



Level One

MODULE 04101-08 – INTRODUCTION TO THE SHEET METAL TRADE

1. Describe what is meant by pride of craftsmanship in the sheet metal trade.
2. Name the general applications of sheet metal construction.
3. List the basic tools and equipment used in the sheet metal trade.
4. Summarize the history and development of the sheet metal trade.
5. Identify shop and field safety considerations specific to the sheet metal trade.
6. Identify types of metal.
7. Identify common fittings.
8. Describe what is involved in being part of a sheet metal training program.
9. Describe how to use a sheet metal gauge.

MODULE 04102-08 – TOOLS OF THE TRADE

1. Identify and describe the proper use of tools commonly used in the sheet metal trade.
2. State general rules for safety when using tools.
3. Describe proper maintenance procedures for tools.
4. Demonstrate how to properly use sheet metal tools.

MODULE 04103-08 – INTRODUCTION TO SHEET METAL LAYOUT AND PROCESSES

1. Define basic layout terminology.
2. Explain how to select and use layout and marking tools.
3. Identify and explain the three development methods for laying out sheet metal patterns.
4. Demonstrate how to select and use hand snips, hacksaws, and squaring shears for cutting out sheet metal parts and patterns.
5. Demonstrate how to select and use forming tools.
6. Demonstrate how to construct seams, edges, and duct connectors.

MODULE 04104-08 – TRADE MATH ONE

1. Convert denominate numbers and solve problems using them.
2. Calculate using rules.
3. Calculate using linear, square, volume, and weight measures.
4. Calculate the stretchouts for selected fittings.
5. Construct simple geometric figures.
6. Calculate the offset using field mitering and the OWL methods.

MODULE 04105-08 – FABRICATION ONE — PARALLEL LINE DEVELOPMENT

1. Explain procedures for parallel line development.
2. Lay out and fabricate selected ductrun fittings.

MODULE 04106-08 – INSTALLATION OF DUCTWORK

1. Identify and describe fasteners used in the sheet metal trade.
2. Select and use the right fastener for the task.
3. Describe some of the more common methods of supporting air system components.
4. Install duct fasteners, hangers, and supports.
5. Describe how to connect rectangular, round, and spiral ductwork.
6. Explain how to properly seal ductwork.

MODULE 04107-08 – INSTALLATION OF AIR DISTRIBUTION ACCESSORIES

1. Identify and explain the purpose of selected air distribution accessories.
2. Correctly install selected air distribution accessories.

MODULE 04108-08 – INSULATION (ELECTIVE)

1. Explain the principles of thermal insulation.
2. Explain the principles of acoustic insulation.
3. Install liner materials on selected duct sections.
4. Install duct wrap on selected duct sections.

MODULE 04109-08 – ARCHITECTURAL SHEET METAL (ELECTIVE)

1. Describe the parts of a roof drainage system.
2. Describe how flashing is used.
3. Describe how gutters and downspouts are used.
4. Lay out and fabricate selected drainage components.
5. Fabricate selected flashing components.

Level Two

MODULE 04201-08 – TRADE MATH TWO

1. Apply mathematical formulas to solve problems.
2. Solve problems sequentially with simple equations.
3. Solve linear, circular, and angle measurement problems.
4. Solve percentage problems.
5. Define and solve ratio and proportion problems.
6. Use a protractor, a vernier caliper, and a micrometer.
7. Calculate selected seam allowances.
8. Demonstrate competence in solving selected field measuring problems.
9. Apply standard rules and practice for solving selected field measurement problems.

MODULE 04202-08 – PLANS AND SPECIFICATIONS

1. Read selected plans to interpret project information.
2. Read and interpret section, elevation, and detail drawings.
3. Read specifications for information about selected parts of a construction job.

MODULE 04203-08 – FABRICATION TWO: RADIAL LINE DEVELOPMENT

1. Describe the principles of radial line development used to determine layouts for sheet metal fittings.
2. Use the principles of radial line development for the layout of selected sheet metal fittings.
3. Layout and fabricate selected sheet metal fittings.

MODULE 04204-08 – SHEET METAL DUCT FABRICATION STANDARDS

1. Explain the effect of operating pressure on the design of a duct system.
2. Locate standards for selected topics, fittings, or components.
3. Define the difference between standards and codes or ordinances.
4. Determine sealing requirements for a selected ductrun by using reference charts and tables.
5. Determine minimum gauge requirements for a selected ductrun by using reference charts and tables.
6. Determine minimum connector and reinforcing requirements for selected ductruns by using reference charts and tables.
7. Describe the purpose of a tie rod and determine when a tie rod is optional or mandatory by using reference charts and tables.
8. Identify the different types of acceptable longitudinal seams, including applications and any limitations.

MODULE 04205-08 – AIR PROPERTIES AND DISTRIBUTION

1. Explain the gas laws (Dalton's, Boyle's, and Charles's) used when dealing with air and its properties and explain how the properties of air relate to one another.
2. Use a psychrometric chart to evaluate air properties and changes in air properties.
3. Explain the differences between propeller and centrifugal fans and blowers.
4. Recognize the instruments used to make measurements in air systems and explain the use of each instrument.
5. Make basic temperature, air pressure, and velocity measurements in an air distribution system.
6. Explain the three fan laws.

MODULE 04206-08 – BEND ALLOWANCES

1. Describe the factors that influence bend allowances on sheet metal blanks.
2. Perform the calculations necessary for determining proper bend allowances on selected sheet metal problems.
3. Apply bend allowance calculations to lay out and fabricate a mating hat channel.
4. Determine bend allowances on selected sheet metal problems.

MODULE 04207-08 – SOLDERING (ELECTIVE)

1. Identify soldering tools and materials.
2. Safely and properly use soldering tools and materials in selected tasks.

MODULE 04208-08 – BASIC PIPING PRACTICES

1. Measure, cut, and join selected types of pipe.
2. Describe the materials from which pipe is made.
3. List some of the applications for selected pipe materials.
4. Describe the common types of pipe fittings, hangers, and supports.

MODULE 04209-08 – FIBERGLASS DUCT (ELECTIVE)

1. Identify types of fiberglass duct.
2. Demonstrate fiberglass duct layout and fabrication methods.
3. Demonstrate the various closure methods for sealing fiberglass duct.
4. Fabricate selected duct modules and fittings using the appropriate tools.
5. Demonstrate hanging and support methods for fiberglass duct.
6. Repair major and minor damage to fiberglass duct.
7. Use the principles of triangulation for laying out selected duct run fittings.
8. Demonstrate skill in the development, layout, and fabrication of selected duct run fittings and related tasks.

Level Three

MODULE 04301-09 - TRADE MATH THREE – FIELD MEASURING AND FITTING

1. Describe common practices used for field measuring and layout of ductruns and fittings.
2. Solve selected field measuring problems, applying standard rules and practices.

MODULE 04302-09 - AIR SYSTEMS

1. Explain the operating principles of different types of air systems.
2. Identify the components that make up an air system.
3. Describe the functions of air systems and their components.

MODULE 04303-09 - PRINCIPLES OF AIRFLOW

1. Explain the principles of airflow that affect the design and sizing of ductrun systems.
2. Identify the components of an air distribution system.
3. Define the terms related to airflow in ducts.
4. Describe the effects of duct sizes, duct shapes, and duct fittings on airflow.

MODULE 04304-09 - LOUVERS, DAMPERS, AND ACCESS DOORS

1. Explain the purpose of selected louvers, dampers, and access doors.
2. Install selected louvers, dampers, and access doors.

MODULE 04305-09 - COMPREHENSIVE PLAN AND SPECIFICATION READING

1. Coordinate with other trades to identify and prevent potential project conflicts.
2. Establish and lay out all wall, floor, and roof openings without conflicting with the work of other trades.
3. Establish accurate material takeoffs and buyout lists for the project.
4. Provide schedule timelines for successful project completion.
5. Read architect's plans and specifications.
6. Interpret specification documents and apply them to the plans.
7. Interpret shop drawings and apply them to the plans and specifications.
8. Develop cut lists for ductruns as shown on shop drawings and develop elevations of installations.
9. Describe a submittal, its derivation, routing, and makeup.
10. Develop a set of as-built drawings.

MODULE 04306-09 - FABRICATION THREE – TRIANGULATION

1. Describe the principles of triangulation used to determine measurements for ductrun fittings.
2. Use the principles of triangulation for laying out selected ductrun fittings.
3. Develop, lay out, and fabricate selected ductrun fittings.

MODULE 04307-09 - ADVANCED ARCHITECTURAL SHEET METAL

1. Lay out, fabricate, and install architectural fabrications.

Level Four

MODULE 04401-09 - SHOP PRODUCTION AND ORGANIZATION

1. Describe the role of the sheet metal shop in fabricating, assembling, and delivering sheet metal assemblies to the construction job site, ready for installation.
2. Identify and describe the planning phases of shop production.
3. Identify and describe the critical path method (CPM).
4. Describe the various jobs and responsibilities of shop personnel.
5. Identify shop process problems and recommendations for proper job control.

MODULE 04402-09 - AIR TESTING AND BALANCING

1. Explain the principles of air balance.
2. Define common terms associated with grilles, registers, and diffusers.
3. Describe the more commonly accepted methods of performing air-balancing procedures.
4. Identify the tools and instruments necessary for balancing air distribution systems.
5. Describe the operation and control of air-balancing components.

MODULE 04403-09 - INTRODUCTION TO WELDING, BRAZING, AND CUTTING

1. Explain the basic theory of arc welding.
2. Identify the necessary health and safety hazards, requirements, and protective equipment for arc welding, flame cutting, and plasma cutting.
3. Explain the characteristics and uses of direct current welding machines, alternating current welding machines, and AC-DC arc-welding machines.
4. Describe the types and uses of welding electrodes and categorize them according to the American Welding Society's (AWS) classification system.
5. Describe the basic setups for gas metal-arc and gas tungsten-arc welding processes.
6. Describe the basic brazing process.
7. Describe the operation and use of a hand plasma cutter.

MODULE 04404-09 - FUME AND EXHAUST SYSTEM DESIGN

1. Interpret codes and specifications pertaining to selected fume or exhaust systems.
2. Select appropriate materials for fabrication of identified exhaust or fume systems or components.
3. Identify different types of hoods and their operating principles, and identify specific applications for each.

MODULE 04405-09 - FABRICATION FOUR – COMPREHENSIVE REVIEW

1. Explain the principles of parallel line development, radial line development, and triangulation.
2. Given a fitting to be fabricated, select the best layout method for that fitting.

MODULE 04406-09 - INTRODUCTORY SUPERVISORY SKILLS

1. Discuss current issues and organizational structure in the construction industry today.
2. Understand and incorporate leadership skills into work habits, including communication, motivation, team building, problem solving, and decision-making skills.
3. Demonstrate an awareness of safety issues, including the cost of accidents and safety regulations.
4. Identify a supervisor's typical safety responsibilities.
5. Show a basic understanding of the planning process, scheduling, and cost and resource control.

