| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E1 | E14 |

# Section E: Structure Plans

INDEX OF SHEETS -

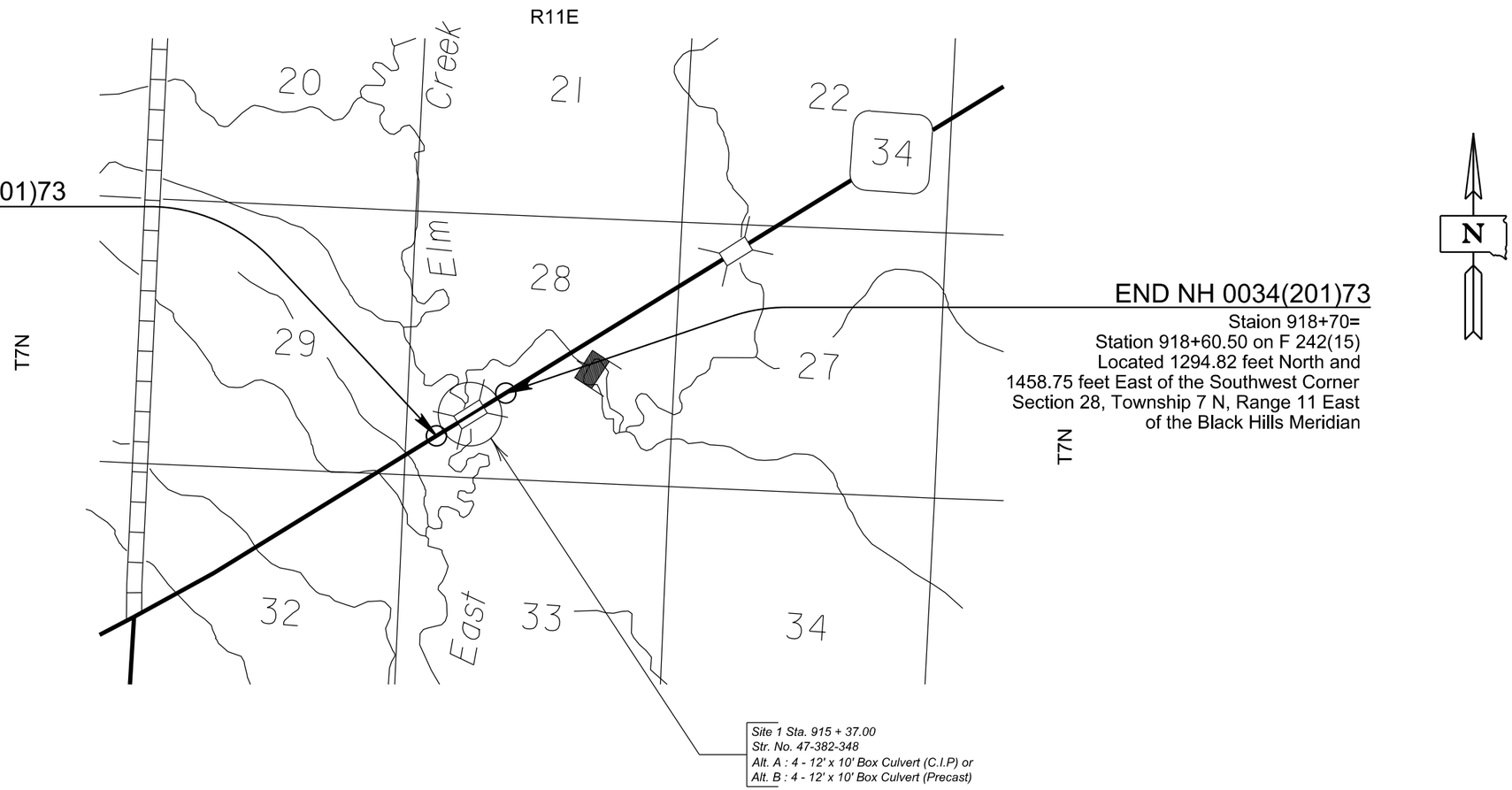


BEGIN NH 0034(201)73

Station 913+00=
Station 912+93.50 on F 242(15)
Located 991.23 feet North and
976.65 feet East of the Southwest Corner
Section 28, Township 7 North, Range 11 East
of the Black Hills Meridian

END NH 0034(201)73

Staion 918+70=
Station 918+60.50 on F 242(15)
Located 1294.82 feet North and
1458.75 feet East of the Southwest Corner
Section 28, Township 7 N, Range 11 East
of the Black Hills Meridian



# SECTION E – ESTIMATE OF STRUCTURE QUANTITIES

**Site 1**
**Str. No. 47-382-348**

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

**Site 1 – Alternate A**
**Str. No. 47-382-348**

| BID ITEM NUMBER | ITEM | QUANTITY | UNIT |
|---|---|---|---|
| 420E0200 | Structure Excavation, Box Culvert | 222 | CuYd |
| 421E0200 | Box Culvert Undercut | 308 | CuYd |
| 460E0120 | Class A45 Concrete, Box Culvert | 502.4 | CuYd |
| 480E0100 | Reinforcing Steel | 73,275 | Lb |
| 700E0210 | Class B Riprap | 95.8 | Ton |
| 831E0110 | Type B Drainage Fabric | 116 | SqYd |

**Site 1 – Alternate B**
**Str. No. 47-382-348**

| BID ITEM NUMBER | ITEM | QUANTITY | UNIT |
|---|---|---|---|
| 420E0200 | Structure Excavation, Box Culvert | 194 | CuYd |
| 421E0200 | Box Culvert Undercut | 277 | CuYd |
| 464E0100 | Controlled Density Fill | 35.7 | CuYd |
| 560E2174 | 2-12'x10' Precast Concrete Box Culvert, Furnish | 172.0 | Ft |
| 560E2175 | 2-12'x10' Precast Concrete Box Culvert, Install | 172.0 | Ft |
| 560E3174 | 2-12'x10' Precast Concrete Box Culvert End Section, Furnish | 4 | Each |
| 560E3175 | 2-12'x10' Precast Concrete Box Culvert End Section, Install | 4 | Each |
| 700E0210 | Class B Riprap | 100.5 | Ton |
| 831E0110 | Type B Drainage Fabric | 122 | SqYd |

## INCIDENTAL WORK, STRUCTURE

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

   Str. No. 47-382-348. In-place centerline Sta. 914+91.51 to Sta. 916+08.50 is a 117' – 0'', 5 span concrete slab bridge with a 30' – 0'' clear roadway width and W beam on curb railing. The substructure consists of 2 column concrete bents on footings and abutments on timber piling. The bridge has been overlaid with 2''of low slump concrete.

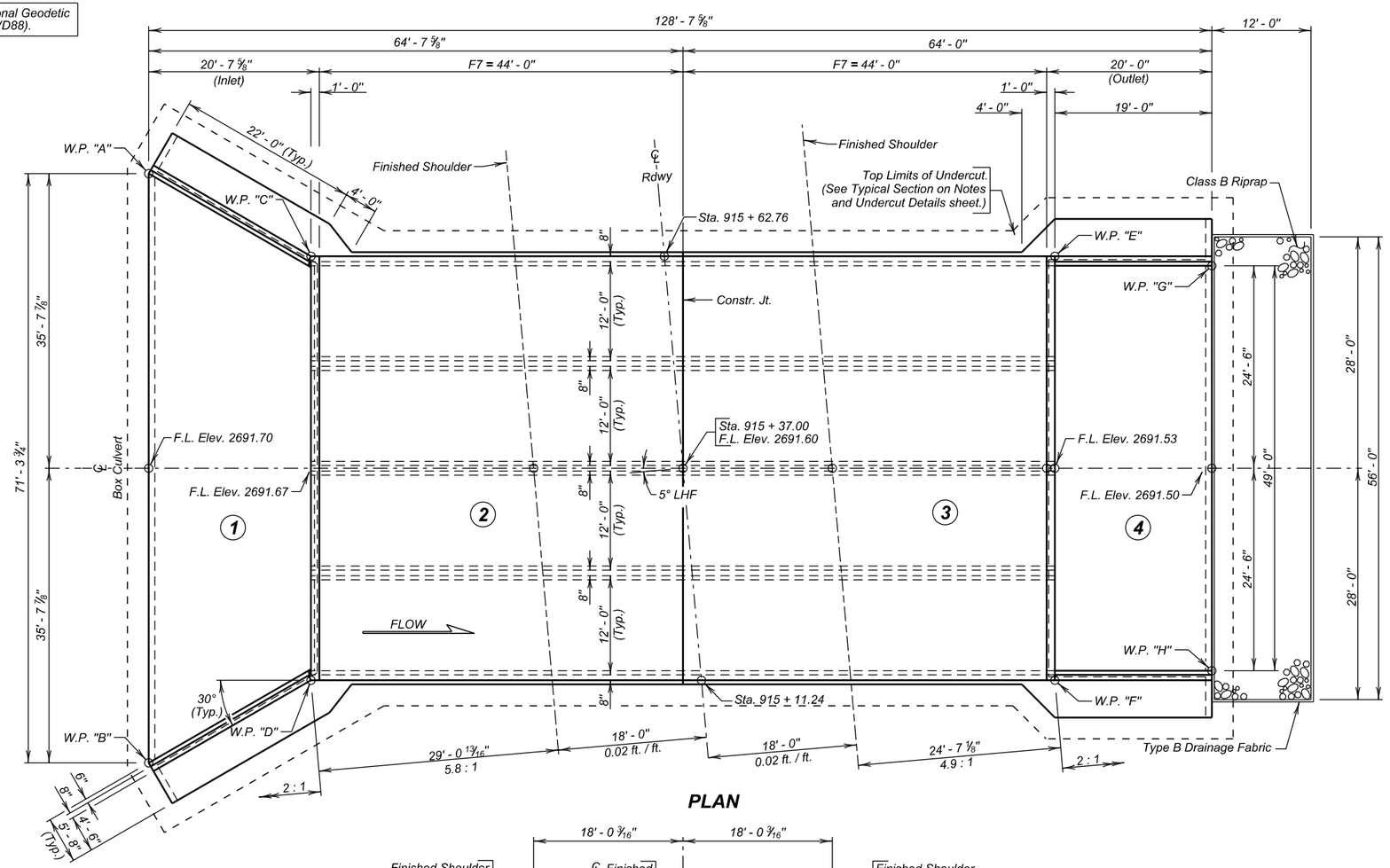
2. Break down and remove the existing structure 1 foot below finished ground or as required to construct the new structures in accordance with Section 110 of the Specifications. All portions of the existing structure will be removed and disposed of by the Contractor on a site obtained by the Contractor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

3. During demolition of structure, efforts will be taken to prevent material from falling into the creek. Under no circumstances is asphalt allowed to fall into the creek.

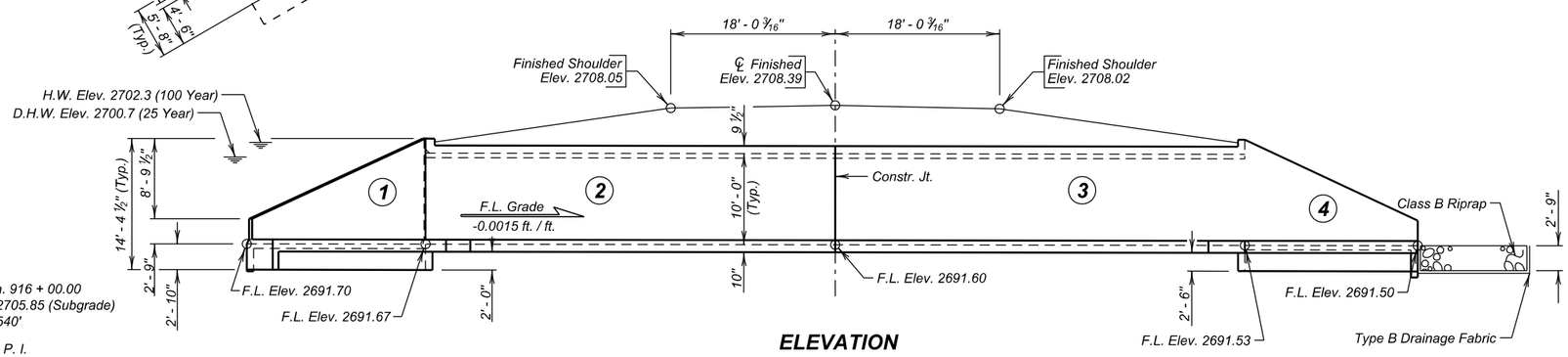
4. The foregoing is a general description of the in-place structure and should not be construed to be complete in all details. Before preparing the bid it will be the responsibility of the Contractor to make a visual inspection of the structure to verify the extent of the work and materials involved.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

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

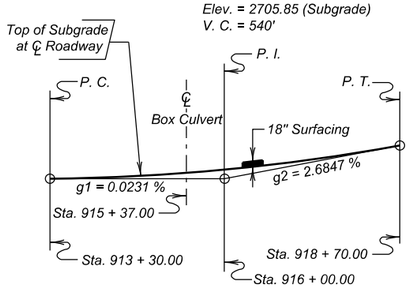
| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E3 | E14 |




## PLAN




## ELEVATION




## VERTICAL CURVE DATA

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.

## HYDRAULIC DATA

| | |
|---|---|
| $Q_d$ | 1909 cfs |
| $A_d$ | 381 sq ft |
| $V_d$ | 5.0 fps |
| $Q_F$ | 1909 cfs |
| $Q_{100}$ | 3402 cfs |
| $Q_{OT}$ | >$Q_{500}$ |
| $V_{max}$ | 8.0 fps |

$Q_d$ = Design discharge for the proposed culvert based on 25 year frequency. El. 2700.7.

$Q_{OT}$ = Overtopping discharge and frequency > $Q_{500}$ year recurrence interval. El. 2707.4 @ Sta. 912 + 00.00.

$Q_F$ = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.

$Q_{100}$ = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 2702.3.

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

## -X028-
## INDEX OF CULVERT SHEETS-



## TABLE OF WORKING POINTS

| W. P. | STATION | OFFSET |
|---|---|---|
| "A" | 915 + 78.15 | 61.28' Lt. |
| "B" | 915 + 07.11 | 67.50' Lt. |
| "C" | 915 + 66.49 | 42.59' Lt. |
| "D" | 915 + 15.35 | 47.07' Lt. |
| "E" | 915 + 58.65 | 47.07' Rt. |
| "F" | 915 + 07.51 | 42.59' Rt. |
| "G" | 915 + 55.83 | 65.89' Rt. |
| "H" | 915 + 07.02 | 61.62' Rt. |

## ESTIMATED QUANTITIES

| | ITEM | UNIT | QUANTITY |
|---|---|---|---|
| | Class A45 Concrete, Box Culvert | Cu. Yd. | 502.4 |
| | Reinforcing Steel | Lb. | 73275 |
| | Structure Excavation, Box Culvert | Cu. Yd. | 221.8 |
| | Box Culvert Undercut | Cu. Yd. | 308 |
| | Type B Drainage Fabric | Sq. Yd. | 116 |
| ✳ | Class B Riprap | Ton | 95.8 |

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

# SITE 1
# ALTERNATE A

**GENERAL DRAWING AND QUANTITIES**

FOR

## 4 - 12' X 10' BOX CULVERT (C.I.P.)

OVER EAST ELM CREEK — 5° LHF SKEW
STA. 915 + 37.00 — SEC. 28-T7N-R11E
STR. NO. 47-382-348 — NH 0034(201)73
PCN 06XN — HL-93

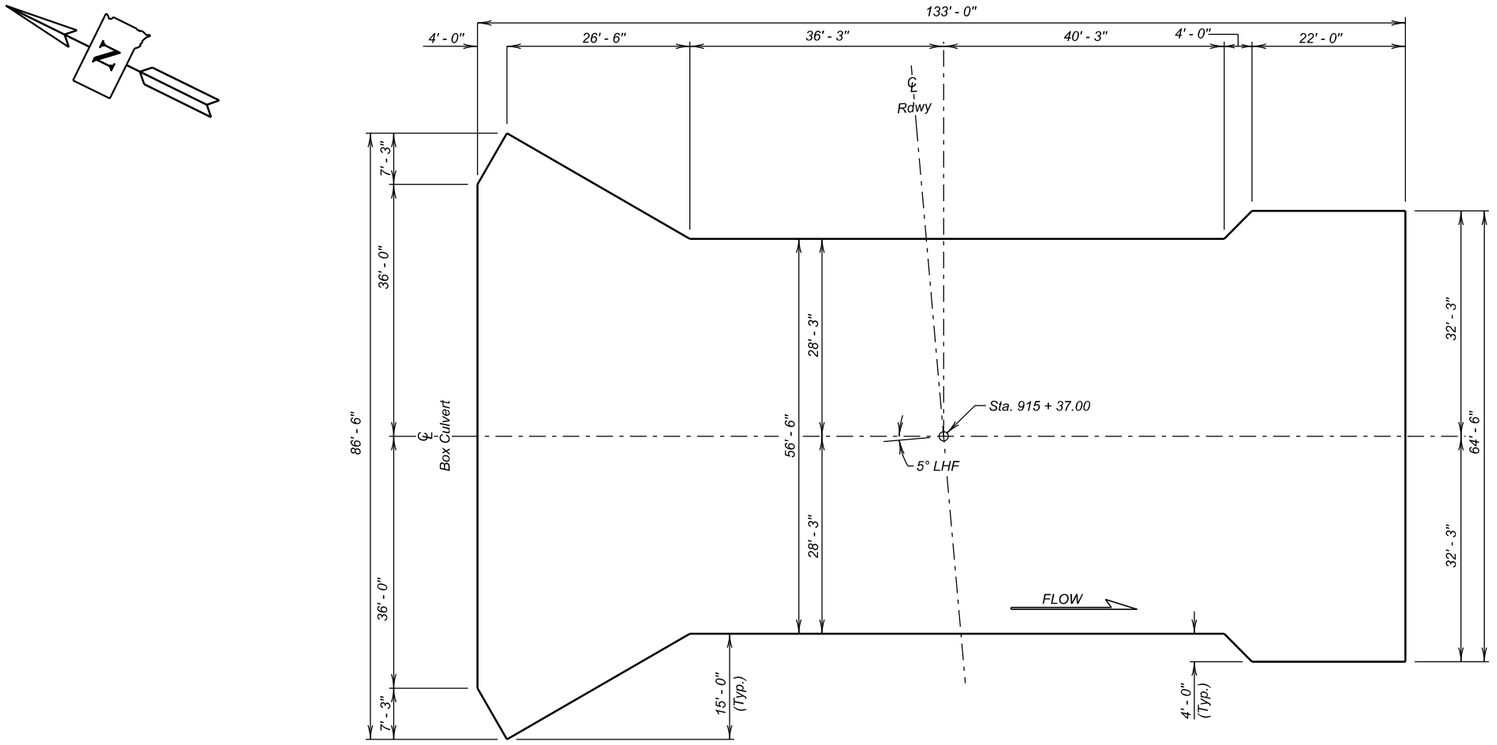
MEADE COUNTY
S. D. DEPT. OF TRANSPORTATION
JUNE 2023



-X028-

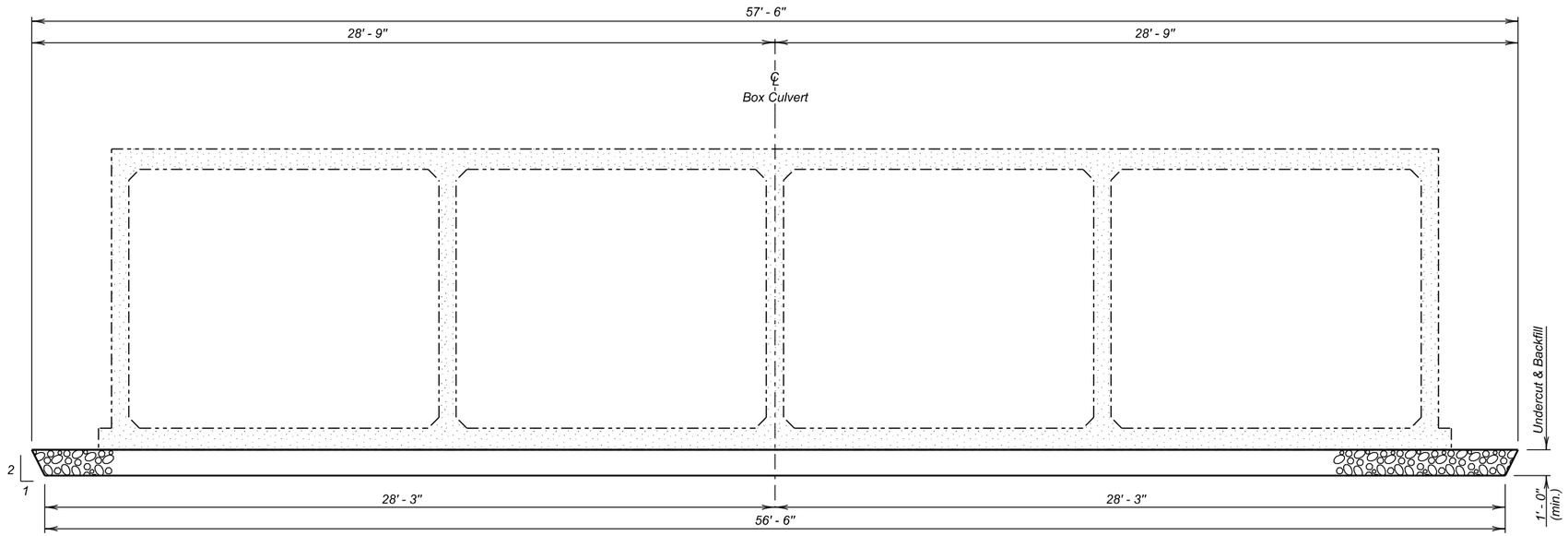
PLANS BY :
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

| DESIGNED BY | CK. DES. BY | DRAFTED BY | |
|---|---|---|---|
| PW | ER | CRW | Steve A Johnson BRIDGE ENGINEER |
| MEAD06XN | 06XNGA01 | | |




## UNDERCUT LAYOUT

(Bottom Dimensions)




## TYPICAL SECTION

(For Limits of Undercut)

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E4 | E14 |

## 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. No construction loading in excess of legal load was considered.
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 7 ft. (F7).
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, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of the cement will be 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 approximately 2 feet of gray silt with clay with gravel (Alluvial Deposits) overlying gray silt clay (Pierre Shale). Groundwater was encountered in borings at an elevation of 2692.7 during the subsurface investigation conducted October 2021. Dewatering wil be required for the construction of the RCBC.

## ESTIMATED QUANTITIES

| | ITEM | UNIT | QUANTITY |
|---|---|---|---|
| ₡ | Box Culvert Undercut | Cu. Yd. | 308 |

₡ 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 10' BOX CULVERT (C.I.P.)

OVER EAST ELM CREEK — 5° LHF SKEW
STA. 915 + 37.00 — SEC. 28-T7N-R11E
STR. NO. 47-382-348 — NH 0034(201)73
HL-93

MEADE COUNTY

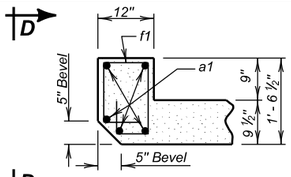
S. D. DEPT. OF TRANSPORTATION

JUNE 2023

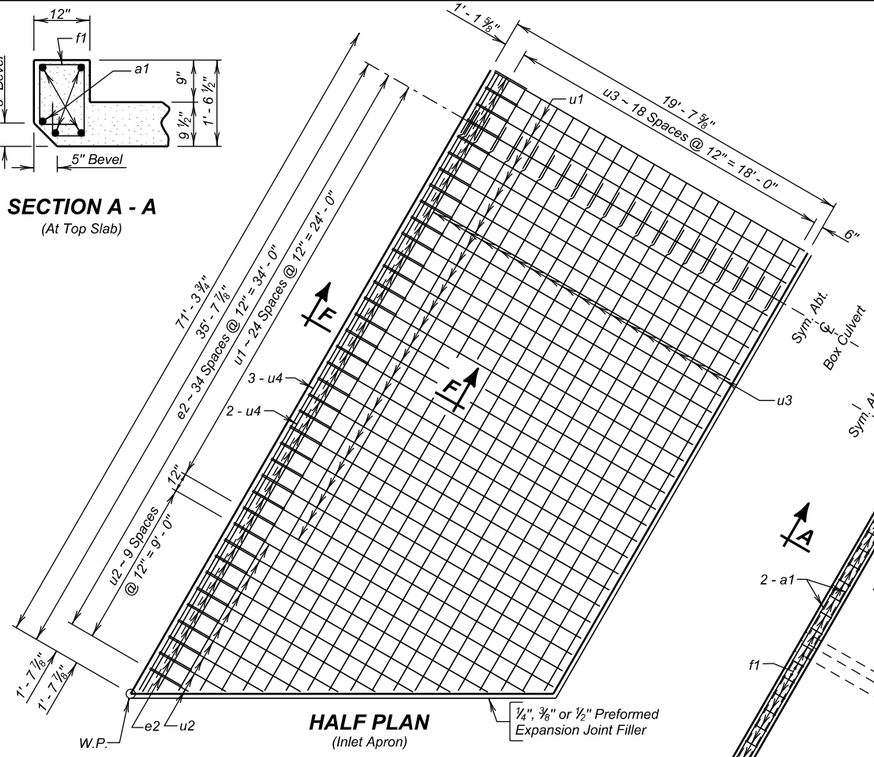


| DESIGNED BY | CK. DES. BY | DRAFTED BY | |
|---|---|---|---|
| PW | ER | CRW | Steve A Johnson BRIDGE ENGINEER |
| MEAD06XN | 06XNGA02 | | |

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E5 | E14 |

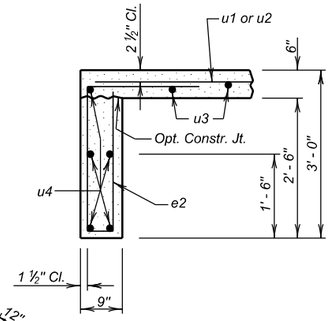



## SECTION A - A
(At Top Slab)

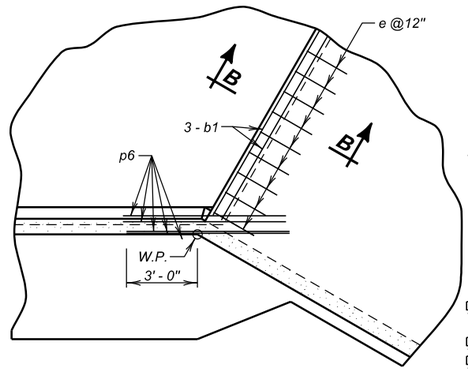



## HALF PLAN
(Inlet Apron)

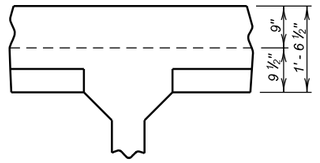
NOTE:
*Apron will NOT be built monolithic with the Box Culvert.*




## SECTION F - F



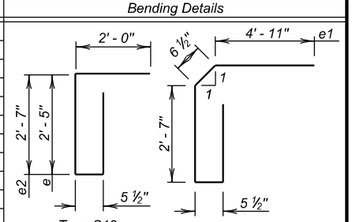

## DETAIL "X"
(At Bottom Slab)

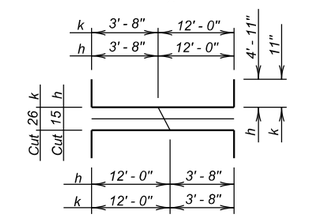


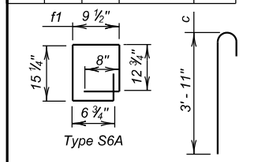

## VIEW D - D
(At Interior Wall)

## REINFORCING SCHEDULE

| | Mk. | No. | Size | Length | Type | Bending Details |
|---|---|---|---|---|---|---|
| | a1 | 5 | 6 | 51' - 0" | Str. | |
| | b1 | 6 | 6 | 49' - 3" | Str. | |
| * | c | 4 | 5 | 4' - 6" | 1A | |
| | c1 | 8 | 5 | 23' - 6" | Str. | |
| | c2 | 4 | 5 | 7' - 0" | 19B | |
| | d1 | 8 | 5 | 6' - 6" | 19B | |
| | e | 50 | 4 | 7' - 0" | S12 | |
| | e1 | 54 | 4 | 11' - 0" | S12A | |
| | f1 | 52 | 4 | 5' - 0" | S6A | |
| | g0 | 12 | 5 | 5' - 0" | 19B | |
| ⌀ | g1 | 18 | 4 | 29' - 6" | 19B | |
| ⌀ | g2 | 4 | 4 | 23' - 9" | 19B | |
| ⌀ | h | 15 | 4 | 25' - 6" | 17A | |
| ⌀ | k | 26 | 4 | 17' - 6" | 17A | |
| | p6 | 10 | 6 | 7' - 0" | Str. | |
| * | p7 | 14 | 4 | 24' - 6" | Str. | |
| * | p8 | 4 | 4 | 25' - 6" | Str. | |
| * | p9 | 4 | 4 | 27' - 6" | Str. | |
| | p10 | 4 | 4 | 29' - 3" | Str. | |
| | INLET APRON | | | | | |
| | e2 | 69 | 4 | 7' - 6" | S12 | |
| ⌀ | u1 | 49 | 4 | 19' - 3" | Str. | |
| ⌀ | u2 | 10 | 4 | 20' - 6" | Str. | |
| ⌀ | u3 | 19 | 4 | 60' - 9" | Str. | |
| ⌀ | u4 | 10 | 4 | 36' - 0" | Str. | |

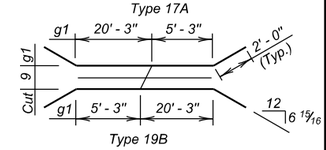


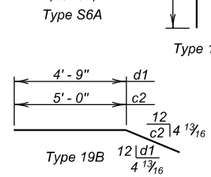



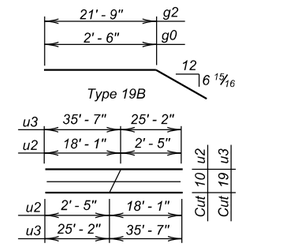





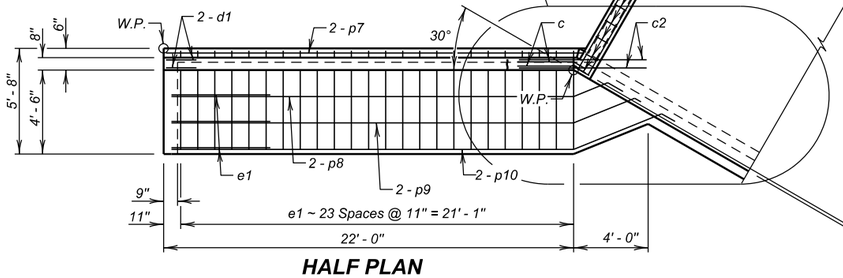




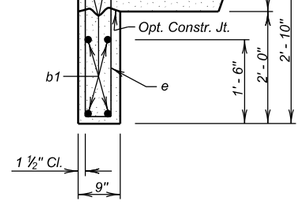



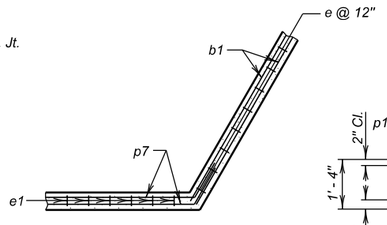

NOTES:
*All dimensions are out to out of bars.*
⌀ *See cutting diagram.*
* *Bend in field as necessary to fit.*



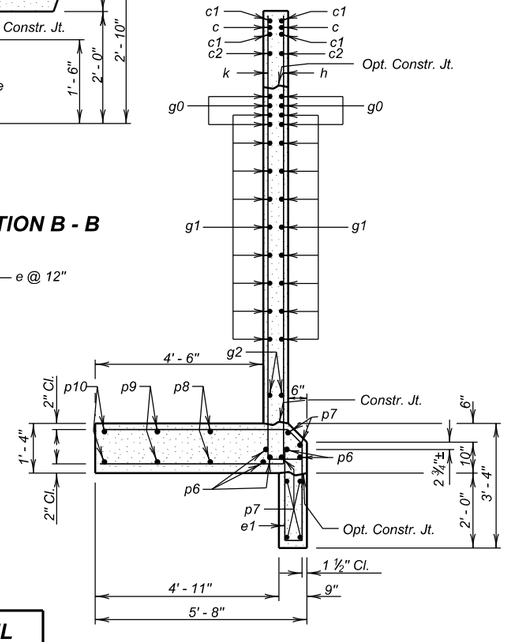

## HALF PLAN



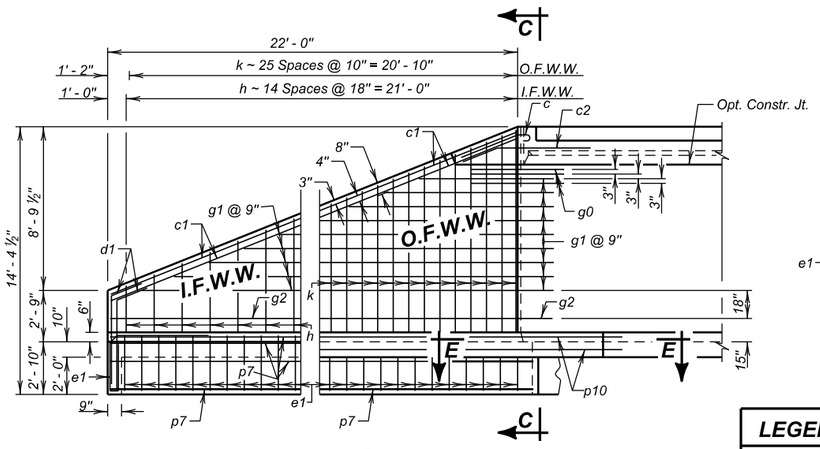

## SECTION B - B




## SECTION E - E




## SECTION C - C




## ELEVATION

### LEGEND FOR PLACING RE-STEEL

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

## ESTIMATED QUANTITIES

| ITEM | Class A45 Concrete, Box Culvert | Reinforcing Steel | Structure Excavation, Box Culvert |
|---|---|---|---|
| UNIT | Cu. Yd. | Lb. | Cu. Yd. |
| Inlet | 31.8 | 3524 | 15.6 |
| Inlet Apron | 26.7 | 2124 | 26.7 |

# SITE 1
# ALTERNATE A
## INLET DETAILS
FOR
## 4 - 12' X 10' BOX CULVERT (C.I.P.)

OVER EAST ELM CREEK
STA. 915 + 37.00
STR. NO. 47-382-348

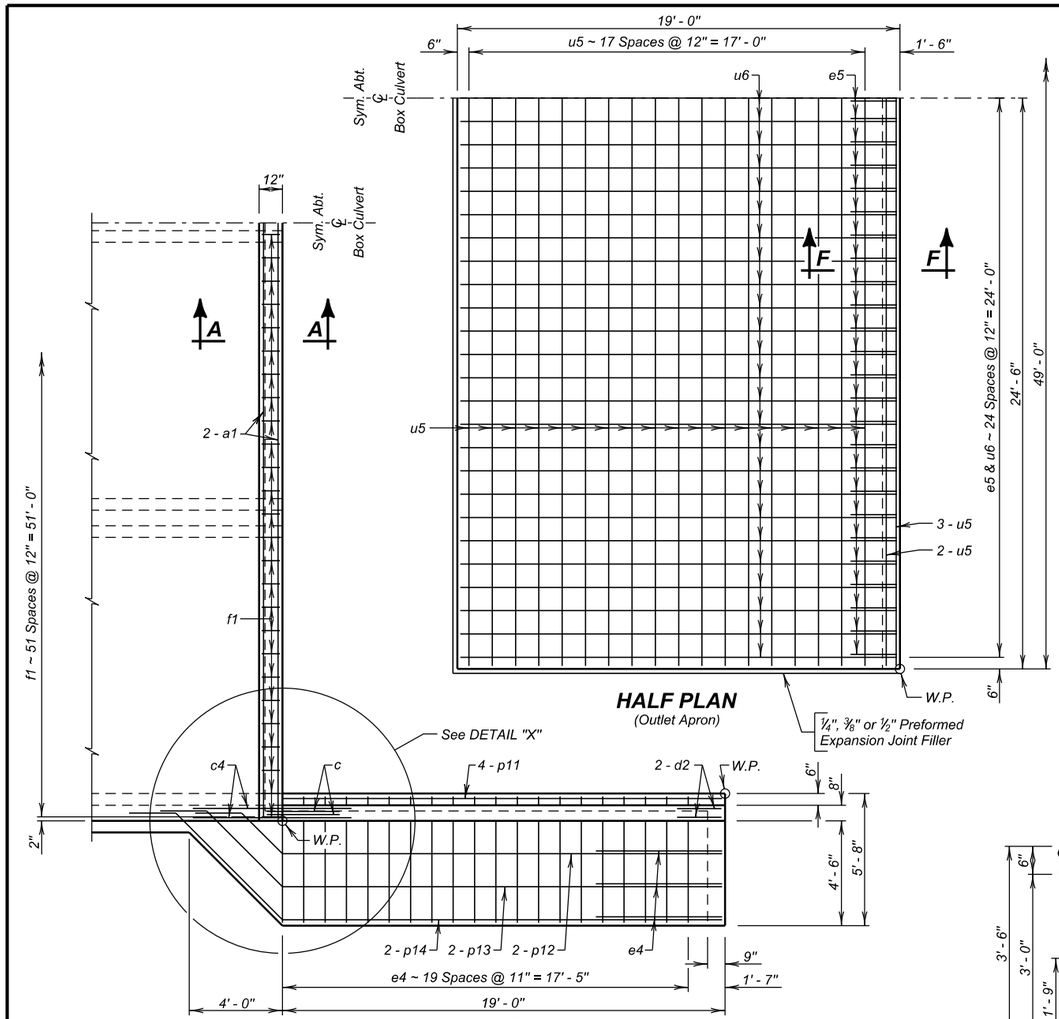
5° LHF SKEW
SEC. 28-T7N-R11E
NH 0034(201)73
HL-93

MEADE COUNTY
S. D. DEPT. OF TRANSPORTATION
JUNE 2023

3 OF 7

| DESIGNED BY | CK. DES. BY | DRAFTED BY | |
|---|---|---|---|
| PW | ER | CRW | Steve A Johnson BRIDGE ENGINEER |
| MEAD06XN | 06XNGA03 | | |

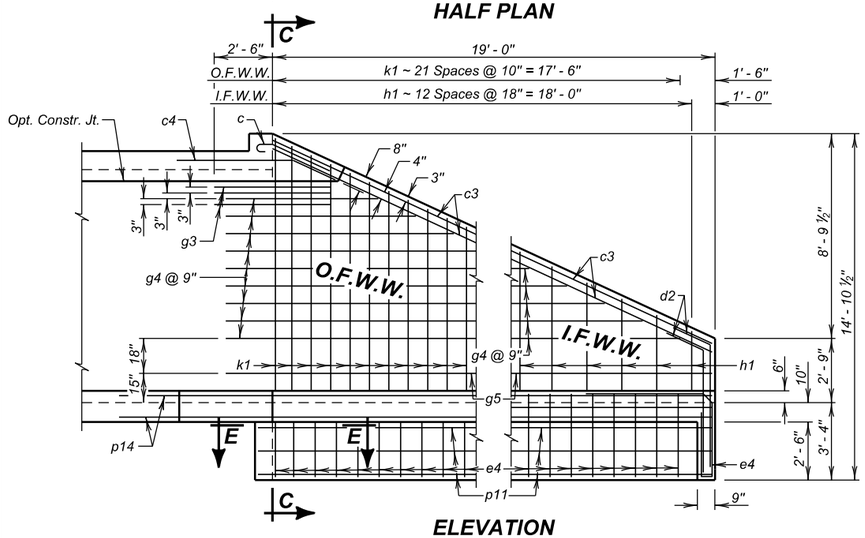
| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E6 | E14 |



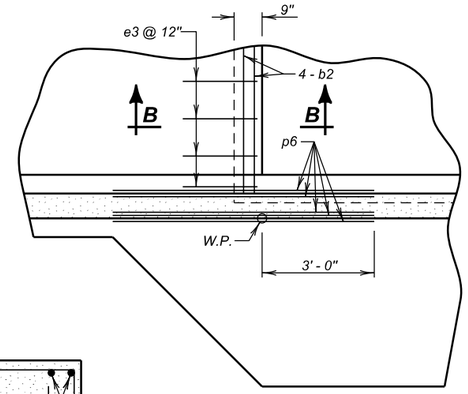

**HALF PLAN**
(Outlet Apron)

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

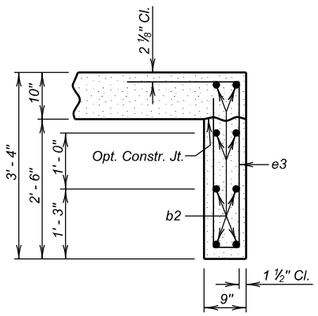
**HALF PLAN**



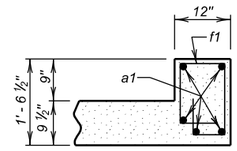

**ELEVATION**



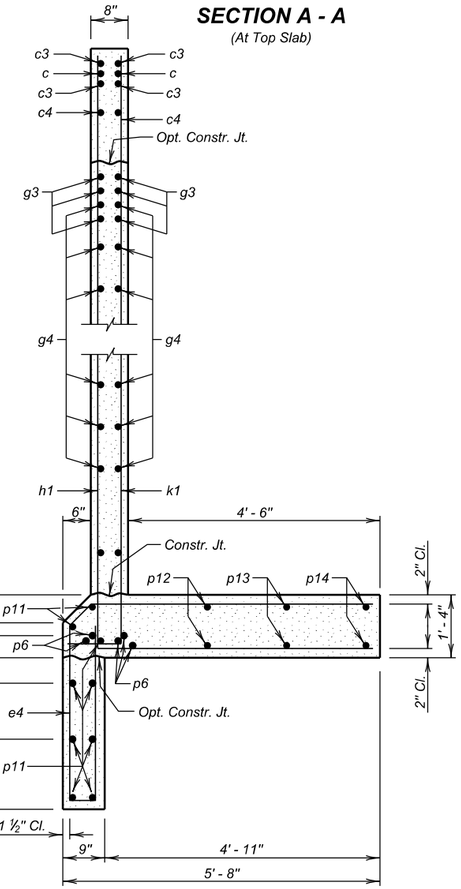

**DETAIL "X"**
(At Bottom Slab)



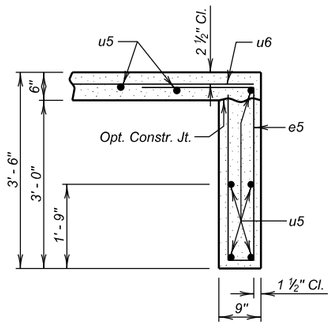

**SECTION B - B**



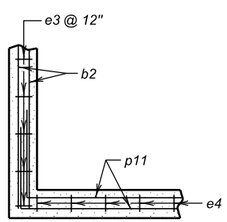

**SECTION A - A**
(At Top Slab)




**SECTION C - C**




**SECTION F - F**

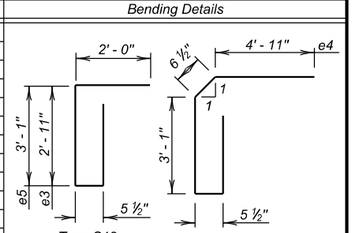


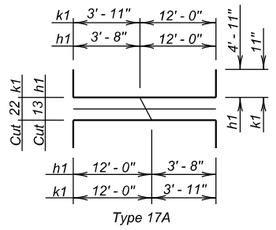

**SECTION E - E**

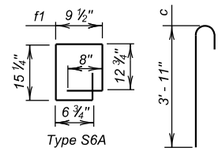
## REINFORCING SCHEDULE

| Mk. | No. | Size | Length | Type |
|---|---|---|---|---|
| a1 | 5 | 6 | 51' - 0" | Str. |
| b2 | 8 | 6 | 50' - 3" | Str. |
| c | 4 | 5 | 4' - 6" | 1A |
| c3 | 8 | 5 | 20' - 9" | Str. |
| c4 | 4 | 5 | 7' - 0" | 19B |
| d2 | 8 | 5 | 7' - 0" | 19B |
| e3 | 50 | 4 | 8' - 0" | S12 |
| e4 | 46 | 4 | 12' - 0" | S12A |
| f1 | 52 | 4 | 5' - 0" | S6A |
| g3 | 12 | 5 | 5' - 0" | Str. |
| ⌀ g4 | 18 | 4 | 26' - 0" | Str. |
| g5 | 4 | 4 | 20' - 9" | Str. |
| ⌀ h1 | 13 | 4 | 25' - 6" | 17A |
| ⌀ k1 | 22 | 4 | 17' - 9" | 17A |
| p6 | 10 | 6 | 7' - 0" | Str. |
| ✳ p11 | 18 | 4 | 21' - 6" | Str. |
| ✳ p12 | 4 | 4 | 22' - 9" | Str. |
| ✳ p13 | 4 | 4 | 24' - 9" | Str. |
| ✳ p14 | 4 | 4 | 27' - 0" | Str. |
| OUTLET APRON | | | | |
| e5 | 49 | 4 | 8' - 6" | S12 |
| u5 | 23 | 4 | 48' - 9" | Str. |
| u6 | 49 | 4 | 18' - 9" | Str. |

Bending Details

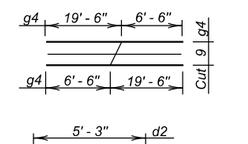


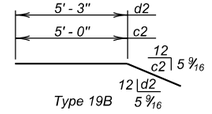










NOTES:
All dimensions are out to out of bars.
⌀ See cutting diagram.
✳ Bend in field as necessary to fit.

## ESTIMATED QUANTITIES

| ITEM | Class A45 Concrete, Box Culvert | Reinforcing Steel | Structure Excavation, Box Culvert |
|---|---|---|---|
| UNIT | Cu. Yd. | Lb. | Cu. Yd. |
| Outlet | 31.2 | 3518 | 16.1 |
| Outlet Apron | 21.3 | 1641 | 21.3 |

## LEGEND FOR PLACING RE-STEEL

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

# SITE 1
# ALTERNATE A

**OUTLET DETAILS**

FOR

## 4 - 12' X 10' BOX CULVERT (C.I.P.)

OVER EAST ELM CREEK
STA. 915 + 37.00
STR. NO. 47-382-348

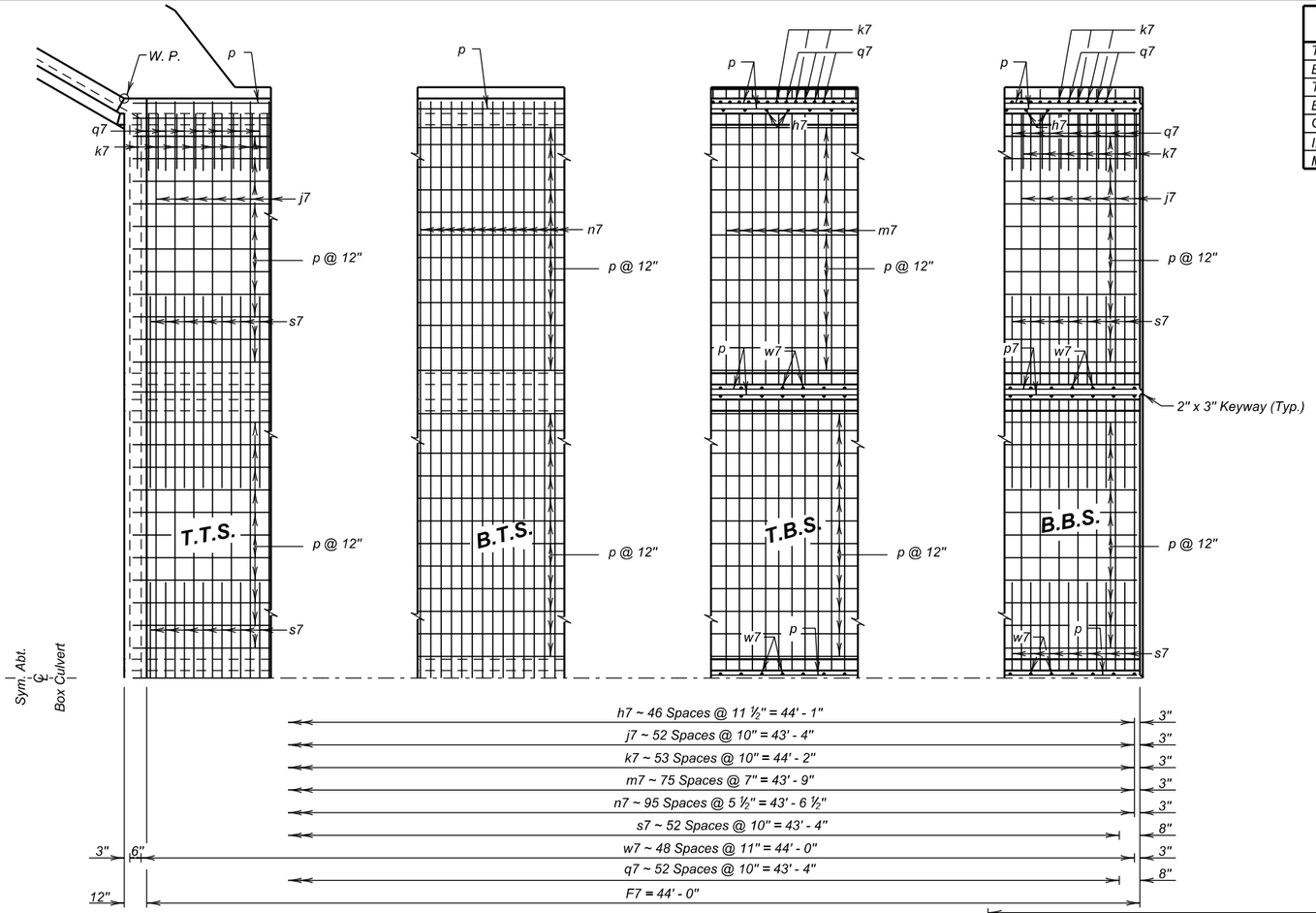
5° LHF SKEW
SEC. 28-T7N-R11E
NH 0034(201)73
HL-93

MEADE COUNTY
S. D. DEPT. OF TRANSPORTATION
JUNE 2023

4 OF 7

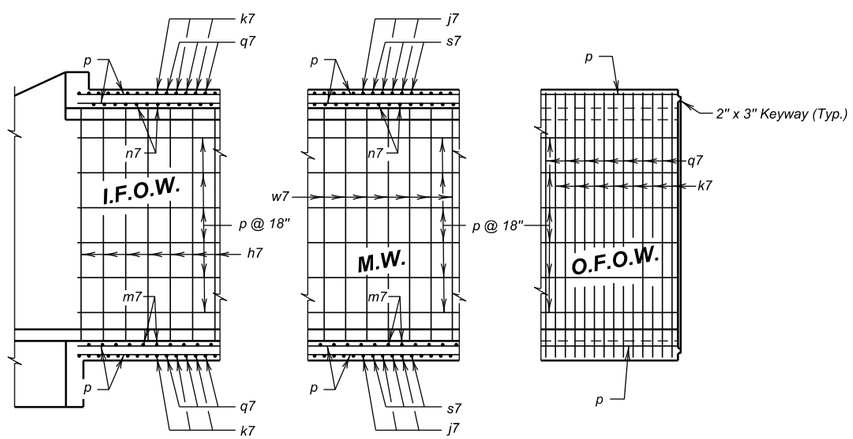
| DESIGNED BY | CK. DES. BY | DRAFTED BY | |
|---|---|---|---|
| PW | ER | BT | Steve A Johnson BRIDGE ENGINEER |
| MEAD06XN | 06XNGA04 | | |

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E7 | E14 |



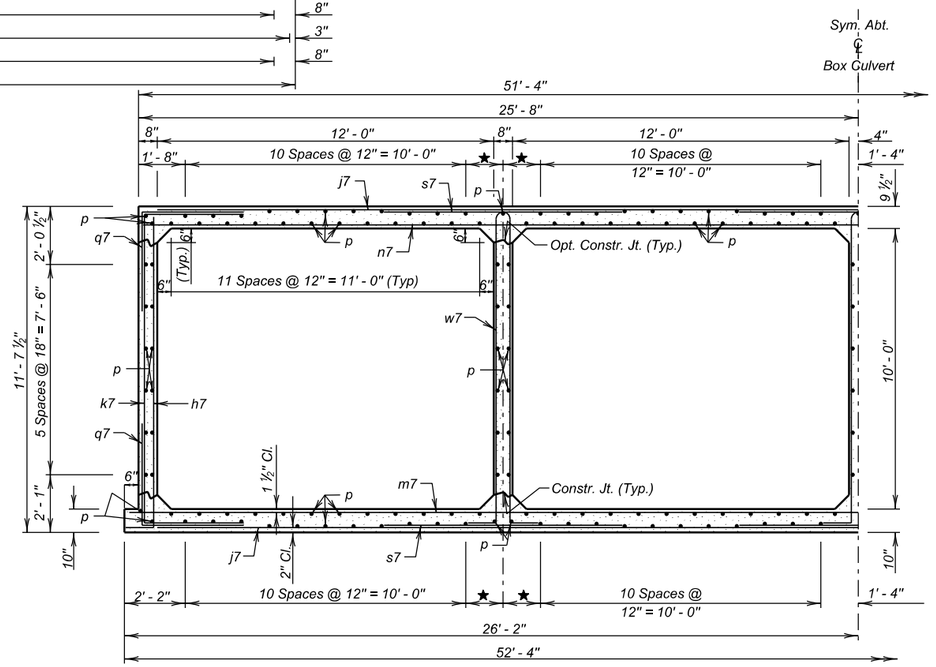

## HALF PLAN

(Outlet shown, Inlet similar by rotation)




## ELEVATION

★ 1' - 4"

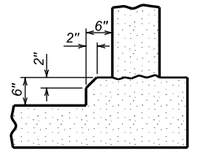



## F7 BARREL SECTION

(7' - 0" Maximum Fill)

## 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 |




## OPTIONAL FILLET DETAIL

(At Bottom Slab)

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

## OPTIONAL POUR - BOTTOM SLAB

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

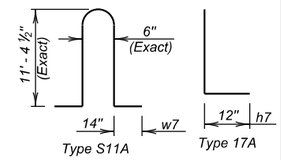
△ Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10. Quantity of z1 bars is for one construction joint.

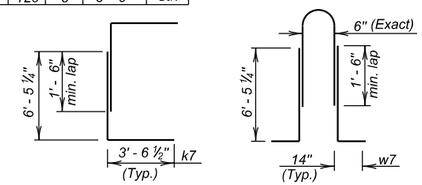
## REINFORCING SCHEDULE

(For 2 - F7 Barrel End Section)

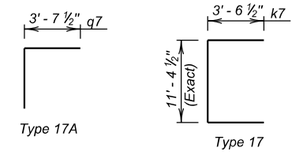
| Mk. | No. | Size | Length | Type |
|---|---|---|---|---|
| h7 | 188 | 4 | 12' - 0" | 17A |
| j7 | 212 | 5 | 50' - 0" | Str. |
| k7 | 216 | 4 | 18' - 6" | 17 |
| m7 | 152 | 5 | 52' - 0" | Str. |
| n7 | 192 | 5 | 51' - 0" | Str. |
| p | 522 | 4 | 44' - 6" | Str. |
| q7 | 424 | 4 | 7' - 3" | 17A |
| s7 | 636 | 5 | 8' - 6" | Str. |
| w7 | 300 | 4 | 25' - 6" | S11A |
| △ z1 | 126 | 5 | 3' - 6" | Str. |

Bending Details




Contractor may use optional reinforcing steel splices, 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 - F7 Barrel End Sections @ 44' - 0" | 391.4 | 62468 | 142.1 |

# SITE 1
# ALTERNATE A

**F7 BARREL END SECTION DETAILS (44' - 0")**

FOR

## 4 - 12' X 10' BOX CULVERT (C.I.P.)

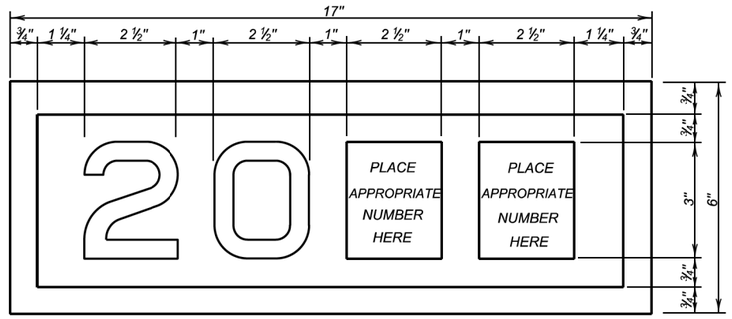
OVER EAST ELM CREEK
STA. 915 + 37.00
STR. NO. 47-382-348

5° LHF SKEW
SEC. 28-T7N-R11E
NH 0034(201)73
HL-93

MEADE COUNTY
S. D. DEPT. OF TRANSPORTATION
JUNE 2023

5 OF 7

| DESIGNED BY | CK. DES. BY | DRAFTED BY | |
|---|---|---|---|
| PW | ER | CRW | Steve A Johnson BRIDGE ENGINEER |
| MEAD06XN | 06XNGA05 | | |




## YEAR PLATE DETAILS

### GENERAL NOTES:

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

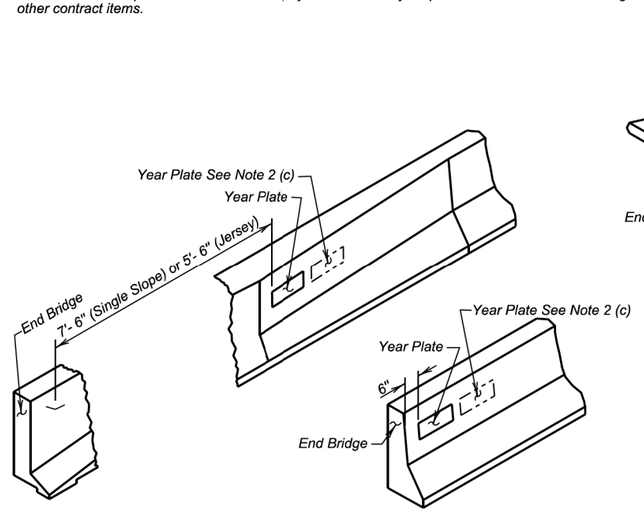
2. Year plates will be located on structure(s) as follows:

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

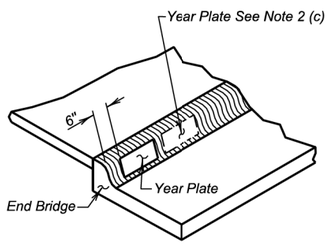
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with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

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

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



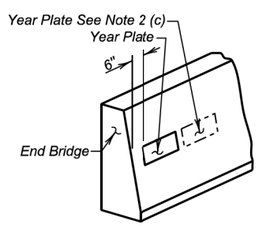

**BARRIER**
(With Endblock)




**TYPE B CURB**



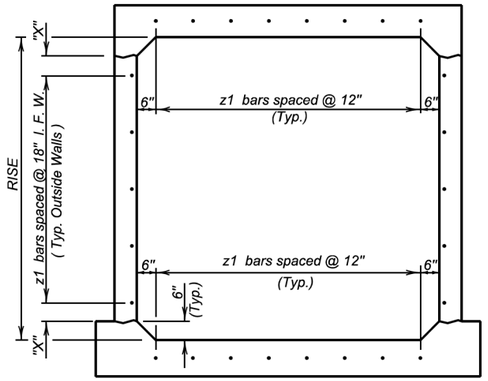

**JERSEY BARRIER**



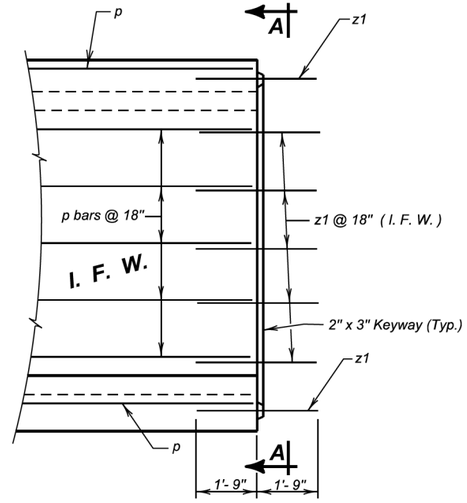

**SINGLE SLOPE BARRIER**

January 22, 2021

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

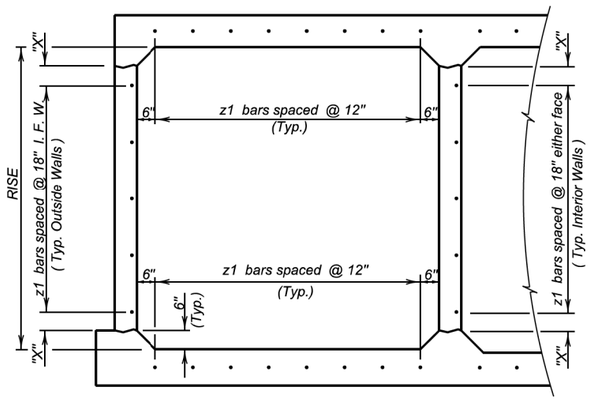



**TYPICAL SINGLE BARREL VIEW A - A**




**ELEVATION**

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




**TYPICAL MULTIPLE BARREL VIEW A - A**

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

### GENERAL NOTES:

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

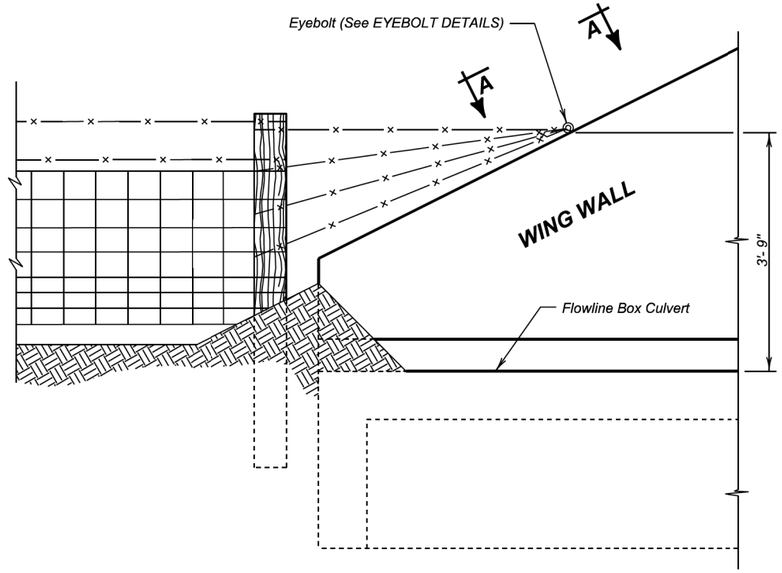
2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

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

SITE 1
ALTERNATE A

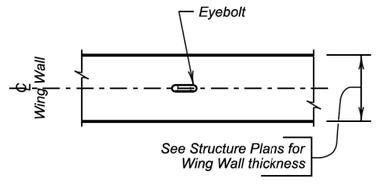
4 - 12' X 10' BOX CULVERT (C.I.P.)
STR. NO. 47-382-348
August 2022



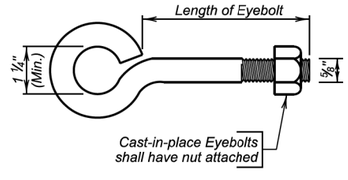

**DETAIL FOR FENCE ANCHORS**

## 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: 2024 | SDDOT | FENCE ANCHORS FOR BOX CULVERT WING WALLS | PLATE NUMBER 620.16 |
|---|---|---|---|
| | | | Sheet 1 of 1 |

SITE 1
ALTERNATE A

4 - 12' X 10' BOX CULVERT (C.I.P.)
STR. NO. 47-382-348
August 2022

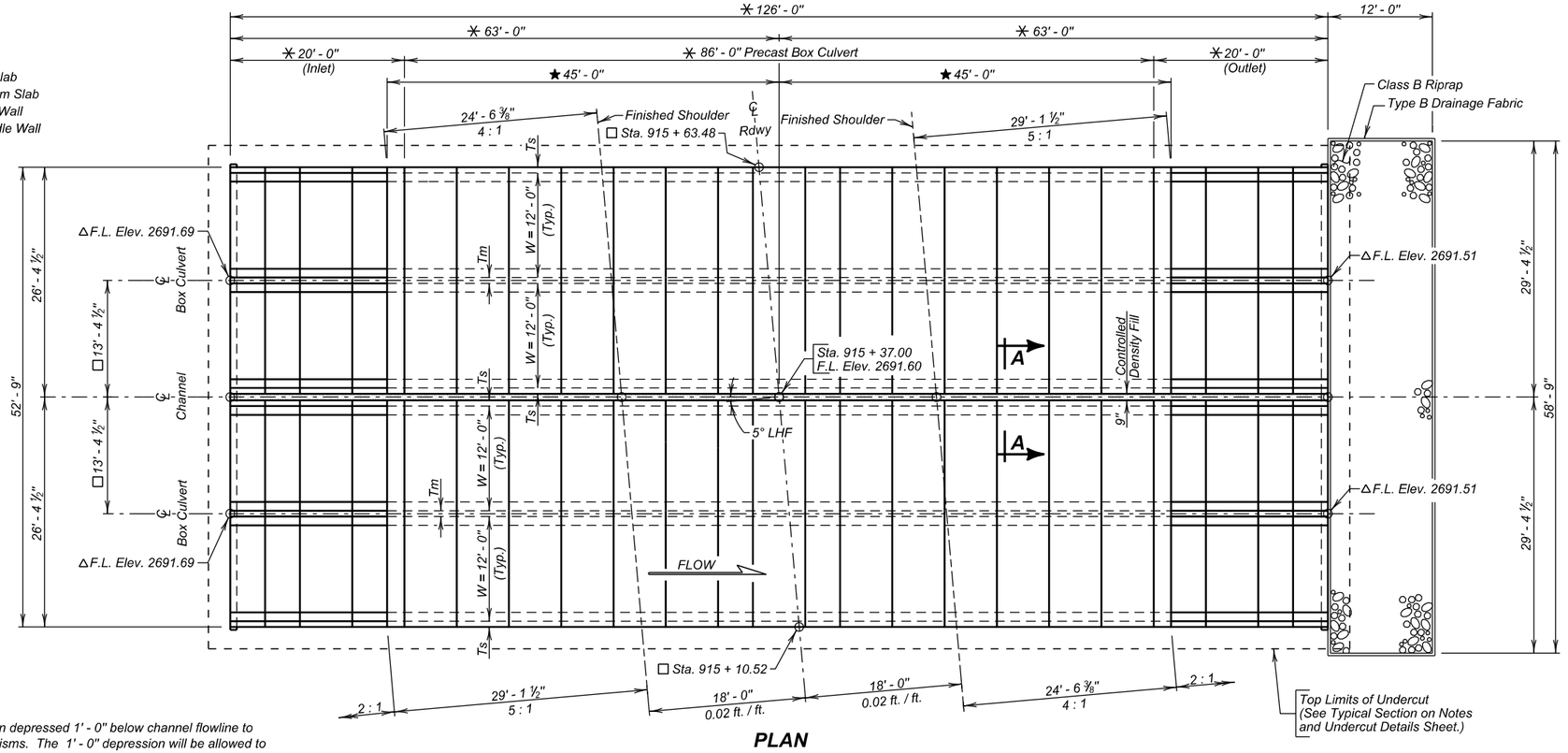
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

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

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E10 | E14 |

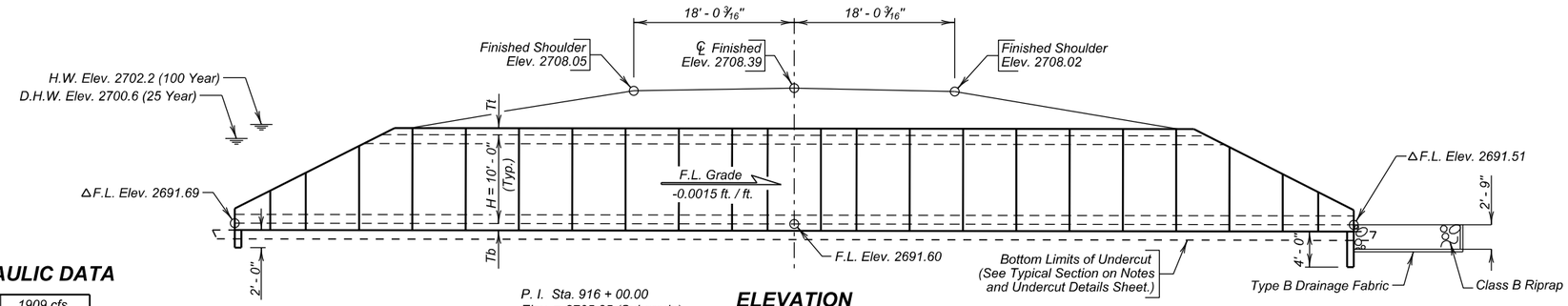
## LEGEND

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

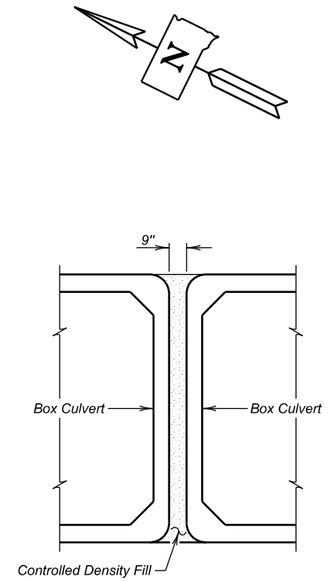



## PLAN

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




## ELEVATION




## SECTION A - A

-X028-

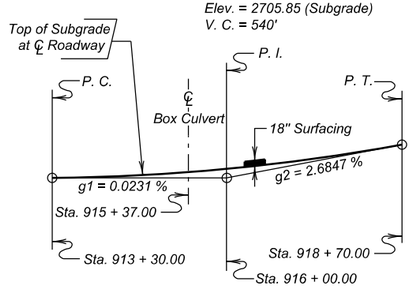
## INDEX OF CULVERT SHEETS-



## HYDRAULIC DATA

| | |
|---|---|
| $Q_d$ | 1909 cfs |
| $A_d$ | 381 sq ft |
| $V_d$ | 5.0 fps |
| $Q_F$ | 1909 cfs |
| $Q_{100}$ | 3402 cfs |
| $Q_{OT}$ | >$Q_{500}$ |
| $V_{max}$ | 8.0 fps |

$Q_d$ = Design discharge for the proposed culvert based on 25 year frequency. El. 2700.7.
$Q_{OT}$ = Overtopping discharge and frequency > $Q_{500}$ year recurrence interval. El. 2707.4 @ Sta. 912 + 00.00.
$Q_F$ = Designated peak discharge for the basin approaching proposed project based on 25 year frequency.
$Q_{100}$ = Computed discharge for the basin approaching proposed project based on 100 year frequency. El. 2702.4.
$V_{max}$ = 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. | 194 |
| | Box Culvert Undercut | Cu. Yd. | 277 |
| | Controlled Density Fill | Cu. Yd. | 35.7 |
| ≠ | Class B Riprap | Ton | 100.5 |
| | Type B Drainage Fabric | Sq. Yd. | 122 |
| | 2 - 12' X 10' Precast Concrete Culvert, Furnish | Ft. | 172 |
| | 2 - 12' X 10' Precast Concrete Culvert, Install | Ft. | 172 |
| | 2 - 12' X 10' Precast Concrete Culvert End Section, Furnish | Each | 4 |
| | 2 - 12' X 10' Precast Concrete Culvert End Section, Install | Each | 4 |

∉ 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.

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

# SITE 1
# ALTERNATE B

**GENERAL DRAWING AND QUANTITIES**

FOR

## 4 - 12' X 10' BOX CULVERT (PRECAST)

OVER EAST ELM CREEK — 5° LHF SKEW
STA. 915 + 37.00 — SEC. 28-T7N-R11E
STR. NO. 47-382-348 — NH 0034(201)73
PCN 06XN — HL-93

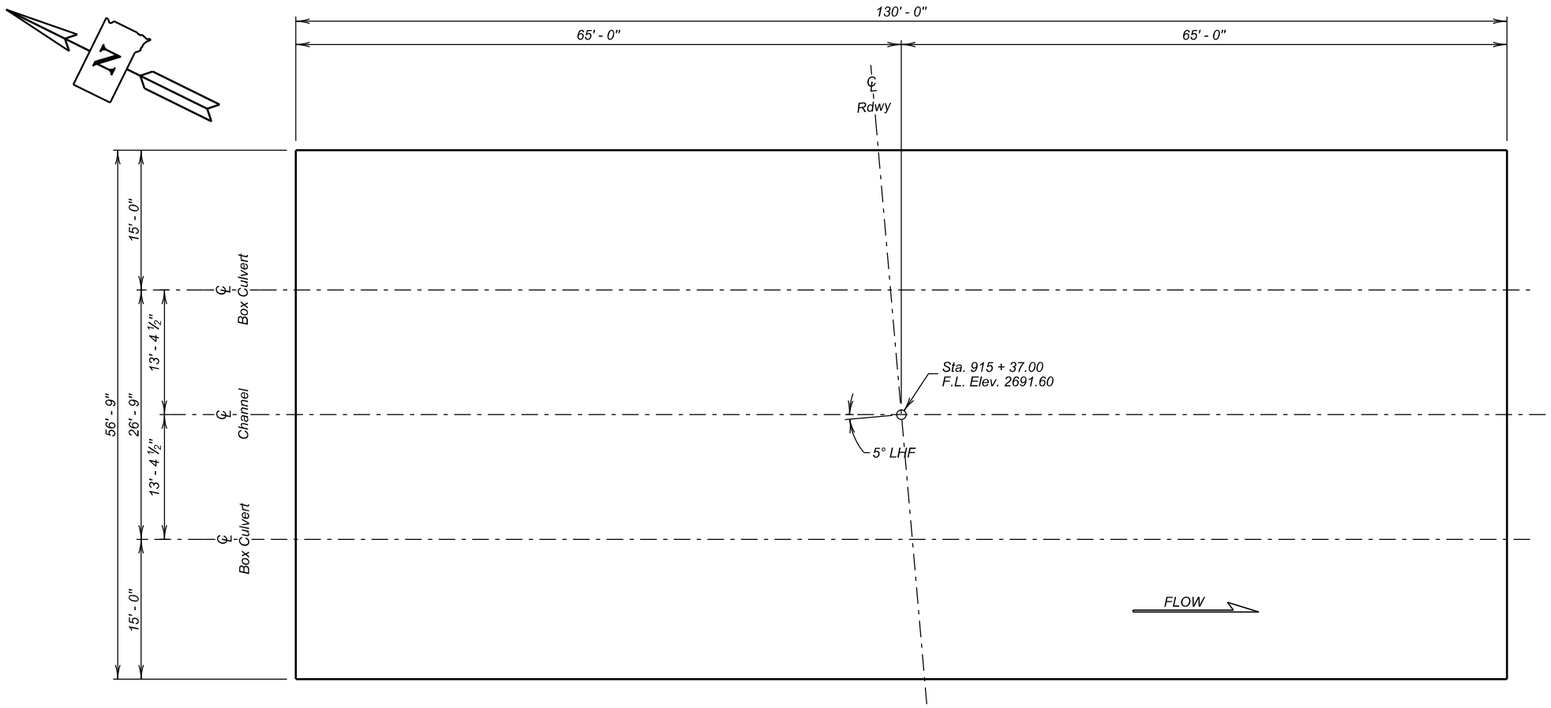
MEADE COUNTY
S. D. DEPT. OF TRANSPORTATION
JULY 2023



-X028-

| DESIGNED BY | CK. DES. BY | DRAFTED BY | |
|---|---|---|---|
| PW | ER | BT | Steve A. Johnson BRIDGE ENGINEER |
| MEAD06XN | 06XNGA08 | | |

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E11 | E14 |

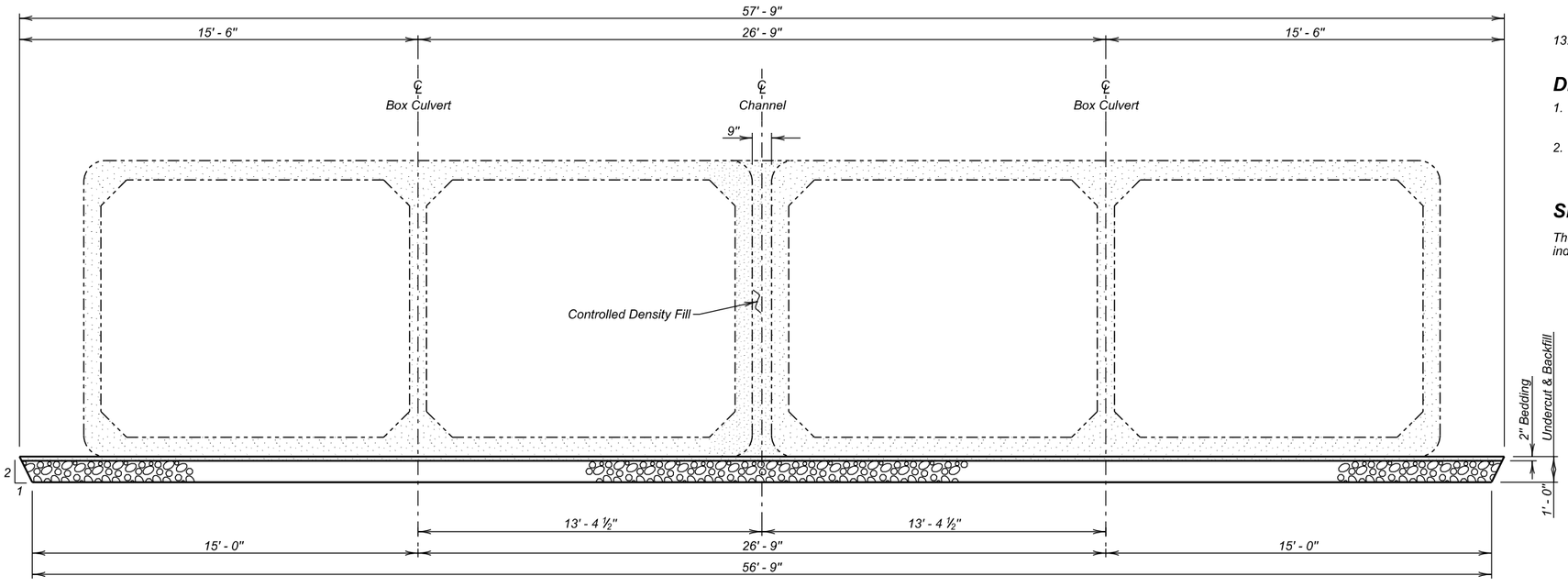



**UNDERCUT LAYOUT**
*(Bottom Dimensions)*

**ESTIMATED QUANTITIES**

| | ITEM | UNIT | QUANTITY |
|---|---|---|---|
| ⌀ | Box Culvert Undercut | Cu. Yd. | 277 |

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




**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, 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 will 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 will not be applied until the depth of fill over the box culvert as required by analysis has been placed. At a minimum, 4 feet of fill will be placed over the box culvert prior to applying the construction load. All costs associated with accommodating any construction loads will 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 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 7 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. *The fabricator will imprint on the structure the date of construction as specified and detailed on Standard Plate 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 approximately 2 feet of gray silt clay with gravel (Alluvial Deposits) overlying gray silt clay (Pierre Shale). Groundwater was encountered in the borings at an elevation of 2692.7 feet during the subsurface investigation conducted in October 2021. Dewatering will be required during the construction of the RCBC.*
13. *Adjust cutoff wall shown on Standard Plates 560.20 and 560.21 to extend the full width of the end sections (out-to-out) plus the 9-inch spacing.*

## 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 Specification.*

## 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.*

# SITE 1
# ALTERNATE B

**NOTES AND UNDERCUT DETAILS**

FOR

## 4 - 12' X 10' BOX CULVERT (PRECAST)

OVER EAST ELM CREEK — 5° LHF SKEW
STA. 915 + 37.00 — SEC. 28-T7N-R11E
STR. NO. 47-382-348 — NH 0034(201)73
HL-93

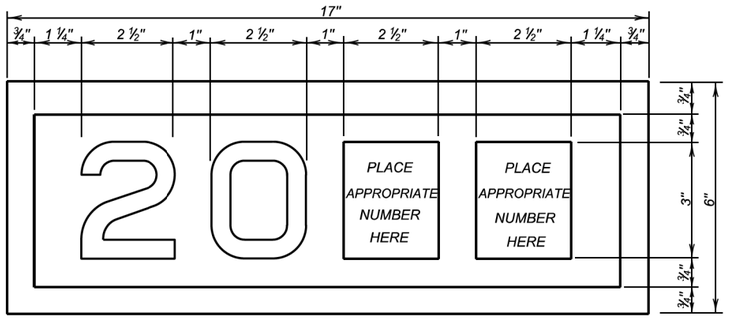
MEADE COUNTY

S. D. DEPT. OF TRANSPORTATION

JULY 2023



| DESIGNED BY | CK. DES. BY | DRAFTED BY | |
|---|---|---|---|
| PW<br>MEAD06XN | ER<br>06XNGA09 | BT | Steve A. Johnson<br>BRIDGE ENGINEER |




## 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.

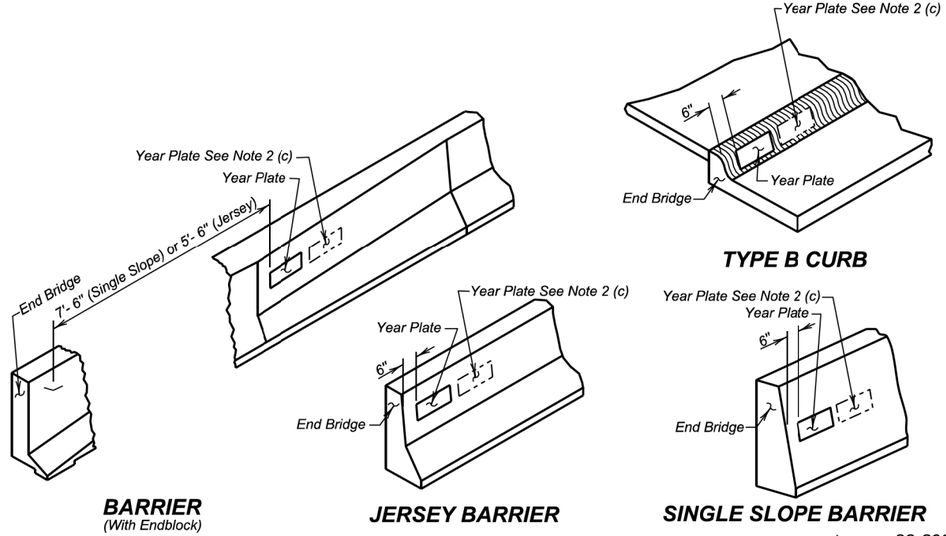
2. Year plates will be located on structure(s) as follows:

   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.

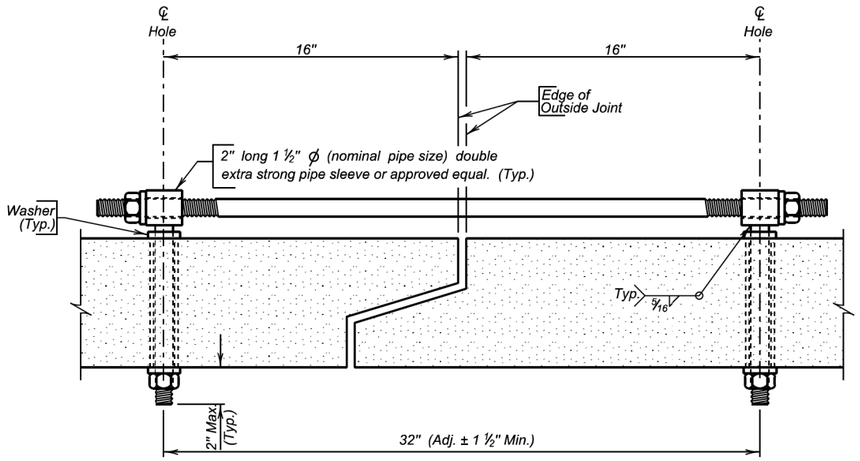
   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

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: 2024 | 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: 2024 | SDDOT | PRECAST BOX CULVERT TIE BOLT ASSEMBLY DETAILS | PLATE NUMBER 560.01 |
|---|---|---|---|
| | | | Sheet 1 of 1 |

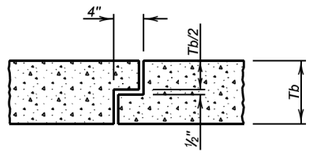
SITE 1
ALTERNATE B

4 - 12' X 10' BOX CULVERT (PRECAST)
STR. NO. 47-382-348
JULY 2023

| STATE OF | PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| S.D. | NH 0034(201)73 | E13 | E14 |

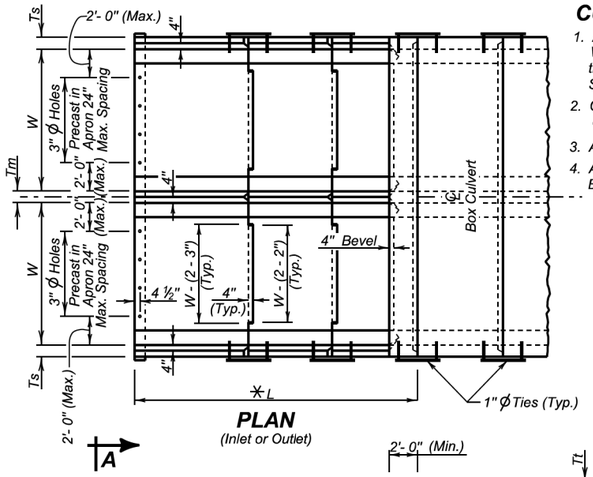
## CUTOFF WALL

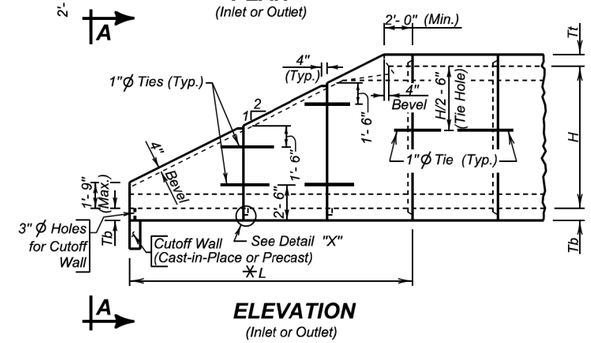
1. All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
2. Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section 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.

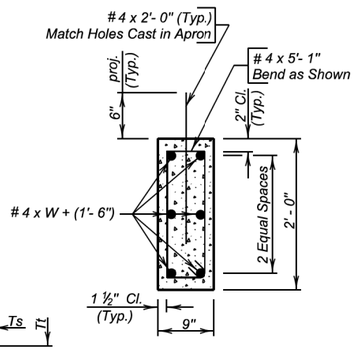



### DETAIL " X "

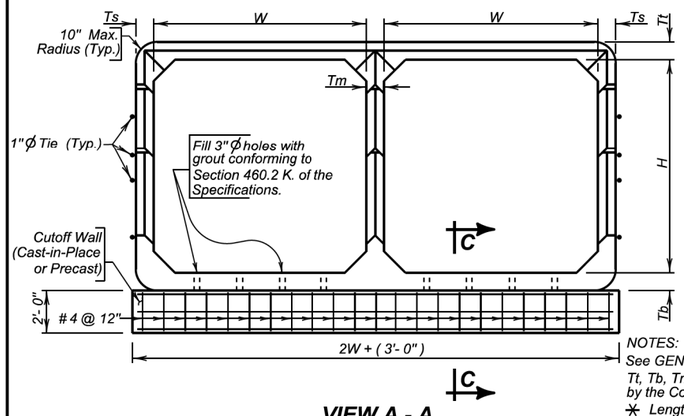
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.




### SEC. C - C




### VIEW A - A

**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

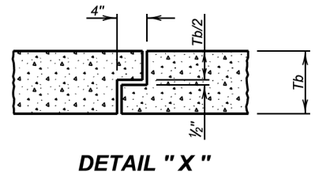
NOTES:
See GENERAL DRAWING for W and H dimensions.
Tt, Tb, Tm, L, and Ts dimensions shall be furnished by the Contractor.
⁎ Length and number of units may vary from that shown.

June 26, 2015

| Published Date: 2024 | SDDOT | PRECAST DOUBLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'–0" CUTOFF WALL | PLATE NUMBER 560.20 |
|---|---|---|---|
| | | | Sheet 1 of 1 |

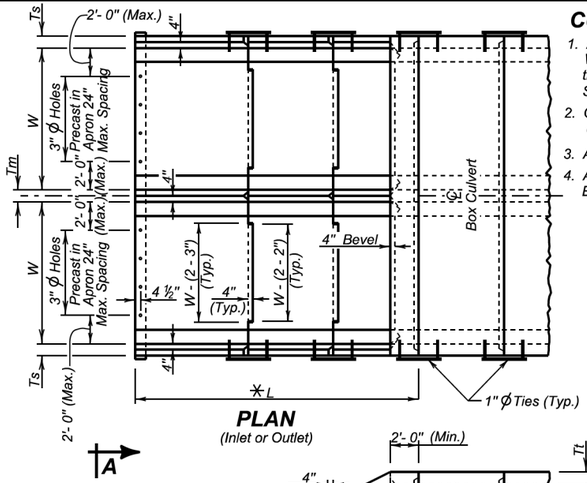
## CUTOFF WALL

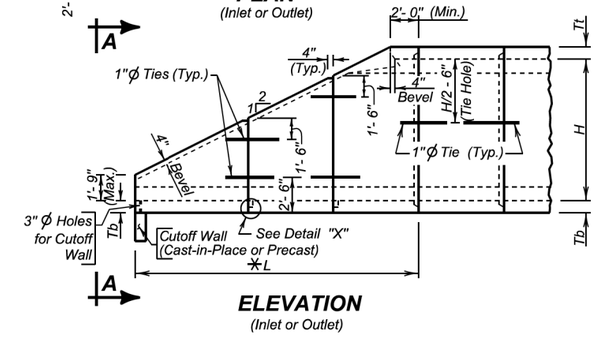
1. All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
2. Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section 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.

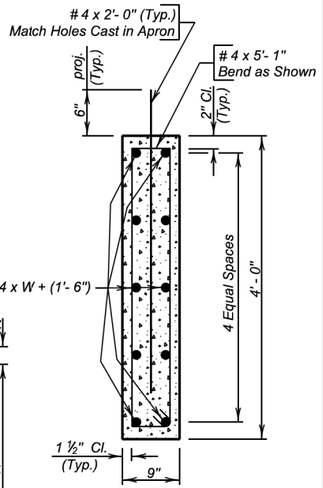



### DETAIL " X "

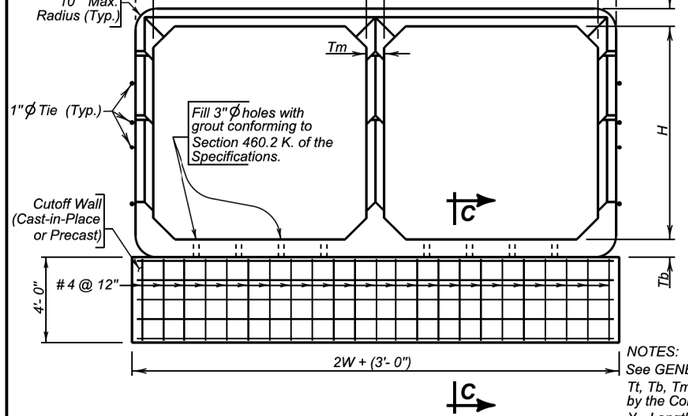
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.




### SEC. C - C




### VIEW A - A

**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

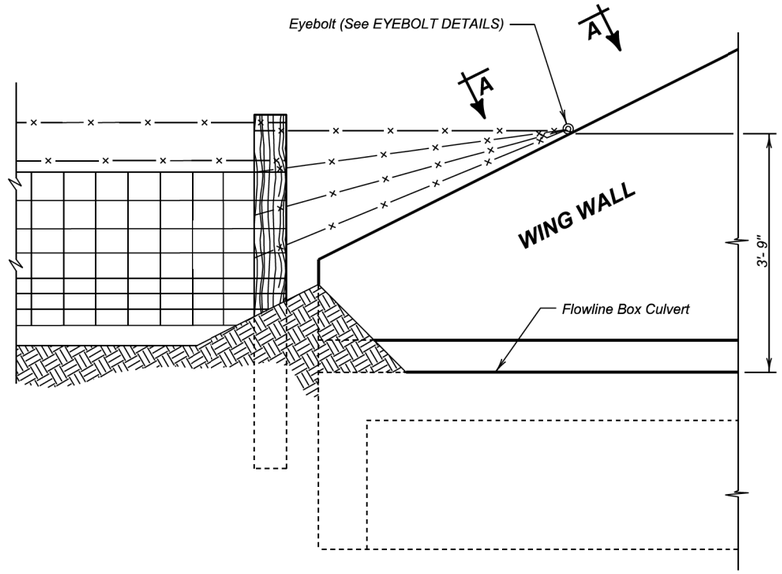
NOTES:
See GENERAL DRAWING for W and H dimensions.
Tt, Tb, Tm, L, and Ts dimensions shall be furnished by the Contractor.
⁎ Length and number of units may vary from that shown.

June 26, 2015

| Published Date: 2024 | SDDOT | PRECAST DOUBLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'–0" CUTOFF WALL | PLATE NUMBER 560.21 |
|---|---|---|---|
| | | | Sheet 1 of 1 |

SITE 1
ALTERNATE B

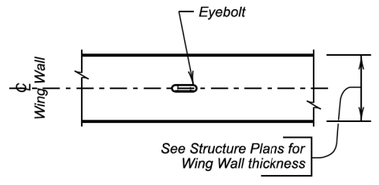
4 - 12' X 10' BOX CULVERT (PRECAST)
STR. NO. 47-382-348
JULY 2023



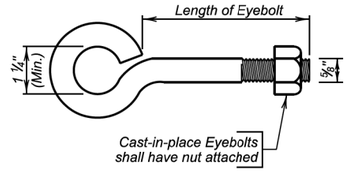

**DETAIL FOR FENCE ANCHORS**

## GENERAL NOTES:

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




**VIEW A - A**




**EYEBOLT DETAILS**

December 23,2012

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

SITE 1
ALTERNATE B

4 - 12' X 10' BOX CULVERT (PRECAST)
STR. NO. 47-382-348
JULY 2023