BRISTOL TECHNICAL EDUCATION CENTER

PART OF THE CONNECTICUT TECHNICAL EDUCATION AND CAREER SYSTEM

Welding and Metal Fabrication

Curriculum Guide

Rev: January 2026

CTECS – Vision of a Graduate

The Vision of a Graduate (VoG) at the Connecticut Technical Education and Career System (CTECS) embodies our commitment to preparing students for success in Connecticut's workforce.

Developed in collaboration with students, parents, staff, and employers, the VoG ensures that CTECS students are not only job-ready but also equipped to lead, innovate, and adapt in a dynamic world.

As educators, we are dedicated to developing these qualities by providing a comprehensive education that empowers our students to achieve their fullest potential and make meaningful contributions to society.

A Problem Solver

Problem solvers tackle challenges by identifying root causes of issues, brainstorming solutions, implementing effective strategies, and demonstrating adaptability.

- Engage students with open-ended, creative thinking tasks that require both conventional and innovative solutions.
- Facilitate group discussions and collaborative projects.
- Use real-world scenarios and hands-on activities.
- Highlight the importance of effort, persistence, and continuous learning.
- Provide regular feedback and encourage reflection.

Work Ready

To be work-ready includes a combination of technical expertise, soft skills, and personal qualities that ensure a graduate can effectively contribute to the workplace from day one.

- Set high standards for punctuality, responsibility, professionalism, and task completion.
- Use project-based learning and collaborative assignments.
- Emphasize clear written and verbal communication.
- Offer practical exercises like mock interviews and resume workshops.
- Integrate technology and teach digital literacy.

Respectful

Graduates who embody respectfulness emphasize the importance of treating others with dignity, valuing diversity, and fostering an inclusive and positive environment, both personally and professionally.

- Demonstrate personal, interpersonal, and professional skills.
- Show respect for diversity.
- Model respect through active listening and empathy.
- Set clear expectations for respectful interactions.
- Promote collaboration and group discussions.
- Celebrate respectful behavior.
- Address disrespect promptly and constructively.

Skilled Socially

Graduates who are skilled socially are equipped to navigate social environments, build relationships, and contribute positively to their communities and workplaces.

- Show awareness of global responsibility to others and the environment.
- Participate in community involvement.
- Design cooperative group projects and team activities
- Set expectations for respect and give regular feedback.
- Facilitate discussions on inclusivity, kindness, and respect.
- Model positive interactions and recognize strong social skills.

A Critical Thinker

Critical thinkers approach problems systematically by analyzing, evaluating, and synthesizing information to make well-informed decisions and contribute to innovative solutions.

- Encourage critical thinking individually and collaboratively.
- Design lessons that challenge assumptions and explore diverse viewpoints.
- Use open-ended questions, rigorous activities, and cross-curricular projects.
- Integrate project-based learning and real-world problem-solving.
- Offer reflective opportunities like journaling and discussions.
- Cultivate an environment that values curiosity and inquiry.

An Effective Communicator

Effective communicators convey ideas, information, and emotions accurately and persuasively, fostering understanding and collaboration.

- Communicate effectively using oral, written, visual, artistic, and technical modes.
- Include group discussions, presentations, and peer reviews.
- Promote active listening and thoughtful responses.
- Offer clear guidelines and constructive feedback.
- Stress clear, respectful, and purposeful communication.

CTECS Instructional Model

CTECS uses the Marzano Compendium to guide research-based instructional strategies that differentiate learning and promote access, engagement, and success for all students. Teachers apply these strategies to support diverse learners (including multilingual learners, students with disabilities, and students with varied academic or technical backgrounds) through scaffolds, modeling, guided practice, and multiple ways to participate and show understanding. This approach ensures every student can work toward proficiency in the Priority Standards and the competencies outlined in the CTECS Vision of a Graduate.

Feedback	Content	Context
Providing and Communicating Clear Learning Goals 1. Providing scales and rubrics 2. Tracking student progress 3. Celebrating success **Using Assessments** 4. Using informal assessments of the whole class 5. Using formal assessments of individual students	**Conducting Direct Instruction Lessons** 6. Chunking content 7. Processing content 8. Recording and representing content **Conducting Practicing and Deepening Lessons** 9. Using structured practice sessions 10. Examining similarities and differences 11. Examining errors in reasoning **Conducting Knowledge Application Lessons** 12. Engaging students in cognitively complex tasks 13. Providing resources and guidance 14. Generating and defending claims **Using Strategies That Appear in All Types of Lessons** 15. Previewing strategies 16. Highlighting critical information 17. Reviewing content 18. Revising knowledge 19. Reflecting on learning 20. Assigning purposeful homework 21. Elaborating on information 22. Organizing students to interact	**Using Engagement Strategies** 23. Noticing and reacting when students are not engaged 24. Increasing response rates 25. Using physical movement 26. Maintaining a lively pace 27. Demonstrating intensity and enthusiasm 28. Presenting unusual information 29. Using friendly controversy 30. Using academic games 31. Providing opportunities for students to talk about themselves 32. Motivating and inspiring students **Implementing Rules and Procedures** 33. Establishing rules and procedures 34. Organizing the physical layout of the classroom 35. Demonstrating withitness 36. Acknowledging adherence to rules and procedures 37. Acknowledging lack of adherence to rules and procedures **Building Relationships** 38. Using verbal and nonverbal behaviors that indicate affection for students 39. Understanding students' backgrounds and interests 40. Displaying objectivity and control **Communicating High Expectations** 41. Demonstrating value and respect for reluctant learners 42. Asking in-depth questions of reluctant learners 43. Probing incorrect answers with reluctant learners

Curriculum Introduction

This curriculum document outlines the essential learning for this trade program and provides a clear structure for planning, instruction, and assessment. It includes the components required by NEASC Standard 2.2a, along with elements that reflect the unique nature of CTECS technical programs. The curriculum is organized to show what students learn in each course, how learning progresses across grade levels, and how instruction supports both technical skill development and the CTECS Vision of a Graduate.

Teachers should use this document to:

- Understand the overall structure and expectations of the course sequence
- Reference the Course Map to see the scope and sequence of Priority Standards and the alignment to District Summative Assessments (DSAs)
- Use the Priority Standards and Units of Study to guide daily, weekly, and cycle-based planning
- Integrate Big Ideas, Essential Questions, Skills/Learning Outcomes, vocabulary, and resources during lesson design
- Identify required safety, industry, and technical content expectations
- Plan and implement formative assessments to monitor progress and guide instruction
- Prepare students for the District Summative Assessments, ensuring alignment with the Course Map
- Maintain consistency of technical and professional practice instruction across campuses while adapting to student needs and industry-based opportunities

Curriculum Components

Course Map

A Course Map serves as the scope and sequence for this course by outlining the progression of instructional units and the standards that guide teaching and assessment. While each campus will have individual student needs, cycle schedules, and industry-based opportunities, all instructors are expected to teach the standards outlined in the Course Map. Using the Course Map below, teachers will intentionally plan learning experiences that prepare students to meet the identified standards within the designated assessment windows.

Priority Standards (Units of Study)

Priority Standards identify the most essential learning in the trade program. They reflect the core technical competencies, safety practices, and industry-aligned skills that require the greatest instructional focus and appear on program assessments. In CTE programs, each Priority Standard also functions as a Unit of Study, because it includes the required components such as big ideas, essential questions, content topics, and skills/learning outcomes aligned to assessments.

Vertical Alignment

Vertical alignment shows how Priority Standards and instructional expectations progress from grade to grade within the trade program. It provides a clear pathway of skill development, increasing complexity, and technical proficiency across the four-year sequence.

Learning Outcomes

Learning outcomes are what students will know (Concepts) and be able to do (Skills). Concepts identify the major content topics within the Priority Standard (Unit of Study). They appear in the left column of the Learning Outcomes table and follow a similar coding structure as the Priority Standard.

Skills are learning objectives that describe the measurable actions students must be able to perform to demonstrate proficiency. They appear in the right column of the Learning Outcomes table and show the progression of learning evidence in the Priority Standard.

Vocabulary

Essential vocabulary includes the technical and academic terms students must understand and use accurately to engage in trade-specific learning and demonstrate proficiency on assessments. Vocabulary is foundational to safety, technical precision, and industry communication, and should be a primary initial focus within each unit and taught explicitly through modeling, demonstration, and repeated application.

Resources

Resources include the tools, equipment, texts, materials, and digital tools that support learning within each unit and reflect industry standards.

Assessment Practices

Teachers use ongoing formative assessments—such as questioning, checks for understanding, performance demonstrations, reflections, and teacher observation—to monitor progress, guide instruction, and support all learners in mastering the Priority Standards.

Each program also includes District Summative Assessments (DSAs), which measure proficiency on the Priority Standards identified in the Course Map. DSAs provide consistent evidence of student learning across campuses and ensure alignment to industry expectations, safety requirements, and program outcomes. Teachers should reference the Course Map and Units of Study when planning instruction to ensure students have opportunities to practice and demonstrate the skills and knowledge assessed on the DSA.

Precision Machining Technology Program Philosophy

The Welding and Metal Fabrication program is grounded in the belief that skilled trades are essential to the strength of our communities, infrastructure, and advanced manufacturing industries. We believe that students learn best through purposeful, hands-on experiences that combine technical knowledge, craftsmanship, problem-solving, and professional responsibility.

Our program emphasizes safety, precision, and quality as foundational principles. Students develop technical competency in welding processes, fabrication techniques, blueprint reading, metallurgy, and industry standards while building habits of accuracy, discipline, and attention to detail. We believe that mastery comes through practice, reflection, and continuous improvement.

Welding is both a science and a craft. Therefore, we integrate academic concepts such as mathematics, measurement, material properties, and technical communication into authentic shop applications. Students are challenged to think critically, work collaboratively, and solve real-world fabrication problems that mirror industry expectations.

We also believe that professional skills are as important as technical ability. Reliability, integrity, teamwork, and pride in workmanship define successful welders and fabricators. Through production work, project-based learning, industry partnerships, and work-based learning opportunities, students develop the confidence and competence required to enter apprenticeships, employment, military service, or post-secondary education.

Goal 1 - General Safety in the Welding Trade	
Big Idea (s): ● **1. Safety needs to be a habit and a consideration throughout daily living as well as in the work environment.** ● **2. Most shop injuries can be avoided if one is safety conscious.** ● **3. Each person is responsible for following safety procedures.**	
Essential Questio n(s): ● **While working in the shop, what type of knowledge does a worker need to remain safe in the environment?** ● **Why is safety such an important concern inside shop environments?**	
Learning Outcomes	
Students will know:	*As evidenced by: (oral, written, or performance)*
1.1 Hazard Identification	● **100% on written safety test** ● **Model safe practices** ● **Describe potential safety risks of:** **Crush points** **Pinch points** **Burns** **Eye injuries** **Electrocution** **Entanglements** **Welding Fumes/Respiratory injuries** **Lifting injuries** **Compressed Gasses** ● **Demonstrate knowledge of proper personal protective equipment** ● **Prepare a list of safety rules for welding shop** ● **Demonstrate proper handling and storage of gas cylinders**
1.2 Safety Data Sheets	● **100% on written safety test** ● **Identify Safety Data Sheets layout and format** ● **Locate Safety Data Sheets in welding shop**

1.3 Fire Safety Procedures	● **100% on written safety test** ● **Demonstrate proper 'hot zone' operation** ● **Locate:** ○ **Fire alarms** ○ **Fire extinguishers** ○ **Eye wash stations** ○ **Power shut offs** ○ **Fire exits**
1.4 Personal Protective Equipment	● **100% on safety test** ● **Wear appropriate safety clothing and equipment:** **Eye Protection** **Welding Helmet** **Jacket** **Gloves** **Safety Shoes** ● **Select proper lens shade for specific welding and cutting operations** ● **Describe dangers of arc flash and damage ultraviolet rays can do to the eyes**
1.5 Hand and Power Tools	● **Demonstration, inspection, and safe use of hand and power tools** **Hammers** **Chisels** **Punches** **Files** **Squares and levels** **Drills** **Saws** **Grinders** ● **Identify damaged tools unsafe for use**
1.6 Angle Grinders	● **Demonstrate ability to change wheels on an angle grinder safely**

	• **Demonstrate proper use of an angle grinder** • **Utilize proper angle grinder maintenance** • **Use grinder properly for weld preparation and to remove mill scale** • **Make a cut safely with a cut off wheel** • **Remove a weld properly using hard discs and flap discs**
Technical Vocabulary - PPE, Dress Code, SDS, Fire Extinguisher. Fire Triangle, Bloodborne Pathogens, AED, Eye Wash Station, Emergency Shut -off, GFCI	
Resources - Welding Fundamentals 6th Edition	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapter 2 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 2 - Proper Setup and Use of Oxy -Fuel Equipment	
Big Idea(s): ● *Proper oxy -fuel set up is essential to maintaining a safe work environment.* ● *Oxy-fuel equipment is used for cutting and heating metal and used in many aspects of the welding industry.* ● *Each person is responsible for following safety procedures.*	
Essential Question(s): ● *What are the advantages and disadvantages of oxy -fuel cutting ?* ● *Why is safety such an important concern in regard to oxy -fuel equipment?*	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
2.1 Oxy -fuel safety	● **Demonstrate proper setup of oxy - fuel equipment**
2.2 Set-up oxy -fuel cutting station	● **Adjust torch to different types of flames** ● **Perform setup and shut down of equipment**
2.3 Cutting with oxy -fuel equipment	● **Demonstrate safe and proper cutting techniques** ● **Perform 90 degree cut and restart cut in mild steel** ● **Make a bevel cut on mild steel** ● **Layout pattern and cut to specifications**
Technical Vocab - **acetylene, oxygen, flashback, infrared rays, orifice, preheat, re gulator, working pressure**	
Resources - Welding Fundamentals: Chapter 3 - Welding and Cutting Processes (pg. 35 -39)	

Welding Fundamentals: Chapter 24 - Oxyfuel Gas and Welding: Equipment and Supplies (pg. 351-370) **Welding Fundamentals: Chapter 25 - Oxyfuel Gas and Welding: Equipment Assembly and Adjustment (pg. 377 -389)** **Welding Fundamentals: Chapter 26 - Oxyfuel Gas Cutting (pg. 393 -401)**	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapter 3 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 3 - Proper Setup and Use of SMAW Equipment	
Big Idea(s): ● ***Shielded Metal Arc Welding is a welding process that is used all over the world for many different applications, from structural building to pipe welding.*** ● ***Shielded Metal Arc Welding is an electric arc process that can be done outside in the elements.***	
Essential Question(s): ● **To what extent do angles affect a groove weld?** ● **What is the value of using SMAW over GMAW for groove welds?**	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
3.1 Equipment and Accessories	● **Perform safety inspections of SMAW equipment and accessories** ● **Perform minor external repairs to SMAW equipment and accessories**
3.2 PPE and Hazard Identification	● **Identify all of the parts of an arc welding outfit and its functio ns** ● **Describe potential electrical hazards** ● **100% on written safety test**
3.3Current and Polarity Settings	● **Identify polarities and how they work within a welding circuit, shown with both a written and hands on assessment**
3.4 Safety Inspections of equipment, PPE, and Work Area	● **Perform safety inspections of SMAW equipment and accessories** ● **Makes minor external rep airs to SMAW equipment and accessories**
3.5 Principles of SMAW	● **Sets up for SMAW operations on carbon steel** ● **Operates SMAW equipment on carbon steel** ● **Makes fillet weld in all positions on carbon steel** ● **Makes groove welds, in all positions, on**

	carbon steel ● Passes SMAW welder performance qualification test
3.6 Safety for out of position welding	● Recall the basic PPE from flat SMAW welding ● Contrast the need for added PPE in out of position welding vs flat welding ● Evaluate PPE for damage ● Wear PPE correctly
3.7 Groove weld positions	● List the four basic groove weld positions ● Explain work angle and travel angle ● Construct a list of angle s for each position
3.8 Groove weld joint types	● List the different types of groove joint configurations ● Discuss bead planning patterns ● Compare concave and convex welds ● Discuss the defects that occur for out of position welding
3.9 Groove weld performance qualification	● Identify material needed for testing ● Interpret the requirements of testing procedure (Amperage, wire feed, preheat) ● Prepare carbon steel for welding ● Weld a 1G/2G/3G/4G to requirements to AWS standards
Technical Vocab - Uphill welding, downhill welding, groove angle, bevel angle, root penetration, root opening, land, face, maximum reinforcement, horizontal, vertical, overhead, root bead, intermediate bead, finish bead, arc blow, arc length, chipping, drag angle, keyhole, porosity, restarts, root pass, inclusions, splatter, travel angle, electrode	
Technical Vocab - arc blow, arc length, chipping, drag angle, keyhole, porosity, restarts, root pass, inclusions, splatter, travel angle, electrode	

Resources -
Welding Fundamentals: Chapter 9 - SMAW: Equipment and Supplies (pg. 127 -130) Welding Fundamentals: Chapter 10 - SMAW: Equipment Assembly and Adjustment (pg. 143 -147)
Welding Fundamentals: Chapter 11 - SMAW: Electrodes (pg. 153 -161)
Welding Fundamentals: Chapter 12 - SMAW: Flat Welding Position (pg. 167 -180)
Welding Fundamentals: Chapter 2 - SMAW: Horizontal, Vertical, and Overhead Welding Positions (pg. 185 -193)

Common Formative Assessment(s)	Summative District Assessment(s)
Welding Fundamentals: Chapters 9 -12 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 4 - Proper Setup and Use of GMAW/FCAW Equipment	
Big Idea(s): ● ***Gas Metal Arc Welding/Flux Cored Arc Welding are welding processes that are used to increase production and lower costs.*** ● ***Flux Cored Arc Welding is a process that can be used outside in the elements.***	
Essential Question(s): ● ***When is the best time to use GM AW/FCAW over other welding processes?*** ● ***What is the appropriate operation to run G.M.A.W. safely?***	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
4.1 GMAW Safety	● **Perform safety inspections of GMAW equipment and accessories** ● **Make minor external repairs to GMAW equipment and accessories**
	●
4.2 Principles of GMAW	● **Set up for GMAW operations on carbon steel** ● **Operate GMAW equipment on carbon steel** ● **Make fillet weld in all positions on carbon steel** ● **Make groove welds, in all positions, on carbon steel** ● **Select proper electrode wire for application used** ● **Pass GMAW welder performance qualification test**
4.3 GMAW Process	● **List advantages and disadvantages of GMAW**
4.4 Methods of metal transfer	● **Identify and distinguish differences between the different methods of metal transfer**

	• short circuit transfer • spray transfer • globular transfer
4.5 Voltage and Wire Speed Settings	• Describe voltage and wire speed settings • Proper set up of a GMAW machine relative to the material being welded
4.6 Shielding Gasses	• Identify and select the proper gas for application
Technical Vocab - inert, nozzle, stick out , short circuit, spray arc, transfer	
Resources - **Welding Fundamentals: Chapter 15 - GMAW and FCAW: Equipment and Supplies (pg. 209 -223)** **Welding Fundamentals: Chapter 16 - GMAW and FCAW: Equipment Assembly and Adjustment (pg. 229 -242)** **Welding Fundamentals: Chapter 17 - GMAW and FCAW: Flat Welding Positio n (pg. 247 -258)** **Welding Fundamentals: Chapter 18 - GMAW and FCAW: Horizontal, Vertical, and Overhead Welding Positions (pg. 263 -271)**	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapters 15-18 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 5: Proper Setup and Use of GTAW Equipment	
Big Idea(s): • ***Gas Tungsten Arc Welding is a welding process in which an arc is stuck between a tungsten electrode and the base metal. The tungsten electrode does not melt or become part of the weld. An inert gas shields the arc area from the atmosphere.***	
Essential Question(s): • ***How is GTAW beneficial when welding aluminum and other metals?*** • ***Why is GTAW used to precision and thin weldments?***	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
5.1 GTAW equipment and supplies	• **Perform safety inspections of GTAW equipment and accessories** • **Make minor external repairs GTAW equipment and accessories**
5.2 Principles of GTAW	• **Set up equipment for GTAW operations on carbon steel** • **Operate GTAW equipment on carbon steel** • **Make fillet weld in all positions on carbon steel** • **Make groove welds, in all positions, on carbon steel** • **Pass GTAW welder performance qualification test**
5.3 GTAW torch	• **Identify the parts of a GTAW torch** • **Operate assembly and break down of a GTAW torch**
5.4 GTAW Safety	• **Identify visible issues with GTAW machinery** • **Makes minor repairs to GTAW**

	equipment and accessories
5.5 Proper Use of GTAW Equipment	• List all PPE required while using this process • Sharpens Tungsten properly • Uses correct collet for tungsten • Set Gas to the appropriate setting • determines appropriate amperage needed for specific task • Perform a successful bead without the use of wire main taining a consistent weld bead • Produces welds with proper toe to crown weld placement
5.6 Performance Qualification	• Identify material needed for testing • Prepare carbon steel for welding • Produce welds with proper bead size, appearance and weld placement before testing • Perform GTAW fillet welds in the 1F and 2F positions according to AWS standards

Technical Vocab -
ceria, thoria, zirconia, collet. gas lens, Heli arc , post flow, pulsed curr ent

Resources -
Welding Fundamentals: Chapter 19 - GTAW: Equipment and Supplies (pg. 277 -287)
Welding Fundamentals: Chapter 20 - GTAW: Equipment Assembly and Adjustment (pg. 291 - 301)
Welding Fundamentals: Chapter 21 - GTAW: Flat Welding Position (pg. 305 -318)
Welding Fundamentals: Chapter 22 - GMAW and FCAW: Horizontal, Vertical, and Overhead Weldi ng Positions (pg. 323 -331)

Common Formative Assessment(s)	Summative District Assessment(s)
Welding Fundamentals: Chapters 19 -22 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 6 - Plasma Arc Cutting Equipment	
Big Idea(s): • ***Plasma Arc Cutting is a cutting process that can be used to cut any metal quickly and cleanly.***	
Essential Question(s): • ***When is the best time to use Plasma Arc Cutting over other cutting processes?*** • ***What safety requirements are needed to operate a Plasma Arc Cutter***	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
6.1 PAC Safety	• **Demonstrate proper setup of PAC equipment** • **identify proper PPE used with PAC**
6.2 PAC cutting setup	• **Demonstrate proper setup of PAC equipment**
6.3 Plasma arc cutting process	• **Demonstrate safe and proper cutting techniques** • **Perform 90 degree cut and restart cut in mild steel** • **Make a bevel cut on mild steel** • **Layout pattern and cut to specifications**
6.4 PAC equipment and supplies	• **Identify the parts of a PAC setup** • **Replace consumables on a PAC torch**
6.5 PAC Safety	• **Identify visible issues with PAC machinery** • **Makes minor repairs to PAC equipment and accessories** • **Wears proper PPE while performing PAC**
Technical Vocab - **constricting nozzle, dross, plasma , swirl ring, gouging, kerf, heat shield**	

Resources - Welding Fundamentals: Chapter 23 - Plasma Arc Cutting (pg. 335 -346)	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapter 23 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 7: Blueprint Reading and Welding Symbols	
Big Idea(s): • ***The ability to read and interpret drawings and welding symbols is critical to a welder's success.*** • ***Blueprint reading gives the fabricator the essential information to create a weldment according to specifications.***	
Essential Question(s): • ***How do we look at the overall blueprint drawing to interpret its meaning?***	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
7.1 Three view and isometric drawings	• **List the names of the views used in orthographic projection** • **Describe characteristics of an isometric drawing**
7.2 The ANSI -AWS welding symbols	• **Identify basic types of welds indicated on the ANSI/AWS weld symbol**
7.3 Weld sizes and weld symbols	• **Locate information on the weld symbol to determine:** **-size of root opening** **-The groove angles** **-desired size** **-contour** **-finish of the weld**
7.4 Hardware and fasteners	• **Identify common fasteners and explain their application Bolts /nuts** **Screws** **Pins** **Rivets** **Anchors**

	• **Select proper hardware for application**
7.5 Thread terminology	• **Identify thread terminology on a written and/or oral assessment** **Screw Thread** **Nominal Size** **Pitch** • **Apply thread terminology during a performance assessment**
Technical Vocab - **arrow side, other side, dimensions, isometric, orthographic, title block, reference line** **pitch, thread per inch**	
Resources - **Welding Fundamentals: Chapter 7 - Weld Joints and Positions (pg. 91 -99)** **Welding Fundamentals: Chapter 28 - Welding Symbols (pg. 107 -119)**	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapter 7, 28 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 8: **Proper Use of Measuring and Fabrication Tools**	
Big Idea(s): ● ***Proper use and care of all tools is essential to maintaining a safe work environment and working efficiently.***	
Essential Question(s): ● ***What type of knowledge does a worker need to properly choose the correct tools and equipment for a task?*** ● ***Why is safety such an important concern in regard to tools and equipment ?***	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
8.1 Hand tools	● **Identify common welding shop hand tools and describe their purpose or function** **Wrenches** **Saws** **Files** **Hand taps/dies (threading)** **Hammers** **Clamps** **Vises** **Pliers** **Screwdrivers** ● **Select the appropriate hand tool for a specific application** ● **Demonstrate the proper safe use and care of each hand tool during a performance assessment**

8.2 Power tools	• **Identify common shop power tools and describe their purpose or function** **Drills** **Saws** **Grinders/Sanders** **Metal Forming tools** • **Demonstrate the proper safe use and care of each power tool during a performance assessment**
8.3 Welding shop equipment	• **Identify common shop Equipment and describe their purpose or function** **Drill Press** **Bandsaws** **Grinders/Sanders** **Benders** **Ironworkers** **Shears** **Lifting and moving** • **Select the appropriate Equipment for a specific application** • **Demonstrate the proper safe use and care of each equipment during a performance assessment**
Technical Vocab - **grit, lubricant, TPI, blade speed, horizontal, vertical**	
Resources - **Welding Fundamentals: Chapter 2 - Safety in the Welding Shop (pg. 19 - 30)** **Welding Fundamentals: Chapter 4 - The Physics of Welding (pg. 47 -53)** **Welding Fundamentals: Chapter 5 - Math for Welding (pg. 59 -70)** **Welding Fundamentals: Chapter 6 - Math Applications for Welders (pg. 75 -82)**	

Common Formative Assessment(s)	Summative District Assessment(s)
Welding Fundamentals: Chapter 2 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 9 - Pipe and Tube Welding	
Big Idea(s): ● ***Pipe and Tube is used in almost every aspect of metalworking and fabricating. Welding it properly and safely is an essential skill for the welder.***	
Essential Question(s): ● ***What determines the process and technique used to weld pipe and tube?*** ● ***How does the welding position affect the way the pipe is welded?***	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
9.1 pipe and tube specifications	● **Identify the differences between pipes and tubes during a performance assessment**
9.2 Positions for pipe and tube welding	● **Identify the positions for both groove and fillet welds on a written assessment**
9.3 Techniques for uphill and downhill welding	● **Demonstrate the technique used for uphill and downhill welding on a practical assessment.**
9.4 Welding pipe using SMAW	● **Weld an open root pipe joint using 6010 electrodes in the 2g position** ● **Weld a closed root pipe joint using 7018 electrodes in the 2g position**
9.5 Welding pipe or tube using GTAW	● **Weld an open root pipe joint using the GTAW process in the 2g position**

9.6 Welding pipe or tube using GMAW	• **Weld an open root pipe joint using the GMAW process in the 1G and 2G position**
Technical Vocab - **open root, groove angle, penetration, filler pass, hot pass, cover pass, backing ring**	
Resources - **Welding Fundamentals: Chapter 33 - Pipe and Tube Welding (pg. 503 -520)**	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapter 33 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 10 - Welding Inspections and Qualifications	
Big Idea(s): ● Welds must be inspected to detect flaws and defects. ● Some welders must be certified to prove they are capable of performing proper welds.	
Essential Question(s): ● What are some of the common ways of detecting flaws and defects in welds? ● Why must some welders be certified?	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
10.1 Welding flaws and defects	**Describes the difference between a welding flaw and a welding defect. Identifies welding flaws on a weldment**
10.2 Nondestructive weld testing	● List and identify the common types of nondestructive weld tests **Visual** **Liquid Pe netrant** **Magnetic Particle** **Ultrasonic** **X-Ray** ● perform visual and liquid penetrant examination of a weldment
10.3 Destructive weld testing	● List and describe the common types of destructive weld tests **Tensile** **Bend** **Fillet break**

	Hardness **Impact** **Peel** **Pressure** ● **Perform a bend and fillet break test on a weld coupon**
10.4 Welder Certification	● **Describe the use of codes and specifications for a weld** ● **Discuss the difference between a WPS and a WPQ** ● **Explain why a welder may need to pass several performance qualifications** ● **List the steps one must follow to conform to most codes**
Technical Vocab - **code, defect, destructive, face bend, impact, radiograph, tensile, ultrasonic, qualification, specification, procedure**	
Resources - **Welding Fundamentals: Chapter 36 - Inspecting and Testing Welds (pg. 553 -572)** **Welding Fundamentals: Chapter 37 - Welder Certification (pg. 573 -583)**	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapter 26, 37 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 11 - Work ethics, habits, and attitude	
Big Idea(s): ● Work ethics are a set of values based on hard work and diligence. ● Hard work, commitment to the company, and a great skill -set is rewarded by employers. ● It is important to continuously project a good work ethic while maintaining employment.	
Essential Question(s): ● What qualities will an employer look for in a prospective new hire? ● How does work history have an impact on obtaining a job? ● Why is sexual harassment such a big deal to both employers and employees?	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
11.1 Employability skills	**List key characteristics that are important for success in the workplace on a written and/or oral assessment.** **Attitude** **Communication** **Cooperation** **Respect** **Productivity** **Character** **Teamwork** **Organizational Skills** ● **Practice employability skills related to a good work ethic in and out of the shop and classroom**

11.2 Interpersonal skills and work ethic	● **Explaining the role of interpersonal skills as an aspect of work ethic on a written and/or oral assessment.** ○ **Habits** ○ **Attitude** ○ **Manners** ○ **Appearance** ○ **Behaviors** ● **Develop and implement strategies for improving interpersonal skills in and out of the shop and classro om**
11.3 Appropriate and productive work ethic.	● **Describe initiative as a part of work ethic on a written and/or oral assessment** ● **Evaluate one's own initiative, and demonstrate an increased initiative in appropriate and productive ways**
11.4 Personal dependability.	● **Explain the importance of being dependable and identify areas for improving personal dependability on a written and/or oral assessment** ● **List characteristics that will improve personal dependability in and out of the shop and classroom**
11.5 Sexual harassment	● **Define what is considered sexual harassment.** ● **Explain the implications of sexual harassment in the workplace on a written and oral assessment**
Technical Vocabulary - **ethics, harassment, dependable, appearance, behavior, cooperation, attitude**	

Common Formative Assessment(s)	Summative District Assessment(s)
Welding Fundamentals: Chapter 1 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 12 - Shop Work	
Big Idea(s): ● Career readiness prepares potential employees with the essential skills needed to maintain and grow in the work field. ● Career readiness prepares students for successful employment.	
Essential Question(s): ● What is the value of recognizing the essential skills needed to acquire employment? ● How does practicing interview skills help with future employment?	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, or performance)***
12.1 Employability skills	● Identify career readiness skills needed ● Explain the importance of the skills ● Demonstrate professionalism ● Practice interview skills
12.2 Mentoring	● Research the roles of a Mentor ● Demonstrate good work habits ● Perform the role as a senior mentor to freshman shop students
12.3 Employment opportunities	● Identify the skills employers are looking for ● Build a resume for employment ● Compare benefit opportunities from different employers ● Apply for jobs through work -based learning opportunities or other avenues available
12.4 Construct Fabrication Projects	**Construct Projects that will Demonstrate Proficiency in the following Compet encies:** ● Employability Skills ● Measuring ● Layout ● Hand Tools ● Portable Power Tools ● Stationary Machines

	• **Materials** • **Proficiency will be determined by scoring a 3 or greater on individual project/production rubrics** • **Demonstrate behavior expected for career employability**
12.5 Welding and Metal Fabrication Portfolio	• **Uploading evidence of proficiencies completing project t o portfolio** • **Update the Competency Checklist**
Technical Vocabulary - workmanship, competency, portfolio, resume	
Resources - GW Publisher	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapters 1, 2, 3 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA

Goal 13 Shop Math and Fabrication	
Big Idea (s): ● **Proper use and care of all tools is essential to maintaining a safe work environment and working efficiently.**	
Essential Question (s): ● **What type of knowledge does a worker need to properly choose the correct tools and equipment for a task?** ● **Why is safety such an important concern in regard to tools and equipment ?**	
Learning Outcomes	
Students will know:	***As evidenced by: (oral, written, o r performance)***
13.1 Fabrication skills	● **Select and safely use welding shop hand and power tools to fabricate weldments** ● **Select and safely use shop equipment to fabricate weldments**
13.2 Measuring	● **Adding Measurements(fractions)** ● **Subtracting fractions(fractions)** ● **Calculate material length** ● **Calculate area of shapes** ● **Find center (Division)** ● **Measure using decimal system**
13.3 Scale Drawings	● **Identify lines of drawings** ● **Create rough sketch of Project with measurements**
13.4 Layout	● **Demonstrate proper layout of shop projects** ● **Analyze layout for errors** ● **Layout material for minimal waste**

Technical Vocabulary - Square, Fractions, Align, Scale, Area, Dimension, Pythagorean Theorem, Right angle Triangle	
Resources - G-W Textbook	
Common Formative Assessment(s)	**Summative District Assessment(s)**
Welding Fundamentals: Chapters 2,3,5,6,8 Written Assessments	Bristol Mid-Year DSA Bristol Final DSA