

Workshop Concept

Welding

Definition:

Welding is a process of joining similar or dissimilar materials by the application of heat and/or pressure.

Advantage: portable, permanent, stronger than the parent materials with a filler metal, the most economical method to join in terms of material usage and fabrication costs .

Disadvantage: Expensive manual Labor, high energy and dangerous, does not allow disassemble and defects.

Application :

- It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, furniture, boilers, general repair work and ship building.

Types of Welding

1. Fusion Welding

2. Solid State Welding

- **Fusion Welding** – melting base metals

Arc Welding– heating with electric arc

Resistance welding– heating with resistance to an electrical current

Oxy-fuel gas Welding – heating with a mixture of oxygen and acetylene (oxyfuel gas)

Other fusion welding – electron beam welding and laser beam welding

- **Solid State Welding** – No melting, No fillers

Diffusion welding– solid-state fusion at an elevated temperature

Friction welding– heating by friction

Ultrasonic welding– moderate pressure with ultrasonic oscillating motion

Types of Welded Joints

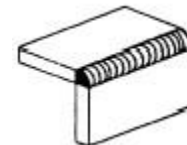
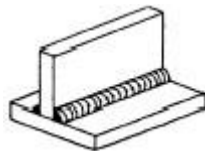
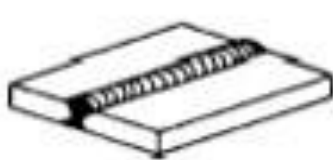
The weld joint is where two or more metal parts are joined by welding. The five basic types of weld joints are the butt, corner, tee, lap, and edge.

1. Butt Joint: it is used to join two members aligned in the same plane. This joint is frequently used in plate, sheet metal, and pipe work.

2. Corner and Tee Joints: these joints are used to join two members located at right angles to each other. In cross section, the corner joint forms an L-shape, and the tee joint has the shape of the letter T.

3. Lap Joint: this joint is made by lapping one piece of metal over another. This is one of the strongest types of joints available; however, for maximum joint efficiency, the overlap should be at least three times the thickness of the thinnest member of the joint.

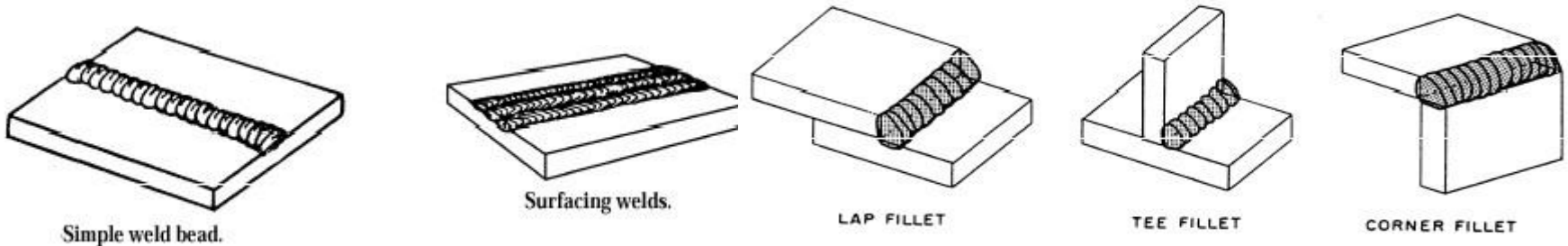
4. Edge Joint: it is used to join the edges of two or more members lying in the same plane. In most cases, one of the members is flanged, as seen in the figure. This type is frequently used in sheet metal work for joining metals 1/4 inch or less in thickness that are not subjected to heavy loads.



Types of Welds

- Fillet weld
- Groove weld
- Plug and slot welds
- Spot and Seam welds
- Flange and Surfacing welds

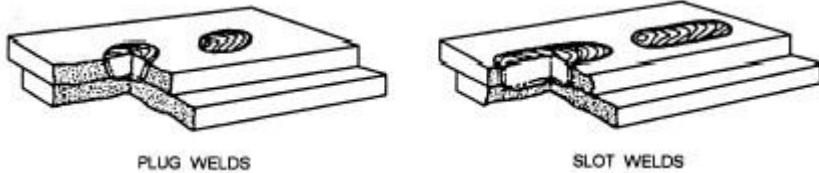
A weld ***Bead*** is a weld deposit produced by a single pass with one of the welding processes.



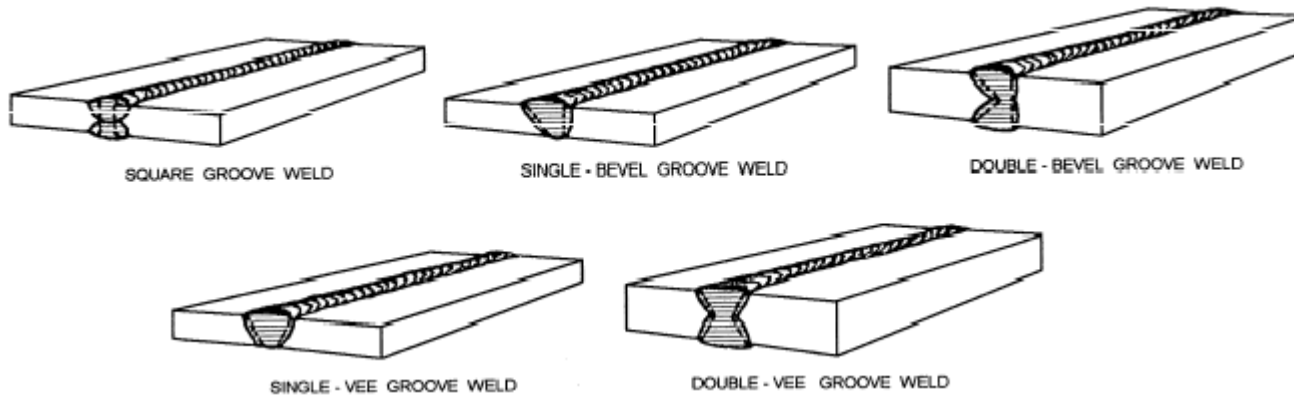
Several weld beads applied side-by-side are usually used in ***Surfacing*** which is a welding process used to apply a hard, wear-resistant layer of metal to surfaces or edges of worn-out parts.

A Fillet weld is triangular in shape and this weld is used to join two surfaces that are at approximately right angles to each other in a lap, tee, or corner joint.

Plug and Slot welds are welds made through holes or slots in one member of a lap joint. These welds are used to join that member to the surface of another member that has been exposed through the hole.



Groove welds (also may be referred to as Butt welds) are simply welds made in the groove between two members to be joined. The weld is adaptable to a variety of butt joints, as seen in the figure.



Classification of welding processes

Arc welding

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

Gas Welding

Oxy-acetylene
Air-acetylene
Oxy-hydrogen

Resistance Welding

Butt
Spot
Seam
Projection
Percussion

Thermit Welding

Solid State Welding

Friction
Ultrasonic
Diffusion
Explosive

Newer Welding

Electron-beam
Laser

Related Process

Oxy-acetylene
cutting
Arc cutting
Hard facing
Brazing
Soldering

