ORIGINATION FORM
Proposed Revisions to the Specifications

(Please provide all information - incomplete forms will be returned)

Date: 07/01/2020

Office: Roadway Design Office

Originator: Gevin McDaniel

Specification Section: 993

Telephone: (850) 414-4284

Article/Subarticle: All

email: gevin.mcdaniel@dot.state.fl.us

****Will the proposed revision require changes to:**

Publication	Yes	No	Office Staff Contacted and date contacted
Standard Plans Index	◯	◯	Derwood Sheppard 6/2020
Traffic Engineering Manual	◯	◯	Javier Ponce 6/2020
FDOT Design Manual	◯	◯	Self
Construction Project Administration Manual	◯	◯	Self
Basis of Estimate/Pay Items	◯	◯	Melissa Hollis 6/2020
Structures Design Guidelines	◯	◯	Self
Approved Product List	◯	◯	Karen Byram 6/2020
Materials Manual	◯	◯	Self

**This section must be completed prior to processing proposed revisions.

Will this revision necessitate any of the following:

Design Bulletin ☐ **Construction Bulletin** ☐ **Estimates Bulletin** ☐ **Materials Bulletin** ☐

Are all references to external publications current? **Yes** ◯ **No** ◯

If not, what references need to be updated? (Please include changes in the redline document.)

Why does the existing language need to be changed?

See attached.

Summary of the changes:

Removed High Performance Delineators and High Visibility Median Separator Delineators from the Specification. These products will also be removed from the APL. Tubular Markers will be the new standard for the Department's channelization devices.

Are these changes applicable to all Department jobs? **Yes** ◯ **No** ◯

If not, what are the restrictions?

Contact the State Specifications Office for assistance in completing this form.

Daniel Strickland 850-414-4130 Daniel.Strickland@dot.state.fl.us Rebecca Frimmel 850-414-4155 Rebecca.Frimmel@dot.state.fl.us

Valencia Cunningham 850-414-4101 Valencia.Cunningham@dot.state.fl.us Darla Hunsicker 850-414-4114 Darla.Hunsicker@dot.state.fl.us

Tubular Marker Implementation: The Department will be using the same product as the Managed Laned Markers for permanent channelizing devices on Arterials and Collectors. The colors for these Tubular Markers will be the same as the lane line that they supplement (white or yellow) per the MUTCD requirements. This also requires a transition plan for the color of Managed Lane Markers.

Are changes in line with promoting and moving the needle on the vital few and how?
This Specification change is in line with moving the needle on the vital few by providing a more visible and durable product as a channelizing device to improve the safety of bicyclists and pedestrians on arterials and collectors. Until now, this product has been used on Managed Lane to preclude lane changing. The durability, visibility and larger diameter of these products are desired. The increased durability will also benefit the department and improved safety by not having to be replaced as often. The reduction in MOT operations for replacement drastically improved safety on our roadways.
What financial impact does the change have? Pay items and consultant fees.
These products have a slightly higher initial cost over "high performance delineators"; however, the long-term savings in maintenance greatly outweighs the increased initial cost. As stated above, the fewer MOT operations improve safety, mobility, and further reduce costs. There is no change to consultant fees.
Which offices does the change impact?
This impacts the Program Management, Materials, Design, Traffic Operations, Safety, Construction, and Maintenance.
What impacts to the Districts are anticipated?
This will clarify and simplify design for the District Design, Traffic Operations, Safety, and Construction Offices. This will also simplify things for maintenance. Maintenance will have fewer products to keep in stock and fewer items/incidences to maintain.
Have District counterpart's comments been addressed?
This change is being communicated to all the District counterparts through the established procedures.
Does the change shift risk and to who?
This change does not shift risks.
What is the communication plan and schedule of events?
The following is the schedule for implementation:

November 2020:

- *Memorandum (not a bulletin) is released to highlight the changes, provide commentary, and show the drafts of the upcoming Specifications changes:*
  - *Drafts of Specifications 704, 991 and 993 will be included in the Memorandum (See February 2021 below)*
  - *Boilerplate MSP will be included in the Memorandum and will be available for use when a shorter height is needed*
- *2021 FDM is published: includes language clarifying the criteria for use of Tubular Markers and Delineators will be released*
- *FY 2021-22 Standard Plans is published: modified to showing proper call-outs for Tubular Markers and Delineators*
- *TEM Section 4.5 will reflect the use of Tubular Markers instead of "Express Lane Markers" and reference Section 704 of the Standard Specifications*
- *Managed Lanes (Manual?, Handbook?) will reflect the use of Tubular Markers instead of "Managed Lane Markers" and reference Section 704 of the Standard Specifications*
- *BOE will be updated to show new Pay Item structure for Tubular Markers*
- *Pay Items for "High Performance Delineators" and "High Visibility Median Separator Delineators" will be removed from the BOE*
- *APL will be updated to show new category for Tubular Markers*
- *APL Items for "High Performance Delineators" and "High Visibility Median Separator Delineators" will be removed*

February 2021:

- *July 2021 Standard Specifications is published:*
  - *New Sections 704 and 991*
  - *Standard Specification 993 will be modified to remove "High Performance Delineators" and "High Visibility Median Separator Delineators"*

Florida Department of Transportation
605 Suwannee Street
Tallahassee, FL 32399-0450

RON DESANTIS
GOVERNOR

KEVIN J. THIBAULT, P.E.
SECRETARY

M E M O R A N D U M

DATE: October 29, 2020

TO: Specification Review Distribution List

FROM: Daniel Strickland, P.E., State Specifications Engineer

SUBJECT: Proposed Specification: **9930100 OBJECT MARKERS AND DELINEATORS**

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

The changes are proposed by Gevin McDaniel from the Roadway Design Office to remove High Performance Delineators and High Visibility Median Separator Delineators from the Specification and add new language to the Standard Specification.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or online at http://fdotewp1.dot.state.fl.us/programmanagement/development/industryreview.aspx . Comments received after **November 30, 2020,** may not be considered. Your input is encouraged.

DS/dh

Attachment

OBJECT MARKERS AND DELINEATORS
(REV 10-228-20)

ARTICLE 993-1 is deleted and the following substituted:

SECTION 993
OBJECT MARKERS AND DELINEATORS

993-1 Object Markers.

993-1.1 General: Object markers shall meet the general requirements outlined in the Manual of Uniform Traffic Control Devices (MUTCD). For uniformity, all Type 1 markers shall be ~~either OM1-1 or~~ OM1-3 style markers, all Type 2 markers shall be ~~either OM2-1V or~~ OM2-2V style markers, and all Type 4 (end of road) markers shall be OM4-3 style markers.~~and all end of road markers shall be either OM4-1 or OM4-3 style markers.~~

~~**993-1.2 Retroreflectors:** The reflectors shall be of acrylic plastic and shall be a minimum of 3 inches in diameter. They shall be mounted in a heavy-duty housing with a back plate.~~

~~The reflector shall consist of a clear and transparent plastic lens, which shall be red or amber as specified, and a plastic back of the same material, fused to the lens under heat and pressure around the entire perimeter, in such manner as to form a homogeneous unit, permanently sealed against dust, water, and water vapor.~~

~~The lens shall consist of a smooth front surface, free from projections or indentations (other than for identification or orientation) and a rear surface bearing a prismatic configuration such that it will effect total internal reflection of light.~~

~~The acrylic plastic shall be of a type meeting the requirements of Federal Specification L-P-380, Type I, Class 3, and, in order that the Department can readily check the suitability of the raw material used, the manufacturer shall stipulate the raw material and the particular molding compound to be furnished.~~

~~**993-1.2.1 Durability Tests for Retroreflectors:** Seal Test: The following test will be used to determine if a reflector is adequately sealed against dust and water.~~

~~Submerge 20 samples in water bath at room temperature. Subject the submerged samples to a vacuum of 10 inches gauge for five minutes. Restore atmospheric pressure and leave samples submerged for five minutes, then remove and examine the samples for water intake. Failure of more than two of the 20 samples tested shall be cause for tentative rejection of the LOT.~~

~~**993-1.2.2 Optical Requirements:** The initial specific intensity of object markers shall be at least equal to the minimum values shown below. Failure to meet the required specific intensity shall constitute failure of the reflector being tested.~~

~~Table 993-1~~

~~Observation Angle~~	~~Entrance Angle~~	~~Specific Intensity candelas/foot-candle~~		
		~~Crystal~~	~~Yellow~~	~~Red~~
~~0.1 degree~~	~~0 degree~~	~~40~~	~~24~~	~~10~~
~~0.1 degree~~	~~20 degree~~	~~16~~	~~10~~	~~4~~

~~The reflector to be tested shall be spun so as to have an average orientation effect, and shall be placed at a distance of 100 feet from a single light source having an effective diameter of 2 inches. The light source shall be operated at approximately normal efficiency. The return light from the reflector shall be measured by means of a photo-electric photometer having a minimum sensitivity of 1 by 10^{7} foot-candles per mm scale division. The photometer shall have a receiving aperture of 1/2 inch diameter, shielded to prevent the entry of stray light. The distance from light source center to aperture center shall be 2.1 inches for the 0.1 degree observation angle.~~

~~If a test distance other than the stipulated 100 feet is used, the source and the aperture dimensions, and the distance between source and aperture shall be modified directly as the test distance.~~

~~**993-1.2.3 Reflector Housing:** The reflector shall be mounted in a housing fabricated of aluminum alloy No. 3003-H 14 (or other alloy approved as equal for the purpose), and having a thickness of 0.064 inches.~~

~~**993-1.3 Retroreflective Sheeting:**~~

~~**993-1.3.1 Retroreflective Sheeting:** The retroreflective sheeting for object markers shall meet the requirements of Section 994, sheeting Types IV, V or XI. The retroreflective area shall be in accordance with the MUTCD. The retroreflective sheeting shall be permanently adhered to 0.040 inch sheet aluminum for Type 2 markers and 0.080 inch sheet aluminum for Type 1, 3 and end of the road markers. Aluminum shall be of 6061-T6 (ASTM B209) prepared in accordance with recommendations of the sheeting manufacturer.~~

~~**993-1.3.2 Assembly:** Type 2 and 3 markers shall be mounted directly to the post by two holes on the face of the marker. The mounting holes shall be 1/4 inch square holes to receive 1/4 inch carriage bolts, or other 1/4 inch bolts and shall be spaced to fit holes on the post spaced at 1 inch centers.~~

~~**993-1.4 Posts:** The marker posts shall be of steel or aluminum as shown in the Standard Plans or the Plans. Steel posts shall be 3 lb/ft. flanged U-Channel. The U-channel posts shall meet the mechanical requirements of ASTM A499, Grade 60. Provide U-channel posts that have been galvanized after fabrication in accordance with ASTM A123 and have a smooth uniform finish free from defects affecting strength, durability and appearance. For each U-channel, punch or drill 3/8 inch diameter holes on 1 inch centers through the center of the post, starting approximately 1 inch from the top and extending the full length of the post. Punching or drilling operations shall be completed prior to galvanization. The weight per foot of a manufacturer's U-channel size shall not vary more than plus or minus 3.5% of its specified weight per foot. Machine-straighten the U-channel to a tolerance of 0.4% of the length. U-channel posts shall be listed on the APL. Round aluminum posts shall meet the requirements of Standard Plans, Index 700-010.~~

~~Use attachment hardware (nuts, bolts, clamps, brackets, braces, etc.) of aluminum or galvanized steel.~~

993-1.2~~3~~ Retroreflective Sheeting:

993-1.2~~3~~.1 Retroreflective Sheeting: The retroreflective sheeting for object markers shall meet the requirements of Section 994, sheeting Types IV, V or XI. The retroreflective area shall be in accordance with the MUTCD. The retroreflective sheeting shall be permanently adhered to ~~0.040 inch~~0.040-inch sheet aluminum for Type 2 markers and 0.080 inch sheet aluminum for Type 1, 3 and end of the road markers. Aluminum shall be of

6061-T6 (ASTM B209) prepared in accordance with recommendations of the sheeting manufacturer.

993-1.23.2 Assembly: Type 2 and 3 markers shall be mounted directly to the post by two holes on the face of the marker. The mounting holes shall be 1/4 inch square holes to receive 1/4 inch carriage bolts, or other 1/4 inch bolts and shall be spaced to fit holes on the post spaced at 1 inch centers.

993-1.34 Posts: The marker posts shall be of steel or aluminum as shown in the Standard Plans or the Plans. Steel posts shall be 3 lb/ft. flanged U Channel. The U channel posts shall meet the mechanical requirements of ASTM A499, Grade 60. Provide U channel posts that have been galvanized after fabrication in accordance with ASTM A123 and have a smooth uniform finish free from defects affecting strength, durability, and appearance. For each U channel, punch or drill 3/8 inch diameter holes on 1 inch centers through the center of the post, starting approximately 1 inch from the top and extending the full length of the post. Punching or drilling operations shall be completed prior to galvanization. The weight per foot of a manufacturer's U channel size shall not vary more than plus or minus 3.5% of its specified weight per foot. Machine-straighten the U channel to a tolerance of 0.4% of the length. U channel posts shall be listed on the APL. Round aluminum posts shall meet the requirements of Standard Plans, Index 700 010.

Use attachment hardware (nuts, bolts, clamps, brackets, braces, etc.) of aluminum or galvanized steel.

ARTICLE 993-2 is deleted and the following substituted:

993-2 Delineators.

993-2.1 General: Delineators shall be classified into ~~five~~ the following types: flexible post delineators, nonflexible post delineators, ~~high visibility median separator delineators, high performance delineators,~~ and barrier delineators.

993-2.2 Flexible Post Delineators:

993-2.2.1 Dimensions: The post shall have a minimum width of 3 inches facing traffic and of such length to generally provide a height of 48 inches above the pavement surface.

993-2.2.2 Color: The post shall be opaque white. The yellowness index shall not exceed 12 when tested in accordance with ASTM E313. The daytime~~light~~ 45 degrees, 0 degrees luminance~~ous~~ factor, Cap Y, ~~directional reflectance~~ shall be a minimum of 70, ~~when~~ tested in accordance with ASTM E1347 or ASTM E1164.

993- 2.2.3 Retroreflective Sheeting: The reflective sheeting shall be Types IV, V, or XI and meet the requirements of Section 994. The reflective sheeting shall have a minimum width of 3 inches and have a minimum area of 30 square inches.

993-2.2.4 Impact Performance: Six of the eight posts shall be capable of returning to a vertical position plus or minus 10 degrees with no delaminating. No post shall split, crack, break, or separate from base. Posts shall be tested and evaluated according to the National Testing Product Evaluation Program (NTPEP) ~~Project Work Plan for Field Evaluation of Flexible Surface Mounted Delineator Posts~~ Evaluation of Temporary Traffic Control Devices: Flexible Delineators, for the following categories:

993-2.2.4.1 Pavement/Surface mounted: Use the Metropolitan Delineator Applications category for Hot Weather with a minimum of 10 impacts (default testing procedure uses a maximum of 200 impacts).

993-2.2.4.2 Ground mounted: Use the Ground Mount Side of Roadway Applications category for Hot Weather (default testing procedure uses a maximum of 10 impacts). ~~A temperature of 65°F or greater may be used in lieu of the NTPEP temperature requirements. Posts shall be capable of returning to a vertical position plus or minus 5 degrees with no delaminating, and one post may list no more than 10 degrees. No post shall split, crack, break, or separate from base.~~

993-2.3 Nonflexible Post Delineators:

993-2.3.1 Posts: The posts shall meet the requirements of 993-1.4, except the steel delineator post shall be 1.1 lb/ft.

993-2.3.2 Retroreflective Sheeting: The retroreflective sheeting shall be Types IV, V- or- XI sheeting and meet the requirements of Section 994. The reflective sheeting shall have a minimum width of 4 inches and have a minimum area of 32 square inches. The retroreflective sheeting shall be permanently adhered to 0.040--inch sheet aluminum.

~~**993-2.4 High Visibility Median Separator Delineators:**~~

~~**993-2.4.1 Dimensions:** The delineator shall have a minimum height of 42 inches above the surface of the separator.~~

~~**993-2.4.2 Post Base:** The base shall be manufactured to accommodate the replacement of the post. The base shall be mechanically anchored to the separator and be capable of withstanding ten vehicle impacts without damage.~~

~~**993-2.4.3 Color:** The plastic post shall be opaque white. The yellowness index shall not exceed 12 when tested in accordance with ASTM E313. The daylight 45 degree, 0 degree luminous directional reflectance shall be a minimum of 70 when tested in accordance with ASTM E1347 or ASTM E1164.~~

~~**993-2.4.4 Retroreflective Sheeting:** The reflective sheeting shall be Types IV, V or XI and meet the requirements of Section 994. The reflective sheeting shall have a minimum width of 8 inches and have a minimum area of 230 square inches facing the approach to the separator. The sheeting shall be yellow in color for both approaches.~~

~~**993-2.4.5 Impact Performance:** The post, installed according to manufacturer's recommendations, shall be capable of returning to a vertical position plus or minus 5 degrees when tested according to National Testing Product Evaluation Program (NTPEP). The NTPEP requirement of one-half of the hits at 32 F is waived. All hits may be at 65 F or greater. NTPEP data or independent test lab data shall be submitted for product approval.~~

~~**993-2.5 High Performance Delineators:**~~

~~**993-2.5.1 Dimensions:** The delineator shall have a minimum height of 36 inches above the pavement surface and have a minimum diameter of 2 inches.~~

~~**993-2.5.2 Post Base:** The base shall be mechanically anchored to the pavement and be capable of withstanding 50 vehicle impacts without damage.~~

~~**993-2.5.3 Color:** The plastic post shall be opaque white. The yellowness index shall not exceed 12 when tested in accordance with ASTM E313. The daylight 45 degree, 0 degree luminous directional reflectance shall be a minimum of 70 when tested in accordance with ASTM E1347 or ASTM E1164.~~

~~**993-2.5.4 Retroreflective Sheeting:** The reflective sheeting shall be Type V abrasion resistant sheeting and meet the requirements of Section 994. The reflective sheeting shall have a minimum omni directional area of 30 square inches.~~

~~**993-2.5.5 Impact Performance:** To resist an impact of a test vehicle, the post must restore to within 10 degrees of vertical in any direction, and not have a crack or tear~~

~~through more than 50% of its cross section. List/Lean must be measured from the point the post protrudes from the base to the top edge of the post. For acceptance purposes, there should be no post failures and no more than two posts may list between 5 degrees and 10 degrees after receiving fifty vehicle impacts.~~

~~Impact testing must be performed in accordance with NTPEP Evaluation of Temporary Traffic Control Devices: Flexible Delineators, for the category of High Speed Applications. Testing must be performed by a facility that is listed on the Laboratories Accredited to Crash Test Roadside Safety Hardware which can be found at the following URL: http://tf13.org/Subcommittee_7_Test_Facilities.php.~~

993-2.~~6~~4 Barrier Delineators:

993-2.~~6~~4.1 General: Barrier delineators shall consist of retroreflective sheeting permanently adhered to 0.090 ~~-~~inch minimum thick body. The body shall have a flexible hinge which allows the reflector to fold down and spring back to an upright position after impact. Barrier delineators for guardrail shall be designed for mounting to the web of steel posts or designed for mounting to the top of wood posts. Barrier delineators for concrete barrier, traffic railings, and vehicular longitudinal channelizing devices (LCDs) shall be designed for mounting to the top of each device.

993-2.~~6~~4.2 Retroreflective Sheeting: The sheeting for barrier delineators shall be Type IV or XI meeting the requirements of Section 994. The sheeting shall be yellow or white, depending on the locations of use for each. The dimensions of the retroreflective sheeting shall be 3 inches wide by 4 inches high. The sheeting shall be installed by the delineator manufacturer.