Intermediate Plumbing Unit 3

Content Area: **CTE**
Course(s):
Time Period: **January**
Length: **MP 3 (45 Days)**
Status: **Published**

Unit Title:

Installation and Maintenance of Plumbing Systems

Unit Overview:

Unit 3 Overview: Installation and Maintenance of Plumbing Systems

In Unit 3, students will learn the essential skills for installing and maintaining plumbing systems in homes and businesses. Over the course of 45 days, they will explore the steps required to properly install pipes, faucets, fixtures, and other plumbing components. These lessons will focus on making sure systems work correctly, are safe to use, and meet building codes and standards.

The unit also teaches students how to identify and fix common plumbing problems, like leaks or blockages, through troubleshooting techniques. Students will learn the differences between public water systems, which serve entire communities, and private systems, like well water, and how to maintain each type effectively. By the end of this unit, students will have hands-on experience in diagnosing issues and maintaining plumbing systems to ensure they operate efficiently and reliably. This knowledge prepares them for real-world challenges and gives them a solid foundation for careers in plumbing.

Essential Questions:

1. What skills are required for installing plumbing systems?

2. How do plumbers diagnose and repair system issues?

3. What are the differences between public and private water systems?

Enduring Understandings:

1. Proper installation techniques ensure functional and safe plumbing systems.

2. Troubleshooting and repairs are critical for maintaining system performance.

3. Understanding system differences inform design and maintenance practices.

Standards/Indicators/Student Learning Objectives (SLOs):

9.3.12.AC	Architecture & Construction
9.3.12.AC.3	Comply with regulations and applicable codes to establish and manage a legal and safe workplace.
9.3.12.AC.6	Read, interpret and use technical drawings, documents and specifications to plan a project.
9.3.12.AC-CST	Construction
9.3.12.AC-CST.5	Apply practices and procedures required to maintain jobsite safety.
9.3.12.AC-CST.7	Compare and contrast the building systems and components required for a construction project.
9.3.12.AC-CST.9	Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.
9.3.12.AC-DES	Design/Pre-Construction
9.3.12.AC-DES.3	Describe the requirements of the integral systems that impact the design of buildings.
9.3.12.AC-DES.4	Apply building codes, laws and rules in the project design.
9.3.12.AC-DES.8	Apply standards, applications and restrictions pertaining to the selection and use of construction materials, components and assemblies in the project design.
9.3.12.AC-MO	Maintenance/Operations
9.3.12.AC-MO.1	Recognize and employ universal construction signs and symbols to function safely in the workplace.
9.3.12.AC-MO.3	Apply construction skills when repairing, restoring or renovating existing buildings.
9.3.12.AC-MO.4	Determine work required to repair or renovate an existing building.
9.3.12.AC-MO.6	Maintain and inspect building systems to achieve safe and efficient operation of buildings.

Lesson Titles:

1. Introduction to Plumbing Installation Techniques
   Explore the basics of installing plumbing systems in residential and commercial buildings.

2. Pipe Installation: Materials, Methods, and Best Practices
   Learn how to select, measure, cut, and connect different types of pipes.

3. Faucet and Fixture Installation: A Step-by-Step Guide
   Hands-on lesson on installing and securing faucets, sinks, and other fixtures.

4. Troubleshooting Common Plumbing Installation Issues

   Identify and solve common problems encountered during plumbing installations.

5. Understanding Public Water Systems
   Examine the design, operation, and maintenance of public water systems.

6. Private Water Systems: Well Design and Maintenance
   Dive into the components and upkeep of private water systems like wells.

7. Sewage Systems: Installation Techniques and Code Compliance
   Learn how to install sewage systems while adhering to building codes.

8. Diagnosing and Repairing Plumbing System Failures
   Practice techniques for identifying and fixing leaks, clogs, and system malfunctions.

9. Plumbing Maintenance Protocols: Tools and Techniques
   Discover the best practices for routine plumbing system maintenance.

10. Using Technology to Improve Plumbing System Efficiency
    Explore tools like pipe cameras and pressure testers to enhance system performance and diagnostics.

Career Readiness, Life Literacies, & Key Skills:

TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).

TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.DC.6	Select information to post online that positively impacts personal image and future college and career opportunities.
	Innovative ideas or innovation can lead to career opportunities.

Inter-Disciplinary Connections:

1. Math

- Apply geometry and algebra for pipe measurements, angles, and calculating water flow rates.
- Utilize ratios and conversions for sizing fixtures and determining system pressures.

2. Science

- Explore fluid dynamics and the principles of water flow, pressure, and resistance in plumbing systems.
- Study environmental science topics like water conservation and the impact of plumbing on ecosystems.

3. Technology

- Use diagnostic tools such as pipe cameras, pressure testers, and software for system design and troubleshooting.
- Discuss advancements in plumbing technologies, including smart water systems and sustainable materials.

4. History/Social Studies

- Explore the historical development of plumbing systems and their impact on urbanization and public health.
- Examine plumbing systems' role in addressing global water and sanitation challenges.

5. Career Technical Education

- Connect plumbing skills to real-world job opportunities in residential, commercial, and industrial sectors.
- Emphasize employability skills, including problem-solving, teamwork, and adherence to professional standards.

6. English/Language Arts

- Develop technical reading and writing skills through plumbing codes, installation manuals, and maintenance protocols.

Summative Assessment:

High-Stakes Assessments:

- Comprehensive Exams: Final exams covering a broad range of course material can assess students' understanding of key concepts and principles.
- Capstone Project Presentations: Formal presentations showcase students' project management skills, decision-making, and communication abilities.

Performance-Based Assessments:

- Project Portfolio Reviews: A portfolio compiled throughout the program can demonstrate a student's growth, technical skills, and problem-solving abilities in various areas of the plumbing trade.
- Simulated Project Management Tasks: Students could be presented with a realistic construction scenario where they must apply their knowledge and skills to develop solutions or make critical decisions.

Industry-Standard Certifications:

- Encouraging students to pursue industry certifications relevant to plumbing can demonstrate their commitment to the field and mastery of specific skills.

Considerations for Choosing Summative Assessments:

- Alignment with Learning Outcomes: Ensure the chosen assessments directly measure the program's overall learning objectives and desired competencies.
- Depth vs. Breadth: Balance the need to assess a broad range of knowledge with in-depth exploration of critical skills.
- Authenticity: Choose assessments that reflect real-world scenarios and tasks a plumber encounters.
- Multiple Measures: Utilize a combination of assessments to provide a holistic picture of student learning.
- Faculty Collaboration: Ensure consistency and fairness in assessments across different courses within the program.

Additional Tips:

- Develop clear rubrics outlining specific criteria for evaluating performance on each summative assessment.
- Provide students ample opportunities to practice and refine their skills before summative assessments.
- Offer feedback on summative assessments to help students identify areas for improvement and guide their future learning.

- Alternate Assessment
- Benchmark
- Group Project Assessment
- Individual Project Assessment
- Marking Period Assessment
- Module Section Assessment

Resources & Materials:

Plumbing Level 1 Book NCCER Fifth Edition

Google Classroom

Promethean Board

Canva

Kahoot

https://www.youtube.com/

CBS Plumbing Trade

https://www.cbsnews.com/video/plying-their-trades/#

Run Time 7:20

Toilet

How The Toilet Changed History

Run Time 7:15

Toilet Parts: What They Are and Common Fixes (DIY) | Family Handyman.

Workplace Hazards Video Run Time

Top 6 Workplace Hazards Identified

Run Time 8:11

PPE Video

PPE - Safety Training Video Course - SafetyInfo.com

Run Time 10:49

NJ Master Plumbers Information

New Jersey Plumbing License Requirements

NJ Plumbing Wages

Plumber salary in New Jersey

Plumbing Trade Video

6 Lessons I Learned as a Plumbing Apprentice

Time 9:03

Plumbing Trade Video

Plumbers Can SPECIALISE In Many Area... Here Are The Different Types!

Run Time 8:23

Mike Rowe On The Trades

https://youtu.be/3h_pp8CHEQ0

Run Time 8:25

PPE

Plumbing PPE Plumbers Must NEVER Work Without!

Run Time 9:04

FATAL Plumbing Mistakes EVERY Plumber Needs To Know About!

Run Time 8:09

NJ One Call

New Jersey One Call

Power Tools

Let's learn about a couple of plumbing power tools - Plumbing Power Tools

Run Time 12:34

Types Of Hot/Cold Water Pipes And Fittings

PEX vs COPPER vs CPVC plumbing pipes

Run Time 16:55

Plastic Pipe

Gluing PVC Pipe & ABS Pipe [How To]

Run Time 8:16

Plastic Pipe

10 MISTAKES When Working With Plastic Pipes (PVC, CPVC & ABS) | GOT2LEARN

Run Time 8:26

IPS

When to Use Pipe dope, Teflon Tape, Neither or Both for Threaded Connection

Run Time 3:54

IPS

How to Use a Pipe Wrench

Run Time 4:31

IPS

RIDGID 300 Compact Threading Machine

Run Time 18:26

OSHA

Top OSHA 10 OSHA Violations of 2023 | And how to prevent similar citations.

Run Time 8:51

Ladder Safety

Run Time 4:33

Personal Protective Equipment Milwaukee

Old vs. new growth trees and the wood products they make

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

1. Instructional Strategy: Hands-On Demonstration

- Learning Activity: Demonstrate the installation of a residential sink, including connecting the water supply lines, drain, and fixtures. Students replicate the process under supervision.
- Level of Bloom's/DOK: Applying/DOK 2 - Students apply learned techniques to complete a task accurately.

2. Instructional Strategy: Problem-Based Learning (PBL)

- Learning Activity: Present students with a real-world scenario: a leaking faucet in a commercial setting. Students diagnose the issue, suggest solutions, and execute the repair.
- Level of Bloom's/DOK: Analyzing/DOK 3 - Students analyze the problem and create a repair plan.

3. Instructional Strategy: Collaborative Group Work

- Learning Activity: In teams, students design a plumbing system for a small home, including water and sewage layouts, and present their blueprint for feedback.
- Level of Bloom's/DOK: Creating/DOK 4 - Students synthesize knowledge to design a functional plumbing system.

4. Instructional Strategy: Socratic Questioning

- Learning Activity: Engage students in a discussion comparing public and private water systems. Include questions about installation practices, maintenance challenges, and environmental impacts.
- Level of Bloom's/DOK: Evaluating/DOK 3 - Students evaluate and compare the two systems, justifying their arguments with evidence.

5. Instructional Strategy: Scaffolded Practice

- Learning Activity: Begin with guided instruction on troubleshooting a clogged sewage line, followed

by independent practice where students identify and correct mock system malfunctions.
- Level of Bloom's/DOK: Understanding/DOK 2 (initial stage), progressing to Applying/DOK 3 - Students progressively demonstrate independent troubleshooting skills.

Formative Assessment:

In-Class Activities:

- Quick Quizzes: Short, unannounced quizzes at the beginning or end of class can assess comprehension of key concepts from previous lessons or gauge readiness for new material..
- Think-Pair-Share: Encourage individual reflection followed by partnered discussions and sharing key takeaways with the class. This promotes active learning and identifies common misconceptions.
- Minute Papers: Have students write a one-minute summary of the main points learned or lingering questions they have. This helps identify areas needing clarification.

Classroom Discussions & Activities:

- Open-ended Questions: Encourage students to think critically and elaborate on their understanding by posing open-ended questions throughout lessons.
- Case Studies & Problem-solving: Present real-world plumbing scenarios or problems for students to analyze and propose solutions. This assesses critical thinking and application of knowledge.
- Role-playing Activities: Simulate real-world situations like project meetings or client interactions to practice communication, negotiation, and problem-solving skills.

Peer-Based Assessment:

- Peer Reviews: Students can review each other's work, providing constructive feedback on project plans, presentations, or technical drawings. This fosters collaboration and self-assessment skills.
- Group Work & Discussions: Collaborative activities encourage students to explain concepts to one another, solidifying their understanding and identifying areas where they can learn from peers.

Technology-Assisted Assessments:

- Online Quizzes & Polls: Utilize online platforms for short quizzes, polls, or concept checks to gauge student understanding in real-time and adjust instruction accordingly.

- Anticipatory Set
- Exit Tickets
- Hands-On Activities (Individual & Groups)
- Hands-On Observations (Individual & Groups)
- Questioning, Scenarios, and Problem-Solving (Open Ended and Multiple Choice)
- Warm-Up

Modifications

ELL Modifications:

- Choice of test format (multiple-choice, essay, true-false)
- Continue practicing vocabulary
- Provide study guides prior to tests
- Read directions to the student
- Read test passages aloud (for comprehension assessment)
- Vary test formats

G&T Modifications:

- Alternate assignments/enrichment assignments
- Enrichment projects
- Extension activities
- Higher-level cooperative learning activities
- Pairing direct instruction with coaching to promote self-directed learning
- Provide higher-order questioning and discussion opportunities
- Provide texts at a higher reading level
- Tiered assignments
- Tiered centers

At Risk Modifications

The possible list of modifications/accommodations identified for Special Education students can be utilized for At-Risk students. Teachers should utilize ongoing methods to provide instruction, assess student needs, and utilize modifications specific to the needs of individual students. In addition, the following may be considered:

- Additional time for assignments
- Adjusted assignment timelines
- Agenda book and checklists
- Answers to be dictated
- Assistance in maintaining uncluttered space
- Books on tape
- Concrete examples
- Extra visual and verbal cues and prompts
- Follow a routine/schedule
- Graphic organizers

- Have students restate information
- No penalty for spelling errors or sloppy handwriting
- Peer or scribe note-taking
- Personalized examples
- Preferential seating
- Provision of notes or outlines
- Reduction of distractions
- Review of directions
- Review sessions
- Space for movement or breaks
- Support auditory presentations with visuals
- Teach time management skills
- Use of a study carrel
- Use of mnemonics
- Varied reinforcement procedures
- Work in progress check

IEP & 504 Modifications:

*All teachers of students with special needs must review each student's IEP. Teachers must then select the appropriate modifications and/or accommodations necessary to enable the student to appropriately progress in the general curriculum.

Possible Modifications/Accommodations: (See listed items below):

- Allow for redos/retakes
- Assign fewer problems at one time (e.g., assign only odds or evens)
- Differentiated center-based small group instruction
- Extra time on assessments
- Highlight key directions
- If a manipulative is used during instruction, allow its use on a test
- Opportunities for cooperative partner work
- Provide reteach pages if necessary
- Provide several ways to solve a problem if possible
- Provide visual aids and anchor charts
- Test in alternative site
- Tiered lessons and assignments
- Use of a graphic organizer
- Use of concrete materials and objects (manipulatives)
- Use of word processor

Technology Materials and Standards

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C	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.