

STEM Welding

This category helps 4-H'ers learn the basics of welding. In addition, 4-H'ers get the opportunity to present their knowledge on the topic and display what they have made. Involvement in STEM Welding gives participants a first-hand experience in a skill that can be used for a lifetime. For help getting started with this project contact your county 4-H office.

Rules

1. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
2. All welds exhibited in class 1 or 2 must be mounted on a 12 inches high x 15 inches long display board of thickness not to exceed 3/8 inch. Attach each weld on a wire loop hinge or equivalent, so the judge can look at the bottom side of the weld when necessary. Each weld should be labeled with information stated 1) type of welding process (stick, MIG, TIG, Oxy-Acetylene, etc.) 2) kind of weld, 3) welder setting, 4) electrode/wire/rod size, and 5) electrode/wire/rod ID numbers. **Attach a wire to display board so it can be hung like a picture frame. No picture frame hangers accepted.**
3. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
4. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
5. Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: what you learned. All reports should include 4-Her name and county, be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.
6. If no plans are included with welding art, welding article, welding furniture or composite weld project item will be disqualified.
7. All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.

See General Rules.

Eligibility - All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.

Quota - Maximum of 1 entry per class. Each individual is limited to one exhibit per class.

Scoresheets, forms, contest study materials, and additional resources can be found at <http://go.unl.edu/ne4hwelding>.

Divisions - Arcs and Sparks

- **H920001 - Welding Joints** - (SF281) - a display of one butt, one lap and one fillet weld.
- **H920002 Position Welds** - (SF281) - a display showing three beads welded in the vertical down, horizontal and overhead positions.
- **H920003 – Welding Art – (SF283)** – any art created using tack welds to hold the metal pieces together (examples include horseshoe projects). Type of welder, welder settings, all plans, plan

alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.

- **H920004 - Welding Article** - (SF281) - any shop article where welding is used construction. 60% of the item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish because project may be displayed outside.
- **H920005 - Welding Furniture** - (SF282) – any furniture with 75% welding is used in the construction. 60% of the item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. **Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article.** Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish because project may be displayed outside.
- **H920006 - Plasma Cutter/Welder Design** - (SF279) – Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4-H members will create a notebook describing the design process to create the "artwork" to butt cut into metal. In the notebook include:
 - A photo (front and back) of the finished project.
 - Instructions on how the design was created (include software used), this allows for replication of the project.
 - Lessons learned or improvements to the project.
 - Steps to finish the project.
- **H920007 - Composite Weld Project** - (SF280) - 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. **Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article.** Protect plans with a cover. If project is designed to be outside, it is required to have an appropriate outdoor finish because project may be displayed outside.

Rules

1. Class 1: 4-H Welding Project Tips and Suggestions

1. All welds should be made with the same electrode/wire/rod size and number.
2. Welds should be made only on one side of metal so penetration can be judged.
3. Welds should be cleaned with a chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.
4. It is suggested that all welds be of the same size and thickness as metal. These pieces, referred to as coupons, should be 1.5 to 2 inches wide and 3.5 to 4 inches long. A good way to get this size is to buy a new cold rolled strap iron and cut it to length. The extra width is needed to provide enough metal to absorb the heat from the welding process and prevent the coupons from becoming too hot before the bead is completed. Narrower coupons will become very hot, making an average welder setting too cold at the bead start, just about right in the middle, and too hot at the end. The correct way to weld narrow strips is to make short beads and allow time to cool, however this project requires a full-length bead.
5. Stick welding: Suggested coupon thickness - 1/4 inch if using 1/8 inch rod. Suggested rod-AC and DC straight or reverse polarity- first E-7014, second E-6013
6. MIG welding: Suggested coupon thickness - 1/4 inch if using .035 wire and 1/8 inch if using .023 wire
7. Oxy-Acetylene: Suggested coupon thickness - 1/8 inch. Suggested rod– 1/8 inch mild steel rod 4-H

2. Class 2 Welding Project Tips and Suggestions

1. It is suggested that all welds be of the same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4 inches x 4 inches or on individual coupons that are about 2 inches x 4 inches and $\frac{1}{4}$ inch thick. Suggested rods for this class of position welds for AC and DC straight or reverse polarity is, first E-6013, second E-7014 and E-6010 for DC reverse polarity only.
2. Welds should be cleaned with a chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.
3. 4-H Welding Project Tips and Suggestions: Class 3 & 4 1. All welds should be cleaned and protected from rust with paint or light oil. Plans are to be complete enough that if they were given to a welding shop, the item could be made without further instructions. Bill of materials should include a cost for all items used including steel, electrodes, paint, wheels, etc.

Resources STEM: Welding

Learn to cut metal with an arc solder; Weld high carbon, spring steel and alloy steels; Weld horizontal, vertical and overhead positions

URL: https://4hcurriculum.unl.edu/index.php/main/program_project/143