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ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

Preliminary Plan Review Bureau

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SUBJECT: CRITERIA FOR TREATMENT OF SAFETY WALKS AND BRIDGE RAILING WHEN WORK IS DONE ON A BRIDGE.

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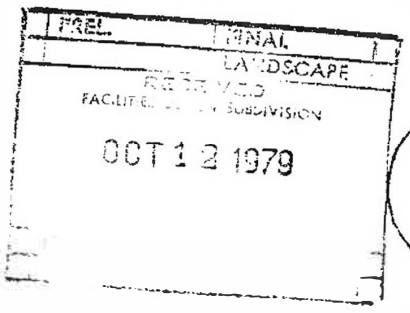
The attached document titled "Criteria For Treatment Of Safety Walks And Bridge Railing When Work Is Done On A Bridge" was developed for the purpose of providing guidelines for the treatment of existing safety walks and bridge railings whenever contract work is proposed for an existing structure.

Special conditions and unusual railing systems, such as concrete parapets, will occur which are not covered by these guidelines. In addition, there will be situations where questions will arise regarding the rationale used to make decisions. In those cases, the Special Design Unit of the Structures Design and Review Bureau should be consulted.

The decision was made by the Structures Design and Construction Subdivision to use a 2-rail steel rail system on curbless bridges. Previously, a 4-rail steel rail system had been specified. This decision is reflected in Sections 3.1.3 and 3.2.4 of the attached document. The Structures Design and Review Bureau is currently completing details for a 2-rail system to be used where bridges are curbless. If you are designing a new or rehabilitating an existing curbless bridge and need the details for the appropriate 2-rail steel system prior to the formal distribution of the BDD Sheet, contact the Special Design Unit of the Structures Design and Review Bureau.

Under no circumstances shall the 2-rail steel system detailed on BDD 78-51 be used on curbless bridges.

Attachment



CRITERIA FOR

TREATMENT OF SAFETY WALKS AND BRIDGE RAILING WHEN WORK IS DONE ON A BRIDGE

The purpose of this instruction is to provide criteria for the treatment of existing safety walks and bridge railing whenever contract work is proposed for an existing bridge. This applies to bridge rehabilitation projects and also to projects which entail miscellaneous work on the bridge such as pavement overlay or railing replacement or upgrading.

1.0 GENERAL.

1.1 It is inevitable that conditions and railing systems will occur which are not covered by these criteria. In those cases, refer the matter to the Special Design Unit of the Structural Design and Review Bureau.

1.2 For bridge rehabilitation projects, the safety walk and railing treatment shall be shown on the preliminary plan. The Bridge Rehabilitation Project Report shall indicate the rationale for the selection shown, and include the type of existing railing; highway posted speed; widths of roadway, safety walk and/or sidewalk; two-way AADT and two-way design hour traffic volume (DHV). Where divided highways with one-way bridges are encountered, report the one-way AADT and DHV for each bridge. In addition, the report shall include information concerning the accident history of the bridge.

1.3 For projects where work on bridges is incidental to highway R & P, safety or other types of work, the safety walk and railing treatments, as well as other work on the bridge, must be described in a report submitted to the Deputy Chief Engineer (Structures) in accordance with E.I. 75-63. The information in 1.2, above, must be included in the report, as well as the proposed upgrading treatment as prescribed by these criteria. It is important to emphasize that this information must be submitted early, before the preparation of plans, so timely decisions as to treatment can be made.

1.4 In some cases, it is desirable to replace a bridge railing system with a concrete safety shape (Jersey barrier) at the curb line or a vertical-faced concrete parapet (behind sidewalk). Because of the added weight, structural analysis of the supporting structure is necessary. Approval by the Deputy Chief Engineer (Structures) is required.

1.5 The criteria for sidewalk railings do not apply if there is a separate traffic barrier between the roadway and sidewalk or in other cases where the sidewalk railing is not subject to vehicular impact.

1.0 GENERAL. (CONTD)

1.6 The details shown on BDD 79-57A and 79-57B shall be followed for attachment of box beam railing to through girder and truss bridges.

1.7 These criteria do not specifically cover treatment of existing concrete and masonry parapets because of the variety of types, structural condition and physical situation that exists. Good judgment on the part of the Designer is important. Consultation with the Special Design Unit of the Structural Design and Review Bureau is recommended if there are any questions.

1.8 Regional Directors are requested to alert their Designers to these criteria. We suggest that the Regional Structures Engineer be given responsibility for coordinating the submission of all plans and reports involving bridge railings to this office.

1.9 Reproducibles of BDD 78-51 (2-rail steel railing) and BDD 78-52A and 78-52B (4-rail steel railing) may be obtained from the Supervisor of the Bridge Design Section of the Structural Design and Review Bureau. These reproducibles may be used in the production of railing details for specific projects.

2.0 TREATMENT OF SAFETY WALKS.(Between 9" and 3'-0" from face-of-rail to face-of-curb

Two basic types of fascia details will be encountered. They are:

a. Concrete Fascia - In this case, the concrete deck extends to the fascia. It may be overlayed by a sidewalk, safety walk, or brush curb.

b. Steel Fascia - In this case, the fascia, including the sidewalk or safety walk, consists of structural steel shapes and plates.

If the fascia consists of both concrete and steel, it shall be treated according to the criteria set forth for steel fasciae.

2.1 Concrete Fascia

2.1.1 General. When it is necessary to completely remove a safety walk overlay because of deterioration or for other reasons, replacement curb shall be located as set forth in 2.1.2, except that, in the case of bridges over streams, the overlay shall generally not be replaced, and the superstructure shall be "curbless". In any case, where a curb is to be used, it shall be transitioned properly at the ends of the bridge.

2.1 Concrete Fascia (Contd)

2.1.2 As a general policy, safety walks shall be reduced in width so that the curbs extend no less than six (6") inches beyond the face of the bridge railing, nor more than nine (9") inches beyond the face of the bridge railing. Since this change in railing is intended to reduce the probability of vehicles vaulting the railing, the smaller dimension (six inches) is preferred.

Exceptions to this policy may be made, and the existing safety walk retained. The following factors must be evaluated when considering an exception:

a. Accident Record - If the bridge has a high accident rate and the width of available travel way can in any way be related to it, the safety walk should be removed.

b. Vehicle Speed - The ability of a Driver to perform various safety maneuvers decreases with an increase in speed. In addition, the force with which a vehicle hits an object is directly proportional to the square of the speed, and the probability of vaulting is greater at higher speeds.

c. Width Of Roadway On Bridge - Wider traffic lanes are safer than narrow. Therefore, it is more important to cut back the curb on bridges with substandard widths than those of a width which meets standards. For example, widening a 9 foot lane to 10 feet would generally be much more effective and desirable than widening a 12' lane with a two foot curb offset one additional foot.

d. Traffic Volume - The number of people exposed to a potentially hazardous feature increases with traffic volume. Thus, the likelihood of some kind of accident increases as traffic increases. In many areas, heavy traffic travels at the posted speed, but spaced closer than safe driving procedures would dictate. This compounds the potential for an accident.

When an exception is being sought, the evaluation of these factors shall be submitted with the report appropriate for the type of work being done(see 1.2 and 1.3)to the Deputy Chief Engineer(Structures) for review. Questions concerning removal or retention of safety walks should be directed to the Special Design Unit of the Structures Design and Review Bureau.

It is expected that, when the operating speeds are in the range of 55 mph, exceptions to the above policy will be considered only when unusual situations and/or costly modifications are required by the reduction. More exceptions would be likely at lower operating speeds.

2.2 Steel Fascia

Where steel fasciae exist on a bridge, safety walks shall generally not be reduced in width because of the high cost involved. Exceptions may be made. The fascia may be replaced or altered when the accident history indicates a reduction in the width of the safety walk is likely to significantly improve safety. Fascia replacement or alteration may also be required if the fascia cannot properly anchor the railing system. When a steel fascia is replaced, generally the new construction will be concrete. This usually requires the replacement of a portion of the bridge deck. In any case, where a curb is used, it shall be transitioned properly at the ends of the bridge.

2.3 Bridge Widening

These criteria shall not be interpreted to preclude widening the bridge to carry full approach shoulders, when such work is warranted to improve safety or increase capacity. Such widening will add considerably to the cost of the project. However, the expense may be justified if there is a high accident record which can be attributed to the narrow shoulders, or if the full shoulders will relieve congestion on a heavily traveled highway. The Federal Highway Administration encourages widening Interstate highway bridges to carry full shoulders and will approve such work on other highways where there is adequate justification.

3.0 TREATMENT OF BRIDGE RAILING.

It should be noted that the categories listed (brush curb, safety walk, sidewalk, or curbless) apply to the conditions that will exist after reconstruction is complete, regardless of the original condition. For instance, the criteria under "Brush Curb" apply whether the original condition is a brush curb, a safety walk which is being cut back or a safety walk with a railing which is being blocked out to within nine (9") inches of curb.

3.1 Dislocation of existing railing necessary

When structural slab removal or other work necessitates dislocation of existing bridge railing, the railing treatment will be determined in accordance with one of three reconstructed deck configurations.

3.1.1 Brush Curb.(9" or less from face-of-curb to face-of-railing)

Existing 2-rail steel railings conforming to BDD 65-51 and superseding sheets and 4-rail steel railings conforming to BDD 78-52A shall be removed, stored, and reset. All other steel railings and all aluminum railings shall be replaced with the current 2-rail steel railing. The face of railing should be six (6") inches in back of the face of curb and in no case more than nine (9") inches.

3.1 Dislocation of existing railing necessary (Contd)

3.1.2 Sidewalk.(3'-0" and greater from face-of-curb to face-of-rail)

Existing 4-rail steel railings conforming to BDD 78-52A and 78-52B and superseding sheets shall be removed, stored, and reset. All other steel railings and all aluminum railings shall be replaced with the current 4-rail steel railing.

3.1.3 Curbless.

Existing 2-rail steel railings conforming to BDD 65-51 and superseding sheets and existing 4-rail steel railings, conforming to BDD 65-52 and superseding sheets, shall be removed, stored, and reset. If there will be substantial pedestrian traffic on the bridge shoulder, 2-rail railings shall not be reused, but shall be replaced with the current 4-rail steel railing. All other steel railings and all aluminum railings shall be replaced with the current 2-rail steel railing used for curbless bridges.

3.2 Dislocation of existing railing not necessary

When dislocation of existing bridge railing systems is not necessitated by other work being done on the bridge, some railing systems, which would be replaced if they were to be dislocated during construction, will be retained. The rationale for this policy is that certain systems, which do not need to be dislocated during construction, provide a safe and cost-effective barrier, even though they are not equal to the current railing systems. Some of these systems must be upgraded to attain the degree of safety necessary.

The rationale upon which to base the decision to either replace, retain as is, or upgrade a railing system should be based on the factors listed below. Note that most of these factors are the same as shown in Section 2.1.2, but, since they relate to a different situation, the discussion of the factor may differ from the earlier discussion:

a. Accident Record - A high accident rate would be sufficient reason to replace the railing system if the existing system is substandard.

b. Vehicle Speed - The ability of a Driver to perform various safety maneuvers decreases with increased speed. Thus, more accidents can be expected at higher vehicle speed. In addition, the force with which a vehicle hits an object is directly proportional to the square of the speed.

3.2 Dislocation of existing railing not necessary (Contd)

c. Width Of Roadway On Bridge - The width of the roadway on the bridge directly affects the magnitude of the angle of impact with the railing. The wider the bridge, the higher the possible angle of impact. The highest angle would be attained by a vehicle starting on one side of the bridge and crossing over to the other side. Therefore, the presence of a median barrier reduces the effective width of the bridge for this consideration.

d. Traffic Volume - The number of people exposed to collision with the railing system increases with an increase in traffic volume. Thus, statistically, the likelihood of some kind of accident increases as the traffic volume increases. Heavy traffic often travels at the posted speed, but spaced closer than safe driving procedures would dictate. This increases the potential for accidents.

e. Horizontal Curve On The Approach Or Bridge - The presence of a horizontal curve on the approach to the bridge or the bridge itself will increase the possible angle of impact of a vehicle. The sharper the curve, the higher the possible angle of impact.

The evaluation of the above five factors, leading to the decision for a specific situation, should be documented in accordance with Subsections 1.2 and 1.3 of these criteria, and will be the justification for the decision. Questions concerning decisions on railing systems should be referred to the Special Design Unit of the Structures Design and Review Bureau.

The railing system treatment to be used shall be determined by the reconstructed deck configuration, as follows:

3.2.1 Brush Curb. (9" or less from face-of-curb to face-of-railing)

Wherever feasible, completed railing treatment on existing safety walks shall be such that the distance from the face of curb to the face of the closest railing element to the curb shall be no less than 6" nor no more than 9", with 6" being the desirable value. Three courses of action are possible, depending on the circumstances existing at a given bridge:

a. Leave System Intact.

Existing 2-rail steel railings conforming to BDD 65-51 or superseding sheets, 4-rail steel railings conforming to BDD 65-52 or superseding sheets, or 3-rail aluminum railings conforming to BDD 65-55, 66-55, or 70-55 shall be left intact. All other railing systems shall be upgraded or replaced.

3.2 Dislocation of existing railing not necessary (Contd)

3.2.1 Brush Curb. (9" or less from face-of-curb to face-of-railing) (Contd)

b. Upgrade the System.

Where justified, railing systems detailed on the current BDD sheets for railing upgrading may be upgraded and retained. Care should be taken not to upgrade railing systems for which replacement parts are not available.

c. Replace the System.

If it is not feasible to leave the railing system intact or upgrade it, it should be replaced with the current 2-rail steel railing designed for mounting on a curb.

3.2.2 Safety Walk. (Between 9" and 3'-0" from face-of-curb to face-of-railing)

This situation will apply only when safety walks are to remain in-place in accordance with 2.1.2 and 2.2.

Existing 2-rail steel railings conforming to BDD 65-51 and superseding sheets and 4-rail steel railings conforming to BDD 65-52 and superseding sheets shall be retained. Where justified, 3-rail aluminum railings conforming to BDD 65-55, 66-55, or 70-55 may be retained.

Where justified, railing systems detailed on the current BDD sheets for railing upgrading may be upgraded and retained. Care should be taken not to upgrade railing systems for which replacement parts are not available. It should be noted that, when a railing system is upgraded, the method of upgrading may result in the face of the railing being less than nine (9") inches from the face of the curb. When this occurs, the safety walk is effectively reduced to a brush curb category.

All railing systems not mentioned in the previous two paragraphs must be replaced unless permission to retain them is granted by the Deputy Chief Engineer (Structures).

3.2.3 Sidewalk. (3'-0" and greater from face-of-curb to face-of-rail)

Existing 4-rail steel railings conforming to BDD 78-52A and BDD 78-52B and superseding sheets shall be retained. If justified, existing 4-rail steel railings conforming to BDD 65-52 and superseding sheets and 3-rail aluminum railings conforming to BDD 65-55, 66-55, and 70-55 may be retained.

3.2 Dislocation of existing railing not necessary (Contd)

3.2.3 Sidewalk. (3'-0" and greater from face-of-curb to face-of-rail)(Contd)

Where sufficient justification exists, railing systems detailed on the current BDD sheets for railing upgrading may be upgraded and retained.

All railing systems not mentioned in the previous two paragraphs must be replaced unless permission to retain them is granted by the Deputy Chief Engineer (Structures).

3.2.4 Curbless.

Existing 2-rail steel railings conforming to BDD 65-51 and superseding sheets and existing 4-rail steel railings conforming to BDD 65-52 and superseding sheets shall be retained. All other steel and aluminum railings shall be replaced with current 2-rail steel railing used for curbless bridges.

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