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Welding Aluminium

Preparing the Joint

It is important that the surfaces to be joined are cleaned before welding. Oils, paint, grease, moisture and the thick oxide layer should be removed. Hydrogen released by contaminants can cause porosity.

The surface oxides are best removed either by mechanical or chemical means. A wire brush with stainless steel bristles approx. 0.010 - 0.015 in. in diameter is a recommended mechanical tool. The brush must be kept free from contaminants.

Table 1 lists some common chemical treatments that are used to remove oxides. The cleaning should take place before fitup or fixturing since the joint may be difficult to access for cleaning afterward.

TABLE 1: Typical Chemical Treatments for Removal of Oxide from Aluminum Surfaces

SOLUTION	CONCENTRATION	TEMPERATURE °F	CONTAINER MATERIAL	PROCEDURE	PURPOSE
Nitric acid	50% water, 50% nitric acid, technical grade	65-75	Stainless Steel	Immersion 15 min. Rinse in cold water, then in hot water. Dry.	Removal of thin oxide film for welding.
Sodium Hydroxide (caustic soda) followed by Nitric acid	5% Sodium hydroxide in water	160	Mild Steel	Immersion for 10-60 sec. Rinse in cold water	Removal of thick oxide film for all welding and brazing processes.
	Concentrated	65-75	Stainless Steel	Immerse for 30 sec. Rinse in cold water, then in hot water. Dry.	
Sulfuric-chromic	H ₂ SO ₄ - 1 gal. CrO ₃ - 45 oz. Water - 9 gal.	160 - 180	Antimonial lead-lined steel tank	Dip for 2-3 min. Rinse in cold water, then in hot water. Dry.	Removal of films and stains from heat treating, and oxide coatings.
Phosphoric-chromic	H ₃ PO ₃ (75%) - 3.5 gal. CrO ₃ - 1.75 lbs. Water - 10 gal.	200	Stainless Steel	Dip for 5-10 min. Rinse in cold water. Rinse in hot water. Dry.	Removal of anodic coatings.

NOTE: There are many proprietary materials and methods for removing aluminum oxides. Most of these are as efficient as the solutions listed

ELECTRODE SELECTION

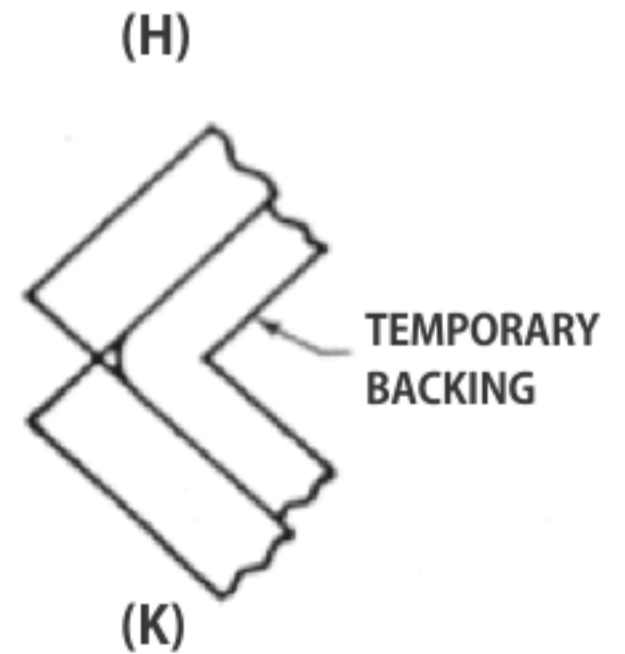
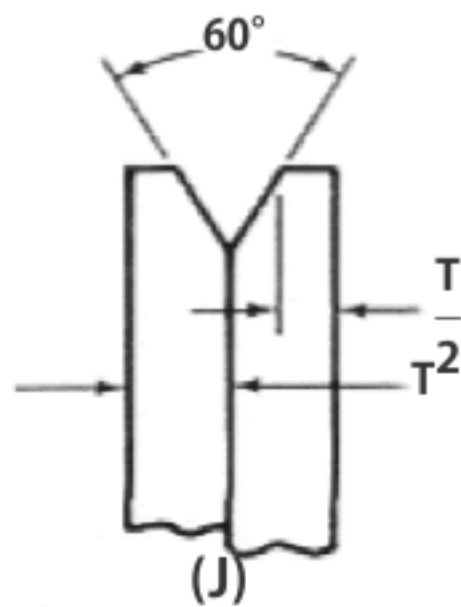
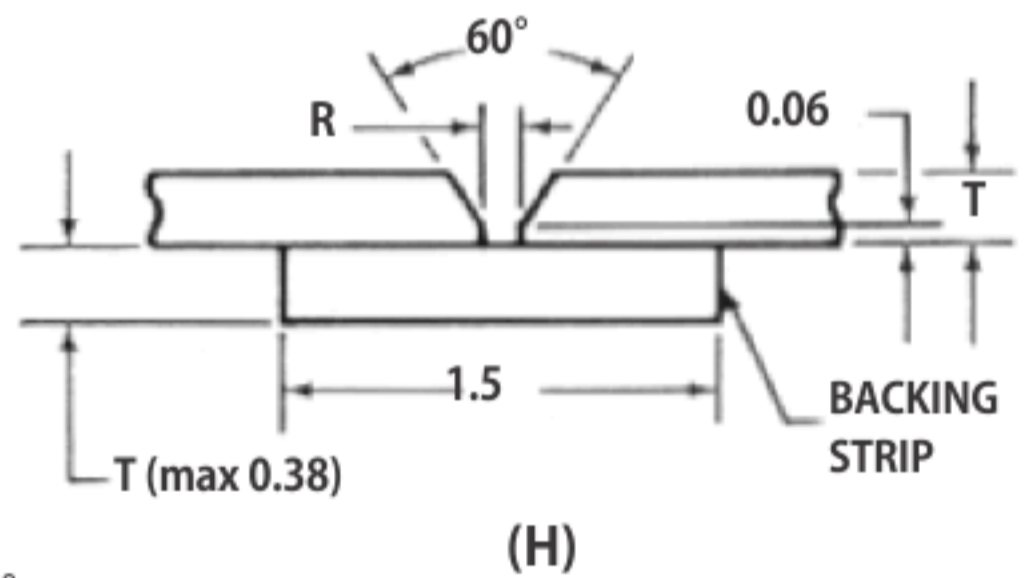
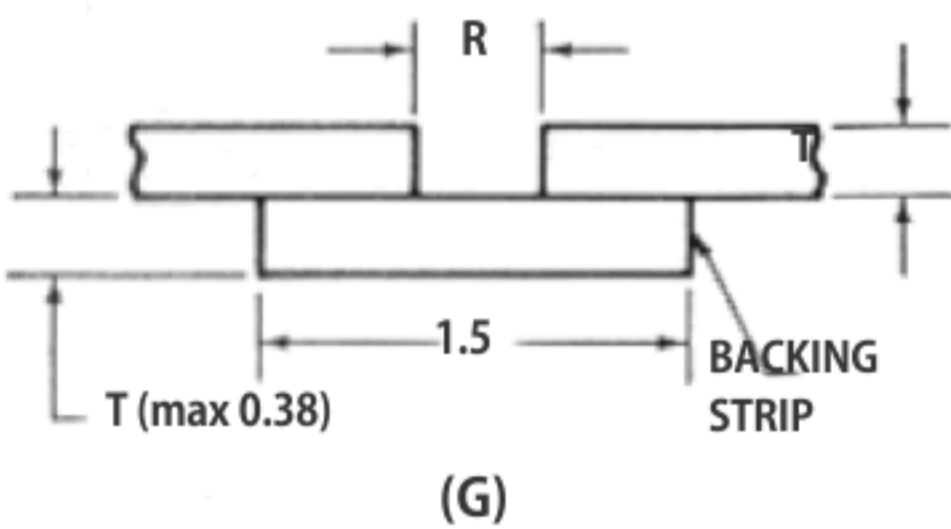
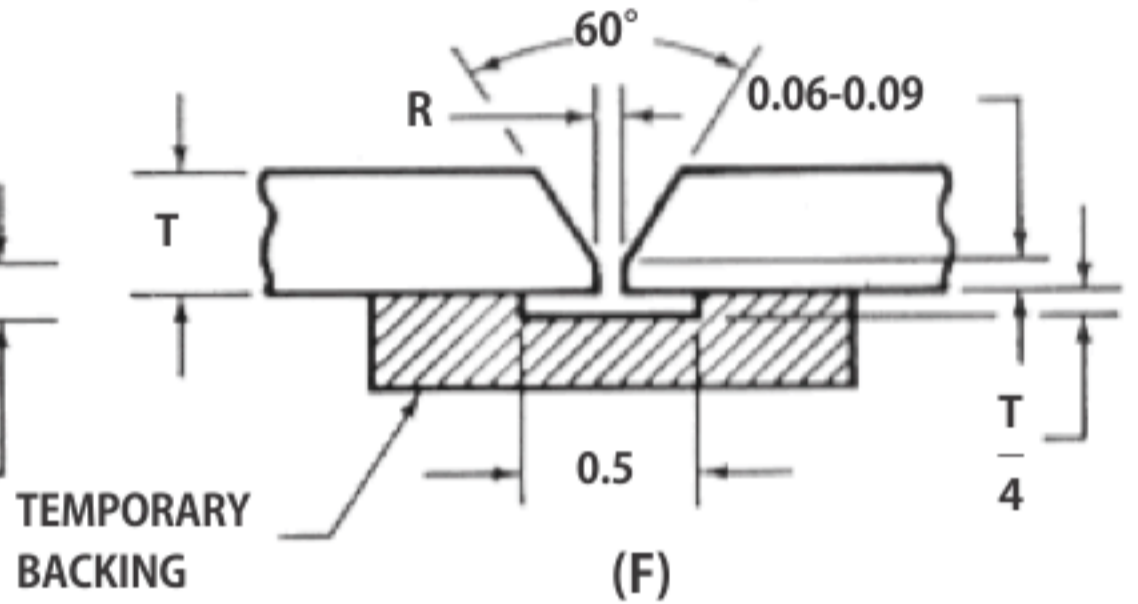
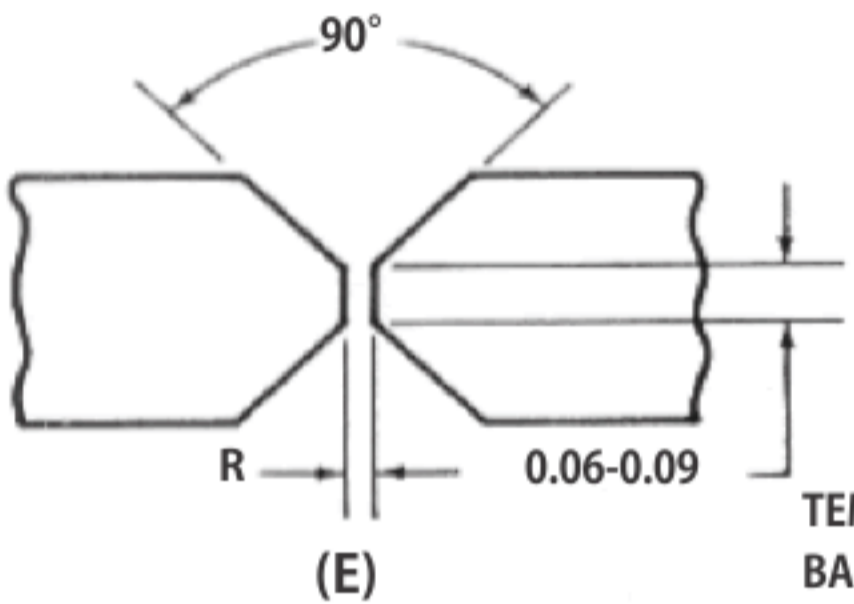
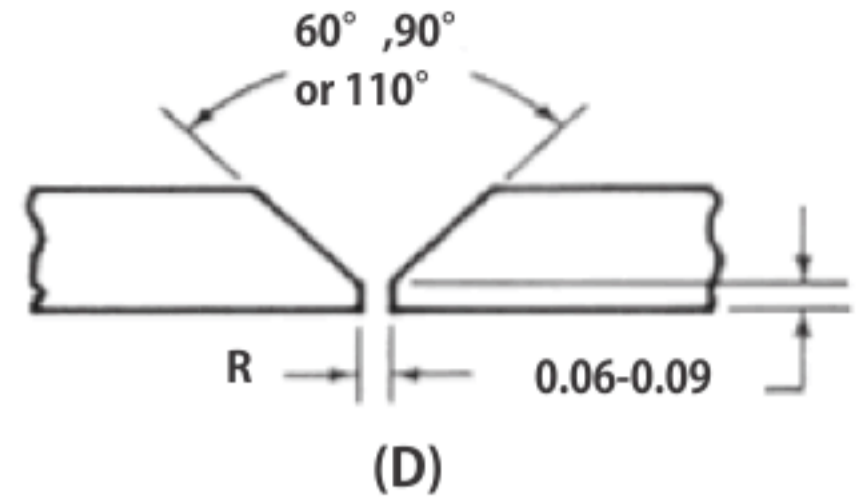
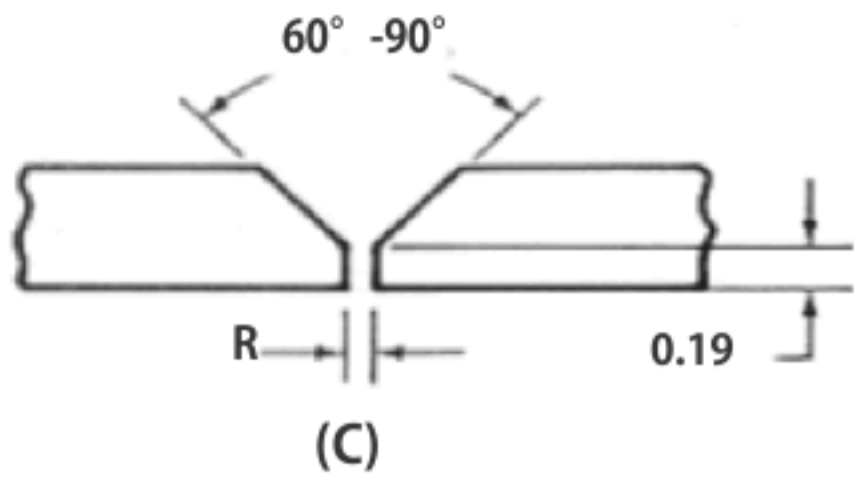
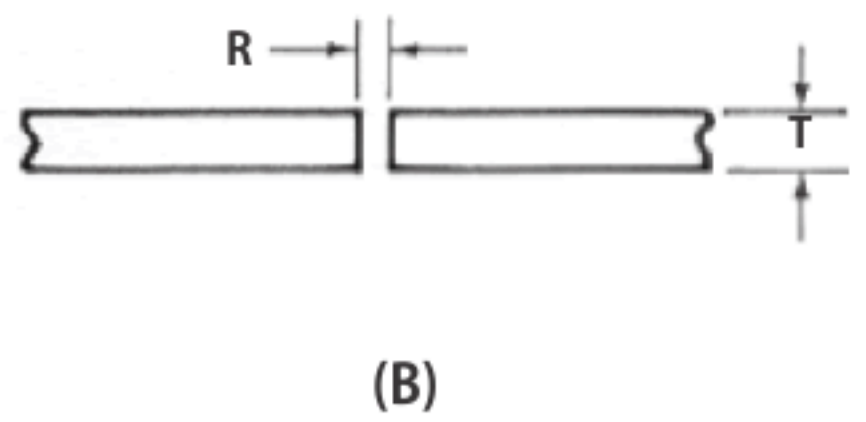
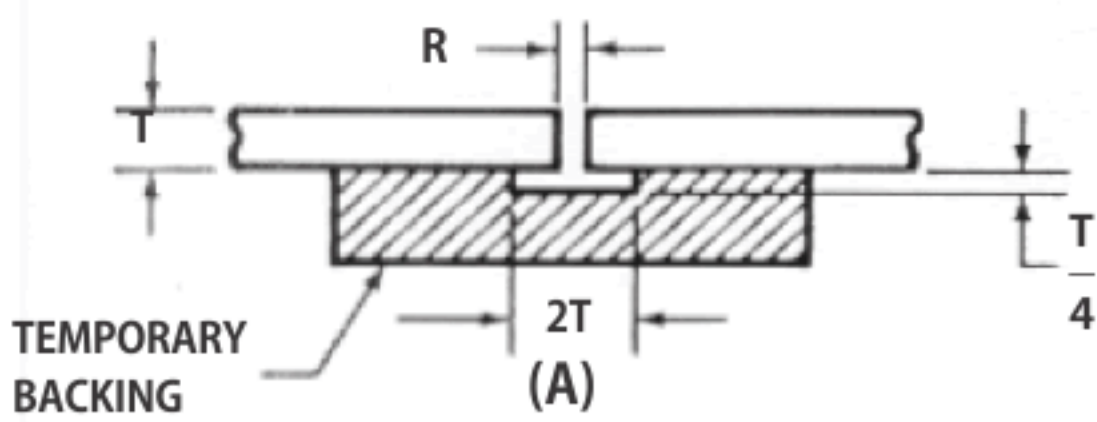
TABLE 2: Suggested Filler Metals for Commonly Welded Aluminum Alloys to Provide Specific Requirements

Base Metal	Recommended filler metal for:				
	High Strength	Good Ductility	Colour Match after Anodizing	Saltwater Corrosion Resistance	Least Cracking Tendency
1100	4043	1100	1100	1100	4043
2219	2319	2319	2319	2319	2319
3003	4043	1100	1100	1100	4043
5052	5356	5654	5356	5554	5356
5083	5183	5356	5183	5183	5356
5086	5356	5356	5356	5356	5356
5454	5356	5554	5554	5554	5356
5456	5556	5356	5556	5556	5356
6061	5356	5356	5654	4043	4043
6063	5356	5356	5356	4043	4043
7005	5556	5356	5356	5356	5356
7039	5556	5356	5356	5356	5356

Joint Geometry

Typically, the geometries for aluminum joints are equivalent to geometries for steel, but since the aluminum weld pool is more fluid and the welding gun nozzle a little larger, the geometry generally has smaller root openings and greater groove angles than designs for steel.

A groove angle of 60° is a minimum for a thickness of 0.12 in. Greater thicknesses may require angles of 75° to 90°.



NOTE:
DIMENSIONS
ARE IN
INCHES.

