**COURSE DESCRIPTION**

*Basic Principles of Welding* is a course designed to follow *Introduction to Welding*, in which students will learn more advanced skills and knowledge related to cutting and welding applications. Development of welding and cutting skills will be continued in the context of a series of projects. Combined with the third year course, *Advanced Welding Applications and Certification*, the student should be prepared for *Entry Level Welder* Certification, as defined by American Welding Society QC10.

*It is strongly recommended that administration and guidance follow the scope and sequence and course recommendations as listed.*

**Recommended Prerequisites:**
- Introduction to Welding

**Recommended Credits:**
- 1

**Recommended Grade Level(s):**
- 10th or 11th

**Number of Competencies in Course:**
- 54

**Note:** *This course may be offered as a part of the Construction or the Manufacturing Sub-Clusters, depending upon the student's career focus. Construction Core is recommended for students in the Construction Sub-Cluster, but it is not required for students in the Manufacturing Sub-Cluster.*
BASIC PRINCIPLES OF WELDING

STANDARDS

1.0 Students will assume responsibility for the safety of themselves, their coworkers, and bystanders.

2.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

3.0 Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the workplace.

4.0 Students will interpret drawings and welding symbol information.

5.0 Students will interpret, layout, and fabricate in conformance to construction and fabrication drawings.

6.0 Students will make single-and multiple-pass fillet and groove welds using a Shielded Metal Arc Welding (SMAW) process.

7.0 Students will pad beads and make fillet welds on plain carbon steel in all positions using a short-circuit, spray transfer, or pulsed-arc Gas Metal Arc Welding (GMAW) process.

8.0 Students will pad beads and make fillet welds on plain carbon steel in all positions using a Flux-Cored Arc Welding (FCAW) process.

9.0 Students will pad beads and make fillet welds on carbon steel, stainless steel, and aluminum in all positions using a Gas Tungsten Arc Welding (GTAW) process.
BASIC PRINCIPLES OF WELDING

STANDARD 1.0

Students will assume responsibility for the safety of themselves, their coworkers, and bystanders.

LEARNING EXPECTATIONS

The student will:
1.1 Demonstrate a positive attitude regarding safety practices and issues.
1.2 Use and inspect personal protective equipment.
1.3 Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
1.4 Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
1.5 Assume responsibilities under HazCom (Hazard Communication) regulations.
1.6 Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
1.7 Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards and regarding emergency response procedures.
1.8 Demonstrate appropriate related safety procedures.
1.9 Pass with 100% accuracy a written examination relating to safety issues.
1.10 Pass with 100% accuracy a performance examination relating to safety.
1.11 Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:
1.1A Is attentive during safety discussions.
1.1B Actively seeks information about safe procedures.
1.1C Responds positively to instruction, advice, and correction regarding safety issues.
1.1D Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
1.1E Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, or alcohol.
1.2 Selects, inspects, and uses the correct personal protective equipment for the assigned task.
1.3A Inspects power tools for intact guards, shields, insulation, and other protective devices.
1.3B Inspects extension cords for the presence of a functional ground connection prior to use.
1.3C Operates and maintains tools in accordance with manufacturer’s instructions and as required by regulation or company policy.
1.3D Properly places and secures ladders and scaffolding prior to use.
1.4A Is observant of personnel and activities in the vicinity of the work area.
1.4B Warns nearby personnel, prior to starting potentially hazardous actions.
1.5A When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets) and identifies the health hazards associated with the new material.
1.5B Reports hazards found on the job site to the supervisor.
1.6A ERECTS SHIELDS, BARRIERS, AND SIGNAGE TO PROTECT COWORKERS AND BYSTANDERS PRIOR TO STARTING POTENTIALLY HAZARDOUS TASKS.

1.6B PROVIDES AND ACTIVATES ADEQUATE VENTILATION EQUIPMENT AS REQUIRED BY THE TASK.

1.7A REPORTS ALL INJURIES TO SELF TO THE IMMEDIATE SUPERVISOR.

1.7B REPORTS OBSERVED UNGUARDED HAZARDS TO THEIR IMMEDIATE SUPERVISOR.

1.8 COMPLIES WITH PERSONAL ASSIGNMENTS REGARDING EMERGENCY ASSIGNMENTS.

1.9 Passes with 100% accuracy a written examination relating specifically to content area.

1.10 Passes with 100% accuracy a performance examination relating specifically to welding tools, equipment and supplies.

1.11 Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor’s discretion.

- Conduct a practice drill simulating a hazardous solvent spill in which an emergency action plan is to be implemented.
- Instruct a visitor to obviously approach the vicinity of a student conducting a hazardous activity and note the level of awareness demonstrated by the student.
- For a project requiring the use of ladders and/or scaffolding, note the proper placement and securing procedures followed by students.

INTEGRATION LINKAGES

Language Arts, Mathematics, Algebra, Geometry, English, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary’s Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA
BASIC PRINCIPLES OF WELDING

STANDARD 2.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:
2.1 Cultivate positive leadership skills.
2.2 Participate in the student organization directly related to their program of study as an integral part of classroom instruction.
2.3 Assess situations, apply problem-solving techniques and decision-making skills within the school, community, and workplace.
2.4 Participate as a team member in a learning environment.
2.5 Respect the opinions, customs, and individual differences of others.
2.6 Build personal career development by identifying career interests, strengths, and opportunities.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
2.1A Demonstrates character and leadership using creative-and critical-thinking skills.
2.1B Uses creative thought process by “thinking outside the box.”
2.2A Relates the creed, purposes, motto, and emblem of their student organization, directly related to personal and professional development.
2.2B Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
2.3A Makes decisions and assumes responsibilities.
2.3B Analyzes a situation and uses the Professional Development Program or career technical student organization materials directly related to the student’s program of study to resolve it.
2.3C Understands the importance of learning new information for both current and future problem solving and decision making.
2.4A Organizes committees and participates in functions.
2.4B Cooperates with peers to select and organize a community service project.
2.5A Researches different customs and individual differences of others.
2.5B Interacts respectfully with individuals of different cultures, gender, and backgrounds.
2.5C Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
2.6A Creates personal career development by identifying career interests, strengths, and opportunities.
2.6B Identifies opportunities for career development and certification requirements.
2.6C Plans personal educational paths based on available courses and current career goals.
2.6D Creates a resume that reflects student’s skills, abilities, and interests.
SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various career technical student organizations’ programs and/or competitive events.
- Implement an annual program of work.
- Prepare a meeting agenda for a specific career technical student organization monthly meeting.
- Attend a professional organization meeting.
- Develop a program of study within their career opportunities.
- Participate in the American Spirit Award competition with SkillsUSA.
- Complete Professional Development Program Level I and Level II, SkillsUSA.

INTEGRATION LINKAGES

SkillsUSA, Professional Development Program; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; English; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary’s Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary’s Commission on Achieving Necessary Skills (SCANS)
BASIC PRINCIPLES OF WELDING

STANDARD 3.0

Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the workplace.

LEARNING EXPECTATIONS

The student will:
3.1 Assume responsibility for accomplishing classroom assignments and workplace goals within accepted time frames.
3.2 Develop advanced study skills.
3.3 Demonstrate and use written and verbal communication skills.
3.4 Read and understand technical documents such as regulations, manuals, reports, forms, graphs, charts, and tables related to welding.
3.5 Apply the foundations of mathematical principles such as algebra, geometry, and advanced math to solve problems related to welding.
3.6 Apply basic scientific principles and methods to solve problems and complete tasks related to welding.
3.7 Demonstrate an understanding of computer operations and related applications to input, store, retrieve, and output information as it relates to the course.
3.8 Research, recognize, and understand the interactions of the environment and green issues as they relate to the course work and to a global economy.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:
3.1A Uses appropriate time management to achieve goals.
3.1B Arrives at school on time each day.
3.1C Completes assignments and meets deadlines.
3.2A Assesses current personal study skills.
3.2B Demonstrates advanced note-taking ability.
3.2C Formulates appropriate study strategies for given tasks.
3.3A Communicates ideas, information, and messages in a logical manner.
3.3B Fills out forms, time sheets, reports, logs, and documents to comply with class and project requirements.
3.4A Reads and understands technical documents and uses industry jargon, acronyms, and terminology related to welding appropriately.
3.4B Recognizes the meaning of specialized words or phrases unique to the career and welding industry.
3.5A Utilizes computation in adding, subtracting, multiplying, and dividing of whole numbers, fractions, decimals, and percents.
3.5B Chooses the right mathematical method or formula to solve a problem.
3.5C Performs math operations accurately to complete classroom and lab tasks.
3.6A Demonstrates an understanding of scientific principles critical to the course.
3.6B Applies scientific principles and technology to solve problems and complete tasks.
3.6C Demonstrates knowledge of the scientific method (e.g., identifies the problem, collects information, forms opinions, and draws conclusions).
3.7A Uses basic computer hardware (e.g., PCs, printers) and software to perform tasks as required for the course work.
3.7B Demonstrates an understanding of capabilities of computers and common computer terminology (e.g., program, operating system).
3.7C Applies the appropriate technical solution to complete tasks.
3.7D Inputs data and information accurately for the course requirements.
3.8A Researches and recognizes green trends in career area and industry.
3.8B Examines current environmentally-friendly trends.
3.8C Applies sustainability practices by understanding processes that are non-polluting, conserving of energy and natural resources, and economically efficient.

**SAMPLE PERFORMANCE TASKS**

- Examine and compile different learning styles for portfolios.
- Create calendars containing all activities and obligations for one month. Discusses how to handle conflicting or competing obligations then complete daily and weekly plans showing tasks, priorities, and scheduling.
- Complete self-assessments of study habits.
- Compute precise and exact measurements.
- Explore study strategies for different subjects and tasks, then, analyze two homework assignments and select the best strategies for completing them.
- Create “life maps” showing necessary steps or “landmarks” along the path to personal, financial, educational, and career goals.
- Take notes during counselor classroom visits and work in small groups to create flow charts of the path options.
- List attitudes that lead to success, then, rate individually in these areas. Work together to suggest strategies for overcoming the weaknesses identified own and partners’ self-assessments then share with the class the strategies developed.
- Research the Internet and other resources to collect and analyze data concerning climate change.
- Keep a data file of alternative energy sources and the sources’ impact on the environment.
- Develop a recycling project at home or for the school environment.

**INTEGRATION LINKAGES**

SkillsUSA, Professional Development Program; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; English; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary’s Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary’s Commission on Achieving Necessary Skills (SCANS)
BASIC PRINCIPLES OF WELDING

STANDARD 4.0

Students will interpret drawings and welding symbol information.

LEARNING EXPECTATIONS

The student will:
4.1 Read and sketch drawings.
4.2 Identify basic weld symbols.
4.3 Identify lines and joints.
4.4 Differentiate between drawings and blueprints.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:
4.1A Sketches parts and assigns measurements to the sketch.
4.1B Understands blueprint format
4.2A Interprets welding symbol information.
4.2B Identifies and labels parts of a fillet weld and v-groove.
4.3A Labels all common lines of a blueprint.
4.3B Labels butt, tee, lap, edge, and corner joints.
4.4A Compares information on drawings and blueprints.

SAMPLE PERFORMANCE TASKS

- Examine and explain parts to determine application of symbols from drawings, sketches, and blueprints.
- Examine projects to distinguish various types of lines and joints.
- Keep records reflecting successful completion of assignments.

INTEGRATION LINKAGES

Writing and Communication Skills, Teamwork and Leadership Skills, Language Arts, Mathematics, Algebra, Geometry, English, Art, Blueprint Reading, Computer Skills, Internet Skills, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary’s Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA)
BASIC PRINCIPLES OF WELDING

STANDARD 5.0

Students will interpret, layout, and fabricate in conformance to construction and fabrication drawings.

LEARNING EXPECTATIONS

The student will:

5.1 Correctly interpret dimensions and locations of components in construction and fabrication drawings.

5.2 Correctly scale dimensions in construction and fabrication drawings.

5.3 Correctly interpret orthographic views shown in construction and fabrication drawings.

5.4 Recognize and correctly interpret lines and symbols commonly used in construction and fabrication drawings.

5.5 Read and demonstrate understanding of the welding terms and definitions from ANSI/AWS A3.0, Standard Welding Terms and Definition.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

5.1A Makes a material take-off in conformance to construction and fabrication drawings and specifications.

5.1B Lays out components, structural and others, and their locations to dimensions and tolerances indicated on construction and fabrication drawings.

5.2A Uses the scale of a drawing to determine locations not explicitly dimensioned.

5.2B Uses the scale of a drawing to determine dimensions not explicitly shown on drawing.

5.3 Interprets three-dimensional features found in construction and fabrication drawings.

5.4A Distinguishes between object lines, dimension and extension lines, center lines, section lines, and other lines commonly found in construction and fabrication drawings.

5.4B Identifies symbols commonly used in construction and fabrication drawings, including material, electrical, plumbing, HVAC, and plot plan and survey symbols.

5.4C Interprets welding symbols to determine type, geometry, process, extent, and required testing of welds.

5.5A Pronounces and uses welding terms in conversation.

5.5B Uses welding terms in written work.

SAMPLE PERFORMANCE TASKS

- Given shop and assembly drawings for a weldment composed of five to ten components where some components are medium- to high-carbon steel, do a material take-off, including estimates of quantities of filler materials.

- Given shop and assembly drawings for a weldment composed of five to ten components where some components are medium- to high-carbon steel, make a written assembly plan to minimize the possibility of distortion or cracking, and execute the assembly plan.

- Given shop and assembly drawings for a weldment composed of five to ten stainless steel components, make layouts in preparation for all required cutting, and make the required cuts.

- Given shop and assembly drawings for a weldment composed of five to ten aluminum components, make a written assembly plan to minimize the possibility of distortion or cracking and execute the assembly plan.
INTEGRATION LINKAGES

Language Arts, Mathematics, English, Algebra, Geometry, Blueprint Reading, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education and Research (NCCER), Secretary’s Commission on Achieving Necessary Skills (SCANS), Professional Development Program (PDP), SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA)
BASIC PRINCIPLES OF WELDING

STANDARD 6.0

Students will make single-and multiple-pass fillet welds and groove welds with backing using a shielded metal arc welding (SMAW) process.

LEARNING EXPECTATIONS

The student will:
6.1 Identify and explain equipment, equipment setup, and electrical current that apply to shielded metal arc welding (SMAW).
6.2 Make single-and multiple-pass fillet welds and groove welds with backing in the flat position.
6.3 Make single-and multiple-pass fillet welds and groove welds with backing in the horizontal position.
6.4 Make single-and multiple-pass fillet welds and groove welds with backing in the vertical position.
6.5 Make single-and multiple-pass fillet welds and groove welds with backing in the overhead position.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:
6.1A Safely set up equipment for shielded metal arc welding.
6.1B Identify and explain SMAW safety.
6.2A Produces a single-pass fillet weld on plain carbon steel in the flat position.
6.2B Produces a multiple-pass fillet weld on plain carbon steel in the flat position.
6.2C Produces a multiple-pass groove weld with backing on plain carbon steel in the flat position.
6.3A Produces a single-pass fillet weld on plain carbon steel in the horizontal position.
6.3B Produces a multiple-pass fillet weld on plain carbon steel in the horizontal position.
6.3C Produces a multiple-pass groove weld with backing on plain carbon steel in the horizontal position.
6.4A Produces a single-pass fillet weld on plain carbon steel in a vertical position.
6.4B Produces a multiple-pass fillet weld on plain carbon steel in a vertical position.
6.4C Produces a multiple-pass groove weld with backing on plain carbon steel in a vertical position.
6.5A Produces a single-pass fillet weld on plain carbon steel in an overhead position.
6.5B Produces a multiple-pass fillet weld on plain carbon steel in an overhead position.
6.5C Produces a multiple-pass groove weld with backing on plain carbon steel in an overhead position.

SAMPLE PERFORMANCE TASKS

- Complete projects to enhance the learning activity. Integrate related academic skills and knowledge to design, lay out, and fabricate a welding project.
- Practice for the Entry-Level Welder Certification.
INTEGRATION LINKAGES

Language Arts, Mathematics, Algebra, Geometry, English, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary’s Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA
BASIC PRINCIPLES OF WELDING

STANDARD 7.0
Students will pad beads and make fillet welds on plain carbon steel in all positions using short-circuit, pulsed-arc, globular, and spray transfer methods of Gas Metal Arc Welding (GMAW) process.

LEARNING EXPECTATIONS
The student will:
7.1 Identify and explain safety procedures, equipment, equipment set up, and electrical current that apply to Gas Metal Arc Welding (GMAW).
7.2 Identify and explain the use of Gas Metal Arc Welding (GMAW) shielding gases and filler metals.
7.3 Pad beads and make acceptable fillet welds on plain carbon steel using short-circuit, pulsed-arc, globular, or spray transfer methods in all feasible positions.
7.4 Comprehend the distinctive features of Gas Metal Arc Welding (GMAW).
7.5 Visually examine the beads and fillet welds for acceptability to American Welding Society QC-10 standards.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET
The student:
7.1A Safely set up equipment for Gas Metal Arc Welding (GMAW).
7.1B Identify and explain Gas Metal Arc Welding (GMAW) safety.
7.1C Identify and explain Gas Metal Arc Welding (GMAW) power sources.
7.2A Identify factors that affect electrode selection.
7.2B Explain the American Welding Society (AWS) filler metal classification system.
7.3A In all feasible positions, pads beads on plain carbon steel using short-circuit, pulsed-arc, globular, and spray transfer methods.
7.3B In all feasible positions, makes a fillet weld on plain carbon steel using short-circuit, pulsed-arc, globular, and spray transfer methods.
7.4A Demonstrates the method(s) of metal transfer used in the Gas Metal Arc Welding (GMAW) process.
7.4B Demonstrates the arc-control and oxidation-prevention processes used with Gas Metal Arc Welding (GMAW).

SAMPLE PERFORMANCE TASKS
- Using the Gas Metal Arc Welding (GMAW) process of welding, complete an assigned project that incorporates design, fabrication, evaluation, and testing. Based on the instructor's decision, the project may incorporate welding processes other than Gas Metal Arc Welding (GMAW).
- Comply with safety rules and regulations in the handling and operation of welding equipment.
INTEGRATION LINKAGES

Language Arts, Mathematics, English IV, Algebra, Geometry, Blueprint Reading, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary’s Commission on Achieving Necessary Skills (SCANS), Professional Development Program (PDP), SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA)
BASIC PRINCIPLES OF WELDING

STANDARD 8.0

Students will pad beads and make fillet welds on plain carbon steel in all positions using Flux-Cored Arc Welding (FCAW) process.

LEARNING EXPECTATIONS

The student will:

8.1 Identify and explain safety procedures, equipment, equipment setup, and electrical current that apply to Flux Cored Arc Welding (FCAW).
8.2 Identify and explain the use of Flux Cored Arc Welding (FCAW) shielding gases and filler metals.
8.3 Pad beads and make acceptable fillet welds on plain carbon steel using the Flux-Cored Arc Welding (FCAW) process in all feasible positions.
8.4 Comprehend the distinctive features of Flux Cored Arc Welding (FCAW).
8.5 Visually examine the beads and fillet welds for acceptability to American Welding Society QC-10 standards.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

8.1A Safely sets-up equipment for Flux Cored Arc Welding (FCAW)
8.1B Identifies and explains Flux Cored Arc Welding (FCAW) safety.
8.1C Identifies and explains Flux Cored Arc Welding (FCAW) power sources.
8.2A Identifies factors that affect electrode and shielding gas selection.
8.2B Explains the American Welding Society (AWS) filler metal classification system.
8.3A In all feasible positions, pad beads on plain carbon steel using Flux-Cored Arc Welding (FCAW) process.
8.3B In all feasible positions, makes a fillet weld on plain carbon steel using Flux-Cored Arc Welding (FCAW) process.
8.4A Demonstrates the method(s) of metal transfer used in the Flux Cored Arc Welding (FCAW) process.
8.4B Demonstrates the arc-control and oxidation-prevention processes used with Flux Cored Arc Welding (FCAW).
8.4C Explains self-shielded and gas shielded Flux Cored Arc Welding (FCAW).

SAMPLE PERFORMANCE TASKS

- Using the Flux Cored Arc Welding (FCAW) process of welding, complete an assigned project that incorporates design, fabrication, evaluation, and testing. Based on the instructor's decision, the project may incorporate welding processes other than Flux Cored Arc Welding (FCAW).
- Comply with safety rules and regulations in the handling and operation of welding equipment.
INTEGRATION LINKAGES

Language Arts, Mathematics, English, Algebra, Geometry, Blueprint Reading, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary’s Commission on Achieving Necessary Skills (SCANS), Professional Development Program (PDP), SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA)
BASIC PRINCIPLES OF WELDING

STANDARD 9.0

Students will pad beads and make fillet welds on various metals in all positions using a Gas Tungsten Arc Welding (GTAW) process.

LEARNING EXPECTATIONS

The student will:

9.1 Identify and explain safety procedures, equipment, equipment setup, and electrical current that apply to Gas Tungsten Arc Welding (GTAW).

9.2 Identify and explain the use of Gas Tungsten Arc Welding (GTAW) shielding gases and filler metals.

9.3 Pad beads and make acceptable fillet welds on various metals using a Gas Tungsten Arc Welding (GTAW) process in all feasible positions.

9.4 Comprehend the distinctive features of Gas Tungsten Arc Welding (GTAW)

9.5 Visually examine the beads and fillet welds for acceptability to American Welding Society QC-10 standards.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

9.1A Safely sets up equipment for Gas Tungsten Arc Welding (GTAW).

9.1B Identifies and explain Gas Tungsten Arc Welding (GTAW) safety.

9.1C Identifies and explains Flux Cored Arc Welding (Gas Tungsten Arc Welding (GTAW) power sources.

9.2A Identifies factors that affect filler metal and shielding gas selection.

9.2B Explains the American Welding Society (AWS) filler metal classification system.

9.3A In all feasible positions, pads beads on carbon steel, stainless steel, and aluminum using a Gas Tungsten Arc Welding (GTAW) process.

9.3B In all feasible positions, makes a fillet weld on carbon steel, stainless steel, and aluminum using a Gas Tungsten Arc Welding (GTAW) process.

9.4A Explains arc-control and oxidation-prevention processes used with Gas Tungsten Arc Welding (GTAW).

9.4B Explains the process and necessity of purging certain metals to prevent oxidation.

9.5 Visually examines the beads and fillet welds for acceptability to American Welding Society QC-10 standards.

SAMPLE PERFORMANCE TASKS

- Using the GTAW process of welding, complete assigned projects that incorporates design, fabrication, evaluation, and testing. Based on the instructor's decision, projects may incorporate welding processes other than GTAW. Projects should include welding on carbon steel, stainless steel, and aluminum.

- Comply with safety rules and regulations in the handling and operation of welding equipment.

- Practice GTAW welding for AWS tests on coupons of carbon steel, stainless steel, and aluminum.
INTEGRATION LINKAGES
Language Arts, Mathematics, English, Algebra, Geometry, Blueprint Reading, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary’s Commission on Achieving Necessary Skills (SCANS), Professional Development Program (PDP), SkillsUSA, Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA)