# WELDING

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

**State 4-H O-Rama**

**Senior 4-H'ers**

## 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 horizontal (2F) position with E7018 Electrodes.

## 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 *(60 minutes)*
3. Identification *(15 minutes)*

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

| EVENTS | POINTS |
|---|---|
| Written Examination | 25 points |
| SMAW Skills Event | 50 points |
| Identification Test | 25 points |

**Event No. I - Written Examination**

Will consist of 25 multiple choice questions. Included will be questions on safety, equipment, methods, power sources, reading a 1/16 ruler, weld types and weld quality. The questions will be based from a Test Bank. Please contact your local extension agent for this resource document.

**Rules:**

Time limit is 20 minutes.

**Scoring:** 1 point per question

**Event No. II - SHIELDED METAL ARC WELDING CONTEST (SMAW Skills)**

# SMAW 2F Fillet Weld Procedure Using 1/8" 7018 Electrode

## Welding Procedure Specification (WPS) Overview

Welding Process: SMAW (Shielded Metal Arc Welding) Joint Type: Tee Joint

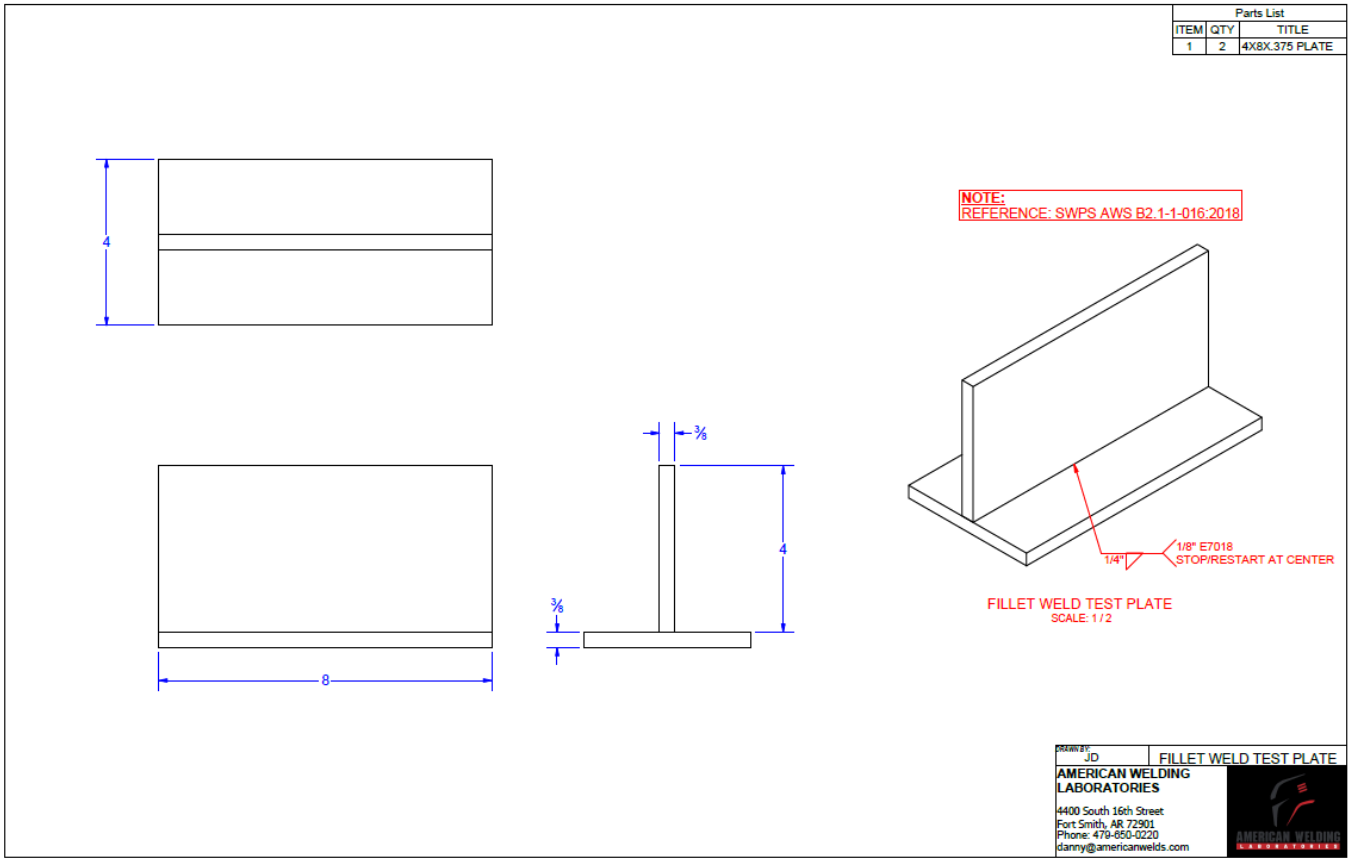
Weld Type: 2F Fillet Weld (horizontal position) Electrode: E7018 (low-hydrogen, iron powder electrode) Polarity: DCEP (Direct Current Electrode Positive)

Base Material: Mild steel (e.g., ASTM A36) Thickness: Typically, 3/8" to 1/2"

Preheat: As required (typically 50–150°F for mild steel) Interpass Temp: < 300°F

**Step-by-Step Welding Procedure**

1. Preparation
    - Clean all surfaces of rust, oil, paint, and mill scale.
    - Ensure a tight fit-up with no gaps at the tee joint.
    - Clamp the pieces securely to avoid distortion.
2. Electrode Setup
    - Use E7018 electrodes, 1/8" diameter recommended.
    - Store electrodes in a rod oven at ~250°F to prevent moisture absorption.
3. Machine Settings
    - Amperage: 110–130 A (depending on electrode size and material thickness)
    - Polarity: DCEP
    - Arc Length: Short arc (about the diameter of the electrode)
4. Welding Technique
    - Use a drag (backhand) technique with a 5–15° travel angle.
    - Maintain a steady travel speed to ensure consistent bead profile.
    - Use a slight weaving motion if needed to fill the joint adequately.
5. Stop and Restart (Mid-Weld)
    - Stopping:
        - Taper off the weld by reducing travel speed slightly.
        - Back-step slightly to fill the crater and avoid a crater crack.
        - Chip and brush the end of the weld to remove slag and prepare for restart.
    - Restarting:
        - Strike the arc slightly ahead of the crater.
        - Move back into the crater to remelt and tie in the weld.
        - Pause briefly to fill the crater, then resume normal travel speed.
        - Feather the restart area with a grinder if needed before continuing.
6. Post-Weld
    - Allow the weld to cool slowly.
    - Clean slag thoroughly with a chipping hammer and wire brush.
    - Visually inspect for defects (undercut, porosity, overlap).
    - Prepare for break as per test standard.




***NOTE:*** Each contestant will be suitably attired for SMAW, by wearing industrial quality eye protection, a long sleeve shirt, long pants and high-top foot protection (no athletic footwear). 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.

Criteria for Acceptance (5pts each)

- Uniform appearance on the bead face
- Craters and restarts filled to the full cross section of the weld
- Uniform weld size plus or minus 1/16 of an inch
- Acceptable weld profile in accordance with AWS D1.1
- Smooth transition with complete fusion at the toes of the weld
- No porosity
- No excessive undercut
- No inclusions
- No cracks
- No overlap

**Rules:**

Time limit is 60 minutes.

**Scoring:**

**Event No. III – Material & Parts Identification**

The proper identification of welding industry items will consist of 25 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.

**Rules:**

Time limit is 15 minutes

## AWARDS

1st through 5th place contestants will receive a banner.

# Welding Certification

After the welding contest, there will be an opportunity to earn a welding certification. If you are interested in getting certified, stay after the contest. You will duplicate the same weld you performed during the contest. If it passes a visual inspection, it will then undergo a break test and be evaluated according to American Welding Society (AWS) criteria by a Certified Welding Inspector. If your weld meets AWS break test standards, you will receive a welding certification for that weld.

## PREPARED BY

Committee Members:

| | |
|---|---|
| Anna Barnett - | CEA Fulton County |
| Gerald Hewitt - | CEA Montgomery County |
| Ronnie Horn - | CEA Washington County |
| Priscella Thomas-Scott- | 4-H Events Coordinator |

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