

BR C 70-0.28

Replacing a deteriorated steel bridge with an innovative buried bridge structure



Design & Construction Members

- Scott C. Coleman, P.E., P.S., Logan County Engineer
- Michael J. Kerns, P.E., Assistant Engineer
- Elliott Fullerton, Bridge Superintendent
- Luke Jolliff, Dave Kirkpatrick, Kyle Rumer & Brandon Moon
- Others (i.e. Survey Crew & Road Crew members)

Project Details

- What was replaced: A deteriorated steel bridge built in 1958 & rehabbed with additional beams in 1997
- 2021: Mike Steenhoek from the Soy Transportation Coalition (STC), shared a funding opportunity with us & gave us a brochure titled 'Top 20 Innovations for Rural Bridge Replacement and Repair' ('Top 20')
- We compared our list of bridges that needed replaced or repaired in the near future and found a few bridges that we thought might have a reasonable chance to be replaced with a buried bridge structure, one of the 'Top 20' recommendations
- We analyzed survey data for the sites, ran hydraulic reports, and evaluated cost estimates for the potential bridges
- ConTech supplied a BridgeCor galvanized steel multi-plate single radius arch (24'-1" span x 10'-5" rise) and aluminum headwalls (28'-6" wide) for \$41,400
- September 18, 2023: Construction began
- November 17, 2023: Construction finished

1958 Bridge



Miami 70-0.28
Downstream

1958 Bridge



70-0.28

Pic7

Removing 1958 bridge



Removing 1958 bridge



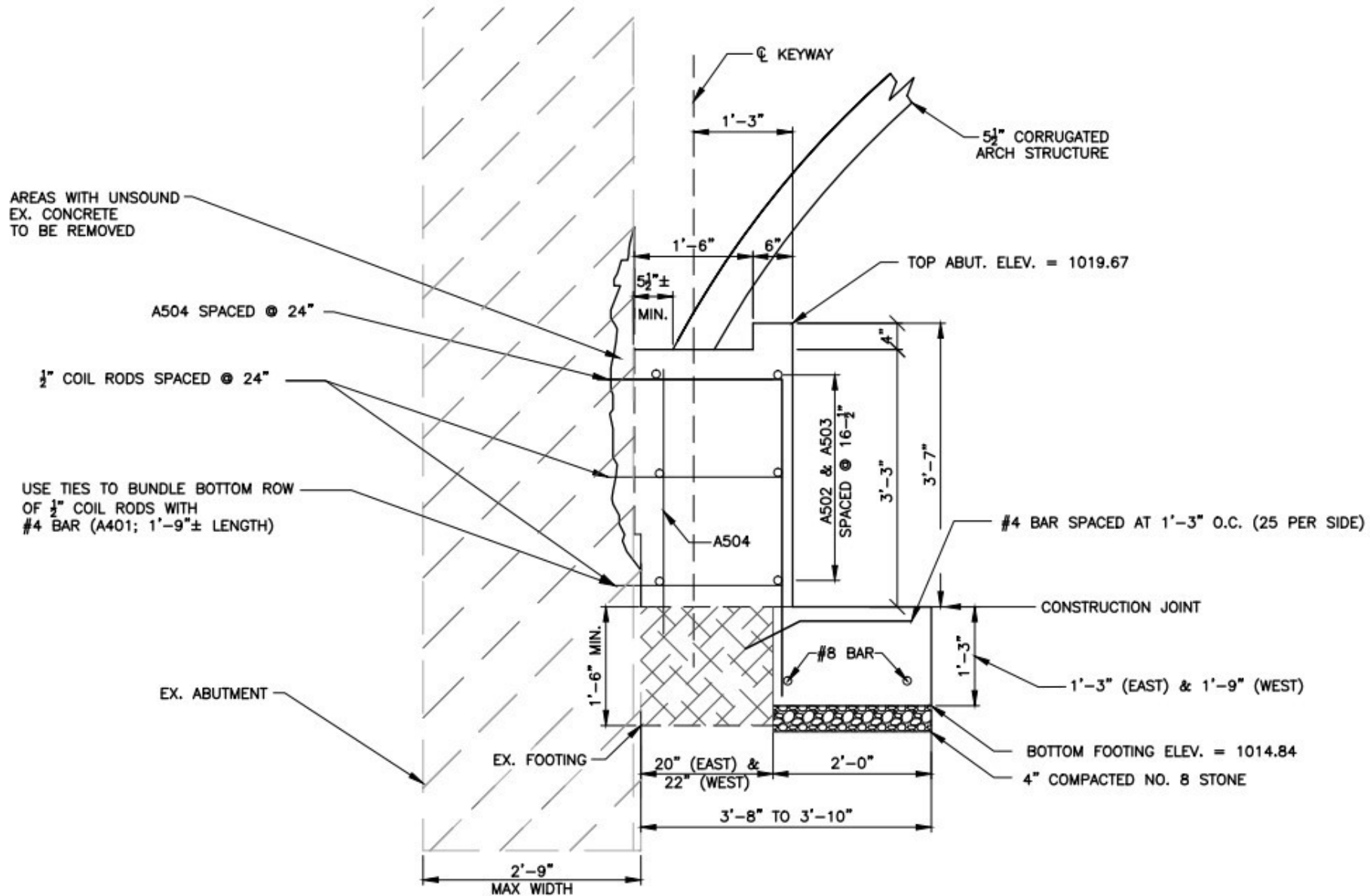
Removing 1958 bridge



Dewatering pipe installed



Stub Abutment & Footing



ABUTMENT & FOOTING SECTION VIEW

Stub Abutment & Footing



Stub Abutment & Footing



Stub Abutment & Footing



NOTES:

1. REBAR CONCRETE COVER = 3"
2. ALL REBAR TO BE EITHER GRADE 60, UNCOATED BARS, OR GRADE 60, GALVANIZED BARS
3. MINIMUM 37" LAP LENGTH
4. KEYWAY TO BE GROUTED AFTER MULTI PLATE ARCH INSTALLED
5. 1,500 PSI FOOTING CONCRETE = 4 CY PER SIDE (5 CY MINIMUM PER LOAD)
6. QC1 4,000 PSI ABUTMENT CONCRETE = 8 CY PER SIDE
7. 4" OF #8 AGGREGATE BEDDING FOR FOOTINGS = 2.5 TON/SIDE
8. 4,000 PSI NON-SHRINK GROUT FOR KEYWAY AND BETWEEN ARCH AND EX. ABUT. UP TO A 3.5' WIDE STRIP = 12.5 CY/SIDE
9. BARS ARE TO BE EPOXY SET WITH PRO-POXY 400 (OR EQUIVALENT) IN HOLES DRILLED UP TO $\frac{1}{4}$ " SIZE LARGER THAN REBAR SIZE. CLEAN DRILLED HOLES AND ALLOW TO DRY BEFORE INSTALLING REBAR. BARS TO HAVE 4" MINIMUM EMBEDMENT INTO EXISTING CONCRETE STRUCTURES.

Stub Abutment & Footing



Stub Abutment & Footing



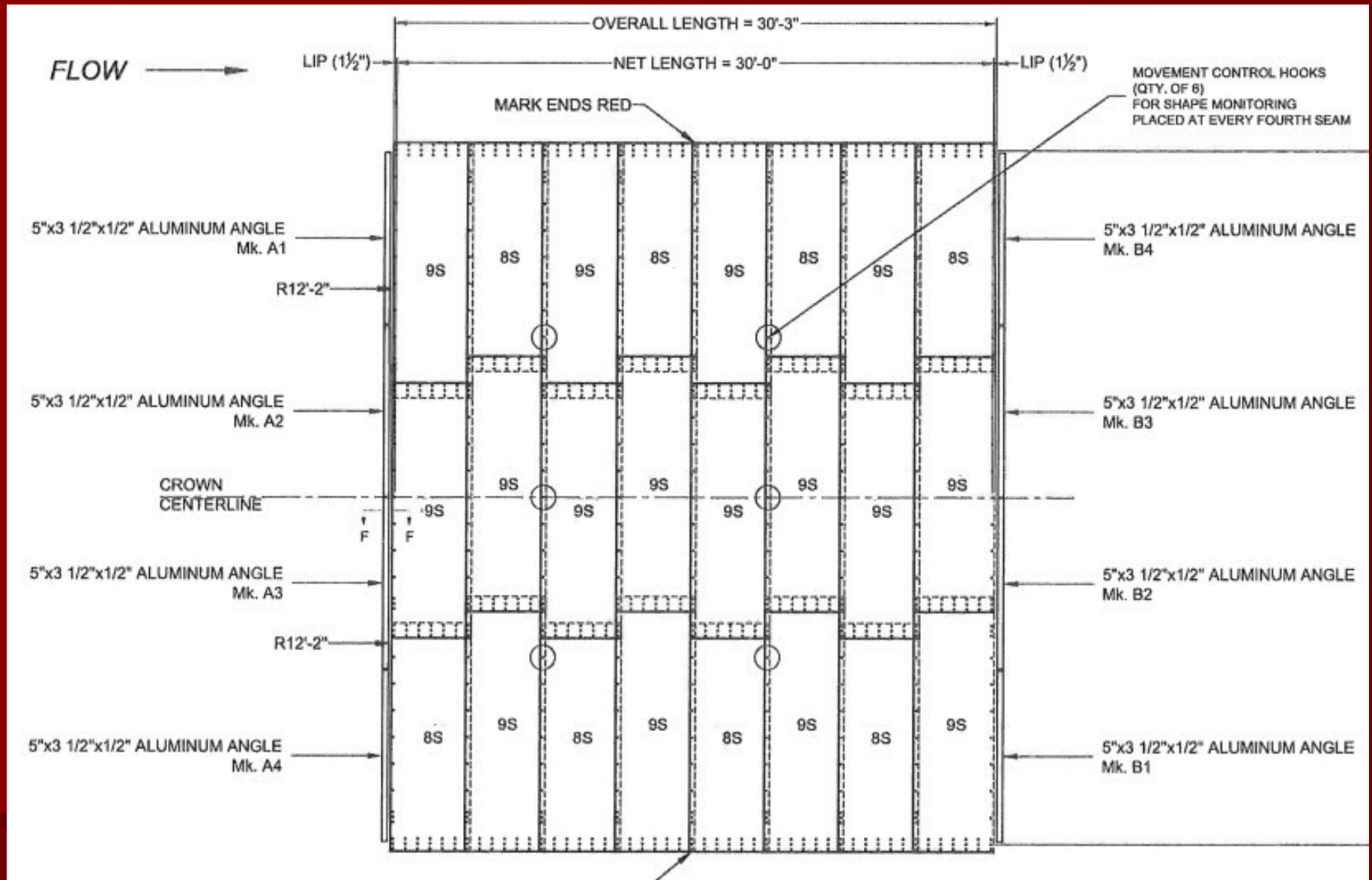
Stub Abutment & Footing



Stub Abutment & Footing



Galvanized Steel Deep Corrugated Arch Structure



On-site pre-assembly and material list review meeting with ConTech

Installing Arch Structure

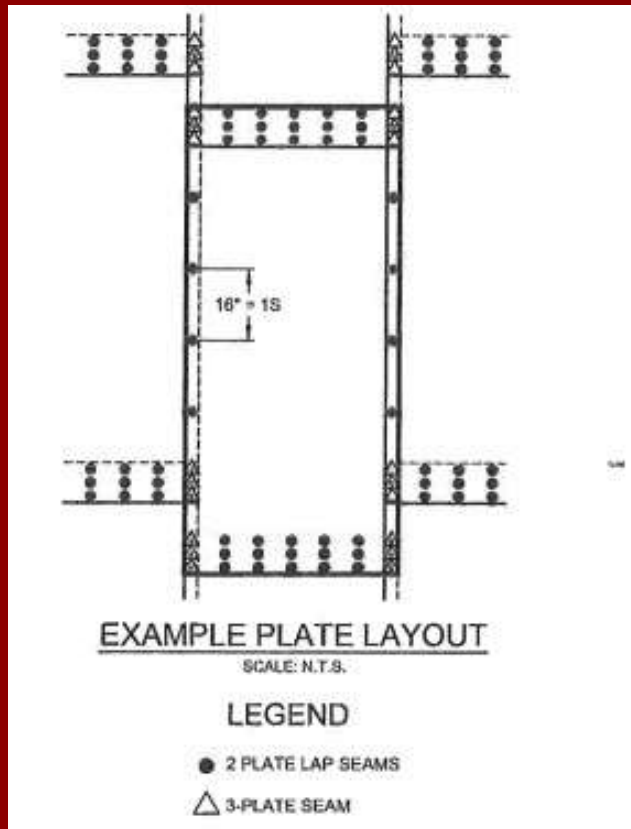


Plate weights

- 459 pounds & 411 pounds

Installing Arch Structure



Installing Arch Structure



Installing Arch Structure



Installing Arch Structure



Installing Arch Structure



Installing Arch Structure



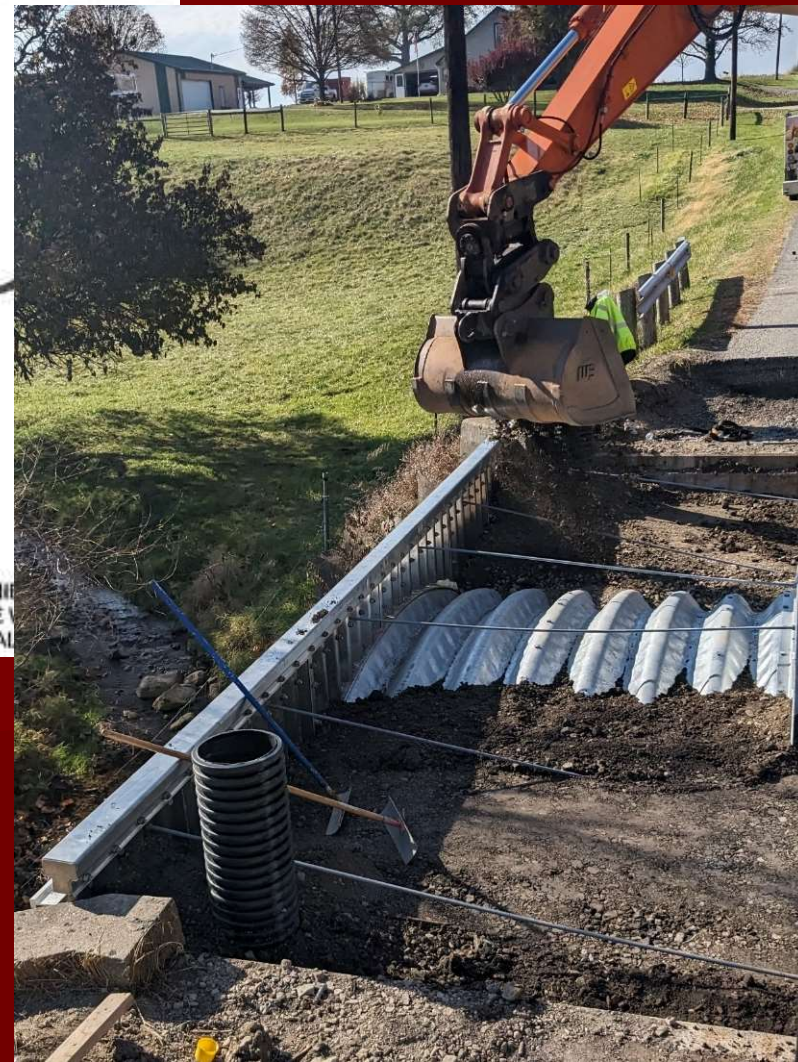
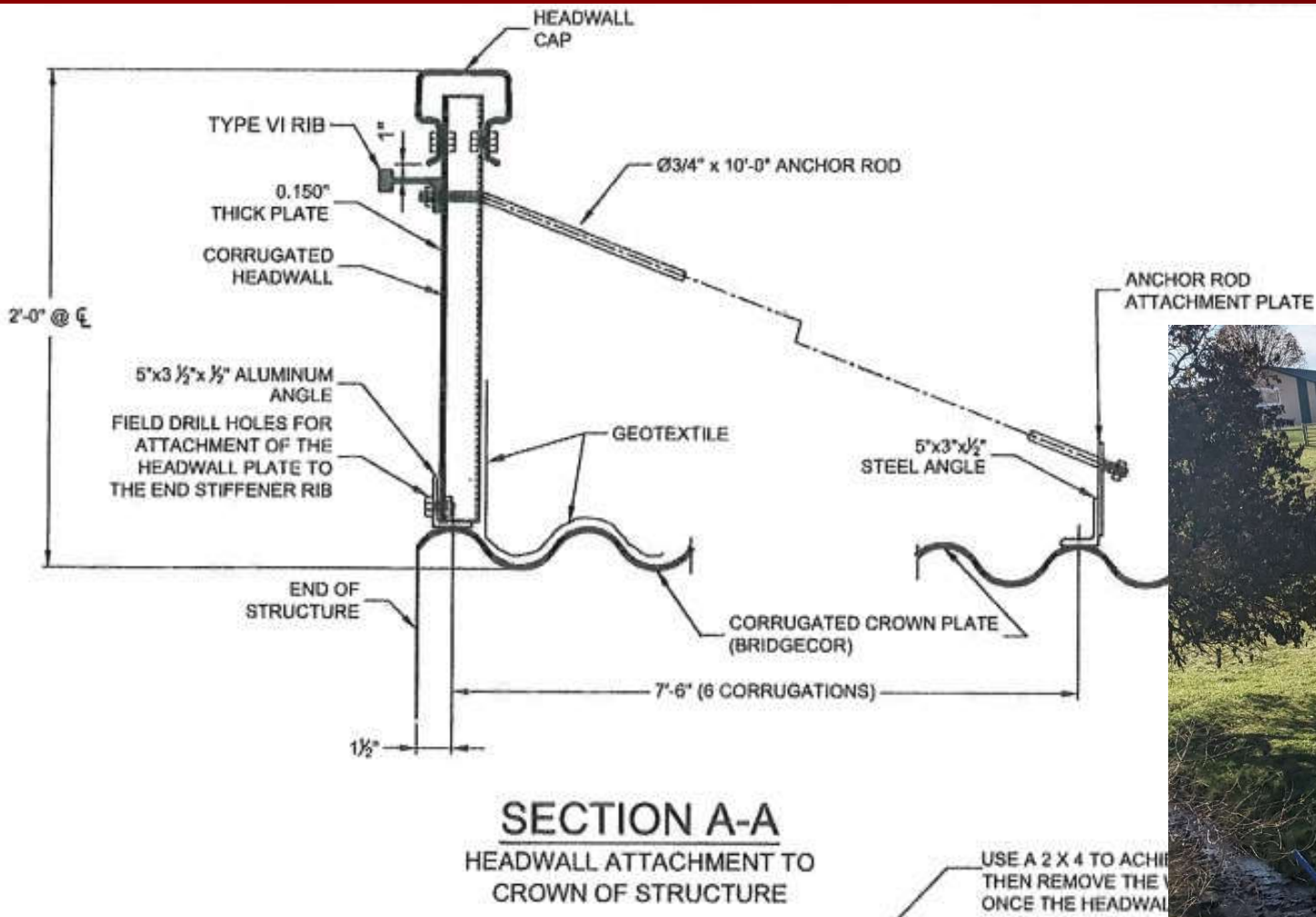
Headwalls



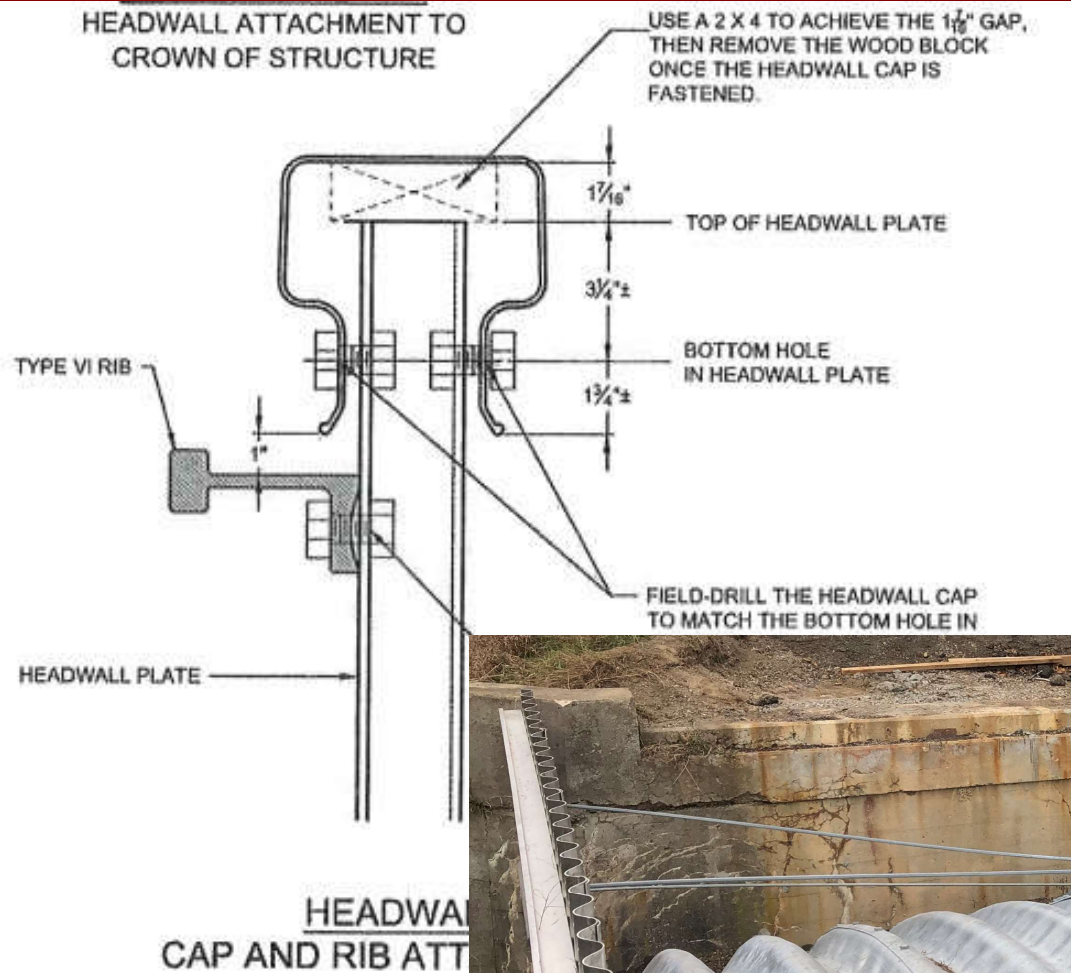
Benefits of aluminum vs. CIP concrete headwalls

- Easier & quicker to construct
- Estimated cost savings = \$25,800

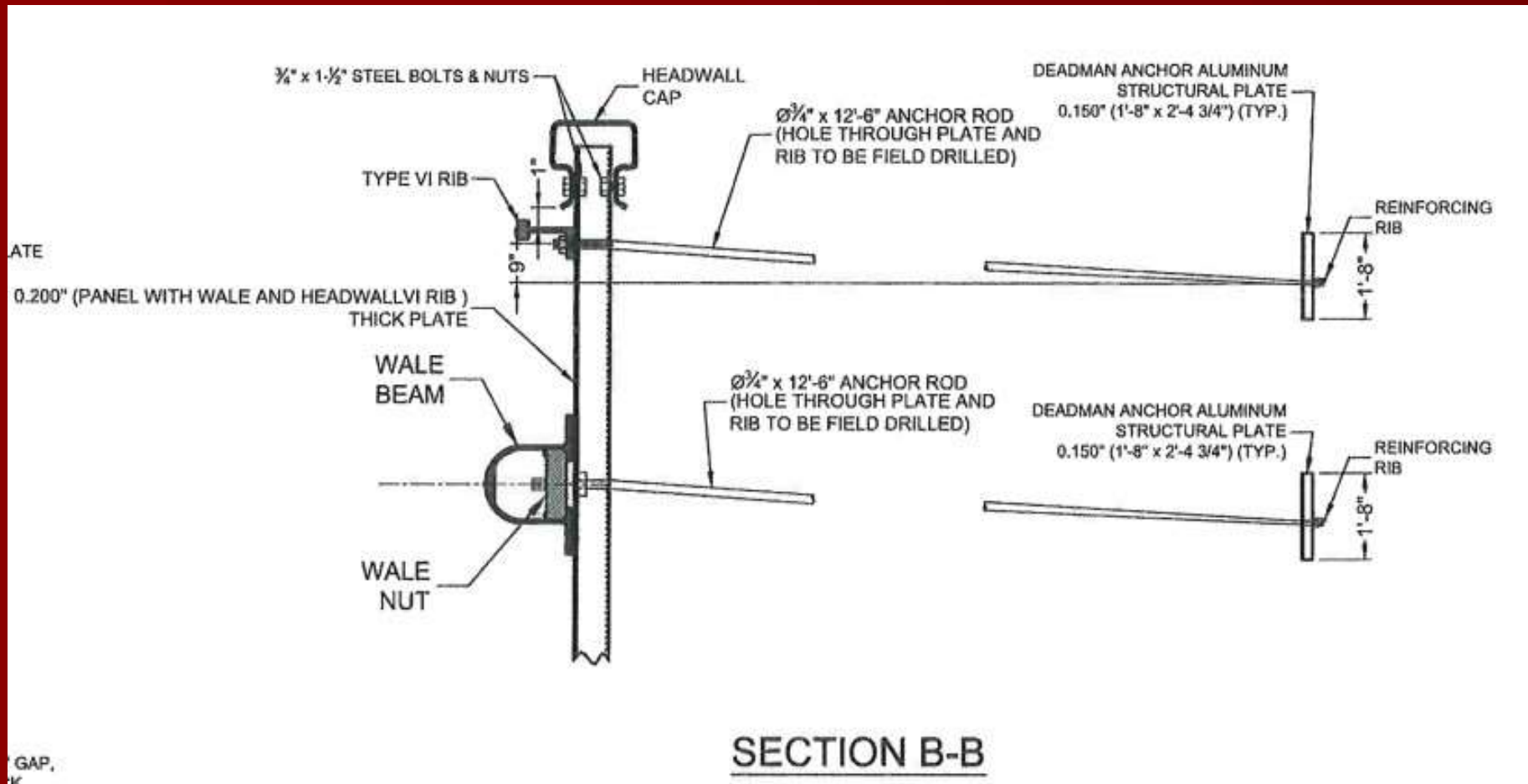
Headwalls



Headwalls



Headwalls



Headwalls



Headwalls



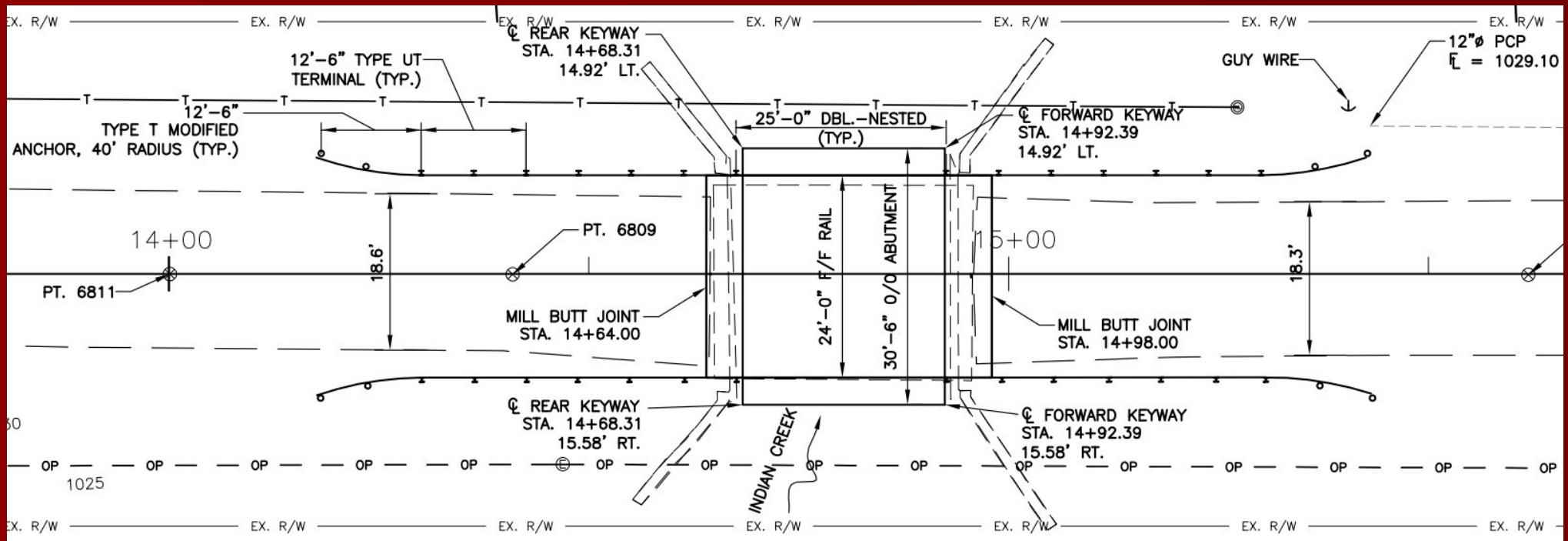
Headwalls



Headwalls



Roadway



Roadway



Roadway



Roadway



Roadway



Roadway



Estimated Costs and Funding

- Estimated cost for a simple span superstructure on new piling and abutments = \$158,400
- Pre-construction engineering and surveying services for this project totaled \$8,188.93 & this was funded by the STC
- STC was willing to consider funding pre-construction engineering and surveying services up to a maximum amount of \$10,000 if we used one of the 'Top 20' innovative bridge ideas

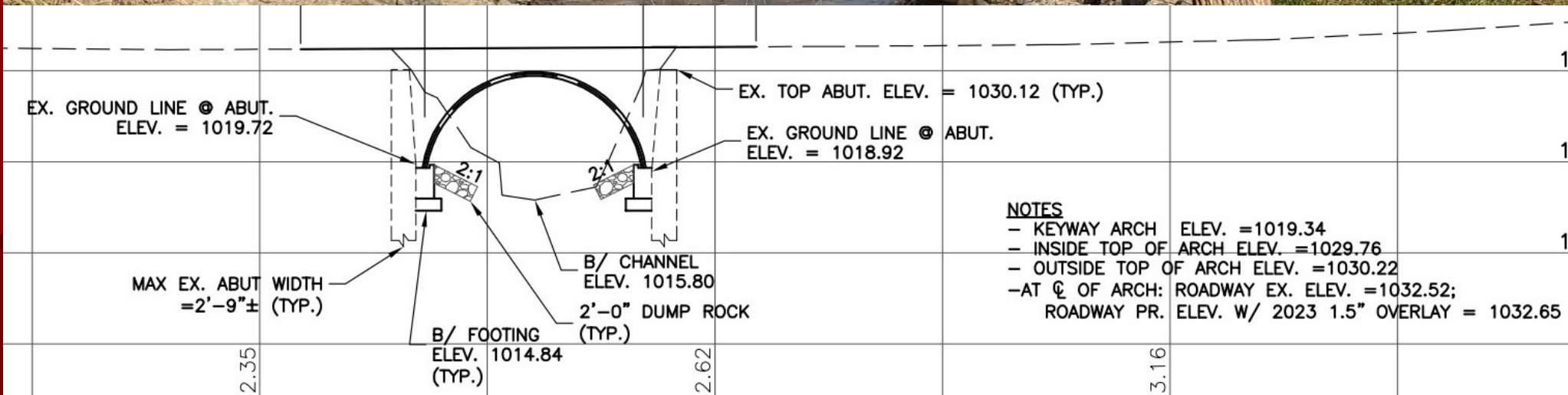
Force Account (FA) Summary

	<u>Final Costs</u>		<u>Estimated Costs</u>
Labor	\$ 53,955.97	Labor	\$ 39,139.00
Materials	\$ 60,386.90	Materials	\$ 62,259.00
Equipment	\$ 26,725.03	Equipment	\$ 21,367.00
FA Final Total	\$ 141,067.90	FA Estimated Total	\$ 122,765.00

Design Notes

- Maintain existing roadway elevations
- Coordinate bridge replacement with paving program
- Stay within existing right-of-way
- Meet hydraulic requirements
- Minimum cover = 2.25'
- Proposed structure to fit within the existing concrete walls

Profile view



Questions?

- Thank you to STC's Mike Steenhoek and Contech's John V. Kanzlemar, Sr. Bridge Consultant, for helping with this project
- Per Mike Steenhoek's (msteenhoek@soytransportation.org) email from 4/8/'24: "One of the concepts from our "Top 20" report that we would like to further promote is the use of railroad flat cars, and we are willing to increase the available funding to do so. Whenever I have seen them utilized, there has been a significant cost and time savings while maintaining safety. We have \$30,000 available do to a project in Ohio in which a rural bridge would be replaced via this method."
- This presentation is located on our website: www.lceo.us

