

Course Outline

Building and Construction Trades

REVISED: August/2020

Job Title

Plumber

Career Pathway:

Residential and Commercial Construction

Industry Sector:

Building and Construction Trades

O*NET-SOC CODE:

47-2152.02

CBEDS Title:

Introduction to Building and Construction Trades

CBEDS No.:

5501

71-45-80

Plumbing/2

Credits: 15

Hours: 180

Course Description:

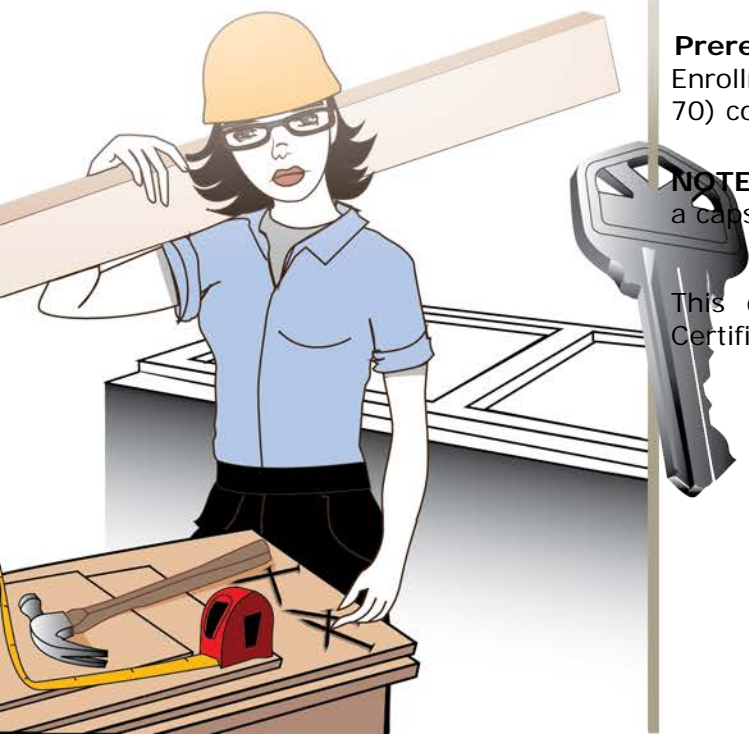
This competency-based course is the second in a sequence of two designed for plumbing. It provides students with project-based experiences in basic plumbing according to the Uniform Plumbing Code and the Los Angeles Plumbing Code requirements. Technical instruction includes an introduction, and reviews of workplace safety rules and regulations, resource management, trade mathematics, and employability skills. Emphasis is placed on the sizing techniques for water supply piping, water supply protection, proper selection and use of fixtures and appliances, testing and inspection techniques, and the basic procedures for plumbing a house. Basic entrepreneurial skills and the use of sustainable and green materials and technology are also covered in the instruction. The competencies in this course are aligned with the California High School Academic Content Standards and the California Career Technical Education Model Curriculum Standards.

Prerequisites:

Enrollment requires successful completion of Plumbing/1 (71-45-70) course.

NOTE: For Perkins purposes this course has been designated as a capstone course.

This course cannot be repeated once a student receives a Certificate of Completion.



COURSE OUTLINE COMPETENCY-BASED COMPONENTS

A course outline reflects the essential intent and content of the course described. Acceptable course outlines have six components. (Education Code Section 52506). Course outlines for all apportionment classes, including those in jails, state hospitals, and convalescent hospitals, contain the six required elements:

(EC 52504; 5CCR 10508 [b]; Adult Education Handbook for California [1977], Section 100)

COURSE OUTLINE COMPONENTS

LOCATION

GOALS AND PURPOSES

Cover

The educational goals or purposes of every course are clearly stated, and the class periods are devoted to instruction. The course should be broad enough in scope and should have sufficient educational worth to justify the expenditure of public funds.

The goals and purpose of a course are stated in the COURSE DESCRIPTION. Course descriptions state the major emphasis and content of a course and are written to be understandable by a prospective student.

PERFORMANCE OBJECTIVES OR COMPETENCIES

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Objectives should be delineated and described in terms of measurable results for the student and include the possible ways in which the objectives contribute to the student's acquisition of skills and competencies.

Performance Objectives are sequentially listed in the COMPETENCY-BASED COMPONENTS section of the course outline. Competency Areas are units of instruction based on related competencies. Competency Statements are competency area goals that together define the framework and purpose of a course. Competencies fall on a continuum between goals and performance objectives and denote the outcome of instruction.

Competency-based instruction tells a student before instruction what skills or knowledge they will demonstrate after instruction. Competency-based education provides instruction which enables each student to attain individual goals as measured against pre-stated standards.

Competency-based instruction provides immediate and continual repetition and in competency-based education the curriculum, instruction, and assessment share common characteristics based on clearly stated competencies. Curriculum, instruction, and assessment in competency-based education are explicit, known, agreed upon, integrated, performance oriented, and adaptive.

COURSE OUTLINE COMPETENCY-BASED COMPONENTS
(continued)

COURSE OUTLINE COMPONENTS

LOCATION

INSTRUCTIONAL STRATEGIES

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Instructional techniques or methods could include laboratory techniques, lecture method, small-group discussion, grouping plans, and other strategies used in the classroom.

Instructional strategies for this course are listed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructional strategies and activities for a course should be selected so that the overall teaching approach takes into account the instructional standards of a particular program, i.e., English as a Second Language, Programs for Adults with Disabilities.

UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT

Cover

The approximate time devoted to each instructional unit within the course, as well as the total hours for the course, is indicated. The time in class is consistent with the needs of the student, and the length of the class should be that it ensures the student will learn at an optimum level.

pp. 7-17

Units of study, with approximate hours allotted for each unit are listed in the COMPETENCY AREA STATEMENT(S) of the course outline. The total hours of the course, including work-based learning hours (community classroom and cooperative vocational education) is listed on the cover of every CBE course outline. Each Competency Area listed within a CBE outline is assigned hours of instruction per unit.

EVALUATION PROCEDURES

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The evaluation describes measurable evaluation criteria clearly within the reach of the student. The evaluation indicates anticipated improvement in performances as well as anticipated skills and competencies to be achieved.

Evaluation procedures are detailed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructors monitor students' progress on a continuing basis, assessing students on attainment of objectives identified in the course outline through a variety of formal and informal tests (applied performance procedures, observations, and simulations), paper and pencil exams, and standardized tests.

REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT

Cover

After a student has completed all the objectives of the course, he or she should not be allowed to reenroll in the course. There is, therefore, a need for a statement about the conditions for possible repetition of a course to prevent perpetuation of students in a particular program for an indefinite period of time.

ACKNOWLEDGMENTS

Thanks to LUZ GRANADOS for developing and editing this curriculum. Acknowledgment is also given to ERICA ROSARIO for designing the original artwork for the course covers.

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CALIFORNIA CAREER TECHNICAL EDUCATION MODEL CURRICULUM STANDARDS

Building and Construction Trades Industry Sector

Knowledge and Performance Anchor Standards

1.0 Academics

Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Building and Construction Trades academic alignment matrix for identification of standards.

2.0 Communications

Acquire and accurately use Building and Construction Trades sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0 Career Planning and Management

Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0 Technology

Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Building and Construction Trades sector workplace environment.

5.0 Problem Solving and Critical Thinking

Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Building and Construction Trades sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

6.0 Health and Safety

Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Building and Construction Trades sector workplace environment.

7.0 Responsibility and Flexibility

Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Building and Construction Trades sector workplace environment and community settings.

8.0 Ethics and Legal Responsibilities

Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork

Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization.

10.0 Technical Knowledge and Skills

Apply essential technical knowledge and skills common to all pathways in the Building and Construction Trades sector, following procedures when carrying out experiments or performing technical tasks.

11.0 Demonstration and Application

Demonstrate and apply the knowledge and skills contained in the Building and Construction Trades anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organizations.

Building and Construction Trades Pathway Standards

D. Residential and Commercial Construction Pathway

The Residential and Commercial Construction pathway provides learning opportunities for students interested in preparing for careers in construction and building design, performance, and sustainability. The standards focus on the manner in which residential and commercial structures are designed and built. The pathway includes instruction in the way in which these structures are built (Class B California License).

Sample occupations associated with this pathway:

- ◆ Plumber
- ◆ Electrician
- ◆ Building Inspector
- ◆ Estimator
- ◆ Carpenter

- D1.0 Recognize the impact of financial, technical, environmental, and labor trends on the past and future of the construction industry.
- D2.0 Apply the appropriate mathematical calculations used in the construction trades.
- D3.0 Interpret and apply information from technical drawings, schedules, and specifications used in the construction trades.
- D4.0 Demonstrate techniques for proper site preparation.
- D5.0 Demonstrate foundation layout techniques to include setting forms, placing reinforcements, and placing concrete according to construction drawings, specifications, and building codes.
- D6.0 Demonstrate carpentry techniques for the construction of a single-family residence.
- D7.0 Demonstrate proper installation techniques of interior finish materials and protective finishes.
- D8.0 Demonstrate the application of exterior finish materials and protective finishes in building construction.
- D9.0 Understand, integrate, and employ sustainable construction practices in the building trades.
- D10.0 Demonstrate skills necessary to complete a plumbing system in a single-family residence in accordance with accepted industry standards.
- D11.0 Demonstrate skills necessary to complete an electrical system in a single-family residence in accordance with accepted industry standards.

CBE
Competency-Based Education

COMPETENCY-BASED COMPONENTS
for the Plumbing/2 Course

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>A. ORIENTATION AND SAFETY</p> <p>Review, apply, and evaluate classroom and workplace policies and procedures used in accordance with federal, state, and local safety and environmental regulations.</p>	<ol style="list-style-type: none"> 1. Review the scope and purpose of the course. 2. Review the overall course content as a part of the Linked Learning. 3. Review classroom policies and procedures. 4. Review classroom and workplace first aid and emergency procedures. 5. Review the different occupations in the Building Trades and Construction Industry Sector which have an impact on the role of the plumbers. 6. Review the opportunities available for promoting gender equity and the representation of non-traditional populations in plumbing. 7. Review the following legislative mandates and their impact on the plumbing trade: <ol style="list-style-type: none"> a. Uniform Building Codes b. Americans with Disabilities Act c. State Fire Codes d. County Fire Codes e. City/local Fire Codes f. State Life Safety Codes g. County Life Safety Codes h. City/local Life Safety Codes i. U.S. Title 24 j. U.S. Title 19 8. Review the purpose of the California Occupational Safety and Health Administration (Cal/OSHA) and its laws governing plumbers. 9. Review the impact of Environmental Protection Agency (EPA) legislation on the Building Trades and Construction Industry Sector practices. 10. Review and demonstrate the procedures for contacting proper authorities for the removal of hazardous materials based on the EPA standards. 11. Review and demonstrate the use of the Material Safety Data Sheet (MSDS) as it applies to the plumbing trade. 12. Review the role of the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ in increasing the use of sustainable and green building practices in California. 	<p>Career Ready Practice: 2, 6, 7, 12</p> <p>CTE Anchor: Communications: 2.1, 2.2, 2.3 Problem Solving and Critical Thinking: 5.1, 5.4 Health and Safety: 6.1, 6.2, 6.3, 6.5, 6.6, 6.7, 6.8, 6.9, 6.11 Ethics and Legal Responsibilities: 8.2, 8.3 Leadership and Teamwork: 9.6 Technical Knowledge and Skills: 10.1, 10.2</p> <p>CTE Pathway: D1.1, D1.2, D1.3, D9.1, D9.2</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(5 hours)	13. Review the provisions of the California Title 24 Energy Efficiency Standards (a.k.a. 2008 California Green Building Standards Code) as they relate to the Building Trades and Construction Industry Sector. 14. OSHA 10 training 15. Pass the safety test with 100% accuracy.	
B. RESOURCE MANAGEMENT REVIEW Understand, apply, and evaluate resource management principles and techniques in the plumbing business.	1. Review the following: <ol style="list-style-type: none"> resources management sustainability critical path method (CPM) 2. Review the management of the following resources in the plumbing business: <ol style="list-style-type: none"> time materials personnel 3. Review the following components of CPM and how they impact project management: <ol style="list-style-type: none"> work breakdown structure duration dependencies 4. Review specific examples of effective management of the following in the plumbing business: <ol style="list-style-type: none"> time materials personnel 5. Review the benefits of effective resource management in the plumbing business: <ol style="list-style-type: none"> profitability sustainability company growth 6. Review the economic benefits and liabilities of managing resources in an environmentally responsible way.	Career Ready Practice: 2, 5, 8, 12 CTE Anchor: Communications: 2.1, 2.2, 2.3 Technology: 4.3 Problem Solving and Critical Thinking: 5.1, 5.2, 5.4 Responsibility and Flexibility: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6 Technical Knowledge and Skills: 10.1 CTE Pathway: D1.1, D2.3, D3.7
C. TRADE MATHEMATICS REVIEW Understand, apply, and evaluate the mathematical requirements in the workplace.	1. Review the practical applications of math in plumbing. 2. Review and demonstrate problem-solving techniques involving whole number problems, using arithmetic operations (addition, subtraction, multiplication, and division). 3. Review and demonstrate problem-solving techniques involving various fraction problems using arithmetic operations. 4. Review and demonstrate problem-solving techniques involving various decimal problems using addition, subtraction, multiplication, and division. 5. Review and demonstrate techniques for changing fractions to decimals. 6. Review and demonstrate techniques for changing decimals to fractions.	Career Ready Practice: 1, 2, 5 CTE Anchor: Communications: 2.1, 2.2, 2.3 Problem Solving and Critical Thinking: 5.2 Technical Knowledge and Skills:

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(5 hours)	<ol style="list-style-type: none"> 7. Review the English system of measuring length. 8. Review the English system of measuring weight. 9. Review the English system of measuring volume or capacity. 10. Review and demonstrate English and metric problem-solving techniques for various measuring problems using arithmetic operations. 11. Review and demonstrate English and metric measuring techniques of objects by using tools common to the trade. 12. Express metric units in ascending and descending powers of ten. 13. Convert the English numbering system to metric system. 14. Convert metric system to English numbering system. 15. Calculate square roots of English numbers. 16. Review and demonstrate problem-solving techniques for geometric problems. 17. Review and demonstrate problem-solving techniques for algebraic problems. 18. Review and demonstrate problem-solving techniques using percentages. 19. Review and demonstrate techniques for reading and interpreting graphs. 20. Review and demonstrate techniques for using a calculator 	<p>10.1 CTE Pathway: D2.1, D2.2</p>
<p>D. SIZING WATER SUPPLY PIPING</p> <p>Understand, apply, and evaluate the procedures necessary to size water piping properly.</p> <p>(10 Hours)</p>	<ol style="list-style-type: none"> 1. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for sizing water piping. 2. Describe the typical minimum sizes of sanitary drainage and venting for fixtures for a typical: <ol style="list-style-type: none"> a. one-story, one-family dwelling b. two-story, one-family dwelling c. duplex residence 	<p>Career Ready Practice: 2, 5</p> <p>CTE Anchor: Communications: 2.1, 2.2, 2.3 Problem Solving and Critical Thinking: 5.1, 5.2, 5.4 Health and Safety: 6.6 Ethics and Legal Responsibilities: 8.1, 8.2</p> <p>CTE Pathway: D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D3.1, D3.2, D3.3, D3.4, D3.5, D10.2</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>E. WATER SUPPLY PROTECTION</p> <p>Understand, apply, and evaluate the practices and procedures necessary to protect potable water.</p> <p>(20 Hours)</p>	<ol style="list-style-type: none"> 1. Define/Identify the following: <ol style="list-style-type: none"> a. potable water b. backflow c. back-siphonage d. back pressure e. cross-connection f. air gap 2. Identify the causes of the following: <ol style="list-style-type: none"> a. backflow b. back-siphonage c. back pressure d. cross-connection e. air gap 3. Define the following: <ol style="list-style-type: none"> a. backflow prevention device b. degree of hazard c. toxic substance d. nontoxic substance e. check valve 4. Identify and describe the features, functions, and installation requirements of the following backflow prevention devices: <ol style="list-style-type: none"> a. barometric loop b. vacuum breaker c. atmospheric vacuum breaker (AVB) d. hose thread vacuum breaker e. hand-held tub and shower spray vacuum breakers f. pressure vacuum breakers (PVB) 5. Describe the environmental and economic impact of incorporating LEED-approved water supply protection materials and practices. 6. Identify and describe the features, functions, and installation requirements of the following backflow prevention devices with integral check valves: <ol style="list-style-type: none"> a. double check valve with intermediate atmospheric vent b. double check valve assembly (DCVA) c. residential dual check valve d. beverage dispenser carbonator dual check valve e. reduced pressure zone (RPZ) backflow preventer 7. Describe the Safe Drinking Water Act of 1974 and its relevance to cross-connection control programs. 8. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for potable water supply protection. 	<p>Career Ready Practice: 2, 5, 7, 12</p> <p>CTE Anchor: Communications: 2.1, 2.2, 2.3 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Health and Safety: 6.6 Ethics and Legal Responsibilities: 8.1, 8.2, 8.3 Technical Knowledge and Skills: 10.1, 10.2</p> <p>CTE Pathway: D1.2, D1.3, D2.1, D2.4, D2.5, D2.6, D3.1, D3.2, D3.3, D3.4, D3.5, D3.7, D9.1, D9.2, D10.2, D10.3, D10.12</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>F. FIXTURES AND APPLIANCES</p> <p>Understand, apply, and evaluate the procedures and practices used to deliver potable water, drain wastewater, and vent gases from plumbing fixtures and appliances.</p>	<ol style="list-style-type: none"> 1. Identify and describe the features and functions of the following: <ol style="list-style-type: none"> a. fixture b. appliance c. fixture trim 2. Differentiate between a fixture and an appliance. 3. Describe the environmental and economic impact of incorporating LEED-approved fixtures and appliances and their installation practices. 4. Identify and describe the function of a water closet or toilet. 5. Identify and describe the functions of the following water closet components: <ol style="list-style-type: none"> a. water spot b. trap seal c. passageway d. jet 6. Describe and demonstrate the general operation of water closets. 7. Describe the use and specific operating principles of the following types of water closets: <ol style="list-style-type: none"> a. siphon jet b. gravity-fed c. blowout 8. Describe the effect of the Energy Policy Act of 1992 on flushing devices. 9. Describe the use and operation of the following types of flushing devices: <ol style="list-style-type: none"> a. manual flush tank b. manual pressure tank 10. Identify and describe the features and functions of the following: <ol style="list-style-type: none"> a. flushometer valve b. urinal flushometer valve c. water closet flushometer valve d. diaphragm flushometer valve e. electronic flushometer valve 11. Describe and demonstrate the installation of water closets. 12. Describe specifications for water closet seats. 13. Identify and describe the features and functions of the following: <ol style="list-style-type: none"> a. urinal b. washout urinal c. siphon jet urinal d. blowout urinal e. waterless urinal 14. Describe and demonstrate the installation of urinals. 	<p>Career Ready Practice: 1, 2, 4, 5, 12</p> <p>CTE Anchor: Communications: 2.1, 2.2, 2.3 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Health and Safety: 6.4, 6.5, 6.6, 6.7, 6.12 Ethics and Legal Responsibilities: 8.2 Technical Knowledge and Skills: 10.1, 10.2, 10.3, 10.5 Demonstration and Application: 11.1</p> <p>CTE Pathway: D1.2, D1.3, D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, D3.1, D3.2, D3.3, D3.4, D3.5, D3.7, D4.1, D10.1, D10.2, D10.3, D10.4, D10.5, D10.6, D10.7, D10.8, D10.9, D10.10, D10.11, D10.12</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
	<p>15. Identify and describe the features and functions of the following:</p> <ol style="list-style-type: none"> a. lavatory b. wall-hung lavatory c. pedestal lavatory d. countertop (vanity) lavatory e. self-rimming lavatory f. vanity-top lavatory g. lavatory trim h. faucet i. compression faucet j. port control faucet k. pop-up waste fitting l. combination fitting m. centerset faucet n. concealed faucet <p>16. Describe and demonstrate the installation of lavatories including faucets and drain fittings.</p> <p>17. Identify and describe the features and functions of the following:</p> <ol style="list-style-type: none"> a. bathtub b. right-hand bathtub c. left-hand bathtub d. recessed bathtub e. freestanding bathtub f. drop-in bathtub g. whirlpool bathtub h. overrim bathtub fitting i. combination waste and overflow fitting <p>18. Describe and demonstrate the installation of bathtubs including faucets and drain fittings.</p> <p>19. Identify and describe the function of a shower.</p> <p>20. Identify and describe the functions of the following components of a shower:</p> <ol style="list-style-type: none"> a. pressure-balancing valve b. thermostatic valve c. shower drain <p>21. Describe and demonstrate the installation of showers including faucets and drain fittings.</p> <p>22. Identify and describe the features and functions of the following:</p> <ol style="list-style-type: none"> a. kitchen sink b. self-rimming kitchen sink c. metal-framed kitchen sink d. undercounter kitchen sink <p>23. Describe and demonstrate the installation of kitchen sinks including faucets and drain fittings.</p>	

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
	<p>24. Identify and describe the features and functions of the following:</p> <ul style="list-style-type: none"> a. food waste disposer b. domestic dishwasher c. laundry tray (tub) d. clothes washer outlet boxes e. floor drain f. floor sink <p>25. Describe and demonstrate the installation of food waste disposers, domestic dishwashers, laundry trays (including faucets and fittings), and clothes washer outlet boxes.</p> <p>26. Describe and demonstrate the installation of floor drains and floor sinks.</p> <p>27. Identify and describe the features and functions of the following:</p> <ul style="list-style-type: none"> a. drinking fountain b. water cooler <p>28. Describe the sanitary features of drinking fountains and water coolers.</p> <p>29. Describe and demonstrate the installation of drinking fountains and water coolers.</p> <p>30. Identify and describe the features and functions of the following:</p> <ul style="list-style-type: none"> a. service sink b. mop basin <p>31. Describe and demonstrate the installation of service sinks and mop basins including water supply and basin drain fittings.</p> <p>32. Identify and describe the functions of the following:</p> <ul style="list-style-type: none"> a. water softener b. automatic water softener (cabinet and two-tank) <p>33. Identify and describe the function of zeolite in a water softener.</p> <p>34. Describe the water softening process.</p> <p>35. Describe the advantages and disadvantages of soft water.</p> <p>36. Describe and demonstrate the installation of automatic water softeners.</p> <p>37. Identify and describe the features and functions of the following:</p> <ul style="list-style-type: none"> a. water filter b. carbon water filter c. reverse osmosis water filter <p>38. Describe the advantages and disadvantages of water filters.</p> <p>39. Describe and demonstrate the installation of water filters.</p> <p>40. Identify and describe the features and function of a water heater.</p> <p>41. Identify and describe the features of a gas water heater.</p> <p>42. Identify and describe the function of a thermocouple.</p> <p>43. Identify and describe the features of an electric water heater.</p> <p>44. Identify and describe the function of an immersion element.</p>	

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(40 Hours)	<p>45. Identify and describe the danger of:</p> <ol style="list-style-type: none"> a. superheated steam b. water hammer <p>46. Identify and describe the importance of the following:</p> <ol style="list-style-type: none"> a. relief valve b. temperature and pressure (T&P) relief valve c. water hammer arrestor <p>47. Describe the difference between rough-in and finishing installation.</p> <p>48. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for plumbing fixtures and fixture fittings.</p> <p>49. Describe the Americans with Disabilities Act (ADA) and its relation to fixtures and appliances.</p> <p>50. Describe the specifications for the following ADA-compliant fixtures:</p> <ol style="list-style-type: none"> a. water closets b. urinals c. lavatories d. bathtubs e. showers f. kitchen sinks g. drinking fountains <p>51. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for the accommodation of persons with disabilities.</p>	
<p>G. TESTING AND INSPECTION</p> <p>Understand, apply, and evaluate the procedures and practices to test and inspect plumbing systems.</p>	<ol style="list-style-type: none"> 1. Describe the testing sequence for plumbing systems. 2. Define the following types of tests and equipment: <ol style="list-style-type: none"> a. air test b. inflatable test plug c. mechanical test plug d. test gauge assembly e. test cap f. pipe cap g. hydrostatic test h. ultrasonic test i. smoke test j. odor test 3. Describe the procedure for performing the following tests: <ol style="list-style-type: none"> a. on building sewers: visual inspection, air test, hydrostatic test b. on the water main and water service piping: a hydrostatic test c. on sanitary drainage and vent piping: air test, hydrostatic test d. on storm water drainage piping: air test, hydrostatic test e. on potable water supply and distribution piping: air test, ultrasonic leak detection 	<p>Career Ready Practice: 1, 2, 4, 5, 7, 9, 11, 12</p> <p>CTE Anchor: Communications: 2.1, 2.2, 2.3, 2.4 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Health and Safety: 6.6 Responsibility and Flexibility: 7.2 Ethics and Legal Responsibilities: 8.1, 8.2, 8.3, 8.4 Technical Knowledge and Skills: 10.1, 10.2, 10.4</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(34 Hours)	<ol style="list-style-type: none"> 4. Describe the procedure for performing the following: <ol style="list-style-type: none"> a. a final air test b. smoke leak detection c. odorant leak detection d. general plumbing test e. inspection preparation procedures 5. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code testing procedures for: water supply and distribution, sanitary drainage, building sewers, storm drainage. 	<p>CTE Pathway: D1.2, D1.3, D3.7, D4.1, D10.3, D10.6, D10.12</p>
<p>H. PLUMBING A HOUSE</p> <p>Understand, apply, and evaluate the procedures and practices necessary to install a plumbing system.</p>	<ol style="list-style-type: none"> 1. Describe the areas of a dwelling that require piping, fixtures, and appliances. 2. Define the following: <ol style="list-style-type: none"> k. specifications l. rough-in drawing m. grade n. fall o. run p. benchmark 3. Describe the importance of obtaining a plumbing permit. 4. Describe the factors that must be considered before installing a building sewer. 5. Describe and demonstrate the following: <ol style="list-style-type: none"> a. calculating the fall of the building sewer b. calculating the grade of the building sewer c. trench excavation techniques d. building sewer installation e. water service installation 6. Review the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for: <ol style="list-style-type: none"> a. protection of piping, materials, and structures b. trenching, excavation and backfill c. building sewers, water supply and distribution 7. Identify and describe the features and functions of the following: <ol style="list-style-type: none"> a. rough-in b. finishing c. isometric drawing d. materials list 8. Describe and demonstrate the process of preparing the DWV piping. 9. Describe and demonstrate the layout of fixtures on different floors including the basement. 10. Describe and demonstrate the layout of the building drain trench. 11. Describe and demonstrate the installation of the building drain. 	<p>Career Ready Practice: 1, 2, 5, 12</p> <p>CTE Anchor: Communications: 2.1, 2.2, 2.3 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Health and Safety: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.12 Ethics and Legal Responsibilities: 8.1, 8.2, 8.3, 8.4 Technical Knowledge and Skills: 10.1, 10.2, 10.3, 10.5 Demonstration and Application: 11.1</p> <p>CTE Pathway: D1.2, D1.3, D2.1, D2.2, D2.3, D2.4, D2.5, D2.6, D2.7, D3.1, D3.2, D3.3, D3.4, D3.5, D3.6, D3.7, D4.1, D4.2, D4.5, D4.6, D4.7</p>

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(55 Hours)	12. Review the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for sanitary drainage. 13. Describe and demonstrate the following: a. kitchen stack layout and installation b. bathroom DWV piping, laundry tray DWV piping, rough plumbing testing and inspection c. shower base and bathtub installation 14. Describe and demonstrate water supply rough-in for the following fixtures: shower faucet, bath and shower faucet, lavatory water piping, water closet water piping. 15. Describe and demonstrate roof jacket installation. 16. Describe and demonstrate water supply distribution piping for: a. cold hard water b. cold soft water c. hot water 17. Describe and demonstrate hydrostatic and final air tests. 18. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for plumbing fixtures and fixture fittings, water supply and distribution, vents, and traps. 19. Describe and demonstrate final clean up procedures.	
I. EMPLOYABILITY SKILLS REVIEW Review, apply, and evaluate the employability skills required in plumbing.	1. Review employer requirements for the following: a. punctuality b. attendance c. attitude toward work d. quality of work teamwork e. responsibility f. timeliness g. communication skills 2. Update list of potential employers through traditional and internet sources. 3. Review the role of social media in job search. 4. Finalize sample résumés and cover letters. 5. Review the importance of filling out a job application legibly, with accurate and complete information. 6. Complete sample job application forms correctly. 7. Review the importance of enthusiasm on a job. 8. Review the importance of appropriate appearance on a job. 9. Review the importance of the continuous upgrading of job skills. 10. Review customer service as a method of building permanent relationships between the organization and the customer. 11. Review and demonstrate appropriate interviewing techniques. 12. Review the informational materials and resources needed to be successful in an interview. 13. Design sample follow-up letters. 14. Review and demonstrate appropriate follow-up procedures.	Career Ready Practice: 1, 2, 3 CTE Anchor: Communications: 2.1, 2.2, 2.3, 2.4 Career Planning and Management: 3.2, 3.3, 3.4, 3.9 Problem Solving and Critical Thinking: 5.1, 5.4 Responsibility and Flexibility: 7.2, 7.4, Ethics and Legal Responsibilities: 8.4 CTE Pathway: D1.1
(5 Hours)		

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
<p>J. ENTREPRENEURIAL SKILLS</p> <p>Review, apply, and evaluate the process involved in becoming an entrepreneur in the plumbing business.</p> <p>(4 Hours)</p>	<ol style="list-style-type: none"> 1. Define entrepreneurship. 2. Identify the necessary characteristics of successful entrepreneurs. 3. Define the contributions of entrepreneurs to the plumbing industry. 4. Explain the purpose and components of a business plan. 5. Examine personal goals prior to opening a business. 6. Evaluate sources of monetary investment in a business opportunity. 7. Define licensing requirements for the plumbing business. 8. Develop a scenario depicting the student as a plumbing business owner. 9. Differentiate between LEED business practices and standard business practices. 	<p>Career Ready Practice: 2, 3, 5, 6, 7, 8, 12</p> <p>CTE Anchor: Communications: 2.2, 2.3, 2.4, 2.5 Career Planning and Management: 3.2, 3.3, 3.4, 3.6, 3.7, 3.9 Technology: 4.1, 4.2 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Responsibility and Flexibility: 7.1, 7.2, 7.4, 7.6, 7.7, 7.8 Ethics and Legal Responsibilities: 8.4, 8.5 Leadership and Teamwork: 9.1, 9.2, 9.4 Technical Knowledge and Skills: 10.1, 10.2, 10.4 Demonstration and Application: 11.5</p> <p>CTE Pathway: D3.7, D9.1, D9.2</p>

SUGGESTED INSTRUCTIONAL MATERIALS and OTHER RESOURCES

TEXTS AND SUPPLEMENTAL BOOKS

2009 Uniform Plumbing Code Illustrated Training Manual (volumes 1 and 2). International Association of Plumbing and Mechanical Officials, 2009.

American Contractors Exam (author). DeWalt Plumbing Licensing Exam Guide. Publisher: DeWalt, 2010.

International Code Council. 2012 International Building Code. Cengage Learning, 2011.

International Code Council. 2012 International Plumbing Code. Cengage Learning, 2011.

Officials Magazine. I.A.P.M.O. Publication.

Plumber's Exam Preparation Guide. Howard C. Massey Craftsman Book Co., 1985.

Reeves Journal. Business News Publishing Co.

Smith, Lee. Mathematics for Plumbers and Pipefitters, 7th Edition. Delmar Cengage Learning, 2007.

Thiesse, J. L. Plumbing Fundamentals. McGraw-Hill, 1981.

Uniform Plumbing Code, 2009 Edition. International Association of Plumbing and Mechanical Officials, 2009.

Woodson, R. Dodge. Plumber's and Pipe Fitter's Calculations Manual, 2nd Edition. McGraw Hill, 2005.

Woodson, R. Plumber's Licensing Study Guide, 2nd Edition. McGraw-Hill Professional, 2006.

RESOURCES

Employer Advisory Board members

CTE Model Curriculum Standards

<http://www.cde.ca.gov/ci/ct/sf/documents/buildingconstruct.pdf>

California Building Standards Commission

www.bsc.ca.gov/default.htm

Green Building Advisor.com

greenbuildingadvisor.com

The Daily Green

thedailygreen.com

COMPETENCY CHECKLIST

TEACHING STRATEGIES and EVALUATION

METHODS AND PROCEDURES

- A. Lectures and discussions
- B. Multimedia presentations
- C. Demonstrations and participation
- D. Individualized instruction
- E. Peer teaching
- F. Role-playing
- G. Guest speakers
- H. Field trips and field study experiences
- I. Projects

EVALUATION

SECTION A – Orientation and Safety – Pass the safety test with 100% accuracy.

SECTION B – Resource Management Review – Pass all assignments and exams on resource management review with a minimum score of 80% or higher.

SECTION C – Trade Mathematics Review – Pass all assignments and exams on trade mathematics review with a minimum score of 80% or higher.

SECTION D – Sizing Water Supply Piping – Pass all assignments and exams on sizing water supply piping with a minimum score of 80% or higher.

SECTION E – Water Supply Protection – Pass all assignments and exams on water supply protection with a minimum score of 80% or higher.

SECTION F – Fixtures and Appliances – Pass all assignments and exams on fixtures and appliances with a minimum score of 80% or higher.

SECTION G – Testing and Inspection – Pass all assignments and exams on testing and inspection with a minimum score of 80% or higher.

SECTION H – Plumbing a House – Pass all assignments and exams on plumbing a house with a minimum score of 80% or higher.

SECTION I – Employability Skills Review – Pass all assignments and exams on employability skills review with a minimum score of 80% or higher.

SECTION J – Entrepreneurial Skills – Pass all assignments and exams on entrepreneurial skills with a minimum score of 80% or higher.

Standards for Career Ready Practice

1. Apply appropriate technical skills and academic knowledge.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education. They make connections between abstract concepts with real-world applications and recognize the value of academic preparation for solving problems, communicating with others, calculating measures, and performing other work-related practices.

2. Communicate clearly, effectively, and with reason.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, using written, verbal, electronic, and/or visual methods. They are skilled at interacting with others: they are active listeners who speak clearly and with purpose, and they are comfortable with terminology that is common to workplace environments. Career-ready individuals consider the audience for their communication and prepare accordingly to ensure the desired outcome.

3. Develop an education and career plan aligned with personal goals.

Career-ready individuals take personal ownership of their educational and career goals and manage their individual plan to attain these goals. They recognize the value of each step in the educational and experiential process, and they understand that nearly all career paths require ongoing education and experience to adapt to practices, procedures, and expectations of an ever-changing work environment. They seek counselors, mentors, and other experts to assist in the planning and execution of education and career plans.

4. Apply technology to enhance productivity.

Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring and using new technology. They understand the inherent risks—personal and organizational—of technology applications, and they take actions to prevent or mitigate these risks.

5. Utilize critical thinking to make sense of problems and persevere in solving them

Career-ready individuals recognize problems in the workplace, understand the nature of the problems, and devise effective plans to solve the problems. They thoughtfully investigate the root cause of a problem prior to introducing solutions. They carefully consider options to solve a problem and, once agreed upon, follow through to ensure the problem is resolved.

6. Practice personal health and understand financial literacy.

Career-ready individuals understand the relationship between personal health and workplace performance. They contribute to their personal well-being through a healthy diet, regular exercise, and mental health activities. Career-ready individuals also understand that financial literacy leads to a secure future that enables career success.

7. Act as a responsible citizen in the workplace and the community.

Career-ready individuals understand the obligations and responsibilities of being a member of a community and demonstrate this understanding every day through their interactions with others. They are aware of the impacts of their decisions on others and the environment around them, and they think about the short-term and long-term consequences of their actions. They are reliable and consistent in going beyond minimum expectations and in participating in activities that serve the greater good.

8. Model integrity, ethical leadership, and effective management.

Career-ready individuals consistently act in ways that align with personal and community-held ideals and principles. They employ ethical behaviors and actions that positively influence others. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the direction and actions of a team or organization, and they recognize the short-term and long-term effects that management's actions and attitudes can have on productivity, morale, and organizational culture.

9. Work productively in teams while integrating cultural and global competence.

Career-ready individuals contribute positively to every team, as both team leaders and team members. To avoid barriers to productive and positive interaction, they apply an awareness of cultural differences. They interact effectively and sensitively with all members of the team and find ways to increase the engagement and contribution of other members.

10. Demonstrate creativity and innovation.

Career-ready individuals recommend ideas that solve problems in new and different ways and contribute to the improvement of the organization. They consider unconventional ideas and suggestions by others as solutions to issues, tasks, or problems. They discern which ideas and suggestions may have the greatest value. They seek new methods, practices, and ideas from a variety of sources and apply those ideas to their own workplace practices.

11. Employ valid and reliable research strategies.

Career-ready individuals employ research practices to plan and carry out investigations, create solutions, and keep abreast of the most current findings related to workplace environments and practices. They use a reliable research process to search for new information and confirm the validity of sources when considering the use and adoption of external information or practices.

12. Understand the environmental, societal, and economic impacts of decisions.

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact other people, organizations, the workplace, and the environment. They are aware of and utilize new technologies, understandings, procedures, and materials and adhere to regulations affecting the nature of their work. They are cognizant of impacts on the social condition, environment, workplace, and profitability of the organization.

Statement for Civil Rights

All educational and vocational opportunities are offered without regard to race, color, national origin, gender, or physical disability.



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