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# STEEL-WOOD COMPOSITE BRIDGE

## INTRODUCTION AND OUTLINE OF THE PROJECT

### NAIL CONNECTED LONGITUDINALLY LAMINATED DECK

- Deck deteriorates after a few years and show required deck problems.
- Bridge inspection and/or testing indicated that the strength between laminates is the most important requirement to improve the deck load capacity.

### TRANSVERSE PRESTRESSING AS A MEANS OF KEEPING THE LAMINATES TOGETHER

- Tests carried out before shoring Herbert Creek Bridge produced a local failure at test vehicle loads of 730 kN.
- Transverse prestressing increased the bridge capacity well above 900 kN gross.
- The installation of Herbert Creek Bridge postproved infeasibility.

### DECK DEFLECTIONS HERBERT CREEK BRIDGE

### PRESTRESS HARDWARE

### EXAMPLE OF NEW CONSTRUCTION

### EXAMPLE OF REHABILITATION

### TRANSVERSE LAMINATED DECK

### BRIDGE WITH TRANSVERSE DECKING

- Deck disintegrates after few years.
- Post-tensioning transverse deck is difficult and expensive.
- Little advantage gained by making the transverse deck composite.

### COMPARISON OF STEEL WEIGHTS

Span (m)	Steel Beam Section (kN/m)	
	Using Non-Composite Transverse Decking	Using Composite Longitudinal Decking
10	80	35
20	125	70
30	175	105
40	250	140
50	415	245

### ADVANTAGE OF RE-ORIENTING THE DECK LAMINATES

- Longitudinal moments and shear forces can be shared between the steel beam and the longitudinal laminates.
- The deck can be easily made composite with steel beam which would further improve the deck capacity.
- Bridge deformations are considerably reduced due to much higher 'E' value in the longitudinal decking.

### INTRODUCTION AND OUTLINE OF THE PROJECT

- Timber bridges are not temporary bridges.
- Nearly 10% of bridges in Ontario are timber bridges.
- The life and performance of nail connected longitudinally laminated wood bridges is considerably enhanced by transverse prestressing.
- Transverse laminated wood decking or steel girders cannot effectively increase the strength of girders because of low E<sub>2</sub> effect in the transverse direction.
- Transverse prestressing of wood decking is last for more than about 10 years.
- In wood steel composite bridges
  - deck laminates are made longitudinal so that their contribution to girder strength is substantial.
  - the decking is transversely prestressed to enhance its load carrying capacity.
  - two methods are proposed to provide shear continuity between the wood decking and steel girders.
  - the decking is partly supported by cross beams.

### USING PLATE AS SHEAR CONNECTOR

### USING CONCRETE BULKHEAD AS SHEAR CONNECTOR

### TEST RESULTS

#### DECK DEFLECTIONS UNDER DUAL AXLE LOADS

#### DEFLECTIONS MEASURED AT DUAL AXLE LOAD OF 127.5 kN