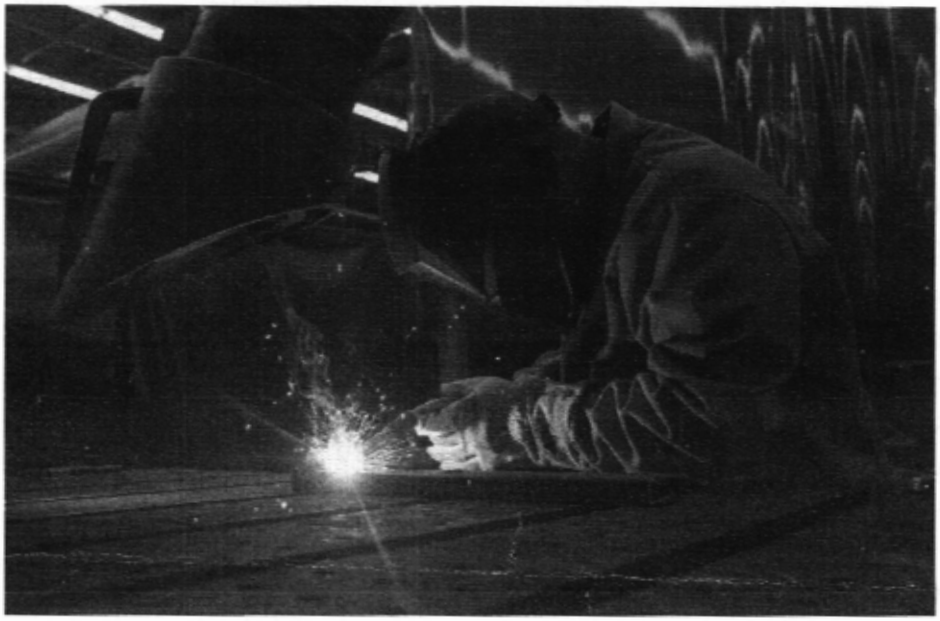
Welding 101: Basic Skills

Learn fundamental welding techniques in this 3 hour intensive with local designer, Myles Geyman



Join local designer, Myles Geyman, as he walks you through the techniques needed to get started in welding.

Over the course of 3 hours, you will learn the fundamentals of MIG welding. Get hands-on practice operating the welder, creating various weld patterns, and feel confident that you can successfully weld metal components together.

You'll walk away with:

- Clearance to use our MIG welder.
- The ability to safely operate the welder and weld different types of metals.
- Begin to understand how to adjust the machine to work best for the type of welding you are performing.
  (Different metal materials and shapes require different voltages and wire feed speeds).
- A bookend that you assembled and welded yourself!

Welding Basics

Gain a fundamental understanding of MIG operation as you learn the safe handling of the equipment, how to ground your material, ventilate your workspace, and how to troubleshoot your welds on the fly as you get comfortable in the workshop.

Objective(s)

- ☐ **Protohaven Orientation**
- ☐ **Class/Student Intros & Goals**
- ☐ **Welding Overview**
  - ☐ What is welding?
  - ☐ Types of welding: Stick, MiG, TiG
  - ☐ What is MIG?
  - ☐ MIG Gun Components/Assembly
  - ☐ General Safety & PPE
  - ☐ Material prep overview
  - ☐ Gas Regulator Overview
  - ☐ High vs. low voltage
  - ☐ Adjusting Feed & Travel Speeds

- ☐ **MIG Basics**
  - ☐ Welding Demo: Proper Stance & Stick Out
  - ☐ Warm up: Weld a straight line, noting travel angles & stick-out
  - ☐ Practice exercises: Weld a straight line on plate, spot welding and joining tubing.

Check in. How's it going? Any questions?

- ☐ **Build a Bookend**

Steps for welding a bookend:

We will take turns welding after each operation.

- Spot weld top to bottom plate
- Weld seam on inside of bookend
- Weld seam on outside of bookend
- Join square tubing
- Add bracing
- Success!

- ☐ **Group Clean-up** (10 min)

Basic Terminology

Types of welding:

Shielded Metal Arc Welding (Stick Welding) Uses a metal electrode covered in flux to create weld. As the current goes from electrode to metal, it melts the metals and electrode, creating a weld pool. The flux coating turns into a gas that shields the weld and creates slag covering the weld. Stick welding can be messy and the slag is hammered off of the weld after cooling. Generally used for large structural metal construction where precision and cleanliness aren't primary concerns.

Gas Metal Arc Welding/Metal Inert Gas Welding (MIG Welding) Uses a wire electrode fed through a nozzle to create arc between metals which melts them and fuses the pieces together. Gas is also fed through the nozzle to create a shield that prevents atmospheric contamination. Typically considered the easiest to learn and most versatile of the various welding techniques.

TIG Welding (Tungsten Inert Gas/Gas Tungsten Arc Welding) Uses a non-consumable electrode shielded by gas to melt metals and create a weld pool. A consumable filler metal is used to promote the fusing of metal pieces. The highest level of control, strength and cleanliness.

Shielding Gas is used to protect the weld from abinet air, which contains elements that can cause cracking, porosity, and other defects.

Stick out refers to the distance of wire between the contact tip and workpiece. For MIG, ⅜-½" is generally ideal, though the joint geometries influence different needs based on the amount of room for the nozzle. A proper stick out length will ensure smooth starts and consistent welds.

Weld Pool commonly refers to the dime-sized workable portion of a weld where the base metal has reached its melting point and is ready to be infused with filler material (Wikipedia)

Welding Flux is a combination of carbonate and silicate materials used in welding processes to shield the weld from atmospheric gases. When the heat of the weld zone reaches the flux, the flux melts and outgasses. The gases produced push the atmospheric gas back, preventing oxidation. Fluxes are made from a combination of organic and inorganic materials including but not limited to ammonium chloride, resin acids, zinc chloride, hydrochloric acid, and borax. (Wikipedia)

Fume extractors reduce smoke and fumes produced by the welding process. They will detect an arc, turn on, and continue to run briefly after welding has ceased.

Mill scale is a type of iron oxide that is formed on the surface of the steel during the hot-rolling process.

Porosity is the presence of holes created from trapped shielding gas released. The presence of porosity in the weld metal is a visible sign of a poor weld

Operating Welder:

To start welder:

- Turn power on
- Turn gas tank valve knob 2-3 turns counter-clockwise
- Turn pressure valve a few turns clockwise until pressure is between 30-40.
- Adjust wire feed speed and voltage according to chart recommendations for metal thickness.
- Attach grounding cord to table or piece to be welded
- Have fun welding!

To shut welder off:

- Turn off tank by rotating knob clockwise
- Turn pressure valve a few turns counter-clockwise to release pressure
- Turn both wire feed and voltage knobs to their lowest setting
- Depress trigger on welding wand to release gas pressure until gas pressure valve indicates pressure has dropped to <10
- Turn machine off
- Wind up cables for storage

Troubleshooting

Common Issues	Possible Causes	Possible Resolutions
Weld has a high crown and does not blend well with base metal	Weld pool is too cold	Ensure stick out is between ⅜"-½"
		Raise voltage to adjust for thicker material
		Lower wire feed rate
Weld is flat or concave and the bead is wide and globby	Weld pool is too hot	Lower voltage
Weld looks porous and cratered	Lack of shielding gas	Ensure that gas is ON and flowing
		Ensure gun angle is within 15 degrees of perpendicular to your weld
		Increase gas flow if needed
Weld is thin and stringy	Travel speed is too fast	Slow down as you weld
Wire is felt "stubbing out" as you weld	Wire feed rate is too high	Check your settings and slow down the feed rate.
Performance is rough and sputtering	Work is not properly grounded	Check your ground
	Stick out is too long	Shorten stick out
	Travel speed is too fast	Slow down

Additional Resources

Wikipedia:

Stick Welding
Shielded_metal_arc_welding

MIG Welding
Gas_metal_arc_welding

TIG Welding
Gas_tungsten_arc_welding

Lincoln Electric TV
https://www.youtube.com/user/lincolnelectrictv

Free Online Miller Electric Welding Guides
https://www.millerwelds.com/resources/welding-guides

Guided DIY Projects & Techniques
https://www.instructables.com/

Online store for purchasing a variety of metals in small quantities
www.onlinemetals.com

McMaster-Carr is a large supplier of industrial equipment and parts
www.mcmaster.com

Glenshaw Steel Supply is a local resource that offers competitive pricing on metal products
www.glenshawsteel.com