

Memorandum

*Serious drought.
Help save water!*

To: STRUCTURE POLICY BOARD

Date: January 17, 2017
(Supercedes Nov. 2, 2016)

From: THOMAS A. OSTROM *T.A.O.*
State Bridge Engineer
Division of Engineering Services

Subject: INTERIM TYPE SELECTION GUIDELINES FOR BRIDGE RAILINGS IN CALIFORNIA

On December 22, 2015, the American Association of State Highway and Transportation Officials (AASHTO) approved a schedule for compliance with the Manual for Assessing Safety Hardware (MASH) for roadside safety hardware devices.

On December 23, 2016, the California Department of Transportation (Caltrans) adopted an implementation schedule whereby bridge railings on projects on the State Highway System advertised on or after October 31, 2019, must comply with MASH criteria for all new permanent installations and full replacements. See Attachment 1.

See Attachment 2 for “MASH Implementation for California Bridge Railings”, and visit <http://des.onramp.dot.ca.gov/structure-policy-innovation/mash-implementation>.

Under MASH, the minimum height for bridge railings is increasing from 32” to 36” for vehicular traffic railings in Test Level 4 locations. For Test Level 2 locations, the minimum railing height is increasing from 27” to 32” above the roadway for vehicular traffic railings and above the top of the walkway for combination railings.

In the interim, we recommend the following type selection guidelines for projects with bridge railings in the planning and design phases. These guidelines will ensure adequate deck width and railing height during the transition to MASH approved systems.

Test Level 4 Locations (TL-4, speed greater than 45 mph):

Railing Type	Preferred Deck Width	Preferred Railing	Avoid
Solid concrete parapet	1’-9”	Concrete Barrier Type 736 (h = 36”) Concrete Barrier Type 742 (h=42”)	Concrete Barrier Type 732 (h = 32”)
Concrete parapet and metal rail	2’-0”	Concrete Barrier Type 90 (h=36”)	
Post and Beam-steel	2’-0”	California ST-70 Bridge Rail (h= 46 ½”) California ST-20S Bridge Rail (h= 54”)	California ST-10 Bridge Rail (h=33”) California ST-30 Bridge Rail (h=32”)
Post and Beam-concrete	2’-0”	Concrete Barrier Type 80 (h= 32”)	

Test Level 2 Locations (TL-2, speed less than or equal to 45 mph):

Railing Type	Preferred Deck Width	Preferred Railing
Solid concrete parapet with sidewalk	1'-0" plus 6'-2"min	Concrete Barrier Type 732SW (h=32" above sidewalk)
Post and Beam – concrete with sidewalk	2'-0" plus 6'-2"min	Concrete Barrier Type 80SW (h=32" above sidewalk)
Post and Beam – steel with sidewalk	2'-0" plus 6'-2"min	California ST-40 Bridge Rail (h=42" above sidewalk)

Please revise your internal business practices to include the Bridge Railing Specialist in the transmittal of Advance Planning Studies and General Plans.

For questions, please contact Shannon Post at (916) 227-8070 or desdesign@dot.ca.gov.

Attachment 1: Implementation of the Manual For Assessing Safety Hardware, dated 12/23/2016

Attachment 2: MASH Implementation for California Bridge Railings, dated January 2017

- c: Shannon Post, Chief, Office of Design and Technical Services, DES
DES Bridge Design Office Chiefs
Sudhakar Vatti, Chief, OSFP/SLA
David Cordova, Office of Standards and Procedures, Division of Design
Tillat Satter, Bridge Railing Specialist, DES
Greg Kaderabek, Bridge Railing Specialist, DES

Memorandum

*Serious drought.
Help save water!*

To: CHIEF DEPUTY DIRECTOR
DEPUTY DIRECTORS
DISTRICT DIRECTORS
DIVISION CHIEFS

Date: December 23, 2016

From: *LH Orcutt*
STEVE TAKIGAWA
for Deputy Director
Maintenance and Operations
Karla Sutliff
for KARLA SUTLIFF
Chief Engineer
Project Delivery

Subject: **IMPLEMENTATION OF THE MANUAL FOR ASSESSING SAFETY HARDWARE**

This memorandum establishes California Department of Transportation's (Caltrans) timeline for implementation of roadside safety hardware and evaluation of new products under the Manual for Assessing Safety Hardware (MASH), consistent with the Association of State Highway and Transportation Officials (AASHTO) and Federal Highway Administration (FHWA) Joint Implementation Agreement for MASH.

As a matter of practice, FHWA performs a crash worthiness review of roadside safety hardware and when found crash worthy issues a federal aid eligibility letter. Caltrans uses this letter as part of its internal product review process. After December 31, 2016, the FHWA will no longer issue eligibility letters for highway safety hardware not successfully crash tested to MASH. Modifications of eligible highway safety hardware must utilize criteria in the MASH for re-evaluation and/or retesting. Manufacturers must submit new products complying with MASH to Caltrans for review and approval. Caltrans has previously adopted MASH for crash testing internal designs of safety hardware and through this implementation will use only those guidelines to evaluate new products.

Caltrans is adopting the AASHTO/FHWA recommendation to implement MASH for evaluating all new permanent installations and full replacements of roadside safety hardware. Below is the Caltrans implementation schedule of MASH for projects that will be advertised on or after the following dates:

- June 30, 2017: inline w-beam terminals (earlier than AASHTO/FHWA letting date)
- October 31, 2017: w-beam barriers and cast-in-place concrete barriers
 - The Midwest Guardrail System, approved on July 9, 2013, is the Caltrans standard for w-beam barriers and is MASH approved.
- April 30, 2018: Flared w-beam terminals
- October 31, 2018: cable barriers, cable barrier terminals, and crash cushions

- October 31, 2019: bridge rails, transitions, all other longitudinal barriers (including portable barriers installed permanently), all other terminals, sign supports, and all other breakaway hardware.

For temporary work zone roadside safety hardware, including portable barriers, devices manufactured after December 31, 2019, must have been successfully tested to MASH. Such devices manufactured by this date, and successfully tested to NCHRP Report 350, may continue to be used throughout their normal service lives.

After December 31, 2016, Caltrans will no longer evaluate highway safety hardware that has not been successfully crash tested to MASH. Modifications of federal aid eligible highway safety hardware must utilize criteria in MASH for re-evaluating and/or retesting.

Implementation will include these actions:

- Projects on the State highway system with an advertising date on or after the above implementation schedule must use safety hardware that complies with the MASH criteria for all new permanent installations and full replacements.
- New products compliant with MASH must be submitted to the Caltrans New Products Coordinator. Then the Caltrans' Highway Safety Features New Products Committee will evaluate and make recommendations for approval of the new products.

The MASH approved safety hardware devices for Caltrans can be found at:
<http://traffic.onramp.dot.ca.gov/safety-devices-approved-products>

For questions regarding this process for highway safety features, please contact Duper Tong, Chief, Office of Traffic Engineering at (916) 654-5176 or by email at duper.tong@dot.ca.gov; or for bridge rails, transitions, sign supports and other breakaway hardware, Shannon Post, Chief, Office of Design and Technical Services at (916) 227-8070 or by email at shannon.post@dot.ca.gov.

- c: Thomas P. Hallenbeck, Chief, Division of Traffic Operations
Tony Tavares, Chief, Division of Maintenance
Rachel Falsetti, Chief, Division of Construction
Janice Benton, Acting Chief, Division of Design
Michael Keever, Chief, Division of Engineering Services
Jim Appleton, Chief, Division of Research, Innovation and System Information

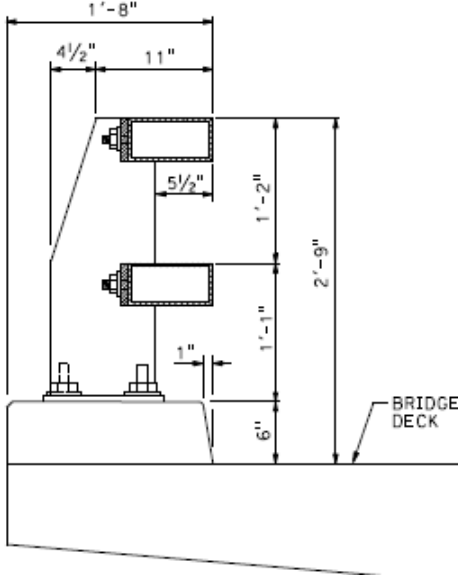
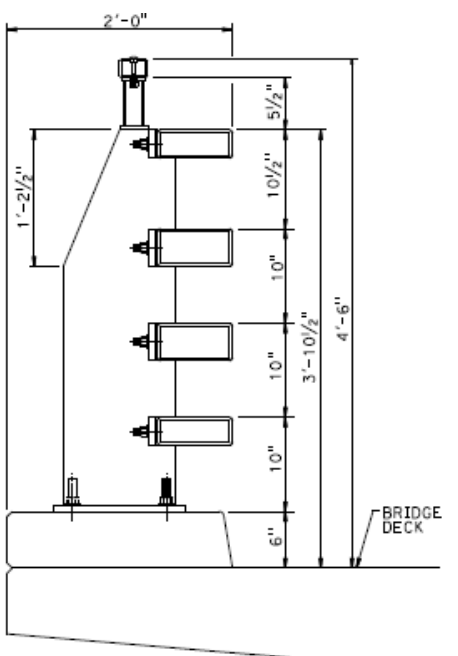
MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS

JANUARY 2017

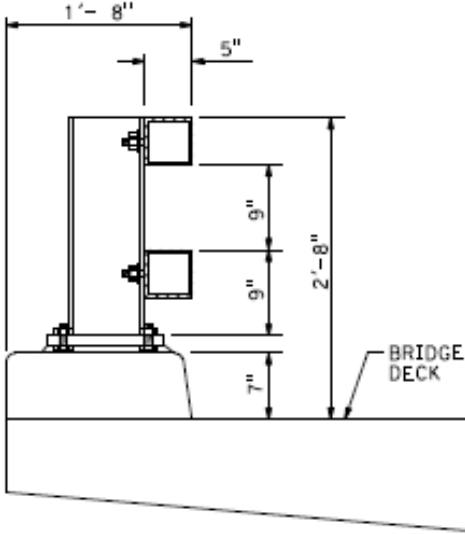
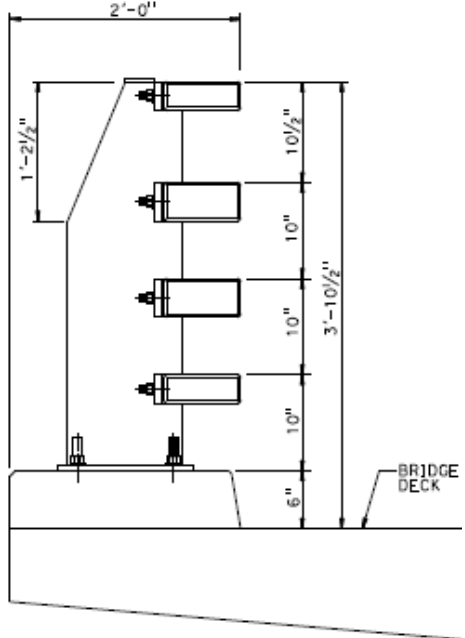
Systems with a TL-4 Crash Test Rating:

These railings are approved for use in California in a high speed location (regulatory speed limit of greater than 45 mph) or a low speed location (regulatory speed limit of 45 mph or less).

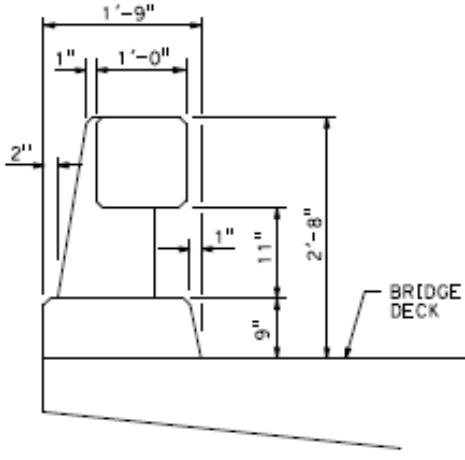
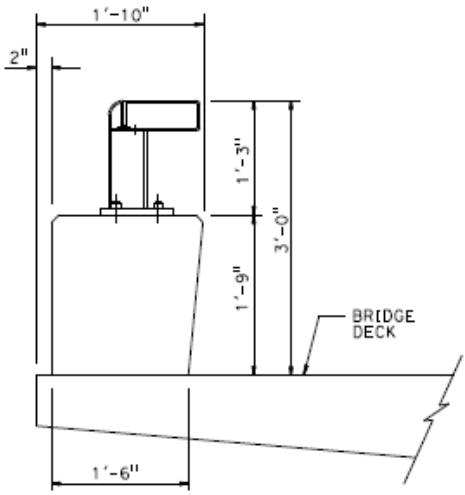
See <http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CALIFORNIA ST-10 BRIDGE RAIL</p>	<p>California ST-10 Bridge Rail NCHRP Report 350 Vehicular Traffic Railing Post and Beam (concrete curb and metal) Hollow structural section (HSS) with 6" concrete curb. Height = 2'-9" Width = 1'-8" Post spacing = 10'-0" max Modifiable for bicycles. Aesthetic see-through rail</p>	<p>No replacement planned</p> <p>No plans for a two beam TL-4 system</p>
 <p style="text-align: center;">CALIFORNIA ST-20S BRIDGE RAIL</p>	<p>California ST-20S Bridge Rail NCHRP Report 350 Combination Traffic Railing (vehicular & bicycle) Post and beam (concrete curb and metal) Hollow structural section (HSS) with 6" concrete curb. Height = 54" Width = 2'-0" Post spacing = 10'-0" max Aesthetic see-through rail.</p>	<p>Will be replaced by proposed California ST-75 Bridge Rail.</p> <p>Caltrans research project to replace with 36" vehicular bridge rail /42" combination bridge rail (vehicular & bicycle) TL-4 system by 2019.</p>

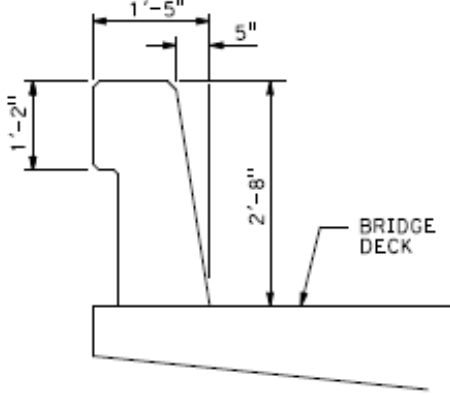
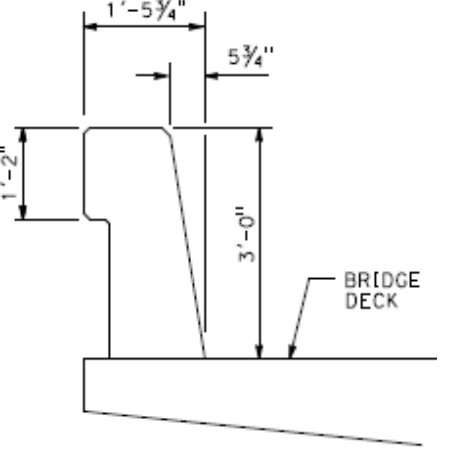
MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS
JANUARY 2017

Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CALIFORNIA ST-30 BRIDGE RAIL</p>	<p>California ST-30 Bridge Rail NCHRP Report 350 Vehicular Traffic Railing Post and Beam (concrete curb and metal) Hollow structural section (HSS) with 7” concrete curb Height = 2’-8” Width= 1’-8” Post spacing = 10’-0” max Modifiable for bicycles. Aesthetic see-through rail.</p>	<p>No replacement planned</p> <p>No plans for a two beam TL-4 system</p>
 <p style="text-align: center;">CALIFORNIA ST-70 BRIDGE RAIL</p>	<p>California ST-70 Bridge Rail NCHRP Report 350 Combination Traffic Railing (vehicular & bicycle) Post and beam (concrete curb and metal) Hollow structural section (HSS) with 6” concrete curb. Height = 3’-10 1/2” Width = 2’-0” Post spacing = 10’-0” max Aesthetic see-through rail</p>	<p>Will be replaced by proposed California ST-75 Bridge Rail</p> <p>Caltrans research project to replace with 36” vehicular bridge rail /42” combination bridge rail (vehicular & bicycle) TL-4 system by 2019</p>

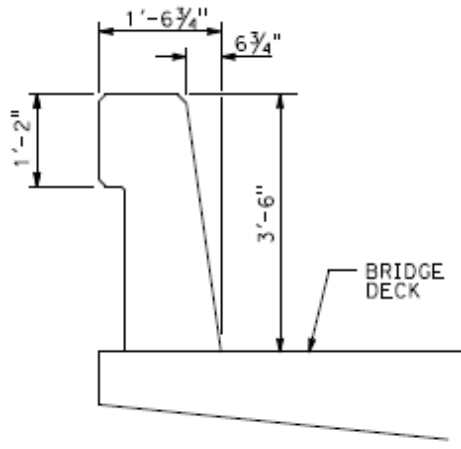
MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS
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Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CONCRETE BARRIER TYPE 80</p>	<p>Concrete Barrier Type 80 NCHRP Report 350 Vehicular Traffic Railing Post and beam (concrete) Concrete with 9" curb Height = 32" Width = 1'-9". Post spacing = 6'-6" max Modifiable for bicycles. Aesthetic see-through rail.</p>	<p>Will be replaced by proposed Concrete Barrier Type 85.</p> <p>Caltrans research project to replace with 36" vehicular bridge rail/42" combination bridge rail (vehicular & bicycle) TL-4 system by 2019.</p>
 <p style="text-align: center;">CONCRETE BARRIER TYPE 90</p>	<p>Concrete Barrier Type 90 NCHRP Report 350 Vehicular Traffic Railing Concrete parapet and metal rail. Height = 36" Width = 1'-8" + 2" clear to edge of deck Post spacing = 10'-0" max. Modifiable for bicycles. Aesthetic see-through rail.</p>	<p>No replacement planned by Caltrans.</p>

MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS
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Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CONCRETE BARRIER TYPE 732</p>	<p>Concrete Barrier Type 732 NCHRP Report 350 Vehicular Traffic Railing Solid concrete barrier. Height = 32" Width = 1'-5" Modifiable for bicycles.</p>	<p>No replacement planned</p>
 <p style="text-align: center;">CONCRETE BARRIER TYPE 736</p>	<p>Concrete Barrier Type 736 NCHRP Report 350 Vehicular Traffic Barrier Solid concrete barrier. Height = 36" Width = 1'-5 3/4" Modifiable for bicycles.</p>	<p>Replacement planned based on TTI Type SSTR(MASH) Height =36"</p>

MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS
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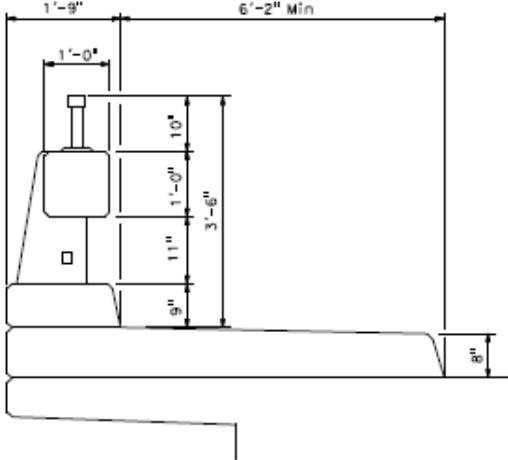
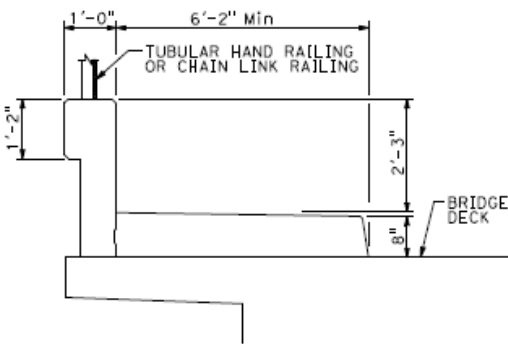
Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CONCRETE BARRIER TYPE 742</p>	<p>Concrete Barrier Type 742 NCHRP Report 350 Combination Traffic Barrier (vehicular & bicycle) Solid concrete barrier. Height = 42" Width = 1'-6 3/4"</p>	<p>Replacement planned based on TTI Type SSTR(MASH)</p> <p>Height=42"</p>

MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS JANUARY 2017

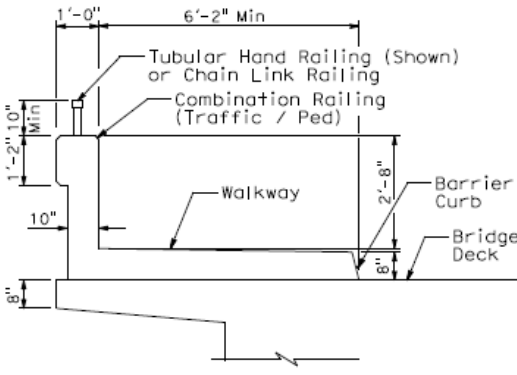
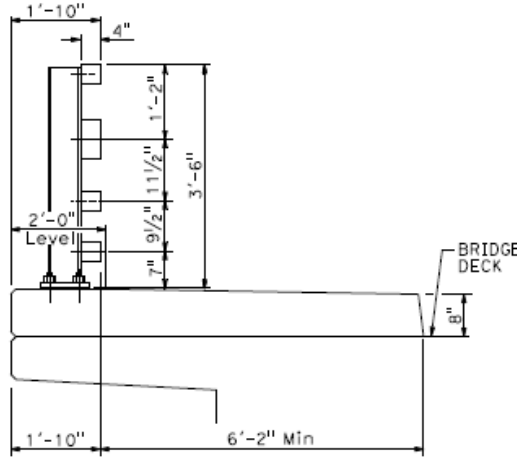
Systems with a TL-2 Crash Test Rating:

These railings are approved for use in California in a low speed location only (regulatory speed limit of 45 mph or less).

See <http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;"><u>CONCRETE BARRIER TYPE 80SW</u></p>	<p>Concrete Barrier Type 80SW NCHRP Report 350 Combination Traffic Railing (vehicular & pedestrian) Post and beam. Concrete with tubular hand rail, 8" curb and integral raised sidewalk. Height = 32" above top of sidewalk plus tubular hand railing. Width = 1'-9" parapet plus sidewalk. Post spacing = 6'-8" max Aesthetic see-through rail</p>	<p>Will be replaced by proposed Concrete Barrier Type 85SW</p>
 <p style="text-align: center;"><u>CONCRETE BARRIER TYPE 26</u></p>	<p>Concrete Barrier Type 26 Combination Traffic Railing (vehicular & pedestrian) Concrete with tubular hand railing or chain link railing, 8" curb and integral raised sidewalk. Height = 27" above top of sidewalk plus tubular hand railing or chain link railing. Width = 1'-0" parapet plus sidewalk</p> <p>ARCHIVED NOT APPROVED FOR NEW CONSTRUCTION</p>	<p>Replaced by Concrete Barrier Type 732SW (MASH)</p>

MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS
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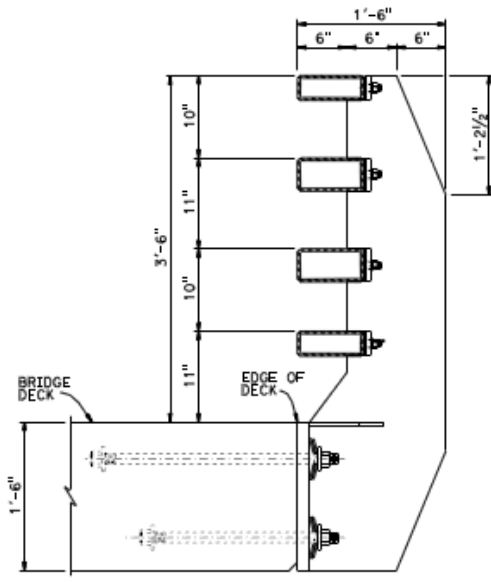
Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CONCRETE BARRIER TYPE 732SW</p>	<p>Concrete Barrier Type 732SW MASH Combination Traffic Railing (vehicular & pedestrian) Solid concrete with tubular hand railing or chain link railing, 8" curb and integral raised sidewalk. Height = 32" above top of sidewalk plus tubular hand railing or chain link railing. Width = 1'-0" parapet plus sidewalk</p>	<p>MASH compliant</p> <p>Added to Standard Plans January 2017.</p>
 <p style="text-align: center;">CALIFORNIA ST-40 BRIDGE RAIL</p>	<p>California ST-40 Bridge Rail NCHRP Report 350 Combination Traffic Railing (vehicular & pedestrian) Post and beam. Hollow structural section (HSS) with 8" concrete curb and integral raised sidewalk. Height = 42" above top of sidewalk. Width = 1'-10" parapet plus sidewalk Post spacing = 8'-0" max Aesthetic see-through rail.</p>	<p>Will be replaced by proposed California ST-75SW Bridge Rail.</p>

MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS JANUARY 2017

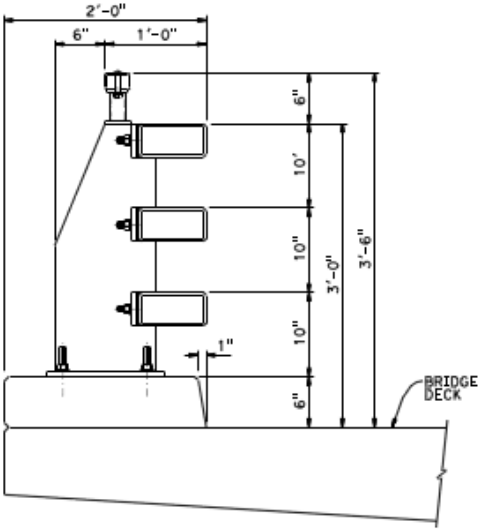
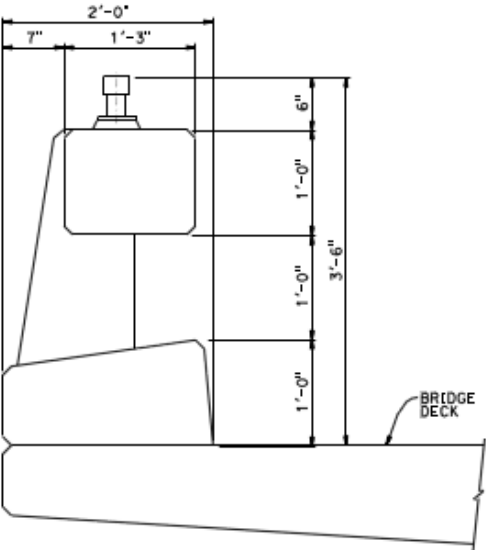
Systems under development

These railing systems are currently under development for use in California.

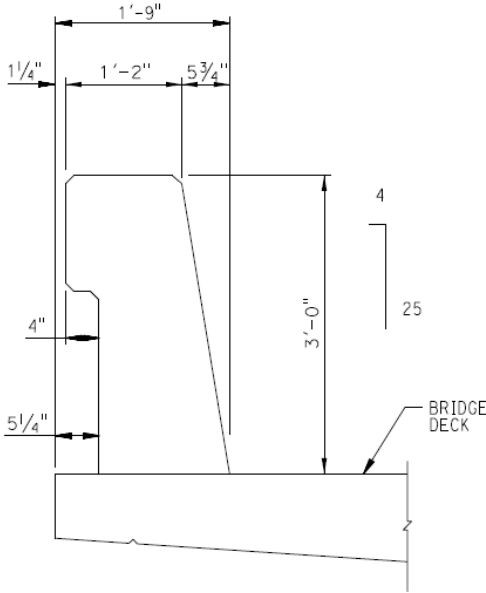
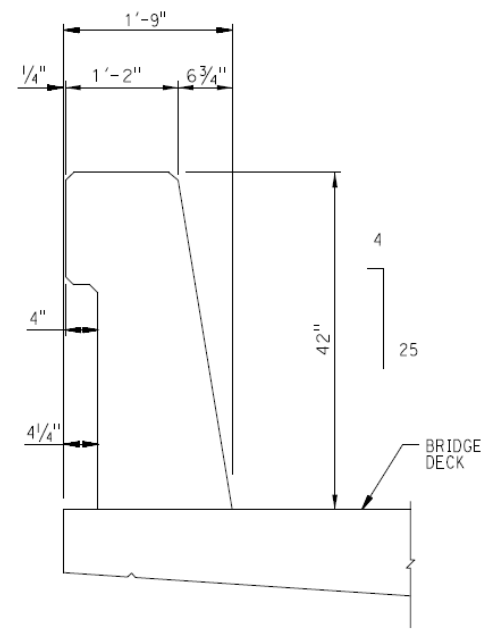
See <http://www.dot.ca.gov/research/operations/roadsidesafety/index.htm>

Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CALIFORNIA ST-70SM BRIDGE RAIL</p>	<p>California ST-70SM MASH TL-4 Combination Traffic Railing (vehicular & bicycle [w/modification of 2 of 4 clear openings]) Post and beam (all metal) Hollow structural section (HSS) side-mounted (no curb). Height = 42" Width = 1'-6" (beyond EOD of deck slab) Post spacing = 10'-0" Aesthetic see-through rail</p> <p style="text-align: center;">PENDING APPROVAL</p>	<p>Testing complete.</p>

MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS
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Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;">CALIFORNIA ST-75 BRIDGE RAIL</p>	<p>California ST-75 Bridge Rail MASH TL-4</p> <p>Combination Traffic Railing (vehicular & bicycle) Post and beam (concrete curb and metal) Hollow structural section (HSS) with 6" concrete curb. Height = 36" Width = 2'-0" Post spacing = 10'-0" Aesthetic see-through rail.</p>	<p>Caltrans research project for 36" vehicular bridge rail /42" combination bridge rail (vehicular & bicycle) TL-4 system by 2019.</p> <p>Design complete.</p>
 <p style="text-align: center;">CONCRETE BARRIER TYPE 85</p>	<p>Concrete Barrier Type 85 MASH TL-4 Vehicular Traffic Railing Post and beam Concrete with 12" curb Height = 36" Width = 2'-0" Post spacing = 10'-0" max Modifiable for bicycles (height & clear openings) Aesthetic see-through rail</p>	<p>Caltrans research project for 36" vehicular bridge rail/42" combination bridge rail (vehicular & bicycle) TL-4 system by 2019.</p> <p>Design complete.</p>

MASH IMPLEMENTATION FOR CALIFORNIA BRIDGE RAILINGS
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Bridge Railing	Description	MASH Strategy
 <p style="text-align: center;"><u>TYPE 836</u></p>	<p>Concrete Barrier Type 836 MASH TL-4 Vehicular Traffic Railing Solid concrete barrier</p> <p>Height =36" Width= 1'-9"</p> <p>Modifiable for bicycles</p>	<p>Design in progress based on TTI Type SSTR (MASH) for TL-4 system by 2019.</p>
 <p style="text-align: center;"><u>TYPE 842</u></p>	<p>Concrete Barrier Type 742 MASH TL-4 Combination Traffic Railing (vehicular & bicycle) Solid concrete barrier</p> <p>Height =42" Width= 1'-9"</p>	<p>Design in progress based on TTI Type SSTR (MASH) for TL-4 system by 2019.</p>