9930206 OBJECT MARKERS AND DELINEATORS
COMMENTS FROM INTERNAL/INDUSTRY REVIEW

Charles Boyd
414-4275
charles.boyd@dot.state.fl.us

Comment: (6-5-14)
I suggest using this reference instead:
http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/laboratories/

Response: Change made.

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Greg Prytyka
414-4792
gregory.prytyka@dot.state.fl.us

Comment: (6-12-14)
I don't think the height of the delineator should be restricted in the specification; that is a design issue. I believe you should specify a range based on what is currently manufactured:

"993-2.6.1 ***Dimensions:*** *The delineator shall have a height of 18, 24, 30, 36, 42 or 48 inches above the pavement surface as specified in the plans, and shall have a minimum* ***width*** *of 2 inches."*

→ **993-2.6 ~~Barrier~~*Express Lane* Delineators:**¶
→ → ***993-2.6.1 Dimensions:*** *The delineator shall have a height of 36 inches above the pavement surface and have a minimum dimension of 2 inches.*¶
→ → ***993-2.6.2 Post Base:*** *The base shall be manufactured to accommodate the*

(At the very least substitute the word "*width*" for "*dimension*).

Response:

Comment: (6-18-14)
In conjunction with my earlier comment, I am also concerned with the following issue:

993-2.6.3 Color: *The plastic post shall be white or orange.*

I thought orange was reserved for construction TCDs. I understand the need to be contrasting in the case of concrete pavements, but perhaps they should be white or purple like the backgrounds on the Sunpass signs (see MUTCD 2F.03).

Response:

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Sue Reiss
210-385-0029
sreiss@impactrecovery.com

Comment: (6-16-14)
New language for performance standard is impossible to meet. Even if a series of posts can be capable of 100 impacts, which is NOT contested, a 100% survival rate with NO delamination is impossible, even with the specified AR sheeting. The process of impacting the posts would necessarily result in some damage to the retroreflective sheeting, including delamination of same.

Response:

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Mark Robinson
mark.robinson@dot.state.fl.us

Comment: (6-20-14)
Do we need to specify a delineator base that will not cause any undue tire damage if traversed?

Response:

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Bessie T. Dickens
850 415-9564
bessie.dickens@dot.state.fl.us

Comment: (6-23-14)
In SUB ARTICLE 993-2.6.5 the web link does not work. Perhaps a typo... "fgwa" probably should be "fhwa".

Response: Change made.

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Chris Jackson
954-236-7375
chris.jackson@rsandh.com

Comment: (6-24-14)
NOTE: These comments were developed collectively by the I-95 Phase 3 Express Lanes Project FDOT and CDC Team.

1. General: Please consider using a higher impact performance standard for Express Lanes delineators. The intent of the new specification should be to enhance current performance standards in order to require a more durable product that can withstand higher impact speeds than used for NTPEP.

Response:

2. Section 993-2.6.1: Suggest defining dimension of 2" diameter rather than just 2".

Response:

3. Section 993-2.6.3: Consider inclusion of yellow for plastic posts, as well as indicated white and orange colors.

Response:

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Robert Hughes
239-218-6801
jim@flexstake.com

Comment: (7-1-14)
Flexstake, Inc. will be making its comments through a letter and attachments sent via Fedex to Chester Henson and Paul Gentry.

1. **993-2.6.2: Post Base**: The post base should be capable of thousands of impacts and last a minimum of seven years while in use on express lanes. Installation of bases should only be with butyl on asphalt or epoxy on concrete; no metallic anchors that would damage the road surface.

Response:

2. **993-2.6.5: Impact Performance**: Speeds should be 70 mph (consistent with express lane speeds). The first post used on I-95 Managed Lanes Phase One is capable of withstanding over 100 impacts at 55 mph, but only 13 impacts at 70 mph (See Attachement "A"). The new specification (See Attachment "E") for I-95 Managed Lanes Phase Two are now 50 impacts at 70 mph. This is because impact speed is more important than the number of impacts as learned from field experience on I-95 Managed Lanes Phase One. I was very fortunate to speak with Mr. Dusty Arrington. Mr. Arrington is a Associate Transportation Researcher at Texas A&M Transportation Institute. One of his specialties includes the durability testing of delineators. He is currently working with TxDOT on a multi-year research product to develop a new delineator durability standard for high durability applications such as HOV lanes. His opinion is that a surface mount delineator installed just a few inches to a few feet from traffic such as the I-95 Managed Lanes, with a posted speed limit of 70 mph or greater should be impacted at posted speed limit (70 mph) if you want a more realistic number of impacts the vehicle will resist. In these cases the offset between the delineator and the travel lane is so small that it doesn't allow for the vehicle to slow down before impacting the delineator. In addition, many of these impacts are due to a lane change maneuver that raises the probability of a higher speed impact. Mr. Arrington's contact information is listed below if you wish to discuss this further with him:

Response:

Test Procedure

Along with an independent professional engineer certifying tests as is currently allowed I would add the following:

1. Radar Certification: Law enforcement to verify speed of each impact.
2. Have a random representative picked by your office (or appropriate office) within FDOT to witness testing as Flexstake has done in the past, and ask your collegues in testing and materials in other states to pick a representative to witness manufacturer's tests from other states. The manufacturer should pay for this service.
3. As to using ISO/IEC Certified FHWA Laboratories this would be a huge burden on our small company more than quadrupling our testing expenses (these expenses do not include travelling approximately 2,000 miles to the nearest testing facility).

Response:

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Paul Gentry

414-4118
paul.gentry@dot.state.fl.us

Comment: (7-3-14)
Specification 993-2.6 Express Lane Delineators will require a Florida Method to be written to address the complete testing requirements for this device as the NTPEP Project work plan referenced only addresses “10 hit” ground and surface mount delineators/drums. In saying that, I have several remarks:

1. What constitutes “damage or failure” to a base after 100 hits? Are we in reality trying to determine a “hinge” failure.

Response:

2. Since these are specified as white or orange post, should there not be a different luminence value(s) for the orange post versus the white post?

Response:

3. What language needs to be included in the specification to specifically state what constitutes a post failure in 993-2.6.5? I also think only having no more than 2 posts listing between 5 degrees and 10 degrees after receiving 100 vehicle hits needs to be discussed further. TTI is going to a maximum of 15 degrees and beyond that constituting a failure.

Response:

3a. Where is the list/lean measurement to be determined (at the top of the delineator, 18 inches above pavement surface to simulate bumper height?).

Response:

3b. Where is the reference to speed at which testing is to be performed.

Response:

3c. Where is the reference to alignment of post for wheel and bumper rollovers?

Response:

4. Since this is an important device for use on our state and federal highways, I would think we would “implement” a Florida Method to reference for testing these devices prior to implementation of this specification. There will be too many unanswered questions to relay on to the manufacturers. Another reason to slow down is the cost to be associated with this testing. All testing criteria needs to be finalized before they proceed with testing.

Response:

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Craig Schulz
2532848005
craig.schulz@pexco.com

Comment: (7-8-14)
Suggested changes are **underlined bold highlighted**.

1. 993-2.6.1 Dimensions:

> → → **993-2.6.1 Dimensions:** The delineator shall have a height of 36 inches above the pavement surface and have a minimum dimension of 2 inches.

Suggested wording: "… and have a minimum dimension of **3**-inches **facing traffic**."
Rationale: We would suggest increasing the overall minimum dimension to 3-inches facing traffic. A 2-inch diameter post is quite skinny and doesn't present much target value. A 3-inch overall minimum presents a substantially larger target, creating more of a "shying" effect, and will be far more visible in both nighttime and daytime conditions.

Response:

2. 993-2.6.2 Post Base:

> → → **993-2.6.2 Post Base:** The base shall be manufactured to accommodate the replacement of the post without tools. The base shall be capable of withstanding 100 vehicle impacts without damage or failure.

Suggested wording: "…accommodate the replacement of the post without **specialty** tools."

Rationale: Every pick-up truck has a toolbox with hammer, screwdriver, nails, pliers, etc. If a post can be replaced with everyday tools, it should be allowed on state highways.
Discussion: If the product desired is a high performance product you cannot limit selection to ease of replacement, this is actually counterintuitive. If you focus primarily on quick replacement, you may be inviting failures. The products that can qualify as truly "high performance" will be of a more permanent nature, with replacement possible with standard everyday tools, which should take less than 3 minutes.

Response:

3. 993-2.6.3 Color:

> → → **993-2.6.3 Color:** The plastic post shall be white or orange. For white delineators, the yellowness index shall not exceed 12 when tested in accordance with ASTM D1925 or 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.

The two ASTM mentioned above only explain how to measure the Yellowness Index (YI). Florida DOT needs to provide details of the exposure method in this proposed specification. Do

you have a copy of this FL DOT specified exposure method that you can forward to us? If not, then do you have the full description of the exposure method so we can evaluate this proposal?

Response:

4. 993-2.6.4:

> → → ***993-2.6.4 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.*

4a. Suggested wording: "shall **be wrapped around the entire post, providing a minimum of 30 square inches**."

Rationale: Clarification is that one continuous wrap, multiple wraps, what is the desired configuration?
Response:

4b. Suggested wording: "The reflective sheeting shall be **white in color and shall**…."
Rationale: The color of the sheeting must be clearly stated in the specification

Response:

5. 993-2.6.5 Impact Performance:

> → → ***993-2.6.5 Impact Performance:*** *The post, installed according to manufacturer's recommendations, shall be capable of returning to a vertical position plus or minus 5 degrees with no delaminating after receiving 100 vehicle impacts 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 shall be at 65°F or greater. For acceptance purposes there shall be no post failures and no more than two posts may list between 5 degrees and 10 degrees after receiving 100 vehicle impacts. Impact testing must be performed by a recognized ~~delineator~~ testing facility that is listed on the FHWA Laboratories Accredited to Crash Test Roadside Safety Hardware, http://safety.fhwa.dot.gov/roadway_dept/policy_guide/road_hardware/laboratories/ or any testing facility that is approved by the State Roadway Design Engineer. ~~Approved testing facilities include Texas Transportation Institute, E Tech Testing Services or other laboratories approved by the Department.~~*

5a. Suggested wording: "after receiving 100 vehicle impacts **by an unshielded MASH vehicle at 55 MPH when tested according to the NTPEP testing work plan for channelizer posts at an American Association for Laboratory Accreditation (A2LA) certified testing facility, conforming to the requirements of ISO/IEC 17024:2003**."

Rationale: The only way to ensure integrity is to require independent testing at an accredited facility.

Response:

5b. Suggested wording: "All hits shall be at **30**°F or greater."

Rationale: Clearly Florida experiences temperatures down to freezing on occasion throughout the year. It makes no logical sense to accept a product that may experience widespread failure during cold snaps. This proposed specification as written is likely to result in the acceptance of products that we believe will perform quite unsatisfactorily in the field.

Response:

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