SECTION 740

SIGNALS AND LIGHTING MATERIALS

Special Provisions

Replace subsection 740-2.02 with the following:

740-2.02 SIGNAL AND LIGHTING POLES. Design and fabricate camera, antennae and OVDS structures with pole shaft lengths to 55 feet long to conform to the 1994 Edition of AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* with interim revisions.

A registered professional engineer shall design the structures and provide stamped shop drawings and calculations. Submit the stamped drawings and calculations for each pole to the Engineer for approval. Design for stresses on the completed structure with hardware in place.

Design Requirements

1. In the stamped calculations, indicate the edition of Standard Specifications to which the poles are being designed and provide the input data used to design each pole and mast arm, including: design wind speed, cross section shape, yield strengths of the component materials, dimensions of the pole components, and a summary of the loads used.

2. On the stamped shop drawings, provide design wind speed and the details for building the poles and mast arms, including: materials specifications, slip fit joint dimensions, pole component dimensions, welds that will be made, and the welding inspection that will be done.

Submit the mill certifications for the steel items (piles, plates, bolts, and other related items) to the Engineer for approval.

Design poles for 100 mph winds with a 1.3 gust factor.

Design each OVDS pole to support a transmitter/receiver with an area of 5.0 square feet, a dead load of 150 pounds, and having its centroid located 16 feet above the base of the pole.

Fabricate camera and antenna structures from tapered steel tubes with a round cross section. Orient hand holes located near the base of poles to face down stream of traffic flow.

Fabricate OVDS structures from non tapered steel tubes with a round cross section. Orient hand holes located near the base of poles to face down stream of traffic flow.

Furnish poles and mast arms up to 40 feet long in one piece. Poles and mast arms

longer than 40 feet may be furnished in one piece or in two segments with a slip type field splice. For slip type joints, provide a minimum overlap of two feet or 1.5 times the inside diameter of the female section whichever is larger. In mast arms, locate these splices at least one foot away from the Plan location of signal heads and signs. In signal poles, locate the edge of the female section at least six-inches above the top of the signal mast arm connection.

Fabricate tubes with walls up to ½-inch thick from the prequalified base metals listed in AWS D1.1 and feature maximum yield strengths of 70,000-psi. Fabricate elements greater than ½-inch thick from steel that conforms to ASTM A 709 and meets the Fracture Critical Impact Test requirements for zone 3. The Department will not accept structures that contain or are made with laminated steel elements.

Fabricate each tube from no more than 2 pieces of steel. When using 2 pieces, place the longitudinal welded seams directly opposite one another. Place the welded seams on adjacent sections to form continuous straight seams from the base to the top of the pole.

Fabricate 10 feet long posts from 11 US Standard Gage sheet steel. Fabricate each post with a minimum inside diameter of five inches at the base plate. Use a 3½-inch long piece of four-inch nominal Schedule 40 pipe that conforms to ASTM A 53 Grade B as a post-top adapter.

The Department does not allow holes made for lifting purposes in the ends of tubular segments. To add lift points, weld them to the tube opposite the longitudinal seam weld on the outside of female segments and on the inside of male segments. Before shipment, remove lift points added to the outside of the tubes, grind the area smooth with the base metal, and hot stick repair the finish according to subsection 660-3.01.8.a. Lift points added to the inside of tubes may be left in place.

Hot-dip galvanize camera, antenna, and OVDS structures to meet AASHTO M 111 and these specifications. Completely submerge pole and mast arm segments in one dip in a kettle of concentrated zinc ammonium chloride flux solution heated to 130°F, then completely submerge in one dip in a separate kettle of prime western grade zinc heated to approximately 825°F. Galvanize bolts and fasteners to meet AASHTO M 232.

After the poles and mast arms are galvanized, remove excess zinc from drip lines and points and the surfaces of tube ends that form slip type joints to provide a smooth finish.

Pole Rejection

The Department will reject poles and mast arms that are:

1. Not fabricated according to these specifications or the approved shop drawings,

2. Bowed with sweeps exceeding ¾ inch throughout the length of the pole, mast arm, or segment, if a two-piece pole or mast arm is furnished,

3. Out of round. Sections are out of round when the diameters of round members or the dimension across the flats of multi-sided members exceed two percent of the dimension specified on the shop drawings.

Fabricate pile cap adapters from grade X42 steel line pipe that conforms to API 5L and from steel plate that conforms to ASTM A 709 Grade 50. Attach the anchor plate to the pile section with a complete joint penetration (CJP) weld. Fabricate the anchor plate to match the base plate of the lighting standard.

Welding Requirements

Perform welding to conform to subsection 504-3.01 8. Welding and the following:

1. Make welds continuous.

2. Use partial joint penetration (PJP) welds in longitudinal seams. PJP welds must provide at least 60 percent penetration.

3. Use CJP groove welds to connect base plates to tubes with walls 5/16 inch thick and thicker. When CJP groove welds are used, use additional fillet welds when deemed necessary.

4. Use socket-type joints with two fillet welds to connect base plates to tubes with walls less than 5/16 of an inch thick.

5. On steels 5/16 of an inch thick and thicker, inspect 100 Percent of CJP welds by either radiography (RT) or ultrasound (UT).

6. Inspect a random 25 percent of PJP and fillet welds by magnetic particle (MT). If a defect is found, inspect 100 percent of the PJP and fillet welds made to fill the order. In steels less than 1/8 inch thick, complete the tests per AWS D1.3.

Pole and Mast Arm Requirements

Finish the edges of poles and mast arms to conform to the following requirements. Before they are hot dip galvanized, neatly round the following features to the radius specified:

1. On holes through which electrical conductors pass, provide a 1/16-inch radius on both the entrance and exit edges,

2. On pole base plates, provide a 1/8-inch radius on edges along which plate thickness is measured and a smooth finish on other exposed edges,

3. On the ends of tubes that form slip type joints, complete the following tasks on the two surfaces that contact one another. First, provide 1/16-inch radii on the inside and outside edges of the female and male segments, respectively. Then, for the length of the joint plus six inches, do two things: a) grind down welds until they feature a radius concentric with the mating surface and b) remove material protruding from the two surfaces, and

4. Grind exposed welds flush with the base metal, except fillet welds and seam welds on top of mast arms. Grinding seam welds on multi-sided poles is not required, except in slip type joints.

Provide caps to cover the free ends of poles and mast arms.

Identify critical information for poles and arms with visible permanent aluminum tags that contain the information shown in Table 740-1. The measurements shown are for illustration purposes only. Use tags large enough to include all required information using ¼ inch high text, 3/8 inch of space between successive lines of text, and at least 3/8 inch of space between the edges of the tag and the text. Secure the tags with two 1/8 inch blind rivets at the base of poles and the under side of mast arms. If a two-piece antenna and signal mast arm with a slip type joint is furnished, mark both pieces with the same message.

TABLE 740-1 POLE MARKINGS		
Note: *Italic type indicates additional Tag Markings if poles have 2 luminaire or 2 signal mast arms.*		
	MEASUREMENTS	**TAG MARKINGS**
Signal Poles		
a) Signal mast arm length	45 ft./*55 ft.*	SMA 45/*SMA 55*
b) Luminaire mast arm length	22 ft./*18 ft.*	LMA 22/*LMA 18*
c) Pole height	36 ft.	PH 36
d) Intersection number (if more than one) -pole number		1 - P 4
e) Sum of signal mast arm moments about centerline of signal pole		SM 4000/*SM 3200*
f) Design wind speed	100 mph	DWS 100
Light Poles		
a) Luminaire mast arm length	15 ft./*15 ft.*	LMA 15/*LMA 15*
b) Pole height	37 ft.	PH 37
OVDS and Camera Poles		
a) Pole height	25 ft.	PH 25
b) Design wind speed	100 mph	DWS 100
Antenna Poles		
a) Antenna mast arm length	45 ft./*55 ft.*	AMA 45/A*MA 55*
b) Pole height	22 ft.	PH 22
c) Design wind speed	100 mph	DWS 100
Signal Mast Arm		
a) Mast arm length	40 ft.	SMA 40
b) Intersection number (if more than one) -pole number		1 - P 4
c) Sum of signal mast arm moments about centerline of signal pole		SM 3740
d) Design wind speed	100 mph	DWS 100
Antenna Mast Arm		
a) Mast arm length	40 ft.	AMA 40
b) Design wind speed	100 mph	DWS 100
Luminaire Mast Arm		
a) Mast arm length	18 ft.	LMA 18
b) Pole number (if unique arm design)		P 4

Replace subsection 740-2.06 with the following:

740-2.06 ELECTRICAL CONDUIT AND FITTINGS. Unless specified otherwise, use rigid metal conduit and fittings for raceways. Furnish galvanized rigid type conduit and elbows that conform to UL-6 and are manufactured of mild steel according to ANSI C80.1. Furnish third party certified fittings designed for rigid metal conduit.

For loop detectors, use Schedule 80 polyvinyl chloride (PVC) conduit that conforms to UL-651. Use PVC fittings meeting NEMA TC 3.

When polyethylene conduits are specified in the Plans, use a smooth wall, schedule 40, high-density polyethylene (HDPE) pipe that conforms to UL 651 B.

Furnish insulated throat grounding bushings made of malleable iron or steel with a mechanically galvanized or zinc plated finish. Grounding lugs shall either be an integral part of the bushing or consist of an attached tin-plated copper saddle. Grounding lugs shall feature a stainless steel screw, the centerline of which falls within 20 degrees of conduit centerline. The bushings furnished shall also feature a stainless steel or brass mounting screw that locks the bushing onto the conduit end.

Furnish conduit outlet bodies and their covers with a hot dip galvanized finish and stainless steel screws. For loop detectors, furnish type X bodies and, for photoelectric control installation, furnish types C and LB conduit bodies.

When Myers hubs are specified, furnish rain-tight, grounding type hubs made of malleable iron with a hot-dip or mechanically galvanized finish.

At expansion joints, provide watertight expansion fittings capable of the following movements without damaging the conduits attached to it or the conductors that pass through it. The movements include: axial expansion or contraction to ¾-inch, angular misalignments in any direction to 30 degrees, and parallel misalignment of the conduits to ¾-inch. The fittings shall also include a braided-copper bonding jumper equal to an 8 AWG conductor, bushings to prevent scraping the conductors, and a smooth inner sleeve that maintains a constant diameter regardless of conduit alignment.