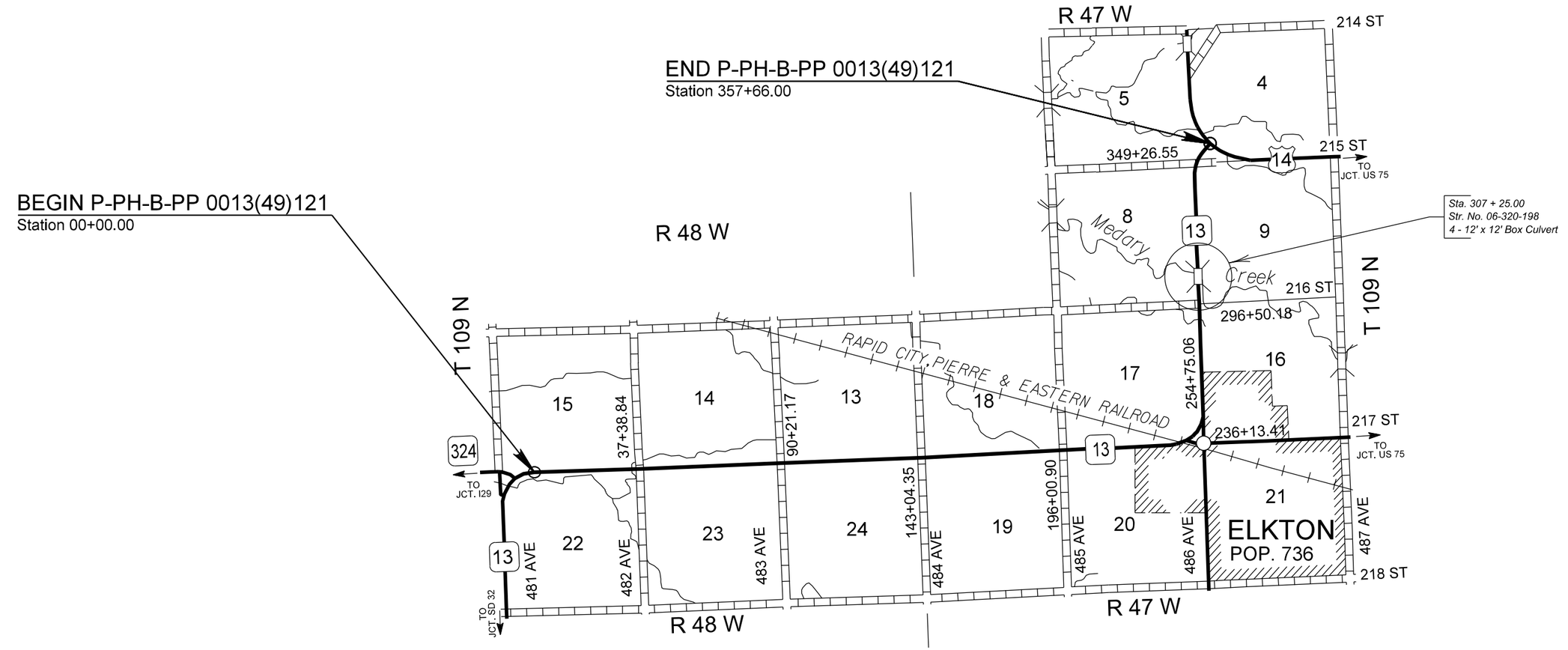
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PP 0013(49)121	E1	E10

Section E: Structure Plans

INDEX OF SHEETS -



SECTION E – ESTIMATE OF STRUCTURE QUANTITIES

Str. No. 06-320-198

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
250E0030	Incidental Work, Structure	Lump Sum	LS
420E0200	Structure Excavation, Box Culvert	227	CuYd
421E0200	Box Culvert Undercut	645	CuYd
460E0120	Class A45 Concrete, Box Culvert	544.2	CuYd
480E0100	Reinforcing Steel	76,357	Lb
700E0210	Class B Riprap	96.3	Ton
831E0110	Type B Drainage Fabric	117	SqYd

INCIDENTAL WORK, STRUCTURE

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

   Str. No. 06-320-198. In place centerline Sta. 306+94.69 to centerline Sta. 307 +70.69 is a 76'-0" single span steel girder bridge 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 overlayed with 2 inches of concrete. The substructure consists of reinforced vertical concrete abutments 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 structure 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.

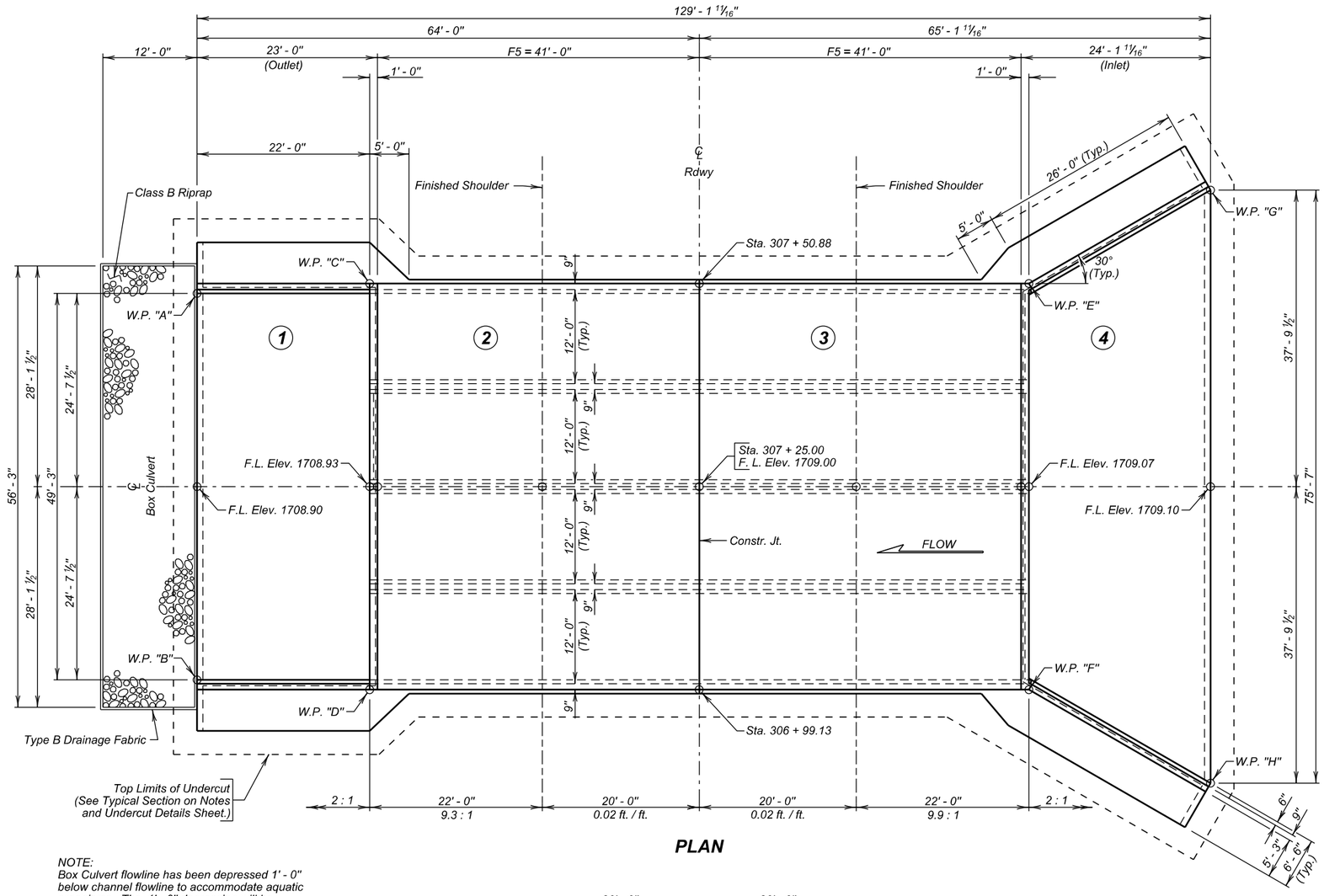
4. The foregoing is a general description of the in-place structure and should not be construed to be complete in all details. Before preparing the bid it will be the responsibility of the Contractor to make a visual inspection of the structure to verify the extent of the work and materials involved. If desired by the Contractor, a copy of the original construction plans may be obtained through the Office of Bridge Design.

NOTICE - LEAD BASED PAINT

Be advised that the paint on the steel surfaces of the existing structure contains lead. The contractor should plan operations accordingly and inform employees of the hazards of lead exposure.

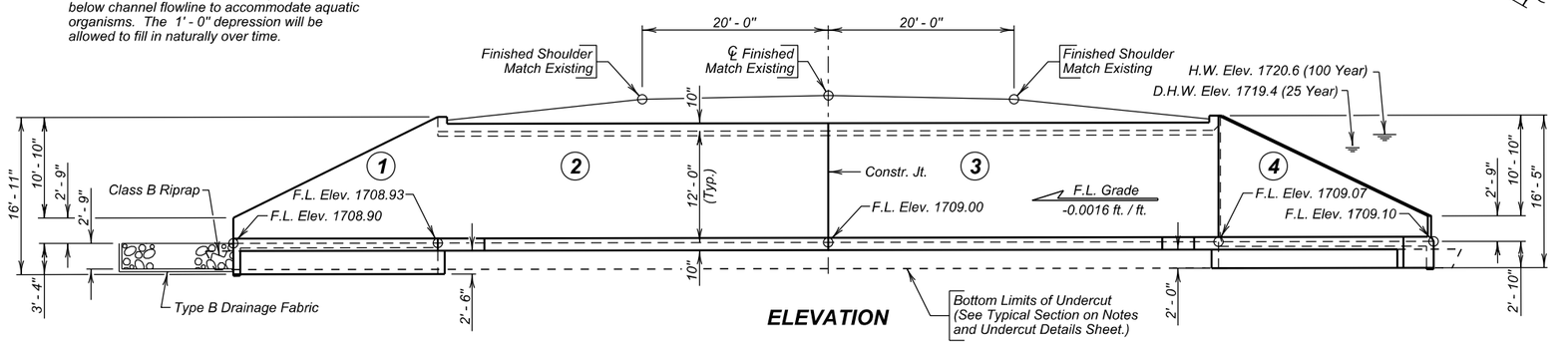
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PP 0013(49)121	E3	E10



PLAN

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

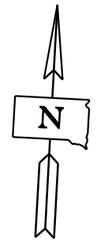


TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	307 + 49.63	64.00' Lt.
"B"	307 + 00.38	64.00' Lt.
"C"	307 + 50.88	42.00' Lt.
"D"	306 + 99.13	42.00' Lt.
"E"	307 + 50.88	42.00' Rt.
"F"	306 + 99.13	42.00' Rt.
"G"	307 + 62.79	65.14' Rt.
"H"	306 + 87.21	65.14' Rt.

HYDRAULIC DATA

Q_d	2102 cfs
A_d	438 sq ft
V_d	4.8 fps
Q_F	2102 cfs
Q_{100}	3467 cfs
Q_{OT}	$>Q_{500}$
V_{max}	7.5 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 1719.4.

Q_{OT} = Overtopping discharge and frequency >500 year recurrence interval. El. 1724.7 @ Sta. 302 + 26 ±.

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. 1720.6.

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

-X028-

INDEX OF CULVERT SHEETS -

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
	Class A45 Concrete, Box Culvert	Cu. Yd.	544.2
	Reinforcing Steel	Lb.	76357
	Structure Excavation, Box Culvert	Cu. Yd.	227
	Box Culvert Undercut	Cu. Yd.	645
#	Class B Riprap	Ton	96.3
	Type B Drainage Fabric	Sq. Yd.	117

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

⚹ Topeka Shiner Stream

GENERAL DRAWING AND QUANTITIES

FOR

4 - 12' X 12' BOX CULVERT

⚹ OVER MEDARY CREEK
STA. 307 + 25.00
STR. NO. 06-320-198
PCN 05EX

0° SKEW
SEC. 8/9-T109N-R47W
P-PH-B-PP 0013(49)121
HL-93

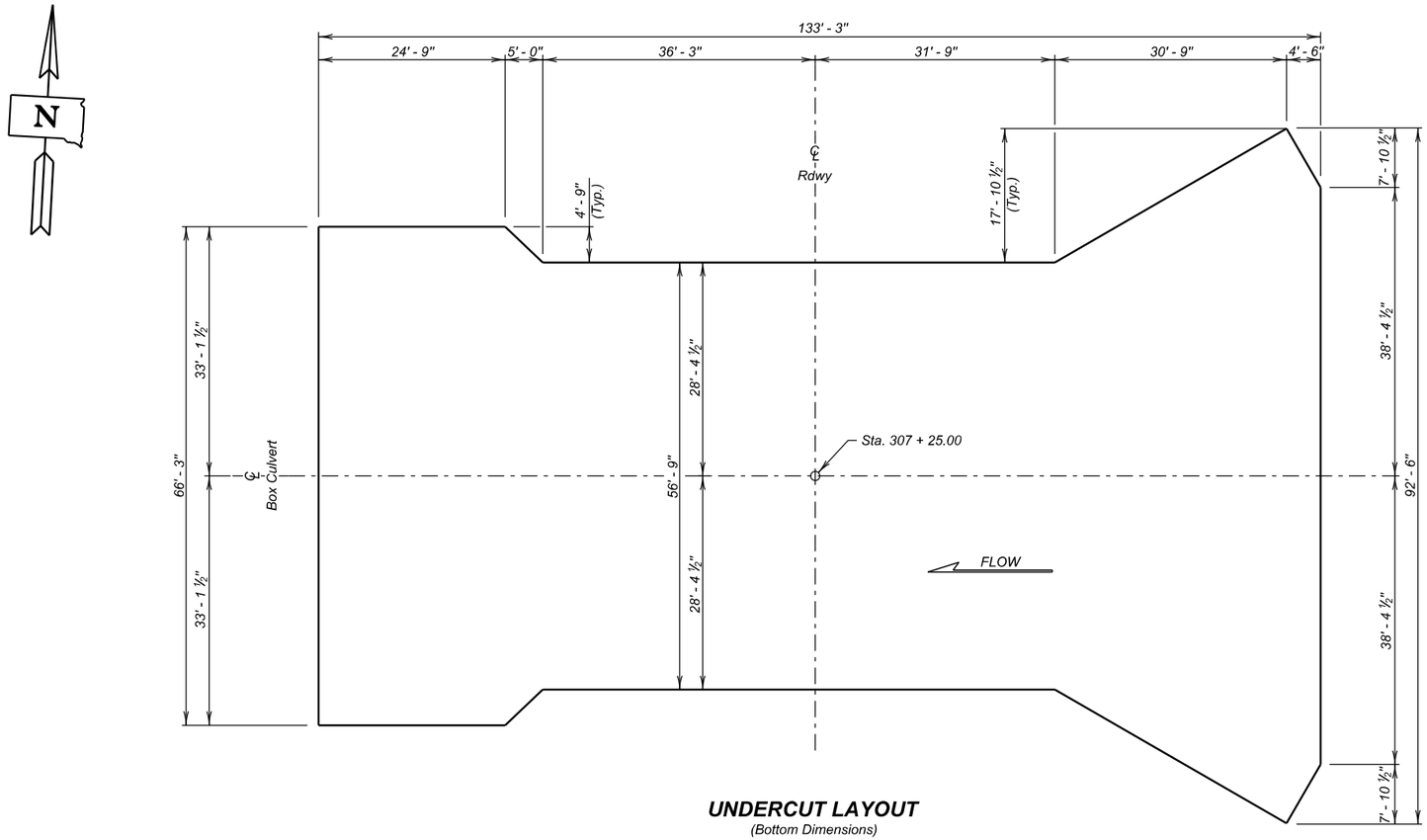
BROOKINGS COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2023

-X028-

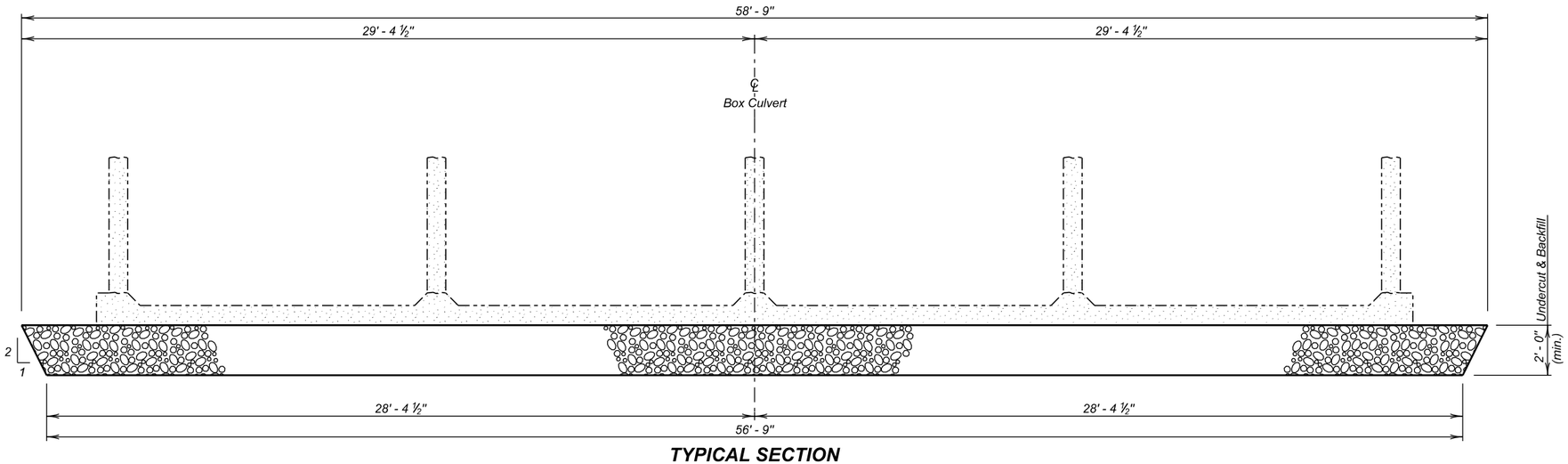
PLANS BY :
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY	CK. DES. BY	DRAFTED BY	
ER	BS/JU	BT	Steve A Johnson BRIDGE ENGINEER
BROK05EX	05EXTA01		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PP 0013(49)121	E4	E10



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, 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 ft. apart with gross axle weight (each axle) = 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 fy = 60000 p.s.i.
4. *All concrete will be Class A45, Box Culvert 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 edges will be chamfered ¾ 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 dark grey gravelly silt sand. Groundwater was encountered in the borings at an elevation of 1712.7 during the subsurface investigation conducted in August 2020. Dewatering will be required for the construction of the RCBC.*

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
℄	Box Culvert Undercut	Cu. Yd.	645

℄ *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

4 - 12' X 12' BOX CULVERT

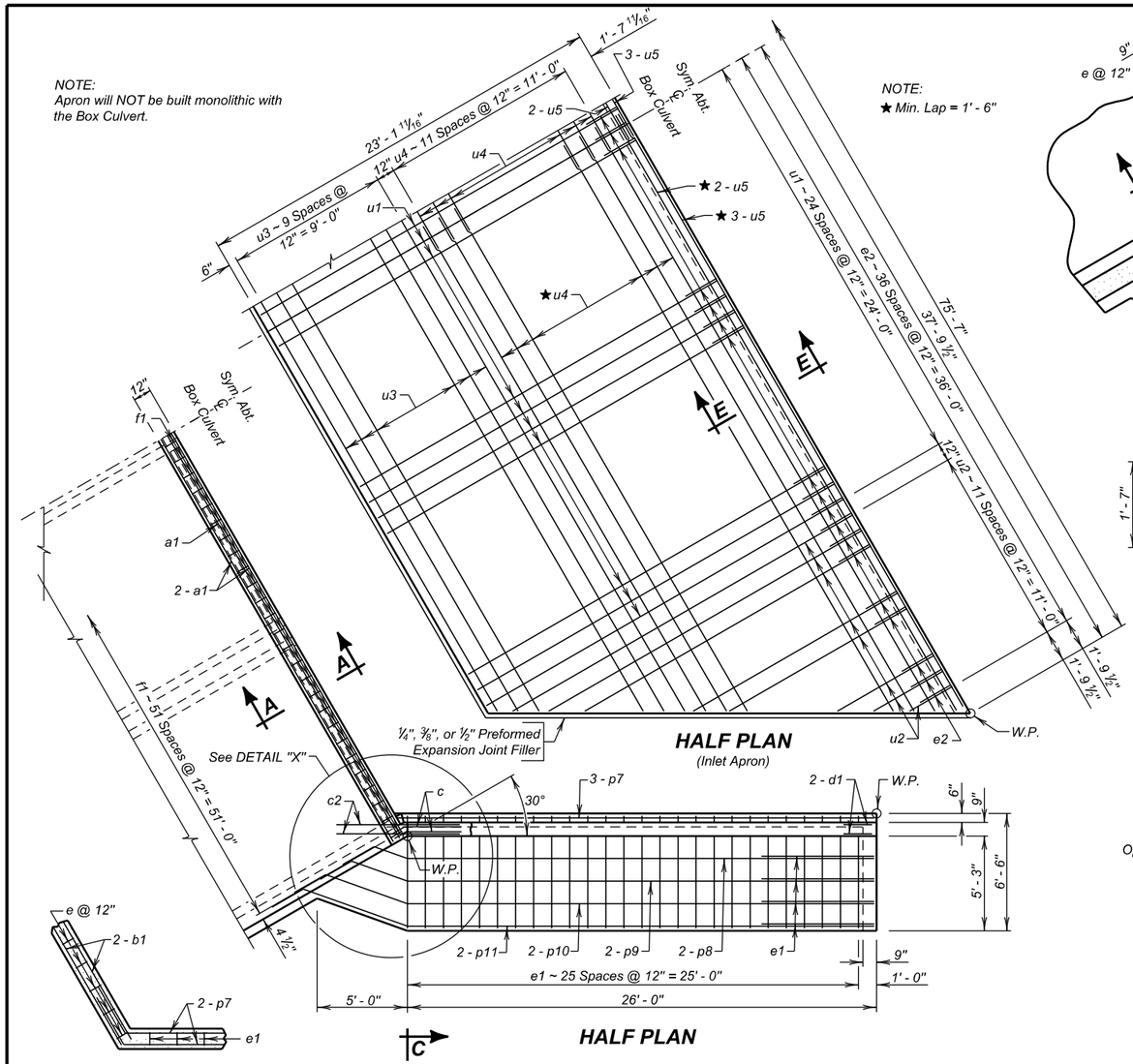
OVER MEDARY CREEK — 0° SKEW
STA. 307 + 25.00 — SEC. 8/9-T109N-R47W
STR. NO. 06-320-198 — P-PH-B-PP 0013(49)121
HL-93

BROOKINGS COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2023

DESIGNED BY	CK. DES. BY	DRAFTED BY	
ER	BS/JU	BT	Steve A Johnson BRIDGE ENGINEER
BROK05EX	05EXTA02		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PP 0013(49)121	E5	E10

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

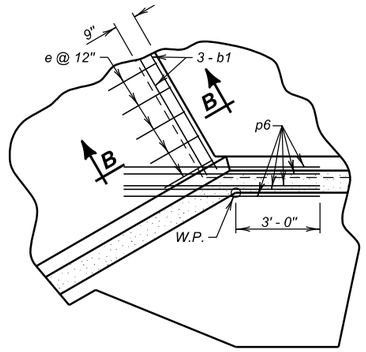


HALF PLAN
(Inlet Apron)

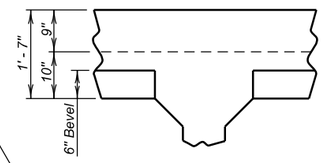
HALF PLAN

SECTION H - H

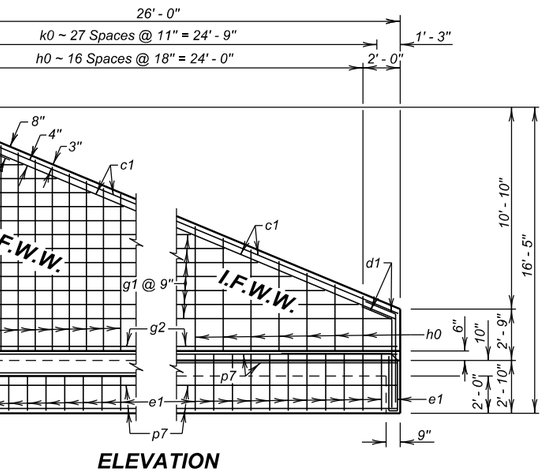
NOTE:
★ Min. Lap = 1' - 6"



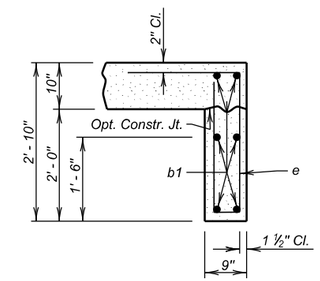
DETAIL "X"
(At Bottom Slab)



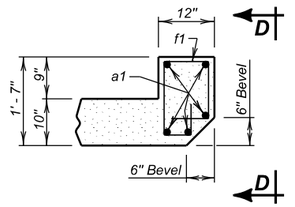
VIEW D - D
(At Interior Wall)



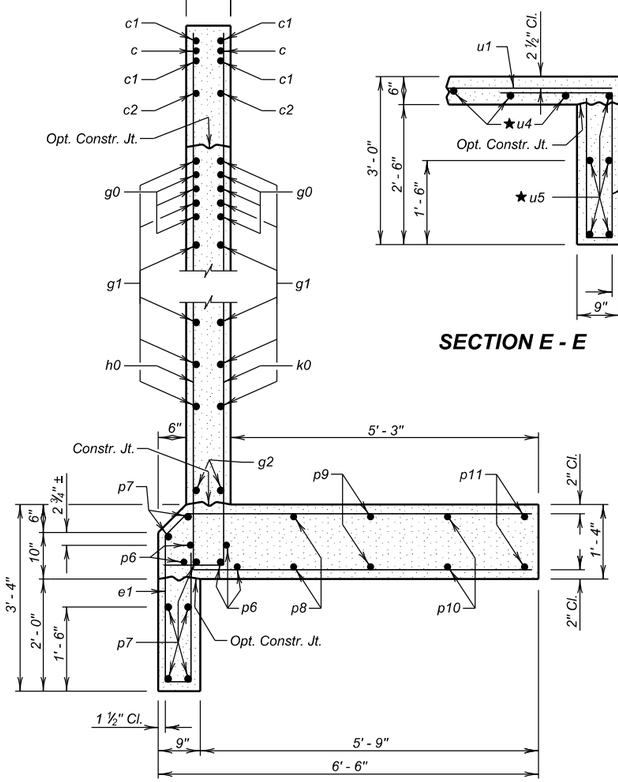
ELEVATION



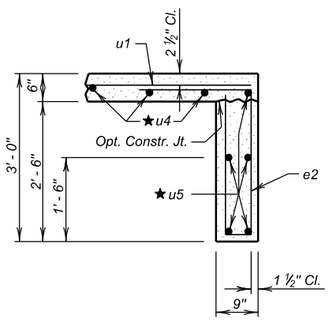
SECTION B - B



SECTION A - A
(At Top Slab)



SECTION C - C

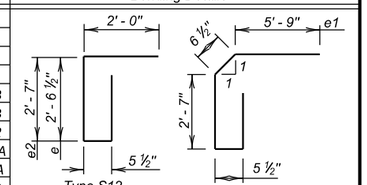


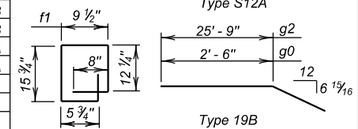
SECTION E - E

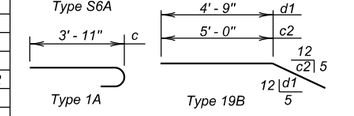
REINFORCING SCHEDULE

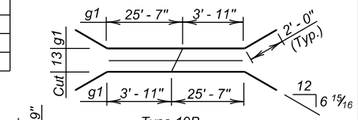
Mk.	No.	Size	Length	Type
a1	5	6	51' - 6"	Str.
b1	6	6	49' - 3"	Str.
c	4	5	4' - 6"	1A
c1	8	5	28' - 0"	Str.
c2	4	5	7' - 0"	19B
d1	8	5	6' - 6"	19B
e	50	4	7' - 3"	S12
e1	60	5	11' - 9"	S12A
f1	52	4	5' - 0"	S6A
g0	12	5	5' - 0"	19B
g1	26	4	33' - 6"	19B
g2	4	4	27' - 9"	19B
h0	17	4	29' - 6"	17A
k0	28	5	20' - 0"	17A
p6	10	6	7' - 0"	Str.
p7	14	4	28' - 6"	Str.
p8	4	4	29' - 6"	Str.
p9	4	4	30' - 9"	Str.
p10	4	4	32' - 3"	Str.
p11	4	4	33' - 6"	Str.
INLET APRON				
e2	73	4	7' - 6"	S12
u1	49	4	22' - 9"	Str.
u2	12	4	24' - 6"	Str.
u3	5	4	108' - 6"	Str.
u4	12	4	68' - 6"	Str.
u5	10	4	38' - 0"	Str.

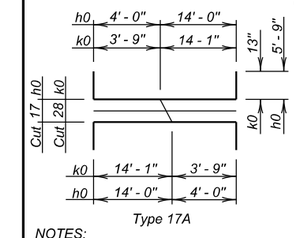
Bending Details

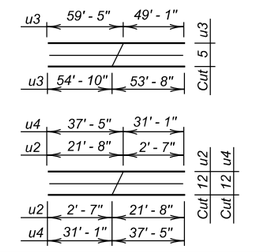












NOTES:
All dimensions are out to out of bars.
⌀ See cutting diagram.
✳ Bend in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	41.4	4664	19.2
Inlet Apron	31.8	2472	31.8

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

FOR

4 - 12' X 12' BOX CULVERT

OVER MEDARY CREEK
STA. 307 + 25.00
STR. NO. 06-320-198

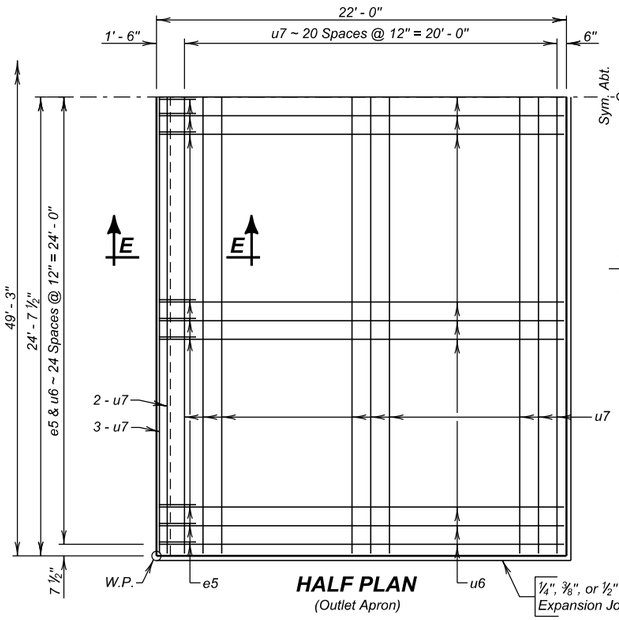
0° SKEW
SEC. 8/9-T109N-R47W
P-PH-B-PP 0013(49)121
HL-93

BROOKINGS COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2023

3 OF 8

DESIGNED BY	CK. DES. BY	DRAFTED BY	
ER	BS/JU	BT	Steve A. Johnson BRIDGE ENGINEER
BROK05EX	05EXTA03		

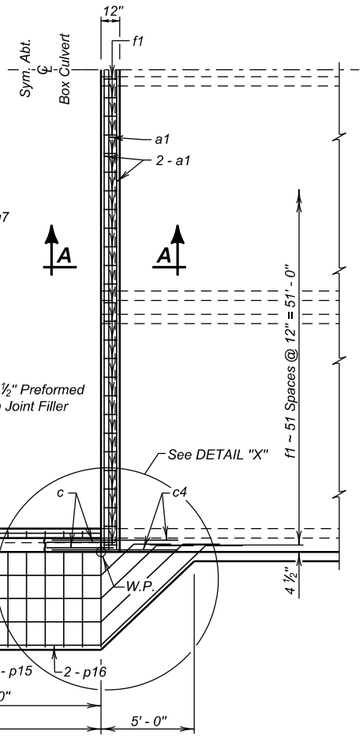
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PP 0013(49)121	E6	E10



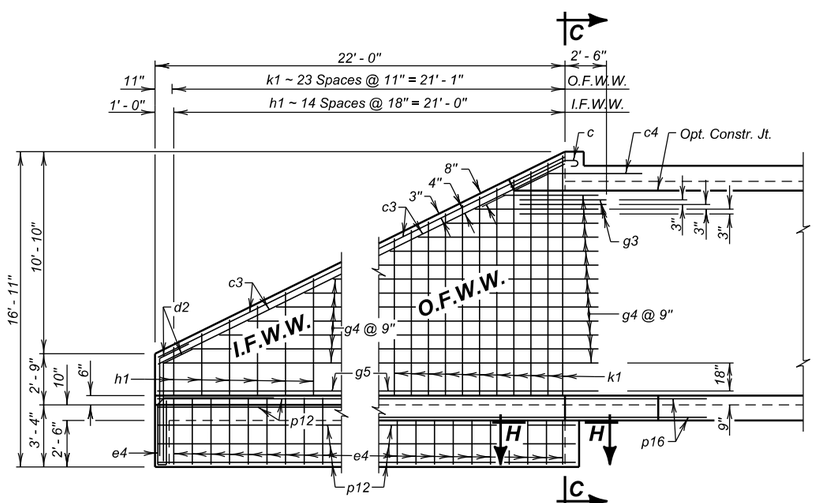
HALF PLAN
(Outlet Apron)

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

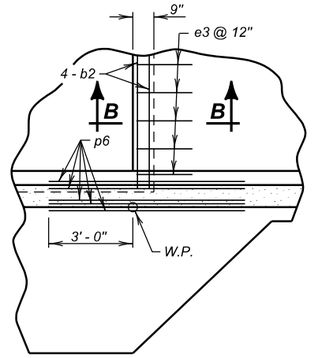
¼", ⅜", or ½" Preformed Expansion Joint Filler



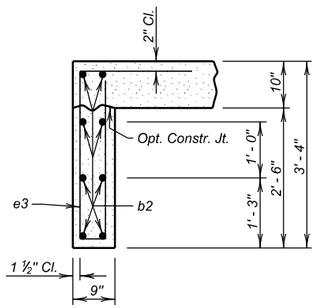
HALF PLAN



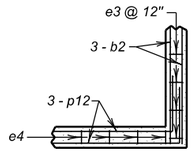
ELEVATION



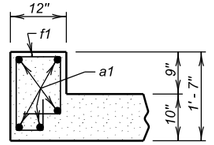
DETAIL "X"
(At Bottom Slab)



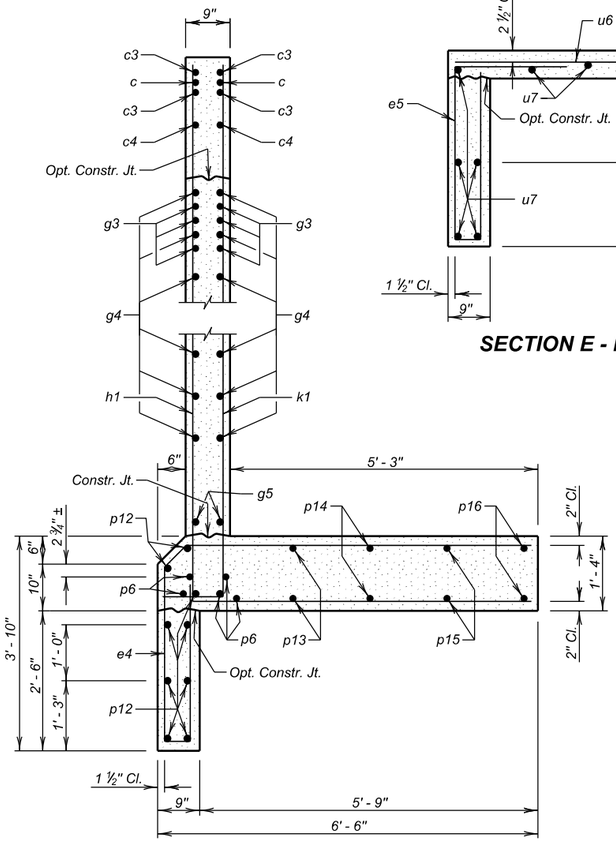
SECTION B - B



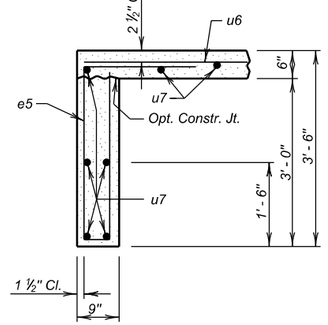
SECTION H - H



SECTION A - A
(At Top Slab)



SECTION C - C

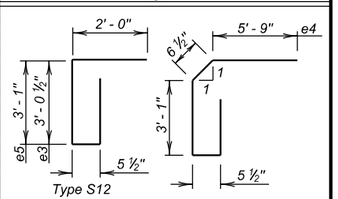


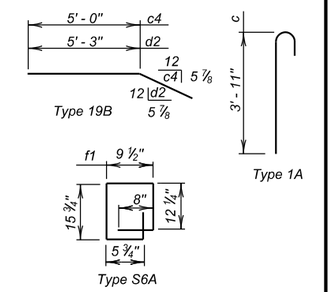
SECTION E - E

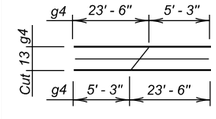
REINFORCING SCHEDULE

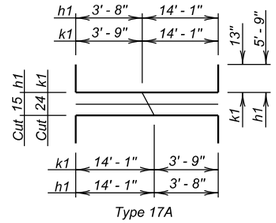
Mk.	No.	Size	Length	Type
a1	5	6	51' - 6"	Str.
b2	8	6	50' - 6"	Str.
* c	4	5	4' - 6"	1A
c3	8	5	24' - 6"	Str.
c4	4	5	7' - 0"	19B
d2	8	5	7' - 0"	19B
e3	50	4	8' - 3"	S12
e4	52	5	12' - 9"	S12A
f1	52	4	5' - 0"	S6A
g3	12	5	5' - 0"	Str.
⌀ g4	26	4	28' - 9"	Str.
g5	4	4	23' - 9"	Str.
⌀ h1	15	4	29' - 3"	17A
⌀ k1	24	5	20' - 0"	17A
p6	10	6	7' - 0"	Str.
* p12	18	4	24' - 6"	Str.
* p13	4	4	25' - 6"	Str.
* p14	4	4	27' - 6"	Str.
* p15	4	4	29' - 3"	Str.
* p16	4	4	31' - 3"	Str.
OUTLET APRON				
e5	49	4	8' - 6"	S12
u6	49	4	21' - 9"	Str.
u7	26	4	49' - 0"	Str.

Bending Details









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	38.2	4567	18.5
Outlet Apron	24.1	1841	24.1

LEGEND FOR PLACING RE-STEEL

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

OUTLET DETAILS

FOR

4 - 12' X 12' BOX CULVERT

OVER MEDARY CREEK — 0° SKEW
STA. 307 + 25.00 — SEC. 8/9-T109N-R47W
STR. NO. 06-320-198 — P-PH-B-PP 0013(49)121
HL-93

BROOKINGS COUNTY

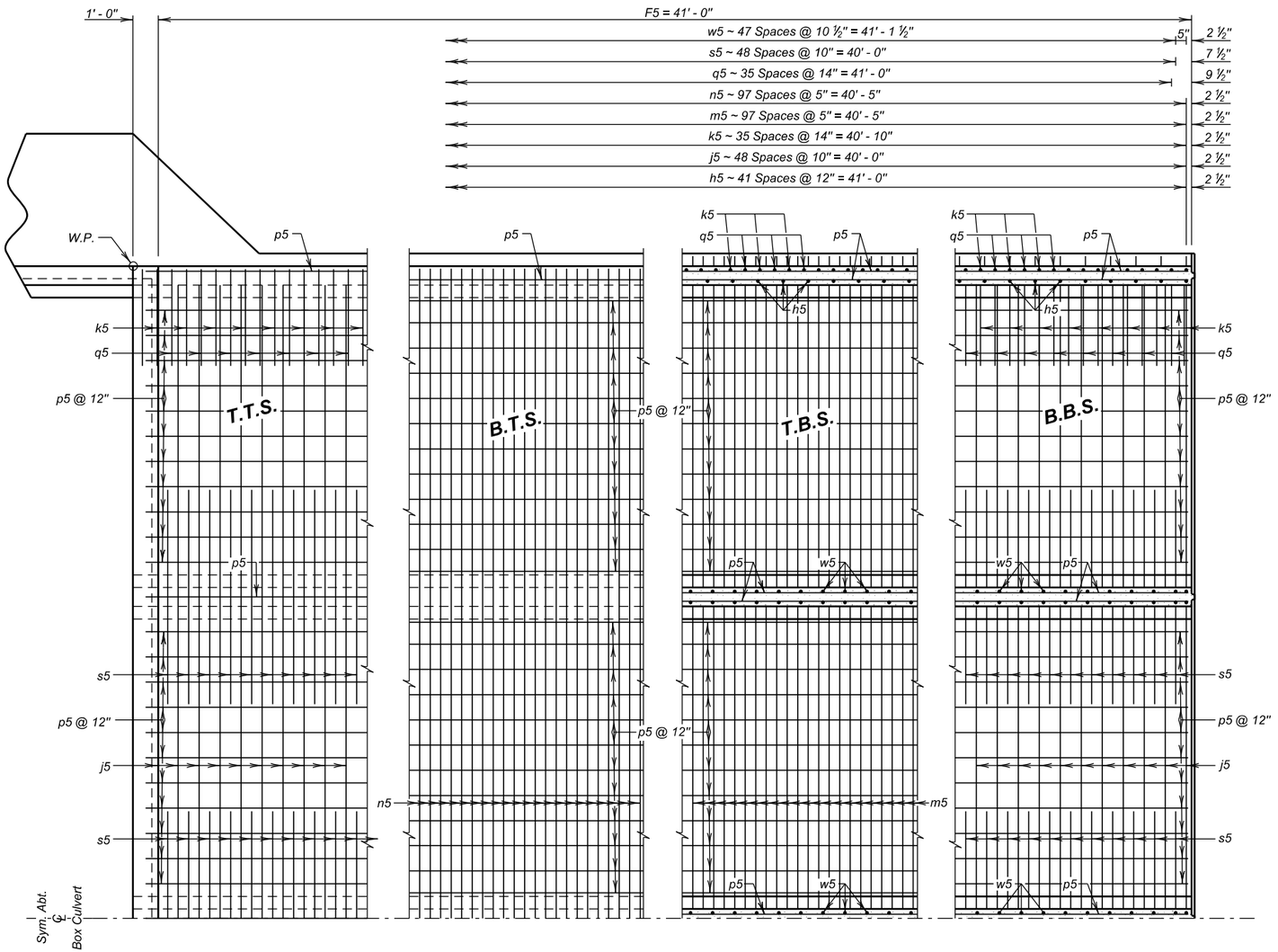
S. D. DEPT. OF TRANSPORTATION

NOVEMBER 2023

4 OF 8

DESIGNED BY	CK. DES. BY	DRAFTED BY	
ER	BS/JU	BT	Steve A Johnson BRIDGE ENGINEER
BROK05EX	05EXTA04		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PP 0013(49)121	E7	E10



PLAN

(Outlet End shown, Inlet similar by rotation)

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 MEDARY CREEK — 0° SKEW

STA. 307 + 25.00 — SEC. 8/9-T109N-R47W

STR. NO. 06-320-198 — P-PH-B-PP 0013(49)121

HL-93

BROOKINGS COUNTY

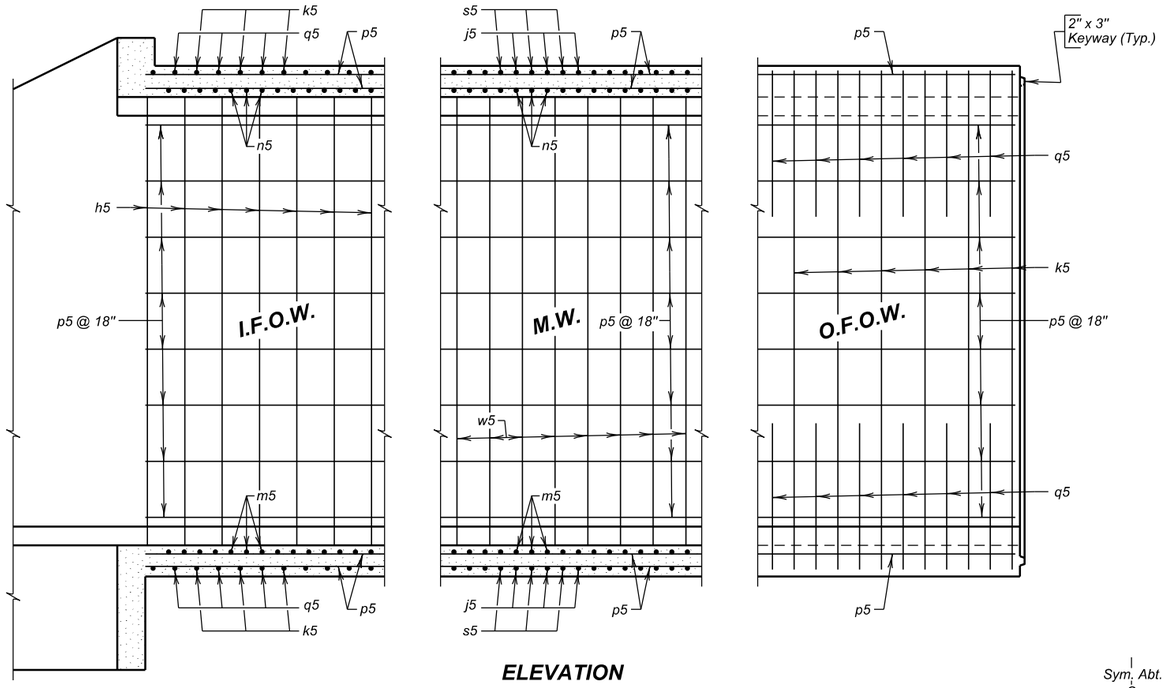
S. D. DEPT. OF TRANSPORTATION

NOVEMBER 2023

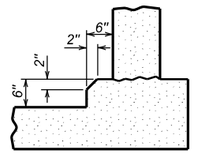
5 OF 8

DESIGNED BY	CK. DES. BY	DRAFTED BY	
ER	BS/JU	BT	Steve A Johnson BRIDGE ENGINEER
BROK05EX	05EXTA05		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P-PH-B-PP 0013(49)121	E8	E10



ELEVATION



OPTIONAL 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 POUR - BOTTOM SLAB

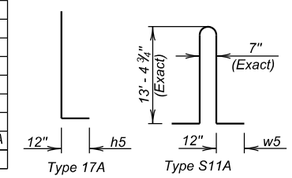
The Bottom Slab may be poured continuously, at the option of the Contractor, with the use of a Preformed Metal keyway conforming to the keyway dimensions and location as shown on the plans. The keyway length will be full width of the bottom slab. Care will be taken to maintain proper alignment of the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

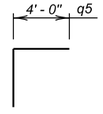
REINFORCING SCHEDULE

(For 2 - F5 Barrel End Sections)

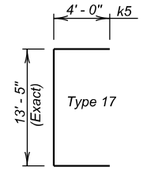
Mk.	No.	Size	Length	Type	Bending Details
h5	168	5	14' - 0"	17A	
j5	196	5	50' - 3"	Str.	
k5	144	5	21' - 6"	17	
m5	196	4	52' - 6"	Str.	
n5	196	5	51' - 6"	Str.	
p5	562	4	41' - 3"	Str.	
q5	284	5	8' - 0"	17A	
s5	588	5	8' - 6"	Str.	
w5	294	4	30' - 0"	S11A	
△ z1	136	5	3' - 6"	Str.	

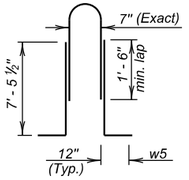


Type 17A Type S11A

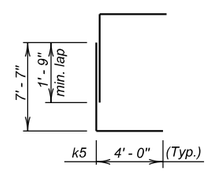


Type 17A





OPTIONAL w5 SPLICE DETAIL



OPTIONAL k5 SPLICE DETAIL

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.

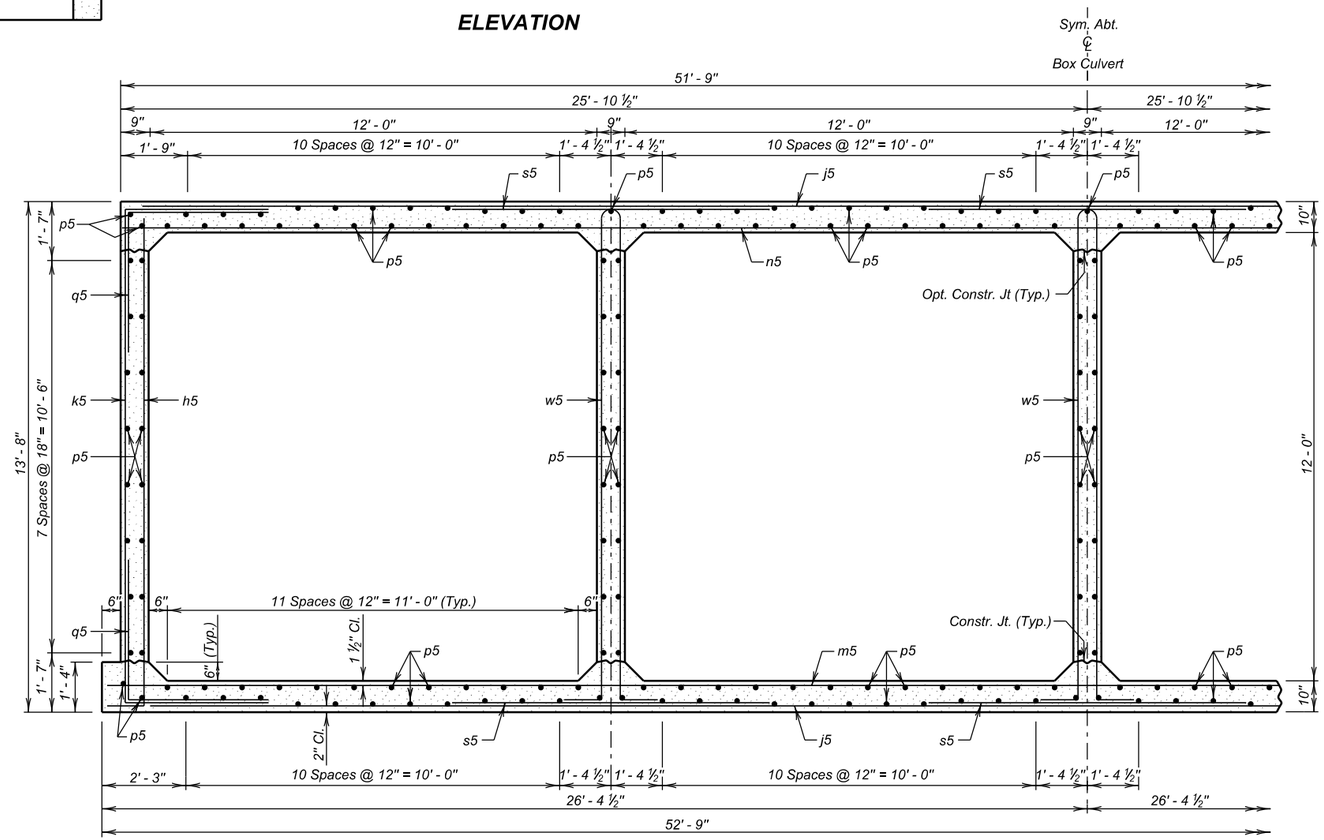
Request for additional reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.

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"	408.7	62813	133.5

LEGEND FOR PLACING RE-STEEL

O.F.O.W.	- Outside Face of Outside Wall
I.F.O.W .	- Inside Face of Outside Wall
M. W.	- Middle Wall



F5 BARREL HALF SECTION

(5' - 0" Maximum Fill)

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

FOR

4 - 12' X 12' BOX CULVERT

OVER MEDARY CREEK — 0° SKEW

STA. 307 + 25.00 — SEC. 8/9-T109N-R47W

STR. NO. 06-320-198 — P-PH-B-PP 0013(49)121

HL-93

BROOKINGS COUNTY

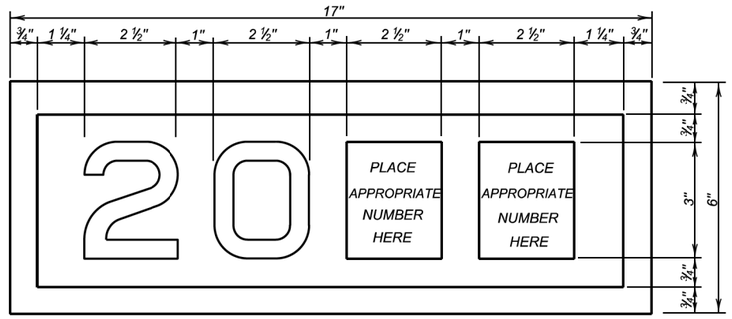
S. D. DEPT. OF TRANSPORTATION

NOVEMBER 2023

6 OF 8

DESIGNED BY	CK. DES. BY	DRAFTED BY	
ER	BS/JU	BT	Steve A Johnson BRIDGE ENGINEER
BROK05EX	05EXTA06		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	PH-P 0013(49)121	E9	E10



YEAR PLATE DETAILS

GENERAL NOTES:

1. 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.

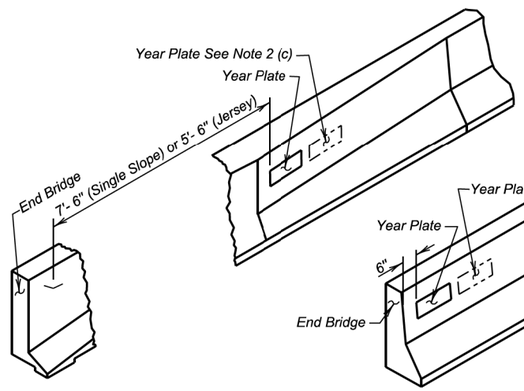
2. Year plates will be located on structure(s) as follows:

   a. On cast-in-place box culverts the year plates will be four and one - half (4 ½) 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.

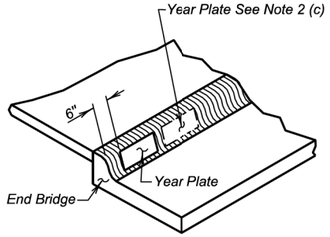
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with 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.

   c. 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.

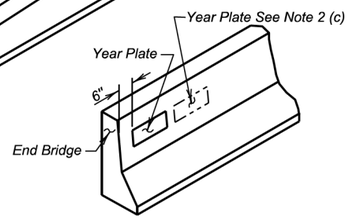
3. There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



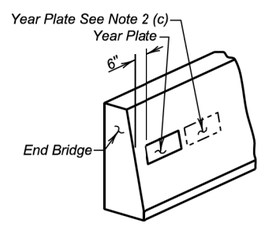
BARRIER
(With Endblock)



TYPE B CURB



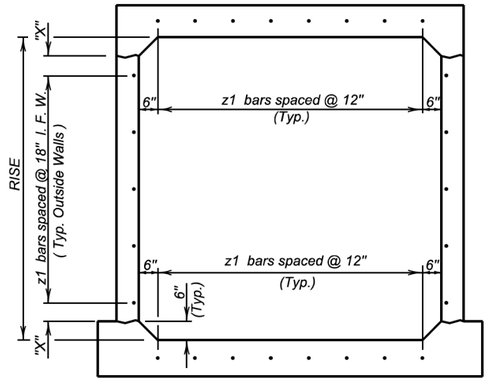
JERSEY BARRIER



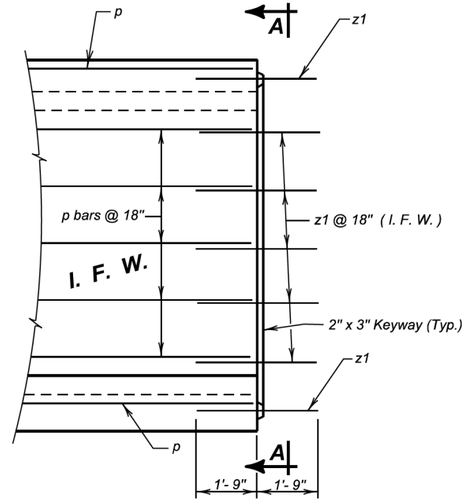
SINGLE SLOPE BARRIER

January 22,2021

Published Date: 2024	SDDOT	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1

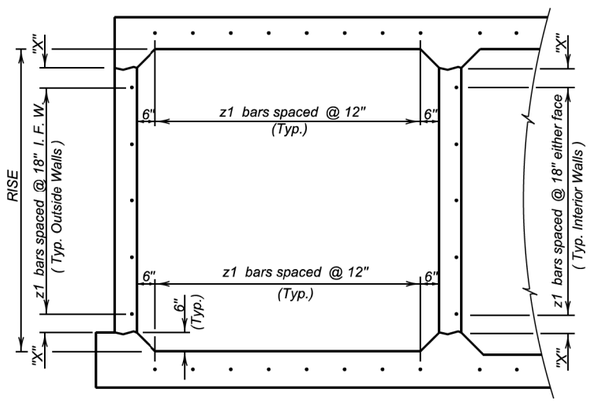


TYPICAL SINGLE BARREL VIEW A - A



ELEVATION

LEGEND FOR PLACING RE-STEEL
I. F. W. - Inside Face Wall



TYPICAL MULTIPLE BARREL VIEW A - A

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"

GENERAL NOTES:

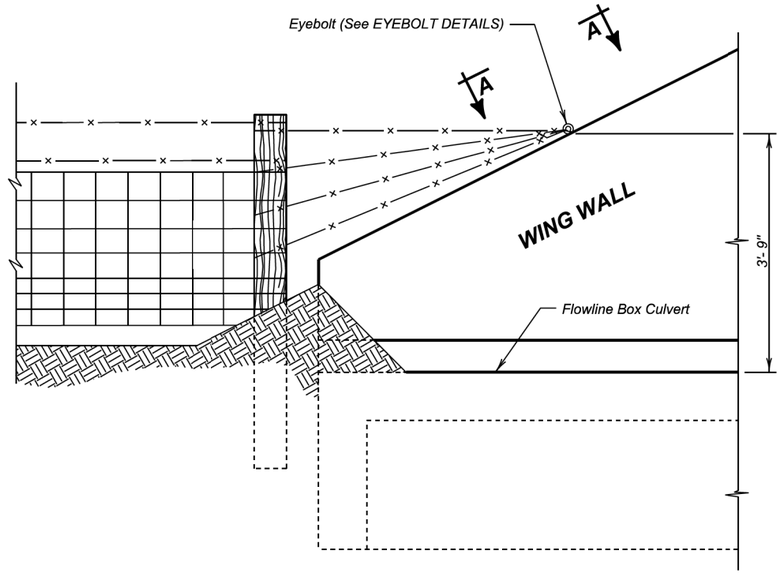
1. z1 bars will be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars will be lapped with the longitudinal p bars in the inside face of the wall for outside walls and in either face for interior walls. z1 bars are listed and included elsewhere in plans.

2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

Published Date: 2024	SDDOT	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1

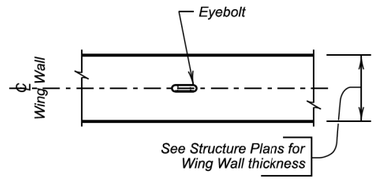
4 - 12' X 12' BOX CULVERT
STR. NO. 06-320-198
NOVEMBER 2023



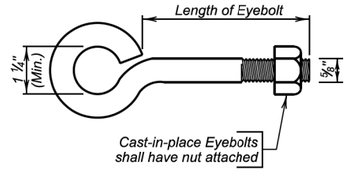
DETAIL FOR FENCE ANCHORS

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 ⅝ 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 ½ 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 ⅝ 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

Published Date: 2024	SDDOT	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
			Sheet 1 of 1