

Knowledge domain: Mechanical
Unit: Attachment
Skill: Working with a Welder

Tools and Parts Required:

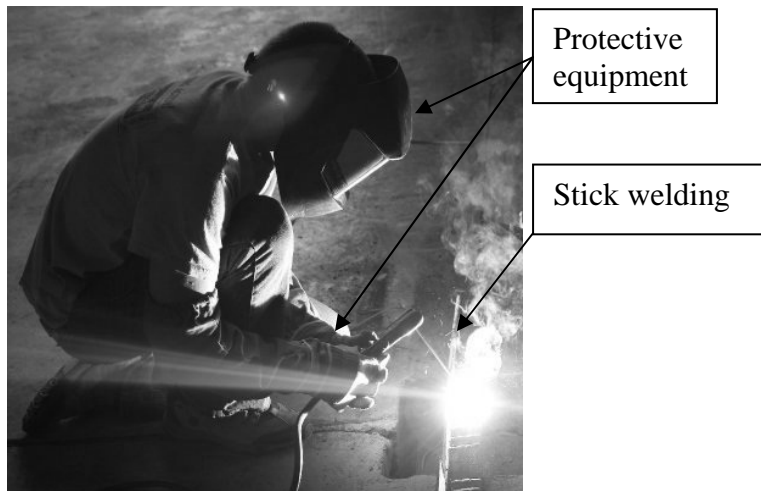
- 1) 2 Pieces of metal
- 2) Grinder
- 3) Steel wool
- 4) Safety glasses

Introduction

Welding is a process that joins materials together. Welding usually involves joining metals or thermoplastics. The material is joined with a filler and melted together with a welding tool. When heated, the filler forms a pool of molten material. When the molten material cools, the joint is strengthened. If done correctly, a weld is as strong as the parent material. Many different tools and energy sources can be used for welding, including an electric arc, a gas flame, and a laser. (See the different types of welds below). Welding can be dangerous. Precautions must be taken to avoid injury. This skill introduces the basics of welding and how to work with a professional welder.

Example

Below is a picture of stick welding. Welds may be common on equipment such as tables and cabinets.



Identification and Diagnosis

One should weld two metal pieces together when it is best for the design. Other methods of joining metal include screws, super glue, and epoxy. Only weld when you want the pieces permanently joined together.

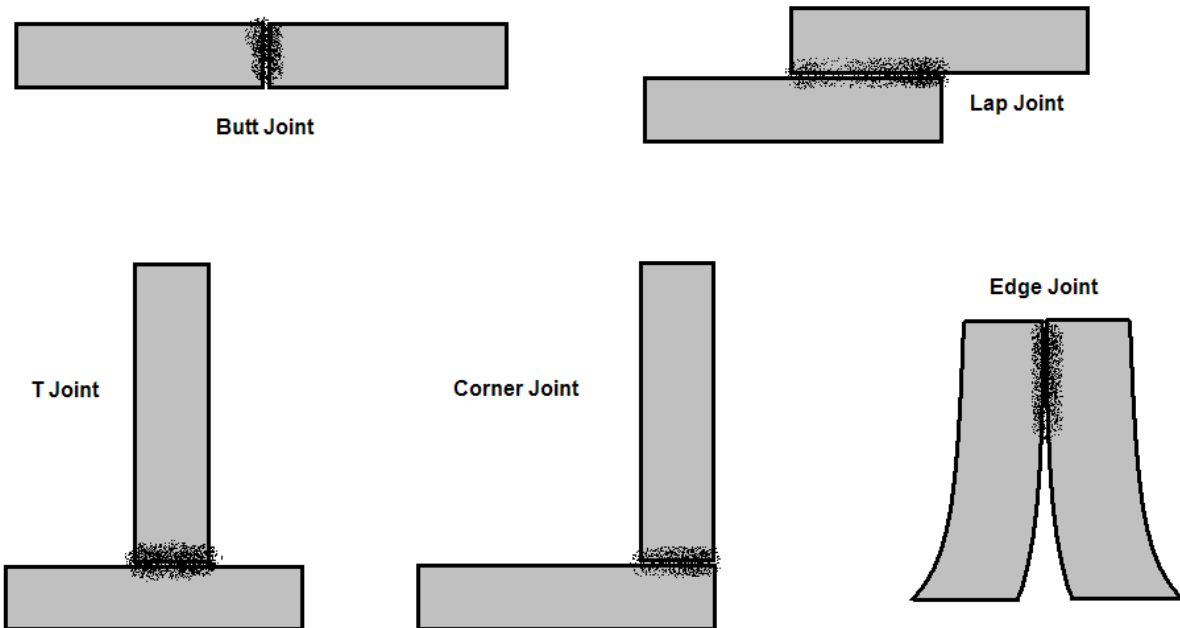
Types of Welds

Three common types of welds are stick, MIG and TIG. All three are types of arc welding. An electric current is used to create an arc between the base material and an electrode.

	Stick Welding	MIG (metal inert gas)	TIG (tungsten inert gas)
Other Names	Shielded Metal Arc Welding (SMAW) Manual metal arc Welding (MMA)	Gas metal arc Welding (GMAW)	Gas tungsten arc Welding (GTAW)
Common Uses	heavy welds on iron and steel (repair work and construction)	sheet metal, steel car body work	thin welds, aluminum, stainless steel (bicycle, aircraft, etc)
Mechanism	The electrode is a consumable electrode rod, or 'stick'. The electrode is covered with a flux that protects the weld area from contamination.	The electrode is a continuous wire feed. An inert or semi-inert gas mixture protects the weld from contamination.	The electrode is non-consumable tungsten. An inert or semi-inert gas mixture protects the weld from contamination.
Advantages	<ul style="list-style-type: none">- Requires little operator training.- Works on rusty or dirty metal	<ul style="list-style-type: none">- Requires little operator training- Faster than stick welding-	<ul style="list-style-type: none">- Useful for welding thin materials and non-ferrous materials- Stable arc produces high quality welds
Disadvantages	<ul style="list-style-type: none">- Slower, because consumable electrodes must be replaced and flux must be removed.- Generally limited to ferrous materials. (Ex: stainless steel, carbon steel, cast iron, wrought iron and pig iron.)	<ul style="list-style-type: none">- Material to be welded must be very clean	<ul style="list-style-type: none">- Requires significant operator skill- Material to be welded must be very clean

Types of Weld Joints

Welds can be geometrically prepared in many different ways. The five basic types of weld joints are the butt joint, lap joint, T joint, corner joint, and edge joint.



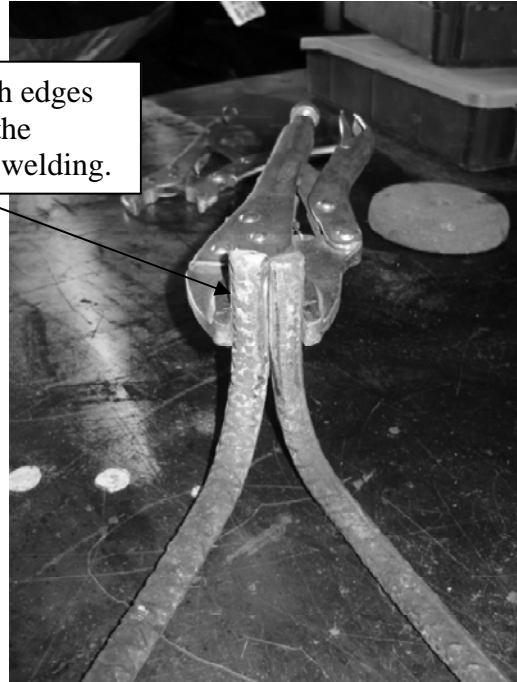
Procedure

This section describes how to prepare metal for welding. Always wear safety glasses when preparing metal for welding.

1. Determine the pieces to be welded.
2. Think about how the pieces will be welded together based on the types of welds above. Inspect the surfaces that will be welded. Use a grinder or steel wool to clean and prepare the surfaces
 - Coating or rust needs to be removed with a grinder or steel wool. Car metal can be especially rusty.
 - Improving a bad weld is difficult. Remove any previous welds with a straight or flat grinder,. If necessary, use an angle grinder to remove the previous weld.
 - Insure edges are clean. Clean edges insure that the weld will be solid and hold well.
3. To assure proper alignment, clamp the pieces to be welded in position. Provide this assembly to a qualified welder with written details of the location of the weld.



Grind rough edges
to prepare the
surface for welding.



Remove rust with
steel wool or a
grinder.

Exercise

Your instructor will give a piece of metal. Use a grinder and steel wool to prepare the metal for welding.

Find a partner. Discuss the following

- Where have you seen welds used? Why was it used over other methods?
- Imagine that you are creating a cube. What types of joints are necessary?

Your instructor must verify your work before you continue.

Preventative Maintenance and Calibration

Always calibrate every medical device before returning it to use.