

## SECTION 657 POLES, ARMS, STANDARDS, AND BASES

### 657.1 Description

- (1) This section describes furnishing and installing poles, arms, standards, and bases for lighting and traffic signals.

### 657.2 Materials

#### 657.2.1 Poles

- (1) Design support structures, consisting of poles and arms, conforming to AASHTO design and fabrication standards for structural supports for highway signs, luminaires, and traffic signals. Use a design life of 50 years. Design to withstand a 3 second gust wind speed of 90 mph (145 km/h). Do not use the methods of appendix C of those AASHTO standards.
- (2) Design support structures to the AASHTO fatigue category criteria as follows:
  1. Traffic signal support structures:
    - No fatigue analysis is required for type 1 structures.
    - Category II criteria for type 12 and type 13 structures.
    - Category III criteria for type 9 and type 10 structures.
  2. Lighting support structures:
    - No fatigue analysis is required for type 4, 5, 6, 7, and 8 structures.
- (3) For structures requiring a fatigue analysis, use 45 mph (72 km/h) for truck-induced gusts.
- (4) Along with the materials list, submit a certificate of compliance certifying that poles as furnished, conform to the above structural performance requirements. Ensure that the certificate of compliance is on the manufacturer's letterhead stationery, signed by an authorized officer of the company, and notarized. Send a copy of the certificate and a copy of the pole shop drawings to the department electrical engineer. The department's review does not relieve the contractor of the responsibility for satisfactory results and is not considered an approval. Furnish poles from an approved manufacturer.
- (5) Furnish shop drawings as specified in 506.3.2, except submit 5 copies with the materials list. Ensure the drawings contain sufficient detail to allow satisfactory review and show the outside diameters of the pole at the butt, top, and splice locations the plans show. Show the width, depth, length, and thickness of all material, and list all pertinent ASTM specification designations and metal alloy designations together with the tensile strength of all metallic members.
- (6) After completing the manufacturing process, ensure that all shafts 35 feet (10.7 m) or less in length for lighting poles only, are round, of one-piece construction, and of the specified length.
- (7) Construct poles of materials having sufficient rigidity that, with all material installed and in place as the plans show, the centerline of the shaft appears vertical. Include dampers for lighting poles, type 5, 6, 7, in locations such as structure-mounted poles where vibrations may be more prevalent. However, if vibration becomes a concern after a pole has been installed, dampeners shall be installed at the project engineers discretion and they shall be paid for as extra work.
- (8) After welding and before zinc coating, clean the exterior surfaces of each steel pole free of all loose rust and mill scale, dirt, oil or grease, and other foreign substances.
- (9) Apply a zinc coating conforming to the process specified for steel sign bridges in 641.2.8. Ensure that the zinc coating is tight, free from rough areas or slag, and presents a uniform appearance.
- (10) After completing manufacturing, clean the exterior surfaces of each pole free of all loose scale, dirt, oil or grease, and other foreign substances.
- (11) The contractor may package poles in bundles containing a maximum of 4 poles.
- (12) Provide a reinforced hand hole measuring 4 inches by 6 inches (100 mm by 150 mm) as the plans show. Locate the hand hole 18 inches (450 mm) from the bottom of the pole base plate to the center of the door.
- (13) For the hand hole, include an access cover mounted to the pole by 2 1/4-20x3/4" (M6 x 1.00 x 19 mm) hex head stainless steel bolts.
- (14) Provide a grounding lug complete with mounting hardware as required, inside the pole as the plans show.

- (15) Provide access to the grounding lug from the hand hole. Mount the grounding lug by welding it directly opposite the hand hole on the inside wall of the pole.
- (16) Equip the top of the pole shaft with a removable, ventilated cap held securely in place by at least one hex head stainless steel set bolt, 1/4-20x3/4 inch screw (M6 x 1.00 x 19 mm ).
- (17) Ensure that all castings are clean, smooth, and with all details well defined and true to pattern.
- (18) Attach base plates firmly to the pole shaft by welding or other approved method.
- (19) Indent print the aluminum pole type and the wall thickness in 2 locations on the side of the pole base plate, 180 degrees apart.
- (20) Indent print the steel poles in 2 locations on the side of the pole base plate, 180 degrees apart, before galvanizing.
- (21) Use aluminum shims.
- (22) Install identification plaques as the plans show.

### **657.2.2 Monotube Arms**

- (1) Design monotube arms as specified for traffic signal support structures in 657.2.1(1) through 657.2.1(3).
- (2) Base the designs on the completed maximum loading configurations the standard detail drawings show. Along with the materials list, submit a certificate of compliance certifying that arms as furnished, conform to the above structural performance requirements. Ensure that the certificate of compliance is on the manufacturer's letterhead stationery, signed by an authorized officer of the company, and notarized. Send a copy of the certificate and a copy of the monotube arm shop drawings to the department electrical engineer. This paper work is for informational review only, not for approval.
- (3) Furnish shop drawings conforming to 506.3.2. Show the width, depth, length, and thickness of the arms, and list ASTM designations.
- (4) List strength and grade specification ratings on the shop drawings.
- (5) Furnish monotube arms conforming to the following:
  1. Consist of zinc coated steel round or oval members.
  2. Have a mounting device welded to the pole end of the monotube arm that allows the attachment of the arm to a pole as the plans show.
  3. Have stiffeners or gussets if required between the arm tube and the arm mounting device to provide adequate strength to resist side loads.
  4. Have a clean, uniform natural finish. No paint or other corrosion preventive maintenance coating is required.
  5. Have the wiring raceway entrance through the upper mounting bracket.
- (6) After welding and before zinc coating, clean the exterior surfaces of each arm free of all loose rust and mill scale, dirt, oil or grease, and other foreign substances.
- (7) Apply zinc coating as specified for sign bridge components in 641.2.8. Ensure that the zinc coating is tight, free from rough areas or slag, and presents a uniform appearance.
- (8) After manufacturing is complete, clean the exterior surfaces of each pole free of all loose scale, dirt, oil or grease, and other foreign substances.

### **657.2.3 Luminaire Arms**

- (1) Design luminaire arms to withstand all loads that the units are subject to in the field, including the loads applied by the materials attached to the structure. Design luminaire arms as specified for lighting structures in 657.2.1(1). Along with the materials list, submit a certificate of compliance certifying that arms as furnished, conform to the above structural performance requirements. Ensure that the certificate of compliance is on the manufacturer's letterhead stationery, signed by an officer of the company and notarized. Send a copy of the certificate and a copy of the luminaire arm shop drawings to the department electrical engineer. This paper work is for informational review only, not for approval.
- (2) Furnish shop drawings conforming to 506.3.2. Include the dimensions of all members, list the ASTM alloy designation of aluminum members, and show weld details.
- (3) Furnish luminaire arms and mounting clamps made of extruded aluminum. Provide a mounting clamp welded to the pole end of the luminaire arm that is compatible to, and allows the attachment of, the

luminaire arm to a round pole, dimensioned as the plans show. Install mounting clamps with stainless steel bolts, nuts, and washers. Use stainless steel bolts, nuts, and washers conforming to ASTM A 320.

- (4) Furnish a clean luminaire arm with a uniform natural aluminum finish. Do not paint or apply other corrosion preventive maintenance.

#### **657.2.4 Traffic Signal Standards**

##### **657.2.4.1 General**

- (1) Equip the top of the standards with a removable, ventilated cap, held securely in place by at least one hex head stainless steel bolt, 1/4-20x3/4 inch (M6 x 1.00 x 19 mm).

##### **657.2.4.2 Aluminum**

- (1) Furnish standards consisting of extruded, seamless aluminum alloy 6061-T6, manufactured conforming to ASTM B 241, or porthole extruded, aluminum alloy 6061-T6, manufactured conforming to ASTM B 429.
- (2) Furnish standards conforming to the following:
  1. Threaded on one end, tapered, and conforming to national pipe threading dimensions and normal practice.
  2. Outside dimension of 4-1/2 inch (115 mm).
  3. Schedule 80 aluminum pipe.
- (3) The manufacturer shall indent print the ASTM and alloy designations on the traffic signal standards using 1/4 inch (6 mm) size dies on the outside of the standard 2 inches (50 mm) above the threading.

#### **657.2.5 Pedestal Bases**

- (1) Furnish cast aluminum alloy pedestal bases designed as specified for traffic signal support structures in 657.2.1(1) and selected from the department's approved products list. Ensure that castings are true to pattern in form and dimensions and free from pouring faults, sponginess, cracks, sharp edges, blow holes, and other defects in positions affecting strength and value for the service intended. Thread all casting collars to mate with the traffic signal standards furnished for the contract and specified in 657.2.2.
- (2) If the engineer requests, provide one randomly selected sample pedestal base per traffic signal location. The department will base acceptance of all pedestal bases at that traffic signal location on destructive tests of that sample base.
- (3) Along with the materials list, submit a certificate of compliance certifying that base as furnished, conform to the above structural performance requirements. Provide the certificate of compliance on the manufacturer's letterhead stationery, signed by an authorized officer of the company, and notarized.

#### **657.2.6 Transformer Bases**

- (1) Furnish cast aluminum alloy transformer bases designed as specified for traffic signal support structures in 657.2.1(1) and selected from the department's approved products list. Ensure that castings are true to pattern in form and dimensions and free from pouring faults, sponginess, cracks, sharp edges, blow holes, and other defects in positions affecting strength and value for the service intended.
- (2) Along with the materials list, submit a certificate of compliance certifying that bases as furnished, conform to the above structural performance requirements. Provide the certificate of compliance on the manufacturer's letterhead stationery, signed by an authorized officer of the company, and notarized.
- (3) Use mounting washers conforming to the manufacturer's instructions.

### **657.3 Construction**

#### **657.3.1 Poles**

- (1) Under the Poles bid items, furnish and install poles, ventilated pole caps, and all necessary miscellaneous hardware needed to complete the installation of the poles.
- (2) Install poles as specified in the plan details.
- (3) Before installation, clean each pole free of oil and foreign matter. Coat the following surfaces of aluminum poles with an approved corrosion preventative if required by the special provisions:
  1. The bottom 24 inches (600 mm) of the inside of the pole.
  2. Top and bottom of the pole base plate.

3. Top and bottom of shims.

- (4) Follow the application procedure and drying time instructions provided by the corrosion preventative manufacturer.
- (5) After completing erection using normal pole shaft raking techniques, ensure the centerline of the shaft appears vertical.

#### **657.3.2 Monotube Arms**

- (1) Under the Monotube Arms bid items, furnish and install monotube arms for traffic signals.

#### **657.3.3 Luminaire Arms**

- (1) Under the Luminaire Arms bid items, furnish and install aluminum luminaire arms together with hardware and fittings as the plans show.
- (2) Securely clamped luminaire arms to the pole and rake so that the initial level of the luminaire tenon is plus 3 degrees.

#### **657.3.4 Traffic Signal Standards**

- (1) Under the Traffic Signal Standards bid items, furnish and install standards and ventilated polecaps for traffic signals.
- (2) Traffic signal standards shall be perpendicular to the bottom of a traffic signal pedestal base when installed tight in the top of the base, and the base has been leveled on its concrete foundation.
- (3) Thread standards into a traffic signal base straight and true, with no circular swing or sway.

#### **657.3.5 Bases**

- (1) Before installing, clean the mill scale, oil, and foreign material off transformer bases, traffic signal pedestal bases, and all other aluminum bases. Coat the bases with an approved corrosion preventative on the following surfaces, if the special provisions require:
  - Top and bottom surfaces of transformer bases.
  - The entire inside surface of transformer bases.
  - The bottom surface of pedestal bases.
  - The entire inside surface of pedestal bases.
  - All surfaces of aluminum shims.
  - Apply and dry conforming to the manufacturer's instructions.
- (2) Under the Pedestal Bases bid item, furnish and install department-approved pedestal bases for traffic signal standards, including necessary hardware.
- (3) Under the Transformer Bases bid items, furnish and install department-approved transformer bases for poles, including necessary hardware. Install transformer bases conforming to the manufacturer's instructions.

#### **657.4 Measurement**

- (1) The department will measure all the bid items under this section as each individual unit acceptably completed.

#### **657.5 Payment**

- (1) The department will pay for measured quantities at the contract unit price under the following bid items:

<u>ITEM NUMBER</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
657.0100	Pedestal Bases	EACH
657.0200 - 0249	Transformer Bases Breakaway (size)	EACH
657.0250 - 0299	Transformer Bases Standard (size)	EACH
657.0300 - 0399	Poles (type)	EACH
657.0400 - 0499	Traffic Signal Standards Aluminum (length)	EACH
657.0500 - 0599	Monotube Arms (length)	EACH
657.0600 - 0699	Luminaire Arms Single Member (clamp size) (length)	EACH
657.0700 - 0799	Luminaire Arms Truss (type) (clamp size) (length)	EACH

- (2) Payment for Pedestal Bases is full compensation for providing the pedestal base, mechanical grounding connector and related mounting hardware; for leveling shims if required; and for preventing corrosion if required. The department will pay for sample bases, provided under 657.2.5, at the contract unit price for Pedestal Base.
- (3) Payment for the Transformer Bases bid items is full compensation for providing the transformer base, mechanical grounding connector, and related hardware; for leveling shims if required; and for preventing corrosion if required.
- (4) Payment for the Poles bid items is full compensation for providing all materials, including poles, all hardware and fittings necessary to install the pole; for corrosion prevention if required; for installing identification plaques if required; and for providing festoon outlets if required.
- (5) Payment for the Traffic Signal Standards Aluminum bid items is full compensation for providing the standards and pole cap.
- (6) Payment for the Monotube Arms bid items is full compensation for providing all materials, including all hardware, fittings, mounting devices, shims, and attachments necessary to completely install the arm.
- (7) Payment for the Luminaire Arms Single Member and Luminaire Arms Truss bid items is full compensation for providing all materials, including all hardware, fittings, mounting clamps, shims if required, and attachments necessary to completely install the luminaire arm.