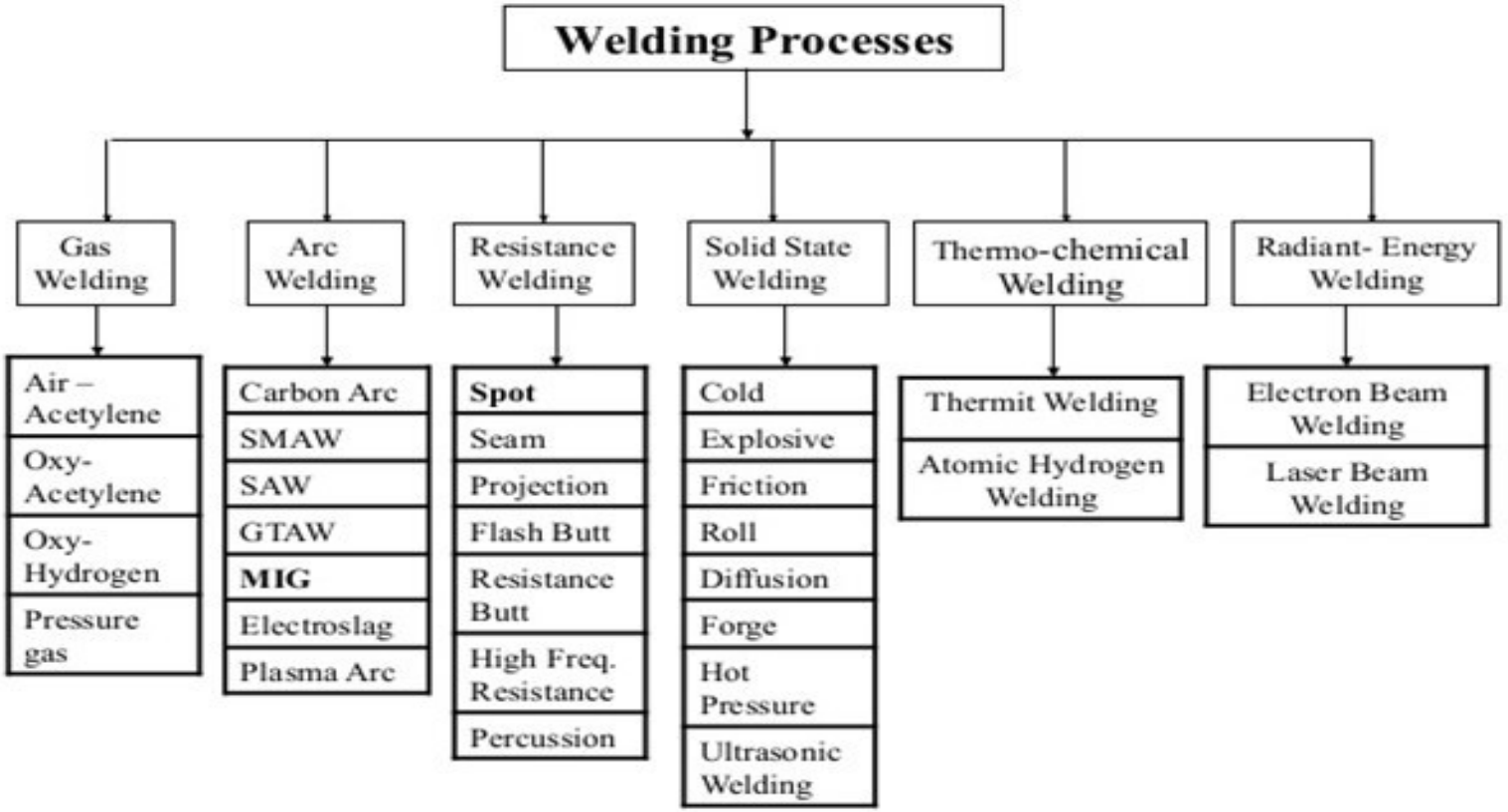
WELDING

- WELDING IS A FABRICATION PROCESS THAT JOINS MATERIALS, USUALLY METALS OR THERMOPLASTICS, BY HEATING THEM TO A SUITABLE TEMPRATURE, WITH OR WITHOUT THE APPLICATION OF PRESSURE, FILLER METAL AND FLUX

- IN ADDITION TO MELTING THE BASE METAL, A FILLER MATERIAL IS TYPICALLY ADDED TO THE JOINT TO FORM A POOL OF MOLTEN MATERIAL (THE WELD POOL) THAT COOLS TO FORM A JOINT

- MANY DIFFERENT ENERGY SOURCES CAN BE USED FOR WELDING, INCLUDING A GAS FLAME (CHEMICAL), AN ELECTRIC ARC (ELECTRICAL), A LASER, AN ELECTRON BEAM, FRICTION, AND ULTRASOUND

Classification of Welding Processes



GAS WELDING

- GAS WELDING IS A FUSION WELDING PROCESS, IN WHICH THE AT FOR WELDING IS OBTAINED BY THE COMBUSTION OF O2 AND FUAL.
- FUAL MAY BE ACETYLENE , H2 OR PROPENE.

TYPES

1. OXY – ACETYLENE
2. AIR- ACETYLENE
3. OXY-HYDROGEN
4. OXY-FUAL

ARC WELDING

- ARC WELDING IS A FUSION WELDING PROCESS IN WHICH THE HEAT REQUIRED TO FUSE THE METAL IS OBTAIN FROM THE ELECTRIC ARC BETWEEN THE BASE METAL AND AN ELECTRODE.

TYPES

1. CARBON ARC WELDING
2. SMAW
3. SAW
4. GTAW
5. MIG WELDING
6. ELECTRO SLAG WELDING
7. PLASMA ARC WELDING

RESISTANCE WELDING

- RESISTANCE WELDING IS THE JOINING OF METALS BY APPLYING PRESSURE AND PASSING CURRENT FOR A LENGTH OF TIME THROUGH THE METAL AREA WHICH IS TO BE JOINED.
- THE KEY ADVANTAGE OF RESISTANCE WELDING IS THAT NO OTHER MATERIALS ARE NEEDED TO CREATE THE BOND, WHICH MAKES THIS PROCESS EXTREMELY COST EFFECTIVE.

TYPES

1. SPOT WELDING
2. SEAM WELDING
3. PROJECTION WELDING
4. FLASH BUTT WELDING
5. PERCUSSION WELDING
6. HIGH FREQUENCY RESISTANCE WELDING

WELD JOINTS

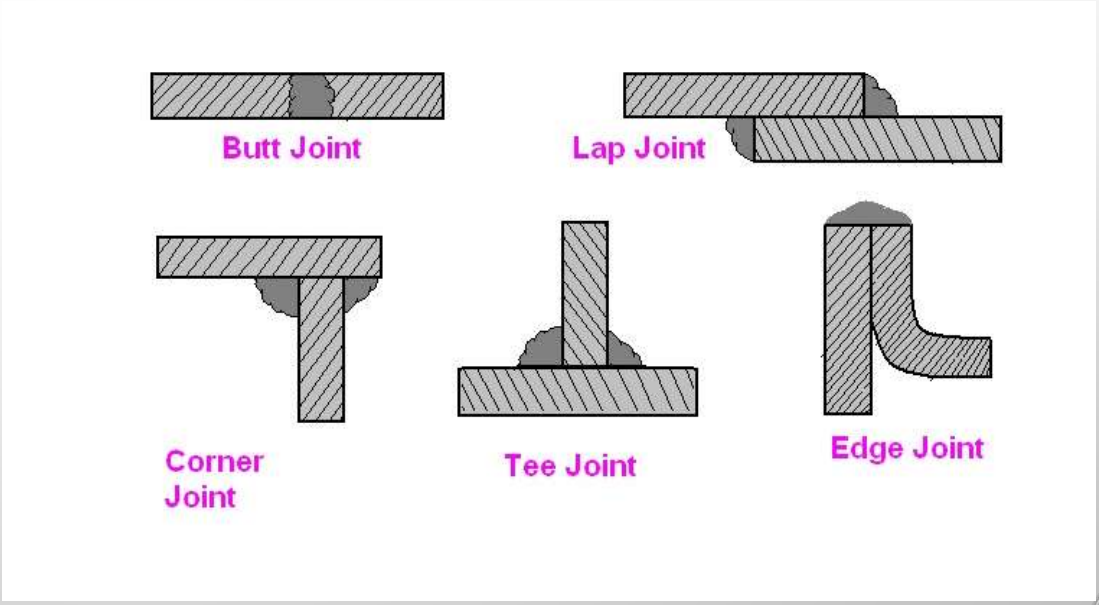
- A WELDING JOINT IS A POINT OR EDGE WHERE TWO OR MORE PIECES ARE JOINED TOGETHER

LAP JOINT

- A LAP JOINT OR OVERLAP JOINT IS A JOINT IN WHICH THE MEMBERS OVERLAP

BUTT JOINT

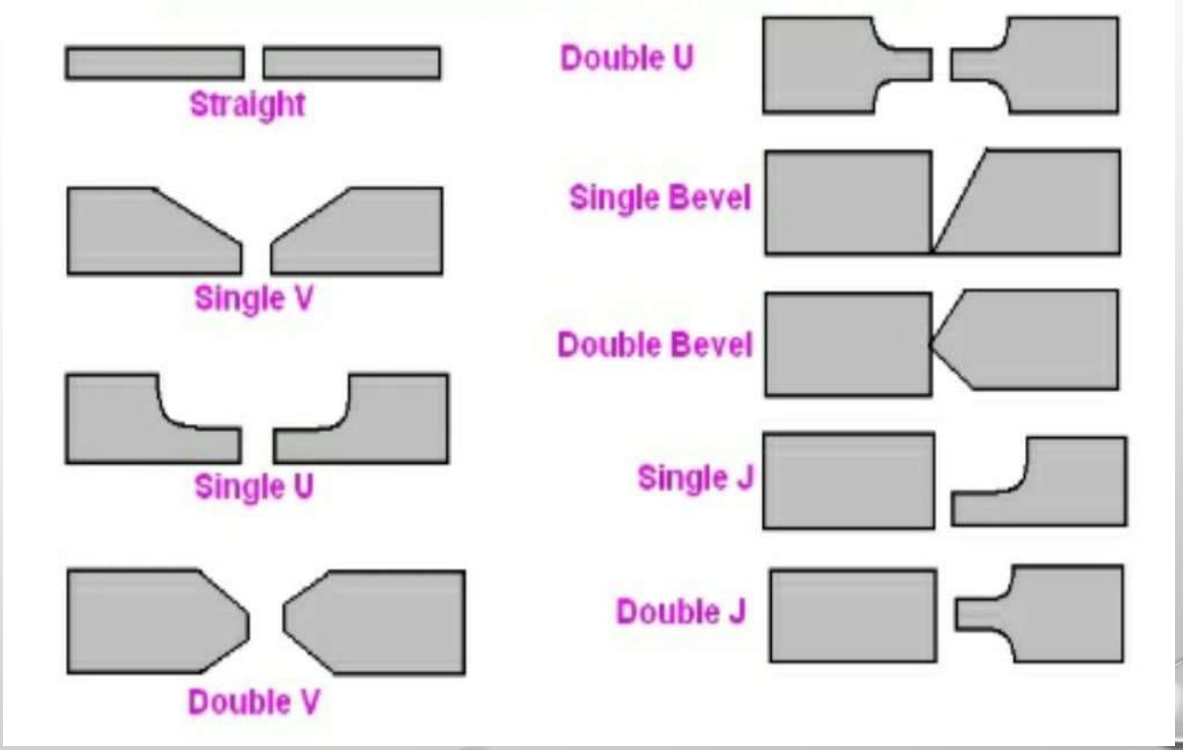
- A BUTT JOINT IS A TECHNIQUE IN WHICH TWO PIECES OF MATERIAL ARE JOINED BY SIMPLY PLACING THEIR ENDS TOGETHER WITHOUT ANY SPECIAL SHAPING



WELD JOINT PREPARATION

- WHEN THE THICKNESS OF THE TWO PIECES TO BE JOINED IS SMALL THEN THIS STRAIGHT EDGES TYPE OF EDGE ARE PREPARED

- HOWEVER, WHEN THE THICKNESS INCREASES, IT BECOMES NECESSARY TO PREPARE THE EDGE IN SUCH A WAY THAT THE HEAT IS ABLE TO PENETRATE THE ENTIRE DEPTH, TO FACILITATE THIS, JOINT IS WIDENED



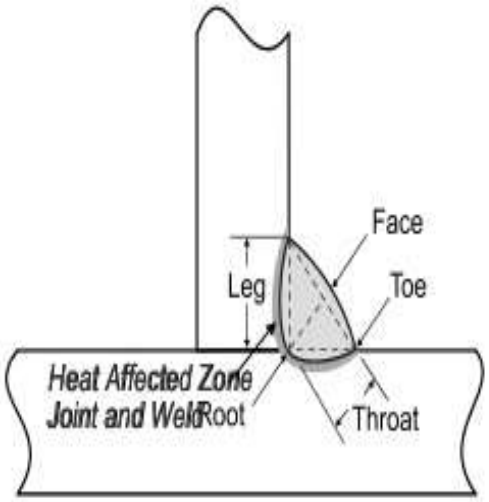
WELD TERMINOLOGY

FACE

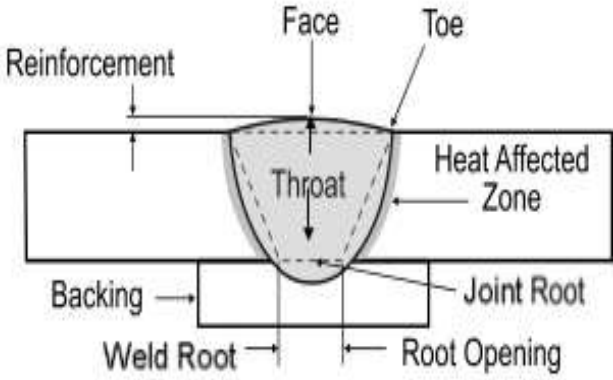
- THE EXPOSED SURFACE OF A WELD ON THE SIDE FROM WHICH WELDING WAS DONE.

TOE

- THE JUNCTION BETWEEN THE FACE OF A WELD AND THE BASE METAL.



Fillet Weld Terminology



Groove Weld Terminology

WELD TERMINOLOGY

HEAT AFFECTED ZONE

- THAT PORTION OF THE BASE METAL WHICH HAS NOT BEEN MELTED, BUT WHOSE MECHANICAL PROPERTIES OR MICROSTRUCTURE HAVE BEEN ALREADY ALTERED BY THE HEAT OF WELDING

ROOT

- THE EXPOSED SURFACE OF A WELD ON THE SIDE OTHER THAN THAT FROM WHICH WELDING WAS DONE

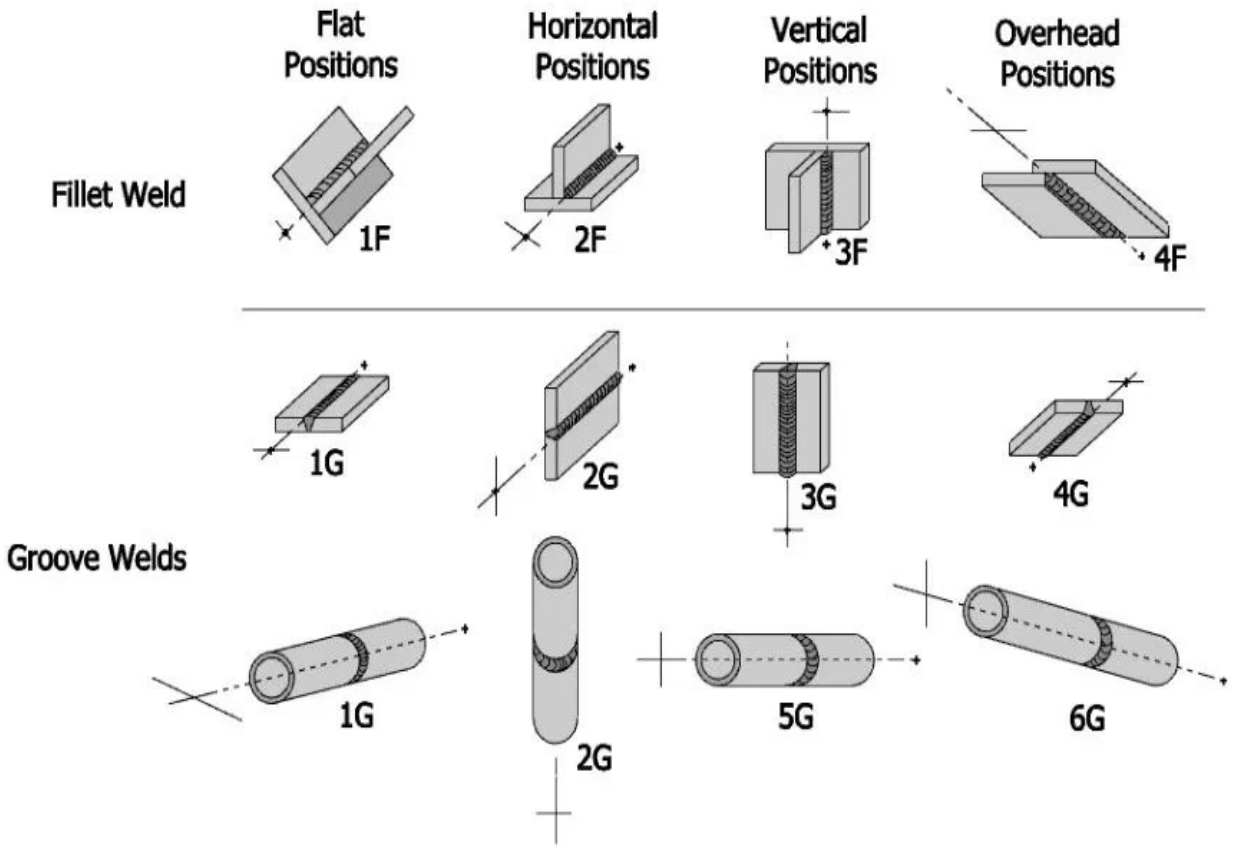
REINFORCEMENT

- WELD METAL IN EXCESS OF THE QUANTITY REQUIRED TO FILL A JOINT.

WELDING POSITIONS

- THE WELDING POSITION REFERS TO THE POSITION OF THE WELDING OPERATOR TOWARDS THE WORK PIECE TO BE WELDED.

- BECAUSE OF GRAVITY, THE WELDING POSITION AFFECTS THE FLOW OF MOLTEN FILLER METAL.



WELDING POSITIONS

FLAT POSITION

- THE EASIEST TYPE TO PERFORM IS THE FLAT POSITION
- IT INVOLVES WELDING ON THE TOP SIDE OF THE JOINT. IN THIS POSITION, THE MOLTEN METAL IS DRAWN DOWNWARD INTO THE JOINT. THE RESULT IS A FASTER AND EASIER WELD.

HORIZONTAL POSITION

- 2G IS A GROOVE WELD POSITION THAT INVOLVES PLACING THE WELD AXIS IN A HORIZONTAL PLANE OR APPROXIMATELY HORIZONTAL. AS FOR THE FACE OF THE WELD, IT SHOULD LIE IN AN APPROXIMATELY VERTICAL PLANE.

WELDING POSITIONS

VERTICAL POSITION

- IN THIS POSITION, BOTH THE PLATE AND THE WELD LIE VERTICALLY OR ALMOST VERTICALLY
- WHEN WELDING VERTICALLY, THE FORCE OF GRAVITY PUSHES THE MOLTEN METAL DOWNWARD AND SO IT HAS THE TENDENCY TO PILE UP. TO COUNTERACT THIS, YOU CAN USE EITHER AN UPWARD OR DOWNHILL VERTICAL POSITION

OVER HEAD POSITION

- IN THE OVERHEAD POSITION, THE METAL DEPOSITED TO THE JOINT TENDS TO SAG ON THE PLATE, RESULTING IN A BEAD WITH A HIGHER CROWN. TO PREVENT THIS, KEEP THE MOLTEN PUDDLE SMALL.
- IF THE WELD PUDDLE BECOMES TOO LARGE, REMOVE THE FLAME FOR A MOMENT IN ORDER TO ALLOW THE MOLTEN METAL TO COOL.

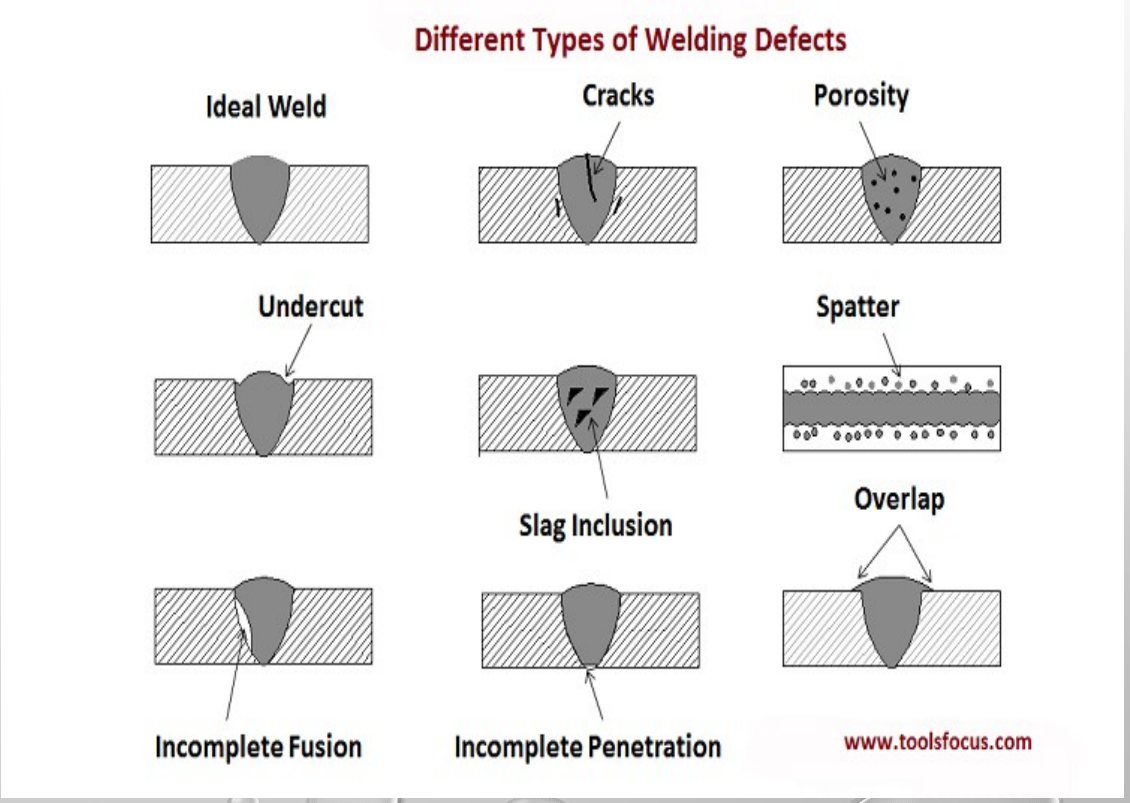
WELD DEFECTS

WELD CRACK

- DISCONTINUITY IN THE WELD ZONE
- GENERALLY RESULTS FROM STRESSES CAUSED BY EXPANSION AND CONTRACTION

SPATTER

- GLOBULES OF METAL EXPELLED FROM THE ELECTRODE AND DEPOSITED ON THE PARENT METAL



CONTINUED…

UNDERCUT

- GROOVE FORMED ALONG THE EDGES OF WELDING BEAD,THEREBY REDUCING THE THICKNESS OF BASE METAL.
- CAUSED DUE TO EXCESSIVE CURRENT OR WELDING SPEED AND WRONG ELECTRODE POSITION

SLAG INCLUSION

- MIXING OF SLAG OR ANOTHER FOREIGN MATTER INSIDE OF WELD METAL
- CAUSED DUE TO INADEQUATE SLAG REMOVAL BETWEEN RUNS OR ELECTRODE REPLACE

POROSITY

- HOLE IN THE WELD METAL CAUSED BY MIXING OF GASES
- CAUSED DUE TO WRONG TYPE OF ELECTRODE

SOLDERING

- SOLDERING IS A PROCESS IN WHICH TWO OR MORE ITEMS ARE JOINED TOGETHER WITH NON-FERROUS FILLER METAL AT A TEMP BELOW 427 °C .
- UNLIKE WELDING, SOLDERING DOES NOT INVOLVE MELTING THE WORK PIECES
- THE BOND BETWEEN SOLDERING ALLOY AND BASE METAL IS BY WETTING AND SURFACE ALLOYING
- IN SOLDERING , LED-TIN ALLOY IS USED AS A FILLER ROD MATERIAL

BRAZING

- BRAZING IS DEFINED AS JOINING THE METALS WITH NON – FERROUS FILLER METALAT TEMP ABOVE AND AT BELOW THE MELTING TEMP OF METALS BEING JOINED.
- IT GIVES MUCH STRONGER JOINTS THAN SOLDERING.
- THE LIQUID METAL FLOWS INTO GAP BY CAPILLARY ACTION.
- GENERALLY CU ALLOY IS USED AS FILLER ROD MATERIAL
- HEAT SOURCE USED IS OXY-HYDROGEN FLAME

THANK YOU