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Part 50: Architecture and Construction, Career Pathway

Plumbing

Plumbing

Mississippi Department of Education

2012

Program CIP: 46.0503 – Plumbing Technology/Plumber

Note: This document will be completed in its entirety upon implementation in a Career and Technical Center.

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The Research and Curriculum Unit (RCU), located in Starkville, MS, as part of Mississippi State University, was established to foster educational enhancements and innovations. In keeping with the land grant mission of Mississippi State University, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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Ms. Kami Bumgarner
Mr. Howell "Hal" N. Gage
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Ms. Rosetta Richards
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Standards

Standards are superscripted in each unit and are referenced in the appendices. Standards in the *Plumbing Curriculum Framework and Supporting Materials* are based on the following:

National Center for Construction Education Research, Plumbing
The NCCER developed and published a set of industry standards that are taught nationwide by contractors, associations, construction users, and secondary and postsecondary schools called the Contren Learning Series. When developing this set of standards, the NCCER assembled a team of subject matter experts that represented construction companies and schools across the nation. Each committee met several times and combined experts' knowledge and experience to finalize the set of national industry standards. http://www.nccer.org/

Common Core State Standards Initiative
The Common Core State Standards© provide a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them. The standards are designed to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers. With American students fully prepared for the future, our communities will be best positioned to compete successfully in the global economy. Copyright 2010. National Governors Association Center for Best Practices and Council of Chief State School Officers. All rights reserved. States and territories of the United States as well as the District of Columbia that have adopted the Common Core State Standards in whole are exempt from this provision and no attribution to the National Governors Association Center for Best Practices and Council of Chief State School Officers is required. Reprinted from http://www.corestandards.org/.

National Educational Technology Standards for Students
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21st Century Skills and Information and Communication Technologies Literacy Standards
In defining 21st century learning, the Partnership for 21st Century Skills has embraced five content and skill areas that represent the essential knowledge for the 21st century: global awareness; civic engagement; financial, economic, and business literacy; learning skills that encompass problem-solving, critical-thinking, and self-directional skills; and Information and Communication Technology (ICT) literacy.

Preface

Secondary career– technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act IV, 2007; and No Child Left Behind Act of 2001).

Plumbing Executive Summary

Pathway Description
Plumbing is a pathway in the Architecture and Construction career cluster. Study in the course allows an individual to prepare for employment and/or continued education in the plumbing field. Skills developed through the course of study assist students in meeting requirements for the NCCER certification. Students are provided the opportunity to participate in Career and Technical Student Organizations to include SkillsUSA.

Industry Certification
The NCCER developed and published a set of industry standards that are taught nationwide by contractors, associations, construction users, and secondary and postsecondary schools called the Contren Learning Series. When developing this set of standards, the NCCER assembled a team of subject matter experts that represented construction companies and schools across the nation. Each committee met several times and combined experts' knowledge and experience to finalize the set of national industry standards.

As a part of the accreditation process, all Mississippi construction instructors will be required to successfully complete the Instructor Certification Training Program. This program ensures that instructors possess a deep knowledge of content of the standards.

This state-of-the-art curriculum is modeled after the eight Mississippi NCCER Accredited Training and Education Facilities (ATEF). In order to become an NCCER ATEF program, school districts must meet a set of guidelines including the following:

1. Use the approved curriculum.
2. All instructors must be NCCER certified.
3. All completed Form 200s and release forms on all student completions are to be forwarded to MCEF for proper approval. MCEF will in turn forward to NCCER for processing.
4. Follow NCCER guidelines on test security and performance profiles.
5. Have an active advisory committee with at least two commercial contractors involved.
6. Follow safety practices and Occupational Safety and Health Administration (OSHA) standards used in the class and lab areas.
7. Involve commercial contractors in class presentations or field trips.
8. All construction programs must be included in the accreditation process.
9. Show active involvement in student leadership development (e.g., VICA and SkillsUSA).
10. Provide demonstrated placement into construction-related occupations and timely reports to MCEF.

Districts will be required to complete a self-evaluation of all programs and host a site visit from industry to ensure proper lab, safety, and instructional procedures are in place.

Assessment

Students will be assessed using the Plumbing MS-CPAS2 test. The MS-CPAS2 blueprint will be developed and placed online once the curriculum is implemented. A test will be developed once the curriculum is implemented. All students will test after year one of the Construction program. A second test covering the second year material in Plumbing will be administered to students upon completion of their program. If there are questions regarding assessment of this program, please contact the Architecture and Construction Instructional Design Specialist at the Research and Curriculum Unit at 662.325.2510.

Student Prerequisites
In order for students to be successful in the Plumbing program, the following student prerequisites are in place:

1. C or higher in English (the previous year)
2. C or higher in math (last course taken or the instructor can specify the math)

or

3. Instructor approval and TABE Reading Score (eighth grade or higher)

or

4. Instructor approval

Licensure Requirements

980 Career Pathway: Plumbing

This endorsement licenses a person to teach the following secondary courses:

993101 Construction
993102 Safety and Orientation to Construction
993103 Introduction to Construction
993140 Plumbing
993141 Theory and Application of Plumbing I
993142 Theory and Application of Plumbing II

Minimum Requirements for this Endorsement:

1. Education

-Applicant must have earned a two-year college degree (associate degree) or higher from an accredited institution of higher education. [Exception: Teachers with a currently valid license and endorsement #363 Plumbing and Pipe Fitting may earn this endorsement based on that #363 endorsement even if two-year college degree is not earned. All other requirements for this endorsement must be satisfied.]

2. Technology Literacy and Related Assessment of that Competency

-Applicant must validate technology competency by attaining the established minimum score or higher on an assessment approved by the Mississippi Department of Education (MDE). The assessment must be directly related to technology competency required by the grade level and subject matter being taught. Approved assessments for this license are IC3, Propulse, or other specific assessment created by third-party vendors, authorized by the Local Education Agency (LEA) and approved by the MDE.

3. Occupational Experience and Related Assessment of that Experience

-Applicants with an associate degree must have at least two years of verifiable occupational experience in the past ten years. Experience must be appropriate to the subject to be taught.
- Applicants with a bachelor or higher degree must have at least one year of verifiable occupational experience in the past ten years. Experience must be appropriate to the subject to be taught.

This endorsement requires the following assessment(s) of occupational expertise:

National Center for Construction Education and Research (NCCER), National Craft Assessment and Certification Program: Earn required score on Plumber assessment.

OR

Other teacher occupational competency assessment approved by MDE Office of Career and Technical Education.

4. Teacher Education Preparation and Related Assessment(s) of that Education

-Applicant must enroll immediately in Vocational Instructor Preparation (VIP) program or the College and Career Readiness Educator Program (CCREP).
-Applicant must complete the individualized professional development plan (PDP) requirements of the VIP or CCREP program prior to the expiration date of the three-year vocational license.
- Applicant must successfully complete the Contren Instructor Certification.
-Applicant must successfully complete a Certification for online learning workshop, module, or course that is approved by the Mississippi Department of Education.

- Applicant must successfully complete the Construction Certification workshop, module, or course that is approved by the Mississippi Department of Education.

Note #1: If the applicant meets all requirements listed above, that applicant will be issued a 980 endorsement—a five-year license. If the applicant does not meet all requirements, the applicant may be issued a three-year endorsement (license), and all requirements stated above must be satisfied prior to the ending date of that license.

Professional Learning

The professional learning itinerary for the middle school or individual pathways can be found at the Research and Curriculum Unit's Web site (www.rcu.msstate.edu). If you have specific questions about the content of each training session provided, please contact the RCU at 662.325.2510 and ask for the Professional Learning Specialist.

Course Outlines

Option 1—Two One-Carnegie-Unit Courses

Course Description: The Theory and Application of Plumbing I course consists of an in-depth study of plumbing safety, math, drawings, and materials and fittings. This one-Carnegie-unit course should only be taken after students successfully pass Safety and Orientation to Construction and Introduction to Construction.

Course Description: The Theory and Application of Plumbing II course consists of an in-depth study of fixtures and faucets; drain, waste, and vent (DWV) systems; and water distribution systems. This one-Carnegie-unit course should only be taken after students successfully pass Theory and Application of Plumbing I.

Theory and Application of Plumbing I—Course Code: 993141

Unit Number	Unit Name	Hours
1	Introduction and Orientation	10
2	Basic Safety	20
3	Plumbing Math	30
4	Plumbing Drawings	20
5	Plumbing Materials and Fittings	30
Total		110

Theory and Application of Plumbing II—Course Code: 993142

Unit Number	Unit Name	Hours
6	Fixtures and Faucets	20
7	Introduction to Drain, Waste, and Vents (DWV) Systems	45
8	Introduction to Water Distribution Systems	45
Total		110

Option 2—One Two-Carnegie-Unit Courses

Course Description: The Plumbing course consists of an in-depth study of plumbing safety; math; drawings; fixtures and faucets; introduction to drain, waste, and vent (DWV) systems; and water distribution systems. This two-Carnegie-unit course should only be taken after students successfully pass Construction. Upon the completion of the two courses, students will have the knowledge to complete the Contren Level I Certification.

Plumbing—Course Code:993140

Unit Number	Unit Name	Hours
1	Introduction and Orientation	10
2	Basic Safety	20
3	Plumbing Math	30
4	Plumbing Drawings	20
5	Plumbing Materials and Fittings	30
6	Fixtures and Faucets	20
7	Introduction to Drain, Waste, and Vents (DWV) Systems	45
8	Introduction to Water Distribution Systems	45
Total		220

Plumbing Research Synopsis

Introduction

Needs of the Future Workforce

Employment (with industry job data BLS/EMSI table)

Occupational title	Employment, 2006	Projected employment, 2016	Change 2006–2016		Mean annual wage (in dollars)
			Number	Percent	

Perkins IV Requirements
Entrepreneurship and Free Enterprise (if applicable)
Workforce Learning
Pathway Map (provide link to graphic)

Curriculum Content

Summary of Standards
Industry Certification (Provide Crosswalk Table—not part of curriculum document)
Applied Academic Credit (Provide Crosswalk Table—not part of curriculum document)

Academic Infusion

Subheadings of academic areas if needed

Case Studies (not part of curriculum document)

Transition to Postsecondary Education (if applicable)

Dual Enrollment
Program of Study

Professional Preparation

Teacher Competence
Teacher Licensure

Assessment

Best Practices

Innovative Instructional Technologies
Differentiated Instruction
Career and Technical Education Student Organizations
Cooperative Learning
Dynamic Instruction/Assessment
Field Experience/Lab Experience

Conclusions

Professional Organizations

Organization Name
Address
City, ST #####
###.###.####
Web site link

Organization Name
Address
City, ST #####
###.###.####
Web site link

Organization Name
Address
City, ST #####
###.###.####
Web site link

Using this Document

Unit Number and Title

Suggested Time on Task
An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie-unit credit. The curriculum framework should account for approximately 75–80% of the time in the course.

Competencies and Suggested Performance Indicators
A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested performance indicators represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Suggested Teaching Strategies
This section of each unit indicates research-based strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies that reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.

Suggested Assessment Strategies
This section indicates research-based strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

Integrated Academic Topics, 21st Century Skills and Information and Communication Technology Literacy Standards, ACT College Readiness Standards, and Technology Standards for Students
This section identifies related academic topics as required in the Subject Area Testing Program (SATP) in Algebra I, Biology I, English II, and U.S. History from 1877, which are integrated into the content of the unit. Research-based teaching strategies also incorporate ACT College Readiness standards. This section also identifies the 21st Century Skills and Information and Communication Technology Literacy skills. In addition, national technology standards for students associated with the competencies and suggested objectives for the unit are also identified.

References
A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested, and the list may be modified or enhanced based on needs and abilities of students and on available resources.

Plumbing
Unit 1: Introduction and Orientation

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Describe local program and vocational center policies and procedures. DOK 1, EMP		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Describe local program and vocational center policies and procedures, including dress code, attendance, academic requirements, discipline, shop and/or lab rules and regulations, and transportation regulations.	a. Present local program and vocational center policies and procedures. Show students a safety video, such as Farm Bureau Shop and Farm Safety, and lead a class discussion concerning the importance of safety in the shop. Instructor will discuss shop-safety rules. Students will read the handbook to become aware of what is expected of them in relation to the policies and procedures of the school. This will include dress code, attendance, academic requirements, discipline, and transportation regulations. Students will work together in pairs. A student with a higher reading ability will team up with a student with a lower reading ability to get a better understanding of the school's program policies and procedures. Students will create and role-play shop-safety scenarios. **NOTE: Required written tests will follow each section of guidelines for shop and/or lab safety rules and procedures.**	a. Students and parents will sign a contract agreeing to school policies and procedures. Submit written report on rules and regulations. Explanation of local student-handbook requirements. Exercises to identify equipment and functions found in the school lab. Assess student orientation knowledge through teacher observations and written unit test. File completed test to document student mastery of the school and program policies and procedures. **NOTE: Students are required to complete the written safety test with 100% accuracy before entering the shop for lab activities. This test will be documented in the student file.**

Competency 2: Describe employment opportunities and responsibilities. DOK1, EMP		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Describe employment opportunities, including potential earnings, employee benefits, job availability, working	a. Use the Contren Series Core Text and online, Basic Employability Skills Unit and Carpentry Level I, Orientation to the Trade Unit to define trade terms related to basic employability skills. Discuss the chapter and perform the related activities to promote	a. Assessment will be determined by a matching test for definitions and the level of success regarding the Contren activities.

conditions, and educational requirements.	awareness of employability skills. Students will use career software, such as *Choices*, to measure their aptitudes and abilities for particular careers. Students will use the Internet to research a list of careers for which they will be qualified upon program completion. Students will use available resources (college catalogs, college websites) to research information about postsecondary educational opportunities. Students will select a career in the field and outline educational and skill requirements, expected job growth, and entry-level salaries. Utilize the Ask an expert on the MSU website to conduct research on the chosen career. Discuss the parts of a résumé, cover letter, and/or job application and provide each student a written sample. Have each student use the Internet or newspapers to choose a job for which they are qualified and prepare a résumé and cover letter that can be used to apply for the selected job.	Lessons involving writing and math skills will be integrated with the appropriate department. Use a checklist to evaluate the resume and cover letter. Use a checklist to evaluate the presentation. Review career software printout to assess student aptitudes and abilities.
b. Describe basic employee responsibilities and appropriate work ethics.	b. Discuss basic employee responsibilities to include punctuality, honesty, and initiative. Have the students role-play various scenarios related to employee responsibilities.	b. Assess the role-playing exercise using the role-play or skit rubric.

Competency 3: Explore leadership skills and personal development opportunities provided students by student organizations to include SkillsUSA. DOK2, EMP

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Demonstrate effective teambuilding and leadership skills.	a. Bring a current or former member to discuss the student organization. Have the students brainstorm community service and organize a community service project. Have students research leaders in construction and prepare a written and/or oral presentation. Include leadership responsibilities, qualities, and so forth. Show students SkillsUSA promotional video. Develop a construction crew for various projects. A crew leader will oversee the projects.	a. Assess the individual components of the project using a rubric. Include teamwork, leadership, and efficiency. Use a written and presentation rubric to assess the research project.

Competency 4: Demonstrate the ability to follow verbal and written instructions and communicate effectively in job situations. DOK2, COM

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Follow basic written and verbal instructions.	a. Utilize Contren module on communication skills in text and online to present concepts and ideas. Engage students in a game such as Simon Says to introduce the importance of following instructions. Give students a list of simple tasks which require action. Have students complete tasks according to written instructions only. Give students a list of verbal instructions which require action. Have students complete tasks according to verbal instructions only. Have students discuss the pros	a. Utilize rubrics and checklists for following written and verbal instructions. Utilize established rubrics for classroom discussion.

	and cons of trying to follow written and verbal instructions and the importance of following instructions thoroughly. Have students follow the emergency-drill procedures.	
b. Effectively communicate in on-the-job situations.	b. Guide students in a brainstorming session of different ways people communicate. Divide students into pairs to simulate an interview process. One student would be the potential employer and be supplied with questions generated by the instructor. The other student would be the applicant. The dialogue could be videotaped and shown to the class for discussion about strengthens and weakness of the communication. Assign students to a group project which requires them to make class presentations in various formats, such as Photo Story, PowerPoint, Movie Maker, or another format. Assign different formats to each group and discuss the strengths and weaknesses of each format after the presentation.	b. Utilize established interview rubrics for interview process. Utilize established presentation rubrics for group presentations.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Calibri 10-point font

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need, e..g., drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Unit 2: Basic Safety

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Describe general safety rules for working in a shop and/or lab and industry. DOK1, SAF		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Describe how to avoid on-site accidents.	a. Identify, discuss, and demonstrate terms, rules, and procedures related to shop and/or lab and industry safety. (Contren Core Text Basic Safety Unit and Level I Orientation to the Trade Unit in text and online). Provide the students with a list of safety terms and have them define the terms. Pair the students to quiz each other on the definitions in preparation for a written exam.	a. Student participation will be monitored by the teacher, and the written exam will be utilized to test student knowledge.
b. Explain the relationship between housekeeping and safety.	b. Using the guidelines provided for personal safety (i.e., clothing, jewelry, hair, eyes, and ears), divide the students into pairs and assign each pair one of the guidelines. Each pair will demonstrate the "dos and don'ts" of the guideline.	b. The "dos and don'ts" exercise will be critiqued with a peer review.
c. Explain the importance of following all safety rules and company safety policies.	c. Have an industry speaker present to the class the necessity of safety in the work environment. The students will write a summary of the presentation. NOTE: SAFETY IS TO BE TAUGHT AS AN ONGOING PART OF THE COURSE THROUGHOUT THE YEAR.	c. The summary of the speaker's presentation will be critiqued using a rubric.
d. Explain the importance of reporting all on-the-job injuries, accidents, and near misses.	d. Divide the students into teams and have them develop scenarios of hazards and accidents using the Contren Series Core Text, Basic Safety Unit, publications, and the Internet. This will include tools, spills, working around welding, improper use of barriers, ladders or scaffolds, use of Material Safety Data Sheet (MSDS) information, fires, and electrical situations. In a game-type situation, one team will read a scenario, and the other teams will compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation or accident. Points will be awarded to the teams with the correct answers.	d. The teams will be rewarded according the points earned from the game. This could be extra points, classroom privileges, and so forth.
e. Explain the need for evacuation policies and the importance of following them.	e. Review and practice evacuation procedures. Required written tests will follow each section of guidelines for safety rules and procedures.	e. Written exam will be graded.
f. Explain the need for an employer substance abuse policy and how it relates to safety.	f. Have the class discuss various scenarios concerning operating equipment will under the influence of substances. Required written tests will follow each section of guidelines for safety rules and procedures.	f. Written exam will be graded.

Competency 2: Identify and apply safety around welding operations. DOK1, SAF		
Suggested Performance	**Suggested Teaching Strategies**	**Suggested Assessment**

Indicators		Strategies
a. Use proper safety practices when welding or working around welding operations.	a. Show illustrations of injuries caused by failure to observe safety precautions in welding operations. Have a welding professional speak to the class concerning safety. Students will write a brief report on speaker's message and content.	a. Assess students' written work with an established rubric.
b. Use proper safety practices when welding in or near trenches and excavations.	b. Have students observe a welding operation and see the first-hand dangers associated with welding.	b. Utilize Contren written and performance assessments.
c. Explain the term *proximity work*.	c. Have the students discuss various scenarios for the dangers of proximity work. Required written tests will follow each section of guidelines for safety rules and procedures.	c. Written exams will be graded.

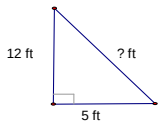
Competency 3: Explain the appropriate safety precautions to take around common job-site hazards. DOK1, SAF

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Explain the safety requirements for working in confined areas.	a. Define terms related to confined space hazards. Provide color-coded illustrations of common safety barriers and barricades. Have students identify common safety colors to demonstrate awareness of coding.	a. Use a checklist to observe student understanding of lockout and/or tag-out procedure.
b. Explain and practice lockout and/or tag-out procedures.	b. Demonstrate lockout and/or tag-out procedures and provide safety rules related to these procedures. Have students perform lockout and/or tag-out on a piece of shop or lab equipment.	b. Utilize Contren written and performance assessments.
c. Explain the different barriers and barricades and how they are used.	c. Divide the students into teams and have them develop scenarios of hazards and accidents using the Contren Series Core Text, Basic Safety Unit, publications, and the Internet. This will include tools; spills; working around welding; improper use of barriers, ladders, or scaffolds; use of MSDS information; fires; and electrical situations. In a game-type situation, one team will read a scenario, and the other teams will compete to be the first to provide the proper safety measures which should have been used to prevent the hazardous situation or accident. Points will be awarded to the teams with the correct answers.	c. The teams will be rewarded according the points earned from the game. This could be extra points, classroom privileges, and so forth.

Competency 4: Demonstrate the appropriate use and care of personal protective equipment (PPE). DOK2, SAF

Suggested Performance Indicators	Suggested Teaching Strategies	Suggested Assessment Strategies
a. Identify commonly used personal protective equipment items.	a. Have an industry speaker present to the class the necessity of safety in the work environment. The students will write a summary of the presentation.	a. Utilize established written project rubric. Observe student activity to evaluate concept retention. Evaluate student presentations according to established rubric.

b. Understand proper use and care of PPE.	b. Provide examples of damaged or misused safety equipment and allow students to identify defects. Have students create a poem, song, or rap which includes relevant information about using and caring for PPE.	b. Utilize Contren written and performance assessments.

Competency 5: Explain lifting and the use of ladders and scaffolds. DOK1, SAF ALGI4		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Identify and explain the procedures for lifting heavy objects.	a. Have students design posters depicting the correct and incorrect ways to lift. Have students demonstrate safe-lifting procedures.	a. Utilize established poster presentation rubric for assessing student work. Utilize checklists to evaluate student performance.
b. Inspect and safely work with various ladders and scaffolds.	b. Discuss ladder safety and OSHA and ANSI requirements related to ladder safety. Have students demonstrate proper ladder usage Have the students solve for the missing side of a right triangle using the Pythagorean Theorem. For example, a construction worker needs a ladder to reach the top of a building that is 12 ft. high. The ladder will safely rest on the ground 5 ft from the bottom of the building. How long should the worker let out the ladder?  	b. Utilize an answer key to evaluate the problem-solving situation. Utilize Contren written and performance assessments.

Competency 6: Explain the Material Safety Data Sheets (MSDS). DOK1, SAF		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Explain the function of the MSDS.	a. Provide students with examples of MSDS. Explain parts of MSDS.	a. Utilize group work rubric for evaluating student work
b. Interpret the requirements of the MSDS.	b. Have students work in groups to locate information from MSDS.	b. Utilize Contren written and performance assessments.

Competency 7: Explain fires. DOK1, SAF		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Explain the process by which fires start.	a. Illustrate the fire triangle (using Contren text and Contren Connect, internet resources, or power point presentations.)	a. Check terminology through matching quiz or other objective assessment.
b. Explain fire prevention of various flammable liquids.	b. Provide students with necessary terminology. Explain the classes of fires and the applicable fire extinguishers to put out these types of fires.	b. Use established group discussion rubric to evaluate student participation.
c. Explain the classes of fire and the types of extinguishers.	c. Bring in local fire department to give a fire-safety presentation and lead class in discussion about fires.	c. Utilize Contren written and performance assessments.

Competency 8: Explain safety in and around electrical situations. DOK1, SAF		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Explain injuries when electrical contact occurs.	a. Have students brainstorm potential injuries from electrical shock to check prior knowledge. Use pictures and graphics to illustrate electrical injuries and hazards.	a. Use established classroom-discussion rubric to evaluate student participation.
b. Explain safety around electrical hazards.	b. Utilize Allied Health students or other medical personnel to explain electrical-injury first aid.	b. Observe student participation in discussions by outside presenters.
c. Explain action to take when an electrical shock occurs.	c. Provide students with electrical safety guides or checklists.	c. Utilize Contren written and performance assessments for the unit.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Use Calibri 10-point font.

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need, e.g, drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Unit 3: Plumbing Math

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Apply basic mathematics for plumbing. DOK1, IPM		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Add, subtract, multiply, and divide whole numbers, fractions, and decimals.	a. Have students complete a short pretest to apply the four basic math skills with whole numbers, fractions, decimals, and percentages (may use Contren Core Text, Basic Math Unit in text and online). Give students the correct answers to problems and ask at least one student who got the answers for whole numbers correct to write the problems on the chalkboard or a piece of chart paper. Have students who did not get the problems correct listen as the student at the board or paper works the problems. Do this procedure for fractions and percentages as well, having students rotate through the skills until each student has spent time with each set of problems. Have a different student lead the discussion each time students rotate so that the students who are just learning how to work the problems have a chance to teach the other students. Demonstrate how the use of fitting dimension tables and use common pipe-measuring techniques. Demonstrate how to use a fitting dimension table to determine fitting allowances and thread makeup. Calculate the end-to-end and center-to-center measurements using the fitting dimension tables. Have the students calculate the end-to-end measurements and demonstrate in the lab using various piping materials. Have the students calculate the center-to-center measurements and demonstrate in the lab using various piping materials.	a. Assess the pretest using the test key. Monitor group work as students perform calculations. Evaluate students on a posttest with whole number, fraction, and percentage problems. Assessment for use of fitting dimension tables is teacher observation. Use activity key to assess calculations.
b. Lay out simple and rolling offsets.	b. Have the students calculate a simple offset and rolling offset and demonstrate in the lab using various piping materials.	b. Utilize Contren written and performance assessments for the unit.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Use Calibri 10-point font.

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need. E.g., drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Unit 4: Plumbing Drawings

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Identify and interpret drawings related to plumbing. DOK1, IPD		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Identify and interpret various symbols.	a. Using the Contren Plumbing materials in text and online, identify terms, symbols, abbreviations, and lines used on the blueprints. Have students identify the three basic views of a drawing and the various lines used on drawings, interpret dimensions and symbols, and interpret isometric views of plumbing drawings. Interpret general and specific notes on drawings.	a. Assess activity using a teacher-made key. Material list will be used to assess the activity.
b. Identify, interpret, and locate details on a piping and structural blueprint.	b. Interpret notes, specifications, and dimensions. Locate details on drawings. Have the students use the internet catalogues and other ordering materials to prepare an order list of materials needed for a specific job as interpreted from the blueprint specifications.	b. Utilize Contren written and performance assessments for the unit.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Use Calibri 10-point font.

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need, e.g., drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Unit 5: Plumbing Materials and Fittings

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Identify different types of plastic pipes, PEX, and fittings. DOK2, PPF		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Identify types of fittings and valves.	a. Using the Contren Plumbing materials in text and online, identify the types of materials and schedules of plastic and PEX piping. Discuss the proper and improper applications of the various plastic pipes. Identify types of fittings and valves used in plastic and PEX piping. Let the students pick the proper material for a given situation, join the various types of plastic fittings, and join PEX material using the various crimp rings and compression fittings.	a. The materials identification activity will be assessed by teacher observation. Use the performance evaluation to assess measuring and cutting.
b. Identify and use different types of hangers and supports.	b. Have the students list the kinds of hangers and supports needed for these pipes. Demonstrate and have students properly measure, cut, and join the various plastic piping.	b. Use the performance evaluation to assess the joining activity.
c. Explain proper procedures for handling, storage, and protection of pipe.	c. Explain the proper procedures for the handling, storage, and protection of plastic pipes. Have the students create a written procedure manual for use in plumbing business.	c. Use a written-presentation rubric to assess activity. Utilize Contren written and performance assessments for the unit.

Competency 2: Discuss copper pipe and fittings. DOK2, CPF		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Identify sizes and types of copper piping.	a. Using the Contren Plumbing materials in text and online, identify the types of materials and schedules of copper piping. Have the students research the proper and improper applications of the various copper pipes. Identify types of fittings and valves used copper piping. Have the students list the kinds of hangers and supports needed for these pipes.	a. The materials identification activity will be assessed by teacher observation.
b. Demonstrate joining copper pipe.	b. Demonstrate and have the students properly measure, cut, and join copper piping and fitting by soldering and brazing. Given a situation let the students pick the proper material and join copper material using	b. Use the performance evaluation to assess measuring, cutting, and joining activity.

	the various methods and compression fittings.	
c. Explain proper procedures for handling, storage, and protection of copper pipe.	c. Explain the proper procedures for the handling, storage, and protection of copper pipes. Have the students add these procedures to the written procedure manual for use in plumbing business.	c. Use a written-presentation rubric to assess activity. Utilize Contren written and performance assessments for the unit.

Competency 3: Discuss copper cast-iron pipe and fittings.[DOK2, CIF]		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Discuss the types of materials and applications of cast-iron pipe.	a. Using the Contren Plumbing materials in text and online, identify the types of materials and schedules of cast-iron piping. Have the students research the proper and improper applications of the various cast-iron pipes. Identify types of fittings used with no-hub and hub cast iron. Have the students list the kinds of hangers and supports needed for these pipes.	a. The materials identification activity will be assessed by teacher observation.
b. Demonstrate the joining of cast-iron pipe.	b. Demonstrate and have the students properly measure, cut, and join cast-iron piping and fitting. Instructor can provide a specific situation and let let the students pick the proper material and join cast-iron material.	b. Use the performance evaluation to assess measuring, cutting, and joining activity.
c. Explain proper procedures for handling, storage, and protection of cast-iron pipe.	c. Explain the proper procedures for the handling, storage, and protection of cast-iron pipes. Have the students add these procedures to the written procedure manual for use in plumbing business.	c. Use a written-presentation rubric to assess activity. Utilize Contren written and performance assessments for the unit

Competency 4: Discuss carbon steel pipe and fittings [DOK2, CSF]		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Discuss the types of materials and applications of carbon steel pipe.	a. Using the Contren Plumbing materials in text and online, identify the types of materials and schedules of carbon steel piping. Have the students research the proper and improper applications of the various carbon steel pipes. Identify types of fittings used in carbon steel pipe. Have the students list the kinds of hangers and supports needed for these pipes.	a. The materials-identification activity will be assessed by teacher observation. Use the performance evaluation to assess measuring, cutting, and joining activity.
b. Demonstrate the joining of carbon steel pipe.	b. Demonstrate and have the students properly measure, cut, and join carbon steel piping and fitting. Explain the proper procedures for the handling, storage, and protection of carbon steel pipes. Have the	b. Use a written-presentation rubric to assess activity. Utilize Contren written and

	students add these procedures to the written procedure manual for use in plumbing business.	performance assessments for the unit.

Competency 5: Discuss corrugated stainless steel tubing DOK2, CST		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Discuss the types of materials and applications of corrugated stainless steel tubing.	a. Identify the common manufacturers of corrugated stainless steel tubing. Invite the manufacturer's representative to come to the class and certify the students for installing corrugated stainless steel. Have the students research the proper and improper applications of the various corrugated stainless steel tubing.	a. The materials-identification activity will be assessed by teacher observation. Use the performance evaluation to assess measuring, cutting, and joining activity.
b. Demonstrate the joining of corrugated stainless steel tubing.	b. Demonstrate and have the students properly measure, cut, and join corrugated stainless steel tubing. Explain the proper procedures for the handling, storage, and protection of corrugated stainless steel tubing. Have the students add these procedures to the written procedure manual for use in the plumbing business.	b. Use a written-presentation rubric to assess activity. Utilize Contren written and performance assessments for the unit.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Use Calibri 10-point font.

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need, e.g., drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Unit 6: Fixtures and Faucets

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Explain the procedures and install bathroom fixtures according to local, state, and/or international codes.[DOK2, FXF]		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Discuss codes.	a. Using the Contren Plumbing Level One in text and online and the local adopted code, initiate discussion by asking questions such as: Why are all occupied premises required to have potable water? How can plumbing fixtures effect water conservation? What are the required plumbing fixtures for a family dwelling? Have students research the latest international plumbing code to determine the location of information in the code. A teacher made set of questions will be used to do the search for information.	a. Discussion will be assessed by teacher observation. The information search will be assessed by teacher-made answer key.
b. Identify and install basic types of fixtures and faucets	b. Demonstrate the procedures for installing a lavatory, tub, shower, water closet, and bidet. Have the students perform an installation of each.	b. Performance evaluation will assess the installations. Utilize Contren written and performance assessments for the unit.

Competency 2: Demonstrate the procedures and install other residential fixtures according to local, state, and/or international codes.[DOK2, FXF]		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Performance indicators are reflected in the competency.	a. Demonstrate the procedures for installing washer boxes, icemaker box, laundry trays, filtering systems, kitchen sinks, garbage disposals, and dishwashers. Have the students perform an installation of each.	a. Performance evaluation will assess the installations. Utilize Contren written and performance assessments for the unit.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Use Calibri 10-point font.

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need, e.g., drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Unit 7: Introduction to Drain, Waste, and Vent (DWV) Systems

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Identify and explain safety in drainage and sewer systems. DOK1, DWV		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Discuss health department regulations for drainage and sewer systems and local and international plumbing code terms.	a. Using the Contren plumbing materials in text and online and copies of the codes and health department regulations, have the students research topics specific to drainage and sewer systems. The students will prepare and present a written report on their assigned topics.	a. Written- and oral-presentation rubrics will be used for assigned topics.
b. Identify approved traps and vents.	b. Discuss traps and clean-out systems to include types and parts of traps, installation requirements, and seals.	b. Teacher observation will assess the discussion. Utilize Contren written and performance assessments for the unit.

Competency 2: Demonstrate and install various systems and fittings used in drainage and sewer systems. DOK2, DWV		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Discuss the types of drains.	a. Using the Contren Plumbing materials in text and online, discuss the types of systems. Have the students identify the types, match with the proper fittings, and relate to their applications.	a. Matching activity will be assessed using a key.
b. Install various types of drains.	b. Demonstrate installation procedures and have the students perform installation of systems.	b. Performance rubric will assess the installations. Utilize Contren written and performance assessments for the unit.

Competency 3: Install various types of soil and waste pipes. DOK2, DWV		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Estimate the drainage fixture unit.	a. Divide the students into groups and provide a work-order scenario for the group to determine materials needed and provide an estimate for the customer.	a. The project will be assessed by instructor made key.
b. Install various traps and stacks.	b. Have the students perform the installation of the project assigned.	b. The performance rubric will assess the installations. Utilize Contren written and performance assessments for the unit.

Competency 4: Identify the types of sewers. DOK1, DWV		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Performance indicators are reflected in the competency.	a. Student groups will be assigned a type of sewer and will research the type of sewer. The group will prepare an oral presentation to include a visual diagram (poster) of the workings of the sewer.	a. Assessment for the project will include oral-presentation and poster rubrics. Utilize Contren written and performance assessments for the unit.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Use Calibri 10-point font.

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need, e.g., drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Unit 8: Introduction to Water Distribution Systems

Understandings and Goals

Enduring Understandings
In this unit, the student will:

- Type Enduring Understandings here.

Essential Questions

- Type Essential Questions here.

Vocabulary

Identify and review the unit vocabulary.

List terms here. Definitions will be in Appendix B.

Suggested Learning Experiences

Competency 1: Identify and install a potable cold water system.[DOK3, WDS]		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Discuss the sources of water.	a. Initiate student discussion of water sources by asking the following questions: Where does water come from? What is the water cycle? Where does the water in your area come from?	a. Teacher observation and group discussion rubric will assess the discussion.
b. Identify, estimate, and install a potable cold water system.	b. Provide students with a list of materials and have them estimate the materials involved in the project. Students will then install a complete system.	b. Estimation activity will be assessed using an answer key. The performance rubric will assess the installations. Utilize Contren written and performance assessments for the unit.

Competency 2: Estimate and install a hot water system.[DOK3, WDS TTA3, TTA4]		
Suggested Performance Indicators	**Suggested Teaching Strategies**	**Suggested Assessment Strategies**
a. Performance indicators are reflected in the competency.	a. Given a set of specifications for a job, the students will estimate the materials and cost of the hot water system. Demonstrate the installation process and have the students perform the actual installation of the hot water system.	a. Estimation key and performance rubric will be used to assess the project. Utilize Contren written and performance assessments for the unit.

Note: Instruction for a portion of this unit may be accomplished in an online environment.

Performance Task

Performance Task Title

Type performance task instructions in block paragraph form. Use Calibri 10-point font.

Attachments for Performance Task

List any attachments for performance task here (e.g., Health Science Performance Task.docx). (Rubrics will be at the end in Appendix A; these attachments are any other essential items the performance task may need, e.g.,., drawing, graph, periodic table, etc.)

Unit Resources

Books:

Journals:

Web sites:

Other:

List any Web sites/books/Web resources used or referenced in this unit.

Student Competency Profile

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Introduction and Orientation		
	1.	Describe local program and vocational center policies and procedures. DOK 1, EMP
	2.	Describe employment opportunities and responsibilities. DOK1, EMP
	3.	Explore leadership skills and personal development opportunities provided to students by student organizations to include SkillsUSA. DOK2, EMP
	4.	Demonstrate the ability to follow verbal and written instructions and communicate effectively in job situations. DOK2, COM
Unit 2: Basic Safety		
	1.	Describe general safety rules for working in a shop and/or lab and industry. DOK1, SAF
	2.	Identify and apply safety around welding operations. DOK1, SAF
	3.	Explain the appropriate safety precautions to take around common job-site hazards. DOK1,
	4.	Demonstrate the appropriate use and care of personal protective equipment (PPE). DOK2, SAF
	5.	Explain lifting and the use of ladders and scaffolds. DOK1, SAF ALGI4
	6.	Explain the Material Safety Data Sheets (MSDS). DOK1, SAF
	7.	Explain fires. DOK1, SAF
	8.	Explain safety in and around electrical situations. DOK1, SAF
Unit 3: Plumbing Math		
	1.	Apply basic mathematics for plumbing. DOK1, IPM
Unit 4: Plumbing Drawings		
	1.	Identify and interpret drawings related to plumbing. DOK1, IPD
Unit 5: Plumbing Materials and Fittings		
	1.	Identify different types of plastic pipes, PEX, and fittings. DOK2, PPF
	2.	Discuss copper pipe and fittings. DOK2, CPF
	3.	Discuss copper cast-iron pipe and fittings. DOK2, CIF
	4.	Discuss carbon steel pipe and fittings DOK2, CSF
	5.	Discuss corrugated stainless steel tubing DOK2, CST
Unit 6: Fixtures and Faucets		

	1.	Explain the procedures and install bathroom fixtures according to local, state, and/or international codes.[DOK2, FXF]
	2.	Demonstrate the procedures and install other residential fixtures according to local, state, and/or international codes.[DOK2, FXF]
Unit 7: Introduction to Drain, Waste, and Vent (DWV) Systems		
	1.	Identify and explain safety in drainage and sewer systems. [DOK1, **DWV**]
	2.	Demonstrate and install various systems and fittings used in drainage and sewer systems.[DOK2, DWV]
	3.	Install various types of soil and waste pipes.[DOK2, DWV]
	4.	Identify the types of sewers. [DOK1, DWV]
Unit 8: Introduction to Water Distribution Systems		
	1.	Identify and install a potable cold water system.[DOK3, **WDS**]
	2.	Estimate and install a hot water system.[DOK3, WDS TTA3, TTA4]

Appendix A: Activities and Rubrics

Alphabetized list of activities and rubrics follows.

Appendix B: Glossary

Organized by unit and alphabetized.

Appendix C: Industry Standards

Contren Best Practices for Plumbing

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
Industry Standards									
CCR		X							
PLS			X						
IPM				X					
IPD					X				
PPF						X			
CPF						X			
CIF						X			
CSF						X			
CST						X			
FAF							X		
DWV								X	
WDS									X

CCR-Contren Core
PLS-PLUMBING SAFETY
IPM-INTRODUCTION TO PLUMBING MATH
IPD-INTRODUCTION TO PLUMBING DRAWINGS
PPF-PLASTIC PIPE AND FITTINGS
CPF-COPPER PIPE AND FITTINGS
CIF-CAST-IRON PIPE AND FITTINGS
CSF-CARBON STEEL PIPE AND FITTINGS
CST-CORRUGATED STAINLESS STEEL TUBING
FAF-FIXTURES AND FAUCETS
DWV-INTRODUCTION TO DRAIN, WASTE, AND VENT (DWV) SYSTEMS
WDS-INTRODUCTION TO WATER DISTRIBUTION SYSTEMS

Appendix D: 21st Century Skills[1]

CSS1-21st Century Themes

CS1 Global Awareness

1. Using 21st century skills to understand and address global issues
2. Learning from and working collaboratively with individuals representing diverse cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
3. Understanding other nations and cultures, including the use of non-English languages

CS2 Financial, Economic, Business, and Entrepreneurial Literacy

1. Knowing how to make appropriate personal economic choices
2. Understanding the role of the economy in society
3. Using entrepreneurial skills to enhance workplace productivity and career options

CS3 Civic Literacy

1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
2. Exercising the rights and obligations of citizenship at local, state, national, and global levels
3. Understanding the local and global implications of civic decisions

CS4 Health Literacy

1. Obtaining, interpreting, and understanding basic health information and services and using such information and services in ways that enhance health
2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance, and stress reduction
3. Using available information to make appropriate health-related decisions
4. Establishing and monitoring personal and family health goals
5. Understanding national and international public health and safety issues

CS5 Environmental Literacy

1. Demonstrate knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water, and ecosystems.
2. Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.).
3. Investigate and analyze environmental issues, and make accurate conclusions about effective solutions.
4. Take individual and collective action toward addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues).

CSS2-Learning and Innovation Skills

CS6 Creativity and Innovation

1. Think Creatively
2. Work Creatively with Others
3. Implement Innovations

CS7 Critical Thinking and Problem Solving

1. Reason Effectively
2. Use Systems Thinking
3. Make Judgments and Decisions

[1] *21st century skills.* (n.d.). Washington, DC: Partnership for 21st Century Skills.

4. Solve Problems

CS8 Communication and Collaboration

1. Communicate Clearly
2. Collaborate with Others

CSS3-Information, Media and Technology Skills

CS9 Information Literacy

1. Access and Evaluate Information
2. Use and Manage Information

CS10 Media Literacy

1. Analyze Media
2. Create Media Products

CS11 ICT Literacy

1. Apply Technology Effectively

CSS4-Life and Career Skills

CS12 Flexibility and Adaptability

1. Adapt to Change
2. Be Flexible

CS13 Initiative and Self-Direction

1. Manage Goals and Time
2. Work Independently
3. Be Self-directed Learners

CS14 Social and Cross-Cultural Skills

1. Interact Effectively with Others
2. Work Effectively in Diverse Teams

CS15 Productivity and Accountability

1. Manage Projects
2. Produce Results

CS16 Leadership and Responsibility

1. Guide and Lead Others
2. Be Responsible to Others

Appendix E: Common Core Standards

English Language Arts

Key Ideas and details

CCE1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCE2: Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CCE3: Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

CCE4: Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

CCE5: Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

CCE6: Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

CCE7: Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

CCE8: Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

CCE9: Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

CCE10: Read and comprehend complex literary and informational texts independently and proficiently.

Mathematics (High School)

Number and Quantity

The Real Number System

CCM1: Extend the properties of exponents to rational exponents.

CCM2: Use properties of rational and irrational numbers.

Quantities

CCM3: Reason quantitatively and use units to solve problems.

The Complex Number System

CCM4: Perform arithmetic operations with complex numbers.

CCM5: Represent complex numbers and their operations on the complex plane.

CCM6: Use complex numbers in polynomial identities and equations.

Vector and Matrix Quantities

CCM7: Represent and model with vector quantities.

CCM8: Perform operations on vectors.

CCM9: Perform operations on matrices and use matrices in applications.

Algebra

Interpret the structure of expressions

CCM10: Write expressions in equivalent forms to solve problems.

Arithmetic with Polynomials and Rational Expressions

CCM11: Perform arithmetic operations on polynomials.

CCM12: Understand the relationship between zeros and factors of polynomials.

CCM13: Use polynomial identities to solve problems.

CCM14: Rewrite rational expressions.

Creating Equations

CCM15: Create equations that describe numbers or relationships.

Reasoning with Equations and Inequalities

CCM16: Understand solving equations as a process of reasoning and explain the reasoning.

CCM17: Solve equations and inequalities in one variable.

CCM18: Solve systems of equations.

CCM19: Represent and solve equations and inequalities graphically.

Functions

CCM20: Understand the concept of a function and use function notation.

CCM21: Interpret functions that arise in applications in terms of the context.

CCM22: Analyze functions using different representations.

Building Functions

CCM23: Build a function that models a relationship between two quantities.

CCM24: Build new functions from existing functions.

Linear, Quadratic, and Exponential Models

CCM25: Construct and compare linear, quadratic, and exponential models and solve problems.

CCM26: Interpret expressions for functions in terms of the situation they model.

Trigonometric Functions

CCM27: Extend the domain of trigonometric functions using the unit circle.

CCM28: Model periodic phenomena with trigonometric functions.

CCM29: Prove and apply trigonometric identities.

Geometry

CCM30: Experiment with transformations in the plane.

CCM31: Understand congruence in terms of rigid motions.

CCM32: Prove geometric theorems.

CCM33: Make geometric constructions.

Similarity, Right Triangles, and Trigonometry

CCM34: Understand similarity in terms of similarity transformations.

CCM35: Prove theorems involving similarity.

CCM36: Define trigonometric ratios and solve problems involving right triangles.

CCM37: Apply trigonometry to general triangles.

Circles

CCM38: Understand and apply theorems about circles.

CCM39: Find arc lengths and areas of sectors of circles.

Expressing Geometric Properties with Equations

CCM40: Translate between the geometric description and the equation for a conic section.

CCM41: Use coordinates to prove simple geometric theorems algebraically.

Geometric Measurement and Dimension

CCM42: Explain volume formulas and use them to solve problems.

CCM43: Visualize relationships between two-dimensional and three-dimensional objects.

Modeling with Geometry

CCM44: Apply geometric concepts in modeling situations.

Statistics and Probability

CCM45: Summarize, represent, and interpret data on a single count or measurement variable.

CCM46: Summarize, represent, and interpret data on two categorical and quantitative variables.

CCM47: Interpret linear models.

Making Inferences and Justifying Conclusions

CCM48: Understand and evaluate random processes underlying statistical experiments.

CCM49: Make inferences and justify conclusions from sample surveys, experiments, and observational studies.

Conditional Probability and the Rules of Probability

CCM50: Understand independence and conditional probability and use them to interpret data.

CCM51: Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Using Probability to Make Decisions

CCM52: Calculate expected values and use them to solve problems.

CCM53: Use probability to evaluate outcomes of decisions.

Appendix F: National Educational Technology Standards for Students (NETS-S)

T1 Creativity and Innovation
T2 Communication and Collaboration
T3 Research and Information Fluency
T4 Critical Thinking, Problem Solving, and Decision Making
T5 Digital Citizenship
T6 Technology Operations and Concepts

T1 Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students do the following:

a. Apply existing knowledge to generate new ideas, products, or processes.
b. Create original works as a means of personal or group expression.
c. Use models and simulations to explore complex systems and issues.
d. Identify trends and forecast possibilities.

T2 Communication and Collaboration

Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. Students do the following:

a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media.
b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats.
c. Develop cultural understanding and global awareness by engaging with learners of other cultures.
d. Contribute to project teams to produce original works or solve problems.

T3 Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students do the following:

a. Plan strategies to guide inquiry.
b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks.
d. Process data and report results.

T4 Critical Thinking, Problem Solving, and Decision Making

Students use critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students do the following:

a. Identify and define authentic problems and significant questions for investigation.
b. Plan and manage activities to develop a solution or complete a project.
c. Collect and analyze data to identify solutions and/or make informed decisions.
d. Use multiple processes and diverse perspectives to explore alternative solutions.

T5 Digital Citizenship

Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. Students do the following:

a. Advocate and practice safe, legal, and responsible use of information and technology.

b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity.
c. Demonstrate personal responsibility for lifelong learning.
d. Exhibit leadership for digital citizenship.

T6 Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students do the following:

a. Understand and use technology systems.
b. Select and use applications effectively and productively.
c. Troubleshoot systems and applications.
d. Transfer current knowledge to learning of new technologies.