Course Outline

Building and Construction Trades **REVISED: August/2017**

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

71-45-70

Plumbing / 1

Credits: 15 **Hours:** 180

Course Description:
This competency-based course is the first 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 orientation, workplace safety rules and regulations, resource management, trade mathematics, and employability skills. Emphasis is placed on the proper selection and use of plumbing materials (including sustainable and green products) and tools, pipefitting techniques, components of the sanitary drainage, vent and storm water drainage systems, the sizing techniques for sanitary drainage and vent piping, and plumbing traps. 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 the Construction Work/1 (71-35-50) course.

NOTE: For Perkins purposes this course has been designated as an **introductory / concentrator** course.

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

Los Angeles Unified School District
Division of Adult and Career Education
Instructional and Couseling Services Unit
Adult Curriculum Office
adultinstruction.org

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	pp. 7-17

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	p. 19
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. 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.	pp. 7-17
EVALUATION PROCEDURES	p. 19
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

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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.

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/1 Course

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
A. ORIENTATION AND SAFETY Understand, apply, and evaluate classroom and workplace policies and procedures used in accordance with federal, state, and local safety and environmental regulations.	1. Define the scope and purpose of the course. 2. Define the overall course content as a part of the Linked Learning. 3. Define classroom policies and procedures. 4. Define classroom and workplace first aid and emergency procedures. 5. Define the different occupations in the Building Trades and Construction Industry Sector which have an impact on the role of the plumbers. 6. Define the opportunities available for promoting gender equity and the representation of non-traditional populations in plumbing. 7. Define the following legislative mandates and their impact on the plumbing trade: 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. Define the purpose of the California Occupational Safety and Health Administration (Cal/OSHA) and its laws governing plumbers. 9. Define the impact of Environmental Protection Agency (EPA) legislation on the Building Trades and Construction Industry Sector practices. 10. Define and demonstrate the procedures for contacting proper authorities for the removal of hazardous materials based on the EPA standards. 11. Define and demonstrate the use of the Material Safety Data Sheet (MSDS) as it applies to the plumbing trade. 12. Define 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.	**Career Ready Practice:** 2, 6, 12 **CTE Anchor:** Communications: 2.3, 2.5 Career Planning and Management: 3.4 Health and Safety: 6.1, 6.2, 6.3, 6.5, 6.6, 6.8, 6.9, 6.11 Ethics and Legal Responsibilities: 8.2, 8.3 Leadership and Teamwork: 9.6 Technical Knowledge and Skills: 10.2 **CTE Pathway:** D1.1, D1.2, D1.3, D9.1, D9.2

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(6 hours)	13. Define 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. Pass the safety test with 100% accuracy.	
B. RESOURCE MANAGEMENT Understand, apply, and evaluate resource management principles and techniques in the plumbing business. (3 hours)	1. Define the following: a. resources b. management c. sustainability d. critical path method (CPM) 2. Describe the management of the following resources in the plumbing business: a. time b. materials c. personnel 3. Describe the following components of CPM and how they impact project management: a. work breakdown structure b. duration c. dependencies 4. List specific examples of effective management of the following in the plumbing business: a. time b. materials c. personnel 5. Describe the benefits of effective resource management in the plumbing business: a. profitability b. sustainability c. company growth 6. Describe the economic benefits and liabilities of managing resources in an environmentally responsible way.	**Career Ready Practice:** 2, 8, 12 **CTE Anchor:** Communications: 2.4 Career Planning and Management: 3.5 Technology: 4.3 Problem Solving and Critical Thinking: 5.1, 5.2, 5.4 Responsibility and Flexibility: 7.1, 7.3, 7.4, 7.6 Technical Knowledge and Skills: 10.1 **CTE Pathway:** D1.1, D2.3, D3.7
C. TRADE MATHEMATICS Understand, apply, and evaluate the mathematical requirements in the workplace.	1. Describe the practical applications of math in plumbing. 2. Describe and demonstrate problem-solving techniques involving whole number problems, using arithmetic operations (addition, subtraction, multiplication, and division). 3. Describe and demonstrate problem-solving techniques involving various fraction problems using arithmetic operations. 4. Describe and demonstrate problem-solving techniques involving various decimal problems using addition, subtraction, multiplication, and division. 5. Describe and demonstrate techniques for changing fractions to decimals. 6. Describe and demonstrate techniques for changing decimals to fractions. 7. Describe the English system of measuring length.	**Career Ready Practice:** 1, 2, 5 **CTE Anchor:** Communications: 2.3 Problem Solving and Critical Thinking: 5.2 **CTE Pathway:** D2.1, D2.2, D2.3

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(10 hours)	8. Describe the English system of measuring weight. 9. Describe the English system of measuring volume or capacity. 10. Describe and demonstrate English and metric problem-solving techniques for various measuring problems using arithmetic operations 11. Describe 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. Describe and demonstrate problem-solving techniques for geometric problems. 17. Describe and demonstrate problem-solving techniques for algebraic problems. 18. Describe and demonstrate problem-solving techniques using percentages. 19. Describe and demonstrate techniques for reading and interpreting graphs. 20. Describe and demonstrate techniques for using a calculator.	
D. MATERIALS Understand, apply, and evaluate the safe use, maintenance, and storage of plumbing materials.	1. Identify and describe the features and functions of the following: a. pipe b. schedule 40 pipe c. fitting d. valve e. meter 2. Describe the meaning of different pipe colors for plastic pipes. 3. Describe and demonstrate the safe use, maintenance, and storage of different types of plastic pipe. 4. Describe the purpose of the following types of plastic fittings: a. elbow b. tee c. coupling d. cap e. bushing f. adapter g. compression fitting h. union i. manifold 5. Identify and describe the features and functions of the following: a. copper pipe b. pressure fitting c. soldering d. solder joint e. rolled groove joint fittings f. flared joint	**Career Ready Practice:** 2, 4, 7, 12 **CTE Anchor:** Ethics and Legal Responsibilities: 8.2 Technical Knowledge and Skills: 10.1 **CTE Pathway:** D10.1

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(15 Hours)	g. compression joint fittings 6. Describe and demonstrate the safe use, maintenance, and storage of copper pipe. 7. Describe the purpose of the following types of copper fittings: a. sanitary tee b. trap c. wye 8. Describe the difference between solder joint fittings, solder joint pressure fittings, solder joint DWV fittings, rolled groove joint fittings, and compression joint fittings. 9. Identify and describe the features and functions of the following: a. cast iron soil pipe b. no-hub cast iron soil pipe c. bell-and-spigot cast iron soil pipe d. compression gasket 10. Describe and demonstrate the safe use, maintenance, and storage of cast iron soil pipe. 11. Describe the purpose of the following types of cast iron fittings: a. bend b. blind plug c. closet flange d. reducer e. gasket f. clean-out plug 12. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures that specify the use of the following: a. plastic pipe and fittings b. copper pipe and fittings c. cast iron soil pipe and fittings 13. Describe the advantages and disadvantages of using plastic pipe and fittings, copper pipe and fittings, and cast iron soil pipe and fittings. 14. Identify and describe the features and functions of the following: a. sillcock or hose bibb b. vacuum breaker c. ball valve d. pressure-reducing valve e. relief valve 15. Describe and demonstrate the safe use, maintenance, and storage of valves. 16. Describe the purpose of different types of valves. 17. Describe the environmental and economic impact of incorporating LEED-approved plumbing materials and practices. 18. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures that specify the use of valves for plumbing systems.	

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
E. TOOLS Understand, apply, and evaluate the safe use, maintenance, and storage of plumbing tools.	1. Identify and describe the features and functions of the following: a. hand tools b. power hand tools c. electric hand tools d. stationary power tools 2. Describe and demonstrate the safe use, maintenance, and storage of the following layout and measuring tools: a. rule and tape b. plumb bob c. torpedo level d. chalk line e. soapstone 3. Describe and demonstrate the safe use, maintenance and storage of the slip-joint pliers and pipe vises. 4. Describe and demonstrate the safe use, maintenance, and storage of the following cutting and drilling tools: a. power saws: reciprocating saw and portable band saw b. hand saws: universal saw, keyhole saw, hacksaw, jab c. snips: sheet metal snips, aviation snips d. portable drills: right-angle, pistol grip, hammer-drill, rotary hammer, core drill e. drill bits: solid bit, twist drill, spade bit, self-feed bit, multi-piece bit, hole saw, depth guide, core bit 5. Describe and demonstrate the safe use, maintenance, and storage of the following plastic pipe tools and equipment: a. chop saw b. ratchet cutter c. scissors cutter d. pencil-type and cone-type deburring tools 6. Describe and demonstrate the safe use, maintenance, and storage of the following copper pipe tools and equipment: a. tubing cutter b. inside and outside pipe cleaning tools c. methylacetylene propadiene stabilized gas (MAPP) torch d. spring bender 7. Describe and demonstrate the safe use, maintenance, and storage of the following cast iron soil pipe tools and equipment: a. cutting and grinding tools: ratchet cutter, squeeze cutter, hydraulic cutter, grinder b. assembly tools: rubber gaskets, bell-and-spigot gaskets, stainless steel clamp assembly, t-handled torque wrench, nut driver c. compression gasket tools: soil pipe assembly tool, lead maul 8. Describe and demonstrate the safe use, maintenance, and storage of the following: a. finishing tools: smooth-jawed pliers, hex wrench, adjustable wrench b. specialty assembly tools: basin wrench, strap wrench,	**Career Ready Practice:** 1, 2, 4, 6, 12 **CTE Anchor:** Communications: 2.3 Health and Safety: 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.12 Technical Knowledge and Skills: 10.5 **CTE Pathway:** D10.1

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(15 Hours)	basket strainer wrenches, rim wrench c. cutting tools: internal tubing cutter, jab saw 9. Describe and demonstrate the safe use, maintenance, and storage of the following testing tools and equipment: a. mechanical and inflatable test plugs b. test cap c. test gauge 10. Describe and demonstrate the safe use, maintenance, and storage of the following digging and lifting tools: a. shovel and pick b. ratchet lever c. chain lever hoists 11. Describe excavation protection systems and the OSHA regulations that pertain to trenching and excavations.	
F. PIPEFITTING Understand, apply, and evaluate the techniques for joining, installing and supporting pipe.	1. Define the following: a. solvent cementing/solvent welding b. primer c. interference fit d. outside diameter e. inside diameter 2. Describe the difference between the joining methods for the following pipes: a. ABS b. PVC c. CPVC d. PEX 3. Describe and demonstrate the safety precautions to take when working around primer and solvent cement. 4. Describe and demonstrate the proper procedure for the preparation and assembly of plastic pipe and fittings. 5. Describe and demonstrate the proper procedures for preparing and installing both expanded and crimped PEX tubing. 6. Define the following: a. 95-5 solder b. lead-free solder c. flux d. soldering e. brazing 7. Describe and demonstrate the proper procedure for the preparation and assembly of the following: a. soldered copper pipe and fittings b. brazed copper pipe and fittings c. flared joints d. compression joints e. no-hub cast iron soil pipe joints f. bell-and spigot cast iron soil pipe compression gasket joints 8. Compare the advantages and disadvantages of threaded pipe joints to cut groove pipe joints. 9. Describe the importance of installing and supporting pipe correctly.	**Career Ready Practice:** 1, 2 **CTE Anchor:** Problem Solving and Critical Thinking: 5.3 Technical Knowledge and Skills: 10.1, 10.3 Demonstration and Application: 11.1, 11.2 **CTE Pathway:** D2.2, D10.1, D10.2, D10.3, D10.5, D10.6

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(35 Hours)	10. Describe and demonstrate the proper procedure for installing underground pipe. 11. Describe and demonstrate the proper anchors and anchoring accessories for the following: a. concrete and solid masonry b. hollow wall c. hollow masonry 12. Describe and demonstrate the proper support brackets for the following: a. wood-frame construction b. metal-frame construction c. adjacent pipes 13. Define the following: a. horizontal b. vertical 14. Describe and demonstrate the use of the following: a. various accessories for maintaining the alignment of vertical pipe b. various accessories for supporting horizontal pipe 15. Describe and demonstrate the proper procedures for hanging and supporting aboveground pipe, including changes in pipe direction. 16. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures that specify the assembly of the following: a. plastic pipe and fittings b. copper pipe and fittings c. cast iron pipe and fittings d. the permitted spacing of and supports for above ground pipe	
G. SANITARY DRAINAGE, VENT, AND STORM WATER DRAINAGE (DWV) SYSTEMS Understand and apply the design of sanitary drainage, vent and storm water drainage systems.	1. Identify and describe the features and functions of the following: a. sanitary drainage b. vent c. storm water 2. Describe the purpose of sanitary drainage, vent and storm water drainage systems. 3. Describe the reasons for using ABS and PVC materials for DWV piping. 4. Describe the factors that influence the design of sanitary drainage, vent and storm water drainage systems. 5. Identify and describe the features and functions of the following: a. soil pipe b. waste pipe c. horizontal pipe d. vertical pipe e. fixture f. drainage fixture unit (DFU)	**Career Ready Practice:** 2, 7, 12 **CTE Anchor:** Problem Solving and Critical Thinking: 5.2, 5.3 Ethics and Legal Responsibilities: 8.2 Technical Knowledge and Skills: 10.1, 10.2, 10.3 Demonstration and Application: 11.1, 11.2

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
	g. horizontal branch drain h. stack i. branch interval j. offset stack 6. Describe DFU values for common plumbing fixtures. 7. Describe and demonstrate the use of a sizing table to calculate the drain size based on two buildings with different numbers and types of fixtures. 8. Describe the order in which building drains are sized. 9. Describe all the factors that are taken into account when designing a horizontal waste pipe. 10. Sketch and calculate the maximum load for a horizontal branch drain for two plumbing systems with different numbers and types of fixtures. 11. Define the following terms that relate to sanitary drainage piping installation: a. grade or pitch b. changes in direction c. cleanout 12. Describe factors that can affect the horizontal drainage piping grade or pitch. 13. Describe the importance of selecting the proper fittings for changes in direction. 14. Sketch a DWV system, showing the proper fittings, where there is a change: a. from the horizontal to the vertical b. from the horizontal to the horizontal 15. Describe the proper locations for cleanouts. 16. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for sanitary drainage piping regarding: a. materials b. DFU values c. fixture unit equivalents d. size of piping e. changes in direction of flow f. cleanouts g. grade of horizontal piping h. gravity requirement 17. Define the following terms that relate to sanitary drainage piping venting: a. vent pipes b. atmospheric pressure (minus and plus) c. vacuum d. water seal trap e. trap seal loss f. siphonage g. back pressure 18. Identify and describe the features and functions of vent pipes. 19. Describe the importance of a fully-functioning vent system. 20. Describe the relationship between atmospheric pressure and	**CTE Pathway:** D2.1, D2.2, D2.6, D2.7, D3.4, D4.1, D4.2, D4.5, D4.6, D4.7, D10.5, D10.7, D10.8

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(35 Hours)	the drainage system. 21. Define and describe the relationship between trap seal loss, siphonage, and back pressure. 22. Describe causes of retarded flow in the drainage system. 23. Describe the effect of sewer gas on the drainage system and the method used to reduce this effect. 24. Describe the function of the stack vent and the vent stack. 25. Define developed length of a vent pipe. 26. Describe how vent pipes are sized. 27. Describe the sizing and length of vent stacks based on DFU and soil or waste stack size. 28. Describe the sizing and length of individual, branch, circuit and stack vents based on DFU. 29. Define and describe the function and procedure for installing of a stack terminal. 30. Define and describe the importance of proper trap-to-vent distance. 31. Define and describe the function of: individual vent, common vent, branch vent, wet vent. 32. Sketch and demonstrate the set-up of a combination vent piping system. 33. Define and describe the function of the storm water drainage system versus the sewage system. 34. Compare the common features of the storm water drainage system and the sanitary drainage system. 35. Define and describe the function and installation procedures for roof drains and storm drain traps. 36. Define and describe the relationship between projected roof area and rainwater leader. 37. Describe the sizing and length of horizontal storm drain size based on drain diameter and roof slope. 38. Describe green and sustainable practices in constructing storm water drainage systems. 39. Sketch and demonstrate the set-up of a storm water drainage system including storm drains, rainwater leaders, and storm drain traps. 40. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for vents and storm drainage.	
H. SIZING SANITARY DRAINAGE AND VENT PIPING Understand and apply the construction of sanitary drainage, vent and storm water drainage systems for residential and commercial buildings.	1. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for fixture connections and joints and connections for sanitary drainage systems. 2. Review the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for sanitary drainage piping and vents. 3. Review the symbols used in piping drawings. 4. Identify and describe the features and functions of the following: a. one-story dwelling b. one-family dwelling c. two-story dwelling	**Career Ready Practice:** 1, 2, 6, 7, 12 **CTE Anchor:** Communications: 2.3 Problem Solving and Critical Thinking: 5.2, 5.3

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(30 Hours)	d. duplex residence 5. Perform the following for a one-story, one-family dwelling: a. describe the typical type and number of plumbing fixtures b. sketch and size the drainage and vent requirements, including a bathroom stack with individually-vented fixtures c. create a materials list d. demonstrate drain and vent assembly procedures 6. Perform the following for a two-story, one-family dwelling: a. describe the typical type and number of plumbing fixtures b. sketch and size the drainage and vent requirements, including a bathroom stack with individually-vented fixtures c. create a materials list d. demonstrate drain and vent assembly procedures 7. Perform the following for a duplex residence: a. describe the typical type and number of plumbing fixtures b. sketch and size the drainage and vent requirements, including a bathroom stack with individually-vented fixtures c. create a materials list d. demonstrate drain and vent assembly procedures	Ethics and Legal Responsibilities: 8.2 Technical Knowledge and Skills: 10.1, 10.2, 10.3 Demonstration and Application: 11.1, 11.2 **CTE Pathway:** D1.1, D2.1, D2.3, D2.7, D3.4, D4.1, D5.4, D10.5, D10.6
I. PLUMBING TRAPS Understand, apply, and evaluate the importance of traps in a sanitary drainage system.	1. Identify and describe the features and functions of the following: a. trap b. trap seal 2. Review how a vent system makes a trap more efficient. 3. Describe the parts of a trap. 4. Describe how traps are sized based on the DFU. 5. Describe the function of a cleanout for a trap. 6. Identify and describe the features and functions of the following: a. common seal P-trap b. deep-seal P-trap c. indirect waste pipe d. anti-siphon P-trap e. running trap f. drum trap 7. Describe the advantage and disadvantage of a deep-seal P-trap. 8. Describe the following regarding P-traps: a. diameter dimensions b. material composition c. installation requirements d. protection against freezing 9. Describe the advantage and disadvantage of an anti-siphon trap and a drum trap. 10. List and describe prohibited traps. 11. Review how trap seal loss can occur. 12. Review the concept of trap siphonage.	**Career Ready Practice:** 2 **CTE Anchor:** Problem Solving and Critical Thinking: 5.2, 5.3, 5.4 Ethics and Legal Responsibilities: 8.2, 8.3, 8.7 Technical Knowledge and Skills: 10.2, 10.3 Demonstration and Application: 11.1 **CTE Pathway:** D2.1, D2.3, D3.3, D3.4, D10.1, D10.6, D10.7

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(25 Hours)	13. Define and describe how self-siphonage and siphonage by momentum can occur. 14. Review how back pressure can occur. 15. Define and describe how evaporation can occur. 16. Describe how a trap primer can prevent trap seal loss by evaporation. 17. Describe the importance of testing and protecting a trap against leaks. 18. Describe the effect of high-velocity wind on the trap seal. 19. Describe the current Uniform Plumbing Code and Los Angeles Plumbing Code procedures for traps. 20. Perform the following for a one-story, one-family dwelling with drains, vents and fixtures installed: a. sketch and size the trap requirements b. create a materials list c. demonstrate trap assembly procedures	
J. EMPLOYABILITY SKILLS Understand, apply, and evaluate the employability skills required in plumbing installation. (6 Hours)	1. Summarize 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. Identify potential employers through traditional and internet sources. 3. Define the role of social media in job search. 4. Design sample résumés and cover letters. 5. Define the importance of filling out a job application legibly, with accurate and complete information. 6. Complete sample job application forms correctly. 7. Define the importance of enthusiasm on a job. 8. Define the importance of appropriate appearance on a job. 9. Define the importance of the continuous upgrading of job skills. 10. Define customer service as a method of building permanent relationships between the organization and the customer. 11. Define and demonstrate appropriate interviewing techniques. 12. Identify the informational materials and resources needed to be successful in an interview. 13. Design sample follow-up letters. 14. Define and demonstrate appropriate follow-up procedures.	**Career Ready Practice:** 2, 3, 10 **CTE Anchor:** Communications: 2.2, 2.4 Career Planning and Management: 3.1, 3.2, 3.3, 3.4, 3.8, 3.9 Responsibility and Flexibility: 7.2, 7.7 **CTE Pathway:** D1.1

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

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 – Pass all assignments and exams on resource management with a minimum score of 80% or higher.

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

SECTION D – Materials – Pass all assignments and exams on materials with a minimum score of 80% or higher.

SECTION E – Tools – Pass all assignments and exams on tools with a minimum score of 80% or higher.

SECTION F – Pipefitting – Pass all assignments and exams on pipefitting with a minimum score of 80% or higher.

SECTION G – Sanitary Drainage, Vent, and Storm Water Drainage (DWV) Systems – Pass all assignments and exams on sanitary drainage, vent, and storm water drainage (DWV) systems with a minimum score of 80% or higher.

SECTION H – Sizing Sanitary Drainage and Vent Piping – Pass all assignments and exams on sizing sanitary drainage and vent piping with a minimum score of 80% or higher.

SECTION I – Plumbing Traps – Pass all assignments and exams on plumbing traps with a minimum score of 80% or higher.

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

Statement for Civil Rights

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