



Langley Covered Bridge Rehabilitation

Topics

Location

History

Problems

Choices

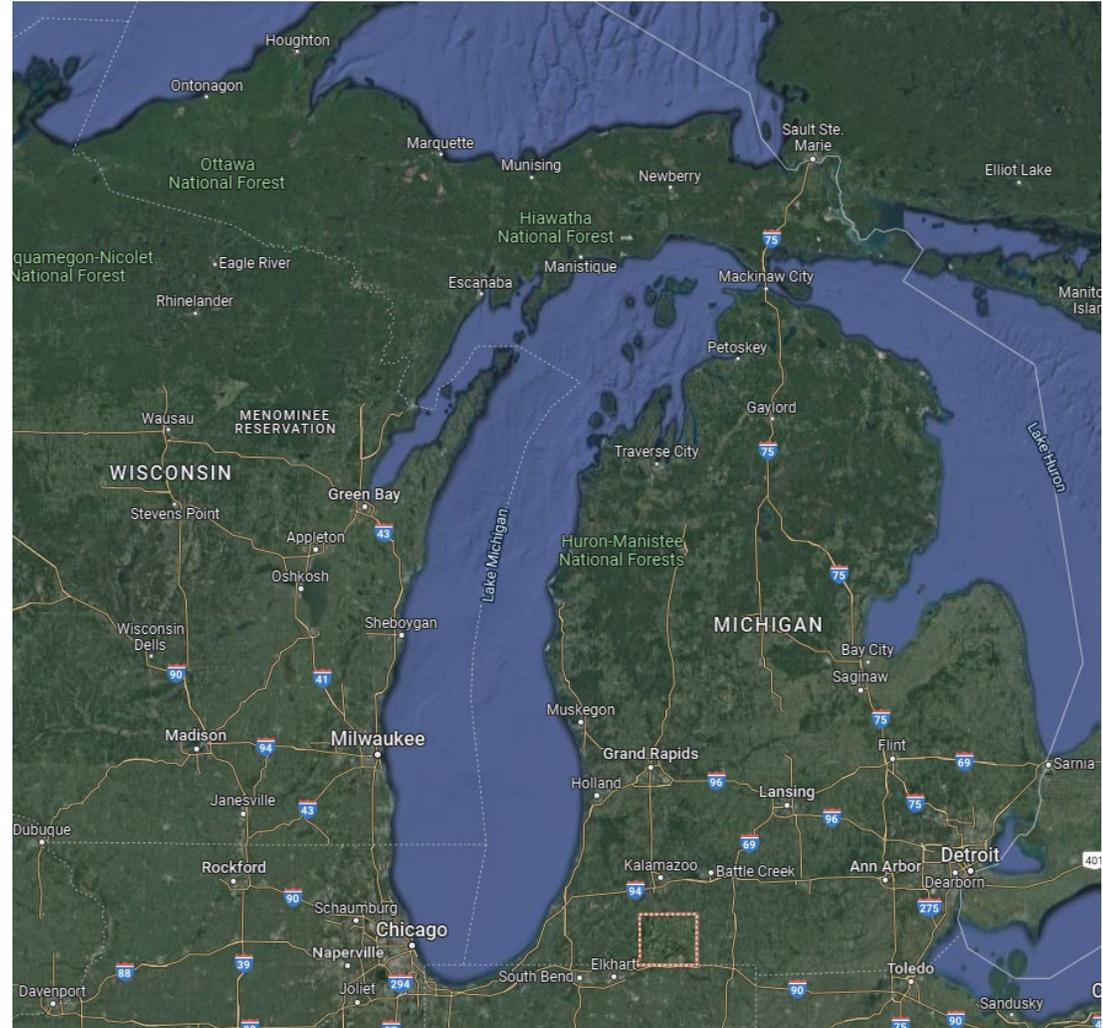
Financing

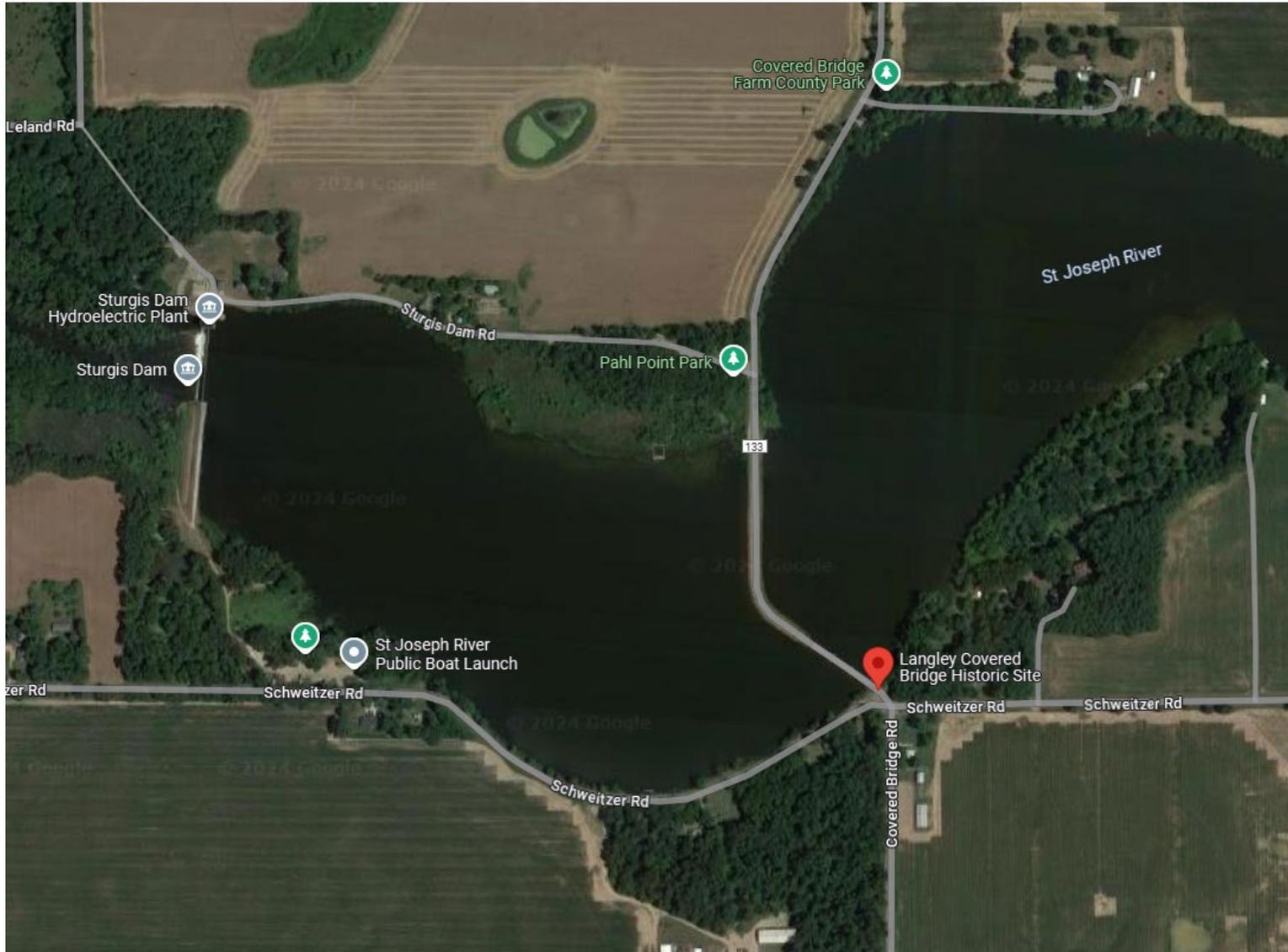
Construction

Other Challenges

St Joseph County

- Southwest Michigan bordering Indiana
- Population of 60,758
- 4th smallest county by size in Michigan
- 100 Bridges
- 1,022 miles of road
- Rural
- A large and growing Amish population
- Two small urban areas but no MPO's





Location

History

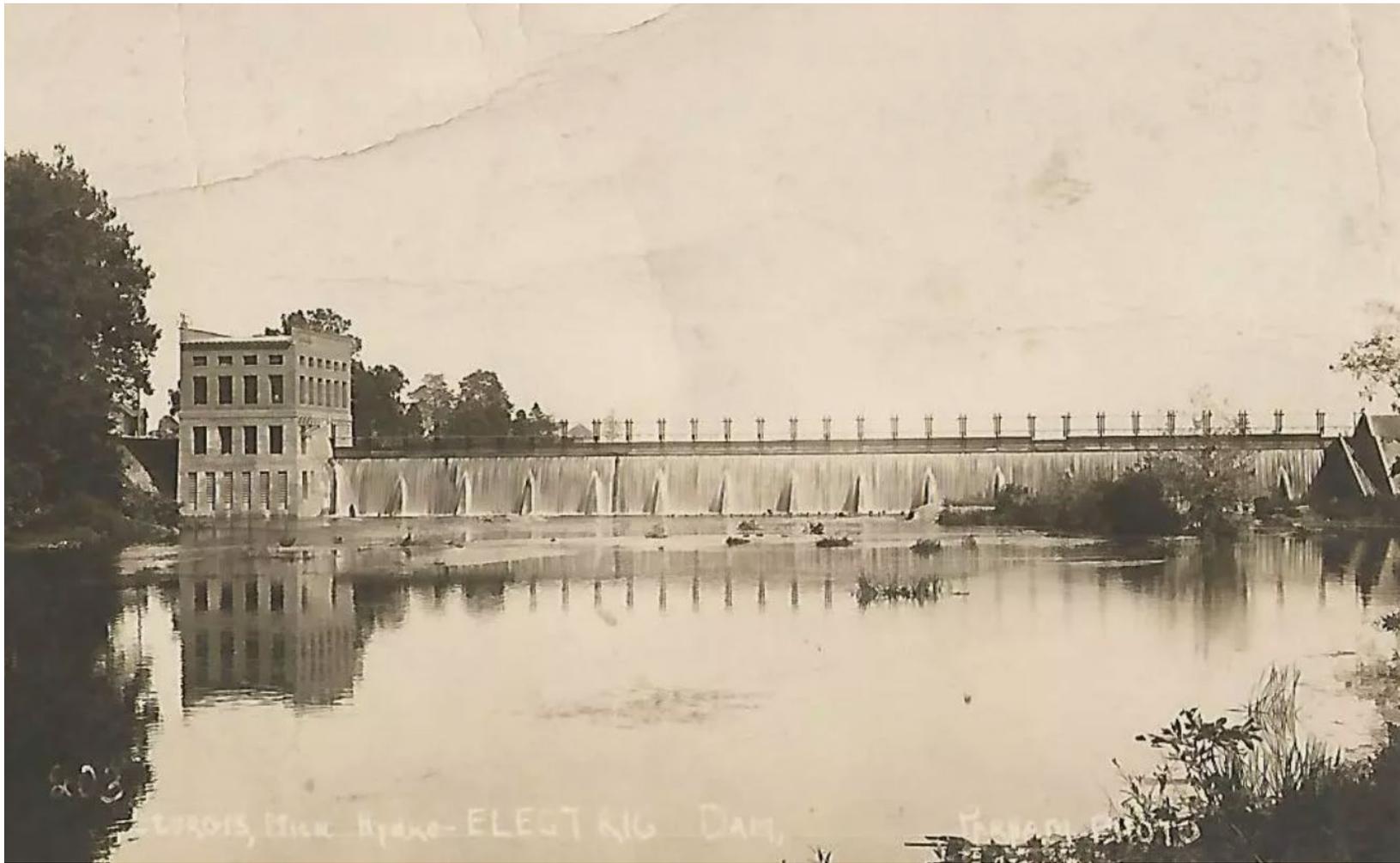
Before there was another bridge that collapsed (The Unknown Bridge)

Built in 1887 by Pierce Bodner

Original Cost \$3,000
(Around \$100k today)

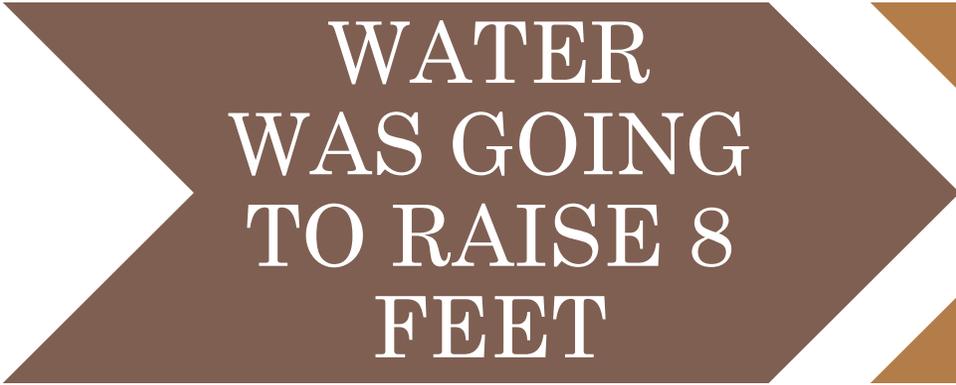
Longest Covered Bridge in Michigan
282 Feet Long

Then in 1909....



Sturgis Dam started Construction

Results



WATER
WAS GOING
TO RAISE 8
FEET



THE
BRIDGE
NEEDED TO
BE RAISED



Realignment



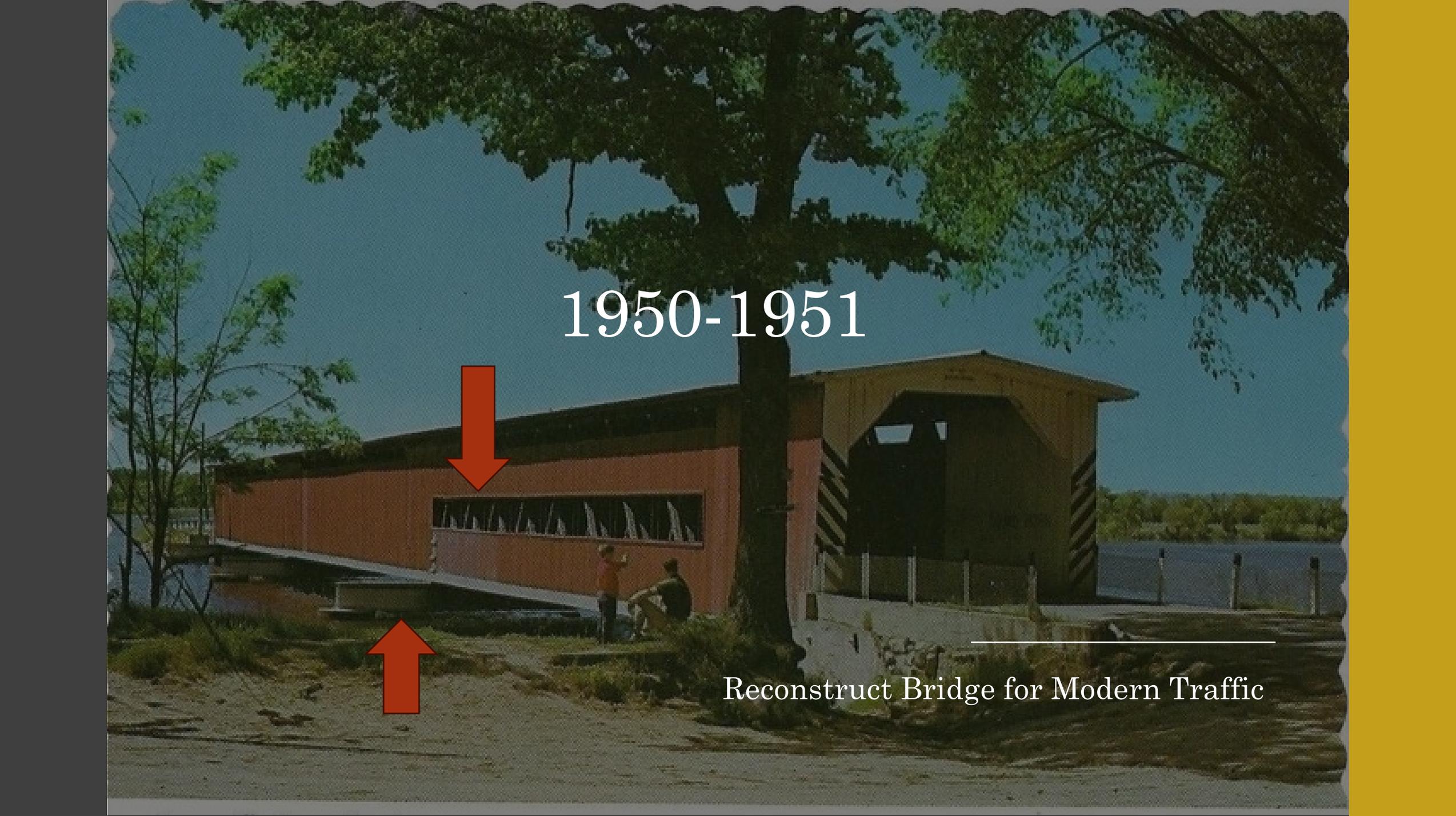
New
Causeway



Raising Piers



Completed



1950-1951

Reconstruct Bridge for Modern Traffic

2008-2009 Historical Rehabilitation



Historical Rehabilitation

- Replace siding and repaint
- Replace roof
- Add steel channels to timber chords
- Add awning over window
- Install height limiters







The Bridge is
Rehabilitated
Work is done for a long
time

Wrong!

Only Timber Fixes



Steel added in 1951
unable to be fixed



Problems









Choices



Oversize Vehicles

Constant threat to the stability of the structure

Multiple times both height limiters were hit at the same time



Crashes happen occasionally





Fires are a real danger

A motorcycle crashed and burned inside the bridge almost one month after the crash shown in the previous slide.

The only reason that major damage did not occur was because the fire unit was already mobilized and close to the north end.

Options



Close Bridge / No New Bridge



Close Bridge / Install New Bridge



Convert to Pedestrian Bridge

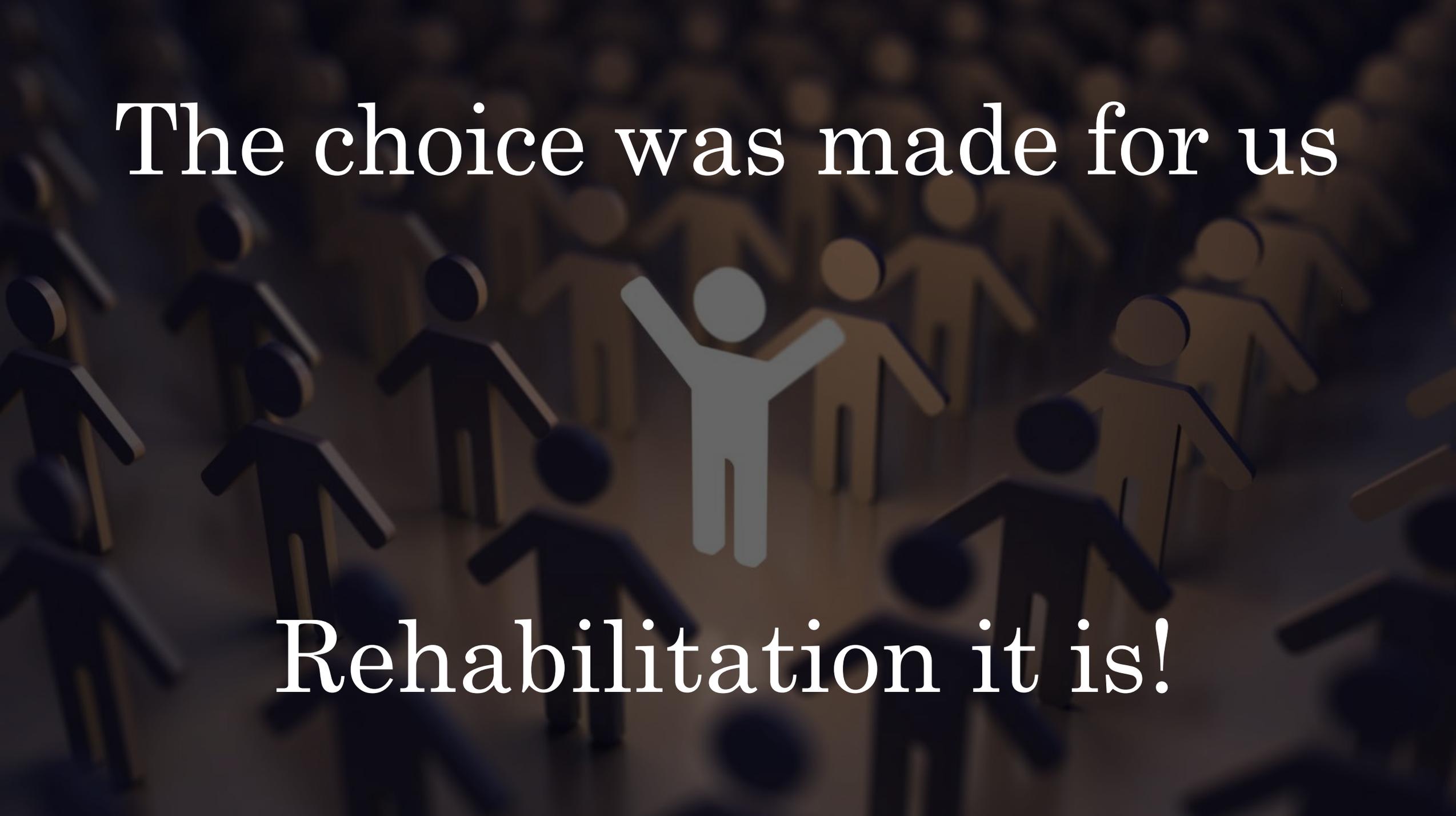


Rehabilitate Bridge



The choice was made for us

Rehabilitation it is!



Financing



Breakdown of Funds

• Covered Bridge Funding	\$3,274,050
• Michigan Economic Development Corporation (MEDC) (Sen. LaSata)	\$750,000
• County Commission	\$500,000
• MDOT Local Bridge	\$1,244,139 (38%)
• Three Rivers Area Chamber of Commerce	\$3,000
• Three River Area Community Foundation	\$5,000
• Sturgis Area Community Foundation	\$5,000
• AEP Foundation Grant	\$25,000
• Consumers Energy Foundation Grant	\$25,000
• St. Joseph County Road Commission	\$716,911 + Engineering

A silhouette of a construction site at sunset. A large crane is on the left, and a hook is suspended in the upper right. In the foreground, several workers are silhouetted against the bright sky, working on a structure of steel beams and scaffolding. The sky is a mix of orange and blue.

Construction

Goals of the Project

Abutments

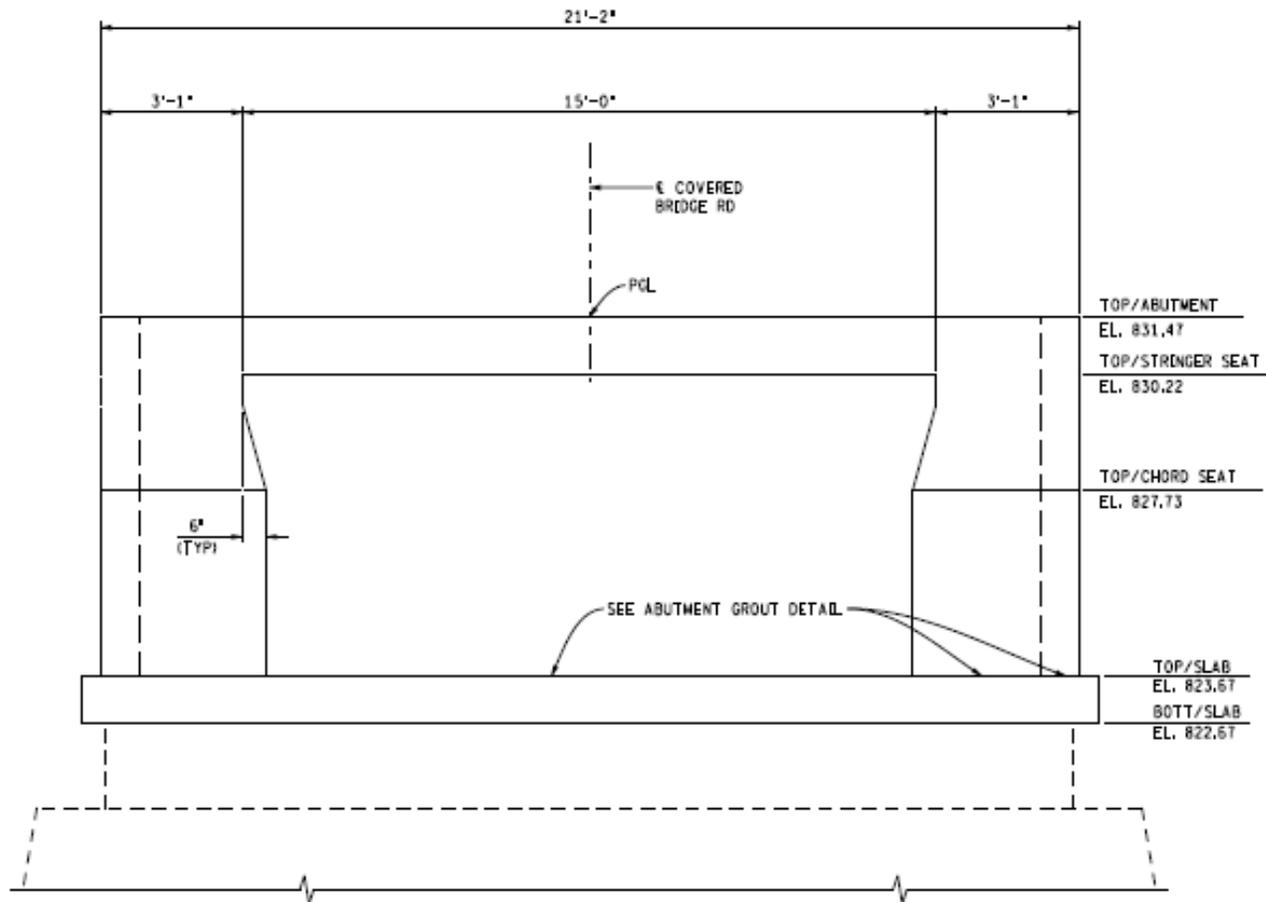
Bearing Pads

New Steel

Fix Sag

New Deck

Full Paint



ABUTMENT B ELEVATION

Abutments

- Plan
 - Cut abutments off
 - Pour new distribution load slab
 - Precast Abutment
 - Fill with Low Density Cellular Conc

A 3D wireframe rendering of a building's rebar structure, showing a complex grid of steel reinforcement bars forming a multi-level structure. The rendering is semi-transparent, revealing the internal framework. The text is overlaid on the central part of the structure.

Contractor wanted to Cast in Place

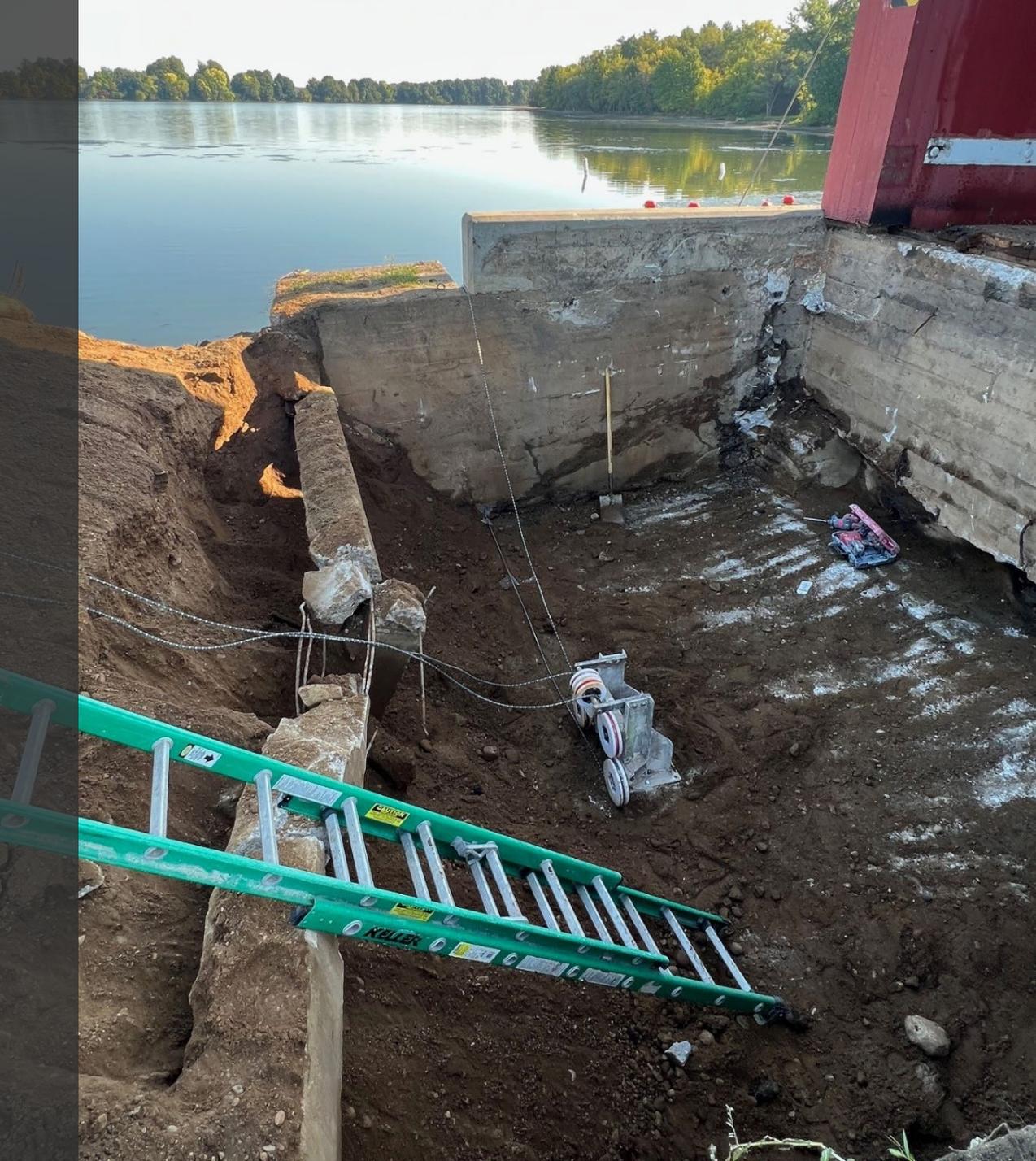
Saved us a lot of headaches

Surprise 1



Construction use to be
more fun







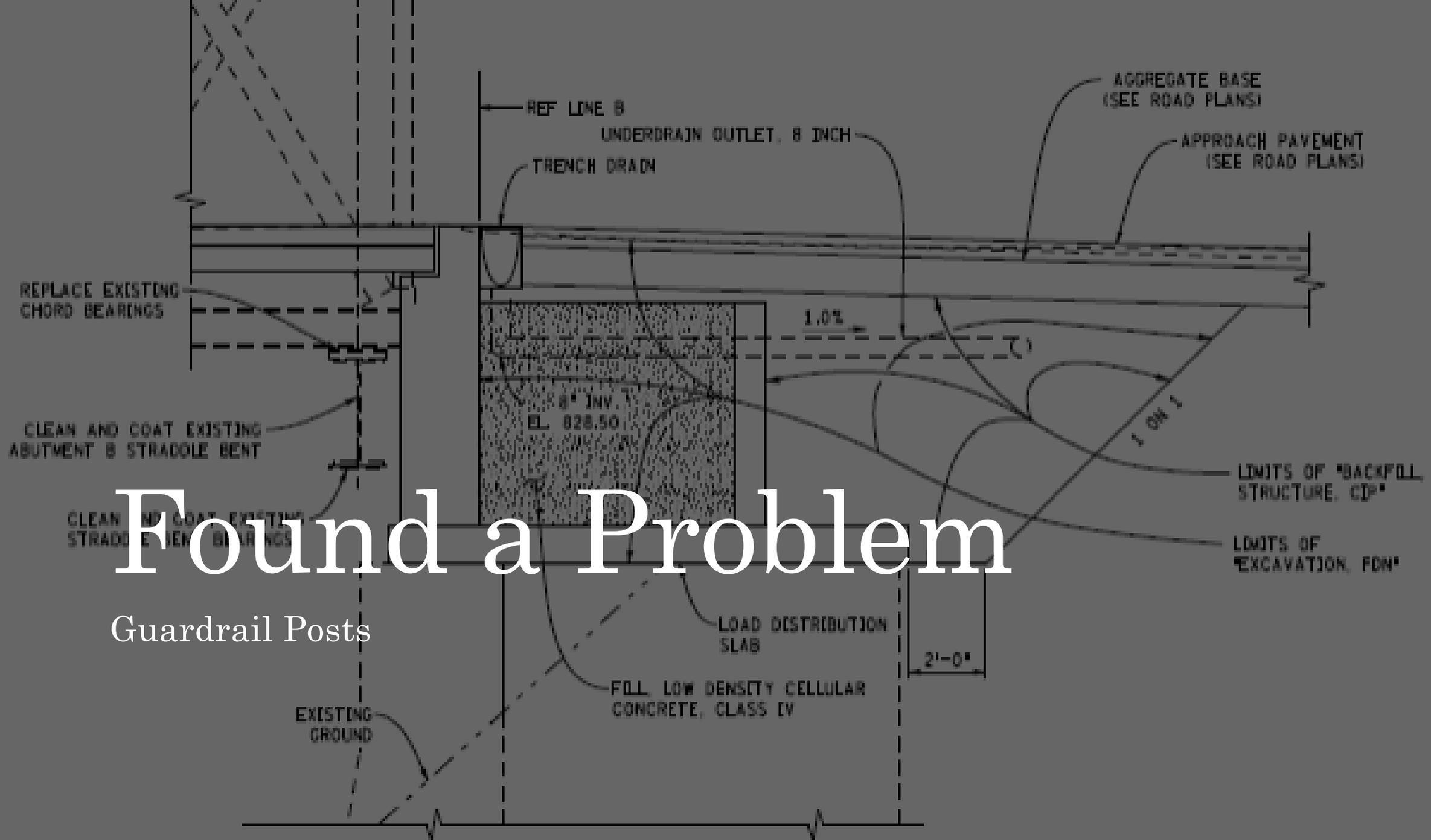
THINK SAFETY

Low Density Cellular Concrete

- Used to decrease weight
 - 42 lb/cft
- Low Strength (Contained)
 - 10 psi min
- 2 ft max lift
 - Cure 24 hrs







Found a Problem

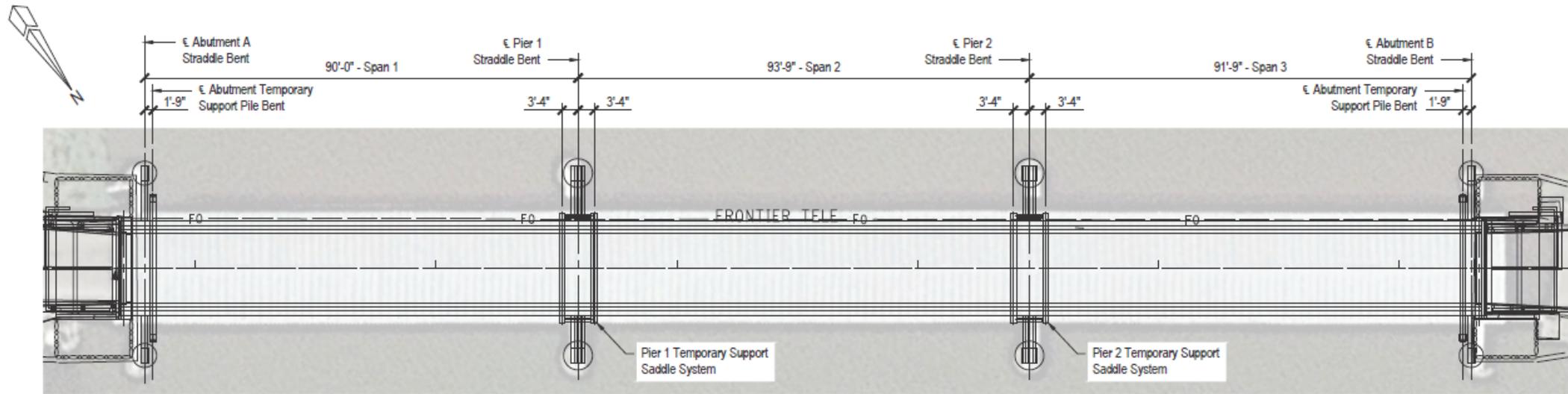
Guardrail Posts



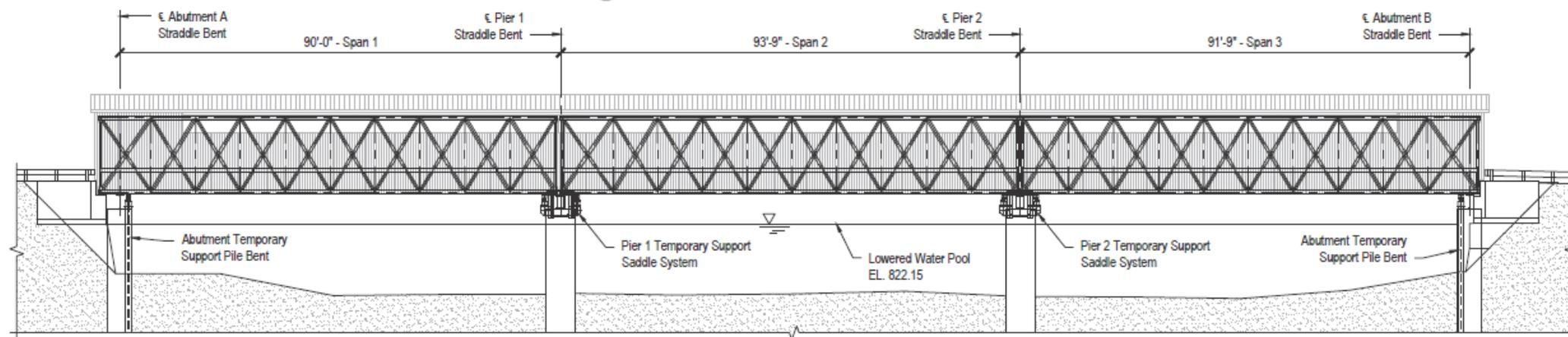


Extension of Wing Walls





BEARING REPLACEMENT LAYOUT



BEARING REPLACEMENT ELEVATION

Bearing Pad Replacement





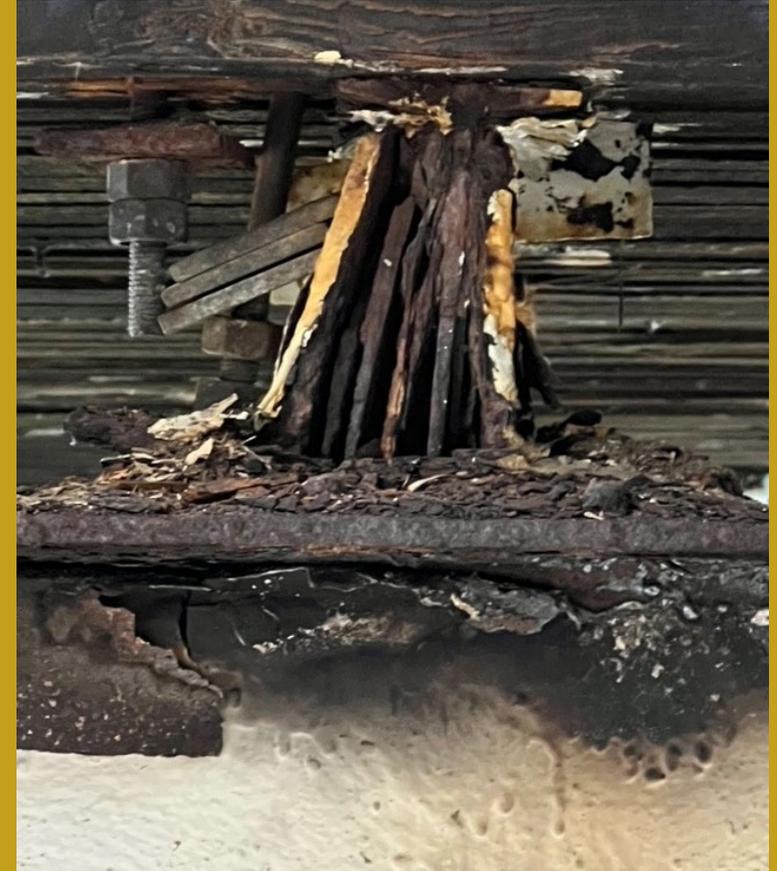






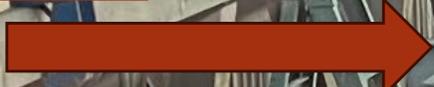
Deck removal

New Steel





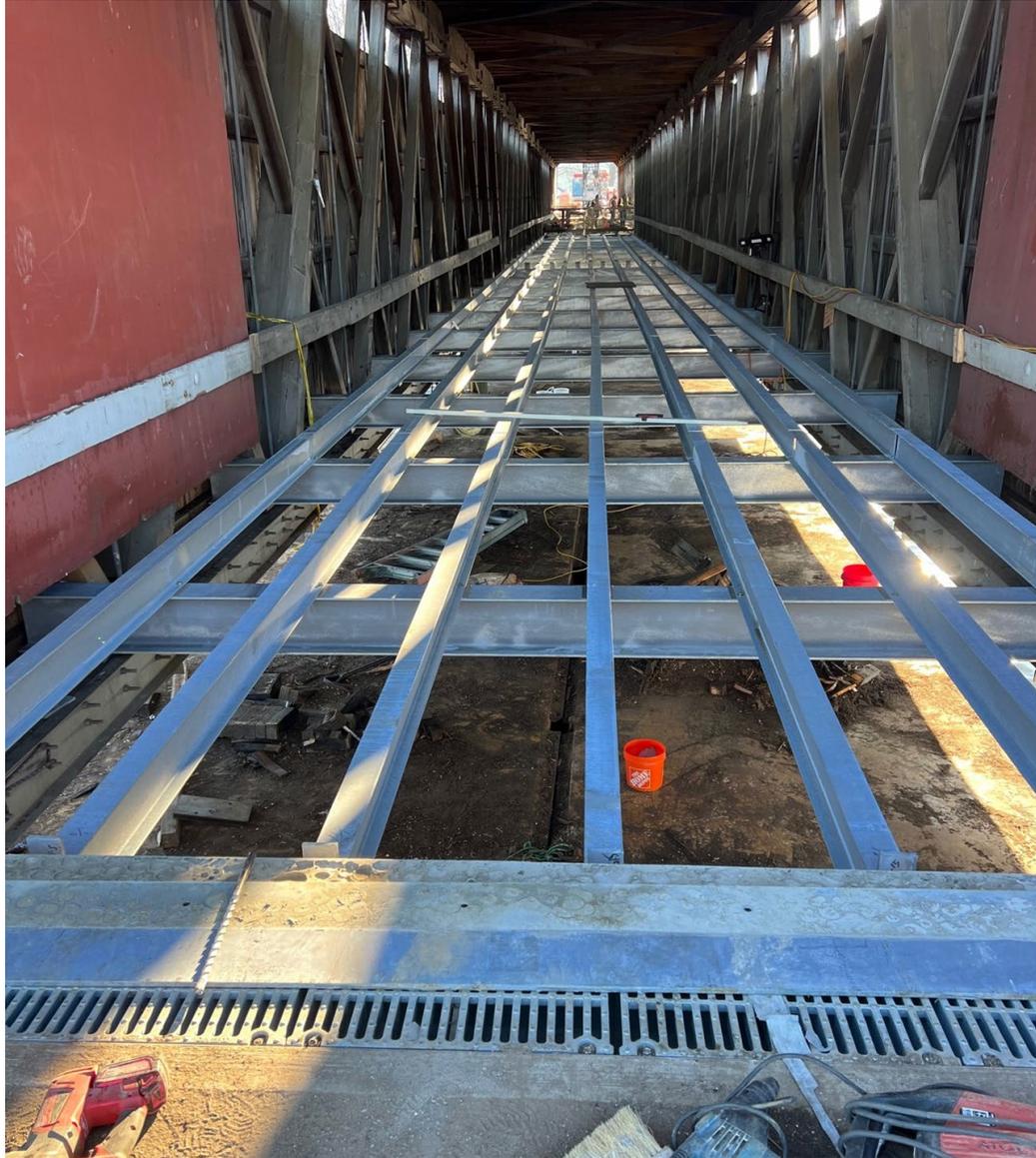
2 Span

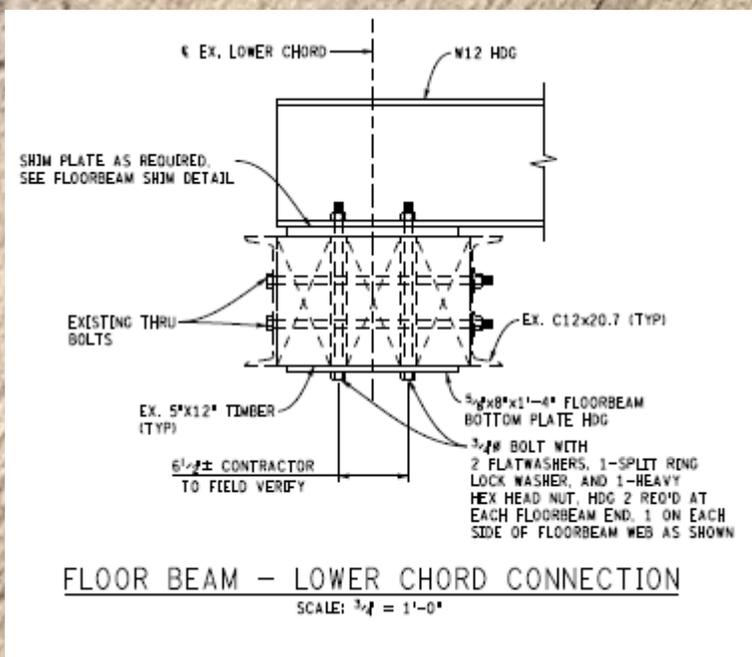


1 Span









Fixing Sag









SAFETY

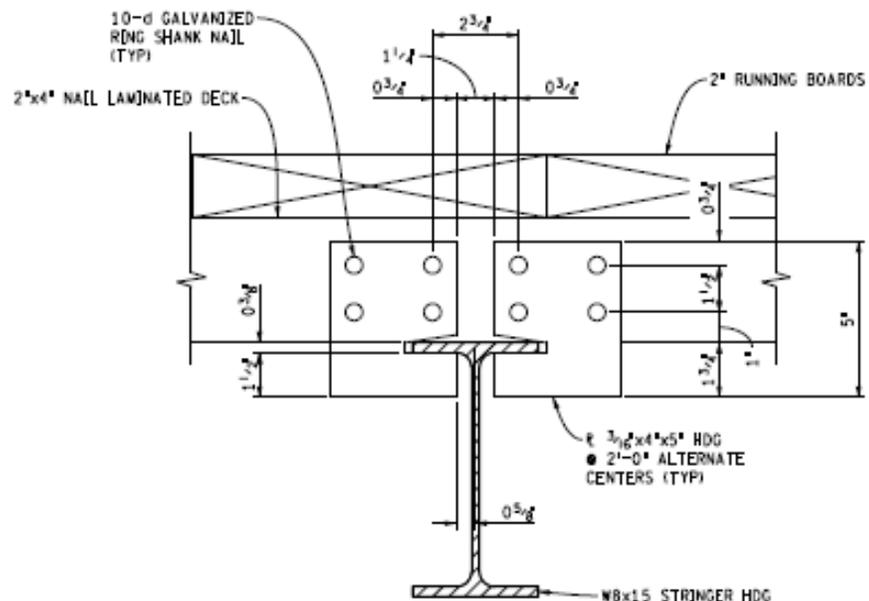
THINK
SAFETY

10'
14'
970





New Deck



DECK TO STRINGER CONNECTION

SCALE: 2" = 1'-0"

980 Clips









Painting



DANGER
RESTRICTED
AREA

CAUTION

The
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Other Challenges

North Abutment

- Beam had to be painted before pour

Abutments Skewed

- Adjusted the beams by small amounts to get bearing

Span 3 Kinked

- Ran Brush block and decking straight

Racoons

- Animal removal had to be done

Drones

- Two residents were flying drones
- One flying legally, one flying within arms length

Bats

- Didn't have to remove roof, but was originally planned

Culvert Found on the South

- Tied into abutment drain system





Thank You



Project Partners

