

ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

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SUBJECT:

BRIDGE DESIGN DETAILS
TIE PLATE CONNECTIONS

Subject Code: 7.35

Distribution:



Main Office



Regions



Special

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[Signature]
DCE (Structures) ~ Director, Trans. Maint. Div.

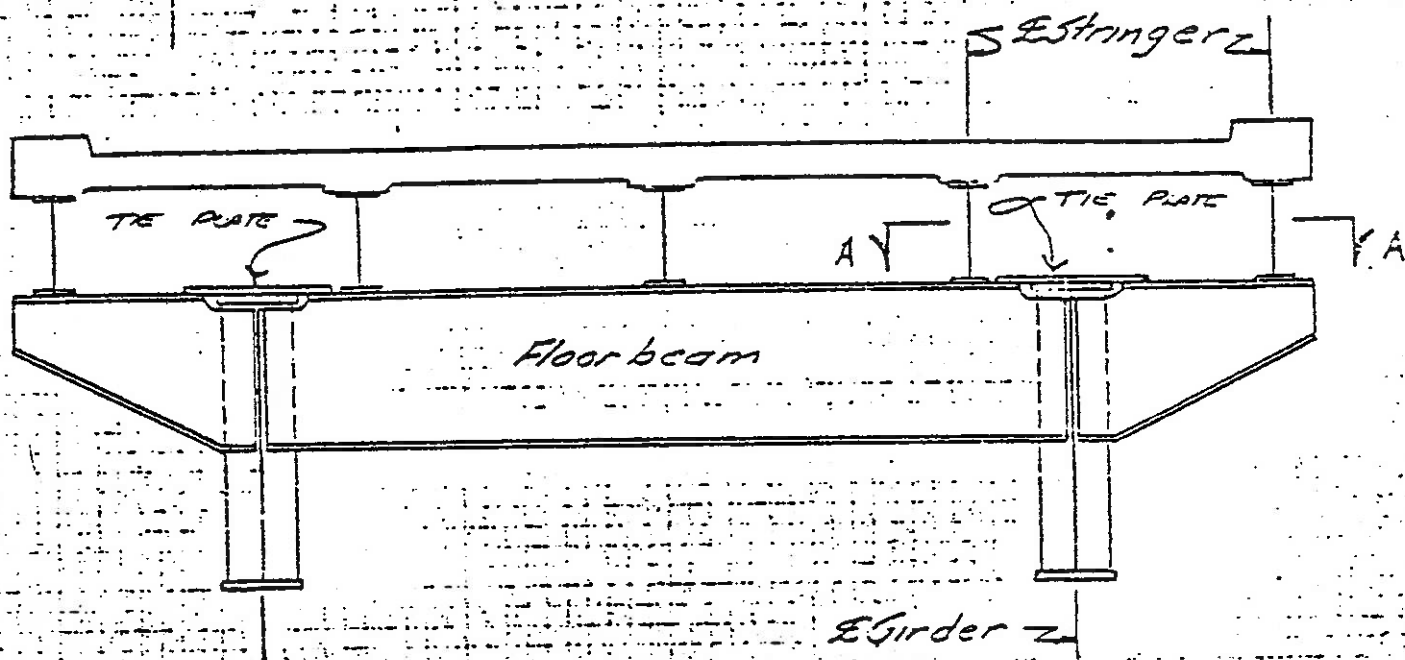
Attached is a copy of FHWA Technical Advisory T 5040.4 dated August 23, 1978. This advisory warns against employing tie plates for connecting cantilevered floorbeam brackets to main longitudinal girders. This practice can lead to fatigue cracking.

A sketch depicting the detail referred to in the technical advisory is attached. This office has long recognized the potential problems with this detail and does not permit it in new designs. However, since there are structures in New York State in which the tie plate connection has been used, the following actions are necessary:

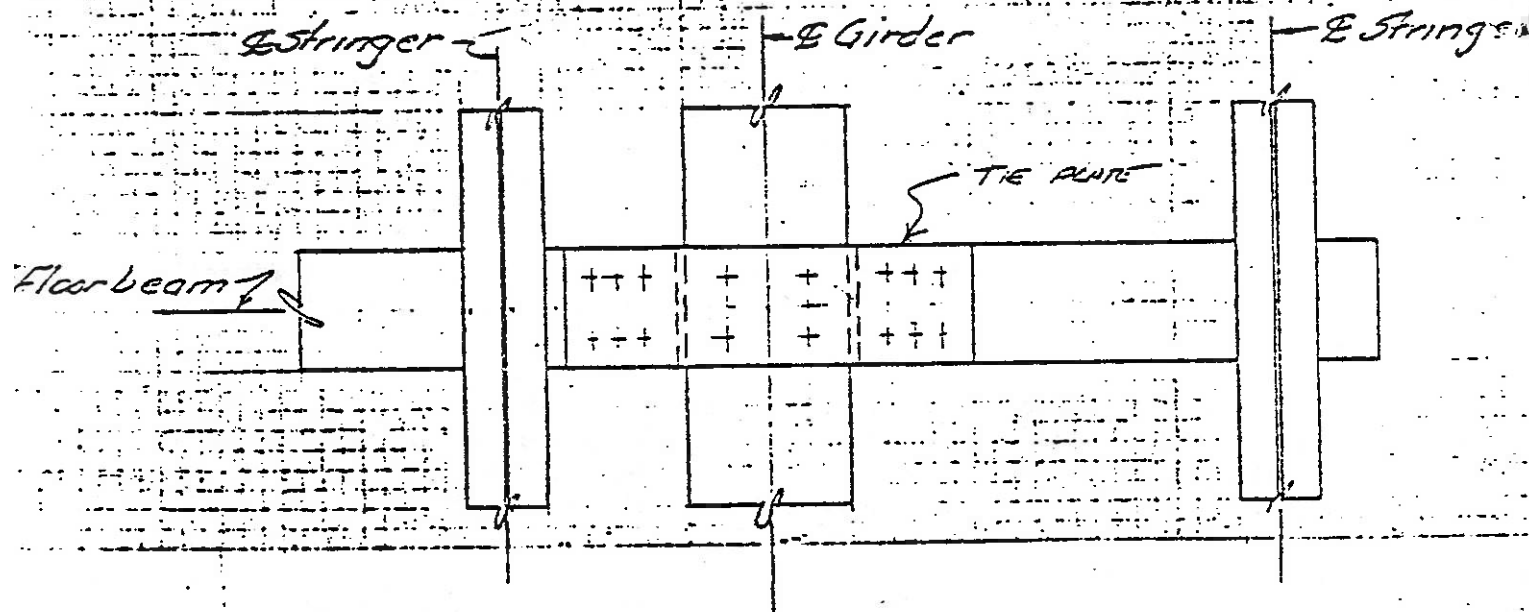
INSPECTION PERSONNEL, when encountering a bridge with cantilever floorbeam brackets, must investigate to determine if tie plates similar to those shown in the sketch are used. If so, the tie plates and the flanges to which they are attached shall be carefully inspected for fatigue cracks. Cracks, if present, should be found adjacent to points of restraint, such as rivets, bolts or welds which connect the tie plate to the flange. Particular attention should be given to tack welds which may be found on riveted or bolted joints.

Any indication of cracks, or the presence of tack welds, shall be reported directly to the Structures Design and Construction Subdivision so that prompt corrective action may be initiated.

DESIGN PERSONNEL, when preparing rehabilitation plans for structures with cantilever floorbeam brackets, must look for the detail described in the Technical Advisory and shown in the sketch. The existence of tie plates (continuity plates), whether or not there are signs of cracking, shall be brought to the attention of the Metals Engineering Unit in the Structures Design and Construction Subdivision. Consulting Engineers and Regional designers shall report the existence of the detail and cracks, if any, discovered during inspection to the Plan Review Unit, who will then inform the Metals Engineering Unit. It is suggested that a special memo be written on the subject to assure that the information in the inspection report is not overlooked. Structures Subdivision designers shall inform the Metals Engineering Unit directly. After reviewing the situation, the Metals Engineering Unit will make suggestions as to corrective work to be included in the plans.



TRANSVERSE SECTION



SECTION A-A

TYPICAL TIE PLATE DETAIL



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SUBJECT

Design Details - Tie Plate Connections

FHWA TECHNICAL ADVISORY

T 5040.4
August 23, 1978

- Par. 1. Purpose
2. Background
3. Discussion
4. Recommendations

1. PURPOSE. To alert personnel of Federal Highway Administration and State highway agencies of a detail area to be avoided in new designs for structural steel bridges, and to point out the need for examination of this detail in bridge inspections.
2. BACKGROUND. Some bridges in Pennsylvania have experienced fatigue cracking of the top tie plate of floor beam brackets which are cantilevered from the main longitudinal girders. Research by Lehigh University has defined and evaluated the nature of this distress under Fritz Engineering Laboratory Report 386.4 and a digest of the results is contained in the Transportation Research Board Record 607, page 56.
3. DISCUSSION
 - a. The tie plate for the floor beam bracket is normally bolted or riveted to both the floor beam bracket and the interior floor beam to transmit the moment capacity of the bracket back to the floor beam. In the instances of distress, this tie plate has also been bolted or riveted to the top flange of the longitudinal girder.
 - b. Due to the cumulative effect of the compression stress in the top flange of the longitudinal girder, a shortening of this flange occurs. This shortening is not shared by the exterior stringers which rest on the top flange of the floor beam bracket and, as a result, a longitudinal displacement occurs in the end of the floor beam bracket relative to the part of the tie plate which is riveted or bolted to the longitudinal girder.

DISTRIBUTION:

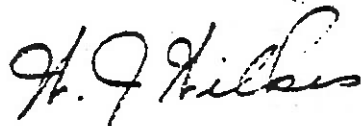
H-W(EO/RD)-1; H-W(DV/HO/NG/RS/TO)-3
H-DM-1; H-D(BR/CM/FH/RP/WB)-3
H-M(BR/EC/FO/RP)-3; H-M(SH)-4

OPI: HNG-32

- c. This relative displacement sets up inplane bending stresses of a repetitive nature under live load which are sufficient to fatigue the tie plate to the point of fracture.
- d. This problem is not in evidence in situations where the stringers frame into the floor beam bracket and the flange of the bracket is in contact with the bottom of the concrete slab.

4. RECOMMENDATIONS

- a. Designs on future projects which utilize this type of detail should avoid bolting the tie plate to the longitudinal girder.
- b. Existing structures which have this detail should be carefully examined for evidence of cracking and the need for repairs. It is recommended that the bolts or rivets which connect the tie plate to the longitudinal girder be removed, and that the holes be protected against corrosion through use of smaller bolts and suitable washers or plates.



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