



Pearson

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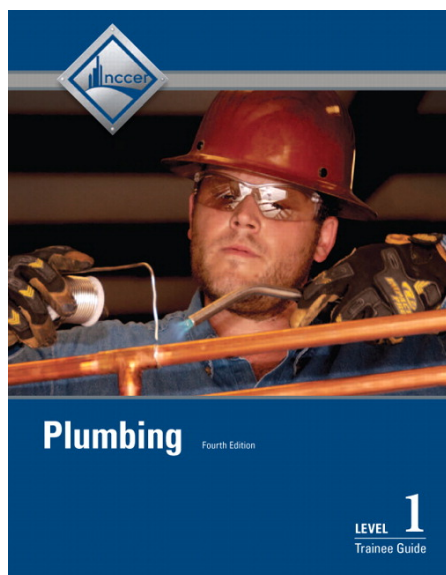
Tennessee CTE 2016 Adoption: Plumbing Systems

Plumbing, Level 1, Fourth Edition, Trainee Guide with NCCERConnect
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Tennessee Plumbing Level 1 Trainee Guide

Pearson Response to TN Reviewer Comments

List of Changes

- An addendum containing new material was added the Trainee Guide.
- A corresponding addendum containing new material was added to the Instructor Guide.
- Tables of Contents for the Trainee Guide and the Instructor Guide were updated to show the addition of the addenda.

Addenda Details

The **Trainee Guide Addendum (Tennessee Learning Addendum)** contains college and career readiness content and seven additional NCCER modules:

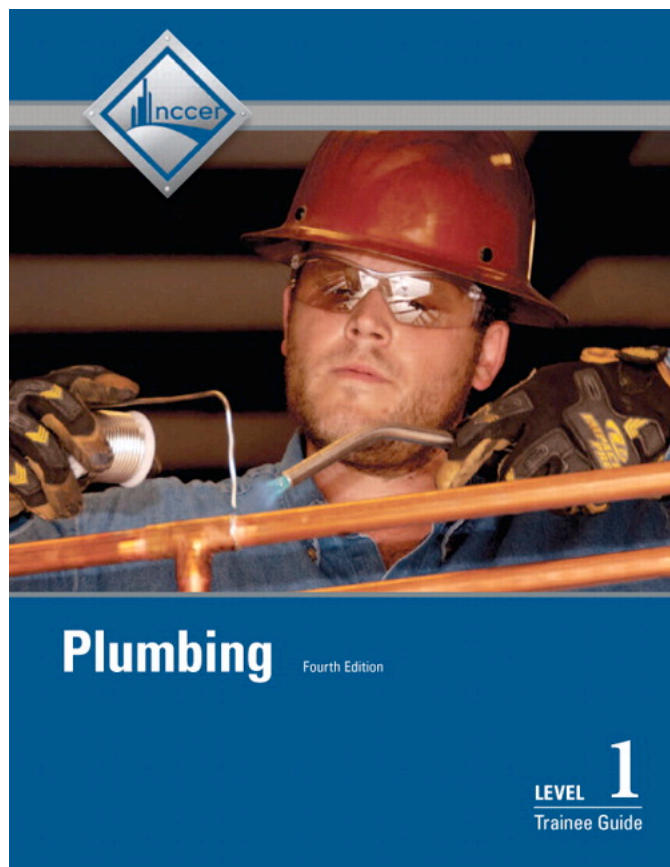
00101-15 Basic Safety
44105-08 Construction Documents
44101-08 Introduction to Project Management
00108-15 Basic Employability Skills
00107-15 Basic Communication
00105-15 Introduction to Construction Drawings
03102-13 Technical Math: 3.20, 3.4.0-3.4.4

The **Instructor Guide Addendum (Tennessee Teaching Addendum)** contains college and career readiness content and the instructor support for the same seven additional NCCER modules:

00101-15 Basic Safety
44105-08 Construction Documents
44101-08 Introduction to Project Management
00108-15 Basic Employability Skills
00107-15 Basic Communication
00105-15 Introduction to Construction Drawings
03102-13 Technical Math: 3.20, 3.4.0-3.4.4

The **Tennessee Teaching Addendum** also contains additional instructor support for Tennessee Department of Education Standards: Safety (1), Tools and Equipment (4), Construction Industry Principles (5) and (6), Copper Tube & Fittings (14), Cast-Iron Pipe & Fittings (16), Carbon Steel Pipe & Fittings (18), Drain, Waste & Vent (DWV) Systems (21), Water Distribution Systems (24), Basic Maintenance & Repair Process (25-26), Green Practices in Plumbing (27), Business & Project Management (28), (31), and (32).

A Correlation and Narrative Brief of Plumbing Level 1 Trainee Guide ©2013



To the Tennessee Learning Expectations for Plumbing Systems

**A Correlation of Plumbing Level 1 Trainee Guide, ©2013 to the Tennessee Department of Education
Standards for Plumbing Systems**

Plumbing Level One, Fourth Edition
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to the
Tennessee Learning Expectations for Plumbing Systems

TEXTBOOK NARRATIVE FOR THE STATE OF TENNESSEE

SUMMARY:

- NCCERconnect – eLearning Series is a new and improved online supplement in XL platform. This unique online course supplement in the form of an electronic book and essential course management tools is delivered through an exceptional user-friendly interface, www.nccerconnect.com. NCCERconnect provides a range of visual, auditory, and interactive elements to enhance student learning and instructor delivery of craft training.
- The realistic ebook experience consists of the actual print book and integrated tools such as highlighting, notes, zoom, bookmarks, search capability, and more! The etext contains links to active figures.
- Prebuilt homework assignments enable students to work at any time, and they incorporate a scores report to gradebook. Homework assignments contain module reading, concept checks, and drag-and-drop Trade Term questions.
- Quiz assignments contain Review Questions in multiple choice, and they incorporate scores report back to gradebook.
- Multimedia library is searchable by modules and contains PPTs and resources.
- Student Support Page includes a written learning pathway for students so they know what is found within the course and how to use the resource. The page also includes technical support resources.

NEW TO THIS EDITION:

- This edition of *Plumbing Level One* contains design improvements and content updates to several technologies that plumbers use every day.
- The environmental effects of plumbing are outlined through new “Going Green” features.
- Coverage of low-flow fixtures, backflow preventers, graywater systems, and brownwater systems has been enhanced.
- Details of the *Globally Harmonized System of Classification and Labeling of Chemicals* are included.
- Several new joining technologies and their associated equipment have been added, as well as an array of new hand and power tools.
- Vital information from earlier editions’ “Corrugated Stainless Steel Tubing” module has been folded into the “Carbon Steel Pipe and Fittings” module. This enables more concise and trade-appropriate learning outcomes.

SUPPLEMENTS:

The NCCERconnect Instructor access card, ISBN 978-0-13426148-5, provides free access to all NCCER courses in www.nccerconnect.com. NCCERConnect provides all the standard XL instructor tools:

- Course Home Manager
- Assignment Manager
- Gradebook displays students' results of Concept Checks, Review Questions, and any additional quizzes/tests added to your course.
- Roster/Course Details
- Course Settings
- Multimedia Library
- Instructor Toolkit provides easy access to lesson plans and lecture slide presentations.
- Customization of your course is easy and allows for maximum flexibility. Move existing folders or create new ones. Add/upload your own content or create additional tests/quizzes. It's all here!
- Instructor Support Page includes a written summary of what is found within the course. The page also includes technical support resources.

The Annotated Instructor's Guide, ISBN 978-0-13-292143-5, contains an access code to the NCCER Instructor Resource Center, which contains the following digital resources:

- Lesson Plans
- Module PowerPoints
- Performance Profile Sheet
- TestGen (Exam Questions)

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Tennessee Department of Education Standards for Plumbing Systems	Plumbing Level 1 Trainee Guide, ©2013
Plumbing Systems	
Course Standards	
Safety	
1) Identify safety hazards on a jobsite and demonstrate practices for safe working. Accurately read, interpret, and demonstrate adherence to safety rules, including but not limited to rules pertaining to electrical safety, Occupational Safety and Health Administration (OSHA) guidelines, and state and national code requirements. Be able to distinguish between the rules and explain why certain rules apply. Recognize and employ universal construction signs and symbols such as colors, flags, stakes, and hand signals that apply to construction workplace situations. Research and evaluate construction company safety plans from local industry. Explain the need for jobsite security to prevent liability. Drawing from examples, create and implement a jobsite safety program in the class to ensure safe practices and procedures including jobsite security procedures. (TN Reading 3, 4, 6; TN Writing 2, 4; NCCER 02102-12)	Reinforce - Plumbing Level One: 02102-12 Plumbing Safety SE/TE: 2.0.0 – 2.2.0, 5.0.0-6.5.2 Module 00101-15 Basic Safety See SE/TE Addendum
2) Continue to maintain safety records and demonstrate adherence to industry-standard practices regarding general machine safety, tool safety, equipment safety, electrical safety, and fire safety to protect all personnel and equipment. For example, when operating tools and equipment, regularly inspect and carefully employ the appropriate personal protective equipment (PPE), as recommended by Occupational, Safety & Health Administration (OSHA) regulations. Incorporate safety procedures when operating tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment. Complete safety test with 100 percent accuracy. (TN Reading 3, 4; NCCER 02102-12)	Reinforce - Plumbing Level One: 02102-12 Plumbing Safety SE/TE: 4.0.0-4.6.0, 5.2.0-5.3.0 Module 00101-15 Basic Safety See SE/TE Addendum
3) Follow procedures to work safely around materials. Adhere to responsibilities for employees in material safety as outlined by the Hazard Communication Standard (HazCom), such as locating and interpreting material safety data sheets (MSDS). For example, obtain an MSDS for a given material from a supplier in the community. Demonstrate safe procedures to move materials by planning the movement, properly lifting, stacking, and storing materials, and selecting proper materials-handling equipment. Describe hazards involved with plumbing work, including working in confined spaces. (TN Reading 3, 4; NCCER 02102-12)	Reinforce - Plumbing Level One: 02102-12 Plumbing Safety SE/TE: 6.0.0-6.5.4, 10.0.0-11.7.0 Module 00101-15 Basic Safety See SE/TE Addendum
Tools & Equipment	

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Tennessee Department of Education Standards for Plumbing Systems	Plumbing Level 1 Trainee Guide, ©2013
4) Identify and select the proper tools and accessories, critique the readiness of the tools, use the tools to accomplish the desired tasks, and then return the tools and accessories to their proper storage. Research a new technology recently developed for the plumbing industry. Write persuasively to convince an employer how the use of the technology could benefit the company, citing evidence from resources. For example, describe how a new power tool could improve efficiency for a plumber. (TN Reading 2, 3, 4; TN Writing 1, 7; NCCER 02103-12)	Reinforce - Plumbing Level One: 02103-12 Tools of the Plumbing Trade SE/TE: Entire Module See TE Addendum
Construction Industry Principles	
5) Locate and assess requirements for performing plumbing work including local, state, and national requirements. Interpret plumbing codes, and determine inspection procedures and other applicable portions of the law. Visit the Tennessee Contractor's Licensing Board's website and analyze its policies and requirements. Explain how such policies impact local construction businesses. (TN Reading 2, 3, 4, 9)	See TE Addendum
6) Consult a variety of sources to describe alternatives to traditional project delivery methods, such as the design-build and construction management-related methods, distinguishing among the roles and relationships of various construction personnel in each scenario. Examine the project delivery method of an actual company. Develop a company profile with supporting graphics the company could share with a client, describing the services provided and explaining the project delivery method used by the company. (TN Reading 2, 3, 4, 5, 7; TN Writing 2, 4; NCCER 44105-08)	44101-08 Introduction to Project Management SE/TE: 7.0.0-7.4.0 See SE/TE Addendum
Construction Drawings & Specifications	
7) Building on knowledge of construction drawings and specifications from <i>Mechanical, Electrical, & Plumbing Systems</i> , examine plumbing drawings and identify common plumbing symbols used for the components of pipe assemblies. Read and interpret construction drawings, including detail drawings and equipment schedules, to create a list of materials needed for a given plumbing project. For example, analyze plumbing plans and isometric drawings to determine the materials needed to install a drain, waste, and vent system. (TN Reading 2, 3, 4, 6, 7; TN Writing 2, 9; NCCER 02105-12)	Plumbing Level One: 02105-12 Introduction to the Plumbing Drawings SE/TE: 1.0.0-3.9.0
8) Explain the relationship between construction drawings and specifications. Describe how both the construction drawings and specifications provide information about the plumbing system for a building. For example, examine construction drawings and specifications to determine the requirements of hangers and supports for a given plumbing piping system. (TN Reading 1, 2, 4, 5, 6, 7; NCCER 02105-12, 44105-08)	Plumbing Level One: 02105-12 Introduction to the Plumbing Drawings SE/TE: 2.0.0-2.7.0 Project Management 44105-08 Construction Documents SE/TE: 4.0-4.3.0 See SE/TE Addendum

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9) Describe processes by which construction professionals obtain clarification from architects regarding construction documents, such as by the use of requests for information (RFI's). Write a request for information (RFI) as would a construction professional to an architect to request clarification for a detail of the construction documents, such as the selection of a product. (TN Reading 6; TN Writing 4; NCCER 02105-12, 44105-08)	44101-08 Introduction to Project Management SE/TE 3.5.0 See SE/TE Addendum 44105-08 Construction Documents SE/TE: 7.0.0-7.4.0 See SE/TE Addendum 00105-15: Introduction to Construction Drawings: 1.3.2 See SE/TE Addendum See TE Addendum
10) Demonstrate the ability to use an architect's scale to measure a component of a scale drawing. Create drawings commonly used in the plumbing trade, including orthographic and isometric sketches. (TN Math G-MD, G-MG; NCCER 02105-12)	Plumbing Level One: 02105-12 Introduction to the Plumbing Drawings SE/TE: 2.2.0-2.3.0, 4.0.0-4.5.0
Plumbing Math	
11) Apply mathematics concepts to solve plumbing problems, distinguishing which principles apply to a given problem. Concepts should include, but are not limited to:	
a. Using the basic rules of right triangles, such as the 3-4-5 ratio, to lay out and check square corners. (TN Math G-SRT; NCCER 02104-12)	See TE Addendum
b. Calculating values associated with angles and triangles to determine the run, travel, and rise of an offset. (TN Math G-SRT; NCCER 02104-12)	See TE Addendum
Plastic Pipe & Fittings	
12) Building on the knowledge of plastic piping from <i>Mechanical, Electrical, and Plumbing Systems</i> , distinguish among different types of plastic plumbing pipe, fittings, valves, hanging, and support. Draw on textual evidence and observations to describe the material properties of plastic pipe and create guidelines for proper storage and handling requirements. Compare and contrast the tools, hazards, and procedures for cutting and joining various types of plastic plumbing pipe, including ABS, PVC, CPVC, PE, PEX, and PB. Create a list of the appropriate piping materials, tools, and equipment needed for a given plastic piping application including supports and spacing. (TN Reading 1, 2, 4; TN Writing 4; NCCER 02106-12)	Plumbing Level One: 02106-12 Plastic Pipe and Fittings SE/TE: 2.0.0-2.6.6, 3.0.0-3.3.0, 5.0.0-5.2.0
13) Read and interpret manufacturer's instructions, construction drawings and specifications, and applicable codes to properly install plastic pipe, including measuring, cutting, joining, and supporting plastic pipe. Utilize the appropriate tools, equipment, PPE, and procedures to safely complete installations. Once installed, pressure test plastic pipe according to local plumbing code to verify installation was properly completed. (TN Reading 2, 3; NCCER 02106-12)	Plumbing Level One: 02106-12 Plastic Pipe and Fittings SE/TE: 2.0.0-2.5.0, 4.0.0-4.3.5, 6.0.0
Copper Tube & Fittings	

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14) Distinguish among different types of copper tube, fittings, valves, hanging, and support. Draw on textual evidence and observations to describe the material properties of copper tube and create guidelines for proper storage and handling requirements. Compare and contrast the tools, hazards, and procedures for cutting and joining various types of copper tube. Create a list of the appropriate piping materials, tools, and equipment needed for a given copper tubing application including supports and spacing. (TN Reading 1, 2, 4; TN Writing 4; NCCER 02107-12)	Plumbing Level One: 02107-12 Copper Tube and Fittings SE/TE: 2.0.0-5.1.3 See TE Addendum
15) Read and interpret manufacturer's instructions, construction drawings and specifications, and applicable codes to properly install copper tubing, including measuring, cutting, bending, joining, grooving, and supporting plastic pipe. Utilize the appropriate tools, equipment, PPE, and procedures to safely complete installations. Once installed, pressure test copper tube according to local plumbing code to verify installation was properly completed. (TN Reading 2, 3, 6, 8; NCCER 02107-12)	Plumbing Level One: 02107-12 Copper Tube and Fittings SE/TE: 4.0.0-7.0.0
Cast-Iron Pipe & Fittings	
16) Distinguish among different types of cast-iron pipe, fittings, valves, hanging, and support. Draw on textual evidence and observations to describe the material properties of cast-iron pipe and create guidelines for proper storage and handling requirements. Compare and contrast the tools, hazards, and procedures for cutting and joining hub-and-spigot cast-iron pipe and no-hub cast-iron pipe. Create a list of the appropriate piping materials, tools, equipment, and PPE needed for a given cast-iron piping application including selecting the correct supports and spacing. (TN Reading 1, 2, 4; TN Writing 4; NCCER 02108-12)	Plumbing Level One: 02108-12 Cast-Iron Pipe and Fittings SE/TE: 2.0.0-5.1.0-5.3.0 See TE Addendum
17) Demonstrate proper procedures to correctly measure, cut, and join cast-iron pipe utilizing the appropriate tools, equipment, and PPE. Describe testing procedures used to check cast-iron piping for leaking joints, as designated in local plumbing code. (TN Reading 2, 3; NCCER 02108-12)	Plumbing Level One: 02108-12 Cast-Iron Pipe and Fittings SE/TE: 5.0.0-6.0.0
Carbon Steel Pipe & Fittings	
18) Distinguish among different types of steel pipe, fittings, valves, hanging, and support. Draw on textual evidence and observations to describe the material properties of steel pipe and create guidelines for proper storage and handling requirements. Compare and contrast the tools, hazards, and procedures for cutting and joining steel pipe. Create a list of the appropriate piping materials, tools, and equipment needed for a given steel piping application including supports and spacing. (TN Reading 1, 2, 4; TN Writing 4; NCCER 02109-12)	Plumbing Level One: 02109-12 Carbon Steel Pipe and Fittings SE/TE: 2.0.0-5.3.0 See TE Addendum

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19) Read and interpret manufacturer's instructions, construction drawings and specifications, and applicable codes to properly install steel pipe, including measuring, cutting, joining, and supporting steel pipe. Utilize the appropriate tools, equipment, PPE, and procedures to safely complete installations. (TN Reading 2, 3; NCCER 02109-12)	Plumbing Level One: 02109-12 Carbon Steel Pipe and Fittings SE/TE: 4.0.0-4.8.0, 6.0.0-6.4.0
Plumbing Fixtures	
20) Describe the features and operating principles of various types of plumbing fixtures, including sinks, lavatories, faucets, bathtubs, showers, and water closets. Analyze the operational procedures of two different water closets, such as a siphon-action water closet and a blow-out water closet. Compare and contrast the functions and benefits of each, citing resources to make a recommendation for a client based on the specific needs of a project. (TN Reading 1, 2, 3, 4, 7; TN Writing 2, 4, 9; TN Physical Science 2; NCCER 02110-12)	Plumbing Level One: 02110-12 Introduction to Plumbing Fixtures SE/TE: Entire module
Drain, Waste, & Vent (DWV) Systems	
21) Study a schematic plan of a typical community sewer system. Citing evidence from a technical description or actual observation of a system, explain how waste moves through a drain, waste, and vent system from the fixture to the environment. Create a graphic illustration to represent the movement of waste from one component to the others in the system. For example, create a basic diagram of how the waste generated by a clean-up sink in the classroom travels to the local sewage treatment plant. (TN Reading 2, 3, 4, 7; NCCER 02111-12)	Plumbing Level One: 02111-12 Introduction to Drain, Waste, and Vent (DMV) Systems SE/TE: 2.0.0, Figure 1, Figure 2 See TE Addendum
22) Demonstrate understanding of the specific roles of various plumbing components in a drain, waste, and vent system by sketching a system model. Label the components, and include a written description of the function of each. Be able to describe the physical principles involved such as gravity and pressure. (TN Reading 2, 3, 4, 5, 7; TN Writing 2; TN Physical Science 1, 4; NCCER 02111-12)	Plumbing Level One: 02111-12 Introduction to Drain, Waste, and Vent (DMV) Systems SE/TE: 2.0.0-5.0.0
23) Analyze the function of a trap by examining a drain, waste, and vent system whose trap has lost its seal. Diagnose and explain the cause and determine the appropriate solution, citing evidence from textbooks or technical manuals in order to justify why the chosen solution is preferable or more effective than another. (TN Reading 1, 2, 4, 5; TN Writing 2, 9; NCCER 02111-12)	Plumbing Level One: 02111-12 Introduction to Drain, Waste, and Vent (DMV) Systems SE/TE: 4.4.0-4.4.8
Water Distribution Systems	

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24) Study a schematic plan of a typical municipal water distribution system. Citing evidence from a technical description or actual observation of a system, explain how water travels from a water treatment plant to a fixture in a residence. Create a graphic illustration to represent the movement of water from one component to the others in the system. For example, sketch an isometric drawing of a simple water distribution system and label its components. (TN Reading 1, 2, 3, 4, 7; TN Writing 2, 9; NCCER 02112-12)	Plumbing Level One: 02112-12 Introduction to Water Distribution Systems SE/TE: 1.0.0-4.2.0
Basic Maintenance & Repair Process	
25) Identify and demonstrate basic troubleshooting strategies appropriate for evaluating plumbing systems and devices. For example, in a drain system, develop and implement a troubleshooting strategy to test and remedy a clogged drain. (TN Reading 3)	See TE Addendum
26) Identify routine maintenance procedures that should be performed on plumbing systems for a given building. Create a timeline of recommended maintenance procedures for a client, justifying why each procedure is necessary by highlighting its preventive or cost-efficient characteristics. For example, create a schedule of items to inspect and clean in order to keep a water heater running efficiently. (TN Reading 2, 3, 4, 7; TN Writing 4)	See TE Addendum
Green Practices in Plumbing	
27) Define the term <i>efficiency</i> in the context of the plumbing profession and plumbing systems. Research and identify strategies used in the design of plumbing systems and plumbing work practices to increase the efficiency of plumbing systems. Drawing on resources such as those from the U.S. Green Building Council and EPA Energy Star, create a recommendation for a client outlining green plumbing strategies for a given building. (TN Reading 2, 3, 4, 7, 9; TN Writing 2, 7, 8; TN Environmental Science 5)	02101-12 Introduction to the Plumbing Profession: 3.4.0, Go Green See TE Addendum
Business & Project Management	
28) Describe the components and purpose of a basic contract document for a residential project, determining the meaning of key terms and other industry-specific words. Recognize the relationship and responsibilities of various parties to a contract. Write a basic contract for a job, such as a plumbing service agreement for work done for a residential client. (TN Reading 2, 3, 4, 5; NCCER 44105-08)	Project Management 44105-08 Construction Documents SE/TE: 5.0.0 See SE/TE Addendum See TE Addendum

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29) Establish and implement specific goals to manage project assignments in a timely manner, including organizing teams to effectively manage assignments, monitoring and reporting on project progress, and evaluating a completed project according to client requirements. For example, inspect and critique a team member's work, providing constructive feedback for improvement. Similarly, respond to constructive feedback from a team member to improve project outcomes and meet project goals. (TN Reading 2, 6; TN Writing 2)	44101-08 Introduction to Project Management: 3.1.0-3.6.0 See SE/TE Addendum 44105-08 Construction Documents: 7.0.0-7.4.0 See SE/TE Addendum 00108-15 Basic Employability Skills: 3.3.0-3.3.3, 3.5.0-3.5.1 See SE/TE Addendum See TE Addendum
30) Interpret construction drawings and applicable local plumbing codes to determine the correct materials, tools, and equipment needed to complete a plumbing project. Plan and implement the steps needed to complete the project, adhering to inspection procedures and employing safe practices throughout. Draw from print and electronic examples to create a material list, cost estimation, project schedule, and inspection checklist for a project, applying the components of the documents to the given project. (TN Reading 2, 3; TN Writing 4)	00105-15 Introduction to Construction Drawings: Entire Module See SE/TE Addendum See TE Addendum
31) Produce clear and coherent writing for communication in the plumbing industry. Create a service order for a given plumbing project. Explain the service order to a peer, as would a service technician to a client. (TN Writing 4)	00107-15 Basic Communication Skills: 2.3.0 See SE/TE Addendum See TE Addendum
32) Utilize technology to write and share periodical reports (weekly, monthly, etc.) to provide others with information about progress during plumbing projects as would a project manager to a supervisor. Summarize activities in a narrative form including overall progress in relationship to a previously planned schedule. (TN Reading 3; TN Writing 2, 4, 6, 10)	4101-08 Introduction to Project Management: 3.5.0 See SE/TE Addendum 44105-08 Construction Documents: 7.0.0 See SE/TE Addendum See TE Addendum
Portfolio	
33) Update materials from coursework to add to the portfolio started in <i>Fundamentals of Construction and Mechanical, Electrical, & Plumbing Systems</i> . Continually reflect on coursework experiences and revise and refine the career plan generated in prior courses. Include photographs or illustrations and written descriptions of sequential progress in construction projects. (TN Writing 2, 4, 5, 6)	N/A