



Michigan Bridge Bundling Update

Michigan Bridge
Conference
Muskegon, MI
March 2023

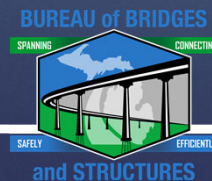
Ihab Darwish, PhD, PE, SE, Benesch
Roger Safford, P.E., HNTB

Agenda

- ▶ Introductions
- ▶ Background and Overview
- ▶ Key Goals & Objectives
- ▶ Pilot Project Development
- ▶ Pilot Project Delivery – The PBTG Innovation
- ▶ CRRSAA Phase II Update
- ▶ Q&A/Adjourn



Collaboration

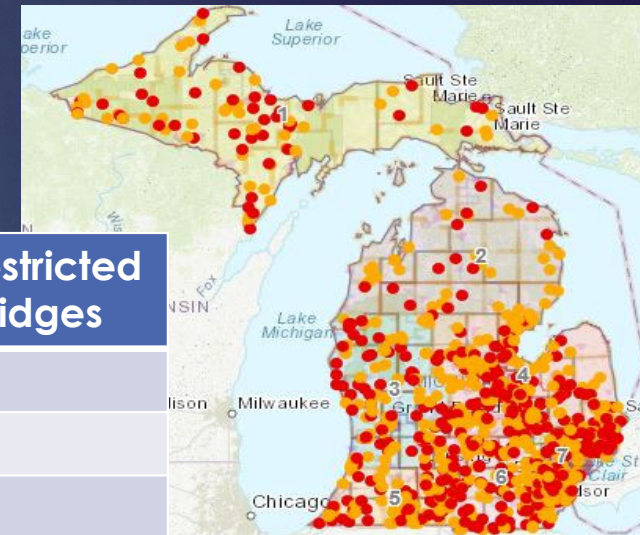


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▶ Q&A

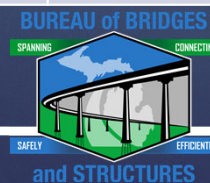
Background and Overview

- *“Bridge bundling is an important ABC planning and programming tool because of the time and cost savings that can be achieved by bundling multiple bridges into a single project.” -FHWA Bridge Bundling Guidebook*
- Journey began over 6 years ago
- ‘Emerging crisis’ in local bridge system condition identified



Month/Year	Serious/Critical Local Bridges	Load Restricted Local Bridges
May 2019	413	1029
July 2020	400	1056
Dec 2022	493	1062

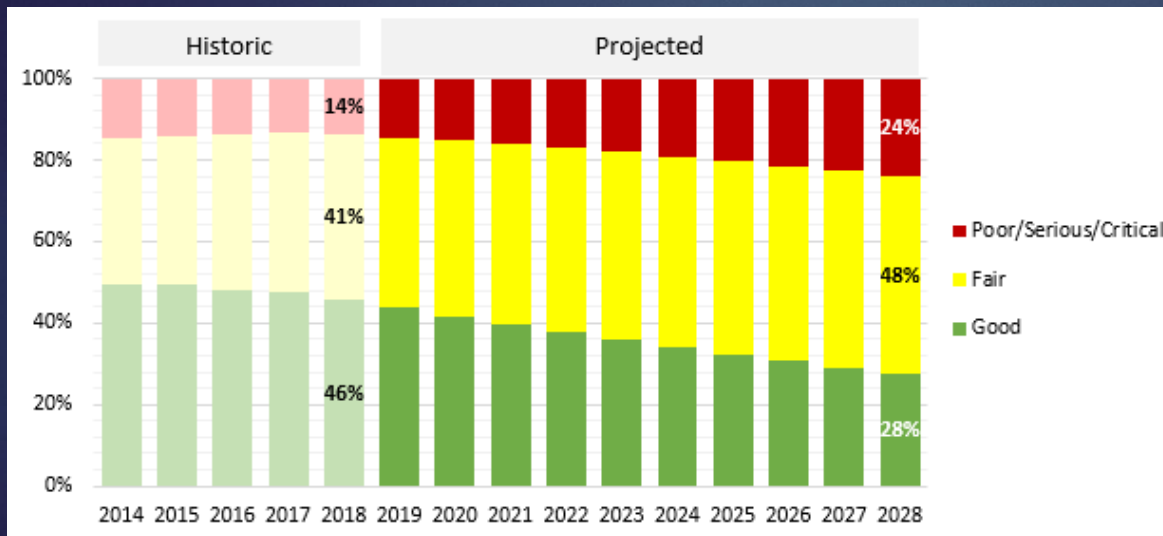
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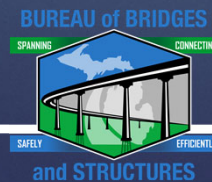
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Background and Overview – Feasibility Study

- Feasibility Study – ‘Making the Case’



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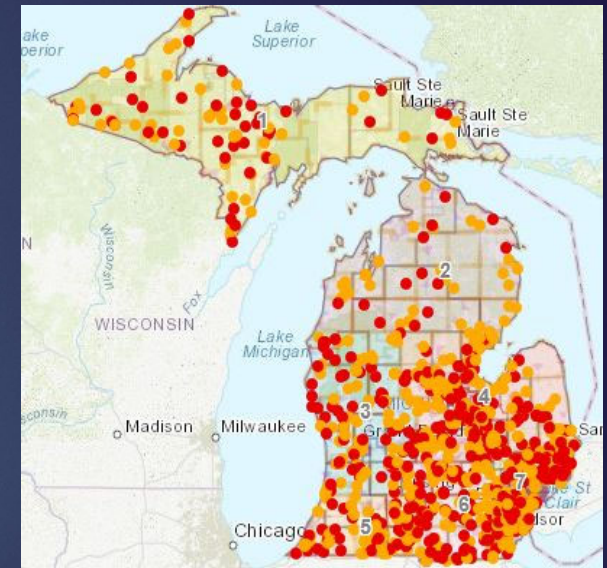
Background & Overview – Local Feedback

Feedback from Local Champions

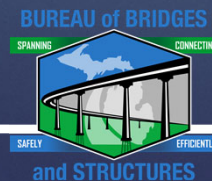
- Survey tool developed – 100+ responses on 736 ‘Bridges of Concern’
- Widespread support was communicated

Final Study Recommendations

- Bundling = Opportunity to Save Time & \$\$\$



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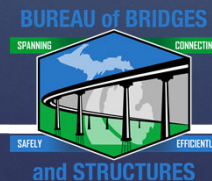
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Key Program Goals & Objectives

- 1 Achieve goal of **Zero Serious and Critical Bridges** statewide
- 2 Prioritize Closed/Critical/Serious/Poor bridges
- 3 Leverage national, statewide, and local best practices
- 4 Use funding sources efficiently



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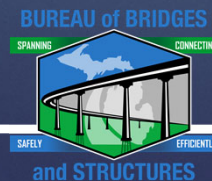
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Key Program Goals & Objectives

- 5 Utilize limited available construction labor and resources
- 6 Encourage standardization, streamlining and innovation to drive program value
- 7 Engage local stakeholders and achieve buy-in for a collaborative and coordinated Michigan bridge program
- 8 Develop maintenance and lifecycle asset management plan to provide the best whole-life value



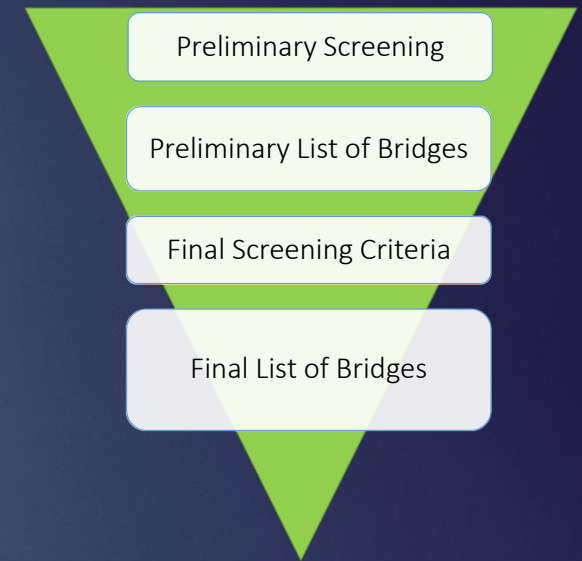
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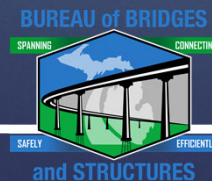
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Program Development – Pilot Project

- Preliminary Screening - December 2019
- Final screening & scoping – May-July 2020
- 19 bridges advanced into final pilot bundle
 - Risk-based engineering
 - Environmental Assessments
 - Risk Assessments
- Virtual DBE Open House & Matchmaking Session – October 2020



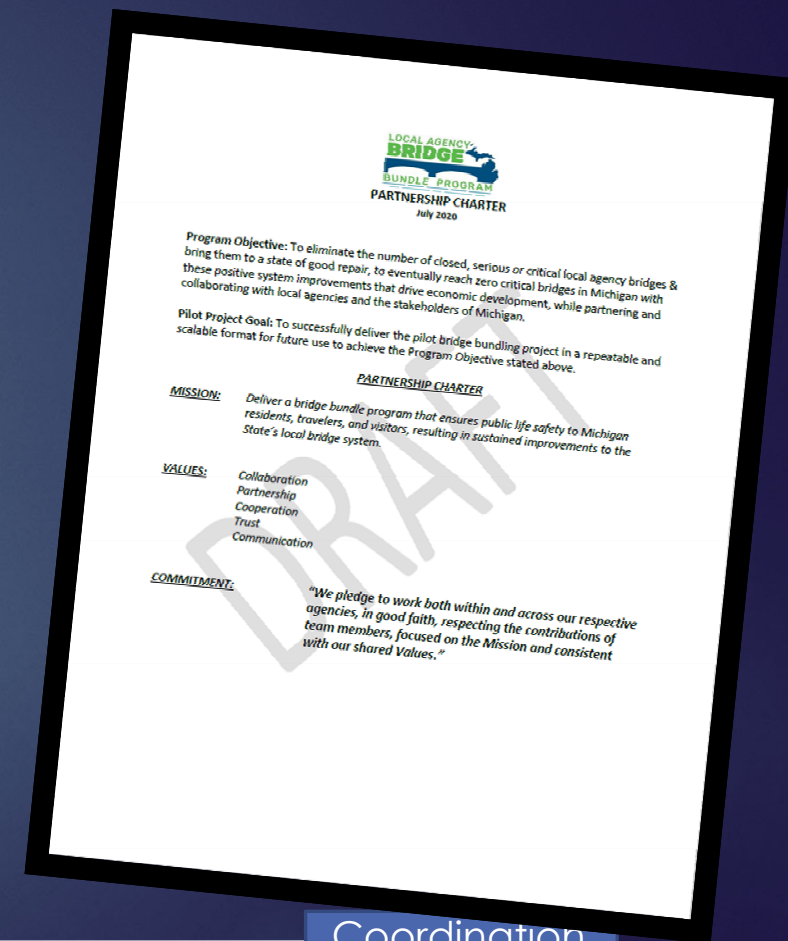
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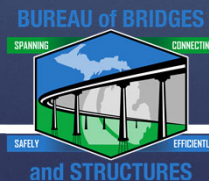
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Partnership Charter: “Vision for Success”

- ▶ Work together as ‘one team’ — locals, CRA, MML, state, federal and consultants
- ▶ Document arrangement of collaboration and partnership through mission and supporting values



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Coordination

Design-Build Contract Development



Focused Effort:

- Low Risk Bridges
- Provide clear direction on design elements
 - Prohibited structure types
- Allow for flexibility
 - Design
 - Construction

DESIGN-BUILD CONTRACT BOOK 1

MICHIGAN DEPARTMENT OF TRANSPORTATION
Design-Build Project

Local Agency Bridge Bundling Pilot Project

Job Number: 209934 / 209935 / 209938 / 209941 / 210793

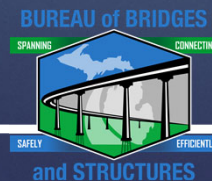
Control Section: 38000

Federal Project Number: 21A0118 / 21A0123 / 21A0120 / 21A0121 /
21A0122

Addendum 3
February 10, 2021



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Procurement



Key Items:

- RFQ Issued – June 24, 2020
- 10-week advertisement
 - 2 - One-on-One Meetings
- ATCs
 - 8 total ATCs were received

Award – March 16th, 2021

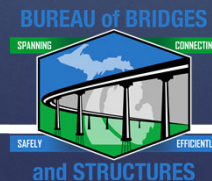
- CA Hull/Anlaan – Joint Venture Contractor
- Benesch – Lead Design Team

2 PROCUREMENT SCHEDULE

The deadlines and due dates shown in Table 2-1 apply to this ITP. MDOT may at its discretion amend this schedule by issuing an addendum to the RFP. All times noted are Eastern Standard Time.

Table 2-1 Procurement Schedule	
Issue Request for Proposals	November 25, 2020
Inquiry/Clarification Submittal #1 and Meeting Agenda Deadline (4:00 pm)	December 10, 2020
One-on-One Meeting – RFP and Initial ATC	December 17, 2020
Inquiry/Clarification Submittal #2 and Meeting Agenda Deadline (4:00 pm)	January 7, 2021
One-on-One Meeting – RFP and Initial/Final ATC	January 12, 2021
*ATC Submittal Deadline (4:00 pm)	January 20, 2021
SOQ Modification Request Deadline	January 25, 2021
Inquiry/Clarification Submittal #3 Deadline	January 25, 2021
MDOT ATC Response Date	February 1, 2021
MDOT Inquiry/Clarification Response Date	February 1, 2021
ATC Resubmittal Deadline (4:00 pm)	February 4, 2021
MDOT ATC Final Response Date	February 9, 2021
1300EZ Form Due (part of typical bid process)	February 18, 2021
Technical Proposal Due (at 11:00 am)	February 18, 2021
**Price Proposal Due Date (at 10:30 am)	February 19, 2021
**Anticipated Notification of Selected Responsive Proposer	February 19, 2021

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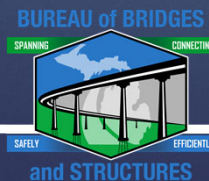


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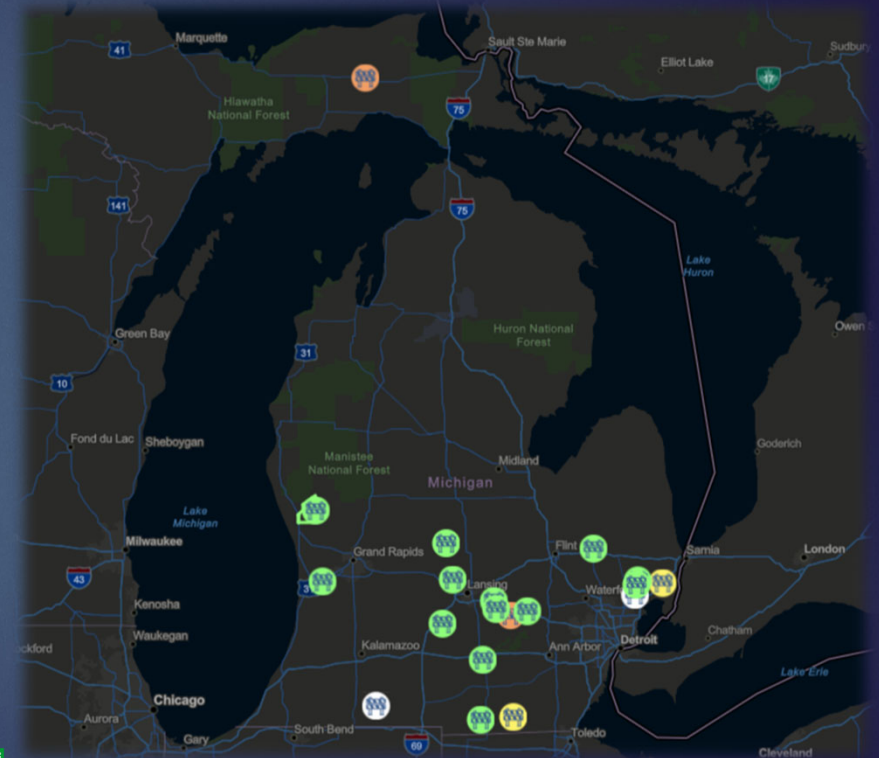
Pilot Project

- ▶ Superstructure Replacement of 19 bridges across the state.
- ▶ Construction cost \$24.3 millions.
- ▶ Benesch was the lead designer of a joint venture between two contractors.
- ▶ Superstructures are replaced with press brake galvanized steel tub girders.
- ▶ Bridge spans ranged between 30' and 60'.
- ▶ 12', 18" & 24" PBFTG used.

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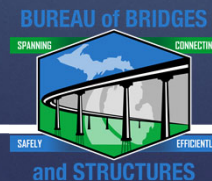


Alternate Technical Concept (ATC)

- ▶ Investigated rolled steel beams, prestressed concrete beams and press brake tub girders.
- ▶ Goals are to minimize grade raise, superstructure weight, and cost.
- ▶ Economy of scale by using one superstructure type among all bridges.
- ▶ In general, furn, fab and erect cost of PBTG is lower than rolled steel beams and concrete box beams.



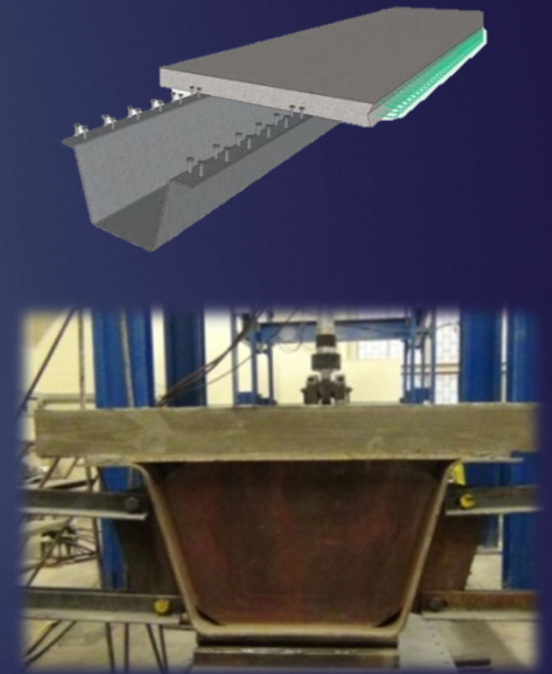
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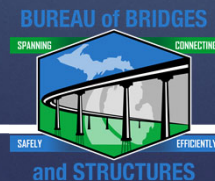
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Press Brake Steel Tub Girder

- Press-brake-formed tub girder is a recently developed technology for short span bridge applications.
- It was developed by a group of organizations led by the SSSBA in response to the challenge by the FHWA to develop a cost-effective short span steel bridge with modular components which could be placed into the mainstream and meet the needs of today's bridge owners, including Accelerated Bridge Construction (ABC).
- It was first used in the construction of the Amish Sawmill bridge in Iowa in 2015.



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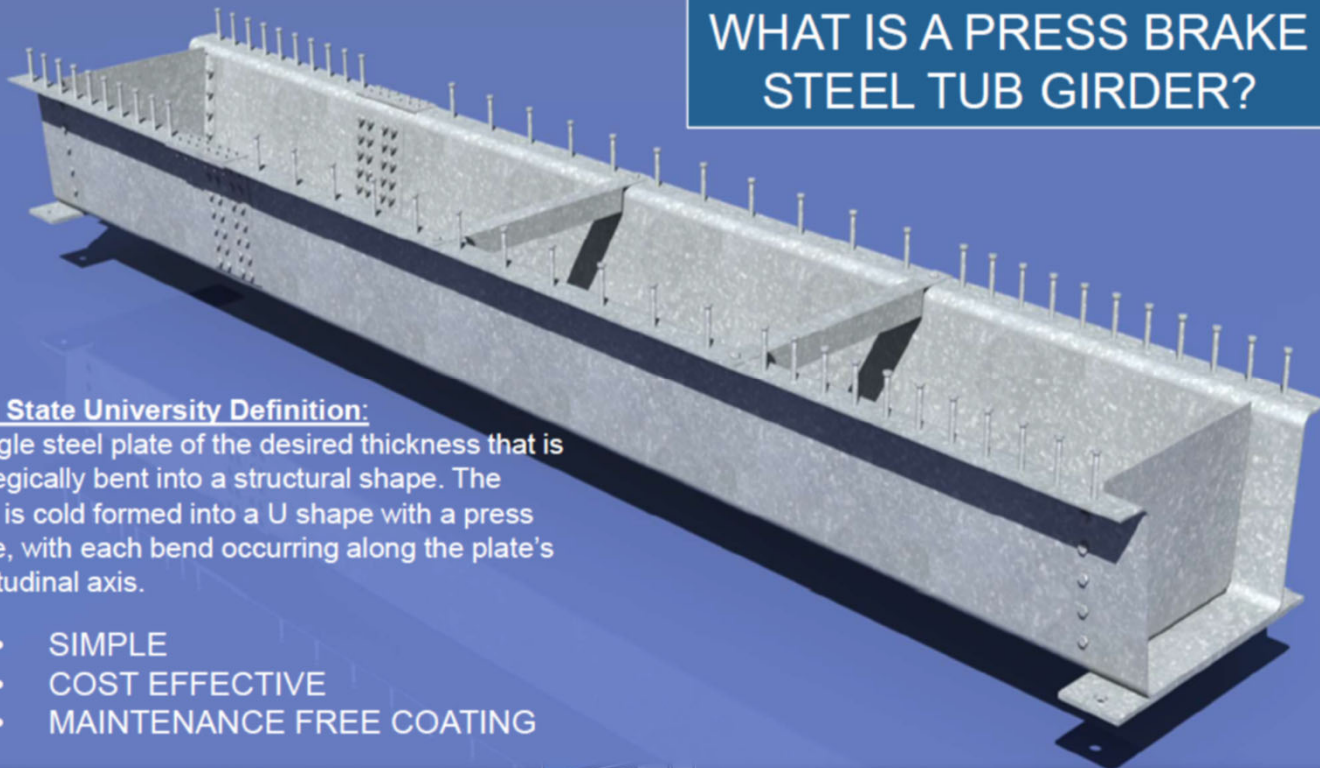
What is A Press Brake Steel Tub Girder

WHAT IS A PRESS BRAKE STEEL TUB GIRDER?

Iowa State University Definition:

A single steel plate of the desired thickness that is strategically bent into a structural shape. The plate is cold formed into a U shape with a press brake, with each bend occurring along the plate's longitudinal axis.

- SIMPLE
- COST EFFECTIVE
- MAINTENANCE FREE COATING

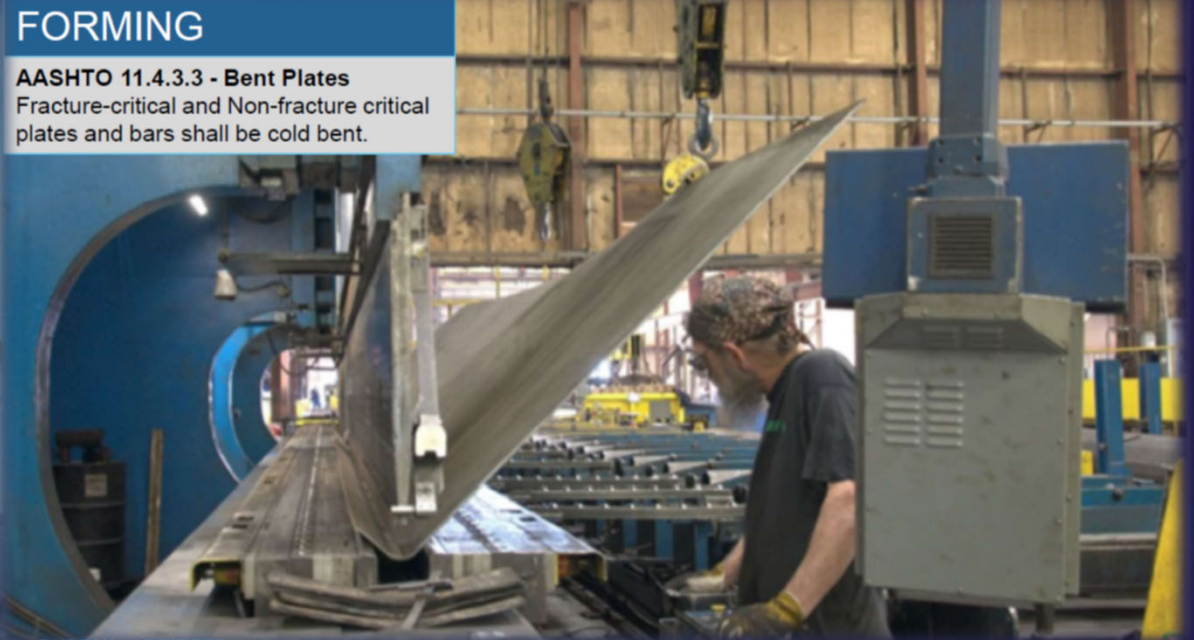


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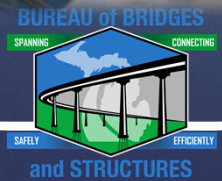
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Press Brake Steel Tub Girder



FORMING
AASHTO 11.4.3.3 - Bent Plates
Fracture-critical and Non-fracture critical plates and bars shall be cold bent.

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Press Brake Steel Tub Girder



SHEAR STUDS

AASHTO 11.3.3

Welded Stud Shear Connectors shall satisfy all requirements of the AASHTO/AWS D1.5M/D1.5 Bridge Welding Code related to material, manufacturing, physical properties, certification, and welding.

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Press Brake Steel Tub Girder

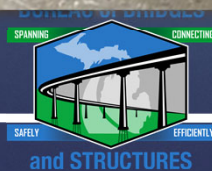
GALVANIZING

AASHTO 11.3.7

Galvanizing shall be in accordance with
AASHTO M 111M/M 111 (ASTM A123/A123M)



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Press Brake Steel Tub Girder



FINISHED PRODUCT

COMPONENT REVIEW

1. Design – AASHTO 6.11
2. Shop Drawings
3. Material – M270 (ASTM A709)
4. Press Brake Forming
5. Welding – AWS D1.5
6. Galvanizing – ASTM A123

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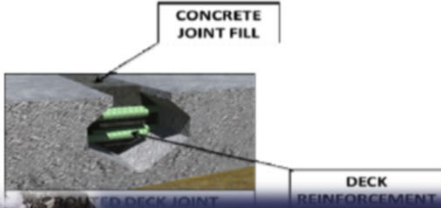
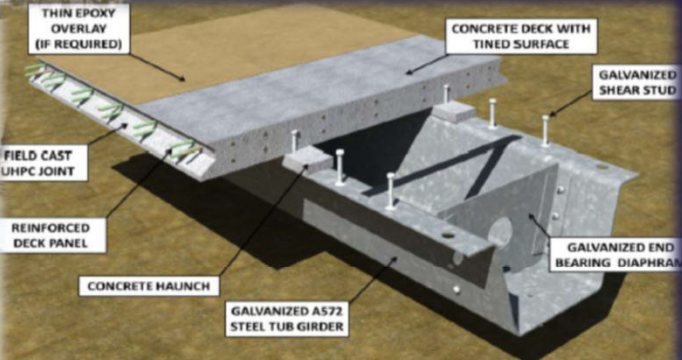


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Press Brake Steel Tub Girder

WHAT ARE THE CONCRETE DRIVING SURFACE OPTIONS?

- CAST-IN-PLACE
- PRECAST DECK FIELD ASSEMBLED (FA)
- PRECAST DECK PRE-ASSEMBLED (ABC)

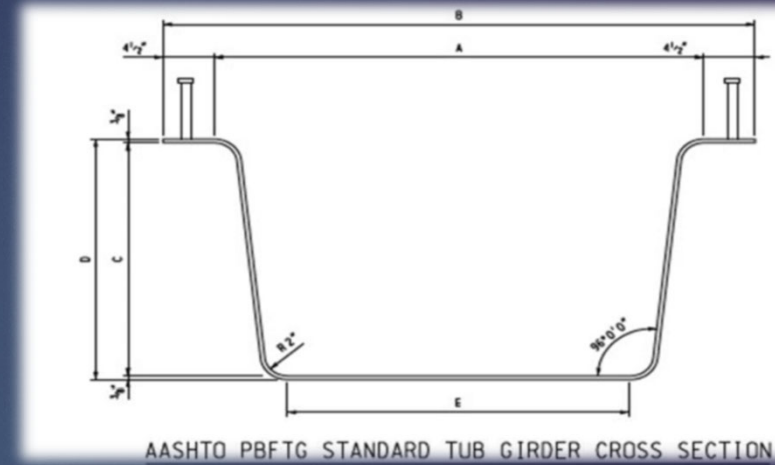


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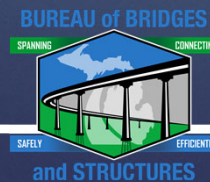
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Press Brake Steel Tub Girder



Section	A	B	C	D	E	bt
U12x89	43	52	11.25	12	32.625	4.5
U18x104	43	52	17.25	18	31.375	4.5
U18x113	43	52	17.25	18	34.94	4.5
U24x117	43	52	23.25	24	30.125	4.5
U24x123	43	52	23.25	24	31.44	4.5
U30x131	43	52	29.25	30	28.875	4.5
U33x141	45	54	32.25	33	30.25	4.5

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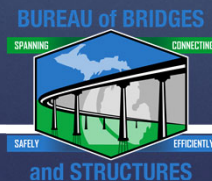
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Press Brake Steel Tub Girder

- ▶ Cost of furn and fab is approximately \$1.85/lb (2021 prices).
- ▶ Works for spans between 20' to 85'.
- ▶ Can accommodate up to 5" camber using cold bending.
- ▶ Can be produced in Grade 36, 50 or 70.
- ▶ Longest section without splicing is 58'.



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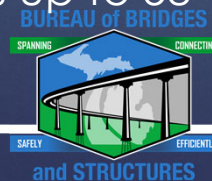
Cost Comparisons (2021)

Beam Type	% Cost Variance (Furn & Fab)
PBTG	0%
Steel I Beam or Plate Girder	+19%
Concrete Box Beams	-15%

- ▶ Proposed superstructure weight shall not exceed as-built superstructure weight plus 10% (5% for some bridges).
- ▶ Or shall not exceed the existing superstructure weight including overlays.

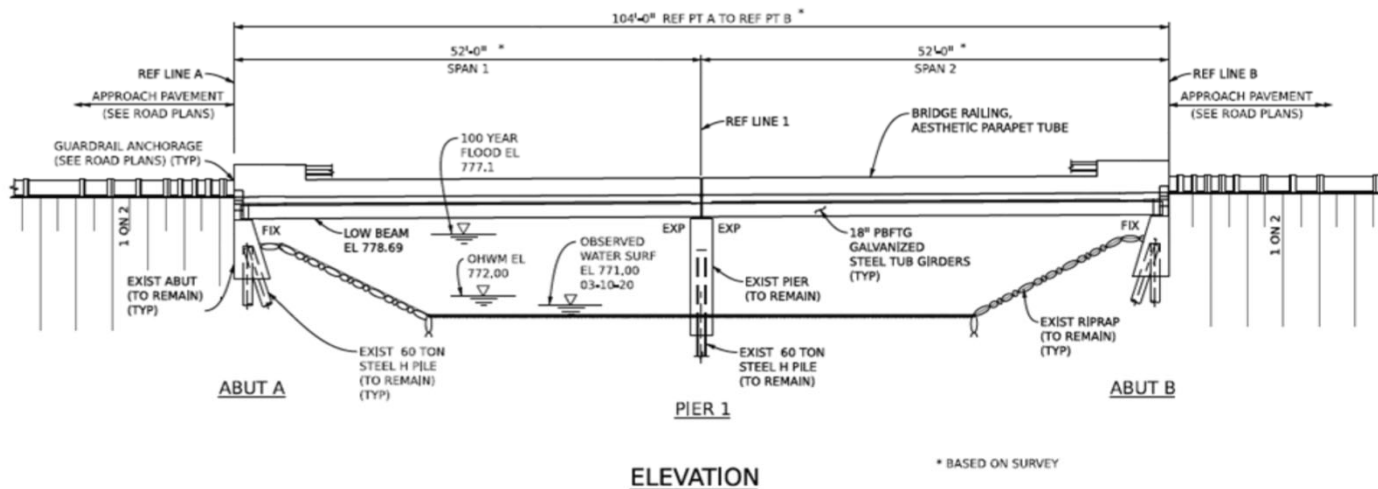
- ▶ Concrete box beams are the cheaper option strictly for beam materials.
- ▶ Due to the weight of the box beams, there would have been substructure modifications needed for some of the bridges to increase the carrying capacity.
- ▶ Erection cost of PGTG for spans up to 58' would offset the increased material cost.

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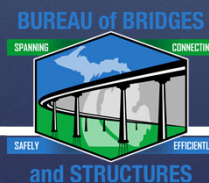
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Herbison Rd over Looking Glass River



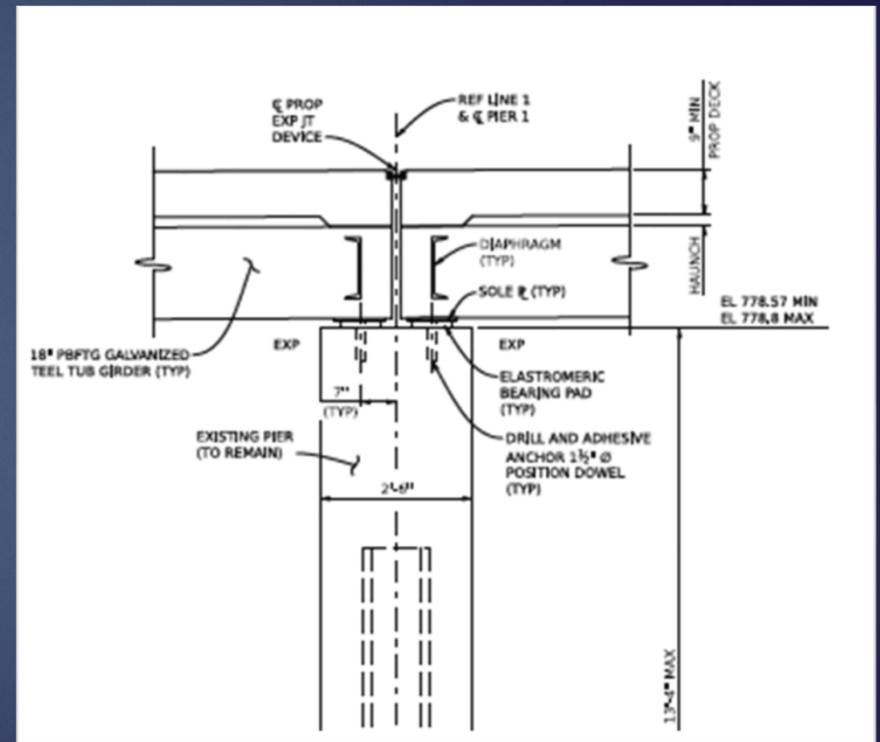
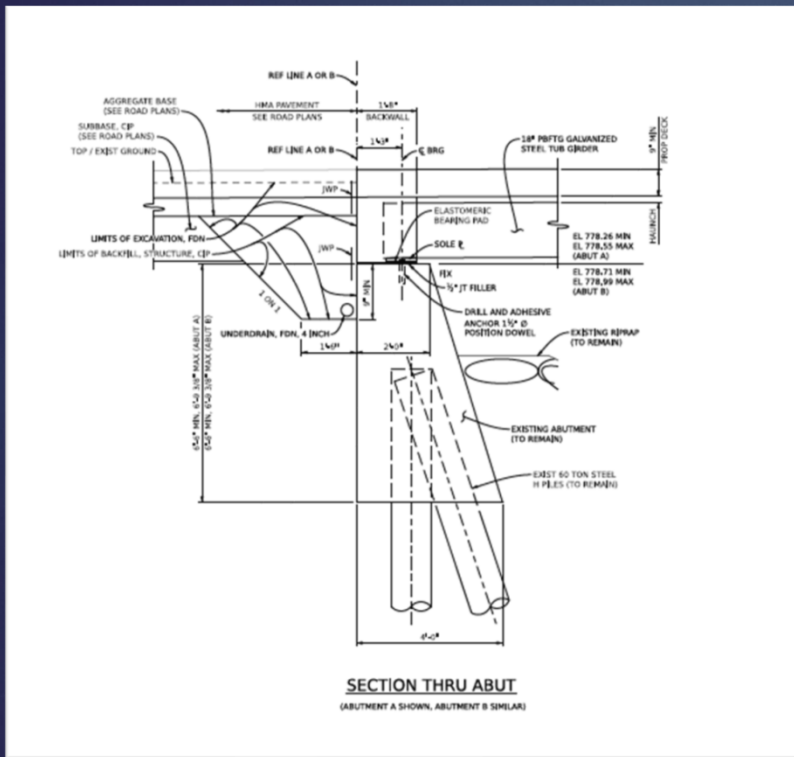
- ▶ 20' Skew bridge
- ▶ Clinton County
- ▶ Existing super is 27" SBS Box beams
- ▶ New super is 18" PBFTG with 9" composite deck

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Herbison Rd over Looking Glass River

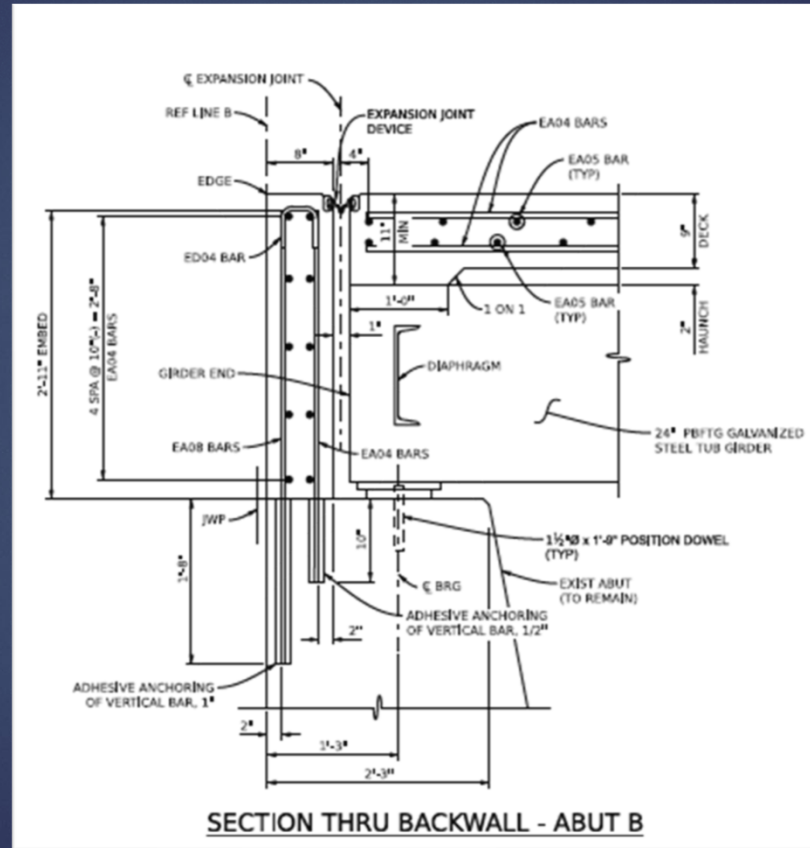


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Independent Backwall Details

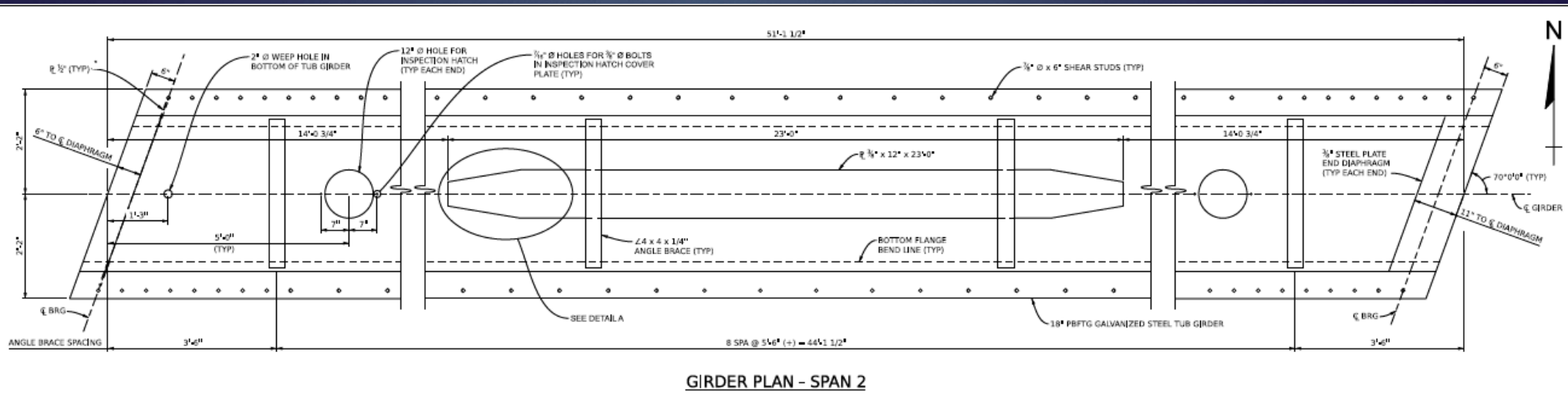


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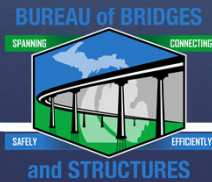


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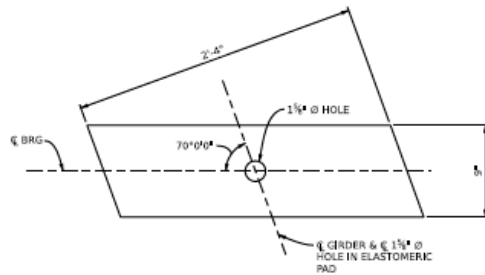


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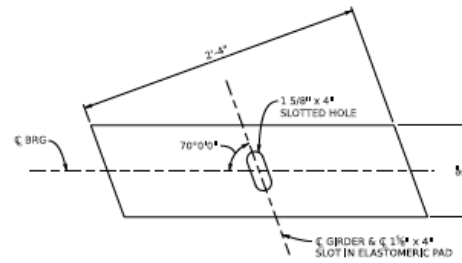


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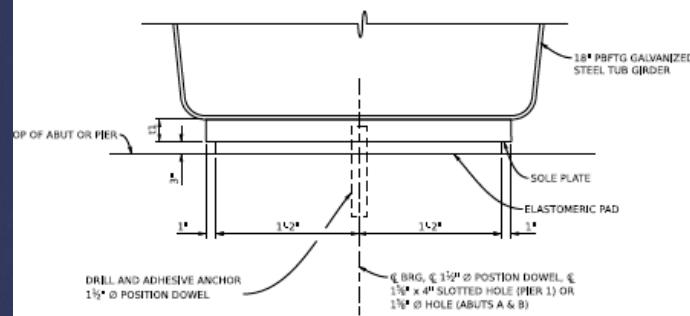
Herbison Rd over Looking Glass River



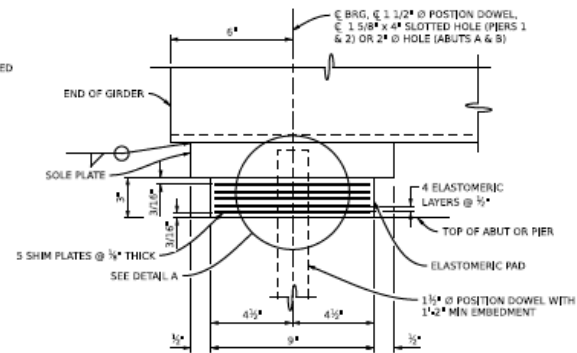
PLAN OF ELASTOMERIC PAD - FIXED BRG



PLAN OF ELASTOMERIC PAD - EXPANSION BRG



SECTION A-A
(LOOKING UPSTATION)



SECTION B-B

RELEASED FOR CONSTRUCTION

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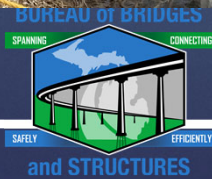


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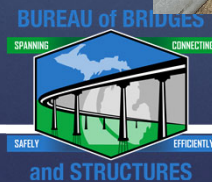


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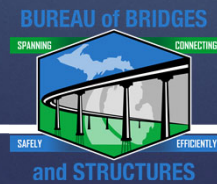


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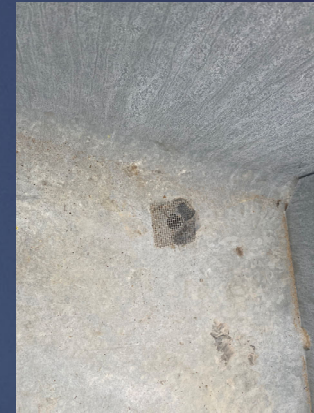


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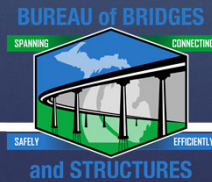


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Herbison Rd over Looking Glass River



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Herbison Rd over Looking Glass River



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Herbison Rd over Looking Glass River



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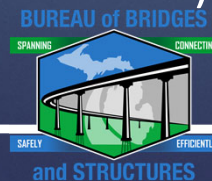
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CRRSAA Phase II Bundle Packages

- ▶ Statewide Permanent Removals (5; Let Nov 4, 2022)-DBB
- ▶ Miller-Rotunda Replacements (2; June 2023)-DBB
- ▶ Upper Replacements (5; July 2023)-DB
- ▶ Two Statewide Removal Packages (8; Oct 2023)-DBB
- ▶ Lower East Replacements (12; Nov 2023)-DB



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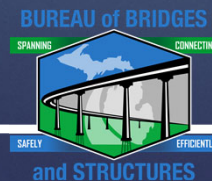
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CRRSAA Phase Bundle Packages

- ▶ Alabaster Road Replacement (Dec 2023)-DBB
- ▶ Lower West Replacements (8; March 2024)-DB
- ▶ Lower East Replacements (13; Aug 2024)-DB
- ▶ Dexter-Chelsea Road Superstructure (Aug 2024)-DBB



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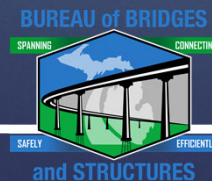
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CRRSAA Phase Progress

- ▶ First removal bundle advertised and awarded
- ▶ Environmental Clearance ongoing for Upper, Removals, Lower West and Lower East Bundles
- ▶ EGLE Permitting – VPR responses received
- ▶ Basis of Design reports being developed & sent for review for DB bundles
- ▶ Risk-based engineering underway - surveys, preliminary design and utility coordination
- ▶ Structure studies and concept plans being developed and provided to champions for review



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Questions?



Michigan Bridge Bundling Update

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March 2023

