U-BEAM™ Bridge System

An AASHTO Focus Technology

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BUILDING THE FUTURE OF INFRASTRUCTURE:

Sustainable, Low-Maintenance Bridges for a Safer Tomorrow

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THE WILL GROUP, INFRASTRUCTURE SOLUTIONS
PRODUCT SPECIALIST
& OUTSIDE SALES REP

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SENIOR BRIDGE ENGINEER
AT VALMONT STRUCTURES

KAY JIMISON
NATIONAL DIRECTOR
OF BUSINESS DEVELOPMENT AND SALES
VALMONT STRUCTURES- BRIDGE DIVISION

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THE WILL GROUP

TWG INFRASTRUCTURE SOLUTIONS

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VALLEY
A valmont COMPANY

valmont COATINGS

valmont SOLAR

valmont STRUCTURES

valmont TELECOM

valmont UTILITY

77 Years

22 Countries

151+ Locations

11,000+ Employees

$6.2B

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The Valmont Difference

- Certified Bridge Fabricator - Intermediate (IBR) are typical bridges that do not require extraordinary measures
- Licensed in all 50 states
- Proprietary design tool available for engineers to design their own bridges

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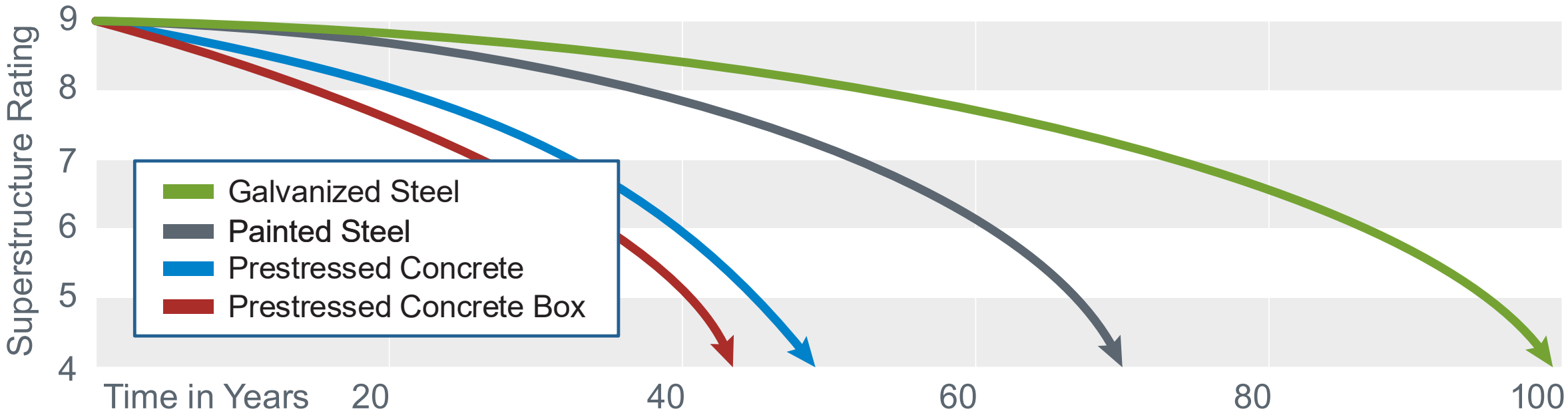
Pivoting to a sustainable future



- Prestressed concrete box beams have been the standard solution since the 1970s for off-system, local agency, non-interstate bridges.
- MDOT study of current inventory shows pre-stressed concrete box beam service life < 50 years
- Bridge engineers need options that can deliver bridges that are operational for 100 years or more according to the FHWA.

What is a Steel Press Brake Tub Girder

PBFTGs utilize a single steel plate that is strategically bent into a superior structural shape.

- AASHTO

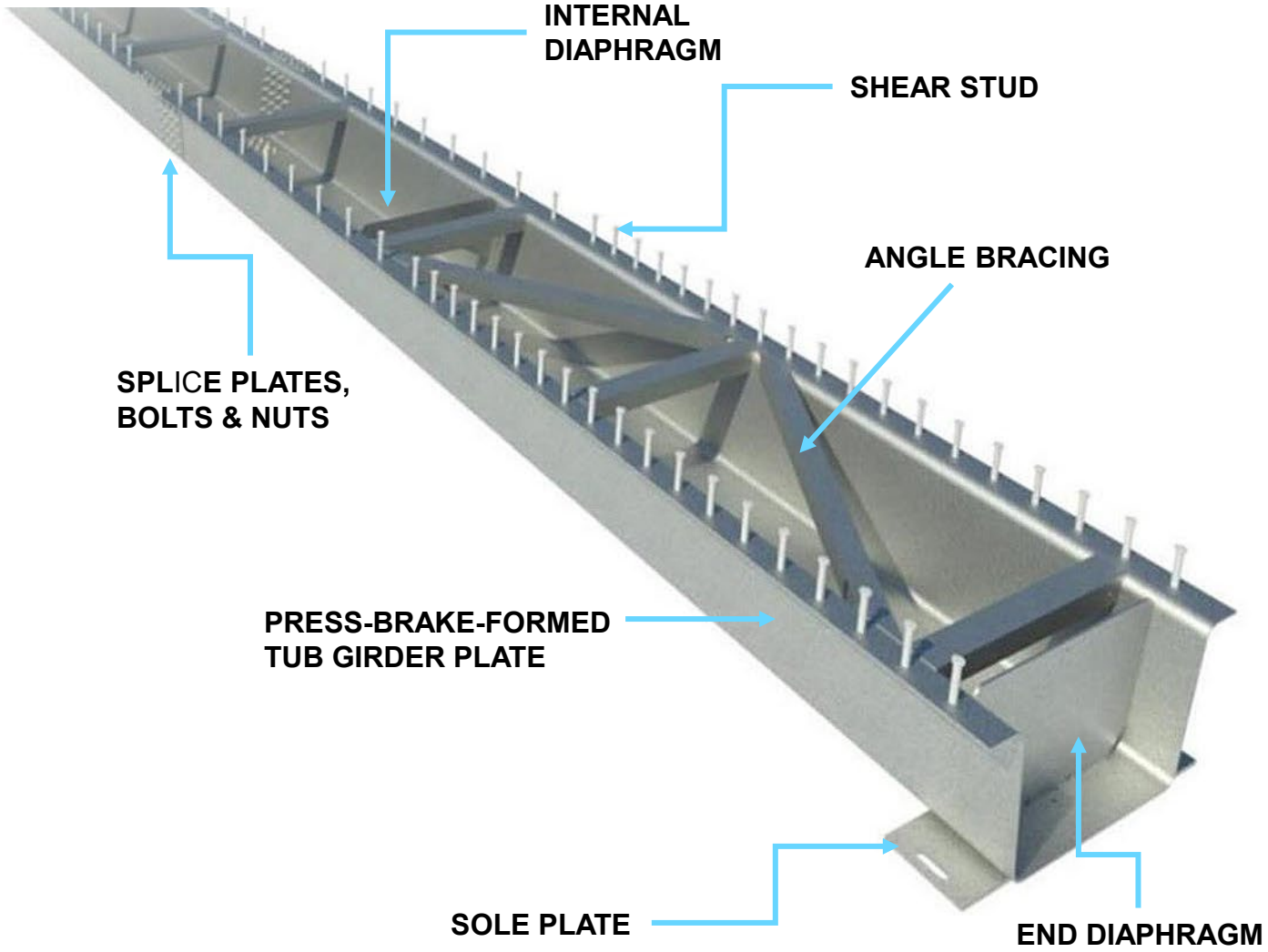
Advantages

- 100 Year Service Life
- AASHTO Approved Design
- AASHTO Approved Fabrication
- Simple Standard Details
- Easy Installation

Valmont U-BEAM™ | Press Brake Steel Tub Girder

Procedures follow AASHTO design & construction specifications:

- Design
- Material
- Shop Drawings
- Press-Brake-Forming
- Stud Welding
- Camber
- Protective Coating
- Inspection



The First Press Brake Tub Girder Bridge Install

Monroe County Road Commission, Mich.

- 2004 Install
- 40’ Long x 34’ Wide
- NBIS Bi-Annual Inspection
- No signs of deterioration of concrete, driving surface, or corrosion in steel girders

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Valmont U-BEAM™ | AASHTO Focus Technology

AASHTO
Innovation Initiative

- Press Brake Tub Girders named an Innovation Initiative as **a ready-to-implement technology** in 2021.
- Press Brake Tub Girders are an AASHTO Focus Technology.
- PBTGs to be included in revisions to the 10th Edition of the AASHTO LRFD Bridge Design Specifications. The revisions allow DOTs, Counties and other entities to utilize AASHTO design guidelines instead of rewriting specifications to include U-BEAMs

"This is great news for state and local Departments of Transportation that are looking for economical, sustainable and accelerated construction solutions for short span bridges, which make up over half of the U.S. bridge inventory."

- Karl Barth, Ph.D., Associate Professor of Civil and Environmental Engineering, West Virginia University

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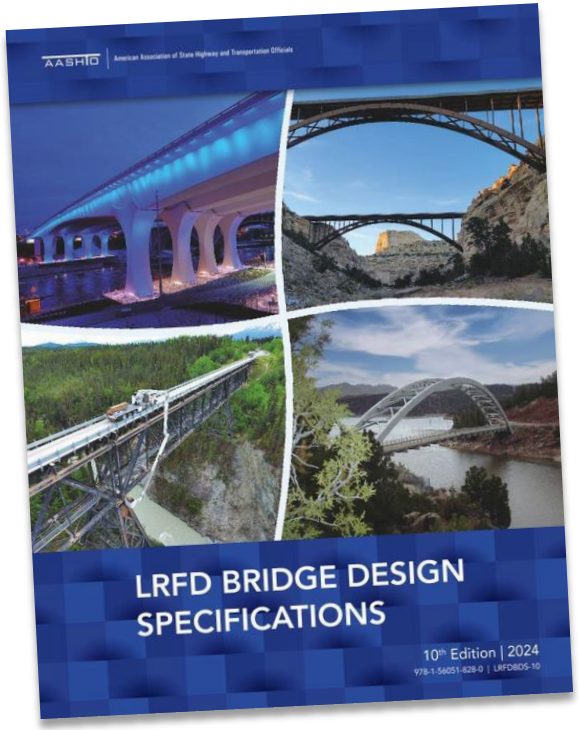
AASHTO Bridge Design Specs – 10th ed.

Updates benefit U-BEAM™ construction



Bent Plates | Section 6.7.8

- Bend radius is no longer a barrier to designing or specifying PBTG

Shear Stud Spacing | Section 6.10.10.1.2

- Spacing reduction allows for higher fatigue cycles

Proportion Limits | Section 6.11.2.2

- AASHTO BDS did not previously recognize “tub-section members that are formed from a single plate”

Bottom Flange Proportion | Section 6.11.2.2

- U-BEAMs meet the new bottom flange proportion requirements

Bracing Requirements | Section 6.11.3.2

- Bracing is no longer an impediment to design or specification

Creep Reduction Factor | Section 6.13.2.8

- Previous AASHTO BDS did not include for galvanized surfaces

Press Brake Tub Girder Resources

Press Brake Tub Girder (PBTG) Research Reports

- 15 Years of Development and Experimental Testing of Press Brake Tub Girders
- Published a 7 Volume Research Report
- https://www.shortspansteelbridges.org/testing-of-press-brake-tub-girders/

Accelerated Bridge Construction | FIU

- The U-BEAM™ is an Implemented Advanced Technology
- Dogwood Bridge Replacement Utilizing Press Brake Tub Girders Webinar

Education

Webinars

Workshops

Conferences

Technical Resources

Standards

Guidelines

Best Practices

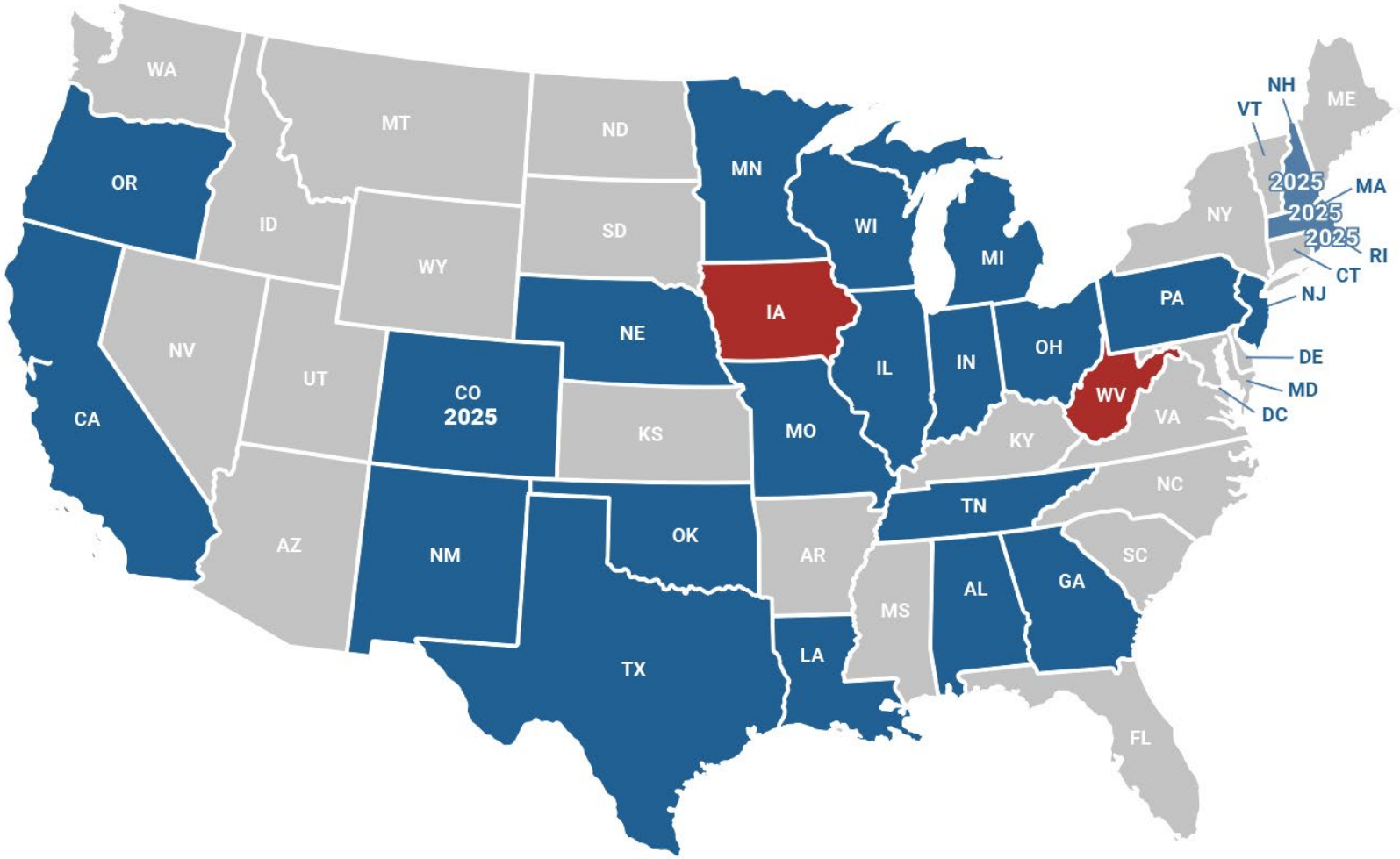
Case Studies

Economics: Steel is Cost-Effective

Innovative & ABC Design

PBTG Installations

More than 130 installations in the US



- **Alabama - 2024**
- **California**
- **Colorado - 2025**
- **Georgia - 2024**
- Illinois
- Indiana
- **Iowa**
- Louisiana
- **Massachusetts - 2025**
- Michigan
- Minnesota
- Missouri
- Nebraska
- **New Hampshire - 2025**
- **New Jersey - 2024**
- **New Mexico**
- **Ohio**
- Oklahoma
- Oregon
- **Pennsylvania**
- **Rhode Island - 2025**
- Tennessee
- Texas
- **West Virginia**
- Wisconsin

- Manitoba, Can.
- Saskatchewan, Can.

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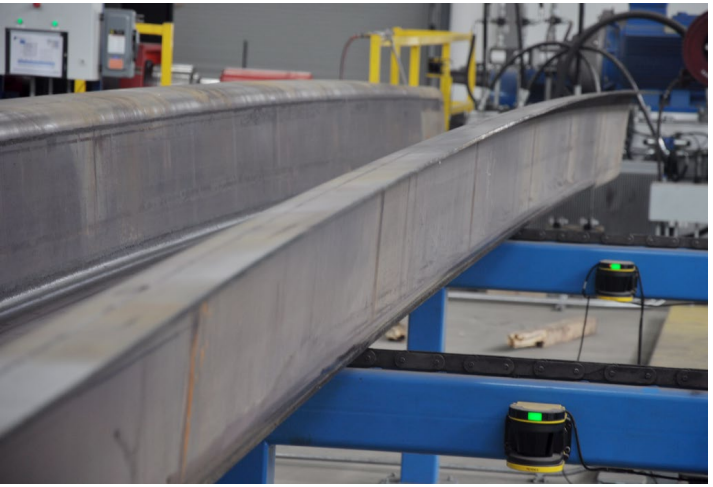
Valmont Manufacturing Innovation



State of the Art Press Brake Fabrication Facility:

- ✓ Open to production August 2021
- ✓ 2000 Ton 60’ Press-Brake
- ✓ Roll form camber capabilities
- ✓ Automated stud welding capabilities
- ✓ Safe and efficient material handling
- ✓ AISC IBR bridge fabrication certification

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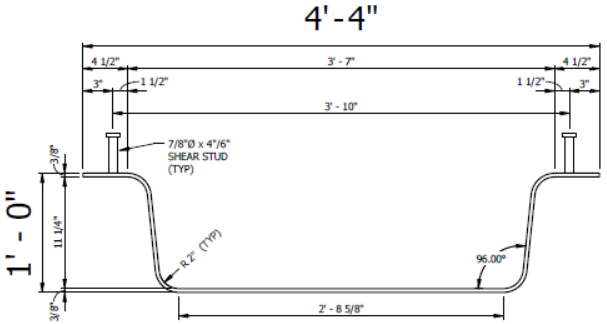
AASHTO Certified Shear Stud Welding

Certified Welders and 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.

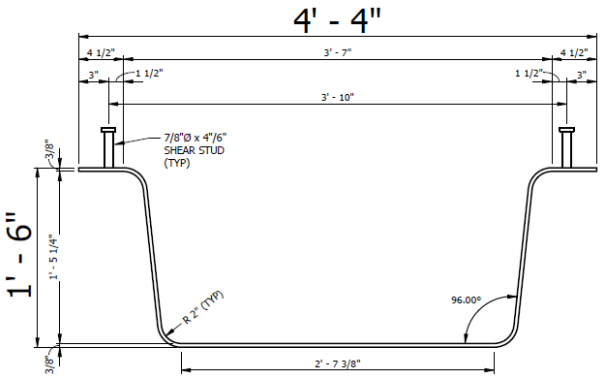
AASHTO Certified Protective Coating

Five Standard U-BEAM™ Shapes



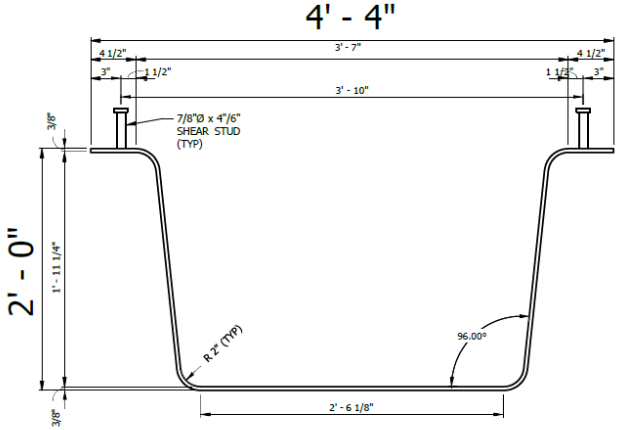
U12 STEEL U-BEAM™

(AASHTO M270, ASTM A709 GR50 T2)



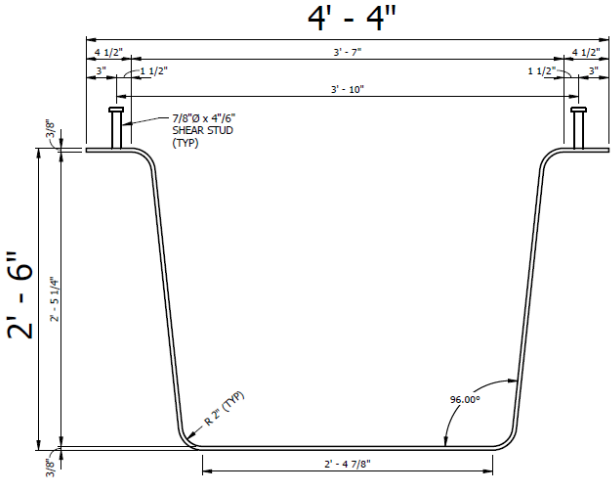
U18 STEEL U-BEAM™

(AASHTO M270, ASTM A709 GR50 T2)



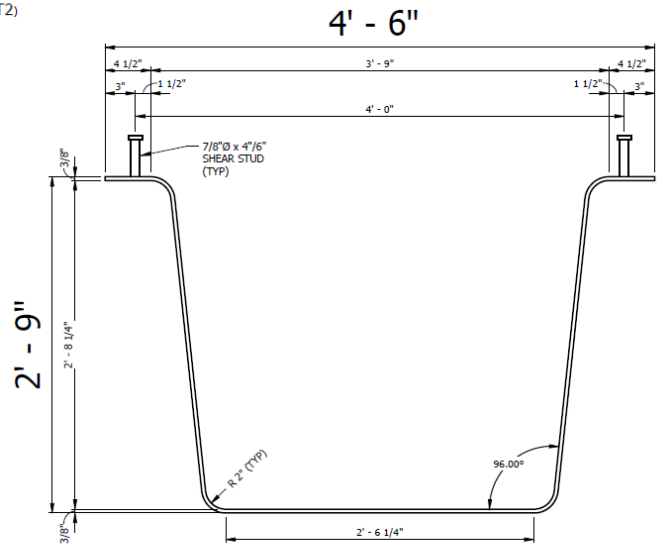
U24 STEEL U-BEAM™

(AASHTO M270, ASTM A709 GR50 T2)



U30 STEEL U-BEAM™

(AASHTO M270, ASTM A709 GR50 T2)



U33 STEEL U-BEAM™

(AASHTO M270, ASTM A572 GR50 T2)

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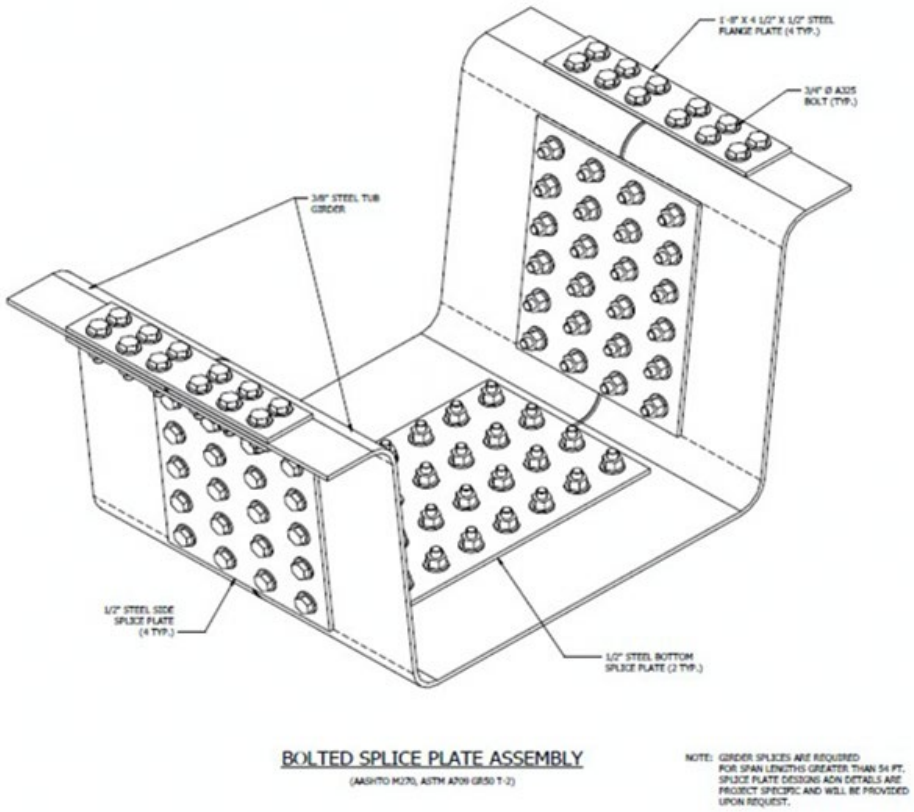
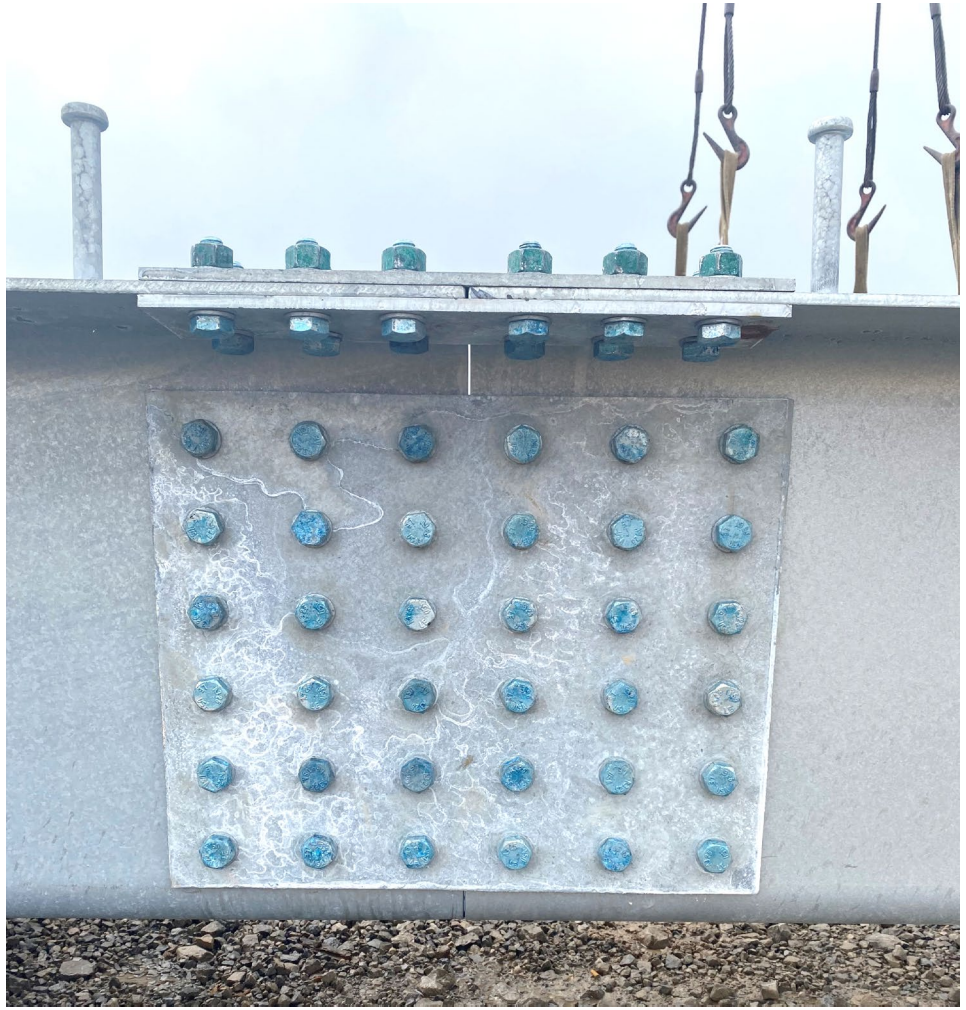
AASHTO Approved Bolted Splice





NBIS Inspection

No fatigue critical details. Visual inspection only, required to ensure no deterioration of the base metal:

- Inspection ports allow for visual inspection of the interior
- Two 1½” diameter weep holes at each end allow drainage

Valmont U-BEAM™ Inspection

- NBIS inspection requirements for U-BEAMs limited to section loss due to corrosion.
- Visual observation of interior U-BEAM™ through openings at each end.
- Inspection for chalky white staining or zinc oxide build-up on the surface.
- **Base metal thickness and coating thickness measured from exterior with electromagnetic gauge per ASTM E376**.

Steel Beams Made Simple

Finished U-BEAM™ Product

Component review | Procedures follow AASHTO design & construction specifications:

1. Material
2. Press Brake Forming
3. Stud Welding
4. Camber
5. Protective Coating
6. Design
7. Shop Drawings
8. Inspection

Cast In Place Concrete Bridge Deck

- Local DOT Approved Concrete Mix Design
- Contractor Installed

Valmont Pre Cast Bridge Unit

- Local DOT Approved Concrete Mix Design
- Precast with Local Qualified Supplier and Approved Procedures

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Full-depth Pre-cast Panel

- Produced in a controlled environment at Local Qualified Precast Manufacturer
- Local DOT Approved Mix Design
- Cast in Accordance with Local Approved Procedures

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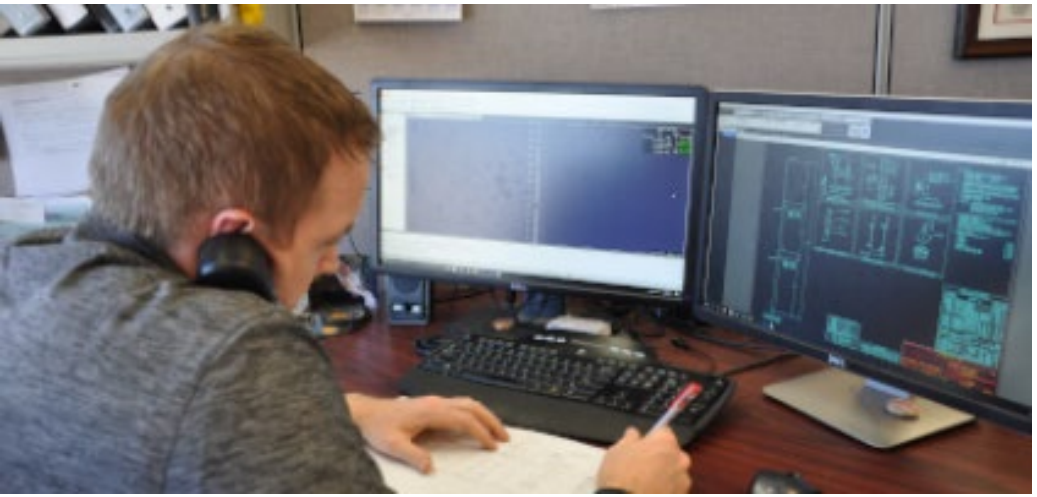
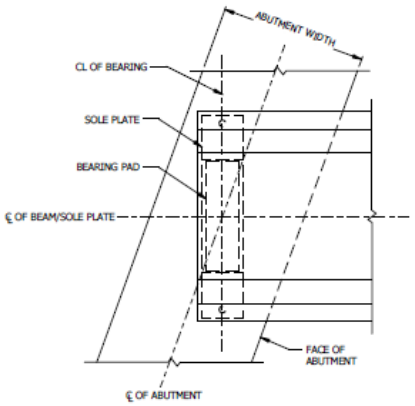
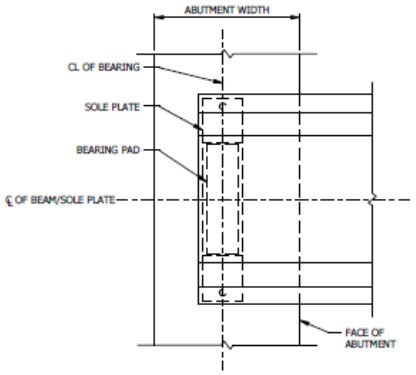
Engineering Services

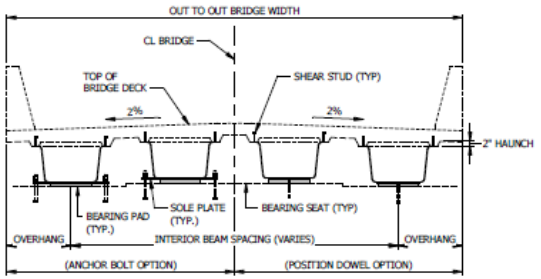




TYPICAL BEARING DETAIL AT SKEWED ABUTMENT



TYPICAL BEARING DETAIL AT SQUARE ABUTMENT



TYPICAL CROSS SECTION (ALTERNATE)
(STEPPED BEARING SURFACE)

Valmont Engineered Support Services

- Construction Accessories (bearing pads, metal deck, forming hardware)
- Stamped Design and Shop Drawings
- Stamped Load Rating
- Superstructure support
- Substructure support
- Calculations

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NEW: U-DESIGN BRIDGE TOOL

U-DESIGN WAS DEVELOPED TO ASSIST WITH THE DESIGN OF A PRESS BRAKE TUB GIRDER SUPERSTRUCTURE:

- Reduce PBTG design time by up to 90%
- Increase confidence in results
- Reduce cost of PBTG design
- Control your specific PBTG solution
- Account for skew and camber
- Get superstructure reactions for a complete bridge design

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Compute
Update Workbook

!WARNING! MUST CLICK ON COMPUTE WORKBOOK FOR ALL CALULATIONS TO UPDATE!

Bridge Geometry

Description	Value	Units	Variable	Comment
Total Width of Bridge:		ft	Wdeck	Out-to-out concrete deck
Total Beam Length:		ft	n/a	End -to-end of beam
Number of Beams in Cross Section:			Nb	See U-BEAM Guidelines
Overhang Deck Edge to Edge of Top Flange:	9	in	Soverhang	See U-BEAM Guidelines
Support Skew Angle:	0	degree	Skew	Square bridge = zero skew
U-BEAM Size:	U12	Text	SectionName	See details below
Beam Location:	Interior		GirderLoc	
End of Beam to Center of Bearing (Left):	6	in	Xbearing1	
End of Beam to Center of Bearing (Right):	6	in	Xbearing2	
Width of Left Sidewalk:	0	ft	Bswalk1	
Width of Right Sidewalk:	0	ft	Bswalk2	
Sacrificial Slab Thickness:	0	in	Tss	
Structural Slab Thickness:	8	in	Td	
Haunch Thickness:	2	in	Th	

TRAINING AND DOCUMENTATION WILL BE AVAILABLE WITH LAUNCH

THE WILL GROUP

Reduced Construction Cost

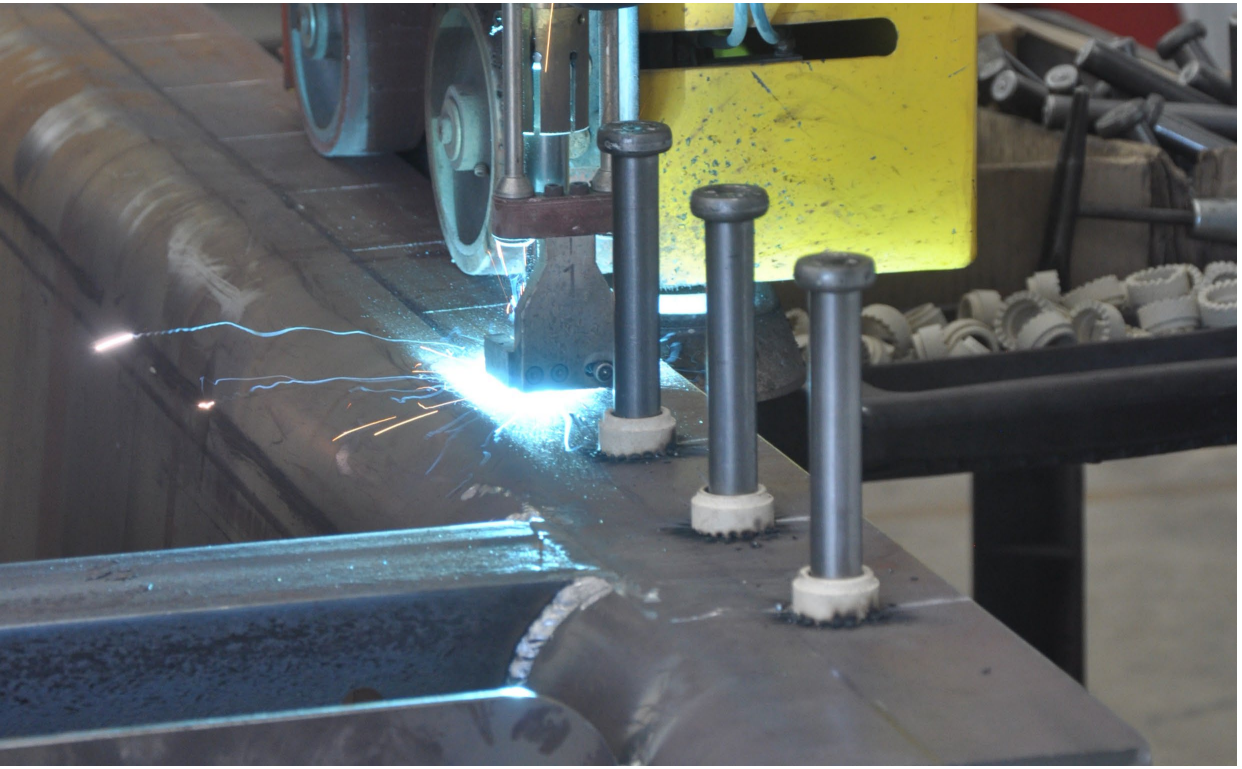
Less Field Work, Less Exposure to Hazardous Conditions

- 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

Safer Working Environment

- Work inside of tub girders with limited fall equipment
- Torsionally rigid beams, shorter spans, don’t require external diaphragms for stability
- Tubs can be picked and moved with smaller/lighter cranes
- Installation of facia brackets on the ground before pick

No Field Welding



- Speedier installation for the contractor
- All welds done by Valmont in a controlled environment
- Shop installed Nelson studs/half hangers

Faster, Easier, Installation

Simple Rigging, Smaller Equipment

- 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)

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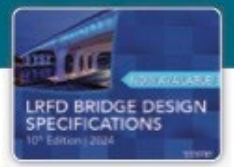
2024 AASHTO Bridge Design Specifications, 10th Ed.

Updates benefit U-BEAM construction

U-BEAM



Bent Plates

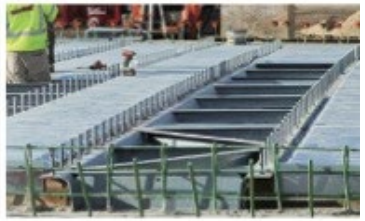
Section 6.7.8 – Structural steel plates shall be bent to the requirements of the AASHTO LRFD Steel Bridge Fabrication Specifications, which specifies 5.0t, where t is the thickness of the plate, and the radius is measured to the concave face of the plate.

- AASHTO BDS did not previously specify a bend radius
- The previous recommended bend radius in the AASHTO Construction Specifications was 3.5t
- Bend radius is no longer a barrier to designing or specifying PBTG

Shear Stud Spacing

Section 6.10.10.1.2 – The minimum spacing of sheer studs was reduced from six times the diameter of the stud to four times the diameter of the stud

- We can now get six 7/8" diameter studs per linear foot of beam instead of four
- This is a 50% increase in allowable studs on beam
- This spacing reduction allows for higher fatigue cycles
- We can accommodate 50% more truck traffic with a single row of studs per flange



Proportion Limits

Section 6.11.2.2 – Top flange to web proportion limits "shall only apply to built-up tub-section members" and "need not apply to tub-section members that are formed from a single plate"

- PBTG did not meet the previous proportion limit requirement
- AASHTO BDS did not previously recognize "tub-section members that are formed from a single plate"
- This eliminates a major obstacle from designing and specifying PBTG

2024 AASHTO Bridge Design Specifications, 10th Ed.

Updates benefit U-BEAM construction

Bottom Flange Proportion

Section 6.11.2.2 – Bottom flange proportion limits have now been included for tub girders in AASHTO BDS-10

- There were no previous bottom flange proportion requirements
- ALL Valmont U-Beams currently meet the new bottom flange proportion requirements
- No change
- This eliminates a major obstacle from designing and specifying PBTG

Bracing Requirements

Section 6.11.3.2 – Top flange bracing systems shall extend between 20 to 25 percent of the span length from each support.

- AASHTO BDS did not previous specify a bracing system length
- Previously Engineers needed to follow a rigorous analysis approach to determine bracing requirements
- This simple approach allows bracing design to no longer be an impediment to designing or specifying PBTG
- This eliminates a major obstacle from designing and specifying PBTG

Creep Reduction Factor

Section 6.13.2.8 – A creep factor taken equal to 0.80 for Class C galvanized faying surfaces

- Previously there we no AASHTO BDS creep reduction factor for galvanized surfaces
- However, Michigan DOT has already applied this creep reduction factor to their design requirements
- This will increase the number of bolts in a splice by about 20%
- We already have splice design standards for this change due to the MDOT requirement

COMING SOON!

A complete Design Guideline for PBTG's will be available from -AISC/NSBA

https://www.aisc.org/nsba/

U-Design Bridge Tool

Description	Value	Units	Variable	Comment
Total Width of Bridge:	35.5833	ft	Wdeck	
Total Girder Length, ft:	89.25	ft	n/a	Total length
Number of Beams:	5		Nb	
Overhang from Deck Edge to Top Flange:	6	in	Soverhang	
Support Skew Angle	15	degree	Skew	Right bridges has zero Skew
Cross Section (U-Beam):	U33	Text	SectionName	
Girder Location:	Exterior		GirderLoc	
End of Slab to Center of Bearing (Left):	6	in	Xbearing1	
End of Slab to Center of Bearing (Right):	6	in	Xbearing2	
Width of Left Sidewalk:	0	ft	Bswalk1	
Width of Right Sidewalk:	0	ft	Bswalk2	
Sacrificial Slab Thickness:	0	in	Tss	
Structural Slab Thickness:	8	in	Td	
Haunch Thickness:	2	in	Th	

Scan code for the complete PBTG's Design Guideline

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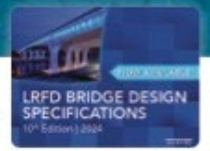
Efficient, Reliable, and Field Proven the U-BEAM™ outshines the competition

U-BEAM



The Valmont U-BEAM™ press brake tub girder was designed and engineered for ease of constructability. Whether it is a more efficient installation, a more reliable primary member, or a field-proven solution engineered for lower lifetime maintenance, the U-BEAM meets or exceeds competing concrete beams or rolled I beams.

Partner with our in-house design support and qualified structural professional engineers to create the right solution for your short span bridge needs. Manufacture and install in record time using smaller equipment and no field welding, ensuring lower labor costs and reduced road closures.

U-BEAM vs. Concrete

- Galvanized U-BEAMs outlast concrete by up to 300%, with concrete lasting only 30 years in many northern states
- Lighter deadload can simplify or downsize substructure requirements. Existing substructure can be retained in some cases
- Installation costs associated with labor and equipment are greatly reduced
- Precise camber and constant haunch can reduce time spent surveying and overall fieldwork schedule by weeks
- U-BEAMs are fully fabricated with all necessary components to attach formwork
- U-BEAMs require only one crane to install even on multiple span projects and can be erected from one side of the bridge
- An excavator can be used to install U-BEAMs on shorter span bridges
- Galvanized coating requires less maintenance over the life of the structure
- U-BEAMs can be erected in hours; concrete beams require days
- Contractors consistently open bridges to traffic just three weeks after setting U-BEAMs

U-BEAM vs. Rolled I Beam

- U-BEAMs require 70% fewer bolts to assemble, reducing contract time and associated costs
- Efficient designs reduce beam lines, requiring fewer tub girders than I-beams for similar span lengths
- Valmont's galvanizing capabilities reduce cost compared to galvanizing with a third party
- Contractors can see a savings of 50% in labor cost
- U-BEAMs utilize efficient forming methods less falsework
- Contractors can work inside of tub girders when installing falsework, providing unmatched safety over conventional beams

U-Design Bridge Tool

Description	Value	Units	Variable	Comment
Total Width of Bridge:	35.5833	ft	Wdeck	
Total Girder Length, ft:	89.25	ft	n/a	Total length
Number of Beams:	5		Nb	
Overhang from Deck Edge to Top Flange:	6	in	Soverhang	
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Cross Section (U-Beam):	U33	Text	SectionName	
Girder Location:	Exterior		GirderLoc	
End of Slab to Center of Bearing (Left):	6	in	Xbearing1	
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Width of Left Sidewalk:	0	ft	Bswalk1	
Width of Right Sidewalk:	0	ft	Bswalk2	
Sacrificial Slab Thickness:	0	in	Tss	
Structural Slab Thickness:	8	in	Td	
Haunch Thickness:	2	in	Th	

U-DESIGN platform assists with the design of a Press Brake Tub Girder superstructure

- ✔ Reduce PBTG design time by up to 90%
- ✔ Increase confidence in results
- ✔ Reduce cost of PBTG design
- ✔ Control your specific PBTG solution
- ✔ Account for skew and camber
- ✔ Get superstructure reactions for a complete bridge design

Benefits of the U-BEAM™

Efficient
FASTER, SAFER BRIDGE CONSTRUCTION
- Installs in hours and days, not months
- Shorter construction times
- Less labor and greater safety

Field Proven
ENGINEERED AND IN USE NATIONWIDE
- Certified by AASHTO, AISC, NSBA and SSSBA
- Engineered and constructed to last 100 years
- Lower lifetime maintenance

Reliable
BACKED BY THE RESOURCES OF A GLOBAL COMPANY
- Engineered and supported by an extensive in-house team
- Powered by Valmont's 75+ years of product innovation
- Galvanized coating extends life of bridge by 60 years

Scan code for more information about the Valmont U-BEAM.

Contact your representative for a demonstration

Manufactured in: **JASPER, TENNESSEE U-BEAM™ PLANT**

- 2000 ton 60' press brake
- Roll form camber capabilities
- Automated stud welding
- Safe and efficient material handling

THE WILL GROUP INFRASTRUCTURE SOLUTIONS

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