



*Florida Department of Transportation*

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GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

JARED W. PERDUE, P.E.  
SECRETARY

August 27, 2026

Daniel Holt, PE, PTOE  
Director, Project Delivery  
Director, Technical Services  
FHWA  
400 West Washington Street, Suite 4200  
Orlando, FL 32801

Re: State Specifications Office  
Section: 649  
Proposed Specification: **6490100 Galvanized Steel Poles, Mast Arms, and Monotube Assemblies**

Dear Mr. Holt:

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

The changes are proposed by Steven Nolan to add provisions for reusing existing mast arm foundations when designated in the Contract Plans.

Please review and transmit your comments, if any, within two weeks (10 business days). Comments should be sent via email [daniel.strickland@dot.state.fl.us](mailto:daniel.strickland@dot.state.fl.us).

If you have any questions relating to this specification change, please call me at (850) 414-4130.

Sincerely,

Signature on File

Daniel Strickland, P.E.  
State Specifications Engineer

DS/jb  
Attachment

cc: Florida Transportation Builders' Assoc.  
State Construction Engineer

## **GALVANIZED STEEL POLES, MAST ARMS, AND MONOTUBE ASSEMBLIES (REV 7-8-26)**

ARTICLE 649-1 is deleted and the following substituted:

### **649-1 Description.**

The work in this Section consists of furnishing and installing galvanized steel strain poles, galvanized steel mast arms, galvanized steel monotube assemblies, and galvanized steel CCTV poles on new or existing foundations 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 poles, mast arms or steel monotube assemblies are painted as called for in the Contract Documents.

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.

All welds must be visually inspected for final approval by an actively certified welding inspector, qualified through the American Welding Society. A certifying statement from the welding inspector must be provided with the components. The document must identify the project information, date of inspection, welding inspector name, and inspector certification number.

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 tolerances are met and that mast arm to pole connections can achieve a snug-tight condition as defined in 649-87.

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 649-7 is deleted and the following substituted:

**649-7 Foundations.**

Install new foundations in accordance with Section 455. Reuse or rehabilitate existing foundations as shown in the Plans and in accordance with this Section.

Prior to fabricating the steel structure for installation on an existing foundation, create a template of the existing bolt pattern for the fabricator. Ensure the existing bolt pattern is consistent with the bolt pattern shown in the Plans. Contact the EOR if the template does not match the bolt pattern shown in the plans to resolve the issue.

For an existing foundation to be rehabilitated, excavate the soil around the foundation to the limits shown in the Plans and in accordance with Section 120. Remove existing concrete according to the demolition limits shown in the Plans without damaging the vertical reinforcing steel. Remove and replace transverse reinforcement and anchor bolts that are within the demolition limits.

ARTICLE 649-8 is deleted and the following substituted:

**649-8~~7~~ 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. Clean anchor bolts which have corrosion of surface rust and coat with galvanizing compound per Section 562. 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 460-6, 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.

For the purposes of this Specification, the anchor nuts (full-height) are installed on top of the plate washers and below the retainer nuts (half-height or full-height). Base plate installation steps are as follows:

1. Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all nuts. Use hardware lubricants approved by the hardware manufacturer. Re-lubricate the exposed threads of the anchor bolts and the threads and bearing surfaces of nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

2. Verify that each leveling nut can be turned onto the bolts past the elevation corresponding to the final elevation of the bottom of the leveling nut and be turned by the effort of a person using an ordinary spud wrench, without employing a pipe extension on the wrench handle.

3. Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation less than or equal to one anchor bolt diameter from the top of the foundation.

4. Place structural plate washers on top of the leveling nuts; one washer on 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 on each anchor bolt, and turn anchor nuts onto the anchor bolts.

6. Tighten anchor nuts against the top of the structural plate washers and base plate 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 after tightening.

8. Before final tightening of the anchor nuts, mark the reference position of each snug-tight anchor nut on one flat with a corresponding reference mark on the base plate. Incrementally turn the anchor nuts using a star pattern until achieving the required nut rotation specified in Table 649-1. Tighten the anchor nuts in two tightening cycles (passes), each approximately one-half the required amount of rotation, up to the final rotation in Table 649-1. After tightening, verify the anchor nut rotation with respect to the reference mark on the base plate. Do not exceed the Table 649-1 value by more than 20 degrees.

9. Turn retainer nuts onto the anchor bolts and tighten each until it is in firm contact with the top surface of the anchor nut. Hold the anchor nut to prevent rotation and tighten the retainer nuts to a snug-tight condition. The final condition is an anchor nut that is rotated with respect to the reference mark on the base plate in accordance with Table 649-1, and a retainer nut that is snug-tight with respect to the anchor nut.

10. Install a screen over the gap between the base plate and foundation concrete in accordance with 649-8, or place a structural grout pad in accordance with 649-9.

| Table 649-1                   |                                        |
|-------------------------------|----------------------------------------|
| Anchor Bolt Diameter (inches) | Nut Rotation from Snug-Tight Condition |

|              |          |
|--------------|----------|
| $\leq 1-1/2$ | 1/3 turn |
| $> 1-1/2$    | 1/6 turn |

**649-~~8~~7.1 Camera Lowering Device Installation:** Meet the requirements of 641-4.4.

ARTICLE 649-9 is deleted and the following substituted:

**649-~~9~~8 Screen Installation.**

On steel strain poles and steel monotube assemblies, install a screen that will prevent vermin and debris from entering the gap between the bottom of the base plate and the top of the concrete foundation. Cover the entire gap with a wire screen, the bottom horizontal wire of which shall be in full contact with the surface of the concrete foundation and the top horizontal wire of which shall not extend beyond the top surface of the base plate. For the screen, use standard grade plain weave galvanized steel wire cloth with 1/2 inch x 1/2 inch mesh and 0.063 inch diameter wires. Vertical screen wires shall not extend beyond the top and bottom horizontal wires of the screen. Use one continuous section of screen with only one overlapping splice where the ends come together and overlap the layers 3 inches minimum. Attach the screen to the vertical side of the base plate with self-tapping stainless steel screws (No. 8, 1/2 inch long) with stainless steel washers (1/4 inch inside diameter). Drill pilot holes into the base plate to facilitate screw installation. Install screws on 9 inch centers maximum and at least one screw shall be installed through the overlapping splice to clamp the layers together. Also clamp the overlapping splice layers together just above the concrete foundation with an all stainless steel fastener assembly consisting of a machine screw (No. 8, 5/8 inch long), nut and two flat washers (1/4 inch inside diameter) and lock washer. Tightly clamp the screen layers between the flat washers.

ARTICLE 649-10 is deleted and the following substituted:

**649-~~9~~10 Structural Grout Pads.**

On mast arm support structures, install a structural grout pad in accordance with the Standard Plans and manufacturer's instructions. Prior to grout placement, flush the top of the foundation with water to remove any dirt and debris.

Mix grout to a fluid state in accordance with the manufacturer's recommendations. Test the grout fluidity using ASTM C939 Flow Cone Method. Discard any grout with an unacceptable efflux time.

Do not use mechanical means to push or vibrate the grout. Clean any excess grout from the base plate. Verify that water inside the pole will drain freely through the installed drain hole.

ARTICLE 649-11 is deleted and the following substituted:

**649-~~11~~0 Method of Measurement.**

The Contract unit price each for poles, mast arms, 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. The cost of new, rehabilitated, or reused foundations will be included with the poles, mast arms, and monotube assemblies.

The Contract unit price for removal of poles, mast arms, and monotube assemblies will include the removal of all attachments (arms, vehicle signals, light fixtures, pedestrian signals, pedestrian detectors and other incidentals).

When removal of the pole and partial foundation removal is called for, remove the pole, foundation, and all accessories or attachments (including pole keys, dead men, guying apparatus, conduit, anchor bolts and reinforcing steel) to a minimum depth of four feet below existing grade.

When removal of the pole and complete foundation removal is called for, completely remove the pole including the foundation and all accessories or attachments as listed above.

SECTION 649 is expanded by the following:

**649-124 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section. Sign panels and 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.       |
| Item No. 649- | Steel CCTV Pole - each.         |

## **GALVANIZED STEEL POLES, MAST ARMS, AND MONOTUBE ASSEMBLIES (REV 7-8-26)**

ARTICLE 649-1 is deleted and the following substituted:

### **649-1 Description.**

The work in this Section consists of furnishing and installing galvanized steel strain poles, galvanized steel mast arms, galvanized steel monotube assemblies, and galvanized steel CCTV poles on new or existing foundations 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 poles, mast arms or steel monotube assemblies are painted as called for in the Contract Documents.

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.

All welds must be visually inspected for final approval by an actively certified welding inspector, qualified through the American Welding Society. A certifying statement from the welding inspector must be provided with the components. The document must identify the project information, date of inspection, welding inspector name, and inspector certification number.

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 tolerances are met and that mast arm to pole connections can achieve a snug-tight condition as defined in 649-8.

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 649-7 is deleted and the following substituted:

**649-7 Foundations.**

Install new foundations in accordance with Section 455. Reuse or rehabilitate existing foundations as shown in the Plans and in accordance with this Section.

Prior to fabricating the steel structure for installation on an existing foundation, create a template of the existing bolt pattern for the fabricator. Ensure the existing bolt pattern is consistent with the bolt pattern shown in the Plans. Contact the EOR if the template does not match the bolt pattern shown in the plans to resolve the issue.

For an existing foundation to be rehabilitated, excavate the soil around the foundation to the limits shown in the Plans and in accordance with Section 120. Remove existing concrete according to the demolition limits shown in the Plans without damaging the vertical reinforcing steel. Remove and replace transverse reinforcement and anchor bolts that are within the demolition limits.

ARTICLE 649-8 is deleted and the following substituted:

**649-8 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. Clean anchor bolts which have corrosion of surface rust and coat with galvanizing compound per Section 562. 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 460-6, 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.

For the purposes of this Specification, the anchor nuts (full-height) are installed on top of the plate washers and below the retainer nuts (half-height or full-height). Base plate installation steps are as follows:

1. Clean and lubricate the exposed threads of all anchor bolts. Clean and lubricate the threads and bearing surfaces of all nuts. Use hardware lubricants approved by the hardware manufacturer. Re-lubricate the exposed threads of the anchor bolts and the threads and bearing surfaces of nuts if more than 24 hours has elapsed since earlier lubrication, or if the anchor bolts and nuts have become wet since they were first lubricated.

2. Verify that each leveling nut can be turned onto the bolts past the elevation corresponding to the final elevation of the bottom of the leveling nut and be turned by the effort of a person using an ordinary spud wrench, without employing a pipe extension on the wrench handle.

3. Turn the leveling nuts onto the anchor bolts and align the nuts to the same elevation less than or equal to one anchor bolt diameter from the top of the foundation.

4. Place structural plate washers on top of the leveling nuts; one washer on 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 on each anchor bolt, and turn anchor nuts onto the anchor bolts.

6. Tighten anchor nuts against the top of the structural plate washers and base plate 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 after tightening.

8. Before final tightening of the anchor nuts, mark the reference position of each snug-tight anchor nut on one flat with a corresponding reference mark on the base plate. Incrementally turn the anchor nuts using a star pattern until achieving the required nut rotation specified in Table 649-1. Tighten the anchor nuts in two tightening cycles (passes), each approximately one-half the required amount of rotation, up to the final rotation in Table 649-1. After tightening, verify the anchor nut rotation with respect to the reference mark on the base plate. Do not exceed the Table 649-1 value by more than 20 degrees.

9. Turn retainer nuts onto the anchor bolts and tighten each until it is in firm contact with the top surface of the anchor nut. Hold the anchor nut to prevent rotation and tighten the retainer nuts to a snug-tight condition. The final condition is an anchor nut that is rotated with respect to the reference mark on the base plate in accordance with Table 649-1, and a retainer nut that is snug-tight with respect to the anchor nut.

10. Install a screen over the gap between the base plate and foundation concrete in accordance with 649-8, or place a structural grout pad in accordance with 649-9.

| Table 649-1                   |                                        |
|-------------------------------|----------------------------------------|
| Anchor Bolt Diameter (inches) | Nut Rotation from Snug-Tight Condition |

|              |          |
|--------------|----------|
| $\leq 1-1/2$ | 1/3 turn |
| $> 1-1/2$    | 1/6 turn |

**649-8.1 Camera Lowering Device Installation:** Meet the requirements of 641-4.4.

ARTICLE 649-9 is deleted and the following substituted:

**649-9 Screen Installation.**

On steel strain poles and steel monotube assemblies, install a screen that will prevent vermin and debris from entering the gap between the bottom of the base plate and the top of the concrete foundation. Cover the entire gap with a wire screen, the bottom horizontal wire of which shall be in full contact with the surface of the concrete foundation and the top horizontal wire of which shall not extend beyond the top surface of the base plate. For the screen, use standard grade plain weave galvanized steel wire cloth with 1/2 inch x 1/2 inch mesh and 0.063 inch diameter wires. Vertical screen wires shall not extend beyond the top and bottom horizontal wires of the screen. Use one continuous section of screen with only one overlapping splice where the ends come together and overlap the layers 3 inches minimum. Attach the screen to the vertical side of the base plate with self-tapping stainless steel screws (No. 8, 1/2 inch long) with stainless steel washers (1/4 inch inside diameter). Drill pilot holes into the base plate to facilitate screw installation. Install screws on 9 inch centers maximum and at least one screw shall be installed through the overlapping splice to clamp the layers together. Also clamp the overlapping splice layers together just above the concrete foundation with an all stainless steel fastener assembly consisting of a machine screw (No. 8, 5/8 inch long), nut and two flat washers (1/4 inch inside diameter) and lock washer. Tightly clamp the screen layers between the flat washers.

ARTICLE 649-10 is deleted and the following substituted:

**649-10 Structural Grout Pads.**

On mast arm support structures, install a structural grout pad in accordance with the Standard Plans and manufacturer's instructions. Prior to grout placement, flush the top of the foundation with water to remove any dirt and debris.

Mix grout to a fluid state in accordance with the manufacturer's recommendations. Test the grout fluidity using ASTM C939 Flow Cone Method. Discard any grout with an unacceptable efflux time.

Do not use mechanical means to push or vibrate the grout. Clean any excess grout from the base plate. Verify that water inside the pole will drain freely through the installed drain hole.

ARTICLE 649-11 is deleted and the following substituted:

**649-11 Method of Measurement.**

The Contract unit price each for poles, mast arms, and monotube assemblies, furnished and installed, will include all materials specified in the Contract Documents, cover plates, caps, clamps, blank sign panel, luminaire bracket, all labor, equipment, miscellaneous materials and

hardware necessary for a complete and acceptable installation. The cost of new, rehabilitated, or reused foundations will be included with the poles, mast arms, and monotube assemblies.

The Contract unit price for removal of poles, mast arms, and monotube assemblies will include the removal of all attachments (arms, vehicle signals, light fixtures, pedestrian signals, pedestrian detectors and other incidentals).

When removal of the pole and partial foundation removal is called for, remove the pole, foundation, and all accessories or attachments (including pole keys, dead men, guying apparatus, conduit, anchor bolts and reinforcing steel) to a minimum depth of four feet below existing grade.

When removal of the pole and complete foundation removal is called for, completely remove the pole including the foundation and all accessories or attachments as listed above.

SECTION 649 is expanded by the following:

**649-12 Basis of Payment.**

Price and payment will be full compensation for all work specified in this Section. Sign panels and 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.       |
| Item No. 649- | Steel CCTV Pole - each.         |