

**649 GALVANIZED STEEL STRAIN POLES, MAST ARMS AND MONOTUBE ASSEMBLIES.**  
**(REV 5-10-07) (FA 6-6-07) (9-07)**

SECTION 649 (Pages 701-705) is deleted and the following substituted:

**SECTION 649**  
**GALVANIZED STEEL STRAIN POLES, MAST**  
**ARMS AND MONOTUBE ASSEMBLIES**

**649-1 Description.**

The work in this Section consists of furnishing and installing galvanized steel strain poles, galvanized steel mast arm(s) and galvanized steel monotube assemblies in accordance with the details shown in the Contract Documents, subject to a five year warranty period as defined herein. The warranty period will apply only when strain poles, mast arms or steel monotube assemblies are painted as called for in the Contract Documents.

**649-2 Materials.**

Use strain poles, mast arm and monotube assemblies listed on the Department's Qualified Products List (QPL) for all standard configurations shown in the Design Standards.

Provide shop drawings and signed and sealed calculations, as needed, in accordance with Section 5 for configurations shown in the plans and denoted as special.

Use coating products meeting the requirements of Section 975.

Use grouts meeting the requirements of Section 934 listed on the QPL.

Use water meeting the requirements of Section 923.

Use membrane curing compounds meeting the requirements of Section 925.

**649-3 Fabrication.**

Fabricate strain poles, mast arm and monotube assemblies and miscellaneous hardware in accordance with the Contract Documents. Cut all materials to the final dimensions and complete all welding prior to galvanizing. Obtain all components for individual strain poles, mast arm and monotube assemblies from the same fabricator. Obtain the luminaire and bracket from other sources, when necessary.

Affix an aluminum identification tag which will be visible from the handhold or located inside the terminal box containing the information described in the Design Standards.

Before shipping, assemble mast arm and monotube assemblies including luminaire and bracket, to assure proper fit. The mast arm and monotube assemblies may be separated for shipment.

Ensure all components are protected from damage during shipping and handling by wrapping or other effective methods. Replace any component, which the Engineer determines is damaged beyond repair, at no additional cost to the Department. If components are wrapped for shipment, remove wrappings no later than five days after receipt of components or immediately if the wrappings become saturated. Post these instructions in brightly colored wording on the wrapper. Failure to comply with these instructions may lead to damage of the coating system and will be cause for the rejection of the component.

#### **649-4 Coatings.**

**649-4.1 Galvanizing:** Galvanize all components in accordance with ASTM A 123, except galvanize all fastener assemblies in accordance with ASTM A 153. Use galvanizing methods which provide surfaces suitable for painting.

**649-4.2 Surface Preparation:** Prepare all galvanized surfaces to be painted in accordance with ASTM D 6386 and the manufacturer of the coating system's specifications. Provide a clean and suitable galvanized surface that maximizes coating system adhesion.

Measure the thickness of the zinc coating after completion of surface preparation using a magnetic thickness gage in accordance with ASTM A 123. Ensure sufficient galvanizing remains on the substrate to meet the requirements of ASTM A 123 and the Contract Documents. Correct any deficient areas to the satisfaction of the Engineer at no additional cost to the Department.

#### **649-4.3 Painting:**

**649-4.3.1 General:** When required by the Contract Documents, provide painted strain poles, mast arms and monotube assemblies. Provide products from a fabricator on the Department's list of Prequalified Fabricators of Painted Galvanized Steel Strain Poles, Mast Arms and Monotube Assemblies. Provide products that will meet specification requirements throughout the warranty period. Meet the color requirement as specified in the Contract Documents. Provide the Engineer with two metal sample coupons, a minimum of 2 x 4 inches, painted concurrently and with the same paint as was used on the first lot of any strain poles, mast arms and monotube assemblies delivered to the jobsite. Provide sample coupons and manufacturer product data sheets to the Engineer along with the delivery of the first shipment of any painted strain poles, mast arms or monotube assemblies delivered to the jobsite. At the time of their delivery, the sample coupons described in this paragraph shall match the color of the strain poles, mast arms and monotube assemblies to within 1ΔE measured as specified in 975-7. If the delivered sample coupons exhibit a difference in color from the strain poles, mast arms and monotube assemblies greater than 1ΔE then the sample coupons will be considered unacceptable and no payment shall be made for the materials which the sample coupons represent. Those materials shall not be accepted by the Department until acceptable representative sample coupons in accordance with the requirements of this Section have been delivered to the Engineer.

**649-4.3.2 Responsible Party Warranty:** When the Contract Documents call for painted galvanized steel strain poles, mast arms or monotube assemblies, the Contractor shall designate a Responsible Party to accept responsibility. The Responsible party designated by the Contractor must execute and deliver to the Department a form, provided by the Department, prior to the first delivery to the jobsite of any painted strain poles, mast arms or monotube assemblies, stipulating that the Responsible Party accepts responsibility for ensuring the coating system adhesion and color retention requirements as specified in 975-7 are met for a period of five years after final acceptance in accordance with 5-11. The Responsible Party shall also bear the continued responsibility for performing all remedial work associated with repairs of any adhesion or color retention failure as defined in Section 975, as to which notice was provided to the Responsible Party within the five year warranty period. Failure to timely designate the Responsible Party will result in the Contractor being the Responsible Party unless otherwise agreed to in writing by the Department. The responsible Party shall be either the Contractor or the Fabricator. When the Responsible Party is the Fabricator, the Responsible Party shall be one of the Fabricators listed on the "Prequalified Fabricators of Painted Galvanized Steel Strain Poles, Mast Arms and Monotube Assemblies." This list may be viewed on the Department's website at the following URL:

www.dot.state.fl.us/construction/ .

Upon final acceptance of the Contract in accordance with 5-11, the Contractor's responsibility to ensure that the coating system adhesion and color retention requirements specified in 975-7 will terminate. The obligations of the Responsible Party set forth in this Section shall start at final acceptance of the Contract in accordance with 5-11 and continue thereafter until expiration of the five year warranty period.

**649-5 Installation.**

Install foundations for strain poles, mast arm and monotube assemblies in accordance with Section 455. Do not install the mast arm pole, strain poles or monotube pole until the foundation has cured for a minimum of seven days. Before erecting the pole clean the top of the foundation of any laitance, oils, grease or any other deleterious materials. Erect strain poles in an orientation which considering the rake and the application, cable forces will produce a plumb pole. Erect monotubes plumb at the time of installation. Plumb the pole supporting mast arms after the mast arms, traffic signals or sign panels have been placed.

If the traffic signals and/or sign panels are not in place within two working days after the mast arm is erected, furnish and install a 3 by 2 foot blank sign panel on the bottom of each mast arm within 6 feet of the mast arm tip and plumb the pole. Re-plumb the pole supporting mast arms after installation of traffic signals and sign panels.

Install bolt, nut and washer assemblies, except nuts on anchor rods, in accordance with Section 460. Install nuts on anchor rods in accordance with the following: use anchor bolt assemblies that are free of rust and corrosion, and lubricate these assemblies prior to installation so that the nut moves freely by hand through the full length of the thread. Bring the lower top anchor nuts on the anchor rods to a "snug tight" condition defined as: the tightness that is attained with a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench such that more than 75% of the faying surfaces are in firm contact. Before snugging the lower top anchor nuts, all bottom leveling nuts shall be leveled. After snugging the lower top anchor nuts, all bottom leveling nuts shall be tightened to the base plate by full effort of an ironworker using an ordinary spud wrench. Use a beveled washer if outer face of the base plate is sloped more than 1:40 or if necessary to attain "snug tight" condition. After attaining "snug tight" condition, additionally tighten the lower top anchor nuts on the anchor rods in accordance with Table A. Nut rotation is relative to anchor rod, tolerance is plus 20 degrees. Install the upper top anchor nuts on the anchor rods on top of the lower top anchor nuts using the tightness that is attained with a few impacts of an impact wrench or the full effort of an ironworker using an ordinary spud wrench. During the tightening of the upper top anchor nuts, the lower top anchor nuts shall be restrained from movement by using an ordinary spud wrench.

Table A	
Anchor Rod Diameter (in.)	Nut Rotation from snug Tight Condition
≤ 1 1/2	1/3 turn
> 1 1/2	1/6 turn

**649-6 Grouting.**

**649-6.1 Alternatives to Grouting:** Optional alternatives to grouting may be allowed by the Engineer where such alternatives are described as an option in the contract plans.

**649-6.2 Preparation:** Flush the top of the foundation with clean water to remove any dirt and debris. Immediately before grouting, saturate the concrete surfaces by ponding or by

placement of saturated rags for a minimum period of two hours. Remove all freestanding water before beginning the grouting operation.

**649-6.3 Forming:** Use watertight non-absorbent forms with a form release agent applied to all interior surfaces. Maintain a 1 inch clearance between the forms and the base plate. Extend the form a minimum of 1 inch above the bottom of the base plate. Attach a head box with a 45 degree slope on the form for grout placement.

**649-6.4 Mixing:** Use only fresh unopened full bags of grout. Mix the grout in a clean, power driven mortar mixer or with a heavy duty drill (850 RPM maximum) using a commercial mixing paddle. Mix the grout in accordance with the manufacturer's instructions. Test the fluidity of the grout using the ASTM C 939 Flow Cone Method. Use grouts that meet the efflux time of 20 to 30 seconds. Do not remix grouts that have begun to set.

**649-6.5 Placing and Curing:** Pour the grout from only one side of the base plate through the head box until the grout has filled the entire form and extends a minimum of 1/4 inch above the bottom of the base plate. Do not allow the grout to overtop the base plate. Do not vibrate grout. Clean excess grout off the base plate after the grout has reached initial set (two to four hours). Cure the grout for a minimum of six hours by covering the entire grout surface with clean saturated rags. Remove the forms after verifying the grout is self supporting by penetration with a pointed masons trowel or other sufficient tool. Cure all exposed grout with a membrane curing compound.

#### **649-7 Remedial Work.**

During the warranty period, the Responsible Party shall perform all remedial work necessary to meet the requirements of this Specification at no cost to the Department. Such remedial work shall be performed within 180 days of notification of a failure by the Department. Failure to perform such remedial work within the time frame specified will result in the work being performed by other forces at the Responsible Party's cost.

If the Responsible Party is the Fabricator, the Fabricator will be removed from the list of "Prequalified Fabricators of Painted Galvanized Steel Strain Poles, Mast Arms and Monotube Assemblies" for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

If the Responsible Party is the Contractor, the Department will suspend, revoke or deny the Responsible Party's certificate of qualification under the terms of Section 337.16(d)(2), Florida Statutes, for a minimum of six months or until payment in full for the correction of the deficiencies or defects has been made, whichever is longer.

#### **649-8 Statewide Disputes Review Board.**

A Statewide Disputes Review Board will resolve any and all disputes that may arise involving administration and enforcement of this Specification. The Responsible Party and the Department acknowledge that use of the Statewide Disputes Review Board is required, and the determinations of the Statewide Disputes Review Board for disputes arising out of this Specification will be binding on both the Responsible Party and the Department, with no right of appeal by either party.

#### **649-9 Method of Measurement.**

**649-9.1 General:** Measurement for payment will be in accordance with the following work tasks.

**649-9.2 Furnish and Install:** The Contract unit price each for strain poles, mast arm and monotube assemblies, furnished and installed, will include all materials specified in the Contract Documents, including the foundation, cover plates, caps, clamps, blank sign panel, luminaire bracket, all labor, equipment, miscellaneous materials and hardware necessary for a complete and acceptable installation.

**649-9.3 Furnish:** The Contract unit price each for strain poles, mast arm and monotube assemblies, furnished, will include all materials, all shipping and handling costs involved in delivery as specified in the Contract Documents.

**649-9.4 Install:** The Contract unit price each for strain poles, mast arm and monotube assemblies, installed, will include the foundation, blank sign panel, all labor, equipment, miscellaneous materials and hardware necessary for a complete and acceptable installation. The Engineer will supply materials as specified in the Contract Documents.

**649-10 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section. Sign panels and/or signal assemblies will be paid for separately.

Payment will be made under:

Item No. 649-	Steel Mast Arm Assembly - each.
Item No. 649-	Steel Monotube Assembly - each.
Item No. 649-	Steel Strain Pole - each.