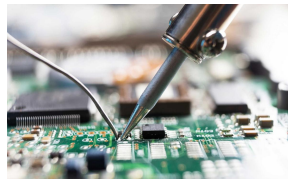
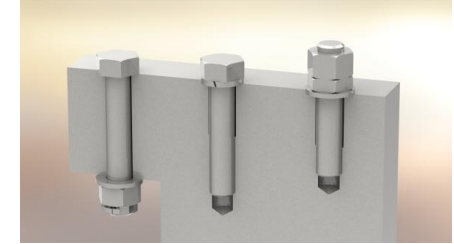




Joining of Materials

Joining of Materials

- Bolted joints (most common in repairs)
- Welding:
 - arc welding ផ្សារប្រើធូបផ្សារ (most important)
 - gas welding ផ្សារដោយកំឡោច ផ្លើងខ្លាំង (if available)
- Soldering
- Adhesive bonding (emergency repairs)

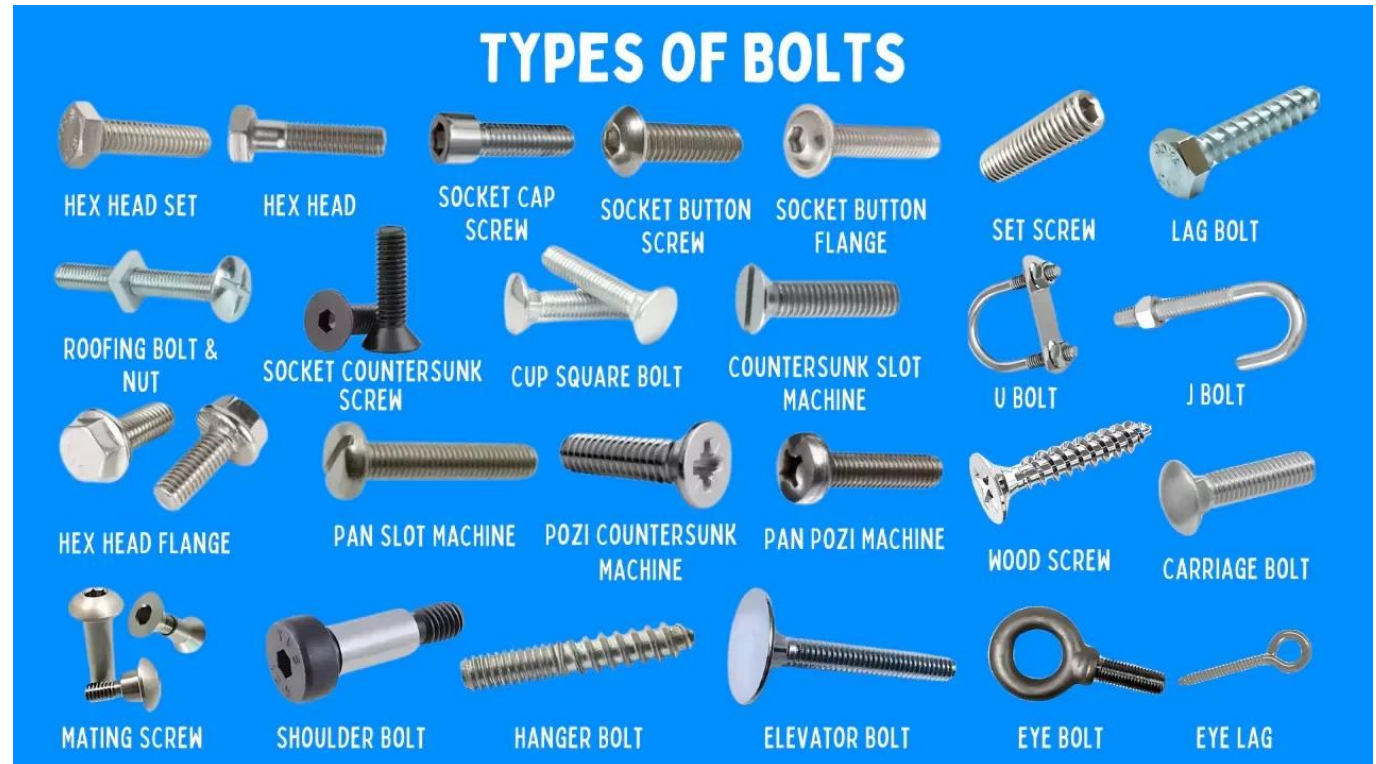
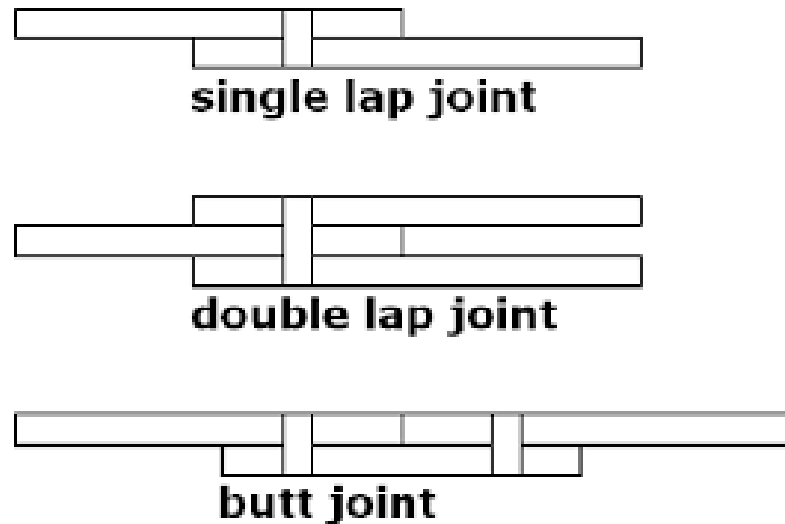


Joining of Materials

- Materials can be joined using different mechanical and non-mechanical methods

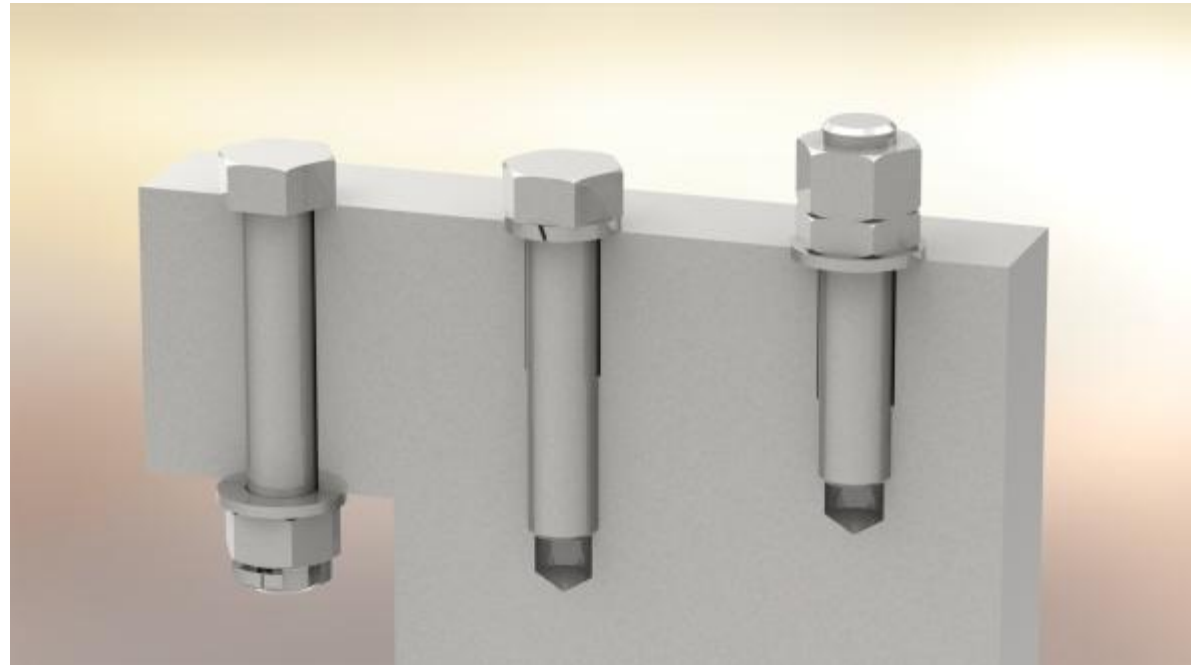
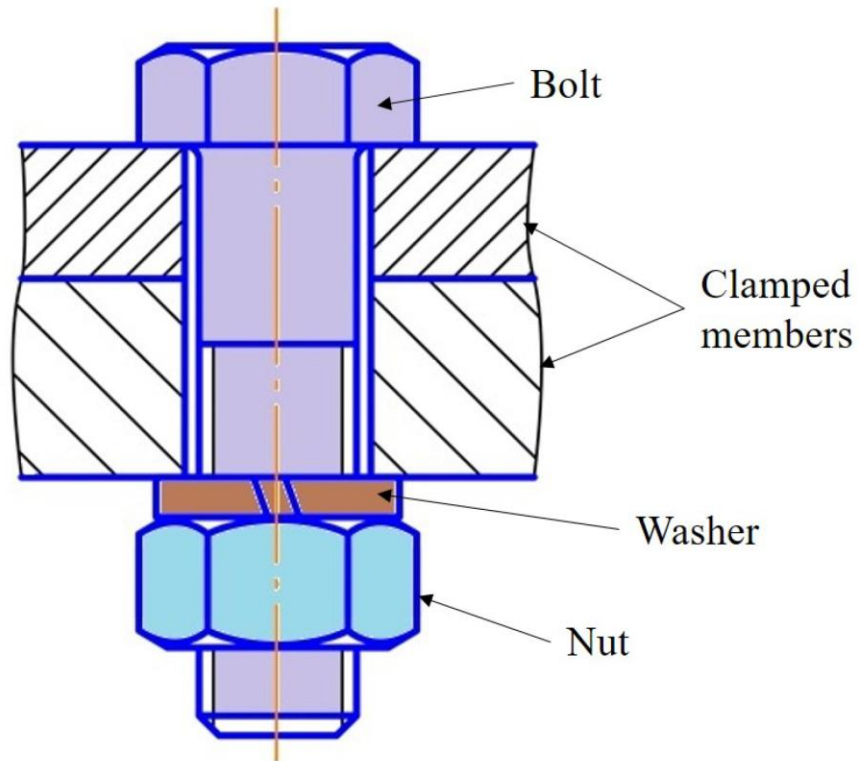
BOLTED JOINTS

- Bolted joints are the most common method used in repairs



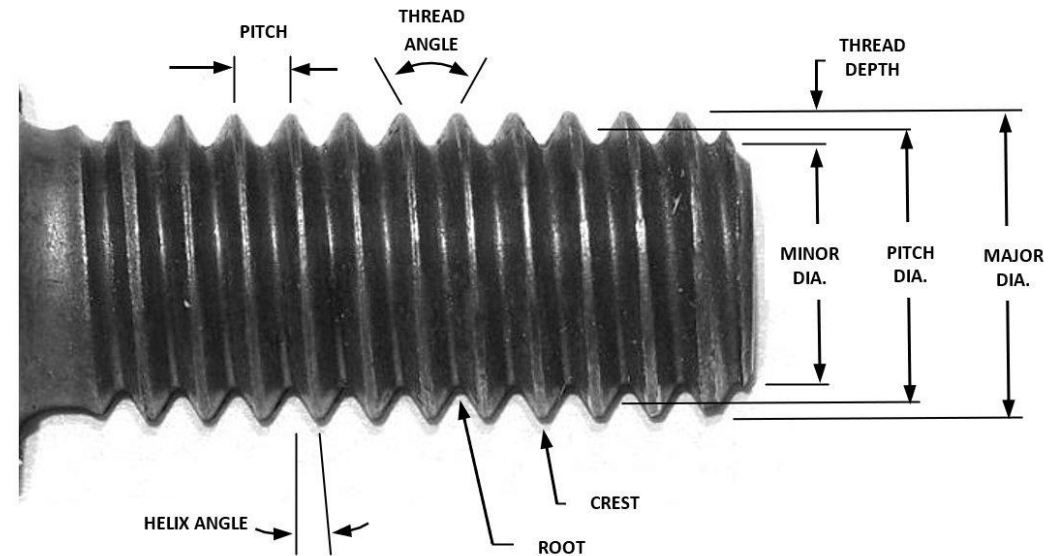
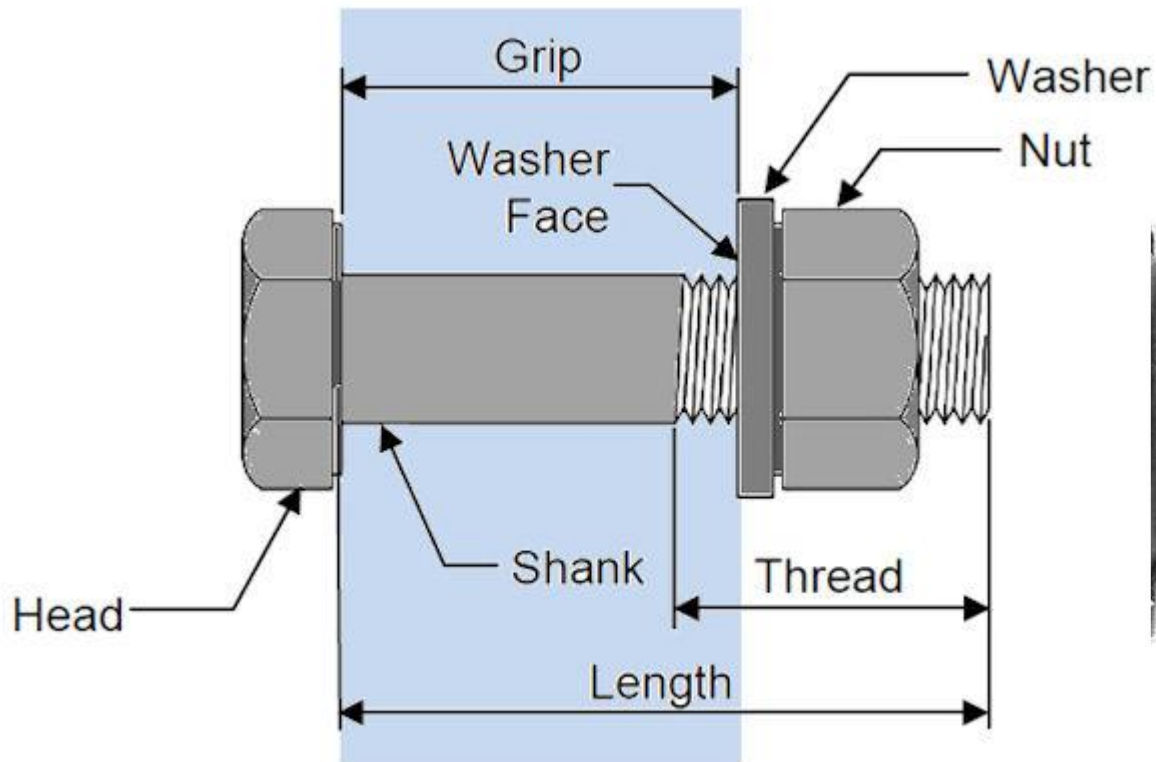
BOLTED JOINTS - Main Components

- A bolted joint consists of a bolt, nut, and washer



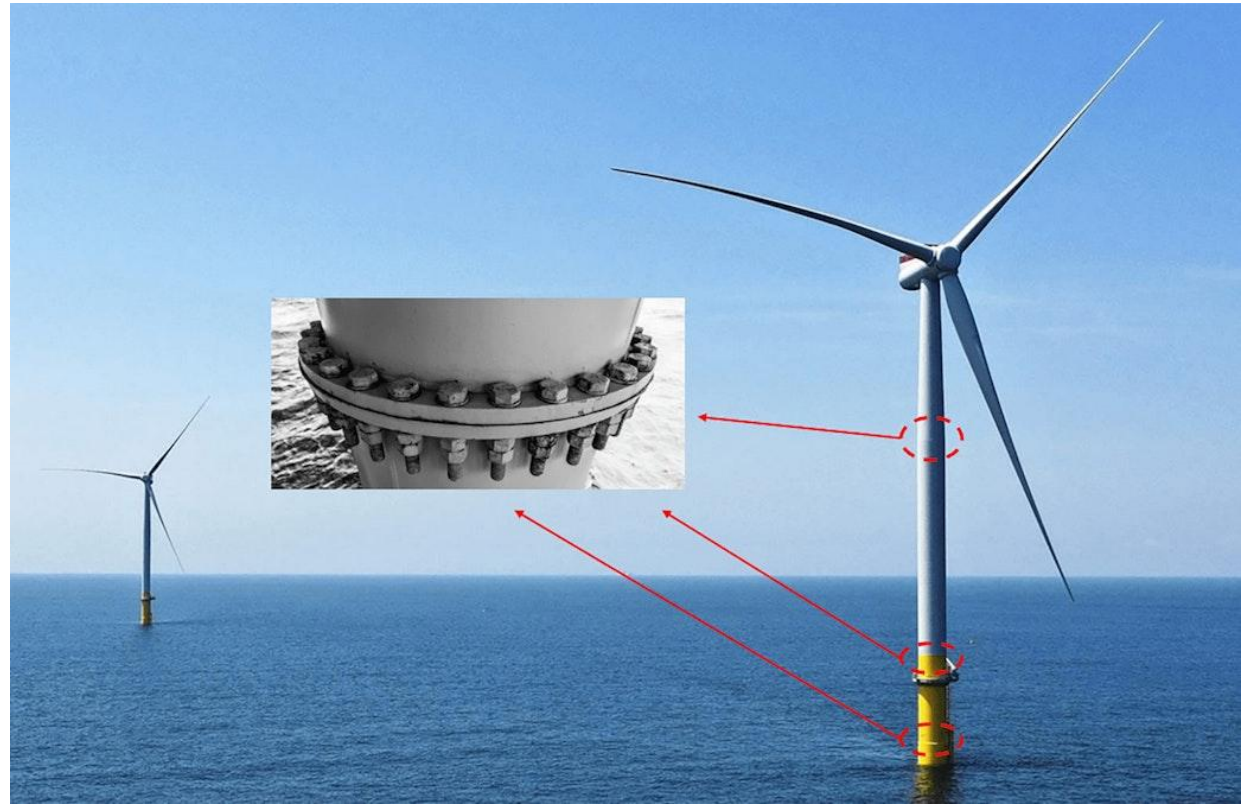
BOLTED JOINTS - Thread

- Threads allow parts to be tightened and held together



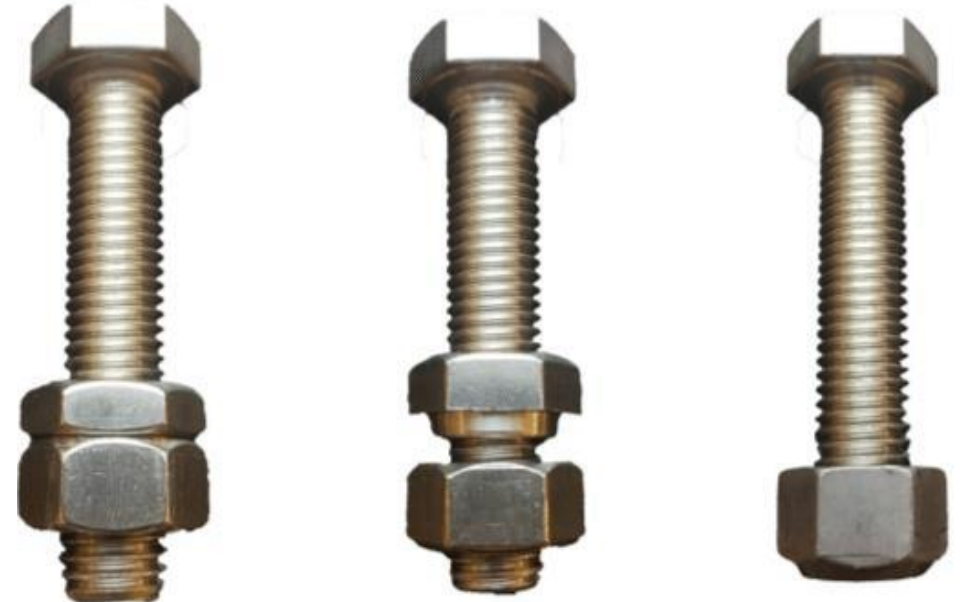
BOLTED JOINTS - Assembly

- Bolted joints can be easily assembled and disassembled



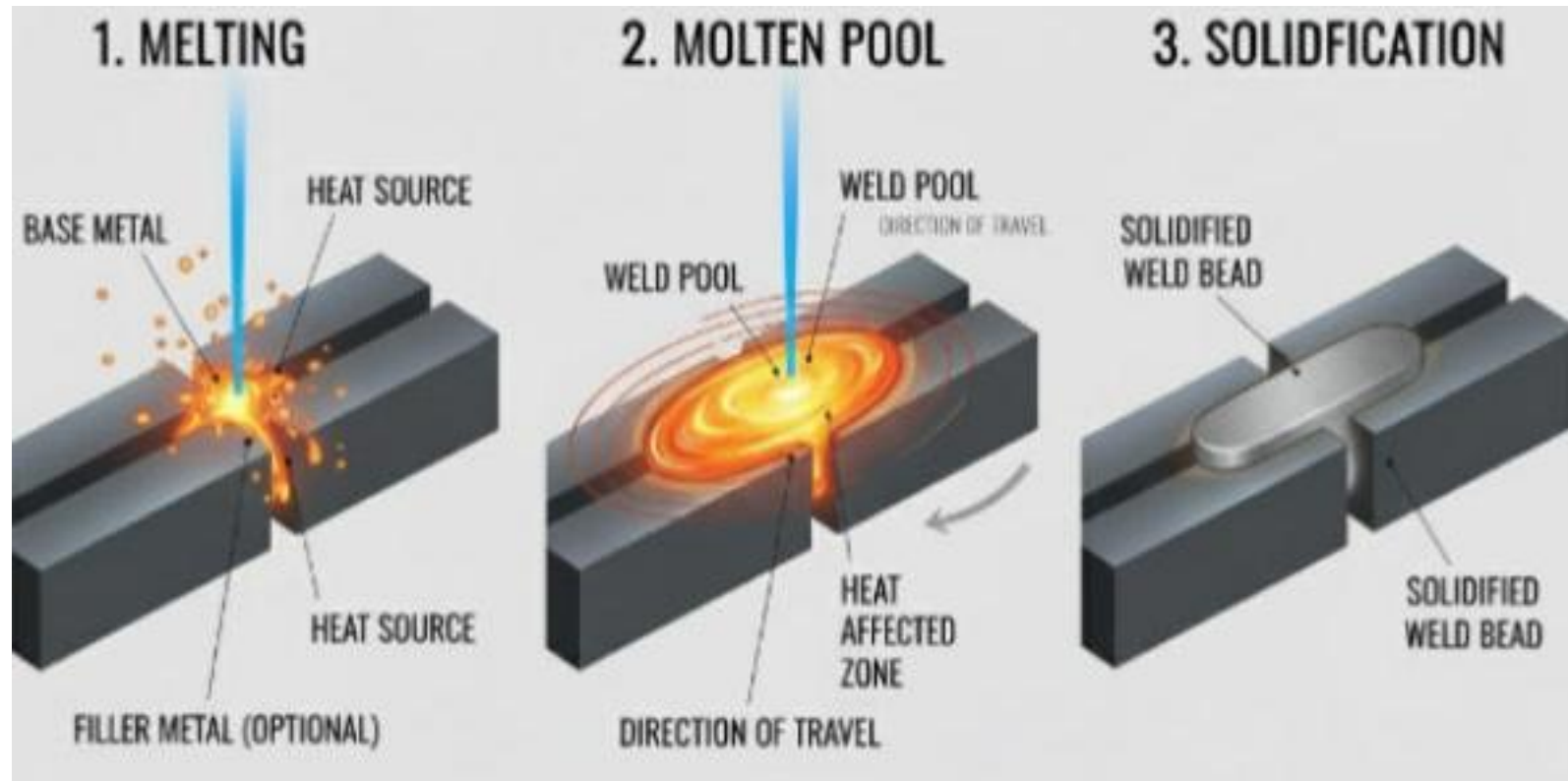
BOLTED JOINTS - Good Practice

- Correct tightening prevents loosening or damage



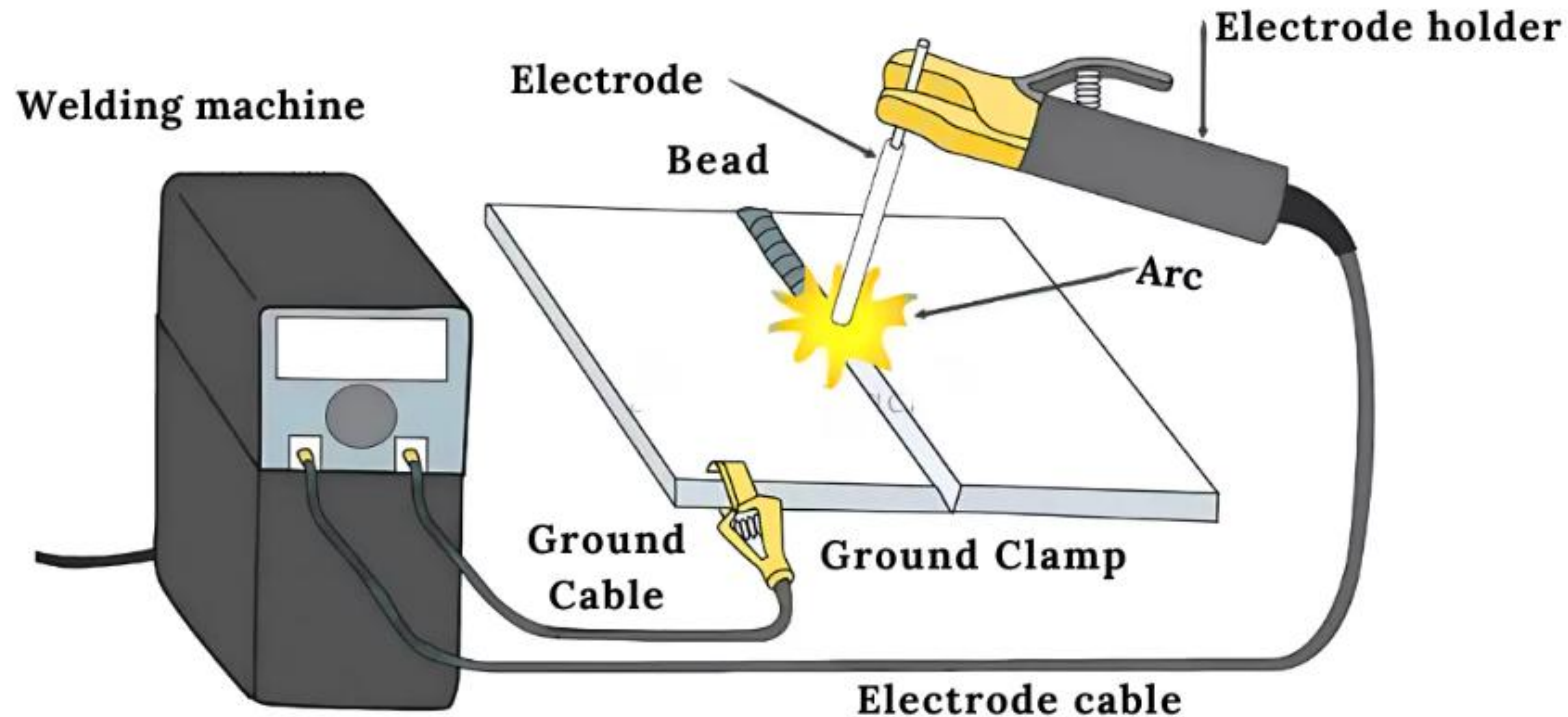
WELDING

- Welding joins materials by melting and fusing them together



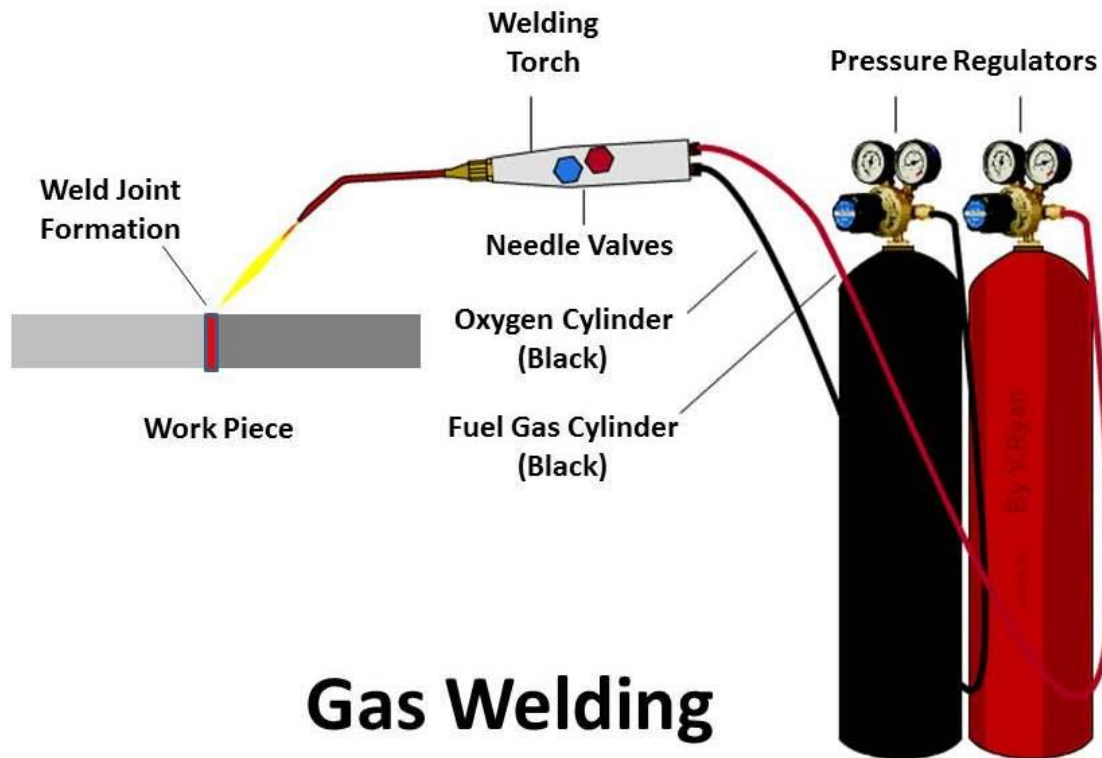
WELDING - Arc Welding

- Arc welding uses electric current to create heat and melt metal



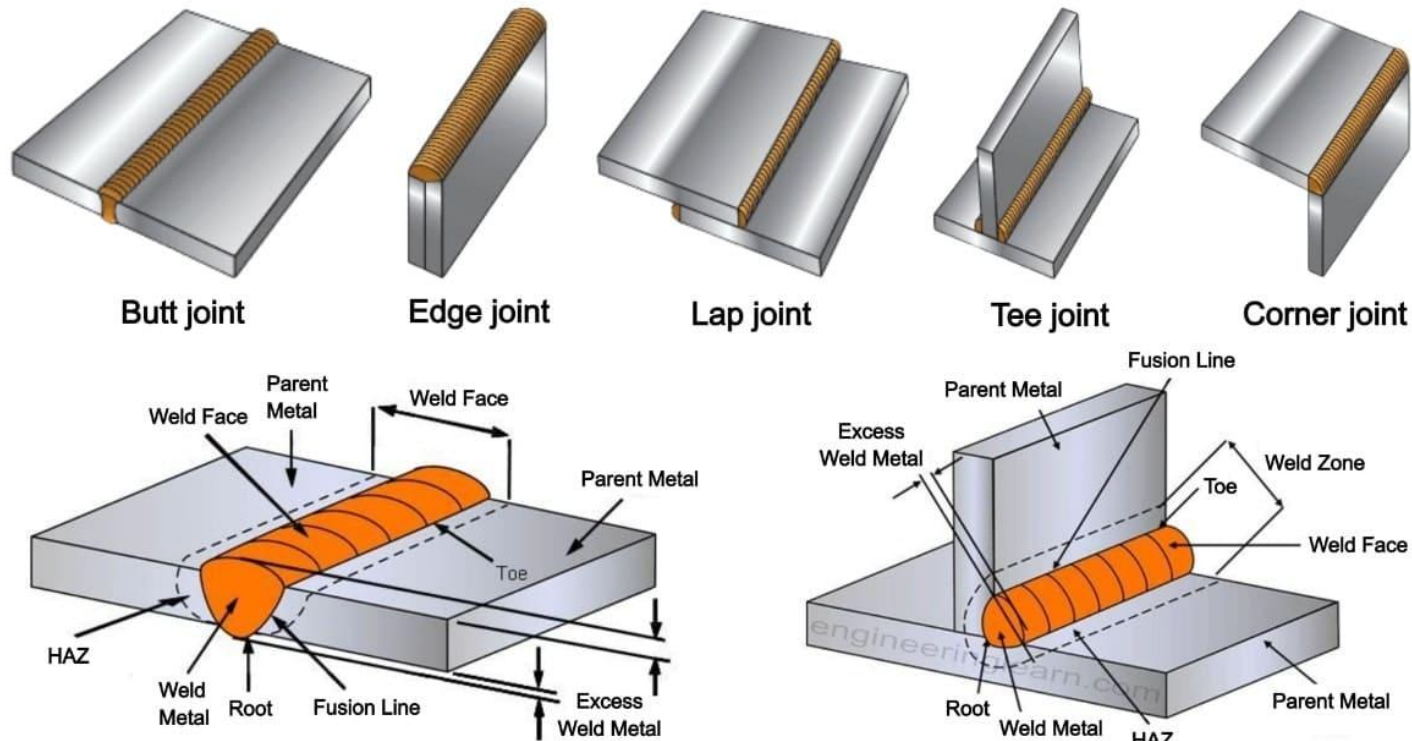
WELDING - Gas Welding

- Gas welding uses a flame to heat and join materials



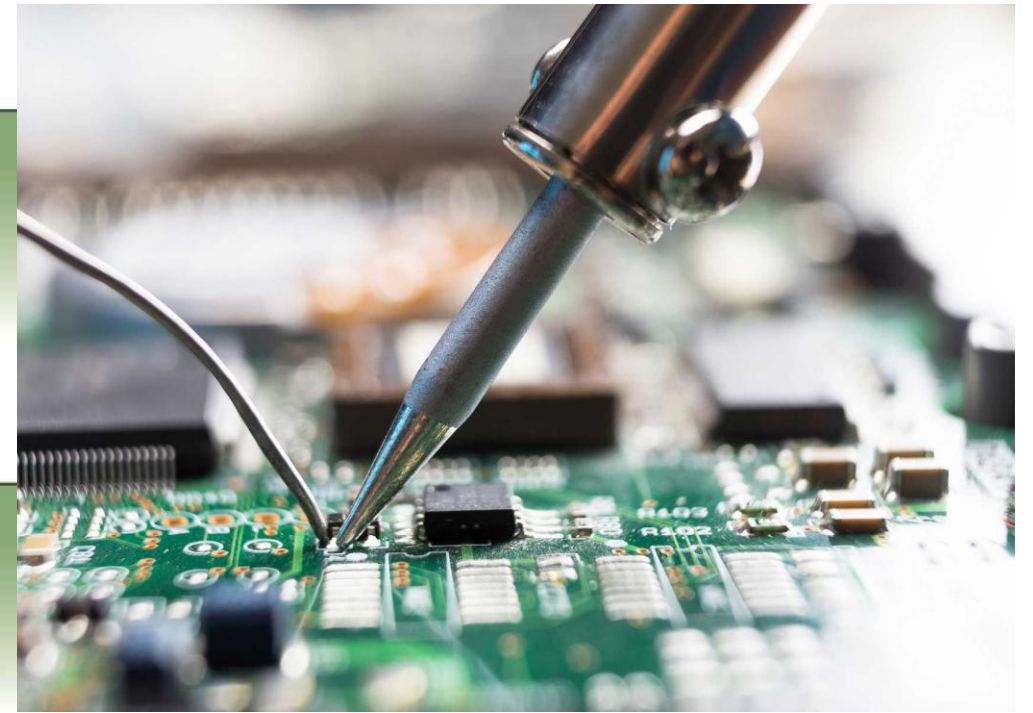
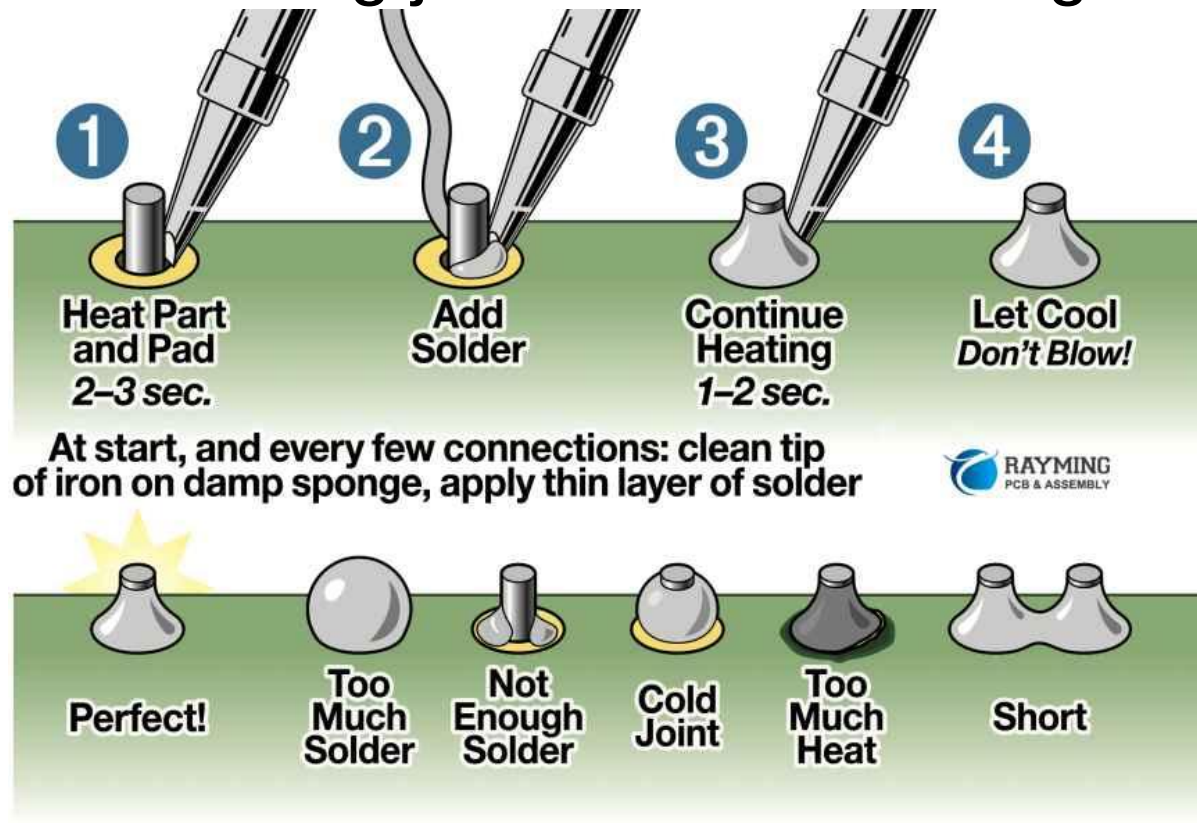
WELDING - Use in Practice

- Welding creates strong permanent joints



SOLDERING

- Soldering joins materials using a low melting filler metal



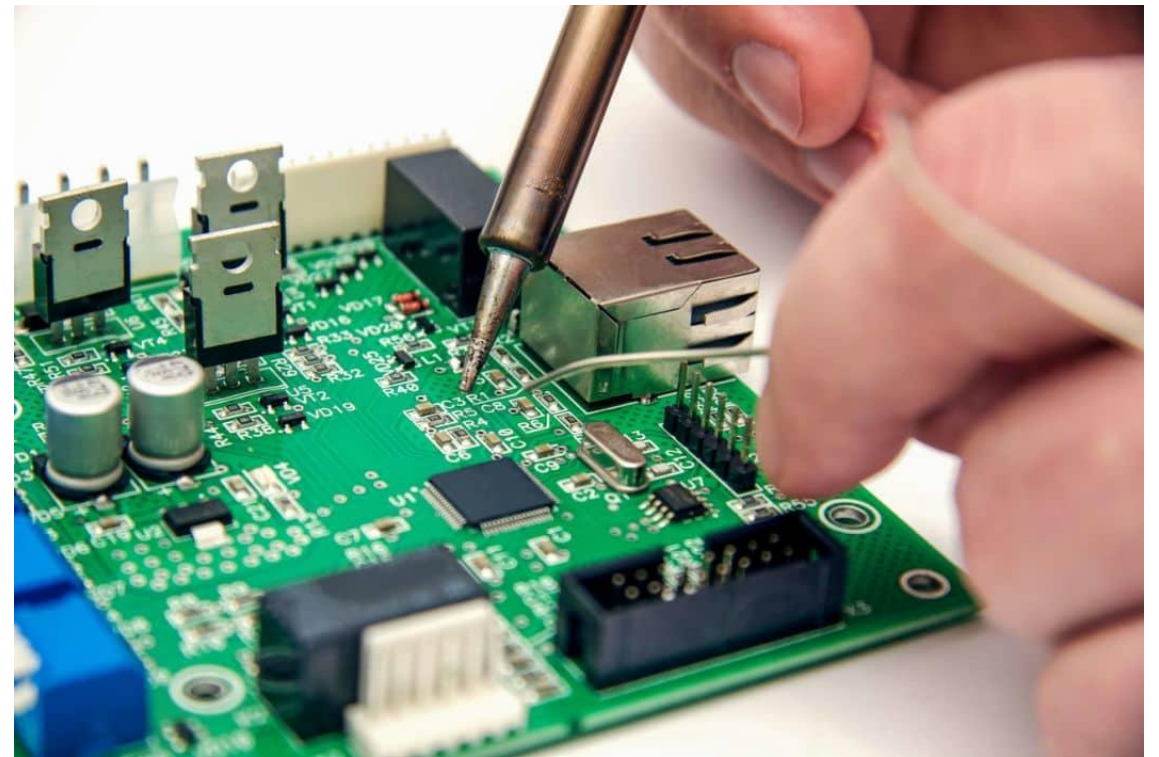
SOLDERING - Characteristics

- The base material is not melted during soldering



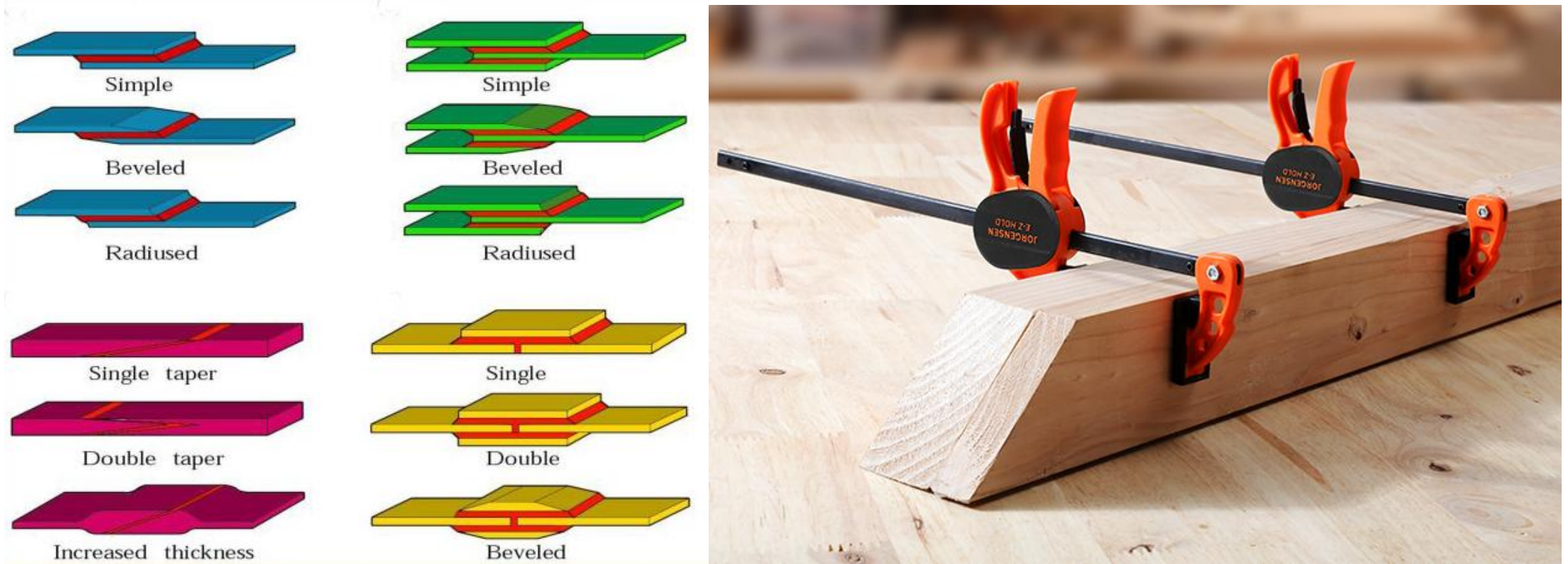
SOLDERING - Typical Use

- Used for small parts and electrical connections



ADHESIVE BONDING

- Adhesives join materials without heat or mechanical fasteners



ADHESIVE BONDING - Use in Repairs

- Adhesive bonding is used for quick or emergency repairs



ADHESIVE BONDING - Limitations

- Adhesive joints are usually weaker than mechanical or welded joints

Difference			
Feature	Thermal Bonding	Laser welding	Adhesive bonding
Principle	Use heat to melt materials and join	Use laser focus to heat materials and form welds	Use adhesive to bond materials together
Applicable materials	Thermoplastic materials, Tubes containing some metal	Various materials (including metals and plastics)	Various materials (plastics, metals, ceramics)
Strength	Usually high	Usually high	Generally low, dependent on adhesive type
Operating temperature	High temperature	High temperature	Normal or low temperature
Equipment cost	Relatively low cost	High equipment cost	Low cost
Curing time	Immediate curing	Immediate curing	May require longer curing time
Operation complexity	Relatively simple operation	Requires professional skills and equipment	Simple operation