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PLANS OF PROPOSED IMPROVEMENT ON THE

PRIMARY ROAD SYSTEM

Story COUNTY

RCB Culvert New - Triple Box

US 30 over S. Skunk River
E of the South Skunk River (WB)

Refer to the Plan Sheets for list of applicable specifications.

Value Engineering Saves. Refer to Article 1105.13 of the Specifications.



Iowa DOT Bridges and Structures
Consultant Coordinator Contact:
Lili Yang

Design Data Urban			
WB US 30			
2024 AADT	16,400	V.P.D.	
Truck DHV	8	%	
WB Lane Only			

Index Of Seals		
Sheet No.	Name	Type
A.1	Jacob J. Shaw	Structural Design
SPS.1	* Adam Tyler	Geotechnical Design

* Braun Intertec

Revisions

	TOTAL
	19
PROJECT IDENTIFICATION NUMBER	
19-85-030-020	
PROJECT NUMBER	
NHSX-030-5(313)--3H-85	
R.O.W. PROJECT NUMBER	
PROJECT DIRECTORY NUMBER	
8503002019	

Structural 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: Jacob J. Shaw Date: 6/15/2026

Printed or Typed Name: Jacob J. Shaw

My license renewal date is December 31, 2026

Pages or sheets covered by this seal: Sheets A.1 - A.2, V.1 - V.15

ESTIMATED CAST-IN-PLACE CULVERT QUANTITIES					
ITEM NO.	ITEM CODE	ITEM	UNIT	DESIGN NO. 827	AS-BUILT QTY.
1	2104-2710020	Excavation, Class 10, Channel	CY	298.9	
2	2402-2720000	Excavation, Class 20	CY	6,082	
3	2402-3825025	Granular Material for Blanket	CY	332	
4	2403-0100020	Structural Concrete (RCB Culvert)	CY	893.2	
5	2404-7775000	Reinforcing Steel	LB	160,692	
6	2501-8400172	Temporary Shoring	LS	1	
7	2507-3250005	Engineering Fabric	SY	509.5	
8	2507-6800061	Revetment, Class E	TON	448.5	
9	2526-8285040	Construction Survey, Location Survey	LS	1	
10	2533-4980005	Mobilization	LS	1	

CAST-IN-PLACE CULVERT ESTIMATE REFERENCE INFORMATION		
ITEM NO.	ITEM CODE	DESCRIPTION
1	2104-2710020	Excavation, Class 10, Channel All waste must be removed from the project site.
2	2402-2720000	Excavation, Class 20 Includes filling and compacting low areas around proposed culvert. Quantity should be reduced by 340 CY in the event that the working blanket is deleted. Includes excavation necessary to "Granular Material for Blanket".
3	2402-3825025	Granular Material for Blanket Granular material shall be in accordance with Section 4118 of the Standard Specifications. Includes 332 CY for a working blanket. The working blanket may be deleted if determined to be unnecessary at the time of construction.
4	2403-0100020	Structural Concrete (RCB Culvert) ---
5	2404-7775000	Reinforcing Steel ---
6	2501-8400172	Temporary Shoring This item will be deleted if the existing shoring from Stage 1 is adequate for Stage 2.
7	2507-3250005	Engineering Fabric 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.
8	2507-6800061	Revetment, Class E Estimated at 1.5 ton/cu yd. Class E revetment shall meet requirements of Article 4130. Broken concrete and granite is not allowed.
9	2526-8285040	Construction Survey, Location Survey ---
10	2533-4980005	Mobilization ---



Note:
Roadway quantities are included in the tied road plans, Project No. NHSX-030-5(310)--3H-85.

Design For 0° Skew

Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert

Estimated Quantities

STA. 1307+00.00 (US 30) Turn-In Date: August 2026

Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 827 Design Sheet No. 1 of 15 FHWA No. 701210

General Notes:

It is the intent of this design to construct a triple 16' x 12' x 214' (128'-0" Stage 2) cast-in-place reinforced concrete box culvert skewed 0° at station 1307+00. Faint lines on plans indicate existing structure.

The City and 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.

The roadway will be open to traffic during construction. See Traffic Control Note.

The R.C.B. Culvert sections are designed for HL-93 live load and earth fills of 2 feet.

Vertical earth pressure, EV=0.120 kcf.

Horizontal earth pressure, EHmax = 0.060 kcf max, EHmin = 0.030 kcf.

The R.C.B. culvert sections are designed for Class 1 exposure conditions.

All slab and floor reinforcing steel is to be supported at intervals of not more than 3'-0" in either direction as outlined in the Standard Specifications.

The clear distance from face of concrete to near edge or end of reinforcing bar to be 2" unless otherwise noted.

Except for dowel bars 5r1 & 5z1 in slab, longitudinal reinforcing is not to extend thru the construction joints.

Floor of barrel is to be finished smooth. Sides of footing are to be formed to ensure correct line and grade.

The permissible construction joint at the top of the walls may be lowered at the Contractor's option with Engineer's approval.

The reinforcement supplied for this structure shall be Grade 60 reinforcement in accordance with the Standard Specifications. The design stresses are based on ASTM A706 Grade 60 reinforcement.

The vertical bars in the walls may be spliced above the footing at the Contractor's option as follows:

Bar Size Number	4	5	6	7	8	9
Minimum Splice Length	20"	24"	29"	34"	38"	47"

This splice, if used, will be at the Contractor's expense.

Reinforcing bar clearances will be as follows:

Edge clearances:	2" except
Top of floor	2¼" to near transverse reinforcing bar
Bottom of floor	3½" to near transverse reinforcing bar
End clearances:	
Vertical top	2"
Vertical bottom	3" or 3½" if overall height of the culvert is not to a full inch
Transverse	2"

All construction joints shall be formed with a beveled keyway.

All beveled keyways shall be centered.

Keyway size shall be 2"x4" except as follows:

Keyway between the floor and wall shall be 2"x6".

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.

All dimensions are in feet and inches unless otherwise noted or shown.

See current Standard Specifications regarding concrete form removal.

These culvert standards label all reinforcing steel with English notation (5a1 is ⅝ 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

When de-watering presents a problem for placing the curtain walls as detailed, alternate methods such as steel sheet pile and precast concrete walls may be approved but at no additional cost. The Culvert Contractor is to submit to the Engineer for approval complete drawings of the proposed curtain wall alternate before beginning construction.

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

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

The Class 20 Excavation quantity is based on the assumption that at the start of culvert construction, the existing groundline shown on the "Situation Plan" for this design.

Class 20 Excavation unsuitable for backfilling shall be disposed of in a manner that will leave the site in a neat condition.

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

Temporary shoring (sheet pile or other) shall be required as necessary to prevent the earth under the traffic lane from sloughing in during construction.

The Contractor shall submit a Temprary Shoring Plan for review. The Temporary Shoring Plan shall be designed and certified by a Professional Engineer licensed in the State of Iowa. When determining slope stability to support structures such as bridges, culverts and retaining walls, a global stability analysis shall be included in the design of the temporary shoring in accordance with Chapter 200F-1 in the Design Manual of the Iowa DOT, Design Bureau. The Contractor shall not procedd with Installation of the temporary shoring without notice to proceed from the Engineer.

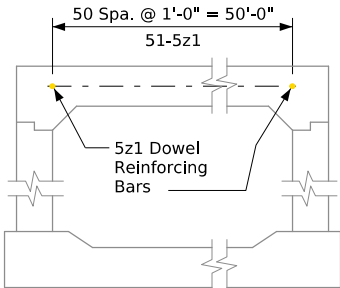
The temporary shoring submittal shall include:

- Design calculations (Including a global stability analysis)
- Soil properties
- Shoring material properties
- Shoring plan layout (showing location of traffic)
- Shoring details

Temporary shoring shall be paid for as a lump sum including all costs for designing, furnishing, and installing. Temporary shoring shall be abandoned in place. In addition to the requirements noted above, Article 1107.07 of the Standard Specifications still applies.

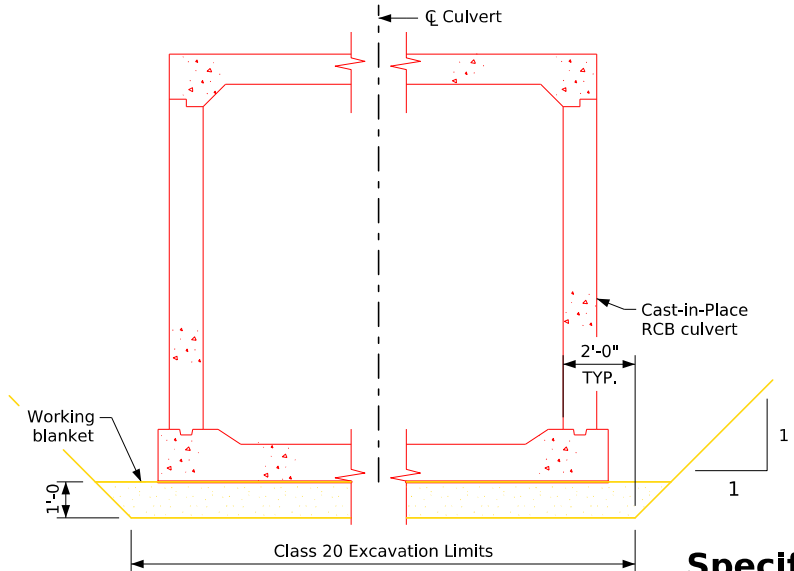
Excess Class 20 Excavation material suitable for backfilling shall be stockpiled at the construction site, as directed by the Engineer.

5z1 x 2'-7" dowel reinforcing bars with a 10 inches minimum embedment into existing concrete shall be set in the slab of the existing culvert. The 5z1 x 2'-7" dowel reinforcing bars shall be centered in the existing slab. All dowels shall be at 1'-0" maximum spacing $\overline{C-C}$ of dowels. Dowels shall be set with polymer grout in accordance with Article 2301.03, E, of the Standard Specifications, and current Supplemental Specifications of the Iowa D.O.T. Highway Division.



Section Near Stage Construction Joint

(Showing spacing of 5z1 dowel bars)



Working Blanket Detail (Cast-in-Place RCB Culvert)

Working blanket shall terminate 3'-0 short of curtain wall. See Standard Road Plan DR-111 for backfilling requirements.

Specifications:

Design: AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017.

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.

Design Stresses:

Design stresses for the following materials are in accordance with the AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017: Reinforcing steel in accordance with AASHTO LRFD Section 5, Grade 60. Concrete in accordance with AASHTO LRFD Section 5, f'c = 4.0 ksi.

Summary of Concrete Quantities

Location	Footing	Walls	Slab	Total
38'-0" Barrel Section (1 Required)	1 @ 77.5	1 @ 65.1	1 @ 76.9	219.5
20'-0" Barrel Section (2 Required)	2 @ 40.8	2 @ 34.2	2 @ 40.5	231.0
10'-0" Barrel Section (1 Required)	1 @ 20.4	1 @ 17.1	1 @ 20.2	57.7
20'-0" Bent Barrel Section (2 Required)	2 @ 40.8	2 @ 34.1	2 @ 40.6	231.0
*Headwall 0° Skew (1 Required)	1 @ 110.9	1 @ 38.5	1 @ 4.6	154.0
Total (CY)	372.0	257.3	263.9	893.2

*Includes parapet and top of wingwall.

Summary of Reinforcing Steel

Location	Quantity	Total
38'-0" Barrel Section (1 Required)	1 @ 39,333	39,333
20'-0" Barrel Section (2 Required)	2 @ 20,702	41,404
10'-0" Barrel Section (1 Required)	1 @ 10,351	10,351
20'-0" Bent Barrel Section (2 Required)	2 @ 23,712	47,424
Headwall 0° Skew (1 Required)	1 @ 21,093	21,093
*5r1 x 3'-6" Dowel Bars (5 Required)	5 @ 190	950
**5z1 x 2'-7" Dowl Bars (1 Required)	1 @ 137	137
Total (LB)		160,692

*One Set Includes 52 - 5r1 Bars = 190 LBS.

**One Set Includes 51 - 5z1 Bars = 137 LBS.

During construction of this project the Culvert Contractor will be required to coordinate operations with those of other Contractors working within the same area. Other work in progress during the same period of time will include, but is not limited to, construction of the following projects:

PCC Pavement - Grade & New	NHSX-030-5(310)--3H-85
Bridge Replacement - PPCB	BRF-030-5(311)--38-85
RCB Culvert New - Triple Box	NHSX-030-5(312)--3H-85
Traffic Signs	NHSX-030-5(314)--3H-85
Lighting	NHSX-030-5(315)--3H-85
Erosion Control	NHSN-030-5(316)--2R-85

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 absence 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	Temporary Shoring	(313)_Story_Design827_TemporaryShoring.pdf	Yes
No.	Calculation Description	Calculation File Name Convention For Submittal	Certified by Iowa P.E. (Yes/No)
2	Temporary Shoring	(313)_Story_Design827_TemporaryShoringCalcs.pdf	Yes

404 Permit information and the pollution prevention plan are included in the tied road plans, Project No. NHSX-030-5(310)--3H-85.

Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert

General Notes

STA. 1307+00.00 (US 30) Turn-in Date: August 2026

Story County

IOWA DEPARTMENT OF TRANSPORTATION
Design No. 827 Design Sheet No. 2 of 15 FHWA No. 701210

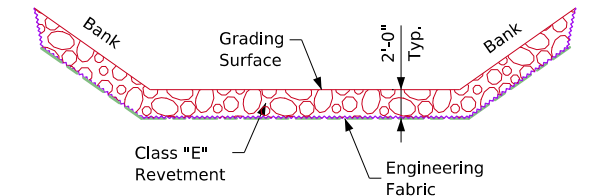


Traffic Control Plan

The Westbound roadway will be open to thru traffic. Refer to the Traffic Control Plan included in the tied Road Plans, Project No. NHSX-030-5(310)--3H-85.

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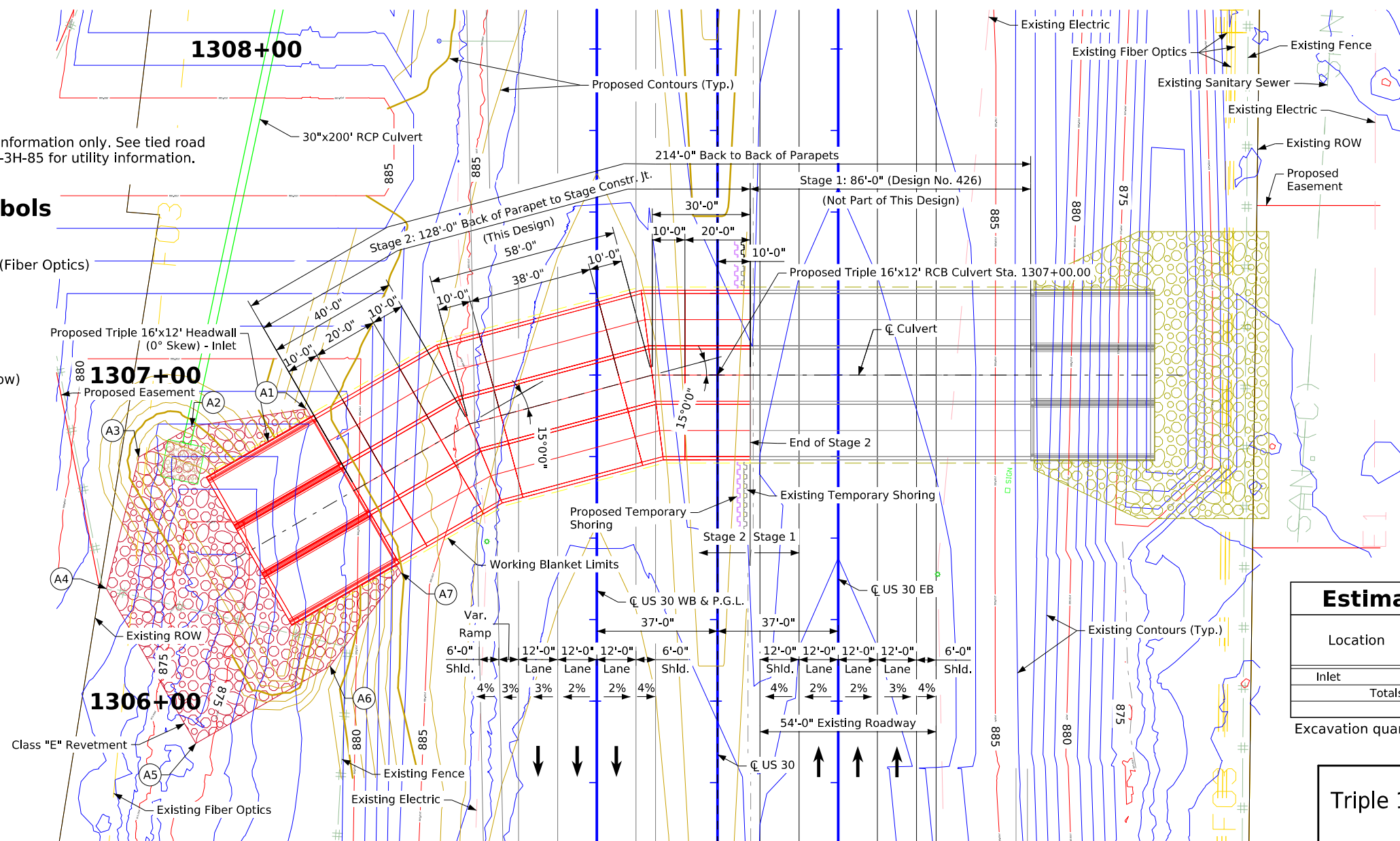
Proposed Profile Grade On WB US 30



Design Fill = 2'-0"
Settlement = 1"



whks
engineers + planners + land surveyors

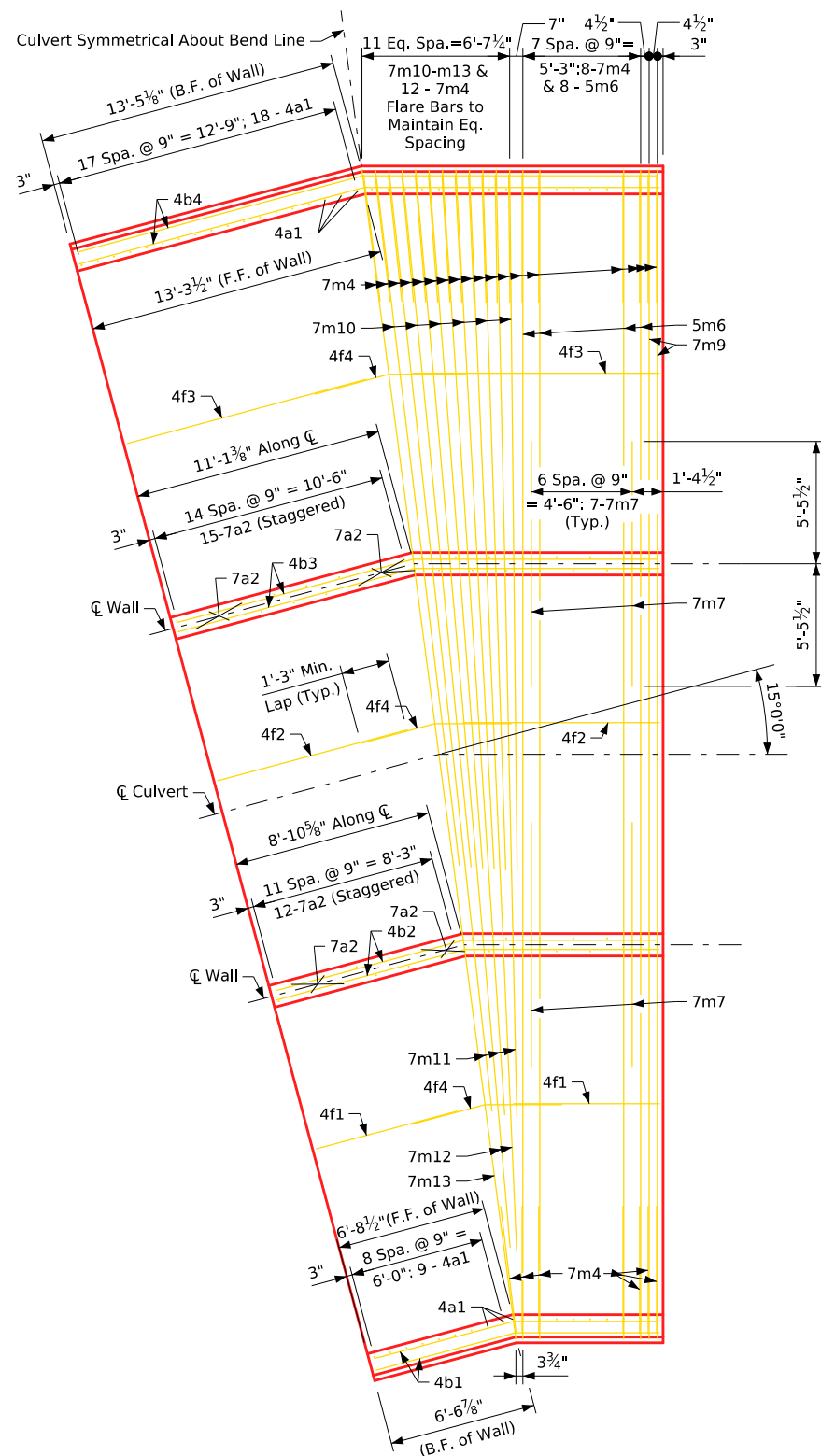


Location	Station	Offset
A1	1306+89.61	126.03' Lt.
A2	1306+84.21	161.13' Lt.
A3	1306+74.82	177.40' Lt.
A4	1306+34.51	187.30' Lt.
A5	1305+87.04	159.89' Lt.
A6	1306+10.80	118.74' Lt.
A7	1306+39.38	97.03' Lt.

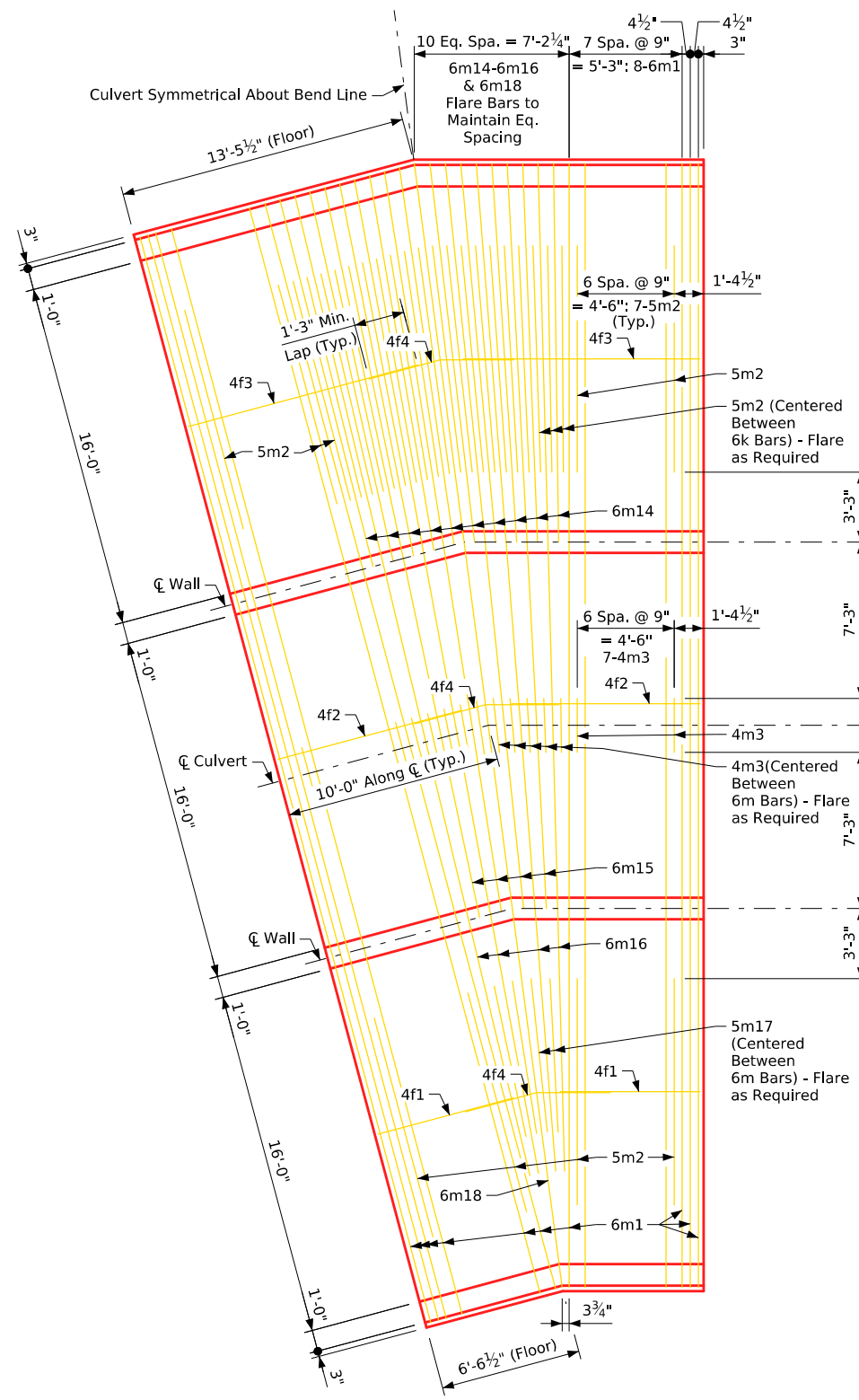
Location	Revetment Class "E" (Ton)	Engineering Fabric (SY)	Excavation Class 10, Channel (CY)
Inlet	448.5	509.5	298.9
Totals	448.5	509.5	298.9

Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert

Design No. 827 Design Sheet No. 3 of 15 FHWA No. 701210



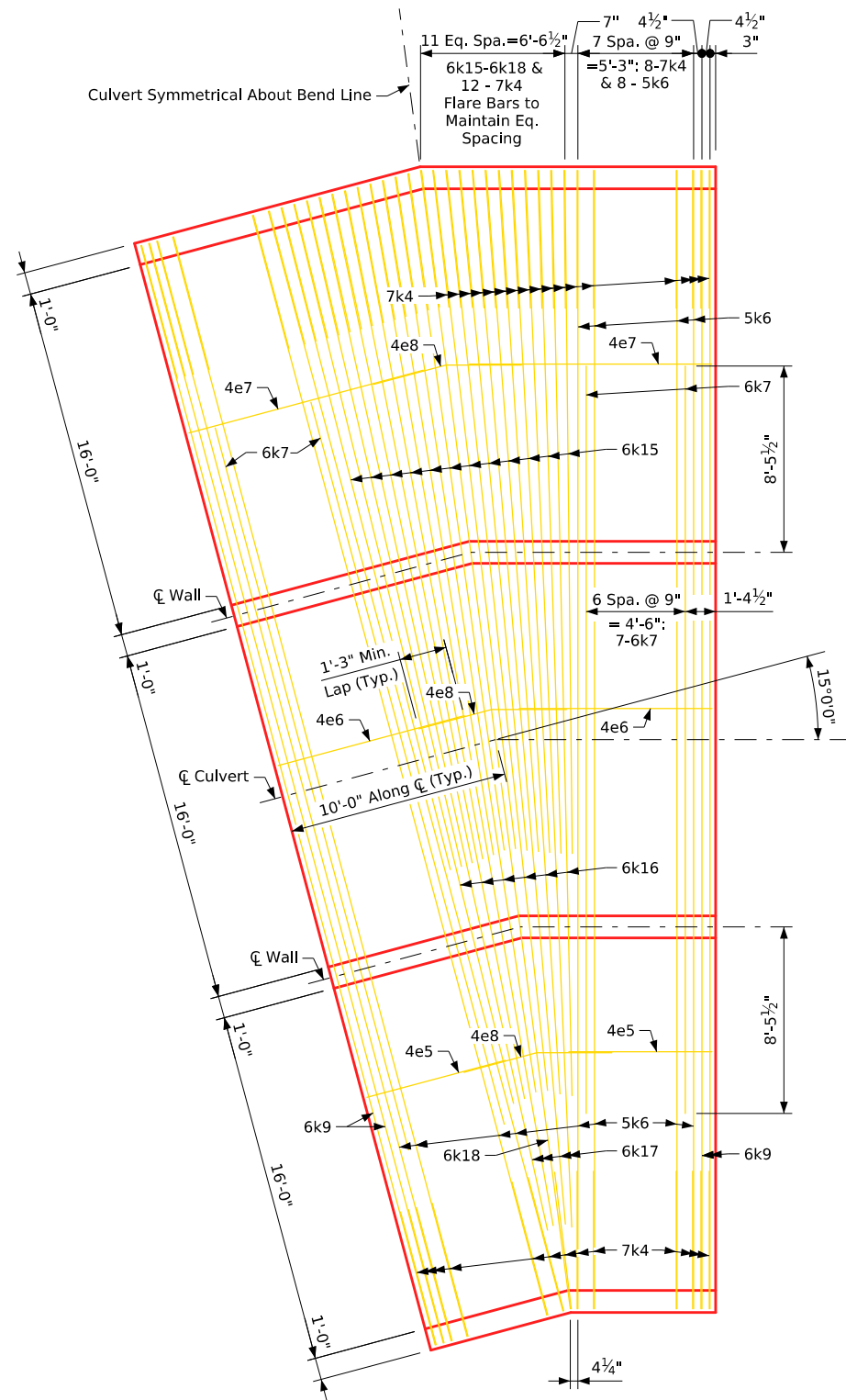
Plan View - Bottom Floor/Wall



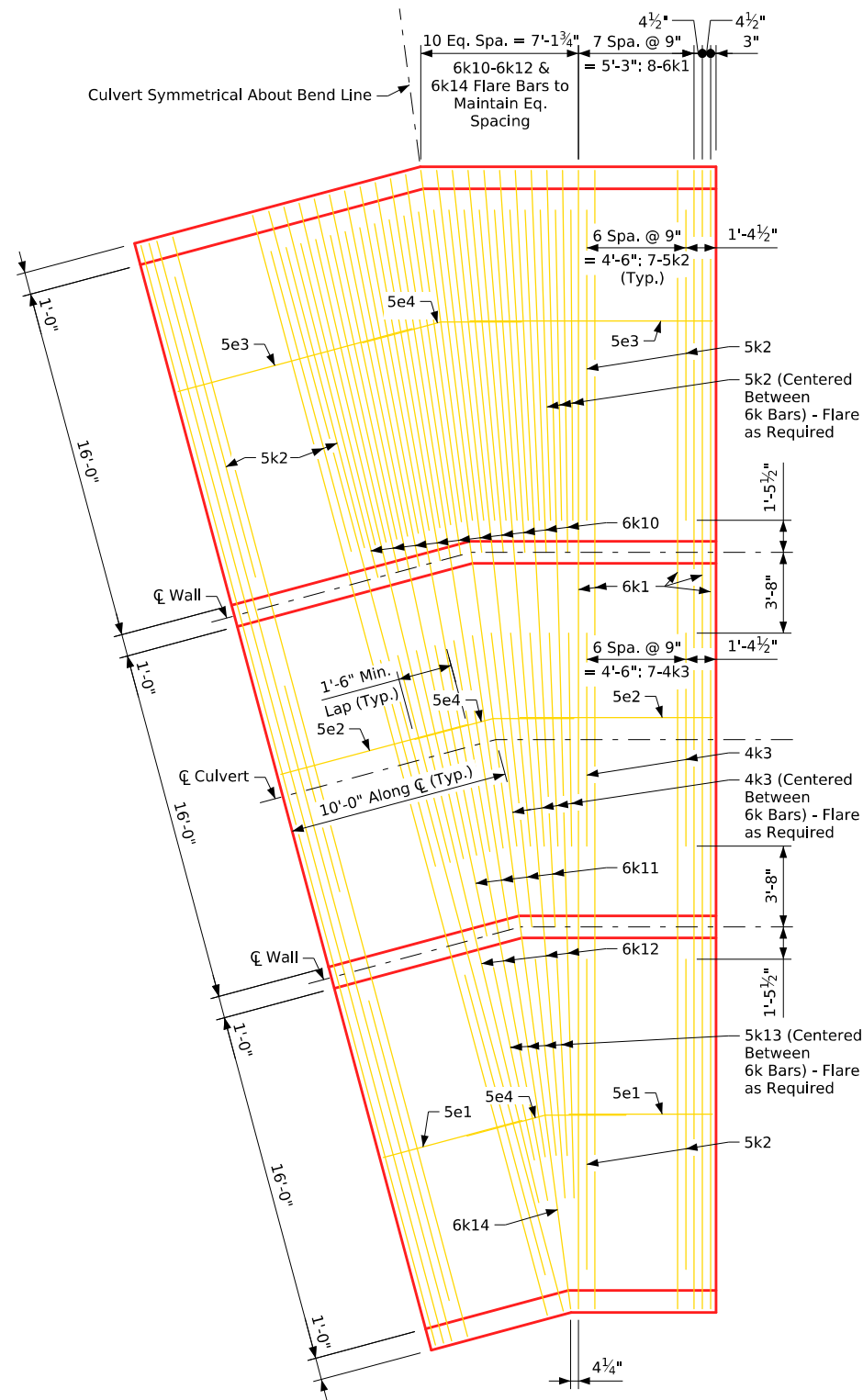
Plan View - Top Floor

Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert
Bent Barrel Floor Plan
 STA. 1307+00.00 (US 30) Turn-In Date: August 2026
Story County
 IOWA DEPARTMENT OF TRANSPORTATION
 Design No. 827 Design Sheet No. 4 of 15 FHWA No. 701210





Plan View - Top Slab



Plan View - Bottom Slab

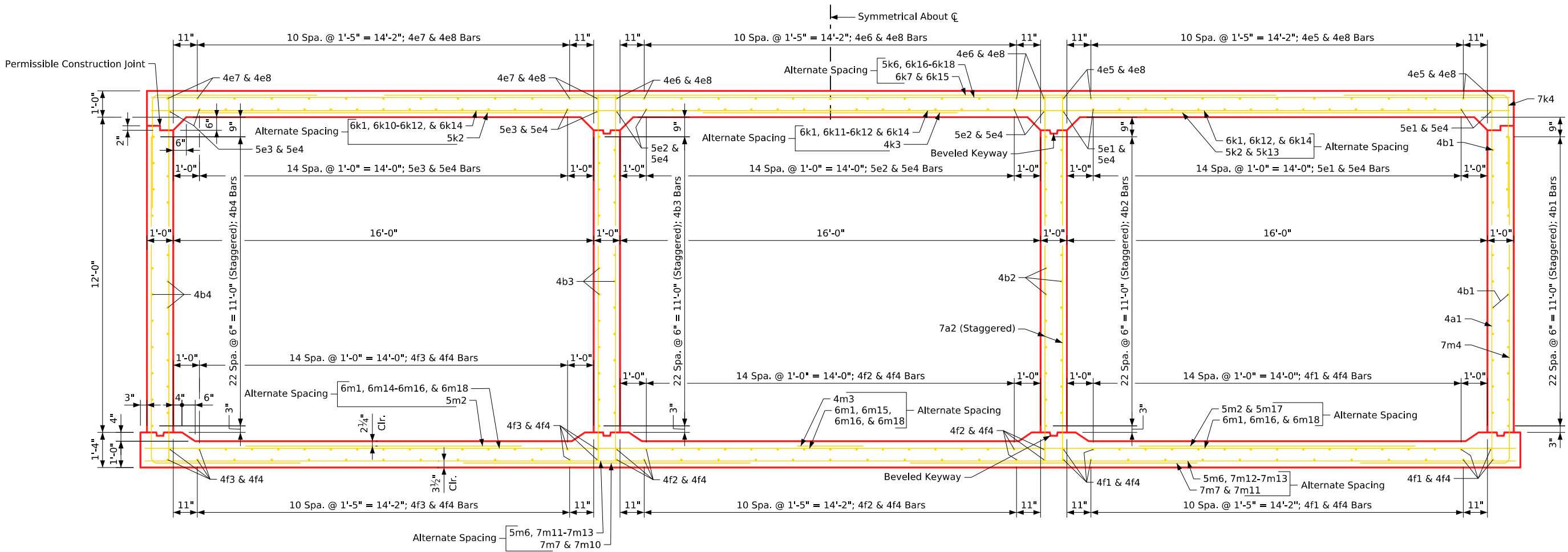


Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert
Bent Barrel Slab Plan
 STA. 1307+00.00 (US 30) Turn-In Date: August 2026
Story County
 IOWA DEPARTMENT OF TRANSPORTATION
 Design No. 827 Design Sheet No. 5 of 15 FHWA No. 701210

FILE NO. 32491	ENGLISH	DESIGN TEAM LG/JS/NL	Story COUNTY	PROJECT NUMBER NHSX-030-5(313)-3H-85	SHEET NUMBER V.5
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Notes:

Dimensions listed on this sheet to be used in conjunction with dimensions and quantities on Design Sheets 4, 5, & 7.



Triple 16' x 12' Bend Barrel Section
(Looking South)



Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert
Bent Barrel Section
STA. 1307+00.00 (US 30) Turn-In Date: August 2026
Story County
IOWA DEPARTMENT OF TRANSPORTATION
Design No. 827 Design Sheet No. 6 of 15 FHWA No. 701210

FILE NO. 32491	ENGLISH	DESIGN TEAM LG/JS/NL	Story COUNTY	PROJECT NUMBER NHSX-030-5(313)-3H-85	SHEET NUMBER V.6
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Allowable Culvert Transverse Bar Splices		
BAR	Splice Location	Min. Lap
6k1, 6k11, 6k12, 6k14	Lap At Interior Wall	2'-5"
5k6	Lap Midway Between Interior Walls	2'-0"
6k9, 6k15, 6k16, 6k17, 6k18	Lap Midway Between Interior Walls	2'-5"
6m1, 6m15, 6m16, 6m18	Lap At Interior Wall	2'-5"
5m6	Lap Midway Between Interior Walls	2'-0"
7m9, 7m10, 7m11, 7m12, 7m13	Lap Midway Between Interior Walls	2'-10"

Slab and floor transverse bars may be spliced with one lap as note in the above table.

Payment for reinforcing bars shall be based on no splices, and no allowance shall be made for additional length of bar required for the use of splices.



One 20'-0" Bend Section						
BAR	LOCATION	SHAPE	NO.	LENGTH	WEIGHT	
4a1	Exterior Walls, Vertical, Front Face		55	13'-11"	511	
7a2	Interior Walls, Vertical		56	13'-11"	1,593	
4b1	Short Exterior Wall, Horizontal		23	12'-10"	197	
4b2	Short Interior Wall, Horizontal		23	17'-4"	266	
4b3	Long Interior Wall, Horizontal		23	21'-10"	335	
4b4	Long Exterior Wall, Horizontal		23	26'-4"	405	
5e1	Slab, Bottom, Longitudinal, Short Barrel		34	6'-6"	231	
5e2	Slab, Bottom, Longitudinal, Middle Barrel		34	8'-9"	310	
5e3	Slab, Bottom, Longitudinal, Long Barrel		34	11'-0"	390	
5e4	Slab, Bottom, Longitudinal, Bend		51	7'-4"	390	
4e5	Slab, Top, Longitudinal, Short Barrel		26	6'-6"	113	
4e6	Slab, Top, Longitudinal, Middle Barrel		26	8'-9"	152	
4e7	Slab, Top, Longitudinal, Long Barrel		26	11'-0"	191	
4e8	Slab, Top, Longitudinal, Bend		39	6'-10"	178	
4f1	Footing, Longitudinal, Short Barrel		60	6'-6"	261	
4f2	Footing, Longitudinal, Middle Barrel		60	8'-9"	351	
4f3	Footing, Longitudinal, Long Barrel		60	11'-0"	441	
4f4	Footing, Longitudinal, Bend		90	6'-10"	411	
6k1	Slab, Bottom, Transverse		20	51'-8"	1,552	
5k2	Slab, Bottom, Transverse		48	14'-1"	705	
4k3	Slab, Bottom, Transverse		24	9'-8"	155	
7k4	Slab, Top, Corner		64	10'-6"	1,374	
5k6	Slab, Top, Transverse		16	51'-8"	862	
6k7	Slab, Top, Transverse		14	33'-11"	713	
6k9	Slab, Top, Transverse, Ends		4	51'-8"	310	
6k10	Slab, Bottom, Transverse, Bend		10	17'-6"	263	
6k11	Slab, Bottom, Transverse, Bend		4	34'-7"	208	
6k12	Slab, Bottom, Transverse, Bend		4	46'-10"	281	
5k13	Slab, Bottom, Transverse, Bend		4	8'-11"	37	
6k14	Slab, Bottom, Transverse, Bend		1	52'-1"	78	
6k15	Slab, Top, Transverse, Bend		12	31'-0"	559	
6k16	Slab, Top, Transverse, Bend		6	42'-0"	379	
6k17	Slab, Top, Transverse, Bend		4	48'-0"	288	
6k18	Slab, Top, Transverse, Bend		1	52'-1"	78	
6m1	Footing, Top, Transverse		20	52'-2"	1,567	
5m2	Footing, Top, Transverse		48	10'-6"	526	
4m3	Footing, Top, Transverse		24	2'-6"	40	
7m4	Footing, Bottom, Corner		66	18'-1"	2,440	
5m6	Footing, Bottom, Transverse		16	52'-2"	871	
7m7	Footing, Bottom, Transverse		28	10'-11"	625	
7m9	Footing, Bottom, Transverse, Ends		4	52'-2"	427	
7m10	Footing, Bottom, Transverse, Bend		12	31'-3"	767	
7m11	Footing, Bottom, Transverse, Bend		6	42'-3"	518	
7m12	Footing, Bottom, Transverse, Bend		4	48'-3"	394	
7m13	Footing, Bottom, Transverse, Bend		1	52'-7"	107	
6m14	Footing, Top, Transverse, Bend		10	17'-8"	265	
6m15	Footing, Top, Transverse, Bend		4	34'-5"	207	
6m16	Footing, Top, Transverse, Bend		4	46'-10"	281	
5m17	Footing, Top, Transverse, Bend		4	7'-2"	30	
6m18	Footing, Top, Transverse, Bend		1	52'-7"	79	
Reinforcing Steel (Non-Coated) - Total (lbs.)					23,712	

Non-Coated Reinforcing

Bent Bar Details

4b1 - 4b4

5e4

4e8, 4f4

7k4

7m4

Note: All dimensions are out to out.
D = pin diameter.

Concrete Placement Quantities (One 20'-0" Bend Section)

Location	Total
Footing	40.8
Walls	34.2
Slab	40.5
Total (Cubic Yards)	115.5

Design For 0° Skew

Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert

Bent Barrel Details

STA. 1307+00.00 (US 30) Turn-In Date: August 2026

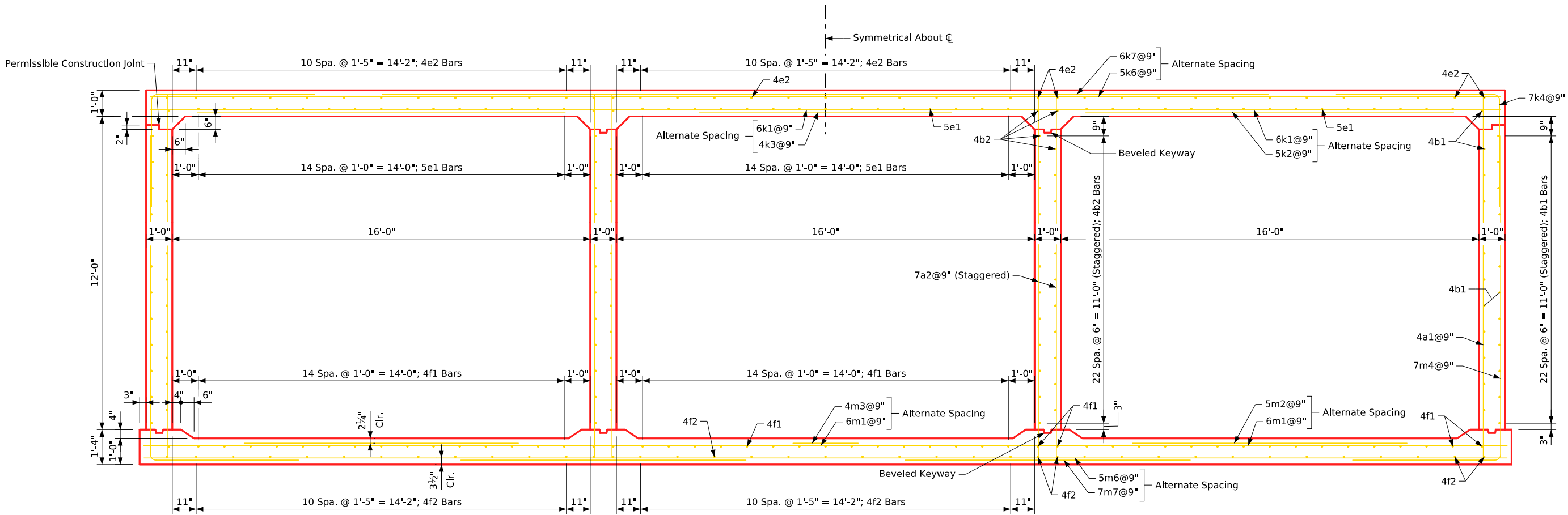
Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 827 Design Sheet No. 7 of 15 FHWA No. 701210

Notes:

Dimensions listed on this sheet to be used in conjunction with dimensions and quantities on Design Sheet 9.

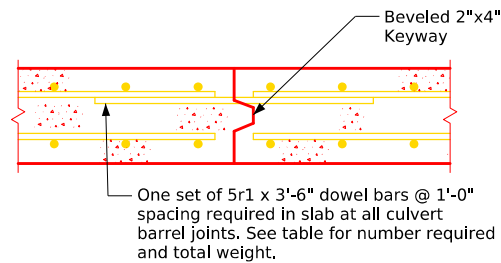


Triple 16' x 12' Barrel Section



Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert
Typical Straight Culvert Barrel Section
STA. 1307+00.00 (US 30) Turn-In Date: August 2026
Story County
IOWA DEPARTMENT OF TRANSPORTATION
Design No. 827 Design Sheet No. 8 of 15 FHWA No. 701210

FILE NO. 32491	ENGLISH	DESIGN TEAM LG/JS/NL	Story COUNTY	PROJECT NUMBER NHSX-030-5(313)-3H-85	SHEET NUMBER V.8
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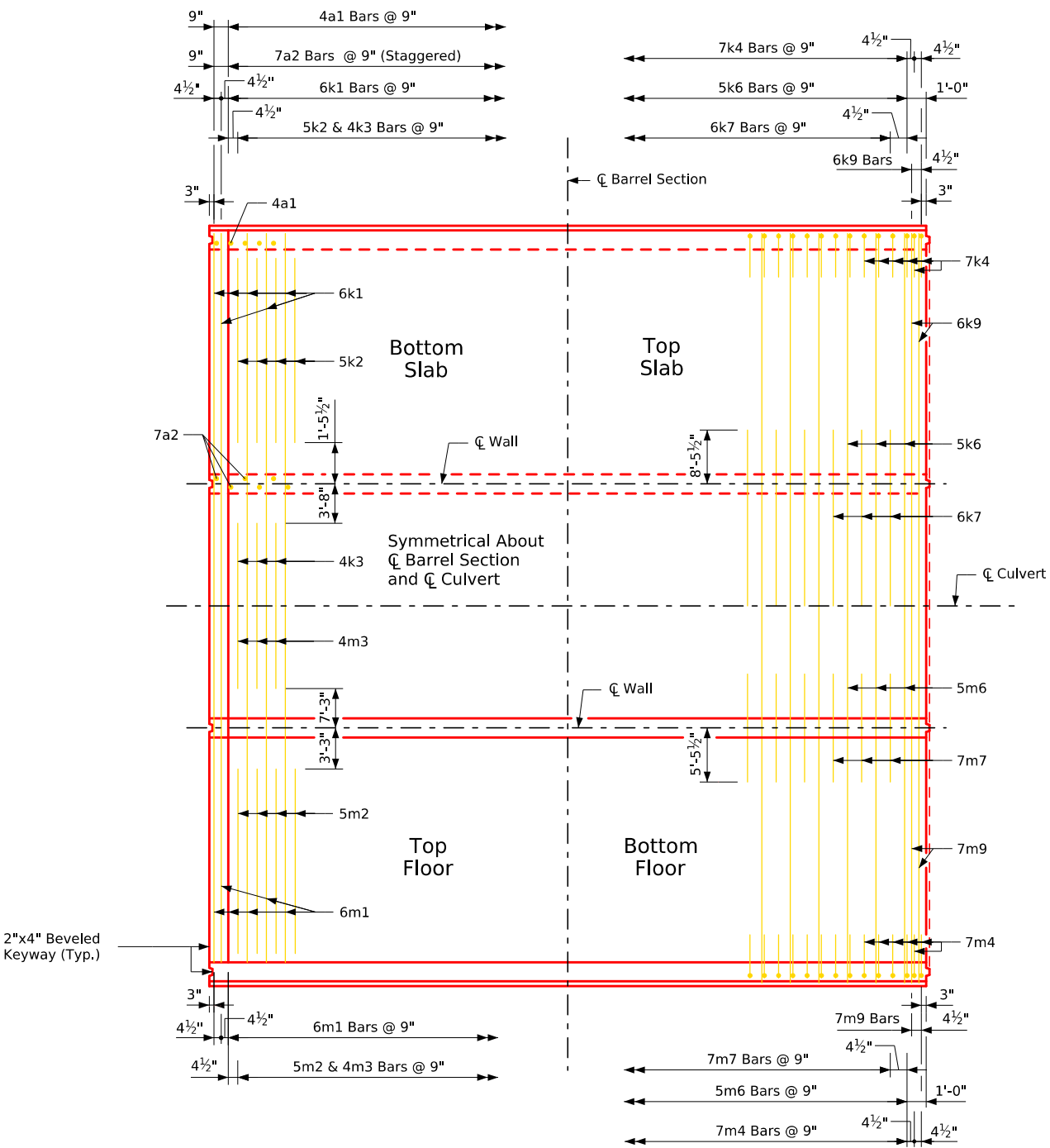
Top Slab Construction Joint Detail

Top Slab Construction Joint 5r1 Bars			
BAR	No./Joint	Total No.	Weight (LB)
5r1	52	260	950

Slab and floor transverse bars may be spliced with one lap as note in the below table.

Payment for reinforcing bars shall be based on no splices, and no allowance shall be made for additional length of bar required for the use of splices.

Allowable Culvert Transverse Bar Splices		
BAR	Splice Location	Min. Lap
6k1	Lap At Interior Wall	2'-5"
5k6	Lap Midway Between Interior Walls	2'-0"
6k9	Lap Midway Between Interior Walls	2'-5"
6m1	Lap At Interior Wall	2'-5"
5m6	Lap Midway Between Interior Walls	2'-0"
7m9	Lap Midway Between Interior Walls	2'-10"

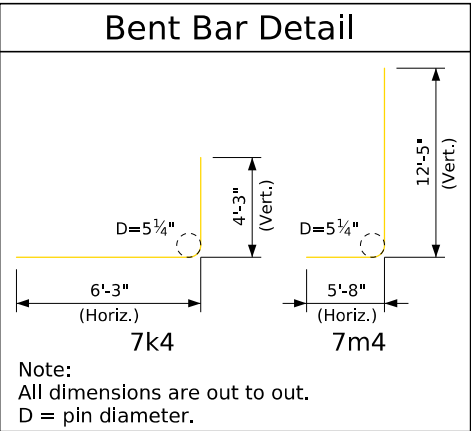


Standard Section Plan View

Note:
All longitudinal barrel steel shall extend at least to the backface of parapet.

Triple 16' x 12' Reinforced Concrete Box Reinforcing			
BAR	Sp.	NO.	L
4a1	9"	---	13'-11"
7a2	9"	---	13'-11"
4b1	6"	48	---
4b2	6"	50	---
5e1	1'-0"	45	---
4e2	1'-5"	39	---
4f1	1'-0"	51	---
4f2	1'-5"	39	---
6k1	9"	---	51'-8"
5k2	9"	---	14'-1"
4k3	9"	---	9'-8"
7k4	9"	---	10'-6"
5k6	9"	---	51'-8"
6k7	9"	---	33'-11"
6k9	4 1/2"	4	51'-8"
6m1	9"	---	52'-2"
5m2	9"	---	10'-6"
4m3	9"	---	2'-6"
7m4	9"	---	18'-1"
5m6	9"	---	52'-2"
7m7	9"	---	10'-11"
7m9	4 1/2"	4	52'-2"

Note: Number of bars is for each barrel segment. Number of bars and bar lengths not listed in the above table shall be determined based on the culvert segment lengths.



Design For 0° Skew

Triple 16' x 12' x 214'-0" (128'-0" Stage 2)

Cast-In-Place RCB Culvert

Straight Barrel Details

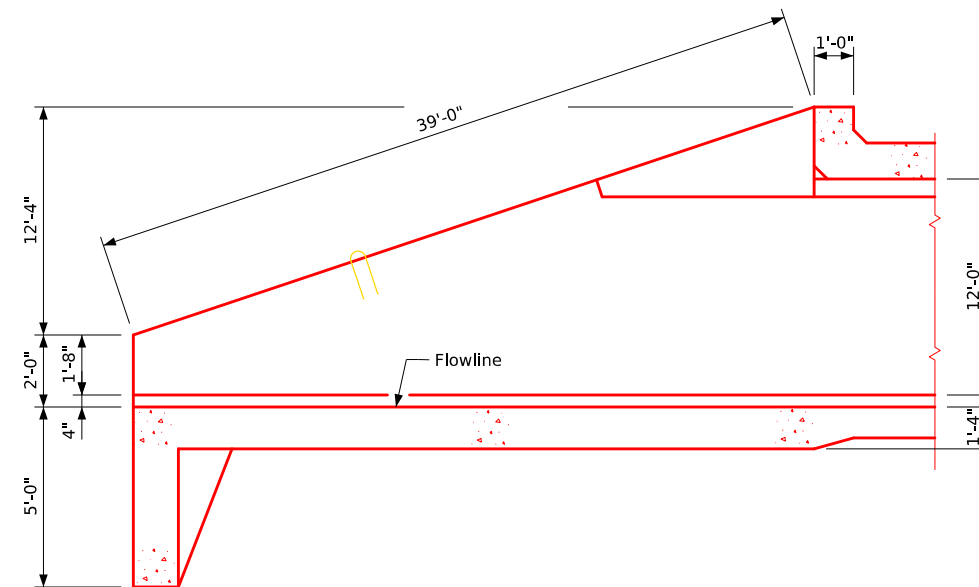
STA. 1307+00.00 (US 30) Turn-In Date: August 2026

Story County

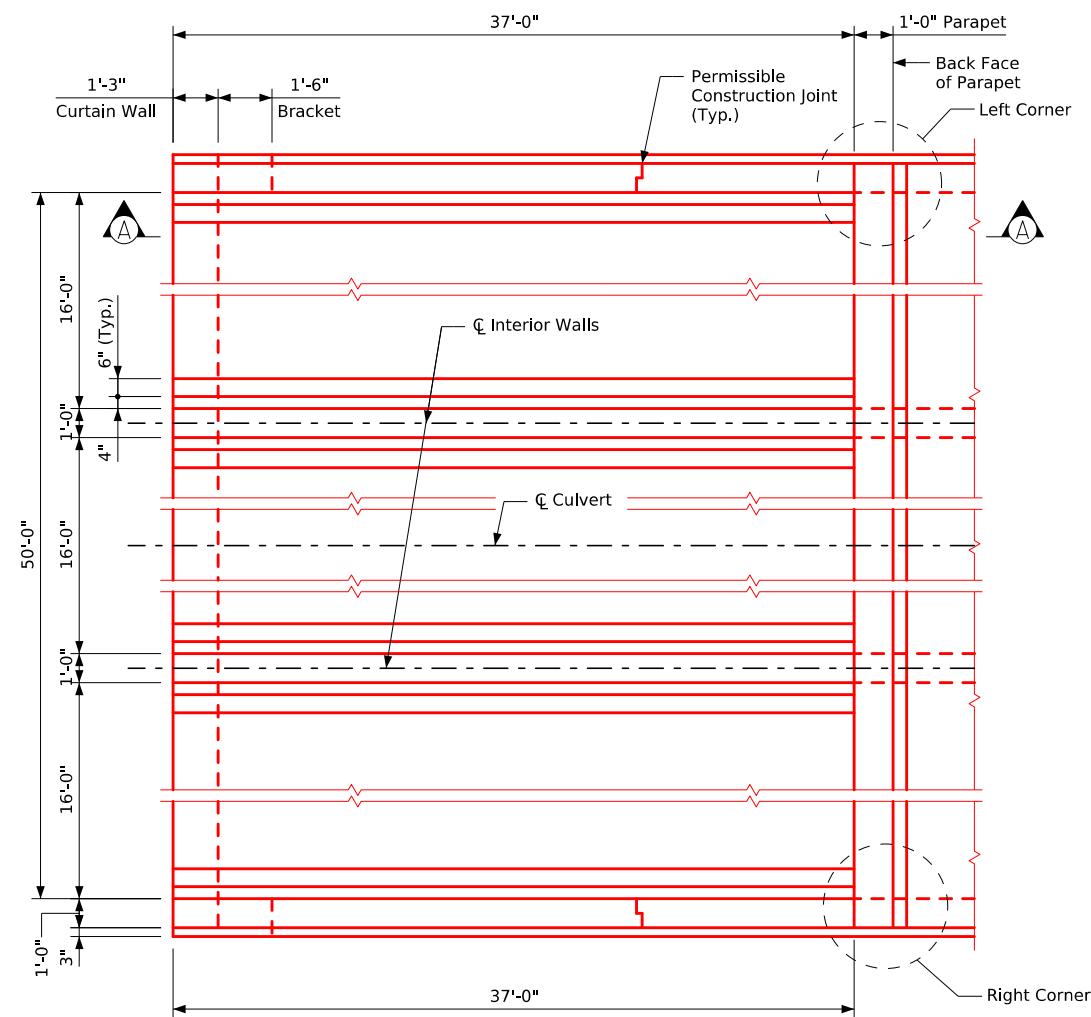
IOWA DEPARTMENT OF TRANSPORTATION

Design No. 827 Design Sheet No. 9 of 15 FHWA No. 701210





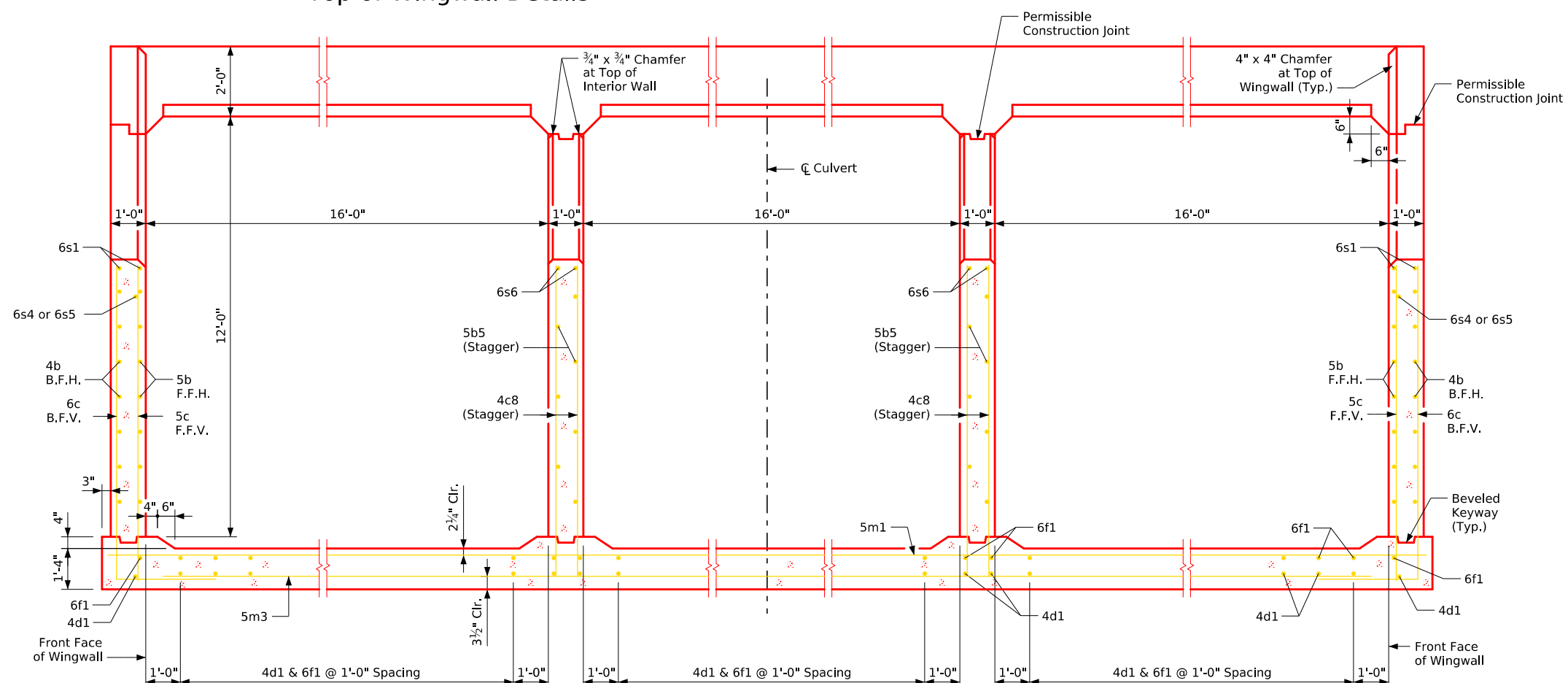
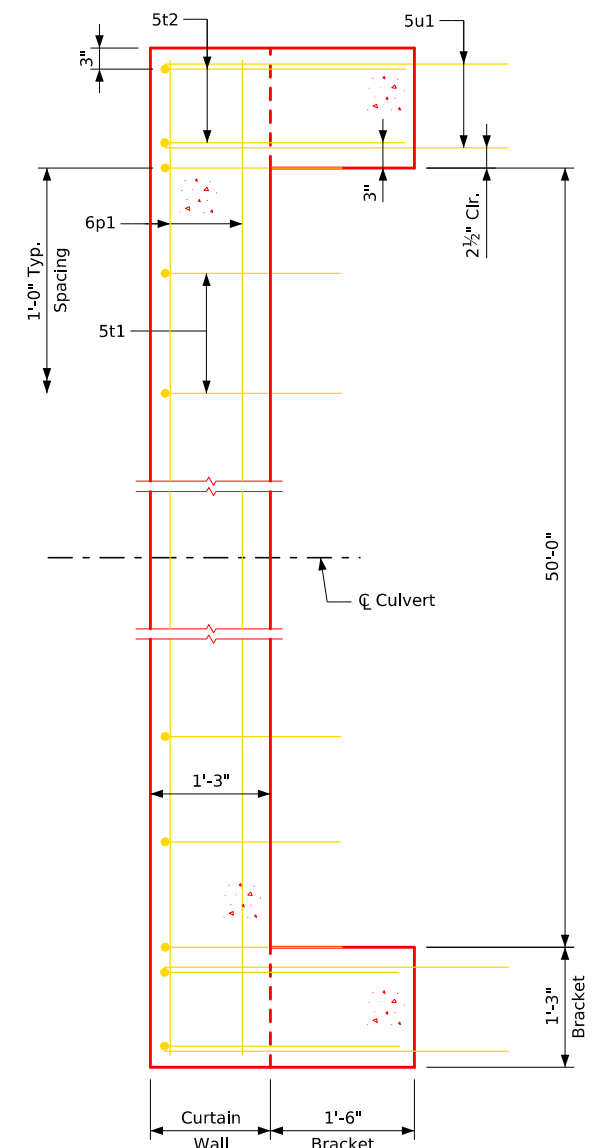
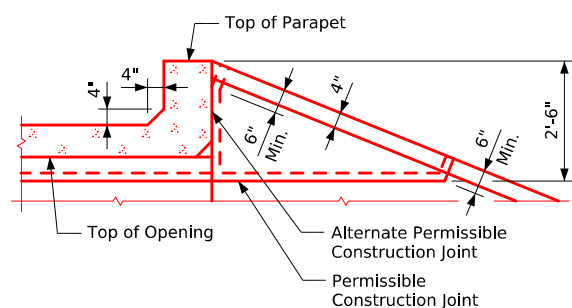
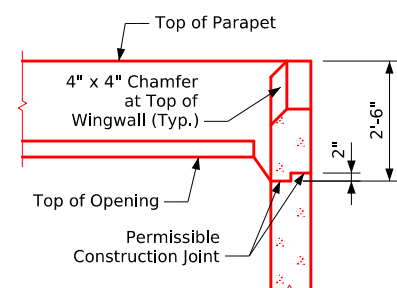
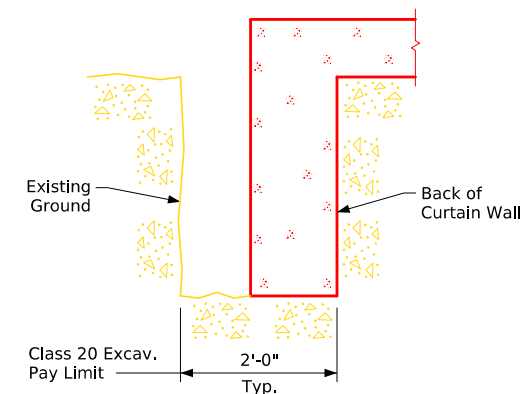
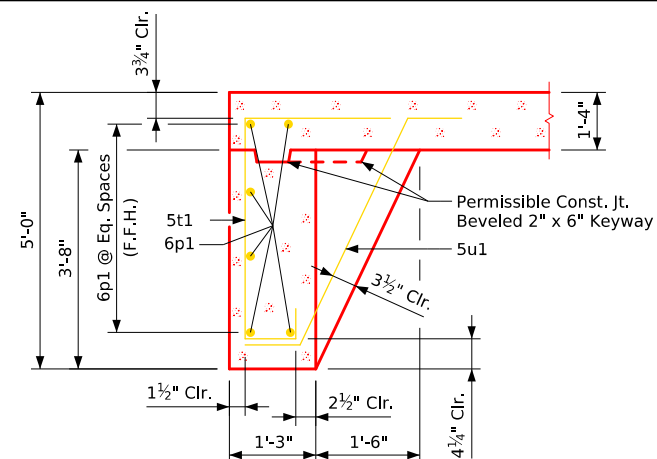
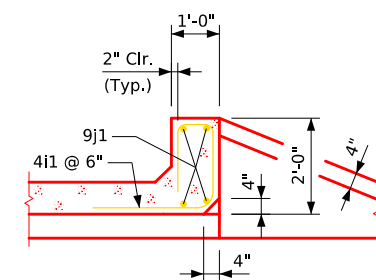
Elevation Section A-A



Plan View

Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert
Headwall Details
 STA. 1307+00.00 (US 30) Turn-In Date: August 2026
Story County
 IOWA DEPARTMENT OF TRANSPORTATION
 Design No. 827 Design Sheet No. 10 of 15 FHWA No. 701210





Typical Cross Section - thru Headwall

Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert

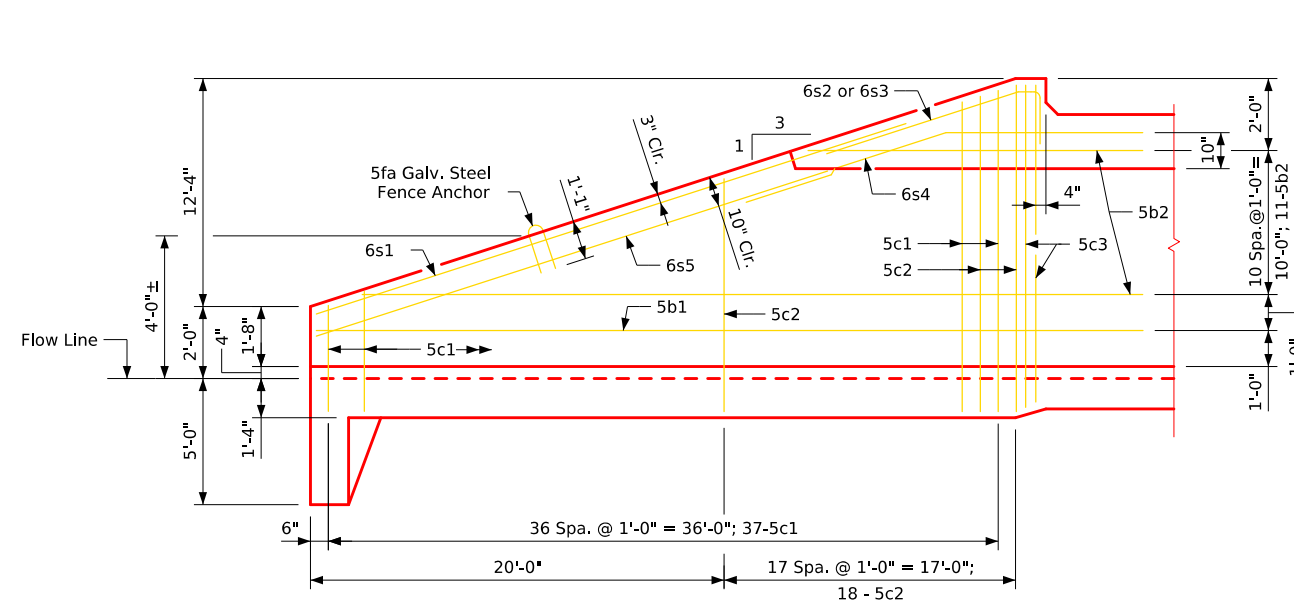
Headwall Details

STA. 1307+00.00 (US 30)	Turn-in Date: August 2026
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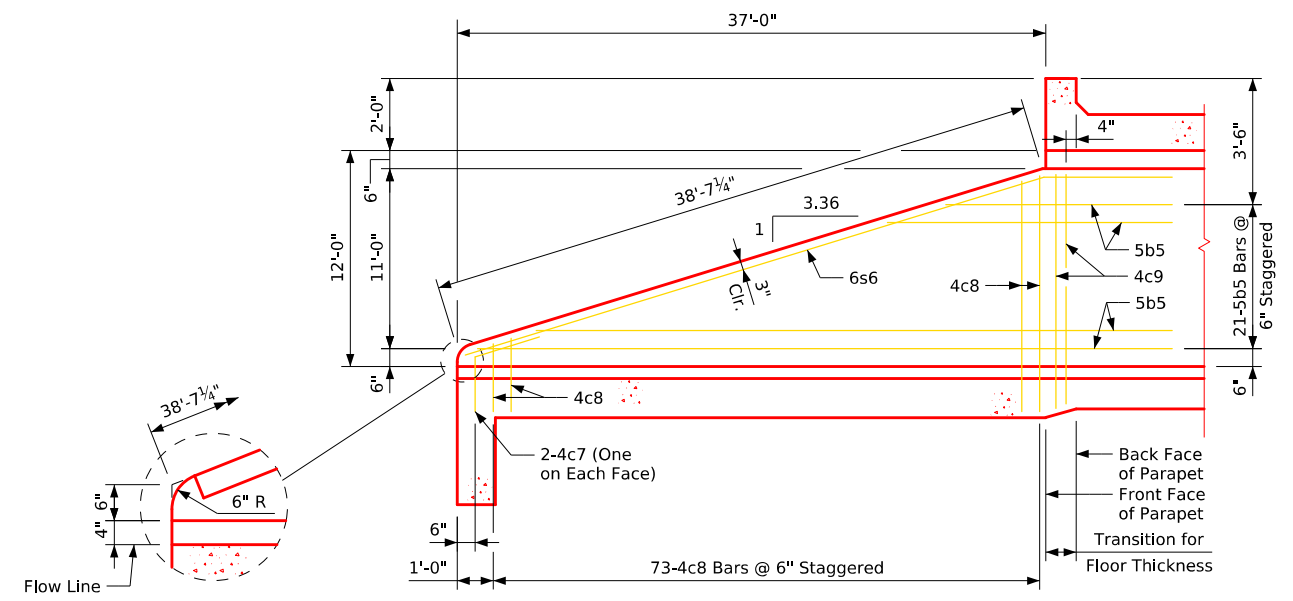
Story County

IOWA DEPARTMENT OF TRANSPORTATION

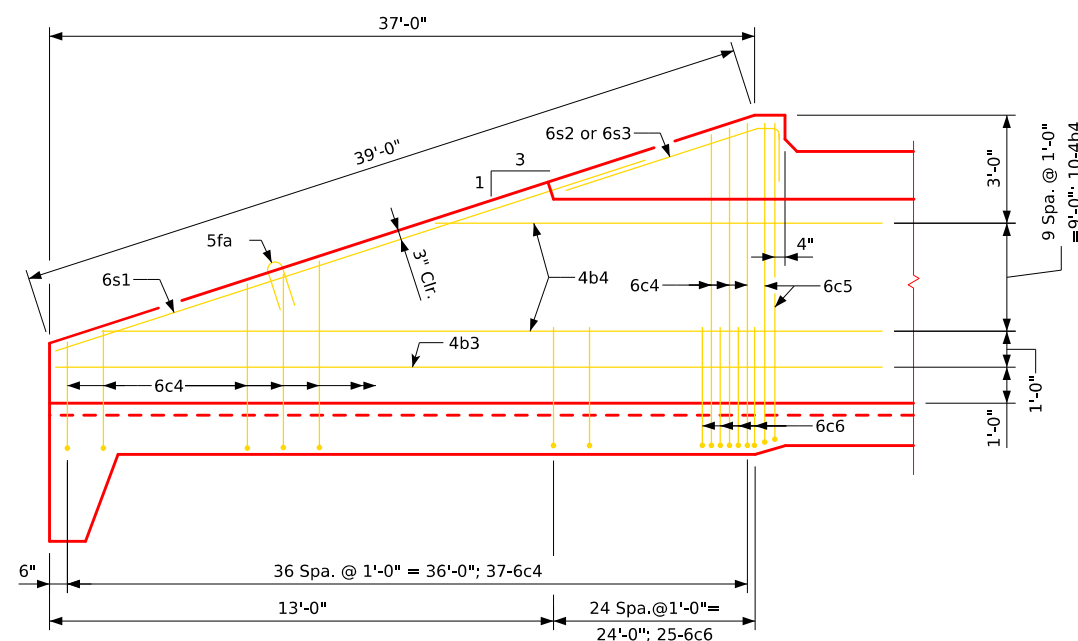
Design No. 827	Design Sheet No. 11 of 15	FHWA No. 701210
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Typical View - Front Face Wingwall Reinforcing



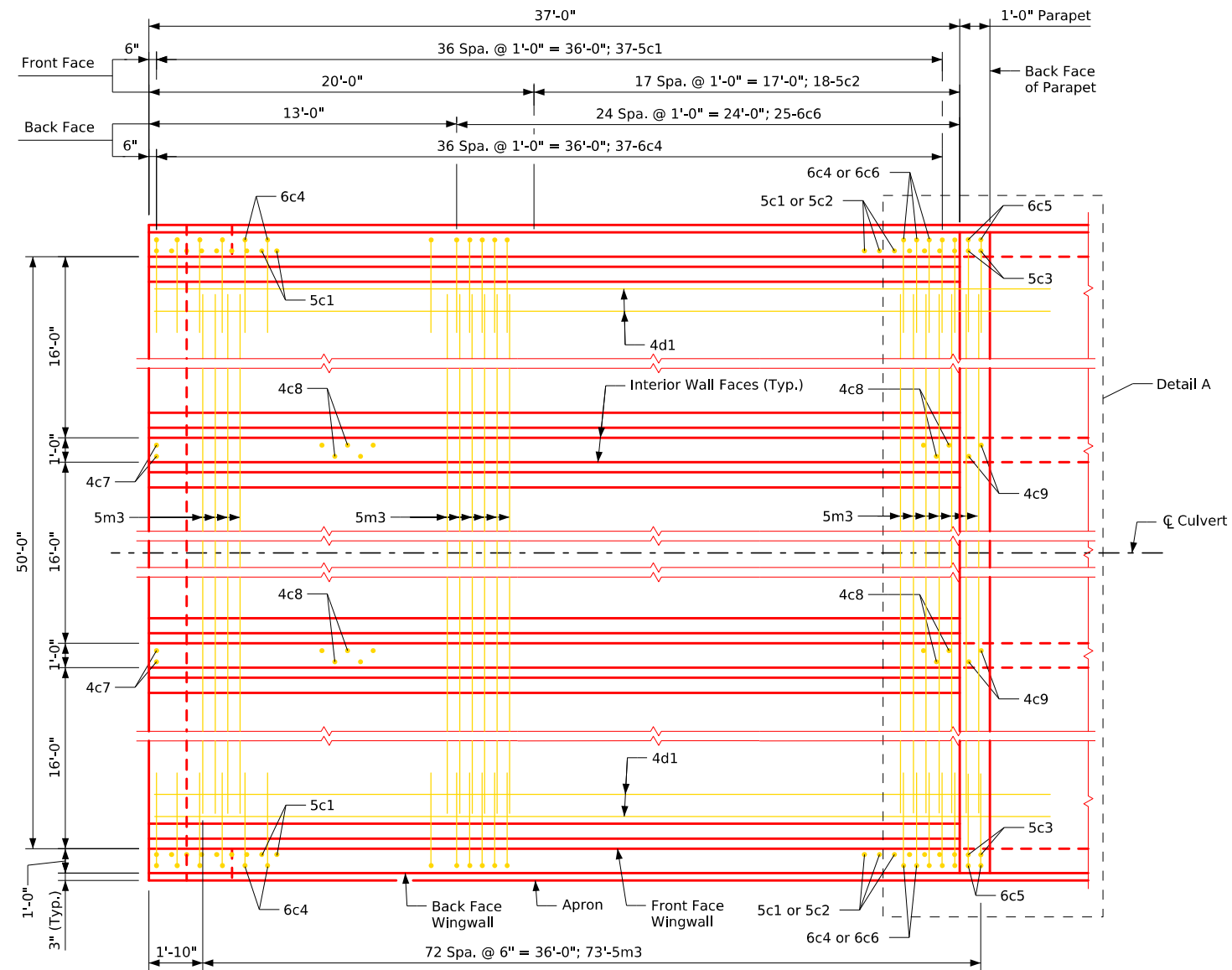
Typical View - Interior Wall



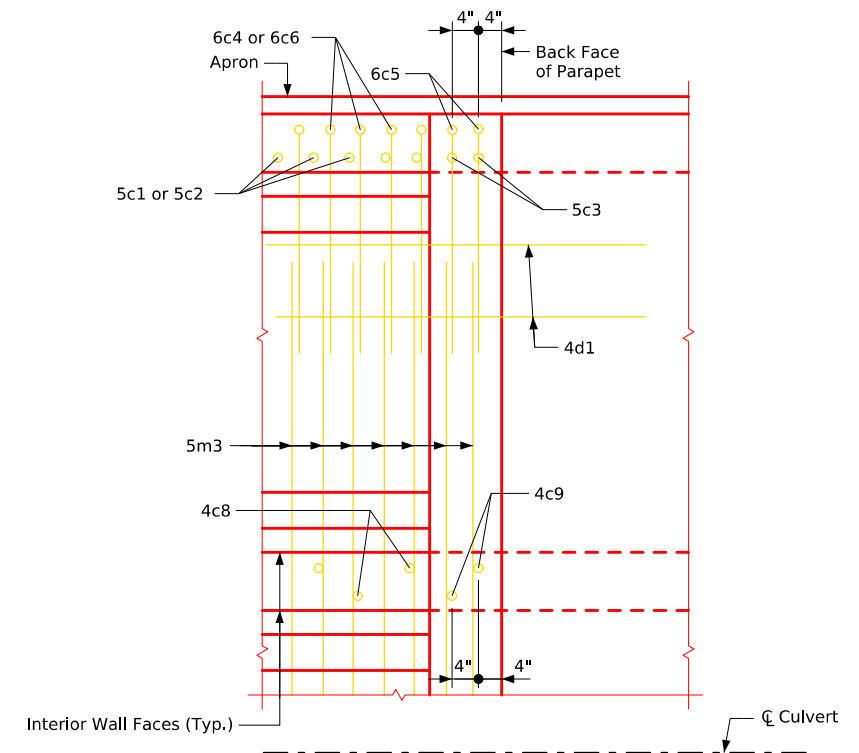
Typical View - Back Face Wingwall Reinforcing

Notes:

1. Apron 5m3 bars are to be centered on $\varnothing$ culvert.
2. B.F.V. (6c5) and F.F.V. (5c3) and interior wall both F.V. (4c9) bars are approximately 4" from the back of parapet.



Plan View - Bottom Apron Reinforcing
(Curtain Wall Reinforcing not shown, See Design Sheet 11)



Detail A

Notes:

1. Apron 5m3 bars are to be centered on C culvert.
2. B.F.V. (6c5), F.F.V. (5c3) and interior wall both F.V. (4c9) bars are approximately 4" from the back of parapet for all headwalls.



Design For 0° Skew

Triple 16' x 12' x 214'-0" (128'-0" Stage 2)

Cast-In-Place RCB Culvert

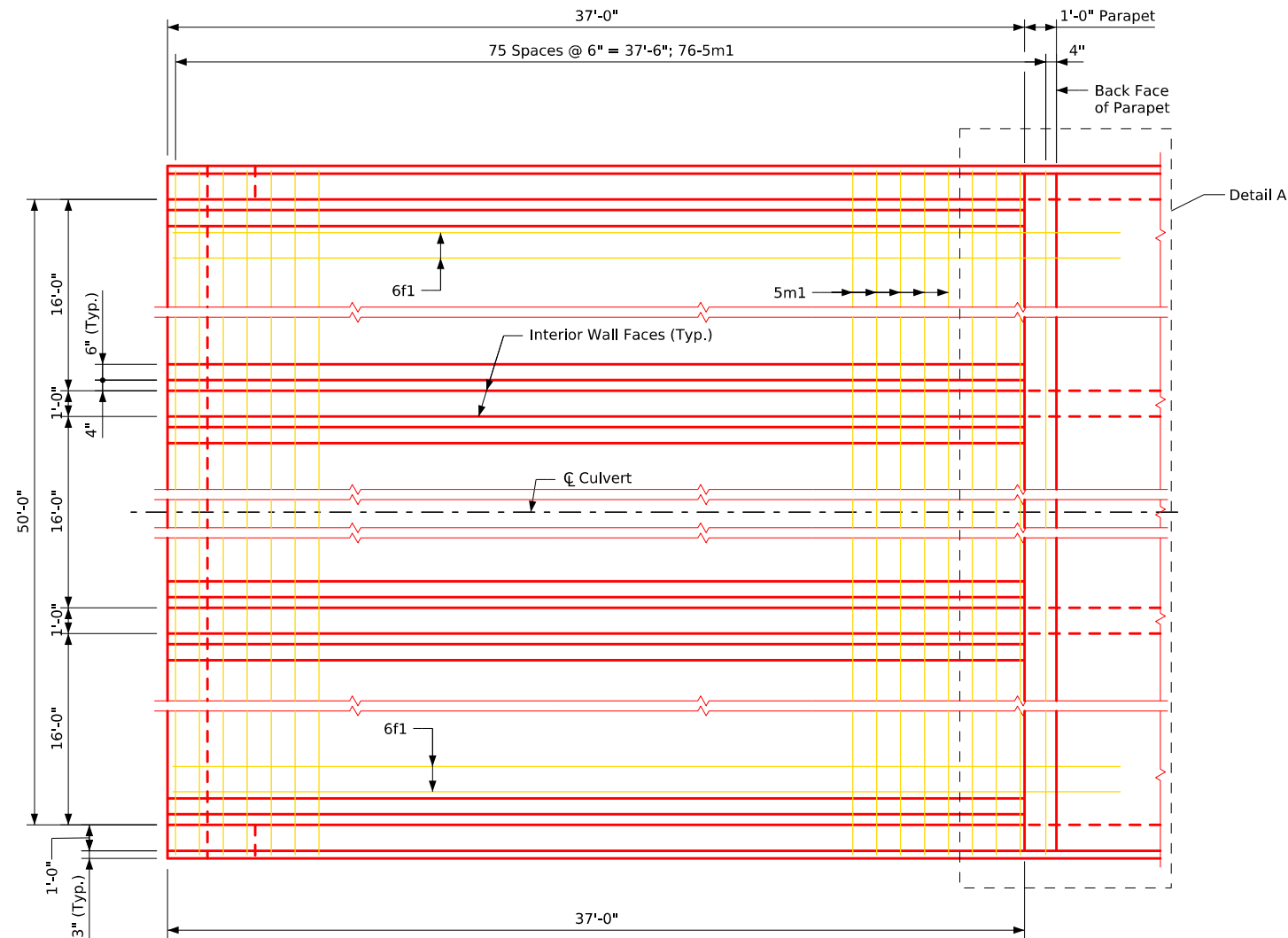
Bottom Apron Reinforcing

STA. 1307+00.00 (US 30) Turn-In Date: August 2026

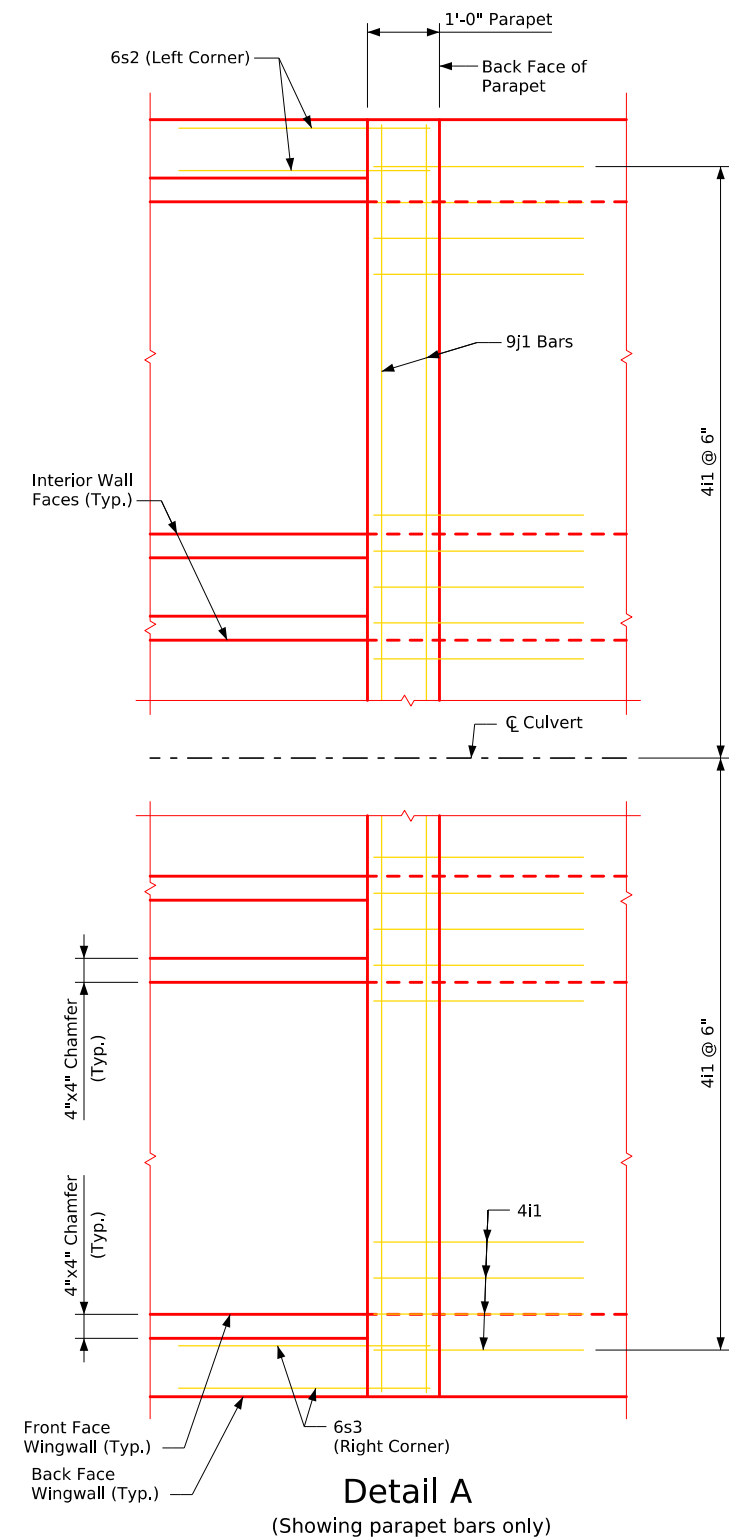
Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 827 Design Sheet No. 13 of 15 FHWA No. 701210



Plan View - Top Apron Reinforcing
(Wall Reinforcing not shown for clarity)



Note:

Top transverse apron bars are referenced approximately 4" from the back of the parapet.

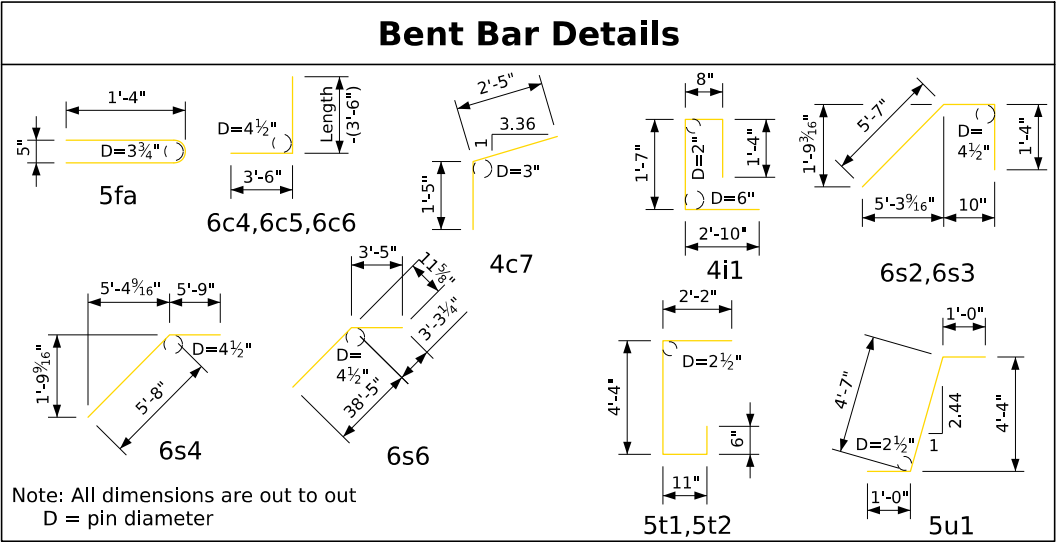


Design For 0° Skew
Triple 16' x 12' x 214'-0" (128'-0" Stage 2)
Cast-In-Place RCB Culvert
Parapet & Top Apron Reinforcing
 STA. 1307+00.00 (US 30) Turn-In Date: August 2026
Story County
 IOWA DEPARTMENT OF TRANSPORTATION
 Design No. 827 Design Sheet No. 14 of 15 FHWA No. 701210

FILE NO. 32491	ENGLISH	DESIGN TEAM LG/JS/NL	Story COUNTY	PROJECT NUMBER NHSX-030-5(313)-3H-85	SHEET NUMBER V.14
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Headwall Notes:

- 1. The sides of the apron are to be formed to ensure correct line and grade.
- 2. All apron reinforcing steel is to be supported by bar chairs at intervals of not more than 3'-0" in either direction as outlined in the Standard Specifications.
- 3. Clear distance from face of concrete to near reinforcing bar is to be 2" unless otherwise noted or shown. Clearance to the bottom ends of vertical bars shall be 3 inches.
- 4. Concrete quantities are estimated from back of parapet.
- 5. Horizontal tails of bars "b" & "s" estimated to extend 2'-5" beyond back of parapet (into end of barrel). Longitudinal bars "4d1" and "6f1" estimated to project into end section of barrel a minimum of 2'-5" beyond back of parapet. The "length" column reflects total number of feet necessary to meet these requirements.



Transverse apron and horizontal parapet and curtain bars may be spliced with one lap as note in the below table.

Payment for reinforcing bars shall be based on no splices, and no allowance shall be made for additional length of bar required for the use of splices.

Allowable Headwall Bar Splices		
BAR	Splice Location	Min. Lap
9j1	Parapet Midpoint	5'-8"
5m1	Lap At Interior Wall	2'-8"
5m3	Lap Midway Between Interior Walls	2'-0"
6p1	Curtain Wall Midpoint	3'-2"



Reinforcing Steel - One Headwall									
	BAR	LOCATION	SHAPE	TOTAL NO.	LENGTH	VARIABLE BARS			WEIGHT
						NO. SETS	MIN.	MAX	
Non-Coated Reinforcing	5fa	Fence Anchor (Galv.)		2	2'-10"				6
	5b1	Wingwall, F.F.H.		2	40'-3"				84
	5b2	Wingwall, F.F.H.		22	Varies	2	8'-10"	38'-10"	547
	4b3	Wingwall, B.F.H.		2	40'-3"				54
	4b4	Wingwall, B.F.H.		20	Varies	2	11'-10"	38'-10"	338
	5b5	Interior Wall, Both F.H.		42	Varies	2	6'-3"	39'-10"	1,009
	5c1	Wingwall, F.F.V		74	Varies	2	2'-8"	14'-8"	669
	5c2	Wingwall, F.F.V		36	Varies	2	9'-2"	14'-10"	451
	5c3	Wingwall, F.F.V		4	15'-1"				63
	6c4	Wingwall, B.F.V		74	Varies	2	6'-4"	18'-4"	1,371
	6c5	Wingwall, B.F.V		4	18'-7"				112
	6c6	Wingwall, B.F.V		50	8'-6"				638
	4c7	Interior Wall, Both F.V.		4	3'-10"				10
	4c8	Interior Wall, Both F.V.		146	Varies	2	1'-7"	12'-4"	679
	4c9	Interior Wall, Both F.V.		4	12'-7"				34
	4d1	Apron, Longit., Bott.		51	40'-3"				1,371
	6f1	Apron, Longit., Top		51	40'-3"				3,083
	4i1	Parapet, Vertical		103	6'-5"				441
	9j1	Parapet, Horizontal		4	51'-8"				703
	5m1	Apron, Trans., Top		76	52'-2"				4,135
	5m3	Apron, Trans., Bott.		73	48'-7"				3,699
	6p1	Curtain, Horiz.		6	52'-2"				470
	6s1	Wing Slope, Both F.		4	35'-8"				214
	6s2	Wing Slope, Both F. (Left Corner)		2	7'-9"				23
	6s3	Wing Slope, Both F. (Right Corner)		2	7'-9"				23
	6s4	Wing Slope, F.F.		2	11'-5"				34
	6s5	Wing Slope, F.F.		2	33'-2"				100
	6s6	Interior Wall, Both F.		4	41'-10"				251
	5t1	Curtain, Vert.		51	7'-11"				421
	5t2	Curtain, Vert. Ends		4	7'-11"				33
	5u1	Bracket, Vert.		4	6'-7"				27
	Reinforcing Steel - Total (lbs.)								21,093

Concrete Quantities (One Headwall)	
Location	Quantity
Parapet Δ	4.6
Wingwalls	38.5
Apron	110.9
Total (Cubic Yards)	154.0

Δ Includes top of wingwall quantities.

Design For 0° Skew

Triple 16' x 12' x 214'-0" (128'-0" Stage 2)

Cast-In-Place RCB Culvert

Headwall Details

STA. 1307+00.00 (US 30) Turn-In Date: August 2026

Story County

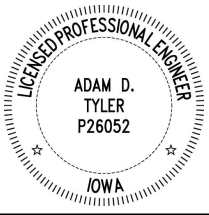
IOWA DEPARTMENT OF TRANSPORTATION

Design No. 827 Design Sheet No. 15 of 15 FHWA No. 701210

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

Install a 1-foot thick Working Blanket directly below the cast-in-place RCB culvert, extending from within 3 feet of each proposed curtain wall, and to a distance of at least 2 feet beyond the sides of the proposed culvert as measured from inside face. The Working Blanket shall consist of Granular Material for Blanket. The Working Blanket may also be altered or deleted if determined to be unnecessary at the time of construction. The Working Blanket is not shown in profile view. Refer to Working Blanket Coordinate Table for approximate plan limits.

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: *Adam Tyler* Date: 06/15/2026
Printed or Typed Name: Adam Tyler
My license renewal date is December 31, 2027

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



Location

US 30 Over S. Skunk River Overflow
T-83N R-24W
Section 13
Washington Township
Story County
City of Ames
FHWA No. 701210
Bridge Maint. No. 8550.3S030
Latitude 42.006097°
Longitude -93.592343°

STAGE 2 CULVERT CONSTRUCTION

END STAGE 1 CULVERT CONSTRUCTION
BEGIN STAGE 2 CULVERT CONSTRUCTION

STAGE 1 CULVERT CONSTRUCTION

SB5046
EL. 883.8

SB5045
EL. 884.0

SB5044
EL. 883.3

Working Blanket

Working Blanket Coordinate Table

Point	Station	Offset
A	1306+69.97	LT.158
B	1307+18.39	LT.74
C	1307+28.25	LT.37
D	1307+28.25	RT.17
E	1306+71.75	RT.17
F	1306+71.75	LT.36
G	1306+69.19	LT.46
H	1306+21.04	LT.129

Design For 0° Skew
Triple 16'x12'x214' (128' Stage 2)
Reinforced Concrete Box Culvert

Soil Profile Sheet

STA. 1307+00.00 (US 30)

Story County

IOWA DEPARTMENT OF TRANSPORTATION

Design No. 827

Design Sheet No. 1 of 2

FHWA No. 701210

FILE NO. 32491

ENGLISH

DESIGN TEAM WHKS/Braun Intertec

Story COUNTY

PROJECT NUMBER NHSX-030-5(313)--3H-85

SHEET NUMBER SPS.1

* Water level not observed while drilling

The diagram illustrates a geological cross-section of a bridge approach embankment, showing the relationship between existing ground, construction stages, and various soil layers. The embankment is divided into two main construction stages: Stage 1 Culvert Construction and Stage 2 Culvert Construction.

Soil Layers and Descriptions:

- (A)-TOPSOIL:** The uppermost layer, shown as a thin layer above the embankment.
- (B)-DARK BROWN, MEDIUM, SANDY CLAY, TRACE GRAVEL (ALLUVIUM):** Located on the left side of the embankment, above the Stage 2 construction.
- (C)-BROWN, STIFF TO MEDIUM, FINE TO MEDIUM-GRAINED, SILTY SAND (ALLUVIUM):** Located in the center of the embankment, above the Stage 1 construction.
- (C)-DARK BROWN, VERY STIFF TO STIFF, HIGHLY PLASTIC CLAY, TRACE ORGANIC (ALLUVIUM):** Located in the center of the embankment, below the Stage 1 construction.
- (D)-GRAY, LOOSE, FINE TO COARSE-GRAINED, SILTY SAND, LITTLE GRAVEL (ALLUVIUM):** Located on the left side of the embankment, below the Stage 2 construction.
- (D)-GRAY, SOFT TO MEDIUM, SANDY CLAY, LITTLE GRAVEL (ALLUVIUM):** Located in the center of the embankment, below the Stage 1 construction.
- (E)-TAN AND GRAY, LOOSE, FINE TO COARSE-GRAINED, POORLY GRADED GRAVEL WITH SILT (ALLUVIUM):** Located in the center of the embankment, below the Stage 1 construction.
- (E)-GRAY, VERY LOOSE, FINE TO COARSE-GRAINED, CLAYEY SAND (ALLUVIUM):** Located on the right side of the embankment, below the Stage 2 construction.
- (C)-BROWN, LOOSE, FINE TO COARSE-GRAINED, CLAYEY SAND, TRACE GRAVEL (ALLUVIUM):** Located on the right side of the embankment, below the Stage 2 construction.
- (D)-GRAY, LOOSE TO MEDIUM DENSE, FINE TO COARSE-GRAINED, POORLY GRADED SAND WITH SAND (ALLUVIUM):** Located on the right side of the embankment, below the Stage 2 construction.
- (F)-GRAY:** Located at the bottom of the embankment, below the Stage 2 construction.

Construction Stages:

- STAGE 1 CULVERT CONSTRUCTION:** Indicated by a dashed line and arrows, showing the location of the culvert structure.
- STAGE 2 CULVERT CONSTRUCTION:** Indicated by a solid line and arrows, showing the location of the culvert structure.

Groundwater Levels:

- EXIST. GROUND:** The existing ground surface, shown as a solid line.
- WATER TABLE:** Indicated by a dashed line with arrows, showing the level of groundwater.

Layer Thickness Data:

Layer	Thickness
B1	7
C1	9
C2	7
D1	5
D2	5
E1	8
E2	9
F1	10
F2	10
B1/C1	24
C2	10
C3	10
C4/D1	8
D2/E1	4
F1	15
F2	17
F3	16
F4	18
B1/C1	8
C2	6
C3	6
D1	8
D2	8
D3	30
D4	15

Layer	Thickness
A	1.5'
B	2.5'
C	9.0'
D	17.0'

SHELBY TUBE CORE DATA	
CORE NO.	SB5045-C2 (6.0'-8.0')
CLASSIFICATION (AASHTO)	-
COEFF. CONSOL. FT2/DAY	0.25
TRIAXIAL COMPRESSION	-
COHESION, C - PSF	-
FRICTION ANGLE, f - Degrees	-
MOISTURE CONTENT %	25
DENSITY - PCF	95
UU - UNCONSOLIDATED & UNDRAINED	
CU - CONSOLIDATED & UNDRAINED	
UC - UNCONFINED COMPRESSION (COHESION = 1/2 UC STRENGTH)	

Layer	Thickness
A	1.0'
B	3.5'
C	9.5'
D	6.0'
E	3.0'
F	17.0'

Layer	Thickness
A	1.0'
B	2.0'
C	5.5'
D	8.5'
E	9.0'
F	29.0'

