

## Pipefitting Technology I

PEIMS Code: N1300425

Abbreviation: PIPETEC1

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:

Students will learn the types of work performed, responsibilities and career opportunities within the industry, and safety principles associated with pipefitting. Additionally, students will learn care, selection, and use of hand and power tools of the trade and ladder and scaffold safety, selection, construction, and the associated hazards. Oxyfuel cutting and associated safety procedures will be reinforced. Students will learn the maintenance, operation, and safety of motorized equipment. This class may lead to the National Center for Construction Education and Research (NCCER) certification.

### Essential Knowledge and Skills:

- (a) General requirements. This course is recommended for students in Grades 11-12. Prerequisites: Algebra I and geometry. Recommended prerequisite: National Center for Construction Education and Research (NCCER) Core, 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 Pipefitting Technology I, students will gain knowledge in how to layout, assemble, install, alter, and repair pipelines or pipe systems that carry water, steam, air, lubrication, or other liquids or gases for industrial production and process systems. Additionally, students will apply pipe system knowledge and blueprint reading capability to select pipe size and type, related equipment and materials such as pipe supports, hangars, and hydraulic supports systems, according to required specifications.

- (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 is expected to demonstrate professional standards/employability skills as required by business and industry. The student is expected to:
    - (A) demonstrate oral communication, written communication, leadership skills, teamwork skills, conflict management, customer service, professionalism, work ethic, integrity, multitasking, initiative, creativity, and how to follow directions; and
    - (B) explain the importance of showing up to work on time, maintaining appropriate personal appearance, working as a team member, and being honest.
  - (2) The student explains the pipefitting industry. The student is expected to:
    - (A) identify the differences between plumbing and pipefitting;
    - (B) describe the types of work performed by pipefitters;
    - (C) identify career opportunities available to pipefitters;
    - (D) explain the purpose and objectives of an apprentice training program; and
    - (E) explain the responsibilities and characteristics of a good pipefitter.
  - (3) The student demonstrates knowledge of different types of pipefitter hand 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 pipe vises and stands, pipe wrenches, levels, pipe fabrication tools, pipe bending tools, pipe threaders, portable power drives, and pipe bevelers;
    - (B) demonstrate how to properly care for selected pipefitter hand tools;
    - (C) demonstrate how to cut pipe using a portable band saw;
    - (D) demonstrate the proper and safe operation of machines used in pipe joint preparation such as;
    - (E) perform selected pipe joint preparation operations using power tools;
    - (F) describe the various pneumatic tools used for plant maintenance;
    - (G) identify and describe the safe use of impact, cutting, and grinding tools;
    - (H) explain how pneumatic hammers, nailers, and staplers are selected and used in a safe manner;
    - (I) describe the use of pneumatic assembly tools such as grinders, sanders, screwdrivers, and drills and how other types of production tools are selected and used;
    - (J) identify the proper procedures for pneumatic tool and system care;

- (K) identify safe tool use procedures and how vibration and excess noise can cause bodily injury;
  - (L) safely set up and operate a portable electric drill, electric drill press, and electric hammer;
  - (M) choose the proper drill bit for various drilling applications;
  - (N) set up and use a variety of hand and bench grinders;
  - (O) safely use the proper grinder for various jobs; and
  - (P) follow the necessary steps for proper tool maintenance.
- (4) The student understands the safety requirements for oxyfuel cutting. The student is expected to:
- (A) identify and explain the use of oxyfuel cutting equipment;
  - (B) perform set up procedures for oxyfuel equipment;
  - (C) demonstrate lighting and adjusting procedures on an oxyfuel torch;
  - (D) demonstrate shut down procedures on oxyfuel cutting equipment;
  - (E) demonstrate how to disassemble oxyfuel equipment;
  - (F) demonstrate how to change empty oxygen and gas cylinders;
  - (G) perform oxyfuel cutting using straight line and square shapes, piercing and slot cutting, bevels, and washing;
  - (H) demonstrate how to operate a motorized, portable oxyfuel gas-cutting machine;
  - (I) identify the safety equipment and precautions necessary for oxyfuel welding;
  - (J) describe how to adjust the torch to produce a neutral flame, a carbonizing flame, or an oxidizing flame; and
  - (K) describe how the various types of flames are normally used by the oxyfuel welder.
- (5) 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 rolling scaffolds used on a work site;
  - (B) demonstrate the safe use of various ladders and scaffolding; and
  - (C) demonstrate how to properly set up, inspect, and use stepladders, extension ladders, and scaffolding;
  - (D) identify the agencies that make and enforce safety regulations and explain an employee's responsibilities under those regulations;
  - (E) identify the physical hazards associated with chemicals and describe how to avoid those hazards;
  - (F) identify several 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 guarding and name several 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.
- (6) The student demonstrates knowledge of safety procedures and preventative maintenance considerations for using motor-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, pumps, forklift trucks, and hydraulic cranes on job sites;
  - (B) identify and explain the operation and use of the motor-driven equipment such as welding machines, portable generators, air compressors, portable pumps, aerial lifts, forklifts, compaction equipment, trenching equipment, backhoe loaders and mobile cranes;
  - (C) perform prestart checks and operate equipment such as portable generators, welding machines, portable pumps and air compressors;
  - (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 industry who should be part of the planning and execution of preventive maintenance programs for pipefitting equipment; and
  - (G) discuss the causes, effects, and goals of a successful preventive maintenance program.

### Recommended Resources and Materials:

#### Textbook:

NCCER (2006). *Pipefitting Level 1 Trainee Guide* (3<sup>rd</sup> ed.). Alachua, FL: Pearson.

#### Curriculum Resources, Materials, Course Planning Tools; performance Profiles, Course Maps, Equipment and Material Lists:

National Center for Construction Education & Research. (2017). *Pipefitting*. Retrieved from National Center for Construction Education & Research: <https://www.nccer.org/workforce-development-programs/disciplines/craft-details/pipefitting>

**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:*

1. Identify various pipefitting hand tools.
2. Secure a section of pipe in a vise and pipe stand.
3. Properly use:
  - a. Straight pipe wrenches
  - b. Offset pipe wrenches
  - c. Chain wrenches
  - d. Strap wrenches
4. Properly use:
  - a. Laser level
  - b. Torpedo and larger levels
  - c. Tubing water level
  - d. Center finder
5. Check square and level:
  - a. Turn tongue 180 degrees from where it was.
- b. Flip level to ensure it is level
  6. Cut pipe using a portable band saw (do not use threading machine).
  7. Operate a portable grinder.
  8. Replace dies in a threading machine.
  9. Cut, ream, and thread pipe using a threading machine.
  10. Cut and thread nipples using a nipple chuck.
  11. Thread pipe using a portable power drive.
  12. Identify several types of pipe bevelers.
  13. Set up oxyfuel equipment.
  14. Light and adjust an oxyfuel cutting torch.
  15. Shut down oxyfuel cutting equipment.
  16. Disassemble oxyfuel equipment.
  17. Change empty cylinders.
  18. Perform straight line and square shape cutting.
  19. Perform piercing and slot cutting.
  20. Perform bevel cutting.

21. Perform washing.
22. Select, inspect, and use stepladders.
23. Select, inspect, and use straight and extension ladders.
24. Erect, inspect, and disassemble tubular buck scaffolding.
25. Perform all prestart checks for engine-driven generators.
26. Set up and operate engine-driven welding machines.
27. Operate engine-driven generators.
28. Perform all prestart checks for portable air compressors.
29. Operate portable air compressors.
30. Identify portable pumps to use for specific applications.
31. Identify forklift trucks and recognize safety hazards involved in working around them.
32. Identify types of hydraulic cranes and recognize safety hazards involved in working around them.

#### **Suggested methods for evaluating student outcomes:**

- 1) Quick Quizzes
- 2) Laboratory activities that correspond to Performance Tasks
- 3) Module Projects
- 4) Module Review
- 5) Module Examination
  - a) Trainees must score 70% or higher to receive recognition from NCCER.
  - b) Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
- 6) Performance Testing
  - a) 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.
  - b) Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

**Teacher qualifications:**

An assignment for Pipefitting Technology I and Pipefitting Technology II is allowed with one of the following certificates:

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

**Additional information:**

After the Level I course, students will be prepared for the National Center for Construction Education and Research (NCCER) Pipefitting Level 1 Credential