



## Florida Department of Transportation

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GOVERNOR

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ANANTH PRASAD, P.E.  
SECRETARY

November 13, 2012

Monica Gourdine  
Program Operations Engineer  
Federal Highway Administration  
545 John Knox Road, Suite 200  
Tallahassee, Florida 32303

Re: Office of Design, Specifications  
Section **649**  
Proposed Specification: **6490200 Galvanized Steel Strain Poles, Mast Arms and Monotube Assemblies.**

Dear Ms. Gourdine:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

These changes were proposed by Andre Pavlov of the State Structures Design Office to delete the need for shop drawings and update the specifications based on the AASHTO LTS 5<sup>th</sup> Edition enhancements.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to SP965TT or [trey.tillander@dot.state.fl.us](mailto:trey.tillander@dot.state.fl.us).

If you have any questions relating to this specification change, please call me at 414-4140.

Sincerely,

V. Y. "Trey" Tillander, III, P.E.  
State Specifications Engineer

TT/cah

Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## **GALVANIZED STEEL STRAIN POLES, MAST ARMS AND MONOTUBE ASSEMBLIES.**

(REV ~~109-1527-12~~)

ARTICLE 649-2 (Page 799) is deleted and the following substituted:

### **649-2 Materials.**

Use pole assemblies as shown in the Design Standards when standard mast arm assemblies or standard strain pole assemblies are required by the Contract Documents.

Obtain strain poles, mast arm, and monotube assemblies from a fabrication facility that is listed on the Department's list of Metal Producers with Accepted Quality Control Program, meeting the requirements of 105-3.

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

Use coating products meeting the requirements of Section 975.

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

Use water meeting the requirements of Section 923.

Use membrane curing compounds meeting the requirements of Section 925.

ARTICLE 649-5 (Pages 801 – 802) is deleted and the following substituted:

### **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 achieved 70% of the specified 28-day concrete strength and verifying test results have been provided to the Engineer. Determine concrete strength from tests on a minimum of two test cylinders prepared and tested in accordance with ASTM C31 and ASTM C39. 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 foot 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 ASTM A325 bolt, nut and washer assemblies in accordance with the following. Use bolt, nut and washer assemblies that are free of rust and corrosion and that are lubricated properly as demonstrated by being able to easily hand turn the nut on the bolt thread for its entire length. Tighten nuts to ~~the full effort of an ironworker using an ordinary spud wrench~~ *a snug tight condition* to bring the faying surfaces of the assembly into full contact which is referred to as snug-tight. *Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person on a 12 inch long wrench or equivalent.* After bringing the faying surfaces to a snug-tight condition, tighten nuts in accordance with the turn-of-nut method in 460-5, Table 460-7. Maintain uniform contact

pressure on the faying surfaces during snugging and turn-of-nut process, by using a bolt tightening pattern that balances the clamping force of each bolt, as closely as possible, with the equal clamping force of a companion bolt.

*Installation steps are as follows:*

1) *Verify that the nuts can be turned onto the bolts past the elevation corresponding to the bottom of each in-place leveling nut and be backed off by the effort of one person on a 12 inch long wrench ~~or equivalent~~, without employing a pipe extension on the wrench handle.*

2) *Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the leveling nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and leveling nuts have become wet since they were first lubricated.*

3) *Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation.*

4) *Place structural plate washers on top of the leveling nuts; one washer corresponding to each anchor bolt.*

5) *Install the base plate onto the leveling nut washers, place structural plate washers on top of the base plate; one washer corresponding to each anchor bolt, and turn the top nuts onto the anchor bolts.*

6) *Tighten top nuts to a snug-tight condition in a star pattern. ~~Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person on a 12 inch long wrench or equivalent.~~ A star tightening pattern is one in which the nuts on opposite or near opposite sides of the bolt circle are successively tightened in a pattern resembling a star. For an 8 bolt circle with bolts sequentially numbered 1 to 8, tighten nuts in the following bolt order: (1, 5, 7, 3, 8, 4, 6, 2).*

7) *Tighten leveling nuts to a snug-tight condition in a star pattern. The distance from the bottom of the leveling nuts to the top of the concrete must not exceed one anchor bolt diameter.*

8) *Before final tightening of the top nuts, mark the reference position of each tip nut in a snug-tight condition with a suitable marking on one flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern until achieving the required nut rotation specified in ~~Table A5-10~~. Turn the nuts in at least 2 full tightening cycles (passes). After tightening, verify the nut rotation. Do not exceed the ~~Table A~~ value by more than 20 degrees.*

9) *Tighten each retainer or jam nut until it is in firm contact with the top surface of the anchor bolt nut then while preventing the anchor bolt nut from rotating, tighten the jam nut until it is snug tight. ~~Use ASTM F1554 anchor bolt assemblies that are free of rust and corrosion, and lubricate these assemblies prior to installation so that the nut turns easily by hand the entire length of the bolt thread. Install nuts on anchor bolts in accordance with the sequence that follows. Ensure that the base plate is level by incrementally adjusting the leveling nuts all of which must be in direct contact with the bottom surface of the base plate at the conclusion of the leveling process. The distance from the bottom of leveling nuts to the top of the concrete foundation must not exceed one anchor bolt diameter. Tighten all the anchor bolt nuts so they are in direct contact with the top surface of the base plate and are snug tight. Snug tight is attained by~~*

applying the full tightening effort of an ironworker using an ordinary spud wrench. If the top surface of the base plate has a slope that exceeds 1:40, use a beveled washer under the anchor bolt nut. Tighten the leveling nuts until they are snug tight. Match mark the anchor bolt nut relative to the anchor bolt to ensure that the anchor bolt nut is rotated by the fraction of a turn specified in Table A and apply the turn to the nut. Do not exceed the Table A value by more than 20 degrees. Tighten each retainer or jam nut until it is in firm contact with the top surface of the anchor bolt nut then while preventing the anchor bolt nut from rotating, tighten the jam nut until it is snug tight. During each stage of leveling nut, anchor bolt nut and jam nut tightening, use a pattern of tightening that, as nearly as possible, produces a balanced distribution of clamping forces on the base plate as tightening progresses.

Table A	
Anchor Bolt Diameter (in.)	Nut Rotation from Snug-Tight Condition
$\leq 1 \frac{1}{2}$	1/3 turn
$> 1 \frac{1}{2}$	1/6 turn

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

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Install ASTM A325 bolt, nut and washer assemblies in accordance with the following. Use bolt, nut and washer assemblies that are free of rust and corrosion and that are lubricated properly as demonstrated by being able to easily hand turn the nut on the bolt thread for its entire length. Tighten nuts to a snug tight condition to bring the faying surfaces of the assembly into full contact which is referred to as snug-tight. Snug-tight is defined as the maximum nut rotation resulting from the full effort of one person on a 12 inch long wrench or equivalent. After bringing the faying surfaces to a snug-tight condition, tighten nuts in accordance with the turn-of-nut method in 460-5, Table 460-7. Maintain uniform contact pressure on the faying surfaces during snugging and turn-of-nut process, by using a bolt tightening pattern that balances the clamping force of each bolt, as closely as possible, with the equal clamping force of a companion bolt.

Installation steps are as follows:

1) Verify that the nuts can be turned onto the bolts past the elevation corresponding to the bottom of each in-place leveling nut and be backed off by the effort of one person on a 12 inch long wrench, without employing a pipe extension on the wrench handle.

2) Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all leveling nuts. Re-lubricate the exposed threads of the anchor bolts and the threads of the leveling nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and leveling nuts have become wet since they were first lubricated.

3) Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation.

4) Place structural plate washers on top of the leveling nuts; one washer corresponding to each anchor bolt.

5) Install the base plate onto the leveling nut washers, place structural plate washers on top of the base plate; one washer corresponding to each anchor bolt, and turn the top nuts onto the anchor bolts.

6) Tighten top nuts to a snug-tight condition in a star pattern. A star tightening pattern is one in which the nuts on opposite or near opposite sides of the bolt circle are successively tightened in a pattern resembling a star. For an 8 bolt circle with bolts sequentially numbered 1 to 8, tighten nuts in the following bolt order: (1, 5, 7, 3, 8, 4, 6, 2).

7) Tighten leveling nuts to a snug-tight condition in a star pattern. The distance from the bottom of the leveling nuts to the top of the concrete must not exceed one anchor bolt diameter.

8) Before final tightening of the top nuts, mark the reference position of each tip nut in a snug-tight condition with a suitable marking on one flat with a corresponding reference mark on the base plate at each bolt. Then incrementally turn the top nuts using a star pattern until achieving the required nut rotation specified in Table A. Turn the nuts in at least 2 full tightening cycles (passes). After tightening, verify the nut rotation. Do not exceed the Table A value by more than 20 degrees.

9) Tighten each retainer or jam nut until it is in firm contact with the top surface of the anchor bolt nut then while preventing the anchor bolt nut from rotating, tighten the jam nut until it is snug tight.

Table A	
Anchor Bolt Diameter (in.)	Nut Rotation from Snug-Tight Condition
$\leq 1 \frac{1}{2}$	1/3 turn
$> 1 \frac{1}{2}$	1/6 turn