

Sheet Metal Apprenticeship Program Curriculum

Sheet Metal Level One

04101-01 Introduction to the Sheet Metal Trade (5 Hours)

Summarizes the history and development of the sheet metal trade, explains the benefits of apprenticeship training, and identifies career opportunities in the trade.

04102-01 Tools of the Trade (5 Hours)

Describes the hand and power tools used in the sheet metal trade, including layout tools and cutting, bending, and forming machines. Safety and maintenance guidelines also are included.

04103-01 Fasteners, Hangers, and Supports (7.5 Hours)

Describes the types of fasteners (screws, nuts, bolts, and rivets) and supports used in an air distribution system. Discusses proper spacing of hangers, load ratings, and installation of hangers and support systems.

04104-01 Installation of Air Distribution Accessories (5 Hours)

Describes how air distribution accessories, such as louvers, dampers, and access doors, function as part of an air distribution system. Includes installation guidelines and checklists.

04105-01 Insulation (7.5 Hours)

Describes how to install fiberglass blanket insulation, fiberglass foam insulation, and fiberglass pipe insulation using approved adhesives and fastening techniques. Also covers the fabrication and installation of fitting covers and preformed fitting covers.

04106-01 Introduction to Sheet Metal Layout and Processes (7.5 Hours)

Introduces parallel line development, radial line development, and triangulation. Covers selection and use of layout, hand, and machine tools. Discusses how to transfer patterns, and how to cut, form, and assemble parts.

04107-01 Trade Math One (12.5 Hours)

Builds on trainees' basic math skills to solve trade-related problems. Covers denominate numbers, American and metric system conversions, basic geometry, and calculation of stretchouts.

04108-01 Fabrication One – Parallel Line Development (22.5 Hours)

Covers the steps involved in using the parallel line development method to lay out fittings and includes step-by-step procedures for selected fittings.

Sheet Metal Level Two

04201-02 Trade Math Two (20 Hours)

Demonstrates how to apply mathematical formulas to solve a variety of mathematical problems. Covers linear, area, volume, and angle measurement and percentages, ratios, and proportions. Provides practical instruction in using protractors, vernier calipers, and micrometers and in solving field measuring problems.

04202-02 Basic Piping Practices (7.5 Hours)

Reviews the methods for measuring, cutting, and joining selected types of pipe using fittings, hangers, and supports. Also reviews pipe materials and applications.

04203-02 Fabrication Two: Radial Line Development (55 Hours)

Introduces trainees to the principles of radial line development that are used to determine layouts for sheet metal fittings. Includes practice layout and fabrication tasks that allow trainees to develop and demonstrate their skills.

04204-02 Bend Allowances (5 Hours)

Provides instruction and practice in determining proper bend allowances in sheet metal. Also demonstrates how to lay out and fabricate sheet metal according to calculations.

04205-02 Blueprints and Specifications (20 Hours)

Reviews how to read and interpret section, elevation, and detail drawings. Also covers other specifications and other sources of project information. Blueprints included.

04206-02 Air Properties and Distribution (15 Hours)

Explains the properties of air and how these properties relate to one another. Trainees will learn how to use the gas laws, psychrometric charts, and measuring instruments to evaluate air properties in an air distribution system.

04207-02 Sheet Metal Duct Fabrication Standards (7.5 Hours)

Explains how to determine the various requirements for a duct system, including operating pressures, metal gauges, connectors, reinforcements, tie rods, and seams. Also reviews how to use standards, codes, and ordinances to design a duct system.

04208-02 Soldering (15 Hours)

Identifies soldering tools, materials, and techniques. Also provides trainees with a wide range of soldering tasks for practice.

04209-02 Fiberglass Duct (Elective) (20 Hours)

Reviews fiberglass duct as well as layout and fabrication methods. Also discusses closure, hanging, and support methods and how to repair major and minor damage to fiberglass duct.

Sheet Metal Level Three

04301-03 Trade Math Three: Field Measuring and Fitting (15 Hours)

Describes the techniques used for field measuring and layout of ductruns and fittings. Also provides practice field measuring problems.

04302-03 Air Systems (10 Hours)

Reviews the operating principles, components, and applications of common all-air systems. Discusses constant volume systems, variable volume systems, variable temperature (VVT) systems, variable air volume (VAV) systems, and dual-duct VAV systems.

04303-03 Introduction to Welding, Brazing, and Cutting (20 Hours)

Introduces trainees to the equipment and techniques of welding metal. Discusses the different types of metal joints and how to weld them. Includes shielded metal-arc welding, carbon-arc welding, brazing, and flame cutting methods.

04304-03 Principles of Refrigeration (7.5 Hours)

Introduces trainees to refrigeration systems and their components. Explains the refrigeration cycle and the role of heat pumps.

04305-03 Principles of Airflow (22.5 Hours)

Explains the basic principles of airflow and reviews how airflow is affected by duct size, shape, and fittings. Also reviews the components of an air distribution system.

04306-03 Comprehensive Blueprint and Specification Reading (30 Hours)

Provides a case-study approach to learning how to use building plans and specifications to lay out, fabricate, and install HVAC systems. Trainees will proceed through the module as if they were working on an actual building project. Blueprints included.

04307-03 Fabrication Three: Triangulation (40 Hours)

Describes the principles of triangulation and how it can be used to measure ductrun fittings. Provides trainees with a variety of tasks to practice developing, laying out, and fabricating selected ductrun fittings.

04308-03 Architectural Sheet Metal (Elective) (15 Hours)

Provides instruction in how to lay out and fabricate the various sheet metal components of a roof drainage system. Includes flashing, gutters, and downspouts.

Sheet Metal Level Four

04401-03 Shop Production and Organization (25 Hours)

Introduces trainees to the important production, organization, planning, and control functions that occur in a sheet metal shop. Includes discussions of project planning techniques, principles of efficient shop layout and materials flow, and the roles and relationships of shop personnel.

04402-03 Air Balance (25 Hours)

Describes how to balance air distribution systems so that the right amount of air is correctly distributed at the proper velocities and returned to the heating and cooling units. Reviews the tools and techniques used for adjusting fans, volume dampers, registers, and grilles.

04403-03 Louvers, Dampers, and Access Doors (20 Hours)

Discusses the different types of louvers, dampers, and access doors used in air distribution systems, and reviews the standards that apply to them. Includes several louver fabrication exercises.

04404-03 Fume and Exhaust System Design (25 Hours)

Discusses effective and safe workspace ventilation. Introduces the trainees to applicable standards and regulations and reviews the many different types of hoods, filters, and duct designs used in fume and exhaust systems.

04405-03 Fabrication Four: Comprehensive Review (40 Hours)

Offers 12 fabrication tasks that serve as a comprehensive review of parallel line, radial line, and triangulation pattern development methods as taught in the NCCER Sheet Metal curriculum.

04406-03 (MT-101) Introductory Skills for the Crew Leader (16 Hours)

Teaches the basic skills required to supervise personnel. Discusses principles of project planning and management and presents several case studies for student participation.