install, and service indoor air quality and air distribution systems across residential and commercial HVACR applications. Students will be equipped to measure and balance airflow, fabricate and install ductwork components, diagnose ventilation and air quality issues, and recommend humidity and air purification solutions — building a well-rounded, in-demand career as a professional HVACR indoor air quality technician.

Pre-Requisites: HVC 005

HVC007 - Heating Systems

In this course, students will learn Heating Systems, gaining an understanding of gas-fired heating systems, oil-fired heating systems, electric heating systems, air-source heat pumps, geothermal heat pumps, and hydronic heating fundamentals. They will be guided through gas furnace operation, heat exchangers, sizing gas piping, operating a fan relay center, taking voltage, amperage, and temperature rise readings, operating reversing valves, forcing defrost cycles, measuring heat pump performance, and installation procedures for wiring, brazing, evacuating, and charging heat pumps. The knowledge and skills gained in this course will help them to professionally install, operate, troubleshoot, and repair a full range of residential and commercial heating systems with confidence and precision. Students will be equipped to inspect heat exchangers, diagnose electrical and

mechanical faults, perform complete heat pump installations, and deliver professional-quality heating system service — building a versatile, well-rounded, and rewarding career as a professional HVACR heating systems technician.

Pre-Requisites: HVC 005

HVC008 - Energy Management & Conservation

This course introduces students to Energy Management and Conservation, gaining an understanding of solar power and thermal storage, and energy management principles. They will be guided through taking measurements to determine the best placement for a solar collector, and calculating EER for actual amp draw, actual voltage, and actual indoor blower CFM. Students will develop a thorough understanding of how solar energy systems are designed, positioned, and integrated into HVACR applications, and how energy management strategies reduce operating costs and meet building energy standards. The knowledge and skills gained in this course will help them to professionally assess, implement, and optimize energy management and solar conversion solutions across residential and commercial HVACR applications — equipping them to calculate key efficiency metrics, determine optimal solar collector placement, and contribute to the growing demand for sustainable, energy-efficient building systems as a forward-thinking and highly valued HVACR energy management professional.

Pre-Requisites: HVC 007

HVC009 - Commercial Refrigeration Systems 1: Basics

Through this course, students will build a solid foundation in Commercial Refrigeration Systems, gaining an understanding of commercial refrigeration systems, commercial compressors, evaporators, condensers, heat exchangers, metering devices and valves, and commercial refrigeration system configurations. They will be guided through the basics of operating and servicing commercial coolers and freezers, cleaning and sanitizing ice machines, adjusting water-regulating valves to control head pressure, calculating belt-drive compressor speed, cleaning condenser coils, and testing filter-driers, metering devices, and liquid line solenoids. The knowledge and skills gained in this course will help them to professionally operate, maintain, troubleshoot, and repair a full range of commercial refrigeration systems in food service, retail, and cold storage environments. They will be able to do basic jobs on servicing compressors, evaporators, and condensers, diagnose system faults efficiently, and build a specialized, highly valued career as a professional commercial refrigeration systems technician.

Pre-Requisites: HVC 008

HVC010 - Commercial Refrigeration Systems 2: Installation

In this course, students will learn how to install Commercial Refrigeration Systems, gaining an understanding of commercial refrigeration system installation, troubleshooting commercial systems through system and component diagnosis, and servicing commercial systems. They will be guided through replacing a TXV on an air-conditioning system, installing a sight glass, maintaining and cleaning an ice machine, testing the efficiency of a water-cooled condenser, and testing hot-gas and electric defrost systems. The knowledge and skills gained in this course will help them to professionally install, diagnose, troubleshoot, and service a full range of commercial refrigeration systems and components in food service, retail, and cold storage environments — equipping them to perform advanced system and component-level diagnostics, replace critical refrigeration components, maintain ice machines to food safety standards, and build a distinguished, specialized career as a professional commercial refrigeration installation and service technician.

Pre-Requisites: HVC 009

HVC011 - Commercial Refrigeration Systems 3: Design

In this training course, students will dive deeper in the Commercial Refrigeration Systems, and start learning on the design, gaining an understanding of heat loads and system thermodynamics, and commercial refrigeration component selection. They will be guided through finding the area and volume of different objects, piping design, and removing and replacing a liquid receiver. Students will develop a thorough understanding of thermodynamic principles governing commercial refrigeration system design, including how heat loads are calculated and applied to determine correct equipment sizing, and how to select the right compressors, evaporators, condensers, and metering devices for any given application. The knowledge and skills gained in this course will help them to professionally design, select components for, and install commercial refrigeration systems that are precisely sized, thermodynamically optimized, and built to perform reliably — equipping them to apply heat load analysis, design efficient piping systems, and build a distinguished career as a professional commercial refrigeration systems designer and technician.

Pre-Requisites: HVC 010

HVC012 - Job Application Skills

This course is specifically designed to guide students through the job application processes. Grounded in real-world expectations and industry-aligned practices, this course equips students with the tools, strategies, and confidence needed to successfully enter and thrive in today's competitive job market. Students will build and refine professional resumes, develop effective job search strategies, and participate in mock interviews. Through structured practice, discussion, and hands-on exercises, students will gain a deep understanding of professional communication standards, enabling them to interact with confidence and clarity alongside co-workers, supervisors, and clients in any workplace environment.

Pre-Requisites: HVC 011

HVC013 - Externship

Students will acquire working skills on the job as a component of their education and hands-on training at PTTI. Emphasis will be placed on applying skills learned, working well with other employees, teamwork, and helping companies become more productive, higher quality and increased quality standards of work.

Pre-Requisites: HVC 012