

SECTION 731 STRUCTURAL SUPPORTS AND FOUNDATIONS FOR TRAFFIC SIGNAL AND HIGHWAY LIGHTING: of the Standard Specifications is modified to add:

731-2 Materials

731-2.01 Aluminum Poles and Mast Arms:

(A) General:

Standard aluminum poles and mast arms for highway lighting shall include pole shaft, pole base and mast arm assembly in accordance with the project plans and Standard Drawings, as specified herein. Aluminum components of the pole, mast arm, base, and hardware shall conform to the details shown on the Standard Drawings and in these specifications. Each pole and mast arm shall be designed and manufactured as a complete assembly. The assembly shall be furnished and installed as a complete unit that is configured to the necessary dimensions with all the required components including mounting brackets and assembly, ground lug, rain cap, hand hole cover, anchor bolts, nuts, washers and related hardware and accessories.

(B) Pole and Mast Arm Assembly Design Parameters:

The design of the pole assembly (pole, mast arm, and luminaire attachment portion) shall be per AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 1994 with interim's. The design of the poles, mast arms and luminaire mounting brackets shall be based on a wind speed of 80 miles per hour with a luminaire having an effective projected area of 1.6 sq. ft. and a weight of 55 pounds. The design shall also be based upon the worst case loading, derived by combining the loads caused by a 20-foot mast arm, design luminaire, design wind speed and other dead loads, as appropriate. Secondary deflections shall be accounted for in all designs. The maximum calculated deflection shall not exceed 8 percent of the pole height.

The pole and mast arm shall be supplied from the same manufacturer and of similar metal properties providing a uniform appearance.

(1) Pole Shafts:

The tapered pole shaft shall be fabricated from a one-piece, seamless, round tapered tube of Aluminum Alloy 6063-T6, conforming to the requirements of ASTM Designation B 221, and shall be full-length heat treated after tapering and welding on the base and hand hole reinforcing to produce a T6 temper. The pole shafts shall maintain a uniform taper rate from the base of the pole to the pole top. The base plate shall be constructed to match the foundation bolt pattern for standard poles shown in the Standard Drawings for Aluminum Light Poles.

No field splices of pole shafts shall be allowed. The pole shaft shall also have an internal vibration damper.

The pole shaft shall be smooth with a uniform brushed sheen finish that is free from all dents, scratches, and shipping / handling marks. Poles that have a finish that is not uniform or that fails to meet the requirements of this specification will be rejected by the Engineer and shall be repaired or replaced at no expense to the Department in accordance with Section 105.

All aluminum poles shall have a hand hole that is in conformance with the details and requirements of T.S. 4-20, with the exception that the hand hole shall use aluminum components and screws.

All poles shall be engraved above the hand hole with the manufacturer's name, pole type, ADOT standard drawing number, pole length, and gage number. The engraving shall be permanent and easily legible.

(2) Truss Mast Arms:

The aluminum truss mast arms shall be fabricated by the same manufacturer as the aluminum pole manufacturer and from Aluminum Alloy 6063-T6 conforming to the requirements of ASTM Designation B 221.

The aluminum mast arms shall be smooth with a uniform brushed sheen finish that is free from all dents, scratches, and shipping / handling marks. Aluminum mast arms that have a finish that is not uniform or that fails to meet the requirements of this specification will be rejected by the Engineer and shall be repaired or replaced at no expense to the Department in accordance with Section 105.

All mast arms shall be engraved above the mounting bracket with the manufacturer's name, ADOT standard drawing number, mast arm length, and gage number. The engraving shall be permanent and easily legible.

(3) Welding

Welding of all components of aluminum light poles shall conform to the American Welding Society (AWS) D1.2 Specifications for Class I Structures. All aluminum components and welding shall be identified and included in the Certificate of Analysis, which shall state compliance to AWS Specifications.

(C) Submittals:

The Contractor shall submit a Certificate of Analysis for all aluminum components and welding in accordance with the requirements of Section 106.05. The Contractor shall also submit shop drawings that have been sealed and signed by a registered professional engineer that show all the details of the poles assembly

units to be furnished and installed. The shop drawings shall be CAD quality and complete in every aspect, including all dimensions, material specifications and appropriate details. The details shall include the configuration of the pole shaft, mast arm and mast arm mounting bracket, base plates, luminaire mounting bracket and the hand hole. All welds shall be shown and identified with standard AWS symbols. The submittal shall include structural calculations along with the name of the engineer(s) who sealed the drawings and performed the calculations.

The Contractor shall submit three copies of the supporting documents for review by the Engineer. The principal purpose of the review is to verify that suitable structural calculations have been made in the design of the pole and mast arm assembly. The Contractor's engineer shall utilize accepted standard engineering principles. If a computer program is utilized, the Contractor shall furnish the Engineer with all necessary information, such as formulas and assumptions, to conduct a meaningful review (e.g. formula, assumptions, iteration process, and deflection requirements).

The Engineer shall provide written review comments to the Contractor. The Contractor shall respond to these comments and resubmit the calculations, if required. Fabrication shall not take place until the shop drawings have been approved.

If the Contractor utilizes a pre-approved design from ADOT's Approved Product List (APL), submittal of the structural calculations is not required. Shop drawings for APL designs shall be submitted. Drawing numbers for the pre-approved designs found in the APL are available on the Internet at <http://www.dot.state.az.us/ABOUT/prideapl.htm>.

731-2.02 Standard Steel Poles:

(E) Slip-Away Bases: Is revised to read:

(E) Steel Mast Arms:

Luminaire mast arms for standard steel poles that are not tapered shall be fabricated from steel pipe as specified in ASTM A 53. All mast arms shall conform to the dimensions and bending radius shown on the Standard Drawings. The pipe shall be one piece and free from burrs or sharp edges that could damage lighting conductors.

Traffic signal mast arms shall be tapered, unless specified otherwise on the project plans.

Tapered mast arms shall be fabricated from sheet steel conforming to the requirements of ASTM A 36, except for the types K and R pole mast arms. The mast arms for the types K and R poles shall be constructed of sheet steel with a minimum yield stress of 48,000 pound per square inch after fabrication. Mast arms shall be fabricated according to the thickness requirements shown on the

Standard Drawings, or on the project plans. A taper rate of 0.14 inches change in diameter per linear foot shall be required unless otherwise specified.

All bolts, washers, and nuts for attaching the mast arm to the pole shall be fabricated from steel conforming to the requirements of ASTM A 325 and shall be electrogalvanized in accordance with the requirements of ASTM B 633.

Mast arms with galvanized tie rods shall be used on wood pole applications only, typically for temporary signal and lighting installations. The tie rods shall attach to the wood pole and mast arm in accordance with a method that has been recommended by the mast arm manufacturer and submitted to the Engineer for approval.

All steel mast arms shall be galvanized in accordance with the requirements of ASTM A 123. The manufacturer shall ensure that all mast arms shall be free of excess galvanizing slag inside the mast arm. The visual appearance of the galvanized finish shall be uniform and free from dark streaks, dark patches, and chain or handling/tie down strap marks. Mast arms with galvanized finishes that are not uniform may be rejected by the Engineer, and may require repair or replacement at no additional cost to the Department.

(F) **Break-Away Bases:** has been revised and moved to section 731-2.04:

(G) **Anchor Bolts:** has been revised and moved to section 731-2.04:

731-2.04 Mast Arms and Tie Rods: is revised to read:

Foundations and Break-Away Transformer Bases:

(A) **Foundations:**

All concrete used for traffic signal and light pole foundations shall be in accordance with the requirements of section 1006. Concrete shall be Class S with a required 28 day compressive strength of 3,000 pounds per square inch.

(B) **Anchor Bolts:**

All traffic signal and light pole anchor bolts shall be fabricated from ASTM A 36 steel that is fully galvanized in accordance with ASTM A 153, and comply with T.S. 4-23 of the Standard Drawings for Traffic Signal and Lighting. All anchor bolts shall be submitted for approval and a certificate of analysis shall be provided from the manufacturer that is in accordance with subsection 106.05.

Each anchor bolt shall be threaded at both ends with sufficient threads to allow two nuts, two washers, the pole base plate, 1 inch below the bottom leveling nut, and ½ inch above the top nut.

(C) Breakaway Transformer Bases:

Breakaway bases for light poles and flasher poles shall be a frangible pole mounting pedestal (base). Breakaway bases shall be used on Type A, E, F, G, H, I, S, and T poles when indicated on the project plans or specifications. Breakaway bases shall be fabricated from 356 T-6 aluminum alloy and shall have a stainless steel wheelabrated finish. The breakaway shall have all the necessary hardware to make a complete and functional unit. Washers and nuts shall meet or exceed ASTM A 36 minimum strength requirements and shall be galvanized in accordance with ASTM A 153. Bolts connecting the pole to the base shall be ASTM A 325. Anchor bolts connecting the breakaway base to the foundation shall conform to ASTM F 1554 GR 55. All bolts shall be galvanized in accordance with ASTM A 153. The 2 ³/₄ inch X ¹/₂ inch thick washers shall be zinc mechanically coated per ASTM B695-85 Class 50. Welding of all components of aluminum breakaway bases shall conform to the AWS D1.2 Specifications for Class I Structures. All aluminum components and welding shall be identified and included in the Certificate of Analysis.

Breakaway bases shall be certified by the manufacturer to meet or exceed the change in momentum requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, and to be acceptable for use on Federal Aid projects. The manufacturer shall also certify that the breakaway base has been tested and approved by the Federal Highway Administration (FHWA) and that the casting have the same chemistry, mechanical properties, and geometry as the casting used in the tests. The contractor shall submit a Certificate of Analysis for all aluminum components and welding in accordance with the requirements of Section 106.05.