

CONTENT STANDARD 1.0: TRADE MATH**Performance Standard 1.1: Basic Math**

- 1.1.1 Perform addition, subtraction, multiplication, and division calculations of whole numbers.
- 1.1.2 Perform addition and subtraction calculations of common fractions.
- 1.1.3 Perform multiplication and division calculations of common fractions.
- 1.1.4 Perform addition, subtraction, multiplication, and division calculations of decimal fractions.
- 1.1.5 Perform ratio and proportion calculations.
- 1.1.6 Perform percent, percentage, and discount calculations.
- 1.1.7 Perform angular, length, and converted temperature measure calculations.
- 1.1.8 Perform area calculations.
- 1.1.9 Perform volume calculations.
- 1.1.10 Solve basic equations.
- 1.1.11 Demonstrate the use of order of operations.

CONTENT STANDARD 2.0: GENERAL SAFETY**Performance Standard 2.1: Workplace Safety**

- 2.1.1 Describe potential excavation site hazards.
- 2.1.2 Explain proper personal protective equipment (PPE) use.
- 2.1.3 Describe proper material handling, storage, use, and disposal.
- 2.1.4 Describe ladder, stairway, and scaffold hazards and proper use.
- 2.1.5 Describe jobsite electrical hazards and proper lockout/tagout use.
- 2.1.6 Describe proper refrigerant and pressure vessel usage and storage.
- 2.1.7 Identify safety data sheets (SDS) properties of chemicals specific to HVAC.
- 2.1.8 Identify and describe environmental hazards (e.g. lead, silica, asbestos, carbon monoxide).
- 2.1.9 Identify the hazards associated with confined spaces.
- 2.1.10 Use appropriate fire extinguishers and other such safety devices.
- 2.1.11 Identify the importance safety procedures for brazing and soldering.

CONTENT STANDARD 3.0: TOOLS AND MATERIALS**Performance Standard 3.1: Power and Hand Tool Use**

- 3.1.1 Describe proper hand tool use.
- 3.1.2 Describe proper power tool use.
- 3.1.3 Identify proper use of various types of torches.
- 3.1.4 Identify proper use of piping and tubing fabrication tools.

Performance Standard 3.2: Tubing and Piping

- 3.2.1 Identify the purpose of the piping, tubing and fittings used in the heating, air-conditioning, and refrigeration industry.
- 3.2.2 Identify appropriate brazing and soldering alloys and materials.
- 3.2.3 Explain the purposes and procedures for protecting piping materials and fabrication, such as valves, fittings, and products from heat.

CONTENT STANDARD 4.0: ENERGY SOURCES

Performance Standard 4.1: Energy Sources

- 4.1.1 Explain natural, LP gas, and fuel oil combustion characteristics.
- 4.1.2 Describe the application of geothermal systems.
- 4.1.3 Describe the application of renewable energy systems.
- 4.1.4 Describe the application of electric production systems.

CONTENT STANDARD 5.0: BASIC SYSTEMS OVERVIEW

Performance Standard 5.1: Basic Systems Overview

- 5.1.1 Describe fossil-fuel and electrical furnace operations.
- 5.1.2 Describe the typical configuration of residential split air conditioning systems.
- 5.1.3 List various types of commercial air conditioning systems and their application.
- 5.1.4 Describe the configuration of common duct systems.

CONTENT STANDARD 6.0: INTRO TO APPLIED SCIENCE

Performance Standard 6.1: Intro to Applied Science

- 6.1.1 Perform energy conversion calculations.
- 6.1.2 Perform sensible, latent, and total heat calculations.
- 6.1.3 Differentiate between saturated, superheated, and subcooled refrigerant.
- 6.1.4 Explain atmospheric, absolute, and gauge pressure relationship.
- 6.1.5 Convert gauge pressure, absolute pressure, and vacuum.
- 6.1.6 Diagram a basic refrigeration cycle identifying pressure, temperature, and state of refrigerant.
- 6.1.7 List the type and function of the four major refrigeration components.
- 6.1.8 Describe the methods of heat transfer.

CONTENT STANDARD 7.0: APPLIANCE INSTALLATION

Performance Standard 7.1: Appliance Installation

- 7.1.1 Apply NEC standards to HVAC electrical circuit installations.
- 7.1.2 Interpret HVAC manufacturer electrical name plate data.
- 7.1.3 Apply appropriate code standards.
- 7.1.4 Describe gas, oil, and electrical appliance installation, start-up, and checkout procedures.
- 7.1.5 Describe sheet metal, fiberglass, and flex duct installation procedures.
- 7.1.6 Describe split and packaged air conditioning system installation, start-up, and checkout procedures.

CONTENT STANDARD 8.0: INTRODUCTION TO CONSTRUCTION DRAWINGS AND SPECIFICATIONS

Performance Standard 8.1: Introduction to Construction Drawings and Specifications

- 8.1.1 Identify the application of architectural plans and specifications.
- 8.1.2 Interpret mechanical, plumbing, and electrical drawing symbols.
- 8.1.3 Interpret specification documents and apply to plans.
- 8.1.4 Interpret shop drawings and apply to plans and specifications.

- 8.1.5 Describe a submittal and its derivation, routing, and makeup.
- 8.1.6 Develop cut lists for duct runs from shop drawings.
- 8.1.7 Interpret as-built modifications on HVAC mechanical plans.
- 8.1.8 Perform HVAC equipment and material takeoff.

CONTENT STANDARD 9.0: BASIC ELECTRICITY

Performance Standard 9.1: Basic Electricity

- 9.1.1 Describe basic electrical theory.
- 9.1.2 Describe series, parallel, and combination circuit characteristics.
- 9.1.3 Calculate electrical circuit values.
- 9.1.4 Describe electrical meter functions.
- 9.1.5 Measure electrical circuit values.
- 9.1.6 Identify electrical symbols.
- 9.1.7 Draw basic HVAC electrical circuit diagrams.
- 9.1.8 Interpret basic residential HVAC schematic diagrams.
- 9.1.9 Interpret basic commercial HVAC schematic diagrams.
- 9.1.10 Explain AC circuit characteristics.
- 9.1.11 Describe power distribution transformer systems.
- 9.1.12 Calculate HVAC branch circuit conductor, breaker, and disconnect sizes.
- 9.1.13 Describe basic motor theory.
- 9.1.14 Describe the five single-phase motor types.
- 9.1.15 Identify single-phase motor diagrams.
- 9.1.16 Explain single-phase motor starting relay operation.
- 9.1.17 Calculate motor capacitor replacement values.
- 9.1.18 Explain three-phase motor operation.
- 9.1.19 Explain ECM motor operation.
- 9.1.20 Perform Ohm's law calculations to series, parallel, and combination circuits.