

# CUSTOMIZED TEACHER ASSESSMENT BLUEPRINT

# HVAC MAINTENANCE TECHNOLOGY PA

# Test Code: 5937 Version: 01

## Specific competencies and skills tested in this assessment:

## **Introduction to HVAC**

Identify HVAC systems Demonstrate awareness of occupational requirements

## **Basic Safety**

Identify causes of jobsite accidents and measures to prevent them Identify jobsite hazards and describe measures to prevent them from occurring Identify and demonstrate the use of personal protective equipment Demonstrate the knowledge of OSHA regulations

### **Tools for HVAC/R**

Identify and safely use basic hand tools used in the trade Identify and safely use basic power tools used in the trade

## **Blueprint Reading**

Identify types of blueprint plans Read and interpret blueprint plans

## **Piping Practices**

Select, measure, cut, and ream piping and tubing Assemble piping projects and pressure test according to trade standards Identify and assemble PVC pipe and fittings Assemble copper tubing projects and pressure test according to trade standards Solder copper tubing Braze and silver solder ACR tubing Identify and demonstrate proper use of fittings and tools for steel (black) pipe Assemble corrugated stainless steel gas tubing (CSST) projects Identify piping material such as PVC, ABS, copper, black iron

## **Basic Electricity**

Calculate basic electrical quantities using Ohm's Law Recognize and draw various types of electrical schematics and symbols Demonstrate electrical testing to include mechanical/electronic relays Wire series circuit, parallel circuit, and series/parallel circuit Install electric disconnects, circuit breakers, and fuses Identify and test capacitors Identify electrical motors and their applications Recognize motor control protection and start devices Demonstrate knowledge of transformers and their applications

### HVAC Maintenance Technology PA (continued)

#### **Introduction to Cooling**

Measure temperature and pressure of a cooling system Calculate superheat and subcooling Locate and describe components of the basic refrigeration cycle Apply pressure temperature charts for various refrigerants Describe the functions of compressors Describe the functions of condensers Describe the functions of evaporators Describe the functions of metering devices Evaluate effects of airflow on system performance

#### **Introduction to Heating**

Describe the principles of combustion Identify temperatures and pressures of a heating system Identify components of various heating systems Perform maintenance on a gas furnace Troubleshoot conventional/condensing gas heating equipment Identify oil heating equipment Install and adjust oil fired equipment Perform annual preventive maintenance on oil fired equipment Troubleshoot oil fired equipment Identify electric heating equipment Identify electric heating equipment Install heating/air conditioning thermostats according to manufacturer's standards Perform combustion analysis on oil and gas fired equipment

#### **Air Distribution Systems**

Identify and describe the different types of duct system components Measure temperature, humidity, and air velocities Determine velocity, static, and total air pressures in a system Perform basic duct fabrication functions

#### Introduction to Hydronic Systems

Describe hot water heating system components Install and service hydronic systems

## Leak Detection, Evacuation, Recovery, and Charging

Locate refrigerant leaks using common types of leak detectors Perform refrigerant recovery Perform system evacuation and dehydration Determine when to charge with liquid versus vapor Weigh in correct system charge (when appropriate)

## HVAC Maintenance Technology PA (continued)

## **Troubleshooting Gas Heating**

Perform gas burner flame proving tests according to trade standards Demonstrate how to install, troubleshoot, and service gas heating equipment

## **Troubleshooting Cooling**

Identify control system components Demonstrate, install, troubleshoot, and service cooling equipment

## Heat Pumps

Explain heat pump modes of operation Identify and describe heat pump components Demonstrate how to install heat pumps

## **Computer Fundamentals**

Identify and demonstrate skills with computer software relating to HVAC

## Written Assessment:

Administration Time:	3 hours
Number of Questions:	194

## Areas Covered:

2%	Introduction to HVAC
7%	Basic Safety
2%	Tools for HVAC/R
2%	Blueprint Reading
12%	Piping Practices
14%	Basic Electricity
12%	Introduction to Cooling
15%	Introduction to Heating
7%	Air Distribution Systems
5%	Introduction to Hydronic Systems
7%	Leak Detection, Evacuation, Recovery, and Charging
4%	Troubleshooting Gas Heating
4%	Troubleshooting Cooling
5%	Heat Pumps
2%	Computer Fundamentals

## Sample Questions:

When using a ladder around electrical lines, the worker should

- A. make sure the ladder has a good base
- B. use wooden stand-offs
- C. not use a metal ladder
- D. wrap the ladder in rags

What is capillary attraction when soldering or brazing?

- A. when the filler metal flows away from the heat
- B. when the capillary tube is connected to the suction line
- C. when the filler metal flows toward the heat
- D. when hot fluid metal rises only to the top of the pipe

The purpose of a step-down transformer is to

- A. decrease secondary current
- B. increase the current for the control circuit
- C. decrease secondary voltage
- D. reduce voltage for control circuit safety

Incomplete combustion results from a lack of

- A. fuel
- B. oxygen
- C. carbon monoxide
- D. carbon dioxide

### A hydronic zone-control valve is actuated by the

- A. temperature of water
- B. circulator
- C. thermostat
- D. pressure of water

## Performance Assessment:

Administration Time:	3 hours
Number of Jobs:	3

## Areas Covered:

34%	<b><u>Brazing or Soldering</u></b> Participant will use safety considerations to flare and braze or solder using a torch. Assemble pieces according to figure shown and absence of leaks.
33%	<b><u>Refrigerant Recovery</u></b> Participant will calibrate manifold gauges, install and remove gauges properly and safely. Purge manifold gauge hoses, adjust/position service valves to read pressures. Recover and replace the correct amount of refrigerant and complete System Conditions Sheet for Job 2.
33%	Gas Furnace Start-Up and Check-Out Participant will test, verify, and adjust manifold gas pressure. Leak test gas connections, check electrical connections, measure and record unit supply voltage. Install thermostat, start equipment, test and adjust burner manifold pressure. Test temperature rise, check fan motor amperage draw, perform steady-state efficiency test, and calculate unit CFM.
Sample Job:	Refrigerant Recovery
Maximum Job Time:	60 minutes
Participant Activity:	Participant will secure the required materials, tools, and equipment, adjust manifold gauges, install gauges properly and safely, purge manifold gauge hoses using the <i>de minimis rule</i> , adjust/position service valves to read pressures or other pertinent conditions, recover the refrigerant using the recovery unit and cylinder, utilizing the <i>vapor recovery method</i> , complete the System Conditions Sheet, turn the system on, and return the refrigerant.