

HVACR 101



What is HVACR?

Module 1 of 10

LEARNING OBJECTIVES

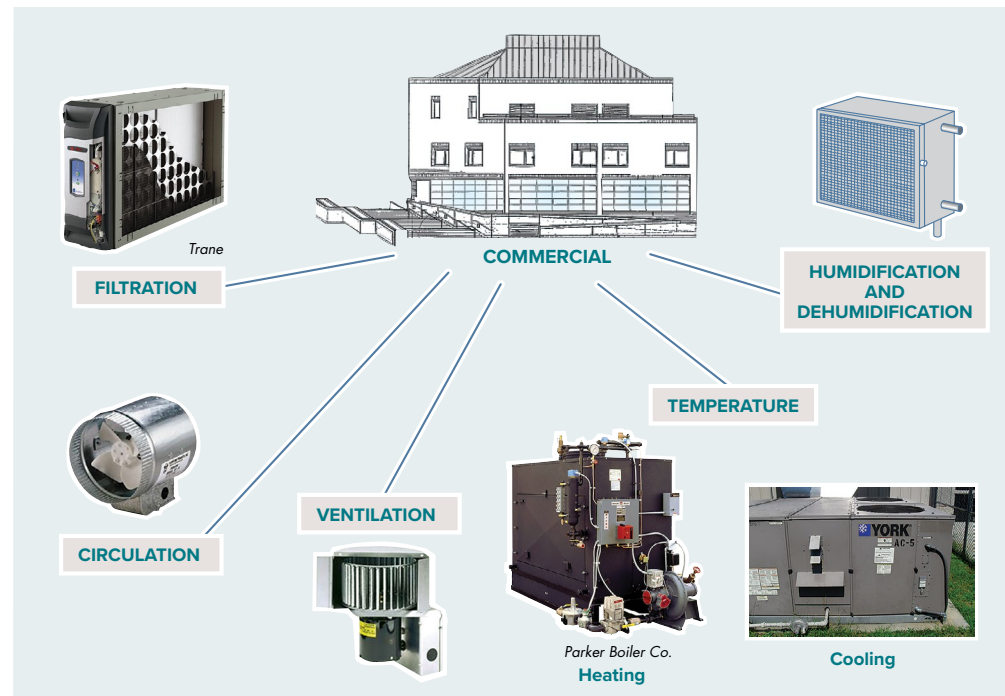
At the end of this module, you will be able to:

1. Explain the acronym HVACR.
2. Identify five (5) goals a of a HVACR system.
3. Explain the difference between natural ventilation and forced ventilation.
4. List the three (3) primary methods of heating a room or facility.
5. Determine the four (4) functions of an air conditioning system.
6. Explain the goal of refrigeration systems.
7. Describe the types of buildings and facilities where technicians work.
8. List four (4) types of services provided by HVACR companies.
9. Explain the type and amount of training required for a journeyman.
10. Identify the typical members of the mechanical service team.
11. Identify options and resources for additional training.



INTRODUCTION

Welcome to the world of Mechanical Service which specializes in the areas of Heating, Ventilation, Air Conditioning, and Refrigeration (HVACR). Your decision to pursue a career in this industry is one which will provide exciting growth opportunities, stimulating challenges, and a great deal of job satisfaction as you strive to meet the day-to-day service needs of your company's customers. While this work may be demanding – and even stressful at times – you are likely to find it a highly gratifying occupation where your contributions will have an immediate and positive impact on your career and company operations.



The ten (10) HVACR 101 modules produced by the **Mechanical Service Contractors of America (MSCA)** provide a thorough overview of what is involved in running a HVACR mechanical service business. The modules review all aspects of operations, including kinds of services provided, types of systems and equipment involved, different ways services are provided to customers, who is responsible for the various service functions, and what resources are available to you in doing your job. They are designed so you will be able to attain this knowledge from the comfort of your desk or home. Rest assured, the technology, mysterious acronyms, and other confusing aspects of the mechanical service business will quickly start to make sense. Soon you will develop a greater understanding of the inner workings of the business through the module series, allowing you to become more confident and effective in your job.

WHAT MECHANICAL SERVICE COMPANIES DO

What is the first thing that comes to mind when you hear the words “mechanical service?” To those outside the HVACR mechanical service industry, the words are probably most often associated with automobiles and individuals who work on them. However, the only similarity between automobile mechanics and technicians employed in HVACR mechanical service companies is that they maintain and repair things. HVACR mechanical service is a much broader field which primarily focuses on indoor environment comfort.

The mission of a mechanical service company is very simple: to control the environment inside a building to ensure the comfort and safety of its occupants. While it is not generally feasible to control the outside environment—Mother Nature takes care of that—mechanical service companies have the ability to control the environment inside a building, making it possible for occupants to conduct day-to-day activities effectively, and for certain systems or processes to continue to operate properly. Most of us take “indoor air” for granted. As long as we are comfortable, little thought is given to the equipment that allows us to function without discomfort.

But what does comfort really mean to most people, and why is it so important to accurately control the indoor environment to assure comfort and safety? Studies conducted by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)—the technical society for the HVACR industry—have determined that on average, people working in an indoor environment are most comfortable when the temperature stays within the range of 72 to 77 degrees Fahrenheit, depending on the season. If the temperature is even a few degrees hotter or colder than the allowable range, discomfort rises quickly and occupant job effectiveness and other activities can be dramatically reduced.

In addition to temperature, ASHRAE studies have found that indoor humidity and airflow around people must be controlled within a similarly narrow range to be considered comfortable for most individuals. If humidity becomes a little too high, or airflow (circulation) is low allowing “stale air” or annoying odors to exist, discomfort rises, which reduces the effectiveness of occupant job performance and other activities. Mechanical service contractors are also aware of the importance of ensuring safe work environments which can include potential indoor air quality issues.

It is the goal of mechanical service companies to make sure that temperature, humidity and ventilation are always maintained in the narrow ranges satisfactory to their customers.

! IMPORTANT
The mission of a mechanical service company is to control the environment inside a building to ensure comfort of its occupants.

! IMPORTANT
MSCA provides member contractors with management and marketing skills, training and educational programs, and government and labor relations.

THE MECHANICAL SERVICE FAMILY

- Heating
- Ventilation
- Air Conditioning
- Refrigeration

! IMPORTANT

Controls are used to regulate the operation of HVACR systems to ensure proper temperature, humidity, ventilation, energy efficiency and more. Controls may be integrated with a Building Automation System (BAS) which is used to control HVACR equipment, lighting, security and other building functions.

HVACR LANGUAGE

Learning the language of the mechanical service industry may be intimidating to outsiders. At first glance it almost seems like learning a foreign language because many of the terms used are unique and exclusive to this field. To the newcomer, this can make communication frustrating when unusual acronyms and abbreviations are routinely used by service technicians and other experienced professionals who assume everyone around them speaks the same language. However, you can develop a good basic understanding of the HVACR language by taking a little time to become familiar with the different HVACR systems and the terminology that goes with them.

Let's begin with the simplest and most often used acronym: HVACR. Building climate and occupant comfort are determined by three functions: **Heating, Ventilation,** and **Air Conditioning**, which are closely interrelated. These functions are often referred to as simply HVAC. Again, they are the primary indoor environmental factors that control occupant comfort in a building. The letter R, which stands for **Refrigeration**, is included at the end of the HVACR acronym. This reflects that mechanical service companies may also provide environment control for applications like food coolers, storage freezers, or ice skating rinks where the purpose is not people comfort, but rather safe and efficient operation of a manufacturing process or commercial activity. In some companies, plumbing and electrical services related to the HVACR installation are also included under the mechanical service umbrella.

Early HVACR systems were primarily mechanical, thus the name mechanical service. However, modern HVACR installations are sophisticated systems using complex electronic controls, so **controls** are another important area that HVACR companies support and a topic that will be discussed in future modules.

HVACR SYSTEM GOALS

Maintaining proper temperature, humidity and ventilation rates are usually the foremost HVACR system goals, but there are others as well. It is important to note that the equipment and systems used may widely vary from one application to the next based upon requirements. For example, a refrigeration application for making ice – such as an ice skating rink – may not include any ventilation aspects. However, when considering most

systems installed to promote occupant comfort and safety in buildings, a properly functioning HVACR system will do the following:

1. Regulate temperature and humidity
2. Circulate appropriate volumes of outside (fresh) air - required by building codes
3. Filter contaminants from air
4. Be unobtrusive and quiet
5. Operate efficiently and economically

VENTILATION



Commercial buildings with fixed glass usually require forced ventilation.

Ventilation simply refers to the changing of air in any indoor space to remove stale air, moisture, odors, smoke, heat, bacteria, or other airborne contaminants. At home we simply open a window to clear the air of unwanted odors or smoke. This is referred to as **natural ventilation** because we are ventilating a space without using a fan or other mechanical system. However, because windows in most commercial buildings do not open, a mechanical system or **forced ventilation** is used to control indoor air quality. Ventilation includes both the exchange of air to the outside as well as circulation of air within the building. Forced air that is carried through ductwork is usually filtered or sometimes put through more elaborate air cleaners to keep it fresh and prevent irritating particles or odors from entering the working environment.

Proper ventilation is one of the most important factors for maintaining acceptable indoor air quality in buildings. Ventilation related equipment is often located in the central mechanical room, on rooftops, and in the indoor zones serving building occupants.

HEATING SYSTEMS



Boiler used to maintain temperature in building spaces by transferring heated fluid through piping.

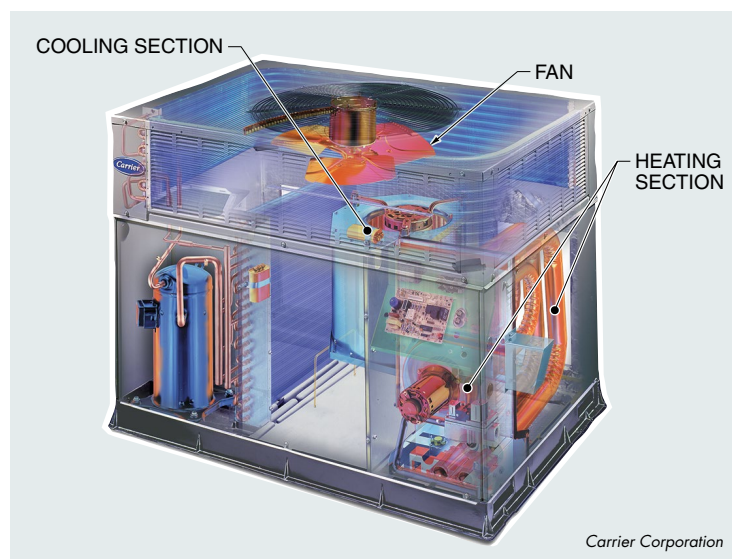
When the weather is cold outside, people want their indoor temperature to be warm and comfortable. Buildings may use **gas boilers, electric heating coils,** or even **geothermal** sources of heat, with water, steam, or air as the transfer medium carrying heat as desired to different zones throughout the building. Typical systems usually consists of **piping** and **ductwork** which takes the heated fluid or forced heated air into different parts of the building. Often the same piping

or ducting may be used for heating or air conditioning to add or remove heat from various building occupied zones. In typical commercial installations, equipment for the heating system is usually housed in a **central mechanical room**. A central mechanical room is a dedicated space within a building where key components of a HVACR system may be located.

A **unitary system** or **packaged unit** may be used to house the heating equipment. In addition, a combination unit may combine heating and air conditioning in one enclosure. Essentially, it is a standalone system/unit which may include gas furnace, heat exchanger and air conditioning system. Since they are self contained, they may be placed at convenient locations within or outside a building.

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WHAT IS HVACR?



Self contained combination unit provides heating and air conditioning.

AIR CONDITIONING

When the weather is too warm, occupants want their indoor spaces to be cooler, and sometimes less humid than the outside air. An air conditioning system provides cooling, ventilation, and humidity control for all or various parts of a building. It does this by moving heat and humidity taken from zones people occupy to someplace outside the building environment. We often think of an air conditioning system as being one that only cools an area. On the contrary, air conditioning simply “conditions air” to whatever temperature is required. Central air conditioning systems are often installed in offices and public buildings. Equipment for a central air conditioning system is usually housed in a central mechanical room, but may also be housed in a unitary system/package unit.

Older buildings sometimes require a **retrofit** which means new equipment or systems must be installed in a building that was not designed to receive them. It is often challenging to find space to install retrofit equipment and systems. Sometimes retrofit equipment must be located on the rooftop or somewhere outside the building.

REFRIGERATION SYSTEMS

The goal of **refrigeration** is to cool a space or substance so that it is below the environmental temperature. Refrigeration systems are used chiefly to store food and other perishables at low temperatures in order to prevent bacteria, yeasts and molds from growing. Some refrigeration systems often cool spaces to a temperature as low as minus 190 degrees Fahrenheit. In addition to freezers and walk-in coolers used in restaurants and other food service establishments, refrigeration specialists may work on ice skating rinks, hockey arenas, food production, or industrial processes that require low temperatures.



Low temperature refrigeration cabinet for proper storage of food products.

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WHAT IS HVACR?

! IMPORTANT

The first large-scale mechanical air conditioning system was invented and used in 1902. Since its inception, continued improvements in heating and air conditioning equipment efficiency have led to today's sophisticated systems. A retrofit goal is to provide optimal performance in older buildings.

WHERE MECHANICAL SERVICE PROVIDERS WORK



HVAC mechanical service is performed in a wide variety of buildings and facilities.

Mechanical service technicians usually work on HVACR systems that provide comfortable indoor climates for building occupants or stabilize environments for safe food storage or efficient industrial processes. The types of environments worked in are as varied as the buildings and manufacturing processes being supported. Depending on age, size and purpose for which the building is used, technicians might find themselves working in an equipment room, on the roof, in a walk-in freezer, or in the basement of a major facility.

The most common types of buildings and facilities where technicians work include:

- Commercial Buildings – includes office buildings, retail stores, banks, hotels
- Manufacturing Plants
- Single and Multi-family Residences – includes apartments and condos
- Industrial Processing Plants – includes refineries and chemical plants
- Food and Retail Establishments – includes restaurants and grocery stores
- Institutional Facilities – includes hospitals, jails, schools and government facilities.

SERVICES OFFERED

HVACR companies may choose to offer a varied range of services to customers depending on their available resources and marketing focus. Smaller companies may choose to offer selected services, while larger HVACR companies usually try to be **one-stop shops** that can provide a complete range of services. A complete range of services usually starts at the “drawing board” where a system is first designed, continuing with construction and installation, and concluding with ongoing maintenance needed to keep installations in peak operating condition. In addition, there are situations where an assessment of existing equipment or systems in older buildings will generate the need for replacement or upgrade to enhance energy efficiency. Generally, services can be classified into four (4) functional areas:

DESIGN

Creating and planning out in graphic form a system for a particular purpose

CONSTRUCTION

Building and putting the designed system in place

MAINTENANCE

Maintaining and keeping the system in good condition so it operates at maximum efficiency

RETROFIT

Upgrade obsolete equipments and/or replace systems for energy efficiency

Besides these functional areas, each company may elect to focus on different categories of customers, such as residential, health care, education, or governmental. Companies may also develop special capabilities with different types of equipment or technology, such as solar or geothermal systems. Companies may also opt to expand into additional building services such as plumbing and controls.

The systems serviced may vary greatly due to such factors as original design, construction and use. Moreover, systems are usually comprised of individual pieces of equipment. As such, the HVACR company may provide service to an independent piece of equipment or system, or inter-connected systems that cover all of the HVACR functions.

In general, each HVACR company develops a business strategy that determines which functional services, customer types, and markets it elects to address. Opportunity and profit potential will vary across these different

business areas, but these strategy choices will determine the total range of services the company ultimately offers to customers.

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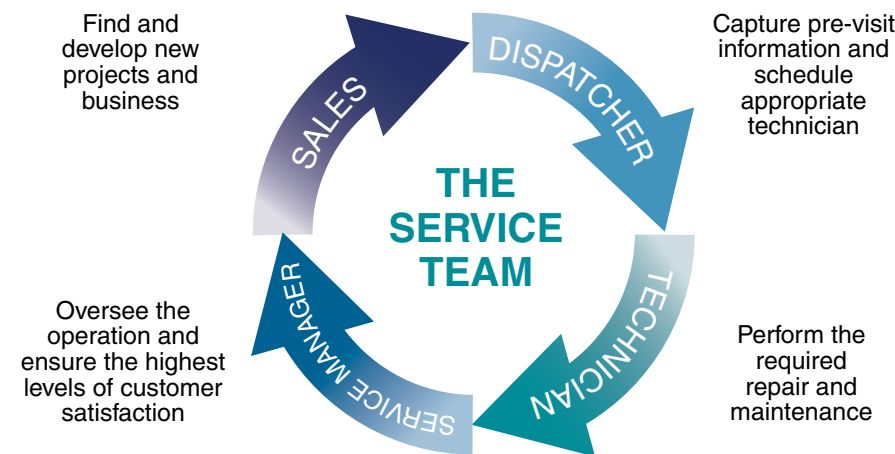
Teamwork is essential in a mechanical service company. It takes the combined knowledge and experience of each team member to accomplish the day-to-day operations and ensure overall success.

THE MECHANICAL SERVICE TEAM

Operating a mechanical service company is similar to running a medical clinic. Just as there is a team of doctors, nurses, and support staff required to attend to a patient, a broken mechanical system requires a well-educated MD, or “mechanical doctor” to fix it as well. While doctors meet with patients to determine their illnesses, technicians usually visit customer sites, using their knowledge to assess the situation and perform additional tests and measurements to “diagnose” HVACR system problems. Based on the results, they offer a “prescription” for the best solution, and “implement a resolution” for the problem.

It takes an entire team of professionals to make the service organization operate efficiently and effectively. A typical mechanical service team may be comprised of individuals performing the sales, dispatcher, service manager and technician functions. Of course, there may be other members of the team based on the personnel structure of the company.

The diagram below shows how HVACR business gets developed, service gets requested, HVACR problems are resolved and customer satisfaction is maintained. The importance of teamwork cannot be overstressed.



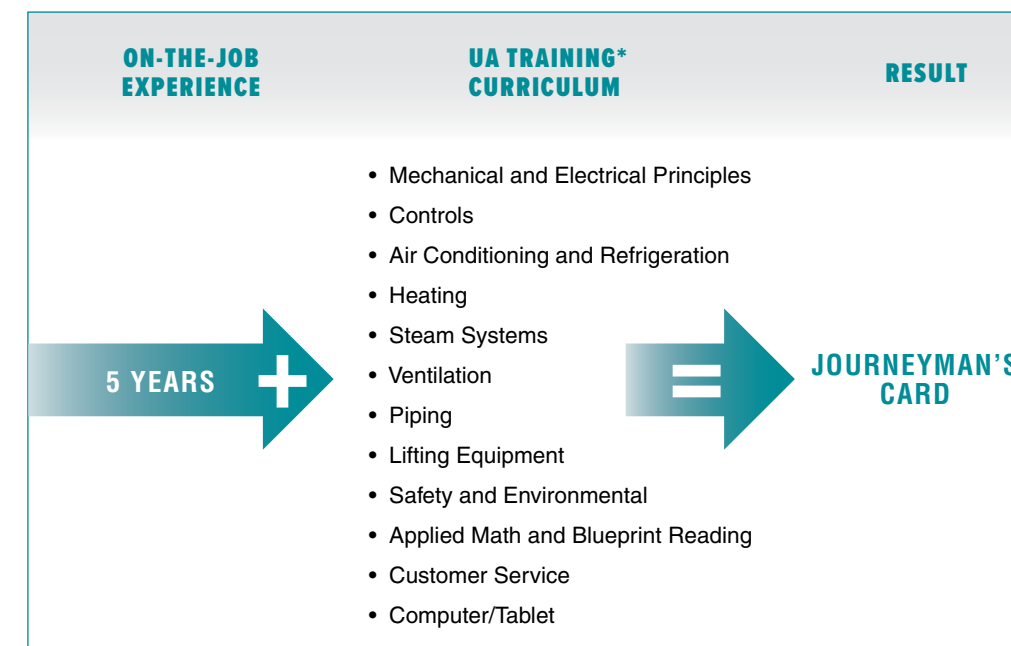
For further information regarding roles and responsibilities of each team member, see the job descriptions in the Appendix at the end of this module.

TRAINING AND EDUCATION

Like any other working professional, service technicians go through a rigorous and extensive training program to gain competence required to work on mechanical systems. Training consists of a combination of on-the-job experience and classroom training. For HVACR service technicians it usually takes five (5) years of on-the-job experience and successful completion of a rigorous training curriculum to attain a journeyman’s card.

Technician training is conducted under the guidance of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada (UA). The **UA** is a multi-craft union whose members are engaged in fabrication, installation and servicing of piping systems. There are approximately 345,000 highly-skilled United Association members who belong to over 275 individual local unions across North America. The UA serves as a collective voice for workers through negotiation and collective bargaining with employing contractor groups, such as the MSCA and local mechanical contractor associations.

In addition to HVACR service technicians, the UA also provides training for pipefitters, plumbers and sprinkler fitters, as well as other trades that work on mechanical systems.



* See Appendix for five year HVACR Service Technician Apprentice Curriculum

The following table outlines different stages of training and types of work that can typically be performed by individuals holding each classification.

JOB CLASSIFICATION	DESCRIPTION ACCORDING TO AGREEMENT
<p>SERVICE JOURNEYMAN</p> <p>Highly qualified service technician who has completed apprenticeship and passed journeyman test. Possesses overall knowledge of all types of HVACR systems.</p>	<ul style="list-style-type: none"> • Skilled craftsman in their trade • Minimum of five (5) years actual practical working experience • May be required to pass an examination as to their skills • Allowed to perform all work covered under the agreement
<p>SERVICEMAN</p> <p>Less experienced service technician qualified to perform most repairs and maintenance on existing installations. Not yet certified to carry a journeyman card.</p>	<ul style="list-style-type: none"> • Must have practical working experience in their trade • May be required to pass an examination • Work scope includes all work necessary to keep light commercial and unitary systems operating in an efficient manner • May assist journeymen in the repair of centrifugal and absorption machines, screw chillers and ammonia systems for the purpose of further developing their technical skills • May attain journeyman status with sufficient training and work experience
<p>SERVICE APPRENTICE</p> <p>An entry-level technician serving an apprenticeship, who works at the direction and guidance of a service journeyman or serviceman.</p>	<ul style="list-style-type: none"> • Governed by the local apprenticeship committee • Allowed to perform all work in the service and maintenance field, limited only by their capabilities • Shall be under the direction of a Serviceman or Service Journeyman
<p>TRADESMAN</p> <p>A stand-alone job classification typically performing routine maintenance tasks. May attain advanced classification through a service apprenticeship program.</p>	<ul style="list-style-type: none"> • Allowed to perform routine maintenance and inspections on all existing systems, including systems operations under contract with customer; filter changing; oiling and greasing; belt adjusting or replacement; cleaning of cooling towers, coils, evaporator and condenser tubes; water treatment; general housekeeping; truck driving, including pick-up and delivery of parts or equipment; indoor air quality (IAQ) related work; installation and replacement of all residential single unitary heating, air conditioning and plumbing systems; and drain and sewer cleaning

Education and training do not end when the technician obtains his/her journeyman’s license. Today’s mechanical service professional faces a challenging dichotomy. Technology being designed into today’s buildings is ever-changing, requiring technicians to have more advanced, updated knowledge of how to maintain them. At the opposite end of the spectrum are older systems that may require a completely different skill set due to their antiquated/outdated nature, age of the building, or original design limitations. Both categories of systems, the newest and the oldest, may require the services of “specialists” – those who have additional training and experience on specific types of equipment. In addition to understanding the complexities of each **original equipment manufacturer’s (OEM)** products, technicians may further specialize in other areas of the mechanical industry such as those listed below.

SPECIFIC AREAS OF TECHNICAL EXPERTISE			
Absorption Units	Air Distribution	Air Filtration	Air Washers
Automation Systems Controls/BMS/EMS	Boilers	Burners	Centrifugal Chillers
Computer Rooms	Electrical	Convectors	Converters
Cooling Towers	Heat Pumps	Evaporative Cooling	Fire Alarm Systems
Heat Recovery	Package Systems	Humidifiers	Ice Machines
Make-Up Air Units	Screw Chillers	Pumps	Reciprocal Chillers
Refrigeration	Water Treatment	Solar Systems	Sprinkler Systems
Water Balancing	VRF System	Turbocor Technology	

One other member of the trade not to be overlooked is the **pipefitter**, who is also sometimes called a **steamfitter**. Their responsibility is to lay out, assemble, fabricate, maintain and repair piping systems for industrial processes and heating and cooling. Pipefitters require a separate license and are trained and tested to a different standard.

It takes a great deal of time, energy, talent, and dedication to acquire skills necessary to be an effective service technician. To the non-technical person who works in the HVACR industry, the types of systems, vocabulary, and the names of parts that go into those systems can seem overwhelmingly complex. Additional modules in this series are designed to give you a better understanding and confidence level, allowing you to feel more comfortable when conversing with those who are more technically savvy.

MSCA AND ITS EDUCATION OPPORTUNITIES

The **Mechanical Service Contractors of America (MSCA)** is a national trade association of more than 1,400 HVACR service contractors. The common bond for all these companies is that their technicians have completed the highly acclaimed UA training and apprenticeship programs. MSCA also provides training opportunities through its education programs for all levels of personnel in the mechanical service industry. Seminars, conferences, and webinars are offered to members at the local and national levels throughout the year. The training calendar, books and other resources available for managing and growing service businesses can be found at the association's website, www.msca.org.

THE FUTURE OF MECHANICAL SERVICE

It is probably safe to say that there will always be a demand for services that make people more comfortable and productive in their working environments. Today's modern buildings and sophisticated mechanical systems are designed to produce comfort and required careful and precise service. In addition, price-conscious building owners and managers are looking for mechanical service providers that can enhance energy efficiency, decrease operating costs and prolong building life. This means that the demand for mechanical service, and workers in the HVACR industry, are not likely to diminish.

In fact, the United States Department of Labor, Bureau of Labor Statistics (BLS) projects that by the year 2020 growth in HVACR industry employment will increase by 34.4% (compared to 14.3% for the 300 other occupations the BLS tracks). As a result, more skilled technicians are needed every year to provide repairs and maintenance. This also means that skills learned in a HVACR training program are likely to always be in demand.



TEST YOURSELF

Module 1 of 10

What is HVACR?

Name _____

Company _____

1. All of the following are part of the HVACR acronym except:
 - a. Air
 - b. Ventilation
 - c. Conditioning
 - d. Reciprocal
2. Which of the following goals does a HVACR system try to accomplish?
 - a. Circulate and filter fresh air
 - b. Operate efficiently and economically
 - c. Be unobtrusive and quiet
 - d. Regulate indoor temperature and humidity
 - e. All of the above
3. Natural ventilation is achieved by using a fan near an open window to either draw cool air in or force warm air out.
 - a. True
 - b. False
4. Which of the following is **not** a primary way in which commercial buildings are typically heated?
 - a. Electric Heating Coils
 - b. Electromagnetic Waves
 - c. Gas Boilers
 - d. Geothermal

5. An air conditioning system may perform which of the following functions?
 - a. Humidity control, ventilation, cooling and water pressurization
 - b. Heating, water pressurization, humidity control and cooling
 - c. Cooling, humidity control, gas pressurization and ventilation
 - d. Ventilation, cooling, humidity control and heating

6. Refrigeration technicians may be required to cool a space to temperatures as low as minus 190 degrees Fahrenheit.
 - a. True
 - b. False

7. Hospitals, jails, schools, and government facilities are examples of what type of building?
 - a. Commercial
 - b. Manufacturing
 - c. Industrial
 - d. Institutional

8. HVACR companies that offer upgrading obsolete equipment and replacing systems for energy efficiency call this service:
 - a. Construction
 - b. Retrofit
 - c. Design
 - d. Maintenance

9. A person that successfully completes the UA training curriculum, has five years of on-the-job experience and meets all other UA and local requirements may attain the following status:
 - a. Serviceman
 - b. Journeyman
 - c. Tradesman
 - d. Master Craftsman

10. The four (4) typical mechanical service team members described in this module are:
 - a. Service manager, special projects manager, field supervisor and technician
 - b. Service manager, special projects manager, dispatcher and technician
 - c. Service manager, sales, dispatcher and special projects manager
 - d. Service manager, sales, dispatcher and technician

There are 2 options to submit *Test Yourself* assessments:

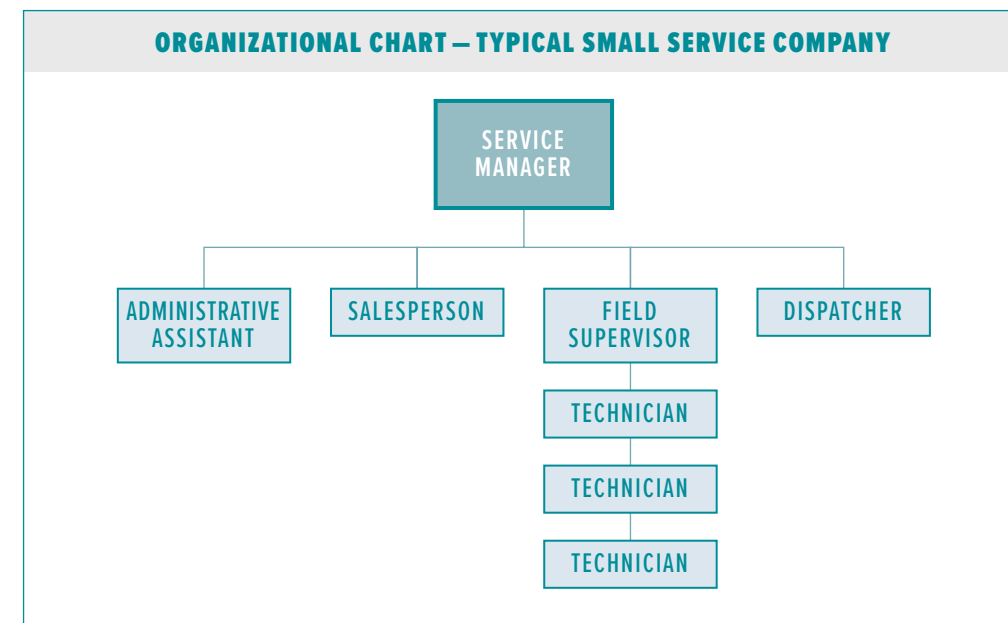
<p>1 Online: Click anywhere on this assessment to complete and submit on-line.</p>	<p>2 Print and Send: Completed assessments can be mailed or emailed. Mailing Address: MSCA-HVACR101 1385 Piccard Drive Rockville, MD 20850 Email Address: HVACR101@mcaa.org</p>
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JOB DESCRIPTIONS – FOR A TYPICAL MECHANICAL SERVICE COMPANY

Sample job descriptions for positions normally found in a mechanical service company are included in this section. The size of the company will dictate which positions may be employed. In addition, if the company is small some functions may have to be combined, or if the company is very large other functions may have to be added. Consequently, each company will need to modify the sample job descriptions to fit their situation.

Job descriptions and organizational charts help explain reporting relationships. The organizational chart below is typical of a small mechanical service company with multiple service technicians and some clerical support.



TITLE: SERVICE MANAGER

Purpose

General management of a major business unit. Responsible for planning, business development, marketing, engineering, financial planning and control. Operates within the overall company strategic business plan and is responsible for developing an operating plan for the business unit. Works within company guidelines for capital investment, resource allocation, general accounting and human resource policies.

Education, Experience and Skills Required

Bachelor's degree in business or engineering or equivalent, with a minimum of ten (10) years in the mechanical service industry. Management, organizational, administrative and strong communication skills are a prerequisite.

Principal Goals and Responsibilities

Within the limits of company policies, the Service Manager plans and approves budgets and, consistent with the company management philosophy, has the responsibility and commensurate authority to implement the company's operating plans -- both directly and through subordinates.

TITLE: ADMINISTRATIVE ASSISTANT

Purpose

Provide administrative support to the Service Manager. Assist with personnel, capital expenditures and coordinate customer service complaints.

Education, Experience and Skills Required

Associate degree or equivalent with a minimum of five to eight (5 to 8) years relevant experience. Solid knowledge of business-related software along with good communication skills is required.

Principal Goals and Responsibilities

Within the limits of company policies and consistent with management philosophy review all contract documents for quotes and bids to the private sector and governmental agencies; read and evaluate all contracts before signing for hold harmless and indemnification clause; communicate with insurance

and bonding company for all major contracts; assist management to prepare subcontracts. Additionally:

- Assist the Service Manager in daily activities, marketing, advertising, sales meetings, and planning.
- Supervise clerical personnel.
- Write help-wanted advertisements; prescreen and test applicants; prepare annual reviews.
- Prepare advertisements for publication; interact with marketing agency; prepare and maintain advertising file for mailing to customers and potential clients.
- Accept and perform special assignments as required.

TITLE: DISPATCHER

Purpose

Coordinate customer service requests and preventive maintenance programs with the assignment of appropriate field service personnel.

Education, Experience and Skills Required

Vo-Tech or High School diploma or applied experience in the mechanical service industry. Excellent communication and organizational skills necessary. Good telephone skills as well as good customer relations are required.

Principal Goals and Responsibilities

- Coordinate with the Service Manager and Field Supervisor the assignment of appropriate field personnel for service calls, start-ups, and warranty jobs.
- Direct the assignment of field personnel to perform preventive maintenance and fixed price repairs.
- Coordinate the assignment of field personnel to perform inspections of air conditioning and heating equipment, air conditioning units, chillers, boilers, refrigeration equipment, and rooftop units.
- Assign field personnel to service calls according to availability of appropriate equipment and closest location to projects.
- Order materials and coordinate back-ordered parts and filters delivery.

TITLE: FIELD SUPERVISOR

Purpose

Provide supervision and technical support to mechanical service technicians. Ensure quality workmanship.

Education, Skills and Experience Required

Seven (7) years relevant experience supervising trade technicians. Sales and customer service experience in a mechanical service environment preferred.

Principal Goals and Responsibilities

- Provide technical assistance and on-site training for team members.
- Ensure completion of maintenance and repair within the scheduled time frame and provide for the response to unscheduled calls in the absence of the assigned technician.
- In collaboration with the Dispatcher to ensure adequate manpower to accomplish work within team. Keep the Service Manager and Dispatcher advised of needs and performance of mechanics.
- Carry out quality checks on work performed by technicians. Report deficiencies to the Service Manager.
- Ensure compliance to the company Safety Program and other policies and procedures. Ensure team members are informed and practice safe work habits and use the appropriate safety equipment.

TITLE: SALESPERSON

Purpose

Develops and implements marketing programs to achieve objectives for sales growth and margin contribution. Directs the sales activities and coordinates information and support from all other departments as needed.

Education, Experience and Skills Required

B.S./B.A. or equivalent work experience with a successful record in service contract, repair and modernization sales. Must possess excellent communication, administration and management skills.

Principal Goals and Responsibilities

- Meet company service sales objectives through the development and execution of the service sales plan, including staffing levels and compensation programs.
- Promote company image, cultivate and maintain strong customer relationships and seek customer feedback as to the company's service products and quality.
- Monitor, evaluate and report all major competitive activities and ensure continuous improvement of the company's products and services. Maintain an active sales account list, which will include key customer accounts and a cross section of the industry by various market niches.
- Increase the effectiveness of the sales activities through continuous training, coaching and development.

TITLE: SERVICE TECHNICIAN

Purpose

Responsible for servicing, maintaining, modifying, renovating and repairing all mechanical equipment, such as air conditioning, ventilation, heating and refrigeration systems on a regular or emergency basis.

Education, Experience and Skills Required

Trade school or apprentice training, with experience in the mechanical equipment trade and possessing good communication skills, including oral and written communication.

Principal Goals and Responsibilities

- Consults with Field Supervisor and Dispatcher on a timely basis regarding job requirements and obtain customer approval for work not previously authorized.
- Responsible for keeping neat and clean while on company business.
- Follows industry and hygiene and safety practices and utilizes protective equipment furnished by the company.

- Responsible for performing all work in accordance with company standards and adheres to all company policies and procedures.
- Keeps current on equipment and systems knowledge by maintaining service manuals and attending union and company training classes.
- Completes payroll and customer reports in a neat and professional manner.
- Responsible for maintaining a valid driver's license.
- Responsible for caring and maintaining company tools and vehicle in accordance with company procedures.

UA FIVE YEAR HVACR SERVICE TECHNICIAN APPRENTICESHIP CURRICULUM		
YEAR 1	TRAINING HOURS	LAB HOURS
General Safety Practices/OSHA Ten Hour Certification	30	45
UA Heritage	30	
Thermal Dynamic Theory and Application		
Theory	10	15
Matter and Energy	10	15
Refrigeration Cycle and Refrigerants	10	15
Tools and Equipment		
Tools and Equipment	7	10.5
Fasteners	5	7.5
Tubing and Piping	10	15
Calibrating Instruments	8	12
Basic Electricity and Magnetism	30	45
Copper Tube Soldering and Brazing	30	45
Basic Math		
Basic Math Review	5.5	
Common Fractions	5.5	
Decimal Fractions	6	
Ratio and Proportion	6	
Percent, Percentage and Discount	6	
Units of Measurement	6	
Formulas for Related Mathematics	6	
Basics of Customer Service	18	

UA FIVE YEAR HVACR SERVICE TECHNICIAN APPRENTICESHIP CURRICULUM		
YEAR 2	TRAINING HOURS	LAB HOURS
Refrigerant Safety	8	
Refrigerant Characteristics and Handling		
Refrigerant Oil Chemistry and Management	18	27
System Evacuation	18	27
System Charging	17	25.5
Electric Motors		
Types of Electric Motors	14.25	21
Application of Motors	13	19.5
Motor Controls	13	19.5
Troubleshooting Electric Motors	13	19.5
Controls		
Introduction to Automatic Controls	26	39
Automatic Control Components and Application	27	40.5
Basic Commercial Refrigeration		
Evaporators and the Refrigeration System	14	21
Condensers	13	19.5
Compressors	13	19.5
Expansion Devices	13	19.5
Customer Relations	9	13.5
EPA Universal Certification (CFC)	20	
R-410A Certification	20	

UA FIVE YEAR HVACR SERVICE TECHNICIAN APPRENTICESHIP CURRICULUM

YEAR 3		
	TRAINING HOURS	LAB HOURS
Air Conditioning (Heating and Humidification)		
Electric Heat	18	27
Gas Heat	7	10.5
Oil Heat	7	10.5
Hydronic Heat	8	12
Indoor Air Quality	7.5	11.25
Air Conditioning (Cooling)		
Comfort and Psychometrics	18	27
Refrigeration Applied to Air Conditioning	18	27
Air Distribution and Balance	18	27
Installation	18	27
Controls	18	27
Typical Operating Conditions	18	27
Troubleshooting	18	27
Mechanical	36	
Blueprint Reading	36	
Controls	36	54
Customer Relations	18	27

UA FIVE YEAR HVACR SERVICE TECHNICIAN APPRENTICESHIP CURRICULUM

YEAR 5		
	TRAINING HOURS	LAB HOURS
Chilled Water Air Conditioning Systems		
High Pressure, Low Pressure and Absorption Chilled Water Systems	92	138
Cooling Towers and Pumps	30	45
Operation, Maintenance and Troubleshooting of Chilled Water A/C Systems	30	45
Pneumatic Controls	30	
UA STAR Exam Review	20	
Steam Systems	12	
Advanced Automatic Controls	14	21
Customer Relations	8	12

UA FIVE YEAR HVACR SERVICE TECHNICIAN APPRENTICESHIP CURRICULUM

YEAR 4		
	TRAINING HOURS	LAB HOURS
Intermediate Commercial Refrigeration		
Special Refrigeration System Components	22	33
Application of Refrigeration Systems	22	33
Commercial Ice Machines	22	33
Special Refrigeration Applications	22	33
Troubleshooting and Typical Operating Conditions for Commercial Refrigeration	22	33
All Weather Systems		
Electric, Gas and Oil Heat for Electric A/C	35	52.5
Air Source Heat Pumps	36	54
Geothermal Heat Pumps	36	54
Lifting and Rigging	8	
Customer Relations	9	13.5