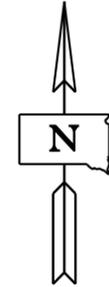


STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E1	E58

Section E: Structure Plans

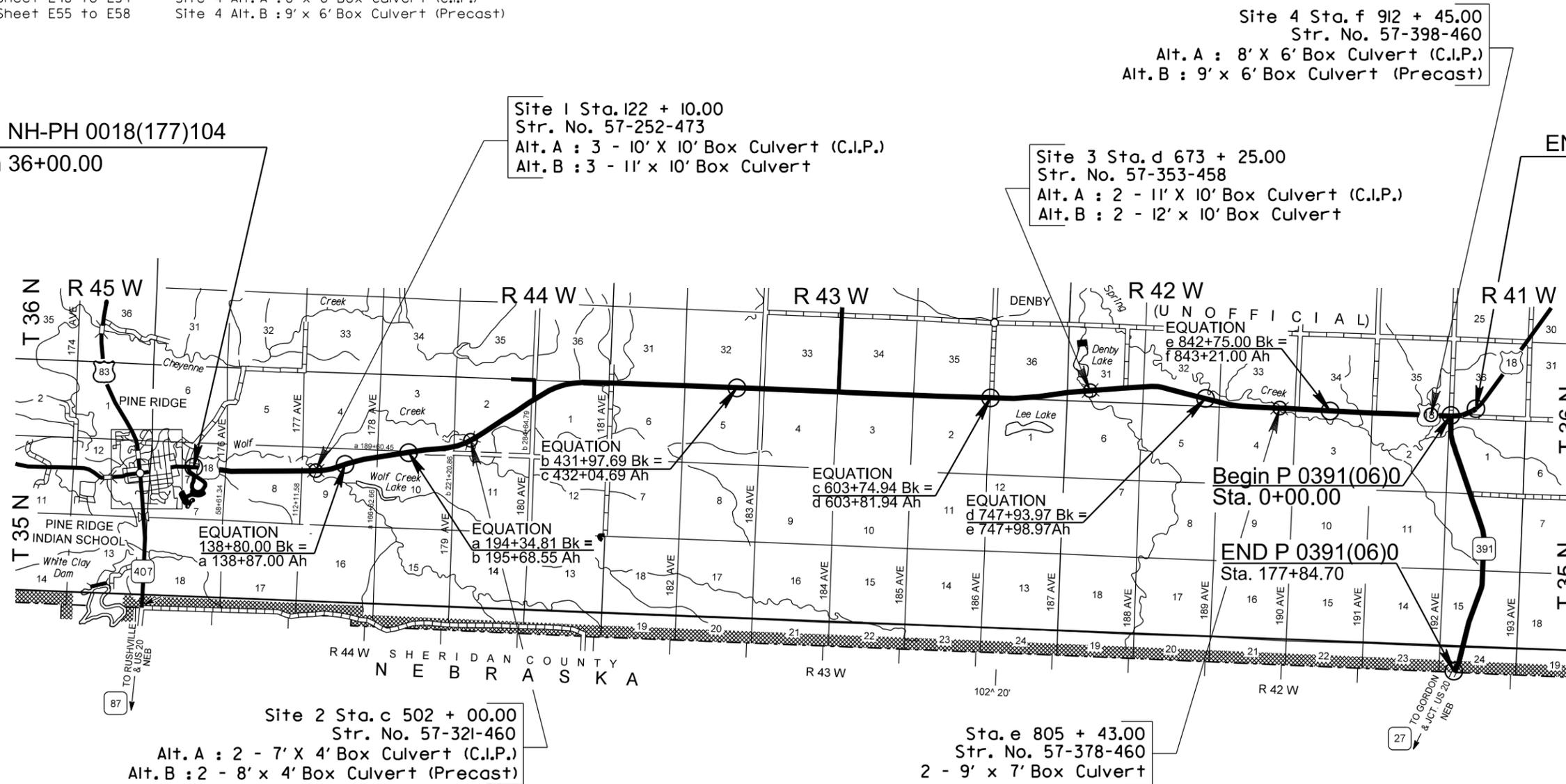


INDEX OF SHEETS -

Sheet E1	Layout Map and Index
Sheet E2	Estimate of Structure Quantities
Sheet E3 to E12	Site 1 Alt. A : 3 - 10' x 10' Box Culvert (C.I.P.)
Sheet E13 to E17	Site 1 Alt. B : 3 - 11' x 10' Box Culvert (Precast)
Sheet E18 to E24	Site 2 Alt. A : 2 - 7' x 4' Box Culvert (C.I.P.)
Sheet E25 to E28	Site 2 Alt. B : 2 - 8' x 4' Box Culvert (Precast)
Sheet E29 to E35	Site 3 Alt. A : 3 - 11' x 10' Box Culvert (C.I.P.)
Sheet E36 to E39	Site 3 Alt. B : 3 - 12' x 10' Box Culvert (Precast)
Sheet E40 to E47	2 - 9' x 7' Box Culvert
Sheet E48 to E54	Site 4 Alt. A : 8' x 6' Box Culvert (C.I.P.)
Sheet E55 to E58	Site 4 Alt. B : 9' x 6' Box Culvert (Precast)

BEGIN NH-PH 0018(177)104
Station 36+00.00

END NH-PH 0018(177)104
Station f 934+24.00



SECTION E – ESTIMATE OF STRUCTURE QUANTITIES

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
250E0030	Incidental Work, Structure	Lump Sum	LS

Site 1 – Alternate A
Str. No. 57-252-473
3 – 10' x 10' Box Culvert (C.I.P.)
Sta. 122 + 10.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	211	CuYd
421E0200	Box Culvert Undercut	568	CuYd
460E0120	Class A45 Concrete, Box Culvert	554.7	CuYd
480E0100	Reinforcing Steel	72,875	Lb
700E0210	Class B Riprap	226.0	Ton
831E0110	Type B Drainage Fabric	283	SqYd
831E0210	Non-woven Geotextile Separator	957	SqYd

Site 1 – Alternate B
Str. No. 57-252-473
3 – 11' X 10' Box Culvert (Precast)
Sta. 122 + 10.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	170	CuYd
421E0200	Box Culvert Undercut	596	CuYd
464E0100	Controlled Density Fill	52.6	CuYd
560E0166	11'x10' Precast Concrete Box Culvert, Furnish	140.0	Ft
560E0167	11'x10' Precast Concrete Box Culvert, Install	140.0	Ft
560E1166	11'x10' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E1167	11'x10' Precast Concrete Box Culvert End Section, Install	2	Each
560E2148	2-11'x10' Precast Concrete Box Culvert, Furnish	140.0	Ft
560E2149	2-11'x10' Precast Concrete Box Culvert, Install	140.0	Ft
560E3148	2-11'x10' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E3149	2-11'x10' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	65.0	Ton
831E0110	Type B Drainage Fabric	86	SqYd
831E0210	Non-woven Geotextile Separator	982	SqYd

Site 2 – Alternate A
Str. No. 57-321-460
2 – 7' X 4' Box Culvert (C.I.P.)
Sta. c 502 + 00.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	50	CuYd
421E0200	Box Culvert Undercut	179	CuYd
460E0120	Class A45 Concrete, Box Culvert	122.6	CuYd
480E0100	Reinforcing Steel	14,494	Lb
700E0210	Class B Riprap	49.3	Ton
831E0110	Type B Drainage Fabric	82	SqYd
831E0210	Non-woven Geotextile Separator	357	SqYd

Site 2 – Alternate B
Str. No. 57-321-460
2 - 8' x 4' Box Culvert (Precast)
Sta. c 502 + 00.00

Bid Item Number	Item	Quantity	Unit
420E0200	Structure Excavation, Box Culvert	43	CuYd
421E0200	Box Culvert Undercut	174	CuYd
560E2070	2-8'x4' Precast Concrete Box Culvert, Furnish	80.0	Ft
560E2071	2-8'x4' Precast Concrete Box Culvert, Install	80.0	Ft
560E3070	2-8'x4' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E3071	2-8'x4' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	29.9	Ton
831E0110	Type B Drainage Fabric	48	SqYd
831E0210	Non-woven Geotextile Separator	347	SqYd

Site 3 – Alternate A
Str. No. 57-353-458
2 – 11' x 10' Box Culvert (C.I.P.)
Sta. d 673 + 25.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
260E1010	Base Course	154.8	Ton
420E0200	Structure Excavation, Box Culvert	90	CuYd
421E0200	Box Culvert Undercut	269	CuYd
460E0120	Class A45 Concrete, Box Culvert	242.0	CuYd
480E0100	Reinforcing Steel	33,606	Lb
700E0310	Class C Riprap	262.8	Ton
831E0110	Type B Drainage Fabric	271	SqYd
831E0210	Non-woven Geotextile Separator	557	SqYd

Site 3 – Alternate B
Str. No. 57-353-458
2 - 12' x 10' Box Culvert (Precast)
Sta. d 673 + 25.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
260E1010	Base Course	165.8	Ton
420E0200	Structure Excavation, Box Culvert	97	CuYd
421E0200	Box Culvert Undercut	301	CuYd
560E2174	2-12'x10' Precast Concrete Box Culvert, Furnish	86.0	Ft
560E2175	2-12'x10' Precast Concrete Box Culvert, Install	86.0	Ft
560E3174	2-12'x10' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E3175	2-12'x10' Precast Concrete Box Culvert End Section, Install	2	Each
700E0310	Class C Riprap	106.1	Ton
831E0110	Type B Drainage Fabric	111	SqYd
831E0210	Non-woven Geotextile Separator	591	SqYd

Str. No. 57-378-460
2 - 9' x 7' Box Culvert
Sta. e 805 + 43.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	61	CuYd
421E0200	Box Culvert Undercut	212	CuYd
460E0120	Class A45 Concrete, Box Culvert	161.9	CuYd
480E0100	Reinforcing Steel	22,254	Lb
700E0210	Class B Riprap	126.7	Ton
831E0110	Type B Drainage Fabric	185	SqYd
831E0210	Non-woven Geotextile Separator	444	SqYd

Site 4 – Alternate A
Str. No. 57-398-460
8' x 6' Box Culvert (C.I.P.)
Sta. f 912 + 45.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	36	CuYd
421E0200	Box Culvert Undercut	157	CuYd
460E0120	Class A45 Concrete, Box Culvert	93.5	CuYd
480E0100	Reinforcing Steel	11,903	Lb
700E0210	Class B Riprap	50.2	Ton
831E0110	Type B Drainage Fabric	78	SqYd
831E0210	Non-woven Geotextile Separator	342	SqYd

Site 4 – Alternate B
Str. 57-398-460
9' x 6' Box Culvert (Precast)
Sta. f 912 + 45.00

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	28	CuYd
421E0200	Box Culvert Undercut	134	CuYd
560E0112	9'x6' Precast Concrete Box Culvert, Furnish	80.0	Ft
560E0113	9'x6' Precast Concrete Box Culvert, Install	80.0	Ft
560E1112	9'x6' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E1113	9'x6' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	23.3	Ton
831E0110	Type B Drainage Fabric	35	SqYd
831E0210	Non-woven Geotextile Separator	281	SqYd

INCIDENTAL WORK, STRUCTURE

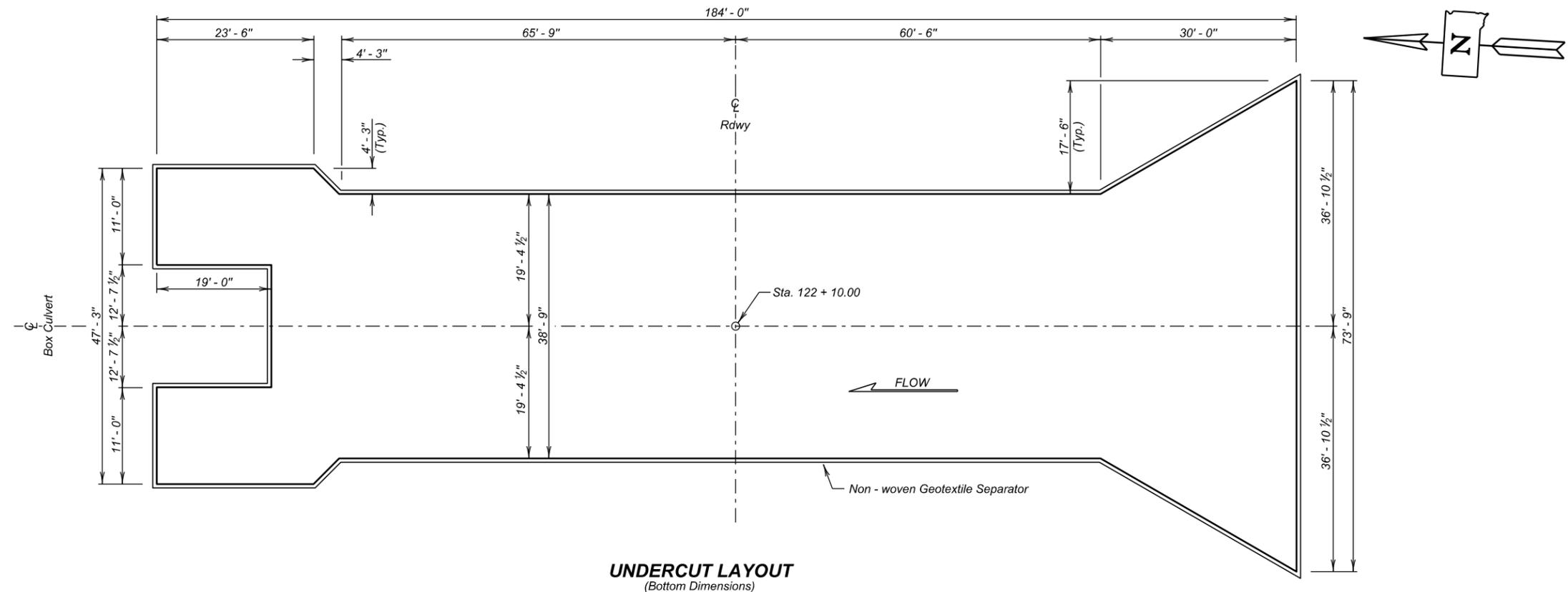
- Str. No. 57-252-473. In place centerline Sta. 122 + 16 is a 3-12' x 10' cast in place reinforced concrete box culvert.

Str. No. 57-353-458. In place centerline Sta. d 673 + 27 is a 2 - 12' x 12' cast in place reinforced concrete box culvert.

Str. No. 57-378-460. In place centerline Sta. e 805 + 43 is a 2 - 10' x 7' cast in place reinforced concrete box culvert.
- Break down and remove the existing structures 1 foot below finished ground or as required to construct the new structures in accordance with Section 110 of the Specifications. All portions of the existing structures shall be removed and disposed of by the Contractor on a site obtained by the Contractor and approved by the Engineer in accordance with COMMITMENT H: WASTE DISPOSAL SITE found in SECTION A.
- During demolition of structures, efforts shall be taken to prevent material from falling into the creek. Under no circumstances is asphalt allowed to fall into the creek.
- The foregoing is a general description of the in-place structures and should not be construed to be complete in all details. Before preparing the bid it shall be the responsibility of the Contractor to make a visual inspection of the structures 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.

Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E4	E58



SPECIFICATIONS

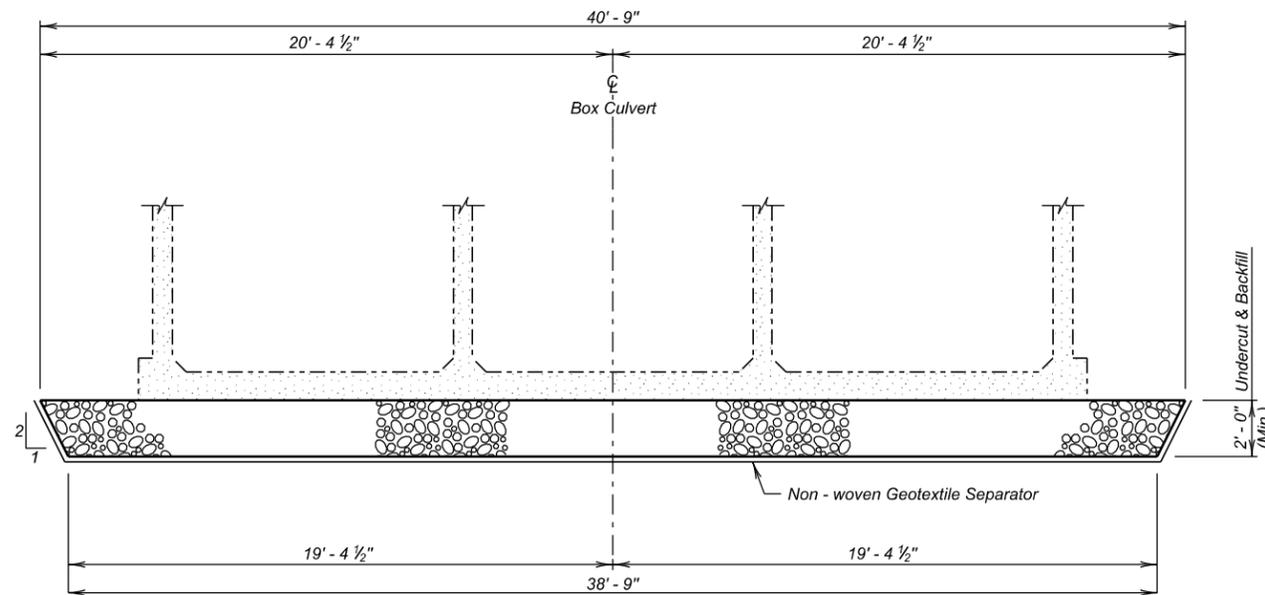
1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the 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 shall 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 15 ft. (S3).
3. Design Material Strengths: Concrete $f_c = 4500$ p.s.i.
Reinforcing Steel $f_y = 60000$ p.s.i.
4. All concrete shall be Class A45 conforming to Section 460.
5. All reinforcing steel shall conform to ASTM A615 Grade 60.
6. All exposed edges shall be chamfered 1/4 inch.
7. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
8. The Contractor shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Care shall be taken to establish Working Points (W.P.) as shown on the wings.
10. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
11. Compaction of earth embankment and box culvert backfill material shall be governed by the Specified Density method.
12. Dimension "L" on the standard box culvert sheet(s) is the barrel section length shown in the PLAN view on the General Drawing (for each S3 barrel section, as applicable).
13. The subsurface soils at Station 122 + 13 consist of brown to light gray sandy silt-clay to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were silt-sand.

GEOTEXTILE

1. A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
2. The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
3. The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
4. The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
5. Payment will be full compensation for furnishing and installing the geotextile only.



TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	568
Non-woven Geotextile Separator	Sq. Yd.	957

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
For payment, quantity is based on plan shown bottom undercut dimensions, Quantity includes 15% for overlapping.

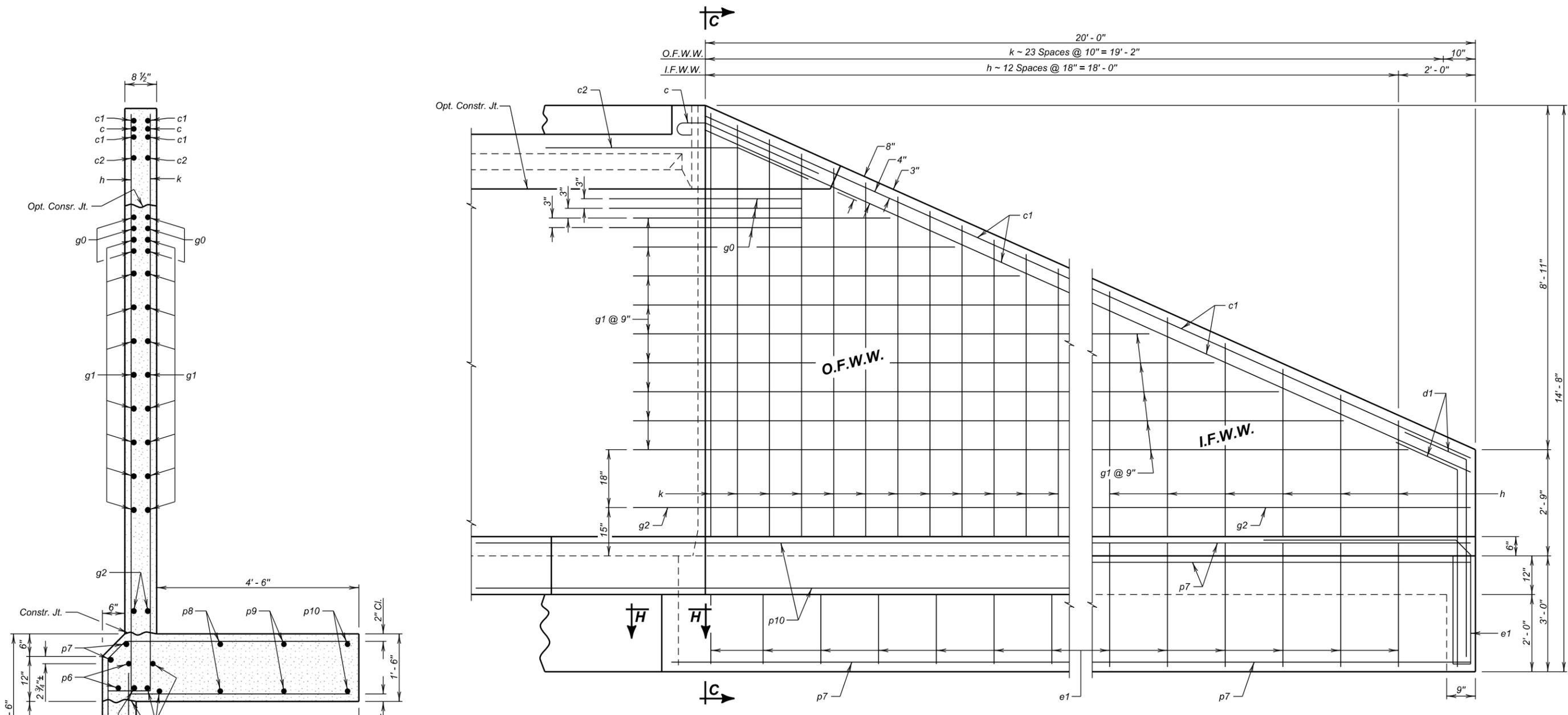
**SITE 1
ALTERNATE A**
NOTES AND UNDERCUT DETAILS
FOR
3 - 10' X 10' BOX CULVERT (C.I.P.)
OVER WOLF CREEK 0° SKEW
STA. 122 + 10.00 SEC. 9-T35N-R44W
STR. NO. 57-252-473 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION
OCTOBER 2013

DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA02	DRAFTED BY GW	Kevin N. Goeden BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E6	E58



VIEW E - E

SEC. C - C

SEC. H - H

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

**SITE 1
ALTERNATE A
INLET DETAILS (B)**

FOR
3 - 10' X 10' BOX CULVERT (C.I.P.)
OVER WOLF CREEK 0° SKEW
STA. 122 + 10.00 SEC. 9-T35N-R44W
STR. NO. 57-252-473 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION

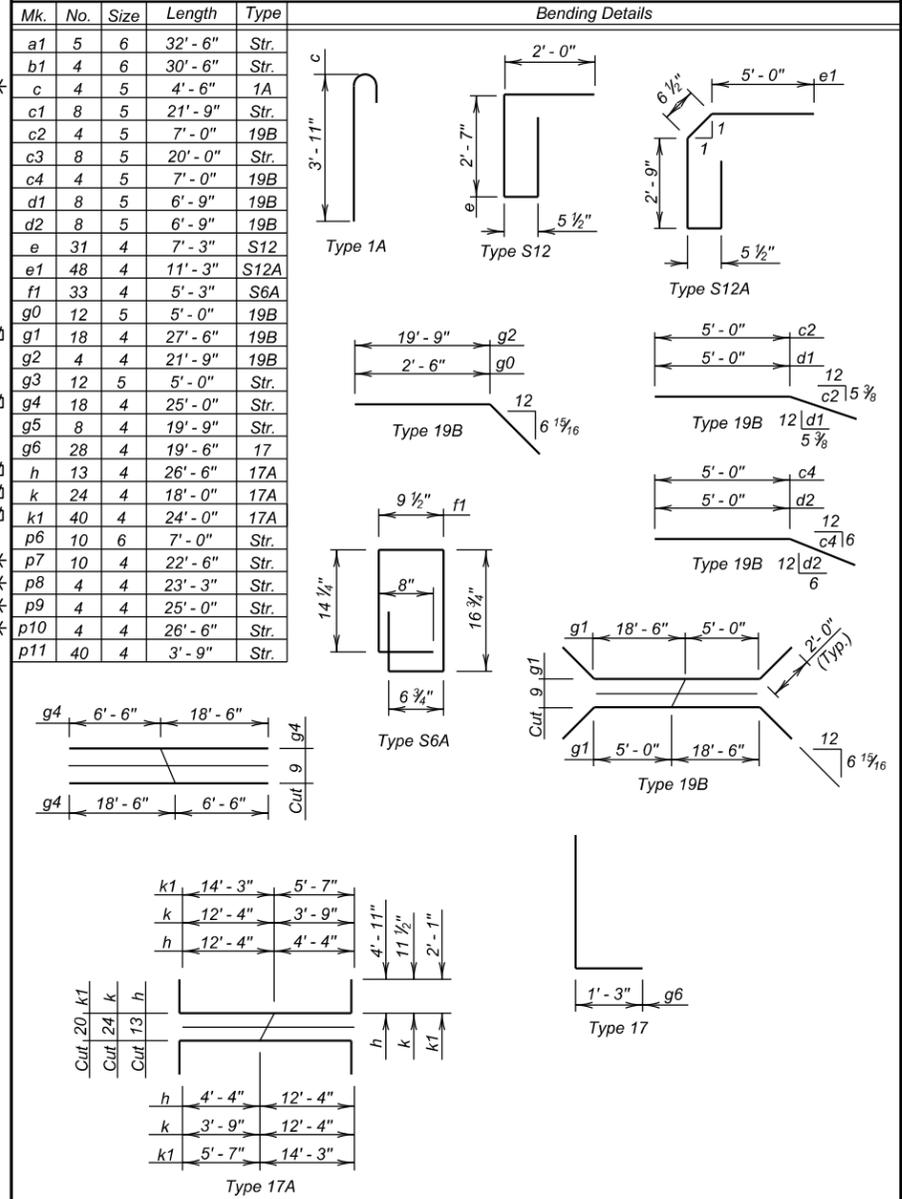
OCTOBER 2013 **4** OF **10**

DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA04	DRAFTED BY GW <i>Kevin N. Coeden</i> BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E7	E58

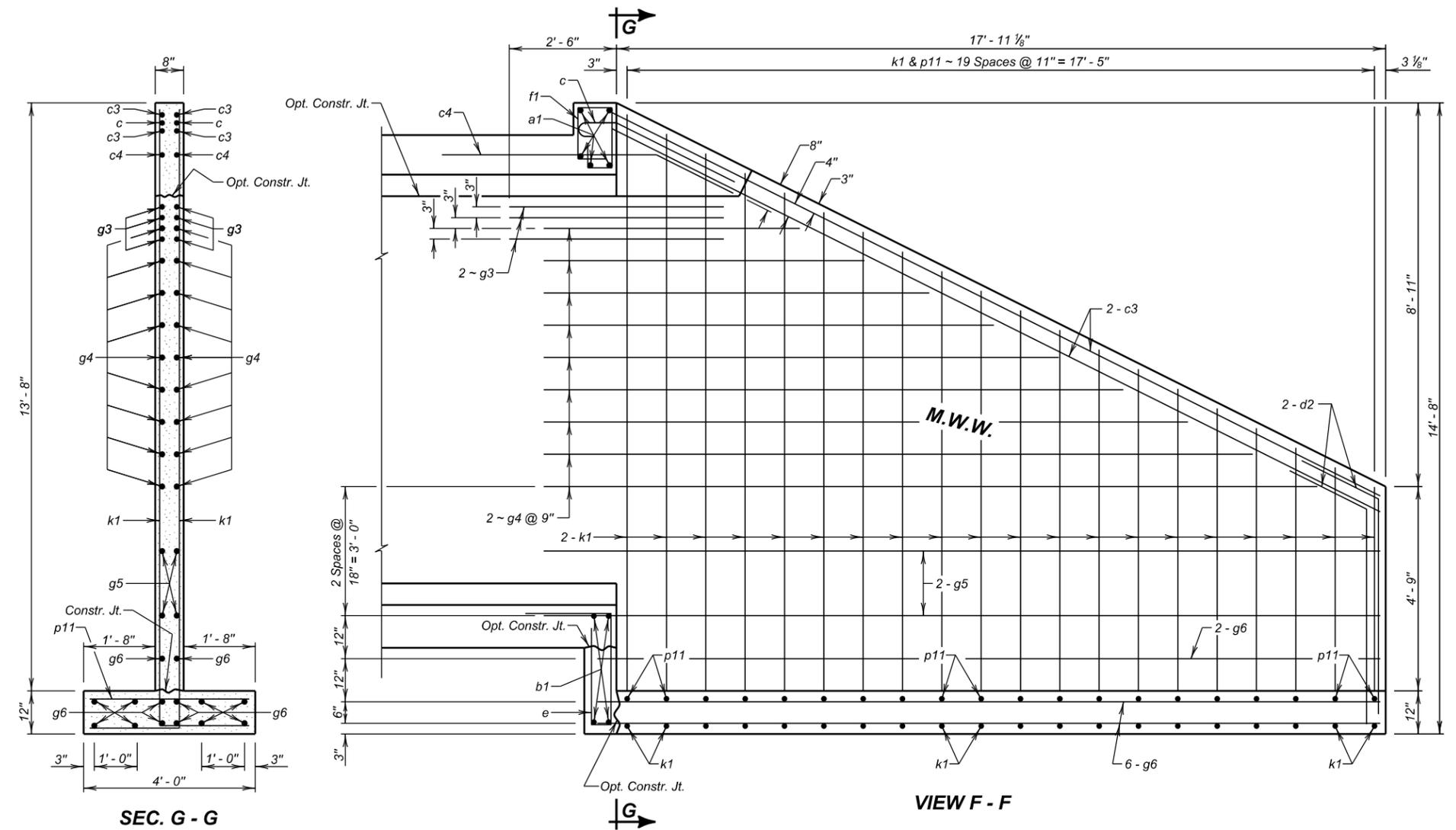
REINFORCING SCHEDULE



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	42.9	4593	22.0

LEGEND FOR PLACING RE-STEEL
 M. W. W. - Middle Wing Wall



**SITE 1
 ALTERNATE A
 INLET DETAILS (C)
 FOR
 3 - 10' X 10' BOX CULVERT (C.I.P.)
 OVER WOLF CREEK 0° SKEW
 STA. 122 + 10.00 SEC. 9-T35N-R44W
 STR. NO. 57-252-473 NH-PH 0018(177)104
 HL-93**

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013 **5** OF **10**

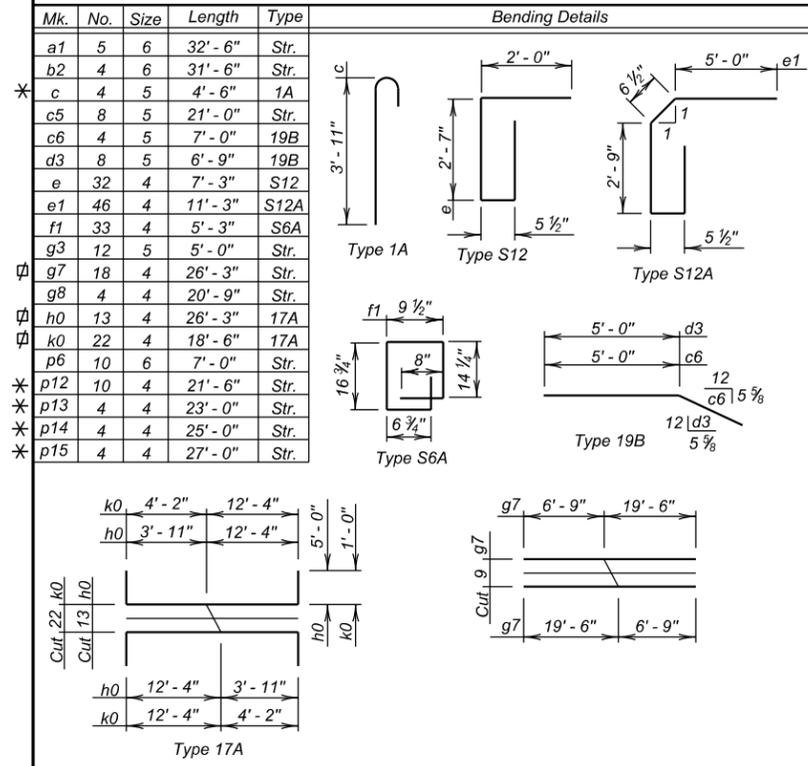
DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA05	DRAFTED BY GW	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E8	E58

REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type
a1	5	6	32'-6"	Str.
b2	4	6	31'-6"	Str.
c	4	5	4'-6"	1A
c5	8	5	21'-0"	Str.
c6	4	5	7'-0"	19B
d3	8	5	6'-9"	19B
e	32	4	7'-3"	S12
e1	46	4	11'-3"	S12A
f1	33	4	5'-3"	S6A
g3	12	5	5'-0"	Str.
g7	18	4	26'-3"	Str.
g8	4	4	20'-9"	Str.
h0	13	4	26'-3"	17A
k0	22	4	18'-6"	17A
p6	10	6	7'-0"	Str.
p12	10	4	21'-6"	Str.
p13	4	4	23'-0"	Str.
p14	4	4	25'-0"	Str.
p15	4	4	27'-0"	Str.



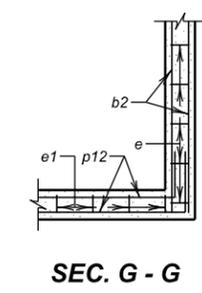
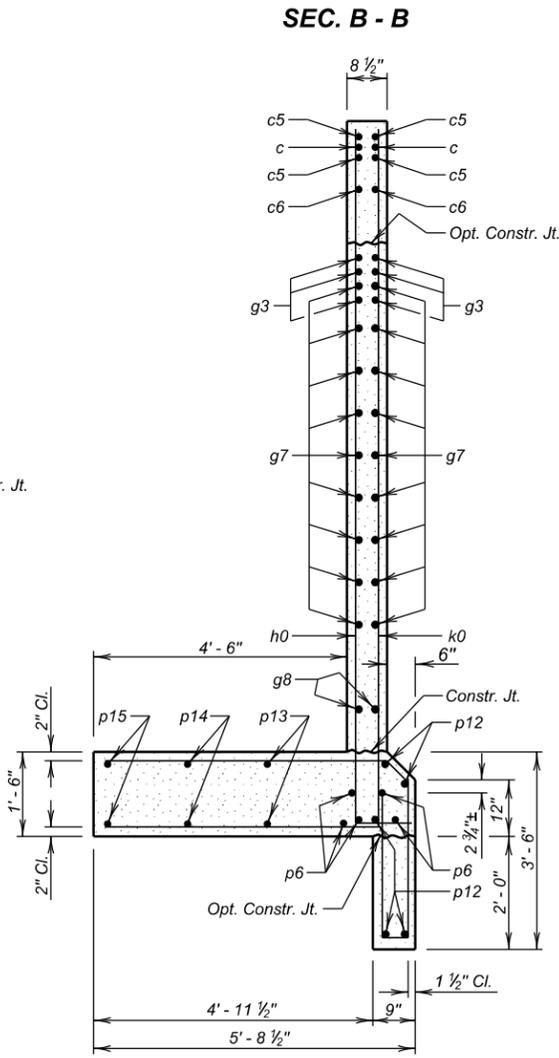
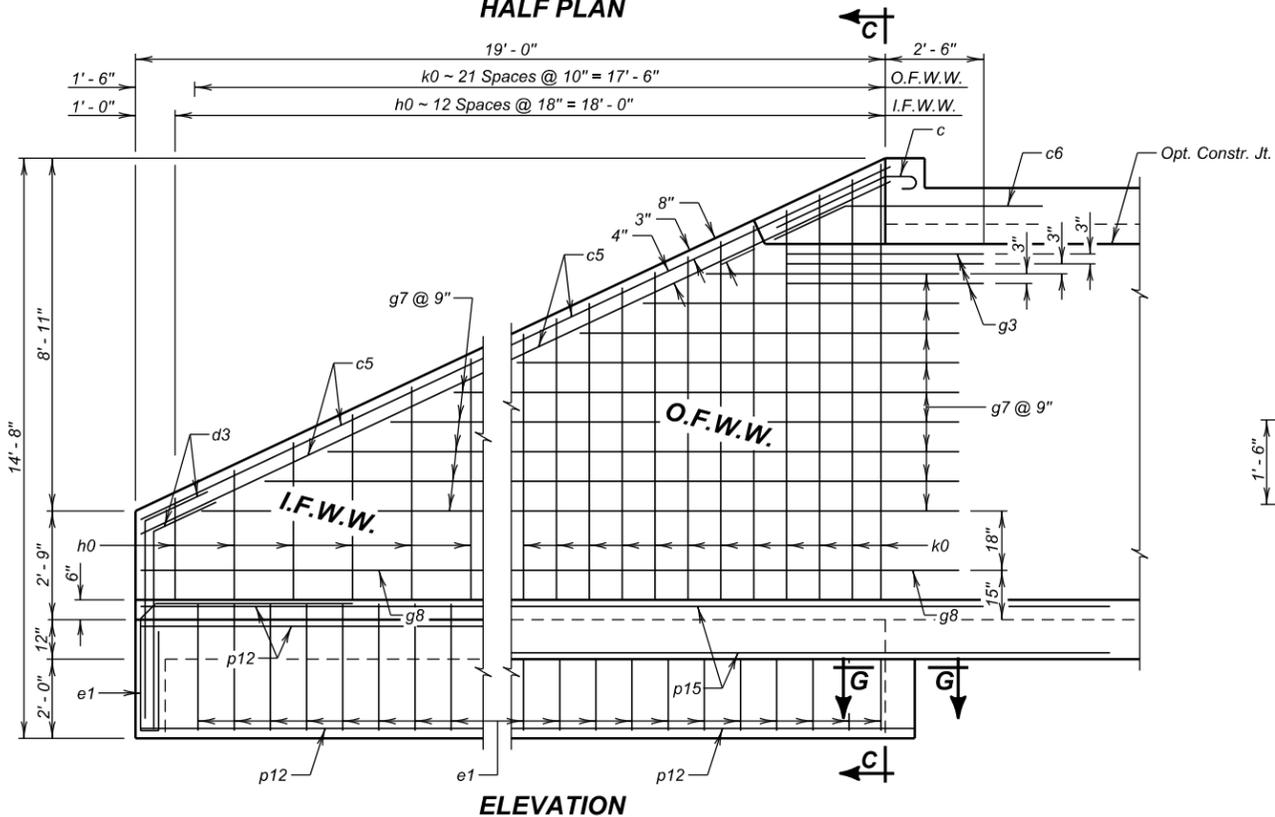
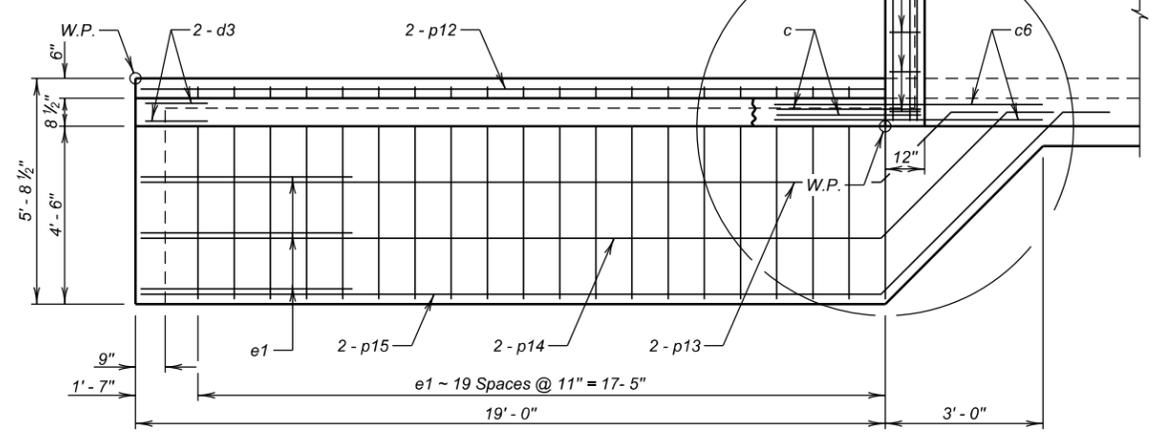
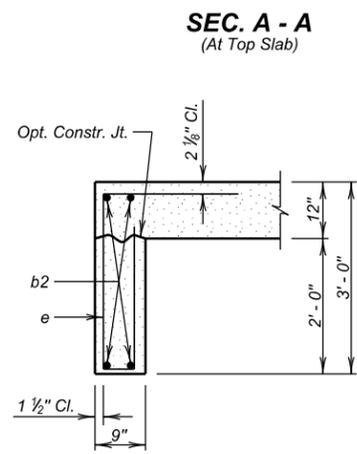
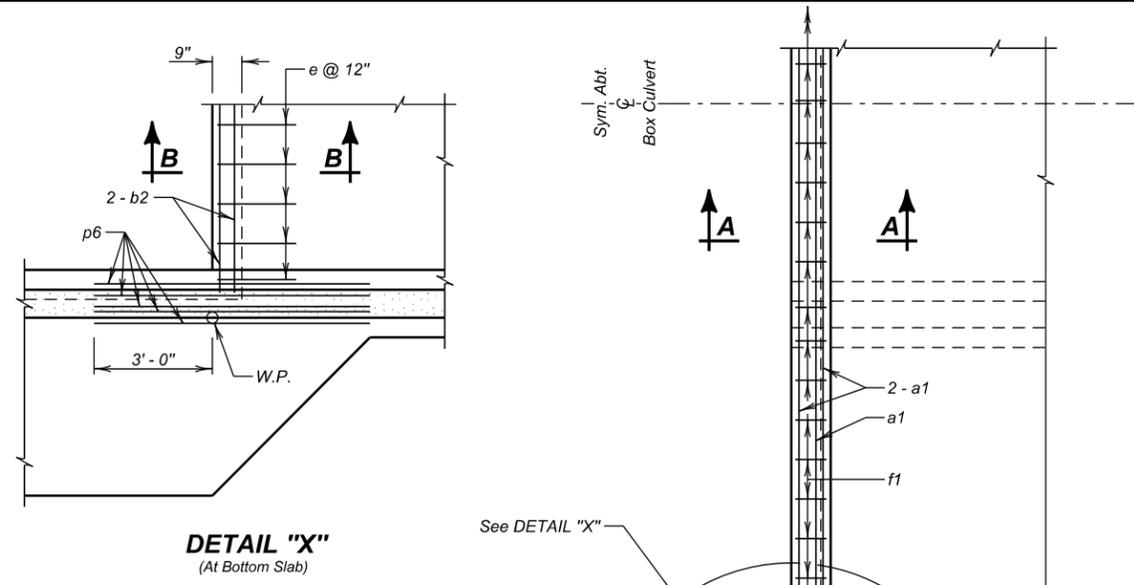
NOTES:
 All dimensions are out to out of bars.
 ☐ See cutting diagram.
 * Bend in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	28.2	2712	14.3

LEGEND FOR PLACING RE-STEEL

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

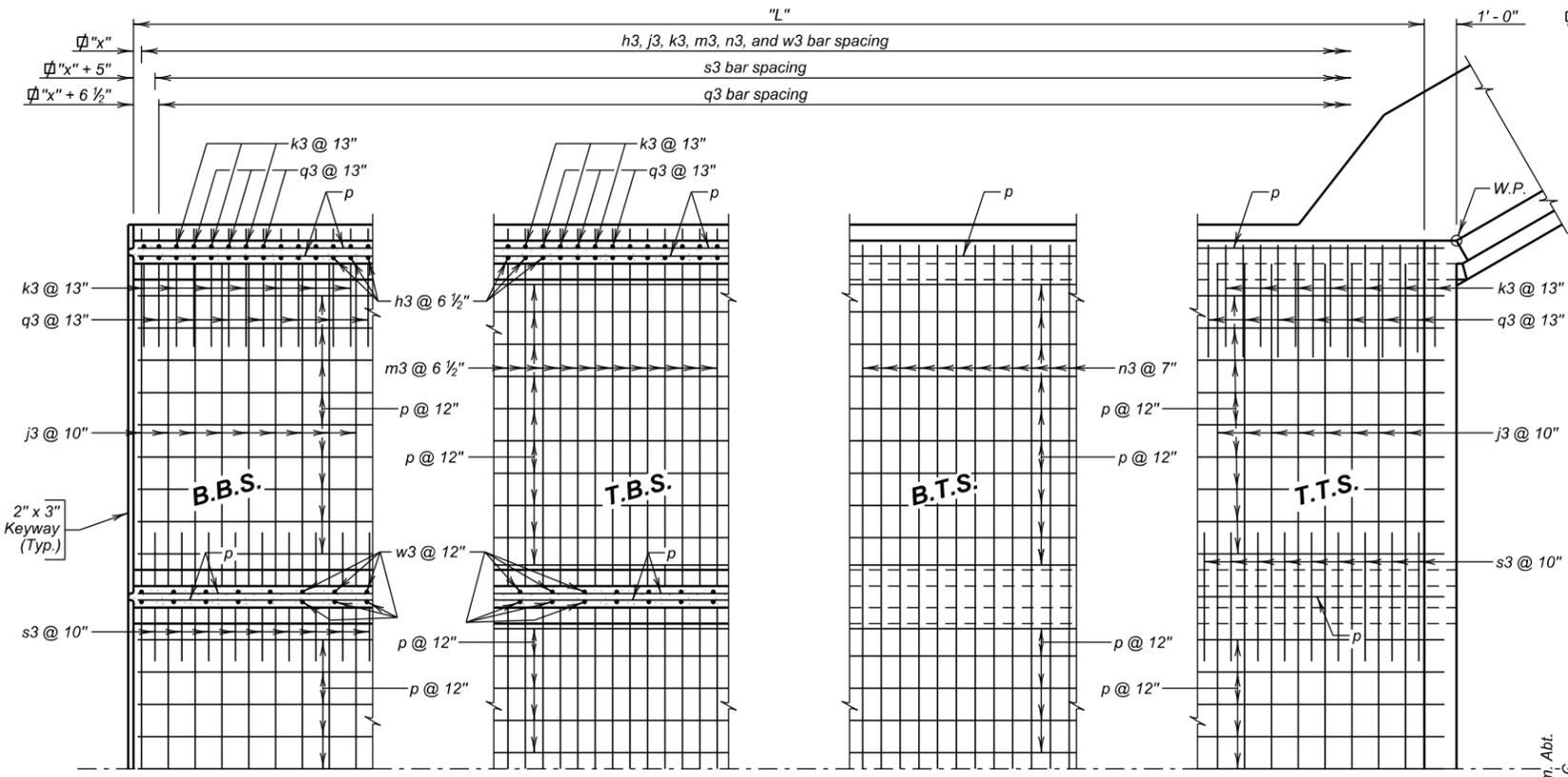


**SITE 1
 ALTERNATE A**
 STANDARD S3 OUTLET DETAILS
 FOR
 3 - 10' X 10' BOX CULVERT (C.I.P.)
 HL-93 0° SKEW

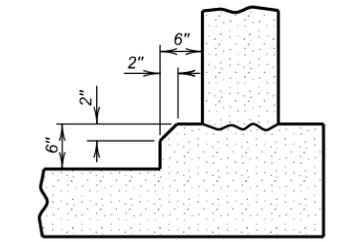
S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013

DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA06	DRAFTED BY GW	Kevin N. Coeden BRIDGE ENGINEER
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Revised July 23, 2015



NOTE: Maximum dimension "x" equal to one half of bar spacing.



OPTIONAL FILLET DETAIL (At Bottom Slab)

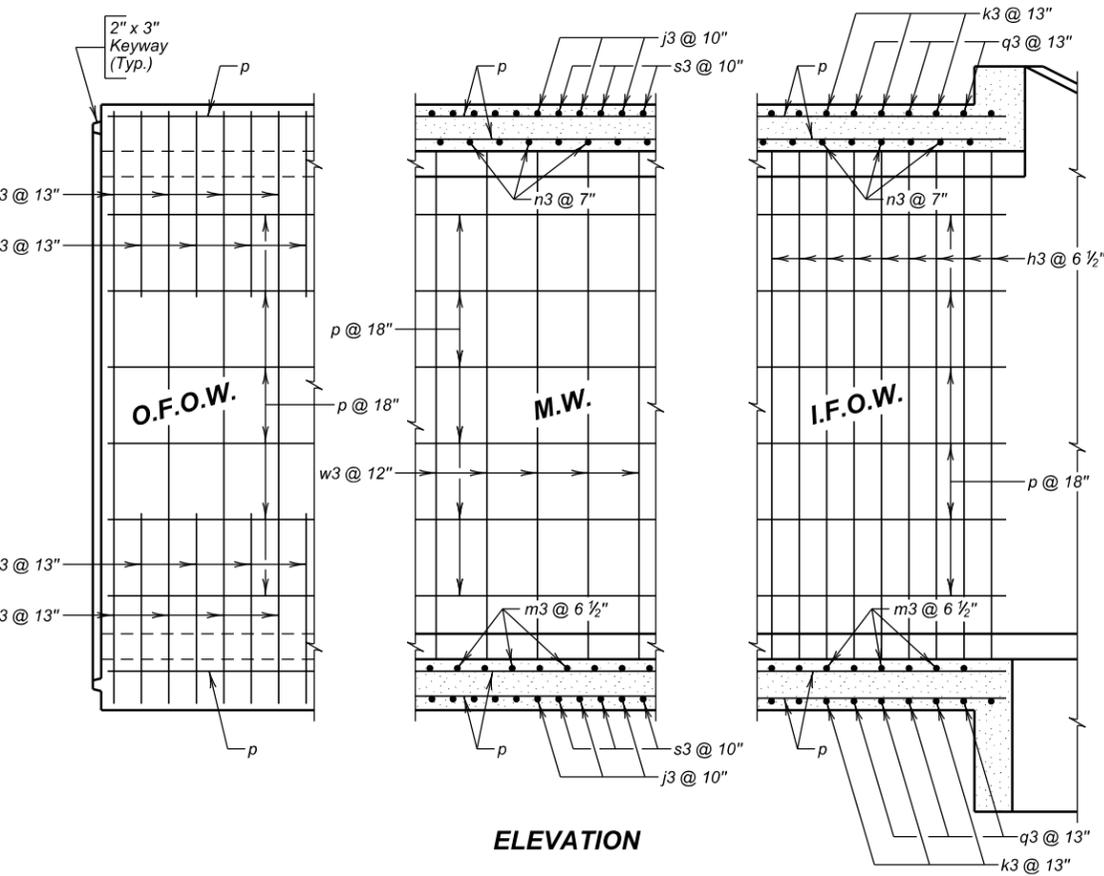
Note: Contractor may form the optional full fillet, with 2" Chamfer, as detailed. The cost of the additional concrete shall be borne by the Contractor.

OPTIONAL POUR - BOTTOM SLAB

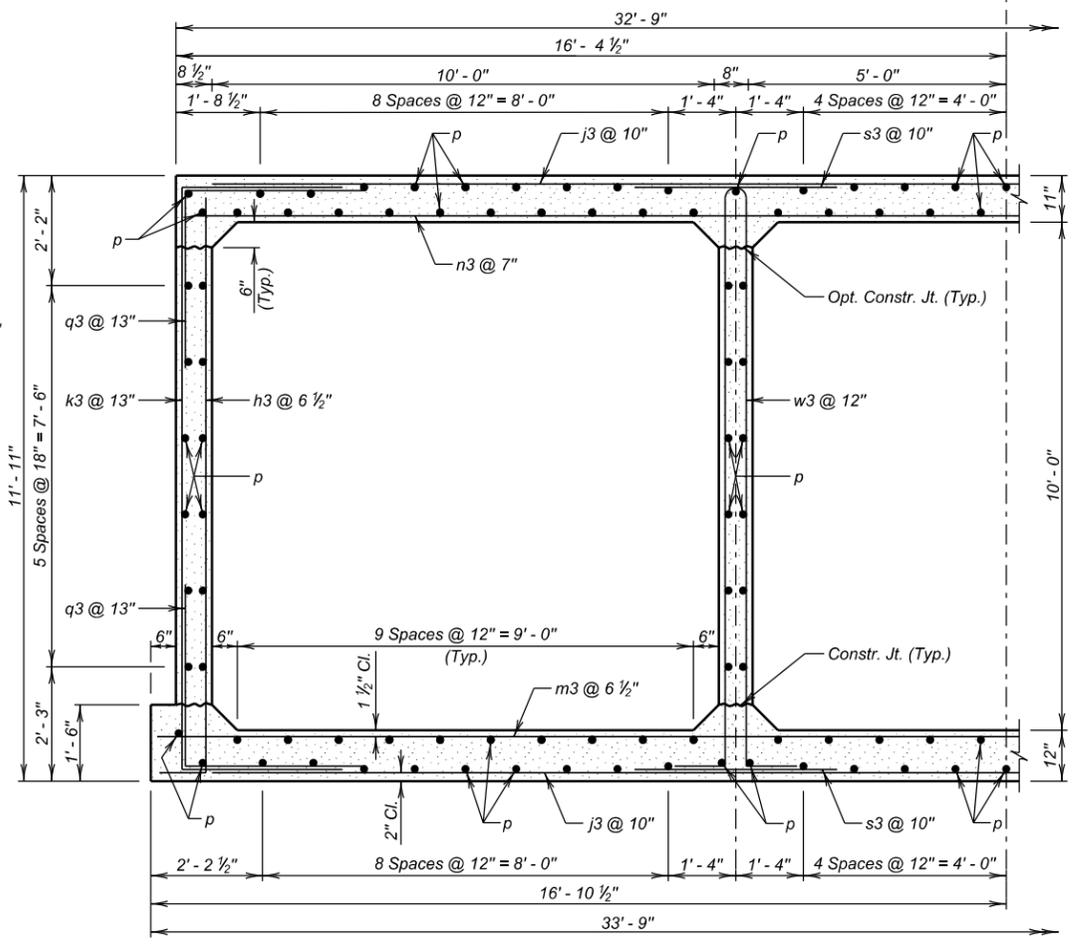
The Bottom Slab may be poured continuously, at the option of the Contractor, with the use of a Preformed Metal keyway conforming to the keyway dimensions and location as shown on the plans. The keyway length shall be full width of the bottom slab. Care shall be taken to maintain proper alignment of the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

Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10.

HALF PLAN (Inlet shown, Outlet similar by rotation)

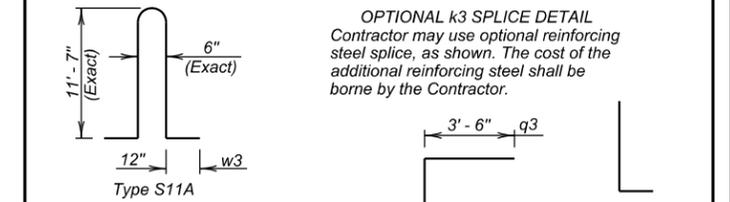


ELEVATION



S3 BARREL HALF SECTION (15' - 0" Maximum Fill)

REINFORCING SCHEDULE				
(For One Standard S3 Barrel End Section)				
Mk.	Φ No.	Size	Length	Type
h3	3.69(L + 1)	4	12' - 3"	17A
j3	2.40L	5	31' - 4"	Str.
k3	1.85(L + 1)	5	18' - 0"	17
m3	1.85L	5	33' - 6"	Str.
n3	1.71L	5	32' - 6"	Str.
q3	3.69(L + 1)	5	7' - 0"	17A
p	176	4	L + 3"	Str.
s3	4.80L	5	4' - 0"	Str.
w3	2.00(L + 1)	4	25' - 6"	S11A
z1	*	5	3' - 6"	Str.



NOTES: All dimensions are out to out of bars.

Round the number of bars up to the nearest whole number, except round h3, j3, k3, s3, q3 and w3 up to the nearest even whole number. 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. * 84 z1 bars required at each construction joint.

ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
1 - Standard S3 Barrel End Section	3.454L	464.45L - 18.53	1.250L
1 - Construction Joint		306.64	

See General Drawing for number of constructions joints required.

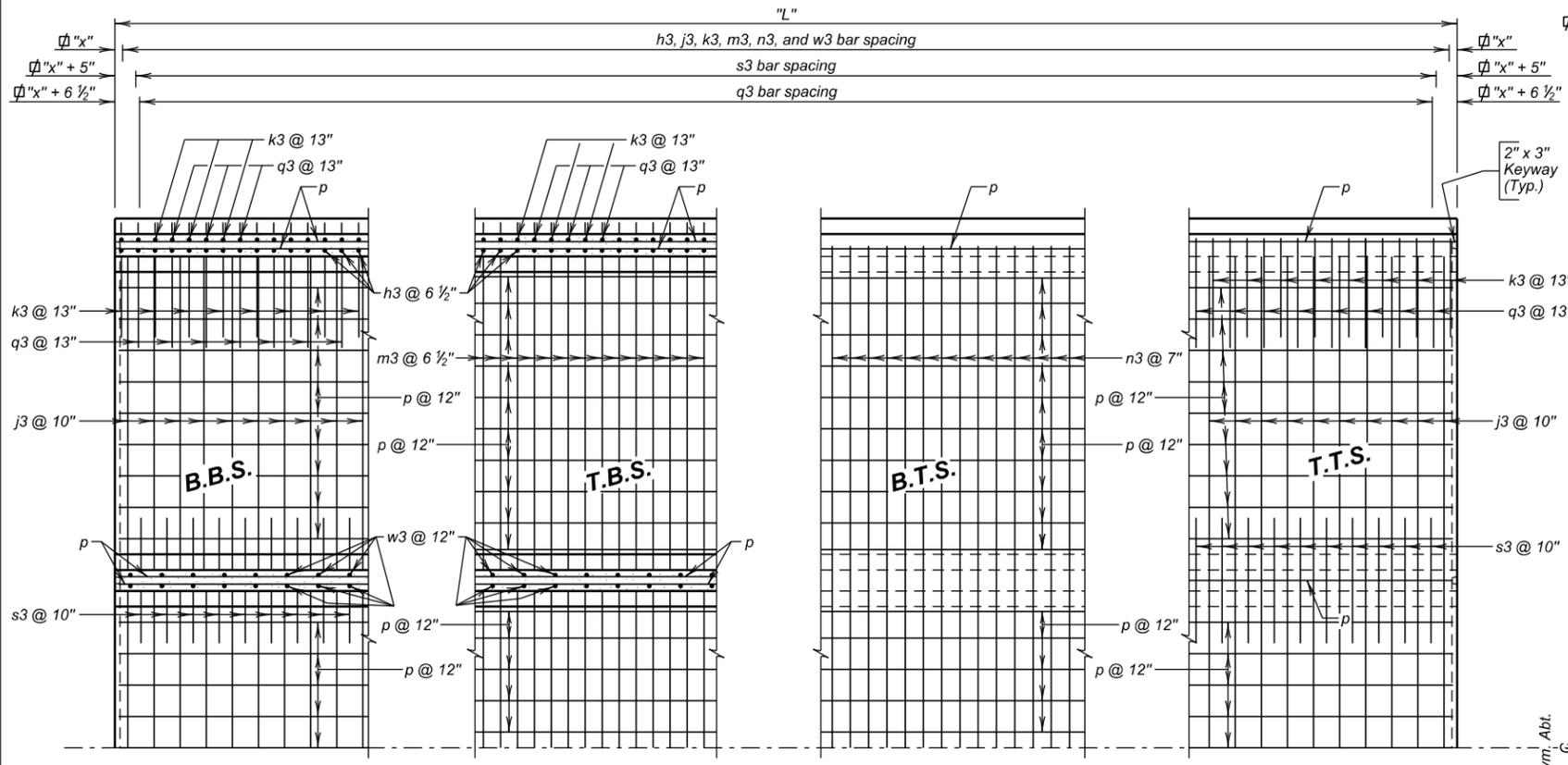
LEGEND FOR PLACING RE- STEEL	
T.T.S.	- Top of Top Slab
B.T.S.	- Bottom of Top Slab
T.B.S.	- Top of Bottom Slab
B.B.S.	- Bottom of Bottom Slab
O.F.O.W.	- Outside Face of Outside Wall
I.F.O.W.	- Inside Face of Outside Wall
M.W.	- Middle Wall

SITE 1
ALTERNATE A
STANDARD S3 BARREL END SECTION DETAILS
FOR
3 - 10' X 10' BOX CULVERT (C.I.P.)
HL-93 0° SKEW

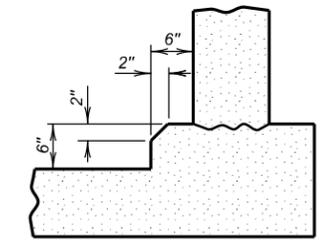
S. D. DEPT. OF TRANSPORTATION
OCTOBER 2013

DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA07	DRAFTED BY GW Kevin N. Coeden BRIDGE ENGINEER
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Revised July 23, 2015



NOTE: Maximum dimension "x" equal to one half of bar spacing.



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 shall be full width of the bottom slab. Care shall be taken to maintain proper alignment of the keyway during the pour sequence. All additional costs of this option shall be borne by the Contractor.

Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10.

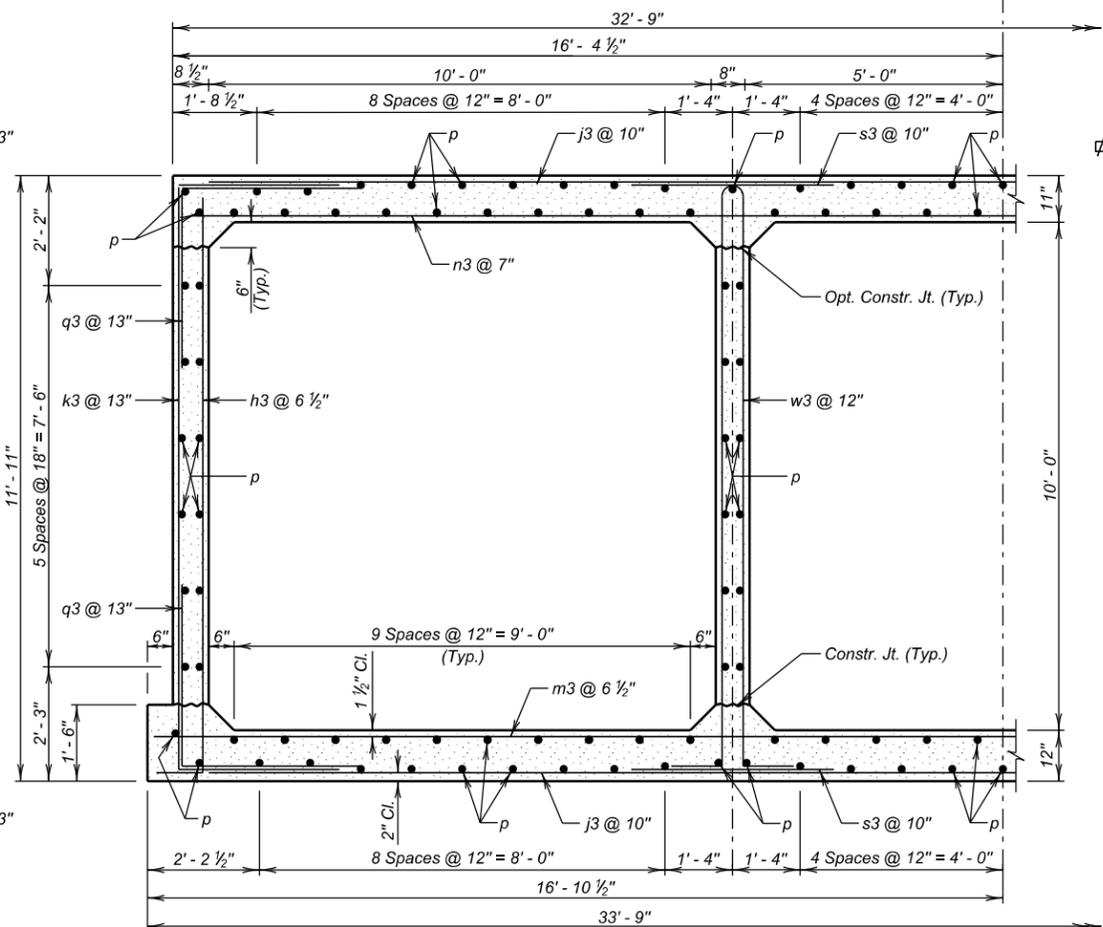
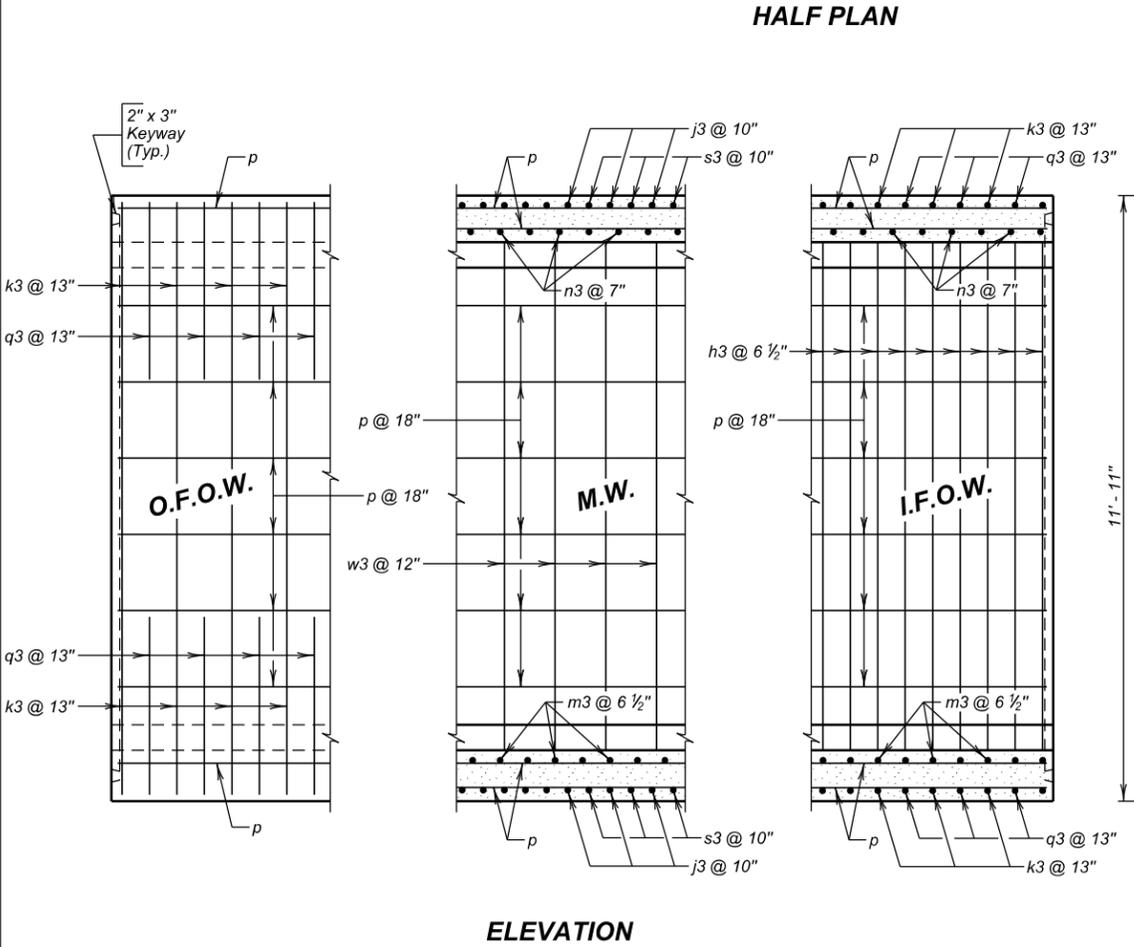
REINFORCING SCHEDULE					Bending Details	
Mk.	ϕ No.	Size	Length	Type		
h3	3.69(L + 1)	4	12' - 3"	17A	k3 3' - 2"	
j3	2.40L	5	31' - 4"	Str.	11' - 8" (Exact) Type 17	
k3	1.85(L + 1)	5	18' - 0"	17	6' - 8 1/2" min. lap	
m3	1.85L	5	33' - 6"	Str.	3' - 2" (Typ.)	
n3	1.71L	5	32' - 6"	Str.		
q3	3.69(L + 1)	5	7' - 0"	17A		
p	176	4	L - 3"	Str.		
s3	4.80L	5	4' - 0"	Str.		
w3	2.00(L + 1)	4	25' - 6"	S11A	12" h3 Type 17A	
z1	*	5	3' - 6"	Str.		

NOTES:
All dimensions are out to out of bars.
 ϕ Round the number of bars up to the nearest whole number, except round h3, j3, k3, s3, q3 and w3 up to the nearest even whole number.
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.
* 84 z1 bars required at each construction joint.

ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
1 - Standard S3 Barrel Interior Section	3.454L	464.45L - 29.39	1.250L
1 - Construction Joint		306.64	

See General Drawing for number of construction joints required.

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

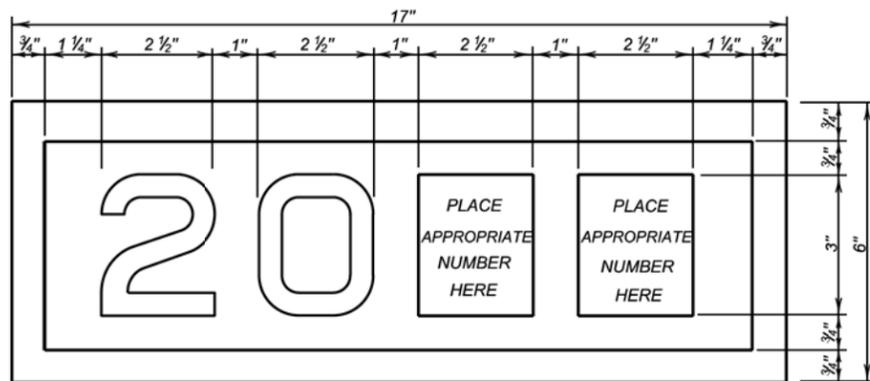


SITE 1
ALTERNATE A
STANDARD S3 BARREL INTERIOR SECTION DETAILS
FOR
3 - 10' X 10' BOX CULVERT (C.I.P.)
HL-93 0° SKEW

S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013

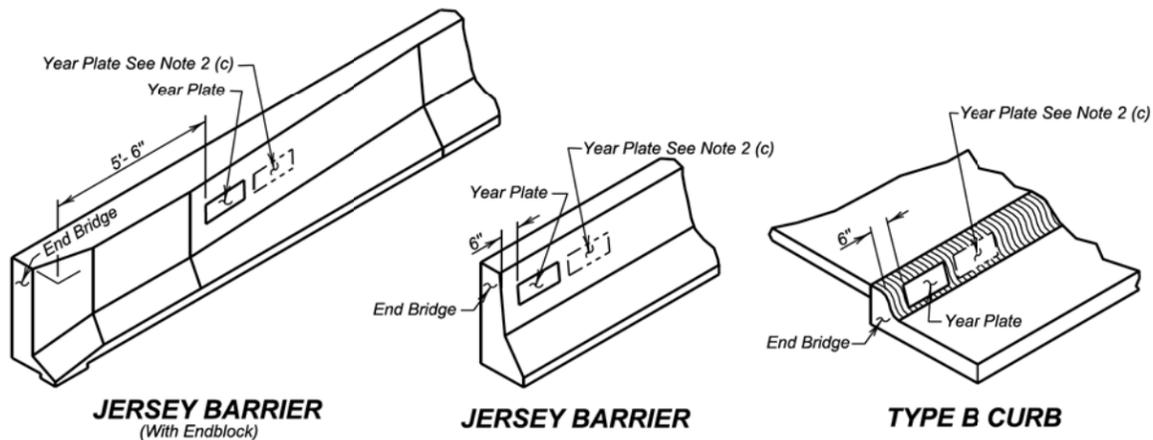
DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA08	DRAFTED BY GW	Kevin N. Boeden BRIDGE ENGINEER
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YEAR PLATE DETAILS

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.



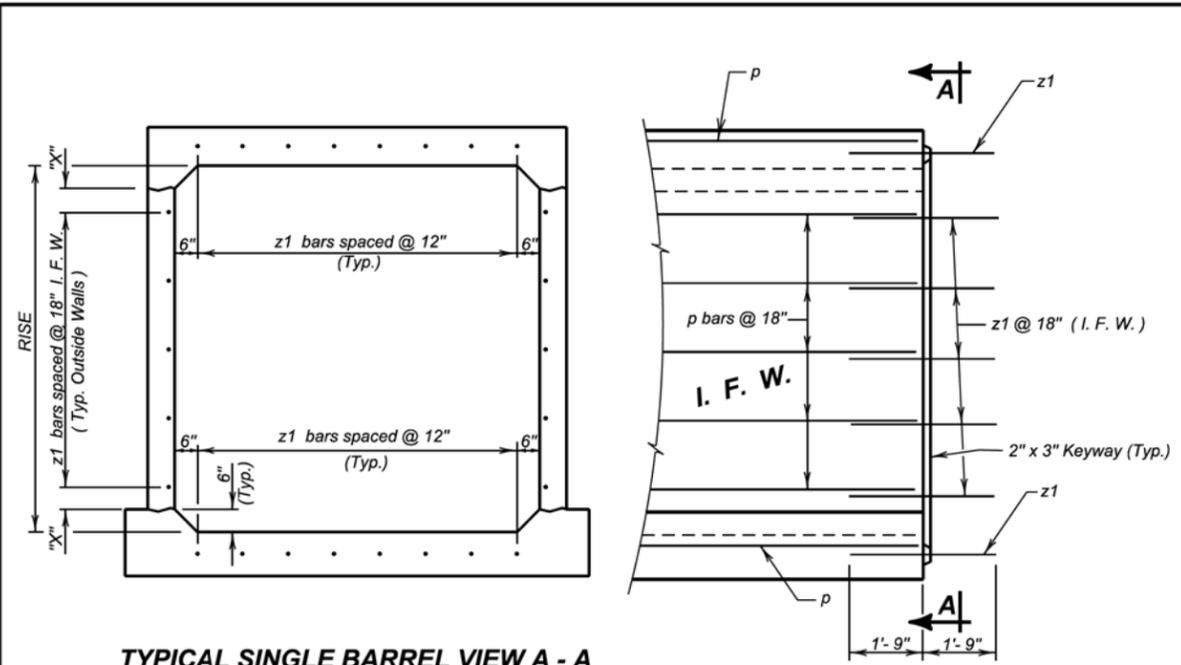
JERSEY BARRIER
(With Endblock)

JERSEY BARRIER

TYPE B CURB

June 26, 2012

S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1



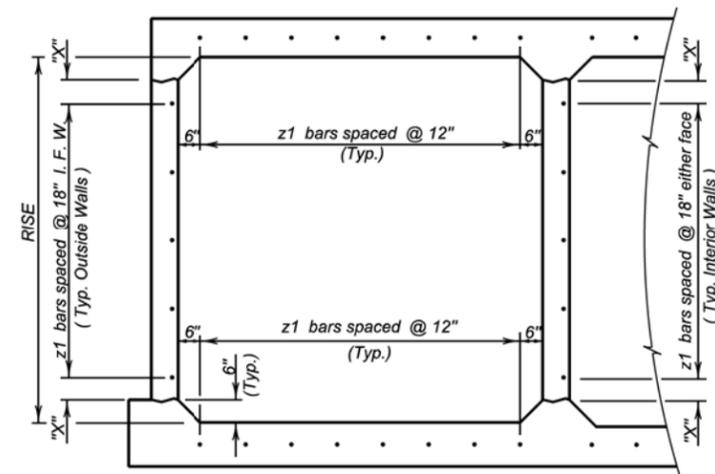
TYPICAL SINGLE BARREL VIEW A - A

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"



TYPICAL MULTIPLE BARREL VIEW A - A

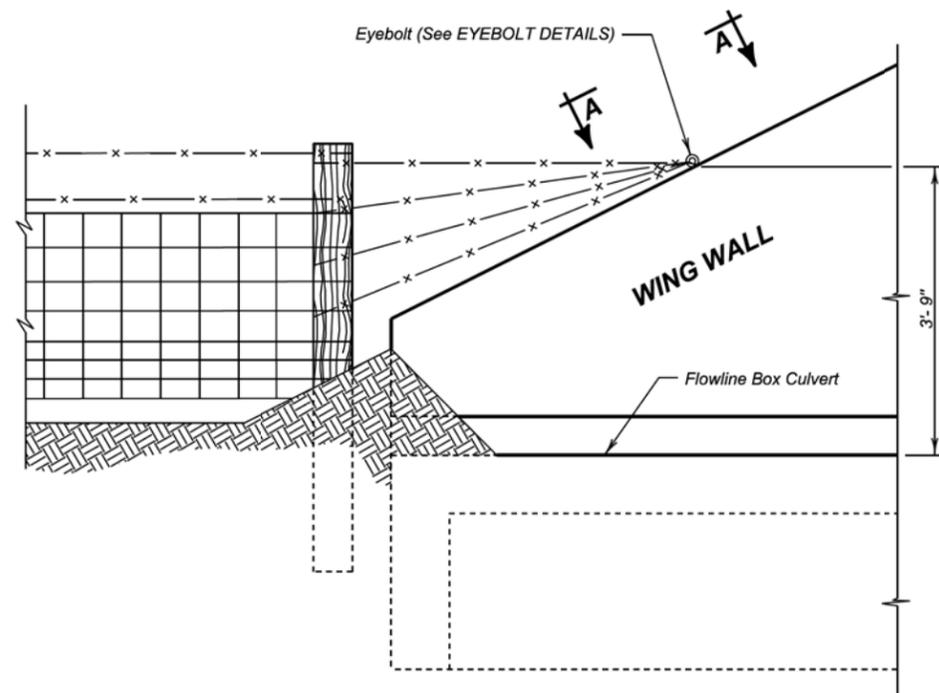
GENERAL NOTES:

- z1 bars shall be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars shall 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 shall be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 26, 2012

S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1

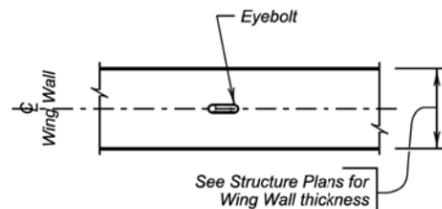
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E12	E58



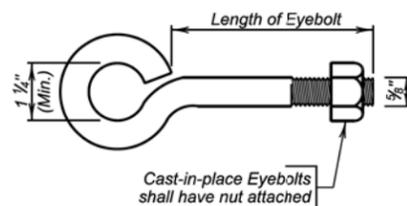
DETAIL FOR FENCE ANCHORS

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

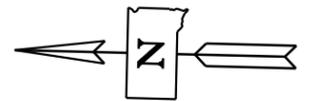
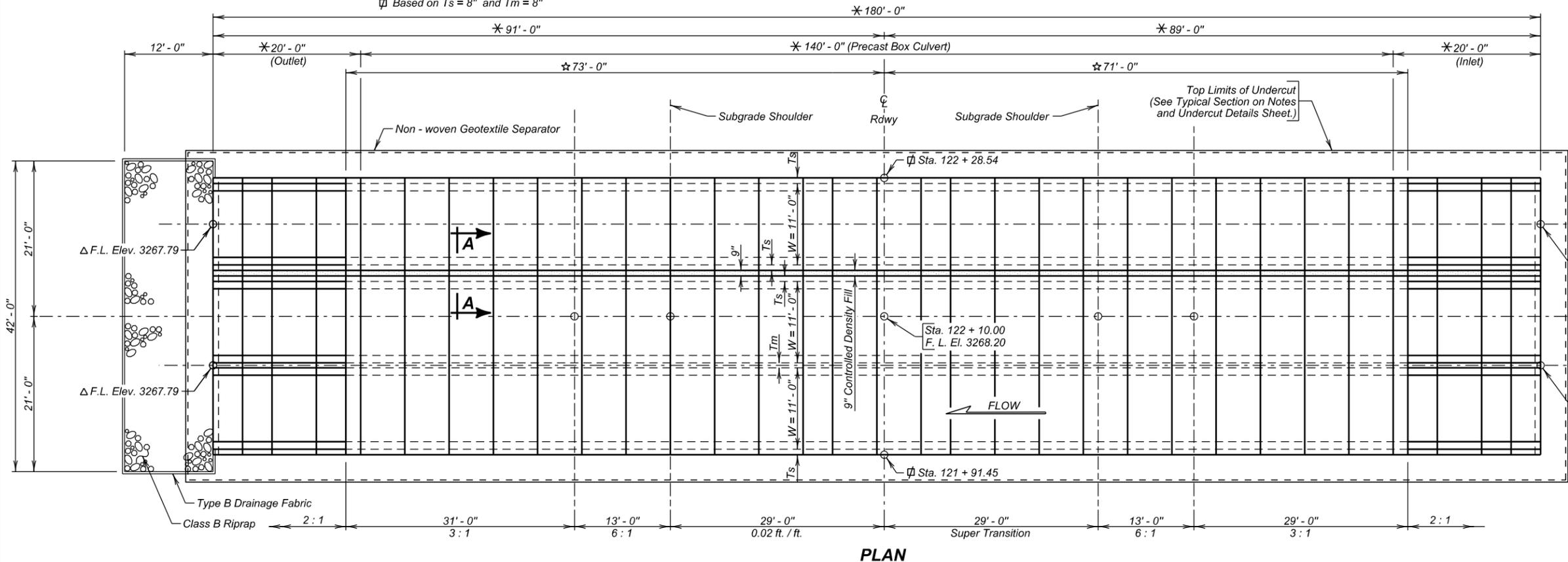
Published Date: 3rd Qtr. 2015

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 fill slopes.
- △ Based on dimensions shown.
- ⌀ Based on $T_s = 8"$ and $T_m = 8"$

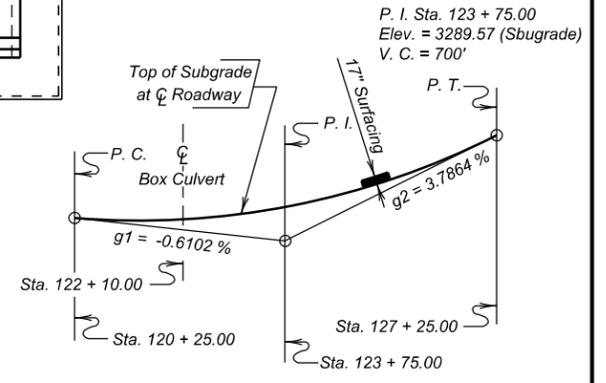
Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E13	E58



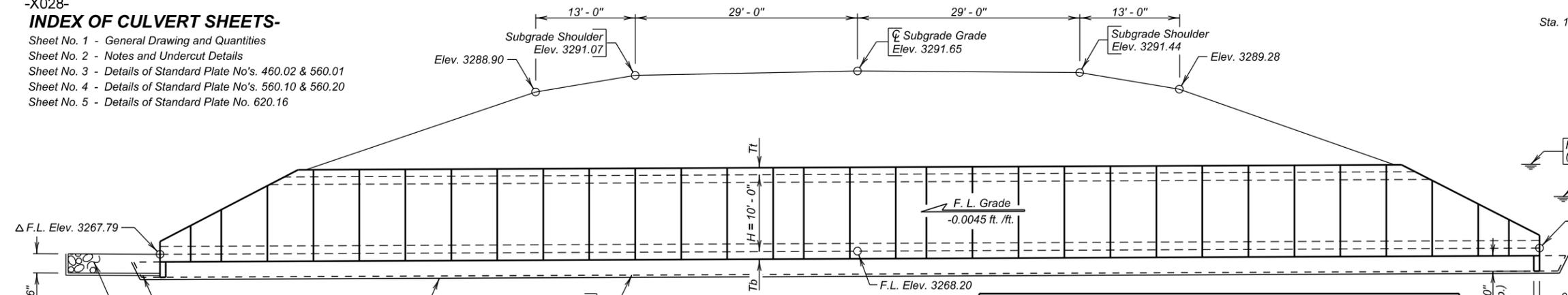
LEGEND

- 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



-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 & 560.20
- Sheet No. 5 - Details of Standard Plate No. 620.16



VERTICAL CURVE DATA

SITE 1 ALTERNATE B

GENERAL DRAWING AND QUANTITIES

FOR
3 - 11' X 10' BOX CULVERT (PRECAST)
 OVER WOLF CREEK 0° SKEW
 STA. 122 + 10.00 SEC. 9-T35N-R44W
 STR. NO. 57-252-473 NH-PH 0018(177)104
 PCN 02QC HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION

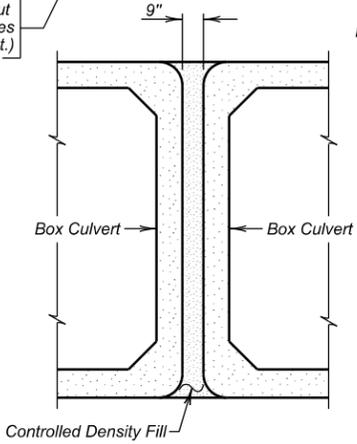
OCTOBER 2013 (1) OF (5)

HYDRAULIC DATA

Q_d	911 cfs
A_d	179 sq. ft.
V_d	5.1 fps
Q_F	911 cfs
Q_{100}	2456 cfs
Q_{OT}	$> Q_{100}$
V_{max}	9.3 fps

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.

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 3275.3
 Q_{OT} = Overtopping discharge and frequency $> Q_{100}$ yr. recurrence interval. El. 3292.76 @ Sta. 121 + 00.00
 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. 3279.7
 V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.



ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Structure Excavation, Box Culvert	Cu. Yd.	169.9
Box Culvert Undercut	Cu. Yd.	596
Controlled Density Fill	Cu. Yd.	52.6
Class B Riprap	Ton	65.0
Type B Drainage Fabric	Sq. Yd.	86
Non - woven Geotextile Separator	Sq. Yd.	982
11' X 10' Precast Concrete Culvert, Furnish	Ft.	140
11' X 10' Precast Concrete Culvert, Install	Ft.	140
11' X 10' Precast Concrete Culvert End Section, Furnish	Each	2
11' X 10' Precast Concrete Culvert End Section, Install	Each	2
2 - 11' X 10' Precast Concrete Culvert, Furnish	Ft.	140
2 - 11' X 10' Precast Concrete Culvert, Install	Ft.	140
2 - 11' X 10' Precast Concrete Culvert End Section, Furnish	Each	2
2 - 11' X 10' Precast Concrete Culvert End Section, Install	Each	2

Quantity is based on 9" bottom slab, 9" top slab, 8" outside walls and 8" interior 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

DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA11	DRAFTED BY GW	Kevin N. Goeden BRIDGE ENGINEER
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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 shall be in accordance with Section 560 of the Specifications with the following criteria:

- Box culvert and box culvert end section design shall conform to the AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
- Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. If construction loads in excess of legal load are anticipated by the Contractor, the Contractor shall submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.
- The box culvert shall be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2010 Edition with the latest Interim Revisions using the LRFR method. The rating shall include evaluation at the Design Load rating for the HL-93 truck at both Inventory and Operating levels and at the 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 noted in the AASHTO Manual for Bridge Evaluation. All sections of the box culvert shall rate at HL-93 or better (Inventory Level). The three SD Legal Loads, the notional rating load and the four specialized hauling vehicles shall rate greater than 1.0 at legal load rating level. Submit Load Rating calculations with the Design and Check Design calculations or shop plans, as appropriate.
- The design of the barrel sections shall be based on a minimum fill height of 2 foot and include all subsequent fill heights up to and including the maximum fill height of 15 ft. over the box culvert.
- Minimum inside corner fillet shall be 6 in.
- Minimum precast barrel section length shall be 4 ft..
- Lift holes shall be plugged with an approved nonshrinkable grout.
- The Fabricator shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
- 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.
- Installation of the precast sections shall be in accordance with the final approved shop plans.
- Compaction of earth embankment and box culvert backfill shall be governed by the Specified Density method.
- Adjust cutoff wall shown on Standard Plates No. 560.10 and 560.20 to extend the full width of the end sections (out-to-out) plus the 9 inch spacing.
- The subsurface soils at Station 122 + 13 consist of brown to light gray sandy silt-clay to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were silt-sand.

CONTROLLED DENSITY FILL

- Controlled density fill shall be placed between the lines of precast box culverts as shown on the plans. Controlled density fill shall be flowable mortar material. Material and mixing shall be in accordance with Section 464 of the Specifications, except as modified below. The mix shall be as follows:

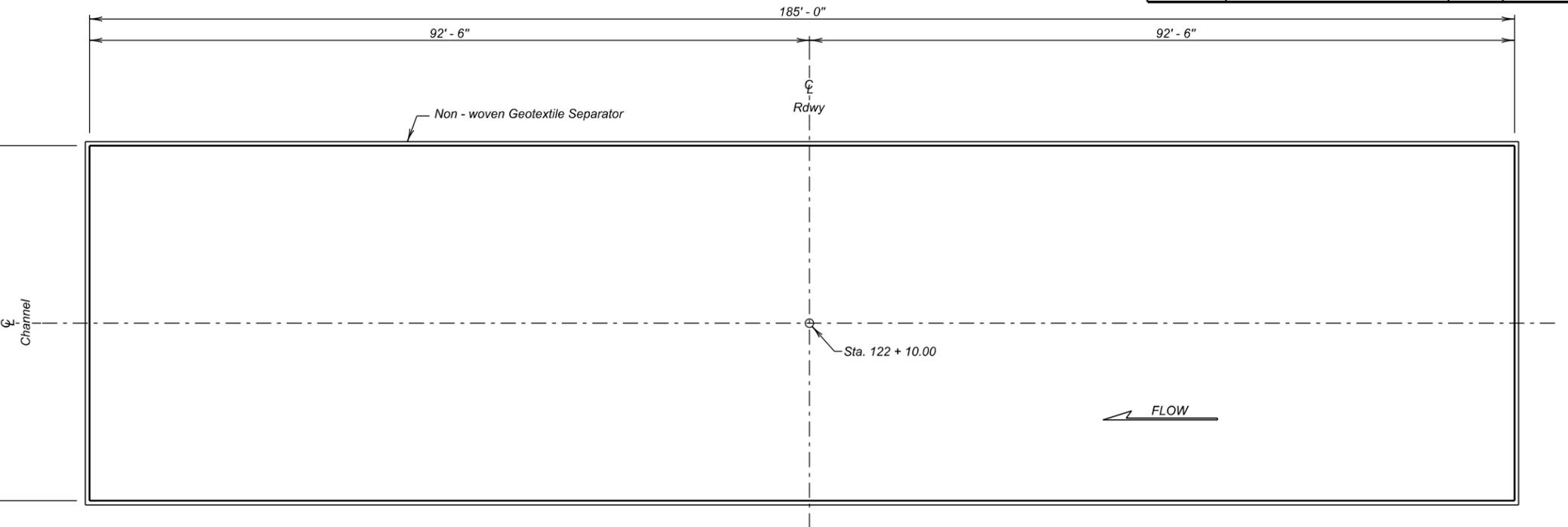
MATERIAL	RATE PER CUBIC YARD
Portland Cement Type I, II, III or V	100 lb.
Fine Aggregate	2600 lb.
Water	60 gal.
Fly Ash, Type C	300 lb.

- The fine aggregate shall be natural sand consisting of mineral aggregate particles conforming in the following gradation requirements:

Percent Passing 3/8 inch sieve	100
Percent Passing No. 200 sieve	0 - 10
- The mix shown above is designed to produce a minimum compressive strength of 100 psi. The Engineer may adjust the proportion of water at the site to provide the necessary mix consistency.
- No backfill material shall be placed sooner than 4 hours after placement of the controlled density fill.
- All costs for furnishing and installing the controlled density fill, included formwork, labor, material, equipment, and incidentals necessary to complete the work shall be included in the contract unit price per cubic yard for Controlled Density Fill. Payment will be for plans quantity regardless of the quantity actually placed.

GEOTEXTILE

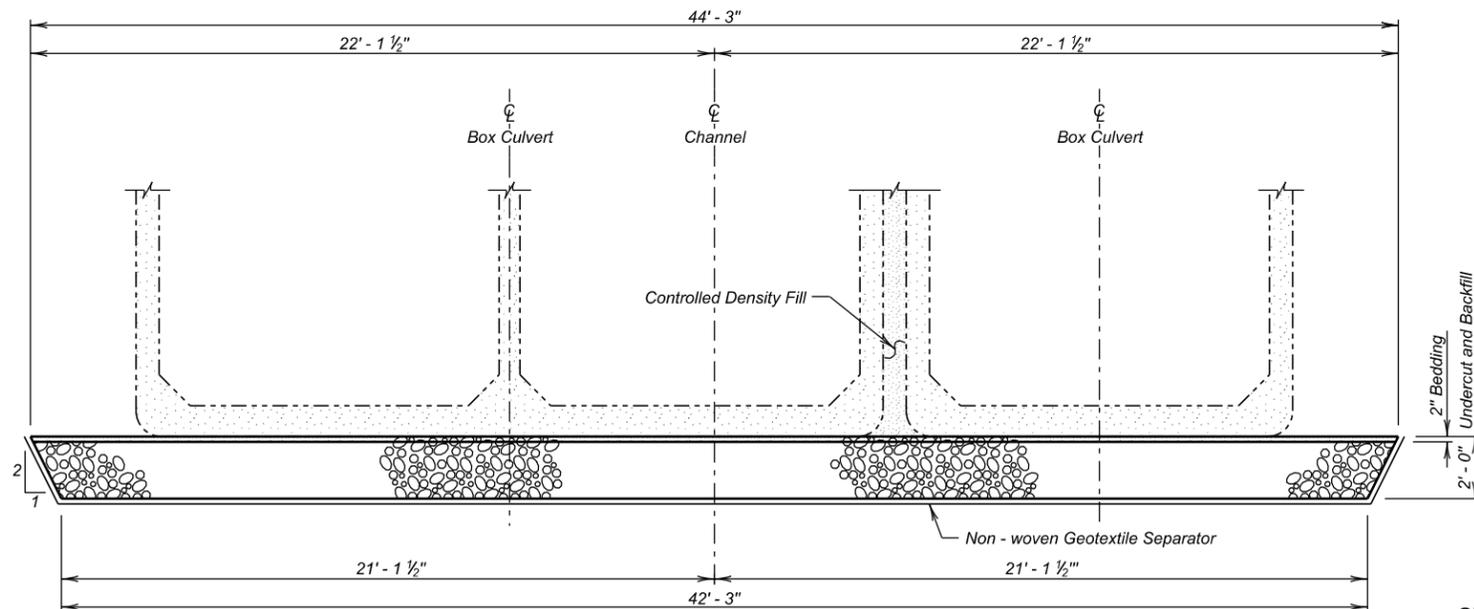
- A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
- The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
- The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
- The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
- Payment will be full compensation for furnishing and installing the geotextile only.



UNDERCUT LAYOUT
(Bottom Dimensions)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	596
Non-woven Geotextile Separator	Sq. Yd.	982

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.



TYPICAL SECTION
(For Limits of Undercut)

DESIGN MIX OF CONCRETE

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

SHOP PLANS

Shop plans shall be required as specified by the Specifications. In lieu of paper copies, shop plans may be submitted electronically in Adobe PDF. Send shop plan submittals to the Office of Bridge Design.

**SITE 1
ALTERNATE B
NOTES AND UNDERCUT DETAILS**

FOR
3 - 11' X 10' BOX CULVERT (PRECAST)
OVER WOLF CREEK 0° RHF SKEW
STA. 122 + 10.00 SEC. 9-T35N-R44W
STR. NO. 57-252-473 NH-PH 0018(177)104
HL-93

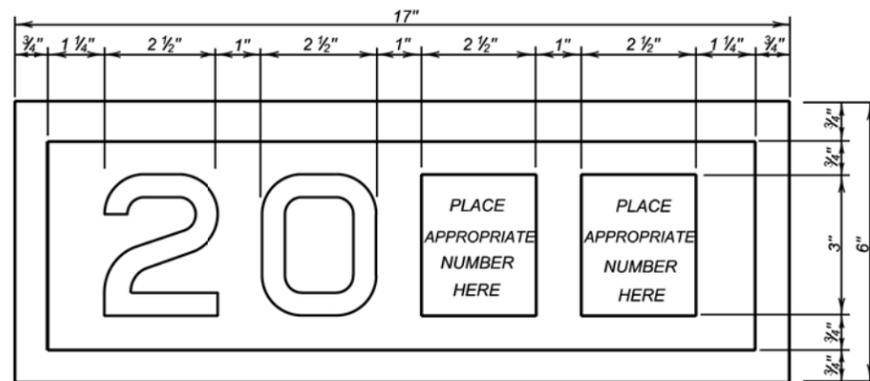
OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013 **2** OF **5**

DESIGNED BY MM OGLA02QC	CK. DES. BY BS 02QCWA12	DRAFTED BY GW	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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Revised July 23, 2015

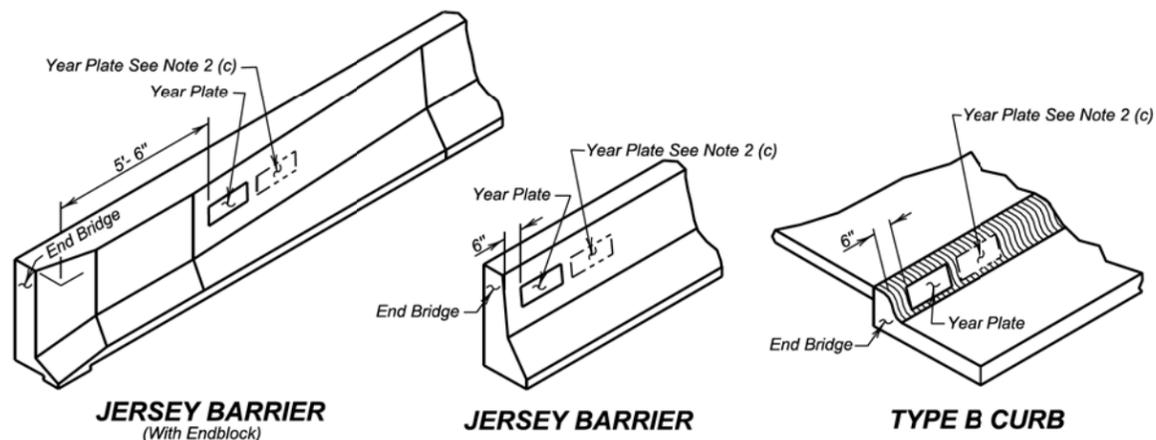
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E14	E58



YEAR PLATE DETAILS

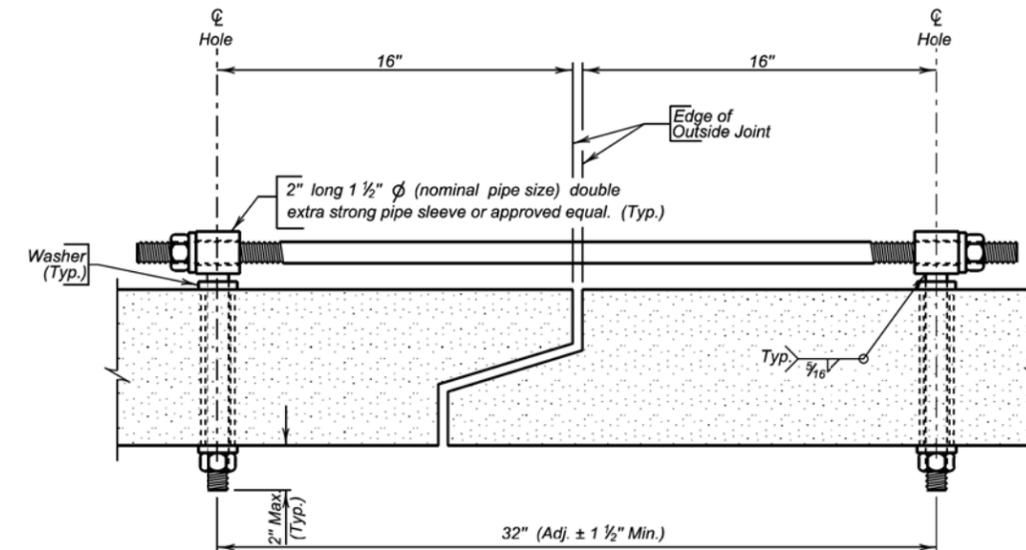
GENERAL NOTES:

- 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: 3rd Qtr. 2015	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



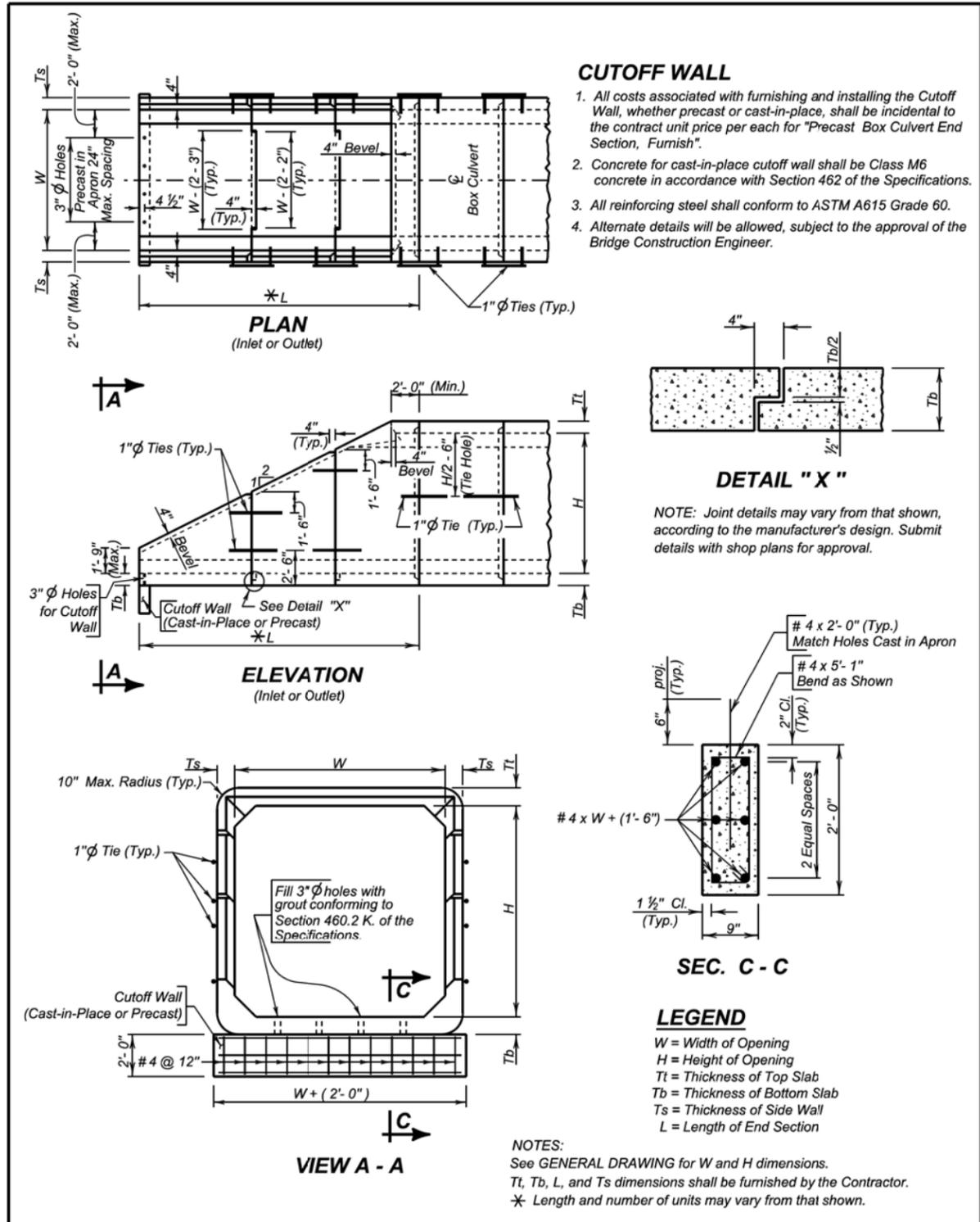
TIE BOLT ASSEMBLY

GENERAL NOTES:

- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36. 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.
- 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".

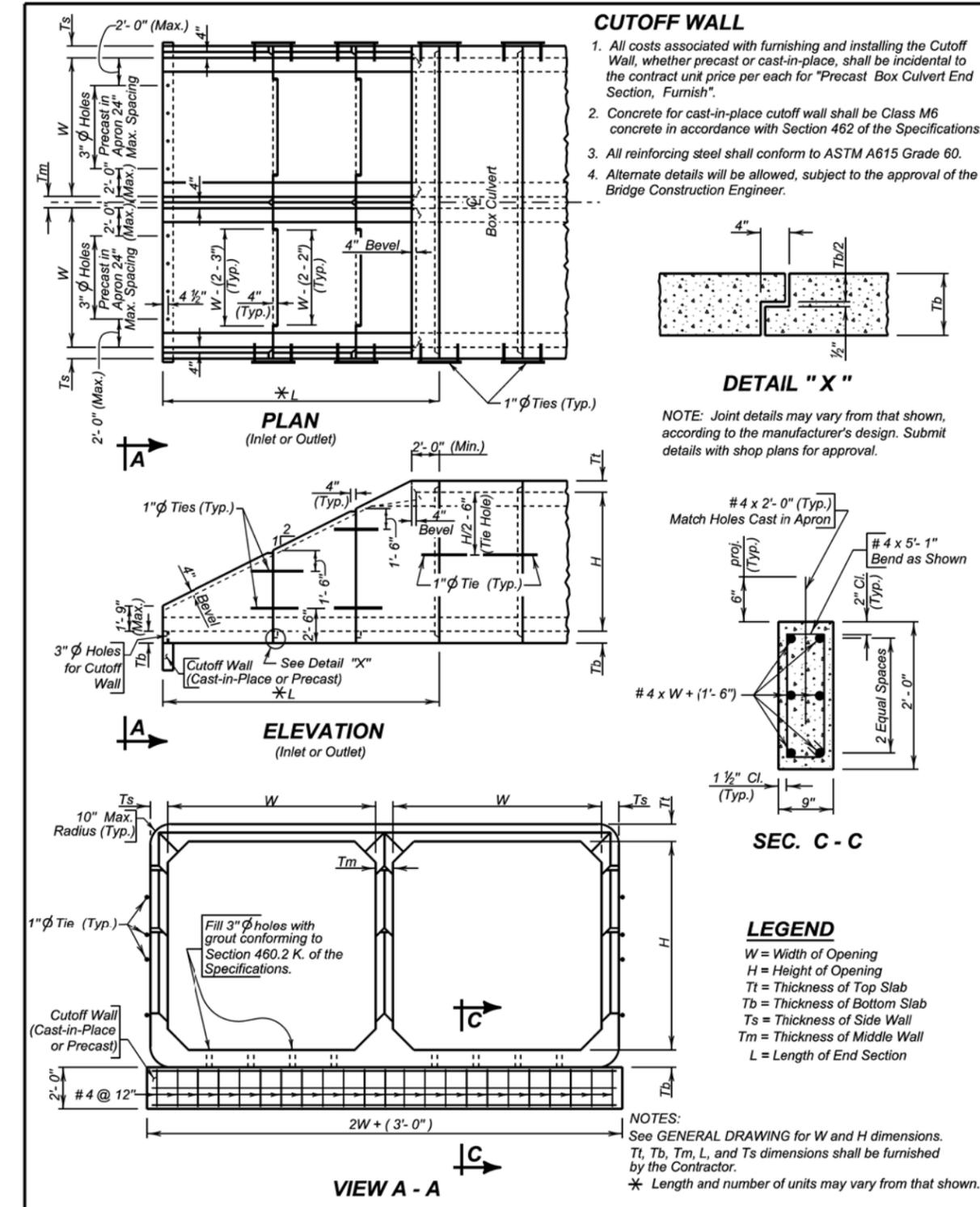
December 23, 2012

Published Date: 3rd Qtr. 2015	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1



June 26, 2015

S D D O T	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'-0" CUTOFF WALL	PLATE NUMBER 560.10
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1

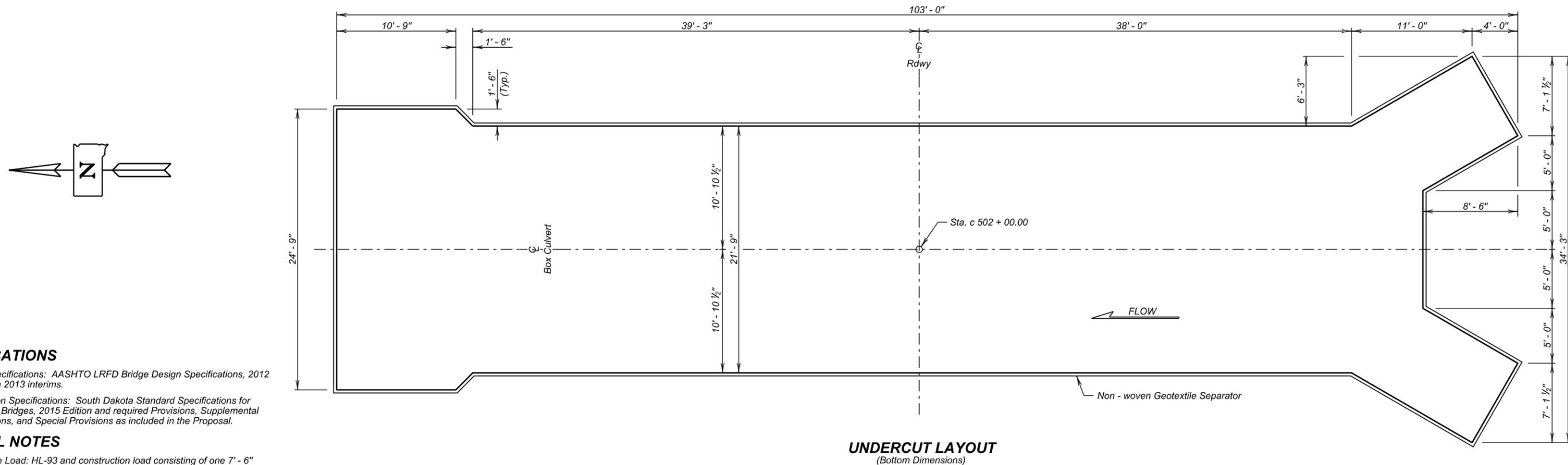


June 26, 2015

S D D O T	PRECAST DOUBLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'-0" CUTOFF WALL	PLATE NUMBER 560.20
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1

Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E19	E58



UNDERCUT LAYOUT
(Bottom Dimensions)

SPECIFICATIONS

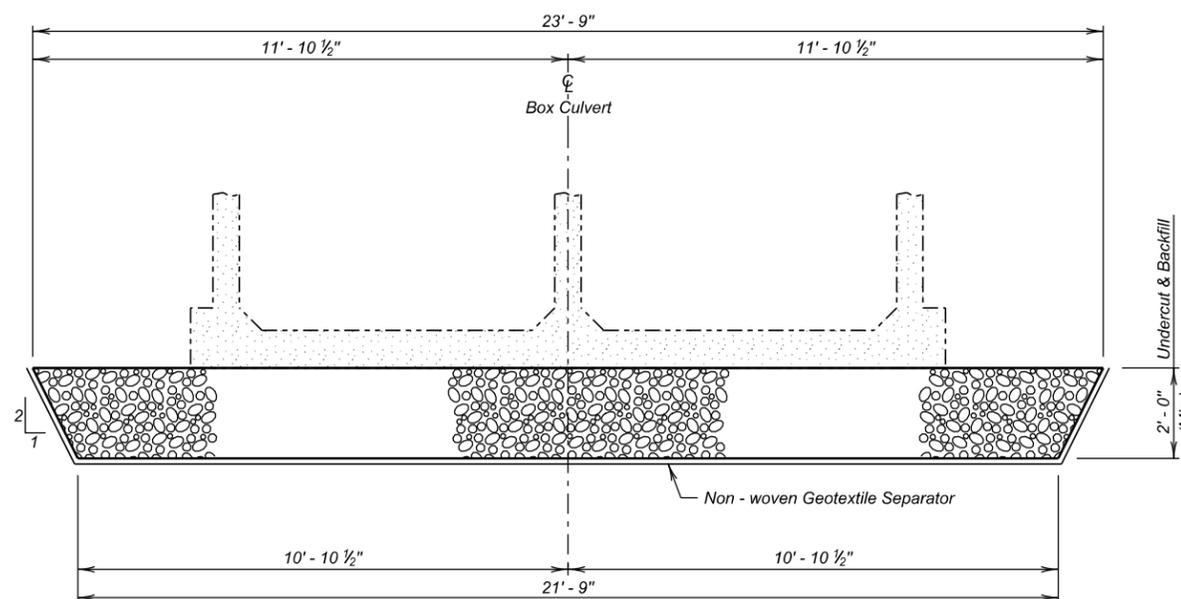
1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

1. Design Live Load: HL-93 and construction load consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall 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 1 foot 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. High sulfate levels are likely to be encountered at this location. All concrete shall be Class A45 conforming to Section 460, with the following modifications: the type of cement shall be either a type II with 20% Class F Modified Fly Ash substituted for cement in accordance with Section 605 or Type V.
5. All reinforcing steel shall conform to ASTM A615 Grade 60.
6. All exposed edges shall be chamfered $\frac{3}{4}$ inch.
7. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
8. The Contractor shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Care shall be taken to establish Working Points (W.P.) as shown on the wings.
10. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
11. Compaction of earth embankment and box culvert backfill material shall be governed by the Specified Density method.
12. The subsurface soils at Station c502 + 00 consist of brown clay-silt to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were silt-clay to silt.

GEOTEXTILE

1. A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
2. The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
3. The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
4. The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
5. Payment will be full compensation for furnishing and installing the geotextile only.



TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	179
Non-woven Geotextile Separator	Sq. Yd.	357

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.

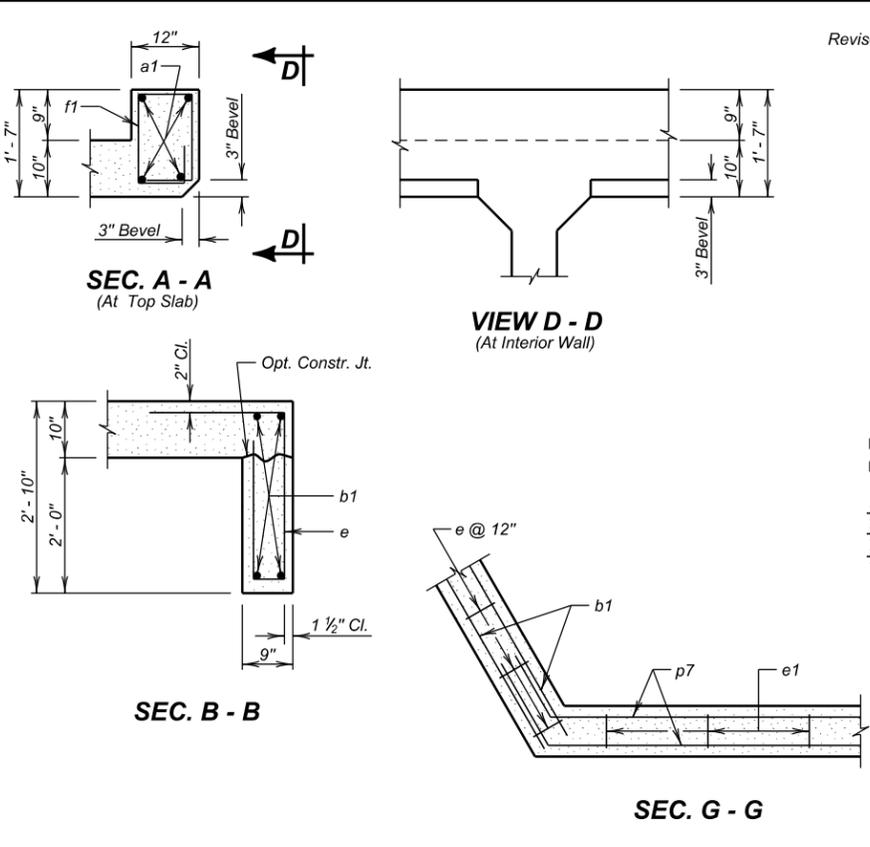
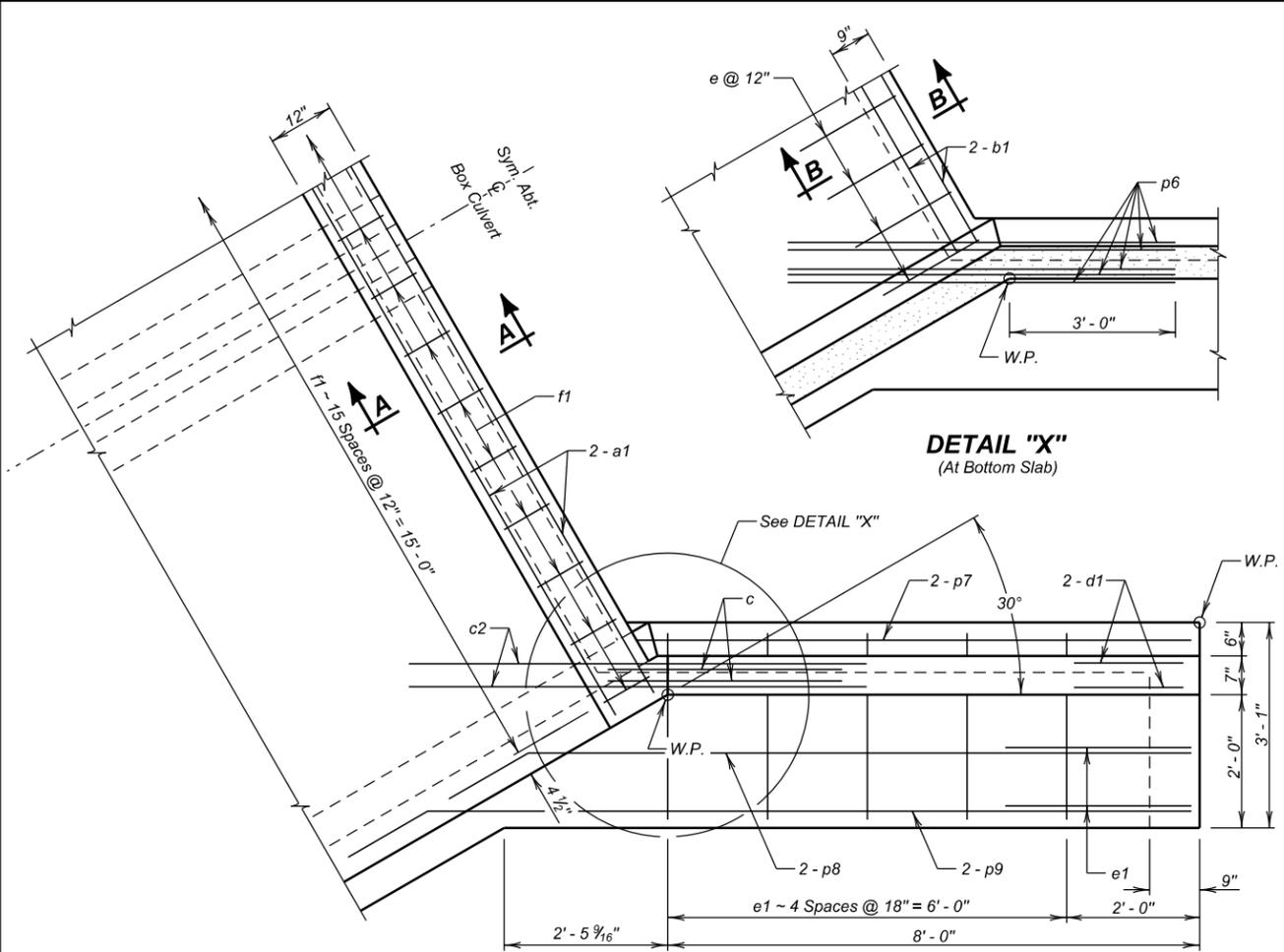
**SITE 2
ALTERNATE A**
NOTES AND UNDERCUT DETAILS
FOR
2 - 7' X 4' BOX CULVERT (C.I.P.)
OVER TRIB. TO FAST HORSE CREEK 0° SKEW
STA. c 502 + 00.00 SEC. 3/34-T35/36N-R43W
STR. NO. 57-321-460 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION
OCTOBER 2013

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWB02	DRAFTED BY GW	Kevin N. Goeden BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E20	E58

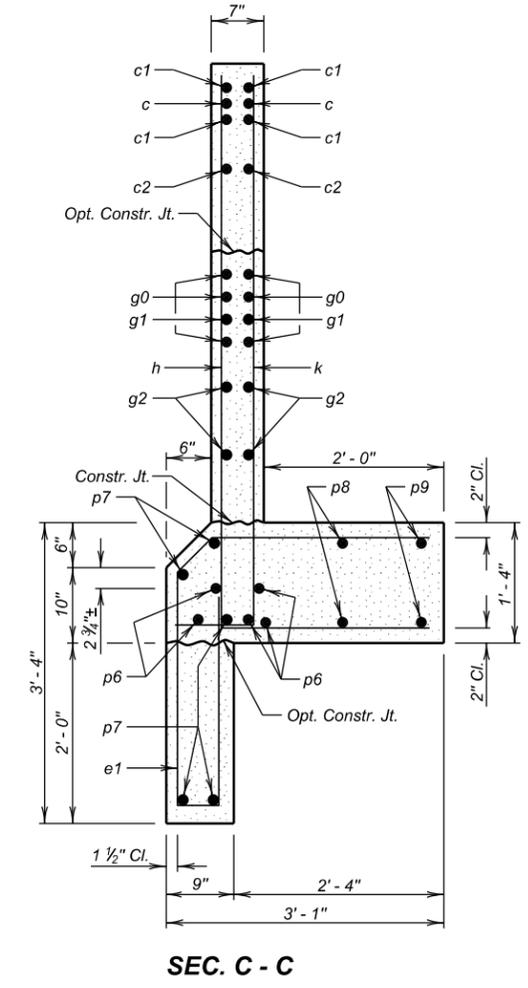
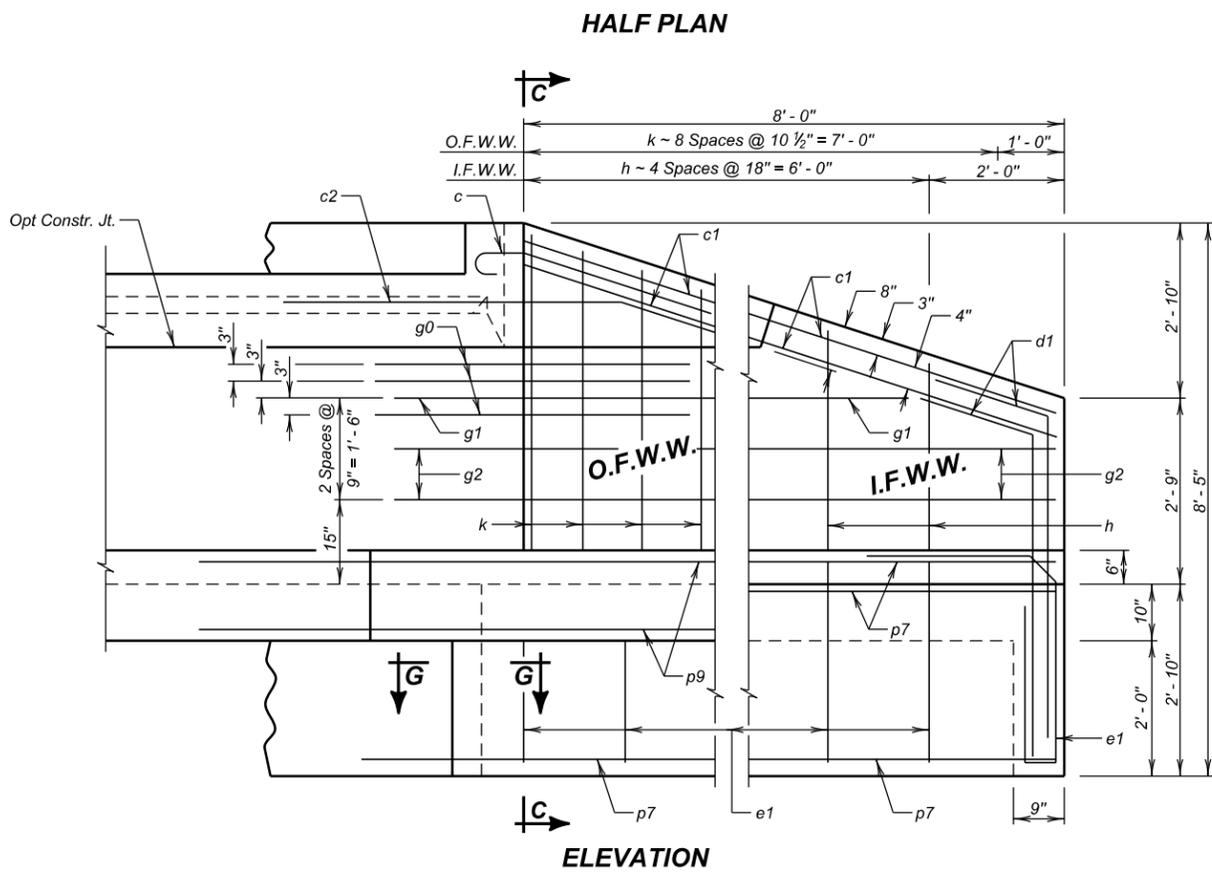


REINFORCING SCHEDULE				
Mk.	No.	Size	Length	Type
a1	4	6	15'-6"	Str.
b1	4	6	14'-0"	Str.
c	4	5	4'-6"	1A
c1	8	5	8'-6"	Str.
c2	4	5	7'-0"	19B
d1	8	5	6'-6"	19B
e	15	4	7'-3"	S12
e1	14	4	8'-3"	S12A
f1	16	4	5'-6"	S6A
g0	12	5	5'-0"	19B
g1	4	4	8'-3"	19B
g2	8	4	9'-9"	19B
h	5	4	14'-6"	17A
k	9	4	11'-6"	17A
p6	10	6	7'-0"	Str.
p7	10	4	10'-6"	Str.
p8	4	4	11'-6"	Str.
p9	4	4	13'-0"	Str.

Bending Details	
Type 1A	
Type 19B	
Type S12	
Type S12A	
Type S6A	
Type 17A	

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	7.6	1054	4.2



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

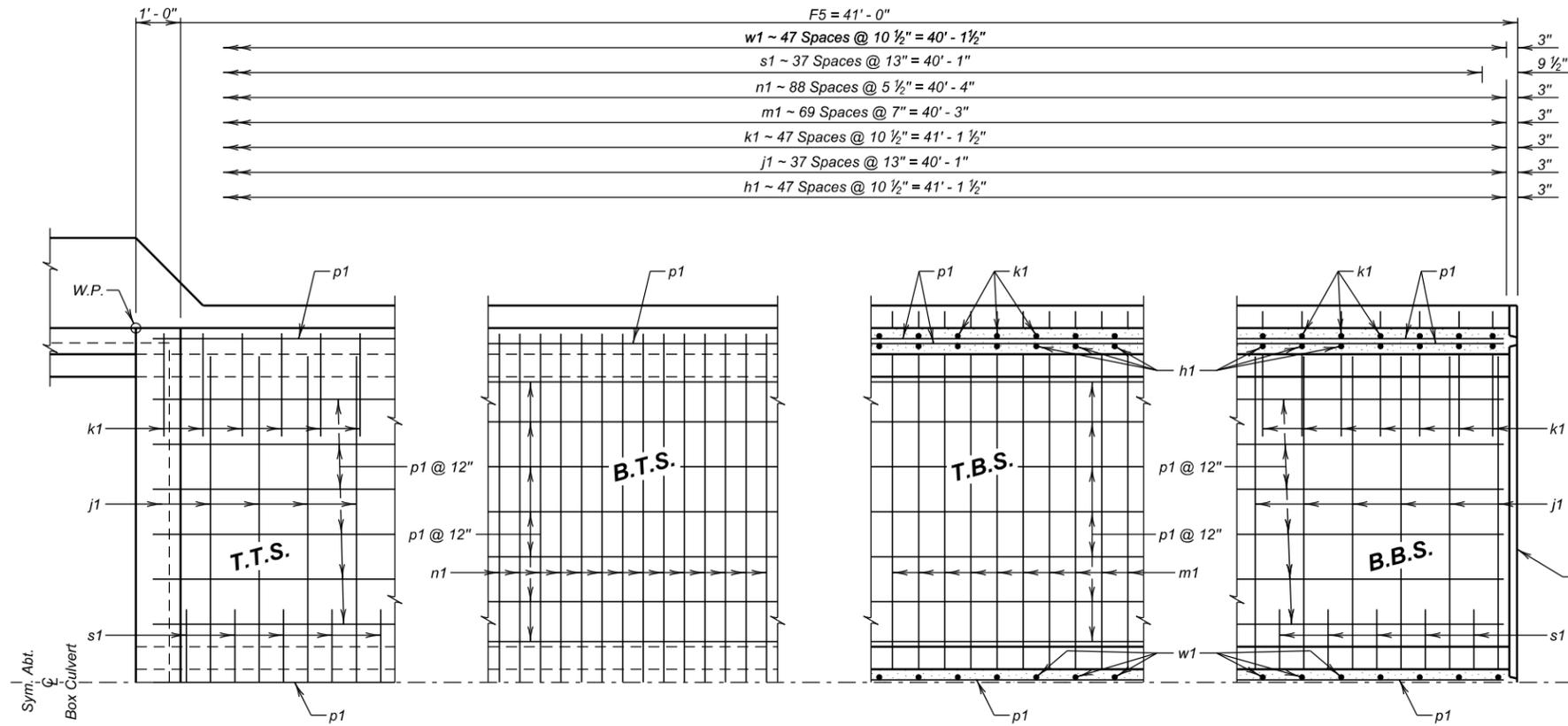
**SITE 2
 ALTERNATE A
 INLET DETAILS
 FOR
 2 - 7' X 4' BOX CULVERT (C.I.P.)
 OVER TRIB. TO FAST HORSE CREEK 0° SKEW
 STA. c 502 + 00.00 SEC. 3/34-T35/36N-R43W
 STR. NO. 57-321-460 NH-PH 0018(177)104
 HL-93**

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013

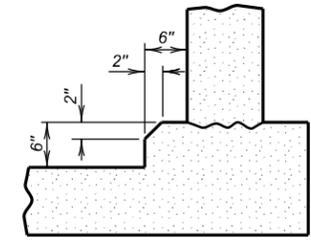
DESIGNED BY MM OGLA020C	CHECKED BY JMH 020CW803	DRAWN BY GW	<i>Kevin N. Goeden</i> BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E22	E58



HALF PLAN
(Outlet shown, Inlet similar by rotation)



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 shall be borne by the Contractor.

△ Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10.

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

Mk.	No.	Size	Length	Type
h1	192	4	6' - 0"	17A
j1	152	4	14' - 6"	Str.
k1	192	4	10' - 6"	17
m1	140	4	16' - 6"	Str.
n1	178	4	15' - 6"	Str.
p1	150	4	41' - 6"	Str.
s1	152	4	3' - 3"	Str.
w1	96	4	13' - 0"	S11A
z1	34	5	3' - 6"	Str.

Bending Details

OPTIONAL k1 SPLICE DETAIL
Contractor may use optional reinforcing steel splice, as shown. The cost of the additional reinforcing steel shall be borne by the Contractor.

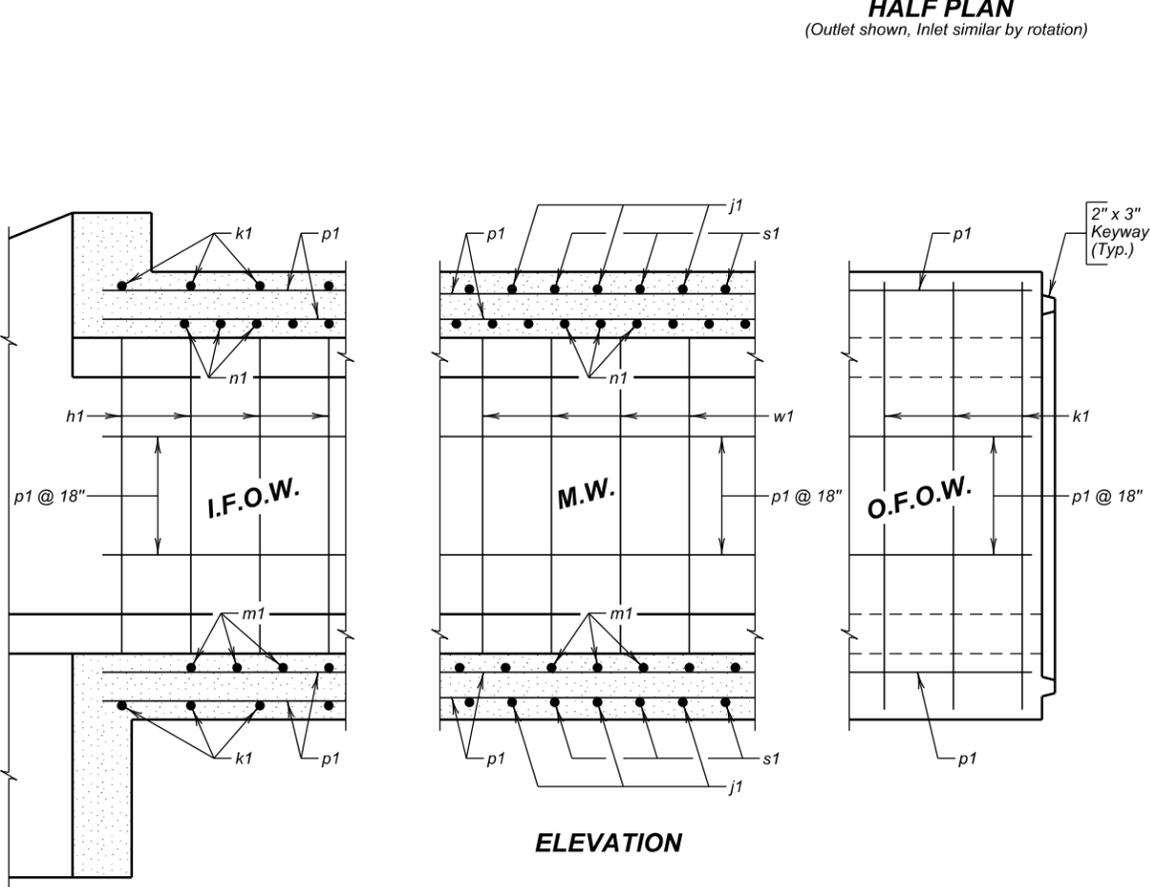
NOTES:
All dimensions are out to out of bars.
Request for additional reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.

ESTIMATED QUANTITIES

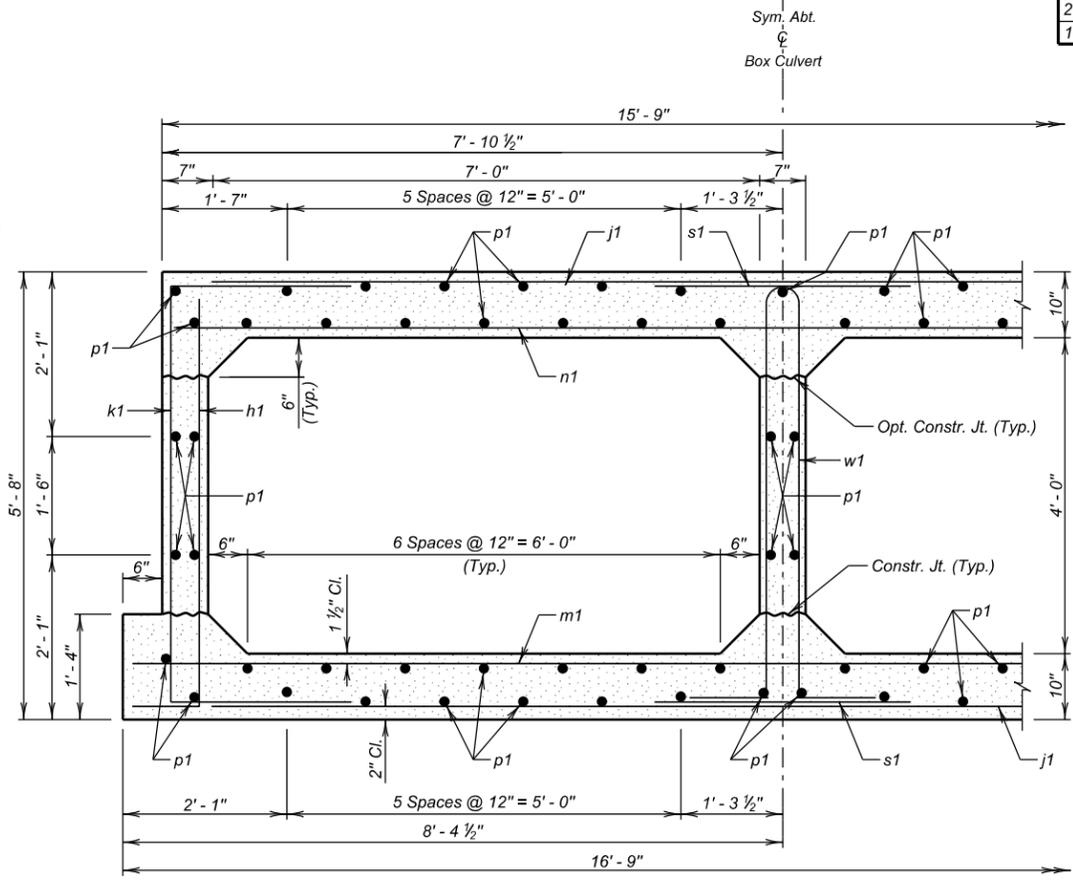
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
2 - F5 Barrel End Sections @ 41' - 0"	108.1	12297	42.4
1 - Construction Joint		124	

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



ELEVATION



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

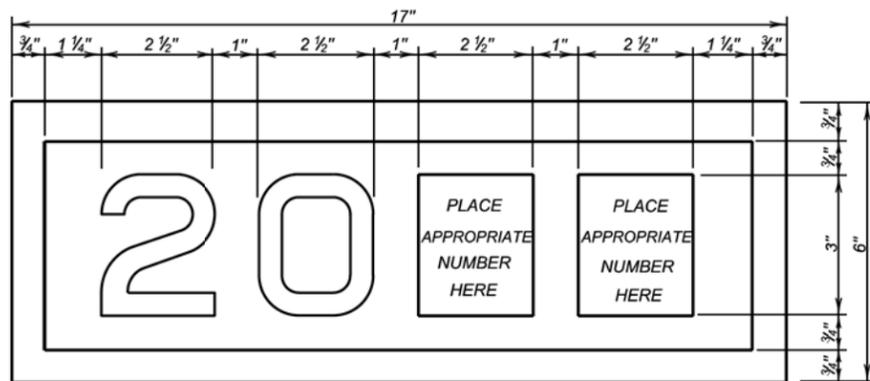
OPTIONAL POUR - BOTTOM SLAB

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 shall be full width of the bottom slab. Care shall be taken to maintain proper alignment of the keyway during the pour sequence. All additional costs of this option shall be borne by the Contractor.

SITE 2 ALTERNATE A
F5 BARREL END SECTION DETAILS (41' - 0")
FOR
2 - 7' X 4' BOX CULVERT (C.I.P.)
OVER TRIB. TO FAST HORSE CREEK 0° SKEW
STA. c 502 + 00.00 SEC. 3/34-T35/36N-R43W
STR. NO. 57-321-460 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION
OCTOBER 2013

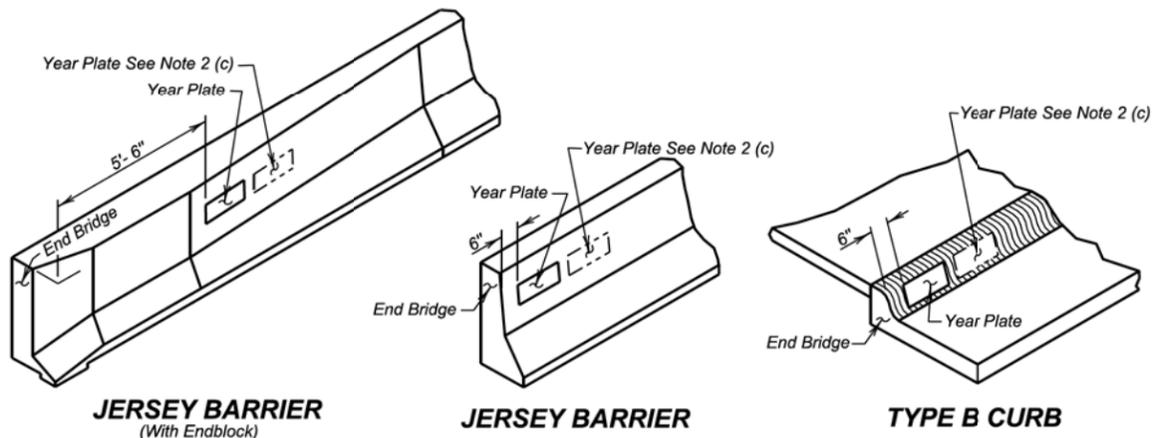
DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWB05	DRAFTED BY GW	Kevin N. Coeden BRIDGE ENGINEER
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YEAR PLATE DETAILS

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.



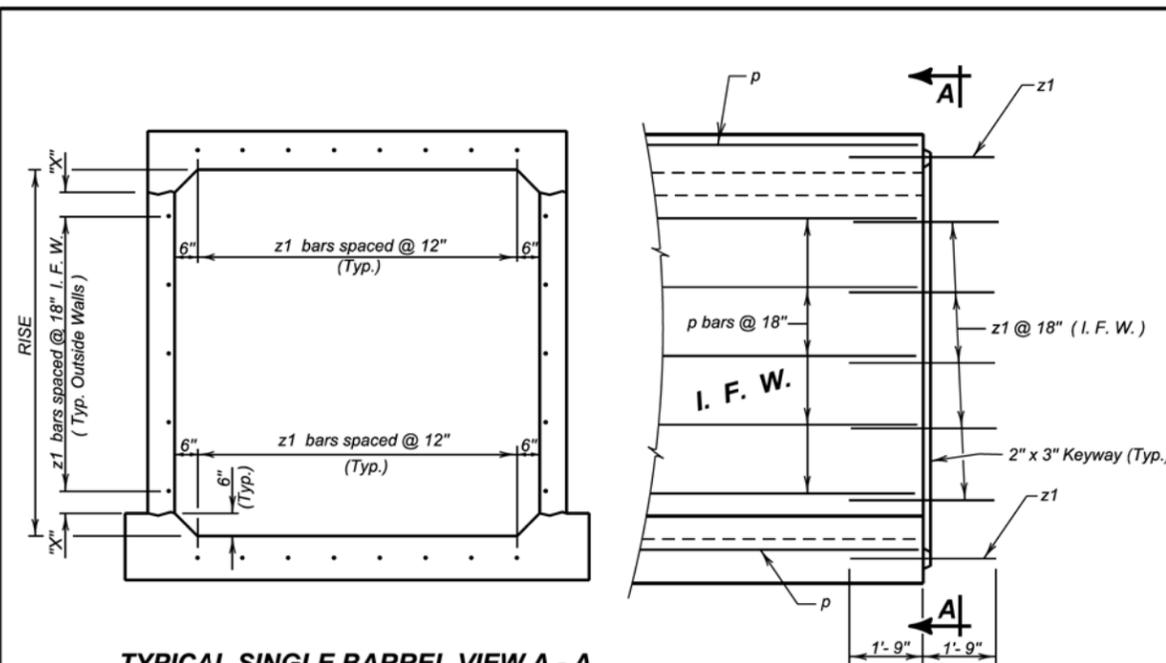
JERSEY BARRIER
(With Endblock)

JERSEY BARRIER

TYPE B CURB

June 26, 2012

S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1



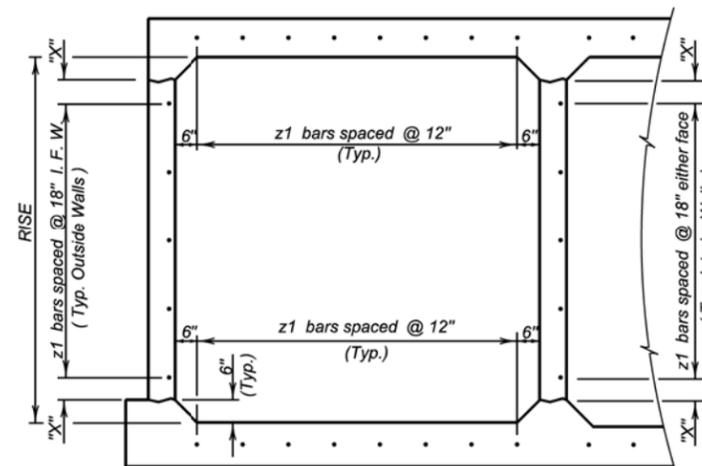
TYPICAL SINGLE BARREL VIEW A - A

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"



TYPICAL MULTIPLE BARREL VIEW A - A

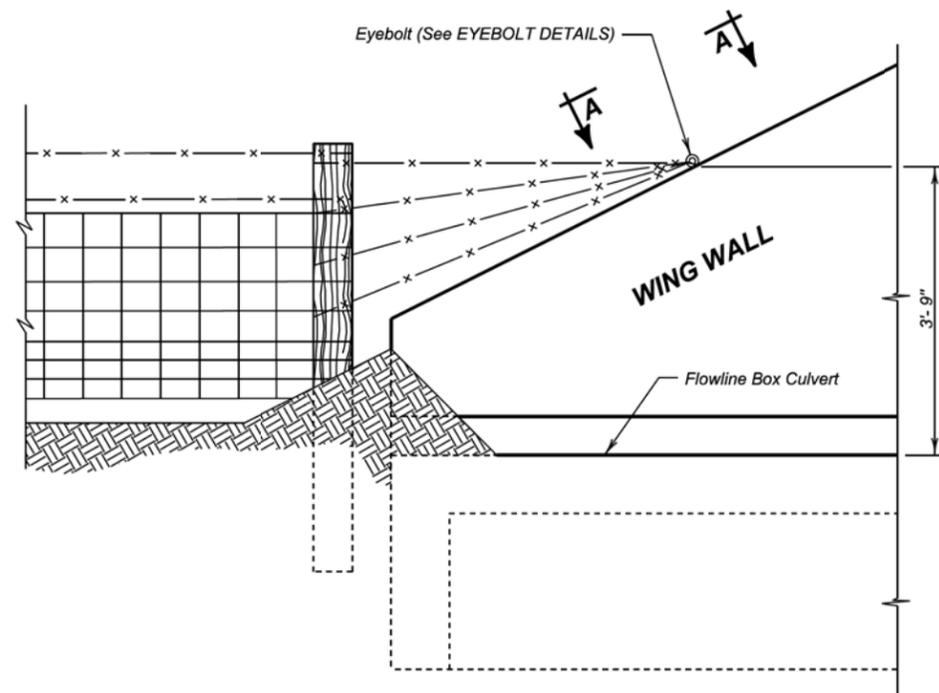
GENERAL NOTES:

- z1 bars shall be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars shall 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 shall be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 26, 2012

S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1

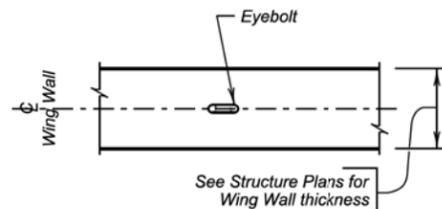
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E24	E58



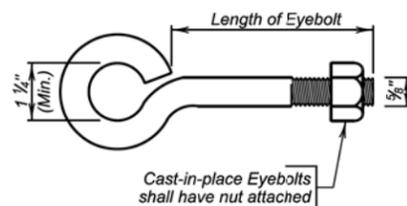
DETAIL FOR FENCE ANCHORS

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 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 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.
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

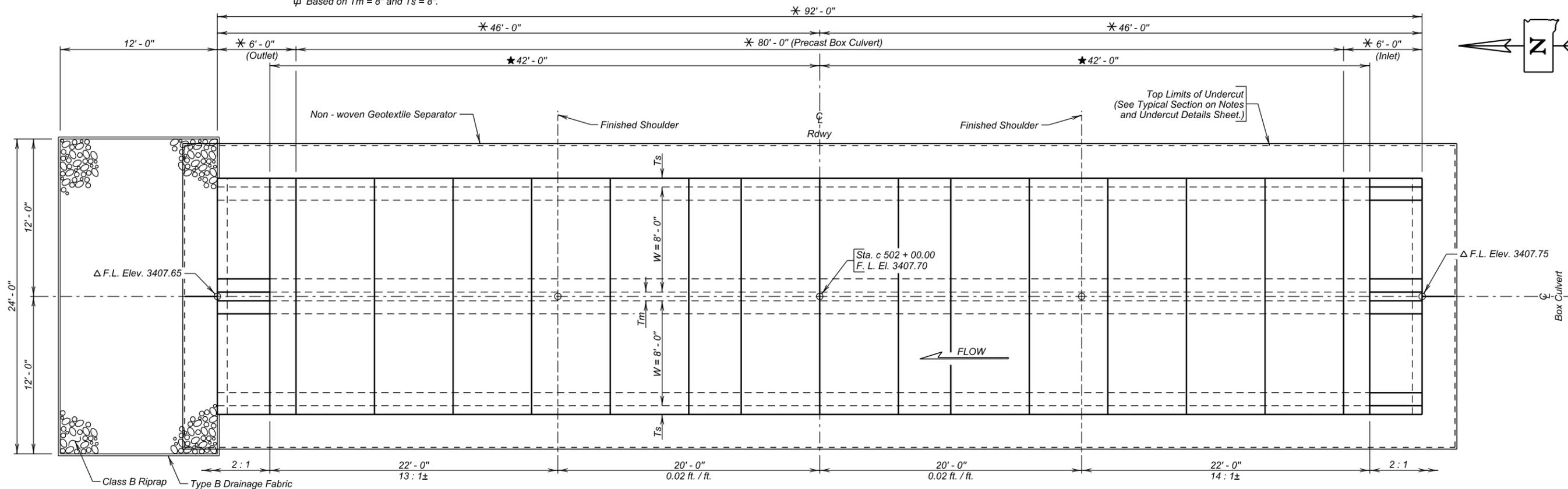
Published Date: 3rd Qtr. 2015

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 $T_m = 8"$ and $T_s = 8"$.

Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E25	E58



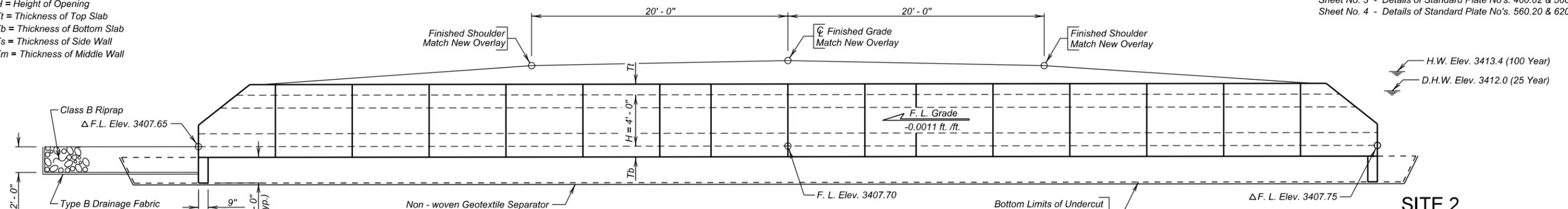
PLAN

LEGEND

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

INDEX OF CULVERT SHEETS -

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



ELEVATION

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	203 cfs
A_d	27 sq. ft.
V_d	7.4 fps
Q_F	203 cfs
Q_{100}	340 cfs
Q_{OT}	361 cfs
V_{max}	8.8 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 3412.00
 Q_{OT} = Overtopping discharge and frequency $> Q_{100}$ yr. recurrence interval. El. 3413.64. Location M. L. Sta 495 + 00.00
 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. 3413.4
 V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Structure Excavation, Box Culvert	Cu. Yd.	43.0
Box Culvert Undercut	Cu. Yd.	174
Class B Riprap	Ton	29.9
Type B Drainage Fabric	Sq. Yd.	48
Non - woven Geotextile Separator	Sq. Yd.	347
2 - 8' X 4' Precast Concrete Culvert, Furnish	Ft.	80
2 - 8' X 4' Precast Concrete Culvert, Install	Ft.	80
2 - 8' X 4' Precast Concrete Culvert End Section, Furnish	Each	2
2 - 8' X 4' Precast Concrete Culvert End Section, Install	Each	2

⊕ Quantity is based on 8" bottom slab, 8" 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.

**SITE 2
ALTERNATE B**

GENERAL DRAWING AND QUANTITIES

FOR
2 - 8' X 4' BOX CULVERT (PRECAST)
 OVER TRIB. TO FAST HORSE CREEK 0° SKEW
 STA. c 502 + 00.00 SEC. 3/34-T35/36N-R43W
 STR. NO. 57-321-460 NH-PH 0018(177)104
 PCN 02QC HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013 **1** OF **4**

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

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWB08	DRAFTED BY GW Kevin N. Goeden BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E26	E58

SPECIFICATIONS

Use South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.

GENERAL NOTES

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

- Box culvert and box culvert end section design shall conform to the AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
- Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. If construction loads in excess of legal load are anticipated by the Contractor, the Contractor shall submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.
- The box culvert shall be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2010 Edition with the latest Interim Revisions using the LRFR method. The rating shall include evaluation at the Design Load rating for the HL-93 truck at both Inventory and Operating levels and at the 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 noted in the AASHTO Manual for Bridge Evaluation. All sections of the box culvert shall rate at HL-93 or better (Inventory Level). The three SD Legal Loads, the notional rating load and the four specialized hauling vehicles shall rate greater than 1.0 at legal load rating level. Submit Load Rating calculations with the Design and Check Design calculations or shop plans, as appropriate.
- The design of the barrel sections shall be based on a minimum fill height of 1 foot and include all subsequent fill heights up to and including the maximum fill height of 5 ft. over the box culvert.
- Minimum inside corner fillet shall be 6 in.
- Minimum precast barrel section length shall be 4 ft..
- Lift holes shall be plugged with an approved nonshrinkable grout.
- The Fabricator shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
- 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.
- Installation of the precast sections shall be in accordance with the final approved shop plans.
- Compaction of earth embankment and box culvert backfill shall be governed by the Specified Density method.
- The subsurface soils at Station c502 + 00 consist of brown clay-silt to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were silt-clay to silt.

DESIGN MIX OF CONCRETE

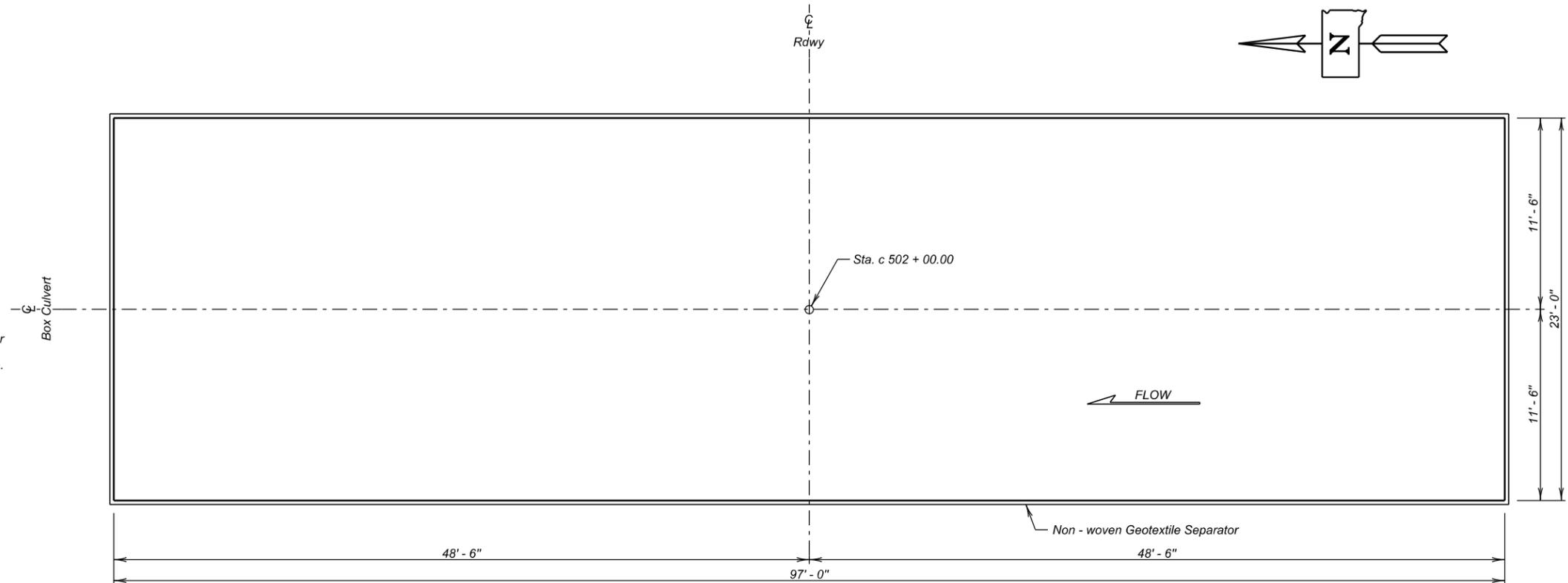
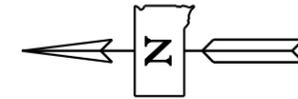
- Mix shall be as per fabricator's design, however minimum compressive strength shall not be less than 4500 p.s.i. at 28 days.
- High sulfate levels are likely to be encountered at this location. The type of cement shall be either a Type II with 20% Class F Modified Fly Ash substituted for cement in accordance with Section 605 or a Type V. The Water/Cementitious material ratio shall not exceed 0.45 as defined in Section 460.3 C.

GEOTEXTILE

- A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
- The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
- The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
- The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
- Payment will be full compensation for furnishing and installing the geotextile only.

SHOP PLANS

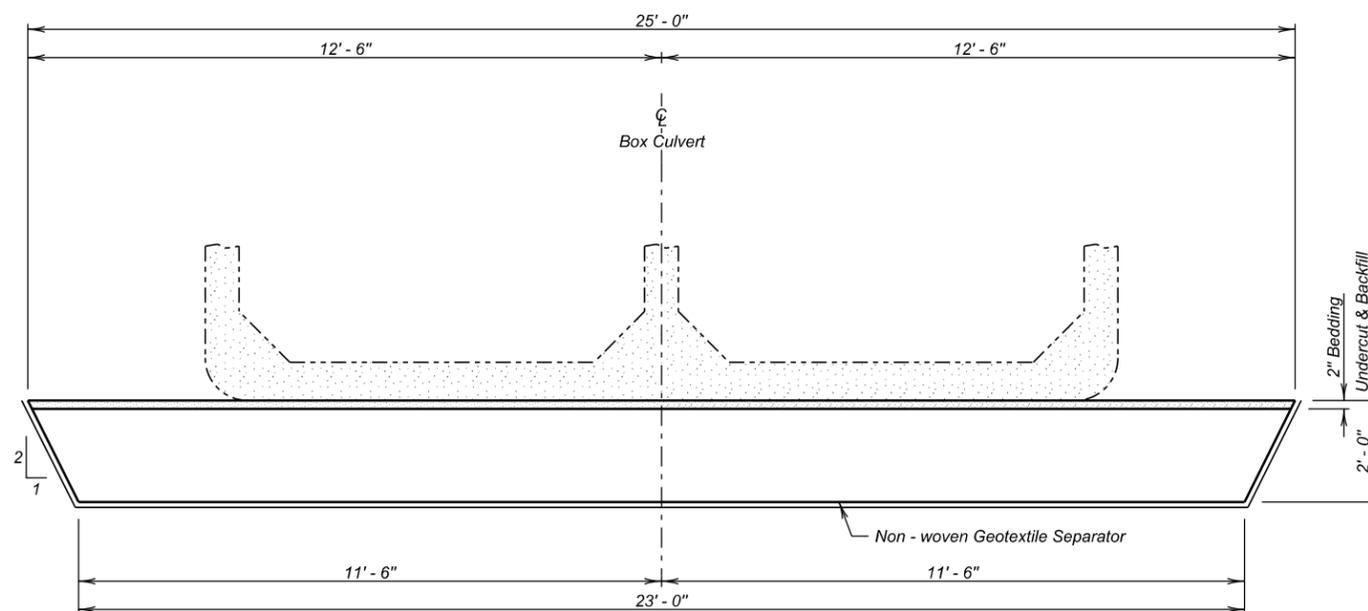
Shop plans shall be required as specified by the Specifications. In lieu of paper copies, shop plans may be submitted electronically in Adobe PDF. Send shop plan submittals to the Office of Bridge Design.



UNDERCUT LAYOUT
(Bottom Dimensions)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	174
Non-woven Geotextile Separator	Sq. Yd.	347

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.



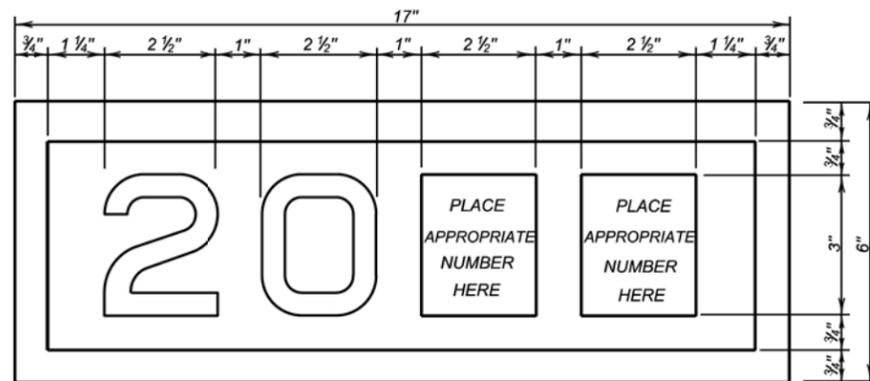
TYPICAL SECTION
(For Limits of Undercut)

**SITE 2
ALTERNATE B**
NOTES AND UNDERCUT DETAILS
FOR
2 - 8' X 4' BOX CULVERT (PRECAST)
OVER TRIB. TO FAST HORSE CREEK 0° SKEW
STA. c 502 + 00.00 SEC. 3/34-T35/36N-R43W
STR. NO. 57-321-460 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013 **2** OF **4**

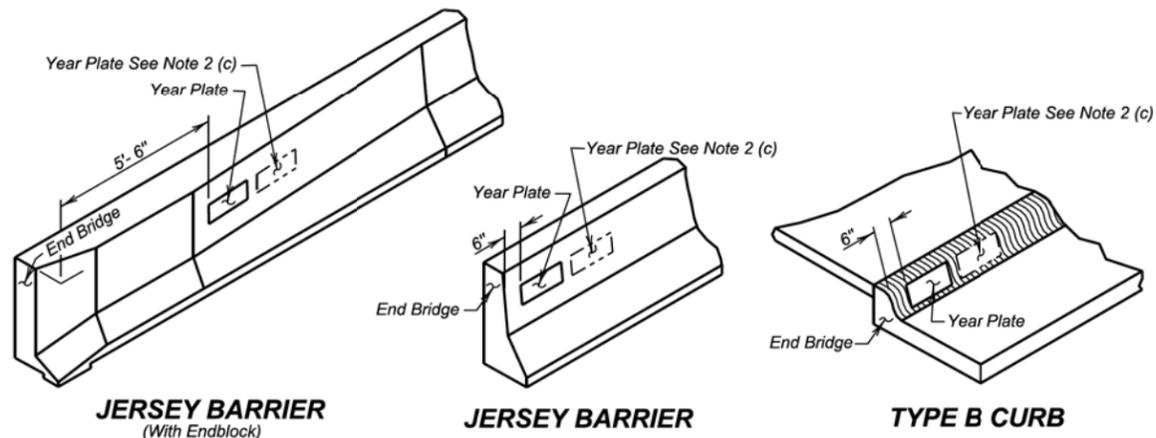
DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWB09	DRAFTED BY GW	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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YEAR PLATE DETAILS

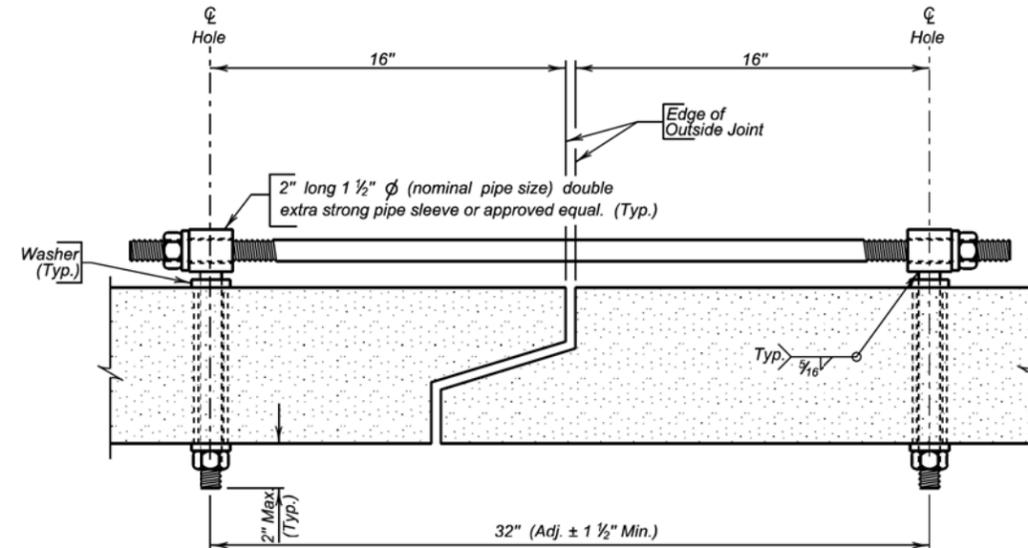
GENERAL NOTES:

- 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: 3rd Qtr. 2015	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



TIE BOLT ASSEMBLY

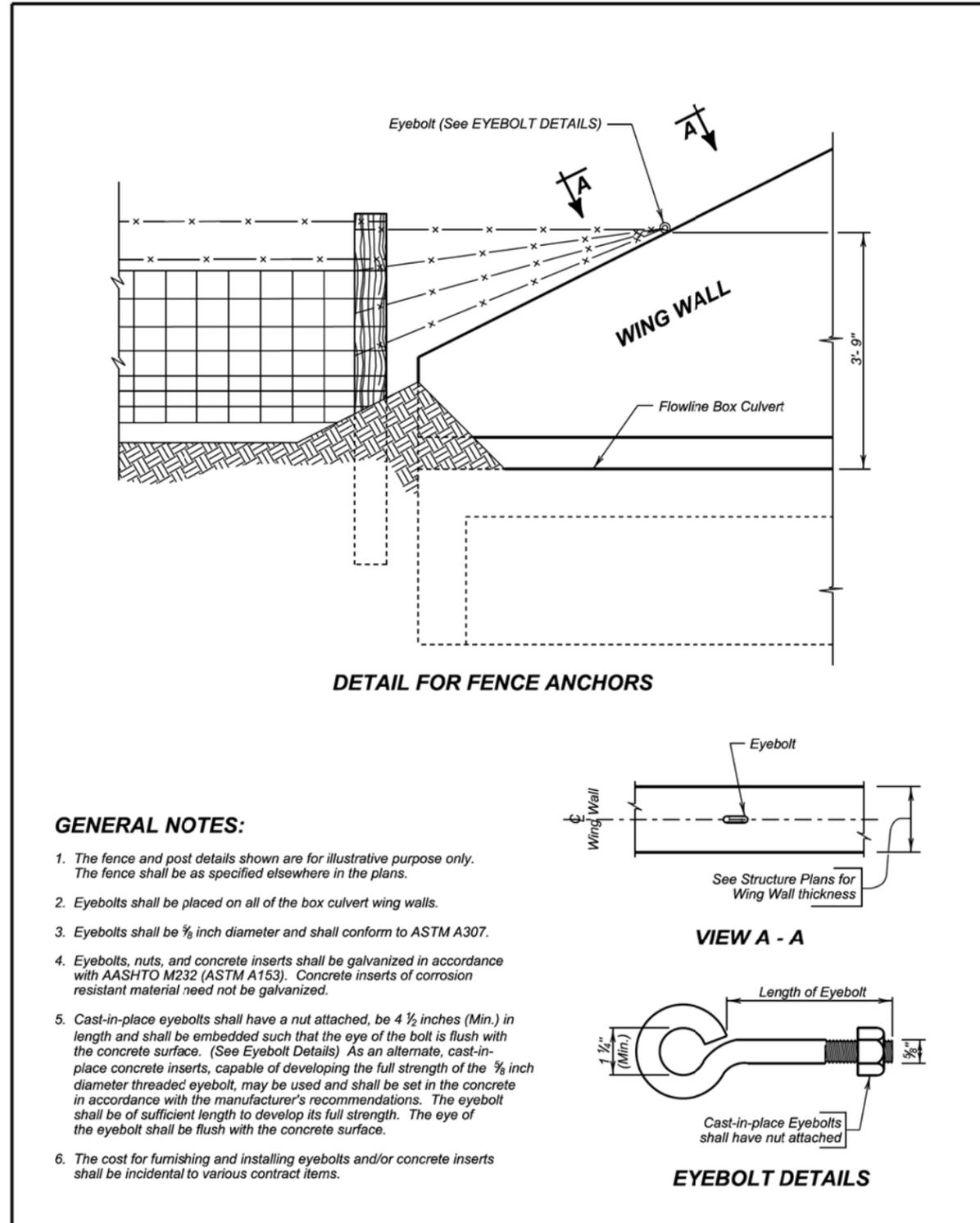
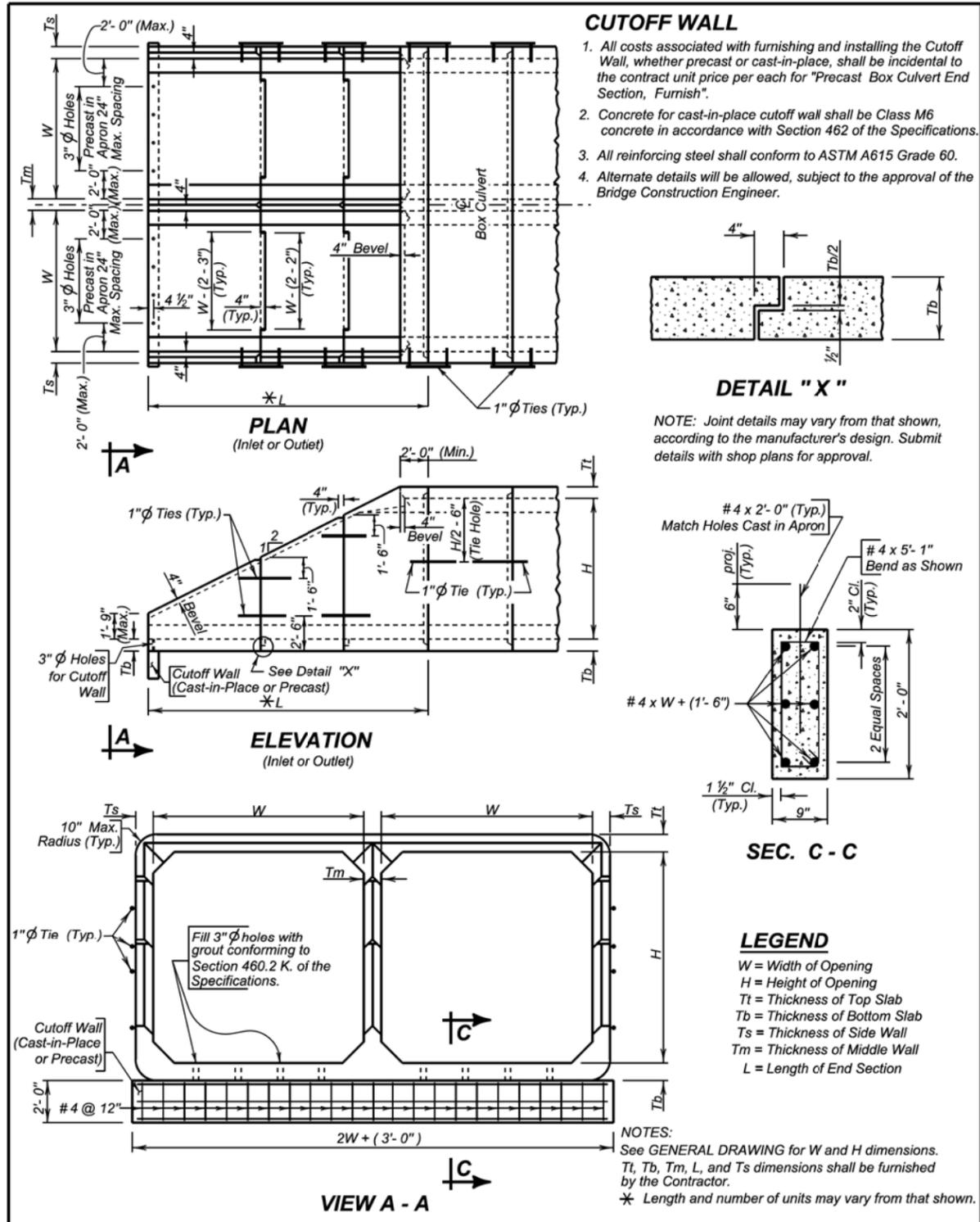
GENERAL NOTES:

- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36. 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.
- 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".

December 23, 2012

Published Date: 3rd Qtr. 2015	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E28	E58



S D D O T	PRECAST DOUBLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'-0" CUTOFF WALL	PLATE NUMBER 560.20
		Sheet 1 of 1

Published Date: 3rd Qtr. 2015

June 26, 2015

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

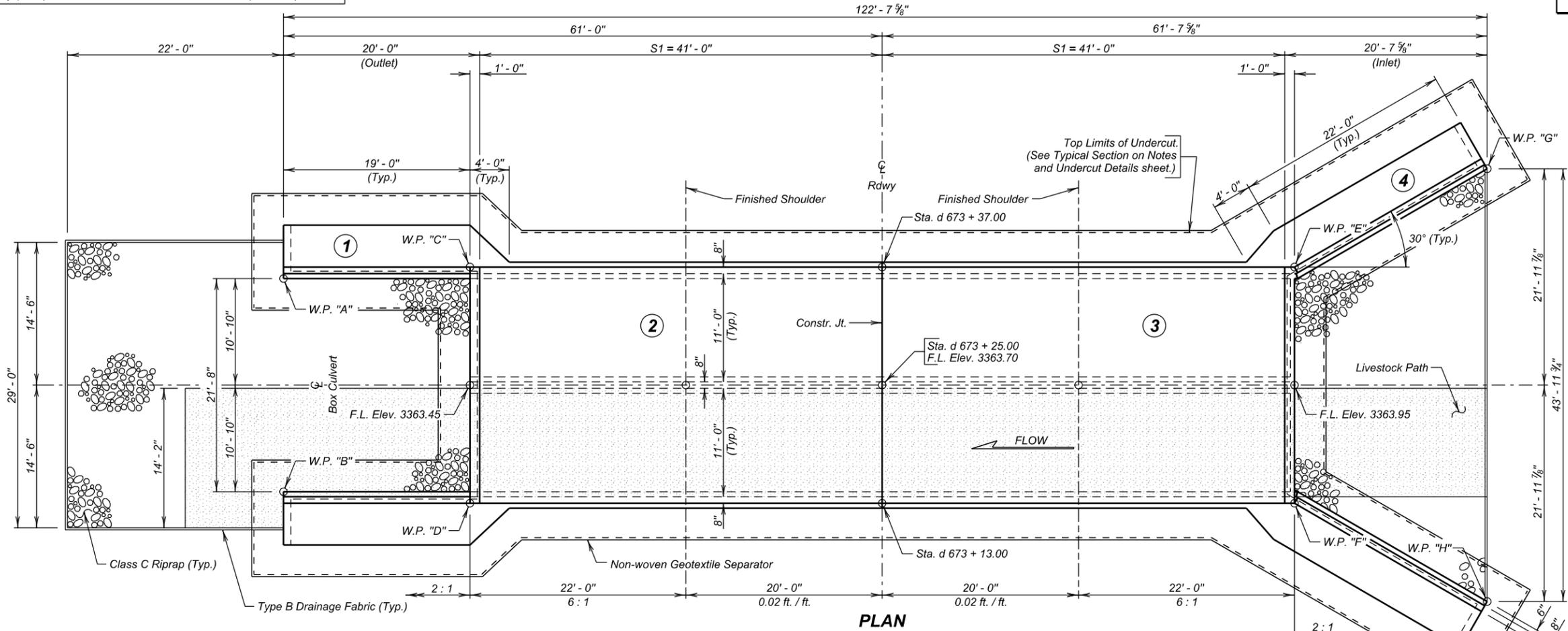
Published Date: 3rd Qtr. 2015

December 23, 2012

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

Revised July 23, 2015

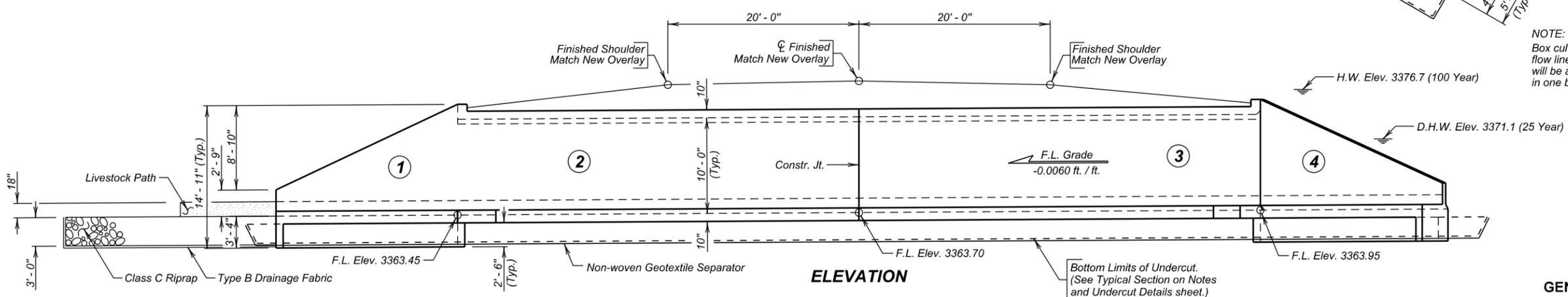
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E29	E58



-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 - Standard S1 Barrel End Section Details
- Sheet No. 6 - Details of Standard Plate No's. 460.02 and 460.10
- Sheet No. 7 - Details of 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. Base course will be located in one barrel of box culvert to allow for a livestock path.



SITE 3 ALTERNATE A
GENERAL DRAWING AND QUANTITIES
FOR

2 - 11' X 10' BOX CULVERT (C.I.P.)
OVER WOUNDED KNEE CREEK 0° SKEW
STA. d 673 + 25.00 SEC. 31-T36N-R42W
STR. NO. 57-353-458 NH-PH 0018(177)104
PCN 02QC HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013 **1** OF **7**

HYDRAULIC DATA

Q _d	919 cfs
A _d	84 sq. ft.
V _d	11.0 fps
Q _F	919 cfs
Q ₁₀₀	2500 cfs
Q _{OT}	>Q ₁₀₀ cfs
V _{max}	15.4 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 3371.1.
Q_{OT} = Overtopping discharge and frequency > Q₁₀₀ yr. recurrence interval. El. 3378. 4 @ Sta. 671 + 50.00.
Q_F = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.
Q₁₀₀ = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 3376.7.
V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	d 673 + 35.83	61.00 Lt.
"B"	d 673 + 14.17	61.00 Lt.
"C"	d 673 + 37.00	42.00 Lt.
"D"	d 673 + 13.00	42.00 Lt.
"E"	d 673 + 37.00	42.00 Rt.
"F"	d 673 + 13.00	42.00 Rt.
"G"	d 673 + 46.99	61.64 Rt.
"H"	d 673 + 03.01	61.64 Rt.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	242.0
Reinforcing Steel	Lb.	33606
Structure Excavation, Box Culvert	Cu. Yd.	90
Box Culvert Undercut	Cu. Yd.	269
Base Course	Ton	154.8
Type B Drainage Fabric	Sq. Yd.	271
Class C Riprap	Ton	262.8
Non-woven Geotextile Separator	Sq. Yd.	557

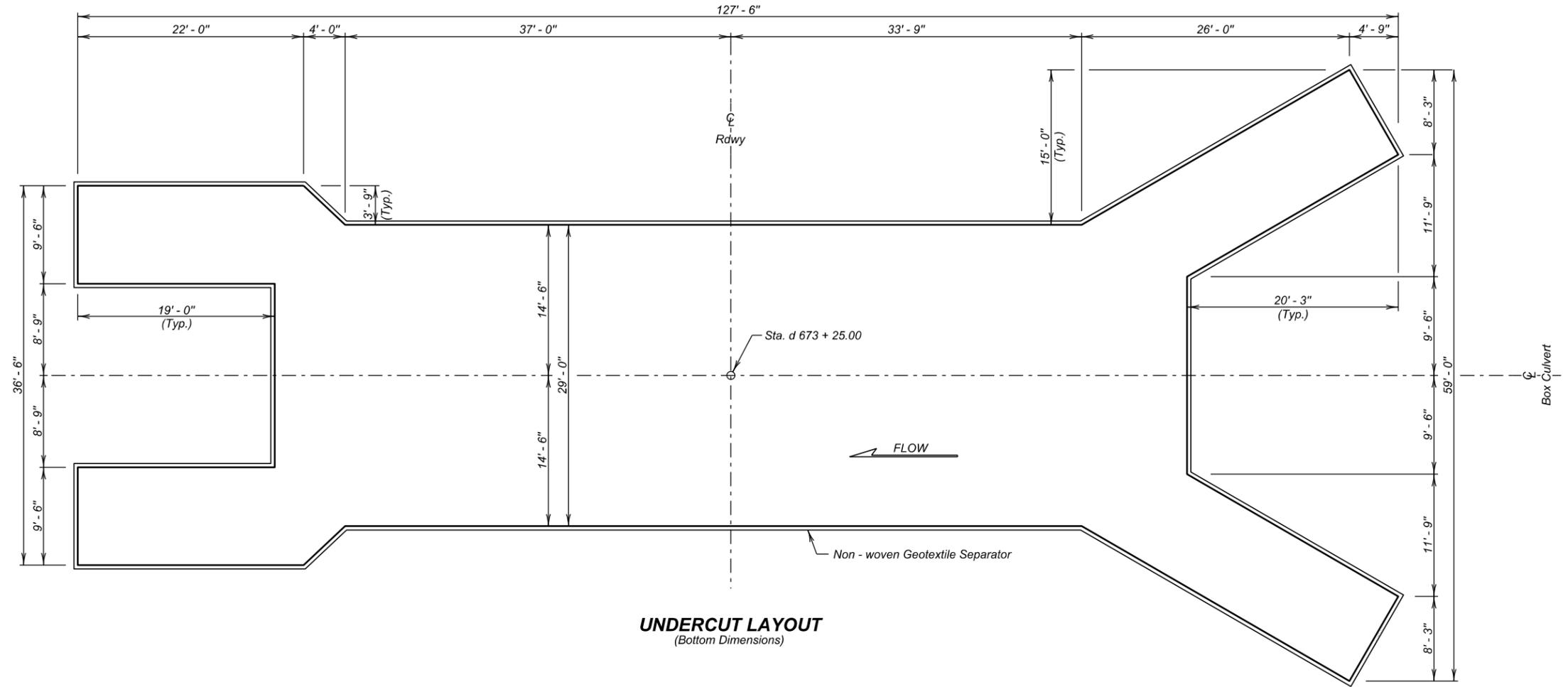
∅ For estimating purposes only, a factor of 1.4 tons/cu. yd. was used to convert Cu. Yds. to Tons.
∅ For estimating purposes only, a factor of 1.89 tons/cu. yd. was used to convert Cu. Yds. to Tons.

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

-X028-

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWC01	DRAFTED BY GW	Kevin N. Coeden BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E30	E58



SPECIFICATIONS

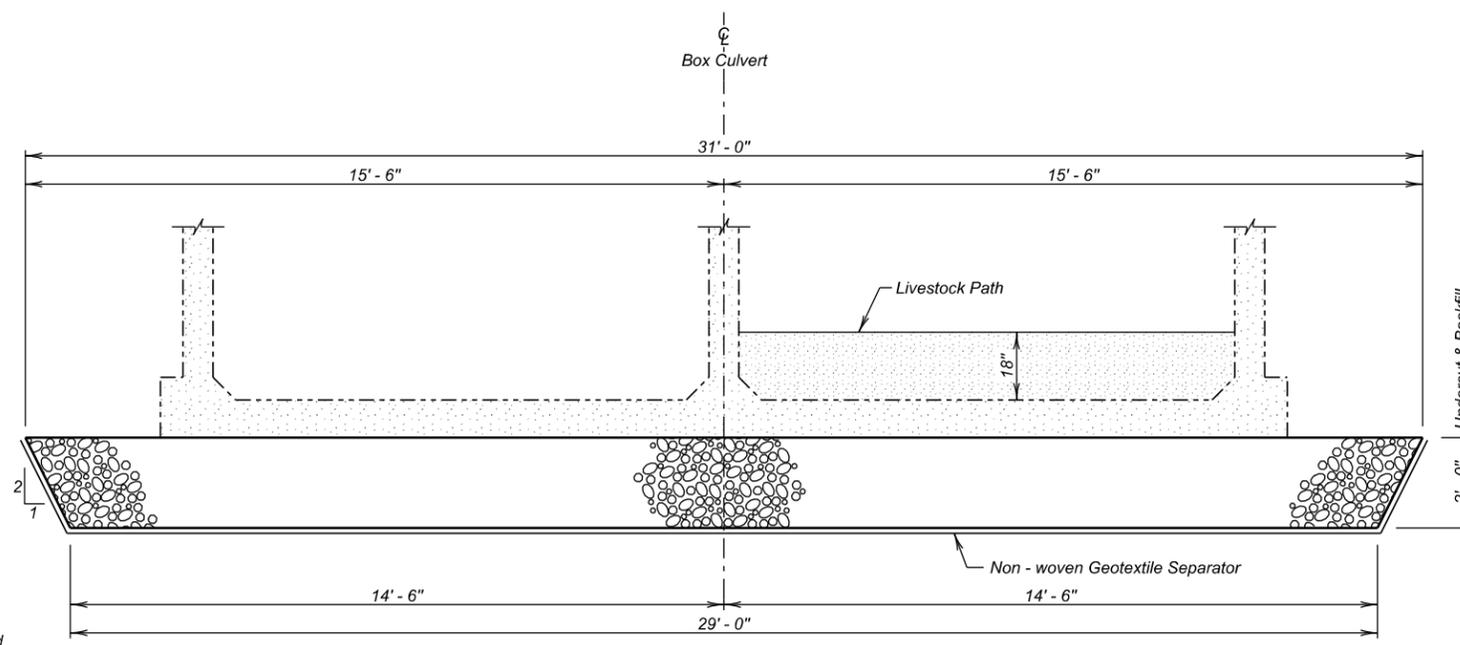
1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

1. Design Live Load: HL-93 and construction load consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall 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. (S1).
3. Design Material Strengths: Concrete $f_c = 4500$ p.s.i.
Reinforcing Steel $f_y = 60000$ p.s.i.
4. All concrete shall be Class A45 conforming to Section 460.
5. All reinforcing steel shall conform to ASTM A615 Grade 60.
6. All exposed edges shall be chamfered $\frac{3}{4}$ inch.
7. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
8. The Contractor shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Care shall be taken to establish Working Points (W.P.) as shown on the wings.
10. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
11. Compaction of earth embankment and box culvert backfill material shall be governed by the Specified Density method.
12. Dimension "L" on the standard box culvert sheet(s) is the barrel section length shown in the PLAN view on the General Drawing (for each S1, S2 etc. barrel section, as applicable).
13. All costs associated with supplying and placing base course for livestock path shall be paid for at the contract unit price per ton for base course. The base course material shall comply with Section 882.
14. The subsurface soils at Station d673 + 13 consist of gray sandy silt-clay to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were silt-sand.

GEOTEXTILE

1. A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
2. The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
3. The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a manner that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
4. The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
5. Payment will be full compensation for furnishing and installing the geotextile only.

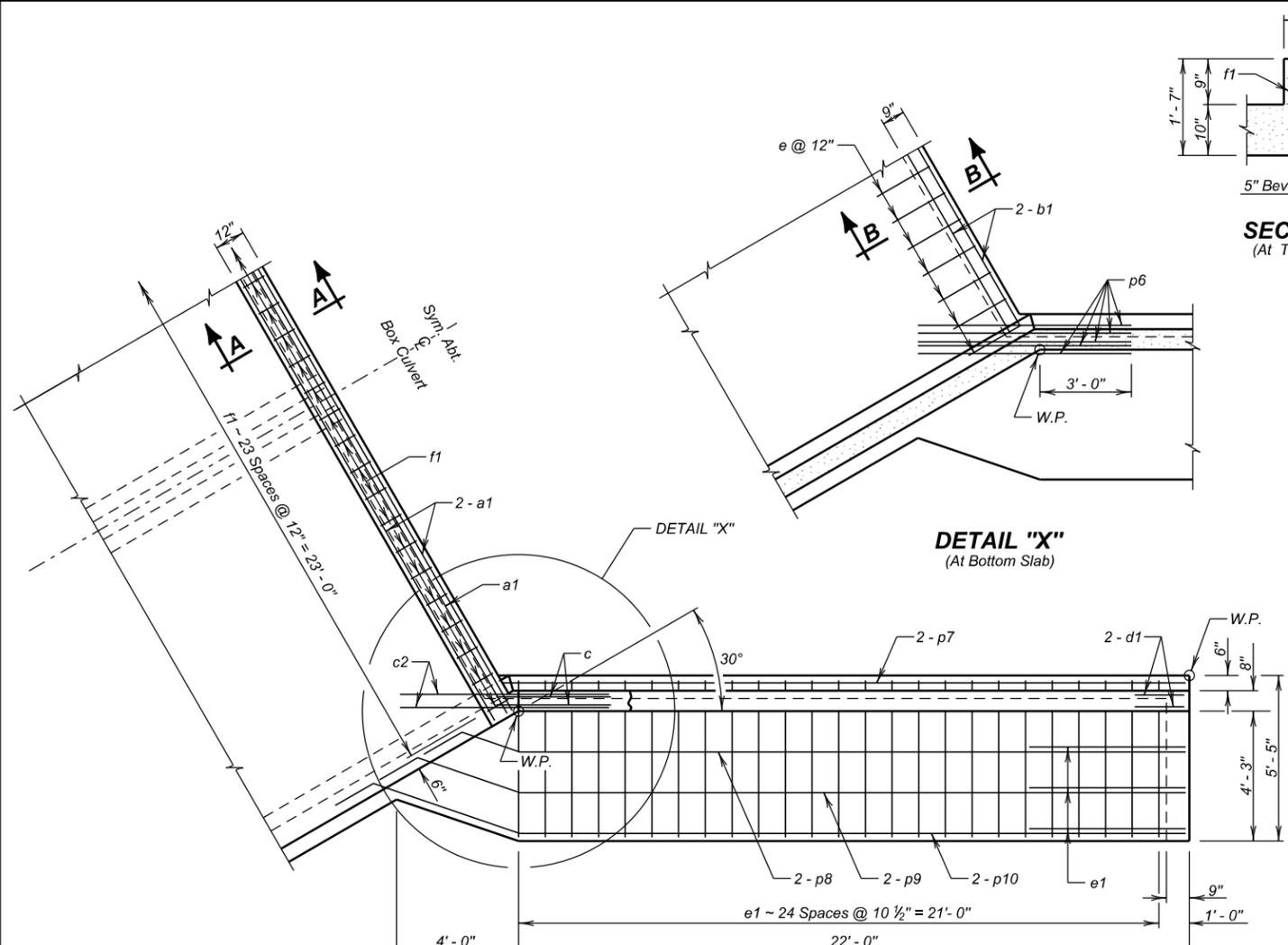


TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	269
Non-woven Geotextile Separator	Sq. Yd.	557

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders change.
For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.

**SITE 3
ALTERNATE A**
NOTES AND UNDERCUT DETAILS
FOR
2 - 11' X 10' BOX CULVERT (C.I.P.)
OVER WOUNDED KNEE CREEK 0° SKEW
STA. d 673 + 25.00 SEC. 31-T36N-R42W
STR. NO. 57-353-458 NH-PH 0018(177)104
HL-93



REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type
a1	5	6	23'-9"	Str.
b1	4	6	22'-0"	Str.
c	4	5	4'-6"	1A
c1	8	5	23'-9"	Str.
c2	4	5	7'-0"	19B
d1	8	5	7'-0"	19B
e	23	4	8'-3"	S12
e1	56	4	11'-9"	S12A
f1	24	4	5'-3"	S6A
g0	12	5	5'-0"	19B
g1	18	4	29'-9"	19B
g2	4	4	23'-9"	19B
h	15	4	25'-3"	17A
k	27	4	17'-9"	17A
p6	10	6	7'-0"	Str.
p7	10	4	24'-6"	Str.
p8	4	4	25'-3"	Str.
p9	4	4	26'-9"	Str.
p10	4	4	28'-6"	Str.

Bending Details

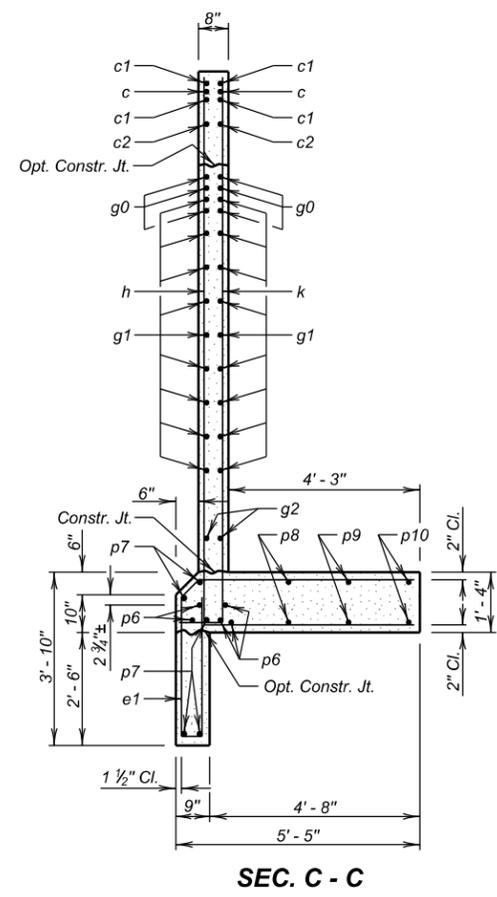
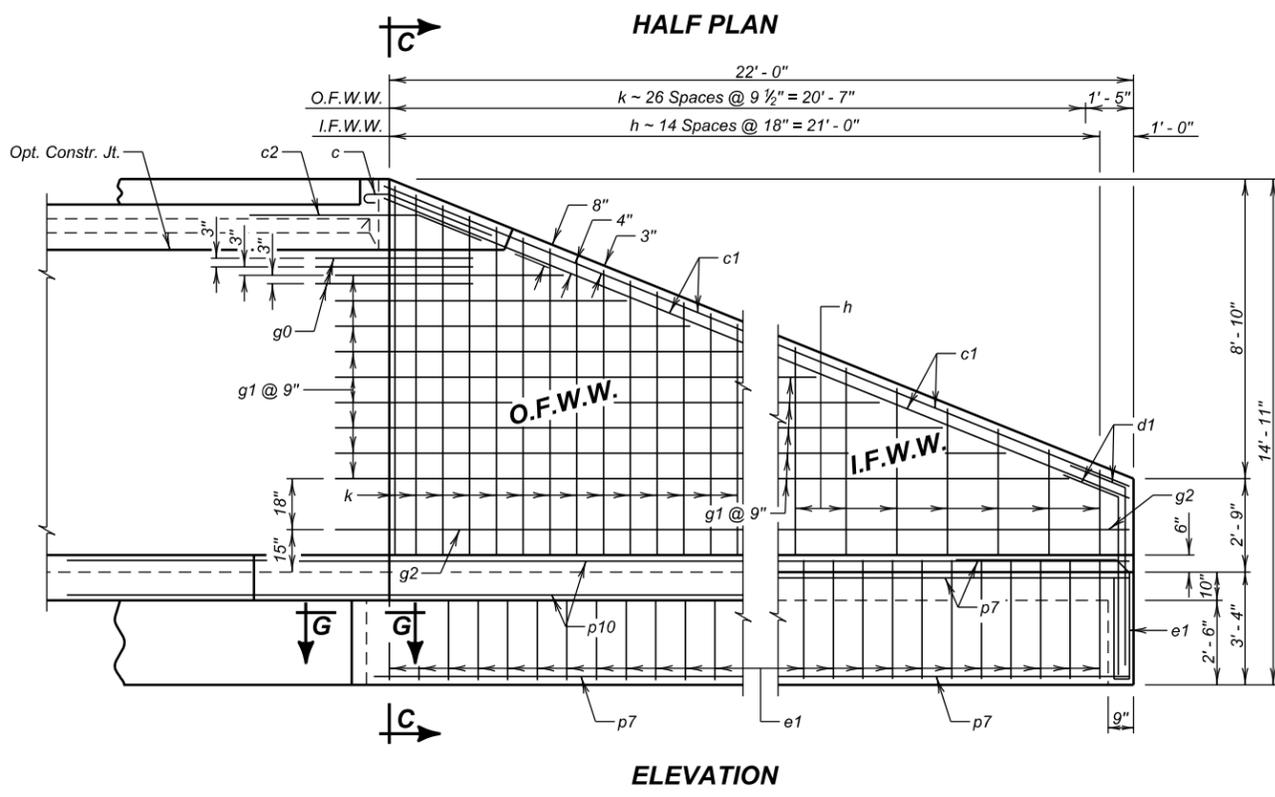
NOTES:
 All dimensions are out to out of bars.
 ☐ See cutting diagram.
 * Bend in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	27.9	2806	13.9

LEGEND FOR PLACING RE-STEEL

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



**SITE 3
 ALTERNATE A
 INLET DETAILS
 FOR
 2 - 11' X 10' BOX CULVERT (C.I.P.)
 OVER WOUNDED KNEE CREEK 0° SKEW
 STA. d 673 + 25.00 SEC. 31-T36N-R42W
 STR. NO. 57-353-458 NH-PH 0018(177)104
 HL-93**

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013

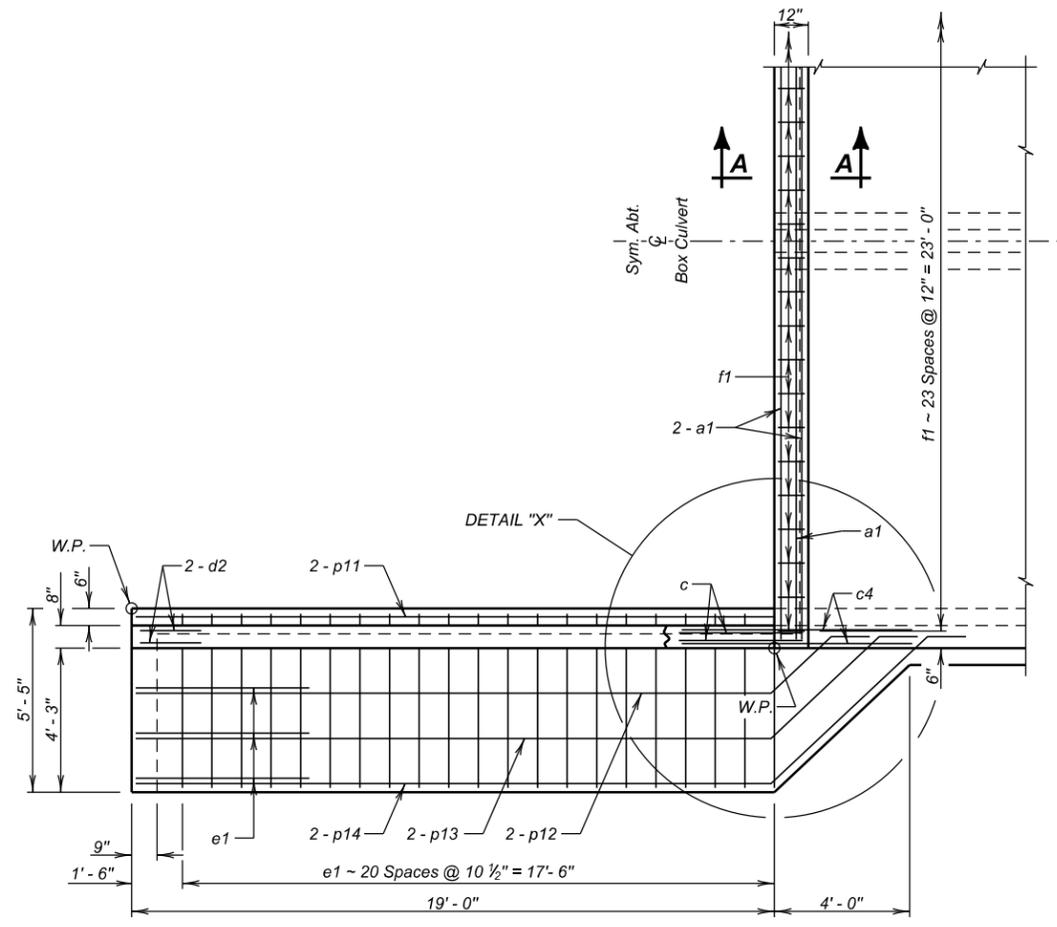
Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E32	E58

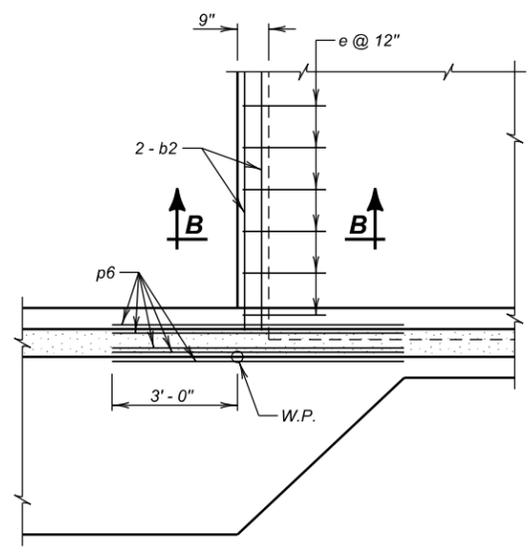
REINFORCING SCHEDULE				
Mk.	No.	Size	Length	Type
a1	5	6	23'-9"	Str.
b2	4	6	22'-9"	Str.
c	4	5	4'-6"	1A
c3	8	5	21'-0"	Str.
c4	4	5	7'-0"	19B
d2	8	5	7'-0"	19B
e	23	4	8'-3"	S12
e1	48	4	11'-9"	S12A
f1	24	4	5'-3"	S6A
g	12	4	5'-0"	Str.
g3	18	4	26'-0"	Str.
g4	4	4	20'-9"	Str.
h0	13	4	25'-3"	17A
k0	24	4	17'-6"	17A
p6	10	6	7'-0"	Str.
p11	10	4	21'-6"	Str.
p12	4	4	22'-9"	Str.
p13	4	4	24'-9"	Str.
p14	4	4	26'-6"	Str.

Bending Details	
Type 1A	Type S12
Type S12A	Type S6A
Type 19B	Type 17A

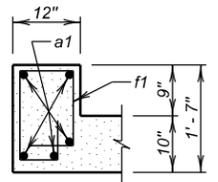
NOTES:
 All dimensions are out to out of bars.
 See cutting diagram.
 Bend in field as necessary to fit.



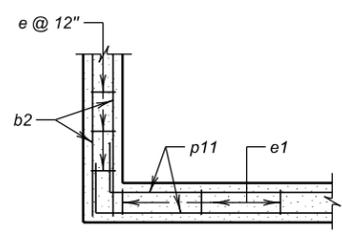
HALF PLAN



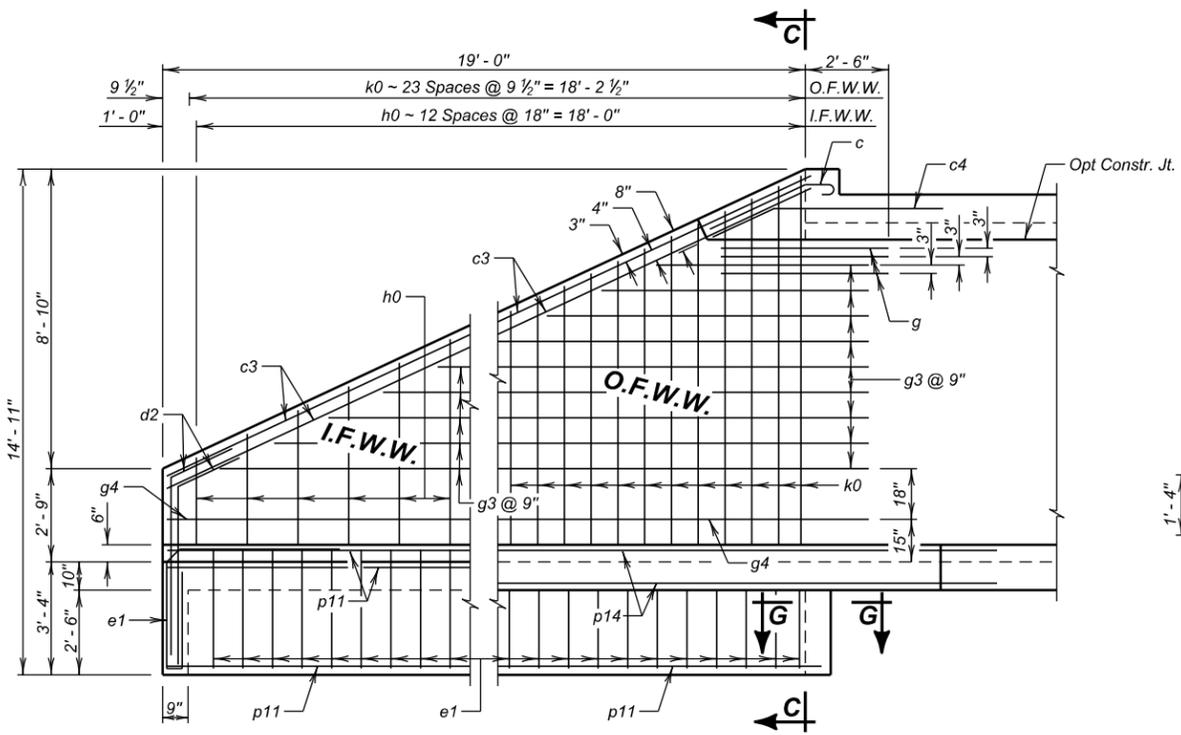
DETAIL "X"
(At Bottom Slab)



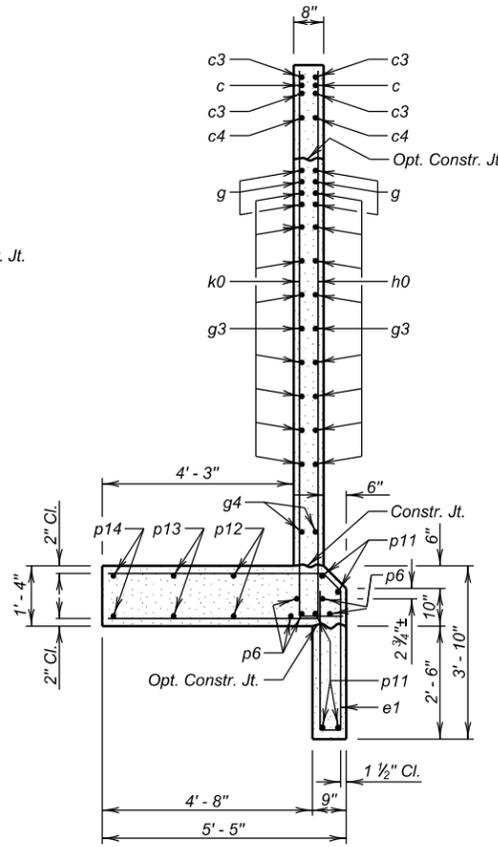
SEC. A - A
(At Top Slab)



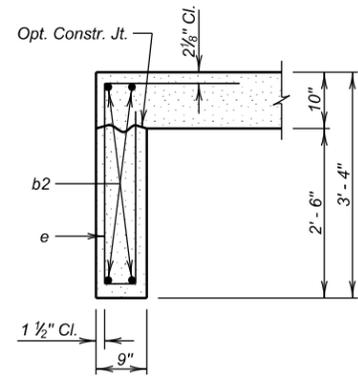
SEC. G - G



ELEVATION



SEC. C - C



SEC. B - B

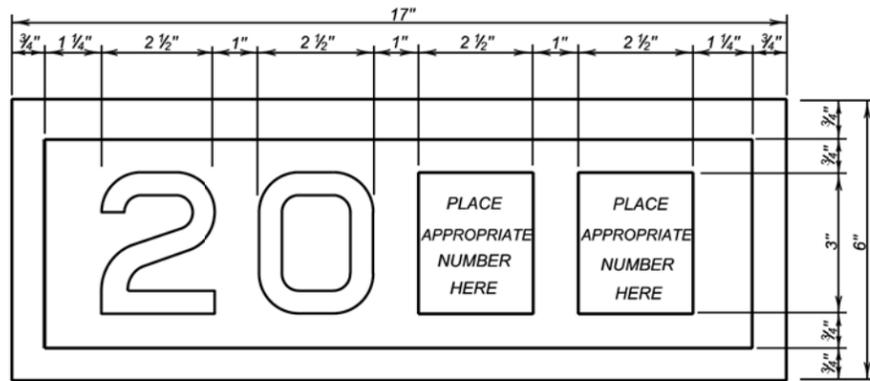
ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	24.8	2561	12.5

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

**SITE 3
ALTERNATE A
OUTLET DETAILS**
FOR
2 - 11' X 10' BOX CULVERT (C.I.P.)
OVER WOUNDED KNEE CREEK 0° SKEW
STA. d 673 + 25.00 SEC. 31-T36N-R42W
STR. NO. 57-353-458 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION
OCTOBER 2013

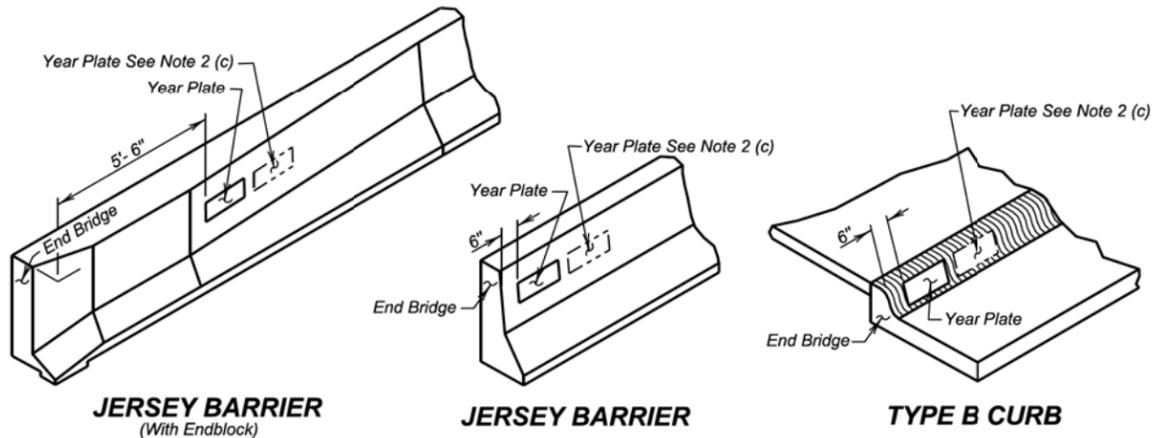
DESIGNED BY MM OGLA020C	CHECKED BY JMH 020CWC04	DRAWN BY GW	Kevin N. Coeden BRIDGE ENGINEER
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YEAR PLATE DETAILS

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.



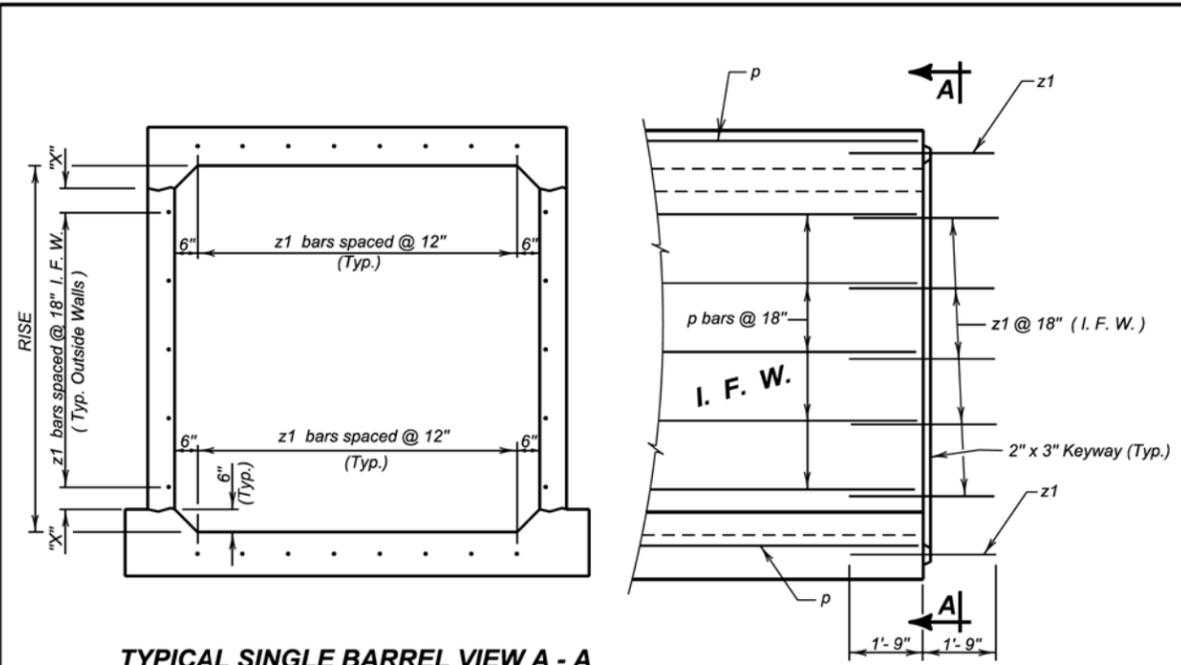
JERSEY BARRIER
(With Endblock)

JERSEY BARRIER

TYPE B CURB

June 26, 2012

S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1



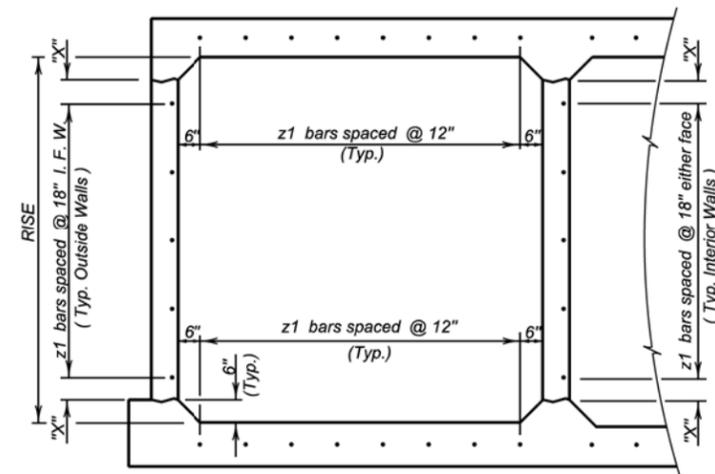
TYPICAL SINGLE BARREL VIEW A - A

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"



TYPICAL MULTIPLE BARREL VIEW A - A

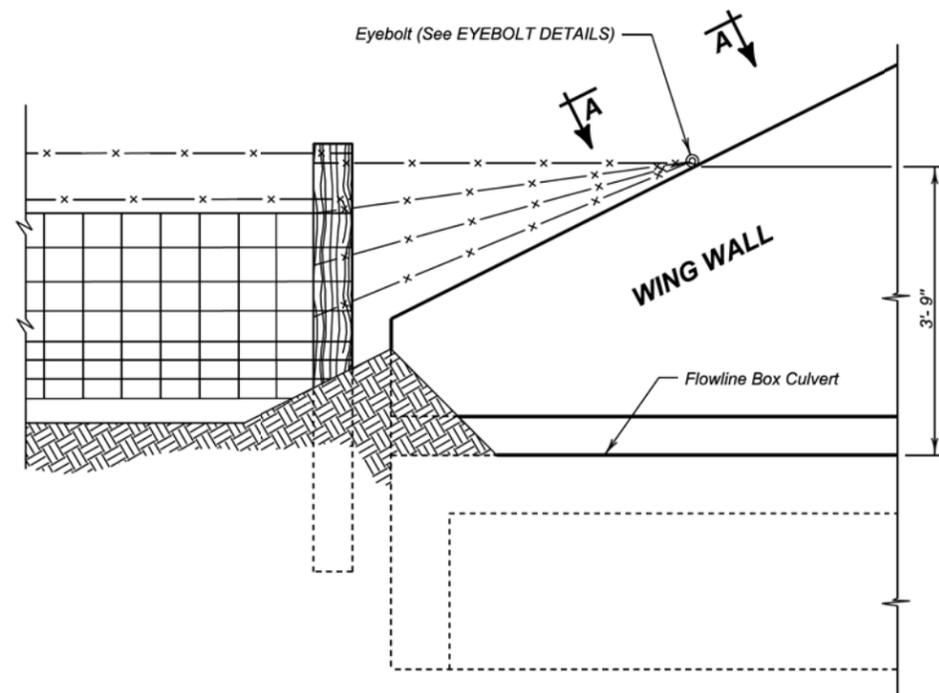
GENERAL NOTES:

- z1 bars shall be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars shall 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 shall be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 26, 2012

S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1

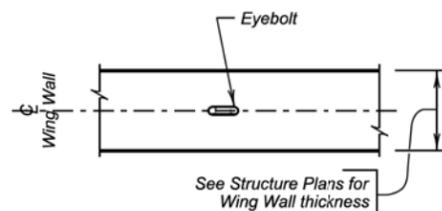
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E35	E58



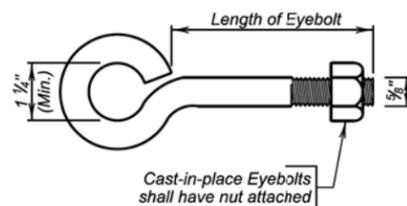
DETAIL FOR FENCE ANCHORS

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 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 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.
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

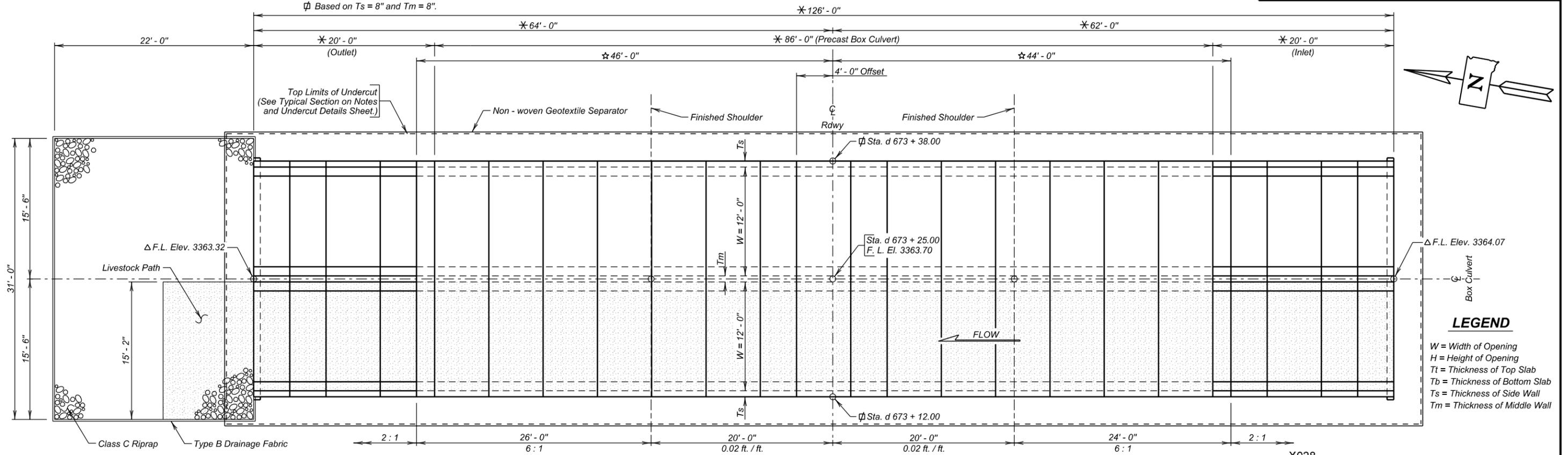
Published Date: 3rd Qtr. 2015

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 fill slopes.
- △ Based on dimensions shown.
- ∅ Based on $T_s = 8"$ and $T_m = 8"$.

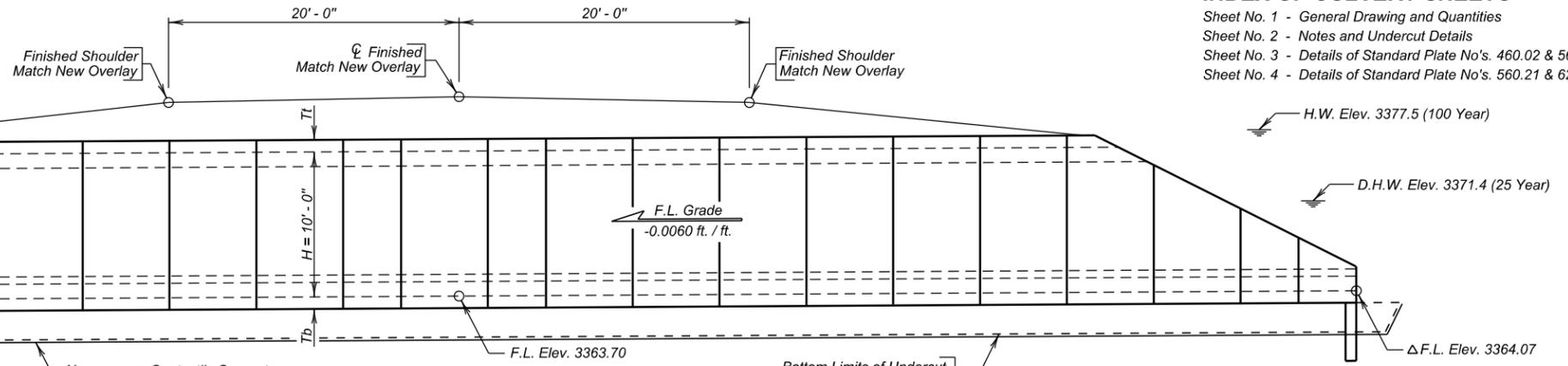
Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E36	E58



PLAN

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. Base course will be located in one barrel of box culvert to allow for a livestock path.



ELEVATION

-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. 560.21 & 620.16

HYDRAULIC DATA

Q_d	919 cfs
A_d	86 sq. ft.
V_d	10.7 fps
Q_F	919 cfs
Q_{100}	2500 cfs
Q_{OT}	$> Q_{100}$ cfs
V_{max}	15.0 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 3371.4.
 Q_{OT} = Overtopping discharge and frequency $> Q_{100}$ yr. recurrence interval. El. 3378.4 @ Sta. 671 + 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. 3377.5.
 V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
∅ Structure Excavation, Box Culvert	Cu. Yd.	97
∅ Box Culvert Undercut	Cu. Yd.	301
∅ Base Course	Ton	165.8
# Class C Riprap	Ton	106.1
∅ Type B Drainage Fabric	Sq. Yd.	111
∅ Non-woven Geotextile Separator	Sq. Yd.	591
2 - 12' X 10' Precast Concrete Culvert, Furnish	Ft.	86
2 - 12' X 10' Precast Concrete Culvert, Install	Ft.	86
2 - 12' X 10' Precast Concrete Culvert End Section, Furnish	Each	2
2 - 12' X 10' Precast Concrete 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.
 ∅ For estimating purposes only, a factor of 1.89 tons/cu. yd. was used to convert Cu. Yd. to Tons.

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

SITE 3 ALTERNATE B
GENERAL DRAWING AND QUANTITIES

FOR
2 - 12' X 10' BOX CULVERT (PRECAST)
 OVER WOUNDED KNEE CREEK 0° SKEW
 STA. d 673 + 25.00 SEC. 31-T36N-R42W
 STR. NO. 57-353-458 NH-PH 0018(177)104
 PCN 02QC HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013

-X028-

DESIGNED BY MM OGLA02QC	CHECKED BY JMH 02QCWC08	DRAFTED BY GW	<i>Kevin N. Coeden</i> BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E37	E58

SPECIFICATIONS

Use 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

- Box culvert and box culvert end section design shall conform to the AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
- Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. If construction loads in excess of legal load are anticipated by the Contractor, the Contractor shall submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.
- The box culvert shall be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2010 Edition with the latest Interim Revisions using the LRFR method. The rating shall include evaluation at the Design Load rating for the HL-93 truck at both Inventory and Operating levels and at the 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 noted in the AASHTO Manual for Bridge Evaluation. All sections of the box culvert shall rate at HL-93 or better (Inventory Level). The three SD Legal Loads, the notional rating load and the four specialized hauling vehicles shall rate greater than 1.0 at legal load rating level. Submit Load Rating calculations with the Design and Check Design calculations or shop plans, as appropriate.
- The design of the barrel sections shall be based on a minimum fill height of 2 feet and include all subsequent fill heights up to and including the maximum fill height of 5 ft. over the box culvert.
- Minimum inside corner fillet shall be 6 in.
- Minimum precast barrel section length shall be 4 ft.
- Lift holes shall be plugged with an approved nonshrinkable grout.
- The Fabricator shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
- 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.
- Installation of the precast sections shall be in accordance with the final approved shop plans.
- Compaction of earth embankment and box culvert backfill shall be governed by the Specified Density method.
- All costs associated with supplying and placing base course for livestock path shall be paid for at the contract unit price per ton for base course. The base course material shall comply with Section 882.
- The subsurface soils at Station d673 + 13 consist of gray sandy silt-clay to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were silt-sand.

GEOTEXTILE

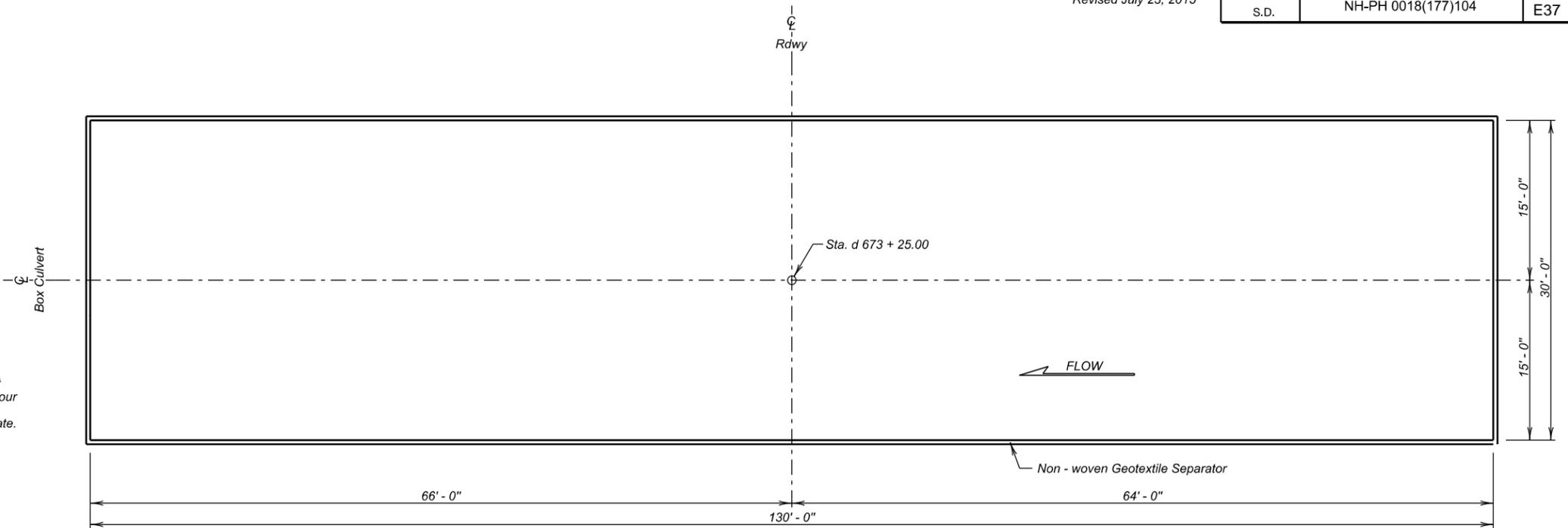
- A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
- The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
- The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
- The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
- Payment will be full compensation for furnishing and installing the geotextile only.

DESIGN MIX OF CONCRETE

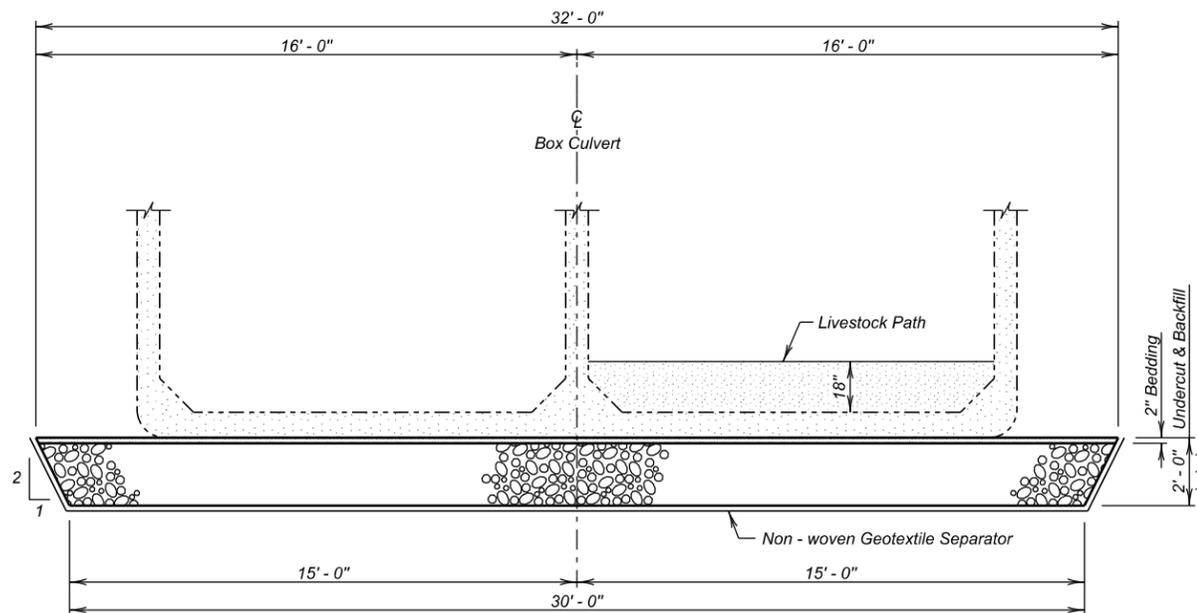
- Mix shall be as per fabricator's design, however minimum compressive strength shall not be less than 4500 p.s.i. at 28 days.
- Type II cement is required.

SHOP PLANS

Shop plans shall be required as specified by the Specifications. In lieu of paper copies, shop plans may be submitted electronically in Adobe PDF. Send shop plan submittals to the Office of Bridge Design.



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	301
Non-woven Geotextile Separator	Sq. Yd.	591

- For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
- For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.

SITE 3 ALTERNATE B

NOTES AND UNDERCUT DETAILS

FOR

2 - 12' X 10' BOX CULVERT (PRECAST)

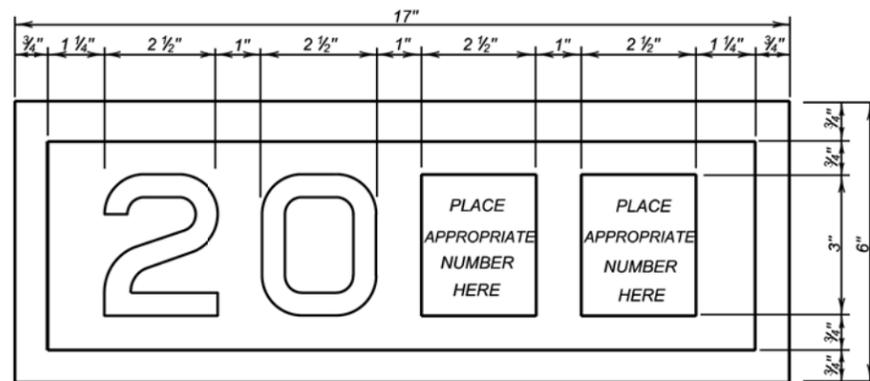
OVER WOUNDED KNEE CREEK 0° SKEW
 STA. d 673 + 25.00 SEC. 31-T36N-R42W
 STR. NO. 57-353-458 NH-PH 0018(177)104
 HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013

2 OF 4

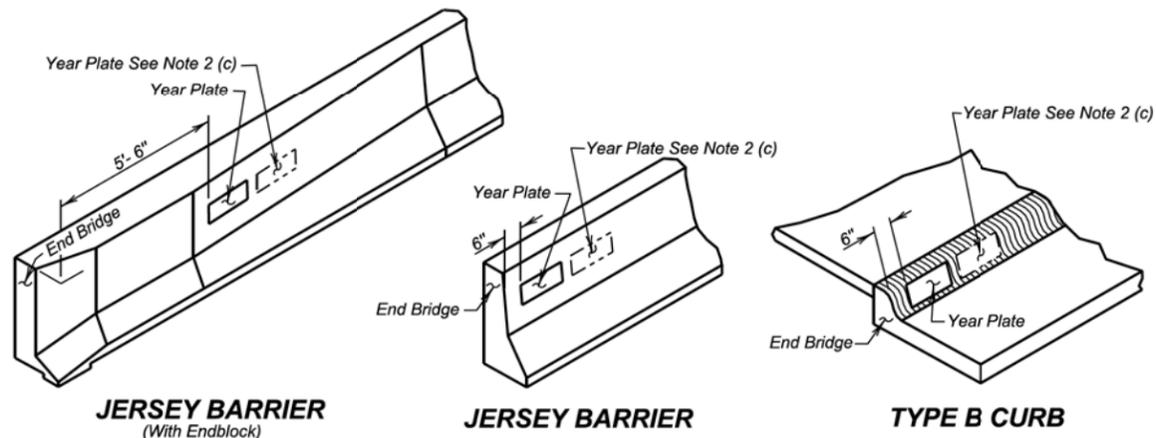
DESIGNED BY MM OGLA02QC	CHECKED BY JMH 02QCWC09	DRAFTED BY GW	Kevin N. Coeden BRIDGE ENGINEER
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YEAR PLATE DETAILS

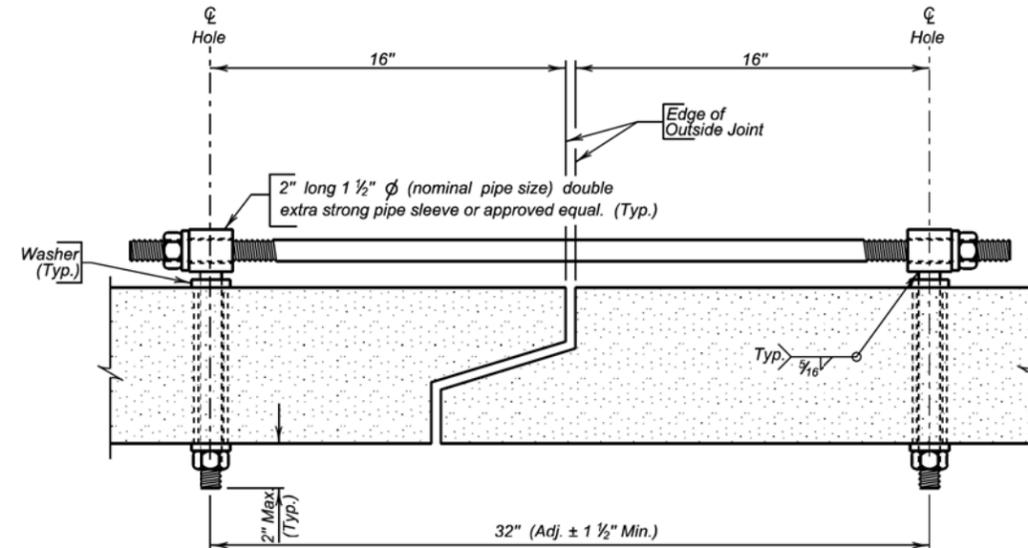
GENERAL NOTES:

- 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: 3rd Qtr. 2015	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



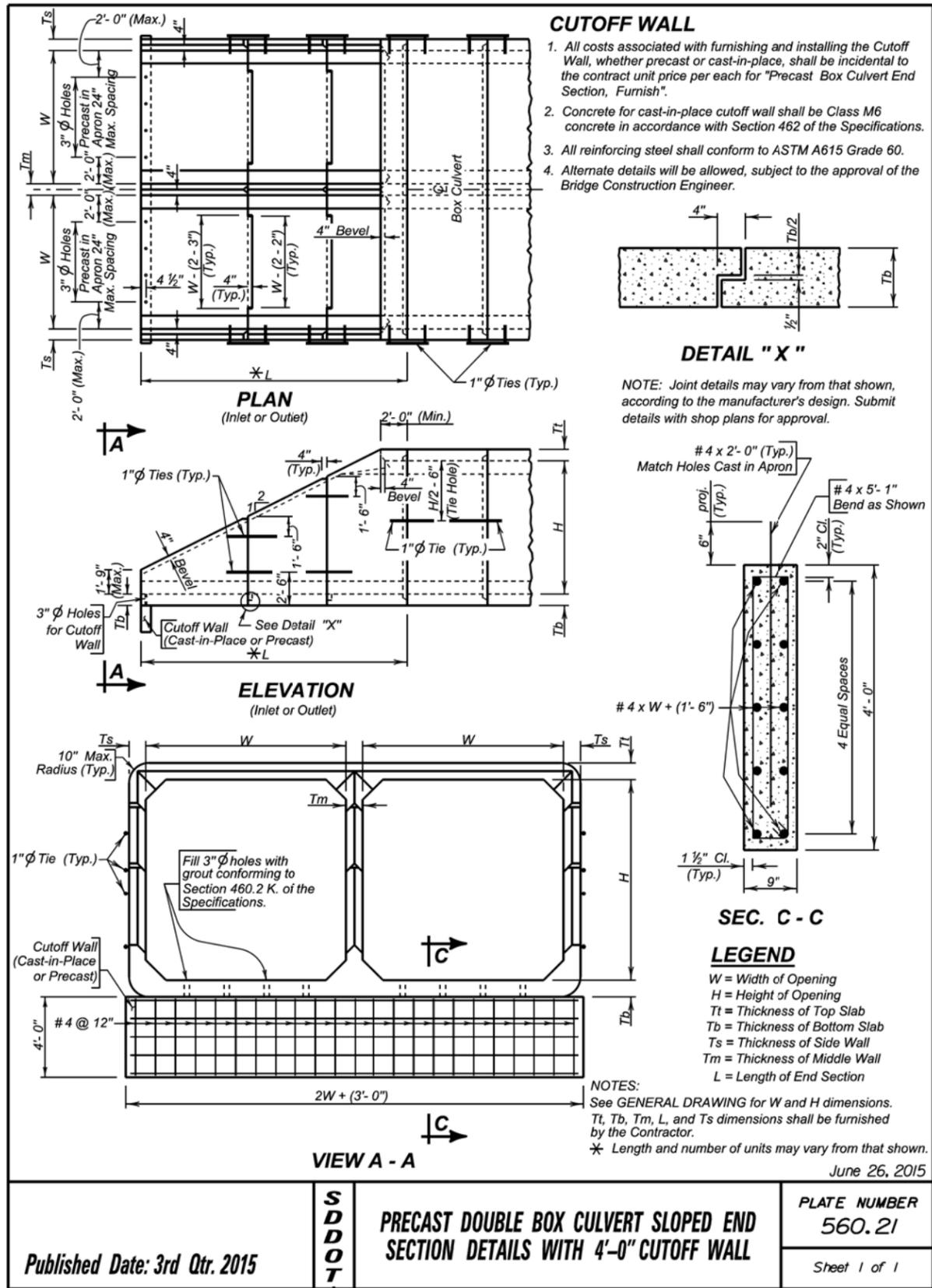
TIE BOLT ASSEMBLY

GENERAL NOTES:

- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36. 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.
- 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".

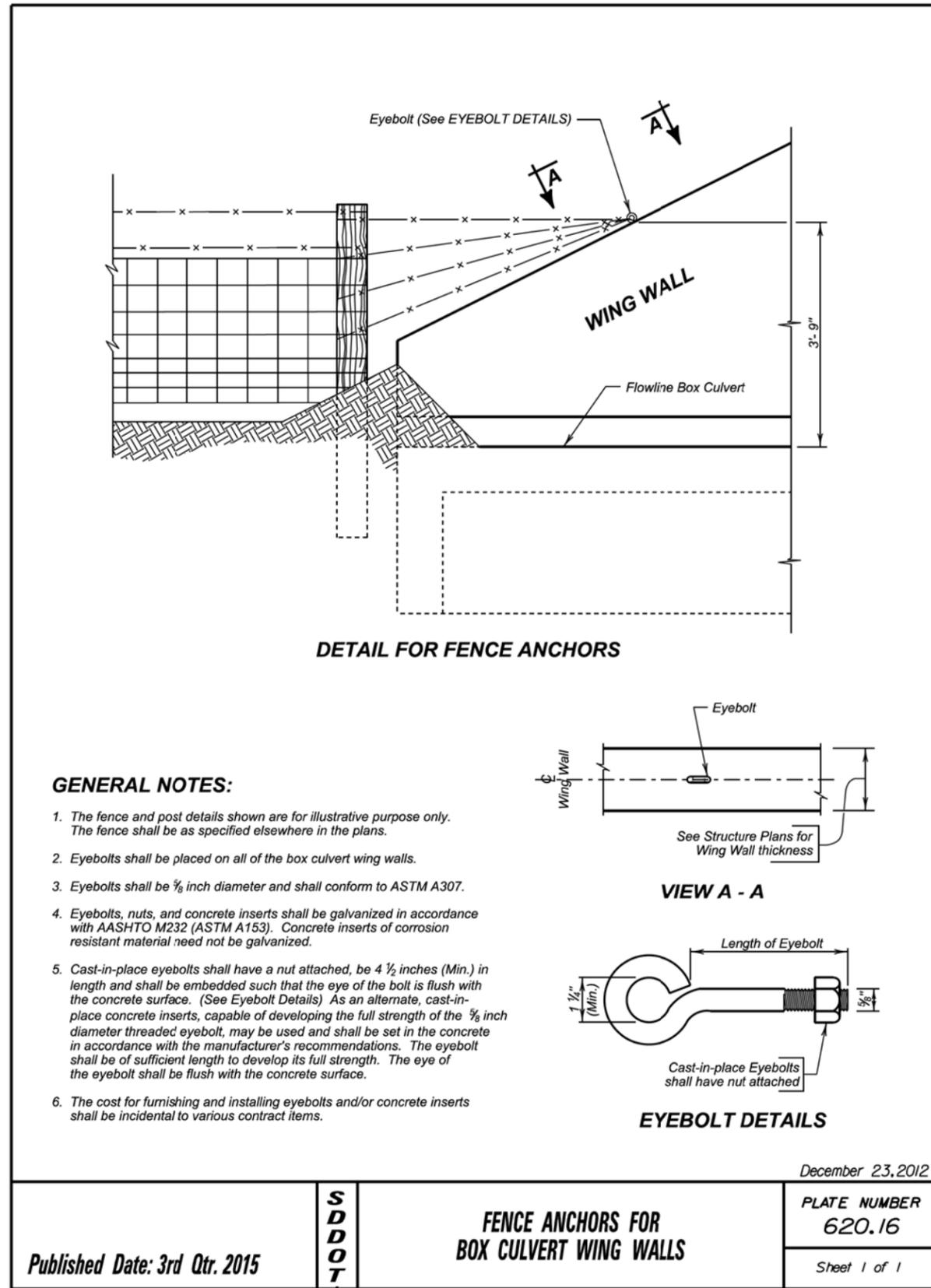
December 23, 2012

Published Date: 3rd Qtr. 2015	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1



S D D O T	PRECAST DOUBLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'-0" CUTOFF WALL	PLATE NUMBER 560.21
		Sheet 1 of 1

Published Date: 3rd Qtr. 2015

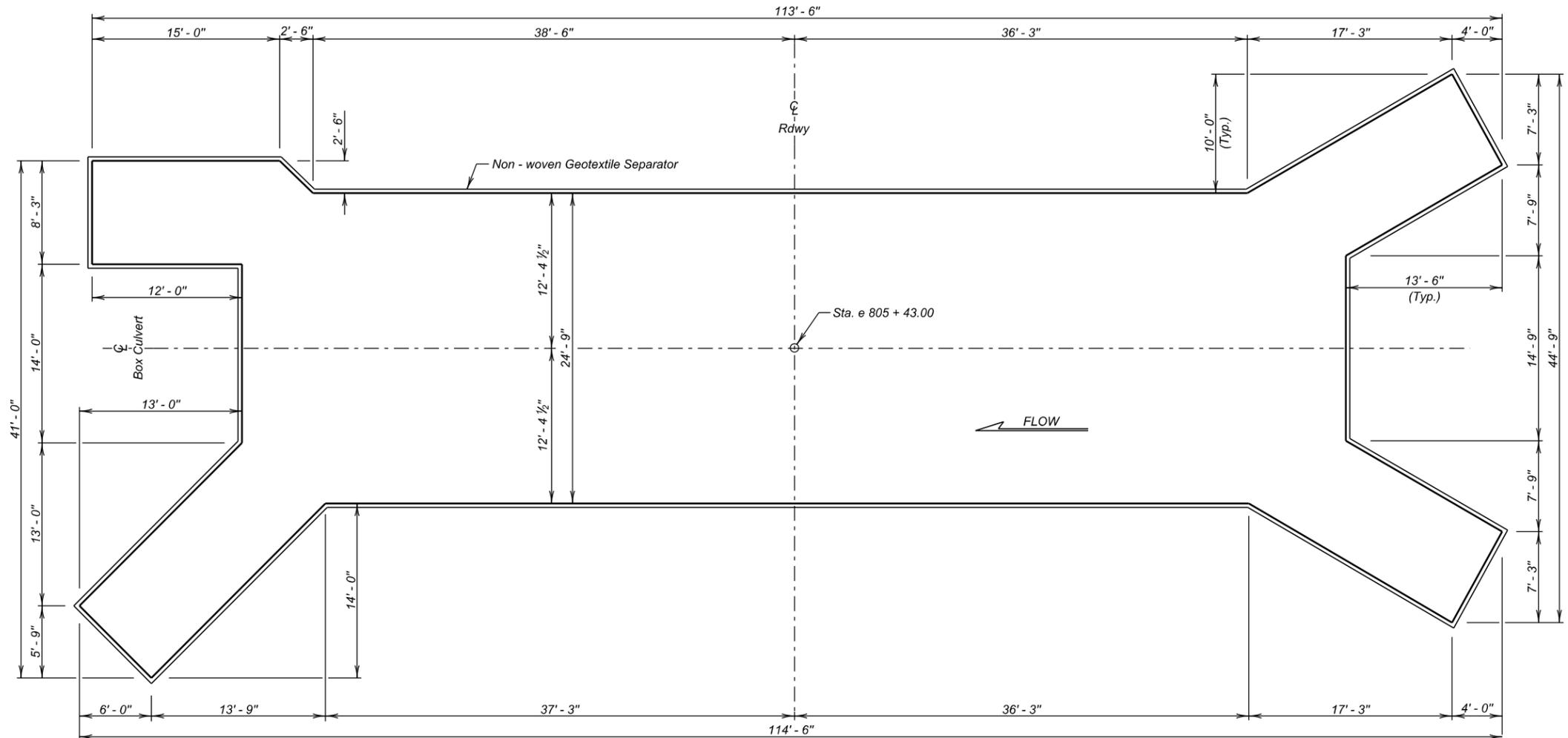
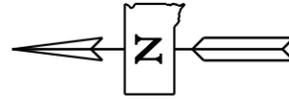


S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
		Sheet 1 of 1

Published Date: 3rd Qtr. 2015

Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E41	E58



SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
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.

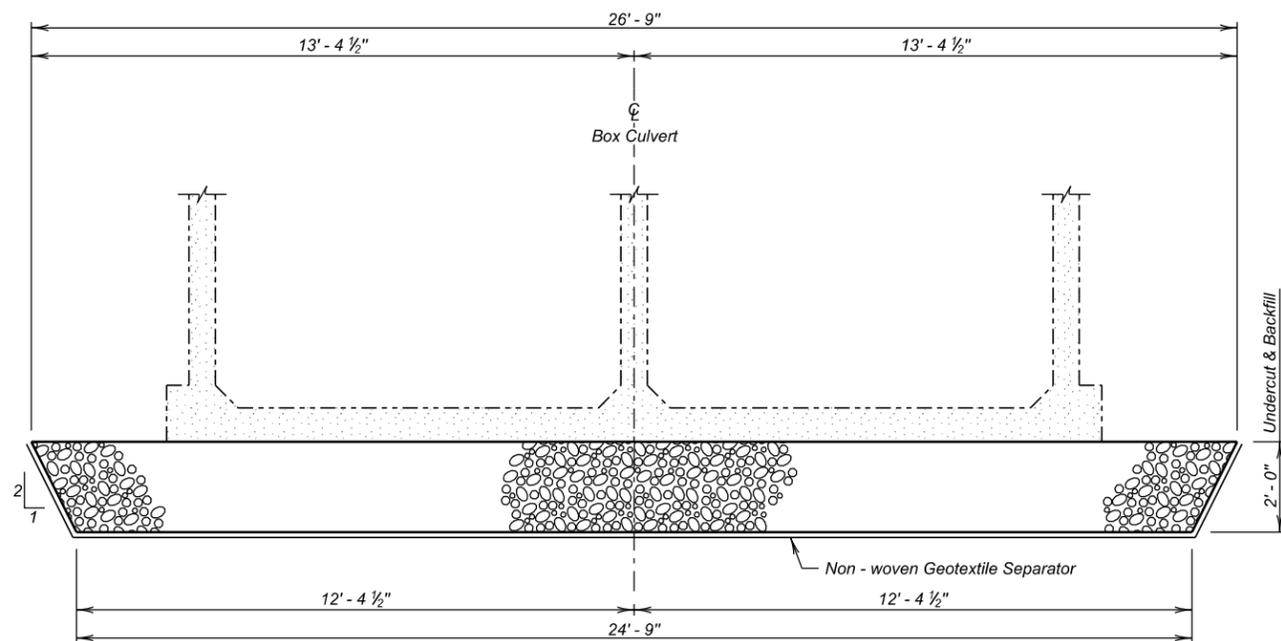
GENERAL NOTES

1. Design Live Load: HL-93 and construction load consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall 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. (S1).
3. Design Material Strengths: Concrete $f'_c = 4500$ p.s.i.
Reinforcing Steel $f_y = 60000$ p.s.i.
4. All concrete shall be Class A45 conforming to Section 460.
5. All reinforcing steel shall conform to ASTM A615 Grade 60.
6. All exposed edges shall be chamfered $\frac{3}{4}$ inch.
7. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
8. The Contractor shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Care shall be taken to establish Working Points (W.P.) as shown on the wings.
10. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
11. Compaction of earth embankment and box culvert backfill material shall be governed by the Specified Density method.
12. Dimension "L" on the standard box culvert sheet(s) is the barrel section length shown in the PLAN view on the General Drawing (for each S1, S2 etc. barrel section, as applicable).
13. The subsurface soils at Station e805 + 43 consist of dark gray sandy clay-silt to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were silt-sand.

GEOTEXTILE

1. A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
2. The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
3. The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
4. The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
5. Payment will be full compensation for furnishing and installing the geotextile only.

UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	212
Non - woven Geotextile Separator	Sq. Yd.	444

- For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
- For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.

NOTES AND UNDERCUT DETAILS
FOR

2 - 9' X 7' BOX CULVERT

OVER SPRING CREEK 0° SKEW
 STA. e 805 + 43.00 SEC. 33/4-T35/36N-R42W
 STR. NO. 57-378-460 NH-PH 0018(177)104
 HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWD02	DRAFTED BY GW	Kevin N. Goeden BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E42	E58

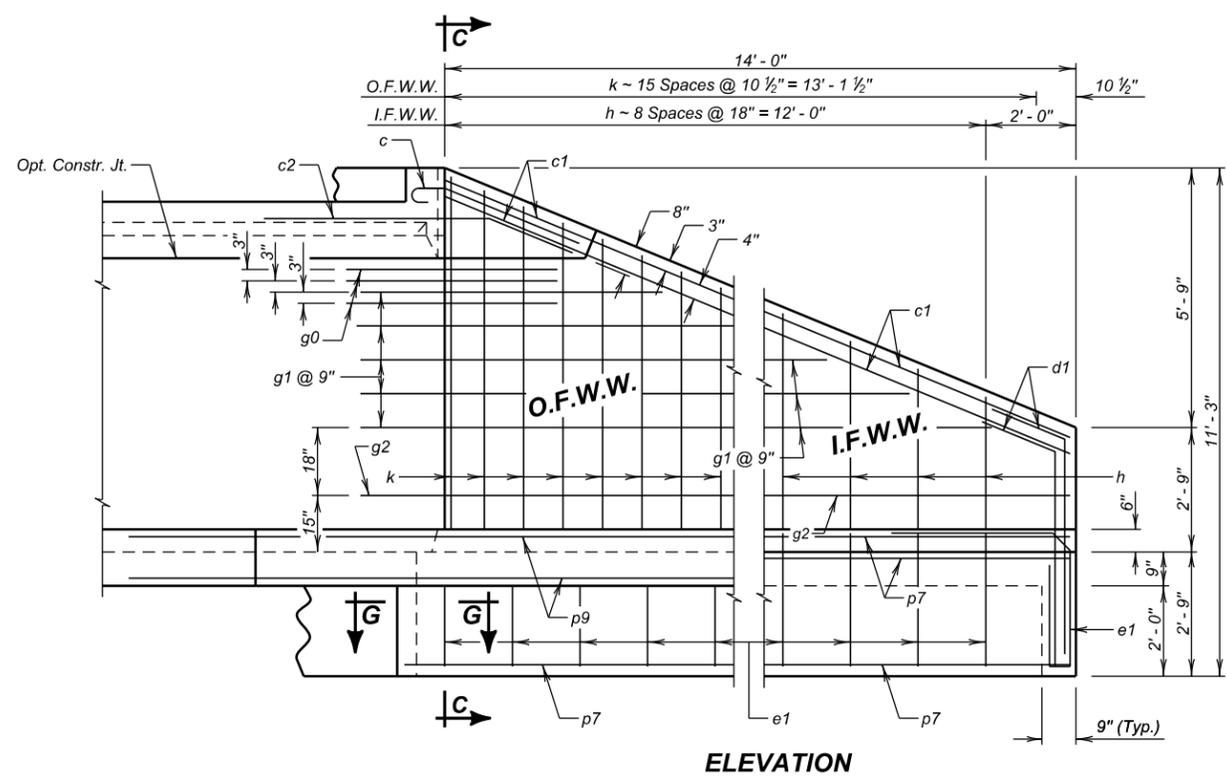
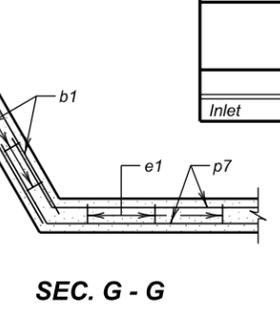
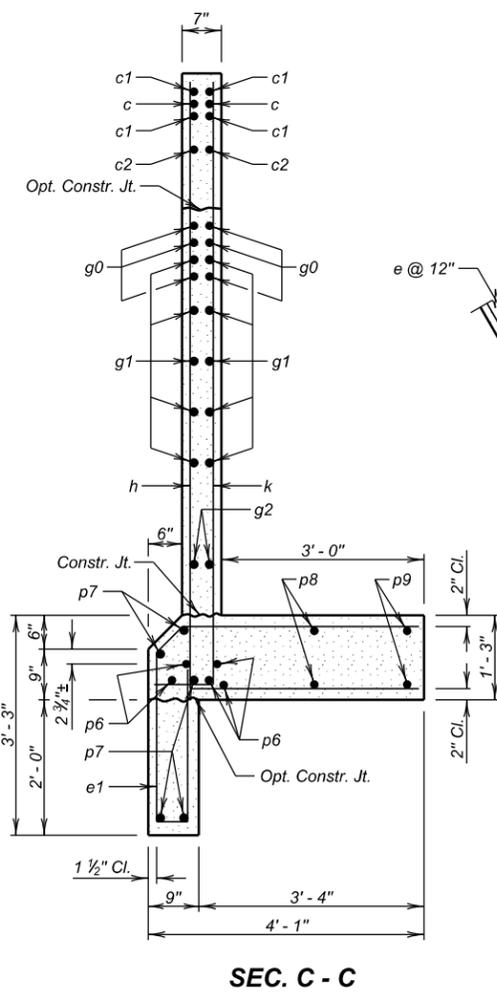
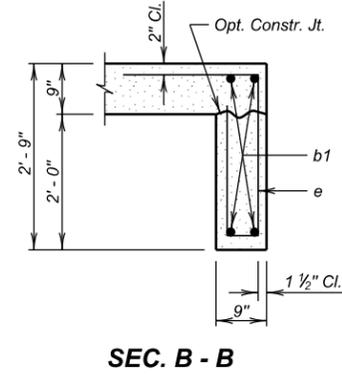
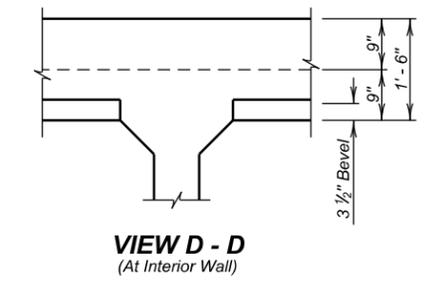
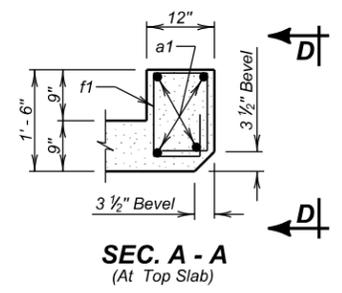
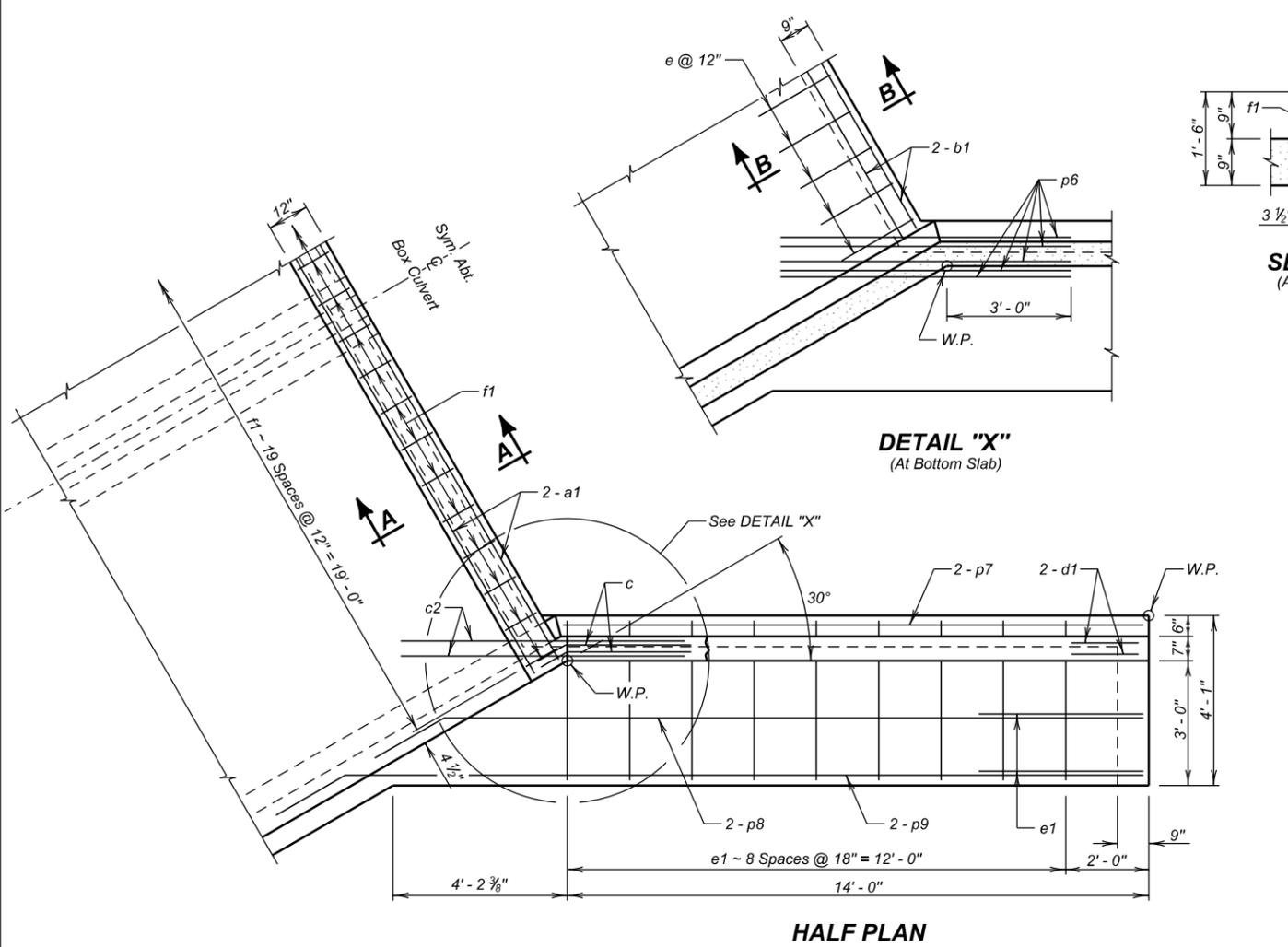
REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details	
a1	4	6	19'-6"	Str.		
b1	4	6	17'-6"	Str.		
c	4	5	4'-6"	1A		
c1	8	5	15'-0"	Str.		
c2	4	5	7'-0"	19B		
d1	8	5	6'-6"	19B		
e	18	4	7'-0"	S12		
e1	22	4	9'-3"	S12A		
f1	20	4	5'-3"	S6A		
g0	12	5	5'-0"	19B		
g1	10	4	21'-6"	19B		
g2	4	4	15'-9"	19B		
h	9	4	19'-6"	17A		
k	16	4	14'-3"	17A		
p6	10	6	7'-0"	Str.		
p7	10	4	16'-6"	Str.		
p8	4	4	18'-3"	Str.		
p9	4	4	20'-9"	Str.		

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

ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	14.0	1577	7.1

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



STANDARD S1 INLET DETAILS FOR 2 - 9' X 7' BOX CULVERT

HL-93 0° SKEW

S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013

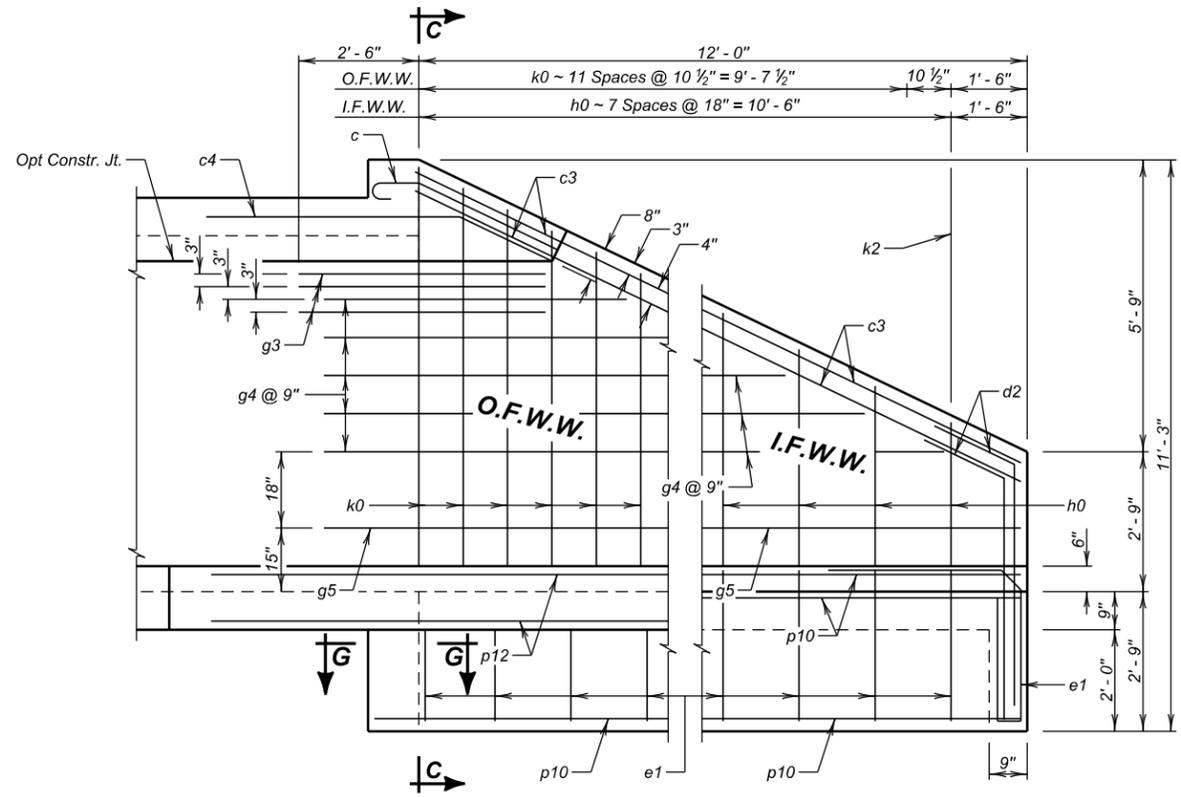
DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWD03	DRAFTED BY GW	Kevin N. Coeden BRIDGE ENGINEER
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Revised July 23, 2015

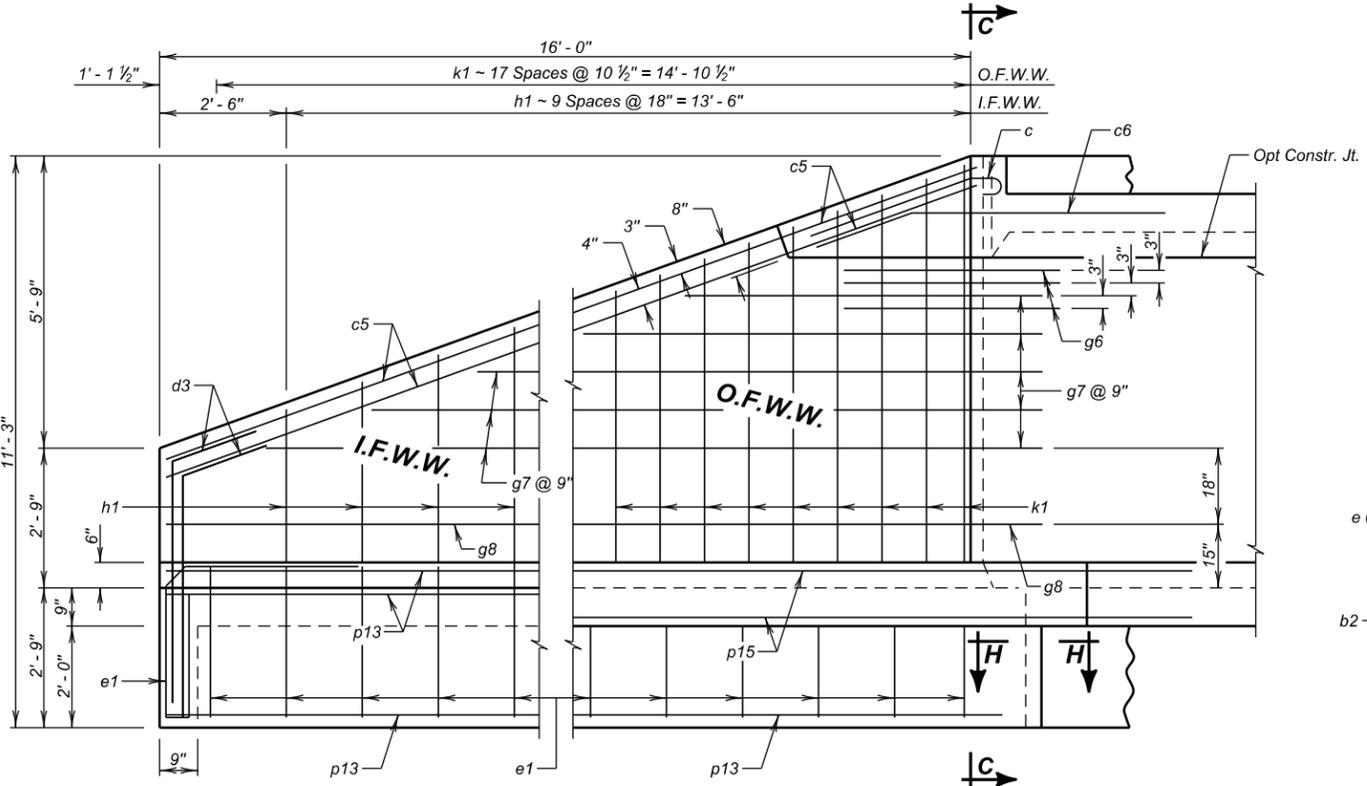
ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	13.8	1619	6.9

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

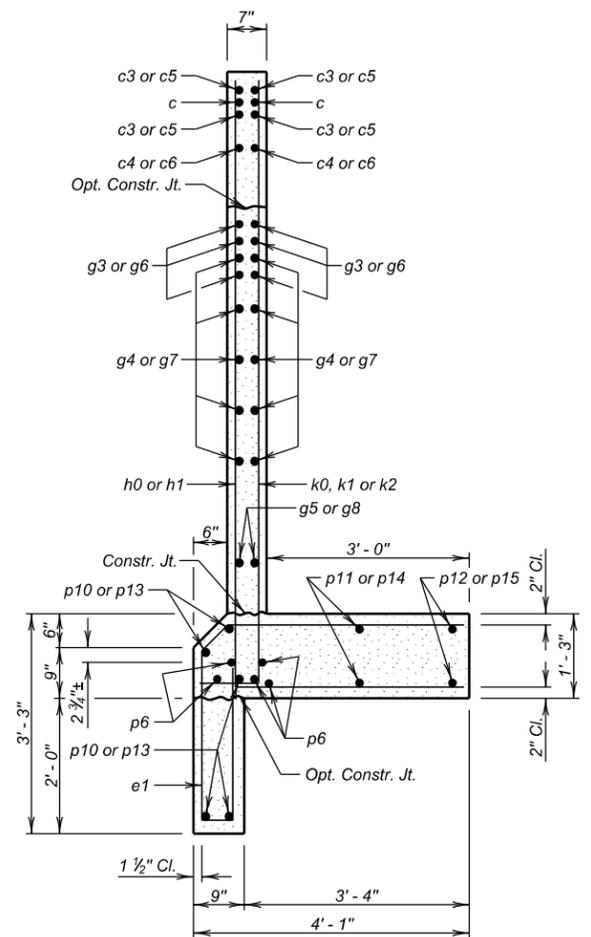
REINFORCING SCHEDULE				
Mk.	No.	Size	Length	Type
a1	4	6	19'-6"	Str.
b2	4	6	18'-0"	Str.
c	4	5	4'-6"	1A
c3	4	5	13'-3"	Str.
c4	2	5	7'-0"	19B
c5	4	5	17'-0"	Str.
c6	2	5	7'-0"	19B
d2	4	5	6'-6"	19B
d3	4	5	6'-6"	19B
e	18	4	7'-0"	S12
e1	23	4	9'-3"	S12A
f1	20	4	5'-3"	S6A
g3	6	5	5'-0"	Str.
g4	5	4	18'-9"	Str.
g5	4	4	13'-9"	Str.
g6	6	5	5'-0"	19B
g7	5	4	24'-0"	19B
g8	4	4	17'-9"	19B
h0	4	4	19'-6"	17A
h1	5	4	19'-9"	17A
k0	6	4	15'-0"	17A
k1	9	4	14'-3"	17A
k2	1	4	4'-9"	17A
p6	10	6	7'-0"	Str.
p10	5	4	14'-6"	Str.
p11	2	4	15'-6"	Str.
p12	2	4	17'-6"	Str.
p13	5	4	18'-6"	Str.
p14	2	4	19'-3"	Str.
p15	2	4	20'-6"	Str.



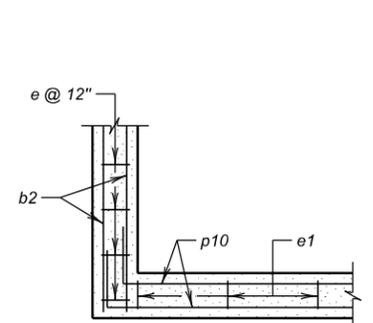
VIEW D - D



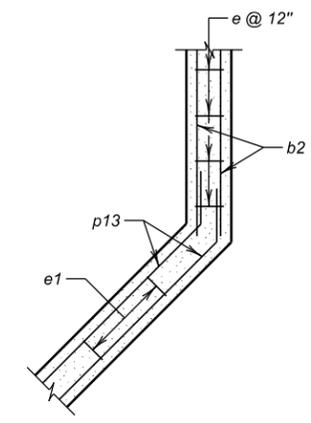
VIEW E - E



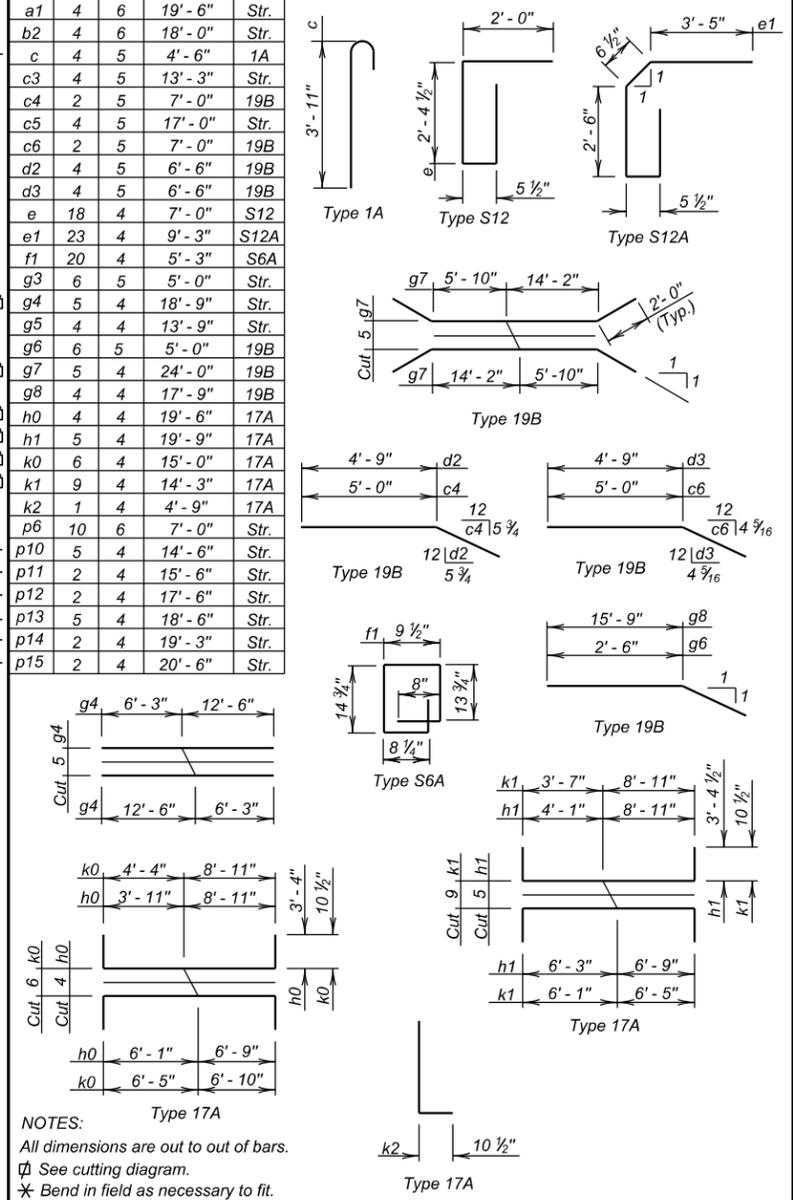
SEC. C - C



SEC. G - G



SEC. H - H



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

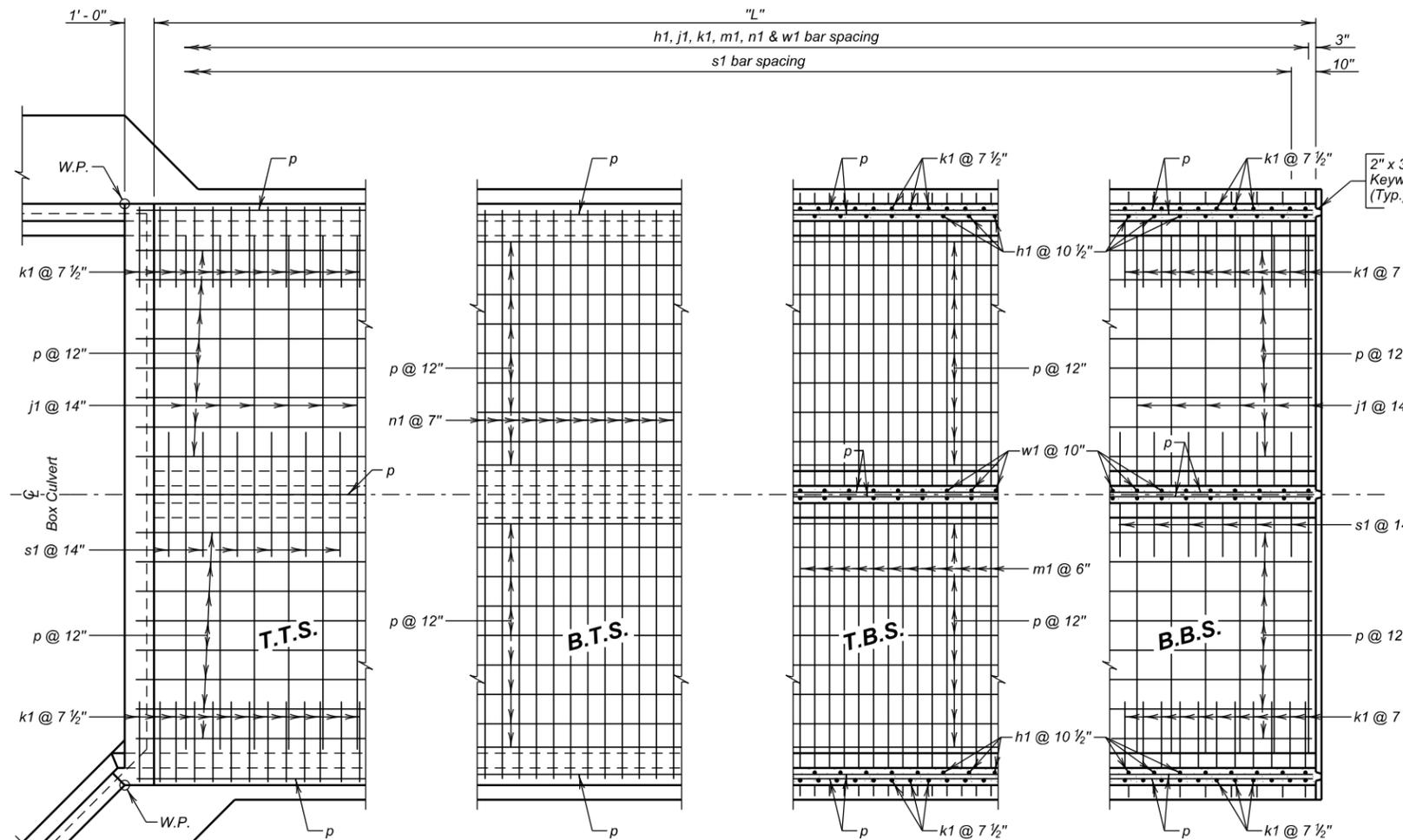
OUTLET DETAILS (B)
 FOR
2 - 9' X 7' BOX CULVERT
 OVER SPRING CREEK
 STA. e 805 + 43.00
 STR. NO. 57-378-460
 0° SKEW
 SEC. 33/4-T35/36N-R42W
 NH-PH 0018(177)104
 HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013

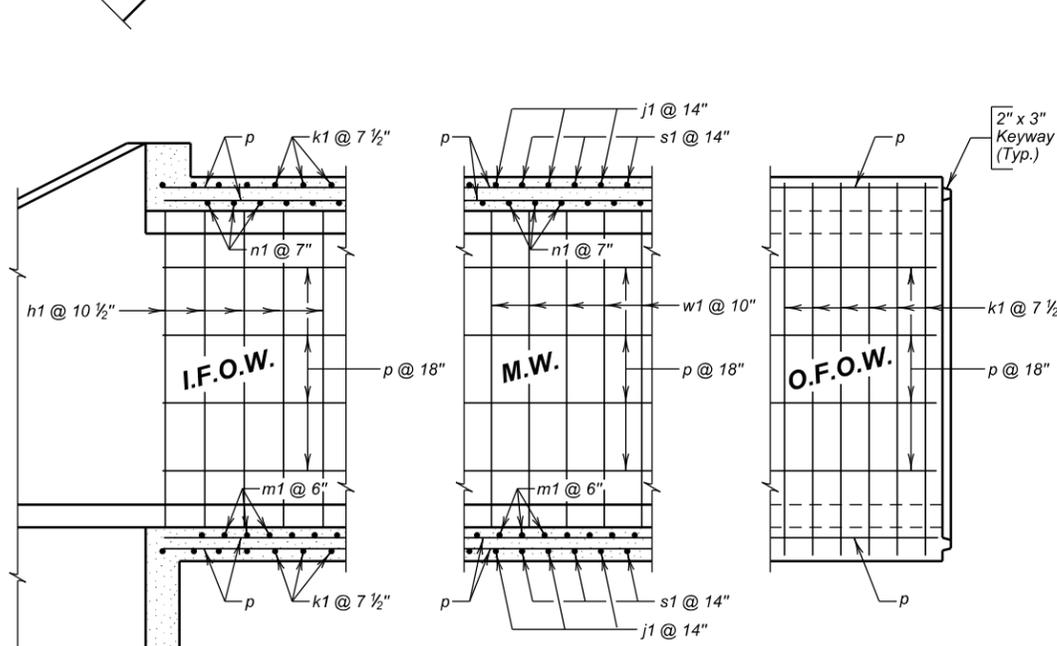
DESIGNED BY: MM OGLA02QC
 CK. DES. BY: JMH 02QCWD05
 DRAFTED BY: GW
 Kevin N. Coeden
 BRIDGE ENGINEER

Revised July 23, 2015

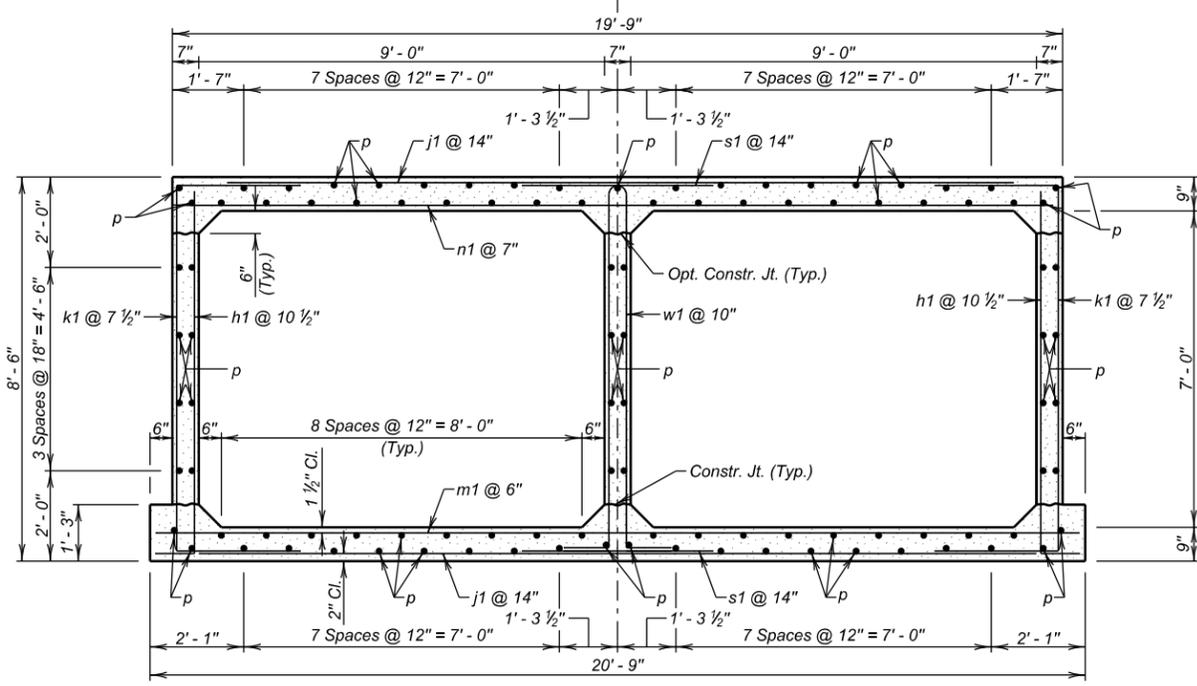
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E45	E58



PLAN
(Outlet shown, Inlet similar by rotation)



ELEVATION



S1 BARREL SECTION
(5' - 0" Maximum Fill)

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 shall be borne by the Contractor.

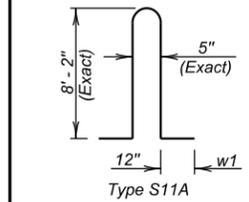
OPTIONAL POUR - BOTTOM SLAB

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 shall be full width of the bottom slab. Care shall be taken to maintain proper alignment of the keyway during the pour sequence. All additional costs of this option shall be borne by the Contractor.

Δ Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10.

REINFORCING SCHEDULE

Mk.	Φ No.	Size	Length	Type	Bending Details
h1	2.29(L + 1)	4	8' - 9"	17A	
j1	1.71L	5	18' - 6"	Str.	
k1	3.20(L + 1)	4	13' - 9"	17	
m1	2.00L	4	20' - 6"	Str.	
n1	1.71L	5	19' - 6"	Str.	
p	103	4	L + 6"	Str.	
s1	1.71L	5	4' - 3"	Str.	
w1	1.20(L + 1)	4	18' - 6"	S11A	
z1	*	5	3' - 6"	Str.	



NOTES:

- All dimensions are out to out of bars.
- Φ Round the number of bars up to the nearest whole number, except round h1, j1, k1, s1 and w1 up to the nearest even whole number.
- 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.
- * 48 z1 bars required at each construction joint.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu.Yd.	Lb.	Cu.Yd.
1 - S1 Barrel End Section	1.635L	229.15L + 92.00	0.576L
1 - Construction Joint		175.22	

∅ See General Drawing for number of constructions joints required.

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

STANDARD S1 BARREL END SECTION DETAILS

FOR 2 - 9' X 7' BOX CULVERT

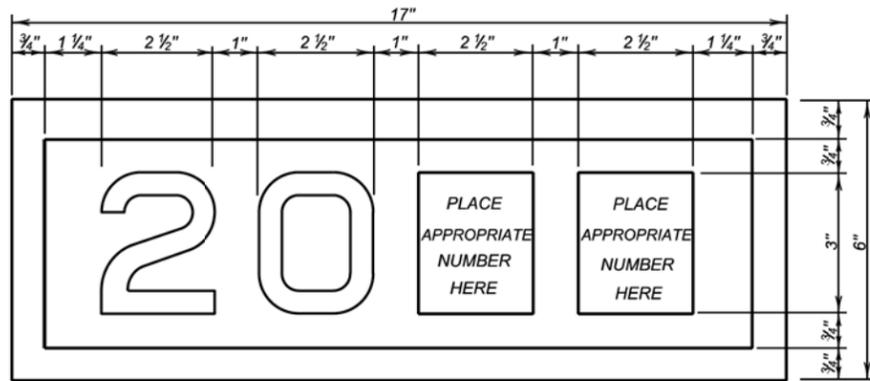
HL-93

0° SKEW

S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013

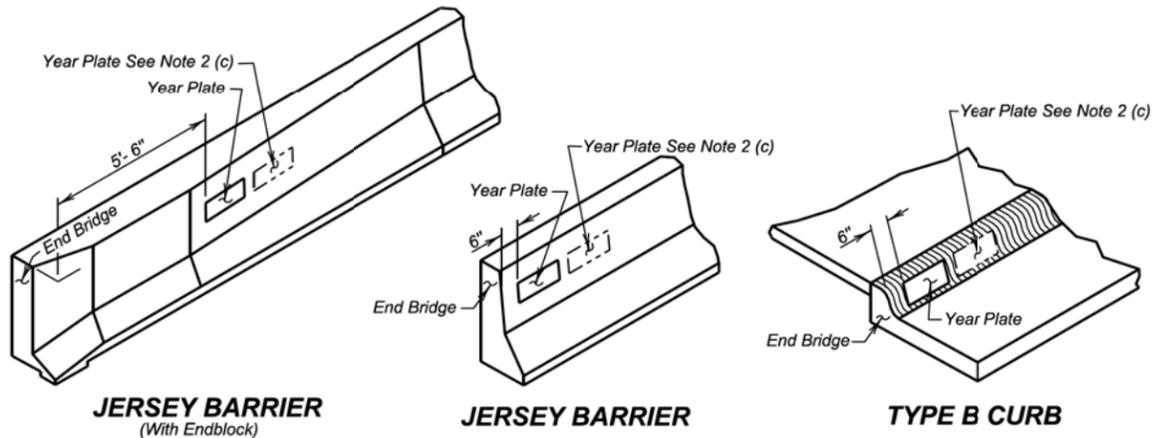
DESIGNED BY MM OGLA020C	CHECKED BY JMH 020CWD06	DRAWN BY GW	Kevin N. Coeden BRIDGE ENGINEER
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YEAR PLATE DETAILS

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.



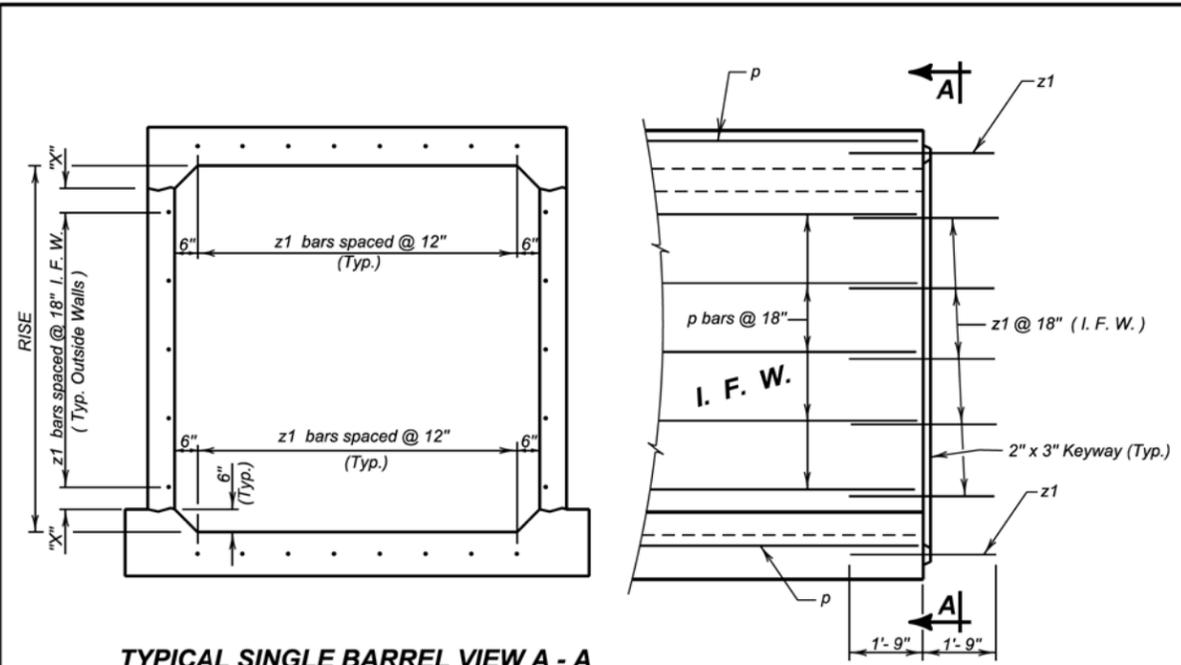
JERSEY BARRIER
(With Endblock)

JERSEY BARRIER

TYPE B CURB

June 26, 2012

S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1



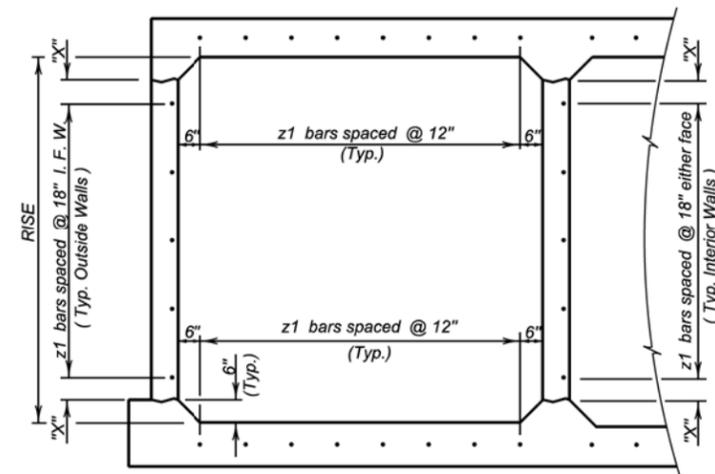
TYPICAL SINGLE BARREL VIEW A - A

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"



TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

- z1 bars shall be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars shall 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 shall be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 26, 2012

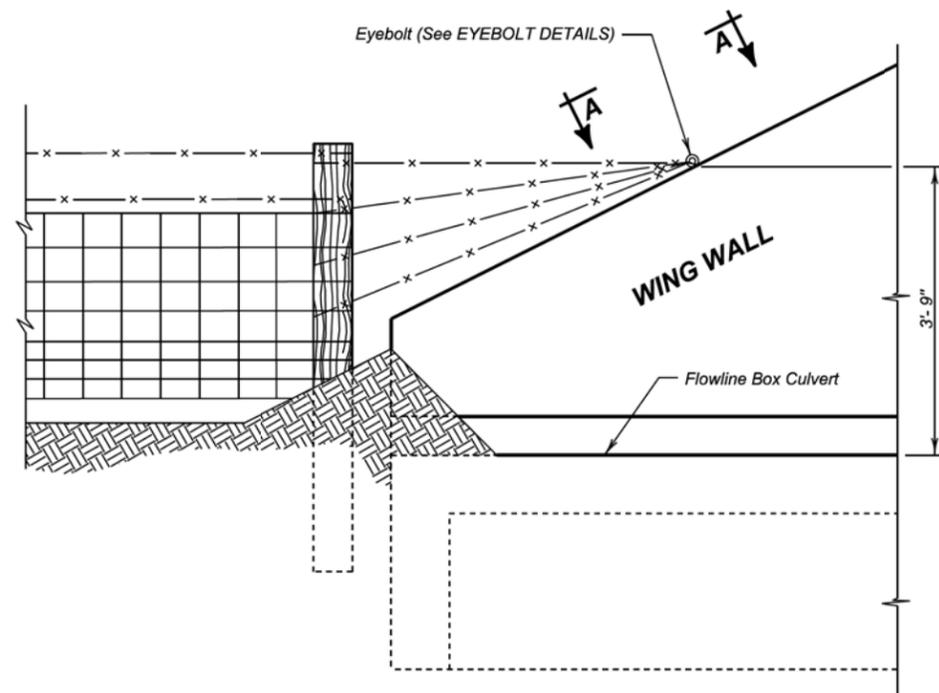
S D D O T	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1

2 - 9' X 7' BOX CULVERT

STR. NO. 57-378-460

OCTOBER 2013

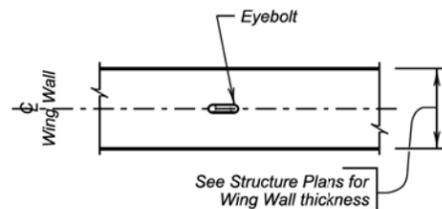
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E47	E58



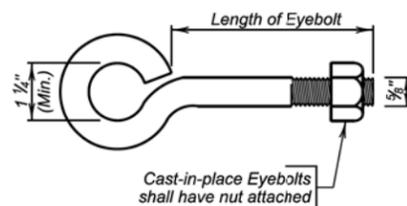
DETAIL FOR FENCE ANCHORS

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 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 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.
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: 3rd Qtr. 2015

2 - 9' X 7' BOX CULVERT

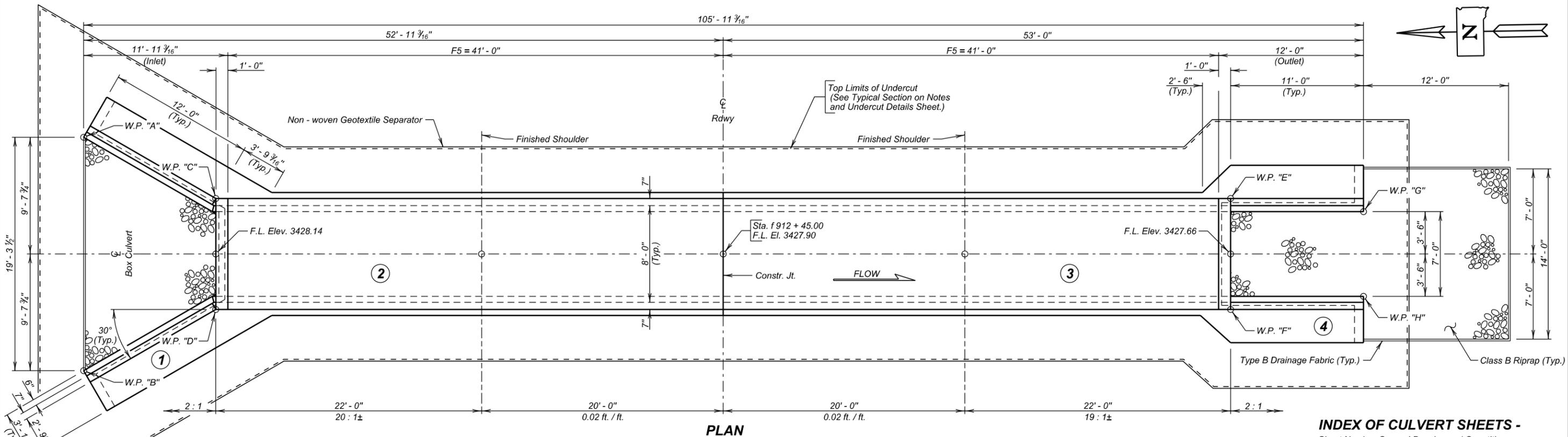
STR. NO. 57-378-460

OCTOBER 2013

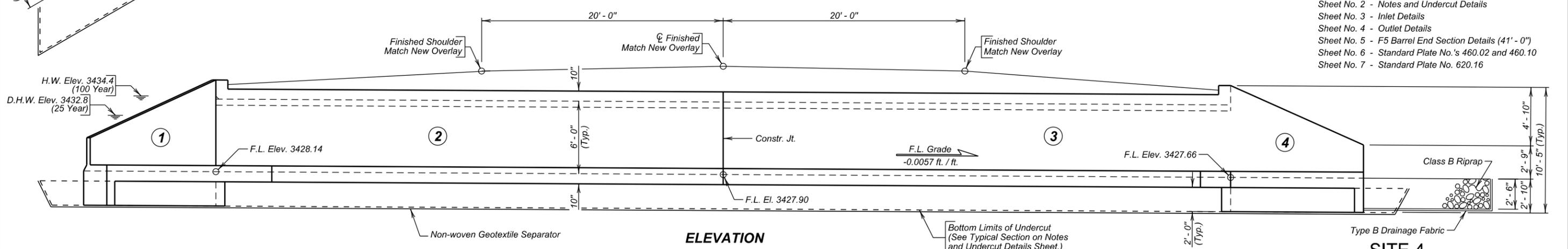
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E48	E58



PLAN



ELEVATION

- 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	154 cfs
A_d	18 sq. ft.
V_d	8.5 fps
Q_F	154 cfs
Q_{100}	271 cfs
Q_{OT}	> Q_{100} cfs
V_{max}	10.3 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 3432.8.
 Q_{OT} = Overtopping discharge and frequency > Q_{100} yr. recurrence interval. El. 3436.2 @ Sta. 911 + 00.00.
 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. 3434.4.
 V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.

TABLE OF WORKING POINTS		
W. P.	STATION	OFFSET
"A"	f 912 + 54.65	52.93 Lt.
"B"	f 912 + 35.35	52.93 Lt.
"C"	f 912 + 49.58	42.00 Lt.
"D"	f 912 + 40.42	42.00 Lt.
"E"	f 912 + 49.58	42.00 Rt.
"F"	f 912 + 40.42	42.00 Rt.
"G"	f 912 + 48.50	53.00 Rt.
"H"	f 912 + 41.50	53.00 Rt.

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	93.5
Reinforcing Steel	Lb.	11903
Structure Excavation, Box Culvert	Cu. Yd.	36
Box Culvert Undercut	Cu. Yd.	157
Class B Riprap	Ton	50.2
Type B Drainage Fabric	Sq. Yd.	78
Non-woven Geotextile Separator	Sq. Yd.	342

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

**SITE 4
ALTERNATE A**

GENERAL DRAWING AND QUANTITIES

FOR

8' X 6' BOX CULVERT (C.I.P.)

OVER TRIB. TO SPRING CREEK 0° SKEW
 STA. f 912 + 45.00 SEC. 2/35-T35/36N-R42W
 STR. NO. 57-398-460 NH-PH 0018(177)104
 PCN 02QC HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION

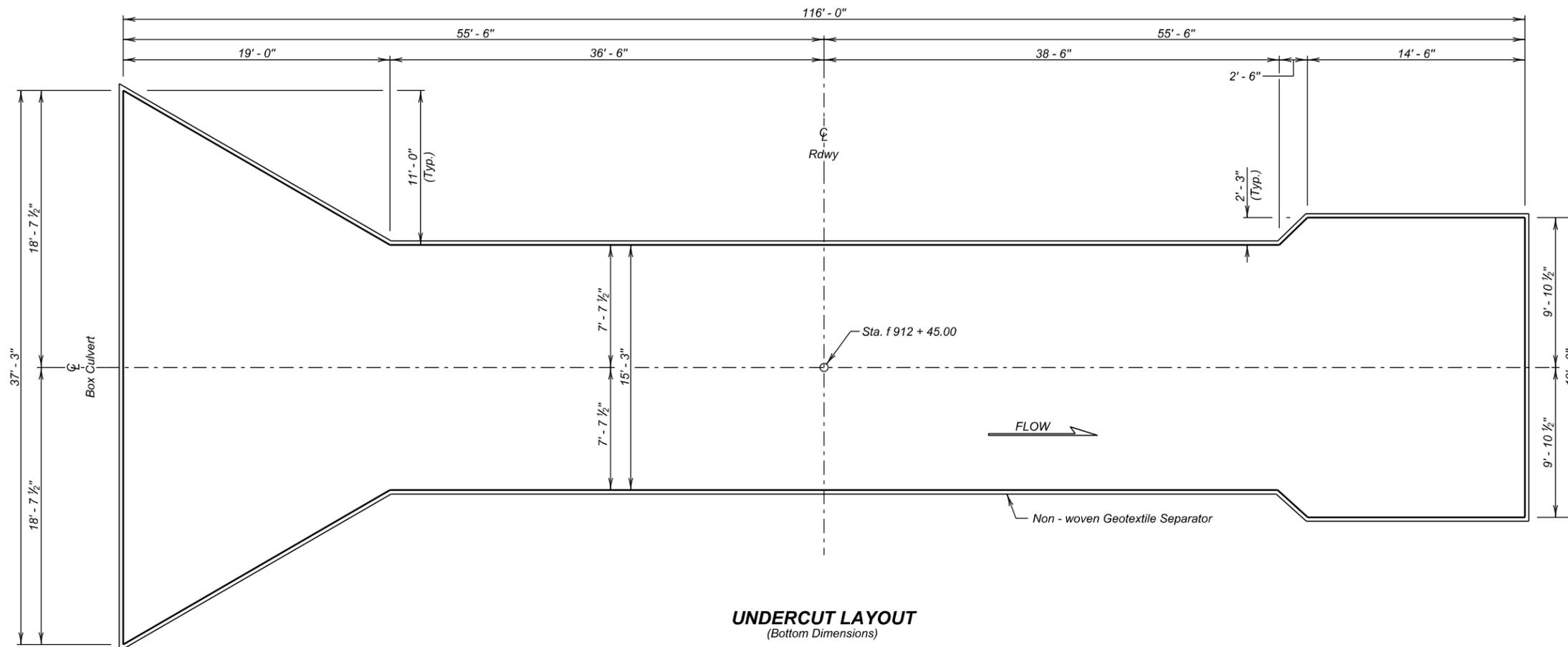
OCTOBER 2013 **1** OF **7**

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

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWE01	DRAFTED BY GW	<i>Kevin N. Coeden</i> BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E49	E58



SPECIFICATIONS

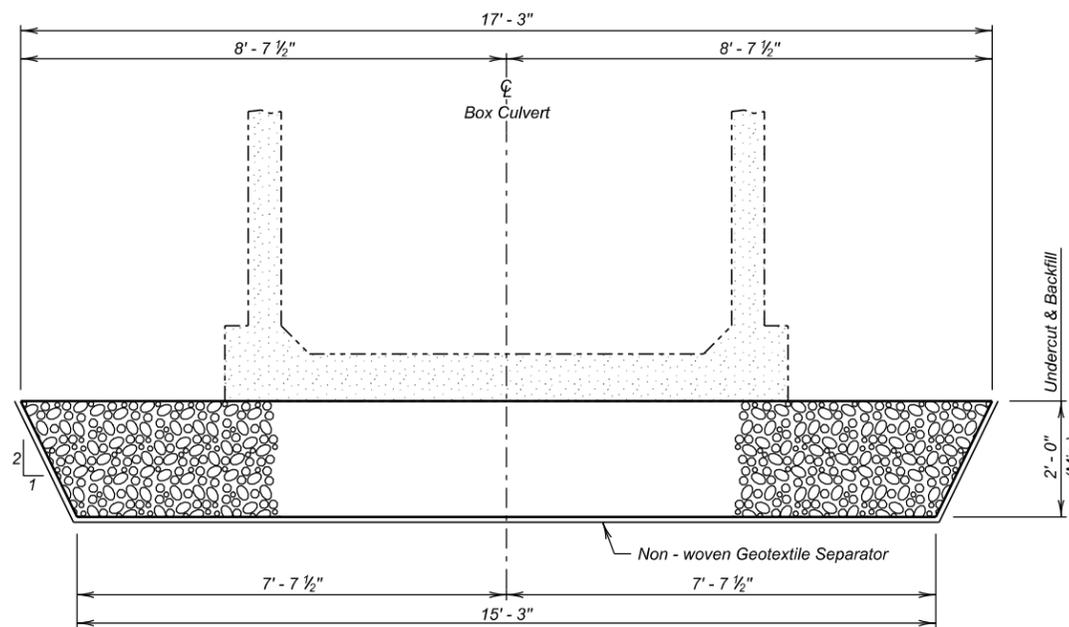
1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required Provisions, Supplemental Specifications, and Special Provisions as included in the Proposal.

GENERAL NOTES

1. Design Live Load: HL-93 and construction load consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall 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 1 foot and includes all subsequent fill heights up to and including the maximum fill height of 5 ft. (F5).
3. Design Material Strengths: Concrete $f_c = 4500$ p.s.i.
Reinforcing Steel $f_y = 60000$ p.s.i.
4. High sulfate levels are likely to be encountered at this location. All concrete shall be Class A45 conforming to Section 460, with the following modifications: the type of cement shall be either a type II with 20% Class F Modified Fly Ash substituted for cement in accordance with Section 605 or a type V.
5. All reinforcing steel shall conform to ASTM A615 Grade 60.
6. All exposed edges shall be chamfered $\frac{3}{4}$ inch.
7. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
8. The Contractor shall imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Care shall be taken to establish Working Points (W.P.) as shown on the wings.
10. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
11. Compaction of earth embankment and box culvert backfill material shall be governed by the Specified Density method.
12. The subsurface soils at Station f912 + 45 consist of dark gray sandy clay-silt to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were clay-silt to clay-sand.

GEOTEXTILE

1. A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
2. The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
3. The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
4. The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
5. Payment will be full compensation for furnishing and installing the geotextile only.



TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	157
Non-woven Geotextile Separator	Sq. Yd.	342

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.

**SITE 4
ALTERNATE A**
NOTES AND UNDERCUT DETAILS
FOR
8' X 6' BOX CULVERT (C.I.P.)
OVER TRIB. TO SPRING CREEK 0° SKEW
STA. f 912 + 45.00 SEC. 2/35-T35/36N-R42W
STR. NO. 57-398-460 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION
OCTOBER 2013

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWE02	DRAFTED BY GW	Kevin N. Goeden BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E50	E58

REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type	Bending Details		
a1	4	6	9'-0"	Str.			
b1	4	6	7'-3"	Str.			
c	4	5	4'-6"	1A			
c1	8	5	13'-0"	Str.			
c2	4	5	7'-0"	19B			
d1	8	5	6'-6"	19B			
e	8	4	7'-3"	S12			
e1	20	4	9'-0"	S12A			
f1	9	4	5'-6"	S6A			
g0	12	5	5'-0"	19B			
g1	10	4	19'-9"	19B			
g2	4	4	13'-9"	19B			
h	8	4	18'-3"	17A			
k	13	4	13'-9"	17A			
p6	10	6	7'-0"	Str.			
p7	10	4	14'-6"	Str.			
p8	4	4	15'-6"	Str.			
p9	4	4	18'-3"	Str.			

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

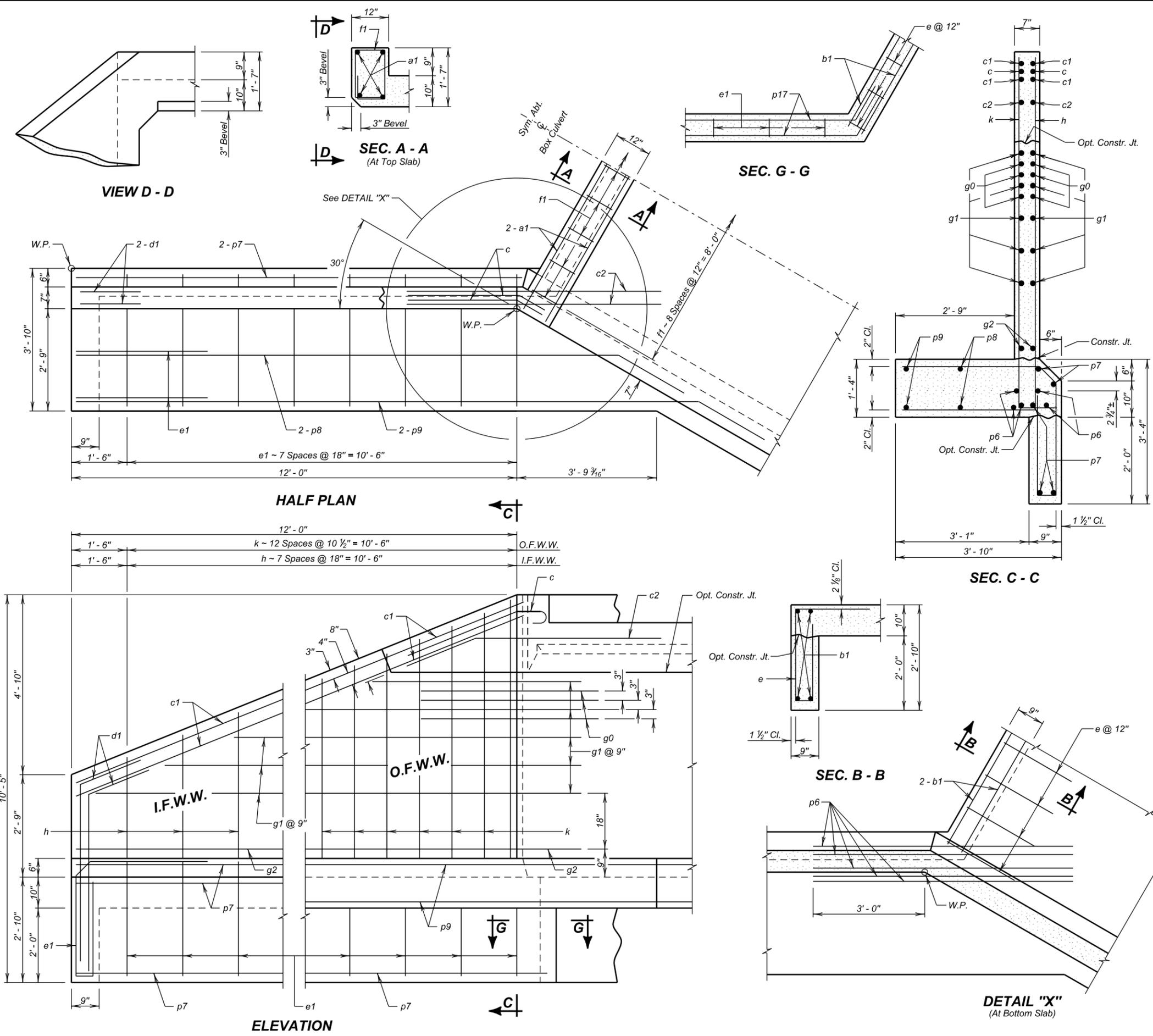
ESTIMATED QUANTITIES			
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	10.6	1241	5.6

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

SITE 4 ALTERNATE A
INLET DETAILS
 FOR
8' X 6' BOX CULVERT (C.I.P.)
 OVER TRIB. TO SPRING CREEK 0° SKEW
 STA. f 912 + 45.00 SEC. 2/35-T35/36N-R42W
 STR. NO. 57-398-460 NH-PH 0018(177)104
 HL-93

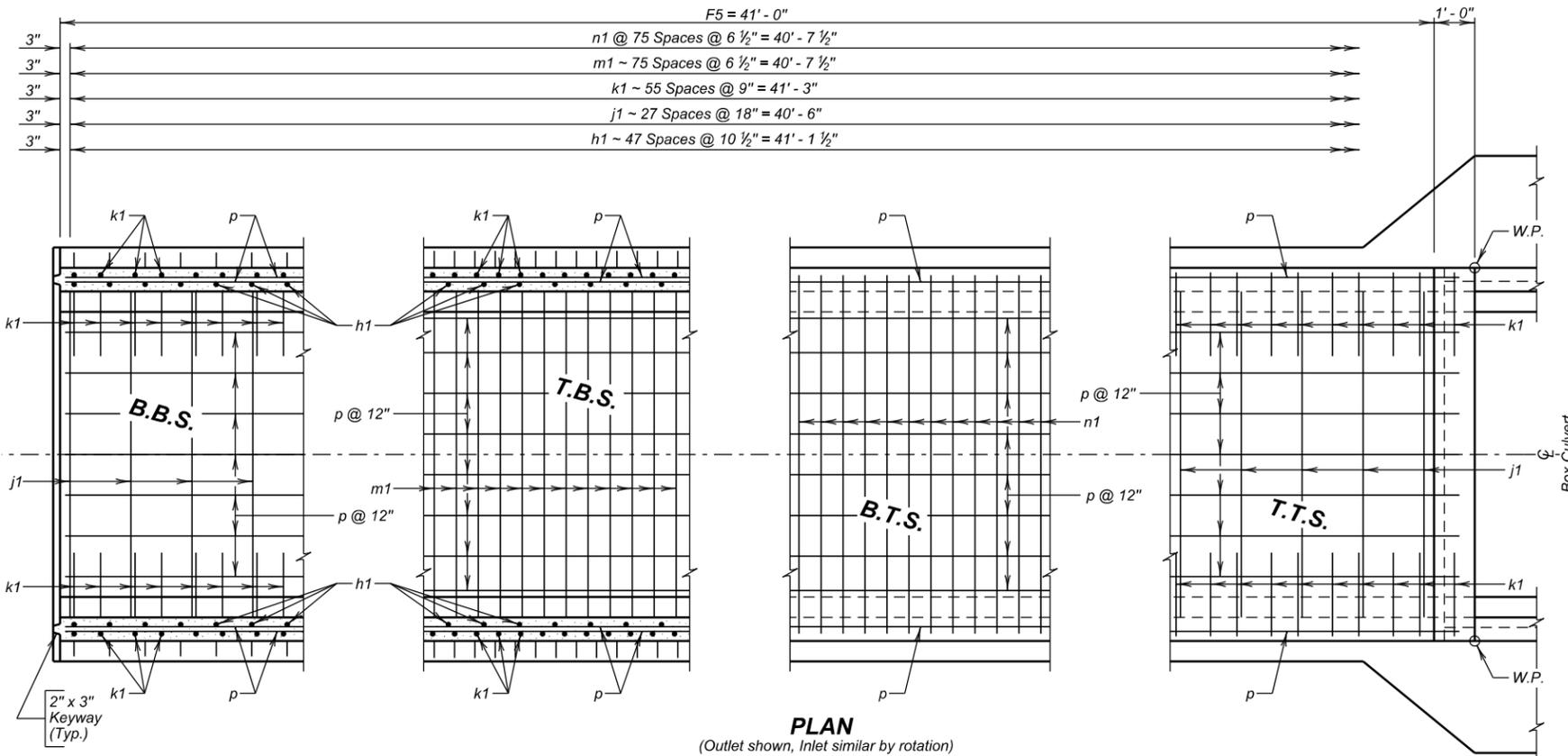
OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION
 OCTOBER 2013 **3** OF **7**

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWE03	DRAFTED BY GW	Kevin N. Coeden BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E52	E58



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 shall 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 listed are for one construction joint.

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

Mk.	No.	Size	Length	Type	Bending Details
h1	192	4	8' - 0"	17A	
j1	112	4	8' - 0"	Str.	
k1	224	4	11' - 9"	17	
m1	152	5	10' - 0"	Str.	
n1	152	5	9' - 0"	Str.	
p	108	4	41' - 6"	Str.	
z1	24	5	3' - 6"	Str.	

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"	73.2	9477	25.7

LEGEND FOR PLACING RE-STEEL

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

OPTIONAL POUR - BOTTOM SLAB

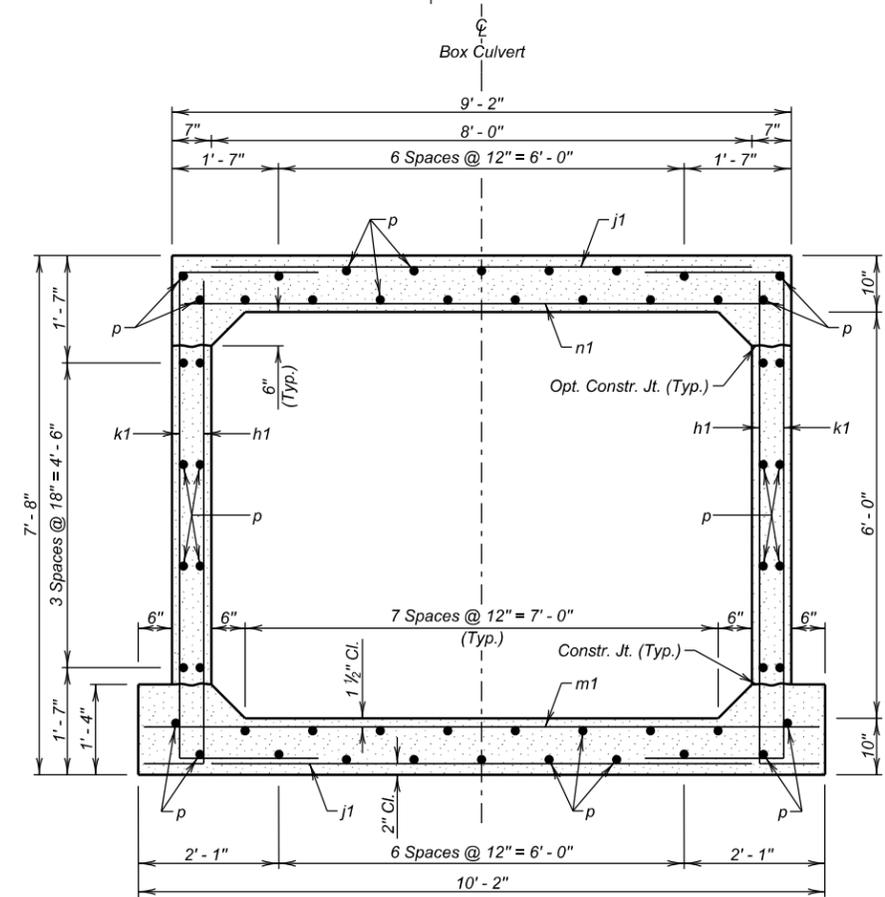
The Bottom Slab may be poured continuously, at the option of the Contractor, with the use of a Preformed Metal keyway conforming to the keyway dimensions and location as shown on the plans. The keyway length shall be full width of the bottom slab. Care shall be taken to maintain proper alignment of the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

**SITE 4
ALTERNATE A
F5 BARREL END SECTION DETAILS (41' - 0")**

FOR
8' X 6' BOX CULVERT (C.I.P.)
 OVER TRIB. TO SPRING CREEK 0° SKEW
 STA. f 912 + 45.00 SEC. 2/35-T35/36N-R42W
 STR. NO. 57-398-460 NH-PH 0018(177)104
 HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION

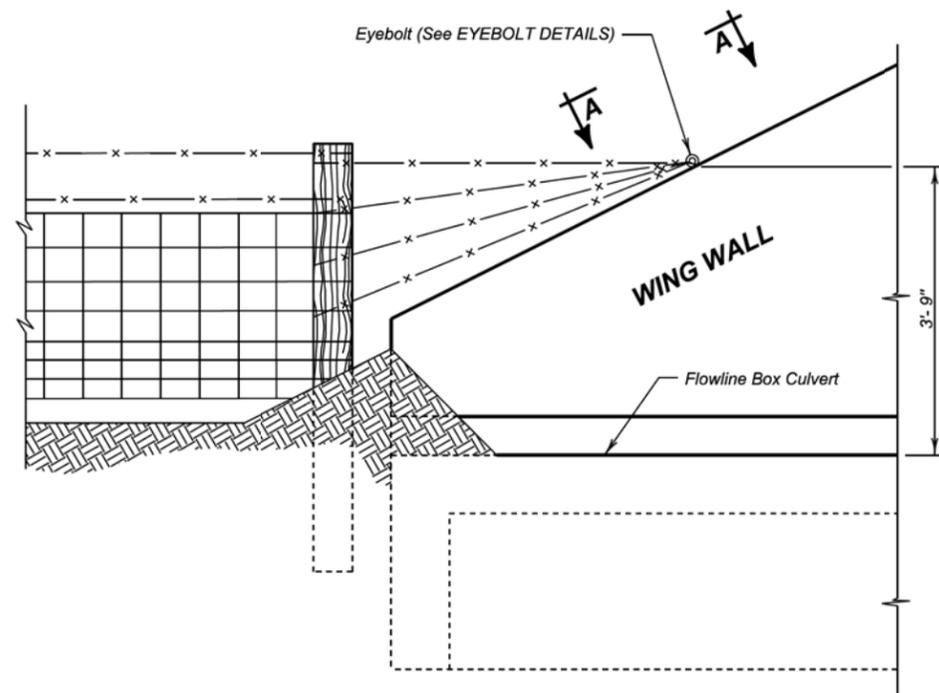
OCTOBER 2013 (5) OF (7)



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

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWE05	DRAFTED BY GW	Kevin N. Coeden BRIDGE ENGINEER
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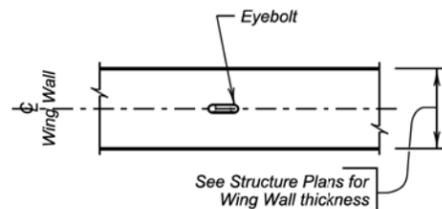
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E54	E58



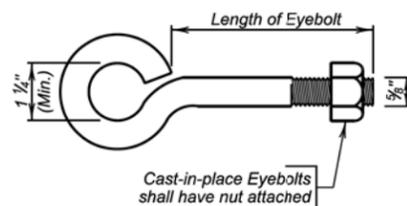
DETAIL FOR FENCE ANCHORS

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 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 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.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23, 2012

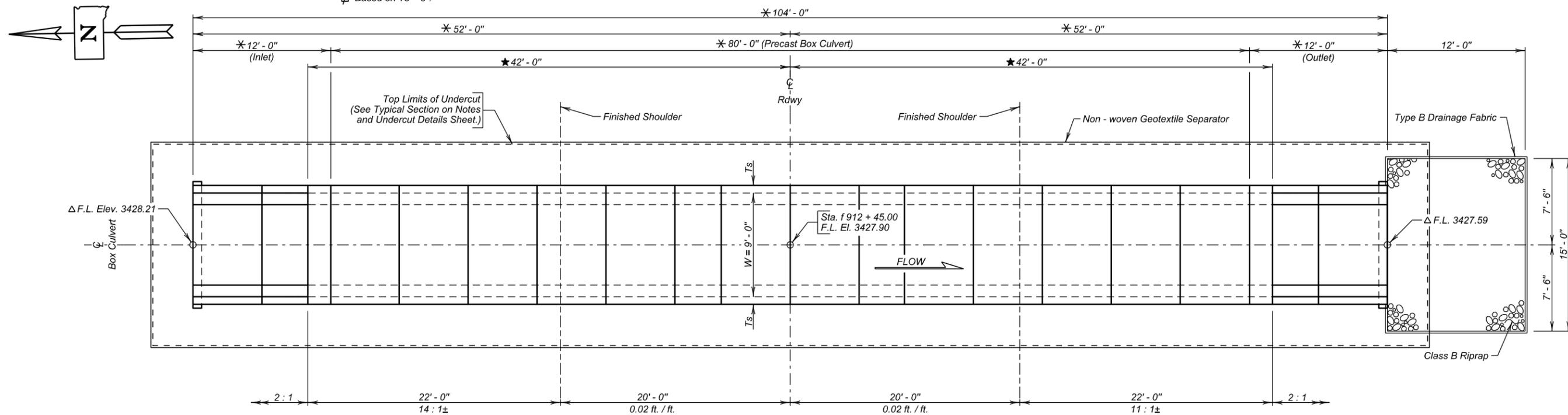
S D D O T	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
	Published Date: 3rd Qtr. 2015	Sheet 1 of 1

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

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

Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E55	E58



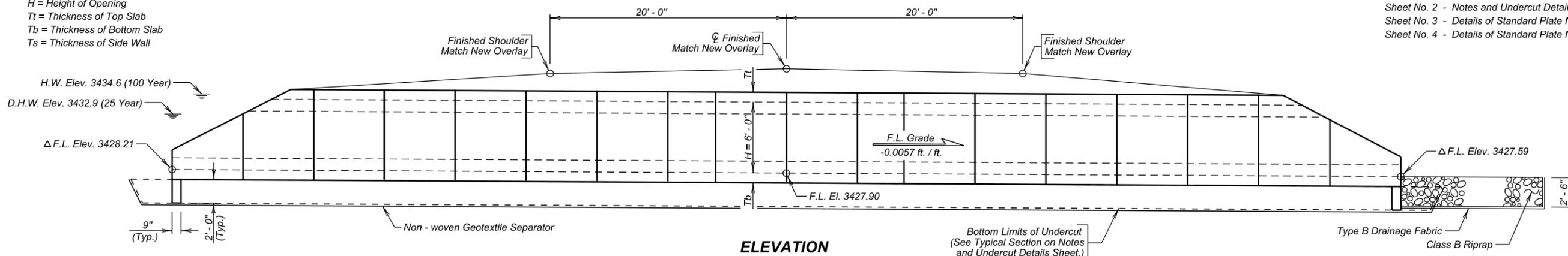
PLAN

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 & 620.16

LEGEND

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



ELEVATION

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	154 cfs
A_d	19 sq. ft.
V_d	8.2 fps
Q_F	154 cfs
Q_{100}	271 cfs
Q_{OT}	> Q_{100} cfs
V_{max}	9.9 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 3432.9.
 Q_{OT} = Overtopping discharge and frequency > Q_{100} yr. recurrence interval. El. 3436.2 @ Sta. 911 + 00.00.
 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. 3434.6.
 V_{max} = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Structure Excavation, Box Culvert	Cu. Yd.	28
Box Culvert Undercut	Cu. Yd.	134
Class B Riprap	Ton	23.3
Type B Drainage Fabric	Sq. Yd.	35
Non-woven Geotextile Separator	Sq. Yd.	281
9' X 6' Precast Concrete Culvert, Furnish	Ft.	80
9' X 6' Precast Concrete Culvert, Install	Ft.	80
9' X 6' Precast Concrete Culvert End Section, Furnish	Each	2
9' X 6' Precast Concrete Culvert End Section, Install	Each	2

△ Quantity is based on 8" bottom slab, 8" 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.

**SITE 4
ALTERNATE B
GENERAL DRAWING AND QUANTITIES**

FOR
9' X 6' BOX CULVERT (PRECAST)
 OVER TRIB. TO SPRING CREEK 0° SKEW
 STA. f 912 + 45.00 SEC. 2/35-T35/36N-R42W
 STR. NO. 57-398-460 NH-PH 0018(177)104
 PCN 02QC HL-93

OGLALA LAKOTA COUNTY
 S. D. DEPT. OF TRANSPORTATION

OCTOBER 2013

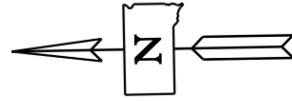
1 OF 4

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

DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWE08	DRAFTED BY GW Kevin N. Goeden BRIDGE ENGINEER
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Revised July 23, 2015

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E56	E58



SPECIFICATIONS

Use South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.

GENERAL NOTES

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

1. Box culvert and box culvert end section design shall conform to the AASHTO LRFD Bridge Design Specifications, 2012 Edition with 2013 interims.
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 shall not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. If construction loads in excess of legal load are anticipated by the Contractor, the Contractor shall 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 shall be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2010 Edition with the latest Interim Revisions using the LRFR method. The rating shall include evaluation at the Design Load rating for the HL-93 truck at both Inventory and Operating levels and at the 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 noted in the AASHTO Manual for Bridge Evaluation. All sections of the box culvert shall rate at HL-93 or better (Inventory Level). The three SD Legal Loads, the notional rating load and the four specialized hauling vehicles shall rate greater than 1.0 at legal load rating level. Submit Load Rating calculations with the Design and Check Design calculations or shop plans, as appropriate.
4. The design of the barrel sections shall be based on a minimum fill height of 1 foot and include all subsequent fill heights up to and including the maximum fill height of 5 ft. over the box culvert.
5. Minimum inside corner fillet shall be 6 in.
6. Minimum precast barrel section length shall be 4 ft.
7. Lift holes shall be plugged with an approved nonshrinkable grout.
8. The Fabricator shall 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 shall be in accordance with the final approved shop plans.
11. Compaction of earth embankment and box culvert backfill shall be governed by the Specified Density method.
12. The subsurface soils at Station f912 + 45 consist of dark gray sandy clay-silt to 4' below flow line. Classification results of soil samples collected from below flow line during the subsurface investigation were clay-silt to clay-sand.

GEOTEXTILE

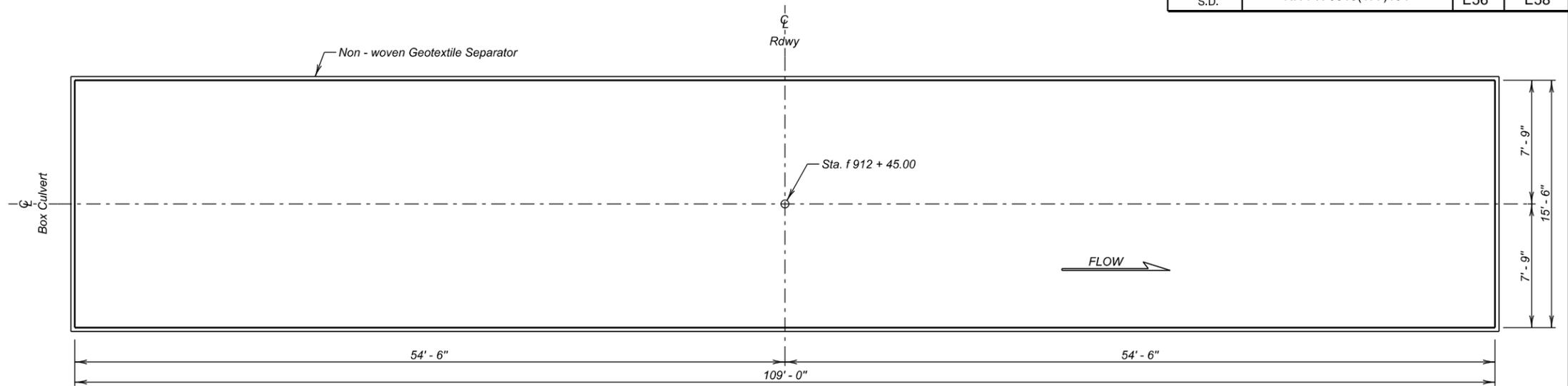
1. A layer of Non-woven Geotextile Separator shall be placed at the bottom of the undercut prior to backfilling with granular material.
2. The top of the subgrade shall be prepared by smoothing the surface of the subgrade to minimize any ruts, ridges, and depressions. Any rocks or other protrusions that might damage the geotextile will be removed. The geotextile will be unrolled perpendicular to the centerline and overlapped a minimum of 2 feet.
3. The geotextile will be placed as taut as possible with minimal wrinkles. Placement will be so that subsequent granular cover material does not shove, wrinkle or distort the in place geotextile. The overlaps will be shingled in a matter that assures granular material will not be forced under the geotextile during backfilling operations. The geotextile may be held in place with small piles of granular material or staples. No traffic will be allowed on the uncovered geotextile. The granular material shall be placed in lifts not exceeding 6 inch loose depth and compacted to 95% maximum dry density as determined by the Specified Density Method.
4. The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Non-woven Geotextile Separator (Section 831 of the Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
5. Payment will be full compensation for furnishing and installing the geotextile only.

DESIGN MIX OF CONCRETE

1. Mix shall be as per fabricator's design, however minimum compressive strength shall not be less than 4500 p.s.i. at 28 days.
2. High sulfate levels are likely to be encountered on this project. The type of cement shall be either a Type V or a Type II with 20% Class F Modified Fly Ash substituted for cement in accordance with Section 605. The Water/Cementitious material ratio shall not exceed 0.45 as defined in Section 460.3 C.

SHOP PLANS

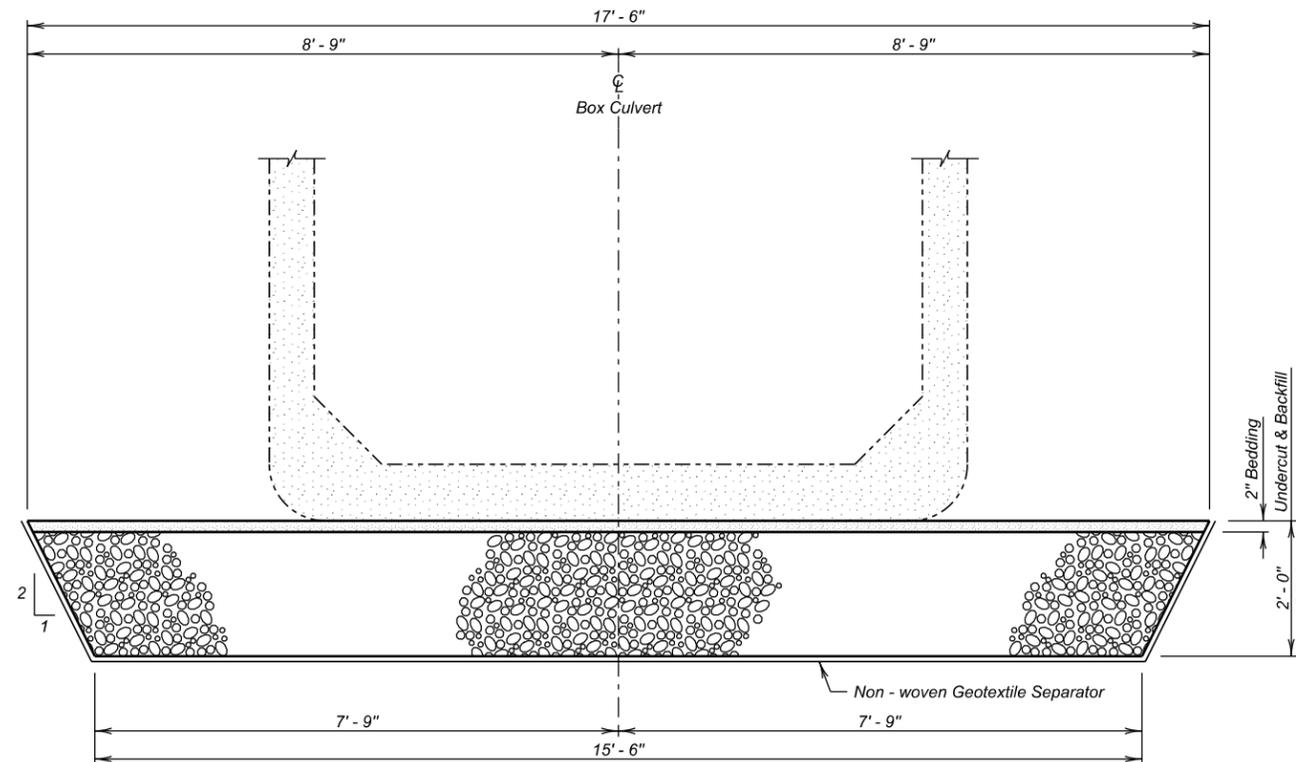
Shop plans shall be required as specified by the Specifications. In lieu of paper copies, shop plans may be submitted electronically in Adobe PDF. Send shop plan submittals to the Office of Bridge Design.



UNDERCUT LAYOUT
(Bottom Dimensions)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	134
Non - woven Geotextile Separator	Sq. Yd.	281

For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.
For payment, quantity is based on plan shown bottom undercut dimensions. Quantity includes 15% for overlapping.



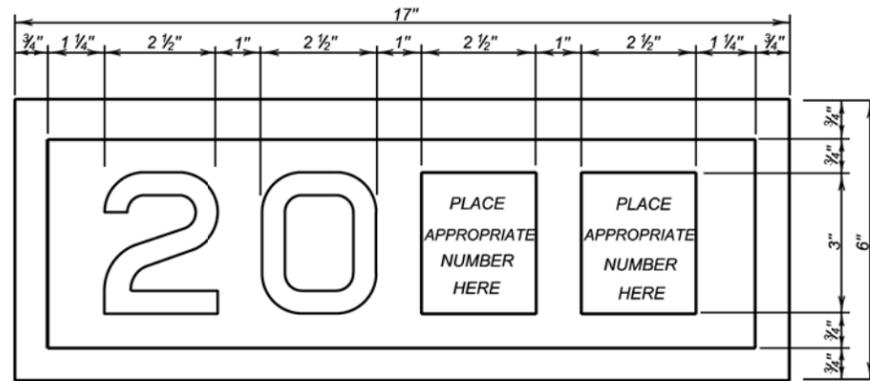
TYPICAL SECTION
(For Limits of Undercut)

**SITE 4
ALTERNATE B**

NOTES AND UNDERCUT DETAILS
FOR
9' X 6' BOX CULVERT (PRECAST)
OVER TRIB. TO SPRING CREEK 0° SKEW
STA. f 912 + 45.00 SEC. 2/35-T35/36N-R42W
STR. NO. 57-398-460 NH-PH 0018(177)104
HL-93

OGLALA LAKOTA COUNTY
S. D. DEPT. OF TRANSPORTATION
OCTOBER 2013

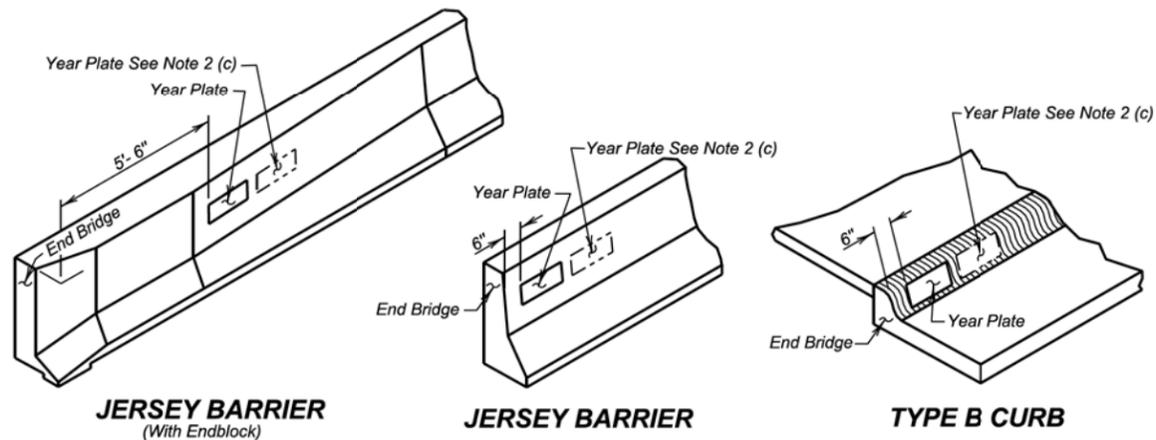
DESIGNED BY MM OGLA02QC	CK. DES. BY JMH 02QCWE09	DRAFTED BY GW	Kevin N. Goeden BRIDGE ENGINEER
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YEAR PLATE DETAILS

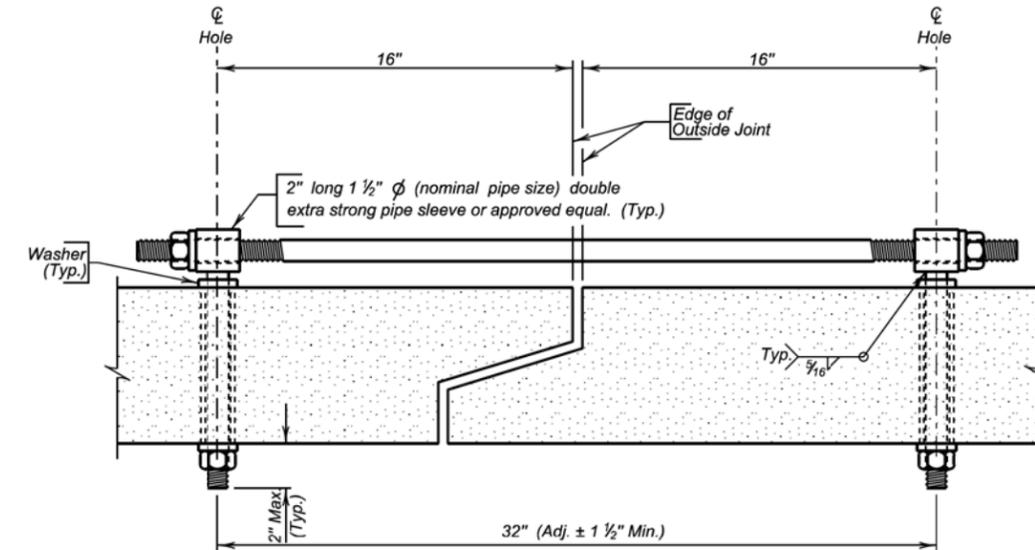
GENERAL NOTES:

- 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: 3rd Qtr. 2015	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



TIE BOLT ASSEMBLY

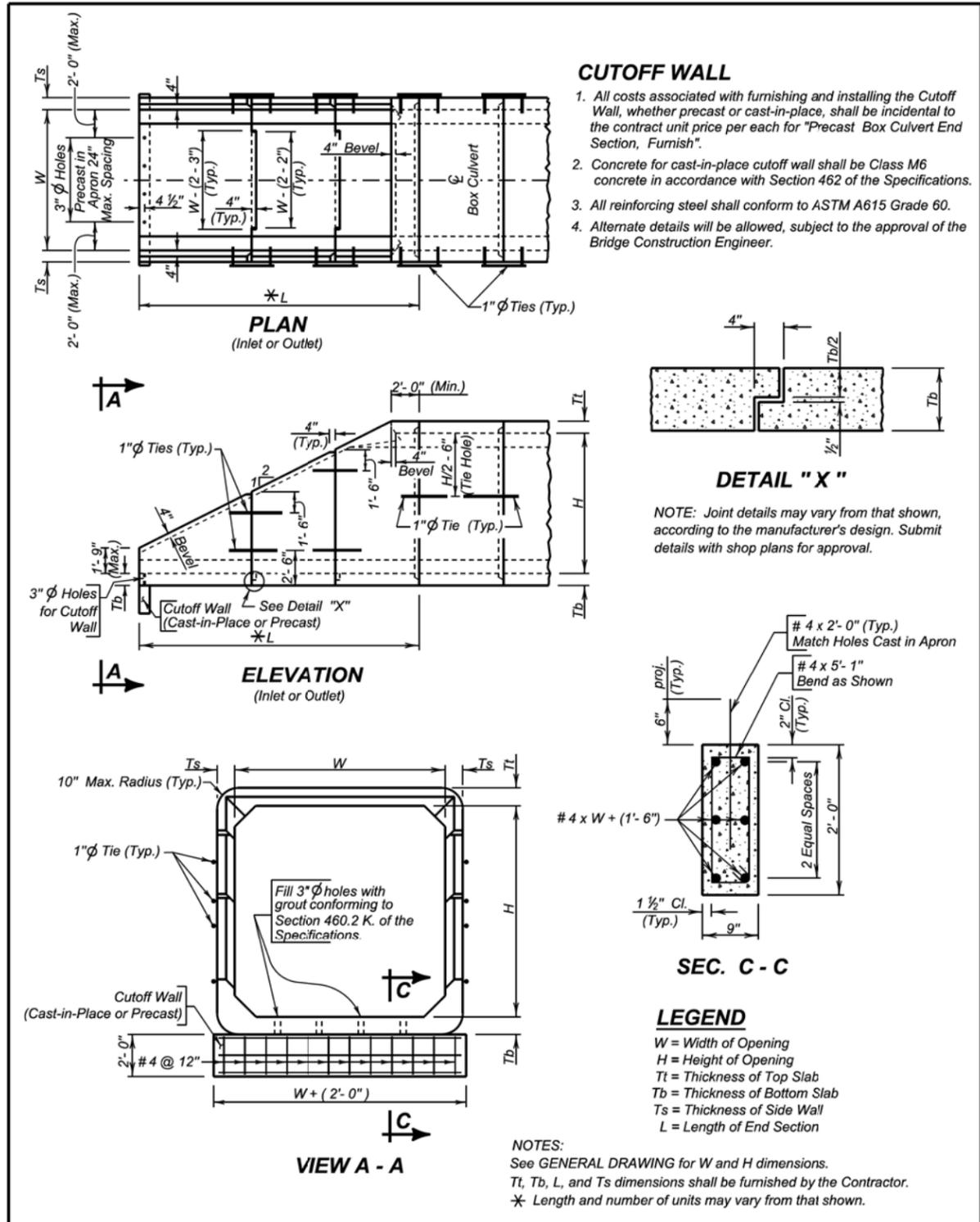
GENERAL NOTES:

- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36. 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.
- 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".

December 23, 2012

Published Date: 3rd Qtr. 2015	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1

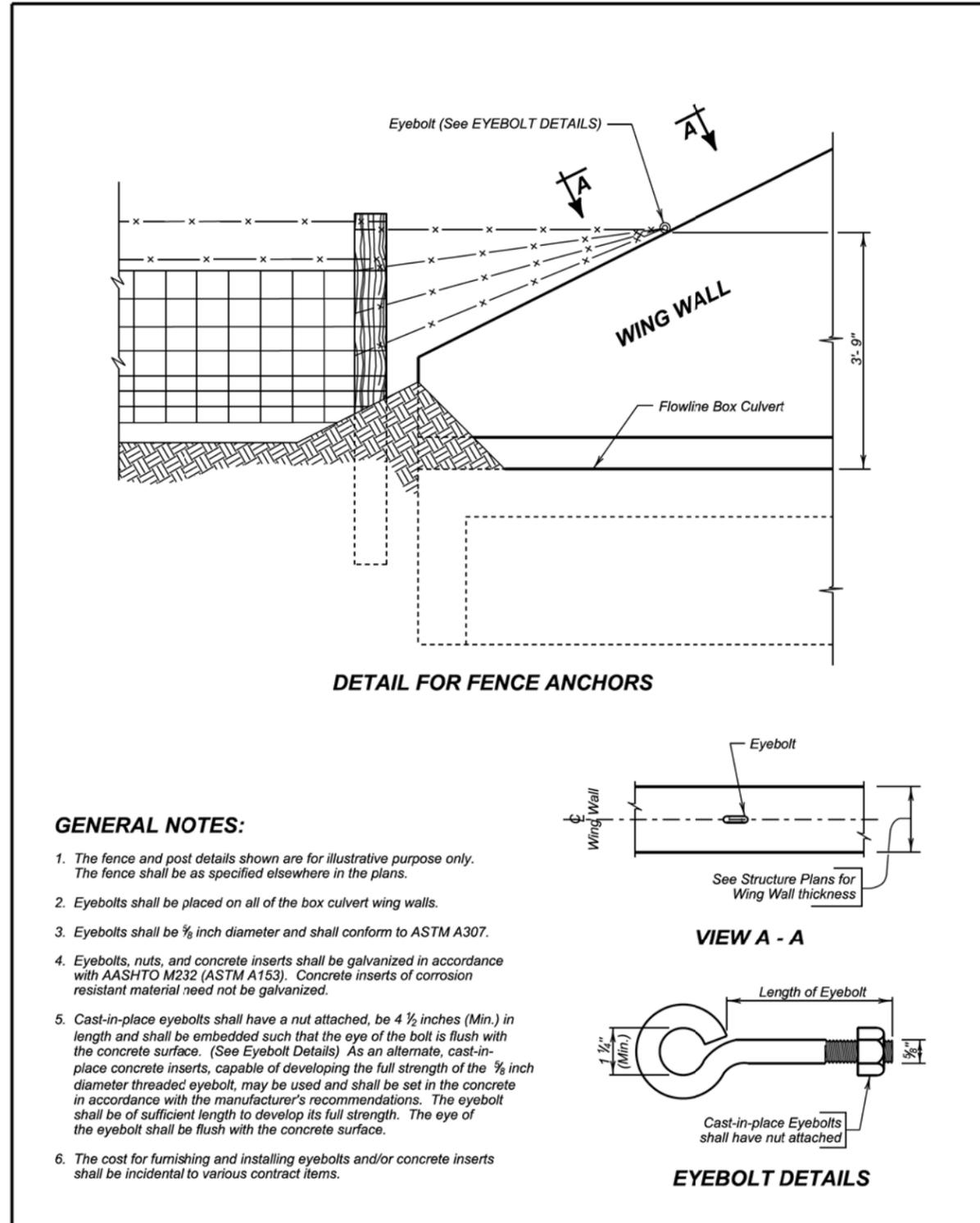
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH-PH 0018(177)104	E58	E58



June 26, 2015

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

Published Date: 3rd Qtr. 2015



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: 3rd Qtr. 2015