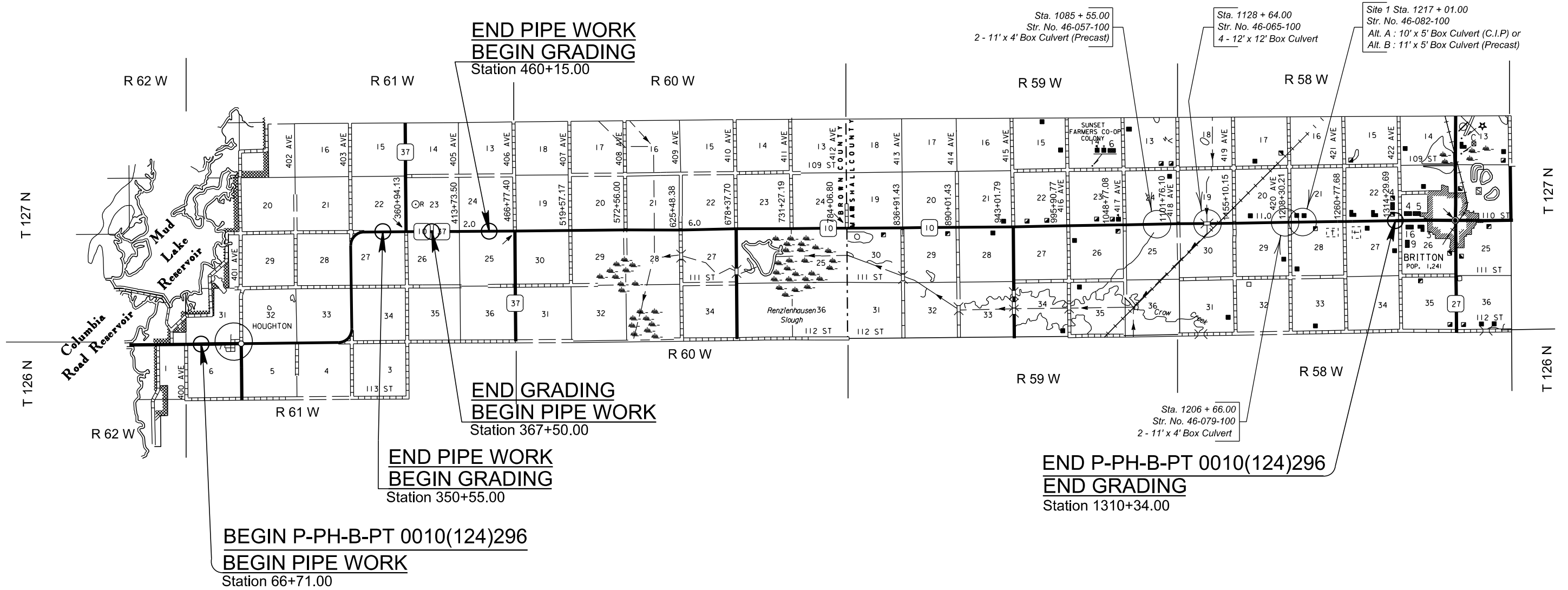
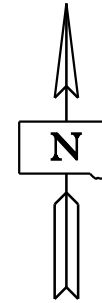


STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E1	E37

Section E: Structure Plans

INDEX OF SHEETS -

Sheet E1	Layout Map and Index
Sheet E2	Estimate of Structure Quantities & Notes
Sheet E3 to E7	Str. No. 46-057-100 2 - 11' x 4' Box Culvert (Precast)
Sheet E8 to E17	Str. No. 46-065-100 4 - 12' x 12' Box Culvert
Sheet E18 to E25	Str. No. 46-079-100 2 - 11' x 4' Box Culvert
Sheet E26 to E32	Str. No. 46-082-100 Site 1 Alt. A : 10' x 5' Box Culvert (C.I.P.)
Sheet E33 to E37	Str. No. 46-082-100 Site 1 Alt. B : 11' x 5' Box Culvert (Precast)



SECTION E – ESTIMATE OF STRUCTURE QUANTITIES

Str. No. 46-057-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	69	CuYd
421E0200	Box Culvert Undercut	217	CuYd
560E2136	2-11'x4' Precast Concrete Box Culvert, Furnish	80.0	Ft
560E2137	2-11'x4' Precast Concrete Box Culvert, Install	80.0	Ft
560E3136	2-11'x4' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E3137	2-11'x4' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	49.2	Ton
831E0110	Type B Drainage Fabric	64	SqYd

Str. No. 46-065-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
250E0030	Incidental Work, Structure	Lump Sum	LS
420E0200	Structure Excavation, Box Culvert	251	CuYd
421E0200	Box Culvert Undercut	738	CuYd
460E0120	Class A45 Concrete, Box Culvert	579.1	CuYd
480E0100	Reinforcing Steel	82,601	Lb
700E0210	Class B Riprap	229.6	Ton
831E0110	Type B Drainage Fabric	283	SqYd

Str. No. 46-079-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	106	CuYd
421E0200	Box Culvert Undercut	278	CuYd
460E0120	Class A45 Concrete, Box Culvert	222.7	CuYd
480E0100	Reinforcing Steel	34,252	Lb
700E0210	Class B Riprap	50.8	Ton
831E0110	Type B Drainage Fabric	66	SqYd

Site 1 – Alternate A

Str. No. 46-082-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	46	CuYd
421E0200	Box Culvert Undercut	170	CuYd
460E0120	Class A45 Concrete, Box Culvert	105.2	CuYd
480E0100	Reinforcing Steel	17,193	Lb
700E0210	Class B Riprap	27.4	Ton
831E0110	Type B Drainage Fabric	40	SqYd

Site 1 – Alternate B

Str. No. 46-082-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	37	CuYd
421E0200	Box Culvert Undercut	137	CuYd
560E0156	11'x5' Precast Concrete Box Culvert, Furnish	80.0	Ft
560E0157	11'x5' Precast Concrete Box Culvert, Install	80.0	Ft
560E1156	11'x5' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E1157	11'x5' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	29.1	Ton
831E0110	Type B Drainage Fabric	41	SqYd

INCIDENTAL WORK, STRUCTURE

1. Incidental Work, Structure will consist of the removal of the following structure:

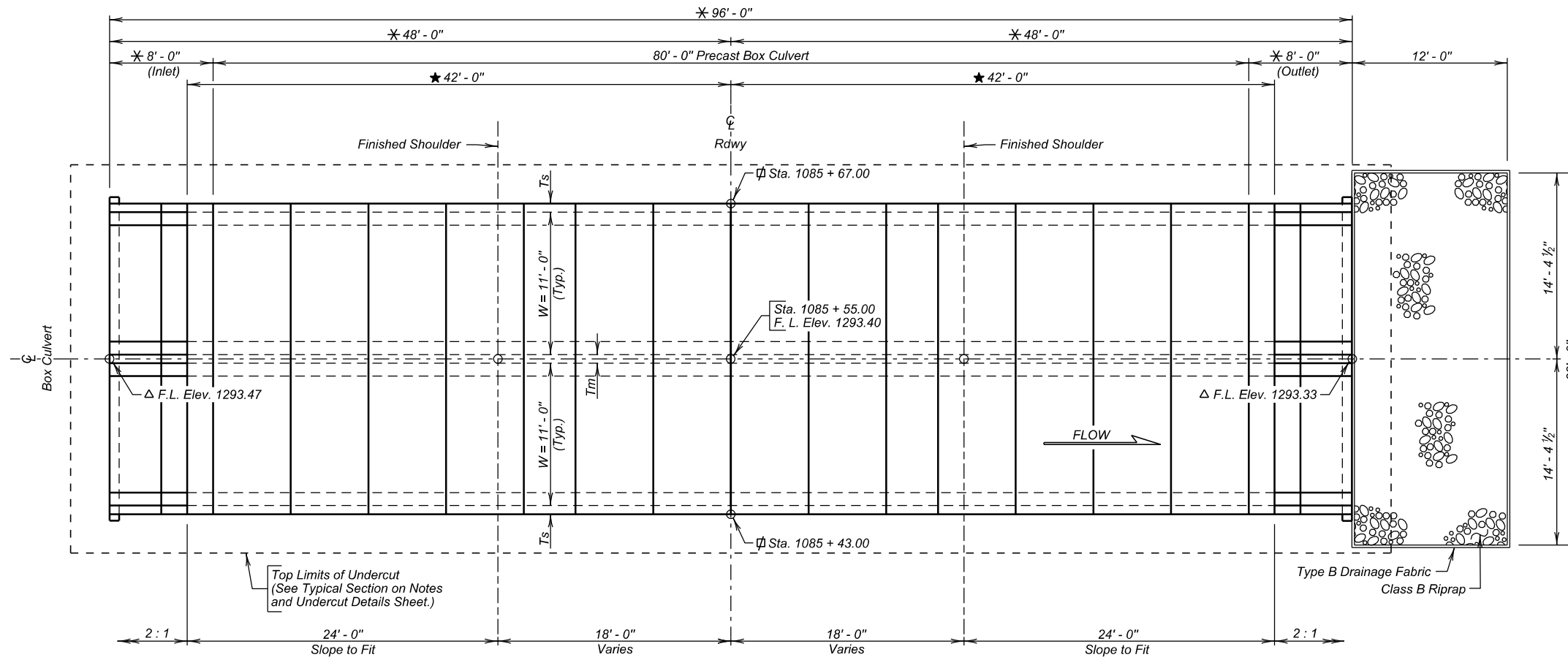
Str. No. 46-065-100. In place centerline Sta. 1128+36.80 to centerline Sta. 1128+90.47 is a 53'-8" 3 span concrete viaduct with a 30'-0" clear roadway. The superstructure consists of a reinforced concrete slab with concrete pigeon hole railing faced with steel W-beam continuous across the bridge. The deck has been overlaid with 2 inches of asphalt. The substructure consists of 4 column reinforced concrete bents and reinforced vertical concrete abutments, all of which are supported on timber piling with 45 degree flared wings.

2. Break down and remove the existing structure 1 foot below finished ground or as required to construct the new structure in accordance with Section 110 of the Specifications. All portions of the existing structures will be removed and disposed of by the Contractor on a site obtained by the Contractor and approved by the Engineer in accordance with the ENVIRONMENTAL COMMITMENTS found in SECTION A.
3. During demolition of structure, efforts will be taken to prevent material from falling into the creek. Under no circumstances is asphalt allowed to fall into the creek.
4. The foregoing is a general description of the in-place structure and should not be construed to be complete in all details. Before preparing the bid it will be the responsibility of the Contractor to make a visual inspection of the structure to verify the extent of the work and materials involved. If desired by the Contractor, a copy of the original construction plans may be obtained through the Office of Bridge Design.

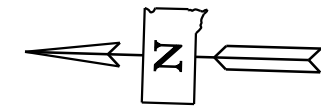
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

- * Dimension may vary with fabricator and/or installation. See Shop Plans for actual installation length.
- ★ Minimum distance to satisfy clear zone.
- △ Based on dimensions shown.
- ⌀ Based on 8" exterior walls and 8" middle wall.

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E3	E37

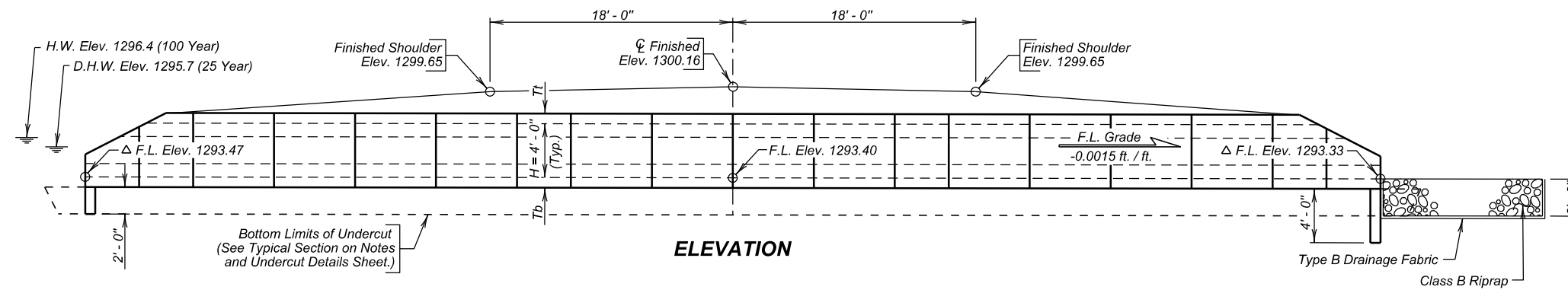


PLAN



LEGEND

- W = Width of Opening
- H = Height of Opening
- Tt = Thickness of Top Slab
- Tb = Thickness of Bottom Slab
- Ts = Thickness of Side Wall
- Tm = Thickness of Middle Wall



ELEVATION

HYDRAULIC DATA

Q_d	177 cfs
A_d	28 sq ft
V_d	6.4 fps
Q_F	177 cfs
Q_{100}	336 cfs
Q_{OT}	> Q_{100}
V_{max}	7.3 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1295.7.
 Q_{OT} = Overtopping discharge and frequency >100 year recurrence interval. El. 1299.9 @ Sta. 1092 + 50±.
 Q_F = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.
 Q_{100} = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 1296.4.
 V_{max} = Maximum computed outlet velocity for the proposed culvert, based on 100 year frequency.

-X028-

INDEX OF CULVERT SHEETS-

- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Notes and Undercut Details
- Sheet No. 3 - Details of Standard Plate No.'s 460.02 & 560.01
- Sheet No. 4 - Details of Standard Plate No.'s 560.20 & 560.21
- Sheet No. 5 - Details of Standard Plate No. 620.16

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Structure Excavation, Box Culvert	Cu. Yd.	69
Box Culvert Undercut	Cu. Yd.	217
Class B Riprap	Ton	49.2
Type B Drainage Fabric	Sq. Yd.	64
2 - 11' X 4' Precast Concrete Culvert, Furnish	Ft.	80
2 - 11' X 4' Precast Concrete Culvert, Install	Ft.	80
2 - 11' X 4' Precast Concrete Culvert End Section, Furnish	Each	2
2 - 11' X 4' Precast Concrete Culvert End Section, Install	Each	2

Quantity is based on 9" bottom slab, 9" top slab, 8" outside walls.
 * For estimating purposes only, a factor of 1.4 tons/cu. yd. was used to convert Cu. Yd. to Tons.

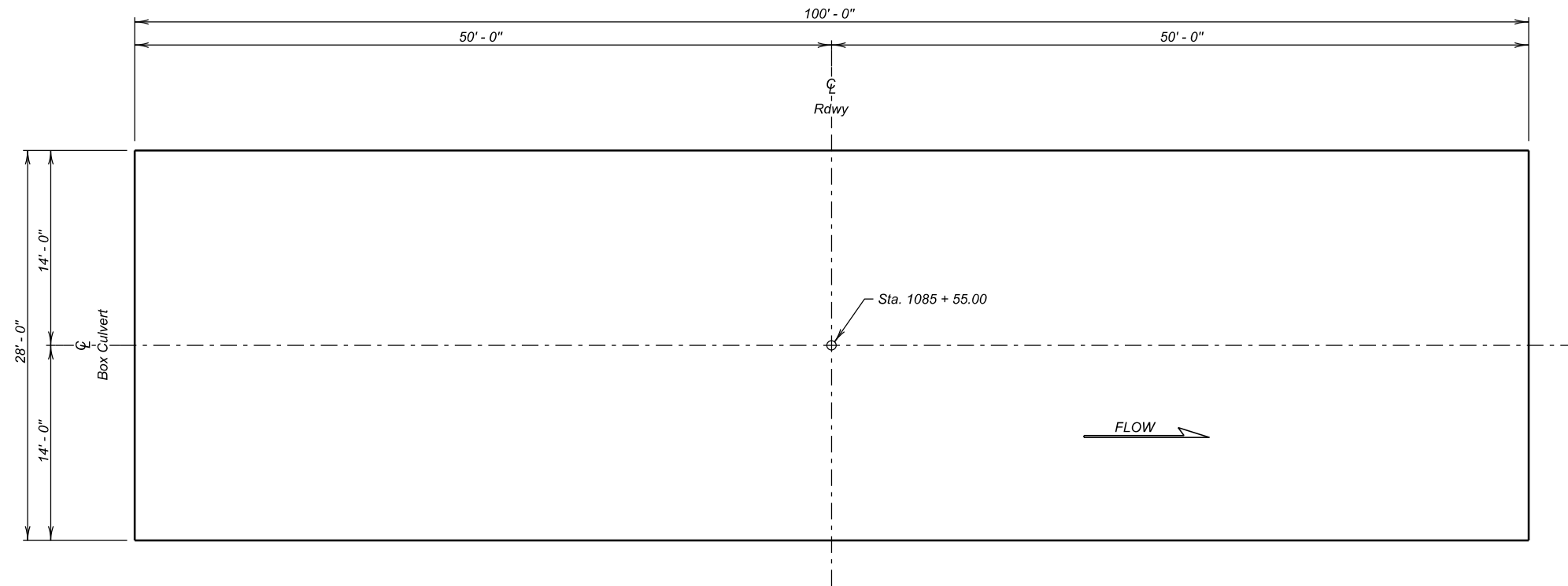
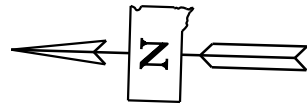
GENERAL DRAWING AND QUANTITIES

FOR
2 - 11' X 4' BOX CULVERT (PRECAST)
 OVER TRIB. TO CROW CREEK 0° SKEW
 STA. 1085 +55.00 SEC. 24/25-T127N-R59W
 STR. NO. 46-057-100 P-PH-B-PT 0010(124)296
 PCN 05F4 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022

PLANS BY:
 OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY CM MRSH05F4	CK. DES. BY BR 05F4TA01	DRAFTED BY BT Steve A. Johnson	BRIDGE ENGINEER
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UNDERCUT LAYOUT
(Bottom Dimensions)

SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

Design will be in accordance with Section 560 of the Construction Specifications with the following criteria:

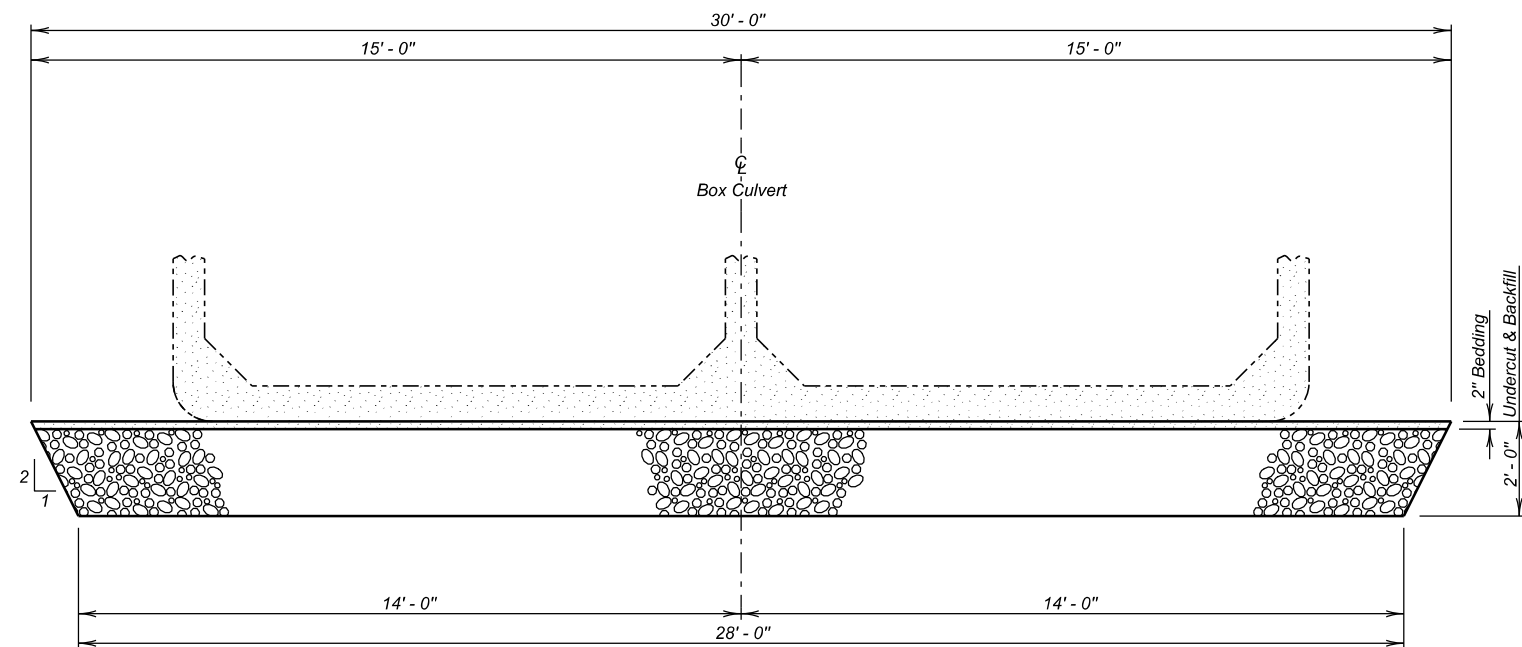
1. Box culvert and box culvert end section design will conform to the AASHTO LRFD Bridge Design Specifications, 8th Edition.
2. Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the Box Culvert. If other construction loads in excess of legal load are anticipated by the Contractor, the Contractor will submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.
3. The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with the latest Interim Revisions using the LRFR method. The rating will include evaluation of the Design HL-93 truck at both Inventory and Operating levels and a Legal Load rating for three SD legal trucks (Type 3, 3S2 and 3-2) as well as the notional rating load and four specialized hauling vehicles. The structure will also be evaluated for the emergency vehicles, EV2 and EV3, at the legal load rating level. All sections of the box culvert will rate at HL-93 or better (Inventory Level). The three SD legal loads, the notional rating load, the four specialized hauling vehicles, and two emergency vehicles will rate greater than 1.0 at legal load rating level. AASHTOWare Bridge Rating (BrR) is required to be used to rate the box culvert. Include the BrR model and a load rating summary table with the load rating calculations. Submit load rating calculations with the design and independent check design calculations or shop plans, as appropriate.
4. The design of the barrel sections will be based on a minimum fill height of 2 feet and include all subsequent fill heights up to and including the maximum fill height of 5 feet over the box culvert.
5. Minimum inside corner fillet shall be 6 in.
6. Minimum precast barrel section length will be 6 foot sections; however, no more than two 4 foot sections are allowed in any one length of precast barrel.
7. Lift holes will be plugged with an approved non-shrinkable grout.
8. The Fabricator will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Alternate end section details will be allowed, subject to the approval of the Bridge Construction Engineer. No additional payment will be made for any change in the barrel/end section configuration.
10. Installation of the precast sections will be in accordance with the final approved shop plans.
11. Care will be taken when placing sections. Sections will be only moved using the lifting holes by approved equipment.
12. Soils below the bottom of the proposed RCB consist of dark grey silt clay. Groundwater was encountered in the borings at an elevation of 1290.0 during the subsurface investigation conducted in July 2020.

DESIGN MIX OF CONCRETE

1. Mix will be as per fabricator's design; however, a minimum compressive strength will not be less than 4500 p.s.i. at 28 days.
2. High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a type V or a type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.

SHOP PLANS

The fabricator shall submit shop plans in accordance with the Construction Specifications. Include design and independent check design, if applicable, with initial submittal.



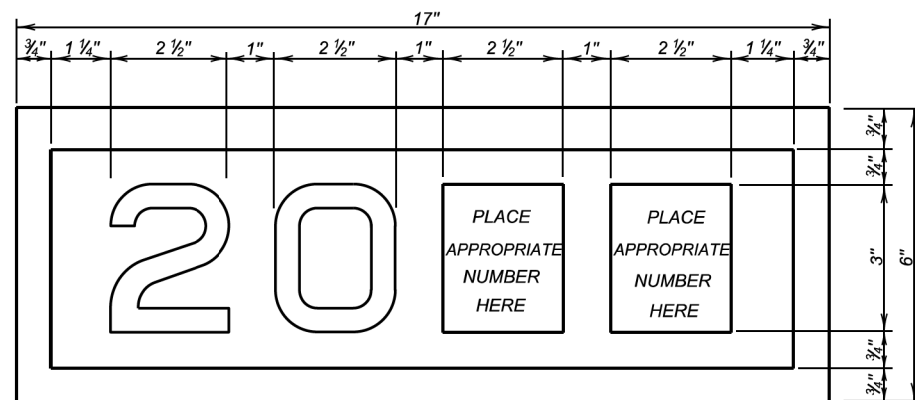
TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	217

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.

NOTES AND UNDERCUT DETAILS
FOR
2 - 11' X 4' BOX CULVERT (PRECAST)
OVER TRIB. TO CROW CREEK 0° SKEW
STA. 1085 +55.00 SEC. 24/25-T127N-R59W
STR. NO. 46-057-100 P-PH-B-PT 0010(124)296
HL-93

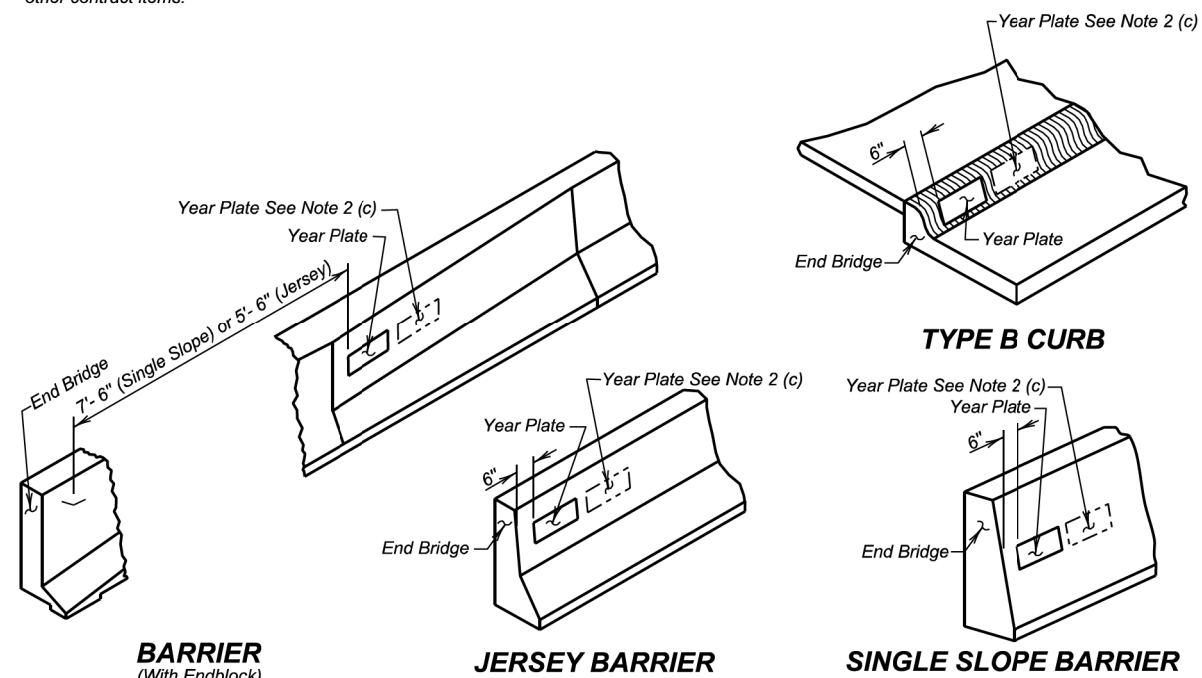
MARSHALL COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2022



YEAR PLATE DETAILS

GENERAL NOTES:

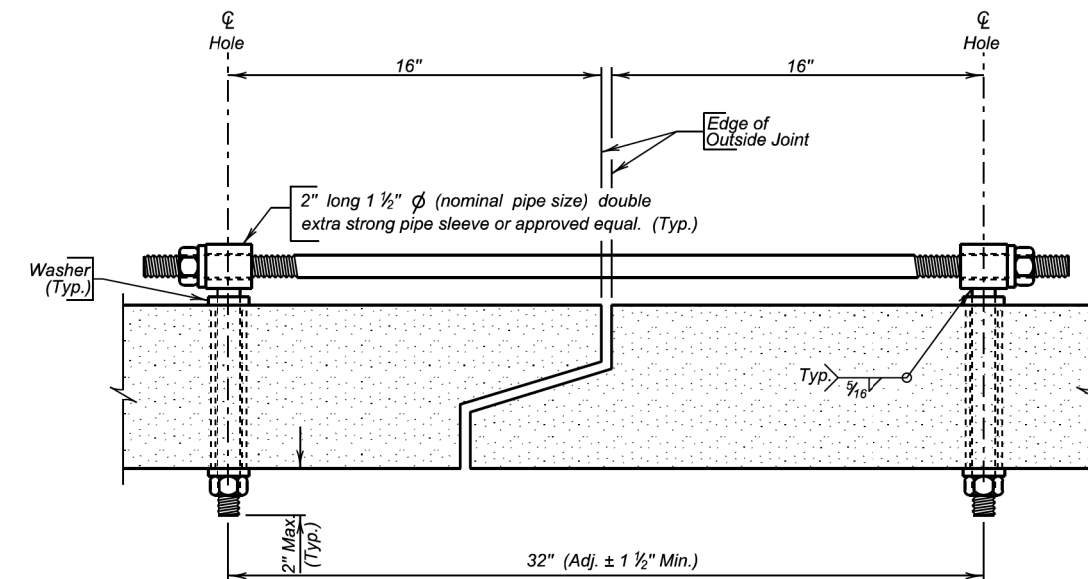
- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located on structure(s) as follows:
 - On cast-in-place box culverts the year plates will be four and one-half (4 1/2) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.
 - On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'-6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.
 - When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.
- There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



TYPE B CURB

January 22, 2021

Published Date: 2024	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1



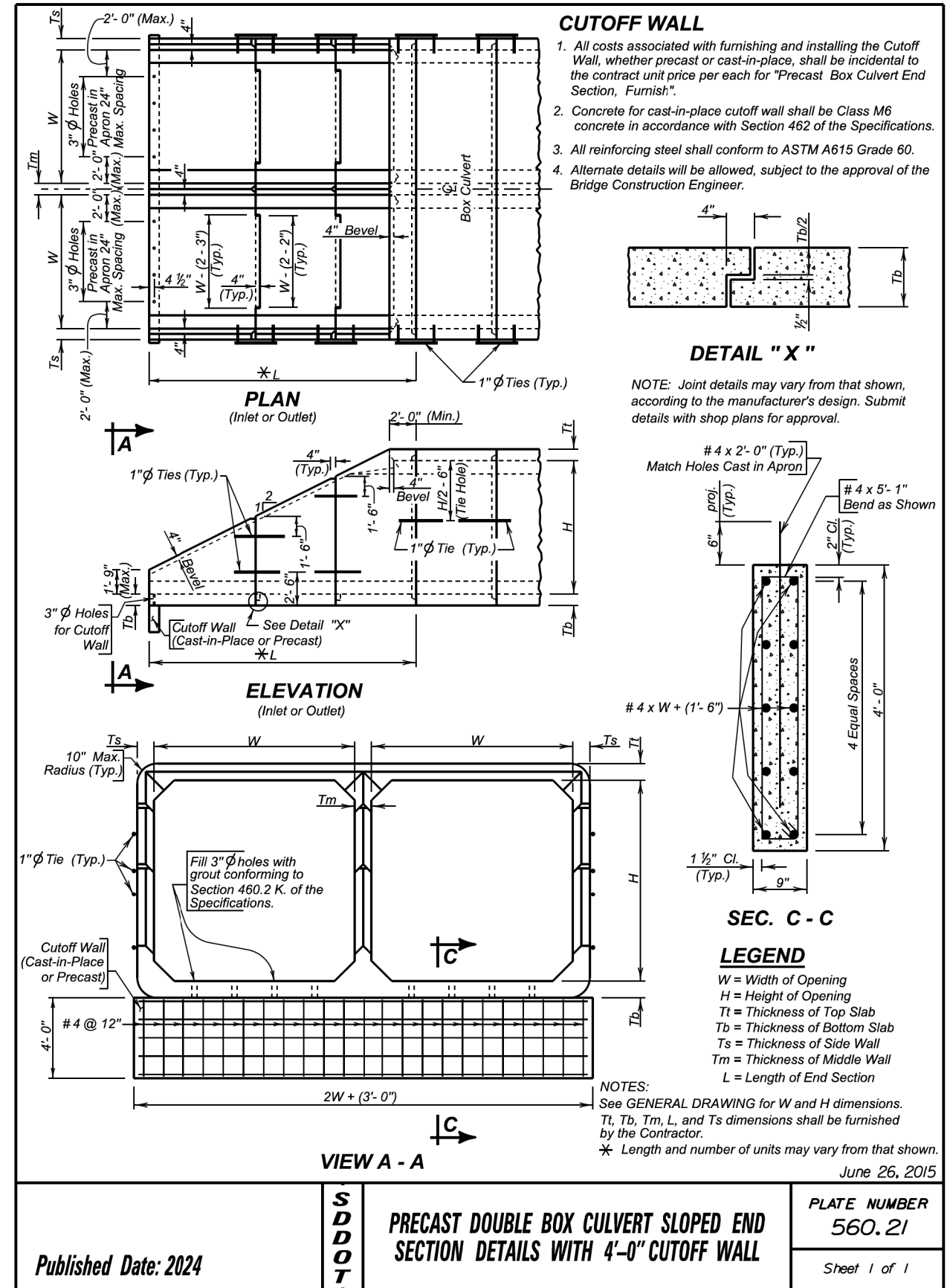
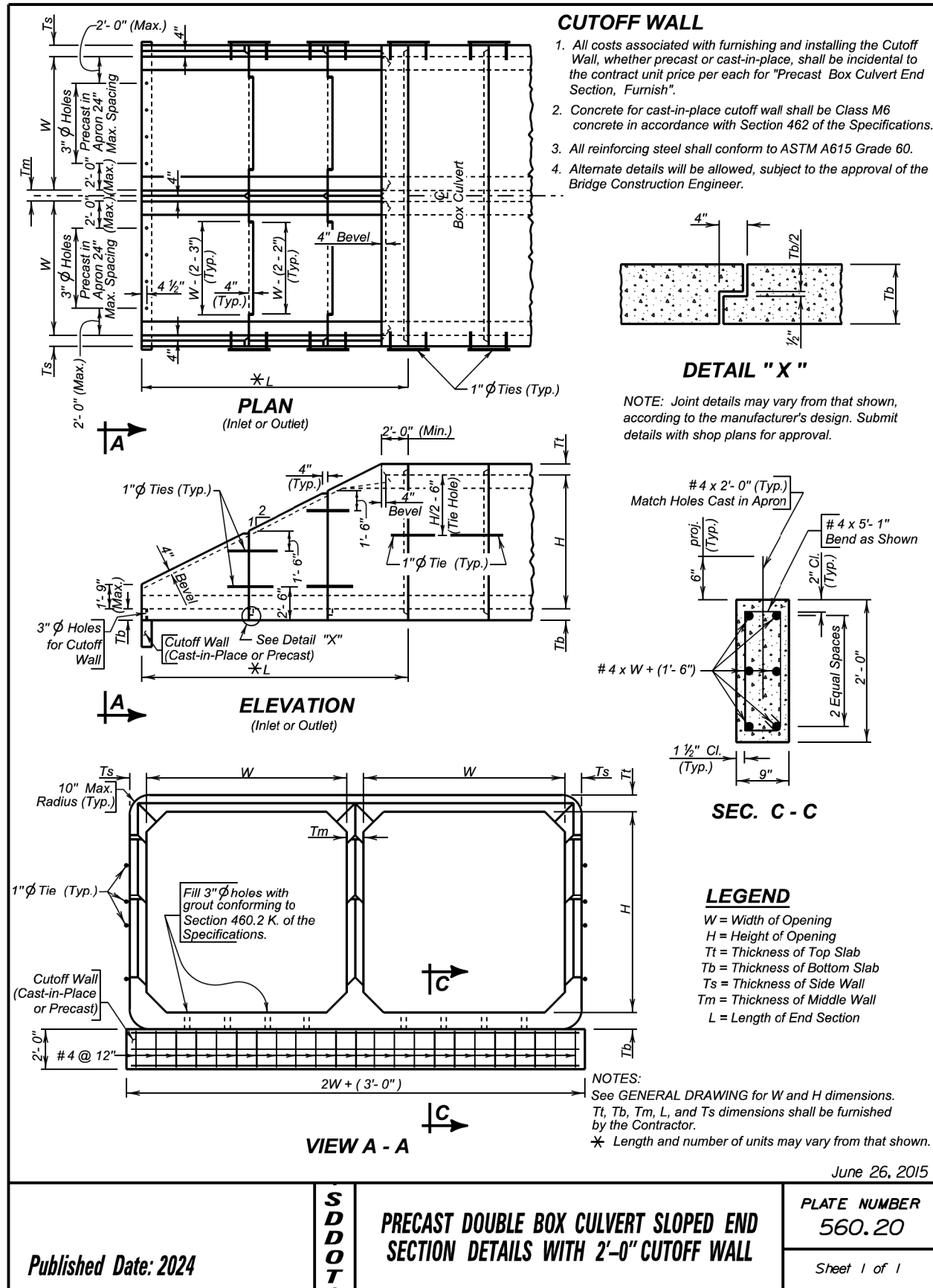
TIE BOLT ASSEMBLY

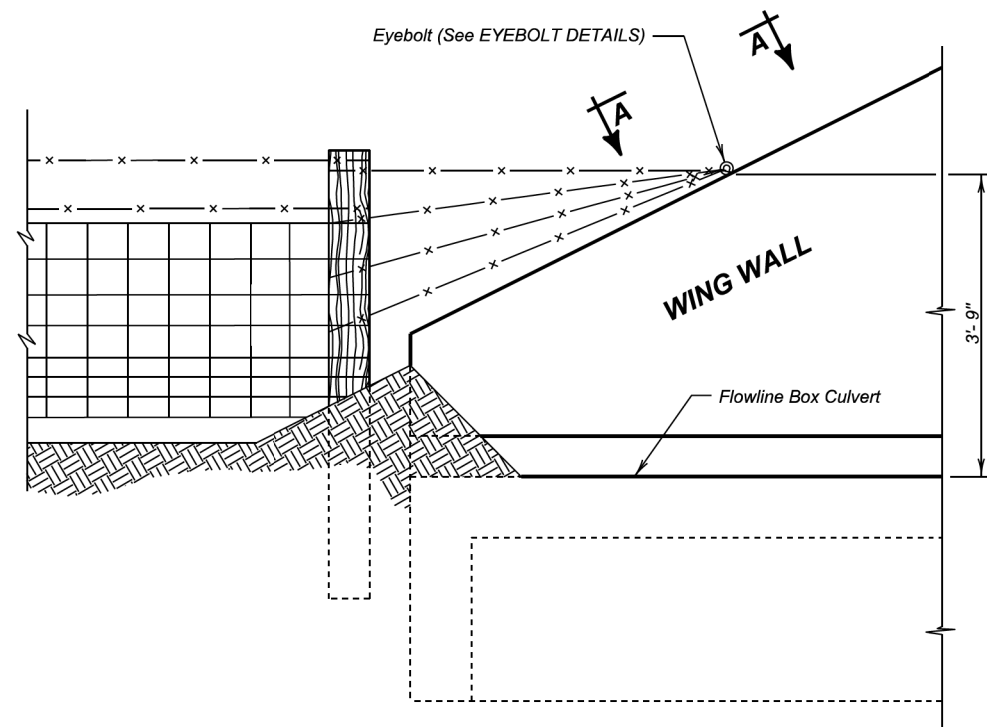
GENERAL NOTES:

- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36, ASTM A307, or ASTM F1554, Gr. 36. Nuts shall be heavy hex in conformance with ASTM A563. Washers shall conform to ASTM F436, Type 1. The welded pipe sleeve shall conform to ASTM A53, Grade B.
- Welding and weld inspection shall be in conformance with AWS/ANSI D1.1 - (Current Year) Structural Welding Code - Steel.
- Tie Bolt Assembly shall be galvanized in accordance with ASTM A153 or ASTM F2329 as applicable.
- Tie Bolt Assembly details may vary from that shown, but alternate tie bolt assemblies are subject to testing to demonstrate equal strength. Submit details, through proper channels, to the Office of Bridge Design for approval.
- All costs for furnishing and installing the precast box culvert tie bolt assembly shall be incidental to the contract unit price per Foot for "Precast Concrete Box Culvert, Furnish".

March 21, 2016

Published Date: 2024	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1

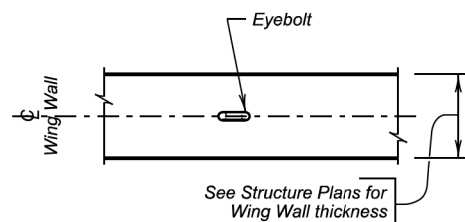




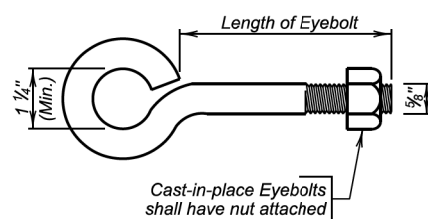
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be $\frac{5}{8}$ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be $4\frac{1}{2}$ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the $\frac{5}{8}$ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



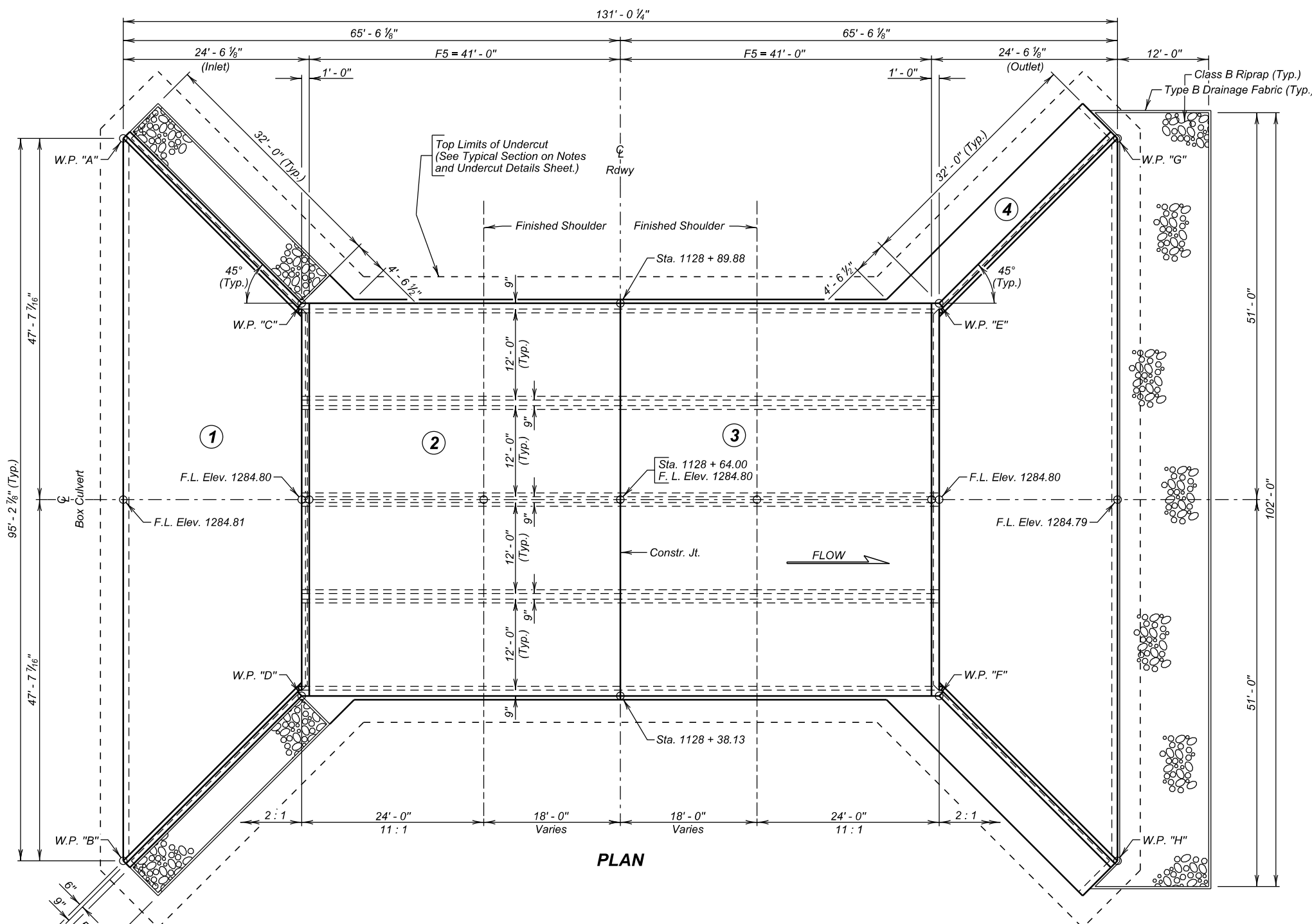
EYEBOLT DETAILS

December 23, 2012

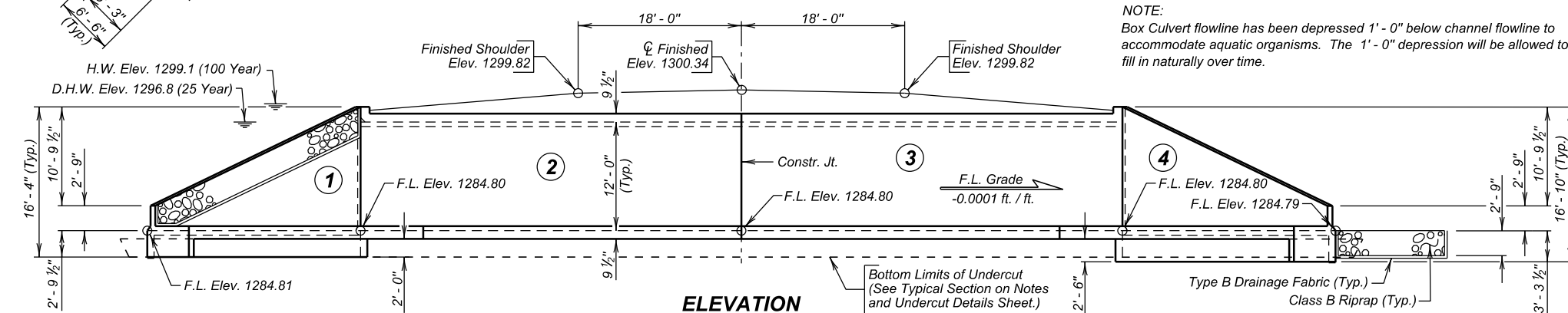
S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
	Published Date: 2024	Sheet 1 of 1

The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E8	E37



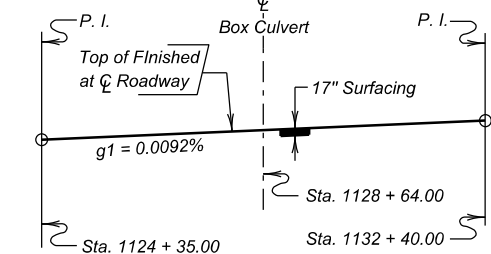
PLAN



ELEVATION

NOTE:
Box Culvert flowline has been depressed 1'-0" below channel flowline to accommodate aquatic organisms. The 1'-0" depression will be allowed to fill in naturally over time.

P. I. Sta. 1124 + 35.00 Elev. = 1300.30 (Finished) V.C. = 0'
P. I. Sta. 1132 + 40.00 Elev. = 1300.37 (Finished) V.C. = 0'



GRADELINE DATA

HYDRAULIC DATA

Q_d	1593 cfs
A_d	637 sq ft
V_d	2.5 fps
Q_F	1593 cfs
Q_{100}	3524 cfs
Q_{OT}	$>Q_{100}$
V_{max}	5.1 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1296.8.
 Q_{OT} = Overtopping discharge and frequency >100 year recurrence interval. El. 1300.2 @ Sta. 1123 + 40 ±.
 Q_F = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.
 Q_{100} = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 1299.1.
 V_{max} = Maximum computed outlet velocity for the proposed culvert, based on 100 year frequency.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	579.1
Reinforcing Steel	Lb.	82601
Structure Excavation, Box Culvert	Cu. Yd.	251
Box Culvert Undercut	Cu. Yd.	738
Class B Riprap	Ton	229.6
Type B Drainage Fabric	Sq. Yd.	283

≠ For estimating purposes only, a factor of 1.4 tons/cu. yd. was used to convert Cu. Yd. to Tons.

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	1129 + 11.62	65.51' Lt.
"B"	1128 + 16.38	65.51' Lt.
"C"	1128 + 89.88	42.00' Lt.
"D"	1128 + 38.13	42.00' Lt.
"E"	1128 + 89.88	42.00' Rt.
"F"	1128 + 38.13	42.00' Rt.
"G"	1129 + 11.62	65.51' Rt.
"H"	1128 + 16.38	65.51' Rt.

-X028- INDEX OF CULVERT SHEETS -

- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Notes and Undercut Details
- Sheet No. 3 - Inlet Details (A)
- Sheet No. 4 - Inlet Details (B)
- Sheet No. 5 - Outlet Details (A)
- Sheet No. 6 - Outlet Details (B)
- Sheet No. 7 - F5 Barrel End Section Details (41' - 0") (A)
- Sheet No. 8 - F5 Barrel End Section Details (41' - 0") (B)
- Sheet No. 9 - Standard Plate No.'s 460.02 and 460.10
- Sheet No. 10 - Standard Plate No. 620.16

GENERAL DRAWING AND QUANTITIES

FOR
4 - 12' X 12' BOX CULVERT
OVER DAYTON-CROW CREEK 0° SKEW
STA. 1128 + 64.00 SEC. 19/30-T127N-R58W
STR. NO. 46-065-100 P-PH-B-PT 0010(124)296
PCN 05F4 HL-93

MARSHALL COUNTY
S. D. DEPT. OF TRANSPORTATION

AUGUST 2022 **1** OF **10**

PLANS BY:
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY CM MRSH05F4	CK. DES. BY BR 05F4TB01	DRAFTED BY BT <i>Steve A. Johnson</i>	BRIDGE ENGINEER
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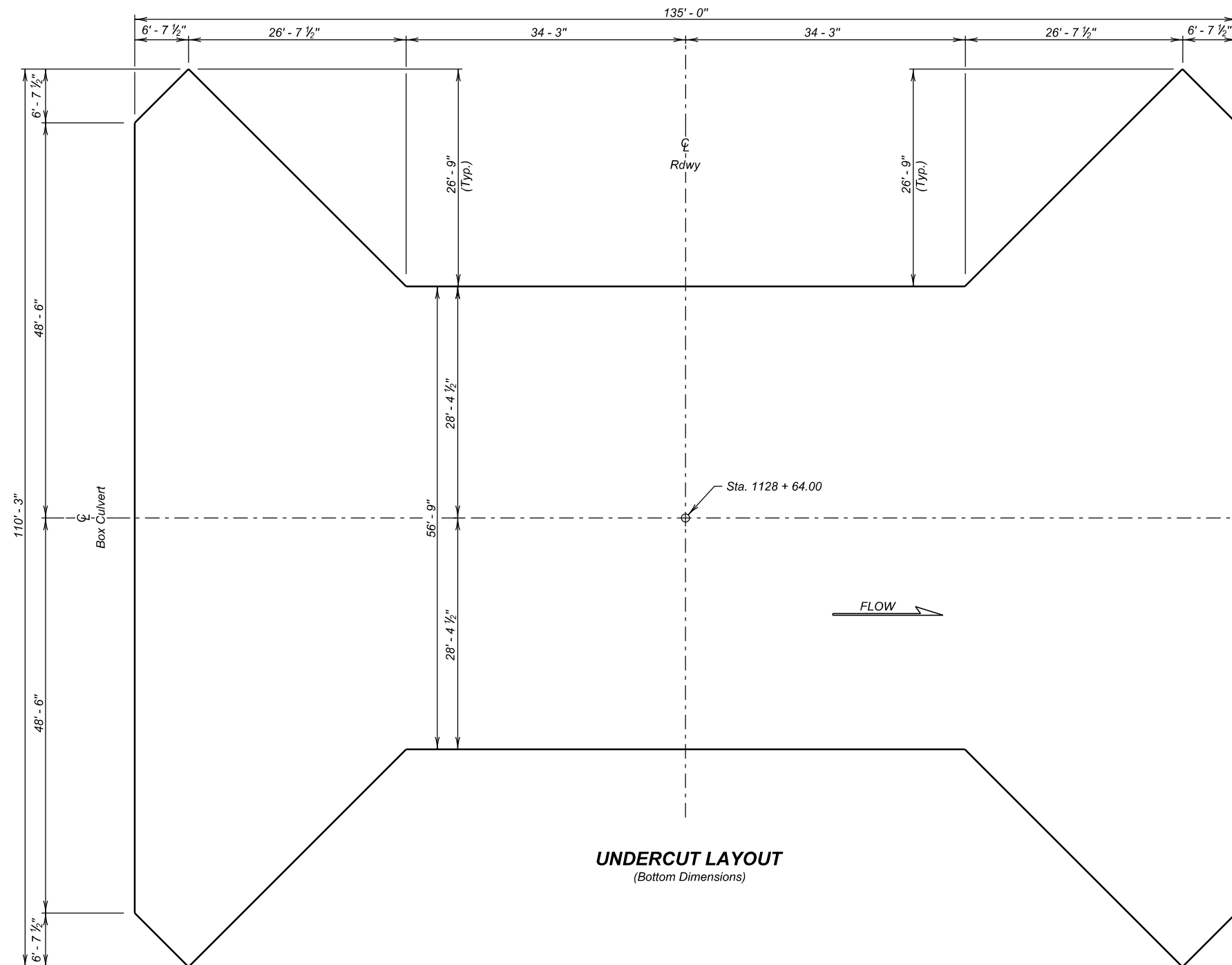
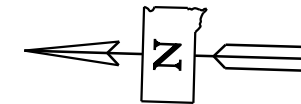
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E9	E37

SPECIFICATIONS

- Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
- Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

- Design Live Load: HL-93 and construction load consisting of two 7' - 6" gage axles spaced 30 feet apart with gross axle weight (each axle) = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the box culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.
- The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 5 ft. (F5).
- Design Material Strengths: Concrete $f'_c = 4500$ p.s.i.
Reinforcing Steel $F_y = 60000$ p.s.i.
- High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a type V or a type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.
- All reinforcing steel will conform to ASTM A615 Grade 60.
- All lap splices shown are contact lap splices unless noted otherwise.
- All exposed edges will be chamfered $\frac{3}{4}$ inch unless noted otherwise in the plans.
- Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
- The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
- Care will be taken to establish Working Points (W.P.) as shown on the wings.
- Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
- Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.
- Soils below the bottom of the proposed RCBC consist of brown silt sand. Groundwater was encountered in the borings at an elevation of 1291.7 during the subsurface investigation conducted in July 2020. Dewatering will be required during the construction of the RCBC.

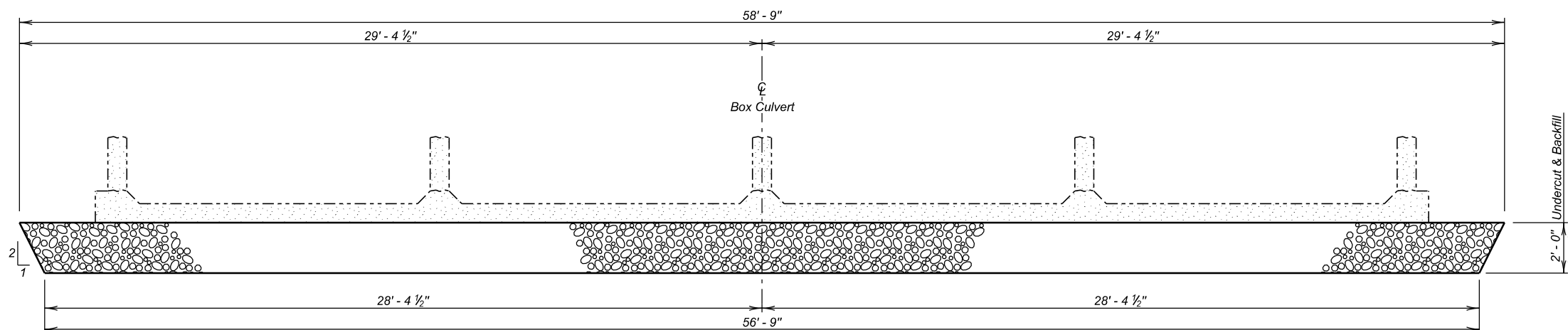


UNDERCUT LAYOUT
(Bottom Dimensions)

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	738

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.



TYPICAL SECTION
(For Limits of Undercut)

NOTES AND UNDERCUT DETAILS

FOR

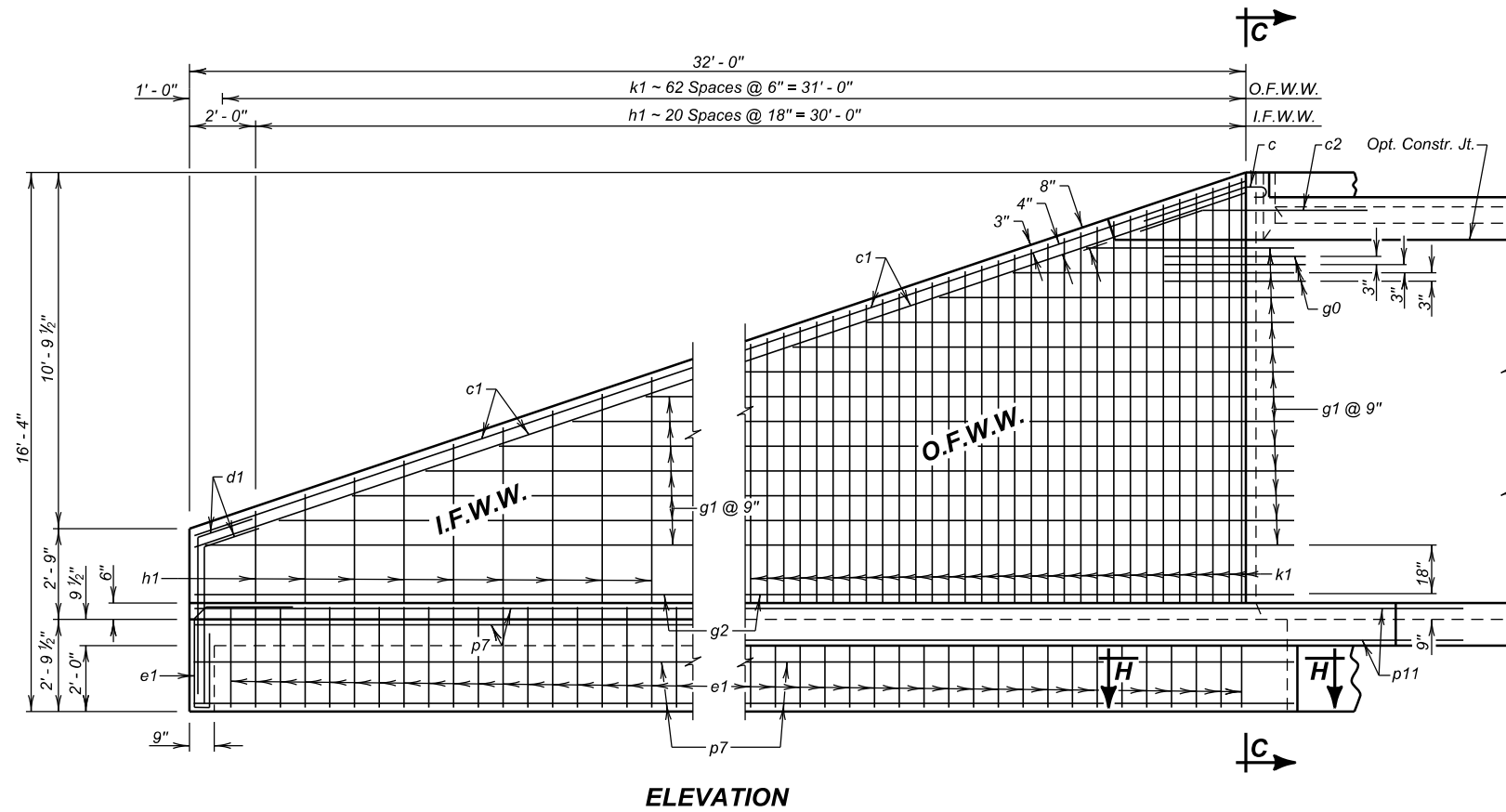
4 - 12' X 12' BOX CULVERT

OVER DAYTON-CROW CREEK 0° SKEW
 STA. 1128 + 64.00 SEC. 19/30-T127N-R58W
 STR. NO. 46-065-100 P-PH-B-PT 0010(124)296
 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022

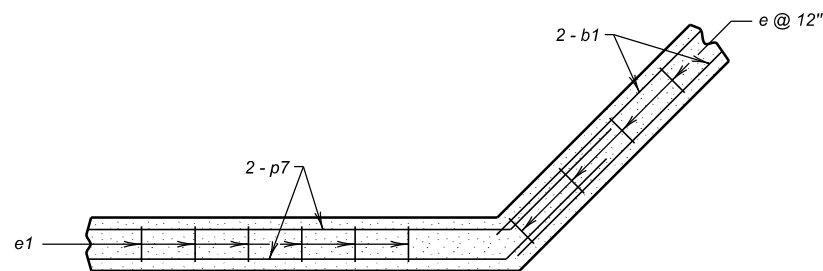
2 OF 10

DESIGNED BY CM MRS05F4	CK. DES. BY BR 05F4TB02	DRAFTED BY BT Steve A. Johnson	BRIDGE ENGINEER
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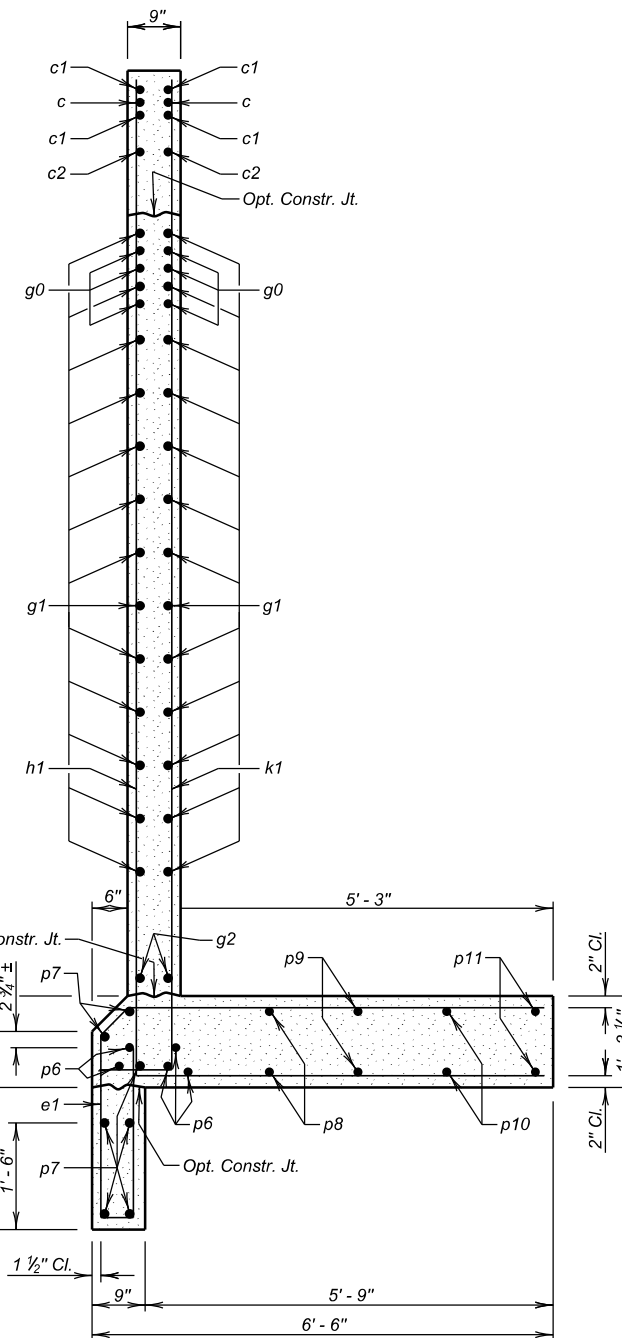


ELEVATION

LEGEND FOR PLACING RE-STEEL
 O. F. W. W. - Outside Face of Wing Wall
 I. F. W. W. - Inside Face of Wing Wall



SECTION H - H



SECTION C - C

REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details
a1	5	6	51'-6"	Str.	
b1	6	6	48'-6"	Str.	
c	4	5	4'-6"	1A	
c1	8	5	33'-9"	Str.	
c2	4	5	7'-0"	19B	
d1	8	5	6'-6"	19B	
e	50	4	7'-0"	S12	
e1	92	4	11'-9"	S12A	
f1	52	4	5'-0"	S6A	
g0	12	5	5'-0"	19B	
g1	26	4	40'-3"	19B	
g2	4	4	33'-9"	19B	
h1	21	4	29'-6"	17A	
k1	63	4	19'-9"	17A	
p6	10	6	7'-0"	Str.	
p7	14	4	34'-6"	Str.	
p8	4	4	35'-3"	Str.	
p9	4	4	36'-6"	Str.	
p10	4	4	37'-9"	Str.	
p11	4	4	39'-0"	Str.	
INLET APRON					
e2	91	4	7'-6"	S12	
u1	49	4	23'-3"	Str.	
u2	22	4	23'-6"	Str.	
u3	23	4	72'-0"	Str.	
u4	10	4	47'-9"	Str.	

NOTES:
 All dimensions are out to out of bars.
 ☐ See cutting diagram.
 * Bend in field as necessary to fit.

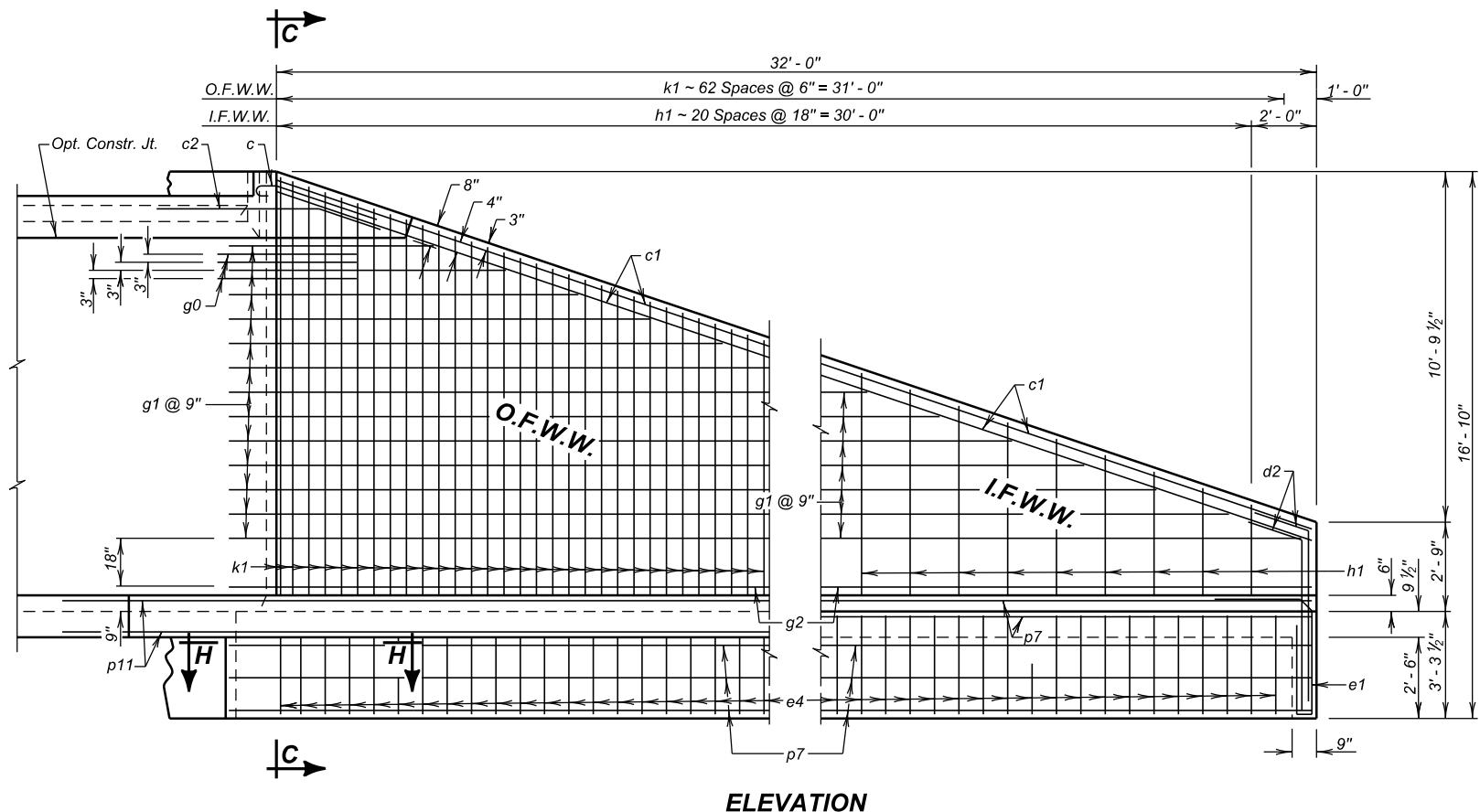
ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	47.6	5021	21.5
Inlet Apron	37.7	2987	37.7

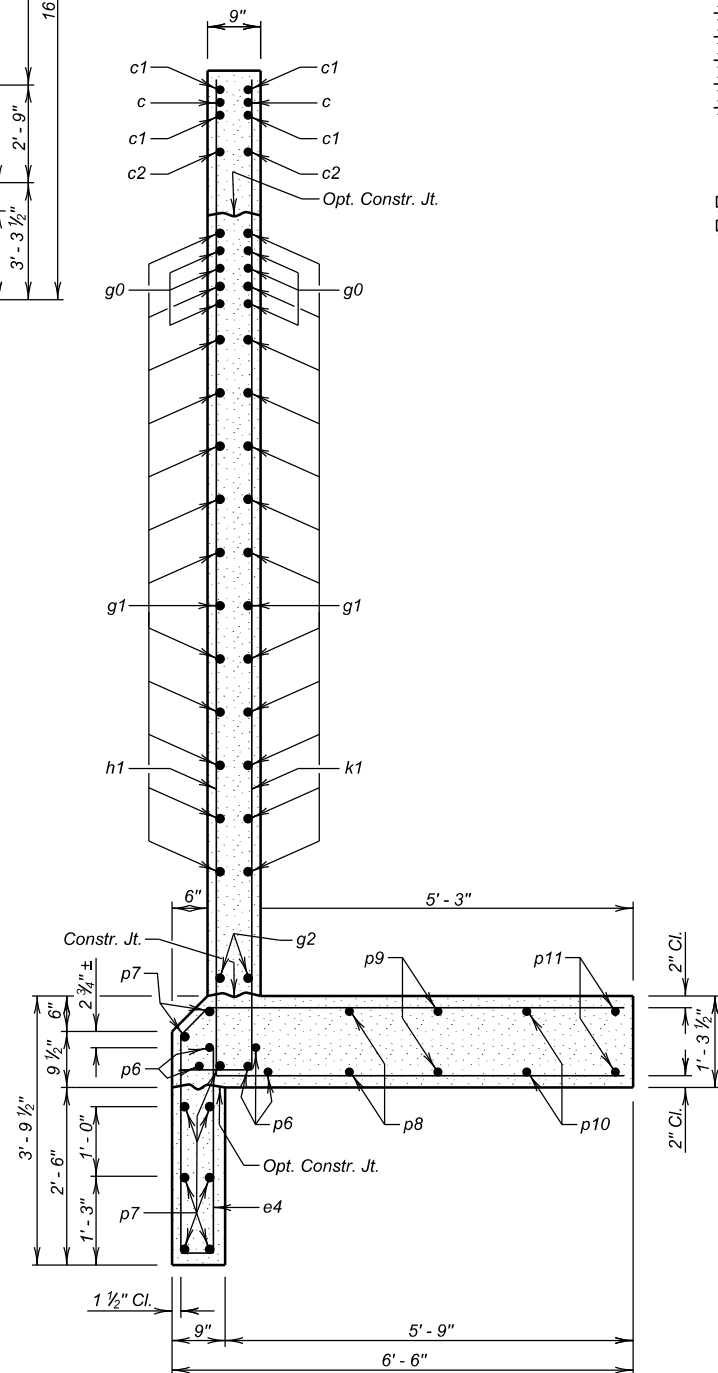
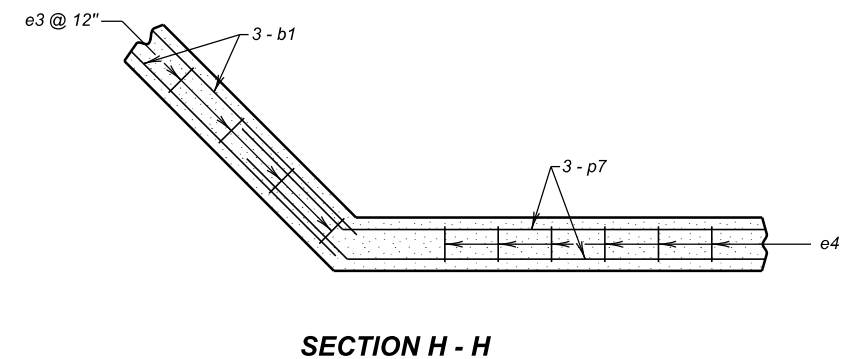
INLET DETAILS (B)

FOR
4 - 12' X 12' BOX CULVERT
 OVER DAYTON-CROW CREEK 0° SKEW
 STA. 1128 + 64.00 SEC. 19/30-T127N-R58W
 STR. NO. 46-065-100 P-PH-B-PT 0010(124)296
 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022



LEGEND FOR PLACING RE-STEEL
 O. F. W. W. - Outside Face of Wing Wall
 I. F. W. W. - Inside Face of Wing Wall



REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details
a1	5	6	51'-6"	Str.	
b1	8	6	48'-6"	Str.	
c	4	5	4'-6"	1A	
c1	8	5	33'-9"	Str.	
c2	4	5	7'-0"	19B	
d2	4	5	7'-0"	19B	
e3	50	4	8'-0"	S12	
e4	92	4	12'-6"	S12A	
f1	52	4	5'-0"	S6A	
g0	12	5	5'-0"	19B	
g1	26	4	40'-3"	19B	
g2	4	4	33'-9"	19B	
h1	21	4	29'-6"	17A	
k1	63	4	19'-9"	17A	
p6	10	6	7'-0"	Str.	
p7	18	4	34'-6"	Str.	
p8	4	4	35'-3"	Str.	
p9	4	4	36'-6"	Str.	
p10	4	4	37'-9"	Str.	
p11	4	4	39'-0"	Str.	
OUTLET APRON					
e5	91	4	8'-6"	S12	
u1	49	4	23'-3"	Str.	
u2	22	4	23'-6"	Str.	
u3	23	4	72'-0"	Str.	
u4	10	4	47'-9"	Str.	

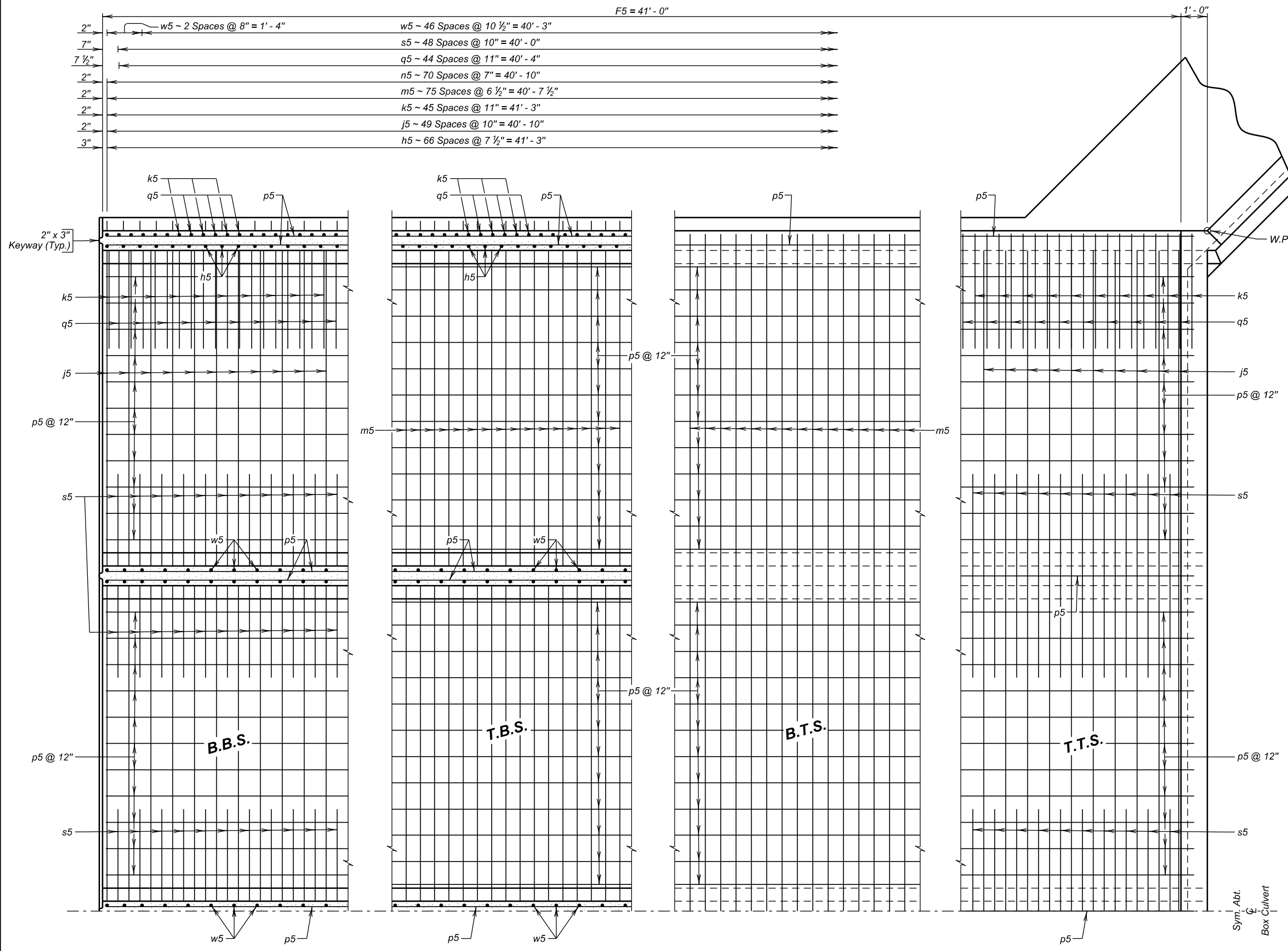
NOTES:
 All dimensions are out to out of bars.
 ☐ See cutting diagram.
 * Bend in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	49.6	5464	23.2
Outlet Apron	39.0	3048	39.0

OUTLET DETAILS (B)
 FOR
4 - 12' X 12' BOX CULVERT
 OVER DAYTON-CROW CREEK 0° SKEW
 STA. 1128 + 64.00 SEC. 19/30-T127N-R58W
 STR. NO. 46-065-100 P-PH-B-PT 0010(124)296
 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022

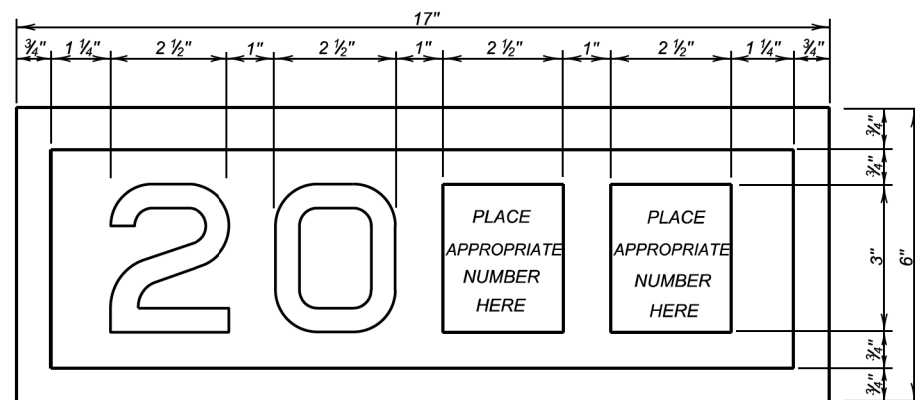


LEGEND FOR PLACING RE-STEEL	
T.T.S.	- Top of Top Slab
B.T.S.	- Bottom of Top Slab
T.B.S.	- Top of Bottom Slab
B.B.S.	- Bottom of Bottom Slab

F5 BARREL END SECTION DETAILS (41' - 0") (A)
 FOR
4 - 12' X 12' BOX CULVERT
 OVER DAYTON-CROW CREEK 0° SKEW
 STA. 1128 + 64.00 SEC. 19/30-T127N-R58W
 STR. NO. 46-065-100 P-PH-B-PT 0010(124)296
 HL-93

PLAN
 (Outlet End shown, Inlet similar by rotation)

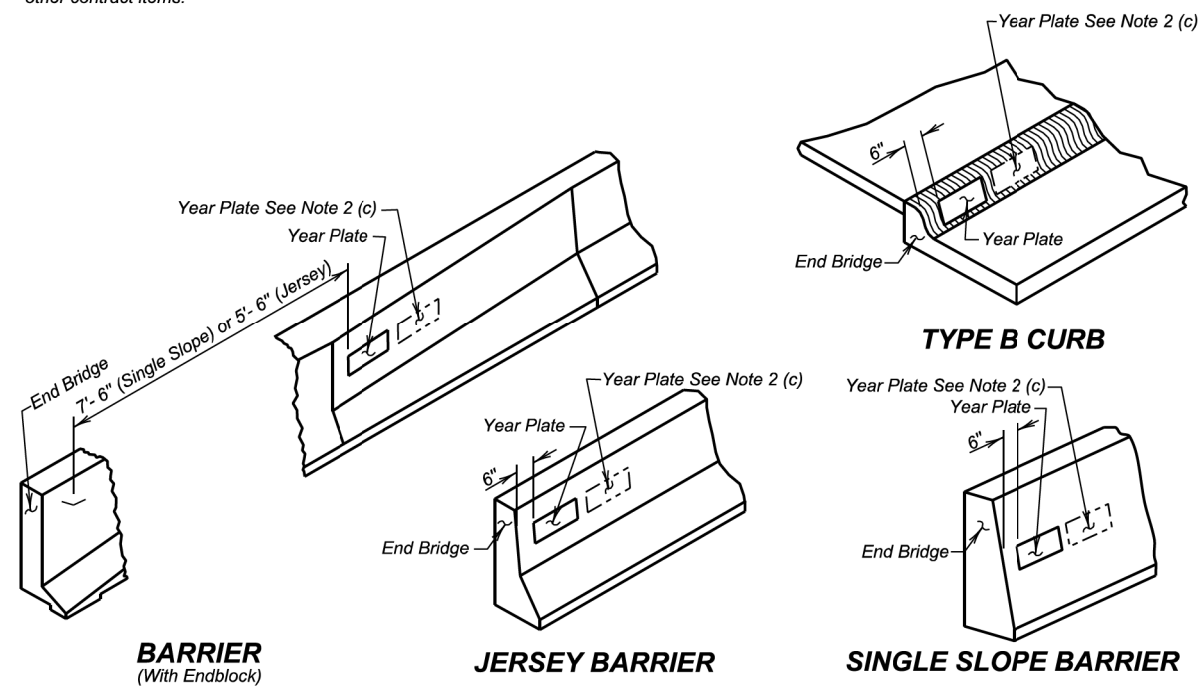
MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022



YEAR PLATE DETAILS

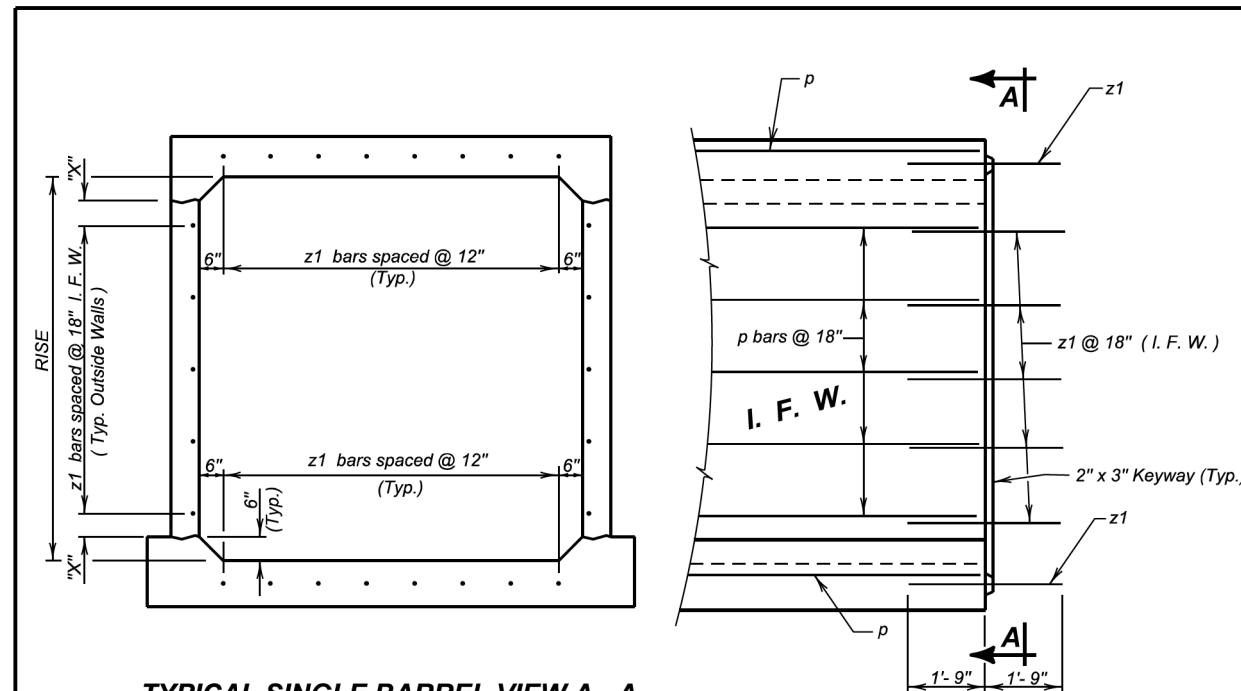
GENERAL NOTES:

- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located on structure(s) as follows:
 - On cast-in-place box culverts the year plates will be four and one-half (4 1/2) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.
 - On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'-6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.
 - When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.
- There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



January 22, 2021

Published Date: 2024	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



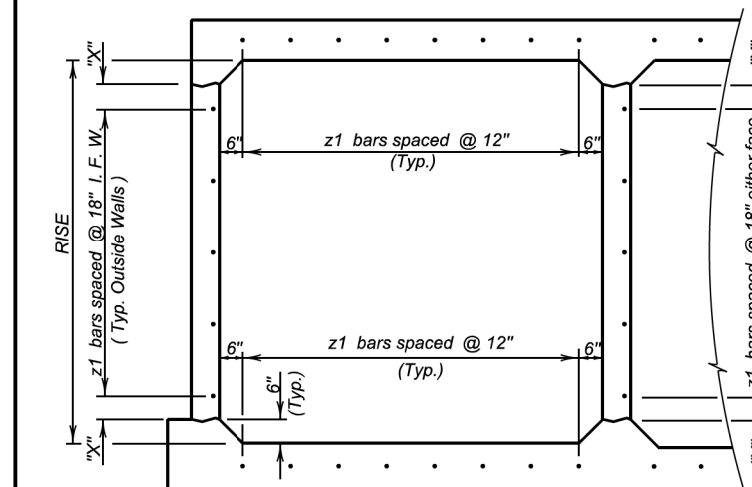
TYPICAL SINGLE BARREL VIEW A - A

ELEVATION

LEGEND FOR PLACING RE-STEEL

I. F. W. - Inside Face Wall

RISE	"X"
3'-0"	3"
4'-0"	9"
5'-0"	6"
6'-0"	3"
7'-0"	9"
8'-0"	6"
9'-0"	3"
10'-0"	9"
11'-0"	6"
12'-0"	3"
13'-0"	9"
14'-0"	6"



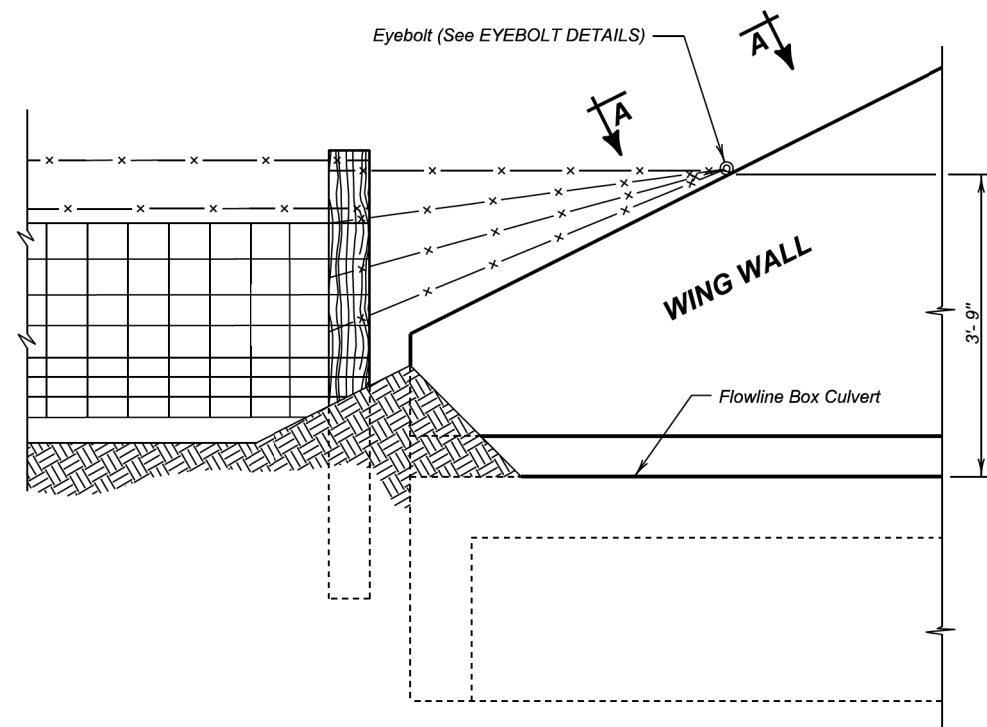
TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

- z1 bars will be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars will be lapped with the longitudinal p bars in the inside face of the wall for outside walls and in either face for interior walls. z1 bars are listed and included elsewhere in plans.
- Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

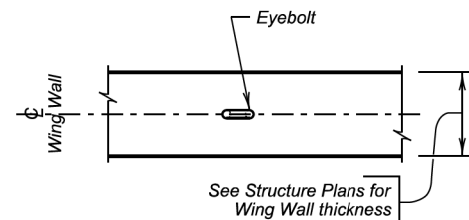
Published Date: 2024	S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1



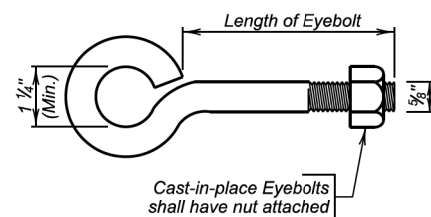
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be $\frac{5}{8}$ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be $4\frac{1}{2}$ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the $\frac{5}{8}$ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

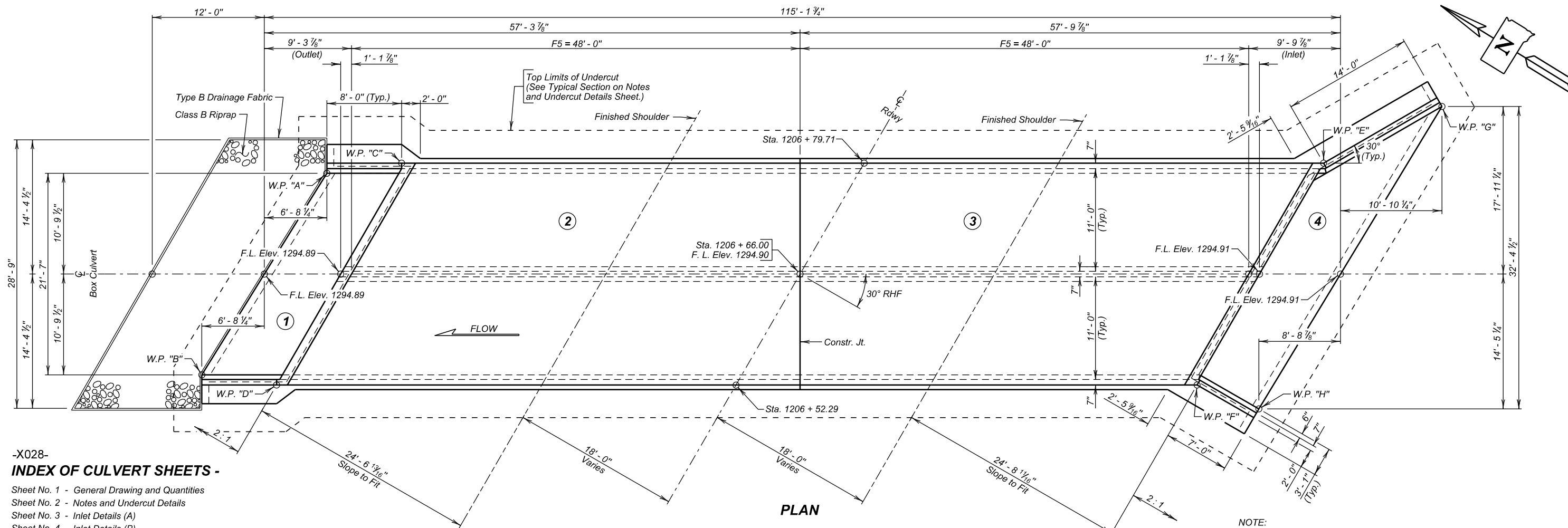
December 23, 2012

S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
		Sheet 1 of 1

Published Date: 2024

The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

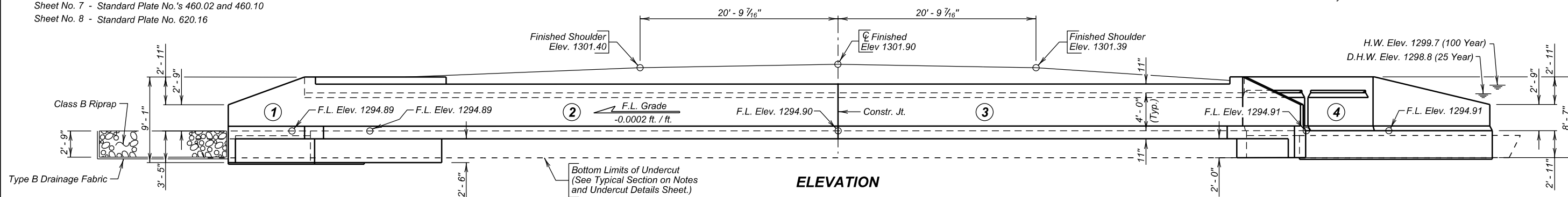
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E18	E37



**-X028-
INDEX OF CULVERT SHEETS -**

- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Notes and Undercut Details
- Sheet No. 3 - Inlet Details (A)
- Sheet No. 4 - Inlet Details (B)
- Sheet No. 5 - Outlet Details
- Sheet No. 6 - F5 Barrel End Section Details (48' - 0")
- Sheet No. 7 - Standard Plate No.'s 460.02 and 460.10
- Sheet No. 8 - Standard Plate No. 620.16

NOTE:
Box Culvert flowline has been depressed 1' - 0" below channel flowline to accommodate aquatic organisms. The 1' - 0" depression will be allowed to fill in naturally over time.



HYDRAULIC DATA

Q_d	245 cfs
A_d	42 sq ft
V_d	5.8 fps
Q_F	245 cfs
Q_{100}	476 cfs
Q_{OT}	$>Q_{100}$
V_{max}	6.5 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1298.8.
 Q_{OT} = Overtopping discharge and frequency >100 year recurrence interval. El. 1301.5 @ Sta. 1201 + 85±.
 Q_F = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.
 Q_{100} = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 1299.7.
 V_{max} = Maximum computed outlet velocity for the proposed culvert, based on 100 year frequency.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	222.7
Reinforcing Steel	Lb.	34252
Structure Excavation, Box Culvert	Cu. Yd.	106
Box Culvert Undercut	Cu. Yd.	278
Class B Riprap	Ton	50.8
Type B Drainage Fabric	Sq. Yd.	66

* For estimating purposes only, a factor of 1.4 tons/cu. yd. was used to convert Cu. Yd. to Tons.

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	1206 + 50.03	49.25' Lt.
"B"	1206 + 24.65	50.04' Lt.
"C"	1206 + 54.97	42.86' Lt.
"D"	1206 + 27.71	42.57' Lt.
"E"	1207 + 04.29	42.57' Rt.
"F"	1206 + 76.96	42.73' Rt.
"G"	1207 + 15.87	50.51' Rt.
"H"	1206 + 78.04	49.73' Rt.

GENERAL DRAWING AND QUANTITIES

FOR
2 - 11' X 4' BOX CULVERT
 OVER TRIB. TO CROW CREEK 30° RHF SKEW
 STA. 1206 + 66.00 SEC. 20/29-T127N-R58W
 STR. NO. 46-079-100 P-PH-B-PT 0010(124)296
 PCN 05F4 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION

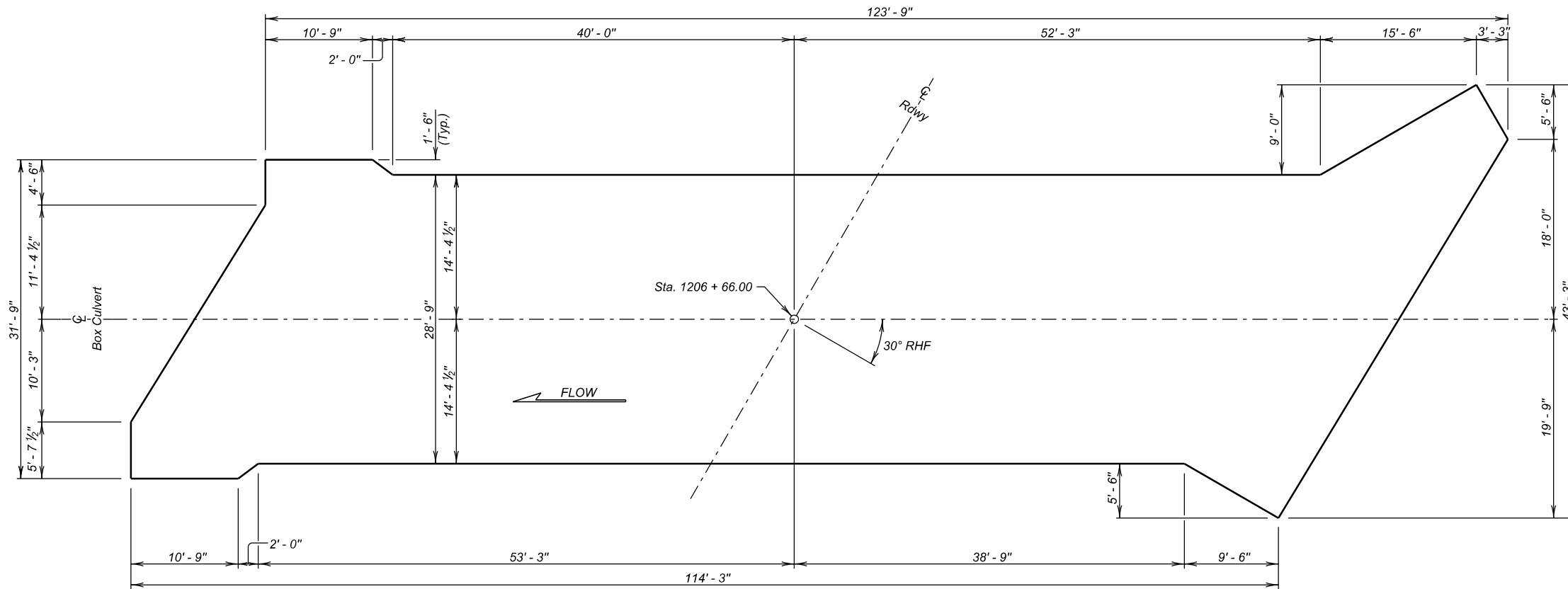
AUGUST 2022

1 OF 8

-X028-

PLANS BY:
 OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY BR MRSH05F4	CK. DES. BY ER 05F4TC01	DRAFTED BY BT <i>Steve A. Johnson</i>	BRIDGE ENGINEER
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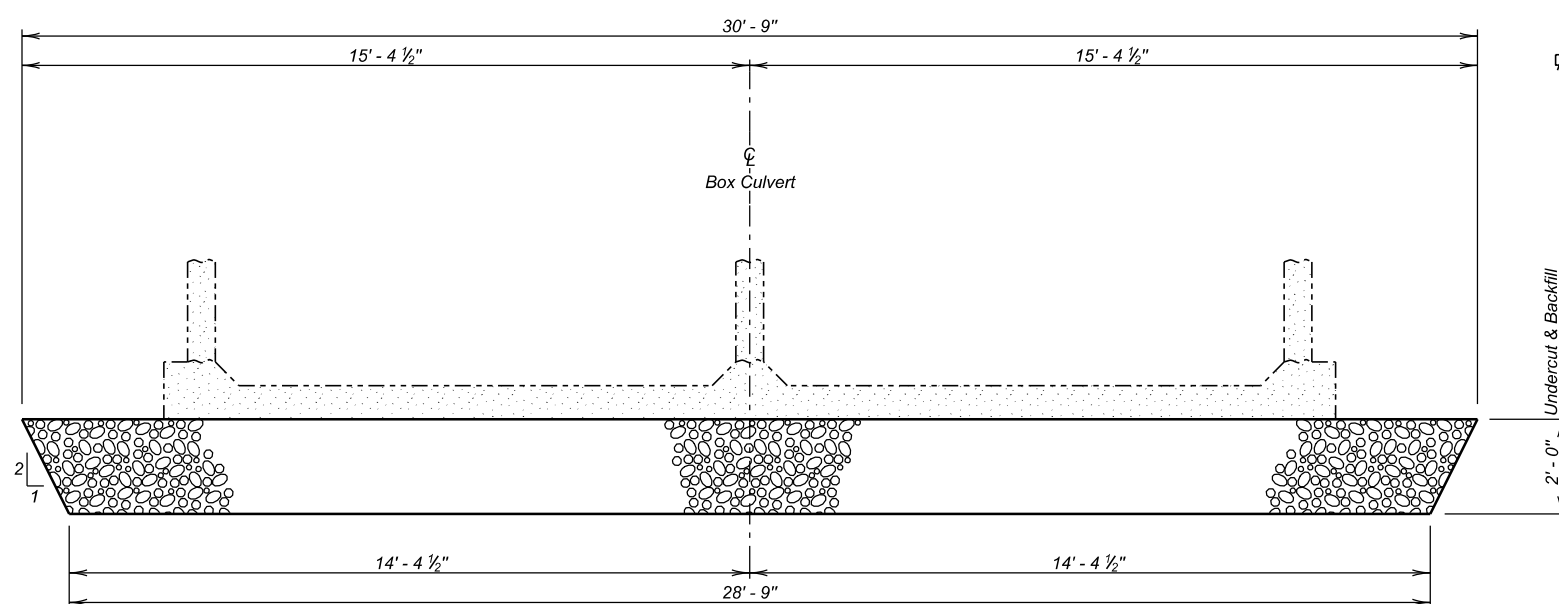
UNDERCUT LAYOUT
(Bottom Dimensions)

SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

1. Design Live Load: HL-93 and construction load consisting of two 7' - 6" gage axles spaced 30 foot apart with gross axle weight (each axle) = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the box culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.
2. The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 5 ft. (F5).
3. Design Material Strengths: Concrete $f'_c = 4500$ p.s.i.
Reinforcing Steel $F_y = 60000$ p.s.i.
4. High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a type V or a type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.
5. All reinforcing steel will conform to ASTM A615 Grade 60.
6. All lap splices shown are contact lap splices unless noted otherwise.
7. All exposed edges will be chamfered 3/4 inch unless noted otherwise in the plans.
8. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
9. The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
10. Care will be taken to establish Working Points (W.P.) as shown on the wings.
11. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
12. Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.
13. Soils below the bottom of the proposed RCBC consist of approximately 2' of brown silt clay overlying light brown sand silt. Groundwater was encountered in the borings at an elevation of 1295.1 during the subsurface investigation conducted in July 2020. Dewatering will be required during the construction of the RCBC.



TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	278

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.

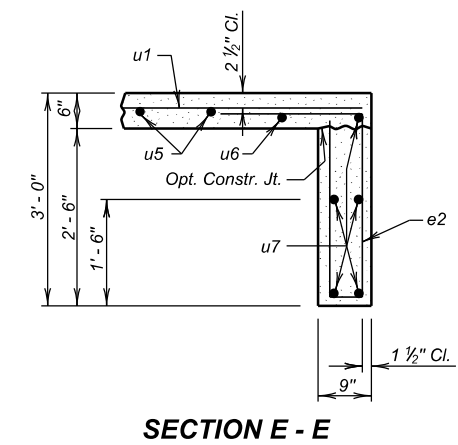
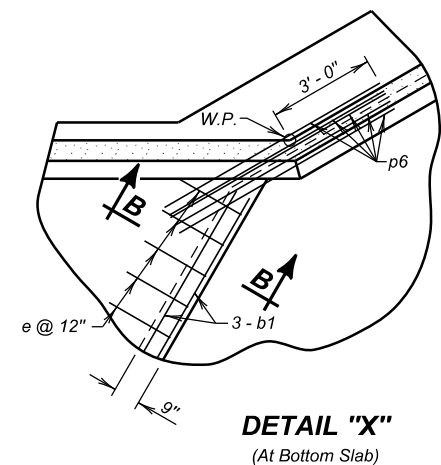
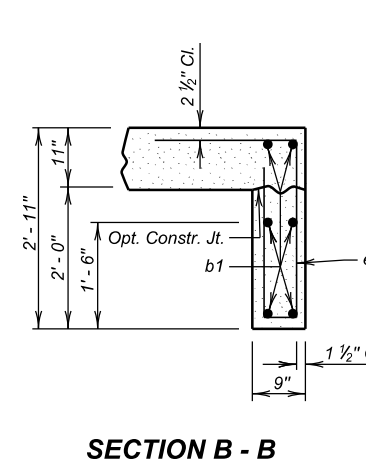
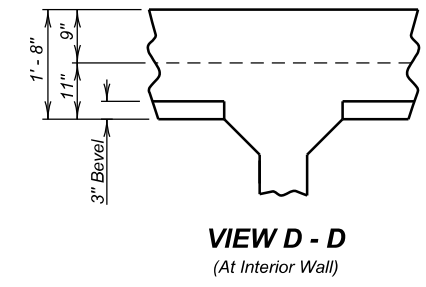
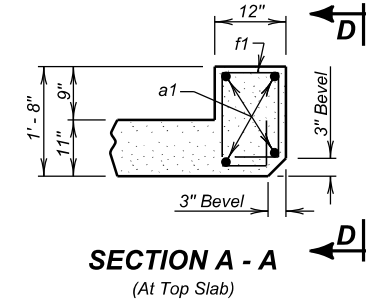
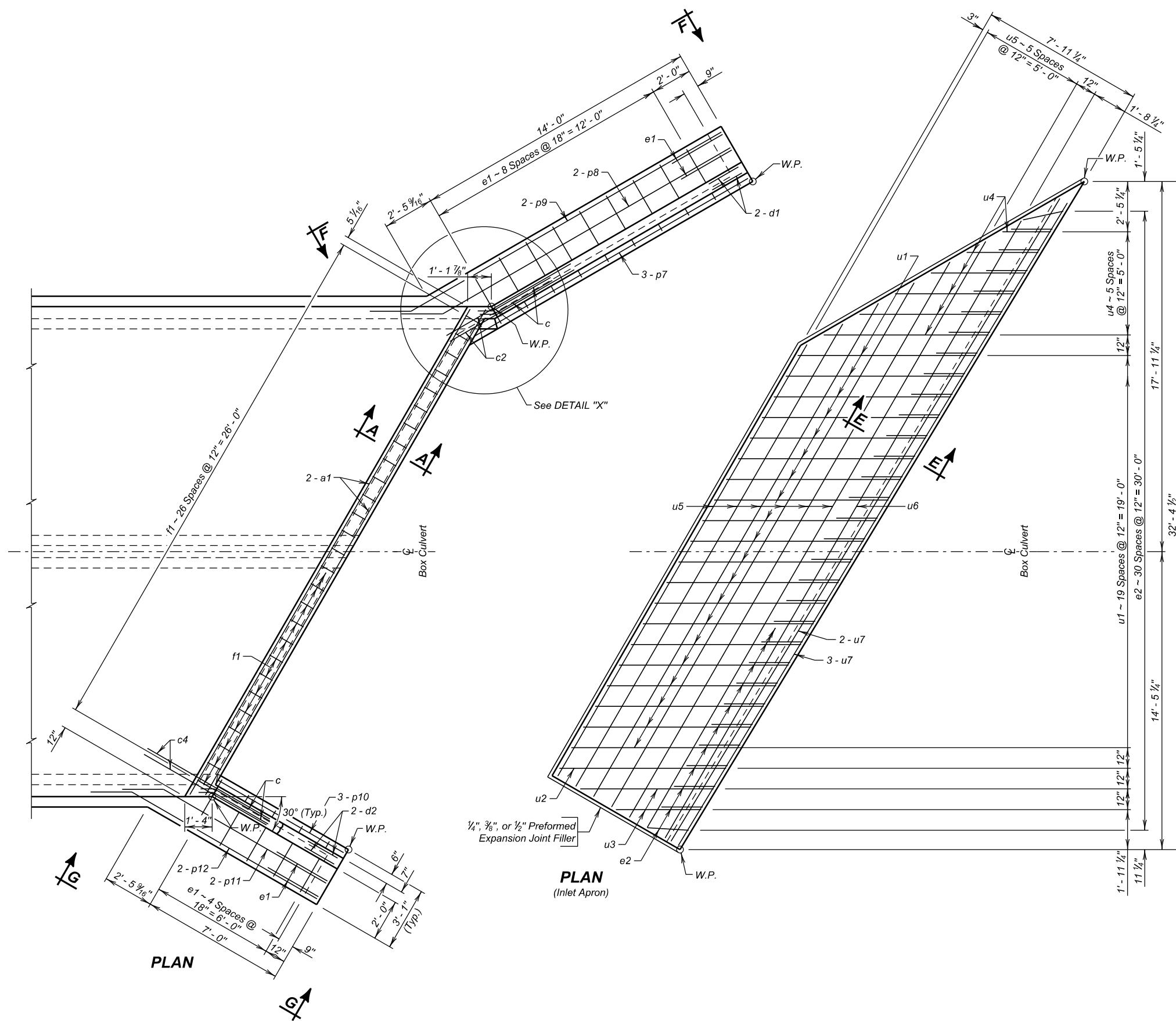
NOTES AND UNDERCUT DETAILS

FOR
2 - 11' X 4' BOX CULVERT
OVER TRIB. TO CROW CREEK 30° RHF SKEW
STA. 1206 + 66.00 SEC. 20/29-T127N-R58W
STR. NO. 46-079-100 P-PH-B-PT 0010(124)296
HL-93

MARSHALL COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2022

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E20	E37

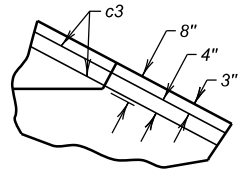
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



INLET DETAILS (A)
FOR
2 - 11' X 4' BOX CULVERT
OVER TRIB. TO CROW CREEK 30° RHF SKEW
STA. 1206 + 66.00 SEC. 20/29-T127N-R58W
STR. NO. 46-079-100 P-PH-B-PT 0010(124)296
HL-93

MARSHALL COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2022

DESIGNED BY BR MRS05F4	CK. DES. BY ER 05F4TC03	DRAFTED BY BT	Steve A. Johnson BRIDGE ENGINEER
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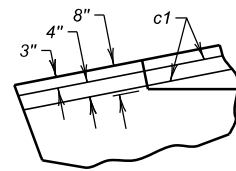


DETAIL "Z"

(c, c4, h1, h2, and k1 bars not shown)

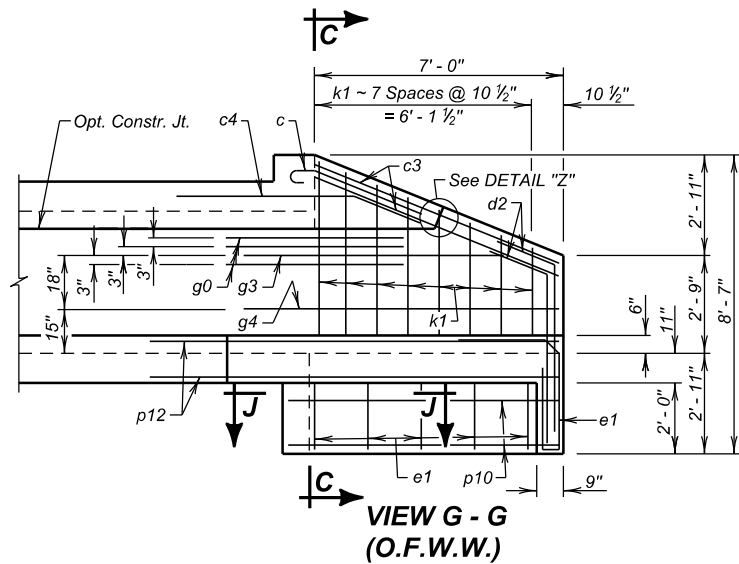
LEGEND FOR PLACING RE-STEEL

O. F. W. W. - Outside Face of Wing Wall
I. F. W. W. - Inside Face of Wing Wall

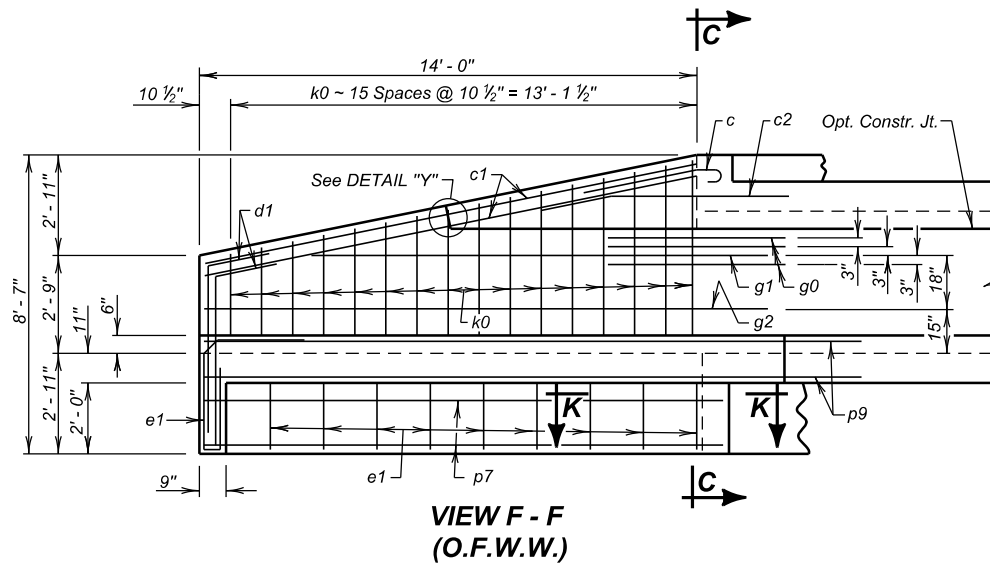


DETAIL "Y"

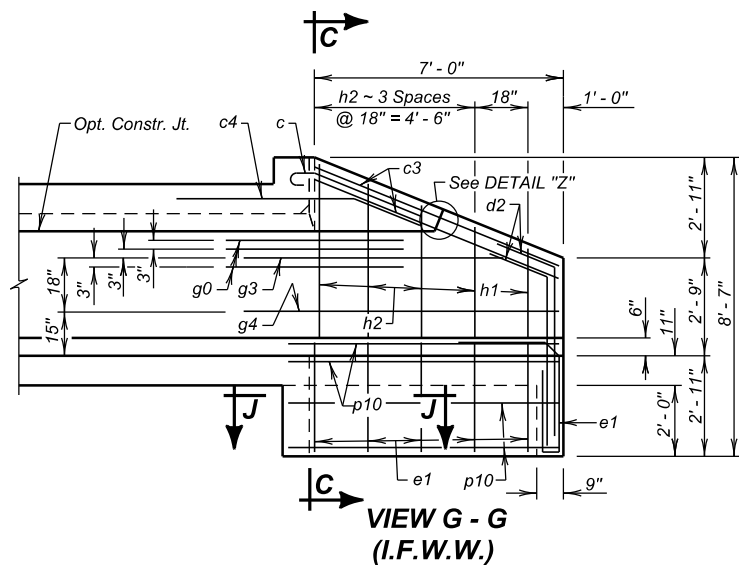
(c, c2, h0, h1, and k0 bars not shown)



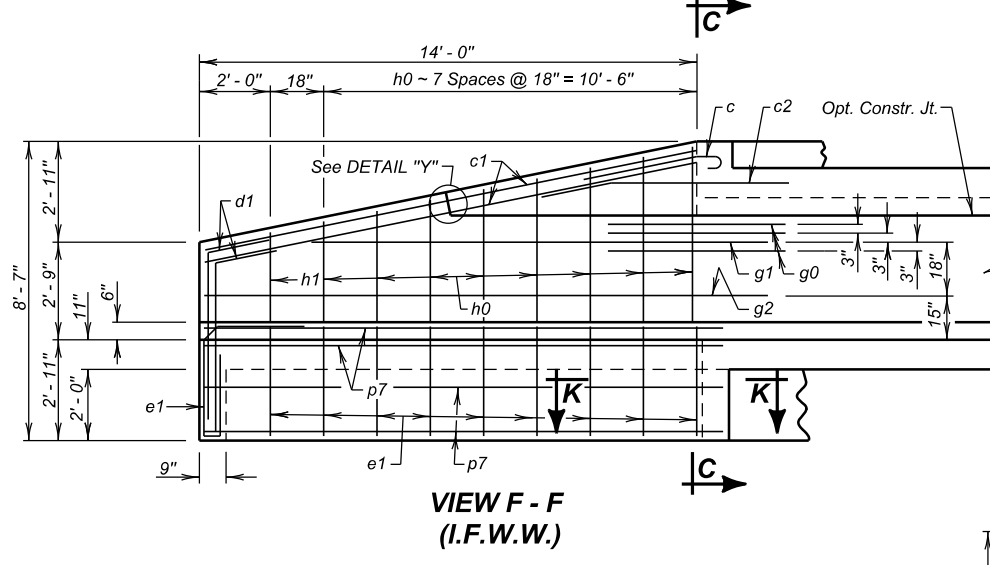
**VIEW G - G
(O.F.W.W.)**



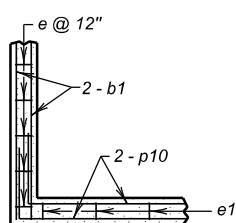
**VIEW F - F
(O.F.W.W.)**



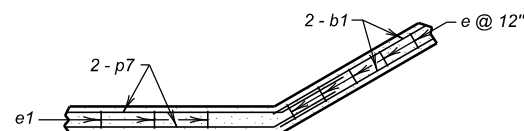
**VIEW G - G
(I.F.W.W.)**



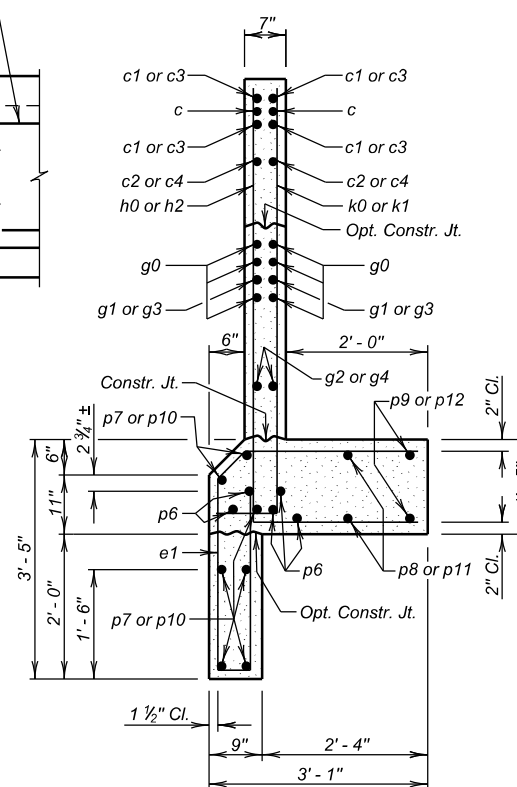
**VIEW F - F
(I.F.W.W.)**



SECTION J - J

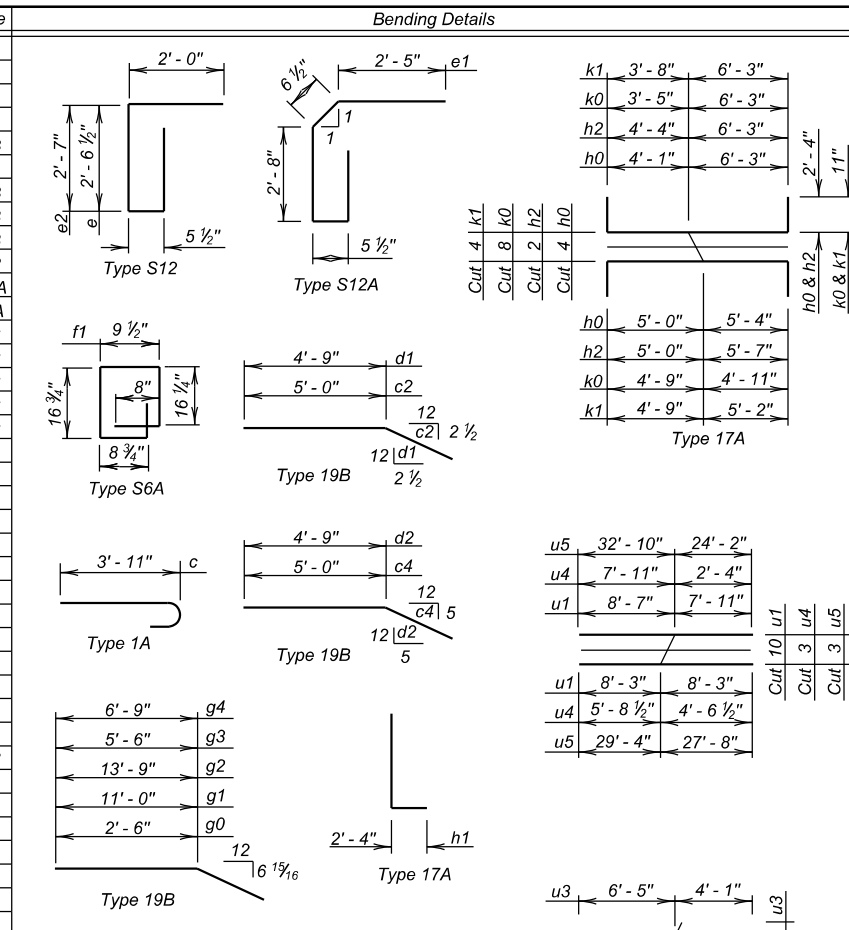


SECTION K - K



SECTION C - C

REINFORCING SCHEDULE				
Mk.	No.	Size	Length	Type
a1	4	6	27'-0"	Str.
b1	6	6	24'-6"	Str.
c	4	5	4'-6"	1A
c1	4	5	14'-3"	Str.
c2	2	5	7'-0"	19B
c3	4	5	7'-6"	Str.
c4	2	5	7'-0"	19B
d1	4	5	6'-6"	19B
d2	4	5	6'-6"	19B
e	25	4	7'-3"	S12
e1	18	4	8'-6"	S12A
f1	27	4	5'-9"	S6A
g0	12	5	5'-0"	19B
g1	2	4	13'-0"	19B
g2	2	4	15'-9"	19B
g3	2	4	7'-6"	19B
g4	2	4	8'-9"	19B
h0	4	4	15'-0"	17A
h1	2	4	6'-0"	17A
h2	2	4	15'-3"	17A
k0	8	4	11'-6"	17A
k1	4	4	11'-9"	17A
p6	10	6	7'-0"	Str.
p7	7	4	16'-6"	Str.
p8	2	4	17'-9"	Str.
p9	2	4	19'-3"	Str.
p10	7	4	9'-6"	Str.
p11	2	4	10'-9"	Str.
p12	2	4	12'-3"	Str.
INLET APRON				
e2	31	4	7'-6"	S12
u1	10	4	16'-6"	Str.
u2	1	4	7'-9"	Str.
u3	1	4	10'-6"	Str.
u4	3	4	10'-3"	Str.
u5	3	4	57'-0"	Str.
u6	1	4	34'-6"	Str.
u7	5	4	36'-6"	Str.



NOTES:
All dimensions are out to out of bars.
∅ See cutting diagram.
* Bend in field as necessary to fit.

ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	11.2	1494	6.3
Inlet Apron	7.4	557	7.4

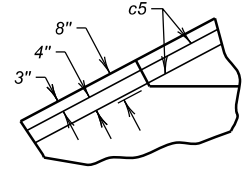
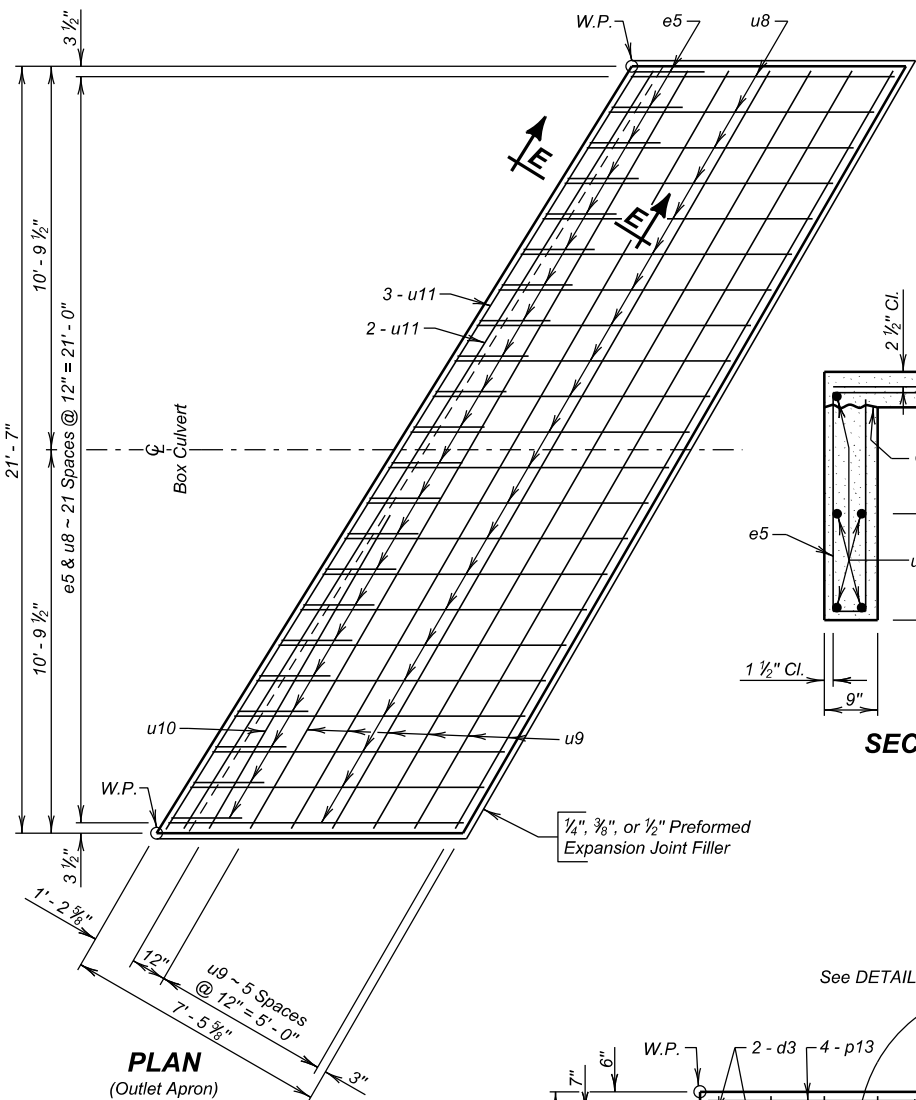
INLET DETAILS (B)
FOR
2 - 11' X 4' BOX CULVERT
OVER TRIB. TO CROW CREEK 30° RHF SKEW
STA. 1206 + 66.00 SEC. 20/29-T127N-R58W
STR. NO. 46-079-100 P-PH-B-PT 0010(124)296
HL-93

MARSHALL COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2022

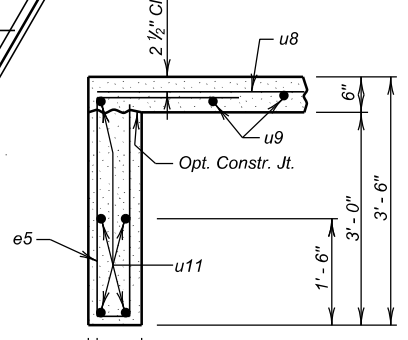
LEGEND FOR PLACING RE-STEEL

O. F. W. W. - Outside Face of Wing Wall
 I. F. W. W. - Inside Face of Wing Wall

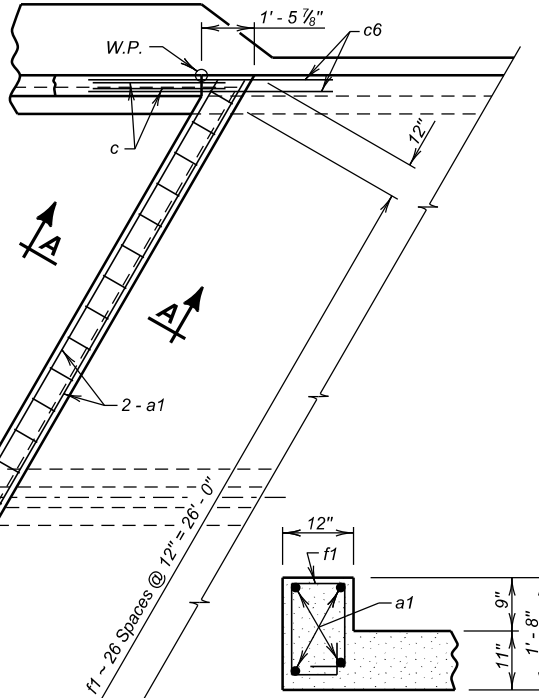
NOTE:
 Apron will NOT be built monolithic with the Box Culvert.



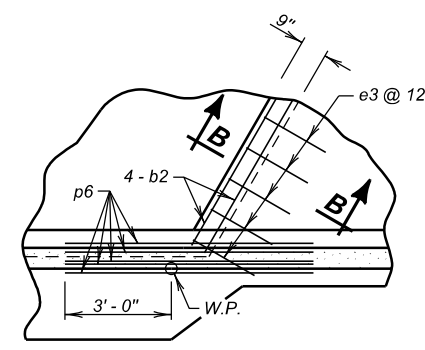
DETAIL "Y"
 (c, c6, h3, and k2 bars not shown)



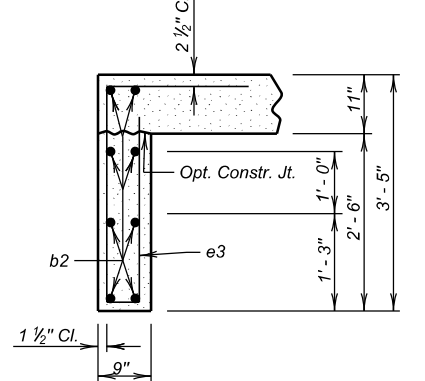
SECTION E - E



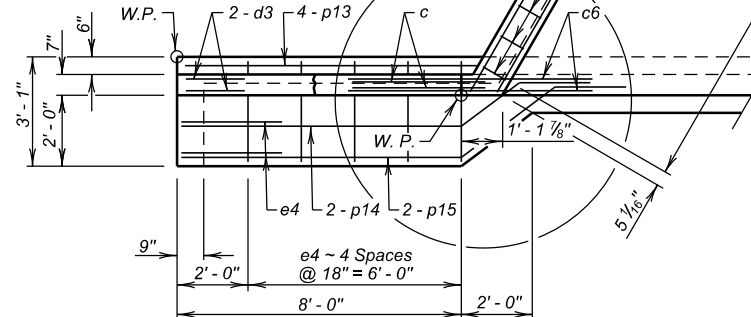
SECTION A - A
 (At Top Slab)



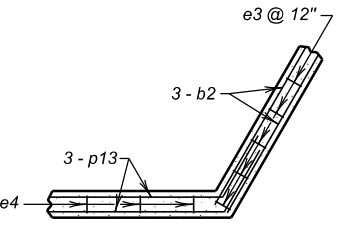
DETAIL "X"
 (At Bottom Slab)



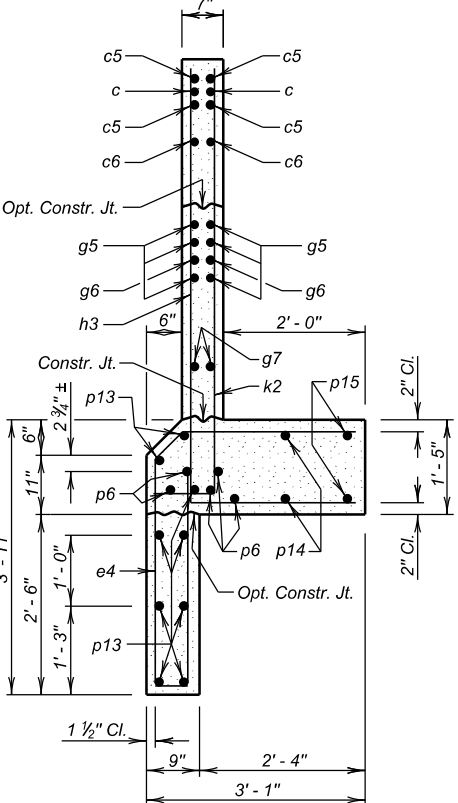
SECTION B - B



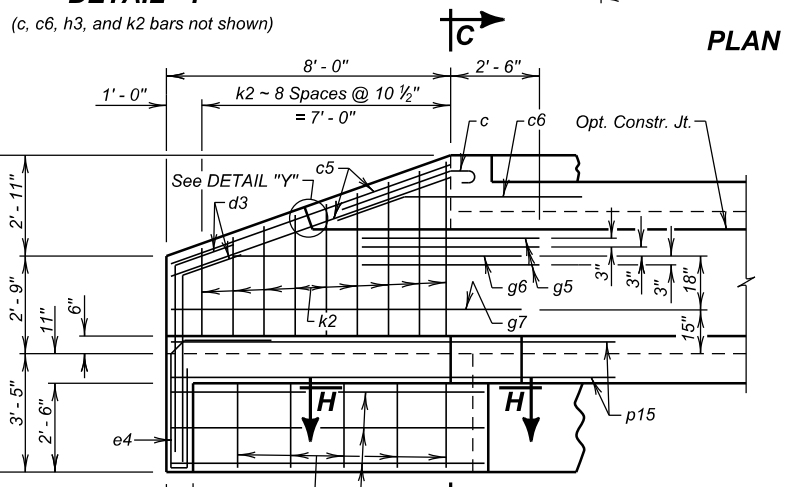
PLAN



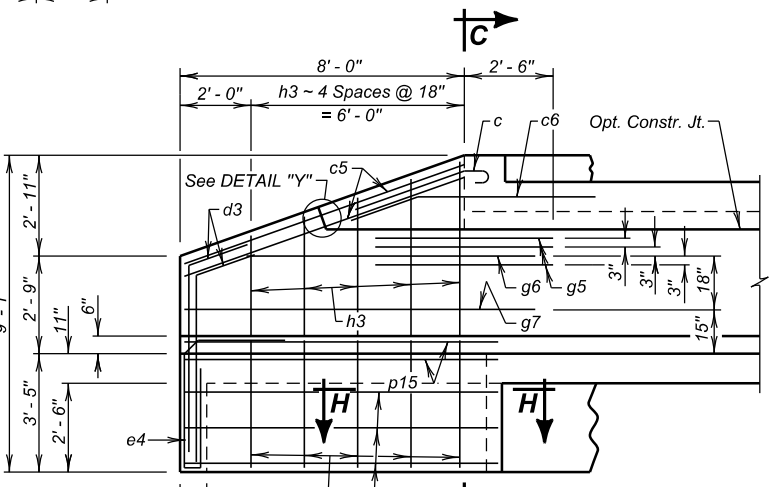
SECTION H - H



SECTION C - C



ELEVATION
 (O.F.W.W.)



ELEVATION
 (I.F.W.W.)

REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details
a1	4	6	27'-0"	Str.	
b2	8	6	26'-3"	Str.	
c	4	5	4'-6"	1A	
c5	8	5	8'-6"	Str.	
c6	4	5	7'-0"	19B	
d3	8	5	7'-0"	19B	
e3	27	4	8'-3"	S12	
e4	14	4	9'-6"	S12A	
f1	27	4	5'-9"	S6A	
g5	12	5	5'-0"	Str.	
g6	4	4	8'-3"	Str.	
g7	4	4	9'-9"	Str.	
h3	5	4	15'-0"	17A	
k2	9	4	11'-9"	17A	
p6	10	6	7'-0"	Str.	
p13	18	4	10'-6"	Str.	
p14	4	4	11'-3"	Str.	
p15	4	4	13'-0"	Str.	

OUTLET APRON

Mk.	No.	Size	Length	Type
e5	22	4	8'-6"	S12
u8	11	4	15'-3"	Str.
u9	6	4	24'-6"	Str.
u10	1	4	10'-3"	Str.
u11	5	4	25'-3"	Str.

NOTES:
 All dimensions are out to out of bars.
 See cutting diagram.
 Bend in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	10.4	1524	6.1
Outlet Apron	5.4	426	5.4

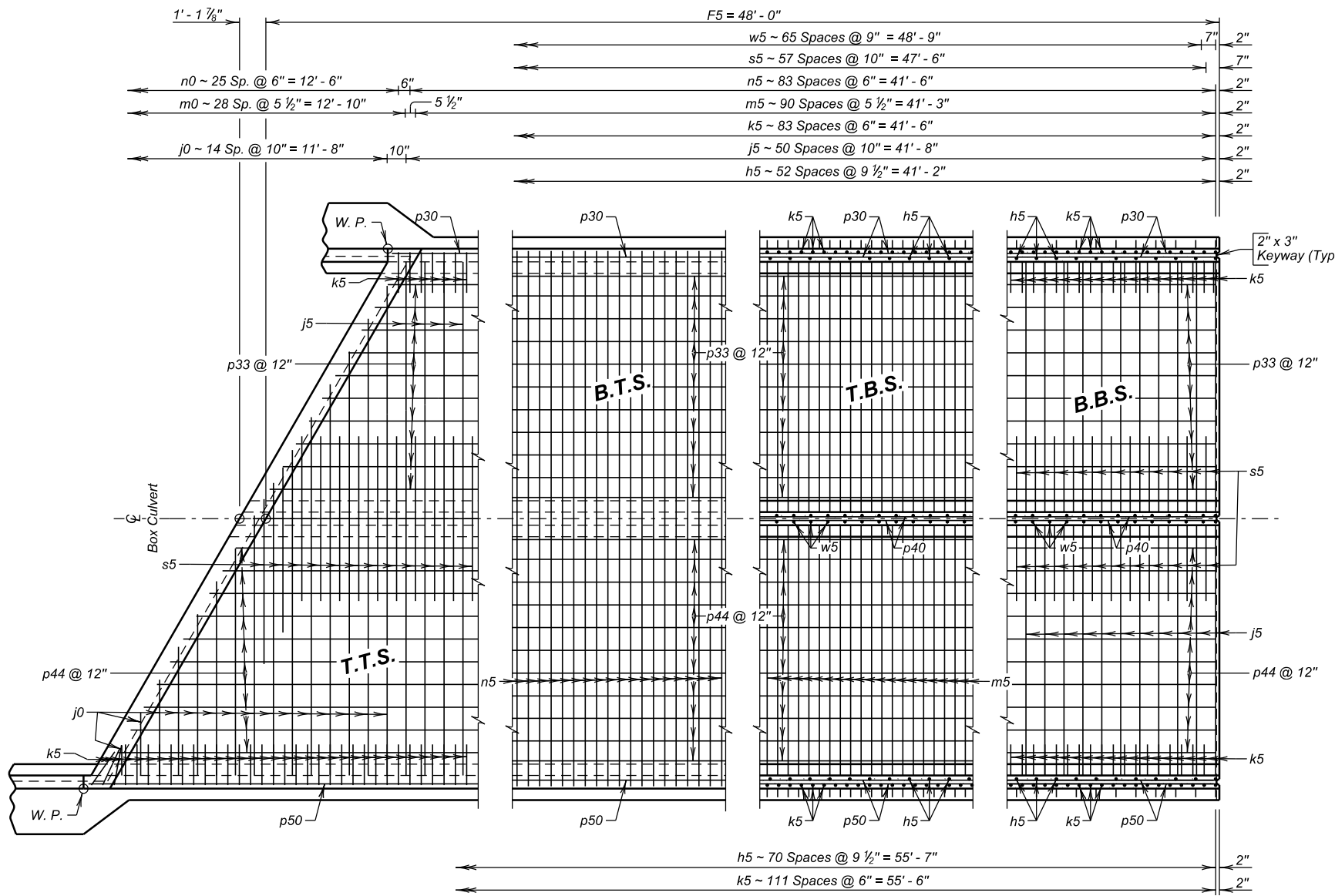
OULET DETAILS

FOR
2 - 11' X 4' BOX CULVERT
 OVER TRIB. TO CROW CREEK 30° RHF SKEW
 STA. 1206 + 66.00 SEC. 20/29-T127N-R58W
 STR. NO. 46-079-100 P-PH-B-PT 0010(124)296
 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION

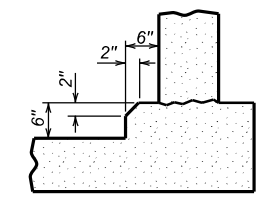
AUGUST 2022 (5) OF (8)

DESIGNED BY BR MRS05F4 CK. DES. BY ER 05F4TC05 DRAFTED BY BT
 Steve A. Johnson
 BRIDGE ENGINEER



LEGEND FOR PLACING RE-STEEL

T.T.S.	- Top of Top Slab
B.T.S.	- Bottom of Top Slab
T.B.S.	- Top of Bottom Slab
B.B.S.	- Bottom of Bottom Slab
O.F.O.W.	- Outside Face of Outside Wall
I.F.O.W.	- Inside Face of Outside Wall
M.W.	- Middle Wall



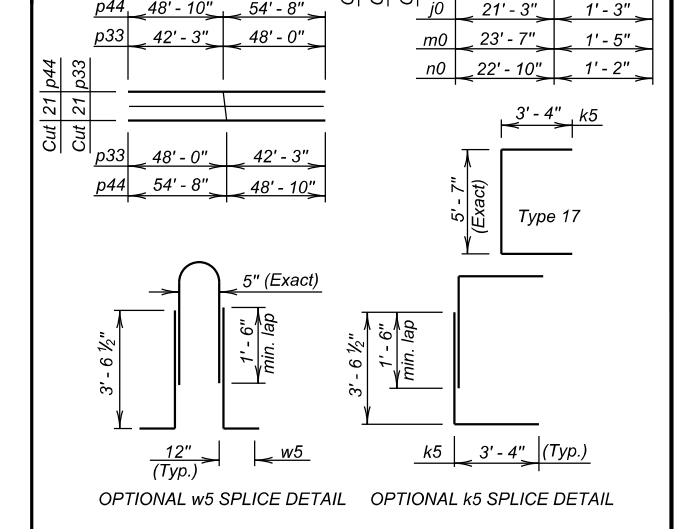
NOTE: Contractor may form the optional full fillet, with 2" Chamfer, as detailed. The cost of the additional concrete will be borne by the Contractor.

OPTIONAL POUR - BOTTOM SLAB
The Bottom Slab may be poured continuously, at the option of the Contractor, with the use of a Preformed Metal keyway conforming to the keyway dimensions and location as shown on the plans. The keyway length will be full width of the bottom slab. Care will be taken to maintain proper alignment of the keyway during the pour sequence. All additional costs of this option will be borne by the Contractor.

Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10. Quantity of z1 bars is for one construction joint.

REINFORCING SCHEDULE
(For 2 - F5 Barrel End Section @ 48' - 0'')

Mk.	No.	Size	Length	Type	Bending Details
h5	248	4	6' - 0"	17A	
j0	30	5	22' - 6"	Str.	
j5	204	5	22' - 6"	Str.	
k5	392	4	12' - 3"	17	
m0	29	5	25' - 0"	Str.	
m5	182	5	24' - 6"	Str.	
n0	26	5	24' - 0"	Str.	
n5	168	5	23' - 6"	Str.	
p30	16	4	42' - 3"	Str.	
p33	42	4	90' - 3"	Str.	
p40	14	4	48' - 3"	Str.	
p44	42	4	103' - 6"	Str.	
p50	16	4	55' - 9"	Str.	
s5	232	5	8' - 6"	Str.	
w5	134	4	13' - 6"	S11A	
z1	50	5	3' - 6"	Str.	



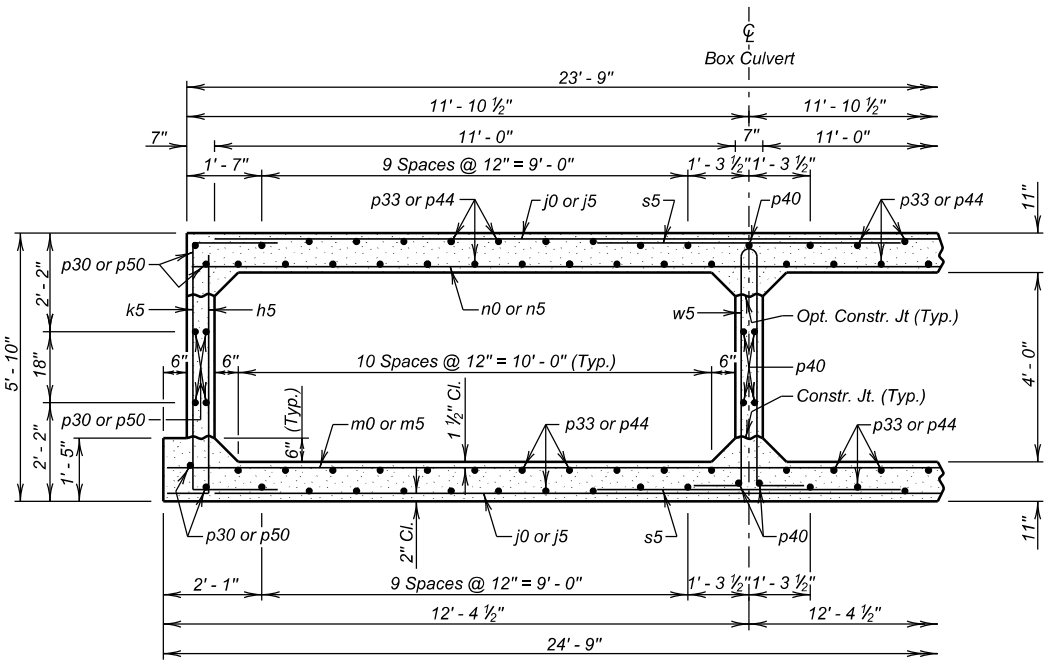
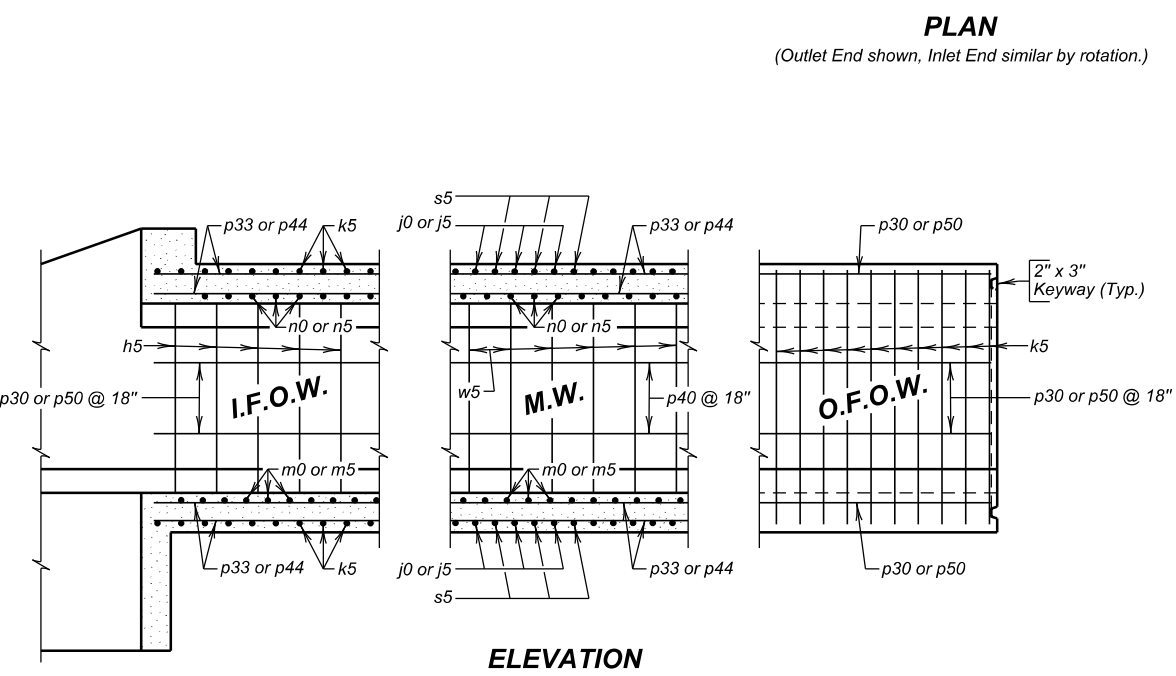
Contractor may use optional reinforcing steel splices, as shown. The cost of the additional reinforcing steel will be borne by the Contractor.

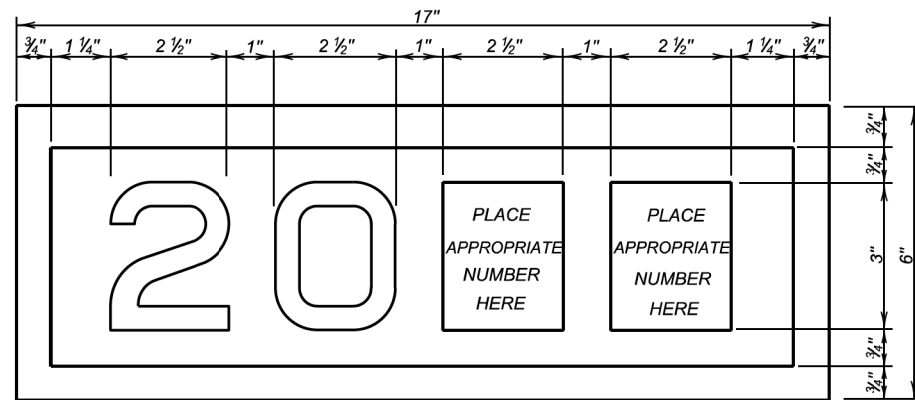
NOTES:
 All dimensions are out to out of bars.
 See cutting diagram.
 Request for additional reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
2 - F5 Barrel End Sections @ 48' - 0"	188.3	30251	80.7

F5 BARREL END SECTION DETAILS (48' - 0'')
 FOR
2 - 11' X 4' BOX CULVERT
 OVER TRIB. TO CROW CREEK 30° RHF SKEW
 STA. 1206 + 66.00 SEC. 20/29-T127N-R58W
 STR. NO. 46-079-100 P-PH-B-PT 0010(124)296
 HL-93

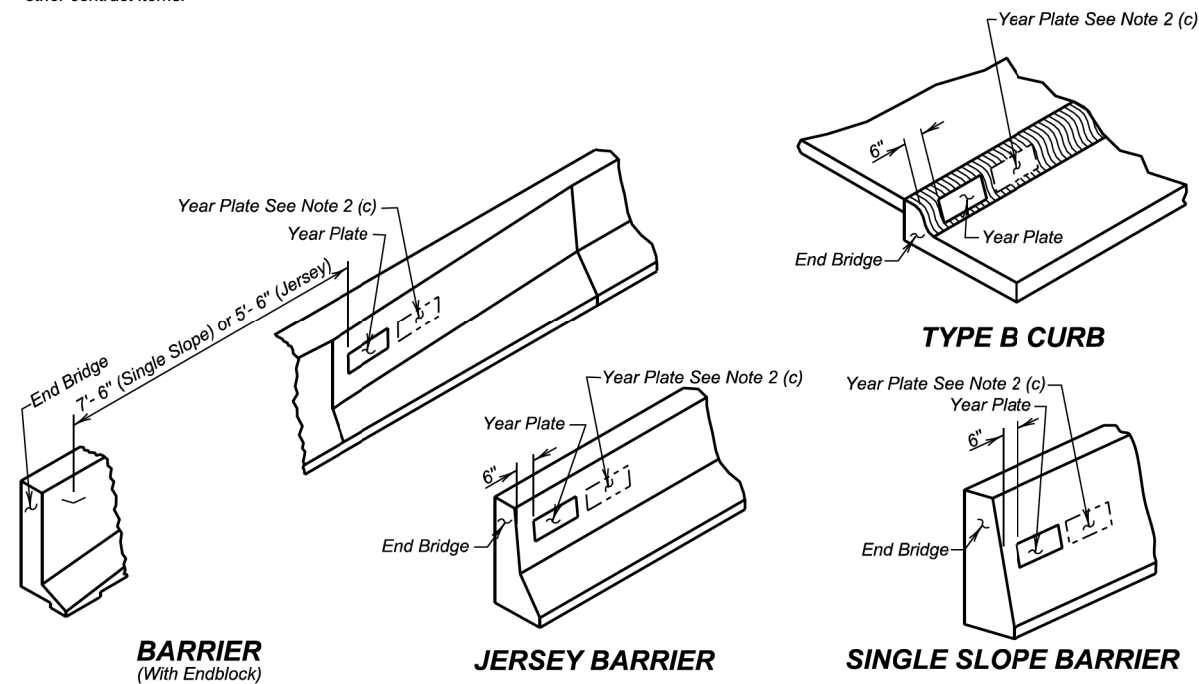




YEAR PLATE DETAILS

GENERAL NOTES:

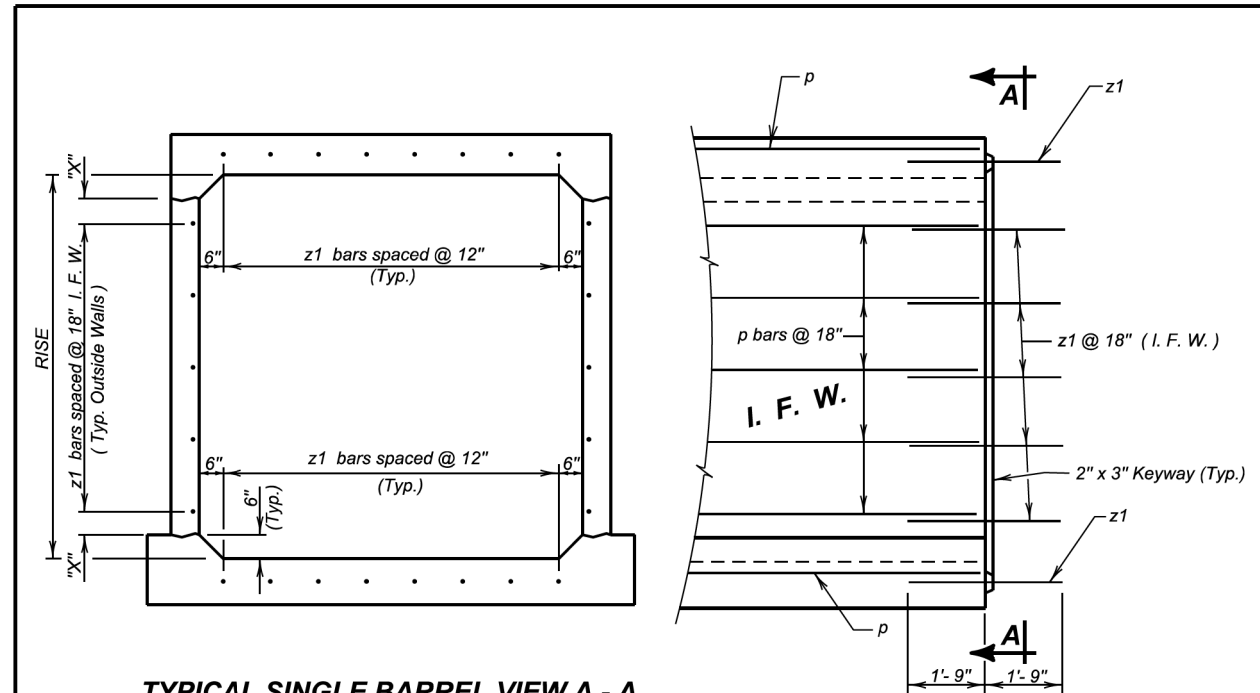
- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located on structure(s) as follows:
 - On cast-in-place box culverts the year plates will be four and one-half (4 1/2) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.
 - On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'-6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.
 - When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.
- There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



TYPE B CURB

January 22, 2021

Published Date: 2024	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



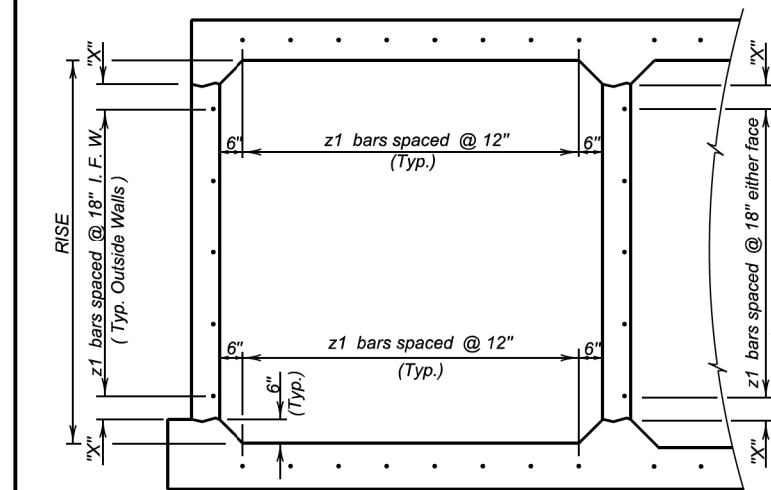
TYPICAL SINGLE BARREL VIEW A - A

ELEVATION

LEGEND FOR PLACING RE-STEEL

I. F. W. - Inside Face Wall

RISE	"X"
3'-0"	3"
4'-0"	9"
5'-0"	6"
6'-0"	3"
7'-0"	9"
8'-0"	6"
9'-0"	3"
10'-0"	9"
11'-0"	6"
12'-0"	3"
13'-0"	9"
14'-0"	6"



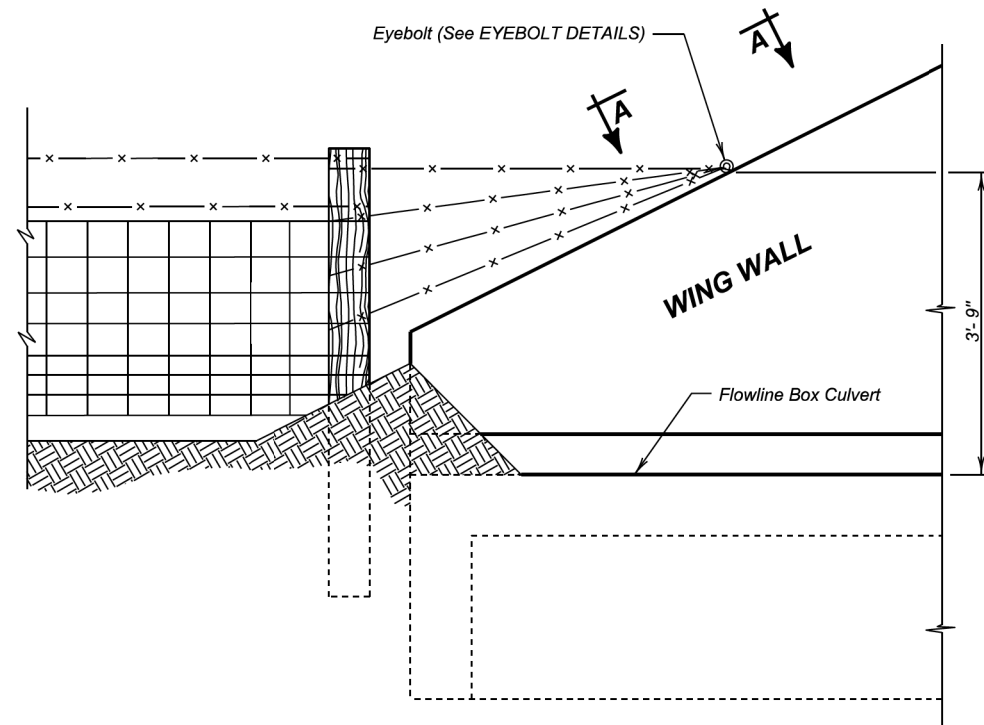
TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

- z1 bars will be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars will be lapped with the longitudinal p bars in the inside face of the wall for outside walls and in either face for interior walls. z1 bars are listed and included elsewhere in plans.
- Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

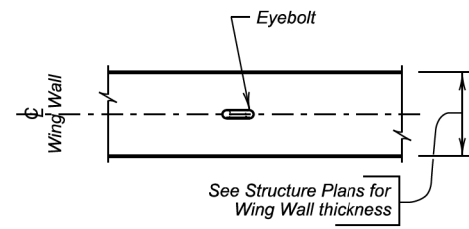
Published Date: 2024	S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1



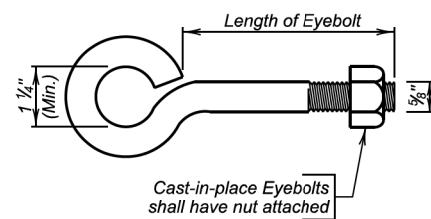
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be $\frac{5}{8}$ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be $4\frac{1}{2}$ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the $\frac{5}{8}$ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23, 2012

S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
		Sheet 1 of 1

Published Date: 2024

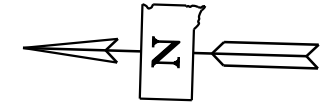
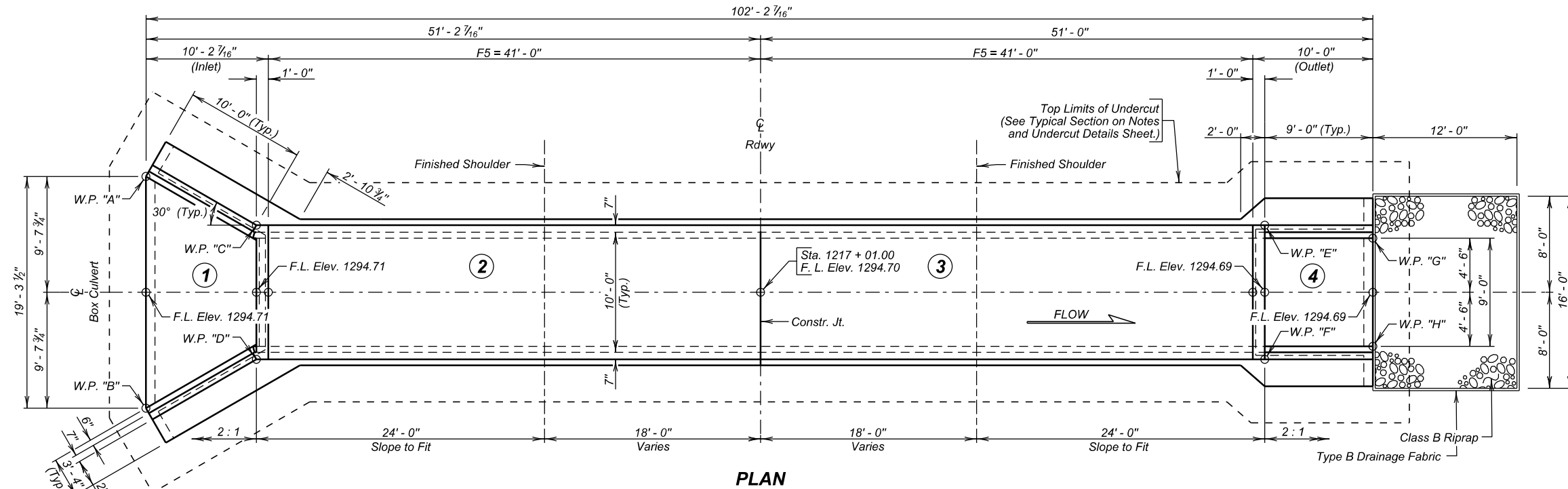
2 - 11' X 4' BOX CULVERT

STR. NO. 46-079-100

AUGUST 2022

The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

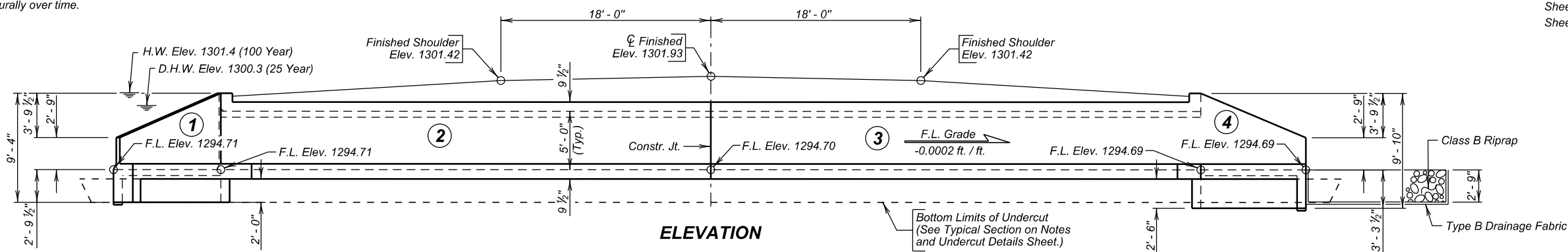
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E26	E37



INDEX OF CULVERT SHEETS -

- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Notes and Undercut Details
- Sheet No. 3 - Inlet Details
- Sheet No. 4 - Outlet Details
- Sheet No. 5 - F5 Barrel End Section Details (41' - 0")
- Sheet No. 6 - Standard Plate No.'s 460.02 and 460.10
- Sheet No. 7 - Standard Plate No. 620.16

NOTE:
Box Culvert flowline has been depressed 1' - 0" below channel flowline to accommodate aquatic organisms. The 1' - 0" depression will be allowed to fill in naturally over time.



HYDRAULIC DATA

Q_d	231 cfs
A_d	25 sq ft
V_d	9.1 fps
Q_F	231 cfs
Q_{100}	447 cfs
Q_{OT}	$>Q_{100}$
V_{max}	9.9 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1300.3.

Q_{OT} = Overtopping discharge and frequency >100 year recurrence interval. El. 1301.9 @ Sta. 1217 + 83±.

Q_F = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.

Q_{100} = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 1301.4.

V_{max} = Maximum computed outlet velocity for the proposed culvert, based on 100 year frequency.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	105.2
Reinforcing Steel	Lb.	17193
Structure Excavation, Box Culvert	Cu. Yd.	46
Box Culvert Undercut	Cu. Yd.	170
Class B Riprap	Ton	27.4
Type B Drainage Fabric	Sq. Yd.	40

* For estimating purposes only, a factor of 1.4 tons/cu. yd. was used to convert Cu. Yd. to Tons.

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	1217 + 10.65	51.20' Lt.
"B"	1216 + 91.35	51.20' Lt.
"C"	1217 + 06.58	42.00' Lt.
"D"	1216 + 95.42	42.00' Lt.
"E"	1217 + 06.58	42.00' Rt.
"F"	1216 + 95.42	42.00' Rt.
"G"	1217 + 05.50	51.00' Rt.
"H"	1216 + 95.50	51.00' Rt.

**SITE 1
ALTERNATE A**

GENERAL DRAWING AND QUANTITIES

FOR

10' X 5' BOX CULVERT (C.I.P.)

OVER TRIB. TO CROW CREEK 0° SKEW
 STA. 1217 + 01.00 SEC. 21/28-T127N-R58W
 STR. NO. 46-082-100 P-PH-B-PT 0010(124)296
 PCN 05F4 HL-93

MARSHALL COUNTY

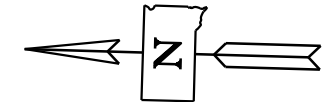
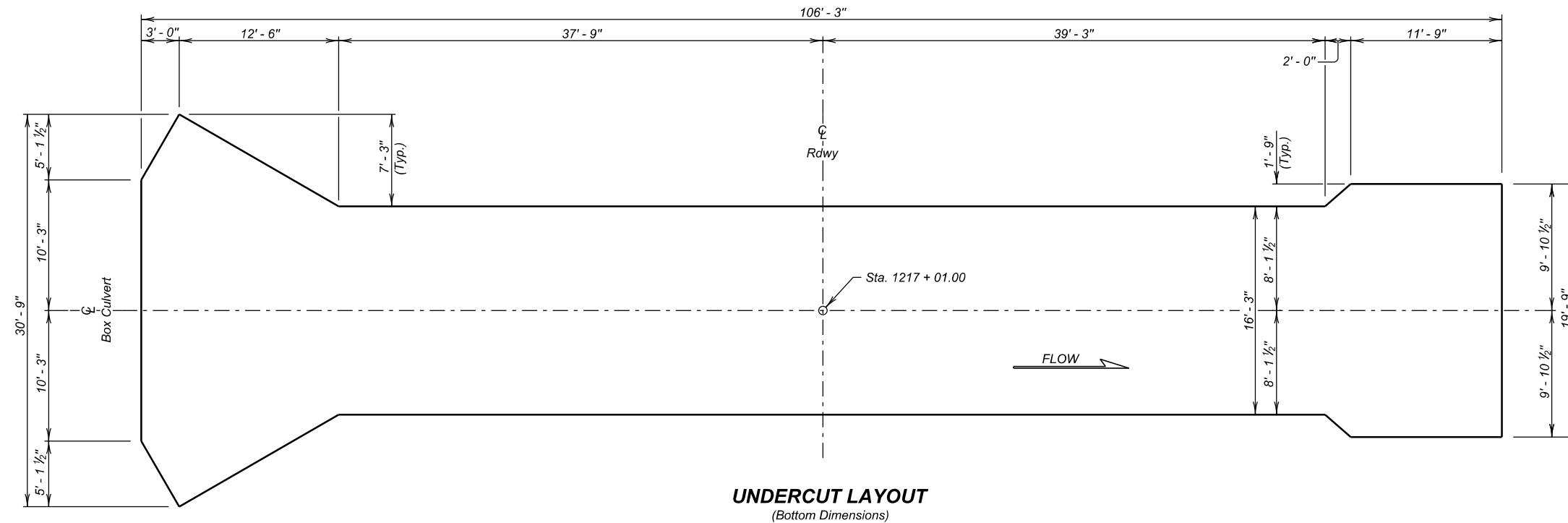
S. D. DEPT. OF TRANSPORTATION

AUGUST 2022

1 OF 7

PLANS BY:
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY CM MRSH05F4	CK. DES. BY BR 05F4TD01	DRAFTED BY BT <i>Steve A. Johnson</i>	BRIDGE ENGINEER
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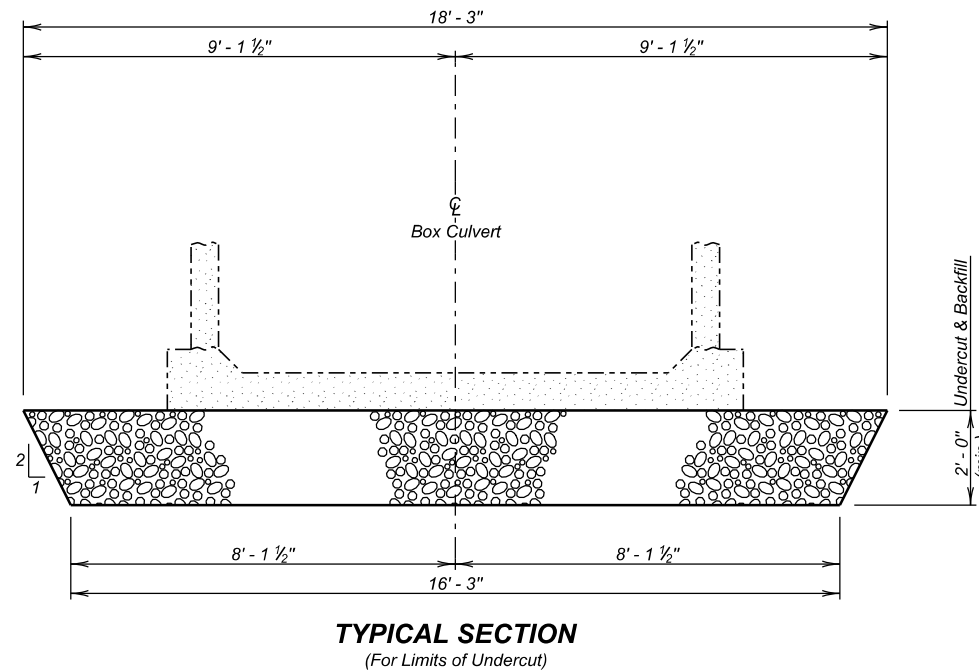


SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

1. Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross axle weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. of fill has been placed over the box culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.
2. The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 5 ft. (F5).
3. Design Material Strengths: Concrete $f'_c = 4500$ p.s.i.
Reinforcing Steel $f_y = 60000$ p.s.i.
4. High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a type V or a type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.
5. All reinforcing steel will conform to ASTM A615 Grade 60.
6. All lap splices shown are contact lap splices unless noted otherwise.
7. All exposed edges will be chamfered $\frac{3}{4}$ inch unless noted otherwise in the plans.
8. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
9. The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
10. Care will be taken to establish Working Points (W.P.) as shown on the wings.
11. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
12. Cost of Prefomed Expansion Joint Filler used in apron construction will be incidental to the other contract items.
13. Soils below the bottom of the proposed RCBC consist of soft brown silt clay with sand. Groundwater was encountered in the borings at an elevation of 1296.2 during the subsurface investigation conducted in July 2020. Dewatering will be required during the construction of the RCBC. All costs incurred for dewatering will be incidental to the other contract items.



ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	170

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.

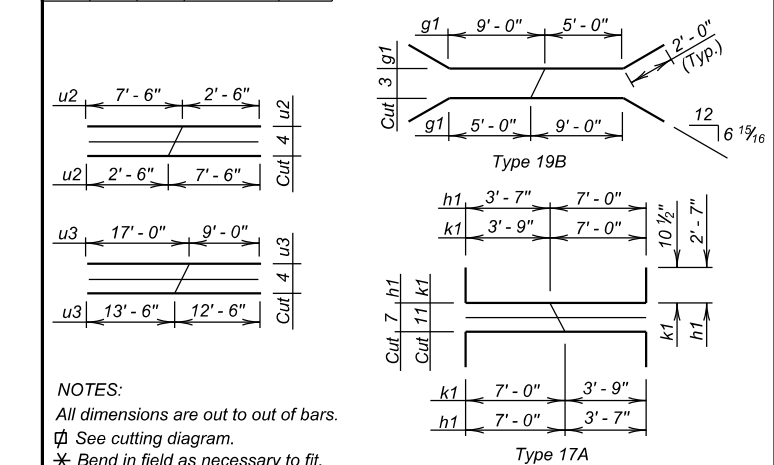
SITE 1
ALTERNATE A
NOTES AND UNDERCUT DETAILS
 FOR
10' X 5' BOX CULVERT (C.I.P.)
 OVER TRIB. TO CROW CREEK 0° SKEW
 STA. 1217 + 01.00 SEC. 21/28-T127N-R58W
 STR. NO. 46-082-100 P-PH-B-PT 0010(124)296
 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022

DESIGNED BY CM MRS05F4	CK. DES. BY BR 05F4TD02	DRAFTED BY BT	<i>Steve A. Johnson</i> BRIDGE ENGINEER
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REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details	
a1	4	6	10'-9"	Str.	Type S12	
b1	6	6	9'-6"	Str.	Type S12A	
c	4	5	4'-6"	1A	Type 19B	
c1	8	5	10'-6"	Str.	Type 19B	
c2	4	5	7'-0"	19B	Type 19B	
d1	8	5	6'-6"	19B	Type 19B	
e	10	4	7'-0"	S12	Type S6A	
e1	18	4	8'-6"	S12A	Type S6A	
f1	12	4	5'-0"	S6A	Type 19B	
g0	12	5	5'-0"	19B	Type 19B	
g1	6	4	18'-0"	19B	Type 19B	
g2	4	4	11'-9"	19B	Type 19B	
h1	7	4	15'-9"	17A	Type 19B	
k1	11	4	12'-6"	17A	Type 19B	
p6	10	6	7'-0"	Str.	Type 19B	
p7	14	4	12'-6"	Str.	Type 19B	
p8	4	4	13'-9"	Str.	Type 19B	
p9	4	4	15'-6"	Str.	Type 19B	
INLET APRON					Type 19B	
e2	17	4	7'-6"	S12	Type 19B	
u1	9	4	8'-9"	Str.	Type 19B	
u2	4	4	10'-0"	Str.	Type 19B	
u3	4	4	26'-0"	Str.	Type 19B	
u4	6	4	18'-3"	Str.	Type 19B	



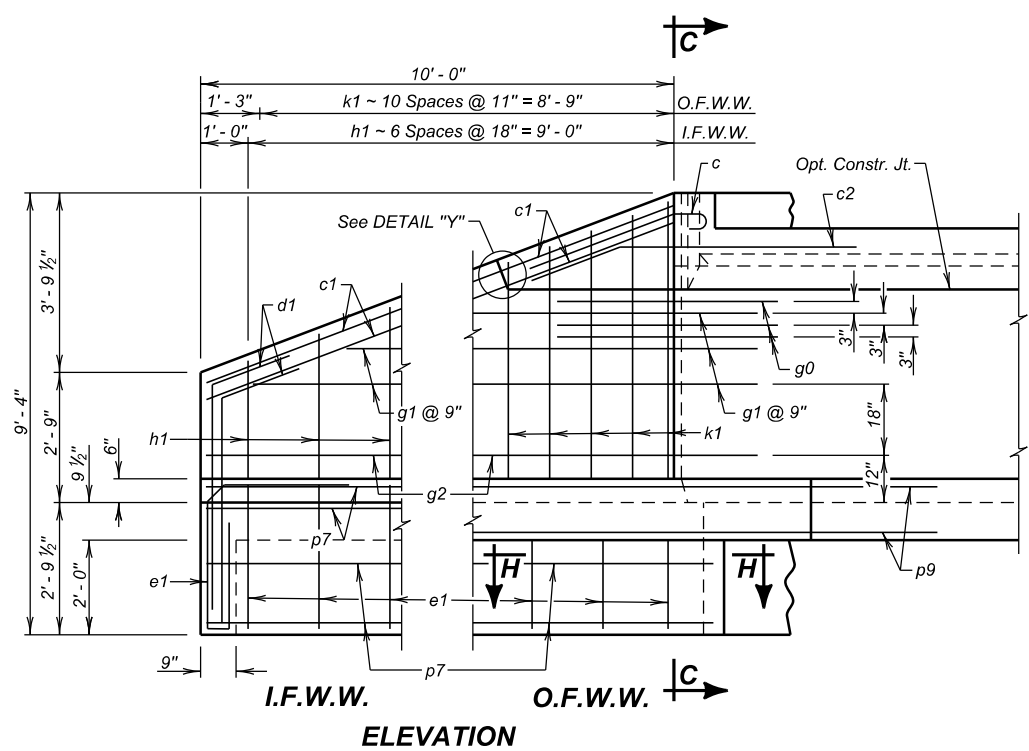
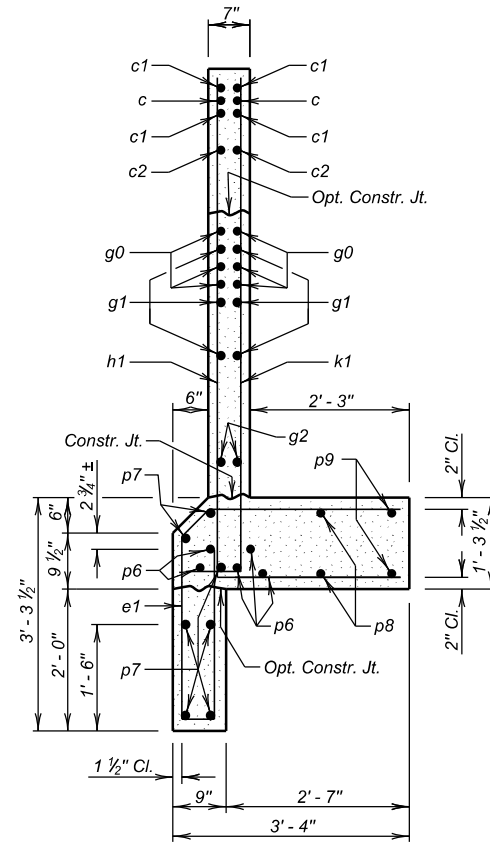
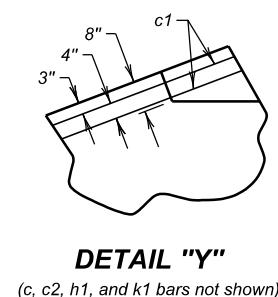
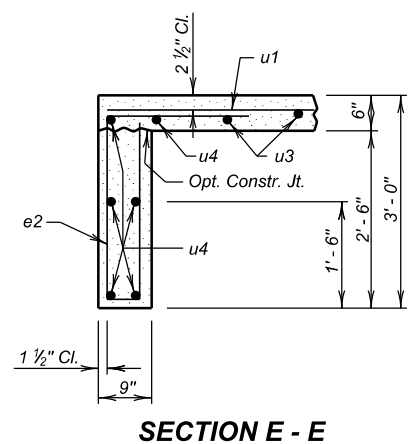
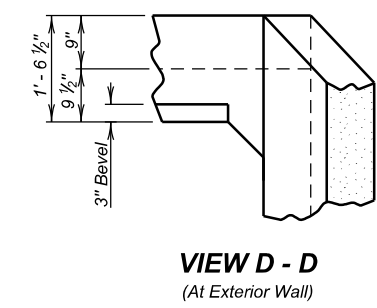
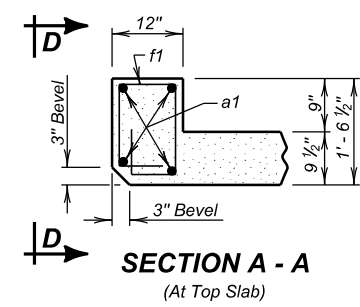
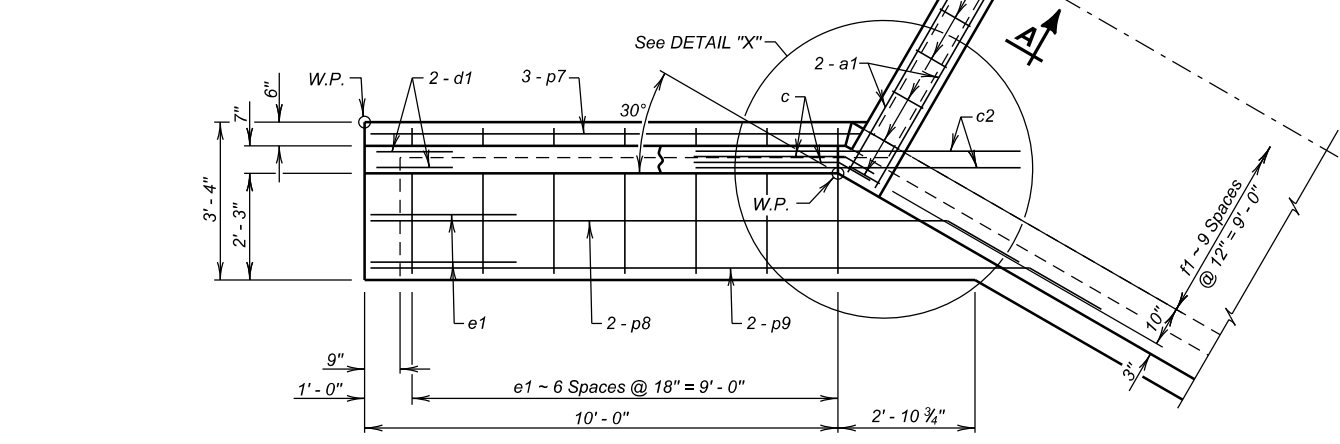
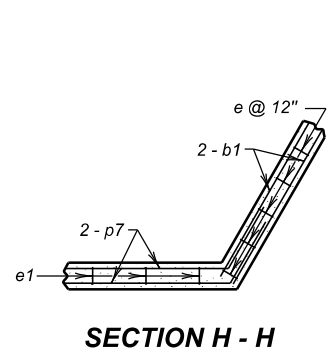
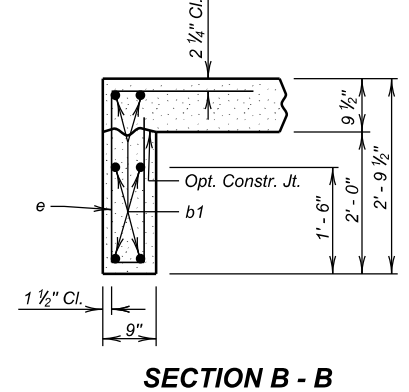
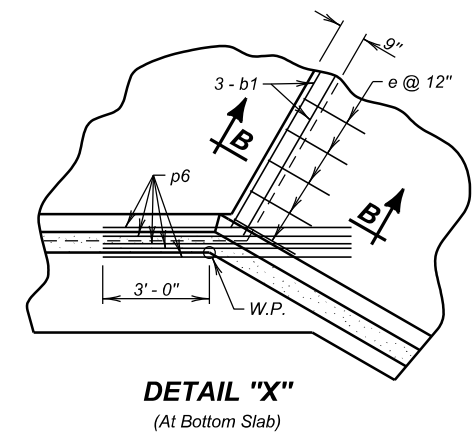
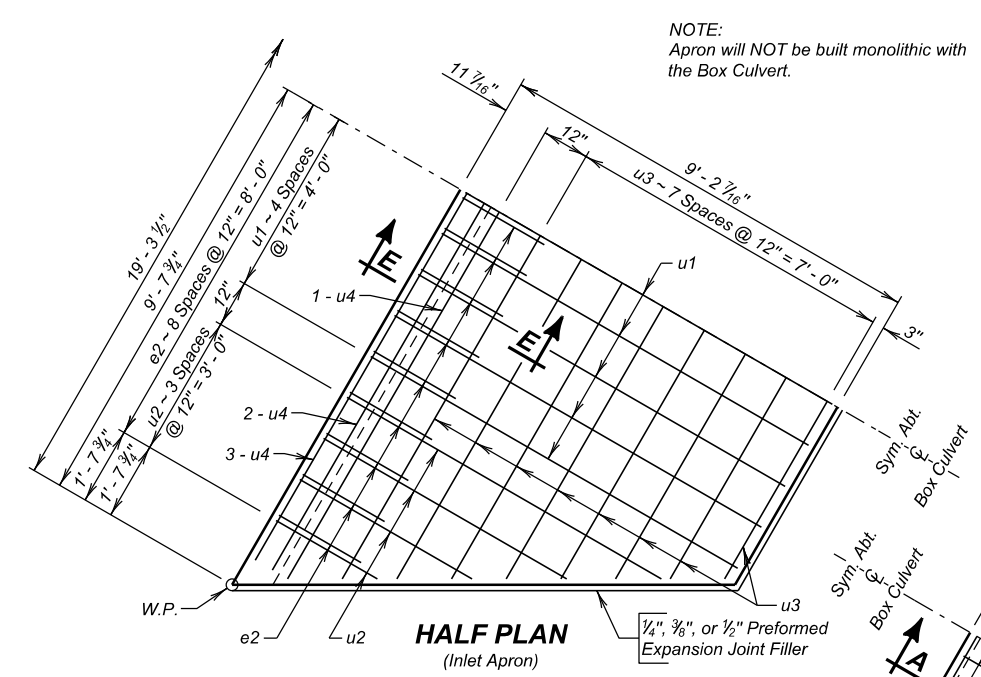
ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	10.2	1099	5.1
Inlet Apron	3.8	295	3.8

SITE 1 ALTERNATE A INLET DETAILS FOR 10' X 5' BOX CULVERT (C.I.P.)

OVER TRIB. TO CROW CREEK 0° SKEW
 STA. 1217 + 01.00 SEC. 21/28-T127N-R58W
 STR. NO. 46-082-100 P-PH-B-PT 0010(124)296
 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022



LEGEND FOR PLACING RE-STEEL	
O. F. W. W.	- Outside Face of Wing Wall
I. F. W. W.	- Inside Face of Wing Wall

REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details	
a1	4	6	10'-9"	Str.		
b2	8	6	10'-3"	Str.		
c	4	5	4'-6"	1A		
c3	8	5	9'-9"	Str.		
c4	4	5	7'-0"	19B		
d2	8	5	7'-0"	19B		
e3	9	4	8'-0"	S12		
e4	16	4	9'-6"	S12A		
f1	12	4	5'-0"	S6A		
g3	12	5	5'-0"	Str.		
g4	6	4	16'-3"	Str.		
g5	4	4	10'-9"	Str.		
h2	6	4	16'-0"	17A		
k2	10	4	12'-6"	17A		
p6	10	6	7'-0"	Str.		
p11	18	4	11'-6"	Str.		
p12	4	4	13'-9"	Str.		
p13	4	4	15'-9"	Str.		

OUTLET APRON					
e5	10	4	8'-6"	S12	
u5	22	4	8'-9"	Str.	

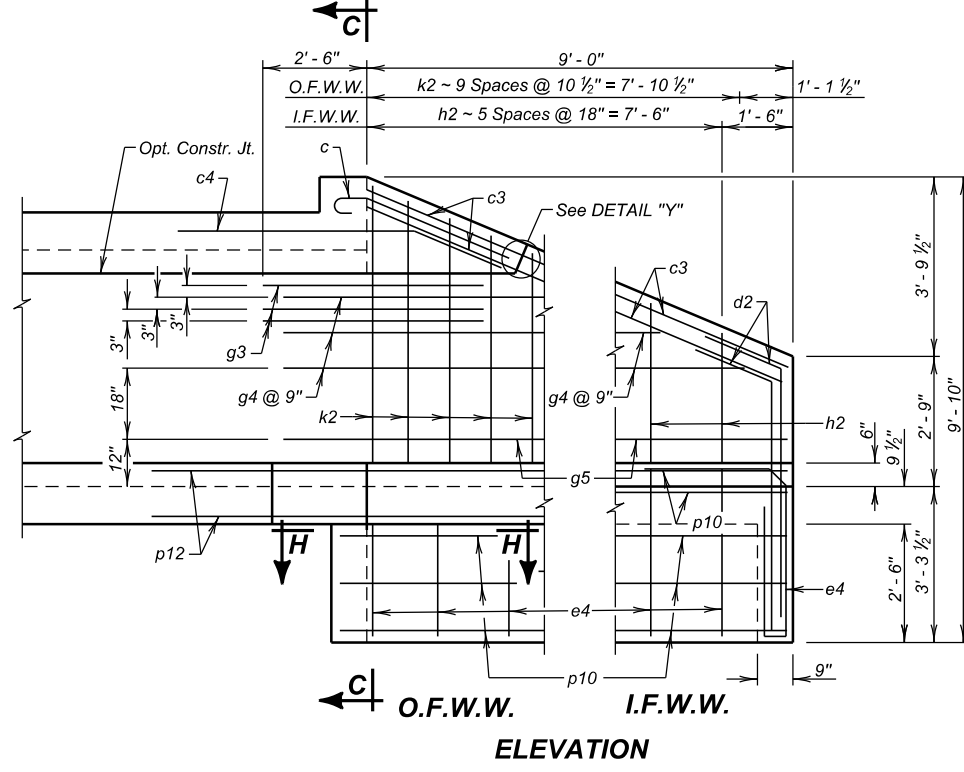
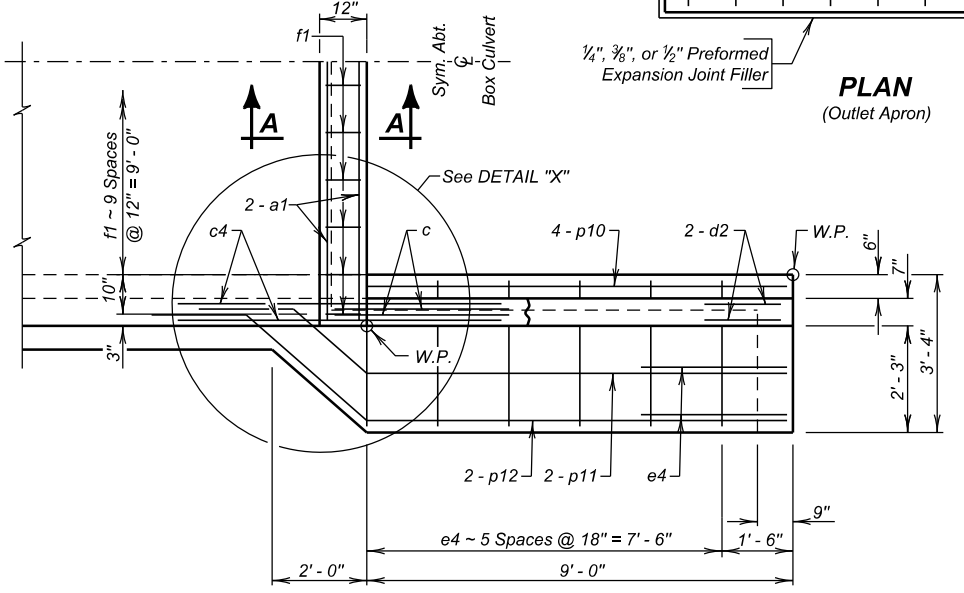
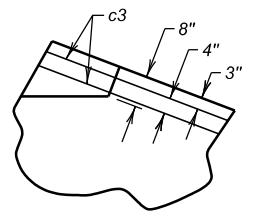
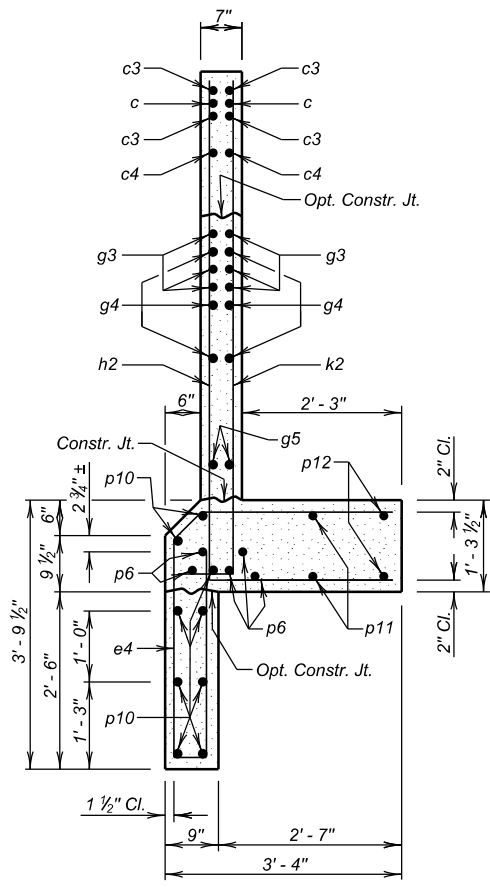
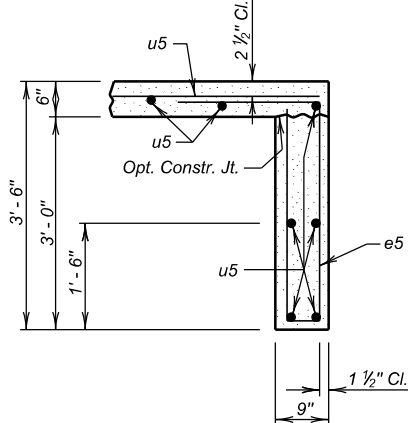
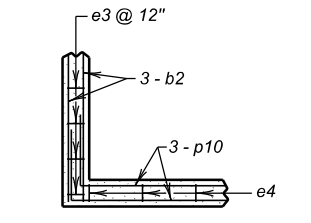
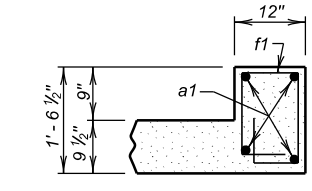
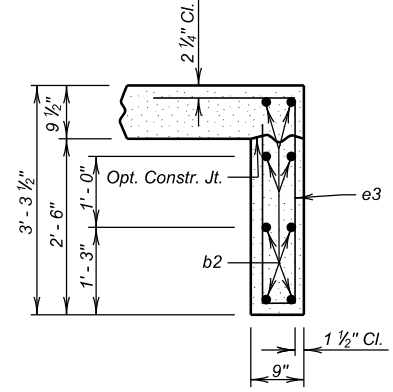
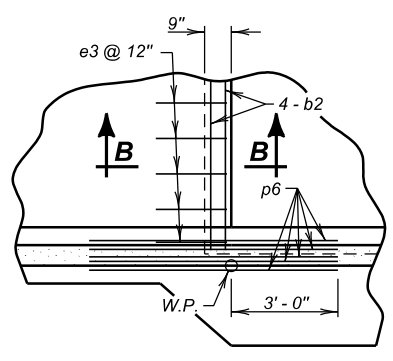
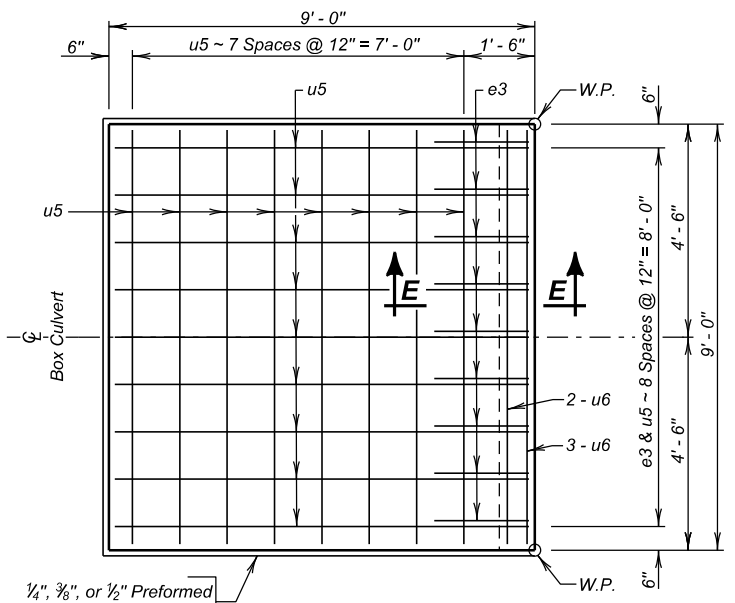
ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	9.0	1099	5.1
Outlet Apron	2.2	185	2.2

LEGEND FOR PLACING RE-STEEL
 O. F. W. W. - Outside Face of Wing Wall
 I. F. W. W. - Inside Face of Wing Wall

**SITE 1
 ALTERNATE A
 OUTLET DETAILS
 FOR
 10' X 5' BOX CULVERT (C.I.P.)
 OVER TRIB. TO CROW CREEK 0° SKEW
 STA. 1217 + 01.00 SEC. 21/28-T127N-R58W
 STR. NO. 46-082-100 P-PH-B-PT 0010(124)296
 HL-93**

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022 4 OF 7

DESIGNED BY CM MRSH05F4	CK. DES. BY BR 05F4TD04	DRAFTED BY BT <i>Steve A. Johnson</i>	BRIDGE ENGINEER
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NOTE:
Apron will NOT be built monolithic with the Box Culvert.

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E30	E37

REINFORCING SCHEDULE
(For 2 - F5 Barrel End Sections @ 41' - 0")

Mk.	No.	Size	Length	Type	Bending Details
h5	192	4	6' - 9"	17A	
j5	112	4	10' - 0"	Str.	
k5	336	5	11' - 9"	17	
m5	152	6	12' - 0"	Str.	
n5	164	6	11' - 0"	Str.	
p5	120	4	41' - 6"	Str.	
z1	26	5	3' - 6"	Str.	<p>OPTIONAL k5 SPLICE DETAIL Contractor may use optional reinforcing steel splice, as shown. The cost of the additional reinforcing steel will be borne by the Contractor.</p>

NOTES:
All dimensions are out to out of bars.
Request for additional reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu.Yd.	Lb.	Cu.Yd.
2 - F5 Barrel End Sections @ 41' - 0"	80.0	14515	30.0

LEGEND FOR PLACING RE-STEEL

T.T.S.	- Top of Top Slab
B.T.S.	- Bottom of Top Slab
T.B.S.	- Top of Bottom Slab
B.B.S.	- Bottom of Bottom Slab
O.F.W.	- Outside Face of Wall
I.F.W.	- Inside Face of Wall

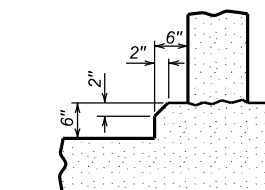
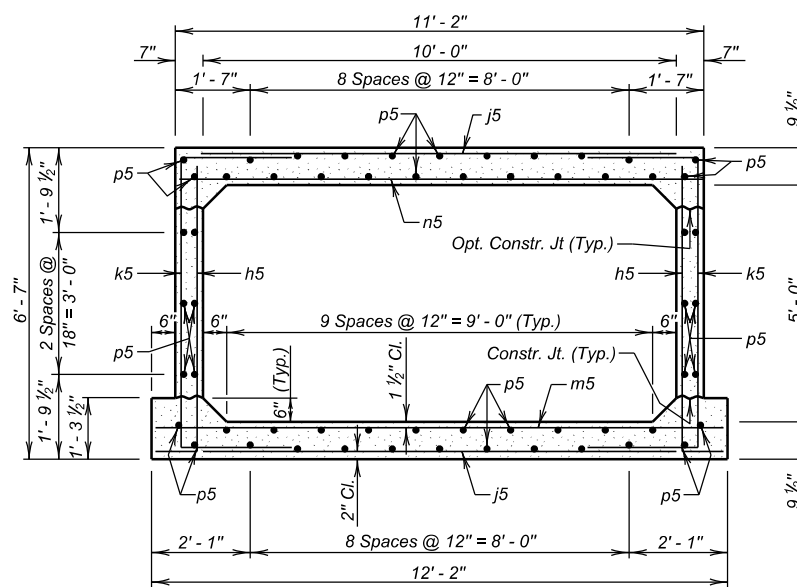
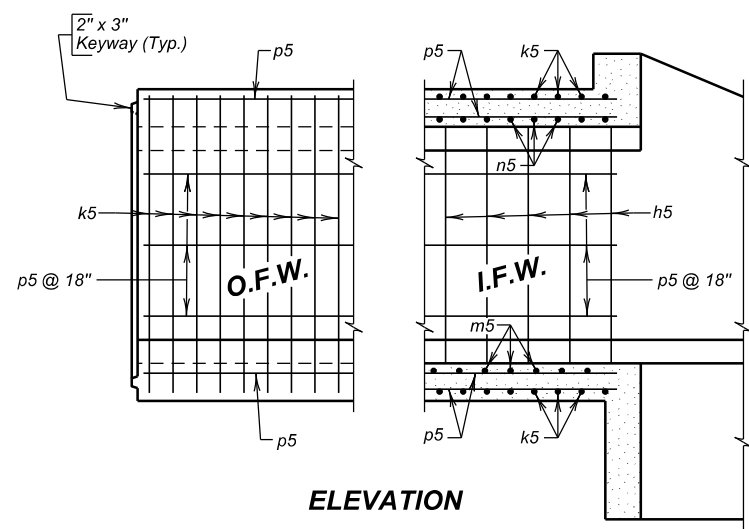
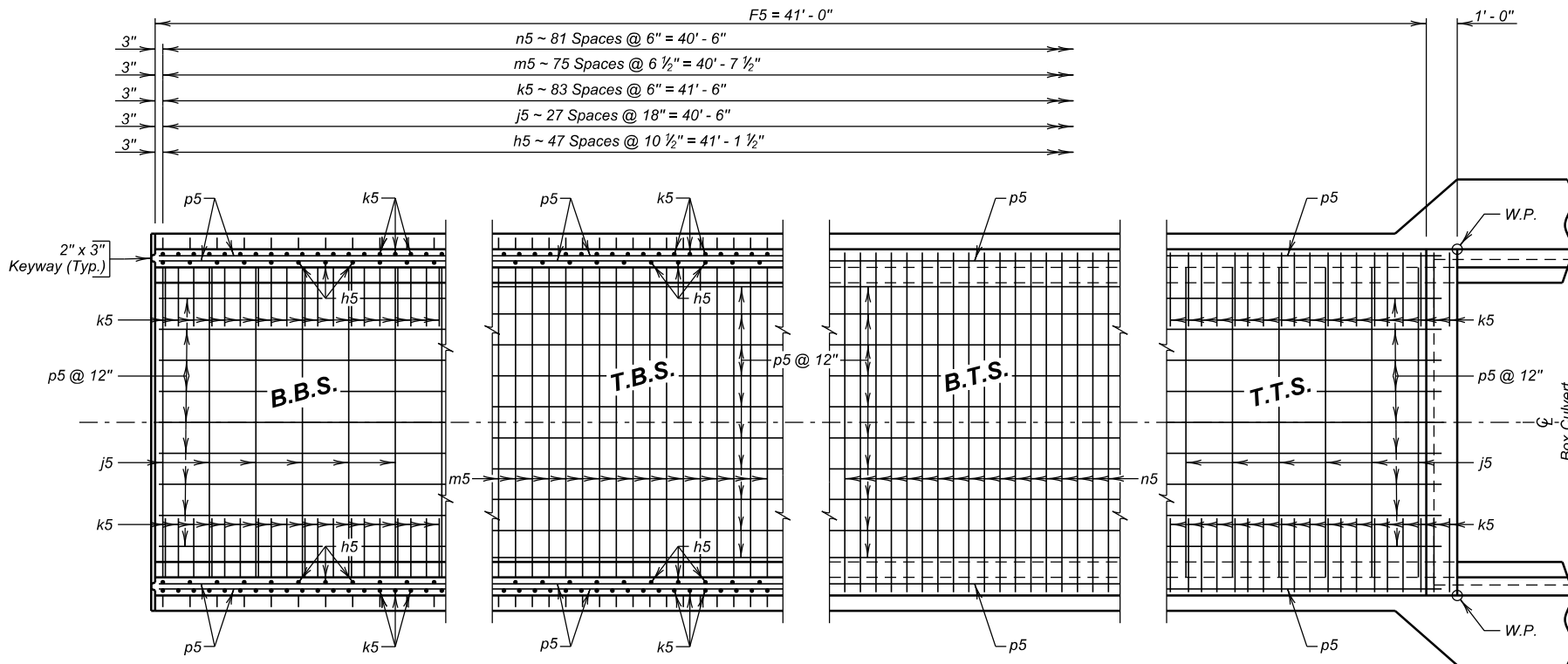
**SITE 1
ALTERNATE A**

F5 BARREL END SECTION DETAILS (41' - 0")

FOR
10' X 5' BOX CULVERT (C.I.P.)
OVER TRIB. TO CROW CREEK 0° SKEW
STA. 1217 + 01.00 SEC. 21/28-T127N-R58W
STR. NO. 46-082-100 P-PH-B-PT 0010(124)296
HL-93

MARSHALL COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2022

DESIGNED BY CM MRS05F4	CK. DES. BY BR 05F4TD05	DRAFTED BY BT <i>Steve A. Johnson</i>	BRIDGE ENGINEER
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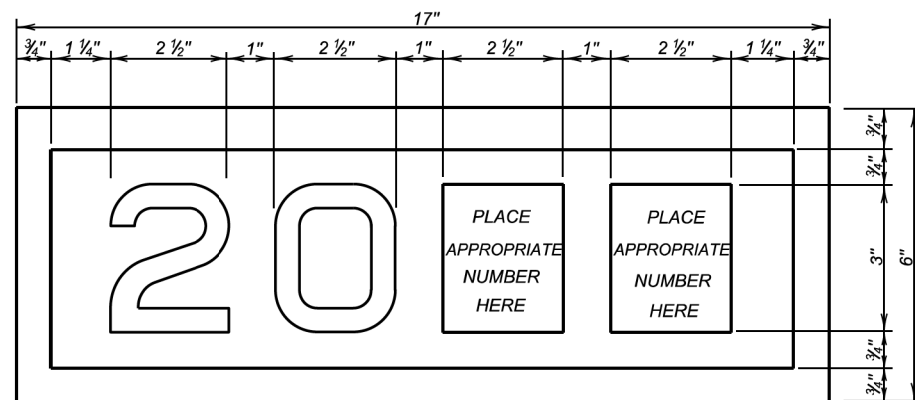


NOTE: Contractor may form the optional full fillet, with 2" Chamfer, as detailed. The cost of the additional concrete will be borne by the Contractor.

OPTIONAL POUR - BOTTOM SLAB

The Bottom Slab may be poured continuously, at the option of the Contractor, with the use of a Preformed Metal keyway conforming to the keyway dimensions and location as shown on the plans. The keyway length will be full width of the bottom slab. Care will be taken to maintain proper alignment of the keyway during the pour sequence. All additional costs of this option will be borne by the Contractor.

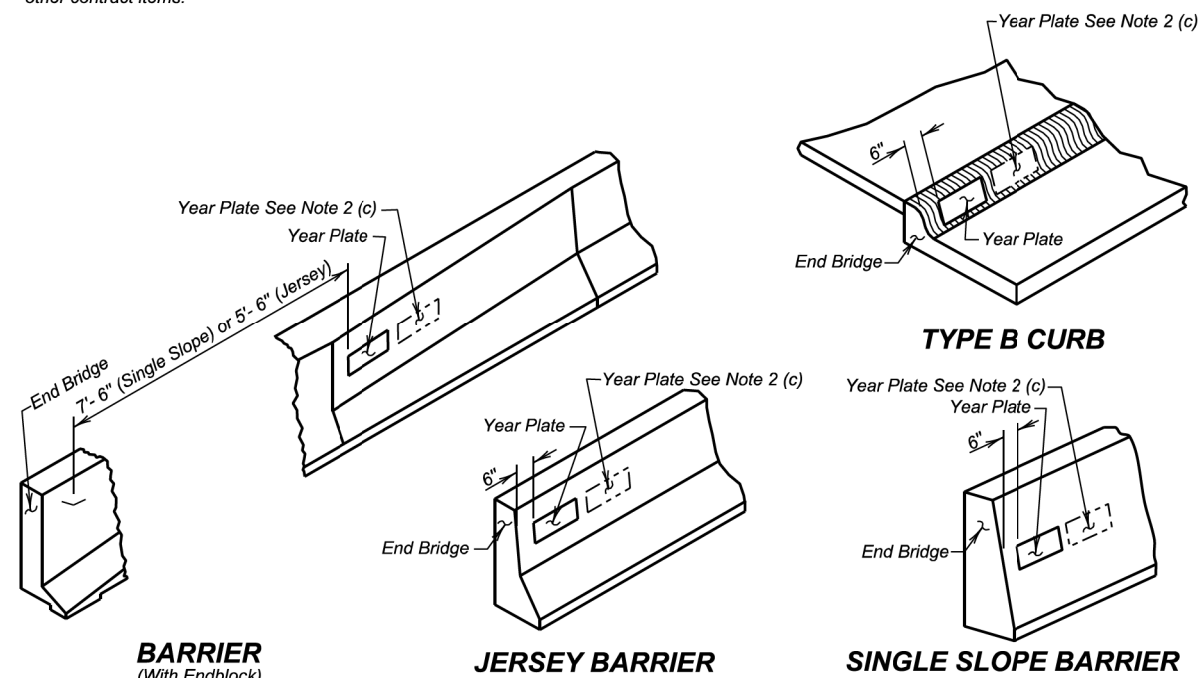
△ Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10. Quantity of z1 bars is for one construction joint.



YEAR PLATE DETAILS

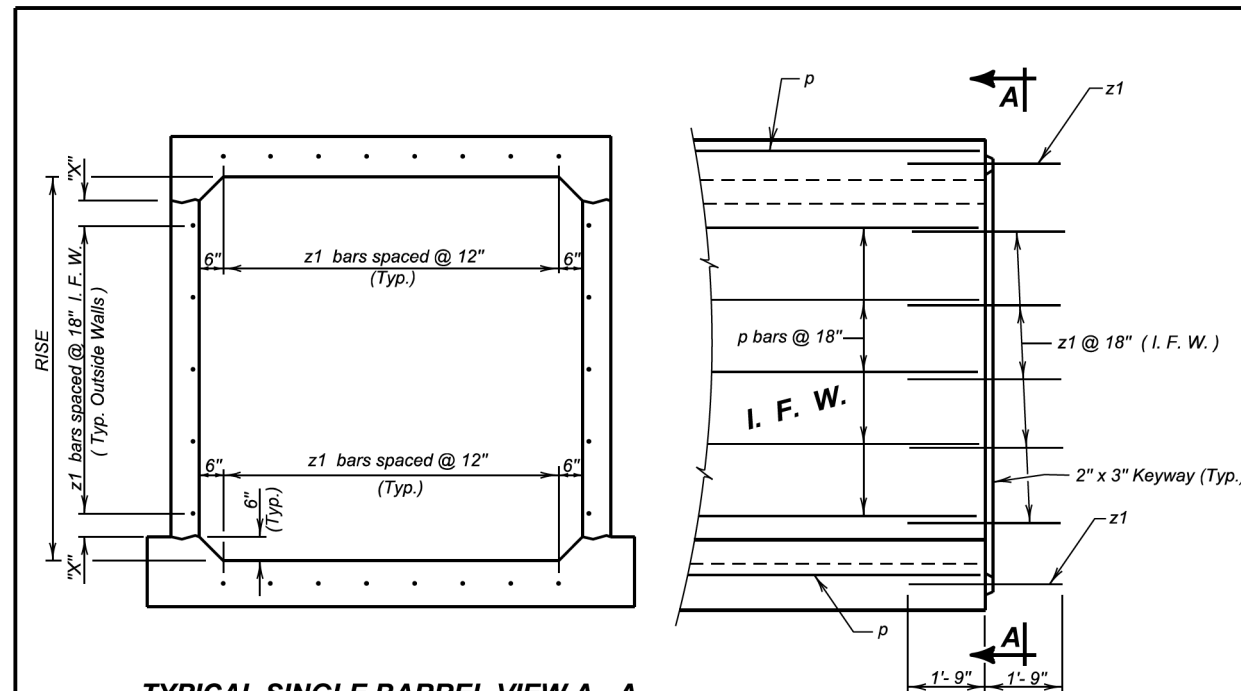
GENERAL NOTES:

- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located on structure(s) as follows:
 - On cast-in-place box culverts the year plates will be four and one-half (4 1/2) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.
 - On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'-6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.
 - When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.
- There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



January 22, 2021

Published Date: 2024	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



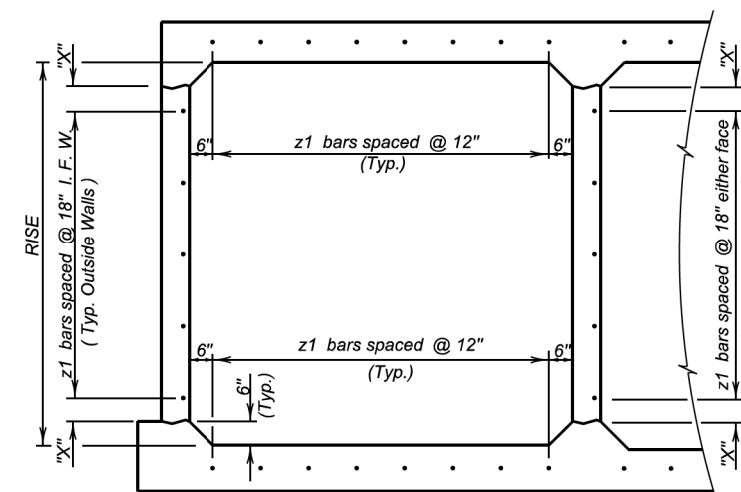
TYPICAL SINGLE BARREL VIEW A - A

ELEVATION

LEGEND FOR PLACING RE-STEEL

I. F. W. - Inside Face Wall

RISE	"X"
3'-0"	3"
4'-0"	9"
5'-0"	6"
6'-0"	3"
7'-0"	9"
8'-0"	6"
9'-0"	3"
10'-0"	9"
11'-0"	6"
12'-0"	3"
13'-0"	9"
14'-0"	6"



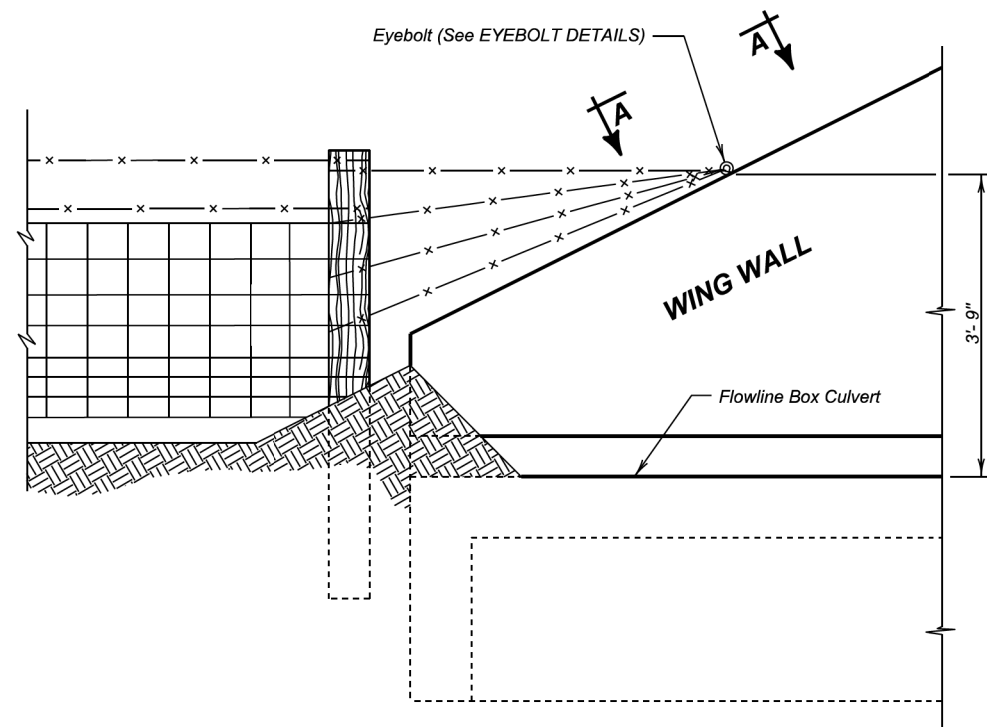
TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

- z1 bars will be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars will be lapped with the longitudinal p bars in the inside face of the wall for outside walls and in either face for interior walls. z1 bars are listed and included elsewhere in plans.
- Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

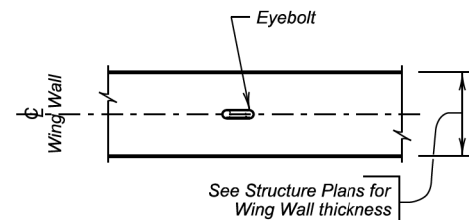
Published Date: 2024	S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1



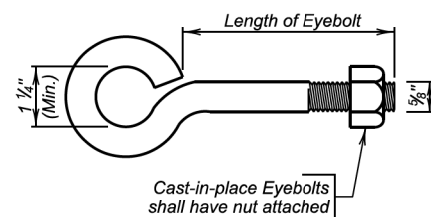
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be $\frac{5}{8}$ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be $4\frac{1}{2}$ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the $\frac{5}{8}$ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

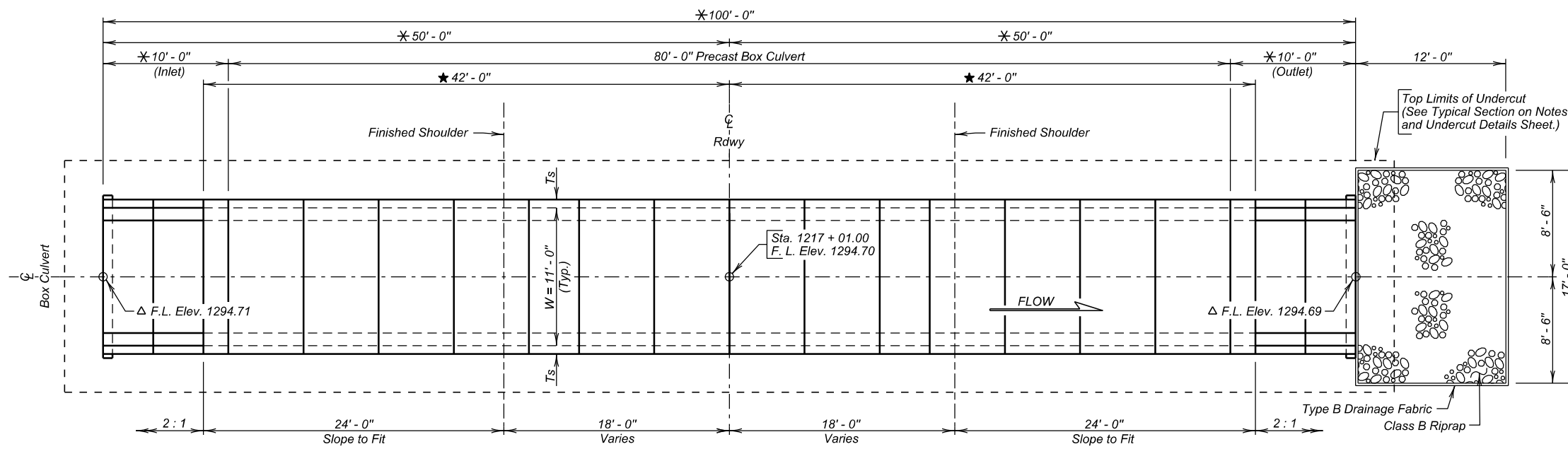
December 23, 2012

S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
	Published Date: 2024	Sheet 1 of 1

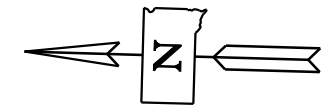
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

- * Dimension may vary with fabricator and/or installation. See Shop Plans for actual installation length.
- ★ Minimum distance to satisfy clear zone.
- △ Based on dimensions shown.
- ⌀ Based on 8" exterior walls.

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E33	E37



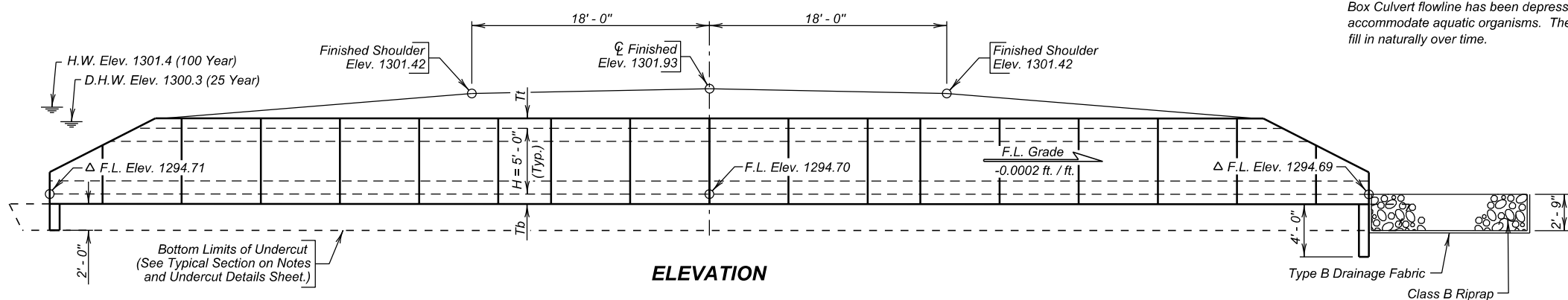
PLAN



LEGEND

- W = Width of Opening
- H = Height of Opening
- Tt = Thickness of Top Slab
- Tb = Thickness of Bottom Slab
- Ts = Thickness of Side Wall

NOTE:
Box Culvert flowline has been depressed 1'-0" below channel flowline to accommodate aquatic organisms. The 1'-0" depression will be allowed to fill in naturally over time.



ELEVATION

HYDRAULIC DATA

Q_d	231 cfs
A_d	26 sq ft
V_d	8.8 fps
Q_F	231 cfs
Q_{100}	447 cfs
Q_{OT}	$> Q_{100}$
V_{max}	9.6 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1300.3.
 Q_{OT} = Overtopping discharge and frequency >100 year recurrence interval. El. 1301.9 @ Sta. 1217 + 83±.
 Q_F = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.
 Q_{100} = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 1301.4.
 V_{max} = Maximum computed outlet velocity for the proposed culvert, based on 100 year frequency.

INDEX OF CULVERT SHEETS-

- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Notes and Undercut Details
- Sheet No. 3 - Details of Standard Plate No.'s 460.02 & 560.01
- Sheet No. 4 - Details of Standard Plate No.'s 560.10 & 560.11
- Sheet No. 5 - Details of Standard Plate No. 620.16

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Structure Excavation, Box Culvert	Cu. Yd.	37
Box Culvert Undercut	Cu. Yd.	137
Class B Riprap	Ton	29.1
Type B Drainage Fabric	Sq. Yd.	41
11' X 5' Precast Concrete Culvert, Furnish	Ft.	80
11' X 5' Precast Concrete Culvert, Install	Ft.	80
11' X 5' Precast Concrete Culvert End Section, Furnish	Each	2
11' X 5' Precast Concrete Culvert End Section, Install	Each	2

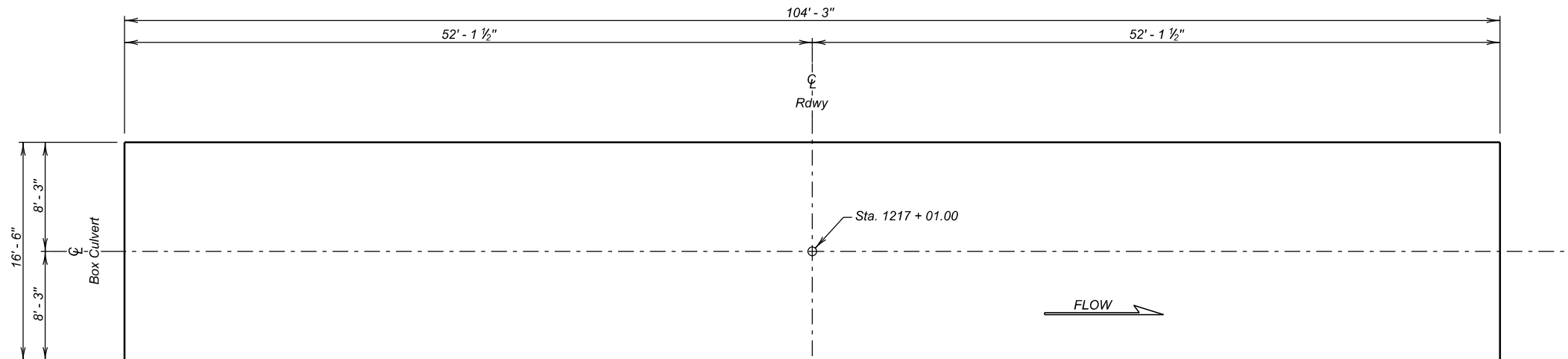
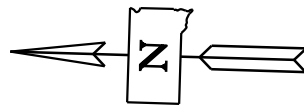
Quantity is based on 9" bottom slab, 9" top slab, 8" outside walls.
 # For estimating purposes only, a factor of 1.4 tons/cu. yd. was used to convert Cu. Yd. to Tons.

**SITE 1
ALTERNATE B
GENERAL DRAWING AND QUANTITIES**

FOR
11' X 5' BOX CULVERT (PRECAST)
 OVER TRIB. TO CROW CREEK 0° SKEW
 STA. 1217 + 01.00 SEC. 21/28-T127N-R58W
 STR. NO. 46-082-100 P-PH-B-PT 0010(124)296
 PCN 05F4 HL-93

MARSHALL COUNTY
 S. D. DEPT. OF TRANSPORTATION
 AUGUST 2022

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PT 0010(124)296	E34	E37



UNDERCUT LAYOUT
(Bottom Dimensions)

SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

Design will be in accordance with Section 560 of the Construction Specifications with the following criteria:

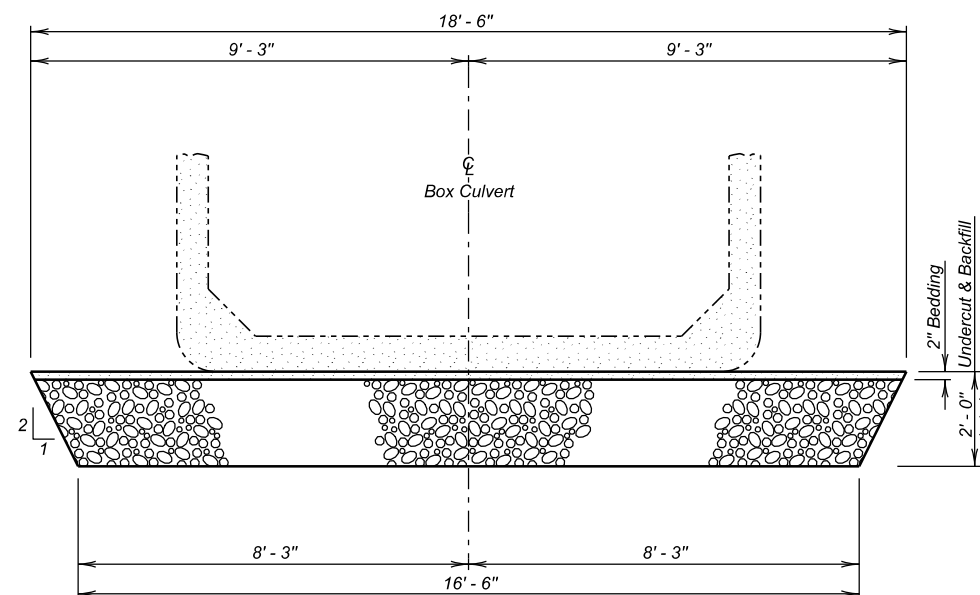
1. Box culvert and box culvert end section design will conform to the AASHTO LRFD Bridge Design Specifications, 8th Edition.
2. Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the Box Culvert. If other construction loads in excess of legal load are anticipated by the Contractor, the Contractor will submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.
3. The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with the latest Interim Revisions using the LRFR method. The rating will include evaluation of the Design HL-93 truck at both Inventory and Operating levels and a Legal Load rating for three SD legal trucks (Type 3, 3S2 and 3-2) as well as the notional rating load and four specialized hauling vehicles. The structure will also be evaluated for the emergency vehicles, EV2 and EV3, at the legal load rating level. All sections of the box culvert will rate at HL-93 or better (Inventory Level). The three SD legal loads, the notional rating load, the four specialized hauling vehicles, and two emergency vehicles will rate greater than 1.0 at legal load rating level. AASHTOWare Bridge Rating (BrR) is required to be used to rate the box culvert. Include the BrR rating model and a load rating summary table with the load rating calculations, Submit load rating calculations with the design and independent check design calculations or shop plans, as appropriate.
4. The design of the barrel sections will be based on a minimum fill height of 2 feet and include all subsequent fill heights up to and including the maximum fill height of 5 feet over the box culvert.
5. Minimum inside corner fillet shall be 6 in.
6. Minimum precast barrel section length will be 6 foot sections; however, no more than two 4 foot sections are allowed in any one length of precast barrel.
7. Lift holes will be plugged with an approved non-shrinkable grout.
8. The Fabricator will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Alternate end section details will be allowed, subject to the approval of the Bridge Construction Engineer. No additional payment will be made for any change in the barrel/end section configuration.
10. Installation of the precast sections will be in accordance with the final approved shop plans.
11. Care will be taken when placing sections. Sections will be only moved using the lifting holes by approved equipment.
12. Soils below the bottom of the proposed RCBC consist of soft brown silt clay with sand. Groundwater was encountered in the borings at an elevation of 1296.2 during the subsurface investigation conducted in July 2020. Dewatering will be required during the construction of the RCBC. All costs incurred for dewatering will be incidental to the other contract items.

DESIGN MIX OF CONCRETE

1. Mix will be as per fabricator's design; however, a minimum compressive strength will not be less than 4500 p.s.i. at 28 days.
2. High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a type V or a type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.

SHOP PLANS

The fabricator shall submit shop plans in accordance with the Construction Specifications. Include design and independent check design, if applicable, with initial submittal.



TYPICAL SECTION
(For Limits of Undercut)

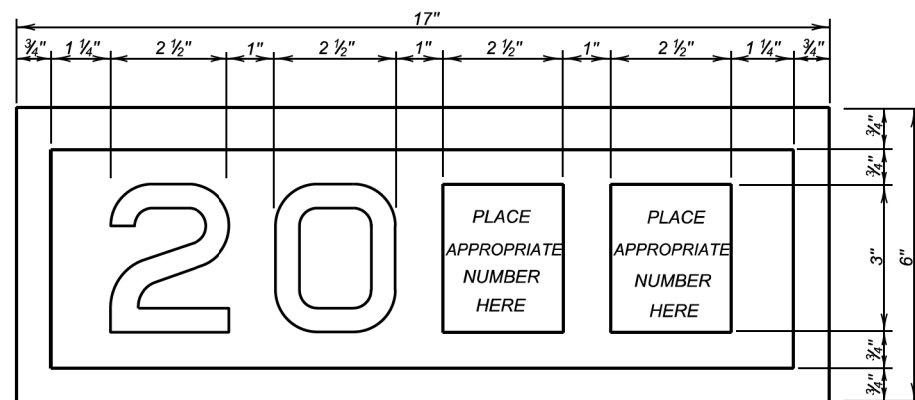
ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	137

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.

**SITE 1
ALTERNATE B**
NOTES AND UNDERCUT DETAILS
FOR
11' X 5' BOX CULVERT (PRECAST)
OVER TRIB. TO CROW CREEK 0° SKEW
STA. 1217 + 01.00 SEC. 21/28-T127N-R58W
STR. NO. 46-082-100 P-PH-B-PT 0010(124)296
HL-93

MARSHALL COUNTY
S. D. DEPT. OF TRANSPORTATION
AUGUST 2022

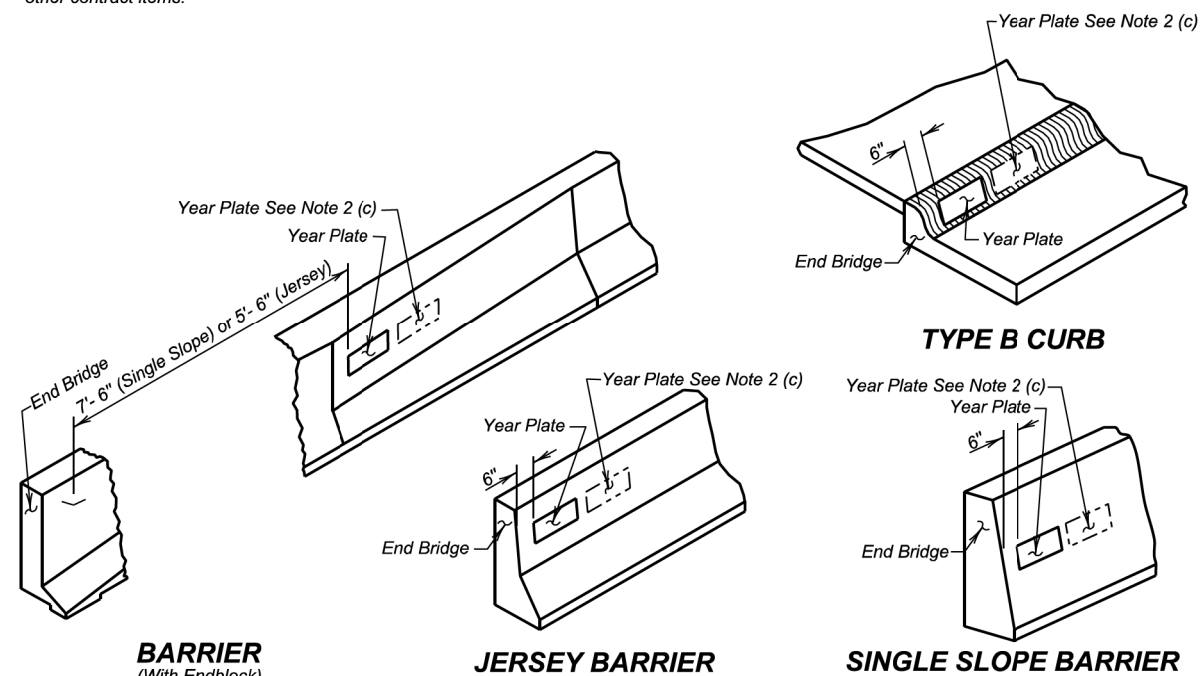
DESIGNED BY CM MRS05F4	CK. DES. BY BR 05F4TD09	DRAFTED BY BT	Steve A. Johnson BRIDGE ENGINEER
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YEAR PLATE DETAILS

GENERAL NOTES:

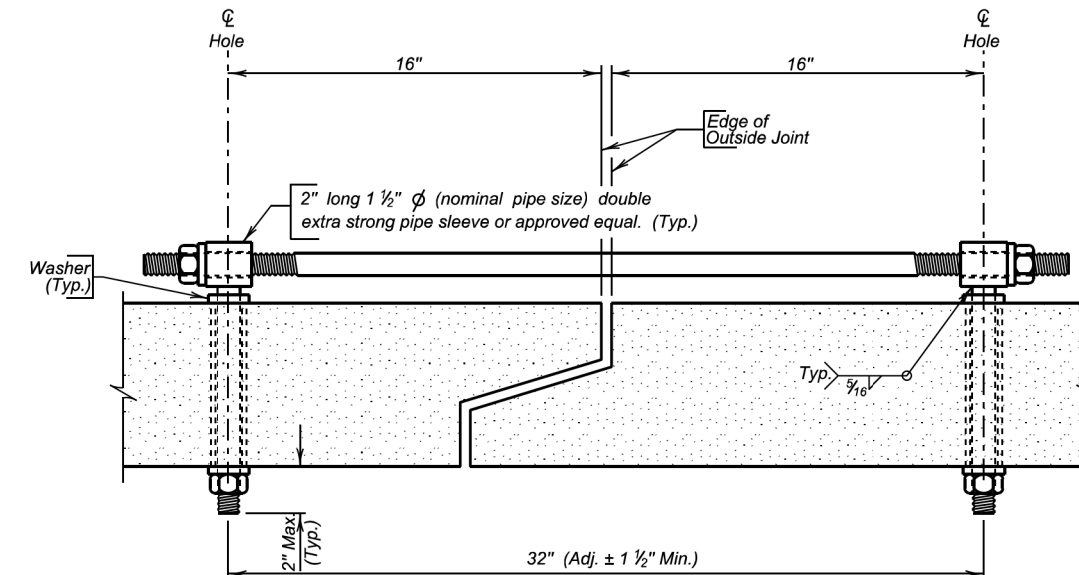
- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located on structure(s) as follows:
 - On cast-in-place box culverts the year plates will be four and one-half (4 1/2) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.
 - On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'-6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.
 - When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.
- There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



TYPE B CURB

January 22, 2021

Published Date: 2024	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1



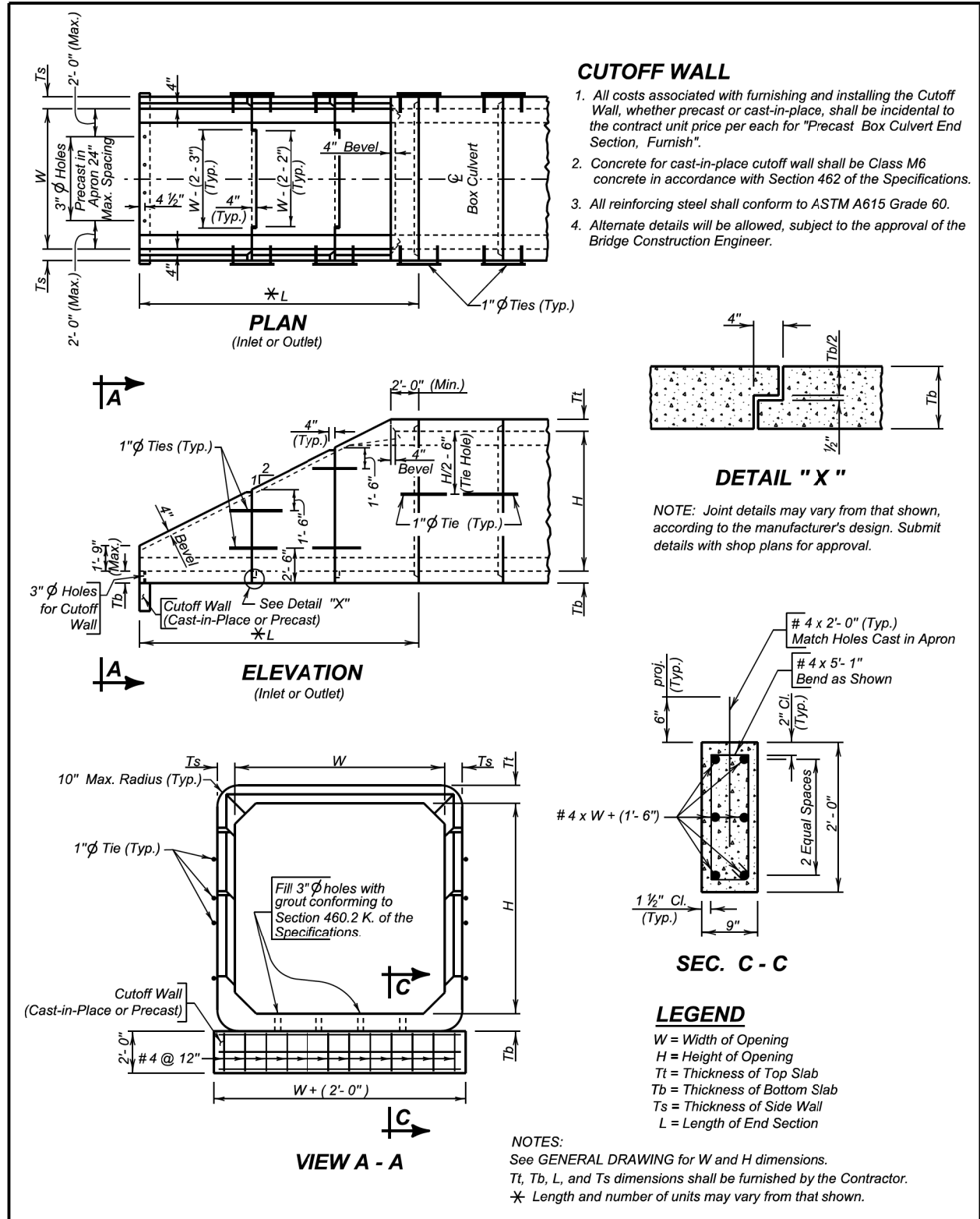
TIE BOLT ASSEMBLY

GENERAL NOTES:

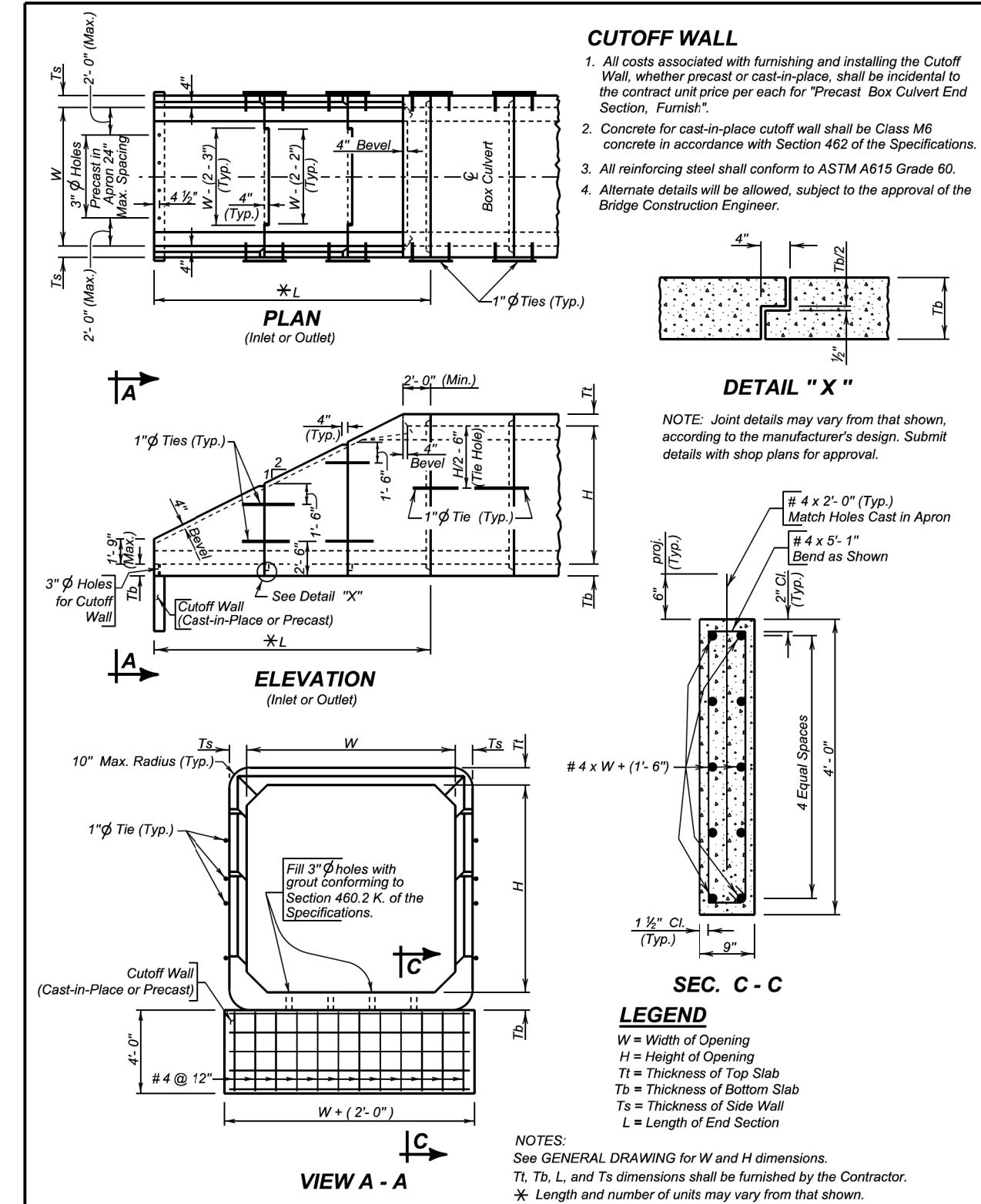
- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36, ASTM A307, or ASTM F1554, Gr. 36. Nuts shall be heavy hex in conformance with ASTM A563. Washers shall conform to ASTM F436, Type 1. The welded pipe sleeve shall conform to ASTM A53, Grade B.
- Welding and weld inspection shall be in conformance with AWS/ANSI D1.1 - (Current Year) Structural Welding Code - Steel.
- Tie Bolt Assembly shall be galvanized in accordance with ASTM A153 or ASTM F2329 as applicable.
- Tie Bolt Assembly details may vary from that shown, but alternate tie bolt assemblies are subject to testing to demonstrate equal strength. Submit details, through proper channels, to the Office of Bridge Design for approval.
- All costs for furnishing and installing the precast box culvert tie bolt assembly shall be incidental to the contract unit price per Foot for "Precast Concrete Box Culvert, Furnish".

March 21, 2016

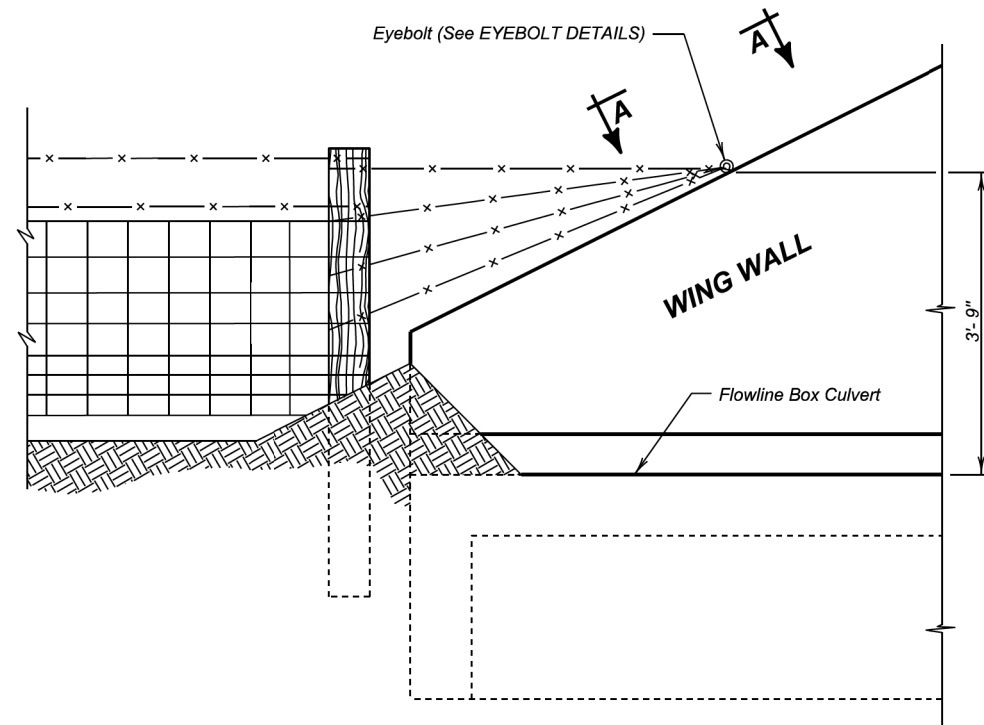
Published Date: 2024	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1



Published Date: 2024	S D D O T	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'-0" CUTOFF WALL	PLATE NUMBER 560.10
			Sheet 1 of 1



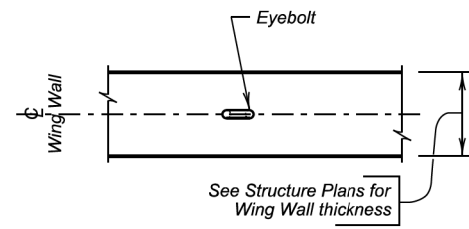
Published Date: 2024	S D D O T	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'-0" CUTOFF WALL	PLATE NUMBER 560.11
			Sheet 1 of 1



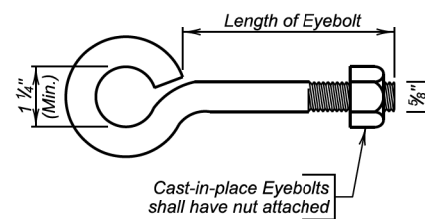
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be $\frac{5}{8}$ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be $4\frac{1}{2}$ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the $\frac{5}{8}$ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23, 2012

S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
		Sheet 1 of 1

Published Date: 2024