MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TRAFFIC SIGNAL MAST ARM POLE AND MAST ARM

SIG:EMS 1 of 4 APPR:MLO:MJF:08-26-24
FHWA:APPR:08-26-24

a. Description. This work consists of furnishing, fabricating, and erecting a traffic signal mast arm pole and mast arm as shown on the plans, in accordance with the standard specifications, and as specified herein. This special provision is for an anchor base type steel mast arm pole, including mast arms, and other associated hardware required to complete the work.

b. Material. Furnish material in accordance with sections 906 and 908 (as modified by 20SP-908A - Miscellaneous Metal Products Revisions) of the Standard Specifications for Construction and this special provision.

Material specifications for the traffic signal mast arm pole and mast arm are included in Table 1.

Table 1: Material and Coating Specifications

Component	Specifications
Pole Tube	*ASTM A595/A595M GR A or ASTM A572/A572M GR 50*
Mast Arm Tube	*ASTM A595/A595M GR A or ASTM A572/A572M GR 50*
Mast Arm Clamp	*ASTM A36/A36M*
Gusset Plate	*ASTM A36/A36M*
Hand Hole Frame	*ASTM A705/A705M* or *ASTM A572/A572M GR 50*
Lifting Pipe	*ASTM A53/A53M GR B or ASTM A501/A501M*
Hand Hole Cover	*ASTM A1011/A1011M GR 36*
Pole Top	*ASTM B26/B26M (356F or 43)*
Stainless Steel Hardware	*AISI 300 SERIES (18-8)*
Luminaire Arm Bolts	*ASTM F3125/F3125M GR A325*
Mast Arm Studs	*ASTM A449*
Mast Arm Shear Bolts	*ASTM F3125/F3125M GR A325*
“ANCO” Lock Nuts or Equivalent	*ASTM A563/A563M GR DH*
Flat Washers	*ASTM F436/F436M*
Lock Washers	*ANSI B18.21.1*
Base Plate	*ASTM A36/A36M*
Bottom Steel Template	*ASTM A36/A36M*
Back Plate	*ASTM A36/A36M*
Mast Arm Plate	*ASTM A36/A36M*
Steel Plate and Shape Finish	*ASTM A123/A123M*
Hardware Finish	*ASTM A153/A153M*

Telescopic Field Splice Bolt	*ASTM A307*
C-Hook	*ASTM A36/A36M*
J-Hook	*ASTM A36/A36M*

Use high strength bolts, nuts, and washers in accordance with subsection 906.07 of the Standard Specifications for Construction.

Blast clean fabricated components with a nominal thickness greater than 1/2 inch to remove mill scale and welding slab before galvanizing. For components with a nominal thickness of 1/2 inch or less, blast cleaning can be waived if the galvanizer inspects the material and provides a written statement to the fabricator that blast cleaning is not required. Otherwise blast cleaning is required.

Furnish a vibration mitigation device as shown on the plans. Ensure the device is an active, non-aerodynamic vibration damper system. Ensure the installed device can reduce the loaded maximum vertical movement at the tip of the arm to 8 inches measured from the highest to the lowest point of deflection at wind speeds of 5-20 mph. The device must furnish, and the documentation must show an 85 percent or greater excitation reduction for the structures where the device is being installed. Ensure effectiveness is proven through an analytical model and approved by the Engineer. Test the device to withstand over 15 million large amplitude cycles with no deterioration of the dampening performance. Ensure the device can dampen large displacements and small displacements, be self-adapting, and not require structure-specific tuning.

Structural steel material used to fabricate the traffic signal mast arm pole and mast arm will be accepted based on “Fabrication Inspection” per the *MQAP Manual*. Mast arm studs, mast arm shear bolts, and luminaire arm bolts will be accepted based on “Test” per the *MQAP Manual.*

c. Fabrication. Fabricate and weld in accordance with section 707 of the Standard Specifications for Construction.

1. Ensure the pole and arm tubes have a uniform taper.

2. Ensure the pole and mast arm tubes are single ply and round or 16-sided.

3. Tolerance for overall length of pole tube and arm tube(s) is -1/8 inch/+3 inch. Tolerance for sweep and camber of pole tube and arm tube(s) is 1/8 inch per 10 foot. Tolerance for twist of pole tube and arm tube(s) is ±10 degrees.

4. The pole and mast arm tubes cannot have more than two longitudinal welds. Roll or grind flush the longitudinal seam weld. Transverse welds in the pole and arm tubes are prohibited.

5. Attach the arm tube to a mast arm plate with a full penetration weld. Shop drill holes in mast arm back plate and shop weld pipes to the mast arm back plate.

6. Ensure all welds are 100 percent VT inspected by an *AWS* CWI.

7. Ensure all fillet welds are MT inspected in accordance with subsection 707.03.D.12 of the Standard Specifications for Construction, except testing frequency must be 25 percent.

8. Ensure all PJP groove longitudinal seam welds are MT inspected in accordance with subsection 707.03.D.12 of the Standard Specifications for Construction, except testing frequency must be 10 percent.

9. Ensure all CJP groove welds are 100 percent UT inspected per subsection 820.03.D.1 of the Standard Specifications for Construction. Acceptance criteria for material thickness equal to or greater than 5/16 inch will be in accordance with the cyclically loaded nontubular connections in tension criteria stated in *AWS Clause 6*.

10. Ensure ends of all CJP groove longitudinal seam welds are PT inspected in accordance with subsection 707.03.D.12 of the Standard Specifications for Construction, except if at least one inch of the end of the pole will be removed after UT inspection has been completed.

11. Evenly space the pole base plate holes so the pole may be bolted to a concrete foundation as shown on the plans. Finish the lower surface of the base plate flat and at 90 degrees to the pole axis.

12. Furnish a handhole opening and cover. Weld a reinforcing frame to the pole for the handhole opening. Ensure the placement of the hand hole does not reduce the strength of the pole. Securely fasten the handhole cover using stainless steel hex head cap screws or by an approved locking device.

13. Furnish a suitable pole top with means for securing it to the top of the pole.

14. Furnish a hook or other suitable device for the support of cable on the inside of the pole near the top.

15. Weld square stock that has been drilled and tapped to the inside of the handhole so that it is readily accessible from the handhole for grounding purposes.

16. Fabricate the arm to pole upright connection to compensate for mast arm deflection. Show this detail on shop drawings for approval by the Engineer.

17. The manufacturer must submit all the necessary documentation and testing of the vibration mitigation device to prove the device is effective for their structures.

18. Ensure steel plates and shapes are hot-dip galvanized in accordance with subsection 716.03.B.4 of the Standard Specifications for Construction. If mast arms are required to have a duplex coating, ensure the coating is in accordance with 20SP-716A - Coating of Galvanized Lighting, Signal, Sign, and Miscellaneous Support Structures.

19. Submit shop drawings in accordance with subsection 707.03.A of the Standard Specifications for Construction.

20. Ultrasonically test (UT) the toe of the weld connecting multi-sided pole tubes to base plates and the toe of the weld connecting multi-sided mast arm tubes to transverse plates after galvanizing. Test at each corner of the multi-sided tube. Perform UT in accordance with AWS D1.1 using a small angle beam transducer capable of detecting shallow toe cracks.

d. Erection. Tighten anchor bolts in accordance with subsections 810.03.N.2 and

810.03.N.3 of the Standard Specifications for Construction (as modified by 20SP-810H - Permanent Traffic Signs and Supports Revisions).

Bolt the arm tube to the pole tube as shown on the plans. Field drill holes through the pole tube using the pipes shop welded to the mast arm back plate as guides. Do not field drill the mast arm back plate. Repair the galvanization coating after any field drilling. Control distortion of flange plates for flatness to assure full contact between mating surfaces in an unbolted, relaxed condition.

Tighten pole cap, mast arm cap, and luminaire arm high strength bolts to a snug tight condition in accordance with 707.03.E.6.c of the Standard Specifications for Construction.

Furnish the Engineer 5 working days notification prior to the start of installation so they may witness or monitor the contractor's activities.

e. Construction. Ensure all work complies with sections 818, 820, and subsection 810.03 (as modified by 20SP-810H – Permanent Traffic Signs and Supports Revisions) of the Standard Specifications for Construction, the applicable signal construction plan sheets, and this special provision.

Perform repairs to galvanized surfaces in accordance with subsection 716.03.E of the Standard Specifications for Construction.

f. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Mast Arm Pole, Cat __	Each
Mast Arm, __ foot, Cat __	Each

Mast Arm Pole, Cat __ and **Mast Arm,** __ **foot, Cat** __ includes furnishing all materials, fabrication, shop cleaning, galvanizing, shipping, and erection. Payment for furnishing and installing the vibration mitigation device where required and submitting all required information is included in the pay item **Mast Arm,** __ **foot, Cat** __.

No extension of time or additional compensation will be granted due to obtaining the proper *AISC* certifications and/or endorsements required for this project.

Construction of the foundation will be included in other items.