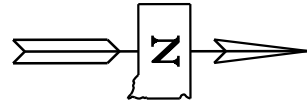


FOR BIDDING PURPOSES ONLY

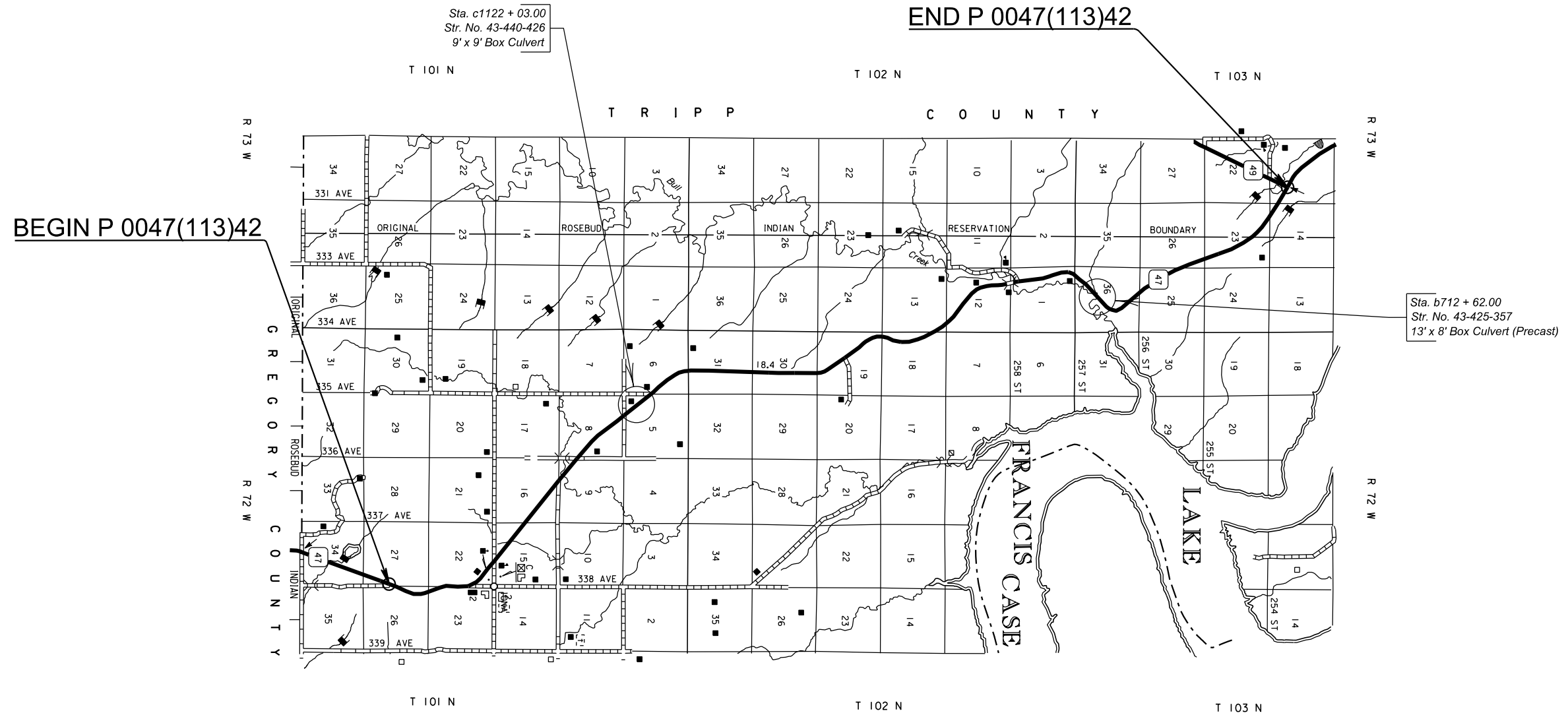
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E1	E17

# Section E: Structure Plans



## INDEX OF SHEETS -

Sheet E1	Layout Map and Index
Sheet E2	Estimate of Structure Quantities
Sheet E3 to E12	Str.No. 43-425-357 13' X 8' Box Culvert (Precast)
Sheet E13 to E17	Str.No. 43-440-426 9' X 9' Box Culvert



FOR BIDDING PURPOSES ONLY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0908(95)362	E2	E17

**SECTION E – ESTIMATE OF STRUCTURE QUANTITIES**

Str. Nos. 43-425-357 & 43-440-426

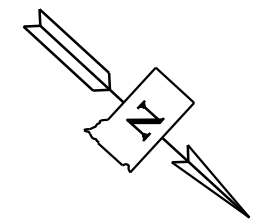
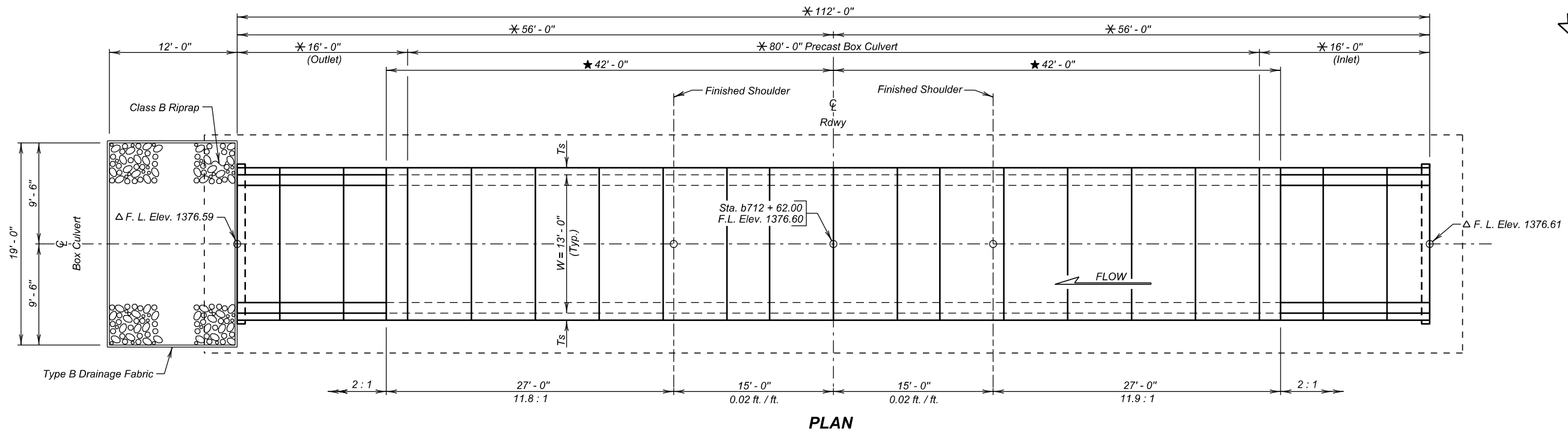
BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	102	CuYd
421E0200	Box Culvert Undercut	275	CuYd
460E0120	Class A45 Concrete, Box Culvert	151.2	CuYd
460E0380	Install Dowel in Concrete	18	Each
480E0100	Reinforcing Steel	22,072	Lb
560E0216	13'x8' Precast Concrete Box Culvert, Furnish	80.0	Ft
560E0217	13'x8' Precast Concrete Box Culvert, Install	80.0	Ft
560E1216	13'x8' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E1217	13'x8' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	79.6	Ton
831E0110	Type B Drainage Fabric	104	SqYd
831E0300	Reinforcement Fabric (MSE)	239	SqYd

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

- \* Dimension may vary with fabricator and/or installation. See Shop Plans for actual installation length.
- ★ Minimum distance to satisfy clear zone.
- △ Based on dimensions shown.
- ⊠ Based on 8" exterior walls and 8" middle wall.

FOR BIDDING PURPOSES ONLY

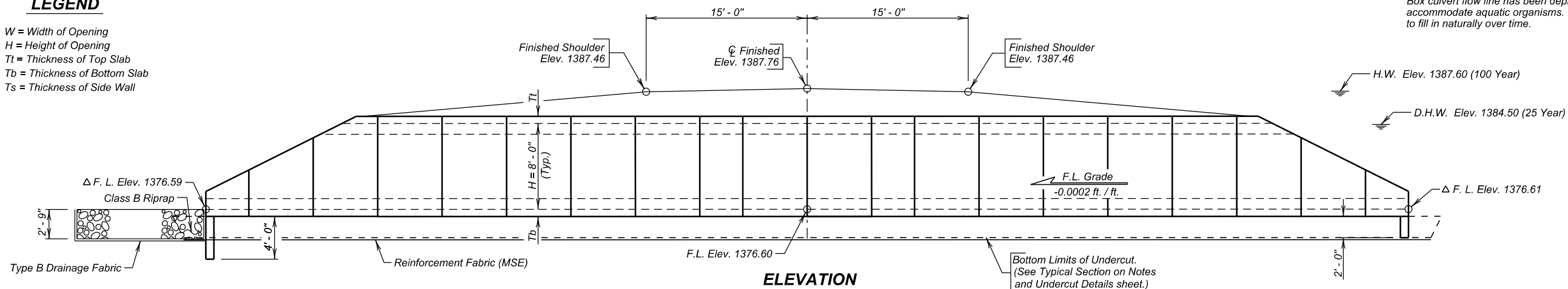
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E3	E17



**LEGEND**

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

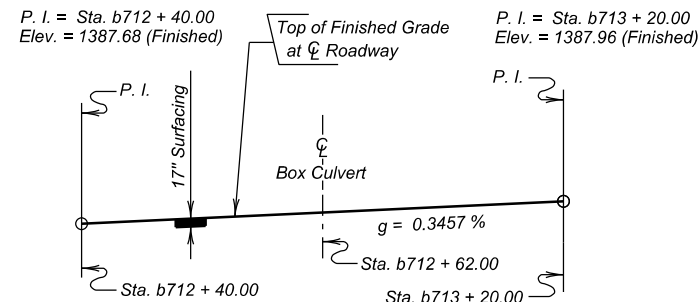
NOTE:  
Box culvert flow line has been depressed 1' - 0" below channel flow line to accommodate aquatic organisms. The 1' - 0" depression will be allowed to fill in naturally over time.



**HYDRAULIC DATA**

$Q_d$	477 cfs
$A_d$	70 sq. ft.
$V_d$	6.8 fps
$Q_F$	477 cfs
$Q_{100}$	865 cfs
$Q_{OT}$	865 cfs
$V_{max}$	9.5 fps

$Q_d$  = Design discharge for the proposed culvert based on 25 year frequency. El. 1384.50.  
 $Q_{OT}$  = Overtopping discharge and frequency 100 yr. recurrence interval. El. 1387.6 at Sta. b712 + 17.00.  
 $Q_F$  = 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. 1387.6.  
 $V_{max}$  = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency.



**GRADELINE DATA**

**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 and 560.01
- Sheet No. 4 - Details of Standard Plate No's 560.10 and 560.11
- Sheet No. 5 - Details of Standard Plate No. 620.16

**ESTIMATED QUANTITIES**

ITEM	UNIT	QUANTITY
Structure Excavation, Box Culvert	Cu. Yd.	39
Box Culvert Undercut	Cu. Yd.	171
13' X 8' Precast Concrete Culvert, Furnish	Ft.	80
13' X 8' Precast Concrete Culvert, Install	Ft.	80
13' X 8' Precast Concrete Culvert End Section, Furnish	Each	2
13' X 8' Precast Concrete Culvert End Section, Install	Each	2
Class B Riprap	Ton	32.5
Type B Drainage Fabric	Sq. Yd.	45
Reinforcement Fabric (MSE)	Sq. Yd.	239

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

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

**GENERAL DRAWING AND QUANTITIES**

FOR  
**13' X 8' BOX CULVERT (PRECAST)**  
 OVER TRIB. TO BULL CREEK 0° SKEW  
 STA. b712 + 62.00 SEC. 36-T103N-R73W  
 STR. NO. 43-425-357 P 0047(113)42  
 PCN 05UN HL-93

LYMAN COUNTY  
 S. D. DEPT. OF TRANSPORTATION

FEBRUARY 2021

1 OF 5

DESIGNED BY BS LYMN05UN	CK. DES. BY CM 05UNGA01	DRAFTED BY BT	Steve A. Johnson BRIDGE ENGINEER
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**SPECIFICATIONS:**

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

**GENERAL NOTES:**

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

1. Box Culvert and box culvert end section design will conform to the AASHTO LRFD Bridge Design Specifications, 9th Edition.
2. Design Live Load: HL-93. No construction loading in excess of legal load is anticipated. If construction loading in excess of legal load is anticipated by the Contractor, the Contractor shall submit a proposal including a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval. Upon approval, the construction load shall not be applied until the depth of fill over the box culvert as required by analysis has been placed. At a minimum, 4 ft. of fill shall be placed over the box culvert prior to applying the construction load. All costs associated with accommodating any construction loads shall be borne by the Contractor.
3. The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with 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 the 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 load rating calculations. Submit load rating calculations with the design and independent check design calculations or shop plans, as appropriate.
4. The design of the barrel sections shall be based on a minimum fill height of 2 foot and include all subsequent fill heights up to and including the maximum fill height of 5 ft. over the box culvert.
5. Minimum inside corner fillet shall 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. The Fabricator will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
9. Alternate end section details will be allowed, subject to the approval of the Bridge Construction Engineer. No additional payment will be made for any change in the barrel/end section configuration.
10. Installation of the precast sections will be in accordance with the final approved shop plans.
11. Care will be taken when placing sections. Sections will be only moved using the lifting holes by approved equipment.
12. Soils below the bottom of the proposed RCBC consist of brown gray silt clay. Groundwater was encountered in the borings at an elevation of 1376.5 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. The water/cementitious material ratio will not exceed 0.45 as defined in Section 460.3 C.

**SHOP PLANS**

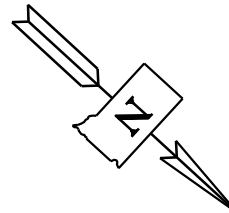
The fabricator will submit shop plans in accordance with the Specifications or in Adobe PDF format. Shop plan submittals shall be sent to the Office of Bridge Design. Include design and check design, if applicable, with initial submittal.

**GEOTEXTILE SPECIFICATION**

1. The geotextile will conform to specification for Geotextiles and Impermeable Plastic Membrane, Reinforcement Fabric (MSE) (Section 831 of the Standard Specifications). The geotextile will be on the Approved Products List for this material or will be certified by the supplier to meet this specification prior to installation.
2. Reinforcement Fabric (MSE) will be paid for at the contract unit price per sq. yd. for Reinforcement Fabric (MSE). Payment will be full compensation for furnishing and installing the Reinforcement Fabric (MSE) only. Granular backfill materials will be paid for as part of the Box Culvert Undercut bid item.

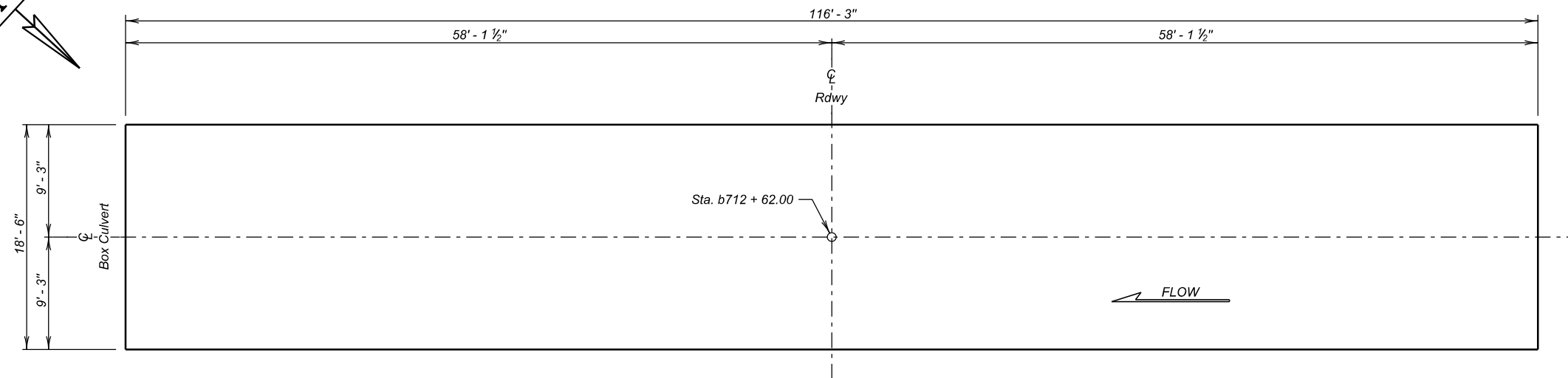
**INSTALLATION PROCEDURE - GEOTEXTILE**

1. Place the Reinforcement Fabric (MSE) on as level and smooth of surface as possible.
2. Any protrusions that might damage the geotextile will be removed prior to placing the geotextile.
3. All seams in the geotextile will be stitched in accordance with the seaming procedure notes and as shown on the details labeled "Seam Types".
4. No equipment is to be allowed on the geotextile until the granular material is in place.
5. The geotextile should be kept as taut as possible prior to backfilling.
6. Granular backfill material will be dumped behind the leading edge of the fill and pushed into place with a loader or dozer.

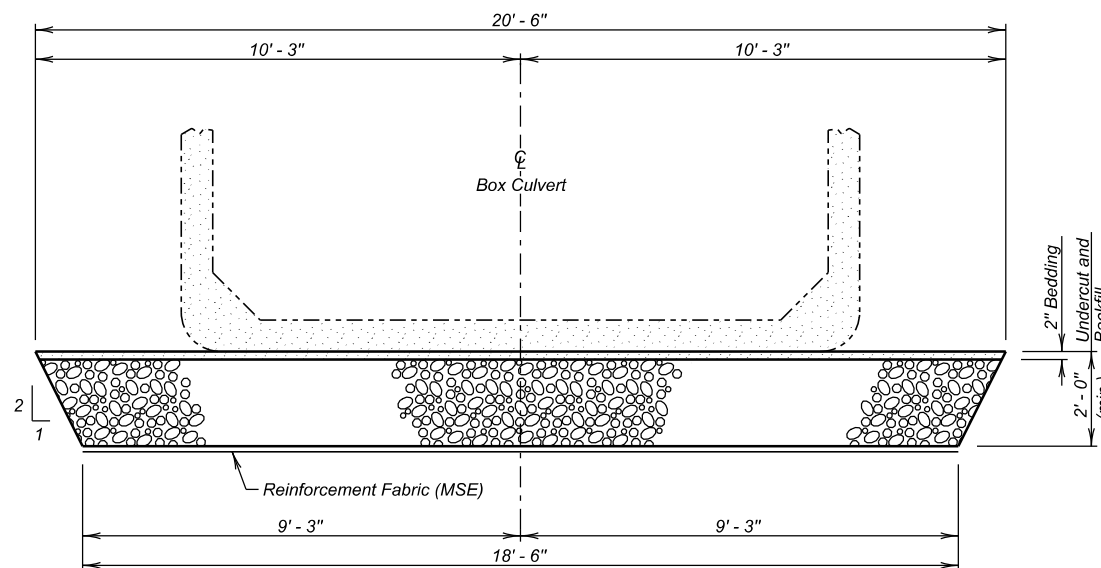


FOR BIDDING PURPOSES ONLY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E4	E17



**UNDERCUT LAYOUT**  
(Bottom Dimensions)



**TYPICAL SECTION**  
(For Limits of Undercut)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	171
Reinforcement Fabric (MSE)	Sq. Yd.	239

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

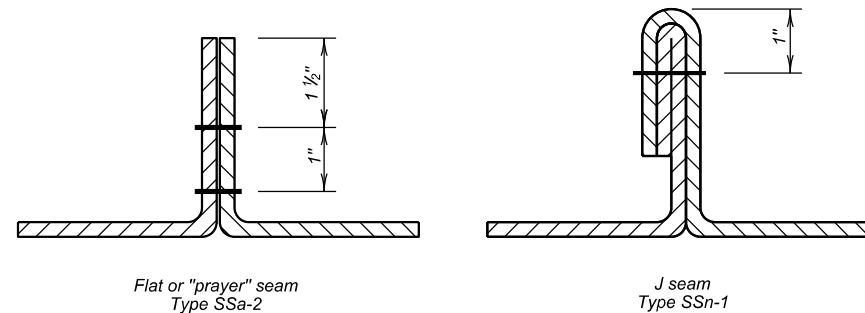
**NOTES AND UNDERCUT DETAILS**

FOR  
**13' X 8' BOX CULVERT (PRECAST)**  
 OVER TRIB. TO BULL CREEK 0° SKEW  
 STA. b712 + 62.00 SEC. 36-T103N-R73W  
 STR. NO. 43-425-357 P 0047(113)42  
 HL-93

LYMAN COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 FEBRUARY 2021

**SEAMING PROCEDURE**

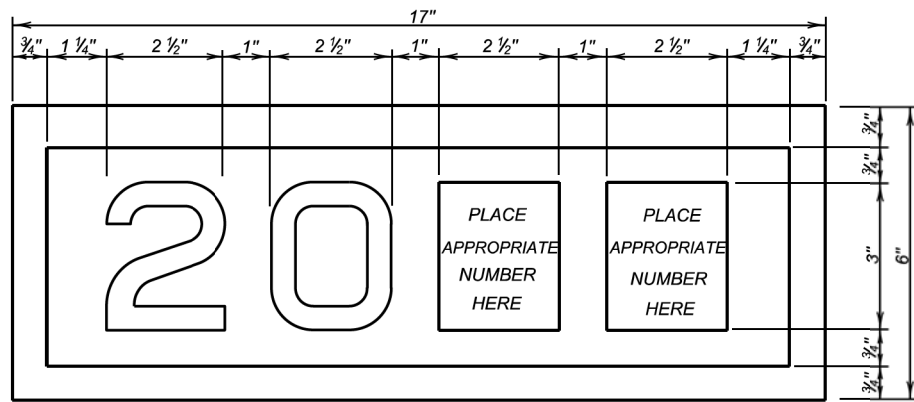
1. The sewn seams will consist of two parallel rows of stitching ("prayer" seam, TypeSSa-2), or will consist of a J-seam, (Type SSn-1), using a single row of stitching. The stitching will be lock type stitch.
2. If the SSa-2 seam is used, the two rows of stitching will be 1" apart with a tolerance of plus or minus 1/2" and will not cross, except for restitching. The minimum seam allowance, i.e., the minimum distance from the geotextile edge to the stitch line nearest to that edge, will be 1 1/2".
3. If the J-seam, Type SSn-1, is used, the minimum seam allowance will be 1".
4. The seam, stitch type, and the equipment used to perform the stitching will be as recommended by the manufacturer of the geotextile and approved by the Engineer.
5. The seams will be sewn in such a manner that the seam can be readily inspected by the Engineer.



**GEOTEXTILE SEAM TYPES**

DESIGNED BY BS LYMN05UN	CK. DES. BY CM 05UNGA02	DRAFTED BY BT	Steve A. Johnson BRIDGE ENGINEER
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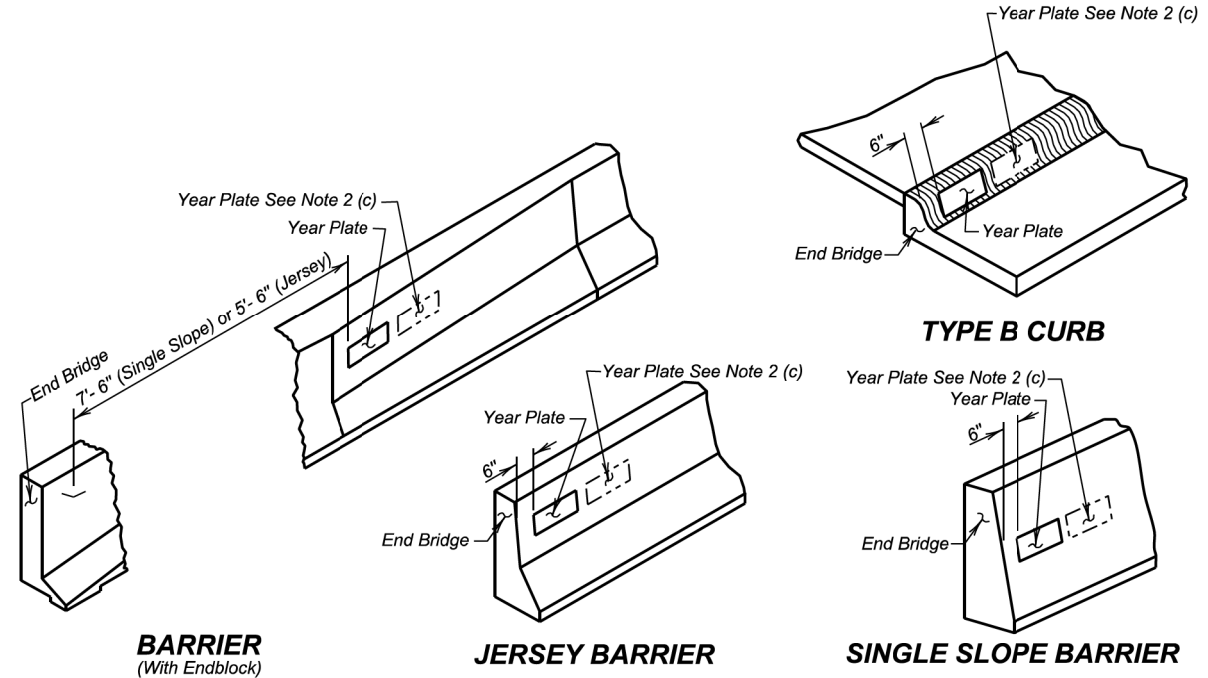
FOR BIDDING PURPOSES ONLY



YEAR PLATE DETAILS

GENERAL NOTES:

- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located on structure(s) as follows:
  - On cast-in-place box culverts the year plates will be four and one-half (4 1/2) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.
  - On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'-6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.
  - When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.
- There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



TYPE B CURB

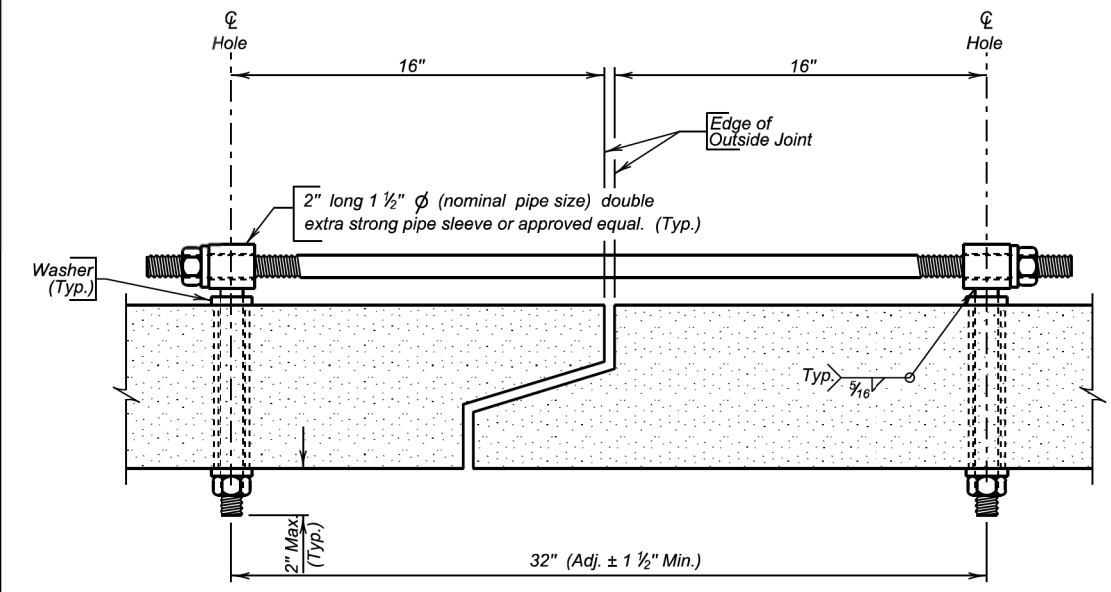
BARRIER (With Endblock)

JERSEY BARRIER

SINGLE SLOPE BARRIER

January 22, 2021

Published Date: 2025	S D D O T	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 of 1



TIE BOLT ASSEMBLY

GENERAL NOTES:

- All holes for tie bolts shall be cast-in-place, 16 inches from outside edge of joint. Cast in inserts or sleeves, if used, shall be made of a corrosion resistant material.
- Ties shall be 1 inch diameter and conform to the requirements of ASTM A36, ASTM A307, or ASTM F1554, Gr. 36. Nuts shall be heavy hex in conformance with ASTM A563. Washers shall conform to ASTM F436, Type 1. The welded pipe sleeve shall conform to ASTM A53, Grade B.
- Welding and weld inspection shall be in conformance with AWS/ANSI D1.1 - (Current Year) Structural Welding Code - Steel.
- Tie Bolt Assembly shall be galvanized in accordance with ASTM A153 or ASTM F2329 as applicable.
- Tie Bolt Assembly details may vary from that shown, but alternate tie bolt assemblies are subject to testing to demonstrate equal strength. Submit details, through proper channels, to the Office of Bridge Design for approval.
- All costs for furnishing and installing the precast box culvert tie bolt assembly shall be incidental to the contract unit price per Foot for "Precast Concrete Box Culvert, Furnish".

March 21, 2016

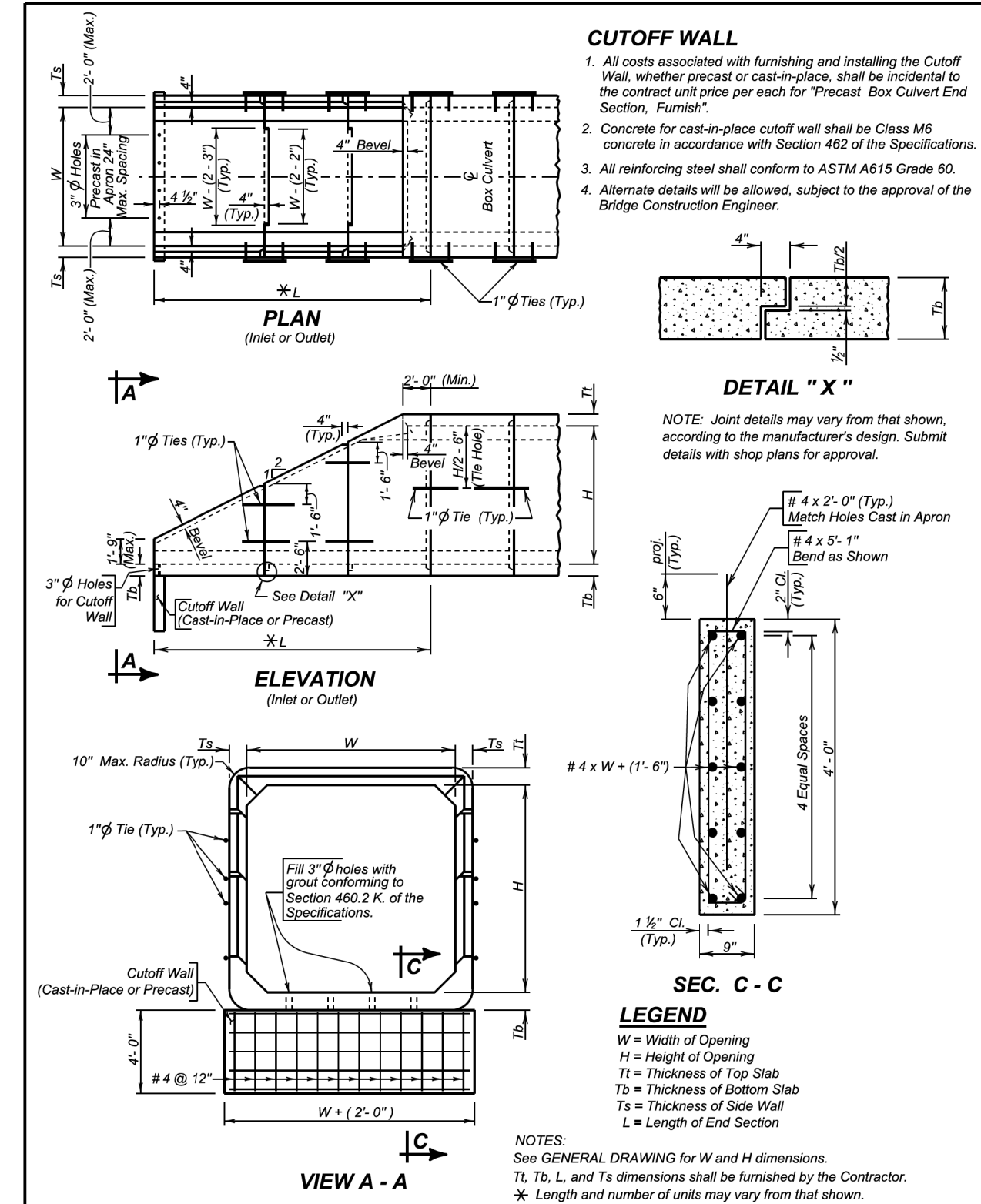
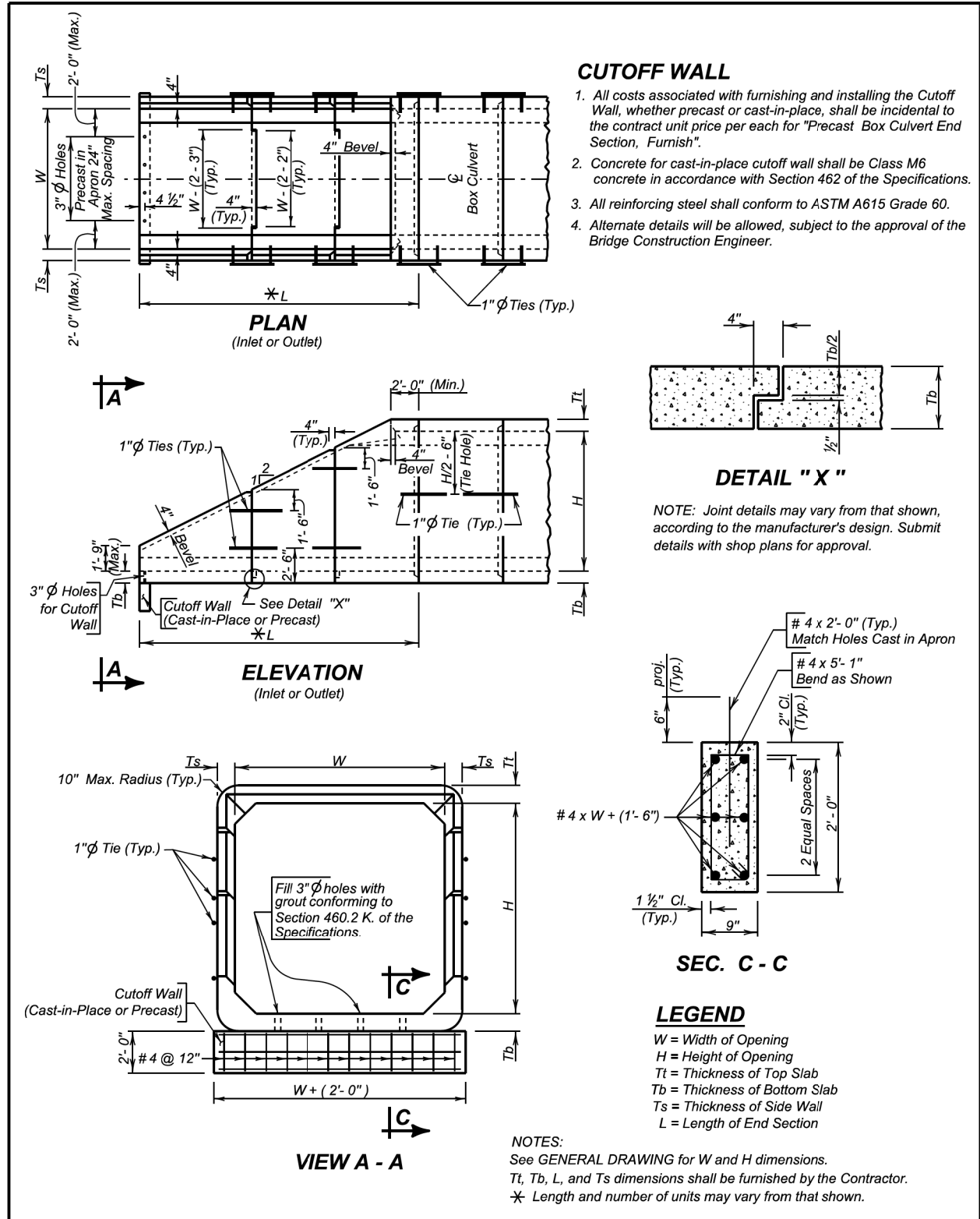
Published Date: 2025	S D D O T	PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS	PLATE NUMBER 560.01
			Sheet 1 of 1

13' X 8' BOX CULVERT (PRECAST)

STR. NO. 43-425-357

FEBRUARY 2021

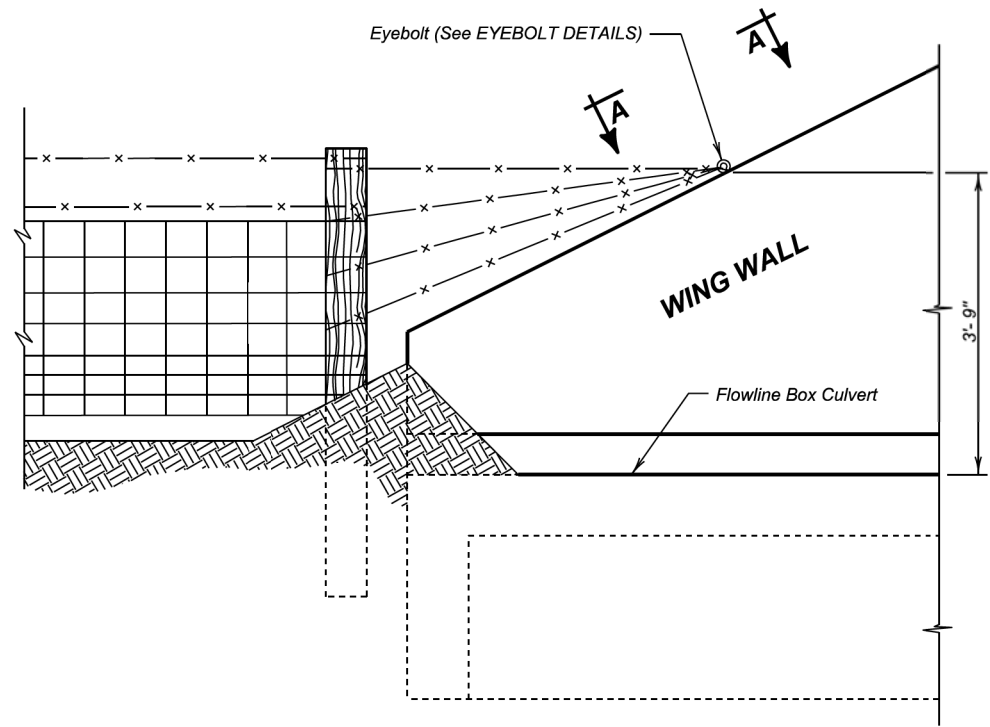
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E6	E17



Published Date: 2025	S D D O T	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'-0" CUTOFF WALL	PLATE NUMBER 560.10
			Sheet 1 of 1

Published Date: 2025	S D D O T	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'-0" CUTOFF WALL	PLATE NUMBER 560.11
			Sheet 1 of 1

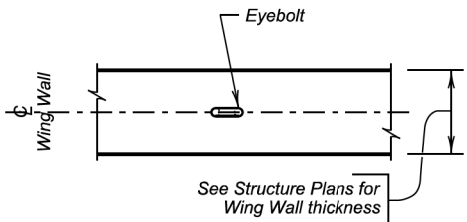
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E7	E17



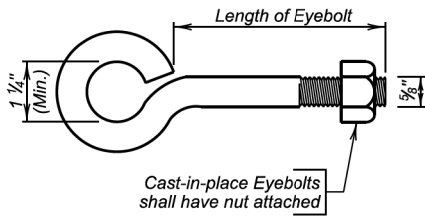
DETAIL FOR FENCE ANCHORS

**GENERAL NOTES:**

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be 5/8 inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be 4 1/2 inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the 5/8 inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



VIEW A - A



EYEBOLT DETAILS

December 23, 2012

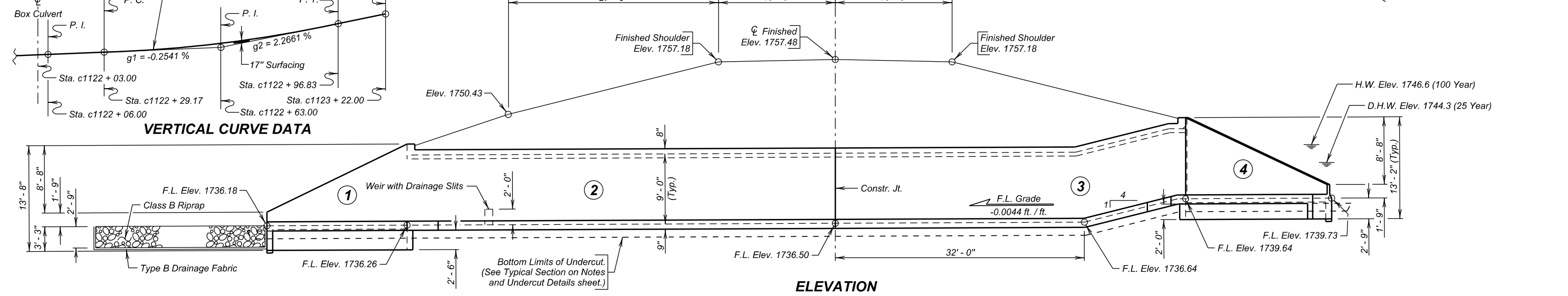
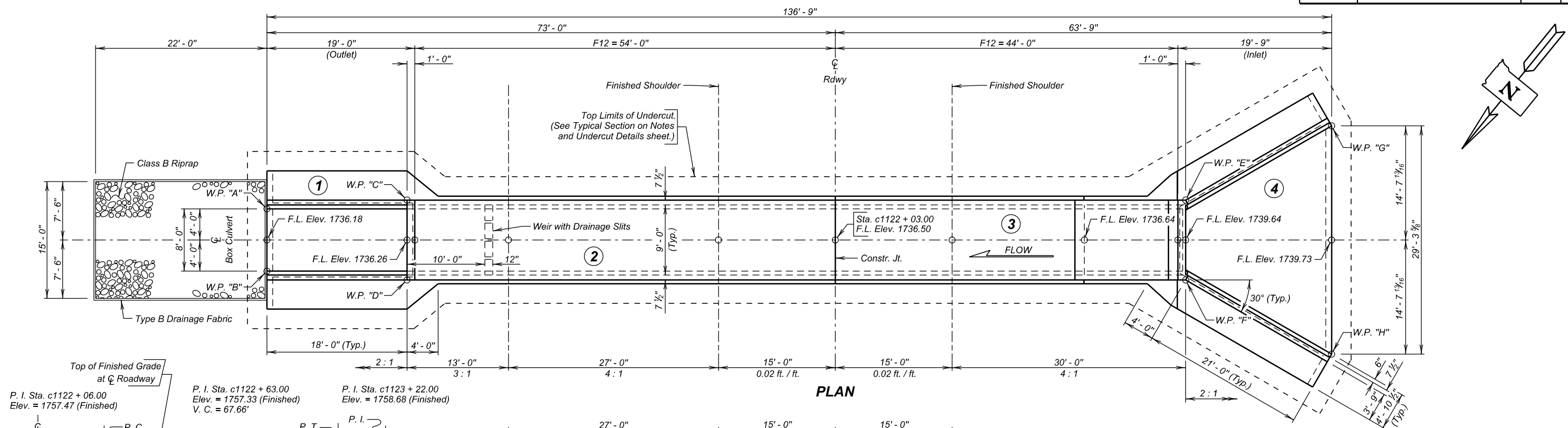
<b>S D D O T</b>	<b>FENCE ANCHORS FOR BOX CULVERT WING WALLS</b>	PLATE NUMBER <b>620.16</b>
		Sheet 1 of 1

Published Date: 2025

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

FOR BIDDING PURPOSES ONLY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E8	E17



**HYDRAULIC DATA**

$Q_d$	273 cfs
$A_d$	19 sq. ft.
$V_d$	14.1 fps
$Q_F$	273 cfs
$Q_{100}$	498 cfs
$Q_{OT}$	> $Q_{100}$ cfs
$V_{max}$	15.8 fps

$Q_d$  = Design discharge for the proposed culvert based on 25 year frequency. El. 1744.3.

$V_d$  = 17.2 fps dissipated to 14.1 fps

$Q_{OT}$  = Overtopping discharge and frequency >  $Q_{100}$  yr. recurrence interval. El. 1757.4 at Sta. c1122 + 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. 1746.6.

$V_{max}$  = Maximum computed outlet velocity for the proposed culvert based on a 100 year frequency. 19.8 fps dissipated to 15.8 fps.

**TABLE OF WORKING POINTS**

W. P.	STATION	OFFSET
"A"	c1122 + 67.00	73.00' Lt.
"B"	c1122 + 59.00	73.00' Lt.
"C"	c1122 + 68.13	55.00' Lt.
"D"	c1122 + 57.87	55.00' Lt.
"E"	c1122 + 68.13	45.00' Rt.
"F"	c1122 + 57.87	45.00' Rt.
"G"	c1122 + 77.65	63.75' Rt.
"H"	c1122 + 48.35	63.75' Rt.

**ESTIMATED QUANTITIES**

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	151.2
Reinforcing Steel	Lb.	22072
Structure Excavation, Box Culvert	Cu. Yd.	63
Box Culvert Undercut	Cu. Yd.	104
Install Dowel in Concrete	Ea.	18
Type B Drainage Fabric	Sq. Yd.	59
Class B Riprap	Ton	47.1

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

**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 - F12 Barrel End Section Details (54' - 0") (A)
- Sheet No. 6 - F12 Barrel End Section Details (54' - 0") (B)
- Sheet No. 7 - F12 Barrel End Section Details (44' - 0") (A)
- Sheet No. 8 - F12 Barrel End Section Details (44' - 0") (B)
- Sheet No. 9 - Details of Standard Plate No's 460.02 and 460.10
- Sheet No. 10 - Details of Standard Plate No. 620.16

**GENERAL DRAWING AND QUANTITIES**

FOR  
**9' X 9' BOX CULVERT**  
 OVER TRIB. TO WATERHOLE CREEK 0° SKEW  
 STA. c1122 + 03.00 SEC. 5-T101N-R72W  
 STR. NO. 43-440-426 P 0047(113)42  
 PCN 05UN HL-93

LYMAN COUNTY  
 S. D. DEPT. OF TRANSPORTATION

FEBRUARY 2021 **1** OF **10**

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

DESIGNED BY CM LYMN05UN	CK. DES. BY BS 05JNGB02	DRAFTED BY BT Steve A. Johnson	BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E9	E17

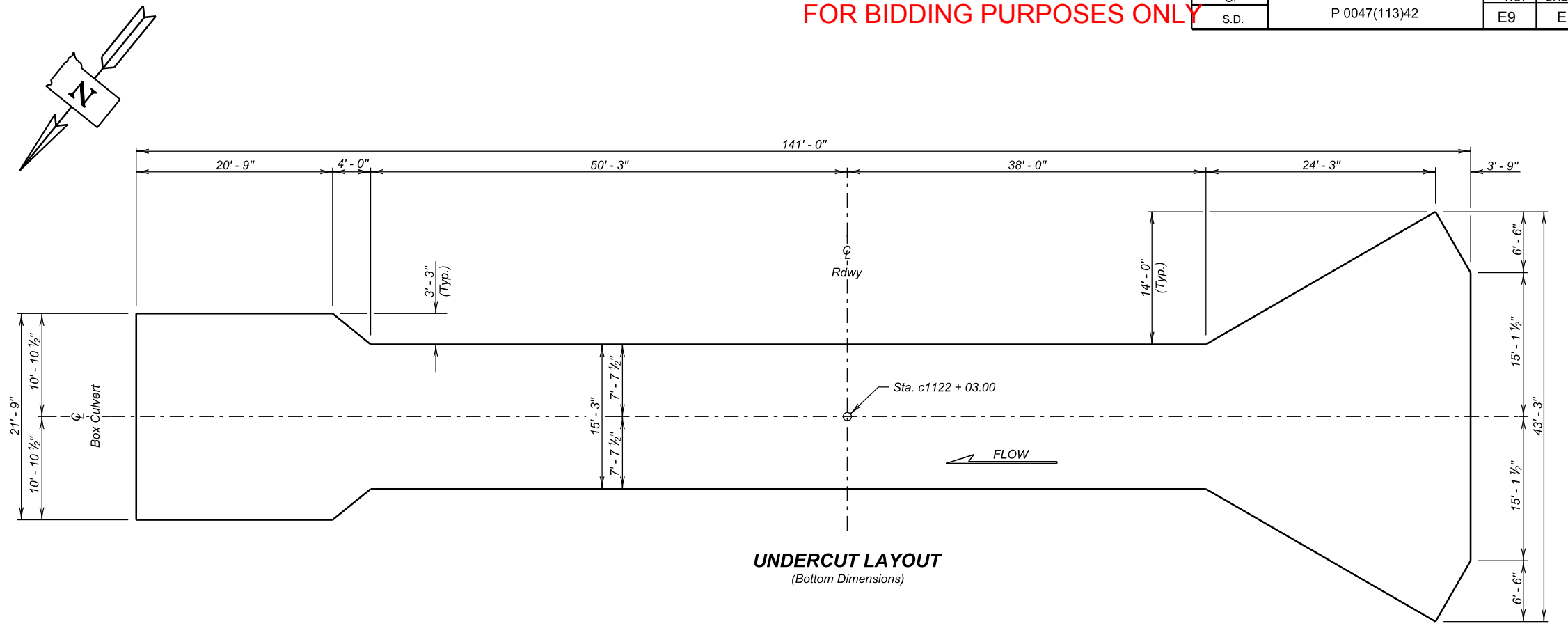
FOR BIDDING PURPOSES ONLY

**SPECIFICATIONS**

- Design Specifications: AASHTO LRFD Bridge Design Specifications, 9th Edition.
- 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.

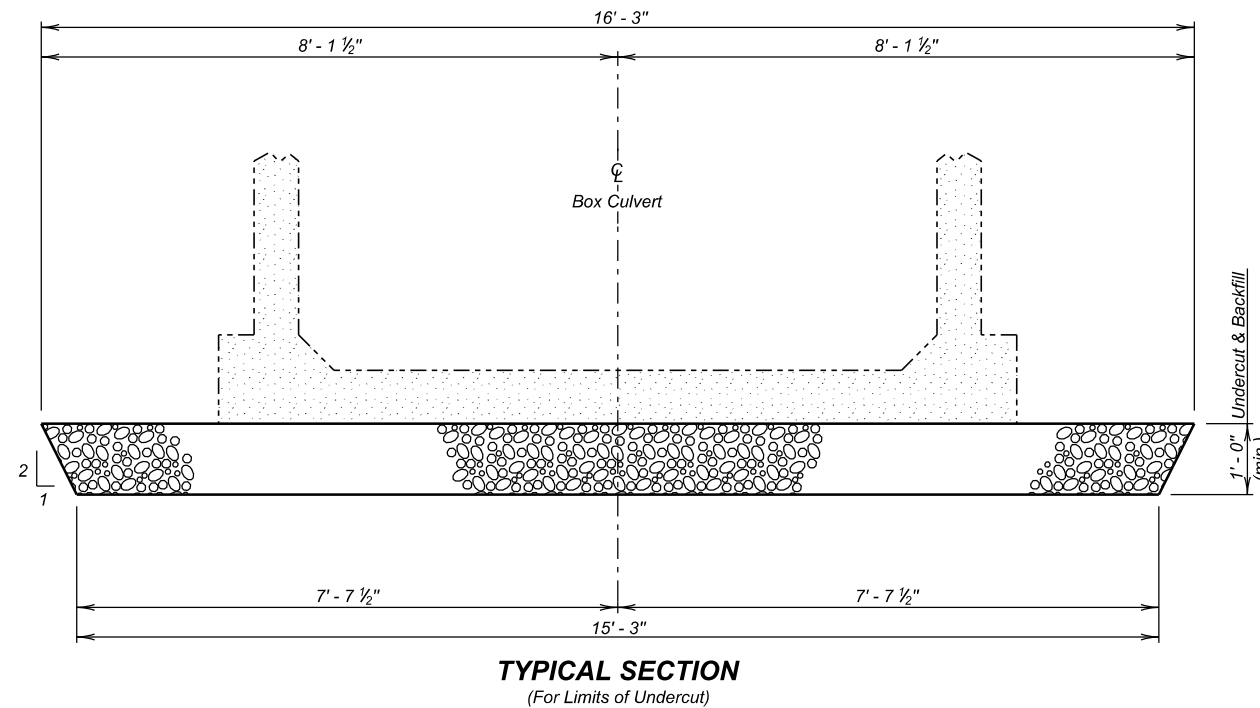
**GENERAL NOTES**

- Design Live Load: HL-93 and construction load consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load shall not be applied until a minimum of 4 ft. of fill has been placed over the Box Culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.
- 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) as required.
- Design Material Strengths: Concrete  $f_c = 4500$  p.s.i.  
Reinforcing Steel  $f_y = 60000$  p.s.i.
- 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.
- All reinforcing steel will conform to ASTM A615 Grade 60.
- All exposed edges will be chamfered  $\frac{3}{4}$  inch.
- Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
- The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
- Care will be taken to establish Working Points (W.P.) as shown on the wings.
- Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
- Cost of Prefomed Expansion Joint Filler used in apron construction will be incidental to the other contract items.
- Soils below the bottom of the proposed RCBC consist of gray silt clay. Groundwater was not encountered in the borings during the subsurface investigation conducted in May 2020 but due to seasonal fluctuations may be present during construction.



**INSTALLING DOWELS IN CONCRETE**

- Holes drilled in the existing concrete will be true and normal or as shown in the plans. Drilling holes using a core drill will not be allowed. Care will be taken not to damage the existing reinforcing steel. The Contractor can still expect to encounter and have to drill through steel or shift dowel spacing as approved by the Engineer to miss the existing reinforcing steel. If the Contractor shifts the dowel spacing, the unused drill holes shall be completely filled with epoxy resin specified in note number 2 under "Installing Dowels in Concrete" as approved by the Engineer.
- The epoxy resin mixture will be of a type for bonding steel to hardened concrete and shall conform to AASHTO M235 Type IV, Grade 3 (Equivalent to ASTM C881, Type IV, Grade 3). Grade 1, 2 or 3 may be used for vertical dowels and Grade 3 epoxy will be used for all horizontal dowels.
- The diameter of the drilled holes will not be less than  $\frac{1}{8}$  greater, nor more than  $\frac{3}{8}$  inch greater than the diameter of the dowels, or as per the 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 ensure that all debris or loose material has been removed prior to epoxy injection.
- Mix epoxy resin as recommended by the Manufacturer and apply by an injection method as approved by the Engineer. Beginning at the back of the drilled holes, fill the holes  $\frac{1}{2}$  to  $\frac{1}{2}$  full of epoxy, or as recommended by the Manufacturer, prior to insertion of the steel bar. Care will be taken to prevent epoxy from running out of the horizontal holes prior to steel bar insertion. Rotate the steel rod during installation to eliminate voids and ensure complete bonding of the bar. Insertion of the rods by the dipping or painting methods will not be allowed.
- No loads will be applied to the epoxy grouted bars until the epoxy resin has had sufficient time to cure as specified by the epoxy resin manufacturer.
- Embed c11 and a12 bars 5" into existing concrete.
- The a12 and c11 bars shall be #4 deformed bars conforming to ASTM A615 Grade 60.
- The cost of drilling holes, epoxy resin, bars, installation, and other incidental items will be included in the contract unit price per each for Install Dowel in Concrete.



ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Box Culvert Undercut	Cu. Yd.	104

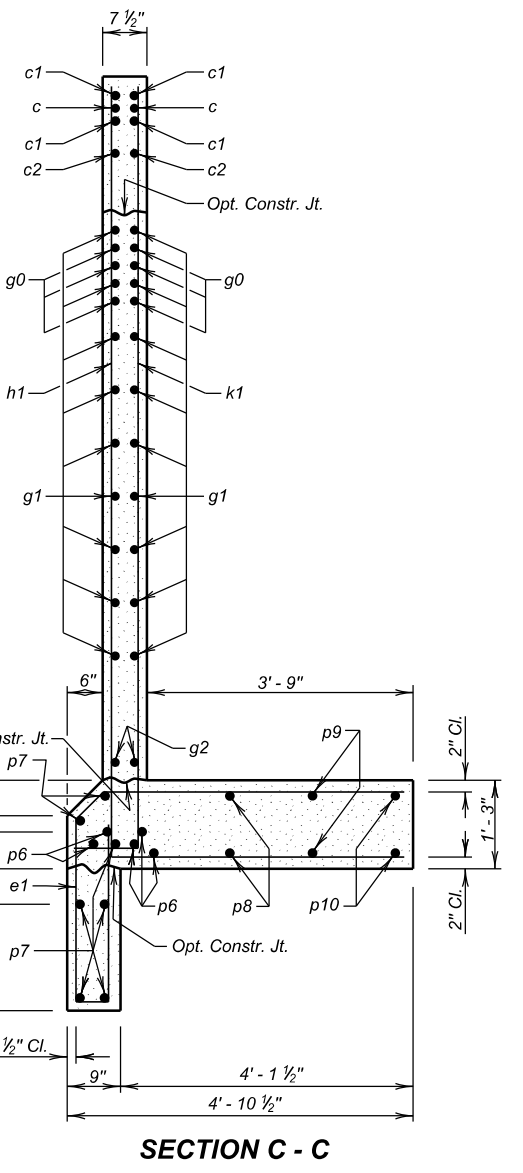
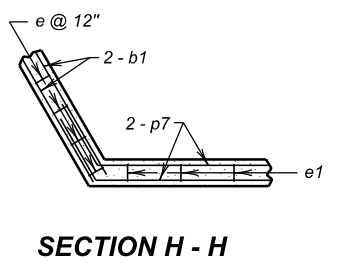
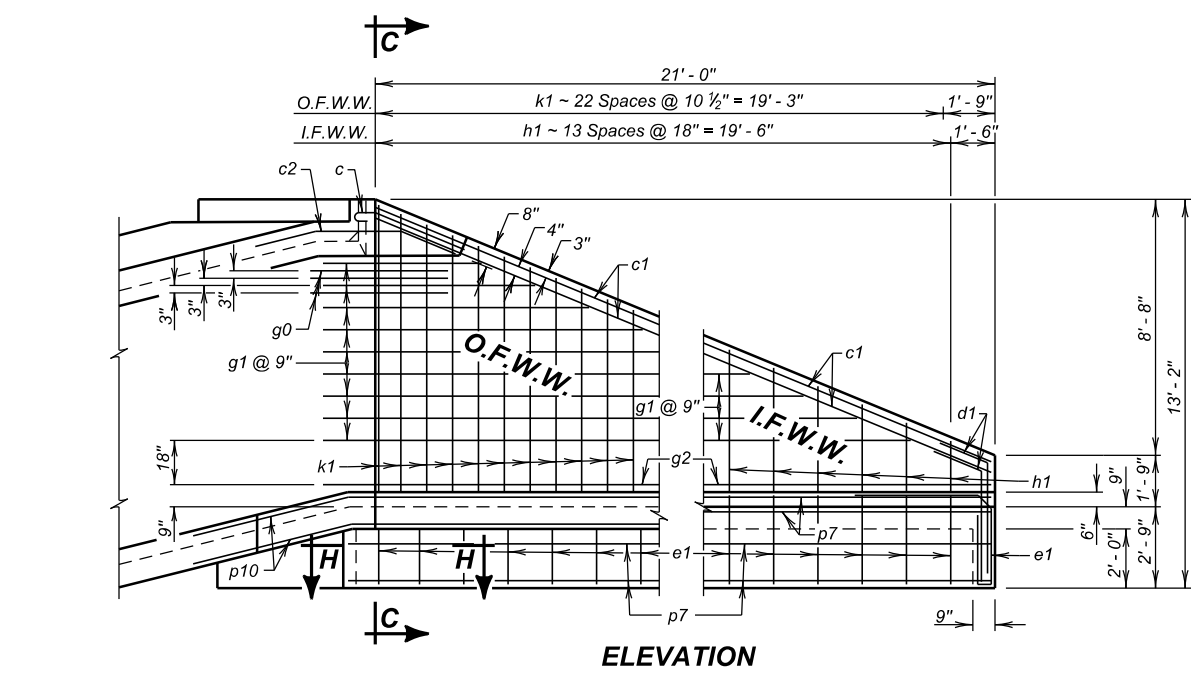
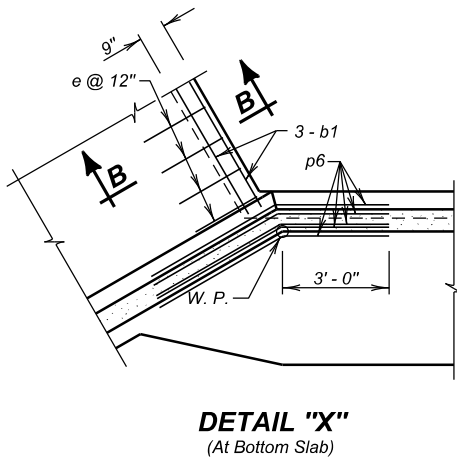
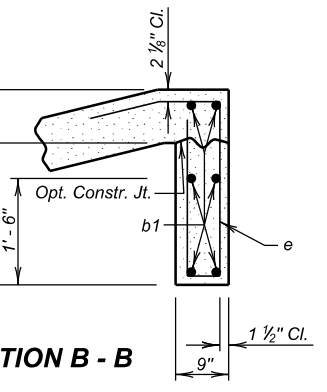
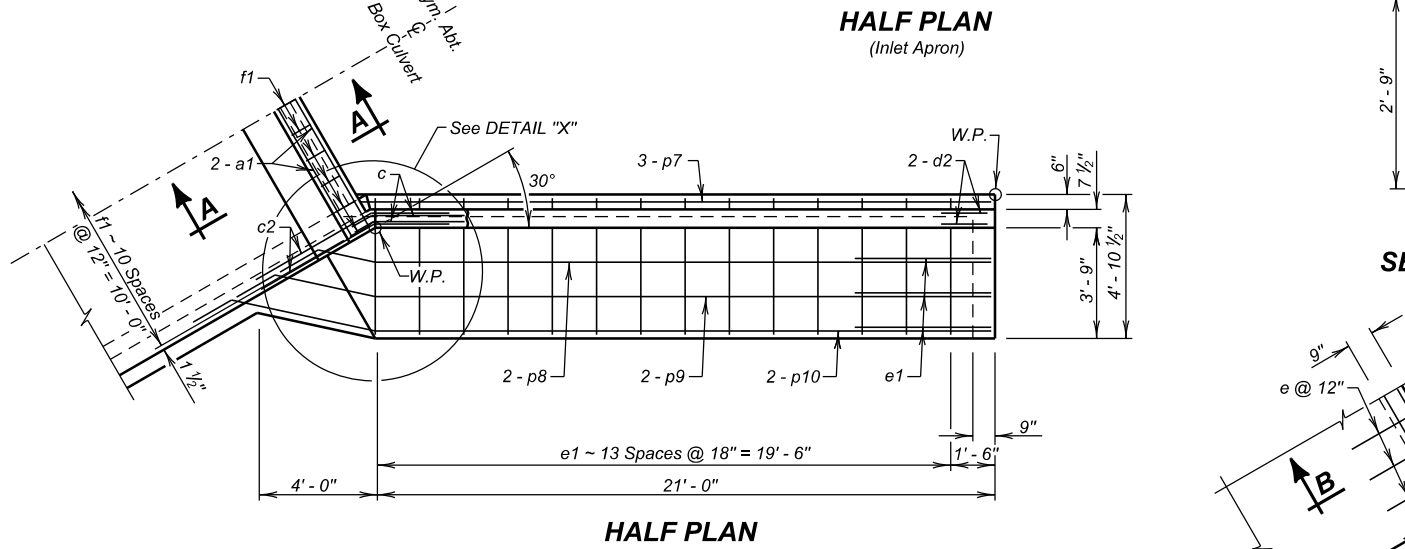
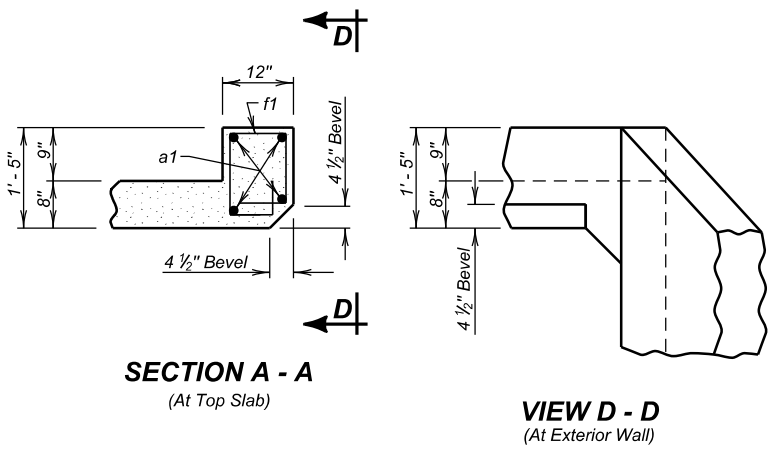
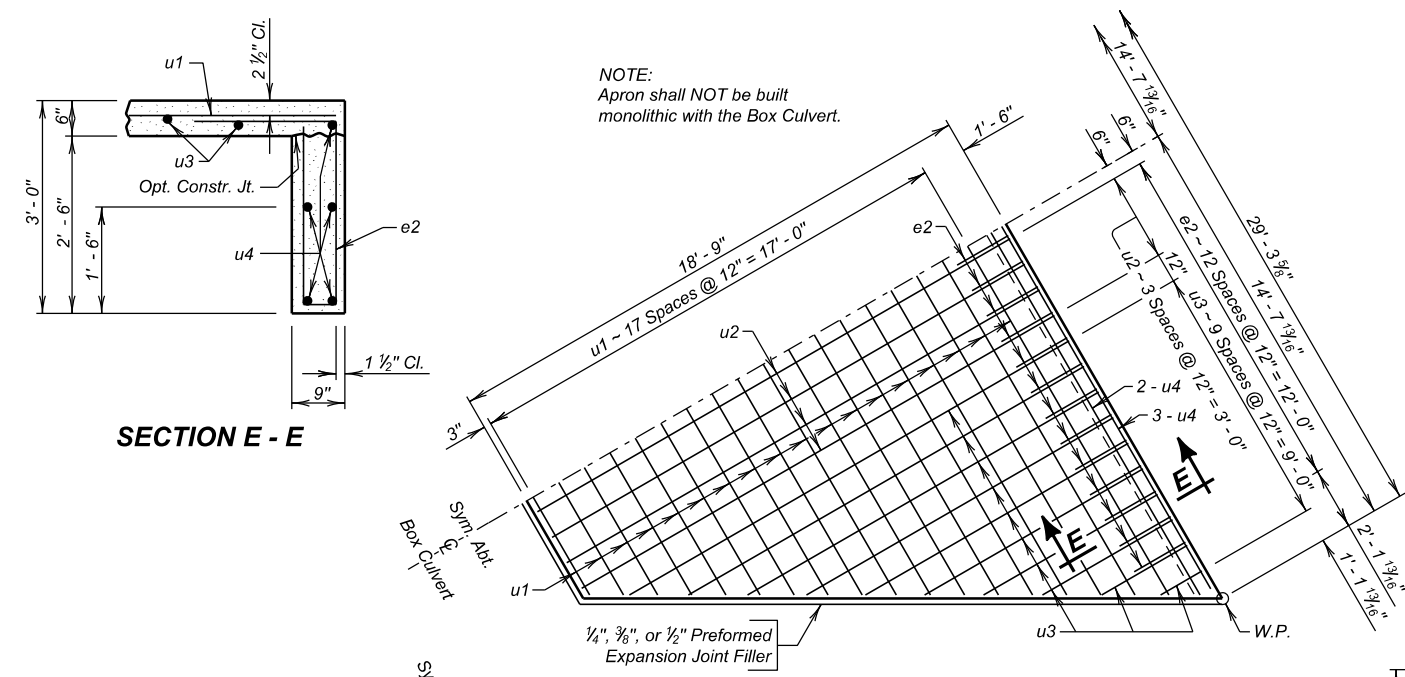
For payment, quantity is based on plan shown undercut dimensions and will not be measured unless the Engineer orders a change.

**NOTES AND UNDERCUT DETAILS**  
FOR  
**9' X 9' BOX CULVERT**  
OVER TRIB. TO WATERHOLE CREEK 0° SKEW  
STA. c1122 + 03.00 SEC. 5-T101N-R72W  
STR. NO. 43-440-426 P 0047(113)42  
HL-93

LYMAN COUNTY  
S. D. DEPT. OF TRANSPORTATION  
FEBRUARY 2021

DESIGNED BY CM LYMN05JUN	CK. DES. BY BS 05JUN02	DRAFTED BY BT	Steve A. Johnson BRIDGE ENGINEER
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FOR BIDDING PURPOSES ONLY



**LEGEND FOR PLACING RE-STEEL**

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

**REINFORCING SCHEDULE**

Mk.	No.	Size	Length	Type
a1	4	6	10'-0"	Str.
b1	6	6	8'-3"	Str.
c	4	5	4'-6"	1A
c1	8	5	22'-6"	Str.
c2	4	5	7'-0"	19B
d1	8	5	5'-6"	19B
e	10	4	7'-0"	12
e1	34	4	10'-0"	S12A
f1	11	4	5'-0"	S6A
g0	12	5	5'-0"	19B
g1	18	4	27'-3"	19B
g2	4	4	22'-9"	19B
h1	14	4	22'-0"	17A
k1	23	4	15'-9"	17A
p6	10	6	7'-0"	Str.
p7	14	4	20'-6"	Str.
p8	4	4	24'-6"	Str.
p9	4	4	25'-9"	Str.
p10	4	4	27'-6"	Str.

**BENDING DETAILS**

**INLET APRON**

Mk.	No.	Size	Length	Type
e2	26	4	7'-3"	S12
u1	9	4	35'-0"	Str.
u2	8	4	18'-3"	Str.
u3	9	4	20'-3"	Str.
u4	5	4	28'-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.
Inlet	20.9	2130	10.5
Inlet Apron	8.4	651	8.4

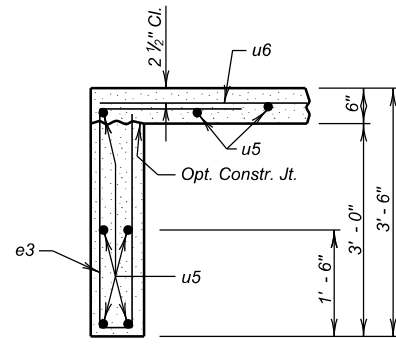
**INLET DETAILS FOR 9' X 9' BOX CULVERT**

OVER TRIB. TO WATERHOLE CREEK 0° SKEW  
 STA. c1122 + 03.00 SEC. 5-T101N-R72W  
 STR. NO. 43-440-426 P 0047(113)42 HL-93

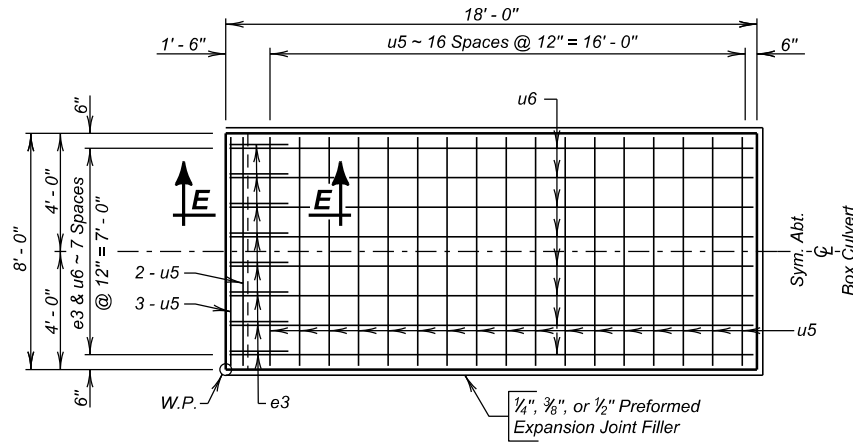
LYMAN COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 FEBRUARY 2021

**FOR BIDDING PURPOSES ONLY**

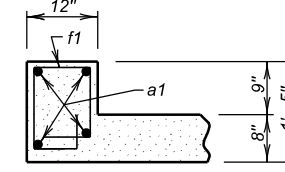
NOTE:  
Apron shall NOT be built monolithic with the Box Culvert.



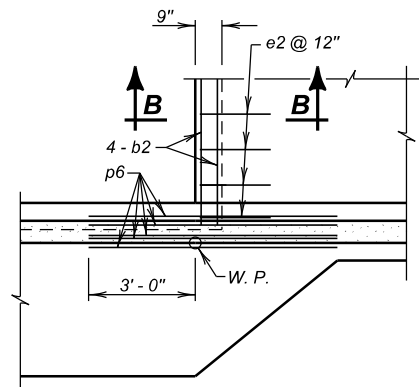
**SECTION E - E**



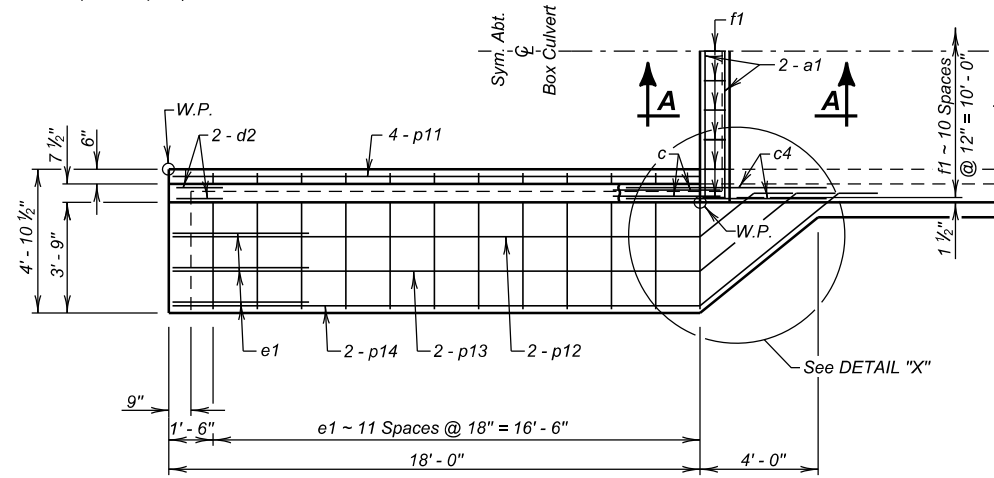
**PLAN**  
(Outlet Apron)



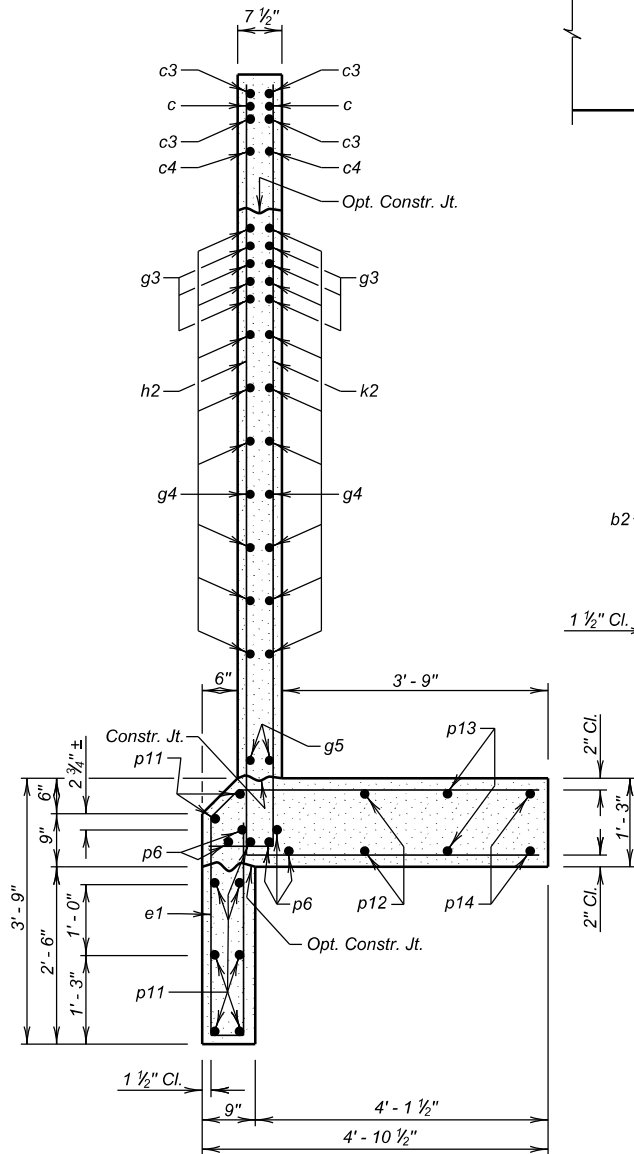
**SECTION A - A**  
(At Top Slab)



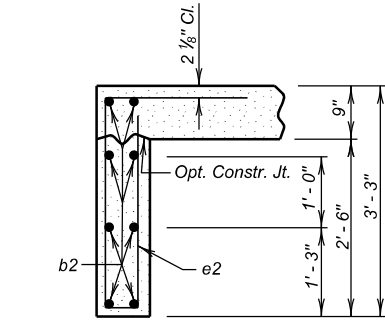
**DETAIL "X"**  
(At Bottom Slab)



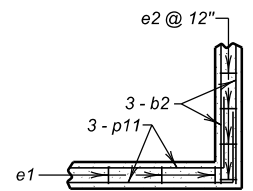
**HALF PLAN**



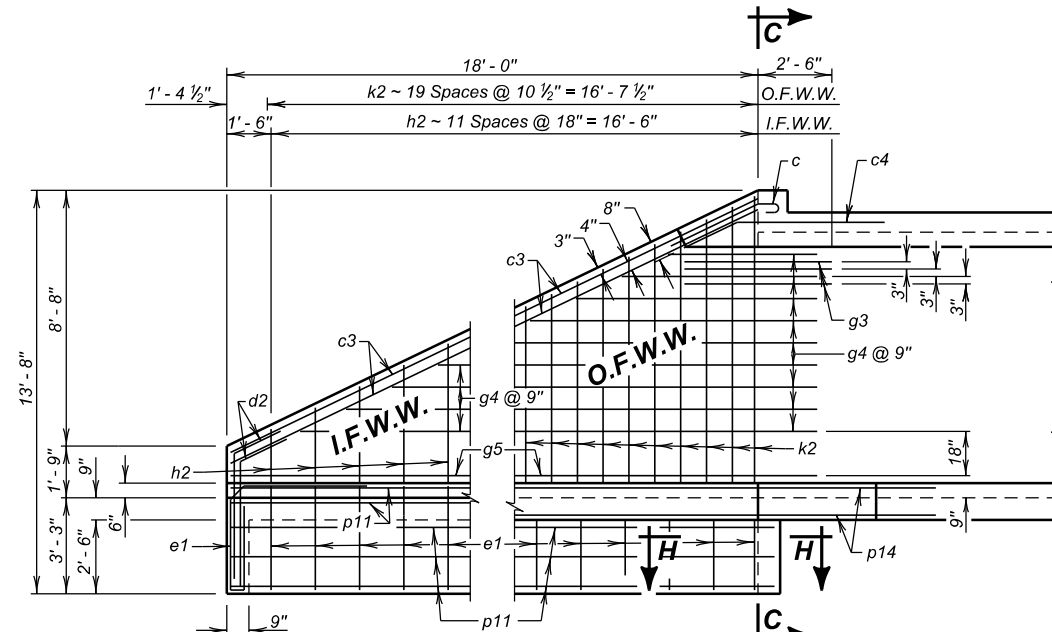
**SECTION C - C**



**SECTION B - B**



**SECTION H - H**



**ELEVATION**

**LEGEND FOR PLACING RE-STEEL**

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

**REINFORCING SCHEDULE**

Mk.	No.	Size	Length	Type	Bending Details	
a1	4	6	10'-0"	Str.	Type S12	
b2	8	6	9'-3"	Str.	Type S12A	
c	4	5	4'-6"	1A	Type 1A	
c3	8	5	19'-9"	Str.	Type 19B	
c4	4	5	7'-0"	19B	Type 19B	
d2	8	5	5'-6"	19B	Type 19B	
e1	30	4	11'-0"	S12A	Type S12A	
e2	10	4	8'-0"	S12	Type S12	
f1	11	4	5'-0"	S6A	Type S6A	
g3	12	5	5'-0"	Str.	Type 1A	
g4	18	4	23'-3"	Str.	Type 19B	
g5	4	4	19'-9"	Str.	Type 19B	
h2	12	4	22'-0"	17A	Type 17A	
k2	20	4	15'-6"	17A	Type 17A	
p6	10	6	7'-0"	Str.	Type 19B	
p11	18	4	20'-6"	Str.	Type 19B	
p12	4	4	21'-6"	Str.	Type 19B	
p13	4	4	23'-6"	Str.	Type 19B	
p14	4	4	25'-6"	Str.	Type 19B	

**OUTLET APRON**

Mk.	No.	Size	Length	Type
e3	8	4	8'-3"	S12
u5	22	4	7'-9"	Str.
u6	8	4	17'-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	18.9	2059	10.0
Outlet Apron	3.2	252	3.2

**OUTLET DETAILS**

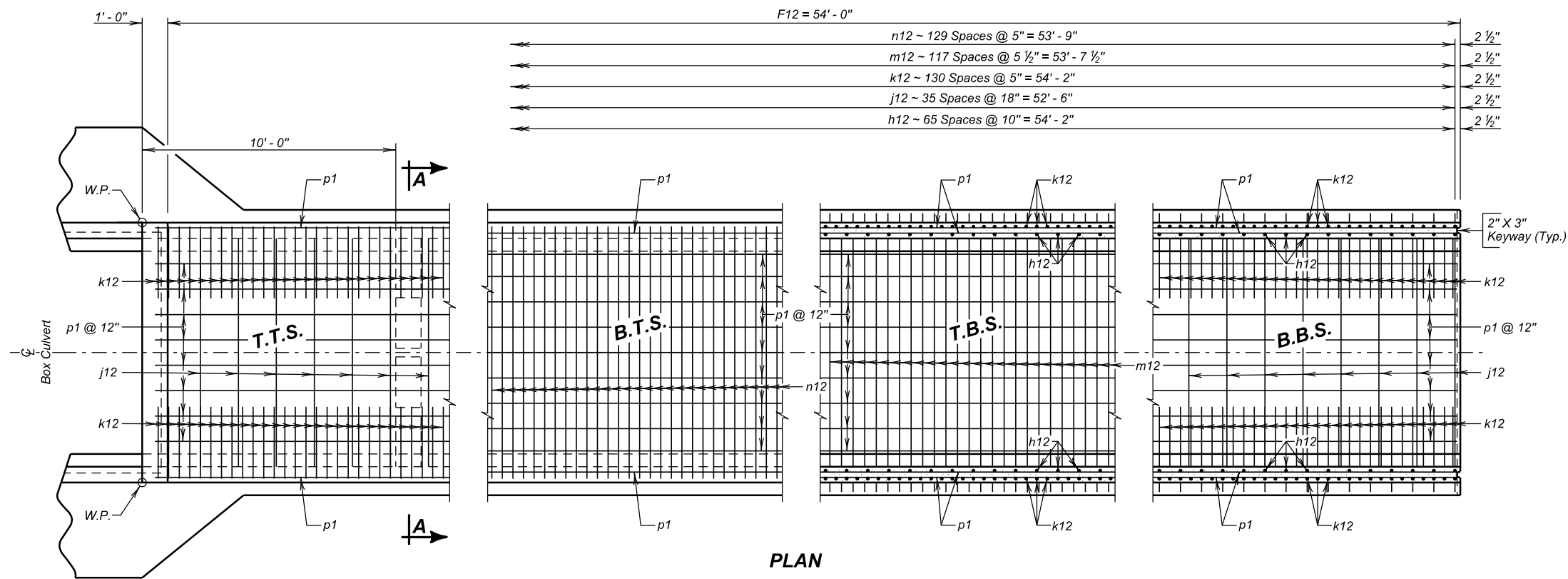
FOR  
**9' X 9' BOX CULVERT**  
OVER TRIB. TO WATERHOLE CREEK  
STA. c1122 + 03.00  
STR. NO. 43-440-426  
0° SKEW  
SEC. 5-T101N-R72W  
P 0047(113)42  
HL-93

LYMAN COUNTY  
S. D. DEPT. OF TRANSPORTATION

FEBRUARY 2021

FOR BIDDING PURPOSES ONLY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E12	E17



**REINFORCING SCHEDULE**  
(For One F12 Barrel End Section @ 54' - 0")

Mk.	No.	Size	Length	Type	Bending Details
a11	16	4	1'-9"	Str.	
a12	2	4	1'-6"	Str.	
c11	16	4	2'-3"	17A	
h12	132	4	11'-0"	17A	
j12	72	4	9'-0"	Str.	
k12	262	4	15'-9"	17	
m12	118	5	11'-0"	Str.	
n12	130	5	10'-0"	Str.	
p1	66	4	54'-6"	Str.	
z1	30	5	3'-6"	Str.	

**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.

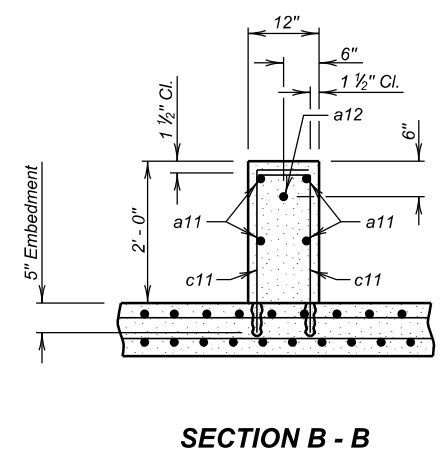
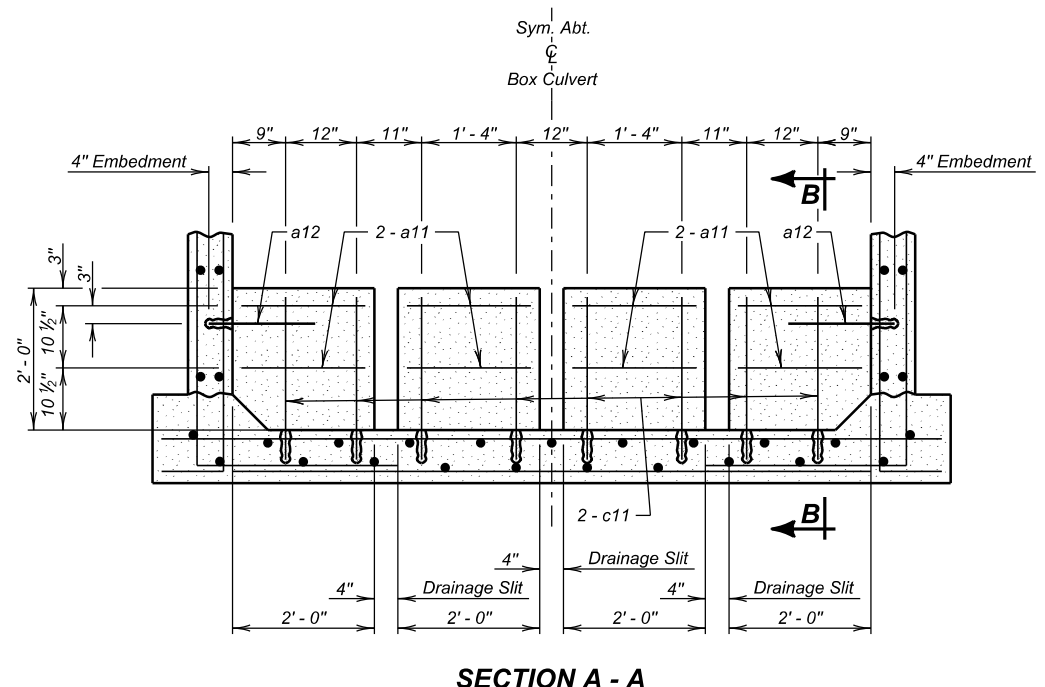
**NOTES:**  
All dimensions are out to out of bars.  
Request for additional reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.  
Quantity of a11, a12 and c11 bars are not included in reinforcing steel. See notes on NOTES AND UNDERCUT DETAILS sheet.

**ESTIMATED QUANTITIES**

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert	Install Dowel in Concrete
UNIT	Cu.Yd.	Lb.	Cu.Yd.	Ea.
1 - F12 Barrel End Section @ 54' - 0"	55.0	9381	16.9	18

**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



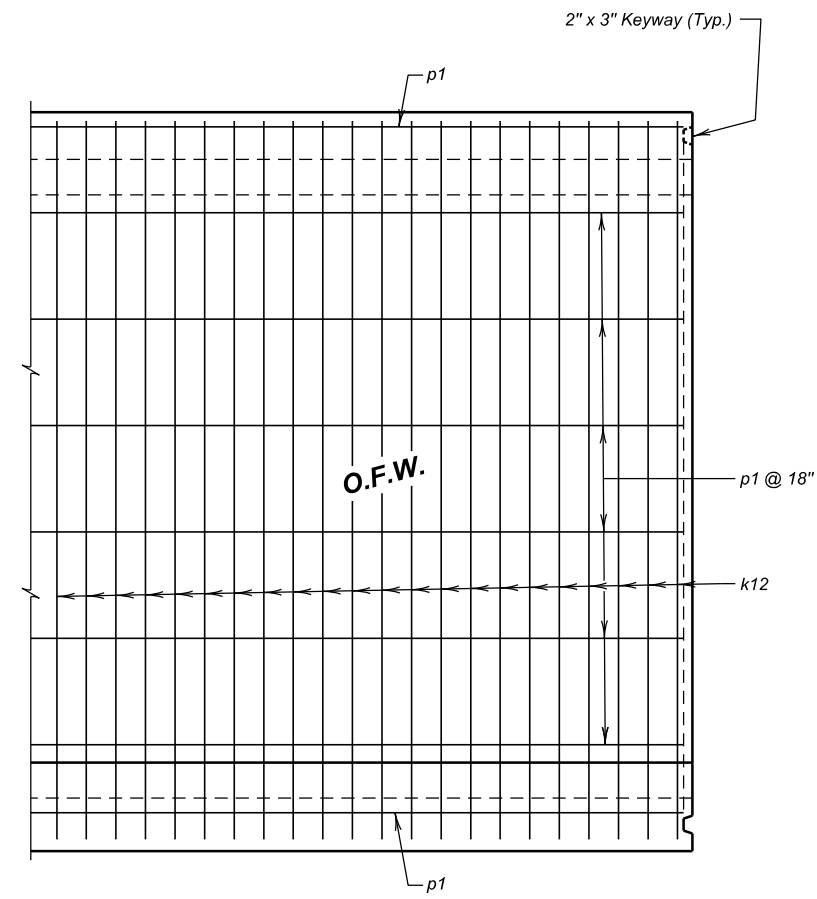
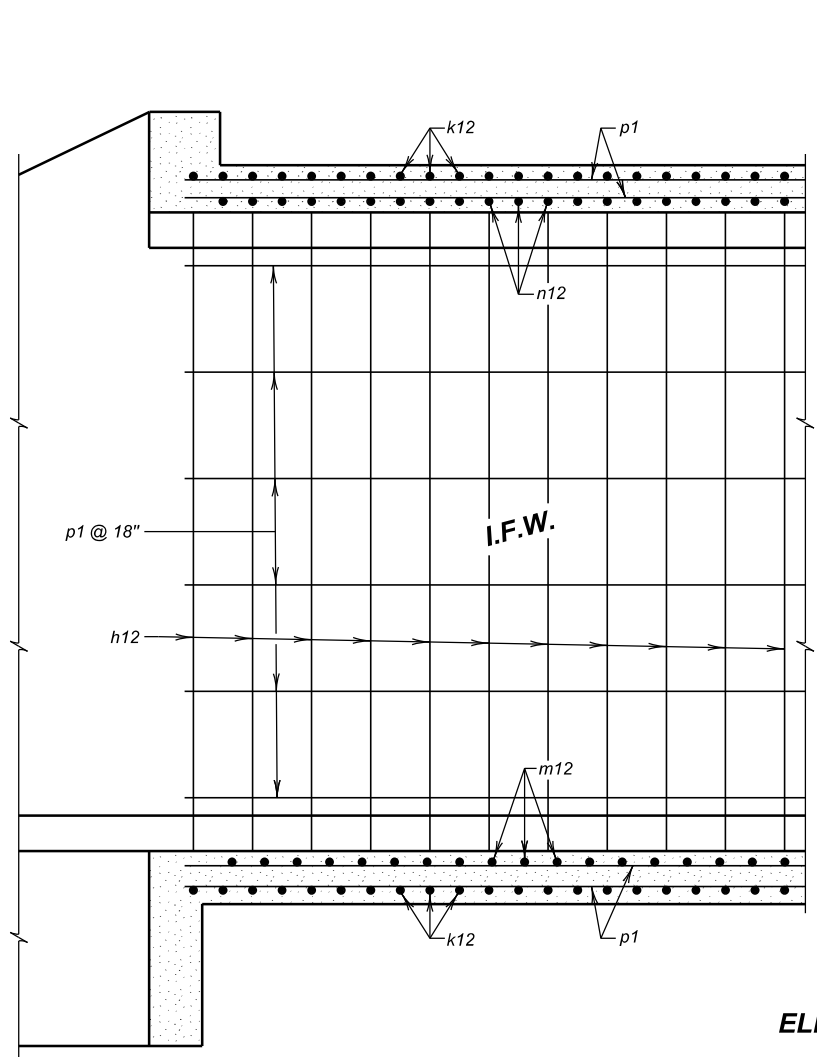
**F12 BARREL END SECTION DETAILS (54' - 0") (A)**  
FOR  
**9' X 9' BOX CULVERT**  
OVER TRIB. TO WATERHOLE CREEK 0° SKEW  
STA. c1122 + 03.00 SEC. 5-T101N-R72W  
STR. NO. 43-440-426 P 0047(113)42  
HL-93

LYMAN COUNTY  
S. D. DEPT. OF TRANSPORTATION  
FEBRUARY 2021

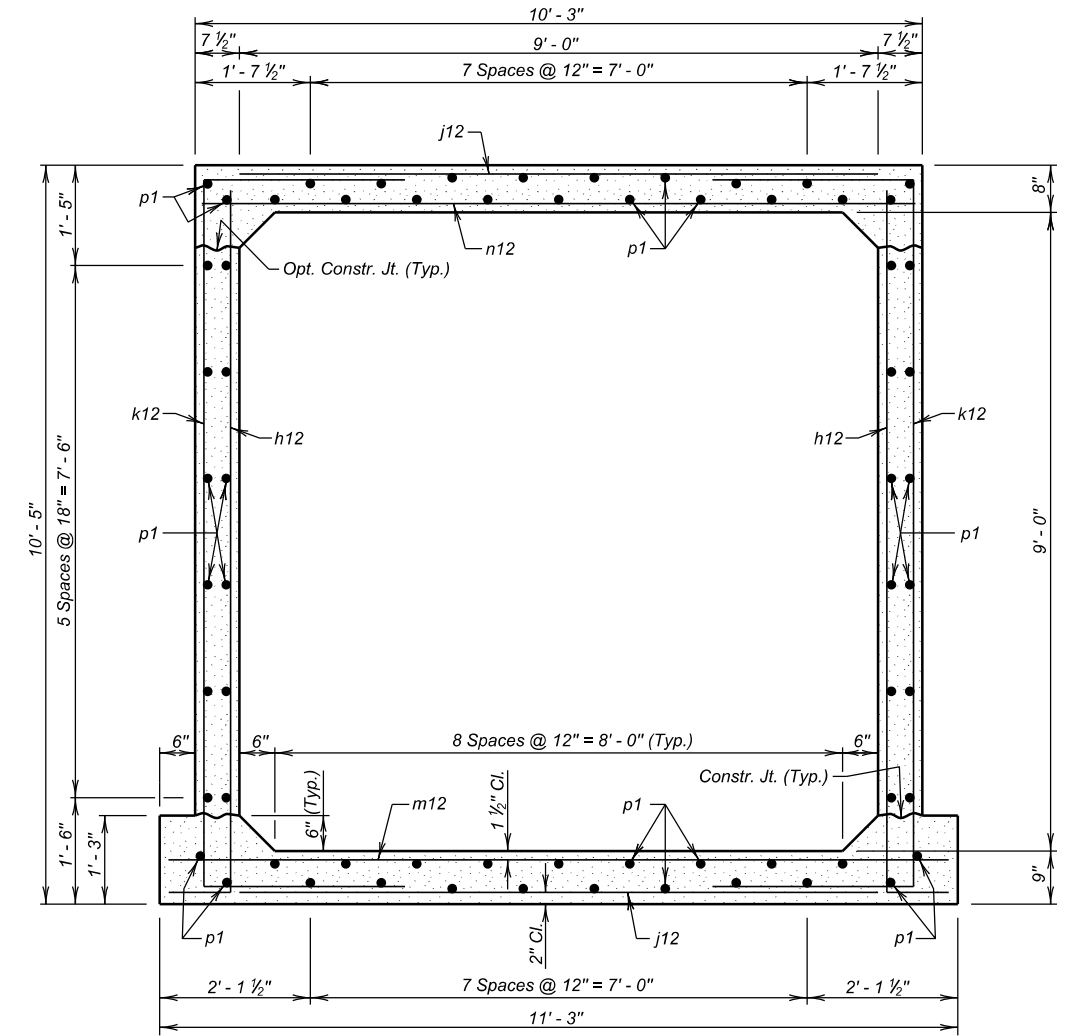
DESIGNED BY CM LYMN05UN	CK. DES. BY BS 05UNGB05	DRAFTED BY BT	 BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E13	E17

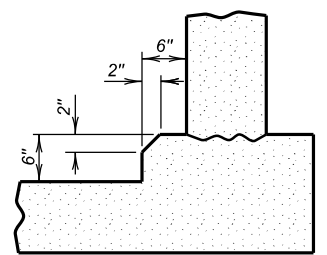


ELEVATION



F12 BARREL SECTION  
(12' - 0" Maximum Fill)

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



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 END SECTION DETAILS (54' - 0") (B)

FOR  
9' X 9' BOX CULVERT  
OVER TRIB. TO WATERHOLE CREEK 0° SKEW  
STA. c1122 + 03.00 SEC. 5-T101N-R72W  
STR. NO. 43-440-426 P 0047(113)42  
HL-93

LYMAN COUNTY  
S. D. DEPT. OF TRANSPORTATION  
FEBRUARY 2021

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FOR BIDDING PURPOSES ONLY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E14	E17

### REINFORCING SCHEDULE

(For One F12 Barrel End Section @ 44' - 0")

Mk.	No.	Size	Length	Type
h12	80	4	11' - 0"	17A
h13	28	4	11' - 3"	17A
j12	60	4	9' - 0"	Str.
k12	152	4	15' - 9"	17
k13	2	4	15' - 9"	17
k14	4	4	16' - 0"	17
k15	2	4	16' - 0"	17
k16	52	4	16' - 3"	17
k17	2	4	16' - 0"	17
m12	97	5	11' - 0"	Str.
n12	105	5	10' - 0"	Str.
p2	10	4	44' - 6"	19
p3	11	4	44' - 6"	19
p4	11	4	44' - 6"	19
p5	10	4	44' - 6"	19
p15	4	4	44' - 6"	19
p16	4	4	44' - 6"	19
p17	4	4	44' - 6"	19
p18	4	4	44' - 6"	19
p19	4	4	44' - 6"	19
p20	4	4	44' - 6"	19

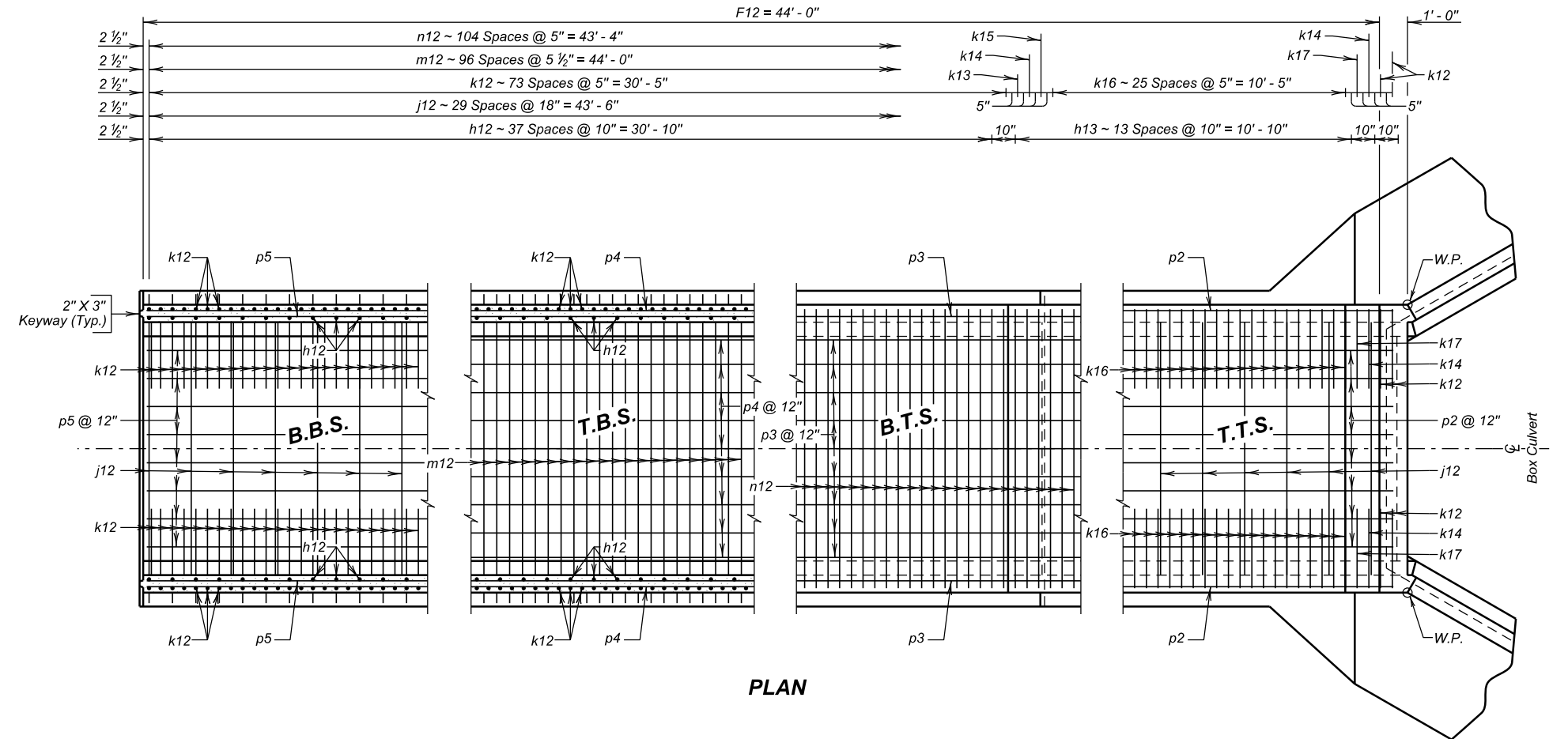
**Bending Details**

**Type 17**

**Type 19**

**Type 17A**

**NOTES:**  
 All dimension are from outside to outside.  
 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.

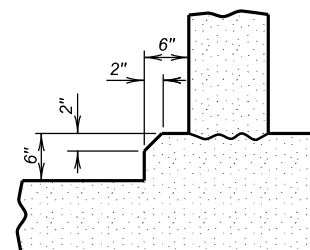


### ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu.Yd.	Lb.	Cu.Yd.
1 - F12 Barrel End Section @ 44' - 0"	44.8	7599	13.8

### 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



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 END SECTION DETAILS (44' - 0") (A)

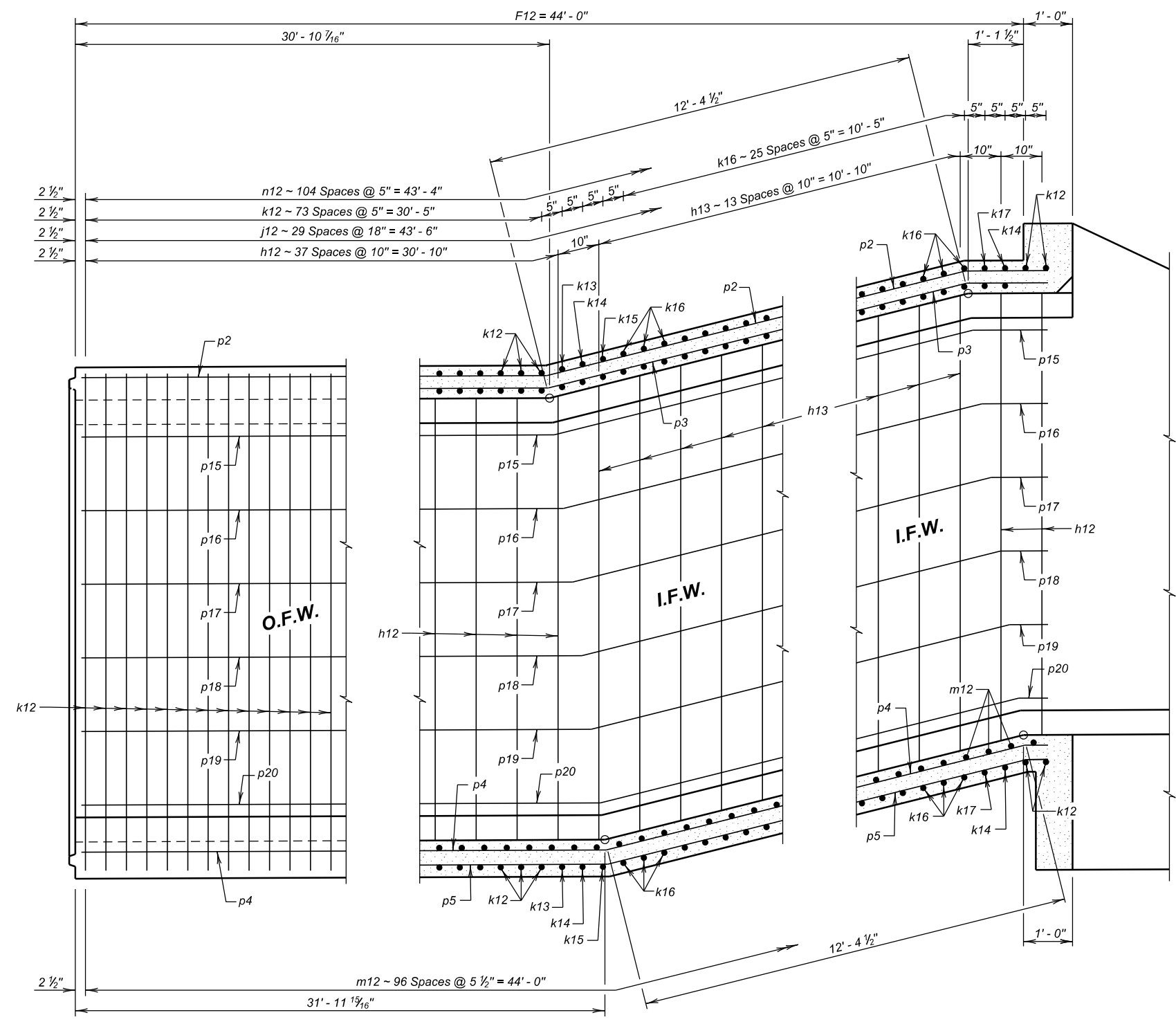
FOR  
**9' X 9' BOX CULVERT**  
 OVER TRIB. TO WATERHOLE CREEK 0° SKEW  
 STA. c1122 + 03.00 SEC. 5-T101N-R72W  
 STR. NO. 43-440-426 P 0047(113)42  
 HL-93

LYMAN COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 FEBRUARY 2021

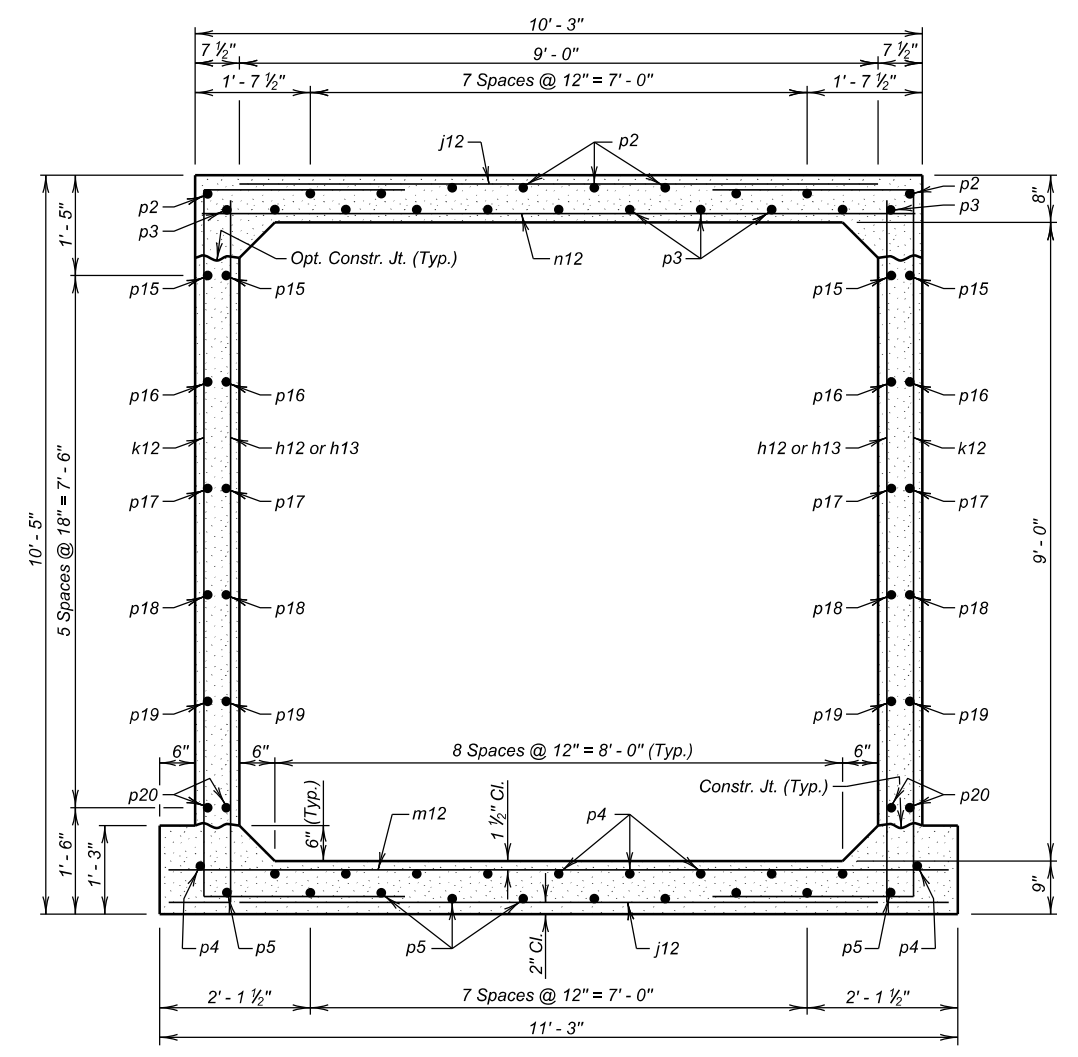
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E15	E17

FOR BIDDING PURPOSES ONLY



ELEVATION



F12 BARREL SECTION  
(12'-0" Maximum Fill)

F12 BARREL END SECTION DETAILS (44' - 0") (B)

FOR  
**9' X 9' BOX CULVERT**  
 OVER TRIB. TO WATERHOLE CREEK 0° SKEW  
 STA. c1122 + 03.00 SEC. 5-T101N-R72W  
 STR. NO. 43-440-426 P 0047(113)42  
 HL-93

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

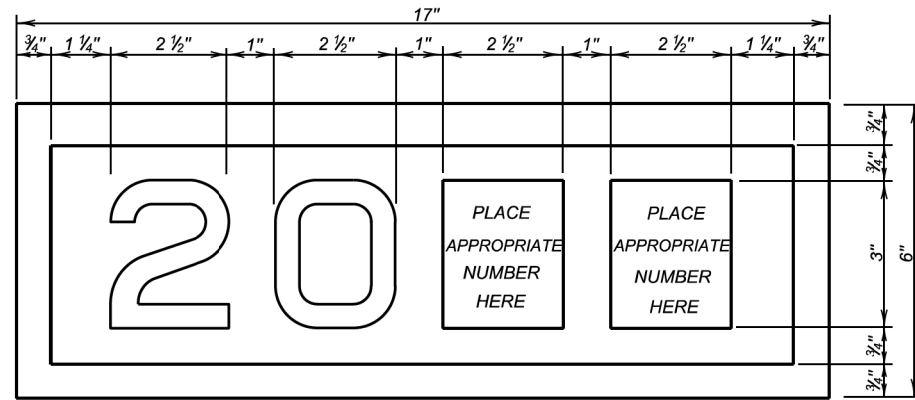
LYMAN COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 FEBRUARY 2021

DESIGNED BY  
 CM  
 LYMN05JUN

CK. DES. BY  
 BS  
 05JUNGB08

DRAFTED BY  
 BT

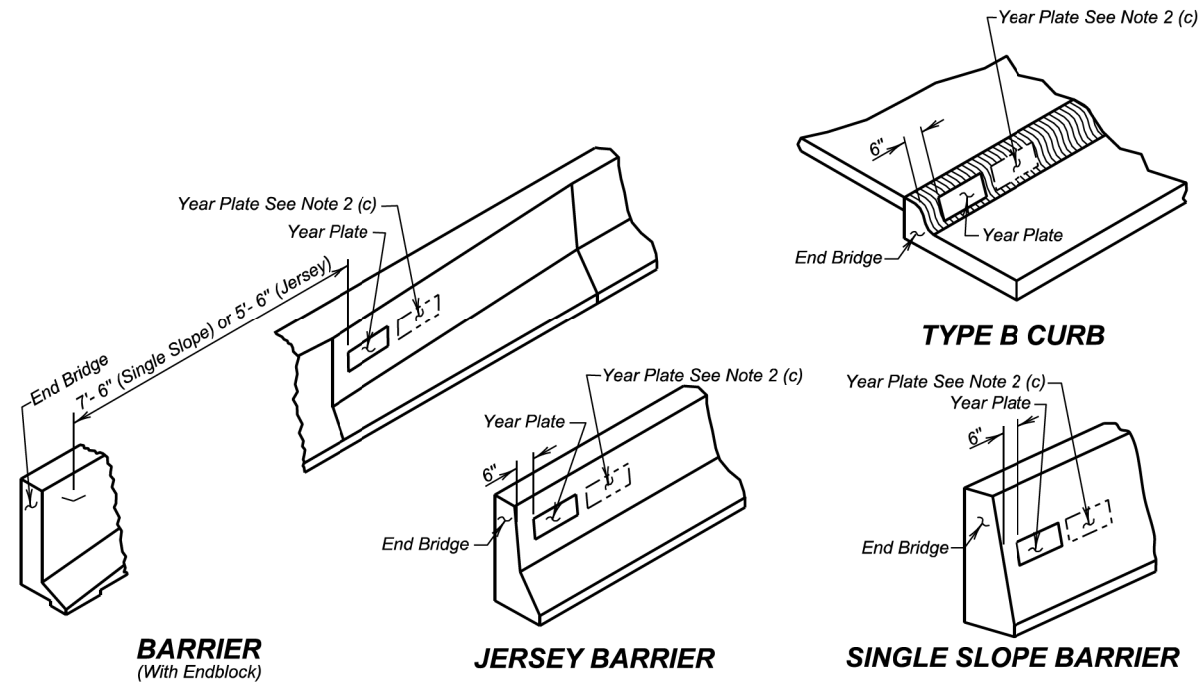
Steve A. Johnson  
 BRIDGE ENGINEER



YEAR PLATE DETAILS

**GENERAL NOTES:**

- Year plates of the general dimensions shown will be constructed on all box culverts and bridges. The year plates will be constructed in reverse and attached to the forms in such a manner that the finished imprint in the concrete does not exceed one-half (1/2) inch in depth.
- Year plates will be located on structure(s) as follows:
  - On cast-in-place box culverts the year plates will be four and one-half (4 1/2) inches below the top of the upstream parapet wall and centered laterally on the upstream face. On precast box culverts the year plate will be centered laterally on the upstream face of the top slab. Where an extended interior wall interferes with this location, the year plate will be centered in an adjacent barrel.
  - On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with barrier endblocks, the year plate will be centered on the upper sloped portion of the barrier approximately 5'-6" for "Jersey" shaped barriers from the end of the bridge and 7'-6" for "Single Slope" shaped barriers from the end of bridge, or as designated by the Engineer. There will be one year plate at each end of the bridge on opposite sides.
  - When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.
- There will be no separate measurement or payment made for year plates on box culverts and bridges. All costs for this work will be incidental to other contract items.



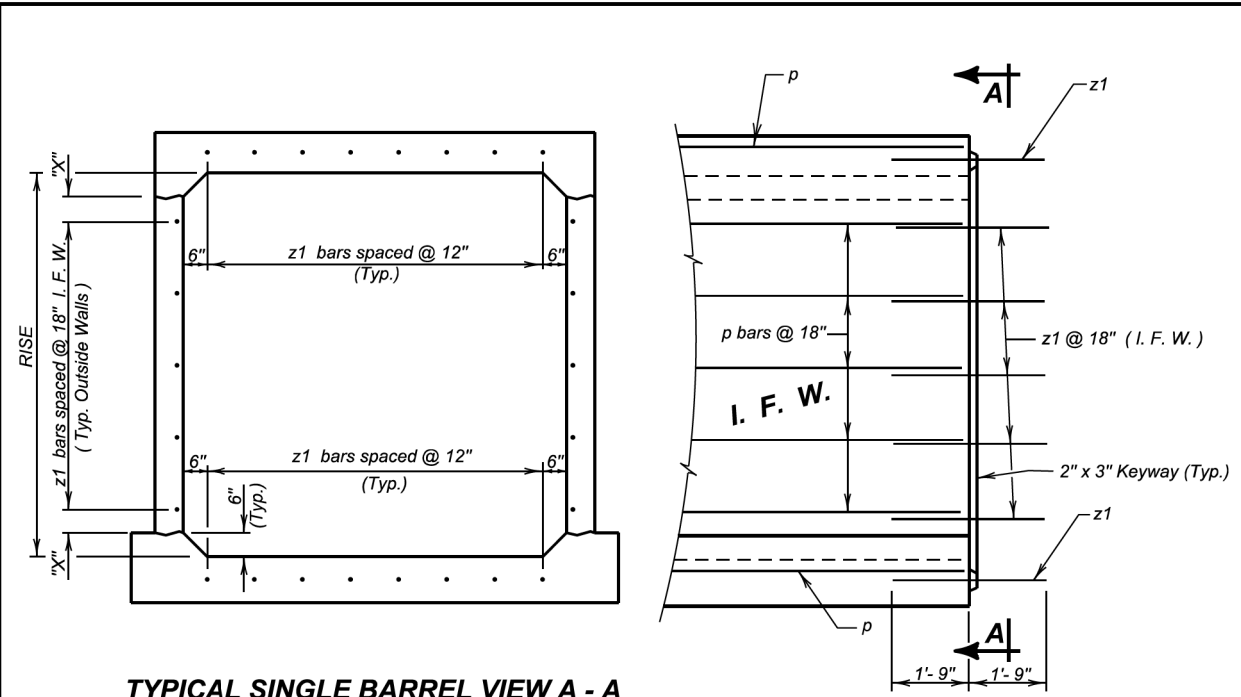
**BARRIER**  
(With Endblock)

**JERSEY BARRIER**

**SINGLE SLOPE BARRIER**

January 22, 2021

<b>S D D O T</b>	<b>YEAR PLATE DETAILS</b>	PLATE NUMBER 460.02
	Published Date: 2025	Sheet 1 of 1



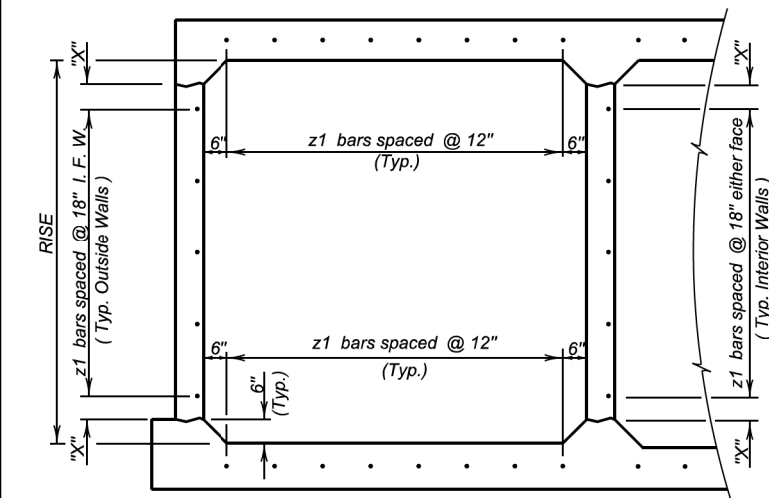
TYPICAL SINGLE BARREL VIEW A - A

ELEVATION

**LEGEND FOR PLACING RE-STEEL**

I. F. W. - Inside Face Wall

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



TYPICAL MULTIPLE BARREL VIEW A - A

**GENERAL NOTES:**

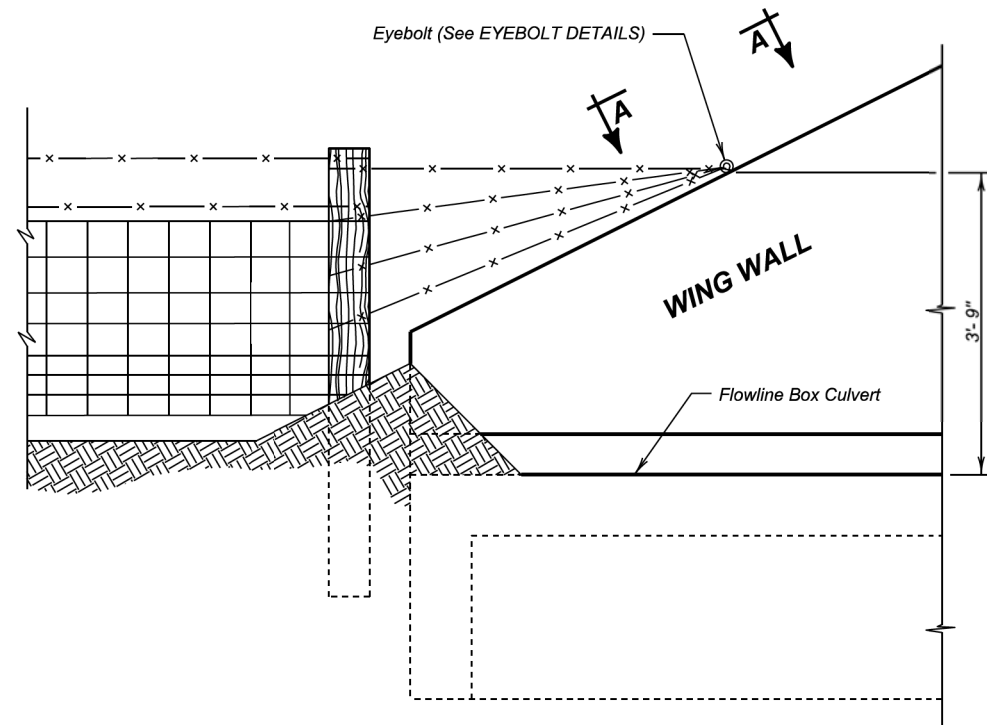
- z1 bars will be placed in the middle of the 2" X 3" keyway in the top and bottom slabs. z1 bars will be lapped with the longitudinal p bars in the inside face of the wall for outside walls and in either face for interior walls. z1 bars are listed and included elsewhere in plans.
- Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

<b>S D D O T</b>	<b>BOX CULVERT BARREL TIE REINFORCEMENT</b>	PLATE NUMBER 460.10
	Published Date: 2025	Sheet 1 of 1



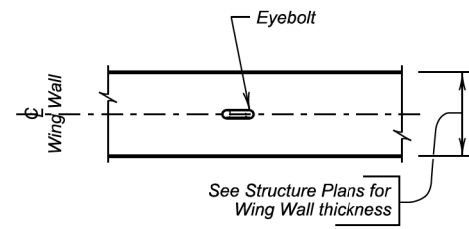
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0047(113)42	E17	E17



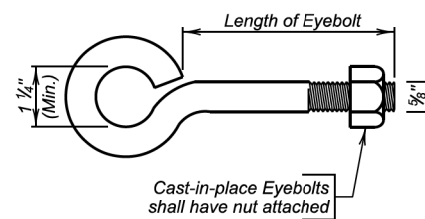
**DETAIL FOR FENCE ANCHORS**

**GENERAL NOTES:**

1. The fence and post details shown are for illustrative purpose only. The fence shall be as specified elsewhere in the plans.
2. Eyebolts shall be placed on all of the box culvert wing walls.
3. Eyebolts shall be 5/8 inch diameter and shall conform to ASTM A307.
4. Eyebolts, nuts, and concrete inserts shall be galvanized in accordance with AASHTO M232 (ASTM A153). Concrete inserts of corrosion resistant material need not be galvanized.
5. Cast-in-place eyebolts shall have a nut attached, be 4 1/2 inches (Min.) in length and shall be embedded such that the eye of the bolt is flush with the concrete surface. (See Eyebolt Details) As an alternate, cast-in-place concrete inserts, capable of developing the full strength of the 5/8 inch diameter threaded eyebolt, may be used and shall be set in the concrete in accordance with the manufacturer's recommendations. The eyebolt shall be of sufficient length to develop its full strength. The eye of the eyebolt shall be flush with the concrete surface.
6. The cost for furnishing and installing eyebolts and/or concrete inserts shall be incidental to various contract items.



**VIEW A - A**



**EYEBOLT DETAILS**

December 23, 2012

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

Published Date: 2025