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Part 102: Architecture and Construction – Career Pathway

2013 Construction Core

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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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Standards

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

Name of Industry Standards

NCCER Learning Series from the National Center for Construction Education and Research
Reprinted with permission from NCCER Learning Series, Copyright 2009, National Center for Construction Education and Research, (352) 334-0920, http://www.nccer.org/index.asp

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
Reprinted with permission from *National Educational Technology Standards for Students: Connecting Curriculum and Technology*, Copyright 2007, International Society for Technology in Education (ISTE), 800.336.5191 (U.S. and Canada) or 541.302.3777 (International), iste@iste.org, www.iste.org. All rights reserved. Permission does not constitute an endorsement by ISTE.

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 and technical education programs in Mississippi face 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).

Mississippi Teacher Professional Resources

There are several resources for Mississippi teachers.

My PLC: An online registration for all professional-development sessions

To register for any session, teachers will need an account in the registration system, MyPLC, https://myplc.rcu.msstate.edu. To create an account, click on the link and navigate to the "Request a Guest ID" link. The ID should be the teacher's first initial and last name and the last four (4) digits of the social security number. Teachers should complete the entire form, which will then be sent to a secure server. Upon activation of the teacher's account, he or she will receive an e-mail with login instructions. The teacher may then browse for the available sessions and register for the desired courses.

Should you need additional instructions, please call 662.325.2510.

Blackboard/PACE site: An online resource

Preparation for Academic and Career Education (PACE) sites have been created for Mississippi career and technical educators to have one central location for obtaining information regarding their teaching practice and classrooms. Each of the 16 career clusters has an individual site. Within the appropriate PACE site, a career pathway that is currently taught in Mississippi schools will be located, along with information from the Mississippi Department of Education (MDE) state curriculum coordinator, the MDE student organization coordinator, and the Research and Curriculum Unit (RCU) curriculum specialist. As information that is relevant to an educator's particular course is available, this information will be posted to the PACE site.

To log in to Blackboard:

1. Visit http://rcu.blackboard.com.
2. Log in with your first initial, last name, and last four (4) digits of your social security number (e.g., ddorroh3456).
3. Input the password: rcu.
4. Should you need additional instructions, please call 662.325.2510.

Construction Core Executive Summary

Pathway Description

The Construction Core instructional program provides a foundation of knowledge to prepare students for employment or continued education in several occupations related to the construction industry. The curriculum framework for this program was developed in partnership with the Mississippi Construction Education Foundation (MCEF). MCEF is the accredited sponsor for the National Center for Construction Education and Research (NCCER).

When developing this curriculum, the authors recognized the importance of incorporating differentiated instruction and the needs of the 21st-century learners. Therefore, teaching strategies include a blend of online and face-to-face instruction that align with NCCER Connect e-books, online lectures, video presentations, online quizzes, active figures, and Spanish content. Students will have access to this information both to learn new content as well as to review, reinforce, or revise their work.

Industry Certification

The NCCER published the ***Learning Series*** as the set of industry standards that should be taught nationwide by contractors, associations, and secondary and postsecondary schools**.** To develop the *Learning Series*, the NCCER assembled a team of subject-matter experts that represented construction companies and schools across the nation. Each committee met several times, combining experts' knowledge and experience to finalize the benchmarks and requirements included in the standards.

As a part of the certification process, all Mississippi Construction pathway instructors will be required to successfully complete the **Instructor Certification Training Program**. Doing so

ensures that instructors possess the necessary comprehensive knowledge and understanding of the standards.

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

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 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 (SkillsUSA).
10. Provide demonstrated placement into construction-related occupations, and provide timely reports to MCEF.
11. Districts will be required to complete a self-evaluation of all programs and host a site visit for a representative from industry to ensure that proper lab, safety, and instructional procedures are in place.

Assessment

Students will be assessed using the Construction Core Year 1 MS-CPAS2 test. The MS-CPAS2 blueprint can be found at http://info.rcu.msstate.edu/services/curriculum.asp. If there are questions regarding assessment of this program, please contact the Architecture & 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 Construction 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

Teacher Licensure

The latest teacher licensure information can be found at http://www.mde.k12.ms.us/educator-licensure.

Professional Learning

If you have specific questions about the content of any of training sessions provided, please contact the Research and Curriculum Unit at 662.325.2510 and ask for a professional-learning specialist.

Course Outlines

Option 1

This curriculum consists of the following two 1-Carnegie unit courses:

1. Safety and Orientation to Construction (Course Code: 993102)
2. Introduction to Construction (Course Code: 993103)

Course Description: Safety and Orientation to Construction includes an introduction to the field as well as fundamentals of construction safety, tools, math, and blueprint reading, as well as basic carpentry, electrical, masonry, and plumbing skills.

Course Description: Introduction to Construction emphasizes an overview of construction-related trades such as carpentry, electrical wiring, masonry, and plumbing. This course gives students' real-world, hands-on practice in these areas. This course should be taken only after students successfully pass Safety and Orientation to Construction.

Safety and Orientation to Construction (Course Code: 993102)

Unit		Title	Hours
1		Introduction and Orientation	15
2		Basic Safety	24
3		Basic Math	29
4		Hand and Power Tools	24
5		Introduction to Blueprints	24
6		Introduction to Materials Handling	24
			140

Introduction to Construction (Course Code: 993103)

Unit		Title	Hours
7		Introduction to Carpentry	38
8		Introduction to Electrical Wiring	34
9		Introduction to Masonry	34
10		Introduction to Plumbing	34
			140

Option 2

This curriculum consists of the following one 2-Carnegie-unit course:

Construction (Course Code: 993101)

Course Description: The Construction course introduces students to fundamentals of construction safety, tools, math, and blueprint reading, as well as basic carpentry, electrical, masonry, and plumbing skills.

Construction (Course Code: 993101)

Unit		Title	Hours
1		Introduction and Orientation	15
2		Basic Safety	24
3		Basic Math	29
4		Hand and Power Tools	24
5		Introduction to Blueprints	24
6		Introduction to Materials Handling	24
7		Introduction to Carpentry	38
8		Introduction to Electrical Wiring	34
9		Introduction to Masonry	34
10		Introduction to Plumbing	34
			280

Construction Core Research Synopsis

By implementing the National Center for Construction Education and Research's Learning Series construction skills standards into the construction-related pathways, students who successfully master the curriculum should have the skills required to enter the workforce or pursue an advanced degree. These skills are based on industry-validated performance indicators. The pathway will include applied instruction designed to articulate with programs offered in Mississippi's community and junior colleges.

The Research Synopsis is located in the appropriate local district option chosen for Year 2.

Professional Organizations

Association for Supervision and Curriculum Development (ASCD)
1703 North Beauregard Street
Alexandria, VA 22311-1714
800.933.ASCD
http://www.ascd.org

Association for Career and Technical Education (ACTE)
1410 King Street
Alexandria, VA 22314
800.826.9972
http://www.acteonline.org

Mississippi Association for Supervision and Curriculum Development (MASCD)
P.O. Box 13576
Jackson, MS 39236
601.591.2210
http://www.mascd.com

Mississippi Department of Education (MDE)
Office of Career and Technical Education
P.O. Box 771
Jackson, MS 39205
601.359.3940
http://www.mde.k12.ms.us/career-and-technical-education

SkillsUSA
14001 SkillsUSA Way
Leesburg, VA 20176
703.777.8810
FAX: 703.777.8999
http://www.skillsusa.org/

Using This Document and the Blackboard Site

Suggested Time on Task
This section indicates 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 (Found on the Blackboard site)
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 (Found on the Blackboard site)
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.

Unit 1: Introduction and Orientation

Competencies and Suggested Objectives
1. Describe local program and center expectations, policies, and procedures. DOK 1, EMP a. Describe local program and career center policies and procedures, including dress code, attendance, academic requirements, discipline, shop/lab rules and regulations, and transportation regulations. b. Give a brief overview of the course. Explain to students what Construction Technology is, why it is important, and how it will be delivered. c. Compare and contrast local program and school policies to expectations of employers. d. Preview course objectives, program policy, and the industry standards.
2. Describe employment opportunities and responsibilities. DOK 1, EMP a. Describe employment opportunities, including potential earnings, employee benefits, job availability, working conditions, educational requirements, required technology skills, and continuing education/training. b. Describe basic employee responsibilities and appropriate work ethics. c. Compare and contrast employment responsibilities and expectations to local school and program policies and expectations. d. Demonstrate computer systems and their uses in the construction industry. e. Define effective relationship skills and workplace issues to include but not limited to sexual harassment, stress, and substance abuse.
3. Research, design, and conduct a project that will apply the knowledge and skills learned in the Construction Pathway course in a real-world, unpredictable environment. DOK3, EMP a. Demonstrate effective team-building and leadership skills. b. Explore leadership skills and personal-development opportunities provided to students through student organizations such as SkillsUSA. c. Work as a team to design a community service project for which the knowledge and skills learned in the course can be used to improve the lives of others.
4. Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations. DOK 2, COM a. Follow basic written and verbal instructions. b. Effectively communicate in on-the-job situations using verbal, written, or electronic communication.

Scenario

The Perfect Peanut Butter and Jelly Sandwich

Unit 1

You are the superintendent of the construction crew who needs to provide instructions for preparing peanut butter and jelly sandwiches for the crew. The superintendent will prepare written instructions and pass them on to the foreman, who will then verbally assign the job to the helper. The helper will correctly prepare the sandwiches according to the instructions. You will be judged using a communication or presentation rubric.

Attachments for Scenario

None

Unit 2: Basic Safety

Competencies and Suggested Objectives
1. Describe, define, and illustrate general safety rules for working in a shop/lab and how they relate to the construction industry. DOK 2, BSM a. Describe how to avoid on-site accidents. b. Explain the relationship between housekeeping and safety. c. Explain the importance of following all safety rules and company safety policies according to OSHA standards, including addressing General Duty Clause and *1926 CFR Subpart C.* d. Explain the importance of reporting all on-the-job injuries, accidents, and near misses. e. Explain the need for evacuation policies and the importance of following them. f. Explain causes of accidents and the impact of accident costs. g. Compare and contrast shop/lab safety rules to industry safety rules. **Note:** Safety is to be taught as an ongoing part of the program. Students are required to complete the written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.
2. Identify and apply safety around welding operations. DOK 1, BSM a. Use proper safety practices when welding or working around welding operations. b. Use proper safety practices when welding in or near trenches and excavations. c. Explain the term "proximity work."
3. Display appropriate safety precautions to take around common jobsite hazards. DOK 1, BSM a. Explain the safety requirements for working in confined areas. b. Explain the different barriers and barricades and how they are used.
4. Demonstrate the appropriate use and care of personal protective equipment (PPE). DOK 1, BSM a. Identify commonly used PPE items. b. Understand proper use of PPE. c. Demonstrate appropriate care for PPE.
5. Explain fall protection, ladder, stair, and scaffold procedures and requirements. DOK 1, BSM a. Explain the use of proper fall protection. b. Inspect and safely work with various ladders, stairs, and scaffolds.
6. Explain the material safety data sheet (MSDS). DOK 1, BSM a. Explain the function of the MSDS. b. Interpret the requirements of the MSDS. c. Discuss hazardous material exposures.
7. Display appropriate safety procedures related to fires. DOK 1, BSM a. Explain the process by which fires start. b. Explain fire prevention of various flammable liquids. c. Explain the classes of fire and the types of extinguishers. d. Illustrate the proper steps to follow when using a fire extinguisher. e. Demonstrate the proper techniques for putting out a fire.

8. Explain safety in and around electrical situations. (DOK 1, BSM)
    a. Explain injuries that can result when electrical contact occurs.
    b. Explain safety around electrical hazards.
    c. Explain action to take when an electrical shock occurs.

Scenario

Safety Hazard Inspection

Unit 2

You are a safety inspector, and your job is to inspect the job site for safety hazards. You will identify and list all hazards and complete the inspection report. You will report the results of the inspection to the superintendent of the job site and discuss the corrections that must be completed before the job site will be declared safe. You will be judged using the Case-Study \ Rubric.

Attachments for Scenario

None

Unit 3: Introduction to Construction Math

Competencies and Suggested Objectives
1. Apply the four basic math skills using whole numbers, fractions, decimals, and percentages, both with and without a calculator. DOK 2, ICM) a. Define basic geometric shapes used in the construction industry. b. Add, subtract, multiply, and divide whole numbers, decimals, and fractions with and without a calculator. c. Convert whole numbers to fractions, and convert fractions to whole numbers. d. Convert decimals to percentages, and convert percentages to decimals. e. Convert fractions to decimals. f. Convert fractions to percentages. g. Demonstrate reading a standard and metric ruler and tape measure. h. Recognize and use metric units of length, weight, volume, and temperature.

Scenario

Job Estimation

Unit 3

You are the subcontractor who is bidding on a job using specifications provided by the contractor. Estimate the amount of materials, cost, and labor for the bid. The completed bid will be submitted to the contractor for consideration. All bids will be judged using an answer key.

Attachments for Scenario

None

Unit 4: Hand and Power Tools

Competencies and Suggested Objectives
1. Demonstrate the use and maintenance of hand and power tools. DOK 2, IHT, IPT a. Identify, visually inspect, and discuss the safe use of common hand and power tools. b. Discuss rules of safety. c. Select and demonstrate the use of tools. d. Explain the procedures for maintenance.

Scenario

Making the Cut

Unit 4

You are an apprentice on a job, and you must demonstrate to your supervisor the safe use of hand and power tools. You will begin by measuring a specified length, choose the correct tool, then correctly and safely demonstrate the procedure. The supervisor will evaluate you using the Performance Rubric.

Attachments for Scenario

None

Unit 5: Introduction to Construction Drawings

Competencies and Suggested Objectives
1. Read, analyze, and understand basic components of a blueprint. DOK 3, BLU a. Recognize and identify terms, components, and symbols commonly used on blueprints. b. Relate information on construction drawings to actual locations on the print. c. Recognize different classifications of drawing. d. Interpret and use drawing dimensions.

Scenario

<u>Sketching for Fire-Safety Plan</u>

Unit 5

You are a student and need to design a fire safety plan for your home. Measure each room in your house and sketch it to scale. Include the escape routes, direction of doors, north reference, and any exterior features such as sidewalks and trees. Present the sketch to the class. You will be judged with the Presentation Rubric.

Attachments for Scenario

None

Unit 6: Introduction to Materials Handling

Competencies and Suggested Objectives
1. Safely handle and store materials. DOK 1, IMH a. Define a load. b. Establish a pre-task plan prior to moving a load. c. Use proper materials-handling techniques. d. Choose appropriate materials-handling equipment for the task. e. Recognize hazards and follow safety procedures required for materials handling.

Scenario

Moving Day

Unit 6

You are a helper who has been assigned the job of material placement. Follow the instructions of the supervisor to properly move and store the materials on the job site. The supervisor will inspect the job when completed. You will be judged using the Performance Rubric.

Attachments for Scenario

None

Unit 7: Introduction to Carpentry

Competencies and Suggested Objectives
1. Explain the fundamentals of the carpentry trade. DOK 1, OTT a. Define terms related to the carpentry trade. b. Discuss the history of the carpentry trade. c. Describe modern carpentry. d. Describe career ladders, stages of progress, and advancement possibilities in carpentry work. e. Exhibit the skills, attitudes, abilities, personal traits, and responsibilities a person needs to work as a successful carpenter. f. Recognize materials used and the importance of safety in the carpentry industry.
2. Demonstrate safety when working in carpentry and with carpentry tools. DOK 2, HPT a. Demonstrate safety procedures related to carpentry and working with carpentry tools. b. Identify hazards related to carpentry and how to avoid or minimize them in the workplace.
3. Correctly identify building materials, fasteners, and adhesives. DOK 2, BFA a. Identify and state the use of various building materials, types of softwoods and hardwoods, and the safety precautions associated with each. b. Identify the different grades and markings of wood building materials and types of engineered lumber. c. Calculate the quantities of lumber and wood products using industry-standard methods. d. Describe the fasteners, anchors, and adhesives used in construction work and explain their uses.

Scenario

<u>Your First Job</u>

Unit 7

You are a lead carpenter and have been assigned to construct a project according to the supervisor's specifications using the appropriate materials, fasteners, and/or adhesives. The supervisor will inspect and approve the job. You will be evaluated using the Performance Rubric.

Attachments for Scenario

None

Unit 8: Introduction to Electrical Wiring

Competencies and Suggested Objectives
1. Explain the fundamentals of the electrical trade. DOK 1, OET a. Describe the apprenticeship/training, career paths/opportunities, and responsibilities for electrical trades. b. Define the various sectors of the electrical industry. c. State the tasks typically performed by an electrician.
2. Demonstrate safety in and around electrical circuits and equipment. DOK 2, ESF a. Define terms related to electrical safety. b. Demonstrate safe working procedures in a construction and shop/lab environment. c. Explain the purpose of OSHA and how it promotes safety on the job. d. Identify electrical hazards and how to avoid or minimize them in the workplace. e. Explain safety issues concerning lock-out/tag-out procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection systems. d. Develop a task plan and a hazard assessment for a given task and select the appropriate PPE and work methods to safely perform the task.
3. Discuss electrical circuits. DOK 2, IEC a. Define voltage and identify the ways in which it can be produced. b. Explain the difference between conductors and insulators. c. Define the units of measurement that are used to measure the properties of electricity. d. Identify the meters used to measure voltage, current, and resistance. e. Explain the basic characteristics of series and parallel circuits.

Scenario

Unit 8

You are an electrician that has been called on a job to troubleshoot a faulty circuit. You will begin by making a safety checklist of possible visible problems such as burned wires, loose wires, incorrect connections, bad switches, or receptacles. Before beginning you must follow the NEC safety procedures for dealing with electrical circuits. Present your findings and solution to the problem to your supervisor. You will be evaluated using the Performance Rubric.

Attachments for Scenario

None

Unit 9: Introduction to Masonry

Competencies and Suggested Objectives
1. Explain the fundamentals of the masonry trade. DOK 1, ITM a. Review the history of masonry. b. Explain modern masonry materials and methods. c. Describe career ladders and advancement possibilities in masonry work. d. Demonstrate the skills, attitudes, and abilities needed to work as a mason.
2. Identify and discuss safety issues in and around the masonry work site. DOK 1, ITM, MTE a. Identify hazards related to masonry and how to avoid or minimize them in the workplace. b. Identify and describe the safe use of tools and equipment used in performing masonry tasks. c. Demonstrate safe working procedures related to masonry. d. Demonstrate the correct procedure for assembling and disassembling scaffolding according to federal safety regulations. e. Perform safety and mechanical checks on a mechanical mixer.
3. Explain and define terms and materials associated with masonry. DOK 1, MIT a. Name the different types of brick, block, and stone. b. Label parts of a brick, block, and stone. c. Identify the positions as they appear in a wall. d. Identify the materials used in the masonry trade.
4. Perform procedures used in masonry trades. DOK 2, MIT a. Identify the positions of masonry units as they appear in a wall. b. Measure, mark, and cut brick and block to specifications. c. Lay out a brick and/or block wall using the dry bond method. d. Mix a batch of mortar. e. Lay a wall between established leads.

Scenario

<u>How Do You Stack Up</u>

Unit 9

You are the brick mason and have been assigned to build a project according to the supervisor's specifications. Select the proper materials and tools. Prepare mortar for the project. Lay out the project using proper tools. The supervisor will inspect the project and you will be assessed using the Performance Rubric.

Attachments for Scenario

None

Unit 10: Introduction to Plumbing

Competencies and Suggested Objectives
1. Recognize the fundamentals and use appropriate materials of the plumbing trade. DOK 2, IPP, PLT a. Identify terms related to the plumbing trade. b. Describe the historical development of the plumbing trade. c. Describe the importance of plumbers in modern society and career opportunities available. d. Explore leadership skills and personal development opportunities related to plumbing. e. Describe the functions of water supply and sewage treatment systems. f. Explain how the water supply and sewage treatment facilities function. g. Relate the development of plumbing to improvement in public health. h. Identify materials of the plumbing trade. i. Utilize materials of the plumbing trade.
2. Identify tools and safety procedures used in plumbing trades, and perform basic plumbing operations using proper tools and safety procedures. DOK 1, PLT a. Identify and describe how to handle unsafe acts and conditions that cause accidents. b. Use and care for personal protective equipment. c. Identify jobsite hazards specific to the plumbing industry. d. Identify basic hand and power tools used in the plumbing trade. e. Demonstrate how to use and maintain power tools safely. f. Demonstrate proper selection of tools for various plumbing tasks. g. Demonstrate how to prepare a surface for tool use. h. Describe the safety requirements for using plumbing tools. i. Explain how to work safely in and around a trench.

Scenario

Water Works

Unit 10

You are a plumber and have been assigned to build a project according to the supervisor's specifications. Select the proper materials and tools. Prepare materials for the project. Lay out the project using proper tools. The supervisor will inspect the project and you will be assessed using the Performance Assessment.

Attachments for Scenario

None

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 career center expectations, policies, and procedures.
	2.	Describe employment opportunities and responsibilities.
	3.	Research, design, and conduct a project that will apply the knowledge and skills learned in the Construction Pathway course in a real-world, unpredictable environment.
	4.	Demonstrate the ability to follow verbal and written instructions and communicate effectively in on-the-job situations.
Unit 2: Basic Safety		
	1.	Describe, define, and illustrate general safety rules for working in a shop/lab and how they relate to the construction industry.
	2.	Identify and apply safety around welding operations.
	3.	Display appropriate safety precautions to take around common jobsite hazards.
	4.	Demonstrate the appropriate use and care of personal protective equipment (PPE).
	5.	Explain fall protection, ladder, stair, and scaffold procedures and requirements.
	6.	Explain the material safety data sheet (MSDS).
	7.	Display appropriate safety procedures related to fires.
	8.	Explain safety in and around electrical situations.
Unit 3: Introduction to Construction Math		
	1.	Apply the four basic math skills using whole numbers, fractions, decimals, and percentages, both with and without a calculator.
Unit 4: Hand and Power Tools		
	1.	Demonstrate the use and maintenance of hand and power tools.
Unit 5: Introduction to Construction Drawings		
	1.	Read, analyze, and understand basic components of a blueprint.
Unit 6: Introduction to Materials Handling		
	1.	Safely handle and store materials.
Unit 7: Introduction to Carpentry		

	1.	Explain the fundamentals of the carpentry trade.
	2.	Demonstrate safety when working in carpentry and with carpentry tools.
	3.	Correctly identify building materials, fasteners, and adhesives.
Unit 8: Introduction to Electrical Wiring		
	1.	Explain the fundamentals of the electrical trade.
	2.	Demonstrate safety in and around electrical circuits and equipment.
	3.	Discuss electrical circuits.
Unit 9: Introduction to Masonry		
	1.	Explain the fundamentals of the masonry trade.
	2.	Identify and discuss safety issues in and around the masonry work site.
	3.	Explain and define terms and materials associated with masonry.
	4.	Perform procedures used in masonry trades.
Unit 10: Introduction to Plumbing		
	1.	Recognize the fundamentals and use appropriate materials of the plumbing trade.
	2.	Identify tools and safety procedures used in plumbing trades, and perform basic plumbing operations using proper tools and safety procedures.

Appendix A: Unit References

General Books and Trade Publications
All of the Construction Core references listed under General Books and Trade Publications are used for multiple units. Unit-specific references are listed under the appropriate unit number.

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Appendix B: Glossary

Unit 1
Basic Communication (00107-09)

Active listening: A process that involves respecting others, listening to what is being said, and understanding what is being said.
Appendix: A source of detailed or specific information placed at the end of a section, a chapter, or a book.
Body Language: A person's physical posture and gestures that reflect how that person is feeling.
Bullets: Large, vertically aligned dots that highlight items in a list.
Electronic signature: A signature that is used to sign electronic documents by capturing handwritten signatures through computer technology and attaching them to the document or file.
Font: The type style used for printed letters and numbers.
Glossary: An alphabetical list of terms and definitions.
Graph: Information shown as a picture or chart. Graphs may be represented in various forms, including line graphs and bar charts.
Index: An alphabetical list of topics, along with the page numbers where each topic appears.
Italics: Letters and numbers that lean to the right rather than stand straight up.
Jargon: Specialized terms used in a specific industry.
Memo: Informal written correspondence. Another term form memorandum (plural: memoranda).
Permit: A legal document that allows a task to be undertaken.
Punch list: A written list that identifies deficiencies requiring correction at completion.
Table: A way to present important text and numbers to they can be read and understood at a glance.
Table of contents: A list of book chapters or sections, usually located at the front of the book.
Text message: A short message (160 characters or fewer) sent from a cell phone.

Basic Employability Skills (00108-09)

Absenteeism: Consistent failure to show up for work
Computer literacy: An understanding of how computers work and what they are used for.
Confidentiality: Privacy of information.
Critical thinking skills: The skills required to evaluate and use information to make decisions or reach conclusions.
Goal-oriented: To be focused on an objective.
Harassment: A type of discrimination that can be based on race, age, disabilities, sex, religion, cultural issues, health, or language barriers.
Leadership: The ability to set an example for others to follow by exercising authority and responsibility.
Mission statement: A statement of how a company does business.
Professionalism: Integrity and work-appropriate manners.
Reference: A person who can confirm to a potential employer that you have the skills, experience, and work habits that are listed in your résumé.

Self-presentation: The way a person dresses, speaks, acts, and interacts with others.
Tactful: Aware of the effects of your statements and actions on others.
Teamwork: The cooperation of coworkers to achieve one or more goals.
Work ethic: Work habits that are the foundation of a person's ability to do his or her job.

Unit 2
Basic Safety (00101-09)

Combustible: Capable of easily igniting and rapidly burning; used to describe a fuel with a flashpoint at or above 100 °F.
Competent person: A person who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to eliminate them.
Confined space: A work area large enough for a person to work but arranged in such a way that an employee must physically enter the space to perform work. A confined space has a limited or restricted means of entry and exit. It is not designed for continuous work. Tanks, vessels, silos, pits, vaults, and hoppers are examples of confined spaces.
Excavation: Any man-made cut, cavity, trench, or depression in an earth surface formed by removing earth. It can be made for anything from basements to highways.
Extension ladder: A ladder made of two straight ladders that are connected so that the overall length can be adjusted.
Flammable: Capable of easily igniting and rapidly burning; used to describe a fuel with a flashpoint below 100 °F.
Flashback: A welding flame that flares up and chars the hose at or near the torch connection; caused by improperly mixed fuel.
Flash burn: The damage that can be done to eyes after even brief exposure to ultraviolet light form arc welding; requires medical attention.
Flash goggles: Eye protection worn during welding operations.
Flash point: The temperature at which fuel gives off enough gases (vapors) to burn.
Ground fault circuit interrupter (GFCI): A device that interrupts and de-energizes an electrical circuit to protect a person from electrocution.
Hazard Communication Standard (HazCom): the Occupational Safety and Health Administration (OSHA) standard that requires contractors to educate employees about hazardous chemicals on the job site and how to work with them safely.
Lockout/tagout: A formal procedure for taking equipment out of service and ensuring that it cannot be operated until a qualified person has removed the lockout or tagout device (such as a lock or warning tag).
Material safety data sheet (MSDS): A document that must accompany any hazardous substance. The MSDS identifies the substance and gives the exposure limits, the physical and chemical characteristics, the kind of hazard it presents, precautions for safe handling and use, and specific control measures.
Occupational Safety and Health Administration (OSHA): An agency of the U.S. Department of Labor; also refers to the Occupational and Safety and Health Act of 1970, a law that applies to more than 111 million workers and 7 million job sites in the country.

Permit-required confined spaces: A confined space that has been evaluated and found to have actual or potential hazards, such as a toxic atmosphere or other serious safety or health hazard. Workers need written authorization to enter a permit-required confined space.
Personal protective equipment (PPE): Equipment or clothing designed to prevent or reduce injuries.
Proximity work: Work done near a hazard while not actually in contact with the hazard.
Qualified person: A person who, by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience, has demonstrated the ability to solve or prevent problems relating to a certain subject, work, or project.
Respirator: A device that provides clean, filtered air for breathing, regardless of what is in the surrounding air.
Scaffold: An elevated platform for workers and materials.
Shoring: Using pieces of timber, usually in a diagonal position, to hold a wall in place temporarily.
Signaler: A person who is responsible for directing a vehicle when the driver's vision is blocked in any way.
Six-foot rule: A rule stating that platforms or work surfaces with unprotected sides or edges that are six feet or higher than the ground or level below it require fall protection.
Stepladder: A self-supporting ladder consisting of two elements hinged at the top.
Straight ladder: A nonadjustable ladder.
Trench: A narrow excavation made below the surface of the ground that is generally deeper that it is wide, with a maximum width of 15 feet.
Welding shield: (1) A protective screen set up around a welding operation designed to safeguard workers not directly involved in that operation; (2) a shield that provides eye and face protection for welders by either connecting to helmet-like headgear or attaching directly to a hard hat; also called a welding helmet.

Unit 3
Introduction to Construction Math (00102-09)

Acute angle: Any angle between 0 degrees and 90 degrees.
Angle: The shape made by two straight lines coming together at a point. The space between those two lines is measured in degrees.
Area: The surface or amount of space occupied by a two-dimensional object such as a rectangle, circle, or square. To calculate the area for rectangles and squares, multiply the length and width. To calculate the area for circles, multiply the radius squared and pi.
Bisect: To divide into equal parts.
Circumference: The distance around the curved line that forms a circle.
Decimal: Part of a number represented by digits to the right of a point, called a decimal point. For example, in the number 1.25, .25 is the decimal part of the number.
Denominator: The part of a fraction below the dividing line. For example the 2 in ½ is the denominator.
Diameter: The length of a straight line that crosses from one side of a circle, through the center point, to a point on the opposite side. The diameter is the longest straight line you can draw inside a circle.

Equivalent fractions: Fractions having different numerators and denominators, but equal values, such as ½ and 2/4.
Formula: A mathematical process used to solve a problem. For example, the formula for finding the area of a rectangle is side A times side B =Area, or A x B = Area.
Fraction: A number represented by a numerator and a denominator, such as ½.
Improper Fraction: A fraction whose numerator is larger than its denominator. For example, 8/4 and 6/3 are improper fractions.
Mixed number: A combination of a whole number with a fraction or decimal. Examples of mixed numbers are 7/16, 5.75, and 1¼.
Numerator: The part of the fraction above the dividing line. For example, the 1 in ½ is the numerator.
Obtuse angle: Any angle between 90 degrees and 180 degrees.
Percent: Of or out of one hundred. For example, 8 is 8 percent (%) of 100.
Place Value: The exact quantity of a digit, determined by its place within the whole number or by its place within the whole number or by its relationship to the decimal point.
Quotient: The result of a division. For example, when dividing 6 by 2, the quotient is 3.
Rectangle: A four-sided shape with four 90-degree angles. Opposite sides of a rectangle are always parallel and the same length. Adjacent sides are perpendicular and are not equal in length.
Remainder: The leftover amount in a division problem. For example, in the problem 34 ÷ 8, 8 goes into 34 four times (8 x 4 = 32) and 2 is left over; in other words, it is the remainder.
Square: (1) A special type of rectangle with four equal sides and four 90-degree angles. (2) The product of a number multiplied by itself. For example, 25 is the square of 5; 16 is the square of 4.
Sum: The total in an addition problem. For example, in the problem 7 + 8 = 15, 15 is the sum.
Triangle: A closed shape that has three sides and three angles.
Vertex: A point at which two or more lines or curves come together.
Volume: The amount of space occupied in three dimensions (length, width, and height/depth/thickness).
Whole numbers: Complete units without fractions or decimals.

Unit 4
Introduction to Hand Tools (00103-09)

Adjustable end wrench: A smooth-jawed adjustable wrench used for turning nuts, bolts, and pipe fittings. Often referred to as a Crescent® wrench.
Ball peen hammer: A hammer with a flat face that is used to strike cold chisels and punches. The rounded end – the peen- is used to bend and shape soft metal.
Bell-faced hammer: A claw hammer with a slightly rounded, or convex face.
Chisel: A metal tool with a sharpened, beveled edge used to cut and shape wood, stone, or metal.
Claw hammer: A hammer with a flat striking face. The other end of the head is curved and divided into two claws to remove nails.
Combination wrench: A wrench with an open end and a closed end.
Fastener: A device such as a bolt, clasp, hook, or lock used to attach or secure one material to another.
Flat bar: A prying tool with a nail slot at the end to pull nails out in tightly enclosed areas. It can also be used as a small pry bar.

Hex key wrench: A hexagonal steel bar that is bent to form a right angle. Often referred to as an Allen® wrench.
Joint: The point where members or the edges of members are joined. The types of welding joints are butt joint, corner joint, and T-joint.
Kerf: A cut or channel made by a saw.
Level: Perfectly horizontal; completely flat; also, a tool used to determine if an object is level.
Miter joint: A joint made by fastening together usually perpendicular parts with the ends cut at an angle.
Nail puller: A tool used to remove nails.
Open-end wrench: A nonadjustable wrench with an opening at each end that determines the size of the wrench.
Pipe wrench: A wrench for griping and turning a pipe or pipe-shaped object; it tightens when turned in one direction.
Pliers: A scissor-shaped type of adjustable wrench equipped with jaws and teeth to grip objects.
Punch: A steel tool used to indent metal.
Rafter angle square: A type of carpenter's square made of cast aluminum that combines a protractor, try square, and framing square.
Striking (or slugging wrench): A nonadjustable wrench with an enclosed, circular opening designed to lock on to the fastener when the wrench is struck.
Try square: A square whose legs are fixed at a right angle.
Weld: To heat or fuse two or more pieces of metal so that the finished piece is as strong as the original; a welded joint.

Unit 5
Introduction to Power Tools (00104-09)

Abrasive: A substance, such as sandpaper, that is used to wear away material.
Auger: A tool with a spiral cutting edge for boring holes in wood and other materials.
Chuck: A clamping device that holds an attachment; for example, the chuck of the drill holds the drill bit.
Electric tools: Tools powered by electricity. The electricity is supplied by either an AC source (wall plug) or a DC source (battery).
Ferromagnetic: Having magnetic properties. Substances such as iron, nickel, cobalt, and various alloys are ferromagnetic.
Ground fault circuit interrupter (GFCI): A circuit breaker designed to protect people from electric shock and to protect equipment from damage by interrupting the flow of electricity if a circuit fault occurs.
Hydraulic tools: Tools powered by fluid pressure. The pressure is produced by hand pumps or electric pumps.
Pneumatic tools: Air-powered tools. The power is produced by electric or fuel-powered compressors.
Reciprocating: Moving back and forth:
Shank: The smooth part of a drill bit that fits into the chuck.
Trigger lock: A small lever, switch, or part that you push or pull to activate a locking catch or spring. Activating the trigger lock causes the trigger to stay in the operating mode even without your finger on the trigger.

Unit 6
Introduction to Construction Drawings (00105-09)

Architect: A qualified, licensed person who creates and designs drawings for a construction project.
Beam: A large, horizontal structural member made of concrete, steel, wood, or other structural material to provide support above a large opening.
Blueprints: The traditional name used to describe construction drawings.
Computer-aided drafting (CAD): The making of a set of construction drawings with the aid of a computer.
Construction drawings: Architectural or working drawings used to represent a structure or system.
Contour lines: Solid or dashed lines showing the elevation of the earth on a civil drawing.
Detail drawings: Enlarged views of part of a drawing used to show an area more clearly.
Dimensions: Measurement such as length, width, and height shown on a drawing.
Electrical plans: Engineered drawings that show all electrical supply and distribution.
Elevation drawing: Side view of a building or object, showing height and width.
Floor plan: A drawing that provides an aerial view of the layout of each room.
Foundation plan: A drawing that shows the layout and elevation of the building foundation.
Hidden line: A dashed line showing an object obstructed from view by another object.
Isometric drawing: A type of three-dimensional drawing of an object.
Legend: A description of the symbols and abbreviations used in a set of drawings.
Mechanical Plans: Engineered drawings that show the mechanical systems, such as motors and piping.
Plumbing Plans: Engineered drawings that show the layout for the plumbing system.
Roof Plan: A drawing of the view of the roof from above the building.
Scale: The ratio between the size of a drawing on an object and the size of the actual object.
Schematic: A one-line drawing showing the flow path for electrical circuitry.
Section drawing: A cross-sectional view of a specific location, showing the inside of an object or building.
Specifications: Precise written presentation of the details of a plan.
Symbol: A drawing that represents a material or component on a plan.
Title block: A part of a drawing sheet that includes some general information about the project.

Unit 6
Introduction to Materials Handling (00109-09)

Concrete Mule: Sometimes referred to as a *Georgia buggy*, a wheeled device used when a concrete pour is in a place that a concrete delivery truck or pump cannot reach.
Fall zone: When lifting, the area having a diameter twice the height of the object being lifted.
Freight elevator: An elevator used to transport materials from floor to floor.
Hand truck: Also known as dollies, hand trucks are two-wheeled carts that are used to transport large, heavy loads such as gas cylinders or drums.
Industrial forklift: A vehicle with a power-operated pronged platform that can be raised and lowered for insertion under a load to be lifted and moved.

Load: The quantity of materials able to be carried, transported, or relocated at one time by a machine, vehicle, piece of equipment, or person.
Material cart: Four-wheeled device used to transport materials around a job site.
Pallet jack: Also known as a pallet truck, a device used to lift and move heavy or stacked pallets.
Powered wheelbarrow: Also known as a power buggy, similar to a manual wheelbarrow, but powered by an electric or gas motor.
Roller skids: A device that includes a surface table and two, three, or four roller skids. Materials that are to be moved are placed on the table surface and then pushed on the skids.
Spotter: A person who walks in front of another worker who is carrying or transporting a long load to ensure there is a clear, unobstructed path.
Wheelbarrow: A one-or two-wheeled vehicle with handles at the rear, used to carry small loads.
Work zone: The area in which a forklift may come in contact with objects or people, either with the rear end or the front forks.

Unit 7
Level 1 Carpentry

Orientation to the Trade (27101-06)

Building codes: Codes published by state and local governments to establish minimum standards for various types of interior and exterior construction.
Finish carpentry: The portion of the carpentry trade associated with interior and exterior trim, cabinetry, siding, wall finishes, and decorative work.
Rough carpentry: The portion of the carpentry trade associated with framing and other work that will be covered with finish materials.
Takeoff: A list of building materials obtained by analyzing the project drawings (also known as a material takeoff).

Building Materials, Fasteners, and Adhesives (27102-06)

Cantilever: A beam, truss, or slab (floor) that extends past the last point of support.
Galvanized: Protected from rusting by a zinc coating.
Header: A piece used to span an opening (door, window, etc.). It is typically designed to carry a load.
Jambs: The sides and tops of window and door frames.
Joist: Generally, equally-spaced framing members that support floors and ceilings.
Millwork: Manufactured wood products such as doors, windows, and moldings.
Nail set: A punch-like metal tool used to recess finishing nails.
Rafter: A sloping structural member of a roof frame to which sheathing is secured.
Sheathing: Sheet material or boards to which roofing material or siding is secured.
Tongue-and-groove: A joint made by fitting a tongue on the edge of a board into a matching groove on the adjoining board.
Vaulted ceiling: A high, open ceiling that generally follows the roof pitch.

Hand and Power Tools (27103-06)

Dado: A rectangular groove or rabbet cut that is made partway through and across the grain in lumber.
Door jack: A holder or stand used to hold a door on edge while planning, routing, or installing hinges.
Miter box: A device that is used to cut lumber at precise angles.
Rabbet cut: A rectangular cut made along the edge or end of a board t receive another board that has been similarly cut.
Tenon: A tongue that is cut on the end of a piece of wood and shaped to fit into a mortise.
True: Accurately shaped or fitted.

Unit 8
Level 1 Electrical

Orientation to the Electrical Trade (26101-08)

Electrical service: The electrical components that are used to connect the commercial power to the premises wiring system.
Occupational Safety and Health Administration (OSHA): The federal government agency established to ensure a safe and healthy environment in the workplace.
On-the-job training (OJT): Job-related learning acquired while working.
Raceway systems: Conduit, fittings, boxes, and enclosures that house the conductors in an electrical system.
Rough-in: The installation of the raceway system (including conduit, boxes, and enclosures), wiring, or cable.
Trim-out: After rough-in, the installation and termination of devices and fixtures.

Electrical Safety (26102-08)

Double-insulated/ungrounded tool: An electrical tool that is constructed so that the case is insulated from electrical energy. The case is made of a nonconductive material.
Fibrillation: Very rapid irregular contractions of the muscle fibers of the heart that result in the heartbeat and pulse going out of rhythm with each other.
Grounded tool: An electrical tool with a three-prong plug at the end of its power cord or some other means to ensure that stray current travels to ground without passing through the body of the user. The ground plug is bonded to the conductive frame of the tool.
Ground fault circuit interrupter (GFCI): A protective device that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds some predetermined value. This value is less than required to operate the over-current protective device of the supply circuit.
Polychlorinated bipheryls (PCBs): Toxic chemicals that may be contained in liquids used to cool certain types of large transformers and capacitors.

Introduction to Electrical Circuits (26103-08)

Ammeter: An instrument for measuring electrical current.
Ampere: A unit of electrical current. For example, one volt across one ohm of resistance causes a current flow of one ampere.
Battery: A DC voltage source consisting of two or more cells that convert chemical energy into electrical energy.
Circuit: A complete path for current flow.
Conductor: A material through which it is relatively easy to maintain an electric current.
Insulator: A material through which it is difficult to conduct an electric current.
Ohm (Ω): The basic unit of measurement for resistance.
Ohmmeter: An instrument used for measuring resistance.
Power: The rate of doing work or the rate at which energy is used or dissipated. Electrical power is the rate of doing electrical work. Electrical power is measured in watts.
Series circuit: A circuit with only one path for current flow.
Volt (V): The unit of measurement for voltage (electromotive force or difference of potential). One volt is equivalent to the force required to produce a current of one ampere through a resistance of one ohm.
Watt (W): The basic unit of measurement for electrical power.

Unit 9
Level 1 Masonry

Introduction to Masonry (28101-04)

Admixture: A chemical or mineral other than water, cement, or aggregate added to mortar immediately before or during mixing to change its setting time or curing time, to reduce water, or to change the overall properties of the mortar.
Aggregate: Materials such as crushed stone or gravel used as a filler in concrete and concrete block.
Butter: Apply mortar to the end of a masonry unit.
Course: A row or horizontal layer of masonry units.
Facing: That part of a masonry unit or wall that shows after construction; the finished side of a masonry unit.
Grout: A mixture of Portland cement, lime, and water, with or without fine aggregate, with a high enough water content that it can be poured into spaces between masonry units and voids in a wall.
Mortar: A mixture of Portland cement, lime, fine aggregate, and water, plastic or stiff enough to hold its shape between masonry units.
Parapet: A low wall or railing.
Weephole: A small opening in mortar joints or faces to allow the escape of moisture.

Masonry Tools and Equipment (28102-04)

Bed joint: A horizontal joint between two masonry units.
Corner pole: Any type of post braced into a plumb position so that a line can be fastened to it. Also called a deadman.
Lead: The two corners of a structural unit or wall, built first and used as a position marker and measuring guide for the entire wall.
Temper: To remix mortar by adding water to make it more workable.

Masonry Units and Installation Techniques (28105-04)

Closure unit: The last brick or block to fill a course.
Dry bond: Laying out masonry units without mortar to establish spacing.
Rackback: A lead or other structure built with each course of masonry shorter than the course below it.
Tail: To check the spacing of head joints by checking the diagonal edges of the courses on a lead or corner.

Unit 10
Level 1 Plumbing

Introduction to the Plumbing Profession (02101-12)

Honesty: Be honest and truthful in all dealings. Conduct business according to the highest professional standards. Faithfully fulfill all contracts and commitments. Do not deliberately mislead or deceive others.
Integrity: Demonstrate personal integrity and the courage of your convictions by doing what is right even where there is pressure to do otherwise. Do not sacrifice your principles because it seems easier.
Fairness: Be fair and just in all dealings. Do not take undue advantage of another's mistakes or difficulties. Fair people are open-minded and committed to justice, equal treatment of individuals, and tolerance for and acceptance of diversity.
Leadership: By your own conduct, seek to be a positive role model for others.

Tools of the Plumbing Trade (02103-12)

Burr: Uneven or jagged edge left on metal by certain cutting tools.
Diameter: The distance across the center of a circle.
Ferrous: Containing iron.
Plumb: Straight on a vertical plane.
Reaming: A process that removes burrs from pipes after they have been cut.
Solder: An alloy (tin plus antimony, copper, and silver) with a low melting point used to join metals or seal joints.
Tolerance: Allowable variation in a given measurement or quantity.
Tube sock: Uncut tubing material on hand for use on a project.

Appendix C: Industry Standards

NCCER Learning Series Standards for the Construction Core Technology Program[1] (taken from the National Center for Construction Education and Research)

Crosswalk for Construction Core

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
CORE BSM			X								
ICM				X							
IHT					X						
IPT					X						
BLU						X					
COM		X									
EMP		X									
IMH							X				
LEVEL 1 CARPENTRY											
OTT								X			
BFA								X			
HPT								X			
LEVEL 1 ELECTRICAL											
OET									X		
ESF									X		
IEC									X		
LEVEL 1 MASONRY											
ITM										X	
MTE										X	
MIT										X	
LEVEL 1 PLUMBING											
IPP											X
PLT											X

NCCER Core

BSM – BASIC SAFETY (00101-09)
ICM – INTRODUCTION TO CONSTRUCTION MATH (00102-09)
IHT – INTRODUCTION TO HAND TOOLS (00103-09)
IPT – INTRODUCTION TO POWER TOOLS (00104-09)
BLU – INTRODUCTION TO CONSTRUCTION DRAWINGS (00105-09)
COM – BASIC COMMUNICATION SKILLS (00107-09)
EMP – BASIC EMPLOYABILITY SKILLS (00108-09)
IMH – INTRODUCTION TO MATERIALS HANDLING (00109-09)
LEVEL 1 CARPENTRY

OTT – ORIENTATION TO THE TRADE (27101-06)

[1] *NCCER learning series.* Retrieved October 12, 2011, from http://www.nccer.org/

BFA – BUILDING MATERIALS, FASTNERS, AND ADHESIVES (27102-06)
HPT – HAND AND POWER TOOLS (27103-06)

LEVEL 1 ELECTRICAL

OET – ORIENTATION TO THE ELECTRICAL TRADE (26101-08)
ESF – ELECTRICAL SAFETY (26102-08)
IEC – INTRODUCTION TO ELECTRICAL CIRCUITS (26103-08)

LEVEL 1 MASONRY

ITM – INTORDUCTION TO MASONRY (28101-04)
MTE – MASONRY TOOLS AND EQUIPMENT (28102-04)
MIT – MASONRY UNITS AND INSTALLATION TECHNIQUES (28105-04)

LEVEL 1 PLUMBING

IPP – INTRODUCTION TO THE PLUMBING PROFESSION (02101-12)
PLT – TOOLS OF THE PLUMBING TRADE (02103-12)

Appendix D: 21st Century Skills[2]

21st Century Crosswalk for Construction Core											
	Units	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**	**Unit 5**	**Unit 6**	**Unit 7**	**Unit 8**	**Unit 9**	**Unit 10**
21st Century Standards											
CS1		X	X	X	X	X	X	X	X	X	X
CS2		X	X	X	X	X	X	X	X	X	X
CS3		X	X		X	X	X		X	X	X
CS4		X	X	X	X	X	X	X	X	X	X
CS5											
CS6		X	X	X	X	X	X	X	X	X	X
CS7		X	X	X	X	X	X	X	X	X	X
CS8		X	X	X	X	X	X	X	X	X	X
CS9		X	X	X	X	X	X	X	X	X	X
CS10		X									
CS11		X									
CS12		X	X	X	X	X	X	X	X	X	X
CS13		X	X	X	X	X	X	X	X	X	X
CS14		X	X	X	X	X	X	X	X	X	X
CS15		X	X	X	X	X	X	X	X	X	X
CS16		X	X	X	X	X	X	X	X	X	X

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

[2] *21st century skills.* (n.d.). Washington, DC: Partnership for 21st Century Skills.

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
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

Common Core Crosswalk for

	Units	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
Common Core Standards											
CCR1		X	X	X	X		X	X	X	X	X
CCR2		X	X	X	X		X	X	X	X	X
CCR3		X	X		X		X	X	X	X	X
CCR4		X	X		X	X	X	X	X	X	X
CCR5		X	X		X	X	X	X	X	X	X
CCR6		X			X						
CCR7		X	X		X	X	X	X	X	X	X
CCR8		X			X	X	X	X	X	X	X
CCR9		X			X	X	X	X	X	X	X
CCR10			X		X	X	X	X	X	X	X
CCW1											
CCW2		X				X					
CCW3			X		X	X	X	X	X	X	X
CCW4		X	X		X	X	X	X	X	X	X
CCW5		X	X		X	X	X	X	X	X	X
CCW6					X			X	X	X	X
CCW7		X						X	X	X	X
CCW8		X	X		X	X	X	X	X	X	X
CCW9											
CCW10						X		X	X	X	X
CCSL1		X	X	X	X	X	X	X	X	X	X
CCSL2											
CCSL3		X	X				X	X	X	X	X
CCSL4		X	X	X	X	X	X	X	X	X	X
CCSL5		X						X	X	X	X
CCSL6		X						X	X	X	X
CCL1			X		X	X	X	X	X	X	X
CCL2			X					X	X	X	X
CCL3			X								
CCL4		X	X		X	X	X	X	X	X	X
CCL5											
CCL6		X	X	X	X	X	X	X	X	X	X
CCM1				X				X	X	X	X
CCM2				X				X	X	X	X
CCM3				X				X	X	X	X
CCM4				X				X	X	X	X
CCM5				X				X	X	X	X
CCM6				X				X	X	X	X
CCM7				X		X					
CCM8				X		X					
CCM9				X		X					
CCM10				X				X	X	X	X
CCM11				X				X	X	X	X
CCM12				X				X	X	X	X
CCM13				X				X	X	X	X
CCM14				X				X	X	X	X
CCM15											
CCM16				X				X	X	X	X
CCM17				X				X	X	X	X
CCM18				X				X	X	X	X
CCM19				X				X	X	X	X
CCM20				X				X	X	X	X
CCM21				X				X	X	X	X
CCM22				X				X	X	X	X
CCM23											

CCM24											
CCM25											
CCM26				X				X	X	X	X
CCM27				X				X	X	X	X
CCM28				X				X	X	X	X
CCM29				X				X	X	X	X
CCM30				X		X		X	X	X	X
CCM31				X		X		X	X	X	X
CCM32				X		X		X	X	X	X
CCM33				X		X		X	X	X	X
CCM34											
CCM35											
CCM36											
CCM37											
CCM38											
CCM39											
CCM40				X		X		X	X	X	X
CCM41				X		X		X	X	X	X
CCM42				X		X		X	X	X	X
CCM43				X		X		X	X	X	X
CCM44				X		X		X	X	X	X
CCM45											
CCM46											
CCM47											
CCM48											
CCM49											
CCM50											
CCM51											
CCM52											
CCM53											

English Language Arts (6-12)

College and Career Readiness Anchor Standards for *Reading*

Key Ideas and Details

CCR1: 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.

CCR2: Determine central ideas or themes of a text, and analyze their development; summarize the key supporting details and ideas.

CCR3: Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

CCR4: 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.

CCR5: 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.

CCR6: Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

CCR7: Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.

CCR8: 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.

CCR9: 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

CCR10: Read and comprehend complex literary and informational texts independently and proficiently. Mathematics (High School)

College and Career Readiness Anchor Standards for *Writing*

Text Types and Purposes

CCW1: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

CCW2: Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

CCW3: Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

CCW4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCW5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCW6: Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

CCW7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

CCW8: Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

CCW9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

CCW10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

College and Career Readiness Anchor Standards for *Speaking and Listening*

Comprehension and Collaboration

CCSL1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

CCSL2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSL3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

CCSL4: Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

CCSL5: Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

CCSL6: Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

College and Career Readiness Anchor Standards for *Language*

Conventions of Standard English

CCL1: Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CCL2: Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

CCL3: Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

CCL4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

CCL5: Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

CCL6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

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)

NETS Crosswalk for Construction Core											
	Course	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10
NETS Standards											
T1		X						X	X	X	X
T2		X	X		X	X	X		X	X	X
T3		X		X	X	X	X		X	X	X
T4		X	X	X	X	X	X	X	X	X	X
T5		X									
T6		X	X	x	X	X	X		X	X	X

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.