

The background features abstract, overlapping geometric shapes in various shades of green, ranging from light lime to dark forest green. These shapes are primarily located on the left and right sides of the frame, creating a modern, angular aesthetic. The central area is a plain white background where the text is placed.

Introduction to Welding

Hacksburg

Agenda

- ▶ What is Welding
- ▶ Safety
- ▶ Terminology
- ▶ Welding types
 - ▶ MMAW/SMAW/Stick
 - ▶ GMAW/MIG
 - ▶ GTAW/TIG
- ▶ Additional Resources

Welding



- ▶ “Using high heat to melt parts together and allowing them to cool, causing fusion”
- ▶ A filler material is typically added that can be stronger than the base material
- ▶ Heat can be generated using a gas flame, an electric arc, a laser, an electron beam, friction, or ultrasound

Welding Safety

- ▶ Risk of burns, electric shock, vision damage, inhalation of poisonous gases and fumes, and exposure to intense ultraviolet radiation
- ▶ Proper protective equipment includes
 - ▶ Welding helmet
 - ▶ Welding jacket
 - ▶ Closed toe shoes
 - ▶ Non-synthetic long pants

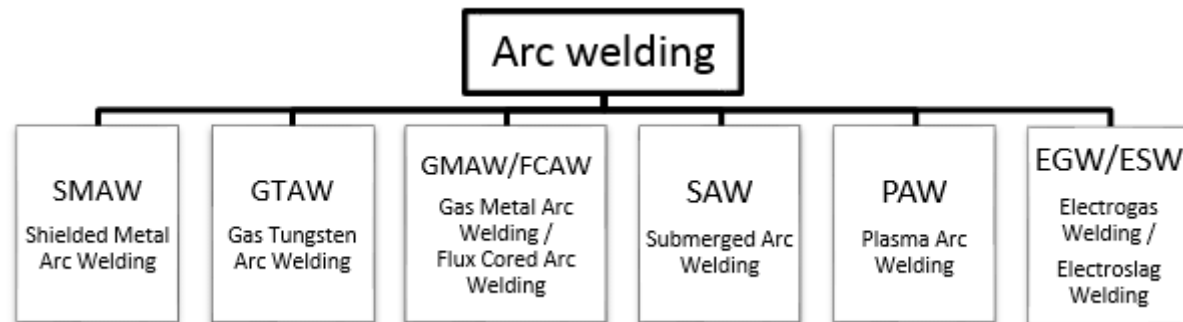


Terminology

- ▶ Arc: electricity traveling through the air, generates large amount of heat and light
- ▶ Brazing: metal joining process where the base material is not melted
- ▶ Electrode: conducts the electrical current to a work piece
- ▶ Filler Material: metal that is added when making a weld
- ▶ Flux: material that cleans metals to prepare them for welding
- ▶ Inert Gas: Gas that doesn't combine chemically with metal
- ▶ Non-Ferrous: metals that do not have any iron, such as aluminum
- ▶ Porosity: gas pockets or inclusions present in the welded material
- ▶ Root: where the materials are the smallest distance from each other
- ▶ Weld pool: molten portion of a weld where the base metal has reached its melting point

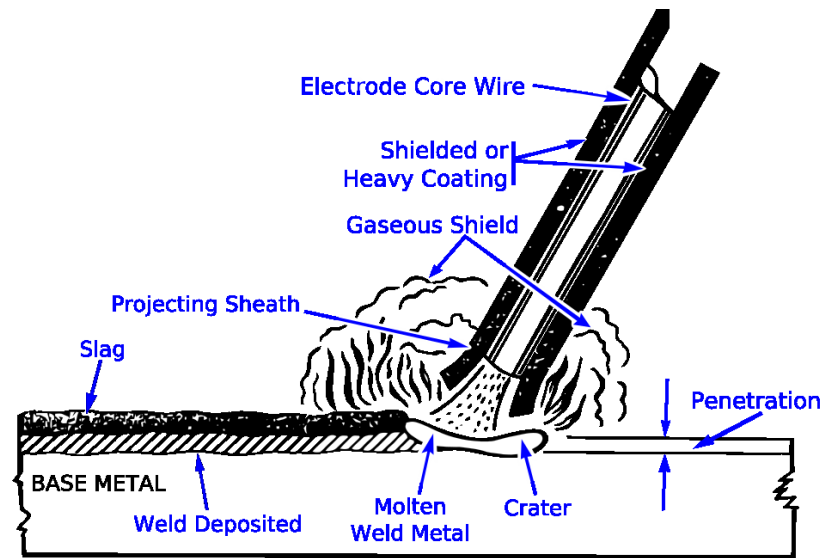
Welding Processes

- ▶ 3 common arc welding processes:
 - ▶ Shielded metal arc welding (SMAW), aka manual metal arc welding (MMAW) or stick welding
 - ▶ Gas metal arc welding (GMAW), aka metal inert gas (MIG)
 - ▶ Gas tungsten arc welding (GTAW), aka tungsten inert gas (TIG) welding



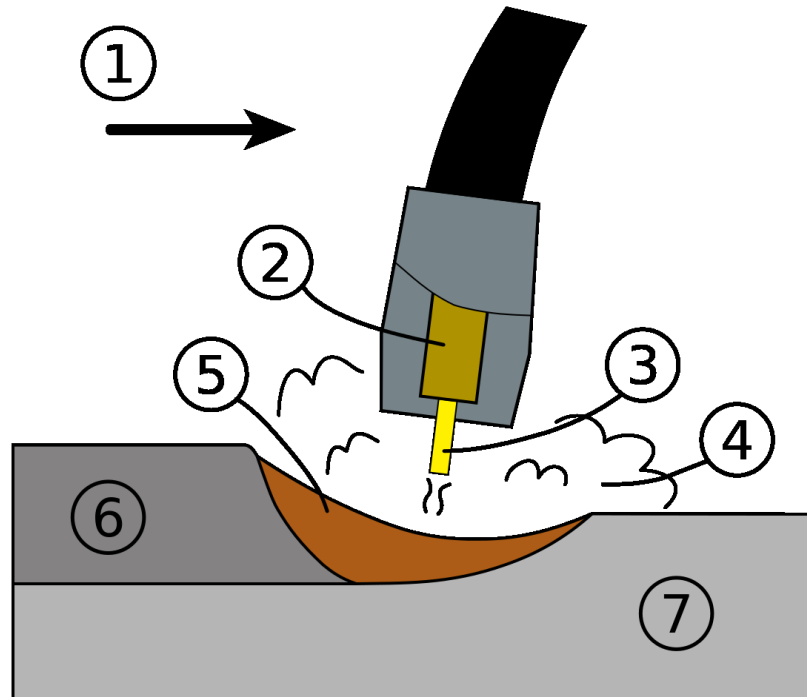
Stick Welding

- ▶ Uses a consumable electrode covered with a flux to lay the weld
- ▶ As the weld is laid, the flux disintegrates, forming a shielding gas and a layer of slag, which protect the weld area from air
- ▶ Versatility and simplicity make it one of the world's first and most popular welding processes
- ▶ Used primarily to weld iron and steels
- ▶ Slag and spatter can require additional effort to clean and electrode needs to be frequently replaced



MIG Welding

- ▶ Uses a consumable MIG wire electrode
- ▶ Faster welding time compared to other welding processes
- ▶ Most common industrial welding process, due to its versatility, speed and ease of adapting to robotic automation
- ▶ flux cored arc welding uses an electrode wire that is hollow and filled with flux and often does not require a shielding gas



TIG Welding

- ▶ Uses a non-consumable tungsten electrode to produce the weld
- ▶ Manual feeding of the filler metal using a separate filler rod
- ▶ Greater control over the weld than other processes allowing for stronger, higher quality welds
- ▶ More complex and difficult to master, and significantly slower than most other welding techniques
- ▶ most commonly used to weld non-ferrous metals such as aluminum

