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9. Rehabilitation of a Lenticular Steel Truss in New Jersey (USA)

Engineer: A. G. Lichtenstein and Assoc.
Fair Lawn, NJ

Contractor: E. Daskall Corp., Suttern, NY

Date of repair: September 1983 – April 1984

Neshanic Station is a small town in Somerset County, New Jersey. In this community there exists Bridge No. CO 601 which is composed of two spans 44.20 m (145 feet) each, over the South Branch of the Raritan River. The bridge accommodates one traffic lane in two directions and one sidewalk.

The bridge was constructed in 1986 by the Berlin Bridge Company of Berlin, Connecticut as a patented system and still retains its original configuration as a lenticular parabolic truss supported on the original stone abutments and piers. The structure has been judged a Historic Bridge by American Standards and the community of Neshanic Station indicated a desire to preserve and rehabilitate the bridge in lieu of replacement.

The bottom chord is made up wrought iron eye bars; the upper chord is composed of steel channels and a plate; the verticals and diagonals are constructed with rolled steel sections. The original steel floor beams, king posted, have remained in good condition. Steel stringers and an asphalt steel corrugated metal deck form the floor system for the bridge and have been replaced many times during its ninety year life.

An indepth inspection of the bridge was conducted by the Consulting Engineer including non destructive testing of the eye bars, pins and other main connections of the bridge. All the elements of the trusses have been found to be in good condition except the *top chord*. The existing channels in the upper chord have completely corroded (holed through in many places) so that the bridge could barely support its own weight. The bridge was closed to traffic.

The assignment then was how to reconstruct the upper chord economically without changing the historic appearance of the bridge. This challenge was met by the interesting idea of installing new high strength steel beams between the existing corroded channels in the top chord and transferring the stresses from these channels to the new beams via specially designed web plates and bolts. A new steel beam was hoisted in this space between the channels and kept in place by bolting to the top cover plate of the upper chord. The contractor then installed the web plates which were detailed to have a perfect half round contact surface on one side, abutting the existing pin. After these web plates were bolted to the new beam on both sides, the contractor jacked these web plates in a horizontal direction so that contact between web plates and the pins was as tight as possible. In this way, a new upper chord was created, hidden within the confines of the old deteriorated upper chord without changing the distinctive appearance of the parabolic Lenticular Truss.

The other areas of the bridge needing rehabilitation were the corrugated metal deck which was completely

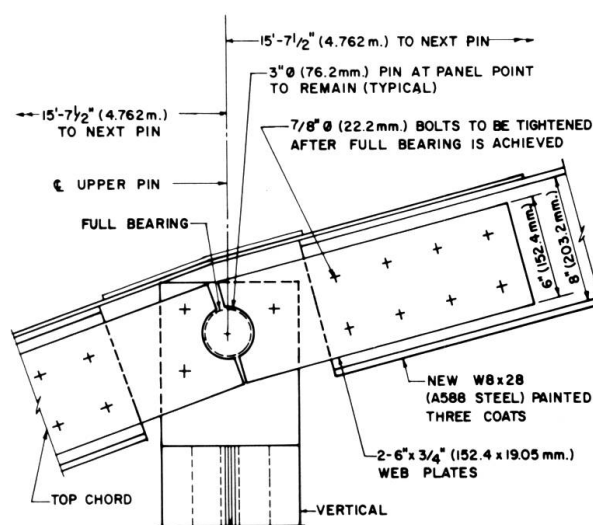


Fig. 1 Section along top chord

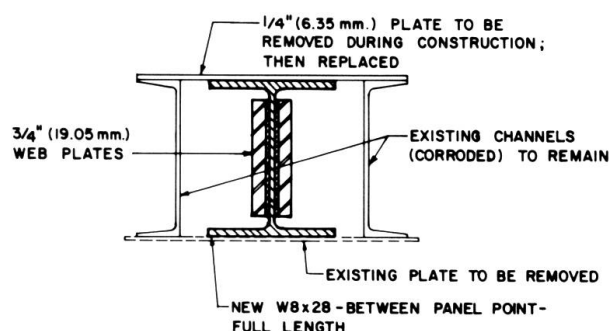


Fig. 2 Section through top chord

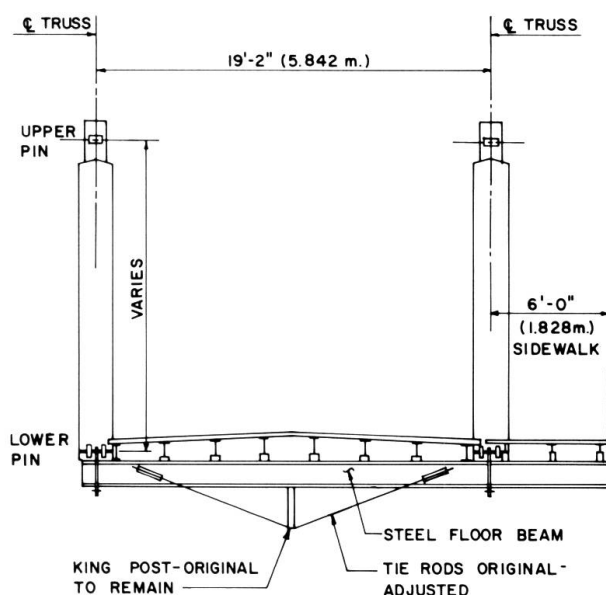


Fig. 3 Typical bridge cross section



Fig. 4 General elevation

replaced; the sidewalk timber planking was replaced where necessary and hand railing repaired; tensioning of the tie rods in the King Posts of the floor beams; and reinforcing the tower legs at the piers and abutments. The entire bridge was sandblasted and painted with two coats of paint. Fig. 1 and 2 describe the Repair details of the upper chord, and Fig. 3 the King Posted Floor Beams.

The construction cost was \$ 325 000, and the bridge has been carrying H15 AASHTO type traffic satisfactorily, including Fire Apparatus and Ambulances. The Federal Highway Administration (USA) has recognized the Consulting Engineer with an *Honorable Mention Award* for designing the restoration of this specialized historic structure, so highly valued by the Community.

(A. G. Lichtenstein)



Fig. 5 View of upper chord with new member in place