Welding

Nebraska Career Development Event
Handbook and Rules for 2024-2027

1. PURPOSE

The Nebraska Welding Career Development Event is designed to promote and create an interest in welding by providing opportunities for recognition through evaluation of the contestants' manipulative skills and general knowledge. These skills and knowledge correlate to the students' preparation for employment in the broad field of welding, including agricultural and industrial welding.

AFNR courses that may align to Welding include: Power, Structure, & Technical Systems, Metals & Fabrication, Basic Welding, Advanced Welding, Agriculture Mechanics, and others.

2. OBJECTIVES

Contestants will demonstrate their ability to perform jobs and skills that are reflective of those required in the welding industry. The contest will consist of a hands on component and a general knowledge component. Specific competency areas will include the following:

1. Demonstrate an understanding of the need for shop safety and rules governing the use of equipment.
    a. Understand the main hazards that are possible in the shop setting.
2. Observe proper dress and use of personal protective equipment.
    a. Understand and be able to demonstrate proper handling and storing of materials. Students should have an understanding of gases used, how they are safely transported and stored.
3. Demonstrate proper machine and tool safety and operation.
    a. Assessment on safety and equipment operation on the written test. Students will not be scored but can be disqualified on demonstrating welding safety.
4. The student will use common measurement systems and read blueprints using welding symbols.
    a. Students will use a ruler/tape measure to follow the welding blueprint and create the weld.
    b. Students will be assessed on correct measurements given on blueprints and performed on their welds.
    c. Students will be assessed from the blueprint given and interpreted into the weld turned in.
5. Using the references below, students will use objectives from the resources.
    a. Students will be tested on their knowledge of their welding process (SMAW, GMAW, OFW and GTAW).

Each welder will be tested on each standard or benchmark in their specific area (OA, SMAW, GMAW, GTAW) these standards will also be assessed through their weld demonstration.

a. Demonstrate their individual Welding Processes: There are 4 processes described as competency areas for the contestants. They are SMAW, GMAW, GTAW and OFW.
b. Demonstrate welds on mild steel
c. Be able to use a variety of filler metals
d. Students should be able to weld the following positions and joints: Contestants will weld in the flat (1G and 1F), horizontal (2G and 2F), vertical (3G and 3F)
e. Students should be able to perform the following possible joint configurations: square butt or prepared groove, lap and T fillet, pipe to plate or pipe to pipe joints.
f. Students should be able to use a variety of welding equipment/machines: Welding equipment may be obtained from a variety of sources and may include transformer, transformer/rectifier, and/or inverters.

3. ELIGIBILITY

This event is open to students in grades 9-12. Schools can qualify a team (although those welders that qualify that district team do not need to be the same welders for the state team) through their district contest. The top 5 schools from each district may qualify a team for the state CDE. If a school qualifies more than one team their second team falls out of the top 5 and the 6th team

moves up. Students may participate in the event if their team wins the state championship by participating in a different welding area.

4. REQUIRED ATTIRE

ZERO TOLERANCE POLICY: Students who do not have all their own required welding and safety equipment will not be allowed to register or participate in any part of the welding event.

Each student must bring to the competition all items listed in Section 5.

Contestants that do not wear safety glasses will not be able to participate in the lab part of the welding event.

5. REQUIRED SUPPLIES AND EQUIPMENT

ZERO TOLERANCE POLICY: Students without their own required supplies will not be able to participate in the event.

Each student must bring to the competition:

1. All PPE (Personal Protective Equipment)
   a. Safety glasses (approved ANSI Z87 with side-shields). Safety glasses must be worn at all times while in the welding lab (this includes under the welding helmet).
   b. Welding helmet/face shield/goggles with appropriate #5 - #7 filter lenses for the OFW processes
   c. Welding helmet with appropriate #10 - #12 filter lenses for the AW processes
   d. Leather gloves
   e. Appropriate leather or fire-retardant cloth welding jacket with full length sleeves. No Exceptions. Only fire resistant rated jackets (no coveralls) are permitted.
   f. High top leather shoes or boots. (No tennis shoes or sport shoes)
   g. Full-length cotton jeans with no holes or frays.
2. Tools
   a. Tape measure
   b. Magnetic Square
   c. Soap Stone
   d. Combination Square
   e. Chipping hammer (SMAW)
   f. Wire Brush (SMAW)
   g. Metal Pliers

No unauthorized notes, printed material or tools are permitted - violators could be disqualified.

6. EVENT SCHEDULE

Welding participants will meet in rooms V103 and V104 for registration. The rooms are located by the SCC Registration near the east entrance.

Each division will involve a 30 minute written test and a 30 minute skill test. A 10 minute orientation for each division will also be included, for a total of 70 minutes per event division. Safety will be a big part of the event and will be emphasized at all times.

7. ANNUAL THEME

There is no annual theme for this event.

8. EVENT FORMAT

Overview - Contestants will be supplied plan sets at the contest site which outline the hands- on portion of the contest. These plan sets will be basic, three view, shop drawings which incorporate welding symbols and procedures. Contestants will be required to interpret the drawings and weld symbols to configure their projects following the described welding symbols, procedures and measurements. Projects will be submitted at the end of the prescribed time period for evaluation by the judges.

Orientation: 10 minutes

Written Examination: 30-minute time limit

An exam will be distributed for **SMAW/MIG/OA and GTAW**.

1. Questions: 25 questions worth 2 points each
2. Types of questions: True & False and/or Multiple Choice Questions
3. Question areas:
    a. Safety, Equipment
    b. Set Up, and Electrodes/Flames/Wire
    c. Welding Power Sources
    d. Procedures
    e. Terms and Definitions (see resource list by specific area)

Practicum: 30 minute time limit

Students will participate in one of four welding areas: SMAW/MIG/OA/GTAW

Shielded Metal Arc Welding

Weld joints: Butt, Lap, T joint, Inside Corner Joint Weld types: Square Groove and Fillet
Welds Weld positions: Flat, Horizontal, Vertical Down, Vertical Up, around pipe Material thickness: 3/16"- 1/4"
Base metal type: Mild Steel
Electrodes: Diameters = 3/32" or 1/8", E6010, E6011, E6013, E7014, or E7018 Power Source: Combination AC- DC

Oxygen Acetylene Welding

Weld joints: Butt, Lap, T Joints, Inside Corner Joints, around tubing or pipe
Weld types: Square Groove and Fillet Welds
Weld positions: Flat, Horizontal, Vertical Up

Material thickness: 3/32"- 1/8"
Material Type: Mild Steel
Filler metal:

- Mild Steel - 3/32"
- Diameter - RG-45
- Coated Braze Welding Rod - 3/32" Diameter

Gas Metal Arc Welding

Weld Positions: Flat, Horizontal, and Vertical (down),vertical up,

Weld joints: Butt, Lap, Inside Corner, and T Joints around pipe or tubing
Weld types: Groove & Fillet Welds
Material thickness: 1/8" to 1/4"
Base Metal Type: Mild Steel
Shielding gas type: C25

Gas Tungsten Arc Welding

Weld Positions: Flat, Horizontal, and Vertical (down), vertical up

Weld joints: Butt, Lap, Inside Corner, and T Joints around pipe or tubing Weld types: Groove & Fillet Welds
Material thickness: 16 gauge or 3/32" or 1/8" or ¼" Base Metal Type: Mild Steel
Shielding gas type: Argon

9. SCORING

Team Scoring	Exam	Score
Exams	50	200
GMAW Welder	50	150
OA Welder	50	150
SMAW Welder	50	150
GTAW Welder	50	150
Total team score	200	800

After a warning, the sponsoring school reserves the right to remove any contestant that violates accepted safety practices that endanger him/her or others in the contest.

Any observed communications other than with the judges may result in disqualification of the individual or team.

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10. TIEBREAKER

a) Written Test for individual
b) Highest Practicum scores for team

11. RESOURCE MATERIALS

It's recommended that students use the following materials in preparation for the event:

a. Instructional Videos by Dan Zabel at Southeast Community College:

- Mig Setup 1
  https://go.unl.edu/mig1
- Mig Setup 2
  https://go.unl.edu/mig2
- SMAW Setup
  https://go.unl.edu/smaw
- O/A Setup
  https://go.unl.edu/oa

b. Primary Resource for Exam:

- Modern Welding by Althouse, Turnquist, Bowditch, and Bowditch - The Goodheart- Willcox Company, Inc.- Tinley Park, Illinois.

1. Shielded Metal Arc Welding (SMAW) (Chapter 5 and 6)
2. Oxy Fuel Welding (OFW) (Chapter 4, 11-16)
3. Gas Metal Arc Welding (GMAW) (Chapter 7-9)
4. Gas Tungsten Arc Welding (GTAW) (Chapter 8)
5. Safety (Chapter 1)
6. Blueprint Reading (Chapter 2 and 3)
7. Project Layout (Chapter 2 and 3)

c. Secondary Resources:

- See the NE Ag Ed Google classroom or CDE resource file for additional resources.

d. See Appendix 1: Sample Rubric.

12. PAST EXAMS

Past exams are not available for this event.

13. POST-CDE DEBRIEFING OPPORTUNITY

Teachers and students can tour the Southeast Community College welding facilities during State Convention by contacting the superintendents. Following the competition, welds may be picked up from 3:00 - 5:00 p.m. the day of the event. Pictures can be taken of welds and welders at this time. Students will be able to pick up welds if the scoring of the welds has been completed. Teachers and students will be able to get copies of the welding plans. No pictures or copies of the test can be taken.

Appendix 1. Sample Welding Rubric

This rubric is provided as a courtesy to help instructors coach students. Rubrics will not be completed at the state CDE.

DEFECTS	POINTS
Incorrect Start of Bead	-1
Arc Strikes Out of Weld Zone	-2
Incorrect Bead Height or Throat Zone	-4
Continuity of Bead Height	-2
Excessive Penetration	-3
Insufficient Penetration	-3
Flux Inclusion	-10
Porosity (Surface or Internal)	-5
Undercut	-4
General Appearance	-1 to -5
Whiskers or Filler Wire Stubs (MIG, TIG, OAW)	-5
Incorrect Weld Bead Profile	-10
Cracks	-25
Weldment Dimensions Incorrect	-25
Improper Finish or Bead	-1