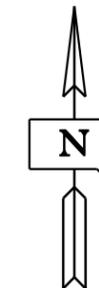


STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH 0038(48)306	E1	E21

Revised February 3, 2026 ER

Section E: Structure Plans



INDEX OF SHEETS -

Sheet E1	Layout Map and Index
Sheet E2	Estimate of Structure Quantities
Sheet E3 to E9	Str. No. 31-068-100 2 - 7' x 6' Box Culvert Extension
Sheet E10 to E16	Site 1 Alt. A : Str. No. 31-122-100 2 - 10' x 9' Box Culvert (C.I.P.)
Sheet E17 to E21	Site 1 Alt. B : Str. No. 31-122-100 2 - 11' x 9' Box Culvert (Precast)

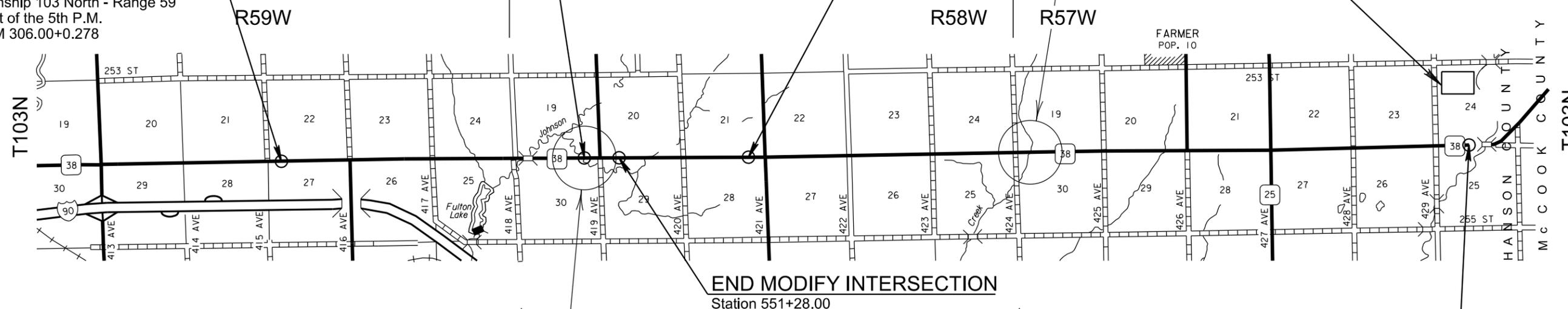
BEGIN P-PH 0038(48)306
BEGIN PIPE WORK
 Station 334+00.00 located 24.26 feet North and 1009.12 feet East of the Northwest corner of Section 27 - Township 103 North - Range 59 West of the 5th P.M.
 MRM 306.00+0.278

BEGIN MODIFY INTERSECTION
 Station 520+18.00

END PIPE WORK
BEGIN GRADING
 Station 629+60.00

Option Borrow Pit
 N 1/2 of
 Sec 24 - T103N - R57W

Site 1 Sta. 809 + 12.00
 Str. No. 31-122-100
 Alt. A : 2 - 10' x 9' Box Culvert (C.I.P.) or
 Alt. B : 2 - 11' x 9' Box Culvert (Precast)



END MODIFY INTERSECTION
 Station 551+28.00

Sta. 525 + 48.32
 Str. No. 31-068-100
 2 - 7' x 6' Box Culvert Extension

END P-PH 0038(48)306
 Station 1082+24.00 located 54.85 feet South and 1068.66 feet West of the N1/4 corner of Section 25 - Township 103 North - Range 57 West of the 5th P.M.
 MRM 320.00+0.278

SECTION E – ESTIMATE OF STRUCTURE QUANTITIES

Str. No. 31-068-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	15	CuYd
421E0200	Box Culvert Undercut	54	CuYd
460E0120	Class A45 Concrete, Box Culvert	25.4	CuYd
460E0300	Breakout Structural Concrete	13.8	CuYd
460E0380	Install Dowel in Concrete	32	Each
480E0100	Reinforcing Steel	3,241	Lb
700E0310	Class C Riprap	87.8	Ton
831E0110	Type B Drainage Fabric	90	SqYd

Site 1 – Alternate A

Str. No. 31-122-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	92	CuYd
421E0200	Box Culvert Undercut	145	CuYd
460E0120	Class A45 Concrete, Box Culvert	222.5	CuYd
480E0100	Reinforcing Steel	30,393	Lb
700E0210	Class B Riprap	77.0	Ton
831E0110	Type B Drainage Fabric	89	SqYd

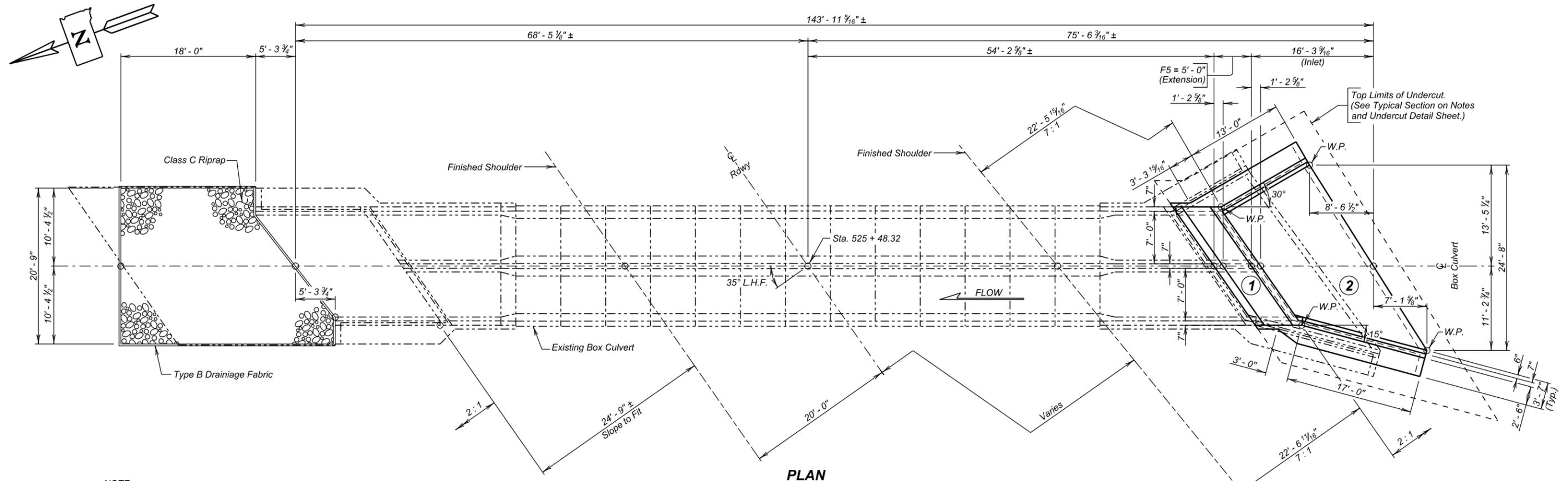
Site 1 – Alternate B

Str. No. 31-122-100

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	82	CuYd
421E0200	Box Culvert Undercut	128	CuYd
560E2146	2-11'x9' Precast Concrete Box Culvert, Furnish	80.0	Ft
560E2147	2-11'x9' Precast Concrete Box Culvert, Install	80.0	Ft
560E3146	2-11'x9' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E3147	2-11'x9' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	82.7	Ton
831E0110	Type B Drainage Fabric	95	SqYd

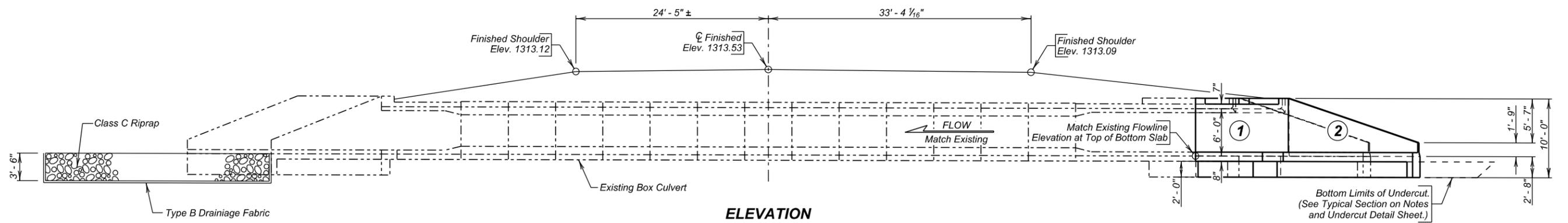
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH0038(48)306	E3	E21



PLAN

NOTE:
All stations and elevations are based on survey of the existing box culvert. The intent is to match the existing box location, flowline and slope.



ELEVATION

INDEX OF CULVERT SHEETS-

- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Notes and Undercut Details
- Sheet No. 3 - Breakout and Dowel Placement Details
- Sheet No. 4 - Inlet Details (A)
- Sheet No. 5 - Inlet Details (B)
- Sheet No. 6 - F5 Barrel End Section Details (5' - 0")
- Sheet No. 7 - Details of Standard Plate No's 460.03 and 620.16

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Breakout Structural Concrete	Cu. Yd.	13.8
Install Dowel in Concrete	Each	32
Class A45 Concrete, Box Culvert	Cu. Yd.	25.4
Reinforcing Steel	Lb.	3241
Structure Excavation, Box Culvert	Cu. Yd.	15.0
Box Culvert Undercut	Cu. Yd.	54
Type B Drainage Fabric	Sq. Yd.	90
* Class C Riprap	Ton	87.8

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

GENERAL DRAWING AND QUANTITIES

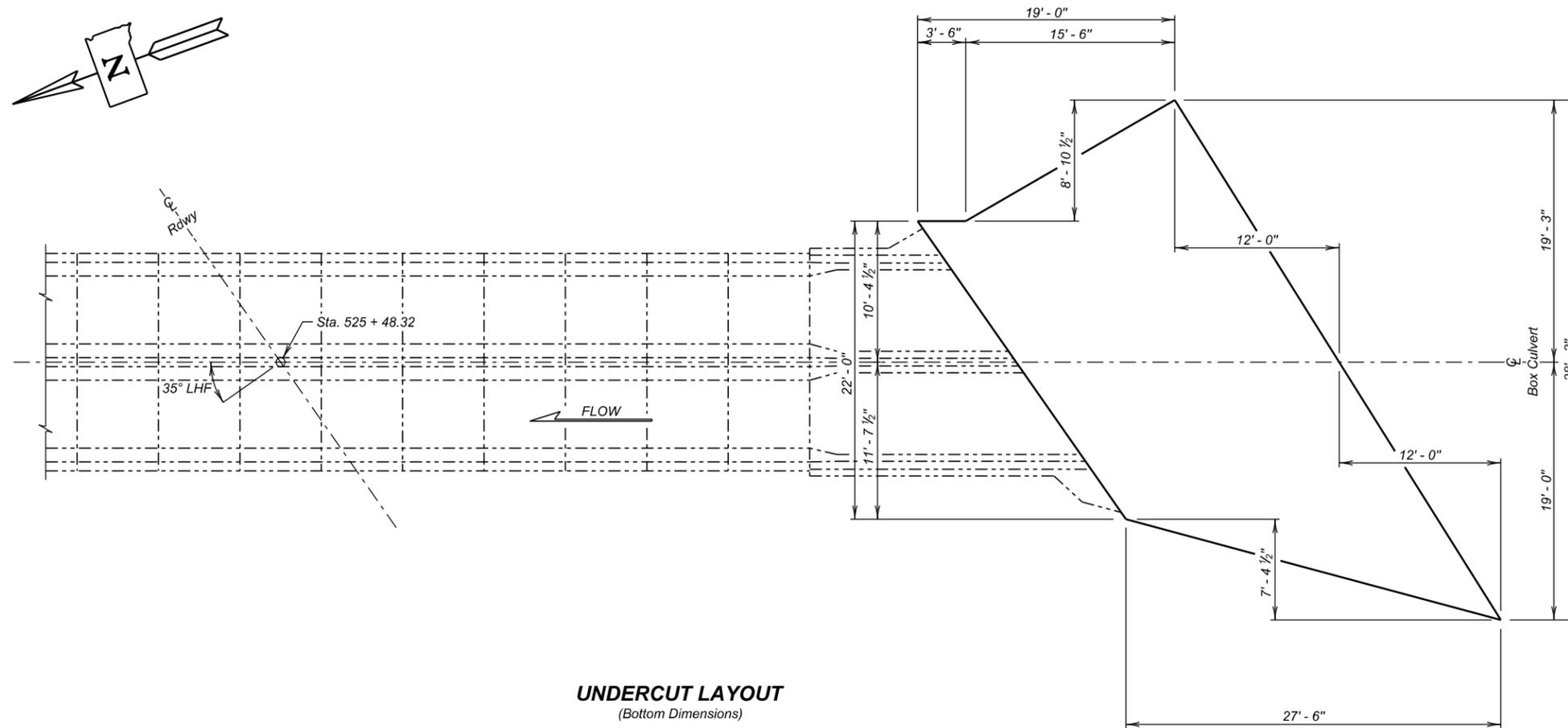
FOR
2 - 7' X 6' BOX CULVERT EXTENSION
OVER JOHNSON CRK. TRIB. 35° LHF SKEW
STA. 525 + 48.32 SEC. 30/19-T103N-R58W
STR. NO. 31-068-100 P-PH 0038(48)306
PCN 05FA HL-93

HANSON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2024

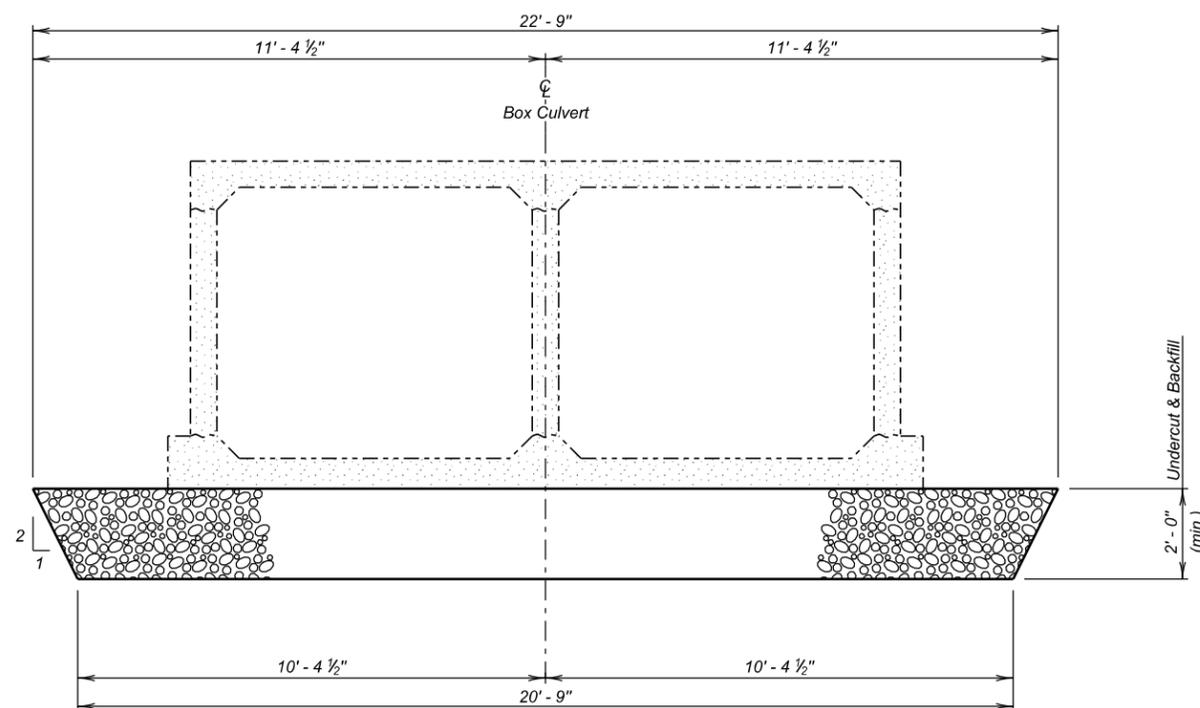
PLANS BY:
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FATA01	DRAFTED BY BT/MG	<i>Steve Johnson</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH0038(48)306	E4	E21



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 10-1-25 Version, Required Provisions, and Special Provisions as included in the Proposal. The Standard Specifications for Roads and Bridges are available for download and viewing at <https://dot.sd.gov/doing-business/contractors/standard-specifications>.

GENERAL NOTES

1. Design Live Load: HL-93. No construction loading in excess of legal load was considered.
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 feet (F5).
3. Design Material Strengths: Concrete $f'_c = 4500$ p.s.i.
Reinforcing Steel $f_y = 60000$ p.s.i.
4. All concrete will be Class A45 conforming to Section 460 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 concrete corners and 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 the existing box culvert construction as well as the date of new construction as specified and detailed on Standard Plate 460.03.
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. The proposed box culvert extension will be constructed within a slough area. Soft compressible materials will be encountered below the box extension footprint.
14. Surface water was not observed at the time of field investigation (August 2022); however, groundwater can be expected to be encountered. Dewatering will be required for construction of the RCBC. All cost incurred for dewatering will be incidental to other contract items.

DIMENSIONS OF EXISTING BOX CULVERT

All details and dimensions of the Existing Box Culvert, contained in these plans, are based upon the original construction plans and as-built information only. It is the Contractor's responsibility to inspect and verify the actual field conditions and any necessary dimensions affecting the satisfactory completion of the work required for this project. Original construction plans can be obtained from the Office of Bridge Design.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	54

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 - 7' X 6' BOX CULVERT EXTENSION
OVER JOHNSON CRK. TRIB. 35° LHF SKEW
STA. 525 + 48.32 SEC. 30/19-T103N-R58W
STR. NO. 31-068-100 P-PH 0038(48)306
HL-93

HANSON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2024

DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FATA02	DRAFTED BY MG	<i>Steve A. Johnson</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH0038(48)306	E5	E21

BREAKOUT STRUCTURAL CONCRETE

- This work will consist of breaking out and disposing of structural concrete. All broken out concrete and other discarded material will be disposed of in accordance with the WASTE DISPOSAL SITE notes found in the Environmental Commitments Notes.
- Define the breakout limits with 3/4 inch deep saw cuts.
- Any additional breakout required due to spalling or cracking of the existing structure will be determined by the Engineer. Where additional breakout in the barrel section of the existing structure is required, care will be taken not to damage any of the existing reinforcing steel. All steel will be left in place and thoroughly cleaned by sandblasting.
- Additional breakout in existing walls or top slab will require shoring up of the parapet and top slab, as directed by the Engineer.
- Plans quantity payment will be full compensation for this item regardless of the quantity actually broken out, unless measurement is ordered by the Engineer. If the Engineer orders breakout beyond the limits shown, this additional breakout will be paid for at the contract unit price per cubic yard for Breakout Structural Concrete. If additional breakout is caused by the Contractor's operations, no additional payment will be made.
- Breakout Structural Concrete will be paid for at the contract unit price per cubic yard. This payment will be full compensation for furnishing all materials, labor, tools and equipment necessary or incidental to breaking out the structural concrete. Payment includes, but is not limited to, excavation required to perform the required breakout, sawcutting, breaking out concrete, cleaning, and sandblasting reinforcing steel and concrete surfaces, and removing and disposing of all waste materials to satisfactorily complete the work.

INSTALLING DOWELS IN CONCRETE

- The epoxy resin mixture will be of a type for bonding steel to hardened concrete and will conform to AASHTO M235 Type IV, Grade 3 (Equivalent to ASTM C881 Type IV, Grade 3).
- The diameter of the drilled holes shall not be less than 1/8 inch greater, nor more than 3/8 inch greater than the diameter of the dowels or as per the Manufacturer's recommendations. Holes will not be drilled using core bits. The drilled holes will be blown out with compressed air using a device that will reach the back of the hole to ensure that all debris or loose material has been removed prior to epoxy injection.
- Mix epoxy resin as recommended by the Manufacturer and apply by an injection method as approved by the Engineer. Beginning at the back of the drilled holes, fill the holes 1/3 to 1/2 full of epoxy, or as recommended by the Manufacturer, prior to insertion of the steel bar. Care will be taken to prevent epoxy from running out of the horizontal holes prior to steel bar insertion. Rotate the steel bar during installation to eliminate voids and ensure complete bonding of the bar. Insertion of the bars by the dipping or painting methods will not be allowed.
- No loads will be applied to the epoxy grouted dowel bars until the epoxy resin has had sufficient time to cure as specified by the epoxy resin manufacturer.
- Embed dowels 8" into existing concrete.
- Dowel bars will be #6 deformed bars conforming to ASTM A615 Grade 60.
- The cost of drilling holes, epoxy resin, dowels, installation, and other incidental items will be included in the contract unit price per each for Install Dowel in Concrete.

ESTIMATED QUANTITIES

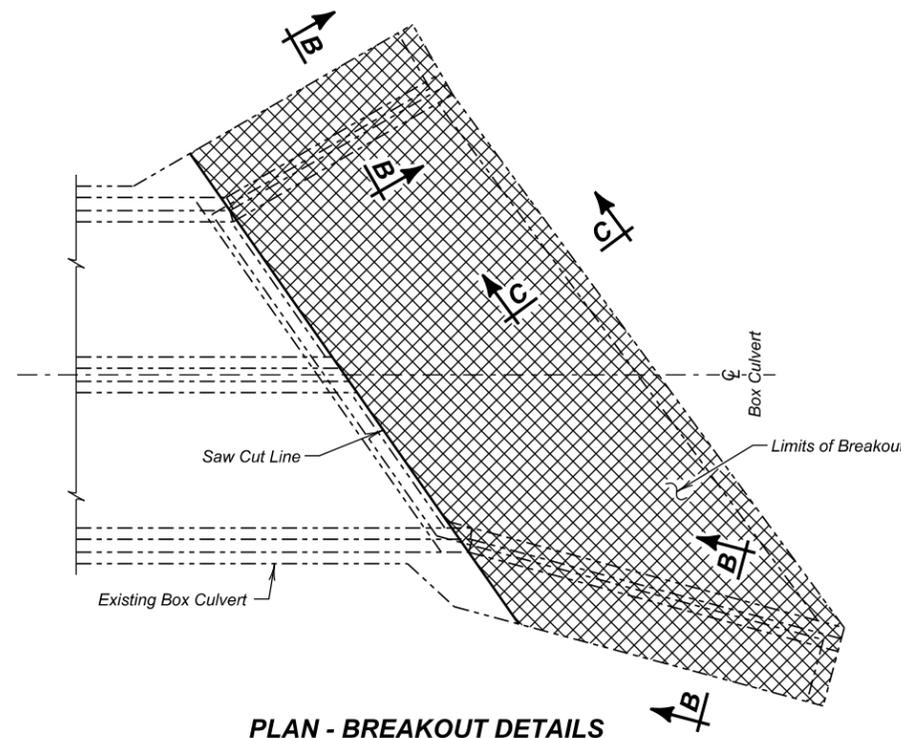
ITEM	UNIT	QUANTITY
Breakout Structural Concrete	Cu. Yd.	13.8
Install Dowel in Concrete	Each	32

BREAKOUT AND DOWEL PLACEMENT DETAILS FOR

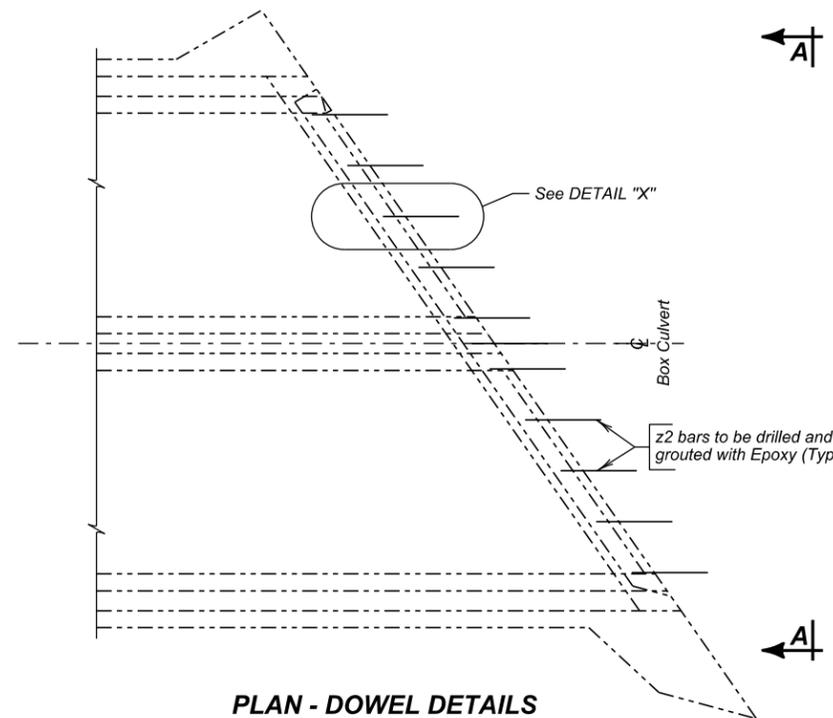
2 - 7' X 6' BOX CULVERT EXTENSION
 OVER JOHNSON CRK. TRIB. 35° LHF SKEW
 STA. 525 + 48.32 SEC. 30/19-T103N-R58W
 STR. NO. 31-068-100 P-PH 0038(48)306
 HL-93

HANSON COUNTY
 S. D. DEPT. OF TRANSPORTATION
 APRIL 2024

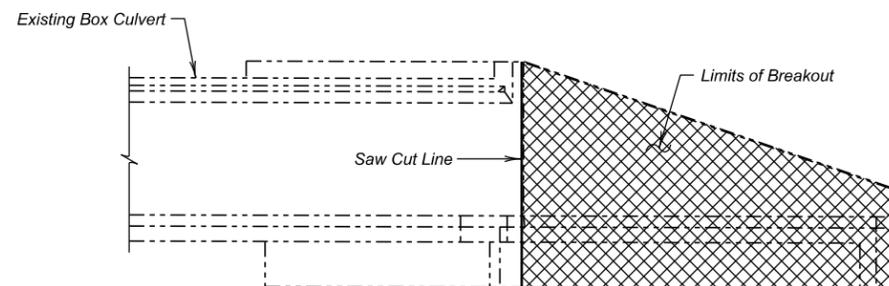
DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FATA03	DRAFTED BY MG	<i>Steve A. Johnson</i> BRIDGE ENGINEER
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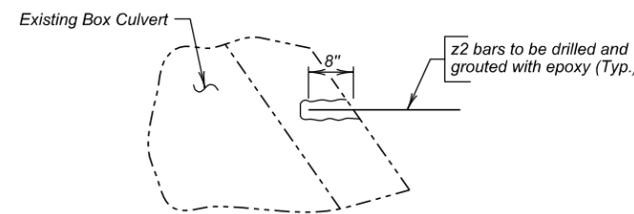
PLAN - BREAKOUT DETAILS



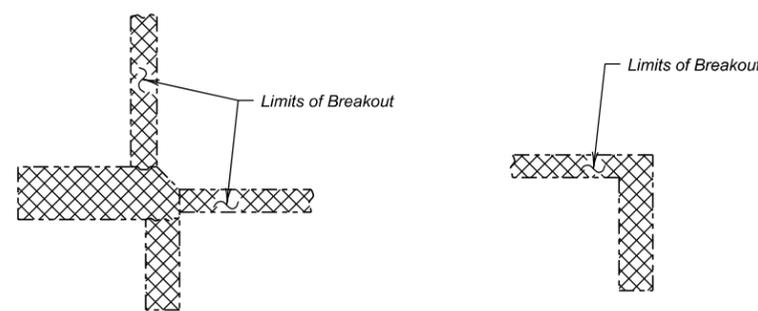
PLAN - DOWEL DETAILS



ELEVATION - BREAKOUT DETAILS

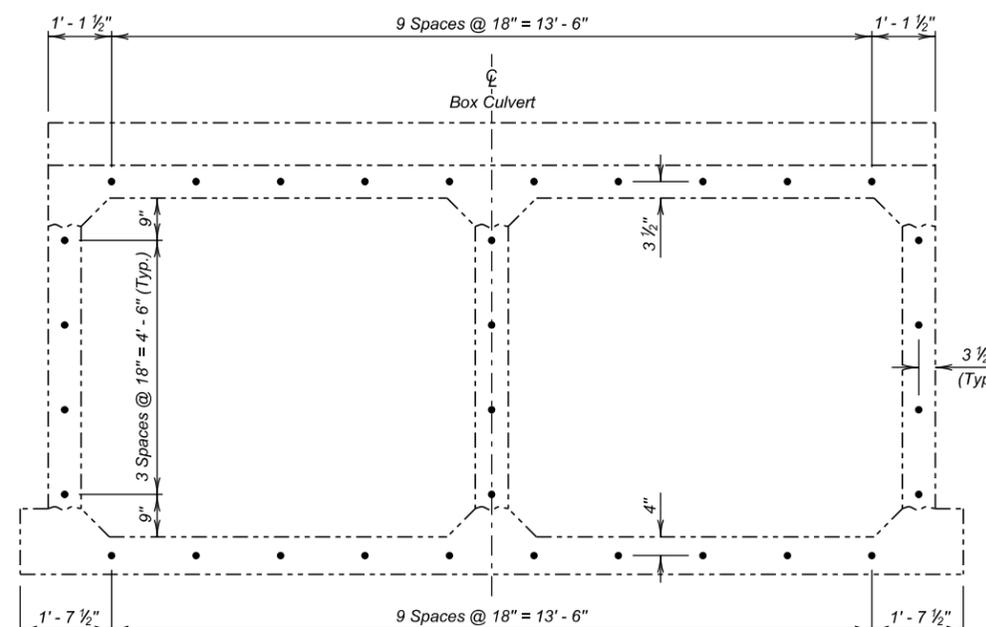


DETAIL "X"



SECTION B - B

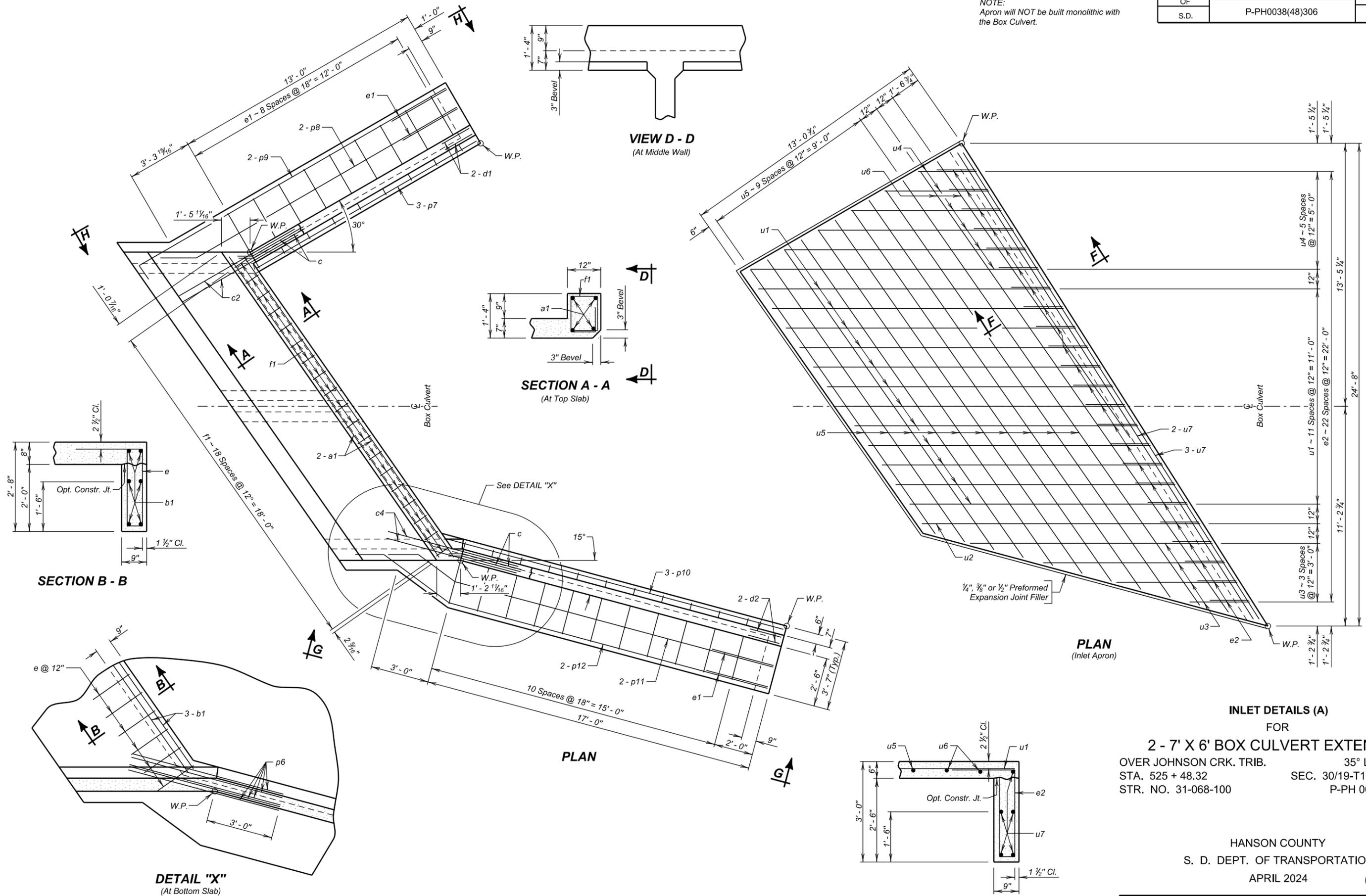
SECTION C - C



VIEW A - A
(Dowel Locations)

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH0038(48)306	E6	E21

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



PLAN
(Inlet Apron)

PLAN

SECTION F - F

DETAIL "X"
(At Bottom Slab)

INLET DETAILS (A)
FOR

2 - 7' X 6' BOX CULVERT EXTENSION
OVER JOHNSON CRK. TRIB. 35° LHF SKEW
STA. 525 + 48.32 SEC. 30/19-T103N-R58W
STR. NO. 31-068-100 P-PH 0038(48)306
HL-93

HANSON COUNTY
S. D. DEPT. OF TRANSPORTATION

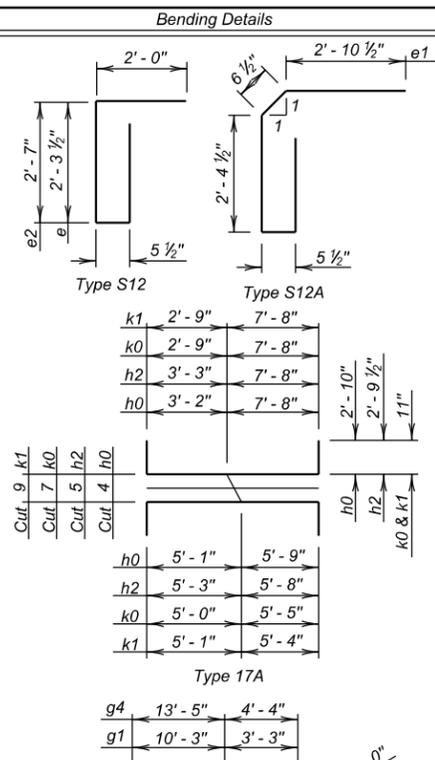
APRIL 2024

DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FATA04	DRAFTED BY MG	<i>Steve A. Johnson</i> BRIDGE ENGINEER
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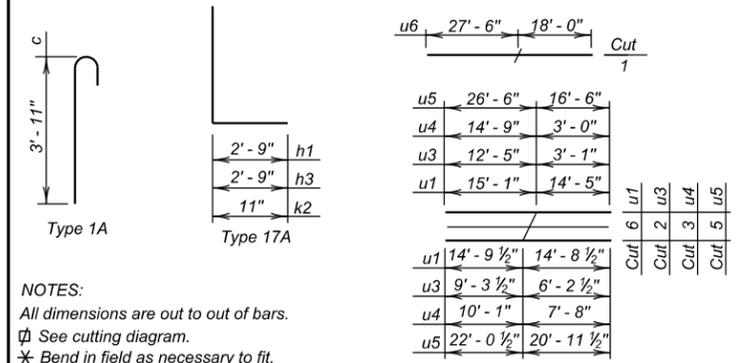
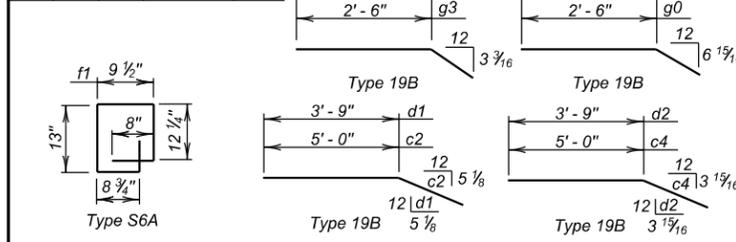
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH0038(48)306	E7	E21

REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type
a1	4	6	18'-9"	Str.
b1	6	6	17'-3"	Str.
c	4	5	4'-6"	1A
c1	4	5	14'-0"	Str.
c2	2	5	7'-0"	19B
c3	4	5	17'-9"	Str.
c4	2	5	7'-0"	19B
d1	4	5	5'-6"	19B
d2	4	5	5'-6"	19B
e	18	4	7'-0"	S12
e1	24	4	8'-6"	S12A
f1	19	4	5'-0"	S6A
g0	6	5	5'-0"	19B
g1	5	4	17'-6"	19B
g2	2	4	14'-9"	19B
g3	6	5	5'-0"	19B
g4	5	4	21'-9"	19B
g5	2	4	18'-9"	19B
h0	4	4	16'-6"	17A
h1	1	4	5'-3"	17A
h2	5	4	16'-6"	17A
h3	1	4	5'-6"	17A
k0	7	4	12'-3"	17A
k1	9	4	12'-3"	17A
k2	1	4	3'-3"	17A
p6	10	6	7'-0"	Str.
p7	7	4	15'-6"	Str.
p8	2	4	17'-3"	Str.
p9	2	4	19'-0"	Str.
p10	7	4	19'-6"	Str.
p11	2	4	20'-9"	Str.
p12	2	4	22'-6"	Str.



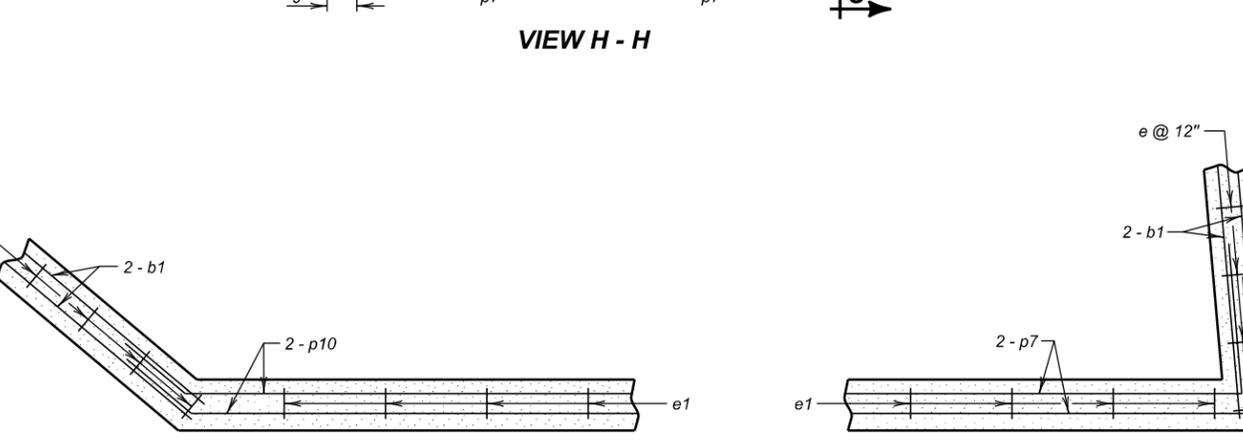
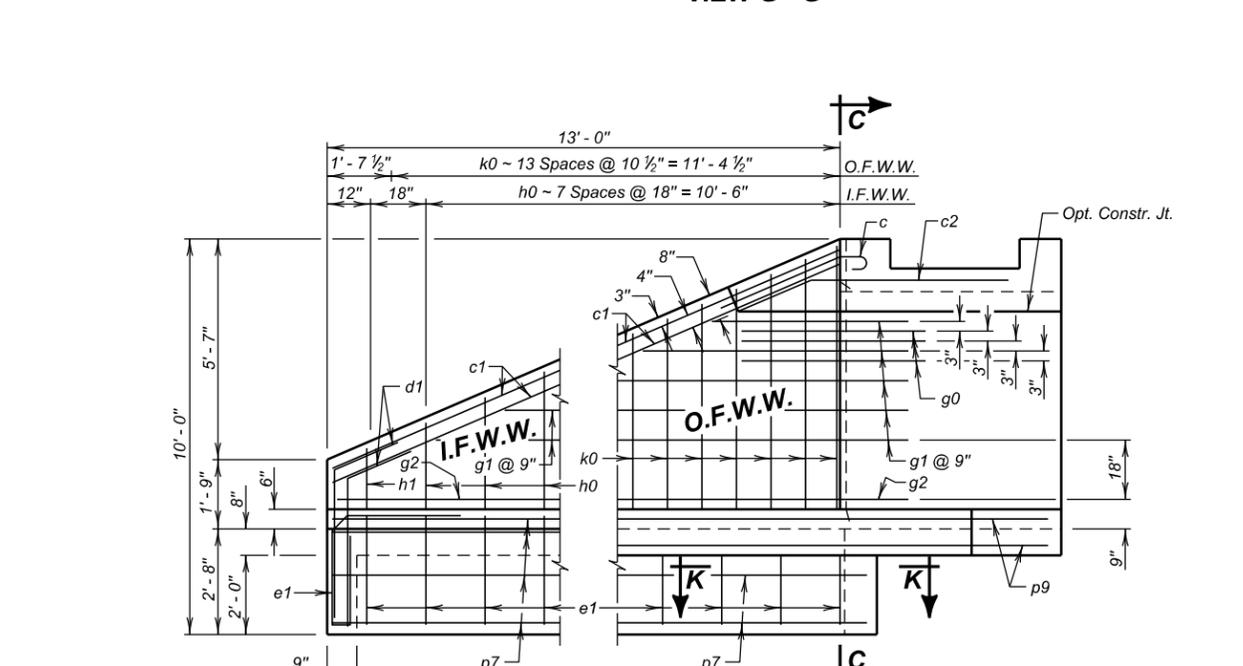
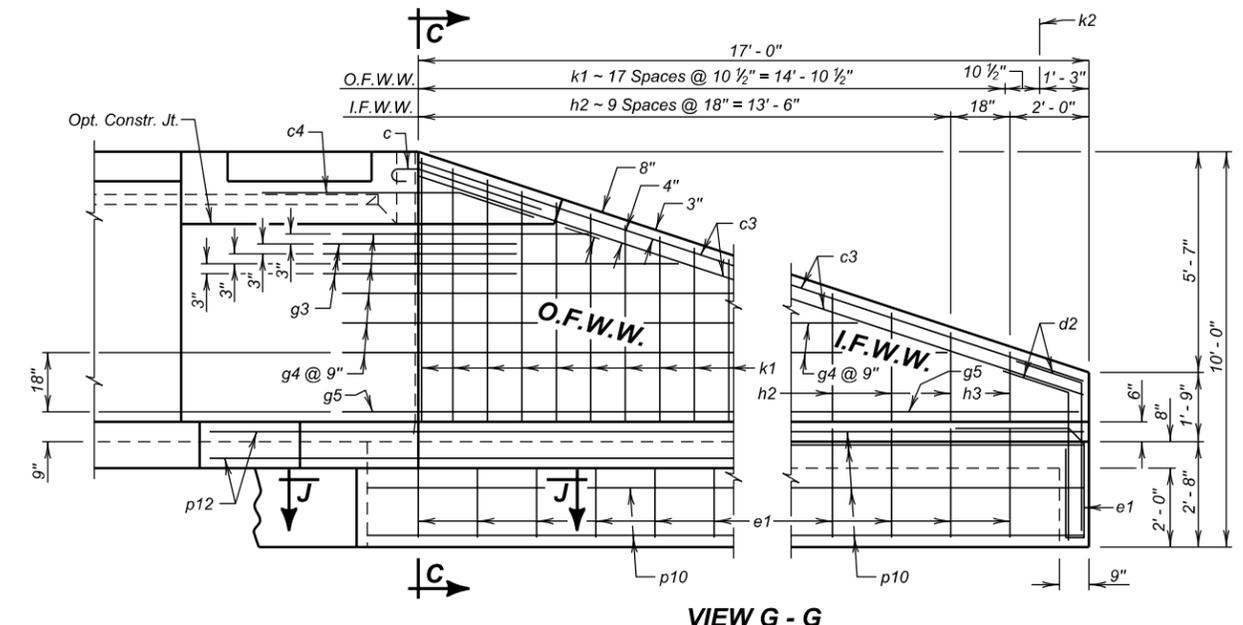
Mk.	No.	Size	Length	Type
e2	23	4	7'-6"	S12
u1	6	4	29'-6"	Str.
u2	1	4	14'-3"	Str.
u3	2	4	15'-6"	Str.
u4	3	4	17'-9"	Str.
u5	5	4	43'-0"	Str.
u6	1	4	45'-6"	Str.
u7	5	4	28'-3"	Str.



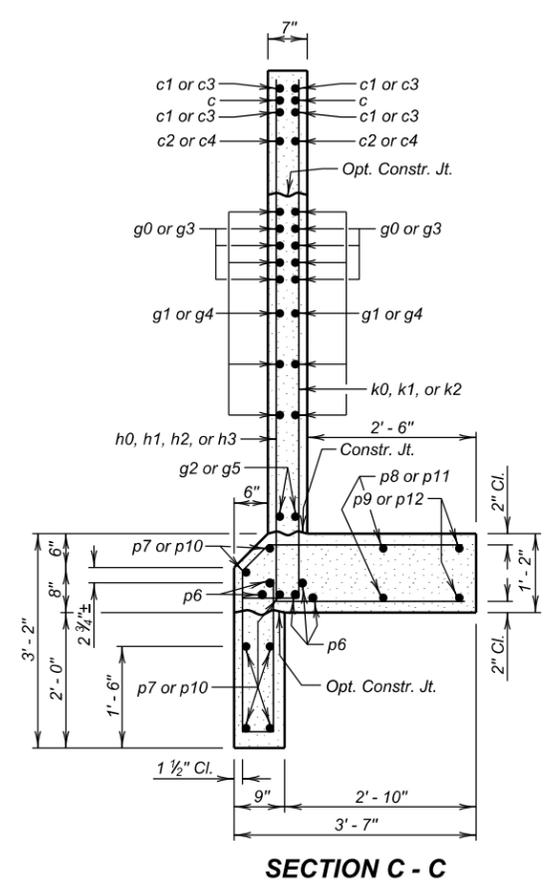
NOTES:
 All dimensions are out to out of bars.
 ☉ See cutting diagram.
 * Bend in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	12.3	1631	6.3
Inlet Apron	6.6	568	6.6



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



INLET DETAILS (B)
 FOR
2 - 7' X 6' BOX CULVERT EXTENSION
 OVER JOHNSON CRK. TRIB. 35° LHF SKEW
 STA. 525 + 48.32 SEC. 30/19-T103N-R58W
 STR. NO. 31-068-100 P-PH 0038(48)306
 HL-93

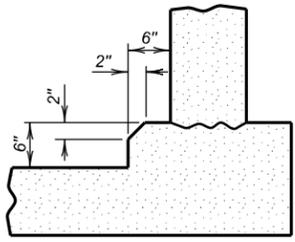
HANSON COUNTY
 S. D. DEPT. OF TRANSPORTATION
 APRIL 2024

DESIGNED BY ER HANS05FA
 CK. DES. BY SD 05FATA05
 DRAFTED BY MG
 Steve A. Johnson
 BRIDGE ENGINEER

REINFORCING SCHEDULE

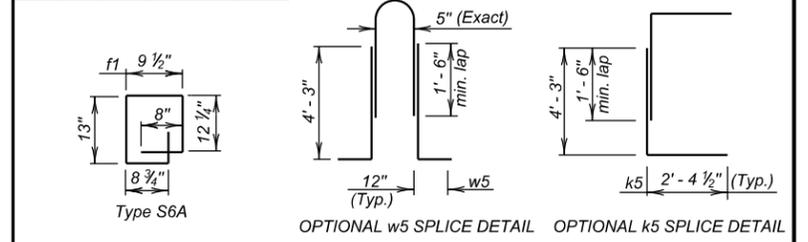
(For One F5 Barrel End Section)

Mk.	No.	Size	Length	Type	Bending Details	
a1	4	6	18'-9"	Str.	Type 17	
f1	19	4	5'-0"	S6A	Type 17A	
h5	12	4	7'-6"	17A	Type S11A	
j5	8	4	17'-9"	Str.		
k5	16	4	11'-9"	17		
m5	7	4	20'-0"	Str.		
n5	6	4	18'-9"	Str.		
p5	87	4	5'-6"	Str.		
s5	6	4	5'-0"	Str.		
w5	7	4	16'-6"	S11A		
z2	32	6	2'-3"	Str.		



FILLET DETAIL
(At Bottom Slab)

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 w5 SPLICE DETAIL OPTIONAL k5 SPLICE DETAIL

NOTES:
All dimensions are out to out of bars.
* Quantity of z2 bars is not included in reinforcing steel. See BREAKOUT AND DOWEL PLACEMENT DETAILS Sheet.
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.
1 - F5 Barrel End Section @ 5' - 0"	6.5	1042	2.1

LEGEND FOR PLACING RE-STEEL

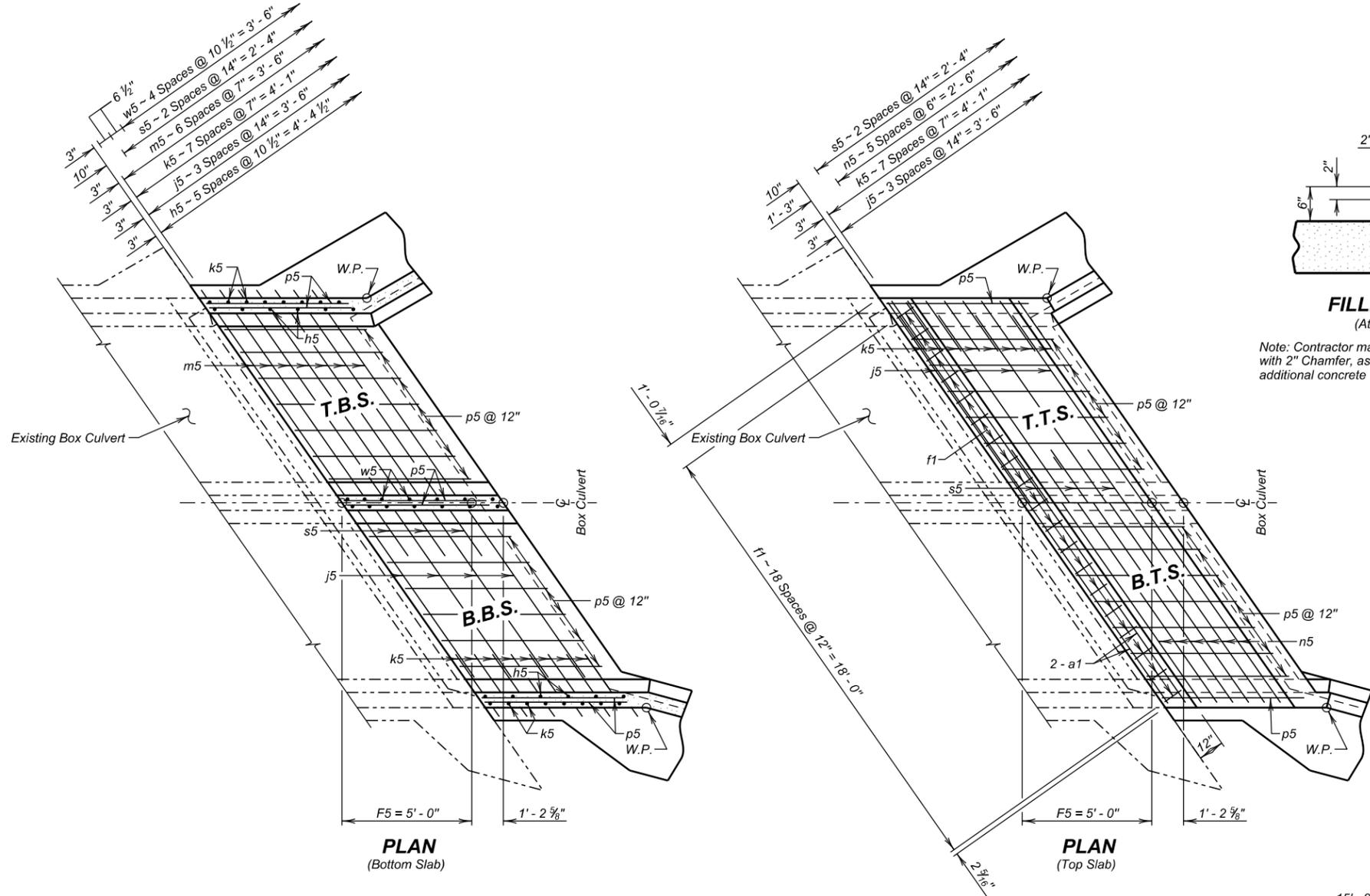
T.T.S. - Top of Top Slab
B.T.S. - Bottom of Top Slab
T.B.S. - Top of Bottom Slab
B.B.S. - Bottom of Bottom Slab
O.F.O.W. - Outside Face of Outside Wall
I.F.O.W. - Inside Face of Outside Wall
M.W. - Middle Wall

F5 BARREL END SECTION DETAILS (5' - 0")

FOR
2 - 7' X 6' BOX CULVERT EXTENSION
OVER JOHNSON CRK. TRIB. 35° LHF SKEW
STA. 525 + 48.32 SEC. 30/19-T103N-R58W
STR. NO. 31-068-100 P-PH 0038(48)306
HL-93

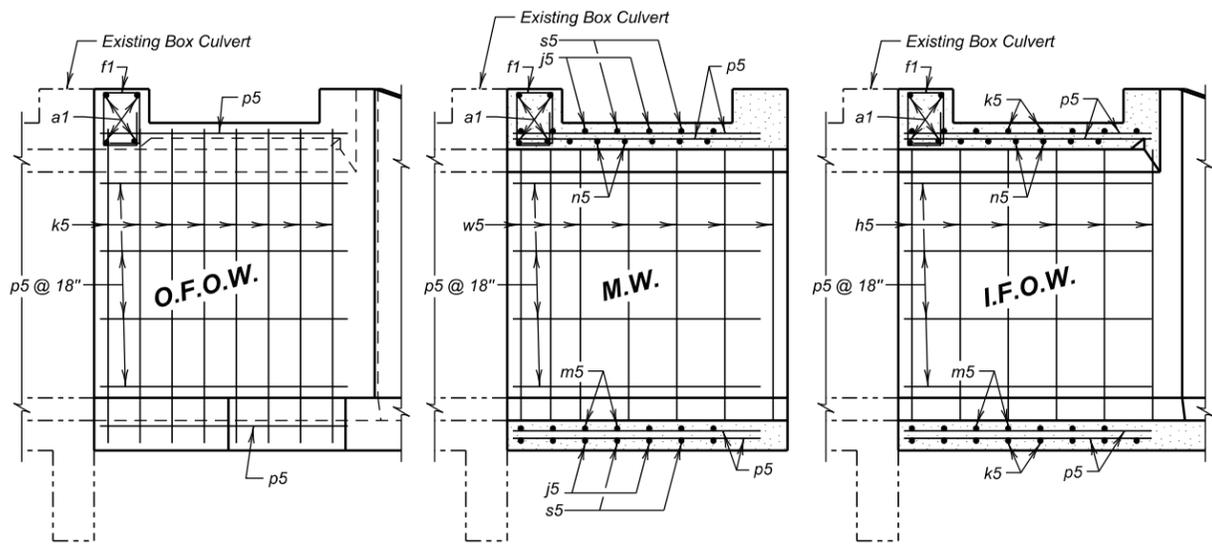
HANSON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2024

DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FATA06	DRAFTED BY MG	<i>Steve A. Johnson</i> BRIDGE ENGINEER
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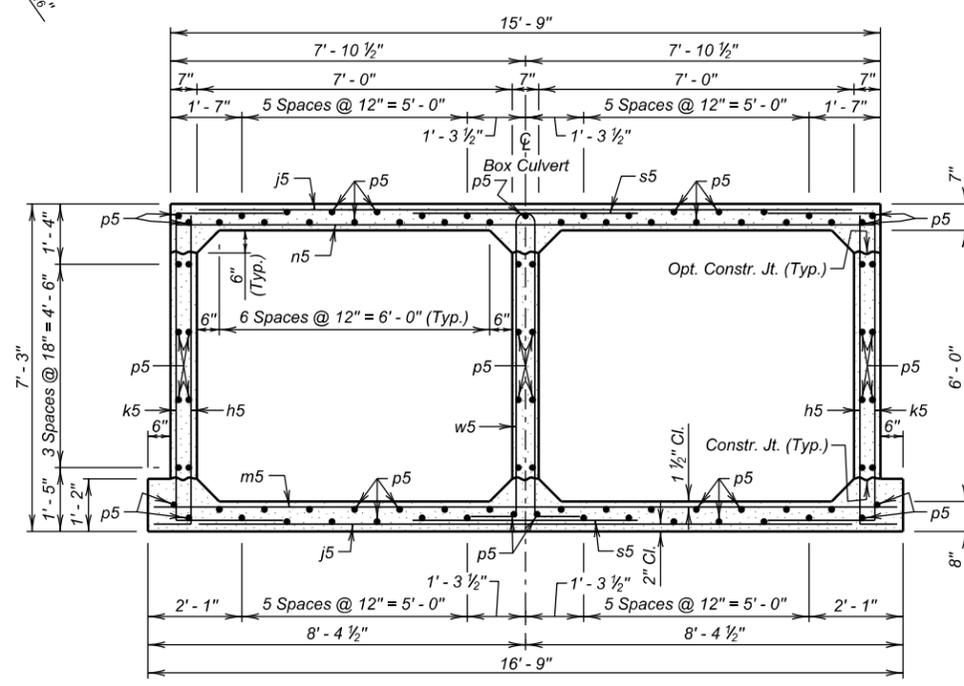


PLAN
(Bottom Slab)

PLAN
(Top Slab)

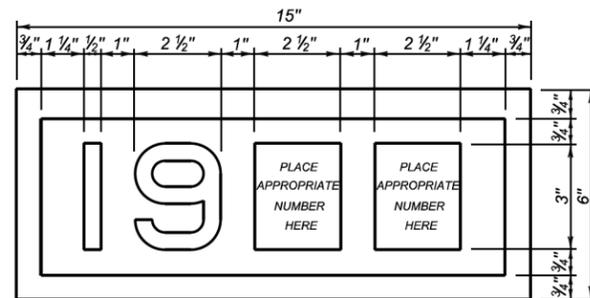


ELEVATION

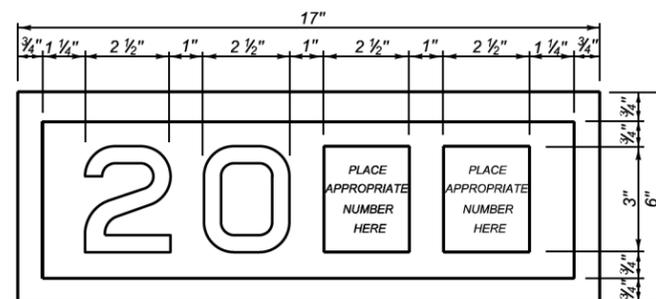


F5 BARREL SECTION
(5' - 0" Maximum Fill)

**YEAR PLATE
DETAILS FOR
ORIGINAL CONSTRUCTION**

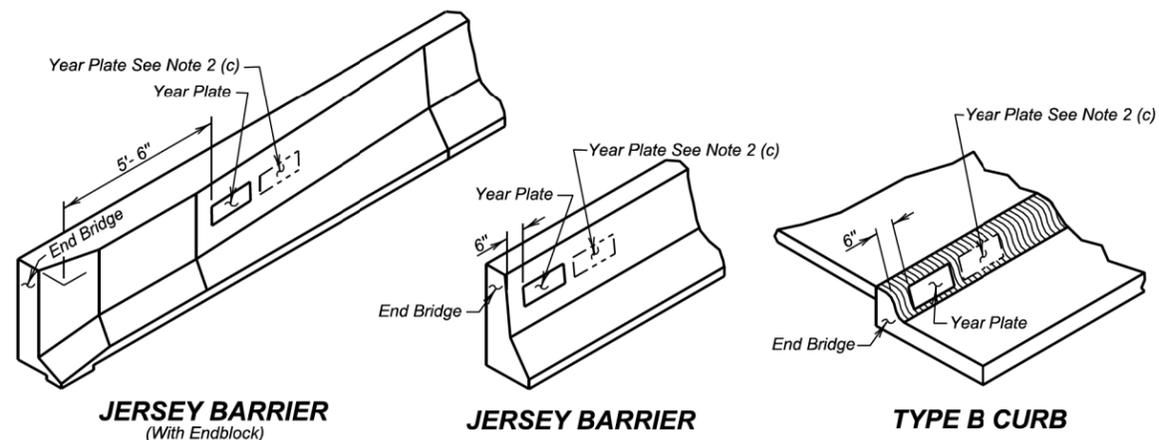


**YEAR PLATE
DETAILS FOR
NEW CONSTRUCTION**



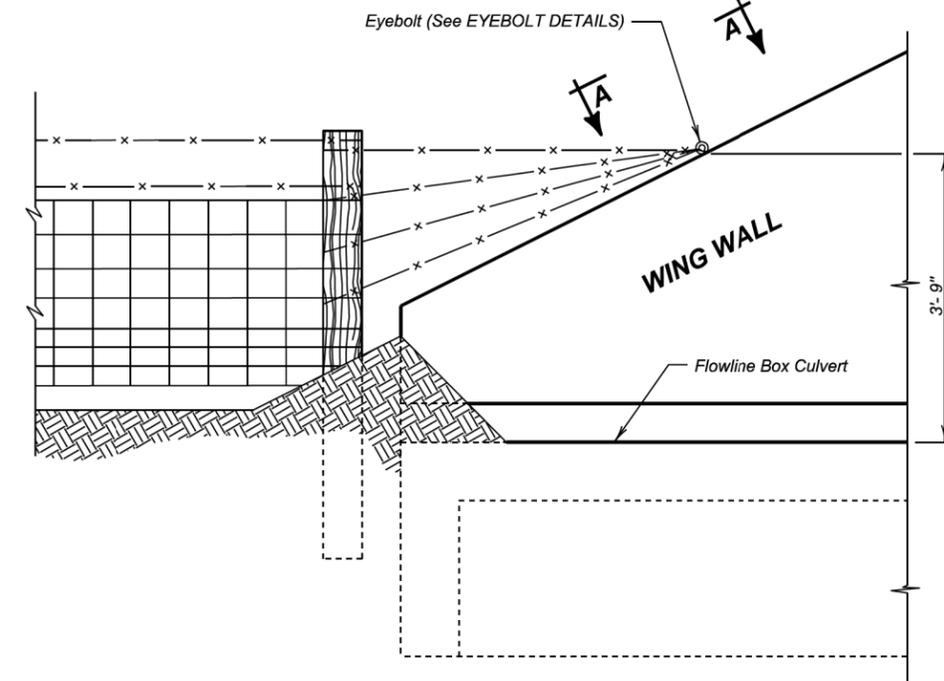
GENERAL NOTES:

- Year plates of the general dimensions shown shall be constructed on all box culverts and bridges. The year plates shall 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 shall be located on structure(s) as follows:
 - On cast-in-place box culverts the year plates shall 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 shall be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate shall be centered in an adjacent barrel.
 - On bridges with six (6) inch curbs or "Jersey" shaped barriers with no endblocks, the year plate shall 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 "Jersey" shaped barrier endblocks, the year plate shall be centered on the upper sloped portion of the barrier approximately 5'-6" from the end of the bridge, or as designated by the Engineer. There shall 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 shall be placed as listed above and the other located adjacent to it. Both year plates shall 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 shall be incidental to other contract items.



June 26, 2012

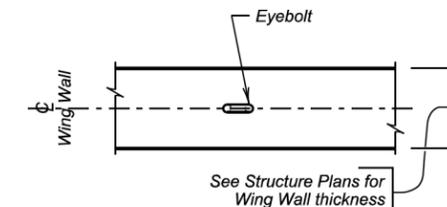
Published Date: 2026	S D D O T	DUAL DATE YEAR PLATE DETAILS	PLATE NUMBER 460.03
			Sheet 1 of 1



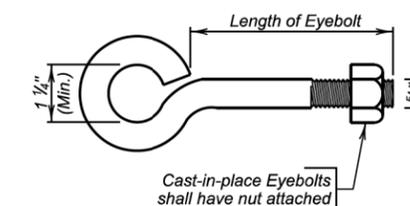
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

- The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
- Eyebolts shall be placed on all of the box culvert wing walls.
- Eyebolts shall be 5/8 inch diameter and shall conform to ASTM A307.
- 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.
- Cast-in-place eyebolts shall have a nut attached, be 4 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 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.
- The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

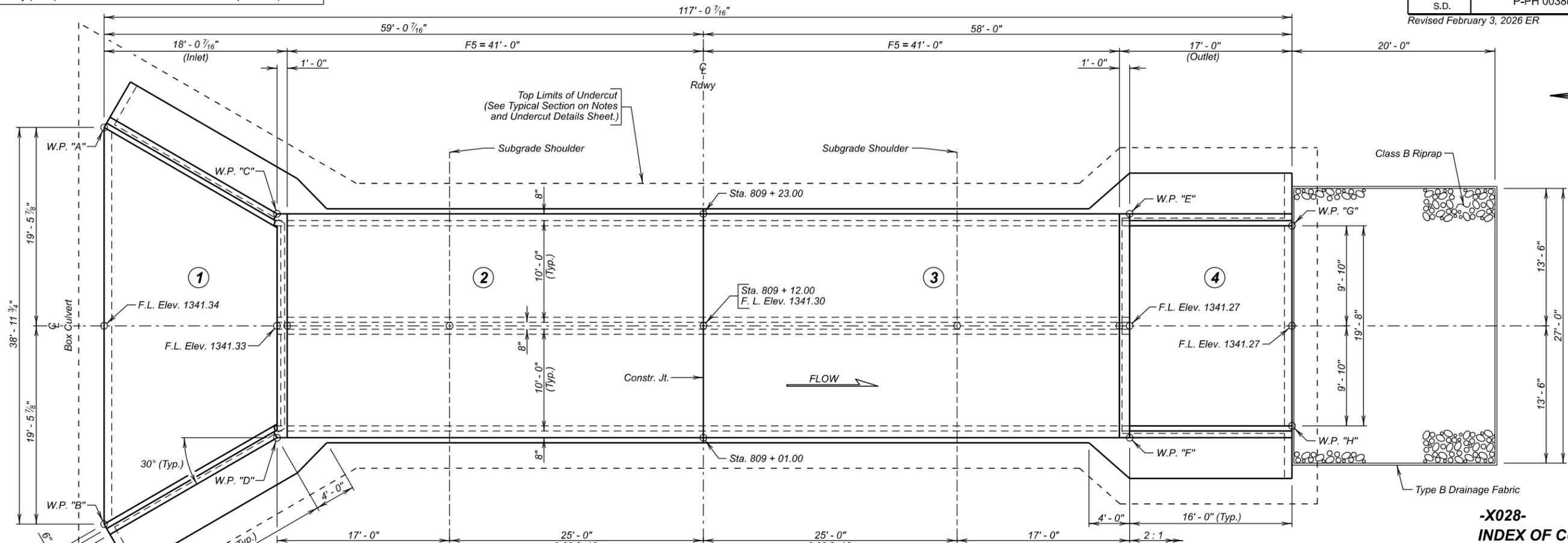
December 23, 2012

Published Date: 2026	S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
			Sheet 1 of 1

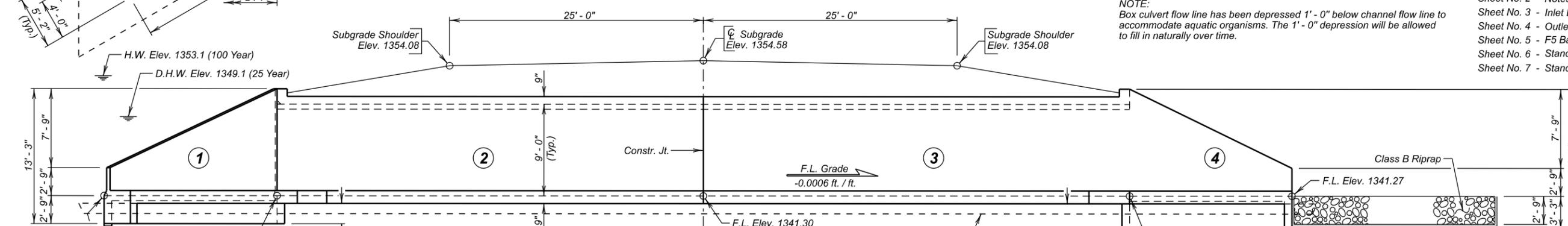
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH 0038(48)306	E10	E21

Revised February 3, 2026 ER



PLAN



ELEVATION

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

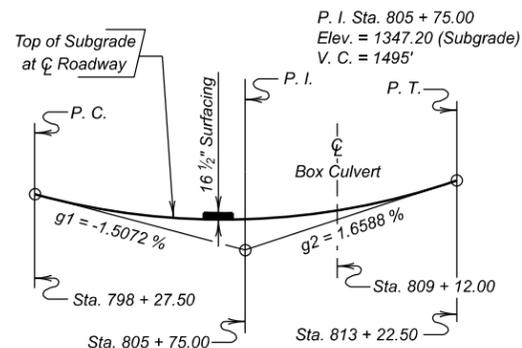
- Sheet No. 1 - General Drawing and Quantities
- Sheet No. 2 - Notes and Undercut Details
- Sheet No. 3 - Inlet Details
- Sheet No. 4 - Outlet Details
- Sheet No. 5 - F5 Barrel End Section Details (41' - 0")
- Sheet No. 6 - Standard Plate No.'s 460.02 and 460.10
- Sheet No. 7 - Standard Plate No. 620.16

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

HYDRAULIC DATA

Q_d	857 cfs
A_d	78 sq. ft.
V_d	11.0 fps
Q_F	857 cfs
Q_{100}	1802 cfs
Q_{OT}	> Q_{100} cfs
V_{max}	14.3 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1349.1.
 Q_{OT} = Overtopping discharge and frequency > Q_{100} yr. recurrence interval. El. 1354.5. Location Sta. 805 + 50.00 ±.
 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. 1353.1.
 V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.



VERTICAL CURVE DATA

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	809 + 31.49	59.04' Lt.
"B"	808 + 92.51	59.04' Lt.
"C"	809 + 23.00	42.00' Lt.
"D"	809 + 01.00	42.00' Lt.
"E"	809 + 23.00	42.00' Rt.
"F"	809 + 01.00	42.00' Rt.
"G"	809 + 21.83	58.00' Rt.
"H"	809 + 02.17	58.00' Rt.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	222.5
Reinforcing Steel	Lb.	30393
Structure Excavation, Box Culvert	Cu. Yd.	92
Box Culvert Undercut	Cu. Yd.	145
Class B Riprap	Ton	77.0
Type B Drainage Fabric	Sq. Yd.	89

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

**SITE 1
ALTERNATE A**

GENERAL DRAWING AND QUANTITIES

FOR
2 - 10' X 9' BOX CULVERT (C.I.P.)
 OVER PIERRE CREEK 0° SKEW
 STA. 809 + 12.00 SEC. 19/30-T103N-R57W
 STR. NO. 31-122-100 P-PH 0038(48)306
 PCN 05FA HL-93

HANSON COUNTY
 S. D. DEPT. OF TRANSPORTATION

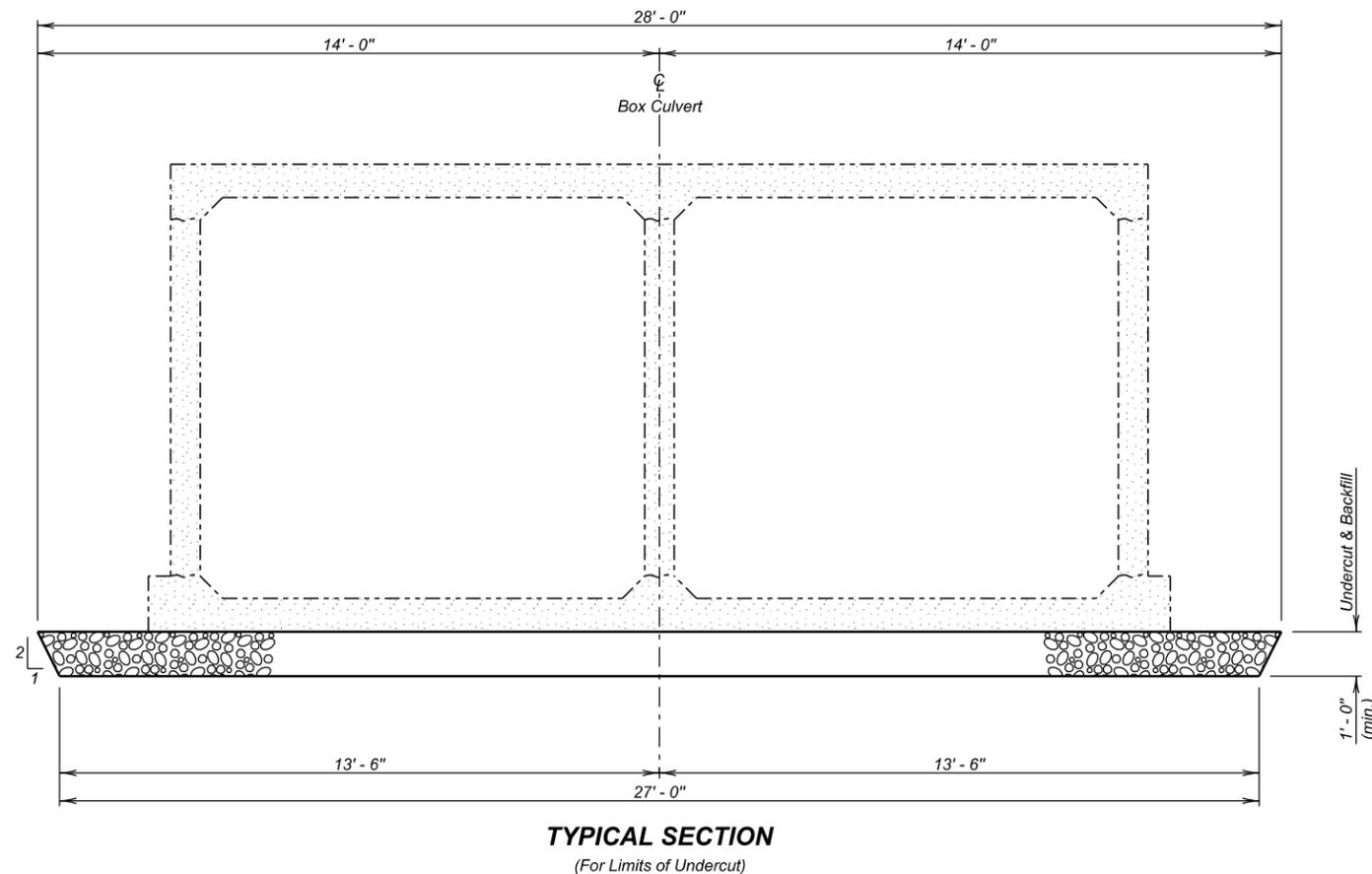
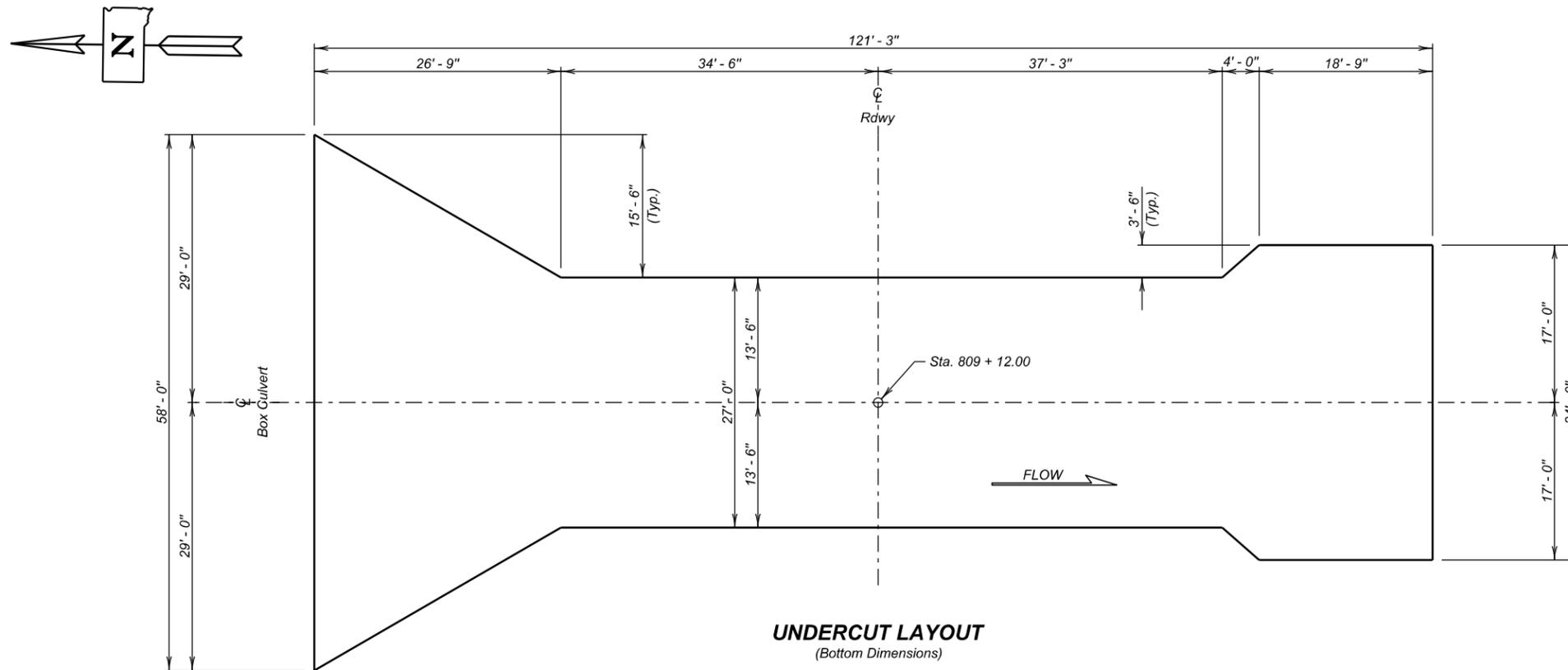
APRIL 2024

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

DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FALA01	DRAFTED BY MG	<i>Steve Johnson</i> BRIDGE ENGINEER
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-X028-

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH 0038(48)306	E11	E21



SPECIFICATIONS

- Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
- Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 10-1-25 Version, Required Provisions, and Special Provisions as included in the Proposal. The Standard Specifications for Roads and BRidges are available for download and viewing at <https://dot.sd.gov/doing-business/contractors/standard-specifications>.

GENERAL NOTES

- 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.
- 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 heights of 5 ft. (F5).
- Design Material Strengths: Concrete $f'c = 4500$ p.s.i.
Reinforcing Steel $f_y = 60000$ p.s.i.
- All concrete will be Class A45, Box Culvert conforming to Section 460 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 $\frac{3}{8}$ 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.
- Box culvert construction will require the excavation of alluvial deposits and in-place Sioux Quartzite. In-place quartzite will be encountered at or below elevation 1341.03. Alluvial deposits at this location consist of sand to cobble sized clasts of glacial origin interspersed within redeposited boulder sized blocks of quartzite. Extra effort will be required to excavate large boulders and in-place quartzite to the undercut limits. Blasting will not be allowed.
- Surface water was observed at Station 809+20 at an elevation of 1342.79 feet in August 2022. Dewatering will be required for construction of the RCBC. All cost incurred for dewatering will be incidental to other contract items.
- If in-place quartzite is encountered during construction, the depth of the undercut may be reduced to a minimum depth of 6 inches in the affected area and the cutoff wall may be terminated at the quartzite elevation. Approval from the Bridge Construction Engineer is required prior to the undercut depth or terminating the cutoff wall at the quartzite elevation.

ESTIMATED QUANTITIES

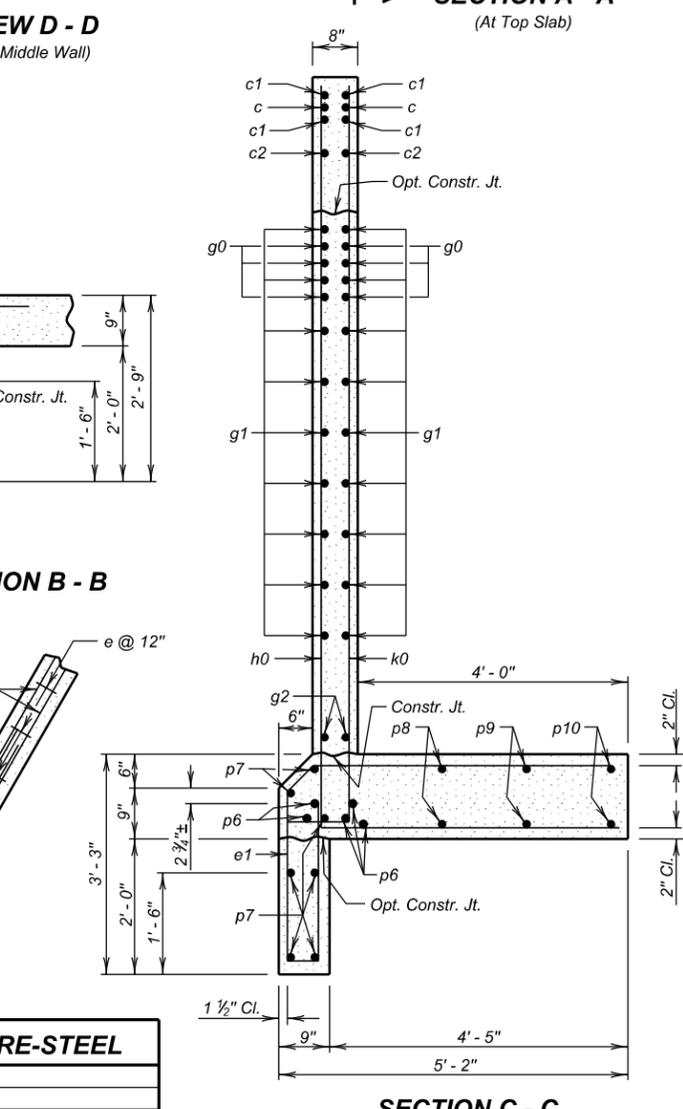
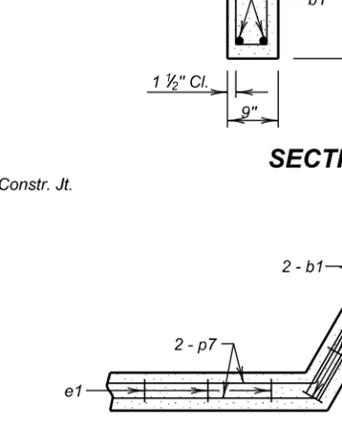
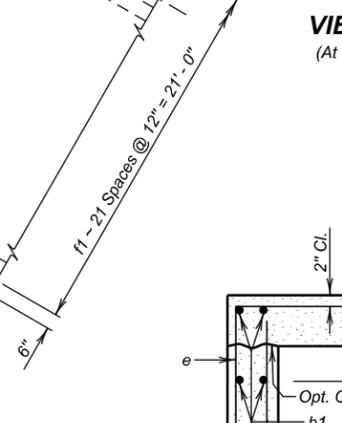
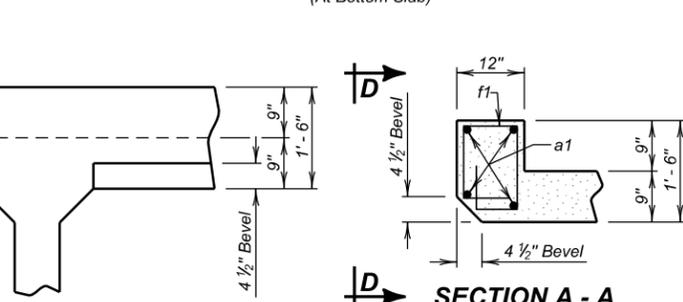
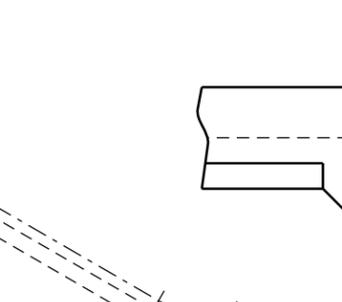
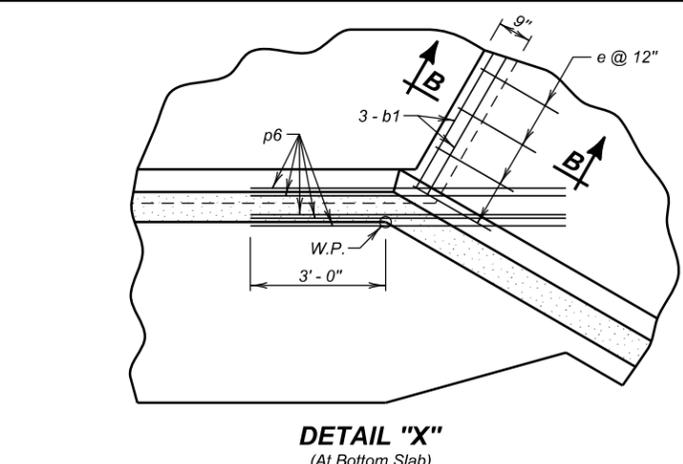
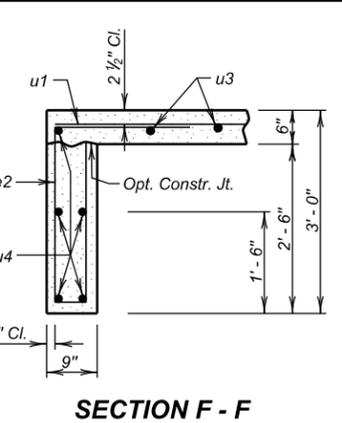
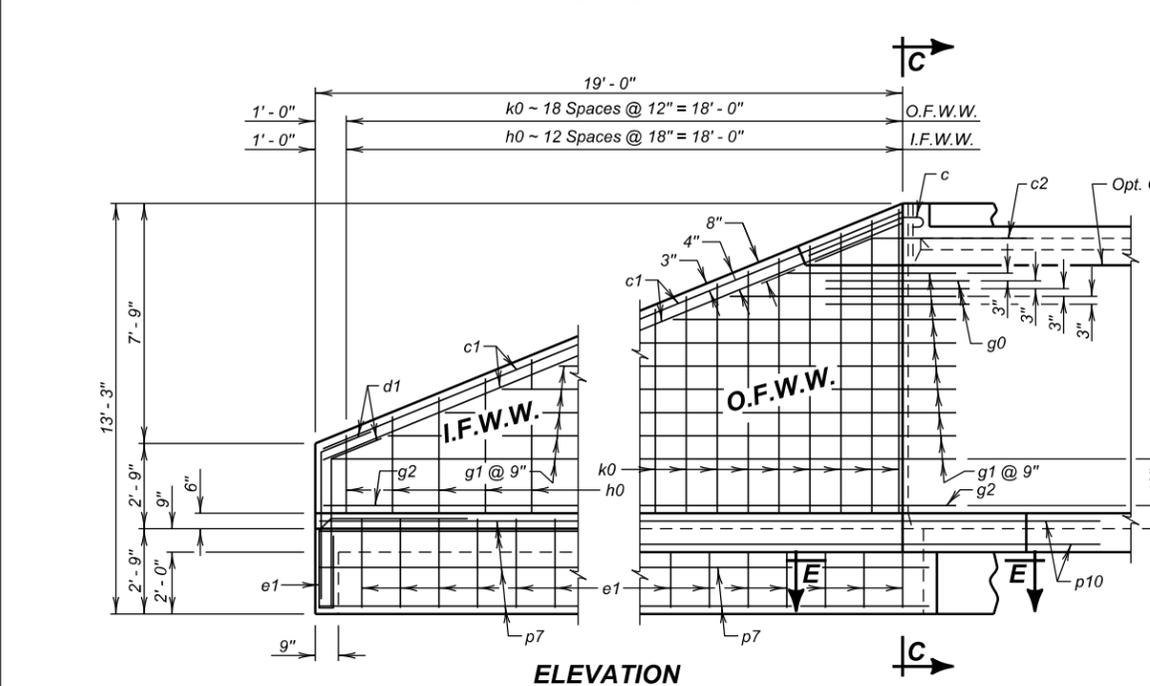
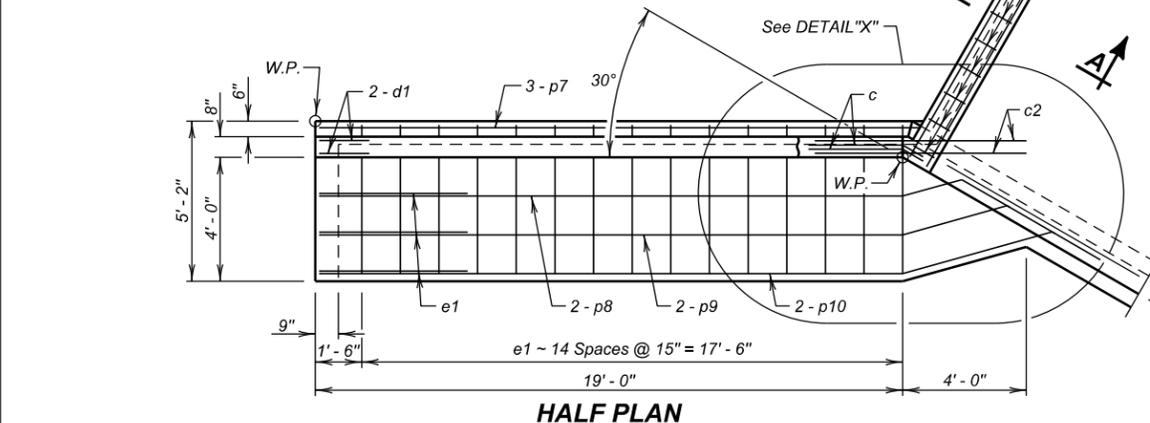
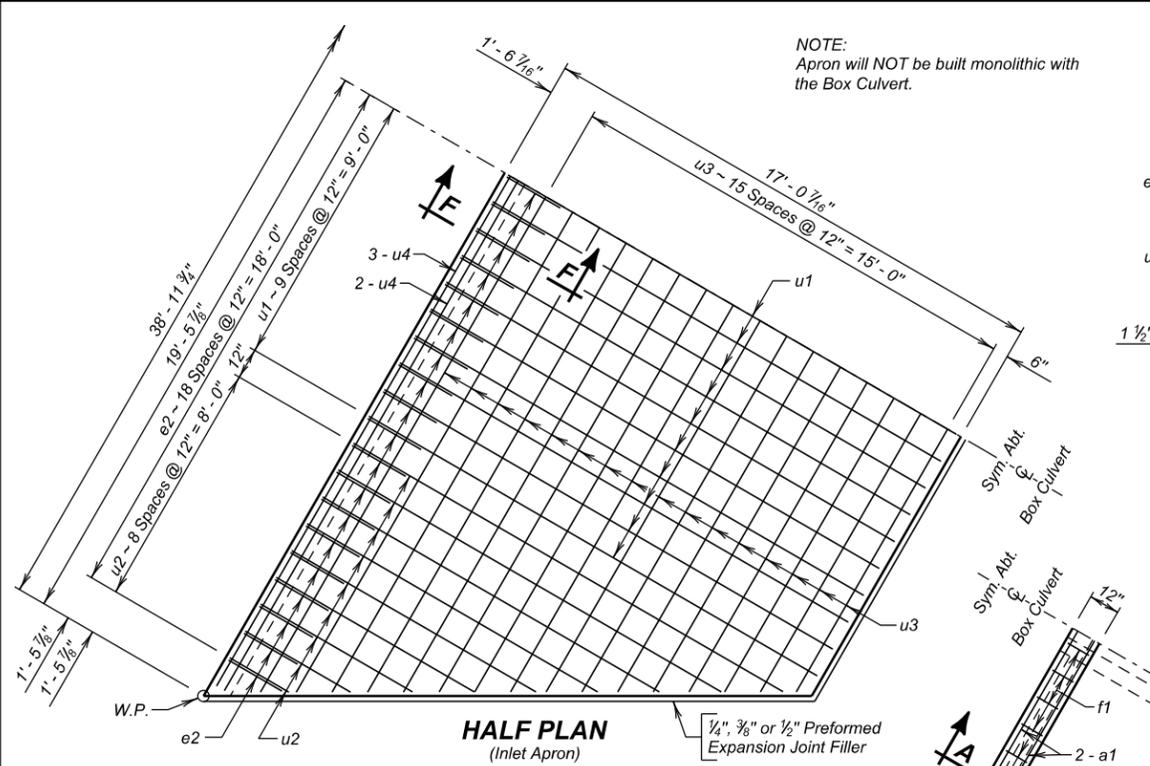
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	145

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
2 - 10' X 9' BOX CULVERT (C.I.P.)
OVER PIERRE CREEK 0° SKEW
STA. 809 + 12.00 SEC. 19/30-T103N-R57W
STR. NO. 31-122-100 P-PH 0038(48)306
HL-93**

HANSON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2024

DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FALA02	DRAFTED BY MG	<i>Steve A. Johnson</i> BRIDGE ENGINEER
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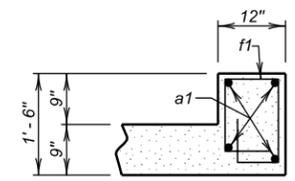
LEGEND FOR PLACING RE-STEEL

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

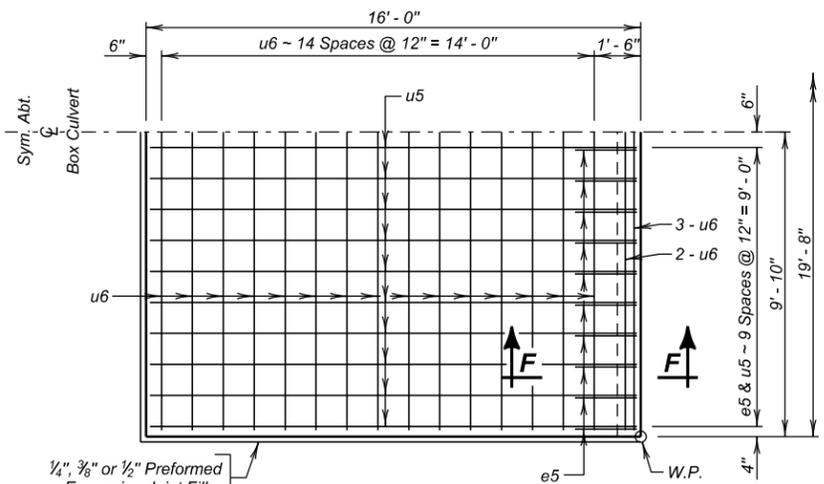
REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details
a1	4	6	21'-9"	Str.	
b1	6	6	20'-0"	Str.	
c	4	5	4'-6"	1A	
c1	8	5	20'-6"	Str.	
c2	4	5	7'-0"	19B	
d1	8	5	6'-6"	19B	
e	21	4	7'-0"	S12	
e1	36	4	10'-3"	S12A	
f1	22	4	5'-0"	S6A	
g0	12	5	5'-0"	19B	
g1	18	4	26'-3"	19B	
g2	4	4	20'-9"	19B	
h0	13	4	23'-3"	17A	
k0	19	4	16'-6"	17A	
p6	10	6	7'-0"	Str.	
p7	14	4	21'-6"	Str.	
p8	4	4	22'-6"	Str.	
p9	4	4	24'-0"	Str.	
p10	4	4	25'-6"	Str.	
INLET APRON					
e2	37	4	7'-6"	S12	
u1	19	4	16'-9"	Str.	
u2	9	4	18'-3"	Str.	
u3	8	4	56'-6"	Str.	
u4	5	4	38'-0"	Str.	
u2	9	4	16'-0 1/2"	2'-2 1/2"	
u2	16'-0 1/2"	2'-2 1/2"			
u3	19'-7"	36'-11"			
u3	8	4	27'-8"	28'-10"	
u3	27'-8"	28'-10"			
u2	9	4	2'-2 1/2"	16'-0 1/2"	
u2	2'-2 1/2"	16'-0 1/2"			
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u2	9	4	2'-2 1/2"	16'-0 1/2"	
u2	2'-2 1/2"	16'-0 1/2"			
u3	8	4	27'-8"	28'-10"	
u3	27'-8"	28'-10"			
u2	9	4	2'-2 1/2"	16'-0 1/2"	
u2	2'-2 1/2"	16'-0 1/2"			
u3	8	4	27'-8"	28'-10"	
u3	27'-8"	28'-10"			
u2	9	4	2'-2 1/2"	16'-0 1/2"	
u2	2'-2 1/2"	16'-0 1/2"			
u3	8	4	27'-8"	28'-10"	
u3	27'-8"	28'-10"			
u2	9	4	2'-2 1/2"	16'-0 1/2"	
u2	2'-2 1/2"	16'-0 1/2"			
u3	8	4	27'-8"	28'-10"	
u3	27'-8"	28'-10"			
u2	9	4	2'-2 1/2"	16'-0 1/2"	
u2	2'-2 1/2"	16'-0 1/2"			
u3	8	4	27'-8"		

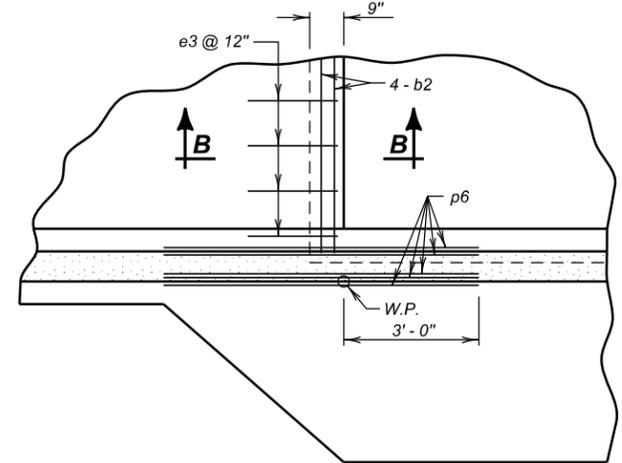
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



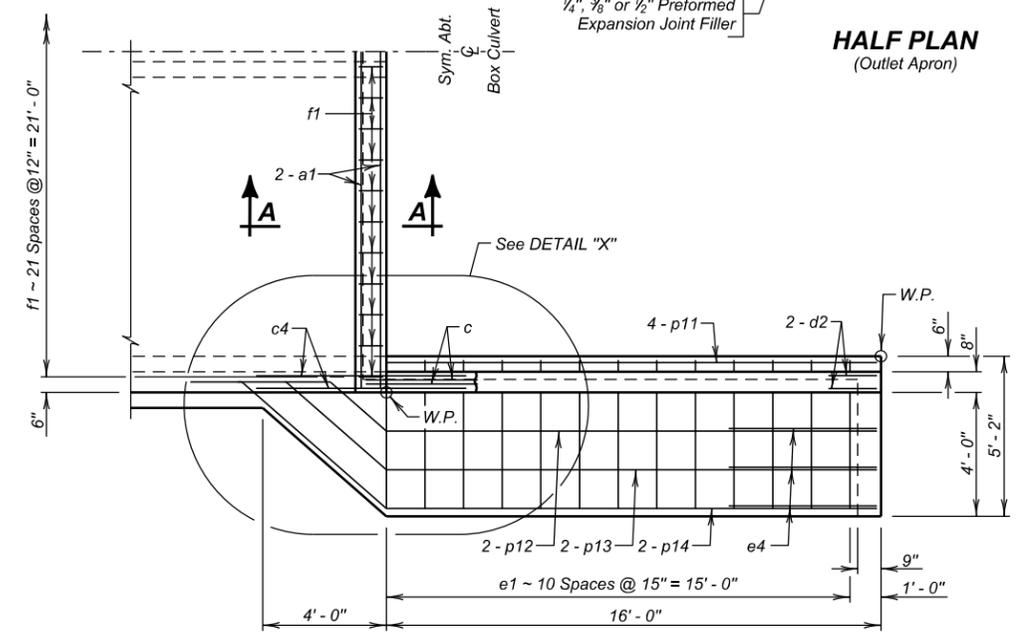
SECTION A - A
(At Top Slab)



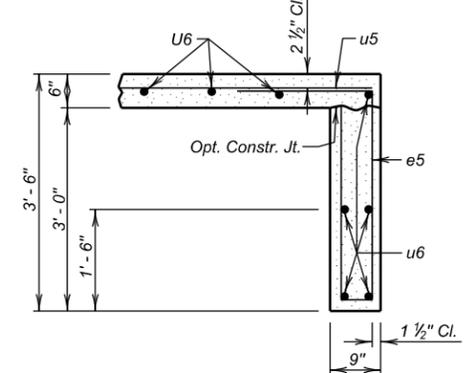
HALF PLAN
(Outlet Apron)



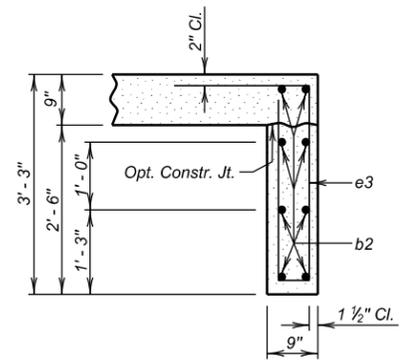
DETAIL 'X'
(At Bottom Slab)



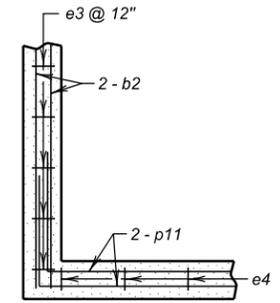
HALF PLAN



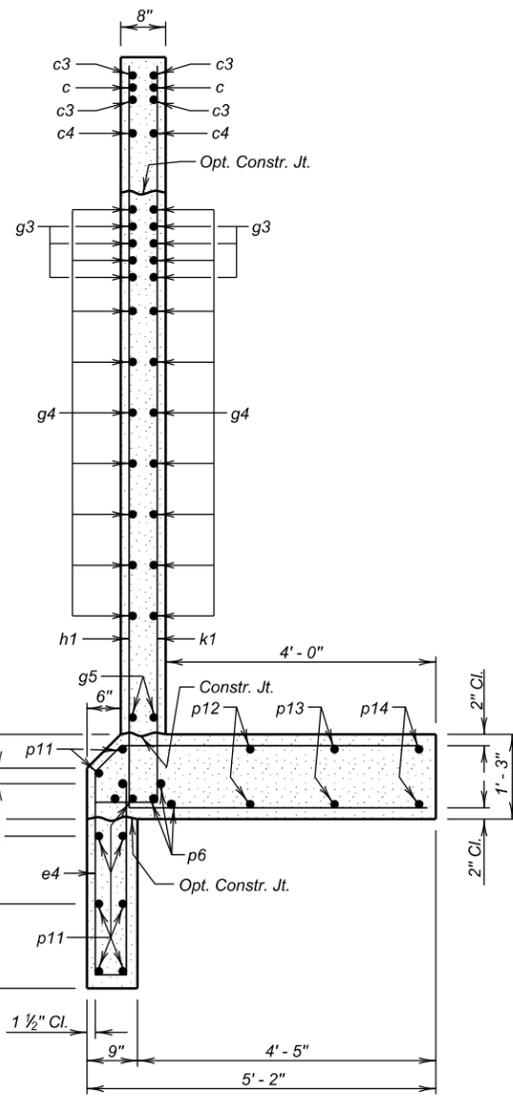
SECTION F - F



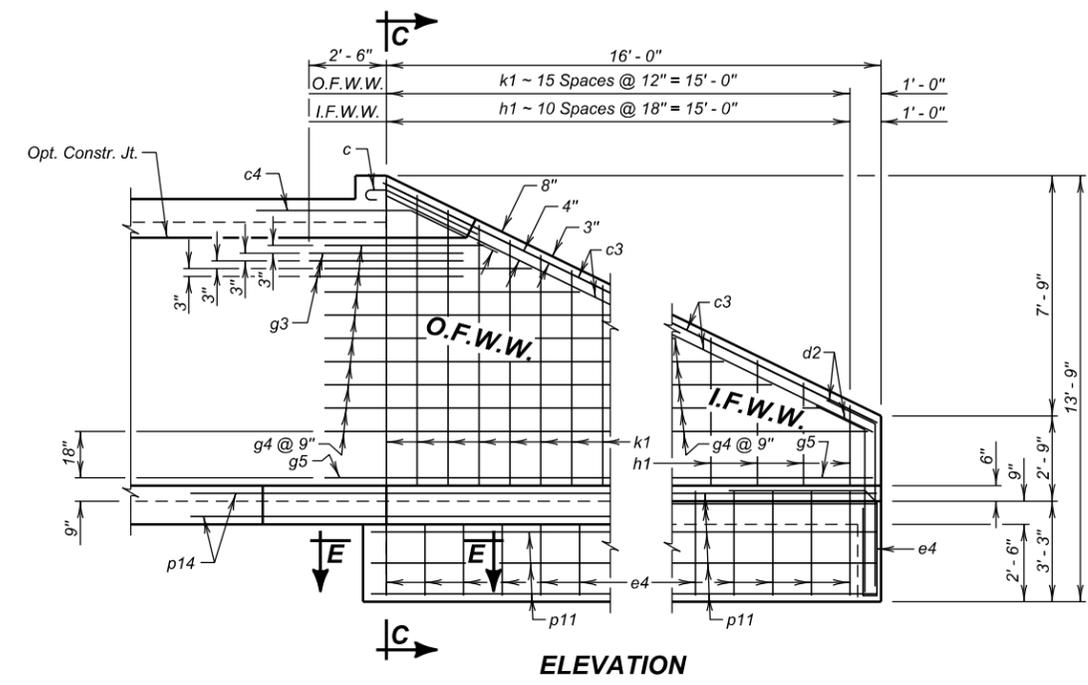
SECTION B - B



SECTION E - E



SECTION C - C



ELEVATION

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	21'-9"	Str.	
b2	8	6	20'-9"	Str.	
c	4	5	4'-6"	1A	
c3	8	5	17'-9"	Str.	
c4	4	5	7'-0"	19B	
d2	8	5	7'-0"	19B	
e3	21	4	8'-0"	S12	
e4	32	4	11'-3"	S12A	
f1	22	4	5'-0"	S6A	
g3	12	5	5'-0"	Str.	
g4	18	4	22'-9"	Str.	
g5	4	4	17'-9"	Str.	
h1	11	4	23'-3"	17A	
k1	16	4	16'-6"	17A	
p6	10	6	7'-0"	Str.	
p11	18	4	18'-6"	Str.	
p12	4	4	20'-0"	Str.	
p13	4	4	21'-9"	Str.	
p14	4	4	23'-9"	Str.	

OUTLET APRON

Bar	Qty	Size	Length	Type
e5	20	4	8'-6"	S12
u5	20	4	15'-9"	Str.
u6	20	4	19'-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	19.9	2294	9.9
Outlet Apron	7.4	581	7.4

SITE 1 ALTERNATE A
OUTLET DETAILS
FOR
2 - 10' X 9' BOX CULVERT (C.I.P.)
OVER PIERRE CREEK
STA. 809 + 12.00
STR. NO. 31-122-100

0° SKEW
SEC. 19/30-T103N-R57W
P-PH 0038(48)306
HL-93

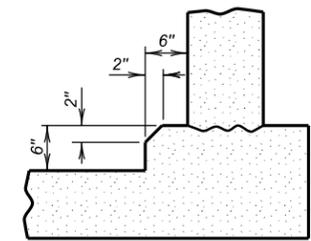
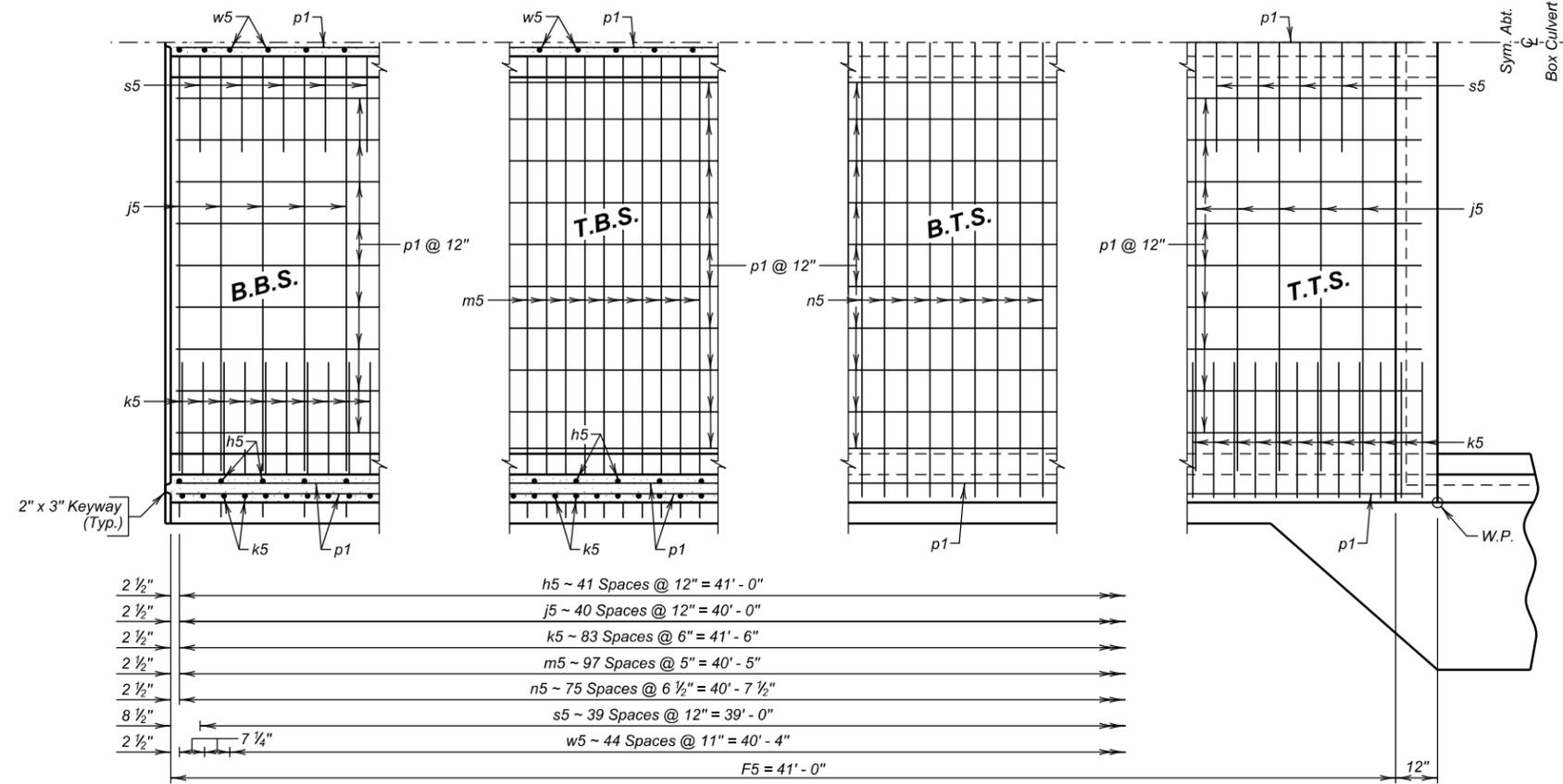
HANSON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2024

DESIGNED BY ER HANS05FA
CK. DES. BY SD 05FALA04
DRAFTED BY MG

Steve A. Johnson
BRIDGE ENGINEER

4 OF 7

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH 0038(48)306	E14	E21



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

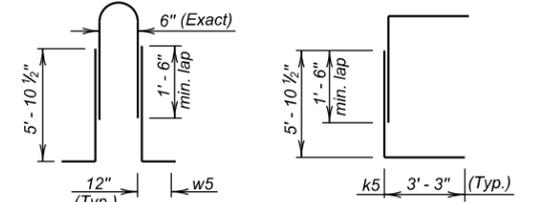
OPTIONAL POUR - BOTTOM SLAB

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.

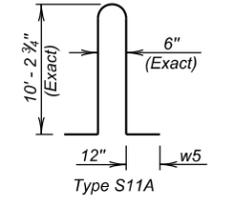
△ Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10. Number of z1 bars shown is for one construction joint.

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

Mk.	No.	Size	Length	Type	Bending Details
h5	168	4	10' - 9"	17A	
j5	164	5	20' - 6"	Str.	
k5	336	4	16' - 9"	17	
m5	196	4	22' - 9"	Str.	
n5	152	5	21' - 9"	Str.	
p1	246	4	41' - 6"	Str.	
s5	160	5	5' - 3"	Str.	
w5	94	4	22' - 9"	Str.	
z1	58	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.
 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"	161.7	24235	52.4

LEGEND FOR PLACING RE-STEEL

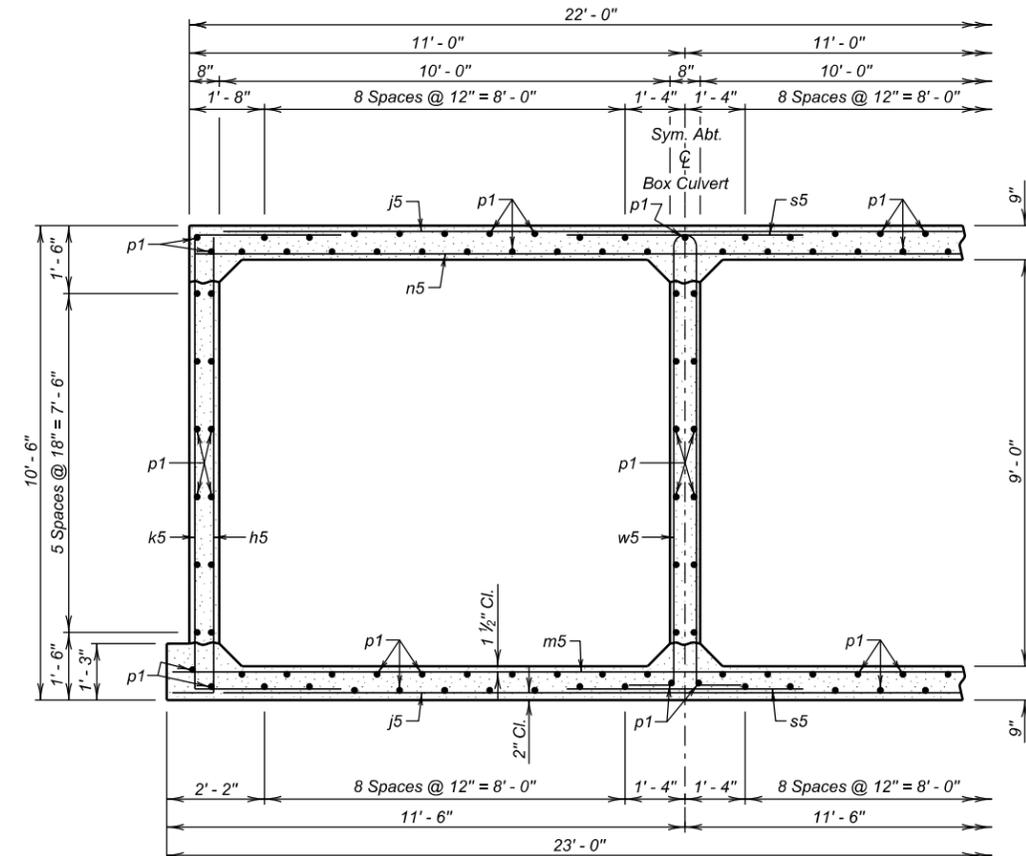
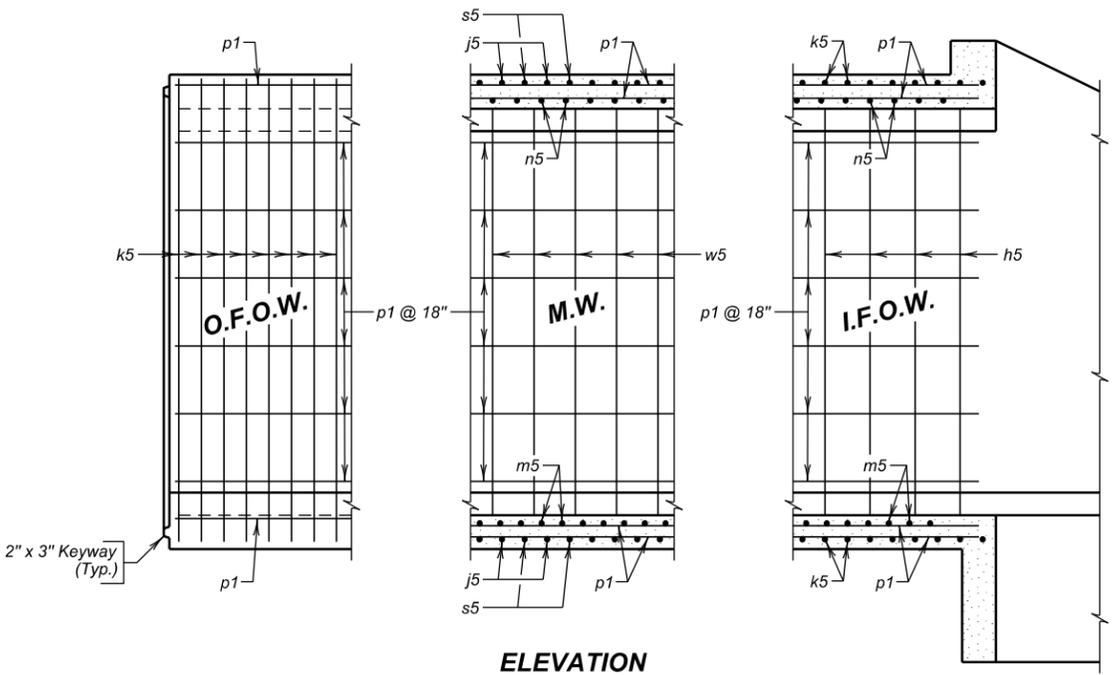
- T.T.S. - Top of Top Slab
- B.T.S. - Bottom of Top Slab
- T.B.S. - Top of Bottom Slab
- B.B.S. - Bottom of Bottom Slab
- O.F.O.W. - Outside Face of Outside Wall
- I.F.O.W. - Inside Face of Outside Wall
- M.W. - Middle Wall

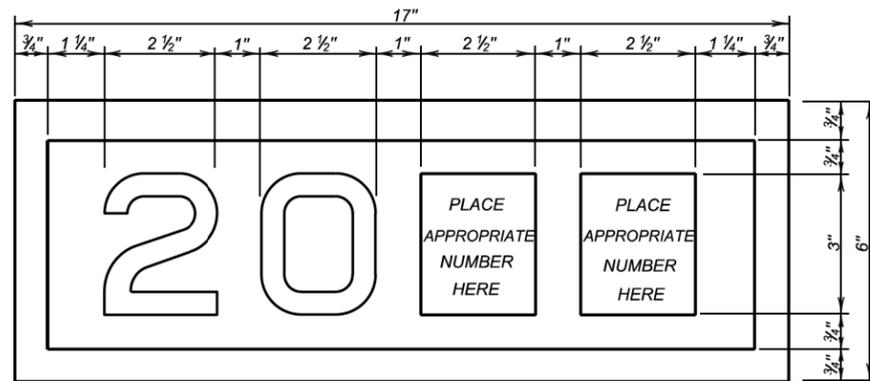
SITE 1
ALTERNATE A
F5 BARREL END SECTION DETAILS (41' - 0")
 FOR
2 - 10' X 9' BOX CULVERT (C.I.P.)
 OVER PIERRE CREEK 0° SKEW
 STA. 809 + 12.00 SEC. 19/30-T103N-R57W
 STR. NO. 31-122-100 P-PH 0038(48)306
 HL-93

HANSON COUNTY
 S. D. DEPT. OF TRANSPORTATION
 APRIL 2024

DESIGNED BY ER HANS05FA
 CK. DES. BY SD 05FALA05
 DRAFTED BY MG

Steve A. Johnson
 BRIDGE ENGINEER

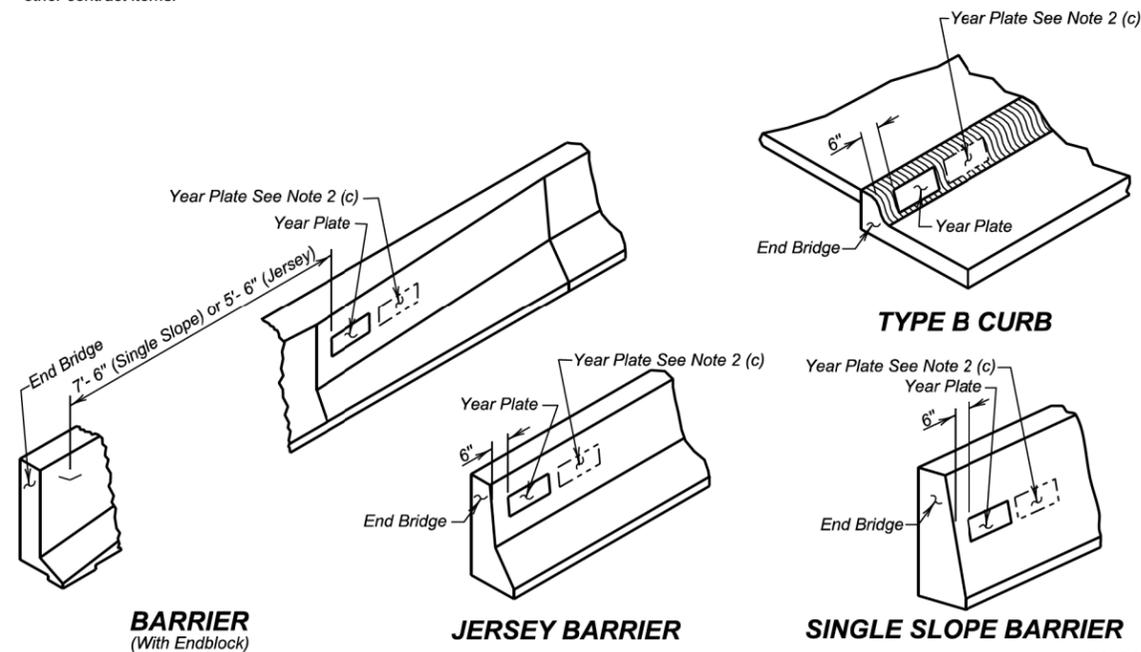




YEAR PLATE DETAILS

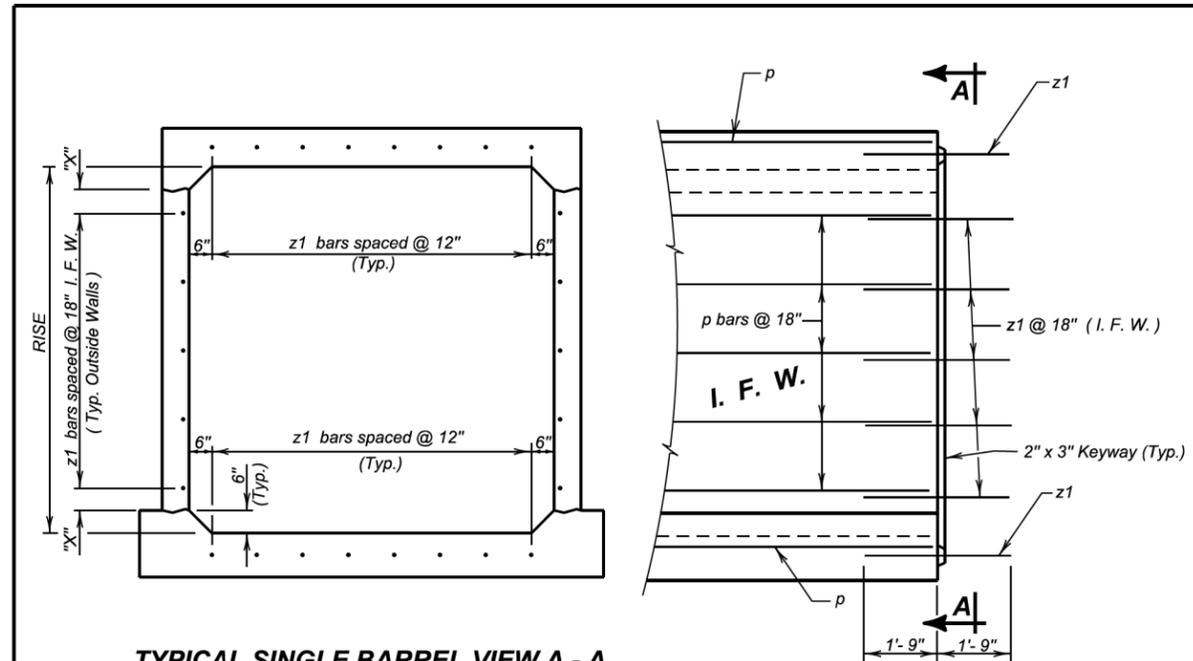
GENERAL NOTES:

- 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: 2026	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



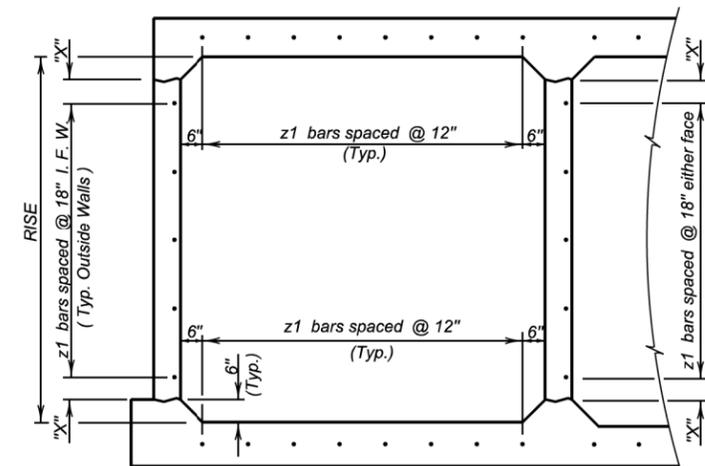
TYPICAL SINGLE BARREL VIEW A - A

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"



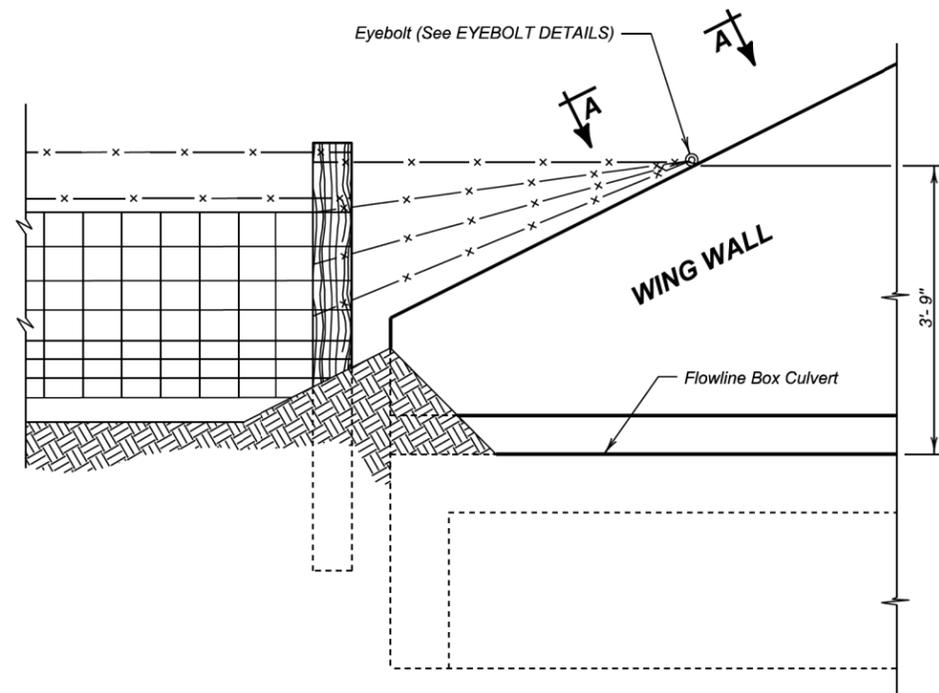
TYPICAL MULTIPLE BARREL VIEW A - A

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

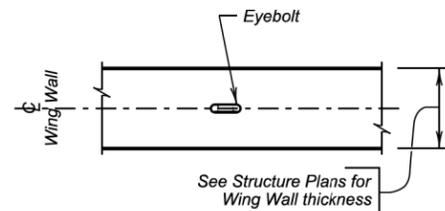
Published Date: 2026	S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1



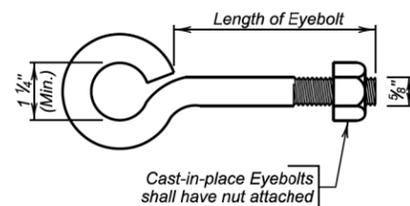
DETAIL FOR FENCE ANCHORS

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

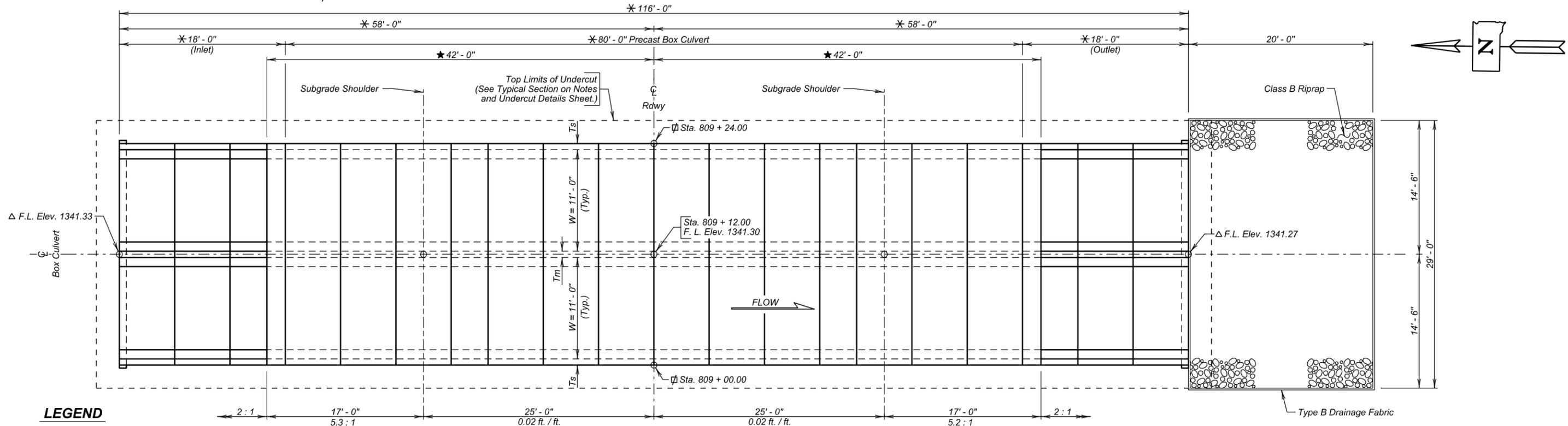
S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
		Sheet 1 of 1

Published Date: 2026

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.

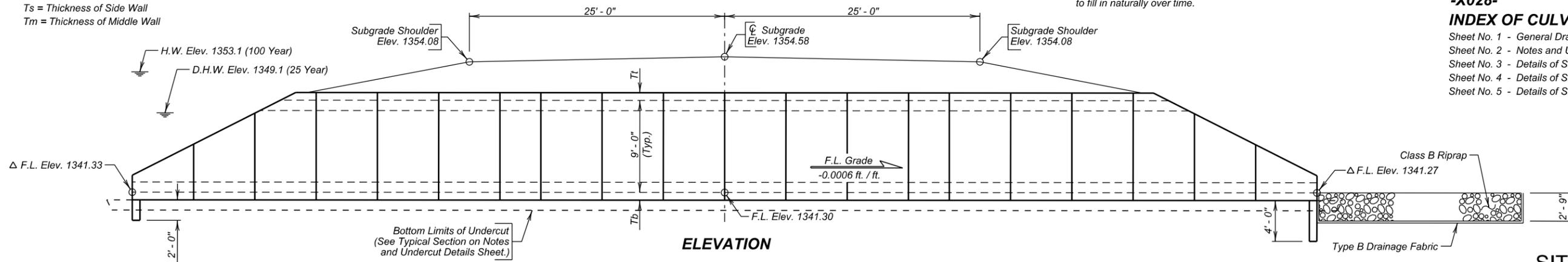
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH 0038(48)306	E17	E21



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

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



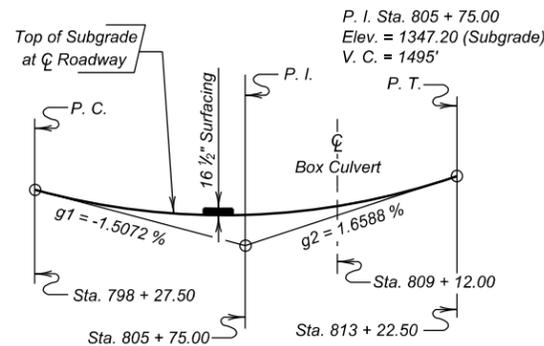
-X028- INDEX OF CULVERT SHEETS-

- 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 560.10 & 560.11
- Sheet No. 5 - Details of Standard Plate No. 620.16

HYDRAULIC DATA

Q_d	857 cfs
A_d	86 sq. ft.
V_d	10.0 fps
Q_F	857 cfs
Q_{100}	1802 cfs
Q_{OT}	> Q_{100} cfs
V_{max}	13.8 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1349.1.
 Q_{OT} = Overtopping discharge and frequency > Q_{100} yr. recurrence interval. El. 1354.5. Location Sta. 805 + 50.00 ±.
 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. 1353.1.
 V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.



VERTICAL CURVE DATA

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Structure Excavation, Box Culvert	Cu. Yd.	81.6
Box Culvert Undercut	Cu. Yd.	128
Class B Riprap	Ton	82.7
Type B Drainage Fabric	Sq. Yd.	95
2 - 11' X 9' Precast Concrete Box Culvert, Furnish	Ft.	80
2 - 11' X 9' Precast Concrete Box Culvert, Install	Ft.	80
2 - 11' X 9' Precast Concrete Box Culvert End Section, Furnish	Each	2
2 - 11' X 9' Precast Concrete Box Culvert End Section, Install	Each	2

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

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

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

FOR
2 - 11' X 9' BOX CULVERT (PRECAST)
 OVER PIERRE CREEK 0° SKEW
 STA. 809 + 12.00 SEC. 19/30-T103N-R57W
 STR. NO. 31-122-100 P-PH 0038(48)306
 PCN 05FA HL-93

HANSON COUNTY
 S. D. DEPT. OF TRANSPORTATION

APRIL 2024

1 OF 5

-X028-

DESIGNED BY ER HANS05FA	CK. DES. BY SD 05FALA08	DRAFTED BY MG	<i>Steve A. Johnson</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH 0038(48)306	E18	E21

SPECIFICATIONS

Use South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and Required Provisions, Supplemental Specifications and/or 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:

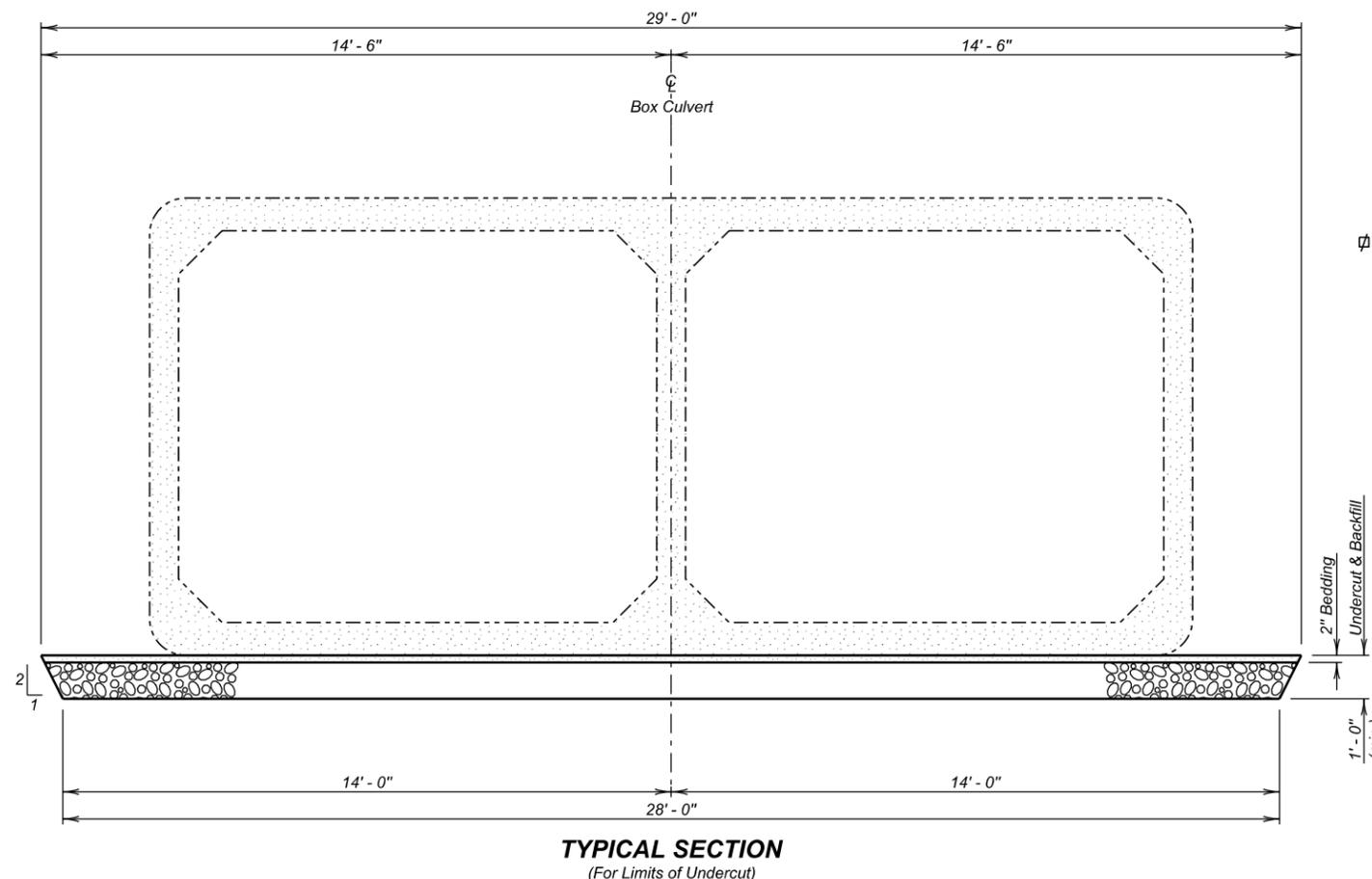
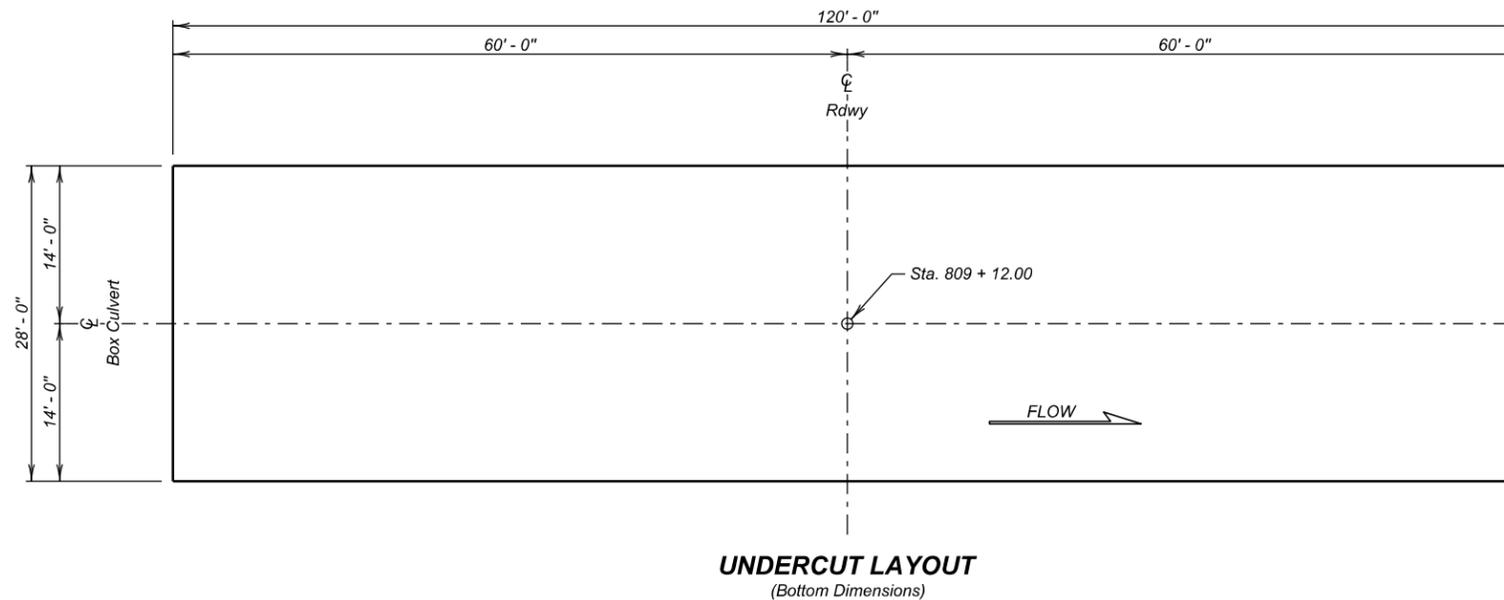
1. Box culvert and box culvert end section design will conform to the AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. 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 sheet with 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 6 ft. over the box culvert.
5. Minimum inside corner fillet will be 6 inches.
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. Box culvert construction will require the excavation of alluvial deposits and in place Sioux Quartzite. In place quartzite will be encountered at or below elevation 1341.03. Alluvial deposits at this location consist of sand to cobble sized clasts of glacial origin interspersed within redeposited boulder sized blocks of quartzite. Extra effort will be required to excavate large boulders and in place quartzite to the undercut limits. Blasting will not be allowed.
13. Surface water was observed at Station 809+20 at an elevation of 1342.79 feet in August 2022. Dewatering will be required for construction of the RCBC. All cost incurred for dewatering will be incidental to other contract items.
14. If in place quartzite is encountered during construction, the depth of the undercut may be reduced to a minimum depth of 6 inches in the affected area and the cutoff wall may be terminated at the quartzite elevation. Approval from the Bridge Construction Engineer is required prior to the undercut depth or terminating the cutoff wall at the quartzite elevation.

DESIGN MIX OF CONCRETE

1. Mix will be as per fabricator's design, however minimum compressive strength will not be less than 4500 p.s.i. at 28 days.
2. Type II cement is required.

SHOP PLANS

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



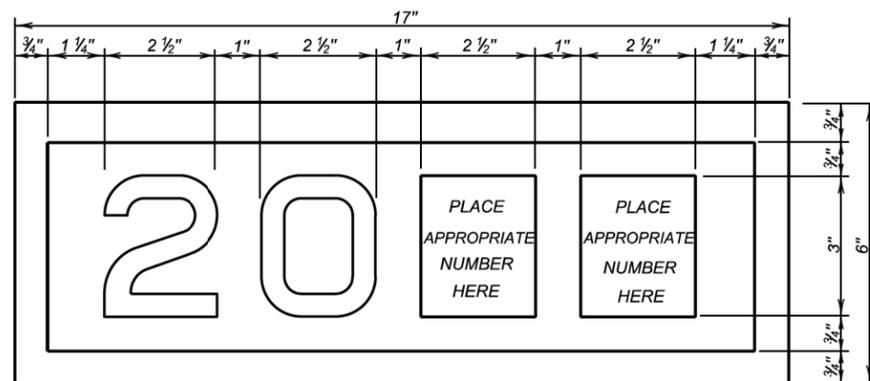
ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	128

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
2 - 11' X 9' BOX CULVERT (PRECAST)
OVER PIERRE CREEK
STA. 809 + 12.00
STR. NO. 31-122-100
0° SKEW
SEC. 19/30-T103N-R57W
P-PH 0038(48)306
HL-93

HANSON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2024

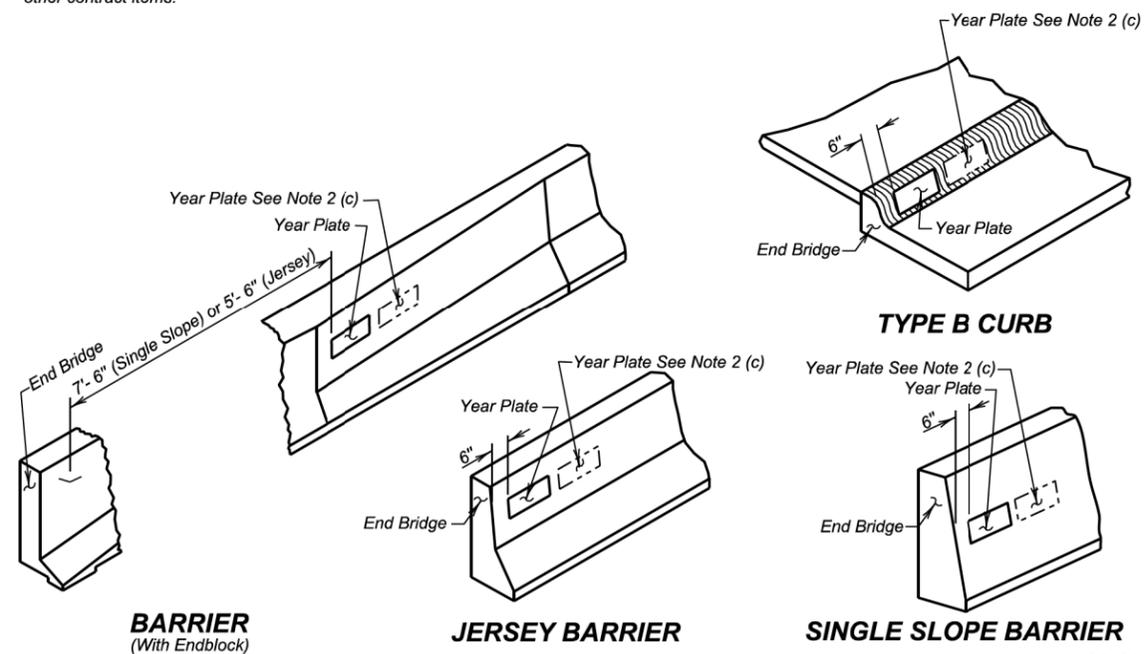
DESIGNED BY ER HANSO5FA	CK. DES. BY SD 05FALA09	DRAFTED BY MG	Steve A. Johnson BRIDGE ENGINEER
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YEAR PLATE DETAILS

GENERAL NOTES:

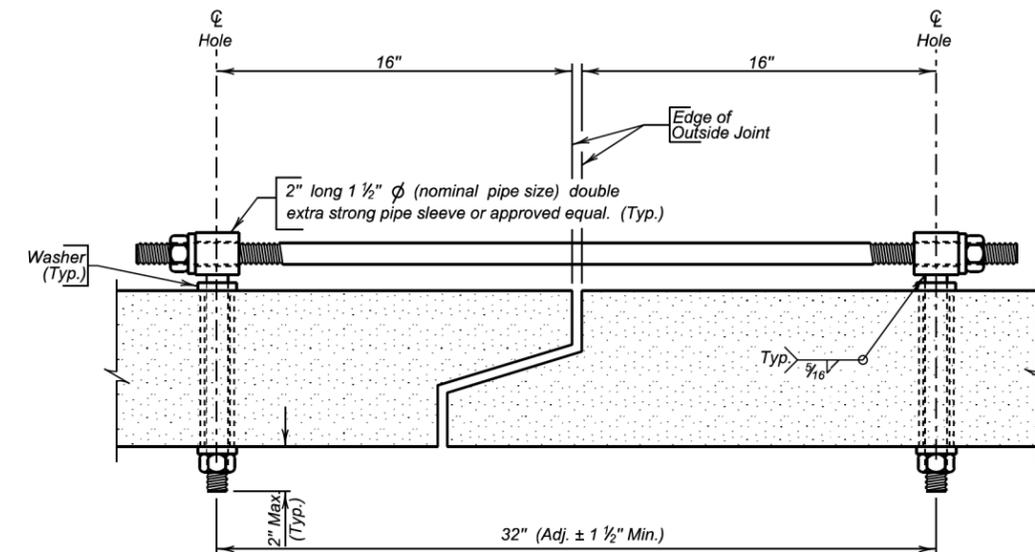
- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located 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

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			Sheet 1 of 1



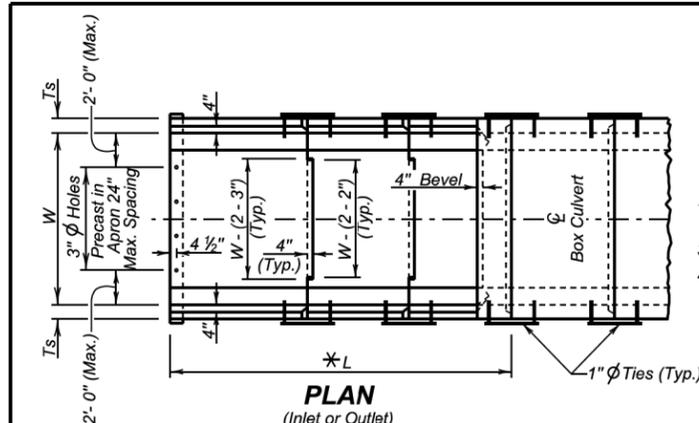
TIE BOLT ASSEMBLY

GENERAL NOTES:

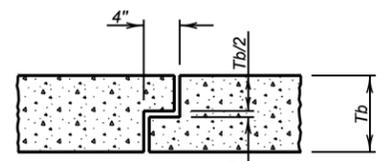
- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36, ASTM A307, or ASTM F1554, Gr. 36. Nuts shall be heavy 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: 2026	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1

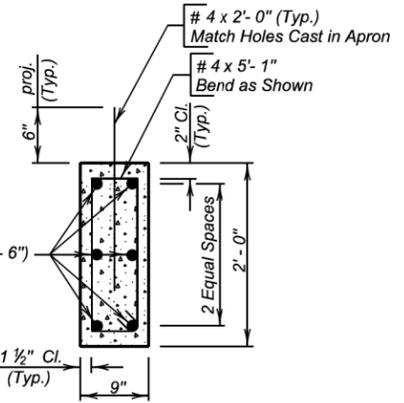
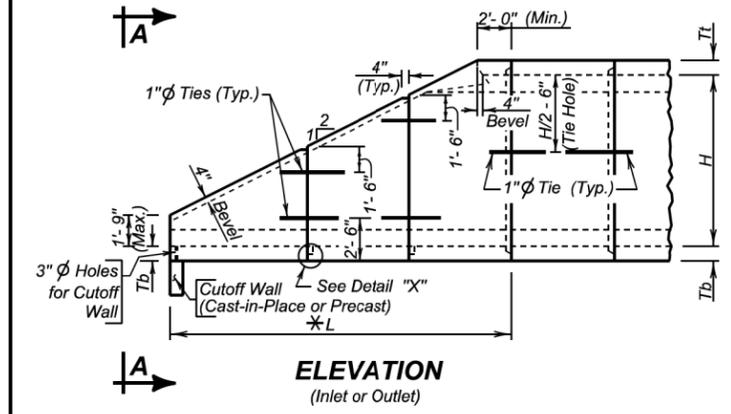


- CUTOFF WALL**
- All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
 - Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section 462 of the Specifications.
 - All reinforcing steel shall conform to ASTM A615 Grade 60.
 - Alternate details will be allowed, subject to the approval of the Bridge Construction Engineer.



DETAIL "X"

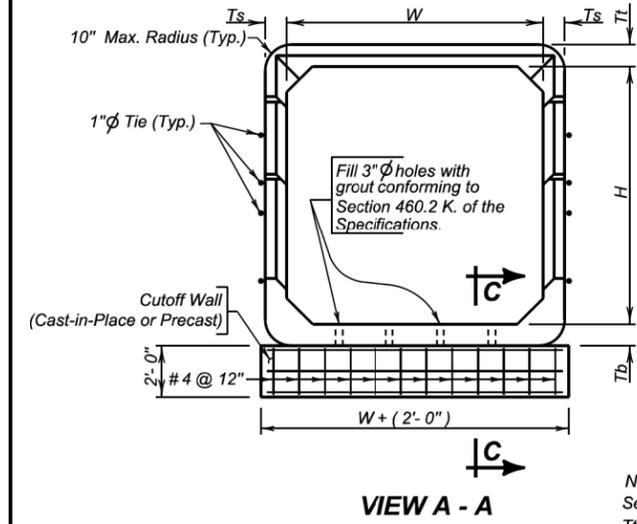
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.



SEC. C - C

LEGEND

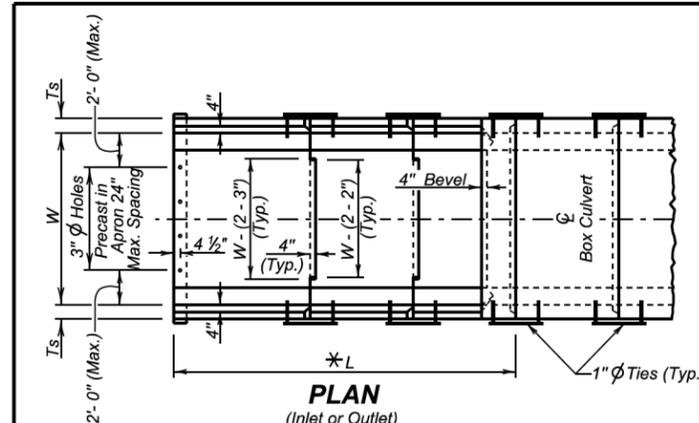
W = Width of Opening
H = Height of Opening
Tt = Thickness of Top Slab
Tb = Thickness of Bottom Slab
Ts = Thickness of Side Wall
L = Length of End Section



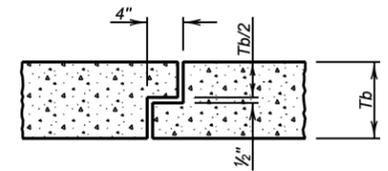
NOTES:
See GENERAL DRAWING for W and H dimensions.
Tt, Tb, L, and Ts dimensions shall be furnished by the Contractor.
* Length and number of units may vary from that shown.

June 26, 2015

Published Date: 2026	S D D O T	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'-0" CUTOFF WALL	PLATE NUMBER 560.10
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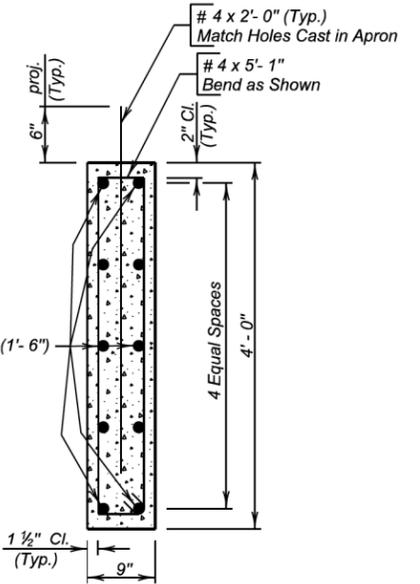
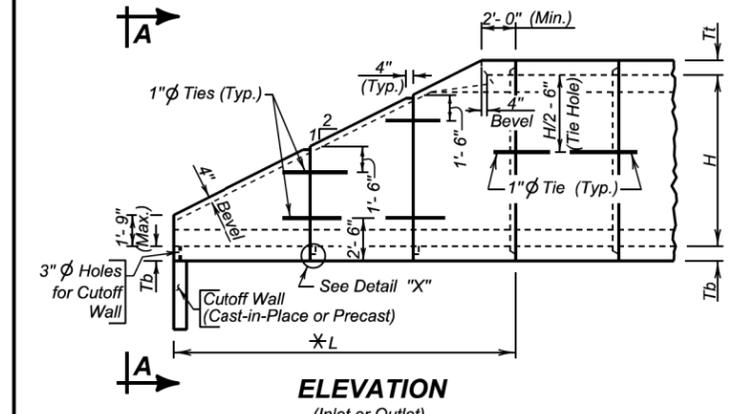


- CUTOFF WALL**
- All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
 - Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section 462 of the Specifications.
 - All reinforcing steel shall conform to ASTM A615 Grade 60.
 - Alternate details will be allowed, subject to the approval of the Bridge Construction Engineer.



DETAIL "X"

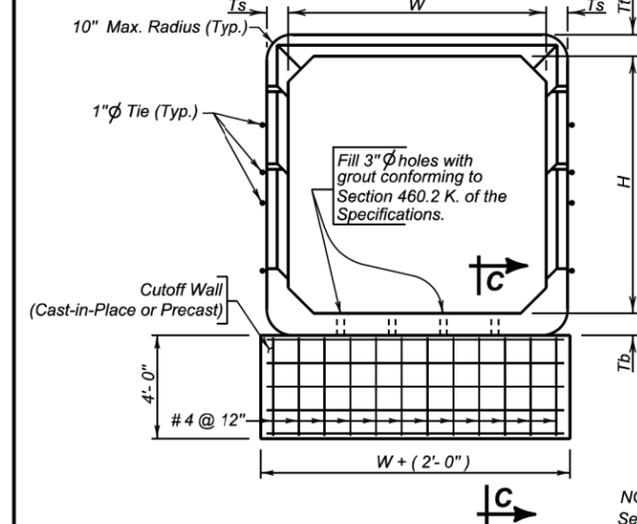
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.



SEC. C - C

LEGEND

W = Width of Opening
H = Height of Opening
Tt = Thickness of Top Slab
Tb = Thickness of Bottom Slab
Ts = Thickness of Side Wall
L = Length of End Section



NOTES:
See GENERAL DRAWING for W and H dimensions.
Tt, Tb, L, and Ts dimensions shall be furnished by the Contractor.
* Length and number of units may vary from that shown.

June 26, 2015

Published Date: 2026	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

