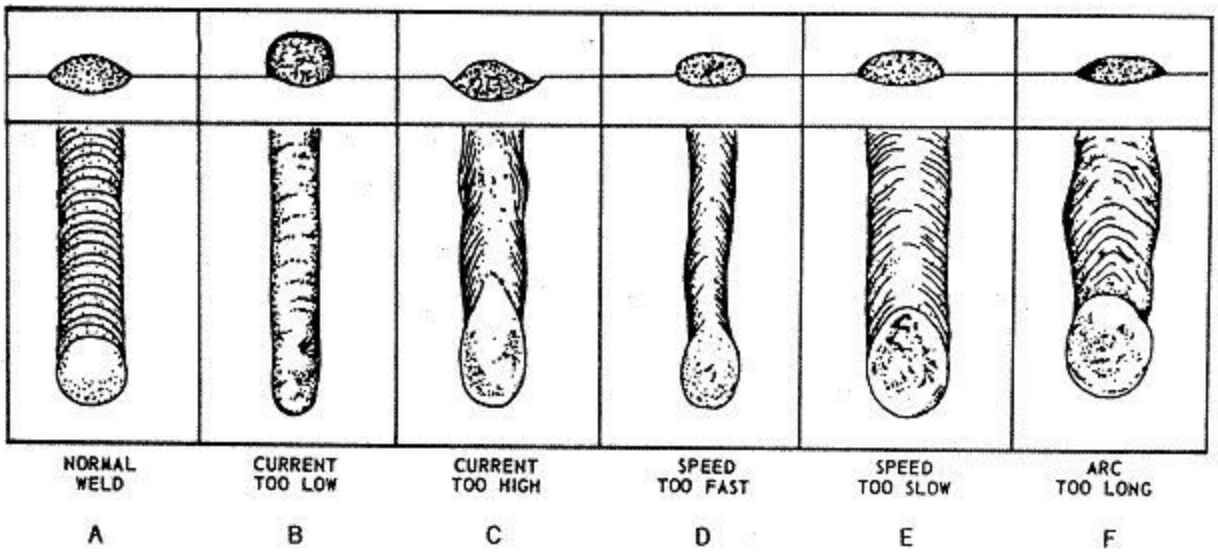
# **Current** (AMPS)

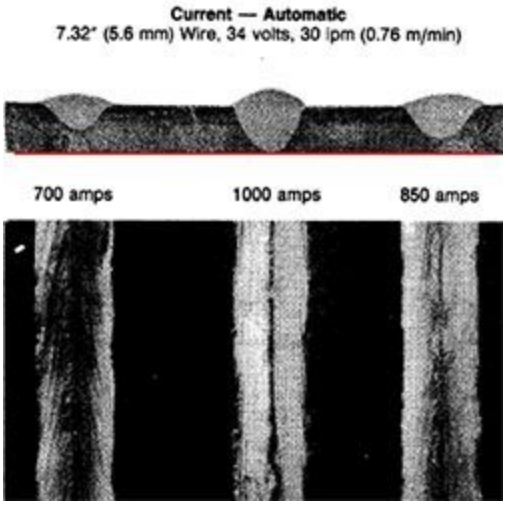
- Arc welding uses high current because high current produces heat in the arc
- Current also affects weld penetration
- Increased current increases  rate at which weld can be completed
- Current must be regulated because:
    - If current to high - arc will be erratic. Excess penetration and undercut. Additionally, excess current generates excess heat, leading to distortion and causing base metals to vaporize into air. Excess current will also use excess filler material
    - If current too low - unstable arc also results, leading to insufficient penetration




# **Voltage** (V) or (E)

- The force that causes current to flow. It is the “pressure” that pulses current through a circuit

- Voltage is always present in an electrical outlet, but only put into use when circuit is closed with something plugged into outlet
- Sometimes represented by E for electromotive force
- Arc welding uses high current, but low voltage. High current plus low voltage means electricity flows rapidly but with little pressure
- Depending on the particular arc process used, voltage can change the characteristics of the arc
    - In mig (GMAW), voltage directly affects arc length, insufficient voltages cause dramatic arcs that don't melt the base metals. Using too much voltage produces a wide flat bead




## **Resistance** (R)

- Force that resists current flow. Measured in OHMs, $\Omega$
- Although resistance opposes current, it also makes it possible for electricity to perform work. When current flows through resistance, it converts into other forms of energy
- Some resistance exists in all materials, including the welding cables carrying currents in the circuit. How much depends on the length and diameter of the cable. Short cables with large diameter have less resistance than larger cables with smaller diameters

- Welding applications requiring high current levels on long cables lengths need thicker cables. Thinner cables would have too much resistance and would change too much electrical energy into excess heat. Manufacturers and welding reference books provide tables listing recommended cable sizes for various current levels and cable lengths