MANUFACTURING PRACTICES
BETP 1303

SHIELDED METAL ARC WELDING (SMAW)

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Lesson Outcomes

At the end of this topic, students be able to:

1. Observe the safety equipment and safety precautions in welding workshop

2. Differentiate the various type of welding machines

3. Explain the different usage of welding and manage to choose on it's applications

4. Identified the different technology of welding

Contents

- Introductions
- Principles of SMAW
  - Electrodes
    - Electrode coding
    - Some electrode types
    - Electrode selection
    - Electrode and amperage selection chart

Introductions

Definitions of welding

Softening with heat and applying pressure by fastening two pieces of metal together.

Safety

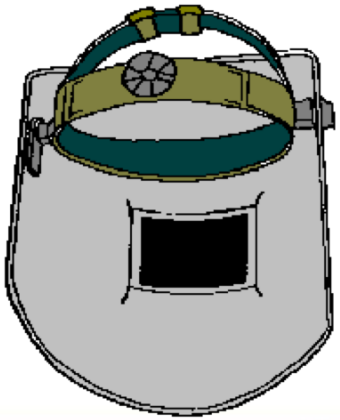
Good ventilation is personnel protection and essential such as screens, overalls, mask, gloves, etc are required to prevent burns from the arc radiations and molten metal.

Safety Precautions in Welding

The risks involved during various welding processes can be classified under the following:-

- Fumes Radiations from the arc
- Electric shock
- Burns
- Slag removal

Welding Shield



Fumes radiations from the arc

- Oxy-fuel equipment demands specific safety precautions.
- Welding of galvanised metals, welding in enclosed spaces, etc.
- Fumes adequate circulation must be available in enclosed buildings.
- Fume extraction tools is needed when using especially gas shielded processes.

Electric shock

- Where the worker has to stand on the activity itself, working environments increase the potential of electric shock. Environments such as boilers and small tanks which warm and damp.
- **A secure welding return clamp is necessary to prevent** damage to other portable electrical tools and electric shock.

Burns

- Leather aprons, welding screens, gauntlets, spats, skull caps, boots, overalls and filters are available to protect burns from cutting and welding.

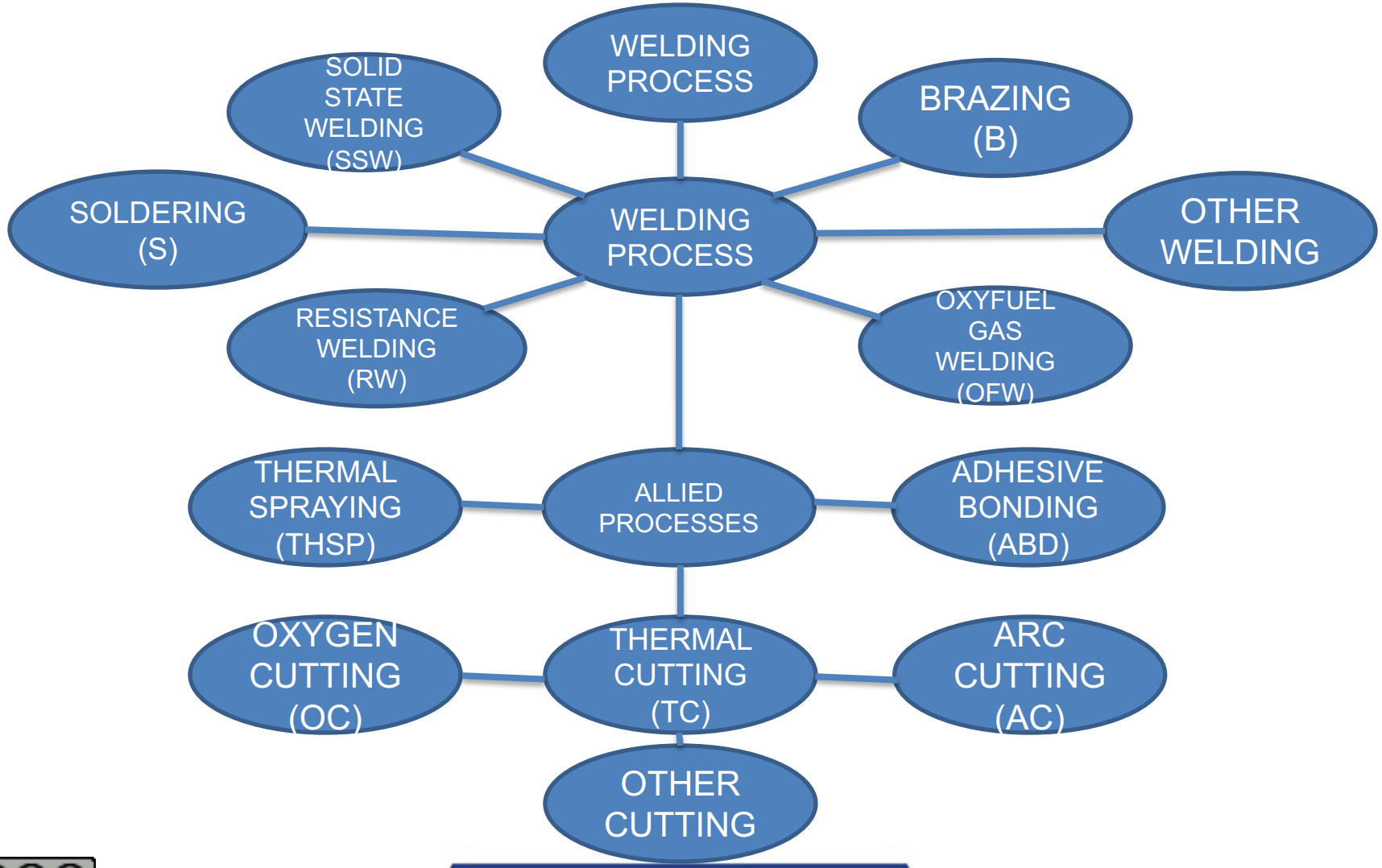
Slag removal

- Safety goggles and chipping hammers approved must be applied during the taking away of welding slag.
- Slag should be permitted to cool before removing away, as this will decrease the chance of hot slag burning any clothing or materials but also increase the mechanical properties of the weld.

Welding Technology

- Welding processes are classified in letter designation required and their official groupings to the process.
- Related and allied processes include thermal spraying, adhesive bonding and thermal cutting.
- Capillary attraction divide the welding processes grouped under "Solid State Welding", "Brazing" and "Soldering" from "Arc Welding", "Resistance Welding", "Gas Welding", and "Other Processes."

Master Chart of Welding and Allied Processes (Figure1)



Letter designation and welding processes

Group	Welding Process	Letter Designation
Arc welding	Carbon Arc	CAW
	Flux Cored Arc	FCAW
	Gas Metal Arc	GMAW
	Gas Tungsten Arc	GTAW
	Plasma Arc	PAW
	Shielded Metal Arc	SMAW
	Stud Arc	SW
	Submerged Arc	SAW

Letter designation and welding processes

Brazing	Diffusion Brazing	DFB
	Dip Brazing	DB
	Furnace Brazing	FB
	Induction Brazing	IB
	Infrared Brazing	IRB
	Resistance Brazing	RB
	Torch Brazing	TB

Letter designation and welding processes

Oxyfuel Gas Welding	Oxyacetylene Welding	OAW
	Oxyhydrogen Welding	OHW
	Pressure Gas Welding	PGW
Resistance Welding	Flash Welding	FW
	High Frequency Resistance	HFRW
	Percussion Welding	PEW
	Projection Welding	RPW
	Resistance-Seam Welding	RSEW
	Resistance-Spot Welding	RSW
	Upset Welding	UW

Letter designation and welding processes

Solid State Welding	Cold Welding	CW
	Diffusion Welding	DFW
	Explosion Welding	EXW
	Forge Welding	FOW
	Friction Welding	FRW
	Hot Pressure Welding	HPW
	Roll Welding	ROW
	Ultrasonic Welding	USW

Letter designation and welding processes

Soldering	Dip Soldering	DS
	Furnace Soldering	FS
	Induction Soldering	IS
	Infrared Soldering	IRS
	Iron Soldering	INS
	Resistance Soldering	RS
	Torch Soldering	TS
	Wave Soldering	WS
Other Welding Processes	**Electron Beam**	**EBW**
	Electroslag	ESW
	Induction	IW
	Laser Beam	LBW
	Thermit	TW

Arc Welding

- The **carbon arc welding** (CAW) process is considered to be the oldest of arc welding and the beginning of all the arc welding processes.
- In carbon arc welding the materials being bonded. A carbon electrode is applied to produce an electric arc between the electrode.
- This arc produces highly temperatures of 3,000°C which at this level the apart materials become welded together and form a bond.

Arc Welding

- The metal arc welding process soon developed into the currently popular **shielded metal arc welding (SMAW).**
- Arc welding process which produces coalescence of metals by heating with an arc between the materials and a covered metal electrode.
- Filler metal is from the electrode and pressure is not used.
- Shielding is gained from decomposition of the electrode covering.

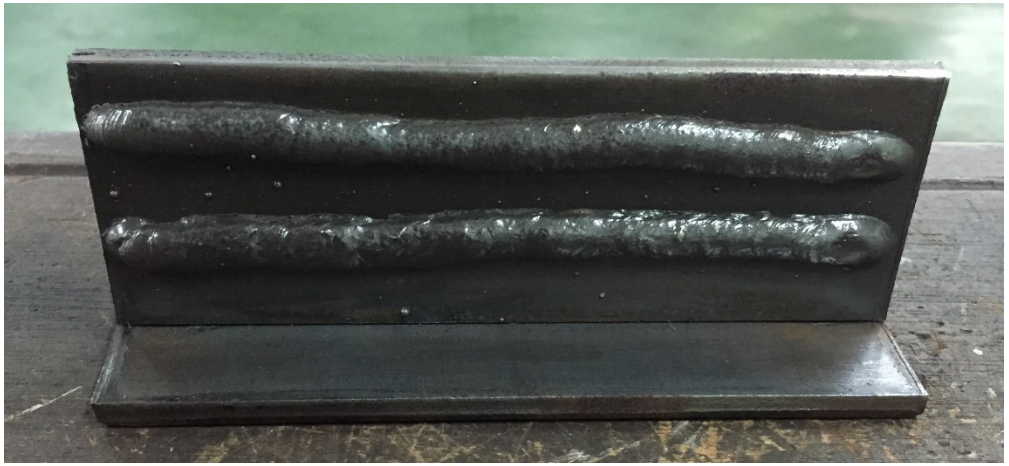
Arc Welding

- **Submerged arc welding (SAW)** process made automatic welding famous.
- Which a welding process by heating them with an arc or arcs between a bare metal electrode or electrodes and the work piece to produce coalescence of metals.
- Filler metal is gained from a added welding rod and pressure is not used and the electrode. It is normally limited to the horizontal position or flat.

Arc Welding

- To weld nonferrous metals, particularly aluminium and magnesium is challenged. **Gas tungsten arc welding (GTAW)** is the solution.
- An arc welding process by heating with an arc between a tungsten (non-consumable) electrode and the material which produces coalescence of metals . Shielding is gained from a gas mixture or gas.

Examples products by welding



Self-Test

1. Define what is sheet metal processes?

2. Differentiate between sheet metal cutting, bending and drawing.

3. Explain types of fabrication machines.

4. What is the equipment for sheet metal fabrication?

5. What's the different methods for developing the patterns for forms ?

Summary

- ✓ Observe the safety equipment and safety precautions in welding workshop
- ✓ Differentiate the various type of welding machines
- ✓ Explain the different usage of welding and manage to choose on it's applications