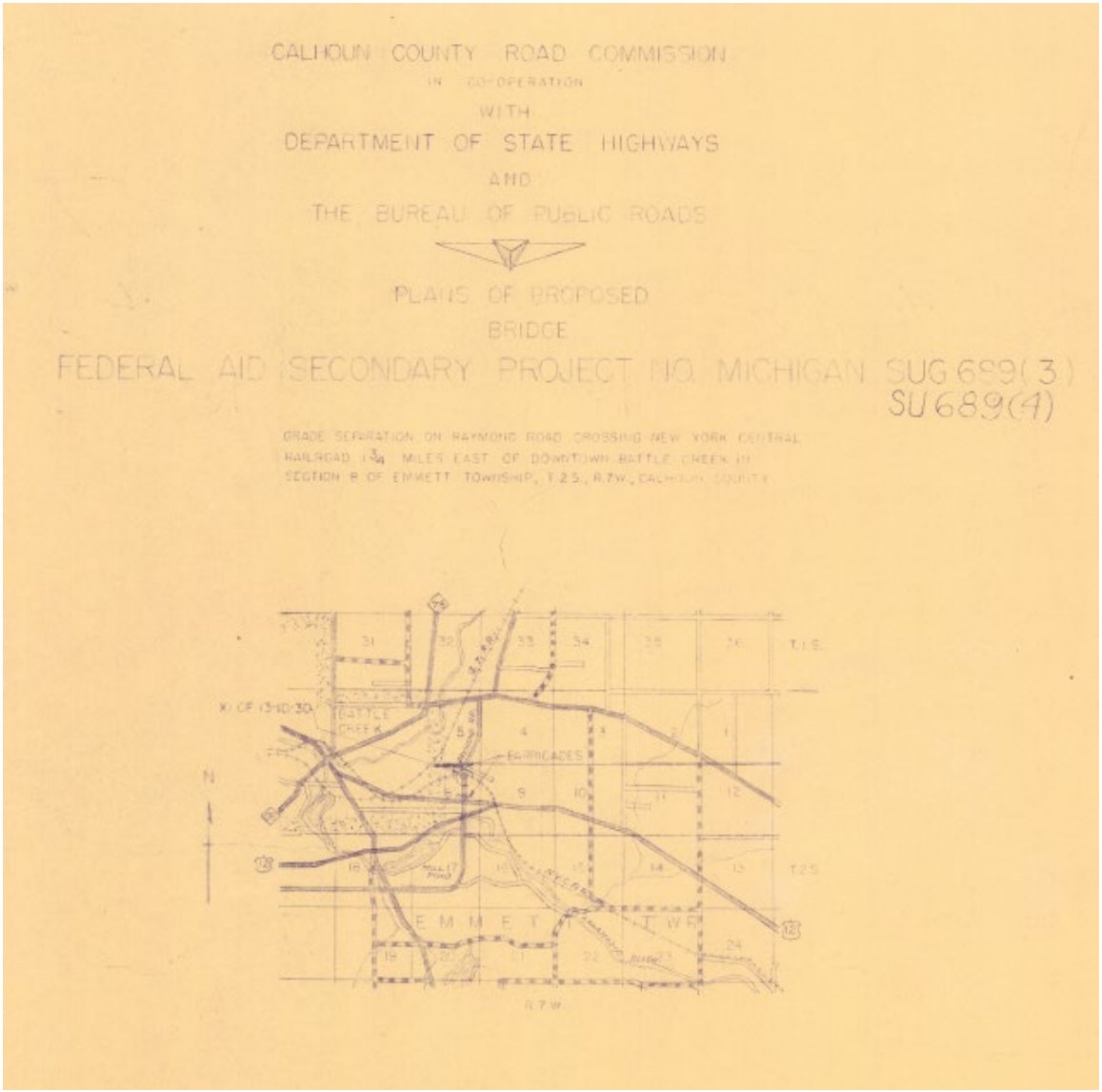
Raymond Road Bridge Rehabilitation

Calhoun County Road Department

Overview

- Built in 1968
- Four spans
- Concrete Box Beams supported by three piers of concrete columns
- Critical railroad crossing
- ADT 8600



- Submitted this bridge for replacement for 5+ times through the MDOT Bridge Program
- Re-scoped the application from replacement to rehabilitation in 2019
- Bridge was selected in 2019 for construction in 2022
  - Estimated Cost: $1,175,910
- Anlaan won the bid in 2022
  - Only bidder on the project

List of Vendors

Rank	Vendor ID/Name	Total Bid	Percent Of Low Bid	Percent Of Estimate
0	-EST- - Engineer's Estimate	$1,175,910.00	78.72%	100.00%
1	02946 - Anlaan Corporation	$1,493,767.25	100.00%	127.03%

Initial Plans

- The bulk of the work was rehabilitating the columns.
- The proposed superstructure repairs were minor in comparison:
  - Concrete Deck Patching
  - Miscellaneous concrete repair
  - Waterproof Membrane Installation
  - New bridge railing and guardrail.
  - Repaving

Permitting Delays

- The Raymond Road bridge spans an MDOT owned railway.
- Norfolk Southern and Amtrak both operate on this line.
- No coordination was done during the G.I. phase with Norfolk Southern.
- MDOT & Norfolk Southern disagreed over which of them was responsible for issuing a ROW permit.
- This delayed the project until the following construction season.

Start of Construction

Once railroad permits were obtained, the Contractor could get underneath the bridge to begin work.

The construction of the existing columns varied from what was designed for.

CCRD and the Contractor agreed that a new design for columns was needed before the substructure work began.

The Contractor started work on the superstructure while a new plan for the substructure could be created and approved.

Michigan Department of Transportation

Contract Modification

05/30/2023 7:59 AM
FieldManager 5.3c

Contract: 13000-209858, Bridge rehabilitation including bituminous surface remove an

Cont. Mod. Number	Revision Number	Cont. Mod. Date	Electronic File Created	Net Change	Awarded Contract Amount
1		05/30/2023	Yes	$1,324,270.05	$1,493,767.25

Route	Managing Office	District	Entered By
	Calhoun County Road Department	05004	Kristine O Parsons

Contract Location
Raymond Road over Michigan Department of Transportation Rail

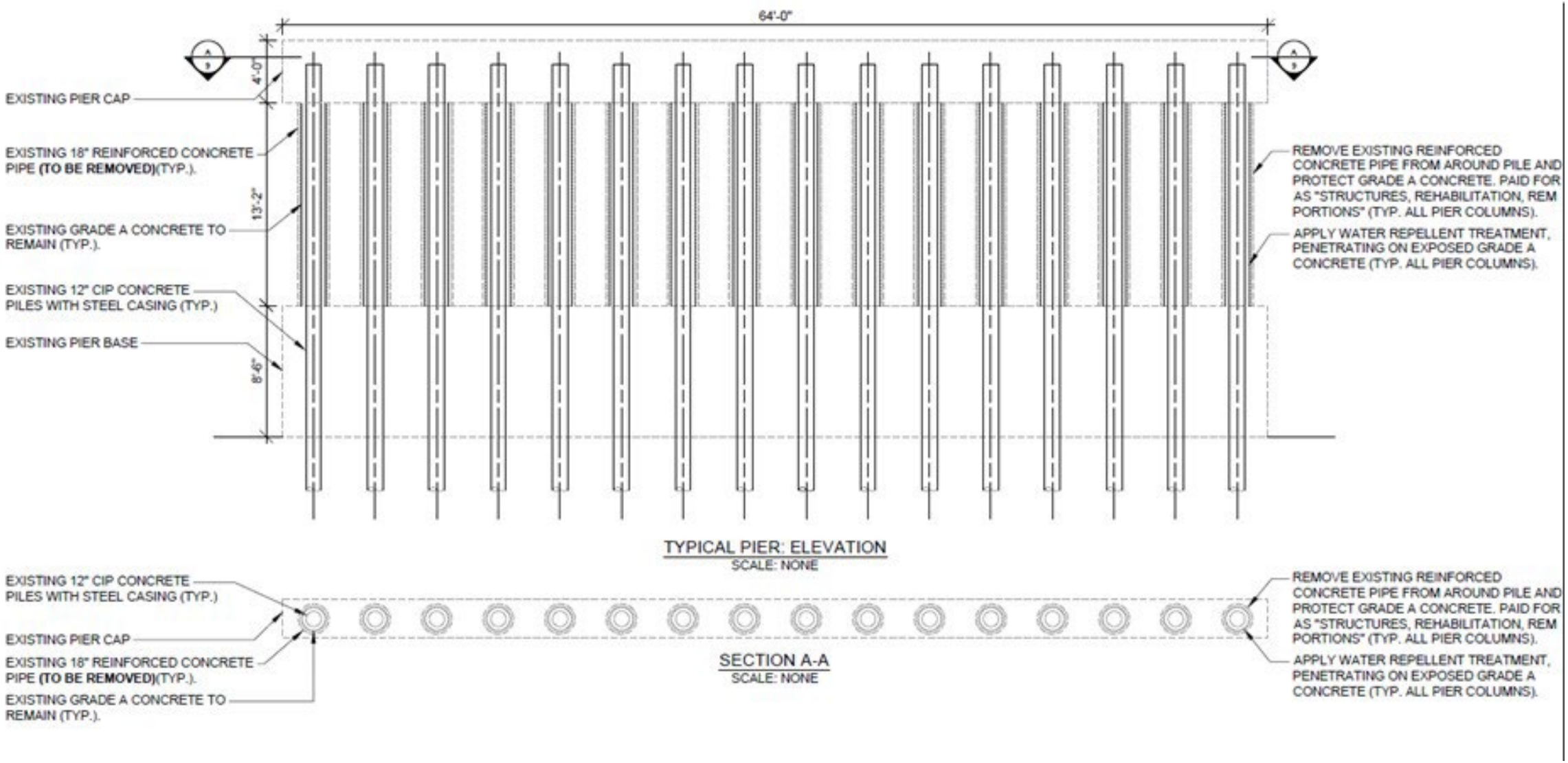
Short Description
Contract mod for column repair/replacement work

Description of Changes
A. Original Contract Amount: $1,493,767.25
B. Current Contract Amount: $2,818,037.30
C. Net Total Change: $1,324,270.05
D. Net Percent Change: 88.7%

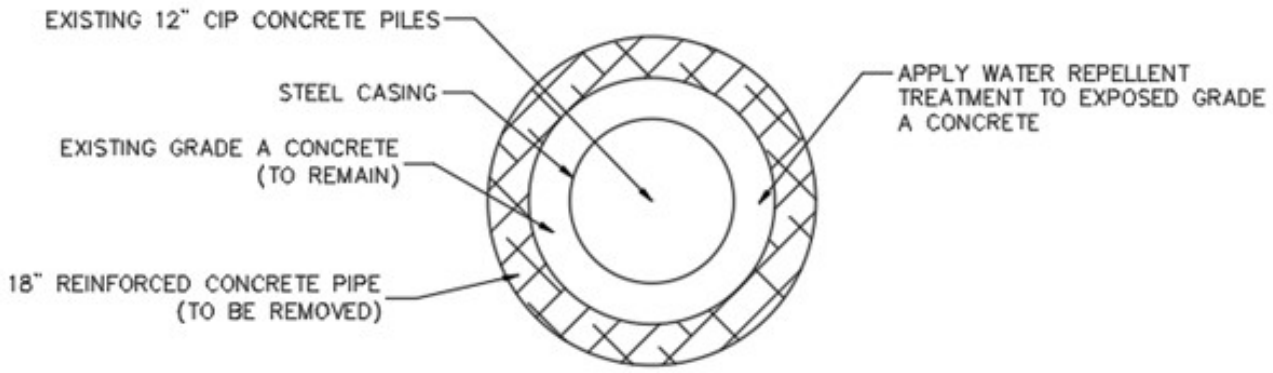
Contract Modification 1

- Added 12 items to address the deteriorated columns
- Included an E.O.T. for 238 calendar days
- $1,324,270.05 increase
- 88.7% over original contract amount

Initial Substructure Plans



Initial Substructure Plans

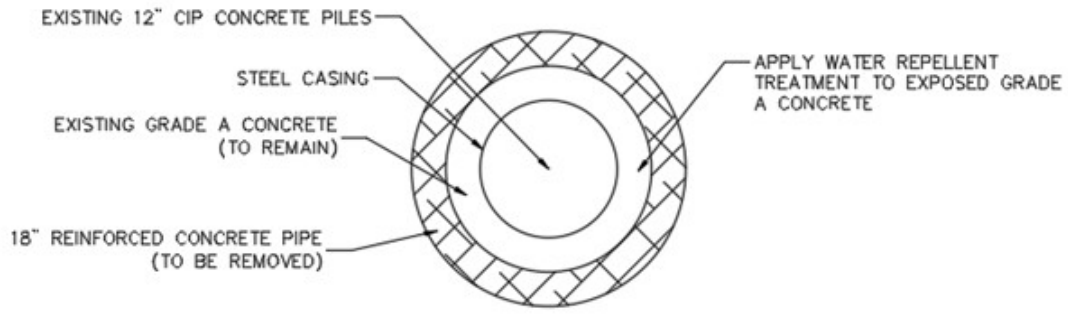


- It was assumed that the columns were concrete piles, surrounded by steel casing, and Grade A concrete, and that the columns were enclosed in reinforced concrete pipe.
- The plans were to remove the concrete pipe, exposing the Grade A concrete.
- The Grade A concrete would then be finished with a water repellent treatment.

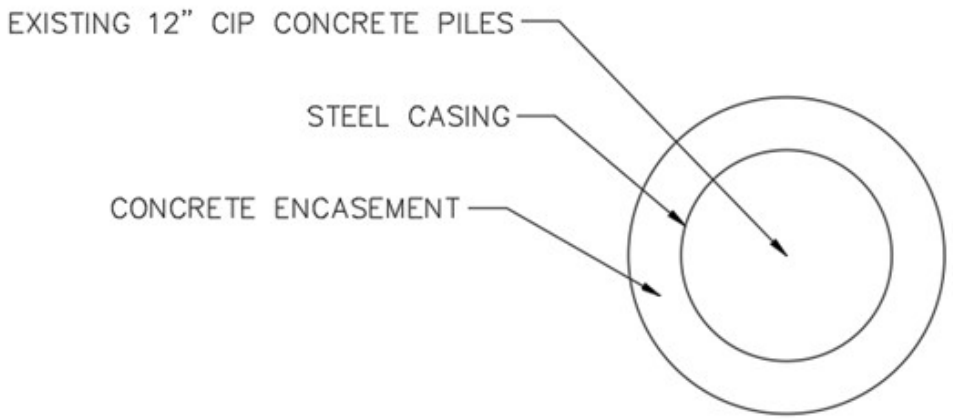
Existing Column Design

- Upon starting construction, it was discovered that design assumptions were incorrect.
- Failed exterior concrete was not RCP and there was only one layer of concrete outside of the steel casing.
- Some of the columns were too deteriorated to be rehabilitated and would need to be replaced.
- Forced to develop an alternative design

Assumed Column Design



Actual Column Design




Concrete Encasement
Steel Casing
Concrete Pile

- Construction was initially planned to be done part width
- No longer feasible due to the increased scope of substructure work
- Bridge was fully closed to traffic with a detour in place
- Heavily increased the traffic impact for local traffic

Substructure Redesign
Case 1 – Rehab

Used for cases where the interior steel casing and concrete pile was sound enough to be rehabilitated

Contractor could work on rehab 3 columns at a time per pier

Contractor could not rehab adjacent columns at the same time

28 of 48 columns were rehabilitated

- Exterior concrete was removed
- Steel was blasted, cleaned, and coated
- Anchors installed in pier cap and crash wall
- Rebar cage tied to the anchors
- Form placed around rebar and concrete was poured

- Top portion of column was left open during the first pour
- Top was filled with a latex concrete mix

Substructure Redesign
Case 2 – Replacement

Steel casing was too deteriorated to be cleaned and coated.

No live load was allowed on the bridge while a column was removed.

Only one column could be removed at a time, and the column had to be immediately replaced following removal.

20 of 48 columns were replaced.

- Exterior concrete was chipped away
- Steel casing was cut, and the pile was removed

- W12 x 28 steel column was lifted into place
- Anchor bolts were installed into the pier cap and crash wall to anchor the new column

- An under-bridge truck was used for ease of access to the columns, while keeping equipment near the tracks to a minimum.

work platform underneath bridge

- Tarps were placed over the tracks to keep them free of debris while chipping concrete

Track Details

- Passing trains varied from 2 to 6 per day
- Amtrak averaged 1-2 trains in the morning and 1-2 trains in the afternoon
- Norfolk Southern usually had 1 train per day

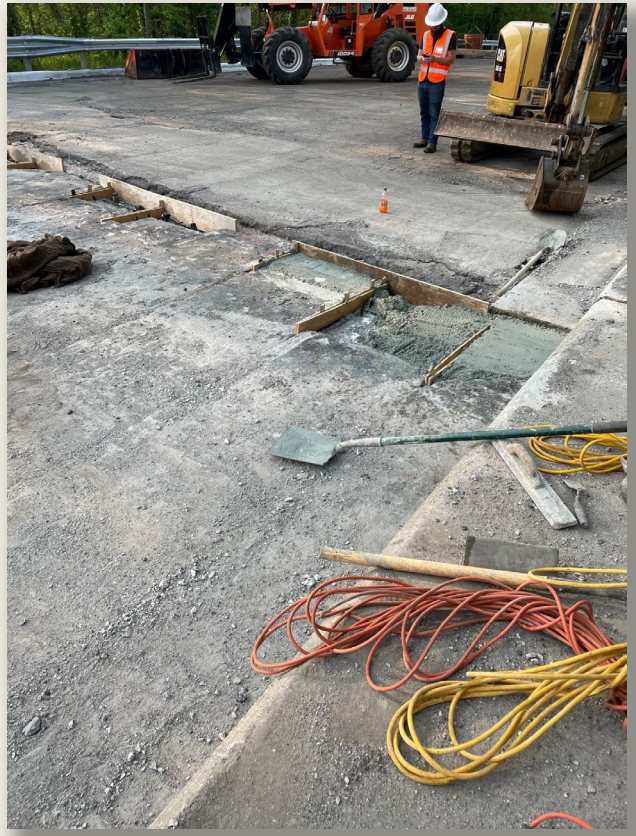
Railroad Flagging

- Each rail company had a flagger onsite anytime work took place below the bridge.
- Flagging costs were approximately $1000/day per flagger.
- Flaggers would give 1 hour notice of a train approaching.
- All workers, equipment, and debris had to be off the tracks at least 15 minutes prior to a train passing.
- This resulted in slow progress on days with high train traffic

Superstructure Repairs

Minor Concrete Repairs

Concrete Deck Patching



Curb Repair

Concrete Sealing

Deck Paving

Lessons Learned

Uncertainties on rehabilitation projects:

- Plan the worst, hope for the best
- Estimate conservatively and use contingency

High costs and time delays associated with rail projects:

- Rail permitting takes time
- Railroad flagging is expensive
- Expect progress to be slow when working within rail ROW

Only 1 bid was received for this project

- In hindsight, it might have been advantageous to explore re-bidding
- Railroad projects are not enticing to contractors