



**California Traffic Control Devices Committee (CTCDC)
Agenda Item Report**



Meeting Date: May 04, 2023	From: Florencia Allenger, PE, Caltrans
Item Number: 20-12	
Sponsored By: Yue Wang, PE, Caltrans	Presented By: Brian Hadley, PE, Caltrans, I-5 NCC Sr Resident Engineer
Description: Planned modification / continuation of Active Experiment 20-12 Orange Contrasted Temporary Pavement Delineation in Construction Zones on Interstate 5 (I-5) North Coast Corridor (NCC) Segment 4 Project.	

Recommendation:

Motion by committee to continue with a modified experiment on I-5 NCC Segment 4 construction, orange contrasting the temporary lane line striping of the freeway main lanes. In both the northbound and southbound directions, Alternative 1 detail (16' orange paint contrast line preceding standard 12' white paint lane line) will be used.

Agency Making Request/Sponsor:

Brian Hadley, Caltrans District 11 / Yue Wang, CTCDC Member.

Background:

The active CTCDC Experiment 20-12 – Orange Contrasted Temporary Pavement Delineation in Construction Zones [and FHWA experiment 6(09)-59(E) - Orange Contrast Temporary Pavement Markings - CA DOT] is currently being conducted during construction stage 1 of the I-5 NCC Segment 4 A/B project (Contract 11-2T35U4). During construction stage 2 of this project, the plan is to continue with a modified experiment using orange contrasted striping with the lane lines of the freeway main lanes only. In both the northbound and southbound directions of I-5, the Alternative 1 detail (16' orange paint contrast line preceding standard 12' white paint lane line) will be used. Orange contrasting the lane lines of the main lanes will be similar to how Washington State DOT is using orange striping on a construction project in their experiment approved by the FHWA. Temporary striping operations for construction stage 2 of I-5 NCC Segment 4 A/B are expected to occur in June 2023. Also, the I-5 NCC Segment 4 C project, within the same work limits of the Segment 4 A/B project, begins construction soon after. Construction stage 2 striping of Segment 4 A/B will continue to be the construction stage 1 striping of Segment 4 C. For clarity of construction delineation, motorist awareness of work zones, safety, perceptions of the public and data gathering opportunities, orange contrasted striping is planned on both stages and phases of I-5 NCC Segment 4.

Attachments:

Attachment A – PowerPoint Presentation



ATTACHMENT A



California Traffic Control Devices Committee (CTCDC)
Agenda Item Report



Attachment A – PowerPoint Presentation.

See next page.

Orange Contrasted Temporary Pavement Delineation in Construction Zones

Active Experiment 20-12

planned modification / continuation update
for California Traffic Control Devices Committee
by California Department of Transportation (Caltrans)
District 11 – Brian Hadley, I-5 NCC Sr. R.E.

May 4, 2023



Experiment Schedule and Reporting

Proposed and updated Current Timeline

July 2020 to December 2020
(Update: October 2020-March 2021)

Caltrans DRISI develops a contract for formal research of the orange contrasted temporary striping

January 2021 to March 2022
(Update: May 2022 to May 2023)

Striping with orange evaluated for at least one year, and the data collected analyzed to consider its effectiveness for work zones.

May 2020 to September 2020

Requests to the FHWA Office of Traffic Operations and the California Traffic Control Devices Committee (CTCDC) for permission to experiment.

September 2020 to December 2020
(Update: April 2022)

Orange contrasted temporary pavement delineation installed as the striping on one or more of the I-5 NCC projects.

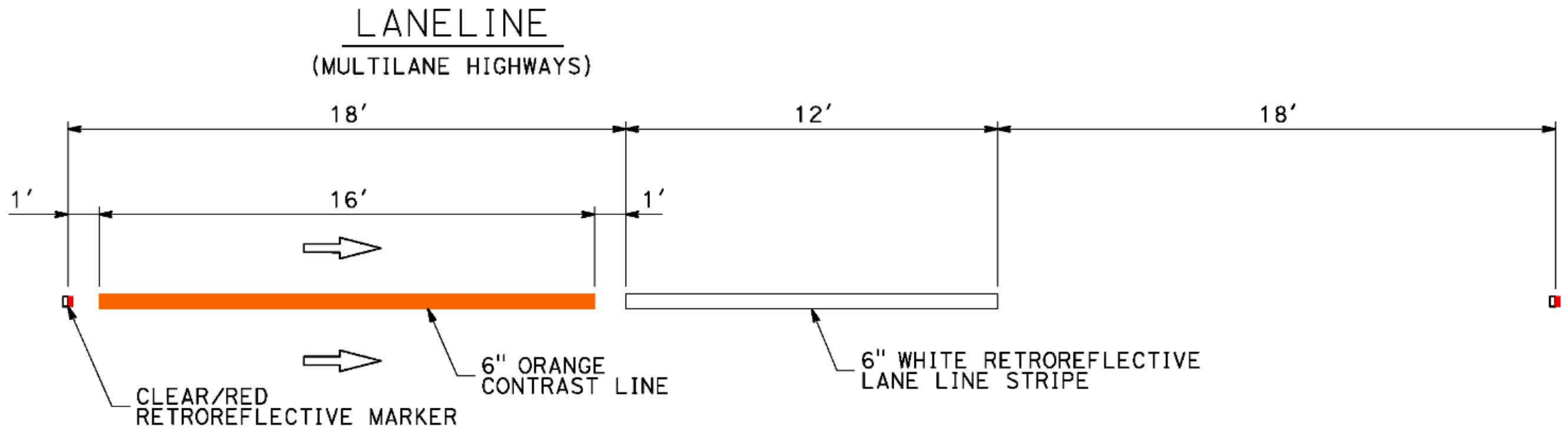
May 2022
(Update: November 2023)

Caltrans reports back to the FHWA and CTCDC on the status of the evaluation of orange contrasted temporary pavement delineation in construction zones.



Alternatives

- Two orange contrast alternatives used on the I-5 NCC Segment 4 project:
 - Alternative 1 detail for lane lines was installed in the southbound direction.

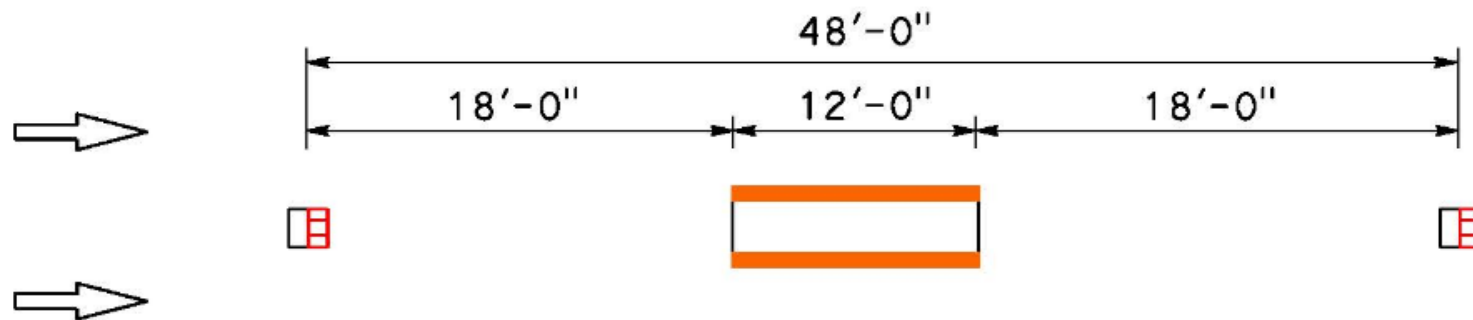


Alternatives

- Two orange contrast alternatives used on the I-5 NCC Segment 4 project:
 - Alternative 2 detail for lane lines was installed in the northbound direction.

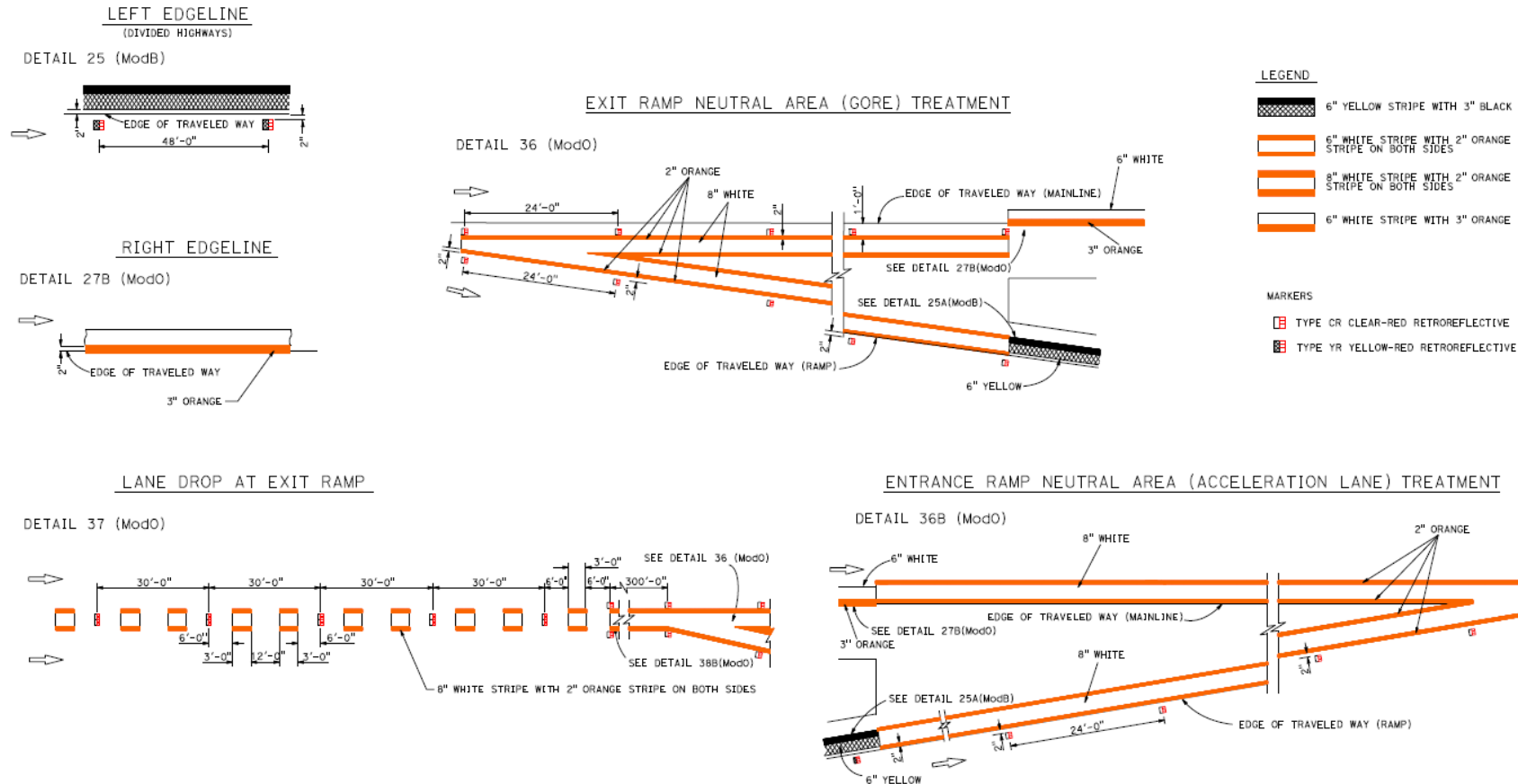
LANELINE
(MULTILANE HIGHWAYS)

DETAIL 12 (Mod0)



Alternatives

- Details for right edge line, lane drop, and gores that were installed in both directions.



Alternative 1



Alternative 1



Alternative 2



Alternative 2



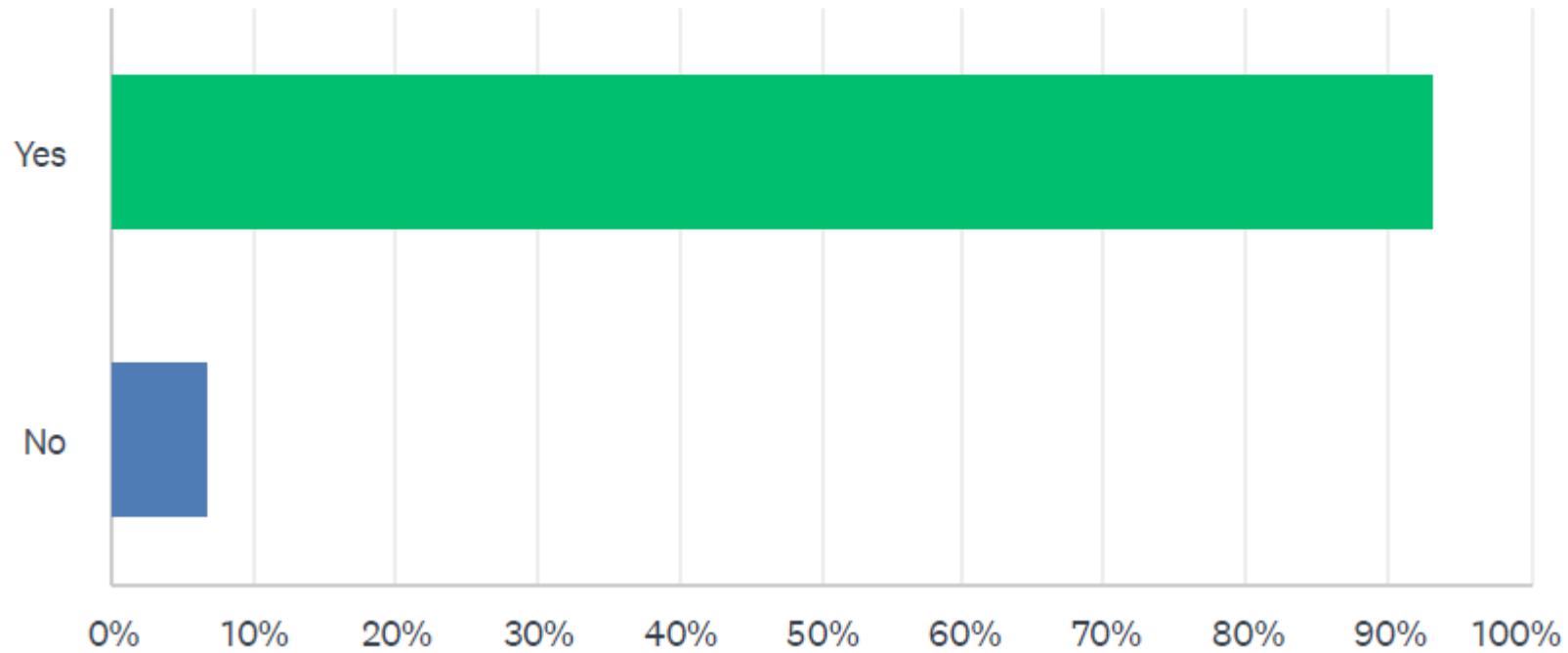


Yamacraw Ave 1/2
Cannon Road 1/2
Palomar Airport Rd 3/2



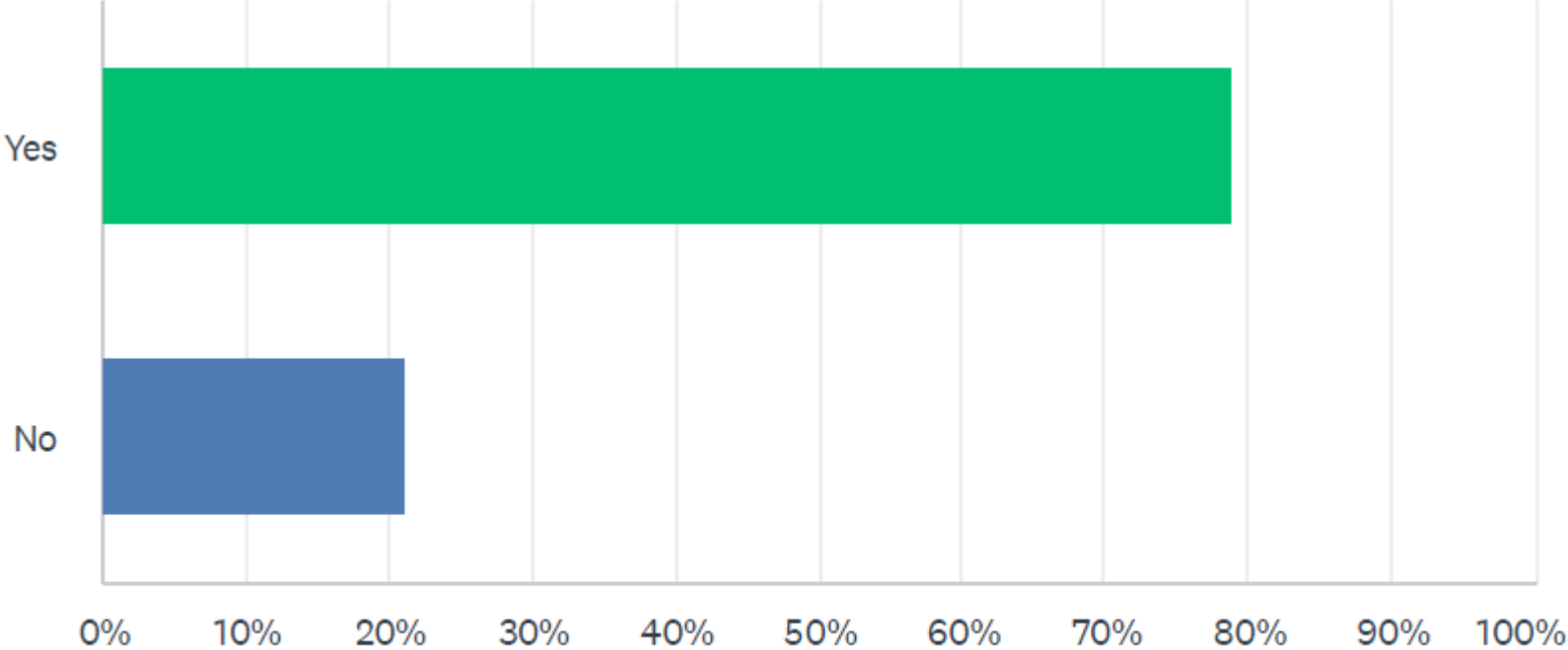
Did you notice the orange contrasted striping in the construction work zone between Palomar Airport Road and SR 78?

Answered: 939 Skipped: 0



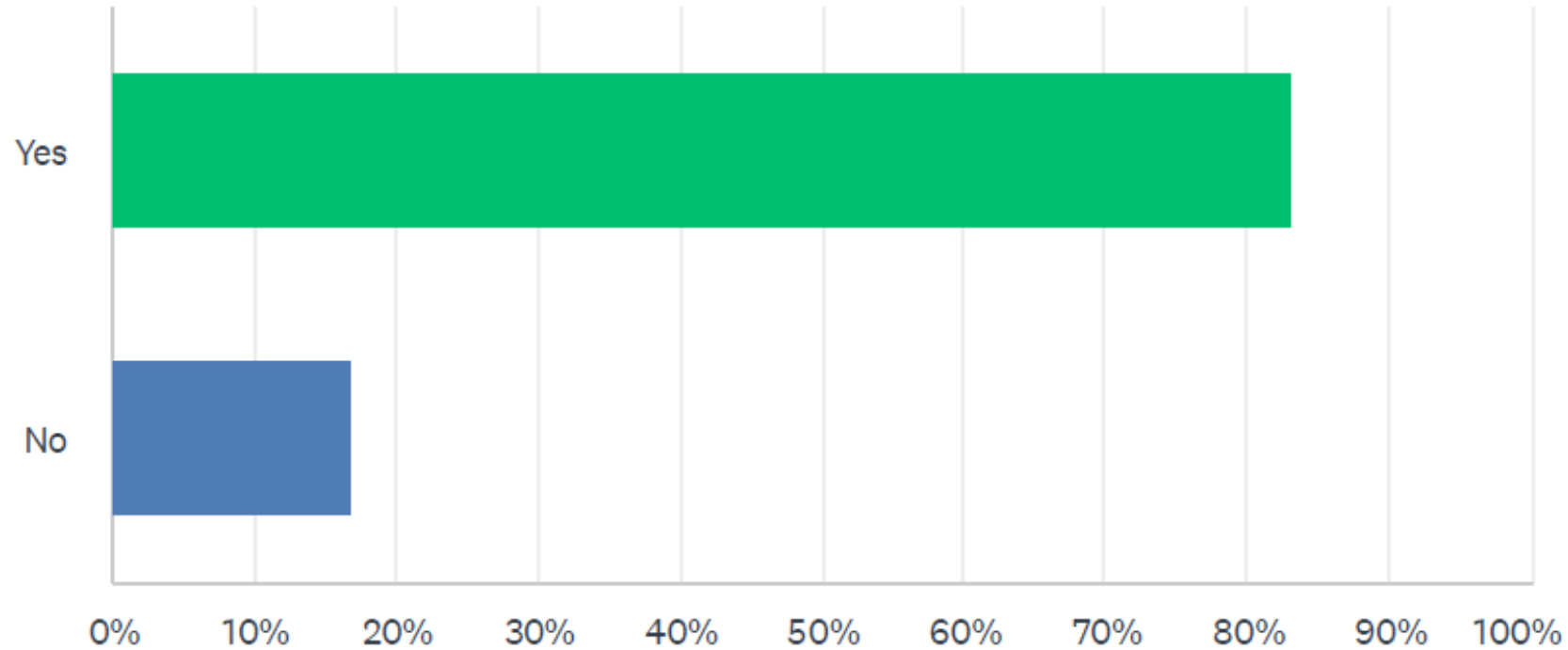
Did the orange contrasted striping increase your awareness of being in a road construction work zone?

Answered: 861 Skipped: 78



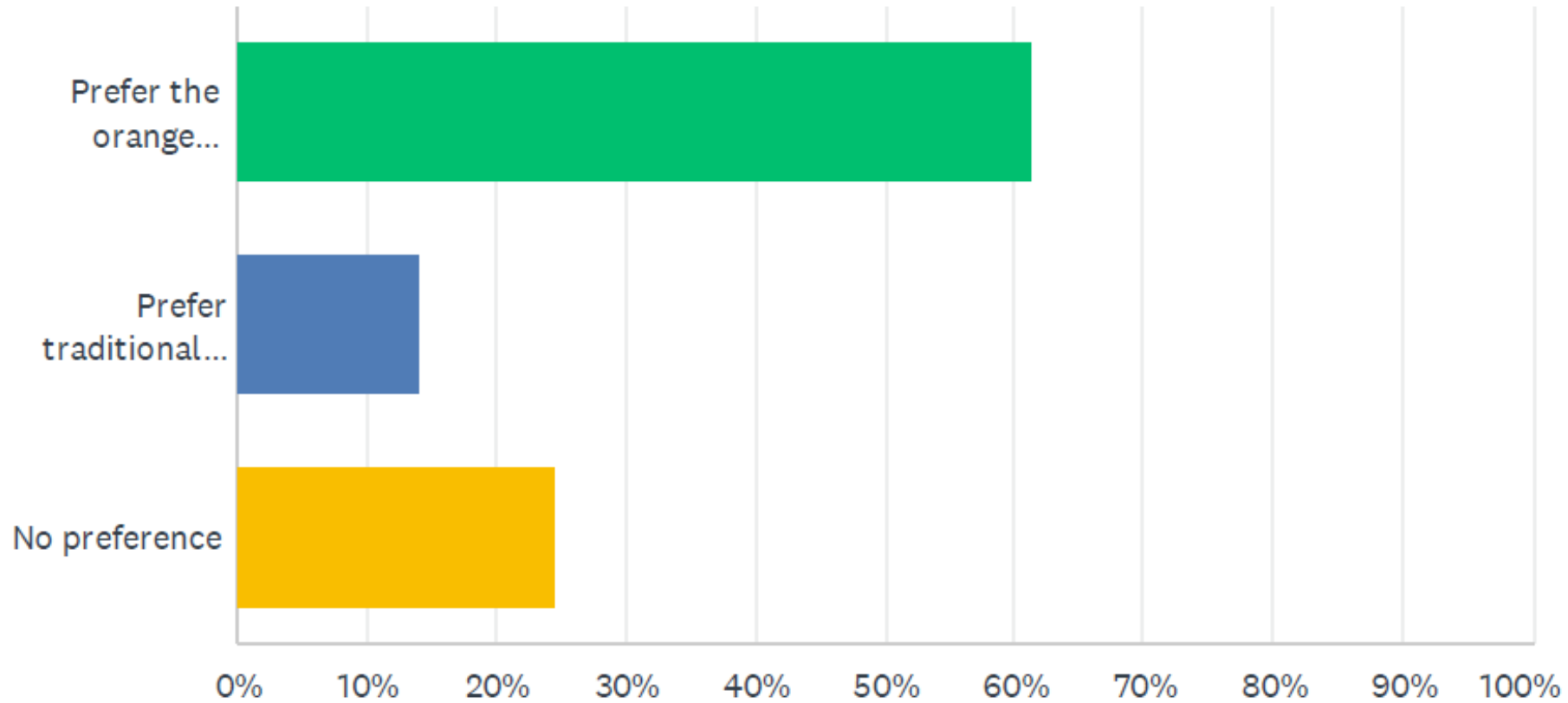
Would you like to see orange contrasted striping used in more road construction zones?

Answered: 907 Skipped: 32



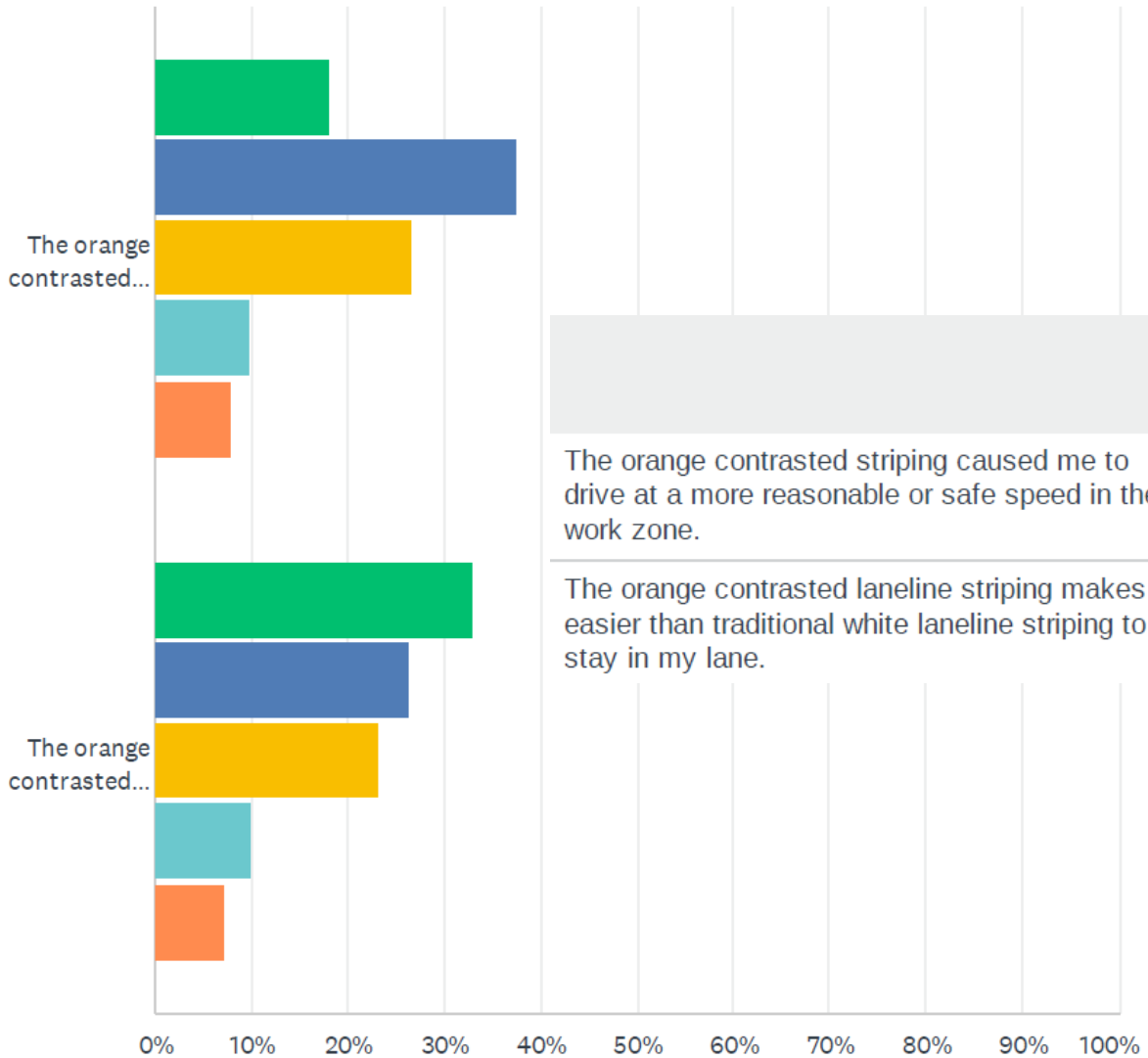
What is your opinion of the orange contrasted striping at night?

Answered: 465 Skipped: 474



Please select your level of agreement to the following statements:

Answered: 852 Skipped: 87

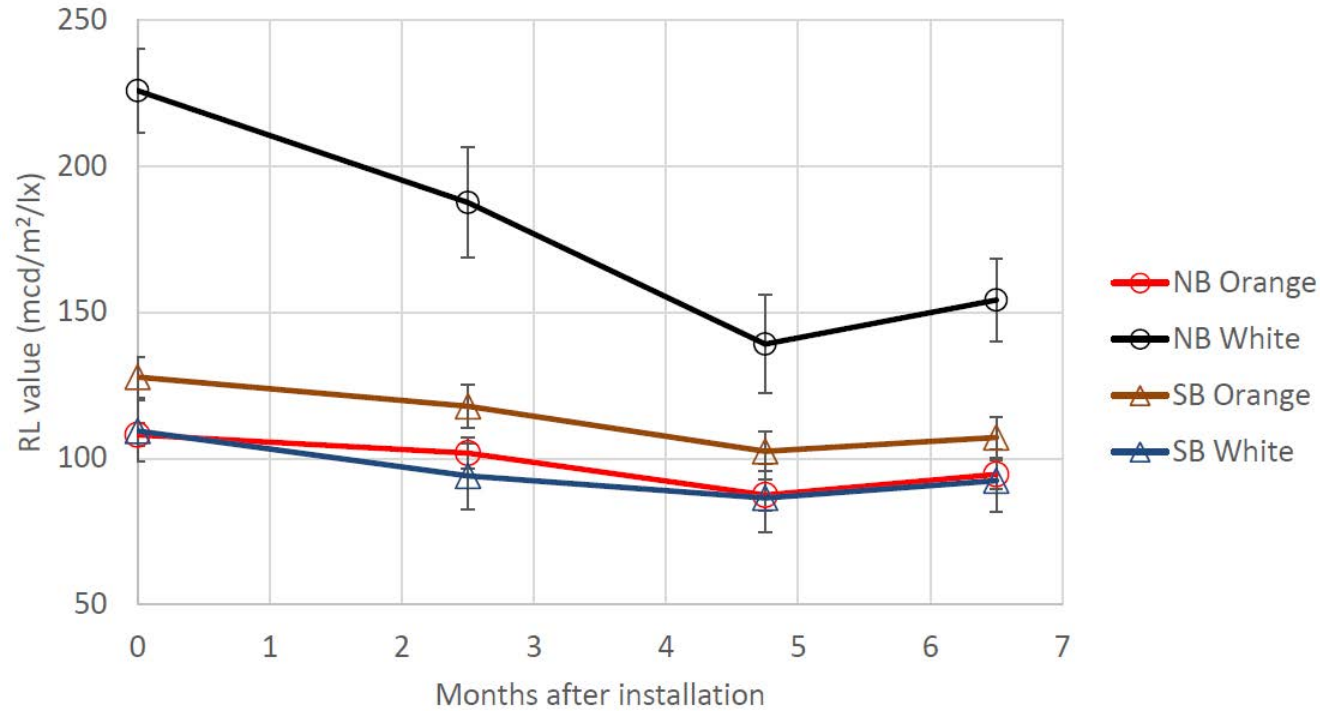


	STRONGLY AGREE	AGREE	NEITHER AGREE OR DISAGREE	DISAGREE	STRONGLY DISAGREE	TOTAL
The orange contrasted striping caused me to drive at a more reasonable or safe speed in the work zone.	18.08% 154	37.56% 320	26.64% 227	9.86% 84	7.86% 67	852

The orange contrasted laneline striping makes it easier than traditional white laneline striping to stay in my lane.	33.06% 281	26.35% 224	23.29% 198	10.12% 86	7.18% 61	850
--	---------------	---------------	---------------	--------------	-------------	-----

■ Strongly ag...
 ■ Agree
 ■ Neither agr...
 ■ Disagree
 ■ Strongly dis...

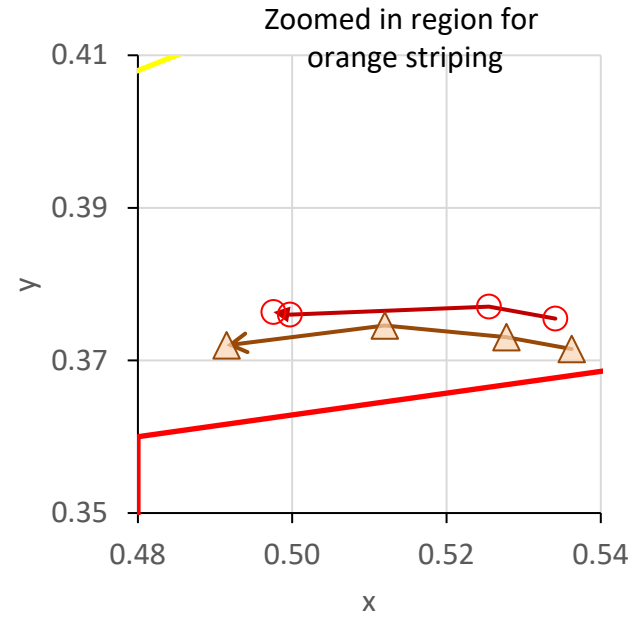
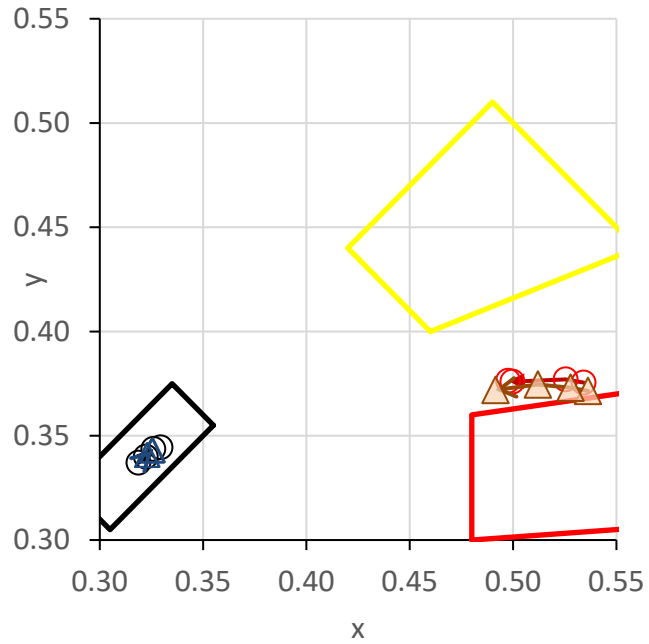
Average Retroreflectivity



Months	NB Orange		NB White		SB Orange		SB White	
	Av. RL	σRL	Av. RL	σRL	Av. RL	σRL	Av. RL	σRL
0	108.13	13.91	225.71	28.89	127.83	20.73	109.42	21.01
2.5	101.82	14.95	187.48	37.79	117.83	19.60	94.04	22.65
4.75	87.51	13.78	139.13	33.48	102.44	17.75	86.48	23.03
6.5	94.58	14.21	154.19	28.66	107.21	20.75	92.44	21.52

all Av. RL and σRL values in (mcd/m²/lx)

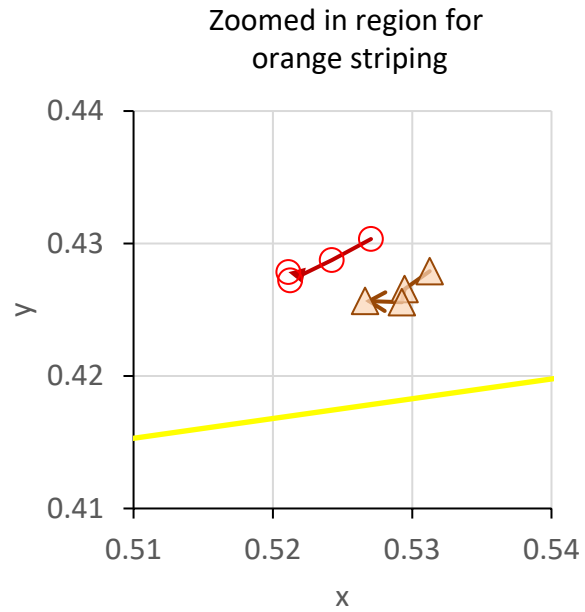
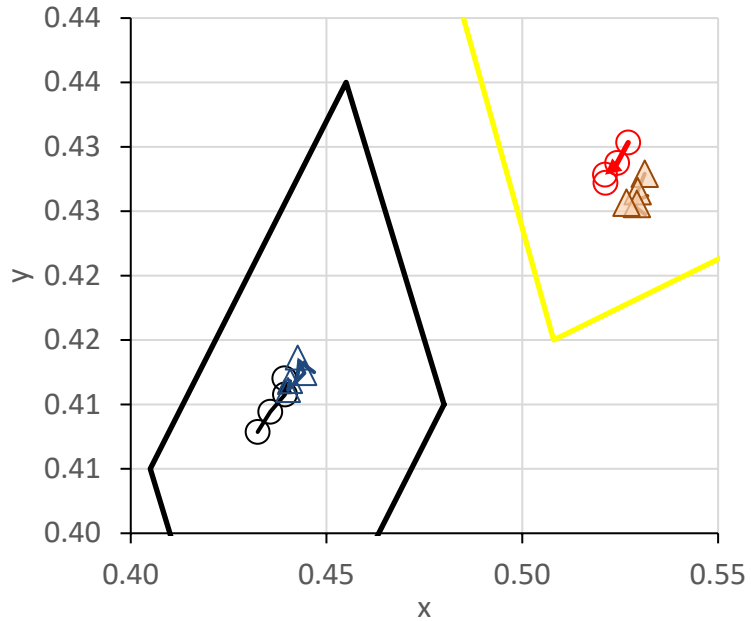
Daytime Chromaticity



- white region
- red region
- yellow region
- NB Orange
- NB White
- △ SB Orange
- △ SB White

	NB Orange		NB White		SB Orange		SB White	
Months	x	y	x	y	x	y	x	y
0	0.5341	0.3755	0.3187	0.3371	0.5362	0.3715	0.3228	0.3408
2.5	0.5255	0.3771	0.3223	0.3400	0.5278	0.3731	0.3232	0.3408
4.75	0.4997	0.3760	0.3295	0.3444	0.5120	0.3746	0.3257	0.3431
6.5	0.4976	0.3763	0.3259	0.3436	0.4915	0.3720	0.3253	0.3428

Nighttime Chromaticity



— white region

— yellow region

○ NB Orange

○ NB White

△ SB Orange

△ SB White

Months	NB Orange		NB White		SB Orange		SB White	
	x	y	x	y	x	y	x	y
0	0.5270	0.4303	0.4324	0.4079	0.5313	0.4279	0.4407	0.4118
2.5	0.5242	0.4287	0.4356	0.4094	0.5295	0.4266	0.4402	0.4111
4.75	0.5212	0.4272	0.4394	0.4108	0.5293	0.4256	0.4443	0.4124
6.5	0.5211	0.4278	0.4392	0.4120	0.5266	0.4257	0.4426	0.4136

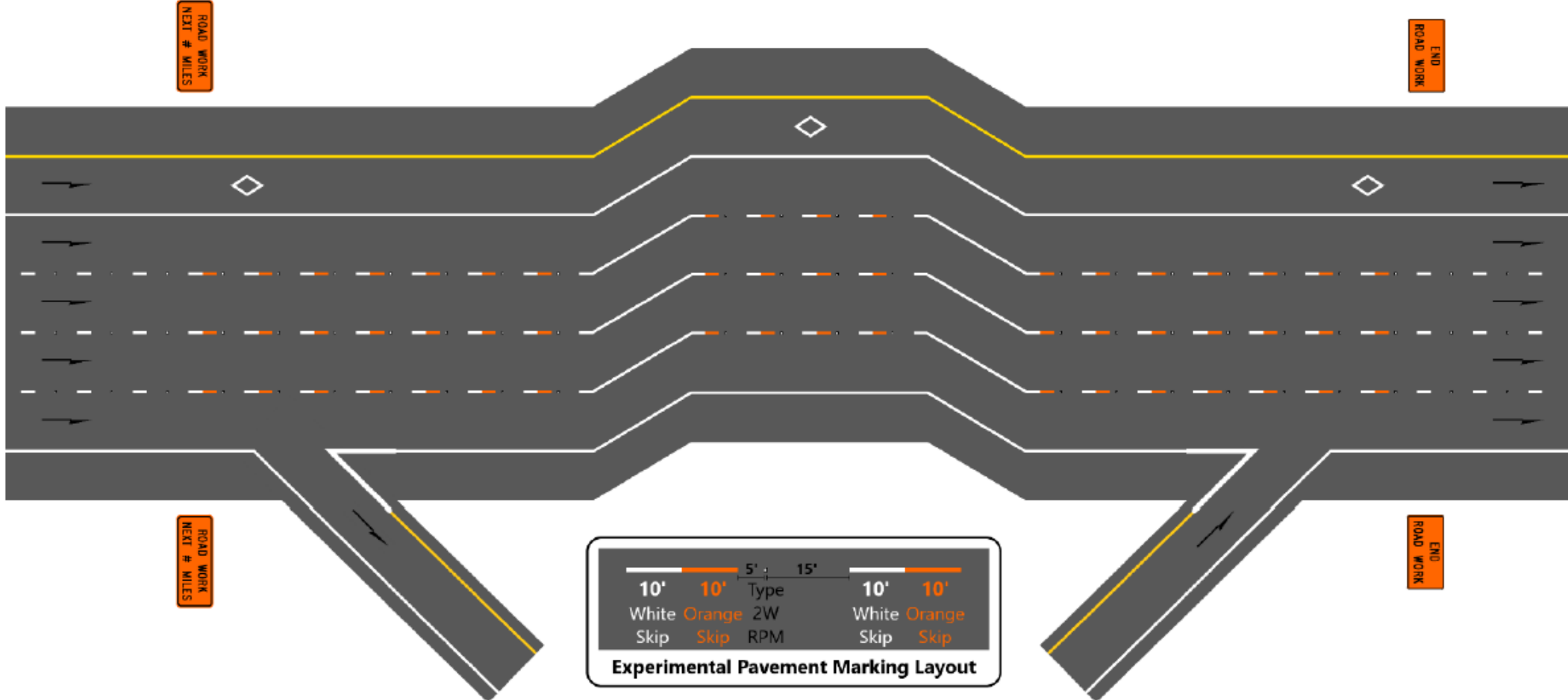
Request to Experiment

Orange Contrast Enhancing System in Work Zones
Washington State Department of Transportation

Table of Contents

Table of Contents.....	1
Background and Nature of Problem	2
Background	2
Nature of Problem	2
High-Profile Work Zone Intrusion	3
Highway Workers Are Vulnerable (FHWA, NACTO).....	3
Work Zone Safety Activities in Washington State	3
Objective.....	3
Description of Proposed Experimentation	4
Illustrations	4
Phase 1 – Conventional Work Zone Pavement Marking	4
Phase 2 – Experimental Work Zone Orange Contrast Enhancement	5
Supporting Information, Experimentations & Research.....	5
Non-proprietary statement	7
Project Information.....	7
Project Description	7
Project Staging Overview	8
Project Location	8
Vicinity Map	8
Project Location Sketch.....	9
Evaluation Plan	9
Agreement to Terminate or Restore Site	10
Progress Reports.....	10
Schedule.....	10
Technical Advisory Committee	10
Communications Plan	10
Contacts	11
Principal Investigator	Error! Bookmark not defined.
WSDOT	11
References	11

Phase 2 – Experimental Work Zone Orange Contrast Enhancement



The experimental work zone pavement marking contrast enhancement will match the conventional marking pattern, with the exception a 10-foot orange pavement contrast stripe will follow the 10-foot white, broken General Purpose lane lines. The left edge, HOV lane line, right edge, and gore markings will remain unchanged.







Leucadia 4
Encinitas 7
San Diego 32

FedEx

CERTIFIED

562-949-4930

2232

Black contrast examples with permanent stripe markings



California Manual on Uniform Traffic Control Devices (MUTCD) Section 3A

CHAPTER 3A. GENERAL

Section 3A.01 Functions and Limitations

Support:

01 Markings on highways and on private roads open to public travel (see definition in Section 1A.13) have important functions in providing guidance and information for the road user. Major marking types include pavement and curb markings, delineators, colored pavements, channelizing devices, and islands. In some cases, markings are used to supplement other traffic control devices such as signs, signals, and other markings. In other instances, markings are used alone to effectively convey regulations, guidance, or warnings in ways not obtainable by the use of other devices.

02 Markings have limitations. Visibility of the markings can be limited by snow, debris, and water on or adjacent to the markings. Marking durability is affected by material characteristics, traffic volumes, weather, and location. However, under most highway conditions, markings provide important information while allowing minimal diversion of attention from the roadway.

Section 3A.05 Colors

Standard:

01 Markings shall be yellow, white, red, blue, green or purple. The colors for markings shall conform to the standard highway colors. Black in conjunction with one of the colors mentioned in the first sentence of this paragraph shall be a usable color.

01a The color of curb markings shall conform to CVC 21458. Refer to CVC 21374 for exceptions.

02 When used, white markings for longitudinal lines shall delineate:

- A. The separation of traffic flows in the same direction, or**
- B. The right-hand edge of the roadway.**

03 When used, yellow markings for longitudinal lines shall delineate:

- A. The separation of traffic traveling in opposite directions,**
- B. The left-hand edge of the roadways of divided highways and one-way streets or ramps, or**
- C. The separation of two-way left-turn lanes and reversible lanes from other lanes.**

04 When used, red raised pavement markers or delineators shall delineate:

- A. Truck escape ramps, or**
- B. One-way roadways, ramps, or travel lanes that shall not be entered or used in the direction from which the markers are visible.**

Support:

04a Red pavement markers are used to alert possible wrong way drivers on freeways as shown in Figure 3A-102(CA) and Figure 3A-105(CA), Details 9A, 12A and 25A 14 and 14A.

Standard:

05 When used, blue markings shall supplement white markings for parking spaces for persons with disabilities.

06 When used, purple markings shall supplement lane line or edge line markings for toll plaza approach lanes that are restricted to use only by vehicles with registered electronic toll collection accounts.

Option:

07 Colors used for official route shield signs (see Section 2D.11) may be used as colors of symbol markings to simulate route shields on the pavement (see Section 3B.20.)

08 Black may be used in combination with the colors mentioned in the first sentence of Paragraph 1 where a light-colored pavement does not provide sufficient contrast with the markings.

08a If the material used for centerline marking is paint, a 3-inch wide black line may be placed between the 4-inch wide yellow lines on streets and highways under local jurisdiction.

Standard:

08b If the material used for centerline marking is paint, a 3-inch wide black line shall be placed between the 4-inch wide yellow lines on State highways.

09 When used in combination with other colors, black is not considered a marking color, but only a contrast-enhancing system for the markings.

Thank You

Questions?

