

# Vermont Career Technical Education (CTE) Program Critical Proficiencies

## Welding CTE Programs

The Critical Proficiencies identify the essential knowledge, skills, and abilities that VT CTE students need to demonstrate (1) to be program completers, and (2) to be prepared for future learning. Critical proficiencies promote high expectations for all students, and support students' personal, professional, and academic development. At the high school level, VT's Proficiency-Based Graduation Requirements (PBGRs) reflect the critical proficiencies that lead to postsecondary career and college readiness.

For each of the unique program areas which categorize VT's CTE programs, the proficiency template includes:

- Program-Area Descriptions
- Career Ready Practices
- Career Cluster(s) and Pathway(s)
- Anchor Standards
- Program Technical Standards
- Academic Alignment
- CTE Program Elements

### Advance CTE Common Career Technical Core - Career Ready Practices

The Common Career Technical Core (CCTC) is a state-led initiative to establish a set of rigorous, high-quality standards for Career Technical Education (CTE). The CCTC includes a set of standards for each Career Cluster® and corresponding Career Pathways that define what students should know and be able to do after completing instruction in a program of study. The CCTC also includes an overarching set of Career Ready Practices that apply to all programs of study. The Career Ready Practices include statements that address the knowledge, skills, and dispositions that are important to becoming career ready.

The Career Ready Practices were developed from a state-led initiative sponsored by the National Association of State Directors of Career Technical Education Consortium (NASDCTEC).

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline, or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study. (NASDCTEC, 2012)



The Career Ready Practices

- are applicable across all program areas.
- align with the VT Transferable Skills Proficiency-Based Graduation Requirements (PBGRs) and VT Portrait of a Graduate.
- are the *transferable skills* of the Common Career Technical Core and the *portrait* of a VT CTE program completer.

### **Advance CTE Common Career Technical Core - Career Cluster and Pathway Standards**

The Common Career Technical Core is divided into Career Cluster and Pathway standards. Each Career Cluster contains one or more pathways with pathway-specific technical standards. The template shows which CCTC Career Cluster and Pathway standards are relevant to VT CTE programs.

### **Anchor Standards**

The Anchor Standards build upon the Career Ready Practices and show the overarching standards categories which are common across all technical programs within their Career Cluster(s) and Pathway(s). The VT CTE Anchor Standards are derived from and align with the CCTC Anchor Standards.

### **Program Technical Standards**

The Program Technical Standards build on and continue the Anchor Standards with more complexity, rigor, and career specificity. Knowledge and skills are learned and applied within a standards-based CTE program that integrates classroom, laboratory, and work-based instruction. The VT CTE Program Technical Standards are tailored to the unique characteristics and structure of each of the program areas.

### **Academic Alignment**

Each program-area template includes academic alignment with the VT Content-Area Sample Graduation Proficiencies as part of VT's Proficiency-Based Graduation Requirements (PBGRs). These include Common Core State Standards in English Language Arts and Mathematics, Next Generation Science Standards, as well as other adopted national and state academic standards.

## CTE Critical Proficiency Template

<b>Critical Proficiency Template</b>	Attributes:
<b>Program-Area Descriptions</b>	For VT CTE Program Areas
<b>Common Career Technical Core - Career Ready Practices</b>	<ol style="list-style-type: none"> <li>1. Act as a responsible and contributing citizen and employee.</li> <li>2. Apply appropriate academic and technical skills.</li> <li>3. Attend to personal health and financial well-being.</li> <li>4. Communicate clearly and effectively and with reason.</li> <li>5. Consider the environmental, social, and economic impacts of decisions.</li> <li>6. Demonstrate creativity and innovation.</li> <li>7. Employ valid and reliable research strategies.</li> <li>8. Utilize critical thinking to make sense of problems and persevere in solving them.</li> <li>9. Model integrity, ethical leadership, and effective management.</li> <li>10. Plan education and career paths aligned to personal goals.</li> <li>11. Use technology to enhance productivity.</li> <li>12. Work productively in teams while using cultural global competence.</li> </ol>
<b>Common Career Technical Core - Career Cluster(s) and Pathway(s)</b>	Relevant to VT CTE Program Areas
<b>Anchor Standards</b>	<ol style="list-style-type: none"> <li>1. Academics</li> <li>2. Communication</li> <li>3. Problem Solving and Critical Thinking</li> <li>4. Technology</li> <li>5. Systems (Responsibility and Flexibility)</li> <li>6. Health and Safety</li> <li>7. Leadership and Teamwork</li> <li>8. Ethics and Legal Responsibilities</li> <li>9. Career Planning and Management</li> <li>10. Technical Knowledge and Skills (see Program Technical Standards)</li> <li>11. Demonstration and Application (see CTE Program Elements)</li> </ol>
<b>Program Technical Standards</b>	Build on the Anchor Standards with more complexity, rigor, and career specificity
<b>Academic Alignment</b>	With VT Content-Area Graduation Proficiencies

<b>Critical Proficiency Template</b>	Attributes:
<b>CTE Program Elements</b>	Demonstration and application: <ul style="list-style-type: none"> <li>• Dual Enrollment/Fast Forward Courses</li> <li>• Industry Recognized Credentials (IRCs)</li> <li>• Work-Based Learning/Co-op/Apprenticeship</li> <li>• National Career Technical Student Organizations</li> <li>• Entrepreneurship</li> <li>• Portfolio/Personalized Learning Plan</li> </ul>

### VT Welding CTE Programs

Students in **Welding** programs have in-depth, hands-on experiences in principles of metallurgy; print reading, measurement, and properties of metals; safety procedures and machine operation; metal-fabricating and joining methods; SMAW, GMAW, FCAW, GTAW; thermal cutting; codes, inspections, and certifications.

The standards in this program area are designed to prepare students for technical training, postsecondary education, and/or entry-level employment in the welding industry. Students engage in an instructional program that integrates academic and technical preparation, career exploration, and preparation for postsecondary education and/or training. Knowledge and skills are learned and applied within a standards-based CTE program that integrates classroom, laboratory, and work-based instruction.

### Advance CTE Common Career Technical Core - Career Ready Practices

<b>Advance CTE Common Career Technical Core - <a href="#">Career Ready Practices</a>:</b>	Aligned with <a href="#">VT Transferable Skills</a> Proficiency-Based Graduation Requirements (PBGRs) and <a href="#">VT Portrait of a Graduate</a>
<b>1. Act as a responsible and contributing citizen and employee.</b>	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community, and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
<b>2. Apply appropriate academic and technical skills.</b>	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

<p><b>Advance CTE Common Career Technical Core - Career Ready Practices:</b></p>	<p>Aligned with <a href="#">VT Transferable Skills</a> Proficiency-Based Graduation Requirements (PBGRs) and <a href="#">VT Portrait of a Graduate</a></p>
<p><b>3. Attend to personal health and financial well-being.</b></p>	<p>Career-ready individuals understand the relationship between personal health, workplace performance, and personal well-being; they act on that understanding to regularly practice healthy diet, exercise, and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial wellbeing, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.</p>
<p><b>4. Communicate clearly and effectively and with reason.</b></p>	<p>Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.</p>
<p><b>5. Consider the environmental, social, and economic impacts of decisions.</b></p>	<p>Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment, and the profitability of the organization.</p>
<p><b>6. Demonstrate creativity and innovation.</b></p>	<p>Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks, or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.</p>
<p><b>7. Employ valid and reliable research strategies.</b></p>	<p>Career-ready individuals are discerning in accepting and using new information to make decisions, change practices, or inform strategies. They use reliable research processes to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.</p>

<p><b>Advance CTE Common Career Technical Core - Career Ready Practices:</b></p>	<p>Aligned with <a href="#">VT Transferable Skills</a> Proficiency-Based Graduation Requirements (PBGRs) and <a href="#">VT Portrait of a Graduate</a></p>
<p><b>8. Utilize critical thinking to make sense of problems and persevere in solving them.</b></p>	<p>Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.</p>
<p><b>9. Model integrity, ethical leadership, and effective management.</b></p>	<p>Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' actions, attitudes, and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals, and organizational culture.</p>
<p><b>10. Plan education and career paths aligned to personal goals.</b></p>	<p>Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience, and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.</p>
<p><b>11. Use technology to enhance productivity.</b></p>	<p>Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks - personal and organizational - of technology applications, and they take actions to prevent or mitigate these risks.</p>

<b>Advance CTE Common Career Technical Core - Career Ready Practices:</b>	Aligned with <a href="#">VT Transferable Skills</a> Proficiency-Based Graduation Requirements (PBGRs) and <a href="#">VT Portrait of a Graduate</a>
<b>12. Work productively in teams while using cultural global competence.</b>	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural differences to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

**Advance CTE Common Career Technical Core - [Architecture and Construction](#) and [Manufacturing](#) Career Cluster and Pathway Standards**

<b>The following Career Cluster and Pathway standards are relevant to VT Welding CTE programs:</b>	The following Career Cluster® is focused on careers in designing, planning, managing, building, and maintaining the built environment.
<b>Architecture and Construction Career Cluster</b>	<ol style="list-style-type: none"> <li>1. Use vocabulary, symbols, and formulas common to architecture and construction.</li> <li>2. Comply with regulations and applicable codes.</li> <li>3. Read, interpret, and use technical drawings, documents, and specifications to plan a project.</li> </ol>
<b>Construction Pathway</b>	<ol style="list-style-type: none"> <li>1. Safely use and maintain appropriate tools, machinery, equipment, and resources to accomplish construction project goals.</li> </ol>
	The following Career Cluster® is focused on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing, and process engineering.
<b>Manufacturing Career Cluster</b>	<ol style="list-style-type: none"> <li>1. Evaluate the nature and scope of the Manufacturing Career Cluster and the role of manufacturing in society and in the economy.</li> <li>2. Comply with federal, state, and local regulations to ensure worker safety and health and environmental work practices.</li> <li>3. Describe government policies and industry standards that apply to manufacturing.</li> </ol>



<b>The following Career Cluster and Pathway standards are relevant to VT Welding CTE programs:</b>	The following Career Cluster® is focused on careers in designing, planning, managing, building, and maintaining the built environment.
<b>Production Pathway</b>	<ol style="list-style-type: none"> <li>1. Diagnose production process problems and take corrective action to meet production quality standards.</li> <li>2. Manage safe and healthy production working conditions and environmental risks.</li> <li>3. Make continuous improvement recommendations based on the results of production process audits and inspections.</li> <li>4. Demonstrate the safe use of manufacturing equipment.</li> </ol>

### VT CTE Program Anchor Standards

<b>Anchor Standards:</b>	Aligned with Advance CTE Common Career Technical Core - Career Cluster Anchor Standards
<b>1. Academics</b>	Achieve additional academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities.
<b>2. Communication</b>	Acquire and accurately use terminology and information at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.
<b>3. Problem Solving and Critical Thinking</b>	Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem using critical and creative thinking; logical reasoning, analysis, inquiry, and problem-solving techniques.
<b>4. Technology</b>	Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the workplace environment.
<b>5. Systems</b> (Responsibility and Flexibility)	Initiate, and participate in, a range of collaborations to demonstrate behaviors that reflect personal and professional responsibility, flexibility, and respect in the workplace environment and community settings.
<b>6. Health and Safety</b>	Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the workplace environment.
<b>7. Leadership and Teamwork</b>	Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.



<b>Anchor Standards:</b>	Aligned with Advance CTE Common Career Technical Core - Career Cluster Anchor Standards
<b>8. Ethics and Legal Responsibilities</b>	Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.
<b>9. Career Planning and Management</b>	Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.
<b>10. Technical Knowledge and Skills</b> (see Program Technical Standards)	Apply essential technical knowledge and skills common to the Career Cluster and Pathway(s), following procedures when carrying out experiments and/or performing technical tasks.
<b>11. Demonstration and Application</b> (see CTE Program Elements)	Demonstrate and apply technical knowledge and skills across a variety of CTE-specific opportunities in classroom, laboratory, and workplace settings.

## VT Welding CTE Program Technical Standards

*\*Aligned with NCCER Welding 1 and 2; AWS Guidelines for Entry-Level Welder*

<p><b>Program Technical Standards:</b></p>	<p>Standards for each career path build on and continue the Anchor Standards with more complexity, rigor, and career specificity.</p>
<p><b>Standard 1: Welding Safety</b> (NCCER Welding 1 – Module 1)</p>	<p>WELDING PPE</p> <ul style="list-style-type: none"> <li>a. Demonstrate use of all welding Personal Protective Equipment.</li> <li>b. Demonstrate proper and safe work practices in the welding work area.</li> </ul> <p>WELDING AND CUTTING EQUIPMENT SAFETY</p> <ul style="list-style-type: none"> <li>a. Demonstrate proper “Hot Zone” preparation.</li> <li>b. Demonstrate safe and proper use and inspection of ventilation equipment.</li> <li>c. Demonstrate proper inspection and operation of equipment used for each required welding and thermal cutting process. <i>(This is best done as part of the process module for each of the required welding and thermal cutting processes.)</i></li> <li>d. Pass a written program specific “Welding Safety Exam.”</li> </ul>
<p><b>Standard 2: Thermal Cutting Processes</b> (NCCER Welding 1 – Module 2)</p> <p>(NCCER Welding 1 – Module 3)</p>	<p>OXY-FUEL CUTTING (OFC) THEORY</p> <ul style="list-style-type: none"> <li>a. Describe how to safely set-up, test for leaks, adjust, operate, and shut down an OFC torch.</li> <li>b. Identify specific levels of cylinder content and working pressures related to OFC.</li> </ul> <p>OXY-FUEL CUTTING (OFC) PRACTICAL</p> <ul style="list-style-type: none"> <li>c. Demonstrate how to change fuel and oxygen cylinders.</li> <li>d. Demonstrate how to change and clean cutting tips.</li> <li>e. Demonstrate a straight cut, beveled cut, radius cut, and piercing on carbon steel.</li> </ul> <p>PLASMA ARC CUTTING (PAC) THEORY</p> <ul style="list-style-type: none"> <li>f. Describe how to safely set up, adjust, operate, and shutdown the PAC equipment.</li> </ul> <p>PLASMA ARC CUTTING (PAC) PRACTICAL</p> <ul style="list-style-type: none"> <li>g. Demonstrate how to replace all consumable torch parts.</li> <li>h. Demonstrate a straight cut, radius cut, and piercing on carbon steel.</li> </ul> <p>AIR CARBON ARC CUTTING (CAC-A) THEORY</p> <ul style="list-style-type: none"> <li>i. Describe how to safely set up, adjust, operate, and shutdown the CAC-A equipment using industry-specific terminology.</li> </ul> <p>AIR CARBON ARC CUTTING (CAC-A) PRACTICAL</p> <ul style="list-style-type: none"> <li>j. Demonstrate how to replace all consumable parts.</li> <li>k. Observe a demonstration (or operate) CAC-A equipment on carbon steel.</li> </ul>

<p><b>Program Technical Standards:</b></p>	<p>Standards for each career path build on and continue the Anchor Standards with more complexity, rigor, and career specificity.</p>
<p><b>Standard 3: Welding Processes</b> <i>(NCCER Welding 1 – Module 6)</i></p>	<p><b>SHIELDED METAL ARC WELDING (SMAW) THEORY</b></p> <ol style="list-style-type: none"> <li>Describe how to safely set-up, adjust, operate, and shut down SMAW equipment.</li> <li>Describe SMAW fundamentals: arc length, electrode angles, amps, manipulation, and travel speed.</li> <li>Describe SMAW equipment. (power source type, polarity, etc.).</li> <li>Describe SMAW electrodes, their numeric designation, and their uses.</li> <li>Describe how to strike the arc, maintain correct arc length, read the puddle, and deposit a weld of the correct size.</li> </ol> <p><b>SHIELDED METAL ARC WELDING (SMAW) PRACTICAL</b></p> <ol style="list-style-type: none"> <li>Troubleshoot and repair common problems associated with SMAW welding machines.</li> <li>Perform pad work in all positions.</li> <li>Perform fillet welds in all positions.</li> <li>Perform groove welds in all positions.</li> <li>Read, understand, and set-up equipment in accordance with an approved AWS Standard Welding Procedure.</li> <li>Pass a welder performance qualification test in accordance with AWS D1.1 Structural Steel Code</li> </ol>
<p><b>Standard 3: Welding Processes Advanced Welding Processes (Choose 1 Process)</b> <i>(NCCER Welding 2 – Module 11)</i></p>	<p><b>GAS METAL ARC WELDING (GMAW) THEORY</b></p> <ol style="list-style-type: none"> <li>Describe how to safely set-up, adjust, operate, and shut down GMAW equipment.</li> <li>Describe GMAW fundamentals: wire speed, voltage, electrode extension, electrode angles, manipulation, and travel speed.</li> <li>Describe GMAW equipment. (power source type, polarity, etc.)</li> <li>Describe GMAW filler wire types, numeric designation, and their uses.</li> <li>Describe how to initiate the arc, maintain correct electrode extension, read the puddle, and deposit a weld of the correct size.</li> </ol> <p><b>GAS METAL ARC WELDING (GMAW) PRACTICAL</b></p> <ol style="list-style-type: none"> <li>Troubleshoot and repair common problems associated with GMAW machines and wire feeders (birds' nest, worn contact tip, drive rolls, spool drift, liners, etc.).</li> <li>Perform pad work in all positions on carbon steel.</li> <li>Perform a single and 3-bead fillet in all positions on carbon steel.</li> <li><b>OPTIONAL:</b> Pass a welder performance qualification test in accordance with AWS D9.1 Sheet Metal Welding Code.</li> </ol>

<p><b>Program Technical Standards:</b></p>	<p>Standards for each career path build on and continue the Anchor Standards with more complexity, rigor, and career specificity.</p>
	<p><b>FLUX-CORED ARC WELDING (FCAW) THEORY</b></p> <ol style="list-style-type: none"> <li>a. Describe how to safely set-up, adjust, operate, and shut down FCAW equipment.</li> <li>b. Describe FCAW fundamentals: wire speed, voltage, electrode extension, electrode angles, manipulation, and travel speed.</li> <li>c. Describe FCAW equipment. (power source type, polarity, etc.)</li> <li>d. Describe FCAW filler wire types, numeric designation, and their uses.</li> <li>e. Describe how to initiate the arc, maintain correct electrode extension, read the puddle, and deposit a weld of the correct size.</li> </ol> <p><b>FLUX-CORED ARC WELDING (FCAW) PRACTICAL</b></p> <ol style="list-style-type: none"> <li>f. Troubleshoot and repair common problems associated with FCAW machines and wire feeders (birds' nest, worn contact tip, drive rolls, spool drift, liners, etc.).</li> <li>g. Perform pad work in all position on carbon steel.</li> <li>h. Perform a single and 3-bead fillet in all position on carbon steel.</li> <li>i. <b>OPTIONAL:</b> Pass a welder performance qualification test in accordance with AWS D1.1 Structural Steel Code.</li> </ol> <p><b>GAS TUNGSTEN ARC WELDING (GTAW) THEORY</b></p> <ol style="list-style-type: none"> <li>a. Describe how to safely set-up, adjust, operate, and shut down GTAW equipment.</li> <li>b. Describe GTAW fundamentals: arc length, electrode angles (work and travel), amps, manipulation, and travel speed.</li> <li>c. Describe GTAW equipment. Explain: power sources, polarity, shielding gasses, remote controls, etc.</li> <li>d. Describe tungsten electrodes, their uses, and how you properly prepare them.</li> <li>e. Describe GTAW torches (water and air cooled) and all their internal parts.</li> </ol> <p><b>GAS TUNGSTEN ARC WELDING (GTAW) PRACTICAL</b></p> <ol style="list-style-type: none"> <li>f. Troubleshoot and repair common problems associated with welding machines.</li> <li>g. Perform pad work on aluminum, stainless steel, and steel.</li> <li>h. Perform a single and 3-bead fillet in all position on carbon steel.</li> <li>i. <b>OPTIONAL:</b> Pass a welder performance qualification test in accordance with AWS D9.1 Sheet Metal Welding Code.</li> </ol>

<b>Program Technical Standards:</b>	Standards for each career path build on and continue the Anchor Standards with more complexity, rigor, and career specificity.
<b>Standard 4: Fabrication Fundamentals</b> <i>(NCCER Welding 2 – Module 8 and 9)</i>  <i>(NCCER Welding 1 – Module 4 and 7)</i>  <i>(NCCER Welding 2 – Module 10)</i>	<b>DRAWINGS AND WELDING SYMBOLS</b> <ul style="list-style-type: none"> <li>a. Recognize and identify title block, basic print terms, abbreviations, and line types.</li> <li>b. Understand and read size and location dimensioning.</li> <li>c. Develop a project bill of materials based on a welding shop drawing.</li> <li>d. Read and interpret an AWS welding symbols chart.</li> </ul> <b>LAYOUT AND MEASUREMENT</b> <ul style="list-style-type: none"> <li>e. Define: tolerance, bend allowance, and units of measurement used in metal fabrication.</li> <li>f. Describe the use of a decimal equivalent chart.</li> <li>g. Demonstrate the proper use of common hand tools: carpenter square, combination square, tape measure, fillet weld gauges, sheet metal gauge, protractor, dial calipers.</li> <li>h. Layout material so it may be fabricated to the specifications on a shop drawing.</li> <li>i. Layout materials to the +/- tolerance that is specified on the shop drawing.</li> <li>j. Describe and/or demonstrate how to square, level, and plumb a project.</li> <li>k. Layout a project to allow for maximum utilization of the material.</li> </ul> <b>MATERIAL PREPARATION</b> <ul style="list-style-type: none"> <li>l. Explain and demonstrate safe practices and the proper use of power tools required for material preparation.</li> <li>m. Describe how to control material distortion.</li> <li>n. Prepare a weldment by grinding, cutting, or cleaning material to meet the specifications on the shop drawing.</li> </ul> <b>METAL IDENTIFICATION</b> <ul style="list-style-type: none"> <li>o. Explain the characteristics of ferrous and non-ferrous metals.</li> <li>p. Identify metals: Aluminum, Copper, Brass, Stainless Steel, Low and High carbon steel</li> <li>q. Identify metals using the following tests: spark test, color test, magnetic test.</li> <li>r. Defined the term metallurgy.</li> </ul> <b>PREVENTATIVE EQUIPMENT MAINTENANCE</b> <ul style="list-style-type: none"> <li>s. Perform rust removal and prevention on bare metal surfaces of shop equipment.</li> <li>t. Check and maintain hydraulic oil and coolant levels in equipment.</li> <li>u. Locate and service grease fittings in accordance with manufacture recommendations.</li> <li>v. Change blades (bandsaw, cold saw, portable bandsaw, chop saw, etc.)</li> </ul>

<b>Program Technical Standards:</b>	Standards for each career path build on and continue the Anchor Standards with more complexity, rigor, and career specificity.
	<p><b>FABRICATION TOOLS AND EQUIPMENT</b></p> <ul style="list-style-type: none"> <li>w. Demonstrate safe and proper set up, adjustment, and operation of stationary shop fabrication equipment. (shearing, punching, sawing, sanding, drilling, and forming equipment)</li> <li>x. Tap and thread metal using a decimal equivalent/tap &amp; die chart for reference.</li> </ul>
<b>Standard 5: Inspection and Testing</b> <i>(NCCER Welding 1 – Module 5)</i>	<p><b>CODES, STANDARDS, PROCEDURES</b></p> <ul style="list-style-type: none"> <li>a. Read, understand, and explain an AWS standard welding procedure.</li> <li>b. Set up and adjust welding equipment in accordance with an AWS standard welding procedure.</li> </ul> <p><b>INSPECTION METHODS</b></p> <ul style="list-style-type: none"> <li>c. Describe Destructive and Non-Destructive testing methods.</li> <li>d. Define welding inspection acronyms and their relationship to the inspection methods. VT, PT, MT, RT, UT</li> <li>e. Identify and describe common weld discontinuities and their causes.</li> <li>f. Witness a guided bend test and interpret/discuss the results.</li> </ul>
<b>6. Communication</b>	<ul style="list-style-type: none"> <li>a. Demonstrate effective verbal and written communication skills in the welding classroom, lab, and workplace.</li> </ul>
<b>7. Leadership and Teamwork</b>	<ul style="list-style-type: none"> <li>a. Demonstrate an ability to work independently and as a collaborative team member in the welding industry.</li> </ul>
<b>8. Ethics and Legal Responsibilities</b>	<ul style="list-style-type: none"> <li>a. Recognize the professional and ethical standards that are required in the welding industry.</li> </ul>
<b>9. Career Development</b>	<ul style="list-style-type: none"> <li>a. Identify and explore the various career and trade options in the welding industry, and research the training and certification process for welders.</li> </ul>

**VT Welding CTE Program - Academic Alignment with [VT Content Area Graduation Proficiencies \(PBGRs\)](#)**

Graduation Proficiencies:	Indicators:
<a href="#">English Language Arts</a>	High School 1. <b>Reading:</b> b, c, d, g 2. <b>Writing:</b> a, b, d, e 3. <b>Writing:</b> c 4. <b>Speaking and Listening:</b> a, b, d 5. <b>Speaking and Listening:</b> a, b, d 6. <b>Language:</b> a, c, e
<a href="#">Mathematics</a>	High School 1. <b>Modeling:</b> a, b 2. <b>Number and Quantity:</b> c 5. <b>Geometry:</b> d, h, i, m, n
<a href="#">Science</a>	High School 1. <b>Physical Sciences:</b> Structure/Properties of Matter, Forces, and Interactions: c, e 2. <b>Physical Sciences:</b> Energy, Waves, and Electromagnetic Radiation: c 8. <b>Engineering, Technology, and Application of Science:</b> a, i
<a href="#">Global Citizenship/Social Studies</a>	End of Gr. 12 <b>Inquiry:</b> Constructing compelling and supporting questions: a, d; Determining helpful sources: a <b>Economics:</b> Economic Decision Making: a; Exchange and Markets: a <b>Geography:</b> Human Environment Interaction: Place, Regions, and Culture: a <b>Communicating Conclusions and Taking Informed Action:</b> Communicating: b
<a href="#">Art: Visual Art</a>	High School 1. <b>Create:</b> a, c, d 4. <b>Connect:</b> a



## VT Welding CTE Program Elements

<b>Demonstration and Application:</b>	Available Options:
<b>Dual Enrollment/Fast Forward Courses</b>	Course list link to be added in 2024
<b>Industry Recognized Credentials (IRCs)</b>	<p><b>Safety and Foundation Credentials (Tier 1):</b>  <a href="https://education.vermont.gov/documents/vermont-cte-programs-approved-tier-1-credentials-2022">https://education.vermont.gov/documents/vermont-cte-programs-approved-tier-1-credentials-2022</a></p> <p><b>Post-Secondary IRCs (Tier 2):</b>  <a href="https://education.vermont.gov/documents/vt-cte-programs-approved-postsecondary-tier-2-credentials-2022">https://education.vermont.gov/documents/vt-cte-programs-approved-postsecondary-tier-2-credentials-2022</a></p>
<b>National Career Technical Student Organizations (CTSOs)</b>	SkillsUSA
<b>Work-Based Learning/Co-op (WBL)</b>	Varies by CTE Center
<b>Entrepreneurship Opportunities</b>	Varies by CTE Center
<b>Portfolio/Personalized Learning Plan (PLP)</b>	Varies by CTE Center