

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

### 657.1 Description

- (1) This section describes providing poles, arms, standards, and bases for lighting and traffic signals. This section also describes installing department-furnished components for lighting and traffic signals.

### 657.2 Materials

#### 657.2.1 Department-Furnished Materials

- (1) The department will furnish the following:
  - Type 9, 10, 12, and 13 poles and associated mounting hardware and pole caps.
  - Monotube arms and associated connecting bolts.
  - Steel luminaire arms and associated connecting bolts.

#### 657.2.2 Contractor-Furnished Materials

##### 657.2.2.1 Poles

###### 657.2.2.1.1 General

- (1) 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.
- (2) Furnish poles from a department-approved manufacturer. Submit a materials list and accompanying certificate of compliance certifying that the poles incorporated into the work conform to the specified design criteria and other contract requirements. Ensure that the certificate of compliance is on the manufacturer's letterhead, signed by an authorized company officer, and is notarized. Also send a copy of the certificate and a copy of the pole shop drawings to the department electrical engineer.
- (3) Include hand holes with a bolt-on access cover as the plans show. Provide a grounding L-clip welded directly opposite the hand hole on the inside wall of the pole.
- (4) Weld base plates to the pole shaft. Identify the pole type and wall thickness using 1/2 inch lettering indent printed in 2 locations on the side of the pole base plate, 180 degrees apart. Indent print before galvanizing steel poles.
- (5) Complete all welding before galvanizing steel poles. Clean exterior surfaces of steel poles after welding to ensure they are free of loose rust and mill scale, dirt, oil or grease, and other contaminants before zinc coating. Zinc coat as specified in [641.2.8](#). Ensure that the coating is tight, free from rough areas or slag, and presents a uniform appearance. Clean after manufacturing is complete to remove loose and foreign material.
- (6) Furnish aluminum or galvanized steel shims matching the pole pole material.

###### 657.2.2.1.2 Poles Designed Under Current AASHTO Standards

- (1) Except for type 2 and 3 poles, design support structures, consisting of poles and arms, conforming to the minimum wall thickness the plan details show and 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. Do not use the methods of appendix C of those AASHTO standards. No fatigue analysis is required.
- (2) Construct poles of materials having sufficient rigidity that, with all material installed as the plans show, the centerline of the shaft is vertical. Ensure that lighting poles nominally 40 feet or less in length are made of one piece and round in cross section.
- (3) Incorporate dampeners as the plans show and for poles used in configurations susceptible to vibration.

###### 657.2.2.1.3 Poles Designed Under Legacy Standards

- (1) For Types 2 and 3 poles, design support structures conforming to the AASHTO standard specification for structural supports for highway signs, luminaires, and traffic signals as published in the 1994, third edition. Design for the following:
  - A wind speed of 80 mph with a 1.3 gust factor.

- Dead and live load related to a 25 foot trombone mast arm with 5 section signal head and a pair of twin 15-foot luminaire arms mounted on the pole as the plans show.

#### **657.2.2.2 Trombone Arms**

- (1) Design aluminum trombone arms as specified in [657.2.2.1.3](#) based on the completed maximum loading configuration the plans show. Furnish shop drawings conforming to [657.2.2.1.1](#) that show the width, depth, length, and thickness of all members. Also list the ASTM alloy designation and strength of each aluminum member on the shop drawings.
- (2) Submit a materials list and accompanying certificate of compliance certifying that the trombone arms incorporated into the work conform to the specified design criteria and other contract requirements. Ensure that the certificate of compliance is on the manufacturer's letterhead, signed by an authorized company officer, and is notarized. Also send a copy of the certificate of compliance and a copy of the shop drawings to the department's electrical engineer for informational review.
- (3) Ensure that the design incorporates all of the following:
  1. Round or oval upper and lower aluminum members joined by one or more tubular vertical struts welded to them.
  2. A mounting clamp welded to the pole end of the trombone arm that allows attachment to a round pole.
  3. Gussets at the joints between the main arm tubes and the arm clamps to resist side loads.
  4. A horizontally adjustable strut to allow mounting five 12-inch signal faces with backplates.
  5. A clean, uniform, natural aluminum finish. Do not paint or apply other anti-corrosion coatings.
  6. A wiring raceway entrance through the upper mounting bracket.
  7. Vertically adjustable through plus or minus 10 degrees as the plans show.

#### **657.2.2.3 Aluminum Luminaire Arms**

- (1) Design aluminum luminaire arms as specified in [657.2.2.1.2](#) to withstand in-service field loadings including loads imposed by components attached to the arms. Furnish shop drawings conforming to [657.2.2.1.1](#). Include the dimensions of all members, list the ASTM alloy designation of aluminum members, and show weld details.
- (2) Submit a materials list and accompanying certificate of compliance certifying that the luminaire arms incorporated into the work conform to the specified design criteria and other contract requirements. Ensure that the certificate of compliance is on the manufacturer's letterhead, signed by an authorized company officer, and is notarized. Also send a copy of the certificate of compliance and a copy of the shop drawings to the department's electrical engineer.
- (3) Make luminaire arms out of extruded aluminum. Ensure that the arms are clean with a uniform natural aluminum finish. Do not paint or apply other anti-corrosion coatings.
- (4) Furnish an extruded aluminum fixture welded to the pole end of the luminaire arm that allows the arm to be clamped to a round pole dimensioned as the plans show. Furnish mounting clamps with stainless steel bolts, nuts, and washers conforming to ASTM A 320.

#### **657.2.2.4 Traffic Signal Standards**

- (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. Also conform 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.
  3. Schedule 80 aluminum pipe.
- (2) Ensure that the manufacturer has indent printed the ASTM and alloy designations 2 inches above the threading on the outside of each standard using 1/4 inch dies.

#### **657.2.2.5 Bases**

- (1) Furnish cast aluminum alloy pedestal and transformer bases from the department's approved products list and meeting the design criteria specified in [657.2.2.1.2](#). Ensure that castings are true to pattern in form and dimensions and free from defects affecting strength or service life.

- (2) Submit a materials list and accompanying certificate of compliance certifying that the bases incorporated into the work conform to the specified design criteria and other contract requirements. Ensure that the certificate of compliance is on the manufacturer's letterhead, signed by an authorized company officer, and is notarized.
- (3) 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.
- (4) Thread casting collars for pedestal bases to mate with the traffic signal standards furnished under the contract.
- (5) Use mounting washers for transformer bases conforming to the manufacturer's instructions.

### **657.3 Construction**

#### **657.3.1 General**

##### **657.3.1.1 Installation**

- (1) Under the contractor-provided bid items numbered from 657.0100 - 0999 furnish and install everything required to complete the installation as the plans show.
- (2) Under the install bid items numbered from 657.1000 - 1999 install the department-furnished components indicated in the bid item names. Also furnish and install fittings, either aluminum or galvanized steel shims, hardware, and other components the department does not furnish but that are required to complete the installation as the plans show.
- (3) Install a grounding lug either inside the base or pole as required to connect equipment grounding conductors.

##### **657.3.1.2 Welding**

- (1) Perform all shop welding as the plans show and conforming to the following:
  - For steel poles and arms: AWS D 1.1, Structural Welding Code - Steel.
  - For aluminum poles and arms: AWS D 1.2, Structural Welding Code - Aluminum.
- (2) Do not weld in the field without the engineer's written approval. The engineer will only allow field welding for repairs in noncritical locations and when a department-approved individual competent to perform inspections is present during the welding. Perform all field welding using personnel qualified under AWS D 1.5, Bridge Welding Code for steel or AWS D 1.2, Structural Welding Code - Aluminum for aluminum.

##### **657.3.2 Poles**

- (1) Clean each pole before installation and, if the special provisions require, coat aluminum poles with a corrosive protection material from the department's approved products as follows:
  - The bottom 24 inches of the inside of the pole.
  - Top and bottom of the pole base plate.
  - Top and bottom of shims.
  - Apply and dry conforming to the manufacturer's instructions.
- (2) Secure type 9, 10, 12, and 13 structures to anchor assemblies and document tensioning procedures as specified in [641.3.1.2](#).
- (3) After completing erection using normal pole shaft raking techniques, ensure that the centerline of the shaft is vertical.
- (4) Install dampeners as the plans show and for poles used in configurations susceptible to vibration. If the engineer determines that vibration is a problem after a pole has been installed, install dampeners as the engineer directs.
- (5) Install identification plaques as the plans show.

##### **657.3.3 Arms**

- (1) Install trombone, monotube, and luminaire arms to supporting structures at the height and alignment the plans show. Clamp luminaire arms to the pole and rake so the initial level of the luminaire tenon is plus 3 degrees.

#### 657.3.4 Standards

- (1) Thread traffic signal standards into their pedestal bases without damaging the threads. Ensure that the base is level on its concrete foundation and the standard is vertical after all connections are tight.

#### 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) 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 - 0299	Transformer Bases Breakaway (size)	EACH
657.0300 - 0399	Poles (type)	EACH
657.0400 - 0499	Traffic Signal Standards Aluminum (length)	EACH
657.0560 - 0599	Trombone 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
657.1300 - 1399	Install Poles (type)	EACH
657.1500 - 1599	Install Monotube Arms (length)	EACH
657.1800 - 1899	Install Luminaire Arms Steel (length)	EACH

- (2) Payment for Pedestal Bases and the Transformer Bases bid items is full compensation for providing the pedestal base including grounding lugs and related mounting hardware; for leveling shims; and for corrosion prevention. The department will pay for sample pedestal bases, provided under [657.2.2.5](#), at the contract unit price for Pedestal Bases.
- (3) Payment for the Poles bid items is full compensation for providing poles including grounding lugs and related mounting hardware; for hardware and fittings necessary to install the pole; for leveling shims; for dampeners; for installing identification plaques; and for corrosion prevention.
- (4) Payment for the Traffic Signal Standards Aluminum bid items is full compensation for providing the standards.
- (5) Payment for the Trombone Arms and Luminaire Arms bid items is full compensation for providing arms including related mounting hardware and leveling shims.
- (6) Payment for the Install Poles bid items is full compensation for installing department-furnished poles and for providing grounding lugs, fittings, shims, hardware, and other required components the department does not furnish.
- (7) Payment for the Install Monotube Arms and Install Luminaire Arms Steel bid items is full compensation for installing department-furnished arms and providing related mounting hardware, leveling shims, and other required components the department does not furnish.