# Carpentry I

**8601 36 weeks / 140 hours**

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Acknowledgments

The components of this instructional framework were developed by the following curriculum development panelists:

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Office of Career, Technical, and Adult Education
Virginia Department of Education

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Course Description

Suggested Grade Level: 10 or 11

Carpentry I is foundational for achieving high-level construction industry skills that can result in an exciting and lucrative career. With an emphasis on safety, students are taught to use hand and power tools, cut stock, apply construction mathematics, interpret blueprints, and understand basic rigging. Students will become proficient in identifying types of residential construction components to frame walls, floors, ceilings, roofs, doors, and windows. All students will obtain the required Construction Industry OSHA 10 safety credential.

As noted in Superintendent's Memo #058-17 (2-28-2017), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.

Task Essentials List

- Tasks/competencies designated by plus icons (➕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (_circle) are optional
- Tasks/competencies designated by minus icons (➖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

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<td>Report personal injuries and environmental and equipment safety violations to the appropriate authority.</td>
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<td>51</td>
<td>✗</td>
<td>Pass a safety exam for lab/site safety and the use of tools and equipment specific to the construction industry.</td>
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**Using Hand and Power Tools**

| 52 |  ✗  | Identify hand tools and power tools in carpentry. |
| 53 |  ✗  | Maintain hand and power tools. |

**Applying Mathematics Related to Carpentry and Construction**

| 54 |  ✗  | Demonstrate how to work with whole numbers. |
| 55 |  ✗  | Demonstrate how to work with fractions. |
| 56 |  ✗  | Demonstrate how to work with decimals. |
| 57 |  ✗  | Convert between fractions, decimals, and percentages. |
| 58 |  ✗  | Convert measurements between U.S. customary units and metric units of measurement. |
| 59 |  ✗  | Identify the geometric formulas for shapes common to carpentry. |

**Reading Blueprints**

<p>| 60 |  ✗  | Identify basic blueprint terms, components, and symbols. |</p>
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**Performing Basic Carpentry Skills**

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**Cutting and Shaping Stock**

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**Working with Fasteners**

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### Identifying Basic Rigging Procedures

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<td>Identify the basic hitch configurations and their proper connections.</td>
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<td>107</td>
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Legend: ☑Essential ☐Non-essential ☞Omitted
Applying Basic Construction Safety Standards (Core Safety)

Task Number 39

Comply with federal, state, and local safety requirements.

Definition

Compliance should include

- understanding the roles of the Occupational Safety and Health Administration (OSHA), Virginia Occupational Safety and Health (VOSH), and the Environmental Protection Agency (EPA)
- identifying the OSHA Hazard Communication Standard (HazCom)
- interpreting the information included on safety data sheets (SDS)
- describing the responsibilities of employers and employees under HazCom.

Process/Skill Questions

- Where should hazardous materials be stored?
- What information can be found on an SDS?

NCCER Carpentry Standards

Level One, Module One (27101-13): Orientation to the Trade

Module One (27101-13) reviews the history of the carpentry trade, describes the apprentice program, identifies career opportunities for carpenters, explores the SkillsUSA program, and lists the responsibilities and characteristics a carpenter should possess.

NCCER Core Curriculum: Introductory Craft Skills, 2015

00101-15 Basic Safety

Module One (00101-15) explains the importance of safety in the construction and industrial crafts. Trainees will learn how to identify and follow safe work practices and procedures and how to properly inspect and use safety equipment. Trainees will be able to describe the safety practices associated with elevated work; energy release; and various hazards encountered on job sites.
Task Number 40

Identify personal protective equipment (PPE) requirements.

Definition

Identification could include procedures for inspecting, wearing, and removing

- eye protection
- respirator
- hard hat
- gloves
- safety harness
- hearing protection
- safety shoes.

Identification should also include explaining when particular PPE is required.

Process/Skill Questions

- What are some dangerous effects of sun exposure, and how can these risks be mitigated?
- Why is wearing jewelry prohibited while in the lab or on the job site?

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Task Number 41
Maintain a safe working environment.

Definition

Maintaining safety should be an ongoing process and should result in identifying potential hazards on a job site or in the lab, such as unstable or improperly erected scaffolding, electrical hazards, job-site debris, improperly stored materials, and air quality hazards. When present, hazards must be remedied by appropriate measures, in compliance with school and instructor guidelines.

Process/Skill Questions

- What are examples of job-site hazards?
- Why is it important to use good housekeeping standards on a job site?
- Why is it important to store materials and tools in their proper places?

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Task Number 42

Explain safe working practices around electrical hazards.

Definition

Explanation should include

- identifying equipment used to test electrical circuits
- describing safe working conditions (e.g., grounding, using ground-fault circuit interrupters [GFCIs] and cords)
• demonstrating safe work habits.

Process/Skill Questions

• What is the definition of proximity work?
• What are safe working clearances, according to the National Electrical Code (NEC)?
• What are considered safe working conditions and safe work habits?
• What is the unseen hazard with electrical work?
• What are some common electrical workplace issues?

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Task Number 43

Identify emergency first-aid procedures.

Definition

Identification should include standard first-aid procedures and school policies regarding incidents involving

• bodily fluids
• electrical injuries
• eye injuries
• falls
• burns.

Process/Skill Questions

• What are the steps that should be followed after an accident?
• Why is knowing cardiopulmonary resuscitation (CPR) an important skill in the construction trades?
• Why is it important to be certified to administer first aid?
• What are the different degrees of electrical burns?

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Task Number 44

Identify the types of fires and the methods used to extinguish them.

Definition

Identification should include classifications of fires (e.g., Classes A, B, C, and D), causes and prevention of fires, types of extinguishers, and, when possible, the demonstrated use of a fire extinguisher, in accordance with government regulations and instructor guidelines.

Process/Skill Questions

• Why do fires have different classifications, and what are they?
• What is the fire triangle and the fire tetrahedron?
• What are the three things necessary to start a fire?
• Why is it important to know the classification of fire when trying to extinguish it?
• Why should extinguishers be inspected, and how often should they be inspected?
• What are the classifications of extinguishers?

NCCER Core Curriculum: Introductory Craft Skills, 2015

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Task Number 45

Inspect course-specific hand and power tools to visually identify defects.

Definition

Inspection of tools should include

- identifying components of machinery (e.g., guards, blades, moving parts, start/stop switches)
- identifying standard safety procedures (i.e., lab practices and manufacturer recommendations)
- observing a demonstration of the safe operation and use of each piece of machinery in the lab
- identifying tool defects.

Process/Skill Questions

- What are some of the basic power tools used in construction?
- What are the proper actions to take before using a circular saw?
- Why should a power tool always be grounded?

NCCER Carpentry Standards

Level One, Module Three (27103-13): Hand and Power Tools
Module Three (27103-13) provides detailed descriptions of the hand tools and portable power tools used by carpenters. Emphasis is on safe and proper operation of tools, as well as care and maintenance.

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Task Number 46

Demonstrate lifting and carrying techniques.
Definition

Demonstration involves lifting and carrying materials and equipment based on the principles of

- lifting with the legs
- keeping the back straight
- holding the load close to the body
- getting help, if necessary.

Process/Skill Questions

- What are common injuries associated with improper lifting techniques?
- What can one do to prevent injury?
- How does positioning affect technique?

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Task Number 47

Demonstrate safe laddering techniques.

Definition

Demonstration should involve using appropriate conduct and safety procedures while

- using aluminum ladders (e.g., three-point contact)
- carrying ladders (e.g., two people at all times)
- erecting and setting ladders (e.g., using the 4:1 rule)
- identifying types of ladders and the components and safety features of each (e.g., wall or straight, extension, roof, attic, special-purpose, solid-beam, aluminum, wood/aluminum truss ladder, fiberglass).

Process/Skill Questions

- Why are ladders rated for certain weights?
- Why is the apex (highest point) of a stepladder not considered a step?
- What other methods are used to adjust ladders?
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Task Number 48

Demonstrate safe scaffolding techniques.

Definition
Demonstration should include inspecting settings, duty ratings, and safety tags.

Process/Skill Questions
- How can one determine the safe weight limit of any particular scaffolding?
- When is scaffolding preferred or required?

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Task Number 49

Report personal injuries and environmental and equipment safety violations to the appropriate authority.

Definition
Report should include
- providing a verbal or written statement
• identifying the violation
• documenting the date when the incident or behavior was observed
• following the protocol for submitting the report to the instructor, supervisor, or the local OSHA inspector.

Process/Skill Questions

• What ethical considerations might be involved when reporting coworkers?
• Why is it important to follow reporting procedures?
• What is liability?

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Task Number 50

Earn the Construction Industry OSHA 10 card.

Definition

Earning a Construction Industry OSHA 10 card will

• recognize that one has acquired 10 hours of safety instruction
• help teach national standards for personal safety within a lab environment
• validate safety skills to the industry
• help workers become more safety-conscious and responsible.

Process/Skill Questions

• What are the benefits of earning the Construction Industry OSHA 10 card?
• What is OSHA, and how are its standards validated?
• Why was OSHA established, and how has it evolved?

Task Number 51
Pass a safety exam for lab/site safety and the use of tools and equipment specific to the construction industry.

Definition

Assessment must measure participation in safety training programs, including attending safety meetings and periodically demonstrating knowledge and skills gained from program topics (e.g., interpretation of SDS).

Process/Skill Questions

- How often should one participate in safety training programs? Why?
- Why are retraining programs relevant to a company's insurance policy?
- What is workers' compensation?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00101-15 Basic Safety
Module One (00101-15) explains the importance of safety in the construction and industrial crafts. Trainees will learn how to identify and follow safe work practices and procedures and how to properly inspect and use safety equipment. Trainees will be able to describe the safety practices associated with elevated work; energy release; and various hazards encountered on job sites.

Using Hand and Power Tools

Task Number 52

Identify hand tools and power tools in carpentry.

Definition

Identification could include

- nail guns, hammers, including claw hammers, sledgehammers, and ball-peen hammers
- screwdrivers, including slot-, Phillips-, clutch-, star-, square-, and Allen-head screwdrivers
- ripping bars and nail pullers
- wrenches, including pipe, spud, box-end, open-end, striking, slugging, and combination wrenches
- pliers, including slip-joint, long-nose (needle-nose), lineman's, groove-joint or water pump, and locking pliers
- wire cutters
- spirit, electronic, and laser levels
- squares, including carpenter’s square and combination square
- rules and measuring tape
- vises
- clamps
- saws, including circular, saber, reciprocating, backsaw, compass saw, coping saw, dovetail saw, hacksaw, and hand saw (crosscut saw and ripsaw)
- files, rasps, and chisels
- plumb bob
- sockets and ratchets
- utility knives
- chain falls and come-alongs
- wire brushes
- shovels
- power drills, including electric, cordless, hammer, electromagnetic, and pneumatic drills
- grinders and sanders, including angle grinders, end grinders, detail grinders, bench grinders, portable belt sanders, and random orbital sanders
- pavement breakers/hydraulic jacks.

Process/Skill Questions

- What are the different sizes of Phillips-head screwdrivers?
- What are the basic tools carpenters wear on a tool belt?
- What are the expectations on job sites regarding tool ownership? How is this different from school?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00103-15 Introduction to Hand Tools
Module Three (00103-15) instructs trainees in the identification, use, and care of hand tools. Developing the knowledge to properly choose and safely use hand tools is an essential part of the construction industry.

00104-15 Introduction to Power Tools
Module Four (00104-15) identifies and describes some of the power tools used by construction workers. The construction of each tool is discussed, along with information regarding the safe usage and typical maintenance requirements of power tools.

Task Number 53

Maintain hand and power tools.

Definition

Maintenance should include applying safety awareness and
• describing the rationale for keeping tools in good working order
• replacing tools in the same order and condition they were prior to their use (e.g., cleaning, lubricating, storing)
• making basic adjustments to or replacing worn components with instructor approval and by following manufacturer guidelines
• notifying the instructor about heavily worn, broken, or malfunctioning tools
• using the tool only for its intended purpose and adhering to all safety guidelines from the manufacturer, the instructor, and the school.

Process/Skill Questions

• What are safety concerns when using a power circular saw?
• Why should a power tool always be grounded?

NCCER Core Curriculum: Introductory Craft Skills, 2015

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Applying Mathematics Related to Carpentry and Construction

Task Number 54

Demonstrate how to work with whole numbers.

Definition

Demonstration should include

• identifying different whole numbers and their place values
• adding, subtracting, multiplying, and dividing whole numbers
• solving construction-related problems involving one-, two-, and three-digit whole numbers.

Process/Skill Questions
• Why is it important to perform basic mathematical tasks without a calculator?
• What are common carpentry situations requiring mathematics?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00102-15 Introduction to Construction Math
Module Two (00102-15) introduces trainees to basic math skills needed in the construction environment. The module reviews whole numbers and fractions; working with decimals; the four primary math operations; reading rulers and tape measures; the Imperial and metric units of measurement; basic geometric figures; and area and volume calculations for two-dimensional and three-dimensional objects.

Task Number 55

Demonstrate how to work with fractions.

Definition

Demonstration should include

• defining equivalent fractions
• showing lowest common denominators
• describing improper fractions
• changing improper fractions to mixed numbers
• adding, subtracting, multiplying, and dividing fractions
• solving construction-related problems using fractions.

Process/Skill Questions

• What are common carpentry tasks requiring the use of fractions?

NCCER Core Curriculum: Introductory Craft Skills, 2015

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Task Number 56
Demonstrate how to work with decimals.

Definition

Demonstration should include

- describing decimals and their place values
- adding, subtracting, multiplying, and dividing decimals
- solving construction-related problems using decimal numbers down to the thousandths place.

Process/Skill Questions

- What is the base-10 system?
- What is its probable origin?

NCCER Core Curriculum: Introductory Craft Skills, 2015

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Task Number 57

Convert between fractions, decimals, and percentages.

Definition

Conversion should include

- decimals to percentages
- percentages to decimals
- fractions to decimals
- decimals to fractions.

Process/Skill Questions

- In which carpentry tasks are conversions commonly used? Percentages?
- When might you need to convert a decimal to a percentage?
- When might you need to convert a fraction to a decimal or a decimal to a fraction?
Why might it be easier to multiply a decimal rather than a fraction?

Task Number 58

Convert measurements between U.S. customary units and metric units of measurement.

Definition

Identification should include

- U.S. customary and metric measurements of length, weight, volume, and temperature
- sizes of particular measurements relative to their basic units (e.g., deca-, hecto-, kilo-, mega-, deci-, centi-, milli-, and micro-)
- symbols associated with different measurements.

Process/Skill Questions

- What are the processes of converting lengths from one system to another?
- What is the mathematical relationship among the units of length in the metric system?
  How does this simplify the calculations involved?
Identify the geometric formulas for shapes common to carpentry.

Definition

Identification should include

- describing the characteristics of various types of angles and geometric shapes
- using the appropriate formula to calculate square footage (i.e., area) for rectangles, squares, triangles, and circles
- using the appropriate formula to determine perimeter, circumference, diameter, radius, volume, and angle (i.e., slope, grade) for various shapes.

Process/Skill Questions

- What is the calculation for the hypotenuse of a triangle?
- How many degrees are in each angle of an octagon?
- Why is pi a crucial measurement? What is it, and how is it used in carpentry?

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Reading Blueprints

Task Number 60

Identify basic blueprint terms, components, and symbols.

Definition

Identification should include

- components, including title block, border, drawing area, revision block, legend, and scale
- lines of construction, including dimension lines, leaders and arrowheads, property lines, cut lines, section cuts, hidden lines, center lines, and object lines
- common abbreviations, symbols, and keynotes.
Process/Skill Questions

- What plans are needed to obtain a building permit?
- Why do carpenters need to understand symbols on construction/building plans that are not related to carpentry work?

NCCER Carpentry Standards

Level One, Module Four (27104-13): Introduction to Construction Drawings, Specifications, and Layout
Module Four (27104-13) describes the information contained in construction drawings, including foundation, floor, and other plan view drawings, as well as how to read them. It also describes how to interpret schedules and specifications, and how to use the 3-4-5 rule to square buildings.

NCCER Core Curriculum: Introductory Craft Skills, 2015

00102-15 Introduction to Construction Math
Module Two (00102-15) introduces trainees to basic math skills needed in the construction environment. The module reviews whole numbers and fractions; working with decimals; the four primary math operations; reading rulers and tape measures; the Imperial and metric units of measurement; basic geometric figures; and area and volume calculations for two-dimensional and three-dimensional objects.

00105-15 Introduction to Construction Drawings
Module Five (00105-15) provides trainees with the information and skills needed to read and understand construction drawings. This module includes a set of four oversize drawings, which is included as an Appendix in the Trainee Guide. The drawings are also available for download from www.nccerire.com.

Task Number 61

Identify classifications of drawings.

Definition

Identification should include types of plans, including

- civil
- architectural
- structural
- mechanical
- plumbing.

Process/Skill Questions
• To which drawing would you refer to find out about doors and windows?
• Which drawing would you use to find the location of the house on the property?

NCCER Carpentry Standards

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NCCER Core Curriculum: Introductory Craft Skills, 2015

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Task Number 62

Interpret scale.

Definition

Interpretation should be made for a variety of scales and be performed measure-to-scale and scale-to-measurement.

Process/Skill Questions

• What factors determine the scale used on a drawing?
• How many scales are on the scale rule?

NCCER Carpentry Standards

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Performing Basic Carpentry Skills

Task Number 63

Communicate verbally and in writing, using construction terminology.

Definition

Communication could include

- using terminology specific to carpentry
- completing
  - work orders
  - proposals
  - prints
  - invoices
  - estimates
  - contracts
  - schedules.

Process/Skill Questions

- What does liquidated damages mean?
- What is a bonus clause?
- What is a change order?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00107-15 Basic Communication Skills
Module Seven (00107-15) provides trainees with the information and skills needed to communicate effectively and clearly. Developing good communications skills enables the construction professional to become a confident, reliable asset to their craft.

Task Number 64
Identify communication technology and hand signals common to the construction site.

**Definition**

Identification should include

- hand signals for working around machinery or in high-noise areas
- portable communication devices and etiquette for using them.

**Process/Skill Questions**

- With whom might you need to communicate on a construction site?
- What are the consequences of poor communication on a job site?

**NCCER Core Curriculum: Introductory Craft Skills, 2015**

**00107-15 Basic Communication Skills**

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**Task Number 65**

**Check stock and assemblies for squareness.**

**Definition**

Checking should include testing stock and/or assemblies for a variety of applications to detect deviation from a right angle, a straight line, or a plane surface.

**Process/Skill Questions**

- What tools can you use to check for squareness?
- What method can you use to determine whether a cabinet frame is square?

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**Task Number 66**

**Measure materials, using a standard measuring device.**
Definition

Measuring involves

- selecting the correct device for the situation
- recognizing and identifying correct lengths to within +/- 1/8 inch
- reading the measurement
- marking the stock.

Process/Skill Questions

- What is the smallest measurement on most measuring tapes used in construction?
- What lengths of measuring tapes are commonly used in construction?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00109-15 Introduction to Materials Handling

Module Nine (00109-15) provides safety guidelines for workers handling materials on the job site. It covers proper procedures and techniques to use when lifting, stacking, transporting, and unloading materials. It also introduces basic motorized and non-motorized material-handling equipment commonly found in the construction environment.

Task Number 67

Determine whether a surface is level or plumb.

Definition

Determination include

- selecting tools to check surfaces
- using a level
- checking if a horizontal surface is level
- checking if a vertical surface is plumb
- reading a level and noting whether the bubble is off-center.

Process/Skill Questions

- What is the difference between level and plumb?
- What are the different lengths of levels used?
- What are the possible consequences of failing to determine whether a surface is level or plumb?
Task Number 68

Handle materials.

Definition

Handling should include

- demonstrating safe procedures in lifting, carrying, and stacking materials
- using PPE.

Process/Skill Questions

- What PPE should one use when handling materials?
- When is help required when handling materials?

NCCER Carpentry Standards

Level One, Module Two (27102-13): Building Materials, Fasteners, and Adhesives
Module Two (27102-13) provides an overview of the building materials used by carpenters, including lumber, engineered wood products, concrete, and steel framing materials. The module also describes the various fasteners, anchors, and adhesives used in construction.

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Task Number 69

Store materials.

Definition

Storage includes

- considering environmental factors such as humidity, light, and physical restrictions
- securing materials to prevent weather exposure and theft.
Process/Skill Questions

- How is lumber affected by extended exposure to weather?
- Where should flammable materials be stored?

NCCER Carpentry Standards

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Task Number 70

Identify materials.

Definition
Identification includes selecting materials relevant to the assigned job, including various

- oriented strand board (OSB)
- plywood
- lumber
- fasteners
- adhesives
- millwork.

Process/Skill Questions

- What is the purpose of the grade stamp on materials?
- Why is two-by material actually 1-1/2 inches thick?

NCCER Carpentry Standards

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**Task Number 71**

**Examine energy efficiency in the construction industry.**

**Definition**

Examination should include

- new materials
- changes in code (e.g., thermal requirements)
- how energy efficiency is tested.

**Process/Skill Questions**

- What types of energy efficient materials are currently available?
- What are R values?
- What is a BTU?

**Cutting and Shaping Stock**

**Task Number 72**

**Cross cut and rip stock to size, using hand and power tools.**

**Definition**

Cutting and ripping should be accomplished using hand and power tools and should yield

- stock cut to specifications +/- 1/8 inch
- edges cut to a 90-degree angle with no chips or splinters.
Process/Skill Questions

- What is the difference between rip and crosscut?
- What type of blade would be best to rip and cross cut stock? Why?

NCCER Carpentry Standards

Level One, Module Three (27103-13): Hand and Power Tools
Module Three (27103-13) provides detailed descriptions of the hand tools and portable power tools used by carpenters. Emphasis is on safe and proper operation of tools, as well as care and maintenance.

Task Number 73

Bore holes, using hand and power tools.

Definition

Boring holes includes measuring the specific hole diameter according to specifications and finding the correct location within +/- 1/16 inch.

Process/Skill Questions

- What type of bit could be used to make a flat-bottom hole?
- What feature determines the size of a portable drill?

NCCER Carpentry Standards

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Module Three (27103-13) provides detailed descriptions of the hand tools and portable power tools used by carpenters. Emphasis is on safe and proper operation of tools, as well as care and maintenance.

Task Number 74

Square stock to 90 degrees.

Definition

Squaring stock requires material cut to a 90-degree angle, accurate to within +/- 1/16 inch.
Process/Skill Questions

- What is the purpose of cutting stock to 90 degrees?
- What tools could be used to determine squareness?

Task Number 75

Cut a miter joint, using hand and power tools.

Definition

Cutting a miter joint requires that the joint fits snugly and that the angle is correct, according to specifications.

Process/Skill Questions

- What degree cut is made to make most miter joints?
- What tools would you use to cut miter joints?

NCCER Carpentry Standards

Level One, Module Three (27103-13): Hand and Power Tools
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Working with Fasteners

Task Number 76

Apply clamping devices.

Definition

Application involves closing surfaces with specified clamps, without scarring.

Process/Skill Questions

- What are the different types of clamps used?
- What types of clamps would be used when gluing boards edge to edge?
Task Number 77

Fasten stock with metal fasteners (e.g., nails, screws, staples).

Definition

Fastening should include

- selecting the appropriate fastener
- applying the fastener with hand and pneumatic tools
- using the appropriate size and number of fasteners, according to local building codes.

Process/Skill Questions

- What determines the size of nails?
- What is the gauge of a screw?

Identifying Elements of Foundations and Forms

Task Number 78

Describe the functions of a builder's level and a laser level.

Definition

Description should include
• identifying the builder's level, the laser level, and the basic components of each
• providing the basic function of each tool, including examples of when each tool is used
• summarizing manufacturer information about setting up and using each device.

Process/Skill Questions

• What is the purpose of a builder's level?
• What types of levels are available?
• In which situations might one level be preferred over the other?

Task Number 79

Identify procedures for form maintenance.

Definition

Identification should include procedures for cleaning, covering, and storing concrete form materials.

Process/Skill Questions

• What is the best way to store form materials?
• What are some consequences of not properly storing form materials?

Identifying Elements of Floors

Task Number 80

Identify the sill plate.

Definition

Identification should include

• the components of the sill plate
• the function of the sill plate
• the location of the sill plate once it is installed
• the building code reference for the sill plate's use or installation requirements.

Process/Skill Questions
What type of lumber should be used for a sill plate?
What type of system should be used to secure a sill plate?

NCCER Carpentry Standards

Level One, Module Five (27105-13): Floor Systems
Module Five (27105-13) describes the layout and construction procedures for floor systems, including how to read and interpret construction drawings and specifications, and how to identify different types of framing systems, floor system components, and floor system materials. It also covers how to estimate the amount of materials needed for a floor assembly and on some common alternative floor systems.

Task Number 81

Identify solid or engineered wood products.

Definition

Identification should include the

- function of the beam/girder
- location of the beam/girder once it is installed
- building code reference for the beam's/girder's use or installation requirements.

Process/Skill Questions

- How do you determine whether to use solid or engineered wood product beams/girders?
- How is a beam/girder supported?

NCCER Carpentry Standards

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Task Number 82

Identify the Lally (i.e., basement pole) column.
Definition

Identification should include

- the function of the Lally column
- the location of the Lally column, once it is installed
- the building code reference for the Lally column's use or installation requirements.

Process/Skill Questions

- What is the proper method for installing a Lally column?
- What are the consequences of removing a Lally column?

NCCER Carpentry Standards

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Task Number 83

Lay out floor framing detail on the sill plate.

Definition

Layout should include

- locating wall and floor openings
- following the building plans
- selecting the correct tools
- laying out in 16- and 24-inch on center (OC).

Process/Skill Questions

- Which set of plans do you use to determine floor layout?
- What are some of the specialty details to accommodate floor framing?

NCCER Carpentry Standards

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Task Number 84

Identify floor joists and alternative floor systems.

Definition

Identification should include

- the definition of cutting
- types of floor systems (e.g., floor trusses, I-joists, metal floor systems)
- components of floor systems
- the parts of a floor joist with engineered lumber
- the function of the floor joists
- the location of the floor joists, once they are installed
- the crown on floor joists
- the building code reference for the use or installation requirements of floor joists.

Process/Skill Questions

- What is a crown?
- What is the difference between a bow and a crown?
- What are the consequences of improper installation?
- What are floor trusses?
- What is an I-joist?
- Why is steel a good alternative floor system?

NCCER Carpentry Standards

Level One, Module Five (27105-13): Floor Systems

Module Five (27105-13) describes the layout and construction procedures for floor systems, including how to read and interpret construction drawings and specifications, and how to identify different types of framing systems, floor system components, and floor system materials. It also covers how to estimate the amount of materials needed for a floor assembly and on some common alternative floor systems.

Task Number 85
Identify the floor opening.

Definition

Identification should include the

- function of the floor opening
- location of the floor opening once it is created
- building code reference for the floor opening's dimensions or installation requirements.

Process/Skill Questions

- What areas need floor frame openings?
- What are the special framing situations for floor openings?

NCCER Carpentry Standards

Level One, Module Five (27105-13): Floor Systems

Module Five (27105-13) describes the layout and construction procedures for floor systems, including how to read and interpret construction drawings and specifications, and how to identify different types of framing systems, floor system components, and floor system materials. It also covers how to estimate the amount of materials needed for a floor assembly and on some common alternative floor systems.

Task Number 86

Identify bridging and blocking.

Definition

Identification should include the

- components
- function
- location once installed
- building code reference for use or installation requirements.

Process/Skill Questions

- What are the types of metal bridging?
- What are the different uses of bridging and blocking?

NCCER Carpentry Standards
Level One, Module Five (27105-13): Floor Systems

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Task Number 87

Identify subfloor sheathing.

Definition

Identification should include

- the physical description of subfloor sheathing
- the function of subfloor sheathing
- orientation of the sheathing (i.e., long dimension perpendicular to the framing)
- the building code reference for the use or installation requirements of subfloor sheathing.

Process/Skill Questions

- What factors should be considered when determining the type of subfloor sheathing to use?
- What methods should be used to reduce the number of structural problems?
- What are the consequences of improper installation of sheathing?

NCCER Carpentry Standards

Task Number 88

Identify subfloor-framing fasteners and adhesives.

Definition
Identification should include

- types of fasteners and adhesives
- function of different fasteners and adhesives
- correlating fasteners and adhesives to different types of jobs or building materials
- the location of the fasteners and adhesives, once they are installed
- the building code reference for the use or installation requirements of fasteners and adhesives.

Process/Skill Questions

- How do you determine the appropriate fastener and/or adhesive?
- Where do you find information on the precautions that should be taken with adhesives?
- What precautions should be taken with adhesives?

NCCER Carpentry Standards

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Identifying Elements of Walls

Task Number 89

Cut wall plates.

Definition

Cutting should ensure that

- wall plates are proper length, within +/- 1/16 inch
- splices are on stud center
- top and sole plates are identical in length
- wall plates are spliced according to code.

Process/Skill Questions

- What are some of the possible consequences of cutting improperly?
- How is the appropriate length for a cut determined?
NCCER Carpentry Standards

Level One, Module Six (27111-13): Wall Systems
Module Six (27111-13) describes the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing. The module also includes estimating materials required to frame walls.

Task Number 90

Identify the framing layout on wall plates.

Definition

Identification should include

- locating rough openings, corners, and wall Ts
- ensuring that stud layout is 16 inches or 24 inches OC, as required by plans
- ensuring that door and window openings are of the proper width, within +/- 1/16 inch
- identifying wall plate layout marks
- stocking proper components.

Process/Skill Questions

- What are special wall framing details?

NCCER Carpentry Standards

Level One, Module Six (27111-13): Wall Systems
Module Six (27111-13) describes the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing. The module also includes estimating materials required to frame walls.

Task Number 91

Identify wall framing members.

Definition

Identification should include the

- physical description of studs, headers, jacks, rough sills, cripples, and corner and T-posts
- function of studs, headers, jacks, rough sills, cripples, and corner and T-posts
• location of studs, headers, jacks, rough sills, cripples, and corner and T-posts
• building code reference for the use or installation requirements of studs, headers, jacks, rough sills, cripples, and corner and T-posts.

Process/Skill Questions

• What should be done before cutting these parts?
• Where should you look to determine what size to make these components?
• What are the different ways to make corner and T-posts?
• What are the differences between load-bearing and non-load-bearing headers?

NCCER Carpentry Standards

Level One, Module Six (27111-13): Wall Systems
Module Six (27111-13) describes the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing. The module also includes estimating materials required to frame walls.

Task Number 92

Identify types of door openings.

Definition

Identification should include

• dimensions of rough vs. finished openings
• the physical description of door openings
• the function of door openings
• the location of door openings
• the building code reference for the installation requirements of door openings.

Process/Skill Questions

• Which set of plans identifies the placement of door openings?
• What are the differences in the building code between door opening requirements for commercial and residential use?
• What is the difference between rough opening and finished opening dimensions?

NCCER Carpentry Standards

Level One, Module Six (27111-13): Wall Systems
Module Six (27111-13) describes the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing. The module also includes estimating materials required to frame walls.

Task Number 93

Identify types of window openings.

Definition

Identification should include

- dimensions of rough vs. finished openings
- the physical description of window openings
- the function of window openings
- the location of window openings
- the building code reference for the installation requirements of window openings.

Process/Skill Questions

- Which set of plans identifies window openings?
- When installing headers for different types of window openings, what should be considered?
- What is the difference between rough opening and finished opening dimensions?

NCCER Carpentry Standards

Level One, Module Six (27111-13): Wall Systems
Module Six (27111-13) describes the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing. The module also includes estimating materials required to frame walls.

Task Number 94

Identify metal-stud framing.

Definition

Identification should include

- the physical description of metal-stud framing
- the function of metal-stud framing
• determining when metal-stud framing is the best choice
• the building code reference for the use or installation requirements of metal-stud framing.

Process/Skill Questions

• What determines placement of different framing members within the wall section?
• How does the height of the wall determine the size of the framing member used?

NCCER Carpentry Standards

Level One, Module Six (27111-13): Wall Systems
Module Six (27111-13) describes the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing. The module also includes estimating materials required to frame walls.

Task Number 95

Identify types of exterior wall sheathing.

Definition

Identification should include the

• physical description of exterior wall sheathing
• function of the exterior wall sheathing
• differences in types of exterior wall sheathing
• building code reference for the use or installation requirements of exterior wall sheathing
• function of energy-efficient wall sheathing.

Process/Skill Questions

• What types of sheathing are available?
• What types of sheathing should be used with specific exterior finishes?

NCCER Carpentry Standards

Level One, Module Six (27111-13): Wall Systems
Module Six (27111-13) describes the procedures for laying out and framing walls, including roughing-in door and window openings, constructing corners and partition Ts, bracing walls, and applying sheathing. The module also includes estimating materials required to frame walls.

Identifying Elements of Ceilings
Task Number 96

Identify ceiling-framing detail on the top wall plate.

Definition

Identification should include

- determining the number of ceiling joists used on a particular installation and why this number might change for different jobs
- physically describing the top wall plate
- deciding the location and procedure for marking openings, according to building plans.

Process/Skill Questions

- Where are the details for ceiling framing located within the building plans?
- What are the typical layout dimensions for ceiling members?

NCCER Carpentry Standards

Level One, Module Seven (27112-13): Ceiling and Roof Framing
Module Seven (27112-13) provides an overview of ceiling and roof framing, including the components of ceiling and roof framing, the different types of roofs used in residential construction, and the use of trusses in basic roof framing. The methods for laying out rafters, erecting a gable roof, framing a basic gable end wall, and installing roof sheathing are introduced. It also provides instruction on how to estimate the amount of materials needed for a material takeoff for a roof.

Task Number 97

Identify the ceiling opening.

Definition

Identification should include the

- physical description of the ceiling opening
- function of ceiling opening
- location of ceiling opening
- building code reference for the installation requirements of ceiling opening.

Process/Skill Questions
Where do you find ceiling openings on the plans?
What situation would require special ceiling framing?

NCCER Carpentry Standards

Level One, Module Seven (27112-13): Ceiling and Roof Framing
Module Seven (27112-13) provides an overview of ceiling and roof framing, including the components of ceiling and roof framing, the different types of roofs used in residential construction, and the use of trusses in basic roof framing. The methods for laying out rafters, erecting a gable roof, framing a basic gable end wall, and installing roof sheathing are introduced. It also provides instruction on how to estimate the amount of materials needed for a material takeoff for a roof.

Task Number 98

Identify a strongback.

Definition

Identification should include

- the physical description of a strongback (i.e., stiffener, catwalk).
- the function of a strongback
- the location of a strongback, once it is installed
- the building code reference for the installation requirements of a strongback.

Process/Skill Questions

- What is a strongback?
- When is a strongback required? When is a catwalk required?
- What are potential consequences of not installing a strongback?

NCCER Carpentry Standards

Level One, Module Seven (27112-13): Ceiling and Roof Framing
Module Seven (27112-13) provides an overview of ceiling and roof framing, including the components of ceiling and roof framing, the different types of roofs used in residential construction, and the use of trusses in basic roof framing. The methods for laying out rafters, erecting a gable roof, framing a basic gable end wall, and installing roof sheathing are introduced. It also provides instruction on how to estimate the amount of materials needed for a material takeoff for a roof.
Identifying Elements of Roofs

Task Number 99

Identify roof framing detail on the double top plate.

Definition

Identification should include

- describing the double top plate and its function
- determining the types of rafters, pitch, overhang, and spacing from building plans
- following a blueprint for layout on a double top plate.

Process/Skill Questions

- To which set of plans do you refer when reading and laying out roof framing detail on the double top plate?
- What would be considered roof framing details?
- How does region and type of climate affect spacing and sizing?
- What types of fasteners can be used?

NCCER Carpentry Standards

Level One, Module Seven (27112-13): Ceiling and Roof Framing

Module Seven (27112-13) provides an overview of ceiling and roof framing, including the components of ceiling and roof framing, the different types of roofs used in residential construction, and the use of trusses in basic roof framing. The methods for laying out rafters, erecting a gable roof, framing a basic gable end wall, and installing roof sheathing are introduced. It also provides instruction on how to estimate the amount of materials needed for a material takeoff for a roof.

Task Number 100

Identify common, valley, hip, and jack/criple rafters.

Definition

Identification should include
• the physical description of each
• the function of each
• the location of each once they are installed
• rafter layout specifications
• rafter length measurements
• pitch and birdsmouth
• the building code reference for the installation requirements of rafters.

Process/Skill Questions

• What are the differences among common, valley, hip, and jack/cripple rafters? In what situations should each be used?
• Which set of plans should be read and followed when laying out rafters?
• What determines the spacing and size of rafters?
• What are the various methods for installing rafters?
• What are the advantages and disadvantages of each installation method?

NCCER Carpentry Standards

Level One, Module Seven (27112-13): Ceiling and Roof Framing
Module Seven (27112-13) provides an overview of ceiling and roof framing, including the components of ceiling and roof framing, the different types of roofs used in residential construction, and the use of trusses in basic roof framing. The methods for laying out rafters, erecting a gable roof, framing a basic gable end wall, and installing roof sheathing are introduced. It also provides instruction on how to estimate the amount of materials needed for a material takeoff for a roof.

Task Number 101

Identify types of roof openings.

Definition

Identification requires knowledge of framing according to specifications. For a chimney, headers must be set plumb, header top must be beveled for slope, and frame must clear chimney by two inches. For a dormer, the lower header must be set plumb and the upper header must be set at right angles to the roof slope. Identification may also include other types of roof openings, such as skylights.

Process/Skill Questions

• Which set of plans contains details for framing a roof opening?
• What are the special considerations when framing roof openings?
• According to building code, what is the tolerance allowed when framing roof openings?
NCCER Carpentry Standards

Level One, Module Seven (27112-13): Ceiling and Roof Framing
Module Seven (27112-13) provides an overview of ceiling and roof framing, including the components of ceiling and roof framing, the different types of roofs used in residential construction, and the use of trusses in basic roof framing. The methods for laying out rafters, erecting a gable roof, framing a basic gable end wall, and installing roof sheathing are introduced. It also provides instruction on how to estimate the amount of materials needed for a material takeoff for a roof.

Task Number 102
Identify types of roofing systems.

Definition
Identification should include

- asphalt roof shingles
- roll-roofing
- wood shakes and shingles
- tile/slate roofing
- metal roofing
- built-up roofing
- single-ply roofing.

Process/Skill Questions

- What is the most common type of roofing for residential construction?
- What is an advantage of metal roofing?

NCCER Carpentry Standards

Level One, Module Seven (27112-13): Ceiling and Roof Framing
Module Seven (27112-13) provides an overview of ceiling and roof framing, including the components of ceiling and roof framing, the different types of roofs used in residential construction, and the use of trusses in basic roof framing. The methods for laying out rafters, erecting a gable roof, framing a basic gable end wall, and installing roof sheathing are introduced. It also provides instruction on how to estimate the amount of materials needed for a material takeoff for a roof.

Identifying Basic Rigging Procedures
Task Number 103

Identify the use of slings and common rigging hardware.

Definition

Identification should include

- slings (e.g., synthetic web sling, alloy steel chain sling, wire rope sling)
- rigging hardware (e.g., shackles, eyebolts, lifting clamps, rigging hooks).

Process/Skill Questions

- What is an eyebolt?
- Why are slings made from a variety of materials?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00106-15 Basic Rigging

Module Six (00106-15) identifies different types of rigging slings and hardware and describes how those items are used. It explains how to properly inspect slings and hardware items. It also examines different types of hoists used in rigging, and it describes common rigging hitches and how to make the Emergency Stop hand signal.

Task Number 104

Identify the basic inspection techniques and rejection criteria used for slings and hardware.

Definition

Identification should include

- visual and manual inspections
- rejection criteria for types of damage (e.g., abrasion, cuts, missing tags, corrosion).

Process/Skill Questions

- What factors would cause the rejection of rigging?
- What are some of the consequences of not routinely inspecting rigging hardware?

NCCER Core Curriculum: Introductory Craft Skills, 2015
Task Number 105

Identify the basic hitch configurations and their proper connections.

Definition

Identification should include vertical, choker, and basket hitches and connections.

Process/Skill Questions

- What are the consequences of making improper connections?
- Why are different hitch configurations needed?

NCCER Core Curriculum: Introductory Craft Skills, 2015

Task Number 106

Identify basic load-handling safety practices.

Definition

Identification should include

- swing-path awareness
- landing-zone designation
- blocking and cribbing procedures
- load positioning for landing
- techniques to avoid (e.g., manhandling loads onto cribbing).
Process/Skill Questions

- What are some basic load-handling practices?
- What is the purpose of a tag line?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00106-15 Basic Rigging
Module Six (00106-15) identifies different types of rigging slings and hardware and describes how those items are used. It explains how to properly inspect slings and hardware items. It also examines different types of hoists used in rigging, and it describes common rigging hitches and how to make the Emergency Stop hand signal.

Task Number 107

Demonstrate American National Standards Institute (ANSI) hand signals.

Definition

Demonstration should include mobile-crane and overhead-crane hand signals.

Process/Skill Questions

- Why might you need to use hand signals at a construction site?
- How many hand signals are available for the operation of a mobile crane?
- What are some of the benefits of knowing a standardized set of hand signals?

NCCER Core Curriculum: Introductory Craft Skills, 2015

00106-15 Basic Rigging
Module Six (00106-15) identifies different types of rigging slings and hardware and describes how those items are used. It explains how to properly inspect slings and hardware items. It also examines different types of hoists used in rigging, and it describes common rigging hitches and how to make the Emergency Stop hand signal.

SOL Correlation by Task

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<th>Task</th>
<th>Description</th>
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<td>Comply with federal, state, and local safety requirements.</td>
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<td>Identify personal protective equipment (PPE) requirements.</td>
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<td>45</td>
<td>Inspect course-specific hand and power tools to visually identify defects.</td>
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<td>46</td>
<td>Demonstrate lifting and carrying techniques.</td>
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<td>47</td>
<td>Demonstrate safe laddering techniques.</td>
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<td>48</td>
<td>Demonstrate safe scaffolding techniques.</td>
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<td>49</td>
<td>Report personal injuries and environmental and equipment safety violations to the appropriate authority.</td>
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<td>50</td>
<td>Earn the Construction Industry OSHA 10 card.</td>
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<tr>
<td>51</td>
<td>Pass a safety exam for lab/site safety and the use of tools and equipment specific to the construction industry.</td>
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<tr>
<td>52</td>
<td>Identify hand tools and power tools in carpentry.</td>
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<td>53</td>
<td>Maintain hand and power tools.</td>
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<td>54</td>
<td>Demonstrate how to work with whole numbers.</td>
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<td>55</td>
<td>Demonstrate how to work with fractions.</td>
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<td>56</td>
<td>Demonstrate how to work with decimals.</td>
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<tr>
<td>57</td>
<td>Convert between fractions, decimals, and percentages.</td>
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<td>58</td>
<td>Convert measurements between U.S. customary units and metric units of measurement.</td>
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<tr>
<td>59</td>
<td>Identify the geometric formulas for shapes common to carpentry.</td>
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<tr>
<td>60</td>
<td>Identify basic blueprint terms, components, and symbols.</td>
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<td>Identify classifications of drawings.</td>
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<td>62</td>
<td>Interpret scale.</td>
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<td>63</td>
<td>Communicate verbally and in writing, using construction terminology.</td>
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<td>64</td>
<td>Identify communication technology and hand signals common to the construction site.</td>
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<td>65</td>
<td>Check stock and assemblies for squareness.</td>
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<td>66</td>
<td>Measure materials, using a standard measuring device.</td>
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<td>67</td>
<td>Determine whether a surface is level or plumb.</td>
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<td>68</td>
<td>Handle materials.</td>
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<td>69</td>
<td>Store materials.</td>
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<td>70</td>
<td>Identify materials.</td>
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<td>71</td>
<td>Examine energy efficiency in the construction industry.</td>
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<td>72</td>
<td>Cross cut and rip stock to size, using hand and power tools.</td>
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<tr>
<td>73</td>
<td>Bore holes, using hand and power tools.</td>
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<td>74</td>
<td>Square stock to 90 degrees.</td>
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<td>75</td>
<td>Cut a miter joint, using hand and power tools.</td>
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<td>76</td>
<td>Apply clamping devices.</td>
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<td>77</td>
<td>Fasten stock with metal fasteners (e.g., nails, screws, staples).</td>
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<td>78</td>
<td>Describe the functions of a builder's level and a laser level.</td>
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<td>Identify solid or engineered wood products.</td>
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<td>Identify the floor opening.</td>
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<td>Identify the framing layout on wall plates.</td>
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<td>Identify wall framing members.</td>
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<td>92</td>
<td>Identify types of door openings.</td>
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<td></td>
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<td>100</td>
<td>Identify types of roof openings.</td>
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<td>101</td>
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<td>103</td>
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<td>106</td>
<td>Demonstrate American National Standards Institute (ANSI) hand signals.</td>
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**Green Building Infusion Units**

The Green Building Infusion Unit (GBIU) was designed to encourage teachers to infuse instructional units on green building knowledge and skills into designated CTE courses. The
infusion unit is not mandatory, and, as such, the tasks/competencies are marked as “optional,” to be taught at the instructor’s discretion. Teachers can find the infusion/unit in the course listing.

Entrepreneurship Infusion Units

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked “optional.” Teachers can find the infusion/unit in the course listing.

Teacher Resources

The National Center for Construction Education and Research (NCCER) provides competencies and objectives as well as modules and lesson plans. Refer to the carpentry craft page on the NCCER website and access those resources on the right hand side under "Course Planning Tools."
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- Carpentry Assessment
- Carpentry Examination
- Carpentry Level One Entry-Level Assessment
- College and Work Readiness Assessment (CWRA+)
- Construction Technologist Entry-Level Assessment
- Core: Introductory Craft Skills Entry-Level Assessment
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- HBI/NAHB Residential Construction Academy (RCA) Series Student Certification Assessments
- ICC Certificates of Completion Examinations
- International Code Council Residential Building Inspector (B1) Examination
- National Career Readiness Certificate Assessment
- Pre-Apprenticeship Certificate Training (PACT) Core Examinations
- Professional Communications Certification Examination
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Carpentry II (8602/36 weeks, 280 hours)
- Entertainment Design and Technology (8489/36 weeks)

Career Cluster: Architecture and Construction

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<th>Pathway</th>
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<td>Construction</td>
<td>Carpenter&lt;br&gt;Construction and Building Inspector&lt;br&gt;Construction Manager&lt;br&gt;Drywall Installer&lt;br&gt;General Contractor&lt;br&gt;Project Manager&lt;br&gt;Roofer</td>
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<tr>
<td>Design/Pre-Construction</td>
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<td>Construction and Building Inspector</td>
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<td>Construction Manager</td>
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<td>Drywall Installer</td>
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<td>General Contractor</td>
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<td>Project Manager</td>
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<td></td>
<td>Restoration Technician</td>
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