HVAC Career Ladder, Curriculum and Job Descriptions

The Pathways Out of Poverty model combines traditional synchronous classroom training with online asynchronous self-paced training, together with practical hands-on training that is accomplished through community colleges’ vocational training centers as well as through on-the-job training with local employers. The following curricula were designed by HVACRedu.net to allow students to gain the knowledge and skills necessary to pass the Heating, Ventilation and Air Conditioning (HVAC) Excellence and/or NATE (North American Technician Excellence) exams that cover the service core. Passing either of these service core exams is a prerequisite for any of the nine specialities that follow.

Individuals may choose to advance in any of the nine specialities depending upon their employers’ needs and local market demand. All nine specialities are supported by curricula offered by HVACedu.net in conjunction with a local partner at the participating community college. For the Pathways initiative, the Air to Air Heat Pump Speciality is emphasized, because of its general application across a broad spectrum of HVAC applications nationwide, and because, most often, the best way to obtain energy efficiency is through improvements made in the operation of the heat pump and air distribution.

The highest level in the enclosed career ladder is the HVAC Efficiency Analyst. As a prerequisite to site for the HVAC Efficiency Analyst exam, the candidate must hold two certifications by NATE. The Pathways project team recommends the Heat Pump Plus Air Distribution, as this most closely fits with the Pathways targeted clients.

Career Ladder

Curriculum

HVACR Service Core Program

Job Descriptions

HVAC Helper
HVAC Installer
HVAC Start-Up Technician
HVAC Service Technician
HVAC Advanced Service Technician

This workforce solution was funded by a grant award by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the DOL. The DOL makes no guarantees, warranties, or assurance of any kind, express or implied, with respect to such information, including any information on linked sites and included in, but not limited to, accuracy of the information or its completeness, timeliness, useful need, adequacy, continued availability or ownership. This solution is copyrighted by the institution that created it. Internal use, by an organization and/or personal use by an individual for non-commercial purposes, is permissible. All other uses require the prior authorization of the copyright owner.
HVAC Career Ladder

1. **Job Readiness Skills / Soft Skills**
2. **Job or Co-operative Work Experience**
3. **HVAC Helper**
4. **Service Core Program (160 credit hours)**
5. **Drug Testing**

- **HVAC Installer**
  - **NATE Service Core Exam**
  - **Lead Installer**
    - **NATE Energy Analyst Training (or similar)**
    - **HVAC Advanced Technician**
  - **Speciality Courses**
    - **HVAC Technician**
      - **HVAC Excellence Master Specialist**
  - **HVAC Excellence Work Ready Exam**

- **HVAC Technician**
  - **Speciality Courses**
  - **HVAC Excellence Master Specialist**

**Pathways**
The HVAC Service Core program is a comprehensive online HVACR education program encompassing heating, ventilation, air conditioning and refrigeration. It is specially structured to prepare technicians to successfully pass the initial NATE Core Service Exam and to enrich the skills of installers and technicians who are:

- Just beginning in the HVACR industry,
- Continuing education for upgrading knowledge and skills, or
- Preparing for certifications or licenses (NATE or ICE).

The content presented in each course focuses on learning objectives that have been identified by HVAC/R industry groups (ARI, NATE, RSES, ACCA and PAHRA) as key knowledge for an HVAC/R technician. This program is offered online and consists of one math review and eight courses in a specific educational sequence for the HVAC Service Core Certificate. Upon successful completion of each course (a score of 75 percent or higher), students are registered into the next course and receive a certificate of completion for the completed course. After successful completion of the math review and all eight courses, students receive a Certificate of Completion for the Service Core Program.

Curriculum included in this packet of materials:

- HVACR Service Core Program
  - Applied Math Review
  - Fundamentals
  - Safety
  - Electrical DC Theory Plus
  - Electrical AC Theory Plus
  - Electrical Common Components
  - Electrical Motors
  - Systems Properties & Measurement
  - Refrigeration I
HVACR Service Core Program

**Name of the Educational Institution:** The online portion of the training is provided by HVACRedu.net and the face-to-face training portion varies based on location, but is usually provided by a community college.

**Prerequisites:** No background experience or education required to begin series. A GED is preferred. Each module is a prerequisite for the next module in the series.

**Contact Information:**
HVACRedu.net  
P.O. Box 77  
Heron, MT 59844  
www.hvacredu.net  
Email: info@hvacredu.net

**Description:** The nine step curriculum consists of nine courses; each course consists of a number of modules, which are outlined below.

**Length:** Courses vary in length according to the number of modules; each module is three hours in length. The entire program consists of 160 hours of instruction.

**Trainer Information:** The in-person trainer supplied by HVACRedu.net or provided by the local community college has a BPI, NATE or HVAC Excellence certification.

**Components of Training:** Online portion provided by HVACRedu.net and in-person component provided by the local community college.

**Cost of the Training:** The total cost for the training is $1,742.00, which may be shared by the employer in certain circumstances.
Applied Math Review

Length of Training: 16 hours

Components of Training: A course designed to refresh and exercise common math concepts as applied to the HVACR workplace. This course provides demonstrations and exercises for the four basic math functions (addition, subtraction, multiplications and division). Each of the four functions is exercised using HVACR workplace applications. Each of the four math functions are applied to:

- Whole numbers
- Fractions
- Decimals

HVACR Fundamentals

Length of Training: 18 hours

Components of Training: This online course is designed to explore the common aspects of HVACR technology. Discussion will focus on such topics as heat transfer methods, basic terminology and definitions, as applied physics for HVACR systems. Six three-hour modules cover:

- Introduction to the industry
- HVACR measurements
- Heat energy
- Pressure
- Gas works
- Air works

HVACR Safety

Length of Training: 18 hours

Components of Training: This online course covers the basic safety considerations of the HVACR workplace. Six three-hour modules cover:

- Hazard communication (labels and MSDS)
- Personal protective equipment (PPE)
- Personal safety in confined space and on ladders
- Fire extinguishers and compressed gas safety
- Electrical lockout / tagout
- Back safety, scaffolds/lifts and fall protection
HVACR Electrical DC Theory Plus

**Length of Training:** 18 hours

**Components of Training:** Basic electrical theory, such as Ohms Law, circuit schematic symbols, and circuit characteristics, will be discussed as it specifically applies to DC & AC circuits in the HVACR industry. Six three-hour modules cover:

- Introduction to the industry
- What is energy?
- Atomic theory
- Basic circuits
- Parallel circuits
- Power

HVACR Electrical AC Theory Plus

**Length of Training:** 18 hours

**Components of Training:** Basic electrical theory, such as Ohms Law, circuit schematic symbols, and circuit characteristics, will be discussed as it specifically applies to DC & AC circuits in the HVACR industry. Six three-hour modules cover:

- Magnetism
- Alternating current
- Loads
- Capacitors
- Resistance
- Transformers

HVACR Electrical Common Components

**Length of Training:** 18 hours

**Components of Training:** This course covers common control components found in HVACR systems. Six three-hour modules cover:

- Control methods, temperature and pressure
- Residential heat / cool thermostats at low voltage
- Relays
- Contractors
- Power wiring
- Electrical drawings
HVACR Electrical Motors

Length of Training: 18 hours

Components of Training: This course is dedicated to the common single-phase and small three-phase electric motors. Six three-hour modules cover:
- Basic electric motor theory
- Open and hermetic motors
- Capacitor motors
- Three-phase motors
- The application of electric motors
- Diagnosing and replacing electric motors

HVACR Systems Air Properties and Measurements

Length of Training: 18 hours

Components of Training: This course is the introduction to HVAC comfort systems. Six three-hour modules cover:
- Heat energy and comfort
- Properties of air
- Psychrometrics
- Total heat in air
- Measuring a heavy invisible moving volume
- “Moving and Grooving” with air

HVACR Refrigeration

Length of Training: 18 hours

Components of Training: This course will serve as an introduction to the mechanical compression refrigeration cycle and the necessary components. Six three-hour modules cover:
- Basic refrigeration cycle physics
- Condensation and condensers
- Expansion and metering devices
- Evaporation and evaporators
- Compression and compressors
- Measuring the normal cycle
Job Descriptions

There is no one national industry-wide standard set of position titles or job descriptions for a career in HVAC. There are three generally recognized categories of business in the HVAC arena: installation, maintenance and service. Installation of a new system only happens when new construction is taking place or when old systems need to be replaced. In the current economy, when new home construction is at a low and home-owners and business people are trying to forestall making major investments in new equipment, it is the maintenance and service (or repair) sectors that are enjoying a positive job opening and growth outlook.

Each state has its own rules governing licensure and unions. Therefore, the following schema was developed to demonstrate our recommended progression from Helper to Advanced HVAC Technician.

Job descriptions included in this packet of materials:
- HVAC Helper
- HVAC Installer
- HVAC Start-Up Technician
- HVAC Service Technician
- HVAC Advanced Service Technician
**HVAC Helper**

**Job Description:** HVAC Helper is an entry level position and requires the performance of a variety of basic tasks associated with assisting an HVAC Installer or Service Technician. Duties may include carrying tools, materials and HVAC equipment from the company truck to the job site; removing discarded materials and equipment from the job site back to the company truck; and generally assisting the more experienced worker(s) on a crew.

**Range of Wages:** Nationwide wages for an HVAC Helper average $9.00 per hour, but can rise within months, if the worker is dependable and shows signs that he/she is able and willing to learn.

**Qualifications:** Formal education is not required to become a HVAC Helper, however a basic understanding of math, reading, writing and clear diction is required. These skills can be gained through soft skill or job readiness training.

**Certification:** There are no required certifications to become an HVAC Helper.

**Experience:** An HVAC Helper is an entry level position and therefore no experience is necessary. However, if a worker does not possess prior work experience, further on-the-job training may be required.

**Employer Type:** HVAC employers tend to be small, private businesses.

**Advancement Options:** An HVAC Helper can advance to an HVAC Installer, maintenance worker, or repairman within months of being hired, if the employee is responsible, able to learn and possesses a positive attitude.

**Additional Comments:** HVAC Helpers should be responsible, reliable, hard working and mature. They may be required to work some weekends and nights, as well has have reliable transportation and a good driving record.

**Drug Testing:** Drug screening may be required.
HVAC Installer

**Job Description**: An HVAC Installer will be responsible for the installation of HVAC units, including electronic and mechanical components; installation of HVAC ductwork, including flexible tubing and sheet metal construction; installation or repair of fuel and water lines; conservation, installation and recycling of CFC or HCFC refrigerants; installation or repair of electrical connections to HVAC components; and installation or repair of HVAC system automation components for businesses or smart homes.

**Range of Wages**: Nationwide wages for an HVAC Installer average $13.71 - $19.95 per hour. Hourly or commission based pay may be available and would be based on experience.

**Qualifications**: Individuals must have a valid driver’s license, have received no recent driving under the influence violations and have no felonies to work in many states. Individuals should also make a professional impression and be able to communicate effectively with homeowners.

**Certification**: HVAC Installers must have passed the U.S. Environmental Protection Agency 608 certification exam, if they handle refrigerants. Certification is not required; however HVAC Installers are encouraged to take training courses in the NATE or HVAC Excellence Service Core Program.

**Experience**: An HVAC Installer must have at least one year of experience as an HVAC Helper.

**Employer Type**: HVAC employers tend to be small, private businesses.

**Advancement Options**: An HVAC Installer can advance to HVAC Start-Up Technician or Installation Leader, upon earning service core certifications.

**Additional Comments**: Applicant may be required to pass a criminal background check.

**Drug Testing**: Drug screening may be required.
HVAC Start-Up Technician

**Job Description**: An HVAC Start-Up Technician’s responsibilities include, but are not limited to, installation and start-up of HVAC equipment, limited troubleshooting, basic residential controls, commissioning, quality control and equipment warranty.

**Range of Wages**: Nationwide wages for an HVAC Start-Up Technician are about $22.12 per hour.

**Qualifications**: Individuals must have technical knowledge of HVAC systems and installation, the ability to read and understand mechanical drawings, a valid drier’s license, good communication skills, attention to detail, strong work ethic, problem solving skills and excellent customer service skills. Additionally, a high school diploma or GED is often required, as well as an acceptable driving record, and the ability to work overtime and weekends.

**Certification**: HVAC Start-Up Technicians must have passed the U.S. Environmental Protection Agency 608 certification exam, if they handle refrigerants. He or she should also have passed at least one NATE or HVAC Excellence service core exam.

**Experience**: An HVAC Start-Up Technician must have at least three years of HVAC experience, with one year of troubleshooting experience preferred.

**Employer Type**: HVAC employers tend to be small, private businesses.

**Advancement Options**: An HVAC Start-Up Technician can choose any of at least nine different specialities, depending upon marketplace demands. The most universal speciality is the “Air-to-Air Heat Pump” Service Technician.

**Additional Comments**: Individuals may be required to pass a criminal background check.

**Drug Testing**: Drug screening may be required.
HVAC Service Technician

Job Description: An HVAC Service Technician must be able to accomplish the same tasks as an Installer, as well as independently power up and adjust control settings to cycle through all designed-for sequences. A Service Technician must be able to acquire, evaluate, and interpret such readings as may be necessary to determine the adequacy and acceptability of system operation to meet customer specifications. Additionally, a Service Technician must be able to perform sufficient field diagnostic procedures to determine causes of inadequate performance and identify corrective actions as necessary.

Range of Wages: Nationwide wages for an HVAC Service Technician is $15.32 - $23.63 per hour. With bonuses, commissions and profit sharing, the total annual pay can range from $34,154 - $54,797 per year.

Qualifications: An HVAC Service Technician must have a valid driver’s license (with no driving under the influence or driving while intoxicated violations) and have access to their own tools. He or she must also have technical knowledge of HVAC systems and installation, the ability to read and understand mechanical drawings, good communication skills, attention to detail, strong work ethic, problem solving skills and excellent customer service skills. A high school diploma or GED is required, as well as an acceptable driving record, and the ability to work overtime and weekends.

Certification: HVAC Service Technicians must have passed the U.S. Environmental Protection Agency 608 certification exam, if they handle refrigerants. They also have typically passed at least one NATE or HVAC Excellence service core exams and one specialty exam.

Experience: An HVAC Service Technician typically must have at least five years of HVAC experience, with one year of troubleshooting experience preferred. A Technician must also have the following skills: ability offer up-sell to customers to improve HVAC systems; ability to advise customers of potential issues and suggest upgrades to improve efficiency and indoor air quality products; and experience with both gas and electric products from various manufacturers.

Employer Type: HVAC employers tend to be small, private businesses.

Advancement Options: An HVAC Service Technician may graduate to an Advanced Service Technician with appropriate experience.

Additional Comments: Individuals must pass a criminal background check in some states. Professional dress and appearance are often required.

Drug Testing: Drug screening may be required.
HVAC Advanced Service Technician

**Job Description:** An HVAC Advanced Service Technician must be able to accomplish the same tasks as an HVAC Service Technician, as well as understand load calculations, equipment selection, air distribution, hydronic distribution, system performance, indoor air-environment quality, and thoroughly understand HVAC maintenance.

**Range of Wages:** Nationwide wages for an HVAC Advanced Service Technician is $16.36 - $54.91 per hour. With bonuses, commissions and profit sharing, the total annual pay can range from $34,000 - $114,200 per year.

**Qualifications:** An HVAC Advanced Service Technician must have a valid driver’s license (with no driving under the influence or driving while intoxicated violations) and have access to their own tools. Additional qualifications include: must have technical knowledge of HVAC systems and installation, the ability to read and understand mechanical drawings, have good communication skills, attention to detail, strong work ethic, problem solving skills and excellent customer service skills. A high school diploma or GED is required, as well as an acceptable driving record, and the ability to work overtime and weekends.

**Certification:** HVAC Advanced Service Technicians must have passed the U.S. Environmental Protection Agency 608 certification exam, if he or she handles refrigerants. Additionally, Advanced Service Technicians should have at least two specialty certifications from NATE or HVAC Excellence. It may also be helpful for an Advanced Service Technician to hold a Certified Plant Engineer from the Association of Facility Engineers, a Certified Energy Manager from Energy Engineers or a Home Energy Auditing certification.

**Experience:** An HVAC Advanced Service Technician must have at least five years of HVAC experience, with several years of troubleshooting experience preferred. He or she should also have experience in the mechanical or electrical trades, or experience in construction or energy-related fields.

**Employer Type:** HVAC employers tend to be small, private businesses.

**Advancement Options:** An HVAC Advanced Service Technician graduate to a Senior Service Technician with appropriate experience. He or she may also become an entrepreneur or branch into the growing and lucrative field of energy auditing.

**Additional Comments:** Individuals must pass a criminal background check in some states.

**Drug Testing:** Drug screening may be required.