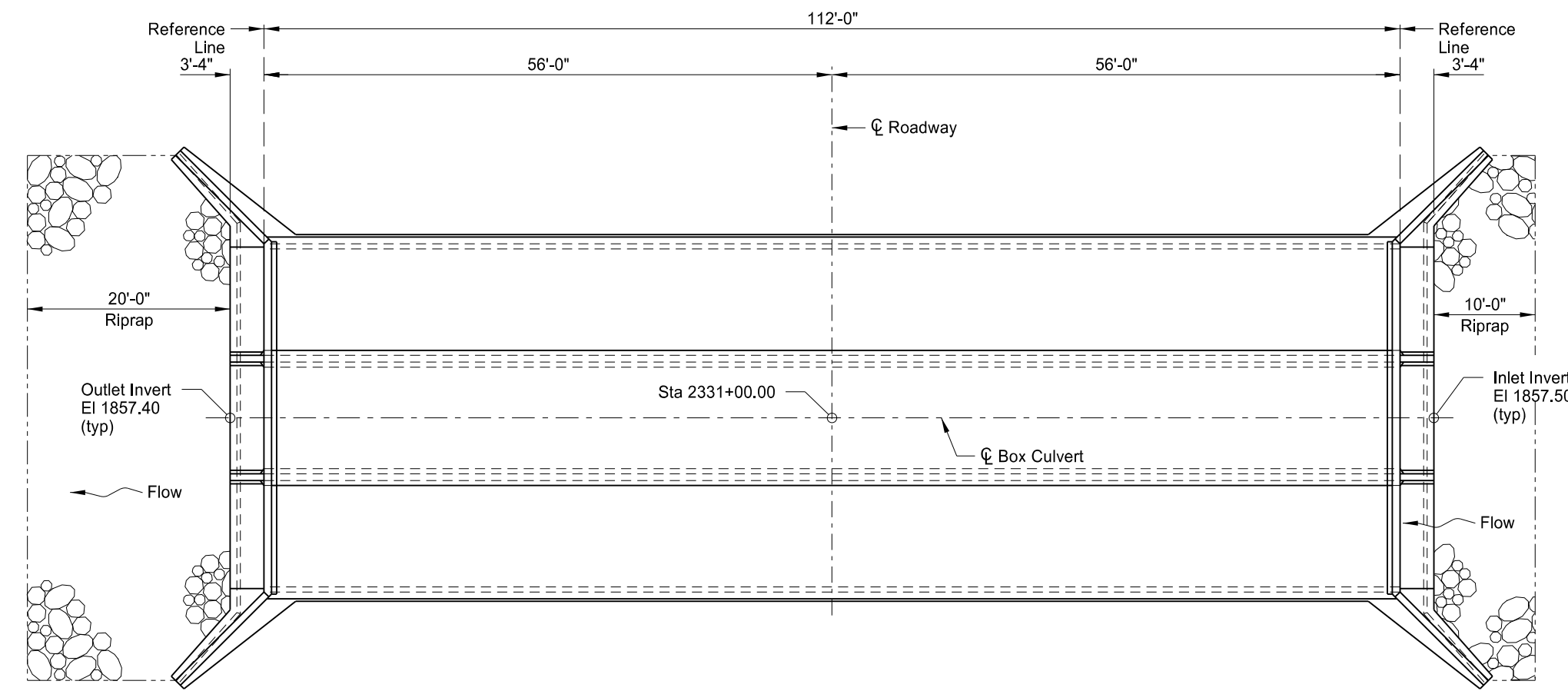
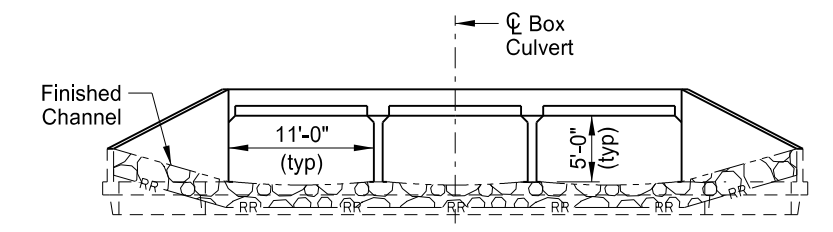


STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	1



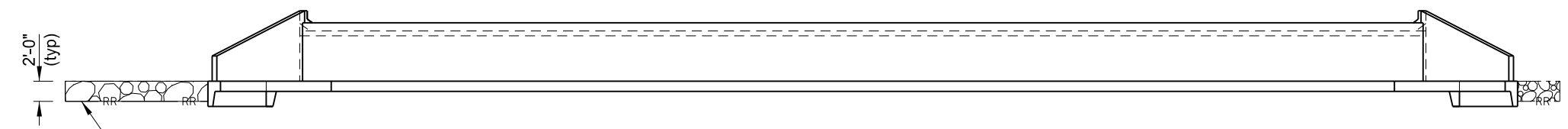
PLAN



END VIEW

DESIGN STRENGTHS:
 f'c = 3,000 psi ~ Class AE-3 Concrete
 fy = 60,000 psi ~ Reinforcing Steel
 Load & Resistance Factor Design

This drawing is preliminary and not for construction or implementation purposes.



ELEVATION

HYDRAULIC DATA:

Drainage Area	9.8	sq mi
Stream Gradient	0.0067	ft/ft
Design Frequency	50	yr
Design Discharge	991	cfs
Design Headwater Stage	1862.38	ft
Design Tailwater Stage	1860.17	ft
Velocity Through Culvert	9.87	fps
100-Year Frequency Discharge	1245	cfs
100-Year Frequency Headwater	1863.18	ft
Overtopping Stage	1867.48	ft
Overtopping Discharge	2243.6	cfs

BOX CULVERT BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
		REMOVAL OF STRUCTURE	L SUM	1
210	0050	BOX CULVERT EXCAVATION	EA	1
210	0210	FOUNDATION FILL	CY	690
210	0405	FOUNDATION PREPARATION-BOX CULVERT	EA	1
256	0200	RIPRAP GRADE II	CY	85
602	1131	CLASS AE-3 CONCRETE-BOX CULVERT	CY	326.2
612	0114	REINFORCING STEEL-GRADE 60-BOX CULVERT	LBS	47,012
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	520
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	170

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT
HL-93 DESIGN LOADING	
LOCATION	
CLEAR SPAN 3 x 11' CLEAR HEIGHT 5' MAXIMUM FILL 0' STATION: 2331+00.00	
REINFORCED CONCRETE TRIPLE BOX CULVERT LAYOUT	
ND DEPARTMENT OF TRANSPORTATION BRIDGE DIVISION	

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	project number	170	2

NOTES

- 100 SCOPE OF WORK: Work at this site consists of removing an existing structure and building a new triple barrel 11' x 5' x 112'-0" reinforced concrete box culvert.
- 202 REMOVAL OF STRUCTURE: The existing structure is a 2-span concrete slab bridge, 36'-0" long with a clear roadway width of 26'-0". Include all work required to remove the bridge in the contract unit price for "Removal of Structure".
- 210 ORDINARY BACKFILL: Compact material as specified in Section 203.04 G.2.a, "ND T 180."
- 602 CLASS AE-3 CONCRETE: The strength requirements of Section 802.01 A.2 "Class AE and AAE Mixes" are revised to develop a design compressive strength of 3,000 psi (AE-3) and 4,000 psi (AAE-3) at 28 days.

Cast the following elements of each section in one continuous run:

1. Floor slab and wing footings
2. Each intermediate wall up to the bottom of fillets
3. Each sidewall up to the bottom of fillets with its adjacent wings complete to the top
4. Roof slab and parapets

Allow the concrete in the walls to set at least two hours before the roof slab is poured.

- 602 CURING CONCRETE: Wet cure all concrete surfaces not covered by forms. Cover the concrete with a double thickness of burlap. Maintain surface moisture between the final finish and placement of burlap by periodic applications of a light fog spray of water. Keep the burlap continuously moist until the end of the curing period.
- 602 WEATHER LIMITATIONS: All requests in accordance with 602.04 C.4 "Weather Limitations" require approval from the NDDOT Bridge Division.
- 612 REINFORCING STEEL: When the distance between end bars is not evenly divisible by bar spacing, adjust the odd distance by a few irregular spaces near the center, not at the ends of the culvert.

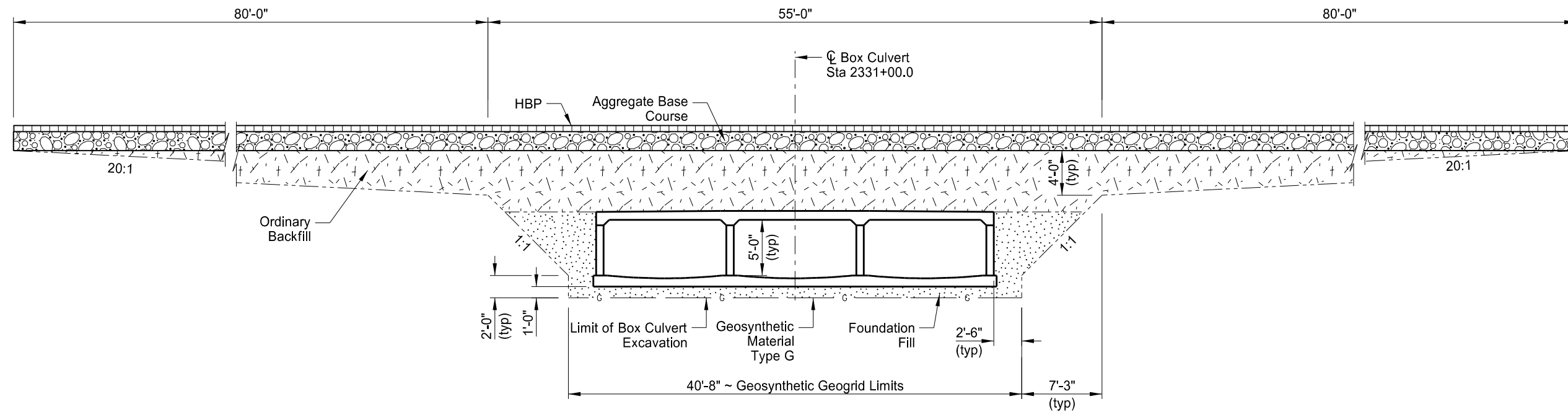
Place bolsters and bar supports for the roof steel at a maximum of 4 foot spacing.

Dimensions of bent bars are given out to out.

This document
is preliminary
and not for
construction or
implementation
purposes.

PRELIMINARY

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	3



(SHOWING SECTION ALONG ϕ ROADWAY)
**GEOSYNTHETIC GEOGRID PLACEMENT AND FOUNDATION FILL
 THROUGH EXISTING EMBANKMENT**

NOTES:

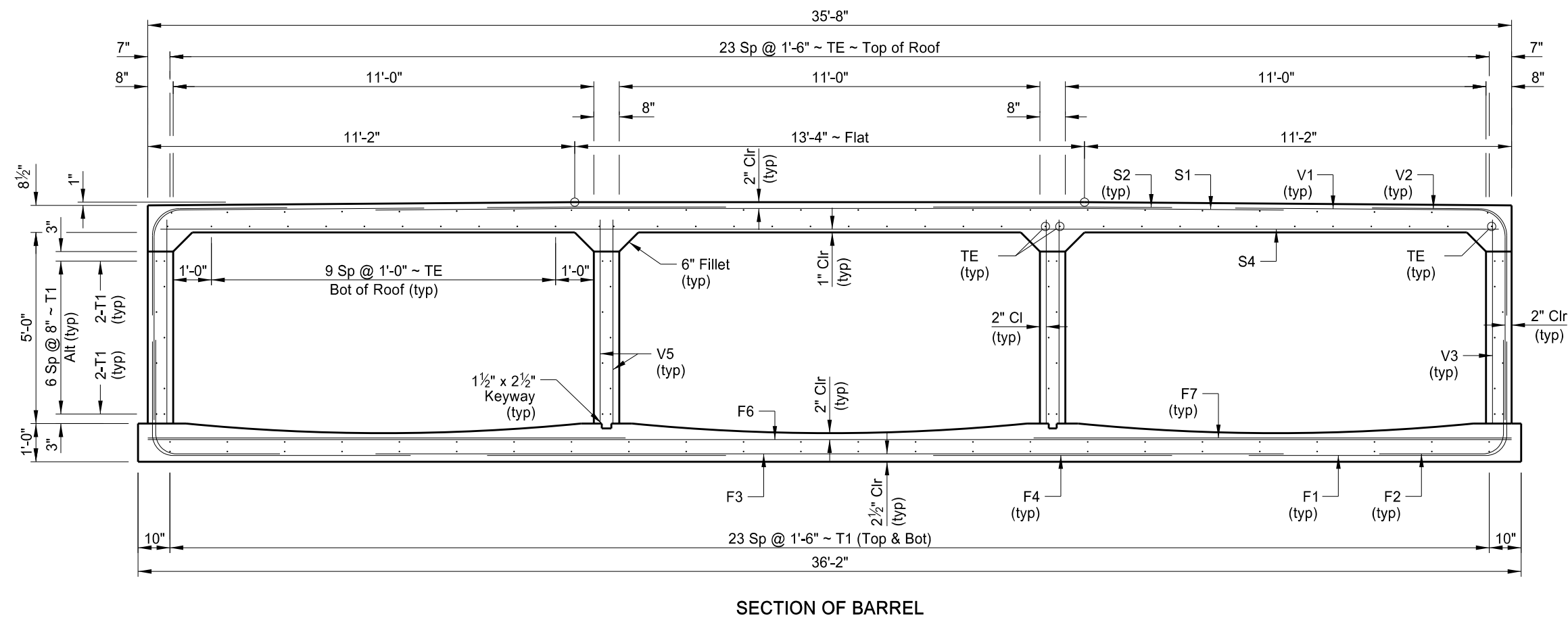
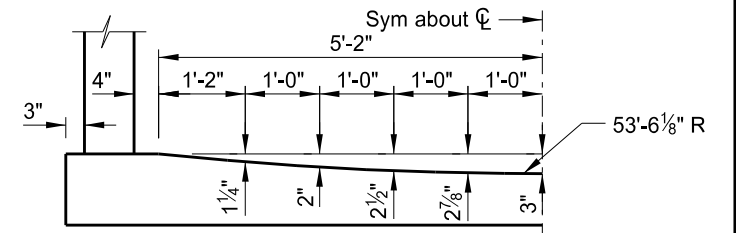
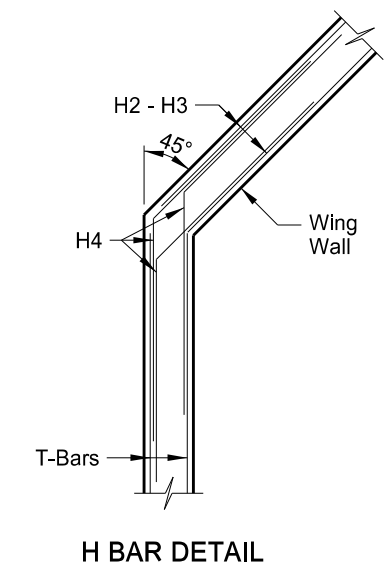
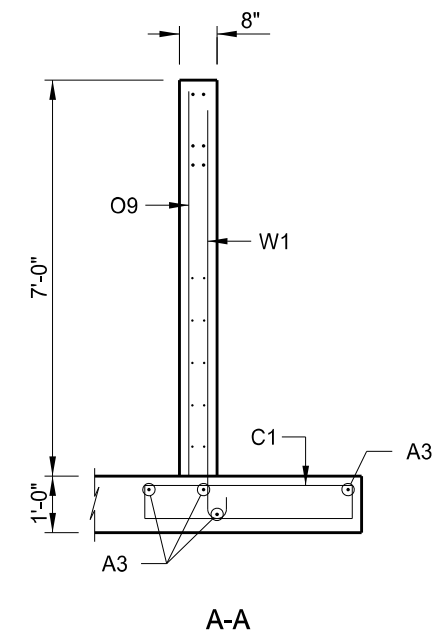
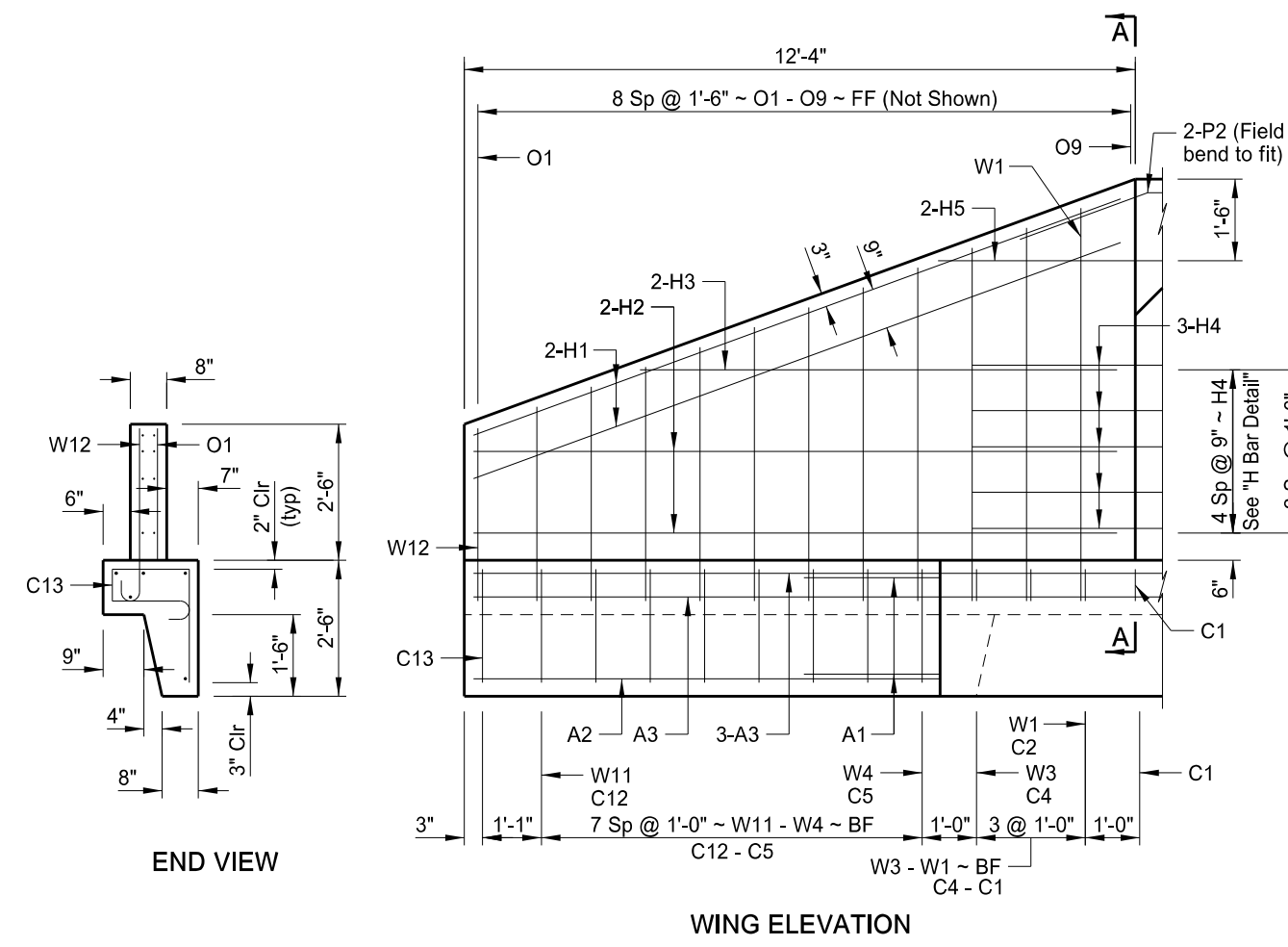
Provide a 1'-0" minimum depth of foundation fill under the floor. Remove and replace all unsound material under the box with foundation fill. The engineer will determine the depth required.

Extend the geosynthetic material and foundation fill to the end of the apron.

This drawing is preliminary and not for construction or implementation purposes.

LOCATION
EXCAVATION & FOUNDATION FILL DETAIL

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	4

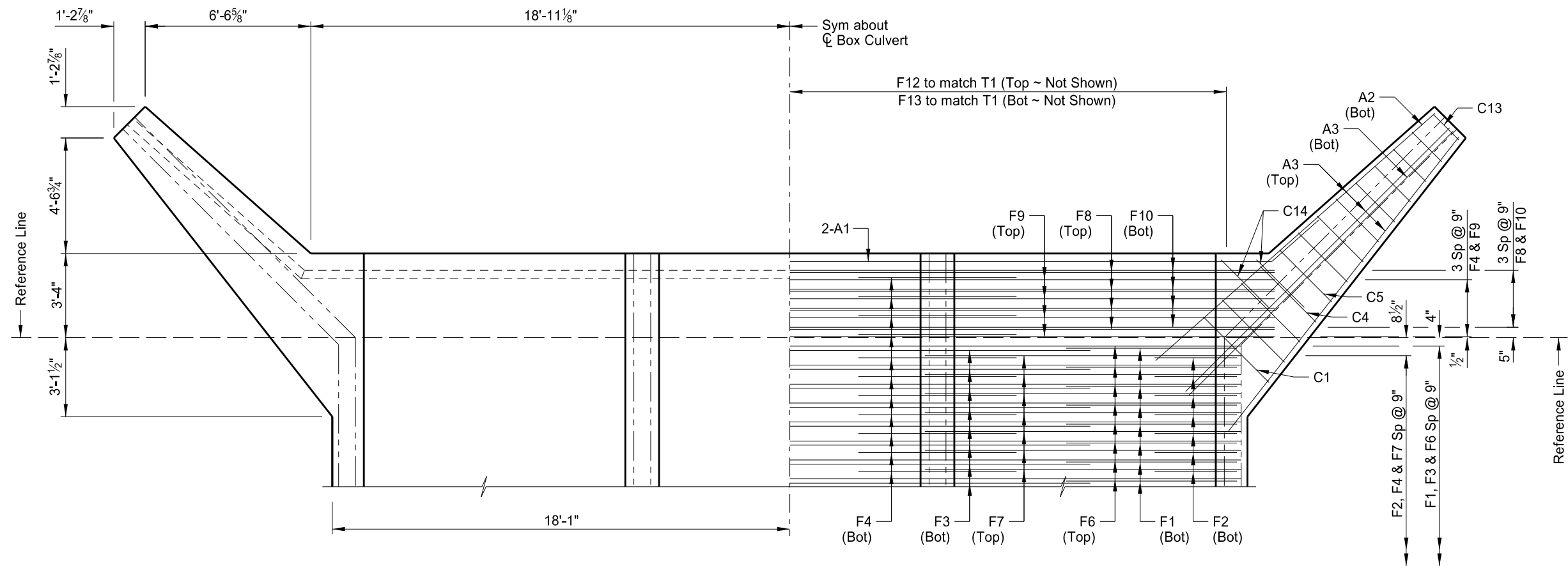


NOMENCLATURE:
 FF = FRONT FACE
 BF = BACK FACE

This drawing is preliminary and not for construction or implementation purposes.

LOCATION
 BARREL SECTION & WING DETAILS

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	5



(SHOWING DIMENSIONS)

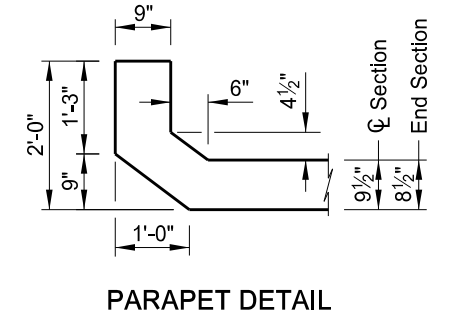
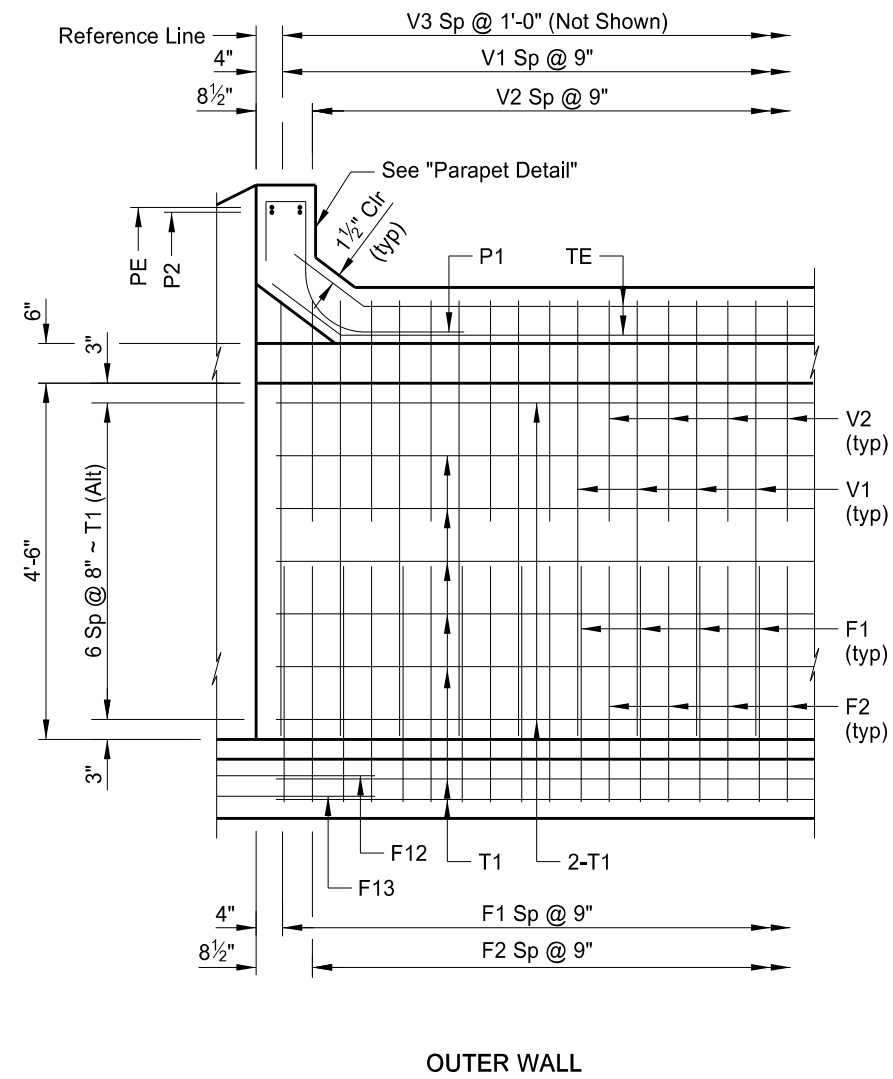
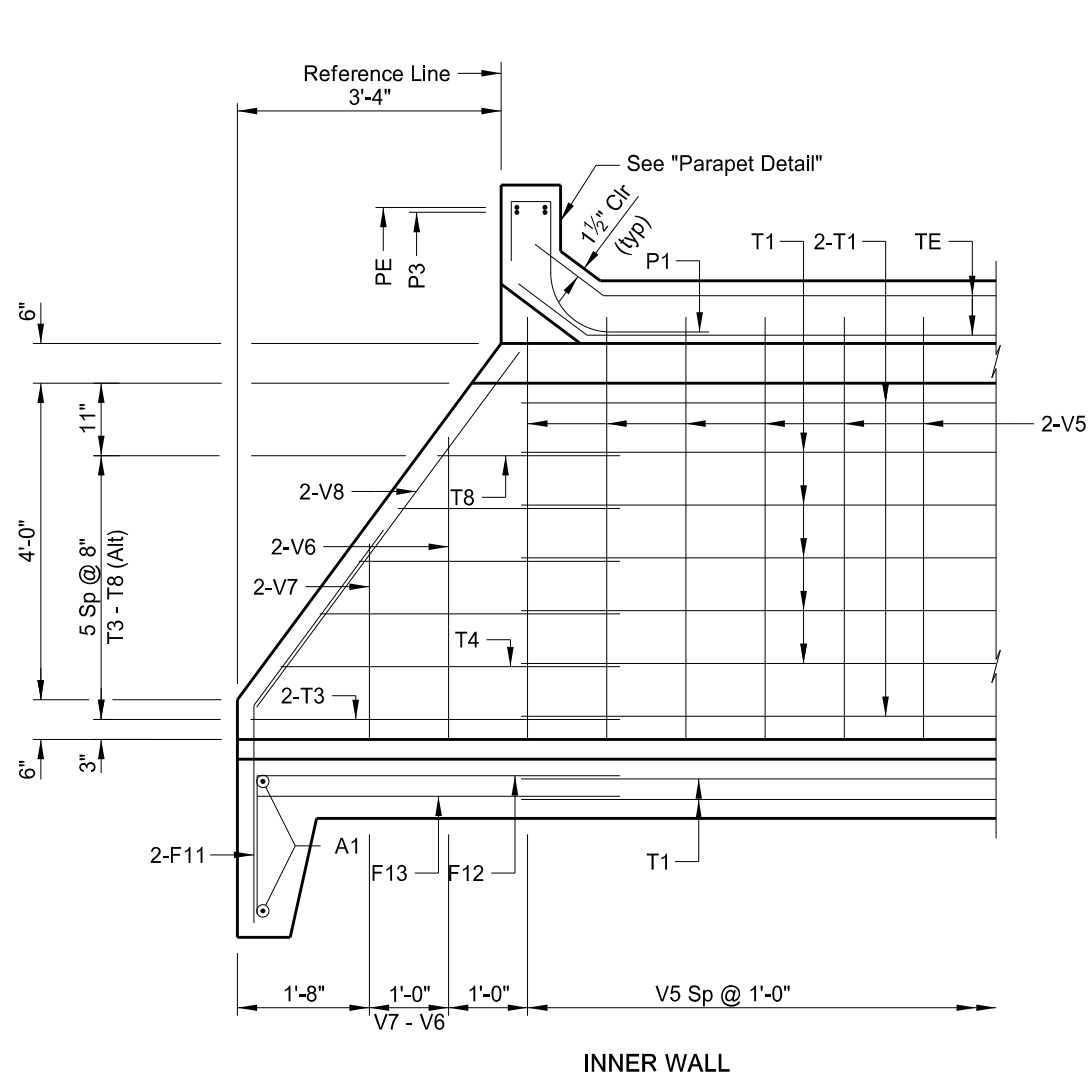
(SHOWING REINFORCING)

FLOOR PLAN

This drawing is preliminary and not for construction or implementation purposes.

LOCATION
FLOOR DETAIL

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	6



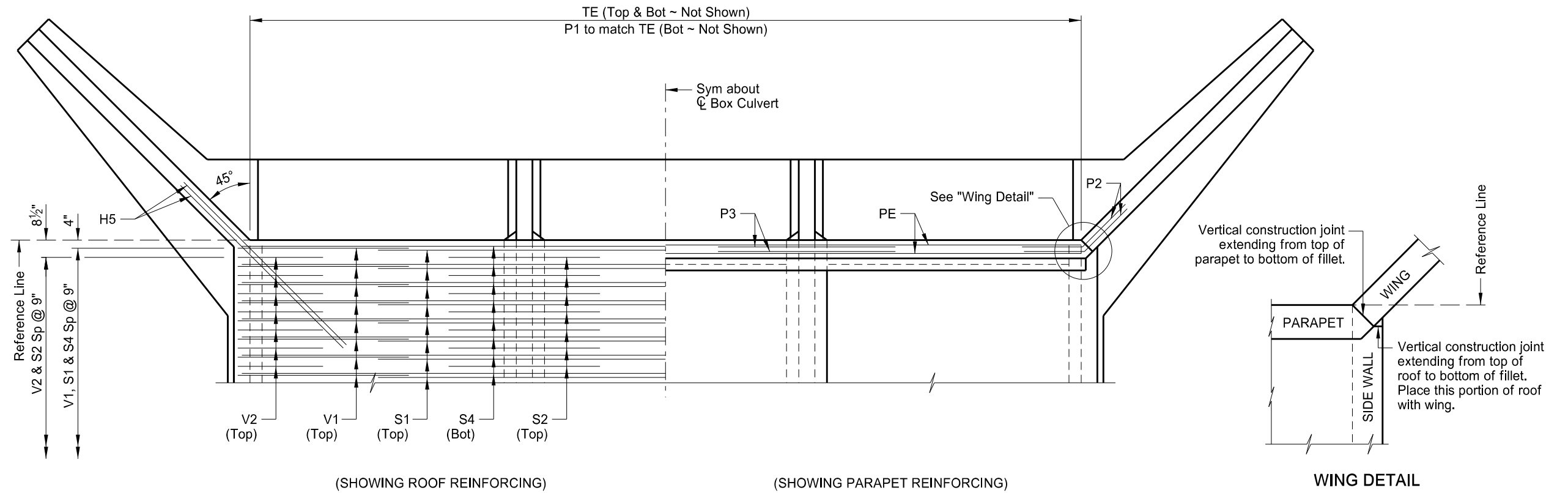
LONGITUDINAL SECTIONS

This drawing is preliminary and not for construction or implementation purposes.

LOCATION

WALL DETAILS &
 PARAPET DETAIL

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	7



(SHOWING ROOF REINFORCING)

(SHOWING PARAPET REINFORCING)

WING DETAIL

ROOF PLAN

This drawing is preliminary and not for construction or implementation purposes.

LOCATION

ROOF DETAILS

BAR LIST (CONSTANT)					BAR LIST (VARIABLE)				
MARK	SIZE	NO.	LENGTH	SHAPE	MARK	SIZE	NO.	LENGTH	SHAPE
W1	4	4	7'-7"	BENT	V1	4	300	12'-3"	BENT
W2	4	4	7'-4"	BENT	V2	5	296	6'-0"	BENT
W3	4	4	6'-11"	BENT	V3	4	226	5'-4"	STR.
W4	4	4	6'-7"	BENT	V5	4	456	5'-4"	STR.
W5	4	4	6'-2"	BENT					
W6	4	4	5'-10"	BENT	F1	4	300	9'-6"	BENT
W7	4	4	5'-6"	BENT	F2	4	296	6'-0"	BENT
W8	4	4	5'-1"	BENT	F3	4	150	23'-9"	STR.
W9	4	4	4'-9"	BENT	F4	5	312	6'-3"	STR.
W10	4	4	4'-5"	BENT	F6	4	150	35'-8"	STR.
W11	4	4	4'-0"	BENT	F7	4	296	12'-6"	STR.
W12	4	4	3'-7"	BENT					
					S1	5	150	23'-9"	STR.
C1	4	4	9'-0"	BENT	S2	6	296	6'-3"	STR.
C2	4	4	8'-8"	BENT	S4	5	150	35'-0"	STR.
C3	4	4	8'-4"	BENT					
C4	4	4	8'-0"	BENT	T1	4	84	112'-9"	STR.
C5	4	4	9'-0"	BENT	TE	4	60	113'-4"	BENT
C6	4	4	8'-8"	BENT					
C7	4	4	8'-4"	BENT					
C8	4	4	8'-0"	BENT					
C9	4	4	7'-6"	BENT					
C10	4	4	7'-2"	BENT					
C11	4	4	6'-10"	BENT					
C12	4	4	6'-6"	BENT					
C13	4	4	6'-0"	BENT					
C14	4	8	4'-9"	BENT					
H1	6	16	12'-8"	STR.					
H2	4	16	11'-11"	STR.					
H3	4	8	8'-10"	STR.					
H4	4	60	6'-0"	BENT					
H5	6	8	9'-6"	STR.					
O1-O9	4	4 SETS	41'-8"	STR.					
A1	6	8	22'-5"	BENT					
A2	6	4	8'-9"	STR.					
A3	6	16	14'-9"	STR.					
P1	4	72	4'-7"	BENT					
P2	6	8	5'-0"	BENT					
P3	6	8	7'-4"	STR.					
PE	6	8	18'-2"	STR.					
V6	4	8	3'-9"	STR.					
V7	4	8	2'-5"	STR.					
V8	6	8	5'-7"	STR.					
F8	4	8	38'-4"	STR.					
F9	4	8	38'-4"	STR.					
F10	4	8	38'-4"	STR.					
F11	6	8	5'-6"	BENT					
F12	4	48	6'-4"	BENT					
F13	4	48	4'-7"	STR.					
T3	4	8	4'-8"	STR.					
T4-T8	4	4 SETS	16'-6"	STR.					

23 U.S.C. 407
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	8

NOTES:

- Verify the quantity, size, and shape of the bar reinforcement against the structure drawings and immediately notify the Engineer of any discrepancies. Discrepancies in the bar list will not be cause for adjustment of the contract unit price.
- All dimensions are out to out of bars.
- Nominal length of each bent bar or cut bar is the sum total of the detailing dimensions for that bar, unless otherwise noted.
- The radius dimension in the "Bar Details" indicates the outside radius.

NOTE:

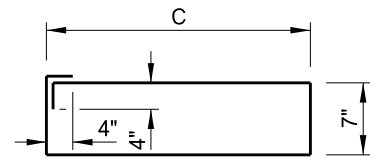
Unless construction requirements dictate otherwise, the Contractor has the option to construct the box culvert using construction joints or as one continuous unit. If construction joints are used, the longitudinal bar lengths may be adjusted, but a minimum lap length of 1'-3" must be maintained.

ENTIRE FLOOR	"L" x 1.14806 + 17.61541 = 146.2 CY
TWO OUTSIDE WALLS & FOUR WINGS	"L" x 0.22222 + 5.66328 = 30.6 CY
INSIDE WALLS	"L" x 0.22222 + 0.90535 = 25.8 CY
ENTIRE ROOF	"L" x 1.08848 + 1.70081 = 123.6 CY
TOTAL	"L" x 2.68098 + 25.88485 = 326.2 CY

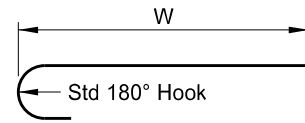
This drawing
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implementation
purposes.

CLASS AE-3 CONCRETE	326.2 CY
REINFORCING STEEL	47,012 LBS

LOCATION
REINFORCING BAR LIST

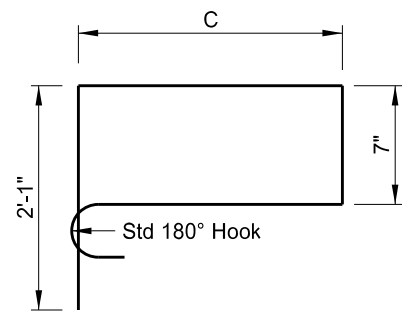


C1 - C4

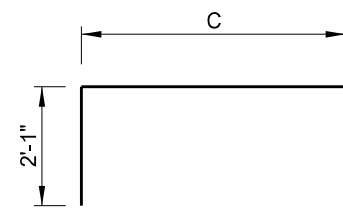


W1 - W12

MARK	"W"
W1	7'- 2"
W2	6'- 10"
W3	6'- 5"
W4	6'- 1"
W5	5'- 8"
W6	5'- 4"
W7	5'- 0"
W8	4'- 7"
W9	4'- 3"
W10	3'- 11"
W11	3'- 6"
W12	3'- 1"

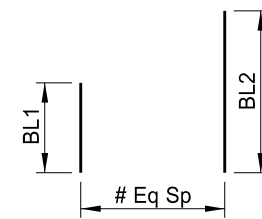


C5 - C13



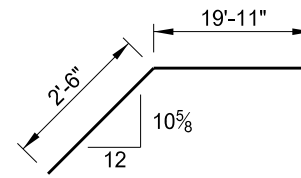
C14

MARK	"C"
C1	3'- 7"
C2	3'- 5"
C3	3'- 3"
C4	3'- 1"
C5	2'- 11"
C6	2'- 9"
C7	2'- 7"
C8	2'- 5"
C9	2'- 2"
C10	2'- 0"
C11	1'- 10"
C12	1'- 8"
C13	1'- 5"
C14	2'- 8"

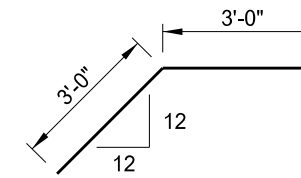


MARK	LENGTH	BL1	BL2	SPACES
O1-O9	41'-8"	2'-5"	6'-10"	8
T4-T8	16'-6"	2'-4"	4'-3"	4

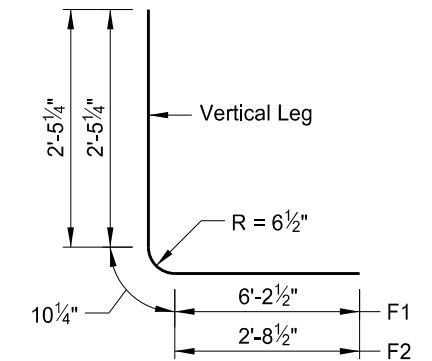
STRAIGHT BAR SET DETAIL



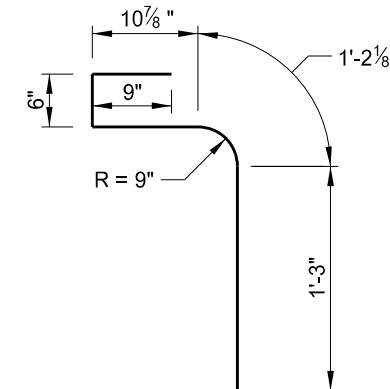
A1



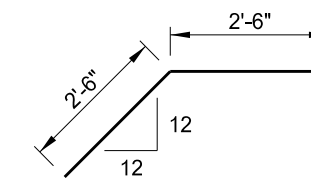
H4



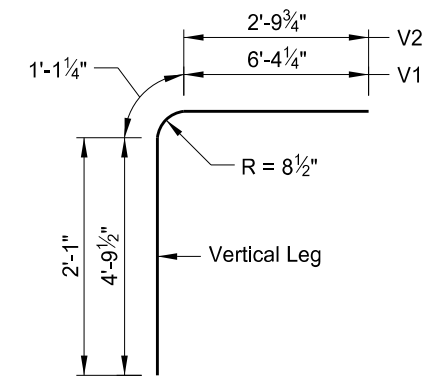
F1 & F2



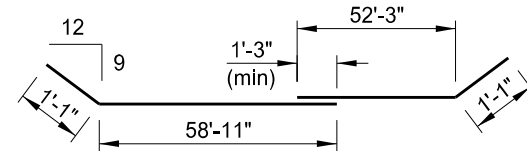
P1



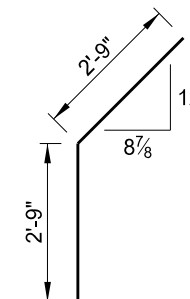
P2



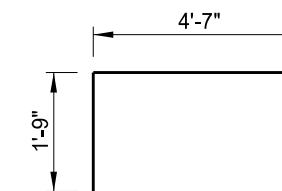
V1 & V2



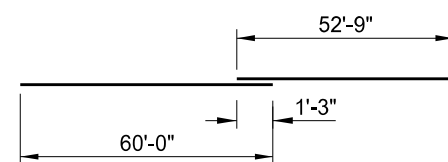
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F11



F12

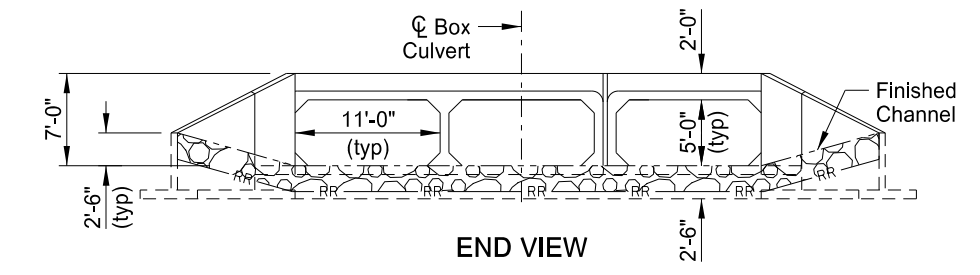
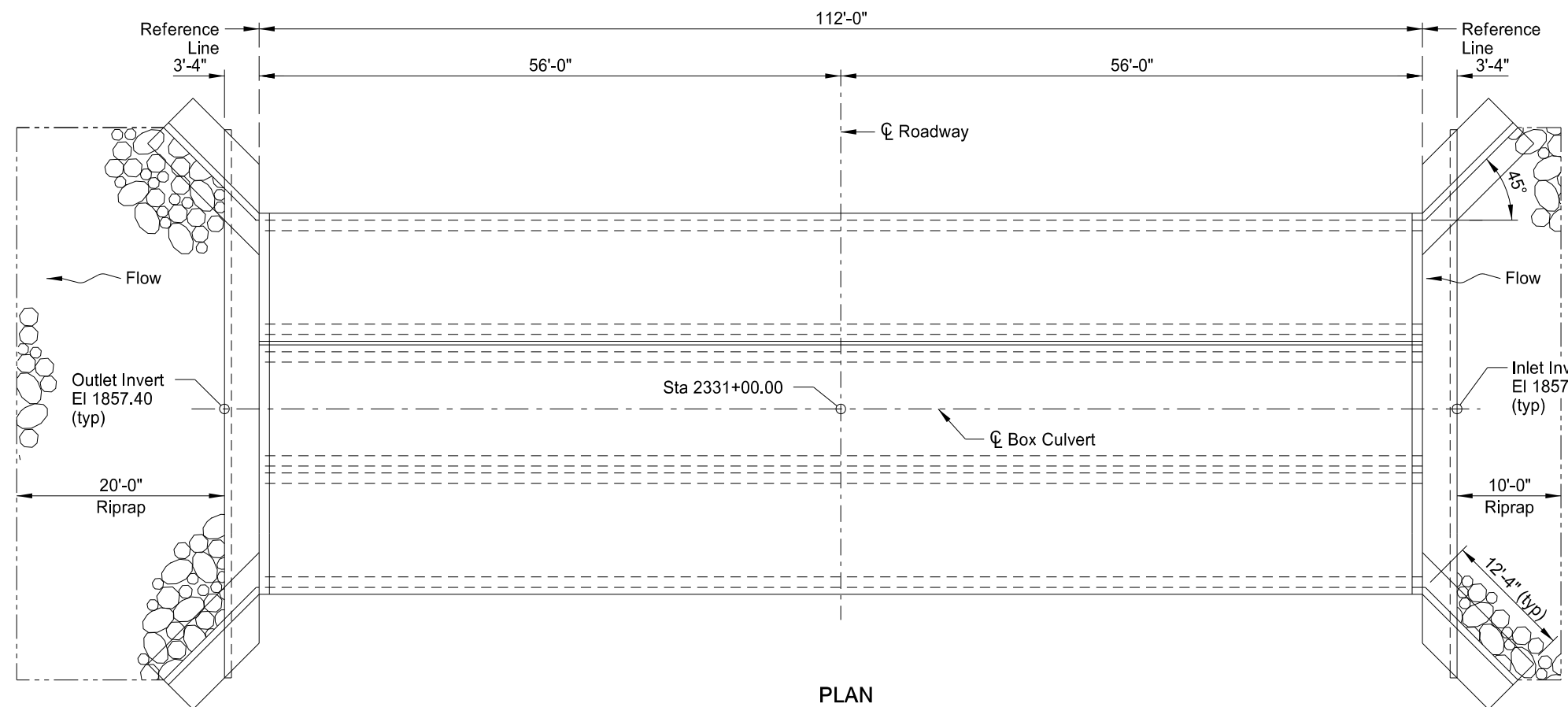


T1

This drawing is preliminary and not for construction or implementation purposes.

LOCATION
BAR DETAILS

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	project number	170	10

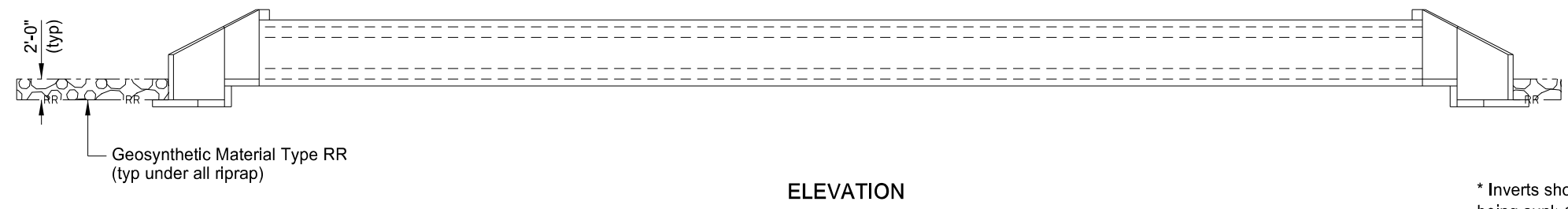


For a single barrel box culvert with 8" thick roof, 8" floor and 8" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (SINGLE)		FACTORED DESIGN SHEARS (SINGLE)	
WALL MOMENT	1,000 ft-lbs	WALL SHEAR	1,000 lbs
ROOF MOMENTS		ROOF SHEARS	
CORNER	1,000 ft-lbs	CORNER	1,000 lbs
BOTTOM	1,000 ft-lbs	FLOOR SHEARS	
FLOOR MOMENTS		CORNER	1,000 lbs
CORNER	1,000 ft-lbs		
TOP	1,000 ft-lbs		

For a double barrel box culvert with 8" thick roof, 8" floor and 8" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (DOUBLE)		FACTORED DESIGN SHEARS (DOUBLE)	
WALL MOMENT	1,000 ft-lbs	WALL SHEAR	1,000 lbs
ROOF MOMENTS		ROOF SHEARS	
CORNER	1,000 ft-lbs	CORNER	1,000 lbs
BOTTOM	1,000 ft-lbs	WALL	1,000 lbs
TOP	1,000 ft-lbs	FLOOR SHEARS	
FLOOR MOMENTS		CORNER	1,000 lbs
CORNER	1,000 ft-lbs	WALL	1,000 lbs
TOP	1,000 ft-lbs		
BOTTOM	1,000 ft-lbs		



* Inverts shown include culvert and associated riprap being sunk 1 ft below existing stream bed elevation.

HYDRAULIC DATA:

Drainage Area	9.8	sq mi
Stream Gradient	0.0067	ft/ft
Design Frequency	50	yr
Design Discharge	991	cfs
Design Headwater Stage	1862.38	ft
Design Tailwater Stage	1860.17	ft
Velocity Through Culvert	9.87	fps
100-Year Frequency Discharge	1245	cfs
100-Year Frequency Headwater	1863.18	ft
Overtopping Stage	1867.48	ft
Overtopping Discharge	2243.6	cfs

BOX CULVERT BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
		L SUM		1
202	0105	REMOVAL OF STRUCTURE	EA	1
210	0050	BOX CULVERT EXCAVATION	CY	690
210	0210	FOUNDATION FILL	EA	1
210	0405	FOUNDATION PREPARATION-BOX CULVERT	CY	85
256	0200	RIPRAP GRADE II	LF	112
606	1105	11FT X 5FT PRECAST RCB CULVERT	LF	112
606	3105	DBL 11FT X 5FT PRECAST RCB CULVERT	EA	2
606	7105	DBL 11FT X 5FT PRECAST RCB END SECTION	SY	520
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	170
709	0155	GEOSYNTHETIC MATERIAL TYPE RR		

This drawing is preliminary and not for construction or implementation purposes.

SPECIAL PROVISIONS	
SSP 2	MIGRATORY BIRD TREATY ACT
STANDARD DRAWINGS	
D-714-22	
HL-93 DESIGN LOADING	
LOCATION	
CLEAR SPAN 3 x 11' CLEAR HEIGHT 5' MAXIMUM FILL 0' STATION: 2331+00.00	
PRECAST CONCRETE TRIPLE BOX CULVERT LAYOUT	
ND DEPARTMENT OF TRANSPORTATION BRIDGE DIVISION	

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	project number	170	11

NOTES

MIX DESIGNS

- 100 SCOPE OF WORK: Work at this site consists of removing an existing structure and building a new triple barrel 11' x 5' x 112'-0" precast concrete box culvert.
- 202 REMOVAL OF STRUCTURE: The existing structure is a 2-span concrete slab bridge, 36'-0" long with a clear roadway width of 26'-0". Include all work required to remove the bridge and old abutments from a previous structure in the contract unit price for "Removal of Structure."
- 210 ORDINARY BACKFILL: Compact material as specified in Section 203.04 E.2.a, "ND T 180."
- 606 JOINTS: Provide joints in accordance with Section 606.E.3, with the exception that a 12" minimum width waterproof membrane is allowable around the exterior surfaces of the box culvert walls and roof.
- 606 PRECAST SECTION: Tie the barrel sections together with 1"φ tie bolts as shown on Standard Drawing D-714-22. Place two ties per exterior wall joint, located at third points of the wall clear height.

Mix Design 1

Cement	100 lbs
Fly Ash	300 lbs
Fine Aggregate	2600 lbs
Water	70 gals

Mix Design 2 (No Fly Ash)

Cement	165 lbs
Fly Ash	NA
Fine Aggregate	2600 lbs
Water	50 gals

For the 12" cap, use a weatherproof and freeze/thaw resistant, non-shrink cement grout material such as SikaGrout® 212, BASF Masterflow® 928, Euclid NS Grout, or an approved equal which complies with ASTM C1107.

Include the controlled density backfill and material used for the 12" cap in the price bid for "Dbl 11Ft X 5Ft Precast RCB Culvert."

Payment for "Dbl 11Ft X 5Ft Precast RCB End Section" includes the apron, cutoff wall, parapet and wingwalls. Attach the apron to the last barrel section, the wingwalls and the cutoff wall. Attach the wingwalls to the last barrel section. Provide a welded tie type system for the connections of the apron to the box and wingwalls. Connect the wingwalls to the last barrel section by the use of tie bolts, steel-bolted plates or other approved method so the inside corner surface is smooth.

Use ASTM A36 steel for bolts, plates, angles, and studs. Use heavy hex nuts meeting the requirements of ASTM A563 and washers meeting ASTM F436, Type 1. Provide welded pipe sleeves meeting the requirements of ASTM A53, Grade B. Galvanize hardware and structural steel according to Section 854.

Welders are to meet the requirements of Section 105.06 D. Galvanize field welds according to Section 854.02.

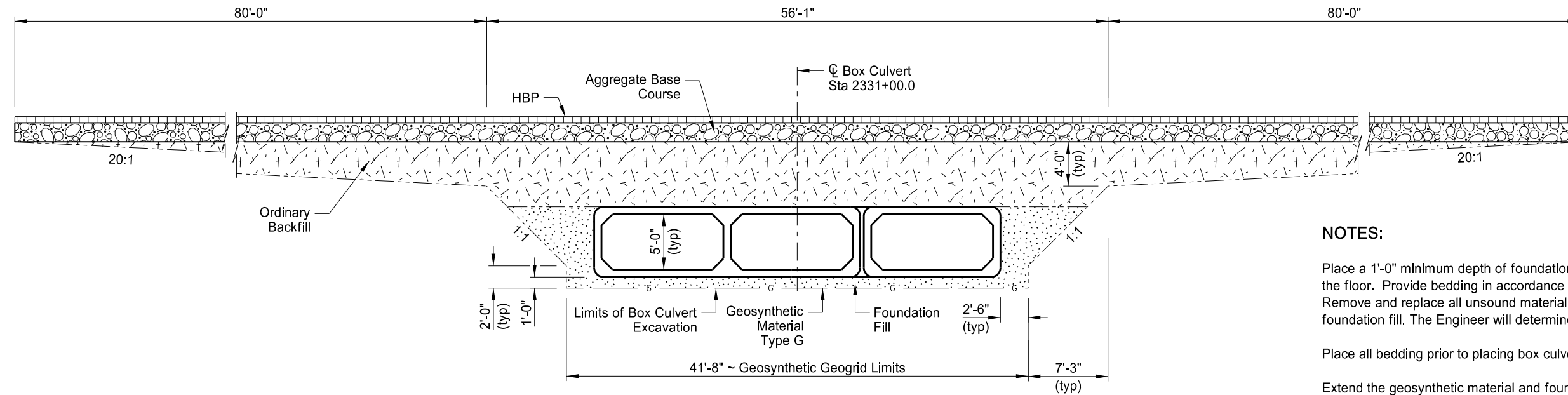
Cast holes at 3'-0" centers through the apron and into the cutoff wall to receive ¾" diameter reinforcing bars. Cast holes in the last barrel section at 1'-0" centers for ½" diameter reinforcing bars to attach the parapet. Cast parapet against the section. Install the bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage, in accordance with Section 806.02.

Provide a distance of 1'-0" between separate precast units. Fill this gap with a controlled density backfill. Use a controlled density backfill consisting of cement, water, pozzolanic materials, and fillers. Use a material that is fluid on placement to flow around and fill voids in the backfill area. Use a material that is able to support normal loads after 6 hours and have a compressive strength in the range of 75 psi to 125 psi at 28 days. If the mix design shown is used, no further testing will be required. The mix design yields approximately one cubic yard of flowable mortar.

This document
 is preliminary
 and not for
 construction or
 implementation
 purposes.

PRELIMINARY

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	PROJECT NUMBER	170	12



NOTES:

Place a 1'-0" minimum depth of foundation fill and bedding under the floor. Provide bedding in accordance with Section 606.E.1. Remove and replace all unsound material under the box with foundation fill. The Engineer will determine the depth required.

Place all bedding prior to placing box culvert sections.

Extend the geosynthetic material and foundation fill to the end of the apron.

(SHOWING SECTION ALONG ϕ ROADWAY)

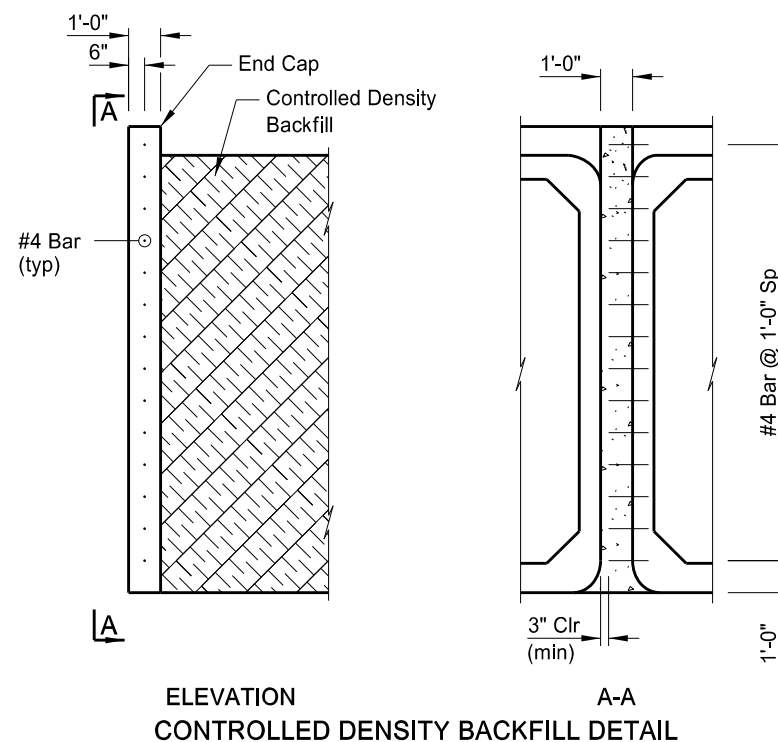
GEOSYNTHETIC GEOGRID PLACEMENT AND FOUNDATION FILL THROUGH EXISTING EMBANKMENT

NOTES:

The intent of this detail is to show only the placement of the controlled density backfill between adjacent barrels. The representation of the size of barrels is arbitrary.

Embed the # 4 bar 6" into the side of one of the box culvert end sections maintaining a 3" minimum clearance from the other box culvert. Spacing measured 1'-0" from bottom of box and spaced at 1'-0" up the front face.

Install the # 4 bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage and that meets the requirements of Section 806.02.



This drawing is preliminary and not for construction or implementation purposes.

LOCATION
EXCAVATION & FOUNDATION FILL DETAIL