State of California
DEPARTMENT OF TRANSPORTATION

California State Transportation Agency

Memorandum

Serious drought.
Help Save Water!

To: ALL DISTRICT DIRECTORS

Date: July 2, 2014

File:

From: S. SEAN NOZZARI
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Traffic Operations
Mail Station 36

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Mail Station 31

Subject: **Retroreflective Sheeting for Guide Sign Policy**

The California Department of Transportation (Caltrans) policy for sign sheeting material for highway guide signs has changed. Attached is an appendix, which provides general direction. With award of the upcoming State-furnished sign contract, Caltrans' basic policy will be to use high-performance ASTM Type XI on guide signs. This memorandum and appendix supersedes memoranda dated March 16, 1999, and its attachment, dated March 12, 1999, signed by Hamed Benouar and Randell H. Iwasaki.

As an interim measure (until a new contract is executed after July 17, 2014), districts are authorized to specify retroreflective sign sheeting, in accordance with this policy, for new and replacement guide signs, effective immediately. This may be done under the existing contract with Safeway Sign Company, see:

<https://www.bidsync.com/DPX?ac=agencycontview&contid=106359>

We realize there will be a number of details to be worked out as we upgrade existing guide signs, including but not limited to the removal of catwalks, stairs, and/or lighting features as part of future projects and undertakings. If you or your staff has any questions, please contact Duper Tong at (916) 654-5176, or e-mail at: <duper.tong@dot.ca.gov>.

Attachments
(1) Appendix: Retroreflective Sheeting for Guide Sign Policy – July 1, 2014
Memorandum from Sean Nozzari and Tony Tavares
(2) Basic Guide for Selection of Retroreflective ASTM 4956-13 Sheeting on Guide Signs on the CA State Highway System

c: Steve Takigawa – Deputy Director Maintenance and Operations
All Deputy District Directors, Traffic Operations
All Deputy District Directors, Maintenance
Kelly Takigawa – Division of Procurement and Contracts

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Appendix: Retroreflective Sheeting for Guide Sign Policy July 2, 2014 Memorandum from SEAN NOZZARI and TONY TAVARES

This appendix updates Caltrans policy and practice to specify retroreflective sign sheeting material to be used for new guide signs, effective immediately, and will be fully-implemented by award of the California Department of General Services sign contracts (anticipated after July 17, 2014).

GENERAL DIRECTION:

ASTM Type XI retroreflective sign sheeting shall be used on Caltrans projects on the State Highway System (SHS) for roadside (ground mounted) guide signs. For overhead guide signs, ASTM Type XI sheeting shall also be specified so that the illumination can be turned off or removed. Sign legends, arrows and borders on these types of signs will be cutout retroreflective sheeting, and provide appropriate contrast ratio with the background sheeting. Districts are encouraged to specify anti-graffiti premium overlay film if a sign is anticipated for installation in graffiti-prone areas. Pricing for these sheeting products will be available in the new contract.

The requirement for ASTM Type XI retroreflective sign sheeting applies to guide signs and panels that are part of a guide sign assembly, or route marker assembly as follows:

Guide Signs and panels:	Guide Sign Panel backgrounds:
• White on green • White on blue • White on brown (including white legends, arrows, borders, or other copy for contrasting background colors of guide signs)	• Fluorescent yellow warning panels included as part of the guide sign assembly • US Route shields, and route marker assemblies include cardinal direction and directional arrow guide sign plaques with black copy on white backgrounds (black, non-reflective copy)

With the award of the anticipated July 2014 contract, fluorescent yellow shall be the standard background color for all yellow warning signs, and warning panels on guide sign assemblies. See "Basic Guide for Selection of Retroreflective ASTM D4956-13 Sheeting on Guide Signs on the CA State Highway System," attached.

The primary reasons for these changes are:

1. Nighttime retroreflectivity for newly-fabricated guide signs will be enhanced and the service life of signs will be increased by providing higher-performance retroreflective sheeting types.

The primary reasons for these changes are (continued):

2. The 2010 edition of the California Manual on Uniform Traffic Control Devices (CA MUTCD) published January 21, 2010, adopted FHWA's requirements to specify minimum levels of retroreflectivity for roadway signs. As adopted, this policy established the baseline at which signs are no longer serviceable, per Table 2A-3. This policy update establishes specifications of high-performance retroreflective sheeting types for new guide signs.
3. Since the adoption of established minimum levels of retroreflectivity in January 2010, retroreflective sign sheeting manufacturers have introduced brighter, high-performance ASTM Type XI retroreflective sheeting that was not identified in the FHWA's original policy, nor mentioned in Table 2A-3. This direction strongly encourages use of innovative, new products that enhance conspicuity of roadway signing, both day and night.
4. Life cycle analyses of Type XI sheeting allows for extended service life of signs as compared to ten-year warranteed products for other ASTM sheeting types.
5. Specifications for the statewide state-furnished procurement contracts will include competitive pricing for higher-performance sign sheeting; and plans, specifications, and estimates for contractor-furnished sign projects shall also include high-performance types of retroreflective sheeting.

BACKGROUND:

ASTM Type III or IV sheeting has been the standard retroreflective sign sheeting used for green background and white copy and borders for overhead guide signs since March 1999. Legends, arrows, borders, route shields, and other copy or symbols on these signs are predominantly white, and may also include other specified colors of cutout, applied retroreflective sheeting. Policy changes made in March 1999 suspended the use of white, raised button copy and borders with opaque, green backgrounds on guide signs.

Various districts have performed pilot projects to install high-performance retroreflective sheeting, and observations of these signs with and without illumination have demonstrated encouraging results. Retroreflective sheeting for sign backgrounds, borders, legend, symbols, arrows, and other miscellaneous copy such as route shields and route marker assembly guide sign panels are specified to meet CA MUTCD standards in Section 2A.07, paragraphs 01-02 and 10:

Section 2A.07 Retroreflectivity and Illumination

Support:

01 There are many materials currently available for retroreflection and various methods currently available for the illumination of signs and object markers. New materials and methods continue to emerge. New materials and methods can be used as long as the signs and object markers meet the standard requirements for color, both by day and by night.

Standard:

02 **Regulatory, warning, and guide signs and object markers shall be retroreflective (see Section 2A.08) or illuminated to show the same shape and similar color by both day and night, unless otherwise provided in the text discussion in this Manual for a particular sign or group of signs.**

10 **The uniformity of the sign design shall be maintained without any decrease in visibility, legibility, or driver comprehension during either daytime or nighttime conditions.**

(underline in Paragraph 02 added for emphasis)

Key findings referenced to cited research, or Florida DOT Policy Document:

Florida DOT (dated October 11, 2013)
ROADWAY DESIGN BULLETIN 13-12
DCE MEMORANDUM No. 23-13
MAINTEANNCE MEMORANDUM 07-13
(FHWA Approved: 10/10/2013)

Requirements included the following items:

- For Existing Overhead Signs with External Sign Lighting – Continue to light the sign until the lighting fixture/system or sign panel requires replacement or major repairs; then replace existing panel with new panel meeting the current MUTCD requirements and with Type XI sheeting and remove the existing lighting system (including fixtures, support brackets, conduit, hardware, etc.).
- Existing Overhead Signs Without Lighting – Replace existing panel when it no longer meets reflectivity requirements using Type XI sheeting.

University of North Florida Research Report to Florida DOT (dated June 2013)

- Life-cycle cost spreadsheet was developed and used to calculate the cost of replacing the current sign sheeting in Florida with high-reflective sheeting and the cost of installing/upgrading sign lighting. Based on this analysis, we found that under the conditions considered (either on straight and flat roadways on horizontal curves, in rural areas or urban areas), the most cost effective approach to maintain overhead guide luminance is to use (installing or replacing with) induction or LED luminaires. The results also indicate that a viable alternative (in terms of maintaining luminance and being cost effective) would be to use either Type VIII or Type XI legend sheeting materials and forgo sign lighting.
- (2011) Unit Cost and Service Life for Different ***Legend*** Sheeting Types:

		Expected Service Life (years)	
Sheeting Type	2011 Unit Cost ($/ft^2)	Urban area	Rural area
ASTM Type III	1.15	0	20
ASTM Type IV	1.15	4	20
ASTM Type VIII	2.80	20	20
ASTM Type XI	3.79	20	20

University of North Florida Research Report to Florida DOT (dated June 2013) continued:

- Research results indicate a viable alternative (in terms of maintaining luminance and being cost effective) would be to use either Type VIII or Type XI legend sheeting materials and forgo sign lighting. For Type XI sheeting materials, sign lighting would be needed along horizontal curves in rural areas with radii of 880 feet and horizontal curves in urban 2,500 feet or less.
- Indiana DOT Study (dated November 13, 2009)
  Life cycle cost comparison between three options shows even with an assumed 14-year replacement cycle for unlit signs, it is still much more cost effective than using external sign lights:

  Annualized Cost (14 yr, 4%):
  Lit IV legend on IV background: $ 1,505.06
  Unlit IV legend on IV background: $ 113.03
  Unlit XI legend on IV background: $ 148.39

Miscellaneous points:

- Use of ASTM Type XI sheeting, mixing with legend sheeting types with lesser timeframe warranteed background sheeting types makes little sense, as utilizing materials that are warranteed for the 12 years on the same sign, and if mixed components are used, the warrantee defaults to the lesser timeframe material.

- If sign sheeting manufacturers are willing to extend the warranty period for Type XI sign sheeting, then legend, border, arrows, and any other copy, along with background, shall all be specified with ASTM Type XI sheeting.

Basic Guide for Selection of Retroreflective ASTM D4956-13 Sheeting on Guide Signs on the CA State Highway System

		EXISTING SIGNS & WAREHOUSE STOCK					NEW SIGNS[1]	Protective Overlay Film Clear Premium[5]
		Glass Bead[2]		Microprismatic				
	Luminance ---->	Warm	Hot	Very Hot	High Performance			
Category	Color Combination	Type II	Type III	Type IV	Type VIII	Type IX	Type XI	
Guide	WHITE ON GREEN	DNU	RS	RS, OH	RS, OH	RS, OH	RS, OH	X
Guide	WHITE ON BLUE	RS	RS	RS, OH	RS, OH	RS, OH	RS, OH	X
Guide	WHITE ON BROWN	RS	RS	RS, OH	RS, OH	RS, OH	RS, OH	X
Guide (warning panels)	BLACK ON YELLOW[3,4]	DNU	RS background	RS, OH background	RS, OH background	RS, OH background	RS, OH background	X
Guide (US route shield & panels)	BLACK ON WHITE[3,4]	DNU	RS background	RS, OH background	RS, OH background	RS, OH background	RS, OH background	X

KEY:

RS = OK on roadside signs

OH = OK on overhead signs

DNU = Do Not Use

FOOTNOTES:
(1) Caltrans' basic policy for new guide signs is to use ASTM Type XI sheeting for background and copy on all roadside and overhead guide signs. Consideration should be given to removal of lighting features and infrastructure on overhead sign installations.
(2) Glass beaded white sheeting appears grayish in daylight.
(3) Black is non-reflective and does not have an ASTM designation.
(4) The procurement standard for yellow is flourescent yellow on the SHS.
(5) Sign designers are encouraged to specify anti-graffiti premium overlay film if a sign is anticipated for installation in graffiti-prone areas.

Updated July 2, 2014