TIMBER RAILROAD BRIDGES

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OVERVIEW

- Timber used in RR bridges more than 100 years (many still in service)
- Solid sawn lumber superstructures
- Railroads need to be made aware of value of glued laminated options for rehabilitation and new construction
- Research and education needed to identify most cost effective options

PERTINENT PAST/CURRENT ACTIVITIES

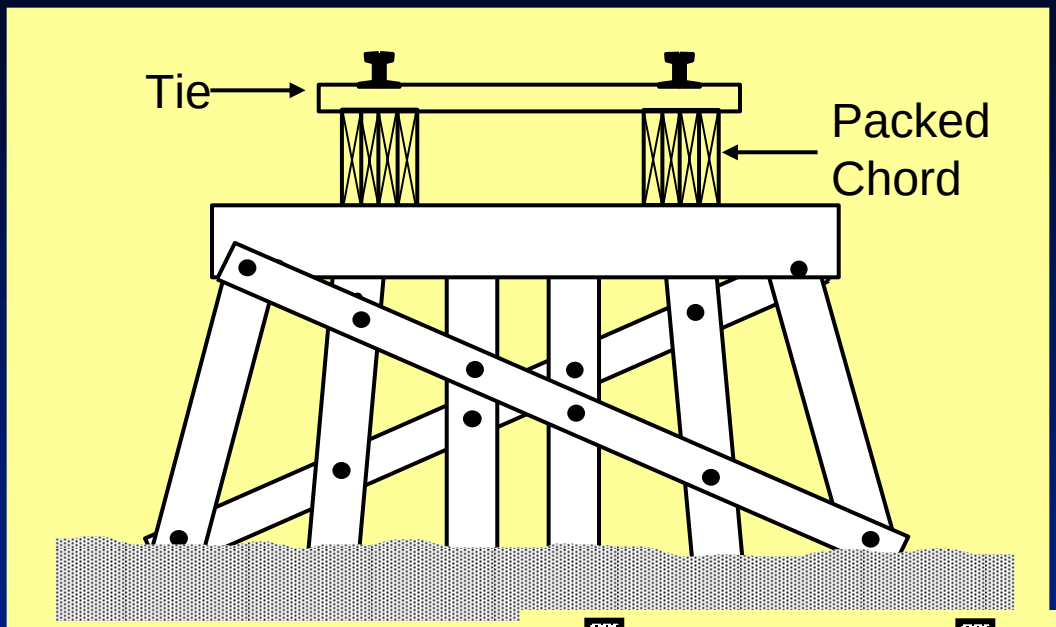
- Testing and evaluation of RR bridges in Texas
- Testing and evaluation of RR bridge in Washington state
- Research needs study

BACKGROUND-Testing and Evaluation of RR Bridges

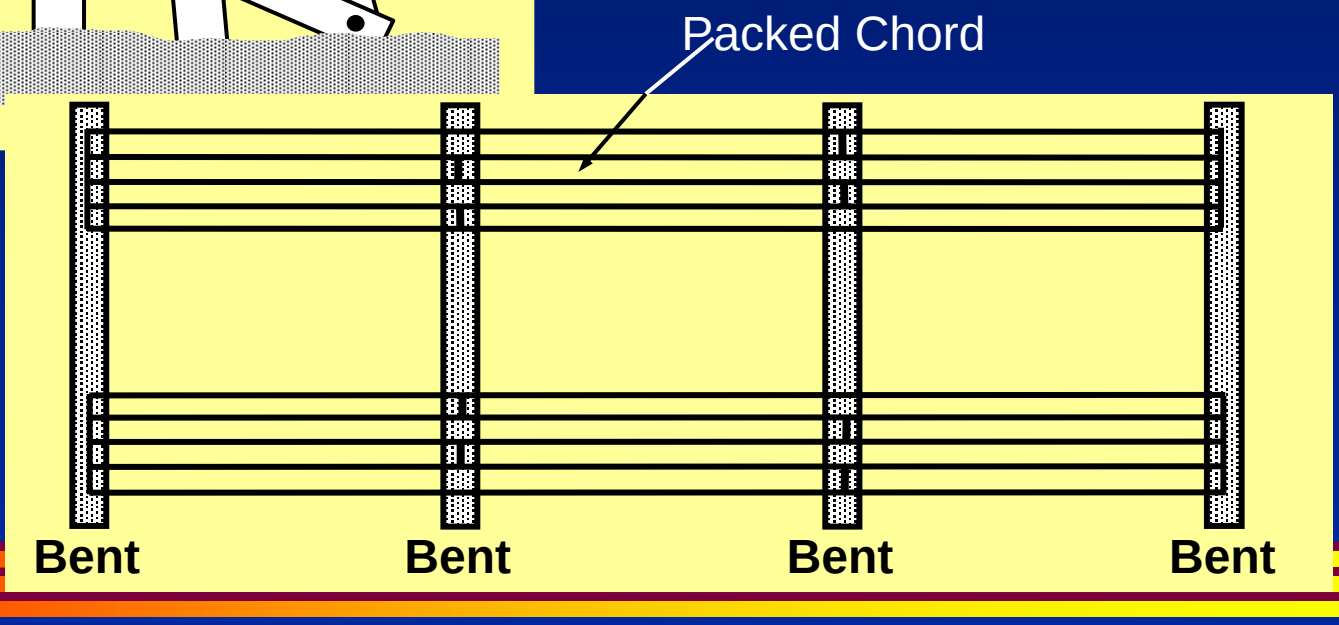
- Existing timber bridges on SP railway line
- Long term performance
  - >60 years
- Recent heavy axle loads
- Condition assessment

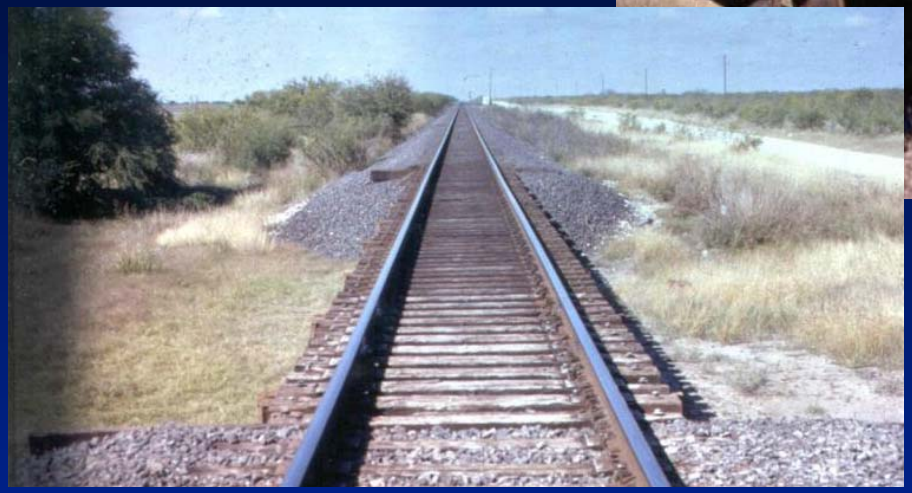
- Rehabilitation program to strength existing bridge (evaluation of effectiveness)

OPEN DECK

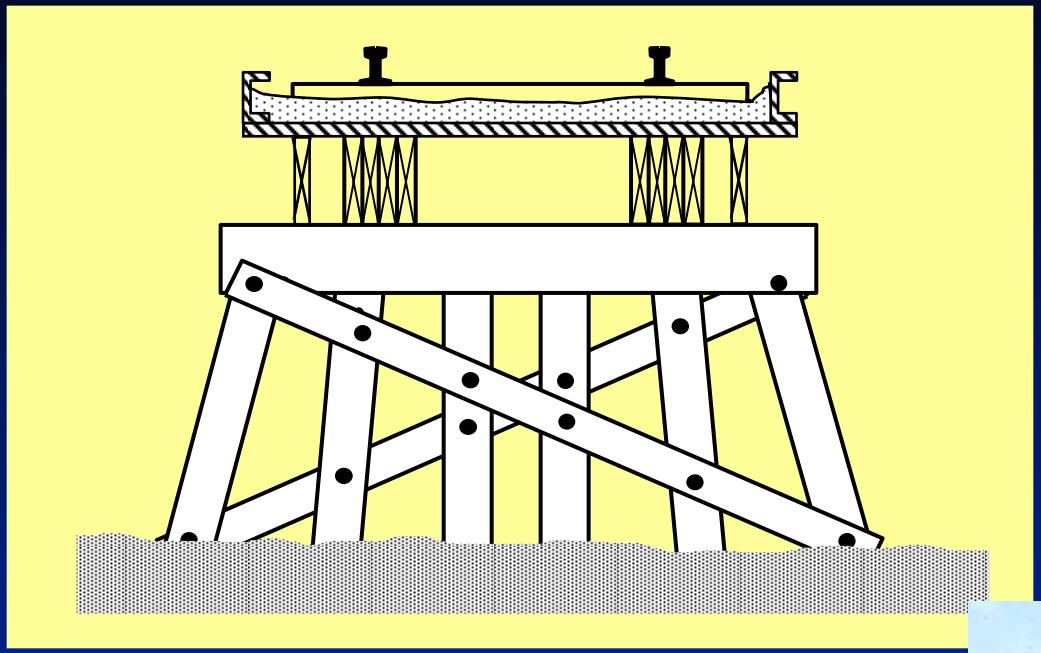


Open Deck



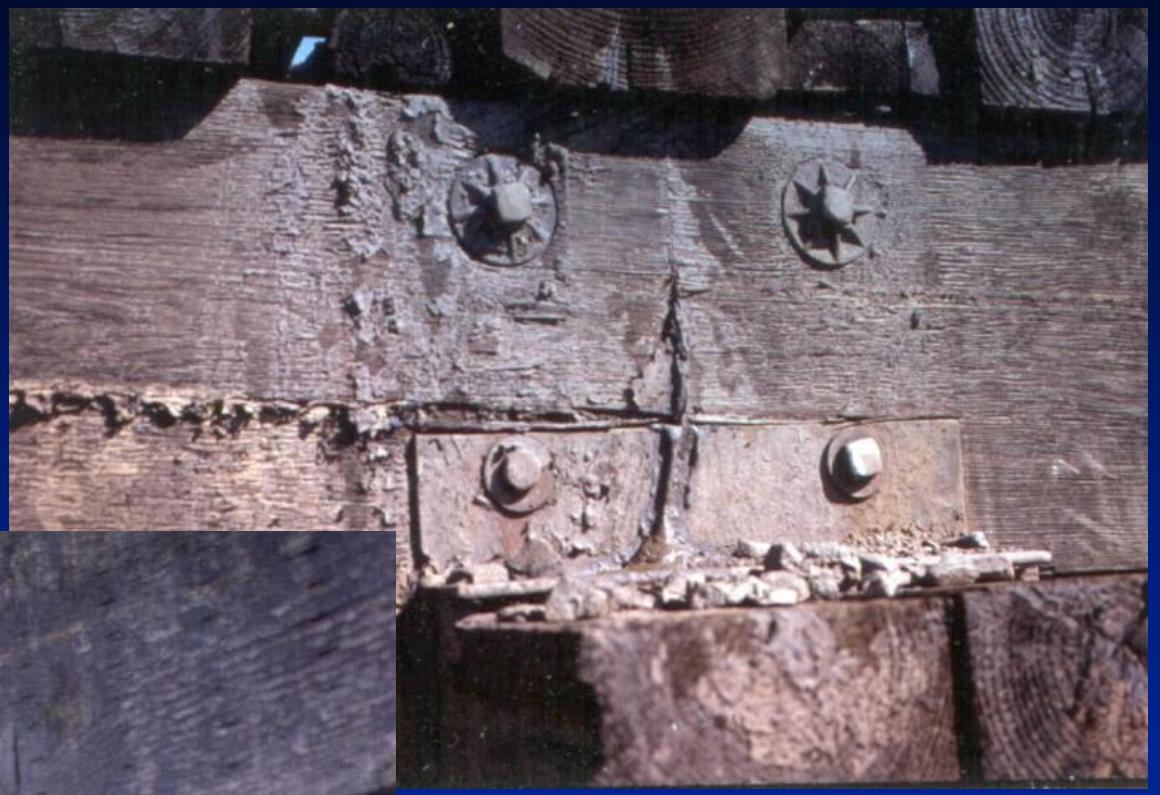


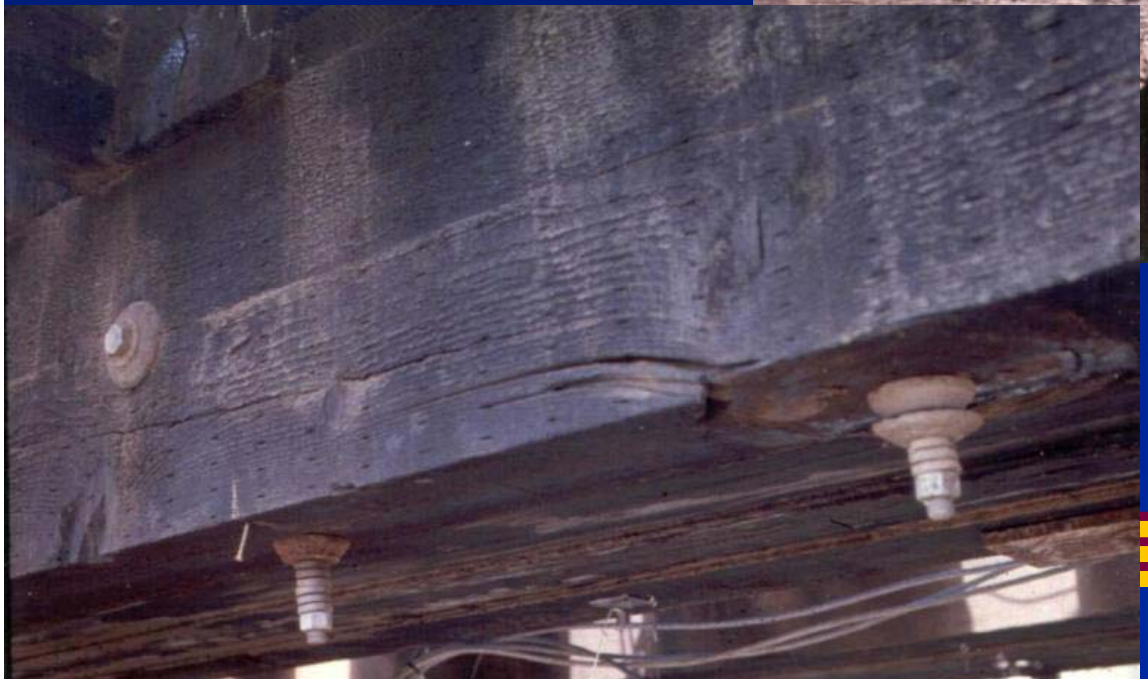
BALLAST DECK



Ballast Deck

Typical Damage and Deterioration





Existing Stringer Condition

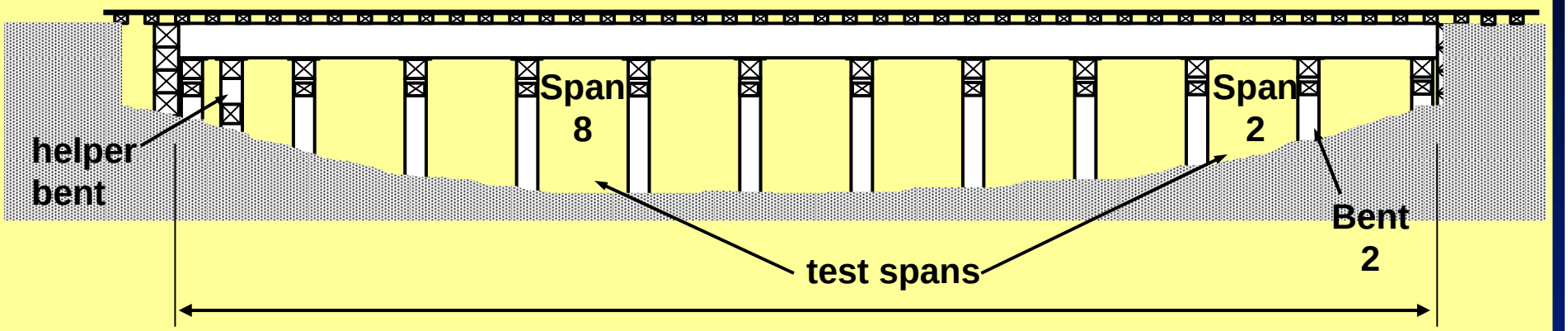
Can’t see interior stringers when in place

"Experimental" Usage of Glued Laminated Stringers

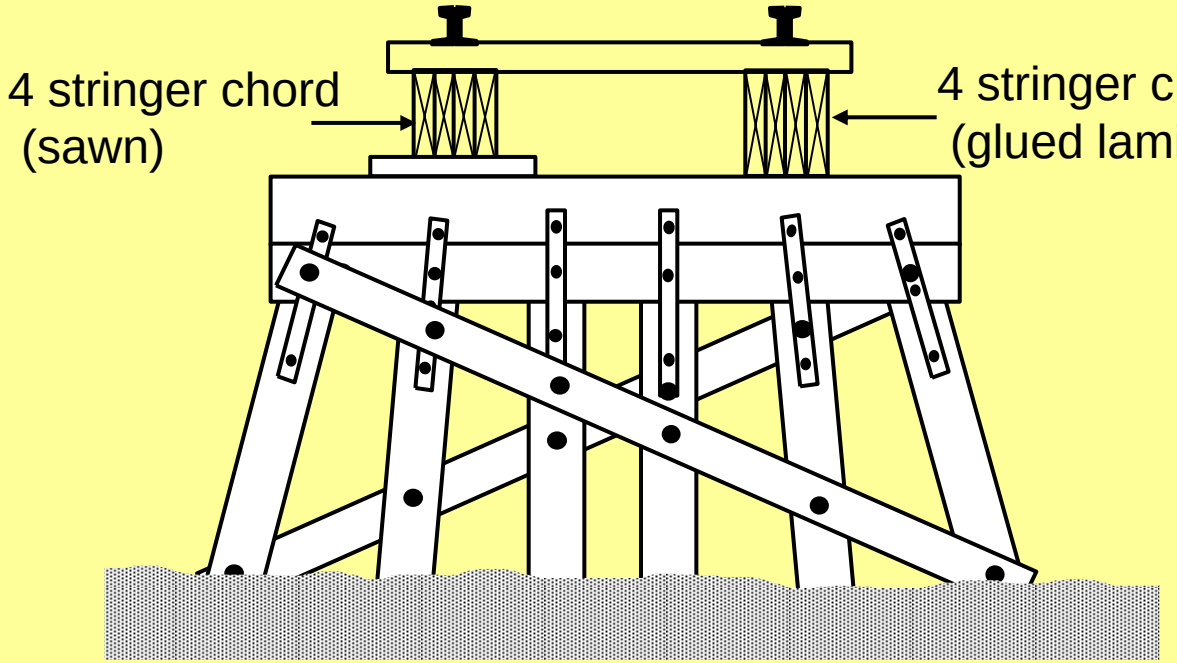
RESEARCH PROGRAM

- D'Hanis bridge test
- Test train
- Revenue traffic
- Static and dynamic loads
- Deflections, accelerations and wheel loads

D'HANIS BRIDGE

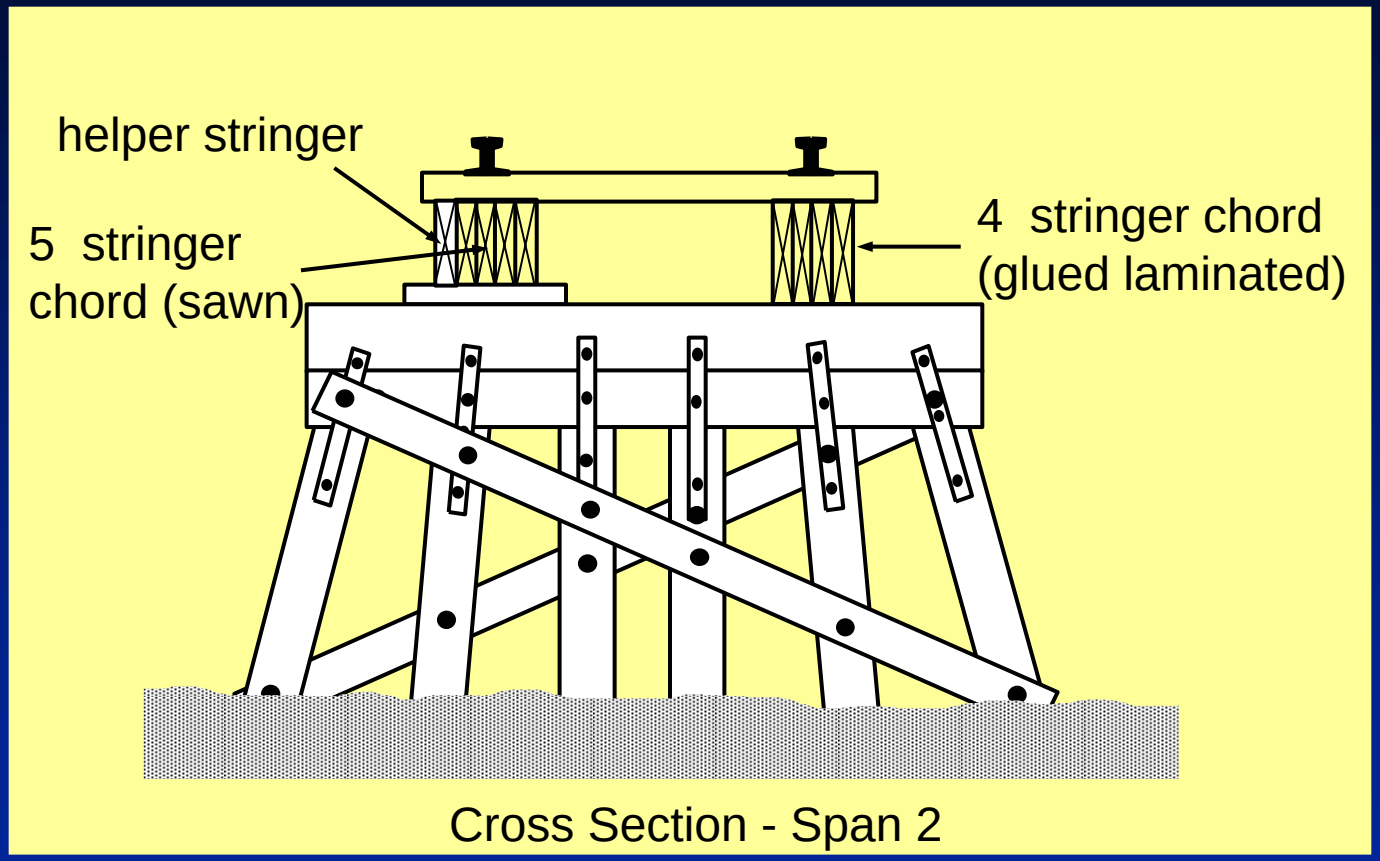


D'HANIS BRIDGE



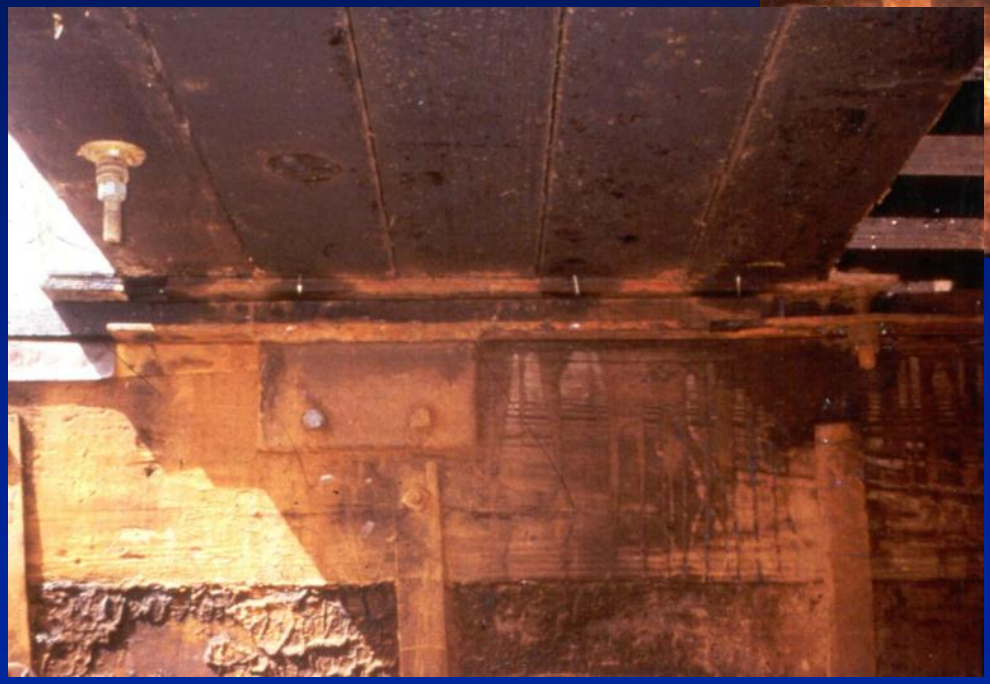
Cross Section - Span 8

D'HANIS BRIDGE



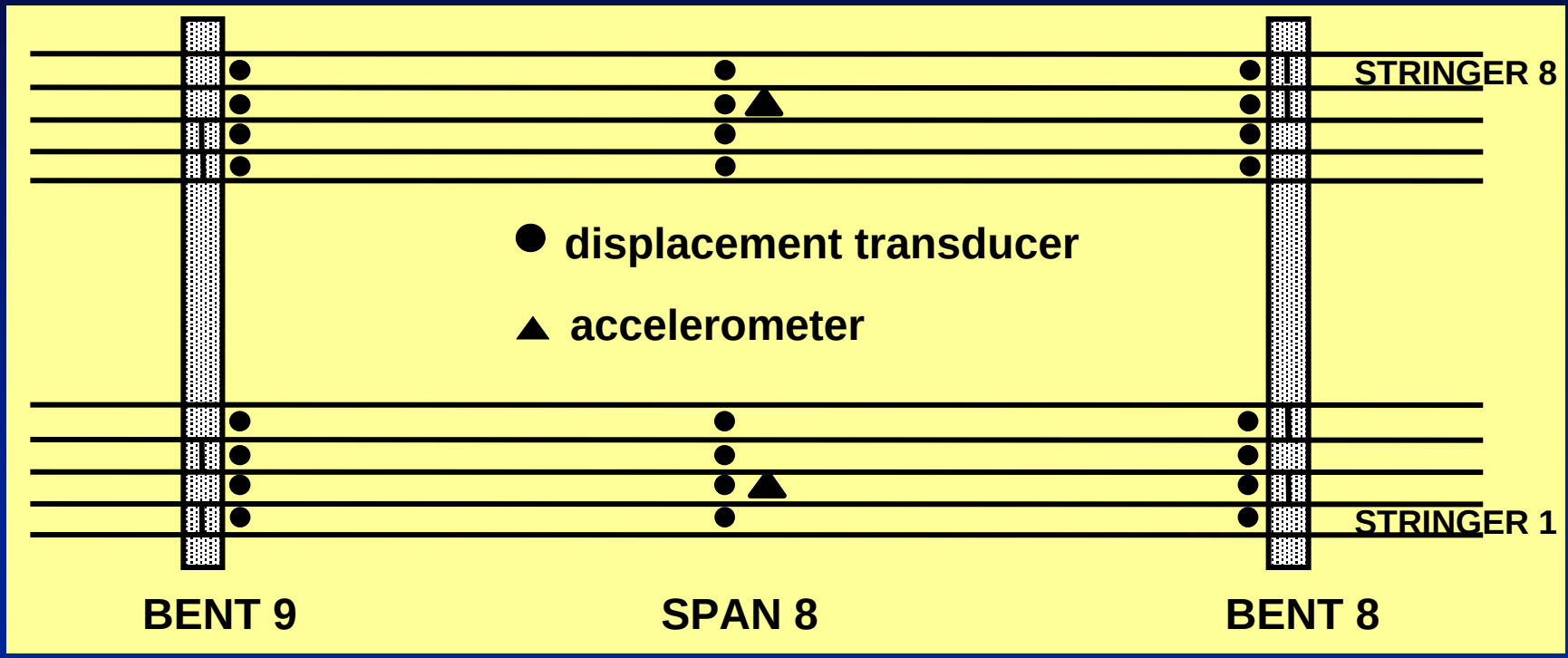
Cross Section - Span 2

Glued laminated
packed chord



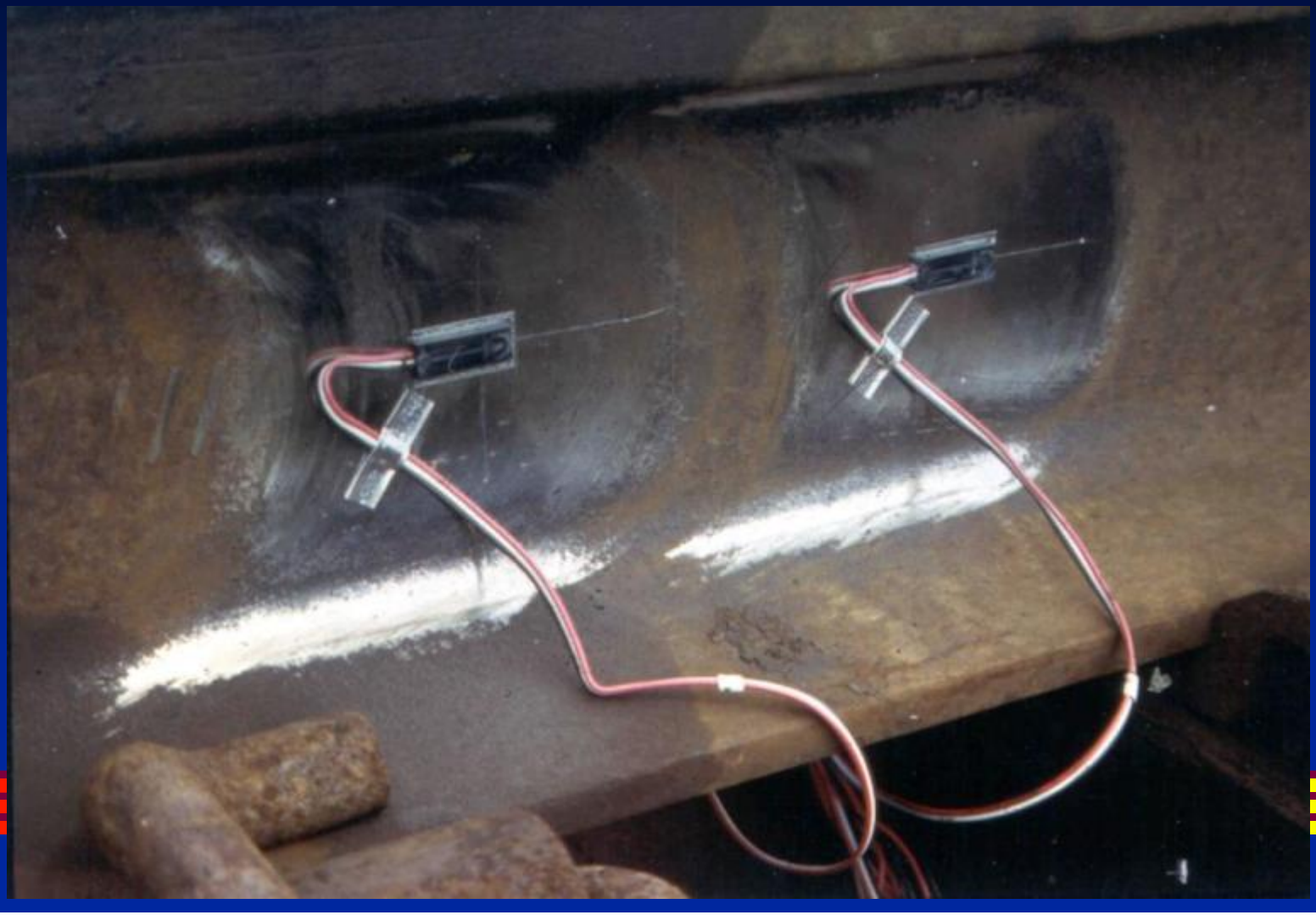
Solid sawn chord
with helper

INSTRUMENTATION



Measuring Shear Deformations

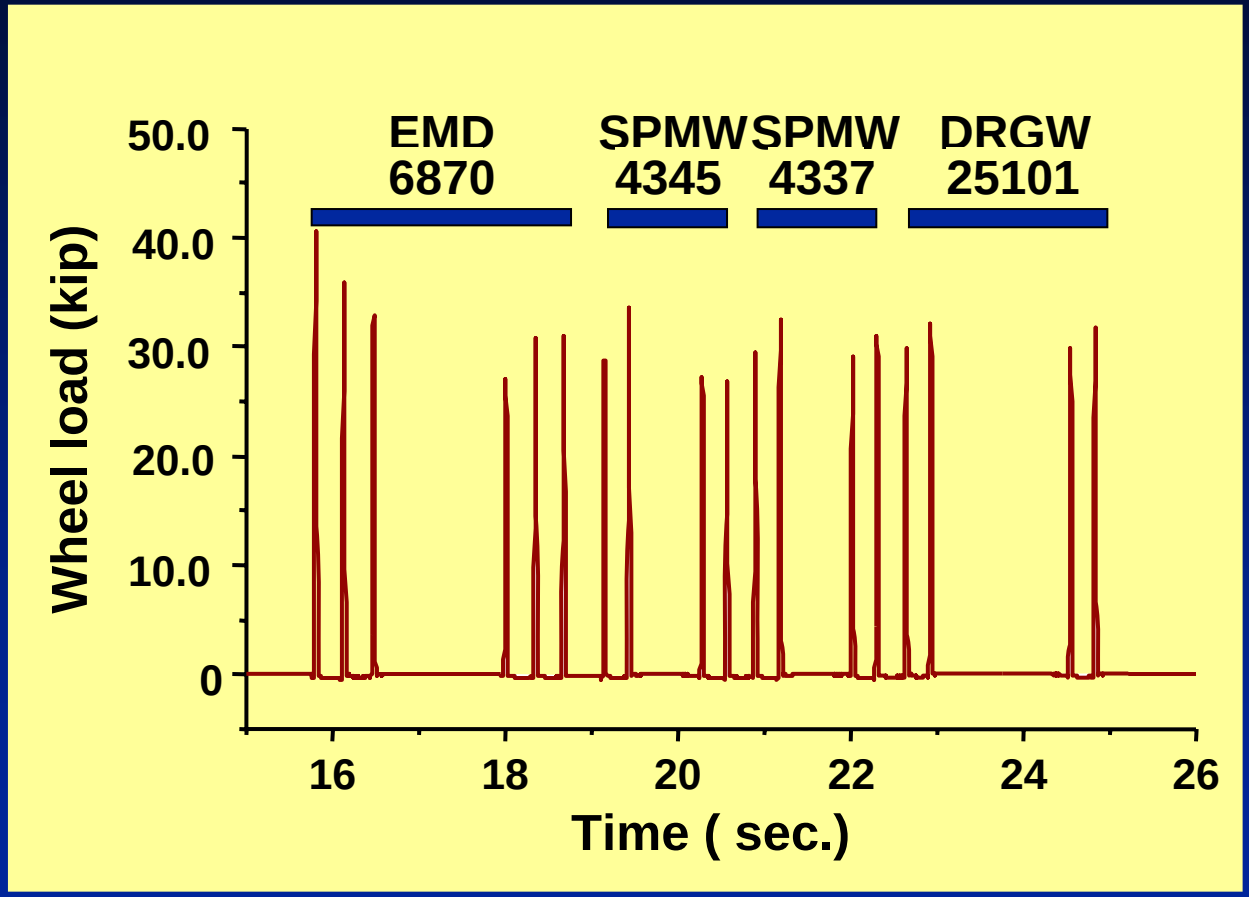
Instrumented Rails for Load Estimation



Controlled Test Train

LOAD TEST RESULTS

Test Train Wheel Loads

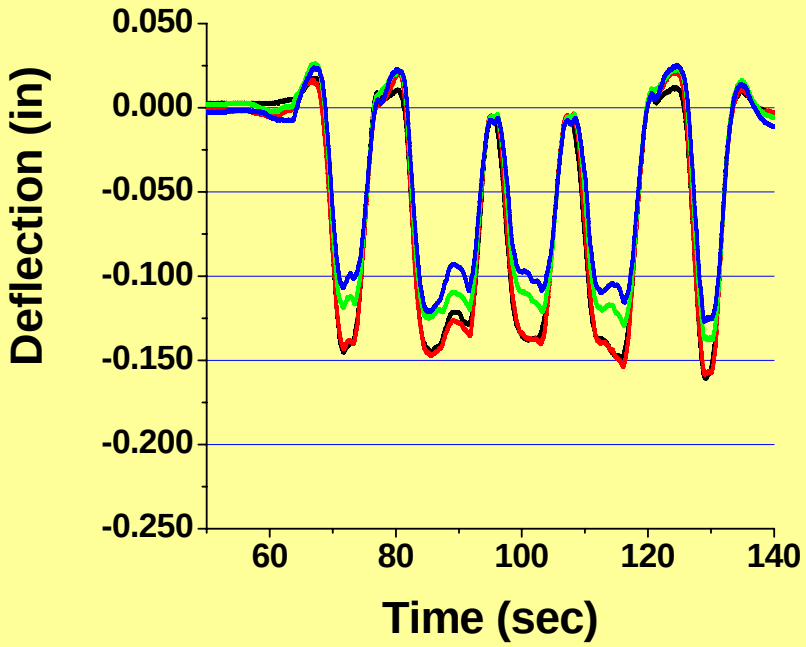


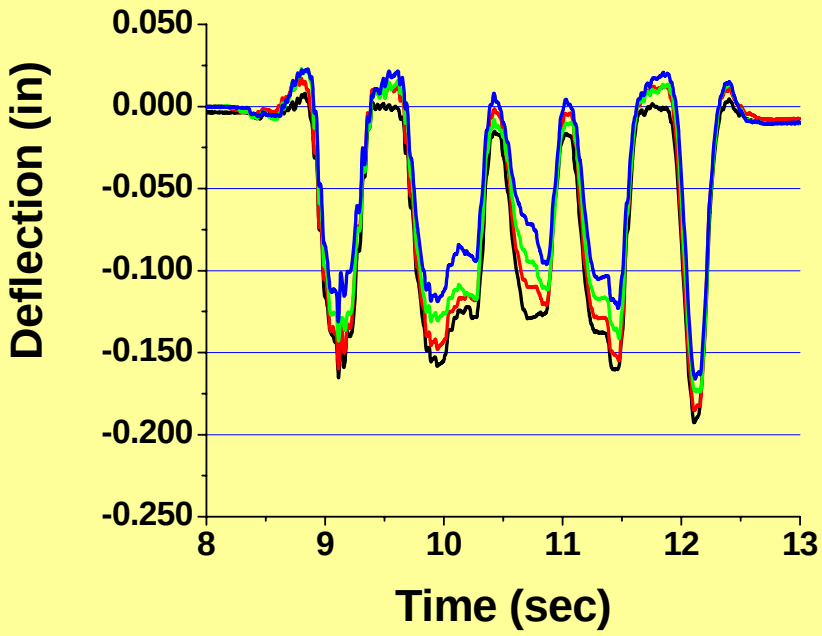
LOAD TEST RESULTS

Dynamic Load Factor

Velocity (mph)	Maximum Wheel Load in Span 8 (kips)	Maximum WheelLoad in Span 2 (kips)	Maximum Wheel Load on Approach (kips)	Span 8 DLF	Span 2 DLF	Approach DLF
crawl	41.0	40.0	40.0	-	-	-
15	41.6	40.7	39.8	1.02	1.02	1.00
30	41.6	46.8	42.8	1.01	1.17	1.06
40	41.0	40.7	53.1	1.00	1.02	1.32

LOAD TEST RESULTS





Slow

Fast

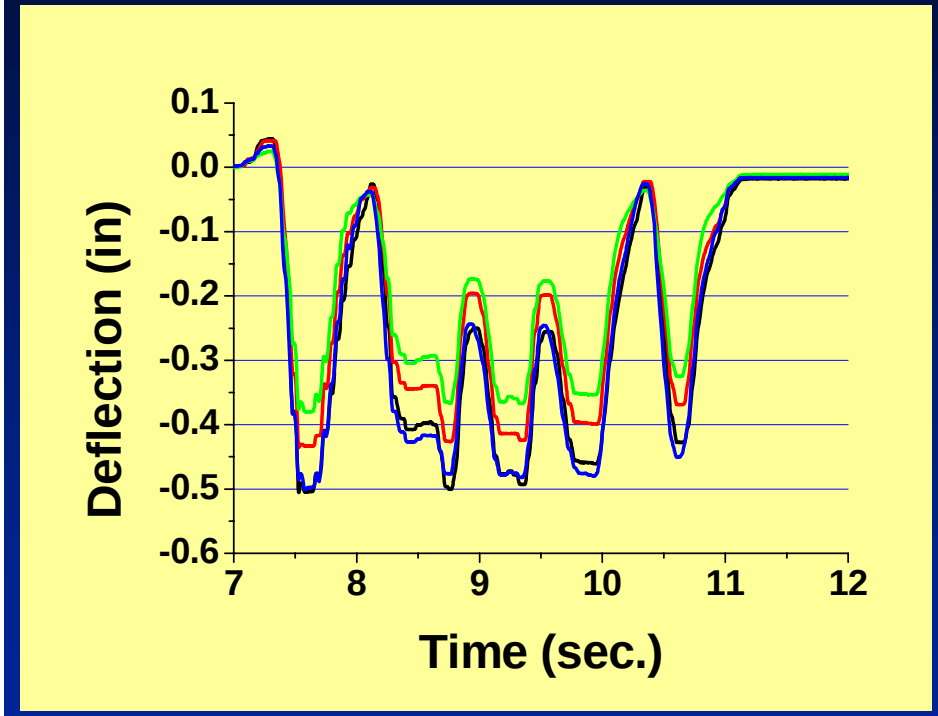
LOAD TEST RESULTS

Dynamic Amplification Factor

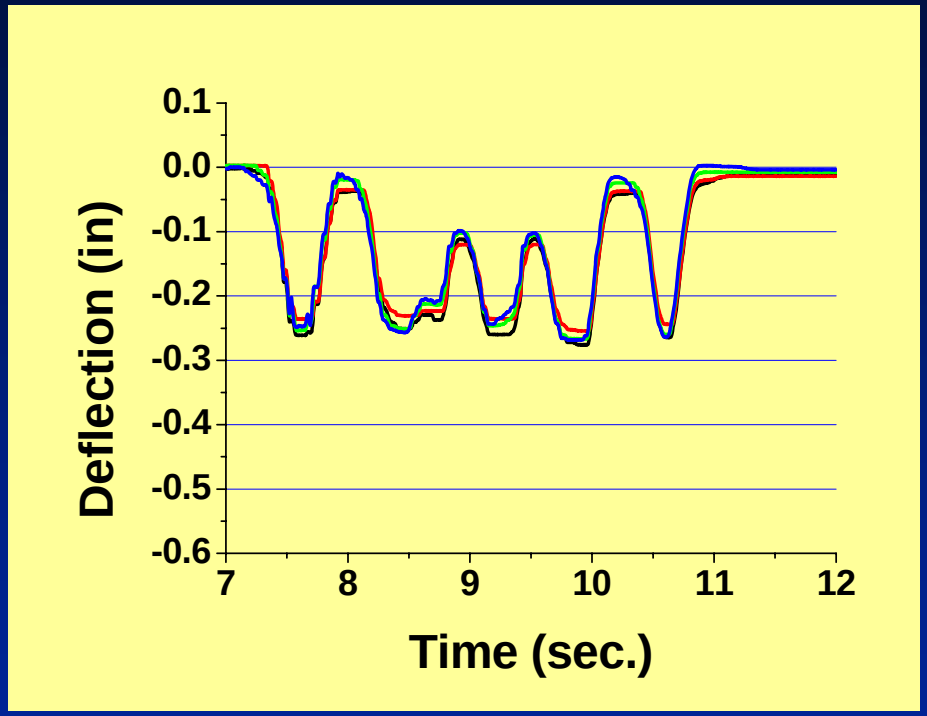
Test Train Velocity (mph)	DAF			
	Span 2		Span 8	
	North Chord	South Chord	North Chord	South Chord
15	1.00	1.05	1.00	1.00
30	1.15	1.05	1.07	1.01
40	1.22	1.06	1.14	1.07

LOAD TEST RESULTS

Span 8



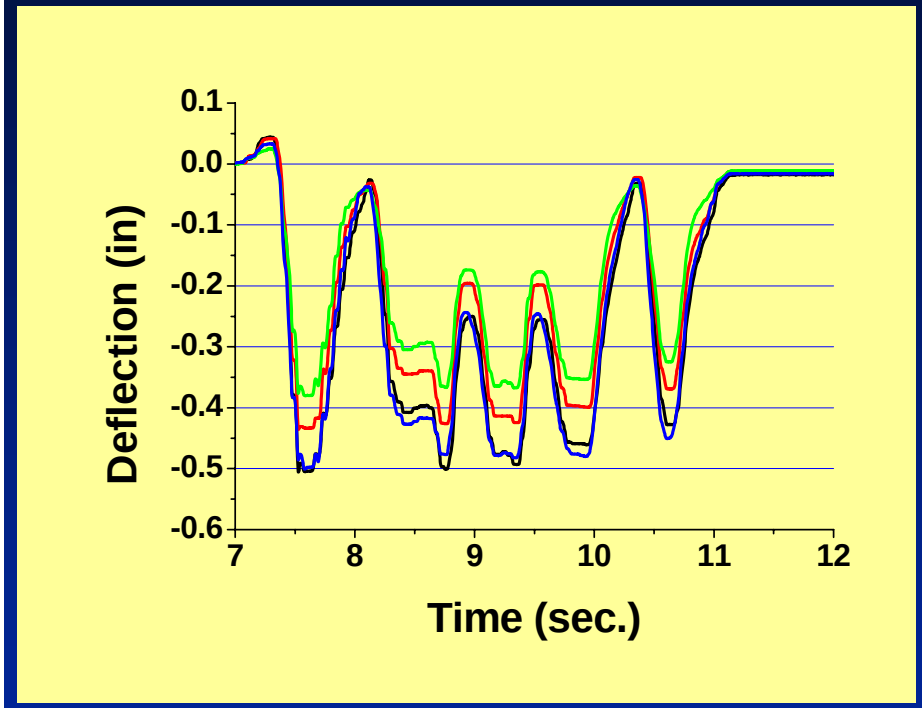
Sawn Chord



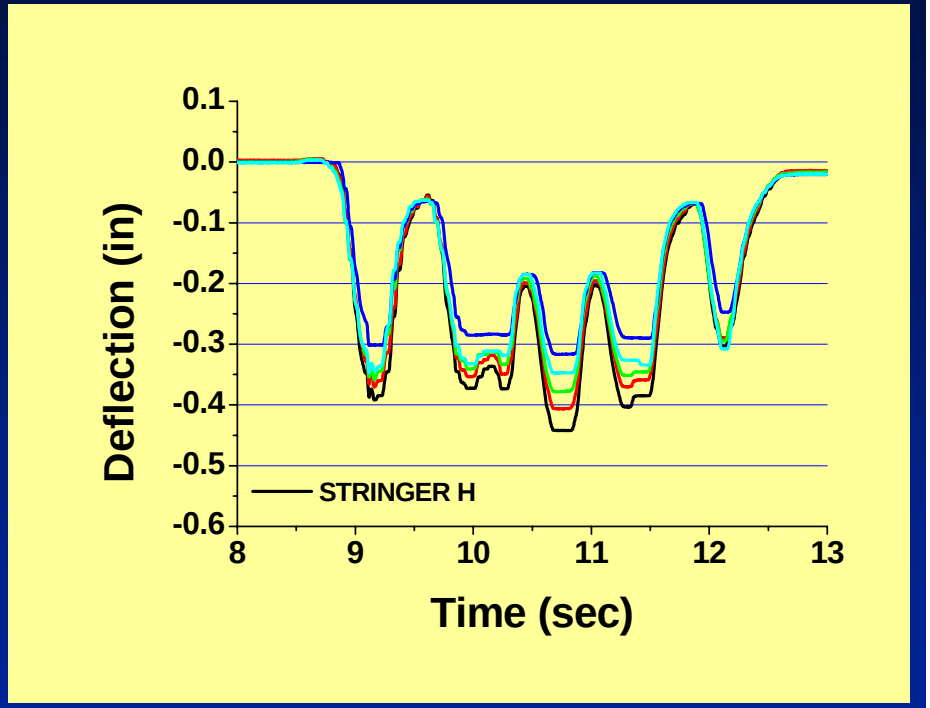
Glulam Chord

LOAD TEST RESULTS

Span 2 vs. Span 8



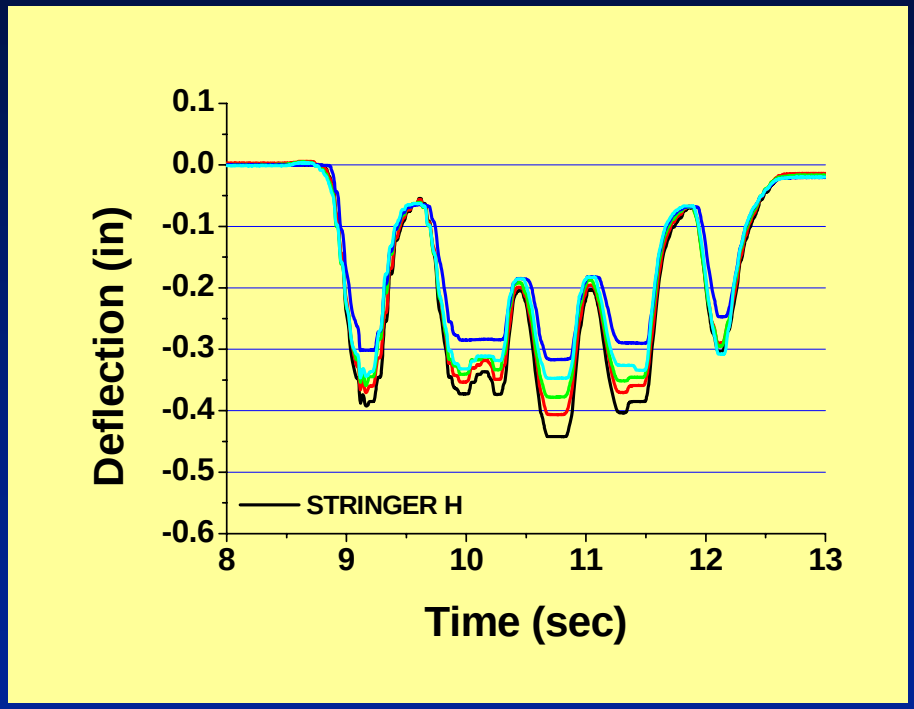
Sawn Chord
Span 8



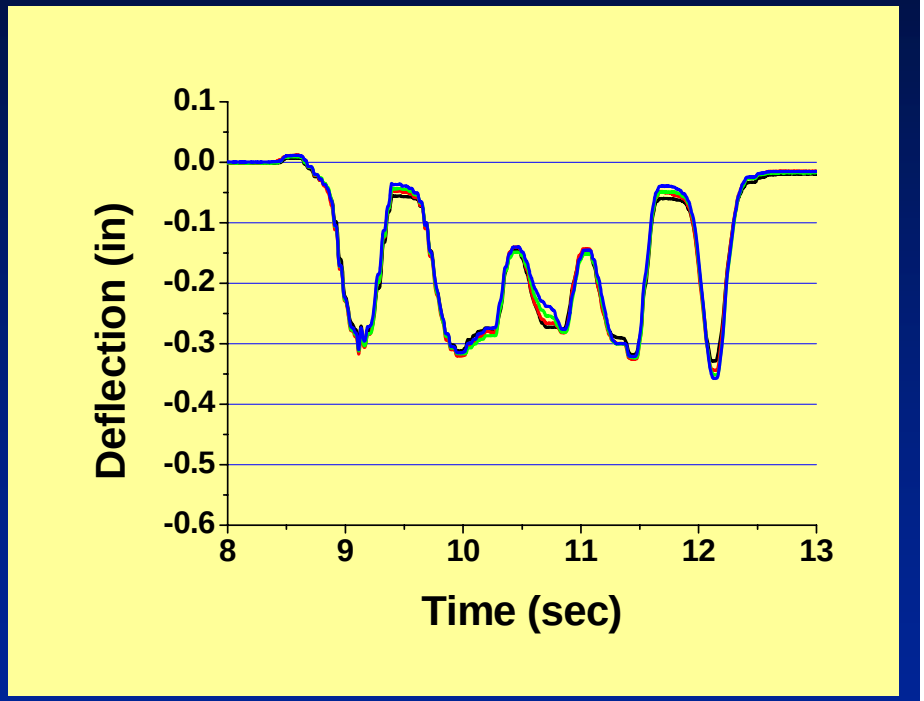
Sawn Chord
Span 2

LOAD TEST RESULTS

Span 2



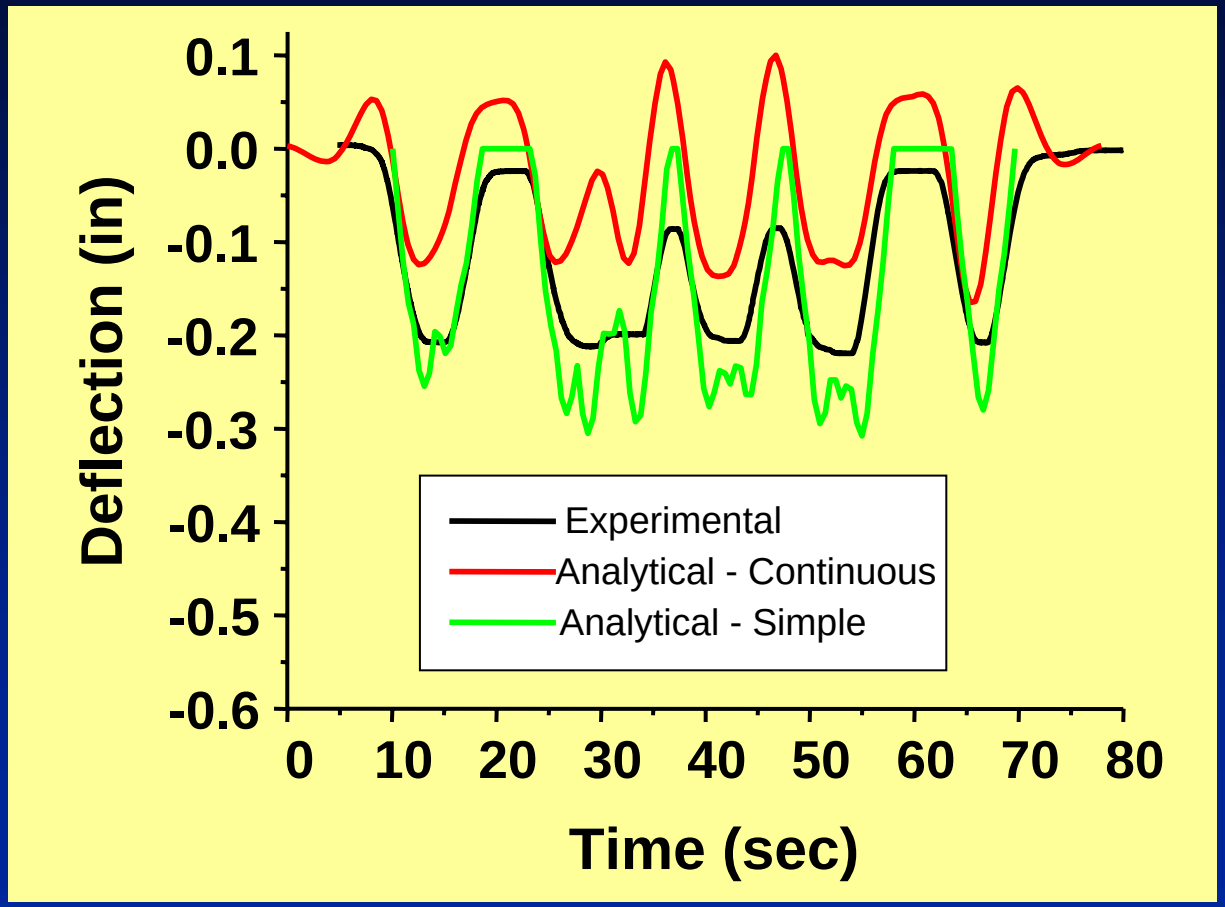
Sawn Chord



Glulam Chord

LOAD TEST RESULTS

Span 8 - Glulam



Research Needs Study

- Currently in progress
- Seeking to define what research is needed to advance the use of timber by railroads