Massachusetts Career and Technical Education

Carpentry

Health & Safety Standards

1 **Safety and Health in a Construction Environment Students will be able to demonstrate health and safety practices in a shop environment and/or at a building site, including the management and maintenance of equipment and tools, use of personal protective equipment (PPE), and personal safety practices.**

a. Select and use PPE according to current industry and OSHA standards.

b. Follow established safety rules and regulations and maintain a safe and clean environment.

c. Identify safety hazards and precautions associated with wood, concrete, steel, and composite building materials.

d. Describe OSHA 10 General Industry standards and explain their relevance to construction.

e. Comply with appropriate fire protection regulations, local permit regulations, and state/federal regulations.

f. Identify, describe, and demonstrate safe use, storage, and maintenance of all related hand tools, according to current industry and OSHA standards.

g. Identify, describe, and demonstrate safe use, storage, and maintenance of all related power tools, according to current industry and OSHA standards.

h. Identify, describe, and demonstrate safe use and maintenance of fall protection according to current industry and OSHA standards.

i. Identify and apply OSHA and other industry recognized health and safety regulations that apply to specific tasks and jobs in carpentry.

j. Identify, describe, and demonstrate safe use and maintenance of ladders according to current industry and OSHA standards.

k. Identify and describe ladder and bracket safety practices and procedures.

l. Demonstrate the safe use and maintenance of extension ladders.

m. Demonstrate the safe use and maintenance of step ladders.

n. Demonstrate the safe use and maintenance of wall brackets and guardrails.

o. Demonstrate the safe use and maintenance of roof brackets.

p. Identify and describe scaffold safety practices and procedures.

q. Erect and disassemble tubular pipe staging systems.

. Erect and disassemble light duty rolling scaffolding systems.

. Erect and disassemble pump jack staging systems.

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lst. Demonstrate the use and maintenance of fall arrest systems.

u. Demonstrate the use and maintenance of rated wood scaffolding planks.

Technical & Integrated Academic Standards

2 **Technical Plans and Print Reading Students will be able to identify, design and interpret technical drawings and blueprints.**

a. Understand terms, abbreviations, symbols, and line types of technical drawings and blueprints.

b. Read and interpret a variety of construction drawings including floor plans, framing plans, electrical and plumbing layouts and specifications, and HVAC requirements.

c. Describe the methods of dimensioning construction drawings and converting blueprint measurements to architect's scale.

d. Develop a material list for framing construction plans and estimate cost.

e. Describe the basic layout of a set of construction documents.

f. Identify and describe a floor plan from a set of construction plans.

g. Identify and describe a framing plan from a set of construction plans.

h. Identify and describe elevations from a set of construction plans.

i. Identify and describe cross sections and details from a set of construction plans.

j. Identify and describe schedules from a set of construction plans.

k. Describe the importance of project specifications and their use.

l. Identify and define abbreviations found on construction plans.

m. Identify and define standard line types used in drawings.

n. Identify and define window, door, and stair floor plan symbols.

o. Identify and define common electric floor plan symbols.

p. Identify and define common plumbing floor plan symbols.

q. Determine true measurements from prints.

r. Identify and demonstrate proper use of the architect scale.

s. Locate the scale of a given drawing.

t. Calculate missing dimensions on a plan without the use of a scale.

u. Using an architectural scale, draw an 8' x 12' shed floor framing plan at a given scale.

lsv. Describe detailed views and schedules within construction plans.

w. Locate and describe a detailed view of a construction drawing.

x. Locate and identify the door sizes and types from the schedule.

y. Locate and identify the window sizes and types from the schedule.

z. Locate and identify the room from the provided schedule.

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a. Identify specific materials required from the construction plans.

bb. Develop a stock list.

cc. Develop a true cost for the items on the stock list.

dd. Apply state and local building codes.

ee. State the purpose of zoning regulations.

ff. Describe the relationships between local, state, and the ICC codes.

gg. Compare the differences between residential and commercial codes.

hh. Explain how a building permit incorporates local building codes.

ii. Outline the building inspection process.

jj. Identify specific code compliance regulations using the respective code book as a reference.

kk. Compile project data, categorize, calculate, audit, and verify information to maximize project efficiency.

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3 **Fundamentals of Carpentry and Building Layout Students will apply fundamental carpentry principles and basic construction math concepts to identify building materials and complete building and building site layout to specifications.**

a. Develop project goals, prioritize, organize, and accomplish work in a timely manner.

b. Identify various types of wood and describe how lumber is graded including choice of wood for exterior and interior uses and storage best practices.

c. Describe the use of PVC and composite materials in a construction plan.

d. Examine the use of different types of masonry units and concrete, metal and metal products, and types of roofing materials.

e. Identify techniques, installation procedures, and construction systems for prefabricated building materials.

f. Compare and contrast modular construction to panelized construction.

lsg. Use precision measuring and leveling tools including water level, builder's level, laser level, or transit level.

h. Explain how angles, shapes, and the Pythagorean Theorem or 3-4-5 rule are used in site and building layout.

i. Explain how to measure horizontal and vertical distances, establish building lines, and use of batter boards to verify corners are square.

j. Inspect installed items for square, plumb, and level.

k. Explain techniques for measuring and calculating rise, run, and stairwell openings; laying out stringers; and fabricating basic stairways.

l. Maintain records, document actions, and present written progress reports to appropriate personnel.

m. Analyzing information and evaluating results to choose the best solution and solve problems.

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l. Recognize and describe the use of building materials.

o. Identify and describe the characteristics of the types of wood used in interior and exterior applications.

p. Identify and describe panel products used in interior and exterior applications.

q. Identify and describe fasteners used in interior and exterior applications.

r. Identify and describe the characteristics of composite and PVC materials.

s. Identify and describe adhesives used in interior and exterior applications.

t. Identify and describe the use of different types of framing connectors.

u. Identify and describe the use of different types of masonry units and concrete.

v. Identify and describe the use of different types of metal products.

w. Identify and describe the use of different types of roofing materials.

x. Describe the best practices for storing materials.

y. Recognize and describe the use of engineered materials.

z. Identify and describe engineered building materials.

aa. Explain the application of engineered materials.

bb. Describe prefabricated panelized systems.

cc. Identify, define, and describe prefabricated construction systems.

dd. Describe construction techniques for prefabricated building materials.

ee. Describe the installation procedures for prefabricated building materials.

ff. Apply carpentry math principles.

gg. Perform Layout procedures.

hh. Describe and demonstrate the installation of batter board.

ii. Layout sills.

jj. Check for square.

kk. Layout floor/ceiling joists.

ll. Layout wall plates and shoes.

mm. Layout a common roof rafter.

nn. Layout a hip or valley roof rafter.

soo. Layout a stair stringer.

pp. Layout a story pole.

qq. Check installed items for square, plumb, and level.

rr. Check walls and posts for plumb using a level and a plumb bob.

ss. Check foundations and sills, floors, and walls for square.

tt. Demonstrate and describe how to check floors and ceilings of varying distances for level.

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4 **Framing Systems Students will be able to demonstrate industry standard practices to build and install floors, exterior walls, interior partitions, ceilings, and roof framing systems.**

a. Identify the components of a wall system and describe how to estimate needed framing materials, including wood frame and metal frame walls.

b. Summarize the steps for laying out and framing walls, including load bearing walls.

c. Assemble and erect a wood frame wall, including plates, corner assemblies, door and window openings, partition Ts, bracing, and fire blocking.

d. Identify and explain the installation of ceiling frame components including how to lay out, cut, and install the required number ceiling joists.

e. Identify common residential roof types and related components.

f. Estimate the number of ceiling joists required for a building.

g. Describe the methods used to lay out and cut common rafters to the proper length.

h. Explain how to estimate the rafters, ridge board, and sheathing needed for a material list.

i. Explain trusses and how they are used in basic roof framing.

j. Describe and apply the factors in the construction of floor framing systems.

k. Estimate the amount of material needed to frame a floor assembly from a set of plans.

l. Explain the importance of layout at 16 inches on center.

m. Identify floor framing members.

n. Demonstrate how and explain why joists are crowned.

o. Explain the purpose of sill seal.

lsp. Layout and install sills.

q. Install band(rim) joist and layout to receive remaining floor framing members.

r. Fabricate floor frame and stairwell openings.

s. Describe the purpose for bridging and apply bridging.

t. Explain and apply nail spacing and nail sizing per building code.

u. Apply subfloor material.

v. Demonstrate practices related to framing exterior walls.

w. Layout and construct bearing walls.

x. Layout and construct bearing wall openings.

y. Layout and construct a gable end wall.

z. Sheath a wall.

aa. Erect temporary brace and straighten wall systems.

bb. Identify rough opening sizes.

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cc. Identify sizes for door and window headers.

dd. Identify wall framing members.

ee. Research and describe code compliant braced wall systems.

ff. Demonstrate practices related to framing interior partitions.

gg. Layout and construct bearing partitions.

hh. Layout and construct non-bearing partitions.

ii. Demonstrate practices related to framing ceilings and roofs.

jj. Layout a ceiling frame.

kk. Layout a roof frame.

ll. Cut and install ceiling frame systems.

mm. Cut and install common rafter systems.

nn. Sheath a gable roof.

oo. Layout and install strapping.

pp. Layout and install hip and valley roof systems.

qq. Layout and install roof truss systems.

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5 **Finish Carpentry Students will demonstrate industry standard techniques to finish interior and exterior systems including installation of siding, trim packages and molding, and weatherization products.**

a. Explain water and moisture management principles for roof and wall systems.

b. Demonstrate installation of decking and railing systems.

c. Install roofing material and roof trim system.

d. Install interior doors and door trim including caulking and weatherstripping.

lse. Inspect ceiling, floor tile, wall coverings, siding, glass, and woodwork to detect and report broken or damaged structures.

f. Demonstrate best practices related to exterior finish.

g. Install windows and doors systems.

h. Apply siding and finish trim systems.

i. Apply caulking and weatherization materials and systems.

j. Demonstrate best practices related to interior finish.

k. Install and finish wallboard products.

l. Install door and window trim.

m. Install interior doors and hardware.

n. Install finished flooring systems.

ı. Install baseboard trim.

ı. Install closet interiors.

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q. Install stair trim and railing system.

r. Install kitchen and bathroom cabinets, and countertops.

6 **Commercial Carpentry Students will be able to identify materials needed and practices applied to complete common commercial carpentry, including knowledge of metal framing systems, types of acoustical ceilings, and commercial flooring products.**

a. Identify, maintain, and manage hand tools, power tools, and equipment.

b. Demonstrate the safe use and maintenance of layout, marking, and measuring tools.

c. Demonstrate the safe use and maintenance of fastening, clamping, and dismantling tools.

d. Demonstrate the safe use and maintenance of sawing and cutting tools.

e. Demonstrate the safe use and maintenance of drilling and boring tools.

f. Demonstrate the safe use and maintenance of planning, smoothing, and shaping tools.

g. Demonstrate the safe use, storage, and maintenance of sawing, planning, and jointing tools.

h. Demonstrate the safe use and maintenance of a circular saw.

i. Demonstrate the safe use and maintenance of a power miter saw box.

j. Demonstrate the safe use and maintenance of a table saw.

k. Demonstrate the safe use and maintenance of reciprocating saws.

l. Demonstrate the safe use and maintenance of cordless circular and reciprocating saws.

m. Demonstrate the safe use and maintenance of a portable bandsaw.

lsn. Demonstrate the safe use and maintenance of a portable planer.

o. Demonstrate the safe use and maintenance of a portable jointer.

p. Use, store, and maintain drilling and boring tools.

q. Demonstrate the safe use and maintenance of drills.

r. Demonstrate the safe use and maintenance of impact and drill drivers.

s. Demonstrate the safe use and maintenance of a drill press.

t. Use, store, and maintain routers and sanders.

u. Demonstrate the safe use and maintenance of routers.

v. Demonstrate the safe use and maintenance of sanders.

w. Use, store, and maintain fastening tools.

x. Demonstrate the safe use and maintenance of a screw gun.

Skip to main content . Demonstrate the safe use and maintenance of pneumatic equipment.

z. Demonstrate the safe use and maintenance of powder actuated fastening tools and systems.

aa. Describe materials and best practices used in commercial carpentry.

bb. Design, layout, and install metal framing system including metal track, studs, and metal door frames.

cc. Identify and describe common metal framing systems.

dd. Layout and erect a metal stud partition at 16” on center using appropriate fasteners.

ee. Identify and describe types of doors and frames.

ff. Identify and describe types of hardware.

gg. Identify and describe types of acoustic ceilings.

hh. Compare and contrast types of commercial flooring products.

ii. Identify and describe types of doors and frames.

jj. Install drywall products.

kk. Install Commercial Finish systems.

ll. Execute installation of suspended ceiling grid system.

mm. Install acoustical ceiling tiles.

nn. Layout and install commercial flooring systems.

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7 **Energy Efficient Systems Students will be able to design energy efficient systems using sustainable, renewable, and reusable resources and identify insulation materials that comply with the International Energy Conservation Code (IECC).**

a. Describe the purpose and components of a building envelope system.

b. Identify ways to minimize air and moisture infiltration in buildings.

c. Identify various air barrier systems.

d. Examine residential energy provisions made by IECC.

e. Explain sustainably sourced lumber.

f. Identify and describe renewable and reusable resources.

g. Examine the necessity of the air exchange system.

h. Design an energy efficient exterior wall that complies with the IECC.

i. Identify Green Building Practices.

j. Describe the building envelope.

k. Identify and describe insulation material systems.

l. Identify and describe air barrier systems.

m. Define efficient use of resources.

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i. Identify and describe renewable and reusable resources.

j. Identify and describe sustainably sourced lumber.

Employability Standards	**8 Employability Skills Students will understand and demonstrate the roles of professional communication, critical thinking, problem solving, professionalism, teamwork, and collaboration within the context of carpentry careers.** a. Demonstrate the impact of communication skills on the success of a carpenter. b. Describe appropriate methods of communication for internal and external stakeholders. c. Evaluate the impact of poor communication by carpenters on the safety of a job site. d. Troubleshoot a project plan to find mistargeted or extraneous work that does not contribute to the ultimate objectives of the project. e. Build a team-based project plan that results in a successful construction project and that includes recruiting teammates and assigning roles for a project. f. Examine the role of carpentry in society, particularly in terms of its significance for employability and career opportunities.
Entrepreneurship Standards	**9 Entrepreneurship Students will be able to describe opportunities for entrepreneurship and be able to evaluate the value proposition of business ownership in the carpentry field.** a. Students will be able to understand and describe the role of a carpenter in a startup carpentry services company. b. Describe the concept of professional networking and demonstrate personal introductions and an “elevator speech” appropriate for other carpenters, contractors, developers, and other potential business partners. c. Evaluate the licensing, regulatory and tax implications of self-employment and business ownership as a carpenter compared to W-2 employment.
Digital Literacy Standards	**10 Digital Literacy Students will be able to demonstrate the use of common software and information technology in a modern carpentry environment.** a. Describe the use of online resources in licensing and professional development as a carpenter. b. Demonstrate the use of common scheduling, resource management, ticketing and/or customer relationship software systems. c. Understand where to find online resources that support effective carpentry and how to be a safe and ethical consumer and creator of digital content. d. Apply strategies for using digital tools and technology to drive business and commerce.