



Planning Arc Welding Projects

Missouri 4-H Youth Development Programs

The arc (electric) welder is a valuable addition to the home shop, even though it is somewhat expensive compared with other shop equipment and requires a little more skill for its operation. The Arc Welding Project is designed so that members can enroll for several years in the project, advancing as their interest develops and changes. This planning guide should be used with members' manual Y 8460, *Arcs and Sparks*.

To help the leader organize meetings, this publication is divided into two levels with four sections per level. Members can become better prepared for the future by the experience of keeping records, preparing and giving demonstrations, and building projects for home and exhibition.

Objectives of the project

The Arc Welding Project helps youths to:

- learn major uses of an arc welder;
- learn to adjust current, strike an arc and run a bead;
- understand and practice rules for safe operation of welding equipment;
- develop personal leadership, decision-making, communication and other important life skills; and
- acquire an understanding of the vocational opportunities in the welding field.

Becoming an Arc Welding Project leader

The most important prerequisite for becoming a successful 4-H project leader is a liking for working with young people. Your basic role as an Arc Welding Project leader will be to help your members acquire the knowledge, skills and experience necessary to do arc welding.

You are not expected to be able to answer all questions! Materials and training from University Outreach and Extension specialists will be helpful. Resource people such as community leaders, vocational teachers and owners of welding shops and industrial equipment stores are often willing to help you.

Challenge

An effective 4-H leader facilitates group learning. In a group setting, 4-H members can learn things that they would not learn alone. Rather than dictate, a good leader guides members as they determine their goals for the project. Flexibility is important in your planning because individual 4-H members learn at different rates.

Learning by doing is the 4-H teaching philosophy. Help your members get actively involved in learning by using techniques such as judging, demonstrating, exhibiting and field trips.

Your challenge is to help youths develop basic life skills that will al-

low them to become happy and productive adults. These life skills include:

- a healthy self-concept and feelings of self-worth;
- ability to interact effectively with others;
- decision-making, thinking and reasoning abilities;
- sound physical development; and
- practical skills for living.

Excellent resources on teaching techniques, life skills and other aspects of 4-H are available at your local University Outreach and Extension center.

Specific arc welding teaching techniques

You can include the following things to make, exhibit or demonstrate.

- Demonstrate the proper use of clothing.
- Demonstrate several beads showing low, high and correct temperature settings.
- Cut designs in sheet metal.
- Make butt welds and fillet welds.
- Repair items by soldering.
- Make practical items needed for home use and exhibition. (for example: foot scraper, tree stand, chipping hammer, saw horse, portable dollies).

Possible tours

Tours can help 4-H members in your project learn by seeing. Try to arrange visits to a:

- welding shop;
- welding supplier;
- hardware store; and
- welding department.

Arc welding safety precautions

When teaching or actually arc welding, be careful! As a project leader you should teach your members to observe the following safety precautions.

- Never look at welding arc with the naked eye.
- Always use a helmet or face shield that is in good condition.
- Replace any cracked or poor-fitting lenses in the helmet or shield.
- Wear suitable clothing to protect all parts of the body from spatter and arc burns, which can be more painful than a sunburn.
- Do not strike an arc or weld until you are sure those in the vicinity have protective equipment or will look in the other direction.
- Do not weld around combustible materials.
- Do not pick up hot metal.
- Do not weld in confined spaces without adequate ventilation.
- Change the welding current adjustment only when the welding circuit is open.
- Do not work on live circuits. Always open the main switch when checking over the machine.
- Do not leave the electrode holder on the welding table or in contact with a grounded metal surface.
- Do not use worn or frayed cables.
- Make sure the ground clamp has a strong spring and that it is fastened securely to the welding table or part being welded.

The family in 4-H

The 4-H member's family, defined in its broadest terms, is important to his or her success. Young people grow and develop as part of a family. More than anything else, family influences what a young person learns and it helps to build the values that will guide the young person's life. Make an effort to ensure that the 4-H member's family is aware of what he or she is learning in arc welding projects.

The teen leader

Older 4-H members (ages 13-19) can be helpful as teen leaders, either as assistants to you or as leaders in their own right (age 16 and older.) Take advantage of their knowledge and willingness to help. Work with the teen leaders prior to the project so you can discuss the role they will play in project activities.

Meeting outline

No set number of meetings is required to qualify a member for completion in your project. A member, however, is required to attend a majority of the instruction hours offered. Most project leaders find that a minimum of 6 to 10 hours of instruction is necessary in order for members to accomplish project goals.

The meetings outlined are intended for intermediate and advanced 4-H members. The series of meetings should acquaint them with various skills necessary to satisfactorily weld joints or repair broken parts. A variety of *Things to Learn* and *Things to Do* are also listed. You may choose those most appropriate for the age level enrolled in your project group. Some subjects may require more than one meeting for completion.

Each project member's manual contains subject matter content on the *what* of the project. Your leader's guide contains more of the *how*.

Orientation meeting

A family member should accompany the 4-H member to the first meeting to discuss what will be taught, requirements of members, project goals, costs and other concerns.

Discuss the tours and field trips that will be a part of the project meetings. Set a time and place for meetings. Elect a junior project chairman to help conduct business and report to the club. Announce plans for the next meeting and make assignments if necessary.

Arc Welding — Level 1

Things to learn	Things to do
<p>1. Organizational meeting</p> <ul style="list-style-type: none"> • Purpose of the 4-H project • Project needs and requirements • Suggested individual goals • Parts of an arc welder and accessory equipment • Important safety precautions • How to give demonstrations • Major uses of arc welder • Common patterns for weaving or oscillating the electrode 	<ul style="list-style-type: none"> • Hand out Y 620, <i>Project Record</i>. • Have members introduce themselves and talk about their welder and welding experiences. • Set up a schedule for the project meetings (time, place, etc.). • Tour workshops and examine welding equipment. • Demonstrate proper adjustment of welding helmet. • Have members make a list of welding equipment considered adequate and necessary for good welding safety. • Have members practice common bead patterns using pliers, pencil and a sheet of paper. • Have members talk to an experienced welder about clothing and safety.
<p>2. Adjusting current, striking an arc and running a bead</p> <ul style="list-style-type: none"> • Rod size and function • Methods of striking an arc • Proper length of arc and speed 	<ul style="list-style-type: none"> • Review safety rules. • Review equipment. • Ask members to demonstrate adjustment of helmet. • Show kinds of electrodes available and the purpose for each. • Demonstrate striking an arc and proper length. • Have members practice striking an arc and running a bead. • Demonstration effects of proper low and high current settings. • Conduct a practice period for members on running a bead, using crescent, figure 8 and circular weave. • Demonstrate and practice safety in removing slag. • Have members evaluate the work of others. Discuss merits of each and ways to improve beads.
<p>3. Welding joints</p> <ul style="list-style-type: none"> • Types of weld joints: butt, lap, tee and corner • Welds classified as bead, groove and fillet 	<ul style="list-style-type: none"> • Review safety rules. • Review information learned in Meeting 2. • Have members demonstrate practices learned at last meeting. • Have members practice beads at various temperatures and speeds. Evaluate and suggest improvements. • Place a butt weld in a vice and hit with a hammer to see if weld or metal gives first. • Assign members to give demonstrations for next meeting. • Select projects that members might wish to make for home or farm. Assist members in obtaining materials.
<p>4. Cutting and soldering</p> <ul style="list-style-type: none"> • Principles of use for cutting metal and soldering • How to judge a class of welding beads 	<ul style="list-style-type: none"> • Discuss and prepare the proper cleaning of work to be welded. • Discuss when edges should be beveled. • Demonstrate how to cut metal and pierce holes. Discuss purpose of a catch bucket. • Have members practice cutting and piercing metal. • Demonstrate principles of soldering with an arc welder. • Demonstrate proper cleaning and flux techniques. • Have members clean a tin strip for soldering. After inspection have members solder two pieces together. • Discuss the different types of solder and function of each. • Have a class of four beads or solder joints to judge. Ask one or more members to explain how they placed the class and why. • Encourage safety procedures around hot tin.

Arc Welding — Level 2

Things to learn	Things to do
1. Organizational meeting <ul style="list-style-type: none"> • Purpose of the project • Project needs and requirements • Suggest individual goals • How to sharpen welding skills 	<ul style="list-style-type: none"> • Hand out Y 620, <i>Project Record</i>. • Set a schedule for project meetings (time, place, etc.). • Ask members to establish their goals for the year. • Have members practice flat bead, butt weld and fillet weld. • Review safety rules and regulations. Practice safe operations.
2. Welding equipment <ul style="list-style-type: none"> • Welding equipment and electrical supply 	<ul style="list-style-type: none"> • Tour a welding supply store or shop. Review various welders, their function and cost. Compare welders and value. • Examine various welding rods. Compare use and cost. • Survey welding equipment and accessories. Discuss the purpose of each and which should be part of a welding shop. • Have each member explore a career using welding skills for a report to other members.
3. Welding skills <ul style="list-style-type: none"> • Correct position, including angles for various welds 	<ul style="list-style-type: none"> • Review amperage and travel speed. • Practice striking an arc using scratch method and tapping method. • Practice running several beads at various temperatures, speeds and weave patterns. • Practice fillet welds in lap joint, tee joint and corner joint. • Discuss correct angle positions for welding various joints and inspect each weld. Critique for speed, amperage and correctness of angles.
4. Construction and repair <ul style="list-style-type: none"> • How to plan a bill of materials and construction blueprints or plans • How to develop a repair plan on equipment which needs repair 	<ul style="list-style-type: none"> • Develop a plan for a welding project, including construction plan, materials needed and cost of materials and welding supplies. • Prepare material for construction making sure joints fit properly. • Construct or repair one or more items for use or exhibition. • Complete work by removing slag and polishing. Finish by painting if appropriate. • Complete Y 620, <i>Project Record</i>.
5. Additional skills <ul style="list-style-type: none"> • How to weld overhead • How to weld metals of various thicknesses • Safety precautions for welding galvanized and painted surfaces • How to weld metals other than steel (aluminum, alloy, etc.) 	



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