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PLANS OF PROPOSED IMPROVEMENT ON THE

# PRIMARY ROAD SYSTEM

# KEOKUK COUNTY

## Bridge Replacement - CCS

IA 21 over Cedar Creek  
1.1 mi. N. of IA 92

Refer to the Plan Sheets for list of applicable specifications.

Value Engineering Saves. Refer to Article 1105.14 of the Specifications.



Iowa DOT Bridges and Structures  
Consultant Coordinator Contact: Lili Yang

Standard Road Plans

Standard Road Plans are listed on sheet number C.10.

Design Data Rural		
2024 AADT	1,930	V.P.D.
TRUCKS	18	%
Total Design ESALs	N.A.	

Index of Seals		
Sheet No.	Name	Type
A.1	Samantha L. Wermager	Structural Design
V.4	Mark D. Werner*	Hydraulic Design
SPS.1	Xinyi Jiang**	Geotechnical Design
CS.1	Buddika Godagama**	Soils Tabulations
A.3	Gregory S. Shuger*	Roadway Design

\*Provided by Stanley Consultants  
\*\* Provided by Braun Intertec

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

*Samantha L. Wermager*

3-30-2026

Signature 

Samantha L. Wermager

Date

Printed or Typed Name

My license renewal date is December 31, 

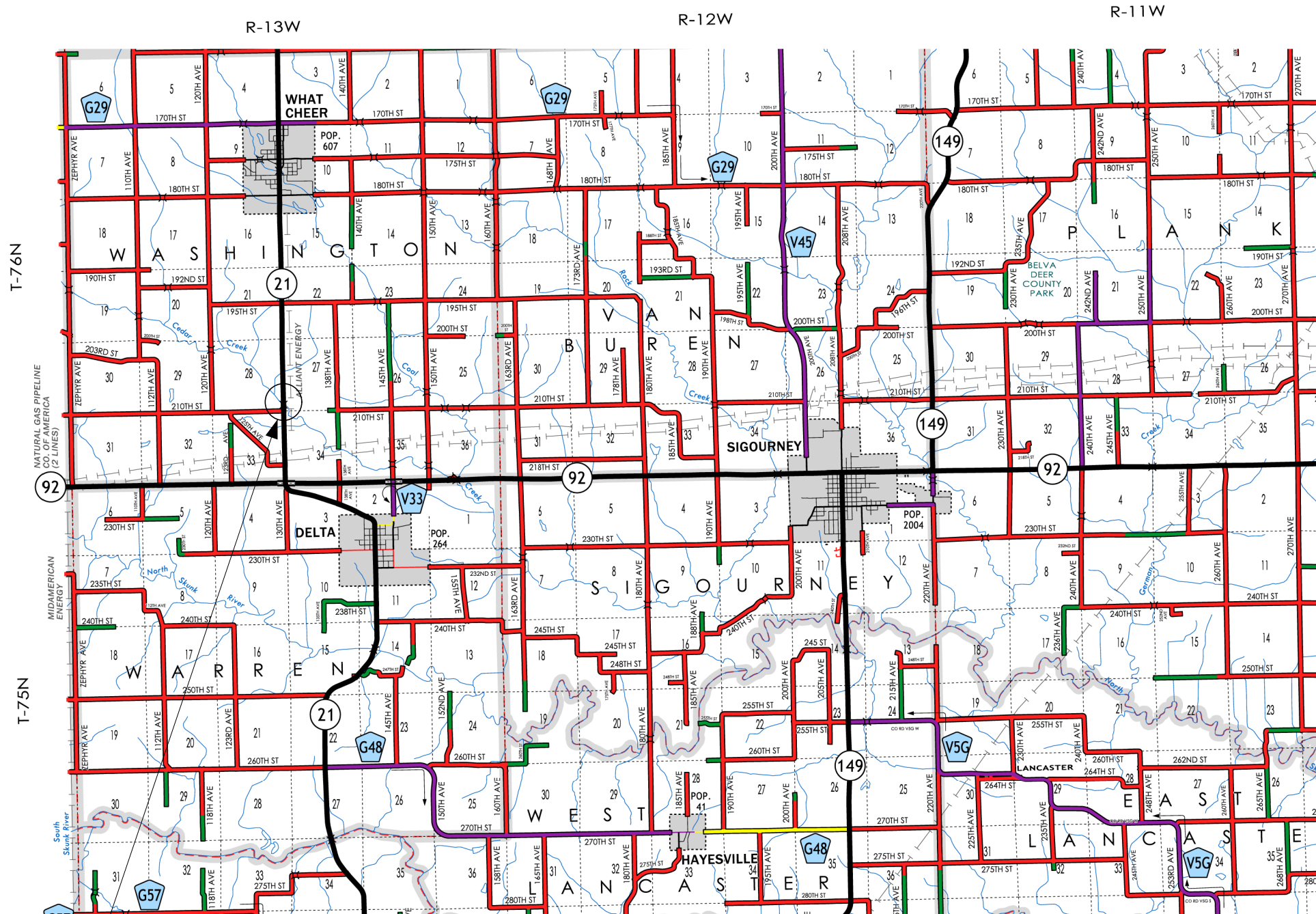
2027

Pages or sheets covered by this seal: 



























A.1-A.2, V.1-V.26

English Bridge Standards		
Standard	Issued	Revised
Revisions		

	TOTAL
	91
PROJECT IDENTIFICATION NUMBER	
21-54-021-020	
CONTRACT ID NUMBER	
54-0211-046	
PROJECT NUMBER	
BRF-021-1(46)--38-54	
R.O.W. PROJECT NUMBER	
PROJECT DIRECTORY NUMBER	
5402102021	



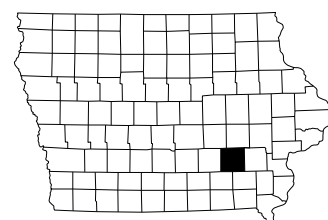
## LEGEND

- |                               |   |
|-------------------------------|---|
| INTERSTATE HIGHWAY            |  |
| PRIMARY HIGHWAY-DIVIDED       |  |
| PRIMARY HIGHWAY               |  |
| PORTLAND CEMENT CONCRETE ROAD |  |
| ASPHALT ROAD                  |  |
| BITUMINOUS ROAD               |  |
| GRAVEL ROAD                   |  |
| EARTHEN ROAD                  |  |
| INTERSTATE HIGHWAY            |  |
| UNITED STATES HIGHWAY         |  |
| STATE HIGHWAY                 |  |
| COUNTY HIGHWAY                |  |
| RAILROAD                      |  |
| PIPELINE                      |  |
| AIRPORT                       |  |
| HYDROLOGY                     |  |
| BRIDGE                        |  |
| STATE BOUNDARY                |  |
| COUNTY BOUNDARY               |  |
| CORPORATE BOUNDARY            |  |
| TOWNSHIP LINE                 |  |
| SECTION LINE                  |  |
| ROAD NAMES                    |  |
| UNINCORPORATED PLACE          |  |
| STATE PARKS                   |  |
| STATE INSTITUTIONS            |  |
| FEDERAL LAND                  |  |

Design No. 0326  
FHWA No. 032601

## Keokuk County Location Map

Not To Scale



Estimated Bridge Quantities - Design 0326									
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Item No.	Item Code	Item	Unit	Total	As Built Quantity
1	2104-2710020	Excavation, Class 10, Channel	C.Y.	1,006.0	
2	2401-6745625	Removal of Existing Bridge	L.S.	1.00	
3	2402-2720000	Excavation, Class 20	C.Y.	150	
4	2403-0100010	Structural Concrete (Bridge)	C.Y.	612.5	
5	2403-1000005	Fiber Reinforcement for Structural Concrete	C.Y.	447.4	
6	2403-1000010	Trial Batch and Test Placement (Fiber Reinforced Concrete)	L.S.	1.00	
7	2404-7775000	Reinforcing Steel	Lb.	36,843	
8	2404-7775005	Reinforcing Steel, Epoxy Coated	Lb.	126,486	
9	2404-7775009	Reinforcing Steel, Stainless Steel	Lb.	3,712	
10	2408-7800000	Structural Steel	Lb.	1,878	
11	2414-6424110	Concrete Barrier Railing	L.F.	307.0	
12	2433-0001060	Concrete Drilled Shaft, 60 in. Diameter	L.F.	209.0	
13	2433-0003000	Demonstration Shaft	L.F.	41.5	
14	2501-0201042	Piles, Steel, HP 10x42	L.F.	840	
15	2501-6335010	Prebored Holes	L.F.	160	
16	2507-3250005	Engineering Fabric	S.Y.	1,641.0	
17	2507-6800061	Revetment, Class E	Ton	1,491.0	
18	2507-8029000	Erosion Stone	Ton	38.0	
19	2520-0005010	Pop-Up Network Device	Each	1.00	
20	2520-3350010	Field Laboratory	Each	1.00	
21	2526-8285040	Construction Survey, Location Survey	L.S.	1.00	
22	2533-4980005	Mobilization	L.S.	1.00	
23	2599-9999010	Prefabricated Bridge Superstructure Move	L.S.	1.00	
24	2599-9999010	Prefabricated Bridge Superstructure Temporary Works	L.S.	1.00	

Item No.	Estimated Reference Information
1.	Includes excavation for revetment and berm lining near both abutments and piers. All waste must be removed from the project site.
2.	The lump sum bid for "Removal of Existing Bridge" shall include removal and disposal of the existing structure, including all attached guardrail. All salvageable material and unsalvageable material shall become the property of the contractor and shall be removed from the site by the contractor. The existing pier shall be removed to an elevation at least two feet below finished groundline and to the extent it will not interfere with the new construction, nor the temporary works for the 'Prefabricated Bridge Superstructure Move'.
	Contractor to add the following information when submitting the Iowa DNR "Notification of Demolition" form: Name of Asbestos Inspector: Brad Azeltine Date Inspected: 6/2/2022 IA License Number: Iowa DOT Phone: 515-239-1938 Procedure used to detect the presence of asbestos materials: Polarized Light Microscopy (PLM)
3.	Includes excavation for bridge abutments and wings. Additional excavation associated with construction of temporary works will be subsidiary to the bid item "Prefabricated Bridge Superstructure Temporary Works".
4.	Concrete for the slab, abutment diaphragms, abutment footings, pier diaphragms, and pier caps shall be Class C, with a 28-day strength of 4.0 ksi, as defined in Section 2403 of the Standard Specifications.
	Includes permanent neoprene bearing pads at abutments and piers. Includes all resilient joint filler and non-shrink grout required. Includes furnishing and placing subdrain (including excavation), floodable backfill, porous backfill, geotextile fabric, water flooding, butyl rubber membrane, and subdrain outlet at abutments. Includes furnishing and placing 3 inch diameter PVC plastic pipe and expanding foam in the abutment wings.
	Includes furnishing and placing concrete sealer on the pier cap as shown in these plans.
5.	Includes the cost of fiber reinforcement for the slab, abutment diaphragms, and pier diaphragms. The concrete is to be paid for in the bid item "Structural Concrete (Bridge)". Refer to Developmental Specifications for "Fiber Reinforcement for Structural Concrete" for additional information.
6.	All work and materials shall be in accordance with Section 2403 of the Standard Specifications unless noted otherwise. The method of measurement for payment shall be lump sum and shall include all labor and materials necessary for trial batch and test placement of fiber reinforced concrete. The Contractor will be paid the contract unit price for Trial Batch and Test Placement (Fiber Reinforced Concrete) upon acceptance of the trial batch and placement by the Iowa DOT's Resident Construction Engineer. Refer to the Developmental Specification for "Fiber Reinforcement for Structural Concrete" for additional information.
8.	Includes mechanical splicers in the abutment footing and superstructure.
10.	Includes cost of 4 drains at 45 lbs. steel per drain. Includes 1,336 lbs. of stainless steel embedded plates (for slide option), and 362 lbs. of corrugated metal pipe.
11.	If placement of concrete is done by the slipforming method, Class BR concrete is required. Cast-in-place barrier rails shall use Class C mix. Price bid for this item shall include the cost of cast-in-place forms if required, for placement of the concrete.
12.	Includes cost of C.S.L. testing at each shaft. Submittal of a drilled shaft installation plan shall be required. Length measured from bottom of rock socket to construction joint. See Design Sheet 10 for additional notes.

Item No.

### Estimated Reference Information

13. Demonstration shaft shall be as detailed on Design Sheet 10. Includes all costs of materials and labor including concrete, reinforcing steel, excavation and excavation incidentals including casing and C.S.L. testing of shaft. See Design Sheet 10 for additional notes.
16. Engineering fabric shall be material as specified for embankment erosion control in accordance with Article 4196.01,B,3, of the Standard Specifications. Material shall be measured in sq. yard of actual area covered.
17. Estimated at 1.5 ton/cu yd. Class E revetment shall meet requirements of Section 4130 of the Standard Specifications.
18. Estimated at 1.6 ton/cu. yd. Erosion Stone shall meet the requirements of Section 4130 of the Standard Specifications.
23. Refer to Special Provisions for Prefabricated Bridge Superstructure Move. Includes cost of temporary laminated neoprene bearings with PTFE as shown on these plans. If additional bearing pads are needed for the Contractor's means and methods of Prefabricated Superstructure Move, they shall be incidental and no additional payment will be made. Bearings used for superstructure move shall not be used for final construction.
24. Refer to Special Provisions for Prefabricated Bridge Superstructure Move.

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Pier Details	V.8
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# Traffic Control Plan

The roadway will be closed to thru traffic only during the critical closure period. Refer to the traffic control plan shown elsewhere in these plans.

Note:  
404 permit information and the  
Pollution Prevention Plan are shown  
elsewhere in these plans.

Note:  
Roadway quantities are shown  
elsewhere in these plans.

Design For 0° Skew

# 140'-0" x 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans 55'-0" Interior Span

## Estimated Quantities

STA. 57+50.00 (☐ IA 21) Turn-In Date: April 2026

### Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326 Design Sheet No. 1 of 26 FHWA No. 032601

## Summary of Concrete Quantities

‡ Includes abutment and pier diaphragm concrete above joints; excludes barrier rail concrete.

(F) Note: The concrete for Fiber Reinforced Structural Concrete is included in the quantity "Structural Concrete (Bridge)" shown on Design Sheet 1. The fiber reinforcement for Fiber Reinforced Concrete is paid for separately in the bid item "Fiber Reinforcement for Structural Concrete" shown on Design Sheet 1.

## Summary of Reinforcing Steel

# Includes abutment and pier diaphragm reinforcing above joints; includes wing reinforcing; excludes barrier rail reinforcing.

## Summary of Excavation

Location	Class 10 Excavation	Class 20 Excavation
South Abutment	525	75
North Abutment	481	75
Total (Cu. Yds.)	1,006	150

## Summary of Foundations

Location	Substructure Type	Foundation Type	Number	Length (Lin. Ft.)	Total (Lin. Ft.)
South Abutment	Integral Abutment Δ	HP10x42	8	50.0	400.0
North Abutment	Integral Abutment Δ	HP10x42	8	55.0	440.0
Pier No. 1	Frame Pier	60" Drilled Shaft	2	53.0	106.0
Pier No. 2	Frame Pier	60" Drilled Shaft	2	51.5	103.0
South Abutment	Integral Abutment Δ	Prebored Holes	8	10.0	80.0
North Abutment	Integral Abutment Δ	Prebored Holes	8	10.0	80.0
Demonstration Shaft	-	60" Drilled Shaft	1	41.5	41.5
Total HP 10x42 (Lin. Ft.)					840.0
Total 60" Drilled Shaft (Lin Ft.)					209.0
Total Demonstration Shaft (Lin Ft.)					41.5
Total Prebored Holes (Lin. Ft.)					160.0

Δ Non-standard ABC Abutment

## Summary of Structural Steel

## Summary of Bearings

[illegible]

\* Laminated Neoprene Bearings w/ PTFE are incidental to "Prefabricated Bridge Superstructure Move".

**\*\* Plain Neoprene Bearing Pads are incidental to "Structural Concrete (Bridge)".**

## Design For 0° Skew

140'-0" x 40'-0" Continuous  
Concrete Slab Bridge

42'-6" End Spans

55'-0" Interior Span

## Summary Quantities

STA. 57+50.00 (C LA 21)

Turn-in Date: April 2026

## Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326

Design Sheet No. 2 of 26

FHWA No. 032601

General Notes:

It is the intent of this design to construct a 140'-0" x 40'-0" continuous concrete slab bridge, skewed 0°, on IA 21 over Cedar Creek at Sta. 57+50.00.

This design is for the replacement of the existing 80'-0" x 30'-0" steel deck girder bridge, Design No. 1448, with a year of construction of 1949. Electronic plans of the existing structure are available to the Contractor as part of the e-files supplied with the contract documents.

The lump sum bid for "Removal of Existing Bridge" shall include all costs associated with removal of the existing 80'-0" x 30'-0" steel deck girder bridge, FHWA No. 032600.

Removals shall be in accordance with Section 2401, of the Standard Specifications.

Faint lines on plans indicate the existing structure.

All plan dimensions are horizontal unless noted otherwise.

Utility companies whose facilities are shown on the plans or known to be within the construction limits shall be notified by the bridge contractor of the construction starting date.

This bridge is designed for HL-93 loading, plus 20 lbs. per square foot of roadway for future wearing surface.

All reinforcing bars and bars noted as dowels supplied for this structure shall be deformed reinforcement unless otherwise noted or shown.

These bridge plans label all reinforcing steel with English notation (5a1 is 5⁄8 inch diameter bar). English reinforcing steel received in the field may display the following "Bar Designation". The "Bar Designation" is the stamped impression on the reinforcing bars, and is equivalent to the bar diameter in millimeters.

English Size	3	4	5	6	7	8	9	10	11
Bar Designation	10	13	16	19	22	25	29	32	36

Minimum clear distance from face of concrete to near reinforcing bar is to be 2" unless otherwise noted or shown.

Keyway dimensions shown on the plans are based on nominal dimensions unless stated otherwise. In addition, the bevel used on the keyway shall be limited to a maximum of 10 degrees from vertical.

It shall be the bridge Contractor's responsibility to provide sites for excess excavated material. No payment for overhaul will be allowed for material hauled to these sites.

Contractor shall provide 2 weeks advanced notice to the Iowa DOT's Resident Construction Engineer before critical closure.

The bridge Contractor will be the only Contractor at the site and is responsible for the completion of all work as detailed and noted in these plans.

Class 20 excavation quantites are based on the assumption that the channel excavation is completed prior to starting construction of the abutments.

The bridge Contractor is to clear and/or shape the channel within the approximate limits shown on the "Situation Plan" and "Longitudinal Section Along Centerline IA 21" on Design Sheet 4 and the "Site Plan" on Design Sheet 5.

Concrete barrier rails placed using slipform method will require the use of a Class BR concrete in accordance with Article 2513.03, A, 2, of the Standard Specifications. Cast-in-place barrier rails shall use Class C mix. Class D concrete is not permitted for concrete barrier rails (cast-in-place or slipformed method).

See roadway plans for longitudinal grooving bid items and notes.

See roadway plans for guardrail bid items and notes.

The floor slab as shown includes a 3⁄4" wearing surface.

The bridge contractor shall prebore holes for abutment piles. Holes shall be bored to the elevations shown on the "Longitudinal Section Along Centerline IA 21" on Design Sheet 4. Piles shall be driven through the holes to at least the specified nominal axial bearing resistance.

General Notes (Cont.):

A scrape sample was taken from an area of this bridge to get an indication of the existence of and level of total lead and total chromium. Analysis of total lead on this sample was 1100 parts per million (ppm). Analysis of total chromium on this sample was 300 ppm. These analyses show the existence of these two toxic constituents. Levels indicated by these tests could create conditions above regulatory limits for health and safety requirements. No other constituents were analyzed. The bidder should not rely on the Iowa DOT's testing and analysis for any purpose other than as an indication of the existence of these two toxic constituents.

Mechanical Splice Assembly Notes:

The bars in the abutment footings and abutment diaphragms shall be spliced at the locations shown using mechanical splice assemblies, for connection of horizontal wing reinforcing bars after the superstructure move. Mechanical splice assemblies consist of mechanical splicers and reinforcing splice bars as required to facilitate the use of the mechanical splicer. The mechanical splice assembly used shall meet the requirements of Materials IM 451 Appendix E.

The cost of all splice assemblies is to be included in the price bid for "Reinforcing Steel, Epoxy Coated" and no separate payment will be made. The weight of mechanical splice assemblies is not included in the quantity shown for "Reinforcing Steel, Epoxy Coated". The number of epoxy coated splice assemblies required are as follows:  
Each Abutment Footing - 12 Assemblies (5n1 & 5n2 Bars) and (5n1 & 5n3 Bars)  
Each Abutment Diaphragm - 12 Assemblies (5n1 & 5n2 Bars)

Pocket Voids:

Abutment footings, abutment diaphragms, pier caps, and pier diaphragms shall be constructed with circular voids to allow placement of dowels secured with non-shrink grout after the bridge move. All voids shall be constructed at the locations shown in these plans with 6"Ø CMP. All 6"Ø CMP shall be galvanized corrugated steel pipe, style 1, 16 gage in accordance with Section 4141 of the Standard Specifications and Materials I.M. 441.

Specifications:

Design: AASHTO LRFD Bridge Design Specifications, 10th Ed., Series of 2024.  
Construction: Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, Series 2023, plus applicable General Supplemental Specifications, Developmental Specifications, Supplemental Specifications and Special Provisions shall apply to construction work on this project.  
- Developmental Specification for "Fiber Reinforcement for Structural Concrete"  
- Developmental Specification for "Construction Progress Schedule"  
- Developmental Specification for "Mass Concrete - Control of Heat of Hydration"  
The following elements qualify as mass concrete on this project: Pier Caps.  
- Developmental Specification for "Portable Pop-up Network for Inspection Use"  
- Special Provisions for "Prefabricated Bridge Superstructure Move"

Working Drawing and Calculation Submittals

Working drawings and calculations shall be submitted for the following items shown in the table below. (Note additional working drawings and calculations may be required in accordance with Article 1105.03 of the Standard Specifications.)

Submittal requirements for working drawings and calculations shall be in accordance with 1105.03 of the Standard Specifications for Highway and Bridge Construction of the Iowa Department of Transportation. The absense of a certification requirement for a submittal does not relieve the Contractor of the responsibility to attain certification.

Calculation submittals in this table which are associated with working drawing submittals shall be submitted on the same day. Review time for calculation submittals shall be of the same duration as and run concurrently with review time for associated working drawings. The calculation submittals listed in the table are not meant to be an exhaustive list and do not relieve the contractor from providing additional calculation submittals if requested by the Engineer.

No.	Working Drawing Description	Working Drawing File Name Convention For Submittal	Certified by Iowa P.E. (Yes/No)
1	Slab Falsework Plans	(46)_Keokuk_Design0326_SlabFalsework.pdf	Yes
2	Slab Drains	(46)_Keokuk_Design0326_SlabDrains.pdf	No
3	Stainless Steel Embedded Diaphragm Plates	(46)_Keokuk_Design0326_StainlessEmbedPl.pdf	No
4	Permanent Neoprene Bearing Pads	(46)_Keokuk_Design0326_PermBearingPads.pdf	No
5	Temporary Laminated Neoprene Bearings	(46)_Keokuk_Design0326_TempBearings.pdf	Yes*
6	Drilled Shaft Installation Plan	(46)_Keokuk_Design0326_DrilledShaftInstall.pdf	No
7	Prefabricated Bridge Superstructure Move	(46)_Keokuk_Design0326_SuperstructureMove.pdf	Yes
8	Acceptance Letter for Temp. Works Const.	(46)_Keokuk_Design0326_AcceptanceLetter.pdf	Yes
No.	Calculation Description	Calculation File Name Convention For Submittal	Certified by Iowa P.E. (Yes/No)
9	Slab Falsework Calculations	(46)_Keokuk_Design0326_SlabFalseworkCalcs.pdf	Yes
10	Prefabricated Bridge Superstructure Move	(46)_Keokuk_Design0326_SuperstructureMoveCalcs.pdf	Yes

\*Yes, but only if design deviates from that shown in these plans.

Design Stresses:

Design stresses for the following materials are in accordance with the AASHTO LRFD Bridge Design Specifications, 10th Ed., Series of 2024.  
Reinforcing steel in accordance with LRFD AASHTO Section 5, Grade 60, for epoxy and non-coated bars, and Grade 60 or 75 for stainless steel reinforcing.  
Concrete in accordance with LRFD AASHTO Section 5, f'c = 4,000 psi.  
Structural steel in accordance with LRFD AASHTO Section 6. ASTM A709 Grade 36 or Grade 50 ( AASHTO M270 Grade 36 or Grade 50).  
n = 8 for tension steel  
2n = 16 for compression steel  
HL-93 live load plus 20 lbs. per sq. ft. for future wearing surface.  
End span length is used to calculate equivalent width in live load distribution.  
Six foot of approach slab dead & live load included in abutment loads.  
Control of cracking by distribution of reinforcement for slab design based on the AASHTO LRFD Bridge Design Specifications, 10th Ed., Series of 2024.

Value Engineering Proposals:

Contractors may develop alternative construction proposals that allow the state to benefit from reduced costs, while maintaining the same or reduced ABC construction schedule for the project. The Contractor shall also perform any necessary redesign of bridge components resulting from the changes. Only alternate designs that utilize a prefabricated bridge constructed off-alignment and moved to the final positon will be accepted for review under the value engineering proposal. The design must provide the required performance, reliability, quality and constructability.

Changes to the prefabricated bridge superstructure move system (E.G. PTFE slide, rollers, SPMT, heavy lift) are not subject to the cost savings sharing requirements of value engineering propals and shall be submitted per the requirements of the Special Provision for Prefabricated Bridge Superstructure Move.

Minimum Age for Concrete Loading Notes:

All concrete pours on the critical path during the critical closure period shall require the use of maturity method as described in Article 2403.03, N, 2 of the Standard Specifications and Materials I.M. 383. The maturity method will be used to determine the minimum age for loading based on strength requirements only. All costs associated with implementing the maturity method will not be paid for separately, but will be incidental to "Structural Concrete (Bridge)".

Bridge Slab Dimensions Table

No.	Item	Unit	Quantity
1	Slab Length	L.F.	141.3
2	Minimum Slab Width	L.F.	43.2
3	Maximum Slab Width	L.F.	43.2
4	Slab Area	S,F.	6,105

- Slab length is measured from face-to-face of paving notches along the centerline of roadway.
3. Slab widths are measured from out-to-out of slab perpendicular to the centerline of roadway.
4. Slab area is to be based on the face-to-face paving notch distance and out-to-out slab dimensions.

Design History at This Site

Des. No.	Type of Work
1448	Original Design
188	Bridge Deck Overlay
---	Scour Countermeasures (2005)
---	Bridge Painting (2020)
120	Retrofit Rail End Sections

Design For 0° Skew

140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans55'-0" Interior Span

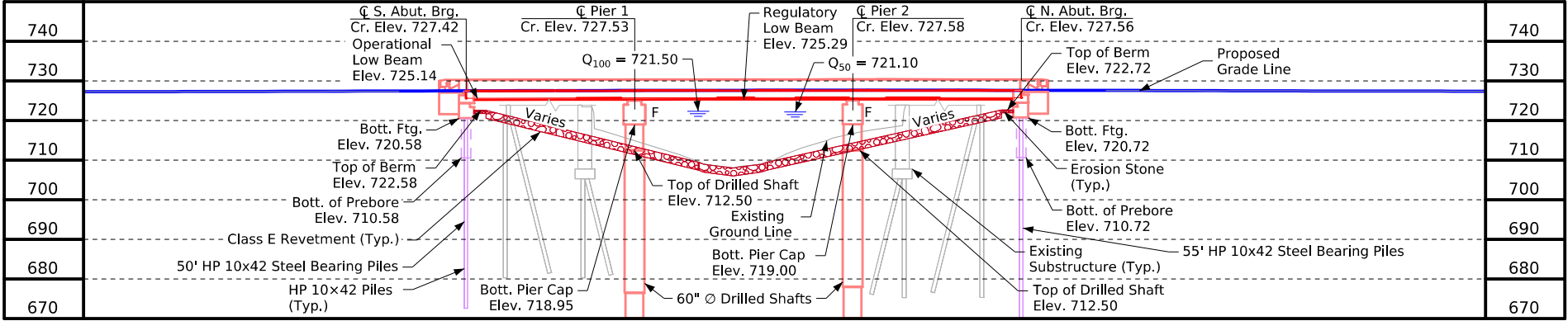
General Notes

STA. 57+50.00 (C̸ IA 21)Turn-in Date: April 2026

Keokuk County

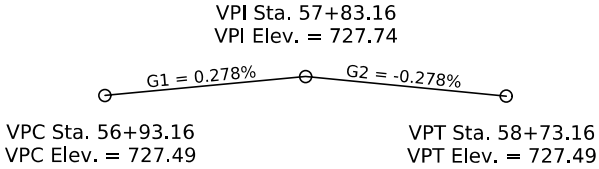
IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326Design Sheet No. 3 of 26FHWA No. 032601



Longitudinal Section Along CL Iowa 21

BENCH MARK NO. CP3: N:6801790.67 E:23379896.47; ELEV 719.57  
SET 3/8" REBAR ON THE SOUTHEAST SIDE OF THE BRIDGE ON THE SOUTH SIDE OF THE CREEK BANK



Proposed Profile  
Grade IA 21

(Note: the vertical profile is in a 0.2679% tangent near the South abutment. See Roadway Sheets for additional profile information.)

Hydraulic Data

RIDB: CedarC\_Keo\_12.0  
Drainage Area = 24.9 Sq. Mi.  
Stream Slope (HGL) = 8.9 Ft./Mi.  
Avg. Low Water Stage = 709.5  
Channel Low Beam = 725.25

Q<sub>50</sub> = 3,200 cfs  
Stage = 721.1  
Avg. Bridge Velocity = 6.2 fps

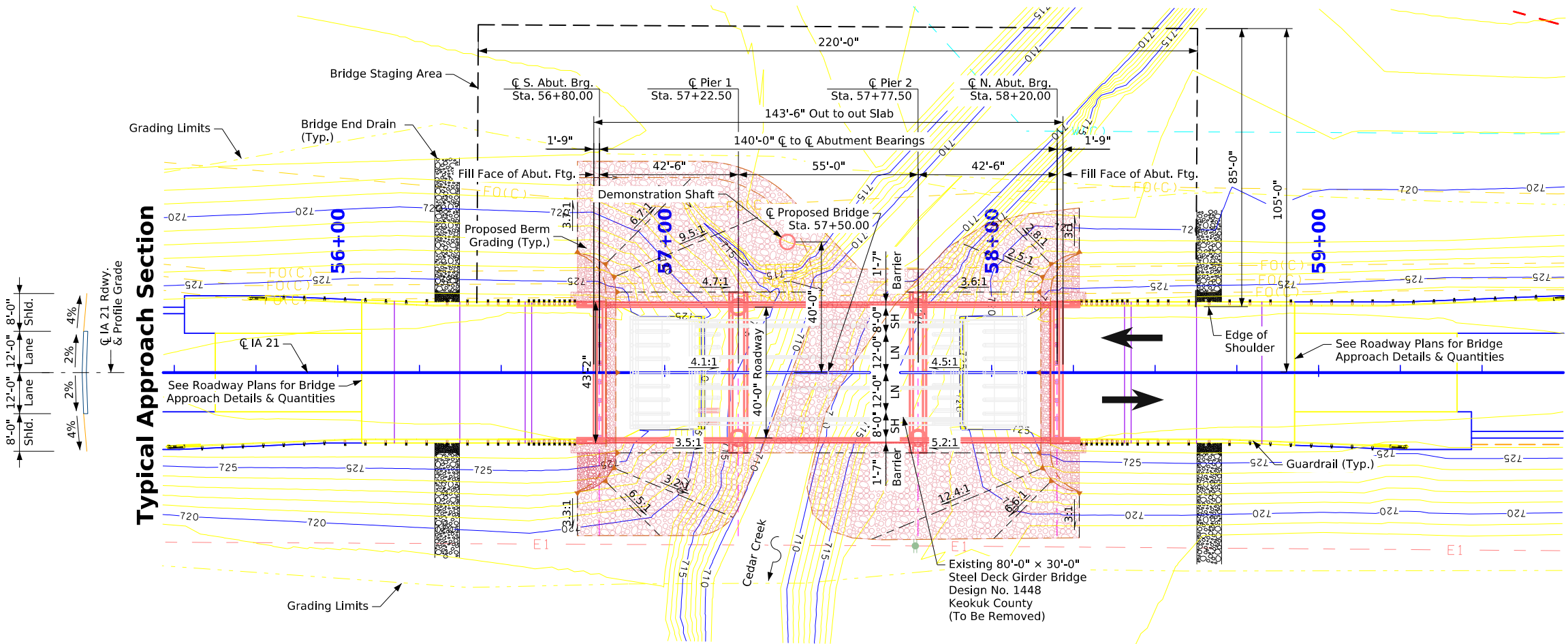
Q<sub>100</sub> = 3,780 cfs  
Stage = 721.5  
Backwater = 1.1 Ft.  
Avg. Bridge Velocity = 6.9 fps

Q<sub>200</sub> = 4,400 cfs  
Stage = 721.9  
Calculated Design Scour = 697.2

Q<sub>500</sub> = 5,260 cfs  
Stage = 722.5  
Avg. Bridge Velocity = 8.6 fps  
Calculated Check Scour = 696.0

Notes

Top of slab crown (Cr.) elevation at CL roadway is 0.03' below the profile grade to account for parabolic crown.  
All units are in feet unless otherwise noted.  
Accelerated Bridge Construction (ABC) sequence is intended, using temporary supports and a prefabricated bridge superstructure move. See Bridge Staging Plan on Design Sheet 6.  
The overhead power line was determined by Alliant Energy to be located at an adequate offset as to not be impeded by the construction activities. Contractor to inform the Engineer if their equipment will need to be located within a 10 ft clearance envelope of the energized overhead power line.  
\* Water Line will be relocated by Wapello Rural Water Association where its location conflicts with the Bridge Staging Area.  
\*\* The existing overhead power line will be relocated by others prior to the drilled shaft construction at east side of the bridge.



Situation Plan



Location

IA 21 over Cedar Creek  
1.1 mi. N. of IA 92  
T-76N R-13W  
Sections 27 & 28  
Washington Township  
Keokuk County  
FHWA No. 32601  
Bridge Maint. No. 5414.5S021  
Latitude 41.351996°  
Longitude -92.354357°

Hydraulic Design



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: Mark D. Werner Date: 12-2-2025

Printed or Typed Name: Mark D. Werner

My license renewal date is December 31, 2027

Pages or sheets covered by this seal: V.4

Utilities Legend:

- Gas Line - Alliant Energy
- Electrical Line - Alliant Energy \*\*
- Water Line - Wapello Rural Water Association \*
- Fiber Optic Line - Windstream (Abandon In Place)

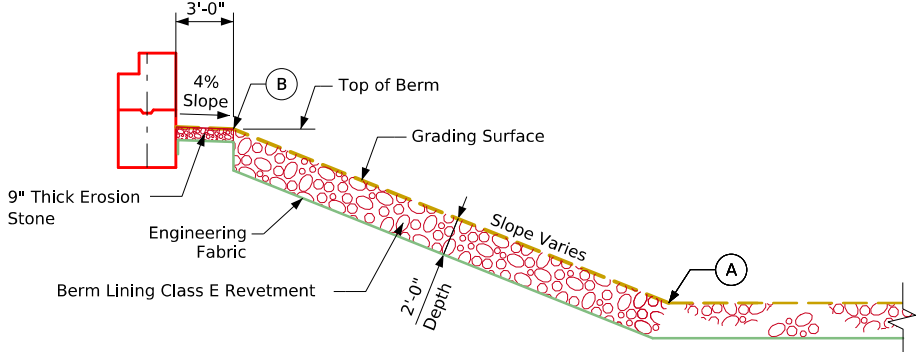
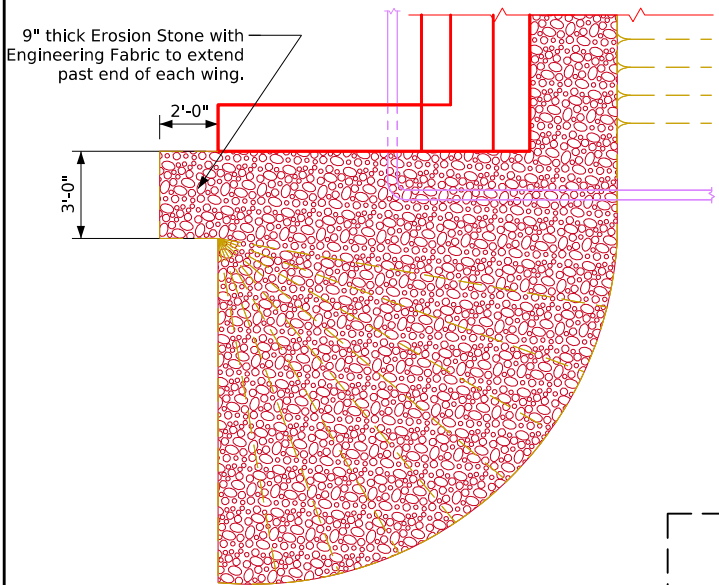
Utilities Notes:

Utilities shown on this sheet are for information only. See Road Design sheets for utility information.  
For utility questions, contact the District Utility Coordinator, Bryan Archer (email: bryan.archer@iowadot.us; phone: 641-469-4025), prior to construction.

Design For 0° Skew  
140'-0" x 40'-0" Continuous  
Concrete Slab Bridge

Situation Plan

42'-6" End Spans 55'-0" Interior Span  
STA. 57+50.00 (CL IA 21) Turn-in Date: April 2026  
Keokuk County  
IOWA DEPARTMENT OF TRANSPORTATION  
Design No. 0326 Design Sheet No. 4 of 26 FHWA No. 032601



Section B-B

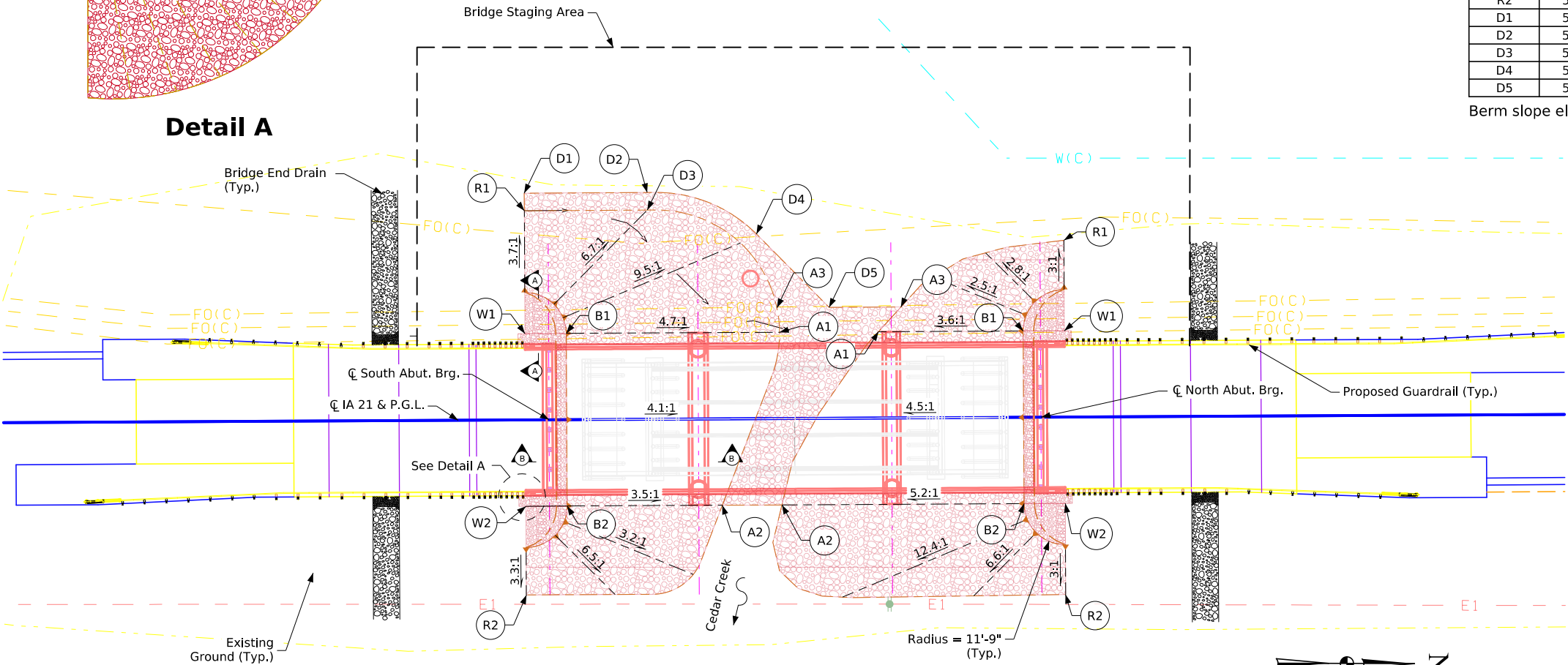
BENCH MARK NO. CP3: N:6801790.67 E:23379896.47; ELEV 719.57  
SET 3/8" REBAR ON THE SOUTHEAST SIDE OF THE BRIDGE ON THE SOUTH SIDE OF THE CREEK BANK

Berm Slope Location Table

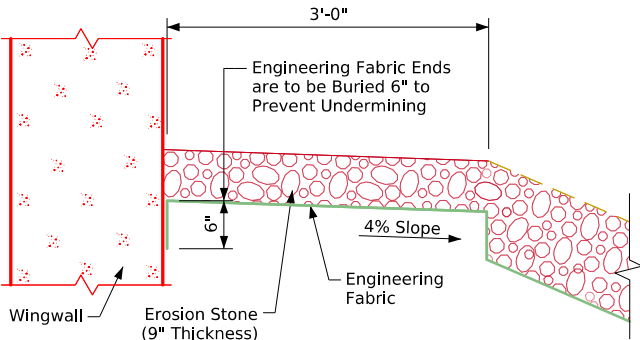
Points	South Abutment			North Abutment		
	Station	Offset	Elev.	Station	Offset	Elev.
A1	57+45.70	24.58' LT	709.60	57+73.86	24.58' LT	711.15
A2	57+29.16	24.58' RT	710.11	57+46.12	24.58' RT	709.45
A3	57+44.99	31.58' LT	712.06	57+80.28	31.58' LT	710.04
B1	56+85.00	24.58' LT	722.58	58+15.00	24.58' LT	722.72
B2	56+85.00	24.58' RT	722.58	58+15.00	24.58' RT	722.72
W1	56+73.25	24.58' LT	726.70	58+26.75	24.58' LT	726.85
W2	56+73.25	24.58' RT	726.70	58+26.75	24.58' RT	726.85
R1	56+73.25	59.58' LT	717.47	58+26.75	50.34' LT	718.58
R2	56+73.25	49.85' RT	719.32	58+26.75	50.51' RT	718.65
D1	56+73.25	64.58' LT	717.85	-	-	-
D2	57+10.70	64.58' LT	717.24	-	-	-
D3	57+10.70	59.58' LT	717.14	-	-	-
D4	57+39.27	52.58' LT	716.89	-	-	-
D5	57+59.85	31.58' LT	708.39	-	-	-

Berm slope elevations reflect the grading surface.

Detail A



Site Plan



Section A-A

General Notes:

The bridge berm foreslope shall be compacted and shaped as shown on these plans, the Situation Plan, and as directed by the Engineer. The berm foreslope shall be firm when the Engineering Fabric, Erosion Stone and Class E Revetment are placed.

Erosion stone shall be placed along the sides of the wings and abutment footing as shown in Section A-A. This is typical at each corner of the bridge unless otherwise noted in the plans. Erosion stone shall also be placed along the top of the berms as shown in Section B-B. The erosion stone and Class E Revetment shall be underlaid with engineering fabric in accordance with Article 4196.01, B, 3, of the Standard Specifications. If the fabric is lapped, the laps shall be a minimum of one foot in length, placed in shingle fashion with the upslope lap piece on top and stapled for continuity.

The erosion stone shall be in accordance with Section 4130, of the Standard Specifications.

The erosion stone shall be deposited, spread, consolidated and shaped by mechanical or hand methods that will provide uniform 9 inch depth and density and provide uniform surface appearance.

Estimated Berm Armoring Quantities

Location	Revetment CL. E (Ton)	Erosion Stone (Ton)	Engineering Fabric (SY)	CL. 10 Channel Excavation (CY)
Berm Lining - South	782	19	860	525
Berm Lining - North	709	19	781	481
Totals	1491	38	1641	1006

Excavation quantity calculated from grading surface.  
Excavation quantity is for embedded revetment and erosion stone core out only, and does not include excavation to the grading surface. Excavation quantity to the grading surface is determined by Road Design and included in the Road Plans.  
Class E revetment based on density of 1.5 ton/CY.  
Erosion stone based on density of 1.6 ton/CY.

Utilities Notes:

Utilities shown on this sheet are for information only. See Road Design sheets for utility information.  
\* Water Line will be relocated by Wapello Rural Water Association where its location conflicts with the Bridge Staging Area.  
\*\* The existing overhead power line will be relocated by others prior to the drilled shaft construction at east side of the bridge. For utility questions, contact the District Utility Coordinator, Bryan Archer (email: bryan.archer@iowadot.us; phone: 641-469-4025), prior to construction.

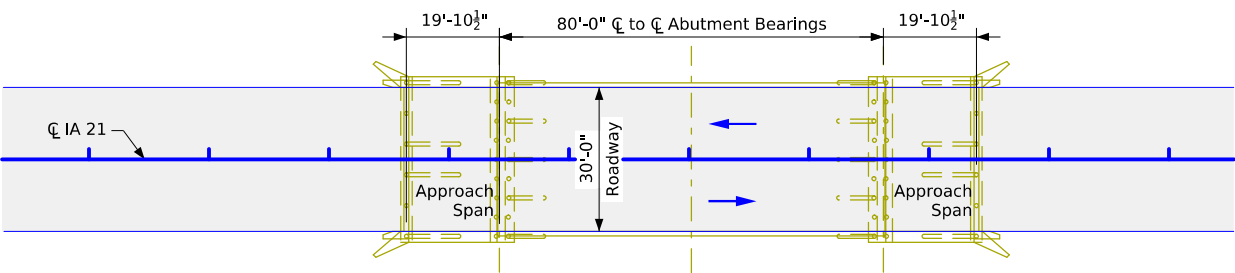
Utilities Legend:

- G Gas Line - Alliant Energy
- E1 Electrical Line - Alliant Energy \*\*
- W(C) Water Line - Wapello Rural Water Association \*
- FO(C) Fiber Optic Line - Windstream (Abandon In Place)

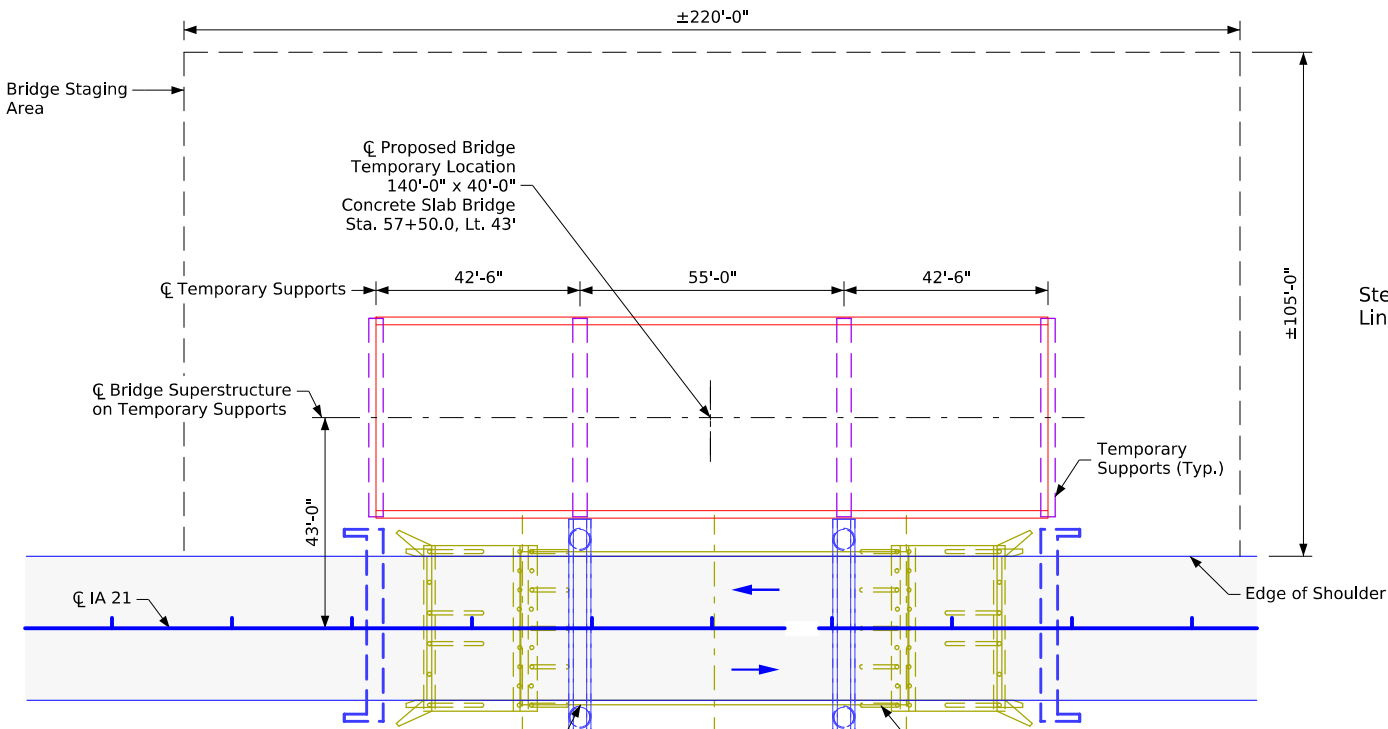
Design For 0° Skew  
140'-0" × 40'-0" Continuous Concrete Slab Bridge

Site Plan

42'-6" End Spans 55'-0" Interior Span  
STA. 57+50.00 (Q IA 21) Turn-in Date: April 2026  
Keokuk County  
IOWA DEPARTMENT OF TRANSPORTATION  
Design No. 0326 Design Sheet No. 5 of 26 FHWA No. 032601

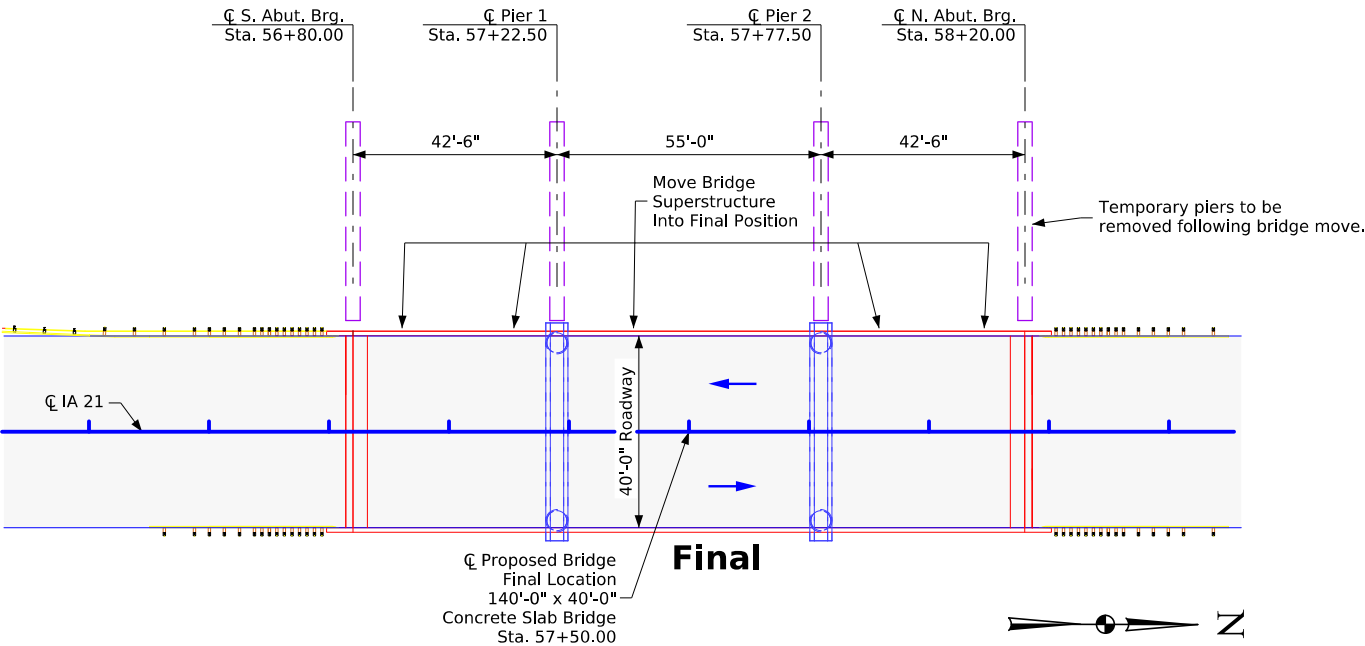


Existing Condition



\* Contractor to remove a portion of the existing steel rail as needed to facilitate drilled shaft installation. Typical at each drilled shaft location.

Stage 1

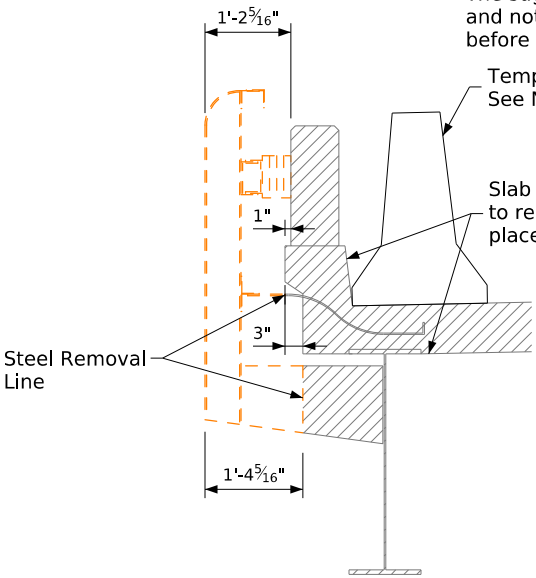


Final

Suggested Construction Sequence for Critical Closure:

- 1. Demolish Existing Bridge.
- 2. Berm Grading / Drive Piling / Place Revetment
- 3. Place Abutment Footing / Pier Caps
- 4. Move Prefabricated Bridge Superstructure
- 5. Place Wingwalls
- 6. Place Backfill Behind Abutments
- 7. Bridge Approach Slab
- 8. Paved Shoulder / Guardrail / Longitudinal Grooving

The suggested construction sequence for critical closure is a general list of major activities and not an exhaustive list of all necessary activities. Barrier Rails may be constructed either before or after Prefabricated Bridge Superstructure Move.



Existing Bridge Railing Removal Detail

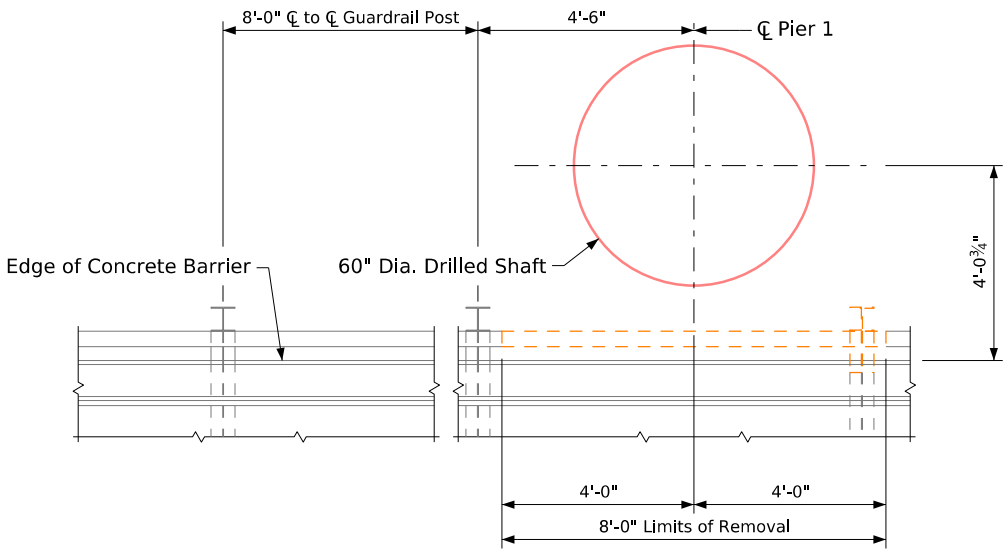
NOTES:  
At the Contractor's option, partial removal of the steel rail and posts will be allowed to facilitate drilled shaft construction. Traffic will be maintained on the existing bridge during and following the partial removal. The Contractor shall submit to the Engineer for approval a partial removal plan before beginning removal operations.

The partial removal plan will show the location and proposed extent of the partial removal, how the removed area will be protected with Temporary Barrier Rail and include all traffic control required during and following removal.

The cost for the partial removal will be considered incidental to the bid item "Removal of Existing Bridge" and no direct payment will be made. Refer to the traffic control plan shown elsewhere in these plans.

The steel overhang brackets shall be cut at the locations noted; no removal of connectors at the girder webs shall be allowed.

\*\* TBR should be placed before the steel rail removal; if the Contractor determines that partial removal of the steel rail as shown is not necessary for the drilled shaft construction, TBR does not need to be placed on the bridge. Refer to Roadway plan sheet B.3 for additional information.



Existing Bridge Railing Removal Detail - Plan View

(Verify all dimensions in the field)  
(West Drilled Shaft Shown, East Drilled Shaft Similar)

Notes:

\* Removal of sections of existing steel rail shall be completed via access from below the bridge such that traffic operations are not impeded prior to the critical closure period.

Grade creek to maintain creek flow around temporary bent locations. Restore creek channel to pre-construction contours after removal of temporary bent piles.

Design For 0° Skew

140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans 55'-0" Interior Span

Bridge Staging Plan

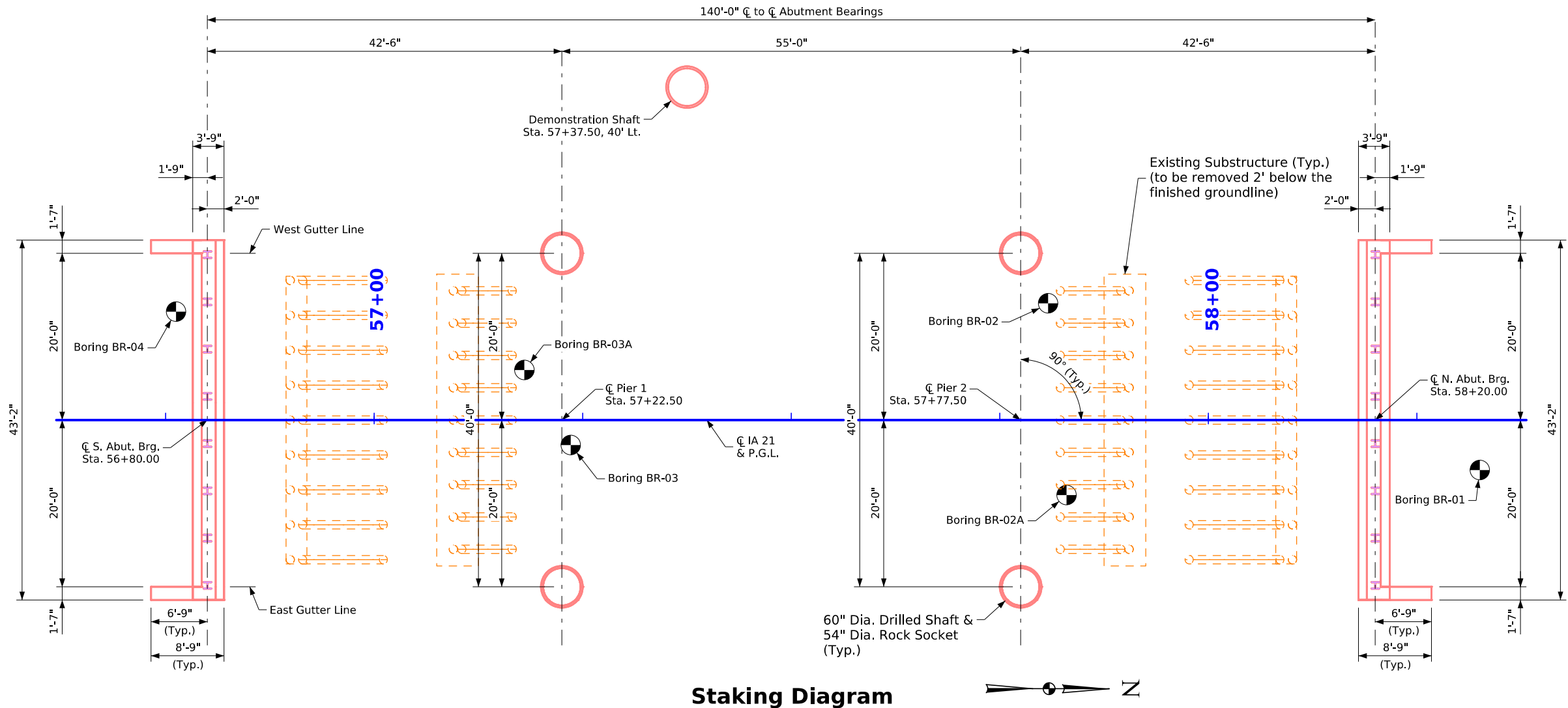
STA. 57+50.00 (CL IA 21) Turn-in Date: April 2026

Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326 Design Sheet No. 6 of 26 FHWA No. 032601

BENCH MARK NO. CP3: N:6801790.67 E:23379896.47; ELEV 719.57  
SET 5/8" REBAR ON THE SOUTHEAST SIDE OF THE BRIDGE ON THE SOUTH SIDE OF THE CREEK BANK



Staking Diagram

Bridge Coordinates				
Location	CL S. Abut. Brg.	CL Pier 1	CL Pier 2	CL N. Abut. Brg.
West Edge of Slab	E = 23379810.226 N = 6801774.827	E = 23379810.000 N = 6801817.326	E = 23379809.707 N = 6801872.326	E = 23379809.481 N = 6801914.825
CL IA 21 & P.G.L.	E = 23379831.809 N = 6801774.942	E = 23379831.583 N = 6801817.441	E = 23379831.290 N = 6801872.440	E = 23379831.064 N = 6801914.940
East Edge of Slab	E = 23379853.392 N = 6801775.057	E = 23379853.166 N = 6801817.556	E = 23379852.873 N = 6801872.555	E = 23379852.647 N = 6801915.055

Note: an electronic file containing the bridge coordinate data is available as part of the e-files supplied with the contract documents. The Contractor shall verify these coordinates with the project horizontal control information provided in the road plans.

Design For 0° Skew

140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans55'-0" Interior Span

Staking Diagram

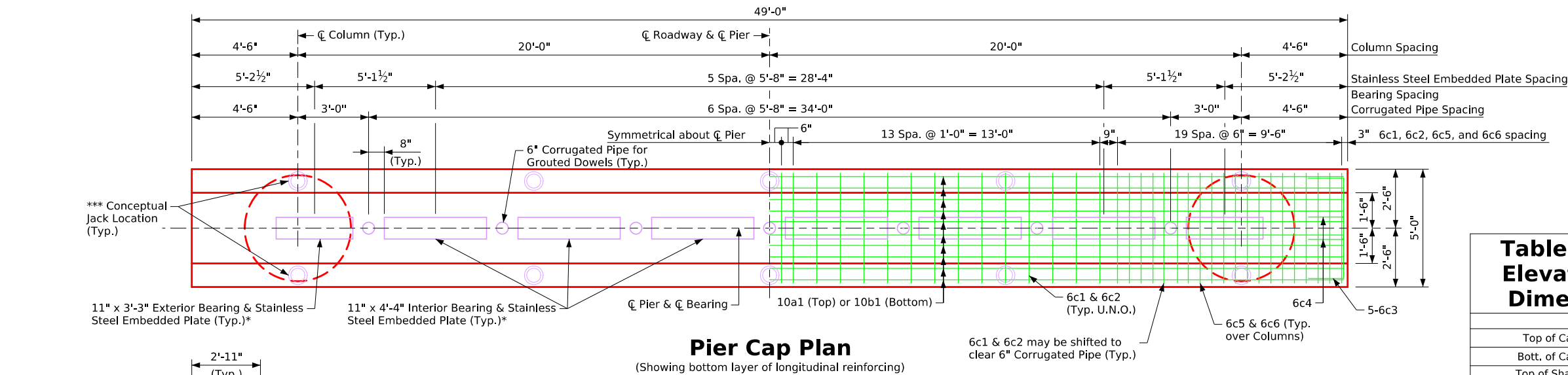
STA. 57+50.00 (CL IA 21)Turn-in Date: April 2026

Keokuk County

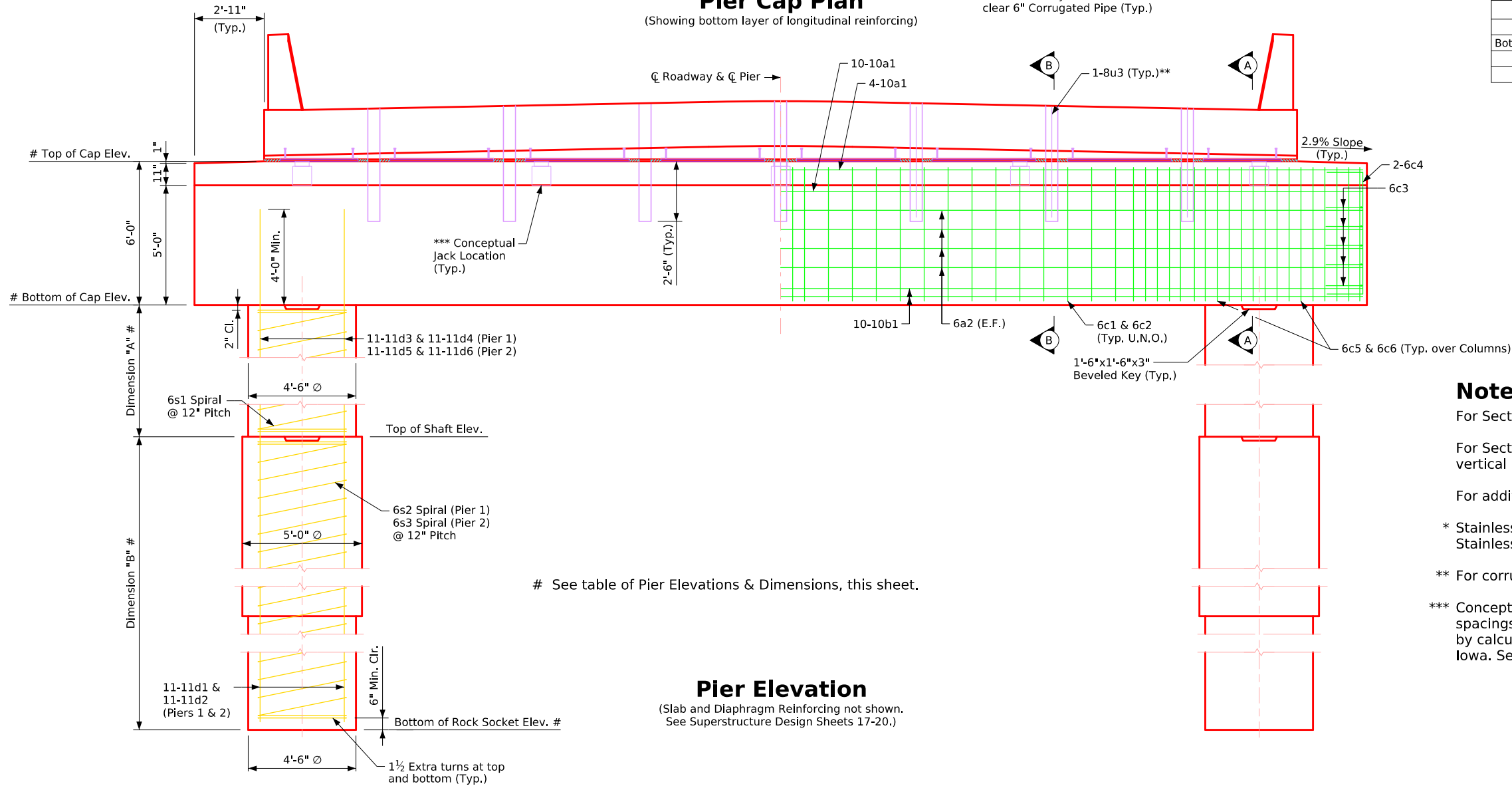
IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326Design Sheet No. 7 of 26FHWA No. 032601

Bench Mark No. CP3: N: 6801790.67 E: 23379896.47, Elev. 719.57  
Set  $\frac{5}{8}$ " Rebar on the Southeast Side of the Bridge on the South Side of the creek bank.



**Pier Cap Plan**  
(Showing bottom layer of longitudinal reinforcing)

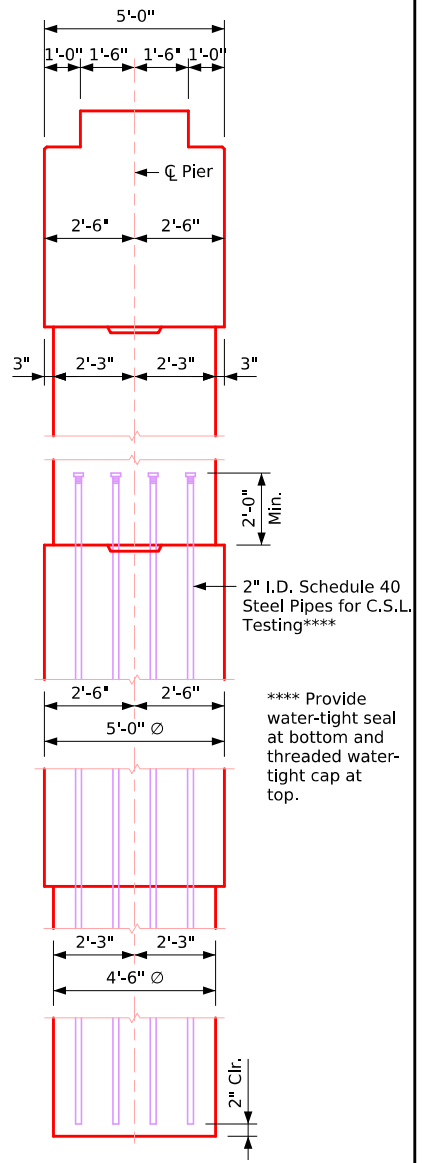


**Pier Elevation**

(Slab and Diaphragm Reinforcing not shown.  
See Superstructure Design Sheets 17-20.)

**Table of Pier Elevations & Dimensions**

	Pier 1	Pier 2
Top of Cap	724.95	725.00
Bott. of Cap	718.95	719.0
Top of Shaft	712.50	712.50
Bott. of Rock Socket	659.50	661.00
Dimension "A"	6'-5 3/8"	6'-6"
Dimension "B"	53'-0"	51'-6"



**End Elevation**

**Notes:**

For Section A-A, Section B-B, and Cap End Reinforcing, see Design Sheet 9.

For Sections Through Column and Drilled Shaft, as well as lap information for vertical bars in Drilled Shaft, see Design Sheet 10.

For additional Pier Notes, see Design Sheet 10.

\* Stainless Steel Embedded Plate is to be cast in the superstructure diaphragm. Stainless Steel Embedded Plates to be deleted if roller move is utilized.

\*\* For corrugated pipe and dowel notes, see Design Sheet 15.

\*\*\* Conceptual jack locations are shown. The actual number of jacks and spacings shall be the responsibility of the Contractor and shall be supported by calculations sealed by a Professional Engineer licensed in the State of Iowa. See Special Provision for "Prefabricated Bridge Move".

Design For 0° Skew  
**140'-0" x 40'-0" Continuous Concrete Slab Bridge**

42'-6" End Spans 55'-0" Interior Span

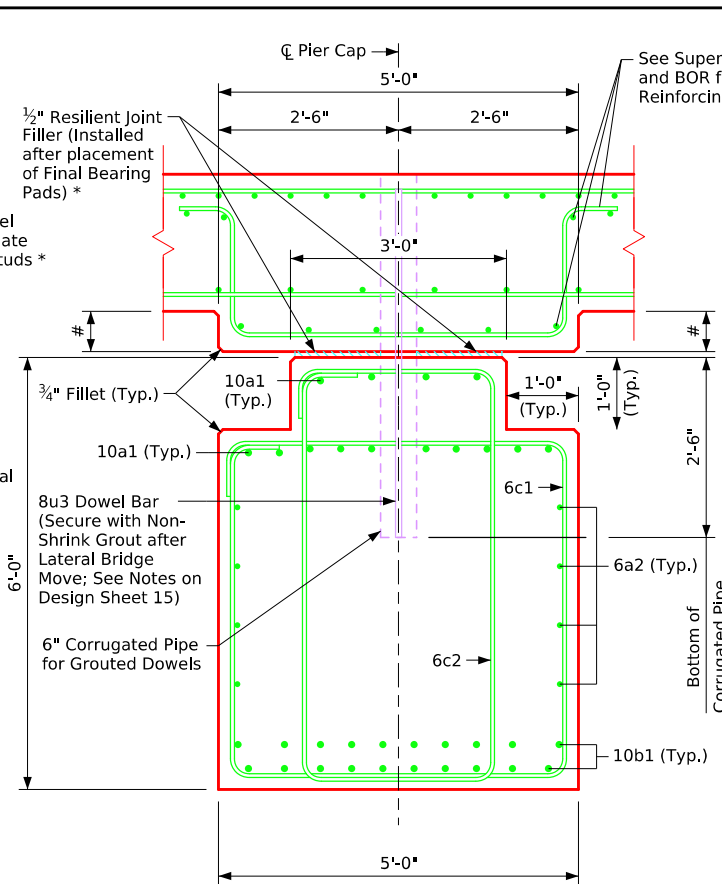
**Pier Details**

STA. 57+50.00 (C/LA 21) Turn-in Date: April 2026

**Keokuk County**

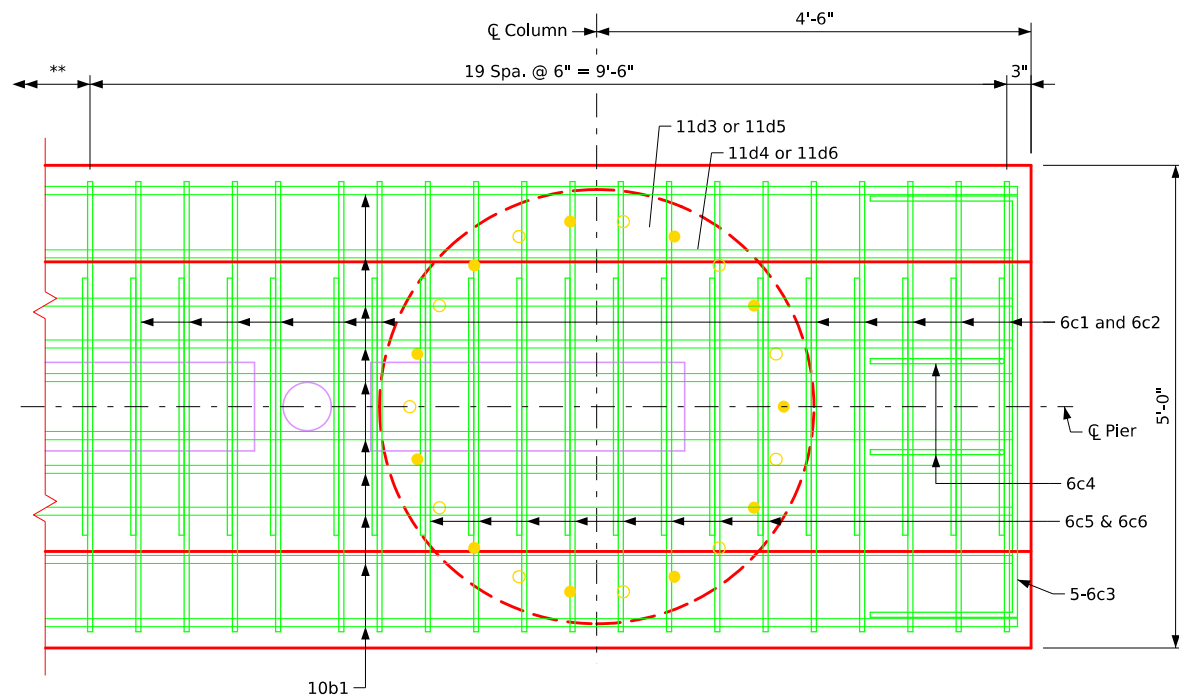
IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326 Design Sheet No. 8 of 26 FHWA No. 032601

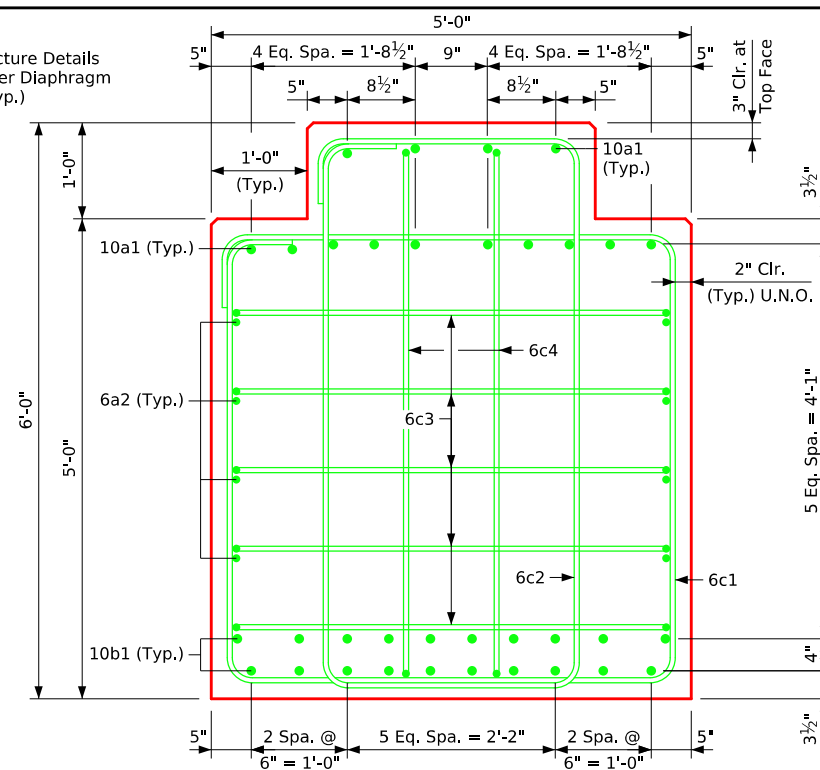


(See Cap End View for longitudinal bar spacing)  
(Spiral not shown for clarity)

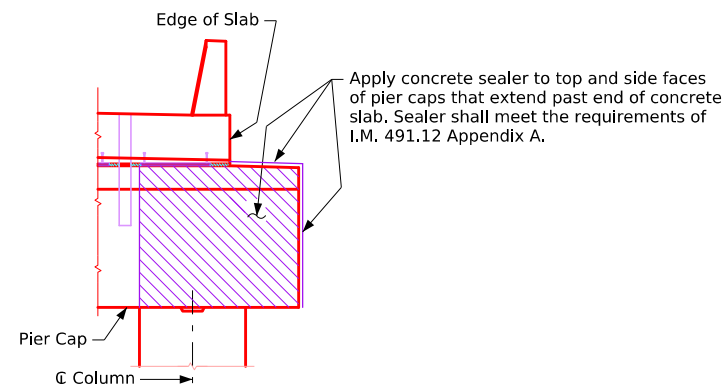
(See Cap End View for longitudinal bar spacing)



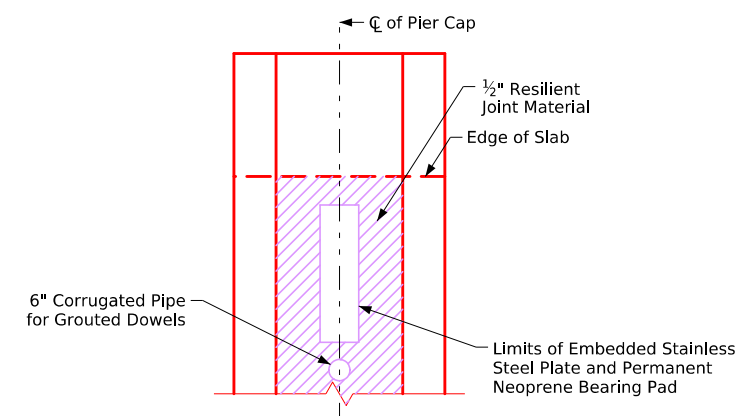
(Showing bottom layer of longitudinal reinforcing)



### Cap End View



## Pier Cap Concrete Sealer Detail



Showing treatment of 1/2" resilient joint material around bearings.

- For locations of Section A-A, B-B and Cap End View, see Design Sheet 8.

- \*\* See Pier Cap Plan Design Sheet 8.

- # Varies, see Design Sheet 17 for additional information.

Design For 0° Skew

# 140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans 55'-0" Interior Span

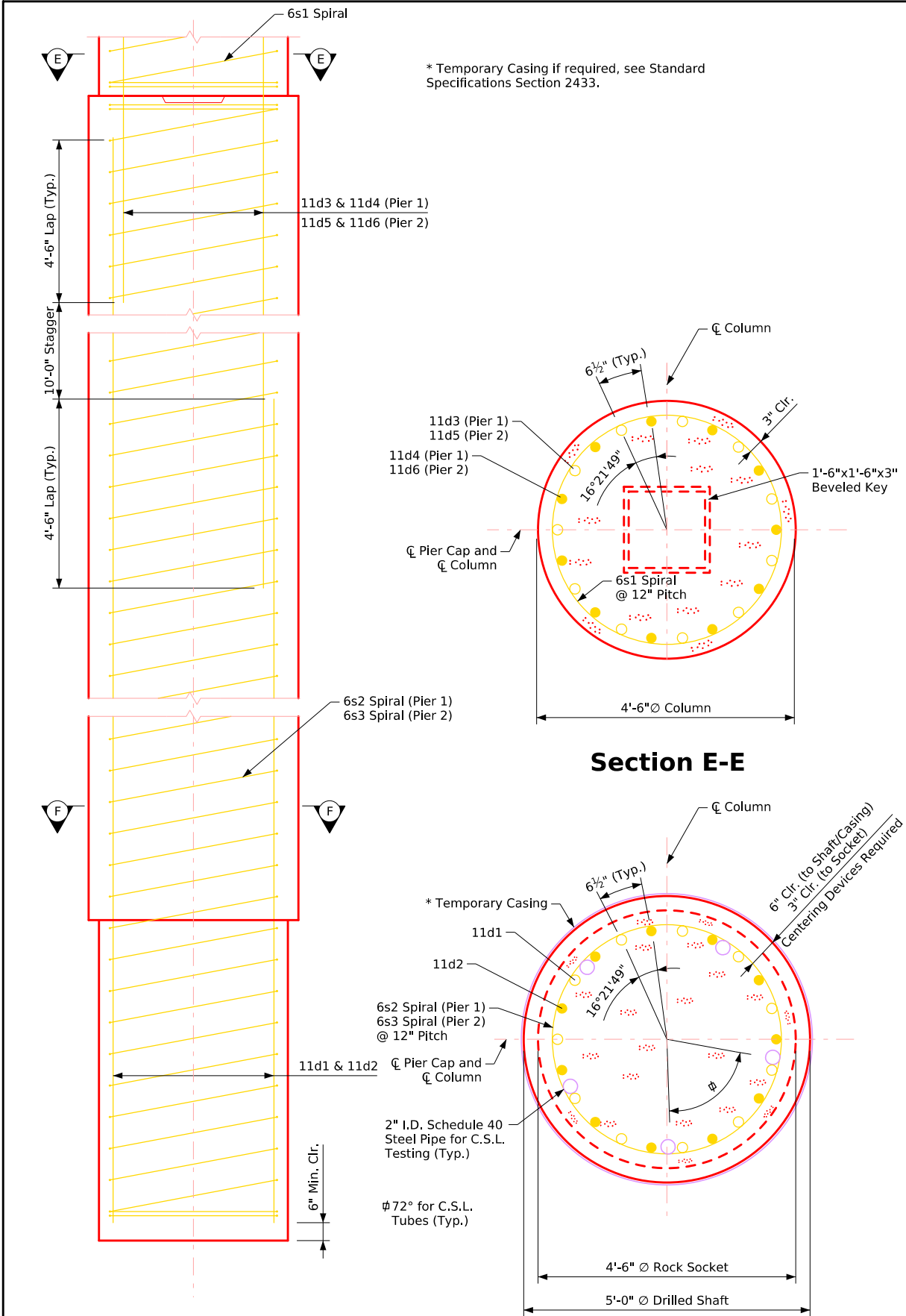
## Pier Details

STA. 57+50.00 (C/L IA 21) Turn-in Date: April 2026

### Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326 Design Sheet No. 9 of 26 FHWA No. 032601



Pier Notes:

All exposed corners 90° or sharper are to be filleted with a 3/4" dressed and beveled strip.

Minimum clear distance from face of concrete to near reinforcing bar is to be 2 inches unless otherwise noted or shown.

Reinforcing shall be securely wired in place before concrete is placed. No exceptions to this requirement shall be permitted.

Spiral reinforcing is to be No. 6 bar (Columns and Shafts), with pitches as shown in these plans. Place 4 equally spaced L 7/8" x 7/8" x 1/8" spacers punched to hold spirals. Spirals are to have 1½ extra turns at top and bottom of columns and shafts.

The spiral reinforcing may be spliced by lapping 3'-1" (#6 bar). The length of spiral shown does not include the lapped length of the splices. The cost of the laps at splices shall be incidental to the bid item "Reinforcing Steel".

The spiral reinforcing may be substituted with circular ties spaced at the same intervals as the spiral reinforcing noted in these plans. Payment will be based on the weight of the spiral reinforcement. No adjustments in reinforcing steel pay weightwill be allowed. See bent bar details for bar size and splice lap length.

Article 4151.03, A, 2, of the Standard Specifications shall not be permitted for spiral reinforcement.

Forms for Pier Caps on Piers 1 & 2 may be removed with the approval of the Engineer when the following two conditions have been met:

- 1) Pier Cap concrete has been in place for a minimum of 5 calendar days, excluding days that the concrete surface is subjected to temperatures at or below 40°f.
- 2) The Pier Cap concrete strength is at least 2.50 ksi

Concrete strength shall be verified by flexural strength according to Materials I.M. 316 or by the maturity method according to Materials I.M. 383. Curing of Pier Cap concrete shall be in accordance with the Standard Specifications. Pier Cap concrete shall attain a minimum concrete strength of 4.00 ksi before being subjected to exterior loads, including superstructure jacking or sliding loads. Pier Cap concrete shall be subjected to exterior loads in accordance with Article 2403.03, N, of the Standard Specifications.

Concrete Sealer is to be applied to the Pier Caps as shown on Design Sheet 9 in accordance with the Standard Specifications. The cost of furnishing and placing Concrete Sealer is to be included in the price bid for "Structural Concrete (Bridge)".

Contractor may remove a section of existing bridge steel rail and posts to provide clearance for drilled shaft and column construction. See optional Existing Bridge Railing Removal Detail and notes on Design Sheet 6.

Drilled Shaft Notes:

Drilled Shaft Axial Resistance is intended to be developed through skin friction between the shaft and the limestone and shale materials indicated in the soil boring logs. Minimum Rock Socket depth into competent rock shall be as shown on Design Sheet 11. If differing site conditions are encountered, adjustment to the contract length may be required.

If the contract length of the Drilled Shafts must be increased by 6" or less, the rebar cage shall remain at the elevation shown in the plans. The clear space from the bottom of cage to bottom of shaft may be increased from 6" up to a maximum of 12". The C.S.L. Tubes shall be lowered to maintain 2" clear from the bottom of the shaft.

If the contract length of the drilled shafts must be increased by more than 6", the rebar cage must be lengthened. the contractor has the option to either:

- 1) Provide longer vertical bars without introducing an additional splice, or
- 2) Lengthen the vertical bars using contact lap or mechanical splices. Minimum contact lap splice length shall be 4'-6". Splices shall be alternated such that 50% of the bars are spliced at the bottom of the shaft and the remaining 50% are spliced at the top of the shaft. Splice locations shall be a minimum of 10 feet apart.

Regardless of which option is selected, the spiral reinforcing shall be lengthened to extend from top to bottom of rebar cage at the pitch called out in the plans. 1½ extra turns shall be provided at top and bottom of cage. Spirals may be lap spliced as described in the notes.

Drilled Shafts shall be constructed in accordance with Section 2433 of the Standard Specifications. Excavation method shall be determined by the Contractor from the approved methods listed in the Specification and shall be subject to the Engineer's approval. Dry excavation methods will not be allowed. Safety and constructability of the excavation shall be the responsibility of the Contractor. Temporary excavation casing may be required. Refer to the Soil Profile Sheets shown elsewhere in these plans.

The price bid for "Concrete Drilled Shaft, 60 in. Diameter" shall include all costs of materials and labor for excavation and concrete placement and all costs for C.S.L. testing.

Crosshole Sonic Log (C.S.L.) testing shall be required at each Drilled Shaft. Testing shall be in accordance with Article 2433.03, J, of the Standard Specifications.

Drilled Shaft Rock Sockets shall be brushed. Grooving shall be required in shale material and not required in limestone material.

The total factored axial load for each drilled shaft is 1,149 kips.

Demonstration Shaft Notes:

Demonstration Shaft shall conform to details for the 60 inch diameter Drilled Shaft on Design Sheets 8-11. Demonstration Shaft shall be constructed at the location shown on Design Sheet 4. Demonstration Shaft shall extend to the elevations shown on Design Sheet 11, and shall extend a minimum of 3 ft. into rock. Length of Rock Socket shall be determined by a boring at the location of the Demonstration Shaft.

Demonstration shaft shall be removed to at least 3 feet below finished grade, unless it conflicts with the temporary works for the 'Prefabricated Bridge Superstructure Move'. The Contractor has the option to incorporate the demonstration shaft into their temporary works, or propose an alternate location for the demonstration shaft, to avoid conflict with the temporary works.

All costs noted as incidental to "Concrete Drilled Shaft, 60 in. Diameter" shall also be incidental to the bid item "Demonstration Shaft." The bid price should also include the cost for the reinforcement in the Demonstration Drilled Shaft.

Design For 0° Skew

140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans55'-0" Interior Span

Drilled Shaft & Pier Details & Notes

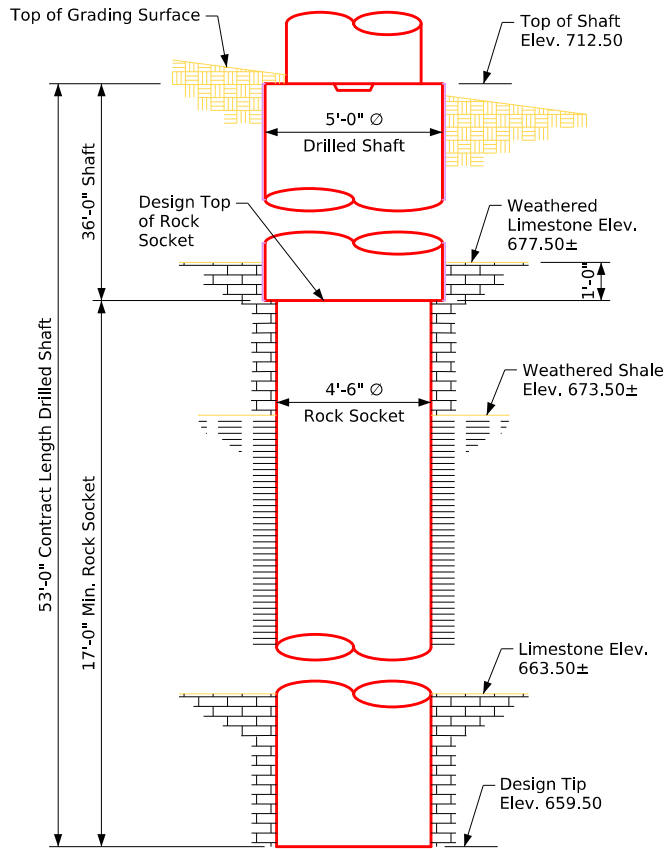
STA. 57+50.00 (C/LA 21)Turn-in Date: April 2026

Keokuk County

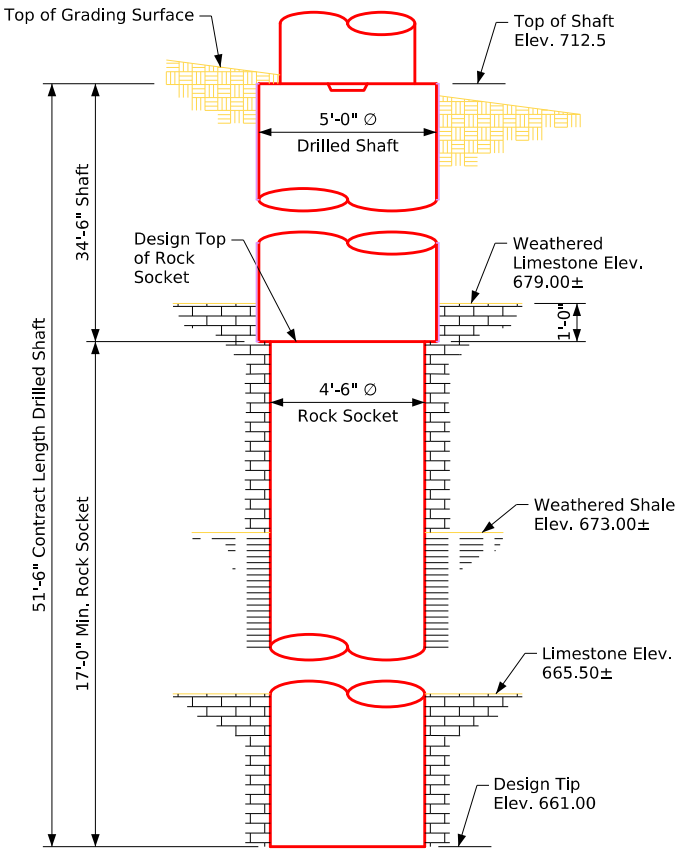
IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326Design Sheet No. 10 of 26FHWA No. 032601

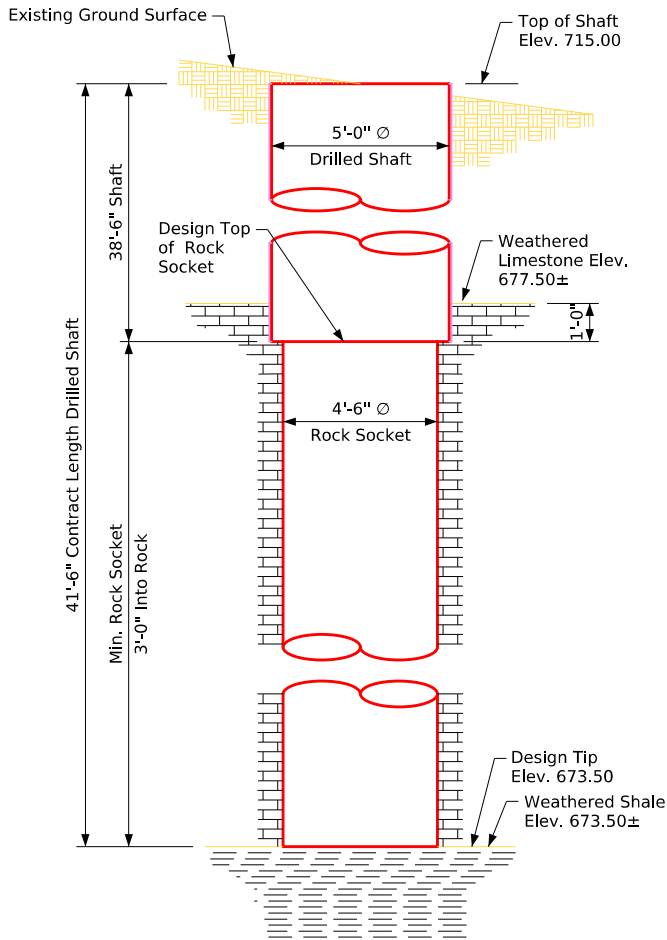
BENCH MARK NO. CP3: N: 6801790.67 E: 23379896.47, ELEV. 719.57  
SET 3/8" REBAR ON SOUTHEAST SIDE OF THE BRIDGE ON THE SOUTH SIDE OF THE CREEK BANK.



Pier 1



Pier 2



Demonstration Shaft

Notes:

For Drilled Shaft and Demonstration Shaft Notes, see Design Sheet 10.

For Pier Drilled Shaft Details, see Design Sheets 8-10.

Design For 0° Skew  
**140'-0" × 40'-0" Continuous Concrete Slab Bridge**  
42'-6" End Spans 55'-0" Interior Span  
**Drilled Shaft Details**  
STA. 57+50.00 (C 1A 21) Turn-In Date: April 2026  
**Keokuk County**  
IOWA DEPARTMENT OF TRANSPORTATION  
Design No. 0326 Design Sheet No. 11 of 26 FHWA No. 032601

The diagram illustrates two methods for connecting reinforcement bars (6c1, 6c2, 6c3, 6c4, 6c5, 6c6) using lap ties. The top method shows a standard lap tie with dimensions: 1'-0" vertical, 1'-0" horizontal, and lap lengths of 4'-8" (6c1, 6c2), 4'-8" (6c3, 6c4), 5'-5" (6c5), and 2'-8" (6c6). The bottom method shows an alternate lap tie with dimensions: 2'-10" vertical, 4'-8" horizontal, and lap lengths of 3'-1" (6c3, 6c4), 4'-8" (6c5), and 5'-7" (6c6). Both methods specify a pin diameter D = 4 1/2".

**Alternate Shaft or Column Tie**  
(Size #6)

Note: Rotate lap 90° every layer when placing bar.

Note: All dimensions are out to out unless noted otherwise. D = Pin Diameter.

Epoxy Coated	Bar	Location	Shape	No.	Length	Weight
	10a1	Cap, Top, Longit.		14	48'-8"	2932
	10b1	Cap, Bottom, Longit.		20	48'-8"	4188
	6a2	Cap, Top & Sides, Longit.		8	48'-8"	585
	6c1	Cap, Hoops		54	20'-8"	1676
	6c2	Cap, Hoops		54	18'-2"	1500
	6c3	Cap, Ends, Horizontal		10	10'-2"	153
	6c4	Cap, Ends, Vertical		4	11'-1"	67
	6c5	Cap, Hoops		16	14'-0"	336
	6c6	Cap, Hoops		16	13'-10"	332
	Reinforcing Steel - Epoxy Coated - Total (Lbs.)					11,769
Non-Coated	11d1	Shaft, Vertical		22	50'-6"	5903
	11d2	Shaft, Vertical		22	40'-6"	4734
	11d3	Column, Vertical		22	17'-0"	1987
	11d4	Column, Vertical		22	27'-0"	3156
	6s1	Column Spiral		2	114'-9"	345
	6s2	Shaft Spiral		2	697'-5"	2095
		Spiral Spacers L <sup>7⁄8</sup> x <sup>7⁄8</sup> x <sup>1⁄8</sup> (0.70 lb/ft)		8	6'-1"	34
		Spiral Spacers L <sup>7⁄8</sup> x <sup>7⁄8</sup> x <sup>1⁄8</sup> (0.70 lb/ft)		8	52'-4"	293
		Reinforcing Steel - Non-Coated - Total (Lbs.)				

Location	Total
Pier Cap	50.8
Columns	7.6
Structural Concrete (Bridge) - Total (Cu. Yds.)	58.4
* Drilled Shafts and Rock Sockets	72.4

Concrete and Reinforcing Steel Quantities are included on the Summary Quantities Sheet.

8u3 vertical dowel bars are included in superstructure quantities.

\* For information only. Concrete for drilled shafts and rock sockets to be included with Drilled Shaft bid item.

Epoxy Coated	Bar	Location	Shape	No.	Length	Weight	
	10a1	Cap, Top, Longit.		14	48'-8"	2932	
	10b1	Cap, Bottom, Longit.		20	48'-8"	4188	
	6a2	Cap, Top & Sides, Longit.		8	48'-8"	585	
	6c1	Cap, Hoops		54	20'-8"	1676	
	6c2	Cap, Hoops		54	18'-6"	1500	
	6c3	Cap, Ends, Horizontal		10	10'-2"	153	
	6c4	Cap, Ends, Vertical		4	11'-1"	67	
	6c5	Cap, Hoops		16	14'-0"	336	
	6c6	Cap, Hoops		16	13'-10"	332	
	Reinforcing Steel - Epoxy Coated - Total (Lbs.)						11,769
Non-Coated	11d1	Shaft, Vertical		22	50'-6"	5903	
	11d2	Shaft, Vertical		22	40'-6"	4734	
	11d5	Column, Vertical		22	15'-6"	1812	
	11d6	Column, Vertical		22	25'-6"	2981	
	6s1	Column Spiral		2	114'-9"	345	
	6s3	Shaft Spiral		2	678'-6"	2038	
		Spiral Spacers L <sup>7⁄8</sup> x <sup>7⁄8</sup> x <sup>1⁄8</sup> (0.70 lb/ft)		8	6'-1"	34	
		Spiral Spacers L <sup>7⁄8</sup> x <sup>7⁄8</sup> x <sup>1⁄8</sup> (0.70 lb/ft)		8	50'-10"	285	
	Reinforcing Steel - Non-Coated - Total (Lbs.)						18,132

Location	Total
Pier Cap	50.8
Columns	7.6
Structural Concrete (Bridge) - Total (Cu. Yds.)	58.4
* Drilled Shafts and Rock Sockets	70.2

Non-Coated	Bar	Location	Shape	No.	Length	Weight
	11d7	Shaft, Vertical		22	40'-10"	4773
	6s4	Shaft Spiral		1	552'-5"	830
		Spiral Spacers L <sup>7</sup> / <sub>8</sub> x <sup>7</sup> / <sub>8</sub> x <sup>1</sup> / <sub>8</sub> (0.70 lb/ft)		4	40'-10"	114
	Reinforcing Steel - Non-Coated - Total (Lbs.)					5717

Design For 0° Skew

# 140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans      55'-0" Interior Span

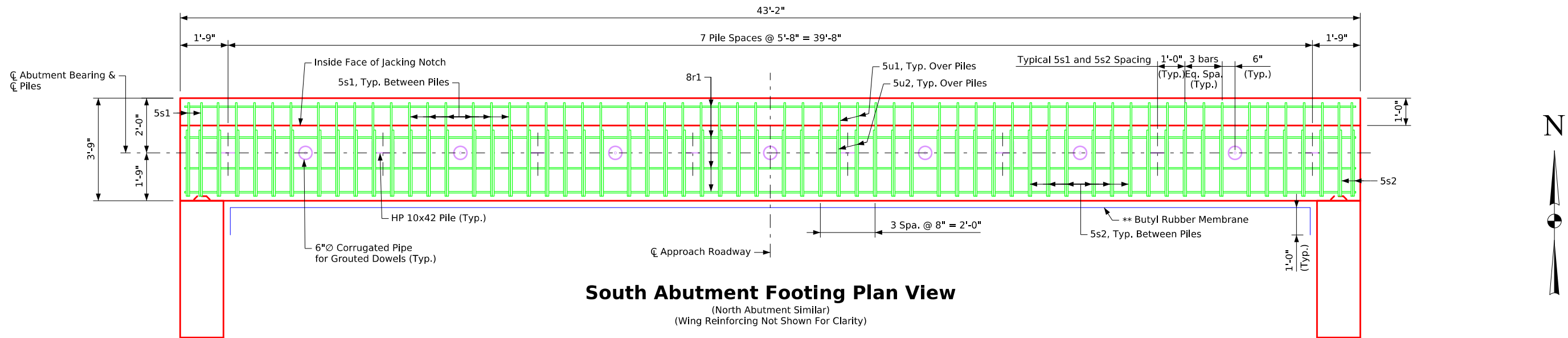
## Pier Quantities

STA. 57+50.00 (C/ IA 21)      Turn-in Date: April 2026

## Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326      Design Sheet No. 12 of 26      FHWA No. 032601



**South Abutment Footing Plan View**

(North Abutment Similar)  
(Wing Reinforcing Not Shown For Clarity)

**Abutment Pile Design Notes:**

The contract length of 50 feet for the south abutment piles and 55 feet for the north abutment piles is based on a mixed soil classification, a total factored axial load per pile (Pu) of 127 kips for the south and north abutment, and a geotechnical resistance factor (phi) of 0.65.

The nominal axial bearing resistance for construction control was determined from a mixed soil classification and a geotechnical resistance factor (phi) of 0.65 for soil and 0.7 for rock end bearing. Piles are assumed to be driven from a start elevation at the bottom of prebore.

**Abutment Pile Driving Note:**

The required nominal axial bearing resistance for south and northabutment piles is 92 tons at end of drive or retap. The pile contract length shall be driven as per plan unless piles reach refusal. Construction control requires a WEAP analysis with bearing graph.

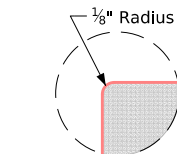
**Notes:**

The spiral at the top of each pile to be 7 turns of No. 2 Bar, 21" Dia., 3" Pitch with 3 - L<sup>7</sup>/<sub>8</sub> x 7/8 x 7/8 spacers punched to hold spiral.

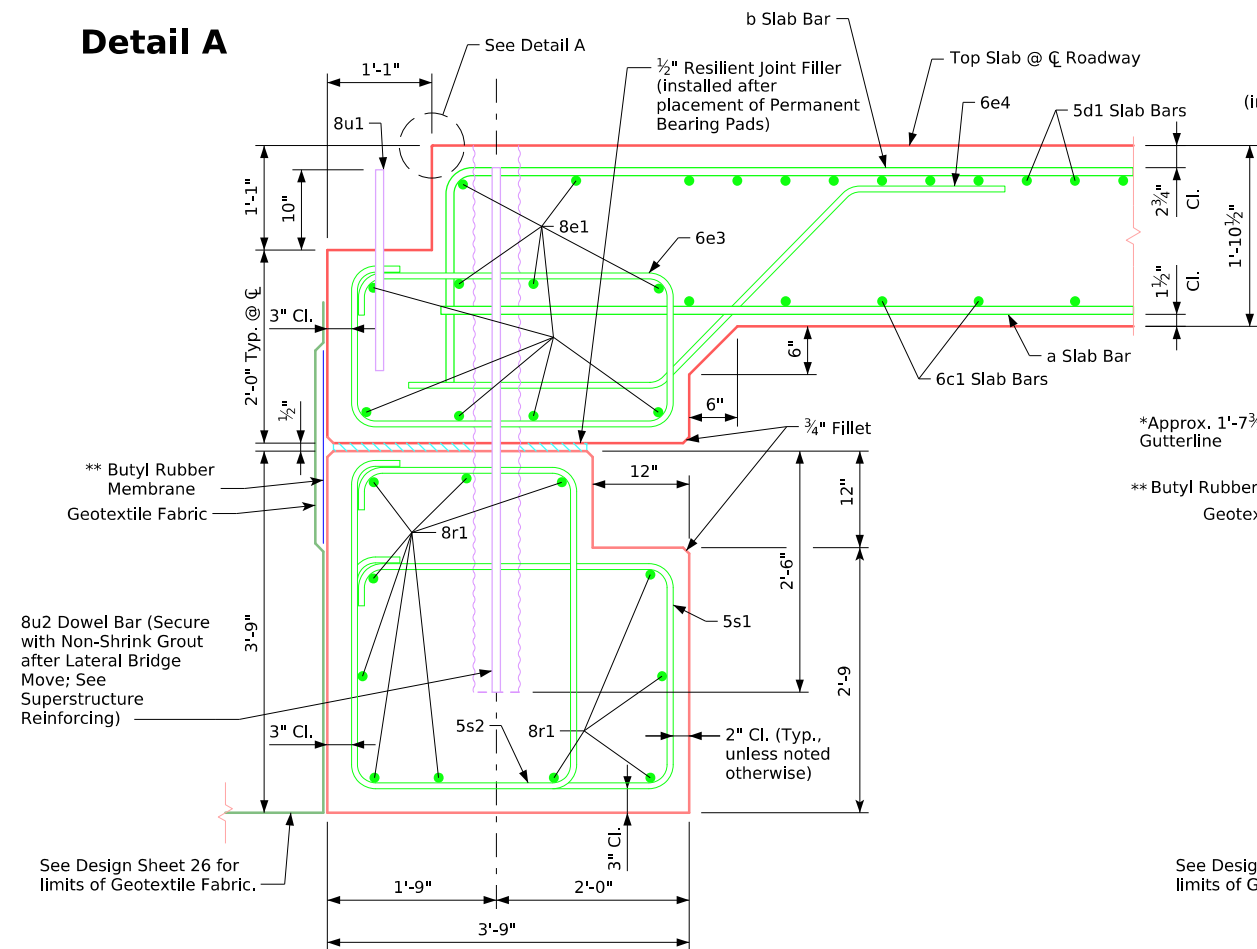
\*\* Butyl rubber membrane to be placed after lateral bridge move to the limits shown in the plans. Membrane shall be centered about the horizontal joint and fastened to both concrete faces with an approved waterproof adhesive. See Design Sheet 26 for additional details.

See Design Sheets 19, 23 & 24 for Wing Wall Reinforcing Details.

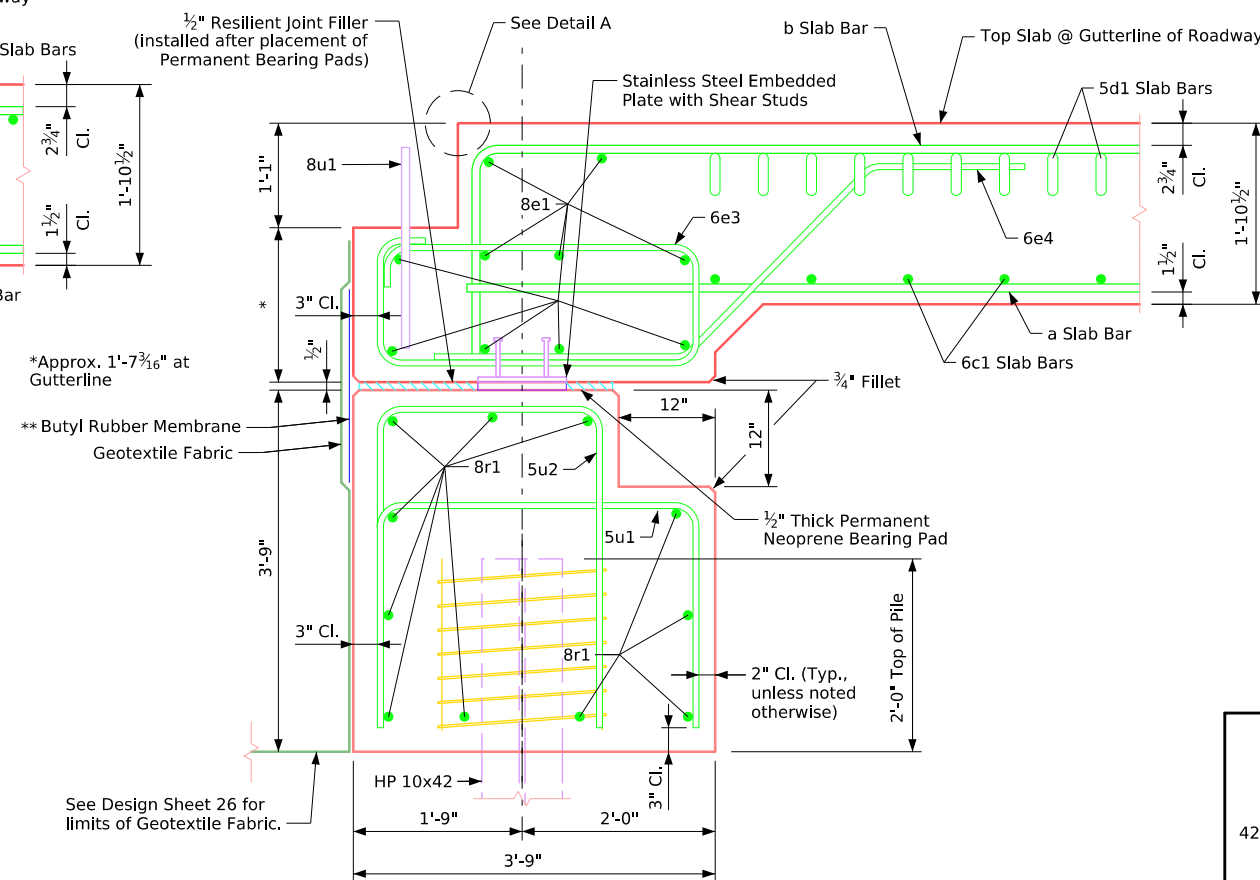
All slab bars, abutment diaphragm bars, and 8u2 dowel bars are included in the Superstructure Quantities.



**Detail A**



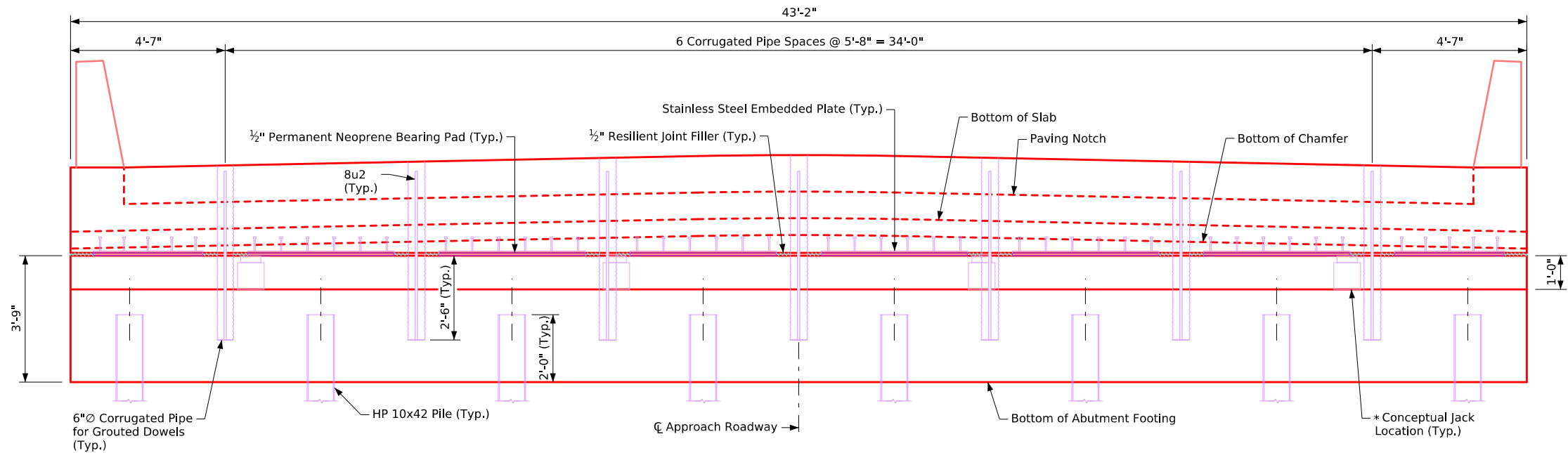
**Abutment Section at Bridge**



**Abutment Section at Gutterline**

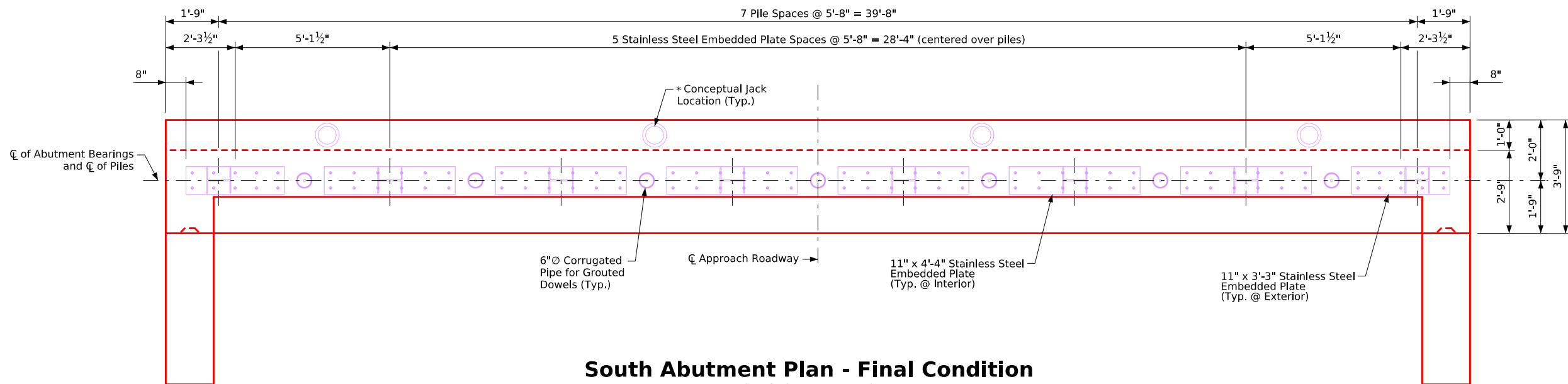
Design For 0° Skew  
**140'-0" × 40'-0" Continuous Concrete Slab Bridge**  
42'-6" End Spans 55'-0" Interior Span  
**Abutment Details**  
STA. 57+50.00 (C/LA 21) Turn-in Date: April 2026  
**Keokuk County**  
IOWA DEPARTMENT OF TRANSPORTATION  
Design No. 0326 Design Sheet No. 13 of 26 FHWA No. 032601





### South Abutment Elevation - Final Condition

(North Abutment Similar)  
(Reinforcing (aside from dowels) not shown, for clarity)



### South Abutment Plan - Final Condition

(North Abutment Similar)  
(Reinforcing (aside from dowels) not shown, for clarity)

#### Notes:

Stainless steel embedded plate is not required on top of sliding surface if a roller-type superstructure move method is used.

See Design Sheet 13 for sections at  $\text{CL}$  Bridge and at Gutterline.

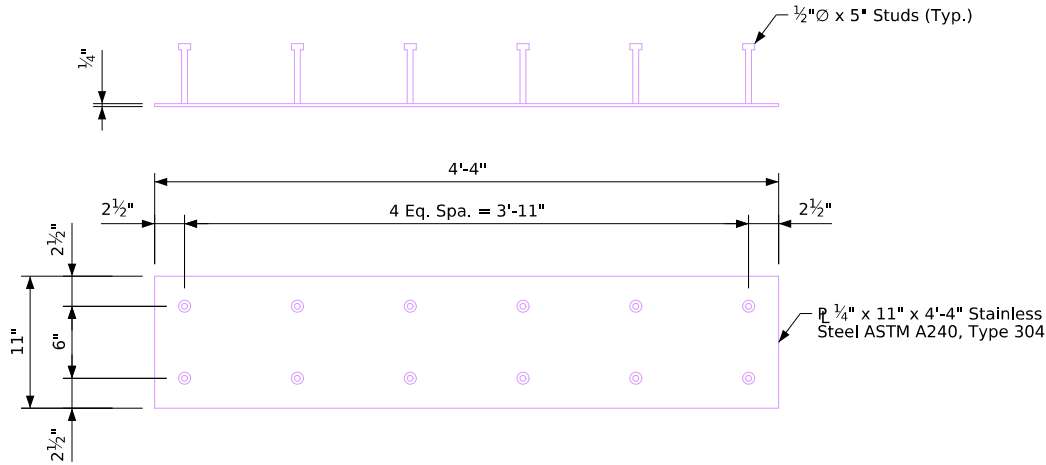
8u2 bars are included in the Superstructure Quantities.

After superstructure move, install  $\frac{1}{2}$ " permanent neoprene bearing pads and resilient joint filler. Then, insert 8u2 dowel bars into 6" diameter corrugated metal pipe sleeves. Fill void with an approved non-shrink hydraulic cement grout per Materials I.M. 491.13, with a minimum compressive strength of 4,000 psi. 8u2 dowel bars shall be centered within each void using bar spacers such that they are held in position during pouring of grout. Dowel bars may not be inserted into fresh grout. Bar clearance to top of slab shall be  $2\frac{3}{4}$ " minimum. Top of grout to be flush with top surface of slab.

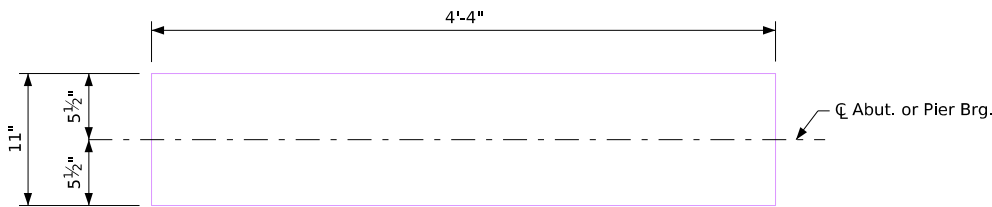
\* Conceptual jack locations are shown. The actual number of jacks and spacings shall be the responsibility of the Contractor and shall be supported by calculations sealed by a Professional Engineer licensed in the State of Iowa. See Special Provision for "Prefabricated Bridge Move".

Design For 0° Skew		
140'-0" × 40'-0" Continuous Concrete Slab Bridge		
42'-6" End Spans		55'-0" Interior Span
Abutment Details		
STA. 57+50.00 ( $\text{CL}$ IA 21)		Turn-in Date: April 2026
Keokuk County		
IOWA DEPARTMENT OF TRANSPORTATION		
Design No. 0326	Design Sheet No. 15 of 26	FHWA No. 032601

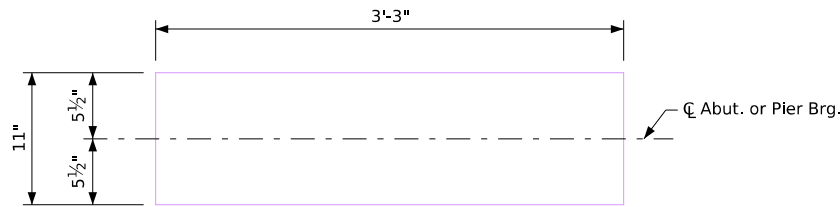
Reinforcing Bar List - One Abutment						
Epoxy Coated	Bar	Location	Shape	No.	Length	Weight
	8r1	Abutment Footing Longitudinal		11	42'-10"	1258
	5s1	Abutment Footing Hoops		46	12'-4"	592
	5s2	Abutment Footing Hoops		46	12'-4"	592
	5u1	Abutment Footing U-bars		16	8'-0"	134
	5u2	Abutment Footing U-bars		16	9'-0"	150
Non-Coated	Reinforcing Steel - Epoxy Coated - Total (Lbs.)					2726
	#2	Pile Spiral		8	38'-6"	51
		Spiral Spacers - L 7/8x7/8x3/8x 0.70		24	1'-10"	31
	Reinforcing Steel - Non-Coated - Total (Lbs.)					82



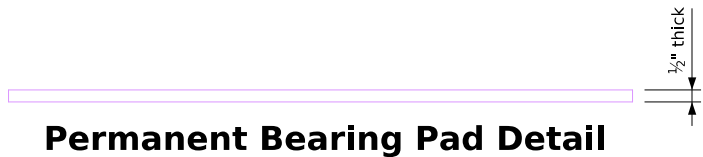
Concrete Placement Summary	
Location	Total
South Abutment Footing	20.9
North Abutment Footing	20.9
Structural Concrete (Bridge) - Total ( Cu. Yds.)	41.8



Permanent Bearing Pad Orientation - Interior



Permanent Bearing Pad Orientation - Exterior



Permanent Bearing Pad Detail

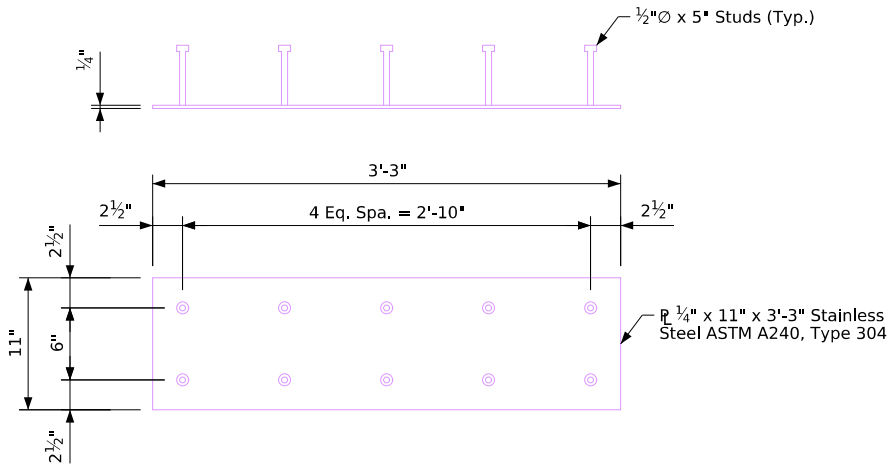
### Notes:

Material for neoprene pads in permanent and temporary cases to be of 60 durometer neoprene.

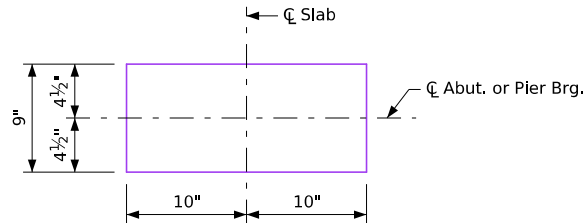
Bottom edge of stainless steel embedded plates shall be flush with bottom surface of abutment and pier diaphragms.

\* If the Contractor chooses a prefabricated bridge move system that does not require sliding the bridge using the stainless steel embedded plates and the temporary bearings with bonded PTFE top surface, then the stainless steel embedded plates and temporary bearings can be omitted.

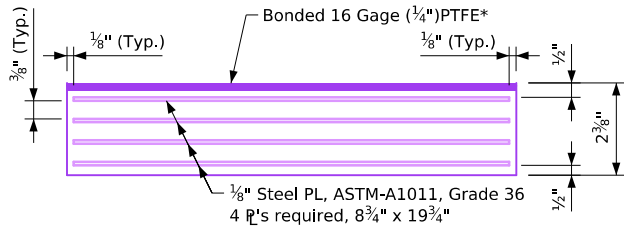
\* Stainless Steel Embedded Plate - Interior



\* Stainless Steel Embedded Plate - Exterior

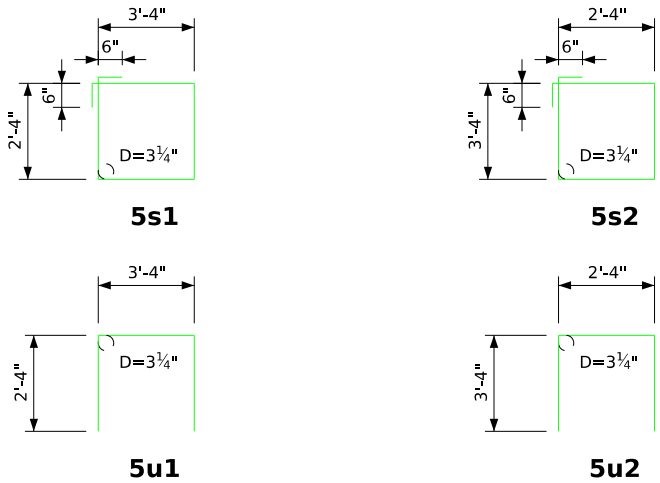


\* Temporary Bearing Orientation



\* Temporary Bearing Detail

### Bent Bar Details

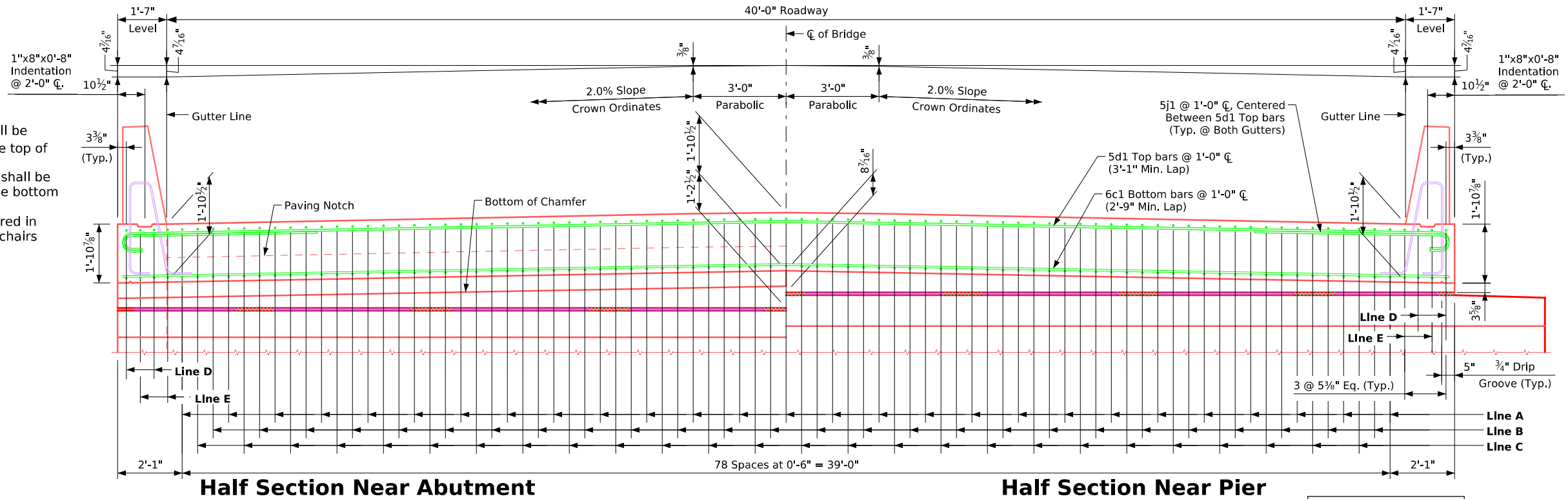


**Note:** All Dimensions Are Out To Out. D = pin Diameter.

Design For 0° Skew		
140'-0" × 40'-0" Continuous Concrete Slab Bridge		
42'-6" End Spans	55'-0" Interior Span	
Abutment Quantities & Details		
STA. 57+50.00 (C IA 21)	Turn-in Date: April 2026	
Keokuk County		
IOWA DEPARTMENT OF TRANSPORTATION		
Design No. 0326	Design Sheet No. 16 of 26	FHWA No. 032601

Notes:

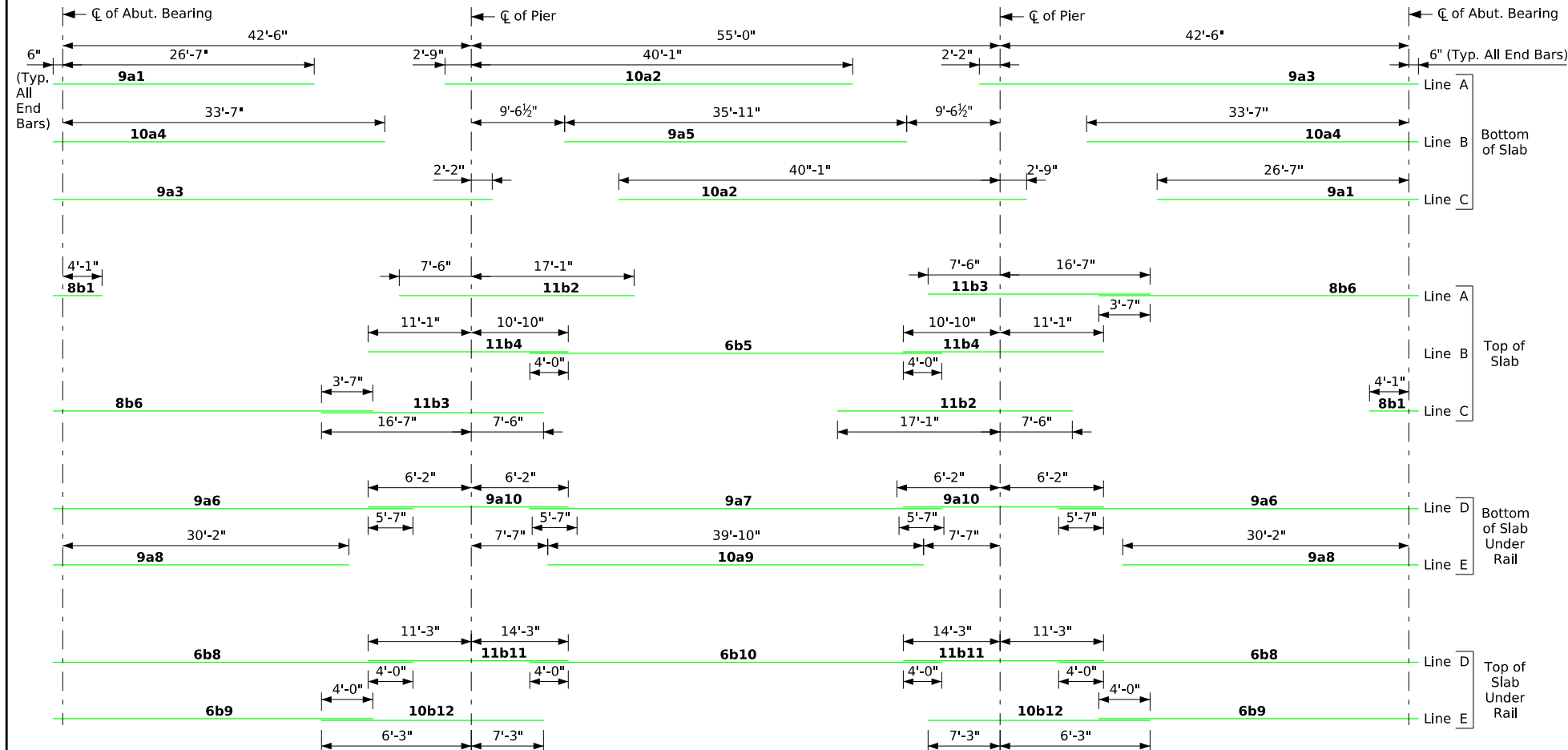
Top longitudinal reinforcing steel shall be parallel to and 2¾ inches clear below the top of the slab.  
Bottom longitudinal reinforcing steel shall be parallel to and 1½ inches clear above the bottom of the slab.  
Reinforcing steel shall be securely wired in place and adequately supported on bar chairs before concrete placement.



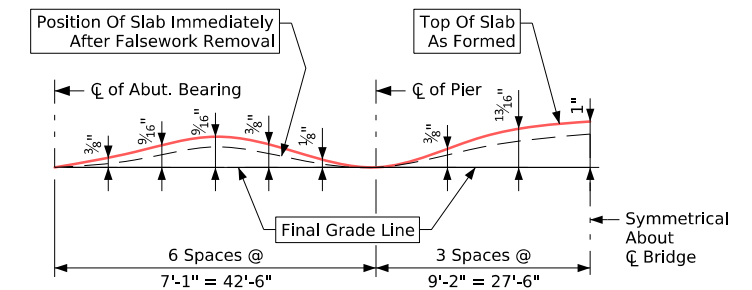
Half Section Near Pier

Slab Cross-Section Area For Single-Slope Barrier Rail = 80.99 sq. ft.

I.M. 451.01  
Requirements Shall  
Apply For Bar Chairs.



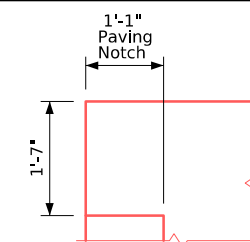
140' - Placement for Longitudinal Reinforcement



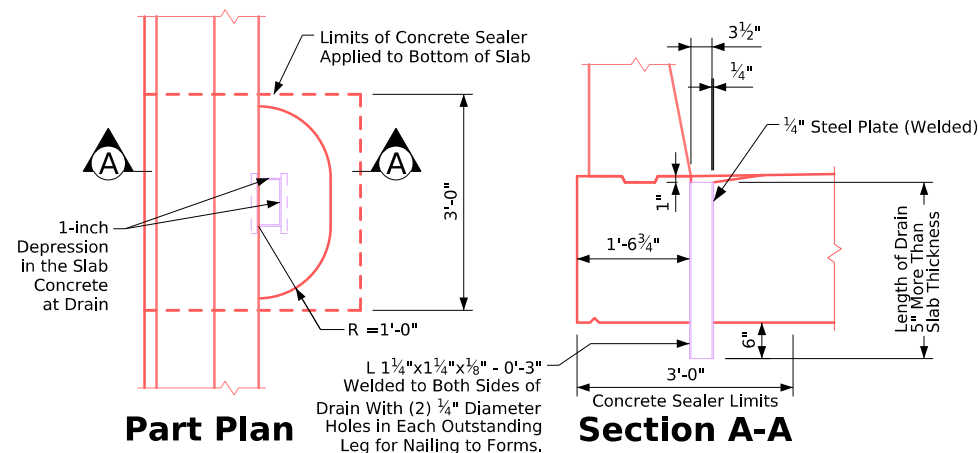
Form Camber Diagram

This diagram illustrates the form camber required to compensate for the anticipated ultimate dead load deflection. The dimensions shown do not account for form deflection or falsework settlement.

Design For 0° Skew  
**140'-0" x 40'-0" Continuous Concrete Slab Bridge**  
42'-6" End Spans 55'-0" Interior Span  
**Superstructure Details**  
STA. 57+50.00 (C/A 21) Turn-in Date: April 2026  
**Keokuk County**  
IOWA DEPARTMENT OF TRANSPORTATION  
Design No. 0326 Design Sheet No. 17 of 26 FHWA No. 032601



\* If transverse construction joints are used, the Contractor's Superstructure Move Engineer shall include calculations to show that the superstructure move will not cause overstress, cracking, or other damage at the joint locations.



Header Drilled for Reinforcing Bars

Nominal Beveled 2" x 6" Keyway

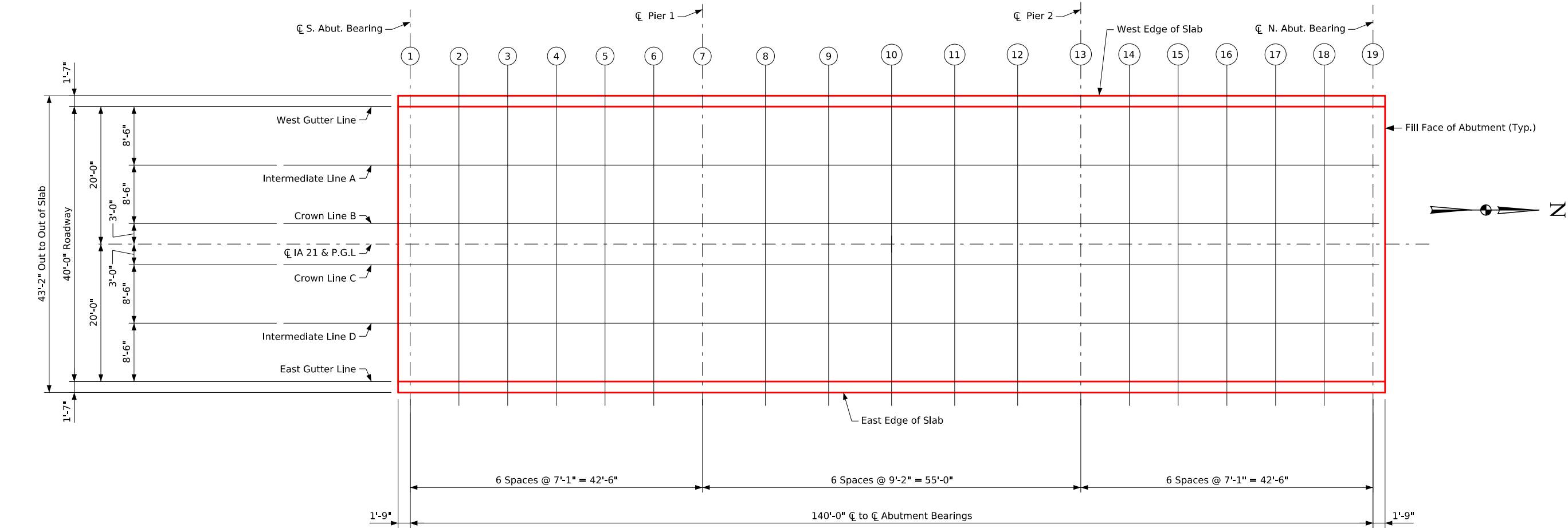
## Transverse Construction Joint



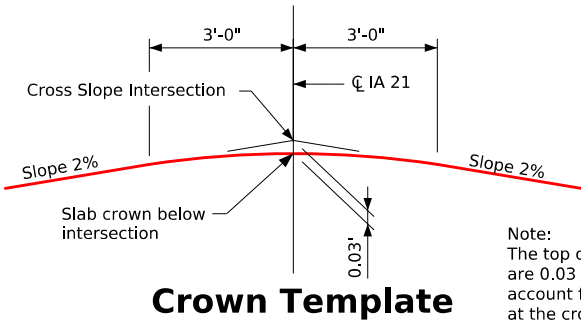


Bench Mark No. CP3: N:6801790.67 E:23379896.47; Elev 719.57  
Set 5/8" rebar on the southeast side of the bridge on the south side of the creek bank.

Top of Slab Elevations																			
Location	☐ S. Abut. Brg.						☐ Pier 1						☐ Pier 2						☐ N. Abut. Brg.
	Line 1	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8	Line 9	Line 10	Line 11	Line 12	Line 13	Line 14	Line 15	Line 16	Line 17	Line 18	Line 19
West Edge of Slab	727.05	727.07	727.09	727.11	727.13	727.14	727.16	727.17	727.19	727.20	727.21	727.21	727.21	727.21	727.21	727.21	727.21	727.20	727.19
West Gutter Line	727.05	727.07	727.09	727.11	727.13	727.14	727.16	727.17	727.19	727.20	727.21	727.21	727.21	727.21	727.21	727.21	727.21	727.20	727.19
Intermediate Line A	727.22	727.24	727.26	727.28	727.30	727.31	727.33	727.34	727.36	727.37	727.38	727.38	727.38	727.38	727.38	727.38	727.38	727.37	727.36
Crown Line B	727.39	727.41	727.43	727.45	727.47	727.48	727.50	727.51	727.53	727.54	727.55	727.55	727.55	727.55	727.55	727.55	727.55	727.54	727.53
☐ Approach Roadway	727.42	727.44	727.46	727.48	727.50	727.51	727.53	727.54	727.56	727.57	727.58	727.58	727.58	727.58	727.58	727.58	727.58	727.57	727.56
Crown Line C	727.39	727.41	727.43	727.45	727.47	727.48	727.50	727.51	727.53	727.54	727.55	727.55	727.55	727.55	727.55	727.55	727.55	727.54	727.53
Intermediate Line D	727.22	727.24	727.26	727.28	727.30	727.31	727.33	727.34	727.36	727.37	727.38	727.38	727.38	727.38	727.38	727.38	727.38	727.37	727.36
East Gutter Line	727.05	727.07	727.09	727.11	727.13	727.14	727.16	727.17	727.19	727.20	727.21	727.21	727.21	727.21	727.21	727.21	727.21	727.20	727.19
East Edge of Slab	727.05	727.07	727.09	727.11	727.13	727.14	727.16	727.17	727.19	727.20	727.21	727.21	727.21	727.21	727.21	727.21	727.21	727.20	727.19



Top of Slab Elevation Locations



Crown Template

Design For 0° Skew

140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans55'-0" Interior Span

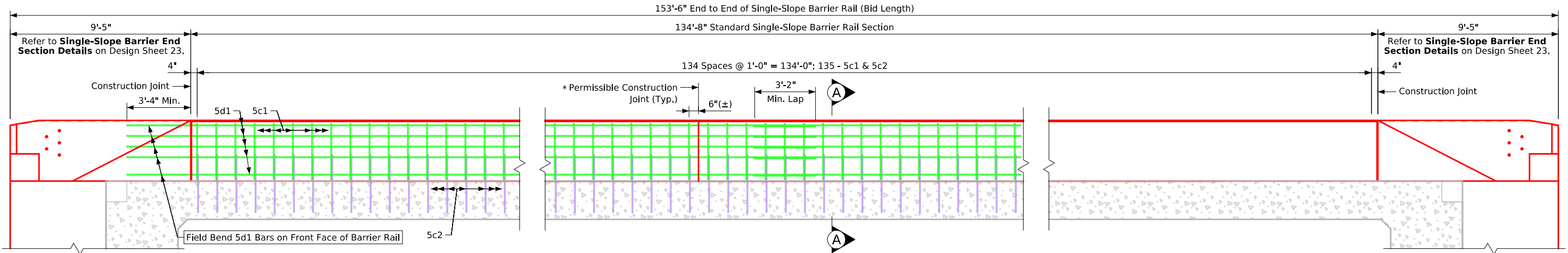
Top of Slab Elevations

STA. 57+50.00 (☐ IA 21)Turn-in Date: April 2026

Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326Design Sheet No. 21 of 26FHWA No. 032601



Elevation of Single-Sloped Barrier Rail

Single-slope Barrier Rail Notes:

Minimum clear distance from face of concrete to near reinforcing bar is to be 2" unless otherwise noted or shown.  
The permissible construction joints are to be placed between vertical bars at a minimum spacing of 20 feet. Construction joint contact surfaces are to be coated with an approved bond breaker.

Cost of the joint sealer and bond breaker shall be considered incidental to other construction.  
The concrete single-sloped barrier rail is to be bid on a lineal foot basis. The number of lineal feet of barrier rail installed will be paid for at the contract price per lineal foot based on plan quantities. Price bid for **Concrete Barrier Rail** shall be full compensation for furnishing all material, excluding reinforcing steel, and all of the equipment and labor required to erect the rail in accordance with these plans and current specifications.

If conduit is required in this plan the rigid steel conduit, junction boxes and fittings including labor and any additional work to do the installation is considered incidental to the cost of the railing.

The joint sealer shall be light gray nonsag latex caulking sealer marketed for outdoor use. No testing or certification is required.

Top of the barrier rail is to be parallel to the theoretical centerline grade.  
Cross sectional area of the standard section of the barrier rail = 3.5 square feet.

All Single-sloped barrier rail reinforcing steel is to be either epoxy coated or stainless steel as shown or noted. The stainless steel reinforcing steel shall be deformed bar Grade 60 meeting the requirements of **Materials I.M.452**.

Concrete Single-sloped barrier rails placed using the slipform method will require the use of a Class BR concrete in accordance with **Article 2513.03, A, 2, of the Standard Specification**. Cast-in-place barrier rails shall use **Class C mix**. Class D concrete is not permitted for concrete single-sloped barrier rails (cast-in-place or slipformed method).

\* If barriers are placed prior to superstructure move, construction joints shall be included in barriers at centerline of piers, centerline of transverse slab joints, and any other locations determined necessary by the Contractor's Superstructure Move Engineer to prevent damage to the barrier during the superstructure move.

Epoxy Reinforcing Steel - Two Barrier Rails

Section	Bar	Location	Shape	No.	Length	Weight
2 Std.Sec	5c1	Rail, Vertical		270	6'-8"	1877
	5d1	Rail, Long.		72	37'-9"	2835
4 End Sec.	6c1	Rail, Vertical		48	5'-11"	427
	5c3	Rail, Vertical (Traffic Face)		12	3'-5"	43
	5c5	Rail, Vertical (End)		16	3'-1"	51
	5d1	Rail, Horiz. (Back Face)		24	9'-1"	227
	5d2	Rail, Horiz. (Traffic Face)		12	9'-1"	114
	5d3	Rail, Horiz. (Traffic Face)		12	9'-6"	119
	5d4	Rail, Horiz. (Traffic Face)		8	6'-3"	52
	5d5	Rail, Horiz. (Top)		8	9'-1"	76
	4t3	Rail, Abut. Wing Tie Bars		32	2'-0"	43
	5t4	Wing, Horiz. (Tie Bars)		8	4'-8"	39
Epoxy Reinforced Total Weight (lbs)					Total	5903

Stainless Steel Reinforcing Steel - Two Barrier Rails

Section	Bar	Location	Shape	No.	Length	Weight
2 Std. Sec	5c2	Rail, Vertical		270	8'-0"	2253
4 End Sec	6c2	Rail, Vertical		24	9'-0"	324
	5c4	Rail, Vertical (Traffic Face)		24	3'-11"	98
	5c6	Rail, Vertical (End)		32	5'-8"	189
	6c7	Rail, Vertical (Slab/Abut.)		24	7'-7"	273
Stainless Steel Reinforced Total Weight (lbs)					Total	3137

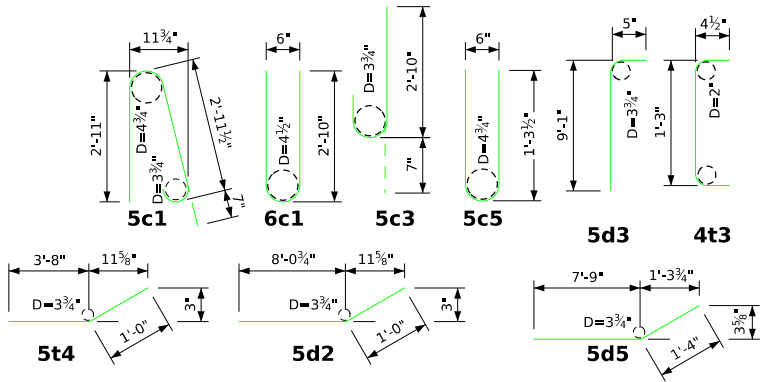
Concrete Placement Summary

Location	Total
Standard Section 2 x 134'-8" @ 0.1301 cu.yd. per ft.	35.0
End Section 4 @ 1.00 cu.yd.	4.0
Total (cu. yd.)	39.0

Concrete Barrier Rail Quantities

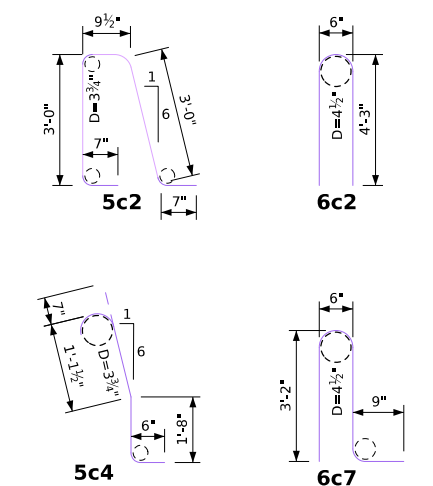
Location	Total
West Concrete Barrier Railing (lin. ft.)	153.5
East Concrete Barrier Railing (lin. ft.)	153.5
Total (lin. ft.)	307.0

Epoxy Bent Bar Details

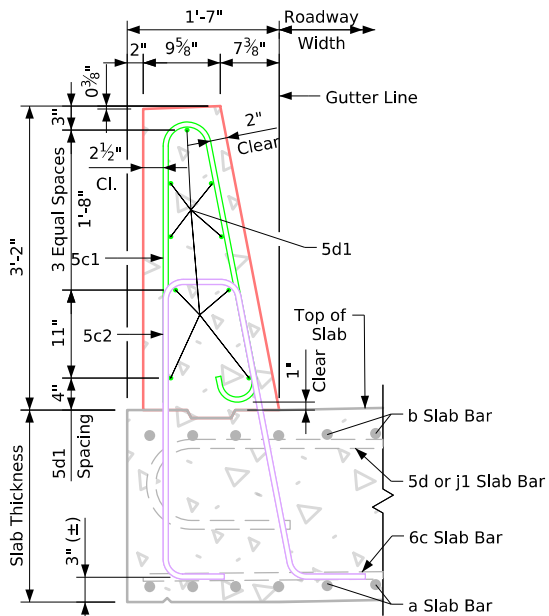


Note: All Dimensions Are Out To Out, D = Pin Diameter.

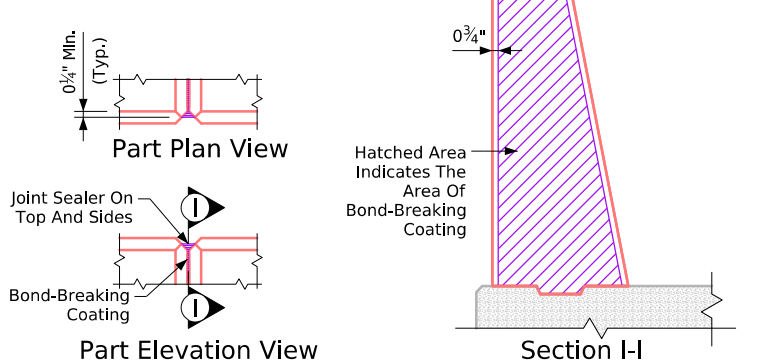
Stainless Bent Bar Details



Note: All Dimensions Are Out To Out, D = Pin Diameter.

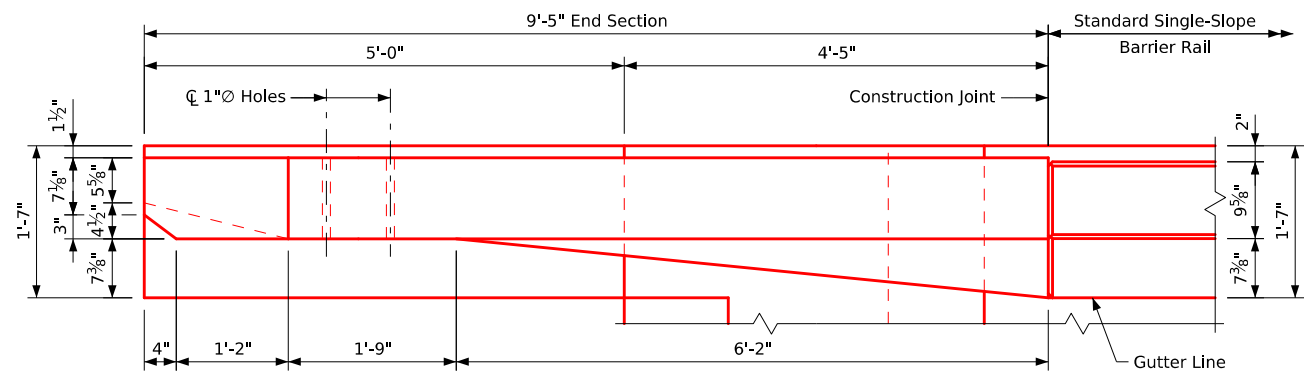


Part Section A-A



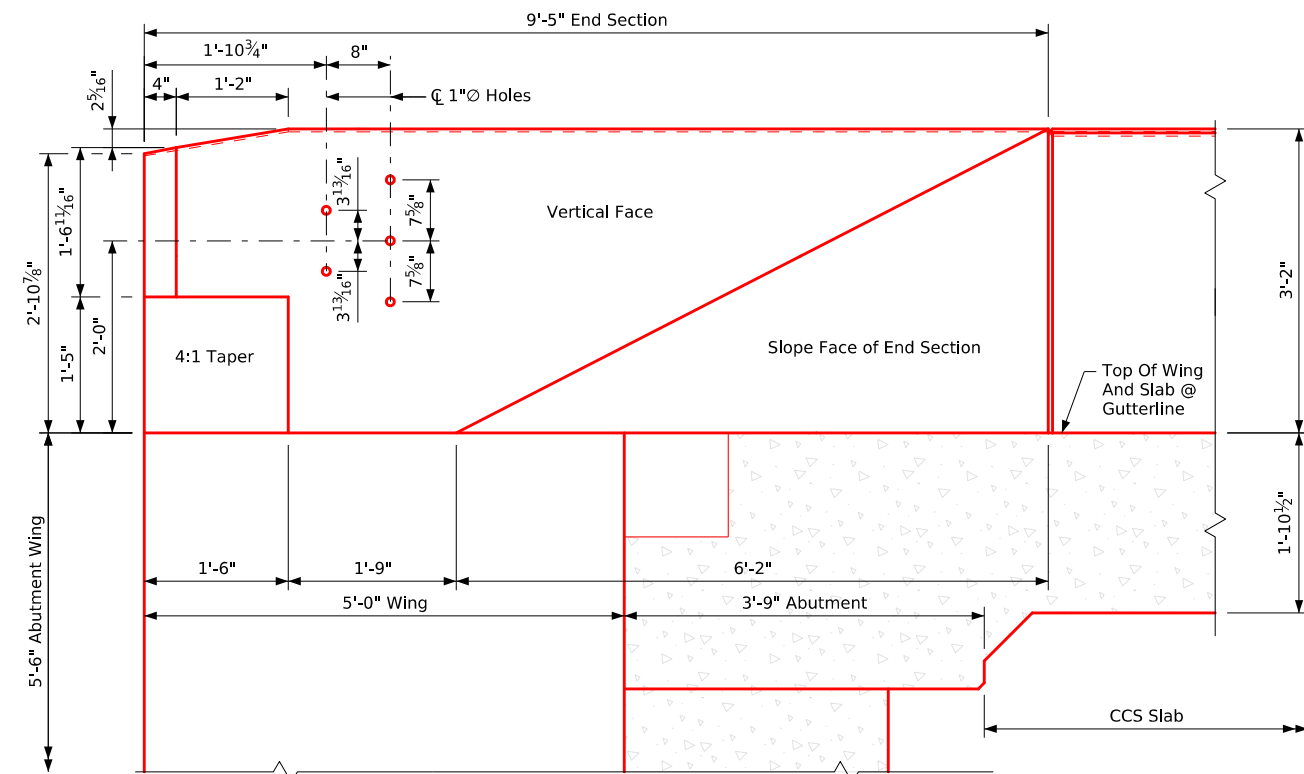
Barrier Rail Joint Details

Design For 0° Skew		
140'-0" x 40'-0" Continuous Concrete Slab Bridge		
42'-6" End Spans	55'-0" Interior Span	
Barrier Rail Details		
STA. 57+50.00 (C 1A 21)	Turn-in Date: April 2026	
Keokuk County		
IOWA DEPARTMENT OF TRANSPORTATION		
Design No. 0326	Design Sheet No. 22 of 26	FHWA No. 032601



**Part Plan View**

Provide five holes formed with 1" diameter plastic conduit. Cost to be included in price of Bid for **Concrete Barrier Rail**.



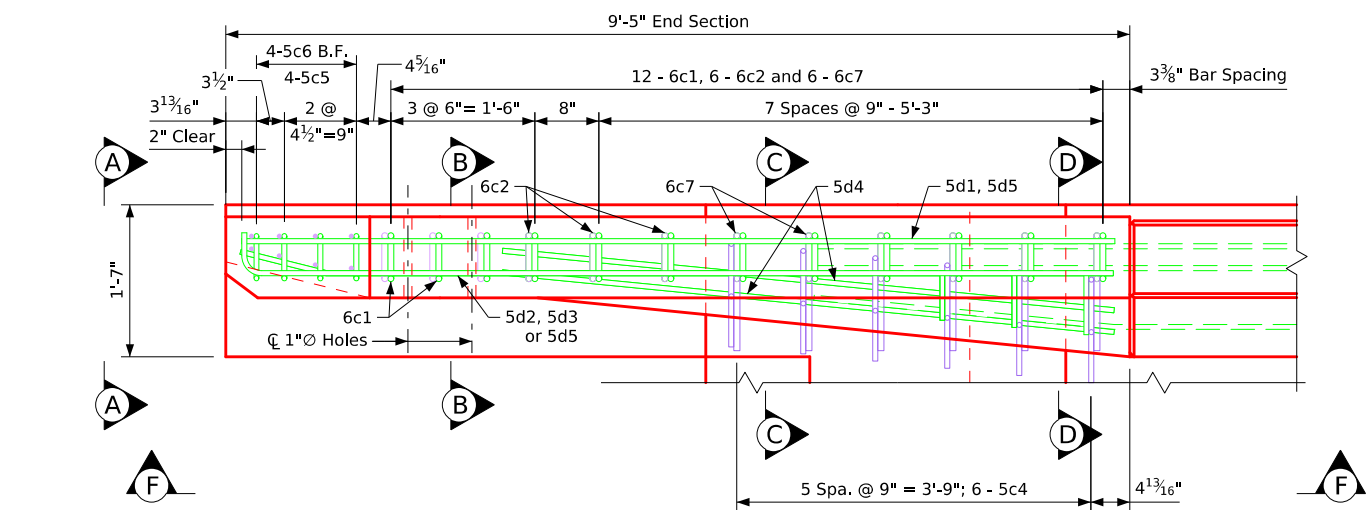
**Part Elevation View**

**Note:** 4t3 placement: Eight bars each at the top two rows of the 5n1 bars in the abutment wing to provide construction tie locations for vertical barrier bars.

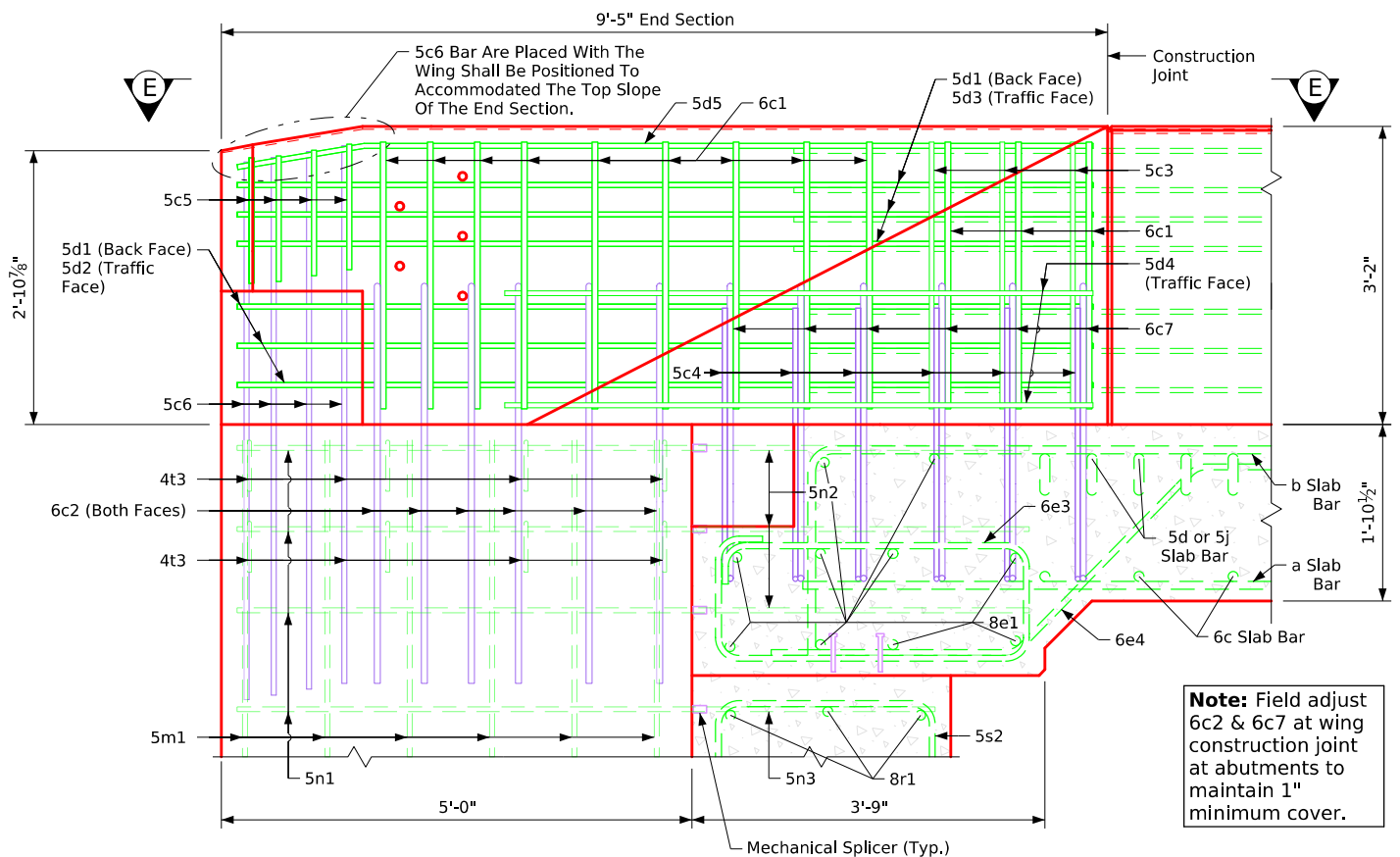
Construction joint between the top of the abutment wing and the single-slope barrier rail is roughened concrete.

6c2, 5c4, 5c6, 6c7, 5t4 and 4t3 bars are to be placed with the abutment wing.

Dashed lines below the top of the wing indicate abutment wing and slab reinforcing steel. For additional details, see Design Sheets 13 & 19.



**Part View E-E**



**Part View F-F**

**Note:**  
For section details, see Design Sheet 24.

**Note:** Field adjust 6c2 & 6c7 at wing construction joint at abutments to maintain 1" minimum cover.

Design For 0° Skew  
**140'-0" × 40'-0" Continuous Concrete Slab Bridge**

42'-6" End Spans 55'-0" Interior Span

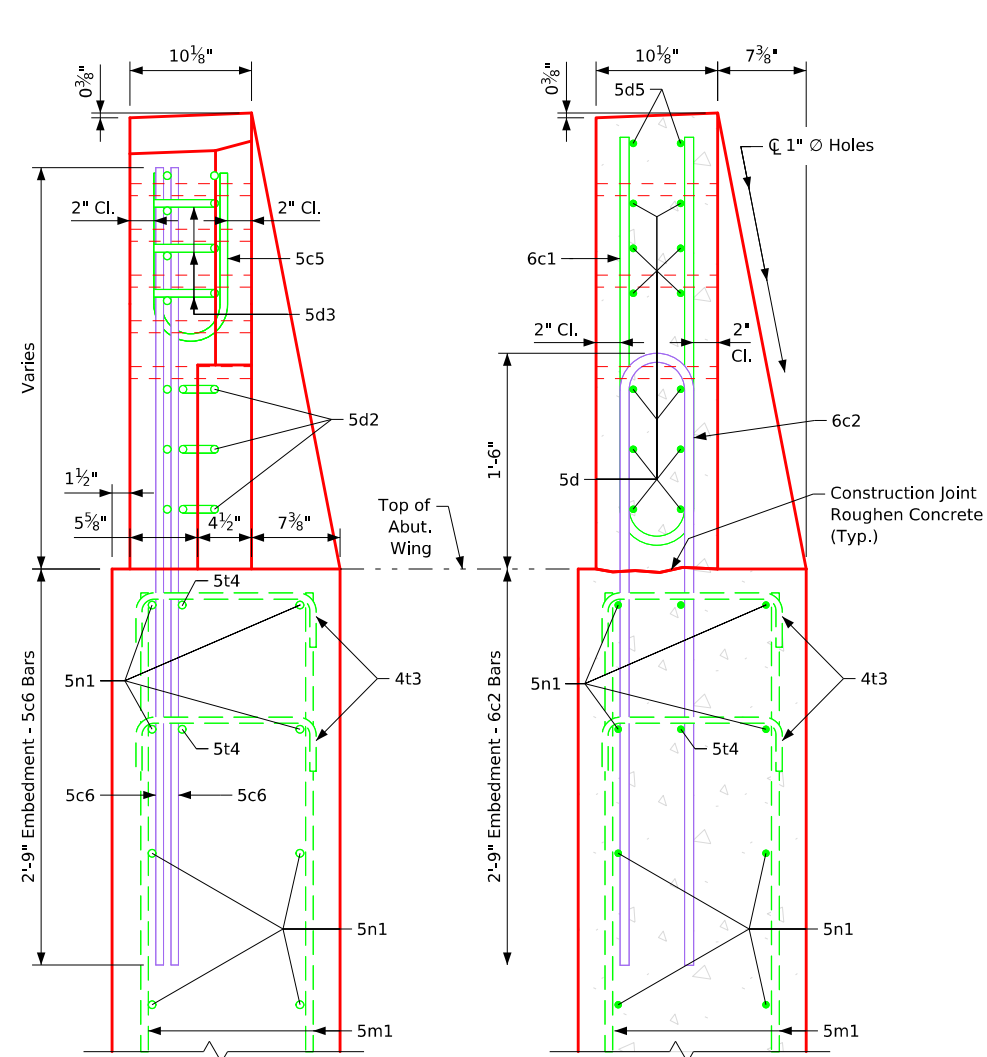
**Barrier Rail End Section**

STA. 57+50.00 (C 1A 21) Turn-In Date: April 2026

**Keokuk County**

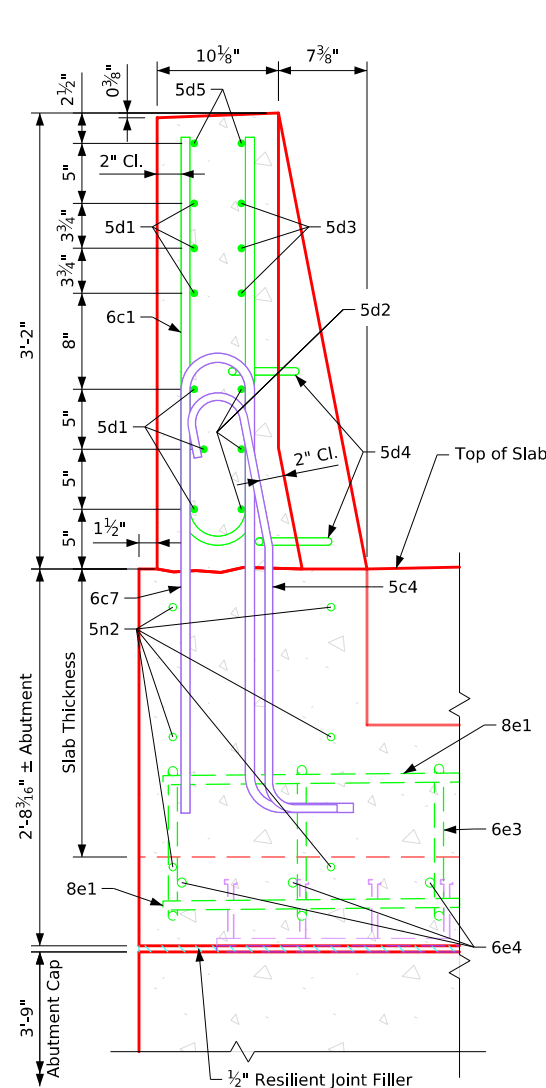
IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326 Design Sheet No. 23 of 26 FHWA No. 032601

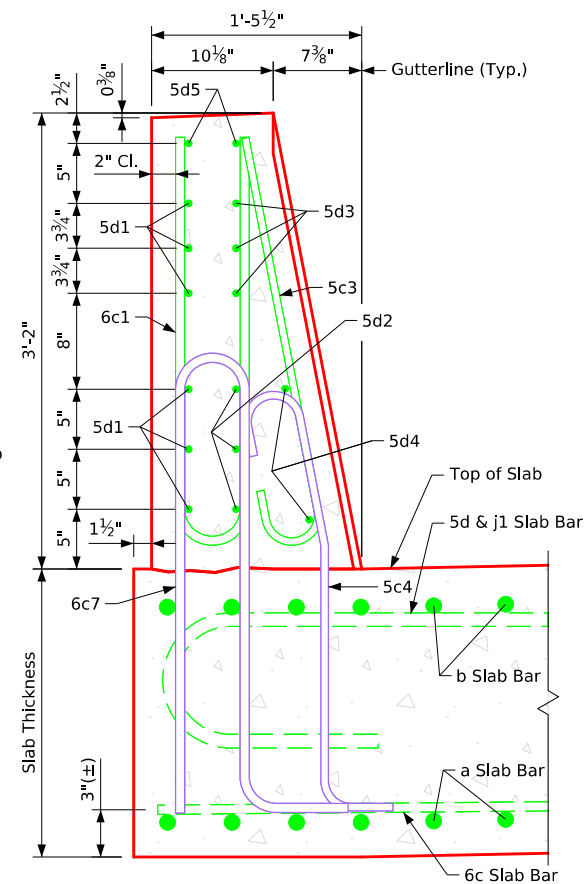


View A-A

Section B-B



Section C-C



Section D-D

**Note:** For End Section locations, see Design Sheet 23.

**Note:** For barrier rail end section quantities, see Design Sheet 22.

**Note:** For additional barrier-to-abutment wing details, see Design Sheet 19.

Design For 0° Skew

**140'-0" × 40'-0" Continuous Concrete Slab Bridge**

42'-6" End Spans 55'-0" Interior Span

**Barrier Rail End Section**

STA. 57+50.00 (C 1A 21) Turn-in Date: April 2026

**Keokuk County**

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326 Design Sheet No. 24 of 26 FHWA No. 032601

BENCH MARK NO. CP3: N:6801790.67 E:23379896.47; ELEV 719.57  
SET 5/8" REBAR ON THE SOUTHEAST SIDE OF THE BRIDGE ON THE  
SOUTH SIDE OF THE CREEK BANK

Subdrain Notes:

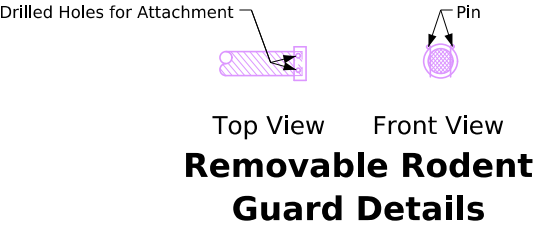
The Bridge Contractor is responsible for installing subdrains behind the abutment. The subdrains shall be 4" in diameter and comply with **Article 4143.01, B, of the Standard Specifications**. The subdrain outlet shall consist of a 6'-0" length of pipe with a removable rodent guard.

The dimensions shown for the proposed subdrains are based on the grading layout of the bridge berms. These dimensions are for estimating purposes only. Required lengths and general locations of subdrains may change due to field adjustments to the grading layout.

The cost for furnishing and placing the subdrain (including excavation), granular backfill, porous backfill, and subdrain outlet is to be included in the price bid for **"Structural Concrete (Bridge)."** No additional payment will be made.

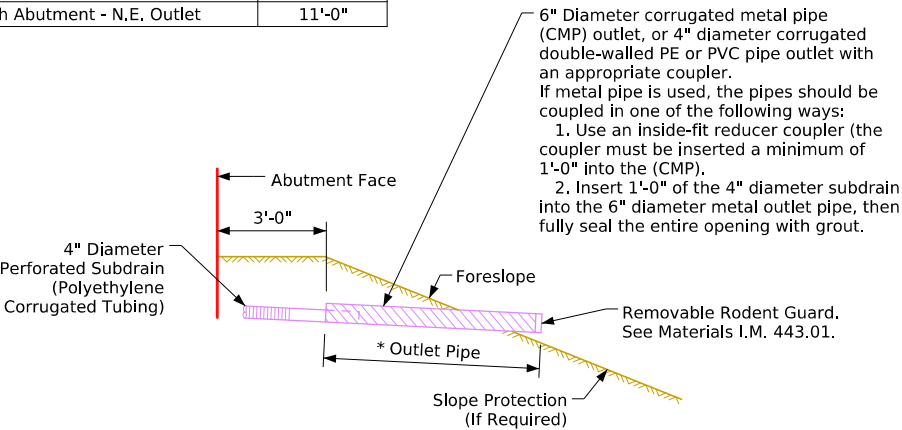
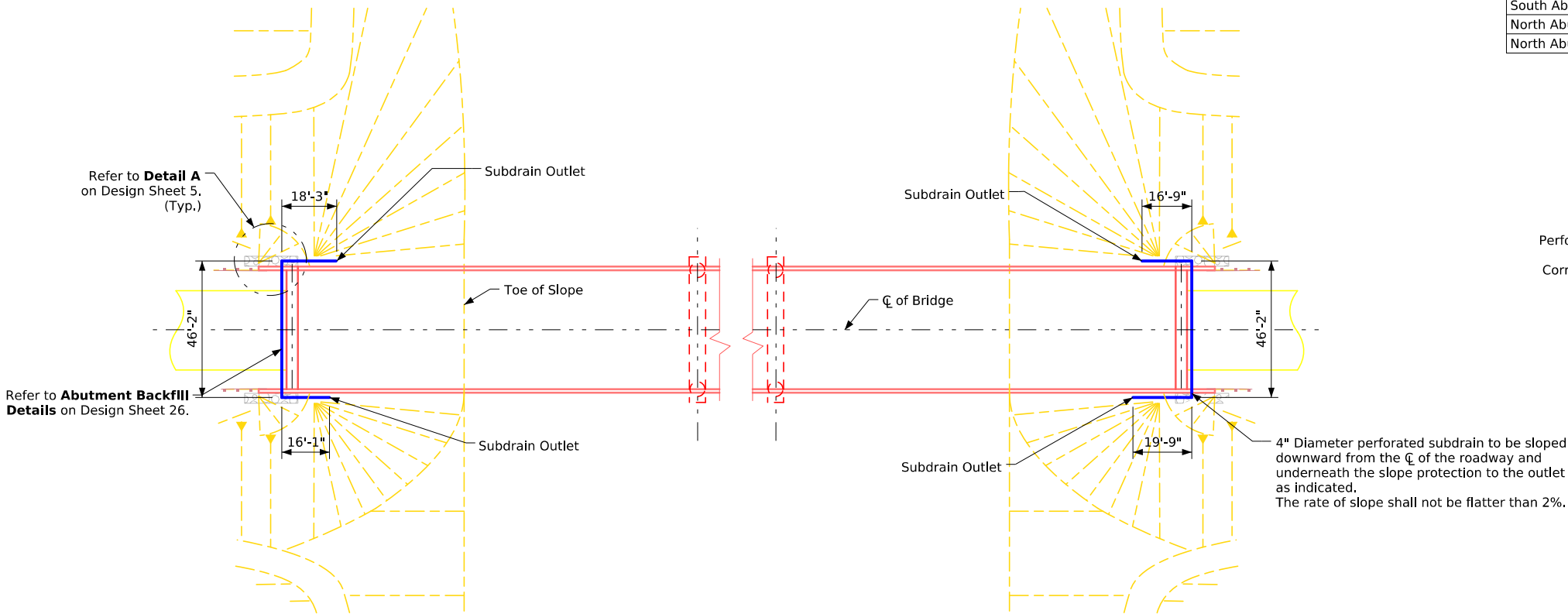
Subdrain Outlet Elevations

South Abutment - S.W. Outlet	±720.43
South Abutment - S.E. Outlet	±720.46
North Abutment - N.W. Outlet	±720.56
North Abutment - N.E. Outlet	±720.52



\*Outlet Pipe Lengths

South Abutment - S.W. Outlet	9'-6"
South Abutment - S.E. Outlet	7'-4"
North Abutment - N.W. Outlet	8'-0"
North Abutment - N.E. Outlet	11'-0"



Typical Subdrain Outlet Details

Situation Plan



Design For 0° Skew

140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans55'-0" Interior Span

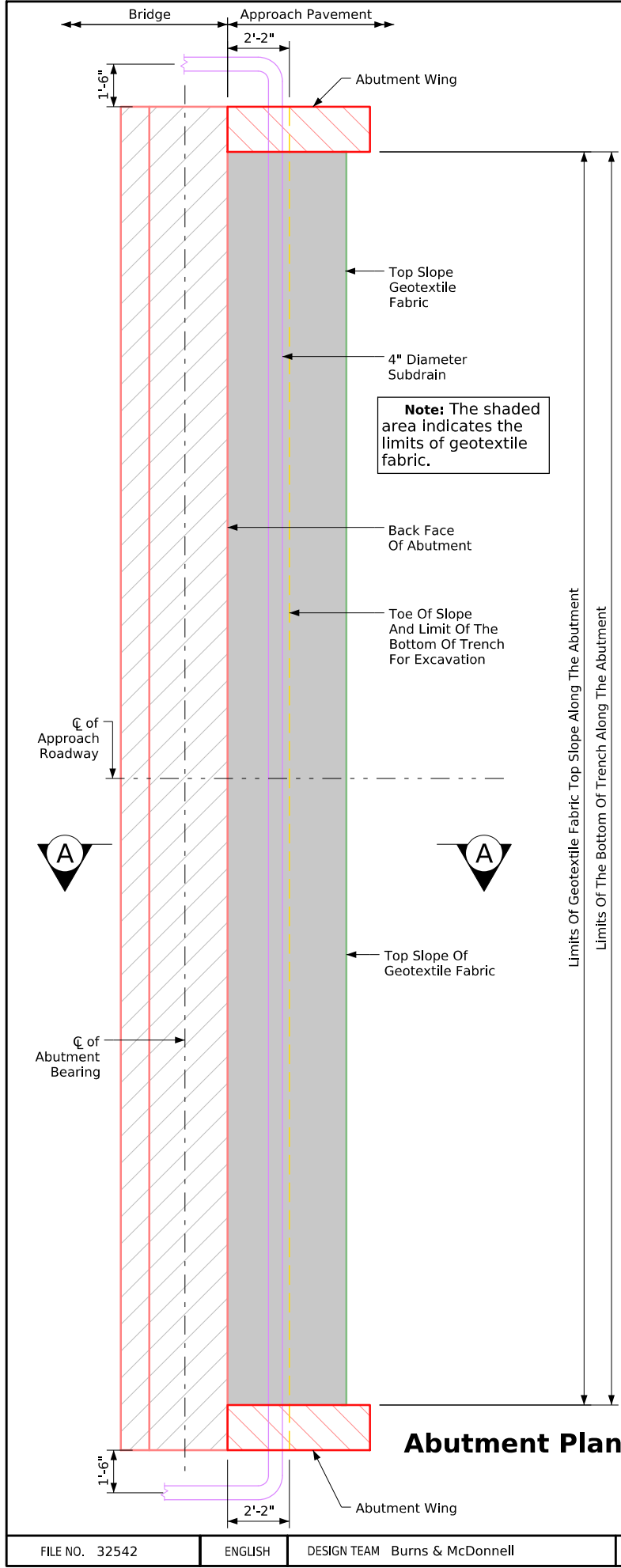
Subdrain Details

STA. 57+50.00 (C of IA 21)Turn-in Date: April 2026

Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326Design Sheet No. 25 of 26FHWA No. 032601



Abutment Backfill Process:

The base of the excavation subgrade behind the abutment shall be graded with a 4% slope away from the abutment footing and a 2% cross slope towards the subdrain outlet. This grading should be completed before the installation of the geotextile and backfill material.

Once the subgrade is shaped, the geotextile fabric and Butyl Rubber Membrane shall be installed according to the details shown on this sheet and Design Sheet 13. Place Butyl Rubber Membrane along back of abutment backwall centered on joint. The fabric is to be placed at the base of the excavation and extended vertically up the abutment backwall, wing walls, and excavation face, reaching a height approximately 1 to 2 feet higher than the porous backfill for the wing walls and excavation face. Extend limits of geotextile fabric to 6" above top of Butyl Membrane along the abutment backwall as shown in the **"Backfill Details"** on this sheet. The fabric strips should overlap by about 1 foot and be pinned in place.

The fabric should be attached to the abutment using lath folded into the fabric and secured with shallow concrete nails. The fabric against the excavation face must also be pinned.

After the fabric is installed, the subdrain shall be placed directly on it at the toe of the rear excavation slope. A slot should be cut in the fabric where the subdrain exits near the end of the abutment wing wall.

Porous backfill shall be placed and leveled without compaction.

Next, floodable backfill shall be used, followed by surface flooding and vibratory compaction. The floodable backfill material must conform to the Standard Specifications. It should be placed in lifts, surface flooded, and compacted with vibratory compaction to ensure full consolidation, with a maximum loose lift thickness of 2 feet.

Surface flooding for each lift should start at the high point of the subdrain and proceed to the low point where the subdrain exits the fabric. Water should be applied through a 2-inch diameter hose, sprayed in 6-foot to 8-foot increments for 3 minutes per increment to ensure uniform flooding.

The placement of floodable backfill, flooding, and compaction should continue until the full thickness of the abutment backfill is completed.

Water used for flooding, subdrains, porous backfill, floodable backfill, and geotextile fabric at the bridge abutments will not be measured separately for payment. The cost of this water shall be included in the contract unit price bid for **"Structural Concrete (Bridge)"**.

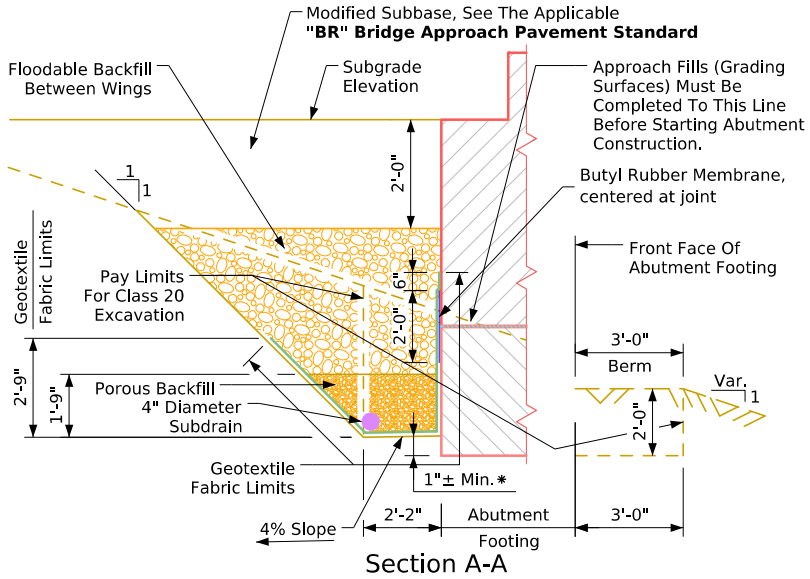
Note:

Subdrain shall slope downward 2% from centerline approach roadway when outletting both sides of the abutment.

Subdrain shall slope downward 2% from high end when outletting at one end of the abutment.

The geotextile fabric shall be in accordance with **Article 4196.01, B, 6 of the Standard Specifications**. If the engineering fabric is lapped the laps shall be a minimum of one foot in length, shingle fashion with up slope lap piece on top and stapled for continuity.

The Butyl Rubber Membrane shall be in accordance with **Materials I.M. 493**.



Backfill Details

**Note:** Geotextile fabric shall be attached to the face of the abutment footing and wings.

\* Dimension varies due to the 2% subdrain slope.

**Note:** For additional details not shown on this sheet, see **Subdrain Details** on Design Sheet 25.

Design For 0° Skew

140'-0" × 40'-0" Continuous Concrete Slab Bridge

42'-6" End Spans55'-0" Interior Span

Abutment Backfill Details

STA. 57+50.00 (☐ 1A 21)Turn-in Date: April 2026

Keokuk County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 0326Design Sheet No. 26 of 26FHWA No. 032601

GEOTECHNICAL DESIGN

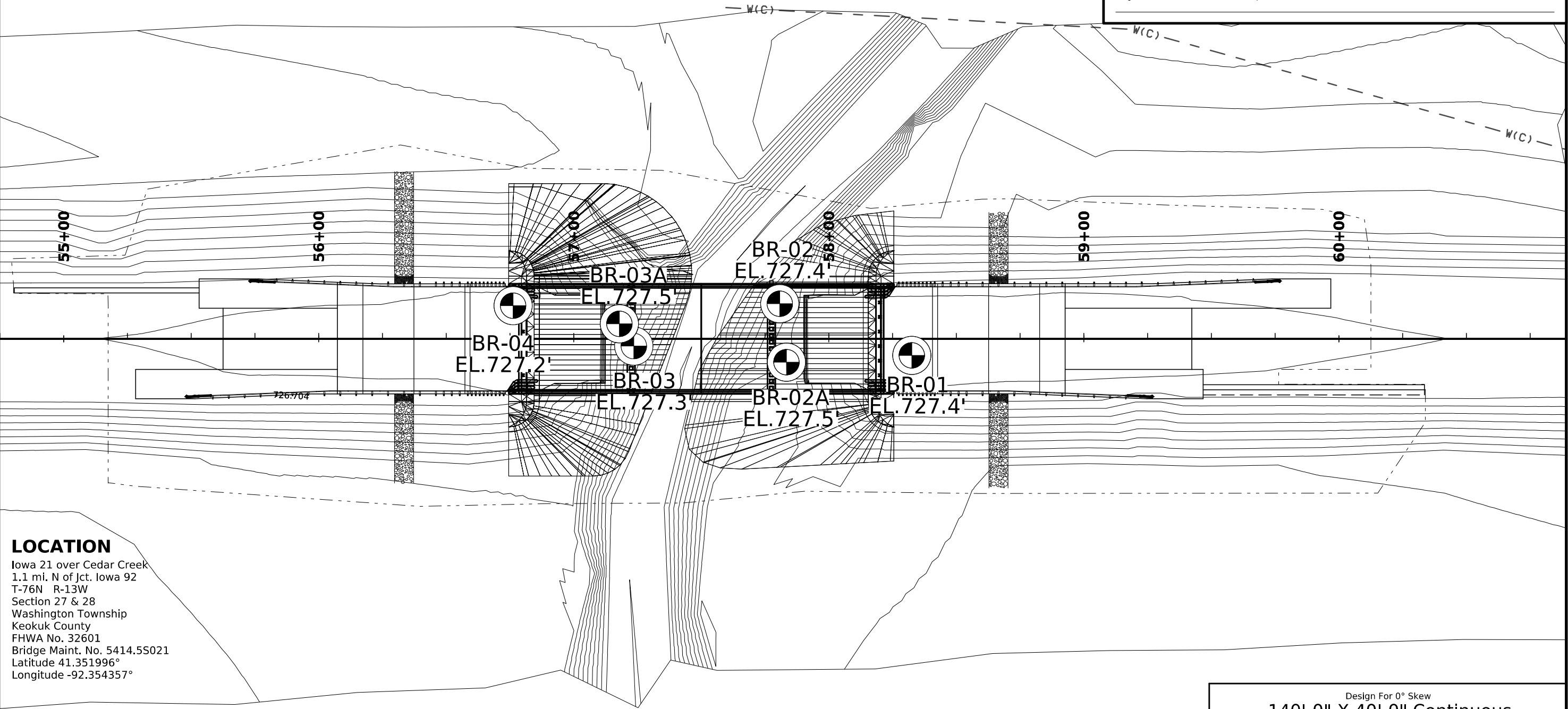


I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: Xinyi Jiang Date: 12-09-2025  
Printed or Typed Name  
My license renewal date is December 31, 2026

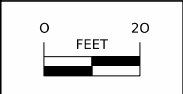
Pages or sheets covered by this seal: SPS.1 & SPS.2

THIS SHEET IS INCLUDED TO SHOW SOIL INFORMATION. DETAILS AND NOTES SHOWN ELSEWHERE IN THESE PLANS SHALL BE USED FOR STRUCTURE CONSTRUCTION.



LOCATION

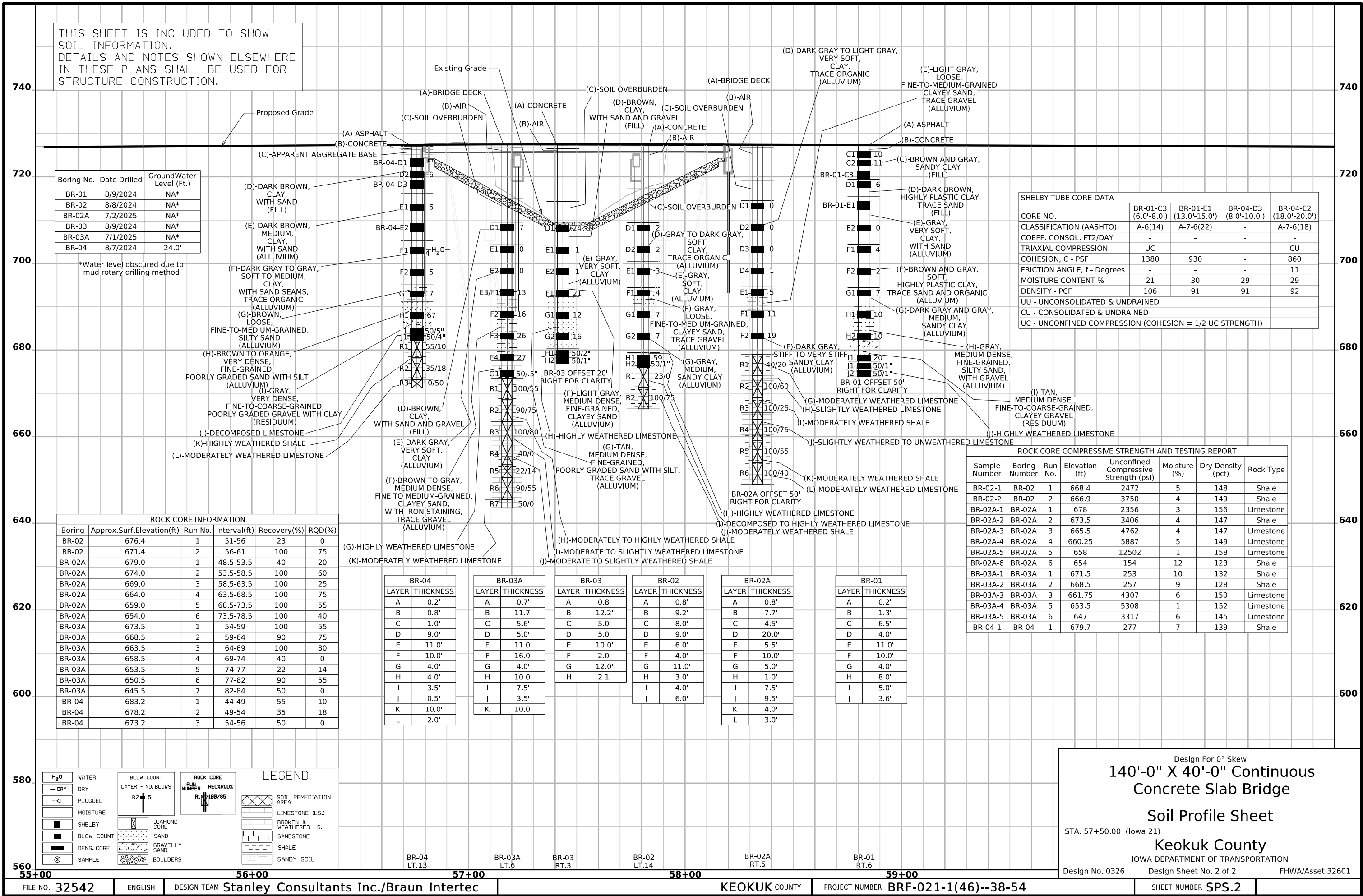
Iowa 21 over Cedar Creek  
1.1 mi. N of Jct. Iowa 92  
T-76N R-13W  
Section 27 & 28  
Washington Township  
Keokuk County  
FHWA No. 32601  
Bridge Maint. No. 5414.5S021  
Latitude 41.351996°  
Longitude -92.354357°





Design For 0° Skew  
**140'-0" X 40'-0" Continuous  
Concrete Slab Bridge**  
**Soil Profile Sheet**

STA. 57+50.00 (Iowa 21)  
**Keokuk County**  
IOWA DEPARTMENT OF TRANSPORTATION  
Design No. 0326 Design Sheet No. 1 of 2 FHWA/Asset 32601

THIS SHEET IS INCLUDED TO SHOW  
SOIL INFORMATION.  
DETAILS AND NOTES SHOWN ELSEWHERE  
IN THESE PLANS SHALL BE USED FOR  
STRUCTURE CONSTRUCTION.



INDEX OF SHEETS	
No.	DESCRIPTION
<b>A Sheets</b>	<b>Title Sheets</b>
A.3	Index of Sheets
<b>B Sheets</b>	<b>Typical Cross Sections and Details</b>
B.1 - 3	Typical Cross Sections and Details
<b>C Sheets</b>	<b>Quantities and General Information</b>
C.1 - 4	Estimated Project Quantities and Reference Notes
C.10	Standard Road Plans
C.5 - 22	Tabulations
<b>CS Sheets</b>	<b>Soils Tabulations</b>
CS.1	Soils Tabulations
<b>D Sheets</b>	<b>Mainline Plan and Profile Sheets</b>
D.1	Plan & Profile Legend & Symbol Information Sheet
D.2	IA 21
<b>G Sheets</b>	<b>Survey Sheets</b>
G.1 - 3	Reference Ties and Bench Marks
G.4	Horizontal Control Tab.
<b>H Sheets</b>	<b>Right-of-Way Sheets</b>
H.1	IA 21
<b>J Sheets</b>	<b>Traffic Control and Staging Sheets</b>
J.1 - 4	Traffic Control Plan and Staging Tabs
J.5 - 6	IA 21 Detour
<b>R Sheets</b>	<b>Erosion Control Sheets</b>
RC.1 - 5	Est. Quantities, PPP, General Notes and Tabulations
RR.1	Erosion Control Legend and Symbol Information Sheet
RR.2 - 3	Drainage Basin and Erosion Control Device Maps
<b>T Sheets</b>	<b>Earthwork Quantity Sheets</b>
T.1A - 3	Earthwork Quantity Sheets
<b>W Sheets</b>	<b>Mainline Cross Sections</b>
W.1	Cross Sections Legend & Symbol Information Sheet
W.2 - 9	Mainline Cross Sections

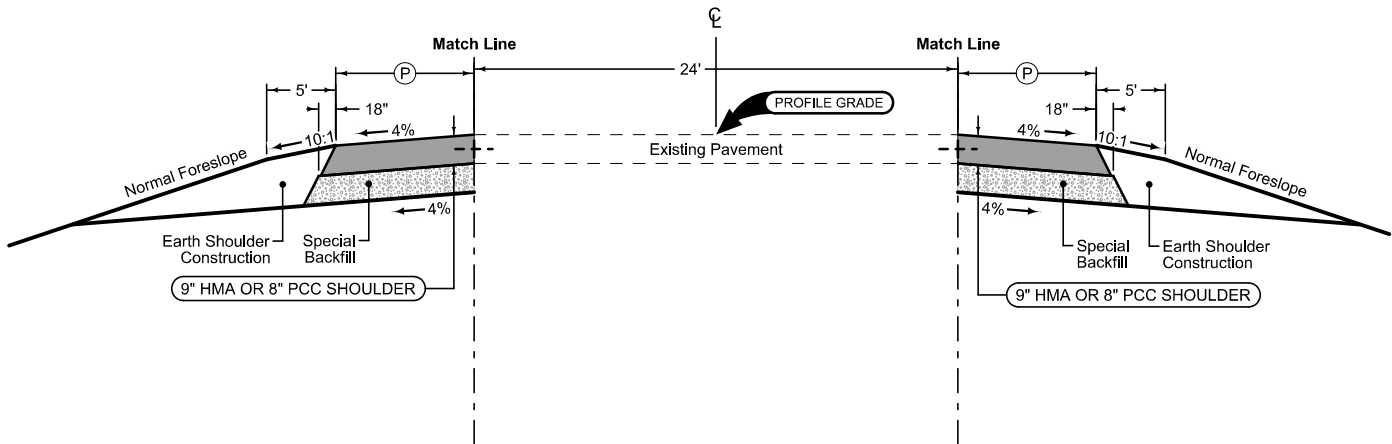
ROADWAY DESIGN	
	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.
	<div><div></div><div>12/4/2025</div></div>
	<div>Signature<div>Gregory S. Shuger</div></div> <div>Date</div>
	<div>Printed or Typed Name</div> <div>My license renewal date is December 31, 2027</div>
	Pages or sheets covered by this seal: A.3, B.1-B.3, C.1-C.22, D.1-D.2, G.1-G.4, H.1, J.1-J.6, RC.1-RC.5, RR.1-RR.3, T.1A-T.3, W.1-W.9

Paved Shoulder at Guardrail

PCC Shoulder Jointing:  
Longitudinal joint: BT-1 or BT-5  
Transverse joints: C at mainline spacing  
HMA Shoulder Jointing:  
Longitudinal joint: B

2_P_Guard_ 04-21-20		
STATION TO STATION		(P) Feet
54+80.66	55+53.09	2
55+53.09	55+62.53	11.5
59+42.36	59+73.83	10.2-11.5
59+73.83	59+96.82	11.5

\*Shoulder Strengthening beyond existing paved shoulder width.



Paved Shoulder at Guardrail

PCC Shoulder Jointing:  
Longitudinal joint: BT-1 or BT-5  
Transverse joints: C at mainline spacing  
HMA Shoulder Jointing:  
Longitudinal joint: B

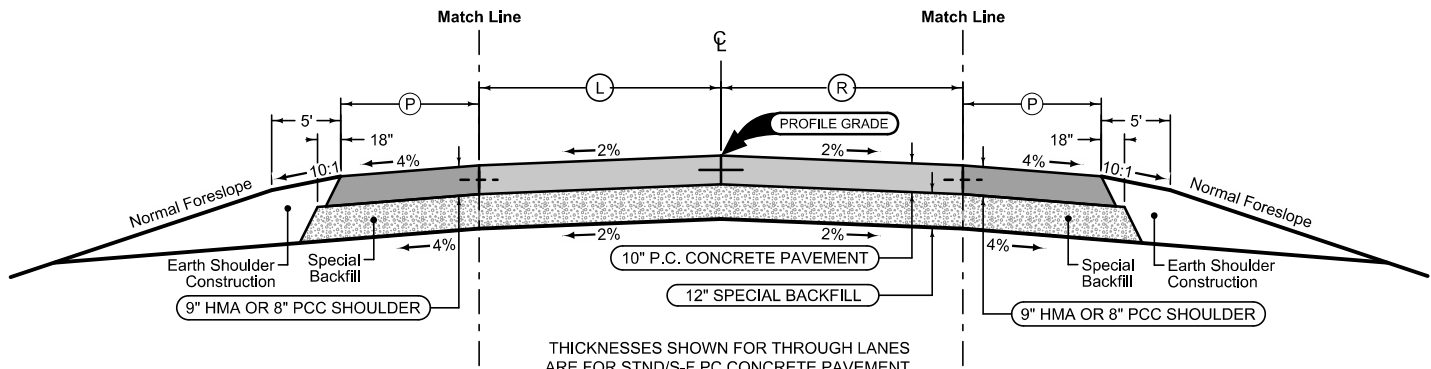
2_P_Guard_ 04-21-20		
STATION TO STATION		(P) Feet
55+28.21	55+51.49	11.5
55+51.49	55+62.53	11.5-11
59+42.36	59+46.78	11.5
59+46.78	60+33.58	2

\*Shoulder Strengthening beyond existing paved shoulder width.

Paved Shoulder at Guardrail

PCC Shoulder Jointing:  
Longitudinal joint: BT-1 or BT-5  
Transverse joints: C at mainline spacing  
HMA Shoulder Jointing:  
Longitudinal joint: B

2_P_Guard_ 04-21-20		
STATION TO STATION		(P) Feet
55+62.53	55+76.44	11.5
55+76.44	56+07.31	11.5-10.2
58+92.69	59+27.36	9.6
59+27.36	59+42.36	9.6-10.2



Mainline Jointing:  
STND/SF PC CONCRETE PAVEMENT  
Transverse joints: CD at 17' spacing  
Longitudinal joint: L-2  
BR-205 APPROACH PAVEMENT  
Match Jointing per SRP BR-205

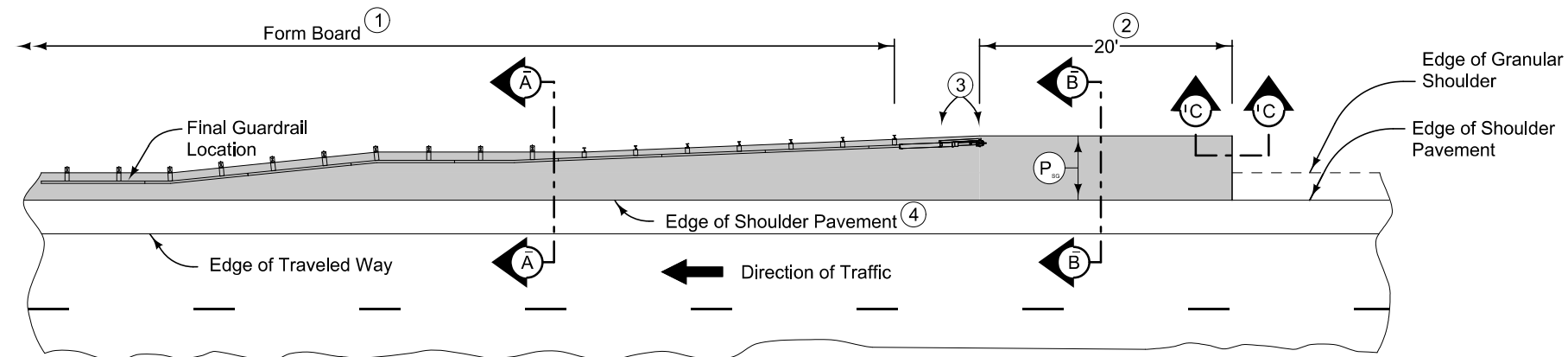
2P_ 04-21-20				
STATION TO STATION		(L) Feet	(R) Feet	
55+62.53	56+07.31	12	12	STND/S-F PC CONCRETE PAVEMENT
58+92.69	59+42.36	12	12	STND/S-F PC CONCRETE PAVEMENT

See Sheet B.2 for "Paved Shoulder at Guardrail" Details

Paved Shoulder at Guardrail

PCC Shoulder Jointing:  
Longitudinal joint: BT-1 or BT-5  
Transverse joints: C at mainline spacing  
HMA Shoulder Jointing:  
Longitudinal joint: B

2_P_Guard_ 04-21-20		
STATION TO STATION		(P) Feet
56+62.53	55+96.52	11-9.6
55+96.52	56+07.31	9.6
58+92.69	59+24.77	10.2-11.5
59+24.77	59+42.36	11.5



PLAN VIEW

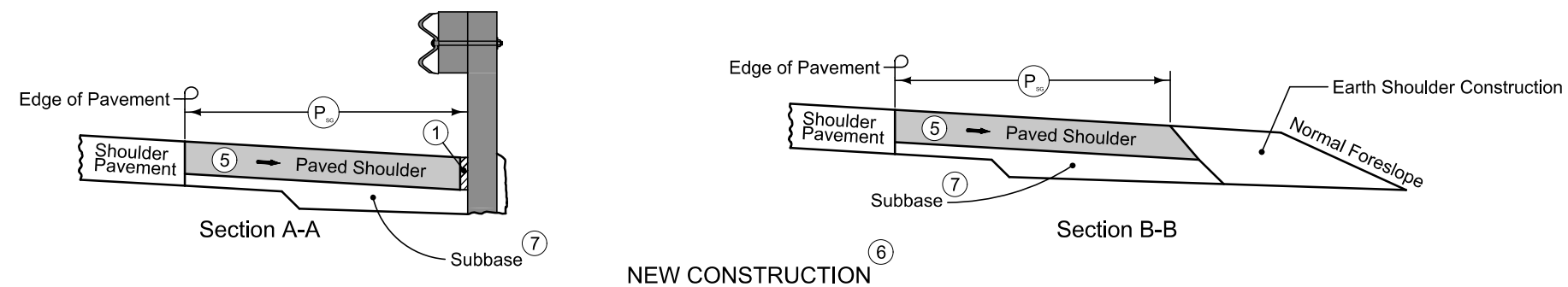
9" HMA Paved Shoulder at guardrail. 8" PCC may be substituted with the following jointing layout:

Match mainline pavement joint spacing. When mainline pavement is 8" or greater in thickness, place additional transverse 'C' joints in shoulder at mid-panel of the mainline pavement. Place longitudinal 'C' joint at P/2 from edge of mainline pavement when P is greater than 10' wide. Terminate longitudinal joint at transverse joint less than 10' in length.

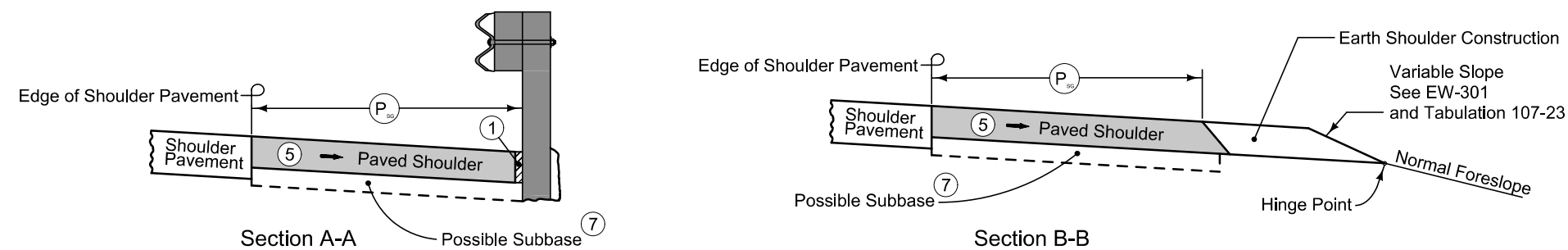
Compaction of HMA is required to face of guardrail post. Hand compaction will be allowed under guardrail. Removal and reinstallation of guardrail will be allowed with no additional payment.

Refer to Tabulation 112-9 for shoulder quantities.

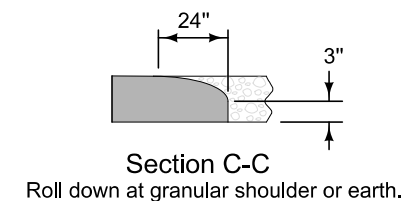
- ① PCC option only: When guardrail posts are installed prior to construction of PCC paved shoulder, fasten form board to the face of guardrail posts for the length shown.
- ② Continue paved shoulder 20 feet beyond the center of the first post.
- ③ Shoulder may be notched for first 2 posts or post sleeves may be installed through pavement. Do not drive posts through pavement.
- ④ 'BT' (per PV-101) joint for PCC shoulder.  
'B' (per PV-101) joint for HMA shoulder.
- ⑤ Match shoulder slope.
- ⑥ The Contractor has the option to pave the paved shoulder at guardrail and the partial width paved shoulder as one operation.
- ⑦ Refer to other details in the plan.

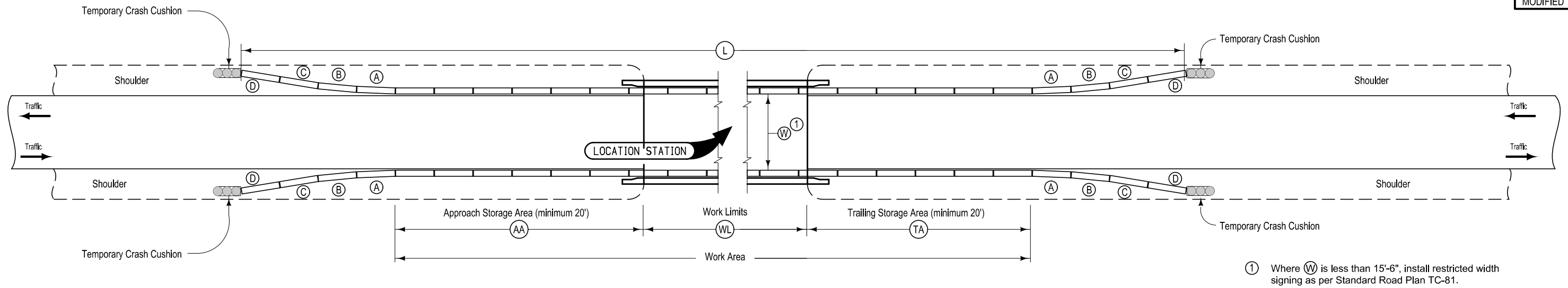


NEW CONSTRUCTION

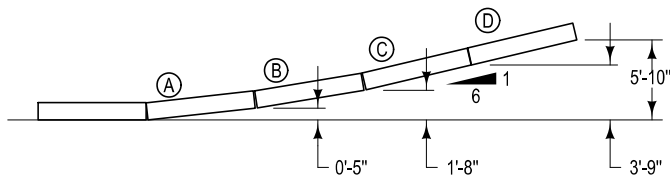


EXISTING SHOULDER

PAVED SHOULDER AT GUARDRAIL  
(ADJACENT TO PARTIAL WIDTH PAVED SHOULDER)



① Where W is less than 15'-6", install restricted width signing as per Standard Road Plan TC-81.



BARRIER OFFSETS FOR FLARE SECTIONS

Station	Side	AA	WL	TA	L	Anchored X	W <sup>①</sup>	Remarks
		Feet	Feet	Feet	Feet		Feet/Inches	
57+50.00	LT	20	160	20	300		26	Stage 1
57+50.00	RT	20	160	20	300		26	Stage 1

TEMPORARY CONCRETE BARRIER LAYOUT  
for Two-Way Traffic

ESTIMATED PROJECT QUANTITIES AND REFERENCE NOTES

Roadway Items : Roadway Items  
Alternate Shoulder Option 1 : PCC Shoulder Option  
Alternate Shoulder Option 2 : HMA Shoulder Option

Item no.	Item Code	Item	Unit	Quantities				Estimate Reference Notes
				Estimated				
				Roadway Items	Alternate Shoulder Option 1	Alternate Shoulder Option 2	Total	
1	2102-0425070	SPECIAL BACKFILL	TON	158.7			158.7	Refer to Tab 100-24 in C Sheets for locations and details. Existing HMA and PCC from Pavement removal may be used on the project as special backfill. Refer also to B sheets.
2	2102-0425070	SPECIAL BACKFILL HMA Option	TON			331.9	331.9	Refer to Tab. 112-9 in C sheets for locations and details. Existing HMA and PCC from Pavement removal may be used on the project as special backfill. Calculated for 13" thick Special Backfill under HMA Shoulders. Refer also to B sheets.
3	2102-0425070	SPECIAL BACKFILL PCC Option	TON		359		359	Refer to Tab. 112-9 in C sheets for locations and details. Existing HMA and PCC from Pavement removal may be used on the project as special backfill. Calculated for 14" thick Special Backfill under PCC Shoulders. Refer also to B sheets.
4	2102-2710070	EXCAVATION, CLASS 10, ROADWAY AND BORROW	CY	792			792	Refer to T Sheets for details. Refer also to Tab. 107-23 in C sheets.
5	2102-2710090	EXCAVATION, CLASS 10, WASTE	CY	911			911	Refer to T Sheets for details.
6	2102-2712015	EXCAVATION, CLASS 12, BOULDERS OR ROCK FRAGMENTS	CY	8			8	Refer to Tab. 103-7 in CS Sheets. Dispose of excess material according to Article 1106.07 of the current specifications.
7	2102-2713090	EXCAVATION, CLASS 13, WASTE	CY	170.8			170.8	Refer to Tab. 112-9 for locations and details.
8	2105-8425015	TOPSOIL, STRIP, SALVAGE AND SPREAD	CY	421			421	Refer to T Sheets for details. Refer also to sheet CS.1.
9	2107-0875100	COMPACTION WITH MOISTURE CONTROL	CY	608			608	Refer to T Sheets and Tab 103-6 in CS Sheets for details.
10	2121-7425010	GRANULAR SHOULDERS, TYPE A	TON	10.1			10.1	Refer to Tab. 112-9 in C sheets for locations and details.
11	2122-5190008	PAVED SHOULDER, P.C. CONCRETE, 8 IN.	SY		384.3		384.3	Refer to Tab. 112-9 in C sheets for locations and details. Refer to Detail 7157 on Sheet B.2 for additional details. Refer also to B sheets.
12	2122-5500090	PAVED SHOULDER, HOT MIX ASPHALT MIXTURE, 9 IN.	SY			384.3	384.3	
13	2123-7450000	SHOULDER CONSTRUCTION, EARTH	STA	4.5			4.5	Refer to Tab. 112-9 in C sheets for locations and details. Excess topsoil may be used for this item.
14	2301-0690205	BRIDGE APPROACH, BR-205	SY	747.4			747.4	Refer to Tab. 112-6 in C sheets for locations and details.

Item no.	Item Code	Item	Unit	Quantities				Estimate Reference Notes
				Estimated				
				Roadway Items	Alternate Shoulder Option 1	Alternate Shoulder Option 2	Total	
15	2301-1033100	STANDARD OR SLIP FORM PORTLAND CEMENT CONCRETE PAVEMENT, CLASS C, CLASS 3 DURABILITY, 10 IN.	SY	251.9			251.9	Refer to Tab. 100-24 in C sheets for locations and details. Refer also to B Sheets.
16	2412-0000100	LONGITUDINAL GROOVING IN CONCRETE, BRIDGE DECK	SY	1,011.9			1,011.9	Refer to Tab 100-28 in C sheets for locations and details.
17	2503-0500402	BRIDGE END DRAIN, DR-402	EACH	4			4	Refer to Tab 104-8A in C sheets for locations and details.
18	2505-4008120	REMOVAL OF STEEL BEAM GUARDRAIL	LF	582			582	Refer to Tab 110-7A in C sheets for locations and details.
19	2505-4008300	STEEL BEAM GUARDRAIL	LF	125			125	Refer to Tab 108-8A in C sheets for locations and details.
20	2505-4008415	STEEL BEAM GUARDRAIL BARRIER TRANSITION SECTION, BA-209	EACH	4			4	
21	2505-4021010	STEEL BEAM GUARDRAIL END ANCHOR, BOLTED	EACH	4			4	
22	2505-4021720	STEEL BEAM GUARDRAIL TANGENT END TERMINAL, BA-205	EACH	4			4	
23	2510-6745850	REMOVAL OF PAVEMENT	SY	1,241.6			1,241.6	Refer to Tab. 110-1 for locations and details.
24	2524-6765010	REMOVE AND REINSTALL SIGN AS PER PLAN	EACH	2			2	Item is for removing and reinstalling Sergeant Eric J. Stein Memorial Bridge signs on North and South side of bridge. Incidental to each sign removal/reinstallation shall be disposal of old posts and providing new posts and appurtenances to reinstall sign in original location.
25	2527-9263209	PAINTED PAVEMENT MARKINGS, WATERBORNE OR SOLVENT-BASED	STA	5.75			5.75	Refer to Tab. 108-22 in C sheets for locations and details.
26	2528-2518000	SAFETY CLOSURE	EACH	4			4	Refer to Tab 108-13A in C sheets for locations and details. Also refer to J sheets.
27	2528-8400048	TEMPORARY BARRIER RAIL, CONCRETE	LF	600			600	Refer to J sheets and Tab. 108-33 on C sheets. Refer also to Detail 8212 on B sheets. All temporary barrier rail shall be nominal 12'-6 long concrete units.
28	2528-8445110	TRAFFIC CONTROL	LS	1			1	Refer to Traffic Control Plan on J Sheets.
29	2528-8445113	FLAGGERS	EACH	0			0	See Proposal. Refer also to J sheets.
30	2528-9290050	PORTABLE DYNAMIC MESSAGE SIGN (PDMS)	CDAY	0			0	See Proposal. Refer also to J sheets.
31	2548-0000100	MILLED SHOULDER RUMBLE STRIPS, HMA SURFACE	STA			2.91	2.91	Refer to Tab. 112-10 in C Sheets for details.
32	2548-0000110	ASPHALT EMULSION FOR FOG SEAL (SHOULDER RUMBLE STRIPS)	GAL			3.2	3.2	
33	2548-0000200	MILLED SHOULDER RUMBLE STRIPS, PCC SURFACE	STA		2.91		2.91	
34	2548-0000320	MILLED CENTERLINE RUMBLE STRIPS, PCC SURFACE	STA	0.95			0.95	Refer to Tab 112-10 for locations and details.
35	2551-0000110	TEMP CRASH CUSHION	EACH	4			4	Refer to Tab 108-30 on C sheets and Detail 8212 on B sheets. Winterize sand filled or water filled crash cushions according to the manufacturer's recommendations if they are to remain in place during winter months.

Item no.	Item Code	Item	Unit	Quantities				Estimate Reference Notes
				Estimated				
				Roadway Items	Alternate Shoulder Option 1	Alternate Shoulder Option 2	Total	
36	2601-2634100	MULCHING	ACRE	4			4	Perform mulching according to Article 2601.03, E, 2, of the Standard Specifications. Anchor mulch into the soil using mulch anchoring equipment with a minimum of two passes. Item is included for areas requiring reshaping and seedbed preparation. Use mulch that is Certified Noxious Weed Seed Free Mulch as certified by the Iowa Crop Improvement Association or adjacent states Crop Improvement Associations. Mulch Rate: 1 1/2 tons of dry cereal straw or native grass straw per acre.
37	2601-2636015	NATIVE GRASS SEEDING	ACRE	1.8			1.8	Seed all areas outside eight feet adjacent to outside shoulder along mainline, side roads, and infield areas at interchanges with "Native Grass Seeding". Refer to Standard Road Plan EC-502.
38	2601-2636043	SEEDING AND FERTILIZING (RURAL)	ACRE	0.2			0.2	Seed and fertilize all areas 8 foot adjacent to the shoulder mainline, medians, and side roads according to Article 2601.03, C, 3, of the Standard Specifications. Use ground driven equipment. Refer to Standard Road Plan EC-502.
39	2601-2642100	STABILIZING CROP - SEEDING AND FERTILIZING	ACRE	2			2	Seed and fertilize all disturbed areas according to Article 2601.03, C, 1, of the Standard Specifications. If permanent seeding cannot be placed due to the restrictive planting dates, stabilizing crop will need to be placed on all disturbed areas as temporary erosion control. Preparation and seeding shall be performed in accordance with Section 2601. Stabilizing crop will not be used when the application dates in Section 2601 allows permanent seeding.
40	2602-0000030	SILT FENCE FOR DITCH CHECKS	LF	1,215			1,215	Refer to Tab 100-18 in RC sheets. Refer also to RR sheets.The tabulation includes estimated locations for placement of "Silt Fence for Ditch Checks" to address erosion to be encountered during construction. Verify the specific locations with the Engineer prior to beginning placement. Bid item includes 50% additional quantity for field adjustments and replacements.
41	2602-0000071	REMOVAL OF SILT FENCE OR SILT FENCE FOR DITCH CHECKS	LF	1,215			1,215	This item is included for silt fence and silt fence for ditch check removal required for staging reasons, removal to allow for replacement (replacement to be paid separately), or for areas that have achieved 70% permanent growth.
42	2602-0000101	MAINTENANCE OF SILT FENCE OR SILT FENCE FOR DITCH CHECK	LF	1,215			1,215	This item is included for clean-out and repair of the silt fence and silt fence for ditch checks during the project.
43	2602-0000150	STABILIZED CONSTRUCTION ENTRANCE, EC-303	LF	400			400	Refer to Standard Road Plan EC-303 for details. Obtain the Engineer's approval for location and length of Stabilized Construction Entrances prior to constructing. Location and limits for Stabilized Construction Entrances will be determined during construction.
44	2602-0000312	PERIMETER AND SLOPE SEDIMENT CONTROL DEVICE, 12 IN. DIA.	LF	3,140			3,140	Refer to Tab. 100-19 in RC sheets for location and details. The tabulation includes estimated locations for placement of "Perimeter and Slope Sediment Control Device, 12 in. dia." to address erosion to be encountered during construction. Verify the specific locations with the Engineer prior to beginning placement. Bid item includes 25% additional quantity for field adjustments and replacements.

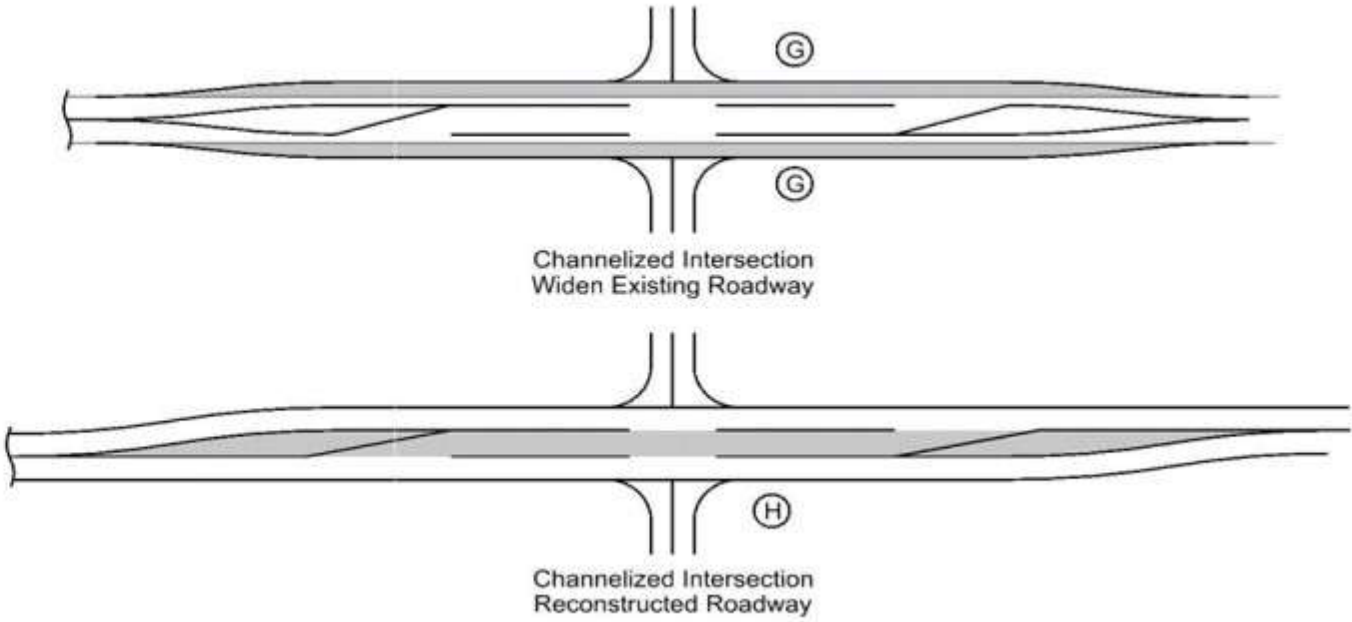
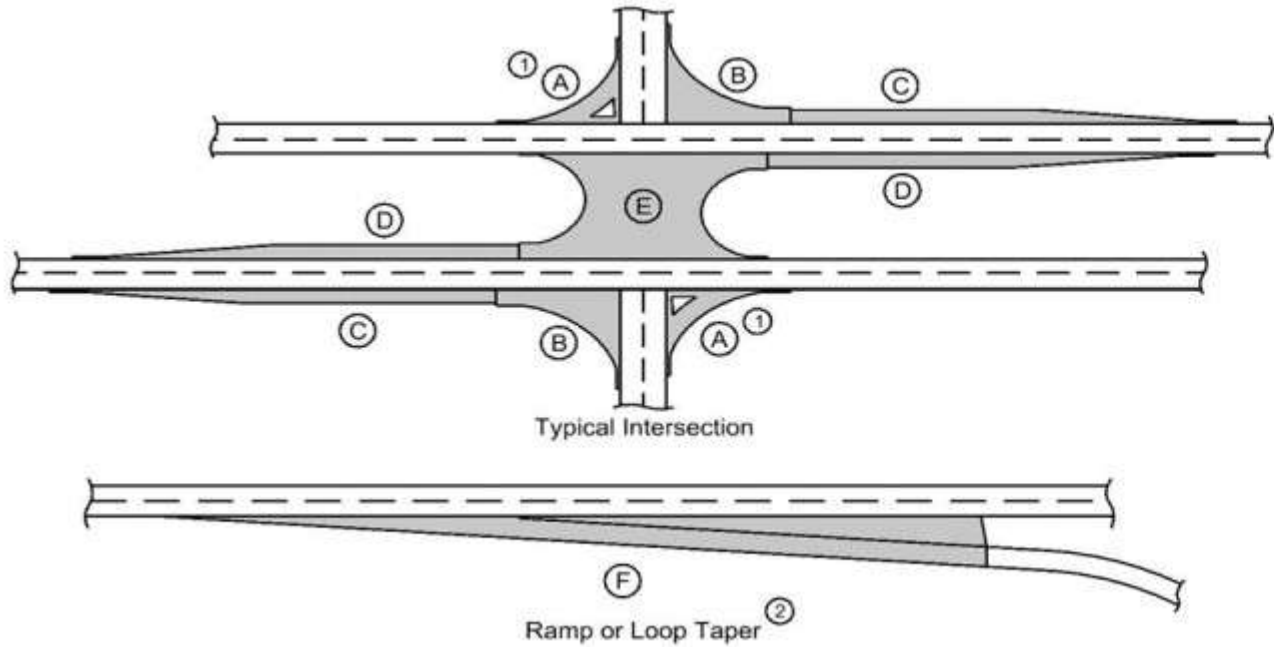
Item no.	Item Code	Item	Unit	Quantities				Estimate Reference Notes
				Estimated				
				Roadway Items	Alternate Shoulder Option 1	Alternate Shoulder Option 2	Total	
45	2602-0000351	REMOVAL OF PERIMETER AND SLOPE OR DITCH CHECK SEDIMENT CONTROL DEVICE	LF	3,140			3,140	Refer to Tab. 100-19 in RC sheets for location and details. Bid item includes 25% additional quantity for field adjustment and replacements. This item is included for perimeter and slope sediments control device removal required for staging reasons., for replacement (replacement to be paid separately), or for areas where grading activities are complete.
46	2602-0010010	MOBILIZATIONS, EROSION CONTROL	EACH	1			1	Quantity is for installation and maintenance of erosion control within project limits.
47	2602-0010020	MOBILIZATIONS, EMERGENCY EROSION CONTROL	EACH	1			1	Quantity is for repair or reinstallation of erosion control due to events requiring emergency measures as determined by the Engineer.

100\_01D  
8/15/22

PROJECT DESCRIPTION

This project involves bridge replacement, approach work, guardrail and shoulder work on IA 21 over Cedar Creek, located 1.1 mi. N. of IA 92 in Keokuk County.

PCC PAVEMENT



(1) Does not include raised island area or curb. Refer to tabulation 112-4 for quantities.  
(2) Refer to PV-410, PV-411, PV-412, and PV-414.  
(3) Quantity includes Pavement Header.

Line No.	Road Identification	Direction of Travel	Station From	Station To	Width (FT)	Length (FT)	Area (SY)	Area A(1) (SY)(3)	Area B (SY)(3)	Area C (SY)(3)	Area D (SY)(3)	Area E (SY)(3)	Area F(2) (SY)(3)	Area G (SY)(3)	Area H (SY)(3)	Area by Thickness - Thickness(IN)	Area by Thickness - Area (SY)	Polymer Grid (SY)	Special Backfill (TON)	Modified Subbase (CY)	Granular Subbase (SY)	Remarks
1.0	IA 21	Both	55+62.53	56+07.31	24.0	44.78	119.41									10.0	119.4		75.230			
2.0	IA 21	Both	58+92.69	59+42.36	24.0	49.67	132.45									10.0	132.5		83.446			

Total: 251.9 158.676

LONGITUDINAL GROOVING			
Line No.	Location	Total (SY)	Remarks
1.0	56+07.31	217.5	South Approach
2.0	56+79.83	576.9	Bridge
3.0	58+20.67	217.5	North Approach
Total:		1011.9	

100\_28  
8/15/22

EXISTING PAVEMENT																					102_05 9/29/23
Line No.	County	Route	Direction of Travel	Begin Ref. Location Sign	End Ref. Location Sign	Year	Type	Project Number	Surface Type	Surface Depth (IN)	Base Type	Base Depth (IN)	Subbase Type	Subbase Depth (IN)	Removal Type	Removal Depth (IN)	Coarse Aggregate Source	Coarse Aggregate Type	Course Aggregate Durability Class	Reinforcement Type	Remarks
1.0	Keokuk	IA-21	Both	013.00	016.75	2021	S	STP-021-1(42)--2C-54	HMA	1.5	HMA	1.5	CIP	4.0	MIL	4.0					WIDEN 3' BOTH S
2.0						1989		FN-21-1(22)--21-54	AAC	4.5							KESWICK	C.LST.			
3.0						1950		F-897*<1>	PC7	7.0							EDDYVILLE	GRAVEL	2		W DSM GR=2

<div>SCOUR PROTECTION OR ROCK FLUME FOR BRIDGE END DRAIN</div> <div>Refer to Standard Road Plan DR-401 and DR-402</div>											104_08A 8/15/22
Line No.	Bridge Station	Bridge Corner	Distance DI-1 or DI-2 (FT)	Bridge End Drain Type	Special Ditch Control, Wood Excelsior Mat EC-101 (SQ)	Turf Reinforced Mat (TRM) Type 2 EC-104 (SQ)	Transition Mat EC-105 (SF)	Macadam Stone Base (TONS)	Engineering Fabric (SY)	Erosion Stone (TON)	Remarks
1.0	57+50.00	SE	41.0	DR-402				1.482	49.8	28.800	
2.0	57+50.00	SW	41.0	DR-402				1.482	60.1	36.000	
3.0	57+50.00	NE	41.0	DR-402				1.482	51.1	29.700	
4.0	57+50.00	NW	41.0	DR-402				1.482	43.4	24.300	
Total:								5.928	204.4	118.8	

Total DR-402 = 4 each

<div>105_04 10/21/25</div> <div>STANDARDS</div> <div>The following Standards apply to construction work on this project.</div>		
Number	Date	Title
BA-200	04-15-25	Steel Beam Guardrail Components
BA-202	04-15-25	Steel Beam Guardrail Bolted End Anchor
BA-205	10-17-23	Steel Beam Guardrail Tangent End Terminal (MASH TL-3)
BA-209	10-15-24	Steel Beam Guardrail Barrier Transition Section (Mash TL-3, 34in Mounting Height)
BA-250	10-21-25	Steel Beam Guardrail Installation at Concrete Barrier or Bridge End Post (MASH TL-3)
BA-401	04-20-21	Temporary Barrier Rail (Precast Concrete)
BA-500	04-20-21	Temporary Crash Cushions Sand Barrel
BR-205	10-21-25	Double Reinforced 12in Approach (Slab Bridge)
BR-213	10-19-21	Bridge Approach (Abutting Pavement)
DR-306	10-17-23	Precast Concrete Headwall for Subdrain Outlets
DR-402	04-16-24	Rock Flume for Bridge End Drain
EC-201	04-20-21	Silt Fence
EC-204	10-19-21	Perimeter, Slope and Ditch Check Sediment Control Devices
EC-303	10-19-21	Stabilized Construction Entrance
EC-502	04-21-15	Seeding in Rural Areas
EW-202	04-19-16	Bridge Berm Grading without Recoverable Slope (Non-Barnroof Section)
EW-301	04-16-24	Guardrail Grading
EW-401	10-20-15	Temporary Stream Crossing, Causeway, or Equipment Pad
PM-110	10-15-24	Line Types
PV-12	04-16-24	Milled Shoulder Rumble Strips
PV-13	04-16-24	Milled Centerline Rumble Strips
PV-101	10-21-25	Joints
PV-102	10-21-25	PCC Curb Details
SI-101	04-19-16	Locations - Type 'A' Signs
SI-102	04-19-16	Locations - Type 'B' Signs
SI-133	10-17-17	Installation - Type 'A' Sign Shim
SI-173	04-19-16	Object Markers
SI-211	10-18-22	Object Marker and Delineator Placement with Guardrail
SI-881	04-16-19	Special Signs for Workzones
TC-1	10-15-19	Work Not Affecting Traffic (Two-Lane or Multi-Lane)
TC-202	04-18-23	Work Within 15 ft of Traveled Way
TC-213	04-18-23	Lane Closure with Flaggers
TC-252	10-21-25	Routes Closed to Traffic

107\_23  
8/15/22

GRADING FOR GUARDRAIL INSTALLATIONS																
Refer to EW-301.																
(1) Lane(s) to which the installation is adjacent.																
Line No.	Direction of Traffic (1)	Station	Side	Foreslope at Guardrail	X1 (FT)	Y1 (FT)	X2 (FT)	Y2 (FT)	X3 (FT)	Y3 (FT)	X4 (FT)	Y4 (FT)	Z (FT)	Excavation Class 10 (CY)	Embankment-in-Place (CY)	Remarks
1.0	NB	56+73.58	Right	3:1	69.2	5.0					125.4	7.0	47.0			See T sheets.
2.0	SB	56+73.58	Left	3:1	44.2	5.0					100.4	7.0	47.0			See T sheets.
3.0	NB	58+26.42	Right	3:1	44.2	5.0					100.4	7.0	47.0			See T sheets.
4.0	SB	58+26.42	Left	3:1	94.2	5.0					150.4	7.0	47.0			See T sheets.

108 08A  
4/25/25

STEEL BEAM GUARDRAIL AT CONCRETE BARRIER OR BRIDGE RAIL END SECTION

Possible Standards: BA-200, BA-201, BA-202, BA-205, BA-206, BA-209, BA-210, BA-211, BA-221, BA-225, BA-250, BA-260, LS-625, LS-626, LS-630, LS-635, SI-172, SI-173 and SI-211.

(1) Lane(s) to which the obstacle is adjacent.  
(2) Not a bid item. Incidental to guardrail installation.

Line No.	Direction of Travel (1)	Side	Station	Offset (FT)	Barrier Transition Section	Barrier Transition Section (EA)	End Terminal	End Terminal Count (EA)	VT1 (LF)	VF (LF)	VT2 (LF)	ET (LF)	BA-211 Station	BA-211 (Type)	SI-211 (Type) (2)	Delineator SI-172 Type 1 (EA) (2)	Object Marker Type 2 (EA) (2)	Object Marker Type 3 Lt (EA)(2)	Object Marker Type 3 Rt (EA)(2)	Bolted End Anchor BA-202 (Type)	Bolted End Anchor BA-202 (EA)	Post Adapter BA-210 (EA)	Steel Beam Guardrail BA-200 (LF)	Remarks
1.0	NB	Outside	56+73.58	20.6	BA-209	1	BA-205	1	78.125			47.70			3				1	D	1		37.5	
2.0	SB	Outside	56+73.58	20.6	BA-209	1	BA-205	1	53.125			47.70			3			1		D	1		12.5	
3.0	NB	Outside	58+26.42	20.6	BA-209	1	BA-205	1	53.125			47.70			3			1		D	1		12.5	
4.0	SB	Outside	58+26.42	20.6	BA-209	1	BA-205	1	103.125			47.70			3				1	D	1		62.5	
Total:						4		4										2	2		4		125	

<div><div>108_13A 3/27/25</div><div><div>SAFETY CLOSURES</div><div>Refer to Section 2528 of the Standard Specifications</div></div></div>			
Station	Road Closure Qty.	Hazard Closure Qty.	Remarks
53+25.00	1		
64+50.00	1		
54+75.00		1	
60+80.00		1	
Total:	2	2	

Safety Closures Total: 4 EACH

<div>108_22 10/21/25</div> <div>PAVEMENT MARKING LINE TYPES</div> <div>Line factors based on 6-inch wide continuous line. *BCY4 - Place on the same side of the roadway to match existing markings near the project. **NPY4 - Estimating purposes only. No Passing Zone Lines will be located in the field. ***MNY6 - Factor of 1.00 includes number of 6-inch passes to cover median nose area. BCY4: Broken Centerline (Yellow) @ 0.17    BCY6: Broken Centerline (Yellow) @ 0.25    BLC6: Broken Line Contrast (White/Black) @ 0.50    BLW4: Broken Lane Line (White) @ 0.17    BLW6: Broken Lane Line (White) @ 0.25 CBW6: Crosswalk Bar (White) @ 10.00    CHW8: Channelizing Line (White) @ 1.33    CHW10: Channelizing Line (White) @ 1.67    CHY8: Channelizing Line (Yellow) @ 1.33    CHY10: Channelizing Line (Yellow) @ 1.67 CLW6: Crosswalk Line (White) @ 2.00    DCY4: Double Centerline (Yellow) @ 1.34    DCY6: Double Centerline (Yellow) @ 2.00    DDY4: Double Dotted Line (Yellow) @ 0.44    DDY6: Double Dotted Line (Yellow) @ 0.67 DLW4: Dotted Line (White) @ 0.22    DLW6: Dotted Line (White) @ 0.33    DLY4: Dotted Line (Yellow) @ 0.22    DLY6: Dotted Line (Yellow) @ 0.33    ELW4: Edge Line Right (White) @ 0.67 ELW6: Edge Line Right (White) @ 1.00    ELY4: Edge Line Left (Yellow) @ 0.67    ELY6: Edge Line Left (Yellow) @ 1.00    LDW8: Lane Drop (White) @ 0.33    LDW10: Lane Drop (White) @ 0.42 MNY6: Median Nose (Yellow) @ 1.00    NPY4: No Passing Zone Line (Yellow) @ 0.84    NPY6: No Passing Zone Line (Yellow) @ 1.25    RLW4: Ramp Edge Line Right (White) @ 0.67    RLW6: Ramp Edge Line Right (White) @ 1.00 RLY4: Ramp Edge Line Left (Yellow) @ 0.67    RLY6: Ramp Edge Line Left (Yellow) @ 1.00    SLW2: Stop Line (White) @ 4.00    SLW4: Solid Lane Line (White) @ 0.67    SLW6: Solid Lane Line (White) @ 1.00 SPW4: Sloped Curb 4" (White) @ 2.16    SPW6: Sloped Curb 6" (White) @ 2.28    SPY4: Sloped Curb 4" (Yellow) @ 2.16    SPY6: Sloped Curb 6" (Yellow) @ 2.28    STW6: Standard Curb 6" (Yellow) @ 2.03 STY6: Standard Curb 6" (Yellow) @ 2.03    YLW2: Yield Line (White) @ 1.15</div>															
Line No.	Road ID	Station From	Station To	Lane	Marking Type	Left	Center	Right	Groove Marking Needed?	Groove Qty. (STA)	BCY4* (STA)	BCY4* Factored (STA)	ELW4 (STA)	ELW4 Factored (STA)	Remarks
1.0	IA 21	55+62.53	59+42.36	Right	Waterborne/Solvent Paint			X					3.80	2.55	
2.0	IA 21	55+62.53	59+42.36	Center	Waterborne/Solvent Paint		X				3.80	0.65			
3.0	IA 22	55+62.53	59+42.36	Left	Waterborne/Solvent Paint	X							3.80	2.55	
Total:											3.8	0.65	7.6	5.1	

Total: Waterborne/Solvent Paint 5.75 STA

CRASH CUSHIONS															108_30 4/16/24
<div>* Bid Item</div> <div>1. Lane(s) to which the installation is adjacent.</div> <div>2. Complete this section when using the Temporary Crash Cushion bid item and Earthwork is needed for Sand Barrel placement. Refer to BA-500.</div>															
Line No.	Lane	Station	Side	Obstacle Width (FT)	Crash Cushion Type	Crash Cushion Quantity	V (FT) (2)	W (FT) (2)	X (FT) (2)	Y (FT) (2)	Z (FT) (2)	Excavation Class 10* (CY)	Embankment in Place* (CY)	Obstacle Description	Remarks
1.0	NB	56+00.00	Right	2.0	Temporary	1								TBR	Stage 1
2.0	NB	59+00.00	Right	2.0	Temporary	1								TBR	Stage 1
3.0	SB	56+00.00	Left	2.0	Temporary	1								TBR	Stage 1
4.0	SB	59+00.00	Left	2.0	Temporary	1								TBR	Stage 1
Total:						4									

<div>108_33 8/15/22</div> <div>TEMPORARY BARRIER RAIL</div> <div>Possible Standard: BA-401 Possible Detail: 560-7</div> <div>* Not a bid item. Anchorage requirements are based on TBR locations shown in the plans. TBR alignments that vary from what is shown in the plans may result in additional TBR sections requiring anchorage.</div>								
Line No.	No.	Station From	Station To	Length (FT)	Barrier Rail Type	Anchored*	Modular Glare Screen System	Remarks
1.0	1	56+00.00	59+00.00	300.0	Concrete BA-401	No	No	NB, Stage 1
2.0	2	56+00.00	59+00.00	300.0	Concrete BA-401	No	No	SB, Stage 1
Total:				600				

<div>REMOVAL OF PAVEMENT</div> <div>Refer to Tabulation 102-5.</div>							110_01 4/5/24
* Not a bid item.							
Line No.	Station From	Station To	Side	Pavement Type	Area (SY)	Saw Cut* (LF)	Remarks
1.0	54+80.66	57+12.31	Both	HMA/PCC	596.1	158.1	Includes lanes and shoulders, South roadway
2.0	57+89.68	60+33.58	Both	HMA/PCC	645.5	186.1	Includes lanes and shoulders, North roadway
Total:					1241.6	344.2	

<div>110_07A 8/15/22</div> <div>REMOVAL OF STEEL BEAM GUARDRAIL</div> <div>(1) Lane(s) to which the installation is adjacent. (2) Includes length of End Terminals and End Anchors.</div>							
Line No.	No.	Direction of Traffic (1)	Station From	Station To	Side	Removal of Guardrail (2) (LF)	
1.0	1	NB	55+18.67	56+91.67	Right	173.0	
2.0	1	NB	58+11.43	59+39.01	Right	128.0	
3.0	1	SB	55+88.60	56+91.67	Left	103.0	
4.0	1	SB	58+11.21	59+88.85	Left	178.0	
Total:						582	

FILE NO. 32542ENGLISHDESIGN TEAM STANLEY CONSULTANTS INC.

KEOKUK COUNTYPROJECT NUMBER BRF-021-1(46)--38-54SHEET NUMBER C.18

12/4/2025 12:31:51 PMGREG.SHUGER@IOWAID

112\_06  
2/22/24

BRIDGE APPROACH SECTION																					
Refer to the BR Series.																					
* Not a bid item																					
Line No.	Bridge Station	End	Skew Ahead Left (Degrees)	Skew Ahead Right (Degrees)	(T) Thickness (IN)	Pay Length (FT)	Non-Reinf. Area (SY)	Single-Reinf. Area (SY)	Double-Reinf. Area (SY)	SRP Approach	SRP Abutment Type	SRP Abutting Pavement	Perforated * 4" Subdrain (LF)	Subdrain * Outlet (STA)	Subdrain * Outlet Side	Porous * Backfill (CY)	Class 'A' * Crushed Stone Backfill (CY)	Modified * Subbase (TON)	Polymer * Grid (SY)	Special * Backfill (TON)	Remarks
1.0	57+50.00	S			12.0	72.0	144.4	95.9	133.4	BR-205		BR-213	60.0	56+17.31	Right	2.3	0.1	354.300	374.9		
2.0	57+50.00	N			12.0	72.0	144.4	95.9	133.4	BR-205		BR-213	60.0	58+82.69	Right	2.3	0.1	354.300	374.9		
Total:							288.8	191.8	266.8				120			4.6	0.2	708.6	749.8		

BR-205 Total: 747.4 SY

112\_09  
10/15/24

SHOULDERS

(1) Lane(s) to which the shoulder is adjacent.  
(2) See Typ. 7156, 7157, or 7158.  
(3) Bid Item.  
(4) Applies only for Paved Shoulders constructed on project with existing granular shoulders.  
(5) Bid Item. Typ. 7156, 7157, or 7158.  
(6) Does not include shrink.  
(7) Paved shoulder thickness specified in Remarks.  
(8) Subbase type specified in Remarks.

Roadway Identification	Direction of Travel (1)	Station From	Station To	Side	P Width (FT)	P SG Width (2) (FT)	G Start Width (FT)	G End Width (FT)	G Width (FT)	L Length (FT)	Class 13 Excavation (CY)(3)(4)	HMA (TON)	HMA (TON/ STA)	Binder (TONS)	Paved Shoulder (3) (SY)	Paved Shoulder at Grd rail (5) (7)(SY)	Special Backfill HMA Alt.(3) (TON)	Special Backfill HMA Alt. (TON/STA)	Special Backfill PCC Alt.(3) (TON)	Special Backfill PCC Alt. (TON/STA)	Granular Shoulder (3) (TON)	Granular Shoulder (TON/STA)	Shoulder Const. Alt (3) (STA)	Earth Shoulder Const. Alt HMA (6) (CY)	Earth Shoulder Const. Alt PCC (6) (CY)	Remarks
IA 21	SB	54+80.66	55+53.09	Left	2		0.0	0.0		72.43	7.2	9.354	12.914	0.561	16.1		22.199	30.649	24.153	33.347			0.72	33.26	33.26	Shoulder Strengthening
	SB	55+53.09	55+76.44	Left	8	3.5	0.0	0.0		23.35	13.3	15.077	64.570	0.905	20.8	9.1	23.978	102.691	25.902	110.931			0.23	10.72	10.72	
	SB	55+76.44	56+07.31	Left	8	3.5 to 2.2	0.0	0.0		30.87	16.5	18.842	61.036	1.131	27.4	9.8	30.179	97.762	32.606	105.622			0.31	14.18	14.18	
	SB	58+92.69	59+27.36	Left	8	1.6	0.0	0.0		34.67	16.4	18.805	54.239	1.128	30.8	6.2	30.608	88.283	33.080	95.414			0.35	15.92	15.92	
	SB	59+27.36	59+73.83	Left	8	1.6 to 3.5	0.0	0.0		46.47	24.2	27.605	59.405	1.656	41.3	13.2	44.373	95.487	47.944	103.172			0.46	21.34	21.34	
	SB	59+73.83	59+96.82	Left	8	3.5	0.0	0.0		22.99	13.1	14.845	64.570	0.891	20.4	8.9	23.609	102.691	25.503	110.931			0.23	10.56	10.56	
	NB	55+28.21	55+51.49	Right	8	3.5	0.0	0.0		23.28	13.2	15.032	64.570	0.902	20.7	9.1	23.906	102.691	25.825	110.931			0.23	10.69	10.69	
	NB	55+51.49	55+96.52	Right	8	3.5 to 1.6	0.0	0.0		45.03	23.5	26.750	59.405	1.605	40.0	12.8	42.998	95.487	46.458	103.172			0.45	20.68	20.68	
	NB	55+96.52	56+07.31	Right	8	1.6	0.0	0.0		10.79	5.1	5.852	54.239	0.351	9.6	1.9	9.526	88.283	10.295	95.414			0.11	4.96	4.96	
	NB	58+92.69	59+24.77	Right	8	2.2 to 3.5	0.0	0.0		32.08	17.2	19.580	61.036	1.175	28.5	10.2	31.362	97.762	33.884	105.622			0.32	14.73	14.73	
	NB	59+24.77	59+46.78	Right	8	3.5	0.0	0.0		22.01	12.5	14.212	64.570	0.853	19.6	8.6	22.602	102.691	24.416	110.931			0.22	10.11	10.11	
	NB	59+46.78	60+33.58	Right	2		2.0	2.0	2	86.80	8.6	11.209	12.914	0.673	19.3		26.604	30.649	28.945	33.347	10.086	11.620	0.87	39.86	39.86	Shoulder Strengthening
Total:												170.8	197.163	11.831	294.5	89.8	331.944	359.011			10.086		4.5	207.01	207.01	

MILLED RUMBLE STRIPS														112_10 4/15/25
* Calculated at 18" width for Shoulder. ** For use with penetrating Engineered Fog Seal. Calculated at 2" wider than rumble strips.														
Line No.	Road Identification	Station From	Station To	Shoulder Pavement Type	Rumble Strip Lane	Rumble Strip Type	Fog Seal Type	L (IN)	PCC Length (STA)	HMA Length (STA)	Fog Seal* Shoulder (GAL)	Effective Shoulder Width HMA (FT)	Effective Shoulder Width Granular\Earth (FT)	Remarks
1.0	IA 21	55+28.21	56+07.31	PCC or HMA	Right Shoulder	Milled	Asphalt Emulsion	12"	0.79	0.79	0.9	8.0		
2.0	IA 21	58+92.69	59+46.78	PCC or HMA	Right Shoulder	Milled	Asphalt Emulsion	12"	0.54	0.54	0.6	8.0		
3.0	IA 21	55+53.09	56+07.31	PCC or HMA	Left Shoulder	Milled	Asphalt Emulsion	12"	0.54	0.54	0.6	8.0		
4.0	IA 21	58+92.69	59+96.82	PCC or HMA	Left Shoulder	Milled	Asphalt Emulsion	12"	1.04	1.04	1.1	8.0		
5.0	IA 21	55+62.53	56+07.31	PCC	Centerline	Milled		12"	0.45					
6.0	IA 21	58+92.69	59+42.36	PCC	Centerline	Milled		12"	0.50					
Total:									3.86	2.91	3.2			

Total: Centerline Rumble Strips 0.95 STA  
Total: Shoulders Rumble Strips 2.91 STA

262\_05  
9/28/22

UTILITIES (POINT 25 PROJECT)

This is a POINT 25 project and is subject to the provisions of IAC 761-115.25.

281\_01  
9/28/22

SECTION 404 PERMIT AND CONDITIONS

Construct this project according to the requirements of U.S. Army Corps of Engineers Nationwide, Permit No. 3. A copy of this permit is available from the Iowa DOT website (<http://www.envpermits.iowadot.gov/>). The U.S. Army Corps of Engineers reserves the right to visit the site without prior notice.

282\_03  
9/28/22

TEMPORARY STREAM CROSSING, CAUSEWAY, OR EQUIPMENT PAD

Standard Road Plan EW-401 is listed in Tabulation 105-4; however, it is included for information purposes only since it is an option. No quantities associated with constructing EW-401 are included in any bid items.

## EMBANKMENT WITH MOISTURE CONTROL

Moisture Control is required for all Class 10 fill placed in all locations and depths. Stability berms placed outside the normal foreslope template and topsoil will not require Moisture Control.

## SHRINKAGE DATA


Material	%	Remarks
Topsoil	40%	Shrinkage
Class 10	30%	Shrinkage
Boulders		8 CY (estimate)

## TOPSOIL STRIPPING AND PLACEMENT

Location				Topsoil Stripping Thickness	Topsoil Placement Thickness	Remarks
Road Identification	Dir. of Traffic	Begin Station	End Station			
				IN	IN	
IA21	NB	55+15	57+00	6.0	8.0	
IA21	NB	58+00	59+50	6.0	8.0	
IA21	SB	55+50	57+00	6.0	8.0	
IA21	SB	58+00	60+00	6.0	8.0	



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

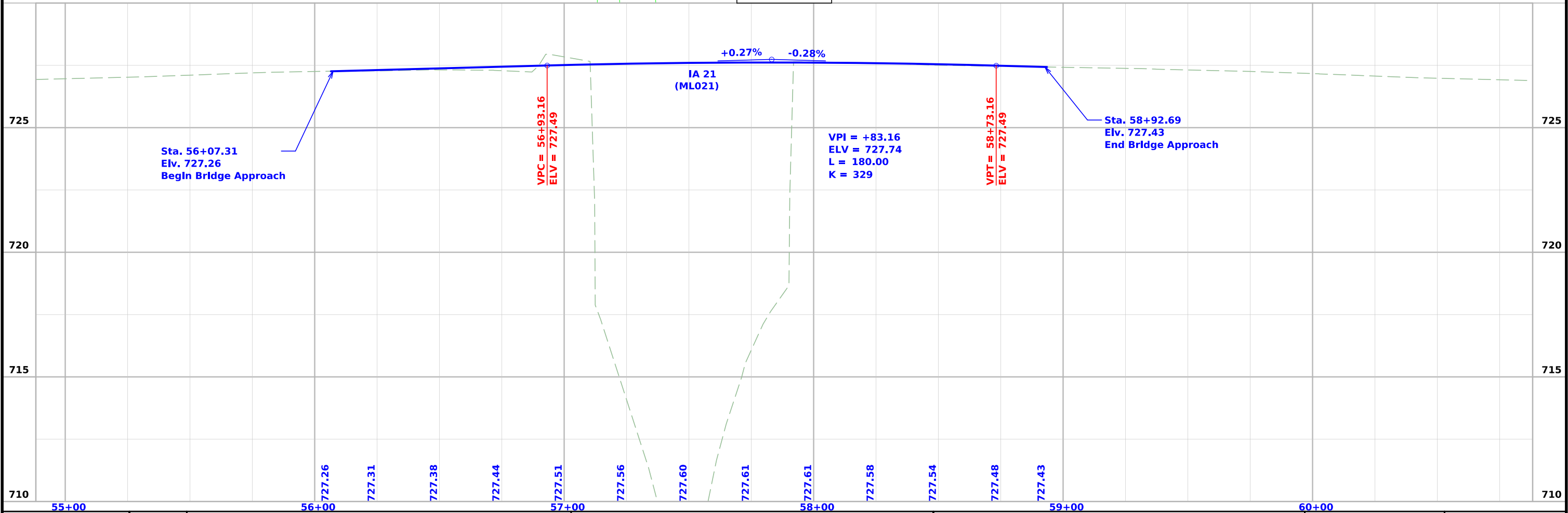
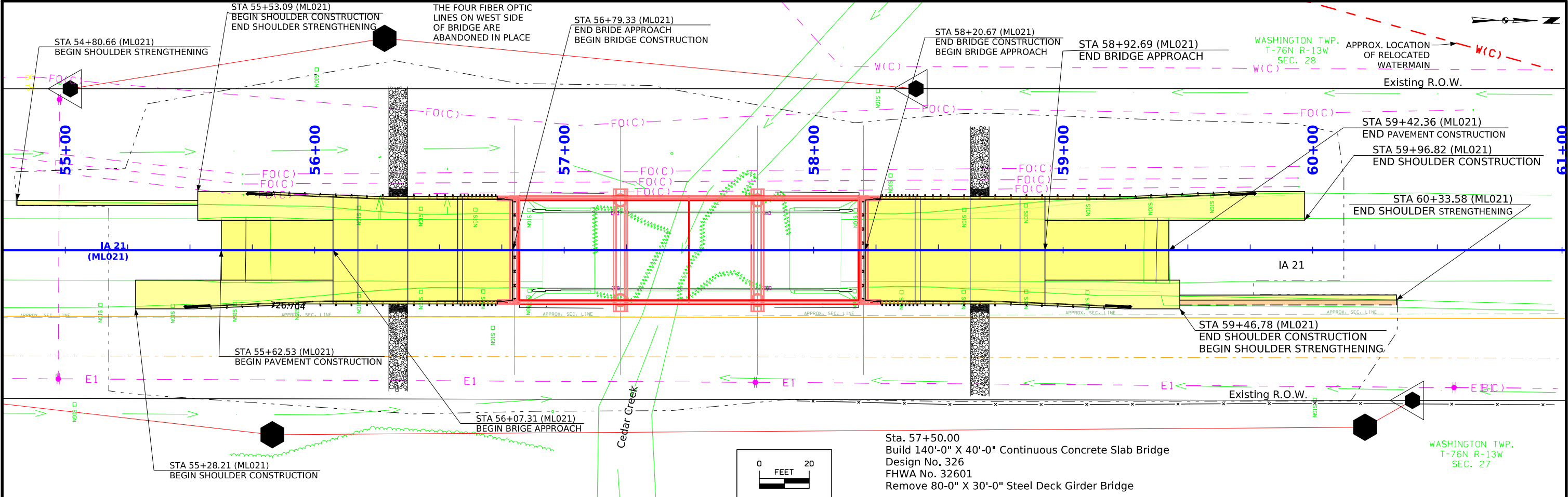
		12/2/2025
Signature		Date

Buddika Godagama

Printed or Typed Name  
My license renewal date is December 31, 20 27

Pages or sheets covered by this seal: CS.1





Survey Information

**SURVEY INDEX**

**County: Keokuk**  
**PIN: 21-54-021-020**  
**Project Number: BRF-021-1(46)--38-54**  
**Location: Cedar Creek 1.1 Mi North of IA 92**  
**Type of Work: Bridge Replacement**

**(U.S. SURVEY FOOT)**  
**VERTICAL DATUM: NAVD88**  
**GEOID MODEL: GEOID12B**

**Alignment Information**

Alignment created by District ROW Office.

**Survey Personnel**

Matthew Fouts – PLS  
Daniel Marti – PLS  
Drake Marti – Survey Technician  
Joshua Randolph – Survey CADD Technician

**Date(s) of Survey**

Begin Date                02/10/2023  
End Date                 02/10/2023

**General Information**

This survey is for preliminary design for the section of approximately 0.1 mile of roadway, there is one bridge along the route. Project datum is provided by Design Survey Office. This project is a full DTM Survey.

**Utility Information**

For logging data and other utility details see Utility Survey and Ownership Report in the Utility folder of the PrelimSurvey project directory.

**Project Control**

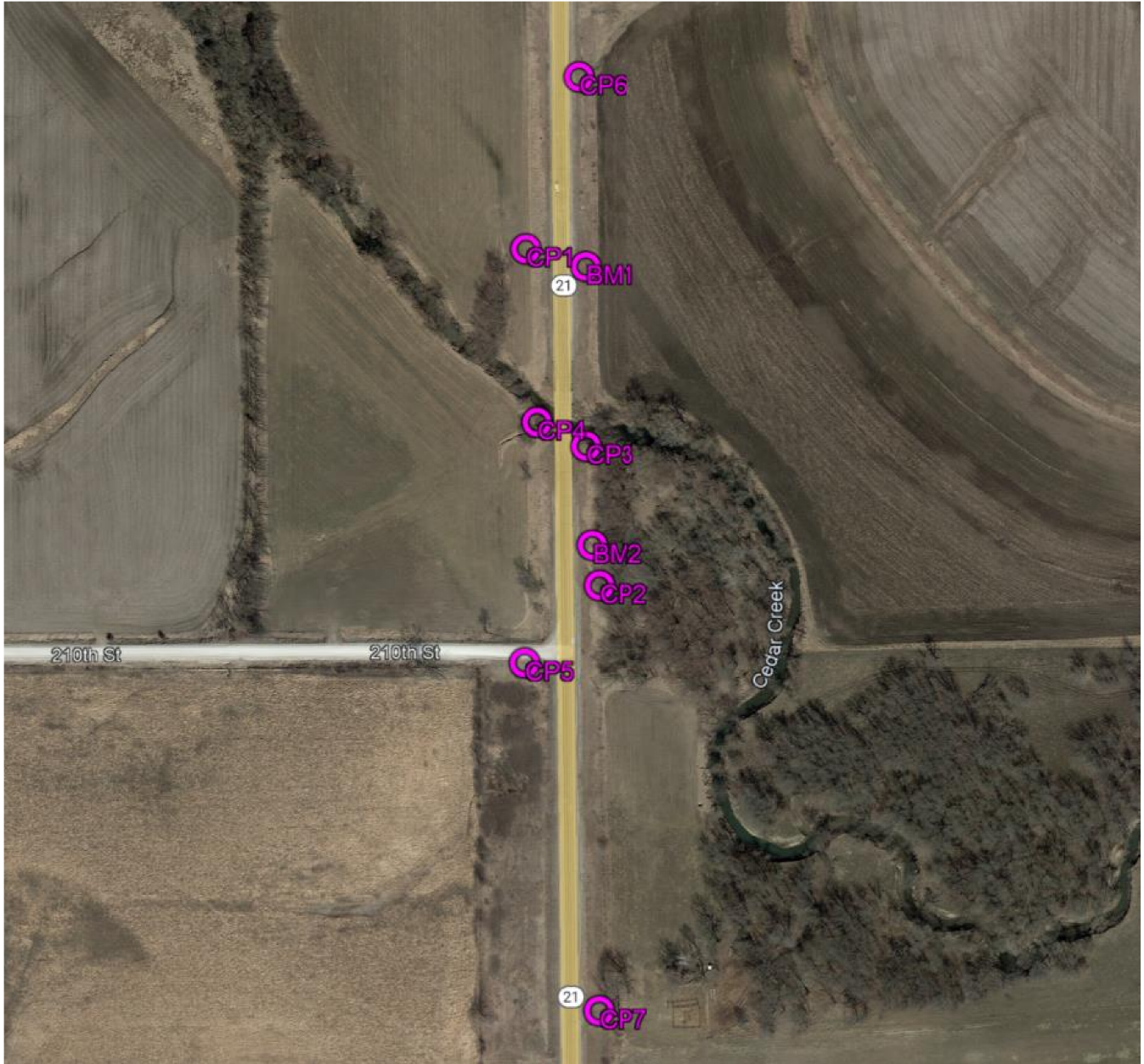
(RTN)  
Nearby Iowa Real Time Network reference stations were utilized to obtain horizontal and vertical control on primary project control points. For additional details of the control survey, contact the Preliminary Survey department.

(Static)  
Static observations were not used for this survey.

**PROJECT DATUM: NAD83(2011) for EPOCH 2010.00**  
**COORDINATE SYSTEM: IOWA REGIONAL COORDINATE SYSTEM ZONE 13**  
**(Fairfield).**

CONTROL POINT VICINITY MAP

This map is a guide to the vicinity of the primary project control points. Primary control is for use with RTK base stations and for RTN validation. Future surveys will use primary project control to establish temporary control as needed for construction or other surveying applications.



HORIZ. DATUM: NAD83(2011) for EPOCH 2010.00 (IaRTN 2019 Adjustment) - Iowa RCS Zone 13 (U.S. Survey Foot)

VERT. DATUM: NAVD88 - Geoid Model: 12B

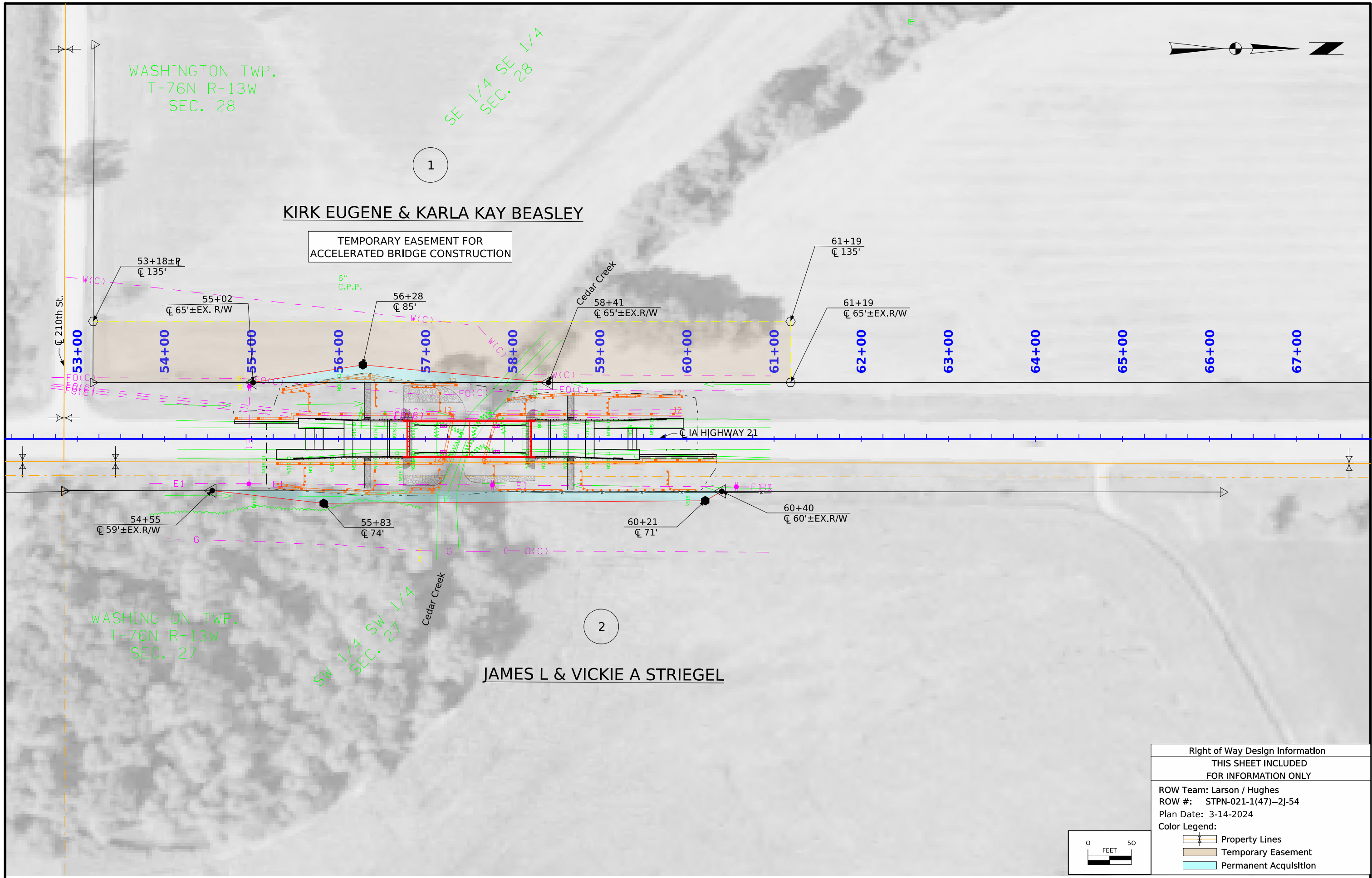
Coordinate listing from next sheet will be used with IaRTN for monument recovery. No other reference ties are given.

HORIZONTAL AND VERTICAL PROJECT CONTROL COORDINATE LISTING  
HORIZ. DATUM: NAD83(2011) for EPOCH 2010.00 (laRTN 2019 Adjustment)  
la. Regional Coordinate System Zone 13 (U.S. Survey Foot)  
VERT. DATUM: NAVD88  
Geoid Model: 2018u3 or 2018u2

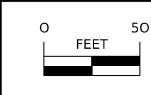
POINT NAME	NORTHING	EASTING	ELEVATION	DESCRIPTION							
CP1	6802215.08	23379805.07	725.69	SET 5/8" REBAR 2'+/- WEST OF HIGHWAY 21 134'+/- NORTH OF BRIDGE GUARD RAIL							
CP2	6801529.83	23379857.38	725.97	SET 5/8" REBAR 1'+/- ON THE SOUTHEAST SIDE OF HIGWAY 21							
CP3	6801790.67	23379896.47	719.57	SET 5/8" REBAR ON THE SOUTHEAST SIDE OF THE BRIDGE ON THE SOUTH SIDE OF THE CREEK BANK							
CP4	6801837.90	23379792.60	717.27	SET 5/8" REBAR ON THE SOUTHWEST SIDE OF HIGHWAY 21 ON THE SOUTH SIDE OF THE CREEK BANK							
BM1	6802152.05	23379884.73	719.86	RAIL ROAD SPIKE IN WEST SIDE OF LIGHT POLE ON THE NORTHEAST SIDE OF HWY 21; 2ND LIGHT POLE UP FROM THE NORTH SIDE OF THE CREEK							
BM2	6801592.07	23379883.66	719.96	RAIL ROAD SPIKE IN WEST SIDE OF LIGHT POLE ON THE NORTHEAST SIDE OF HIGHWAY 21; 1ST POLE SOUTH OF CREEK							
CP5	6801366.00	23379754.62	725.31	60' WEST OF HIGHWAY 21 & 5' SOUTH OF 210TH ST - FENO MONUMENT							
CP6	6802558.19	23379858.53	726.15	15' EAST OF HIGHWAY 21 & 2' SOUTH OF FIELD DRIVE - FENO MONUMENT							
CP7	6800651.29	23379894.34	738.88	60' EAST OF HIGHWAY 21 & 5' NORTH OF FIELD DRIVE INLINE WITH GATE POST EAST - FENO MONUMENT							
NGS8	6790552.56	23349949.67	817.27	NGS	SURVEY DISK IN CONCRETE MONUMENT STAMPED ROSE 1934 0.2' BELOW GROUND						

ALIGNMENT COORDINATES																			101-16 10-20-09	
Name	Location	Point on Tangent			Begin Spiral			Begin Curve			Simple Curve PI or Master PI of SCS			End Curve			End Spiral			
		Station	Coordinates		Station	Coordinates		Station	Coordinates		Station	Coordinates		Station	Coordinates		Station	Coordinates		
			Y (Northing)	X (Easting)		Y (Northing)	X (Easting)		Y (Northing)	X (Easting)		Y (Northing)	X (Easting)		Y (Northing)	X (Easting)		Y (Northing)	X (Easting)	
1	IA 21 (ML021)	22+73.95	6798368.94	23379849.92																
2	IA 21 (ML021)	89+76.43	6805071.33	23379814.28																

FILE NO.	32542	ENGLISH	DESIGN TEAM	Stanley Consultants Inc.	KEOKUK COUNTY	PROJECT NUMBER	BRF-021-1(46)--38-54	SHEET NUMBER	G.4
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Right of Way Design Information	
THIS SHEET INCLUDED FOR INFORMATION ONLY	
ROW Team: Larson / Hughes	
ROW #: STPN-021-1(47)-2J-54	
Plan Date: 3-14-2024	
Color Legend:	
	Property Lines
	Temporary Easement
	Permanent Acquisition



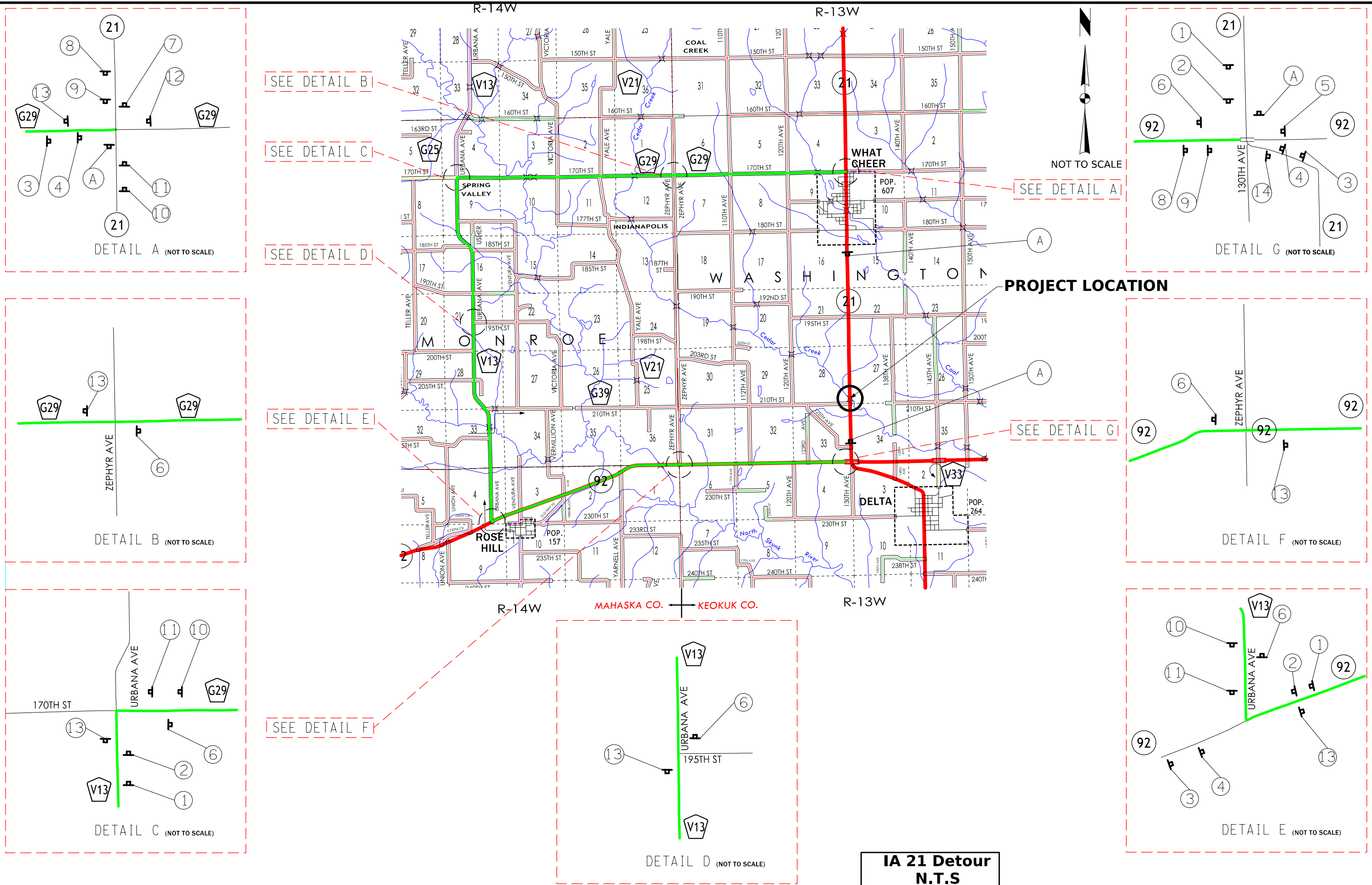
TRAFFIC CONTROL PLAN		108_23A 8/15/22
<p>Stage 1: Maintain existing IA 21 traffic pattern. Temporary Barrier Rail may be used during and after removal of bridge steel barrier rail. Refer to sheet V.6 for Bridge Staging Plan.</p> <p>Stage 2: IA 21 will be closed and an off-site detour will be utilized for stage 2. Offsite detour shall be as shown on J sheets. Maintain traffic on 210th St for the duration of the project.</p> <p>-Contractor shall erect, maintain, and remove all detour signage and PDMS's. Detour signs shall be installed at least 6 ft from edge of shoulder and/or at least 12 ft from traveled way. All signs that conflict with detour signs shall be removed or covered.</p>		



STAGING NOTES		108_26A 8/15/22
Stage 1 Traffic Control: Maintain existing IA 21 traffic pattern. Construction: Construct new bridge on west side of existing bridge.		
Stage 2 Traffic Control: Install offsite detour signage and close IA 21 to traffic. Detour all IA 21 traffic offsite per Sheet J.5. Construction: Demo old bridge. Slide new bridge into final location. Construct approach pavements, shoulders and guardrails.		

<div>COORDINATED OPERATIONS</div> <div>Other work in progress during the same period of time will include the construction of the projects listed. Coordinate operations with those of other contractors working within the same area.</div>				111_01 10/14/22	
Project		Type of Work			
None provided					

FILE NO.	32542	ENGLISH	DESIGN TEAM	STANLEY CONSULTANTS INC.	KEOKUK COUNTY	PROJECT NUMBER	BRF-021-1(46)--38-54	SHEET NUMBER	J.4
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QUANTITY = 3



QUANTITY = 3



QUANTITY = 3



QUANTITY = 1



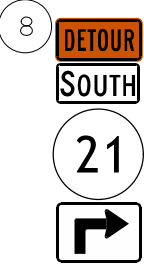
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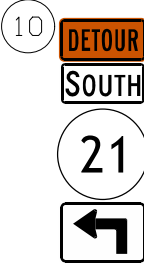
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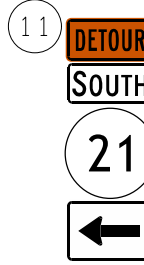
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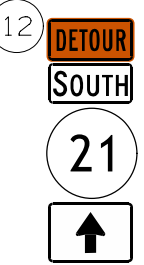
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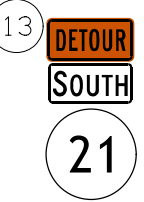
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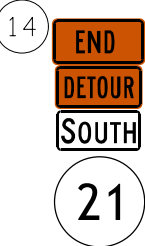
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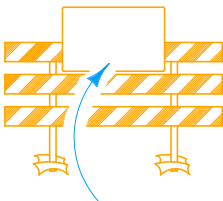


QUANTITY = 1



A

QUANTITY = 4



ROAD CLOSED  
TO  
THRU TRAFFIC

R11-4  
60" x 30"

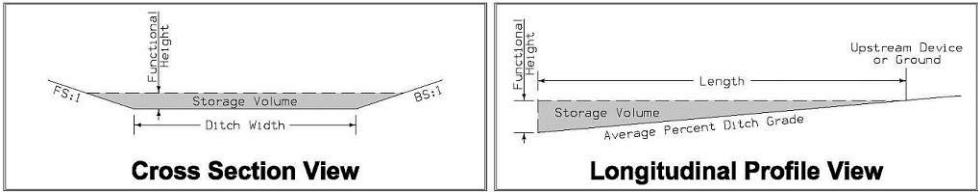
SIGN INVENTORY FOR DETOUR

	I.D. number	Size	Quantity
	M4-8	24" x 12"	38
	M4-8B	24" x 12"	2
	M3-1	24" x 12"	20
	M3-3	24" x 12"	18
	M6-1	21" x 15"	11
	M5-1B	21" x 15"	6
	M5-1	21" x 15"	5
	M6-3	21" x 15"	2
	M1-5	24" x 24"	38

SILT FENCES FOR DITCH CHECKS

Possible Standard: EC-201

100\_18  
8/15/22



\* The functional height used in the volume equation is 85% of effective height. Effective height is 1.58 feet as shown on EC-201.  
\* Volume equation:  $[0.5 \times \text{Spacing} \times (0.5 \times H^2 \times FS + DW \times H + 0.5 \times H^2 \times BS)]$

Line No.	Basin No.	Type	Station	Side	Installation (LF)	Maintenance (LF)	Removal (LF)	Foreslope (FS:1)	Backslope (BS:1)	Ditch Width (FT)	Avg. % Slope Ditch Grade	Volume (CF)	Remarks
1.0	1	Type 4	55+65.00	Left	50.0	5.0	25.0	4.0	6.0		1.0	699.05	
2.0	1	Type 4	56+42.00	Left	52.0	5.2	26.0	4.0	6.0		1.0	699.05	
3.0	1	Type 5	57+16.00	Left	56.0	5.6	28.0	4.0			0.5	568.57	
4.0	1	Type 5	58+15.00	Left	45.0	4.5	22.5	3.0			0.5	426.82	
5.0	1	Type 5	59+10.00	Left	45.0	4.5	22.5	3.0			0.5	426.82	
6.0	1	Type 5	55+60.00	Right	50.0	5.0	25.0	3.0			0.5	426.82	
7.0	1	Type 5	56+41.00	Right	52.0	5.2	26.0	3.0			0.2	426.82	
8.0	1	Type 5	57+16.00	Right	50.0	5.0	25.0	3.0			0.2	426.82	
9.0	1	Type 5	57+80.00	Right	100.0	10.0	50.0	3.0			0.2	426.82	
10.0	01	Type 5	58+80.00	Right	112.0	11.2	56.0	3.0			0.2	426.82	
11.0	1	Type 5	59+80.00	Right	48.0	4.8	24.0	3.0			0.2	426.82	
12.0	1	Type 1	57+75.00	Left	75.0	7.5	37.5	10.0	10.0		0.5	2841.30	
13.0	1	Type 1	58+25.00	Left	75.0	7.5	37.5	10.0	10.0		0.5	2841.30	
Total:					810	81	405					11063.83	

PERIMETER AND SLOPE SEDIMENT CONTROL DEVICE							
Possible Standards: EC-204							
Line No.	Station From	Station To	Side	Sediment Control Device Type	Diameter Size	Length (LF)	Remarks
0.5	53+25.00	58+25.00	Left	Perimeter and Slope	12 inch	530.00	
1.0	54+80.00	57+32.00	Left	Perimeter and Slope	12 inch	260.00	
2.0	57+20.00	57+20.00		Perimeter and Slope	12 inch	60.00	
3.0	55+34.00	57+36.00	Left	Perimeter and Slope	12 inch	210.00	
4.0	55+27.00	57+20.00	Right	Perimeter and Slope	12 inch	200.00	
5.0	55+27.00	57+14.00	Right	Perimeter and Slope	12 inch	190.00	
6.0	57+65.00	57+88.00	Left	Perimeter and Slope	12 inch	60.00	
7.0	57+88.00	59+96.00	Left	Perimeter and Slope	12 inch	210.00	
8.0	57+83.00	59+96.00	Left	Perimeter and Slope	12 inch	220.00	
9.0	57+60.00	60+35.00	Right	Perimeter and Slope	12 inch	270.00	
10.0	58+75.00	61+15.00	Left	Perimeter and Slope	12 inch	300.00	
Total:						2510	


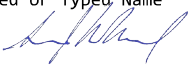
100\_19  
10/15/24

Line No.	Basin No.	Station From	Station To	Direction of Traffic	Side	Discharge Station	Discharge Side	Total Disturbed Area (ACRES)	Disturbed Area with Storage Provided (ACRES)	Disturbed Area without Storage Provided (ACRES)	Best Management Practice	Total Storage Volume Provided (CF)	Total Storage Volume Required (CF)	Storage Volume Met	Remarks
1.0	1	53+20.00	61+20.00			57+50.00	Right	2.8	2.8		Silt Fence for Ditch Check (EC-201)	11063.80	10080.0	Yes	






<div>110_12 1/13/23</div> <div>POLLUTION PREVENTION PLAN</div> <p>This project is regulated by the requirements of the Iowa Department of Natural Resources (DNR) National Pollutant Discharge Elimination System (NPDES) General Permit No. 2 OR an Iowa Department of Natural Resources (DNR) National Pollutant Discharge Elimination System (NPDES) individual storm water permit. The Contractor shall carry out the terms and conditions of this permit and the Pollution Prevention Plan (PPP).</p> <p>This Base PPP includes information on Roles and Responsibilities, Project Site Description, Controls, Maintenance Procedures, Inspection Requirements, Non-Storm Water Controls, Potential Sources of Off Right-of-Way Pollution, and Definitions. This plan references other documents rather than repeating the information contained in the documents. A copy of this Base Pollution Prevention Plan, amended as needed during construction, will be readily available for review.</p> <p>All contractors shall conduct their operations in a manner that controls pollutants, minimizes erosion, and prevents sediments from entering waters of the state and leaving the highway right-of-way. The Contractor shall be responsible for compliance and implementation of the PPP for their entire contract. This responsibility shall be further shared with subcontractors whose work is a source of potential pollution as defined in this PPP.</p> <p>I. ROLES AND RESPONSIBILITIES</p> <p>A. Designer:</p> <ol style="list-style-type: none"><li>1. Prepares Base PPP included in the project plan.</li><li>2. Prepares Notice of Intent (NOI) submitted to Iowa DNR.</li><li>3. Is signature authority on the Base PPP. If consultant designed, signature from Contracting Authority is also required.</li></ol> <p>B. Contractor:</p> <ol style="list-style-type: none"><li>1. Signs a co-permittee certification statement adhering to the requirements of the NPDES permit and this PPP. All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of this PPP.</li><li>2. Designates a Water Pollution Control Manager (WPCM), who has the duties and responsibilities as defined in Section 2602 of the Standard Specifications.</li><li>3. Submits an Erosion Control Implementation Plan (ECIP) and ECIP updates according to Section 2602 of the Standard Specifications.</li><li>4. Installs and maintains appropriate controls. This work may be subcontracted as documented through Subcontractor Request Forms (Form 830231).</li><li>5. Supervises and implements good housekeeping practices according to Paragraph III, C, 2.</li><li>6. Conducts joint required inspections of the site with inspection staff. When Contractor is not mobilized on site, Contractor may delegate this responsibility to a trained or certified subcontractor. Contracting Authority also may waive joint inspection requirement during winter shutdown. In both circumstances, WPCM (or trained or certified delegate from the Contractor) is still responsible to review and sign inspection reports.</li><li>7. Complies with training and certification requirements of Section 2602 of the Standard Specifications.</li><li>8. Submits amended PPP site map according to Section 2602 of the Standard Specifications.</li></ol> <p>C. Subcontractors:</p> <ol style="list-style-type: none"><li>1. Sign a co-permittee certification statement adhering to the requirements of the NPDES permit and this PPP if: responsible for sediment or erosion controls; involved in land disturbing activities; or performing work that is a source of potential pollution as defined in this PPP. Subcontracted work items are identified in Subcontractor Request Forms (Form 830231). All co-permittees are legally required under the Clean Water Act and the Iowa Administrative Code to ensure compliance with the terms and conditions of this PPP.</li><li>2. Implement good housekeeping practices according to Paragraph III, C, 2.</li></ol> <p>D. RCE/Project Engineer:</p> <ol style="list-style-type: none"><li>1. Is Project Storm Water Manager.</li><li>2. On projects where DOT is the Contracting Authority, is current with erosion control training or certification.</li><li>3. Takes actions necessary to ensure compliance with storm water requirements including, where appropriate, issuing stop work orders, and directing additional inspections at construction project sites that are experiencing problems with achieving permit compliance.</li><li>4. Orders the taking of measures to cease, correct, prevent, or minimize the consequences of non-compliance with the storm water requirements of the Applicable Permit.</li><li>5. Supervises all work necessary to meet storm water requirements at the Project, including work performed by contractors and subcontractors.</li><li>6. Requires employees, contractors, and subcontractors to take appropriate responsive action to comply with storm water requirements, including requiring any such person to cease or correct a violation of storm water requirements, and to order or recommend such other actions as necessary to meet storm water requirements.</li><li>7. Is familiar with the Project PPP and storm water site map.</li><li>8. On projects where DOT is Contracting Authority, is responsible for periodically monitoring inspection reports to determine whether deficiencies identified in inspection reports were adequately and timely addressed, and if not, has the authority and responsibility to direct immediate actions to correct the deficiencies.</li><li>9. Is the point of contact for the Project for regulatory officials, Inspector, contractors, and subcontractors regarding storm water requirements.</li></ol>				<div>110_12 1/13/23</div> <div>POLLUTION PREVENTION PLAN</div> <ol style="list-style-type: none"><li>10. Is signature authority on Notice of Discontinuation.</li><li>11. Maintains an up-to-date record of contractors, subcontractors, and subcontracted work items through Subcontractor Request Forms (Form 830231).</li><li>12. Makes information to determine permit compliance available to the DNR upon their request.</li></ol> <p>E. Inspector:</p> <ol style="list-style-type: none"><li>1. Updates PPP through fieldbook entries and storm water site inspection reports if there is a change in design, construction, operation, or maintenance which has a significant effect on the discharge of pollutants from the project.</li><li>2. Makes information to determine permit compliance available to the DNR upon their request.</li><li>3. Conducts joint required inspections of the site with the contractor/subcontractor.</li><li>4. Completes an inspection report after each inspection.</li><li>5. Is signature authority on storm water inspection reports.</li></ol> <p>II. PROJECT SITE DESCRIPTION</p> <p>A. This Pollution Prevention Plan (PPP) is for the construction of a Bridge Replacement.</p> <p>B. This PPP covers approximately 2.8 acres with an estimated 2.8 acres being disturbed. The portion of the PPP covered by this contract has 2.8 acres disturbed.</p> <p>C. The PPP is located in an area of 1 soil association Otley - Ladoga The estimated weighted average runoff coefficient number for this PPP after completion will be 0.32.</p> <p>D. Storm Water Site Map is located in the R sheets. Proposed slopes are shown in cross sections, details, or standard road plans. Supplemental information is located in the Tabulations in the C or CE sheets.</p> <p>E. The base storm water site map is amended by contract modifications and progress payments (fieldbook entries) of completed erosion control work. Also, due to project phasing, erosion and sediment controls shown on project plans may not be installed until needed, based on site conditions. For example, silt fence ditch checks will typically not be installed until the ditch has been installed. Installed locations may also be modified from tabulation locations by field staff. Installed locations will be documented by fieldbook entries and amended PPP site map.</p> <p>F. Runoff from this work will flow into Cedar Creek.</p> <p>III. CONTROLS</p> <p>A. The Contractor’s ECIP specified in Article 2602.03 of the Standard Specifications for accomplishment of storm water controls should clearly describe the intended sequence of major activities, and for each activity define the control measure and the timing during the construction process that the measure will be implemented.</p> <p>B. Preserve vegetation in areas not needed for construction.</p> <p>C. Sections 2601 and 2602 of the Standard Specifications define requirements to implement erosion and sediment control measures. Actual quantities used and installed locations may vary from the Base PPP and amendment of the plan will be documented via fieldbook entries, amended PPP site map, or by contract modification. Additional erosion and sediment control items may be required as determined by the inspector and/or contractor during storm water site inspections. If the work involved is not applicable to any contract items, the work will be paid for according to Article 1109.03 paragraph B of the Standard Specifications.</p> <p>1. EROSION AND SEDIMENT CONTROLS</p> <p>a. Stabilization Practices</p> <ol style="list-style-type: none"><li>1) Site plans will ensure that existing vegetation or natural buffers are preserved where attainable and disturbed portions of the site will be stabilized.</li><li>2) Initialize stabilization of disturbed areas immediately after clearing, grading, excavating, or other earth disturbing activities have:<ol style="list-style-type: none"><li>a) Permanently ceased on any portion of the site, or</li><li>b) Temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days.</li></ol></li><li>3) Staged permanent and/or temporary stabilizing seeding and mulching shall be completed as the disturbed areas are completed. Incomplete areas shall be stabilized according to paragraph III, C, 1, a, 2, b above.</li><li>4) Permanent and Temporary Stabilization practices to be used for this project are located in the storm water site map, Estimated Project Quantities (100-0A, 100-1A, or 100-1C), and Estimate Reference Information (100-4A) located in the C or R sheets. Typical drawings detailing construction of the practices to be used on this project are referenced in the Standard Road Plans Tabulation (105-4) in the C or R sheets.</li><li>5) Preservation of existing vegetation within right-of-way or easements will act as vegetative buffer strips.</li><li>6) Preservation of topsoil: Bid items to be used for this project are located in the Estimated Project Quantities (100-0A, 100-1A, or 100-1C) and Estimate Reference Information (100-4A) located in the C or R sheets. Additional information may be found in the Tabulations in the C or T Tabulation sheets, or is referenced in Section 2105 of the Standard Specifications.</li></ol> <p>b. Structural Practices</p> <ol style="list-style-type: none"><li>1) Structural practices will be implemented to divert flows from exposed soils and detain or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Additionally, structural practices may include: silt basins that provide 3600 cubic feet of storage per acre drained or equivalent sediment controls, outlet structures that withdraw water from surface when discharging basins, and controls to direct storm water to vegetated areas.</li></ol>					
FILE NO.	32542	ENGLISH	DESIGN TEAM	STANLEY CONSULTANTS INC.	KEOKUK COUNTY	PROJECT NUMBER	BRF-021-1(46) -- 38-54	SHEET NUMBER	RC.4




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<div>110_12 1/13/23</div> <div>POLLUTION PREVENTION PLAN</div> <div><p>2) Structural practices to be used for this project are located in the storm water site map, Estimated Project Quantities (100-0A, 100-1A, or 100-1C), and Estimate Reference Information (100-4A) located in the C or R sheets, as well as all other item specific Tabulations. Typical drawings detailing construction of the devices to be used on this project can be found on the B or R sheets or are referenced in the Standard Road Plans Tabulation (105-4) located in the C or R sheets.</p><p>c. Storm Water Management</p><p>Measures shall be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. This may include velocity dissipation devices at discharge locations and along length of outfall channel as necessary to provide a non-erosion velocity flow from structure to water course. If included with this project, these items are located in the storm water site map and Estimated Project Quantities (100-0A, 100-1A, or 100-1C) and Estimate Reference Information (100-4A) located in the C or R sheets, as well as all other item specific Tabulations. Typical drawings detailing construction of the practices to be used on this project are referenced in the Standard Road Plans Tabulation. The installation of these devices may be subject to Section 404 of the Clean Water Act.</p><p>2. OTHER CONTROLS</p><p>Contractor disposal of unused construction materials and construction material wastes shall comply with applicable state and local waste disposal, sanitary sewer, or septic system regulations. In the event of a conflict with other governmental laws, rules and regulations, the more restrictive laws, rules or regulations shall apply.</p><p>a. Vehicle Entrances and Exits - Construct and maintain entrances and exits to prevent tracking of sediments onto roadways.</p><p>b. Material Delivery, Storage and Use - Implement practices to prevent discharge of construction materials during delivery, storage, and use.</p><p>c. Stockpile Management - Install controls to reduce or eliminate pollution of storm water from stockpiles of soil and paving.</p><p>d. Waste Disposal - Do not discharge any materials, including building materials, into waters of the state, except as authorized by a Section 404 permit.</p><p>e. Spill Prevention and Control - Implement chemical spill and leak prevention and response procedures to contain and clean up spills and prevent material discharges to the storm drain system and waters of the state.</p><p>f. Concrete Residuals and Washout Wastes - Waste shall not be discharged to a surface water and is not allowed to adversely affect a water of the state. Designate temporary concrete washout facilities for rinsing out concrete trucks. Provide directions to truck drivers where designated washout facilities are located. Designated washout areas should be located at least 50 feet away from storm drains, streams or other water bodies. Care should be taken to ensure these facilities do not overflow during storm events.</p><p>g. Concrete Grooving/Grinding Slurry - Do not discharge slurry to a waterbody or storm drain. Slurry may be applied on foreslopes or removed from the project.</p><p>h. Vehicle and Equipment Storage and Maintenance Areas - Perform on site fueling and maintenance in accordance with all environment laws such as proper storage of onsite fuels and proper disposal of used engine oil or other fluids on site. Employ washing practices that prevent contamination of surface and ground water from wash water. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge.</p><p>i. Litter Management - Ensure employees properly dispose of litter. Minimize exposure of trash if exposure to precipitation or storm water would result in a discharge of pollutants.</p><p>j. Dewatering - Properly treat water to remove suspended sediment before it re-enters a waterbody or discharges off-site. Measures are also to be taken to prevent scour erosion at dewatering discharge point.</p><p>3. APPROVED STATE OR LOCAL PLANS</p><p>During the course of this construction, it is possible that situations will arise where unknown materials will be encountered. When such situations are encountered, they will be handled according to all federal, state, and local regulations in effect at the time.</p><p>IV. MAINTENANCE PROCEDURES</p><p>The Contractor is required to maintain all temporary erosion and sediment control measures in proper working order, including cleaning, repairing, or replacing them throughout the contract period. This shall begin when the features have lost 50% of their capacity.</p><p>V. INSPECTION REQUIREMENTS</p><p>A. Inspections shall be made jointly by the Contractor and the Contracting Authority's inspector at least once every seven calendar days. Storm water site inspections will include:</p><p>1. Date of the inspection.</p><p>2. Summary of the scope of the inspection.</p><p>3. Name and qualifications of the personnel making the inspection.</p><p>5. Review of erosion and sediment control measures within disturbed areas for the effectiveness in preventing impacts to receiving waters.</p><p>6. Major observations related to the implementation of the PPP.</p><p>7. Identification of corrective actions required to maintain or modify erosion and sediment control measures.</p></div>				<div>110_12 1/13/23</div> <div>POLLUTION PREVENTION PLAN</div> <div><p>B. Include storm water site inspection reports in the Amended PPP. Incorporate any additional erosion and sediment control measures determined as a result of the inspection. Immediately begin corrective actions on all deficiencies found within 3 calendar days of the inspection and complete within 7 calendar days following the inspection. If it is determined that making the corrections less than 72 hours after the inspection is impracticable, it should be documented why it is impracticable and indicate an estimated date by which the corrections will be made.</p><p>VI. NON-STORM WATER DISCHARGES</p><p>This includes subsurface drains (i.e. longitudinal and standard subdrains) and slope drains. The velocity of the discharge from these features may be controlled by the use of headwalls or blocks, Class A stone, erosion stone or other appropriate materials. This also includes uncontaminated groundwater from dewatering operations, which will be controlled as discussed in Section III of the PPP.</p><p>VII. POTENTIAL SOURCES OF OFF RIGHT-OF-WAY (ROW) POLLUTION</p><p>Silts, sediment, and other forms of pollution may be transported onto highway right-of-way (ROW) as a result of a storm event. Potential sources of pollution located outside highway ROW are beyond the control of this PPP. Pollution within highway ROW will be conveyed and controlled per this PPP.</p><p>VIII. DEFINITIONS</p><p>A. Base PPP - Initial Pollution Prevention Plan.</p><p>B. Amended PPP - Base PPP amended during construction. May include Plan Revisions or Contract Modifications for new items, storm water site inspection reports, fieldbook entries made by the inspector, amended PPP site map by the Contractor, ECIP, NOI, co-permittee certifications, and Subcontractor Request Forms. Items amending the PPP are stored electronically and are readily available upon request.</p><p>C. Fieldbook Entries - This contains the inspector's daily diary and bid item postings.</p><p>D. Controls - Methods, practices, or measures to minimize or prevent erosion, control sedimentation, control storm water, or minimize contaminants from other types of waste or materials. Also called Best Management Practices (BMPs).</p><p>E. Signature Authority - Representative authorized to sign various storm water documents.</p><p>-----</p><p>CERTIFICATION STATEMENT</p><p>I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.</p><div><div></div><div>Signature</div></div><div><div>Gregory S. Shuger</div><div>Printed or Typed Name</div></div><div><div></div><div>Signature</div></div><div><div>Steven J. McElmeel</div></div></div>									
FILE NO. 32542		ENGLISH	DESIGN TEAM	STANLEY CONSULTANTS INC.		KEOKUK COUNTY		PROJECT NUMBER	BRF-021-1(46) - -38-54		SHEET NUMBER	RC.5	
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LINE STYLE LEGEND OF LANDSCAPE SHEETS	
LINESTYLE	Design Element
-----	Living Snow Fence Single Row
-----	Living Snow Fence Double Row
-----	Mechanical Edge

















CELL LEGEND OF LANDSCAPE SHEETS		
CELL	Design Element	Plant Diameter
	Clearing	
	Proposed Shrub	6 FT
	Proposed Understory Tree	12 FT
	Proposed Conifer Tree	18 FT
	Proposed Overstory Tree	30 FT

PATTERN LEGEND OF LANDSCAPE SHEETS	
	Brush Clearing
	Clearing & Grubbing
	Spray Area

LINE STYLE LEGEND OF EROSION CONTROL SHEETS	
LINESTYLE	Design Element
	Silt Fence
	Perimeter and Slope Sediment Control Device (9")
	Perimeter and Slope Sediment Control Device (12")
	Perimeter and Slope Sediment Control Device (20")
	Open-Throat Curb Intake Sediment Filter
	Concentrated Flow
	Rock Check and Rock Check Dam
	Sheet Flow

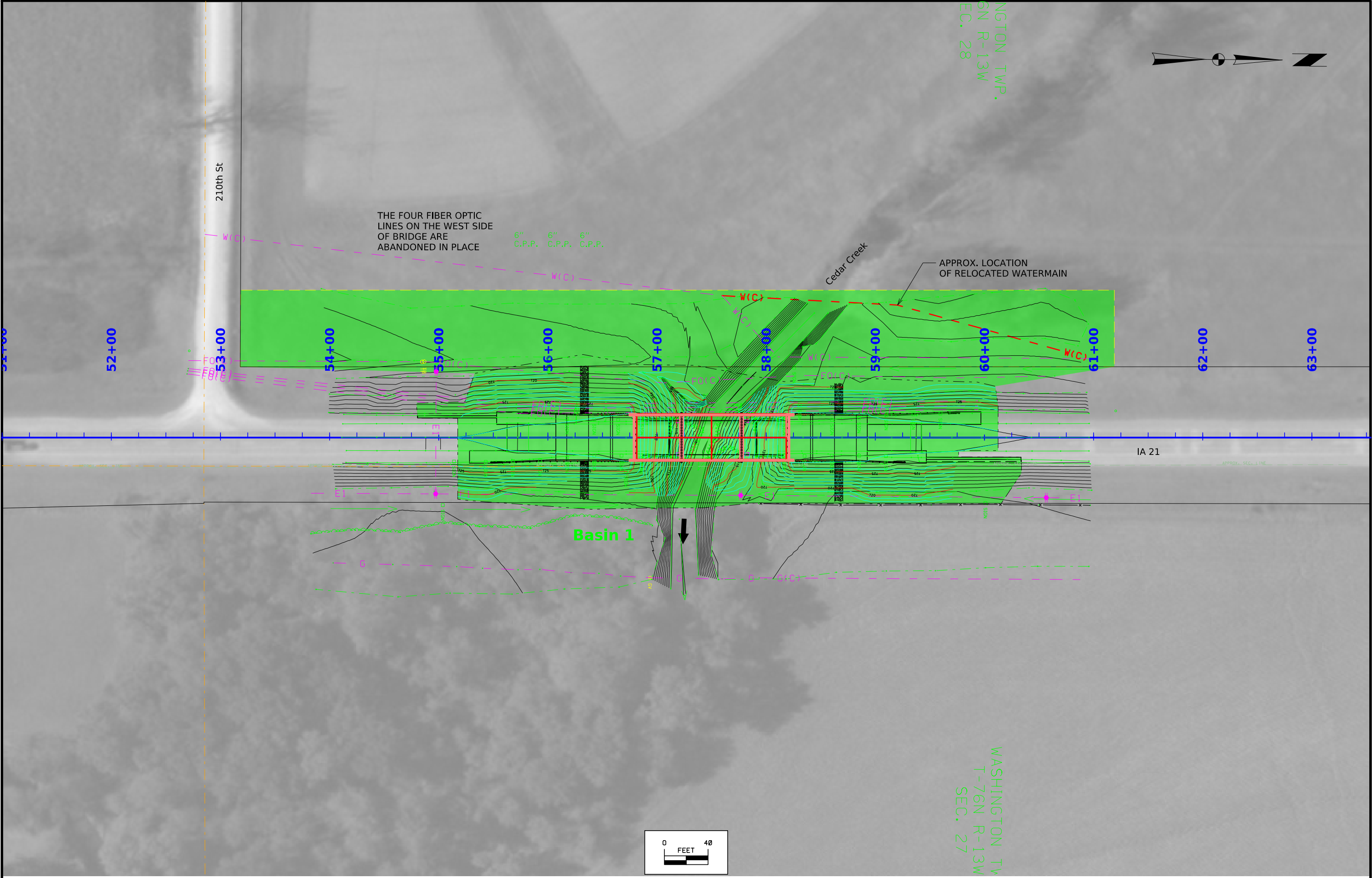
CELL LEGEND OF EROSION CONTROL SHEETS	
CELL	Design Element
	Temporary Sediment Control basin
	Erosion Control for Circular Intake or Manhole Well
	Erosion Control for Rectangular Intake or Manhole Well
	Grate Intake Sediment Filter Bag
	Silt Basin
	Silt Fence Tail
	Stormwater Drainage Basin Discharge Point

PLAN VIEW COLOR LEGEND OF EROSION CONTROL SHEETS				
LINEWORK	Design Color No.			
Green	(2)		Existing Topographic Features and Labels	
Blue	(1)		Proposed Alignment, Stationing, Tic Marks, and Alignment Annotation	
Magenta	(5)		Existing Utilities	
Black	(0)		Permanent Erosion Control Features	
Blaze Orange	(222)		Temporary Erosion Control Features	
SHADING	Design Color No.		Transparency	
Citron	(234)		Mulching, All Types	50%
Light Brown	(238)		Special Ditch Control, Wood Excelsior Mat	0%
Grass Green	(233)		8FT Mow Strip	50%
Red	(3)		Delineates Restricted Areas	0%

PATTERN LEGEND OF EROSION CONTROL SHEETS	
	Seeding and Fertilizing
	Seeding and Fertilizing (Rural)
	Seeding and Fertilizing (Urban)
	Native Grass Seeding
	Salt Tolerant Seeding
	Wetland Grass Seeding
	Wildflower Seeding
	Sodding
	Turf Reinforcement Mat Type 1
	Turf Reinforcement Mat Type 2
	Turf Reinforcement Mat Type 3
	Turf Reinforcement Mat Type 4
	Slope Protection, Wood Excelsior Mat
	Transition Mat
	Rock Features, Permanent
	Rock Features, Temporary

EROSION CONTROL  
LEGEND AND SYMBOL  
INFORMATION SHEET

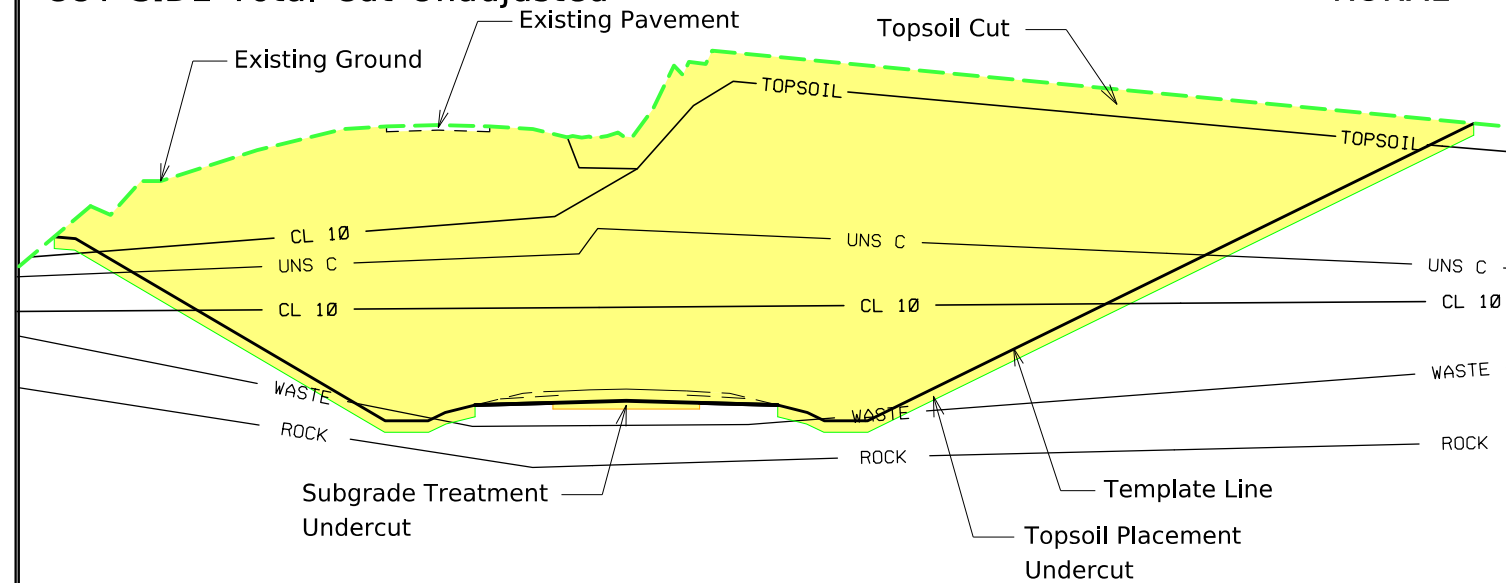
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CUT SIDE Total Cut Unadjusted

RURAL



Notes:

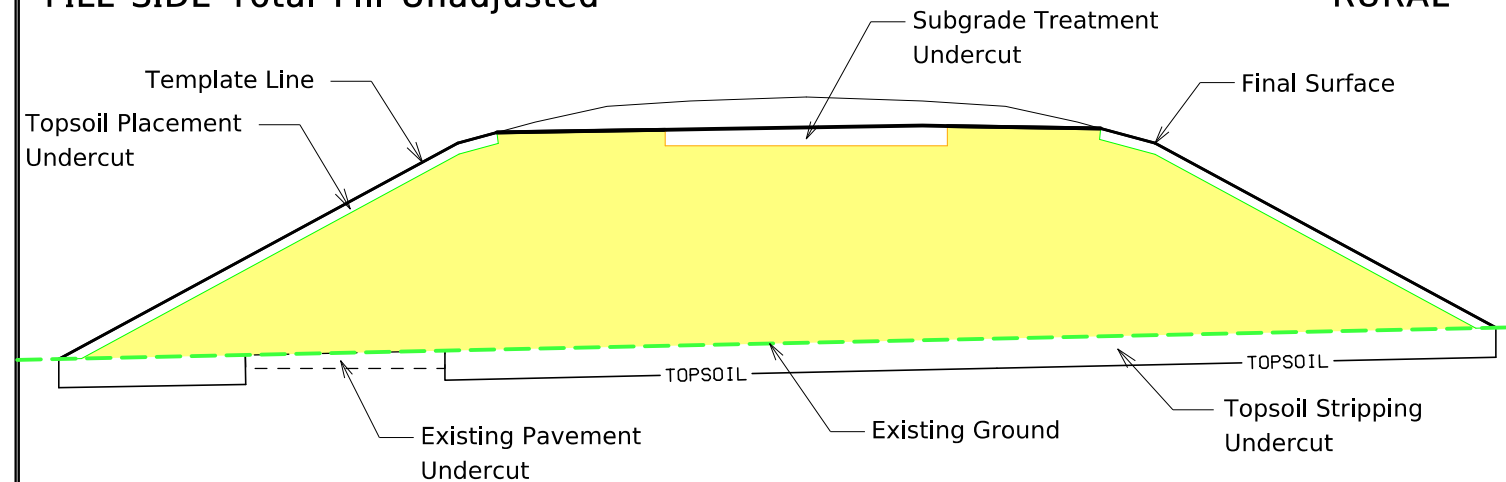
1. "Total Cut Unadjusted" Column includes all cut values in the Station Range based on Typical, Topsoil and Subgrade Treatment needs.
2. "Total Cut Unadjusted" does not include and Existing Pavement values inside or outside the cut template as shown on cross sections.
3. Tabulated Plowing and Shaping operations are included in the "Total Cut Unadjusted" values.

Notes:

1. "Total Cut Adjusted" Column includes all cut values usable as Class 10 material.
2. "Total Cut Adjusted" does not include and Existing Pavement , Existing Topsoil, or material to be wasted.

FILL SIDE Total Fill Unadjusted

RURAL

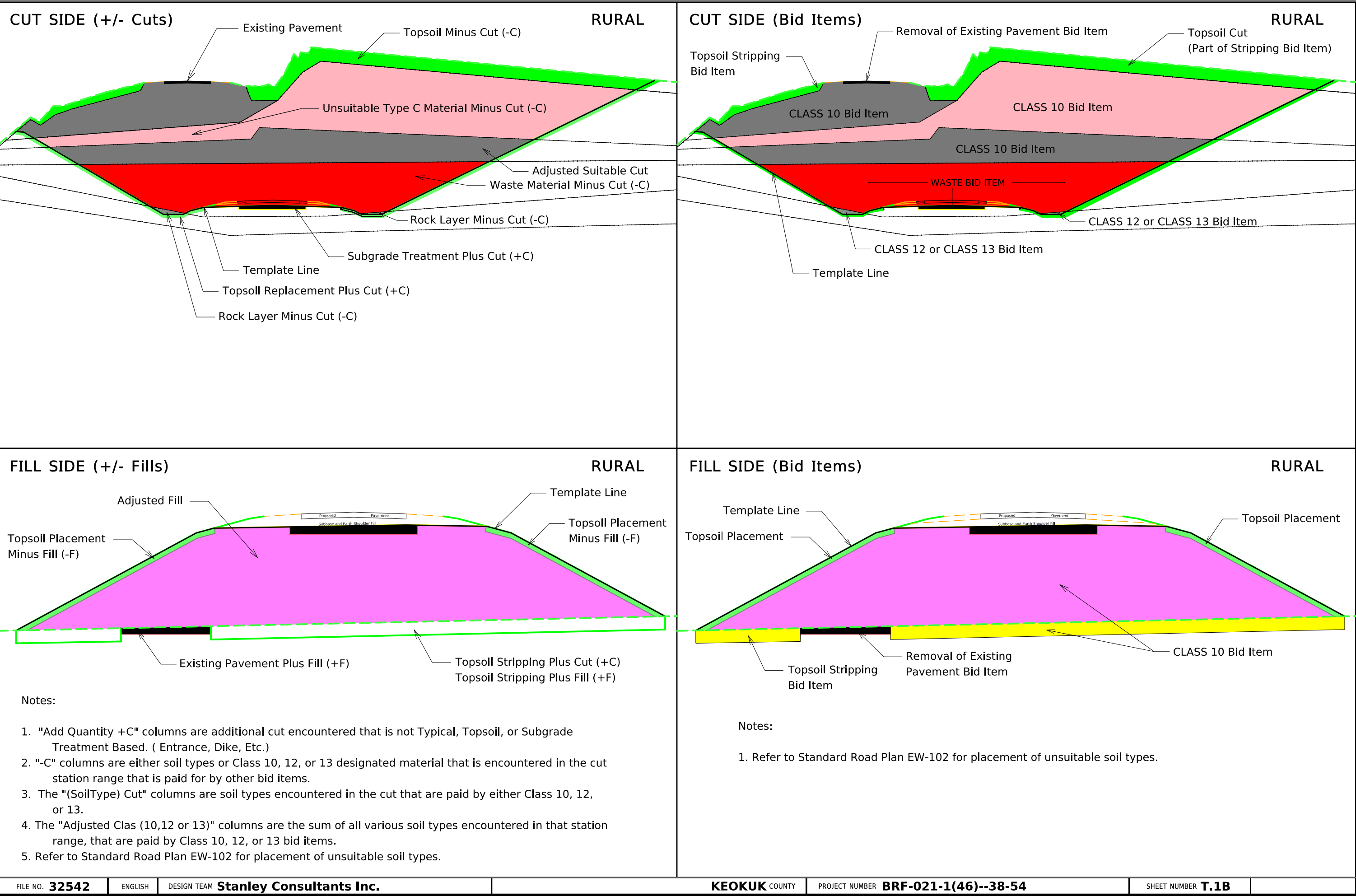


Notes:

1. "Total Fill Unadjusted" Column includes all Class 10, 12, and 13 fill. This excludes the topsoil, subgrade treatment, subbase, new pavement, and shoulder fill needs in that station range.
2. "Total Fill Unadjusted" Column does not include adjustments for additional fill from cuts such as existing pavement removed, plowing and shaping operations, entrances, dikes, or topsoil stripping.

Notes:

1. "Total Fill Adjusted" Column includes all Class 10, 12, and 13 fill and adjustments for additional fill from cuts such as existing pavement, plowing and shaping operations, entrances, dikes, and topsoil stripping.
2. The available area to place unsuitable materials in the T Sheet tabulation does not include the undercut values from the topsoil stripping, existing pavement, or plowing and shaping



Refer to Standard Road Plans EW-101 and EW-102.

107-28  
04-21-15

## TABULATION OF TEMPLATE QUANTITIES AND ADJUSTMENTS

Refer to Standard Road Plans EW-101 and EW-102.

## TABULATION OF TEMPLATE QUANTITIES AND ADJUSTMENTS

107-28  
04-21-15

[illegible]

CROSS SECTION VIEW COLOR LEGEND			
Design Color No.	Feature	Design Color No.	Feature
Aggregate		Structural	
(64)	Choke Stone	(112)	Noise Wall
(42)	Engineering Fabric	(112)	Noise Wall Footing
(8)	Flooded Backfill	(112)	Retaining Wall Back
(92)	Macadam Stone	(112)	Retaining Wall Back Excavate
(20)	Modified	(112)	Retaining Wall Face
(12)	Plowing Shaping	(112)	Retaining Wall Front Excavate
(14)	Porous Backfill	(112)	Retaining Wall Front Footing
(8)	Revetment Class A	(112)	Retaining Wall MSE Gutter
(6)	Revetment Class B	(112)	Retaining Wall Reinforced Earth
(62)	Revetment Class C	Grading	
(188)	Revetment Class D	(8)	Behind Curb Cut
(28)	Revetment Class E	(6)	Granular
(12)	Shoulder Special Backfill	(13)	Granular Back Fill
(12)	Special Backfill	(48)	Rock Undercut
(20)	Subbase	(8)	Shoulder Earth Fill
(20)	Subbase Lower	(2)	Side Slopes
(20)	Subbase Upper	(226)	Side Slopes Dressing
(118)	Subgrade Treatment	Substrata	
Asphalt		(128)	Boulder Substrata
(207)	HMA Base Course	(48)	Broken Weathered Substrata
(207)	HMA Interim Course	(3)	Core Out Substrata
(207)	HMA Surface Course	(203)	Existing Pavement Substrata
Concrete		(6)	Loam Substrata
(0)	Barrier Concrete	(80)	Rock Substrata
(0)	Barrier Concrete Footing	(4)	Select Sand Substrata
(0)	Curb Gutter	(3)	Shale Substrata
(48)	Flowable Mortar	(10)	Topsoil Substrata
(0)	Median Concrete	Unsuitable / Waste	
(0)	PCC Pavement	(3)	Unsuitable Type A
(0)	Sidewalk	(13)	Unsuitable Type B
Shoulder		(11)	Unsuitable Type C
(209)	Shoulder HMA	(3)	Waste
(0)	Shoulder PCC		
(6)	Shoulder Granular		
Existing			
(0)	Existing Pavement		

NOTES:

NOTES:

CROSS SECTIONS  
LEGEND AND INFORMATION SHEET  
(COVERS SHEET SERIES W)

