BRIDGE RAILING REPLACEMENT

A program to replace deficient bridge rail is still being developed. The 1988 AASHTO Interim Guide Specifications will call for Three Performance Level Barriers to be considered in new design of bridges. Within 3 years from this date, the updating of bridge railing could take on a different impact. However, for now we will follow basically the same policy as we currently practice with our concrete safety shape barriers. For State Highway Bridges, no new rail will be considered less than a Performance Level 2 (P.L.–2) barrier rail. Our present Safety Shape Barriers are considered to be P.L.–2 Barriers.

Typical examples of the rails which will continue being replaced are the steel and concrete baluster types, timber rail and metal beam bridge rail. Numerous other rails of various materials on existing bridges that do not comply with the current AASHTO Design Specifications and the 1988 AASHTO Interim Guide Specifications, are also on the replacement list.

Barrier Railing Type I, which was developed in 1963, and the later Railing Type 9, are still considered crashworthy and should only be replaced or retrofitted in special cases, or to correct a specific problem. However, Barrier Railing Type I, and Barrier Railing Type II which is basically Type I on top of a curb, will probably be the next generation railing to be placed on the priority list for retrofitting, though probably still years away. This knowledge may help you in making a decision as to replacing that vintage type barrier if a question ever arises during design stage as to their replacement. See details for Type 25MI or 25M9 Railing Modification attached. This sheet is available from the Walls and Railings Unit.

Until specific guidelines are published for the rail replacement program, requests for rail upgrading or replacement should be reviewed for:

1. Check priority on the list of bridges to be replaced with the Office of Structures Maintenance.
2. Approach roadway width — if the bridge is not as wide as the approaches then the bridge should be widened to match the approach road.
3. Structural adequacy of existing bridge to support new barrier.
4. If the structure is on a major Interstate Highway, priority for updating railing may have to be advanced.

Attached is a sheet with typical details for various rail replacements. The concrete safety shape barrier, now considered a P.L.–2 barrier, is a good performer and is relatively maintenance free. Sheets for each of the examples indicated are available from the Walls and Railings Unit for insertion in plans.

For minor structures, such as culverts, the concrete parapet gives continuity in appearance and a structural end anchorage to the metal beam approach guard rail. Note that the length of bridge is limited to less than 40 feet for practical purposes.

Supersedes Memo to Designers 14-6 dated July 1978

The metal beam guard rail approach rail is usually a District item and is shown on the road plans. The end connection to the bridge rail is a tension connection. The older bridge rails are not adequate to take this force. Therefore, Detail B (sheet A79-D Standard Plans, January, 1988) should be used if the existing bridge rail is not upgraded or replaced.

Method of Anchorage (Retrofit)

On concrete barrier modification projects, where reinforcing bars are bonded in holes drilled in existing decks, the following criteria may be of benefit to the designer.

1. Table of Design Loads (Reference No. 1)

			Pull Out			
Option	Bar Size	Embedment	Min. Edge Distance	1st. Peak Load	Ultimate Load	Material*
A	#6	6" in 1 1/4" hole	4"	26K	30K	MPC
B	#6	5" in 1 1/4" hole	4"	16K	20K	MPC

Option A has First Priority. Minimum deck required on Option B is 6 1/2".

For vehicular impact resistance retrofit barriers were static tested with our details shown on the retrofit sheets provided by the Walls and Railings Unit.

In using the above Method of Anchorage in modifying a barrier design, the designer should be aware the forces shown are ultimate loads, and yielding has already taken place. The designer is referred to other tests, on polyester resin capsules, for anchorage pertaining to designs other than barriers. (Reference No. 2)

2. Sound Wall Installations

Where sound walls are to be constructed on new Type 25 and Type 27 Modified Concrete Barriers, use Option A to attach barrier to the deck for both the front and back rows of dowels. It may be necessary to reconstruct the overhang if the slab will not accommodate the depth of the hole. Spacing of dowels will be determined by the designer, but spacing should be minimized to 12 inches in any existing overhang condition.

Magnesium phosphate concrete should not be used with zinc or cadmium coated bars.

*Call for magnesium phosphate concrete (MPC) in special provisions and drill and bond on plans.

References:

1) CALTRANS - TRANSLAB FHWA/CA/TL/79/16

2) CALTRANS - TRANSLAB REPORT TO FHWA/CA/TL-85/03
Determination of Minimum Embankment Depth in Polyester Resin Capsule Anchors...

3) CALTRANS - TRANSLAB
"Cyclic Testing of #6 Rebar Dowels..." dated February, 1985, John Dusel, Steve Mellon

Philip C Warriner

Guy D. Mancarti

RWB/mp
Attachment