4-H

ELECTRIC

ARC

WELDING

DEARBORN COUNTY 4-H PROJECT

It is recommended that a member complete the requirements for Arc Welding-Beginner before enrolling in this project.

INTERMEDIATE

WHAT YOU WILL LEARN:

1. To continue to practice good safety habits in using the electric arc welder.

2. To do some welding beads.

3. To do some welding joints.

WHAT YOU WILL EXHIBIT: (you will want to practice on scraps first)

1. Begin with a piece of mild steel flat iron 5" x 8" x ¼" on which you will weld:

   A. A row of straight beads.

   B. A row of weave beads.

   C. A row of hard face weave beads.

   D. Weld 2 pieces of flat iron in a "T" joint to the original flat iron. Do the corner weld vertically. The vertical corner weld should be at least 4" long. Weld the 2 pieces to the original flat iron with either straight or weave beads.

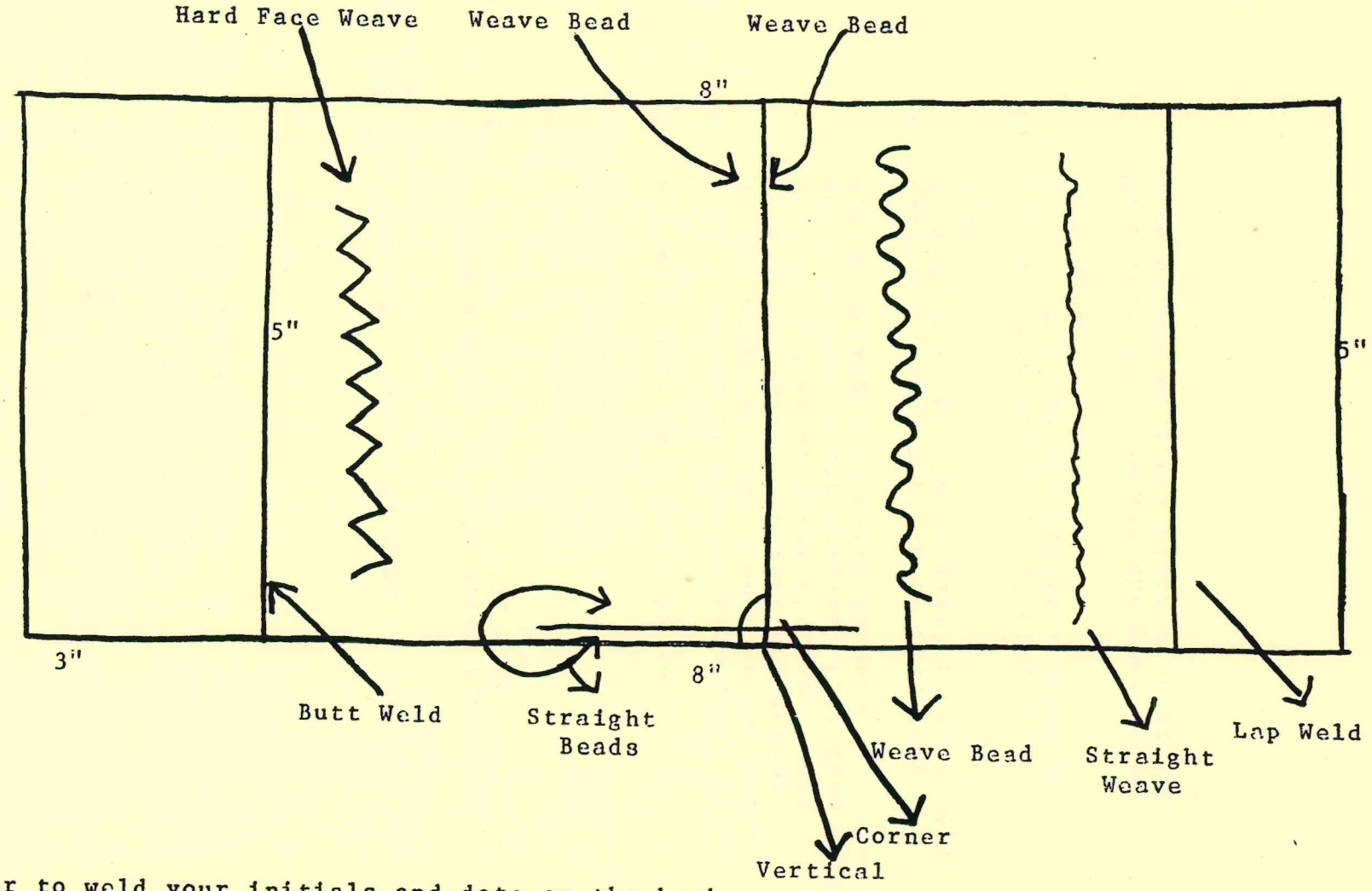
   E. Butt weld another piece of flat iron 3" x 5" x ¼" to the original piece of flat iron.

   F. Lap weld another piece of flat iron 3" x 5" x ¼" to the original piece of flat iron.

   G. Weld your initials and the year on the back of the original piece of flat iron.

THIS IS AN EXAMPLE OF WHAT YOUR EXHIBIT

MAY LOOK LIKE



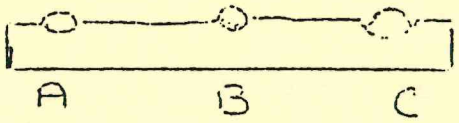
*Note: Remember to weld your initials and date on the back.

SAFETY IN WELDING

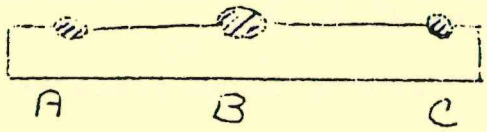
1. Never look at the welding arc with the naked eye.
2. Always use a head or face shield that is in good condition.
3. Wear suitable clothing to protect all parts of the body from arc burn and from spatter, as leather gloves, long-sleeved shirts with cuffs and collar buttoned and cuffs on pants turned down.
4. 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.
5. Do not weld around combustible or flammable materials.
6. Do not pick up hot metal.
7. Do not weld in confined places without adequate ventilation.
8. Always open the main switch or disconnect the plug when checking over a welder.
9. Do not leave the electrode holder on the welding table or in contact with a grounded metal surface.
10. Do not use worn or frayed cables.
11. Stand on dry footing when welding, and keep the body insulated from the electrode, the electrode holder, and the work.
12. Keep the shop clean, particularly around the welder.

ADJUSTING THE WELDING CURRENT

The current setting greatly affects the penetration and the strength of the weld. Too low a current gives shallow penetration and a high bead that is not well fused into the base metal. There will be considerable overlap and welding will be slow. The arc will also be hard to maintain and control. Too high a current penetrates too deeply, makes too wide a crater, with undercutting at the edges, and tends to produce excessive spatter.



Effects of current setting on the weld: A, proper adjustment of the current, giving fairly deep penetration, with good fusion and no overlap or undercutting. B, current too low, resulting in a high bead with poor penetration and poor fusion. C, current too high, resulting in deep penetration, undercutting at the edges of the bead, and excessive spatter.

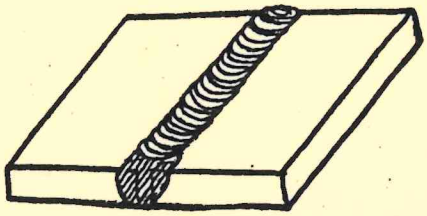


Effects of speed of electrode movement on the weld: A, proper speed, giving a normal bead with good penetration and fusion. B, movement too slow, resulting in a large, wide bead with overlap. C, movement too fast, resulting in a small, narrow, irregular bead with poor penetration.

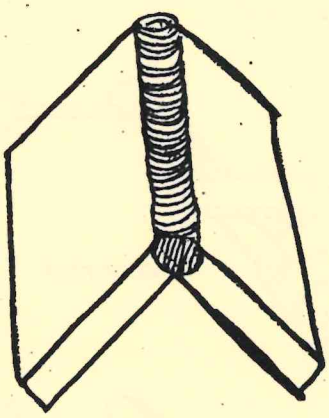
MAKING PRACTICE BEADS

Before attempting to weld two pieces together, practice running beads on flat steel, until you have acquired a fair degree of skill. To make a good bead, use a suitable current adjustment. length of arc, electrode position, and speed of electrode movement. Depositing beads is a fundamental welding operation, and time spent in mastering this will pay off in future work.

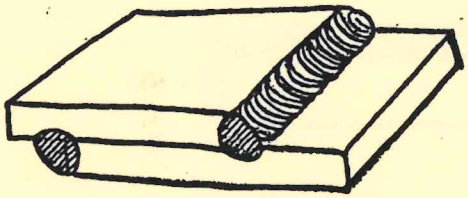
COMMON TYPES OF WELDING JOINTS



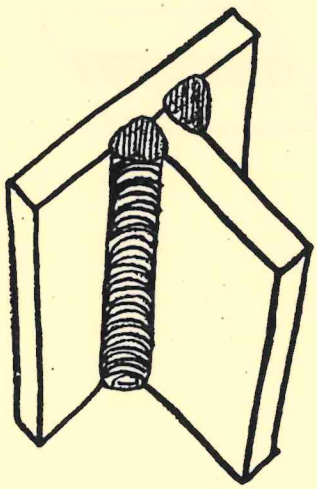
-----Plain Butt Joint



----Corner Joint



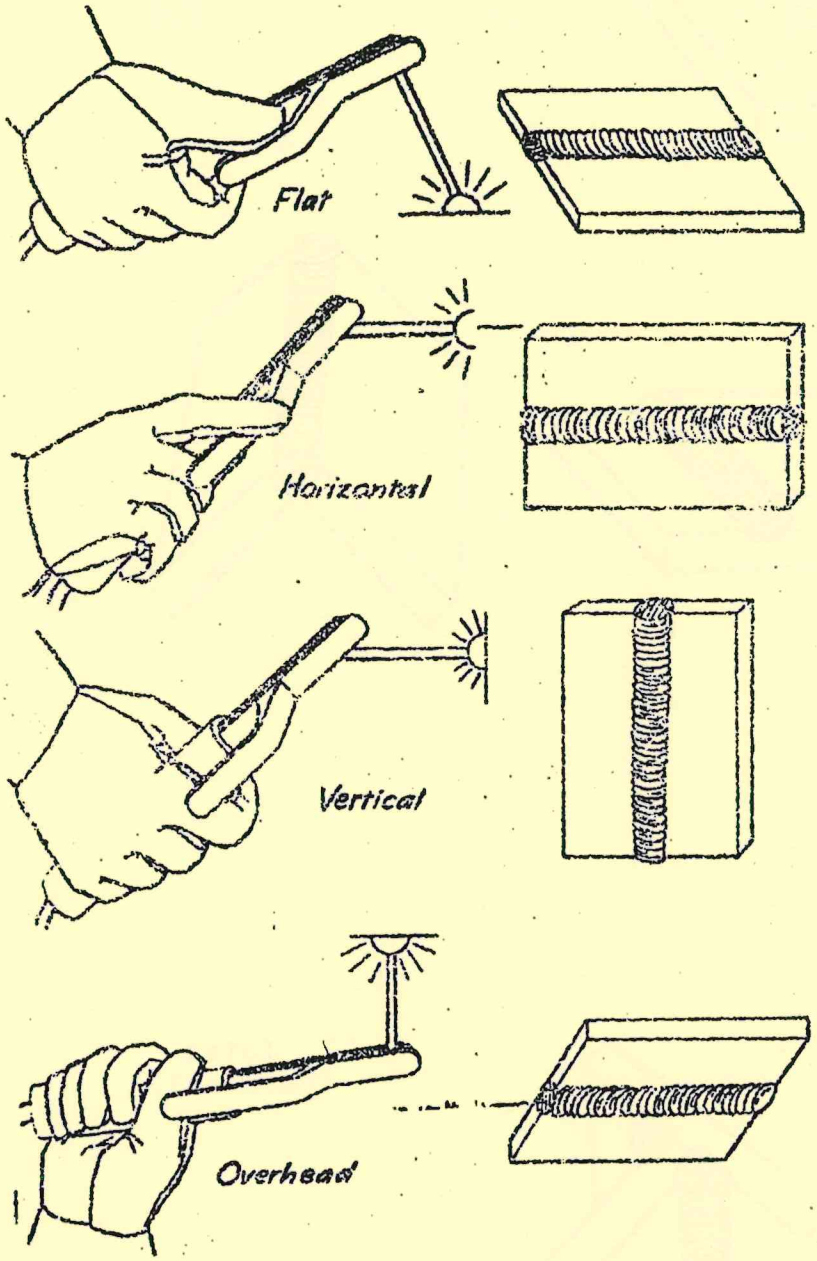
Lap Joint



-----"T" Joint (Vertical)

*Note: Be sure to tack pieces at each end before running beads.

DIFFERENT WELDING POSITIONS

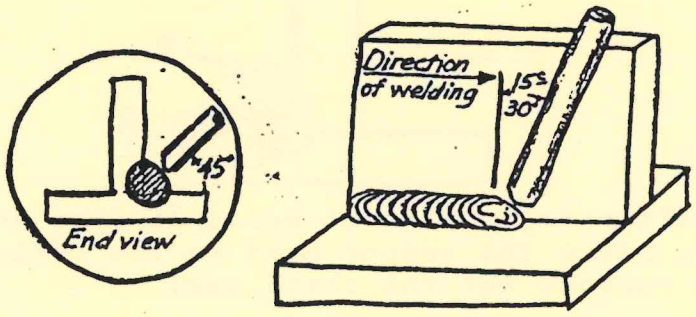


MAKING FILLET WELDS IN FLAT AND HORIZONTAL POSITIONS

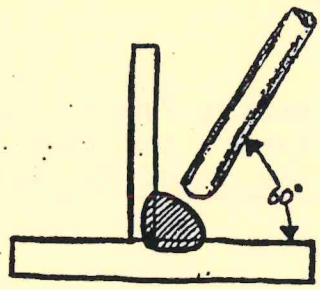
A fillet weld consists of one or more beads run in the angle or corner between two surfaces, as in a tee, lap or corner joint. A fillet weld should penetrate well into both pieces being joined, and should extend out on each surface to a distance about equal to the thickness of the pieces. For most work a weld that has a flat or slightly convex surface is preferred. To insure a good strong weld, it is important to hold the electrode at a suitable sngle, and to use a suitable current setting and speed of electrode movement.

In making a fillet weld between two plates of the same thickness, hold the electrode so that it bisects the angle between them, and lean the top about 15 to 30 degrees in the direction of welding. In welding parts of unequal thickness, point the electrode more toward the thick piece, in order to give uniform heating and penetration in both pieces.

Use a short arc in making fillet welds, as this gives better penetration down into the corner between the two parts. Watch the crater closely and make sure that you get good penetration. Speed of electrode movement is quite important. If it is too fast, there will be poor penetration and undercutting; if too slow, the metal will pile up and give bad overlap.



Making a fillet weld between two pieces of equal thickness. The electrode should about bisect the angle between the two pieces, and the top should lean about 15 to 30 degrees in the direction of welding.



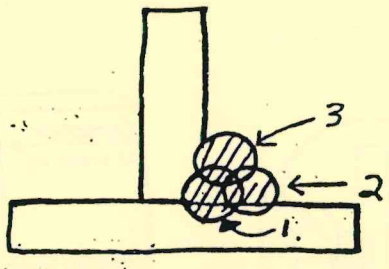
In making a fillet weld between parts of unequal thickness, point the electrode more toward the thick part to give uniform heating and penetration.

WELDING A TEE JOINT

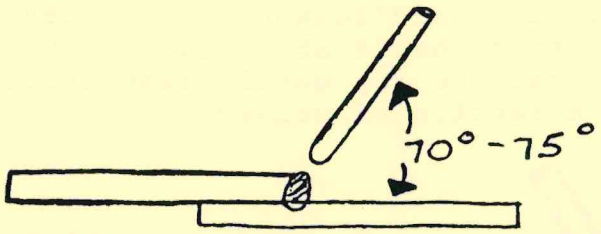
To weld a tee joint, strike an arc at the left end (for right-handed workman) and hold it until the crater penetrates well into the corner between the two pieces. Then move the electrode along slowly without weaving, watching the crater and making sure of good penetration. If the metal is thicker than ¼" additional passes will usually be required to build the weld to suitable size, and these may be made with straight beads or with a weaving motion. The second bead should be placed on the lower or horizontal surface, so that it can serve as a sort of shelf upon which to build the next bead.

MAKING LAP WELDS

To lap-weld two pieces together, simply lap them over each other a suitable distance and hold them in place while fillet welds are made at the ends of the laps. These welds are made in the same manner as fillet welds in a tee joint, except in the case of thin metal (up to ¼" in thickness). Such a weld is usually made in one pass, and with the electrode pointed more toward the flat piece in order to better control the distribution of heat and the placing of the metal. A crescent or circular weave with slight hesitations at the edges of the bead is used to give better fusion and better shape to the weld. For added strength or stiffness, the edges of the lapped joint may be welded, using a single pass with a weaving motion.



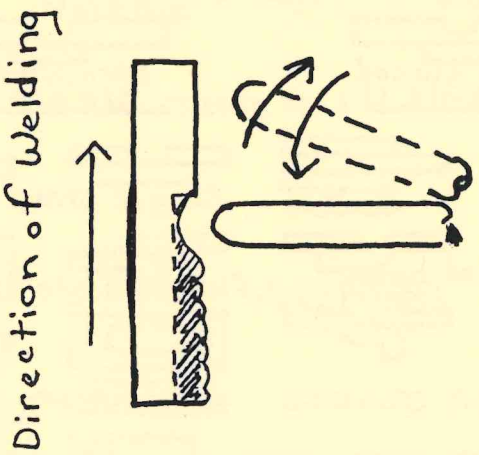
In multiple-pass fillet welds in flat and horizontal positions, place the second bead on the horizontal surface to form a support for the third one.



In making a lap weld in thin material (up to about ¼" thick), point the electrode more toward the flat piece to better control the heat and the placing of the weld metal.

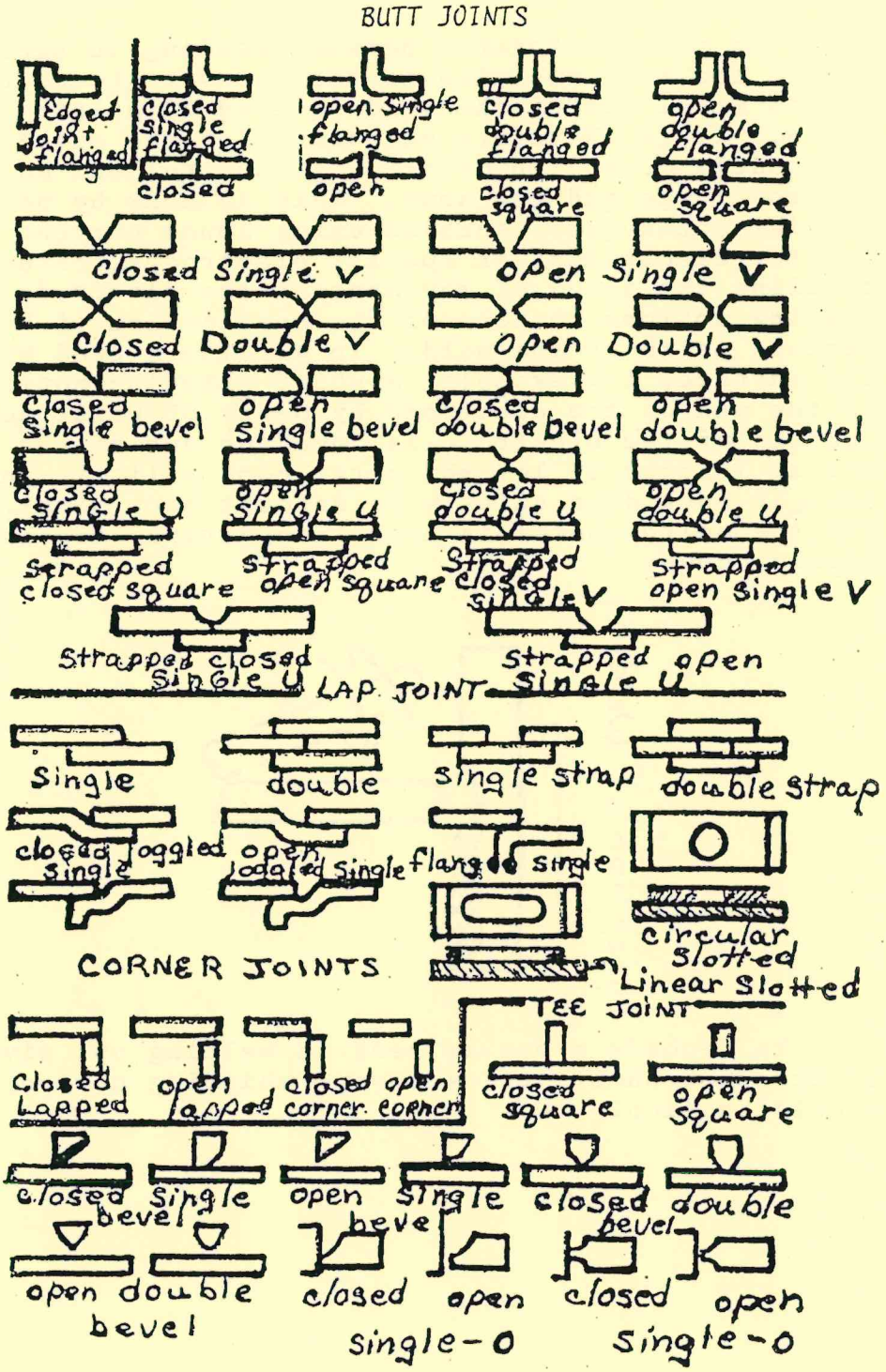
WELDING IN VERTICAL, HORIZONTAL, AND OVERHEAD POSITIONS

The main difference between welding in these positions and in the flat position is that gravity tends to pull the molten metal out of the weld instead of helping to hold it in. It is therefore necessary for the operator to keep the puddle of molten metal under control and not let it get too large and run down. This is donw by means of special technuques, such as using lower current settings, smaller electrodes, or special electrodes, carefully controlling the speed of movement of the electrode, and using weaving motions to control the application of heat to the various parts of the weld. In welding a bead up on a vertical surface, for example, a short whipping motion is given to the end of the electrode by means of wrist action. The tip of the electrode is moved up out of the crater for an instant to let the metal cool a little and then brought back down quickly to deposit more metal. In this way the molten metal is kept from getting too hot and running down.



To deposit a narrow bead in welding up, give the electrode a short, quick upward whipping motion, using a wrist action.

FORMS OF WELDED JOINTS



Welding Intermediate Record Sheet

NAME:_____ GRADE:_____

CLUB:_____

Date project started:_____ Date project completed:_____

How much time did you spend on project:_____(hours)

Cost of materials used:_____

Why are you taking this project?_____

_____

1. What is welding?_____
2. State 3 reasons why welding is important?
   a. _____
   b. _____
   c. _____
3. List the 5 important steps for proper welding procedures.
   a._____
   b._____
   c._____
   d._____
   e._____
4. Why should a welding shield be worn?_____

   _____
5. Describe "Weld Burn" of the eyes:_____

   _____
6. List the four welding positions.
   a._____
   b._____
   c._____
   d._____

7. Can individuals save money by owning a welder?_____

Explain:_____

_____

8. When selecting an electrode, what factors determine the size to be used?_____

_____

_____

9. What is solder made of?_____

_____

10. List some uses of the Carbon Arc Torch.

_____

_____

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Club Leader's Signature