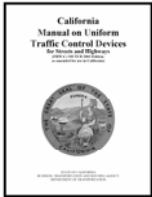


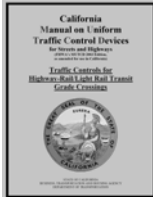
California MUTCD Training

California Public Utilities Commission &
Sacramento Regional Transit District




October 12, 2007

Sacramento, CA



Johnny Bhullar, Caltrans


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TRAFFIC OPERATIONS

Office of Signs,
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CALIFORNIA M.U.T.C.D. BRANCH



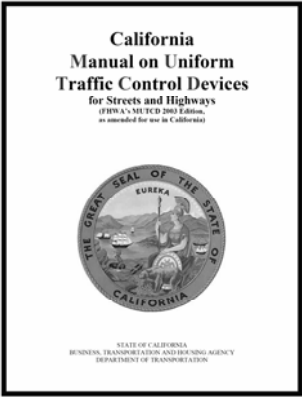
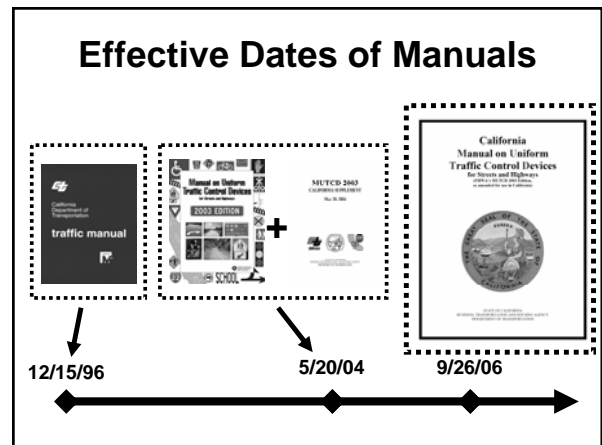
Johnny Bhullar, P.E., T.E.

Senior Transportation Engineer

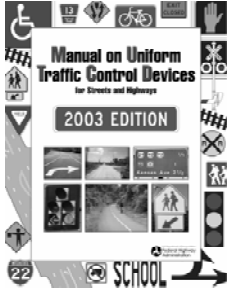
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Department of Transportation
Caltrans, Division of Traffic Operations
Office of Signs, Markings & External Support
1120 N Street, Sacramento CA 95814

(916) 654-7312
CALNET 8-464-7312
FAX (916) 653-3055
johnny.bhullar@dot.ca.gov

California MUTCD

What is the MUTCD?

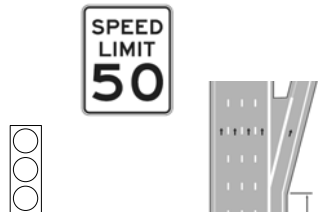


National MUTCD

National standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel.

Types of TCDs

- Signs - Part 2
- Markings - Part 3
- Signals - Part 4
- Parts 6 - 10 are TCD usage "environments"
 - Work Zones, School Zones, Bicycle Facilities, RR Grade Xings & LRT Xings



Know our Customer....

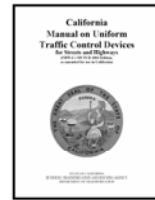
Traffic Control Device – Sign, Marking, Signal
- Regulatory, Warning or Guide

Road User – Motorist, Bicyclist, Pedestrian



CA MUTCD Parts

1. General
2. Signs
3. Markings
4. Highway Traffic Signals
5. TCDs for Low Volume Roads
6. Temporary Traffic Control
7. Traffic Controls for School Areas
8. TCs for Hwy-Rail Grade Crossings
9. TCs for Bicycle Facilities
10. TCs for Hwy-LRT Grade Crossings



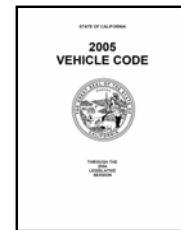
Why the TM or CA MUTCD?



It's the Law!!!

Why the TM or CA MUTCD?

All TCDs on all public streets and highways in CA must conform to Caltrans adopted rules & regulations subject to the provisions of CVC.



Text Headings

- **Standard (“shall”)** – required; mandatory or prohibitive - no exceptions
- **Guidance (“should”)** – recommended; engineering judgment or study
- **Option (“may”)** – permissive
- **Support - informational statement**

Text Headings

- **Section 6F.75 Lighting Devices**
- Guidance:
- Lighting devices should be provided in TTC zones based on engineering judgment.
- When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.
- **Support:**
- Four types of lighting devices are commonly used in TTC zones. They are floodlights, flashing warning beacons, warning lights, and steady-burn electric lamps.
- **Option:**
- Lighting devices may be used to supplement retroreflectORIZED signs, barriers, and channelizing devices. During normal daytime maintenance operations, the functions of flashing warning beacons may be provided by high-intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle.
- **Standard:**
- Although vehicle hazard warning lights are permitted to be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights, they shall not be used instead of high-intensity rotating, flashing, oscillating, or strobe lights.

Let's talk about the TCD Exception Process...

THERE ISN'T ONE!!!

- **Standard: No Deviations**
- **Guidance: May deviate based on your engineering judgement or study**
 - Good idea to document

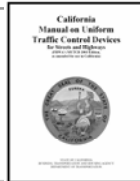
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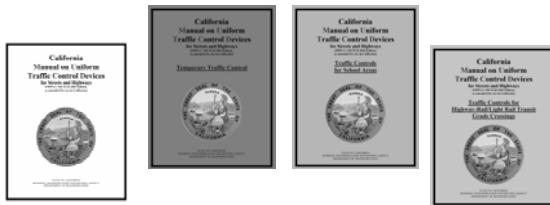
California MUTCD (2008)
On-line at:
http://www.dot.ca.gov/hq/traffops/signtech/mutcdsuppica_mutcd.htm

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CA MUTCD Stand-Alone Docs

| | |
|---|---------|
| California MUTCD (Entire Document) (Cover, introduction, Parts 1 thru 10 and Appendix) | 72.43MB |
| Temporary Traffic Controls (Cover, introduction, Parts 1, 6 and Appendix) | 17.97MB |
| Traffic Controls for School Areas (Cover, introduction, Parts 1, 7 and Appendix) | 6.96MB |
| Traffic Controls for Highway-Rail Light Rail Transit Grade Crossings (Cover, introduction, Parts 1, 8, 10 and Appendix) | 9.61MB |



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The Department of Transportation gratefully acknowledges the Federal Highway Administration's California Division, the California Traffic Control Devices Committee (CTCDC) members, staff from various cities and counties in California and the Department's headquarters and districts staff for providing guidance and direction in the development of this Manual. Information regarding the California portion (blue text and/or blue border line) of this Manual can be obtained by writing to:

State of California
Department of Transportation
Chief, Division of Traffic Operations, MS-36
1120 N Street, Sacramento, CA 95814.

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The California MUTCD is available on the Department of Transportation Web Page at
<http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/>

Google... California MUTCD



CA MUTCD Contacts

| California MUTCD Contacts | |
|---------------------------|--|
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| Johnnie Rapp | California MUTCD |
| Johnnie Rapp | Part 1 - General |
| Johnnie Rapp | Sign Specifications |
| Johnnie Rapp | California Sign Chart |
| Johnnie Rapp | Temporary Traffic Control |
| Johnnie Rapp | Part 2 - Signs |
| Johnnie Rapp | Part 3 - Signs (only the signs listed below) |
| Johnnie Rapp | Speed Limits & Speed Zones |
| Johnnie Rapp | Interchange Exit Numbering |
| Johnnie Rapp | T-200 and Lane Signs |
| Johnnie Rapp | Part 4 - Highway Traffic Signals |
| Johnnie Rapp | Part 5 - TCDs for School Areas |
| Johnnie Rapp | Part 6 - TCDs for Highway-Rail Grade Crossings |
| Johnnie Rapp | Part 7 - TCDs for Light Rail Transit Grade Crossings |
| Johnnie Rapp | Part 8 - TCDs for Bicycle Facilities |

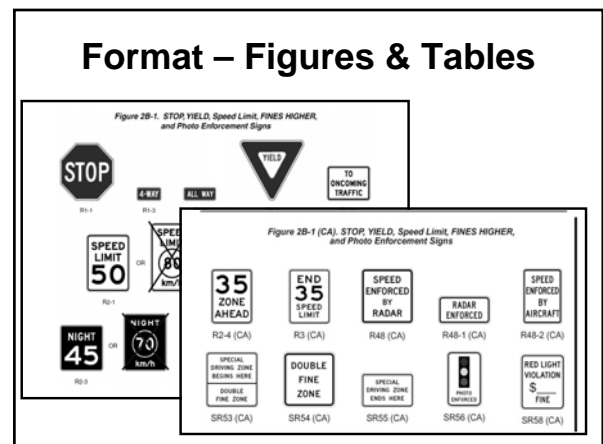
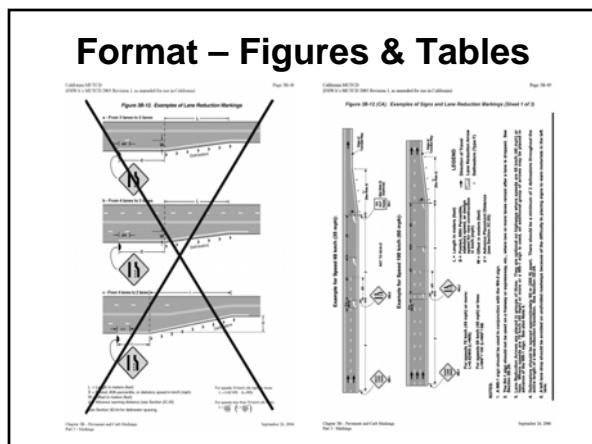
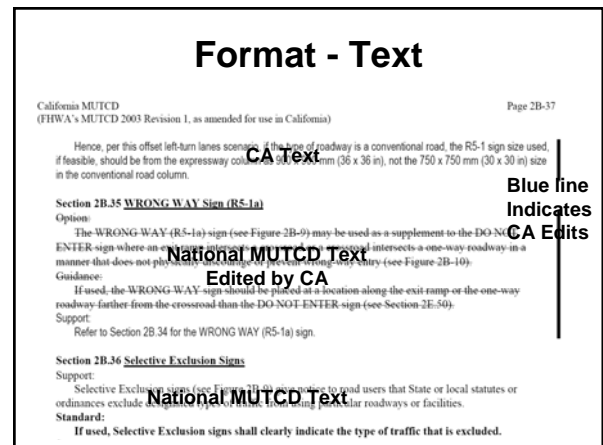
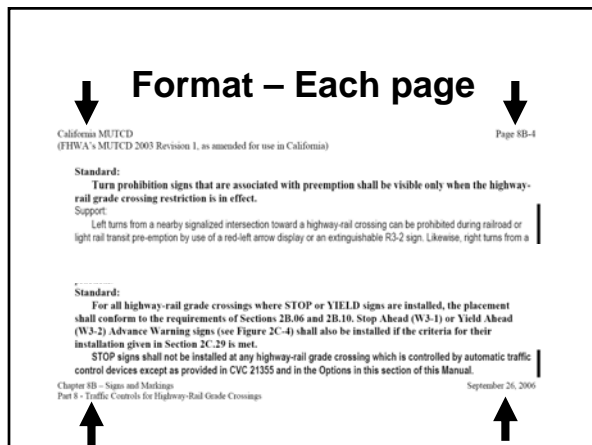
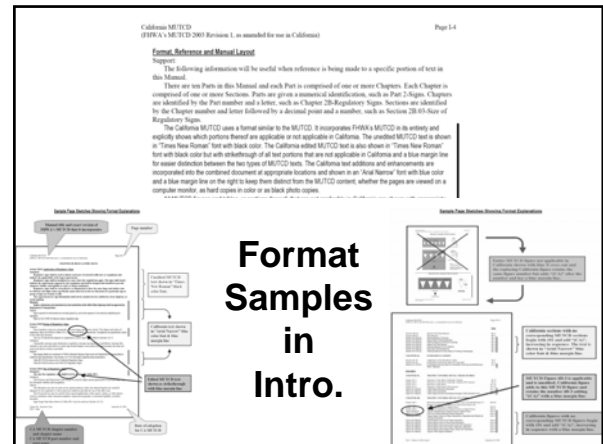
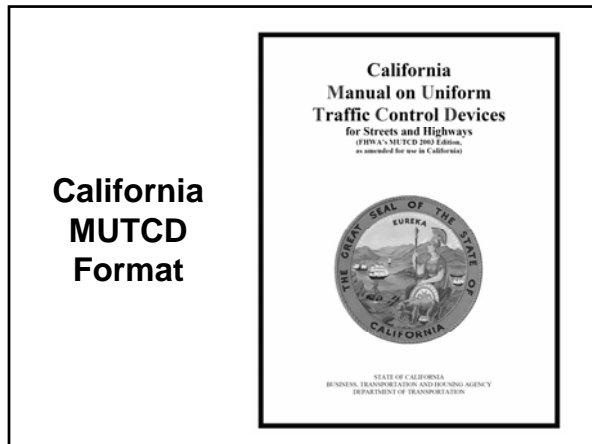


Table 2B-1. Regulatory Sign Sizes (Sheet 1 of 5)

| Sign | MUTCD Code | Section | Conventional Road | Expressway | Freeway | Minimum | Oversized |
|--------------------------------|------------|---------|------------------------------------|--------------------------|--------------------------|------------------------|--------------------------|
| Stop | R1-1 | 28.04 | 750 x 750 (30 x 30) | 900 x 900 (36 x 36) | — | 600 x 600 (24 x 24) | 1200 x 1200 (48 x 48) |
| Yield | R1-2 | 28.08 | 900 x 900 x 1000 (36 x 36 x 40) | 1200 x 1200 (48 x 48) | 1500 x 1500 (60 x 60) | 750 x 750 (30 x 30) | — |
| No Oncoming Traffic | R1-5a | — | 600 x 300 (24 x 12) | — | — | — | — |
| 4-Way | R1-3 | 28.04 | 300 x 300 (12 x 6) | — | — | — | — |
| All Way | R1-4 | 28.04 | 400 x 150 (16 x 6) | — | — | — | — |
| Yield Here to Peds | R1-5 | 28.11 | 420 x 450 (18 x 18) | — | — | — | — |
| Yield Here to Pedestrians | R1-5a | 28.11 | 450 x 600 (18 x 24) | — | — | — | — |
| No Street Ped Crossing | R1-6a | 28.12 | 300 x 900 (12 x 36) | — | — | — | — |
| Speed Limit (English) | R2-1 | 28.13 | 600 x 600 (24 x 24) | 900 x 900 (36 x 36) | 1200 x 1200 (48 x 48) | — | — |
| Speed Limit (kilometers) | R2-2 | 28.13 | 600 x 900 (24 x 36) | 900 x 1200 (36 x 48) | 1200 x 1500 (48 x 60) | — | — |
| Speed-Exceed Limit | R2-3 | 28.14 | 600 x 600 (24 x 24) | 900 x 1200 (36 x 48) | 1200 x 1500 (48 x 60) | — | — |
| Speed-Exceed Limit | R2-3 | 28.14 | 600 x 750 (24 x 30) | 900 x 1500 (36 x 60) | 1200 x 1500 (48 x 60) | — | — |
| Right Speed Limit (all lanes) | R2-3 | 28.15 | 600 x 600 (24 x 24) | 900 x 900 (36 x 36) | 1200 x 1200 (48 x 48) | — | — |
| Speed-Exceed Limit (all lanes) | R2-3 | 28.16 | 600 x 600 (24 x 24) | 900 x 900 (36 x 36) | 1200 x 1200 (48 x 48) | — | — |

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**Part 8
Traffic Controls
for Highway-Rail Grade Crossings**



**Part 10
Traffic Controls
for Highway-Light Rail Transit
Grade Crossings**

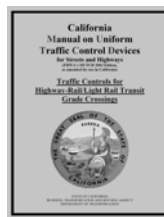


Parts 8 & 10



Hwy-LRT Grade Xings TCD Manual

CTCDC's Light Rail Traffic Manual is incorporated in CA MUTCD



Hwy/Rail TCD Definitions (8A.01)

- Advance Preemption
- Interconnection
- Preemption
- Pre-Signal
- Separation Time
- Simultaneous Preemption
- Vehicle Intrusion Detection Devices

Safety Needs & TCD Selection at Xings (8A.01 & 10A.01)

Rewritten per CPUC & includes:

- Diagnostic team evaluates & recommends safety needs at Xing
- Diagnostic team to include jurisdictional authority, railroad agency & CPUC
- Removal, reduction, addition, or any change of TCDs at grade Xing must be authorized by CPUC



California Public Utilities Commission

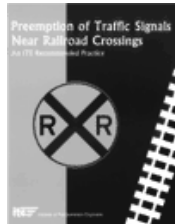
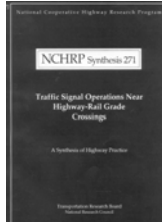


Hwy-Rail Grade Xing Elimination (8A.04)

- Agencies should conduct benefit/cost studies to eliminate grade Xings
- If Xing cannot be justified, it should be eliminated
- When railroad is eliminated, tracks should be removed
- When roadway is eliminated, roadway approaches within railroad R/W should be removed
- When Xing is eliminated, TCDs for the Xing shall be removed



Referenced Documents (8A.101(CA))



GUIDANCE ON TRAFFIC
CONTROL DEVICES AT
HIGHWAY-RAIL GRADE
CROSSINGS

U.S. DEPARTMENT OF
TRANSPORTATION
FEDERAL HIGHWAY
ADMINISTRATION

Crossbuck Sign (8B.03)

Minimum of one X-buck sign shall be placed on each approach to every hwy-rail grade xing

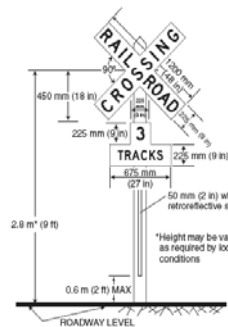
Retroreflective white strip > or = 2" wide required

- on back of each blade, unless X-buck signs are placed back-to-back
- on front and back of sign supports except bottom 2 ft.



Number of Tracks Sign (8B.03)

If two or more tracks, Number of Tracks (R15-2) sign shall be used below the X-buck sign

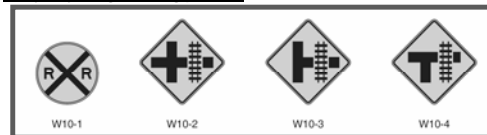


Hwy-RXing Adv Warning Signs (8B.04 & 10C.15)

CA MUTCD Standard

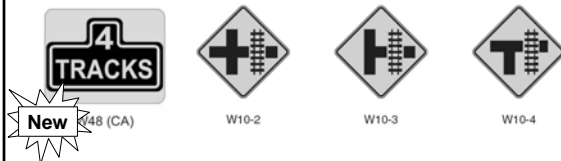
- W10-1 sign shall be used in advance of every hwy-rail grade xing, Except:
 - A On approach from parallel highway if distance < 100 ft between railroad tracks and parallel highway, then W10-2, W10-3 or W10-4 signs, as appropriate, shall be used instead of the W10-1 sign
 - B On low-volume, low-speed hwy or tracks that are infrequently used or flagged by train crews
 - C In CBDs where active hwy-rail xing TCDs are in use
 - D Physical conditions make the sign ineffective

B, C and D exceptions are deleted, requiring the use the W10 series signs for every hwy-rail grade xing per CVC



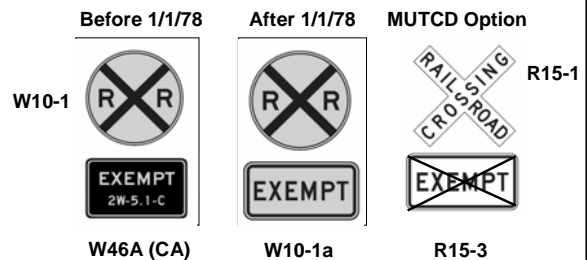
Number of Tracks (W48(CA)) sign (8B.04 & 10C.02)

- New Option to use W48(CA) sign below W10-2, W10-3, or W10-4 signs at grade crossings with two or more tracks
- No Change to its requirement below W10-1 sign if there are two or more tracks



EXEMPT Signs (8B.05)

If exempt crossing established...



CA EXEMPT Sign (8B.05)



W46A (CA) *

- Crossing number, not CPUC Code or Regulation number
- Unique crossing # assigned by CPUC to each at grade exempt crossing established prior to 1/1/78

Activated Blank-Out Signs (8B.06 & 10C.09)



MUTCD word message signs deleted



New CA specs in blank-out version for MUTCD symbol signs

New

If signs are associated with preemption, they shall be visible only when restriction is in effect

DO NOT STOP ON TRACKS Sign (8B.07)

If potential for vehicles stopping on tracks is high per engg. judgment, R8-8 sign should be used
If used, location...

MUTCD – “should” on right & “may” on left
CA MUTCD – “should” on right & left



R8-8

New

Warning Signs



W10-5



W10-8



W10-11



W10-11a



W10-11b



W10-12



W10-13



W10-14



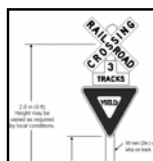
W10-14a



W10-15

STOP or YIELD Signs @ Hwy-Rail Grade Xings (8B.08 & 10C.04)

- May use STOP or YIELD signs at Xings with two or more trains per day & without automatic TCDs or can be used based on engg. Study
- May be installed on X-buck post or on a separate post



YIELD Sign Assembly (8B.08)

- NEW ASSEMBLY
- If YIELD sign used on X-buck, then assembly should include LOOK FOR TRAINS sign



R15-1

R1-2

R106 (CA)

New

Emergency Notification Signs (8B.12 & 10C.21)

Signs w/identification # assigned by CPUC and emergency notification phone number shall be installed & maintained by rail/transit authority at each grade xing



TO REPORT STALLED
VEHICLE ON TRACKS OR
OTHER EMERGENCY
CALL 1-800-555-5555
AND REFER TO
CROSSING #123-1234
ON CHERRY STREET

I-13

Signal Problems or Emergencies
At This Crossing?
Report This Number
305606N
Transit Center Raised
1-800-995-7908
ST BARKLEY ROAD
DOT ICG 305 606N

NO TRAIN HORN Sign (B.14)

- W10-9 sign shall be installed at each hwy-rail grade xing where there is a Federal Railroad Administration authorization for trains not to sound a horn
- If used, it shall be placed below the W10-1 sign



NO
TRAIN HORN

Low Ground Clearance Sign (8B.17)

- If hwy profile is abrupt creating a hang-up situation for long-wheelbase vehicles, the W10-5 signs should be installed
- Since symbol is new, LOW GROUND CLEARANCE educational plaque is required at initial installation and shall remain for 3 years



W10-5

Skewed Crossing Sign (8B.19)

- Should be used on State hwy's (may on local streets) when skew is 30 degrees or less
- If used, symbol should show direction and approximate xing angle
- It should be placed midway between the xing and the W10-1 sign
- W10-12 shall not be used as a replacement for the W10-1 sign and shall not be mounted on the same post as the W10-1 sign



W10-12

Skewed Crossing Sign (8B.19 & 10C.19)



SW27 (CA)
January 1, 2015



SW27-1 (CA)
January 1, 2015

CA signs are deleted and have a target compliance date for removal from field



W10-12

USE MUTCD sign

"Adult" Markings?



Or Narrow



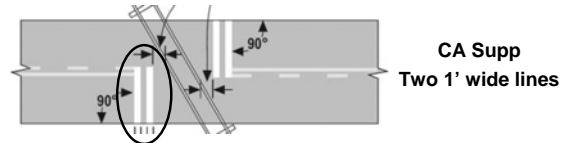
RXR Markings (8B.20)

- Shall on each approach lane on all paved approaches to Grade Xings (CA MUTCD – Only where devices installed per CPUC GO)
- May be omitted at exempt Xings (CA MUTCD – No Omission)
- May be omitted where distance between a cross street and tracks is less than 50 ft
- CA MUTCD - Should be placed with first transverse line adjacent to W10-1 sign

New

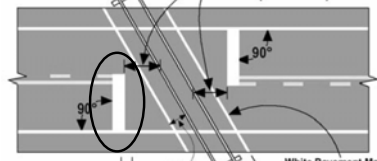


Stop Lines (8B.21)

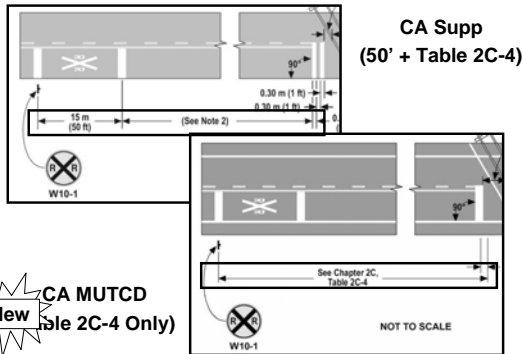


CA MUTCD
Single 2' wide line

New



RXR Placement Distance (8B-6(CA))



New

CA MUTCD
Table 2C-4 Only

CA Supp
(50' + Table 2C-4)

NOT TO SCALE

New Table 8B-1(CA)

Table 8B-1(CA) California Sign Sizes for Grade Crossing Signs

| Sign | California Code | California MUTCD Section | Conventional Road | Expressway | Minimum | Oversized |
|--|-----------------|--------------------------|-------------------|-----------------|---------|-----------|
| EXEMPT | W46A(CA) | 8B.05 | (24 x 12) | (24 x 12) | --- | --- |
| Number of Tracks | W48(CA) | 8B.04 | (30 x 24) | 30 x 24 | --- | --- |
| Light Rail Transit (Trolley) Crossing | W82(CA) | 10C.101(CA) | (24 x 24) | (30 x 30) | --- | --- |
| Light Rail Transit (Trolley) Crossing / LOOK BOTH WAYS | W82-1(CA) | 10C.101(CA) | (24 x 24) | (30 x 30) | --- | --- |
| Train Station NEXT RIGHT | G95F(CA) | 8B.101(CA) | (variable x 36) | (variable x 48) | --- | --- |
| Specific Train Station NEXT RIGHT | G95G(CA) | 8B.101(CA) | variable x 54 | (variable x 66) | --- | --- |
| Light Rail Station | G96(CA) | 10C.20 | (24 x 24) | (30 x 30) | --- | --- |
| Plaque | G96A(CA) | 10C.20 | (24 x 6) | (30 x 8) | --- | --- |
| | G97A(CA) | 8B.101(CA) | (24 x 6) | (30 x 8) | --- | --- |

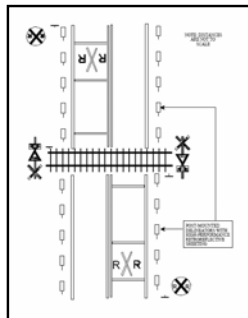
New

Delineators at grade Xings (8C.01)

NEW Support:

- Delineators on right side of approaches to non-illuminated rural grade Xings
- Place from W10-1 sign to R15-1 sign and equal distance downstream
- Spacing ≤ 50 ft

New



Bells & Flashing Signals (8D.02)

CA Supp: ...Standards under development by CPUC and AREMA

- Bells or other audible warning devices shall (CA MUTCD "may") be included in assembly & shall (CA MUTCD "may") be operated in conjunction with flashing light signals as additional warning for pedestrians and bicyclists.

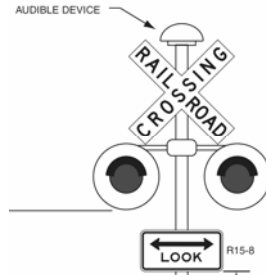


New



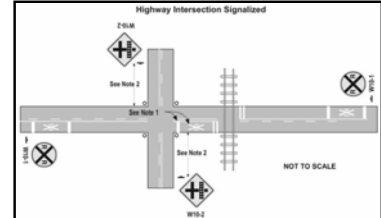
LOOK Sign (10C.03)

GUIDANCE: If signals not sufficient notice then consider LOOK sign and gates



Signals at or Near Hwy-RGXings (8D.07)

- MUTCD option to use traffic control signals instead of flashing-light signals at hwy-rail grade xings where train movements are “very slow”
- CA MUTCD defines “very slow” as ≤ 10 mph



Wayside Horn System (FHWA Interim Approval)

- Optional use of WHS at Hwy-RGXings issued August 2004
- To mitigate sound impact of the train horn
- WHS is located at the xing and directed towards the motorists



CTCDC Experiment: In-Roadway Lights @ RR Xing

Red LEDs at Hwy/RR Xing are under experiment by CPUC in cooperation with Kern County and City of Fresno

