ITEM 680.82XXYY10 – MAST ARM POLE WITH ROTATING ARM LENGTH UPTO 50 ft

DESCRIPTION

Under these items, the Contractor shall furnish and install the combined mast arm poles and mast arms which will support traffic control signals and auxiliary equipment as shown on the Contract Documents or as ordered by the Engineer.

MATERIALS

A GENERAL

1. The mast arm pole and mast arm may be fabricated of pipe, tube, or cold-formed hot rolled steel conforming to one of the following alloys:

   ASTM A53 Grade B
   ASTM A252 Grade 2 or 3
   ASTM A595 Grade A or B

   All alloys used shall be subject to approval of the Engineer.

2. The yield of this pipe or tube shall be not less than 48 ksi. The yield of the cold-formed hot rolled steel shall not be less than 55 ksi for ASTM A595 Grade A or 60 ksi for Grade B.

3. The mast arm pole, mast arm, and base shall be hot-dipped galvanized in accordance with ASTM 123.


5. All other miscellaneous hardware shall be stainless steel.

6. Nut covers shall be cast aluminum or spun aluminum.

7. All hardware shall be packaged for each pole furnished.

B DESIGN REQUIREMENTS: GENERAL

1. Design stress for mast arm poles, mast arms, and all its components shall not exceed 55% (percent) of yield strength of the specified material used, equivalent to a 1.8 factor of safety.

2. All poles shall be designed to support at the free end of the mast arm a load of 463 lb applied vertically downward and a load of 701 lb applied perpendicular to the axis of the mast arm and the vertical force.

3. The mast arm pole and mast arm of the length designated shall be designed such that when assembled as a unit, the maximum horizontal deflection of the pole shall not exceed 3 inches at the top of the shaft in any direction.

   The manufacturer shall certify by a load test in each arm, that the Maximum Vertical Deflection with an applied dead load of 190 lbs. to the free end of the mast arm (as measured in the installed position) shall be limited to the following:
ITEM 680.82XXYY10 – MAST ARM POLE WITH ROTATING ARM LENGTH UPTO 50 ft

<table>
<thead>
<tr>
<th>Mast Arm Length (ft.)</th>
<th>Max. Vertical Arm Deflection (in.)</th>
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<tbody>
<tr>
<td>40 and below</td>
<td>6</td>
</tr>
<tr>
<td>45</td>
<td>9</td>
</tr>
<tr>
<td>50</td>
<td>12</td>
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The maximum horizontal (sideways) deflection of the free end of the mast arm, from the no load position, shall not exceed those indicated on the contract plans.

4. The dimension and roadway clearances shall be as indicated on the contract plans.

5. The assembled unit of mast arm and pole shall be so designed as to permit the arm to be rotated to any angle (0° – 360°) in a horizontal plane and to be secured in that position. This rotation capability shall be provided for at the top of the vertical shaft, where the arm is attached.

C DESIGN REQUIREMENTS: MAST ARM POLES

1. The mast arm pole shall be designed under the load and design requirements set forth in Section B.

2. The cross section of the poles shall be symmetrical about its axis. The poles shall be round. They may be uniformly tapered or have a constant nominal diameter not exceeding those indicated on the details at the base. If longitudinally welded, the exposed weld shall be ground or rolled smooth and flush with the base metal. All such welds shall be continuous. All pipe or tubings shall be full lengths for poles. No splicing will be permitted.

3. The base shall be designed to fully develop the ultimate strength of the pole. The base may have a cross section similar to the pole; it may be round or a regular polygon and shall be designed to fully transfer the load to the anchor bolts.

4. The base of each pole, shall be fabricated to receive anchor bolts spaced equally apart on a bolt circle, indicated on the details symmetrically about the axis of the pole.

5. Each anchor bolt shall be supplied with a leveling nut and a stop nut. Each anchor bolt shall be sized and threaded as indicated on the details. A flat steel plate shall be either welded with a fillet weld or threaded or bolted to the imbedded end.

6. Each pole shall be furnished with bolt cover plates for concealing the exposed ends of the anchor bolts and nuts. A means shall be provided to secure the bolt covers to the base.

7. Each pole shall be provided with a reinforced handhole, as indicated on the details. The removable cover shall be equipped with two (2) Allen keyed, stainless steel bolts.

8. The pole shall be designed and fabricated to accommodate mast arms of 15, 20, 25, 30, 35, 40, 45, and 50 feet. The mast arms and pole shall be completely interchangeable.

9. A bronze grounding stud with bronze lock washer shall be installed inside the pole welded to the shaft opposite the handhole.
D DESIGN REQUIREMENTS: MAST ARMS

1. The mast arm shall be designed for the load and design requirements set forth in Section B.

2. The mast arm shall be designed as a single member without spreader arms, tie rods, or truss members. The mast arm shall have the appearance of an upsweep curving arc.

3. The mast arm shall have a cross section similar to that of the mast arm pole.

4. The rise of the mast arm from the pole end to the free end shall be as indicated on the details. This rise shall be accomplished by sloping the mast arm upward and curving it such that the middle ordinate distance between the curved mast arm and the chord shall not be less than 6 inches for any mast arm length.

5. The arm shall consist of a straight section and a constant radius curved section. These sections shall be dimensioned as indicated on the details. The curved arm shall meet the horizontal plane at the free end with an upward angle of three (3) degrees. The diameter of the arm shall not be greater than the diameter of the pole. Any difference between the diameters shall be made through a smooth appearing tapered reduction fitting at the point of joining. The minimum length of taper shall be as indicated on the details.

6. The mast arm shall be provided with a standard pipe sized as indicated on the details to support standard traffic signal heads to be located at the end of the mast arm.

7. There shall be means provided for a weather tight entrance of electrical conductors from the traffic control devices to the mast arm. This entrance shall be located through the end of the mast arm pipe fitting. At the juncture of the mast arm and mast arm pole, a weather tight exit from the mast arm to the mast arm pole for electrical conductors shall be provided internally.

E BASIS OF ACCEPTANCE

1. The Contractor shall provide descriptions and drawings of each type of mast arm pole for approval.

2. All testing for deflections, when required, shall be made on the mast arm pole and mast arm assembled as a unit. The deflection shall not exceed those specified on the details subject to the loads specified in Section B.2.

3. The manufacturer shall provide when required, a certified report from a certified independent test laboratory that the mast arm and pole have been tested and meet these specifications for deflections and materials. Additional field tests of a complete unit, pole with mast arm attached, may be required as determined by the Engineer.

F GUARANTEE

1. All material and workmanship furnished under this specification, shall be guaranteed for a period of one year from the date of completion of this contract.

2. The Contractor shall be responsible for any defective parts, due to faulty material or workmanship, free from any expense to the State during the term of this guarantee, where such material is exposed to normal operation conditions.
3. Units or parts found damaged or imperfect when inspected after delivery, shall be replaced by the Contractor at his own expense, including all subsequent delivery and shipping charges.

CONSTRUCTION DETAILS

Subsections 680-3.01 to 680-3.12 and 680-3.32 shall apply.

The mast arm pole and mast arm shall be erected upon a foundation, installed under another item, with the handhole located in a direction as approved by the Engineer. The mast arm shall be aligned as shown on the plans or as ordered by the Engineer.

The mast arm pole shall be raked when the mast arm is under a full load as shown on the intersection drawing. The pole shall be raked to a vertical position.

The pole shall be grounded with a solid copper equipment grounding conductor.

All holes and openings shall be field drilled and tapped to insure the proper alignment of attachments and fittings.

All scraped or bruised areas on the mast arm pole or mast arm shall be regalvanized in the field to the satisfaction of the Engineer.

METHOD OF MEASUREMENT

This work shall be measured by the number of mast arm poles with mast arm furnished and installed in accordance with the Contract Documents or as directed by the Engineer.

BASIS OF PAYMENT

Subsection 680-5.01 of the Standard Specifications shall apply.

The unit price bid for each pole shall include the necessary grounding system, anchor bolts, mast arms, pole assembly and erection, field galvanizing as required and the following items. Breakaway transformer bases, when specified, shall be included in the price bid for each pole.

a. Anchor bolt covers if specified.
b. Weather heads and couplings as required.
c. Service bracket.
d. Pole cap and mast arm end caps.
e. Cabinet mounting fittings, plates, brackets as needed for the cabinet being installed.
f. Reinforced couplings for wire entrances to cabinets.
g. Galvanized eyebolt, nuts and washers for attaching span wire assembly.
h. Galvanized pole clamps with eyes for attaching tether wires.

Payment will be made under:

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<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
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<tbody>
<tr>
<td>680.82XXYY10</td>
<td>Mast Arm Traffic Signal Pole</td>
<td>Each</td>
</tr>
</tbody>
</table>

XX = Mast Arm mounting height in feet.
YY = Mast Arm length in whole feet.