



Kinsey Bridge Metal Grid Deck Replacement

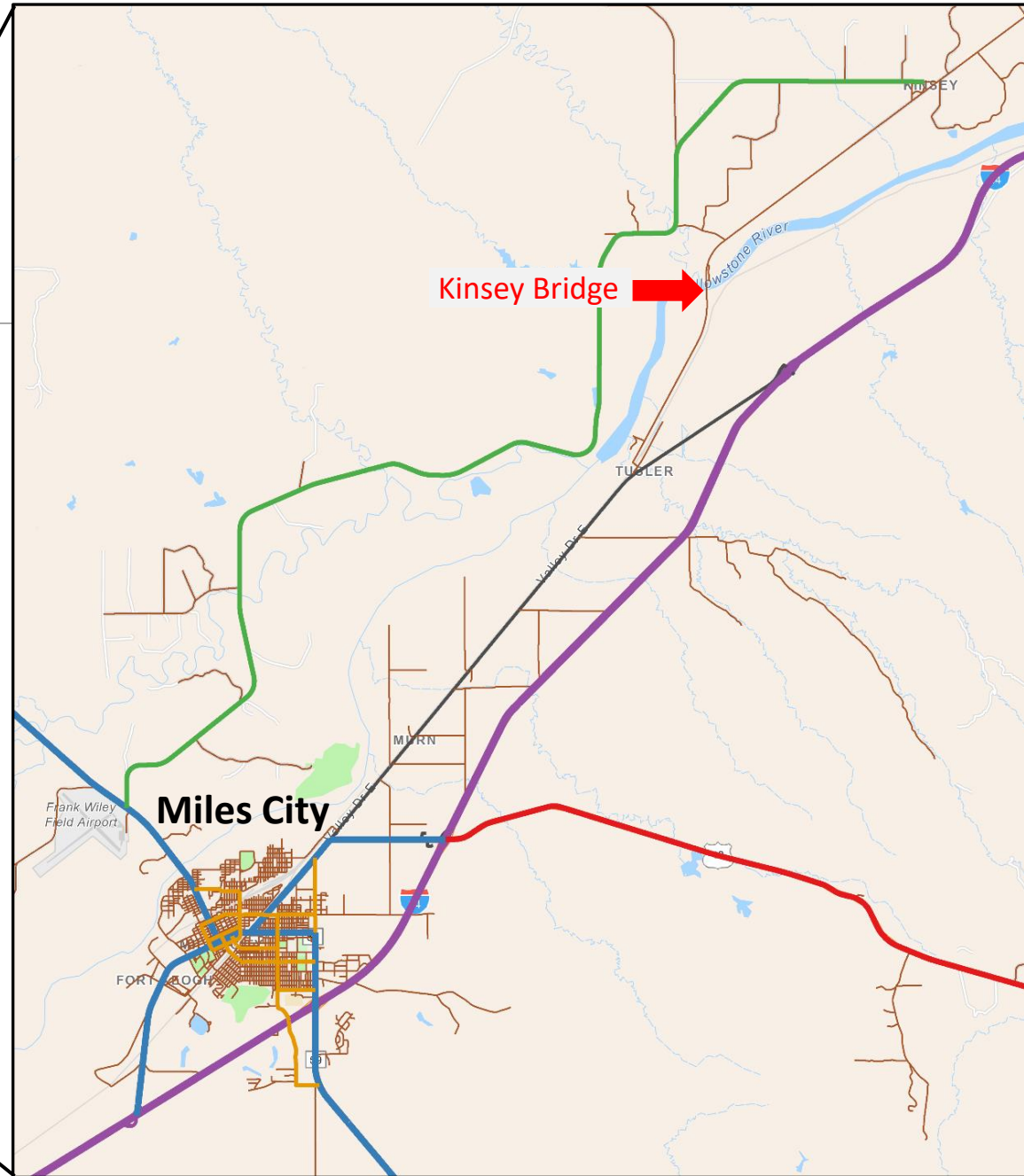
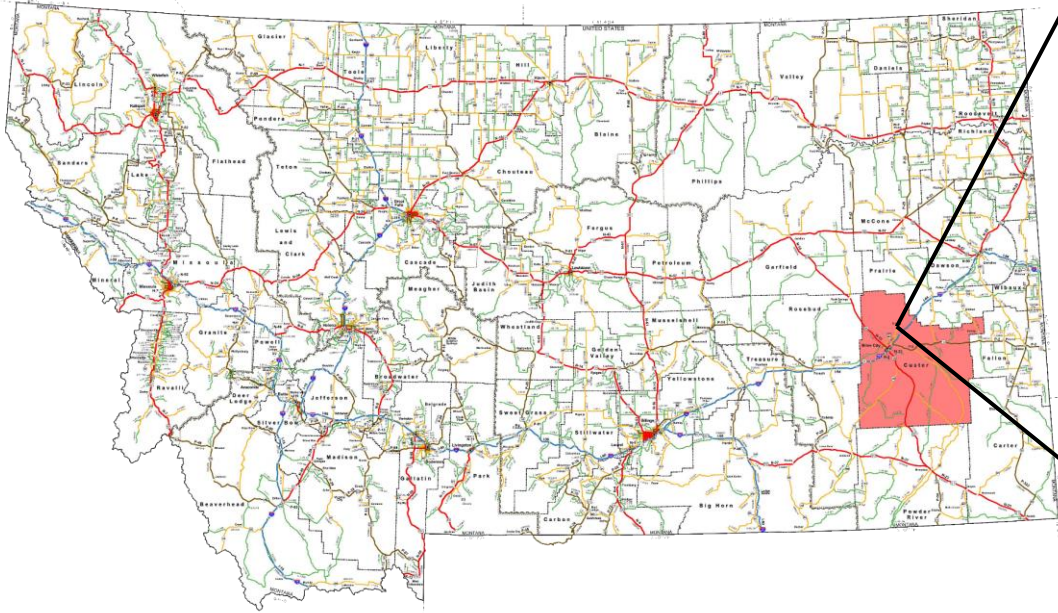
PRESENTERS:

BRENT SCHILLER, P.E., S.E.

JARED LARKIN, E.I.T.

Project Location

- ◆ 9 miles NE of Miles City, MT
- ◆ Over the Yellowstone River



Project Team Roles

- ❖ Custer County – Owner
- ❖ MDT – Funding and Roadway Design
- ❖ Forsgren Associates – Bridge Design
- ❖ Wadsworth Brothers - Contractor



**WADSWORTH
BROTHERS**

FORSGREN
Associates Inc.

Bridge Facts

- ❖ Built in 1907 – 116 years old
- ❖ Single track railroad bridge for Chicago, Milwaukee, St. Paul & Pacific Railroad
- ❖ 4 Parker Through Trusses (270')
- ❖ Bridge length of 1080 feet.
- ❖ Skew of 10 degrees.
- ❖ Abandoned by Railroad in 1980



May 1980 - View looking northeast – Photo from Library of Congress

Reasons for the Project

- ❖ Safety & commercial effectiveness of route was being compromised.
- ❖ Used for local residential, agricultural, & business.
- ❖ Continual deterioration of the existing timber deck & steel planking.
- ❖ Beyond the ability of Custer County to repair.



Rehabilitation Process



FIELD
INVESTIGATION



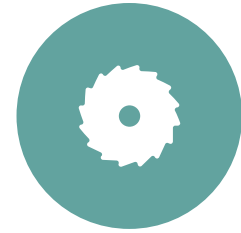
DISCUSSED NEEDS
AND WANTS WITH
THE CLIENT



RECOMMENDATIONS
REPORT



DESIGN



CONSTRUCTION

Field Investigations

- ❖ Documented Deterioration
 - Timber deterioration
 - Makeshift railing
 - Makeshift planking
 - Erosion of roadway near abutments
- ❖ Took Photos
- ❖ Obtained Measurements
- ❖ Verified Record Drawings



Client's Needs and Wants

- ❖ Minimize Maintenance Needs.
- ❖ Winter Weather Considerations.
 - Deck too narrow for County Owned snowplows.
 - Deicing salt could damage the Historic Structure.
- ❖ Galvanized vs Weathering Steel.
 - Public perception concerns.






Recommendations Report

- ❖ Replace Deck – Selected Open Metal Grid Deck.
 - Multiple options assessed (next slide).
- ❖ Load Rating conducted – No load restrictions.
- ❖ New Railing.
- ❖ Repair approach roadway.

Truck / Load Type	Vehicle Weight (Tons)	Rating Factor	Controlling Member
HL-93 Inventory	36	1.42	Deck-Floorbeam
HL-93 Operating	36	1.84	Deck-Floorbeam
Type 3	25	3.35	Floorbeam 4
Type 3S2	36	3.32	Floorbeam 4
Type 3-3	40	3.54	Floorbeam 4
SU4	27	2.96	Floorbeam 4
SU5	31	2.70	Floorbeam 4
SU6	34.75	2.42	Floorbeam 4
SU7	38.75	2.23	Floorbeam 4
EV2	28.75	1.93	Deck-Floorbeam
EV3	43	1.91	Floorbeam 4

Deck Options Table from Recommendations Report

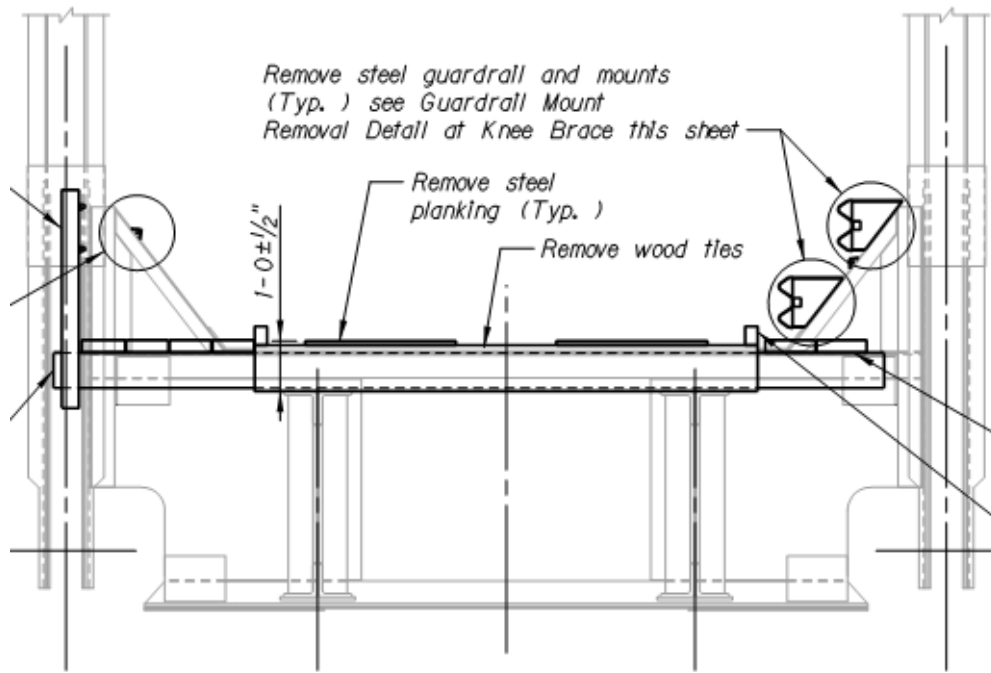
Deck Option Pro/Con PRO:  Neutral:  CON: 	Option 1 - CSBP (Gravel Filled)	Option 2 - CSBP (Reinforced Concrete)	Option 3 - Open Grid Metal Decking	Option 4 - Timber Deck with Timber Ties	Option 5 - Concrete Filled Metal Grid Decking	Option 6 - Precast Concrete Panels
Cost Ranking	#1	#3	#4	#2	#6	#5
Construction Cost	\$1.70M	\$2.20M	\$2.43M	\$2.07M	\$3.48M	\$3.25M
Drainage system needed?	YES	YES	NO	YES	YES	YES
Construction Time.	FAST	SLOW	FAST	SLOW	FAST	FAST
Deck maintenance needs.	ON-GOING	MINIMAL	MINIMAL	ON-GOING	MINIMAL	MINIMAL
Relative lifespan.	SHORTER	LONGER	LONGER	SHORTER	LONGER	LONGER
Difficult or impractical to Install due to truss limitations?	NO	NO	NO	NO	YES	YES



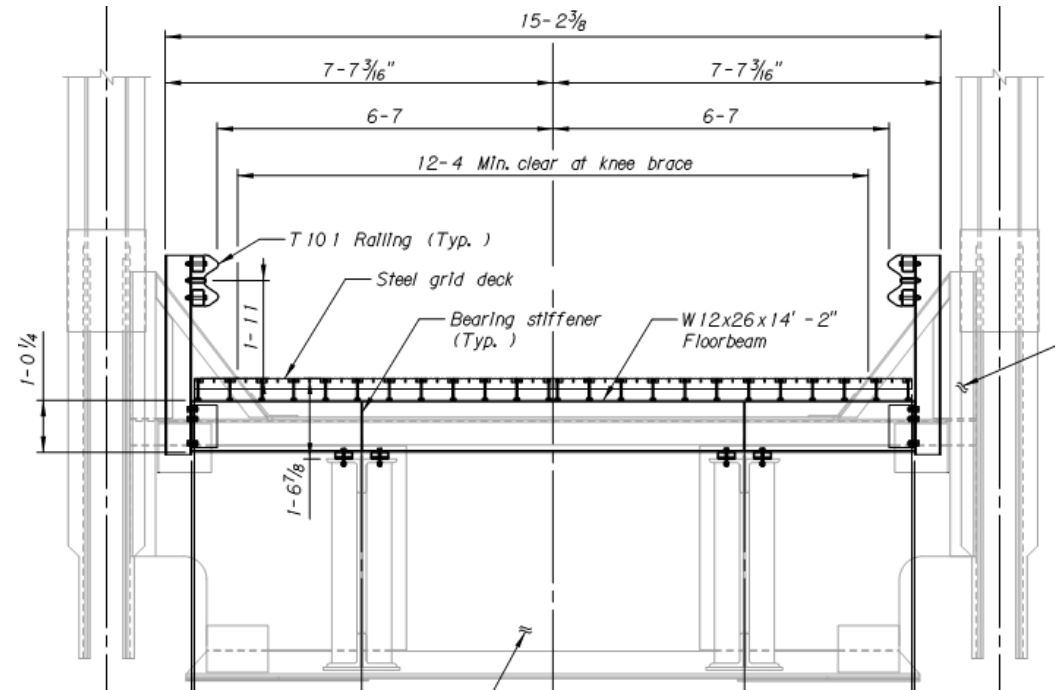
Bridge Design

Bridge Design – Typical Sections

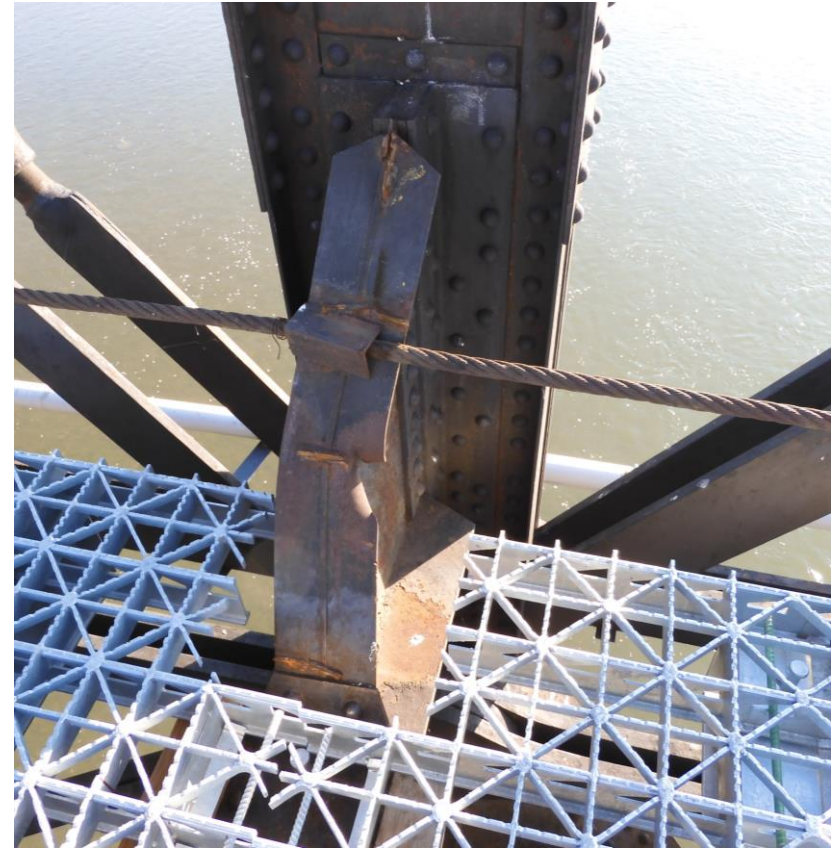
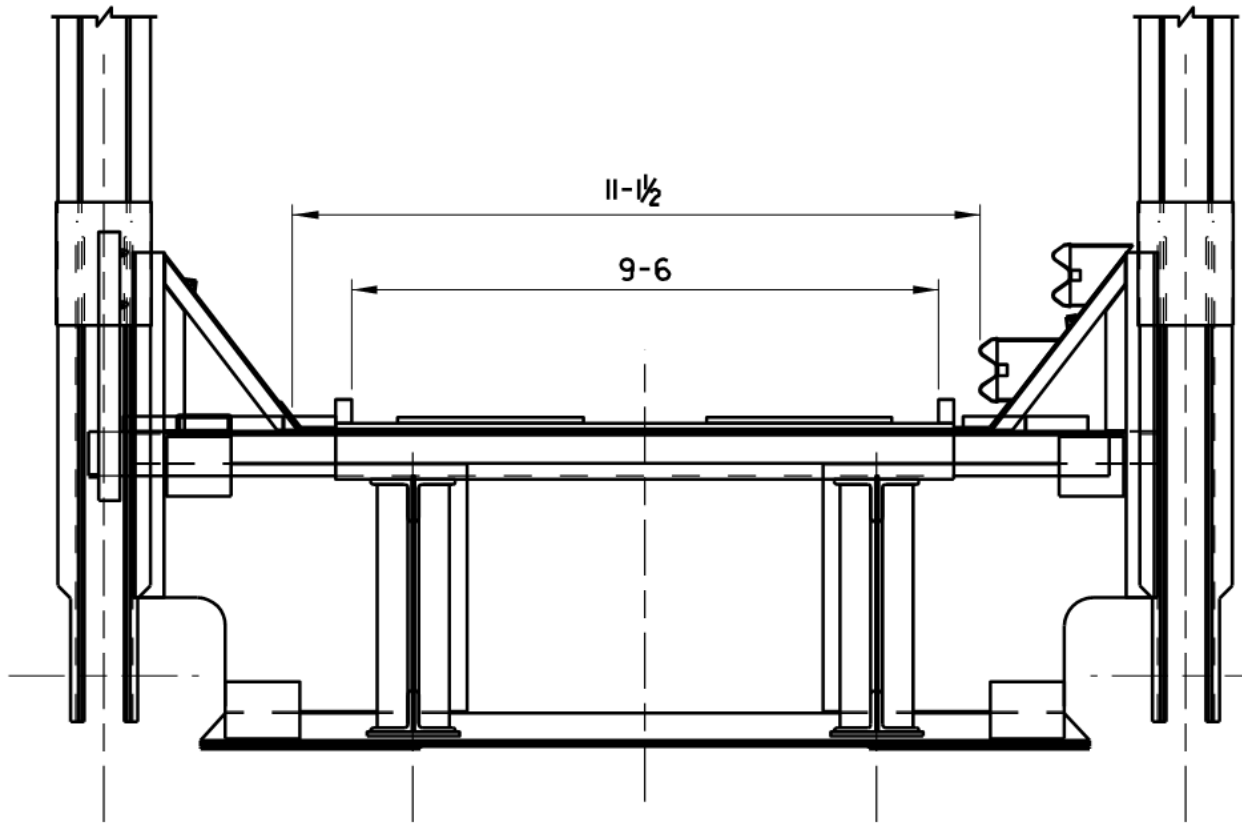
OLD TYPICAL SECTION



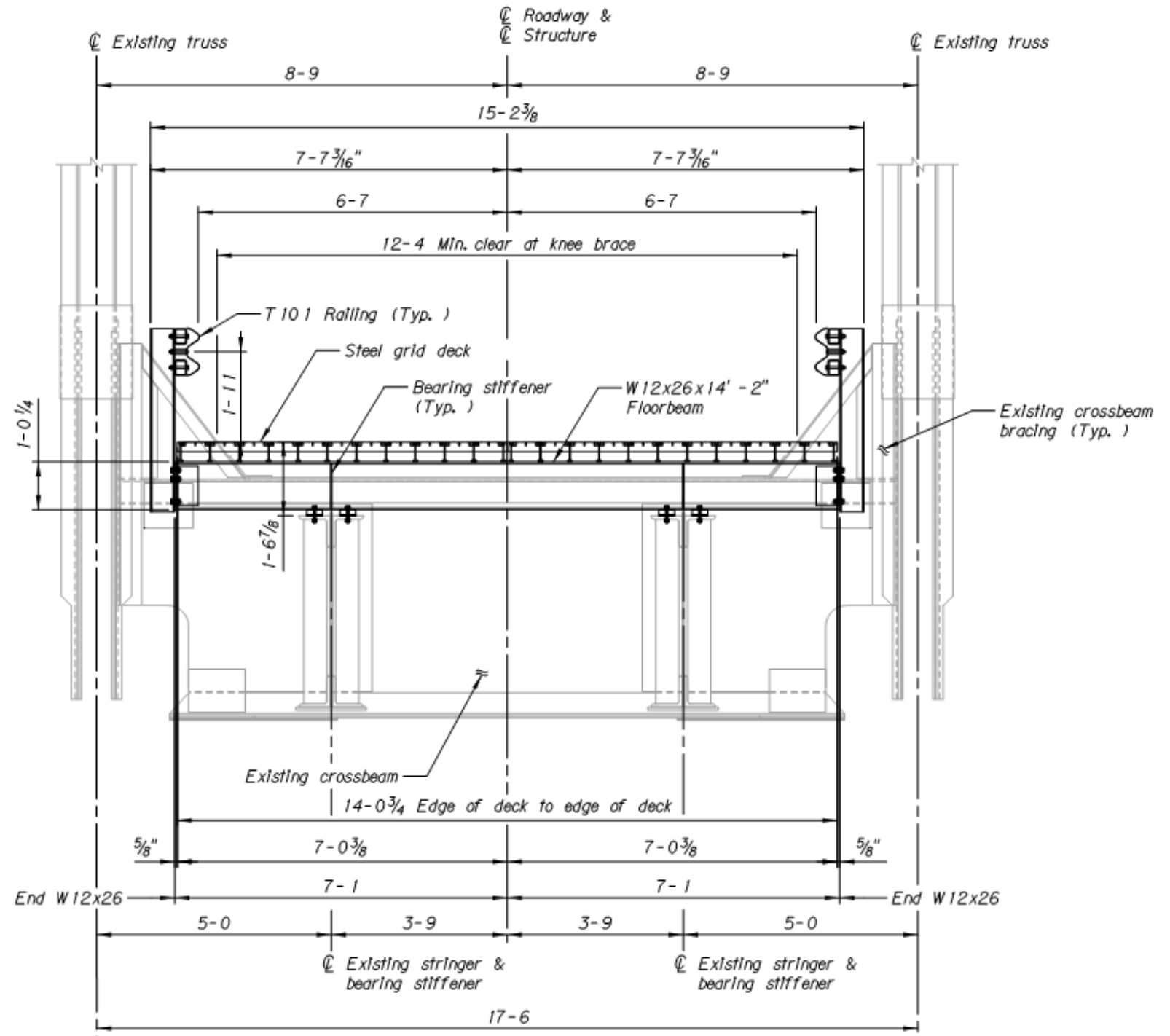
NEW TYPICAL SECTION



Old Typical Section



New Typical Section

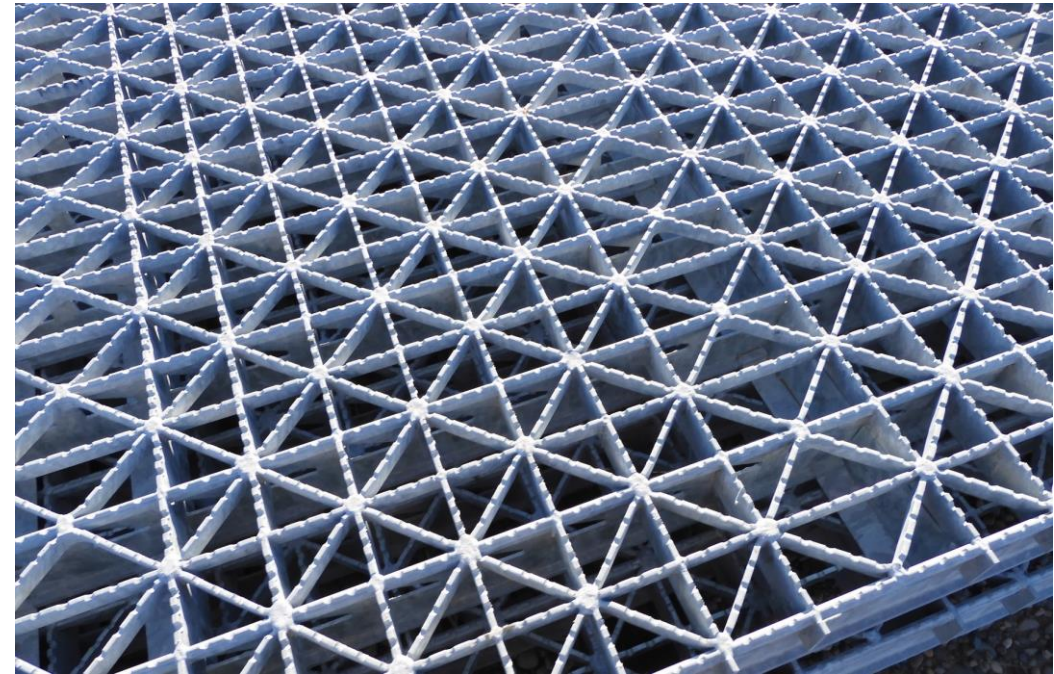


Deck Design

- ❖ Existing Longitudinal Stringers Spaced at 7.5'
- ❖ Looked at spanning transversely over stringers – It would not work.
- ❖ Added New Transverse Floorbeams to reduce deck spans & remove deck overhangs.
- ❖ Deck to Floorbeam Connection
 - Consulted with the Bridge Grid Flooring Manufacturers Association (BGFMA), Fabricators, and Local Bridge Contractors.



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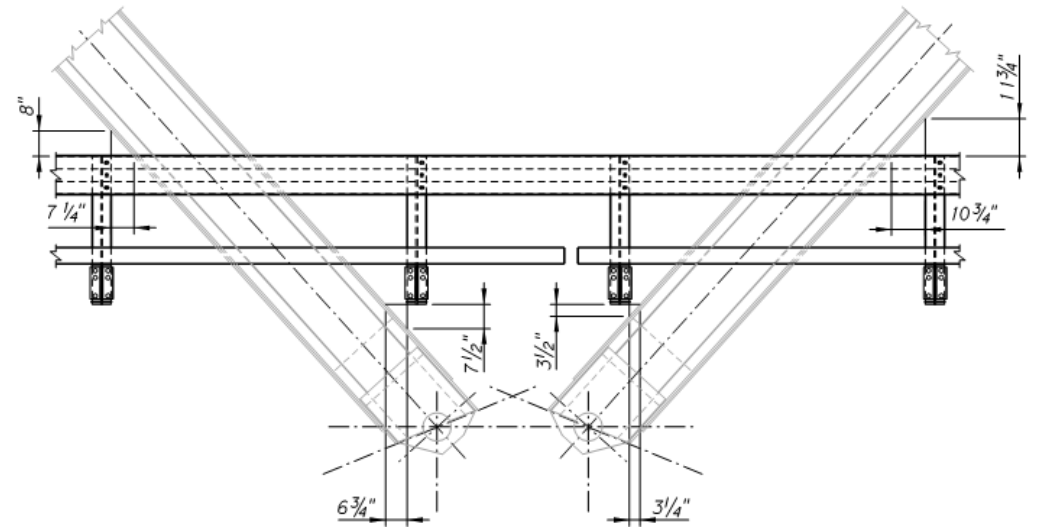


Longitudinal Stringer

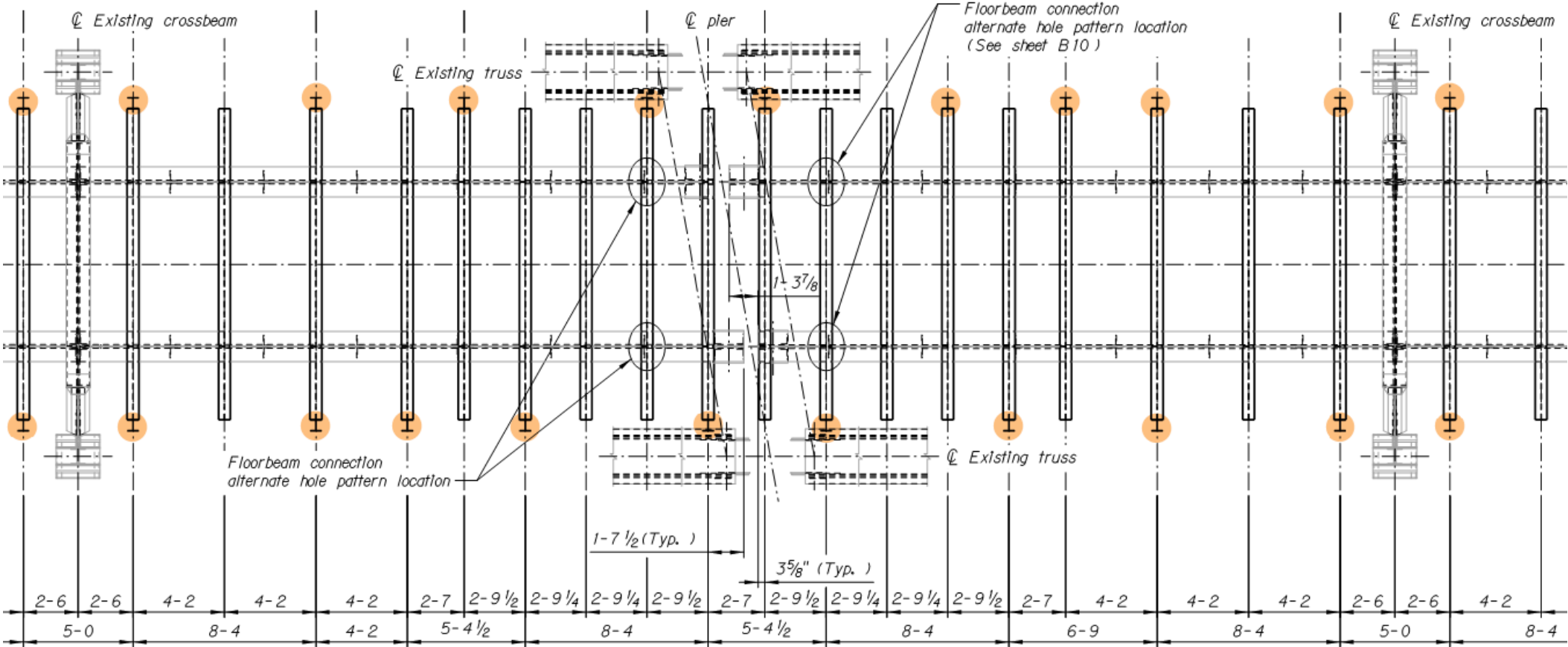
Longitudinal Stringer

New Railing & Post Spacing

- ❖ Maximum post spacing of 8'-4"
- ❖ Posts were attached to the Floorbeams to reduce costs.
- ❖ Spacing adjusted to avoid truss members at span ends.



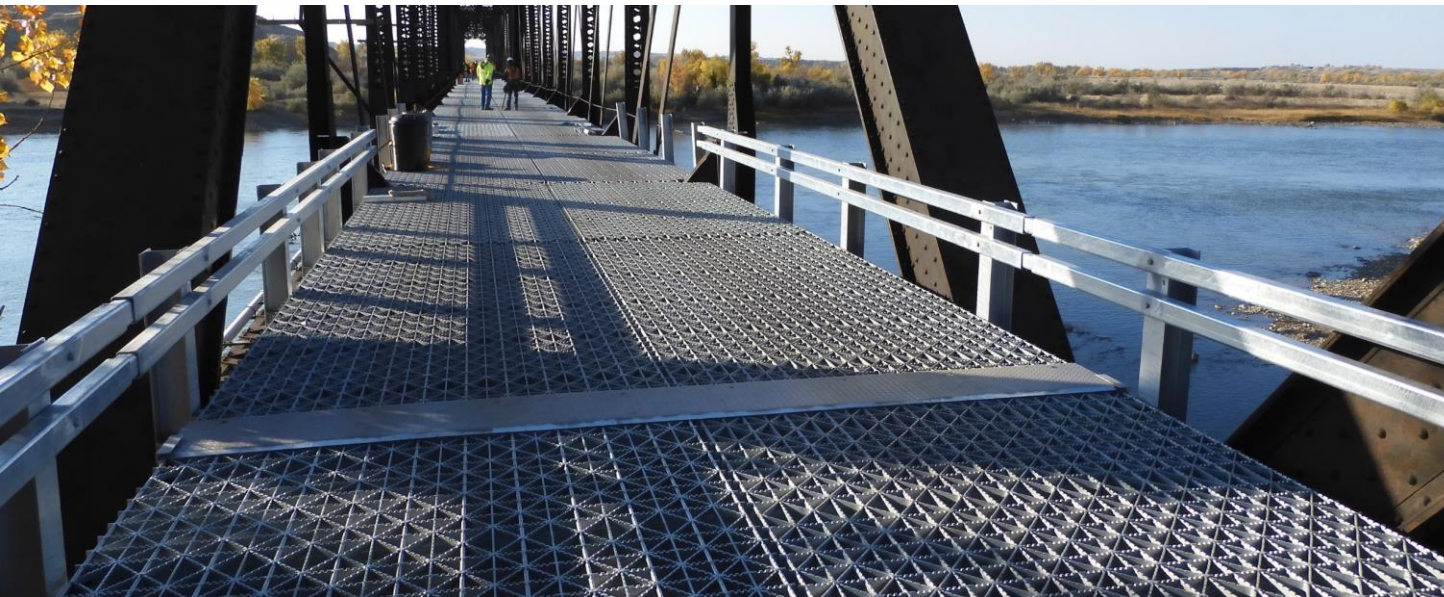
Floorbeam Spacing



DECK FRAMING PLAN AT PIER

Expansion Joint

- ❖ Low Road Speeds (15-20 mph).
- ❖ Tapered plates were selected as a simple and economical choice.
- ❖ Plates textured to provide traction.



Bid Process & Results

- ❖ MDT PS&E Review aided in developing an accurate engineer's estimate.
- ❖ Costs increased from the preliminary estimate due to inflation and adding roadway costs.
- ❖ Engineer's Estimate was \$3.23 million and fell between the number 2 and number 3 bids.
- ❖ Wadsworth Brothers Construction submitted the winning bid.

Rank	Total Bid	% of Low Bid	% of Eng. Est.
1	\$2.70 million	100.00%	83.50%
2	\$3.20 million	118.39%	98.86%
Eng.	\$3.23 million	119.76%	100.00%
3	\$3.32 million	122.95%	102.66%
4	\$3.94 million	146.08%	121.98%
5	\$4.55 million	168.67%	140.84%

Construction



Construction Timeline

- ❖ Letting Date: June 9, 2022
- ❖ Contract Time: 80 working days
- ❖ Contract Notice to Proceed Date: No later than April 17, **2023** (Flex Time)
- ❖ Submittal Review: July 8th – Sept. 8th
- ❖ Wadsworth started work on September 13, 2022.
- ❖ Bridge Reopened on November 23, 2022 (the day before Thanksgiving).
- ❖ Construction Time: 72 calendar days (worked most weekends).

Installation Procedure

- ❖ Removal of Old Deck
- ❖ Floorbeams
- ❖ Deck Panels
- ❖ Expansion Joint Plates
- ❖ Railing
- ❖ Concrete
- ❖ Roadway Approaches



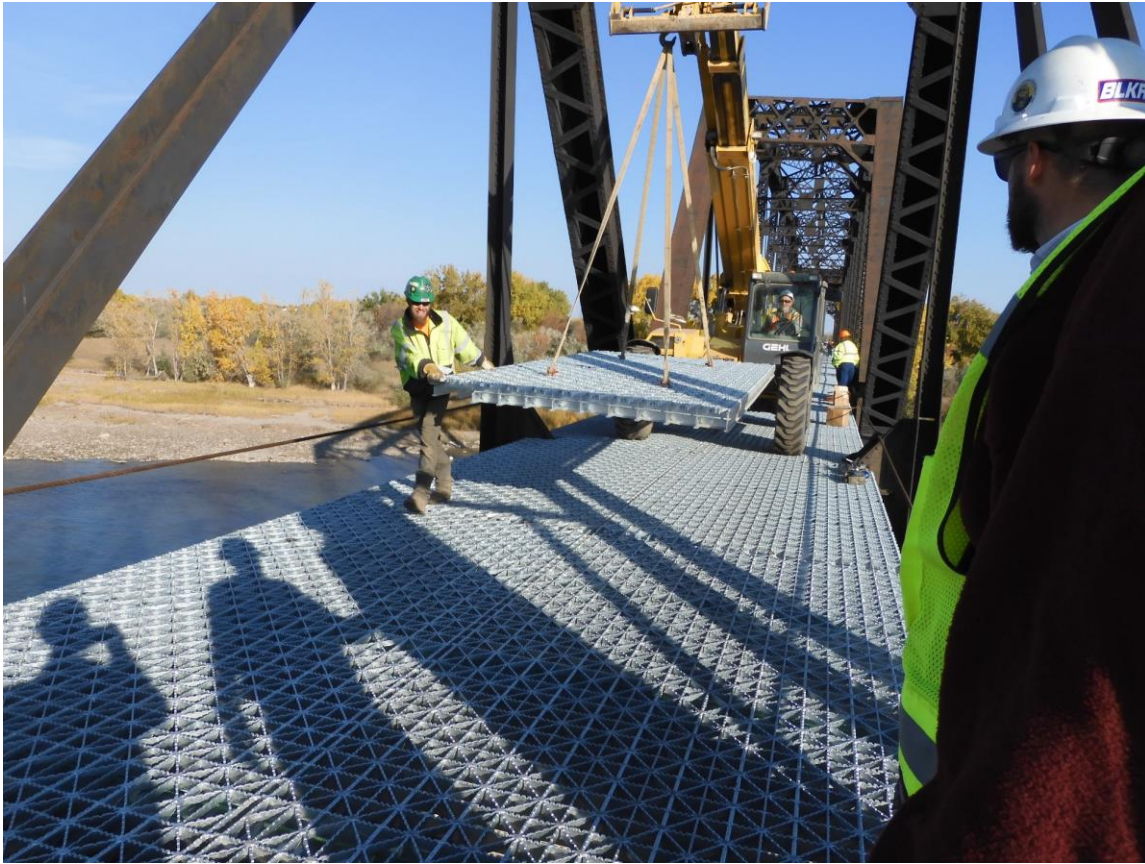
Remove Old Timber Deck



Drill Holes & Place Floorbeams



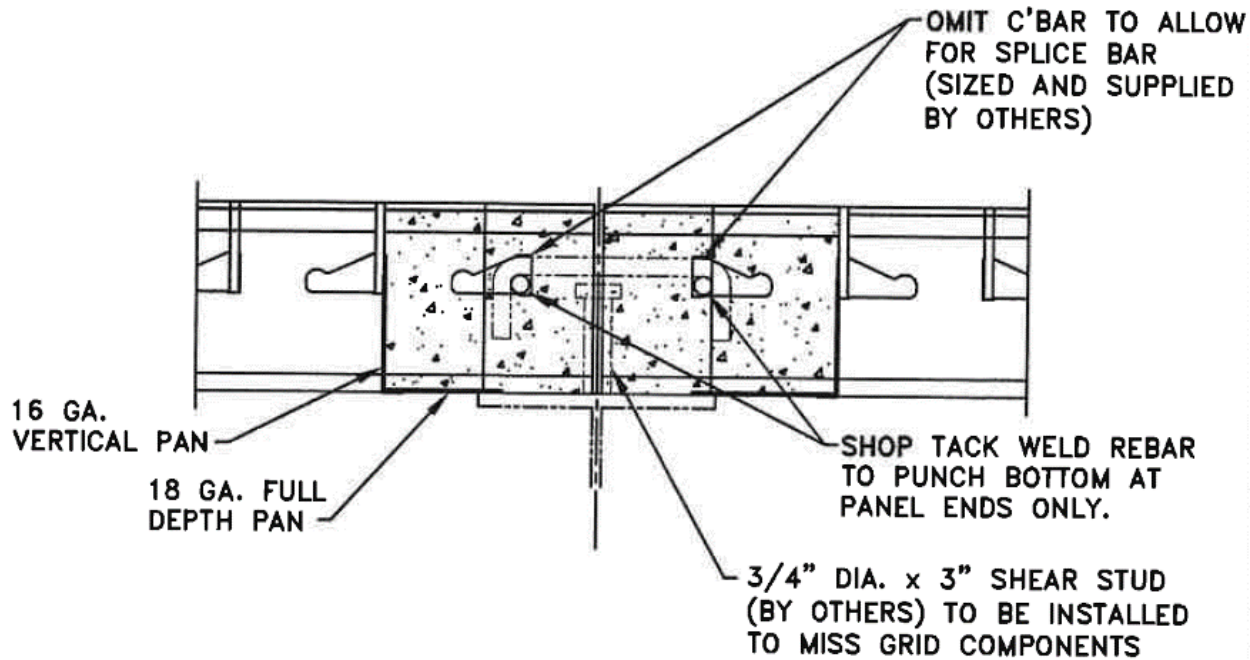
Deck Panel Installation



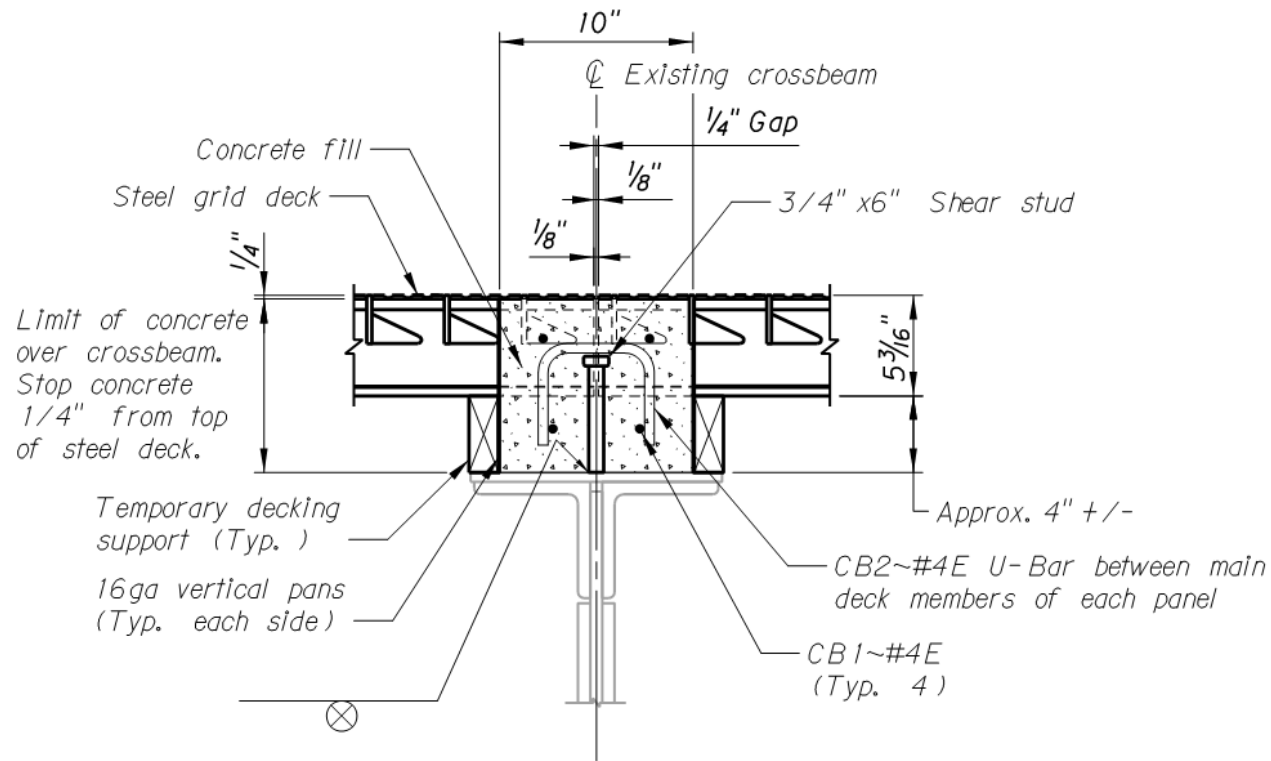
Expansion Joint Plate & Railing

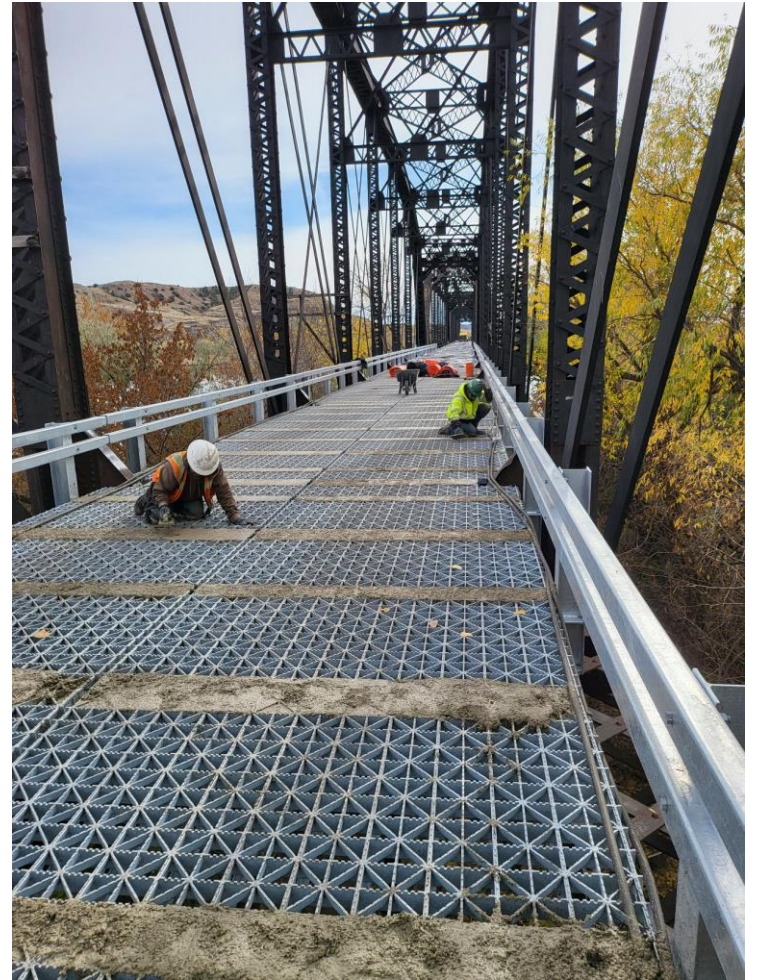
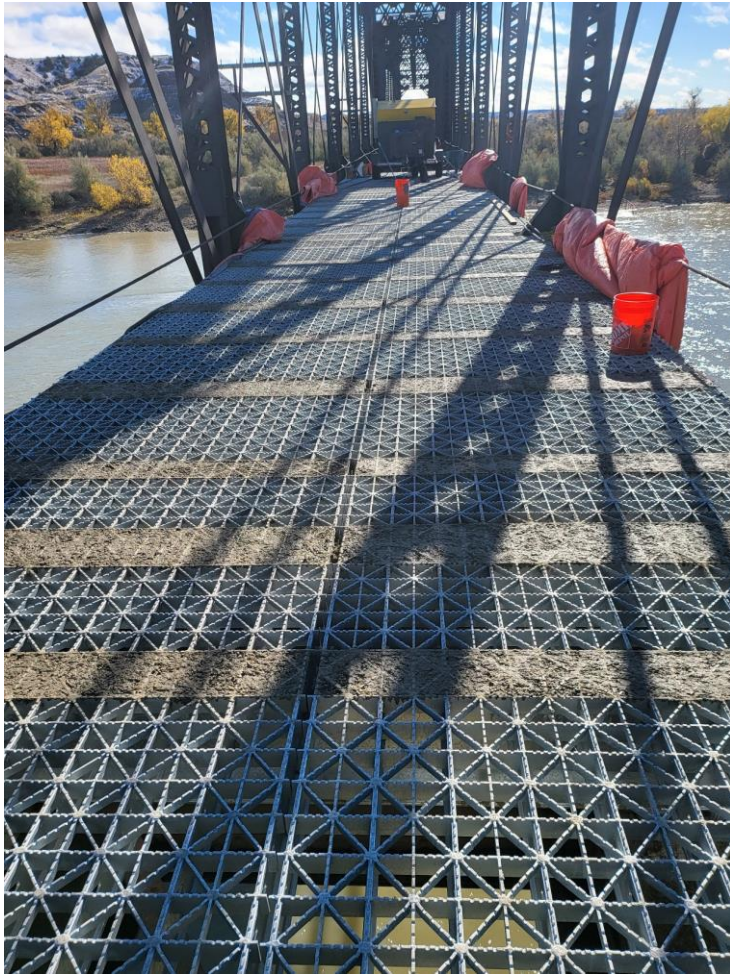
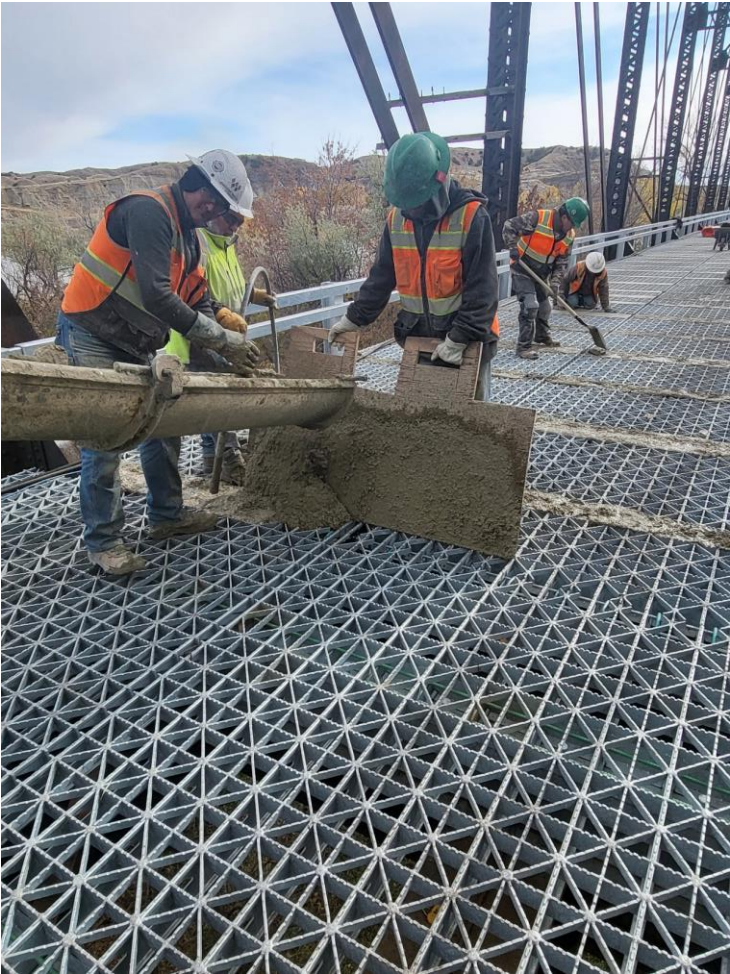


Deck to Floorbeam Connection



Deck to Crossbeam Connection





Concrete

Addressing the Unexpected

- ❖ Some Deck Panels were not resting flat.
 - Tack welded in non-tension zones



Before and After





New Deck &
Winter Weather

Contact Information & Questions

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