



HVAC Mechanics/Installers

Cluster Overview: Planning, managing, and providing scientific research and professional and technical services including laboratory and testing services, and research and development services.

Career Goal (O*NET Code): (NA) - Heating, air conditioning, and refrigeration mechanics and installers—often referred to as HVACR technicians—work on heating, ventilation, cooling, and refrigeration systems that control the air quality in many types of buildings.

Student Name: _____
Grade: _____
School: _____

SUGGESTED COURSEWORK

EXTENDED LEARNING EXPERIENCES

Middle School	8th	HS Courses:	(Local districts may list high school credit courses here)		Curricular Experiences***: BEST Robotics, Inc. FIRST Robotics Competition Project Lead the Way Skills USA Technology Student Association The Infinity Project	Extracurricular Experiences: Destination ImagiNation International Bridge Building Contest Marine Advanced Technology Education Center National Engineering Design Competition UIL Academic Competitions VEX Robotics Competition
	High School	9th	Courses*:	English I Algebra I or Geometry Biology		
Career-Related Electives:			Concepts of Engineering & Technology			
	10th	Courses:	English II Geometry or Algebra II Chemistry	World History Foreign Language II Elective		Service Learning Experiences: Campus Service Organizations Community Service Volunteer Peer Mentoring/Peer Tutoring
		Career-Related Electives:	Engineering Design & Presentation			
	11th	Core Courses:	English III Algebra II or Pre-Calculus Physics	United States History Foreign Language III ** Professional Communications or Speech		
		Career-Related Electives:	Advanced Engineering Design & Presentation			
	12th	Core Courses:	English IV Pre-Calculus or Calculus 4th Science	Government/Economics Elective Elective	COLLEGE CREDIT OPPORTUNITIES -- High School Students should take Advanced Placement (AP), International Baccalaureate (IB), dual credit, Advanced Technical Credit (ATC), or locally articulated courses (Tech Prep), if possible. List those courses that count for college credit on your campus.	
		Career-Related Electives:	Practicum in STEM			
How to Become Heating, Air Conditioning, and Refrigeration Mechanic and Installer Because HVACR systems are increasingly complex, employers generally prefer applicants with postsecondary education or those who have completed a formal apprenticeship. Some states and localities require technicians to be licensed.					Carrer Options (Sample of reported job titles)	Professional Associations: <ul style="list-style-type: none"> • Air Conditioning Contractors of America • Air-Conditioning, Heating, and Refrigeration Institute • Associated Builders and Contractors • Carbon Monoxide Safety Association • Green Mechanical Council • Home Builders Institute • HVAC Excellence • Mechanical Contractors Association of America • National Center for Construction Education and Research • National Occupational Competency Testing Institute • North American Technician Excellence • Plumbing-Heating-Cooling Contractors Association • Radiant Panel Association • Refrigeration Service Engineers Society • Sheet Metal and Air Conditioning Contractors' National United Association
Postsecondary		Texas Southmost College South Texas College Texas State Technical College			<ul style="list-style-type: none"> • Service Technician • HVAC Technician • HVAC Installer • HVAC Specialist • Refrigeration Operator • Transportation Refrigeration Technician • HVAC Mechanic • AC Technician • HVAC /R Technician • HVAC /R Service Technician • Ammonia Refrigeration Technician • Refrigeration Mechanic • Refrigeration Technician 	
		Geothermal Heating and Cooling (CERT) Heating, Ventilation, Air Conditioning & Refrigeration Technology (CERT) Air Conditioning & Refrigeration – Refrigeration Mechanic (CERT) Renewable Energy Technologies (AAS) Heating, Ventilation, Air Conditioning & Refrigeration Technology (AAS) Air Conditioning & Refrigeration (AAS)				
		The University of Texas at Brownsville The University of Texas - Pan American				

* Students must meet local & state high school graduation requirements. ** Required course for the Distinguished Graduation Plan (in addition to other measures).
 *** Based on campus availability. Students may select other elective courses for personal enrichment purposes.

This plan of study serves as a guide, along with other career planning materials, for pursuing a career path and is based on the most recent information as of 2009. All plans meet high school graduation requirements as well as college entrance requirements.



HVAC Mechanics/Installers

TEA Industry Cluster	STEM
SOC Code	-
Identified by	Tech Prep Occupations
Projected Growth (2018)	23 %
BISD Magnet School Available	No

Source: Demand Occupations by Cluster, updated June 27, 2012

Description

What Heating, Air Conditioning, and Refrigeration Mechanics and Installers Do

Heating, air conditioning, and refrigeration mechanics and installers—often referred to as *HVACR technicians*—work on heating, ventilation, cooling, and refrigeration systems that control the air quality in many types of buildings.

Duties

Heating, air conditioning, and refrigeration mechanics and installers typically do the following:

- Travel to worksites
- Follow blueprints or other design specifications to install or repair HVACR systems
- Connect systems to fuel and water supply lines, air ducts, and other components
- Install electrical wiring and controls and test for proper operation
- Inspect and maintain customers' HVACR systems
- Test individual components to determine necessary repairs
- Repair or replace worn or defective parts

Heating and air conditioning systems control the temperature, humidity, and overall air quality in homes, businesses, and other buildings. By providing a climate controlled environment, refrigeration systems make it possible to store and transport food, medicine, and other perishable items.

Although trained to do all three, HVACR technicians sometimes work strictly with heating, air conditioning, or refrigeration systems. They also may specialize in certain types of HVACR equipment, such as water-based heating systems, solar panels, or commercial refrigeration.

Depending on the task, HVACR technicians use many different tools. For example, they often use screwdrivers, wrenches, pipe cutters and other basic handtools when installing systems. To test or install complex system components, technicians may use more sophisticated tools, such as carbon monoxide testers, voltmeters, combustion analyzers, and acetylene torches.

When working on air conditioning and refrigeration systems, technicians must follow government regulations regarding the conservation, recovery, and recycling of refrigerants. This often entails proper handling and disposal of fluids.

Some HVACR technicians sell service contracts to their clients, providing regular maintenance of heating and cooling systems.

Other craft workers sometimes help install or repair cooling and heating systems. For example, on a large air conditioning installation job, especially one in which workers are covered by union contracts, ductwork might be done by sheet metal workers and duct installers, or electrical work by electricians. In addition, home appliance repairers usually service window air conditioners and household refrigerators. For more information on these occupations, see the profiles on [sheet metal workers](#), [electricians](#), or [home appliance repairers](#).

Training Opportunities Linked to Those Jobs

(Degree Types and Colleges/Universities)

How to Become a Heating, Air Conditioning, and Refrigeration Mechanic and Installer

Because HVACR systems are increasingly complex, employers generally prefer applicants with postsecondary education or those who have completed a formal apprenticeship. Some states and localities require technicians to be licensed.

Education

A growing number of HVACR technicians receive postsecondary instruction from technical and trade schools or community colleges that offer programs in heating, air conditioning, and refrigeration. These programs generally last 6 months to 2 years and lead to a certificate; or in some cases, an associate's degree.

High school students interested in becoming HVACR technicians should take courses in shop, math, and physics. Some knowledge of plumbing or electrical work and a basic understanding of electronics can be helpful.

Training and Certification

Some HVACR technicians learn their trade on the job, although this is becoming much less common. Informally trained technicians usually begin by assisting experienced technicians with basic tasks, such as insulating refrigerant lines or cleaning furnaces. In time, they move on to more difficult tasks, including cutting and soldering pipes or checking electrical circuits.

Some technicians receive their training through a formal apprenticeship. Applicants for apprenticeships must have a high school diploma or general equivalency degree (GED). Math and reading skills are essential.

Apprenticeship programs normally last 3 to 5 years, and combine paid on-the-job training with technical instruction. Over the course of the apprenticeship, technicians become familiar with subjects such as safety practices, blueprint reading, and how to use tools.

Apprenticeship programs frequently are run by joint committees representing local chapters of various organizations, including

- Air Conditioning Contractors of America
- Mechanical Contractors Association of America
- Plumbing-Heating-Cooling Contractors Association
- Sheet Metal Workers' International Association
- Plumbing and Pipefitting Industry of the United States and Canada
- Associated Builders and Contractors
- National Association of Home Builders

Whether having learned the occupation through postsecondary education or through other means, HVACR technicians may take several different tests that measure their skills. These tests require different levels of experience. Technicians with relevant coursework and less than 2 years of experience may take the "entry-level" certification exams. These

exams test basic competency in residential heating and cooling, light commercial heating and cooling, and commercial refrigeration. Technicians can take the exams at technical and trade schools.

HVACR technicians who have at least 1 year of installation experience and 2 years of maintenance and repair experience can take a number of specialized exams. These exams certify their competency in working with specific types of equipment, such as oil-burning furnaces or compressed-refrigerant cooling systems. Many organizations offer certifying exams. For example, the [Air-Conditioning, Heating, and Refrigeration Institute](#) offers the Industry Competency Exam. [HVAC Excellence](#) offers a Secondary Employment Ready Exam, a Secondary Heat exam, and a Heat Plus exam. The [National Occupational Competency Testing Institute](#) offers a secondary exam. The [Refrigeration Service Engineers Society](#) offers two levels of certification.

Certifications can be helpful because they show that the technician has specific competencies. Some employers actively seek out industry-certified HVACR technicians.

Licenses

Some states and localities require HVACR technicians to be licensed. Although specific licensure requirements vary, all candidates must pass an exam.

In addition, the U.S. Environmental Protection Agency (EPA) requires all technicians who buy or work with refrigerants to be certified in proper refrigerant handling. To become certified, technicians must pass a written exam specific to 1 of 3 specializations: Type I—servicing small appliances; Type II—high-pressure refrigerants; Type III—low-pressure refrigerants.

Many trade schools, unions, and employer associations offer training programs designed for the EPA exam.

Important Qualities

Customer-service skills. Technicians often work in customers’ homes or business offices, so it is crucial that they be friendly, polite, and punctual. HVACR repair technicians must sometimes deal with unhappy customers whose heating or air condition is not working.

Detail oriented. Technicians must be able to find problems and make precise repairs or adjustments. They must pay attention to details when installing or repairing equipment to make sure it works properly.

Dexterity. Technicians use many handtools and must have good hand-eye coordination to avoid injury.

Mechanical skills. HVACR technicians install and work on complicated climate-control systems. Workers must understand the components and be able to properly assemble and disassemble them.

Physical strength. Workers may have to lift and support heavy equipment and components, often without help.

Time-management skills. HVACR technicians often have a set number of daily maintenance calls. They should be able to keep a schedule and complete all necessary repairs or tasks.

Troubleshooting skills. Heating, air conditioning, and refrigeration systems involve many intricate parts. To repair malfunctioning systems, technicians must be able to identify problems, often with sophisticated diagnostic equipment.

Texas Southmost College	South Texas College	Texas State Technical College	The University of Texas at Brownsville	The University of Texas - Pan American
Geothermal Heating and Cooling (CERT)	Heating, Ventilation, Air Conditioning & Refrigeration Technology (CERT)	Air Conditioning & Refrigeration – Refrigeration Mechanic (CERT)		
Renewable Energy Technologies (AAS)	Heating, Ventilation, Air Conditioning & Refrigeration Technology (AAS)	Air Conditioning & Refrigeration Technology (AAS)		

Local Employers

A & B Electric & Plumbing	Brownsville	Los Cuates Middle School	Los Fresnos
Aiken Elementary School	Brownsville	Metro Cable Svc Inc	Harlingen
Central Plumbing & Electric CO	Harlingen	Pizana Plumbing CO	Brownsville
Guadalupe Educational Ctr	Brownsville	Serv-All Sales & Svc	Brownsville
Innovative Electrical Tech	Harlingen	Toromont Energy Systems	Brownsville

Career Options

(Specific Job Types)

- Service Technician
- Heating, Ventilation, Air Conditioning Service Technician (HVAC Technician)
- Heating, Ventilation, Air Conditioning Service Installer (HVAC Installer)
- Heating, Ventilation, Air Conditioning Service Specialist (HVAC Specialist)
- Heating, Ventilation, Air Conditioning Service Mechanic (HVAC Mechanic)
- Air Conditioning Technician (AC Tech)
- Mechanic
- Refrigeration Mechanic
- Refrigeration Technician
- Service Technician
- Heating, Ventilation, Air Conditioning Service / Refrigeration Technician (HVAC /R Technician)
- Heating, Ventilation, Air Conditioning Service / Refrigeration Service Technician (HVAC /R Service Technician)
- Refrigeration Operator
- Transportation Refrigeration Technician
- Ammonia Refrigeration Technician

Salary Ranges

Wages for Heating, Air Conditioning, and Refrigeration Mechanics and Installers

Location	Pay Period	2011				
		10%	25%	Median	75%	90%
United States	Hourly	\$12.89	\$16.25	\$20.86	\$26.98	\$33.10
	Yearly	\$26,800	\$33,800	\$43,400	\$56,100	\$68,800
Texas	Hourly	\$11.53	\$14.73	\$18.73	\$23.02	\$27.85
	Yearly	\$24,000	\$30,600	\$39,000	\$47,900	\$57,900
Brownsville-Harlingen, TX MSA	Hourly	\$8.97	\$10.70	\$12.74	\$14.67	\$18.03
	Yearly	\$18,700	\$22,300	\$26,500	\$30,500	\$37,500
McAllen-Edinburg-Mission, TX MSA	Hourly	\$9.12	\$11.87	\$13.73	\$16.42	\$19.83
	Yearly	\$19,000	\$24,700	\$28,600	\$34,200	\$41,200

Professional Associations linked to the Careers

For details about apprenticeships or other work opportunities, contact the offices of the state employment service, the state apprenticeship agency, local contractors, or local union-management HVACR apprenticeship committees. Apprenticeship information is available from the U.S. Department of Labor toll free help line: 1 (877) 872-5627, or visit: http://www.doleta.gov/OA/eta_default.cfm.

For information about career opportunities, training, and certification, visit

[Air Conditioning Contractors of America](#)

[Air-Conditioning, Heating, and Refrigeration Institute](#)

[Associated Builders and Contractors](#)

[Carbon Monoxide Safety Association](#)

[Green Mechanical Council](#)

[Home Builders Institute](#)

[HVAC Excellence](#)

[Mechanical Contractors Association of America](#)

[National Center for Construction Education and Research](#)

[National Occupational Competency Testing Institute](#)

[North American Technician Excellence](#)

[Plumbing-Heating-Cooling Contractors Association](#)

[Radiant Panel Association](#)

[Refrigeration Service Engineers Society](#)

[Sheet Metal and Air Conditioning Contractors' National Association](#)

[United Association](#)

Sources

The information provided in this document was collected from the following sources:

- Occupational Outlook Handbook (<http://www.bls.gov/ooh/>)
- O*NET OnLine (<http://www.onetonline.org/>)
- Texas CARES (<http://www.texascaresonline.com/>)
- CareerOneStop (<http://www.careeronestop.org/>)