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Artikel: The Sioux Narrows Bridge, Ontario (Canada)

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1. The Sioux Narrows Bridge, Ontario (Canada)

Owner: *Ministry of Transportation of Ontario*
Design: *Structural Office and Research and Development Branch*
Work Duration: *6 months*
Completion: *1982*

The Sioux Narrows Bridge is on Highway 71 linking Fort Frances and Kenora in northwest Ontario. The bridge was constructed in 1936 with a wooden Howe truss main span of 64 m, Figure 1. It is believed to be the longest single span wood highway bridge in North America.

This bridge was one of the first to be listed under the Heritage Bridge Program of the Ontario Government, being an outstanding example of wood bridge construction, built of B. C. Douglas Fir in sizes no longer available. Most timber highway bridges have been replaced after about 40 years. Plans were prepared for the replacement of the Sioux Narrows bridge in 1975 when the deck was showing signs of deterioration, and the vehicle loads greatly exceeded the design loads. A condition survey showed the truss members to be in good condition, however, and studies were started to try to rehabilitate and keep this heritage bridge in service. Analysis indicated adequate load capacity in the main trusses, but a significant overstress in the transverse floor beam king post and tie bars, Figure 2. The floor system consisted of a traverse nailed laminated wood deck on longitudinal wood stringers, which were supported by transverse wood beams every 2.3 m.

At the time of these studies, the concept of a prestressed longitudinally laminated wood deck had been developed by the Ministry. This prestressed deck type acted like a homogeneous slab, and exhibited much better load distributed characteristics than the old nailed laminated decks. It was calculated that the longitudinal distribution would be improved enough to reduce the stresses in the floor beams to acceptable levels. The decision was made to replace the old deck with a new wood deck, with 190 mm deep laminated prestressed transversely with 25 mm bars at 1.525 m centres, tensioned by hydraulic jacks.

The deck was replaced one lane at a time, Figure 3, so the bridge could remain open to traffic. The prestressing bars were coupled together for construction of the second lane. A new asphalt wearing surface was then applied to the wood deck.

Full scale bridge testing using custom designed load vehicles, instrumentation and mobile laboratory for the computerized data acquisition system is a regular feature of the Ministry's evaluation procedures. Load testing of the deck system was carried out before deck replacement and after, Figure 4. Eight floor beams were instrumented by attaching strain gauges to the steel tie bars. The greatly improved longitudinal distribution characteristics of the prestressed deck was confirmed by a reduction of 35% in the truss bar strains for the same tests as carried out on the old deck. No further strengthening of the floor system is needed. The only other members that may need replacing are the main truss hanger bars, which will be tested shortly.

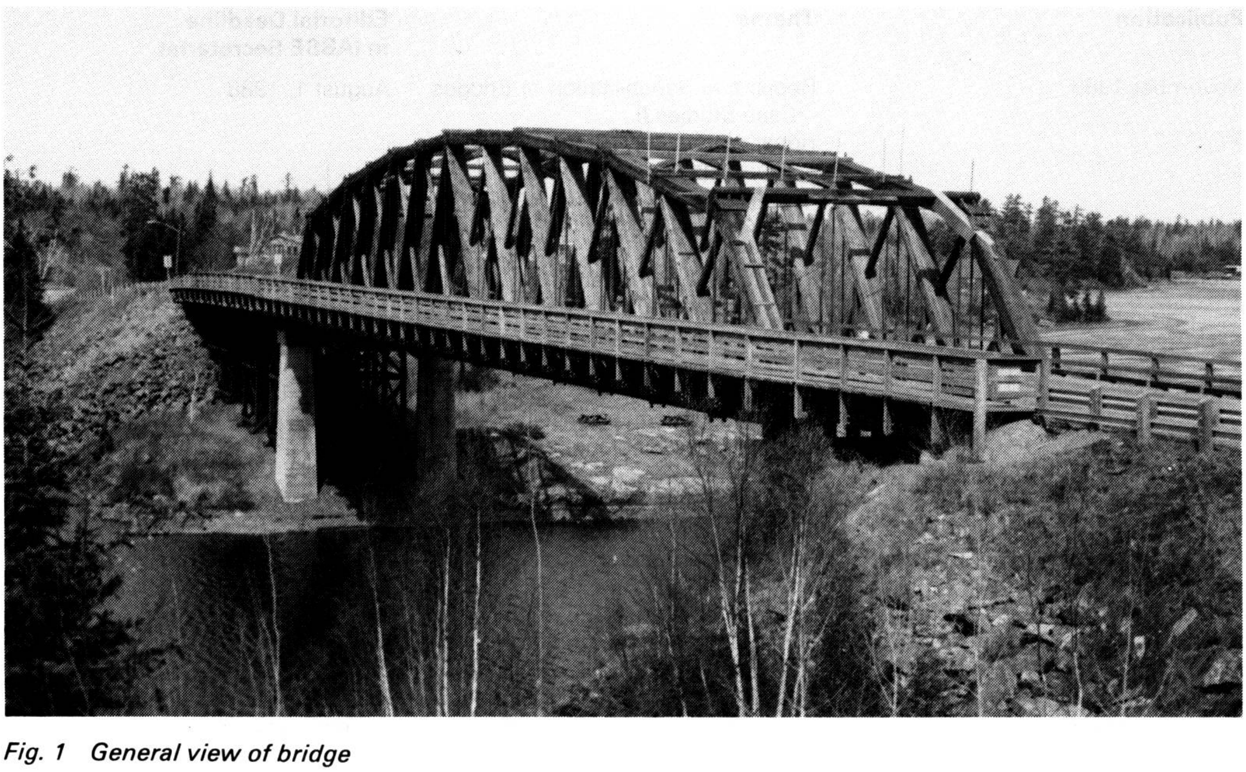

Fig. 1 General view of bridge

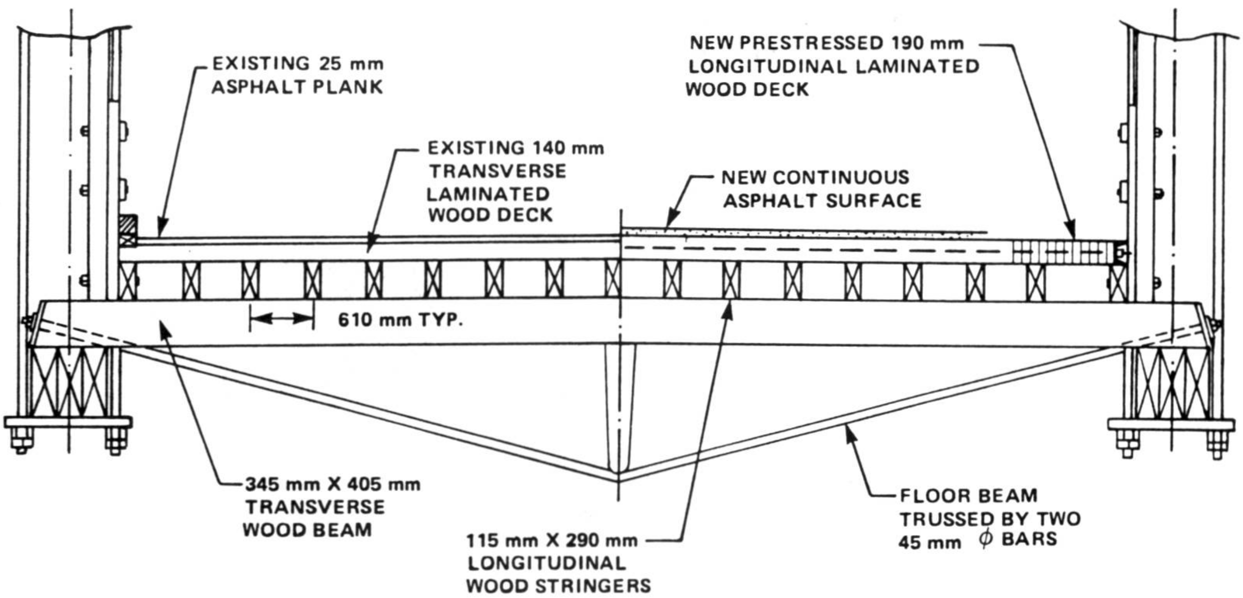

Fig. 2 Cross section of floor system

Fig. 3 Placing prestressed wood deck

Fig. 4 Load testing the rehabilitated bridge

By the application of detailed analysis and testing and the use of an innovative deck rehabilitation scheme, the life of this heritage wood structure has been extended well beyond 50 years, and is performing satisfactorily under full highway loads.

(R.A. Dorton)