The use of TIG welding for aluminum has many advantages for both manual and automatic processes. Filler metal can be either wire or rod and should be compatible with the base alloy. Filler metal must be dry, free of oxides, grease, or other foreign matter. If filler metal becomes damp, heat for 2 hours at 250°F before using. Although ACHF is recommended, DCRP has been successful up to 3/32" thick.

**WELDING STAINLESS STEEL**

In TIG welding of stainless steel, welding rods having the AWS-ASTM prefix of E or ER can be used as filler rods. However, only bare uncoated rods should be used. Stainless steel can be welded using ACHF; however, recommendations for DCSP must be increased 25%. Light gauge metals less then 1/16" thick should always be welded with DCSP using argon gas. Follow the normal precautions for welding stainless such as: Clean surfaces; dry electrodes; use only stainless steel tools and brushes, carefully remove soap from welds after pressure testing; keep stainless from coming in contact with other metals.

**MAGNESIUM (ACHF)**

Magnesium alloys are in three groups. As: (1) aluminum-magnesium, (2) aluminum-magnesium, and (3) magnesium-magnesium. Since magnesium absorbs a number of harmful ingredients and oxidizes rapidly when subjected to welding heat, TIG welding in an inert gas atmosphere is distinctly advantageous. The welding of magnesium is similar to welding of aluminum. Magnesium was one of the first metals to be welded commercially by TIG. Magnesium requires a positive pressure of argon as a backup on the root side of the weld.

**DEOXIDIZED COPPER (DC SP)**

Where extensive welding is to be done, the use of deoxidized oxygen-free copper is preferable over electrolytic tough pitch copper, although TIG welding has been used occasionally to weld zinc-bearing copper alloys, such as brass and commercial bronzes, it is not recommended because the shielding gas does not suppress the vaporization of zinc. For the same reason zinc bearing filler rods should not be used. There is some preference of helium for the inert atmosphere in welding thicknesses above 1/8" because of the improved weld metal fluidity. Preheating recommendations should be followed.

**LOW ALLOY STEEL (DC SP)**

Mild and low carbon steels with less than 0.30% carbon and less than 1" thick, generally do not require preheat. An exception to this allowance is welding on highly restrained joints. These joints should be preheated 50 to 100°F to minimize shrinkage cracks in the base metal. Low alloy steels such as the chromium-molybdenum steels will have mild heat affected zones after welding, if the preheat temperature is too low. This is caused by rapid cooling of the base material and the formation of martensitic grain structures. A 200 to 400°F preheat temperature will slow the cooling rate and prevent the martensitic structure.