



**TYPICAL JOINT
GEOMETRIES
FOR ARC WELDING
OF ALUMINUM**

The Everyday Pocket Handbook for Gas Metal Arc Welding (GMAW) of Aluminum



Number 8 in a series

Compiled as a useful tool for
on-the-job welding personnel by the
AWS Product Development Committee

Edited by
Lee G. Kvidahl
Ingalls Shipbuilding

© 1998 by American Welding Society. All rights reserved
Printed in the United States of America



American Welding Society

NOTE: Although care was taken in choosing and presenting the data in this guide, AWS cannot guarantee that it is error free. Further, this guide is not intended to be an exhaustive treatment of the topic and therefore may not include all available information, including with respect to safety and health issues. By publishing this guide, AWS does not insure anyone using the information it contains against any liability or injury to property or persons arising from that use.

Table of Contents

Basic Safety Precautions	4	Joint Geometry Types	21
Typical Joint Geometries for Arc Welding of Aluminum.....	6	Typical Procedures for Gas Metal Arc Welding of Fillet Welds in Aluminum Alloys with Large Diameter Electrodes and Argon Shielding.....	22
Designations for Wrought Alloy Groups	9	Aluminum Welding Wire.....	23
Chemical Composition of Wrought Aluminum Filler Metals.....	10	Preparation of Aluminum for Welding	24
Typical Aluminum Filler Metal Properties (As-Welded Condition).....	11	Storage of Base Metal.....	24
Guide to the Selection of Filler Metal for General Purpose Welding	12	Storage of Consumables	24
Influence of Shielding Gas on Weld Profile.....	15	Plate Edge Preparation.....	24
Typical Procedures for Gas Metal Arc Welding of Groove Welds in Aluminum Alloys with Argon Shielding.....	16	Cleaning Prior to Welding	24
Typical Procedures for Gas Metal Arc Welding of Fillet Welds in Aluminum Alloys with Argon Shielding.....	18	Oxide Removal with Wire Brushing.....	25
Typical Procedures for Flat Position Gas Metal Arc Welding Groove Welds in Aluminum Alloys with Large Diameter Electrodes.....	19	Shielding Gas Purity	25
		Tips to Make the Aluminum Welding Job Easier	26
		Troubleshooting.....	27
		Basic Welding Symbols and Their Location Significance.....	28
		Location of Elements of a Welding Symbol.....	30

Basic Safety Precautions

Burn Protection. Molten metal, sparks, slag, and hot work surfaces are produced by welding, cutting, and allied processes. These can cause burns if precautionary measures are not used. Workers should wear protective clothing made of fire-resistant material. Pant cuffs, open pockets, or other places on clothing that can catch and retain molten metal or sparks should not be worn. High-top shoes or leather leggings and fire-resistant gloves should be worn. Pant legs should be worn over the outside of high-top shoes. Helmets or hand shields that provide protection for the face, neck, and ears, and a head covering to protect the head should be used. In addition, appropriate eye protection should be used.

Electrical Hazards. Electric shock can kill. However, it can be avoided. Live electrical parts should not be touched. The manufacturer's instructions and recommended safe practices should be read and understood. Faulty installation, improper grounding, and incorrect operation and maintenance of electrical equipment are all sources of danger.

All electrical equipment and the workpiece should be grounded. The workpiece lead is not a ground lead. It is used only to complete the welding circuit. A separate connection is required to ground the workpiece. The workpiece should not be mistaken for a ground connection.



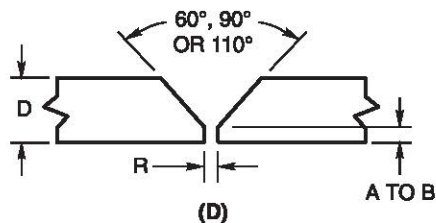
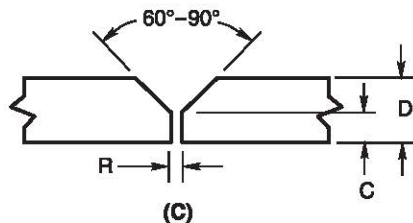
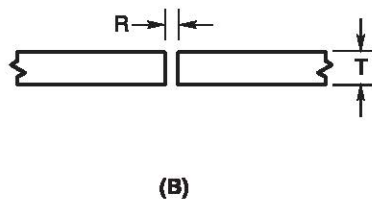
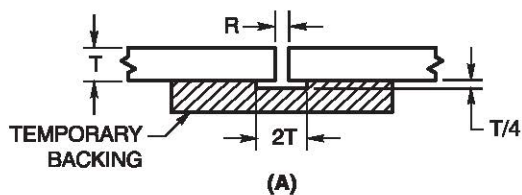
Fumes and Gases. Many welding, cutting, and allied processes produce fumes and gases which may be harmful to health. Avoid breathing the air in the fume plume directly above the arc. Do not weld in a confined area without a ventilation system. Use point-of-welding fume removal when welding galvanized steel, zinc, lead, cadmium, chromium, manganese, brass, or bronze. Do not weld on piping or containers that have held hazardous materials unless the containers have been inerted properly.

Compressed Gas Cylinders. Keep caps on cylinders when not in use. Make sure that gas

cylinders are chained to a wall or other structural support.

Radiation. Arc welding may produce ultraviolet, infrared, or light radiation. Always wear protective clothing and eye protection to protect the skin and eyes from radiation. Shield others from light radiation from your welding operation.

Refer to AWS/ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, for additional information.



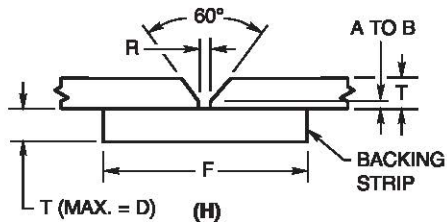
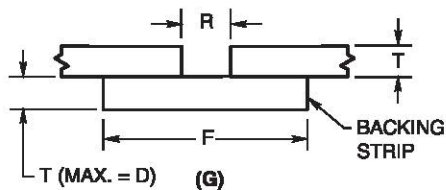
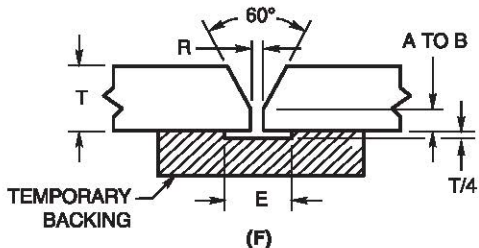
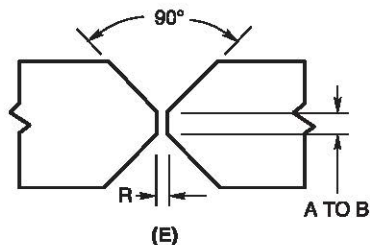
Note: A = 1/16 in. (1.6 mm), B = 3/32 in. (2.4 mm), C = 3/16 in. (4.8 mm), D = 3/8 in. (9.5 mm),
R = root opening, T = thickness.

Typical Joint Geometries for Arc Welding of Aluminum (Not to Scale)



Documents

Document Sharing Hub

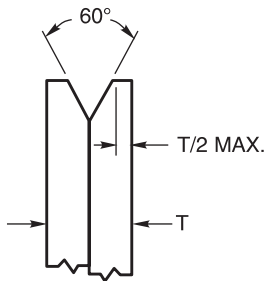


Note: A = 1/16 in. (1.6 mm), B = 3/32 in. (2.4 mm), C = 3/16 in. (4.8 mm), D = 3/8 in. (9.5 mm), E = 1/2 in. (12.7 mm), F = 1-1/2 in. (38.1 mm), R = root opening, T = thickness.

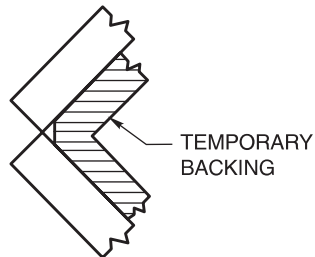
Typical Joint Geometries for Arc Welding of Aluminum (Continued) (Not to Scale)



(I)



(J)



(K)

Note: T = thickness.

Typical Joint Geometries for Arc Welding of Aluminum (Continued)

Designations for Wrought Alloy Groups

A system of four-digit numerical designations is used to identify wrought aluminum alloys. The first digit indicates the alloy group as follows:

Aluminum, 99.0% and greater	1XXX*
Major Alloying Element:	
Copper	2XXX
Manganese	3XXX
Silicon	4XXX
Magnesium	5XXX
Magnesium and Silicon	6XXX
Zinc	7XXX
Other elements	8XXX
Unused series	9XXX

*For 1XXX series, the last two digits indicate the minimum aluminum purity (e.g., 1060 is 99.60% Al minimum). The second digit in all groups indicates consecutive modifications of an original alloy, such as 5154, 5254, 5454, and 5654 alloys.