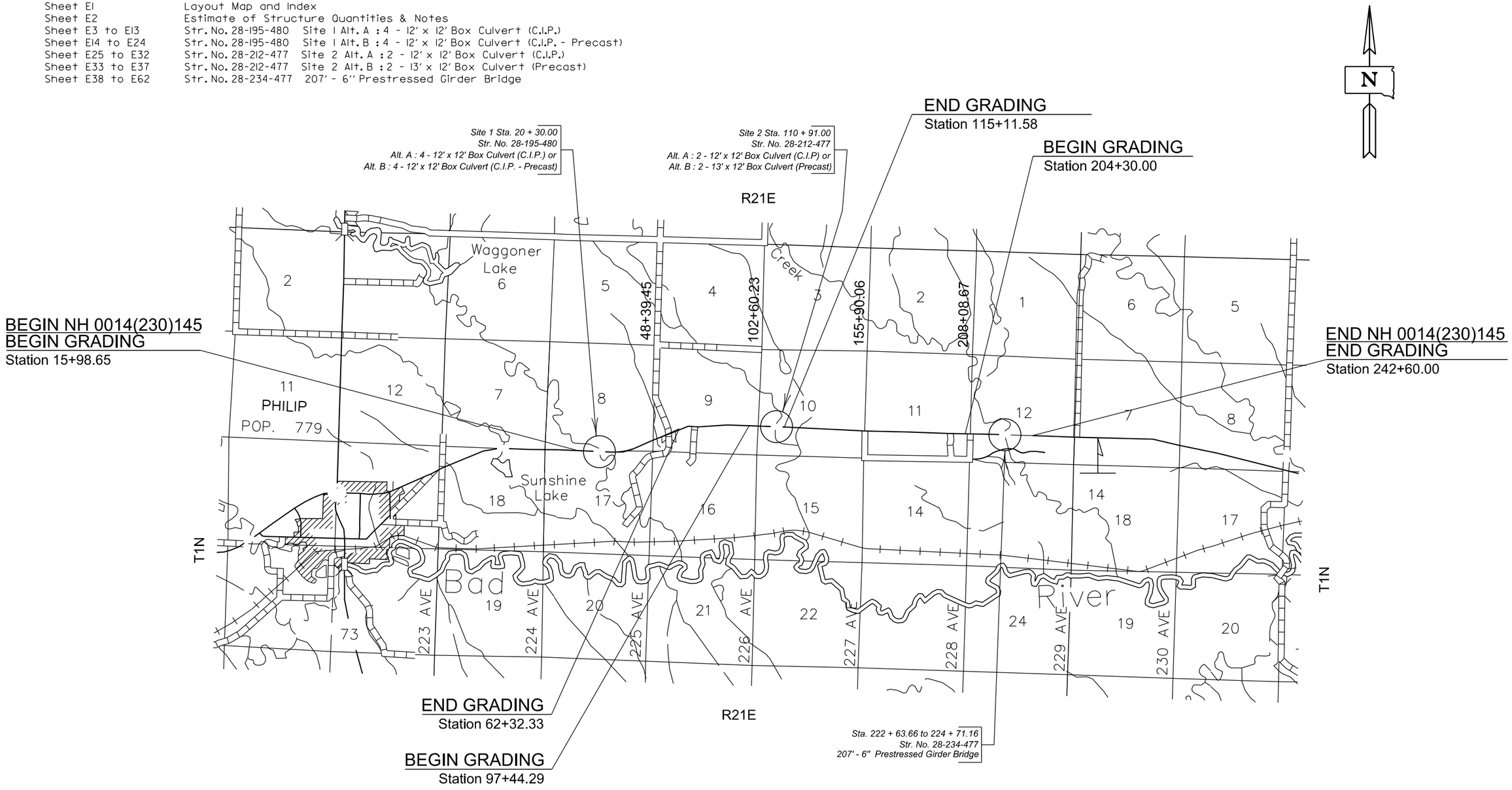
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E1	E62

Section E: Structure Plans

INDEX OF SHEETS -

Sheet E1	Layout Map and Index
Sheet E2	Estimate of Structure Quantities & Notes
Sheet E3 to E13	Str. No. 28-195-480 Site 1 Alt. A : 4 - 12' x 12' Box Culvert (C.I.P.)
Sheet E14 to E24	Str. No. 28-195-480 Site 1 Alt. B : 4 - 12' x 12' Box Culvert (C.I.P. - Precast)
Sheet E25 to E32	Str. No. 28-212-477 Site 2 Alt. A : 2 - 12' x 12' Box Culvert (C.I.P.)
Sheet E33 to E37	Str. No. 28-212-477 Site 2 Alt. B : 2 - 13' x 12' Box Culvert (Precast)
Sheet E38 to E62	Str. No. 28-234-477 207' - 6" Prestressed Girder Bridge



SECTION E – ESTIMATE OF STRUCTURE QUANTITES

Str. No. 28-195-480

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

Site 1 – Alternate A
Str. No. 28-195-480

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	259	CuYd
421E0200	Box Culvert Undercut	710	CuYd
460E0120	Class A45 Concrete, Box Culvert	630.5	CuYd
480E0100	Reinforcing Steel	109,952	Lb
700E0210	Class B Riprap	127.0	Ton
831E0110	Type B Drainage Fabric	149	SqYd

Site 1 – Alternate B
Str. No. 28-195-480

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	162	CuYd
421E0200	Box Culvert Undercut	726	CuYd
460E0120	Class A45 Concrete, Box Culvert	318.9	CuYd
464E0100	Controlled Density Fill	27.0	CuYd
480E0100	Reinforcing Steel	53,269	Lb
560E2178	2-12'x12' Precast Concrete Box Culvert, Furnish	68.0	Ft
560E2179	2-12'x12' Precast Concrete Box Culvert, Install	68.0	Ft
700E0210	Class B Riprap	130.0	Ton
831E0110	Type B Drainage Fabric	152	SqYd

Str. No. 28-212-477

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

Site 2 – Alternate A
Str. No. 28-212-477

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	211	CuYd
421E0200	Box Culvert Undercut	512	CuYd
460E0120	Class A45 Concrete, Box Culvert	518.9	CuYd
480E0100	Reinforcing Steel	75,543	Lb
700E0210	Class B Riprap	61.4	Ton
831E0110	Type B Drainage Fabric	75	SqYd

Site 2 – Alternate B
Str. No. 28-212-477

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	160	CuYd
421E0200	Box Culvert Undercut	451	CuYd
560E2202	2-13'x12' Precast Concrete Box Culvert, Furnish	130.0	Ft
560E2203	2-13'x12' Precast Concrete Box Culvert, Install	130.0	Ft
560E3202	2-13'x12' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E3203	2-13'x12' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	65.4	Ton
831E0110	Type B Drainage Fabric	80	SqYd

Str. No. 28-234-477

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E3310	Bridge Elevation Survey	Lump Sum	LS
009E5000	Concrete Penetrating Sealer	830.0	SqYd
120E7000	Select Granular Backfill	21.1	Ton
250E0030	Incidental Work, Structure	Lump Sum	LS
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
410E2600	Membrane Sealant Expansion Joint	75.8	Ft
420E0100	Structure Excavation, Bridge	18	CuYd
430E0200	Bridge End Embankment	1,115	CuYd
430E0300	Granular Bridge End Backfill	83.6	CuYd
430E0510	Approach Slab Underdrain Excavation	6.3	CuYd
430E0700	Precast Concrete Headwall for Drain	4	Each
460E0030	Class A45 Concrete, Bridge Deck	288.1	CuYd
460E0050	Class A45 Concrete, Bridge	132.4	CuYd
460E0150	Concrete Approach Slab for Bridge	173.3	SqYd
460E0160	Concrete Approach Sleeper Slab for Bridge	37.9	SqYd
465E0100	Class A45 Concrete, Drilled Shaft	79.5	CuYd
465E0200	Drilled Shaft Excavation	74.9	CuYd
465E0400	Crosshole Sonic Log (CSL) Test	1	Each
465E1074	74" Permanent Casing	8.9	Ft
480E0100	Reinforcing Steel	55,570	Lb
480E0200	Epoxy Coated Reinforcing Steel	2,389	Lb
480E0300	Stainless Reinforcing Steel	54,601	Lb
480E0518	No. 18 Rebar Splice	26	Each
510E0300	Preboring Pile	200	Ft
510E3401	HP 12x53 Steel Test Pile, Furnish and Drive	135	Ft
510E3405	HP 12x53 Steel Bearing Pile, Furnish and Drive	1,125	Ft
560E8054	54" Minnesota Shape Prestressed Concrete Beam	1,025	Ft
680E0040	4" Underdrain Pipe	185	Ft
680E2500	Porous Backfill	11.8	Ton
700E0210	Class B Riprap	2,954.4	Ton
700E1100	Overburden Excavation for Riprap	697	CuYd
831E0110	Type B Drainage Fabric	3,517	SqYd
831E1030	Perforated Geocell	604	SqFt

INCIDENTAL WORK, STRUCTURE

1. Incidental Work, Structure shall consist of the removal of the following structures:

   Str. No. 28-195-480 In-place centerline Sta. 19+49.64 to centerline Sta. 20+83.14 is a 133'-6 '', 3 span, steel girder bridge with a 30'-0" clear roadway. The superstructure consists of a reinforced concrete slab with concrete curb with steel railing faced with Thrie-Beam continuous across the bridge. The deck has been overlaid with 2 inches of low slump deck concrete. The substructure consists of 2 column reinforced concrete bents and reinforced vertical concrete abutments, all of which are supported on treated timber piles.

   Str. No. 28-212-477 In-place centerline Sta. 110+30.61 to centerline Sta. 111+49.11 is a 118'-6 '', 3 span, steel girder bridge with a 30'-0" clear roadway. The superstructure consists of a reinforced concrete slab with concrete curb with steel railing faced with Thrie-Beam continuous across the bridge. The deck has been overlaid with 2 inches of low slump deck concrete. The substructure consists of 2 column reinforced concrete bents and reinforced vertical concrete abutments, all of which are supported on treated timber piles.

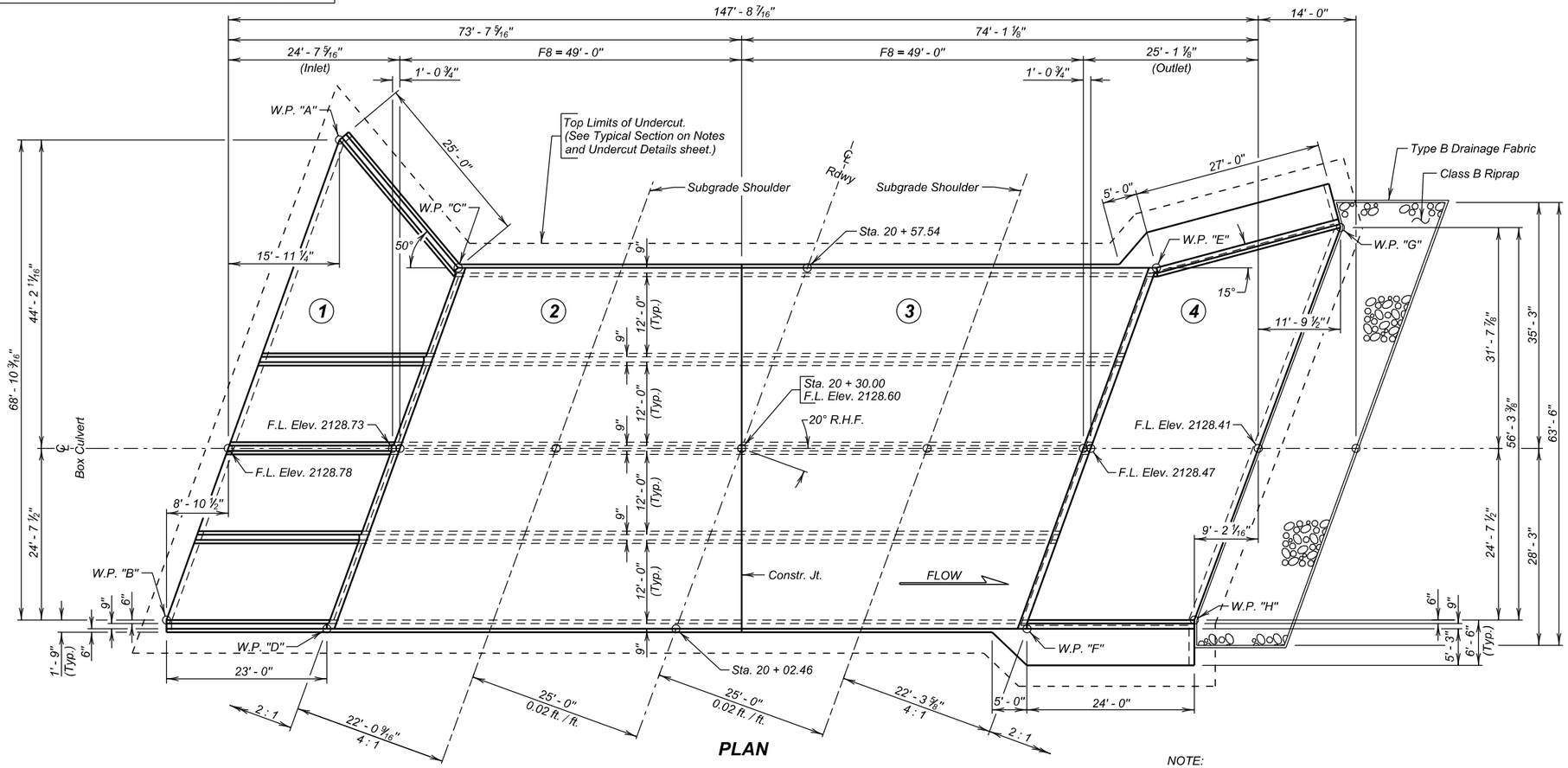
2. Break down and remove the existing structures 1 foot below finished ground or as required to construct the new structures in accordance with Section 110 of the Specifications. All portions of the existing structures shall be removed and disposed of by the Contractor on a site obtained by the Contractor and approved by the Engineer in accordance with Notes found in SECTION A.

3. 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.

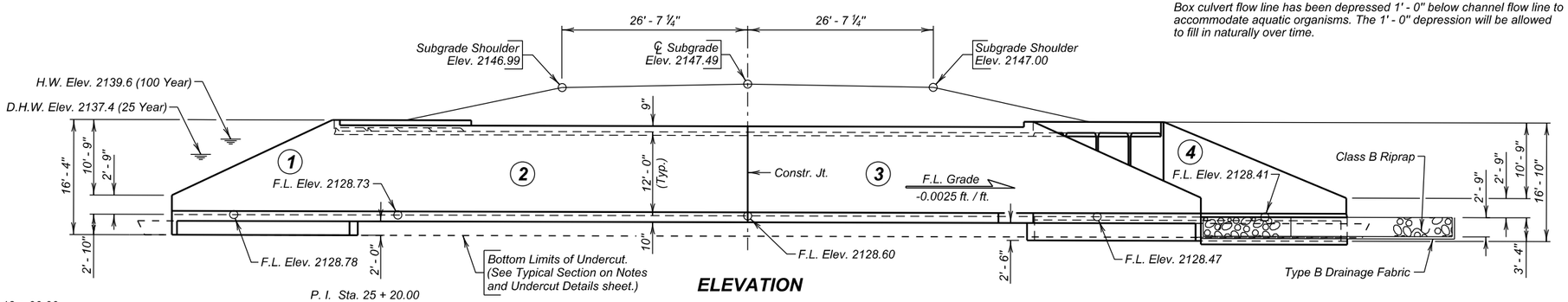
4. The foregoing is a general description of the in-place structures and should not be construed to be complete in all details. Before preparing the bid it shall be the responsibility of the Contractor to make a visual inspection of the structures to verify the extent of the work and materials involved.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

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

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E3	E62

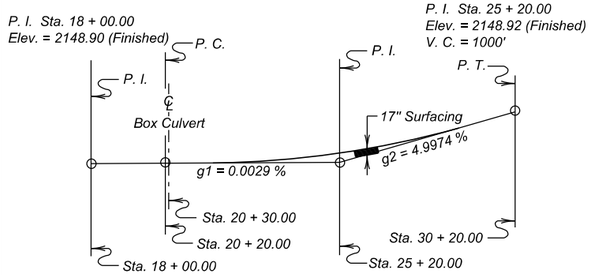


PLAN



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.



VERTICAL CURVE DATA

HYDRAULIC DATA

Q_d	2173 cfs
A_d	410 sq ft
V_d	6.3 fps
Q_F	2173 cfs
Q_{100}	3866 cfs
Q_{OT}	>Q_{500}
V_{max}	10.6 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2137.4.

Q_{OT} = Overtopping discharge and frequency > Q_{500} year recurrence interval. El. 2148.7 @ Sta. 13 + 68.00 ±.

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. 2139.6.

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

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	630.5
Reinforcing Steel	Lb.	109952
Structure Excavation, Box Culvert	Cu. Yd.	259
Box Culvert Undercut	Cu. Yd.	710
Type B Drainage Fabric	Sq. Yd.	149
✳ Class B Riprap	Ton	127.0

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

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

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	20 + 51.83	69.32' Lt.
"B"	19 + 78.65	69.09' Lt.
"C"	20 + 40.41	47.04' Lt.
"D"	19 + 85.34	47.04' Lt.
"E"	20 + 74.66	47.04' Rt.
"F"	20 + 19.68	47.30' Rt.
"G"	20 + 89.12	69.88' Rt.
"H"	20 + 29.06	69.43' Rt.

Z

-X028-

INDEX OF CULVERT SHEETS-

Sheet No. 1 - General Drawing and Quantities
Sheet No. 2 - Notes and Undercut Details
Sheet No. 3 - Inlet Details (A)
Sheet No. 4 - Inlet Details (B)
Sheet No. 5 - Inlet Details (C)
Sheet No. 6 - Outlet Details (A)
Sheet No. 7 - Outlet Details (B)
Sheet No. 8 - F8 Barrel End Section Details (49' - 0") (A)
Sheet No. 9 - F8 Barrel End Section Details (49' - 0") (B)
Sheet No. 10 - Details of Standard Plate No's 460.02 and 460.10
Sheet No. 11 - Details of Standard Plate No. 620.16

SITE 1
ALTERNATE A

GENERAL DRAWING AND QUANTITITES

FOR

4 - 12' x 12' BOX CULVERT

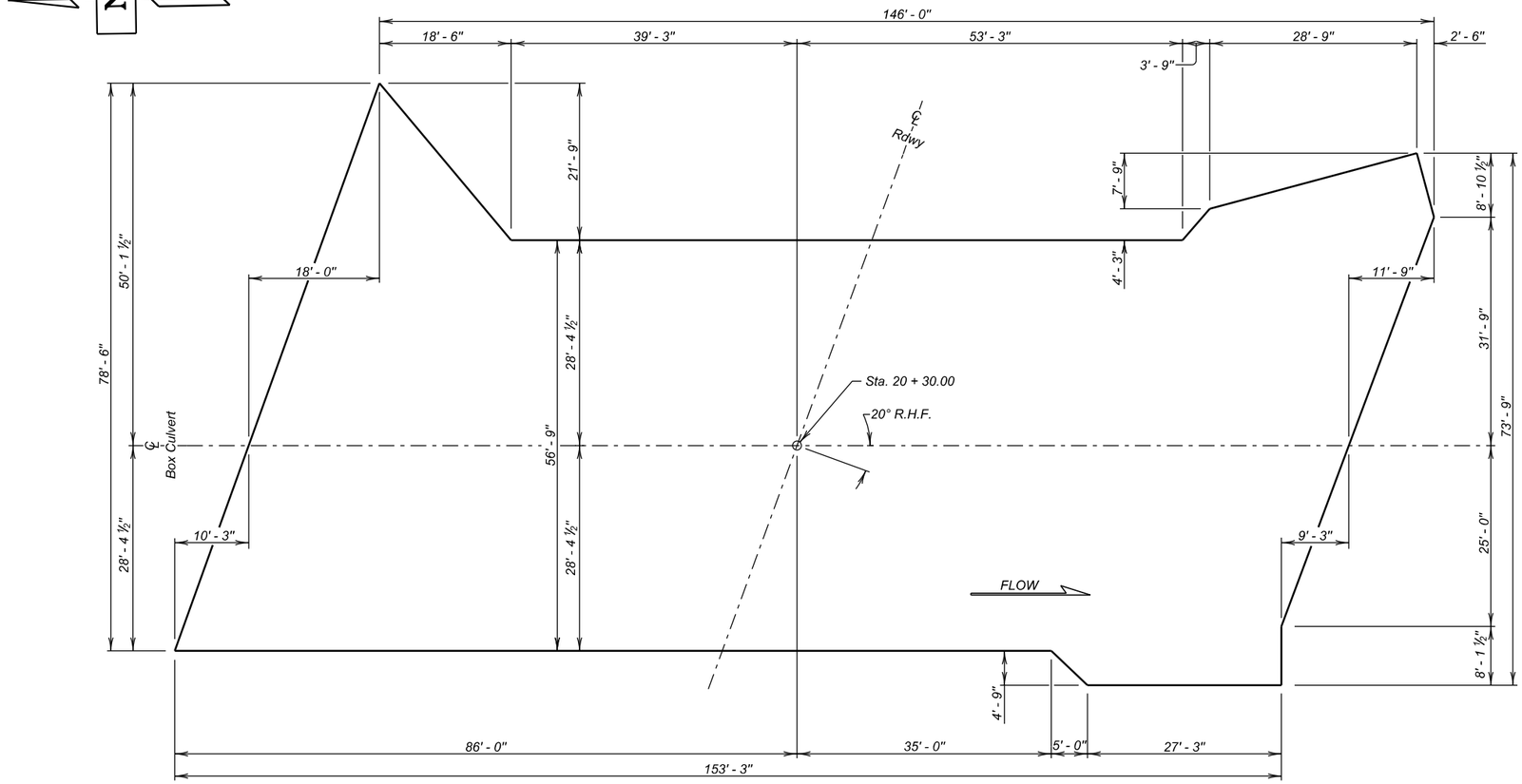
OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
PCN 04FW — HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

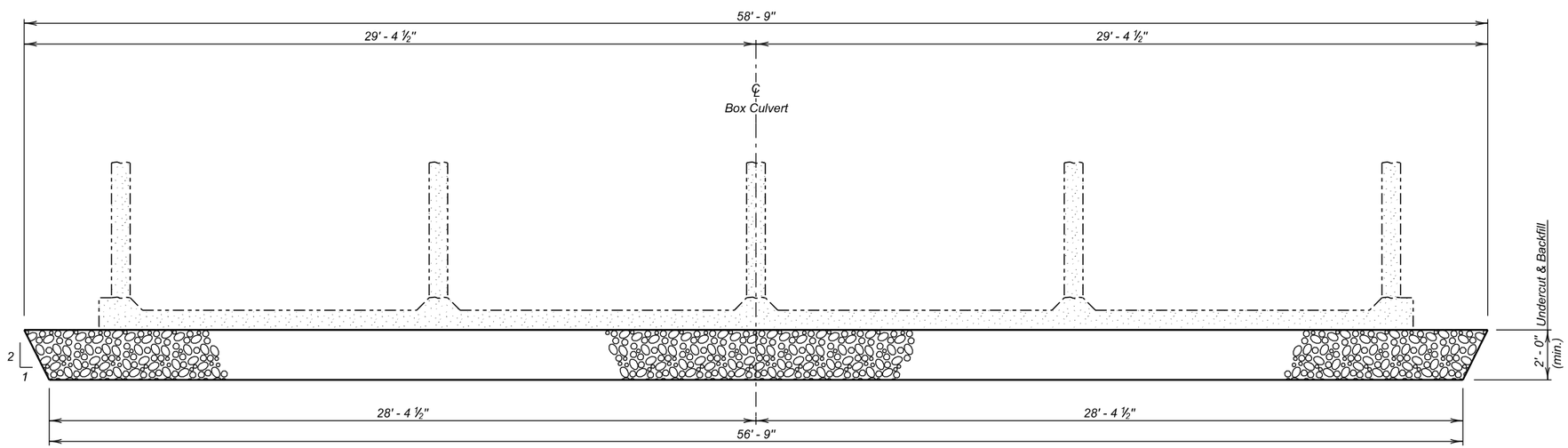
-X028-

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steve A Johnson
HAKN04FW	04FWVMB01		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E4	E62



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SPECIFICATIONS

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

GENERAL NOTES

1. *Design Live Load: HL-93 and construction load consisting of two 7' - 6" gage axles spaced 30 ft. apart with gross axle weight (each axle) = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.*
2. *The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 8 ft. (F8).*
3. *Design Material Strengths: Concrete $f'c$ = 4500 p.s.i.*
   Reinforcing Steel fy = 60000 p.s.i.
4. *All concrete will be Class A45, Box Culvert conforming to Section 460 of the Construction Specifications.*
5. *All reinforcing steel will conform to ASTM A615 Grade 60.*
6. *All lap splices shown are contact lap splices unless noted otherwise.*
7. *All exposed edges will be chamfered ¾ inch unless noted otherwise in the plans.*
8. *Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.*
9. *The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.*
10. *Care will be taken to establish Working Points (W.P.) as shown on the wings.*
11. *Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).*
12. *Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.*
13. *Soils below the bottom of the proposed RCBC consist of 4' of gravelly clay sand alluvium overlying Pierre Shale. Groundwater was encountered in the borings at an elevation of 2131.7 during the subsurface investigation conducted in May 2020. Dewatering will be required during construction.*

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
⌀	Box Culvert Undercut	Cu. Yd.	710

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

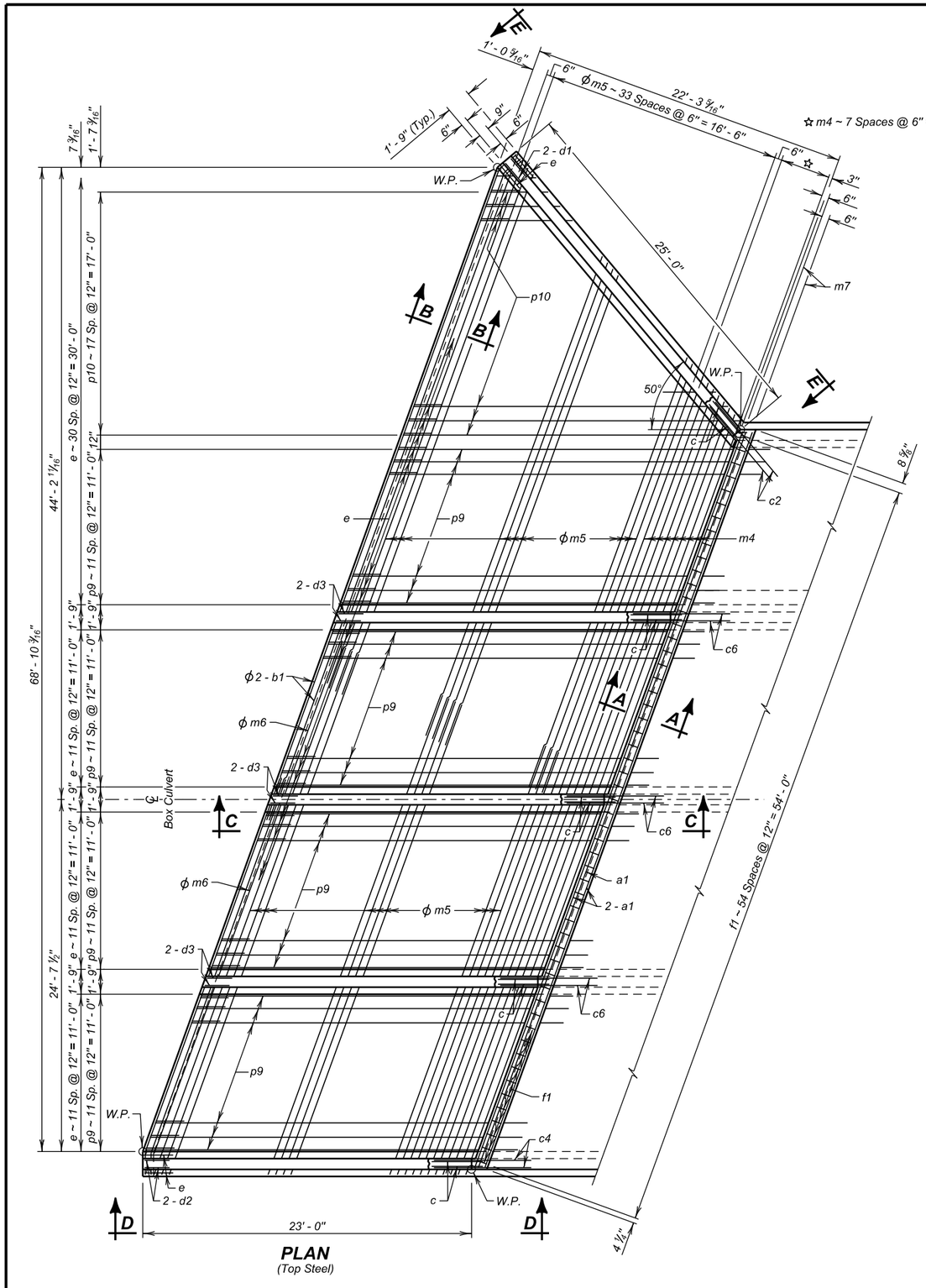
SITE 1
ALTERNATE A
NOTES AND UNDERCUT DETAILS
FOR
4 - 12' x 12' BOX CULVERT

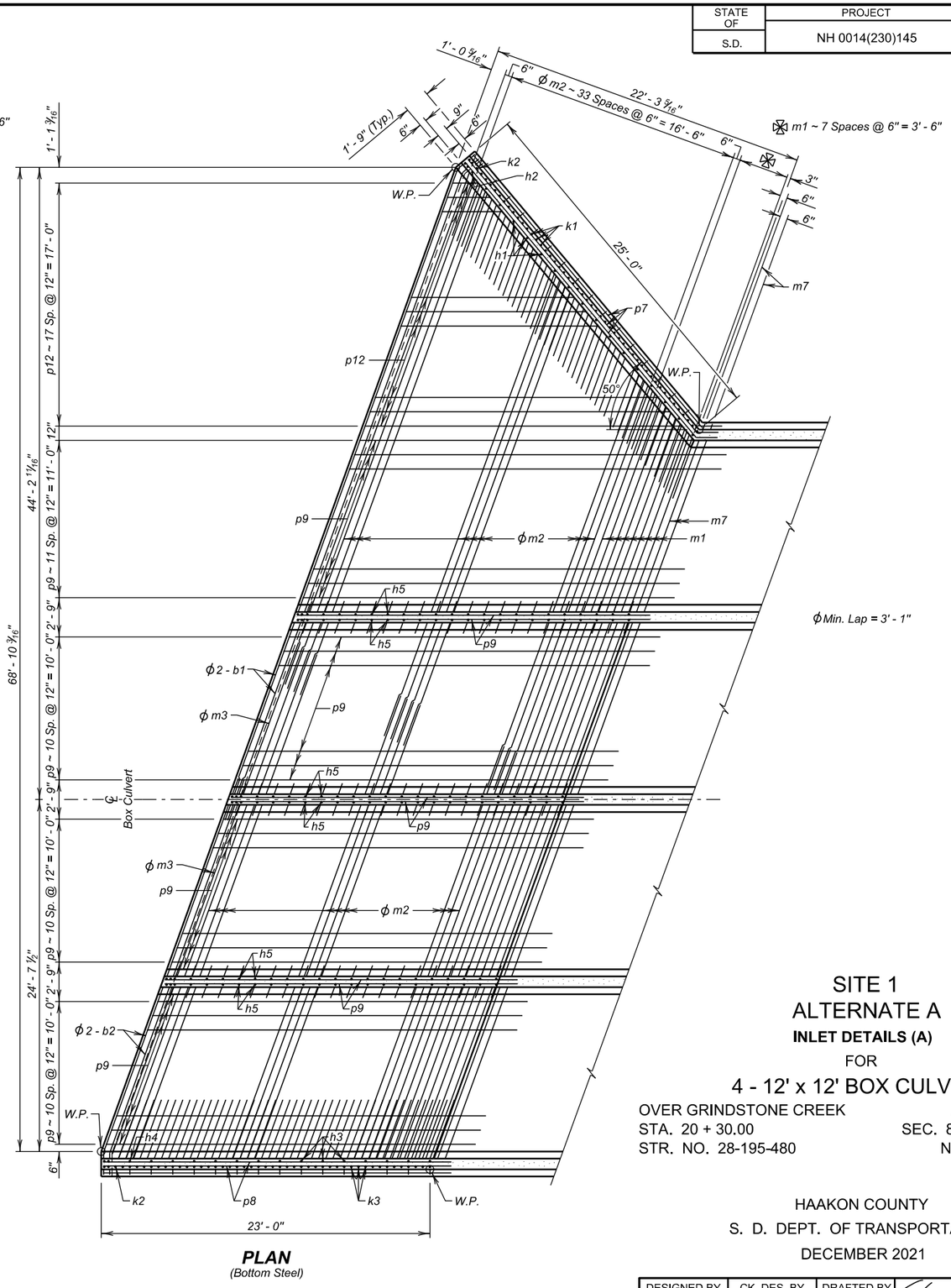
OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB02		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E5	E62





ϕ Min. Lap = 3' - 1"

SITE 1
ALTERNATE A
INLET DETAILS (A)

FOR

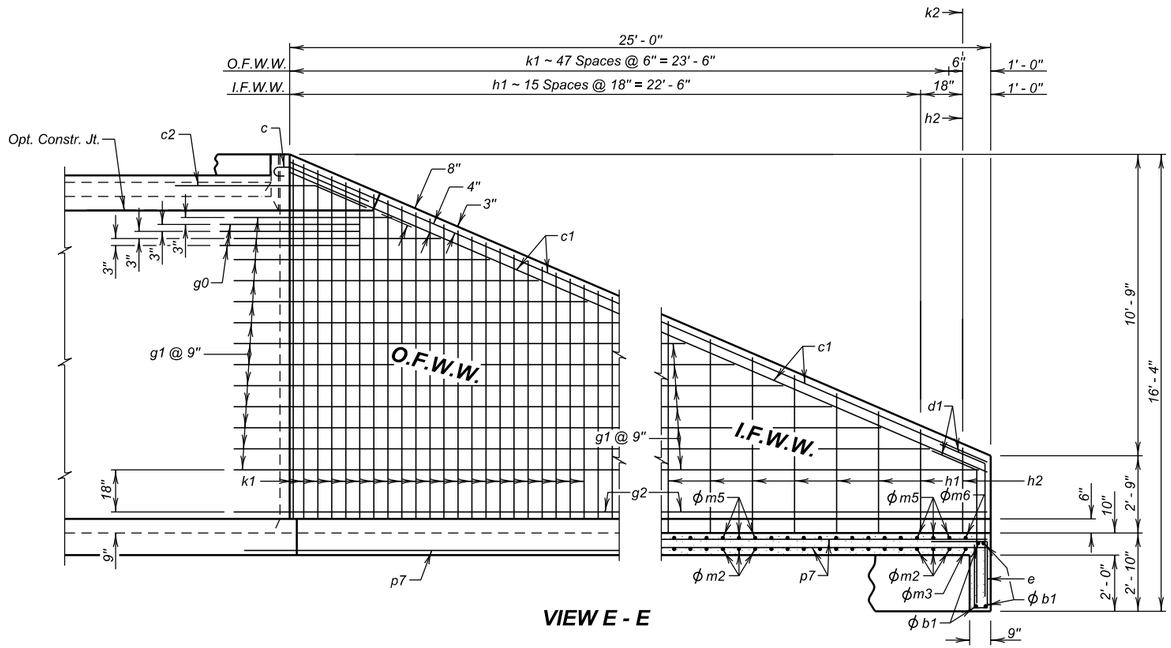
4 - 12' x 12' BOX CULVERT

OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steven A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB03		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E6	E62

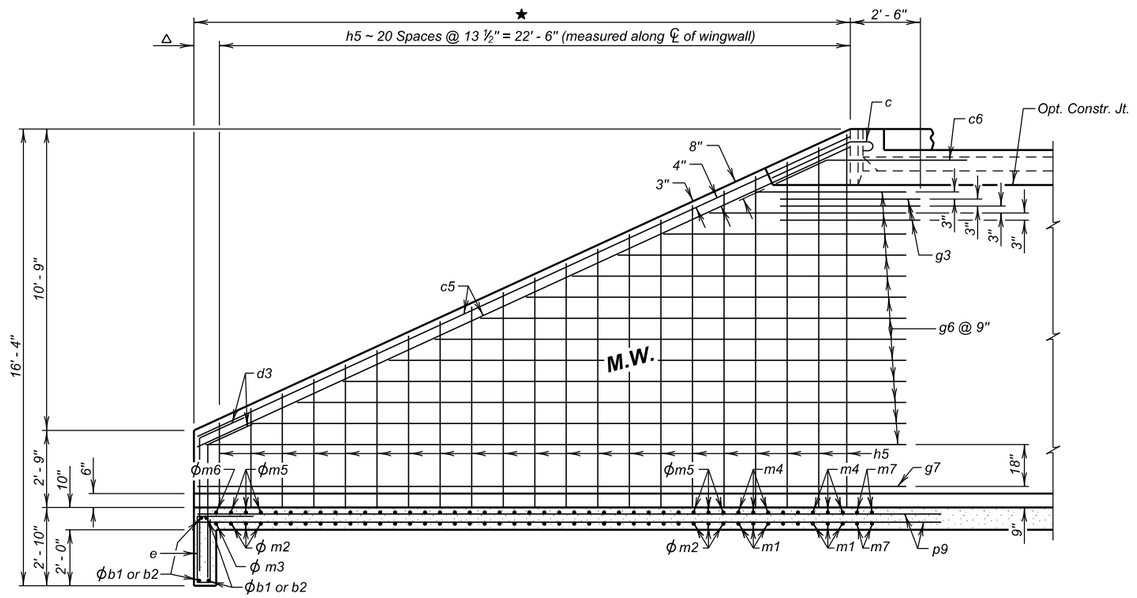


VIEW E - E

23' - 5 7/16" - Short Wall (measured along ℄ of wingwall)
★ 23' - 4 7/8" - Middle Wall (measured along ℄ of wingwall)
23' - 4 3/8" - Long Wall (measured along ℄ of wingwall)

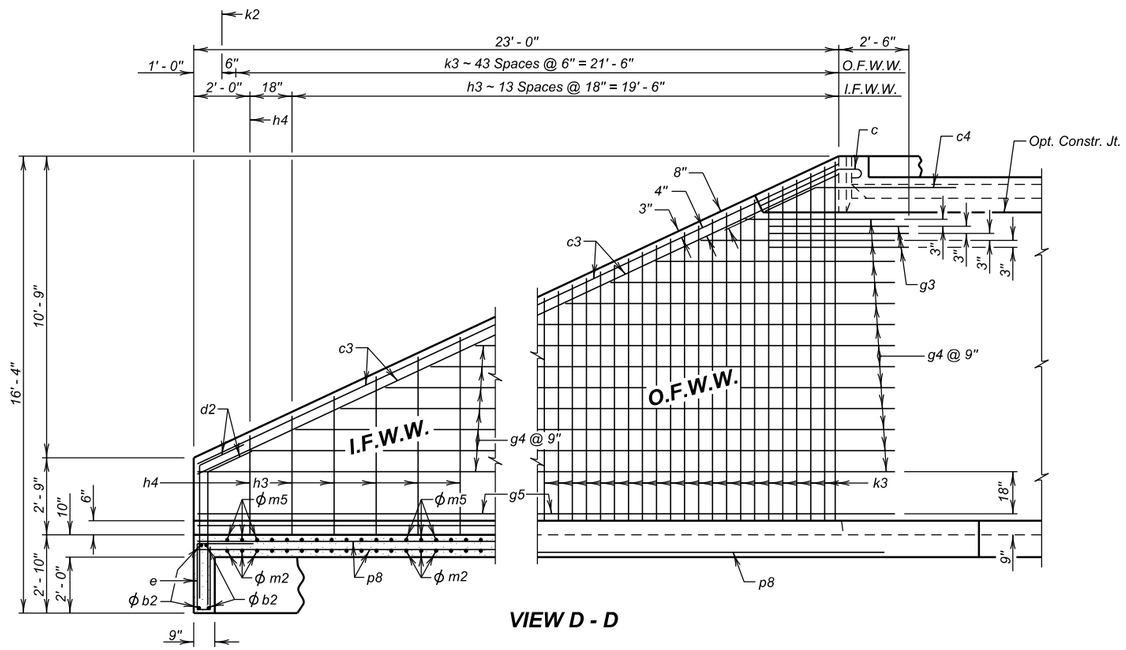
ϕ Min. Lap = 3' - 1"

1' - 0" - Short Wall (measured along ℄ of wingwall)
△ 1' - 0 1/2" - Middle Wall (measured along ℄ of wingwall)
1' - 1 1/8" - Long Wall (measured along ℄ of wingwall)



SECTION C - C

(Middle Wall shown, Long Wall and Short Wall similar except as shown)



VIEW D - D

LEGEND FOR PLACING RE-STEEL

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

SITE 1
ALTERNATE A
INLET DETAILS (B)
FOR
4 - 12' x 12' BOX CULVERT

OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

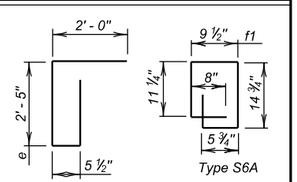
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

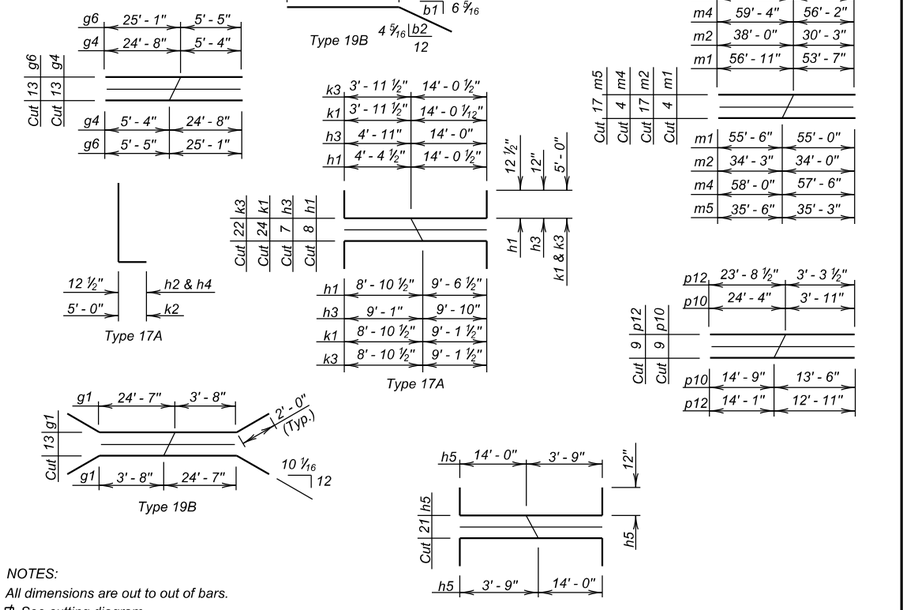
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB04		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E7	E62

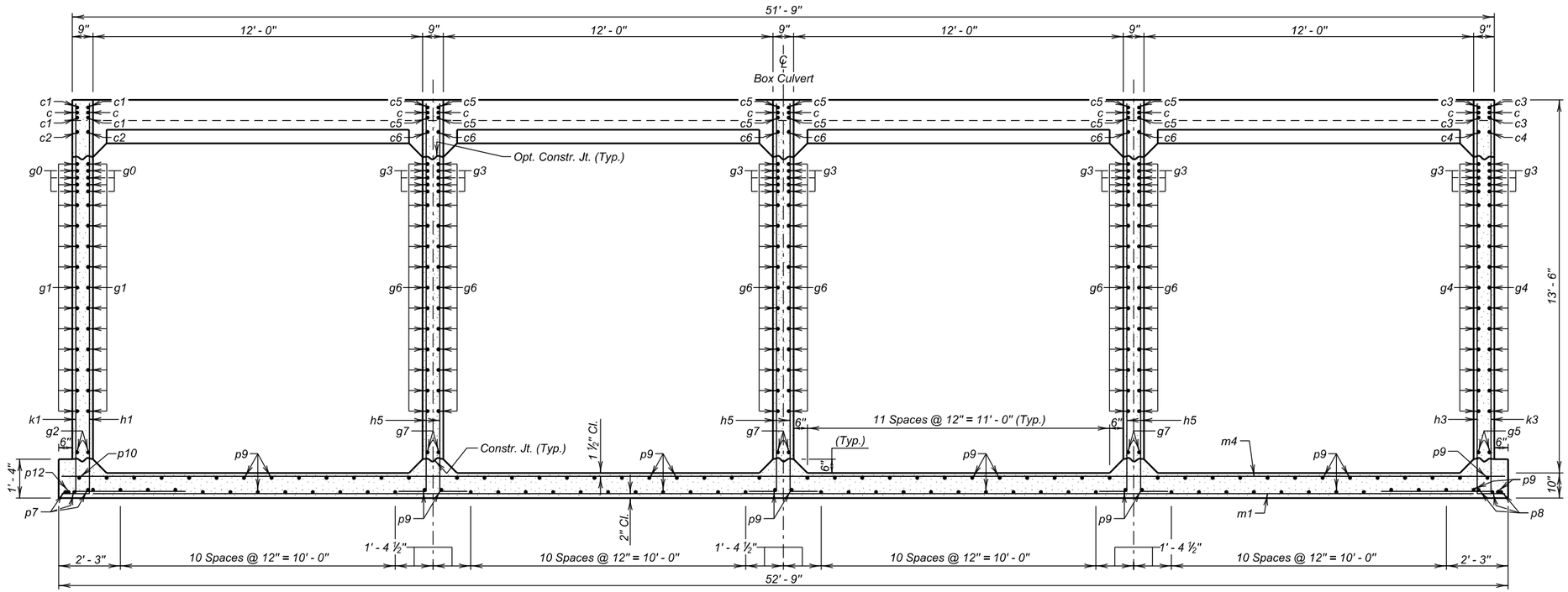
REINFORCING SCHEDULE

	Mk.	No.	Size	Length	Type
	a1	5	6	54' - 9"	Str.
	b1	4	6	50' - 0"	19B
	b2	4	6	28' - 0"	19B
✳	c	10	5	4' - 6"	1A
	c1	4	5	27' - 3"	Str.
	c2	2	5	7' - 0"	19B
	c3	4	5	25' - 3"	Str.
	c4	2	5	7' - 0"	19B
	c5	12	5	25' - 9"	Str.
	c6	6	5	7' - 0"	19B
	d1	4	5	6' - 6"	19B
	d2	4	5	6' - 6"	19B
	d3	12	5	6' - 6"	19B
	e	71	4	7' - 3"	S12
	f1	55	4	4' - 9"	S6A
	g0	6	5	5' - 0"	19B
✠	g1	13	4	32' - 3"	19B
	g2	2	4	26' - 9"	19B
	g3	24	5	5' - 0"	Str.
✠	g4	13	4	30' - 0"	Str.
	g5	2	4	24' - 9"	Str.
✠	g6	39	4	30' - 6"	Str.
	g7	6	4	25' - 3"	Str.
✠	h1	8	4	20' - 6"	17A
	h2	1	4	4' - 9"	17A
✠	h3	7	4	21' - 0"	17A
	h4	1	4	5' - 3"	17A
✠	h5	63	4	19' - 9"	17A
✠	k1	24	6	28' - 0"	17A
	k2	2	6	8' - 9"	17A
✠	k3	22	6	28' - 0"	17A
✠	m1	4	6	110' - 6"	Str.
✠	m2	34	6	68' - 3"	Str.
	m3	2	6	38' - 0"	Str.
✠	m4	4	6	115' - 6"	Str.
✠	m5	34	6	70' - 9"	Str.
	m6	2	6	38' - 3"	Str.
	m7	4	5	58' - 9"	Str.
	p7	3	4	26' - 6"	Str.
	p8	3	4	24' - 6"	Str.
	p9	99	4	25' - 0"	Str.
✠	p10	9	4	28' - 3"	Str.
✠	p12	9	4	27' - 0"	Str.

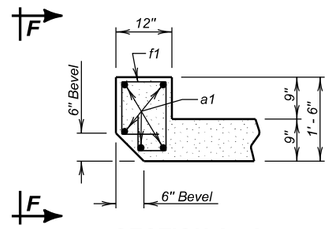




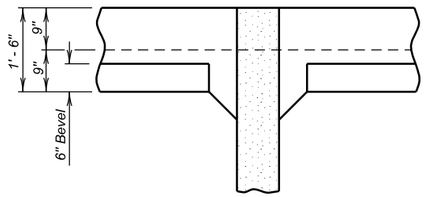
NOTES:
All dimensions are out to out of bars.
✠ See cutting diagram.
✳ Bend in field as necessary to fit.



TYPICAL INLET SECTION
(At parapet)

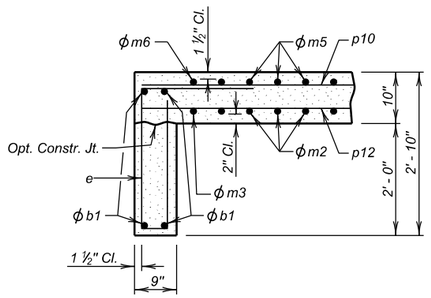


SECTION A - A
(At Top Slab)



VIEW F - F
(At Interior Wall)

ϕ Min. Lap = 3' - 1"



SECTION B - B

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	82.5	17636	47.1

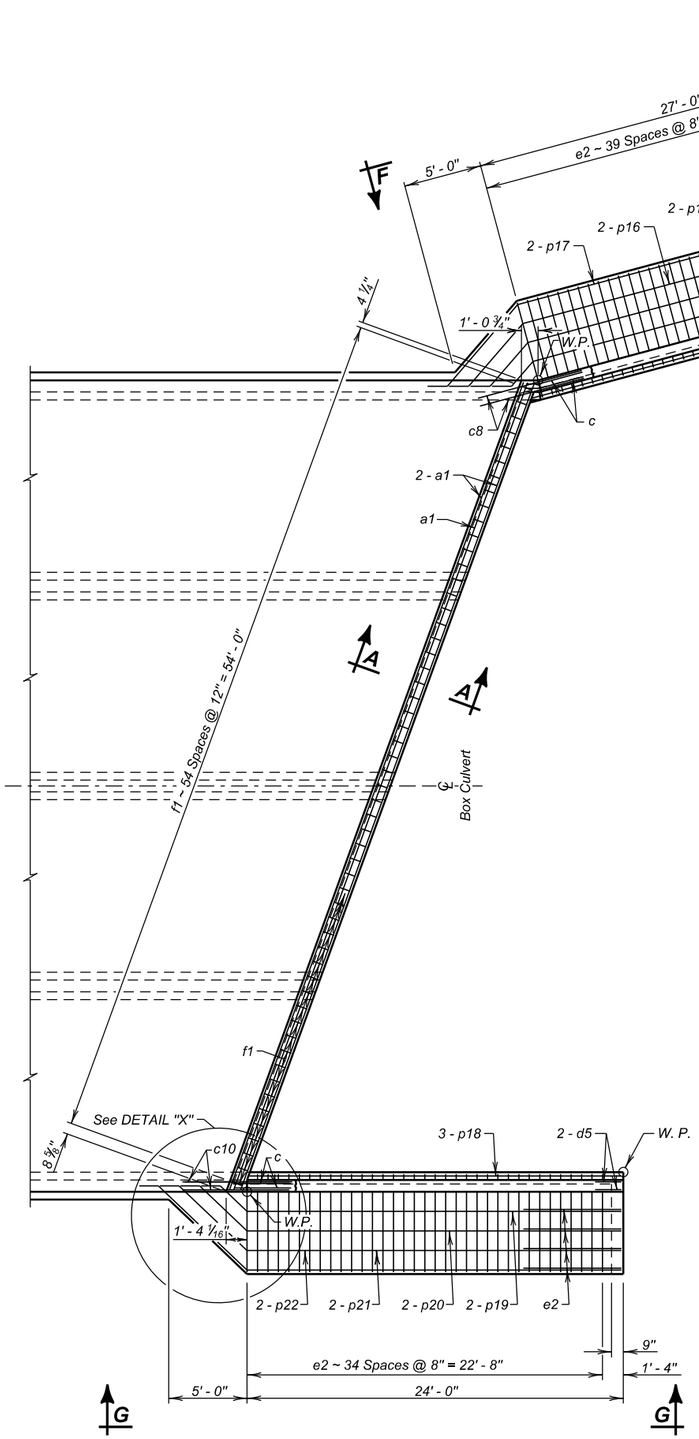
SITE 1
ALTERNATE A
INLET DETAILS (C)
FOR
4 - 12' x 12' BOX CULVERT

OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

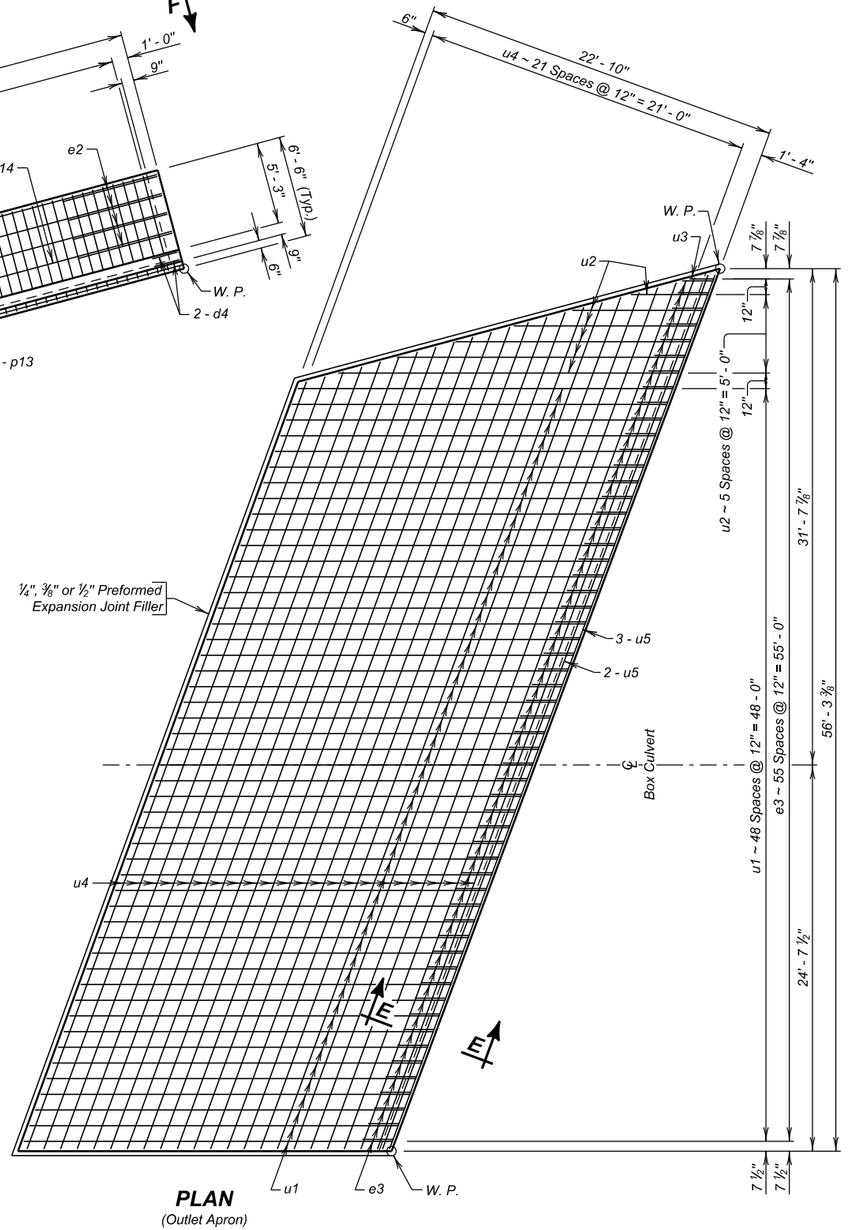
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steve A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB05		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E8	E62

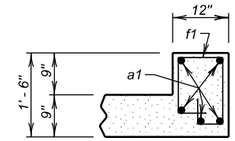


PLAN

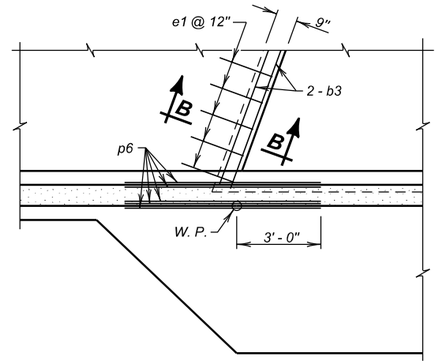


PLAN
(Outlet Apron)

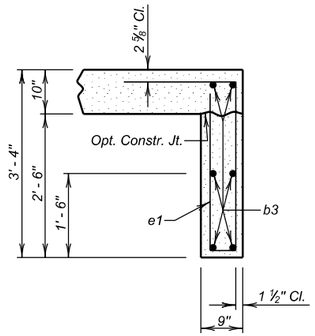
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



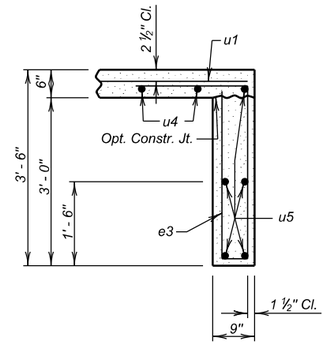
SECTION A - A
(At Top Slab)



DETAIL "X"
(At Bottom Slab)



SECTION B - B



SECTION E - E

SITE 1
ALTERNATE A
OUTLET DETAILS (A)
FOR
4 - 12' x 12' BOX CULVERT

OVER GRINDSTONE CREEK
STA. 20 + 30.00
STR. NO. 28-195-480

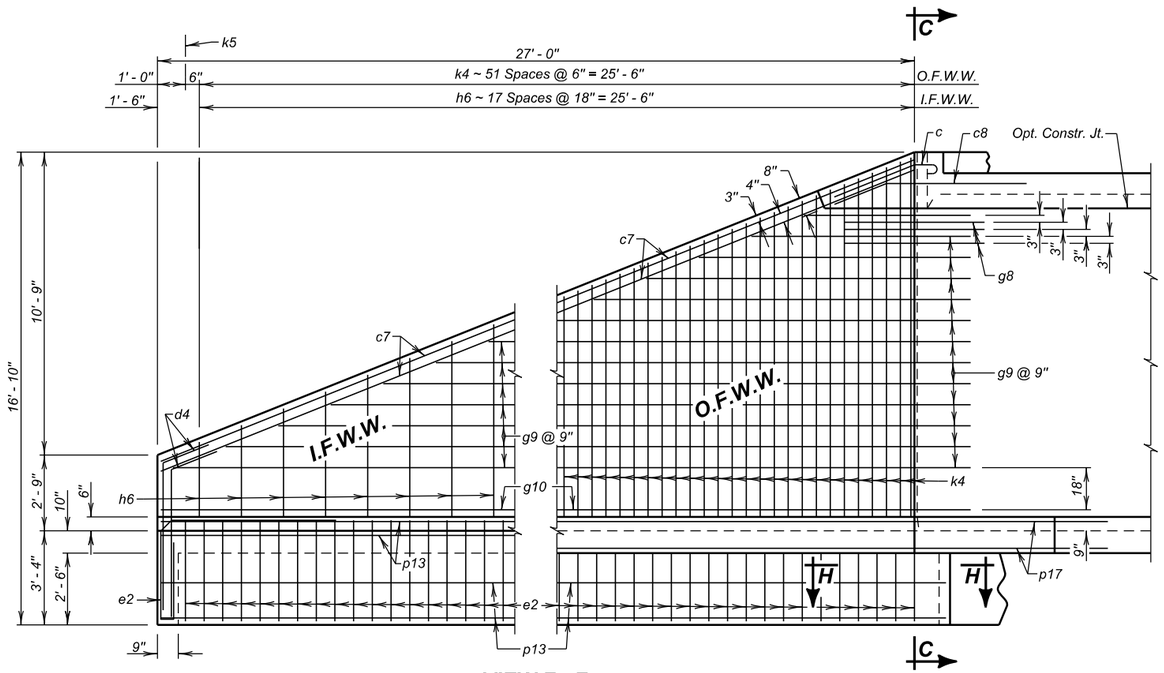
20° RHF SKEW
SEC. 8/17-T01N-R21E
NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

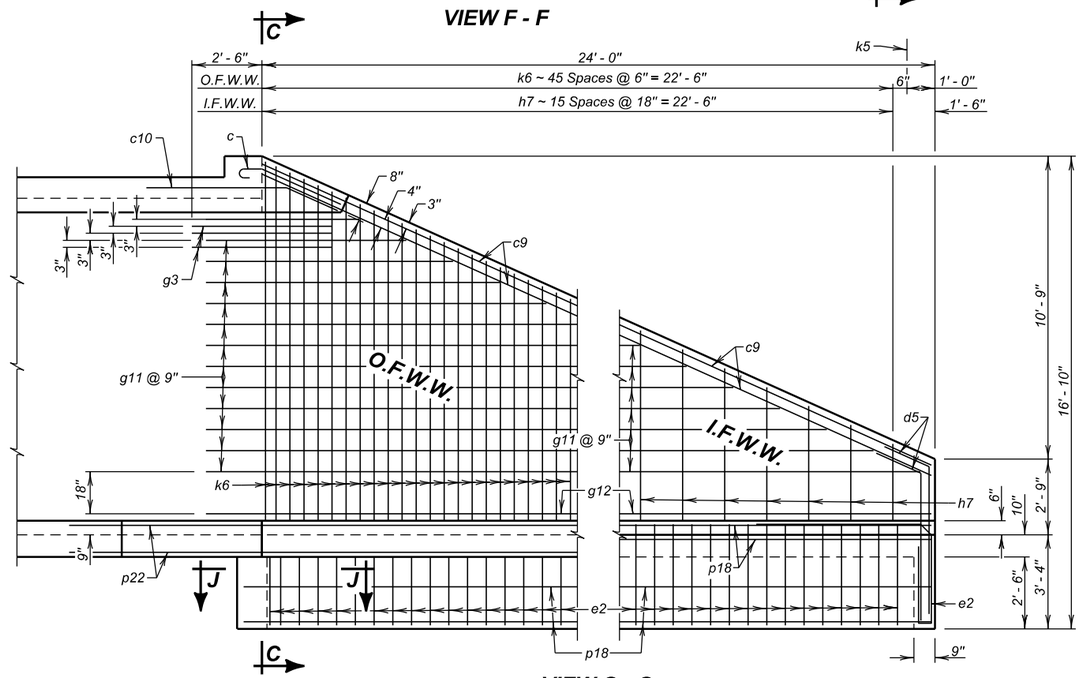
6 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB06		

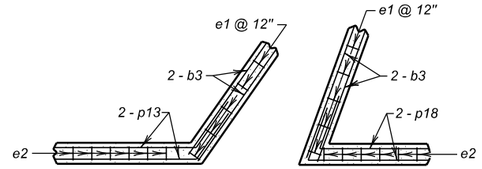
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E9	E62



VIEW F - F

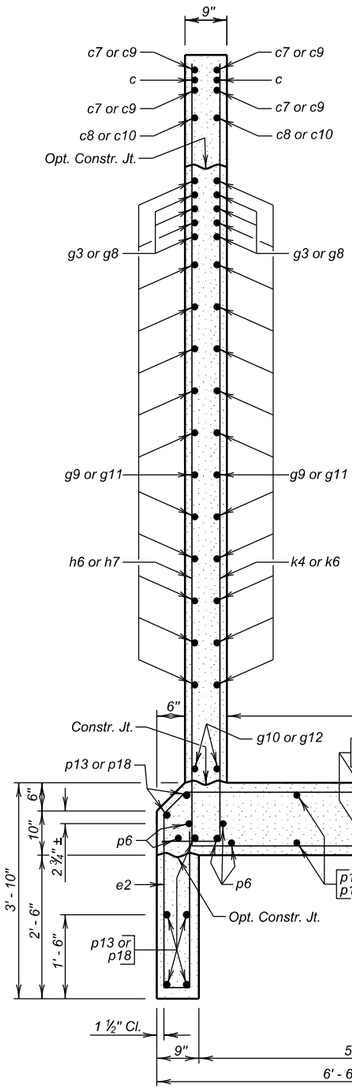


VIEW G - G



SECTION H - H

SECTION J - J

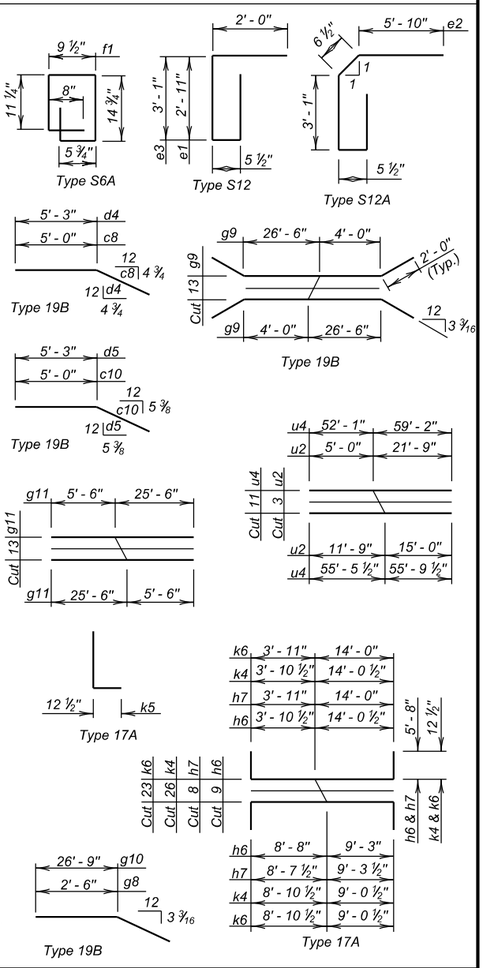


SECTION C - C

REINFORCING SCHEDULE

	Mk.	No.	Size	Length	Type
	a1	5	6	54' - 9"	Str.
	b3	6	6	53' - 6"	Str.
✳	c	4	5	4' - 6"	1A
	c7	4	5	29' - 0"	Str.
	c8	2	5	7' - 0"	19B
	c9	4	5	26' - 3"	Str.
	c10	2	5	7' - 0"	19B
	d4	4	5	7' - 0"	19B
	d5	4	5	7' - 0"	19B
	e1	54	4	8' - 0"	S12
	e2	83	4	12' - 9"	S12A
	f1	55	4	4' - 9"	S6A
	g3	6	5	5' - 0"	Str.
	g8	6	5	5' - 0"	19B
⌀	g9	13	4	34' - 6"	19B
	g10	2	4	28' - 9"	19B
⌀	g11	13	4	31' - 0"	Str.
	g12	2	4	25' - 9"	Str.
⌀	h6	9	4	29' - 3"	17A
⌀	h7	8	4	29' - 3"	17A
⌀	k4	26	4	20' - 0"	17A
	k5	2	4	4' - 9"	17A
⌀	k6	23	4	20' - 0"	17A
	p6	10	6	7' - 0"	Str.
✳	p13	7	4	29' - 6"	Str.
✳	p14	2	4	30' - 6"	Str.
✳	p15	2	4	32' - 3"	Str.
✳	p16	2	4	33 - 9"	Str.
✳	p17	2	4	35' - 3"	Str.
✳	p18	7	4	26' - 6"	Str.
✳	p19	2	4	27' - 9"	Str.
✳	p20	2	4	29' - 6"	Str.
✳	p21	2	4	31' - 6"	Str.
✳	p22	2	4	33' - 3"	Str.
	OUTLET APRON				
	e3	56	4	8' - 6"	S12
	u1	49	4	23' - 6"	Str.
⌀	u2	3	4	26' - 9"	Str.
	u3	1	4	1' - 6"	Str.
⌀	u4	11	4	111' - 3"	Str.
	u5	5	4	59' - 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.
Outlet	44.5	4804	21.8
Outlet Apron	30.7	2158	30.7

LEGEND FOR PLACING RE-STEEL

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

SITE 1
ALTERNATE A
OUTLET DETAILS (B)
FOR
4 - 12' x 12' BOX CULVERT

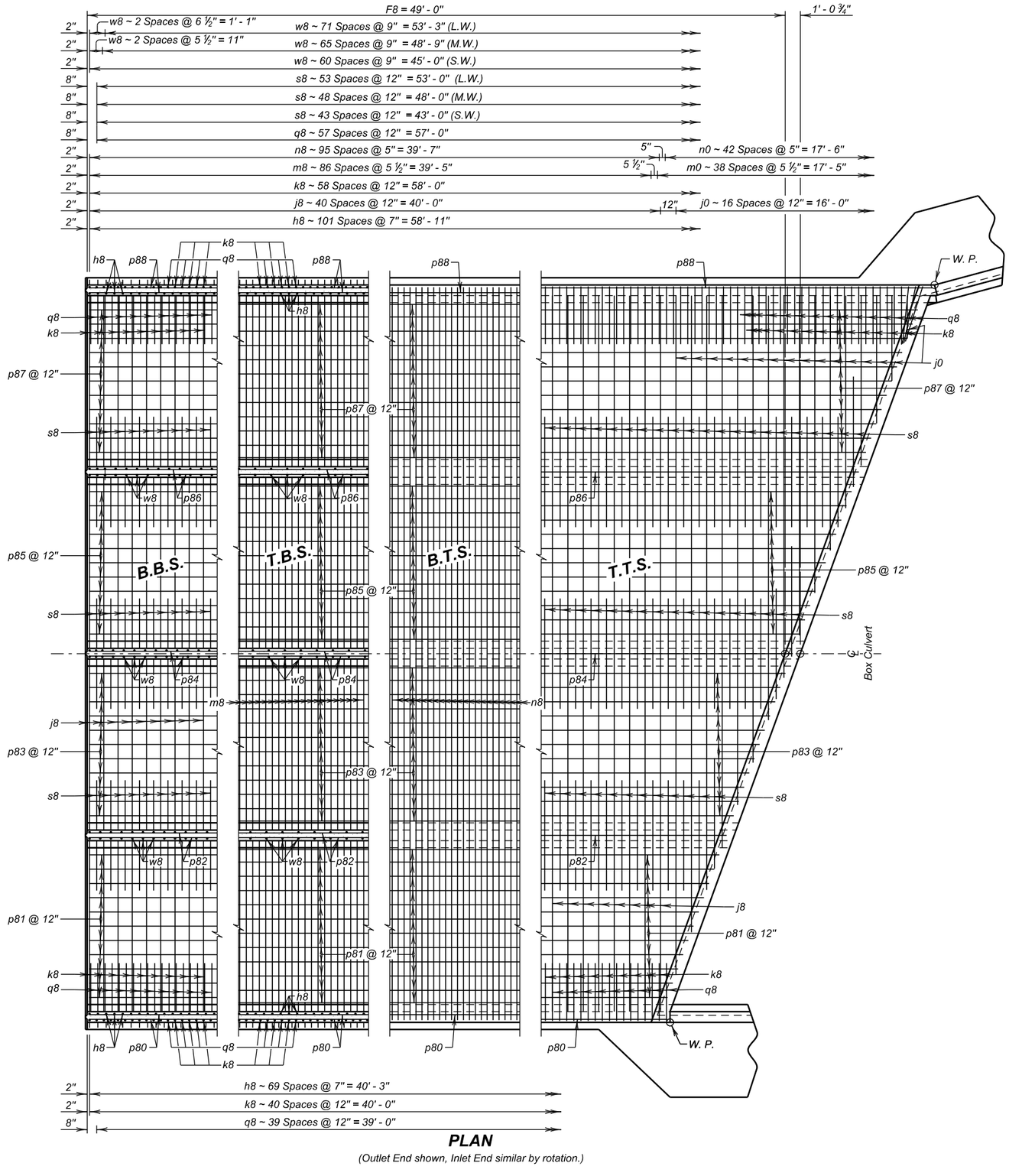
OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

7 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB07		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E10	E62



PLAN

(Outlet End shown, Inlet End similar by rotation.)

LEGEND FOR PLACING RE-STEEL

T. T. S.	- Top of Top Slab
B. T. S.	- Bottom of Top Slab
T. B. S.	- Top of Bottom Slab
B. B. S.	- Bottom of Bottom Slab
S. W.	- Short Wall
M. W.	- Middle Wall
L. W.	- Long Wall

SITE 1
ALTERNATE A

F8 BARREL END SECTION DETAILS (49' - 0") (A)

FOR

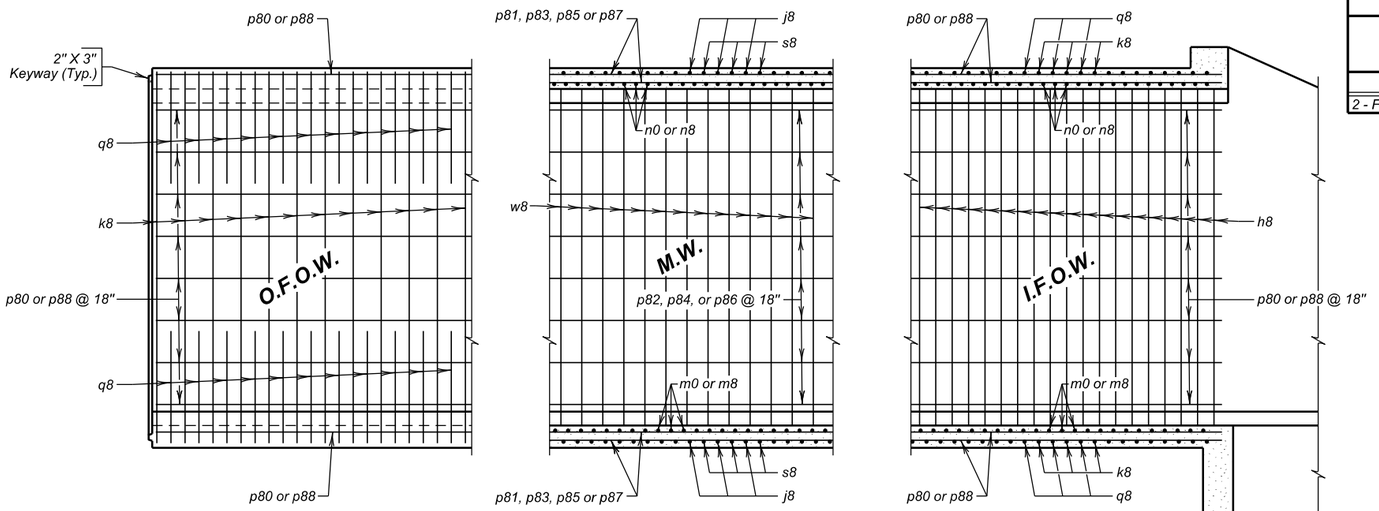
4 - 12' x 12' BOX CULVERT

OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	BRIDGE ENGINEER
HAKN04FW	04FWVMB08		

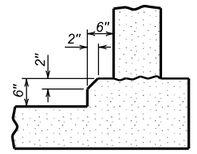
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E11	E62



ELEVATION

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu.Yd.	Lb.	Cu.Yd.
2 - F8 Barrel End Sections @ 49' - 0"	472.8	85354	159.6



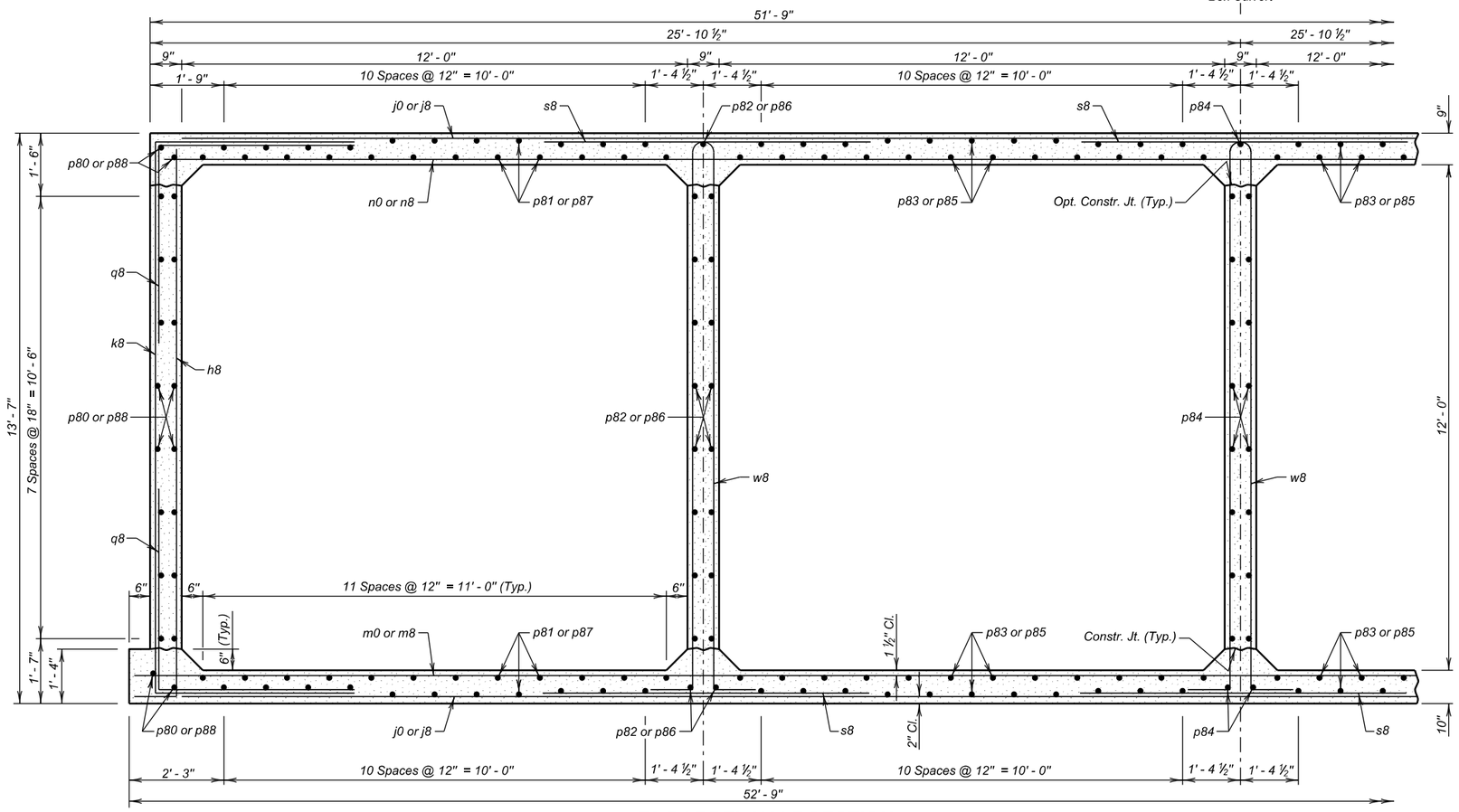
OPTIONAL FILLET DETAIL

(At Bottom Slab)

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

OPTIONAL POUR - BOTTOM SLAB

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



F8 BARREL HALF SECTION

(8' - 0" Maximum Fill)

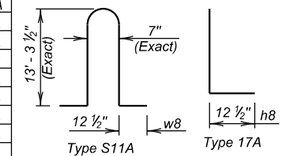
△ *Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10. Quantity of z1 bars is for one construction joint.*

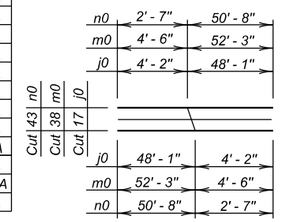
REINFORCING SCHEDULE

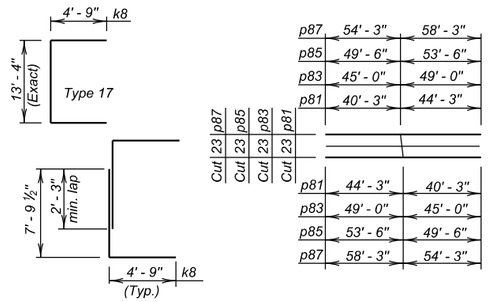
(For 2 - F8 Barrel End Sections)

Mk.	No.	Size	Length	Type
h8	344	4	14' - 0"	17A
⧄ j0	34	6	52' - 3"	Str.
j8	164	6	50' - 3"	Str.
k8	200	5	22' - 9"	17
⧄ m0	39	5	56' - 9"	Str.
m8	174	5	52' - 6"	Str.
⧄ n0	43	5	53' - 3"	Str.
n8	192	5	51' - 6"	Str.
p80	40	4	40' - 3"	Str.
⧄ p81	46	4	84' - 6"	Str.
p82	38	4	44' - 6"	Str.
⧄ p83	46	4	94' - 0"	Str.
p84	38	4	49' - 0"	Str.
⧄ p85	46	4	103' - 0'	Str.
p86	38	4	53' - 9"	Str.
⧄ p87	46	4	112' - 6"	Str.
p88	40	4	59' - 0"	Str.
q8	392	5	9' - 6"	17A
s8	588	6	8' - 0"	Str.
w8	406	4	29' - 0"	S11A
△ z1	136	5	3' - 6"	Str.

Bending Details







OPTIONAL k8 SPLICE DETAIL

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

NOTES:

All dimensions are out to out of bars.

⧄ *See cutting diagram.*

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

Type 17A

LEGEND FOR PLACING RE-STEEL

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

SITE 1
ALTERNATE A

F8 BARREL END SECTION DETAILS (49' - 0") (B)

FOR

4 - 12' x 12' BOX CULVERT

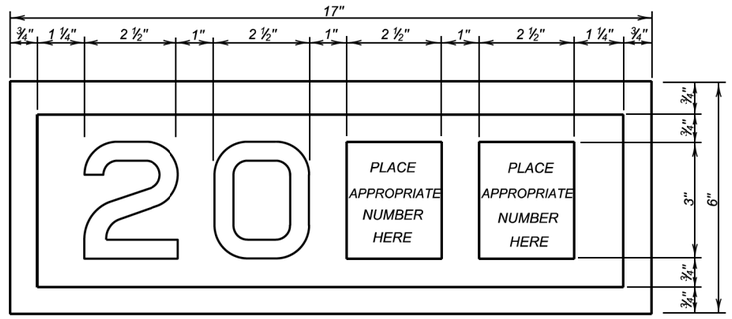
OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2021

9 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB09		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E12	E62



YEAR PLATE DETAILS

GENERAL NOTES:

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

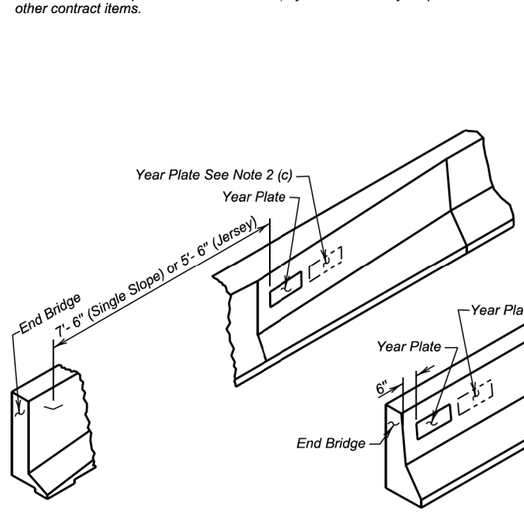
2. Year plates will be located on structure(s) as follows:

   a. On cast-in-place box culverts the year plates will be four and one - half (4 ½) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.

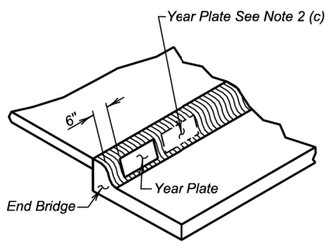
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'- 6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.

   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

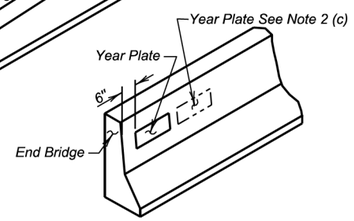
3. There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



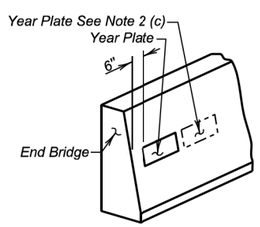
BARRIER
(With Endblock)



TYPE B CURB



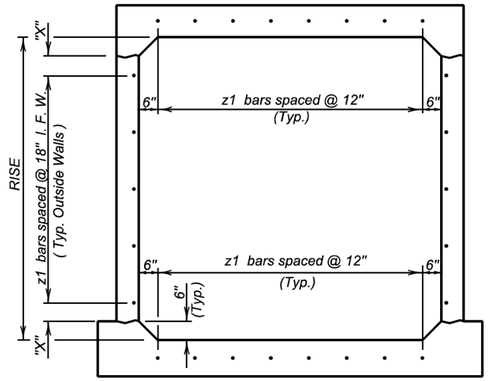
JERSEY BARRIER



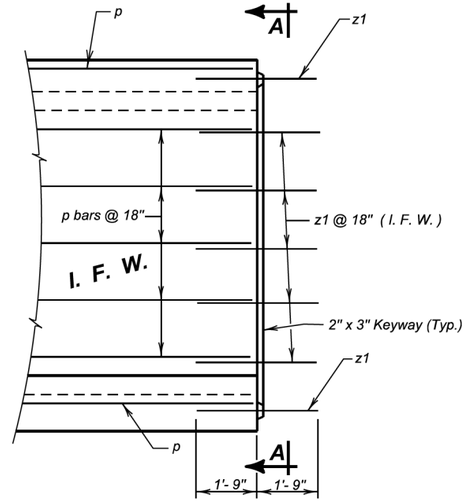
SINGLE SLOPE BARRIER

January 22, 2021

Published Date: 1st Qtr. 2023	SDDOT	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1



TYPICAL SINGLE BARREL VIEW A - A

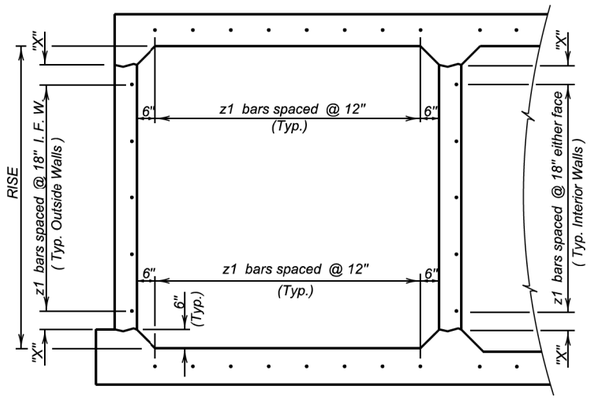


ELEVATION

LEGEND FOR PLACING RE-STEEL

I. F. W.	- Inside Face Wall

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



TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

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

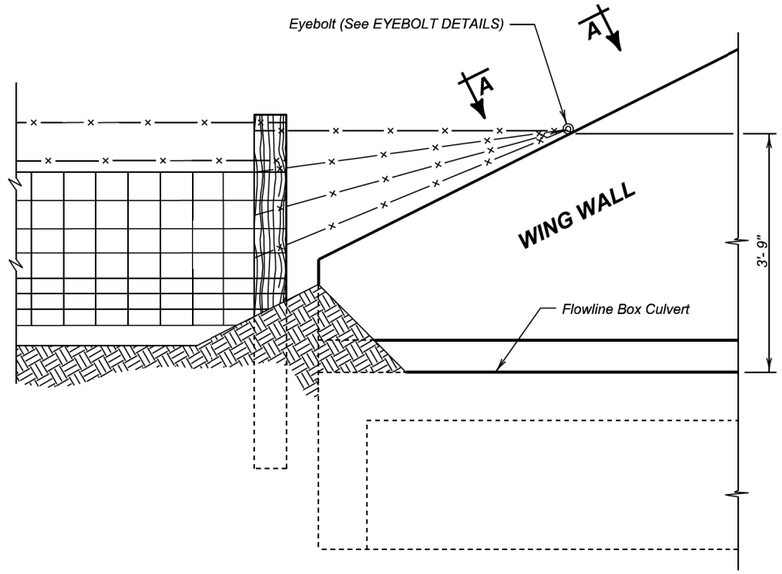
2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

Published Date: 1st Qtr. 2023	SDDOT	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1

SITE 1
ALTERNATE A

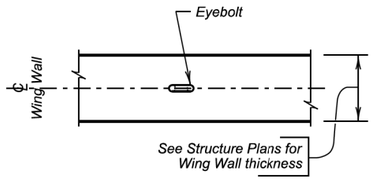
4 - 12' X 12' BOX CULVERT
STR. NO. 28-195-480
DECEMBER 2021



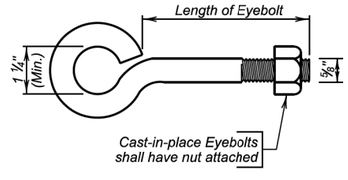
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be ⅝ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be 4 ½ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the ⅝ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23,2012

Published Date: 1st Qtr. 2023	SDDOT	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
			Sheet 1 of 1

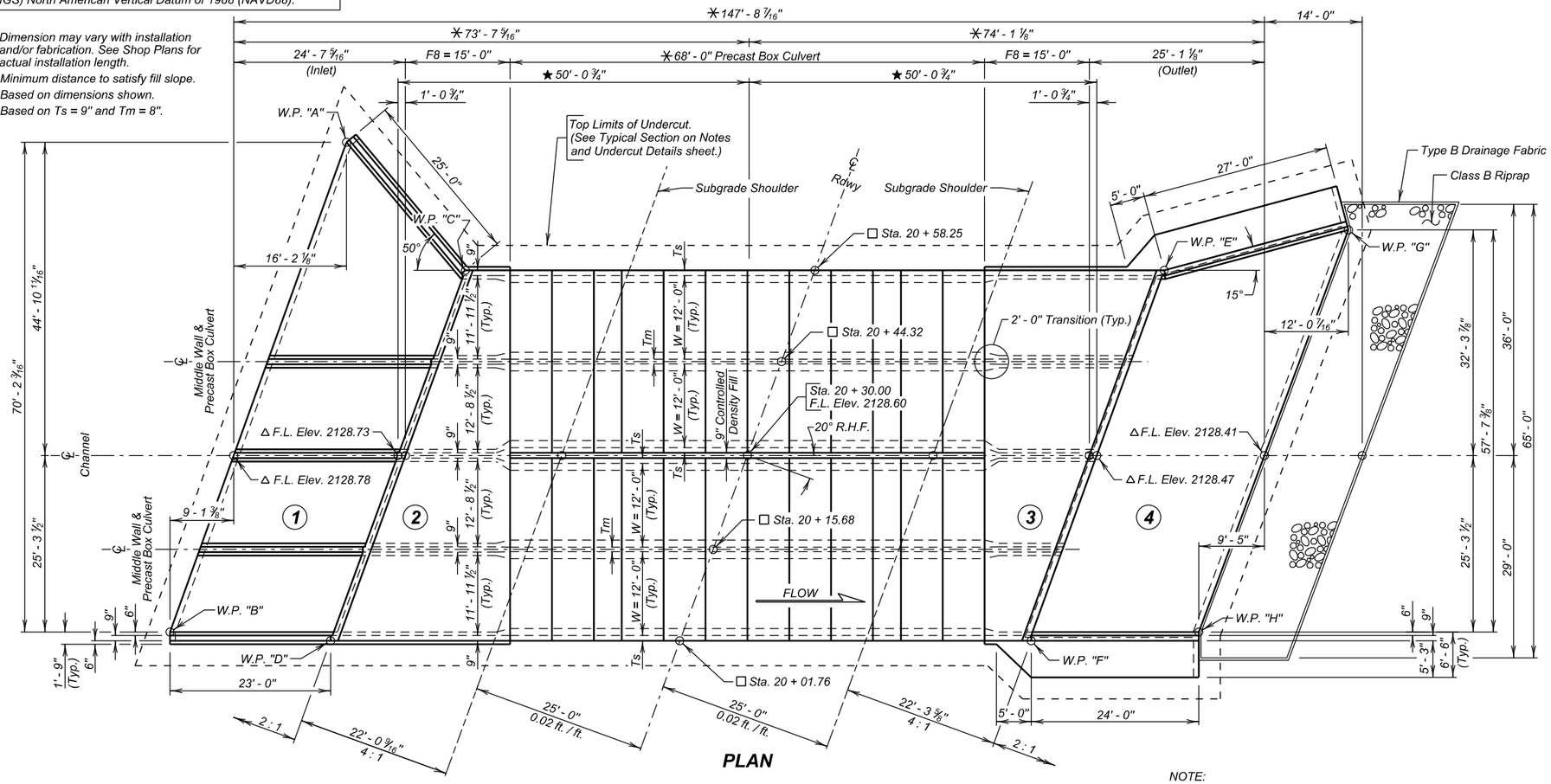
SITE 1
ALTERNATE A

4 - 12' X 12' BOX CULVERT
STR. NO. 28-195-480
DECEMBER 2021

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E14	E62

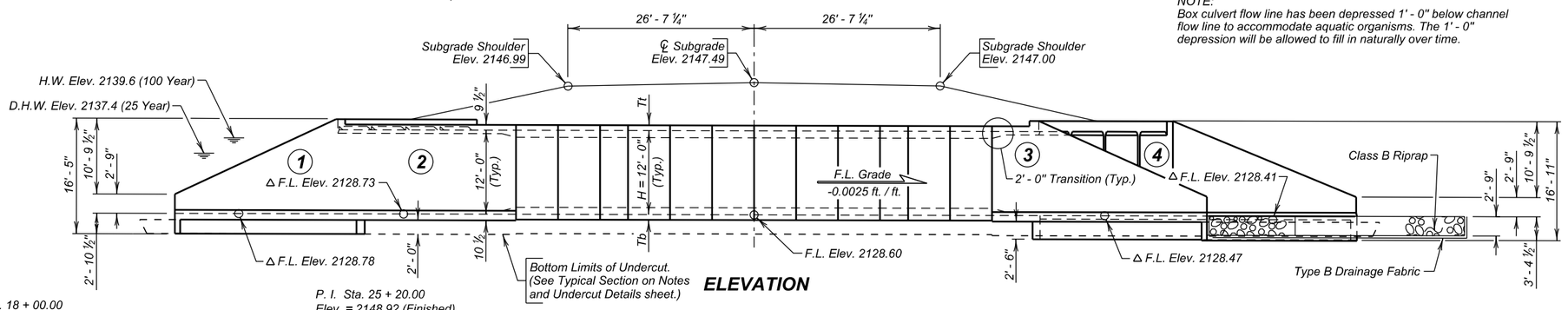
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

⚹ Dimension may vary with installation and/or fabrication. See Shop Plans for actual installation length.
★ Minimum distance to satisfy fill slope.
△ Based on dimensions shown.
☐ Based on Ts = 9" and Tm = 8".



PLAN

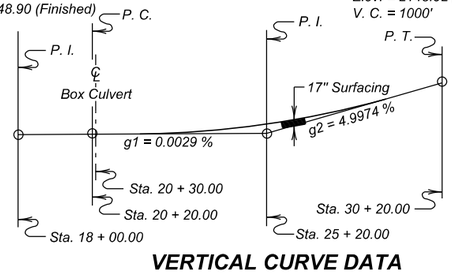
NOTE:
Box culvert flow line has been depressed 1' - 0" below channel flow line to accommodate aquatic organisms. The 1' - 0" depression will be allowed to fill in naturally over time.



ELEVATION

P. I. Sta. 18 + 00.00
Elev. = 2148.90 (Finished)

P. I. Sta. 25 + 20.00
Elev. = 2148.92 (Finished)
V. C. = 1000'



VERTICAL CURVE DATA

HYDRAULIC DATA

Q_d	2173 cfs
A_d	410 sq ft
V_d	6.3 fps
Q_F	2173 cfs
Q_{100}	3866 cfs
Q_{OT}	$>Q_{500}$
V_{max}	10.6 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2137.4.

Q_{OT} = Overtopping discharge and frequency > Q_{500} year recurrence interval. El. 2148.7 @ Sta. 13 + 68.00 ±.

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. 2139.6.

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

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	20 + 52.54	69.32' Lt.
"B"	19 + 77.94	69.09' Lt.
"C"	20 + 41.12	47.04' Lt.
"D"	19 + 84.63	47.04' Lt.
"E"	20 + 75.37	47.04' Rt.
"F"	20 + 18.97	47.30' Rt.
"G"	20 + 89.83	69.88' Rt.
"H"	20 + 28.35	69.43' Rt.

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

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 - Inlet Details (A)
Sheet No. 4 - Inlet Details (B)
Sheet No. 5 - Inlet Details (C)
Sheet No. 6 - Outlet Details (A)
Sheet No. 7 - Outlet Details (B)
Sheet No. 8 - F8 Barrel End Section Details (15' - 0") (A)
Sheet No. 9 - F8 Barrel End Section Details (15' - 0") (B)
Sheet No. 10 - Details of Standard Plate No's 460.02 and 460.10
Sheet No. 11 - Details of Standard Plate No's 560.01 abd 620.16

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
	Class A45 Concrete, Box Culvert	Cu. Yd.	318.9
	Reinforcing Steel	Lb.	53269
∢	Structure Excavation, Box Culvert	Cu. Yd.	162
	Box Culvert Undercut	Cu. Yd.	726
∢	Controlled Density Fill	Cu. Yd.	27.0
	2 - 12' X 12' Precast Concrete Culvert, Furnish	Ft.	68
	2 - 12' X 12' Precast Concrete Culvert, Install	Ft.	68
≠	Class B Riprap	Ton	130.0
	Type B Drainage Fabric	Sq. Yd.	152

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

SITE 1
ALTERNATE B
GENERAL DRAWING AND QUANTITES
FOR
4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

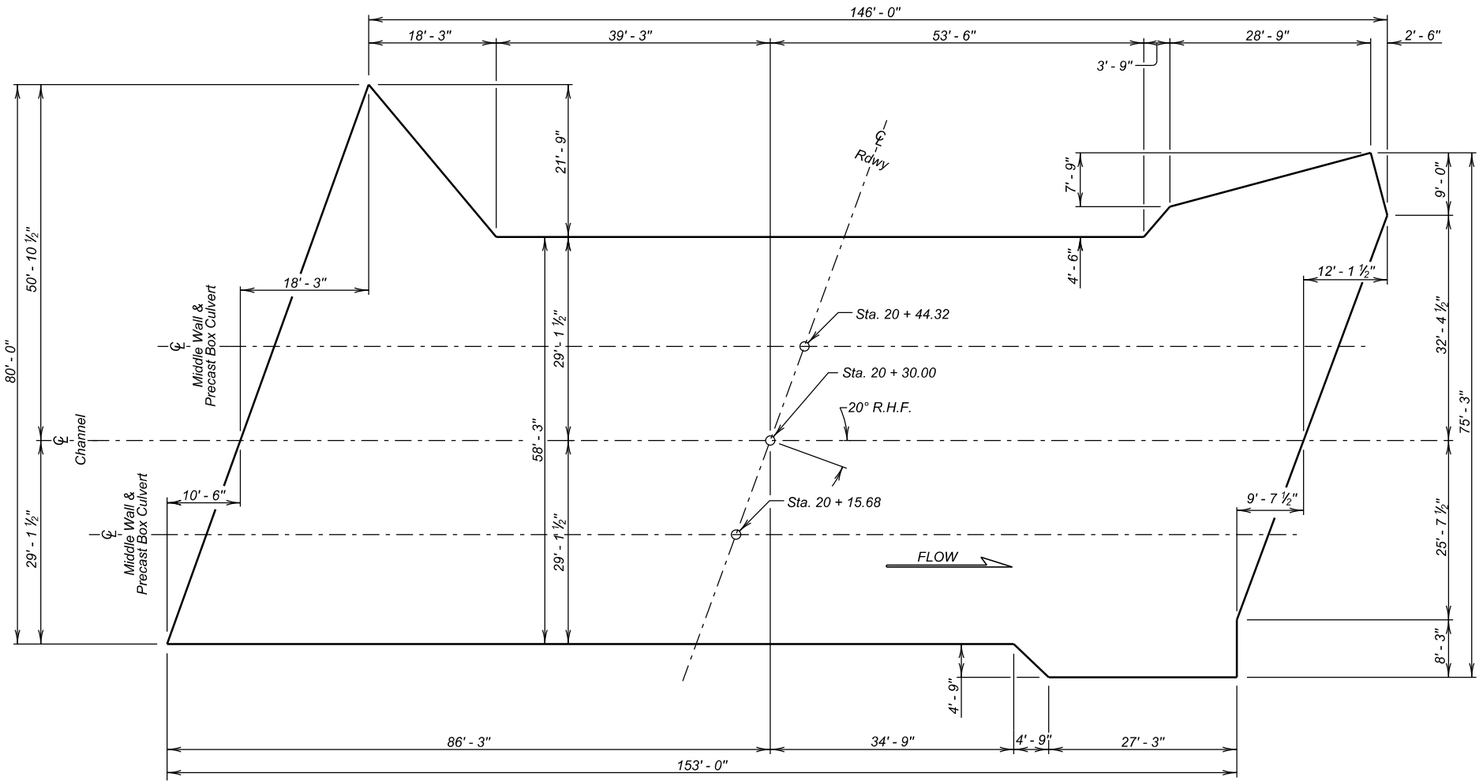
OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
PCN 04FW — HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

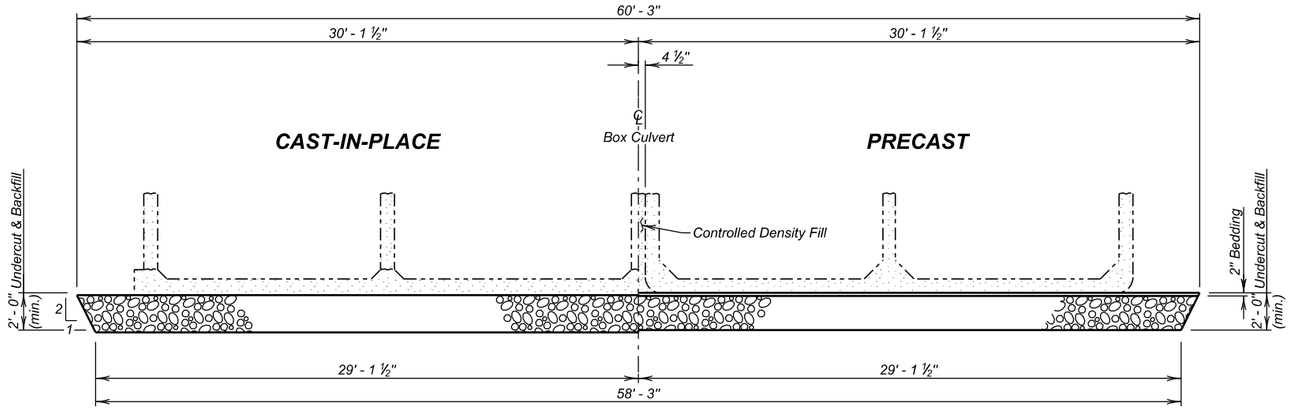
-X028-

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB12		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E15	E62



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SPECIFICATIONS

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

GENERAL NOTES CAST-IN-PLACE PORTIONS

1. Design Live Load: HL-93 and construction load consisting of two 7' - 6" gage axles spaced 30 ft. apart with gross axle weight (each axle) = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.
2. The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 8 ft. (F8).
3. Design Material Strengths: Concrete $f'c$ = 4500 p.s.i.
   Reinforcing Steel f_y = 60000 p.s.i.
4. All concrete will be Class A45, Box Culvert conforming to Section 460 of the Construction Specifications.
5. All reinforcing steel will conform to ASTM A615 Grade 60.
6. All lap splices shown are contact lap splices unless noted otherwise.
7. All exposed edges will be chamfered ¾ inch unless noted otherwise in the plans.
8. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
9. The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
10. Care will be taken to establish Working Points (W.P.) as shown on the wings.
11. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
12. Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.
13. Soils below the bottom of the proposed RCBC consist of 4' of gravelly clay sand alluvium overlying Pierre Shale. Groundwater was encountered in the borings at an elevation of 2131.7 during the subsurface investigation conducted in May 2020. Dewatering will be required during construction.

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
ⓟ	Box Culvert Undercut	Cu. Yd.	726

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

GENERAL NOTES PRECAST PORTIONS

1. Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. If construction loads in excess of legal load are anticipated by the Contractor, the Contractor will submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.
2. The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with the latest Interim Revisions using the LRFR method. The rating will include evaluation of the Design HL-93 truck at both Inventory and Operating levels and a Legal Load rating for three SD legal trucks (Type 3, 3S2 and 3-2) as well as the notional rating load and four specialized hauling vehicles. The structure will also be evaluated for the emergency vehicles, EV2 and EV3, at the legal load rating level. All sections of the box culvert will rate at HL-93 or better (Inventory Level). The three SD legal loads, the notional rating load, the four specialized hauling vehicles, and two emergency vehicles will rate greater than 1.0 at legal load rating level. AASHTOWare Bridge Rating (BrR) is required to be used to rate the box culvert. Include the BrR rating model and a load rating summary table with the load rating calculations, Submit load rating calculations with the design and independent check design calculations or shop plans, as appropriate.
3. The design of the barrel sections will be based on a minimum fill height of 2 feet and include all subsequent fill heights up to and including the maximum fill height of 8 ft. over the box culvert.
4. Minimum inside corner fillet will be 6 in.
5. Minimum precast barrel section length will be 4 ft.
6. Lift holes will be plugged with an approved nonshrinkable grout.
7. Installation of the precast sections will be in accordance with the final approved shop plans.
8. Care will be taken when placing sections. Sections will be only moved using the lifting holes by approved equipment.

DESIGN MIX OF CONCRETE PRECAST PORTIONS

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

CONSTRUCTION JOINT

The end of the precast section, at the construction joint between precast and C. I. P. sections, will incorporate tie reinforcing steel and a 2" x 3" (nominal) keyway as follows:

1. Tie reinforcement matching the size length, and spacing shown of the S. D. Dept. of Transportation STANDARD PLATE NO. 460. 10 titled "BOX CULVERT BARREL TIE REINFORCEMENT" will be fabricated into the end of the precast section.
2. The keyway will be fabricated into the end of the precast section, continuous for the full length of the slabs and walls, and positioned to be centered in the adjoining cast-in-place section members.
3. All costs associated with furnishing the tie reinforcing and keyway will be incidental to the unit price per foot for Precast Concrete Box Culvert Section - Furnish.

SHOP PLANS

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

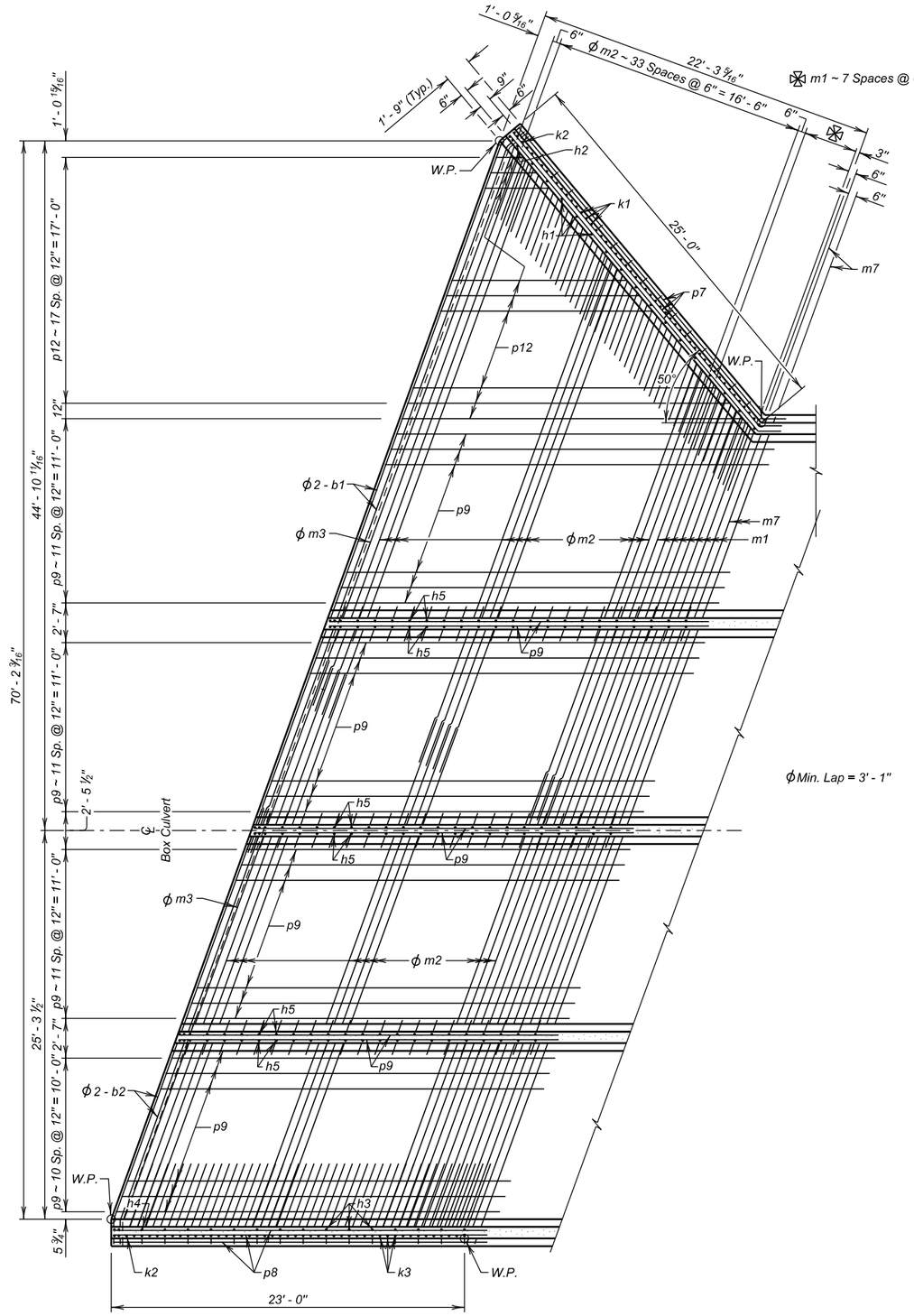
SITE 1
ALTERNATE B
NOTES AND UNDERCUT DETAILS
FOR
4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

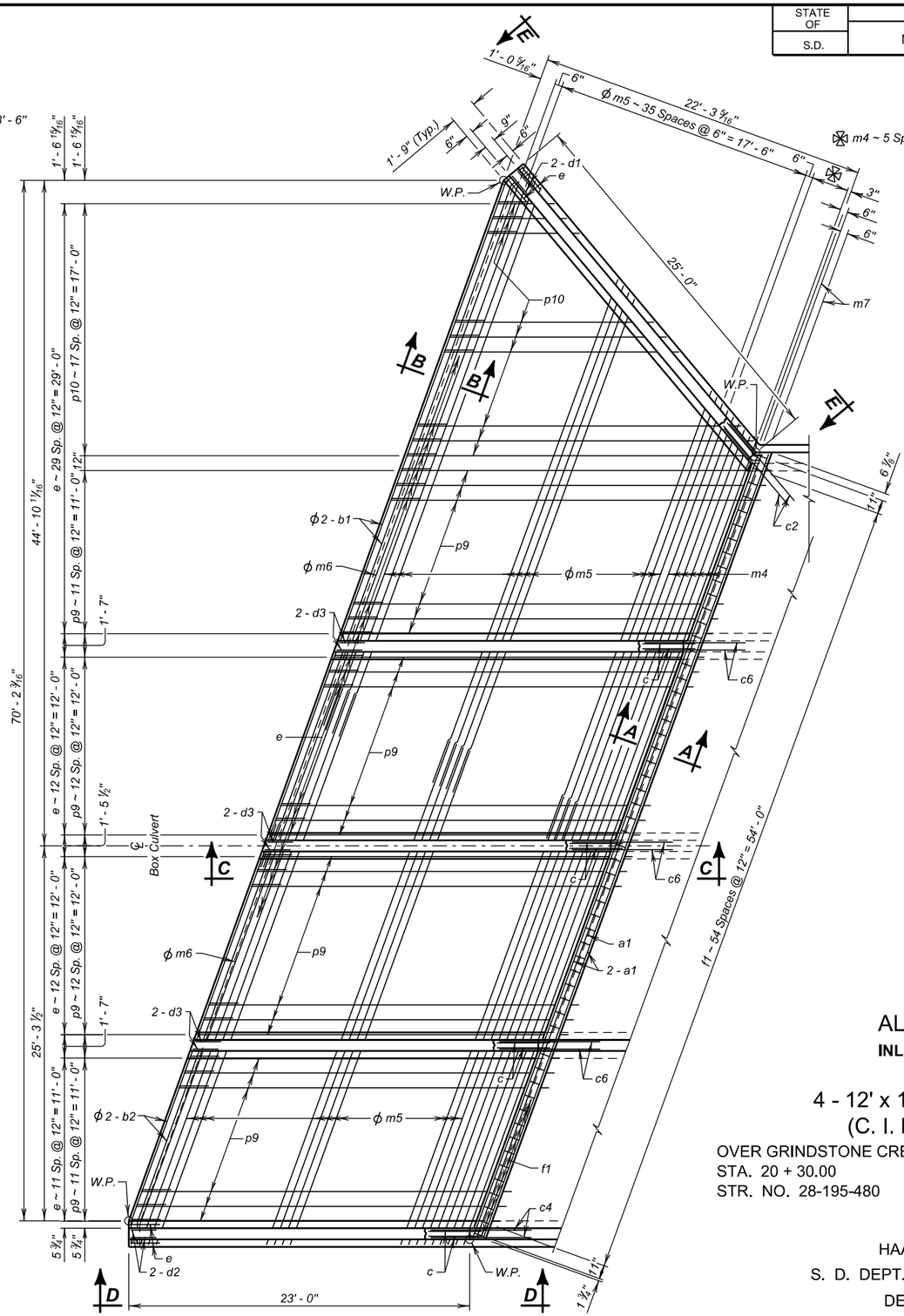
DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB HAKN04FW	AU 04FWVMB13	BT	Steve A. Johnson BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E16	E62



ϕ Min. Lap = 3' - 1"

PLAN
(Bottom Steel)



PLAN
(Top Steel)

SITE 1
ALTERNATE B
INLET DETAILS (A)

FOR

4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

OVER GRINDSTONE CREEK
STA. 20 + 30.00
STR. NO. 28-195-480

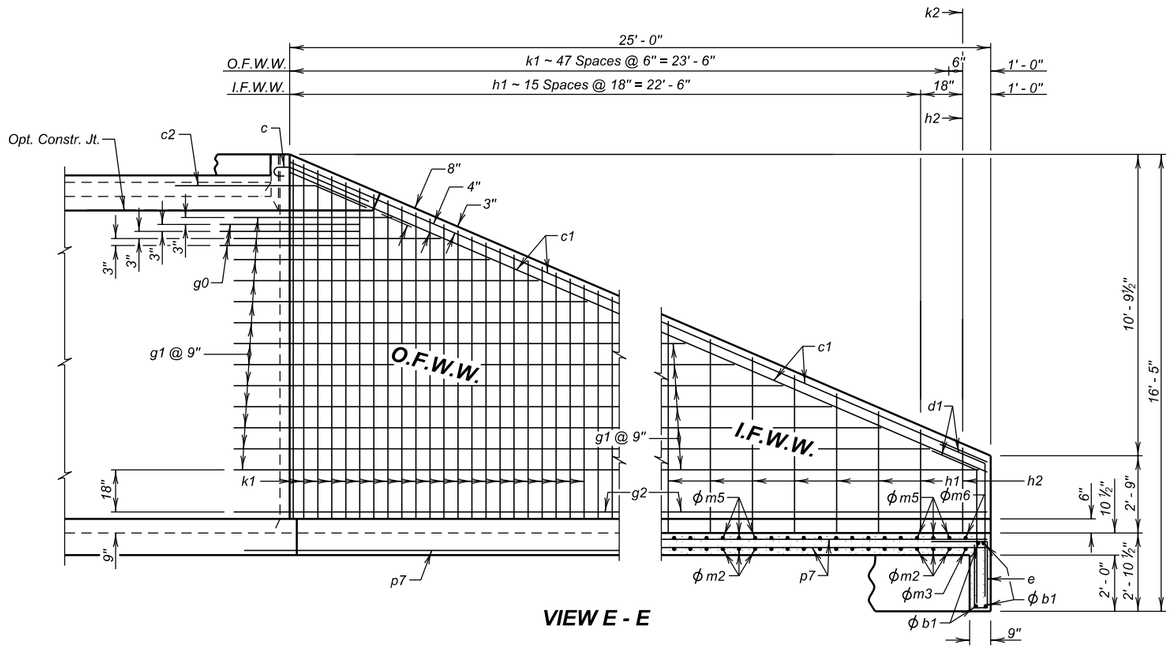
20° RHF SKEW
SEC. 8/17-T01N-R21E
NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

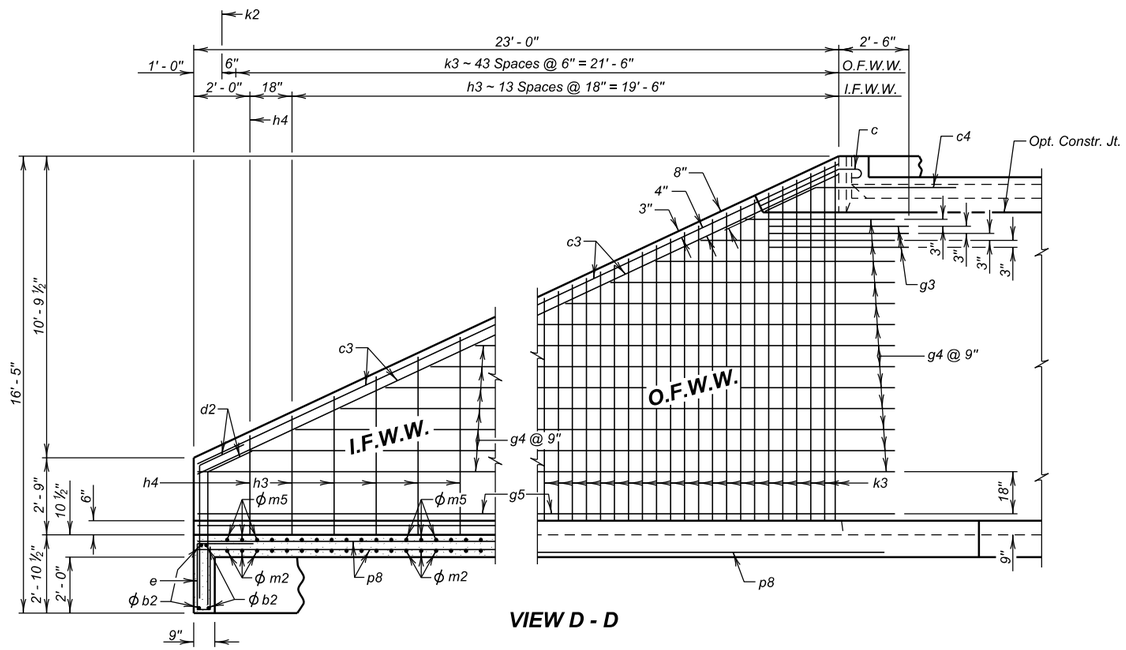
3 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	Steve A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB14		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E17	E62



VIEW E - E

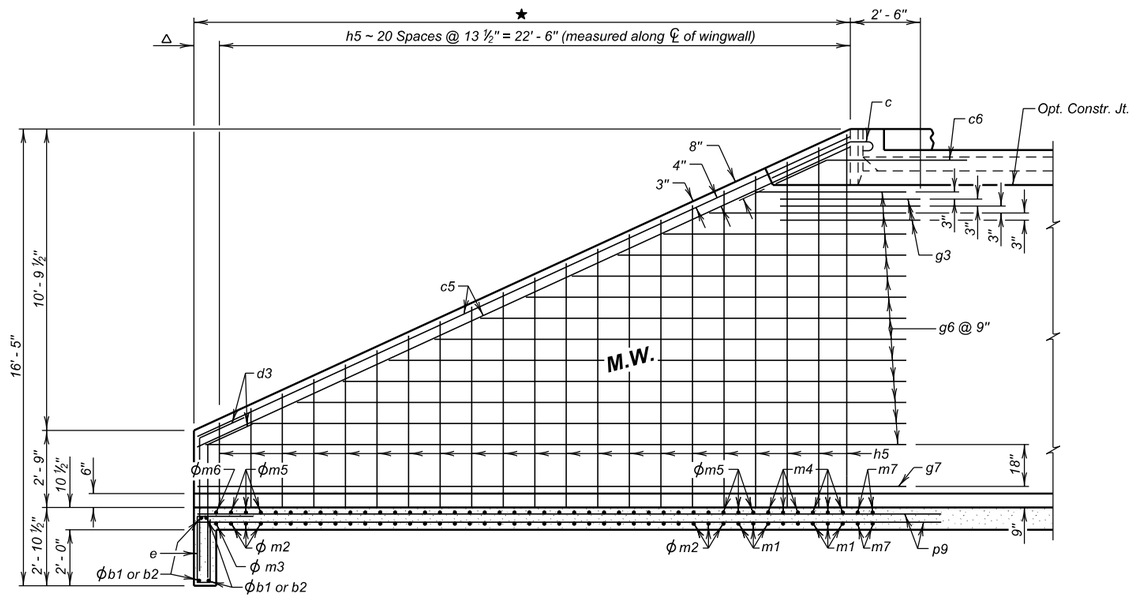


VIEW D - D

★ 23' - 5 ½" - Long Wall (measured along ℄ of wingwall)
★ 23' - 4 ⅞" - Middle Wall (measured along ℄ of wingwall)
★ 23' - 4 5/16" - Short Wall (measured along ℄ of wingwall)

ϕ Min. Lap = 3' - 1"

△ 11 ½" - Long Wall (measured along ℄ of wingwall)
△ 10 ⅞" - Middle Wall (measured along ℄ of wingwall)
△ 10 5/16" - Short Wall (measured along ℄ of wingwall)



SECTION C - C

(Middle Wall shown, Long Wall and Short Wall similar except as shown)

LEGEND FOR PLACING RE-STEEL

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

SITE 1
ALTERNATE B
INLET DETAILS (B)
FOR
4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

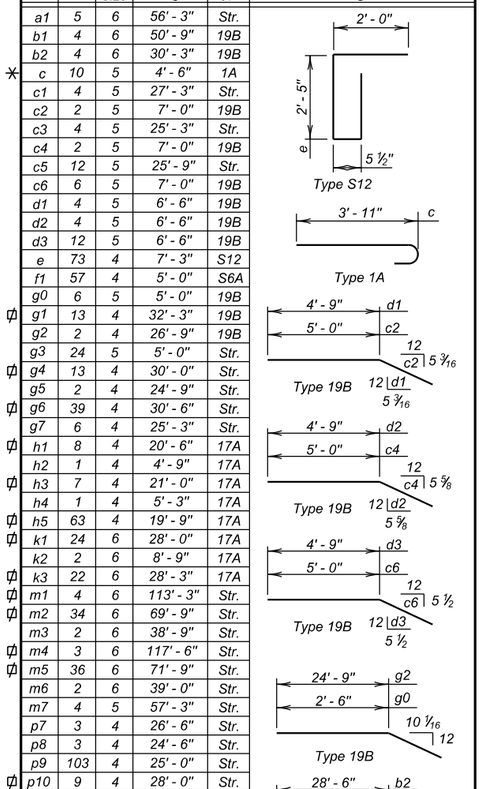
4 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB15		

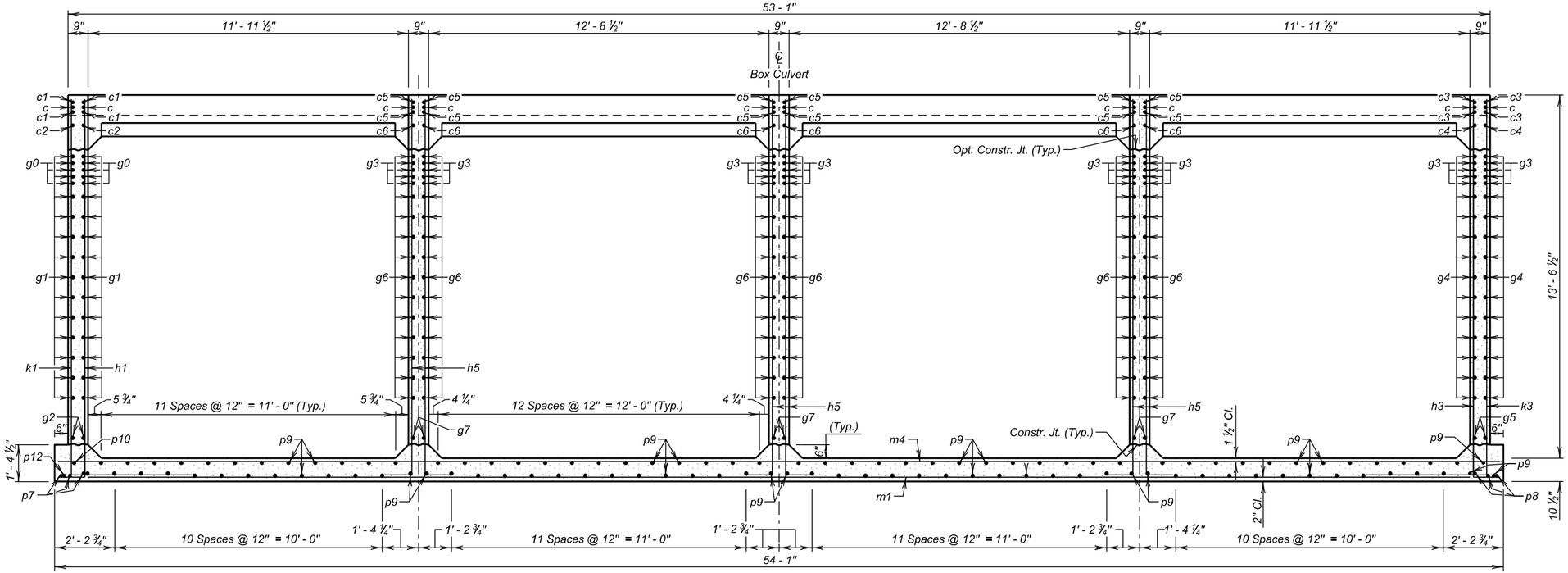
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E18	E62

REINFORCING SCHEDULE

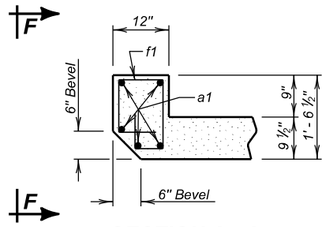
Mk.	No.	Size	Length	Type	Bending Details
a1	5	6	56' - 3"	Str.	
b1	4	6	50' - 9"	19B	
b2	4	6	30' - 3"	19B	
✳ c	10	5	4' - 6"	1A	
c1	4	5	27' - 3"	Str.	
c2	2	5	7' - 0"	19B	
c3	4	5	25' - 3"	Str.	
c4	2	5	7' - 0"	19B	
c5	12	5	25' - 9"	Str.	
c6	6	5	7' - 0"	19B	
d1	4	5	6' - 6"	19B	
d2	4	5	6' - 6"	19B	
d3	12	5	6' - 6"	19B	
e	73	4	7' - 3"	S12	
f1	57	4	5' - 0"	S6A	
g0	6	5	5' - 0"	19B	
⌀ g1	13	4	32' - 3"	19B	
g2	2	4	26' - 9"	19B	
g3	24	5	5' - 0"	Str.	
⌀ g4	13	4	30' - 0"	Str.	
g5	2	4	24' - 9"	Str.	
⌀ g6	39	4	30' - 6"	Str.	
g7	6	4	25' - 3"	Str.	
⌀ h1	8	4	20' - 6"	17A	
h2	1	4	4' - 9"	17A	
⌀ h3	7	4	21' - 0"	17A	
h4	1	4	5' - 3"	17A	
⌀ h5	63	4	19' - 9"	17A	
⌀ k1	24	6	28' - 0"	17A	
k2	2	6	8' - 9"	17A	
⌀ k3	22	6	28' - 3"	17A	
⌀ m1	4	6	113' - 3"	Str.	
⌀ m2	34	6	69' - 9"	Str.	
m3	2	6	38' - 9"	Str.	
⌀ m4	3	6	117' - 6"	Str.	
⌀ m5	36	6	71' - 9"	Str.	
m6	2	6	39' - 0"	Str.	
m7	4	5	57' - 3"	Str.	
p7	3	4	26' - 6"	Str.	
p8	3	4	24' - 6"	Str.	
p9	103	4	25' - 0"	Str.	
⌀ p10	9	4	28' - 0"	Str.	
⌀ p12	9	4	27' - 0"	Str.	



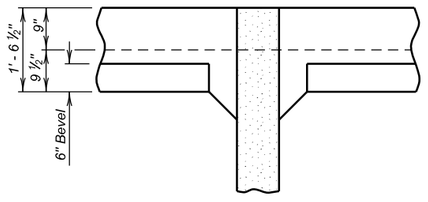
NOTES:
All dimensions are out to out of bars.
⌀ See cutting diagram.
✳ Bend in field as necessary to fit.



TYPICAL INLET SECTION
(At parapet)

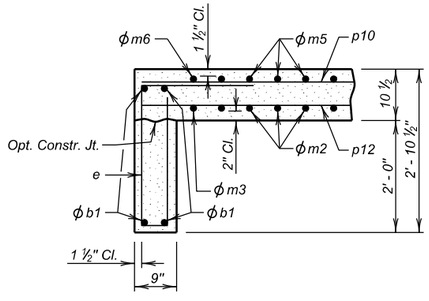


SECTION A - A
(At Top Slab)



VIEW F - F
(At Interior Wall)

⌀ Min. Lap = 3' - 1"



SECTION B - B

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	88.2	18203	55.0

SITE 1
ALTERNATE B
INLET DETAILS (C)
FOR
4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

OVER GRINDSTONE CREEK
STA. 20 + 30.00
STR. NO. 28-195-480

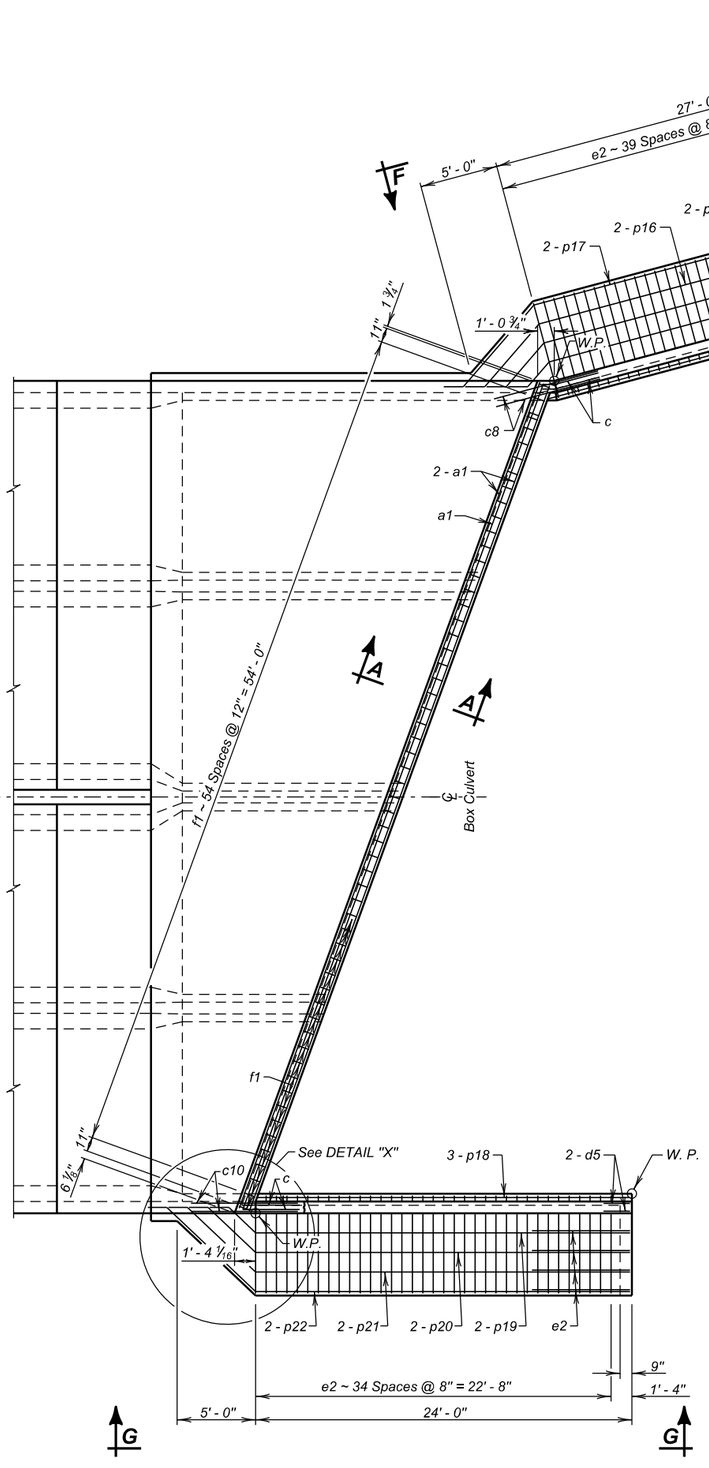
20° RHF SKEW
SEC. 8/17-T01N-R21E
NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

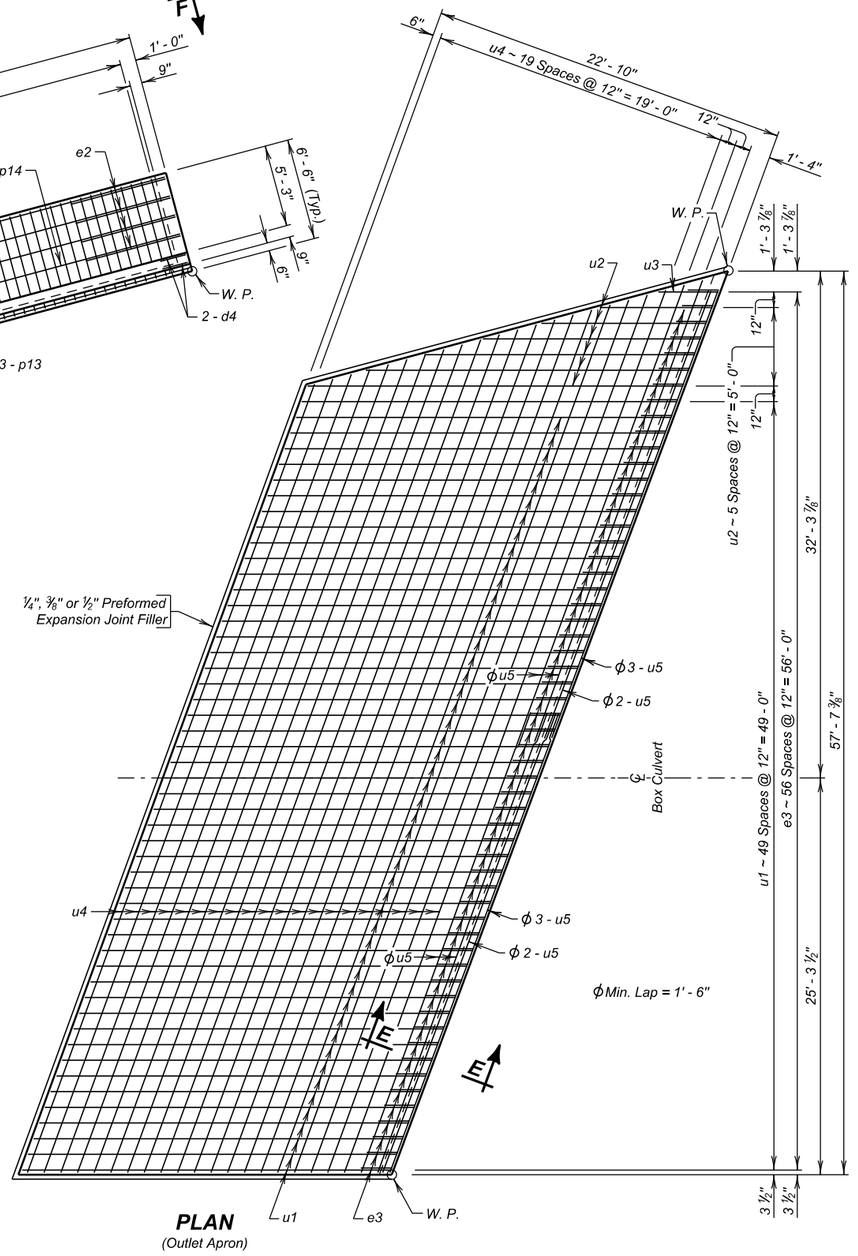
5 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	BRIDGE ENGINEER
HAKN04FW	04FWVMB16		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E19	E62

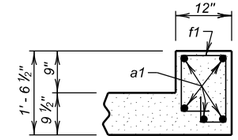


PLAN

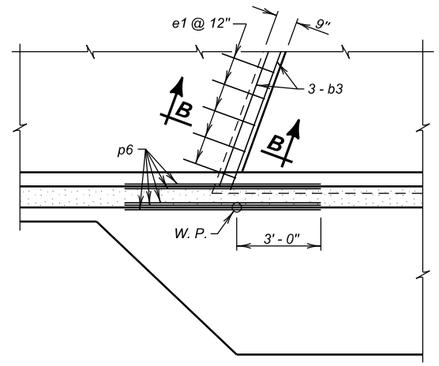


PLAN
(Outlet Apron)

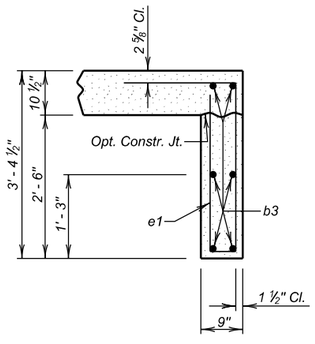
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



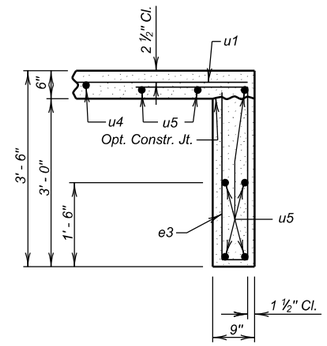
SECTION A - A
(At Top Slab)



DETAIL "X"
(At Bottom Slab)



SECTION B - B



SECTION E - E

SITE 1
ALTERNATE B
OUTLET DETAILS (A)
FOR
4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

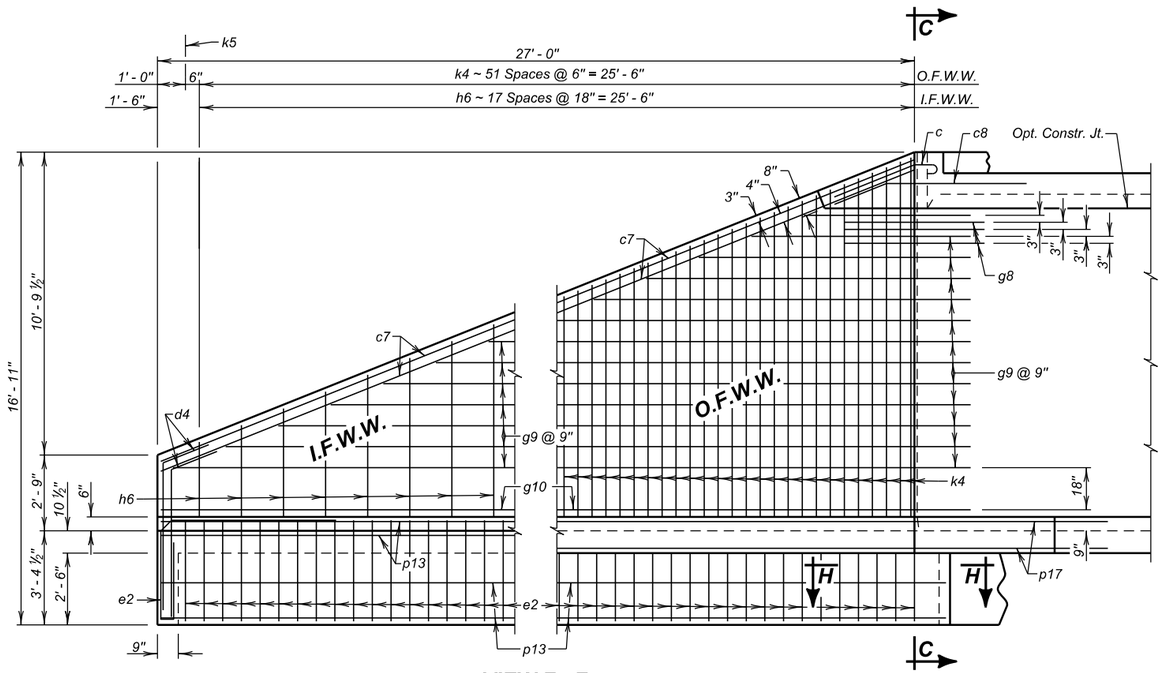
OVER GRINDSTONE CREEK
STA. 20 + 30.00
STR. NO. 28-195-480

20° RHF SKEW
SEC. 8/17-T01N-R21E
NH 0014(230)145
HL-93

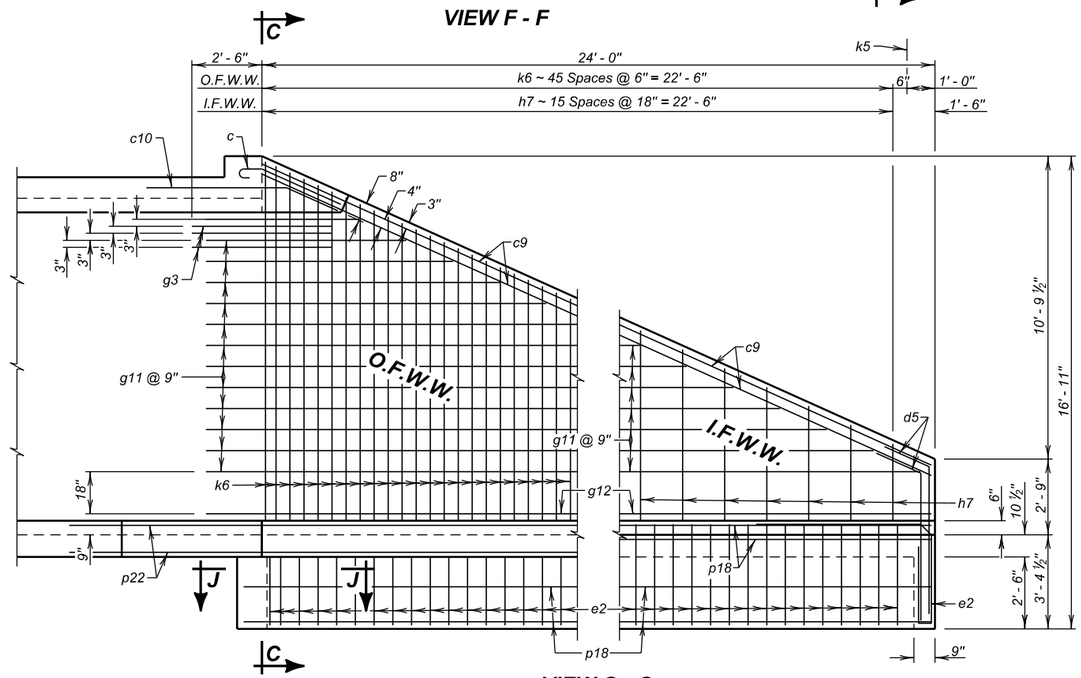
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB17		

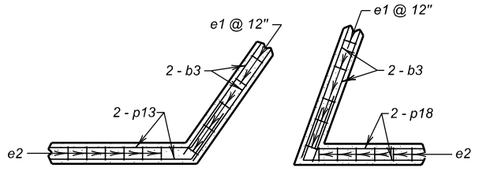
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E20	E62



VIEW F - F

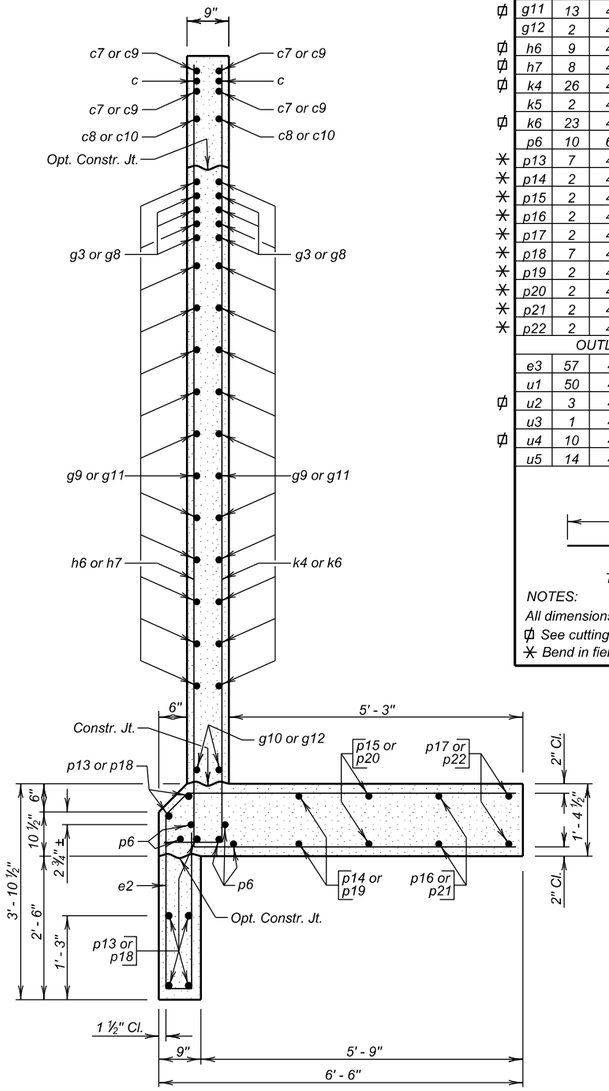


VIEW G - G



SECTION H - H

SECTION J - J

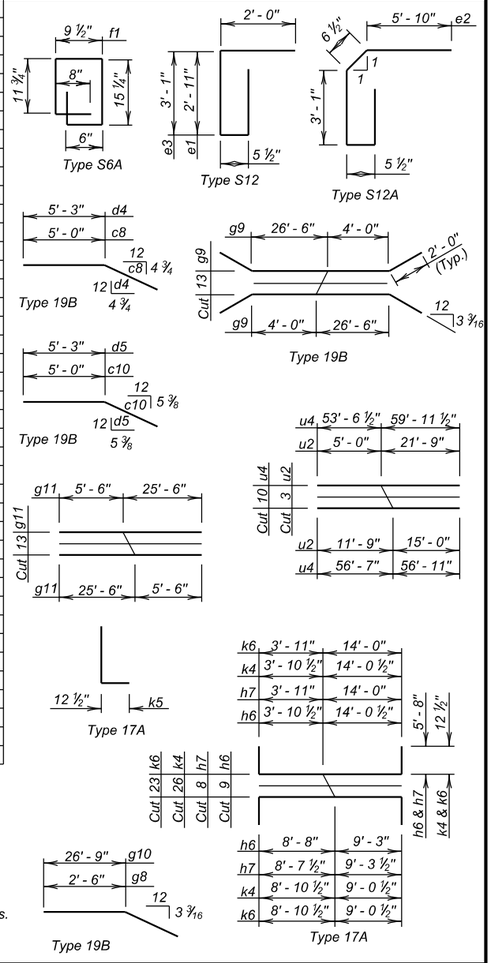


SECTION C - C

REINFORCING SCHEDULE

	Mk.	No.	Size	Length	Type
	a1	5	6	56' - 3"	Str.
	b3	6	6	55' - 0"	Str.
✳	c	4	5	4' - 6"	1A
	c7	4	5	29' - 0"	Str.
	c8	2	5	7' - 0"	19B
	c9	4	5	26' - 3"	Str.
	c10	2	5	7' - 0"	19B
	d4	4	5	7' - 0"	19B
	d5	4	5	7' - 0"	19B
	e1	54	4	8' - 0"	S12
	e2	83	4	12' - 9"	S12A
	f1	57	4	5' - 0"	S6A
	g3	6	5	5' - 0"	Str.
	g8	6	5	5' - 0"	19B
⌀	g9	13	4	34' - 6"	19B
	g10	2	4	28' - 9"	19B
⌀	g11	13	4	31' - 0"	Str.
	g12	2	4	25' - 9"	Str.
⌀	h6	9	4	29' - 3"	17A
⌀	h7	8	4	29' - 3"	17A
⌀	k4	26	4	20' - 0"	17A
	k5	2	4	4' - 9"	17A
⌀	k6	23	4	20' - 0"	17A
	p6	10	6	7' - 0"	Str.
✳	p13	7	4	29' - 6"	Str.
✳	p14	2	4	30' - 6"	Str.
✳	p15	2	4	32' - 3"	Str.
✳	p16	2	4	33 - 9"	Str.
✳	p17	2	4	35' - 3"	Str.
✳	p18	7	4	26' - 6"	Str.
✳	p19	2	4	27' - 9"	Str.
✳	p20	2	4	29' - 6"	Str.
✳	p21	2	4	31' - 6"	Str.
✳	p22	2	4	33' - 3"	Str.
	OUTLET APRON				
	e3	57	4	8' - 6"	S12
	u1	50	4	23' - 6"	Str.
⌀	u2	3	4	26' - 9"	Str.
	u3	1	4	2' - 9"	Str.
⌀	u4	10	4	113' - 6"	Str.
	u5	14	4	31' - 3"	Str.

Bending Details



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

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	45.5	4845	22.6
Outlet Apron	31.5	2215	31.5

LEGEND FOR PLACING RE-STEEL

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

SITE 1
ALTERNATE B
OUTLET DETAILS (B)
FOR
4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

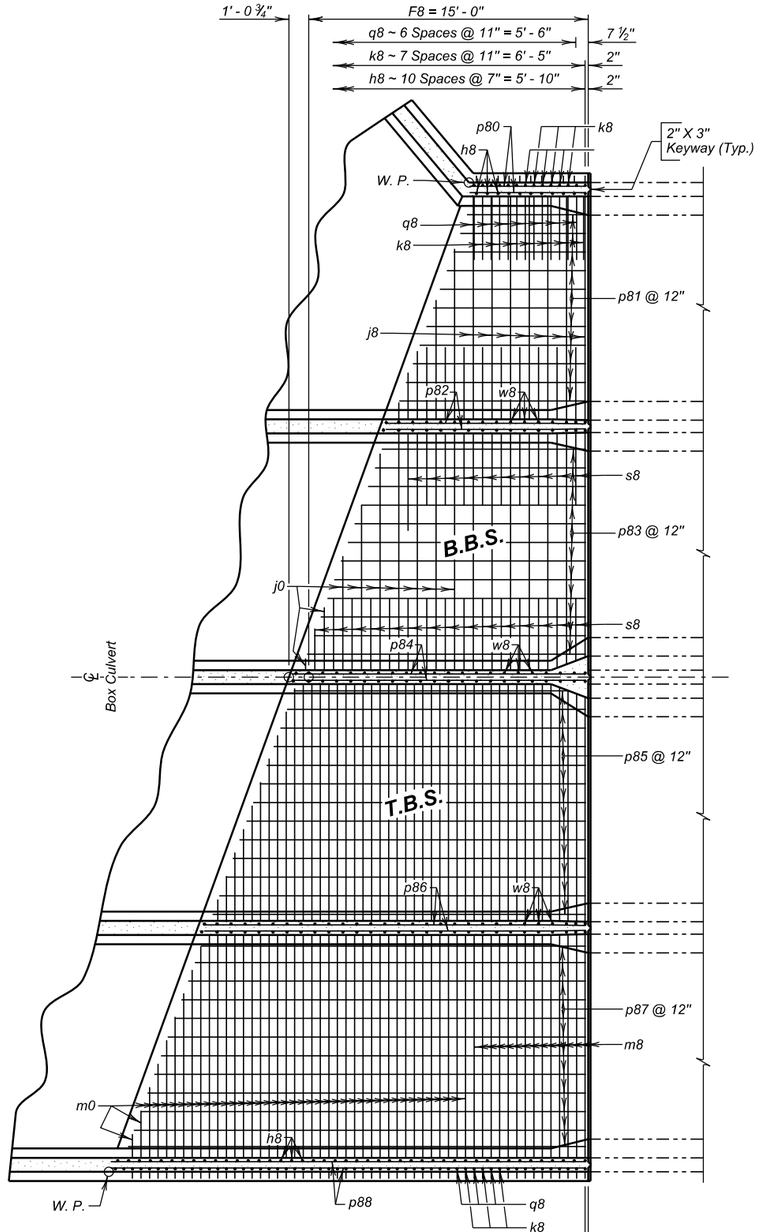
OVER GRINDSTONE CREEK — 20° RHF SKEW
STA. 20 + 30.00 — SEC. 8/17-T01N-R21E
STR. NO. 28-195-480 — NH 0014(230)145
HL-93

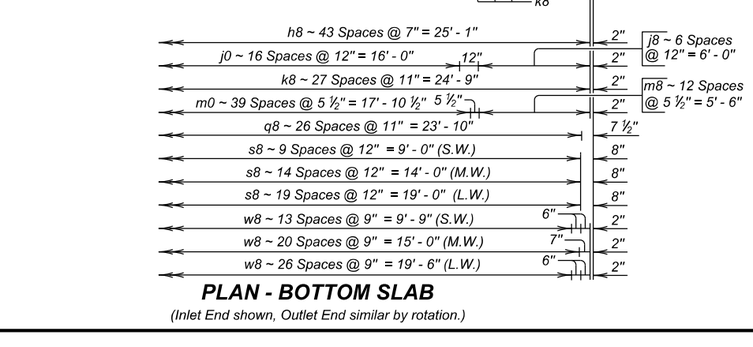
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

7 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB18		

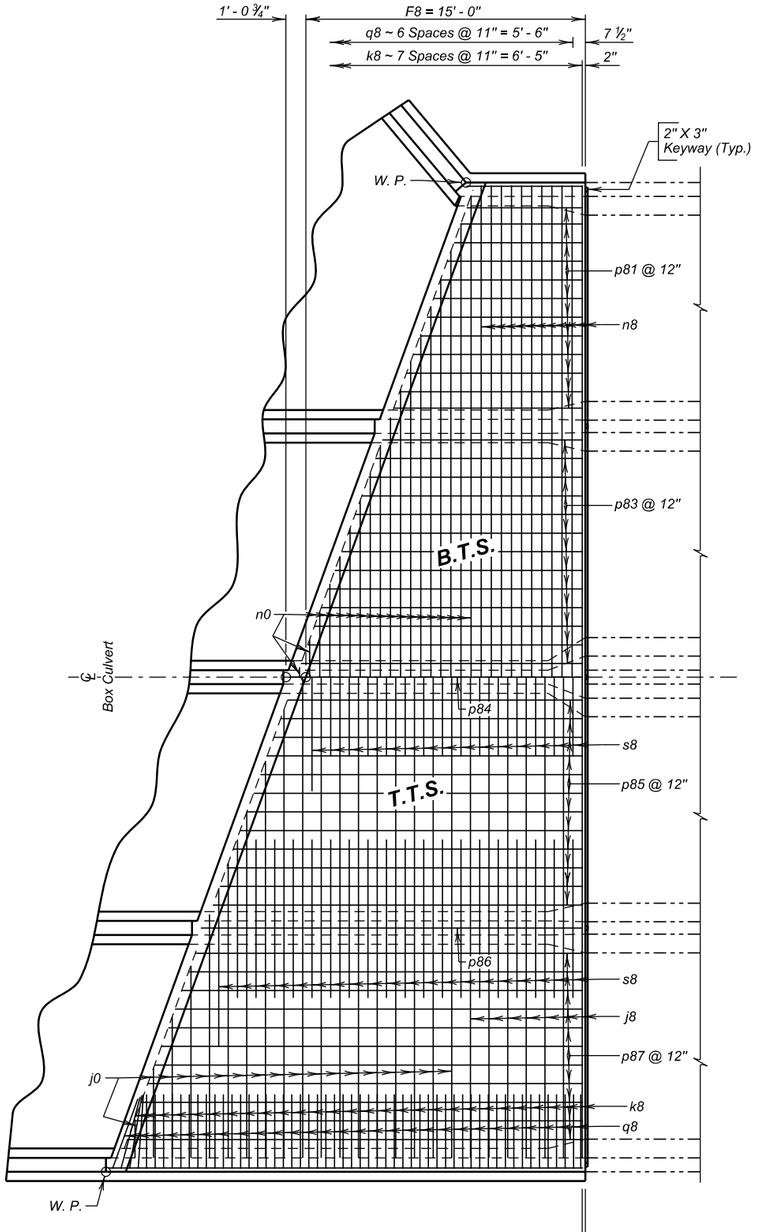
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E21	E62

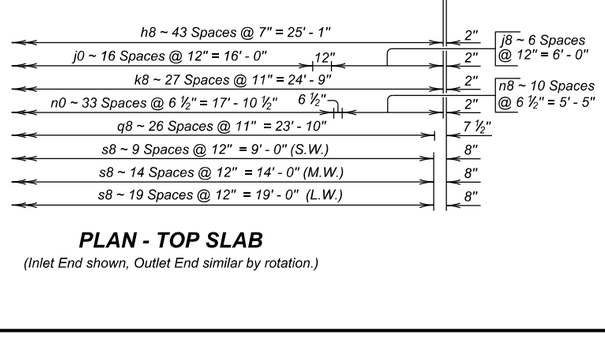




PLAN - BOTTOM SLAB

(Inlet End shown, Outlet End similar by rotation.)





PLAN - TOP SLAB

(Inlet End shown, Outlet End similar by rotation.)

LEGEND FOR PLACING RE-STEEL

T. T. S. - Top of Top Slab
B. T. S. - Bottom of Top Slab
T. B. S. - Top of Bottom Slab
B. B. S. - Bottom of Bottom Slab
S. W. - Short Wall
M. W. - Middle Wall
L. W. - Long Wall

SITE 1

ALTERNATE B

F8 BARREL END SECTION DETAILS (15' - 0") (A)

FOR

4 - 12' x 12' BOX CULVERT

(C. I. P. - PRECAST)

OVER GRINDSTONE CREEK — 20° RHF SKEW

STA. 20 + 30.00 — SEC. 8/17-T01N-R21E

STR. NO. 28-195-480 — NH 0014(230)145

HL-93

HAAKON COUNTY

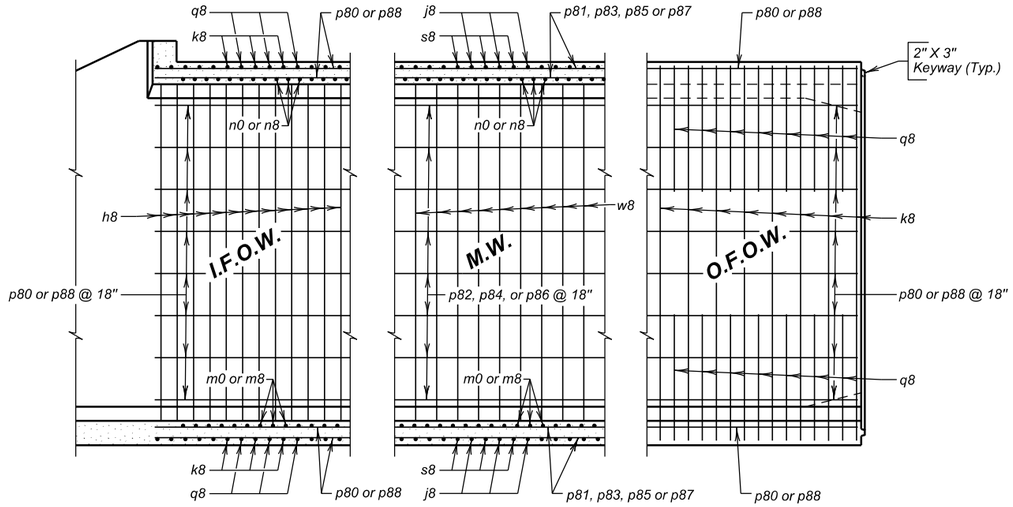
S. D. DEPT. OF TRANSPORTATION

DECEMBER 2022

8 OF 11

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	BRIDGE ENGINEER
HAKN04FW	04FWVMB19		

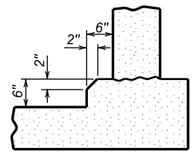
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E22	E62



ELEVATION

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu.Yd.	Lb.	Cu.Yd.
2 - F8 Barrel End Sections @ 15' - 0"	153.7	28006	52.6



OPTIONAL FILLET DETAIL

(At Bottom Slab)

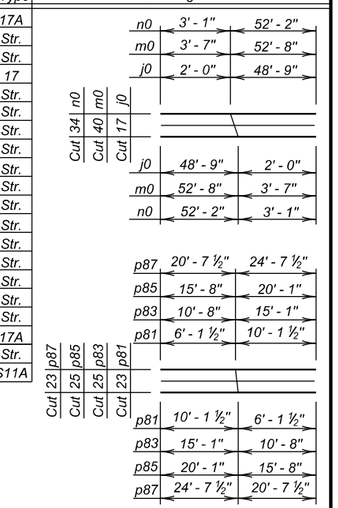
NOTE:
Contractor may form the optional full fillet, with 2" Chamfer, as detailed. The cost of the additional concrete will be borne by the Contractor.

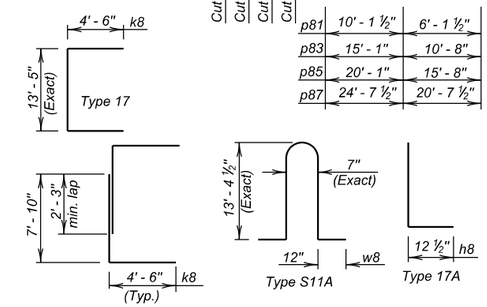
REINFORCING SCHEDULE

(For 2 - F8 Barrel End Sections)

Mk.	No.	Size	Length	Type
h8	110	4	14' - 3"	17A
◫ j0	34	6	50' - 9"	Str.
j8	28	6	51' - 6"	Str.
k8	72	5	22' - 6"	17
◫ m0	40	5	56' - 3"	Str.
m8	26	5	53' - 9"	Str.
◫ n0	34	6	55' - 3"	Str.
n8	22	6	52' - 9"	Str.
6	40	4	6' - 0"	Str.
◫ p81	46	4	16' - 3"	Str.
p82	38	4	10' - 9"	Str.
◫ p83	50	4	25' - 9"	Str.
p84	38	4	15' - 6"	Str.
◫ p85	50	4	35' - 9"	Str.
p86	38	4	20' - 6"	Str.
◫ p87	46	4	45' - 3"	Str.
p88	40	4	25' - 6"	Str.
q8	136	5	9' - 0"	17A
s8	180	6	8' - 6"	Str.
w8	134	4	29' - 0"	S11A

Bending Details



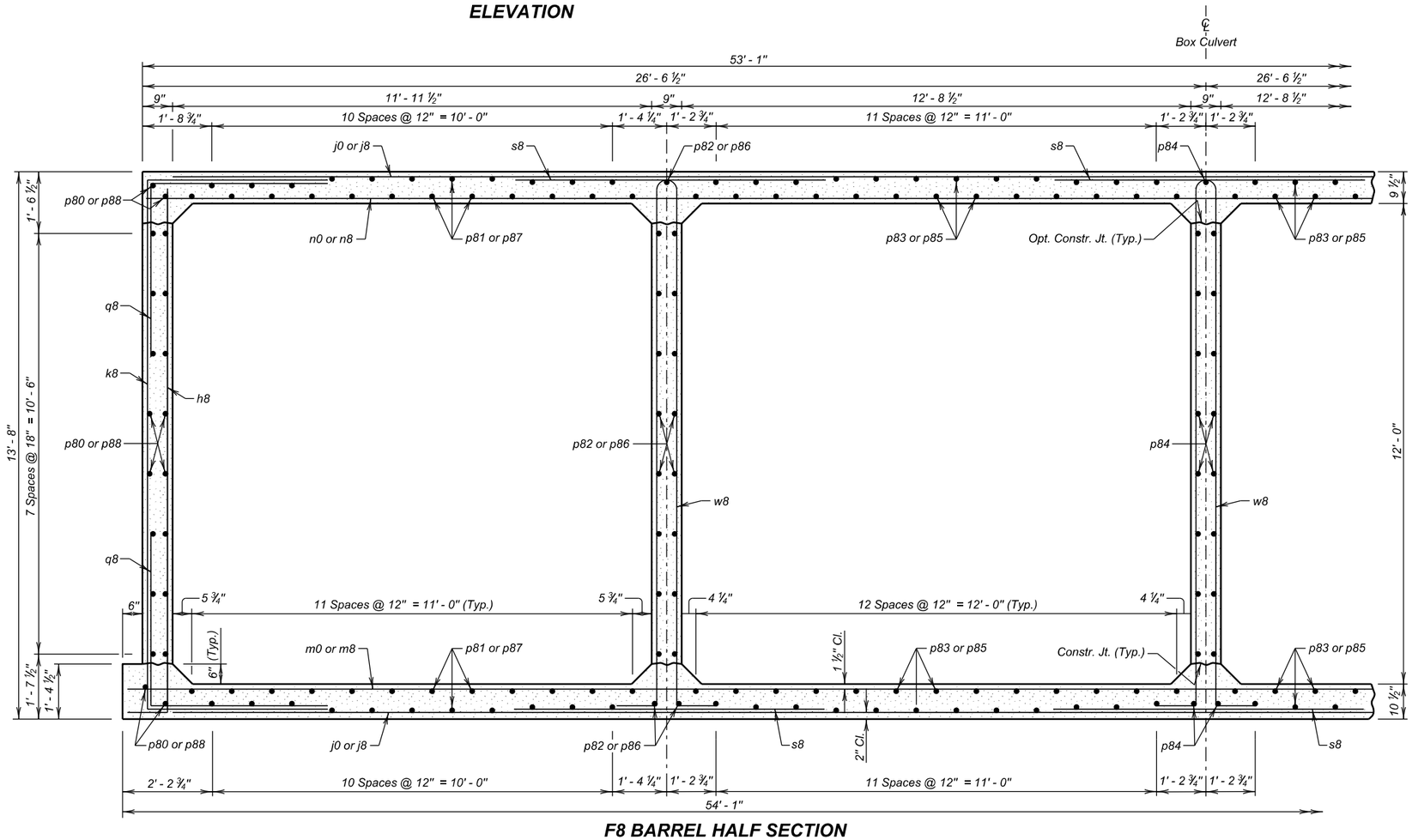


OPTIONAL k8 SPLICE DETAIL
Contractor may use optional reinforcing steel splice, as shown. The cost of the additional reinforcing steel will be borne by the Contractor.

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

LEGEND FOR PLACING RE-STEEL

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



F8 BARREL HALF SECTION

(8' - 0" Maximum Fill)

SITE 1
ALTERNATE B

F8 BARREL END SECTION DETAILS (15' - 0") (B)

FOR

4 - 12' x 12' BOX CULVERT
(C. I. P. - PRECAST)

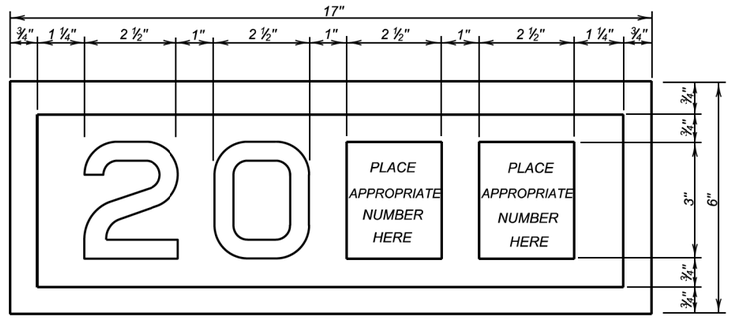
OVER GRINDSTONE CREEK
STA. 20 + 30.00
STR. NO. 28-195-480

20° RHF SKEW
SEC. 8/17-T01N-R21E
NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
DECEMBER 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	AU	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMB20		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E23	E62



YEAR PLATE DETAILS

GENERAL NOTES:

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

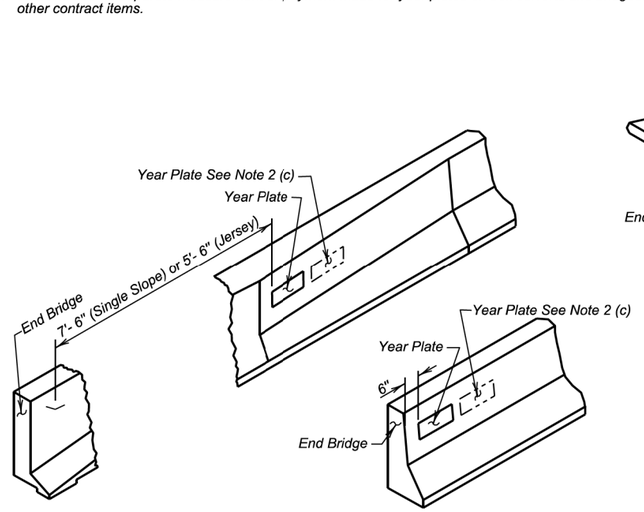
2. Year plates will be located on structure(s) as follows:

   a. On cast-in-place box culverts the year plates will be four and one - half (4 ½) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.

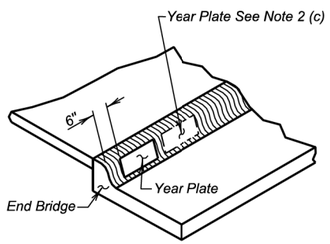
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'- 6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.

   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

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

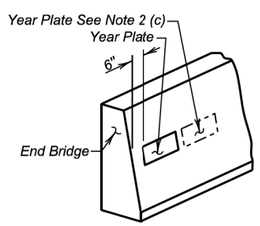


BARRIER
(With Endblock)



TYPE B CURB

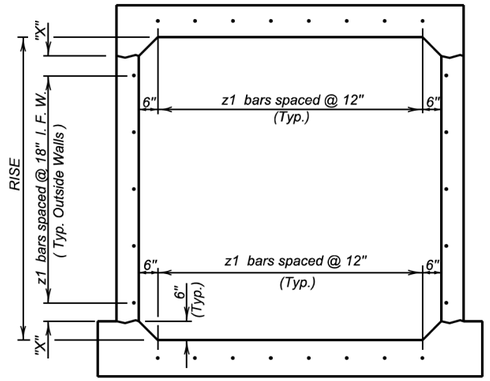
JERSEY BARRIER



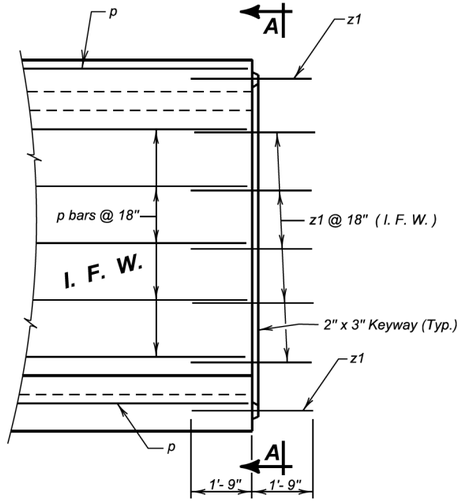
SINGLE SLOPE BARRIER

January 22, 2021

Published Date: 1st Qtr. 2023	SDDOT	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1



TYPICAL SINGLE BARREL VIEW A - A

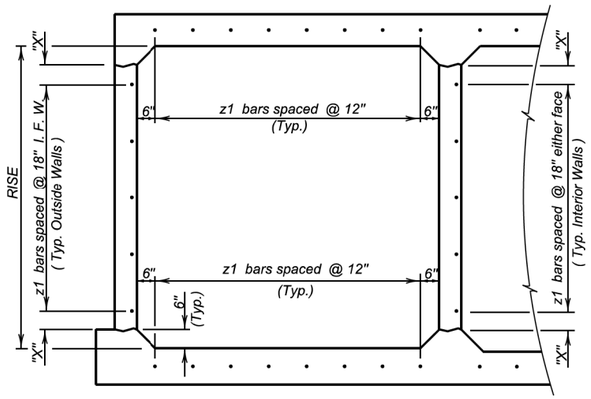


ELEVATION

LEGEND FOR PLACING RE-STEEL

I. F. W. - Inside Face Wall

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



TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

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

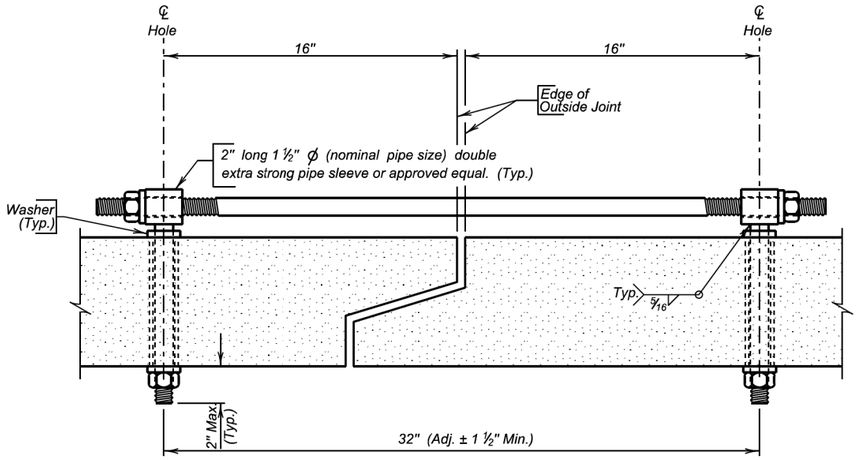
2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

Published Date: 1st Qtr. 2023	SDDOT	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1

SITE 1
ALTERNATE B

4 - 12' X 12' BOX CULVERT
(C. I. P. - PRECAST)
STR. NO. 28-195-480
DECEMBER 2022



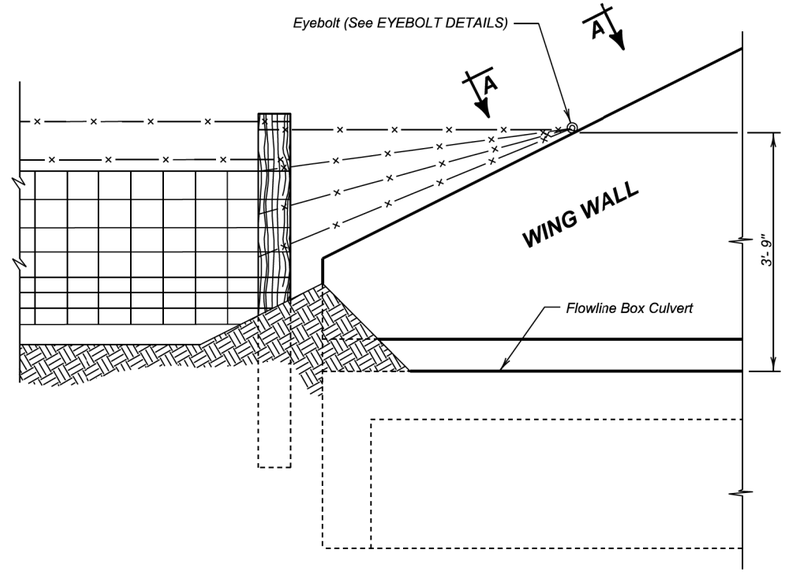
TIE BOLT ASSEMBLY

GENERAL NOTES:

1. 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.
2. Ties shall be 1 inch Ø and conform to the requirements of ASTM A36, ASTM A307, or ASTM F1554, Gr. 36. Nuts shall be heavy hex in conformance with ASTM A563. Washers shall conform to ASTM F436, Type 1. The welded pipe sleeve shall conform to ASTM A53, Grade B.
3. Welding and weld inspection shall be in conformance with AWS/ANSI D1.1 - (Current Year) Structural Welding Code - Steel.
4. Tie Bolt Assembly shall be galvanized in accordance with ASTM A153 or ASTM F2329 as applicable.
5. 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.
6. All costs for furnishing and installing the precast box culvert tie bolt assembly shall be incidental to the contract unit price per Foot for "Precast Concrete Box Culvert, Furnish".

March 21, 2016

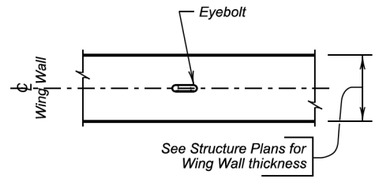
Published Date: 1st Qtr. 2023	SDDOT	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1



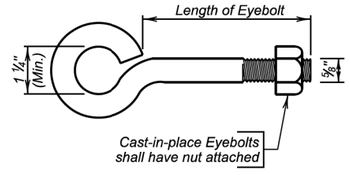
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be ⅞ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be 4 ½ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the ⅞ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23, 2012

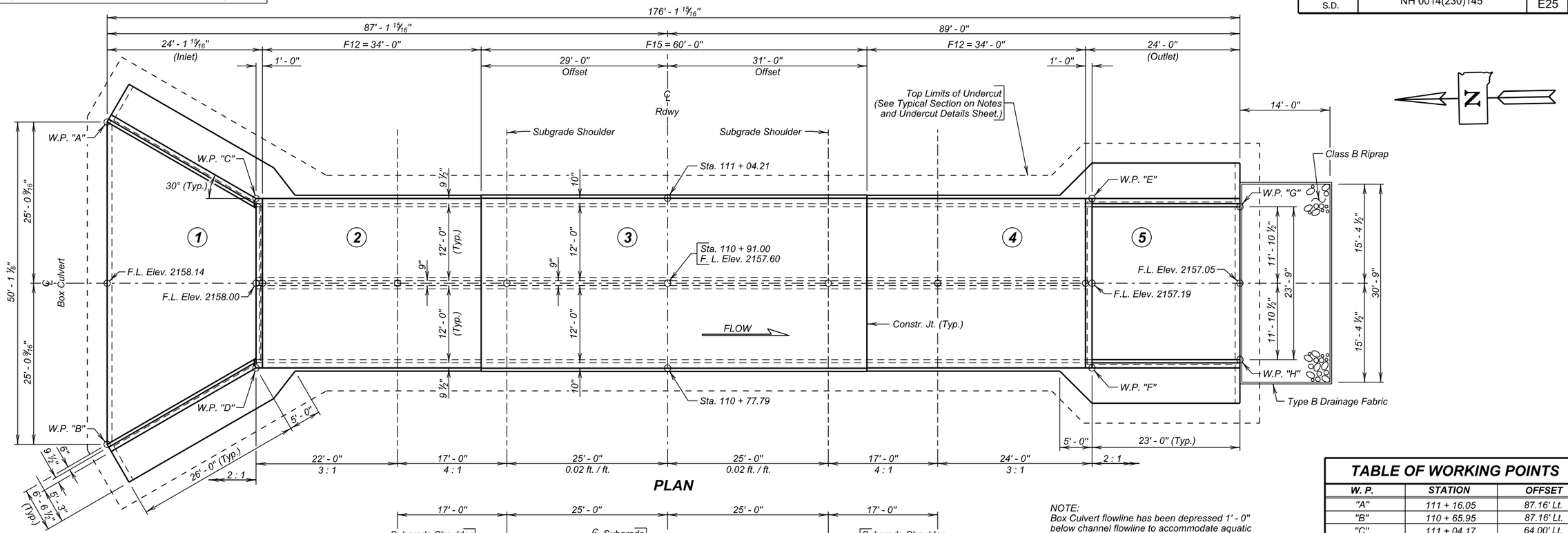
Published Date: 1st Qtr. 2023	SDDOT	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
			Sheet 1 of 1

SITE 1
ALTERNATE B

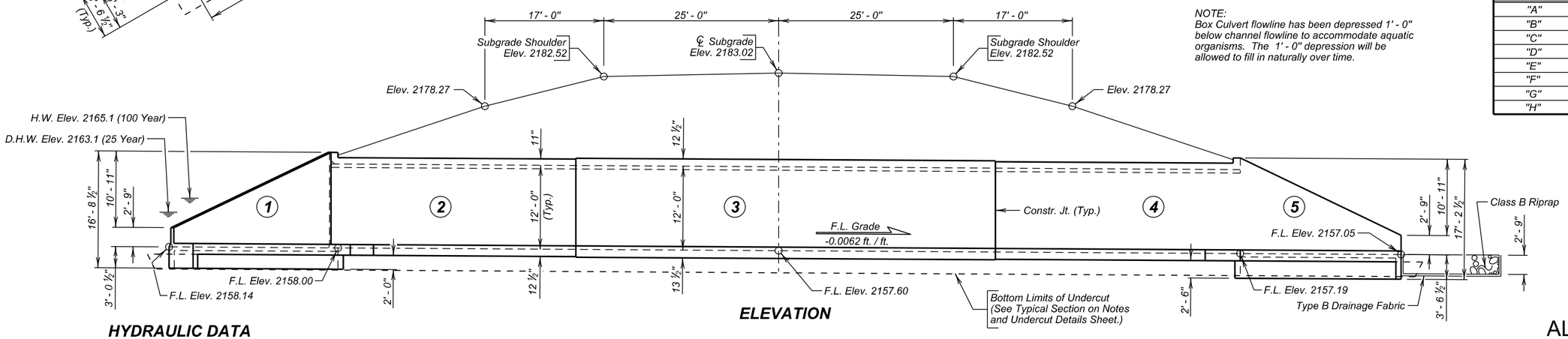
4 - 12' X 12' BOX CULVERT
(C. I. P. - PRECAST)
STR. NO. 28-195-480
DECEMBER 2022

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

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E25	E62



PLAN



ELEVATION

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

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	111 + 16.05	87.16' Lt.
"B"	110 + 65.95	87.16' Lt.
"C"	111 + 04.17	64.00' Lt.
"D"	110 + 77.83	64.00' Lt.
"E"	111 + 04.17	66.00' Rt.
"F"	110 + 77.83	66.00' Rt.
"G"	111 + 02.88	89.00' Rt.
"H"	110 + 79.13	89.00' Rt.

HYDRAULIC DATA

Q_d	581 cfs
A_d	74 sq ft
V_d	7.9 fps
Q_F	581 cfs
Q_{100}	1050 cfs
Q_{OT}	>Q_{500}
V_{max}	11.2 fps

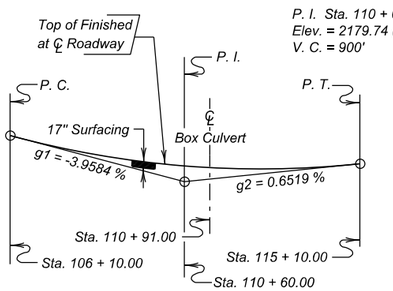
Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2163.1.

Q_{OT} = Overtopping discharge and frequency > Q_{500} year recurrence interval. El. 2182.3 @ Sta. 113 + 78.00 ±.

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. 2165.1.

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



P. I. Sta. 110 + 60.00
Elev. = 2179.74 (Finished)
V. C. = 900'

VERTICAL CURVE DATA

-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 - F15 Barrel Interior Section Details (60' - 0")
Sheet No. 6 - F12 Barrel End Section Details (34' - 0")
Sheet No. 7 - Standard Plate No.'s 460.02 and 460.10
Sheet No. 8 - Standard Plate No. 620.16

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
	Class A45 Concrete, Box Culvert	Cu. Yd.	518.9
	Reinforcing Steel	Lb.	75543
	Structure Excavation, Box Culvert	Cu. Yd.	211
	Box Culvert Undercut	Cu. Yd.	512
#	Class B Riprap	Ton	61.4
	Type B Drainage Fabric	Sq. Yd.	75

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

SITE 2
ALTERNATE A

GENERAL DRAWING AND QUANTITIES

FOR

2 - 12' x 12' BOX CULVERT (C.I.P.)

OVER BELCHER CREEK — 0° SKEW
STA. 110 + 91.00 — SEC. 10-T01N-R21E
STR. NO. 28-212-477 — NH 0014(230)145
PCN 04FW — HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2022

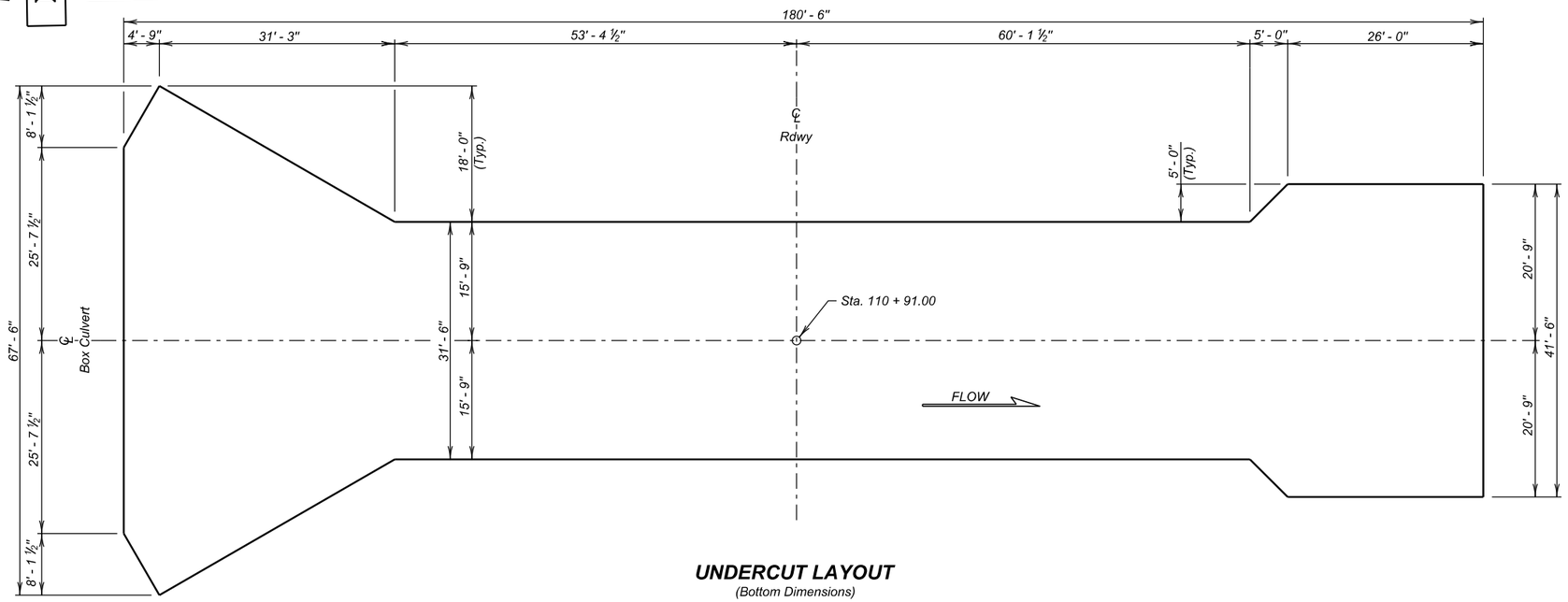
1 OF 8

-X028-

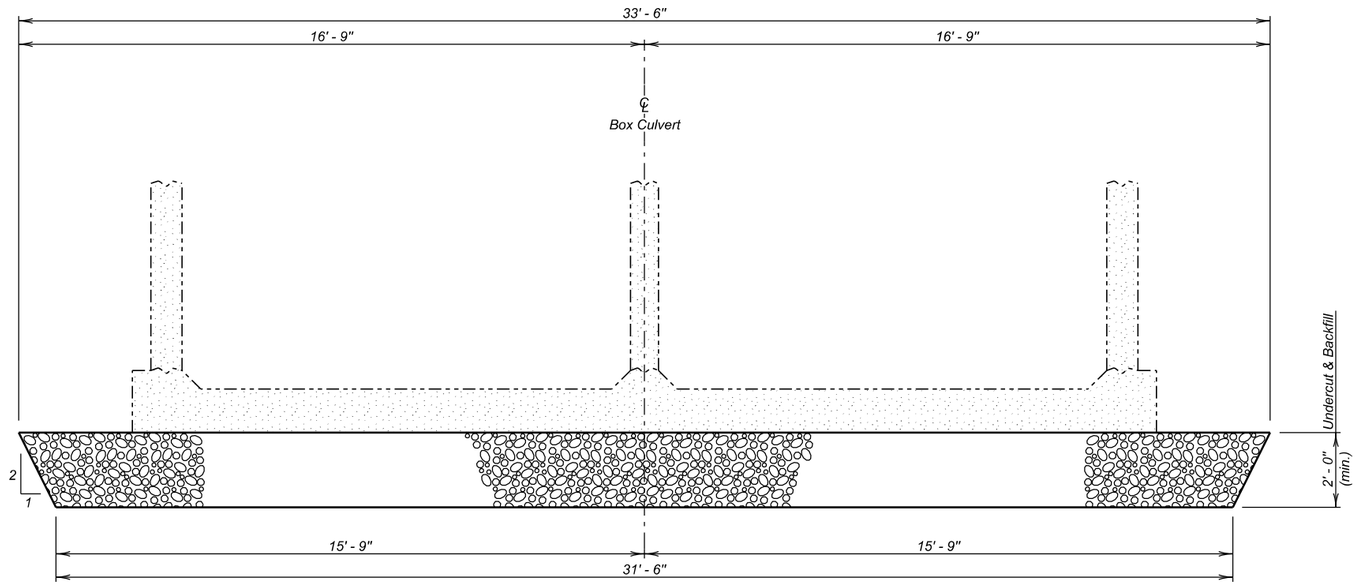
PLANS BY :
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	CM	BT	BRIDGE ENGINEER
HAKN04FW	04FWVMA01		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E26	E62



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SPECIFICATIONS

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

GENERAL NOTES

1. *Design Live Load: HL-93 and construction load consisting of two 7' - 6" gage axles spaced 30 ft. apart with gross axle weight (each axle) = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.*
2. *The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 12 ft. (F12) and 15 ft. (F15).*
3. *Design Material Strengths: Concrete $f'c$ = 4500 p.s.i.*
   Reinforcing Steel fy = 60000 p.s.i.
4. *High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a Type V or Type II with 20 to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.*
5. *All reinforcing steel will conform to ASTM A615 Grade 60.*
6. *All lap splices shown are contact lap splices unless noted otherwise.*
7. *All exposed edges will be chamfered ¾ inch unless noted otherwise in the plans.*
8. *Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.*
9. *The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.*
10. *Care will be taken to establish Working Points (W.P.) as shown on the wings.*
11. *Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).*
12. *Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.*
13. *Soils below the bottom of the proposed RCBC consist of 3' gray clay sand alluvium overlying Pierre Shale. Groundwater was encountered in the borings at an elevation of 2159.5 during the subsurface investigation conducted in May 2020. Dewatering will be required during construction.*

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
⚠ Box Culvert Undercut	Cu. Yd.	512

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

SITE 2
ALTERNATE A
NOTES AND UNDERCUT DETAILS
FOR
2 - 12' x 12' BOX CULVERT (C.I.P.)

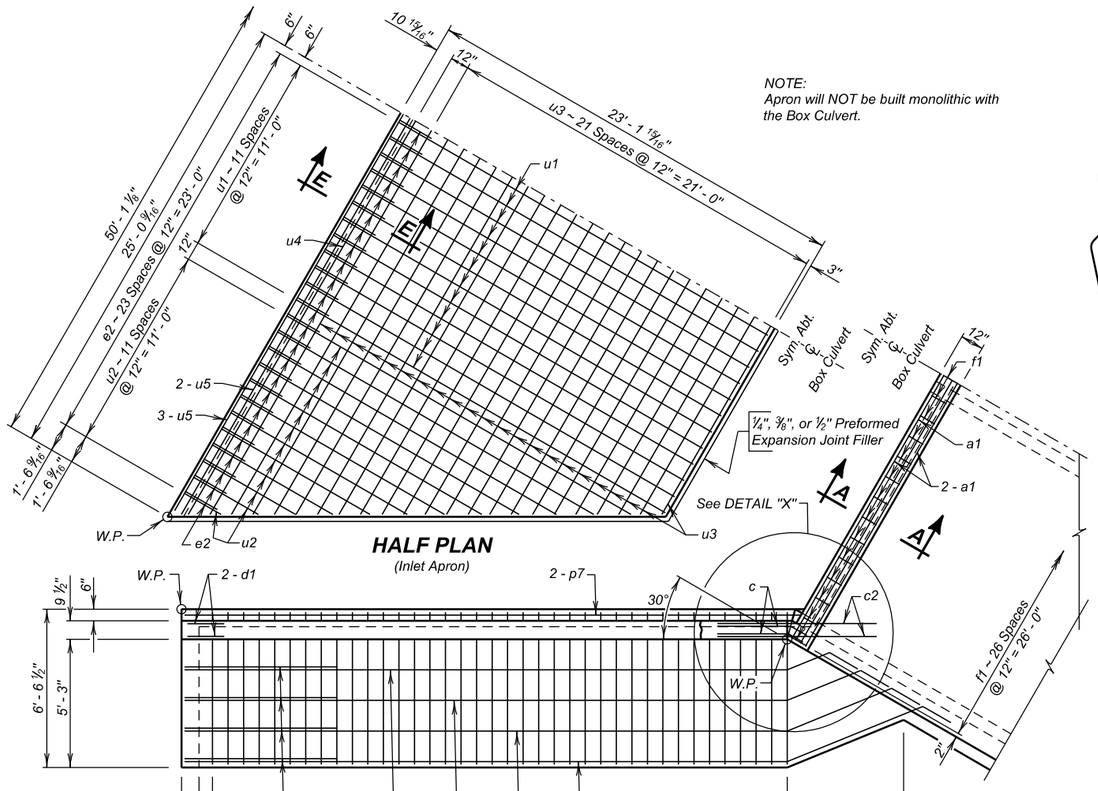
OVER BELCHER CREEK — 0° SKEW
STA. 110 + 91.00 — SEC. 10-T01N-R21E
STR. NO. 28-212-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2022

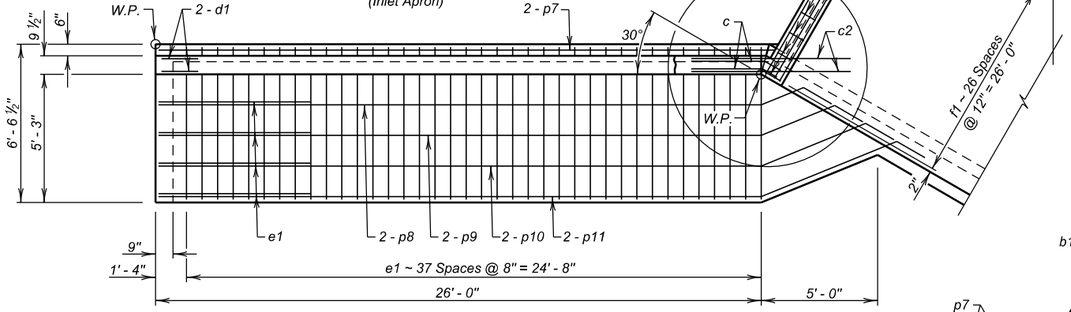
DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	CM	BT	Steve A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMA02		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E27	E62

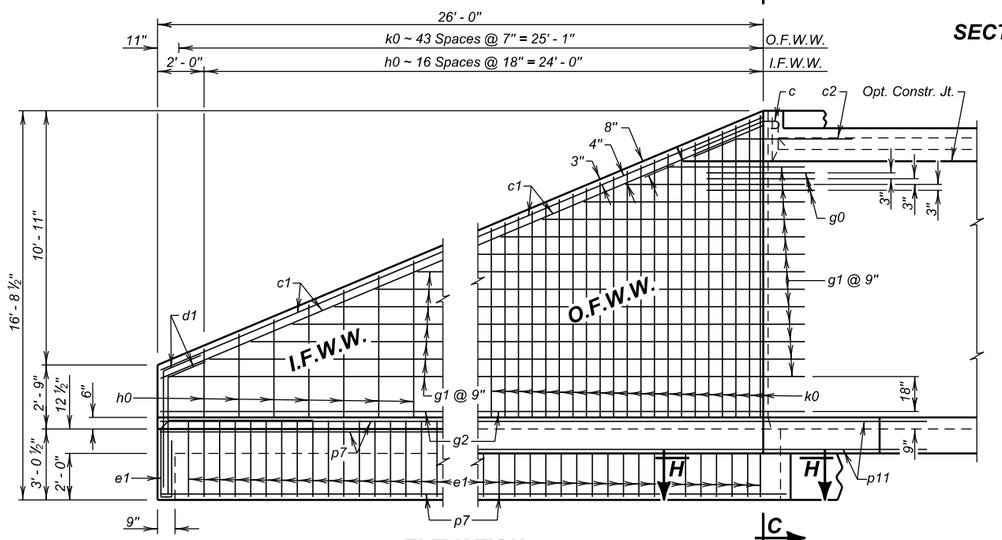
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



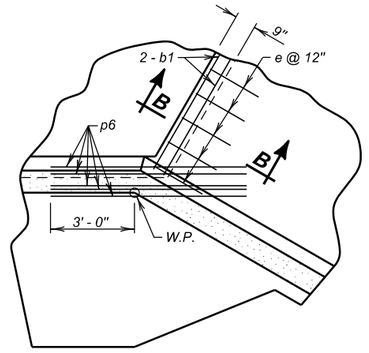
HALF PLAN
(Inlet Apron)



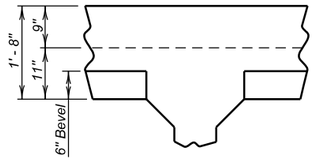
HALF PLAN



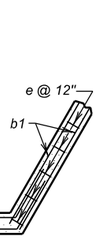
ELEVATION



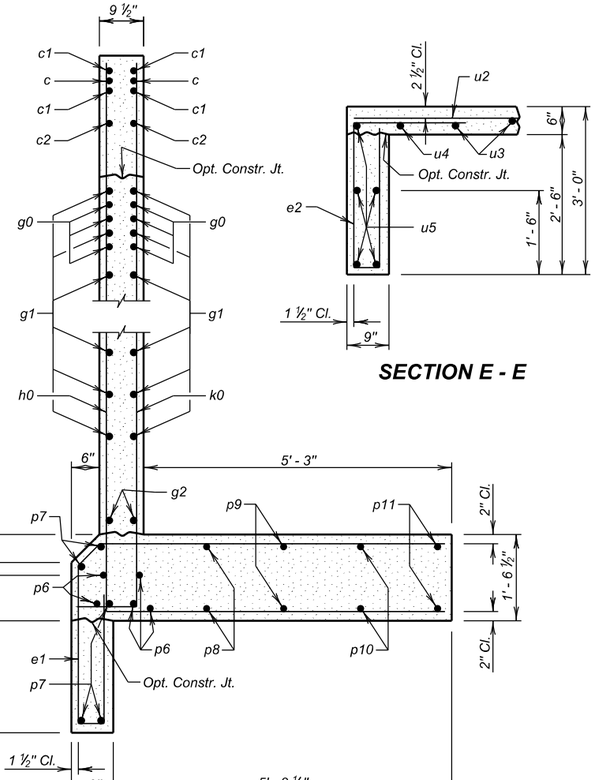
DETAIL "X"
(At Bottom Slab)



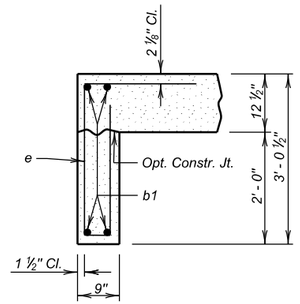
VIEW D - D
(At Interior Wall)



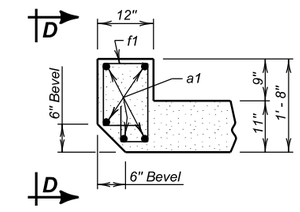
SECTION H - H



SECTION C - C



SECTION B - B

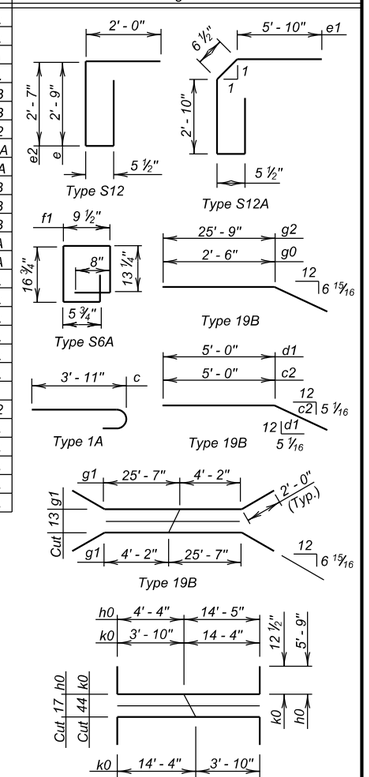


SECTION A - A
(At Top Slab)

SECTION E - E

REINFORCING SCHEDULE

	Mk.	No.	Size	Length	Type	Bending Details
	a1	5	6	26' - 0"	Str.	
	b1	4	6	24' - 0"	Str.	
*	c	4	5	4' - 6"	1A	
	c1	8	5	28' - 0"	Str.	
	c2	4	5	7' - 0"	19B	
	d1	8	5	6' - 9"	19B	
	e	25	4	7' - 6"	S12	
	e1	84	4	12' - 3"	S12A	
	f1	27	4	5' - 3"	S6A	
	g0	12	5	5' - 0"	19B	
⌀	g1	26	4	33' - 9"	19B	
	g2	4	4	27' - 9"	19B	
⌀	h0	17	4	30' - 3"	17A	
⌀	k0	44	4	20' - 3"	17A	
	p6	10	6	7' - 0"	Str.	
*	p7	10	4	28' - 6"	Str.	
*	p8	4	4	29' - 6"	Str.	
*	p9	4	4	30' - 9"	Str.	
*	p10	4	4	32' - 3"	Str.	
*	p11	4	4	33' - 6"	Str.	
	INLET APRON					
	e2	48	4	7' - 6"	S12	
	u1	24	4	22' - 9"	Str.	
	u2	12	4	23' - 6"	Str.	
	u3	11	4	70' - 9"	Str.	
	u4	1	4	48' - 9"	Str.	
	u5	5	4	49' - 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.
Inlet	41.1	3878	20.1
Inlet Apron	19.2	1510	19.2

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 - 12' x 12' BOX CULVERT (C.I.P.)

OVER BELCHER CREEK — 0° SKEW
STA. 110 + 91.00 — SEC. 10-T01N-R21E
STR. NO. 28-212-477 — NH 0014(230)145
HL-93

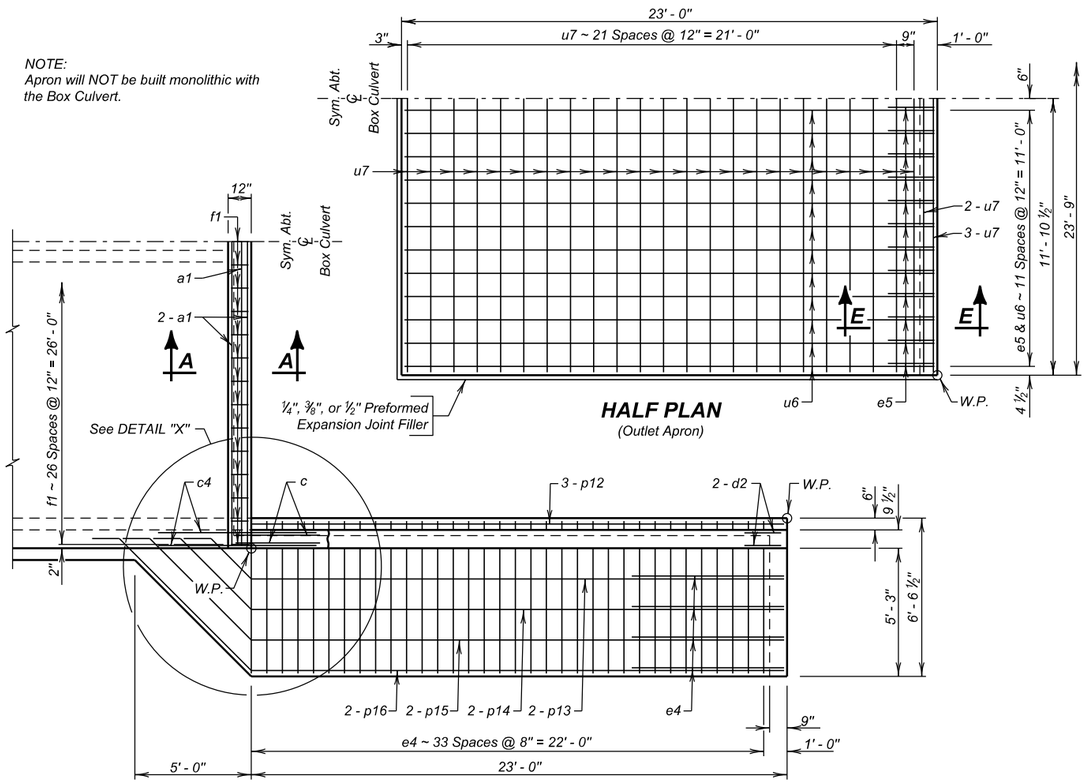
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2022

3 OF 8

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	CM	BT	Steven A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMA03		

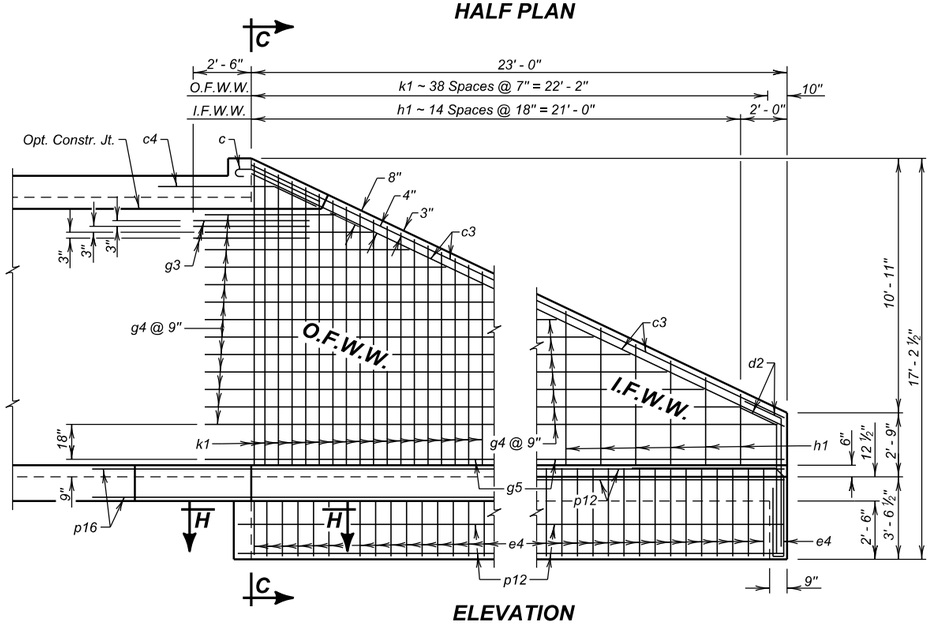
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E28	E62

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



HALF PLAN
(Outlet Apron)

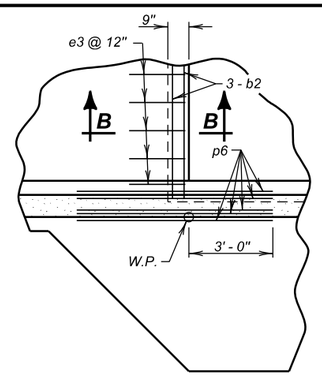
HALF PLAN



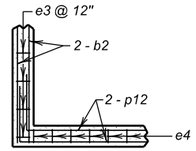
ELEVATION

LEGEND FOR PLACING RE-STEEL

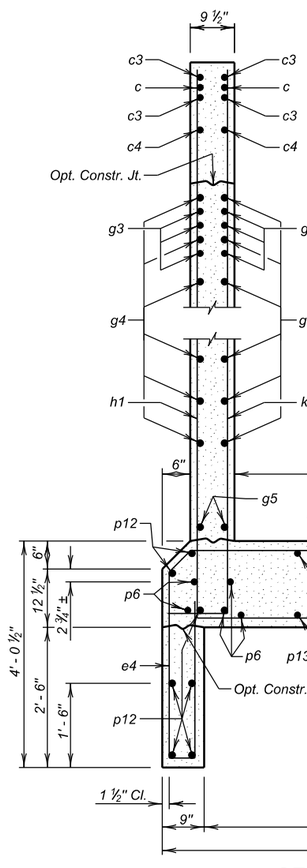
O. F. W. W. - Outside Face of Wing Wall
I. F. W. W. - Inside Face of Wing Wall



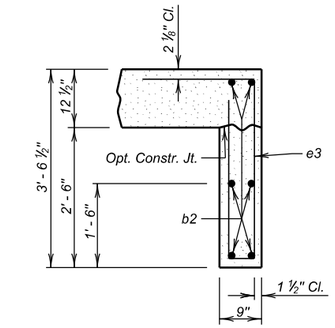
DETAIL "X"
(At Bottom Slab)



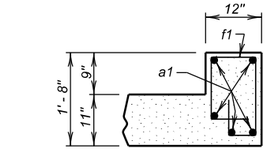
SECTION H - H



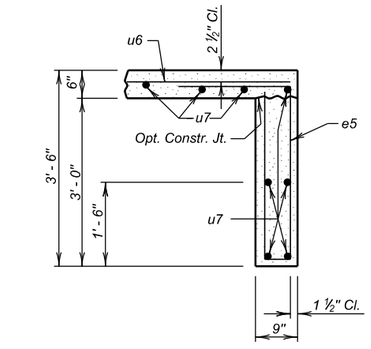
SECTION C - C



SECTION B - B



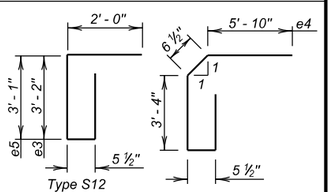
SECTION A - A
(At Top Slab)

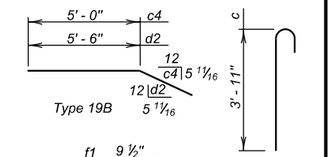


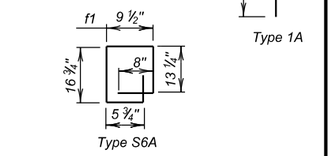
SECTION E - E

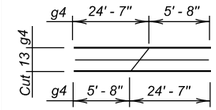
REINFORCING SCHEDULE

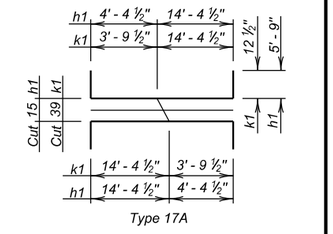
Mk.	No.	Size	Length	Type	Bending Details
a1	5	6	26' - 0"	Str.	
b2	6	6	25' - 0"	Str.	
* c	4	5	4' - 6"	1A	
c3	8	5	25' - 6"	Str.	
c4	4	5	7' - 0"	19B	
d2	8	5	7' - 3"	19B	
e3	26	4	8' - 6"	S12	
e4	76	4	13' - 3"	S12A	
f1	27	4	5' - 3"	S6A	
g3	12	5	5' - 0"	Str.	
⌀ g4	26	4	33' - 9"	Str.	
g5	4	4	24' - 9"	Str.	
⌀ h1	15	4	30' - 3"	17A	
⌀ k1	39	4	20' - 3"	17A	
p6	10	6	7' - 0"	Str.	
* p12	14	4	25' - 6"	Str.	
* p13	4	4	26' - 9"	Str.	
* p14	4	4	28' - 6"	Str.	
* p15	4	4	30' - 6"	Str.	
* p16	4	4	32' - 3"	Str.	
OUTLET APRON					
e5	24	4	8' - 6"	S12	
u6	24	4	22' - 9"	Str.	
u7	28	4	23' - 6"	Str.	











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

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	38.2	3861	19.3
Outlet Apron	12.1	941	12.1

SITE 2
ALTERNATE A
OUTLET DETAILS
FOR
2 - 12' x 12' BOX CULVERT (C.I.P.)

OVER BELCHER CREEK
STA. 110 + 91.00
STR. NO. 28-212-477

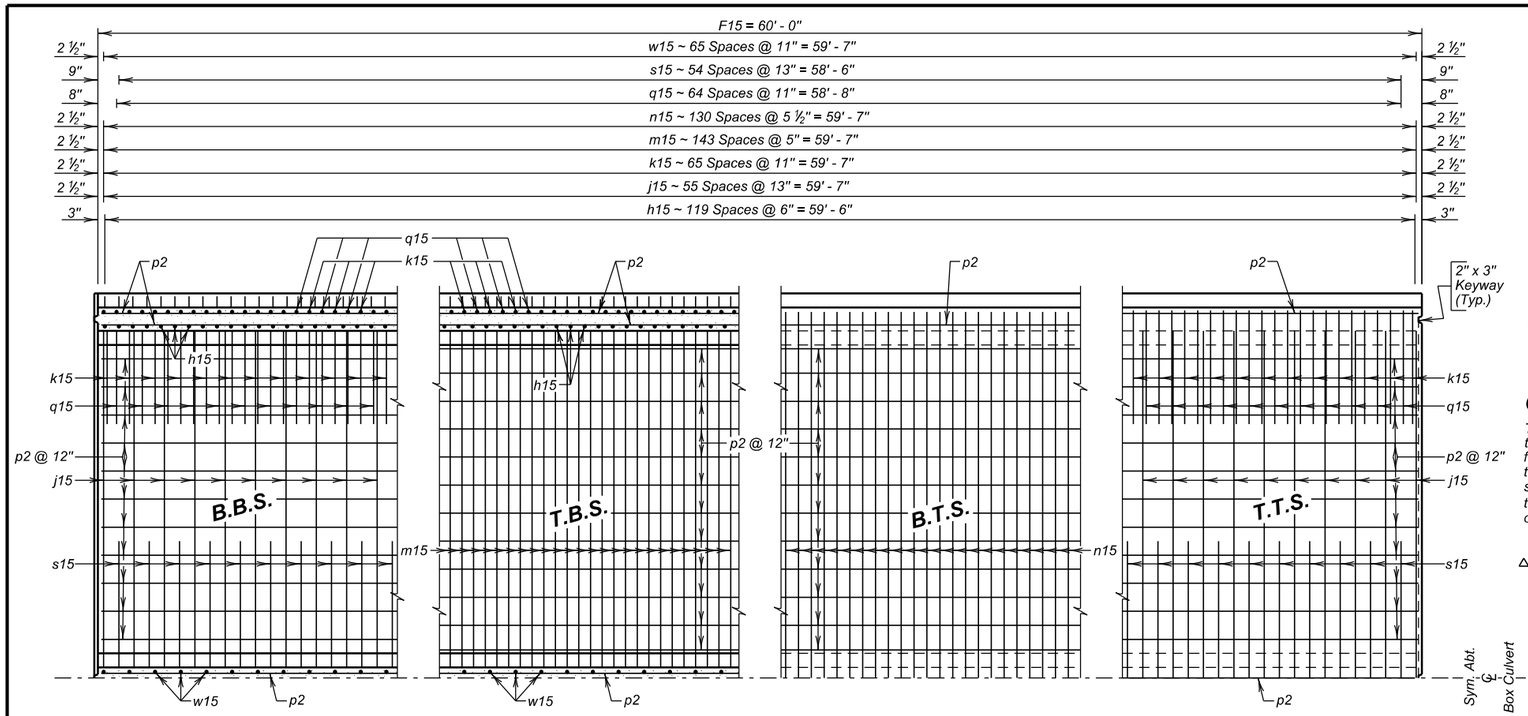
0° SKEW
SEC. 10-T01N-R21E
NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2022

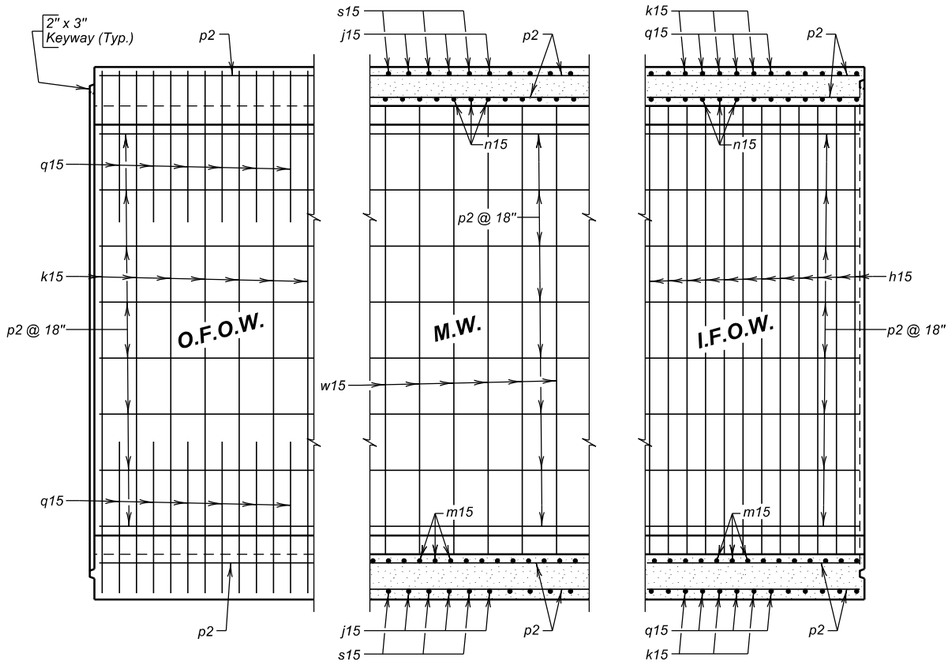
4 OF 8

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	CM	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMA04		

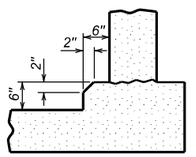
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E29	E62



PLAN



ELEVATION



OPTIONAL FILLET DETAIL

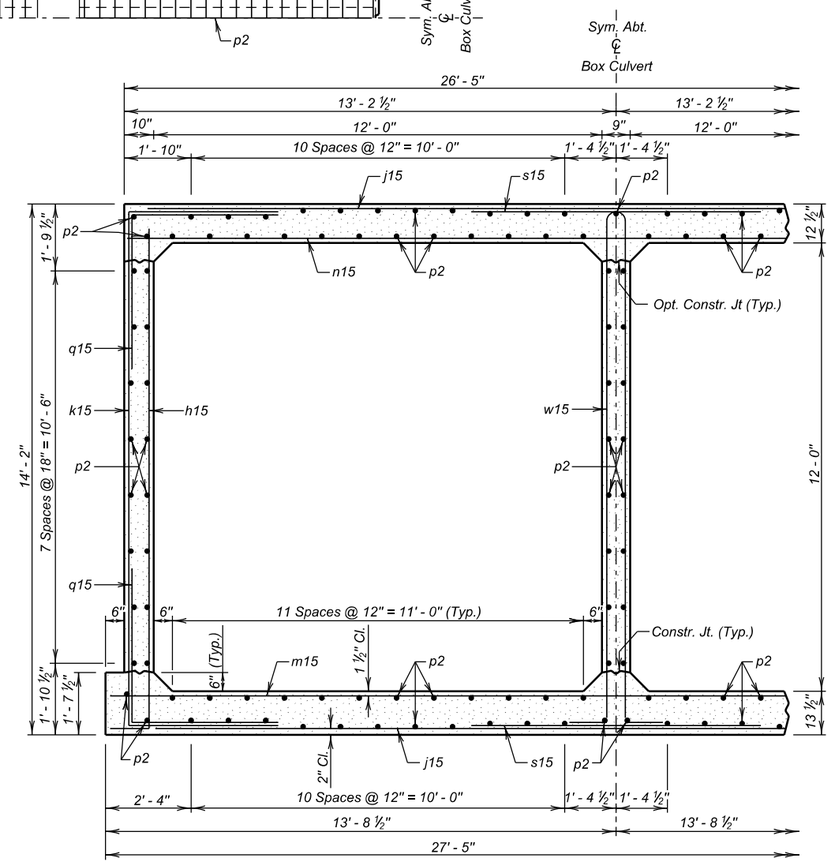
(At Bottom Slab)

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

OPTIONAL POUR - BOTTOM SLAB

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

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



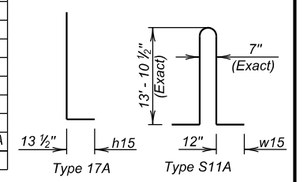
F15 BARREL HALF SECTION

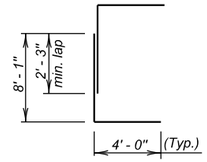
(15' - 0" Maximum Fill)

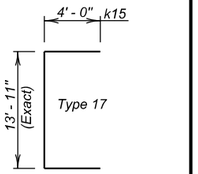
REINFORCING SCHEDULE

(For 1 - F15 Barrel Interior Section)

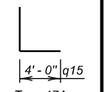
Mk.	No.	Size	Length	Type	Bending Details
h15	240	4	14' - 6"	17A	
j15	112	7	24' - 9"	Str.	
k15	132	5	22' - 0"	17	
m15	144	5	27' - 3"	Str.	
n15	131	5	26' - 3"	Str.	
p2	151	4	59' - 9"	Str.	
q15	260	5	8' - 0"	17A	
s15	110	7	9' - 9"	Str.	
w15	66	4	30' - 3"	S11A	
△ z1	144	5	3' - 6"	Str.	







OPTIONAL k15 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.
1 - F15 Barrel Interior Section @ 60' - 0"	200.1	30947	68.8

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 2
ALTERNATE A

F15 BARREL INTERIOR SECTION DETAILS (60' - 0")

FOR

2 - 12' x 12' BOX CULVERT (C.I.P.)

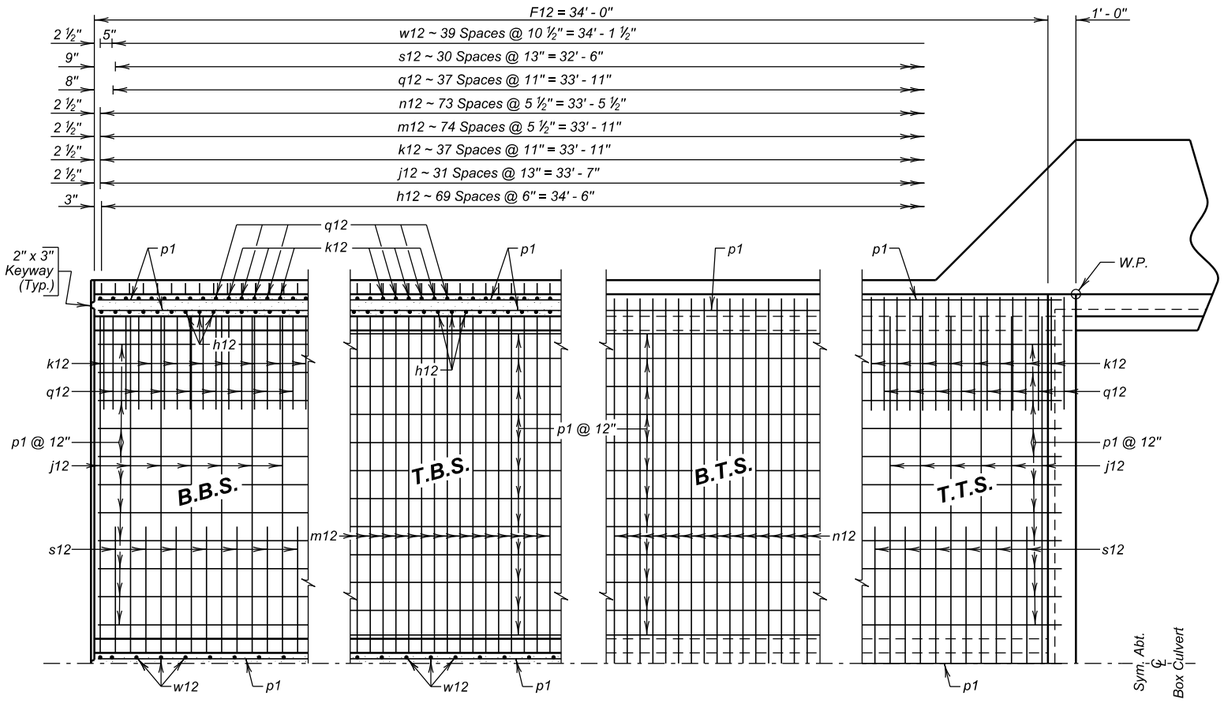
OVER BELCHER CREEK — 0° SKEW
STA. 110 + 91.00 — SEC. 10-T01N-R21E
STR. NO. 28-212-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2022

5 OF 8

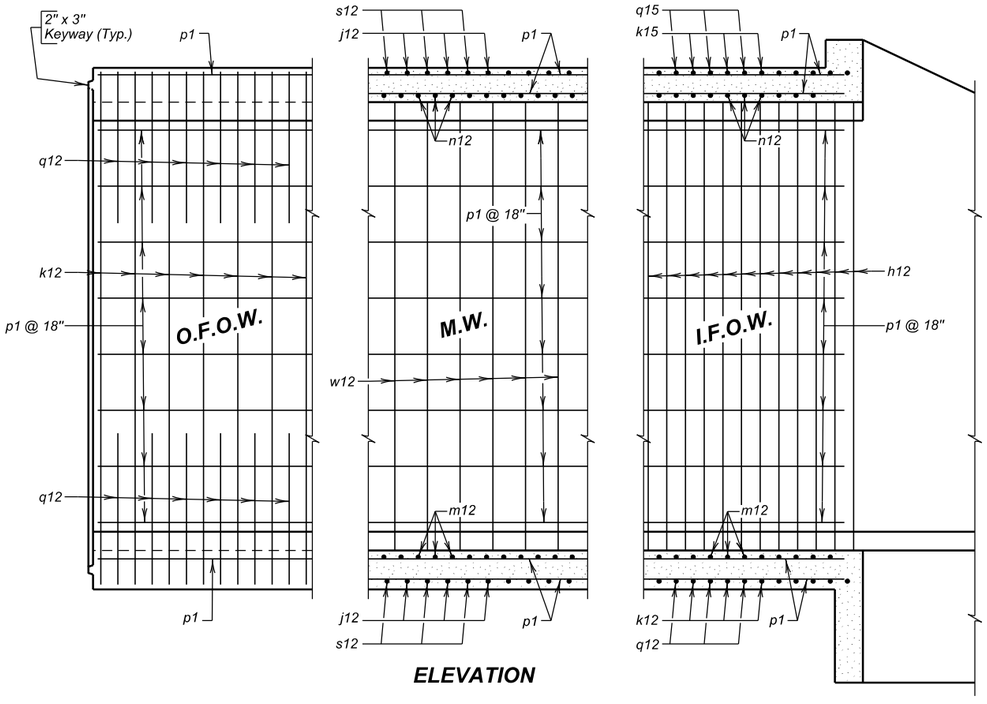
DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	CM	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMA05		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E30	E62

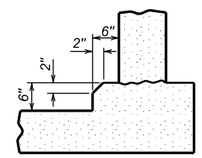


PLAN

(Outlet End shown, Inlet similar by rotation)



ELEVATION



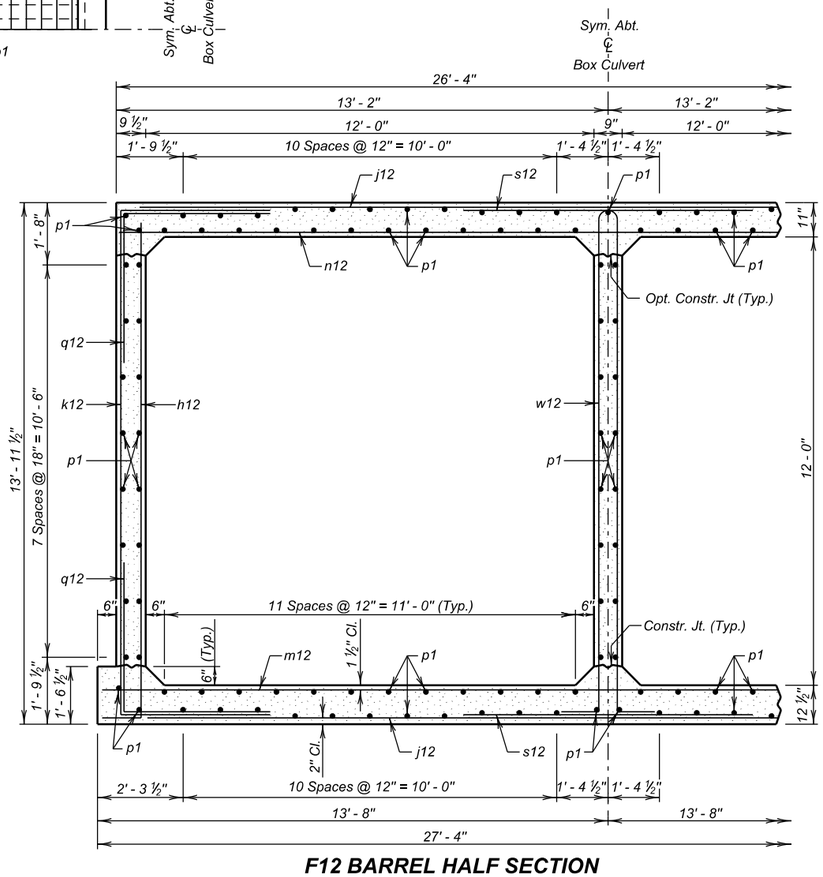
OPTIONAL FILLET DETAIL

(At Bottom Slab)

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

OPTIONAL POUR - BOTTOM SLAB

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



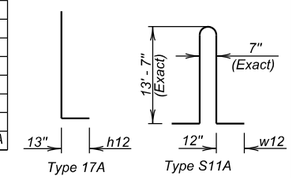
F12 BARREL HALF SECTION

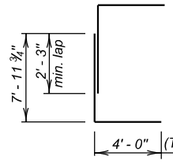
(12' - 0" Maximum Fill)

REINFORCING SCHEDULE

(For 2 - F12 Barrel End Sections)

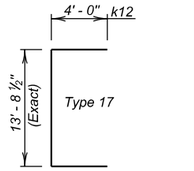
Mk.	No.	Size	Length	Type	Bending Details
h12	280	4	14' - 6"	17A	
j12	128	7	24' - 9"	Str.	
k12	152	5	21' - 9"	17	
m12	150	5	27' - 0"	Str.	
n12	148	5	26' - 0"	Str.	
p1	302	4	34' - 3"	Str.	
q12	304	5	8' - 0"	17A	
s12	124	7	9' - 9"	Str.	
w12	82	4	29' - 6"	S11A	





OPTIONAL k12 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 - F12 Barrel End Sections @ 34' - 0"	208.2	34406	71.8

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 2
ALTERNATE A

F12 BARREL END SECTION DETAILS (34' - 0")

FOR

2 - 12' x 12' BOX CULVERT (C.I.P.)

OVER BELCHER CREEK — 0° SKEW
STA. 110 + 91.00 — SEC. 10-T01N-R21E
STR. NO. 28-212-477 — NH 0014(230)145
HL-93

HAAKON COUNTY

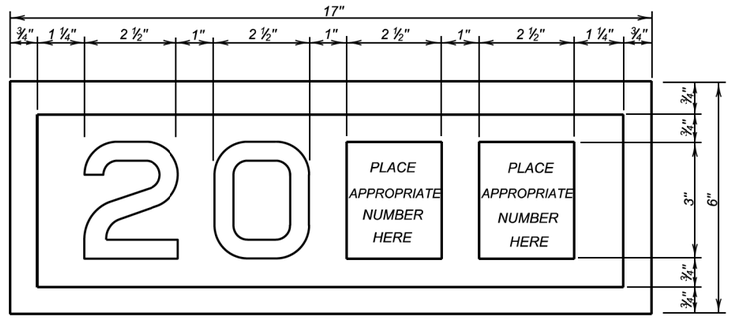
S. D. DEPT. OF TRANSPORTATION

FEBRUARY 2022

6 OF 8

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BB	BT	Steven A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMA06		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E31	E62



YEAR PLATE DETAILS

GENERAL NOTES:

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

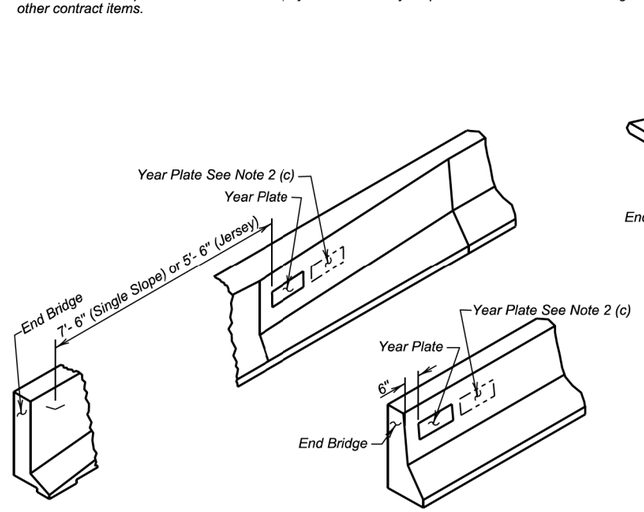
2. Year plates will be located on structure(s) as follows:

   a. On cast-in-place box culverts the year plates will be four and one - half (4 ½) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.

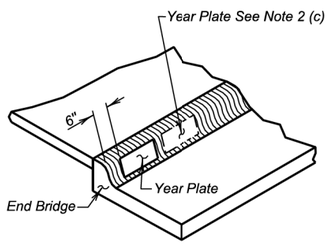
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'- 6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.

   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

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

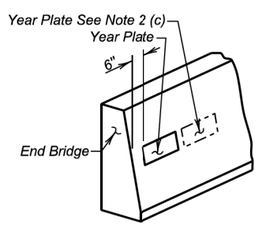


BARRIER
(With Endblock)



TYPE B CURB

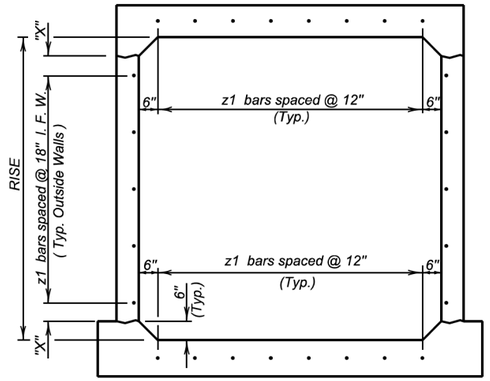
JERSEY BARRIER



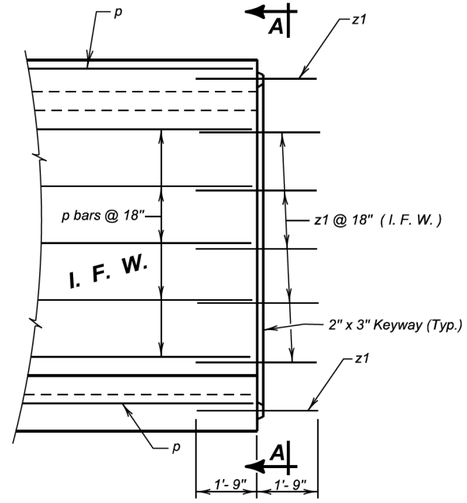
SINGLE SLOPE BARRIER

January 22, 2021

Published Date: 1st Qtr. 2023	SDDOT	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1



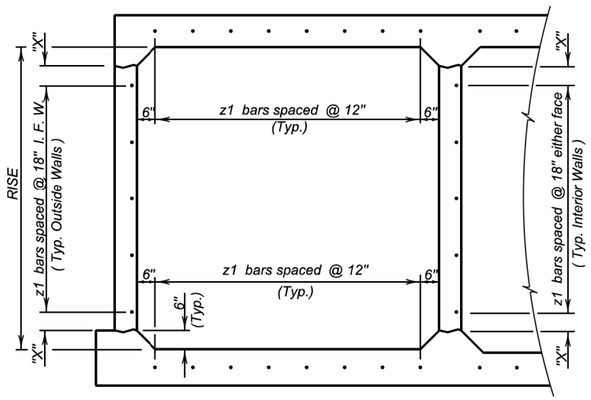
TYPICAL SINGLE BARREL VIEW A - A



ELEVATION

LEGEND FOR PLACING RE-STEEL

I. F. W.	- Inside Face Wall



TYPICAL MULTIPLE BARREL VIEW A - A

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

GENERAL NOTES:

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

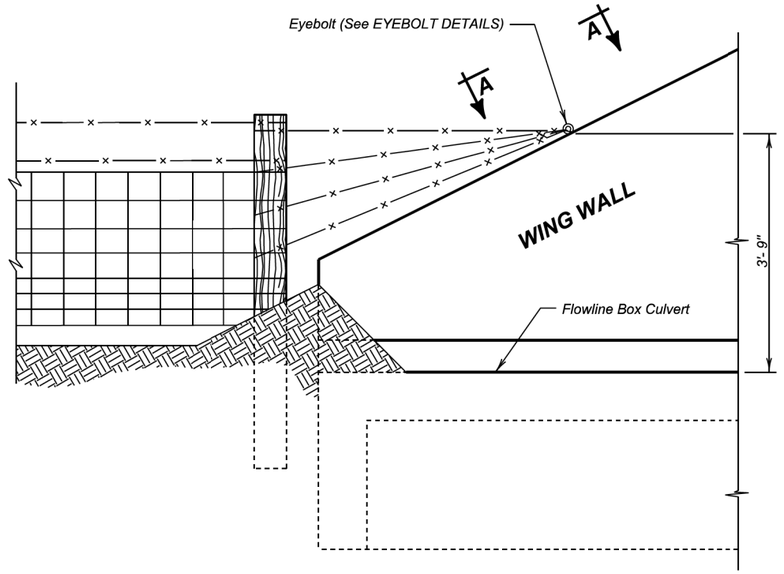
2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

Published Date: 1st Qtr. 2023	SDDOT	BOX CULVERT BARREL TIE REINFORCEMENT	PLATE NUMBER 460.10
			Sheet 1 of 1

SITE 2
ALTERNATE A

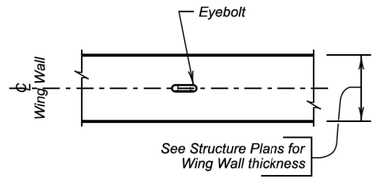
2 - 12' X 12' BOX CULVERT (C.I.P.)
STR. NO. 28-212-477
FEBRUARY 2022



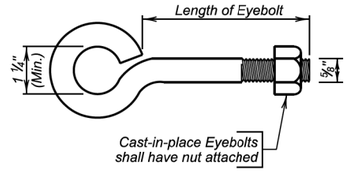
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be ⅝ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be 4 ½ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the ⅝ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23,2012

Published Date: 1st Qtr. 2023	SDDOT	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
			Sheet 1 of 1

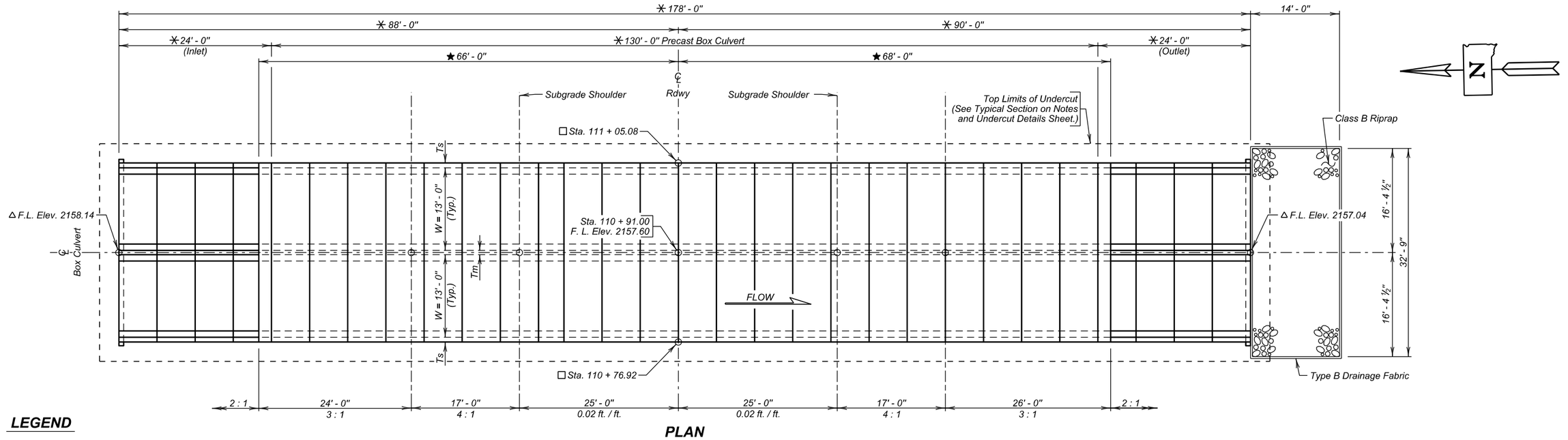
SITE 2
ALTERNATE A

2 - 12' X 12' BOX CULVERT (C.I.P.)
STR. NO. 28-212-477
FEBRUARY 2022

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 installation and/or fabrication. See Shop Plans for actual installation length.
★ Minimum distance to satisfy fill slope.
△ Based on dimensions shown.
☐ Based on Ts = 9" and Tm = 8".

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E33	E62

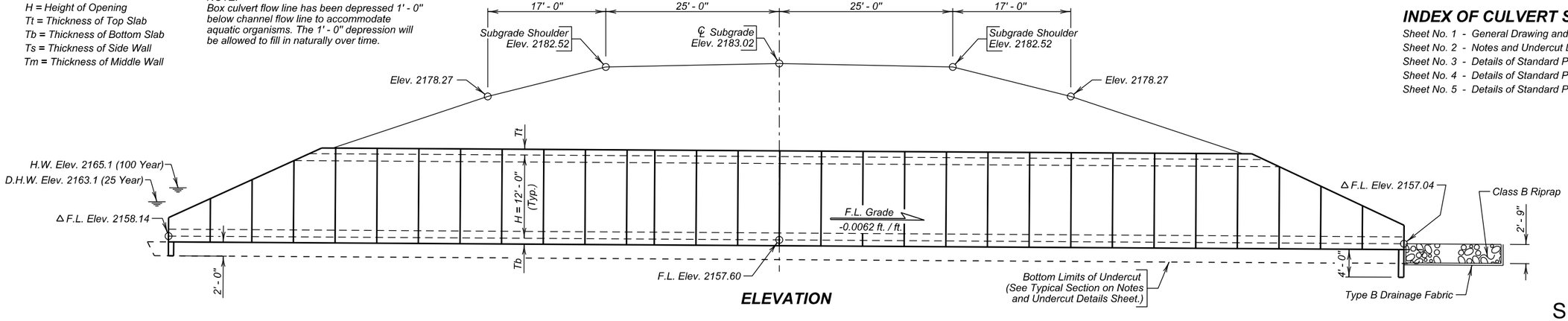


PLAN

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

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.



ELEVATION

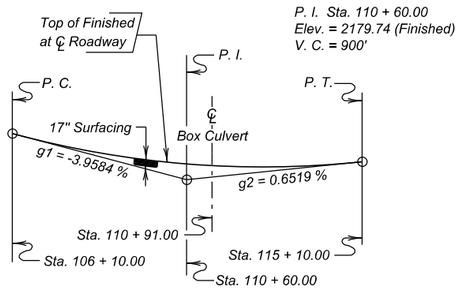
INDEX OF CULVERT SHEETS-

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

HYDRAULIC DATA

Q_d	581 cfs
A_d	80 sq ft
V_d	7.3 fps
Q_F	581 cfs
Q_{100}	1050 cfs
Q_{OT}	>Q_{500}
V_{max}	10.9 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2163.1.
Q_{OT} = Overtopping discharge and frequency > Q_{500} year recurrence interval. El. 2182.3 @ Sta. 113 + 78.00 ±.
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. 2165.1.
V_{max} = Maximum computed outlet velocity for the proposed culvert, based on 100 year frequency.



VERTICAL CURVE DATA

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
∉	Structure Excavation, Box Culvert	Cu. Yd.	160
	Box Culvert Undercut	Cu. Yd.	451
≠	Class B Riprap	Ton	65.4
	Type B Drainage Fabric	Sq. Yd.	80
	2 - 13' X 12' Precast Concrete Culvert, Furnish	Ft.	130
	2 - 13' X 12' Precast Concrete Culvert, Install	Ft.	130
	2 - 13' X 12' Precast Concrete Culvert End Section, Furnish	Each	2
	2 - 13' X 12' Precast Concrete Culvert End Section, Install	Each	2

∉ Quantity is based on 10" bottom slab, 10" top slab, 9" outside walls.
≠ For estimating purposes only, a factor of 1.4 tons/cu. yd. was used to convert Cu. Yd. to Tons.

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

SITE 2
ALTERNATE B

GENERAL DRAWING AND QUANTITIES

FOR

2 - 13' x 12' BOX CULVERT (PRECAST)

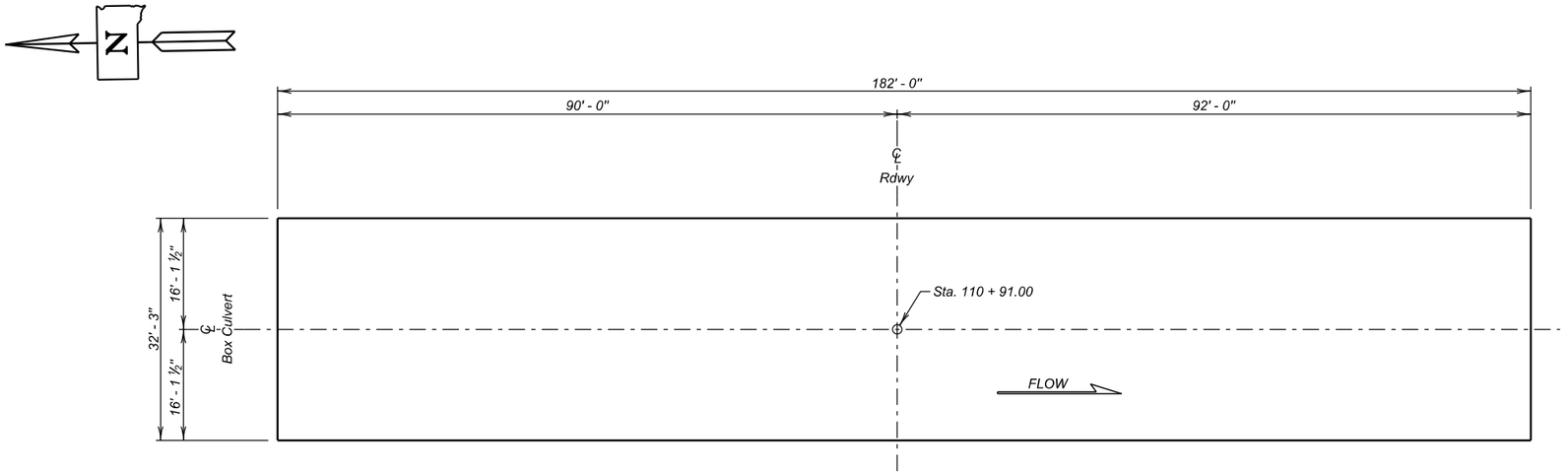
OVER BELCHER CREEK — 0° SKEW
STA. 110 + 91.00 — SEC. 10-T01N-R21E
STR. NO. 28-212-477 — NH 0014(230)145
PCN 04FW — HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2022

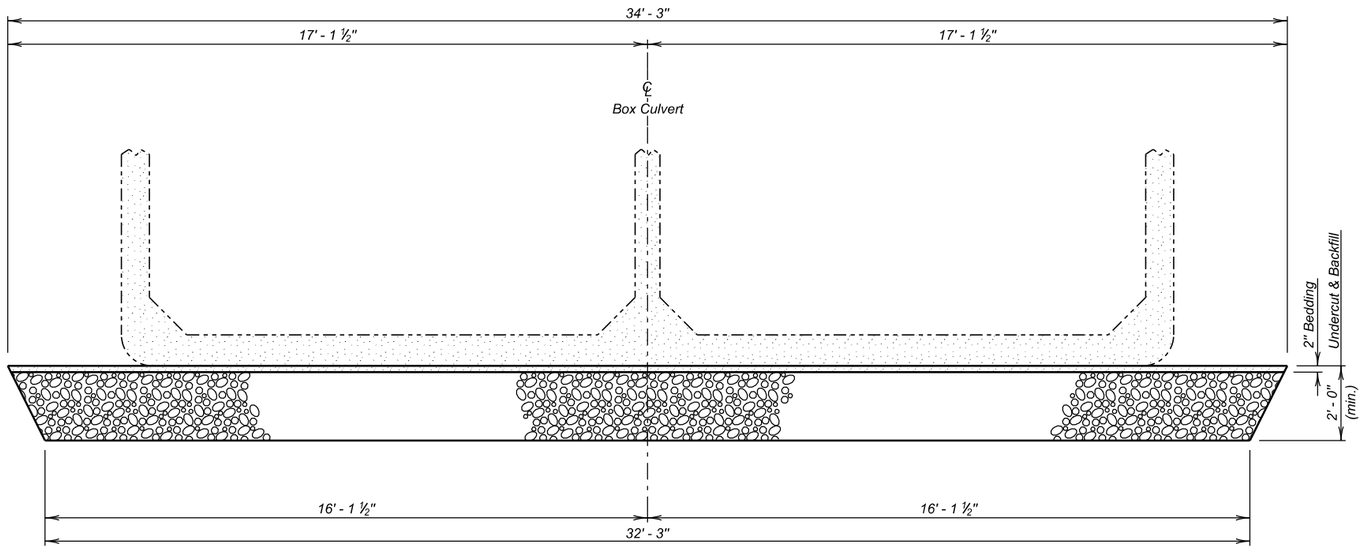
-X028-

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	CM	BT	Steven A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMA09		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0025(85)115	E34	E62



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SPECIFICATIONS

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

GENERAL NOTES

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

1. *Box culvert and box culvert end section design will conform to the AASHTO LRFD Bridge Design Specifications, 8th Edition.*
2. *Design Live Load: HL-93 and construction loading consisting of one 7'-6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the box culvert. If other construction loads in excess of legal load are anticipated by the Contractor, the Contractor will submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.*
3. *The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with the latest Interim Revisions using the LRFR method. The rating will include evaluation of the Design HL-93 truck at both Inventory and Operating levels and a Legal Load rating for three SD legal trucks (Type 3, 3S2 and 3-2) as well as the notional rating load and four specialized hauling vehicles. The structure will also be evaluated for the emergency vehicles, EV2 and EV3, at the legal load rating level. All sections of the box culvert will rate at HL-93 or better (Inventory Level). The three SD legal loads, the notional rating load, the four specialized hauling vehicles, and two emergency vehicles will rate greater than 1.0 at legal load rating level. Submit Load Rating calculations with the Design and Check Design calculations or shop plans, as appropriate.*
4. *The design of the barrel sections will be based on a minimum fill height of 2 foot and include all subsequent fill heights up to and including the maximum fill height of 15 ft. over the box culvert.*
5. *Minimum inside corner fillet will be 6 in.*
6. *Minimum precast barrel section length will be 6 - foot sections; however, no more than two 4-foot sections are allowed in any one length of precast barrel.*
7. *Lift holes will be plugged with an approved nonshrinkable grout.*
8. *All joints will match the existing box culvert.*
9. *Installation of the precast sections will be in accordance with the final approved shop plans.*
10. *Care will be taken when placing sections. Sections will be only moved using the lifting holes by approved equipment.*
11. *Soils below the bottom of the proposed RCBC consist of 3' gray clay sand alluvium overlying Pierre Shale. Groundwater was encountered in the borings at an elevation of 2159.5 during the subsurface investigation conducted in May 2020. Dewatering will be required during construction.*

DESIGN MIX OF CONCRETE

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

SHOP PLANS

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

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
₡	Box Culvert Undercut	Cu. Yd.	451

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

SITE 2
ALTERNATE B

NOTES AND UNDERCUT DETAILS

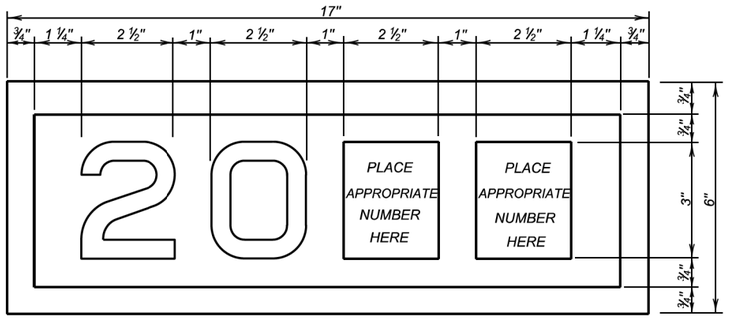
FOR

2 - 13' x 12' BOX CULVERT (PRECAST)

OVER BELCHER CREEK — 0° SKEW
STA. 110 + 91.00 — SEC. 10-T01N-R21E
STR. NO. 28-212-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BB	CM	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWVMA10		



YEAR PLATE DETAILS

GENERAL NOTES:

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

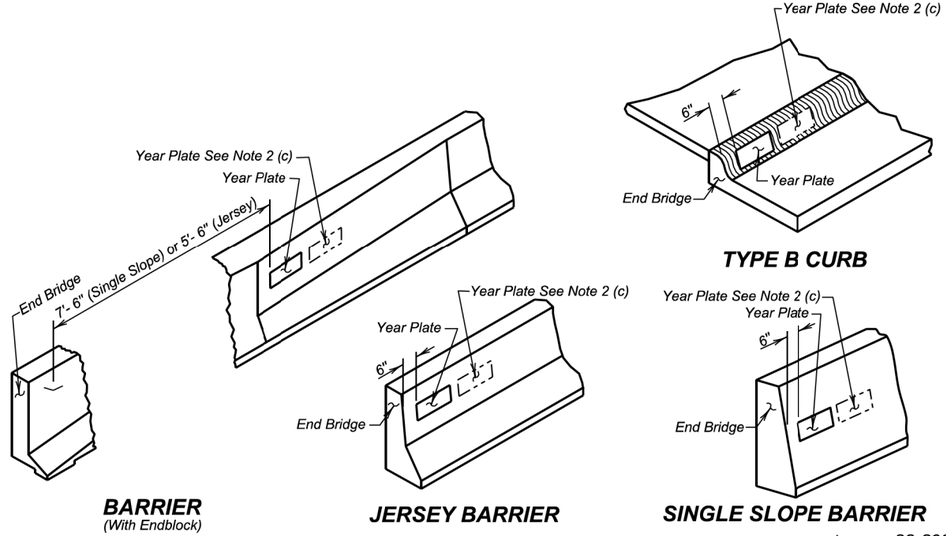
2. Year plates will be located on structure(s) as follows:

   a. On cast-in-place box culverts the year plates will be four and one - half (4 ½) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.

   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'- 6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.

   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

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



BARRIER (With Endblock)

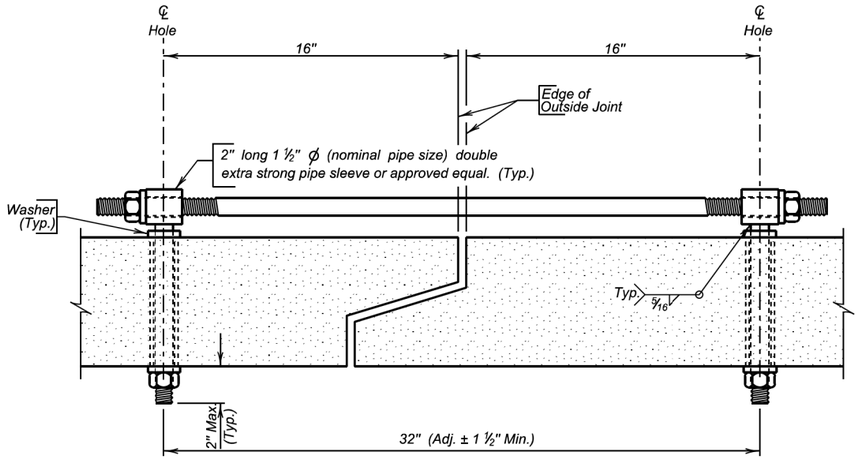
TYPE B CURB

JERSEY BARRIER

SINGLE SLOPE BARRIER

January 22, 2021

Published Date: 1st Qtr. 2023	SDDOT	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1



TIE BOLT ASSEMBLY

GENERAL NOTES:

1. 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.

2. Ties shall be 1 inch ∅ and conform to the requirements of ASTM A36, ASTM A307, or ASTM F1554, Gr. 36. Nuts shall be heavy hex in conformance with ASTM A563. Washers shall conform to ASTM F436, Type 1. The welded pipe sleeve shall conform to ASTM A53, Grade B.

3. Welding and weld inspection shall be in conformance with AWS/ANSI D1.1 - (Current Year) Structural Welding Code - Steel.

4. Tie Bolt Assembly shall be galvanized in accordance with ASTM A153 or ASTM F2329 as applicable.

5. 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.

6. All costs for furnishing and installing the precast box culvert tie bolt assembly shall be incidental to the contract unit price per Foot for "Precast Concrete Box Culvert, Furnish".

March 21, 2016

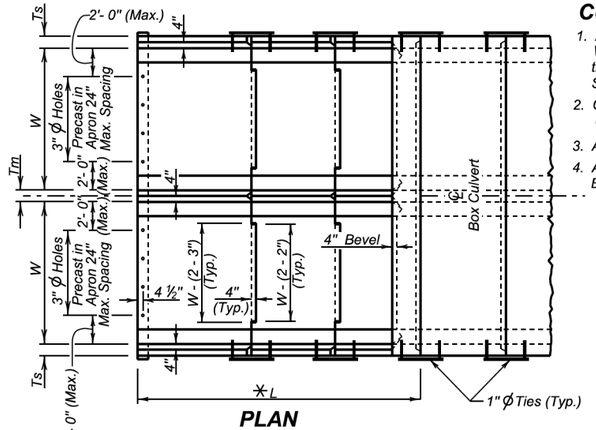
Published Date: 1st Qtr. 2023	SDDOT	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1

SITE 2
ALTERNATE B

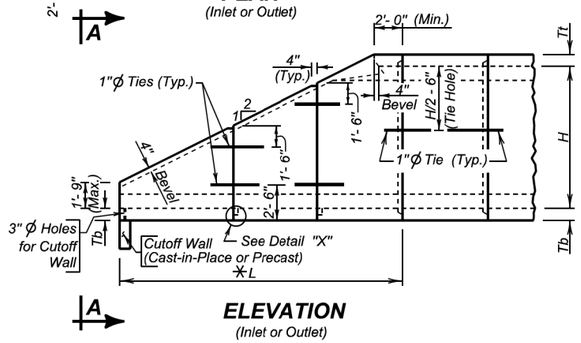
2 - 13' X 12' BOX CULVERT (PRECAST)
STR. NO. 28-212-477
FEBRUARY 2022

CUTOFF WALL

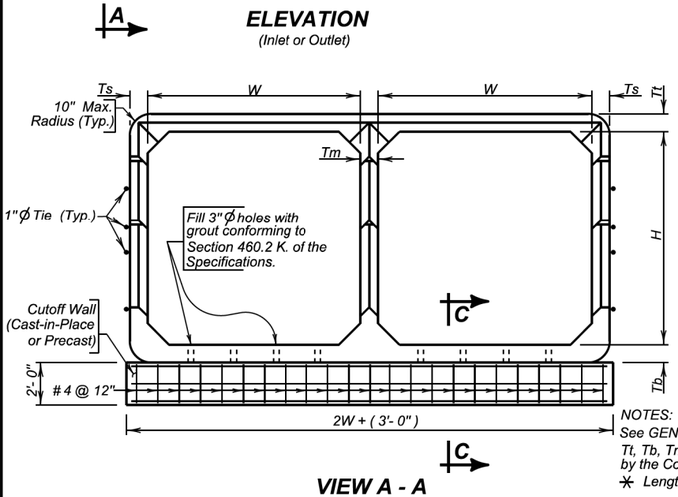
1. All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
2. Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section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



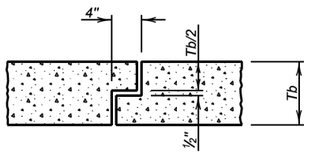
PLAN
(Inlet or Outlet)



ELEVATION
(Inlet or Outlet)

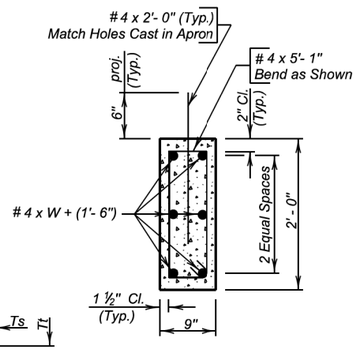


VIEW A - A



DETAIL " X "

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



SEC. C - C

LEGEND

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

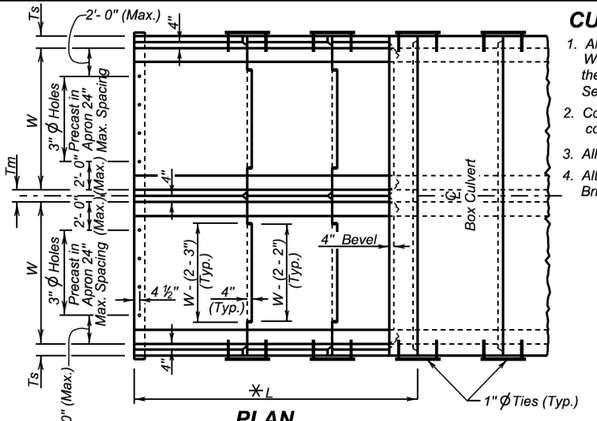
NOTES:
See GENERAL DRAWING for W and H dimensions.
Tt, Tb, Tm, L, and Ts dimensions shall be furnished by the Contractor.
⁎ Length and number of units may vary from that shown.

June 26, 2015

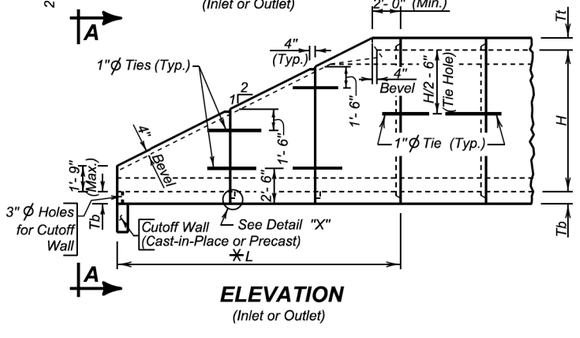
Published Date: 1st Qtr. 2023	SDDOT	PRECAST DOUBLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'–0" CUTOFF WALL	PLATE NUMBER 560.20
			Sheet 1 of 1

CUTOFF WALL

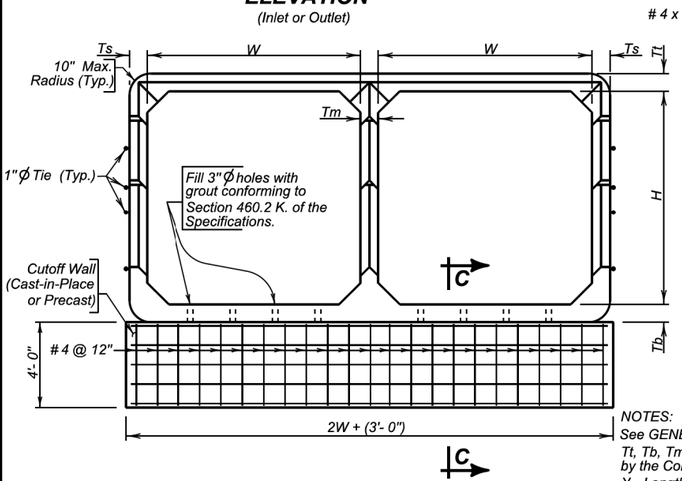
1. All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
2. Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section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



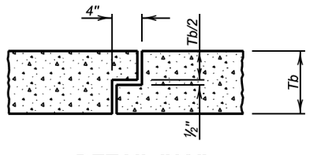
PLAN
(Inlet or Outlet)



ELEVATION
(Inlet or Outlet)

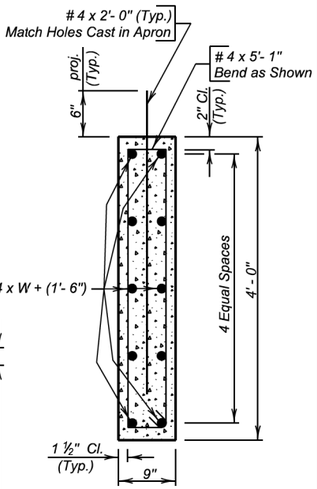


VIEW A - A



DETAIL " X "

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



SEC. C - C

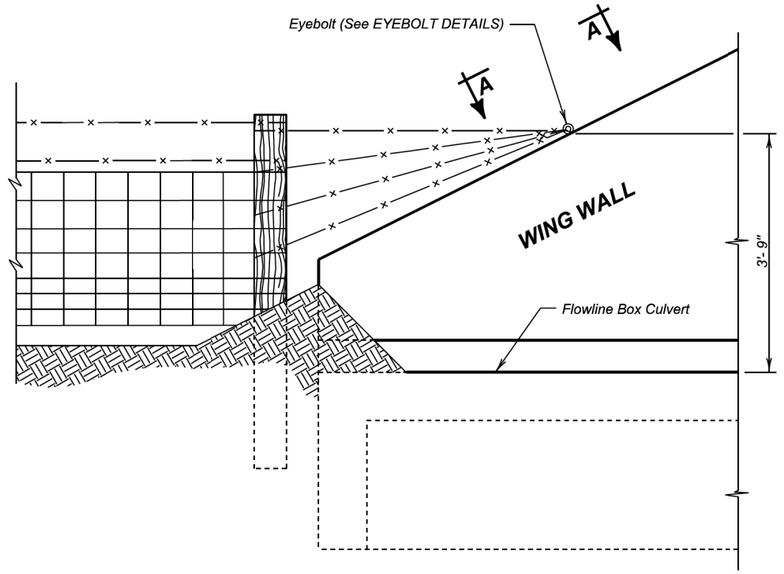
LEGEND

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

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

June 26, 2015

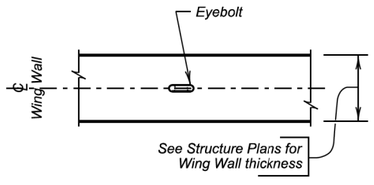
Published Date: 1st Qtr. 2023	SDDOT	PRECAST DOUBLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'–0" CUTOFF WALL	PLATE NUMBER 560.21
			Sheet 1 of 1



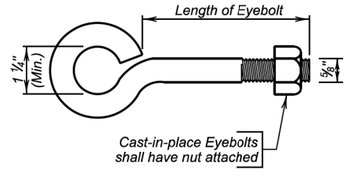
DETAIL FOR FENCE ANCHORS

GENERAL NOTES:

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be ⅝ inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be 4 ½ inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the ⅝ inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23,2012

Published Date: 1st Qtr. 2023	SDDOT	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
			Sheet 1 of 1

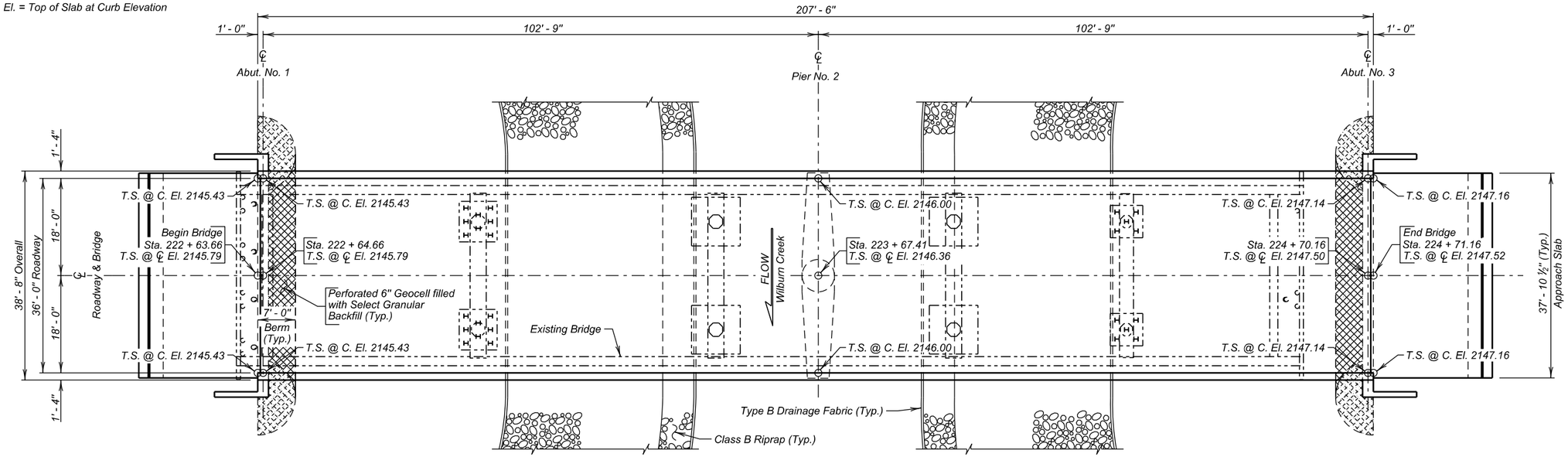
SITE 2
ALTERNATE B

2 - 13' X 12' BOX CULVERT (PRECAST)
STR. NO. 28-212-477
FEBRUARY 2022

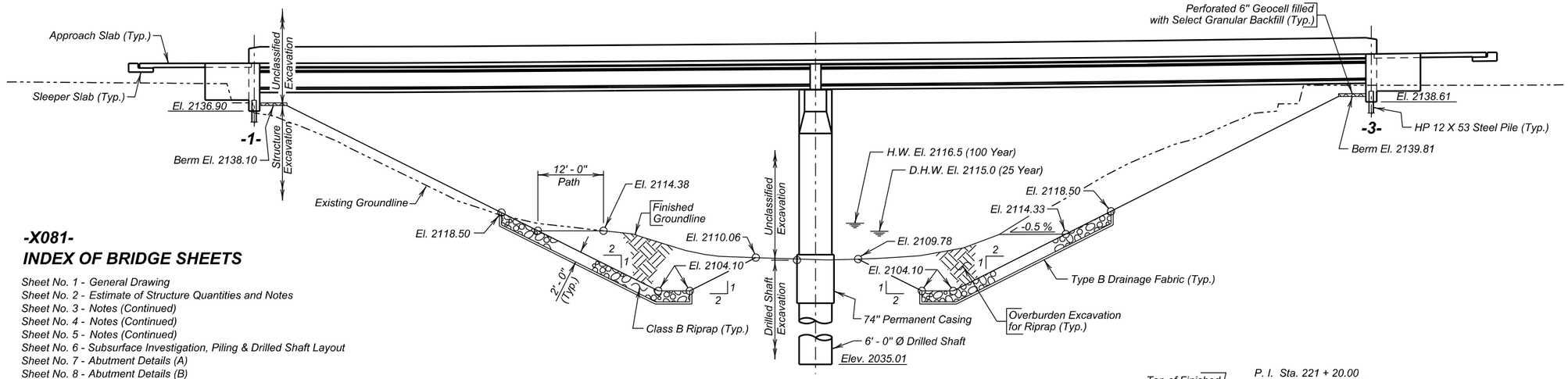
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

NOTE:
T.S. @ ℄ El. = Top of Slab at Centerline Elevation
T.S. @ C. El. = Top of Slab at Curb Elevation

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E38	E62



PLAN



ELEVATION

-X081-
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Sheet No. 1 - General Drawing
Sheet No. 2 - Estimate of Structure Quantities and Notes
Sheet No. 3 - Notes (Continued)
Sheet No. 4 - Notes (Continued)
Sheet No. 5 - Notes (Continued)
Sheet No. 6 - Subsurface Investigation, Piling & Drilled Shaft Layout
Sheet No. 7 - Abutment Details (A)
Sheet No. 8 - Abutment Details (B)
Sheet No. 9 - Pier Details (A)
Sheet No. 10 - Pier Details (B)
Sheet No. 11 - Superstructure Details (A)
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Sheet No. 13 - End Block and Barrier Curb Details
Sheet No. 14 - 102' - 6" Girder Details
Sheet No. 15 - Erection Data and Slab Form Elevations
Sheet No. 16 - Diaphragm Details
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Sheet No. 18 - Details of Bridge End Backfill (B)
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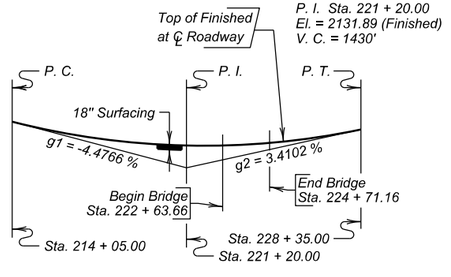
Sheet No. 22 - As-Built Elevation Survey (A)
Sheet No. 23 - As-Built Elevation Survey (B)
Sheet No. 24 - Details of Standard Plate No.'s 430.50 and 460.02
Sheet No. 25 - Details of Standard Plate No.'s 460.05 and 510.40
Sheet No. 26 - Details of Standard Plate No.'s 620.19 and 630.92

HYDRAULIC DATA

Q_d	946 cfs
A_d	150 sq ft
V_d	6.3 fps
Q_F	946 cfs
Q_{100}	1701 cfs
Q_{OT}	$>Q_{500}$
V_{max}	7.6 fps

Q_d = Design discharge for the proposed bridge based on 25 year frequency. El. 2115.0.
Q_{OT} = Overtopping discharge and frequency > Q_{500} year recurrence interval. El. 2145.7 @ Sta. 222 + 03.00 ±.
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. 2116.5.
V_{max} = Maximum computed outlet velocity for the proposed bridge, based on 100 year frequency.



VERTICAL CURVE DATA

GENERAL DRAWING

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
PCN 04FW — HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

-X081-

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

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL HAKN04FW	AG 04FWTC01	BT	Steve A Johnson BRIDGE ENGINEER

ESTIMATE OF STRUCTURE QUANTITIES

DESCRIPTION	QUANTITY	UNIT	REMARKS
Bridge Elevation Survey	Lump Sum	LS	
Concrete Penetrating Sealer	830	SqYd	See Special Provision
Incidental Work, Structure	Lump Sum	LS	
Structural Steel, Miscellaneous	Lump Sum	LS	
Membrane Sealant Expansion Joint	75.8	Ft	
Structure Excavation, Bridge	18	CuYd	
Bridge End Embankment	1,115	CuYd	
Granular Bridge End Backfill	83.6	CuYd	
Approach Slab Underdrain Excavation	6.3	CuYd	
Precast Concrete Headwall for Drain	4	Each	
Class A45 Concrete, Bridge Deck	288.1	CuYd	
Class A45 Concrete, Bridge	132.4	CuYd	
Concrete Approach Slab for Bridge	173.3	SqYd	
Concrete Approach Sleeper Slab for Bridge	37.9	SqYd	
Class A45 Concrete, Drilled Shaft	79.5	CuYd	
Drilled Shaft Excavation	74.9	CuYd	
Crosshole Sonic Log (CSL) Test	1	Each	
74" Permanent Casing	8.9	Ft	
Reinforcing Steel	55,570	Lb	
Epoxy Coated Reinforcing Steel	2,389	Lb	
No. 18 Rebar Splice	26	Each	
Preboring Pile	200	Ft	
HP 12x53 Steel Test Pile, Furnish and Drive	135	Ft	
HP 12x53 Steel Bearing Pile, Furnish and Drive	1,125	Ft	
54" Minnesota Shape Prestressed Concrete Beam	1,025	Ft	
4" Underdrain Pipe	185	Ft	
Porous Backfill	11.8	Ton	
Class B Riprap	2,954.4	Ton	
Type B Drainage Fabric	3,517	SqYd	
Perforated Geocell	604	SqFt	
Overburden Excavation for Riprap	697	CuYd	
Select Granular Backfill	21.1	Ton	
Stainless Reinforcing Steel	54,601	SqYd	See Special Provision

BRIDGE SPECIFICATIONS

1. Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required provisions, supplemental specifications and special provisions as included in the proposal.

BRIDGE DESIGN LOADING

1. AASHTO HL-93.
2. Dead Load includes 22 psf for future wearing surface on the roadway.

DESIGN MATERIAL STRENGTHS*

Class A45 Concrete	f'_c = 4,500 psi
Reinforcing Steel (ASTM A615, Gr. 60)	f_y = 60,000 psi
Piling (ASTM A572 Grade 50)	f_y = 50,000 psi
Stainless Reinforcing Steel (ASTM A955, Gr. 60)	f_y = 60,000 psi

*For prestressed beams, see notes regarding Prestressed Girders.

GENERAL CONSTRUCTION

1. All lap splices shown are contact lap splices unless noted otherwise.
2. All exposed concrete corners and edges will be chamfered 3/4-inch unless noted otherwise.
3. Use 2-inch clear cover on all reinforcing steel except as shown otherwise on plans.
4. The Contractor will imprint on the structure the date of new construction as specified and detailed on Standard Plate 460.02.
5. Barrier Curbs and End blocks will be built perpendicular to the roadway grade line.
6. Requests for construction joints or 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.
7. Bridge berms will be constructed to the plans template prior to any pile driving or construction of abutment footings. See Standard Plate 120.11. Berm slopes will not be disturbed after construction. Any alterations to the berm or slopes after berm construction will be submitted to the Bridge Construction Engineer for approval. Allow 30 days for review of proposals.
8. The elevation of the bridge deck is 18 inches above subgrade elevation.
9. All substructure concrete will be Class A45 conforming to Section 460, with the following modifications: the type of cement will be either a type V or type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605.

INCIDENTAL WORK, STRUCTURE

1. In place centerline Sta. 222+59.73 to centerline Sta. 224+58.81 is a 197'-6" 5 span composite I-beam viaduct bridge with a 30'-0" clear roadway. The superstructure consists of a reinforced concrete slab with metal railing continuous across the bridge. The deck has been overlaid with 1 ½-inches of asphalt. The substructure consists of 2 column reinforced concrete bents and reinforced concrete sill abutments, all of which are supported on timber piling.
2. Break down and remove the existing bridge, and approach/sleeper slabs if applicable, to 1-foot below finished groundline, or as required to construct the new structure in accordance with Section 110 of the Specifications. All portions of the existing bridge will 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.
3. During demolition of the structure, efforts will be taken to prevent material from falling into the creek. Under no circumstances is asphalt allowed to fall into the creek.
4. The foregoing is a general description of the in-place bridge and should not be construed to be complete in all details. Before preparing the bid, it is the responsibility of the Contractor to make a visual inspection of the structure to verify the extent of the work and materials involved. If desired by the Contractor, a copy of the original construction plans may be obtained through the Office of Bridge Design.

NOTICE - LEAD BASED PAINT

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

DESIGN MIX OF CONCRETE

1. All structural concrete will be Class A45 Concrete unless otherwise indicated.
2. Type II cement conforming to Section 750 is required except Type III cement may be used for prestressed beams.
3. Grout design mix will be as specified in Section 460.2 K of the Construction Specifications. A compressive strength of 2000 psi will be attained by the grout prior to erection of any beams. Chamfer edges of grout pads 3/4-inch. The quantity of grout is included in and will be paid for at the contract unit price per cubic yard for Class A45 Concrete, Bridge.

ESTIMATE OF STRUCTURE QUANTITIES AND NOTES

FOR

207' - 6" PRESTR. GIRDER BRIDGE

STR. NO. 28-234-477

NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC02		

ABUTMENTS

1. Preboring piling at each abutment is required to whichever is greater, ten feet or to natural ground.

2. The HP 12x53 Piling were designed using a factored bearing resistance of 98 tons per pile. Piling will develop a field verified nominal bearing resistance of 245 tons per pile.

3. One test pile will be driven at each abutment and will become part of the pile group.

4. The contractor will have sufficient pile splice material on hand before pile driving is started. See Standard Plate 510.40.

5. Piles will not be driven out of position by more than three inches in the direction parallel to the girder centerline. A pile-driving template will be used to ensure this accuracy.

6. Abutment backwalls above the construction joint may be cast separately from the deck slab. The concrete used for the backwalls and wings shall be Class A45 Concrete, Bridge. All abutment and bridge deck concrete will have attained design strength prior to backfilling. Abutment wing walls shall not be cast until after the deck has been poured.

7. Each finished abutment shall include a Bridge Survey Marker. See Standard Plate 460.05.

PIERS

1. The design of the drilled shafts is based upon encountering competent Pierre Shale Formation at elevation 2099. If competent Pierre Shale Formation is not encountered at or above this elevation, contact the Office of Bridge Design, through proper channels, before proceeding with the drilled shaft construction. Geotechnical Engineering Activity personnel will be present during the drilling operations to confirm these elevations and to observe placement of the drilled shafts. The Geotechnical Engineering Activity will be notified a minimum of two weeks prior to the start of excavation for the drilled shafts.

2. The drilled shafts will be constructed using the permanent casing method in conformance with Section 465 of the Construction Specifications. Permanent casings for the drilled shafts will be installed and seated immediately prior to drilled shaft excavation. A construction joint will be placed at the top of the permanent casing and the permanent casing will extend a minimum of 1'-0" above the groundline, waterline, or construction platform elevation, whichever is higher.

3. The construction joint locations and quantities provided on the plans are based upon the estimated existing groundline and waterline elevations. It is the responsibility of the Contractor to verify the existing elevations and have a drilled shaft installation plan submitted and approved prior to ordering the casing. If the Contractor intends to use construction platforms, etc. that would require any of the construction joints to be at a location other than the location shown in the plans, the Contractor will include these proposed changes in the drilled shaft installation plan for approval by the Office of Bridge Design.

4. The quantities for Drilled Shaft Excavation; 74-inch Permanent Casing; Class A45 Concrete, Drilled Shaft; and Class A45 Concrete, Bridge are based upon the construction joint locations as shown in the plans. Payment for these items will be at the contract unit price for the plans shown quantities regardless of any approved changes in the location of the construction joints as requested by the Contractor due to the construction of work platforms, etc. Measurement and payment will be made at the contract unit prices for any changes due to variations in the competent foundation soil or in the locations of the existing groundline and waterline elevations as ordered by the Engineer.

5. The H1 bars are detailed full length of the Drilled Shaft and are provided in the reinforcing schedule. Once the construction joint elevations have been verified and established, mechanical splice details showing location will be submitted for approval to the Office of Bridge Design with the drilled shaft installation plan. Mechanical splices must be staggered and not placed side by side.

6. Drilled Shaft concrete will conform to Section 465 with the following modifications: the type of cement will be either a type V or type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605.

7. Wet drilled shaft excavations will be cleaned by using an air lift system. Details for the air lift system will be included as part of the Drilled Saft Installation Plan.

8. The drilled shaft contractor will include the name of the CSL testing organization meeting the requirements of Section 465.3J with the submittal of the Drilled Shaft installation Plan.

PRESTRESSED GIRDERS

1. Minimum concrete compressive strength f'_c = **7000** psi at 28 days for all girders, f'_{ci} = **6000** psi for all girders.

2. All mild reinforcing steel will be deformed bars conforming to ASTM A615, Grade 60.

3. Individual tendons in all pretensioned sections will consist of seven-wire uncoated Type 270K Strands having a nominal diameter of 0.6-inch and a minimum ultimate strength of 58600 lbs. per cable. An initial tensile force of 43500 lbs. will be applied to all 0.6-inch cables in all girders. All prestressing steel will conform to AASHTO M203. (low-relaxation strands).

4. All prestressed girders within a span will be cast within an 8-day period. If not, the newest girder will be at least 6 weeks old before the deck slab is poured. The girders will be poured in all steel forms.

5. Prestressed concrete girders will always be lifted by the devices provided in the top flanges near the ends of the girders. Types of lifting devices other than those shown on the plans may be used provided they are approved by the Office of Bridge Design. The design of the lifting devices will be the responsibility of the fabricator.

6. Each beam will be marked showing structure number, casting date, and beam number. Marking will be on the face of the beam near the end and the location will be exposed after the diaphragms have been cast. Facia beams will be marked on an inside face. All markings will be stenciled and clearly legible. For beam designations and locations, see superstructure layout plan and Erection Data sheet.

7. The physical properties of the elastomeric bearing pads will conform to the requirements of Section 18.2 of the AASHTO LFRD Bridge Construction Specification and the AASHTO Materials Specification M251. The elastomeric bearing pads will conform to Grade 60 (durometer). The cost of the pads will be incidental to the contract unit price per cubic yard for Class A45 Concrete, Bridge. Certification that pads are 60 durometer and meet the requirements of AASHTO LFRD Bridge Construction Specification Section 18.2 and AASHTO Materials Specification M251 will be furnished to the Engineer with the shop drawings. No laminated bearing pads will be allowed.

8. All exposed corners will be chamfered 3/4-inch or rounded to 3/4-inch radius.

9. Dead Load of girder taken as effective at transfer. Cut strands flush with end of girder and coat end of strands with mortar, EXCEPT the strands that are to be extended and bent,

10. The Contractor will be responsible for ensuring that transportation stresses, handling, and erection do not cause damage to the girders.

11. Furnish and Install Inserts for T8 Rebars as shown in the plans. All costs involved will be incidental to the contract unit price per foot of 54" Minnesota Shape Prestressed Concrete Beam.

NOTES (CONTINUED)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

STR. NO. 28-234-477

NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC03		

SUPERSTRUCTURE

1. Girder lifting hooks will be cut off before placement of concrete deck slab.

2. The diaphragms at the pier will be poured integrally with the deck slab. Placement of diaphragm at the pier will not slow down the rate of deck concrete placement and finishing. The Contractor will place the concrete for the specified diaphragms ahead of the deck concrete in such a manner that advancement of the deck concrete reaches the diaphragm just as placement of concrete in the diaphragm is complete.

3. The use of an approved deck finishing machine will be required during placement of bridge deck concrete. The deck finishing machine will be adjusted and operated in such a manner that the screed or screeds are parallel with the centerline of the bridge. The finish machine and concrete placement will be parallel to the skew of the bridge.

4. The concrete bridge deck will be placed and finished at a minimum rate of 51 feet of deck per hour measured along centerline roadway. If concrete cannot be placed and finished at this rate, the Engineer will order a header installed and operations stopped. If a header is required sometime during the pour operation, its location will be at or as near as possible to the three-quarter point of the span. Notify the Bridge Construction Engineer if deck pour operations are stopped. Operations may resume only when the Engineer is satisfied that a rate of 51 feet per hour can be maintained and the concrete has attained a minimum compressive strength of 2000 psi.

5. Snap ties, if used in the barrier curb formwork, will be corrosion resistant. The corrosion resistant ties will be inert in concrete and compatible with the stainless reinforcing steel.

6. See Special Provision for Concrete Penetrating Sealer.

ABUTMENT BACKWALL COATING

The material for waterproofing the abutment backwall will be one of the products from the approved products list. The acceptable abutment backwall coating suppliers are listed on the approved products list at the following Internet address:

http://apps.sd.gov/applications/HC60ApprovedProducts/ProductList.aspx

The cost of furnishing and applying the coating will be incidental to the contract unit price per cubic yard for Class A45 Concrete, Bridge.

BOLT TESTING

The certified mill test reports for all bolts used on the project will include the test results for all the testing specified in section 972.2 D of the Construction Specifications. Some of these tests are supplemental tests that must be requested at the time the bolts are ordered. It is the responsibility of the Contractor to notify the bolt supplier of these requirements.

SHOP PLANS

Shop plans will be required as specified by the Construction Specifications.

FALL PROTECTION

1. The Contractor will install a Fall Protection System conforming to OSHA Regulations. When working on the girders prior to decking installation, a Horizontal Lifeline – or other OSHA approved system will be installed. The Contractor will have one Personal Fall Arrest System (PFAS) available for use by a Department Inspector. The PFAS will be compatible with the installed Fall Protection System.

2. Modifications to any bridge components used to accommodate the Fall Protection System will be shown on the Falsework Plans and/or the appropriate Shop Plans. Field welding to bridge components shall not be allowed. Field placed concrete inserts or drilled-in anchor bolts will be allowed if approved by the Engineer. All costs associated with providing the Fall Protection System will be incidental to the other contract items.

CLASS B COMMERCIAL TEXTURE FINISH

1. A Class B commercial texture finish will be applied to the inside face and top of Barriers (painted pearl white).

2. The Class B commercial texture finish will be applied in accordance with Section 460.3 L.1.c and Section 460.3 M.1 of the Construction Specifications.

PILE DRIVING

1. A drivability analysis was performed using the wave equation analysis program (GRLWEAP). The following pile hammers were evaluated and found to produce acceptable driving stresses:

   Delmag D25-32 Pileco D25-32

2. Pile hammers not listed will require evaluation and approval prior to use from the Geotechnical Engineering Activity. Requests for evaluation of hammers not listed will be submitted a minimum of 5 business days prior to installation of piles.

APPROACH SLABS

1. Sleeper slab riser will be cast with or later than the approach slab. Care will be taken to ensure the correct grade is maintained across the top pf the sleeper slab riser.

2. The portion of the sleeper slab below the construction joint may be precast. If the bottom portion of the sleeper slab is precast, the Contractor will submit proposed lifting and setting plans to the Bridge Construction Engineer for approval. In addition, if reinforcing or other details differ from those shown in the plans, the Contractor will submit proposed alternate details for approval.

3. The use of an approved finishing machine will be required during placement of Class A45 Concrete for the approach slabs. Concrete placement in front of the machine will be kept parallel to the screed.

4. Concrete Approach Sleeper Slab for Bridge, whether cast-in-place or precast, will be paid for at the contract unit price per square yard. This payment will be full compensation for all excavation, furnishing, hauling, and placing all materials including concrete and reinforcing steel; for disposal of all surplus materials; and for labor, tools, equipment, and any incidentals necessary to complete this item of work.

5. Concrete Approach Slab for Bridge will be paid for at the contract unit price per square yard. This payment will be full compensation for all excavation, furnishing, hauling, and placing all materials including concrete, asphalt paint or 6 mil polyethylene sheeting, elastic joint sealer, and reinforcing steel; for disposal of all excavated material and surplus materials and for labor, tools, equipment, and any incidentals necessary to complete this item of work.

AS - BUILT ELEVATION SURVEY

The Contractor will be responsible for producing an as-built elevation survey soon after construction is completed but before the bridge is opened to traffic. The Contractor will be responsible for recording the as-built elevation shown in the plans. The completed table will be given to the Engineer and copies forwarded to the Office of Bridge Design and the Senior Region Bridge Engineer. The elevations will be based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88). The Engineer will provide the Contractor with a description, elevation, and location of the nearest benchmark that has a NAVD88 established elevation for the Contractor's use. The benchmark shown in Section B has not been tied to the NAVD88. The Contractor will be responsible for establishing a NAVD88 elevation for the benchmark provided in the plans. All cost associated with obtaining the NAVD88 elevations at the locations shown in the table and for the benchmark shown in the plans, including all equipment, labor, and any incidentals required will be incidental to the contractor lump sum price for Bridge Elevation Survey.

NOTES (CONTINUED)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

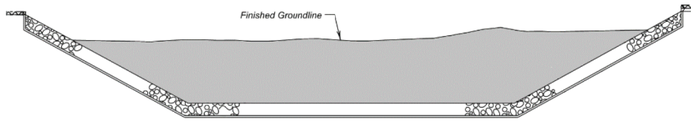
STR. NO. 28-234-477

NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC04		

OVERBURDEN EXCAVATION FOR RIPRAP

1. This work will consist of the removal and replacement of material between the limits of the finished groundline and the top of the riprap. See diagram below (overburden is in grey).



2. Excavation is to be completed after temporary diversion method is in place, if required, with minimal standing water to create the profile of slope protection specified in plans.

3. The removed material will be placed on top of the riprap to the natural ground, proposed groundline, or specified shape and elevations shown in plans. When overburden extends into the streambed it will form the channel bottom and profile as specified in plans under the Riprap Layout. The finished ground under the bridge will be shaped to match the upstream and downstream channel and flood plain.

4. The overburden material will be placed on top of the riprap and have a maximum lift depth of 1' – 0" and compacted free of flowing water or standing water in excess or four inches above the riprap at the lowest elevation.

5. Compaction effort will produce a surface that does not pump, rut, or otherwise displace when traveled over with construction equipment to the satisfaction of the Engineer. Material may be added to excavated material to facilitate compaction and handling. Importing, stockpiling, blending, and/or wasting of materials will be incidental to the contract unit price for Overburden Excavation for Riprap.

6. Payment for Overburden Excavation for Riprap will be at the contract unit price and will be full compensation for labor, equipment, tools, and incidentals, including furnishing, installing, and removal of any temporary works necessary to complete the work. Payment will be for plans quantity unless measurement is ordered by the Engineer.

7. Before preparing the bid, it is the responsibility of the Contractor to verify existing conditions to determine if a temporary diversion method and/or dewatering will be required. If required, the Contractor must submit the temporary diversion method and/or dewatering for approval to the Construction Engineer 30 days prior to construction.

PERFORATED GEOCELL

1. Perforated Geocell will be from the following company or equivalent:

   Company: Agtec
   Phone: 1-818-724-7657
   Website: http://www.agtec.com

2. Perforated Geocell will be 6 inches tall with Type B Drainage Fabric underlying the perforated Geocell. Installation will adhere to the manufacturer's recommendation.

3. Perforated Geocell will be filled with the Select Granular Backfill in accordance with Section 850 of the Construction Specifications.

4. Perforated Geocell will be paid for at the contract unit price per square foot. Payment will be full compensation for furnishing and installing the Perforated Geocell.

5. Select Granular Backfill will be paid for at the contract unit price per ton of material furnished. Payment will be full compensation for furnishing, loading, hauling, and placing the Select Granular Backfill.

APPROACH SLAB UNDERDRAIN SYSTEM

1. An underdrain system will be placed underneath the sleeper slabs and a vertical composite drain behind the abutments as shown in the plans in accordance with Section 435 of the Construction Specifications.

2. The 4-inch diameter Perforated PVC Drain Pipe will be SDR 35 Solvent Weld PVC Pipe conforming to ASTM D3034 and ASTM F758. The 2-inch and 4-inch diameter PVC Outlet Pipe will be Schedule 40 PVC Pipe conforming to ASTM D1785 designated as PVC 1120, PVC 1220, or PVC 2120. Pipe sections will be connected using a PVC Solvent Cement conforming to ASTM D2564. The Drain Sleeve shall conform to ASTM D6707.

3. Care will be taken to ensure that the 4-inch diameter Perforated PVC Drain Pipe and the 2-inch and 4-inch diameter PVC Outlet Pipe are not damaged during construction. Sufficient cover material will be placed over the pipes before compaction equipment is allowed over the underdrain system. Any damaged pipes will be replaced by the Contractor at no additional cost to the Department.

4. All labor, tools, equipment, and any incidentals necessary for the Installation of 4-inch diameter Perforated PVC Drain Pipe, 2-inch and 4-inch diameter PVC Outlet Pipe, SDR Solvent Weld PVC Coupling, and PVC Cement will be incidental to the contract unit price per foot for 4" Underdrain Pipe.

CSL ACCESS TUBES

1. Access tubes will be furnished and installed in the drilled shafts in accordance with Section 465 of the Construction Specifications.

2. All labor, tools, equipment, and any incidentals necessary for the Cross Sonic Log (CSL) Test will be incidental to the contract unit price per Cross Sonic Log (CSL) Test.

NOTES (CONTINUED)

FOR

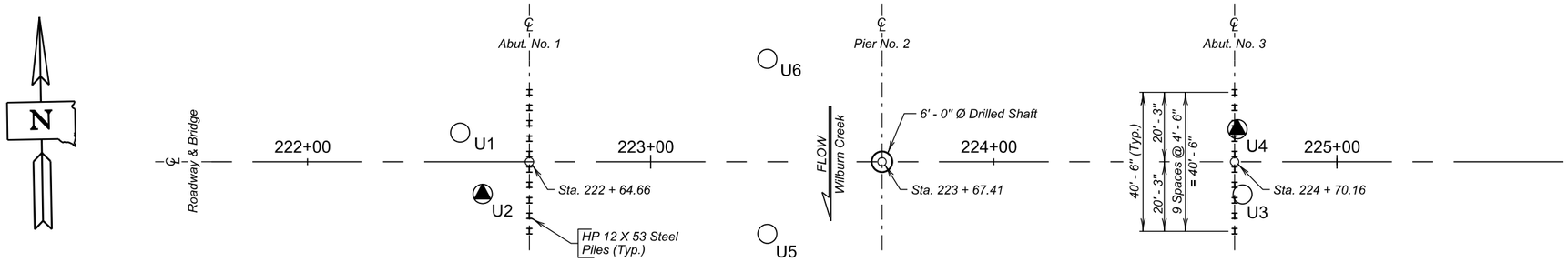
207' - 6" PRESTR. GIRDER BRIDGE

STR. NO. 28-234-477

NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC05		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0012(187)107	E43	E62



PILING & DRILLED SHAFT LAYOUT

Hole Number	U1	
Station	222+44	
Depth	50.5	ft
Soil Color	Dark Gray	
Classification	Clay	
Strength (Qu)	23,450	psf
Dry Density	104.3	pcf
Wet Density	124.9	pcf
Moisture	19.8	%
Pass No. 10	100.0	%
Pass No. 40	100.0	%
Pass No. 200	99.3	%
Sand Content	0.7	%
Silt Content	38.9	%
Clay Content	60.4	%

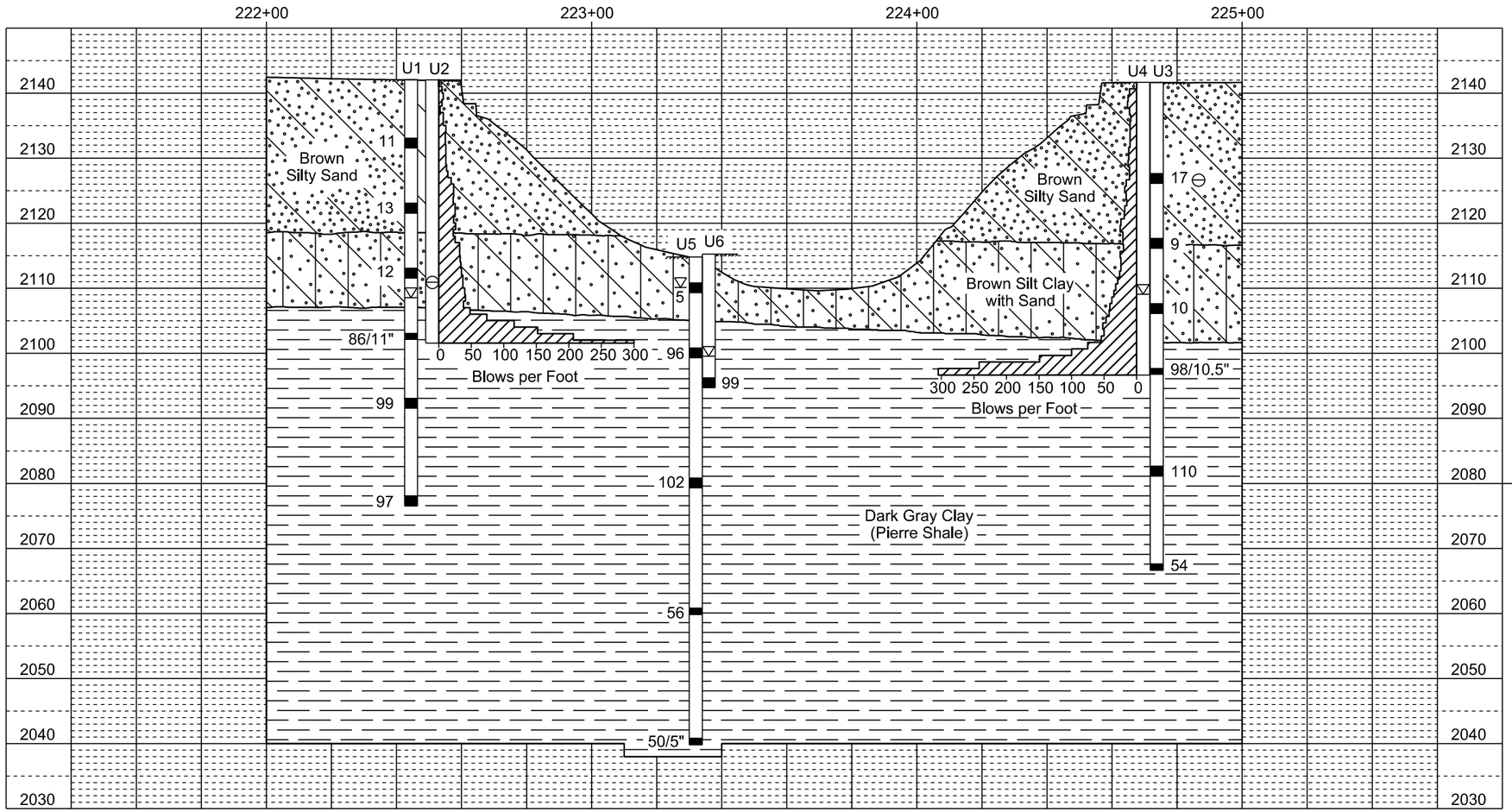
Hole Number	U5	
Station	223+34	
Depth	5.5	ft
Soil Color	Brown	
Classification	Silt Clay	
Strength (Qu)	743	psf
Dry Density	88.3	pcf
Wet Density	114.4	pcf
Moisture	29.7	%
Pass No. 10	100.0	%
Pass No. 40	98.0	%
Pass No. 200	72.6	%
Sand Content	27.4	%
Silt Content	29.6	%
Clay Content	43.0	%

Hole Number	U5	
Station	223+34	
Depth	35.5	ft
Soil Color	Dark Gray	
Classification	Clay	
Strength (Qu)	12,030	psf
Dry Density	101.3	pcf
Wet Density	123.9	pcf
Moisture	22.3	%
Pass No. 10	99.3	%
Pass No. 40	99.3	%
Pass No. 200	99.0	%
Sand Content	0.3	%
Silt Content	32.4	%
Clay Content	66.6	%

Hole Number	U3	
Station	224+72	
Depth	45.5	ft
Soil Color	Dark Gray	
Classification	Clay	
Strength (Qu)	8,497	psf
Dry Density	105.0	pcf
Wet Density	127.9	pcf
Moisture	21.9	%
Pass No. 10	99.9	%
Pass No. 40	99.9	%
Pass No. 200	99.0	%
Sand Content	0.9	%
Silt Content	28.0	%
Clay Content	70.9	%

Sample Zone 48 Blows Per Foot

Penetration Test results are listed as uncorrected "N" values. Blows over inches are listed if refusal is achieved, which is 50 blows within one 6 inch set.



Pierre Shale is a marine shale with a textural classification that varies from silt clay to clay silt. Color varies from buff gray to black. The formation may contain concretion zones that are normally thin but occasionally are massive. These zones may be considered hard and dense. Thin zones may be present that are cemented resulting in claystone or siltstone seams. Bentonite zones may be encountered but are normally less than one half inch thick. Nonweathered Pierre Shale is considered to be "Soft Rock".

The Geotechnical Engineering Activity has all of the boring logs and laboratory test results available for review at the Central Office in Pierre.

LEGEND

Penetration Test
Drive Test
Water
Caved
Sample Zone

Drive tests are conducted by dropping a 490 pound hammer 30 inches to drive a 2 7/8 inch drill stem to measure the resistance to penetration of the soil.

Penetration test holes are drilled with a 6 5/8 inch diameter hollow stem auger. Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil. Penetration Test results are listed as uncorrected "N" values in blows per foot. Blows over inches are listed if refusal is achieved, which is 50 blows within one 6 inch set.

GROUNDWATER ELEVATIONS

MAY 2020

U1		2109.7
U2	(DRY)	2112.1
U3	(DRY)	2127.8
U4		2110.2
U5		2110.1
U6		2099.6

MEASURED SKIN FRICTION

	ELEV.	PSF
U2	2102.7	902
U4	2097.8	723

SUBSURFACE INVESTIGATION, PILING & DRILLED SHAFT LAYOUT

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

HAAKON COUNTY

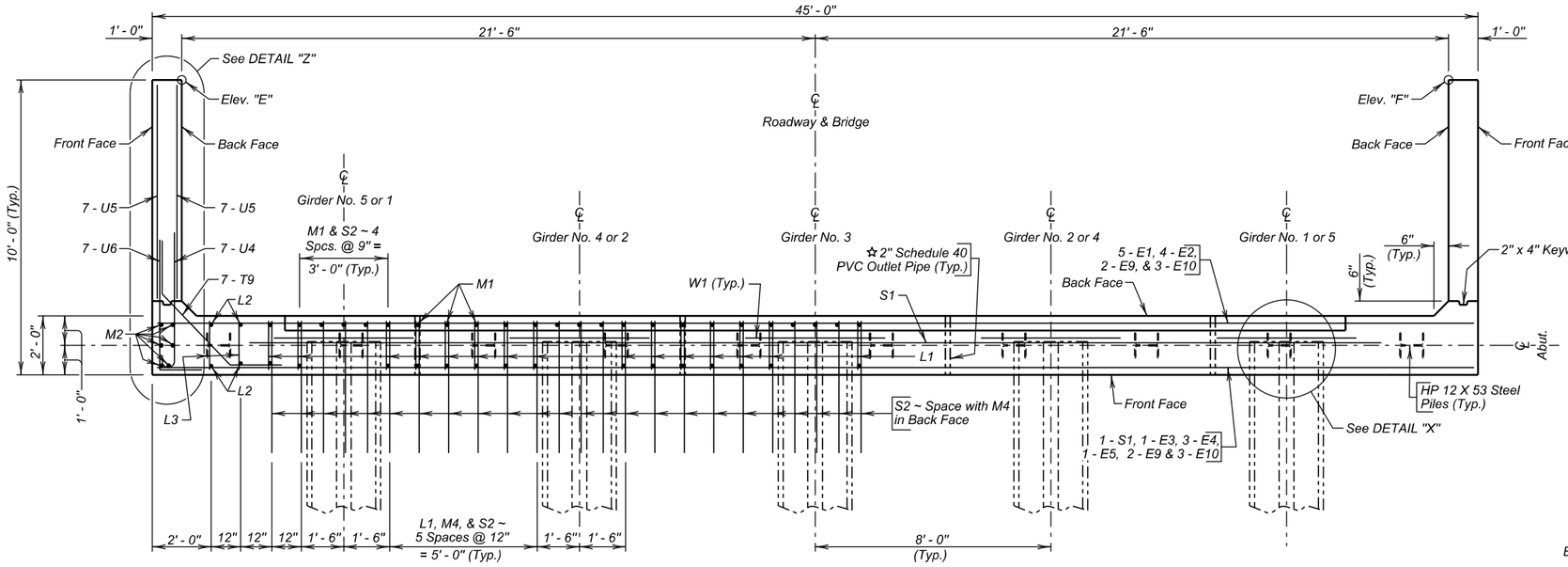
S. D. DEPT. OF TRANSPORTATION

NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG/HK	BT/KG	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC06		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E44	E62

Revised August 4, 2022 CL/AG



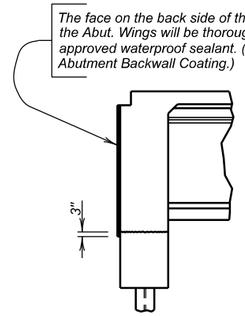
PLAN

(Abut. No. 1 shown, Abut. No. 3 similar opposite hand)

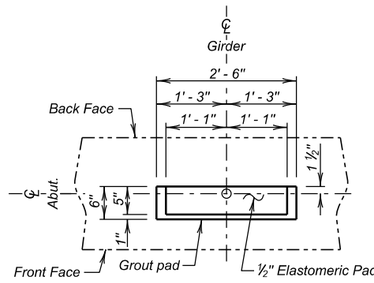
☆ See APPROACH SLAB UNDERDRAIN SYSTEM notes for payment and quantity.

INCREASING STATIONS Abut. No. 1

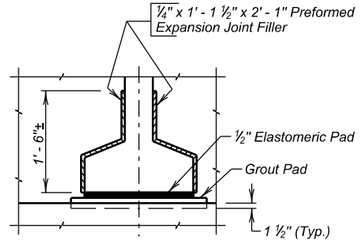
INCREASING STATIONS Abut. No. 3



ABUT. BACKWALL COATING DETAILS

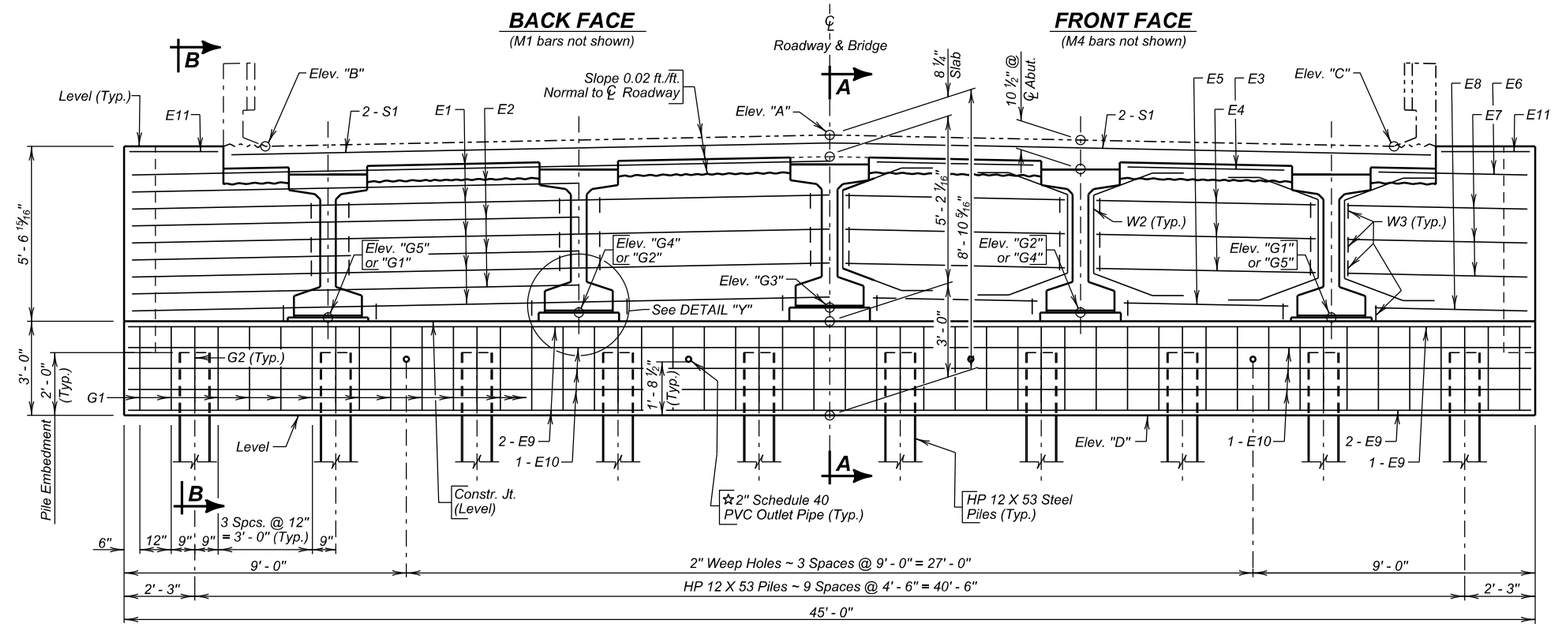


DETAIL "X"



DETAIL "Y"

(Typical at Girder Ends; Abutments only)



ELEVATION

(Along ℄ Abutment)

TABLE OF ELEVATIONS

Abut. No.	Elev. "A"	Elev. "B"	Elev. "C"	Elev. "D"	Elev. "E"	Elev. "F"
1	2145.79	2145.43	2145.43	2136.93	2145.36	2145.36
3	2147.50	2147.14	2147.14	2138.64	2147.07	2147.07

TABLE OF ELEVATIONS

Abut. No.	Elev. "G1"	Elev. "G2"	Elev. "G3"	Elev. "G4"	Elev. "G5"
1	2140.05	2140.21	2140.37	2140.21	2140.05
3	2141.76	2141.92	2142.08	2141.92	2141.76

NOTE - Elev. "A", "B" and "C" are top of slab at ℄ of Abutment. Elev. "E" and "F" are at top of wingwall elevation. Elev. "G1", "G2", "G3", "G4", and "G5" are top of grout pad elevations at ℄ Abutment. Top of grout pads will be level and smooth.

ABUTMENT DETAILS (A)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW

STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E

STR. NO. 28-234-477 — NH 0014(230)145

HL-93

HAAKON COUNTY

S. D. DEPT. OF TRANSPORTATION

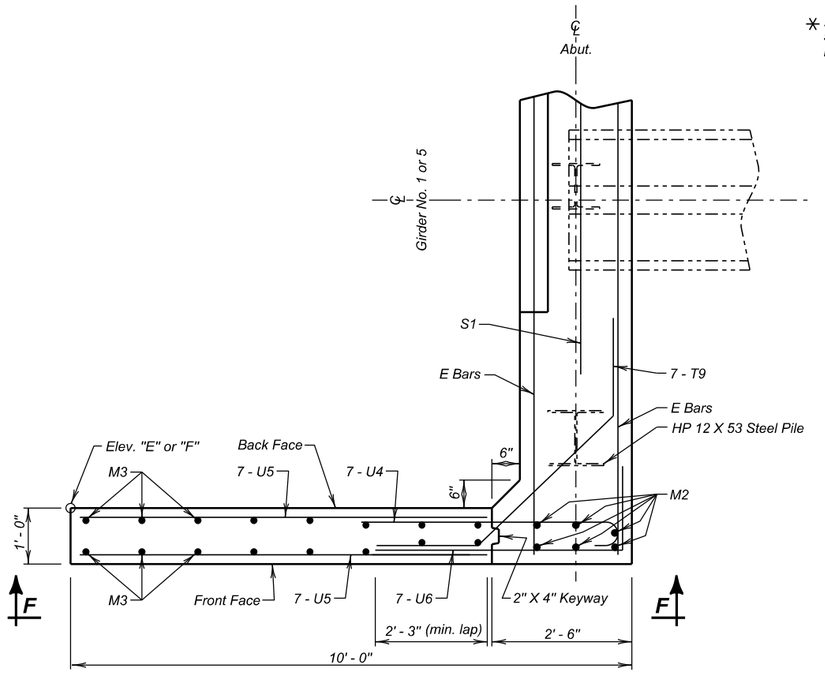
NOVEMBER 2021

7 OF 26

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC07		

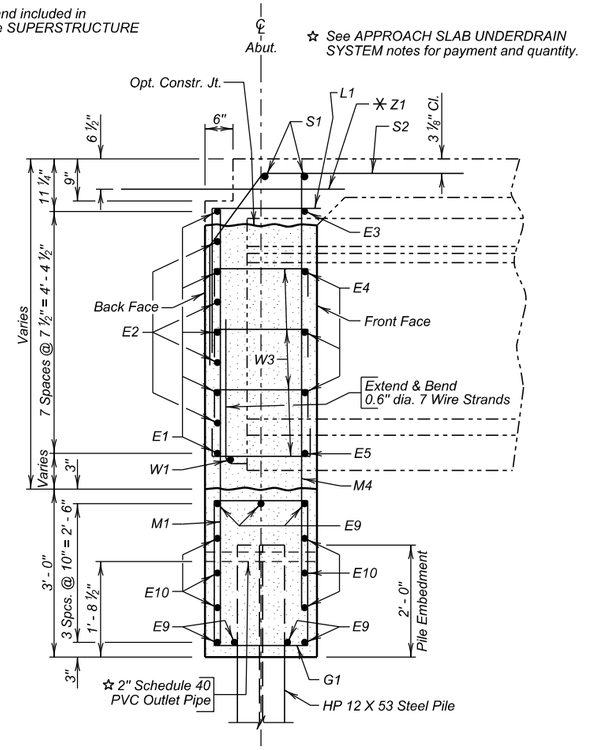
Revised August 4, 2022 CL/AG

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E45	E62



DETAIL "Z"

✳ *Z1 bars are listed and included in superstructure. See SUPERSTRUCTURE DETAILS (A) & (B).*



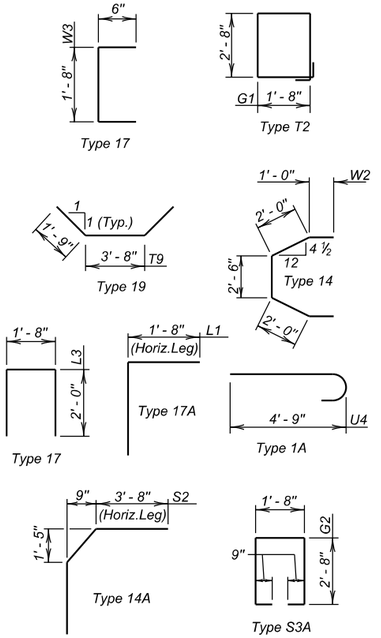
SECTION A - A

Mk.	No.	Size	Length	Type
E1	10	6	22' - 3"	Str.
E2	8	6	14' - 3"	Str.
E3	4	5	5' - 0"	Str.
E4	12	5	7' - 0"	Str.
E5	4	5	5' - 3"	Str.
E6	2	5	4' - 9"	Str.
E7	6	5	5' - 9"	Str.
E8	2	5	4' - 10"	Str.
E9	7	6	44' - 9"	Str.
E10	6	7	44' - 9"	Str.
E11	4	4	2' - 10"	Str.
G1	40	5	9' - 8"	T2
G2	10	5	8' - 6"	S3A
△ L1	43	4	3' - 10"	17A
L2	8	5	8' - 9"	Str.
L3	4	5	5' - 8"	17
M1	43	5	7' - 5"	Str.
M2	12	5	8' - 3"	Str.
M3	32	5	6' - 3"	Str.
△ M4	28	5	7' - 5"	Str.
△ S1	2	9	36' - 0"	Str.
△ S2	73	5	7' - 3"	14A
T9	14	6	7' - 2"	19
U4	14	6	5' - 3"	1A
U5	28	6	7' - 3"	Str.
U6	14	5	6' - 3"	17A
W1	5	5	4' - 6"	Str.
W2	10	4	8' - 8"	14
W3	40	5	3' - 0"	17

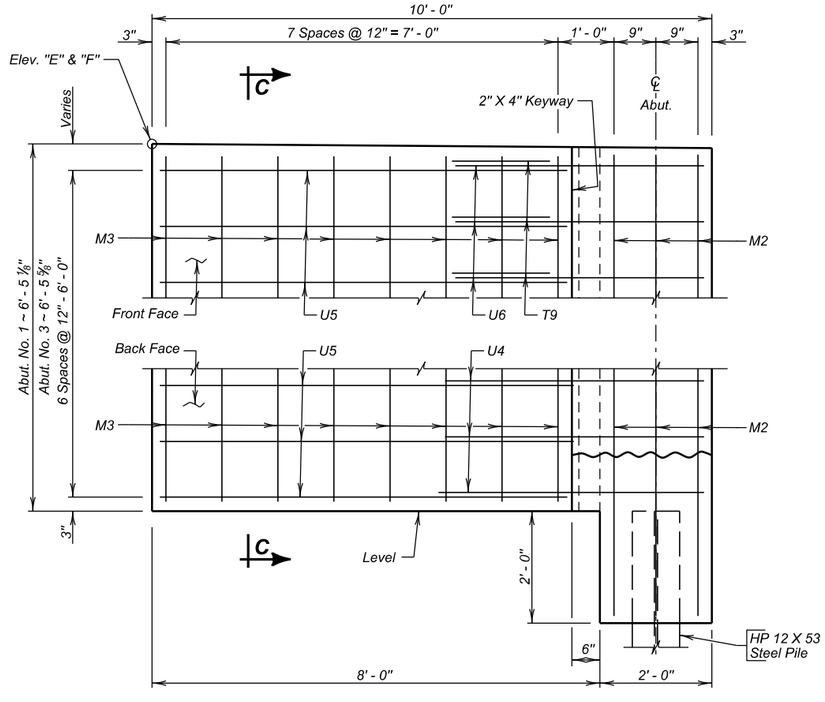
REINFORCING SCHEDULE

(For One Abutment - 2 Required)

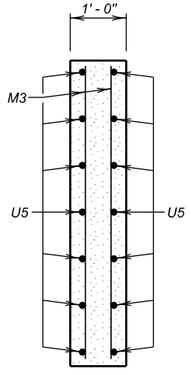
Bending Details



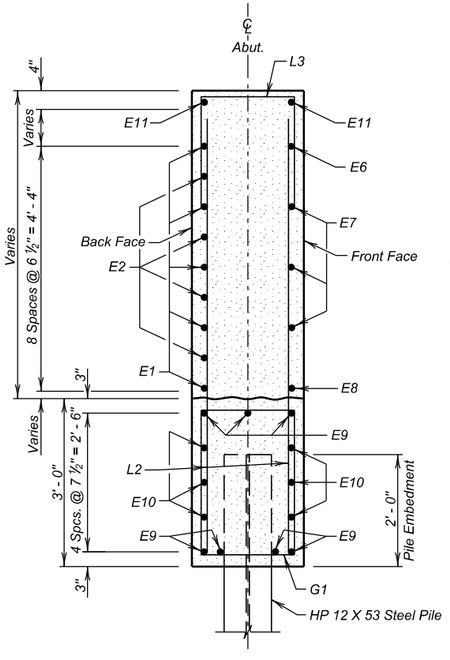
NOTE:
All dimensions are out to out of bars.
△ Bars to be Epoxy Coated.



VIEW F - F



SECTION C - C



SECTION B - B

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY	
		Abut. No. 1	Abut. No. 3
⌀ Class A45 Concrete, Bridge	Cu. Yd.	30.6	30.6
Reinforcing Steel	Lb.	3816	3816
Epoxy Coated Reinforcing Steel	Lb.	1124	1124
Structure Excavation, Bridge	Cu. Yd.	8.9	8.9
HP 12 x 53 Steel Test Pile, Furnish and Drive	Ft.	1 @ 65'	1 @ 70'
HP 12 x 53 Steel Bearing Pile, Furnish and Drive	Ft.	9 @ 60' = 540'	9 @ 65' = 585'
Preboring Pile	Ft.	10 @ 10' = 100'	10 @ 10' = 100'

⌀ *Includes 0.1 cu. yds. for grout pads.*

Note: Concrete will be placed in the space under the beams (within the backwall width) during the pour. upon form removal the space is not completely filled and consolidated, the contractor will grout the remaining voids.

ABUTMENT DETAILS (B)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

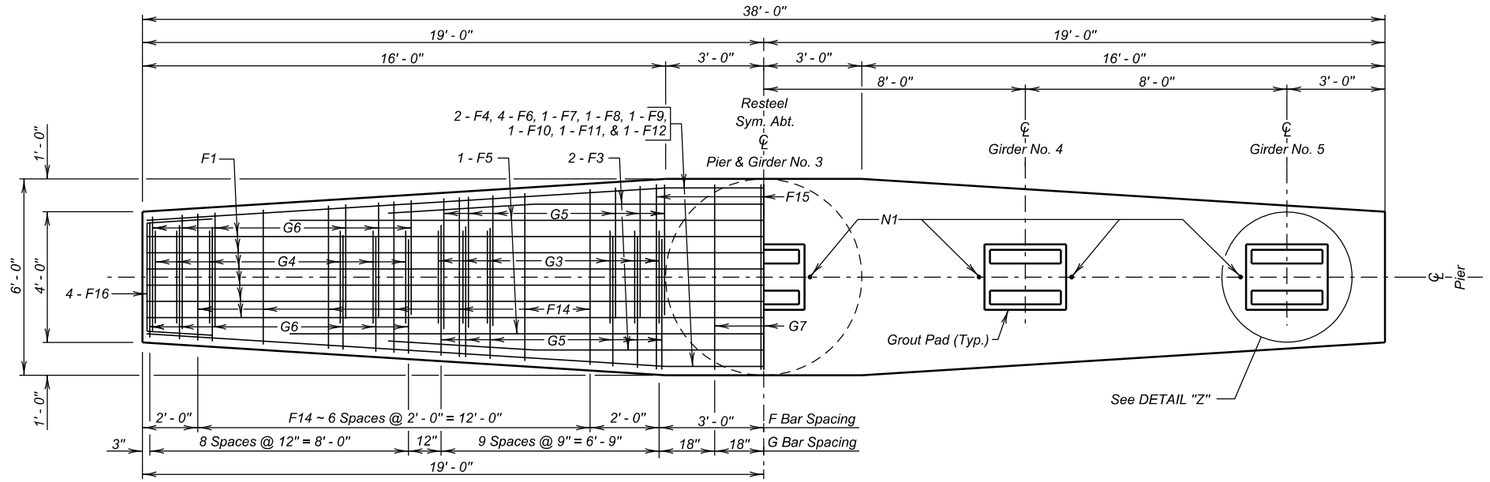
OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

8 OF 26

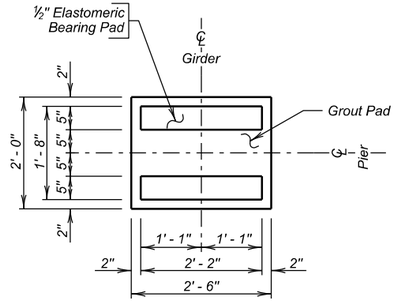
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC08		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0012(187)107	E46	E62

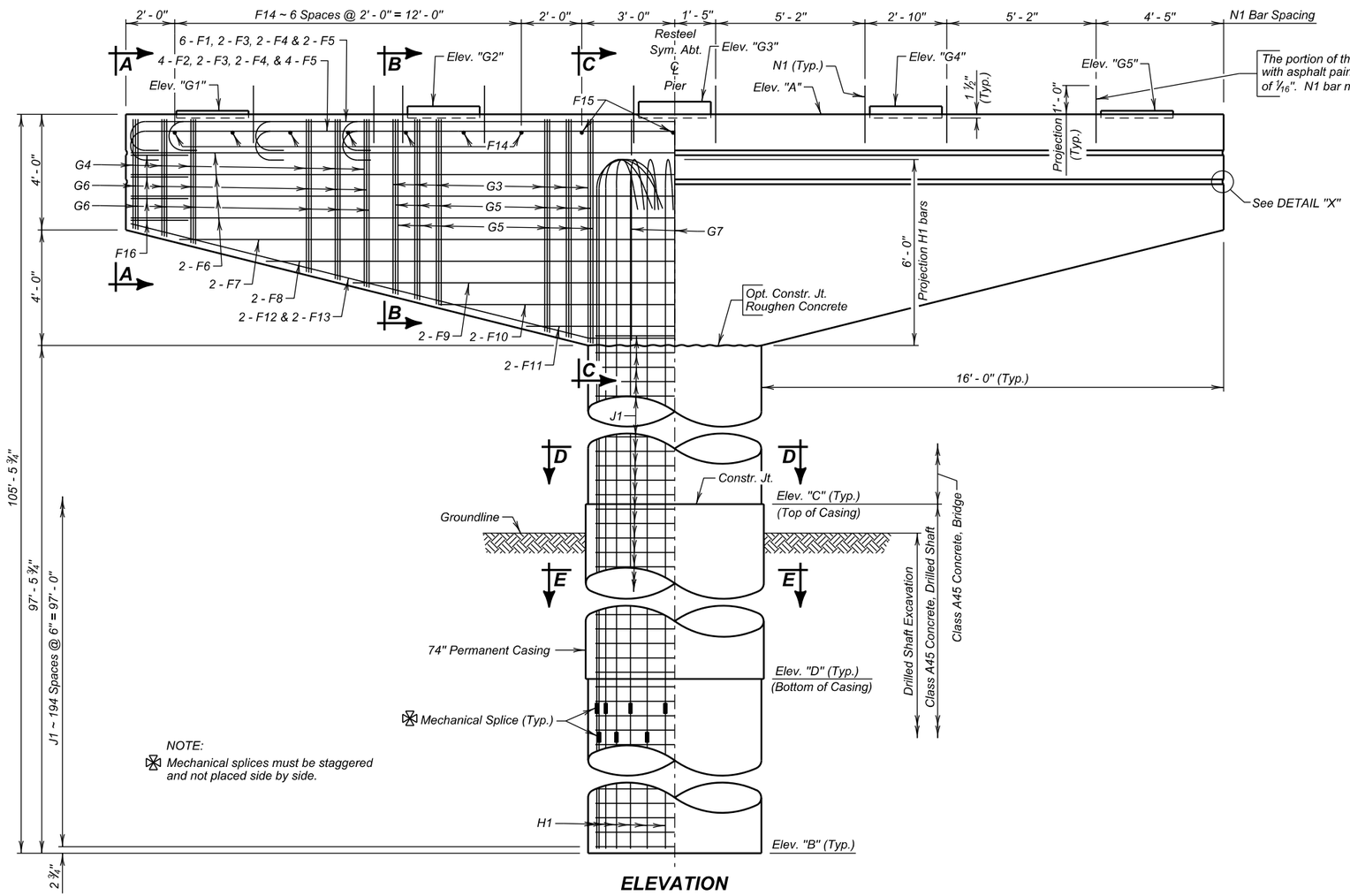


PLAN

INCREASING STATIONS



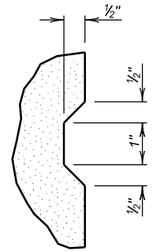
DETAIL "Z"



The portion of the N1 bar above the bent cap is to be coated with asphalt paint or wrapped with tar paper to a minimum thickness of 1/16". N1 bar may be shifted slightly off ℄ Pier to avoid top mat of resteel.

ELEVATION

See DETAIL "X"



DETAIL "X"

TABLE OF ELEVATIONS

Pier No.	★Elev. "G1"	★Elev. "G2"	★Elev. "G3"	★Elev. "G4"	★Elev. "G5"	Elev. "A"	Elev. "B"	Elev. "C"	Elev. "D"
2	2140.62	2140.78	2140.94	2140.78	2140.62	2140.49	2035.01	2110.90	2102.00

NOTE: Top of Grout Pad shall be level and smooth.
★Elevations are Top of Grout Pad at centerline of bent.

PIER DETAILS (A)

FOR

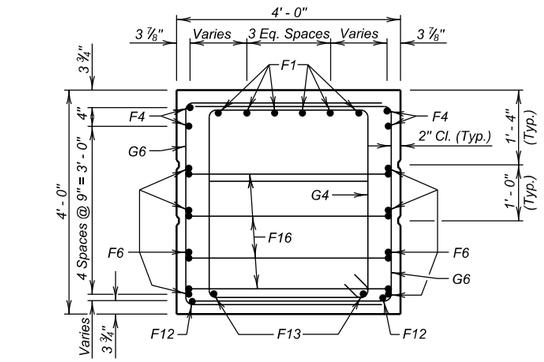
207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

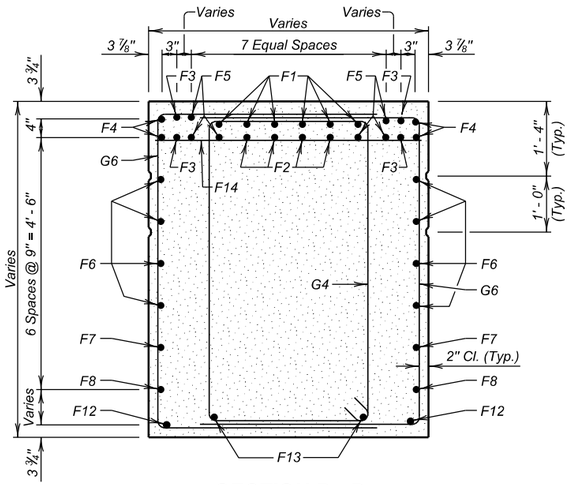
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC09		

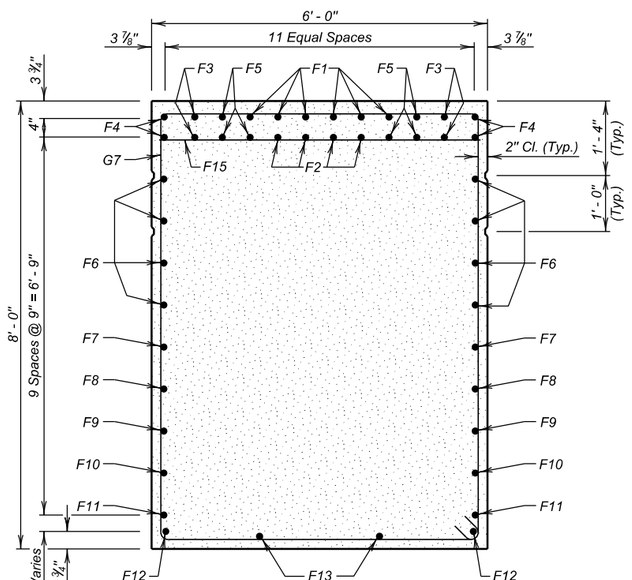
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0012(187)107	E47	E62



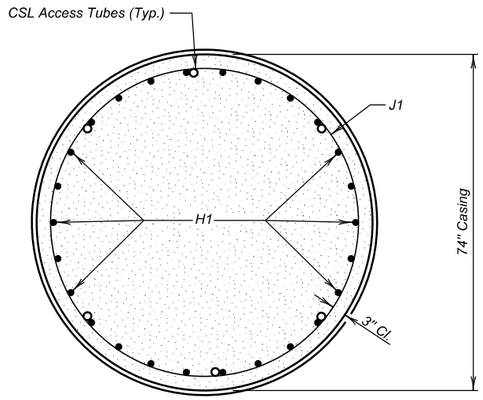
VIEW A - A



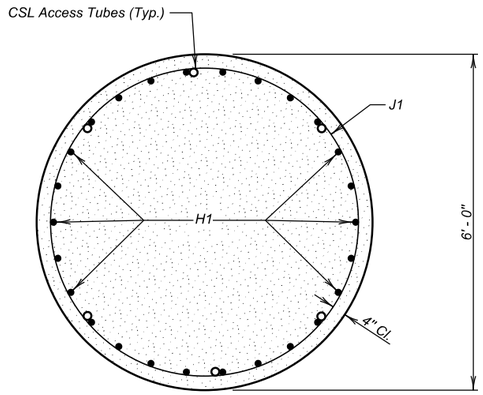
SECTION B - B



SECTION C - C



SECTION D - D



SECTION E - E

ESTIMATED QUANTITIES

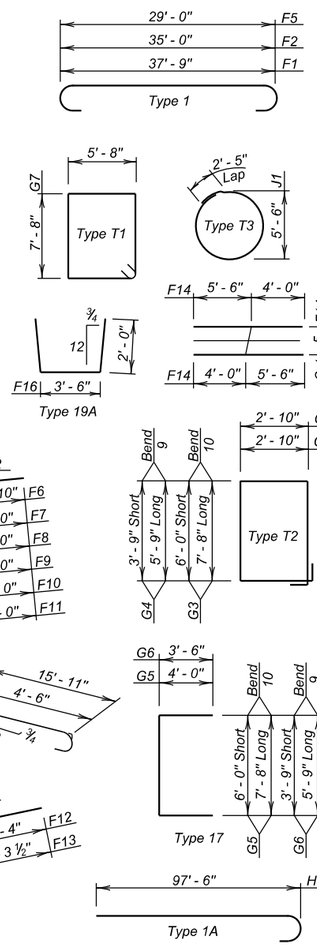
	ITEM	UNIT	QUANTITY
⏍	Class A45 Concrete, Bridge	Cu. Yd.	71.2
	Reinforcing Steel	Lb.	47938
	Drilled Shaft Excavation	Cu. Yd.	74.9
	Class A45 Concrete, Drilled Shaft	Cu. Yd.	79.5
	74" Permanent Casing	Ft.	8.9
	No. 18 Rebar Splice	Each	26
	Cross Hole Sonic Log (CSL) Test	Each	1

⏍ *Includes 0.3 Cu. Yds. for Grout Pads at Pier 2.*

REINFORCING SCHEDULE

(For One Pier - 1 Required)

	Mk.	No.	Size	Length	Type	Bending Details
	F1	6	10	40' - 11"	1	
	F2	4	10	38' - 2"	1	
	F3	4	10	38' - 2"	7	
	F4	4	10	41' - 3"	7	
	F5	6	10	29' - 0"	Str.	
	F6	8	7	37' - 8"	19A	
	F7	2	7	34' - 0"	19A	
	F8	2	7	28' - 0"	19A	
	F9	2	7	22' - 0"	19A	
	F10	2	7	16' - 0"	19A	
	F11	2	7	10' - 0"	19A	
	F12	2	5	38' - 8"	19A	
	F13	2	5	38' - 7"	19A	
⏍	F14	7	5	9' - 6"	Str.	
	F15	3	5	5' - 8"	Str.	
	F16	8	7	7' - 6"	19A	
✳	G3	20	5	19' - 4"	T2	
✳	G4	18	5	15' - 2"	T2	
✳	G5	40	5	14' - 10"	17	
✳	G6	36	5	11' - 9"	17	
	G7	3	5	27' - 8"	T1	
⏍	H1	26	18	104' - 0"	1A	
	J1	196	5	19' - 8"	T3	
	N1	8	8	2' - 0"	Str.	



NOTES-
All dimensions are out to out of bars.
⏍ *See cutting diagram.*
✳ *Length shown is average. Actual lengths vary according to bend diagram.*
⏍ *Length shown is full length required. The contractor must submit a splice plan for approval. Mechanical splices must be staggered and not placed side by side. Splices will not be placed within 10 feet of the point of fixity or top and bottom of casing. The point of fixity is at elevation 2099.*

PIER DETAILS (B)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

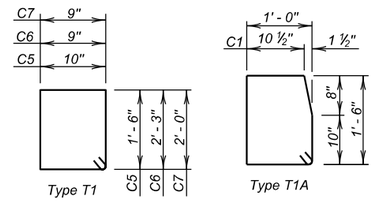
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC10		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E48	E62

REINFORCING SCHEDULE

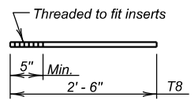
Mk.	No.	Size	Length	Type
B	444	5	39' - 6"	1
B1	204	4	38' - 4"	Str.
B2	203	4	35' - 8"	Str.
B15	12	5	9' - 6"	19B
B16	8	4	49' - 0"	Str.
B17	8	4	5' - 8"	Str.
B18	12	8	3' - 0"	19B
B19	12	5	2' - 0"	Str.
B20	12	6	3' - 6"	17A
B21	4	4	5' - 9"	19
B22	4	4	3' - 3"	19B
C1	392	5	5' - 10"	T1A
C2	396	5	5' - 3"	S11
C3	4	5	5' - 8"	T1A
C4	8	5	5' - 3"	S11
C5	8	5	5' - 7"	T1
C6	12	6	7' - 4"	T1
C7	12	5	6' - 5"	T1
C8	4	6	7' - 3"	17
C9	4	5	3' - 5"	17
D	16	4	53' - 0"	Str.
D0	20	5	44' - 0"	Str.
D1	60	4	41' - 3"	Str.
D2	148	4	42' - 9"	Str.
D3	160	4	43' - 0"	Str.
D4	4	4	2' - 6"	Str.
D5	36	8	32' - 0"	Str.
D6	37	7	51' - 0"	Str.
D7	26	5	17' - 0"	Str.
T1	8	6	5' - 5"	Str.
T2	24	5	7' - 0"	Str.
T3	8	5	5' - 3"	Str.
T4	8	5	5' - 0"	Str.
T5	4	5	35' - 3"	Str.
T6	20	5	4' - 9"	17A
T7	4	5	4' - 8"	Str.
T8	16	6	2' - 6"	Str.
U1	16	4	13' - 9"	S4
U2	10	6	14' - 3"	S4
U3	32	4	3' - 1"	17
Z1	48	7	4' - 0"	Str.

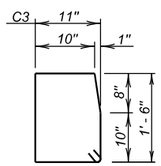
Bending Details



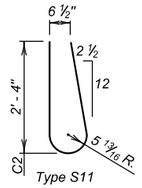
Type T1

Type T1A

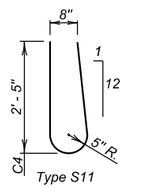




Type T1A



Type S11



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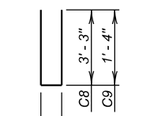
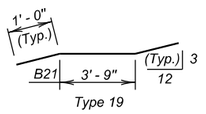
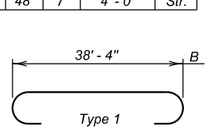


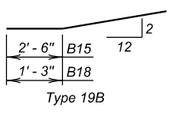
Type 17



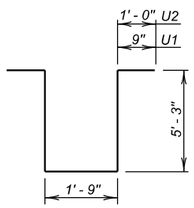
Type 19



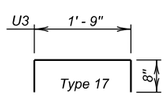
Type 1



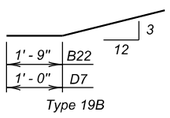
Type 19B



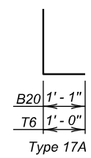
Type S4



Type 17



Type 19B



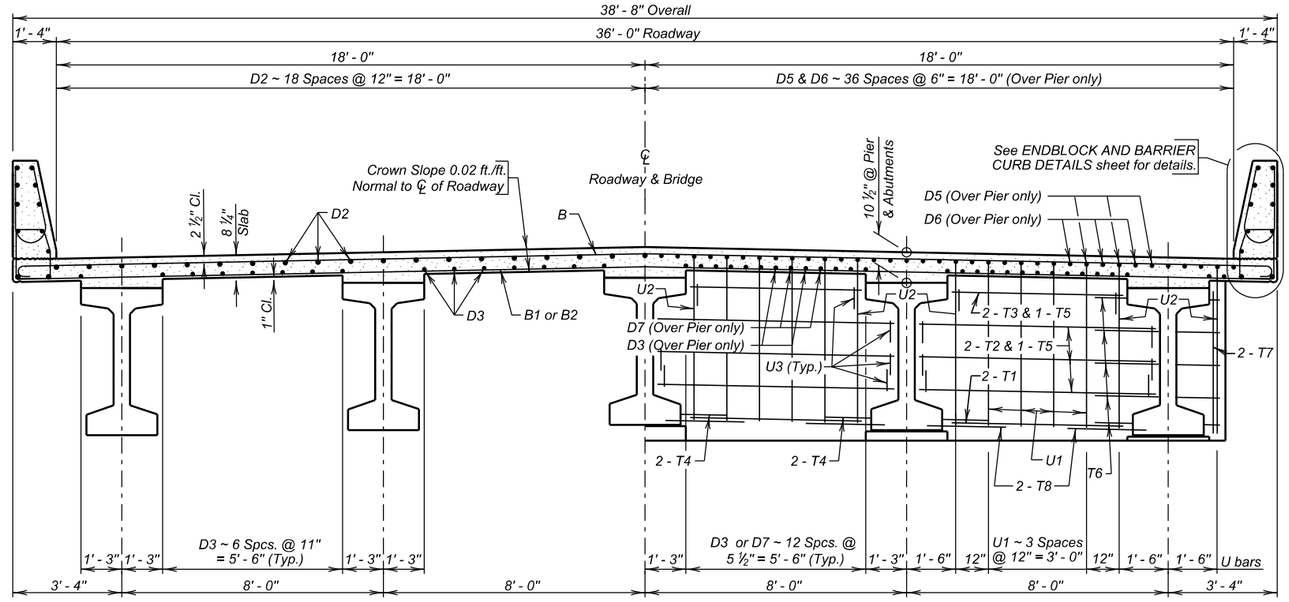
Type 17A

NOTES -
All reinforcing steel will be stainless steel except as noted.
All dimensions are out to out of bars.
✳ Bars to be epoxy coated.
⟠ Bend in field as necessary to fit.
⟡ Tip bars as required to maintain top and bottom clear cover.

ESTIMATED QUANTITIES

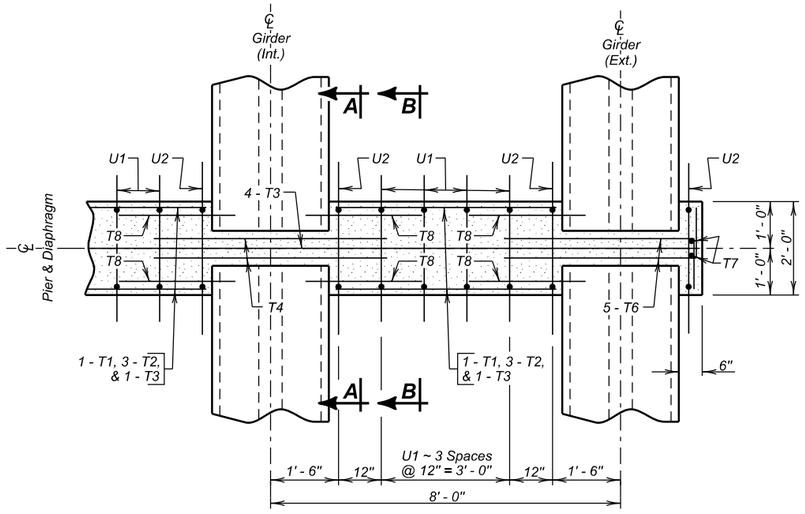
	ITEM	UNIT	QUANTITY
☆	Class A45 Concrete, Bridge Deck	Cu.Yd.	288.1
⏍	Stainless Reinforcing Steel	Lb.	54601
⊛	Epoxy Coated Reinforcing Steel	Lb.	141
	54" Minnesota Shape Prestressed Concrete Beam	Ft.	1025
	Concrete Penetrating Sealer	Sq.Yd.	830

⊛ Only Pier Diaphragms.
⏍ Includes quantities for Pier Diaphragms, Barrier Curbs, and Slab.
☆ Includes quantities for Pier Diaphragm, Barrier Curbs, Slab, and Haunch. (Average depth of 2 ¼" used for Haunch Quantity.) Concrete Quantity for Barrier Curbs is 0.1184 Cu.Yd. / Ft. and for End blocks is 0.7184 Cu.Yd. each.



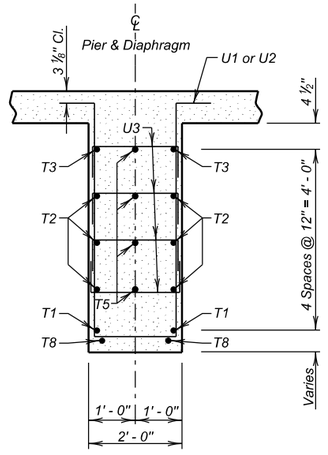
SECTION C - C

(Midspan diaphragm not shown in this section, see DIAPHRAGM DETAILS.)



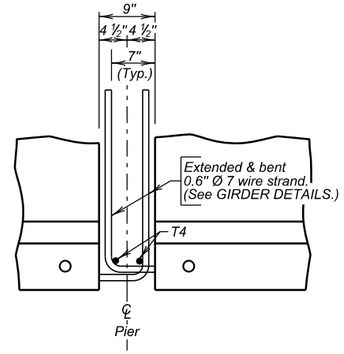
PIER DIAPHRAGMS

(Slab Not Shown)



SECTION B - B

(Girders Not Shown)



SECTION A - A

(Showing extended and bent strand detail and T4 bar placement at Pier. T5 similar at exterior girder.)

NOTE -
Concrete will be placed in the space under the beams at Pier 2 (within the diaphragm width) during the diaphragm pour. If upon form removal the space is not completely filled and consolidated, the contractor will grout in the remaining voids.

SUPERSTRUCTURE DETAILS (B)

FOR

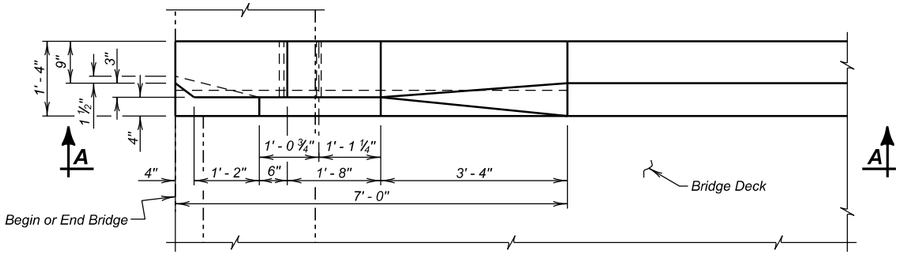
207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

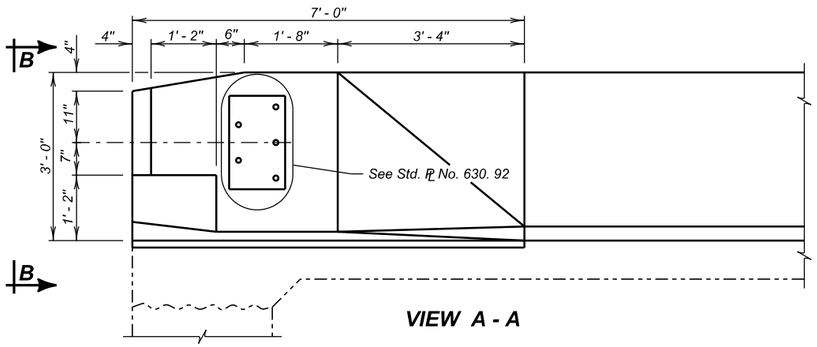
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	BS/AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC12		

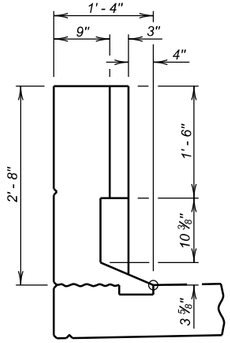
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E49	E62



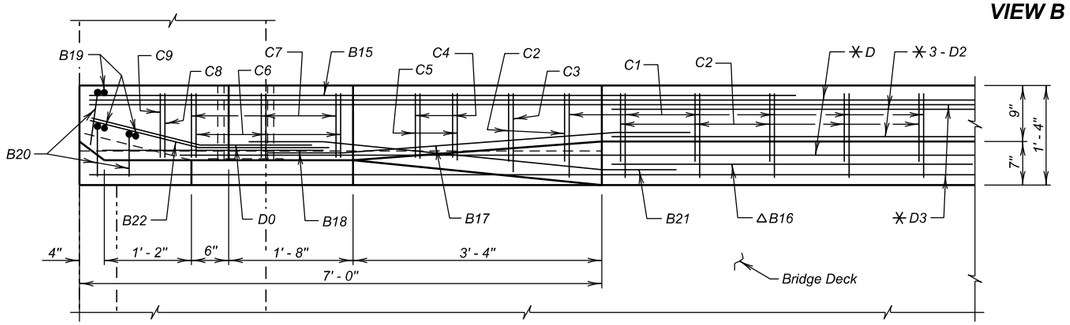
PART PLAN



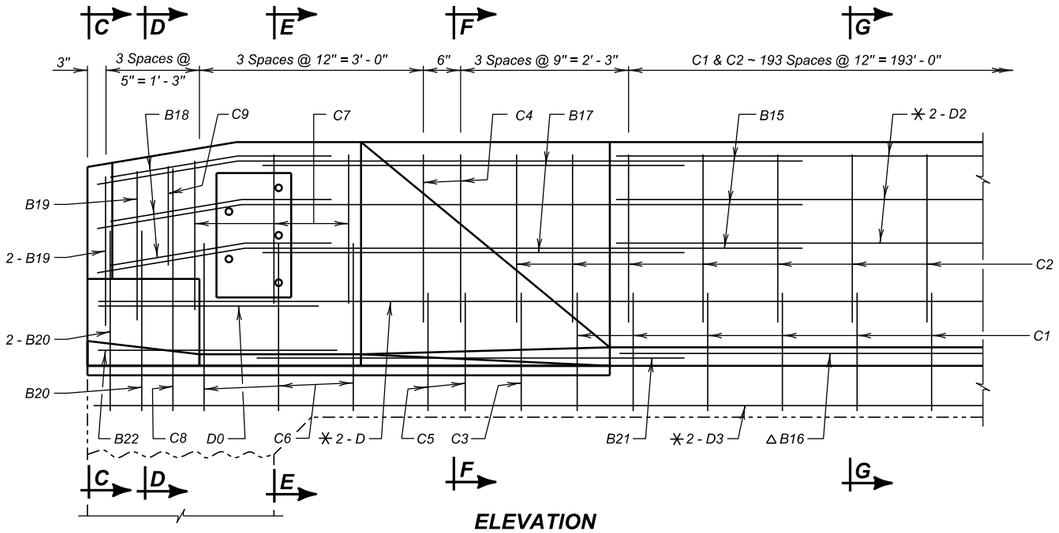
VIEW A - A



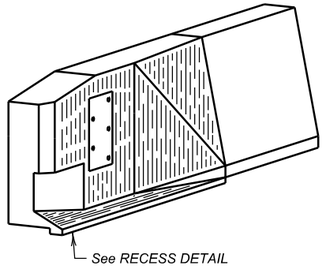
VIEW B - B



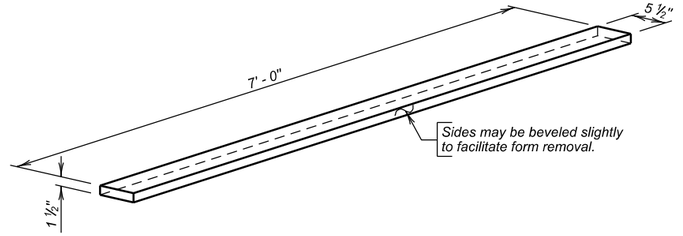
PLAN



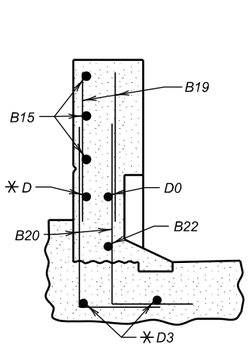
ELEVATION



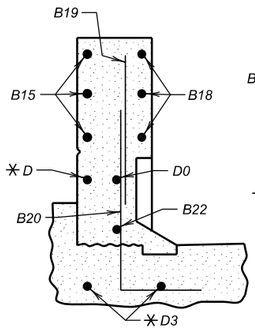
ISOMETRIC VIEW



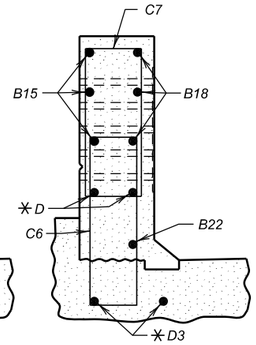
RECESS DETAIL



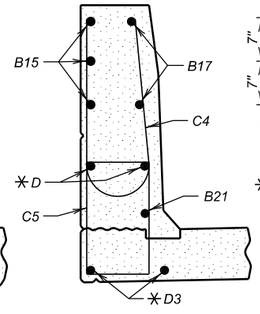
SECTION C - C



SECTION D - D



SECTION E - E



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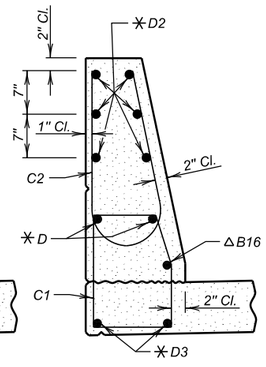
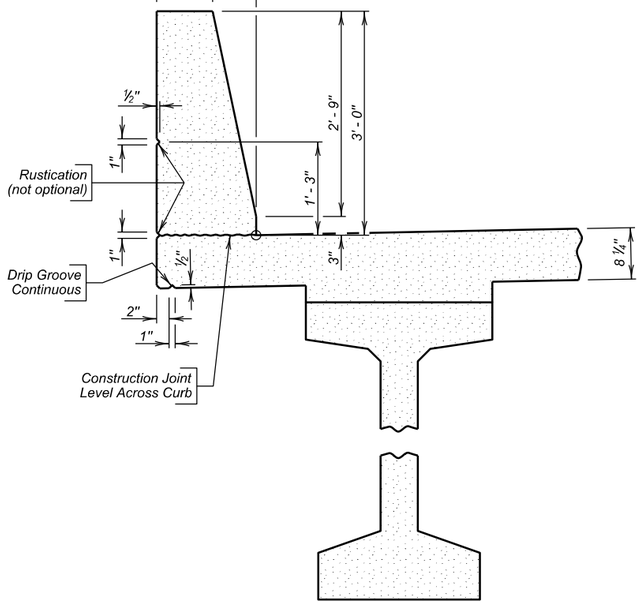


SECTION G - G



BARRIER DETAILS

✳ Min. Lap = 2' - 3"
△ Min. Lap = 1' - 11"

NOTE:
For listing of re-bars see SUPERSTRUCTURE DETAILS (B).

ENDBLOCK AND BARRIER CURB DETAILS

FOR

207' - 6" PRESTR. GIRDER BRIDGE

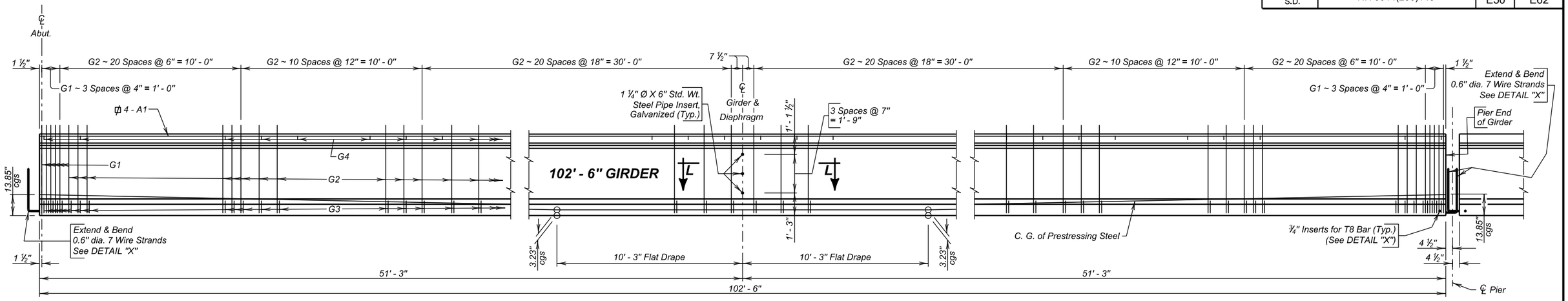
OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

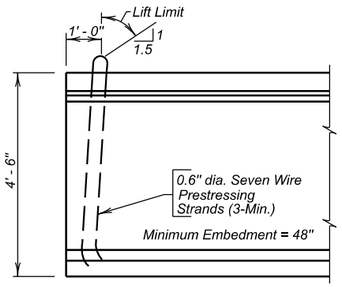
13 OF 26

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	BS/AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC13		

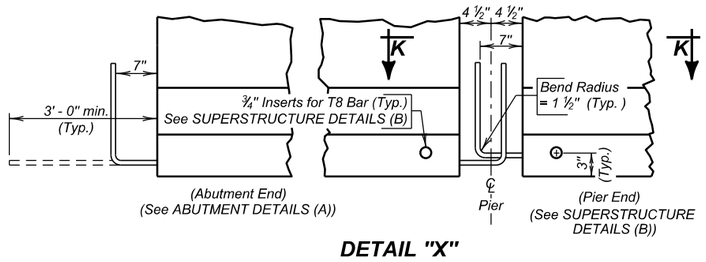
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E50	E62



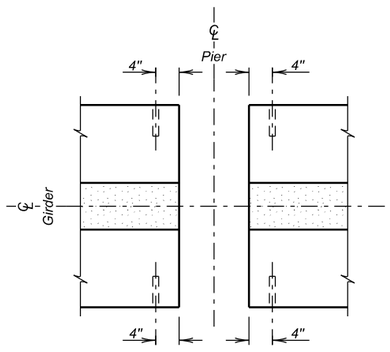
ELEVATION



TYPICAL LIFTING DEVICE



DETAIL "X"



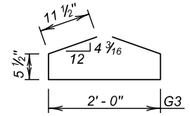
SECTION K - K

Layout for inserts at beam ends (Pier only)

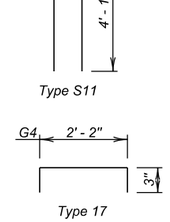
REINFORCING SCHEDULE

(For One Girder)

Mk.	No.	Size	Length	Type	Bending Details
A1	12	7	36' - 1"	Str.	
G1	8	4	10' - 2"	S11	
G2	98	4	10' - 2"	S11	
G3	106	4	4' - 10"	S3A	
G4	52	4	2' - 8"	17	



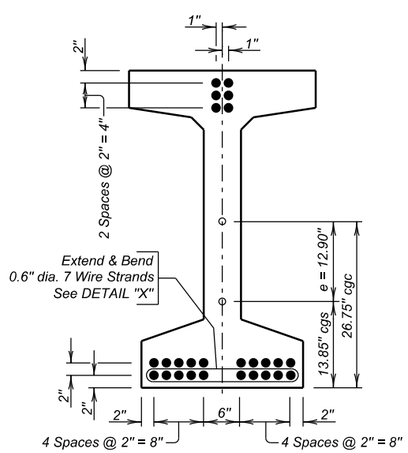
Type S3A



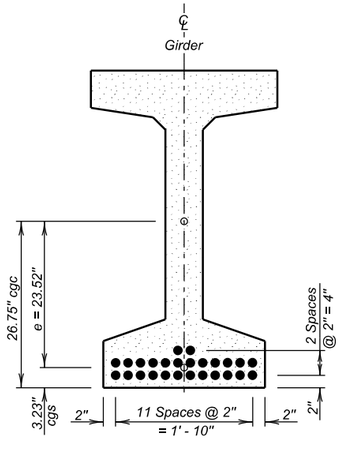
Type S11

Type 17

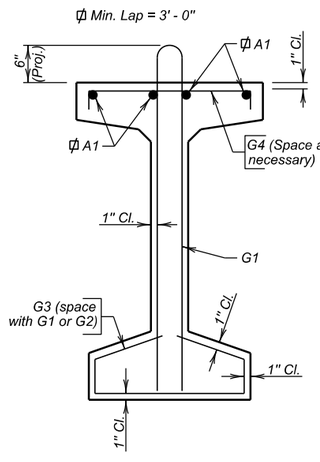
All dimensions are out to out of bars.



END VIEW



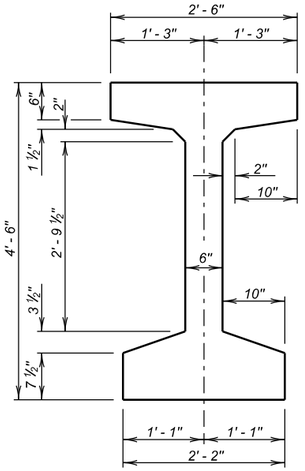
℄ SECTION



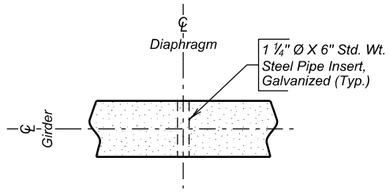
STIRRUP DETAILS

102' - 6" GIRDERS

(26 ~ 0.6 Dia. Type 270 Low Lax. Strands)



TYPE 54 GIRDER



SECTION L - L

102' - 6" GIRDER DETAILS

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW

STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E

STR. NO. 28-234-477 — NH 0014(230)145

HL-93

HAAKON COUNTY

S. D. DEPT. OF TRANSPORTATION

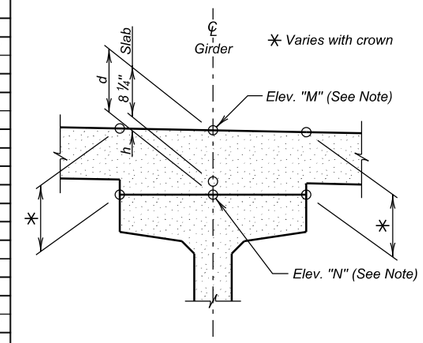
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC14		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E51	E62

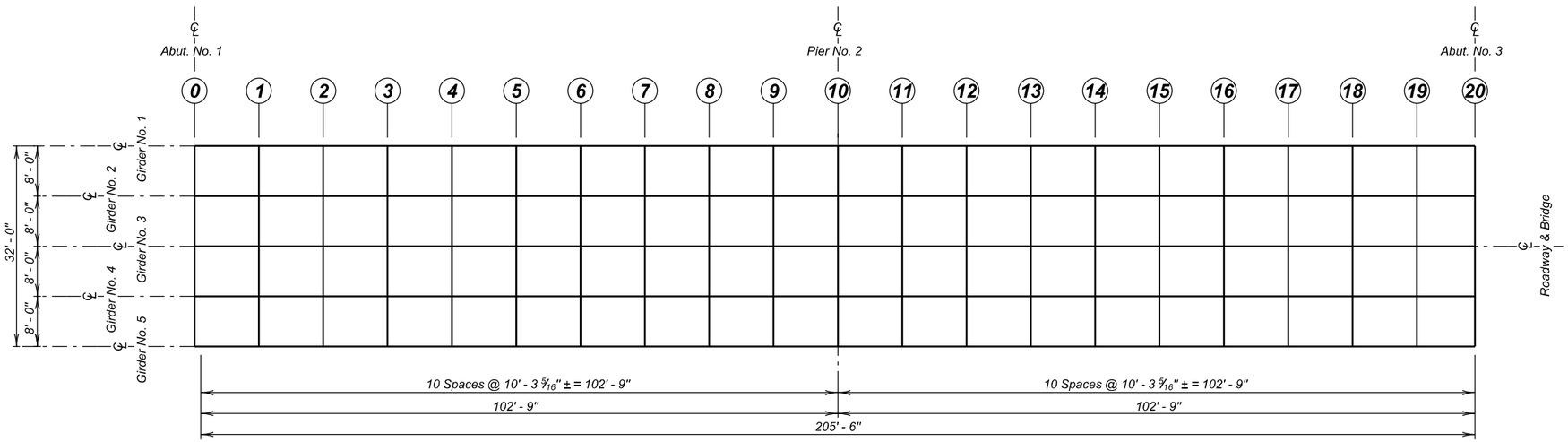
TABLE OF SLAB FORM ELEVATIONS AND CALCULATIONS

		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Girder No. 1	Elev. "M"	2145.473	2145.549	2145.626	2145.700	2145.768	2145.828	2145.880	2145.925	2145.964	2146.000	2146.036	2146.171	2146.306	2146.438	2146.564	2146.682	2146.793	2146.896	2146.993	2147.087	2147.182
	(-) Elev. "N"																					
	(=) d																					
	(-) 0.688																					
	(=) h																					
Girder No. 2	Elev. "M"	2145.633	2145.709	2145.786	2145.860	2145.928	2145.988	2146.040	2146.085	2146.124	2146.160	2146.196	2146.331	2146.466	2146.598	2146.618	2146.731	2146.835	2146.932	2147.153	2147.247	2147.342
	(-) Elev. "N"																					
	(=) d																					
	(-) 0.688																					
	(=) h																					
Girder No. 3	Elev. "M"	2145.793	2145.869	2145.946	2146.020	2146.088	2146.148	2146.200	2146.245	2146.284	2146.320	2146.356	2146.491	2146.626	2146.758	2146.884	2147.002	2147.113	2147.216	2147.313	2147.407	2147.502
	(-) Elev. "N"																					
	(=) d																					
	(-) 0.688																					
	(=) h																					
Girder No. 4	Elev. "M"	2145.633	2145.709	2145.786	2145.860	2145.928	2145.988	2146.040	2146.085	2146.124	2146.160	2146.196	2146.331	2146.466	2146.598	2146.618	2146.731	2146.835	2146.932	2147.153	2147.247	2147.342
	(-) Elev. "N"																					
	(=) d																					
	(-) 0.688																					
	(=) h																					
Girder No. 5	Elev. "M"	2145.473	2145.549	2145.626	2145.700	2145.768	2145.828	2145.880	2145.925	2145.964	2146.000	2146.036	2146.171	2146.306	2146.438	2146.564	2146.682	2146.793	2146.896	2146.993	2147.087	2147.182
	(-) Elev. "N"																					
	(=) d																					
	(-) 0.688																					
	(=) h																					



NOTE –

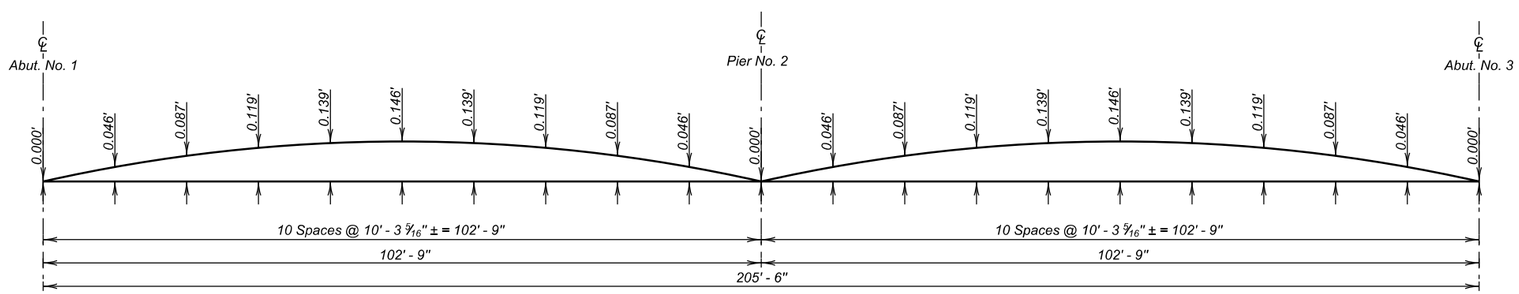
Based on a "d" of 10 ½" at the ℄ of each abutment and 10 ½" at the ℄ of the Pier (see SEC. C - C on SUPERSTRUCTURE DETAILS (B), it is anticipated that the midspan haunch dimension "h" over the ℄ of each girder will be 1 ½". If when computing the dimensions in the table, it is found that any dimension "h" is less than zero or greater than 4" the Office of Bridge Design of the South Dakota Dept. of Transportation shall be notified immediately. After the "Table of Slab Form Elevations and Calculations" has been completely filled out and approved for deck forming, a copy will be forwarded to the Office of Bridge Design for review and analysis for the purpose of securing information relative to camber growth in the beams. This information is necessary for preparing plans for future structures of this type.



GIRDER LAYOUT

NOTE –

The table contains the information necessary to determine the depth of concrete over the girders at points shown. Calculations may be carried in the spaces provided. Elev. "M" is the design elevation of the top of slab before any concrete has been poured. This elevation includes correction for camber and dead load deflection. Elev. "N" is a field measured elevation taken on top of girders at the points shown with the girders in their positions. This elevation must be taken after erection is completed, but prior to placing any of the concrete. Girders will not be supported between bearings when elevations are taken.



CAMBER DIAGRAM

The Camber shown is the amount which has been added to the theoretical slab elevations to get slab elevations shown in the table of Slab Form Elevations and Calculations. Camber shown is for D. L. of slab, traffic barrier, and haunch, but does not include D. L. of beams.

ERECTION DATA AND SLAB FORM ELEVATIONS

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW

STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E

STR. NO. 28-234-477 — NH 0014(230)145

HL-93

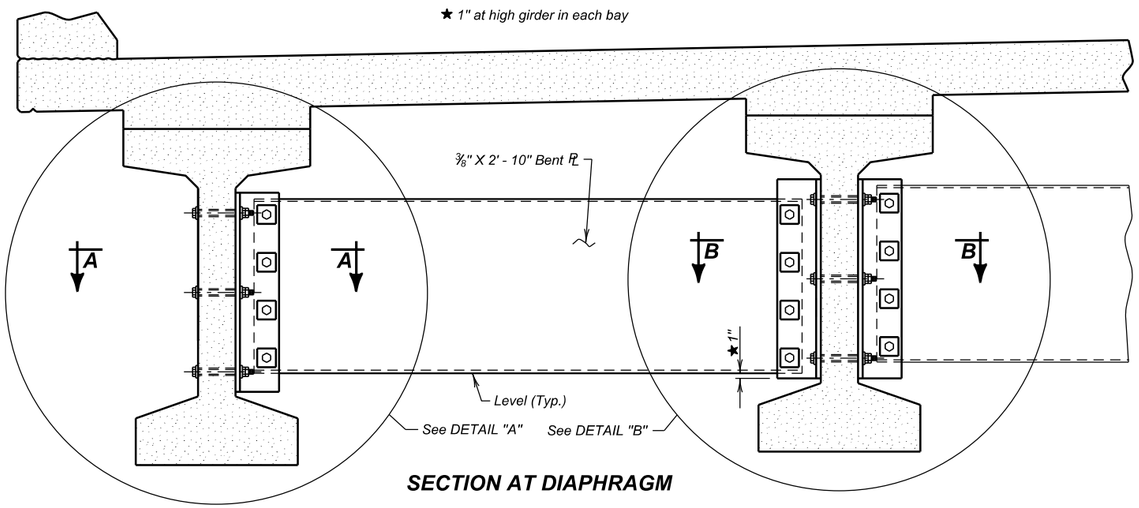
HAAKON COUNTY

S. D. DEPT. OF TRANSPORTATION

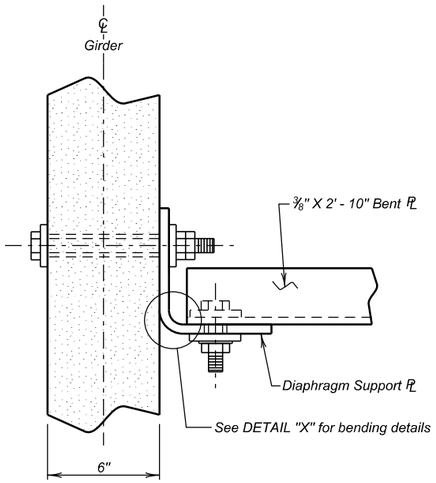
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC15		

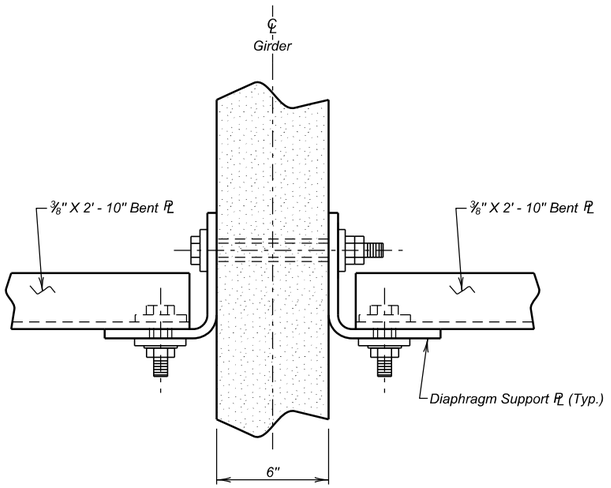
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E52	E62



SECTION AT DIAPHRAGM

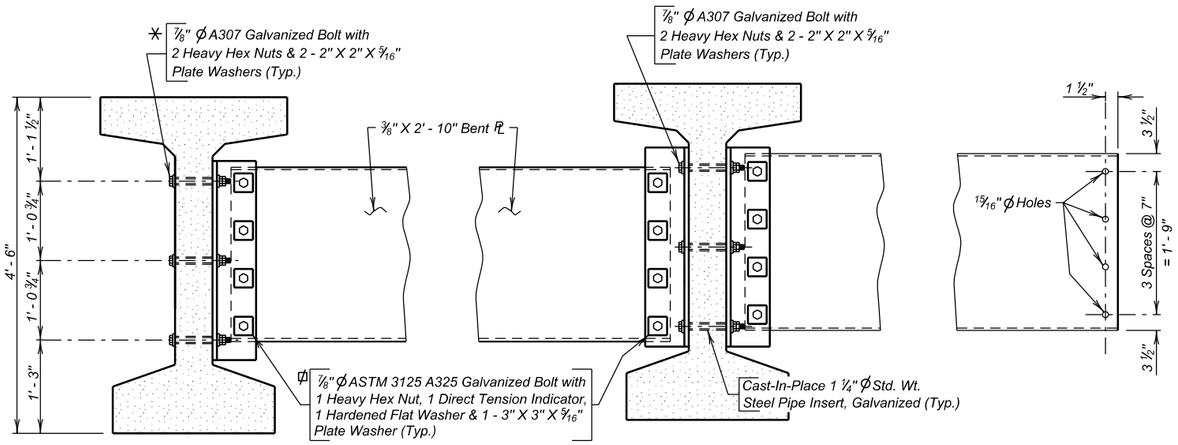


SECTION A - A



SECTION B - B

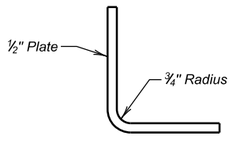
✳ Bolt head will be adjacent to the Exterior Face of the Exterior Girder.



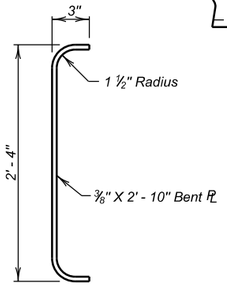
DETAIL "A"
(Typ. Exterior Girder)

⌀ Bolt Head and Direct Tension Indicator will be adjacent to 15/16" ∅ holes in Bent Plate Diaphragm.

DETAIL "B"
(Typ. Interior Girder)



DETAIL "X"



END VIEW BENT PLATE DIAPHRAGM

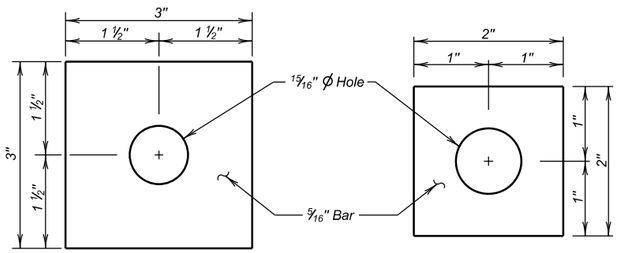
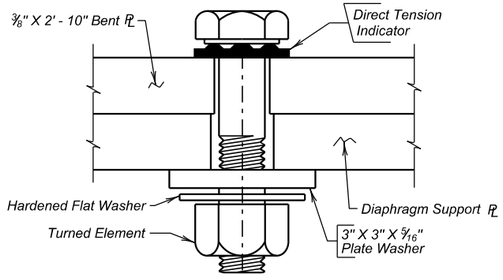
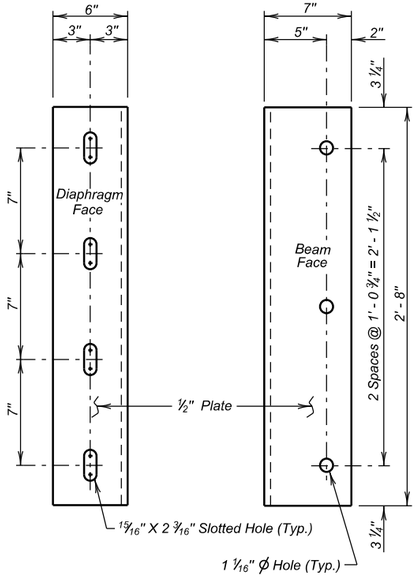


PLATE WASHER DETAILS



DIRECT TENSION INDICATOR DETAIL



DIAPHRAGM SUPPORT PLATE

NOTES:

1. All steel for the diaphragms including plate washers will conform to ASTM A36 and will be galvanized in accordance with ASTM A123 or A153. Bolts, nuts, and washers will be galvanized in accordance with ASTM F2329. Direct Tension Indicators will conform to Section 410 of the Specifications.
2. The steel diaphragms between adjacent girders will be installed as soon as possible and in conjunction with girder erection.
3. All costs associated with furnishing, fabricating, assembly and installation of diaphragms will be included in the contract lump sum price for Structural Steel, Miscellaneous.

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
△	Structural Steel, Miscellaneous	L.S.	Lump Sum

△ For informational purposes only, the estimated weight of structural steel is 2337 Lbs. for 8 diaphragms.

DIAPHRAGM DETAILS

FOR

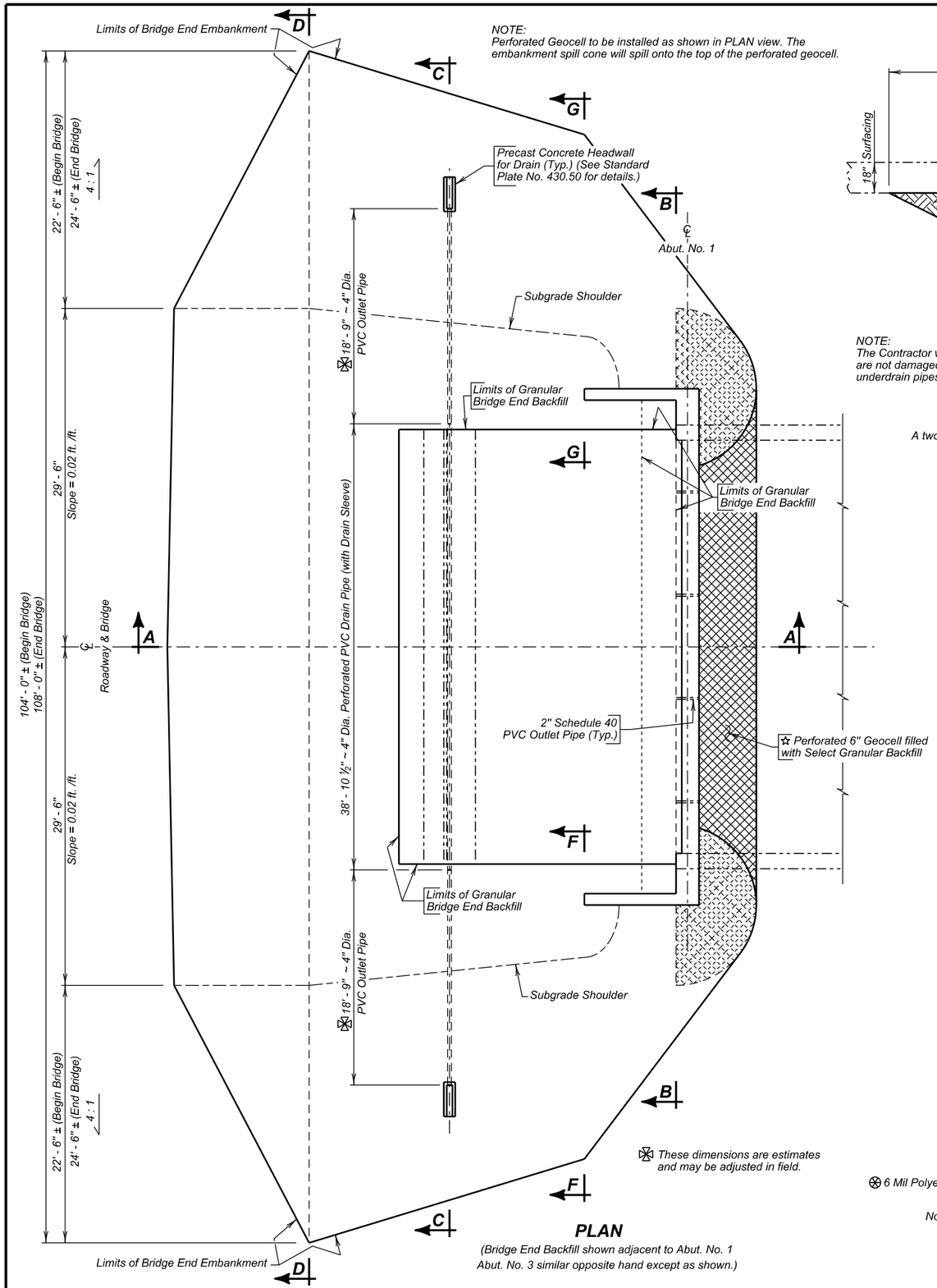
207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
PCN 04FW — HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC16		

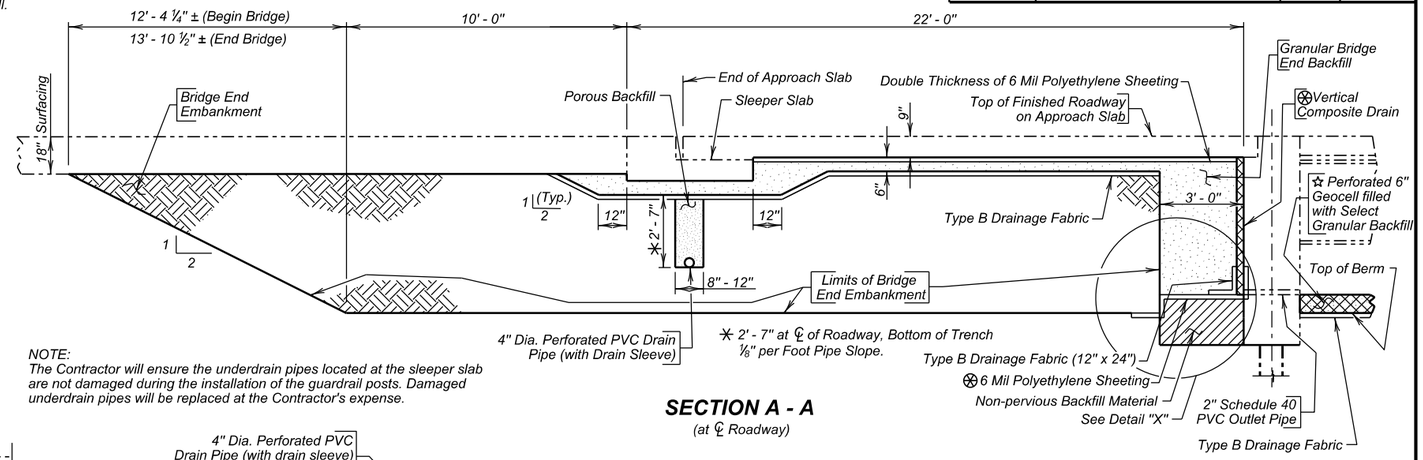
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E53	E62



PLAN

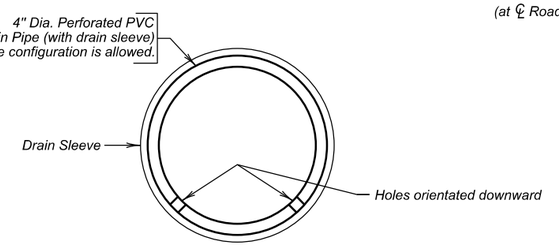
(Bridge End Backfill shown adjacent to Abut. No. 1 Abut. No. 3 similar opposite hand except as shown.)

NOTE:
Perforated Geocell to be installed as shown in PLAN view. The embankment spill cone will spill onto the top of the perforated geocell.

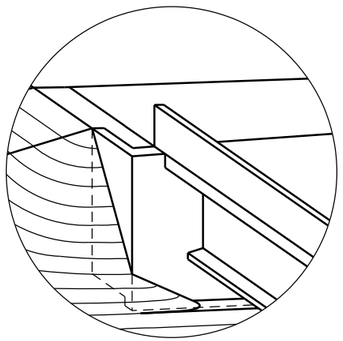


SECTION A - A
(at ℄ Roadway)

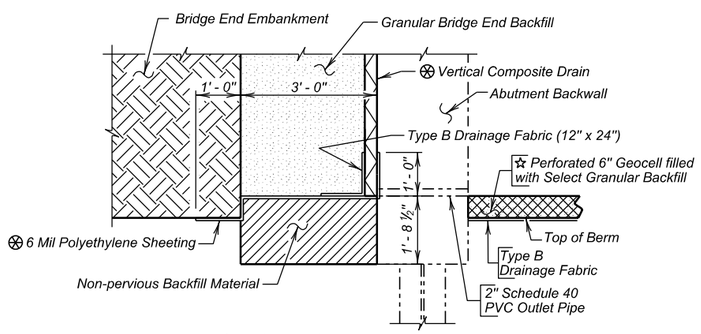
NOTE:
The Contractor will ensure the underdrain pipes located at the sleeper slab are not damaged during the installation of the guardrail posts. Damaged underdrain pipes will be replaced at the Contractor's expense.



DRAIN DETAIL



SPILL CONE DETAIL AT EMBANKMENT



DETAIL "X"

✠ *Provide hole in vertical composite drain and 6 mil polyethylene sheeting to provide drainage through weep holes.*

☆ *See PERFORATED GEOCELL notes for payment information.*

ESTIMATED QUANTITIES
(For Two Abutments)

	ITEM	UNIT	QUANTITY
	Granular Bridge End Backfill	Cu. Yd.	83.6
⊿	Bridge End Embankment	Cu. Yd.	1115
◈ ◫	Porous Backfill	Ton	11.8
	4" Underdrain Pipe	Ft.	185
◈	Approach Slab Underdrain Excavation	Cu. Yd.	6.3
◫	Select Granular Backfill	Ton	21.1
☆	Perforated Geocell	Sq. Ft.	604
	Precast Concrete Headwall for Drain	Each	4

1. 78 ft. 4" dia. Perforated PVC Drain Pipe (with Drain Sleeve).
2. 75 ft. 4" dia. PVC Outlet Pipe.
3. 16 ft. 5" dia. Schedule 40 Steel Pipe.
4. 16 ft. 2" dia. PVC Outlet Pipe.
5. 477 sq. ft. Vertical Composite Drain.

Items 1 thru 5 are approximate quantities contained in the 4" Underdrain Pipe and are for information only.

6. 3106 sq. ft. 6 mil Polyethylene Sheeting, not including laps.
7. 500 sq. yd. Type B Drainage Fabric.

Items 6 and 7 are approximate quantities contained in the Granular Bridge End Backfill and are for information only.

◫ *For estimating purposes only, a factor of 1.89 tons/cu. yd. was used to convert cu. yds. to tons.*

⊿ *Shrinkage Factor of 1.25 used.*

◈ *Quantity based on a 12" wide trench.*

DETAILS OF BRIDGE END BACKFILL (A)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

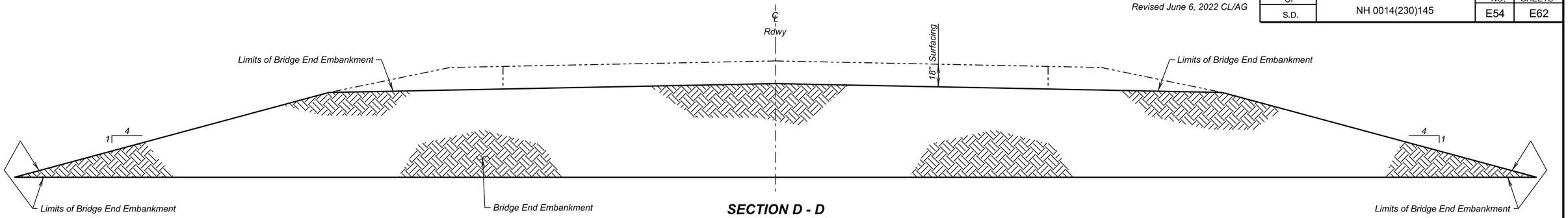
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

17 OF 26

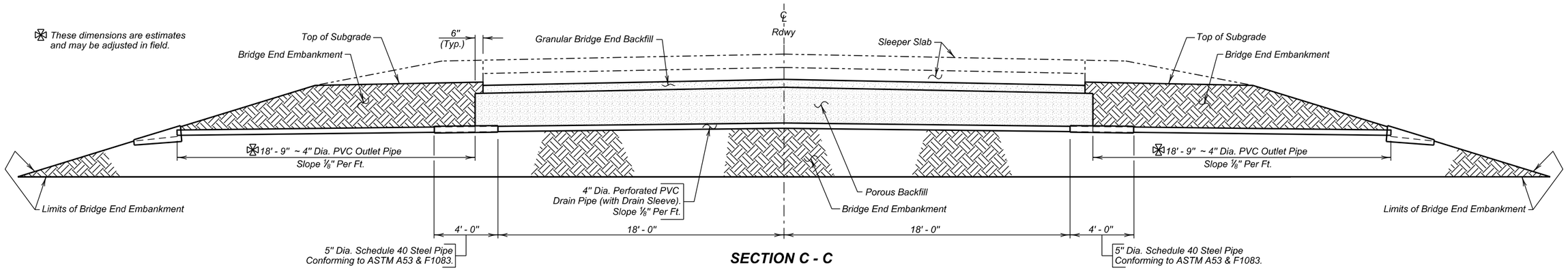
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC17		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E54	E62

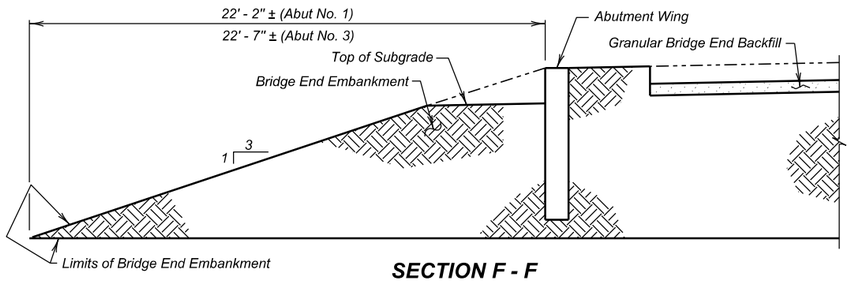
Revised June 6, 2022 CL/AG



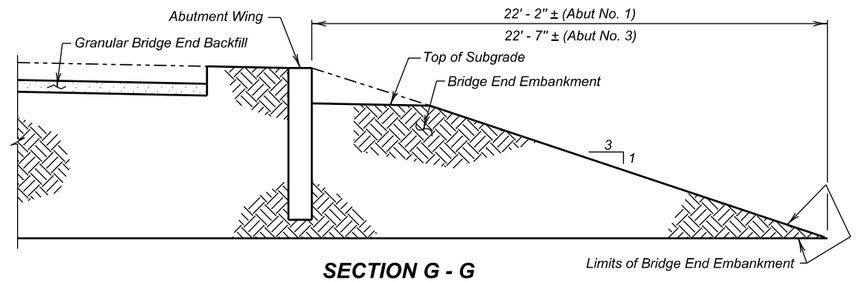
SECTION D - D



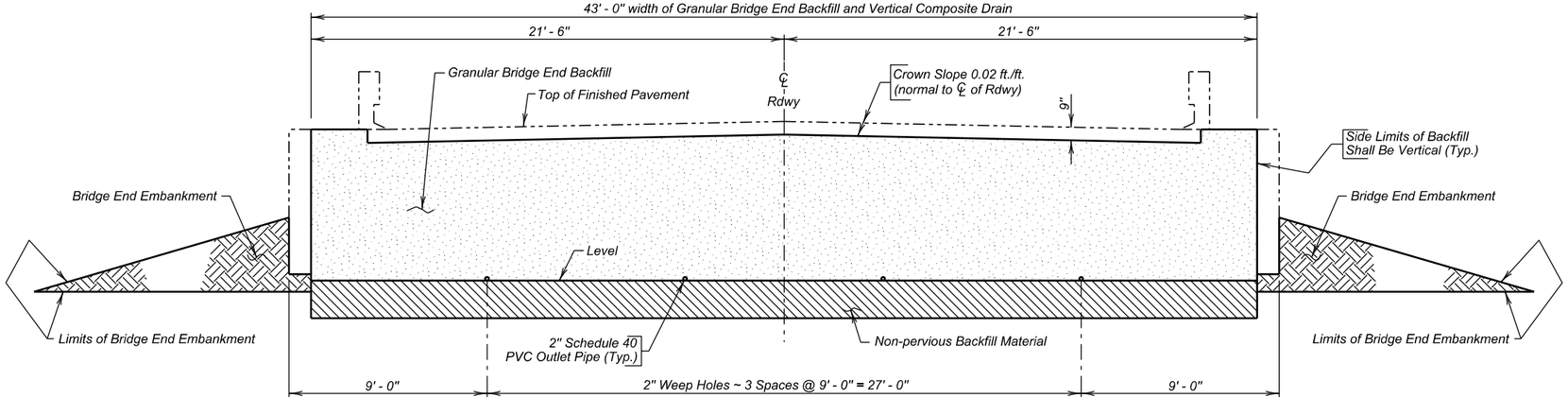
SECTION C - C



SECTION F - F



SECTION G - G



SECTION B - B

DETAILS OF BRIDGE END BACKFILL (B)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

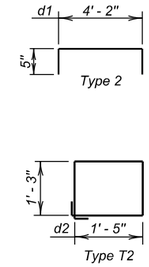
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC18		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E55	E62

REINFORCING SCHEDULE
(For Two Approach Slabs and Two Sleeper Slabs)

Mk.	No.	Size	Length	Type	Bending Details
Sleeper Slab					
c1	32	5	37' - 7"	Str.	
d1	152	4	5' - 0"	2	
d2	76	4	6' - 1"	T2	
Approach Slab					
e1	40	6	37' - 7"	Str.	
e2	28	4	37' - 7"	Str.	
g1	8	8	19' - 8"	Str.	
g2	144	8	20' - 2"	Str.	
g3	4	4	19' - 8"	Str.	
g4	48	4	20' - 2"	Str.	
g5	50	4	6' - 0"	Str.	
h1	4	6	35' - 8"	Str.	



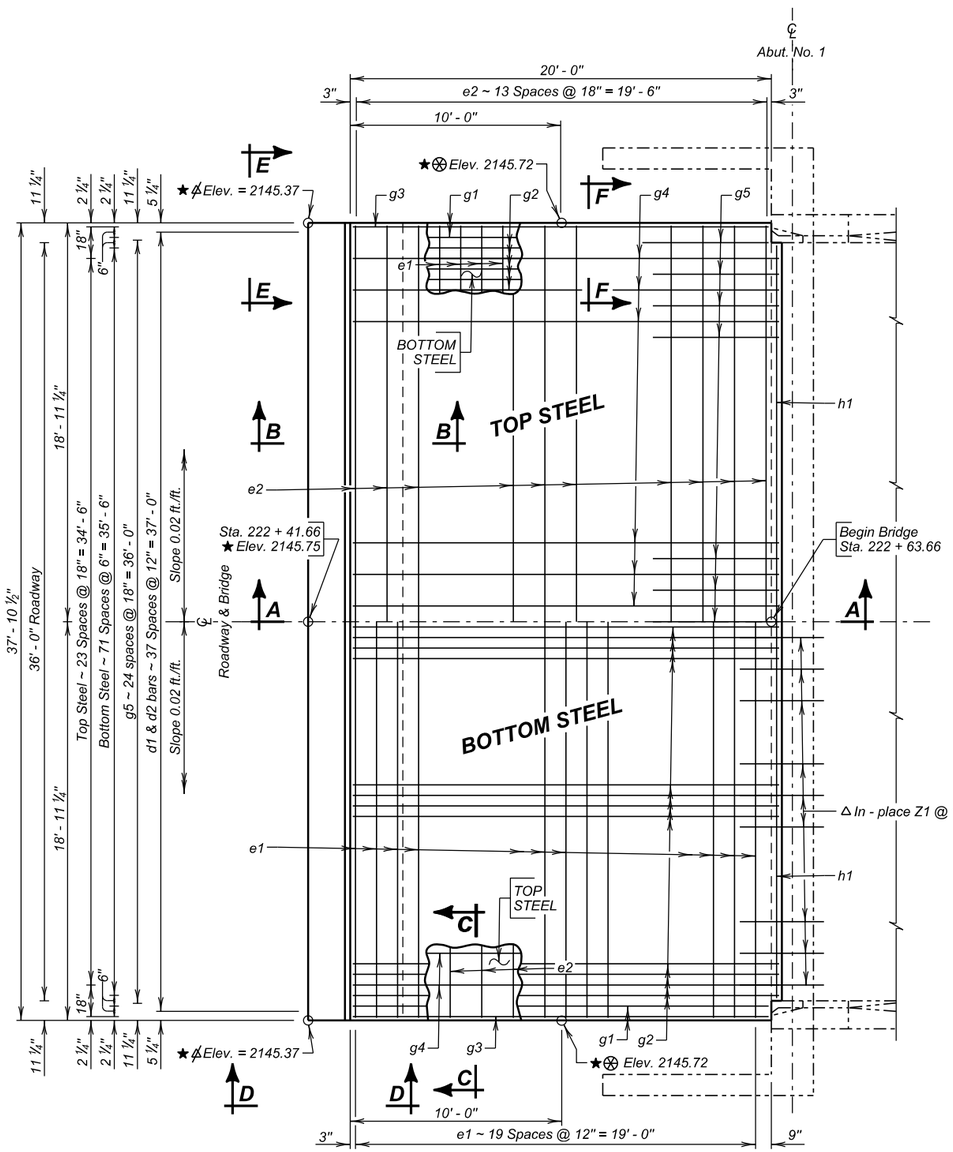
NOTES:
All bars to be epoxy coated.
All dimensions are out to out of bars.

ESTIMATED QUANTITIES
(For Two Approach Slabs and Two Sleeper Slabs)

ITEM	UNIT	QUANTITY
Concrete Approach Slab for Bridge	Sq. Yd.	173.3
Concrete Approach Sleeper Slab for Bridge	Sq. Yd.	37.9

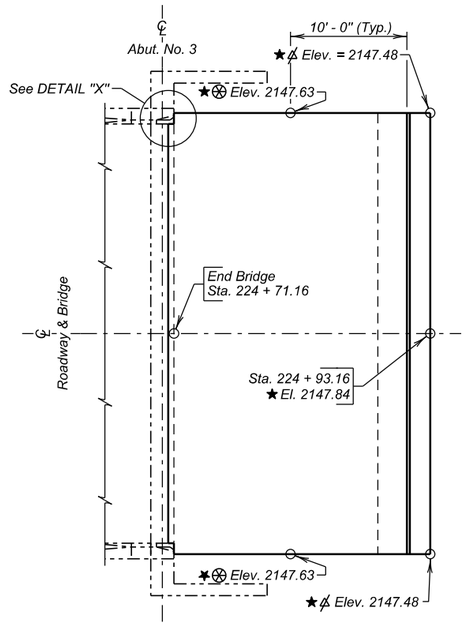
1. 43.7 cu. yds. Concrete in Approach Slab.
2. 12249 lbs. Epoxy Coated Re-Steel in Approach Slab.
3. 13.7 cu. yds. Concrete in Sleeper Slab.
4. 2071 lbs. Epoxy Coated Re-Steel in Sleeper Slab.
5. 19 sq. ft. of 2" Polystyrene Insulation Board.

Items 1 thru 5 are approximate quantities contained in the above bid items and are for information only.

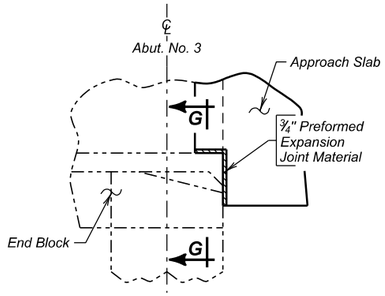


★ Elevations may need to be adjusted for a smooth ride from the final bridge deck elevations to final pavement elevations.

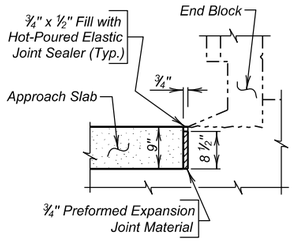
PLAN
(Shown adjacent to Abut. No. 1, Abut. No. 3 similar by rotation except as shown.)



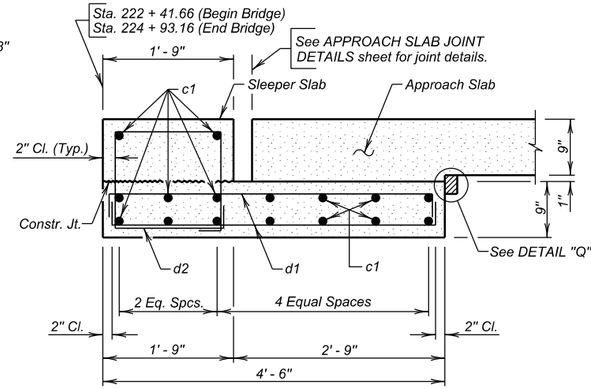
PLAN
(Shown adj. to Abut. No. 3)



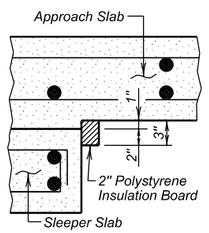
DETAIL "X"



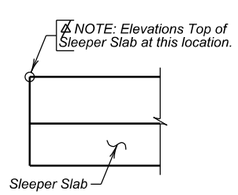
SECTION G - G



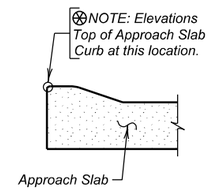
SECTION B - B
(Sleeper Slab)



DETAIL "Q"

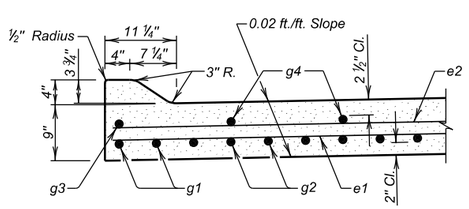


VIEW E - E

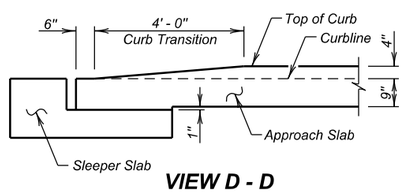


SECTION F - F

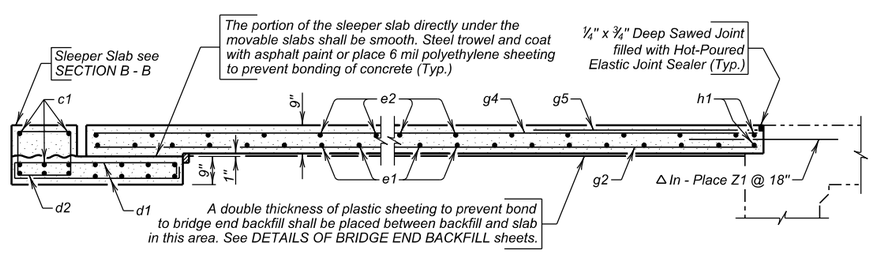
△ In-place Z1 bars and are listed and included in superstructure quantities. See SUPERSTRUCTURE DETAILS sheet.



SECTION C - C



VIEW D - D



SECTION A - A

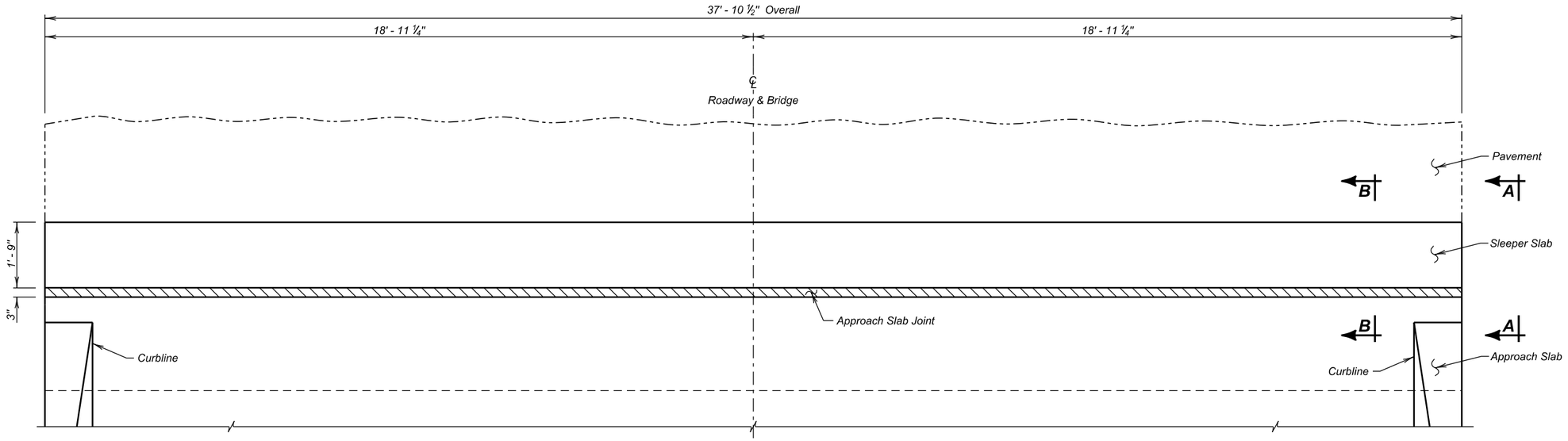
DETAILS OF APPROACH SLAB ADJACENT TO BRDIGE
FOR
207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC19		

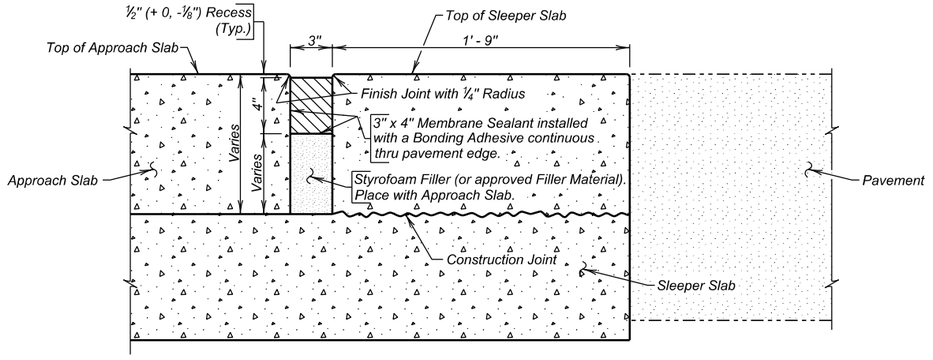
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E56	E62



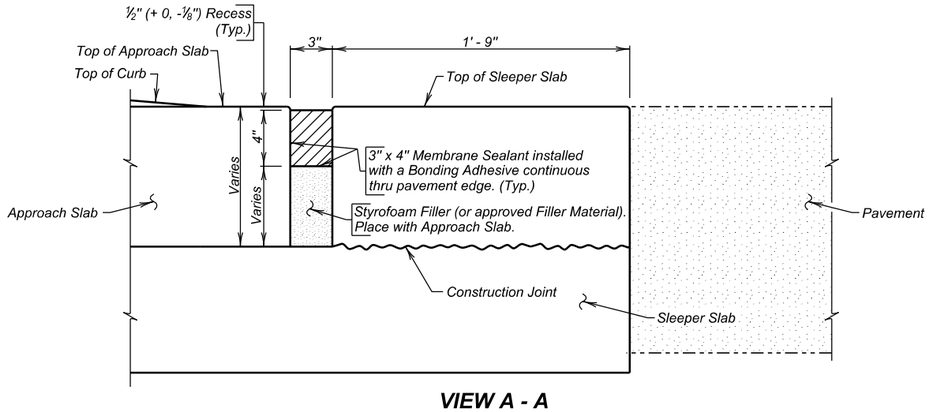
PLAN

GENERAL NOTES

1. The membrane sealant will be on the approved product list for membrane sealant expansion joints.
2. The manufacturer will supply the membrane sealant in packaging that precompresses the membrane sealant. The precompressed dimension will be as recommended by the sealant manufacturer to provide a water tight seal throughout a joint movement range of + 25% (minimum) from the specified joint opening dimension. In no case will the precompressed dimension exceed 75% of the joint opening width. The foam sealant will be slowly self expanding to permit workers ample time to install the membrane sealant before the membrane sealant exceeds the joint opening width.
3. The membrane sealant will be supplied in pieces 5 feet in length or longer. The foam sealant will be ultra-violet and ozone resistant.
4. The bonding adhesive used to attach the membrane sealant to the adjacent concrete will be approved by the membrane sealant manufacturer.
5. Adhesive used to join adjacent pieces of the membrane sealant will be as recommended by the manufacturer.
6. If styrofoam filler material is used in the construction, it will be closed cell and water-tight as approved by the Engineer.
7. The minimum ambient air temperature at the time of joint installation and adhesive curing will be 40° F.
8. A technical representative of the membrane sealant manufacturer will be present at the jobsite during installation. The technical representative will be knowledgeable in the correct procedures for the preparation and installation of the joint material to insure the Contractor installs the joint to the Manufacturers recommendations.
9. Concrete surfaces that will be in contact with the membrane sealant will be thoroughly cleaned by abrasive blasting to remove all laitance and contaminants (such as oil, curing compounds, etc.) from the concrete surface. At a minimum two passes of abrasive blasting with the nozzle held at an angle to within 1 to 2 inches of the concrete surface will be required. Cleaning of the concrete surfaces with solvents, wire brushing, or grinding will not be permitted.
10. After abrasive blasting, but immediately prior to membrane joint installation, the entire joint contact surface will be air blasted. The air compressor used for joint cleaning will be equipped with trap devices capable of providing moisture-free and oil-free air at a recommended pressure of 90 psi. To obtain complete bonding with the adhesive, the adjacent concrete surfaces must be dry and clean. The contact surfaces for the joint will be visually inspected by the Engineer immediately prior to joint installation to verify the surface is dry and clean.
11. Individual spliced sections will be installed as per the manufacturers' recommendations. The membrane joint sealant manufacturer will submit a detailed installation procedure to the Engineer at least 5 days prior to joint installation for his review.
12. Traffic will not be allowed on the joint until the bonding adhesive has had time to cure, as recommended by the manufacturer.
13. Use plywood or other material to protect concrete adjacent to the joint from spalling before any equipment is moved across the joint. Any spall areas will be repaired at the Contractor's expense by breaking out and replacing adjacent concrete, as approved by the Engineer.
14. The membrane sealant expansion joint will be measured in feet to the nearest one-tenth foot, complete in place. Measurement will be made of the overall horizontal length. The membrane sealant expansion joint will be paid for at the contract unit price per foot complete in place. Payment for this item will be full compensation for furnishing all the required materials in place, including labor, equipment and incidentals necessary to complete the work in accordance with the plans and the foregoing specifications.



SECTION B - B



VIEW A - A

ESTIMATED QUANTITIES
(For Two Approach Slabs)

ITEM	UNIT	QUANTITY
Membrane Sealant Expansion Joint	Ft.	75.8

APPROACH SLAB JOINT DETAILS

FOR

207' - 6" PRESTR. GIRDER BRIDGE

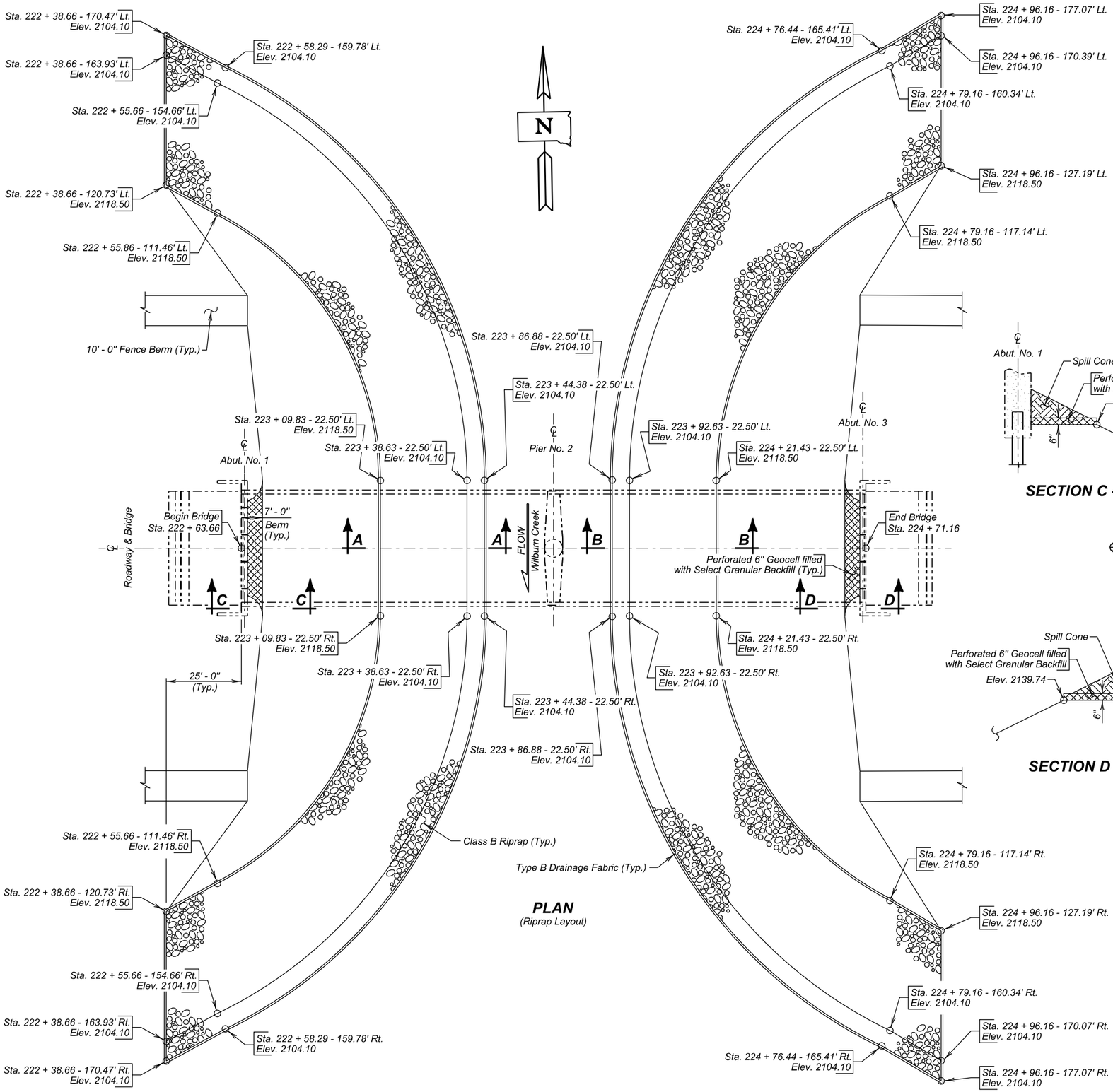
OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

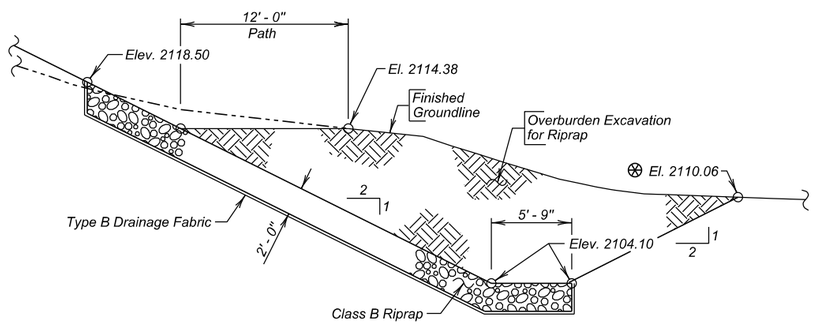
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL HAKN04FW	AG 04FWTC20	BT	Steve A Johnson BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E57	E62

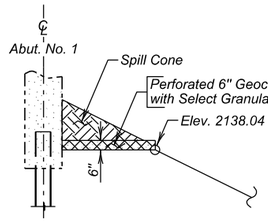
Revised August 4, 2022 CL/AG



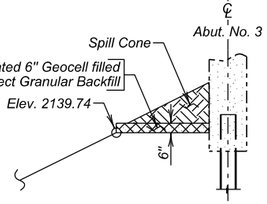
PLAN
(Riprap Layout)



SECTION A - A

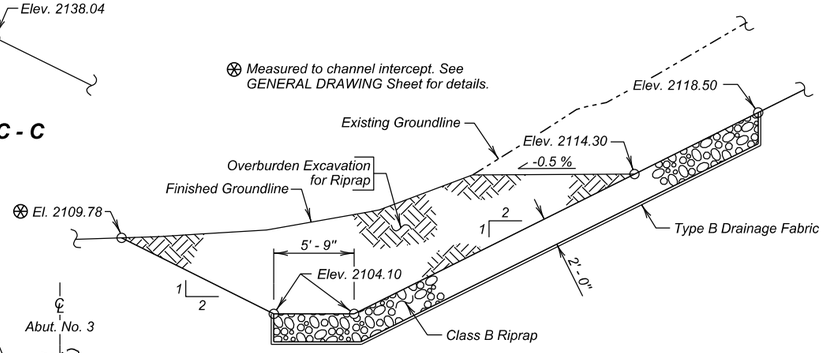


SECTION C - C



SECTION D - D

NOTE:
Restore the channel and channel banks to the existing conditions between the riprap intercepts in accordance with the Overburden Excavation for Riprap notes. This will require a portion of the riprap to be buried.



SECTION B - B

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
#	Class B Riprap	Ton	2954.4
	Type B Drainage Fabric	Sq. Yd.	3517
	Overburden Excavation for Riprap	Cu. Yd.	697

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

RIPRAP LAYOUT

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

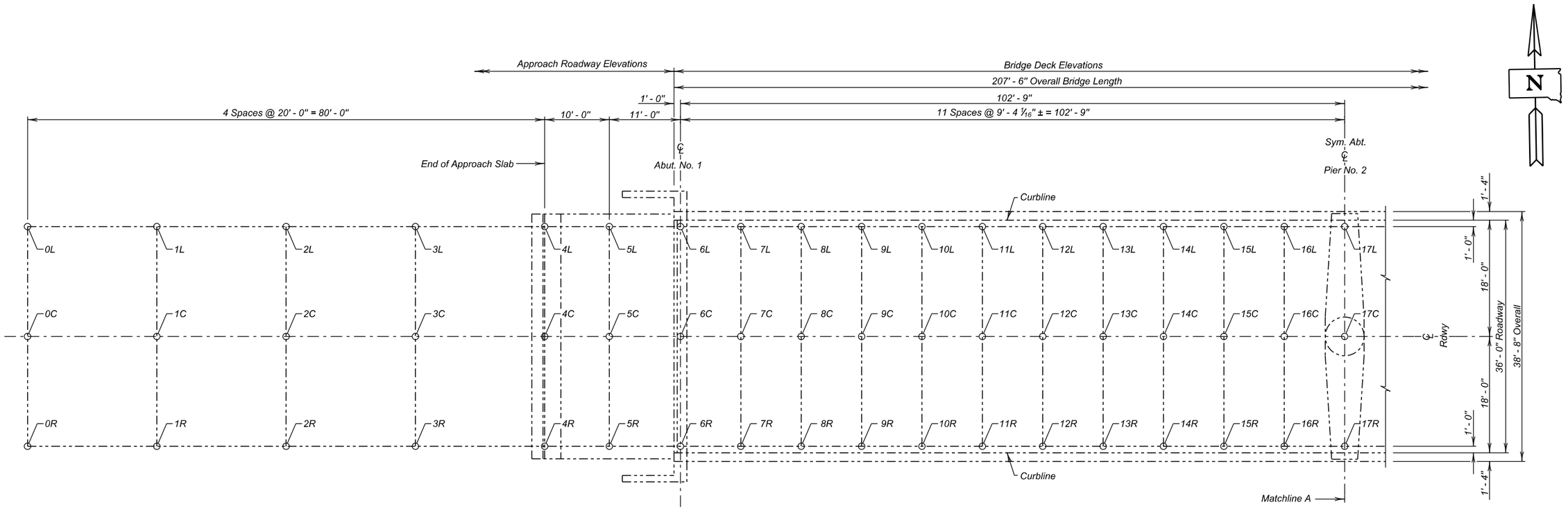
HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

21 OF 26

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC21		

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

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E58	E62



PLAN

Table of As-Built Elevations - Approach Roadway					
Location	Elevation	Location	Elevation	Location	Elevation
0L		0C		0R	
1L		1C		1R	
2L		2C		2R	
3L		3C		3R	
4L		4C		4R	
5L		5C		5R	

NOTE -
The Contractor will be responsible for producing the As - Built Elevation Survey soon after construction is complete and before the bridge is opened to traffic. The As - Built Elevations of the Bridge will be taken and recorded at the locations shown by the table on this sheet. The completed table will be given to the Engineer who will forward a copy to the Office of Bridge Design and the Region Office.

Table of As-Built Elevations - Bridge Deck					
Location	Elevation	Location	Elevation	Location	Elevation
6L		6C		6R	
7L		7C		7R	
8L		8C		8R	
9L		9C		9R	
10L		10C		10R	
11L		11C		11R	
12L		12C		12R	
13L		13C		13R	
14L		14C		14R	
15L		15C		15R	
16L		16C		16R	
17L		17C		17R	

Elevations - Bridge Survey Markers		
Location	Station - Offset	Elevation
Begin Bridge		

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Bridge Elevation Survey	L. S.	Lump Sum

AS - BUILT ELEVATION SURVEY (A)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

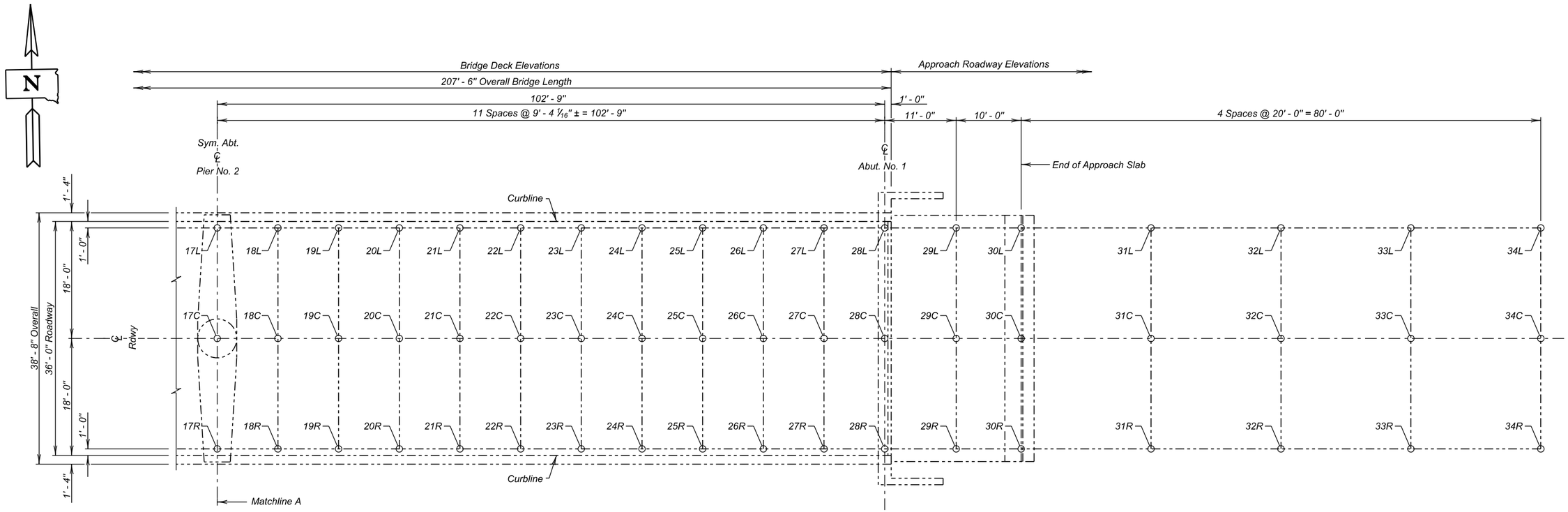
OVER WILBURN CREEK — 0° SKEW
STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E
STR. NO. 28-234-477 — NH 0014(230)145
HL-93

HAAKON COUNTY
S. D. DEPT. OF TRANSPORTATION
NOVEMBER 2021

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC22		

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

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	NH 0014(230)145	E59	E62



PLAN

Table of As-Built Elevations - Bridge Deck					
Location	Elevation	Location	Elevation	Location	Elevation
17L		17C		17R	
18L		18C		18R	
19L		19C		19R	
20L		20C		20R	
21L		21C		21R	
22L		22C		22R	
23L		23C		23R	
24L		24C		24R	
25L		25C		25R	
26L		26C		26R	
27L		27C		27R	
28L		28C		28R	

Table of As-Built Elevations - Approach Roadway					
Location	Elevation	Location	Elevation	Location	Elevation
29L		29C		29R	
30L		30C		30R	
31L		31C		31R	
32L		32C		32R	
33L		33C		33R	
34L		34C		34R	

Elevations - Bridge Survey Markers		
Location	Station - Offset	Elevation
End Bridge		

AS - BUILT ELEVATION SURVEY (B)

FOR

207' - 6" PRESTR. GIRDER BRIDGE

OVER WILBURN CREEK — 0° SKEW

STA. 222 + 63.66 to STA. 224 + 71.16 — SEC. 12-T01N-R21E

STR. NO. 28-234-477 — NH 0014(230)145

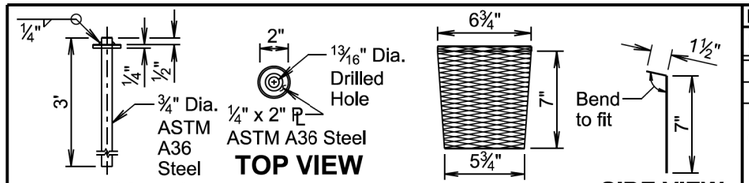
HL-93

HAAKON COUNTY

S. D. DEPT. OF TRANSPORTATION

NOVEMBER 2021

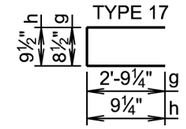
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CL	AG	BT	Steve A. Johnson BRIDGE ENGINEER
HAKN04FW	04FWTC23		

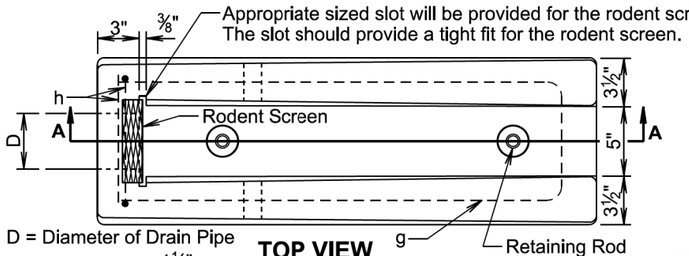


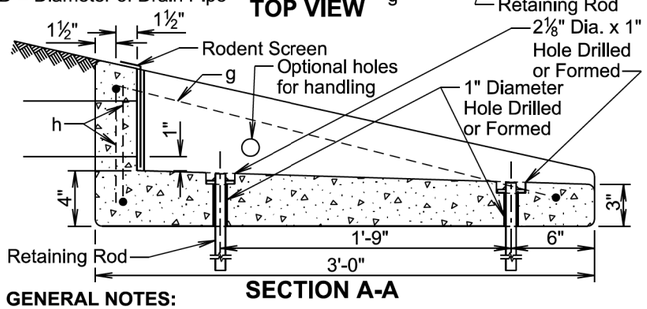
REINFORCING SCHEDULE				
MK.	No.	Size	Length	Type
g	1	4	6'-3"	17
h	2	4	2'-4"	17

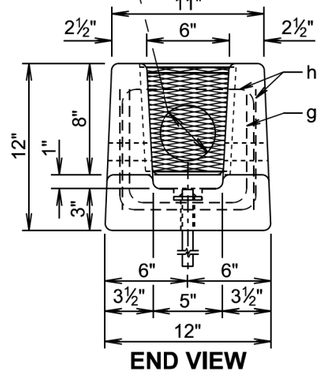
NOTE: All dimensions are out to out of bars.

Bending Details









GENERAL NOTES:

The concrete will be Class M6. The concrete will conform to the requirements of Section 462 of the Specifications. It is estimated that each unit weighs approximately 210 pounds.

All reinforcing steel will conform to ASTM A615, Grade 60 and will be epoxy coated. The reinforcing steel will be securely retained to prevent displacement during placement of concrete. It is estimated that 7.3 pounds of reinforcing steel is required for each unit.

The pipe will be placed in the concrete headwall with the pipe end flush with the concrete surface adjacent to the rodent screen.

The rodent screen will be galvanized 13 Ga. steel with a diamond shaped flattened mesh pattern. The size will be ½". The size refers to the measurement across the smallest diamond shaped opening measured from the centers of the wires.

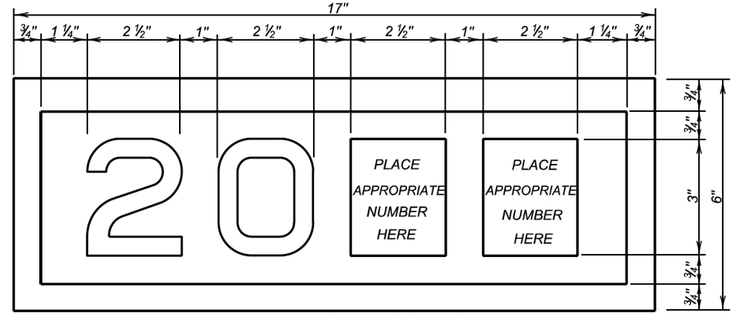
The retaining rod will be galvanized in accordance with ASTM A123 after all shop welding has been completed.

The drawing indicates using ½" fillets; however, ¾" chamfers may be substituted for the ½" fillets.

All costs for furnishing and installing the concrete headwall including equipment, labor, and materials including concrete, reinforcing steel, retaining rods, and rodent screen will be incidental to the contract unit price per each for "Precast Concrete Headwall for Drain".

November 19, 2021

Published Date: 1st Qtr. 2023	SDDOT	PRECAST CONCRETE HEADWALL FOR DRAIN	PLATE NUMBER 430.50 Sheet 1 of 1



YEAR PLATE DETAILS

GENERAL NOTES:

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

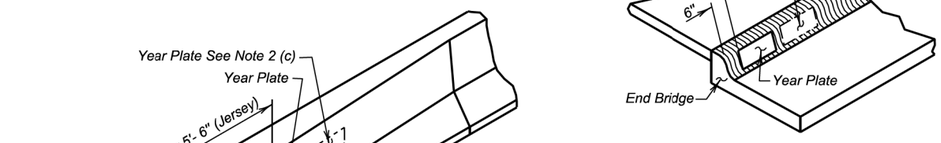
2. *Year plates will be located on structure(s) as follows:*

   a. *On cast-in-place box culverts the year plates will be four and one - half (4 ½) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.*

   b. *On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'- 6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.*

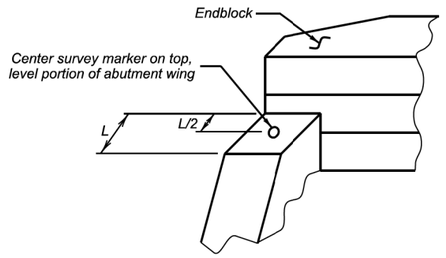
   c. *When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.*

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

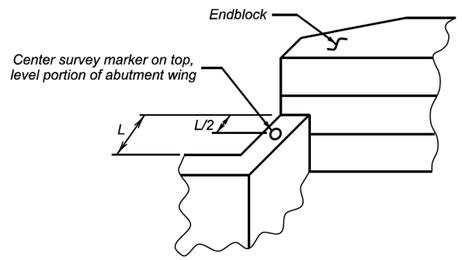


January 22, 2021

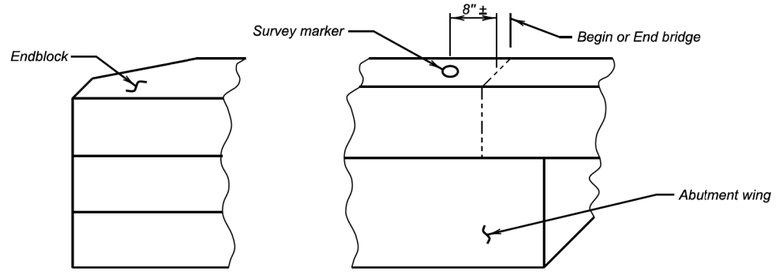
Published Date: 1st Qtr. 2023	SDDOT	YEAR PLATE DETAILS	PLATE NUMBER 460.02 Sheet 1 Of 1



ABUTMENT WITH "STRAIGHT" WINGS



ABUTMENT WITH "SWEPT BACK" WINGS



ABUTMENT WITH "SWEPT BACK" WINGS

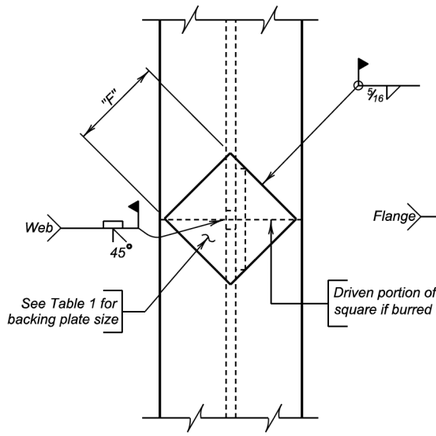
(Endblock on top of wings)

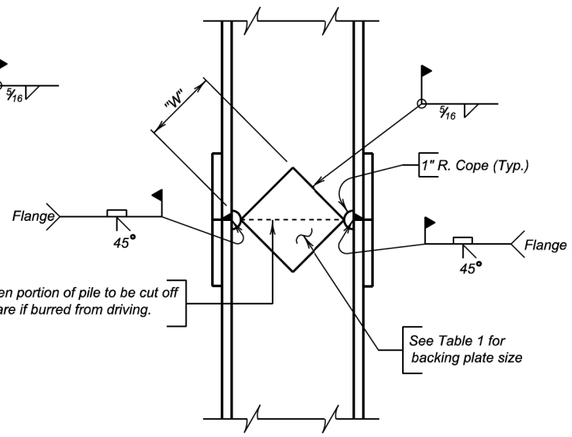
GENERAL NOTES:

1. Survey markers shall be located at each abutment on the same side of the bridge as the year plate. Place survey markers on abutment wings as shown. Two survey markers will be required at each bridge.
2. Survey markers shall be of a type intended for installation in concrete, be made of solid brass or bronze, have a domed top and be either a 3" top diameter (with a ¾" X 2" long ribbed shank), or a US Army Corps of Engineers Type C Disc with a 3 ½" top diameter.
3. There will be no separate measurement or payment made for survey markers. All costs for this work shall be incidental to the other contract items.

June 26,2012

Published Date: 1st Qtr. 2023	SDDOT	BRIDGE SURVEY MARKER	PLATE NUMBER 460.05
			Sheet 1 of 1

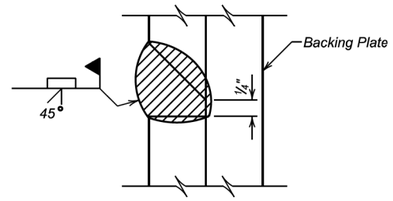




NOTE:

Prepare joint surfaces lower end of upper section on the ground and weld on backing plates; then place upper section on lower section and weld.

COMPLETE JOINT PENETRATION WELD DETAIL



GENERAL NOTES:

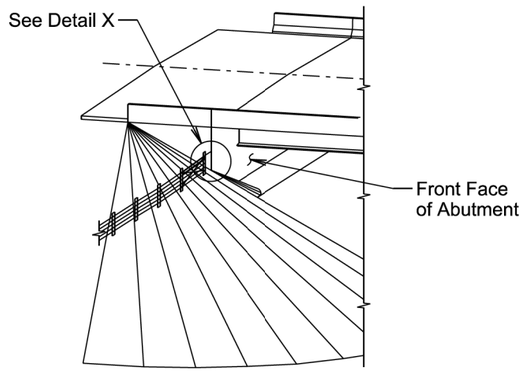
1. Steel for backing plates shall conform to ASTM A709 Grade 50.
2. Welding and weld inspection shall be in conformance with AWS D1.5 (Current Year) Bridge Welding Code - Steel.
3. Welder must be certified and registered with the SDDOT.
4. Backing plate shall at a minimum be as thick as the web of the pile being spliced.
5. Web must be coped with 1 inch radius.
6. Submit Welding Procedure Specification (WPS) to Bridge Construction Engineer for approval prior to pile driving.

TABLE 1
(BACKING PLATES)

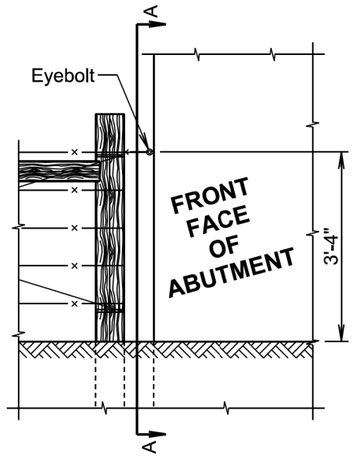
PILE	10"	12"	14"
"F" FLANGE	6 ½"	8"	10"
"W" WEB	4 ¾"	6 ¼"	7 ½"

December 23,2012

Published Date: 1st Qtr. 2023	SDDOT	STEEL PILE SPLICE DETAILS	PLATE NUMBER 510.40
			Sheet 1 of 1



DETAILS FOR FENCE ANCHORS



DETAIL X

GENERAL NOTES:

The fence and post details shown are for illustrative purpose only. The fence will be as specified elsewhere in the plans.

Eyebolts will be placed on all of the bridge abutment wings.

Eyebolts will be ⅝ inch diameter with 6 inches minimum length and will conform to ASTM A307.

Eyebolts will be galvanized in accordance with AASHTO M232 (ASTM A153).

Eyebolts will be installed after abutment wings are backfilled and berm construction is complete. Drill-in and epoxy eyebolts into abutment such that the eye of the bolt is flush with the concrete surface.

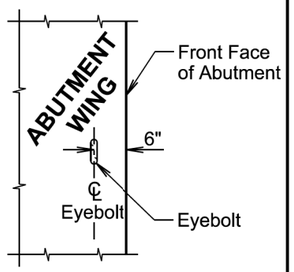
The epoxy resin mixture will be of a type for bonding steel to hardened concrete and will conform to AASHTO M235 Type IV, Grade 3 (Equivalent to ASTM C881, Type IV, Grade 3).

The diameter of the drilled holes will not be less than ⅛ inch greater, nor more than ⅜ inch greater than the diameter of the eyebolts or as per Manufacturer's recommendations. The drilled holes will be blown out with compressed air using a device that will reach the back of the hole to be sure that all debris or loose material has been removed prior to epoxy injection.

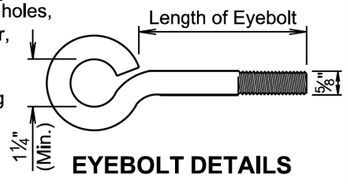
Mix epoxy resin as recommended by the Manufacturer and apply by an injection method as approved by the Engineer. Beginning at the back of the drilled holes, fill the holes ⅓ to ½ full of epoxy, or as recommended by the Manufacturer, prior to insertion of the eyebolts. Care will be taken to prevent epoxy from flowing out of the horizontal holes prior to eyebolt insertion. Rotate the eyebolt during installation to eliminate voids and ensure complete bonding of the bolt. Insertion of the eyebolts by the dipping or painting method will not be allowed.

Loads will not be applied to the epoxy grouted eyebolts until the epoxy resin has had sufficient time to cure as specified by the epoxy resin manufacturer.

The cost for furnishing and installing the eyebolts will be incidental to various contract items.



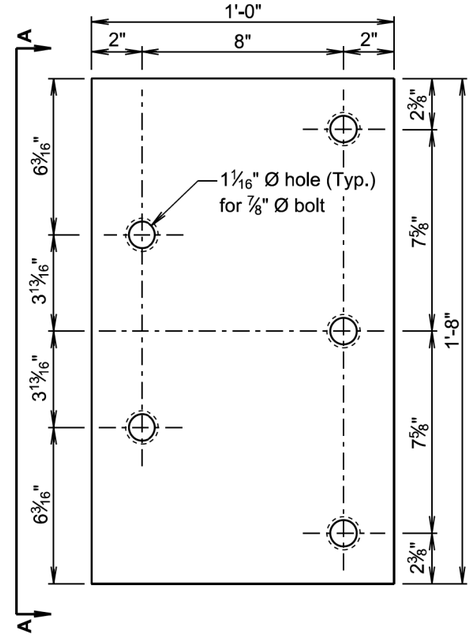
VIEW A-A



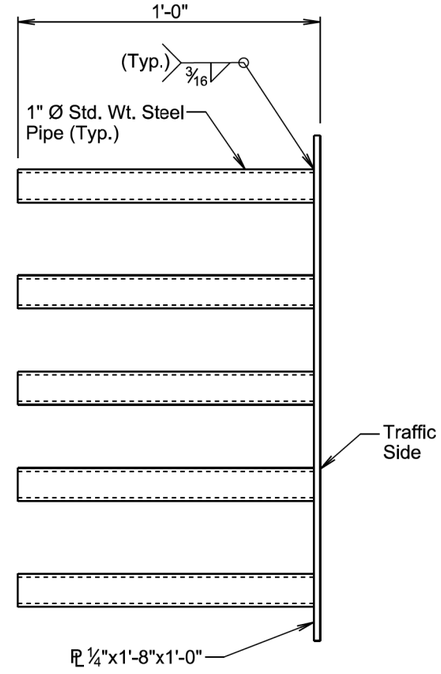
EYEBOLT DETAILS

November 19, 2020

Published Date: 1st Qtr. 2023	SDDOT	FENCE ANCHORS FOR BRIDGE ABUTMENTS (SWEPT BACK WINGS)	PLATE NUMBER 620.19 Sheet 1 of 1



ELEVATION VIEW



VIEW A - A

GENERAL NOTES:

Steel plate for the insert assembly will conform to ASTM A709, Grade 36. The steel pipes will conform to ASTM A53 or ASTM A500, Grade B.

Welding and weld inspection will be in conformance with AWS D1.1 - (Current Year) Structural Welding Code - Steel.

After fabrication, galvanize in accordance with AASHTO M111 (ASTM A123).

Bolts, nuts, and washers will be provided with each assembly. Bolts will be galvanized and conform to the requirements of ASTM A307, F-1554 Grade A325, or A449. Plain washers will be galvanized and conform to ASTM F844.

Bolt heads will be placed on the traffic side of the endblock. Bolt projection at the back side of the insert will not exceed 1 inch beyond the nut.

The cost of the 5 bolt insert plate assembly complete in place including welding and galvanizing will be incidental to the contract unit price per cubic yard for "Class A45 Concrete, Miscellaneous", "Class A45 Concrete, Bridge Deck", or "Class A45 Concrete, Bridge Repair", as applicable.

August 27, 2020

Published Date: 1st Qtr. 2023	SDDOT	5 BOLT INSERT PLATE ASSEMBLY	PLATE NUMBER 630.92 Sheet 1 of 1