Intermediate Plumbing Unit 4

Content Area: **CTE**
Course(s):
Time Period: **April**
Length: **MP 4 (45 Days)**
Status: **Published**

Unit Title:

Advanced Plumbing Systems and Code Compliance

Unit Overview:

Unit 4 Overview: Advanced Plumbing Systems and Code Compliance

In Unit 4, students take their plumbing knowledge to the next level by diving into advanced systems and understanding how to work with plumbing codes. Over 45 days, this unit focuses on learning how to design and maintain more complex plumbing systems and why following plumbing codes is so important for safety and sustainability. Students will also explore how new technology is making plumbing work more efficient and safe.

The lessons start with understanding how to size and install advanced water heaters properly, followed by an overview of New Jersey's plumbing codes and how to apply them to real-world situations. Students will use advanced tools to troubleshoot complex plumbing systems and learn about cutting-edge plumbing technologies, like smart fixtures and diagnostic tools. The unit wraps up with a capstone project where students get hands-on experience designing and installing a plumbing system. By the end of this unit, students will be better prepared to handle advanced plumbing challenges and meet industry standards with confidence.

Essential Questions:

1. How are advanced plumbing systems designed and maintained?

2. Why is adherence to plumbing codes essential?

3. How does technology improve plumbing efficiency?

Enduring Understandings:

1. Advanced plumbing systems require specialized knowledge for effective design and maintenance.

2. Plumbing codes ensure safety, compliance, and environmental sustainability.

3. Technology enhances productivity and safety in plumbing practices.

Standards/Indicators/Student Learning Objectives (SLOs):

9.3.12.AC	Architecture & Construction
9.3.12.AC-CST	Construction
9.3.12.AC-DES	Design/Pre-Construction
9.3.12.AC-MO	Maintenance/Operations
ARCH.9-12.1	Design/Pre-Construction
ARCH.9-12.2	Construction
ARCH.9-12.3	Maintenance and Operations
ARCH.9-12.9.4.12.B.(1).1	Demonstrate communication skills and strategies that are used to work effectively with potential clients and others.
ARCH.9-12.9.4.12.B.18	Employ critical thinking skills (e.g., analyze, synthesize, and evaluate) independently and in teams to solve problems and make decisions.
ARCH.9-12.9.4.12.B.24	Employ technological tools to expedite workflow.
ARCH.9-12.9.4.12.B.32	Employ computer operations applications to manage work tasks.
ARCH.9-12.9.4.12.B.33	Use computer-based equipment (containing embedded computers or processors) to control devices.
ARCH.9-12.9.4.12.B.40	Demonstrate knowledge of personal and jobsite safety rules and regulations to maintain safe and healthful working conditions and environments.
ARCH.9-12.9.4.12.B.51	Conduct and participate in meetings to accomplish tasks.
ARCH.9-12.9.4.12.B.55	Interpret and explain written organizational policies and procedures that help workers perform their tasks according to employer rules and expectations.
ARCH.9-12.9.4.12.B.56	Recognize legal and ethical relationships between employees and employers to establish workplace/jobsite rules, regulations, and guidelines in a design and/or construction setting.
ARCH.9-12.9.4.12.B.57	Read regulations and contracts to ensure ethical and safety elements are observed.
ARCH.9-12.9.4.12.B.74	Read, interpret, and use technical drawings, documents, and specifications to plan a project.
ARCH.9-12.9.4.12.B.75	Use and maintain appropriate tools, machinery, equipment, and resources to accomplish project goals.

All clusters rely on effective oral and written communication strategies for creating, expressing, and interpreting information and ideas that incorporate technical terminology and information.

Effective leadership and teamwork strategies foster collaboration and cooperation between business units, business partners, and business associates toward the accomplishment of organizational goals.

Academic concepts lay the foundation for the full range of career and post-secondary education opportunities within the career cluster.

Implementation of health, safety, and environmental management systems and organizational policies and procedures impacts organizational performance, regulatory compliance, and continuous improvement.

Legal responsibilities, professional ethics, and codes of conduct affect management practices, business performance, and regulatory compliance, as well as the confidence of customers, business partners, and investors.

Roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment impact business operations. Key organizational systems impact organizational performance and the quality of products and services. Understanding the global context of 21st-century industries and careers impacts business operations.

Critical and creative thinking strategies facilitate innovation and problem-solving independently and in teams.

Lesson Titles:

1. Understanding Advanced Water Heater Systems
   Overview of water heater types, sizing requirements, and installation techniques.

2. Sizing Water Heaters for Residential and Commercial Use
   Detailed calculations and considerations for selecting the appropriate water heater.

3. Introduction to NJ Plumbing Code
   Key regulations and guidelines for ensuring code compliance in plumbing systems.

4. Practical Applications of Plumbing Codes
   Hands-on exercises interpreting and applying NJ plumbing codes to project designs.

5. Diagnosing Complex Plumbing System Issues
   Advanced troubleshooting techniques for identifying and resolving system malfunctions.

6. Using Advanced Plumbing Tools for System Maintenance
   Training on the latest tools and technologies used in plumbing diagnostics and repairs.

7. Technology in Plumbing: Smart Systems and IoT
   Exploring the role of smart fixtures, water sensors, and IoT in modern plumbing.

8. Designing Sustainable Plumbing Systems
   Incorporating energy efficiency and water conservation into plumbing system designs.

9. Evaluating Plumbing Systems for Code Compliance
   Techniques for reviewing and inspecting systems to ensure they meet legal standards.

10. Capstone Project: Designing and Installing an Advanced Plumbing System
    A hands-on group project to design, plan, and execute a complete plumbing installation.

Career Readiness, Life Literacies, & Key Skills:

TECH.9.4.12.TL.3	Analyze the effectiveness of the process and quality of collaborative environments.
TECH.9.4.12.TL.4	Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.
	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.

Inter-Disciplinary Connections:

1. Math

- Calculating water heater sizing based on flow rates and household demands.
- Performing advanced measurements, ratios, and estimations for system design.

2. Science

- Understanding principles of thermodynamics in water heating systems.
- Analyzing water pressure, flow, and the impact of material properties on system efficiency.

3. Technology

- Utilizing smart tools and software for plumbing diagnostics and monitoring.
- Applying CAD software for designing plumbing layouts and ensuring code compliance.

4. English/Language Arts

- Interpreting and applying technical language from plumbing codes and manuals.
- Documenting system designs and generating project proposals or reports.

5. History/Social Studies

- Examining historical advancements in plumbing technologies and public health improvements.
- Understanding how building codes reflect societal priorities and regulations.

6. Art and Design

- Creating visual diagrams and blueprints for advanced system installations.
- Designing aesthetically pleasing and functional layouts for plumbing fixtures.

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 Assessment
- Individual Assessment

- Marking Period Assessment
- Module Section Assessment

Resources & Materials:

Plumbing Level 1 Book NCCER Fifth Edition

NJ Liscenced Master Plumbers Code Book

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. Strategy: Direct Instruction with Visual Aids

- Learning Activity: Teacher-led overview of NJ Plumbing Code with real-world examples, supplemented by diagrams and videos.
- Level of Blooms/DOK: Understand (Bloom's) / DOK Level 2 (Skill/Concept) - Students will comprehend the purpose and applications of plumbing codes.

2. Strategy: Project-Based Learning

- Learning Activity: Capstone project where students design and plan an advanced plumbing system, adhering to code requirements.
- Level of Blooms/DOK: Create (Bloom's) / DOK Level 4 (Extended Thinking) - Students will apply knowledge of plumbing systems, codes, and technology to develop a compliant design.

3. Strategy: Hands-On Practice

- Learning Activity: Students will troubleshoot complex plumbing systems using advanced diagnostic tools like digital pressure gauges or inspection cameras.
- Level of Blooms/DOK: Apply (Bloom's) / DOK Level 3 (Strategic Thinking) - Students will solve real-world problems using tools and technical knowledge.

4. Strategy: Collaborative Learning

- Learning Activity: Group activity to analyze case studies of plumbing code violations and propose compliant solutions.
- Level of Blooms/DOK: Evaluate (Bloom's) / DOK Level 3 (Strategic Thinking) - Students will assess scenarios and justify their corrective actions.

5. Strategy: Technology Integration

- Learning Activity: Students will use CAD software to create blueprints for plumbing systems incorporating smart technology features (e.g., IoT devices).
- Level of Blooms/DOK: Apply (Bloom's) / DOK Level 3 (Strategic Thinking) - Students will demonstrate technical proficiency and integrate advanced tools into their designs.

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 and Groups)
- Hands-On Observations (Individual & Groups)
- Questioning, Scenarios, 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.