

Sheet Metal Technology

PEIMS Code: N1300430

Abbreviation: SHTMTL

Grade Level(s): 11–12

Award of Credit: 1.0

State Approved Innovative Course

- Districts must have local board approval to implement innovative courses.
- In accordance with Texas Administrative Code (TAC) §74.27, school districts must provide instruction in all essential knowledge and skills identified in this innovative course.
- Innovative courses may only satisfy elective credit toward graduation requirements.
- Please refer to [TAC §74.13](#) for guidance on endorsements.

Course Description:

The purpose of the proposed *Sheet Metal Technology* course is to prepare students in grades 11-12 for entry into the HVAC/Mechanical sheet metal installation industry. Students will learn the types of work performed, safety requirements, math skills needed and career path options within the sheet metal trades. Additionally, students will learn and apply the knowledge and skills needed to select the proper material, tools and joining methods for various types of HVAC and exhaust systems. Basic code requirements and Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) design principles will be introduced.

Essential Knowledge and Skills:

- (a) General Requirements. This course is recommended for students in grades 11-12. Recommended prerequisites: Algebra I, Geometry, Introduction to Manufacturing, Principles of Construction, or Construction Technology I. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
 - (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - (2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.
 - (3) In Sheet Metal Technology, students will gain knowledge of system lay out, assembly, installation, modification and repair of sheet metal duct that distributes supply, return, and exhaust air throughout residential and commercial buildings. Additionally, students will apply HVAC system knowledge and blueprint reading capability to select duct and insulation

- types and sizes, and hangar materials and spacing, in accordance with SMACNA and local code requirements.
- (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
 - (5) Statements that contain the word “including” reference content that must be mastered, while those containing the phrase “such as” are intended as possible illustrative examples.
- (c) Knowledge and Skills.
- (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:
 - (A) explain the role of an employee in the sheet metal industry;
 - (B) express ideas to others in a clear, concise, and effective manner through written and oral communication;
 - (C) demonstrate critical-thinking skills;
 - (D) demonstrate the ability to solve problems using critical-thinking skills;
 - (E) demonstrate knowledge of basic computer systems;
 - (F) explain common uses for computers in the construction industry;
 - (G) define effective relationship skills;
 - (H) discuss workplace issues such as sexual harassment, stress, and substance abuse;
 - (I) identify job opportunities with their accompanying job duties in occupations such as electrician, building maintenance technician or manager, and electrical engineer; and
 - (J) research career pathways along with the education, job skills, and experience required to achieve a career goal.
 - (2) The student describes the sheet metal industry. The student is expected to:
 - (A) identify the differences between residential and commercial sheet metal installation;
 - (B) describe the types of work performed by sheet metal installers;
 - (C) identify career opportunities available to sheet metal installers;
 - (D) explain the purpose and objectives of an apprentice training program; and
 - (E) explain the responsibilities and characteristics of a good sheet metal installer.
 - (3) The student identifies and demonstrates of the safe use of different types of sheet metal hand and power tools, including electric and pneumatic power tools, related to a specific task. The student is expected to:
 - (A) demonstrate the safety requirements for using reciprocating saws, double cuts, sheet metal cutting tools, sheet metal bending tools,

- impact drivers, drill motors, sheet metal breaks, sheet metal shears and duct jacks;
 - (B) demonstrate how to properly care for selected sheet metal hand tools;
 - (C) demonstrate how to cut sheet metal and all thread with a reciprocating saw;
 - (D) demonstrate the proper and safe operation of equipment used in sheet metal shearing, shaping and joining;
 - (E) demonstrate the proper joining of sheet metal using the Standing S, Flat S, TDC and duct connector methods;
 - (F) demonstrate the safe use of drilling, bending, and joining tools;
 - (G) identify safe tool use procedures and explain how vibration and excess noise can cause bodily injury;
 - (H) safely set up and operate a sheet metal shear and break;
 - (I) choose the proper drill bits and fasteners for various thicknesses of sheet metal;
 - (J) explain the purpose of the different types of hand shears and demonstrate their uses; and
 - (K) follow the necessary steps for proper tool maintenance.
- (4) The student recognizes hazards and general safety procedures. The student is expected to:
- (A) identify the different types of ladders including stepladders, straight, and extension ladders and scaffolds, including fixed scaffolds and platforms used on a work site;
 - (B) demonstrate the safe use of various ladders and scaffolding;
 - (C) demonstrate how to properly set up, inspect, and use stepladders, extension ladders, and scaffolding;
 - (D) identify the agencies that create and enforce safety regulations and explain an employee's responsibilities regarding regulations;
 - (E) identify the physical hazards associated with chemicals and describe how to avoid those hazards;
 - (F) identify electrical shock hazards and the techniques used to prevent shocks;
 - (G) identify the steps in a lock-out/tag-out procedure;
 - (H) explain the importance of machine and tool guarding and name the types of machine guards;
 - (I) identify the four classes of fire and how to extinguish each of them;
 - (J) describe the proper technique used to lift a heavy load; and
 - (K) explain how to avoid hand injuries when using hand and power tools.

- (5) The student demonstrates knowledge of safety procedures and preventative maintenance considerations for using motor and cable driven equipment. The student is expected to:
- (A) describe the safety precautions associated with the use of motor-driven equipment such as engine-driven generators, welding machines, air compressors, forklift trucks, and cable and hydraulic duct jacks;
 - (B) identify and explain the operation and use of the motor-driven equipment such as welding machines, portable generators, air compressors, aerial lifts, forklifts, and cable or hydraulic duct jacks;
 - (C) perform prestart checks and operate equipment such as portable generators, welding machines, air compressors and duct jacks;
 - (D) describe the function of inspection and scheduled maintenance as the basis of preventive maintenance;
 - (E) explain why preventive maintenance is performed and how it's scheduled;
 - (F) identify stakeholders within the industry who should be part of the planning and execution of preventive maintenance programs for sheet metal equipment; and
 - (G) discuss the causes, effects, and goals of a successful preventive maintenance program.

Recommended Resources and Materials:

NCCER Sheet Metal Level 1 Trainee Guide (4th ed.) Alachua, FL: Pearson.

Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Installation and Design Guide.

Recommended Course Activities:

Under the supervision of the instructor, the trainee should be able to do the following through worksheets, projects, reading assignments and exercises.

Identify various sheet metal hand and power tools and how to properly use them.

- Directional metal hand shears
- Sheet metal hammer
- Electric double cuts
- Electric reciprocating saw
- Metal shear
- Metal break
- Impact driver
- Drill motor
- Laser level
- Torpedo and larger levels
- Tape measure
- Check square, plumb and level

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Demonstrate sheet metal procedures.

- Cut sheet metal using hand shears
- Cut sheet metal using electric reciprocating saw
- Bend sheet metal using sheet metal break to 90 and 45 degrees
- Perform straight line square and round shape cutting
- Perform drilling and slot cutting
- Join sheet metal duct using S and drive, TDC and duct connector methods
- Identify various duct insulation materials
- Measure, cut and apply exterior and interior duct insulation
- Identify various duct hanging methods
- Demonstrate proper duct hanger installation
- Explain proper and safe operation of a duct jack

Suggested methods for evaluating student outcomes:

- Quick quizzes
- Laboratory activities that correspond to performance tasks
- Module projects
- Module review
- Module examination
- Trainees must score 70% or higher to receive recognition from NCCER.
 - Record the testing results on Craft Training Report Form and submit the result to the Training Program Sponsor.
- Performance Testing
 - Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the performance testing requirements.
 - Record the testing results on Craft Training Form and submit the results to the Training Program Sponsor.

Teacher qualifications:

An assignment for Sheet Metal Technology is allowed with one or the following certificates:

- Trade and Industrial Education: Grades 6-12. This assignment requires appropriate work approval.
- Trade and Industrial Education: Grades 8-12. This assignment requires appropriate work approval.
- Vocational Trades and Industry. This assignment requires appropriate work approval.

Additional information: