



Program of Study Guide:

Masonry

Comprehensive guidelines and course standards for the Masonry pathway

Office of College and Career Pathways

August 2025

MARYLAND STATE DEPARTMENT OF EDUCATION

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Table of Contents

Document Control Information.....	3
Purpose.....	4
Standards Sources.....	5
Course Descriptions.....	6
Industry-Recognized Credentials and Career-Connected Learning	9
Labor Market Information: Definitions and Data	11
Course Standards: Core Construction Principles	13
Course Standards: Masonry I	17
Course Standards: Masonry II	21

Document Control Information

Title:	Program of Study Guide: Masonry
Security Level:	Approved for Distribution
File Name:	CST_Masonry

DOCUMENT HISTORY

Document Version	Date	Summary of Change
1.0	November 2024	Initial Document
2.0	January 2025	Revisions
3.0	March 2025	Revisions
4.0	May 2025	Revisions
5.0	June 2025	Revisions
6.0	August 2025	Revisions

Purpose

The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Masonry Program of Study. The academic standards in this document are theoretical and performance based. The standards contain content from multiple state departments of education, industry related resources and have been reviewed and vetted by members of the Maryland business and industry community.

In addition to academic standards, the Maryland State Department of Education (MSDE) has incorporated into this document Labor Market Information (LMI) definitions and explanations for the Program of Study; program aligned Industry Recognized Credentials; and Work-Based Learning resources and requirements by course level.

Standards Sources

The following sources collectively support a progression of standards from foundational to advanced Masonry concepts in a high school context, preparing students for industry-aligned certifications like NCCER Core, NCCER Masonry Level 1 and 2, and OSHA 30 and providing them with the necessary knowledge and skills for career readiness in Masonry careers.

Here are the key standards sources for Masonry curriculum:

1. NCCER (National Center for Construction Education and Research)

- A. **Description:** Comprehensive competency-based craft training curriculum including Core curriculum and multiple levels of Masonry training. Includes detailed learning objectives, performance tasks, and assessment materials.
- B. **Use:** Provides the foundational structure for our program, including clear learning progressions and industry-recognized credentials. Aligned with industry needs and updated regularly.
- C. **Source:** Access through NCCER accredited training programs and approved curriculum providers (www.nccer.org)

2. OSHA Standards (29 CFR 1926 Subpart K)

- A. **Description:** Federal safety and health regulations for Masonry safety in construction.
- B. **Use:** Ensures program meets required safety training standards and prepares students for workplace requirements.
- C. **Source:** Freely available at www.osha.gov.

Course Descriptions

Course Level	Course Information	Description
Required Core: Course 1	Core Construction Principles SCED: Pending Grades: 9-12 Prerequisite: None Credit: 1	Construction Fundamentals is a foundational course that introduces essential construction industry knowledge and skills while preparing students for careers in multiple construction trades. Students develop competencies in workplace safety, construction math, hand and power tools, construction drawings, and basic rigging. The course emphasizes comprehensive safety training aligned with OSHA 30 Construction certification requirements. Students also build crucial workplace readiness skills through modules on communication, employability, and material handling. Students can earn both NCCER Core and OSHA 30 Construction certifications upon completion.
Required Core: Course 2	Masonry I SCED: Pending Grades: 10-12 Prerequisite: Core Construction Principles Credit: 1	This course will introduce students to the fundamental principles and techniques of masonry construction. Students develop essential skills in mixing and applying mortar, laying masonry units, and following proper safety protocols. Through hands-on practice, students learn to identify and properly use masonry tools and equipment, interpret construction drawings and specifications, and understand basic mathematical concepts used in masonry work. The course covers multiple types of masonry construction including brick, block, and stone work, while emphasizing the importance of proper measurements and quality control.
Optional Flex: Course 1	Masonry II SCED: Pending Grades: 11-12 Prerequisite: Masonry I Credit: 1	This advanced course focuses on complex residential and commercial masonry applications. Students master sophisticated techniques in constructing reinforced masonry, building fireplaces and chimneys, and installing specialized masonry features such as arches and detailed brickwork patterns. The course emphasizes critical quality control procedures, advanced blueprint reading, and proper installation of masonry openings and metalwork. Students learn to properly install

		insulation, moisture control systems, and various types of masonry reinforcement while adhering to building codes and industry standards. Through hands-on projects, students develop expertise in constructing different wall systems including cavity, composite, and veneer walls.
Optional Flex: Course 2	Career Connected Learning I SCED: Pending Grades: 11-12 Prerequisite: See Course Description Credits: 1-3	Prerequisites: 1. Alignment to the student's 6-Year Plan 2. Completion of: a. Minimum two sequential courses in a CTE pathway, OR b. Minimum two years of the same world language; OR c. Minimum two sequential courses in a comprehensive arts program; OR d. Inclusion in the IEP/504 transition plan with supporting documentation (as required) 3. Endorsement from an educator, mentor, employer, or career coach 4. No more than one course recovery credit in core subjects is needed by the student. This flexible, work-based learning course introduces students to real-world applications of classroom knowledge and technical skills through on-the-job experiences and reflective practices. Students engage in career exploration, skill development, and professional networking by participating in youth apprenticeships, registered apprenticeships, pre-apprenticeships, internships, capstone projects, or other approved career-connected opportunities. Variable credit (1–3) accommodates the required on-the-job training hours and related instruction. By integrating industry standards, employability skills, and personalized learning goals, Career Connected Learning I equips students to make informed career decisions, develop a professional portfolio, and build a strong foundation for success in postsecondary education, training, or the workforce.
Optional Flex: Course 3	Career Connected Learning II SCED: Pending Grades: 11-12 Prerequisite: Career	Building on the foundational experiences of Career Connected Learning I, this advanced work-based learning course provides students with deeper on-the-job practice, leadership opportunities, and refined career exploration. Students continue to enhance their technical and professional skills, expanding their

	Connected Learning I Credits: 1-3	industry networks and aligning personal goals with evolving career interests. Variable credit (1–3) remains aligned with the required training hours and related instruction. Through elevated responsibilities and skill application, Career Connected Learning II prepares students to confidently transition into higher-level postsecondary programs, apprenticeships, or the workforce.
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Dual Enrollment and Career Connected Learning Experiences Must be Aligned to the CTE Core.

Industry-Recognized Credentials and Career-Connected Learning

The *Blueprint for Maryland's Future* and the High School Level of a Registered Apprenticeship

The Maryland State Department of Education recognizes the high-school level of a Registered Apprenticeship (RA), defined as a State-approved Registered Apprenticeship begun during high school in which students complete at least 144 hours of related technical instruction and 250 hours of paid on-the-job training before graduation, with the remaining required apprenticeship hours completed post-graduation, as the gold standard of Career Connected Learning.

The CTE Committee of the Governor's Workforce Development Board, in alignment with federal apprenticeship standards, requires 144 hours of RTI for all high school RA participants, and the Apprenticeship Maryland Program (AMP) defines the minimum RTI as **one course credit equivalent**. This high-school-level Registered Apprenticeship is the preferred career-connected learning option for students to meet the Blueprint's goal that 45% of public high school graduates complete either the high-school level of a Registered Apprenticeship or another industry-recognized credential.

To the extent practicable, the greatest number of students should achieve this goal through participation in a high-school level Registered Apprenticeship, with schools ensuring these requirements are scheduled, completed, and documented for transcript and reporting purposes.

To the extent practicable, the greatest number of students should achieve this goal through the high-school level of a Registered Apprenticeship.

Career-Connected Learning Resources		
Course 1: Career Awareness	Course 2: Career Preparation	Flex Courses: Career-Connected Learning
- Industry Visits - Guest Speakers - Participation in Career and Technical Student Organizations - Postsecondary Visits – Program Specific Site Tours - Mock Interviews	- All of Career Awareness plus the following: - Job Shadow - Employer Mentoring	- Registered Apprenticeship - Internship - School-Based Enterprise - Employer-Directed Capstone

Industry-Recognized Credentials

By the end of Core Construction Principles: NCCER Core + OSHA 30

By the end of Masonry I: Masonry Level 1 Certificate

By the end of Masonry II: Masonry Level 2 Certificate

Optional Credentials (via the Flex Course options): Apprenticeship

Labor Market Information: Definitions and Data

Labor market information (LMI) plays a crucial role in shaping Career and Technical Education (CTE) programs by providing insights into industry demands, employment trends, and skills gaps. This data helps education leaders assess the viability of existing programs and identify opportunities for new offerings. By aligning CTE programs with real-time labor market needs, schools can better prepare students for in-demand careers and ensure that resources are effectively utilized to support pathways that lead to high-quality, sustainable employment.

Standard Occupational Code (SOC) and Aligned Industry:

Indicator	Definition	Pathway Labor Market Data
High Wage¹	Those occupations that have a 25th percentile wage equal to or greater than the most recent MIT Living Wage Index for one adult in the state of Maryland, and/or leads to a position that pays at least the median hourly or annual wage for the DC-VA-MD-WV Metropolitan Statistical Area (MSA). <i>Note: A 25th percentile hourly wage of \$24.74 or greater is required to meet this definition.</i>	Standard Occupational Code: 47-2021: Brickmasons and Blockmasons Hourly Wage/Annual Salary: 25 th Percentile: \$23.74/\$49,379 50 th Percentile: \$28.09/\$58,427 75 th Percentile: \$29.67/\$61,714
High Skill	Those occupations located within the DC-VA-MD-WV Metropolitan Statistical Area (MSA) with the following education or training requirements: completion of an apprenticeship program; completion of an industry-recognized certification or credential; associate's degree, bachelor's degree, or higher.	Typical Entry-Level Education: While there are several organized training programs in the region, there is no formal post-secondary training necessary to enter the workforce for students who have completed this program.
In-Demand	Annual growth plus replacement, across all Maryland occupations, is <u>405</u> openings between 2024-2029.	Annual Openings 133

Lightcast Data Updated August 2025

¹ Living Wage Calculator: <https://livingwage.mit.edu/states/24>

Labor Market Information Data Source

Lightcast occupation employment data are based on final Lightcast industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Lightcast earnings by industry. Foundational data for the state of Maryland is collected and reported by the Maryland Department of Labor.

Methodology for High Wage Calculations

To combine labor market data across multiple Standard Occupational Classifications (SOCs), a weighted average approach was used to ensure accurate representation of the marketplace. Median wages for each SOC were weighted based on their respective employment levels, reflecting the relative demand for each occupation. This method ensures that occupations with higher employment contribute proportionately to the overall wage calculation. Additionally, job openings from all relevant SOCs were summed to determine the total projected demand. For example, if Mechanical Engineers account for 67% of total employment and Electrical Engineers for 33%, their respective wages are weighted accordingly, and job openings are aggregated to provide a comprehensive view of labor market opportunities. This approach delivers a balanced and accurate representation of both wages and employment demand for the program.

Methodology for In-Demand Calculations

The baseline for annual job openings, taking into account new positions and replacement positions, was determined by taking the average of all annual job openings between 2024 and 2029 across all 797 career sectors at the 5-digit SOC code level. For the 2024-2029 period, average job openings (growth + replacement) is 405.

Course Standards: Core Construction Principles

1. GENERAL REQUIREMENTS. This course is recommended for students in Grades 9-12.

2. INTRODUCTION

- A. Career and Technical Education (CTE) instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
- B. The Construction Career Cluster prepares students for careers in designing, planning, and building sustainable infrastructure. This field includes architects, engineers, construction managers, and skilled trades professionals.
- C. The Masonry Program of Study is a comprehensive three-course sequence that prepares students for careers in residential and commercial masonry construction. Beginning with construction fundamentals and OSHA 30 safety training, students progress through fundamental masonry techniques to advanced applications, combining classroom instruction with extensive hands-on laboratory experience. Through this program, students develop the knowledge and skills needed to earn industry-recognized certifications including OSHA 30 Construction and become prepared to test for NCCER Core, NCCER Masonry Level 1, and NCCER Masonry Level 2 credentials. Students master essential skills from workplace safety and basic tool usage to advanced techniques such as reinforced masonry, fireplace construction, and specialized architectural features. This sequential program aligns with industry standards and provides graduates with the technical knowledge and practical skills needed for immediate employment as apprentice masons or continued education in construction management programs, meeting current workforce demands in the construction industry.
- D. Core Construction Principles introduces students to the essential fundamentals of the construction industry with a focus on Masonry career preparation. This foundational course aligns with NCCER Core certification and OSHA safety standards, emphasizing construction safety, basic math operations, hand and power tool operations, blueprint reading, and material handling. Students develop critical workplace skills through modules covering communication, employability skills, and construction drawings.
- E. Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
- F. Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland.

3. KNOWLEDGE AND SKILLS**A. The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:**

1. Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work.
2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn.
3. Employ effective reading, writing, and technical documentation skills.
4. Solve problems using critical thinking techniques and structured troubleshooting methodologies.
5. Demonstrate leadership skills and collaborate effectively as a team member.
6. Implement safety procedures, including proper handling of hardware and following OSHA guidelines.
7. Exhibit an understanding of legal and ethical responsibilities in the construction field, following applicable laws and best practices for safety.
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting.

B. The student identifies various career pathways in the Masonry field. The student is expected to:

1. Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles as a Mason or in the Masonry field.
2. Create a professional resume and portfolio that reflects skills, projects, certifications, and recommendations.
3. Demonstrate effective interview skills for roles in the Masonry field.

C. The student identifies the issues associated with Masonry hazards found on a jobsite. The student is expected to:

1. Demonstrate safe working procedures in a construction environment.
2. Explain the purpose of the Occupational Safety and Health Administration (OSHA) and how it promotes safety on the job.
3. Identify Masonry hazards and how to avoid or minimize them in the workplace.
4. Explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection.

D. The student integrates core academic skills into Masonry construction practices. The student is expected to:

1. Demonstrate the use of clear communication techniques, both written and verbal, that are consistent with industry standards.
2. Execute essential construction and layout calculations that support precise masonry work. Students learn measurement and unit conversion between metric and standard systems, applying these skills to calculate area, perimeter, and volume for material estimation. Geometric concepts emphasize understanding angles, triangles, and the 3-4-5 method for square corners, which are crucial for accurate layout work. Basic algebraic skills are developed through formula manipulation, ratio and proportion problems for material mixing, and calculations for estimating materials and costs. These mathematical foundations ensure students can accurately interpret construction drawings, estimate materials, and execute precise masonry work to specifications.
3. Use scientific principles in the program that emphasize understanding the properties and behavior of construction materials in various conditions. Students explore basic chemistry concepts related to cement hydration, aggregate composition, and material strength. Physics concepts cover force and load principles, center of gravity, and simple machines used in construction. Environmental science applications focus on how temperature, moisture, and weather affect construction materials and processes. Safety science instruction includes understanding chemical reactions in construction materials, proper interpretation of material safety data sheets, and the scientific principles behind personal protective equipment. These scientific concepts provide students with a deeper understanding of why specific masonry techniques and safety procedures are essential in construction.

E. The student demonstrates understanding of construction industry fundamentals and career opportunities. The student is expected to:

1. Analyze the current state and key components of the construction industry.
2. Evaluate the benefits and opportunities available in a construction career.
3. outline the typical career progression path for craft professionals.
4. Develop a plan to pursue a career in the Masonry field.

F. The student implements construction safety protocols and procedures. The student is expected to:

1. Analyze workplace incidents, associated costs, and methods to reduce hazards;
2. Demonstrate proper fall protection techniques and hazard prevention methods.
3. Evaluate Masonry hazards and implement appropriate safety measures.
4. Select and utilize appropriate personal protective equipment (PPE) for specific hazards.
5. Apply safety practices for common job-site hazards.

G. The student applies mathematical principles in construction contexts. The student is expected to:

1. Solve basic arithmetic problems using whole numbers.
2. Calculate measurements and dimensions using fractions.
3. Solve construction-related problems using decimal numbers.
4. Measure lengths accurately using common measuring tools.
5. Convert between units of measurement in both imperial and metric systems.
6. Calculate areas and volumes of common geometric shapes.

H. The student demonstrates proper use and maintenance of hand tools. The student is expected to:

1. Identify and safely operate common hand tools.
2. Select and utilize appropriate measurement and layout tools.
3. Maintain and properly store hand tools common to construction sites.

I. The student demonstrates safe and proper use of power tools. The student is expected to:

1. Identify the tool most appropriate for the job to be performed.
2. Operate industry related tools safely and effectively.
3. Perform maintenance on related industry tools.
4. Demonstrate appropriate storage and safety techniques when tools are not in use.

J. The student interprets construction drawings and specifications. The student is expected to:

1. Identify basic components and features of construction drawings, schematics, and diagrams.
2. Differentiate between various types of construction drawings.
3. Utilize interactive software to develop construction drawings, including but not limited to various CAD programs.

K. The student develops effective workplace communication skills. The student is expected to:

1. Demonstrate effective verbal and non-verbal communication in construction settings.
2. Apply reading and writing skills to construction-related tasks.

L. The student develops professional workplace behaviors and skills. The student is expected to:

1. Understand the importance of consistent attendance, punctuality, and professional communication.
2. Evaluate construction business opportunities and workforce entry strategies.
3. Apply critical thinking skills to solve workplace problems.
4. Demonstrate appropriate social skills in professional settings to include customer service interactions that communicate the problem, potential solutions, and create positive customer experiences.

M. The student implements proper material handling techniques. The student is expected to:

1. Identify and explain specific uses for different industry related materials.
2. Apply safety precautions in material handling operations.
3. Select and operate appropriate material handling equipment.

Course Standards: Masonry I

1. **GENERAL REQUIREMENTS.** This course is recommended for students in Grades 10-12.
2. **INTRODUCTION**
 - A. Career and Technical Education (CTE) instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - B. The Construction Career Cluster prepares students for careers in designing, planning, and building sustainable infrastructure. This field includes architects, engineers, construction managers, and skilled trades professionals.
 - C. The Masonry Program of Study is a comprehensive three-course sequence that prepares students for careers in residential and commercial masonry construction. Beginning with construction fundamentals and OSHA 30 safety training, students progress through fundamental masonry techniques to advanced applications, combining classroom instruction with extensive hands-on laboratory experience. Through this program, students develop the knowledge and skills needed to earn industry-recognized certifications including OSHA 30 Construction and become prepared to test for NCCER Core, NCCER Masonry Level 1, and NCCER Masonry Level 2 credentials. Students master essential skills from workplace safety and basic tool usage to advanced techniques such as reinforced masonry, fireplace construction, and specialized architectural features. This sequential program aligns with industry standards and provides graduates with the technical knowledge and practical skills needed for immediate employment as apprentice masons or continued education in construction management programs, meeting current workforce demands in the construction industry.
 - D. In the Masonry I course, students will be introduced to the fundamental principles and techniques of masonry construction. Students develop essential skills in mixing and applying mortar, laying masonry units, and following proper safety protocols. Through hands-on practice, students learn to identify and properly use masonry tools and equipment, interpret construction drawings and specifications, and understand basic mathematical concepts used in masonry work. The course covers multiple types of masonry construction including brick, block, and stone work, while emphasizing the importance of proper measurements and quality control.
 - E. Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
 - F. Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland.

3. KNOWLEDGE AND SKILLS**A. The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:**

1. Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work.
2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn.
3. Employ effective reading, writing, and technical documentation skills.
4. Solve problems using critical thinking techniques and structured troubleshooting methodologies.
5. Demonstrate leadership skills and collaborate effectively as a team member.
6. Implement safety procedures, including proper handling of hardware and following OSHA guidelines.
7. Exhibit an understanding of legal and ethical responsibilities in the construction field, following applicable laws and best practices for safety.
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting.

B. The student identifies various career pathways in the Masonry field. The student is expected to:

1. Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles as a Mason or in the Masonry field.
2. Create a professional resume and portfolio that reflects skills, projects, certifications, and recommendations.
3. Demonstrate effective interview skills for roles in the Masonry field.

C. The student identifies the issues associated with Masonry hazards found on a jobsite. The student is expected to:

1. Demonstrate safe working procedures in a construction environment.
2. Explain the purpose of the Occupational Safety and Health Administration (OSHA) and how it promotes safety on the job.
3. Identify Masonry related hazards and how to avoid or minimize them in the workplace.
4. Explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection.

D. The student integrates core academic skills into Masonry construction practices. The student is expected to:

1. Demonstrate the use of clear communication techniques, both written and verbal, that are consistent with industry standards.
2. Use precise measurements and calculations specific to basic masonry applications. Students apply geometric and algebraic concepts to wall layout, including calculating bond patterns, spacing, and material quantities. Mathematical skills are developed through mortar mix ratio calculations, coursing calculations for brick and block, and basic estimating for simple masonry projects. Understanding elevations, dimensions, and scaled drawings builds students' ability to translate mathematical concepts into practical masonry applications, ensuring accurate layout and construction of basic masonry structures.
3. Understand the properties and behavior of masonry materials and mortar. Students learn the chemistry behind mortar mixing and curing, including how different environmental conditions affect the curing process. Physical properties of various masonry units, including strength, water absorption, and thermal properties, are explored. Students study how temperature and moisture impact masonry construction, particularly in mortar application and curing. These scientific foundations help students understand why specific techniques and procedures are essential for successful basic masonry construction.

E. The student understands fundamental masonry concepts and safety practices. The student is expected to:

1. Describe modern masonry materials and their applications in construction.
2. Identify proper uses of concrete masonry units, clay units, and stone in construction.
3. Demonstrate proper safety practices when working with masonry materials.
4. Apply proper techniques for mixing mortar by hand.
5. Demonstrate proper procedures for laying masonry units.
6. Explain the career pathways and professional development opportunities in masonry.

F. The student demonstrates mastery of masonry safety protocols and procedures. The student is expected to:

1. Analyze common causes of accidents and hazards in masonry work.
2. Demonstrate proper use of personal protective equipment.
3. Apply safe working procedures when operating from elevated surfaces.
4. Evaluate proper procedures for tool and equipment safety.
5. Demonstrate safe material handling techniques.
6. Execute proper scaffold assembly and disassembly procedures.

G. The student utilizes appropriate tools and equipment in masonry work. The student is expected to:

1. Demonstrate proper use of hand tools in masonry applications.
2. Apply measuring techniques using various masonry measuring tools.
3. Operate mortar mixing equipment safely and effectively.
4. Demonstrate proper use of power tools in masonry applications.
5. Utilize appropriate lifting equipment for masonry materials.
6. Assemble and disassemble scaffolding according to safety guidelines.

H. The student applies mathematical concepts and construction drawings in masonry work.**The student is expected to:**

1. Calculate measurements and dimensions for masonry projects.
2. Interpret construction drawings and specifications.
3. Apply mathematical concepts to determine material requirements.
4. Analyze specifications and standards in masonry projects.
5. Evaluate construction drawings to determine project requirements.

I. The student demonstrates knowledge of mortar properties and applications. The student is expected to:

1. Analyze different types of mortar and their applications.
2. Evaluate properties of plastic and hardened mortar.
3. Diagnose common problems in mortar application.
4. Demonstrate proper mortar mixing procedures.
5. Apply proper techniques for mortar application and cleanup.

J. The student masters masonry unit installation techniques. The student is expected to:

1. Demonstrate proper installation of concrete masonry units.
2. Execute proper brick laying techniques.
3. Perform accurate cutting of masonry units using various tools.
4. Install masonry reinforcement and accessories correctly.
5. Apply proper cleaning techniques for masonry work.
6. Evaluate finished masonry work for quality and accuracy.

Course Standards: Masonry II

1. **GENERAL REQUIREMENTS.** This course is recommended for students in Grades 11-12.
2. **INTRODUCTION**
 - A. Career and Technical Education (CTE) instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.
 - B. The Construction Career Cluster prepares students for careers in designing, planning, and building sustainable infrastructure. This field includes architects, engineers, construction managers, and skilled trades professionals.
 - C. The Masonry Program of Study is a comprehensive three-course sequence that prepares students for careers in residential and commercial masonry construction. Beginning with construction fundamentals and OSHA 30 safety training, students progress through fundamental masonry techniques to advanced applications, combining classroom instruction with extensive hands-on laboratory experience. Through this program, students develop the knowledge and skills needed to earn industry-recognized certifications including OSHA 30 Construction and become prepared to test for NCCER Core, NCCER Masonry Level One, and NCCER Masonry Level Two credentials. Students master essential skills from workplace safety and basic tool usage to advanced techniques such as reinforced masonry, fireplace construction, and specialized architectural features. This sequential program aligns with industry standards and provides graduates with the technical knowledge and practical skills needed for immediate employment as apprentice masons or continued education in construction management programs, meeting current workforce demands in the construction industry.
 - D. Masonry II builds upon foundational masonry skills. This advanced course focuses on complex residential and commercial masonry applications. Students master sophisticated techniques in constructing reinforced masonry, building fireplaces and chimneys, and installing specialized masonry features such as arches and detailed brickwork patterns. The course emphasizes critical quality control procedures, advanced blueprint reading, and proper installation of masonry openings and metalwork. Students learn to properly install insulation, moisture control systems, and various types of masonry reinforcement while adhering to building codes and industry standards. Through hands-on projects, students develop expertise in constructing different wall systems including cavity, composite, and veneer walls.
 - E. Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.
 - F. Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland.

3. KNOWLEDGE AND SKILLS**A. The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:**

1. Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work.
2. Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn.
3. Employ effective reading, writing, and technical documentation skills.
4. Solve problems using critical thinking techniques and structured troubleshooting methodologies.
5. Demonstrate leadership skills and collaborate effectively as a team member.
6. Implement safety procedures, including proper handling of hardware/hand tools and following OSHA guidelines.
7. Exhibit an understanding of legal and ethical responsibilities in the construction field, following applicable laws and best practices for safety.
8. Demonstrate time-management skills and the ability to prioritize tasks in a technical setting.

B. The student identifies various career pathways in the Masonry field. The student is expected to:

1. Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles as a Mason or in the Masonry field.
2. Create a professional resume and portfolio that reflects skills, projects, certifications, and recommendations.
3. Demonstrate effective interview skills for roles in the Masonry field.

C. The student identifies the issues associated with Masonry hazards found on a jobsite. The student is expected to:

1. Demonstrate safe working procedures in a construction environment.
2. Explain the purpose of the Occupational Safety and Health Administration (OSHA) and how it promotes safety on the job.
3. Identify Masonry hazards and how to avoid or minimize them in the workplace.
4. Explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection.

D. The student integrates core academic skills into Masonry construction practices. The student is expected to:

1. Demonstrate the use of clear communication techniques, both written and verbal, that are consistent with industry standards.
2. Apply calculations required for specialized masonry structures. Students apply advanced geometry and algebra to calculate dimensions and layouts for arches, fireplaces, and chimneys. Mathematical concepts include advanced estimating for large projects, calculating structural loads and reinforcement requirements, and determining precise measurements for specialized architectural features. These advanced mathematical skills enable students to plan and execute complex masonry projects while maintaining structural integrity and aesthetic requirements.
3. Use scientific principles that focus on structural behavior and material interaction in complex systems. Students study the physics of load distribution in reinforced masonry, thermal expansion and contraction in different wall systems, and the chemistry of specialized grouts and mortars. Environmental science concepts include advanced understanding of moisture movement through different wall systems, thermal efficiency of various masonry configurations, and the effects of climate on complex masonry structures. Understanding these advanced scientific principles allows students to properly design and construct complex masonry systems that meet both structural and environmental performance requirements.

E. The student interprets residential construction drawings and plans. The student is expected to:

1. Identify and interpret various types of residential construction drawings.
2. Analyze keys, legends, symbols, and architectural terms used in residential drawings.
3. Calculate measurements and dimensions from scaled drawings.
4. Estimate material quantities using construction drawings.
5. Explain the relationship between specifications, standards, and codes in residential construction.
6. Utilize interactive software to develop construction drawings, including but not limited to various CAD programs.

F. The student demonstrates knowledge of residential masonry techniques. The student is expected to:

1. Describe and construct various types of residential foundations.
2. Install clay brick and concrete pavers according to specifications.
3. Layout and construct masonry steps, patios, and decks.
4. Design and construct fireplaces and chimneys following building codes.
5. Execute proper planning and construction of masonry openings.

G. The student applies reinforced masonry techniques. The student is expected to:

1. Explain the characteristics and preparation of grout mixtures.
2. Demonstrate proper placement techniques for low-lift and high-lift grouting.
3. Install reinforcement in masonry walls according to specifications.
4. Construct reinforced walls and masonry elements.
5. Install bond beams, lintels, piers, pilasters, and columns correctly.

H. The student utilizes proper techniques for masonry openings and metalwork. The student is expected to:

1. Install door and window frames in masonry openings.
2. Construct and install windowsills and steel lintels.
3. Create chases and recesses in masonry construction.
4. Install various types of anchors and ties in masonry construction.
5. Apply proper techniques for connecting masonry to structural elements.

I. The student implements advanced laying techniques. The student is expected to:

1. Identify and construct various types of walls including solid, hollow, cavity, composite, and veneer.
2. Install and maintain control joints and expansion joints.
3. Layout and construct various corners and wall intersections.
4. Execute proper toothing and corbeling techniques.
5. Apply appropriate insulation and moisture control methods.

J. The student performs construction inspection and quality control procedures. The student is expected to:

1. Apply standards and specifications for quality control in masonry construction.
2. Build and test masonry sample panels and prisms according to specifications.
3. Conduct mortar testing procedures following industry standards.
4. Perform field inspections and observations of masonry construction.
5. Monitor and verify construction tolerances meet specifications.