



WELDING SAFETY AND TECHNIQUES

Safety

Hazards of cutting and welding processes include:

- High Voltage
- Burns
- Ultraviolet radiation
- Toxic Fumes
- Asphyxiation, And More!

All of these can easily be avoided with simple measures and knowledge.

Safety

- High Voltage:

You will be working with high voltage, but rest assured that you will not be the easiest path for the current to follow as long as the equipment is set up properly, in good operating condition, and you are wearing the appropriate Personal Protective Equipment (PPE). Gloves and Jackets keep you insulated from the current. In rare circumstances the high frequency current can make it through, but it will not harm you.



Safety

- Burns:

While welding you will be heating parts your base metal to it's melting point. This can create small bits of molten metal that travels outward from the weld. The welding a plasma torch can operate near 30,000 degrees Fahrenheit. The metal you will be fusing together will remain quiet hot for quiet some time after you stop. You will be safe from these dangers as long as you are operating the equipment responsibly and wearing the proper PPE.



Safety

- Ultraviolet Radiation

intense U.V. rays are created by the plasma cutter and arc welding machines. This can result in painful “sun” burns on the skin and can cause temporary or permanent blindness to the eyes. Long term exposure increased your risk for skin cancers. With shaded welding hoods protecting your face and eyes and jackets/gloves covering your skin you will be safe from this hazard. But they will only protect you if you have your welding hood facing the arc and have your jacket buttoned to the top to avoid burns.



Safety

- Toxic Fumes

Using arc welding and plasma cutting creates vaporized metals. It also creates O₃ (ozone) which is toxic to humans. The heavy metals inhaled are very harmful to the body and can have long lasting effects if precautions are not taken. There is a localized exhaust vent and a hood vent installed in the welding area. These should be used EVERY time, no matter how small a weld.



Safety

- Asphyxiation

The shielding gases used to protect the molten metals until they solidify displace the oxygen so that it does not react and cause porosity. This heavy gas can also fill your lungs and displace the oxygen causing loss of consciousness and eventually death. So long as your head remains above the welding torch nozzle, and work is being performed in a well ventilated area.



Safety

- There are many hazards involved with welding and metal fabrication, too many to be listed in a short slide show presentation. This lab does not replace appropriate training or experience.
- The warnings, precautions, and instructions discussed in this presentation cannot cover all possible conditions and situations that may occur. The operator must understand that common sense and caution are factors, which cannot be built into this presentation, but must be supplied by the operator.

Welding

- We will be covering:
- Plasma cutting
- Gas Metal Arc Welding (GMAW or MIG)
- And Gas Tungsten Arc Welding (GTAW or TIG)

Welding

- Plasma Cutting

there are 3 states we are familiar with gas, liquid, and solid. So what happens if you were to heat gas even more? This brings us to the fourth state: plasma.

In plasma, the electrons separate from the nucleus leaving behind their positively charged nuclei known as ions.

When the fast-moving electrons collide with other electrons and ions, they release the vast amounts of energy that gives plasma its unique status and unbelievable cutting power. Plasma cutters work by sending a pressurized gas through a small channel. In the center of this channel, you'll find a negatively charged electrode.

A powerful spark is generated between the electrode and the metal. As the gas passes through the channel,

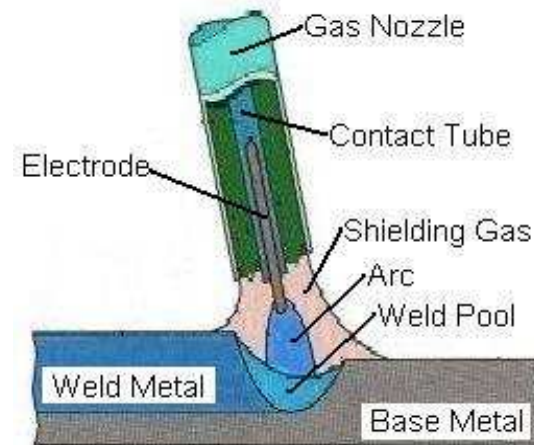
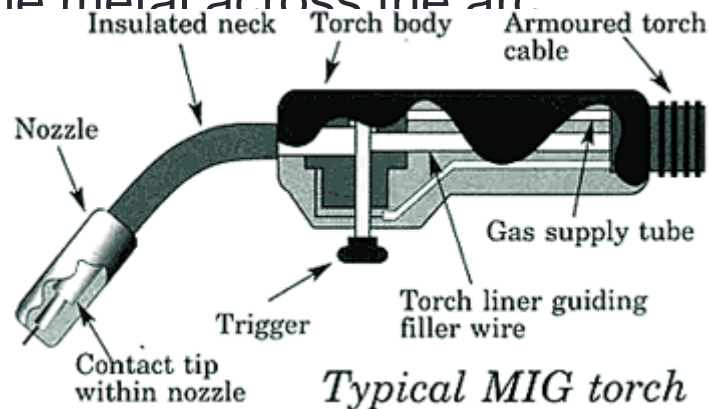
the spark heats the gas until it becomes a stream of directed plasma operating at approximately 30,000 F (16,649 C) and moving at 100 feet per second (6,096 m/sec), that reduces metal to molten slag (dross).



Welding

- Gas Metal Arc Welding (GMAW or MIG)

This “automatic” wire feed arc welding is widely used in manufacturing because of its speed and ease of use. The solid wire being fed into the torch can be changed to match the base metal or can be switched to flux core for gasless outdoor welding or dual shield for high penetration structural welding. The wire, shielding gas, and current are transferred to the end of the torch through the whip. The wire acts as the electrode and the filler. Which means it is emitting the arc that melts the base metal while at the same time it's being consumed and deposited into the metal across the arc.



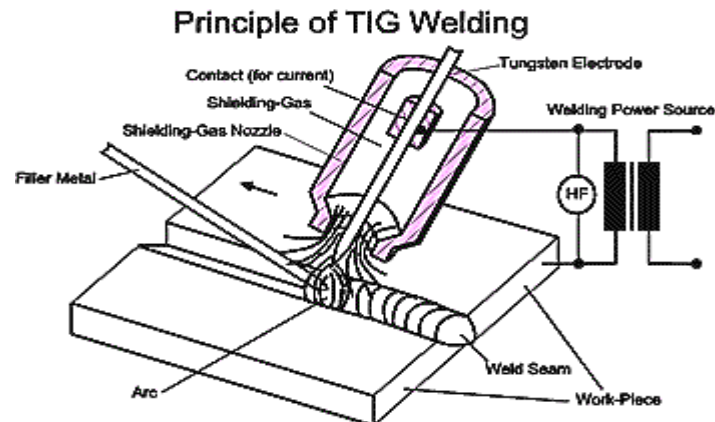
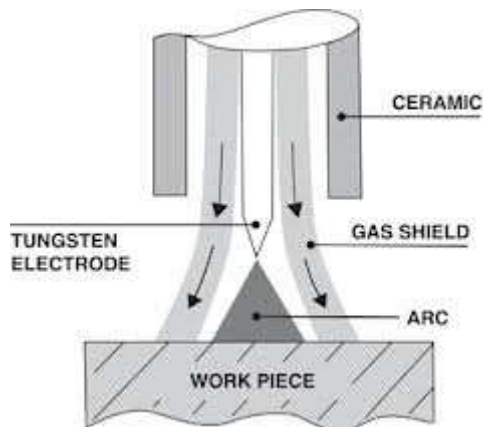
Welding

- Video:
- <http://www.youtube.com/watch?v=U1GTgDQFE4A>
- 1:30-2:30, 6:30-10:00

Welding

- Gas Tungsten Arc Welding (GTAW or TIG)

This process uses a plasma torch held in one hand and a filler wire held in the other hand. The filler metal is added manually to molten pool. While this process is much more labor intensive and slower it has a variety of benefits. Site specific preheating is performed as a function of the welding process. Weld penetration is monitored visually and can be adjusted on the fly by the operator. Stops and starts become less of an issue as welds can be reheated to melting temperature before filler is added. Amperage is adjustable at anytime with a remote foot pedal so that as conditions in the base metal change you operator can adapt to maintain optimal fusion.



Welding

- Video:
- http://www.youtube.com/watch?v=_LibdZxg6oc
- 1:20-end

Welding

- Important things to remember:
 - Electrode stickout should be no more than 1/8th of an inch
 - GMAW Angle should be 30 degrees drag angle.
 - GTAW angle should be no more than 45 degrees drag angle.
 - Electrode and filler should not be touching when current is being turned on.
 - Relaxing and taking your time is the biggest key to making a good weld.

Welding

- There are many different types of welding besides these.
- Make sure to come prepared with good shoes, jeans, and cotton t-shirt.
- This is just an experience, does not substitute training.
- Let me know after you've tried it if you're interested in doing more.

Welding

- QUESTIONS???

