



HEATING, VENTILATION, AND AIR CONDITIONING

Criticality Survey 2022

CONTENT STANDARD 1.0: DEMONSTRATE HVAC CAREER BASICS

Performance Standard 1.1: Identify HVAC-Related Career Pathways and Regulations

1.1.1	Identify and maintain licensing (refrigeration), registration, certification, and industry credentialing requirements (e.g., IDAPA rules, EPA regulations, OSHA, L&I).	2.64
1.1.2	Research postsecondary apprenticeship program opportunities and requirements.	1.82
1.1.3	Identify residential, commercial, and industrial career opportunities.	1.61
1.1.4	Identify the roles of other trades represented on the jobsite.	1.54
1.1.5	Describe opportunities provided by equipment manufacturers.	1.43

CONTENT STANDARD 2.0: PRACTICE JOBSITE AND TOOL SAFETY

Performance Standard 2.1: Practice Jobsite Safety

2.1.1	Identify personal protective equipment (PPE) requirements.	2.57
2.1.2	Demonstrate proper material handling (e.g., sheet metal), storage, use, and disposal.	2.25
2.1.3	Demonstrate precautions for ladder safety.	2.61
2.1.4	Describe stairway and scaffold hazards and precautions.	2.21
2.1.5	Describe jobsite energy hazards and proper lockout/tagout procedures.	2.46
2.1.6	Describe refrigerant and pressure vessel storage.	2.18
2.1.7	Describe the importance of safety procedures for brazing and soldering.	2.18
2.1.8	Identify the location and the types of fire extinguishers and other fire equipment.	2.07
2.1.9	Demonstrate procedures for using fire extinguishers and other fire safety equipment.	2.04
2.1.10	Describe the effects of electrical shock on the human body.	1.86
2.1.11	Explain how to verify that circuits are de-energized.	2.18
2.1.12	Earn the OSHA-10 card (Construction).	1.82
2.1.13	Earn the basic EPA 608 certificate.	2.21

Performance Standard 2.2: Practice Tool Identification and Safety

2.2.1	Demonstrate safe use and maintenance of hand tools and power tools.	2.14
2.2.2	Match tools to their intended use and purpose.	2.18
2.2.3	Perform a safety check before using tools.	2.14
2.2.4	Demonstrate use of refrigerant handling equipment.	2.07
2.2.5	Demonstrate use and storage of oxy-acetylene torches and tanks.	2.14

Performance Standard 2.3: Use Electrical Test Equipment and Meters		
2.3.1	Describe meters and their applications to include ohmmeter, ammeter, multimeter, and voltmeter.	2.18
2.3.2	Select the multimeter setting to read the following: volts, ohms, amps, continuity, and temperature.	2.18
2.3.3	Identify electrical test equipment safety hazards.	2.07
2.3.4	Use an ohmmeter to measure resistance in electrical equipment or conductors.	2.07
2.3.5	Measure voltage between phases and phase-to-ground.	2.00
2.3.6	Measure voltage across open and closed switch contacts.	2.04
2.3.7	Measure amperage reading of various residential loads (e.g., microwave, toaster, curling iron, incandescent versus LED light, desktop computer).	1.71
Performance Standard 2.4: Braze and Solder Tubing and Piping		
2.4.1	Identify the purpose of the piping, tubing, and fittings used in the heating, airconditioning, and refrigeration industry.	2.07
2.4.2.	Identify appropriate brazing and soldering alloys and materials.	2.07
2.4.3	Explain the purposes and procedures for protecting piping materials and fabrication products, such as valves and fittings, from heat.	2.00
2.4.4	Perform brazing operations.	2.18
2.4.5	Perform soldering operations.	2.00
2.4.6	Describe proper use of piping and tubing fabrication tools (e.g., swaging, flaring).	1.96
CONTENT STANDARD 3.0: APPLY ACADEMIC FOUNDATIONS		
Performance Standard 3.1: Apply Trade Mathematics		
3.1.1	Identify industry standard units of measure.	2.11
3.1.2	Convert units of measure.	1.75
3.1.3	Measure and calculate size, area, volume, temperature, and pressure.	1.79
3.1.4	Convert between fractions and decimals.	1.75
3.1.5	Identify measuring tools (i.e., tape measure) and how to use and read them.	2.25
3.1.6	Perform ratio, percentage, and proportion calculations.	1.57
3.1.7	Demonstrate the use of order of operations.	1.86
Performance Standard 3.2: Use Applied Science		
3.2.1	Perform energy conversion calculations.	1.43
3.2.2	Perform sensible, latent, and total heat calculations.	1.61
3.2.3	Differentiate between saturated, superheated, and subcooled refrigerant.	1.86
3.2.4	Explain atmospheric, absolute, and gauge-pressure relationship.	1.89
3.2.5	Convert gauge pressure, absolute pressure, and vacuum.	1.89
3.2.6	Diagram a basic refrigeration cycle, identifying pressure, temperature, and state of refrigerant.	2.18
3.2.7	List the type and function of the four major refrigeration components.	2.07
3.2.8	Describe the methods of heat transfer.	1.89
3.2.9	Describe the three components of the combustion cycle (i.e., heat, fuel, oxygen).	2.04

Performance Standard 3.3: Apply Basic Electricity Fundamentals		
3.3.1	Describe basic electrical theory.	1.82
3.3.2	Describe series, parallel, and combination circuit characteristics.	1.68
3.3.3	Apply Ohm's Law to basic electrical measurements.	1.71
3.3.4	Interpret basic HVAC electrical circuit diagrams.	2.00
3.3.5	Describe basic motor operations.	1.96
CONTENT STANDARD 4.0: INTERPRET BLUEPRINTS, DRAWING, AND DIAGRAMS		
Performance Standard 4.1: Read Blueprints		
4.1.1	Locate the information found in drawing blocks.	1.81
4.1.2	Identify the information found on different types of drawings.	1.81
4.1.3	Interpret common MEP (mechanical, electrical, plumbing) symbols.	1.81
4.1.4	Interpret schedules, block diagrams, and schematic diagrams.	1.96
4.1.5	Interpret drafting lines.	1.59
4.1.6	Measure components of plans, using an architect's scale.	1.48
4.1.7	Measure components of plans, using a metric scale.	1.26
CONTENT STANDARD 5.0: EXPLORE HVAC SYSTEMS		
Performance Standard 5.1: Describe Basic Systems		
5.1.1	Describe fossil-fuel and electrical furnace operations.	1.81
5.1.2	Describe the typical configuration of residential split air conditioning systems.	1.85
5.1.3	List various types of commercial air conditioning systems and their applications.	1.81
5.1.4	Describe the configuration of common duct systems.	1.78
5.1.5	Describe basic control strategies.	1.85
Performance Standard 5.2: Explore Energy Sources		
5.2.1	Explain natural, liquefied petroleum (LP) gas, and fuel oil characteristics.	1.63
5.2.2	Describe the application of geothermal systems.	1.44
5.2.3	Describe the application of renewable energy systems.	1.33
5.2.4	Describe the application of electrical production and transmission systems.	1.26
Performance Standard 5.3: Explore Airflow Distribution		
5.3.1	Describe basic air flow characteristics.	1.78
5.3.2	Explain duct-system pressures.	1.67
5.3.3	Lay out basic fittings (e.g., rectangular duct, transition, furnace base).	1.63
5.3.4	Fabricate basic fittings (e.g., rectangular duct, transition, furnace base).	1.44
Performance Standard 5.4: Practice Installation Techniques		
5.4.1	Describe split and packaged air conditioning system installation, start-up, and checkout procedures.	1.74
5.4.2	Explain heat pump heating and cooling cycles.	1.85
5.4.3	Wire a low-voltage circuit (e.g., thermostat).	1.93
5.4.4	Wire a high-voltage circuit (e.g., supply power source to load).	1.89