Edge preparation of various thickness of metals (GMAW)

Objectives: At the end of this lesson you shall be able to
- **state the edge preparation of GMAW**
- **describe the various types of welding process for required prepartion.**

Base metal preparation: For GMAW/CO_2 welding the edges and the plate surfaces for welding of ferrous and non-ferrous metals are cleaned similar to Shielded Metal Arc Welding process. The groove angle for single V butt joint in case of CO_2 welding is 40^0 to 45^0 only when compared to 60^0 used for shielded metal arc welding (Figs 1,2 & 3). The edge preparation required for the various types of welding process.

Fig 1

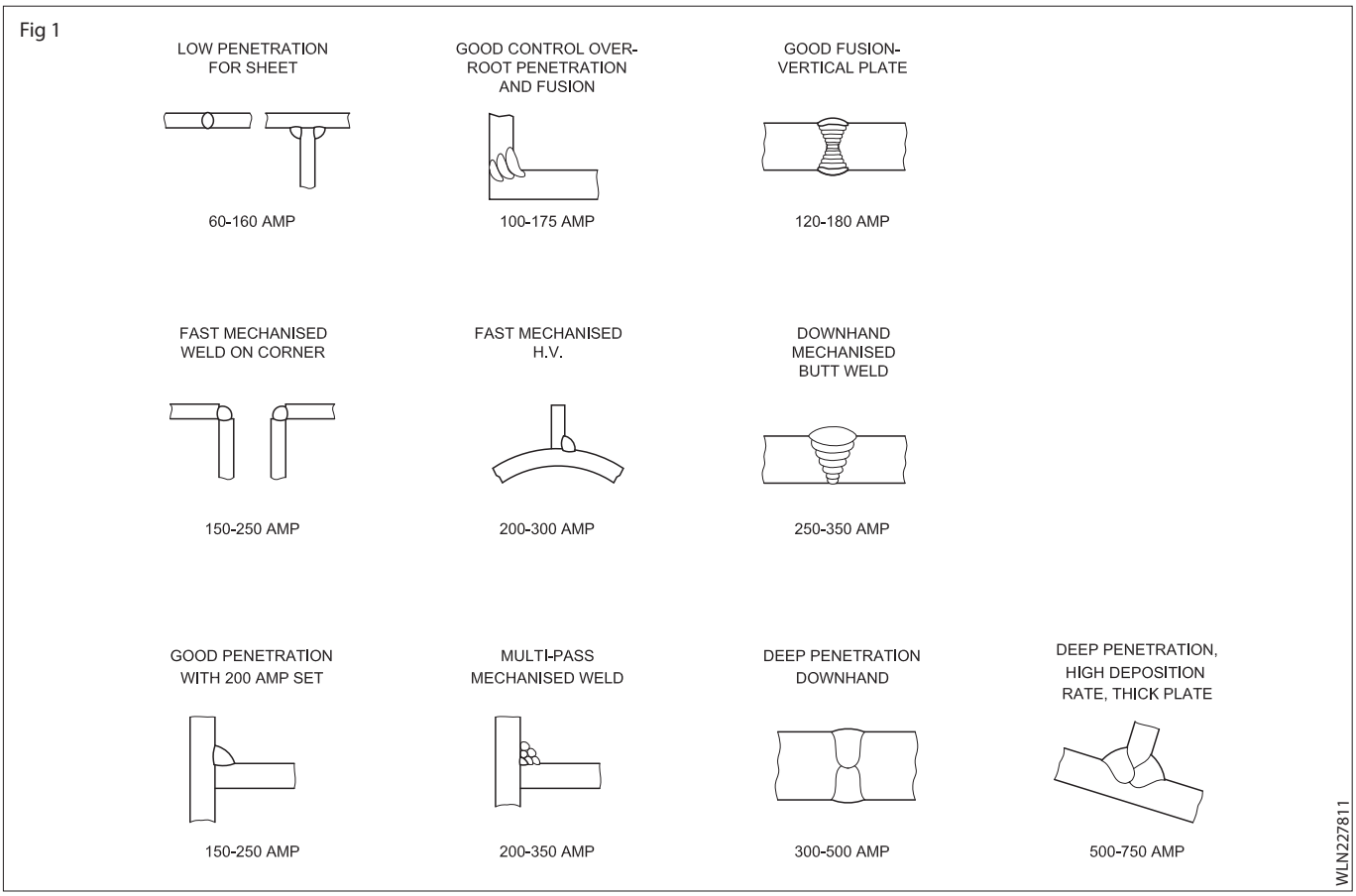


Fig 2

MATERIAL THICKNESS	PROCESS				
	MANUAL METALLIC ARC	MANUAL CO_2 DIP. TRANSFER	MANUAL CO_2 SPRAY TRANSFER	MACHININSED CO_2	SUBMERGED ARC
0.9					
1.6				0.8	
3		1.6		1.6	
5	60° 1.6	60°			
6	60° 1.6	60°	0.8		
10	60°-70° 1.6	60° 1.6	40°- 50° 1.6	1.0	40° 5
12.5	60°-70° 2.4 2.4	60° 1.6	40° - 50° 1.6	40° 1.6	40° 5

WLN227812

Fig 3

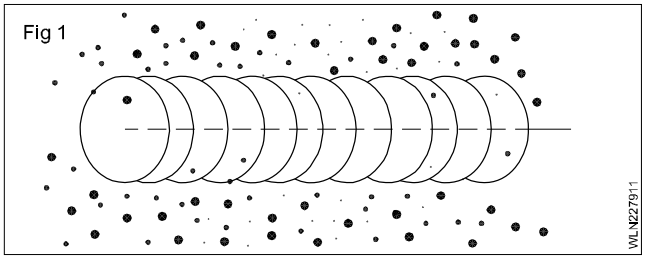
MATERIAL THICKNESS	PROCESS				
	MANUAL METAL ARC	MANUAL CO_2 DIP TRANSFER	MANUAL CO_2 SPRAY TRANSFER	MACHINISED CO_2	SUBMERGED ARC
19	60°-70° 3.2 3.2	60° 1.6	50° 50° 3.2	40° 40° 6	40° 40° 6
25	60°-70° 3.2 60°-70°	60° 1.6 60°	50° 50° 3.2	40° 40° 6	40° 40° 6
38	60°-70° 3.2 60°-70°	60° 1.6 60°	50° 50° 3.2	60° 60° 12.5	40° 40° 12.5
76	20° 20° 3.2	60° 1.6 60°	50° 50° 3.2	30° 30° 12.5	30° R6 30° 3.2

WLN227813

GMAW defects, causes and remedies

Objective: At the end of this lesson you shall be able to
- **state the weld defect, explain the causes and remedy if the defects.**

Excessive spatter

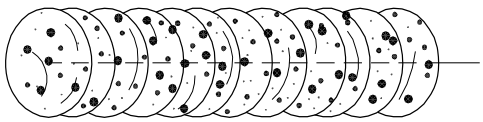


Excessive Spatter : scattering of molten metal particles that cool to solid form near weld bead.

Possible causes	Corrective actions
Wire feed speed too high.	Select lower wire feed speed.
Voltage too high.	Select lower voltage range.
Electrode extension (stickout) too long.	Use shorter electrode extension (stickout).
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, undercoating, and dirt from work surface before welding.
Insufficient shielding gas at welding arc.	Increase flow of shielding gas at regulator/flowmeter and/or prevent drafts near welding arc.
Dirty welding wire.	Use clean, dry welding wire.
	Eliminate pickup of oil or lubricant on welding wire from feeder or liner.

Porosity

Fig 2



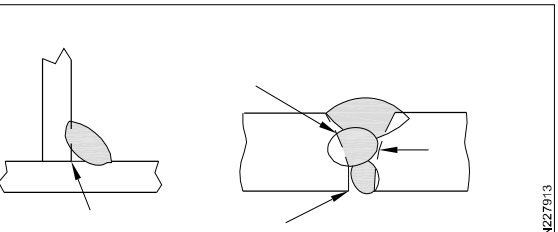
WLN2279I2

Porosity — small cavities or holes resulting from gas pockets in weld metal.

Possible causes	Corrective actions
Inadequate shielding gas coverage.	Check for proper gas flow rate.
	Remove spatter from gun nozzle.
	Check gas hoses for leaks.
	Eliminate drafts near welding arc.
	Hold gun near bead at end of weld until molten metal solidifies.
Wrong gas.	Use welding grade shielding gas; change to different gas.
Dirty welding wire.	Use clean, dry welding wire.
	Eliminate pick up of oil or lubricant on welding wire from feeder or liner.
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding.
	Use a more highly deoxidizing welding wire.
Welding wire extends too far out of nozzle.	Be sure welding wire extends not more than (13 mm) beyond nozzle.

Incomplete fusion

Fig 3



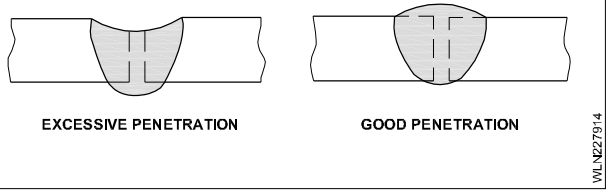
WLN2279I3

Incomplete Fusion — failure of weld metal to fuse completely with base metal or a preceeding weld bead.

Possible causes	Corrective actions
Workpiece dirty.	Remove all grease, oil, moisture, rust, paint, coatings, and dirt from work surface before welding.
Insufficient heat input.	Select higher voltage range and/or adjust wire feed speed.
Improper welding technique.	Place stringer bead in proper location(s) at joint during welding.
	Adjust work angle or widen groove to access bottom during welding.
	Momentarily hold arc on groove side walls when using weaving technique.
	Keep arc on leading edge of weld puddle.
	Use correct gun angle of 0 to 15 degrees.

Excessive penetration

Fig 4

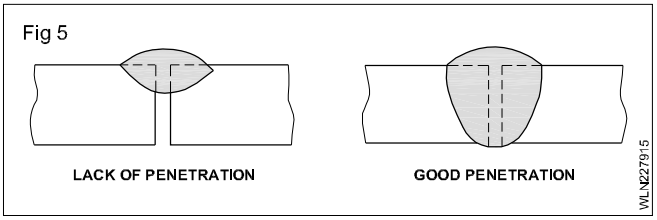


Excessive Penetration — weld metal melting through base metal and hanging underneath weld.

Possible causes	Corrective actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed. Increase travel speed.

Lack of penetration

Fig 5

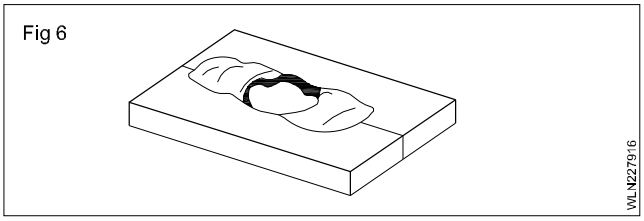


Lack of Penetration — shallow fusion between weld metal and base metal.

Possible causes	Corrective actions
Improper joint preparation.	Material too thick. Joint preparation and design must provide access to bottom of groove while maintaining proper welding wire extension and arc characteristics.
Improper weld technique.	Maintain normal gun angle of 0 to 15 degrees to achieve maximum penetration. Keep arc on leading edge of weld puddle. Be sure welding wire extends not more than (13 mm) beyond nozzle.
Insufficient heat input.	Select higher wire feed speed and/or select higher voltage range. Reduce travel speed.

Burn through

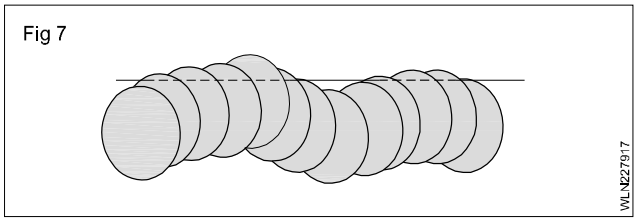
Fig 6



Burn-Through — weld metal melting completely through base metal resulting in holes where no metal remains.

Possible causes	Corrective actions
Excessive heat input.	Select lower voltage range and reduce wire feed speed. Increase and/or maintain steady travel speed.

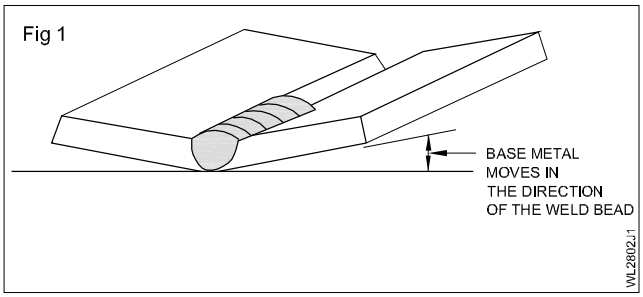
Waviness of bead



Waviness of Bead — weld metal that is not parallel and does not cover joint formed by base metal.

Possible causes	Corrective actions
Unsteady hand.	Support hand on solid surface or use two hands.

Distortion



Distortion — contraction of weld metal during welding that forces base metal to move.

Possible causes	Corrective actions
Excessive heat input.	Use restraint (clamp) to hold base metal in position. Make tack welds along joint before starting welding operation. Select lower voltage range and/or reduce wire feed speed. Increase travel speed. Weld in small segments and allow cooling between welds.