Welding
State 4-H O-Rama – Senior 4-H’ers
Agriculture Systems Technology Management

OVERVIEW
The welding contest is designed to give youth an opportunity to demonstrate their knowledge and skills in arc welding. Safety will be stressed throughout the contest.

TARGETED LIFE SKILLS
Provided through this project area include: Wise use of resources, planning/organizing, goal setting, critical thinking, problem solving, decision making, learning to learn, self-esteem, leadership, cooperation, social skills, time management, career exploration

OBJECTIVES
1. To show skill(s) in the safe handling and application of Arc Welding, equipment and supplies.
2. To show skills in selecting and utilizing Arc Welding equipment and supplies.
3. To show skills in making a weld bead in the flat position, a square groove welded, butt joint in the flat position, and fillet welded, corner joint in the vertical position - up direction.

ELIGIBILITY
Each county may enter no more than two senior 4-H members in the 4-H Welding contest at the Arkansas 4-H O-Rama. No individual who has previously won first place in this activity is eligible to compete. Scores of the competitors will be ranked individually.

ACTIVITY
This contest will include (time limits as shown):
1. Written Examination (20 minutes)
2. Shielded Arc Metal Welding skills event (30 minutes)
3. Identification (15 minutes)

Designated judges will preside over the event and their decisions will be final.

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<td>SMAW Skills Event</td>
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Event No. I - Written Examination
Will consist of 25-30 multiple choice, true-false and/or fill in the blank questions. Included will be questions on safety, equipment, methods, power sources, weld types and weld quality. The questions will be based on the reference source: Arcs and Sparks, Shielded Metal Arc Welding (4-H 573) from The Ohio State University Extension. The reference materials can be obtained from the 4-H State Office or directly from Ohio State University Extension.

Rules:
1. Four penalty points will be given for each question answered incorrectly or unanswered.
2. Time limit is 20 minutes.

Scoring: Number of Questions Missed x 4 = Penalty Points

Event No. II - SHIELDED METAL ARC WELDING CONTEST (SMAW Skills)
For the SMAW skills event each welding contestant will demonstrate their SMAW ability by making two of the following welds: a 3" long bead on plate weld, a 3" long double square groove weld and a 3" long fillet weld. Welding will be done using a Shielded Metal Arc Welding Power Source and 1/8" diameter, AWS type E-6011 electrodes. The power sources, base metal, electrodes and fully equipped welding stations will be provided. Each contestant will be given a copy of Welding Procedure for Event No. II - SMAW SKILLS for study and use during event II.

NOTE: Each contestant will be suitably attired for SMAW, by wearing industrial quality eye protection, long sleeve shirt, long pants and high top foot protection (no athletic foot wear). Gauntlet leather welding gloves and welding helmets with a #10 filter plate will be provided but any welding contest participant may bring and use their own welding equipment. Contestants wearing shorts, short sleeved shirt or any inappropriate clothing or footwear will not be permitted to weld. Industrial quality eye protection (clear or shaded) will be worn in the contest area where the Weldment is being created and especially under the welding helmet during welding.

Rules:
1. One penalty point will be given for each evaluation point missed (100 - total evaluation points awarded).
2. Time limit is 30 minutes.

Scoring: Evaluation Points Missed x 1 = Penalty Points

Event No. III – Material & Parts Identification
The proper identification of welding industry items will consist of 10 materials, tools, and/or parts to be identified by each contestant. There will be a predetermined list of materials, tools, and parts used for the contest (attached). The resource materials listed below will assist in the study process for this event.

SUGGESTED RESOURCES

4-H Arcs and Sparks, Shielded Metal Arc Welding (4-H 573) from the Ohio State University Extension.

AWARDS

The high-point individual will receive a trophy. Individuals scoring second-, third-, fourth-, and fifth-place will receive ribbons. All others will receive participation ribbons.
PREPARED BY

Committee Members:
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Keith Gresham – CEA Dallas Co.
Les Walz – CEA Cleveland Co.
Adam Willis – CEA Newton Co.

NATIONAL YOUTH SHIELDED METAL ARC WELDING CONTEST PROCEDURE for Event No. II - SMAW SKILLS
1. To show skill(s) in the safe handling and application of SMAW equipment and supplies.
2. To show skills in selecting and utilizing SMAW equipment and supplies.
3. To show skills in making a weld bead in the flat position (1G), a square groove welded butt joint in the flat position (1G) and fillet welded, corner joint in the vertical position -up direction (3F-Up).

Material and Equipment:
1. Metal - 3 pieces 3 inches x 3 inches
   2 pieces 2 inches x 3 inches
2. Filler metal - 1/8 inch diameter E6011 electrodes
3. Safety equipment (eye, face, hand, and body)
4. SMAW power source and equipment
5. Chipping hammers with wire brush
6. Combination and Vise-Grip™ pliers
7. Cooling and stub buckets
8. Welding table
Procedure:

1. Determine that the low carbon steel base metal (1/4 inch thick) and filler metal (E-6011 electrode, 1/8 inch diameter) are sufficient and suitable for use.
2. Check the set-up of the SMAW power source and equipment. If not operating properly, ask for assistance.
3. Set the arc welding current selector of the power source to a value based upon the low carbon steel base metal thickness and the electrode (diameter) selected (use either 90, 105 or 120 AMPS). Use a 3x3 piece of base metal for setting power source and practicing welding.
4. Insert the electrode into the electrode holder at a 90° angle.
5. Start the arc by striking the electrode like a match. Using the backhand welding technique maintain a travel angle of 10° - 30° with an "effective" work angle of 90°.
6. Hold a constant arc length (1/8 inch or equal to the diameter of the electrode core wire).
7. Use a uniform travel speed, ripples (with slag removed) will show a half moon or crescent shape.
8. Bead width, including the slag cover, should be approximately 2 but less than 3 electrode (coating) diameters wide.
9. When stopping the weld, raise the electrode slowly and go back over about 1/2 to 3/4 inch of the weld, then lift the electrode to extinguish the arc. This technique will provide filler metal to fill the weld crater as the weld pool solidifies.
10. After running a sample bead on your test plate; readjust the current selector, as necessary. If the electrode sticks to the base metal, increase the current setting. If the electrode spatters too much and the crater becomes too large, then decrease current setting.
11. For the Weld Bead, make a single pass across one 3x3 piece of base metal. The weld bead should be 2 1/2 inches long. The weld bead is to be made in the flat or 1G position. Make the weld after you have tacked the pieces together for the groove weld. See illustration.
12. For the Groove Welded, Butt Joint, space 2 pieces of 3x3 base metal, 1/16 to 1/8 inch apart or equal to the electrode core wire diameter. Then without changing the space between the two
pieces of base metal; tack weld both pieces of base metal together in the flat or 1G position. See illustration.

13. Now, make one pass on each side of the butt joint using the welding technique of Para 5 above. Before making the pass on the second side; clean the side, removing all slag at the root.

14. Hold the proper arc length (approximately 1/8 inch) with the arc pushed halfway into the groove. Travel fast enough to keep the arc at the front edge of the weld pool.

15. Allow the completed square groove weld to cool.

16. For the Fillet Welded, Corner-Joint, tack weld the 2 inch ends of the 2 pieces of 2x3 base metal to the middle of the 3x3 base metal (without the weld bead) forming a corner joint. See illustration.

17. Now, make a single pass fillet weld progressing vertically uphill (3F-up). Use the back hand welding technique with a slight weaving motion or using a whipping motion. Maintain a travel angle of 0E-10E with a work angle of 45E. Start the weld a 1/2 inch above the lower piece of base metal.

18. Hold a short arc length (no more than a 1/8 inch). Travel fast enough to keep the arc at the front edge of the weld pool and the weld pool under control.

19. Allow the completed weldment to cool. There should be three welds on the weldment - a weld bead, a double square groove weld and a single fillet weld.

20. Clean all welds with a chipping hammer and wire brush. Also, clean up all unused electrodes, electrode stubs and any other waste material by properly disposing of these items in the stub bucket.

21. Once the weldment has been cooled and cleaned, submit the weldment to your judge for evaluation.
ARKANSAS 4-H SHIELDED METAL ARC WELDING CONTEST
Event No. II - SMAW Skills

Evaluation:

Participant’s Name_____________________________________ County ____________________

<table>
<thead>
<tr>
<th>Considerations Comments</th>
<th>Possible Points</th>
<th>Weld: Bead/Groove/Fillet Points Earned</th>
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<tbody>
<tr>
<td>1. Bead Width</td>
<td>1</td>
<td>______ / ______ / ______</td>
</tr>
<tr>
<td>2. Bead Height</td>
<td>1</td>
<td>______ / ______ / ______</td>
</tr>
<tr>
<td>3. Appearance - smooth &amp; uniform</td>
<td>1</td>
<td>______ / ______ / ______</td>
</tr>
<tr>
<td>4. Face of weld - slightly convex, free of porosity and free of excessive reinforcement</td>
<td>1</td>
<td>______ / ______ / ______</td>
</tr>
<tr>
<td>5. Edge of bead – no overlapping or undercutting</td>
<td>1</td>
<td>______ / ______ / ______</td>
</tr>
<tr>
<td>6. Start and Stop – full size</td>
<td>1</td>
<td>______ / ______ / ______</td>
</tr>
<tr>
<td>7. Followed Welding Procedure</td>
<td>2</td>
<td>______ / ______ / ______</td>
</tr>
<tr>
<td>8. Safety Practice</td>
<td>2</td>
<td>______ / ______ / ______</td>
</tr>
</tbody>
</table>

Subtotal 10 ______ / ______ / ______

Weighting factor X 2 X 4 X 4

Total ______ / ______ / ______
WELDING PARTS & EQUIPMENT IDENTIFICATION

Score: __________  
Name: __________________________  
County: __________________________

Instructions All Contestants: Write the tag number on the line to the left of the most correct name for each part.

_____ Flat Soap Stone  
_____ Arc Welding Power Source  
_____ C-Clamp  
_____ Work piece Connection (Ground Clamp)  
_____ Electrode Holder  
_____ 7" Angle Grinding Wheel  
_____ Stringer Bead  
_____ Tee Joint  
_____ E-6013 Electrode  
_____ Electrode Lead  
_____ Framing Square  
_____ Clear Cover Plate Lens  
_____ Gauntlet Leather Welding Gloves  
_____ Welding Jacket or Sleeves  
_____ Hand-Held Welding Shield  
_____ Industrial Quality Safety Glasses  
_____ Industrial Quality Safety Goggles  
_____ Arc Weld Gauge  
_____ Speed Square  
_____ Welding Shield or Curtain  
_____ Angle Grinder  
_____ 14" Chop Saw Blade  
_____ E-7018 Electrode  
_____ Locking Plier (Vise-Grip)  
_____ Ball Pein Hammer  
_____ Flat Soap Stone Holder  
_____ Power Switch  
_____ Chop Saw  
_____ Welding Cap  
_____ Tape Measure  
_____ Flat Butt joint  
_____ E-6010 Electrode  
_____ ABC Fire Extinguisher  
_____ Power Cord  
_____ Combination Square  
_____ Lap Joint  
_____ Polarity Switch  
_____ Rod Stub Bucket  
_____ #10 Filter Shade Lens  
_____ Tack Weld  
_____ Amperage Output Gauge  
_____ Ground Lead  
_____ Wire Brush  
_____ Round Soap Stone Holder  
_____ Ear Protection  
_____ Fillet Weld  
_____ E-6011 Electrode  
_____ Leather Rod Pouch  
_____ Tongs  
_____ Magnetic Torpedo Level  
_____ Round Soap Stone  
_____ Slip-Joint Pliers  
_____ Spring Handle Chipping Hammer  
_____ 4 ½" Angle Grinding Wheel  
_____ Bench Grinder  
_____ Hack Saw  
_____ Automatic Welding Helmet  
_____ Welding Helmet with Flip Front  
_____ Cross Pein Hammer