Origination Form

Specifications

Name:	Ben Goldsberry	**Specification Number:**	649-2, 649-7
Email:	ben.goldsberry@dot.state.fl.us	**Associated Specs:**	None.
Date:	2024-05-22T12:03:40Z	**Verified:**	VERIFIED

Summary:

The bolt tightening requirements are being aligned with the recommendations in the AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. This proposed change will restore the procedure that was in place prior to the January 2020 Standard Specifications.

Justification:

These changes are being made to ensure that hardware is correctly installed in accordance with AASHTO recommendations.

Do the changes affect other types of specifications?

Neither

List Specifications Affected:

Other Affected Documents/Offices	Contacted	Yes/No
Other Standard Plans	Rick Jenkins and Josh Turley	Yes
Florida Design Manual		No
Structures Manual		No
Basis of Estimates Manual		No
Approved Product List		No
Construction Office		No
Maintenance Office		No

Materials Manual		No
Traffic Engineering Manual		No

Are changes in line with promoting and making progress on improving safety, enhancing mobility, inspiring innovation, and fostering talent; explain how?

Properly installed hardware that performs as intended will result in improved safety and enhanced mobility.

What financial impact does the change have; project costs, pay item structure, or consultant fees?

No financial impact.

What impact does the change have on production or construction schedules?

Construction schedules can be improved by minimizing confusion in the field on installation procedures.

How does this change improve efficiency or quality?

Quality is improved by ensuring that hardware is correctly installed during initial construction and will perform as intended during the service life of the structure.

Which FDOT offices does the change impact?

Construction.

What is the impact to districts with this change?

No impact to districts.

Does the change shift risk and to who?

This change does not shift risk.

Provide summary and resolution of any outstanding comments from the districts or industry.

Comments and Responses are available on the Track the Status of Revisions hyperlink located on the Specifications landing page: https://www.fdot.gov/programmanagement/Specs.shtm

What is the communication plan?

Through the established specification revision process (e.g., Internal and Industry Review)

What is the schedule for implementation?

The Standard Specifications eBook and Workbook are effective July 1st every year.

GALVANIZED STEEL POLES, MAST ARMS, AND MONOTUBE ASSEMBLIES. (REV 5-22-24)

ARTICLE 649-2 is deleted and the following substituted:

649-2 Materials.

649-2.1 General: Meet the following requirements:

Camera Lowering Device* 641-2.2
Membrane Curing Compounds*.....Section 925
Grouts*.....Section 934
Galvanizing- Components .....ASTM A123
Galvanizing- Fasteners*.....Section 962
Coatings* .....Section 975
*Use products and producers listed on the Department's Approved Product List (APL). Producers seeking inclusion on the list must meet the requirements of Section 6.

649-2.21 Pole Assembly: Use pole assemblies as shown in the Standard Plans when standard mast arm assemblies, standard strain pole assemblies, or standard steel CCTV pole assemblies are required by the Contract Documents.

Obtain poles, assemblies from a fabrication facility that is listed on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

Obtain poles and mast arms from a fabrication facility that is approved in one of the following fabrication categories:

1. American Institute of Steel Construction, Highway Component Manufacturer
2. American Welding Society, Certified Welding Fabricator
3. Canadian Welding Bureau, Fusion Welding of Aluminum (W47.2)

~~Use coating products meeting the requirements of Section 975.~~

~~Use grouts meeting the requirements of Section 934 and listed on the Department's Approved Product List (APL).~~

~~Use water meeting the requirements of Section 923.~~

~~Use membrane curing compounds meeting the requirements of Section 925.~~

~~**649-2.2 Camera Lowering Device:** Meet the requirements of 641-2.2.~~

ARTICLE 649-7 is deleted and the following substituted:

649-7 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. 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.

For the purposes of this Specification, the anchor~~retainer~~ nuts (~~half-height or~~ full-height) are installed on top of the plate washers and below the retainer~~anchor~~ 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 ~~leveling~~ 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 ~~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.

2. Verify that ~~the~~each leveling nut~~s~~ can be turned onto the bolts past the elevation corresponding to the final elevation of the bottom of ~~each in place~~the leveling nut and be ~~backed off~~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 ~~corresponding to~~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 ~~corresponding to~~on each anchor bolt, and turn anchor~~retainer~~ nuts onto the anchor bolts.

6. Tighten anchor~~retainer~~ 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. ~~Turn anchor nuts onto the anchor bolts and tighten each until it is in firm contact with the top surface of the retainer nut; then while preventing the retainer nut from rotating, tighten the anchor nut until it is snug-tight using a star pattern.~~ Before final tightening of the anchor nuts, mark the reference position of each snug-tight anchor~~retainer~~ nut on one flat with a corresponding reference mark on the ~~anchor nut and~~ base plate ~~on each bolt~~. ~~Assure the retainer nut stays in this final position. Then while preventing the retainer nut from rotating,~~ ~~i~~Incrementally turn the anchor nuts using a star pattern until achieving the required nut rotation specified in Table 649-1. ~~Turn~~Tighten the anchor nuts in~~at least~~ two ~~full~~ 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~~retainer nut and verify the retainer nut has not rotated from its snug-tight condition with respect to the plate washer and 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 ~~a retaining nut that is snug-tight with respect to the plate washer, and~~ an anchor nut that is rotated with respect to the reference mark on the ~~retaining nut, plate washer, and~~ base plate in accordance with Table 649-1, and a retainer nut that is snug-tight with respect to the anchor nut.

10~~9~~. 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
≤ 1-1/2	1/3 turn
> 1-1/2	1/6 turn

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