



Florida Department of Transportation

RON DESANTIS
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

KEVIN J. THIBAUT
SECRETARY

June 10, 2019

Khoa Nguyen
Director, Office of Technical Services
Federal Highway Administration
3500 Financial Plaza, Suite 400
Tallahassee, Florida 32312

Re: State Specifications Office
Section: **649**
Proposed Specification: **6490300 Galvanized Steel Poles, Mast Arms, and Monotube Assemblies.**

Dear Mr. Nguyen:

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

The changes are proposed by John Westphal to clarify bolt tightening requirements for mast arms.

Please review and transmit your comments, if any, within two weeks. Comments should be sent via email to stefanie.maxwell@dot.state.fl.us.

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

Sincerely,

Signature on file

Stefanie D. Maxwell, P.E.
Manager, Program Management Office

SM/rf

Attachment

cc: Florida Transportation Builders' Assoc.
State Construction Engineer

**GALVANIZED STEEL POLES, MAST
ARMS, AND MONOTUBE ASSEMBLIES
(REV ~~64-104~~-19)**

ARTICLE 649-3 is deleted and the following substituted:

649-3 Fabrication.

Fabricate 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 handhole or located inside the terminal box containing the information described in the Standard Plans.

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

For mast arms, use adequate manufacturing controls to assure proper fit, ensuring dimensional tolerance are met and that mast arm to pole connections can achieve a snug-tight condition as defined in 649-5.

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.

ARTICLE 6949-5 is deleted and the following substituted:

649-5 Installation.

Install foundations in accordance with Section 455. Do not install poles, mast arm poles, or monotubes until the foundation has achieved 70% of the specified 28-day concrete strength and verifying test results have been submitted 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 x 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 F3125, Grade 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 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-firm contact with plies solidly seated against each other, but not necessarily in continuous contact which is referred to as snug-tight. Snug-tight is defined as the maximum nut rotation resulting from the full effort of ~~one~~ a person using an ordinary 12-inch longspud wrench or equivalent. Visually inspect the connection after snugging all bolts, ensuring firm contact has been achieved at a minimum between faying surfaces beneath bolts within one bolt diameter of bolt hole edges. Re-snug bolts in a connection where faying surfaces are not in firm contact. After bringing the faying surfaces to a snug-tight condition, tighten nuts in accordance with Table 460-7, Nut Rotation from the Snug-Tight Condition. Maintain as close to uniform contact pressure as possible on the faying surfaces during snugging and turn-of-nut process; by utilizing suitable erection methods and 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.

Base plate 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 top 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 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.

10. Install a screen over the gap between the base plate and foundation concrete in accordance with 649-6, or place a structural grout pad in accordance with 649-7.

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

**GALVANIZED STEEL POLES, MAST
ARMS, AND MONOTUBE ASSEMBLIES
(REV 6-10-19)**

ARTICLE 649-3 is deleted and the following substituted:

649-3 Fabrication.

Fabricate 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 handhole or located inside the terminal box containing the information described in the Standard Plans.

Before shipping, assemble monotube assemblies to assure proper fit. Monotube assemblies may be separated for shipment.

For mast arms, use adequate manufacturing controls to assure proper fit, ensuring dimensional tolerance are met and that mast arm to pole connections can achieve a snug-tight condition as defined in 649-5.

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.

ARTICLE 6949-5 is deleted and the following substituted:

649-5 Installation.

Install foundations in accordance with Section 455. Do not install poles, mast arm poles, or monotubes until the foundation has achieved 70% of the specified 28-day concrete strength and verifying test results have been submitted 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 x 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 F3125, Grade 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 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 firm contact with plies solidly seated against each other, but not necessarily in continuous contact. Snug-tight is defined as the maximum nut rotation resulting from the full effort of a person using an ordinary spud wrench. Visually inspect the connection after snugging all bolts, ensuring firm contact has been achieved at a minimum between faying surfaces beneath bolts within one bolt diameter of bolt hole edges. Re-snug bolts in a connection where faying surfaces are not in firm contact. After bringing the faying surfaces to a snug-tight condition, tighten nuts in accordance with Table 460-7, Nut Rotation from the Snug-Tight Condition. Maintain as close to uniform contact pressure as possible on the faying surfaces during snugging and turn-of-nut process by utilizing suitable erection methods and 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.

Base plate 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 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.

10. Install a screen over the gap between the base plate and foundation concrete in accordance with 649-6, or place a structural grout pad in accordance with 649-7.

Anchor Bolt Diameter (inches)	Nut Rotation from Snug-Tight Condition
$\leq 1-1/2$	1/3 turn
$> 1-1/2$	1/6 turn