

SECTION 00965 - METAL CAMERA POLES AND FOUNDATIONS

(Follow all instructions and make all edits with "Track Changes" turned on. This Section is not published in the Oregon Standard. If there are no instructions [purple text] above a subsection, paragraph, sentence, or bullet, then include it in the Project, unless the item(s) that are included in the subsection, paragraph, sentence, or bullet are not required on the Project and then they should be deleted. In general do not re-number or re-letter subsections when item(s) are deleted. Delete all purple text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

Section 00965, ~~which~~ is not a Standard Specification and, is included in this Project by Special Provision.

Description

00965.00 Scope - This Work consists of furnishing, fabricating, galvanizing, and installing Materials for camera poles and foundations. The location of the camera pole is approximate, with exact locations established in the field.

00965.01 Regulations, Standards, and Codes - ~~All~~ Provide designs and workmanship ~~shall conform to~~ meeting the following standards where applicable:

- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.
- *Standards of the American Society for Testing and Materials* (ASTM).
- *American Welding Society* (AWS) - Steel D1.1.

Wherever reference is made to any of the standards mentioned above, the reference means the code, order, or standard in effect on the date the Project is advertised unless specified otherwise on the Plans or Special Provisions.

Do not begin installations until all permits are obtained and copies are given to the Engineer.

00965.02 Calculations and Drawings - Within 30 Calendar Days after execution of the Contract, submit at least six copies of the calculations and shop drawings.

Submit stamped designs, details, plans and calculations along with All engineered details and drawings ~~which that~~ are not prepared by the Agency, but are required in the Contract Documents, ~~shall be submitted for review~~ prior to fabrication. ~~Designs, details, plans and calculations shall be stamped and submitted~~ according to 00150.35.

Upon completion of the installation, submit six copies of all changes made from the original Plans. ~~The~~ Provide information ~~furnished shall that~~ includes s all modifications made ~~and shall~~

represent the material installed and in operation. ~~It shall be~~ Provide information that is sufficiently detailed to enable maintenance forces to replace or repair any part of the Project under routine or emergency maintenance by direct reference.

00965.05 Design and Performance - ~~All~~ Furnish camera poles ~~shall be~~ designed to the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

(a) Design - Design camera poles and foundations according to the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals 5th Edition* with all interim revisions. Design factors include:

- Basic wind speed (3 second gust) 110 mph
- Gust factor (G) 1.14
- Importance factor (Ir) 1.0 (50-year recurrence interval)
- Fatigue category II

Galloping and truck gust fatigue checks are not required.

(b) Performance Calculations - Design the camera pole to support the specified camera and accessories. Include all portions of the effective projected area of the complete lowering system and camera Equipment to be mounted on the pole along with the weight when designing the pole to meet the specified deflection performance criteria. ~~The~~ Ensure the pole top deflection shall does not exceed 1 inch in a 30 mph (non-gust) wind. ~~The~~ Provide calculations shall that include a pole, base plate, handhole, and anchor bolt analysis. Analyze ~~the~~ pole calculations ~~shall be analyzed~~ at the pole base, at 5-foot pole intervals/segments, hand hole locations, and at any other critical pole section. At each of these locations, provide the following information:

- The pole's diameter, thickness, section modulus, moment of inertia, and cross sectional area.
- The centroid, weight, projected area, drag coefficient, velocity pressure, and wind force of each pole segment.
- The axial force, shear force, primary moment, total moment, axial stress, bending stress, allowable axial stress, allowable bending stress, and combined stress ratio (CSR).
- The pole's angular and linear deflection.

~~The weight of~~ Furnish a slip base pole and its attachments above the anchor plate ~~shall be kept to a minimum and shall~~ with minimal weight that does not exceed 1,000 pounds. Determine the total weight of the pole with all appurtenances attached to the pole and submit this with the design calculations.

Hand hole design requirements include:

- Calculations for the moment of inertia, section modulus, and area at the hand hole centerline that show that these values are equal to or greater than the full pipe section properties without a hand hole.

- Calculations that show that the net area of bar forming the hand hole frame is not less than 120 percent of pole cross section removed.
- Calculations that show that the combined stress ratio (CSR) for the steel pole at the centerline elevation of the hand hole is less than or equal to 0.60.

Materials

00965.10 Materials - Furnish Materials meeting the following requirements:

Anchor Rods, Nuts, and Washers	02560.30
Commercial Grade Concrete.....	00440
Reinforcement	00530

Furnish steel pole Materials meeting the requirements of Section 02530 modified as follows:

- ~~Provide~~**Furnish** steel sheet for pole and arms meeting the requirements of ASTM A595, Grade A or B, ASTM A572, or approved equal.
- ~~Provide~~**Furnish** all other steel sheet and plate meeting the requirements of ASTM A36 or ASTM A572, or approved equal.
- Supplementary Requirement S18 (ASTM A6), maximum tensile strength, is required.
- Galvanized base plates and small and hidden pieces do not require controlled silicon content.

~~Provide~~**Furnish** anchor rods ~~conforming according~~ to ASTM F1554 Grade 55 for fixed base foundations and ASTM A449 Type 1 for Slip Base foundations. Galvanize anchor bolts, nuts, and washers according to 02560.40(a).

Construction

00965.41 Excavation - Protect all existing pipes that become a part of a foundation as directed by the Engineer and cooperate with Utilities according to 00150.50.

Do all excavation, backfilling and resurfacing work necessary to complete the work. This includes removal and replacement of curbs, sidewalks, paved surfaces and other materials. On completion of the work, replace and finish all surfaces to correspond with the existing surfaces.

~~Furnish~~**Provide**, place, and remove any shoring required to prevent caving of walls.

When excavating in paved areas, cut with an approved Pavement cutting saw to a depth of at least 2 inches along the neat boundaries of the area to be removed. Cut sharp and well-defined Pavement edges with no evidence of cracking, delaminating, or stressing.

Restore all disturbed landscaping and underground systems to original condition at no additional cost to the Agency upon completion of the work. Use hand excavation if directed.

(a) Excavation for Poles Foundations - Make all excavations for pole foundations to the Neat Lines of the foundations. Hand excavation may be required. Place the concrete directly against the sides of the excavation in undisturbed or well-compacted material.

(b) Disposition of Waste Materials - Dispose of all waste materials on completion of the Work according to 00290.20, or as directed.

00965.43 Foundations - Set forms square and true to line and grade. Construct forms of rigid materials that remain in position until the concrete has set. Use a steel template to accurately locate the anchor bolts and hold them plumb and in proper alignment. Out-of-position anchor rods and anchor rods installed more than 40V:1H out of plumb are cause for rejection of the foundation. Field bending of anchor bolts and field modification of the base plate are not allowed. Where breakaway bases are specified, ~~the construct~~ post stub projections s within shall not exceed the limits shown.

Construct foundations of concrete according to Section 00440 and applicable portions of 00540.48(a). Place concrete:

- With a continuous pour.
- To the elevation shown or directed.
- With conduit ends and anchor rods held securely in proper vertical position and height with a manufacturer's recommended template until the concrete sets.

Maintain rebar clearances during concrete pour.

Finish tops of foundations to Roadway, sidewalk or curb grade, or as directed.

Finish exposed concrete foundations to present a smooth, neat appearance. Fill all holes.

Make no adjustment of anchor rods after concrete has set. Any adjustment made may be cause for rejection of the foundation.

Remove forms and place subsequent loading according to Table 00540-1.

Where obstructions prevent the construction of planned foundations, construct the foundations in the location directed. Any extra cost due to the site change will be paid according to 00195.20.

If it is determined that foundations must need to extend deeper than shown, the extra foundation depth will be paid according to 00195.20.

00965.46 Steel Camera Poles - Camera poles include the pole shaft, hand holes, base plate, top tenon assembly, and anchor rod assembly. Furnish one-piece construction for Ppoles up to 50 feet in length shall be one-piece construction. Furnish two-piece construction for Ppoles greater than 50 feet in length shall be of two-piece construction. Furnish Ppole shafts shall be that are round, 8 sided, 12 sided, or 16 sided with a constant linear taper of 0.14 inch per foot, and contain only one longitudinal seam weld. Unless shown or specified, circumferential welded tube butt splices are not permitted. Laminated tubes are not permitted. Do not erect poles until the Engineer has made a visual inspection of pole welding.

Fabricate entrance openings in steel poles and tenons, including handholes, before galvanizing.

(a) Deviation from Straightness - After the poles are delivered to the Project Site, and before they are erected on the foundations, the Contractor may be required to check any or all poles for deviation from straightness according to the following:

(1) Deviation in One Plane and One Direction Only - Verify that A straight line joining the surface of the pole at the base and the same surface of the pole at the top ~~shall is~~ not ~~be~~ more than 1/2 inch from the surface of the pole for each 10 feet of length from the closest of these points. Verify T the opposite surface ~~shall~~ meets the same requirement.

(2) Deviation in Any Plane - Verify that A straight line connecting the midpoint of the pole at the base, with the midpoint at the top, ~~shall~~ does not pass through the surface of the pole at any intermediate point.

Any pole not meeting these requirements ~~will be is~~ rejected. If more than 25 percent of the poles fail to meet these requirements, sufficient cause exists to reject the entire shipment of poles for the Project.

(b) Welding - Weld steel camera poles according to the American Welding Society (AWS) D1.1. The Provide a fabricator ~~shall to~~ inspect welds ~~in accordance with~~ according to the details and requirements called out ~~on in~~ the Contract Documents. This requirement will override all appropriate weld inspection requirements called out in Section 5.15 WELDING CONNECTIONS in AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. Submit all testing procedures for Engineer's review prior to starting inspection. Submit certified copies of inspection reports to the Engineer for review.

Provide T tackers and welders ~~shall be~~ qualified ~~in accordance with~~ according to the code. Provide T tube longitudinal seam welds ~~shall be~~ free of cracks and excessive undercut, performed with automatic processes, and be visually inspected. Magnetic particle inspect longitudinal welds that are suspected to contain defects. Ultrasonically or radiographically inspect all circumferential butt-welded pole and arm splices. Provide complete penetration welds for L longitudinal seam welds within 6 inches of complete penetration pole to base plate welds. ~~shall be complete penetration welds.~~

If requested by the Engineer, additional weld inspection may be required upon arrival of the material at the Project Site. - If defects are found by this additional inspection, the Contractor ~~shall be is~~ responsible for the additional testing and repair costs. If no defects are found, the Engineer ~~will be is~~ responsible for the additional inspection costs.

(c) Welding Steel After Galvanizing - No field welding of galvanized steel ~~will be is~~ allowed. Perform all welding in a shop. ~~The effected piece shall have the~~ Remove existing galvanizing ~~removed~~ from the heat affected area before welding the effected piece. Perform the weld, remove the galvanizing totally from the entire piece, and hot-dipped galvanized it. A submittal for review according to 00150.35(b)(1) is required that includes the following:

- Explanation for modification.
- Name of shop performing the work.
- Welding procedure.

- Description of the work ~~that will~~to be performed.
- Name of the shop performing the hot-dipped galvanizing.

(d) Identifying Tags - Attach a stainless steel identifying tag to all poles. ~~The~~Furnish tags ~~shall be~~ at least 1/16 inch thick ~~with~~T tag lettering ~~shall be~~ at least 1/4 inch in height, and be stamped into the tag. Attach tags with stainless steel pop rivets of at least 3/16-inch nominal body diameter. Do not locate pop rivet holes within 6 inches of welds. Locate the pole tag approximately 5 feet above the bottom of the base plate. Drill holes for pop rivets prior to hot-dip galvanizing. Remove excess hot-dip galvanizing from holes and repair according to ASTM A780.

~~Tags shall~~! Include the following information on the tags if applicable:

- Manufacturer
- Month and year of manufacture
- Structure Number
- Top Tenon Yield (ksi)
- Top Tenon Flange Plate Yield (ksi)
- Pole thickness (inch)
- Base Plate Yield (ksi)
- Anchor Rod Yield (ksi)

(e) Hand Holes - ProvideT the inside dimensions of the hand hole ~~shall be~~ 5 inches wide and 28 inches tall. ProvideT the hand hole location and all other dimensions ~~shall be~~ as shown. ~~The~~Provide a hand hole ~~shall have~~with a tapped hole for mounting the portable winch.

(f) Pole Top Tenon - FurnishT the pole ~~shall have~~with a custom plate mounted tenon that allows the field modification of the arm/camera orientation up to 360 degrees. FurnishT the tenon ~~shall have~~with mounting holes and slot as required for the mounting of the camera-lowering system. ProvideT the tenon ~~shall be of~~with dimensions necessary to facilitate camera lowering device component installation. ~~Each~~Provide slots ~~shall be~~ parallel to the pole centerline for mounting the lowering device.

(g) Base Plates - Integrally weld the base plates to the tubes with a telescopic welded joint or a full penetration butt weld with backup bar.

(h) Grounding Connection - For standard four-bolt anchor base poles, ~~provide~~furnish a 1/2-inch, Type 308, 309 or 310 stainless steel stud on the inside of the shaft. Locate the stud directly opposite and level with the handhole in the pole. Attach grounding electrode conductors and bonding conductors to the stud with a grounding wire clamp, "acorn style".

(i) Erecting Steel Camera Poles - Erect steel camera poles on concrete foundations and according to the recommendations of the pole manufacturer and as shown. Exercise reasonable care to prevent marking the finish and damaging poles.

~~Construct~~ ~~B~~bolt protrusions on slip base poles ~~shall that do~~ not interfere with the breakaway action of pole. File sharp edges smooth and repair according to ASTM A780.

(1) Repair Damaged Finish - Repair damaged galvanizing according to ASTM A780. Minor scratches less than 3 inches long by 3/16 inch wide or an area of 1/2 square inch can be repaired with the sprayed zinc method.

(2) Assembly of Supports and Bolt Tightening - ~~Furnish~~ ~~N~~nuts ~~shall that~~ have full thread engagement.

a. Anchor Rods for Fixed Base Camera Pole Supports - After foundation concrete strength and curing requirements are satisfied and after inspection of the foundation, pole installation may begin.

Lubricate anchor rods and nuts according to 02560.70. Estimate the required rake, if any, and set the lubricated leveling nuts accordingly, so that when pole installation is complete and all appurtenances are installed on the pole, the top of the pole is plumb with the base of the pole.

Verify the orientation of the camera arm with the Engineer before installing the pole.

Lift the pole into position on the leveling nuts and washers. Make sure all leveling nuts and washers are in full contact with the base plate.

Install washers and lubricated top nuts, and bring to a snug tight condition. Snug tight is defined as the condition when all plies of the connection are in firm contact, and can be obtained by the full effort of a worker on the end of a 12-inch-long wrench. Several passes may be required to obtain uniform snug tightness.

When all anchor rods are snug tight, proceed with installation of arms and other appurtenances, if not previously installed. When installation of arms and appurtenances is complete, and the pole is plumb, final anchor rod tightening may begin. If the pole is not plumb, adjust as required and repeat snug tightening as described above. As a safety measure, provide crane support of the pole until anchor rods tightening is completed.

Mark the position of each turned element (nut or bolt head) with a felt tip pen or similar marker. Rotate each top nut past snug tight by the amount shown in 00965.46(i)(2)(d). Several passes may be required to obtain uniform final tightness. "Cheater" bars or slugging wrenches are allowed if required for large diameter anchor rods.

b. Anchor rods for Slip Base (Break-away) Camera Supports - After foundation concrete strength and curing requirements are satisfied and after inspection of the foundation, pole installation may begin.

~~Furnish~~ ~~Provide~~, at no additional cost to the Agency, a calibrated torque wrench of a capacity appropriate to the size and type of the bolts being tightened. Confirm the accuracy of the calibrated torque wrench through calibration by an approved independent testing agency at least once a year.

Lubricate anchor rods and nuts according to 02560.70. Estimate the required rake, if any, and set the lubricated leveling nuts accordingly, so that when pole installation is complete and all appurtenances are installed on the pole, the top of the pole is plumb with the base of the pole.

Install the anchor plate on the leveling nuts and washers. Make sure all leveling nuts and washers are in full contact with base plate.

Install washers and lubricated top nuts, and bring to a snug tight condition. Snug tight is defined as the condition when all plies of the connection are in firm contact, and can be obtained by the full effort of a worker on the end of a 12-inch-long wrench. Several passes may be required to obtain uniform snug tightness.

Verify the orientation of the camera arm with the Engineer before installing the pole.

When all anchor rods are snug tight, proceed with the "Slip Base Bolting Procedure" as shown on the Plans. When the "Slip Base Bolting Procedure" is complete, final anchor rod tightening may begin. As a safety measure, provide crane support of the pole until anchor rod tightening is complete.

Mark the position of each turned element (nut or bolt head) with a felt tip pen or similar marker. Rotate the top nut of each anchor rod past snug tight by the amount shown in .d below. Several passes may be required to obtain uniform final tightness. "Cheater" bars or slugging wrenches are allowed if required for large diameter anchor rods.

c. High-Strength Bolts in Camera Arm-to-Pole Connections - Do not reuse galvanized high strength bolts. Retightening previously tightened bolts that may have been loosened by the tightening of adjacent bolts will not be considered a reuse.

Lubricate high-strength bolts according to 02560.70. ~~Provide~~Furnish all high-strength bolts with hardened flat washers under the element turned during tightening.

If arms or appurtenances are attached after pole erection, support them until bolts are snug tight.

Install high-strength bolt connections to a snug tight condition. Snug tight is defined as the condition when all plies of the connection are in firm contact, and can be obtained by the full effort of a worker on the end of a 12-inch-long wrench. Several passes may be required to obtain uniform snug tightness.

Mark the position of each turned element (nut or bolt head) with a felt tip pen or similar marker. Rotate each top nut past snug tight by the amount shown in .d below. Several passes may be required to obtain uniform final tightness.

d. Final Tightening - Required final tightening of anchor rods and high-strength bolts are shown in the following Table:

Connection Type	Rotation Past Snug Tight
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ASTM A449 Type 1 Anchor Rods	60° (1/6 turn)
ASTM F1554 Gr. 55 Anchor Rods	60° (1/6 turn)
ASTM F3125, Grade A325 Arm Connection Bolts	60° (1/6 turn)

e. Bolt Inspection - The Engineer will observe the installation and tightening operations to ensure that proper procedures are followed. All inspections ~~will be~~ are visual and no testing will be conducted.

Top surface of bolts or rods that are not flush or do not extend beyond the top of the nut requires the rejection of the installation.

(Use the following subsection .48 to specify coating metal camera poles. Obtain item and color number from the Designer.)

00965.48 Coating - Prepare and powder coat poles according to the applicable portions of Section 00593 or prepare and coat poles according to the applicable portions of Section 00594. ~~Provide~~ Furnish coating materials for field application, repairing damaged coatings, and coating hardware after installation, according to Section 00593 or 00594. Do not coat:

- Slip plate or arm connection surfaces.
- Slip base bolting hardware.
- Anchor rods, anchor rod washers, and anchor rod nuts.

~~Provide~~ Furnish the following colors:

Item

**SAE AMS-STD-595
Color Number**

Measurement

00965.80 Measurement - No measurement of quantities will be made for Work performed under this Section.

Payment

00965.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract Lump Sum amount for the item "Camera Poles and Foundations".

Payment will be payment in full for furnishing and installing all Materials, and for ~~furnishing~~ providing all Equipment, labor, and Incidentals necessary to complete the Work as specified.