Maryland
STATE DEPARTMENT OF EDUCATION

# Program of Study Guide: Carpentry - DRAFT

Comprehensive guidelines and course standards for the Carpentry pathway

Office of College and Career Pathways

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## MARYLAND STATE DEPARTMENT OF EDUCATION



## MARYLAND STATE BOARD OF EDUCATION

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# Purpose

**The purpose of this document is to communicate the required Career and Technical Education (CTE) academic standards for the Carpentry 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 Carpentry concepts in a high school context, preparing students for industry-aligned certifications like NCCER General Carpentry and OSHA 30 and providing them with the necessary knowledge and skills for career readiness in Carpentry fields.

**Here are the key standards sources for Carpentry 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 Carpentry 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 Carpentry 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.

3. **ICC (International Code Council) Building Codes**
   A. **Description:** Comprehensive construction standards including International Residential Code (IRC) and International Building Code (IBC).
   B. **Use:** Essential code knowledge for carpentry work. Can structure code-related learning objectives throughout curriculum.
   C. **Source:** www.iccsafe.org (subscription or purchase required).

4. **AWC (American Wood Council) Standards**
   A. **Description:** Technical standards for wood construction including Wood Frame Construction Manual and National Design Specification
   B. **Use:** Provides technical specifications and best practices for wood construction
   C. **Source:** www.awc.org (some free access, subscription for full access)

5. **SkillsUSA Carpentry Standards**
   A. **Description:** Competition and assessment standards for carpentry skills aligned with industry needs.
   B. **Use:** Framework for hands-on skills development and assessment.
   C. **Source:** www.skillsusa.org (membership required).

6. **HBI (Home Builders Institute) Standards**
   A. **Description:** Industry-driven training standards and curriculum for residential construction.
   B. **Use:** Additional framework for residential construction focus.
   C. **Source:** www.hbi.org (requires program participation).

# Course Descriptions

| Course Level | Course Information | Description |
|---|---|---|
| Required Core: Course 1 | Construction Fundamentals<br>SCED: <XX><br>Grades: 9-12<br>Prerequisite: None<br>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 | Carpentry I<br>SCED: <XX><br>Grades: 10-12<br>Prerequisite: Core Construction Principles<br>Credit: 1 | In Carpentry I, students will explore essential carpentry concepts such as construction safety, blueprint reading, and materials handling. Hands-on training will focus on the proper use of hand and power tools, as well as basic wood-framing techniques for floors, walls, and ceilings. Key skills include constructing simple structures, understanding basic construction math, and adhering to OSHA safety standards. Students will develop a solid understanding of residential construction systems, preparing them for more advanced carpentry tasks. |

| Course Level | Course Information | Description |
|---|---|---|
| Optional Flex: Course 1 | Carpentry II<br>SCED: <XX><br>Grades: 11-12<br>Prerequisite: Carpentry I<br>Credit: 1 | Carpentry II, builds on the skills learned in Carpentry Level 1, focusing on specialized carpentry techniques and complex construction projects. Students will gain expertise in stair layout, roof framing, and installation of exterior finishes such as windows, doors, and siding. The curriculum also emphasizes advanced blueprint reading, material estimation, and job-site management. Hands-on projects include constructing complex frameworks and applying finishing techniques to interior and exterior elements. Upon completion, students will possess the technical skills and knowledge necessary to contribute to professional construction teams or pursue industry certification. motors, conductor installation, installation of Carpentry services, and electric lighting installation. |
| Optional Flex: Course 2 | Career Connected Learning I<br>SCED: <XX><br>Grades: 11-12<br>Prerequisite: Carpentry I<br>Credit: 1 | 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 practice. 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. |

| Course Level | Course Information | Description |
|---|---|---|
| Optional Flex: Course 3 | Career Connected Learning II<br><br>SCED: <XX><br>Grades: 11-12<br>Prerequisite: Career Connected Learning I<br>Credit: 1 | 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 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. |

***Dual Enrollment and Career Connected Learning Experiences Must be Aligned to the CTE Core.***

# Industry-Recognized Credentials and Work-Based Learning

| **Industry-Recognized Credentials – The standards in this document are aligned to the following certifications:** |
|---|
| **By the end of Core Construction Principles:** NCCER Core + OSHA 30<br><br>**By the end of Carpentry 1:** General Carpentry Certificate, NCCER Carpentry I<br><br>**Optional Credentials (via the Flex Course options):** NCCER Carpentry II |

| **Work-Based Learning Examples and Resources** | | |
|---|---|---|
| **Core Construction Principles:**<br>**Career Awareness** | **Carpentry I:**<br>**Career Preparation** | **Carpentry II:**<br>**Career Preparation** |
| • Industry Visits<br>• Guest Speakers<br>• Participation in Career and Technical Student Organizations<br>• Postsecondary Visits – Program Specific Site Tours<br>• Mock Interviews | • All of Career Awareness plus the following:<br>• Job Shadow<br>• Paid and Unpaid Internships | • Paid and Unpaid Internships<br>• Apprenticeships |

# 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 Wage**[1] | 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).<br><br>*Note: A 25th percentile hourly wage of $24.74 or greater is required to meet this definition.* | **Standard Occupational Code:**<br>47-2031: Carpenters<br>**Hourly Wage/Annual Salary:**<br>25th Percentile: $22.18/$46,130<br>50th Percentile: $27.09/$56,350<br>75th Percentile: $34.75/$72,290 |
| **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:**<br>A high school diploma or equivalent is typically required to enter the occupation. Certain high school courses, such as mathematics and mechanical drawing, may be useful. Some vocational-technical schools offer associate's degrees in carpentry. The programs vary in length and teach basics and specialties in carpentry. |
| **In-Demand** | Annual growth plus replacement, across all Maryland occupations, is 405 openings between 2024-2029. | **Annual Openings** |

[1] Living Wage Calculator: https://livingwage.mit.edu/states/24

**Labor Market Information Data Source**

Lightcast Q4 2024 Data Set. 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 Carpentry program prepares students for careers in residential, commercial, and industrial Carpentry systems. Through a comprehensive curriculum aligned with industry standards, students develop foundational construction skills and specialized Carpentry knowledge while earning industry-recognized certifications. The program emphasizes hands-on learning, safety protocols, and real-world applications, preparing graduates for immediate entry into the Carpentry trade or advanced technical education.
   D. Core Construction Principles introduces students to the essential fundamentals of the construction industry with a focus on Carpentry systems 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 Carpentry 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 an Carpenter or in the Carpentry field.
2. Create a professional resume and portfolio that reflects skills, projects, certifications, and recommendations.
3. Demonstrate effective interview skills for roles in the Carpentry field.

**C. The student identifies the issues associated with Carpentry 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 Carpentry 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 Carpentry 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 fundamental measurement concepts including fractions, decimals, and metric conversions - skills essential for accurate construction work. Students will apply geometric principles when calculating areas, perimeters, and volumes of basic shapes, which is crucial for material estimation. Basic algebra comes into play when using construction formulas for things like board feet calculations or concrete volume. The curriculum also naturally incorporates ratio and proportion concepts through tasks like mixing materials and scaling drawings. Construction math fundamentals like reading tape measures, calculating angles, and applying the Pythagorean theorem are essential building blocks introduced in this course.
3. Use several fundamental physics concepts, particularly in the study of basic hand and power tools. Students can learn about simple machines (levers, wedges, inclined planes) and mechanical advantage when using tools like crowbars, hammers, and jacks. Material science concepts emerge when studying properties of common construction materials - understanding concepts like tensile strength, compression, shear forces, and load distribution.

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

1. Analyze the current state and key career fields within Carpentry related careers.
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 Carpentry 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. Identify and mitigate struck-by and caught-in-between hazards.
4. Evaluate Carpentry related hazards and implement appropriate safety measures.
5. Select and utilize appropriate personal protective equipment (PPE) for specific hazards.
6. Identify and mitigate 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.

**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: Carpentry 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 Carpentry program prepares students for careers in residential, commercial, and industrial Carpentry systems. Through a comprehensive curriculum aligned with industry standards, students develop foundational construction skills and specialized Carpentry knowledge while earning industry-recognized certifications. The program emphasizes hands-on learning, safety protocols, and real-world applications, preparing graduates for immediate entry into the Carpentry trade or advanced technical education.
   D. Carpentry I introduces foundational carpentry skills and knowledge, building upon the NCCER Core curriculum. Students will explore essential carpentry concepts such as construction safety, blueprint reading, and materials handling. Hands-on training will focus on the proper use of hand and power tools, as well as basic wood-framing techniques for floors, walls, and ceilings. Key skills include constructing simple structures, understanding basic construction math, and adhering to OSHA safety standards. Students will develop a solid understanding of residential construction systems, preparing them for more advanced carpentry tasks.
   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 Carpentry 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 Carpenter or in the Carpentry field.
2. Create a professional resume and portfolio that reflects skills, projects, certifications, and recommendations.
3. Demonstrate effective interview skills for roles in the Carpentry field.

**C. The student identifies the issues associated with Carpentry 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 Carpentry 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 Carpentry 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 mathematical concepts including the application of the Pythagorean theorem for verifying square corners in construction, ratio and proportion calculations for stair design (such as rise-to-run ratios), area and volume calculations for material estimation (like board feet and concrete volumes), and angular measurements for roof layout. Students must master both precise measurement techniques and estimation skills to meet industry standards for construction accuracy and material efficiency.
3. Use scientific principles include understanding material properties (such as wood grades, treatment processes, and engineered products), physical forces (like load distribution in floor systems and wind loads on structures), and building science principles (including moisture movement, thermal transfer, and air infiltration in building envelopes). Students learn how these scientific principles inform construction decisions, from selecting appropriate materials to implementing proper installation techniques that ensure building durability and efficiency.

**E. The student gains knowledge about building materials used in the construction industry. The student is expected to:**

1. Identify various types of building materials and their uses;.
2. Identify and state the uses of various types of hardwoods and softwoods
3. Identify the different grades and markings of wood building materials.
4. Describe the proper method of storing and handling building materials.
5. State the uses of various types of engineered lumber

6. Calculate the quantities of lumber and wood products using industry-standard methods.
7. Describe the fasteners, anchors, and adhesives used in construction work and explain their uses.

**F. The student interprets architectural and engineering working drawings and specifications. The student is expected to:**

1. Describe the types of drawings usually included in a set of plans and list the information found on each type.
2. Identify the different types of lines used on construction drawings.
3. Identify selected architectural symbols commonly used to represent materials on plans.
4. Identify selected electrical, mechanical, and plumbing symbols commonly used on plans.
5. Identify selected abbreviations commonly used on plans.
6. Read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings.
7. Interpret dimensions contained within drawings based on scale and measurement.
8. State the purpose of written specifications.
9. Identify and describe the parts of a specification.
10. Demonstrate and/or describe how to create a materials list based on drawings/specifications.

**G. The student masters wall system construction. The student is expected to:**

1. Identify all components of a wall system.
2. Calculate material quantities needed for wall framing.
3. Execute the layout process for wall construction.
4. Demonstrate proper wall framing techniques.
5. Construct wall systems including assembly and erection.
6. Install structural components for wall systems.
7. Understand and follow required safety practices common to an active work site.

**H. The student applies roof framing principles. The student is expected to:**

1. Install ceiling frame components according to specifications.
2. Analyze different residential roof types and their components.
3. Apply methods for laying out and cutting common rafters.
4. Construct and sheath a gable roof.
5. Install roof trusses according to specifications.
6. Calculate roof slopes and dimensions accurately.

**I. The student demonstrates stair construction techniques. The student is expected to:**

1. Identify all stairway components and code requirements.
2. Calculate total rise, number and size of risers.
3. Determine number and size of treads needed for a stairway.
4. Layout and construct basic stair systems.
5. Apply appropriate safety measures for stair construction.
6. Install stair components according to specifications.

**J. The student masters building envelope/enclosure systems. The student is expected to:**

1. Analyze the purpose and components of building envelope/enclosure systems.
2. Identify and install various types of windows according to specifications.

3. Identify and install different door types based on application requirements.
4. Apply proper flashing and weatherization techniques.
5. Implement energy efficiency measures in envelope system installation.
6. Verify proper installation of envelope system components.

**K. The student develops advanced carpentry skills through integration. The student is expected to:**

1. Coordinate multiple carpentry systems in complex projects.
2. Apply appropriate safety measures for advanced construction tasks.
3. Evaluate the quality of completed carpentry work.
4. Troubleshoot common carpentry installation issues.
5. Implement sustainable construction practices.
6. Demonstrate leadership in carpentry project execution.

# Course Standards: Carpentry 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 Carpentry program prepares students for careers in residential, commercial, and industrial Carpentry systems. Through a comprehensive curriculum aligned with industry standards, students develop foundational construction skills and specialized Carpentry knowledge while earning industry-recognized certifications. The program emphasizes hands-on learning, safety protocols, and real-world applications, preparing graduates for immediate entry into the Carpentry trade or advanced technical education.
   D. This advanced course builds on the skills learned in Carpentry I, focusing on specialized carpentry techniques and complex construction projects. Students will gain expertise in stair layout, roof framing, and installation of exterior finishes such as windows, doors, and siding. The curriculum also emphasizes advanced blueprint reading, material estimation, and job-site management. Hands-on projects include constructing complex frameworks and applying finishing techniques to interior and exterior elements. Upon completion, students will possess the technical skills and knowledge necessary to contribute to professional construction teams or pursue the NCCER Carpentry Level 2 certificate.
   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 Carpentry 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 an Electrician or in the Carpentry field.
   2. Create a professional resume and portfolio that reflect skills, projects, certifications, and recommendations.
   3. Demonstrate effective interview skills for roles in the Carpentry field.

C. **The student identifies the issues associated with Carpentry 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 Carpentry 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 Carpentry 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 mathematical concepts including the application of the Pythagorean theorem for verifying square corners in construction, ratio and proportion calculations for stair design (such as rise-to-run ratios), area and volume calculations for material estimation (like board feet and concrete volumes), and angular measurements for roof layout. Students must master both precise measurement techniques and estimation skills to meet industry standards for construction accuracy and material efficiency.
   3. Use scientific principles include understanding material properties (such as wood grades, treatment processes, and engineered products), physical forces (like load distribution in floor systems and wind loads on structures), and building science principles (including moisture movement, thermal transfer, and air infiltration in building envelopes). Students learn how these scientific principles inform construction decisions, from selecting appropriate materials to implementing proper installation techniques that ensure building durability and efficiency.

**E. The students analyze steel framing systems and their applications in construction. The student is expected to:**
   1. Differentiate between tools and components of cold-formed steel framing systems and demonstrate their safe use.
   2. Sequence the steps required to lay out and install a steel stud wall.
   3. Examine various steel framing applications in construction projects.

**F. The students evaluate thermal and moisture protection systems in building construction. The student is expected to:**

1. Explain the purpose and applications of building insulation.
2. Compare and contrast different insulation materials and types.
3. Demonstrate proper installation techniques for various insulation systems.
4. Analyze moisture control methods in building construction.
5. Evaluate water and air infiltration control methods in building systems.

**G. The students apply drywall installation techniques and methods. The student is expected to:**

1. Select and analyze materials and tools required for drywall installation.
2. Demonstrate procedures for installing gypsum board on various ceiling and wall configurations.

**H. The students evaluate interior finish, trim, and cabinet installation processes. The student is expected to:**

1. Design job preparation and safety plans for finish carpentry projects.
2. Differentiate between types of standard moldings and materials.
3. Demonstrate installation techniques for various molding and trim types.
4. Classify common types of cabinets and countertops.
5. Analyze common cabinet components and hardware.
6. Demonstrate the layout and installation process for basic cabinet sets.

**I. The students analyze door systems and hardware installation techniques. The student is expected to:**

1. Assess safety hazards related to door installation.
2. Compare common door frames and their installation methods.
3. Evaluate residential door types, hardware, and installation techniques.
4. Analyze commercial door systems, hardware, and installation methods.

**J. The students evaluate suspended and acoustical ceiling systems. The student is expected to:**

1. Select components necessary for suspended ceiling system installation.
2. Analyze reflected ceiling plans for installation requirements.
3. Evaluate key considerations, methods, and best practices in ceiling installation.

**K. The students analyze exterior finish and trim installation processes. The student is expected to:**

1. Assess common hazards and develop site safety plans for exterior trim and finish installation.
2. Sequence the steps for exterior siding preparation.
3. Evaluate common types of exterior siding materials and their installation processes.

**L. The students analyze mass timber construction methods and applications. The student is expected to:**

1. Evaluate the applications of mass timber in the construction industry.
2. Analyze building techniques and tools specific to mass timber construction.
3. Sequence common construction phases in the mass timber building process.

# Course Standards: Career Connected Learning I and II

**Career connected learning is an educational approach that integrates classroom instruction with real-world experiences, enabling high school students to explore potential careers and develop relevant skills before graduation. By participating in work-based learning opportunities—such as apprenticeships, internships, capstone projects, and school-based enterprises—students apply academic concepts in authentic settings, gain practical industry knowledge, and build professional networks. This hands-on engagement helps students connect their studies to future career paths, strengthens their problem-solving and communication skills, and supports a smoother transition into college, vocational programs, or the workforce.**

All Career and Technical Education Programs of Study include aspects of work-based learning, and almost all of the programs include two Career Connected Learning (CCL) courses. Below are the course descriptions for CCL I and CCL II. The CCL standards can be found via this link: