CALIFORNIA TRAFFIC CONTROL DEVICES COMMITTEE (CTCDC) AGENDA
August 9th, 2018 (9:00 A.M. to end)
Caltrans District 11
4050 Taylor Street San Diego, CA 92110
Garcia Auditorium 1-125

The Meeting is open and public/local agencies are invited to attend. For further information regarding this meeting, please contact Vijay Talada at (916) 653-1816, or email vijay.talada@dot.ca.gov. Electronic copies of this meeting Agenda and minutes of the previous meetings are available at http://www.dot.ca.gov/hq/traffops/engineering/ctcdc/index.htm.

Organization Items

1. **Introduction**

2. **Membership**

3. **Approval of Minutes of the May 10th, 2018 Meeting**

4. **Public Comments**

At this time, members of the public may comment on any item not appearing on the agenda. Matters presented under this item cannot be discussed or acted upon by the Committee at this time. For items appearing on the agenda, the public is invited to make comments at the time the item is considered by the Committee.

1. Public comment on items not appearing on the agenda shall be limited to a maximum of 5 minutes each. Total public comment period prior to agenda items shall not exceed 20 minutes. Chairperson will ask for a show of hands from the audience present who would like to speak on non-agendized items. The 20 minutes can be proportioned accordingly if there are more than four speakers wishing to speak. Or an additional public comment period on items not appearing on the agenda can be heard after all agenda items are heard.
2. Public comment on agenda item shall be limited to 3 minutes.
3. During public comments, a member of public may speak only once per agenda item unless specifically requested by a majority of the CTCDC to come back and comment again.
4. Longer comments should be provided in writing 10 days prior to the meeting.

Local agencies conducting experiments should incorporate public feedback (if any input was received) in the status report and/or the Final Report. The merits of an experiment's success will be based on the identified problem or issue the Local/State Agency has identified when requesting permission to experiment. Local/State policies decision are not for CTCDC debate or CTCDC public comment as the CTCDC evaluates the technical merits of the experiment and how well it addressed the identified problem or issue.

When addressing the Committee, for the record please state your name, address, and business or organization you are representing.

5. Items under Experimentation

17-15 Request for Experimentation-Red colored pavement markings for Transit Only Lanes in left turn only lanes-In person status report Pratyush Bhatia

Agenda Items

6. Public Hearing

Prior to adopting rules and regulations prescribing uniform standards and specifications for all official traffic control devices placed pursuant to Section 21400 of the California Vehicle Code, the Department of Transportation is required to consult with local agencies and hold public hearings.

Consent Items (minor discussion with vote expected)

Agenda Item	Description	Submitted by:	Lead	Pages

Information Items (New items that may be voted on or brought back as an Action Item in a future meeting)

Agenda Item	Description	Submitted by:	Lead	Page
18-14	Request for installation of new Freeway Service Patrol (FSP) Sponsor Acknowledgement Signs	Caltrans	Duper Tong	8-9
18-10	Intersection control Evaluation-Draft Language	Caltrans	Duper Tong	10-11

Action Items (Continuing discussion from prior meetings with vote expected)

Agenda Item	Description	Submitted by:	Lead	Page
15-18	Proposal for street names for bridges over Class I bikeway and at Class I bikeway intersections	Caltrans	Duper Tong	12-13

Request for Experimentation

Agenda Item	Description	Submitted by:	Lead	Page
18-15	Request for experimentation with modified 4-section traffic control and R10-15b sign	City of San Diego	Andrew Maximous	14-22
18-16	Request to experiment: Non-standard red colored pavement	Caltrans District 11	Duper Tong	23-28
18-17	Proposal for experimental use of a non-standard traffic control device – green stripe next to edge line	Caltrans District 6	Duper Tong	29-32
18-18	Proposal for experimental use of red pavement markings at a railroad at-grade crossing	CPUC	Duper Tong	33-44
18-19	Proposal for experimental use of a non-standard traffic control device – signing for I-805 and SR-94 transit only lane pilot project	SANDAG	Duper Tong	45-48

Discussion Items

Agenda Item	Description	Submitted by:	Lead	Page

7. Tabled Items

Agenda Item	Description	Submitted by:	Lead

8. Next Meeting
November 1, 2018
TBD

9. Adjourn

5. Items under Experimentation

Some reports are available at: http://www.dot.ca.gov/hq/traffops/engineering/ctcdc/status.htm

12-9 Request to Experiment with Yellow LED Border on Pedestrian Signal (Duper Tong)
Status-6/21/2018-Before data has been collected from D4 and D1. After data is being collected. Cameras will be installed at D12 locations next week.
Status-1/17/2018-Equipment has been installed in D4, and D1 has received the devices
Status-10/3/2017 –Equipment is in the process of being installed to collect before data.
Status-5/18/2017-CTCDC approved the expansion of the experiment
Status: 1/18/17 – Additional locations are being pursued to install this device and collect additional data as per FHWA guidance.
The complete report is posted on the following website:
http://www.dot.ca.gov/hq/traffops/engineering/ctcdc/reports.htm

Joel T. Retanan, P.E., Chief
Division of Research, Innovation and System Information, Caltrans
Ph: (916) 654-8174

12-21 Request to Experiment with In-Roadway Warning Lights (IRWL) System that would supplement existing traffic signals along the Metro Gold Line (LA Metro) (David Fleisch)
Status: 6/20/2018-Final report and attachments to be sent to FHWA shortly.
Status: 1/16/2018: Data is being analyzed
Status: 10/2/2017: Data collection is complete and is currently being analyzed
Status: 3/29/2017: Data collection is in progress
Status: 3/10/2017: LA Metro has received FHWA approval regarding request to modify experiment
Status: 1/11/2017: *8(09)-8(E)-Red In-Roadway Lights at LRT Grade Crossings-Los Angeles, CA (Reference# HOTO-1)*
Lia Yim
LA Metro
Transportation Planning Manager
Countywide Planning & Development, Active Transportation
213.922.4063
YimB@metro.net

15-12 Evaluation of Traffic Calming in Treatments in Princeton, CA (Mike Sallaberry)

Status: 6/20/2018 Caltrans is currently re-surfacing the southern portion of the experimental segment of the project. They should have the experimental striping back in place by the end of next week. Once the striping is replaced, we will collect one more round of data as the visual impact of new pavement with new striping may prove to be a better combination. I'd expect a final report to Caltrans, CTCDC, and FHWA by the end of the calendar year.

Scott M. Lanphier, PE, CFM
Director of Public Works+
1215 Market Street
Colusa, CA 95932
slanphier@countyofcolusa.org

16-08 Request for Permission to Experiment with the Diagonal Down Yellow Arrow Lane Use Control Signal Indications on Freeway (Duper Tong)
Status Date 6/25/2018 District 4 has not implemented experimental graphics yet on the LUS on I-80 due to the opening of the Richmond San Rafael Bridge 3rd Lane Project opening to traffic on April 20, 2018. The RSR Bridge also has the same lane use signs that control the part-time lane, and RSR Bridge connects to the I-80 corridor. Caltrans did not want to confuse the drivers with diagonal down yellow arrows on I-80, when the RSR Bridge 3rd Lane LUS displayed Yellow X. Caltrans is reaching out to FHWA to add RSR Bridge to the experiment.
Status Date- 08/04/2017 Before data is being collected. The data will be collected till fall 2017.
Status Date-08/31/2016 FHWA had provided approval to the request for experimentation
David Man
Caltrans District 4-Senior Transportation Engineer – Electrical

16-09 Request for Permission to Experiment with the Messages and Graphics on Dynamic Message Signs on Freeway (Duper Tong)
Status Date- 6/25/2018 District 4 has started displaying some experimental messages during major incidents with no reported issues. We are moving forward with testing the 4-5 line experimental travel time messages along with BART transit travel times this summer – the experimental messages will be ON throughout the day. Caltrans had some technical delays with BART on exchanging the travel time information from their system, but all issues appeared to be resolved. UC Berkeley recently completed the human factors lab testing of the GRIP aka Congestion Maps display, and researchers are proceeding with driver simulation studies with hopes to submit results to FHWA at the end of 2018 with the goal of live field testing in 2019. The UC Berkeley Study is managed by DRISI.
Status Date- 08/04/2017 Before data is being collected. Experimental six line display message concepts on the six information display boards will be displayed in fall 2017
Status Date-12/9/2016 FHWA had provided approval to the request for experimentation
David Man
Caltrans District 4-Senior Transportation Engineer – Electrical

16-23 Request to experiment with Green backed sharrow in Goleta, CA (Bryan Jones)
Status: 6/29/18 The City has had some delays with our pavement maintenance program for this year and next year. It had been identified that the area of Hollister Ave where we had identified for placement of the Green-backed sharrows was in need of an overlay. We wanted to wait until after the pavement rehabilitation before placing the sharrows since they are expensive to put down. I can provide more information and a schedule for placement once the pavement maintenance projects are scheduled. The pre-construction counts and observations have been completed, the sharrows have not been placed yet.

Status: 11/16/2017 Green backed share lane markings were not installed and agency is waiting for the completion of the slurry seal project which is scheduled to be completed in spring-summer 2018.
Status Date-7/17/2017- The City has completed the before conditions observations. Currently waiting to place the Sharrows until after a needed slurry seal is placed in the project area and it is anticipated that the slurry will be placed late this summer.
Status Date-1/10/2017
The experiment is ongoing. Traffic counts and video data were collected for the before condition observations with standard white shared lane markings on Hollister Avenue in the fall of 2016. The installation of the experimental green-backed sharrows will occur in the next couple months following completion of a roadway surface rehabilitation project that is scheduled for spring of this year on Hollister Avenue.
Thank you,
Teresa

Teresa Lopes, PE
Senior Project Manager
City of Goleta
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16-25 Request to experiment with through lane bicycle box, City of South Pasadena (Mike Sallaberry)
Status Date- 6/25/2018-The project is in the final stage 85% complete. The outstanding items are signage and push ped-buttons. The project is anticipated to be complete early July 2018.
Status Date- 1/18/2018 – The project is out for bid. The bid opening will be on January 30, 2018.
Status Date-10/11/2017- Before study has been completed. The engineering plans are being reviewed. The project is planned to be advertised in November and the project should be complete by January.
Status Date-7/17/2017
The "Before" study will be conducted sometime in the late summer or early autumn of this year after school starts. The "After" study will be conducted after construction, preferably at the same time of year as the "Before" study.

Status Date-1/19/2017
City of South Pasadena is in the process of collecting the “Before” Data

Margaret Lin
Principal Management Analyst
City of South Pasadena
MLin@southpasadenaca.gov

16-33 Request to experiment with non-standard striping detail at Express lanes (Duper Tong)

Status Date -6/20/2018 – RCTC plans on submitting a Final Report by Sep 14 for the Nov 1 CTCDC agenda.
Status Date -8/10/2017- Provided an in person status report at the Aug 10th, CTCDC meeting
Status Date -3/29/2017 -Experimental striping was installed on March 20, 2017
David Thomas
Riverside County Transportation Commission
DThomas@RCTC.org

17-15 Request for Experimentation-Red colored pavement markings for Transit Only Lanes in left turn only lanes (Pratyush Bhatia)

Status Date –6/20/2018- The RED BUS ONLY pavement markings were installed at the two approved locations Mid-May and the City will start collecting data for the after conditions later this month or early July to measure the effect of them
Status Date –10/4/2017 In the process of obtaining bids.
Status Date –08/28/2017-FHWA approval was received

Massoud Saberian, PE,
Transportation and Public Works - Traffic Engineering
69 Stony Circle, Santa Rosa, CA 95401
Tel. 707-543-3818

17-16 Request to Experiment with Internally Illuminated Raised Pavement Markers
LA Metro (David Fleisch)

Status Date-6/21/2018: The design is complete and mylar plans are circulating at the moment for approval signature.
Status Date –10/4/2017 In the process of Designing plans.

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6. Public Hearing

Consent Items (minor discussion with vote expected)

Information Items (New items that may be voted on or brought back as an Action Item in a future meeting)

Item 18-14 Request for installation of new Freeway Service Patrol (FSP) Sponsor Acknowledgement Signs

Recommendation: Grant approval to request the development and installation of new signs.

Requesting Agencies/Sponsor: Metropolitan Transportation Commission (MTC)/ Duper Tong, CTCDC Voting member

Caltrans, CHP, and MTC are partnering on this effort.

Proposal:

MTC is developing a 2-year pilot "sponsorship program" for the FSP on a limited number of State highways in the San Francisco Bay Area. This public-private partnership will allow a business entity to place its branding on FSP trucks for a fee. A key component of these sponsorship programs is the placement of acknowledgement signs on those section of highway which will be patrolled by the sponsored FSP trucks.

There are similar types of FSP sponsorship programs in 38 different states. Revenues from the sponsorship programs allow FSP operators to maintain and even increase the services provided. The purpose of these signs is to inform the traveling public that the service has been sponsored by a person, firm, or entity. The Federal Highway Administration has issued memoranda and policies giving their support and concurrence to these sponsorship programs and the use and placement of the acknowledgement signs.

The sponsorship program would be implemented on 17 FSP patrol routes, or beats. The proposal is for at least 2 signs per beat, so there would be at least 28 to 34 signs installed. Many beats include more than one highway, and Caltrans will later confirm specific installation locations and number of signs. Proposed routes are as follows:

Alameda County: Routes 84, 92, 580, and 880
Contra Costa County: Routes 24 and 680
Marin County: Routes 37, 101, and 580
Napa County: Routes 12 and 29
San Francisco County: Routes 80, 101 and 280
San Mateo County: Routes 92, 101, 280, and 380
Santa Clara County: Routes 85, 87, 101, and 280

Solano County: Routes 12, 37, 80, 505, 680, and 780
Sonoma County: Routes 37 and 101

Signs would be installed prior to the beginning of the pilot program in July 2019.

The new sign to be developed and finalized is based on the following mockup. The sign has been developed in conformance with the FHWA policies on these acknowledgement signs and Section 2H.08-Acknowledgment Signs of the CA MUTCD. The sign layout to provide a blank sponsor area for any future FSP sponsors that may want to participate per adopted policy.

MOCKUP
66”x48” sign with 5”D and 4”D letters
56” maximum recognition area width

Item 18-10 Proposed Changes to Section 4C.01

Recommendation: Request the committee to recommend to include in the CA MUTCD, amendments to Section 4C.01

Agency Making Request/Sponsor: Duper Tong, CTCDC Voting Member (Caltrans)

Note: Red text is newly proposed text.

~~Struck-out blue~~ text is to be deleted from the CA MUTCD.

Background:

At the May 2017 CTCDC Meeting, Caltrans' representatives gave a presentation on the use of ICE strategies, for transportation improvement projects located on and off the State Highway System, and how they can be incorporated to enhance safety and improve mobility on California roadways. The presentation was well received, and the CTCDC suggested that Caltrans consider providing additional guidance for local agencies throughout California.

At the May 2018 CTCDC meeting, Caltrans has proposed policy text and had received CTCDC feedback. The feedback from the CTCDC meeting was to develop "stronger" language regarding consideration of a roundabout while evaluating an intersection for the appropriate traffic control.

The complete meeting minutes can be accessed at:

http://www.dot.ca.gov/trafficops/ctcdc/docs/CTCDC-05-10-18.pdf

This proposal is also consistent with Strategic Highway Safety Plan (SHSP) strategy to improve intersections, interchanges and other roadway access by mainstreaming and accelerating the deployment of highly effective and cost-effective solutions, including roundabouts.

Roundabouts are known to provide safety advantages for all modes of travel. The proposed updates to the CA MUTCD requirements for street and highway infrastructure projects will add new, or expand/modify existing intersections and interchanges guidance to include the evaluation of roundabouts as a countermeasure.

The increased use of roundabouts and other innovative solutions for intersection, interchange and roadway safety is endorsed by the SHSP lead agencies, including but not limited to: Caltrans, CHP, DMV, OTS, CDPH, DMV, EMSA, ABC, California State Association of Counties, and the League of California Cities.

Proposal:

Section 4C.01 Studies and Factors for Justifying Traffic Control Signals

Standard:

01 **An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.**

01a **~~On State highways, the~~ The engineering study shall include consideration of a roundabout (yield control). If a roundabout is determined to provide a viable and practical solution, it shall be studied in lieu of, or in addition to a traffic control signal.**

~~*Guidance:*~~

01b ~~*On local streets and highways, the engineering study should include consideration of a roundabout (yield control). If a roundabout is determined to provide a viable and practical solution, it should be studied in lieu of, or in addition to a traffic control signal.*~~

Support:

01b Refer to Caltrans' website (http://www.dot.ca.gov/hq/traffops/liaisons/ice.html) for more information on the Traffic Operations Policy Directive 13-02, Intersection Control Evaluation (ICE), and other resources for the evaluation of intersection traffic control strategies.

Option:

01c Local agencies may develop their own criteria to study the feasibility of roundabouts when considering intersection modifications on roadways under their jurisdiction.

Standard:

02 **The investigation of the need for a traffic control signal shall include an analysis of factors related to the existing operation and safety at the study location and the potential to improve these conditions, and the applicable factors contained in the following traffic signal warrants:**

Warrant 1, Eight-Hour Vehicular Volume
Warrant 2, Four-Hour Vehicular Volume
Warrant 3, Peak Hour
Warrant 4, Pedestrian Volume
Warrant 5, School Crossing
Warrant 6, Coordinated Signal System
Warrant 7, Crash Experience
Warrant 8, Roadway Network
Warrant 9, Intersection Near a Grade Crossing

03 **The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.**

Action Items (Continuing discussion from prior meetings with vote expected)

Item 15-18 Proposal for street names for bridges over Class I bikeway and at Class I bikeway intersections

Recommendation: Request CTCDC to recommend inclusion of the proposed policy regarding street names at intersections with Class I bikeway and at overpass or bridges when a Class I bikeway crosses under the overpass or bridge.

Agency Making Request/Sponsor: Caltrans/ Duper Tong, CTCDC voting member

Background

At the December 2015 CTCDC meeting, this agenda item was introduced and after discussion CTCDC had recommended that a subcommittee be formed to propose amendment to the CA MUTCD regarding street name signage on Class I bikeways intersections and on overcrossings where Class I bikeways pass underneath the overcrossing.
A subcommittee was formed with CTCDC Active transportation representatives, Caltrans and CTCDC Local Agency representatives and this proposal was developed based on the feedback received from the sub-committee.
The intent of this proposal is to enhance wayfinding for the Class I bikeway users.

Proposal

Proposed text changes are provided in red. The yellow highlighted text is the proposed strikethrough to indicate that the policy is not applicable in California.

Section 2D.43 Street Name Signs (D3-1 or D3-1a)

Guidance:

01 *Street Name (D3-1 or D3-1a or G7-1(CA)) signs (see Figure 2D-10 and 2D-10(CA)) should be installed in urban areas at all street intersections regardless of other route signs that might be present and should be installed in rural areas to identify important roads that are not otherwise signed.*

01a *Street Name (D3-1 or D3-1a or G7-1(CA) signs should be installed at all street and Class I bikeway intersections and at all Class I bikeway intersections.*

Option:

02 For streets that are part of a U.S., State, or county numbered route, a D3-1a Street Name sign (see Figure 2D-10) that incorporates a route shield may be used to assist road users who might not otherwise be able to associate the name of the street with the route number.

Standard:

03 **The lettering for names of streets and highways on Street Name signs shall be composed of a combination of lower-case letters with initial upper-case letters (see Section 2A.13).**

Guidance:

04 *Lettering on post-mounted Street Name signs should be composed of initial upper-case letters at least 6 inches in height and lower-case letters at least 4.5 inches in height.*

….

….

Section 9B.20 Bicycle Guide Signs (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c, D11-1, D11-1c, D3-1, D3-1a and G7-1(CA))

Option:

01 Bike Route Guide (D11-1) signs (see Figure 9B-4) may be provided along designated bicycle routes to inform bicyclists of bicycle route direction changes and to confirm route direction, distance, and destination.

02 If used, Bike Route Guide signs may be repeated at regular intervals so that bicyclists entering from side streets will have an opportunity to know that they are on a bicycle route. Similar guide signing may be used for shared roadways with intermediate signs placed for bicyclist guidance.

03 Alternative Bike Route Guide (D11-1c) signs may be used to provide information on route direction, destination, and/or route name in place of the "BIKE ROUTE" wording on the D11-1 sign (see Figures 9B-4 and 9B-6).

04 Destination (D1-1, D1-1a) signs, ~~Street Name (D3) signs,~~ or Bicycle Destination (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c) signs (see Figure 9B-4) may be installed to provide direction, destination, and distance information as needed for bicycle travel. If several destinations are to be shown at a single location, they may be placed on a single sign with an arrow (and the distance, if desired) for each name. If more than one destination lies in the same direction, a single arrow may be used for the destinations.

Guidance:

04a Street Name (D3-1 or D3-1a or G7-1(CA)) signs should be installed at all street and Class I bikeway intersections and at all Class I bikeway intersections. See Section 2D.43

05 *Adequate separation should be made between any destination or group of destinations in one direction and those in other directions by suitable design of the arrow, spacing of lines of legend, heavy lines entirely across the sign, or separate signs.*

New proposed Section in Part 9:

Section 9B.104 (CA) Signs on Overcrossing Structures

Support:

01 Signage identifying overcrossing structures over a Class I bikeway can be useful in orienting bikeway users.

02 Consider the skew of the structure (greater than 45 degrees), height of the overcrossing structure, and other pertinent factors while determining the feasibility of installing the sign.

Option:

03 Street Name (D3-1 or D3-1a or G7-1(CA)) signs identifying the overcrossing structure over a Class I bikeway may be installed on the overcrossing structure. If sign installation on the overcrossing is not practical, roadside sign installation may be considered.

Guidance:

04 Structural analysis should be considered prior to installation of signs on the overcrossing structure.

Standard:

05 Encroachment permits shall be required for a local agency to install signs on overcrossing structures within State right-of-way.

Request for Experimentation

Item 18-15 Request for experimentation with modified 4-section traffic control and R10-15b sign

Recommendation: Request CTCDC to grant approval to the request for experimentation

Agency Making Request/Sponsor: City of San Diego/ Andrew Maximous, CTCDC voting member

Project Background

The Bayshore Bikeway is a regional corridor that will eventually extend 24 miles around San Diego Bay, providing a vital and scenic connection to major bayfront employers, as well as tourist and recreational destinations. Approximately 16 miles of bike paths have been built to date. The remainder of the existing bikeway consists of on-street segments designated as either bike lanes or bike routes.

The San Diego Association of Governments (SANDAG) is developing additional improvements to the Bayshore Bikeway based on the Bayshore Bikeway Plan, which was adopted by SANDAG in 2006 to identify opportunities to improve the bikeway, primarily along the east side of the San Diego Bay. The objective is to develop a continuous Class I bike path that would allow bike riders to ride all the way around San Diego Bay on a dedicated path away from city streets.

The Barrio Logan segment of the bikeway will stretch 2.5 miles along Harbor Drive between Park Boulevard and 32nd Street and will connect two existing Class I segments of the bikeway. The SANDAG Transportation Committee approved the California Environmental Quality Act (CEQA) exemption for this segment on April 21, 2017. The project is currently in the final design phase and staff is working to obtain required permits for the project, including approval under the National Environmental Policy Act. Construction is expected to be completed in May 2020.

Figure 1. The Proposed Barrio Logan Segment of the Bayshore Bikeway (Image courtesy of SANDAG)

Figure 2. Proposed Project Area & Proposed Experiment Locations
(Image courtesy of Google Maps, Map Data 2018 © and Snazzy Maps)

A. Statement indicating the nature of the problem.

Like many jurisdictions throughout the State and nation, the City of San Diego is concerned with the non-compliance of motorists yielding right-of-way to pedestrians and bicyclists at signal-controlled intersections where Class I shared-use paths are present. To address the motorist non-compliance, the City of San Diego is pursuing an experimental application of a 4-section traffic control signal (CIRCULAR RED, CIRCULAR YELLOW, CIRCULAR GREEN, and flashing right-turn YELLOW ARROW) and a modified R10-15 sign that includes both a pedestrian and bicyclist symbol. The purpose of these experimental treatments is to alert permissive right-turn motorists of pedestrians and bicyclists traveling on the adjacent Class I shared-use path and to remind them to yield right-of-way.

B. Description of the proposed change to the traffic control device or application of the traffic control device, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standard.

Overview

The City of San Diego wishes to experiment with:

1. The modified application of a 4-section traffic control signal capable of displaying: CIRCULAR RED, CIRCULAR YELLOW, CIRCULAR GREEN, and flashing right-turn YELLOW ARROW to be used as a "shared signal".
2. A modified R10-15 sign that includes both a pedestrian and bicyclist symbol.

These new traffic control devices are proposed at the following locations within the City:

1. Cesar E. Chavez Parkway / East Harbor Drive
2. Sampson Street / East Harbor Drive
3. Schley Street / East Harbor Drive
4. Belt Street / East Harbor Drive

4-Section Traffic Control Signal (R,Y,G,YA)

Per Section 4D.22, Paragraph 1, Section C of the 2014 Revision 3 CA MUTCD, "a permissive only **shared signal face**… shall always simultaneously display the same color of circular indication that the adjacent through signal face or faces display."

For through-right lanes with permissive only right-turn movements, the shared signal face capable of displaying CIRCULAR RED, CIRCULAR YELLOW, and CIRCULAR GREEN will be modified to also include a flashing right-turn YELLOW ARROW. This additional flashing right-turn YELLOW ARROW will be simultaneously actived when the CIRCULAR GREEN of the adjacent/shared through signal faces are activated.

This modification seeks to mimic the flashing right-turn YELLOW ARROW provided for right-turn only lanes with permissive only right-turns using **separate signal faces** as shown in Figure 4D-14 of the 2014 Revision 3 CA MUTCD.

The addition of a flashing right-turn YELLOW ARROW on a **shared signal face** reinforces the idea that right-turn movements are **permissive**, and that motorist must be aware of, and yield to, pedestrian/bicycles movements, despite the CIRCULAR GREEN given to the adjacent and shared through lane.

Modified R10-15 Sign

Per the 2014 Revision 2 CA MUTCD Sign Charts, an R10-15 sign shows "Turning Vehicles Yield to Pedestrians." The proposed experimental modification will revise the R10-15 sign to show "Turning Vehicles Yield to Bicycles/Pedestrians." The addition of "Bicycles" to the R10-15 sign will alert drivers that not only pedestrians, but also bicyclists, should be looked for before executing a right-turn.

Future Expansion of Scope

In addition to the four (4) experimentation locations listed above, City of San Diego may be interested in an addendum to this request for experimentation. The City is in the process of developing an extensive network of low-stress urban bikeways.

C. Any illustration that would be helpful to understand the traffic control device or use of the traffic control device

Figure 3. Modified R10-15

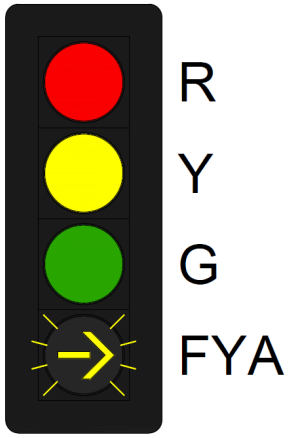


Figure 4. Shared Traffic Control Signal (R,Y,G,YA)

(Figures continue on next page)

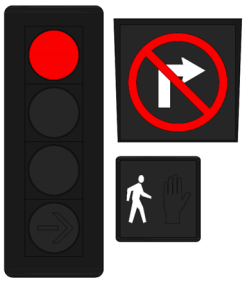
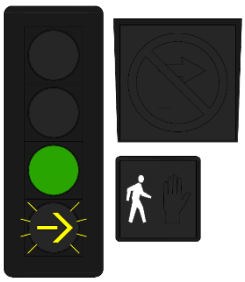
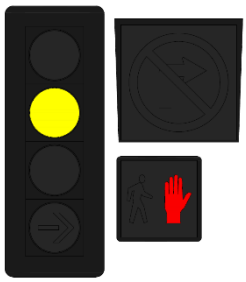
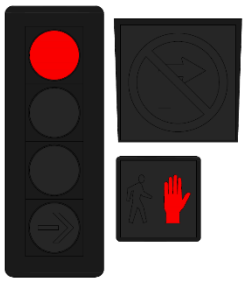
			
1.) Phase begins with leading bike and pedestrian interval. Blank-out sign is activated to prohibit right-turn movements.	2.) Permissive turns across protected shared-use path with flashing yellow arrow for motor vehicles.	3.) Solid yellow change interval.	4.) All red.

Figure 5. Proposed Signal Operations for Permissive Right-Turn Vehicle Movements Across Shared Path

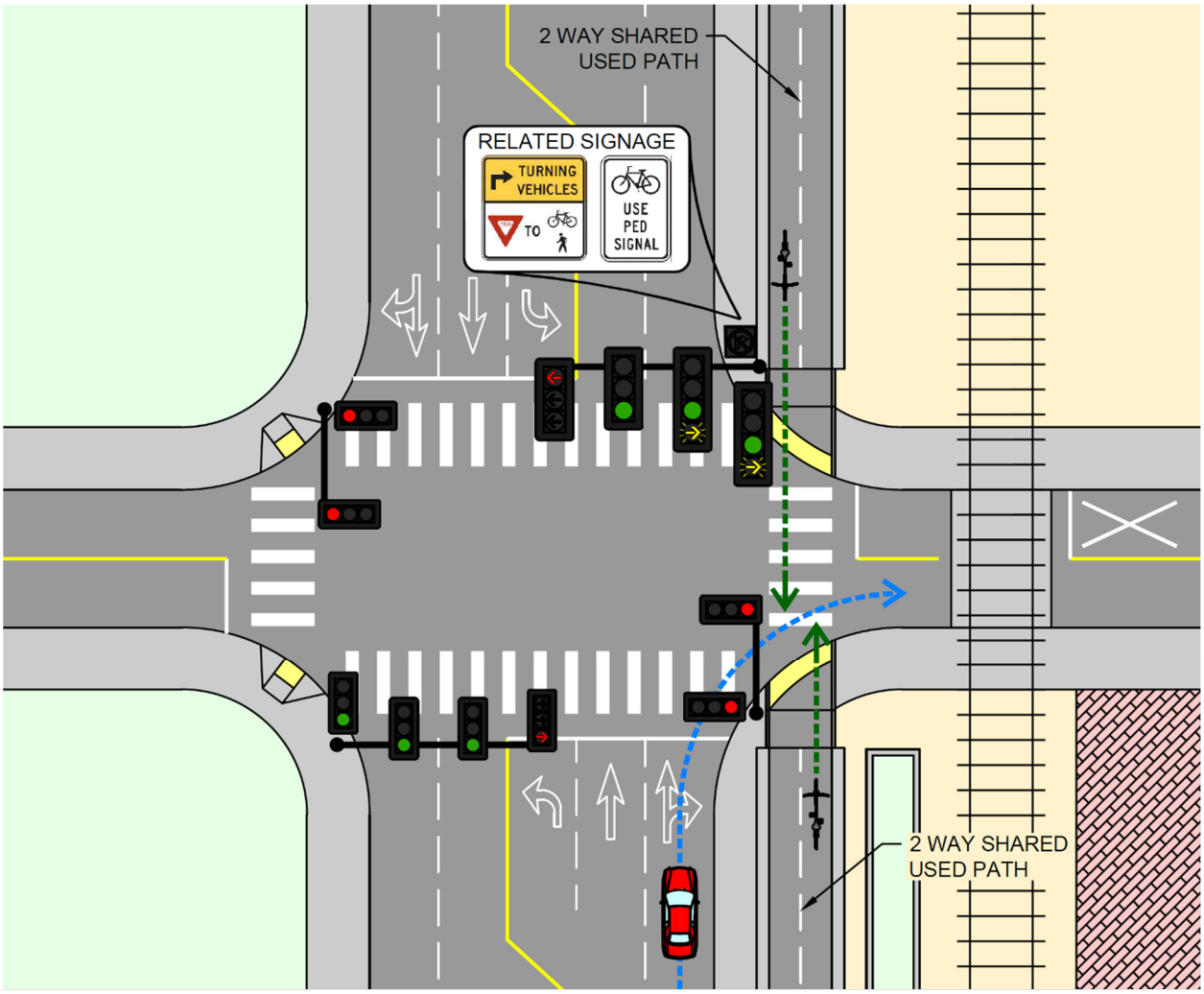


Figure 6. Proposed Layout of Experimental Traffic Control Devices

D. Any supporting data explaining how the traffic control device was developed, if it has been tried, in what ways it was found to be adequate or inadequate, and how this choice of device or application was derived.

4-Section Vehicle Signal Head (R,Y,G,YA)

The modified application of a 4-section traffic control signal (R,Y,G,YA) to be used as a shared signal is consistent with a similar application by the City of Spartanburg, South Carolina, which was approved for experimentation in December of 2016.

Modified R10-15 Sign

This application of a modified R10-15 sign to include both bicycles and pedestrians is consistent with similar applications of a modified R0-15 sign, where conflicting motor vehicles movements cross separated pedestrian/bicycle facilities. Examples can be seen in many locations throughout the United States, including the following cities:

- Cambridge, MA
- Seattle, WA
- New York, NY
- Pittsburgh, PA
- Washington, DC

E. A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright.

To the best of the City of San Diego's knowledge, the modified application of a 4-section traffic control signal (R,Y,G,YA) to be used as shared signal and a modified R10-15 sign that includes both a pedestrian and bicycle symbol, and is not protected by patents or copyrights.

F. The time period and location(s) of the experiment.

Installation of Equipment …… May 2020
Experimentation Period…… May 2020 to May 2021
Evaluation of Results…… Jun 2021
Draft of Final Report…… Aug2021
Final Report…… Oct 2021

G. A detailed research or evaluation plan that must provide for close monitoring of the experimentation, especially in the early stages of its field implementation. The evaluation plan should include before and after studies as well as quantitative data describing the performance of the experimental device.

Overview

The proposed experimental devices and applications will be installed and implemented during the construction of Bayshore Bikeway Barrio Logan Segment that runs along East Harbor, expected to be completed in May 2020.

Prior to this construction, the City of San Diego staff will conduct video observations at similar intersections that feature Class I bikeways and conflicting right-turn movements along the already constructed segments of the Bayshore Bikeway south of the proposed Barrio Logan segment. These observations will be used to determine baseline trends for comparison to the intersections where experimentation will be conducted. The City will also review crash histories and historic traffic counts.

Evaluation metrics are anticipated to include:

- Crash data at the experiment locations
- Motorist and bicyclist behavior and compliance with the devices
    - Yielding behavior
- Motorist and bicyclist interactions
    - Crashes
    - Near misses

As these metrics are evaluated, the City of San Diego will closely monitor conflicts between motorists and bicyclists, with particular scrutiny in the first month of operation. If a substantial number of conflicts are observed at any time during the experimentation, the City will take appropriate steps to remedy the safety issues.

H. An agreement to restore the site of the experiment to a condition that complies with the provisions of the CA MUTCD within 3 months following the end of the time period of the experiment. This agreement must also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines significant safety concerns are directly or indirectly attributable to the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation at any time if there is an indication of safety concerns. If, as a result of the experimentation, a request is made that the CA MUTCD be changed to include the device or application being experimented with, the device or application will be permitted to remain in place until an official rulemaking action has occurred.

The City of San Diego agrees to the above conditions.

I. An agreement to provide semi-annual progress reports for the duration of the experimentation, and an agreement to provide a copy of the final results of the experimentation to the FHWA's Office of Transportation Operations within 3 months following completion of the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation if reports are not provided in accordance with this schedule.

The City of San Diego agrees to the above conditions.

Item 18-16 Request to experiment: Non-standard red colored pavement

Recommendation: Request CTCDC to grant approval to the request for experimentation

Agency Making Request/Sponsor: Caltrans D11/ Duper Tong, CTCDC voting member

The California Department of Transportation (Caltrans) requests approval to conduct an experiment using retroreflective red colored pavement on a Portland Cement Concrete (PCC) bus only lane as a non-standard/new traffic control device to determine its effectiveness in improving operations and safety at the ingress areas and along the dedicated bus only lanes prior to a bus rapid transit station located in the freeway median. The comprehensive work plan is discussed below. Upon completion of the experiment, Caltrans will provide a report that summarizes Caltrans' findings and recommendations.

BACKGROUND

State Route 15 has two Bus Rapid Transit (BRT) stations located in the freeway median in the City of San Diego, California. These facilities have been in operation since March 11, 2018. Ridership access to the BRTs is from above, via either University Avenue or El Cajon Boulevard. Buses access the freeway median BRT stations via the dedicated bus only lanes. The northbound (NB) bus only lane, from the opening to the merge on the trailing end, is approximately 12,650-feet (2.40 miles) while the southbound (SB) bus only lane, from the opening to the merge on the trailing end, is approximately 12,930-feet (2.45 miles). Approaching and within the BRT station areas, State Route 15 is a 6-lane facility with auxiliary lanes. The portion south of Meade Avenue is classified as an Other Principal Arterial, and the portion north of Meade Avenue is classified as an Other Principal Arterial - Freeway or Expressway. The BRTs are south of Meade Avenue.

The use of red colored pavement for public bus systems such as streetcar and/or bus-only lanes is currently experimental. Additionally, the use of colored pavement in these settings requires approval from the FHWA's Office of Transportation Operations. Agencies that desire to experiment with colored pavement should only do so where an engineering study can determine that increased travel speeds will be expected by the public bus vehicle, reduced overall service time through the corridor will be expected by the public bus vehicle, and the implementation of the colored pavement to a converted general purpose lane in the traveled way will not adversely affect the traffic flow in the remaining general purpose lanes.

Caltrans requests approval to conduct an experiment using red colored pavement for a minimum of 365 feet at the openings of the dedicated bus only lane in each direction. The red colored pavement will be supplemented by appropriate signs at the ingress locations improving operations and safety for buses entering the bus only lanes. The red colored pavement will also be supplemented by pavement markings "MTS BUSES ONLY", see Figure 1 below, and spaced approximately every 1000-feet, to enhance motorist notification that the bus only lanes are reserved for buses. The experimental red colored pavement would only be used for the dedicated bus only lanes in the freeway median leading to the BRT stations.

FIGURE 1

The San Diego Association of Governments (SANDAG) originally designed, with Caltrans oversight, the dedicated bus only lanes to improve on-time performance and connections between the existing *Rapid* and local bus routes. After the opening of the BRT stations, some motorists began using the bus only lanes, believing they were an additional lane/HOV lane which lead motorists through the BRT stations. The California Highway Patrol (CHP) immediately began enforcing the dedicated bus only lane when vehicles started using it as a general purpose (GP) lane. On the first day, over 20 vehicles were cited for using the dedicated bus only lane. Within the first month, the CHP has given 55 warnings and 300 tickets; two of the motorists were driving under the influence of alcohol. Subsequent days have shown a reduction in violations but any vehicle other than a bus might create a potential conflict with pedestrians or stopped buses within the BRT station.

The NB ingress is approximately 0.41 mile from the barrier separated BRT station while the SB ingress is approximately 1.17 mile from the barrier separated BRT station. The entrance to the BRT lane is as shown in Figure 2. The dedicated bus only lanes are separated from the GP main lanes by a chevron striped buffer with delineators spaced at 48 feet down the middle of the buffer, Figure 3. Vehicles are using the dedicated bus only lane to bypass the congestion on SR-15 during peak periods and continue downstream to reenter the GP main lanes, thereby queue jumping. This creates a safety concern when vehicles enter the dedicated bus only lanes and merge back over to the GP main lanes into higher speed traffic. Vehicles traversing the BRT station create an additional safety concern.

FIGURE 2

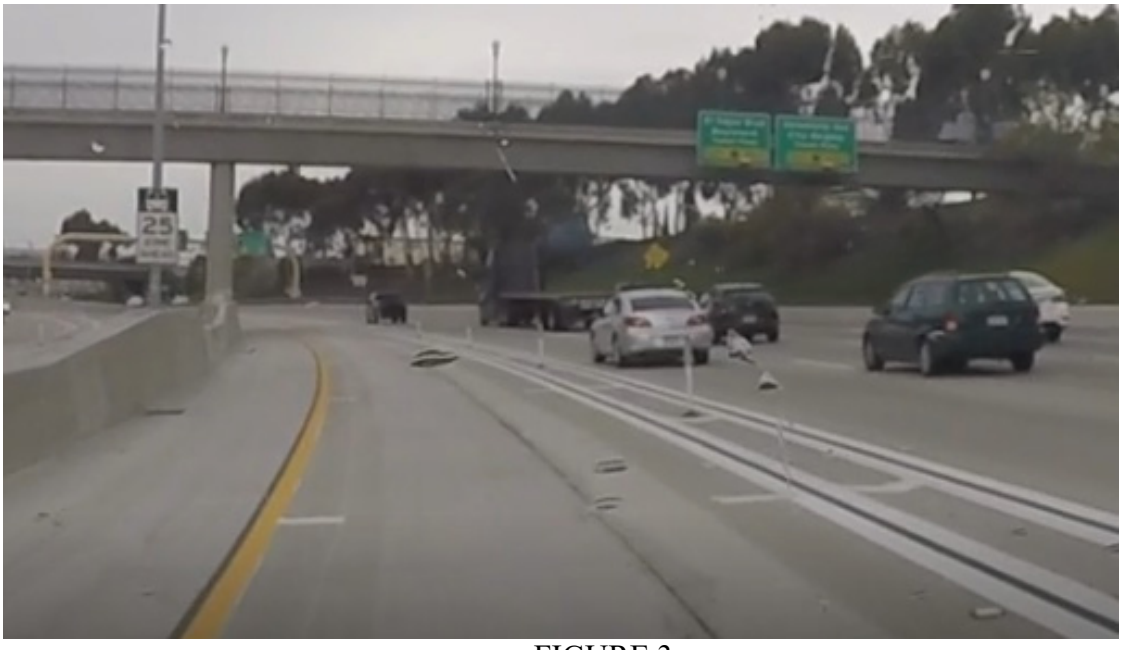


FIGURE 3

PROPOSED SOLUTION

The NB ingress transition area begins on a tangent at the end of a right curve (Exhibit 1, pages 4-5). There is a 365' BUS lane opening consisting of an 8" solid white stripe with straddling 1.5" black stripes separating the dedicated bus only lane from the GP main lanes. Following the ingress is a variable width buffer separating the dedicated bus only lane from the GP main lanes. The buffer has

double double 8" solid white stripes with a 1.5" black stripe in between, white chevrons spaced at approximately 24', and white delineators spaced at approximately 48' down the middle. The buffer continues for approximately 1685 feet. The next 4585 feet are within the BRT station concrete barrier/retaining wall buffer separation. Upon exiting the concrete barrier/retaining wall buffer separation, the bus lane is separated from the GP main lanes by a striped buffer consisting of double double 8" solid white stripes with a 1.5" black stripe in between, white chevrons spaced at approximately 24', and white delineators spaced at approximately 48' down the middle for approximately 5040 feet. This is followed by a 475-foot striped buffer consisting of two 8" solid white stripes straddled with 1.5" black stripes on the edges and white delineators spaced at approximately 48' down the middle. The buffer terminates with a 500-foot section of an 8" solid white stripe straddled with 1.5" black stripes on the edges becoming the #1 NB GP main lane.

The SB ingress transition area begins on a right curve, terminating at the tangent point (Exhibit 1, pages 9-14). There is a 365' BUS lane opening consisting of an 8" solid white stripe with straddling 1.5" black stripes separating the dedicated bus only lane from the GP main lanes. Following the ingress is a variable width buffer separating the dedicated bus only lane from the GP main lanes. The buffer has double double 8" solid white stripes with a 1.5" black stripe in between, white chevrons spaced at approximately 24', and white delineators spaced at approximately 48' down the middle. The buffer continues for approximately 5800 feet. The next 4480 feet are within the BRT station concrete barrier/retaining wall buffer separation. Upon exiting the concrete barrier/retaining wall buffer separation, the bus lane is separated from the GP main lanes by a striped buffer consisting of double double 8" solid white stripes with a 1.5" black stripe in between, white chevrons spaced at approximately 24', and white delineators spaced at approximately 48' down the middle for approximately 585 feet. This is followed by a 425-foot striped buffer consisting of two 8" solid white stripes straddled with 1.5" black stripes on the edges and white delineators spaced at approximately 48' down the middle. The buffer terminates with a 1275-foot section of an 8" solid white stripe straddled with 1.5" black stripes on the edges merging with the #1 SB GP main lane.

Red colored pavement would help to distinguish the dedicated bus only lane from the GP main lanes. This would help to notify motorists that the dedicated bus only lane is for buses only providing a clearer path/delineation to motorists. It would reduce the potential for collisions within the BRT station. It would improve operations in the ingress area by discouraging movements from the GP main lanes into the dedicated bus only lane preventing unnecessary weaving.

Similar red colored pavement exists in a few locations in the United States:

- l-495 Long Island Expressway, NY
- US-36 Colorado
- l-405 Orange County, CA (yellow stripe application)

Based on discussions with Captain James Nellis and his staff of the California Highway Patrol ("CHP") San Diego Division, CHP believes the experimental red colored pavement would be beneficial to discouraging motorists from using the dedicated bus only lanes. Furthermore, the CHP has requested additional signs to further emphasize the dedicated bus only lane.

OBJECTIVE

The objective of the test will be to determine the effectiveness of the experimental red colored pavement supplemented by appropriate signs to improve operations and safety for buses entering the dedicated bus only lane and in keeping GP motorists from using the dedicated bus only lane. The signs and red colored pavement concept plan is included as Exhibit 1. The measure of effectiveness will be general purpose drivers that use the bus lane only before the red pavement is implemented compared to those that use the lane after the treatment.

WORK PLAN

The recently opened median BRT station has been integral in improving bus times for the MTS Rapid Transit network. Effectiveness and acceptance will be measured in accordance with the time period and evaluation procedures shown below.

EXPERIMENT SCHEDULE

- Pre-Installation Evaluation - N/A
- Installation - September 2018
- Experimental Period of Violators - September 2018 to November 2018
- Experimental Period for Red Pavement Durability - September 2018 to February 2019
- Evaluation of Results - April 2019

Three months is considered sufficient time to evaluate effectiveness since this corridor experiences recurring commuting traffic. It is also important that any modifications necessary are made while the current contractor is still onboard.

EVALUATION PROCEDURES

Caltrans District 11 requests that the CTCDC approve the preliminary evaluation plan outlined below. A separate request will be made to the FHWA's Office of Transportation Operations. Other criteria and procedures may evolve during the evaluation period. The additional ways of evaluating the use of the red colored pavement and any changes in procedures added to the assessment criteria will be discussed in the scheduled reports submitted to the project sponsor, CTCDC and the FHWA.

1) Installation Documentation - to be prepared by Caltrans personnel.
2) Maintenance Recording - to be performed throughout the life of the experimentation period. A separate maintenance log sheet will be created for each site. Periodic inspections will be performed and logged by Caltrans Maintenance personnel.
3) Field observations will be performed to determine the effectiveness of the operation. Video and photographs will be used to help document the operation and for reporting to Caltrans and other interested public agencies. Measures of effectiveness and acceptance before, during, and after the testing period may include, but are not limited to, the following actions:

    - Evaluate vehicular conflicts in the ingress zone;
    - Evaluate driver behaviors along the red colored pavement sections; and

- Compare the number vehicles complying or in violation of the dedicated bus only lane (The CHP will be conducting dedicated enforcement during the first three months of the pilot)

ADDITIONAL EVALUATION REQUESTED BY FHWA

1) District 11 will be submitting a similar request to FHWA Office of Transportation Operations, as required by Memorandum dated August 15, 2013: MUTCD – Official Ruling 3(09)-24(I) – Application of Colored Pavement, attached.

Thank you for your consideration of this request. Caltrans is looking forward to working with the CTCDC and FHWA to improve the SR-15 BRT operation to provide a safe and integrated transportation system.

If you have any questions or comments, please feel free to contact me at 619-688-6668 or Marcelo Peinado, District Division Chief of Traffic Operations, at 619-688-3142.

Sincerely,

TIM GUBBINS
Interim District Director
Caltrans District 11

c: Marcelo Peinado, District Division Chief of Traffic Operations
Carmen Sandoval, Public & Legislative Affairs, Caltrans District 11

Attachments:

- Exhibit 1 - Signs and Pavement Marking Concept Plan (16 pages)
- California Highway Patrol letter regarding enforcement issues with the recent opening of the freeway median BRT station/dedicated bus only lane
- MUTCD Official Ruling 3(09)-24(I) Application of Colored Pavement Memorandum

Item 18-17 Proposal for experimental use of a non-standard traffic control device – green stripe next to edge line

Recommendation: Grant approval to request for experimentation
Requesting Agencies/Sponsor: Caltrans District 6/ Duper Tong, CTCDC Voting Member

Proposal
To provide additional guidance for motorists and bicyclists, Caltrans District 6 is proposing to place a 6 inch green stripe along the outer side of edgelines on State highways where bicycle travel is permitted and the additional emphasis is advised.

A. A statement indicating the nature of the problem

There are several freeways that are open to bicycle traffic but not readily apparent to motorists or bicyclists. Typically the only visual cue that a freeway is open to bicycles is signing that does not prohibit bicycles at the beginning of on-ramps. Bicyclists therefore may not realize that they can enter a freeway on-ramp that allows bicyclists, and motorists may not expect bicyclists on the freeway.

There are many conventional highways with wide shoulders that are well suited for bicycle travel. While the shoulders could be designated as Class II bicycle lanes in many cases, there are maintenance considerations with designating bicycle lanes. There is an expectation of a higher level of maintenance in a Class II bicycle lane than a shoulder with regard to debris removal and condition of the surface. Bicycle lane pavement markings and signing also add to the maintenance. While parking is not prohibited in a bicycle lane unless signed, there is a general expectation that bicycle lanes are free from stopped vehicles, and the placement of no parking signs would further add to the maintenance workload. Placing a green stripe in a shoulder could be a more feasible option than installing Class II bicycle lanes to identify a facility suitable for bicycle traffic.

Before edgeline widths were increased from 4 inches to 6 inches in 2017, there was a visible distinction between the Detail 27B edgeline stripe and the 6 inch Detail 39 bicycle lane stripe. The 6 inch green stripe would provide additional conspicuity for Class II bicycle lanes at a much lower cost than having an entirely green bicycle lane.

B. A description of the proposed change, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.

The green stripe is proposed for placement either in shoulders or Class II bicycle lanes to emphasize that bicycles may use the highway facility.

FHWA has issued Interim Approval for optional use of green colored pavement for bicycle lanes (IA-14, dated April 15, 2011). The allowed uses are within bicycle lanes, or extension of bicycle lanes across intersections, driveways, or turn lanes. The Interim Approval states that green colored pavement may be installed within bicycle lanes as a supplement to the other pavement markings that are required for the designation of a bicycle lane. They may be installed for the entire length of the bicycle lane or for only a portion (or portions) of the bicycle lane. The Interim Approval further states that the pattern of the green colored pavement may be installed as a rectangular background behind the word, symbol, and arrow pavement markings in a bicycle lane as a means of enhancing the conspicuity of these word, symbol, and arrow pavement markings. The Interim Approval does not explicitly mention using green colored pavement to enhance a bicycle lane stripe. The Interim Approval also does not address the use of green pavement in shoulders not designated as bicycle lanes.

There have been some applications of green pavement outside designated bicycle lanes or extensions of bicycle lanes. Sharrow markings have been installed within a green rectangular background through the experimental process with FHWA.

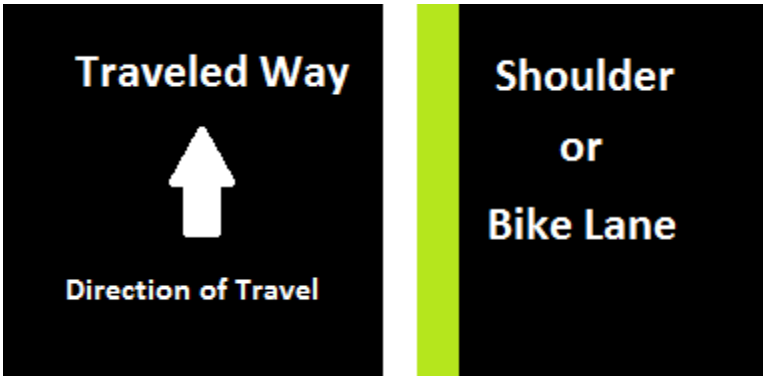
Source: FHWA

The City of Long Beach has an active experiment with a "lane-within-a-lane" or "super sharrow" in which a 6-foot wide portion of the middle of the outside lane was painted green with sharrow markings. The City of Oakland has a similar treatment on a street with a 5-foot wide green band.

Source: FHWA

C. Any illustration, photograph, or videos, which would help, explain the experimental device or use of this device.

The 6 inch green stripe will be placed immediately to the right of the 6 inch edgeline. If a rumble strip is in the shoulder, the green stripe could be placed to the right of the rumble strip.



D. Any supporting data as to how the experimental device was developed, if it has been tried, in what ways it was found to be adequate or inadequate, and how was this choice of device or application arrived at.

Green Class II bicycle lanes and bike boxes are becoming more commonplace, and green is therefore becoming increasingly recognized as denoting a bicycle facility. Placing a green stripe in a shoulder or bicycle lane would be a new application of colored pavement. The green stripe would increase the conspicuity of facilities used by bicyclists and would help in wayfinding for bicyclists and in providing a complete bicycle network.

Placing and maintaining a green stripe in a shoulder would require less maintenance and exposure of workers to traffic than having frequent installations of signs and pavement markings.

E. A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright.

To the best of the Caltrans' knowledge, the concept of using green bicycle stripe next to edgeline is not protected by patents or copyrights.

F. The time period and location(s) of the experiment.

The experiment will occur from approximately April 1, 2019 to March 31, 2020.

Three locations are proposed:

1. State Route 41 from Friant Road in Fresno County to Rio Mesa Boulevard in Madera County – This is a 2.8-mile segment of freeway between two interchanges to provide an alternate route to the old parallel highway, which will be relinquished. The freeway was recently opened to bicyclists because of an ongoing bridge construction project on the old route, and for many bicyclists it also provides a more direct connection that the old route, which is not continuous and requires bicyclists to travel on a path through a regional park.
2. State Route 168 from Temperance Avenue to Owens Mountain Parkway in Fresno County – This is a 1.4 mile segment of freeway between an interchange and the first at-grade intersection where the route becomes an expressway.

3. State Route 58 from Bealville Road/Bena Road to Keene in Kern County – This is a 5.0 mile segment of freeway currently open to bicyclists for which there is no convenient parallel local facility for bicyclists. There is one interchange in the middle of this segment.

G. A detailed research or evaluation plan that must provide for close monitoring of the experimentation, especially in the early stages of its field implementation. The evaluation plan should include before and after studies as well as quantitative data describing the performance of the experimental device.

Before and one-year after bicycle traffic counts would be taken at all test locations to see if the bicycle volume increased. Motorists and bicyclists will also be surveyed as for their understanding of the purpose of the green stripe.

H. An agreement to restore the site of the experiment to a condition that complies with the provisions of this Manual within 3 months following the end of the time period of the experiment. This agreement must also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines significant safety concerns are directly or indirectly attributable to the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation at any time if there is an indication of safety concerns. If, as a result of the experimentation, a request is made that this Manual be changed to include the device or application being experimented with, the device or application will be permitted to remain in place until an official rulemaking action has occurred.

Caltrans agrees to the above conditions.

I. An agreement to provide a progress report at 6 months for the experimentation and an agreement to provide a copy of the final results of the experimentation to the FHWA's Office of Transportation Operations within 3 months following completion of the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation if reports are not provided in accordance with this schedule.

Caltrans agrees to the above conditions.

Item 18-18 Proposal for experimental use of red pavement markings at a railroad at-grade crossing

Recommendation: Request feedback and grant approval to request for experimentation
Requesting Agencies/Sponsor: CPUC/ Duper Tong, CTCDC Voting Member

The California Public Utilities Commission (CPUC), in conjunction with the California Department of Transportation (Caltrans), requests permission to conduct an experiment utilizing red pavement markings at a railroad at-grade crossing. This experiment will study the effects of such markings, covering the entire dynamic envelope[1] of a representative crossing. The objective is to reduce the number of motor vehicle drivers who stop within or in proximity to the dynamic envelope.

1. PROBLEM STATEMENT

The United States has more than 212,000 highway-rail grade crossings where roadways intersect railroad tracks. California alone has over 10,000 highway-rail crossings. Nationwide, over the ten years from 2008 through 2017, 21,095 accidents, resulting in over 2,500 deaths and over 9,000 injuries, occurred at these crossings. In California, 1,393 highway-rail accidents resulted in over 300 deaths and over 750 injuries during this period.[2]

There are limited data disaggregating the various causes of highway-rail grade crossing accidents that show why drivers fail to stop before entering the dynamic envelopes of crossings. The Federal Railroad Administration (FRA) lists causes for a subset of highway-rail accidents – those causing monetary damage to rail equipment and track above a prescribed amount – that indicate that highway user inattentiveness and highway user misjudgment are important factors.[3]

2. PROPOSED SOLUTION

Under the proposed experiment, red markings would be placed within the dynamic envelope at a railroad at-grade crossing, with the concurrence of the local jurisdiction and the railroad company. A researcher would review driver behavior to ascertain whether the markings reduce unsafe driver behavior, i.e., stopping on or near the dynamic envelope of the crossing.

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[1] The area between and six feet adjacent to each side of railroad tracks at a highway-rail track grade crossing

[2] Federal Railroad Administration, Office of Safety Analysis, Table 1.12, Ten Year Accident/Incident Overview, Highway-Rail Incidents, http://safetydata.fra.dot.gov/officeofsafety/publicsite/Query/TenYearAccidentIncidentOverview.aspx

[3] Federal Railroad Administration, Office of Safety Analysis, Table 3.10, Accident Causes, M – Highway-Rail Grade Crossing Accidents, http://safetydata.fra.dot.gov/officeofsafety/publicsite/Query/inccaus.aspx. For the period 2008-2017, out of 1,815 U.S. highway-rail accidents creating damage to rail equipment above the prescribed amounts (which varied from $8,500 in 2008 to $10,700 in 2017), 42 percent were attributed to highway user inattentiveness, and 15 percent were attributed to highway user misjudgment.

Several sections of the *California Manual on Uniform Traffic Control Devices* (CA MUTCD) specify current requirements for pavement markings at highway-rail crossings, including Sections 8B.27, 28, and 29; and 3G.01. Section 8B.29 states in part:

> *Guidance:*
> *If pavement markings are used to convey the dynamic envelope, they should be placed completely outside of the dynamic envelope. If used, dynamic envelope pavement markings should be placed on the highway 6 feet from and parallel to the nearest rail unless the operating railroad company or LRT agency advises otherwise.*

CA MUTCD Section 3G.01 limits the use of colors for markings. White and yellow are the only pavement colors allowed for use as a traffic control devices. Section 3G.01 states:

> **Standard:**
> 03 **If colored pavement is used within the traveled way, on flush or raised islands, or on shoulders to regulate, warn, or guide traffic or if retroreflective colored pavement is used, the colored pavement is considered to be a traffic control device and shall be limited to the following colors and applications:**
> **A. Yellow pavement color shall be used only for flush or raised median islands separating traffic flows in opposite directions or for left-hand shoulders of roadways of divided highways or one-way streets or ramps.**
> **B. White pavement color shall be used for flush or raised channelizing islands where traffic passes on both sides in the same general direction or for right-hand shoulders.**

However, there are a number of interim approvals and authorized experimentations that allowed other colors to be used[4], such as green markings along bike lanes. The Federal Highway Administration (FHWA) previously allowed the use of red markings for experimentation. For example, in 2012, the California Traffic Control Devices Committee (CTCDC)[5] and FHWA[6] authorized the installation of red markings along transit lanes in San Francisco.

This experiment would place pavement markings within, rather than outside of, the dynamic envelope of the selected crossing. The markings would be solid red, rather than the practice shown in some MUTCD figures of using white lines along the edge of the dynamic envelope. The proposed red markings would be a traffic control device used to warn traffic, not an aesthetic treatment.

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[4] "MUTCD – Official Ruling 3(09)-24(I) – Application of Colored Pavement," US Department of Transportation, Federal Highway Administration, August 15, 2013.

[5] CTCDC agenda item 12-18, "Request to Experiment with Red Colored Transit-Only Lanes," CTCDC meeting of August 30, 2012.

[6] FHWA Official Ruling "9(03)-18(E) – Red Colored Pavement for Transit-Only Lanes – San Francisco, CA," September 13, 2012.

The hypothesis is that these changes would improve the ability of drivers to recognize the crossing and where to stop, prior to entering dangerous locations in proximity to railroad tracks. Such markings show great potential in reducing the number of accidents occurring at crossings, especially those resulting from inattentiveness or misjudgment.

3. OBJECTIVE

The objective of the test will be to determine the effectiveness of red pavement markings in influencing drivers to stop outside of the dynamic envelope at the selected crossing.

4. EXPERIMENT SCHEDULE

The schedule is to be determined, in concert with Caltrans, the local jurisdiction, and the railroad company.

Thank you for your consideration of this request. The Commission is looking forward to receiving a positive response from the Committee. Please feel free to call me at (213) 308-7698 if you have questions or comments.

Sincerely,

Roger Clugston, Deputy Director
Office of Rail Safety (ORS)
Safety Enforcement Division (SED)
California Public Utilities Commission
320 West 4th Street, Suite 500
Los Angeles, CA 90013

or

505 Van Ness
San Francisco, CA 94102

roger.clugston@cpuc.ca.gov
rnc@cpuc.ca.gov
www.cpuc.ca.gov

PROPOSAL TO THE CALIFORNIA TRAFFIC CONTROL DEVICES COMMITTEE FOR EXPERIMENTATION OF A NEW TRAFFIC CONTROL DEVICE:

RED PAVEMENT MARKINGS AT A RAILROAD AT-GRADE CROSSING

SCOPE

CPUC, in conjunction with Caltrans, proposes to conduct an experiment utilizing red pavement markings at a railroad at-grade crossing on a State Highway. The proposed location is at the Yosemite Avenue at-grade crossing in the City of Escalon in San Joaquin County, U.S. Department of Transportation Crossing Identification number 028781R. The experiment will study the effects of such markings, covering the entire dynamic envelope at a representative crossing. The objective is to reduce the number of motor vehicle drivers who stop within or in proximity to this envelope. CPUC expects that following evaluation of this initial location, it would be appropriate to expand the experimentation to multiple crossings to evaluate motorist behavior at other locations.

Previous studies provide evidence that pavement markings within the dynamic envelope can reduce the number of motor vehicle drivers who stop within or in proximity to this envelope. In April 2014, the FRA published a research paper titled *"Effect of Dynamic Envelope Pavement Markings on Vehicle Driver Behavior at a Highway-Rail Grade Crossing."* In that study, yellow pavement markings were placed within the dynamic envelope of the Commercial Boulevard grade crossing in Fort Lauderdale, Florida, along with new corresponding signage. The goal of the study was to evaluate the effectiveness of these measures in reducing the number of vehicles that came to a stop within the dynamic envelope, thus lowering the possibility that a vehicle would be present on the rail tracks when a train approached the crossing.

Researchers coded driver-stopping behavior at the Commercial Boulevard crossing for two 14-day periods. Vehicles were coded as having stopped in one of four zones: behind the stop line and gate arm (Zone 1), past the stop line but before the tracks (Zone 2), on the tracks (Zone 3), or immediately after the tracks (Zone 4). Stopping in Zone 3 was considered to be the most dangerous driver behavior, while stopping in Zone 1 was the safest.

Results indicated that the addition of the dynamic envelope pavement markings and modified signage reduced the proportion of vehicles that stopped in Zone 3 by 45 percent in the eastbound direction and 15 percent in the westbound direction. They also increased the proportion of vehicles that stopped in Zone 1, by 9 percent eastbound and 6 percent westbound. Additionally, the study found fewer vehicles stopping in both Zone 2 and Zone 4, which were both moderately dangerous. In particular, there was a 39 percent decrease in the number of motorists stopping in Zone 4 eastbound and a 36 percent decrease for westbound vehicles.[7]

[7] Gabree, S., Chase, S., and daSilva, M., "Effect of Dynamic Envelope Pavement Markings on Vehicle Driver Behavior at a Highway-Rail Grade Crossing," DOT-VNTSC-FRA-13-05, April 2014, https://rosap.ntl.bts.gov/view/dot/12047, pp. 1, 33.

A long-term evaluation of the project concluded that improvements in safe behavior by drivers at the Commercial Boulevard crossing were still evident two years after the markings were installed.[8]

To our knowledge, no similar studies have been conducted in California, and research is needed whether pavement markings would be effective in this state, as well as whether red pavement markings would have similar or greater positive effects on motorist behavior compared with the yellow markings in Florida. No new signage would be needed at the proposed location, as current signage conforms with applicable standards.

Background

For railroad at-grade crossings, the dynamic envelope is the area between and six feet adjacent to each side of railroad tracks. The California MUTCD defines the dynamic envelope as follows: ""Dynamic Envelope—the clearance required for light rail transit traffic or a train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure (see Figure 8B-6(CA) Sheet 1 of 3)." Any object within the dynamic envelope has the potential to be struck by a train as the train passes through the crossing.

[8] Personal communication, Marco daSilva, Volpe National Transportation Systems Center, U.S. Department of Transportation, June 20, 2017.

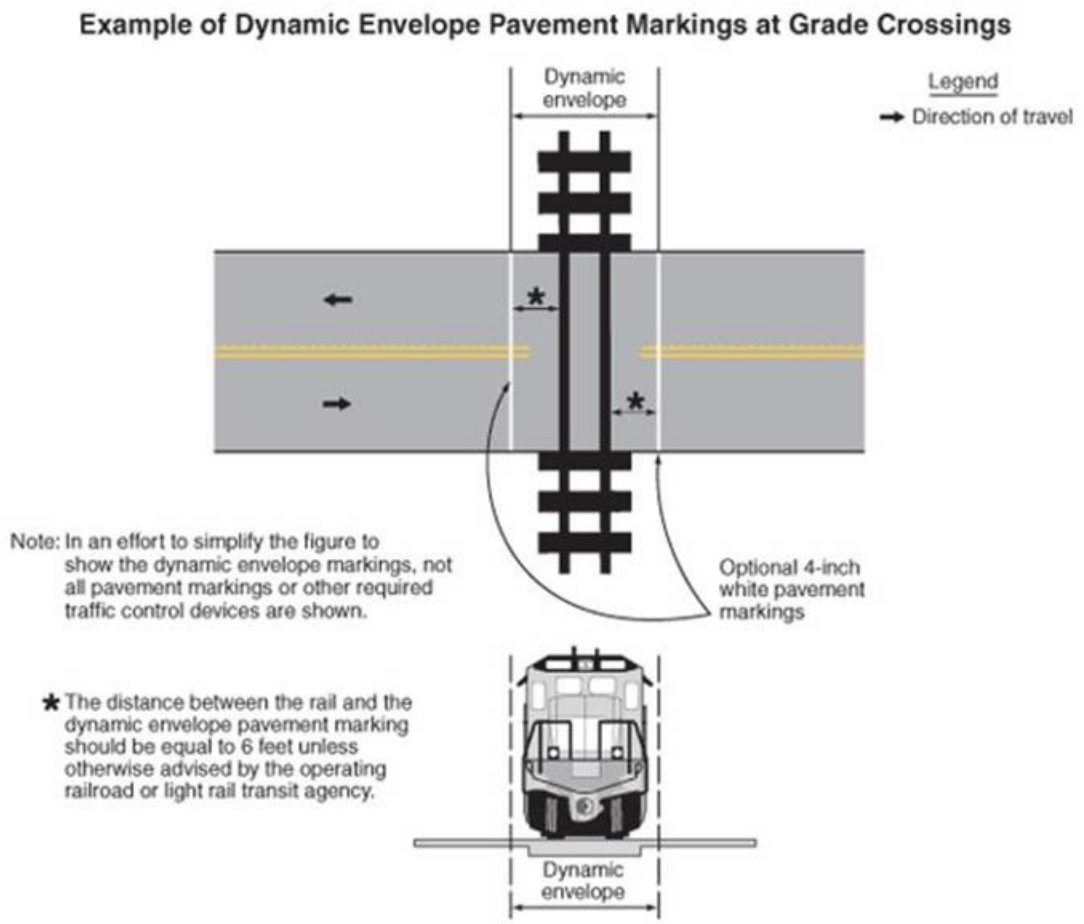

Figure 1: Example of dynamic envelope as shown in Figure 8B-8 of the national MUTCD

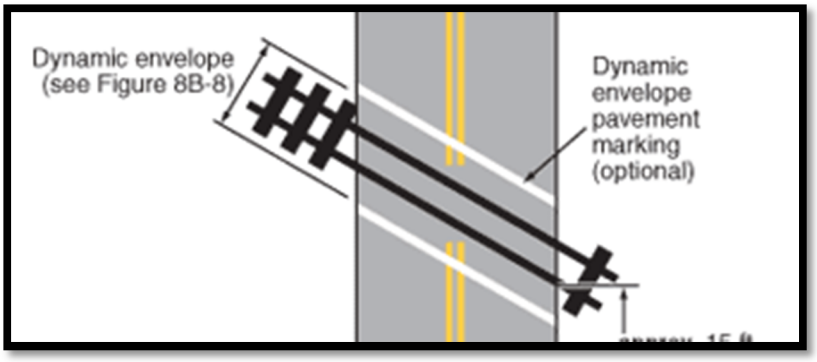

Figure 2: Example of the dynamic envelope marking with 4 inch white lines as shown in Figure 8B-6 of the national MUTCD.

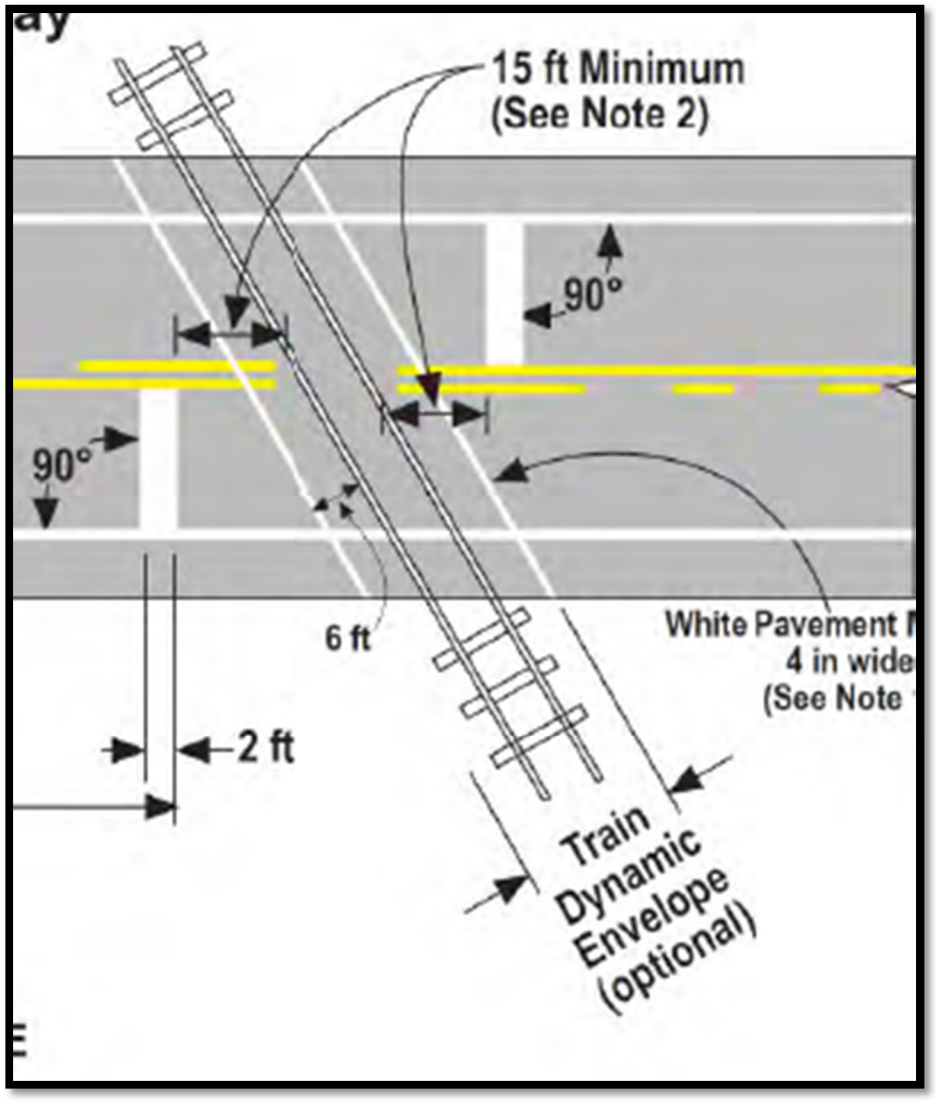

Figure 3: Example of the dynamic envelope with 4 inch white lines as shown in Figure 8B-6(CA) of the California MUTCD.

CA MUTCD Part 3 provides the option to use “diagonal crosshatch markings” for “at-grade crossings:”

Section 3B.24 Chevron and Diagonal Crosshatch Markings

Option:

01 Chevron and diagonal crosshatch markings may be used to discourage travel on certain paved areas, such as … at grade crossings (see Part 8).

Although the national MUTCD allows for the use of diagonal crosshatch at rail at-grade crossings, this is not widely used in practice. CA MUTCD Figure 3B-18(CA) does not provide the crosshatch striping detail shown in national MUTCD Figure 3B-18. A possible concern

regarding this detail is that excessive white striping may cause confusion with other white markings, including edge lines, lane lines, stop lines and stencils (such as KEEP CLEAR).

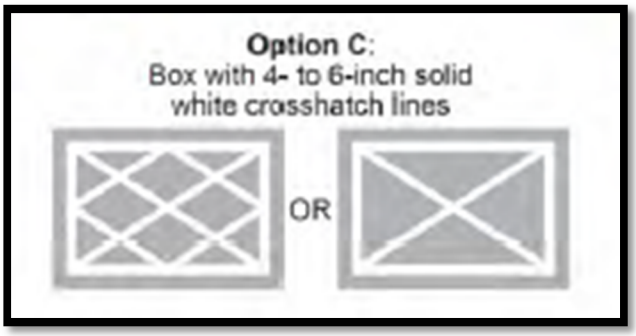

Figure 4: Figure 3B-18 (national version), Option C, Crosshatch

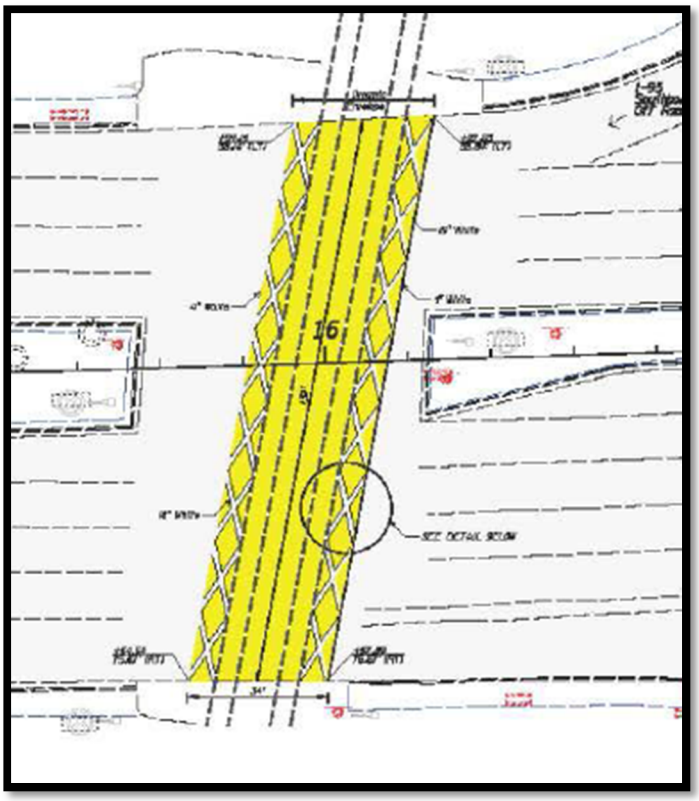

Figure 5: : Experimental pavement markings on the Commercial Boulevard crossing in Florida, showing the use of crosshatch in the area 6 feet outside the rail.

Concerns regarding the use of crosshatch markings include:

- The orientation of the markings may be confusing where the roadway and track intersect at an angle, such as State Route 120, particularly where the motorist approaches along a curve in the roadway.
- Crosshatch markings may leave large gaps in the area where motorists must be discouraged from stopping.

- Striping of diagonal lines through the track area can be difficult because it requires many lines to be separately striped to cover a large area. Track maintenance work by the railroad can accidentally result in the arrangement of panels being shifted, which can change the alignment and orientation of the crosshatch.

There are advantages to solid red markings:

- One advantage is the color. Red may be more likely to get the attention of motorists as they make a decision whether to stop or proceed onto the tracks. Red may be associated with railroad crossing flashing light signals and the red striping on the automatic gate arms.
- Another advantage may be reduced maintenance issues. Solid red color across most of the track area reduces the maintenance issues associated with maintaining the alignment of orientation of crosshatch markings..
- Red markings can be applied independent of the angle of the roadway approach or angle of the track.
- Red markings are less likely to conflict with other roadway markings. White markings can be confused with lane lines, edge lines and stop lines. Yellow markings may conflict with the yellow centerline and median markings.

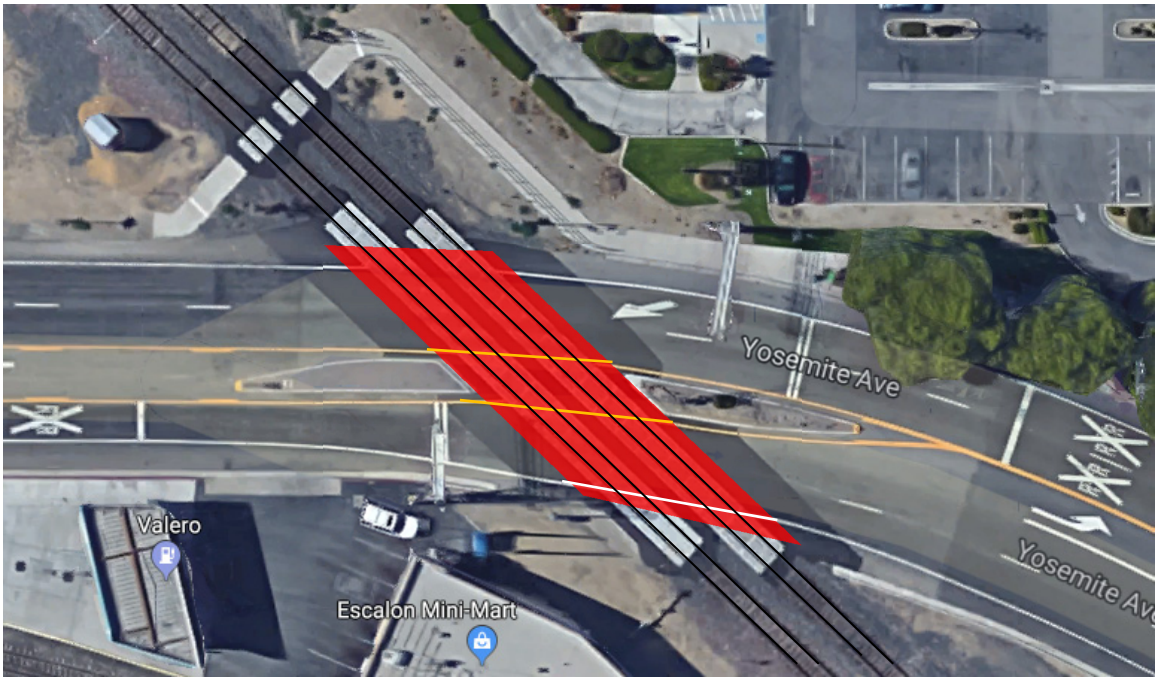

Figure 6: Concept sketch showing the proposed use of red markings within the dynamic envelope at Yosemite Avenue-State Route 120 (DOT# 028781R)

Other uses of red markings have included:

- Red markings have been approved for experimentation as a traffic control device within transit lanes. Such treatments have been installed in San Francisco, California.
- Red colored pavement is used by some roadway agencies as an aesthetic treatment in raised medians;
- Red colored pavement is used by some roadway agencies as an aesthetic treatment in decorative crosswalks.

These potentially conflicting uses of red pavement are not present near the selected crossing.

WORK PLAN

Installation

The pavement markings are proposed for installation in Summer 2019 at the Yosemite Avenue – State Route 120 railroad at-grade crossing in Escalon, California. The crossing is identified as:

DOT# 028781R
CPUC# 002-1101.90.

CPUC records indicate that there is sufficient rail and roadway traffic to collect significant data at this location. CPUC records indicate that approximate daily train movements through the crossing average 27 freight trains at speeds up to 70 miles per hour and 14 passenger trains at speeds up to 79 miles per hour. The average daily traffic count in 2016 was 17,651.

Design

- The red markings will be applied within the dynamic envelope, including the area on the concrete panels at the track and on the asphalt between the two tracks.
- The red markings will include the median area.
- The red markings will extend into the shoulder approximately 3 feet beyond the extension of the roadway edgeline.
- Extensions of the edge line and centerline will be applied to the top of the red markings to provide guidance to motorists regarding lane alignment within the dynamic envelope.
- The red markings will not be applied to the sidewalk or pedestrian crossing.

EVALUATION PROCEDURES

The researcher selected by Caltrans will study the zones in proximity to the selected crossing. Similar to the Florida study described above, using at least one pole-mounted camera viewing each direction of traffic (i.e., a total of at least two cameras), video footage will be captured before and after the installation of the pavement markings. The researcher will evaluate driver behavior. A detailed Scope of Work will be established after CTCDC approval, but a general procedure is proposed below.

None of the existing warning devices or traffic control signs are to be altered as part of this project. The purpose is to study the effects of the pavement marking without any other alterations.

At least one video camera will face each direction of traffic. The video camera will record driver behavior through all 4 zones in a given direction. The video will be recording for at least 8 hours each day, for a total of at least 112 hours over each of two 14-day periods, one pre- and one post-installation of the markings (i.e., a total of at least 224 hours). The duration of these hours may be modified if deemed appropriate.

A researcher will categorize driver-stopping behavior at this crossing for the two 14-day periods. The researcher will identify each time that a vehicle stops in one of the four zones:

- Zone 1: in advance of the automatic gate arm. Vehicles can safely stop in this area during the approach of a train.
- Zone 2: past the automatic gate arm location but prior to the train dynamic envelope, meaning further than 6 feet prior to the nearest rail. Vehicles stopped in this area cannot clearly observe the railroad warning devices upon the approach of a train, and could proceed forward onto the tracks.
- Zone 3: Within the train dynamic envelope, meaning within 6 feet of the rail. Vehicles stopped in this area could be struck by a train.
- Zone 4: Outside the train dynamic envelope (meaning further than 6 feet from the rail) but within approximately 25 feet from the train dynamic envelope. Vehicles stopped in this area can prevent other vehicles from moving off the tracks.

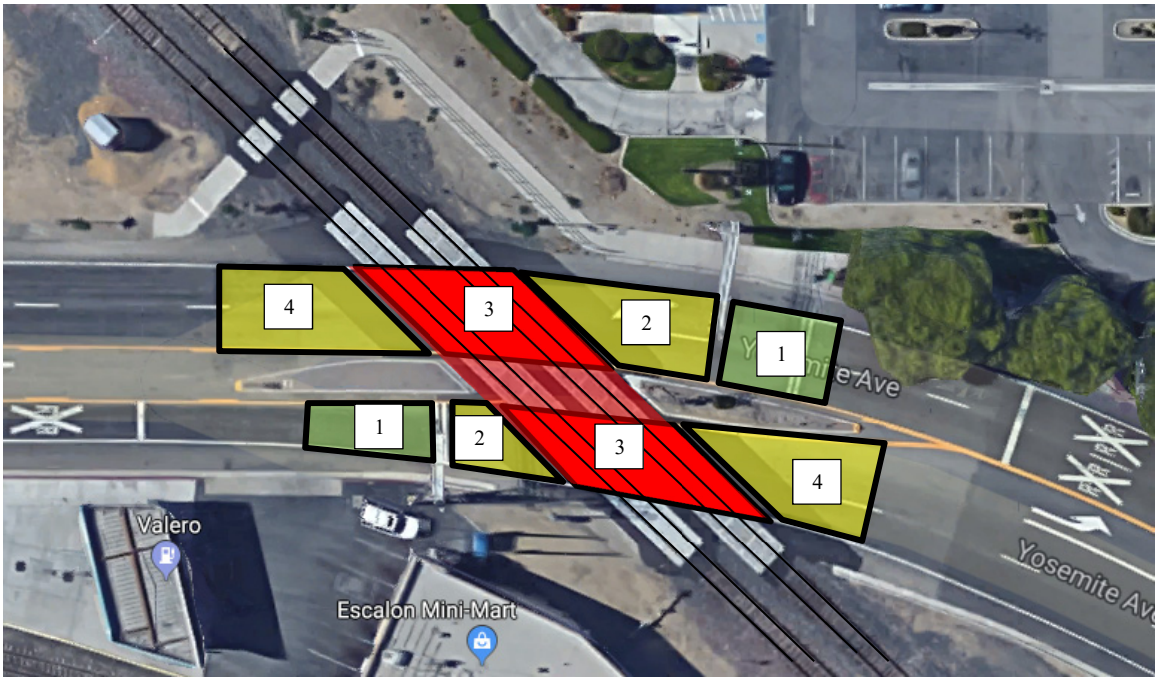

Figure 7: Approximate areas of Zones 1, 2, 3 and 4 to be used for evaluation of driver behavior near the tracks

Time Period

The observation periods are proposed to occur during Summer of 2019.

The pre-installation observation will be carried out for a 14-day period. The red markings will then be installed. The post-installation period will begin at least 4 weeks subsequent to the installation of the red markings. The post-installation observation will then be carried out for a 14-day period.

Analysis and reporting of the results would be provided approximately 6 months following the post-installation period, around the first quarter of 2020.

ADMINISTRATION

Administration of the project is expected to be conducted by Caltrans.

Item 18-19 Proposal for experimental use of a non-standard traffic control device – signing for I-805 and SR-94 transit only lane pilot project

Recommendation: Grant approval to request for experimentation
Requesting Agencies/Sponsor: SANDAG/ Duper Tong, CTCDC Voting Member

The San Diego Association of Governments (SANDAG) and Caltrans District 11 requests permission to experiment with utilizing 1) non-standard static warning, and 2) activated 'blank-out' signing. Signing will be used to warn entrance ramp motorists of MTS transit buses are operating on the Transit Only Lanes (TOL).

Background:
The demonstration pilot (Pilot) project will, over a three-year operation period, allow MTS' South Bay Rapid transit buses to use the existing freeway shoulders for priority access by converting existing freeway shoulders on Interstate 805 (I-805) and State Route 94 (SR-94) into Transit-Only Lanes (TOL). MTS' transit buses will be equipped with state-of-the-art technology for driver assistance and ramp metering safety enhancements. During the Pilot, the TOL, will be available for disabled vehicles, enforcement, emergency access, and other typical shoulder functions. The purpose of this Pilot is to demonstrate the transit benefit and operational feasibility of using existing shoulders for BOS operations in conjunction with technology enhancements through the use of TOL.

The Pilot is proposed along I-805 between State Route 54 (SR 54) (PM 8.9) and SR-94 (PM 13.5) and along SR-94 between I-5 (PM 1.4) and I-805 (PM 4.0)

The Pilot is being conducted as a partnership of the San Diego Association of Governments (SANDAG), the Metropolitan Transit System (MTS), the California Department of Transportation (Caltrans), the Federal Highway Administration (FHWA) the U.S. Department of Transportation (USDOT), and with discussion and input from the California Highway Patrol (CHP). Funding is provided in part by a grant from the Federal Transit Administration. The Pilot demonstration is authorized by the Carrell Act as defined in the California Streets and Highways Code 149 (CSHC 149). Caltrans may terminate the pilot if operations are determined to be unsafe and immitigable.

Figure 1: I-805 and SR-94 Transit Only Lane Pilot Project

Problem Statement:
MTS' South Bay Rapid transit buses are anticipated to be in congested traffic conditions along I-805 and SR-94 during peak period operations. The Pilot is projected to provide travel time savings and high-level of travel time reliability by allowing MTS buses to bypass congested portions of the freeway via TOL operations in converted shoulders and gores.

While CA MUTCD Section 3D.01 will be used for lane word and symbol markings, the CA MUTCD has no current standard for signage concerning TOL and ramp meter conflict warning signs.

Objective:
The objective of the test will be to determine the usage and effectiveness of proposed signing and striping to improving TOL operation and ramp meter safety from the point of view of MTS bus operators, ramp meter motorist, and mainline general traffic motorist.

Proposed Signing Implementation and Locations:
The Pilot includes integration of a Transit Priority System with ramp metering utilizing bus-to-roadside communications to improve safety at entrance ramp merge locations. Vehicles will be held at existing ramp meters by the approaching bus to allow the bus to travel unimpeded. These technologies will improve the safety of the ingress maneuvers from and to the converted freeway shoulders into and across the entrance ramp. The associated ramp meter hold requires that signing improvements will be made at each interchange ramp along the corridor. The signing improvements include static signs alerting drivers to the presence of bus operations and warning drivers that a bus may merge into the ramp or auxiliary lanes from the TOL. Additionally, blank-out signs will be placed at the ramp meter signals showing a graphic bus icon with the anticipated bus merge ahead. Finally, a text only blank-out sign will be installed on the ramp meter poles at the limit line. This sign will be illuminated when the ramp meter is being held to allow for the bus to proceed.

In the I-805 northbound section of the proposed project, there are four metered entrance ramps where experimental signing will be installed:

- Plaza Boulevard
- 43rd Street
- 47th Street
- Imperial Avenue

Finally, modified signing will be made along the main lanes of I-805 and SR-94 to identify where TOL for bus operations begin and end. Additional signage along the corridor will be placed to indicate/remind of the TOL is available for use.

The attached typical exhibits show the experimental signing proposed with potential installation locations as part of the Pilot project.

Please note, that we will also be submitting to FHWA a request for experimentation regarding the proposed graphic bus icon on the blank-out signs.

Evaluation Plan:
The objective of the experiment is to evaluate the effectiveness of the non-standard, static signs and activated blank out signs. SANDAG and Caltrans will conduct before and after studies consistent with SANDAG/Caltrans data collection requirements. SANDAG and Caltrans will provide annual progress reports for the duration of the experiment to the Federal Transit Administration (FTA), Federal Highway Administration (FHWA), and the California Traffic Control Devices Committee (CTCDC), and will provide a copy of the final results to FTA consistent with the federal grant requirements. SANDAG's target construction date is in the Winter 2018.

The experiment is anticipated to be three years starting in late 2019 through 2022. As noted above, SANDAG agrees to terminate the experiment if Caltrans determines that significant safety concerns are attributable to the experiment. All signing and striping for the Pilot will be removed after the completion of the Pilot. SANDAG commits to returning the freeway to pre-Pilot condition. SANDAG understand that approval of any experimentation may also be terminated if no status report is received 45 days prior to each public meeting or no final report is received within 90 days of the terminal date of the experimentation.

Some of the measures that will be observed to evaluate the signing (both static and activated blank out) include:

- Vehicle compliance/red light violations at ramp meter when blank out sign is/is not activated
- Proportion of vehicles encroaching into the TOL
- "Copycat" vehicles following the bus
- Motorist surveys for ramp meter and mainline signing

Anticipated Experiment Schedule:

• Pre-Installation Evaluation	October to December 2018
• Signing and Striping Installation	November to February 2018
• Experimental Period	March 2019 to March 2022
• Evaluation of Results	March 2022

Thank you for your kind consideration of this request. The SANDAG and Caltrans District 11 look forward to receiving a positive response from the Committee. Please feel free to call (619) 699-1959 for Jennifer William or (619) 744-0163 for Edgar Torres, if you have questions or comments.

Sincerely,

Jennifer Williamson – Project Manager
Senior Transportation Planner
SANDAG

Edgar Torres, P.E.
Project Consultant
Kimley-Horn and Associates, Inc.

Discussion Items

7. Tabled Items

8. Next Meeting

November 1, 2018
TBD

9. Adjourn