



## Pipefitting Technology I Lab

PEIMS Code: N1300427

Abbreviation: PIPETECL1

Grade Level(s): 11–12

Award of Credit: 1.0

### 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, 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.

This course has a required corequisite of Pipefitting Technology I.

### 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 Lab, students will learn the types of work performed, responsibilities, 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.

- (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) investigate academic knowledge and skills required for personal career goals in the pipefitting industry;
    - (B) demonstrate the professional standards required in the workplace such as flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, communication skills, leadership skills, work ethic, and integrity in a work situation;
    - (C) explain the importance of showing up to work on time, maintaining appropriate personal appearance, working as a team member and being honest;
    - (D) identify employers' expectations to foster positive customer satisfaction;
    - (E) communicate effectively with others in the workplace to clarify objectives; and
    - (F) demonstrate skills related to health and safety in the workplace as specified by appropriate governmental regulations.
  - (2) The student demonstrates knowledge of 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, specific to a task. The student is expected to:
    - (A) describe 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) explain how to properly care for selected pipefitter hand tools;
    - (C) explain how to cut pipe using a portable band saw;

- (D) prepare selected pipe joint operations for power tools;
  - (E) describe the various pneumatic tools used for plant maintenance;
  - (F) identify and describe the safe use of impact, cutting, and grinding tools;
  - (G) explain how pneumatic hammers, nailers, and staplers are selected;
  - (H) 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;
  - (I) identify the proper procedures for pneumatic tool and system care;
  - (J) identify safe tool use procedures and how vibration and excess noise can cause bodily injury;
  - (K) safely set up and operate a portable electric drill, electric drill press and electric hammer; and
  - (L) choose the proper drill bit for various drilling applications.
- (4) The student understands pipefitting design, symbols and welds as represented on engineering drawings, charts, and diagrams. The student is expected to:
- (A) explain the purpose and importance of engineering drawings, charts, and diagrams;
  - (B) interpret orthographic and isometric views of three-dimensional figures;
  - (C) interpret engineering, drawings, charts, and diagrams;
  - (D) analyze components of the welding symbol;
  - (E) identify types of welding joints;
  - (F) identify positions of welding; and
  - (G) identify types of welds such as fillet, groove, spot, plug, and flanged.
- (5) 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) explain set up procedures for oxyfuel equipment;
  - (C) describe lighting and adjusting procedures on an oxyfuel torch;
  - (D) describe shut down procedures on oxyfuel cutting equipment;
  - (E) describe how to disassemble oxyfuel equipment;
  - (F) describe how to change empty oxygen and gas cylinders;
  - (G) explain how to operate a motorized, portable oxyfuel gas-cutting machine;
  - (H) identify the safety equipment and precautions necessary for oxyfuel welding;
  - (I) describe how to adjust the torch to produce a neutral flame, a carbonizing flame, or an oxidizing flame; and
  - (J) describe how the various types of flames are normally used by the oxyfuel welder.

- (6) 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) identify the agencies that make and enforce safety regulations and explain an employee's responsibilities under those regulations;
  - (C) identify the physical hazards associated with chemicals and describe how to avoid those hazards;
  - (D) identify several electrical shock hazards and the techniques used to prevent shocks;
  - (E) identify the steps in a lock-out / tag-out procedure;
  - (F) identify several types of machine guards and explain the importance of machine guarding;
  - (G) identify the four classes of fire and how to extinguish each of them;
  - (H) describe the proper technique used to lift a heavy load; and
  - (I) explain how to avoid hand injuries when using hand and power tools.
- (7) 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 on 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 is scheduled;
  - (F) identify stakeholders within industry who should be part of the planning and execution of preventive maintenance programs for 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, Grades 11-12, 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