Vocational Technical Education Framework

ଓ

Construction Occupational Cluster

Carpentry (VCARP)

CIP Code 460201

June 2014

Massachusetts Department of Elementary and Secondary Education
Office for Career/Vocational Technical Education
75 Pleasant Street, Malden, MA 02148-4906
781-338-3910
www.doe.mass.edu/cte/

This document was prepared by the
Massachusetts Department of Elementary and Secondary Education
Mitchell D. Chester, Ed.D.
Commissioner

This document printed on recycled paper

Massachusetts Department of Elementary and Secondary Education
75 Pleasant Street, Malden, MA 02148-4906
Phone 781-338-3000 TTY: N.E.T. Relay 800-439-2370
www.doe.mass.edu

Table of Contents

Acknowledgements

Contributors to the 2014 Carpentry Framework (VCARP) Strands 1, 4 and 5:

<div align="center">

Project Administrator
Thomas Hickey, Superintendent
South Shore Vocational Technical High School

Project Managers
Rebecca Buck, Northern Berkshire Vocational Regional School District
Kristin Steiner, Northern Berkshire Vocational Regional School District

MAVA Consultants

</div>

Kathy Conole   Deborah DePaolo   John McDonagh

<div align="center">

Massachusetts Department of Elementary and Secondary Education
Patricia Gregson, Associate Commissioner
Vocational, Workforce and College Readiness Programs

Office for Career/Vocational and Technical Education – Framework Revision Strands 1, 4 and 5
Lisa Sandler, Massachusetts Methods of Administration Coordinator
Gary Gomes, Accountability & Monitoring Supervisor
Marnie Jain, Education Specialist

Framework Strand 1 Leader:
Michael Nixon, MassBay Community College

</div>

Team Members:
    Patricia Allen, Greater New Bedford Regional Technical High School
    Cheryl Bomal, Greater Lowell Technical High School
    Deborah Brightman, Greater New Bedford Regional Technical High School
    Martin Dooley, Lower Pioneer Valley Career and Technical Education Center
    Darla Hartung, Taunton High School
    Rhonda Moran, Lower Pioneer Valley Career and Technical Education Center
    John Morash, Plymouth South High School
    John Taylor, Greater Lowell Technical High School

Resource Experts:
    Anne Gilligan, DESE-Learning Support Service, Safe and Healthy Schools Coordinator
    David Edmonds, DESE-CVTE, Education Specialist
    Lisa Sandler, DESE-CVTE, Massachusetts Methods of Administration Coordinator

<div align="center">

Framework Strand 4 Leader:
Marcia Kessler, Old Colony Regional Vocational Technical High School

</div>

Team Members:
    Erin Carerra, Taunton High School
    Gillian Granger, Blackstone Valley Regional Vocational Technical High School
    Carol Hartnett, Blue Hills Regional Technical High School
    Christina Melvin, Worcester Technical High School

Cecilia Smith, Greater Lawrence Technical School
EJ Smith, Blackstone Valley Regional Vocational Technical High School
Michael Viggiano, Madison Park High School

Resource Experts:
Gary Gomes, DESE-CVTE, Accountability and Monitoring
Elizabeth Hennessy, Blackstone Valley Regional Vocational Technical High School, Dir. of Counseling
Marnie Jain, DESE-CVTE,
Judith McKinstry, Business Professionals of America Director
Lisa Sandler, DESE – CVTE, Massachusetts Methods of Administration Coordinator
Shailah Stewart, DESE - College & Career Readiness, Connecting Activities Coordinator
Karen Ward, SkillsUSA Director

Framework Strand 5 Leader:
Margaret Ellis, JP Keefe Technical High School

Team Members:
Lori Alie, Blackstone Valley Regional Vocational Technical High School
Lori Carr, Taunton High School
Barbara-jean Chauvin, Norfolk County Agricultural High School
Cheryl Hackenson, Tantasqua Regional High School
Clifford Keirstead, Whittier Regional Technical High School
Lynn McKiernan, Assabet Valley Regional Technical High School
John Oldham, Old Colony Regional Vocational Technical High School
Arlene Thompson, Worcester Technical High School

Resource Experts:
Jennifer Green, Network For Teaching Entrepreneurship Executive Director
Donna McFadden, MA DECA Director
Lisa Sandler, DESE –CVTE, Massachusetts Methods of Administration Coordinator
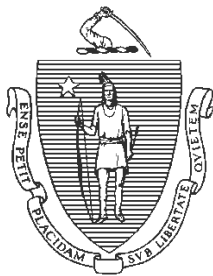
Massachusetts Department of Elementary and Secondary Education

75 Pleasant Street, Malden, Massachusetts 02148-4906   Telephone: (781) 338-3000
TTY: N.E.T. Relay 1-800-439-2370

Mitchell D. Chester, Ed.D.
Commissioner

July 2014

Dear Colleagues,

I am pleased to present to you the *Massachusetts Vocational Technical Education Frameworks,* adopted by the Department of Elementary and Secondary Education in June 2014. These frameworks, one for each of the 44 vocational technical programs, include standards in multiple strands representing all aspects of the industries that students in the vocational technical education program are preparing to enter.

The frameworks also include a crosswalk between the technical standards and relevant standards in Massachusetts Curriculum Frameworks to support effective integration of academic and technical content.

The comments and suggestions received during revision of the 2007 *Massachusetts Vocational Technical Education Frameworks* have strengthened these frameworks. We will continue to work with schools and districts to implement the 2014 *Massachusetts Vocational Technical Education Frameworks* over the next several years, and we encourage your comments.

I want to thank everyone who worked with us to create challenging learning standards for Massachusetts students. I am proud of the work that has been accomplished.

Sincerely,

Mitchell D. Chester, Ed.D.
Commissioner of Elementary and Secondary Education

Introduction

Overview & Organization and Key Changes

<u>Overview</u>

The Massachusetts Department of Elementary and Secondary Education understands the necessity of maintaining current Vocational Technical Education Frameworks which ensure career/vocational technical education students across the Commonwealth are taught the most rigorous standards aligned to the needs of business and industry.

With the advent of the Massachusetts Teaching & Learning System the Office for Career/Vocational Technical Education (CVTE) recognized the significance of including career/vocational technical education in the system and developed a comprehensive plan for including vocational technical education. The plan was designed in a Two Phase Process. Phase One included the revision of strands two, three, and six, of all of the Vocational Technical Education Frameworks. Phase Two consisted of three major components (projects) all equally crucial;

1. The revision of Strands One, Four, and Five to complete the revision of all six strands of the Vocational Technical Education Frameworks;

2. Statewide Professional Development on all revised strands, with training on strands two, three, and six delivered fall 2013, and training on strands one, four, and five delivered spring 2014;

3. The creation and development of additional Model Curriculum Unit (MCU) Teams.

The Office for Career/Vocational Technical Education Framework Team, with support from consultants, began Phase One in the 2012-2013 school year, to revise three of the six strands contained in all of the Vocational Technical Education (VTE) Frameworks. The state was organized into "Collaborative Partnerships" comprised of teams of project administrators, highly qualified subject matter educators, and business and industry partners, whose task was to revise Strand Two – Technical, Strand Three – Embedded Academics, and Strand Six – Technology Literacy. Each team met with a vocational advisory committee which included business and industry representatives and postsecondary education professionals, whose mission was to review and revise the team's draft document during the revisionary process. Once strand two was revised, academic teachers (typically one English Language Arts teacher, one Mathematics teacher, and one Science teacher) worked with the technical subject matter teachers to develop a crosswalk between academic curricula standards and the technical standards, and provided examples of embedded academic content.

The Office for Career/Vocational Technical Education solicited statewide input from technical and academic teachers and administrators at the annual Massachusetts Association of Vocational Administrators (MAVA)/Massachusetts Vocational Association (MVA) - Connecting for Success Conference. Each framework team met with their content colleagues and reviewed the draft revisions and obtained valuable feedback. Additionally, all drafts were reviewed and revised by the Massachusetts Vocational Technical Teacher Testing Program, to ensure appropriate measurable language.

Project consultants designed a new template to ensure all framework teams entered new standards and additional resources in a consistent manner. The framework teams created an "Appendix" listing potential industry recognized credentials attainable by secondary students; lists of professional, student, and relevant government organizations; and useful resources and websites. *It is important to note that although most Framework Teams provided information for the "Appendix", not all teams did. Therefore, sub-headings within the "Appendix" without information have been deleted. Disclaimer: Reference in the Appendices Section to any specific commercial products, processes, or services, or the use of any trade, firm or corporation name is for the information and convenience of the public, and does not constitute endorsement or recommendation by the Massachusetts Department of Elementary and Secondary Education.*

The Office for Career/Vocational Technical Education facilitated a comprehensive vetting process throughout the Commonwealth. During the fall of 2012 districts throughout Massachusetts solicited feedback from each Vocational Program's Advisory Committee members at the Fall Board meetings. Additionally, the Office for Career/Vocational Technical Education met with various licensing boards at the Massachusetts Division of Professional Licensure and provided the applicable draft framework to each board for review. All framework drafts were posted on the CVTE website for public comment. Comments and suggested revisions received were shared with each framework team for response and edits, as appropriate.

The Phase I Process was completed on an accelerated timetable and resulted in all Vocational Technical Education Frameworks; Stand Two and Strand Six, revised with current, rigorous, relevant standards. Strand Three has been redesigned into a crosswalk which directly correlates academic and technical standards. An appendix of useful material for technical teachers recommended by their peers was added to each framework.

Phase II of the Framework Revision Process consisted of three major projects;

1. The Strands One, Four & Five Project, to complete the revision of all six strands of the Vocational Technical Education Frameworks;
2. Statewide Professional Development on all revised strands, with training on strands two, three, and six delivered fall 2013, and training on strands one, four, and five delivered spring 2014;
3. The creation and development of additional Model Curriculum Unit (MCU) Teams.

The Strands One, Four, & Five Project began in the fall of 2013 with the formation of a leadership team and three work groups. Co-Managers led the leadership team comprised of three Strand Coordinators who facilitated work teams and reviewed, researched, and revised these common strands. All skills specific to the vocational technical program have been included into Strand Two Technical.

The Strand One Team revised the safety knowledge and skills that <u>all</u> students need to acquire. The team included relevant issues (i.e., bullying, climate), laws, regulations, guidelines and policies pertaining to safety.

The Strand Four Team revised the Employability Knowledge and Skills that <u>all</u> students need to acquire. Teams considered current research on career readiness, including the work of the College Career Readiness Task Force convened by the Department, changes in workplace, technological changes that impact how people perform their work (i.e., communications methods), and included standards that

emphasize the need for lifelong learning and adaptability given the multiple career changes over and an individual's working life. The team recommended this strand be renamed to: Career Readiness.

The Strand Five Team revised the Management & Entrepreneurship Knowledge and Skills that <u>all</u> students need to acquire.   All business owners and employees must possess management and financial skills to be productive members of society. Skills included financial knowledge and basic business management skills.

All Strand One, Four and Five Project Teams worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Massachusetts Career and Technical Student Organizations to crosswalk standards to national Career & Technical Student Organizations Curricula, as applicable.

The Office for Career/Vocational Technical Education contracted the MAVA Consultant Team to work closely with the office to complete all of the work accomplished during Phase II of the Project.

A remarkable amount of work was accomplished through the efforts of hundreds of professionals who collaborated and diligently supported this work. The Office for Career/Vocational Technical Education is grateful for all the support received from the field, particularly all of the teachers (technical and academic), administrators, advisory committee members, business and industry representatives, the Division of Professional Licensure - boards, the Massachusetts Association of Vocational Administrators, the MAVA Consultants, and the Massachusetts Vocational Association, whose contributions were tremendous.

Special thanks to all staff in the Office for Career/Vocational Technical Education and the CVTE Framework Revision Team who provided guidance and numerous contributions during Phase One of the project.

Organization and Key Changes

This section contains the following:

- Highlights of Changes to the Vocational Technical Education Frameworks; which includes a summary of changes made to each strand.
- Organization of the Frameworks – Strand Two illustrates structure of topic headings, standards and objectives, and performance examples.

Highlights of Changes to the Vocational Technical Education Frameworks:

Strand One:

Safety and Health Knowledge and Skills have been revised to contain the safety standards that are common to all programs. The Strand One Team worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Career and Technical Student Organizations (CTSO) to crosswalk standards to national CTSO Curricula, as applicable.

- No objectives were deleted, only modified.
- Language and wording was clarified.
- Additions included a focus on maintaining a safe school and workplace in terms of creating a positive climate/environment.
- Student safety credential program has been revised.
- Safety attire has been revised.
- Emergency equipment and fire safety has been revised.
- Many new Performance Examples have been included.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below titled: "Organization of the Frameworks – Strand Two". All strands were organized in that manner, with the exception of the former Strand Three.

Strand Two:

The Technical Standards Knowledge and Skills have been revised to reflect business and industry changes since the adoption of the 2007 Vocational Technical Education Frameworks (VTEF). There are additional changes to Strand Two below:

- The Technical Knowledge and Skills (Strand Two) section contains standards specific to the particular vocational program; suffix "a" (as common to all programs) and suffix "c" (as common within a cluster) have been removed.
- Each VTEF Strand Two begins with safety and health knowledge and skills specific to the particular vocational program.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below titled: "Organization of the Frameworks – Strand Two". All strands were organized in that manner, with the exception of the former Strand Three.

- Strand Two of the Frameworks for Animal Science, Environmental Science and Technology, and Horticulture, begin with core standards required for all participants in the programs, followed by a series of standards organized in concentrations. See the section below titled: "Organization of the Frameworks – Strand Two" for more information.
- An update to some of the vocational programs framework is the addition of advanced or supplemental standards which are noted in Strand Two by an asterisk (*). *These standards are not required, but are provided as suggestions that districts may choose to use to increase the depth of a particular topic, or add additional topics, particularly for advanced students or for those seniors who do not participate in cooperative education.* See the section below titled: "Organization of the Frameworks – Strand Two" for more information.

Strand Three:

Since the purpose of Strand Three was to correlate academic content that was *embedded* in the knowledge and skills necessary to perform certain technical skills, it was logical to highlight those connections through a crosswalk between the academic curriculum standards and the technical standards (Strand Two). The crosswalk directly correlates the English Language Arts (2011) and Mathematics (2011) Frameworks, incorporating the Common Core Standards and the Science and Technology/Engineering Frameworks. The crosswalk can be found in the appendix of each vocational framework. The crosswalk also includes performance examples which illustrate integrated academic and technical content.

- Embedded Academics has been replaced with a crosswalk between the academic curriculum standards and the technical knowledge and skills standards. The crosswalk is located in the Appendices.

Strand Four:

Employability (and Career Readiness) Knowledge and Skills focused on providing students with general knowledge and skills to be college and career ready. The Strand Four Team worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Career and Technical Student Organizations to crosswalk standards to national CTSO Curricula, as applicable.

- Language and wording were clarified.
- Additions included a focus on providing students with skills for employability/career readiness.
- Modifications included Career Exploration & Navigation, Communication in the Workplace, and Work Ethic & Professionalism.
- New Performance Examples have been included.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below titled: "Organization of the Frameworks – Strand Two". All strands were organized in that manner, with the exception of the former Strand Three.

Strand Five contains Management and Entrepreneurship Knowledge and Skills that are general for all students. The Strand Five Team worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Massachusetts Career and Technical Student Organizations to crosswalk standards to national Career & Technical Student Organizations Curricula, as applicable.

- Language and wording were clarified and organized into a logical format.
- The Strand Five Team felt that the 2007 curriculum remained valid.
- Additions included a focus on providing students with skills for management and entrepreneurship applicable to all vocational programs.
- Modifications included Starting and Managing a Business, Marketing, and Financial Concepts & Applications in Business, and Legal/Ethical/Social Responsibilities.
- New Performance Examples have been included.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below titled: "Organization of the Frameworks – Strand Two". All strands were organized in that manner, with the exception of the former Strand Three.

Strand Six

Strand Six Technology Literacy Knowledge and Skills has been replaced with the 2008 Massachusetts Technology Literacy Standards and Expectations Framework.

<u>Appendix</u>[1]

Each framework contains an "Appendix" section which includes an Embedded Academic Crosswalk, Industry Recognized Credentials, Statewide Articulation Agreements, Professional, Governmental, and Student Organizations, Resources, and relevant websites.

The Appendix[2] contains:

- Embedded Academic crosswalks for English Language Arts, Mathematics, and Science & Technology/Engineering.
- Statewide Articulations: Current statewide Articulation Agreements and/or Apprenticeship Programs available to the specific vocational program are listed on this page. The development of new statewide articulations continues, and therefore these pages will be revised as new agreements are finalized.

- Industry-Recognized Credentials: Technical Teacher Teams generated lists of credentials for the vocational programs. Program Advisory Committees throughout the state reviewed and provided recommendations through the validation process. *The credential list has been provided as a <u>resource only</u> and districts are not obligated to provide all of the specified credentials for students.*

- Other: These pages provide lists of reference materials, government agencies, professional and student organizations, and useful websites created by each framework team. These are intended as helpful resources for technical teachers, identified by peers. These are not recommended or required by the Department of Elementary & Secondary Education.

---

[1] *Note:* Although most Framework Teams provided information for the "Appendix", not all teams did. *<u>Therefore, sub-headings within the "Appendix" without information have been deleted.</u>*
Disclaimer: Reference in the Appendices Section to any specific commercial products, processes, or services, or the use of any trade, firm or corporation name is for the information and convenience of the public, and does not constitute endorsement or recommendation by the Massachusetts Department of Elementary and Secondary Education.

The Vocational Technical Education Frameworks contain knowledge and skills covering all aspects of industry, reflected in six strands: Safety and Health, Technical, Embedded Academics, Employability, Management and Entrepreneurship, and Technological.

Within each strand, standards and objectives were grouped under topic headings, which are displayed in bold. Each standard is followed by a performance example. In the excerpt below, 2.A is the topic; 2.A.01 is the first standard and 2.A.01.01 and 2.A.01.02 are the objectives under that standard.

2.A   Automotive Technology Specific Safety Practices
2.A.01   Identify and describe safety procedures when dealing with different types of automotive lifts according to current industry standards.
      2.A.01.01   Demonstrate procedures for safe lift operations.
      2.A.01.02   Demonstrate safe use, placement and storage of floor jacks and jack stands.

> 2.A.01   Performance Example:
>
> - Student will set up lift using manufacturer's suggested lift points.

2.A.02   Demonstrate and describe safety procedures when dealing with high pressure systems including necessary ventilation according to current industry standards.
      2.A.02.01   Describe and demonstrate the importance of safety procedures to be used when servicing high pressurized systems (fuel systems, brakes, air conditioning, suspension, hydraulic systems, etc.).
      2.A.02.02   Describe and demonstrate safe use of oxygen/acetylene torches and electric welding equipment.
      2.A.02.03   Demonstrate ventilation procedures to be followed when working in the lab/shop area.

> 2.A.02   Performance Example:
>
> - Student will relieve fuel system pressure to perform necessary repairs.

2.A.03   Identify and describe safety procedures when dealing with electrical circuits according to current industry standards.
      2.A.03.01   Describe safety procedures to be followed when servicing supplemental restraint systems.
      2.A.03.02   Demonstrate safety awareness of high voltage circuits of electric or hybrid electric vehicles and related safety precautions.

> 2.A.03   Performance Example:
>
> - Safely disable Supplemental Restraint System (SRS) air bag for repair using manufacturer's recommendations.

There are additional changes to some of the Frameworks Strand Two (Technical Knowledge and Skills). Specifically, Strand Two of the Frameworks for Animal Science, Environmental Science and Technology and Horticulture begin with core standards required for all participants in the programs, followed by a series of standards organized in concentrations. For example, Strand Two of the Horticulture Framework begins with the core standards required of all Horticulture students

(Topics 2.A through 2.I). These standards are followed by the three concentrations: Arboriculture (Topics 2.J through 2.L), Greenhouse Management and Floriculture (Topics 2.J. through 2.L) and Landscape and Turf Management (Topics 2.M through 2.Q).

Advanced / Supplemental Standards (Not Required)

Another variation that is new to the revised Strand Two Frameworks is the addition of advanced or supplemental standards which are noted with the use of an asterisk (*). *These standards are not required, but are provided as suggestions that districts may choose to use to increase the depth of a particular topic, or add additional topics, particularly for advanced students or for those seniors who do not participate in cooperative education.*

The following is an example from Automotive Technology, where entire topics were added:

Advanced Automotive Technology Technical Knowledge and Skills
Note: The following competencies are optional, supplementary competencies suitable for advanced students. These are not required.

2.CC   Demonstrate appropriate engine repair techniques.
    2.CC.01   Perform appropriate cylinder Head Repair.
        2.CC.01.01*   Diagnose, remove and replace cylinder head(s).
        2.CC.01.02* Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition; determine necessary action.

The following is an example from the Strand Two Radio and Television Broadcasting Framework that shows the addition of an advanced objective, 2.B.04.08*:

2.B.04   Explain concepts fundamental to shooting in cinema and video.

2.B.04.01	Compare and contrast a single-camera and a multiple-camera production.
2.B.04.02	Explain the importance of shooting for the edit (i.e., match on action, sequencing, coverage).
2.B.04.03	Explain the importance of continuity.
2.B.04.04	Explain the 180° Rule line, and its application in various cinema scenarios.
2.B.04.05	Identify and establish a specific point-of-view when shooting from a script.
2.B.04.06	Analyze the methods in which specific shots can evoke emotion from an audience.
2.B.04.07	Define drop frame and non-drop frame code shooting and explain how to account for both when preparing for an edit.
2.B.04.08*	Describe various cinematographic methods necessary when shooting scenes that incorporate post-production visual effect

2.B.04   Performance Examples:

- Students will list similarities and differences of single-camera and multiple-camera shoots.
- Students will describe multiple shooting considerations that are useful in streamlining the editing process.

Construction Occupational Cluster

Carpentry Framework (VCARP)

Strand 1: Safety and Health Knowledge and Skills

1.A   Fundamentals of Health and Safety

1.A.01   Describe and apply health and safety regulations.

    1.A.01.01   Identify, describe and apply health and safety regulations that apply to specific tasks and jobs. Students must complete a safety credential program, e.g., Occupational Safety and Health Administration 10, CareerSafe and ServSafe.

    1.A.01.02   Identify, describe and apply Environmental Protection Agency (EPA) and other environmental protection regulations that apply to specific tasks and jobs in the specific occupational area.

    1.A.01.03   Identify, describe and apply Right-To-Know (Hazard Communication Policy) and other communicative regulations that apply to specific tasks and jobs in the specific occupational area.

    1.A.01.04   Explain procedures for documenting and reporting hazards to appropriate authorities.

    1.A.01.05   Identify and describe potential consequences for non-compliance with appropriate health and safety regulations.

    1.A.01.06   Identify and list contact information for appropriate health and safety agencies and resources.

> 1. A.01   Performance Examples:
> - List and define OSHA Health and Safety Regulations, EPA and other environmental protection regulations to occupational area.
> - List and define Right-to-Know regulations and reporting of hazards and contact information for appropriate health and safety agencies.
> - List the laws and rules of regulatory agencies governing sanitation and safety.
> - Utilize OSHA as well as health and safety websites for purposes of research.

1.A.02   Demonstrate appropriate health and safety practices based on the specific occupational area.

    1.A.02.01   Identify, describe and demonstrate the effective use of Safety Data Sheets (SDS).

    1.A.02.02   Read and interpret chemical, product and equipment labels to determine appropriate health and safety considerations.

    1.A.02.03   Identify, describe and demonstrate personal, shop and job site safety practices and procedures.

    1.A.02.04   Demonstrate safe dress and use of relevant safety gear, personal protective equipment (PPE) and ergonomics, e.g., wrist rests, adjustable workspaces, equipment, gloves, proper footwear, earplugs, eye protection and breathing apparatus.

    1.A.02.05   Demonstrate appropriate safe body mechanics, including appropriate lifting techniques and ergonomics.

1.A.02.06   Locate emergency equipment, first aid kit, SDS information directories and emergency action/response plan/escape routes in your lab, shop and classroom, including labels and signage that follow OSHA Hazard Communication Program (HAZCOM), eyewash stations, shower facilities, sinks, fire extinguishers, fire blankets, telephone, master power switches and emergency exits.

1.A.02.07   Demonstrate the safe use, storage, and maintenance of every piece of equipment in the lab, shop and classroom, e.g., the OSHA Lockout/Tagout Program (LOTO).

1.A.02.08   Describe safety practices and procedures to be followed when working with and around electricity, e.g., ground fault circuit interrupter (GFCI) and frayed wiring.

1.A.02.09   Handle, store, dispose of and recycle hazardous, flammable and combustible materials, according to EPA, OSHA and product specifications.

1.A.02.10   Demonstrate appropriate workspace cleaning, sanitation, disinfection and sterilization procedures required in specific occupational areas, e.g., Workplace Housekeeping OSHA Regulations.

---

1. A.02   Performance Examples:
- Identify, describe and demonstrate the use of SDS.
- List and demonstrate shop dress code, safety procedures and location of emergency equipment in labor classroom.
- Define and demonstrate safe storage and maintenance of equipment and proper disposal or recycling of hazardous, flammable and combustible materials.
- Identify, describe and demonstrate the Universal Precautions set of guidelines.

1.A.03   Demonstrate appropriate responses to situations that may threaten health and safety.

1.A.03.01   Describe First Aid procedures for potential injuries and other health concerns in the specific occupational area.

1.A.03.02   Describe the importance of emergency preparedness and an emergency action/response plan.

1.A.03.03   Describe procedures used to handle emergency situations, defensive measures and accidents, including identification, reporting, response, evacuation plans and follow-up procedures.

1.A.03.04   Identify, describe and demonstrate safety practices in specific occupational areas used to avoid accidents.

1.A.03.05   Identify and describe fire protection, protection, precautions and response procedures.

1.A.03.06   Discuss the role of the individual and the company/organization in ensuring workplace safety including transportation to and from school, school activities and the workplace.

1.A.03.07   Discuss ways to identify, prevent and report school and workplace violence, discrimination, harassment and bullying.

1.A.03.08   Demonstrate positive and appropriate behavior that contributes to a safe and healthy environment in school and the workplace.

1. A.03 Performance Example:
   - Define first aid procedures and protocols used to handle emergency situations and practices used to avoid accidents.
   - View safety videos and discuss the role of workplace safety.
   - Attend or participate in a human rights alliance organization presentation.
   - Observe and/or demonstrate the appropriate use of a fire extinguisher using the (PASS) technique: Pull, Aim, Squeeze, Sweep.
   - Review and discuss specific policies, procedures and protocols regarding discrimination, harassment and bullying.
   - Discuss and/or role-play proper and respectful behavior that contributes to a positive climate.
   - Discuss and/or demonstrate behavior that contributes to a collaborative/teamwork environment.

Selected Websites

- Bullying Prevention and Intervention Resources : www.doe.mass.edu/bullying
- Centers for Disease Control and Prevention: www.cdc.gov
- Environmental Protection Agency : www.epa.gov
- "Lost Youth – Four Stories of Injured Young Workers"– WorkSafeBC: http://www2.worksafebc.com/Publications/Multimedia/Videos.asp?reportid=34291
- Massachusetts Department of Elementary and Secondary Education. (2011). Career/Vocational Technical Education Safety Guide: www.doe.mass.edu/cte
- Massachusetts Department of Elementary and Secondary Education: www.doe.mass.edu
- Massachusetts Emergency Management Agency: www.mass.gov/eopss/agencies/mema
- Massachusetts General Law: www.malegislature.gov
- Massachusetts Health and Human Services: www.mass.gov/dph
- Massachusetts Right to Know Law Summary: http://www.mass.gov/lwd/docs/dos/mwshp/hib397.pdf
- Safety Data Sheet: www. sdsonline.com
- National Fire Protection Association: www.nfpa.org
- Protection of Student Rights: Massachusetts General Law: https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXII/Chapter76/Section5
- Occupational Safety and Health Administration: www.osha.gov
- Readiness and Emergency Management for Schools: www.rems.ed.gov
- Safe and Healthy Learning Environments: www.doe.mass.edu/ssce/safety.html

Strand 2: Technical Knowledge and Skills

2.A **Carpentry Safety and Health Knowledge and Skills**

2.A.01 Successfully complete safety training on all related equipment and materials.

 2.A.01.01 Demonstrate use, storage, and maintenance of all related hand and power tools, according to current industry and OSHA standards.

 2.A.01.02 Identify and describe scaffold safety practices and procedures.

 2.A.01.03 Use and maintain ladders, scaffolding, and fall protection according to current industry and OSHA standards.

 2.A.01.04 Identify the safety hazards associated with the use of ladder brackets, and suggest alternatives.

 2.A.01.05 Identify and apply OSHA and other health and safety regulations that apply to specific tasks and jobs in carpentry.

> 2.A.01 Performance Example:
> - Students will successfully complete OSHA 10-hour certification training.

2.B **Technical Plans and Prints**

2.B.01 Describe the basic layout of a set of construction documents.

 2.B.01.01 Identify and describe a site plan from a basic set of construction plans.

 2.B.01.02 Identify and describe a floor plan from a basic set of construction plans.

 2.B.01.03 Identify and describe a framing plan from a basic set of construction plans.

 2.B.01.04 Identify and describe elevations from a basic set of construction plans.

 2.B.01.05 Identify and describe cross sections from a basic set of construction plans.

 2.B.01.06 Identify and describe details from a basic set of construction plans.

> 2.B.01 Performance Examples:
> - Describe how orthographic projections apply to elevation views.

2.B.02 Define basic abbreviations, line types, symbols and notes.

 2.B.02.01 Identify and define abbreviations found on construction plans.

 2.B.02.02 Identify and define object lines and dimension lines.

 2.B.02.03 Identify and define hidden lines and centerlines.

 2.B.02.04 Identify and define break line, extension line and leader line.

 2.B.02.05 Identify and define window, door and stair floor plan symbols.

 2.B.02.06 Identify and define basic electric floor plan symbols.

 2.B.02.07 Identify and define basic plumbing floor plan symbols.

 2.B.02.08 Define and describe the purpose of the north symbol.

> 2.B.02 Performance Example:
> - Describe the alphabet of lines.

2.B.03 Determine true measurements from prints.

 2.B.03.01 Calculate missing dimensions on a plan without the use of a scale.

 2.B.03.02 Calculate finish floor to finish floor dimensions from cross section or elevations.

> 2.B.03 Performance Example:
> - Determine overall length from outside corner of the building to centerline of front door using carpentry related math.

2.B.04   Describe detail views and schedules.
       2.B.04.01   Locate a detail view on a drawing.
       2.B.04.02   Describe the detail of the view.
       2.B.04.03   Locate the door schedule on a drawing.
       2.B.04.04   Identify the door sizes and types.
       2.B.04.05   Locate the window schedule on a drawing.
       2.B.04.06   Identify the window sizes and types.
       2.B.04.07   Locate a finish schedule on a drawing.
       2.B.04.08   Identify the room finishes on the schedule.

2.B.04	Performance Example:
	▪ Generate a door and window stock list.

2.B.05   Calculate material take off.
       2.B.05.01   Develop a stock list.
       2.B.05.02   Develop a true cost for the items on the stock list.
       2.B.05.03   Determine the delivery method and time frame for the stock list.
       2.B.05.04   Identify the supplier and contact information.

2.B.05	Performance Example:
	▪ Develop a material quantity takeoff for the project and/or job.

2.B.06   Apply state and local building codes.
       2.B.06.01   State the purpose of zoning regulations.
       2.B.06.02   Describe the relationship of the Massachusetts Building Code to the IBC.
       2.B.06.03   Compare the differences between residential and commercial codes.
       2.B.06.04   Explain how a building permit incorporates local building codes.
       2.B.06.05   Outline the building inspection process.
       2.B.06.06   Explain the purpose and procedure for obtaining a Certificate of Occupancy.

2.B.06	Performance Example:
	▪ Identify maximum guardrail balusters spacing for residential construction.

2.B*	Advanced Performance Example:
	▪ Develop a complete cost estimate for a residential building project.

2.C   Specifications
2.C.01   Identify, explain, and use specifications for a construction project.
       2.C.01.01   Describe the importance of project specifications and their use.
       2.C.01.02   Define the divisions that are related to the carpentry field.

2.C.01	Performance Example:
	▪ Describe what Division 2 addresses in a set of specifications.

2.C*	Advanced Performance Example:
	▪ Develop a complete set of the specifications for a residential building project.

2.D   Demonstrate the Fundamentals of Carpentry

2.D.01   Recognize and describe the use of building materials.
   2.D.01.01   Identify and describe the types of building materials.
   2.D.01.02   Describe the use of different types of building materials.

2.D.01	Performance Examples:
	▪ Determine the actual size of a 2 x 4.

2.D.02   Recognize and describe the use of engineered materials.
   2.D.02.01   Identify engineered building materials.
   2.D.02.02   Define the use of engineered materials.

2.D.02	Performance Example:
	▪ Describe a bottom chord as it pertains to a roof truss.

2.D.03   Describe pre-fabricated panelized systems.
   2.D.03.01   Identify, define, and describe pre-fabricated construction systems.
   2.D.03.02   Describe construction techniques for pre-fabricated building materials.
   2.D.03.03   Describe the installation procedures for pre-fabricated building materials.

2.D.03	Performance Example:
	▪ Define modular as it pertains to panelized construction.

2.D.04   Apply carpentry math principles.
   2.D.04.01   Read a tape measure to 1/16th of an inch.
   2.D.04.02   Add/subtract fractions.
   2.D.04.03   Use a calculator to multiply, divide and perform basic trigonometric functions.
   2.D.04.04   Define the importance of a 3-4-5 triangle to carpentry calculations.
   2.D.04.05   Convert cubic feet to cubic yards.
   2.D.04.06   Convert fractions to decimals.
   2.D.04.07   Calculate the area of circles, triangles, squares, rectangles and trapezoids.

2.D.04	Performance Example:
	▪ Determine the line length of a common rafter using the Pythagorean Theorem.

2.D.05   Describe layout procedures.
   2.D.05.01   Describe and demonstrate the installation of batter board.
   2.D.05.02   Layout sills.
   2.D.05.03   Check for square.
   2.D.05.04   Layout floor/ceiling joists.
   2.D.05.05   Layout exterior wall plates and shoes residential.
   2.D.05.06   Layout exterior wall plates and shoes commercial.
   2.D.05.07   Layout roof rafter.
   2.D.05.08   Layout stair stringer.
   2.D.05.09   Layout a story pole.

2.D.05	Performance Example:
	▪ List three ways of laying out a 90 degree angle.

2.D.06   Describe lumber storage techniques.
      2.D.06.01   Describe the best practices for storing materials.

> 2.D.06   Performance Example:
> - Demonstrate and understanding of proper lumber storage.

2.D.07   Check installed items for square, plumb and level.
      2.D.07.01   Check walls for plumb using a level and a plumb bob.
      2.D.07.02   Check floors and walls for square.
      2.D.07.03   Demonstrate and describe how to check floors and ceilings of varying distances for level.

> 2.D.07   Performance Example:
> - Define plumb.

> 2.D*   Advanced Performance Example:
> - Compare and contrast light gauge construction to wood framed construction.

2.E   Hand Tools
2.E.01   Describe and demonstrate the use and care of hand tools.
      2.E.01.01   Demonstrate use and maintenance of layout, marking, and measuring tools.
      2.E.01.02   Demonstrate use and maintenance of fastening, clamping, and dismantling tools.
      2.E.01.03   Demonstrate use and maintenance of sawing tools.
      2.E.01.04   Demonstrate use and maintenance of drilling and boring tools.
      2.E.01.05   Demonstrate use and maintenance of planing, smoothing, and shaping tools.

> 2.E.01   Performance Example:
> - Sharpen a chisel.

> 2.E*   Advanced Performance Example:
> - Disassemble, sharpen, and reassemble a block plane.

2.F   Power Tools
2.F.01   Demonstrate the use, storage, and maintenance of sawing tools.
      2.F.01.01   Demonstrate the use and maintenance of a portable circular saw.
      2.F.01.02   Demonstrate the use and maintenance of a portable power miter box.
      2.F.01.03   Demonstrate the use and maintenance of a portable table saw.
      2.F.01.04   Demonstrate the use and maintenance of reciprocating saws.

> 2.F.01   Performance Examples:
> - Cross a 2 x 4 with a circular saw.

2.F.02   Use, store, and maintain drilling and boring tools.
      2.F.02.01   Demonstrate the use and maintenance of portable drills.

> 2.F.02   Performance Example:
> - List 5 common types of drill bits used in construction.

2.F.03   Use, store, and maintain routers and sanders.
        2.F.03.01   Demonstrate the use and maintenance of a portable router.
        2.F.03.02   Demonstrate the use and maintenance of portable sanders.

2.F.03	Performance Example: ▪ Change a router bit in a portable router.

2.F.04   Use, store, and maintain fastening tools.
        2.F.04.01   Demonstrate the use and maintenance of a screw gun.
        2.F.04.02   Demonstrate the use and maintenance of pneumatic equipment.
        2.F.04.03   Demonstrate the use and maintenance of power fastening tools and
                        systems.

2.F.04	Performance Example: ▪ Clean and oil a nail gun according to manufacturer's specification and current industry and

2.F*	Advanced Performance Example: ▪ Demonstrate the safe use, storage, and maintenance of concrete sawing tools. ▪ Demonstrate the safe use, storage, and maintenance of ceramic tile cutting tools.

2.G   **Ladders and Scaffolds**
2.G.01   Describe and demonstrate the use and maintenance of ladders and brackets.
        2.G.01.01   Identify and describe ladder safety practices and procedures.
        2.G.01.02   Demonstrate the use and maintenance of extension ladders.
        2.G.01.03   Demonstrate the use and maintenance of step ladders.
        2.G.01.04   Identify the safety hazards associated with the use of ladder brackets, and
                        suggest alternatives.
        2.G.01.05   Demonstrate the use and maintenance of wall brackets.
        2.G.01.06   Demonstrate the use and maintenance of roof brackets.

2.G.01	Performance Examples: ▪ Student sets up an extension ladder at the proper angle, etc.

2.G.02   Use and maintain wood, metal, and pump jack scaffolds.
        2.G.02.01   Identify and describe scaffold safety practices and procedures.
        2.G.02.02   Erect tubular pipe staging.
        2.G.02.03   Erect light duty rolling scaffolds.
        2.G.02.04   Erect pump jack staging.
        2.G.02.05   Demonstrate the use and maintenance of fall arrest systems.

2.G.02	Performance Example: ▪ Properly set up baker staging according to current industry and OSHA standards.

2.G*	Advanced Performance Example: ▪ Demonstrate the use and maintenance of construction hoists. ▪ Demonstrate the use and maintenance of Tube and Clamp scaffolds.

2.H   **Framing**

2.H.01   Describe and apply the factors in the construction of floor framing systems.
- 2.H.01.01   Explain the importance of layout at 16 inches on center.
- 2.H.01.02   Identify floor framing members.
- 2.H.01.03   Explain why and demonstrate how to crown joists.
- 2.H.01.04   Explain the purpose of sill seal.
- 2.H.01.05   Demonstrate accurate layout to receive floor joists.
- 2.H.01.06   Fabricate floor frame and stairwell openings.
- 2.H.01.07   Describe the purpose for bridging and apply bridging.
- 2.H.01.08   Identify subfloor material thickness.
- 2.H.01.09   List the purpose of construction adhesive.
- 2.H.01.10   Explain and apply nail spacing and nail sizing.
- 2.H.01.11   Apply subfloor material.

> 2.H.01   Performance Examples:
> - Create a materials list and calculate total cost for 8x12 foot floor from specifications.
> - Layout and frame an 8 x 12 deck using 2 x 8s.

2.H.02   Demonstrate practices related to framing exterior walls.
- 2.H.02.01   Layout and construct bearing walls.
- 2.H.02.02   Layout and construct bearing wall openings.
- 2.H.02.03   Frame a gable end.
- 2.H.02.04   Sheath a wall.
- 2.H.02.05   Erect and brace wall systems.
- 2.H.02.06   Identify opening sizes and components for walls.
- 2.H.02.07   Identify sizes for door headers.
- 2.H.02.08   Identify wall framing members.

> 2.H.02   Performance Example:
> - Students will discuss and identify characteristics of bearing walls.

2.H.03   Demonstrate practices related to framing interior walls.
- 2.H.03.01   Layout and construct non-bearing walls.
- 2.H.03.02   Layout and construct non-bearing wall openings.

> 2.H.03   Performance Example:
> - Frame an interior rough opening.

2.H.04   Demonstrate practices related to framing ceilings and roofs.
- 2.H.04.01   Layout a ceiling frame.
- 2.H.04.02   Layout a roof frame.
- 2.H.04.03   Cut and install ceiling frame systems.
- 2.H.04.04   Cut and install common rafter systems.
- 2.H.04.05   Sheath a gable roof.
- 2.H.04.06   Layout and install strapping.
- 2.H.04.07   Identify hip and valley roof systems.
- 2.H.04.08   Identify roof truss systems.

> 2.H.04   Performance Example:
> - Identify common roof types.

> 2.H*   Advanced Performance Example:
> - Demonstrate practices related to composite wall systems and their total R-value.
> - Demonstrate practices related to sound deadening materials.
> - Demonstrate practices related to Flitch beams.

2.I   Finish Carpentry
   2.I.01   Demonstrate practices related to exterior finish.
           2.I.01.01   Install room trim.
           2.I.01.02   Install roofing materials.
           2.I.01.03   Install windows and doors.
           2.I.01.04   Apply siding and finish trim.
           2.I.01.05   Identify proper installation of platforms, guardrails and handrails.
           2.I.01.06   Apply caulking and weatherization materials.

2.I.01	Performance Examples: ▪ Install a window.

   2.I.02   Demonstrate practices related to interior finish.
           2.I.02.01   Identify insulation material systems.
           2.I.02.02   Install wall board products.
           2.I.02.03   Install door and window trim.
           2.I.02.04   Install interior doors.
           2.I.02.05   Install underlayment.
           2.I.02.06   Install baseboard trim.
           2.I.02.07   Install closet interiors.
           2.I.02.08   Install stair trim.
           2.I.02.09   Identify kitchen and bath cabinets, counter tops, and installation procedures.

2.I.02	Performance Example: ▪ Cope an inside corner.
2.I*	Advanced Performance Example: ▪ Identify residential and commercial types of roofing systems. ▪ Identify kitchen and bath cabinets, counter tops and installation procedures.

2.J   Commercial Carpentry
   2.J.01   Demonstrate commercial carpentry tasks.
           2.J.01.01   Frame metal stud partitions.
           2.J.01.02   Install suspended ceiling systems.
           2.J.01.03   Identify basic concrete form work principles and applications.

2.J.01	Performance Example: ▪ Layout and erect a metal stud partition at 16" on center using appropriate fasteners.

2.J*	Advanced Performance Example: ▪ Describe commercial scaffolding applications and their use.

2.K   Energy Efficient Systems
   2.K.01   Identify energy efficient materials and their use.
           2.K.01.01   Describe an energy efficient building envelope.

2.K.01	Performance Example: ▪ Describe the necessity of the air exchange system.

2.K*	Advanced Performance Example: ▪ Design an energy efficient exterior wall that complies with the Massachusetts energy code.

Strand 3: Embedded Academics

Strand 3: Embedded Academics, a critical piece of a Vocational Technical Education Framework, are presented as Crosswalks between the Massachusetts Vocational Technical Education Frameworks and the Massachusetts Curriculum Frameworks. These Crosswalks are located in the Appendix of this Framework.

Academic Crosswalks

Strand 4: Employability and Career Readiness

4.A   Career Exploration and Navigation

4.A.01   Develop a career plan and portfolio.

    4.A.01.01   Develop and revise career plan annually based on workplace awareness and skill attainment.

    4.A.01.02   Assess personal strengths and interest areas to determine potential careers, career pathways and career ladders.

    4.A.01.03   Examine potential career field(s)/discipline(s) and identify criteria to select, secure and keep employment in chosen field(s).

    4.A.01.04   Research and evaluate a variety of careers utilizing multiple sources of information and resources to determine potential career(s) and alternatives.

    4.A.01.05   Identify training and education requirements that lead to employment in chosen field(s) and demonstrate skills related to evaluating employment opportunities.

    4.A.01.06   Explore and evaluate postsecondary educational opportunities including degrees and certifications available, traditional and nontraditional postsecondary pathways, technical school and apprenticeships, cost of education, financing methods including scholarships and loans and the cost of loan repayment.

    4.A.01.07   Create a portfolio showcasing academic and career growth including a career plan, safety credential, resume and a competency profile demonstrating the acquisition of the knowledge and skills associated with at least two years of full-time study in the Chapter 74 program.

4.A.02   Demonstrate job search skills.

    4.A.02.01   Conduct a job search and complete written and electronic job applications, resumes, cover letters and related correspondence for a chosen career path.

    4.A.02.02   Explore and evaluate postsecondary job opportunities and career pathways specific to career technical areas.

    4.A.02.03   Identify role and use of social media and networking for staying current with career and employment trends as well as networking, job seeking and career development opportunities.

    4.A.02.04   Demonstrate ability to use social media and networking to develop useful occupational contacts, job seeking and career development opportunities.

4.A.03   Demonstrate all phases of the job interview process.

    4.A.03.01   Gather relevant information about potential employer(s) from multiple print and digital sources, assessing the credibility and accuracy of each source.

    4.A.03.02   Identify employment eligibility criteria, such as drug/alcohol free status, clean driving record, etc.

4.A.03.03	Practice effective interviewing skills: appearance, inquiry and dialogue with interviewer, positive attitude and evidence of work ethic and skills.
4.A.03.04	Explore and evaluate employment benefit packages including wages, vacation, health care, union dues, cafeteria plans, tuition reimbursement, retirement and 401K.

4. A   Performance Examples:
- Conduct research to analyze and present on specific careers within a cluster.
- Conduct web-based job search using sites such as Monster.com, CareerBuilder.com, Indeed.com, Snagajob.com, Simplyhired.com and others.
- Create profile on social media/networking site such as LinkedIn and/or LinkedIn University for postsecondary research and employment opportunities.
- Complete online job application.
- Conduct and videotape practice interviews for instructor and student analysis.
- Provide students with sample employment and benefit packages for evaluation.

4.B   Communication in the Workplace

4.B.01   Demonstrate appropriate oral and written communication skills in the workplace.

4.B.01.01	Communicate effectively using the language and vocabulary appropriate to a variety of audiences within the workplace including coworkers, supervisors and customers.
4.B.01.02	Read technical and work-related documents and demonstrate understanding in oral discussion and written exercise.
4.B.01.03	Demonstrate professional writing skills in work-related materials and communications (e.g., letters, memoranda, instructions and directions, reports, summaries, notes and/or outlines).
4.B.01.04	Use a variety of writing/publishing/presentation applications to create and present information in the workplace.
4.B.01.05	Identify, locate, evaluate and use print and electronic resources to resolve issues or problems in the workplace.
4.B.01.06	Use a variety of financial and data analysis tools to analyze and interpret information in the workplace.
4.B.01.07	Orally present technical and work-related information to a variety of audiences.
4.B.01.08	Identify and demonstrate professional non-verbal communication.

4.B.02   Demonstrate active listening skills.

4.B.02.01	Listen attentively and respectfully to others.
4.B.02.02	Focus attentively, make eye contact or other affirming gestures, confirm understanding and follow directions.
4.B.02.03	Show initiative in improving communication skills by asking follow-up questions of speaker in order to confirm understanding.

4.C   Work Ethic and Professionalism

4.C.01   Demonstrate attendance and punctuality.

4.C.01.01   Identify and practice professional time-management and attendance behaviors including punctuality, reliability, planning and flexibility.

4.C.02   Demonstrate proper workplace appearance.

4.C.02.01   Identify and practice professional appearance specific to the workplace.

4.C.02.02   Identify and practice personal hygiene appropriate for duties specific to the workplace.

4.C.02.03   Identify and wear required safety gear specific to the workplace.

4.C.03   Accepts direction and constructive criticism.

4.C.03.01   Demonstrate ability (both verbally and non-verbally) to accept direction and constructive criticism and to implement solutions to change behaviors.

4.C.03.02   Ask appropriate questions to clarify understanding of feedback.

4.C.03.03   Analyze own learning style and seek instructions in a preferred format that works best for their understanding (such as oral, written or visual instruction).

4.C.04   Demonstrate motivation and initiative.

4.C.04.01   Evaluate assigned tasks for time to completion and prioritization.

4.C.04.02   Demonstrate motivation through enthusiasm, engagement, accurate completion of tasks and activities.

4.C.04.03   Demonstrate initiative by requesting new assignments and challenges.

4.C.04.04   Explain proposed solutions to challenges observed in the workplace.

4.C.04.05   Demonstrate the ability to evaluate multiple solutions to problems and challenges using critical reasoning and workplace/industry knowledge and select the best solution to the problem.

4.C.04.06   Implement solution(s) to challenges and/or problem(s) observed in the workplace.

4.C.04.07   See projects through completion and check work for quality and accuracy.

4.C.05   Demonstrate awareness of workplace culture and policy.
      4.C.05.01   Display ethical behavior in use of time, resources, computers and information.
      4.C.05.02   Identify the mission of the organization and/or department.
      4.C.05.03   Explain the benefits of a diverse workplace.
      4.C.05.04   Demonstrate a respect for diversity and its benefit to the workplace.

4.C.06   Interact appropriately with coworkers.
      4.C.06.01   Work productively with individuals and in teams.
      4.C.06.02   Develop positive mentoring and collaborative relationships within work environment.
      4.C.06.03   Show respect and collegiality, both formally and informally.
      4.C.06.04   Explain and follow workplace policy on the use of cell phones and other forms of social media.
      4.C.06.05   Maintain focus on tasks and avoid negative topics or excessive personal conversations in the workplace.
      4.C.06.06   Negotiate solutions to interpersonal and workplace conflicts.

---

4. C   Performance Examples:
- Complete a learning style analysis tool.
- Develop a rubric to assess work ethic and professionalism as detailed in the standards above.

Student Organizations
Business Professionals of America   www.bpa.org

Selected Websites
- 5 Ways to Ace a Job Interview: http://kidshealth.org/teen/school_jobs/jobs/tips_interview.html
- America's Career Resource Network: http://acrn.ovae.org/teachers/careerexpclassrm.htm
- Career Cruiser – Florida Department of Education: http://www.fldoe.org/workforce/pdf/cruiser.pdf
- Career Development Guide and Glossary: http://www.doe.mass.edu/connect/cde.html
- Career One Stop: http://www.careeronestop.org/
- Career Plan: http://www.doe.mass.edu/cd/plan/intro.html
- Career Plan Model: http://www.doe.mass.edu/ccr/epp/samples/cpmodel_11x17.pdf
- Checklist: http://www.doe.mass.edu/cd/plan/checklist.pdf
- Career Tech: http://www.okcareertech.org/cac/Pages/resources_products/ethics_web_sites.htm
- Ethics Resource Center: http://www.ethics.org/
- Interaction in the Workplace: http://hrweb.berkeley.edu/guides/managing-hr/interaction/communication

- Individual Learning Plans: How-to Guide: "Promoting Quality Individualized Learning Plans: A How to Guide on the High School Years" http://www.ncwd-youth.info/ilp/how-to-guide
- ILP Fact Sheet: http://www.ncwd-youth.info/fact-sheet/individualized-learning-plan
- ILP Policy Brief: http://www.ncwd-youth.info/ilp/produce-college-and-career-ready-high-school-graduates
- ILP Resources Home Page: http://www.ncwd-youth.info/ilp
- Interview Skills Lesson Plans: http://www.amphi.com/media/1220281/interview%20skills%20lesson%20plan.doc
- Labor and Workforce Development: http://www.mass.gov/lwd/employment-services/preparing-for-your-job-search/
- Maine Community College System – Center for Career Development: http://www.ccd.me.edu/careerprep/CareerPrepCurriculum_LP-6.pdf
- Massachusetts Work-Based Learning: http://skillspages.com/masswbl
- North Dakota Association of Agriculture Educators: http://www.ndaae.org/attachments/File/Preparing_students_for_a_Job_Interview.pptx
- NY CTE Learning Standards—Career Development and Occupational Studies (CDOS) Resource Guide with Core Curriculum: http://www.p12.nysed.gov/cte/cdlearn/cdosresourceguide.html
- Occupational Outlook Handbook: http://www.bls.gov/ooh/
- Purdue OWL Job Search Resources (for writing resumes, applications, and letters): https://owl.english.purdue.edu/engagement/34/
- Soft Skills to Pay the Bills — Mastering Soft Skills for Workplace Success: http://www.dol.gov/odep/topics/youth/softskills/
- US Department of Labor: http://www.dol.gov/dol/audience/aud-unemployed.htm
- Workplace Communication: http://www.regionalskillstraining.com/sites/default/files/content/WC%20Book%201.pdf
- Your Plan For the Future: http://www.yourplanforthefuture.org

Strand 5: Management and Entrepreneurship Knowledge and Skills

5.A   Starting a Business

5.A.01   Demonstrate an understanding of the practices required to start a business.

 5.A.01.01 Define entrepreneurship and be able to recognize and describe the characteristics of an entrepreneur.

 5.A.01.02 Compare and contrast types of business ownership (i.e., sole proprietorships, franchises, partnerships, corporations).

 5.A.01.03 Identify and explain the purpose and contents of a business plan.

 5.A.01.04 Demonstrate an understanding of the principles and concepts of a business's supply chain (i.e., suppliers, producers and consumers.

> 5. A Performance Examples:
> - Develop a presentation pertaining to an entrepreneur and their business.
> - Communicate with a business owner and discuss the pros and cons of starting and owning a business. Summarize the main points of the discussion.
> - Choose a product or service and describe the process leading to distribution.
> - Write a business plan for a business in your community.

5.B   Managing a Business

5.B.01   Demonstrate an understanding of managing a business.

 5.B.01.01 Formulate short- and long-term business goals.

 5.B.01.02 Demonstrate effective verbal, written and visual communication skills.

 5.B.01.03 Utilize a decision-making process to make effective business decisions.

 5.B.01.04 Identify a business's chain of command and define its organizational structure.

 5.B.01.05 Identify and apply effective customer service skills and practices.

 5.B.01.06 Identify, interpret and develop written operating procedures and policies.

 5.B.01.07 Track inventory, productivity and labor cost.

 5.B.01.08 Demonstrate business meeting skills.

 5.B.01.09 Identify professional organizations and explore their benefits.

> 5. B Performance Examples:
> - Working as a team, role-play situations that an entrepreneur might face in dealing with customers or employees.
> - Contact a relevant professional organization and request information about its benefits, membership requirements and costs.
> - Plan and conduct a business meeting.
> - Identify companies that are known for customer service and list the practices that help differentiate themselves from all others in their industry.

5.C   Marketing a Business

5.C.01   Demonstrate an understanding of marketing and promoting a business.

 5.C.01.01 Explain the role of business in the economy.

 5.C.01.02 Describe the relationship between business and community.

 5.C.01.03 Describe methods of market research and identifying target markets.

5.C.01.04	Describe and apply the concepts of a marketing mix (the 4Ps of marketing: product, price, place and promotion).
5.C.01.05	Compare and contrast the promotional tools and techniques used to sell products, services, images and ideas.
5.C.01.06	Describe the impact of supply and demand on a product or business.
5.C.01.07	Identify direct and indirect competition on a business.
5.C.01.08	Identify and use sales techniques to meet client needs and wants.
5.C.01.09	Discuss strategies to acquire and retain a customer base.

> 5. C Performance Examples:
> - Research reliable sources to identify marketing and industry data related to a business.
> - Conduct market research by developing a survey and presenting the results.
> - Create a promotional campaign using a variety of media.
> - Write a marketing plan for a product.

5.D Financial Concepts and Applications in Business

5.D.01 Demonstrate an understanding of financial concepts and applications.

5.D.01.01	Identify essential financial reports and understand their purpose (i.e., budget, balance sheet and income statement).
5.D.01.02	Describe payroll practices (i.e., deductions – federal, FICA and state taxes and insurances).
5.D.01.03	Identify the importance of maintaining accurate records.
5.D.01.04	Apply practices related to pricing, purchasing and billing.
5.D.01.05	Maintain and reconcile a checking account.
5.D.01.06	Identify the options for funding a business.

> 5. D Performance Examples:
> - Given an employee time card and rate of pay, calculate gross pay, taxes, deductions and net pay.
> - Develop a budget for a simulated business or project.
> - Analyze and discuss financial documents from a company.
> - Research various methods of funding a business.

5.E Legal/Ethical/Social Responsibilities

5.E.01 Demonstrate an understanding of legal, ethical and social responsibility for businesses.

5.E.01.01	Identify state and federal laws and regulations related to managing a business.
5.E.01.02	Describe and identify ethical business practices.
5.E.01.03	Demonstrate an understanding of business contracts.
5.E.01.04	Explain the role of diversity in the workplace.
5.E.01.05	Explain the role of labor organizations.
5.E.01.06	Identify practices that support clean energy technologies and encourage environmental sustainability.
5.E.01.07	Demonstrate an understanding of how technology advancements impact business practices.

5.E   Performance Example:
- Read and interpret a contract.
- Complete an application for a license, permit or certificate.
- Research federal, state and local regulations and laws required for a business.
- Participate in and summarize a discussion with a member of a labor or civil rights organization.

Selected Websites

- CVTE Strand 1, 4, and 5 Resources: https://sites.google.com/a/mccanntech.org/cvte-strands-1-4-and-5-resources/
- Entrepreneur: http://www.entrepreneur.com
- Inc. Magazine: http://www.inc.com/
- Junior Achievement "Be Entrepreneurial Program": https://www.juniorachievement.org/web/ja-usa/home
- Kahn Academy Interviews with Entrepreneurs: https://www.khanacademy.org/economics-finance-domain/entrepreneurship2/interviews-entrepreneurs
- Kauffman Founders School: http://www.entrepreneurship.org/en/founders-school.aspx
- National Federation of Independent Business: www.nfib.com
- National Foundation for Teaching Entrepreneurship (NFTE): www.nfte.com
- SBA Loans: http://www.sba.gov
- SkillsUSA Professional Development Program Competency List: http://www.skillsusa.org/downloads/PDF/lessons/professional/PDPPreview.pdf
- Small Business Administration: www.sba.gov

Glossary

Term	Definition
Balance sheet	A statement of the assets, liabilities and capital of a business at a particular point in time.
Budget	An estimate of income and expenditure for a set period of time.
Business Ownership	Types of business ownership refer to the legal structure of an organization. Legal structures include: Sole Proprietorship, Partnerships, Corporations and Limited Liability Companies.
Business Plan	A written document that describes in detail your business goals and how you are going to achieve them from a marketing, operational and financial point of view.

Term	Definition
Chain of Command and Organizational Structure	Refers to the management structure of an organization. It identifies lines of authority, lines of communication, and reporting relationships. Organizational structure determines how the roles, power and responsibilities are assigned and coordinated and how information flows between the different levels of management. (A visual representation of this structure is called an org chart).
FICA	Federal Insurance Contributions Act requires taxes deducted from pay for supporting Social Security.
Income Statement	A financial statement providing operating results for a specific time period showing a business's revenues, expenses and profit or loss.
Market Research	• Primary: Surveys, Focus Groups, Observation • Secondary: Websites, Internet
Marketing Mix	A set of controlled variables that formulate the strategic position of a product or service in the marketplace. These variables are known as the 4 P's of marketing and include product, place, price and promotion.
Methods to Track Inventory, Productivity and Labor Cost	Refers to the processes a business uses to account for: 1) the inflows and outflows of inventory and materials related to inventory; 2) the efficiency of operations and 3) the cost of labor including salary and benefits.
Promotional Tools and Techniques	The six elements of a promotional mix are: advertising, visual merchandising, public relations, publicity, personal selling and sales promotion.
Supply Chain	The supply chain, or channel of distribution, describes how the product is handled and/or distributed from suppliers with materials, to the manufacturer, wholesaler or retailer and finally to the consumer.
Target Market	Those who are most likely to buy your product or service.

Strand 6: Technology Literacy Knowledge and Skills

6.A   Technology Literacy Knowledge and Skills (Grades 9 through 12)

6.A.01   Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.

    6.A.01.01   Use online help and other support to learn about features of hardware and software, as well as to assess and resolve problems.

    6.A.01.02   Install and uninstall software; compress and expand files (if the district allows it).

    6.A.01.03   Explain effective backup and recovery strategies.

    6.A.01.04   Apply advanced formatting and page layout features when appropriate (e.g., columns, templates, and styles) to improve the appearance of documents and materials.

    6.A.01.05   Use editing features appropriately (e.g., track changes, insert comments).

    6.A.01.06   Identify the use of word processing and desktop publishing skills in various careers.

    6.A.01.07   Identify the use of database skills in various careers.

    6.A.01.08   Define and use functions of a spreadsheet application (e.g., sort, filter, find).

    6.A.01.09   Explain how various formatting options are used to convey information in charts or graphs.

    6.A.01.10   Identify the use of spreadsheet skills in various careers.

    6.A.01.11   Use search engines and online directories.

    6.A.01.12   Explain the differences among various search engines and how they rank results.

    6.A.01.13   Explain and demonstrate effective search strategies for locating and retrieving electronic information (e.g., using syntax and Boolean logic operators).

    6.A.01.14   Describe good practices for password protection and authentication.

6.A.02   Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.

    6.A.02.01   Demonstrate compliance with the school's Acceptable Use Policy.

    6.A.02.02   Explain issues related to the responsible use of technology (e.g., privacy, security).

    6.A.02.03   Explain laws restricting the use of copyrighted materials.

    6.A.02.04   Identify examples of plagiarism, and discuss the possible consequences of plagiarizing the work of others.

6.A.03   Design and implement a personal learning plan that includes the use of technology to support lifelong learning goals.

    6.A.03.01   Evaluate the authenticity, accuracy, appropriateness, and bias of electronic resources, including Web sites.

    6.A.03.02   Analyze the values and points of view that are presented in media messages.

    6.A.03.03   Describe devices, applications, and operating system features that offer accessibility for people with disabilities.

6.A.03.04	Evaluate school and work environments in terms of ergonomic practices.
6.A.03.05	Describe and use safe and appropriate practices when participating in online communities (e.g., discussion groups, blogs, social networking sites).
6.A.03.06	Explain and use practices to protect one's personal safety online (e.g., not sharing personal information with strangers, being alert for online predators, reporting suspicious activities).
6.A.03.07	Explain ways individuals can protect their technology systems and information from unethical users.

6.A.04   Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.

6.A.04.01	Devise and demonstrate strategies for efficiently collecting and organizing information from electronic sources.
6.A.04.02	Compare, evaluate, and select appropriate electronic resources to locate specific information.
6.A.04.03	Select the most appropriate search engines and directories for specific research tasks.
6.A.04.04	Use a variety of media to present information for specific purposes (e.g., reports, research papers, presentations, newsletters, Web sites, podcasts, blogs), citing sources.
6.A.04.05	Demonstrate how the use of various techniques and effects (e.g., editing, music, color, rhetorical devices) can be used to convey meaning in media.
6.A.04.06	Use online communication tools to collaborate with peers, community members, and field experts as appropriate (e.g., bulletin boards, discussion forums, listservs, Web conferencing).
6.A.04.07	Plan and implement a collaborative project with students in other classrooms and schools using telecommunications tools (e.g., e-mail, discussion forums, groupware, interactive Web sites, video conferencing).

Appendices

The framework teams created an "Appendix" listing potential industry recognized credentials attainable by secondary students; lists of professional, student, and relevant government organizations; and useful resources and websites. *It is important to note that although most Framework Teams provided information for the "Appendix", not all teams did. Therefore, sub-headings within the "Appendix" without information have been deleted.*

Disclaimer: Reference in the Appendices Section to any specific commercial products, processes, or services, or the use of any trade, firm or corporation name is for the information and convenience of the public, and does not constitute endorsement or recommendation by the Massachusetts Department of Elementary and Secondary Education.

Embedded Academic Crosswalks

Embedded English Language Arts and Literacy

CVTE Learning Standard Number	Strand Coding Designation Grades ELAs Learning Standard Number	Text of English Language Arts Learning Standard
2.B.01 - 2.B.06, 2.C.01, 2.D.01- 2.D.04	RST Grades 9-10 #4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a technical context relevant to grades 9-10 texts and topics.
Performance Example: • Students will identify and define various symbols, key terms, and abbreviations on a variety of technical plans and prints.		
2.B.05, 2.B.06, 2.C.01 *(incl. Advanced Standard)*	WHST Grades 9-10 #2(a, d)	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
Performance Example: • Students will accurately calculate a material take-off, including the following: stock list, cost, delivery method, time frame, and vendor.		
2.B.06	RST Grades 9-10 #5	Analyze the structure of relationships among concepts in a text, including relationships among key terms.
Performance Example: • Students will demonstrate an understanding of the structure of relationships in building codes, by discussing the differences between residential and commercial building codes. Students will also compare/contrast how the Massachusetts building code relates to the IBC.		
2.B.04, 2.C.01, 2.D.05, 2.D.06, 2.G.01, 2.G.02, 2.H.01, 2.K.01	SL Grades 9-10 #6	Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
Performance Example: • Students will effectively translate technical information, demonstrating command of formal English, by describing the following: importance of project specifications, detail views and schedules, layout procedures, and scaffold safety procedures.		
2.K.01 Advanced Standard	RST Grades 9-10 #7	Translate quantitative or technical information expressed in words in a text into visual form and translate information expressed visually or mathematically into words.
Performance Example: • Students will translate technical information in plans and prints into a visual display (e.g. energy efficient exterior wall that complies with the Massachusetts energy code).		

2.B.06 Advanced Standard	WHST Grades 11-12 #1 (a-e)	Write arguments focused on discipline specific content.
Performance Example: • Students will develop a proposal for a residential building project, based upon customer's expressed ideas, needs, and budget. The completed proposal will include justification for suggested materials not specifically requested by the customer.		
2.H.01	W Pre-9th #2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
Performance Example: • Students will discuss (either written or orally) the purpose of a sill seal.		

Embedded Mathematics

CVTE Learning Standard Number	Math Content Conceptual Category and Domain Code Learning Standard Number	Text of Mathematics Learning Standard
2.B.01	G-SRT8	Use Trigonometric ratios and Pythagorean Theorem to solve right triangles in applied problems.
Performance Example: • Given the distance between two walls and the diagonal distance from floor to opposite wall top, students will determine the height of the walls.		
2.B.02	G-MG3 MA.4	Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.
Performance Example: • Students will examine three dimensional objects and determine surface area, volume, and what lines might be hidden on a set of building plans.		
2.B.03	G-GMD4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
Performance Example: • Students will calculate area for two and three-dimensional objects. Given an amount of cardboard, determine different sizes of a box that could be built. Repeat with lumber and bookcase to be built.		
2.B.05	N-Q3 MA.3.a	Define appropriate quantities for the purpose of descriptive modeling. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements.
Performance Example: • Given a set of construction plans, students will estimate a complete stock list, and compare the variation and costs related.		
2.D.04	N-Q3 MA.3.a G-SRT8 G-GPE7	Identify significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure. Use Trigonometric ratios and Pythagorean Theorem to solve right triangles in applied problems. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Performance Example: • Students will determine actual sizes of material (2 x 4, 2 x 6). Students will determine roof rafter length using Pythagorean Theorem.		
2.D.05	G-CO11	Prove theorems about parallelograms, e.g., rectangles are parallelograms with congruent diagonals.
Performance Example: • Students will prove a door opening is a parallelogram using the Pythagorean Theorem.		
2.D.07	G-CO11	Prove theorems about parallelograms, e.g., rectangles are parallelograms with congruent diagonals.
Performance Example: • Students will determine if a quadrilateral is a parallelogram. Do the diagonals bisect each other? Are the opposite angles congruent?		
2.D.07	G-GPE5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems. Find the equation of a line parallel or perpendicular to a given line that passes through a given point.
Performance Example: • On a coordinate plane, students will draw a line parallel and a line perpendicular given a point, and find associated equations.		
2.E.01	N-Q1	Identify significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure.
Performance Example: • Students will measure a shed with various units of measure (yards, feet, inches, meters, centimeters, millimeters).		
2.H.01	G-GPE6	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.
Performance Example: • Students will layout a 2" x 4" x 8', determine and identify where 16 inches on center is and label.		
2.H.02	G-CO11	Prove theorems about parallelograms; opposite sides are congruent, opposite angles are congruent, rectangles are parallelograms with congruent diagonals.
Performance Example: • Given a set of plans, students will determine door and wall opening requirements.		
2.H.04	G-CO12	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).
Performance Example: • Students will draw the layout of the floor for an 8' x 12' deck.		

Embedded Science and Technology/Engineering

Earth and Space Science

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Earth and Space Science Learning Standard
2.I.01	3. Earth Processes and Cycles 3.1	Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments, and creates

		various types of landscapes. Give examples that show the effects of physical and chemical weathering on the environment.
Performance Example: • Students will demonstrate proper installation of exterior finish materials to protect structure from weatherization.		
2.J.01	3. Earth Processes and Cycles 3.4, 3.5, 3.6	3.4 Explain how water flows into and through a watershed. Explain the roles of aquifers, wells, porosity, permeability, water table, and runoff. 3.5 Describe the processes of the hydrologic cycle, including evaporation, condensation, precipitation, surface runoff and groundwater percolation, infiltration, and transpiration. 3.6 Describe the rock cycle, and the processes that are responsible for the formation of igneous, sedimentary, and metamorphic rocks. Compare the physical properties of these rock types and the physical properties of common rock-forming minerals
Performance Example: • Students will identify basic concrete framework principles and applications.		
2.K.01 Advanced	2. Energy Resources in the Earth System 2.1, 2.2	2.1 Recognize, describe, and compare renewable energy resources (e.g., solar, wind, water, biomass) and nonrenewable energy resources (e.g., fossil fuels, nuclear energy). 2.2 Describe the effects on the environment and on the carbon cycle of using both renewable and nonrenewable sources of energy.
Performance Example: • Students will design an energy efficient exterior wall complying with the MA energy codes.		

Life Science (Biology)

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Biology Learning Standard
2.H.01	Life Science, Energy and Living Things 15	Explain how dead plants and animals are broken down by other living organisms and how this process contributes to the system as a whole.
Performance Example: • Students will make identify one purpose of a sill is to prevent decomposition.		
2.D.01	Life Science Classification of Organisms 1	Classify organisms into the currently recognized kingdoms according to characteristics that they share. Be familiar with organisms from each kingdom.
Performance Example: • Given samples of wood, students will be able to identify various species, properties, and characteristics.		

Physical Science (Chemistry)

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Chemistry Learning Standard
2.1, 2.2	1. Properties of Matter 1.1	Identify and explain physical properties (e.g., density, melting point, boiling point, conductivity, malleability) and chemical properties (e.g., the ability to form new substances). Distinguish between chemical and physical changes.
Performance Example: • Students will demonstrate understanding of SDS sheets and be able to determine appropriate health and safety considerations		
2.D.01, 2.D.02	1. Properties of matter 1.1	Identify and explain physical properties (e.g., density, melting point, boiling point, conductivity, malleability) and chemical properties (e.g., the ability to form new substances). Distinguish between chemical and physical changes.
Performance Example: • Students will define building material, and articulate differences between natural materials and engineered materials.		
2.D.06	7. Solutions, Rates of Reactions, and Equilibrium 7.5	Identify the factors that affect the rate of a chemical reaction (temperature, mixing, concentration, particle size, surface area, catalyst).
Performance Example: • Students will describe and apply best practices in lumber storage.		
2.J.01	6. States of Matter, Kinetic Molecular Theory, and Thermochemistry 6.4	Describe the law of conservation of energy. Explain the difference between an endothermic process and an exothermic process.
Performance Example: • Students will identify basic concrete principles and understand process is exothermic.		
2.J.01	7. Solutions, Rates of Reactions, and Equilibrium 7.3, 7.5	7.3 Identify and explain the factors that affect the rate of dissolving (e.g., temperature, concentration, surface area, pressure, mixing). 7.5 Identify the factors that affect the rate of a chemical reaction (temperature, mixing, concentration, particle size, surface area, catalyst)
Performance Example: • Students will consider aggregates in concrete and understand that changes will affect character and quality.		
2.J.01.03	5. Chemical Reactions and Stoichiometry 5.1	Balance chemical equations by applying the laws of conservation of mass and constant composition (definite proportions).
Performance Example: • Students will identify basic concrete principles and relate curing of concrete to conservation of mass.		

Physical Science (Physics)

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Physics Learning Standard
2.I.02 2.K.01	3. Heat and Heat Transfer 3.1, 3.2, 3.3, 3.4	3.1 Explain how heat energy is transferred by convection, conduction, and radiation. 3.2 Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached. 3.3 Describe the relationship between average molecular kinetic energy and temperature. Recognize that energy is absorbed when a substance changes from a solid to a liquid to a gas, and that energy is released when a substance changes from a gas to a liquid to a solid. Explain the relationships among evaporation, condensation, cooling, and warming. 3.4 Explain the relationships among temperature changes in a substance, the amount of heat transferred, the amount (mass) of the substance, and the specific heat of the substance.
Performance Example: • Students will identify energy efficient materials and discuss their uses.		
2.E.01 2.F.01 2.F.02 2.F.03 2.F.04	1. Motion and Forces 1.7	Distinguish qualitatively between static and kinetic friction, and describe their effects on the motion of objects.
Performance Example: • Students will create projects using both hand tools and power tools. They will demonstrate safe operating procedures and maintenance of sawing, drilling, boring, planning, shaping, mitering, and fastening tools.		
2.E.01 2.F.01 2.F.02 2.F.03 2.F.04	1. Motion and Forces 1.8	Describe conceptually the forces involved in circular motion.
Performance Example: • Students will operate circular motion tools to create and finish a project.		
2.H.02	1. Motion and Forces 1.5	Use a free-body force diagram to show forces acting on a system consisting of a pair of interacting objects. For a diagram with only co-linear forces, determine the net force acting on a system and between the objects.
Performance Example: • Students will layout and construct load bearing walls.		
2.H.04 Advanced	3. Heat and Heat Transfer 3.4	3.4 Explain the relationships among temperature changes in a substance, the amount of heat transferred, the amount (mass) of the substance, and the specific heat of the substance.

Performance Example:
• Students will select and install composite wall systems considering total R-value of materials.

2.H.04 Advanced	1. Motion and Forces 1.5	Use a free-body force diagram to show forces acting on a system consisting of a pair of interacting objects. For a diagram with only co-linear forces, determine the net force acting on a system and between the objects

Performance Example:
• Students will demonstrate proper practices related to Flitch beams.

2.E.01 2.F.01 2.F.02 2.F.03 2.F.04	3. Heat and Heat Transfer 3.4	Explain the relationships among temperature changes in a substance, the amount of heat transferred, the amount (mass) of the substance, and the specific heat of the substance.

Performance Example:
• Students will create projects using a variety of tools and explain heat transfer and friction.

Technology/Engineering

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Technology/Engineering Learning Standard
2.H.01 2.H.02 2.H.03 2.H.04	5. Construction Technology 5.1	Describe and explain parts of a structure, e.g., foundation, flooring, decking, wall, roofing systems.

Performance Example:
• Students will demonstrate understanding and install: floor framing systems, interior and exterior walls, ceilings and roofs.

2.B.05 2.D.01 2.D.02	1. Materials, Tools, and Machines 1.1	Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., strength, hardness, and flexibility)

Performance Example:
• Students will demonstrate the necessary techniques for the layout and developments of a materials list for a project.

2.B.02	3. Communication Technologies 3.4	Identify and explain how symbols and icons (e.g., international symbols and graphics) are used to communicate a message.

Performance Example:
• Students will define basic abbreviations, line types symbols and notes on prints.

2.B.04	3. Communication Technologies 3.2	Identify and explain the appropriate tools, machines, and electronic devices (e.g., drawing tools, computer-aided design, and cameras) used to produce and/or reproduce design solutions (e.g., engineering drawings, prototypes, and reports).

Performance Example:
• Students will identify basic abbreviations, line types symbols and notes on prints.

2.D.04 2.D.07 2.E.01 2.F.01 2.F.02 2.F.03 2.F.04 2.H.01 2.F.04	1. Materials, Tools, and Machines 1.2	Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.
Performance Example: • Students will safely and properly use a variety of measuring, hand and power tools.		
2.D.04 2.D.07 2.E.01 2.F.01 2.F.02 2.F.03 2.F.04 2.H.01 2.F.04	1. Materials, Tools, and Machines 1.3	Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sander, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.
Performance Example: • Students will demonstrate proper use of all measuring, hand and power tools to complete construction projects.		
2.B.01 2.B.02 2.B.03 2.B.04 2.C.01	2. Engineering Design 2.2	Demonstrate methods of representing solutions to a design problem, e.g., sketches, orthographic projections, multi-view drawings.
Performance Example: • Students will demonstrate fundamental understanding of schematics and layout project based on blue print design.		

ARTICULATION AGREEMENT

Between

New England Carpenters Apprenticeship & Training Fund

And

Massachusetts High Schools with Chapter 74-Approved
Vocational Technical Education Carpentry Programs

ARTICULATION AGREEMENT

Between

Massachusetts Community Colleges

And

Massachusetts Chapter 74-Approved Secondary
Career/Vocational Technical Carpentry Programs
Effective Date: November 13, 2014
for more information, click

http://www.masscc.org/partnerships-initiatives/voc-schools-articulation-agreements

Industry Recognized Credentials (Licenses and Certifications/Specialty Programs)

Licenses and Certifications Earned by Qualifying High School Graduates (HS) and Apprenticeship Program Graduates (AP) and Related Technical Courses:

CCHS = Technical Course Completed in High School
IHS = Technical Course Introduced in High School, but completed in the Apprenticeship Program

*OSHA 10 Hour Construction Outreach (HS) (CCHS)
*OSHA 30 Hour Construction Outreach (AP) (CCHS)

Other

Related National, Regional, and State Professional Organizations

- Fitchburg State University, (State), www.fitchburgstate.edu
- National Center for Construction Education and Research, (National), www.nccer.org
- New England Carpenters Training Fund, (National, Regional), www.necarpenterstraining.org
- Wentworth Institute of Technology, (State), www.wit.edu
- Associated Builders and Contractors Inc., www.abc.org
- Associated General Contractors of America, www.agc.org
- National Association of Home Builders, www.nahb.com

Student Organizations

- Skills USA www.maskillsusa.org