

# Uses Established Technology

## Fabrication Follows AASHTO LRFD Bridge Construction Specifications

### Section 11.4.3.3 Steel Structures: Bent Plates

- Fracture-critical and nonfracture-critical plates shall be cold bent
- The minimum bend radii for cold bending shall be 5.0 time the thickness of the plate for all grades and thicknesses of steel confirming to AASHTO M270



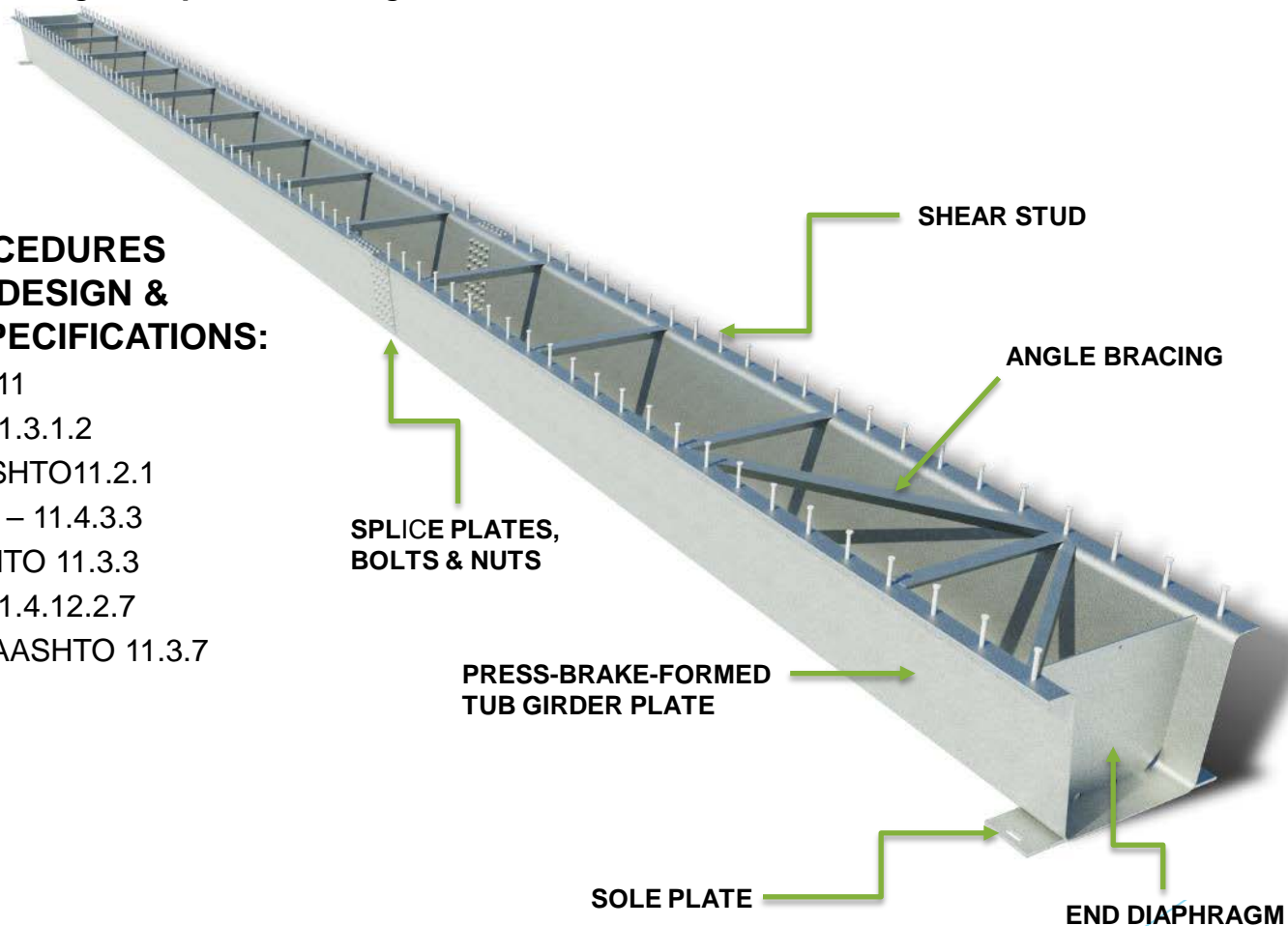
# Press-Brake-Formed Tub Girder Description

## 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.

## **FABRICATION PROCEDURES FOLLOW AASHTO DESIGN & CONSTRUCTION SPECIFICATIONS:**

1. Design – AASHTO 6.11
2. Material – AASHTO 11.3.1.2
3. Shop Drawings – AASHTO 11.2.1
4. Press-Brake-Forming – 11.4.3.3
5. Stud Welding – AASHTO 11.3.3
6. Camber – AASHTO 11.4.12.2.7
7. Protective Coating – AASHTO 11.3.7
8. Inspection - NBIS



# Press-Brake-Formed Tub Girder Inspection

- No fatigue critical details in tension zones.
- NBIS inspection requirements limited to section loss due to corrosion.
- Visual observation of the interior elements through openings at each end.
- Base metal thickness and coating thickness can both be measured from the outside with an electromagnetic gauge per ASTM E376.





# Advantages

- Up to 100 Year Service Life with Galvanized Coating (Other Coatings Available)
- AASHTO LRFD Design - Steel Box Section per AASHTO Section 6.11
  - Additional Analysis Required for LLDF, SSSBA Developing Equations for AASHTO
- Fabrication Process Meets Current AASHTO Specifications for Construction
- Simple Fabrication with Standardized Details
- Easy, Fast, Safe Installations
- Accelerated Bridge Construction (ABC) Options with PBU's
- Cost Savings by Reuse of Existing Substructure





# Suitable Projects

- Any Conventional Beam or Girder Bridge Application
- Up to 100' Long Spans - Accommodates State Specific Loading Requirements
- Multiple Span Bridges with Continuous Bridge Decks



**BARRON COUNTY, WI – 2 52' SPANS**  
**WDOT LOADING – HL-93**



**GRAND TRAVERSE COUNTY, MI – 2 55' SPANS**  
**MDOT LOADING – HL-93(MOD)**



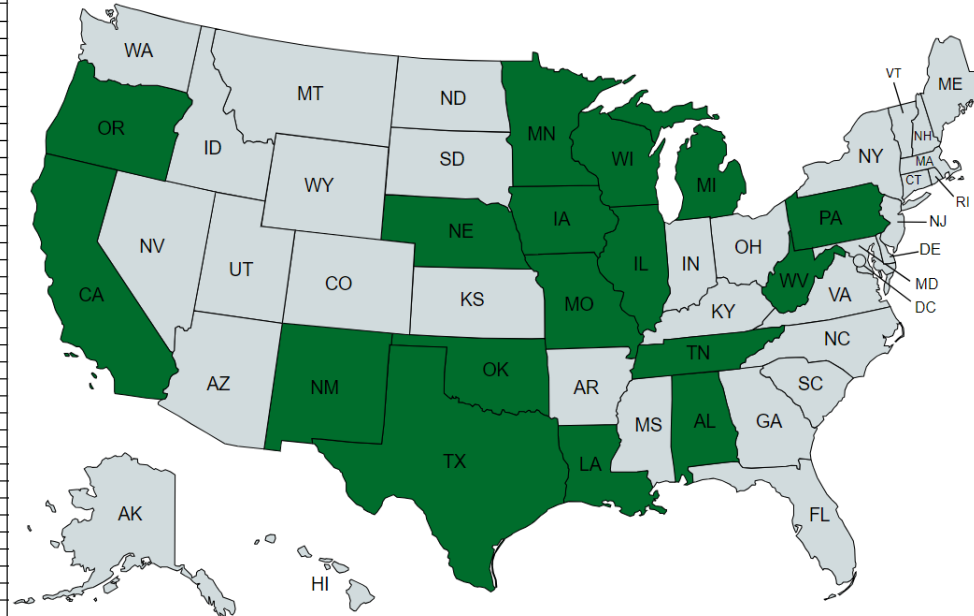
**IMPERIAL COUNTY, CA – 88' SPAN**  
**CALTRANS LOADING WITH P-15 PERMIT TRUCK**



**MERCER COUNTY, PA – 40' SPAN – 20° SKEW**  
**PennDOT LOADING - PHL-93**

# Who have implemented this technology?

PBFTG Project	Year	Owner/Agency	State	# of Bridges
Hemlock Private Property, MI	2004	Hemlock Private Property	MI	1
Swan Valley Golf Course, MI	2005	Swan Valley Golf Course	MI	1
Suder Rd., MI	2005	Monroe County Road Commission, MI	MI	1
Tyler Creek Golf Course, MI	2006	Tyler Creek Golf Course	MI	1
Genoa Red Bluff Middle School, TX	2007	Pasadena, Intermediate School District	TX	1
Lochridge Road over East and West Canal, MI	2007	Bloomfield Township, MI	MI	2
Shelby County Buck Creek Greenway Pedestrian Bridge	2008	Alabaster, Shelby County	AL	1
Brainerd International Raceway, MN	2008	Brainerd International Raceway	MN	1
Granite Ridge Ranch, TX	2008	Grimes County Road Commission, TX	TX	1
Buffalo Springs Drive, TX	2008	Montgomery County, TX	TX	1
Colfax, Canada	2009	Saskatchewan Ministry of Highways	CAN	1
Addicks Bridge, TX	2010	Center Point Energy	TX	1
Channel Road Bridge, TX	2011	City of Austin, TX	TX	1
US316R over Pedestrian Trail, MI	2011	Michigan Department of Transportation	MI	1
FM331 Outfall Channel, TX	2011	Center Point Energy	TX	1
Brunner Ditch, Brazoria, TX	2011	Center Point Energy	TX	1
G. C. W. A. Canal, Brazoria, TX	2011	Center Point Energy	TX	1
Spring Gully Bridge, Harris County, TX	2013	Center Point Energy	TX	2
Rustic Road, Columbia, MO	2014	Boone County Road Commission, MO	MO	1
Saw Mill Road, Buchanan, IA	2017	Buchanan county Road Commission	IA	1
Ira Lee Road over Salado Creek, TX	2017	County of Bexar Public Works, TX	TX	1
Marine City Highway Over Unnamed Canal, MI	2017	St Clair County Road Commission, MI	MI	1
Marine City Highway Over Meldrum Drain, MI	2017	St Clair County Road Commission, MI	MI	1
PDX080 Drainage Ditch, Amazon Distribution, OR	2018	City of Pendleton, OR	OR	1
Anchor Bay Drive, St. Clair, MI	2018	Michigan Department of Transportation	MI	1
Orr Road over Weeks Drain, MI	2018	Midland County Road Commission, MI	MI	1
Grey Road over Bullock Creek, MI	2018	Midland County Road Commission, MI	MI	1
Petersburg Road over Swamp Raisin Creek	2019	Monroe County Road Commission, MI	MI	1
Petersburg Road over Macon Drain	2019	Monroe County Road Commission, MI	MI	1
Starville Road over Beaubien Creek	2019	St Clair County Road Commission, MI	MI	1
Otter Creek Township Road 614	2019	Mercer County Bridge Department	PA	1
Eaton County Road Commission	2020	Michigan DOT	MI	1
Ashley Capital Canton	2020	Ashley Capital, LLC	MI	1
Champaign County	2021	County of Champaign	IL	1
Peoria County Evans Mill Road	2021	Peoria County Road Commission	IL	1
Brookshire Golf Club	2021	Brookshire Golf Course	IN	1
USFS Claiborne Parish- Lake/Caney 902 Bridge	2021	U.S. Forest Service	LA	1
Grand Traverse County River Road 3060	2021	Michigan DOT	MI	1
Grand Traverse County River Road 3061	2021	Michigan DOT	MI	1
Monroe County Cone Road	2021	Michigan DOT	MI	1
Village of Sparta Union Street over Nash Creek	2021	Village of Sparta	MI	1
Clare County Mostellar Road	2021	Clare County Road Commission	MI	1
USACE Fort Wingate	2021	US Army Corps of Eng.	NM	1
Dogwood Road over Main Canal, Imperial County	2022	Imperial County Public Works	CA	1
MDOT Bridge Bundle	2022	Michigan DOT	MI	19
HUSBAND STREET OVER BOOMER CREEK- STILLWATER OK	2022	City of Stillwater	OK	1
TDOT SR339 JONES COVER ROAD OVER WILHITE CREEK- SEVIER COUNTY-	2022	Tennessee DOT	TN	1
CONROE OVER MARTIN CREEK EAST	2022	City of Conroe	TX	1
CONROE OVER MARTIN CREEK WEST	2022	City of Conroe	TX	1
CLARK ROAD OVER CENTRAL CANAL- IMPERIAL COUNTY- CA	2023	Imperial County Public Works	CA	1
COUNTY BRIDGE W-50 - LINCOLN - NE LANCASTER COUNTY	2023	Lancaster county, NE	NE	1
ALLEN ROAD OVER BLAKELY DRAIN- WAYNE COUNTY MI	2023	Wayne County Road commission	MI	1
TANCO MINE- MANITOBA- CANADA	2023	Tanco Mine	CAN	1
Mercer County - 2611, 1317, 3113	2023	Mercer County Bridge Department	PA	3
MASON COUNTY FISHER ROAD OVER LINCOLN RIVER- MI	2023	Michigan DOT	MI	1
<b>TOTAL YEARS OF INSTALLATIONS</b>	<b>19</b>	<b>TOTAL # INSTALLATIONS</b>	<b>77</b>	



77 TOTAL INSTALLATIONS OVER 20 YEARS

NOTABLE OWNERS: US FOREST SERVICE, US ARMY CORPS OF ENGINEERS,  
SASKATCHEWAN MINISTRY OF HIGHWAYS



# Available Resources

- Specifications: Example Special Provision (MDOT Example Below)
- Research: Short Span Steel Bridge Alliance (SSSBA) Research Reports
- Design: AASHTO Section 6.11 Box Section Flexural Members
- Fabrication: AASHTO LRFD Bridge Fabrication Specifications
- Coming Soon....NSBA PBFTG Design Manual

## MDOT SPECIAL PROVISION

MICHIGAN DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
STEEL PRESS-BRAKE-FORMED TUB GIRDER (PBFTG)

SG:DPZ
1 OF 4
5/27/22

**a. Description.** Design, load rate, manufacture, and install steel press-brake-formed tub girders (PBFTG) in accordance with the plans, the Michigan Department of Transportation (MDOT) 2020 Standard Specifications for Construction, and as contained herein.

The PBFTG shall include bearing pads, sole plates, shear developers, & hardware as shown on the plans and as required.

**b. Design.** Certify that the design of the PBFTG is in accordance with AASHTO LRFD Bridge Design Specifications. The design live loading shall be MDOT's HL-93 Mod loading and must be indicated on the plans. The load rating shall pass for all Michigan legal loads and Unrestricted Class A for Overloads. As part of the certification, include the horizontal and vertical reactions at the bearing locations and design calculations. The design must be sealed by a Professional Engineer (PE) licensed in the State of Michigan, and checked and sealed by a PE.

The department reserves the right to reject any beam that fails to meet visual inspection for straightness, twists, bends, etc. The Contractor/Manufacturer will bear all costs to provide a beam that passes all inspections.

**i. Transportation, Handling, Erection, and Construction.** Construct PBFTG in accordance with the MDOT 2020 Standard Specifications for Construction, as shown on plans, and as specified herein.

The Contractor is responsible for proper handling, lifting, storing, transporting and erection of all PBFTG so that they may be placed without damage.

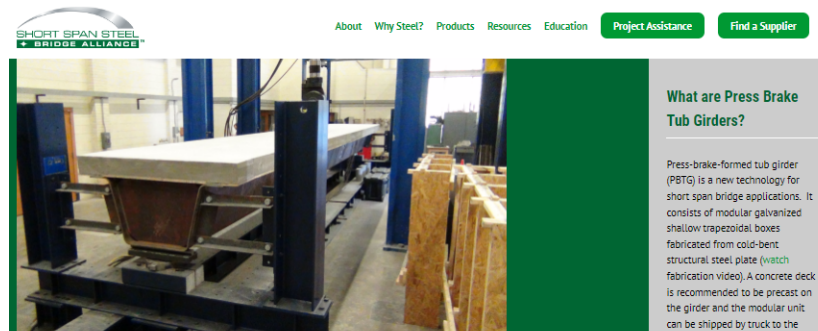
**j. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	Pay Unit
Structural Steel, Furn and Fab, Special (Structure Number) .....	LSUM
Structural Steel, Erect, Special (Structure Number).....	LSUM

Structural Steel, Furn and Fab, Special and Structural Steel, Erect, Special shall include bearing pads, sole plates, shear developers, bolts, washers, welding, welding materials, and hardware as required.

The Contractor is responsible for ordering and obtaining position dowels in accordance with the details in the plans. Position dowels and installation are included in this pay item.

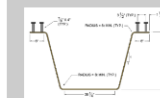
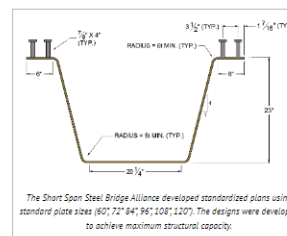
<https://www.shortspansteelbridges.org/testing-of-press-brake-tub-girders/>



## Research Reports: Development and Experimental Testing of Press Brake Tub Girders

Topics: Accelerated, Innovation, Press Brake & Folded Plate, Research

Press brake steel formed tub girder technology consists of cold-bending standard mill plate width and thicknesses to form a trapezoidal box girder. The steel plate can either be weathering steel or galvanized steel, each an economical option. Once the plate has been press-brake-formed, shear studs are then welded to the top flanges. A reinforced concrete deck is then cast on the girder in the fabrication shop and allowed to cure, becoming a composite modular unit. The composite tub girder is then shipped to the bridge site, allowing for accelerated construction and reduced traffic interruptions.



The system utilizes standard plate widths (based on availability) and is optimized to achieve maximum structural capacity, with most of the steel in the bottom flange and increased torsional stiffness. It is a closed system, since the girder is closed at the bottom. It is versatile for multiple-deck options.

The system utilizes Accelerated Bridge Construction practices, since it:

- Can be installed in one or two days
- Is modular, allowing the use of a precast deck
- Is cost-effective—as much as 1/3 less than a standard

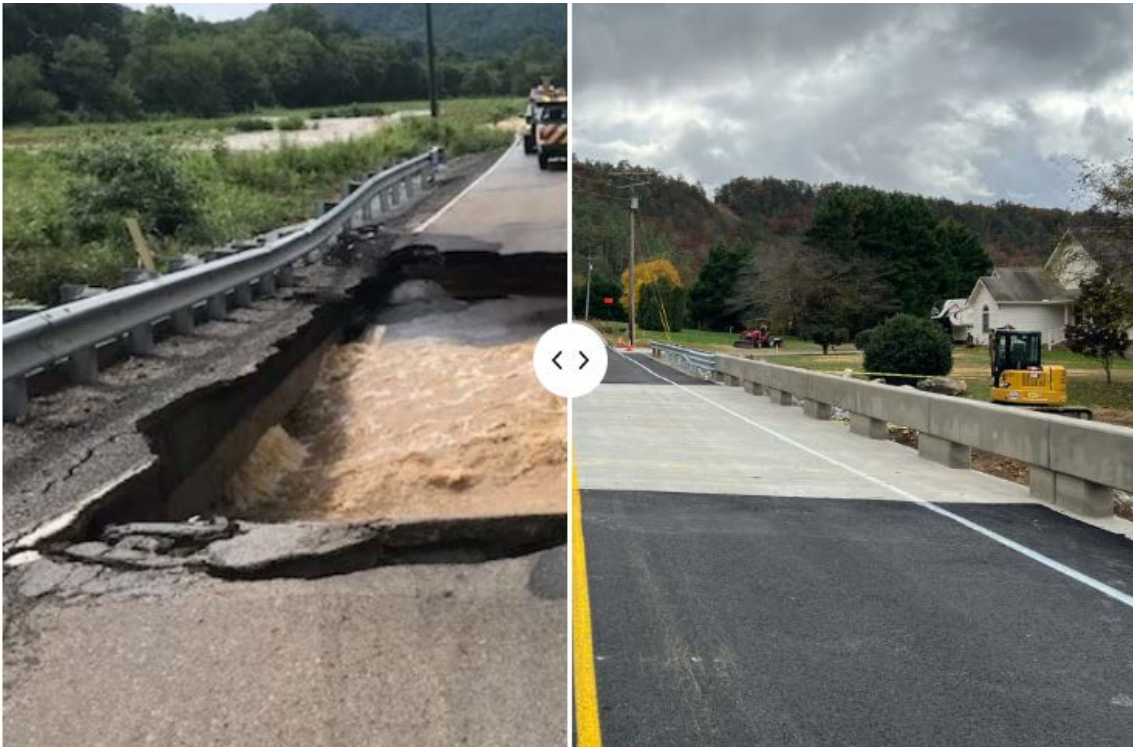
# 2022 TDOT SEVIER COUNTY





# Expedited U-BEAM™ Bridge Installations

- TDOT Sevier County, TN, Emergency Bridge Replacement
- TDOT purchased U-BEAMS direct from Valmont
- Beams supplied in 6 weeks
- Bridge opened in less than 3 months

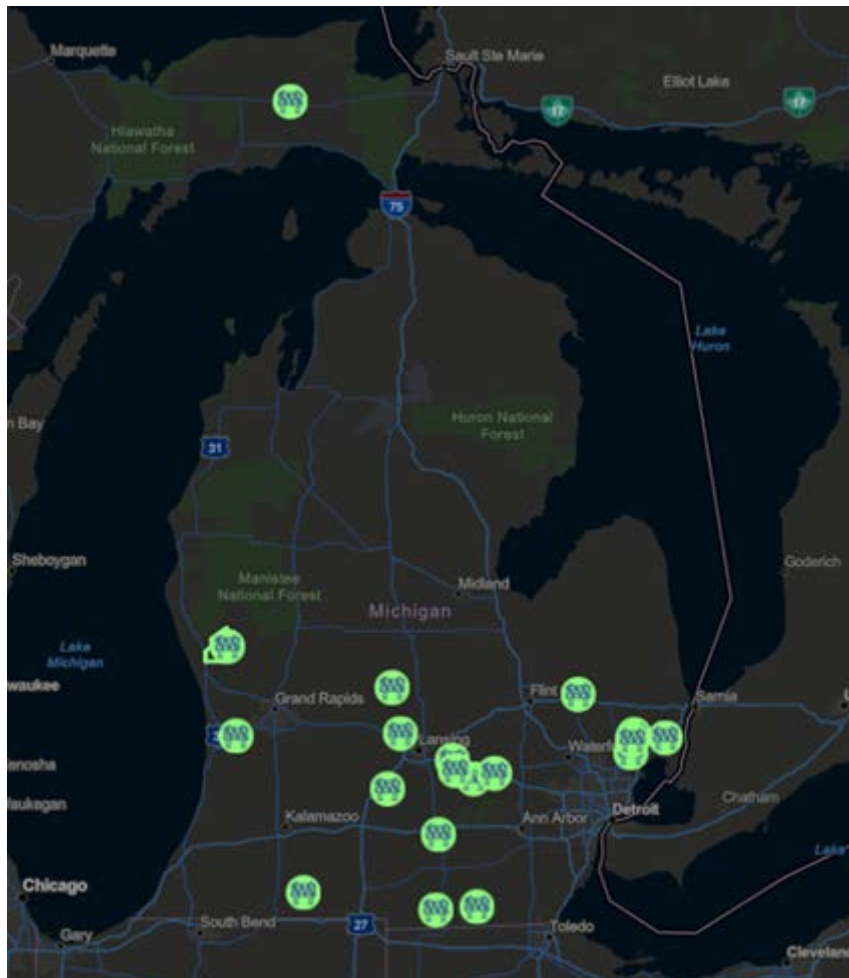


# REBUILDING OUR BRIDGES

## 2021 MDOT BRIDGE BUNDLING PROJECT



# MDOT 19 Bridges Design-Build Bundle Project

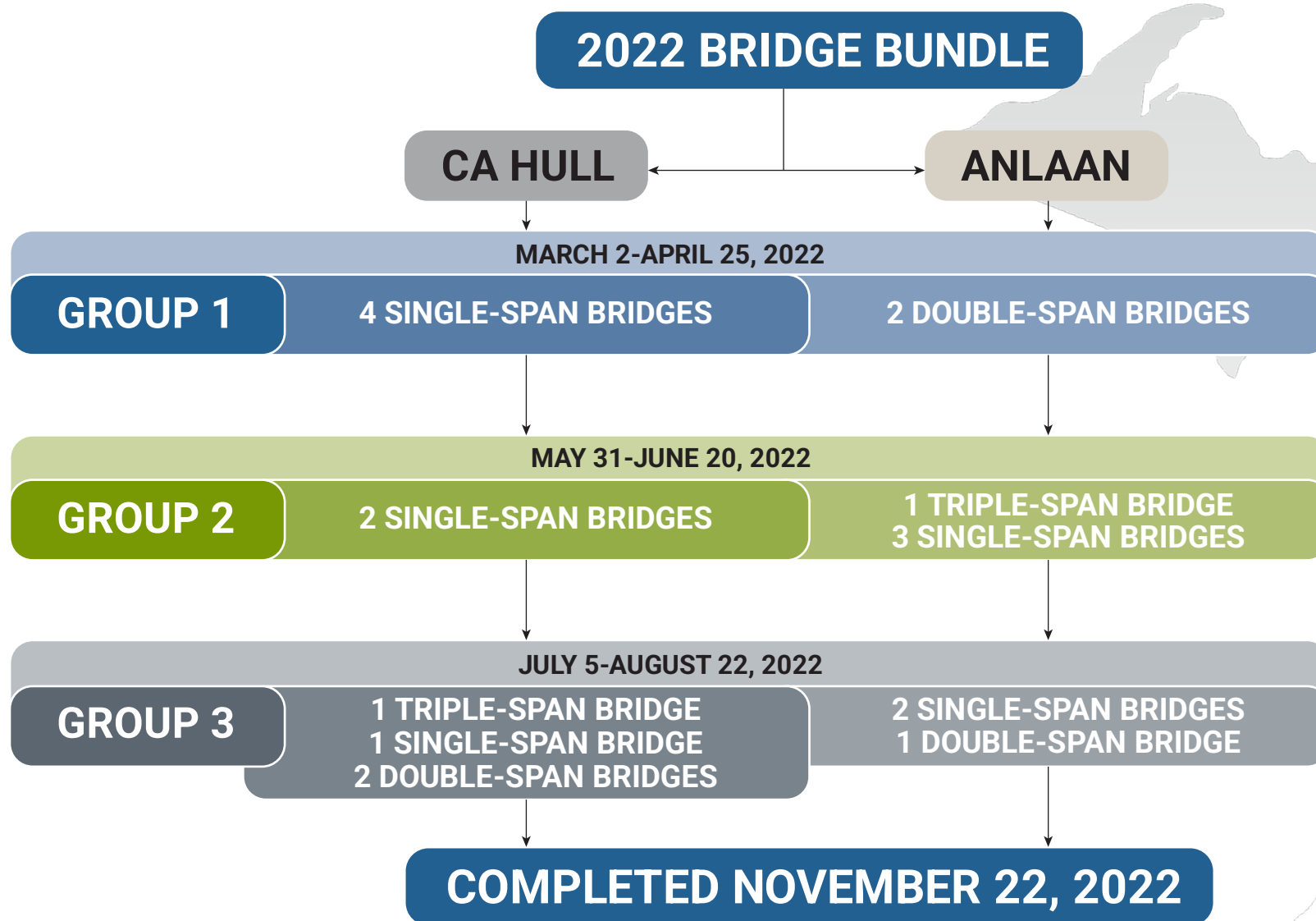


## Project timeline:

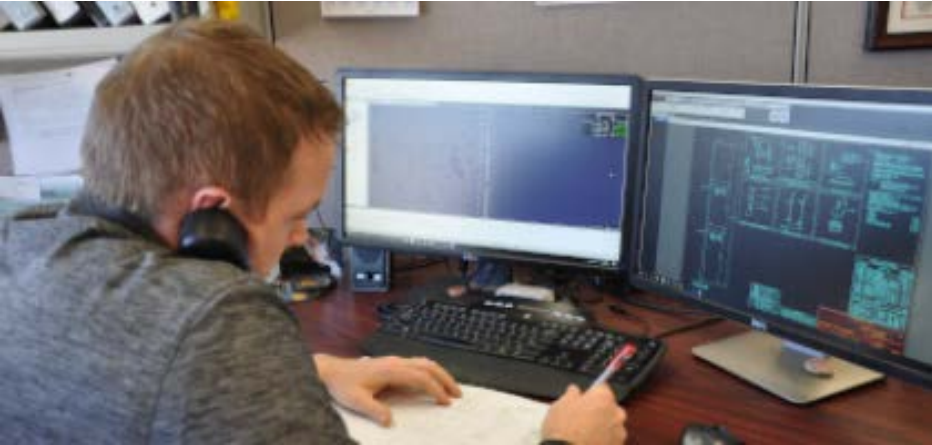
DEC. 2019	MDOT Pilot Announcement
AUG. 2020	5 Contractor Teams Shortlisted
NOV. 2020	MDOT Design-Build Request for Proposal
DEC. 2020	VALMONT Provided U-BEAM™ Priced Solutions to All Shortlisted Contractors
FEB. 2021	Team of CA Hull/Anlaan and Alfred Benesch Named Low Bidder for Project
	Engineers Estimate \$23,785,860
	Low Bidder \$24,262,230
MAR. 2021	CA HULL Provided Valmont Letter of Intent
AUG. 2021	Received Preliminary Designs
DEC. 2021	Started Fabrication
NOV. 2023	<b>Contract Required Completion Date</b>



# MDOT Bridge Bundling Actual Timeline



# U-BEAM™ ADVANTAGE: Engineering Services



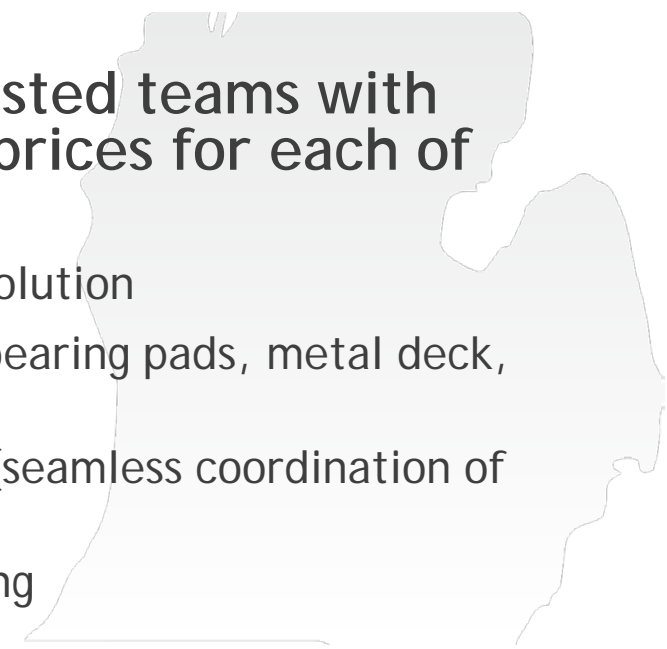
## From Concept to Reality

At Valmont® Structures, we've been turning concepts into reality for decades. We've learned firsthand that the ability to move a concept to reality starts with experience. At Valmont, we have over 100 engineers on staff around the world. Their collective global experience enables us to create unique structures while also meeting specific architectural requirements and municipal codes. But our experience doesn't end there. Instead it extends with the knowledge that is gained working across a wide array of solutions that include lighting, traffic, mass transit, signage, communications structures and **even foundation design**.

## Valmont Engineered Support Services

Valmont provided all 5 shortlisted teams with specific design solutions and prices for each of the 19 bridges, including:

- ▶ Ensured Most Economical U-BEAM™ Solution
- ▶ Provided Construction Accessories (bearing pads, metal deck, forming hardware)
- ▶ Stamped Design and Shop Drawings (seamless coordination of deliverables)
- ▶ Can Also Provide Stamped Load Rating



# U-BEAM™ ADVANTAGE: Time Savings



Reduce Construction  
Schedule By As Much  
As One Year!

Valmont provided all 157 U-BEAMS in an eight-month construction season:

- ▶ Secured ALL 500 tons of material for project by 3/12/21
- ▶ 3rd party inspection at Valmont Jasper, Tenn., facility
- ▶ Hot-Dip Galvanizing at Valmont Birmingham, Ala., facility



# U-BEAM™ ADVANTAGE: Large Production Capacity



PURPOSE BUILT PRESS BRAKE TUB GIRDER FACILITY

## Valmont State-of-the-Art Fabrication Facility

*New plant opened August 2020*



- ▶ AISC and DOT Certifications
- ▶ Designed for efficiency and sustainability
- ▶ Cuts production time by 70%
- ▶ Capabilities include:
  - ▶ 2000 Ton 60' Press Brake
  - ▶ Roll form camber capabilities
  - ▶ Automated stud welding
  - ▶ Safe and efficient material handling

# U-BEAM™ ADVANTAGE: Economy of Scale



## Efficient Freight, Easy Handling

Utilize national carriers on standard size trailers:

- ▶ Deliver as many as six U-BEAMS in a single load
- ▶ Lighter loads for weight restricted access
- ▶ Unload with light equipment (rubber mounted)
- ▶ Easy job site storage (smaller footprint)
- ▶ Easy accessibility to job site (important in rural locations)



# U-BEAM™ ADVANTAGE: Reduced Construction Cost



## Simple Rigging, Smaller Equipment

### Installation Made Easy:

- ▶ Nylon slings with basket rigging
- ▶ extended reach of equipment (eliminate use of barges)
- ▶ Use of smaller equipment (some sites only need an excavator)
- ▶ easy accessibility to job site (important in rural locations)



# U-BEAM™ ADVANTAGE: Reduced Construction Cost



Less Field Work,  
Less Exposure to  
Hazardous Conditions

## Forming Made Simple:

- ▶ No external intermediate diaphragms
- ▶ Concrete forming directly atop top flanges (no welding)
- ▶ Constant haunch (no survey prior to installation)
- ▶ Pre-installed formwork hardware (half-hangers and screed studs)
- ▶ Easily and safely install fascia brackets on the ground

# U-BEAM™ ADVANTAGE: Reduce Costs

## 497 Tons of Steel Purchased Six Months Prior To Fabrication

**Tub girder priced at \$2.11/lb. (2021 Dollars)**

- All plate purchased by 3/12/21
- Price included fully fabricated and galvanized U-BEAMs
- Delivered with field splice material

### U-BEAM™ 2021 BRIDGE BUNDLE PRICING

Price/lb.(fully fabricated, galvanized and delivered): \$2.11 (2021)

U-BEAM™ Designation	Pounds/ft. (fully fabricated and galvanized)	Price/ft. (fully fabricated and galvanized*)
U12	106 lbs.	\$224
U18	117 lbs.	\$247
U24	134lbs.	\$283

*\* Price does not include bearing pads, anchor bolts, metal deck form, or engineering fee for non-standard shapes.*





# MDOT Pilot Project a “Major Success”

## Michigan’s bridge bundling project a ‘major success’ - 19 bridges reopened to normal traffic



(MDOT)

By [Dane Kelly](#)

Published: Nov. 23, 2022 at 4:25 PM EST



LANSING, Mich. (WILX) - The Michigan Department of Transportation’s bridge bundling pilot project was completed Tuesday.

Original story: [Michigan tests bundling bridge projects together to increase efficiency](#)

“The initiative to bundle bridge projects together was done as a means to make construction more time and cost-efficient. When the program was announced in February, MDOT said the project could streamline nearly every aspect of improving bridge conditions.

MDOT announced Wednesday all 19 bridges have been completed and reopened to traffic. The department called the pilot program a **‘major success.’**”