

WELDING DEFECTS

STC/NBQ/NFR



WELDING

- Welding is a materials joining process which produces coalescence of materials by heating them to suitable temperatures with or without the application of pressure or by the application of pressure alone, and with or without the use of filler material.
- Welding is used for making permanent joints.
- It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, boilers, general repair work and ship building.



CLASSIFICATION OF WELDING PROCESSES:

(i). Arc welding

- Carbon arc
- Metal arc
- Metal inert gas
- Tungsten inert gas
- Plasma arc
- Submerged arc
- Electro-slag

(ii). Gas Welding

- Oxy-acetylene
- Air-acetylene
- Oxy-hydrogen

(iii). Resistance Welding

- Butt
- Spot
- Seam
- Projection
- Percussion

(iv)Thermit Welding

(v)Solid State Welding

- Friction
- Ultrasonic
- Diffusion
- Explosive

(vi)Newer Welding

- Electron-beam
- Laser

(vii)Related Process

- Oxy-acetylene cutting
- Arc cutting
- Hard facing
- Brazing
- Soldering

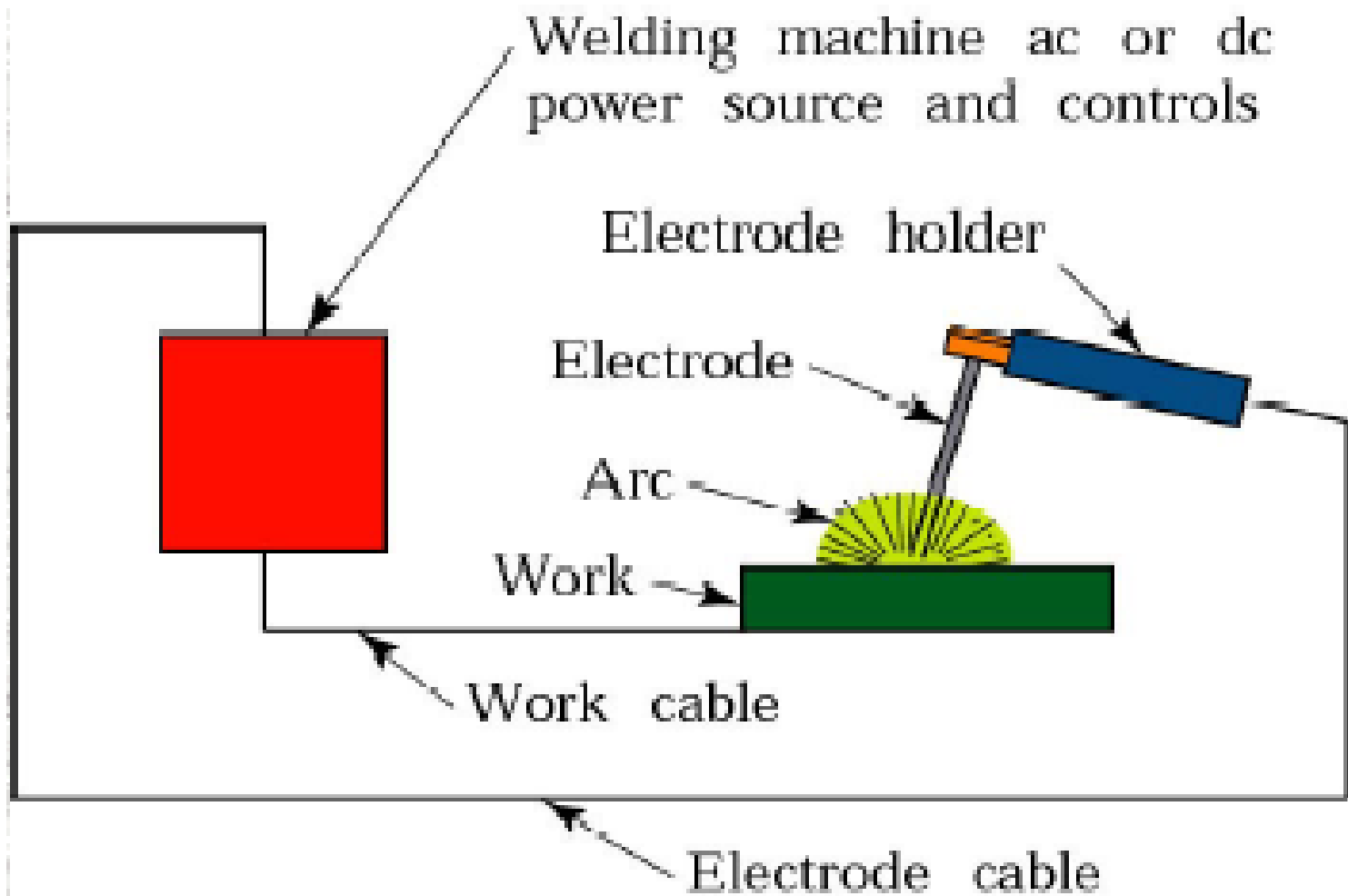


Equipments:

- A welding generator (D.C.) or Transformer (A.C.)
- Two cables one for work and one for electrode
- Electrode holder
- Electrode
- Protective shield
- Gloves
- Wire brush
- Chipping hammer
- Goggles



ARC WELDING EQUIPMENTS



ARC WELDING



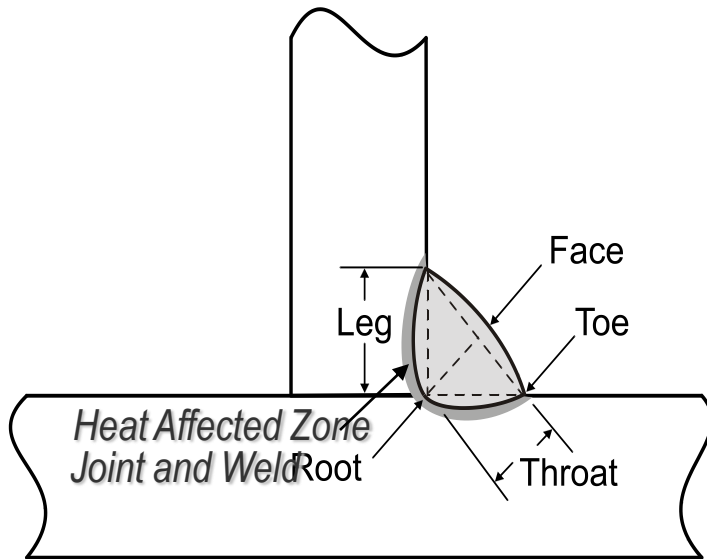
Uses an electric arc to coalesce metals

Arc welding is the most common method of welding metals

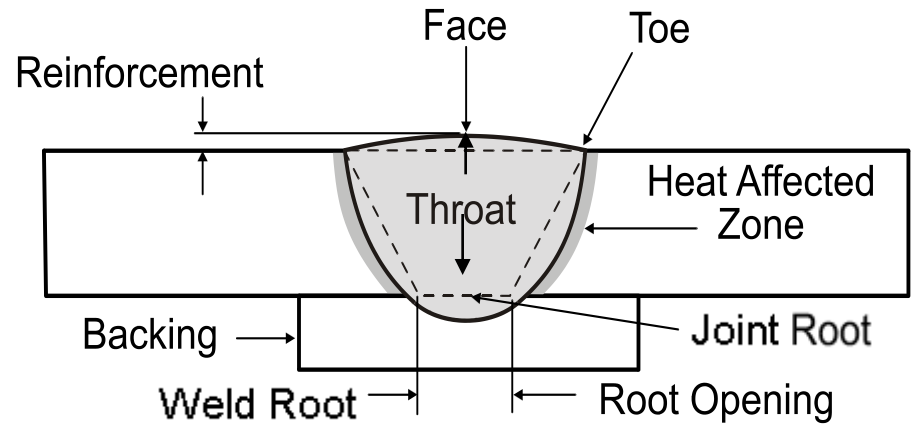
Electricity travels from electrode to base metal to ground



WELD TERMINOLOGY



Fillet Weld Terminology



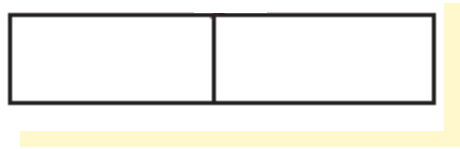
Groove Weld Terminology



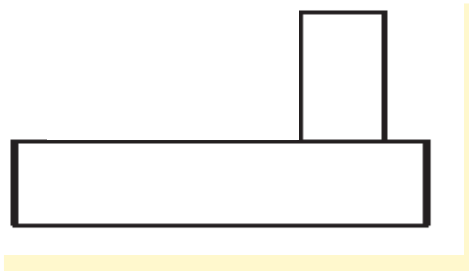
TYPES OF JOINTS

- There are 5 types of joints ...

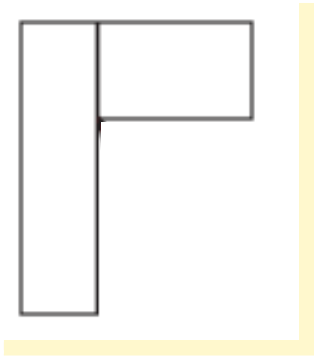
Butt



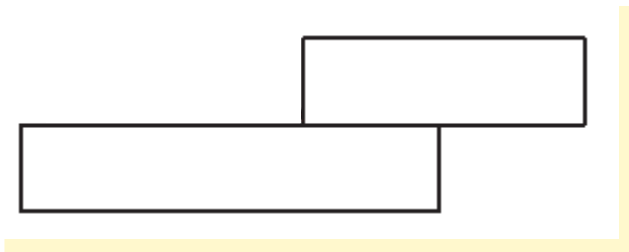
Tee



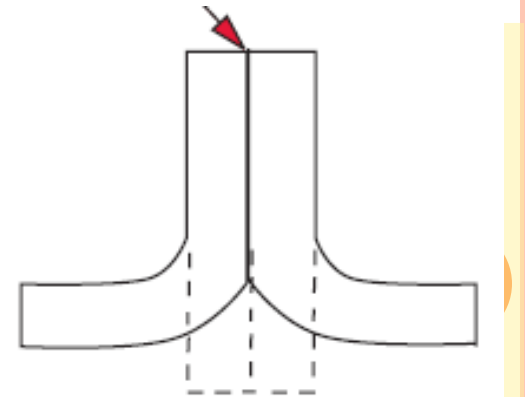
Corner



Lap


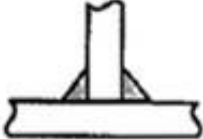
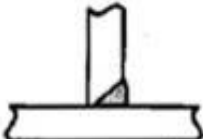
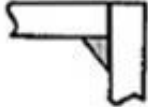
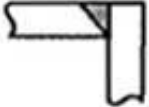
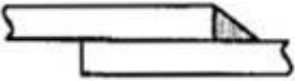


Edge



FILLET AND GROOVE WELDS

- Groove and fillet welds can be made on many types of joints

	Fillet	Groove
Butt	N.A.	
Tee		
Corner		
Lap		N.A.



TYPES OF DEFECTS

- Slag Inclusion
- Undercut
- Porosity
- Incomplete fusion
- Overlap
- Underfill
- Spatter
- Excessive Convexity
- Excessive Weld Reinforcement
- Incomplete Penetration
- Excessive Penetration



SLAG INCLUSION

Cause:- Low amperage, improper techniques, slow travel rate

Prevention:- Increase amperage, increase travel rate

Repair:- Remove by grinding or other mechanical process

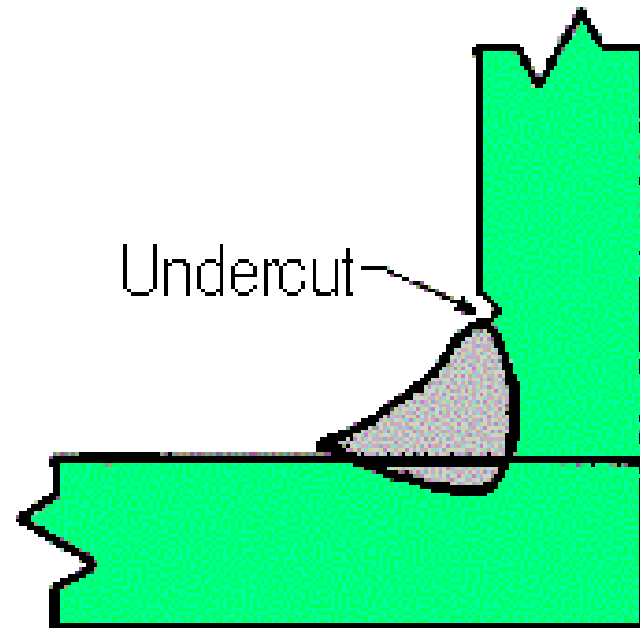


UNDERCUT

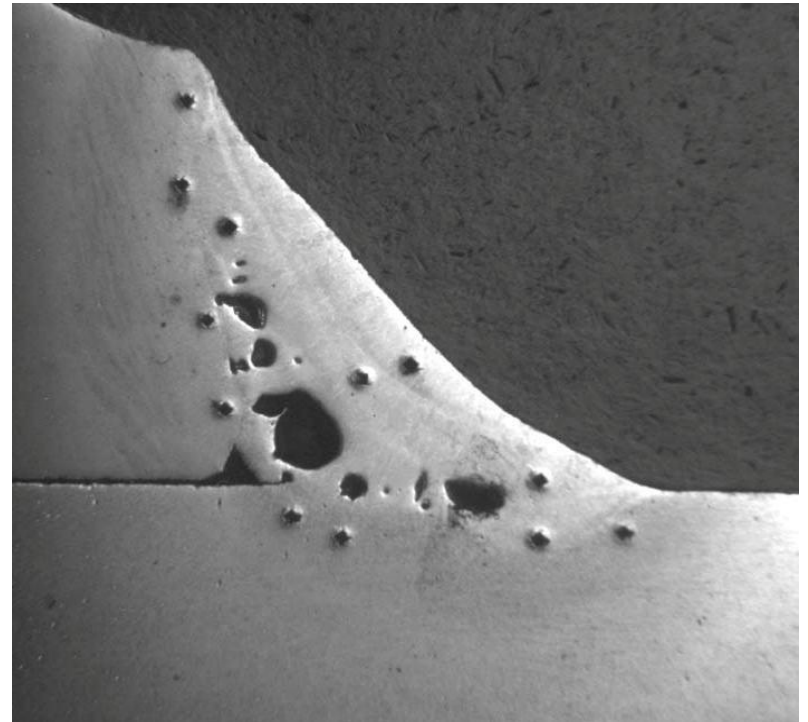
Cause:- High amperage, wrong electrode angle, long arc length, rust

Prevention:- Set machine on scrap metal to correct parameters, clean metal before welding

Repair:- Weld with smaller electrode, sometimes must be low hydrogen with preheat.



POROSITY

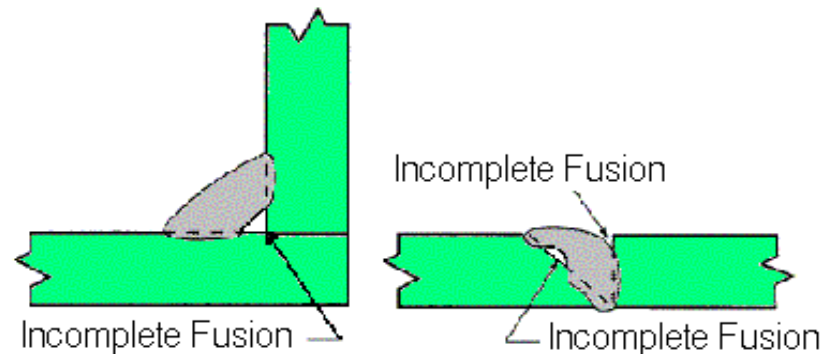


INCOMPLETE FUSION

Cause:- Low amperage, steep electrode angle, fast travel speed, short arc gap, lack of preheat, electrode too small, unclean base metal, arc off seam

Prevention:- Eliminate the potential causes

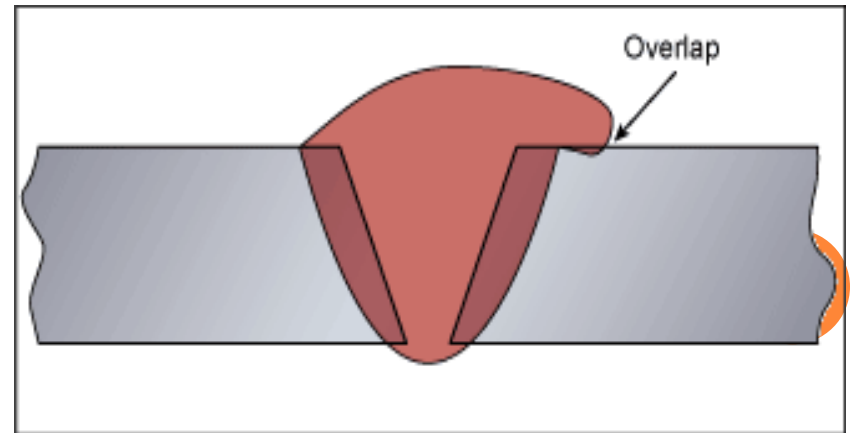
Repair:- Remove & reweld, being careful to completely remove the defective area.



OVERLAP

Cause:- Improper welding technique, steep electrode angle, fast travel speed

Prevention:- Overlap is a contour problem. Proper welding technique will prevent this problem

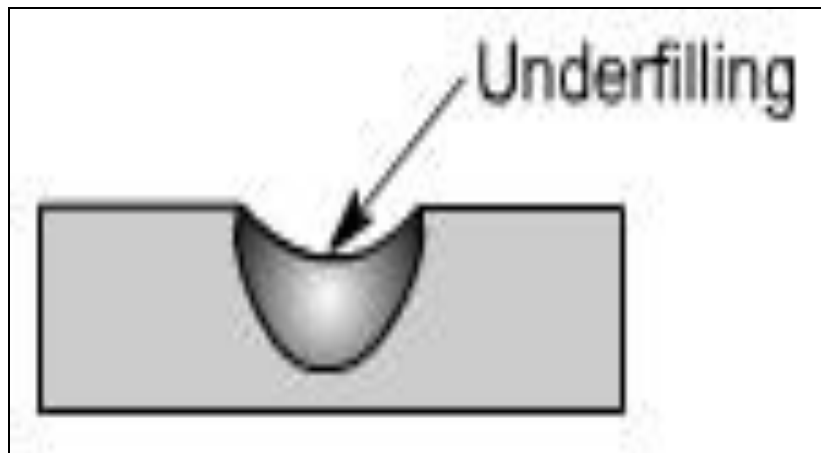


UNDERFILL

Cause:- Improper welding techniques

Prevention:- Apply proper welding techniques for the weld type & position.
Use stripper beads before the cover pass.

Repair:- Simply weld to fill. May require preparation by grinding.

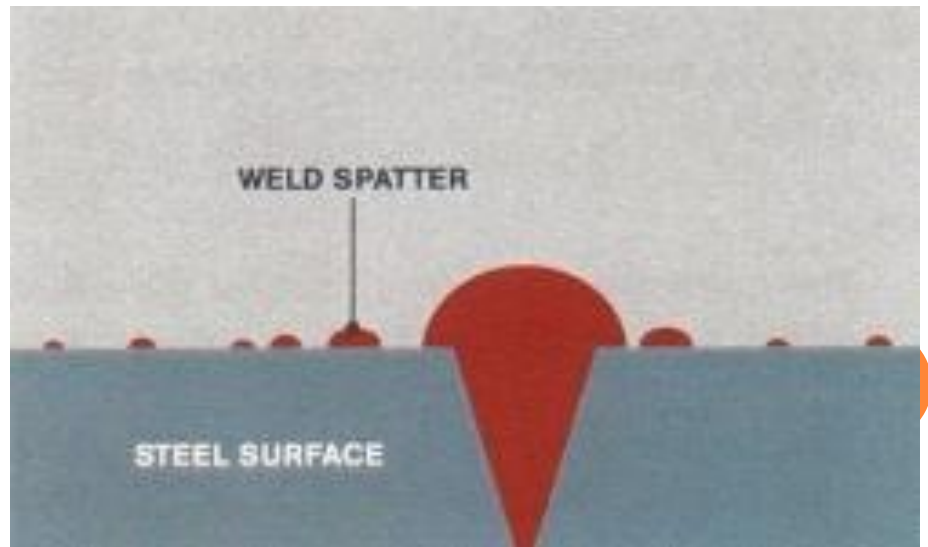


SPATTER

Cause:- High arc power, magnetic arc blow, Damp electrodes

Prevention:- Reduce arc power, reduce arc length, use dry electrodes

Repair:- Remove by mechanical process

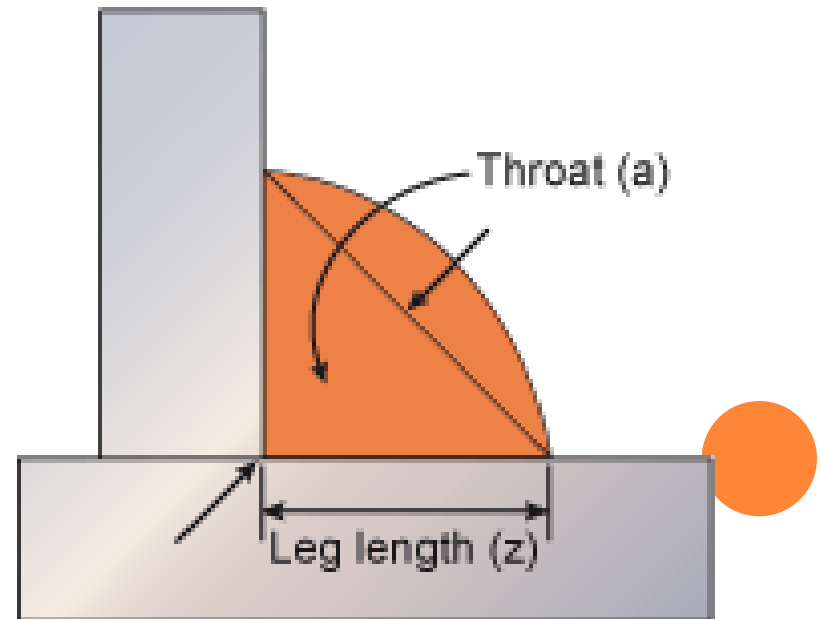


EXCESSIVE CONVEXITY

Cause:- Amperage & travel speed

Prevention:- Observe proper parameters & techniques

Repair:- Must blend smoothly into the base metal

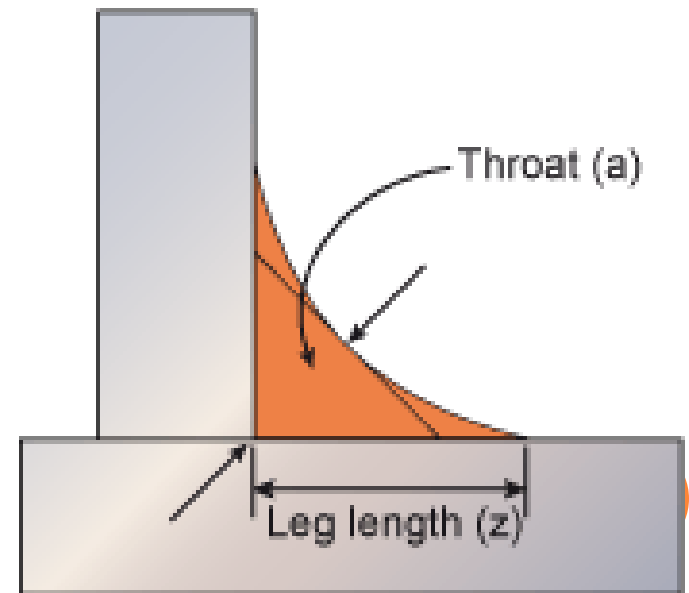


EXCESSIVE CONCAVITY

Cause:- Amperage & travel speed

Prevention:- Observe proper parameters & techniques

Repair:- Must blend smoothly into the base metal

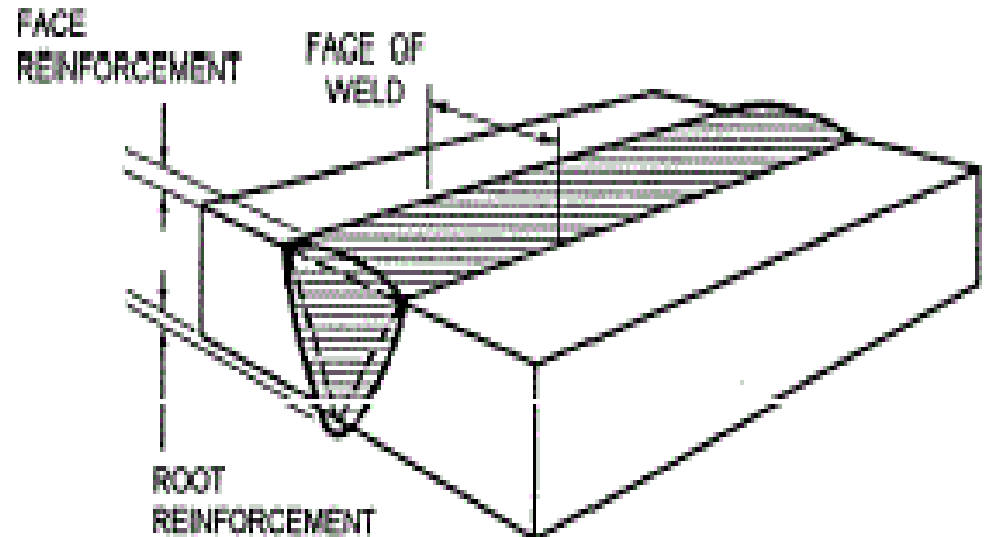


EXCESSIVE WELD REINFORCEMENT

Cause:- Travel speed too slow, amperage too low

Prevention:- Set travel speed & amperage on scrap plate

Repair:- Remove excessive reinforcement and feather the weld toes to a smooth transition to the base plate.

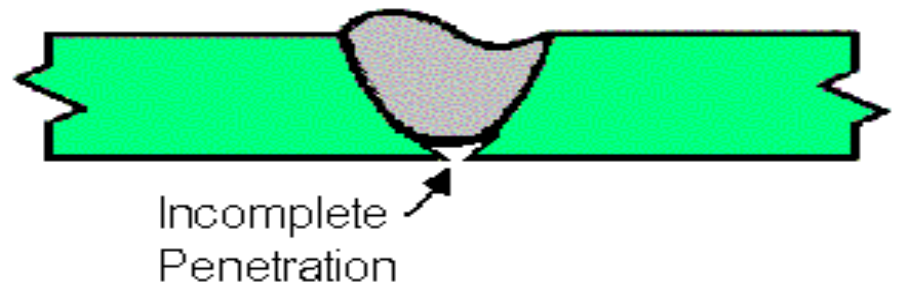


INCOMPLETE PENETRATION

Cause:- Low amperage, low preheat, tight root opening, fast travel speed, short arc length

Prevention:- Correct the contributing factors.

Repair:- Back gauge and back weld



EXCESSIVE PENETRATION

