

## SECTION 715 - ALUMINUM

**715.01 Aluminum.** The Contractor shall furnish aluminum according to the contract. \*|  
\*|

**715.02 Contact with Dissimilar Materials.** The Contractor shall keep the aluminum from direct contact with the steel or other dissimilar material by painting as follows: \*|

(1) The Contractor shall give aluminum surfaces placed in contact with steel one (1) coat of zinc chromate primer according to Federal Specification TT-P-645 or the equivalent coat of a suitable nonhardening joint compound to exclude moisture from the joint during prolonged service. The Contractor shall get additional protection by applying the joint compound and zinc chromate primer. The Contractor shall allow the zinc chromate paint to dry hard (air-dry 24 hours) before assembly of the parts. \*|  
\*|

The Contractor shall paint the steel surfaces placed in contact with aluminum with zinc chromate primer according to Federal Specification TT-P-645. The Contractor shall follow with one (1) coat of paint consisting of two (2) pounds of aluminum paste pigment (ASTM D 962 Type 2, Class B) per gallon of varnish meeting Federal Specification TT-V-81d, Type II. \*|  
\*|

The Contractor need not paint stainless steel, or aluminized, hot-dip zinc-coated, or electrogalvanized steel placed in contact with aluminum. \*|  
\*|

(2) The Contractor shall give aluminum surfaces in contact with wood, concrete, or masonry construction a heavy coat of alkali-resistant bituminous paint before installation. The Contractor need not paint the Aluminum embedded in concrete with alkali-resistant bituminous paint. The bituminous paint used shall conform to United States Military Specification MIL-P-6883. The Contractor shall apply the paint while receiving the paint from the manufacturer without adding thinner. \*|  
\*|

(3) The Contractor shall give aluminum surfaces embedded in concrete one (1) coat of zinc chromate primer conforming to Federal Specification TT-P-645. \*|  
\*|

(4) Water in contact with aluminum after first running over a heavy metal such as copper may contain trace quantities of the dissimilar metal or its corrosive product. The Contractor shall get the protection by painting or plastic coating the dissimilar metal. \*|  
\*|

**715.03 Fabrication of Welded Aluminum Structures.** The welding definitions used in this contract shall be according to the latest edition of AWS Definitions - Welding and Cutting (AWS A3.0) of the American Welding Society. The welding symbols shall be those shown in the latest edition of Standard Welding Symbols (AWS A2.0) of the American Welding Society. \*|  
\*|

**(A) Base Metals.**

(1) The manufacturer shall make aluminum alloys by welding \*|  
according to the contract. \*

(2) Material used for backing shall be at least equivalent  
in weldability to the base metal being welded.

**(B) Welding Processes.** This contract includes provisions for welding by |  
the gas metal-arc process and the gas tungsten-arc process.

**(C) Filler Metal.**

(1) Bare wire electrodes for use with the gas metal-arc process and  
welding rods for use with the gas tungsten-arc process shall conform  
to the latest edition for Aluminum and Aluminum-Alloy Welding Rods \*|  
and Bare Electrodes, AWS A5.10.

(2) Tungsten electrodes for the gas tungsten-arc process shall  
conform to the latest edition for Tungsten-Arch Welding Electrodes, \*|  
AWS A5.12.

(3) Filler metals used with particular base metals shall conform to  
the latest edition for Aluminum Bridge and other Highway Structures \*|  
of the Aluminum Association.

(4) The Contractor shall keep the filler metals covered and store \*|  
the filler metals in a dry place at uniform temperatures. The \*|  
Contractor shall not open the original rod or wire containers until \*|  
the Contractor uses the containers. Rod and wire shall be free of \*|  
moisture, lubricant or other contaminants. The Contractor shall \*|  
keep the spools of wire temporarily left unused on the welding \*|  
machine covered to avoid contamination by dirt and grease collecting \*|  
on the wire. The Contractor shall return the spool to the carton \*|  
and reseal the carton tightly. \*

**(D) Shielding Gases.**

(1) Shielding gases shall be welding grade or better.

(2) Shielding gas for gas metal-arc welding shall be argon, helium  
or a mixture of the two (2) (at least 40 percent helium).

(3) Shielding gas for gas tungsten-arc welding using alternating  
current shall be argon.

(4) Shielding gas for gas tungsten-arc welding using direct  
current, straight-polarity, shall be helium.

(5) The Contractor shall make hose used for shielding gases of \*|  
synthetic rubber or plastic. The Contractor shall not use natural \*|  
rubber hose and previously used hose for acetylene or other gases. \*

**(E) Preparation of Materials.**

(1) Joint details shall be according to design requirements and detail drawings. \*

(2) Edge preparation shall be by sawing, machining, clipping or shearing. Also, the Contractor may use gas tungsten-arc or gas metal-arc cutting. Cut surfaces shall conform to the ANSI Standards surface roughness rating value of one thousand (1,000). The Contractor shall not use oxygen cutting. \*

(3) Surfaces and edges that the Contractor will weld shall be free from fins, tears and other defects that would adversely affect the quality of the weld. \*

(4) The Contractor shall remove dirt, grease, forming or machine lubricants or organic materials from the areas that the Contractor will weld by cleaning with a solvent or by vapor degreasing. \*

(5) On edges and surfaces that the Contractor will weld, the Contractor shall remove the oxide just before welding by wire brushing or by other mechanical methods such as rubbing with steel wool or abrasive cloth, scraping, filing, rotary planing or sanding. If the Contractor uses wire brushing, the Contractor shall make brushes of stainless steel. The Contractor shall not use hand or power driven wire brushes used on other materials on aluminum. \*

(6) If mechanical methods of oxide removal are inadequate, the Contractor shall use a standard chemical method. The Contractor shall weld within twenty-four (24) hours after chemical treatment. \*

(7) When using gas tungsten-arc welding with direct current straight polarity, edges and surfaces that the Contractor will weld shall have the oxide removed by a standard chemical method. \*

(8) The Contractor shall not weld on anodically treated aluminum unless removing the condition from the joint area that the Contractor will weld. \*

**(F) Welding Procedure.**

(1) Butt welds shall have the root of the initial weld chipped or machined out to sound metal before the Contractor starts welding from the second side. Exception are those with the aid of backing. Butt welds made with the use of backing shall have the weld metal thoroughly fused with the backing. If accessible, the Contractor shall remove the backing for welds that are: \*

(a) subject to computed stress and are not part of the structure, and \*

(b) exposed to view from the completed structure and are not \*|  
part of the structure. \*|

The Contractor shall ground the backing smooth. \*|

In tubular members, the Contractor shall make butt welds \*|  
subjected to computed stresses with the aid of permanent backing \*|  
rings or strips.

(2) The procedures used for production welding of particular joints \*|  
shall be the same as used in the procedure qualification for that \*|  
joint.

(3) The Contractor shall protect the shop or field welding \*|  
operations from air currents or drafts. The Contractor shall provide \*|  
Adequate gas shielding to protect the molten metal during \*|  
solidification.

(4) The Contractor shall position the work for flat position \*|  
welding whenever practicable.

(5) In shop and field, weld joints shall be dry at time of welding. \*|

(6) The size of the electrode, voltage and amperage, welding speed,  
gas or gas mixture and gas flow rate shall be suitable for:

(a) the thickness of the material,

(b) design of joint,

(c) welding position, and

(d) other circumstances attending the work.

(7) The Contractor shall do gas metal-arc welding with direct \*|  
current, reverse polarity.

(8) If the joint that the Contractor will weld needs specific root \*|  
penetration, the Contractor shall make a sample joint and a \*|  
macroetched cross section of the weld. The sample joint shall have a \*|  
length of at least one (1) foot. The Contractor shall weld the \*|  
sample joint with the electrode, polarity, amperage, voltage, speed, \*|  
gas mixture and gas flow rate proposed for use in production \*|  
welding. The Engineer may accept evidence on record instead of the \*|  
preceding test. \*|

(9) If the Contractor needs to preheat, the temperature of preheat \*|  
shall not exceed three hundred and fifty (350) degrees Fahrenheit \*|  
for heat-treated alloys and six hundred (600) degrees Fahrenheit for \*|  
non-heat-treated alloys. The Contractor shall measure the \*|  
temperature by the temperature showing crayons or by pyrometric \*|

equipment. The Contractor shall not hold the heat-treated alloys \*|  
at the maximum preheat temperature or at temperatures near the \*|  
maximum for more than thirty (30) minutes.

**(G) Weld Quality.**

(1) The Engineer will not accept the following weld conditions: \*|

(a) Cracks in welds or adjacent base metal;

(b) Copper inclusions; or

(c) Porosity over that permitted by Appendix IV, Section VIII  
of the ASME Boiler and Pressure Vessel Code.

The Engineer may accept the welds from lack of fusion, \*|  
incomplete penetration, or tungsten or oxide inclusions only if \*|  
small and well dispersed. \*|

(2) Undercut shall be less than 0.01 inch deep when its direction |  
is transverse to the primary stress in the part that is undercut. |  
Undercut shall be less than one thirty-secondth (1/32) inch deep |  
when its direction is parallel to the primary stress in the part |  
that is undercut.

(3) No overlap shall be allowed.

(4) The Contractor shall fill the craters to the full cross \*|  
section of the welds. \*|

(5) Welds having defects greater than the levels of acceptance  
specified above shall be considered as rejected unless corrected  
according to Subsection (I). \*|

**--(H) Inspection.**

(1) The Contractor shall inspect the welds visually according to \*|  
Subsection 715.03(G) - Weld Quality. Also, the Contractor shall \*|  
inspect the welds subject to computed stress by the dye penetrant \*|  
method except according to Subsection 715.03(H)(4) or by use of \*|  
radiographic inspection.

(2) For truss type structures, the Contractor shall use the dye \*|  
penetrant method on: \*|

(a) butt welds in columns and main chord members,

(b) fillet welds connecting columns to bases and main chord  
members including the associated flanges, gussets or main  
load-carrying brackets or members, and

(c) fillet welds connecting flanges to the main truss chord members.

On pole type and common light standards, the Contractor shall \*| use the dye penetrant method on butt welds in columns and on \*| fillet welds connecting columns to bases.

(3) The Contractor shall do the dye penetrant tests according to \*| ASTM E 165, Standard Methods for Liquid Penetrant Inspection, Method \*| B, Procedure B-2, or B-3.

(4) The Engineer may omit the dye penetrant inspection provided the \*| Inspector examines each layer of weld metal with a magnifier of 3X \*| minimum before depositing the next successive layer.

#### (I) Corrections.

(1) The Engineer may permit corrective measures listed below. The \*| Contractor shall get the Engineer's acceptance before making each \*| repair. \*|

(2) The Contractor shall correct the defective weld by removing and \*| replacing the entire weld, or as follows:

(a) **Cracks In Welds Of Base Metal.** The Contractor shall \*| resolve full extent of crack dye penetrant method or other \*| positive means. The Contractor shall remove the cracks \*| throughout its length and depth, and reweld.

(b) **Excessive Porosity, Lack Of Fusion.** The Contractor shall \*| remove defective portions and reweld.

(c) **Copper Or Tungsten Inclusions.** The Contractor shall remove \*| defective portions and reweld.

(d) **Excessive Concavity Of Crater, Undercut, Undersize Weld.** \*| The Contractor shall clean and deposit additional weld metal. \*|

(e) **Overlap.** The Contractor shall reduce by removal of excess \*| weld metal.

(3) The Contractor shall remove defective areas by chipping or \*| machining. The Contractor shall not use oxygen cutting. Before \*| rewelding, the Contractor shall inspect the joints. If using dye \*| penetrant to inspect the weld, the Contractor shall remove traces of \*| penetrant solutions with solvent, water, heat or other suitable means before rewelding.

**(J) Qualification of Procedures, Welders And Welding Operators.**

(1) Tests prescribed in Part B, Section IX, of the ASME Boiler and Pressure Vessel Code shall qualify the joint welding procedures. The Engineer may accept evidence of previous qualification of the joint welding procedures that the Contractor will use.

(2) Tests prescribed in Part B, Section IX, of the ASME Boiler and Pressure Vessel Code shall qualify the welders and welding operators. The Engineer may accept evidence of previous qualification of the welders and welding operators. The Contractor shall use the same process and type of equipment for execution of the construction work in qualifying welders and welding operators.