
Jeff Blue, P.E.
Champaign County Engineer

Press Brake Formed Tub Girders

- Relatively Simple Design
  - Substructure
  - Super Structure
- Easy To Handle
- Precast or Poured in Place Decks
- Construction Process
- Contractors “Fear of New Construction Process”
- Longevity
- Cost Comparisons

INDEX OF SHEETS

STANDARDS (IN PROPOSAL)

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280001-07	TEMPORARY EROSION CONTROL SYSTEMS
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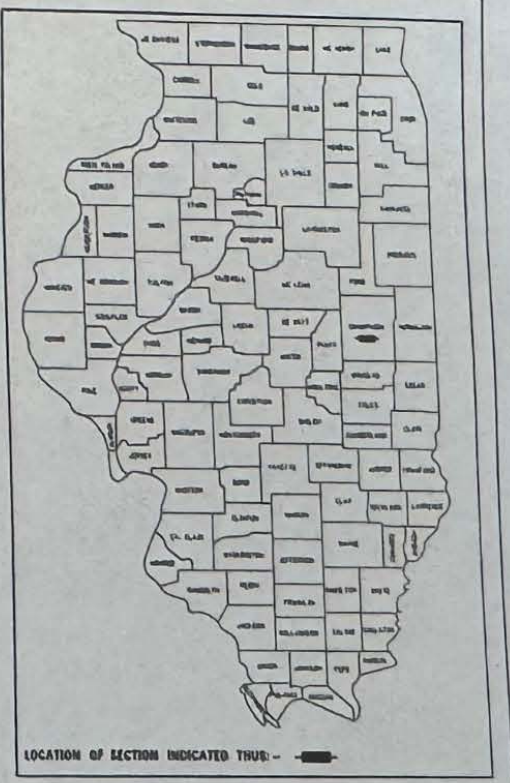
725001-01	OBJECT AND TERMINAL MARKERS
BLR 21-9	TYPICAL APPLICATION OF TRAFFIC CONTROL DEVICES FOR CONSTRUCTION ON RURAL LOCAL HIGHWAYS

STATE OF ILLINOIS

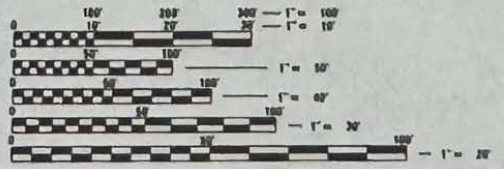
DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED BRIDGE REPLACEMENT LOCAL FUNDS PROJECT

TR 251 (800 N. RD.) OVER TWO MILE SLOUGH
TOLONO TOWNSHIP
SECTION 19-29081-00-BR
CHAMPAIGN COUNTY



FUNCTIONAL CLASSIFICATION - LOCAL ROAD
ADT = 100
ADTT = 15
DESIGN SPEED = 30 MPH

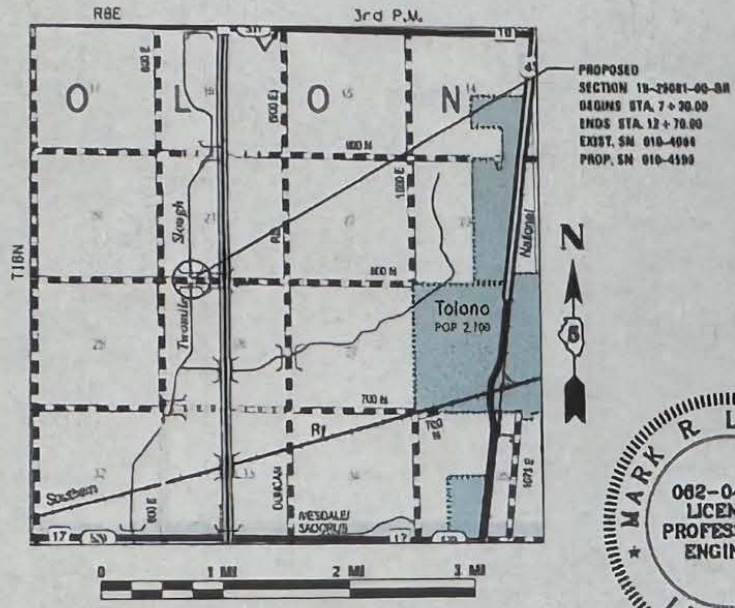


FULL SIZE PLANS HAVE BEEN PREPARED USING STANDARD ENGINEERING SCALES. REDUCED SIZED PLANS WILL NOT CONFORM TO STANDARD SCALES. IN MAKING MEASUREMENTS ON REDUCED PLANS, THE ABOVE SCALES MAY BE USED.

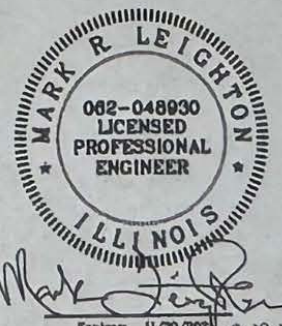
J.U.L.I.E.
JOINT UTILITY LOCATION INFORMATION FOR EXCAVATION
1-800-892-0123
OR 811

UTILITY COMPANIES:

EASTERN ILLINI ELECTRIC COOPERATIVE
330 W. OTTAWA
PO BOX 96
PAXTON, IL 60957
CONTACT: BRIAN J. RONNA



LOCATION MAP
TOTAL LENGTH = 540 FEET (0.102 MI)
NET LENGTH = 540 FEET (0.102 MI)



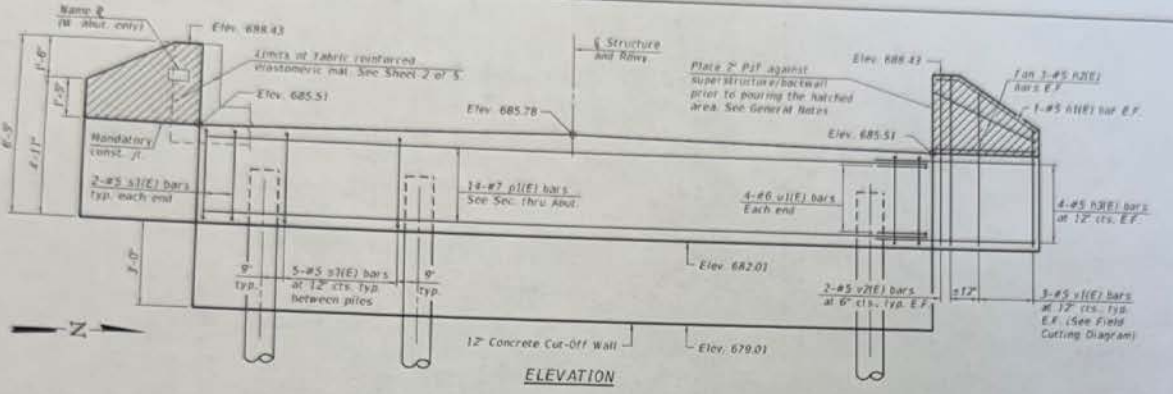
PROJECT MANAGER: MARK R. LEIGHTON, P.E., P.L.S.

APPROVED October 19 20 20

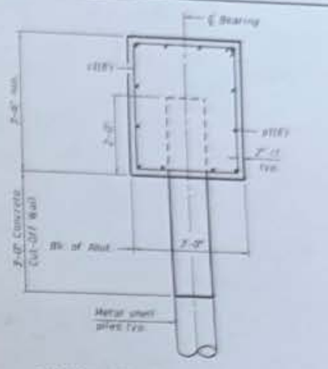
COUNTY ENGINEER

Substructure

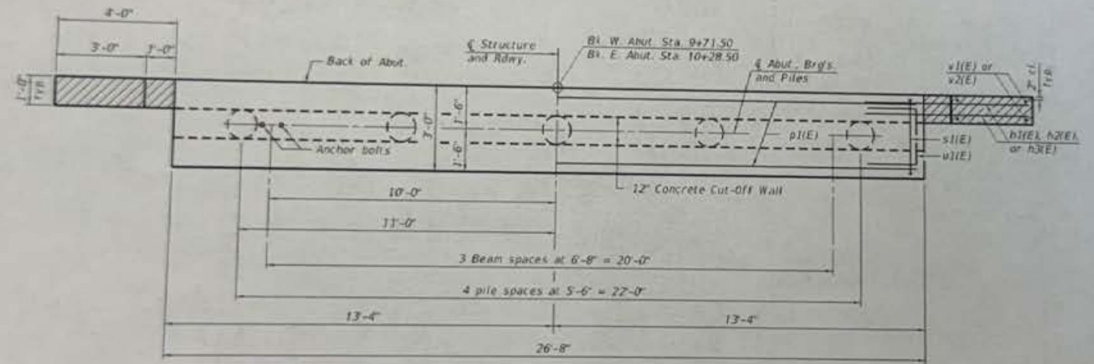
- Typical Substructure Construction
  - Drive Piling
  - Pour Abutments
  - Rip Rap on Slopes



ELEVATION



TYPICAL SECTION THRU ABUTMENT



PLAN

Notes:

1. The hatched area shall be poured after the superstructure is in place.
2. For details of piles, see sheet 4 of 5.
3. See superstructure details for anchor bolt details.

BILL OF MATERIAL
TWO ABUTMENTS

Bar	No.	Size	Length	Shape
h1(E)	9	#5	4'-1"	
h2(E)	24	#5	3'-8"	
h3(E)	32	#5	7'-7"	
p1(E)	28	#7	26'-4"	
s1(E)	48	#5	12'-7"	
u1(E)	16	#6	11'-6"	
v1(E)	12	#5	10'-8"	
v2(E)	16	#5	6'-1"	

Structure Excavation	Cu. Yd.	78
Concrete Structures	Cu. Yd.	25.0
Reinforcement Bars, Epoxy Coated	Pound	3,030
Furnishing Metal Shell Piles, 12" x 0.250"	Foot	315
Driving Piles	Foot	315
Test Pile Metal Shell	Each	1
Controlled Low-Strength Material	Cu. Yd.	56.7
Concrete Cut-Off Wall	Cu. Yd.	5.3

SUPERSTRUCTURE ABUTMENT REACTION TABLE

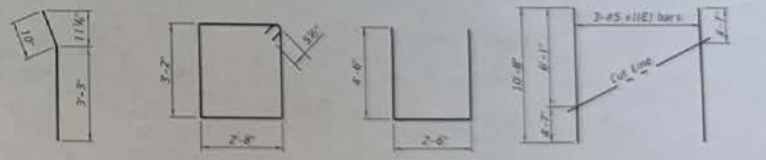
Load	Reaction
Dead Load (DC)	25.0 k
Wearing Surface (DW)	12.0 k
Live Load (LL) Ext. Beam	58.3 k
Live Load (LL) Int. Beam	56.6 k

PILE DATA - W. ABUT.

Type: Metal Shell 12" Ø x 0.25" walls
Nominal Required Bearing: 292 kips
Factored Resistance Available: 161 kips
Est. Length: 35 ft.
No. Production Piles: 5

PILE DATA - E. ABUT.

Type: Metal Shell 12" Ø x 0.25" walls
Nominal Required Bearing: 292 kips
Factored Resistance Available: 161 kips
Est. Length: 35 ft.
No. Production Piles: 4
No. Test Piles: 1



BAR h1(E)

BAR s1(E)

BAR u1(E)

FIELD CUTTING DIAGRAM

Order v1(E) bars full length. Cut as shown and use remainder of bars in opposite face.

whks	DESIGNED - BJJ CHECKED - CEH DRAWN - DLH CHECKED - CEH/MRL	REVISED REVISED REVISED REVISED	Champaign County Highway Department

ABUTMENTS
STRUCTURE NO. 010-4590
SHEET NO. 3 OF 5 SHEETS

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
251	19-29081-00-BR	CHAMPAIGN	33	12

CONTRACT NO.
ILLINOIS FED. AID PROJECT

Galvanized Tub Girder

- Tub Girders Formed/Galvanized by Valmont

Precast Option

Precast Deck poured by McCann

TOTAL BILL OF MATERIAL

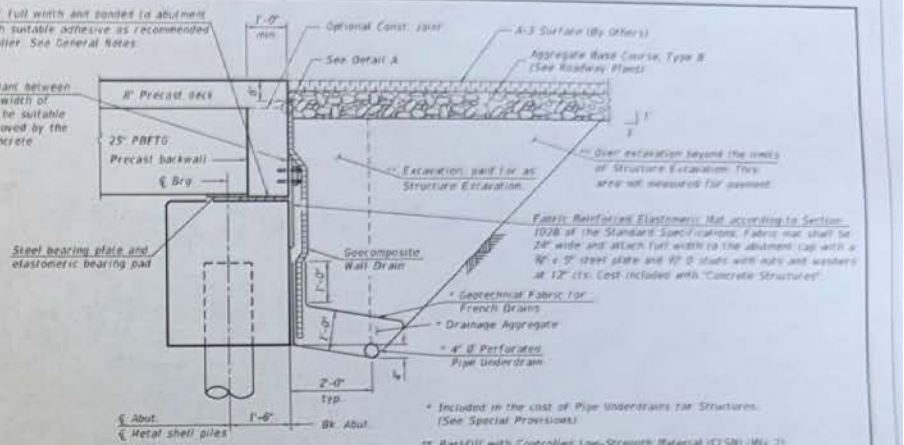
ITEM	UNIT	SUPER	SUB	TOTAL
Channel Excavation	Cu. Yd.		260	260
Removal of Existing Structures	Each		1	1
Structure Excavation	Cu. Yd.		78	78
Concrete Structures	Cu. Yd.		25.0	25.0
Reinforcement Bars, Epoxy Coated	Pound		3030	3030
Furnishing Metal Shell Piles 12" x 0.250"	Foot		315	315
Driving Piles	Foot		315	315
Test Pile Metal Shells	Each		1	1
Name Plates	Each		1	1
Geocomposite Wall Drain	Sq. Yd.		40.1	40.1
Controlled Low-Strength Material	Cu. Yd.		56.7	56.7
Bridge Deck Thin Polymer Overlay, ¾"	Sq. Yd.	169		169
Pipe Underdrains for Structures 4"	Foot		109	109
Grouted Riprap	Sq. Yd.		560	560
Erecting Superstructure	L. Sum	1		1
**** Furnishing Superstructure	L. Sum	1		1
Concrete Cut-Off Wall	Cu. Yd.		5.3	5.3
MGS Bridge Railing	Foot	114		114

**** By others. See General Notes.

GENERAL NOTES

1. All work shall be completed in accordance with the applicable sections of the Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction except as mentioned herein.
2. The prefabricated superstructure units are being fabricated and supplied by others (herein referred to as the Fabricator) on an advanced contract. See special provisions and shop drawings for additional information.
3. The profile grade elevations shown are applicable to the top of the bridge deck prior to placement of the thin polymer overlay.
4. Reinforcement bars designated (E) shall be epoxy coated.
5. Layout of the slope protection system may be varied to suit ground conditions in the field as directed by the Engineer.
6. Bearing seat surfaces shall be constructed or adjusted to the designated elevations within a tolerance of ½ in. (0.01 ft). Adjustments shall be made either by grinding the surface or by shimming the bearings.
7. The indicated anchor bolt diameter, length, and material grade are minimums and may be increased as determined necessary by the Fabricator's SE. See Erecting Superstructure Special Provision for addition details.
8. PJF shall conform to the material specifications of Article 1051.09 except the pressure indicated in Section 1051.09(a)(1) is limited to 15 psi max. The PJF along the abutment cap may be made up of layers of multiple thicknesses and should be lightly compressed by the backwall after the superstructure is set in place.
9. Controlled low strength material shall not be placed behind the abutments until the superstructure is in place.

Note:
All drainage system components shall extend to 2'-0" from end of each wingwall except an outlet pipe shall extend until intersecting with the side slopes. The pipes shall drain into concrete headwalls. (See Article 601.05 of the Standard Specifications and Highway Standard 601101).

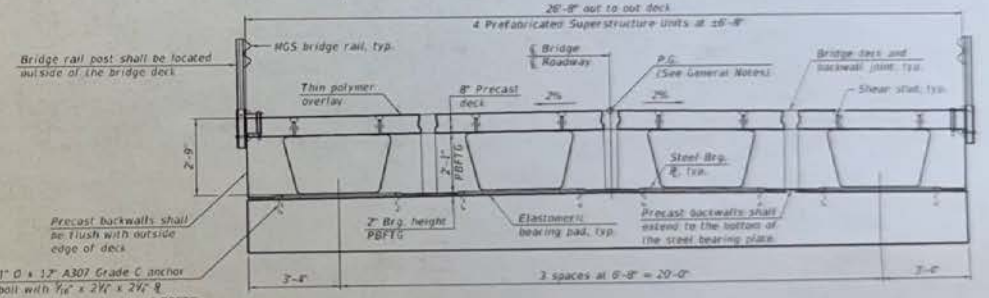


* Included in the cost of Pipe Underdrains for Structures. (See Special Provisions)

** Backfill with Controlled Low-Strength Material (CLSM) (Mix 2) above drainage aggregate for full width of abutment cap.

SECTION AT ABUTMENT

(Dimensions are at Rt. ℄s)



SUPERSTRUCTURE CROSS SECTION

WATERWAY INFORMATION TABLE

Existing Low Grade Elevation: 685.44 ft. @ Sta. 8+20
Proposed Low Grade Elevation: 685.46 ft. @ Sta. 7+30

Drainage Area 5.56 sq. mi.

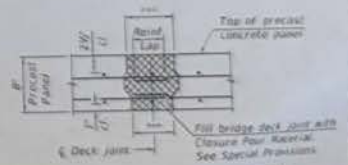
Flood	Freq. Year	Q cfs	Opening sq. ft. Existing	Opening sq. ft. Proposed	Natural H.W.E.	Head (ft.) Existing	Head (ft.) Proposed	Headwater Elev. Existing	Headwater Elev. Proposed
Design	15	980	195	295	684.7	0.4	0.1	685.1	684.8
Base	100	1600	195	348	686.8	0.8	0.6	687.6	687.4
Scour Chkt.	200	1840	195	348	687.5	0.5	0.6	688.0	688.1
Max. Calc.	500	2170	195	348	688.0	0.5	0.6	688.5	688.6

DESIGN SCOUR ELEVATION TABLE

Event / Limit State	Design Scour Elev. (ft.) W. Abut.	E. Abut.	Item 113
Q100	-	-	B
Q200	-	-	
Design	682.0	682.0	
Check	682.0	682.0	

If the Fabricator elects to use the optional construction joint between the slab and backwall, a flexible waterproofing sealant shall be provided as shown. The sealant shall be suitable for use below grade and shall be approved by the Engineer. A notch and backer rod shall be provided as specified by the sealant manufacturer. Cost included with Furnishing Superstructure.

DETAIL A



BRIDGE DECK JOINT DETAIL

(Through ℄ of bridge deck joint, typ.)
Backwall joint details similar)

*** Joint dimensions to be determined by Fabricator. See Special Provisions.

whks

JOB NO. = drawing	DESIGNED - BJJ		REVISED
FILE NAME = 010-4590gn	CHECKED - CER		REVISED
PLOT SCALE = 0.5 / in.	DRAWN - GLR		REVISED
PLOT DATE = 3/28/2022	CHECKED - CER/BRL		REVISED

Champaign County Highway Department

GENERAL DATA
STRUCTURE NO. 010-4590
SHEET NO. 2 OF 5 SHEETS

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
286	18-29681-00-BR	CHAMPAIGN	33	11
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		

Construction Process

Crane and Crew for Setting Beams

Construction Process

Beams Lifted from Truck

Construction Process

Beams Lifted from Truck

Construction Process

Beams Set on Abutments

Construction Process

Beams Set on Abutments

Construction Process

Beams Set on Abutments

Beams Set in One Day

Construction Process

Beams are Pinned

8” Closure Pour Between Beams

Construction Process

8” Closure Pour Between Beams

Done in One Day

Construction Process

Closure Pour Between Beams

9,000 PSI Compressive Strength in 1 Day

Construction Process

Under Bridge

Construction Process

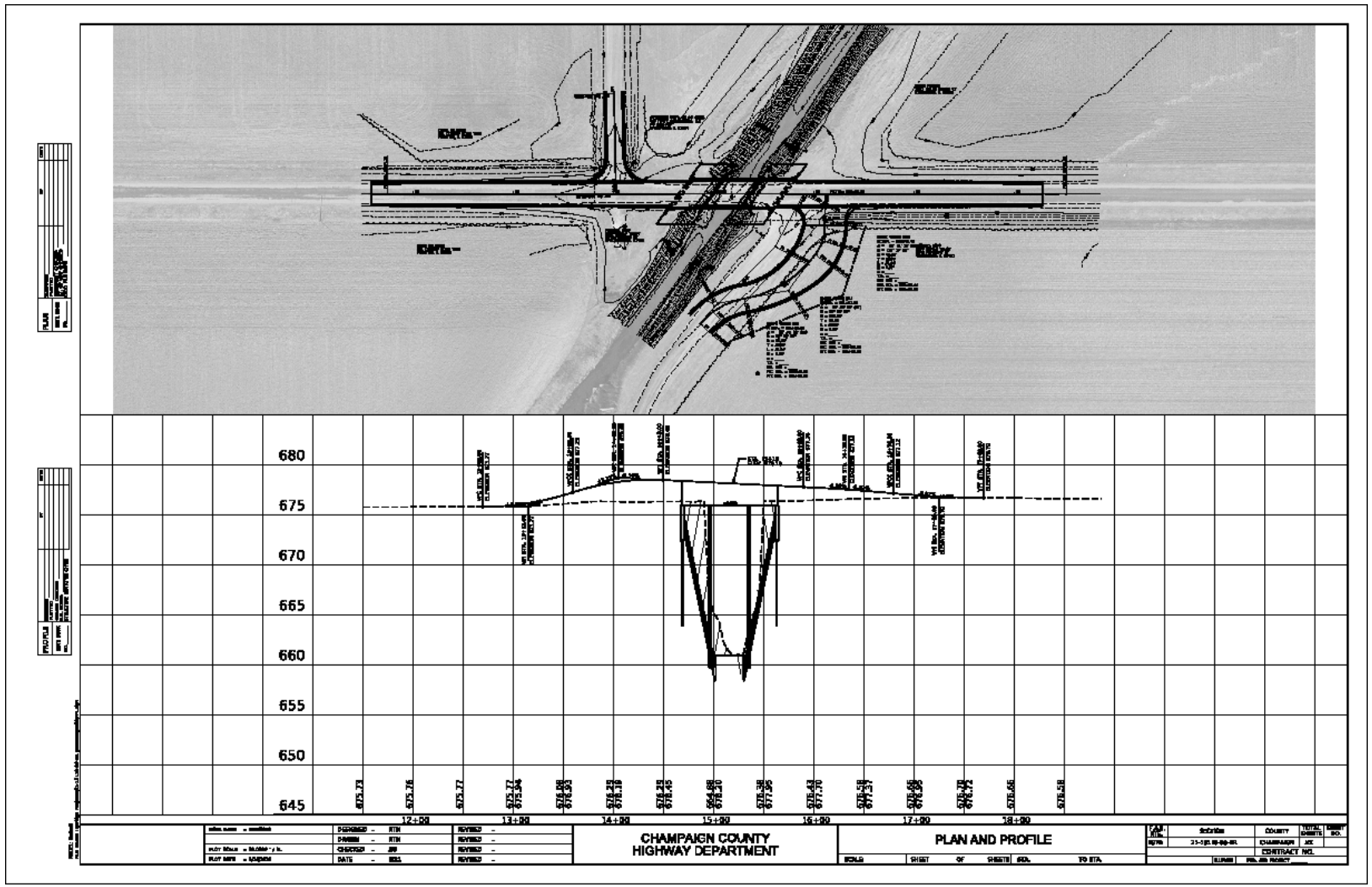
Bare Deck

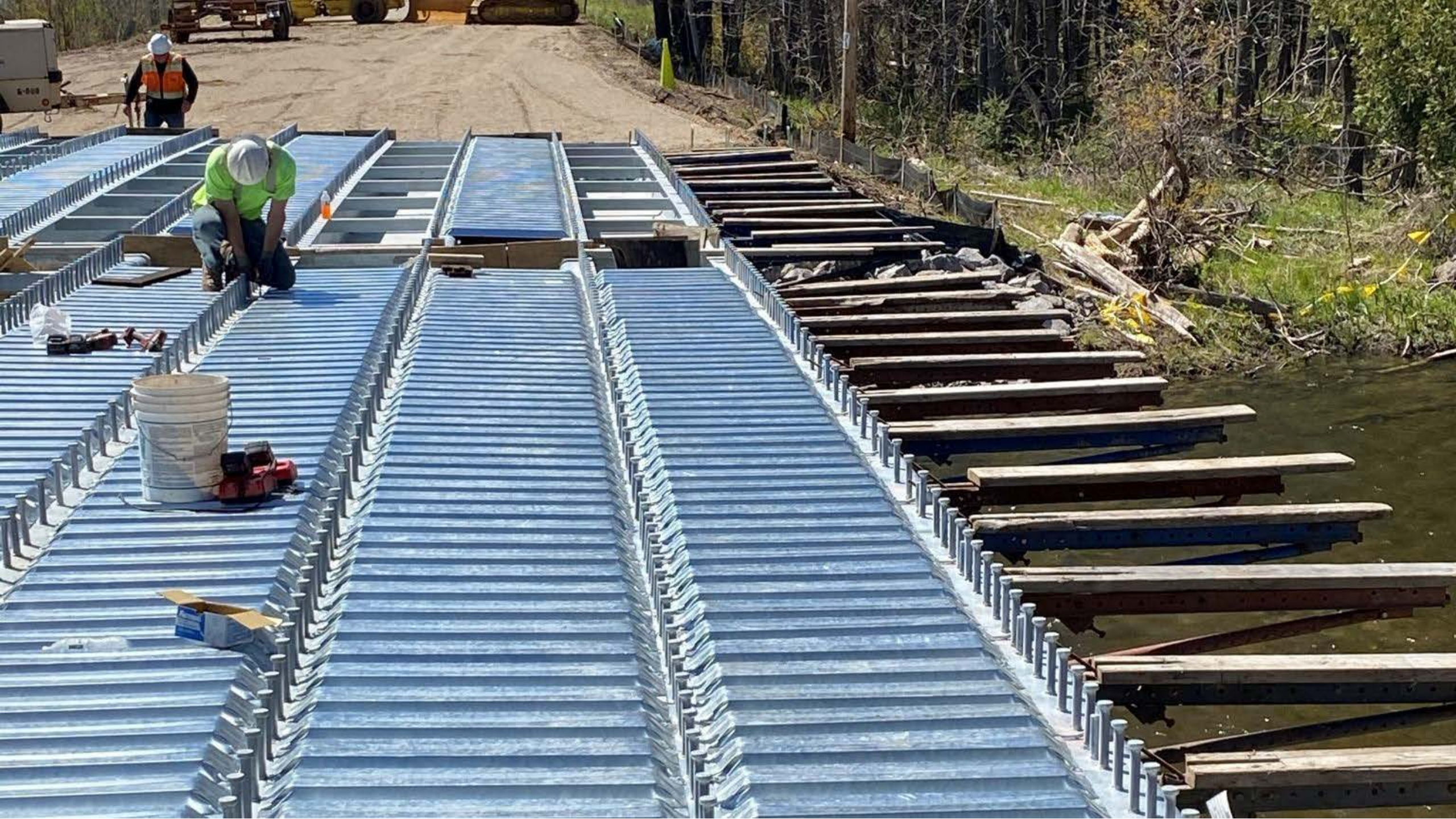
Beams were sealed with Pavix at the plant

Construction Process

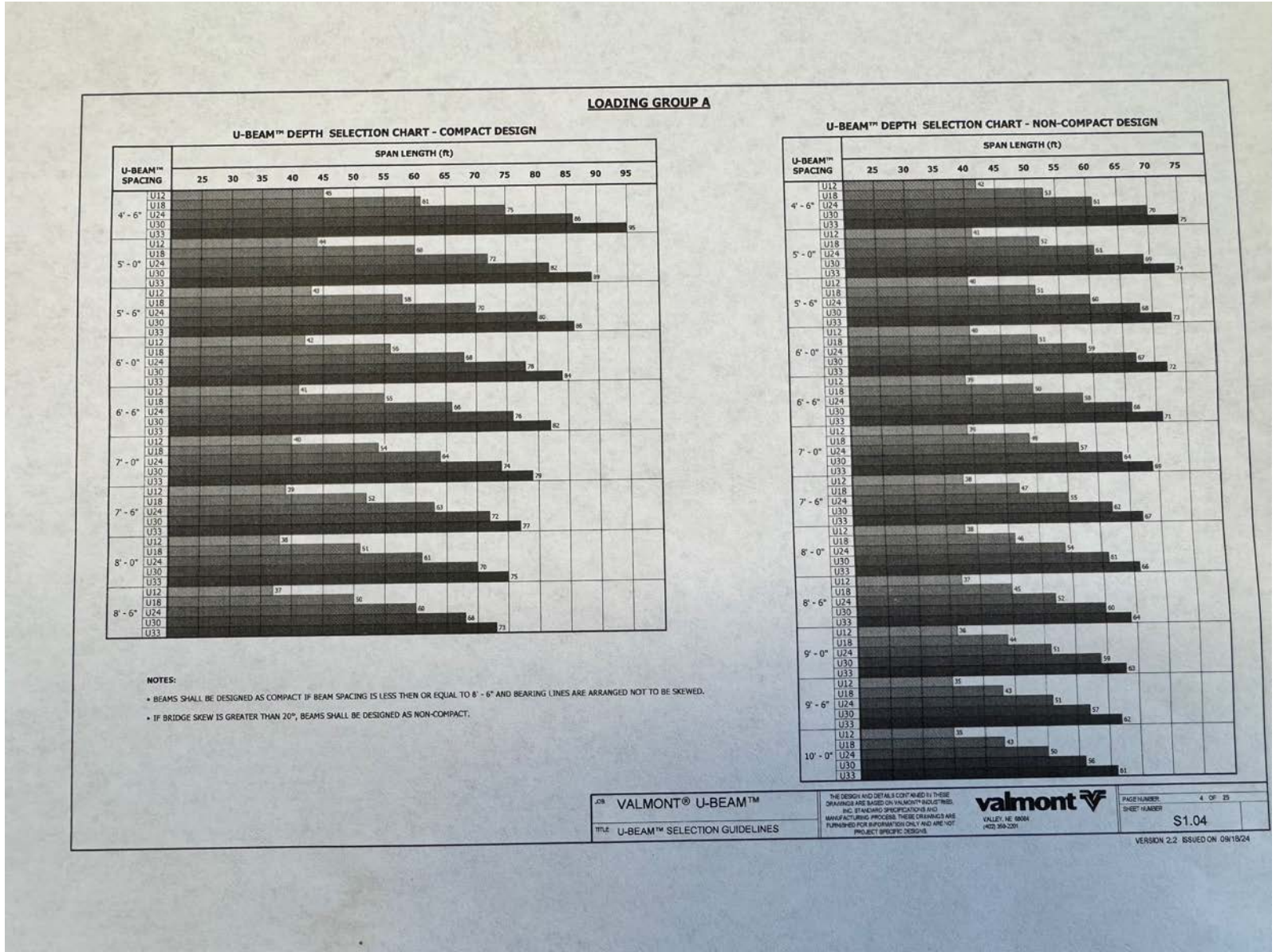
Midwest Guardrail System

New Bridge in Design
Plan and Profile





Simple U-Beam Sizing Chart



LOADING GROUP A

U-BEAM™ DEPTH SELECTION CHART - COMPACT DESIGN

U-BEAM™ SPACING		SPAN LENGTH (ft)														
		25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
4' - 6"	U12					45			61			75				
	U18													86		
	U24															95
	U30															
	U33															
5' - 0"	U12					44			60			72				
	U18													82		
	U24															89
	U30															
	U33															
5' - 6"	U12					43			58			70				
	U18													80		
	U24															86
	U30															
	U33															
6' - 0"	U12					42			56			68				
	U18													78		
	U24															84
	U30															
	U33															
6' - 6"	U12					41			55			66				
	U18													76		
	U24															82
	U30															
	U33															
7' - 0"	U12					40			54			64				
	U18													74		
	U24															79
	U30															
	U33															
7' - 6"	U12					39			52			63				
	U18													72		
	U24															77
	U30															
	U33															
8' - 0"	U12					38			51			61				
	U18													70		
	U24															75
	U30															
	U33															
8' - 6"	U12					37			50			60				
	U18													68		
	U24															73
	U30															
	U33															

U-BEAM™ DEPTH SELECTION CHART - NON-COMPACT DESIGN

U-BEAM™ SPACING		SPAN LENGTH (ft)										
		25	30	35	40	45	50	55	60	65	70	75
4' - 6"	U12					42			53			61
	U18											70
	U24											75
	U30											
	U33											
5' - 0"	U12					41			52			61
	U18											69
	U24											74
	U30											
	U33											
5' - 6"	U12					40			51			60
	U18											68
	U24											73
	U30											
	U33											
6' - 0"	U12					40			51			59
	U18											67
	U24											72
	U30											
	U33											
6' - 6"	U12					39			50			58
	U18											66
	U24											71
	U30											
	U33											
7' - 0"	U12					39			49			57
	U18											64
	U24											69
	U30											
	U33											
7' - 6"	U12					38			47			55
	U18											62
	U24											67
	U30											
	U33											
8' - 0"	U12					38			46			54
	U18											61
	U24											66
	U30											
	U33											
8' - 6"	U12					37			45			52
	U18											60
	U24											64
	U30											
	U33											
9' - 0"	U12					36			44			51
	U18											58
	U24											63
	U30											
	U33											
9' - 6"	U12					35			43			51
	U18											57
	U24											62
	U30											
	U33											
10' - 0"	U12					35			43			50
	U18											56
	U24											61
	U30											
	U33											

NOTES:

- BEAMS SHALL BE DESIGNED AS COMPACT IF BEAM SPACING IS LESS THEN OR EQUAL TO 8' - 6" AND BEARING LINES ARE ARRANGED NOT TO BE SKEWED.
- IF BRIDGE SKEW IS GREATER THAN 20°, BEAMS SHALL BE DESIGNED AS NON-COMPACT.

JOB VALMONT® U-BEAM™

TITLE U-BEAM™ SELECTION GUIDELINES

THE DESIGN AND DETAILS CONTAINED IN THESE DRAWINGS ARE BASED ON VALMONT INDUSTRIES, INC. STANDARD SPECIFICATIONS AND MANUFACTURING PROCESS. THESE DRAWINGS ARE FURNISHED FOR INFORMATION ONLY AND ARE NOT PROJECT SPECIFIC DESIGNS.

valmont

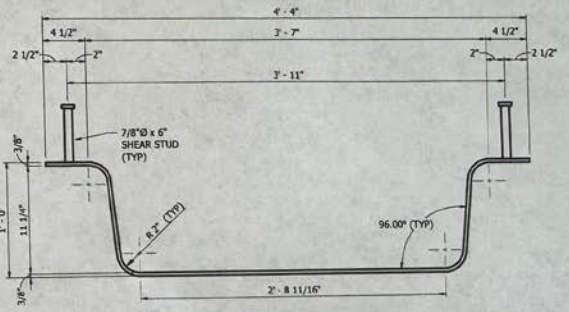
VALLEY, NE 68064
(402) 359-2201

PAGE NUMBER 4 OF 25
SHEET NUMBER S1.04

VERSION 2.2 ISSUED ON 09/18/24

U12			
NON-COMPOSITE SECTION PROPERTIES			
I_{steel}	S_{steel_top}	S_{steel_bottom}	J
in^4	in^3	in^2	in^4
582.74	-73.18	144.35	1.34

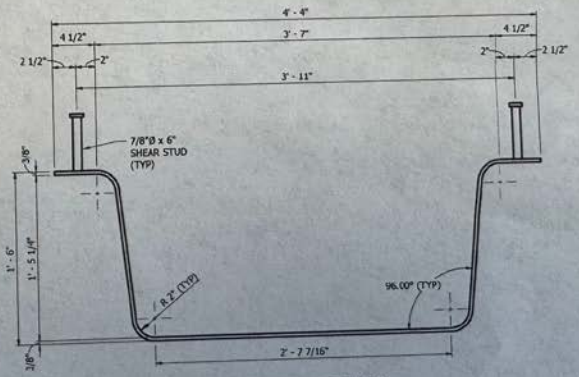
PLATE INFORMATION			
t_{steel}	L_{steel}	A_{steel}	ω_{steel}
in	in	in^2	plf
3/8	70	26.23	90



U12 STEEL U-BEAM™

U18			
NON-COMPOSITE SECTION PROPERTIES			
I_{steel}	S_{steel_top}	S_{steel_bottom}	J
in^4	in^3	in^2	in^4
1475.69	-128.98	224.99	1.70

PLATE INFORMATION			
t_{steel}	L_{steel}	A_{steel}	ω_{steel}
in	in	in^2	plf
3/8	80 3/4	30.29	104



U18 STEEL U-BEAM™

NOTE:
COMPOSITE SECTION PROPERTIES AVAILABLE UPON REQUEST.
INCREASE GIVEN WEIGHT BY 15% MINIMUM FOR THE COMPLETE ASSEMBLED U-BEAM™.

JOB VALMONT® U-BEAM™
TITLE U-BEAM™ SECTIONS

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VALLEY, NE 68064
(402) 359-2201

PAGE NUMBER 7 OF 25
SHEET NUMBER S1.07

VERSION 2.2 ISSUED ON 09/10/24

Redeck of Old Structure

STATE OF ILLINOIS
CHAMPAIGN COUNTY HIGHWAY DEPARTMENT

STRUCTURE NO. 4044
URBANA ROAD DISTRICT

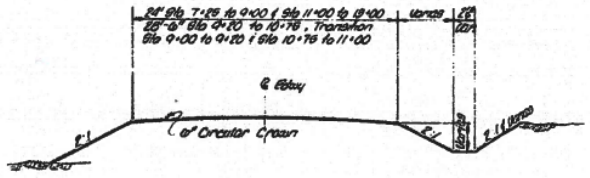
SCALES

PLAN	1 INCH = 50 FEET
PROFILE HORIZ.	1 INCH = 50 FEET
PROFILE VERT.	1 INCH = 5 FEET
CROSS SECTIONS	1 INCH = 5 FEET

SUMMARY OF QUANTITIES

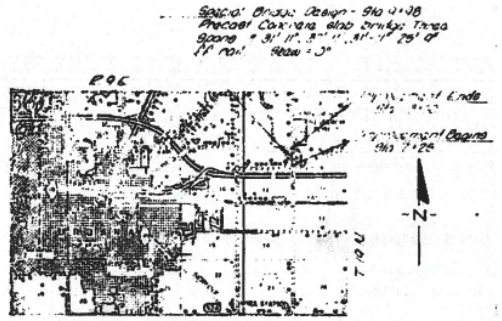
QUANTITY	UNIT	ITEM
2,671	SQ FT	PRECAST CONCRETE BRIDGE SLAB
749	CU YD	CLASS C CONCRETE
5,300	POUND	REINFORCEMENT BARS
212	LIN FT	STEEL RAILING, TYPE 9
1	EACH	TERMINAL SECTION, SINGLE FACE
1	EACH	NAME PLATES
1	EACH	REMOVAL OF EXISTING STRUCTURES
330	LIN FT	FURNISHING STEEL PILES HP10x42
330	LIN FT	DRIVING STEEL PILES
227	SQ YD	WATERPROOFING MEMBRANE SYSTEM
21	TON	BITUMINOUS CONCRETE SURFACE COURSE, CLASS I
21	TON	LEVELING BINDER (MACHINE METHOD)
735	CU YD	EARTH EXCAVATION
875	CU YD	BORROW EXCAVATION
170	CU YD	CHANNEL EXCAVATION
90	INCH DIA	TREE REMOVAL (6 to 15 INCH DIAMETER)
70	INCH DIA	TREE REMOVAL (OVER 15 INCH DIAMETER)
20	LIN FT	STORM SEWERS, TYPE 1, RCCP 24"
116	LIN FT	PIPE DRAINS, CORRUGATED STEEL CULVERT PIPE 21"
40	LIN FT	PIPE DRAINS, CORRUGATED STEEL CULVERT PIPE 24"
1	EACH	TEST PILES STEEL HP10x42

INDEX OF SHEETS



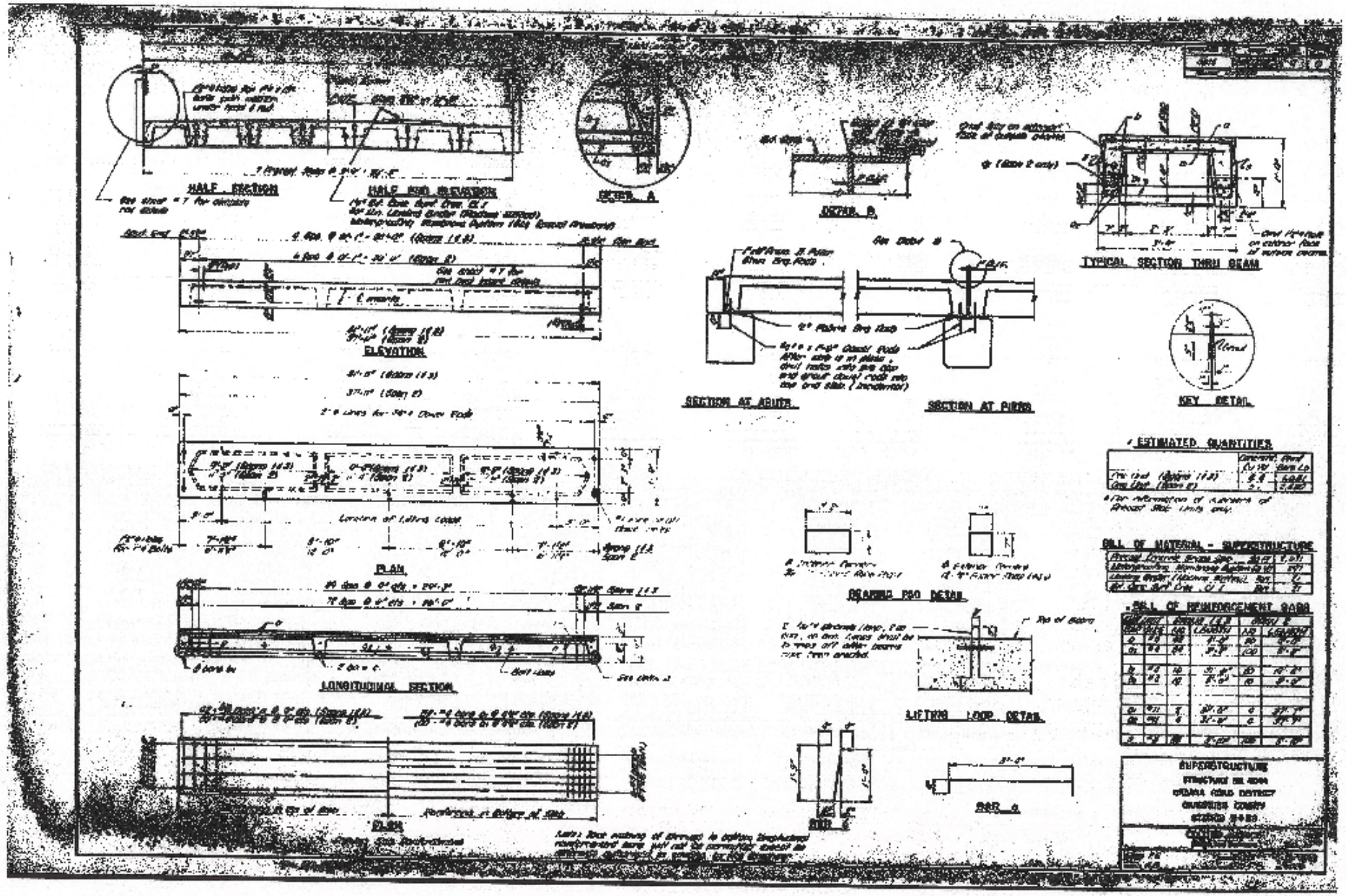
TYPICAL CROSS SECTION

Surfacing will be constructed by others and is not part of this contract.



LAYOUT

APPROX SCALE 1 INCH = 1 MILE
Net length of Section = 879 Feet = 0.1069 Miles


HALF SECTION
HALF END ELEVATION
DETAIL A
DETAIL B
TYPICAL SECTION THRU BEAM
ELEVATION
SECTION AT ABUT.
SECTION AT PIER
KEY DETAIL
PLAN
ESTIMATED QUANTITIES
BILL OF MATERIAL - SUPERSTRUCTURE
BEARING PAD DETAIL
LONGITUDINAL SECTION
BILL OF REINFORCEMENT BARS
LIFTING LOOP DETAIL
BAR G
BAR E
PLAN
SUPERSTRUCTURE

Most Long-Term Bang For Your Buck? Superstructure Costs Only

Precast Beams	Steel Beams With Concrete Deck	Concrete Slab Bridge	Galvanized PBTG With Concrete Deck
• $120/SF • Expected Life - 50 Years	• $150/SF • Expected Life - 75 Years	• $250/SF • Expected Life - 75 Years	• $150/SF • Expected Life - 100 Years

Takeaways

- Relatively Simple Design
  - Substructure – Same as most any other bridge
  - Super Structure – Inhouse, Consultant, Valmont Engineering Team
- Easy To Handle – 100 to 150 pounds per linear foot
- Precast or Poured in Place Decks - Choices
- Construction Process – Simple and quick
- Contractors “Fear of New Construction Process” – Have a pre-bid meeting
- Longevity – A long time
- Cost Comparisons – Similar to most any other system