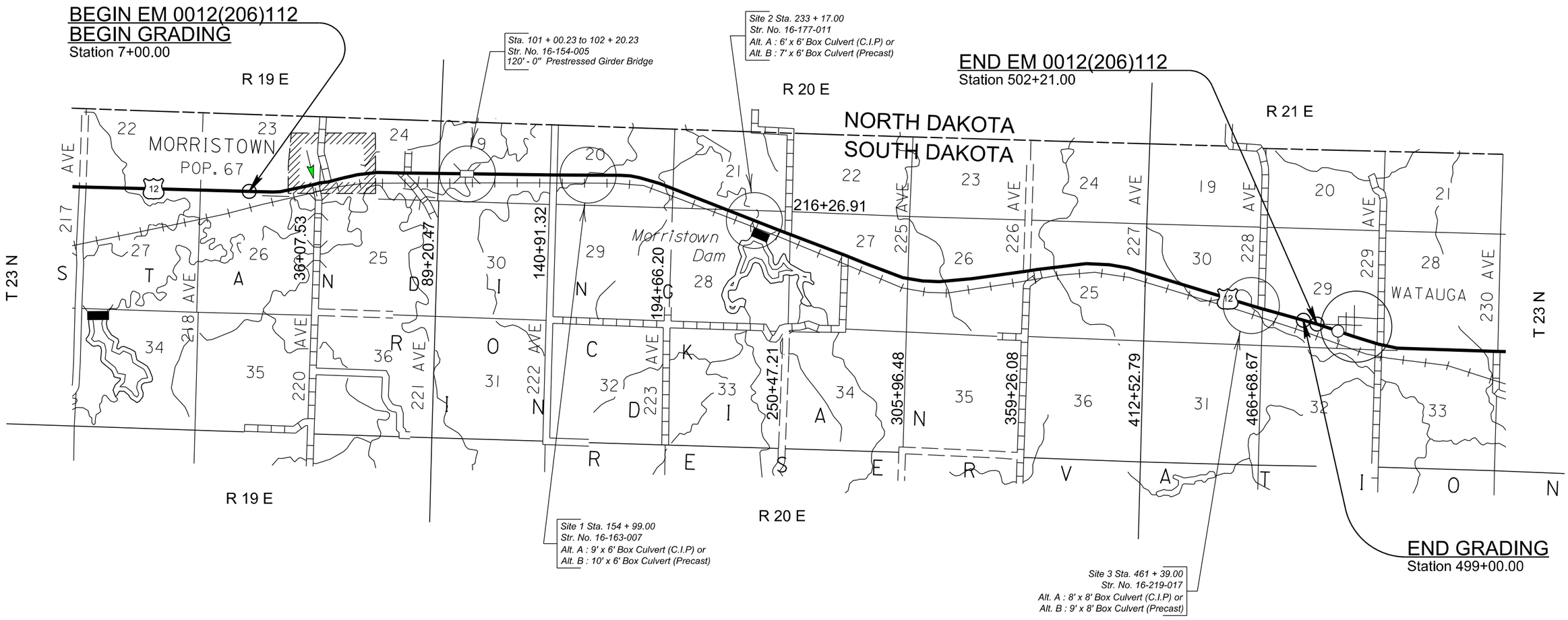
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E1	E60

Section E: Structure Plans

INDEX OF SHEETS -



SECTION E – ESTIMATE OF STRUCTURE QUANTITES

Str. No. 16-154-005

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E3310	Bridge Elevation Survey	Lump Sum	LS
009E5000	Concrete Penetrating Sealer	480.0	SqYd
120E7000	Select Granular Backfill	21.1	Ton
250E0030	Incidental Work, Structure	Lump Sum	LS
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
410E2600	Membrane Sealant Expansion Joint	75.8	Ft
420E0100	Structure Excavation, Bridge	22	CuYd
430E0200	Bridge End Embankment	2,051	CuYd
430E0300	Granular Bridge End Backfill	110.0	CuYd
430E0510	Approach Slab Underdrain Excavation	6.3	CuYd
430E0700	Precast Concrete Headwall for Drain	4	Each
460E0030	Class A45 Concrete, Bridge Deck	196.9	CuYd
460E0050	Class A45 Concrete, Bridge	35.0	CuYd
460E0150	Concrete Approach Slab for Bridge	172.3	SqYd
460E0160	Concrete Approach Sleeper Slab for Bridge	37.9	SqYd
480E0100	Reinforcing Steel	9,604	Lb
480E0200	Epoxy Coated Reinforcing Steel	1,770	Lb
480E0300	Stainless Reinforcing Steel	30,363	Lb
510E0300	Preboring Pile	180	Ft
510E3421	HP 12x74 Steel Test Pile, Furnish and Drive	235	Ft
510E3425	HP 12x74 Steel Bearing Pile, Furnish and Drive	675	Ft
510E4000	Dynamic Pile Test (during driving)	4	Each
510E4010	Dynamic Pile Test (during restrike)	4	Each
510E4050	Static Pile Load Test	2	Each
560E8072	72" Minnesota Shape Prestressed Concrete Beam	592	Ft
680E0040	4" Underdrain Pipe	179	Ft
680E2500	Porous Backfill	13.6	Ton
700E0210	Class B Riprap	2,954.4	Ton
700E1100	Overburden Excavation for Riprap	697	CuYd
831E0110	Type B Drainage Fabric	3,517	SqYd
831E1030	Perforated Geocell	604	SqFt

Site 1 – Alternate A
Str. No. 16-163-007

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	41	CuYd
421E0200	Box Culvert Undercut	165	CuYd
460E0120	Class A45 Concrete, Box Culvert	97.5	CuYd
480E0100	Reinforcing Steel	17,589	Lb
700E0210	Class B Riprap	25.7	Ton
831E0110	Type B Drainage Fabric	37	SqYd

Site 1 – Alternate B
Str. No. 16-163-007

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	44	CuYd
421E0200	Box Culvert Undercut	150	CuYd
560E0134	10'x6' Precast Concrete Box Culvert, Furnish	94.0	Ft
560E0135	10'x6' Precast Concrete Box Culvert, Install	94.0	Ft
560E1134	10'x6' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E1135	10'x6' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	27.4	Ton
831E0110	Type B Drainage Fabric	39	SqYd

Site 2 – Alternate A
Str. No. 16-177-011

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	32	CuYd
421E0200	Box Culvert Undercut	130	CuYd
460E0120	Class A45 Concrete, Box Culvert	78.1	CuYd
480E0100	Reinforcing Steel	11,221	Lb
700E0210	Class B Riprap	27.4	Ton
831E0110	Type B Drainage Fabric	39	SqYd

Site 2 – Alternate B
Str. No. 16-177-011

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	29	CuYd
421E0200	Box Culvert Undercut	113	CuYd
560E0074	7'x6' Precast Concrete Box Culvert, Furnish	84.0	Ft
560E0075	7'x6' Precast Concrete Box Culvert, Install	84.0	Ft
560E1074	7'x6' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E1075	7'x6' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	29.7	Ton
831E0110	Type B Drainage Fabric	41	SqYd

Site 3 – Alternate A
Str. No. 16-219-017

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	50	CuYd
421E0200	Box Culvert Undercut	196	CuYd
460E0120	Class A45 Concrete, Box Culvert	129.5	CuYd
480E0100	Reinforcing Steel	20,214	Lb
700E0210	Class B Riprap	35.9	Ton
831E0110	Type B Drainage Fabric	48	SqYd

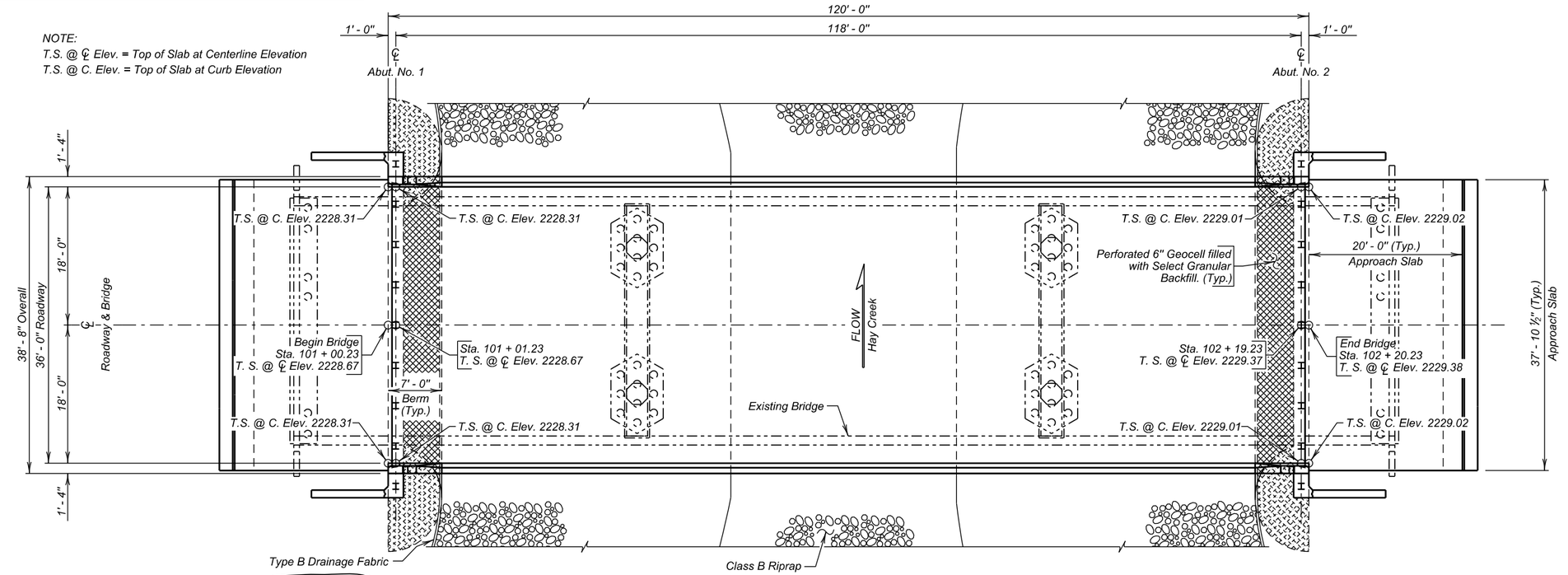
Site 3 – Alternate B
Str. No. 16-219-017

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
420E0200	Structure Excavation, Box Culvert	44	CuYd
421E0200	Box Culvert Undercut	167	CuYd
560E0116	9'x8' Precast Concrete Box Culvert, Furnish	108.0	Ft
560E0117	9'x8' Precast Concrete Box Culvert, Install	108.0	Ft
560E1116	9'x8' Precast Concrete Box Culvert End Section, Furnish	2	Each
560E1117	9'x8' Precast Concrete Box Culvert End Section, Install	2	Each
700E0210	Class B Riprap	38.5	Ton
831E0110	Type B Drainage Fabric	50	SqYd

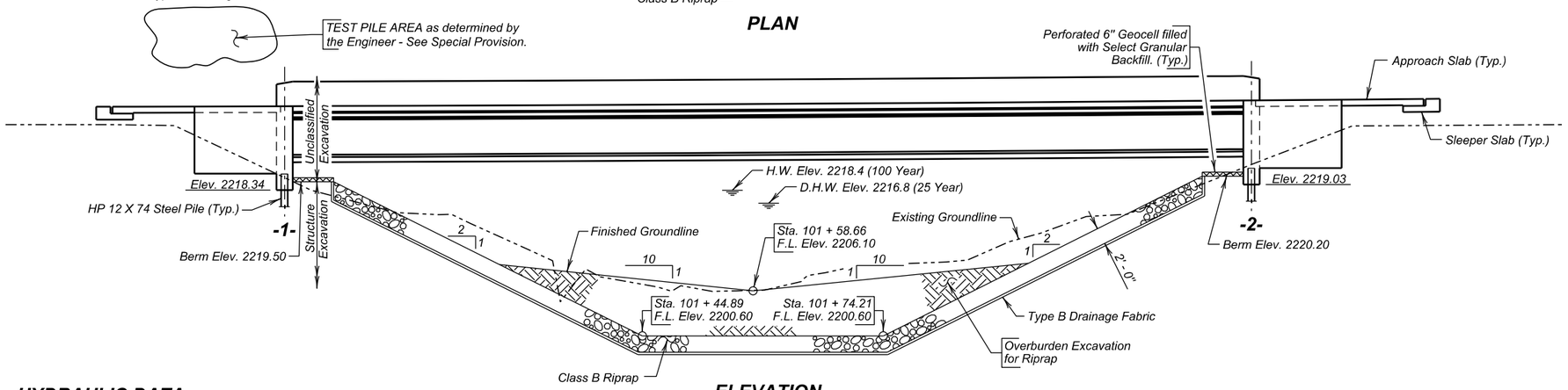
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E3	E60

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



PLAN



ELEVATION

HYDRAULIC DATA

Q_d	2546 cfs
A_d	579 sq ft
V_d	4.4 fps
Q_F	2546 cfs
Q_{100}	4520 cfs
Q_{OT}	$>Q_{500}$
V_{max}	6.3 fps

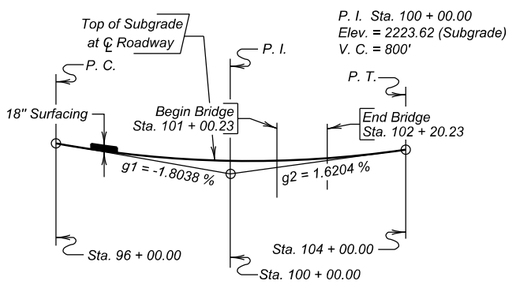
Q_d = Design discharge for the proposed bridge based on 25 year frequency. El. 2216.8.

Q_{OT} = Overtopping discharge and frequency > Q_{500} year recurrence interval. El. 2228.2 @ Sta. 100 + 21.00 ±.

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. 2218.4.

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



VERTICAL CURVE DATA

-X081-
INDEX OF BRIDGE SHEETS -

GENERAL DRAWING

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93
PCN 05HW

CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

MAY 2022

-X081-

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

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA01		

ESTIMATE OF STRUCTURE QUANTITIES

DESCRIPTION	QUANTITY	UNIT	REMARKS
Bridge Elevation Survey	Lump Sum	LS	
Concrete Penetrating Sealer	480.0	SqYd	See Special Provision
Select Granular Backfill	21.1	Ton	
Incidental Work, Structure	Lump Sum	LS	
Structural Steel, Miscellaneous	Lump Sum	LS	
Membrane Sealant Expansion Joint	75.8	Ft	
Structure Excavation, Bridge	22.4	CuYd	
Bridge End Embankment	2,051	CuYd	
Granular Bridge End Backfill	100.0	CuYd	
Approach Slab Underdrain Excavation	6.3	CuYd	
Precast Concrete Headwall for Drain	4	Each	
Class A45 Concrete, Bridge Deck	196.9	CuYd	
Class A45 Concrete, Bridge	35.0	CuYd	
Concrete Approach Slab for Bridge	172.3	SqYd	
Concrete Approach Sleeper Slab for Bridge	37.9	SqYd	
Reinforcing Steel	9,604	Lb	
Epoxy Coated Reinforcing Steel	1,770	Lb	
Stainless Reinforcing Steel	30363	Lb	See Special Provision
Preboring Pile	180	Ft	
HP 12x74 Steel Test Pile, Furnish and Drive	235	Ft	
HP 12x74 Steel Bearing Pile, Furnish and Drive	675	Ft	
Dynamic Pile Test (during driving)	4	Each	See Special Provision
Dynamic Pile Test (during restrike)	4	Each	See Special Provision
Static Pile Load Test	2	Each	See Special Provision
72" Minnesota Shape Prestressed Concrete Beam	592	Ft	
4" Underdrain Pipe	179	Ft	
Porous Backfill	13.6	Ton	
Class B Riprap	2,954.4	Ton	
Overburden Excavation for Riprap	697	CuYd	
Type B Drainage Fabric	3,517	SqYd	
Perforated Geocell	604	SqFt	

SPECIFICATIONS FOR BRIDGE

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

2. Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required provisions, supplemental specifications, and special provisions as included in the proposal.

BRIDGE DESIGN LOADING

1. AASHTO HL-93.

2. Dead Load includes 22 psf for future wearing surface on the roadway.

DESIGN MATERIAL STRENGTHS*

Concrete	f'c = 4,500 psi
Reinforcing Steel (ASTM A615, Gr. 60)	fy = 60,000 psi
Stainless Steel (ASTM A955, GR. 60)	fy = 60,000 psi
Piling (ASTM A572 Grade 50)	fy = 50,000 psi

*For prestressed beams, see notes regarding Prestressed Girders.

GENERAL CONSTRUCTION

1. All lap splices shown are contact lap splices unless noted otherwise.

2. All exposed concrete corners and edges will be chamfered 3/4" unless noted otherwise.

3. Use 2" clear cover on all reinforcing steel except as shown.

4. Contractor will imprint on the structure the date of new construction as specified and detailed on Standard Plate No. 460.02.

5. Barrier Curbs and End blocks will be built normal to the grade.

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

7. Bridge berms will be constructed to the plans template prior to any pile driving or construction of abutment footings. See Standard Plate No. 120.10 as appropriate. Berm slopes will not be disturbed after construction. Any alterations to the berm or slopes after berm construction will be submitted to the Bridge Construction Engineer for approval. Allow 30 days for review of proposals.

8. The elevation of the bridge deck is 18" above subgrade elevation.

INCIDENTAL WORK, STRUCTURE

1. In place centerline Sta. 100+87.92 to centerline Sta. 102+31.42 is a 143'-6" 3 span composite I-beam viaduct with a 30'-0" clear roadway. The superstructure consists of a reinforced concrete slab with steel railing faced with steel W beam continuous across the bridge. The deck has been overlaid with 2 inches of asphalt. The substructure consists of 2 column reinforced concrete bents and reinforced concrete sill abutments, all of which are supported on timber piling.

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

3. The foregoing is a general description of the in-place bridge and should not be construed to be complete in all details. Before preparing the bid it 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.

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

NOTICE - LEAD BASED PAINT

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

DESIGN MIX OF CONCRETE

1. All structural concrete will be Class A45 unless otherwise indicated.

2. Type II cement conforming to Section 750 is required except Type III may be used for the prestressed beams.

3. Grout design mix will be as specified in Section 460.2 K of the Specifications. A compressive strength of 2000 psi will be attained by the grout prior to erection of any beams. Chamfer edges of grout pads ¾". The quantity of grout is included in and will be paid for at the contract unit price per cubic yard for Class A45 Concrete, Bridge.

ABUTMENTS

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

2. The HP 12x74 Piling were designed using a factored bearing resistance of 137 tons per pile. Piling will develop a field verified nominal bearing resistance of 342 tons per pile.

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

4. The Contractor will have sufficient pile splice material on hand before driving is started. See Standard Plate No. 510.40.

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

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

7. Each finished abutment will include a Bridge Survey Marker. See Standard Plate No. 460.05.

ESTIMATE OF STRUCTURE QUANTITIES AND NOTES

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

STR. NO. 16-154-005

MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	SK	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA02		

ABUTMENT BACKWALL COATING

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

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

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

PRESTRESSED GIRDERS

1. Minimum concrete compressive strength f'c = 8200 psi at 28 days for all girders, f'ci = 7200 psi for all Girders.

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

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

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

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

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

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

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

9. Dead Load of girder taken as effective at transfer. Cut strands, except those extended and bent, flush with end of girder and coat end of strands with mortar.

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

SUPERSTRUCTURE

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

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

3. The concrete bridge deck must be placed and finished continuously at a minimum rate of 60 feet of deck per hour measured along Centerline Roadway. If concrete cannot be placed and finished at this rate, the Engineer will order a header installed and operations stopped. If a header is required sometime during the pour operation, its location will be at or as near as possible to the three-quarter point of the span. Notify the Bridge Construction Engineer if deck pour operations are stopped. Operations may resume only when the Engineer is satisfied that a rate of 60 feet per hour can be maintained and the concrete has attained a minimum compressive strength of 2000 psi.

4. Snap ties, if used in the barrier curb formwork, will be epoxy coated. The epoxy coating will be inert in concrete and compatible with the coating applied to the new epoxy coated reinforcing steel.

5. See Special Provision for Concrete Penetrating Sealer.

BOLT TESTING

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

FALL PROTECTION

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

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

CLASS B COMMERCIAL TEXTURE FINISH

1. A Class B commercial texture finish will be applied to the following areas:

   a. **Barrier Rail:** all exposed surfaces (front and top)

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

3. Where the Class B commercial texture finish is to be applied, concrete curing will be accomplished with cotton or burlap mats and polyethylene sheeting. Curing will continue for not less than seven days after placing concrete before the commercial texture finish is applied. The commercial texture finish will be applied in accordance with the manufacturer's recommendations. The commercial texture finish itself does not require a specific cure except for drying.

PILING DRIVING

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

   Delmag D30-32 SPI D30
   APE D30-32 APE D30-42 APE D30-52

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

3. See Special Provision for Dynamic Pile Monitoring and Static Pile Load Test.

4. The Contractor will submit a layout for static pile testing site shown on the General Drawing, including reaction piles , to be approved by the Engineer.

NOTES (CONTINUED)
FOR
120' - 0" PRESTRESSED GIRDER BRIDGE

STR. NO. 16-154-005
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	SK	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA03		

AS - BUILT ELEVATION SURVEY

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

SHOP PLANS

Shop plans will be required as specified by the Specifications.

APPROACH SLABS

1. Sleeper slab riser will be cast with the approach slab or cast after the approach slab is placed. Care will be taken to ensure the correct grade is maintained across the joint.

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

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

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

5. Concrete Approach Slab for Bridge will be paid for at the contract unit price per square yard. This payment will be full compensation for all excavation, furnishing, hauling and placing all materials including concrete, asphalt paint or 4 mil polyethylene sheeting, elastic joint sealer and reinforcing steel; for disposal of all excavated material and surplus materials and for labor, tools, equipment and any incidentals necessary to complete this item of work.

APPROACH SLAB UNDERDRAIN SYSTEM

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

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

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

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

PERFORATED GEOCELL

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

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

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

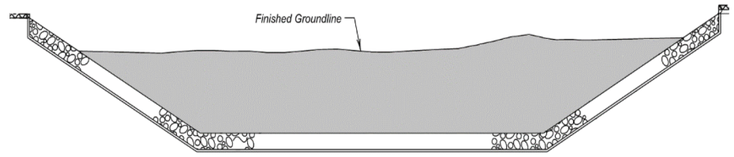
3. Perforated Geocell will be filled with the Select Granular Backfill in accordance with Section 850 of the Construction Specifications.

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

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

OVERBURDEN EXCAVATION FOR RIPRAP

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



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

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

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

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

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

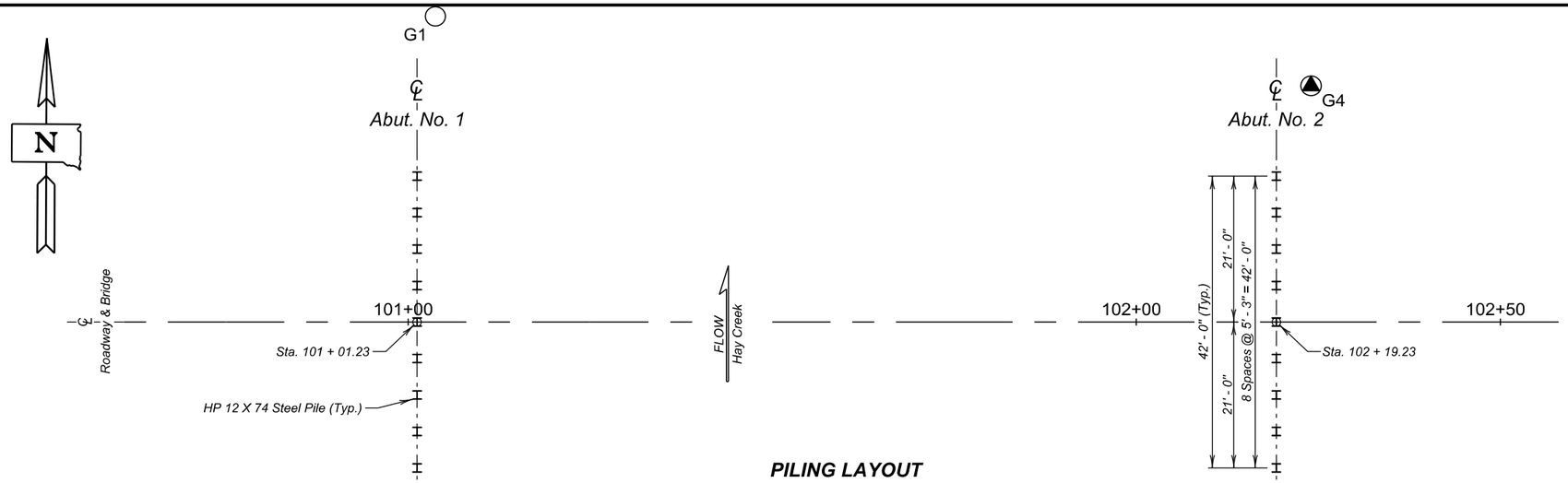
7. Before preparing the bid, it is the responsibility of the Contractor to verify existing conditions to determine if a temporary diversion method and/or dewatering will be required. If required, the Contractor must submit the temporary diversion method and/or dewatering for approval to the Construction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

NOTES (CONTINUED)
FOR
120' - 0" PRESTRESSED GIRDER BRIDGE

STR. NO. 16-154-005
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	SK	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA04		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E7	E60

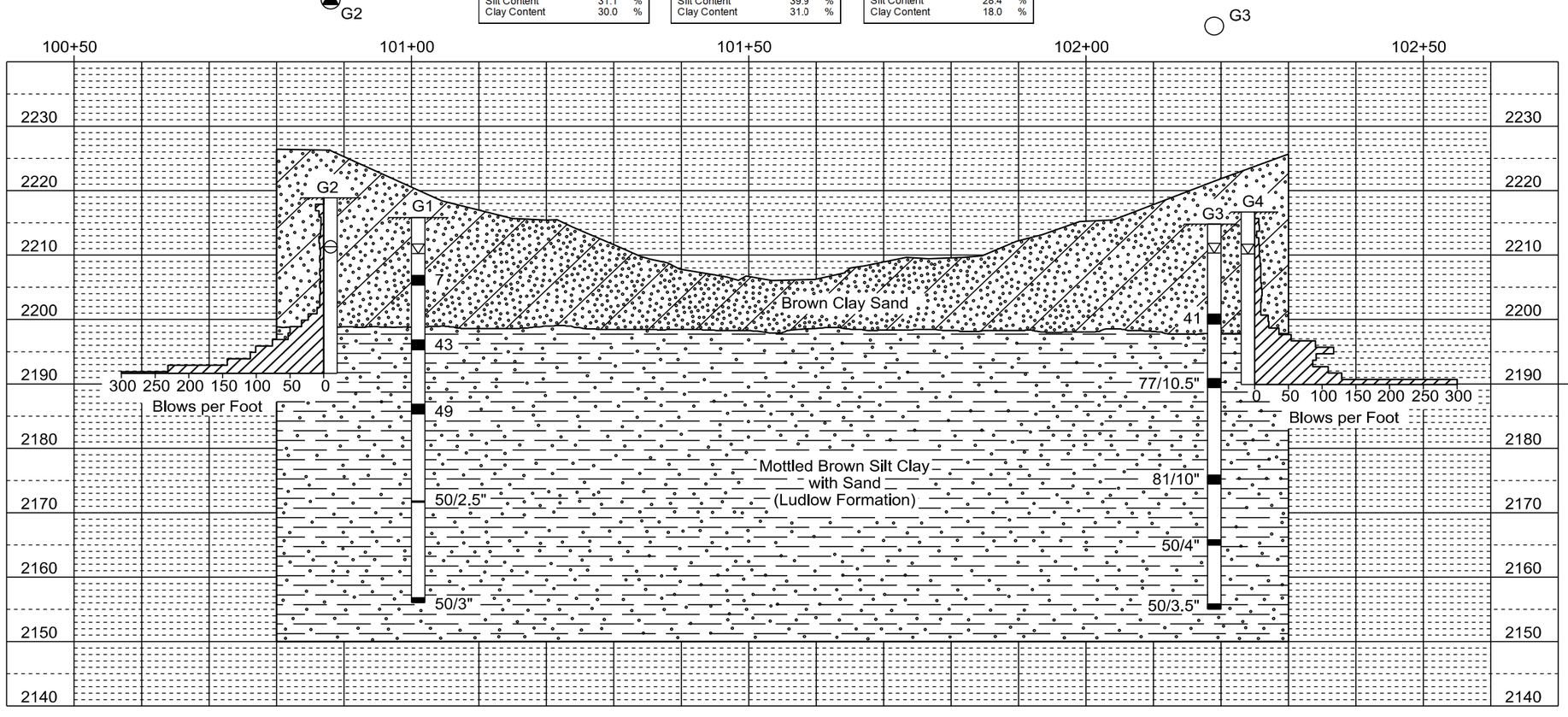


PILING LAYOUT

Hole Number	G1	
Station	101+01	
Depth	10.5	ft
Soil Color	Brown	
Classification	Clay Sand	
Strength (Qu)	941	psf
Dry Density	91.1	pcf
Wet Density	118.9	pcf
Moisture	30.5	%
Pass No. 10	100.0	%
Pass No. 40	99.2	%
Pass No. 200	61.1	%
Sand Content	38.9	%
Silt Content	31.1	%
Clay Content	30.0	%

Hole Number	G1	
Station	101+01	
Depth	30.5	ft
Soil Color	Dark Gray	
Classification	Silt Clay	
Strength (Qu)	8,129	psf
Dry Density	100.4	pcf
Wet Density	124.4	pcf
Moisture	23.9	%
Pass No. 10	100.0	%
Pass No. 40	99.9	%
Pass No. 200	70.9	%
Sand Content	29.1	%
Silt Content	39.9	%
Clay Content	31.0	%

Hole Number	G3	
Station	102+19	
Depth	40.3	ft
Soil Color	Dark Gray	
Classification	Silty Sand	
Strength (Qu)	14,730	psf
Dry Density	103.6	pcf
Wet Density	125.5	pcf
Moisture	22.0	%
Pass No. 10	100.0	%
Pass No. 40	99.9	%
Pass No. 200	46.4	%
Sand Content	53.6	%
Silt Content	28.4	%
Clay Content	18.0	%



The Ludlow Formation is a coastal deposit of loosely consolidated fine to medium grained calcareous sandstone and shale with interbedded layers of siltstone and claystone. Textural classification varies from clay-silt to sand. Colors vary from white, tan, yellow and gray. Bands of lignite may be present.

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

LEGEND

- ○ Penetration Test
- ▲ Drive Test
- ▽ Water
- ⊖ Caved
- ▮ Sample Zone

Drive tests are conducted by dropping a 490 pound hammer 30 inches to drive a 2⅞ inch drill stem to measure the resistance to penetration of the soil.

Penetration test holes are drilled with a 6⅝ inch diameter hollow stem auger. Penetration tests are conducted by dropping a 140 pound hammer 30 inches to obtain 2 inch nominal diameter samples and to measure the resistance to penetration of the soil. Penetration Test results are listed as uncorrected "N" values in blows per foot. Blows over inches are listed if refusal is achieved, which is 50 blows within one 6 inch set.

GROUNDWATER ELEVATIONS

FEBRUARY 2020

G1		2210.2
G2	(DRY)	2211.3
G3		2210.3
G4		2210.2

MEASURED SKIN FRICTION

	ELEV.	PSF
G2	2191.6	1,127
G4	2189.9	1,643

SUBSURFACE INVESTIGATION AND PILING LAYOUT

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

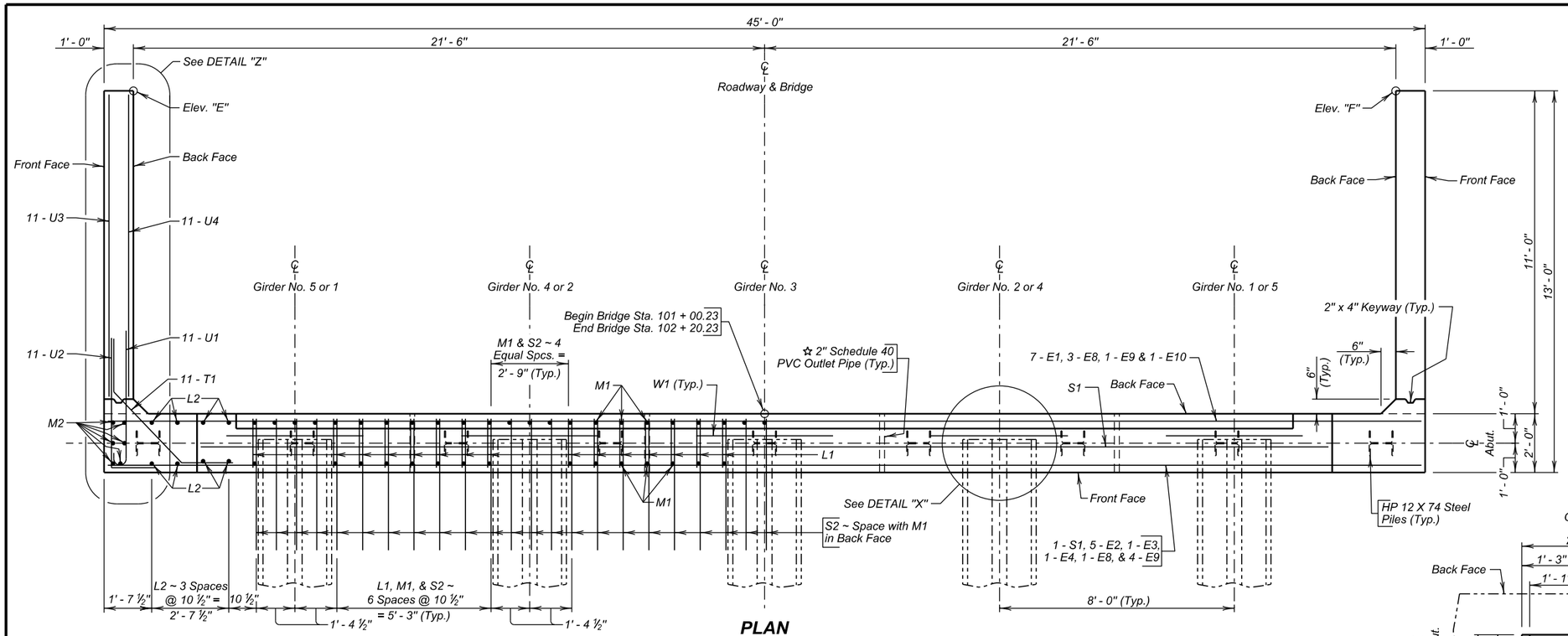
CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	HK/MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA05		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E8	E60



PLAN

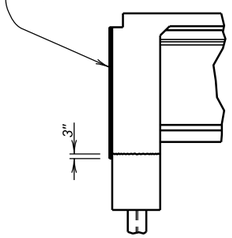
(Abut. No. 1 shown, Abut. No. 2 similar opposite hand)

☆ See APPROACH SLAB UNDERDRAIN SYSTEM notes for payment information.

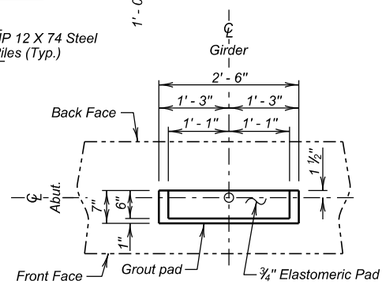
INCREASING STATIONS Abut. No. 1

INCREASING STATIONS Abut. No. 2

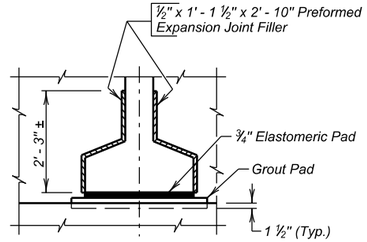
The face on the back side of the Abutment between the Abut. Wings shall be thoroughly coated with an approved waterproof sealant. (See Notes regarding Abutment Backwall Coating.)



ABUTMENT BACKWALL COATING DETAILS

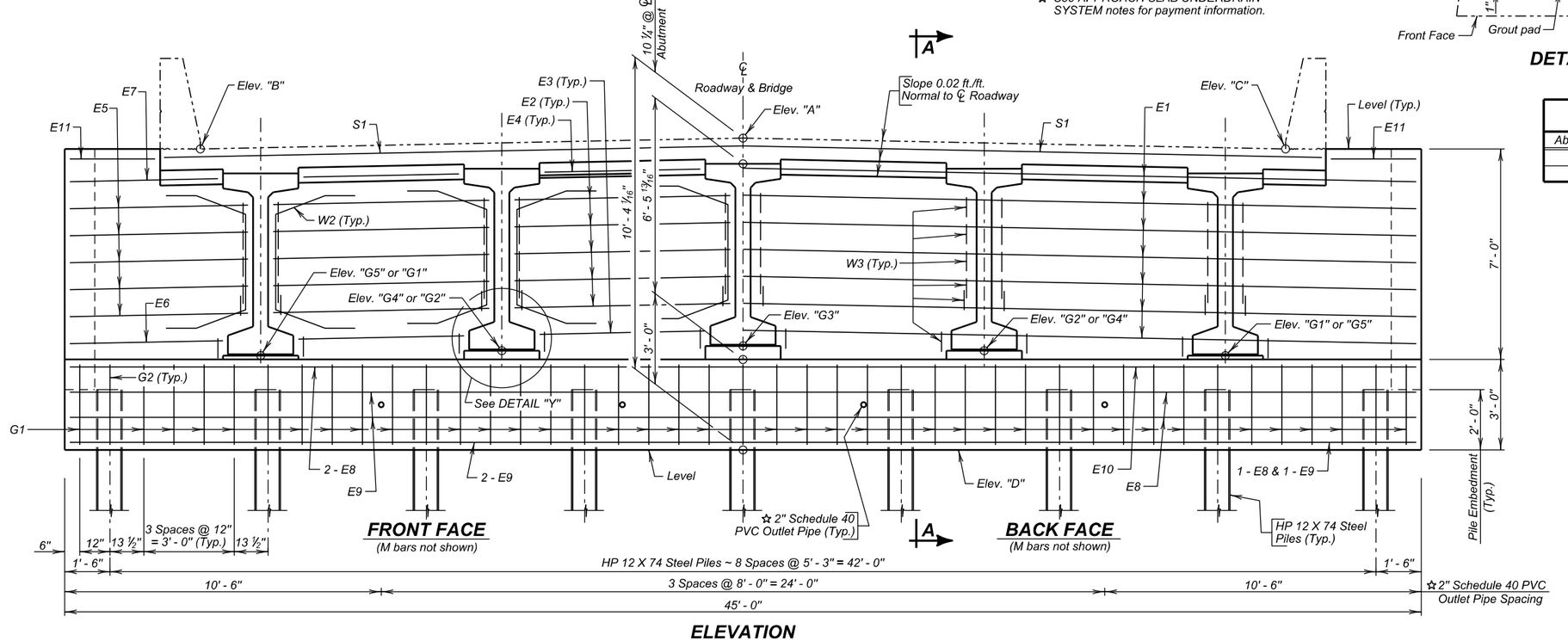


DETAIL "X"



DETAIL "Y"

(Typical at Girder Ends)



ELEVATION

(Along ℄ Abutment)

TABLE OF ELEVATIONS

Abut. No.	Elev. "A"	Elev. "B"	Elev. "C"	Elev. "D"	Elev. "E"	Elev. "F"
1	2228.67	2228.31	2228.31	2218.33	2228.54	2228.54
2	2229.37	2229.01	2229.01	2219.01	2228.80	2228.80

TABLE OF ELEVATIONS

Abut. No.	Elev. "G1"	Elev. "G2"	Elev. "G3"	Elev. "G4"	Elev. "G5"
1	2221.43	2221.59	2221.77	2221.59	2221.43
2	2222.13	2222.29	2222.45	2222.29	2222.13

NOTE - Elev. "A", "B" and "C" are top of slab at ℄ of Abutment. Elev. "E" and "F" are at top of wingwall. Elev. "G1", "G2", "G3", "G4", and "G5" are top of grout pad elevations at ℄ Abutment.
Top of Grout Pads shall be Level and Smooth.

ABUTMENT DETAILS (A)

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

CORSON COUNTY

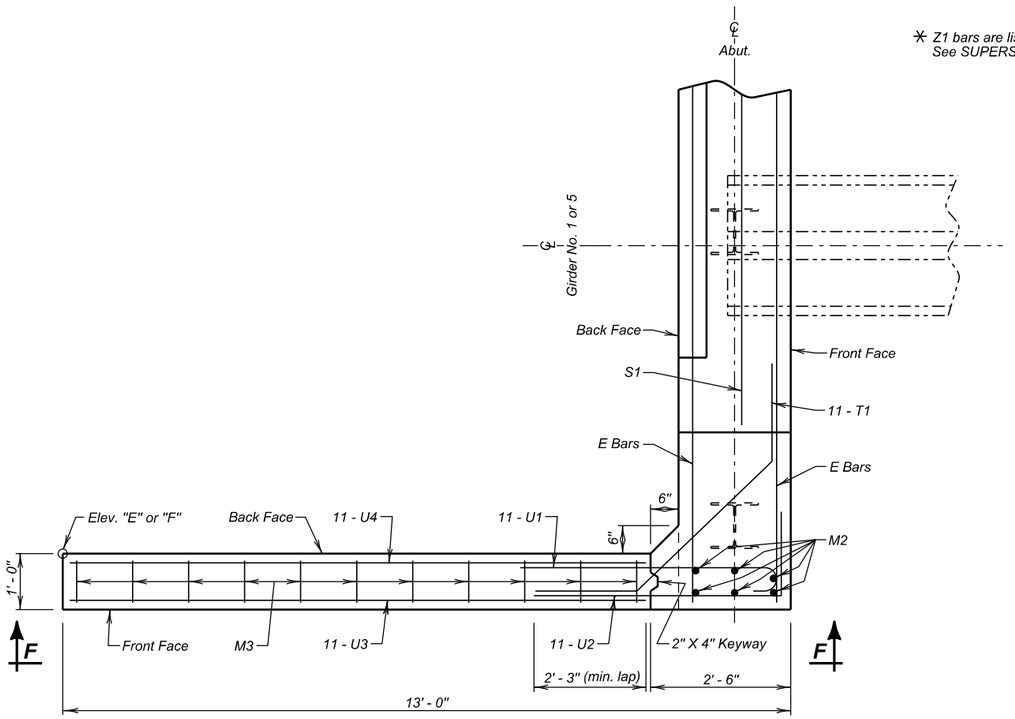
S. D. DEPT. OF TRANSPORTATION

MAY 2022

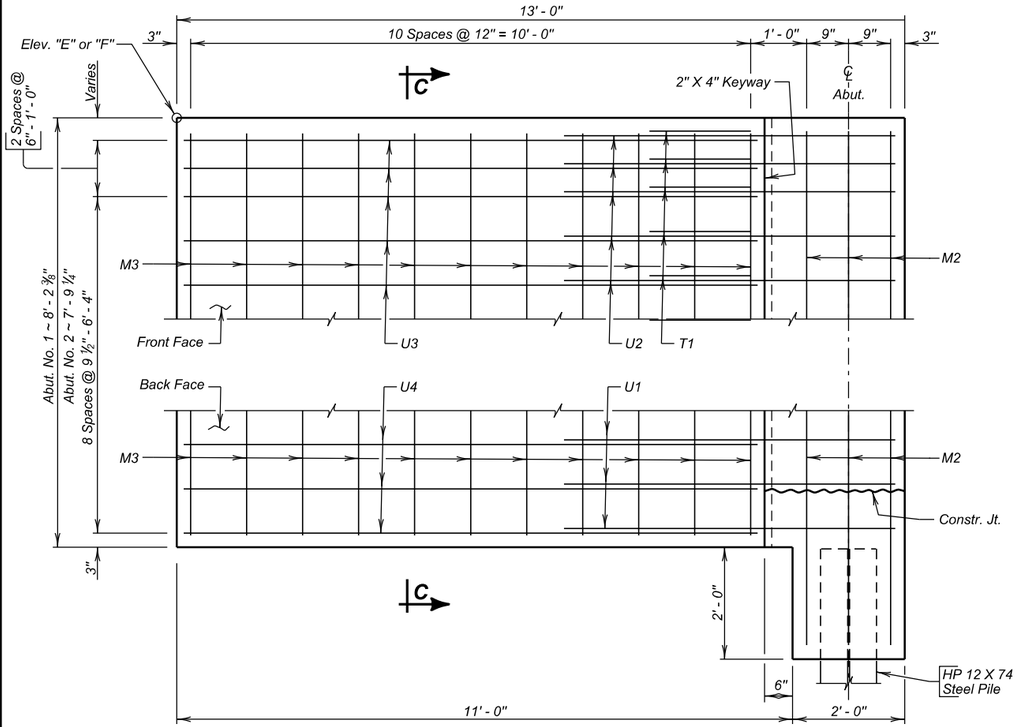
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA06		

Revised July 28, 2023 PW

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E9	E60

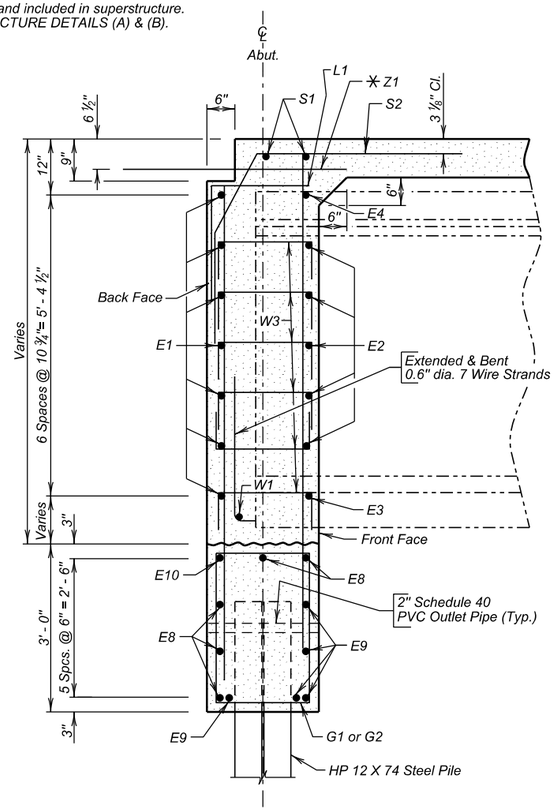


DETAIL "Z"

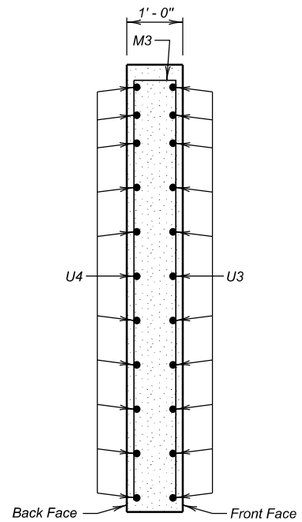


VIEW F - F

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



SECTION A - A



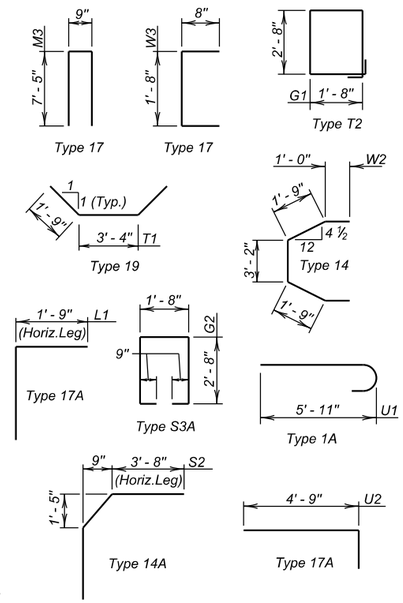
SECTION C - C

REINFORCING SCHEDULE

(For One Abutment - 2 Required)

	Mk.	No.	Size	Length	Type
	E1	7	7	44' - 8"	Str.
	E2	20	5	7' - 2"	Str.
	E3	4	5	5' - 6"	Str.
	E4	4	5	5' - 2"	Str.
	E5	10	5	5' - 11"	Str.
	E6	2	5	5' - 1"	Str.
	E7	2	5	4' - 11"	Str.
	E8	5	6	44' - 8"	Str.
	E9	5	5	44' - 8"	Str.
	E10	1	7	44' - 8"	Str.
	E11	2	5	2' - 10"	Str.
	G1	34	5	9' - 8"	T2
	G2	9	5	8' - 6"	S3A
△	L1	34	4	3' - 10"	17A
	L2	16	5	8' - 11"	Str.
	M1	75	5	8' - 10"	Str.
	M2	12	5	9' - 4"	Str.
	M3	22	5	15' - 7"	17
△	S1	2	9	38' - 5"	Str.
△	S2	45	5	7' - 3"	14A
	T1	22	6	6' - 10"	19
	U1	22	5	6' - 6"	1A
	U2	22	5	6' - 3"	17A
	U3	22	7	10' - 3"	Str.
	U4	22	5	10' - 3"	Str.
	W1	5	5	4' - 6"	Str.
	W2	10	4	8' - 8"	14
	W3	60	5	3' - 0'	17

Bending Details



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

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY Abut. No. 1	QUANTITY Abut. No. 2
	Class A45 Concrete, Bridge Deck	Cu. Yd.	20.8	20.8
ϕ	Class A45 Concrete, Bridge	Cu. Yd.	17.5	17.5
	Reinforcing Steel	Lb.	4802	4802
	Epoxy Coated Reinforcing Steel	Lb.	689	689
	Structure Excavation, Bridge	Cu. Yd.	11.2	11.2
⧫	HP 12 x 74 Steel Test Pile, Furnish and Drive	Ft.	1 @ 45'	———
⧫	HP 12 x 74 Steel Test Pile, Furnish and Drive	Ft.	1 @ 40'	———
	HP 12 x 74 Steel Test Pile, Furnish and Drive	Ft.	2 @ 50'	1 @ 50'
	HP 12 x 74 Steel Bearing Pile, Furnish and Drive	Ft.	7 @ 45' = 315'	8 @ 45' = 360'
	Preboring Pile	Ft.	9 @ 10' = 90'	9 @ 10' = 90'

ϕ Includes 0.1 cu. yds. for grout pads.
⧫ Driven in Test Pile Area adjacent to bridge.

Note: Abutment backwalls are placed and included in quantity for "Class A45 Concrete, Bridge Deck". See SUPERSTRUCTURE DETAILS (B) sheet for details.

Abutment wingwalls shall be cast after the deck has been poured and will be included in quantity for "Class A45 Concrete, Bridge".

Note: Concrete will be placed in the space under the beams (within the backwall width) during the pour. Care will be taken to get the concrete vibrated into this area. If upon form removal the space is not completely filled and consolidated, the contractor will grout the remaining voids.

ABUTMENT DETAILS (B)

FOR

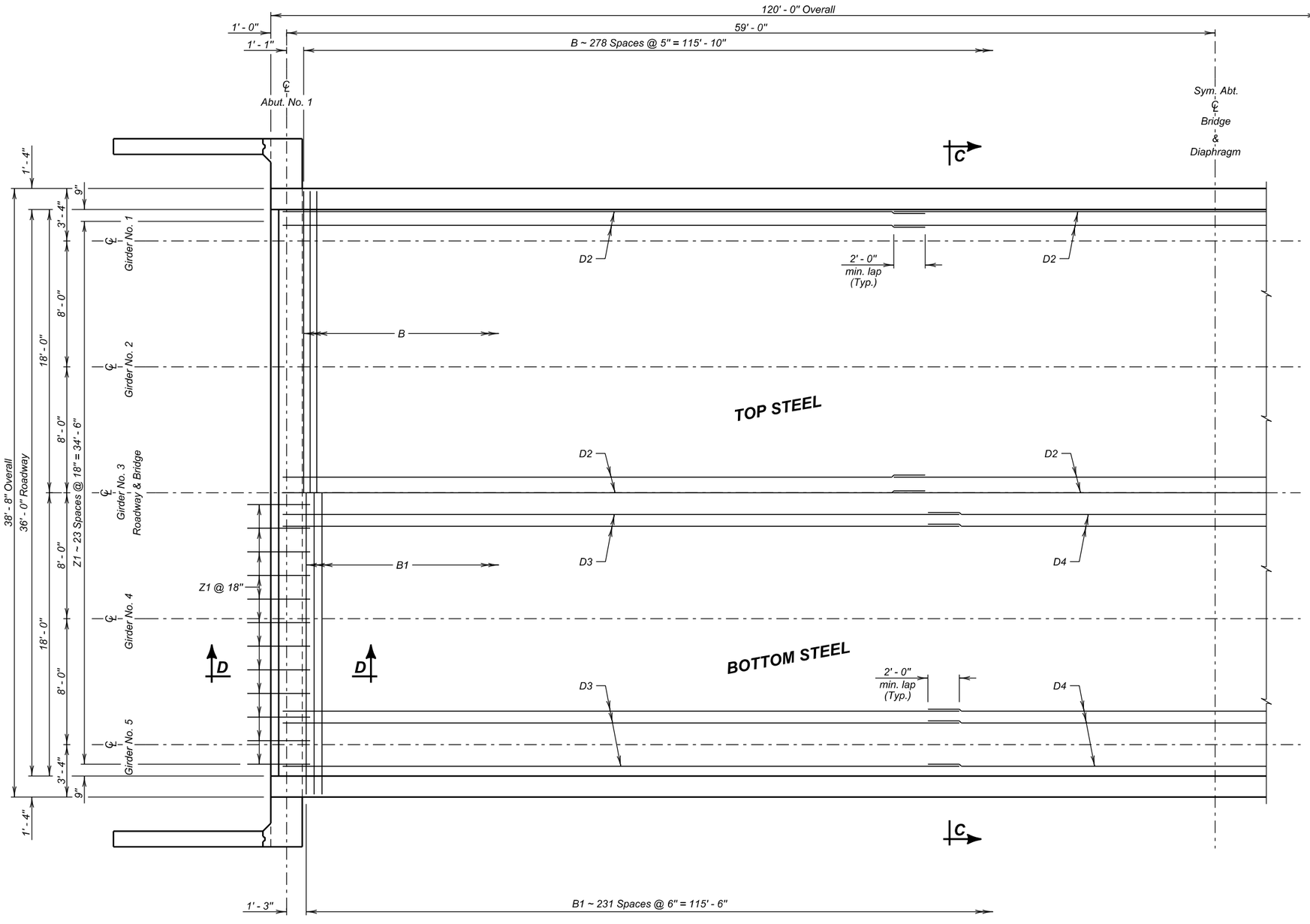
120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

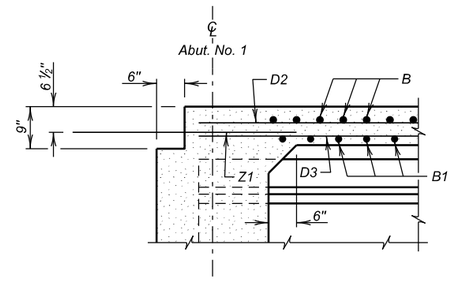
CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA07		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E10	E60



HALF PLAN



SECTION D - D

SUPERSTRUCTURE DETAILS (A)

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY	0° SKEW
OVER HAY CREEK	SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23	EM 0012(206)112
STR. NO. 16-154-005	HL-93

CORSON COUNTY

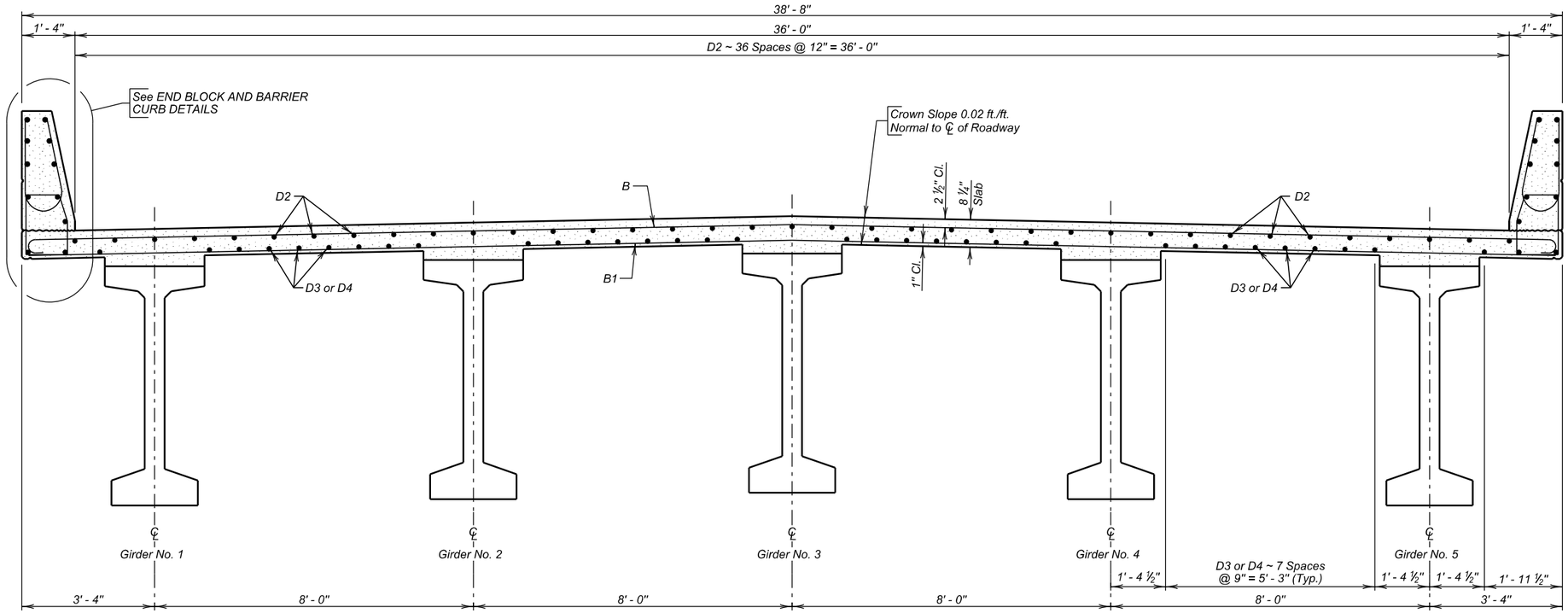
S. D. DEPT. OF TRANSPORTATION

MAY 2022

8 OF 22

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA08		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E11	E60



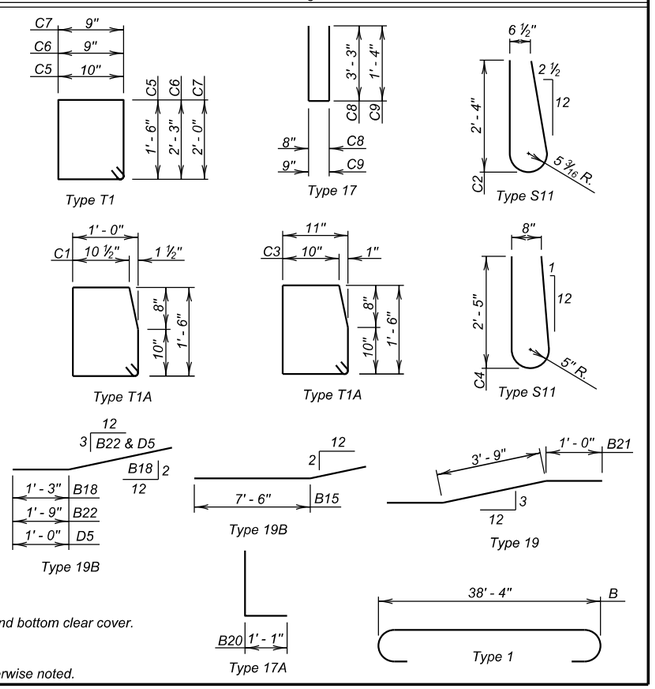
SECTION C - C

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

REINFORCING SCHEDULE

	Mk.	No.	Size	Length	Type
⊄	B	279	5	39' - 6"	1
	B1	232	4	38' - 4"	Str.
	B15	12	5	9' - 6"	19B
	B16	12	4	53' - 7"	Str.
✳	B17	8	4	5' - 8"	Str.
	B18	12	8	3' - 0"	19B
	B19	12	5	2' - 0"	Str.
	B20	12	6	3' - 6"	17A
	B21	4	4	5' - 9"	19
	B22	4	4	3' - 3"	19B
	C1	218	5	5' - 10"	T1A
	C2	222	5	5' - 3"	S11
	C3	4	5	5' - 8"	T1A
	C4	8	5	5' - 3"	S11
	C5	8	5	5' - 7"	T1
	C6	12	6	7' - 4"	T1
	C7	12	5	6' - 5"	T1
	C8	4	6	7' - 3"	17
	C9	4	5	3' - 5"	17
	D	12	4	40' - 4"	Str.
	D0	12	5	41' - 3"	Str.
	D1	24	4	53' - 7"	Str.
	D2	111	5	40' - 10"	Str.
	D3	68	4	43' - 0"	Str.
	D4	34	4	36' - 6"	Str.
	D5	4	4	2' - 6"	19B
ϕ	Z1	48	7	4' - 0"	Str.

Bending Details



NOTES-

✳ Bend in field as necessary to fit.
⊄ Tip bars as required to maintain top and bottom clear cover.
ϕ Bars to be epoxy coated.
All dimensions are out to out of bars.
All bars to be stainless steel unless otherwise noted.

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
☆	Class A45 Concrete, Bridge Deck	Cu.Yd.	155.3
	Stainless Reinforcing Steel	Lb.	30363
	Epoxy Coated Reinforcing Steel	Lb.	392
	72" Minnesota Shape Prestressed Concrete Beam	Ft.	592
	Concrete Penetrating Sealer	Sq.Yd.	480.0

☆ Includes quantities for Barrier Curbs, Slab, and Haunch . (Average depth of 2" used for Haunch Quantity.) Concrete Quantity for Barrier Curbs is 0.1184 Cu. Yd. per foot and for End blocks is 0.7184 Cu.Yd. each.

SUPERSTRUCTURE DETAILS (B)

FOR

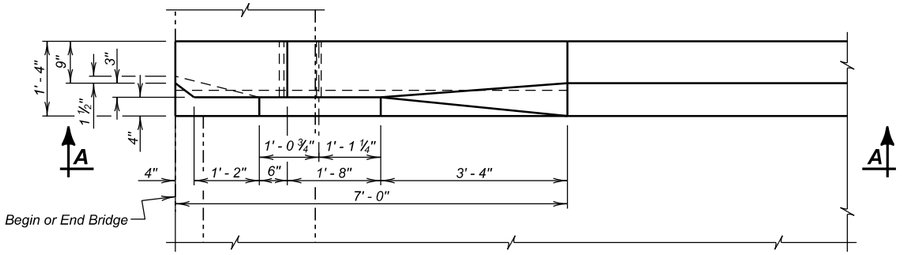
120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

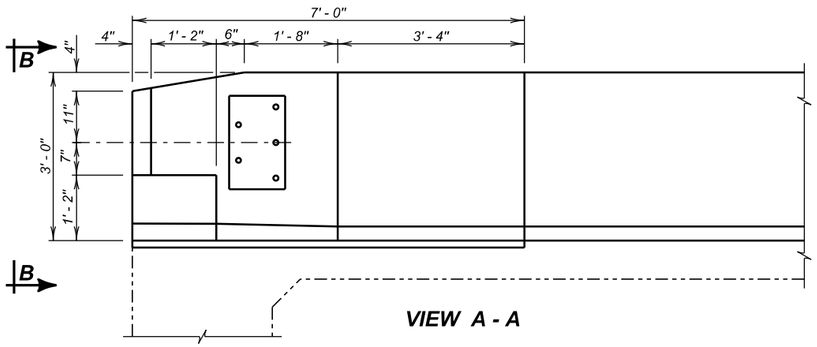
CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	BRIDGE ENGINEER
CORS05HW	05HWGA09		

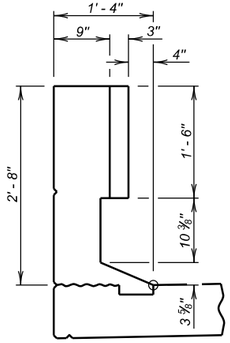
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E12	E60



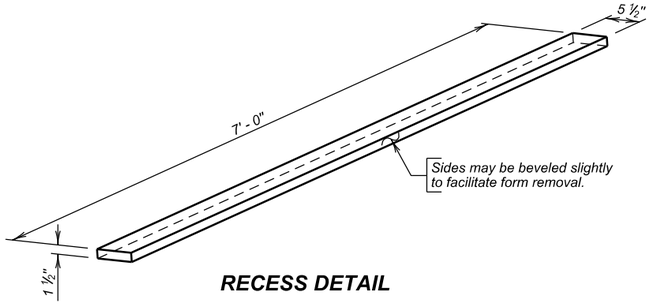
PART PLAN



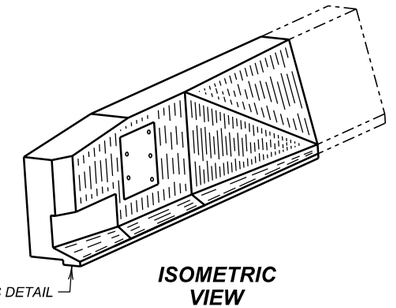
VIEW A - A



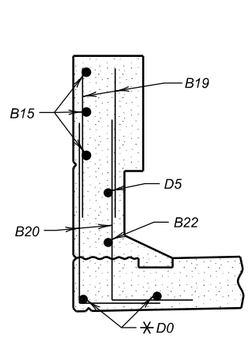
VIEW B - B



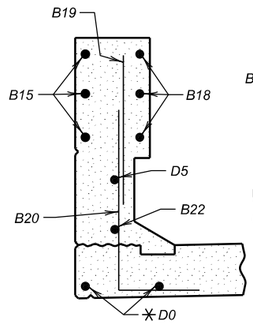
RECESS DETAIL



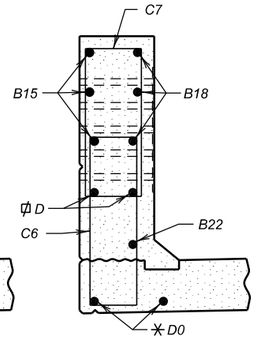
ISOMETRIC VIEW



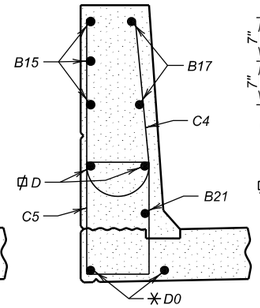
SECTION C - C



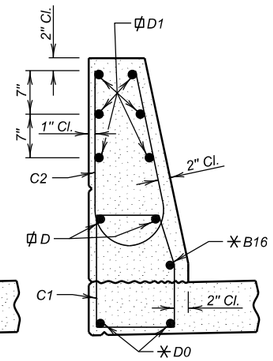
SECTION D - D



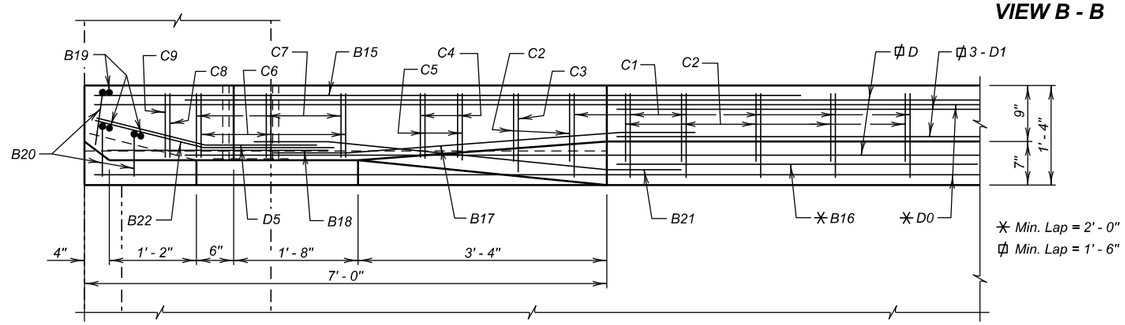
SECTION E - E



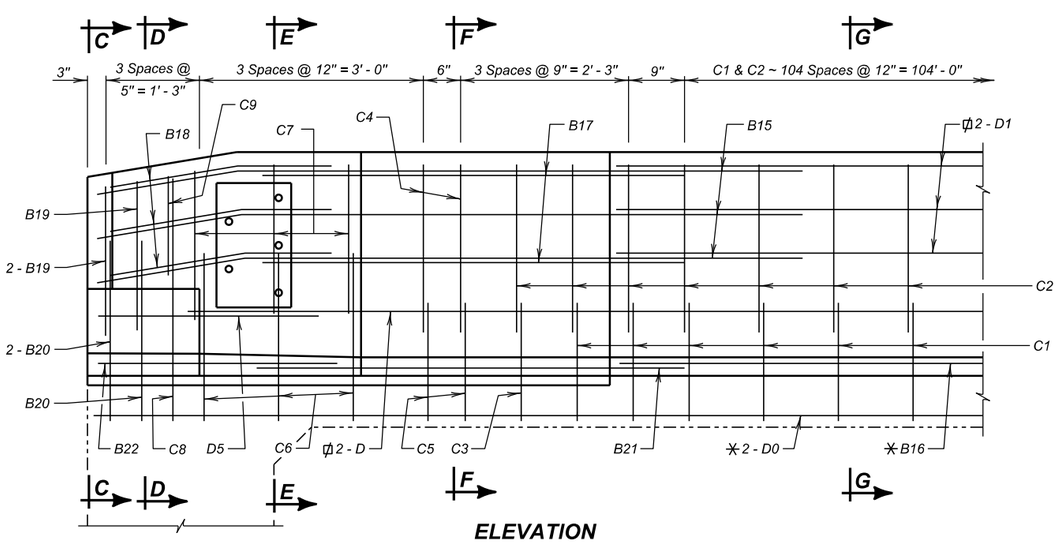
SECTION F - F



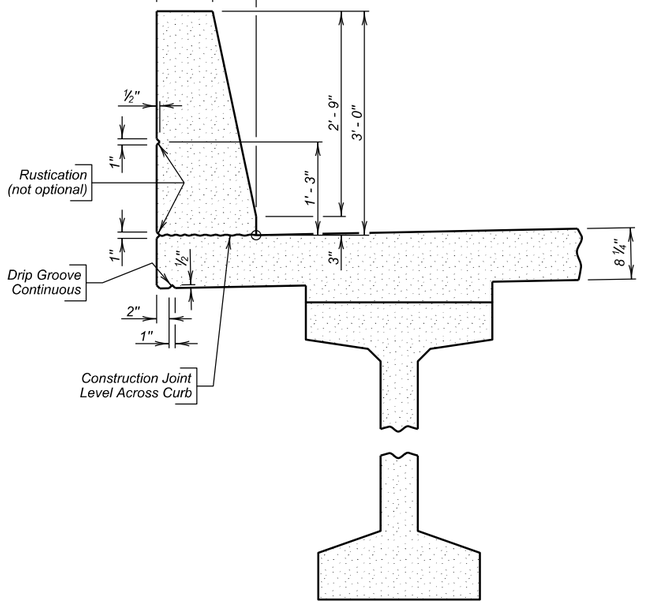
SECTION G - G



PLAN



ELEVATION



BARRIER DETAILS

ENDBLOCK AND BARRIER CURB DETAILS

FOR

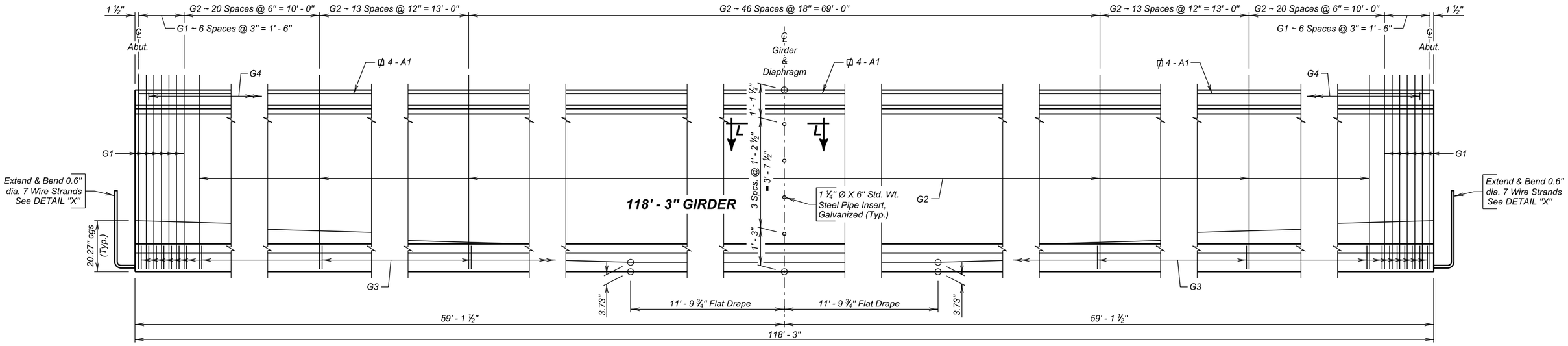
120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

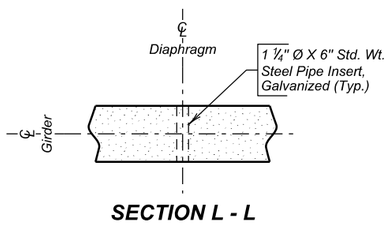
CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A. Johnson BRIDGE ENGINEER
CORS05HW	05HWGA10		

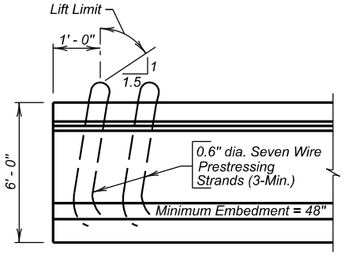
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E13	E60



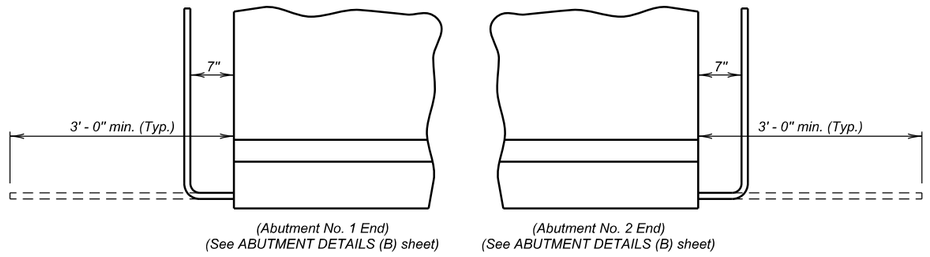
ELEVATION



SECTION L - L



TYPICAL LIFTING DEVICE

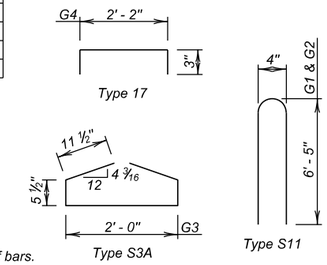


DETAIL "X"

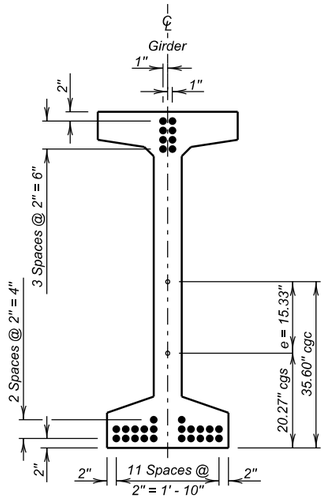
℄ Min. Lap = 3' - 0"

REINFORCING SCHEDULE
(For One Girder)

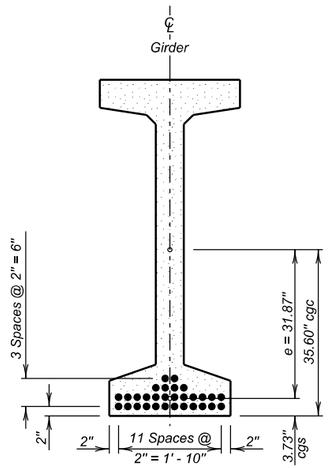
Mk.	No.	Size	Length	Type	Bending Details
A1	12	7	41' - 4"	Str.	
△ G1	14	5	13' - 0"	S11	
△ G2	111	4	13' - 0"	S11	
G3	125	4	4' - 10"	S3A	
G4	63	4	2' - 8"	17	



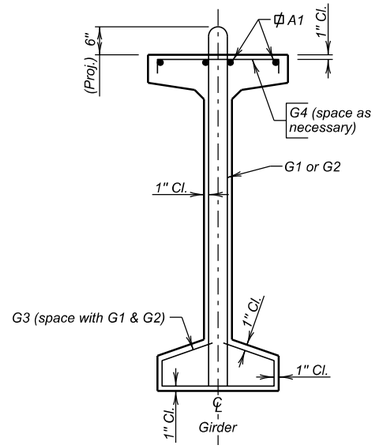
NOTES:
All dimensions are out to out of bars.
△ Bars to be Epoxy Coated.



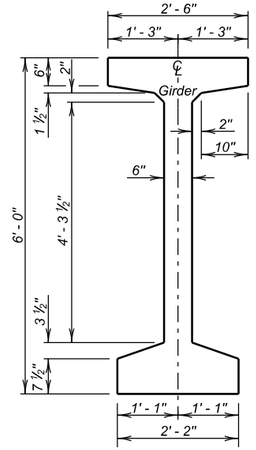
END VIEW



℄ SECTION



STIRRUP DETAILS



TYPE 72 GIRDER

118' - 3" GIRDERS
(30 ~ 0.6 Dia. Type 270 Low Lax. Strands)

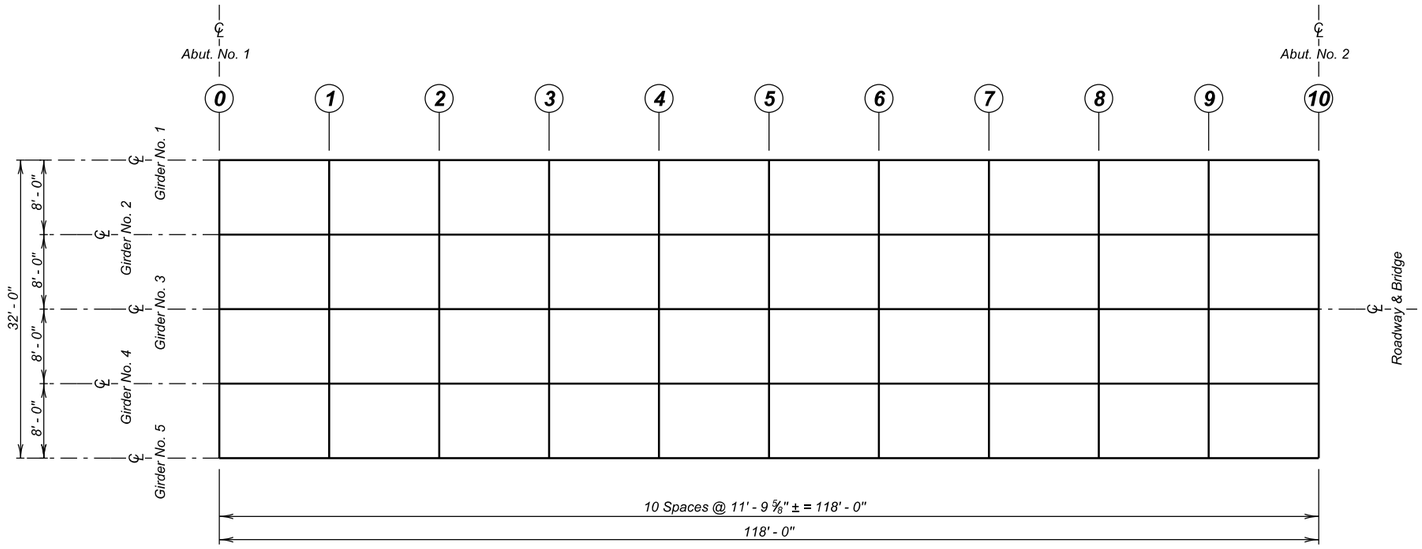
118' - 3" GIRDER DETAILS
FOR
120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

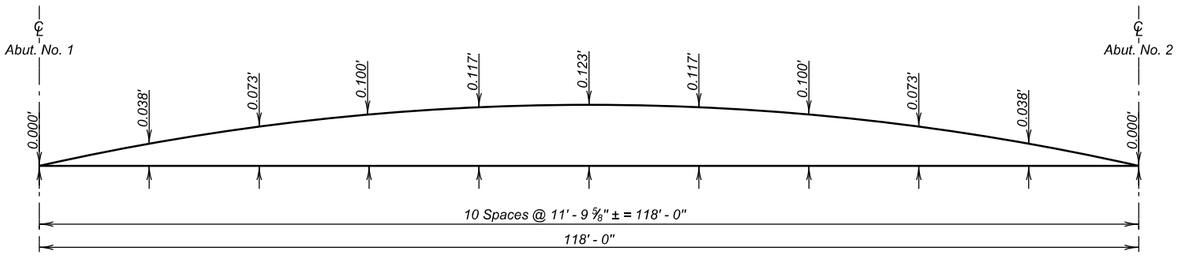
CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA11		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E14	E60



GIRDER LAYOUT

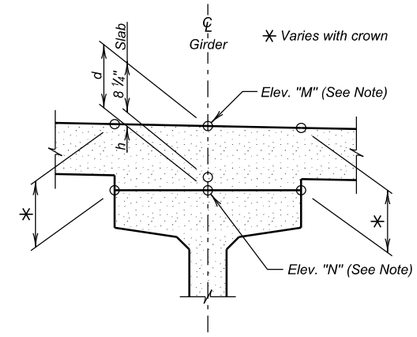


CAMBER DIAGRAM

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

TABLE OF SLAB FORM ELEVATIONS AND CALCULATIONS

		0	1	2	3	4	5	6	7	8	9	10
Girder No. 1	Elev. "M"	2228.351	2228.395	2228.444	2228.499	2228.561	2228.628	2228.701	2228.780	2228.865	2228.956	2229.053
	(-) Elev. "N"											
	(=) d											
	(-) 0.688											
	(=) h											
Girder No. 2	Elev. "M"	2228.511	2228.555	2228.604	2228.659	2228.721	2228.788	2228.861	2228.940	2229.025	2229.116	2229.213
	(-) Elev. "N"											
	(=) d											
	(-) 0.688											
	(=) h											
Girder No. 3	Elev. "M"	2228.671	2228.715	2228.764	2228.819	2228.881	2228.948	2229.021	2229.100	2229.185	2229.276	2229.373
	(-) Elev. "N"											
	(=) d											
	(-) 0.688											
	(=) h											
Girder No. 4	Elev. "M"	2228.511	2228.555	2228.604	2228.659	2228.721	2228.788	2228.861	2228.940	2229.025	2229.116	2229.213
	(-) Elev. "N"											
	(=) d											
	(-) 0.688											
	(=) h											
Girder No. 5	Elev. "M"	2228.351	2228.395	2228.444	2228.499	2228.561	2228.628	2228.701	2228.780	2228.865	2228.956	2229.053
	(-) Elev. "N"											
	(=) d											
	(-) 0.688											
	(=) h											



NOTE –

Based on a "d" of 10 ¼" at the ℄ of each abutment and, it is anticipated that the midspan haunch dimension "h" over the ℄ of each girder will be 1 ½". If when computing the dimensions in the table, it is found that any dimension "h" is less than zero or greater than 4" the Office of Bridge Design of the South Dakota Dept. of Transportation will be notified immediately. After the "Table of Slab Form Elevations and Calculations" has been completely filled out and approved for deck forming, a copy will be forwarded to the Office of Bridge Design for review and analysis for the purpose of securing information relative to camber growth in the beams. This information is necessary for preparing plans for future structures of this type.

NOTE –

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

ERECTION DATA AND SLAB FORM ELEVATIONS

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW

OVER HAY CREEK — SEC. 19-T23N-R20E

STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112

STR. NO. 16-154-005 — HL-93

CORSON COUNTY

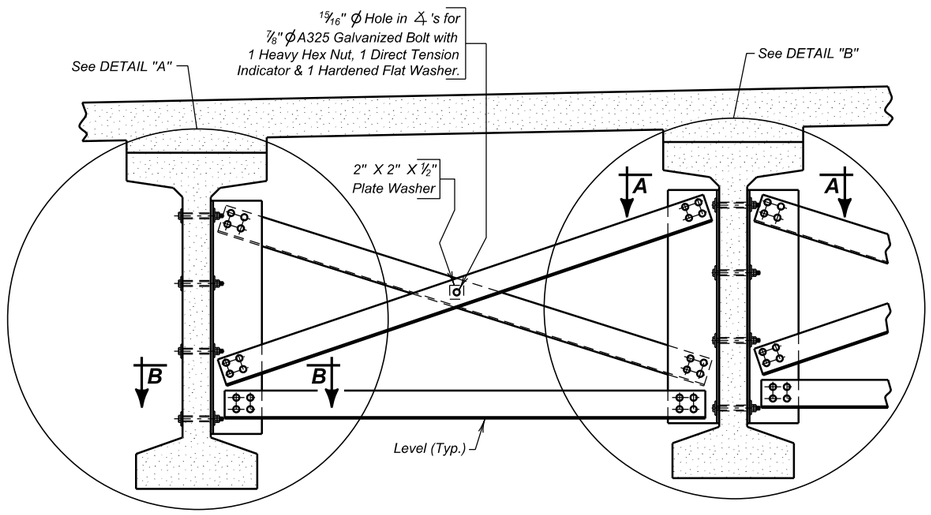
S. D. DEPT. OF TRANSPORTATION

MAY 2022

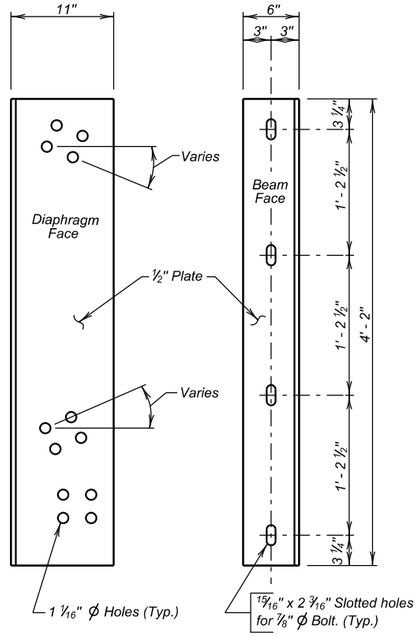
12 OF 22

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA12		

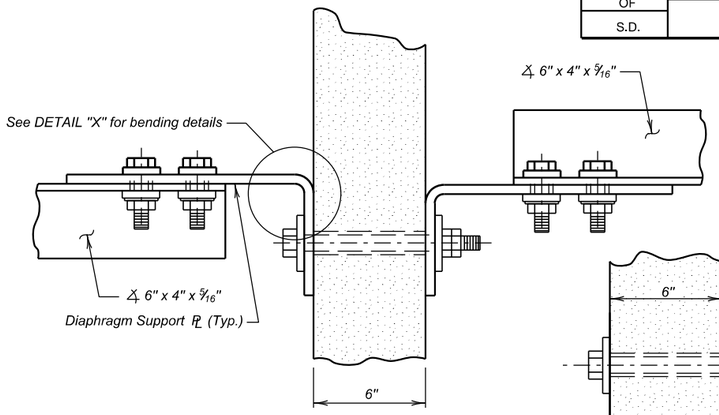
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E15	E60



SECTION AT DIAPHRAGM



DIAPHRAGM SUPPORT PLATE



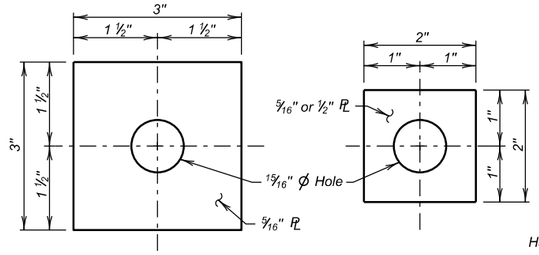
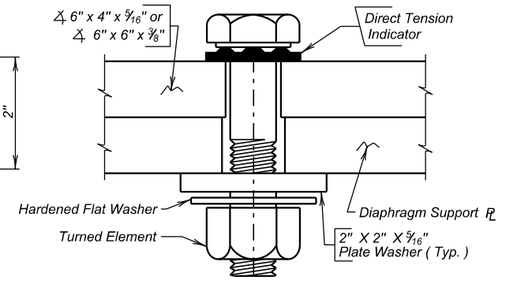


PLATE WASHER DETAILS



DIRECT TENSION INDICATOR DETAIL

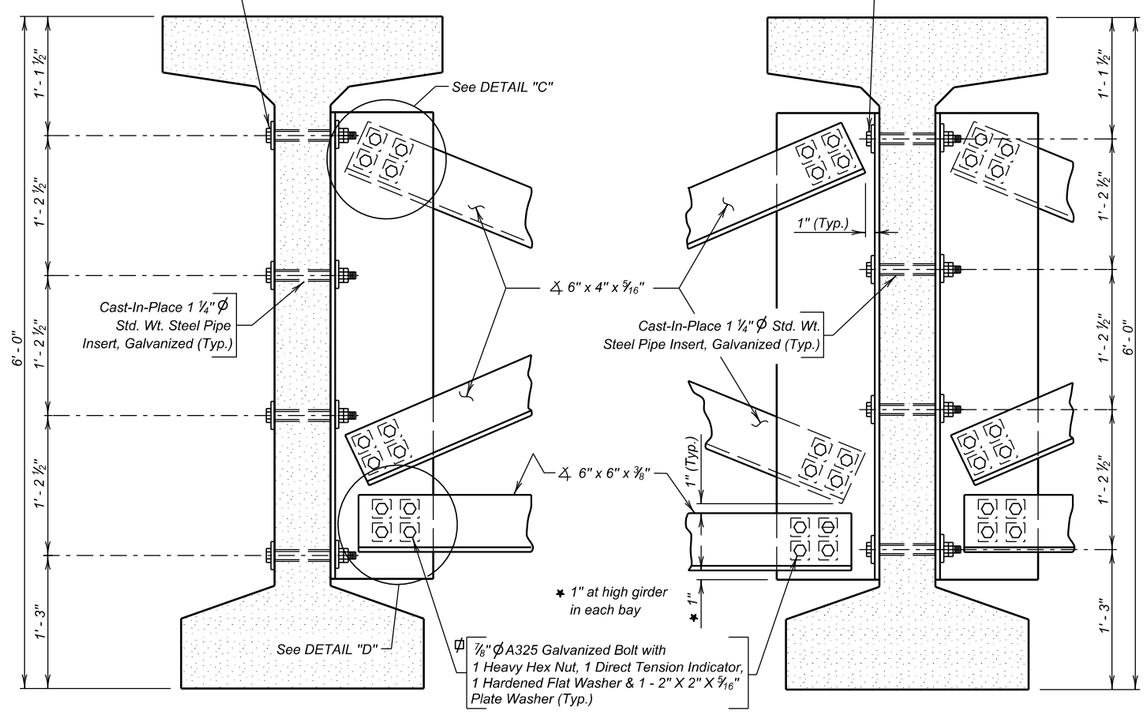
NOTES:

1. All steel for the diaphragms including plate washers will conform to ASTM A36 and will be galvanized in accordance with ASTM A123 or A153. Bolts, nuts, and washers will be galvanized in accordance with ASTM F2329. Direct Tension Indicators will conform to Section 410.30.56 of the Specifications.
2. The steel diaphragms between adjacent girders will be installed as soon as possible and in conjunction with girder erection.
3. All costs associated with furnishing, fabricating, assembly and installation of diaphragms will be included in the lump sum price for Structural Steel, Miscellaneous.

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

△ For informational purposes only, the estimated weight of structural steel is 2248 Lbs. for 4 diaphragms.

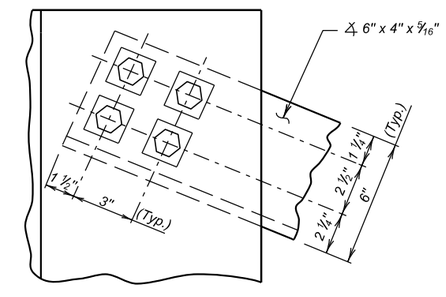
✳ Bolt Head shall be adjacent to the Exterior Face of the Exterior Girder.



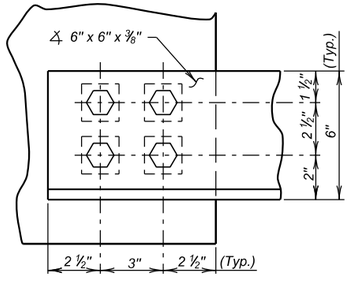
DETAIL "A"
(Typ. Exterior Girder)

⍁ Bolt Head and Hardened Flat Washer shall be adjacent to 15/16" ϕ holes in △'s.

DETAIL "B"
(Typ. Interior Girder)



DETAIL "C"



DETAIL "D"

DIAPHRAGM DETAILS
FOR
120' - 0" PRESTRESSED GIRDER BRIDGE

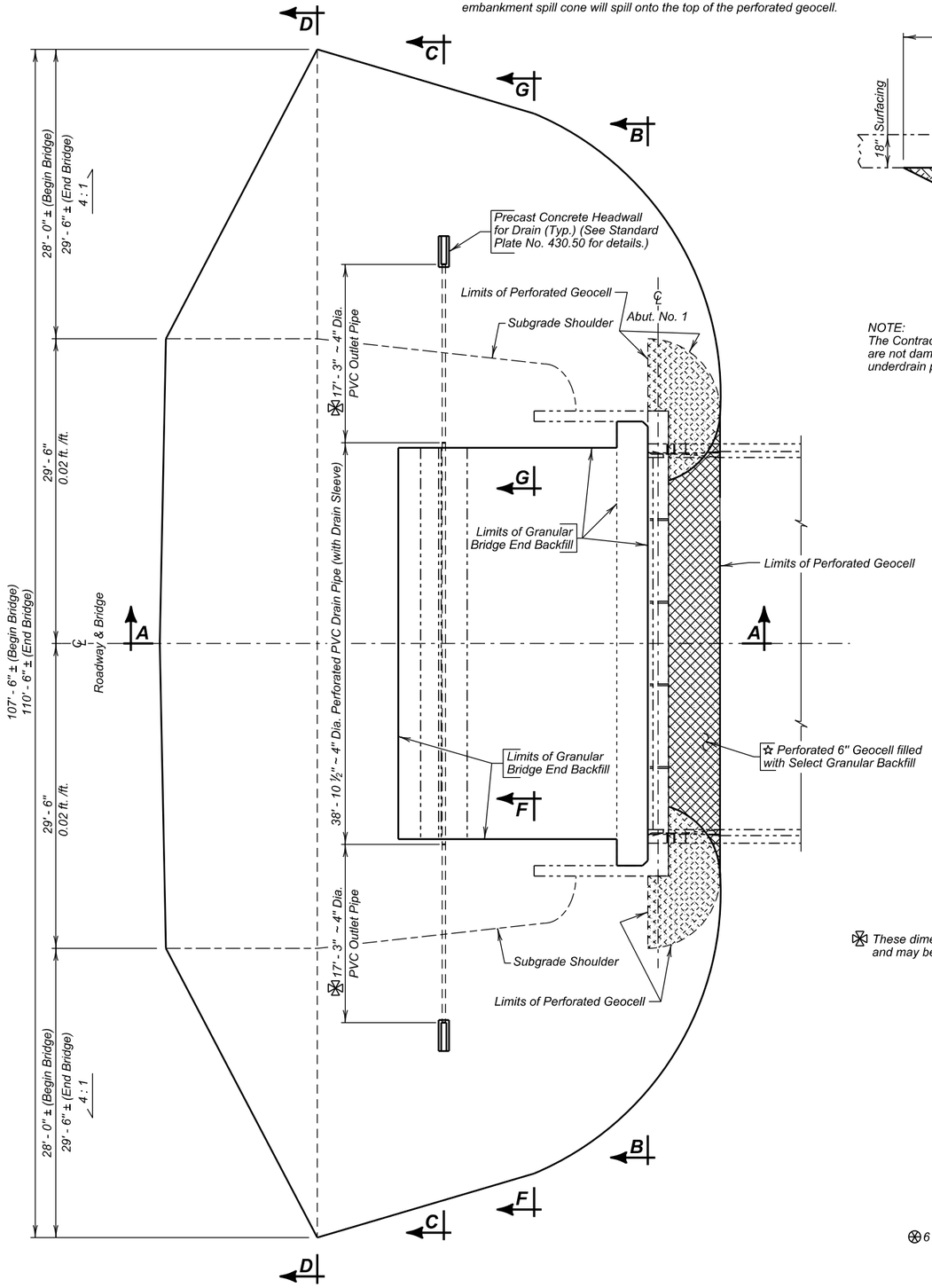
36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

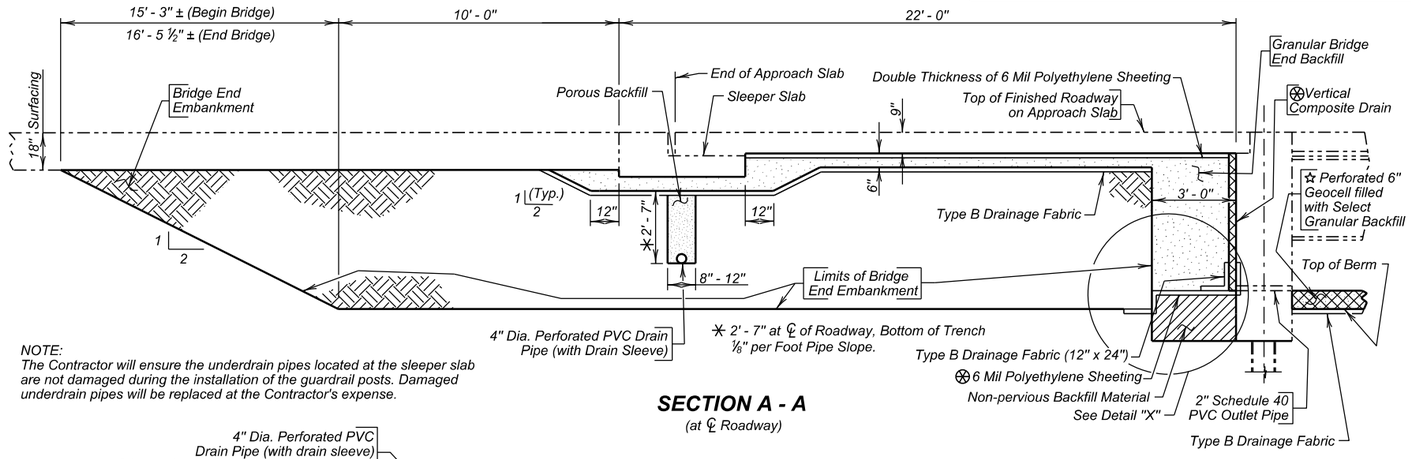
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA13		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E16	E60

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

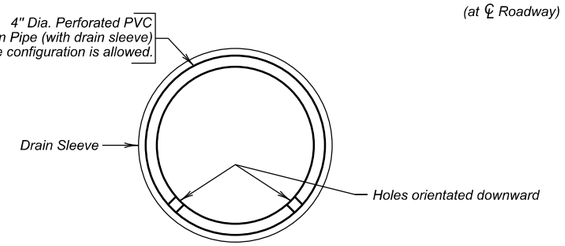


PLAN
(Bridge End Backfill shown adjacent to Abut. No. 1
Abut. No. 2 similar opposite hand except as shown.)

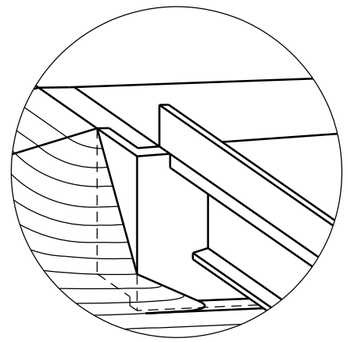


SECTION A - A
(at ℄ Roadway)

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

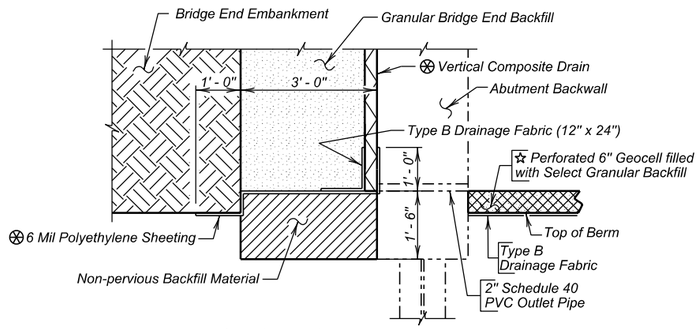


DRAIN DETAIL



✳ These dimensions are estimates and may be adjusted in field.

SPILL CONE DETAIL AT EMBANKMENT



DETAIL "X"

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

☆ See PERFORATED GEOCELL notes for payment information.

ESTIMATED QUANTITIES
(For Two Abutments)

	ITEM	UNIT	QUANTITY
	Granular Bridge End Backfill	Cu. Yd.	110.0
⊿	Bridge End Embankment	Cu. Yd.	2051
⧫ ⧈	Porous Backfill	Ton	13.6
	4" Underdrain Pipe	Ft.	179
⧫	Approach Slab Underdrain Excavation	Cu. Yd.	6.3
⧈	Select Granular Backfill	Ton	21.1
☆	Perforated Geocell	Sq. Ft.	604
	Precast Concrete Headwall for Drain	Each	4

1. 78 ft. 4" dia. Perforated PVC Drain Pipe (with Drain Sleeve).
2. 69 ft. 4" dia. PVC Outlet Pipe.
3. 16 ft. 5" dia. Schedule 40 Steel Pipe.
4. 16 ft. 2" dia. PVC Outlet Pipe.
5. 610 sq. ft. Vertical Composite Drain.

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

6. 3106 sq. ft. 6 mil Polyethylene Sheeting, not including laps.
7. 273 sq. yd. Type B Drainage Fabric.

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

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

⊿ Shrinkage Factor of 1.25 used.

⧫ Quantity based on a 12" wide trench.

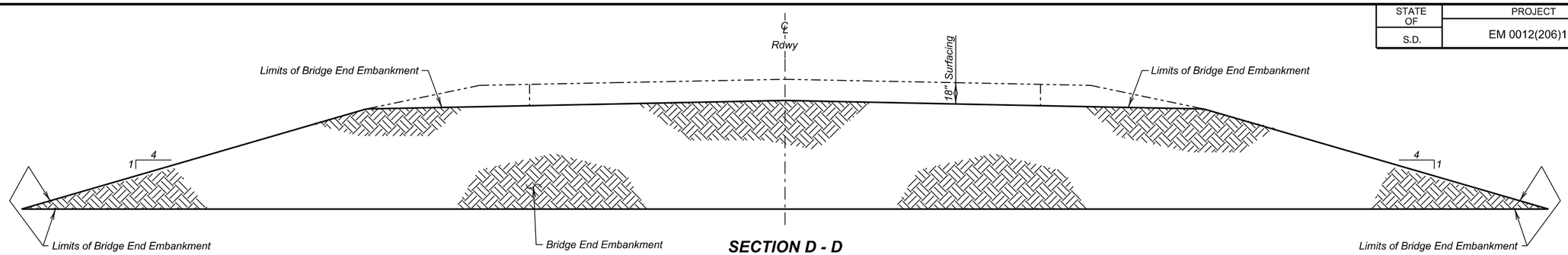
DETAILS OF BRIDGE END BACKFILL (A)
FOR
120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

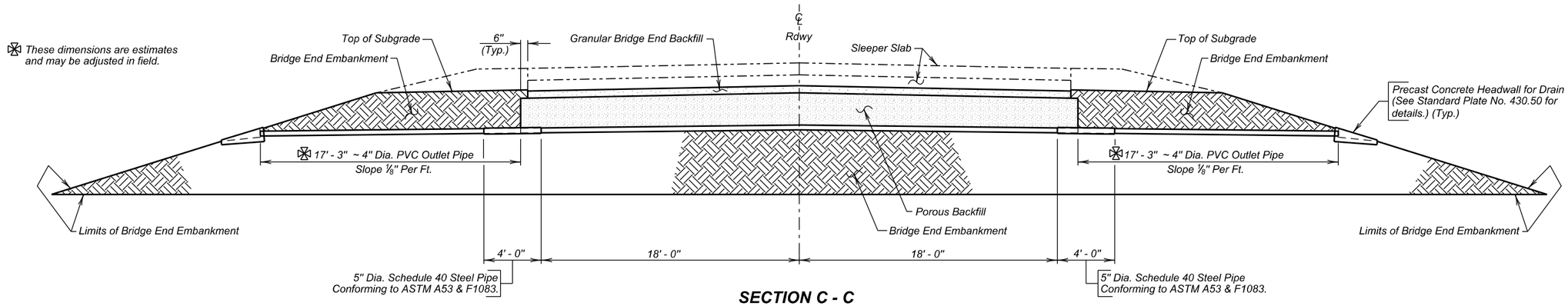
CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA14		

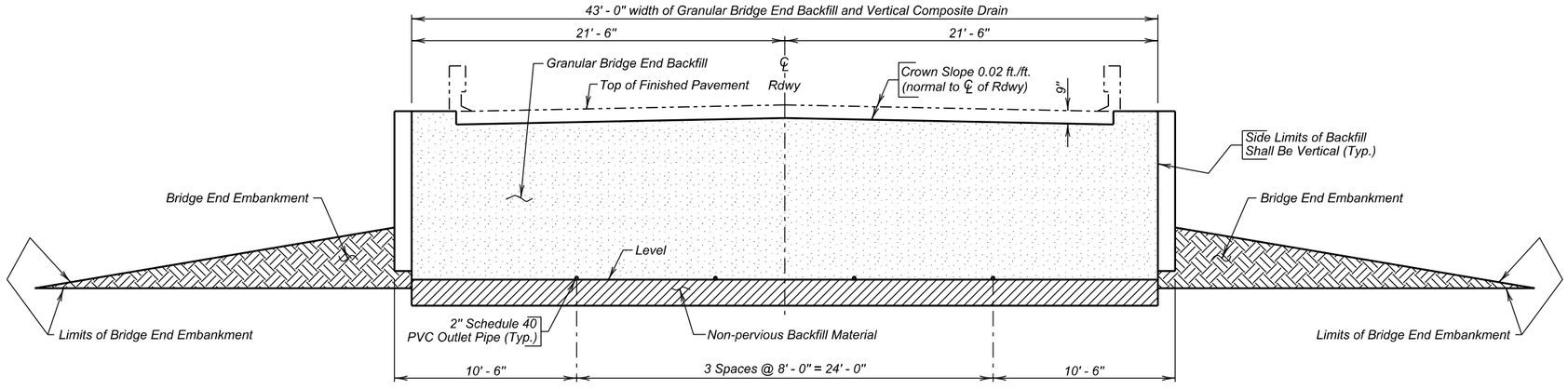
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E17	E60



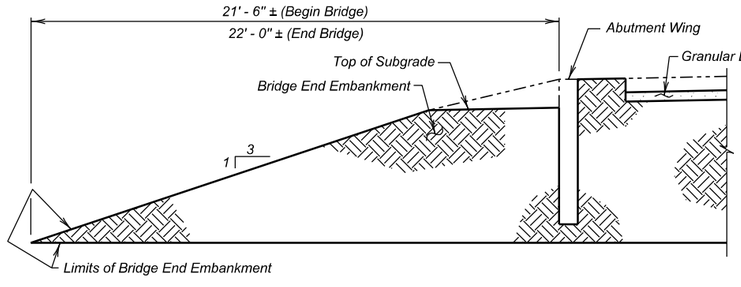
SECTION D - D



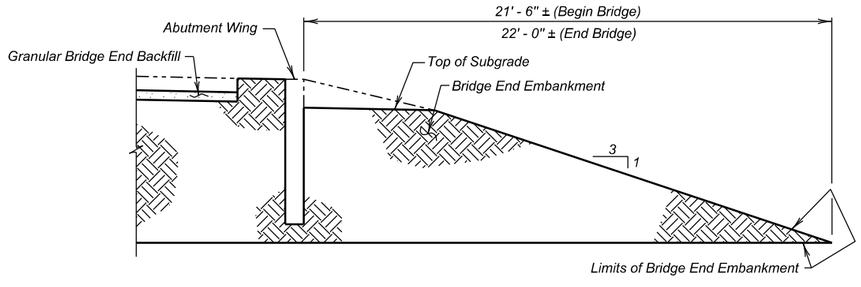
SECTION C - C



SECTION B - B



SECTION F - F



SECTION G - G

DETAILS OF BRIDGE END BACKFILL (B)

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY	0° SKEW
OVER HAY CREEK	SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23	EM 0012(206)112
STR. NO. 16-154-005	HL-93

CORSON COUNTY

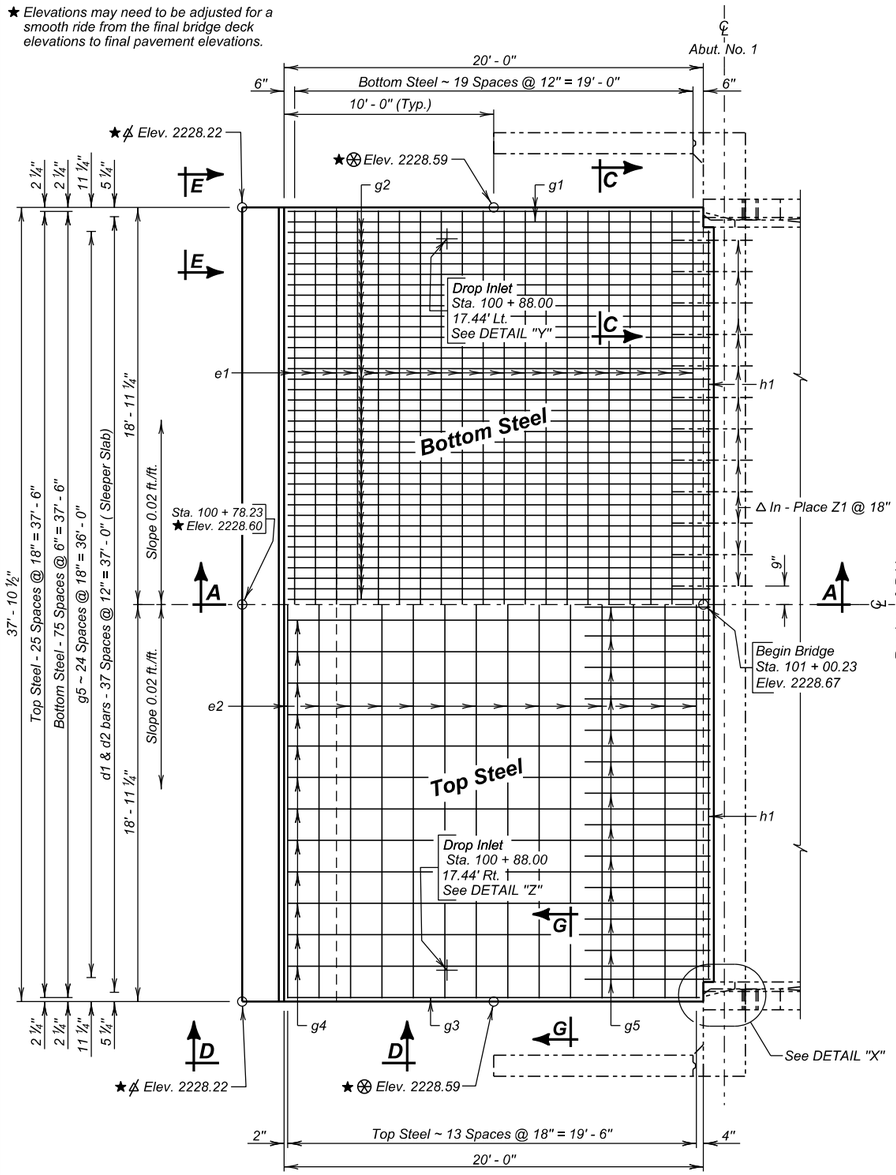
S. D. DEPT. OF TRANSPORTATION

MAY 2022

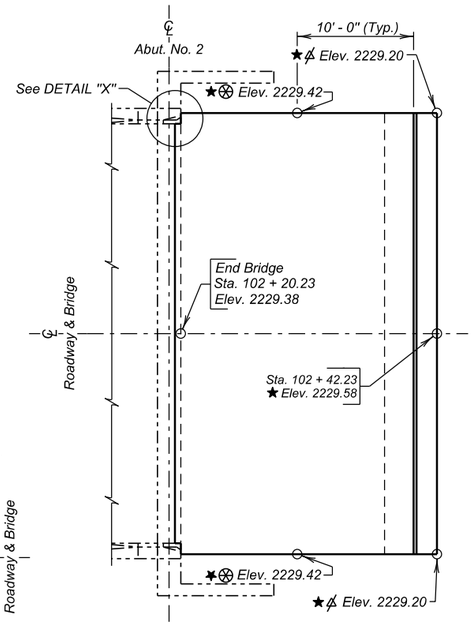
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA15		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E18	E60

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



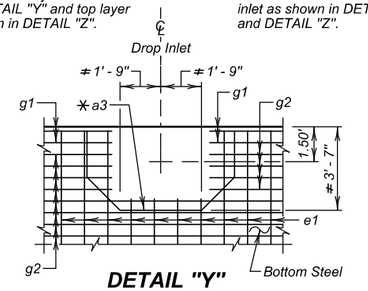
PLAN
(Shown adj. to Abut. No. 1, Abut No. 2 similar opposite hand except as shown.)



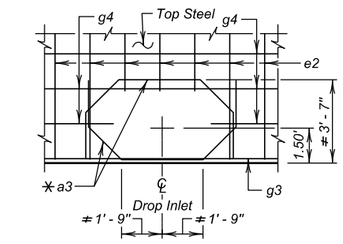
PLAN
(Shown adj. to Abut. No. 2)

⚹ *Add a3 bar to bottom layer of steel as shown in DETAIL "Y" and top layer of steel as shown in DETAIL "Z".*

≠ *Cut all bars in area of drop inlet as shown in DETAIL "Y" and DETAIL "Z".*

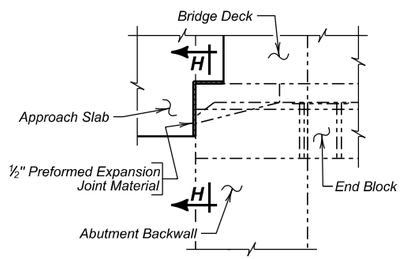


DETAIL "Y"
(Plan for Bottom Steel when drop inlet is used.)

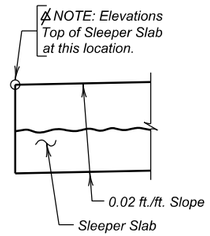


DETAIL "Z"
(Plan for Top Steel when drop inlet is used.)

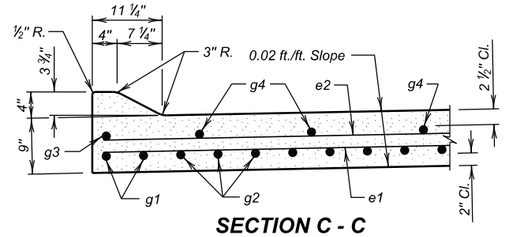
SECTION H - H



DETAIL "X"
(Typ. all corners)

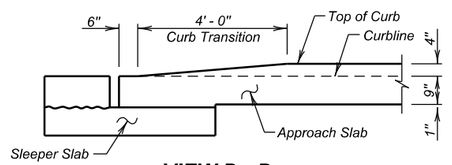


VIEW E - E

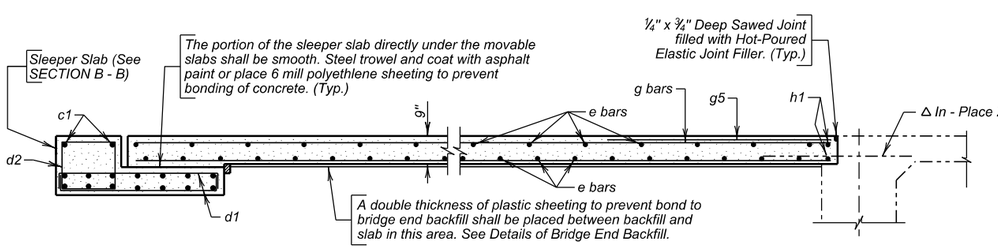


SECTION C - C

SECTION G - G
(Resteel not show)

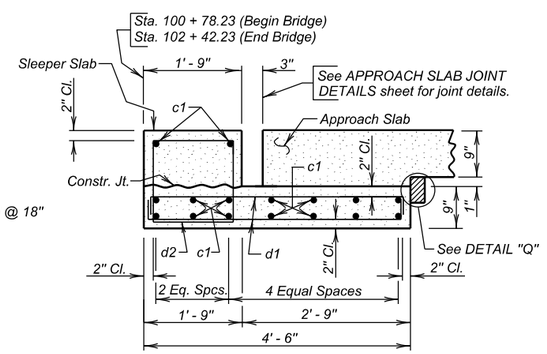


VIEW D - D

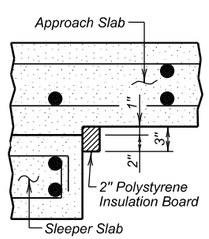


SECTION A - A

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



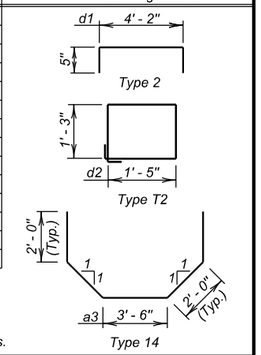
SECTION B - B
(Sleeper Slab)



DETAIL "Q"

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

Mk.	No.	Size	Length	Type
Sleeper Slabs				
c1	32	5	37' - 7"	Str.
d1	152	4	5' - 0"	2
d2	76	4	6' - 1"	T2
Approach Slabs				
a3	6	4	11' - 6"	14
e1	40	6	37' - 7"	Str.
e2	28	4	37' - 7"	Str.
g1	8	8	19' - 8"	Str.
g2	144	8	20' - 2"	Str.
g3	4	4	19' - 8"	Str.
g4	48	4	20' - 2"	Str.
g5	50	4	6' - 0"	Str.
h1	4	6	35' - 8"	Str.



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

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

ITEM	UNIT	QUANTITY
Concrete Approach Slab for Bridge	Sq. Yd.	172.3
Concrete Approach Sleeper Slab for Bridge	Sq. Yd.	37.9

1. 44.2 *Cu. Yds. Concrete in Approach Slabs.*
2. 12295 *Lbs. Epoxy Coated Re-Steel in Approach Slabs.*
3. 13.6 *Cu. Yds. Concrete in Sleeper Slabs.*
4. 2071 *Lbs. Epoxy Coated Re-Steel in Sleeper Slabs.*
5. 19 *Sq. Ft. of Polystryrene Insulation Board*

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

DETAILS OF APPROACH SLAB ADJACENT TO BRIDGE
FOR
120' - 0" PRESTRESSED GIRDER BRIDGE

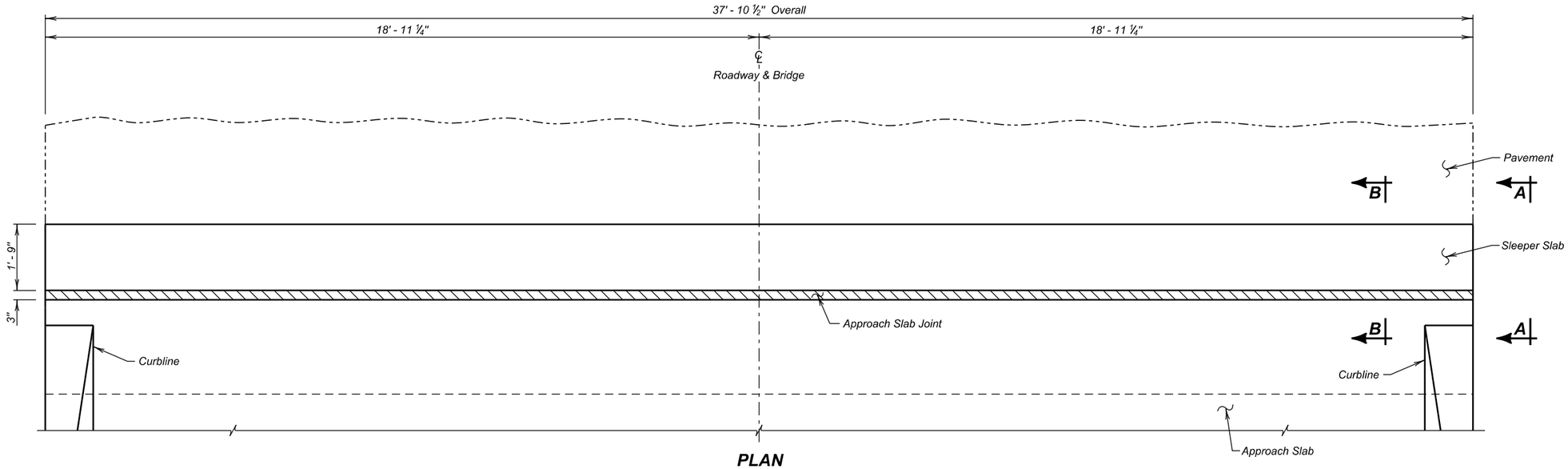
36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

16 OF 22

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA16		

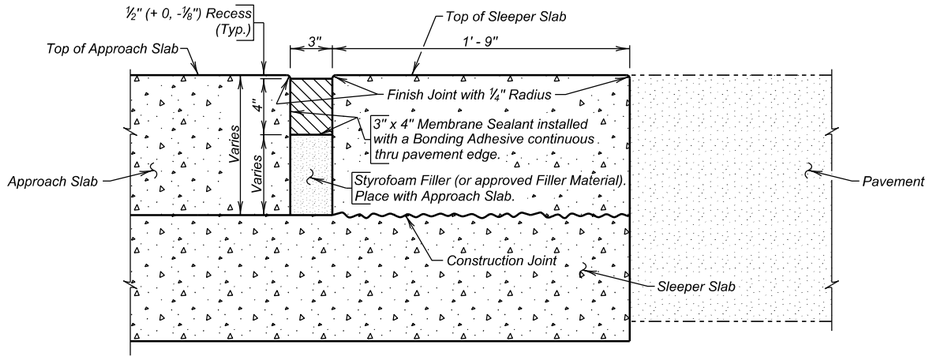
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E19	E60



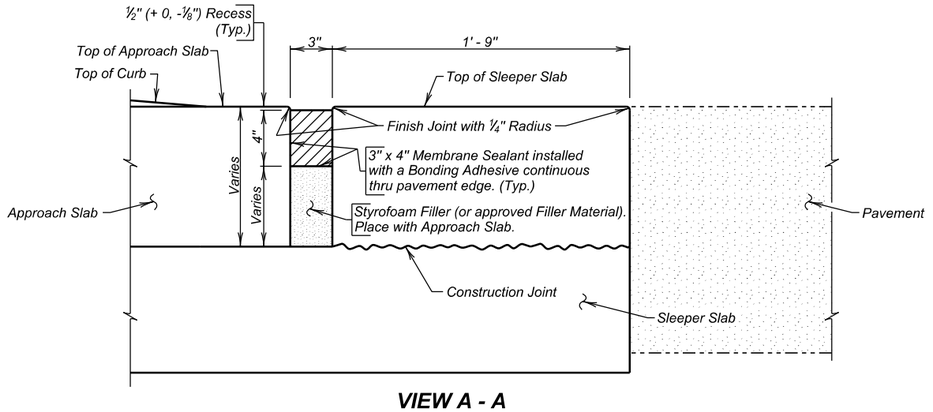
PLAN

GENERAL NOTES

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



SECTION B - B



VIEW A - A

ESTIMATED QUANTITIES
(For Two Approach Slabs)

ITEM	UNIT	QUANTITY
Membrane Sealant Expansion Joint	Ft.	75.8

APPROACH SLAB JOINT DETAILS

FOR

120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

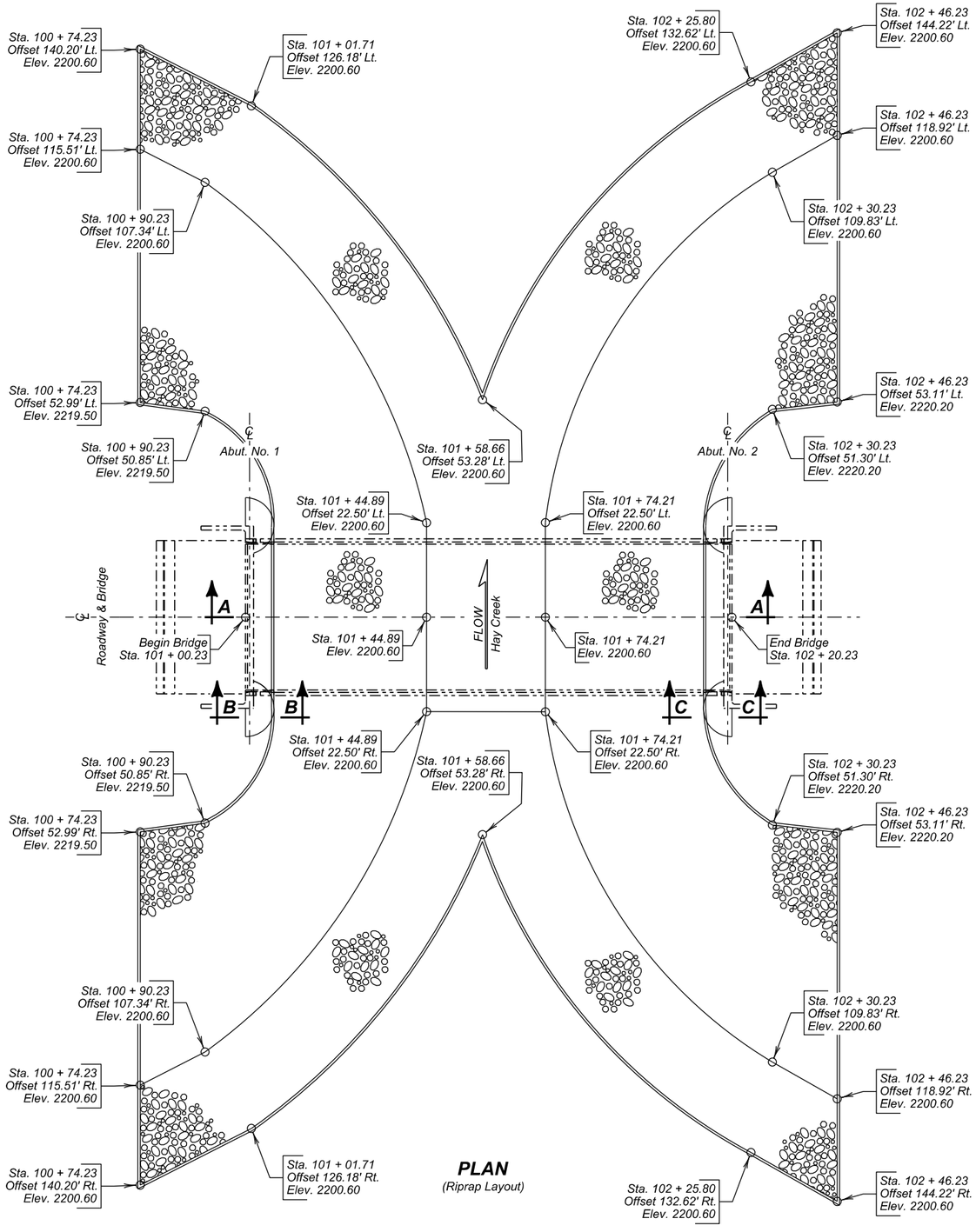
MAY 2022

17 OF 22

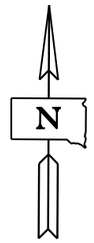
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM CORS05HW	SK 05HWGA17	MG	Steve A Johnson BRIDGE ENGINEER

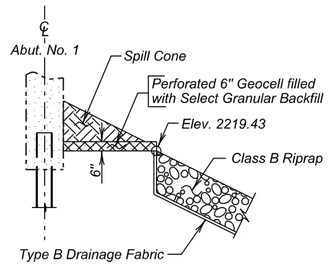
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E20	E60

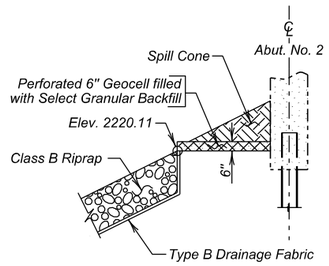


PLAN
(Riprap Layout)



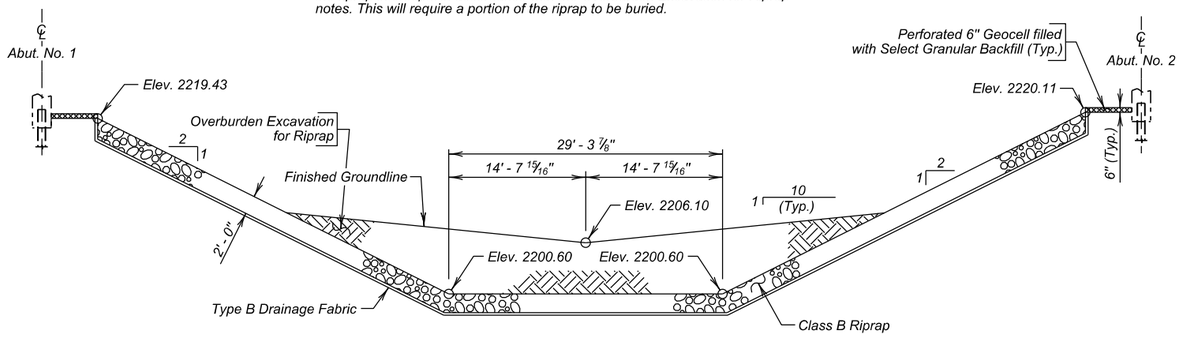


SECTION B - B



SECTION C - C

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



SECTION A - A

ESTIMATED QUANTITIES

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

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

RIPRAP DETAILS
FOR
120' - 0" PRESTRESSED GIRDER BRIDGE

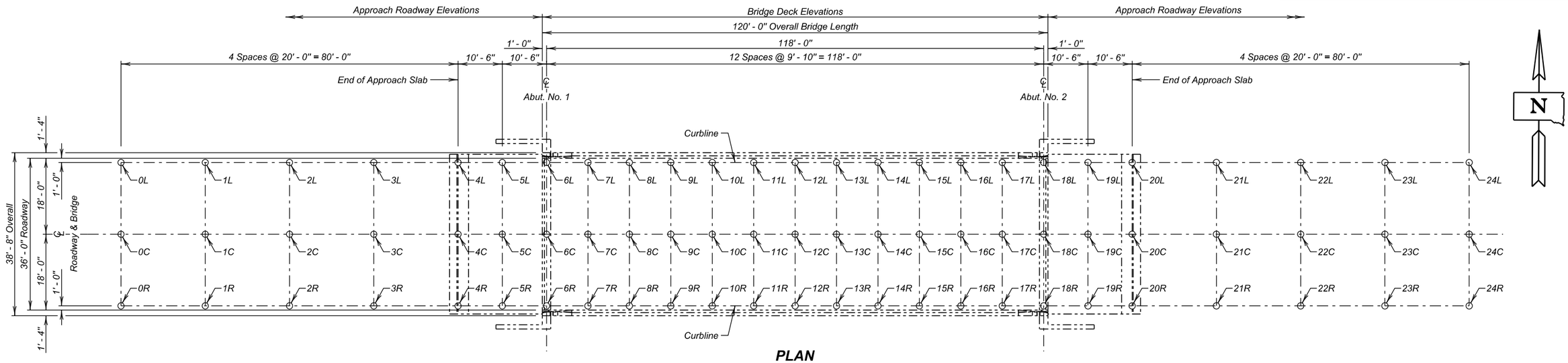
36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA18		

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.	EM 0012(206)112	E21	E60



PLAN

Table of As - Built Elevations - Approach Roadway

Location	Elevation	Location	Elevation	Location	Elevation
0L		0C		0R	
1L		1C		1R	
2L		2C		2R	
3L		3C		3R	
4L		4C		4R	
5L		5C		5R	
19L		19C		19R	
20L		20C		20R	
21L		21C		21R	
22L		22C		22R	
23L		23C		23R	
24L		24C		24R	

Table of As - Built Elevations - Bridge Deck

Location	Elevation	Location	Elevation	Location	Elevation
6L		6C		6R	
7L		7C		7R	
8L		8C		8R	
9L		9C		9R	
10L		10C		10R	
11L		11C		11R	
12L		12C		12R	
13L		13C		13R	
14L		14C		14R	
15L		15C		15R	
16L		16C		16R	
17L		17C		17R	
18L		18C		18R	

Table of Elevations - Bridge Survey Markers

Location	Station - Offset	Elevation
Begin Bridge		
End Bridge		

ESTIMATED QUANTITIES

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

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

AS- BUILT ELEVATION SURVEY

FOR

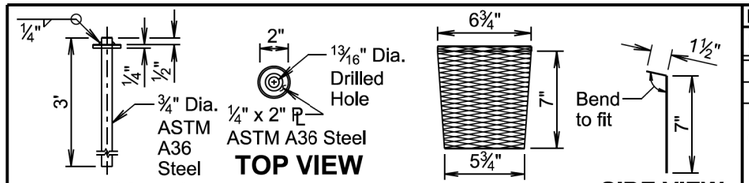
120' - 0" PRESTRESSED GIRDER BRIDGE

36' - 0" ROADWAY — 0° SKEW
OVER HAY CREEK — SEC. 19-T23N-R20E
STA. 101 + 00.23 TO STA. 102 + 20.23 — EM 0012(206)112
STR. NO. 16-154-005 — HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	SK	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGA19		

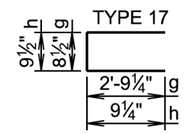
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E22	E60

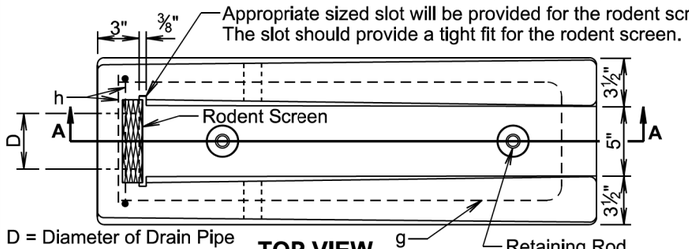


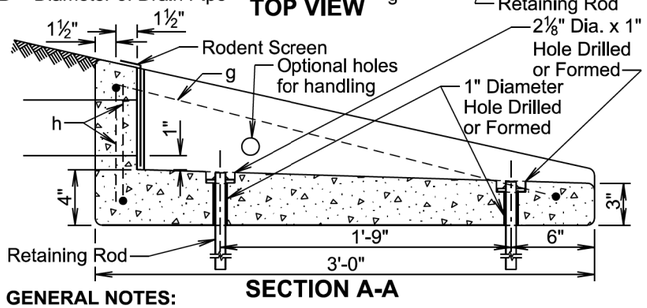
REINFORCING SCHEDULE				
MK.	No.	Size	Length	Type
g	1	4	6'-3"	17
h	2	4	2'-4"	17

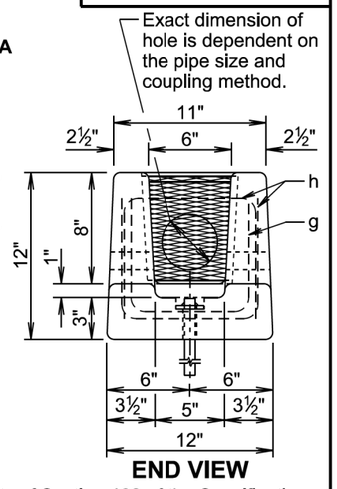
NOTE: All dimensions are out to out of bars.

Bending Details









GENERAL NOTES:

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

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

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

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

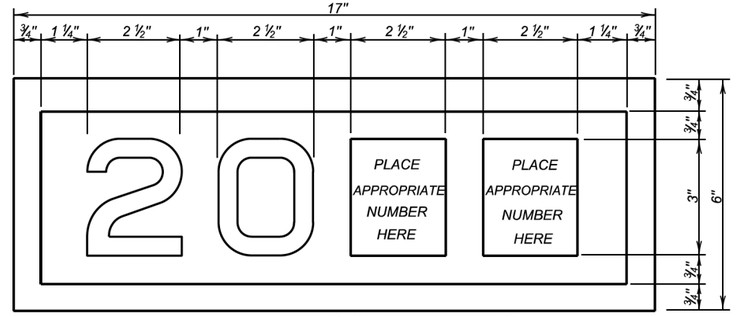
The retaining rod will be galvanized in accordance with ASTM A123 after all shop welding has been completed.

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

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

November 19, 2021

Published Date: 2024	SDDOT	PRECAST CONCRETE HEADWALL FOR DRAIN	PLATE NUMBER 430.50
			Sheet 1 of 1



YEAR PLATE DETAILS

GENERAL NOTES:

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

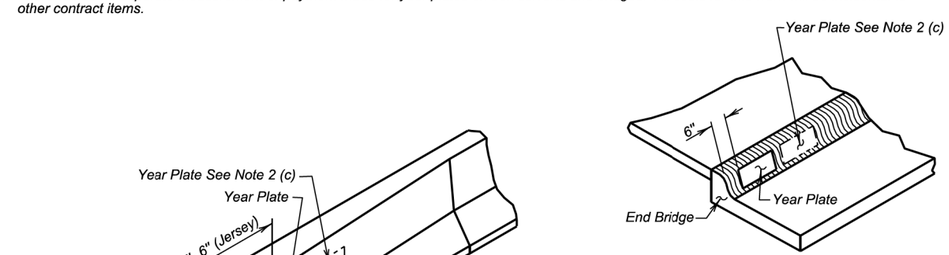
2. *Year plates will be located on structure(s) as follows:*

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

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

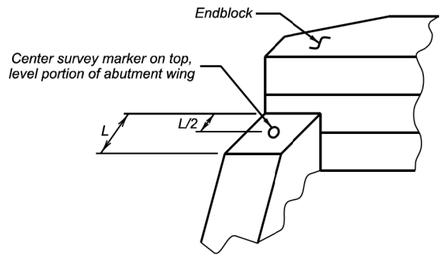
   c. *When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.*

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

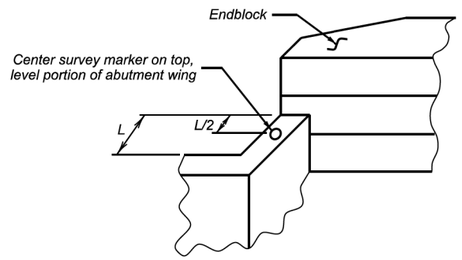


January 22, 2021

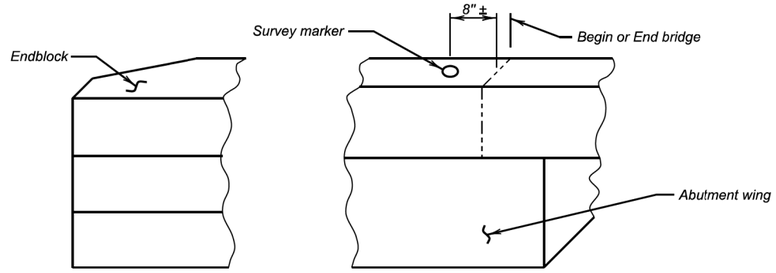
Published Date: 2024	SDDOT	YEAR PLATE DETAILS	PLATE NUMBER 460.02
			Sheet 1 Of 1



ABUTMENT WITH "STRAIGHT" WINGS



ABUTMENT WITH "SWEPT BACK" WINGS



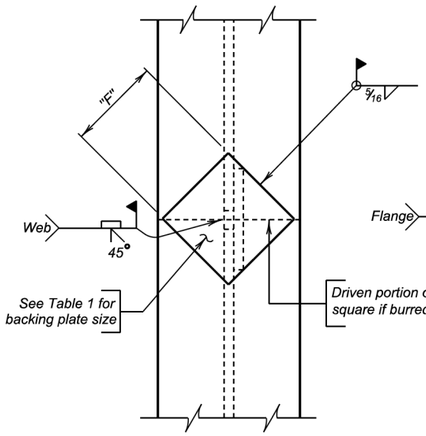
ABUTMENT WITH "SWEPT BACK" WINGS
(Endblock on top of wings)

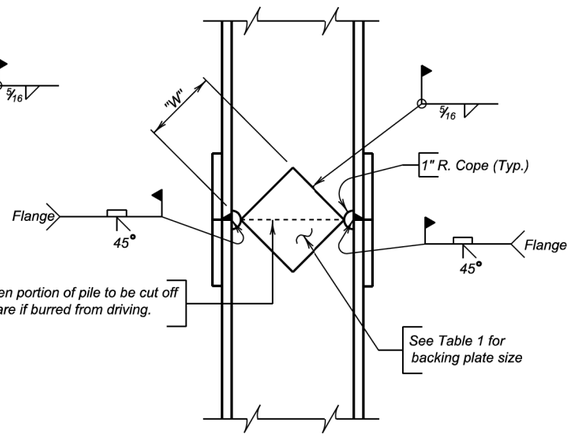
GENERAL NOTES:

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

June 26,2012

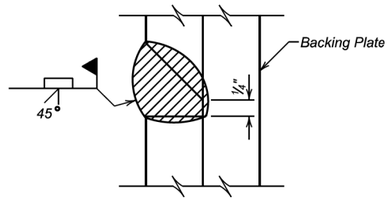
Published Date: 2024	SDDOT	BRIDGE SURVEY MARKER	PLATE NUMBER 460.05
			Sheet 1 of 1





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

COMPLETE JOINT PENETRATION WELD DETAIL



GENERAL NOTES:

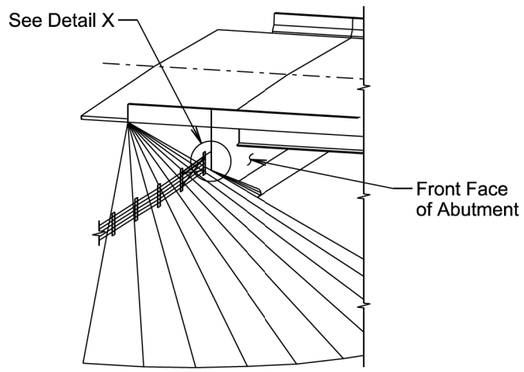
1. Steel for backing plates shall conform to ASTM A709 Grade 50.
2. Welding and weld inspection shall be in conformance with AWS D1.5 (Current Year) Bridge Welding Code - Steel.
3. Welder must be certified and registered with the SDDOT.
4. Backing plate shall at a minimum be as thick as the web of the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

TABLE 1
(BACKING PLATES)

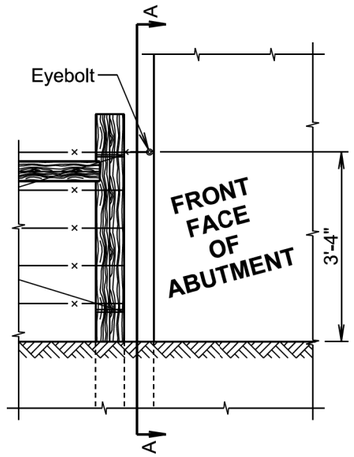
PILE	10"	12"	14"
"F" FLANGE	6 ½"	8"	10"
"W" WEB	4 ¾"	6 ¼"	7 ½"

December 23,2012

Published Date: 2024	SDDOT	STEEL PILE SPLICE DETAILS	PLATE NUMBER 510.40
			Sheet 1 of 1



DETAILS FOR FENCE ANCHORS



DETAIL X

GENERAL NOTES:

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

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

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

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

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

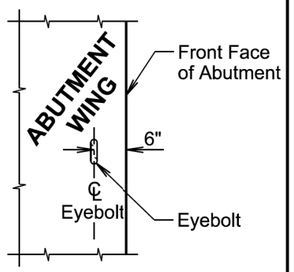
The epoxy resin mixture will be of a type for bonding steel to hardened concrete and will conform to AASHTO M235 Type IV, Grade 3 (Equivalent to ASTM C881, Type IV, Grade 3).

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

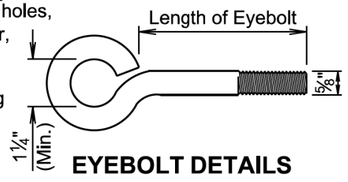
Mix epoxy resin as recommended by the Manufacturer and apply by an injection method as approved by the Engineer. Beginning at the back of the drilled holes, fill the holes ⅓ to ½ full of epoxy, or as recommended by the Manufacturer, prior to insertion of the eyebolts. Care will be taken to prevent epoxy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

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

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



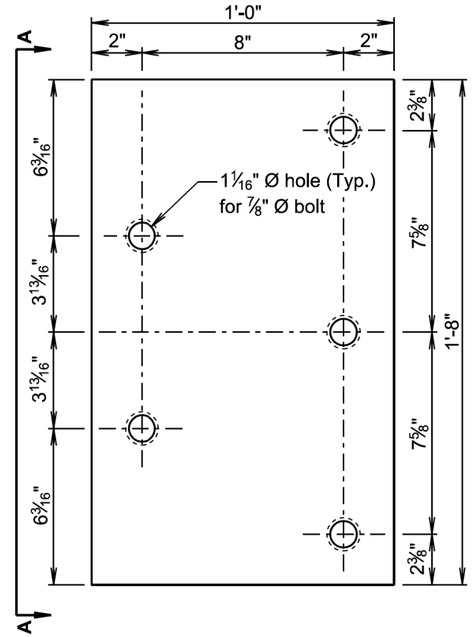
VIEW A-A



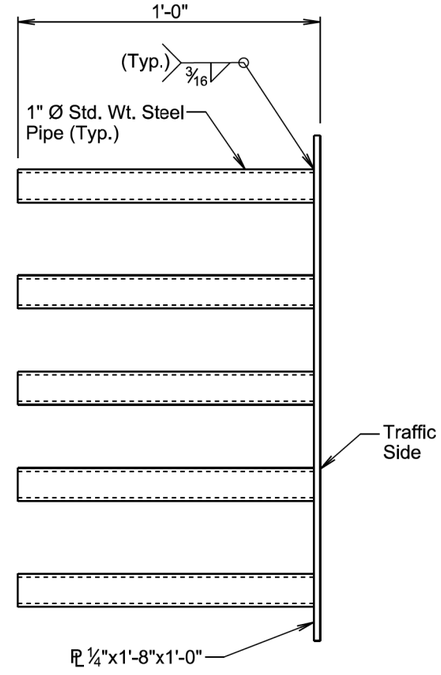
EYEBOLT DETAILS

November 19, 2020

Published Date: 2024	SDDOT	FENCE ANCHORS FOR BRIDGE ABUTMENTS (SWEPT BACK WINGS)	PLATE NUMBER 620.19
			Sheet 1 of 1



ELEVATION VIEW



VIEW A - A

GENERAL NOTES:

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

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

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

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

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

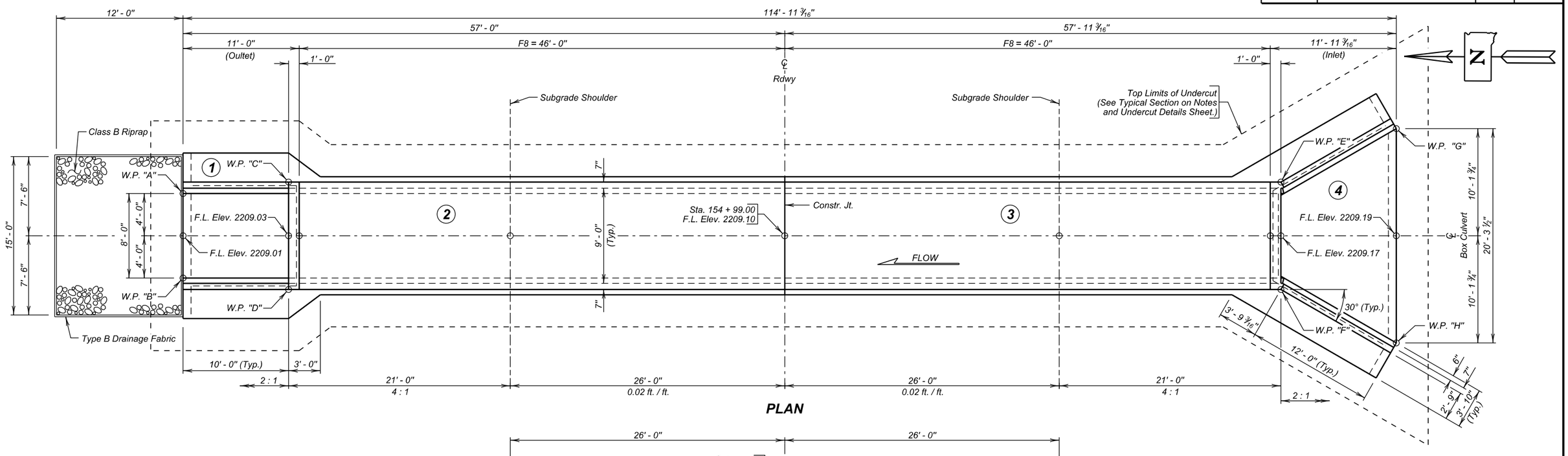
The cost of the 5 bolt insert plate assembly complete in place including welding and galvanizing will be incidental to the contract unit price per cubic yard for "Class A45 Concrete, Miscellaneous", "Class A45 Concrete, Bridge Deck", or "Class A45 Concrete, Bridge Repair", as applicable.

August 27, 2020

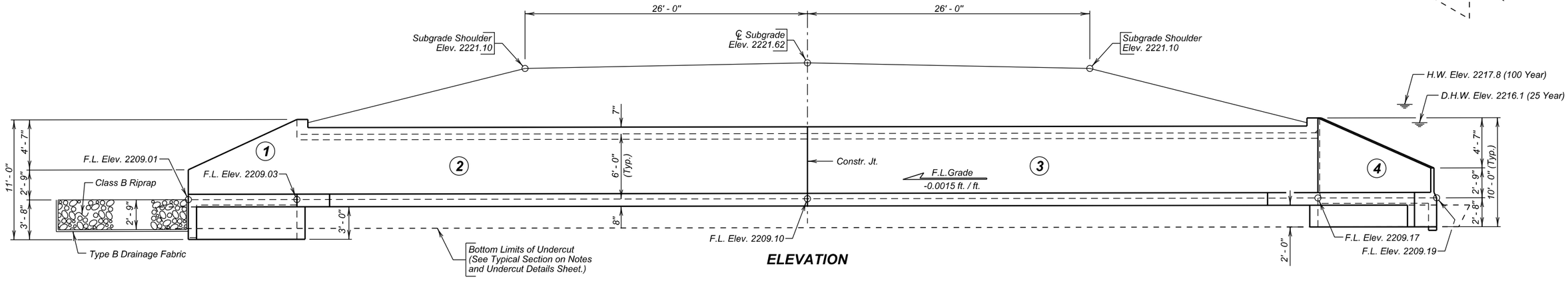
Published Date: 2024	SDDOT	5 BOLT INSERT PLATE ASSEMBLY	PLATE NUMBER 630.92
			Sheet 1 of 1

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

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E25	E60



PLAN



ELEVATION

HYDRAULIC DATA

Q_d	293 cfs
A_d	41 sq ft
V_d	7.2 fps
Q_F	293 cfs
Q_{100}	534 cfs
Q_{OT}	>Q_{100}
V_{max}	9.2 fps

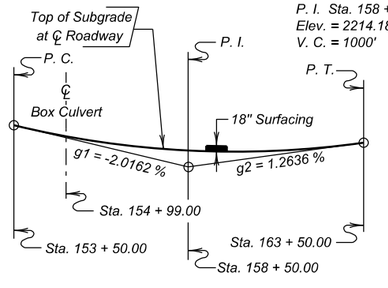
Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2216.1.

Q_{OT} = Overtopping discharge and frequency > Q_{100} year recurrence interval. El. 2219.2 @ Sta. 159 + 65.00 ±.

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. 2217.8.

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



P. I. Sta. 158 + 50.00
Elev. = 2214.18 (Subgrade)
V. C. = 1000'

VERTICAL CURVE DATA

INDEX OF CULVERT SHEETS -

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
	Class A45 Concrete, Box Culvert	Cu. Yd.	97.5
	Reinforcing Steel	Lb.	17589
	Structure Excavation, Box Culvert	Cu. Yd.	41
	Box Culvert Undercut	Cu. Yd.	165
#	Class B Riprap	Ton	25.7
	Type B Drainage Fabric	Sq. Yd.	37

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

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

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	155 + 03.00	57.00' Lt.
"B"	154 + 95.00	57.00' Lt.
"C"	155 + 04.08	47.00' Lt.
"D"	154 + 93.92	47.00' Lt.
"E"	155 + 04.08	47.00' Rt.
"F"	154 + 93.92	47.00' Rt.
"G"	155 + 09.15	57.93' Rt.
"H"	154 + 88.85	57.93' Rt.

SITE 1
ALTERNATE A

GENERAL DRAWING AND QUANTITIES

FOR

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

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 154 + 99.00 — SEC. 20-T23N-R20E
STR. NO. 16-163-007 — EM 0012(206)112
PCN 05HW — HL-93

CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

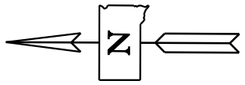
MAY 2022

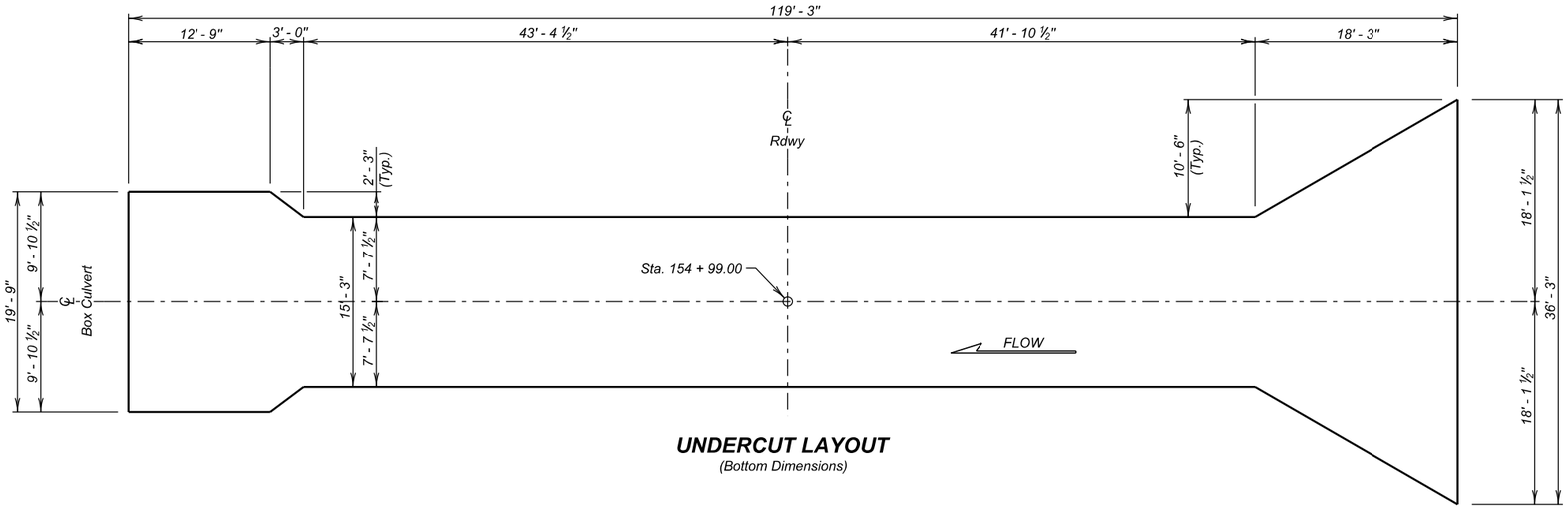
1 OF 7

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

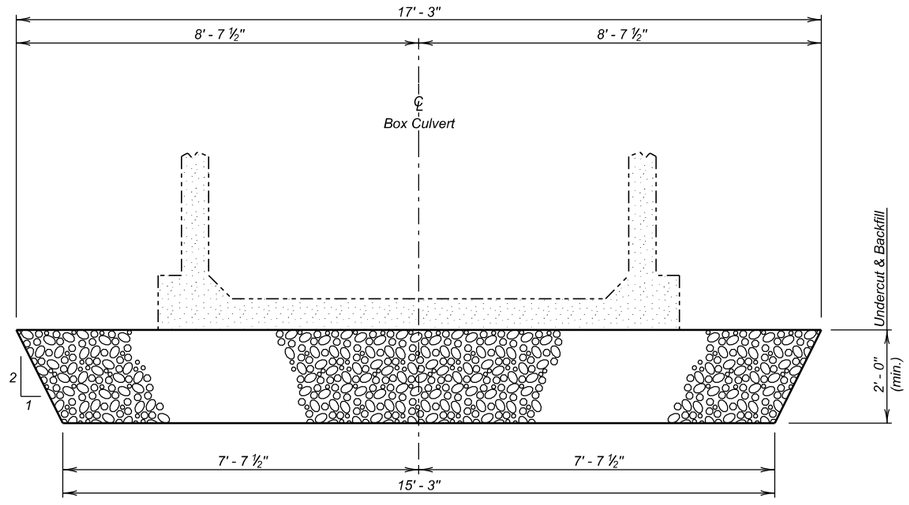
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	BT	BRIDGE ENGINEER
CORS05HW	05HWGB01		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E26	E60





UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SPECIFICATIONS

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

GENERAL NOTES

1. *Design Live Load: HL-93 and construction load consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the box culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.*
2. *The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 8 ft. (F8).*
3. *Design Material Strengths: Concrete $f'c$ = 4500 p.s.i.*
   Reinforcing Steel fy = 60000 p.s.i.
4. *High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a Type V or Type II with 20 to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.*
5. *All reinforcing steel will conform to ASTM A615 Grade 60.*
6. *All lap splices shown are contact lap splices unless noted otherwise.*
7. *All exposed edges will be chamfered ¾ inch unless noted otherwise in the plans.*
8. *Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.*
9. *The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.*
10. *Care will be taken to establish Working Points (W.P.) as shown on the wings.*
11. *Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).*
12. *Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.*
13. *Soils below the bottom of the proposed RCBC consist of 2 feet of brown silt sand overlying gray clay sand. Groundwater was encountered in the borings at an average elevation of 2210.1 during the subsurface investigation conducted in April 2020. Dewatering will be required during construction. All cost incurred for dewatering will be incidental to other contract items.*

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
⌀ Box Culvert Undercut	Cu. Yd.	165

⌀ *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

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

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 154 + 99.00 — SEC. 20-T23N-R20E
STR. NO. 16-163-007 — EM 0012(206)112
HL-93

CORSON COUNTY

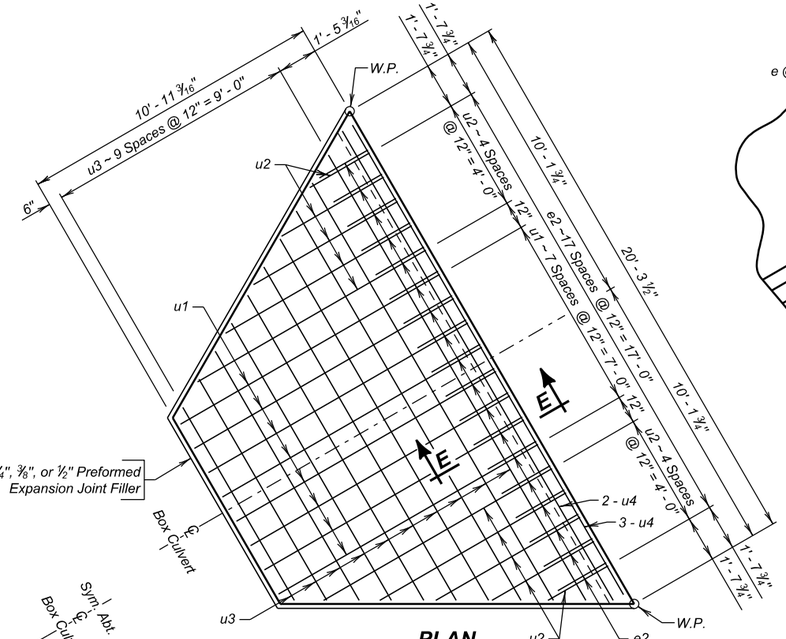
S. D. DEPT. OF TRANSPORTATION

MAY 2022

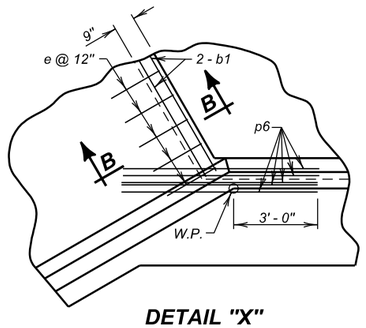
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGB02		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E27	E60

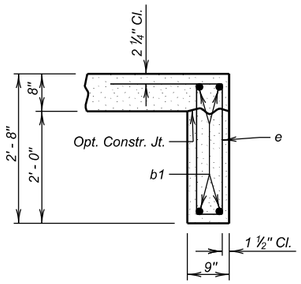
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



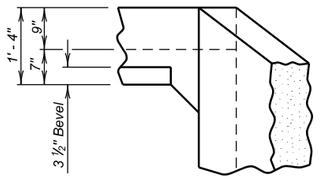
PLAN
(Inlet Apron)



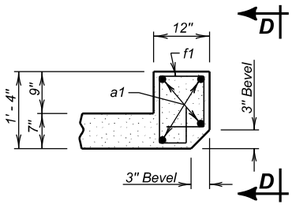
DETAIL "X"
(At Bottom Slab)



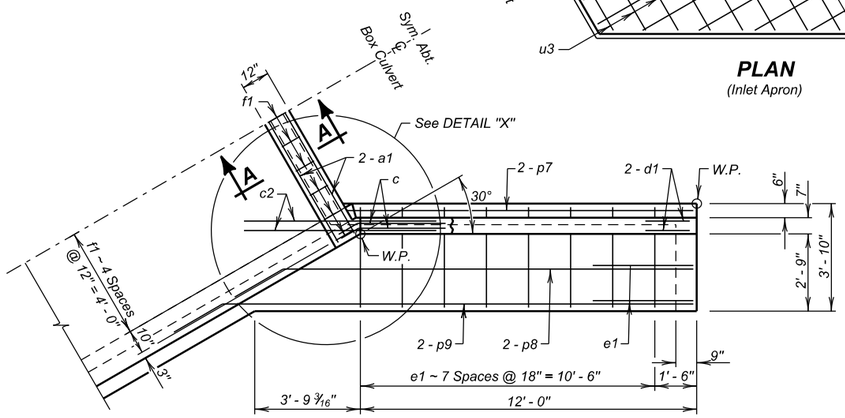
SECTION B - B



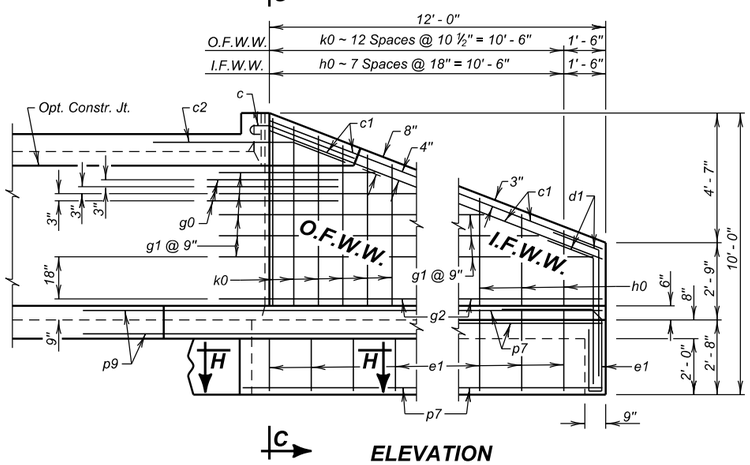
VIEW D - D



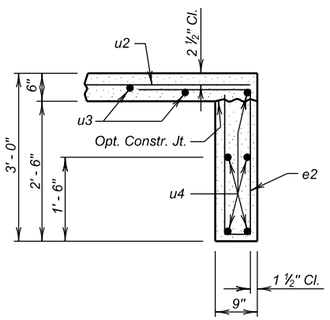
SECTION A - A
(At Top Slab)



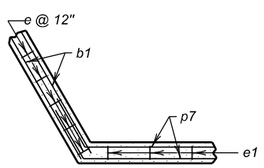
HALF PLAN



ELEVATION



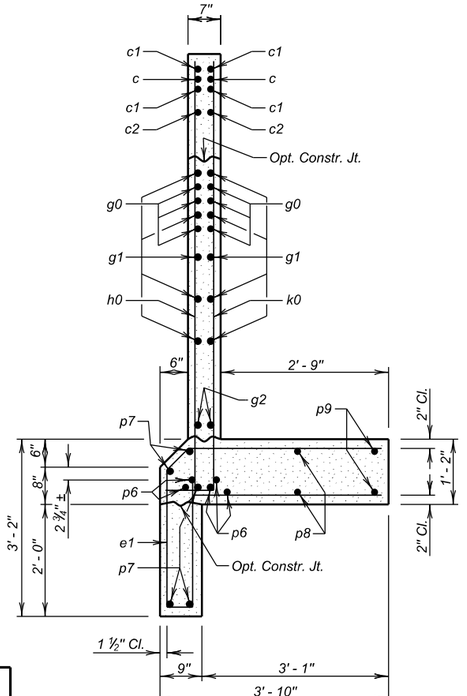
SECTION E - E



SECTION H - H

LEGEND FOR PLACING RE-STEEL

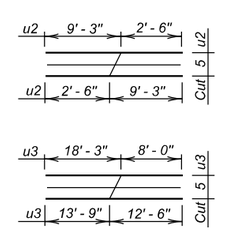
O. F. W. W. - Outside Face of Wing Wall
I. F. W. W. - Inside Face of Wing Wall

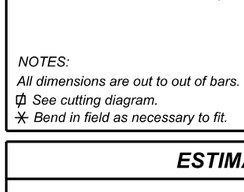


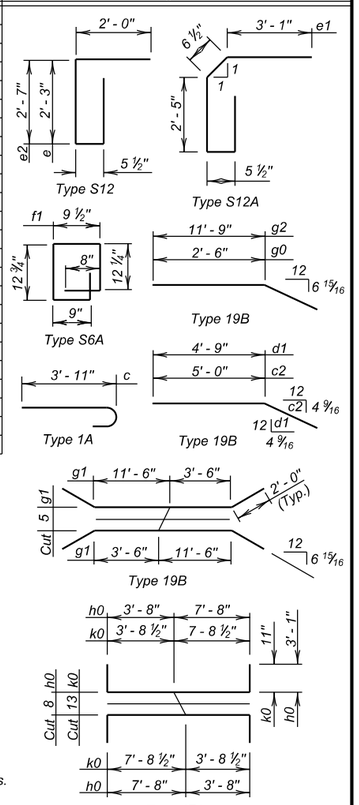
SECTION C - C

REINFORCING SCHEDULE

Mk.	No.	Size	Length	Type
a1	4	6	9' - 9"	Str.
b1	4	6	8' - 6"	Str.
c	4	5	4' - 6"	1A
c1	8	5	12' - 9"	Str.
c2	4	5	7' - 0"	19B
d1	8	5	6' - 6"	19B
e	9	4	6' - 9"	S12
e1	20	4	8' - 9"	S12A
f1	11	4	5' - 0"	S6A
g0	12	5	5' - 0"	19B
g1	10	4	19' - 0"	19B
g2	4	4	13' - 9"	19B
h0	8	4	17' - 6"	17A
k0	13	4	13' - 3"	17A
p6	10	6	7' - 0"	Str.
p7	10	4	14' - 6"	Str.
p8	4	4	16' - 3"	Str.
p9	4	4	18' - 6"	Str.
INLET APRON				
e2	18	4	7' - 6"	S12
u1	8	4	10' - 6"	Str.
u2	5	4	11' - 9"	Str.
u3	5	4	26' - 3"	Str.
u4	5	4	19' - 3"	Str.







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

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	9.9	1242	5.0
Inlet Apron	4.2	338	4.2

SITE 1
ALTERNATE A
INLET DETAILS
FOR
9' X 6' BOX CULVERT (C.I.P.)

OVER TRIB. TO HAY CREEK
STA. 154 + 99.00
STR. NO. 16-163-007

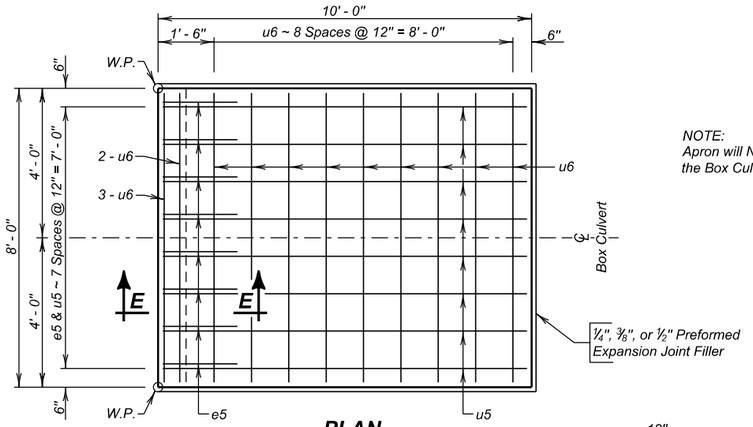
0° SKEW
SEC. 20-T23N-R20E
EM 0012(206)112
HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

3 OF 7

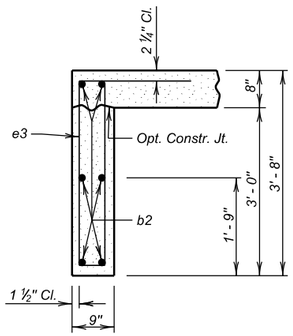
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	BT	BRIDGE ENGINEER
CORS05HW	05HWGB03		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E28	E60

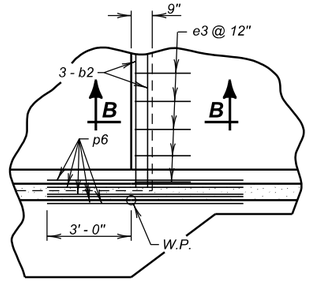


PLAN
(Outlet Apron)

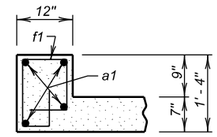
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



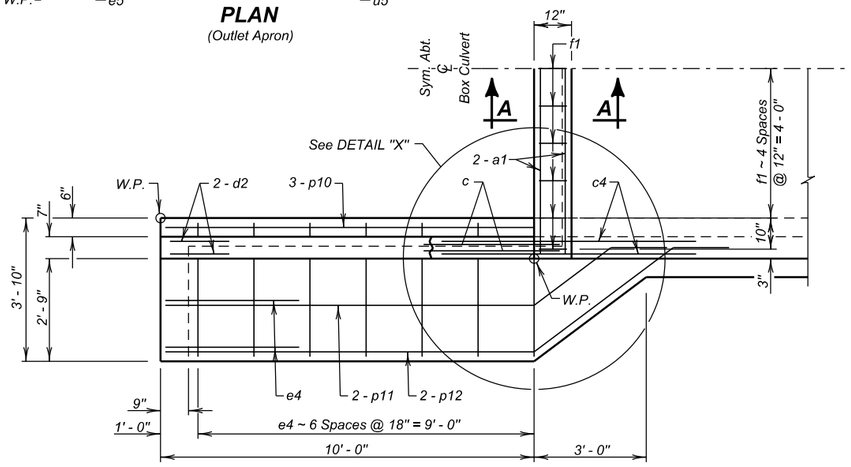
SECTION B - B



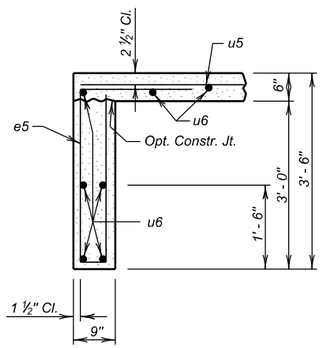
DETAIL "X"
(At Bottom Slab)



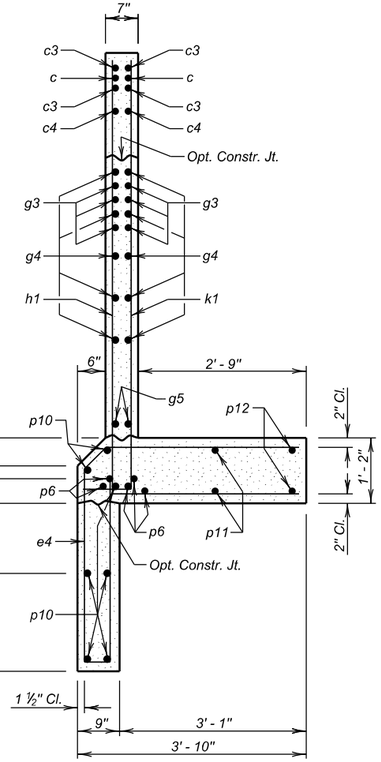
SECTION A - A
(At Top Slab)



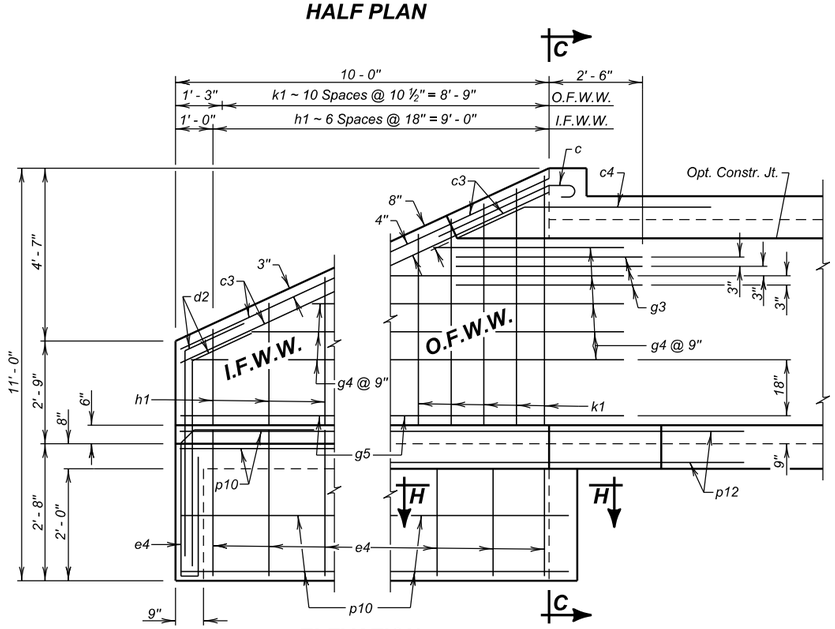
HALF PLAN



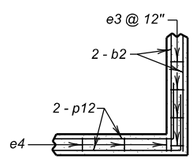
SECTION E - E



SECTION C - C



ELEVATION



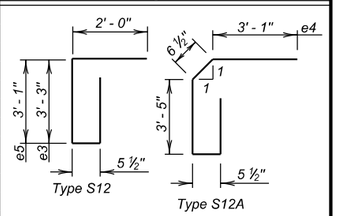
SECTION H - H

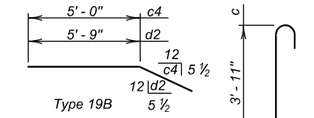
LEGEND FOR PLACING RE-STEEL

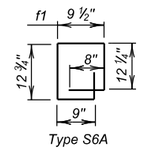
O. F. W. W. - Outside Face of Wing Wall
I. F. W. W. - Inside Face of Wing Wall

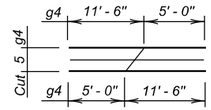
REINFORCING SCHEDULE

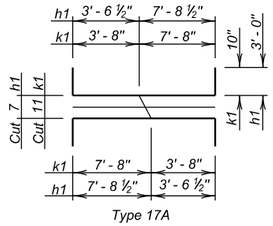
Mk.	No.	Size	Length	Type	Bending Details
a1	4	6	9' - 9"	Str.	
b2	6	6	9' - 3"	Str.	
c	4	5	4' - 6"	1A	
c3	8	5	11' - 0"	Str.	
c4	4	5	7' - 0"	19B	
d2	8	5	7' - 6"	19B	
e3	10	4	8' - 9"	S12	
e4	18	4	10' - 9"	S12A	
f1	11	4	5' - 0"	S6A	
g3	12	5	5' - 0"	Str.	
g4	10	4	16' - 6"	Str.	
g5	4	4	11' - 9"	Str.	
h1	7	4	17' - 3"	17A	
k1	11	4	13' - 0"	17A	
p6	10	6	7' - 0"	Str.	
p10	14	4	12' - 6"	Str.	
p11	4	4	14' - 0"	Str.	
p12	4	4	16' - 3"	Str.	
OUTLET APRON					
e5	8	4	8' - 6"	S12	
u5	8	4	9' - 9"	Str.	
u6	14	4	7' - 9"	Str.	











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

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	8.5	1252	4.3
Outlet Apron	2.1	170	2.1

SITE 1
ALTERNATE A

OUTLET DETAILS

FOR

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

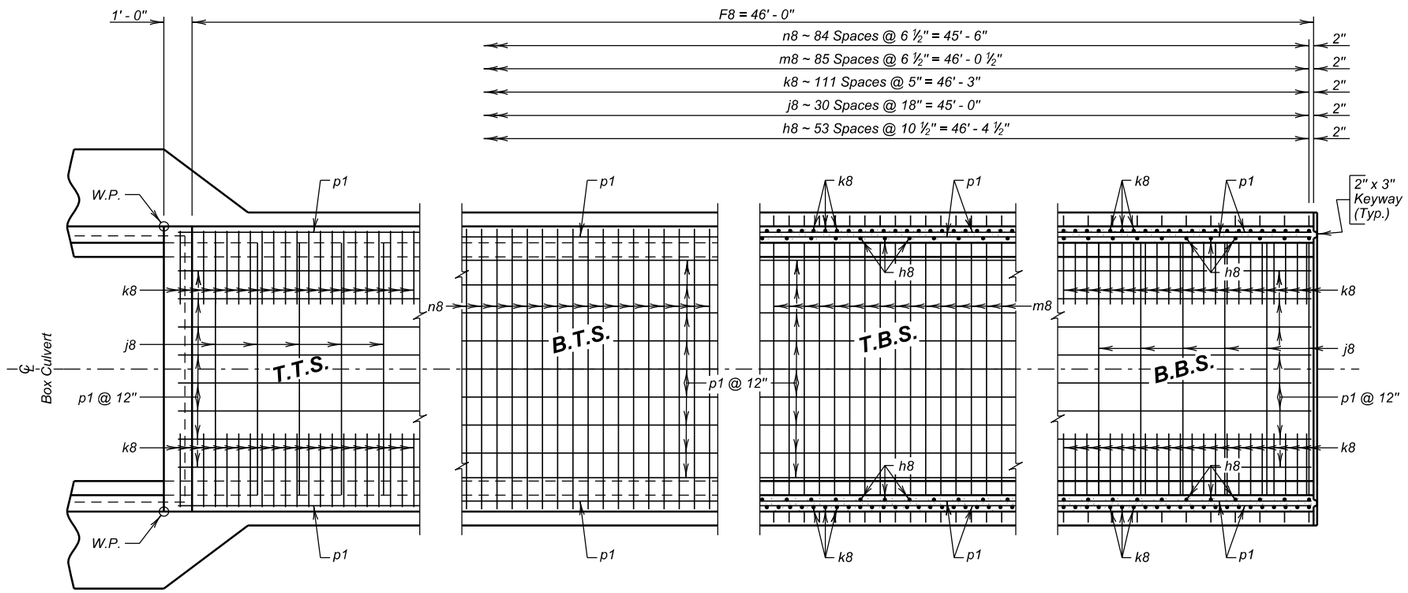
OVER TRIB. TO HAY CREEK
STA. 154 + 99.00
STR. NO. 16-163-007

0° SKEW
SEC. 20-T23N-R20E
EM 0012(206)112
HL-93

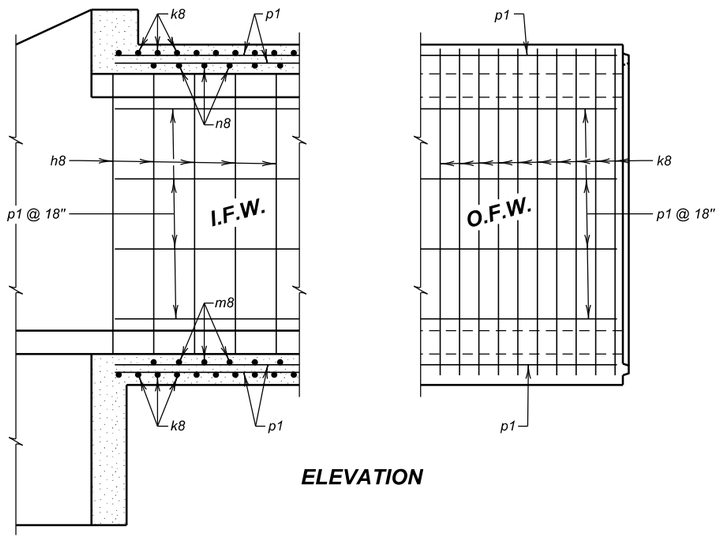
CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGB04		

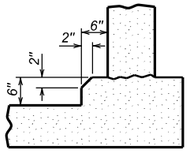
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E29	E60



PLAN
(Outlet End shown, Inlet similar by rotation)



ELEVATION



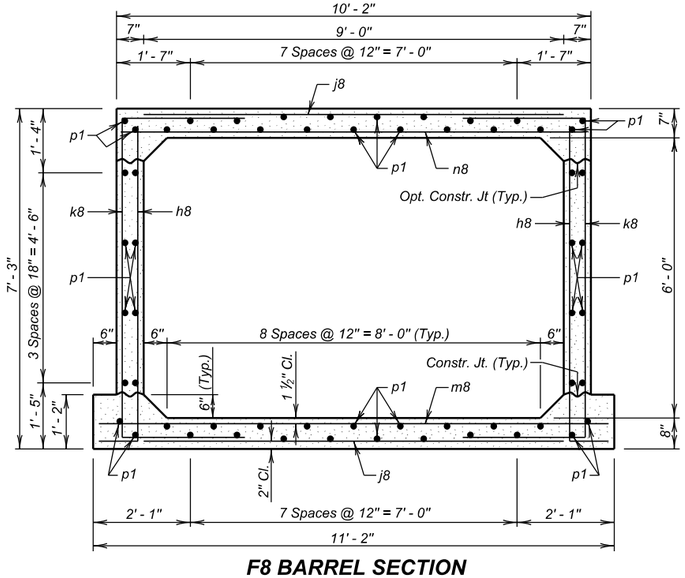
OPTIONAL FILLET DETAIL
(At Bottom Slab)

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

OPTIONAL POUR - BOTTOM SLAB

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

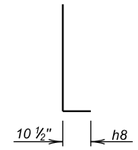
△ *Place z1 bars thru construction joint between barrel sections as shown on Standard Plate No. 460.10. Quantity of z1 bars are for one construction joint.*



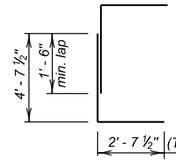
F8 BARREL SECTION
(8' - 0" Maximum Fill)

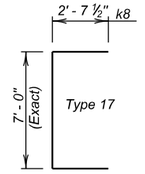
REINFORCING SCHEDULE
(For 2 - F8 Barrel End Sections)

Mk.	No.	Size	Length	Type	Bending Details
h8	216	4	7' - 6"	17A	
j8	124	4	9' - 0"	Str.	
k8	448	4	12' - 3"	17	
m8	172	6	11' - 0"	Str.	
n8	170	6	10' - 0"	Str.	
p1	116	4	46' - 6"	Str.	
△ z1	26	5	3' - 6"	Str.	



Type 17A





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

NOTES:

All dimensions are out to out of bars.

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 - F8 Barrel End Sections @ 46' - 0"	72.8	14587	25.4

LEGEND FOR PLACING RE-STEEL

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

SITE 1
ALTERNATE A

F8 BARREL END SECTION DETAILS (46' - 0")

FOR

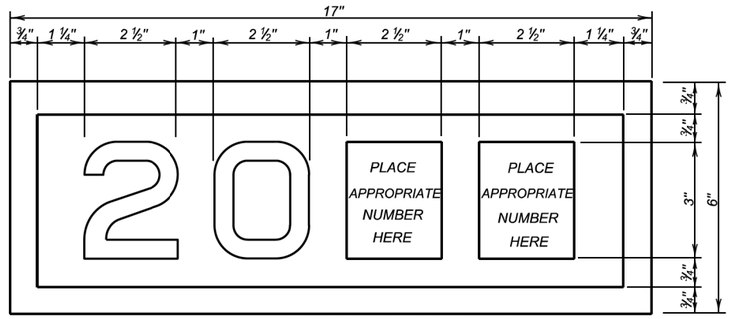
9' X 6' BOX CULVERT (C.I.P.)

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 154 + 99.00 — SEC. 20-T23N-R20E
STR. NO. 16-163-007 — EM 0012(206)112
HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

5 OF 7

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGB05		



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.

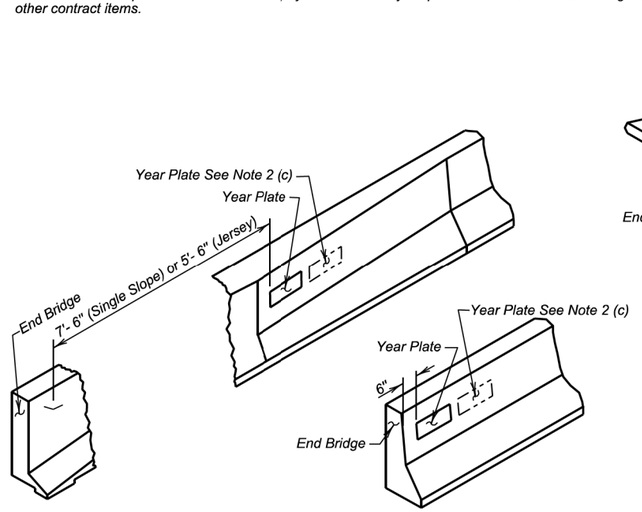
2. Year plates will be located on structure(s) as follows:

   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.

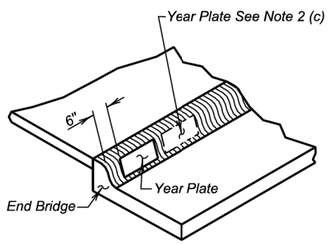
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with 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.

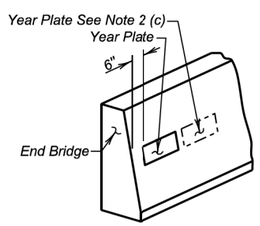


BARRIER
(With Endblock)



TYPE B CURB

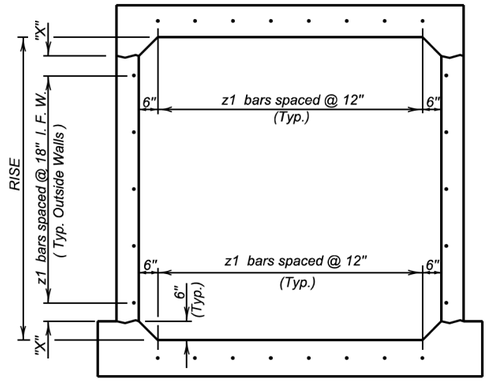
JERSEY BARRIER



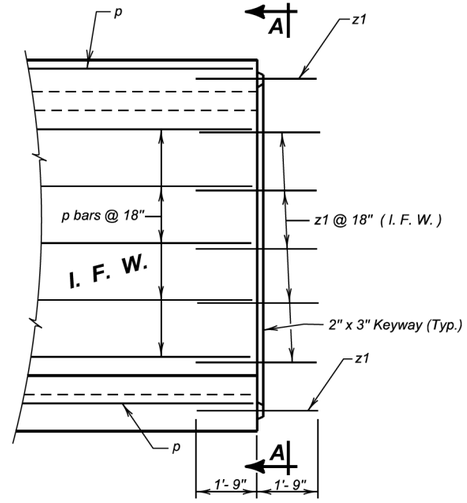
SINGLE SLOPE BARRIER

January 22, 2021

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

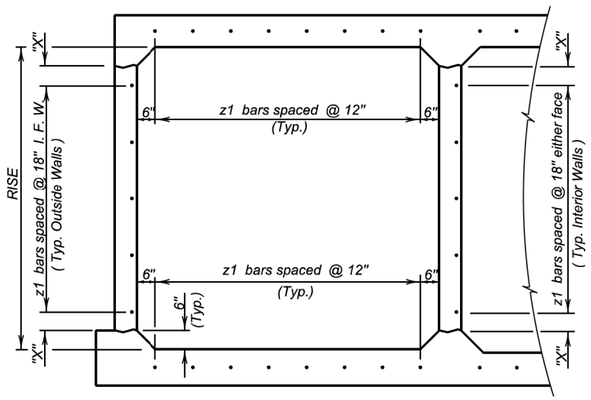


TYPICAL SINGLE BARREL VIEW A - A



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.

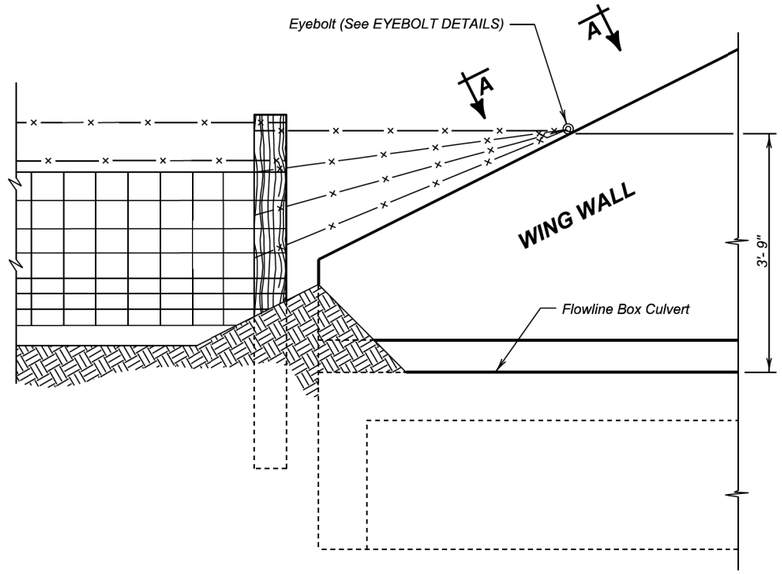
2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

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

SITE 1
ALTERNATE A

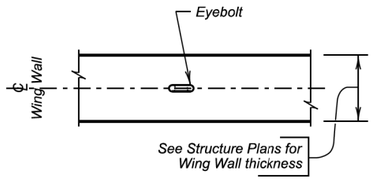
9' X 6' BOX CULVERT (C.I.P.)
STR. NO. 16-163-007
MAY 2022



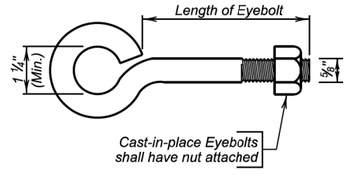
DETAIL FOR FENCE ANCHORS

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

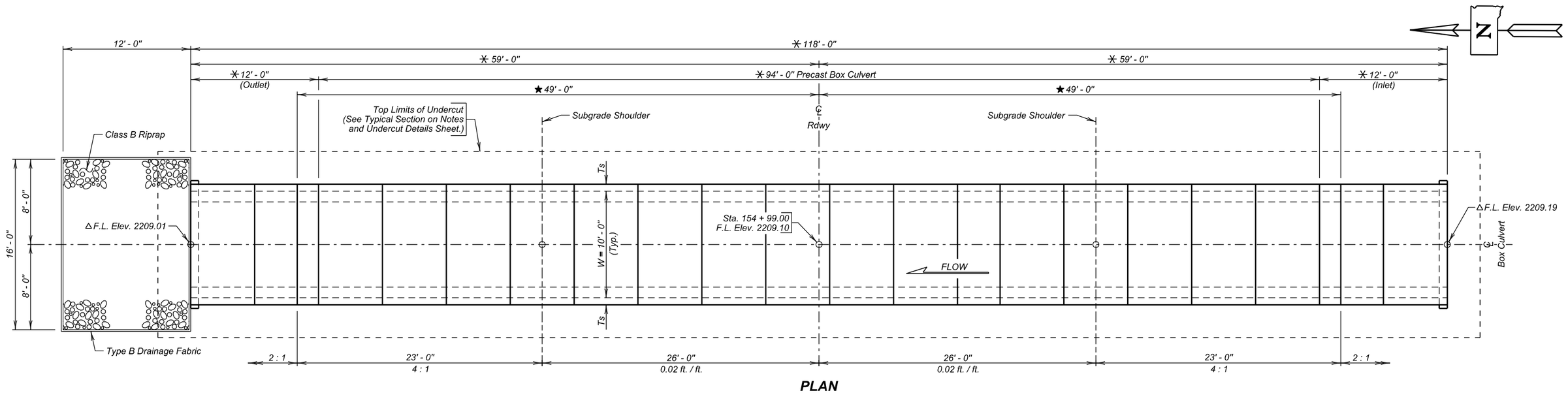
SITE 1
ALTERNATE A

9' X 6' BOX CULVERT (C.I.P.)
STR. NO. 16-163-007
MAY 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.

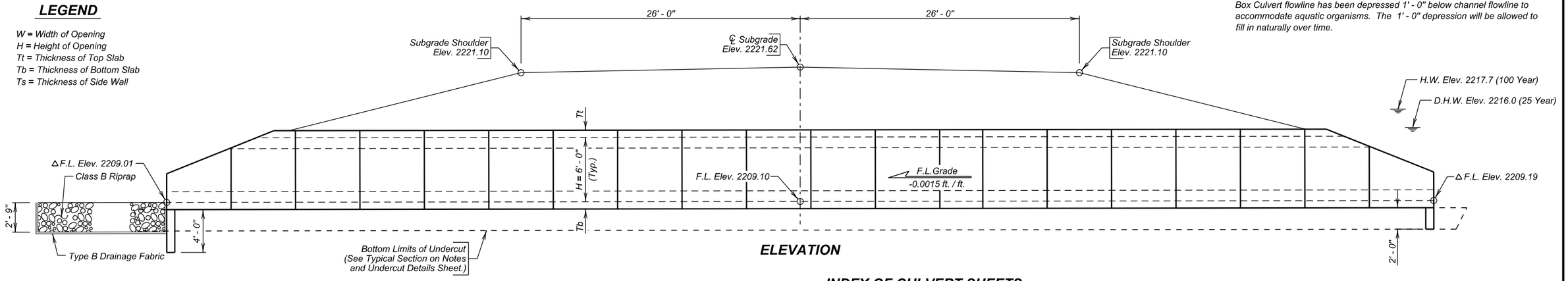
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E32	E60



PLAN

LEGEND

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



ELEVATION

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

HYDRAULIC DATA

Q_d	293 cfs
A_d	46 sq ft
V_d	6.4 fps
Q_F	293 cfs
Q_{100}	534 cfs
Q_{OT}	>Q_{100}
V_{max}	8.3 fps

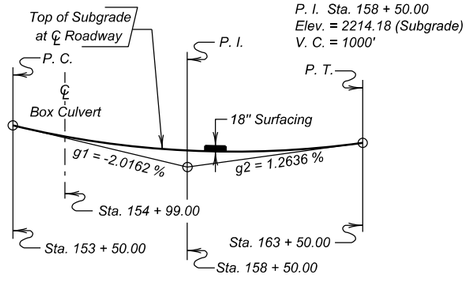
Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2216.0.

Q_{OT} = Overtopping discharge and frequency > Q_{100} year recurrence interval. El. 2219.2 @ Sta. 159 + 65.00 ±.

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. 2217.7.

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



P. I. Sta. 158 + 50.00
Elev. = 2214.18 (Subgrade)
V. C. = 1000'

VERTICAL CURVE DATA

INDEX OF CULVERT SHEETS-

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
∢	Structure Excavation, Box Culvert	Cu. Yd.	44.0
	Box Culvert Undercut	Cu. Yd.	150
≠	Class B Riprap	Ton	27.4
	Type B Drainage Fabric	Sq. Yd.	39
	10' X 6' Precast Concrete Box Culvert, Furnish	Ft.	94
	10' X 6' Precast Concrete Box Culvert, Install	Ft.	94
	10' X 6' Precast Concrete Box Culvert End Section, Furnish	Each	2
	10' X 6' Precast Concrete Box Culvert End Section, Install	Each	2

∢ Quantity is based on 8" bottom slab, 8" top slab and 8" walls.

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

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

SITE 1
ALTERNATE B

GENERAL DRAWING AND QUANTITIES

FOR

10' X 6' BOX CULVERT (PRECAST)

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 154 + 99.00 — SEC. 20-T23N-R20E
STR. NO. 16-163-007 — EM 0012(206)112
PCN 05HW — HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGB08		

Revised August 25, 2023 SK

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E33	E60

SPECIFICATIONS

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

GENERAL NOTES

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

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 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the box culvert. If other construction loads in excess of legal load are anticipated by the Contractor, the Contractor will submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.*
3. *The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with 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 8 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 2 feet of brown silt sand overlying gray clay sand. Groundwater was encountered in the borings at an average elevation of 2210.1 during the subsurface investigation conducted in April 2020. Dewatering will be required during construction. All costs incurred for dewatering will be incidental to other contract items.*

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 a 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.*

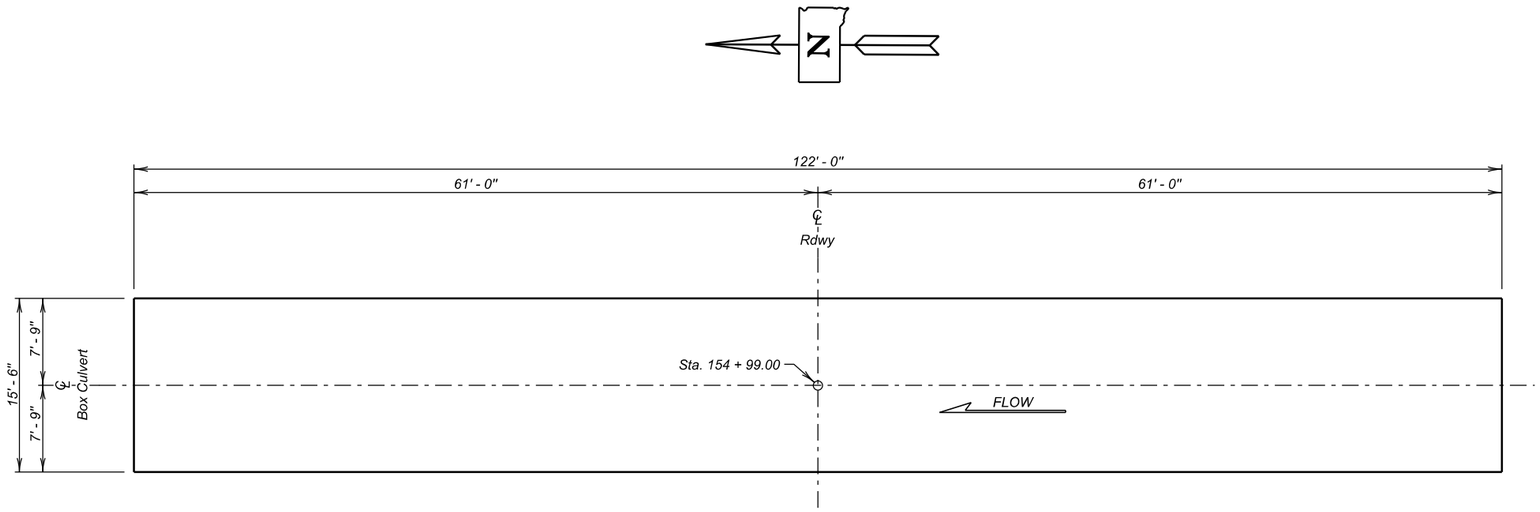
SHOP PLANS

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

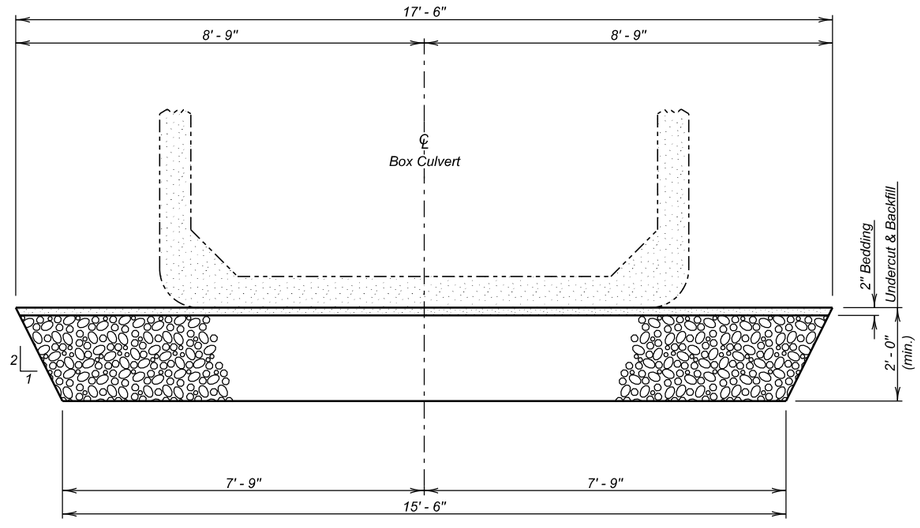
ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
⌀	Box Culvert Undercut	Cu. Yd.	150

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



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SITE 1
ALTERNATE B
NOTES AND UNDERCUT DETAILS

FOR

10' X 6' BOX CULVERT (PRECAST)

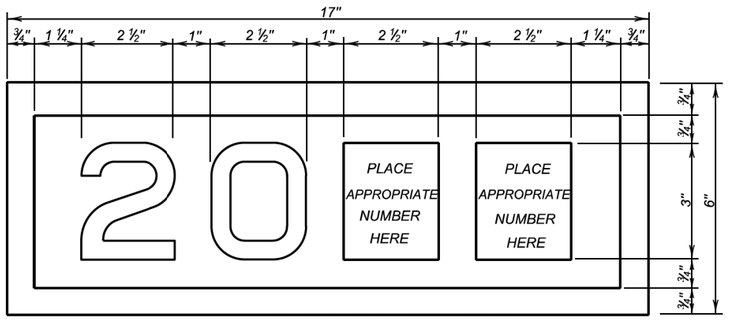
OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 154 + 99.00 — SEC. 20-T23N-R20E
STR. NO. 16-163-007 — EM 0012(206)112
HL-93

CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	BT	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGB09		



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.

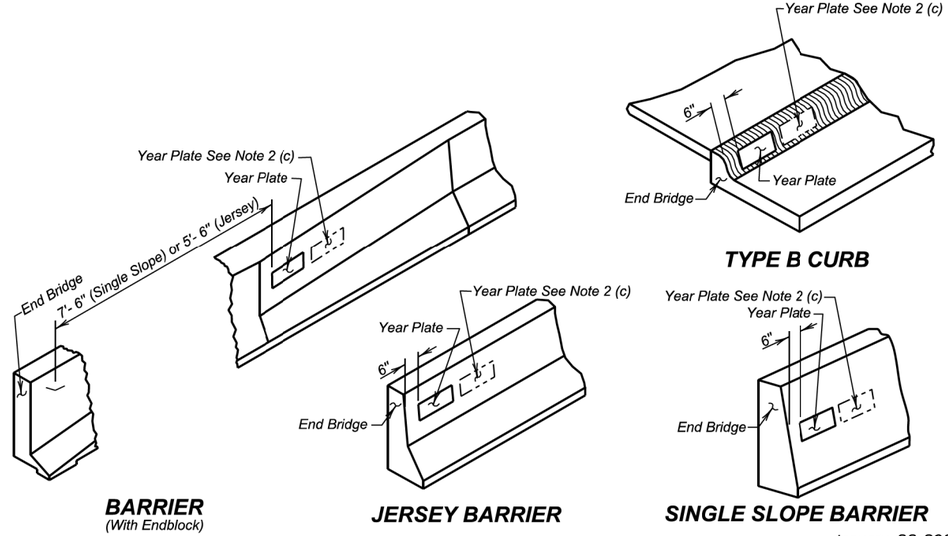
2. Year plates will be located on structure(s) as follows:

   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.

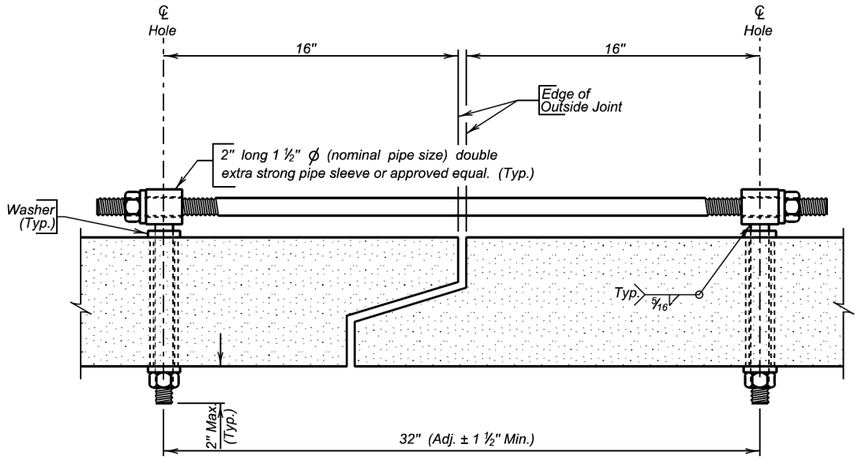
   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

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".

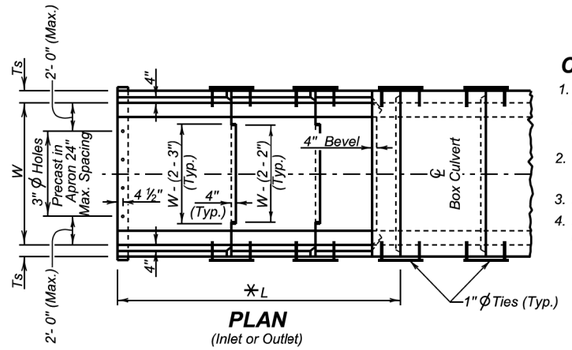
March 21, 2016

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

SITE 1
ALTERNATE B

10' X 6' BOX CULVERT (PRECAST)
STR. NO. 16-163-007
MAY 2022

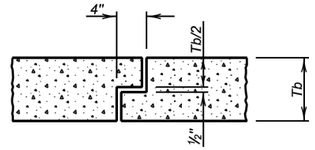
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E35	E60



PLAN
(Inlet or Outlet)

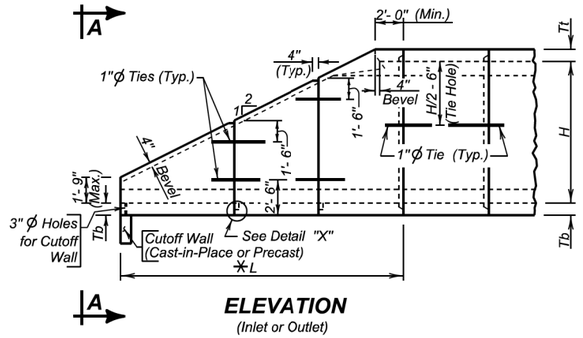
CUTOFF WALL

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.

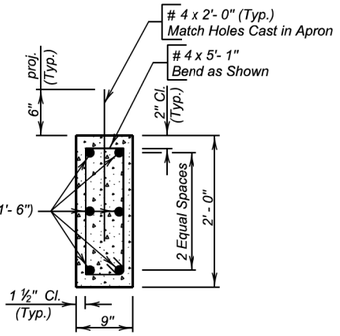


DETAIL " X "

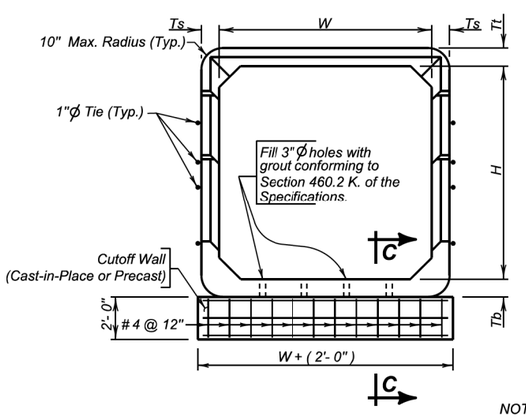
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.



ELEVATION
(Inlet or Outlet)



SEC. C - C



VIEW A - A

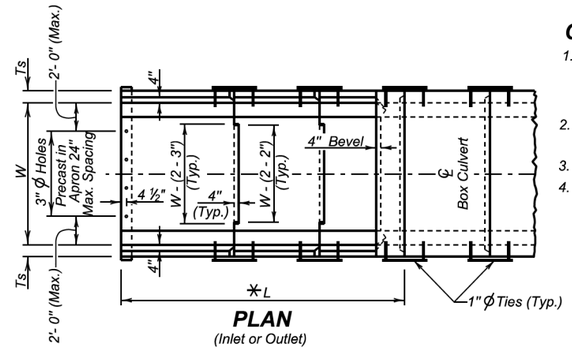
LEGEND

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

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

June 26, 2015

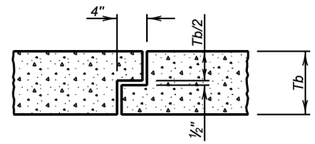
Published Date: 2024	SDDOT	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'–0" CUTOFF WALL	PLATE NUMBER 560.10
			Sheet 1 of 1



PLAN
(Inlet or Outlet)

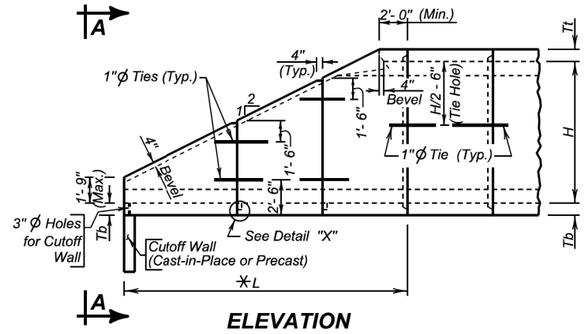
CUTOFF WALL

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.

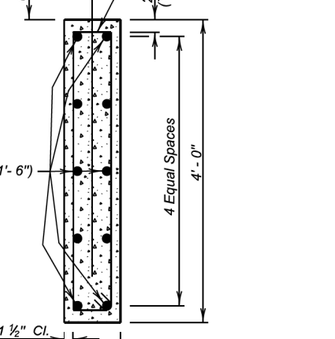


DETAIL " X "

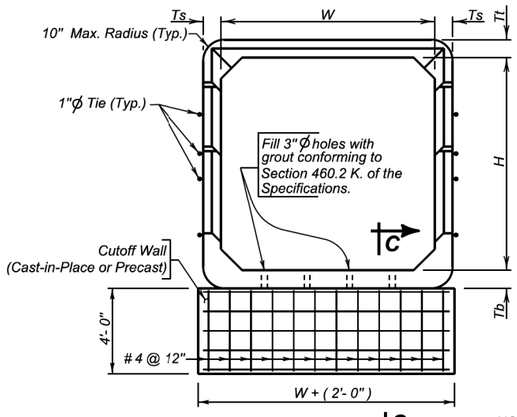
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.



ELEVATION
(Inlet or Outlet)



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
L = Length of End Section

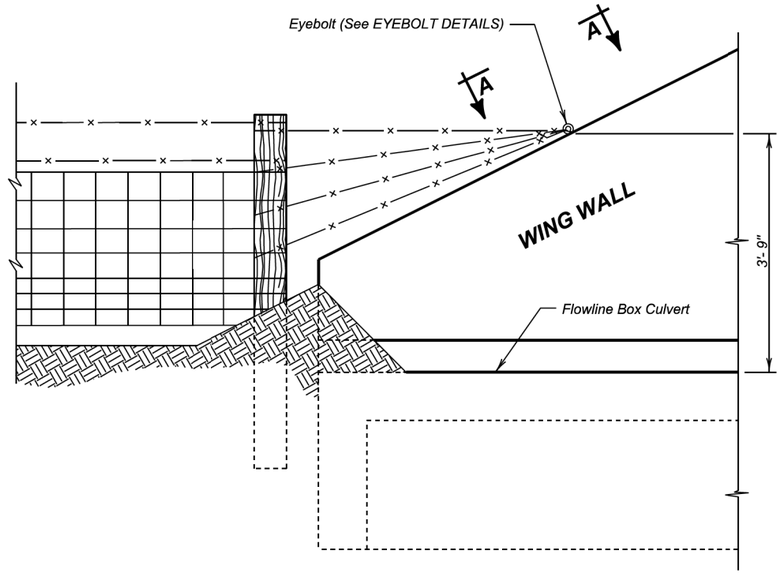
NOTES:
See GENERAL DRAWING for W and H dimensions.
Tt, Tb, L, and Ts dimensions shall be furnished by the Contractor.
⚹ Length and number of units may vary from that shown.

June 26, 2015

Published Date: 2024	SDDOT	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'–0" CUTOFF WALL	PLATE NUMBER 560.11
			Sheet 1 of 1

SITE 1
ALTERNATE B

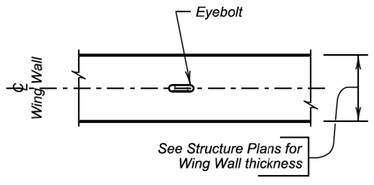
10' X 6' BOX CULVERT (PRECAST)
STR. NO. 16-163-007
MAY 2022



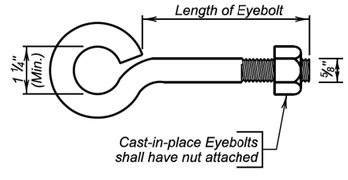
DETAIL FOR FENCE ANCHORS

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

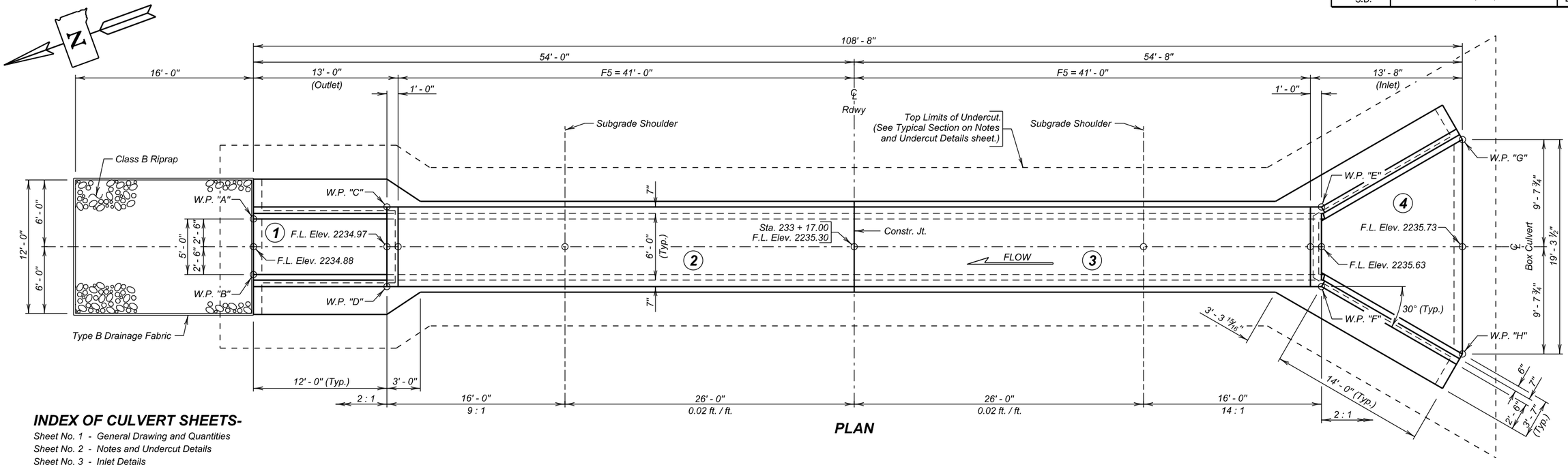
Published Date: 2024	SDDOT	FENCE ANCHORS FOR BOX CULVERT WING WALLS	PLATE NUMBER 620.16
			Sheet 1 of 1

SITE 1
ALTERNATE B

10' X 6' BOX CULVERT (PRECAST)
STR. NO. 16-163-007
MAY 2022

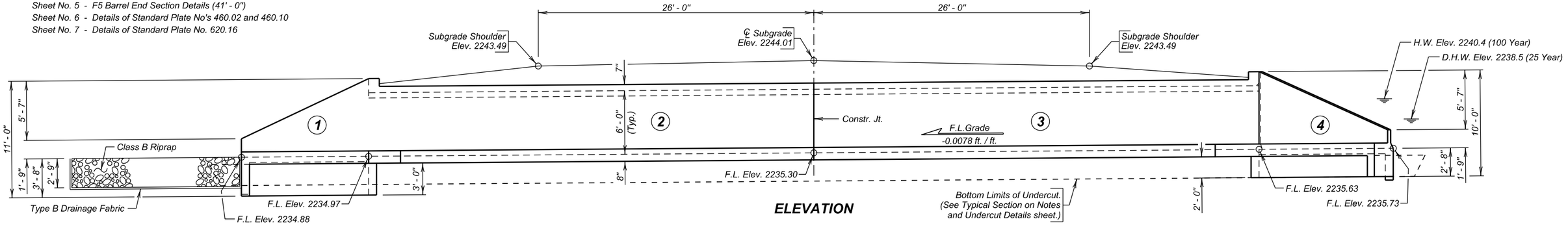
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E37	E60



PLAN

INDEX OF CULVERT SHEETS-



ELEVATION

HYDRAULIC DATA

Q_d	84 cfs
A_d	9 sq ft
V_d	9.8 fps
Q_E	84 cfs
Q_{100}	183 cfs
Q_{OT}	$>Q_{100}$
V_{max}	12.1 fps

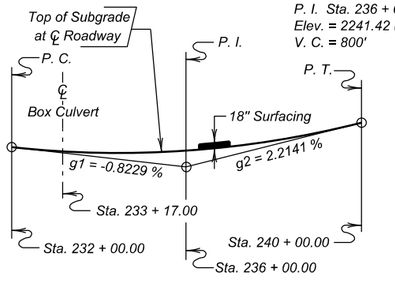
Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2238.5.

Q_{OT} = Overtopping discharge and frequency > Q_{100} year recurrence interval. El. 2245.1 @ Sta. 233 + 61.00 ±.

Q_E = 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. 2240.4.

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



P. I. Sta. 236 + 00.00
Elev. = 2241.42 (Subgrade)
V. C. = 800'

VERTICAL CURVE DATA

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	233 + 19.50	54.00' Lt.
"B"	233 + 14.50	54.00' Lt.
"C"	233 + 20.58	42.00' Lt.
"D"	233 + 13.42	42.00' Lt.
"E"	233 + 20.58	42.00' Rt.
"F"	233 + 13.42	42.00' Rt.
"G"	233 + 26.65	54.67' Rt.
"H"	233 + 07.35	54.67' Rt.

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
	Class A45 Concrete, Box Culvert	Cu. Yd.	78.1
	Reinforcing Steel	Lb.	11221
	Structure Excavation, Box Culvert	Cu. Yd.	32
	Box Culvert Undercut	Cu. Yd.	130
	Type B Drainage Fabric	Sq. Yd.	39
✳	Class B Riprap	Ton	27.4

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

SITE 2
ALTERNATE A

GENERAL DRAWING AND QUANTITIES

FOR

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

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 233 + 17.00 — SEC. 28-T23N-R20E
STR. NO. 16-177-011 — EM 0012(206)112
PCN 05HW — HL-93

CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

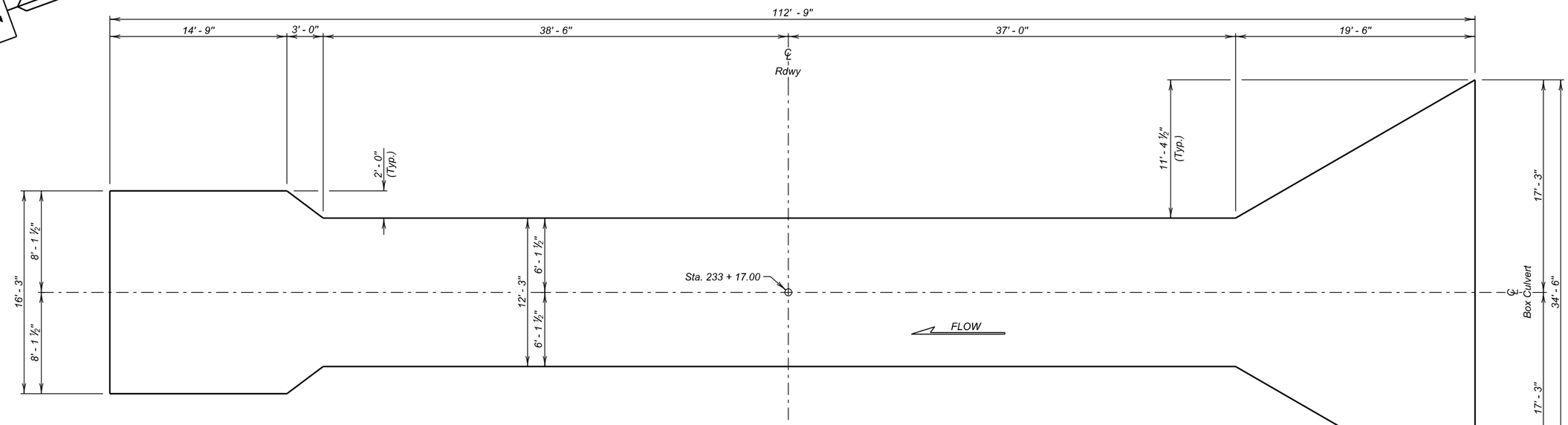
MAY 2022

1 OF 7

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

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGC01		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E38	E60



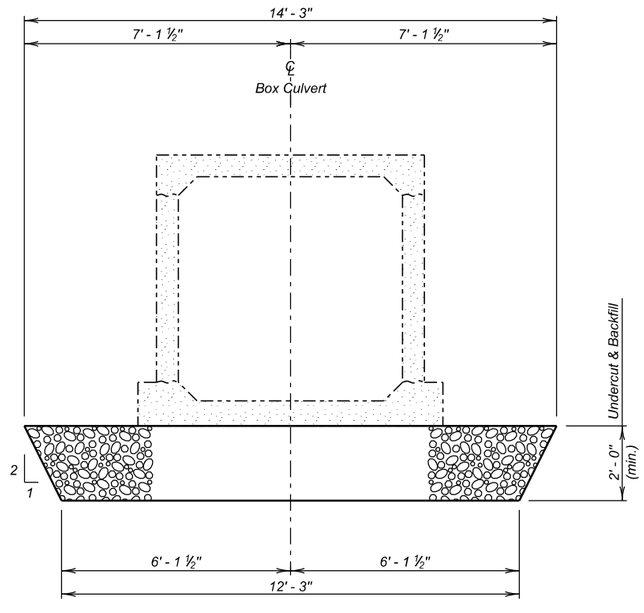
UNDERCUT LAYOUT
(Bottom Dimensions)

SPECIFICATIONS

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

GENERAL NOTES

1. *Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross axle weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. of fill has been placed over the box culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.*
2. *The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 5 ft. (F5).*
3. *Design Material Strengths: Concrete $f'c$ = 4500 p.s.i.*
   Reinforcing Steel fy = 60000 p.s.i.
4. *High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a Type V or Type II with 20 to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.*
5. *All reinforcing steel will conform to ASTM A615 Grade 60.*
6. *All lap splices shown are contact lap splices unless noted otherwise.*
7. *All exposed edges will be chamfered ¾ inch unless noted otherwise in the plans.*
8. *Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.*
9. *The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.*
10. *Care will be taken to establish Working Points (W.P.) as shown on the wings.*
11. *Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).*
12. *Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.*
13. *Soils below the bottom of the proposed RCBC consist of brown gray silt clay. Groundwater was encountered in the borings at an average elevation of 2235.7 during the subsurface investigation conducted in April 2020. Dewatering will be required for the construction of the RCBC. All costs incurred for dewatering will be incidental to other contract items. All cost incurred for dewatering will be incidental to other contract items.*



TYPICAL SECTION
(For Limits of Undercut)

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
⌀	Box Culvert Undercut	Cu. Yd.	130

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

SITE 2
ALTERNATE A

NOTES AND UNDERCUT DETAILS

FOR

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

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 233 + 17.00 — SEC. 28-T23N-R20E
STR. NO. 16-177-011 — EM 0012(206)112
HL-93

CORSON COUNTY

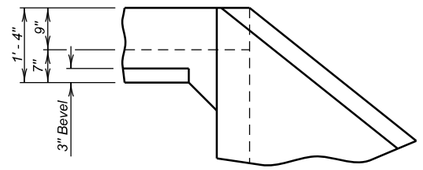
S. D. DEPT. OF TRANSPORTATION

MAY 2022

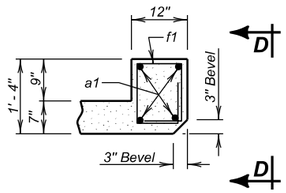
2 OF 7

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGC02		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E39	E60



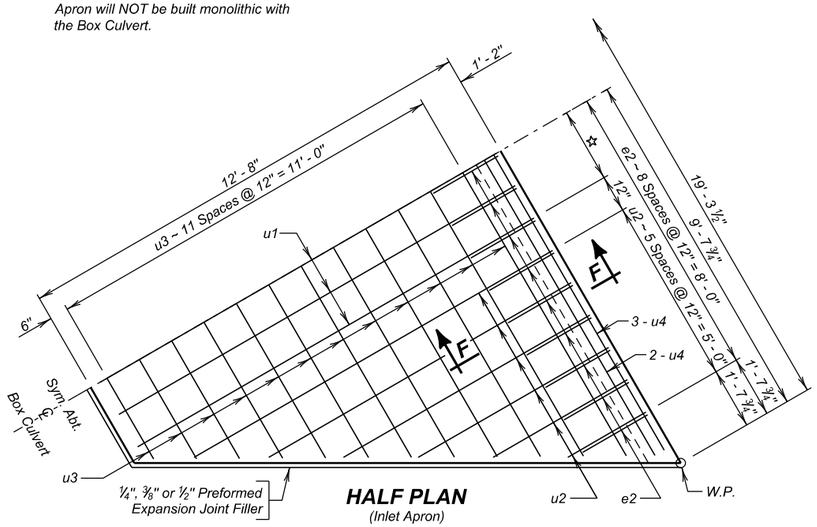
VIEW D - D
(At Exterior Wall)



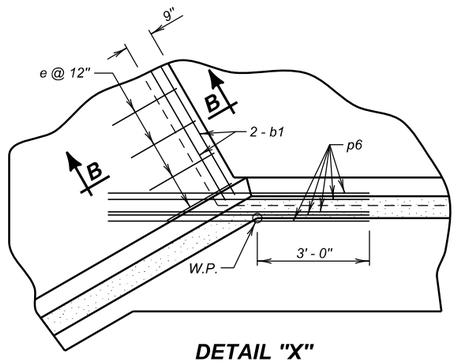
SECTION A - A
(At Top Slab)

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

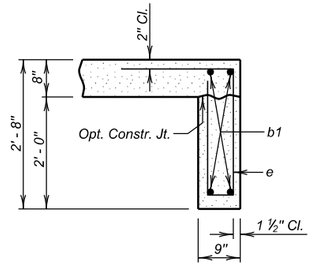
☆ *u1 ~ 2 Spaces @ 12" = 2' - 0"*



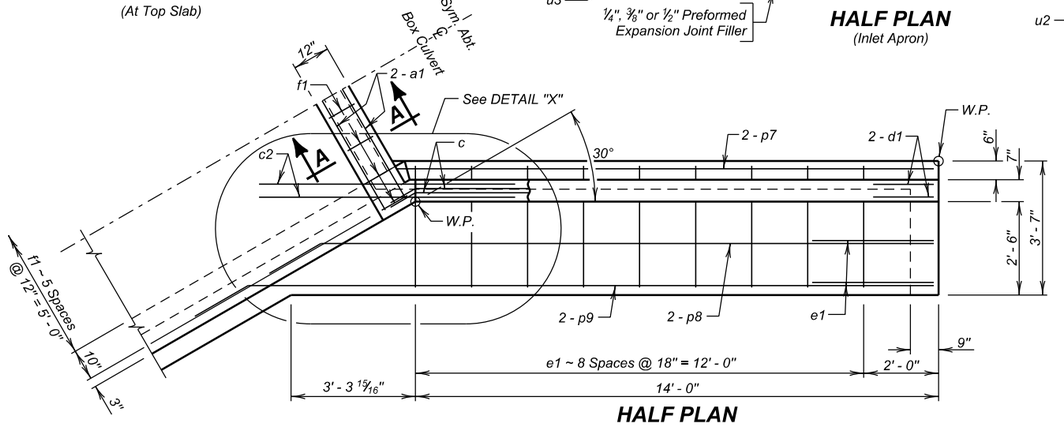
HALF PLAN
(Inlet Apron)



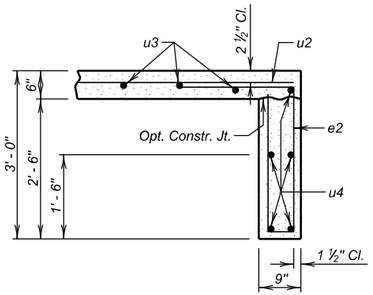
DETAIL "X"
(At Bottom Slab)



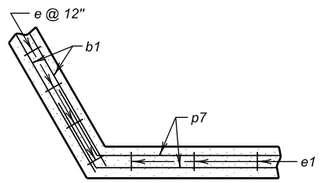
SECTION B - B



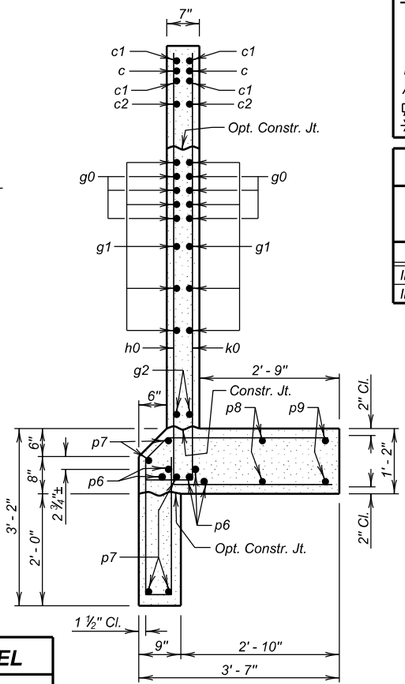
HALF PLAN



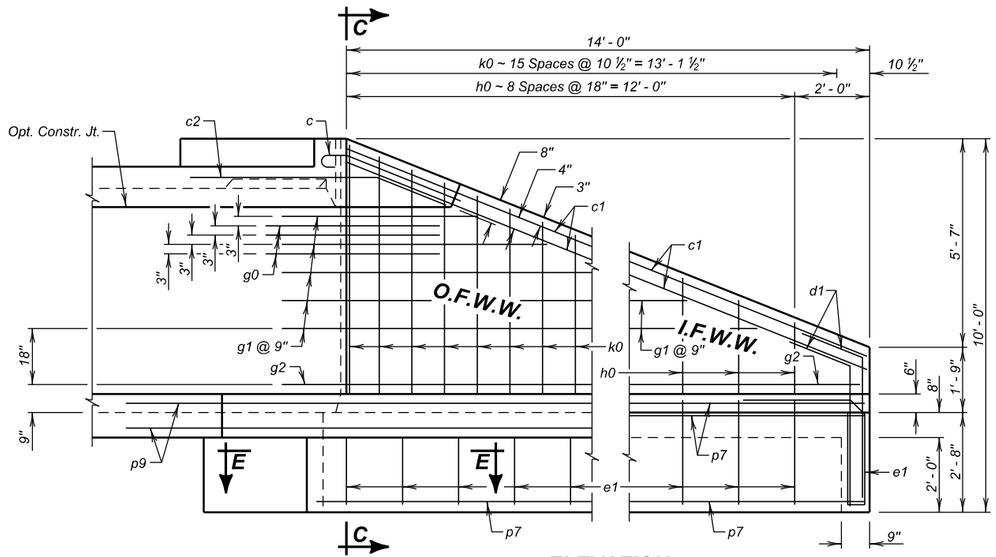
SECTION F - F



SECTION E - E



SECTION C - C



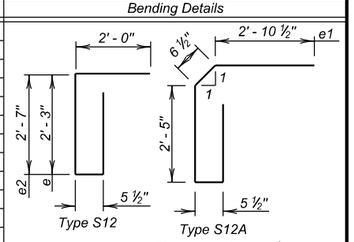
ELEVATION

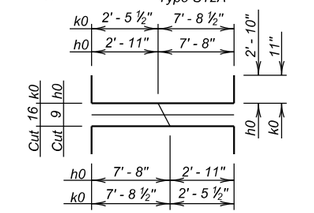
LEGEND FOR PLACING RE-STEEL

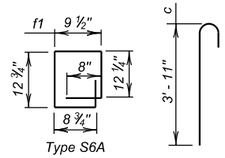
O. F. W. W. - Outside Face of Wing Wall
I. F. W. W. - Inside Face of Wing Wall

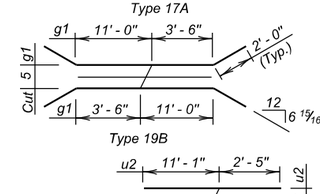
REINFORCING SCHEDULE

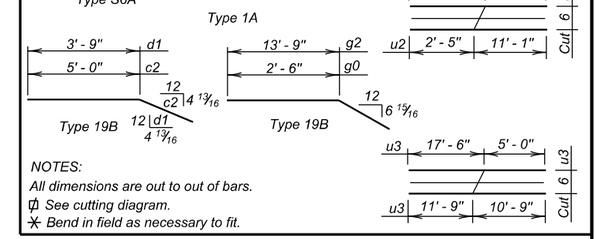
	Mk.	No.	Size	Length	Type	Bending Details
	a1	4	6	6' - 9"	Str.	
	b1	4	6	5' - 6"	Str.	
✳	c	4	5	4' - 6"	1A	
	c1	8	5	15' - 0"	Str.	
	c2	4	5	7' - 0"	19B	
	d1	8	5	5' - 6"	19B	
	e	6	4	6' - 9"	S12	
	e1	22	4	8' - 9"	S12A	
	f1	8	4	5' - 0"	S6A	
	g0	12	5	5' - 0"	19B	
⌀	g1	10	4	18' - 6"	19B	
	g2	4	4	15' - 9"	19B	
⌀	h0	9	4	16' - 3"	17A	
⌀	k0	16	4	12' - 0"	17A	
	p6	10	6	7' - 0"	Str.	
✳	p7	10	4	16' - 6"	Str.	
✳	p8	4	4	18' - 0"	Str.	
✳	p9	4	4	20' - 0"	Str.	
	INLET APRON					
	e2	17	4	7' - 6"	S12	
	u1	5	4	12' - 3"	Str.	
⌀	u2	6	4	13' - 6"	Str.	
⌀	u3	6	4	22' - 6"	Str.	
	u4	5	4	18' - 3"	Str.	











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

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	10.1	1246	5.1
Inlet Apron	4.1	331	4.1

SITE 2
ALTERNATE A

INLET DETAILS

FOR

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

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 233 + 17.00 — SEC. 28-T23N-R20E
STR. NO. 16-177-011 — EM 0012(206)112
HL-93

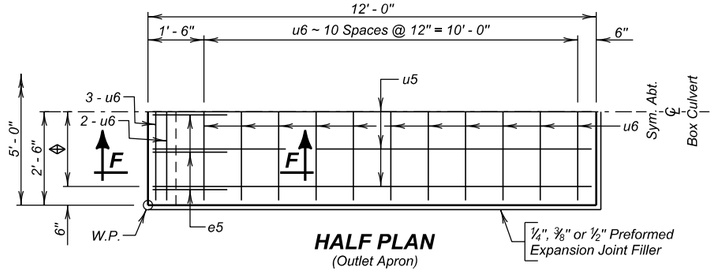
CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGC03		

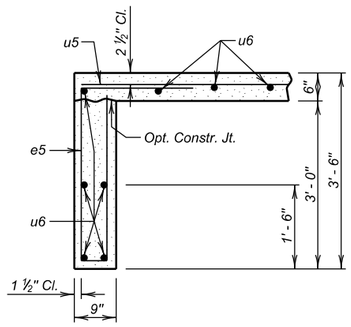
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E40	E60

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

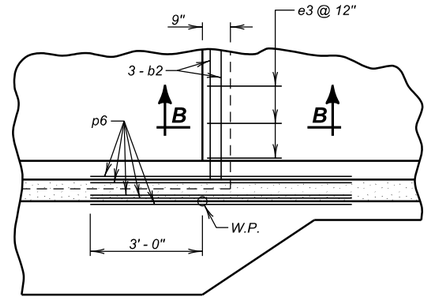
◈ e5 & u5 ~ 2 Spaces @ 12" = 2' - 0"



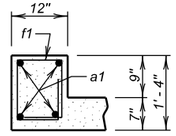
HALF PLAN
(Outlet Apron)



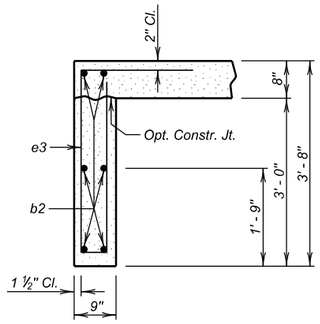
SECTION F - F



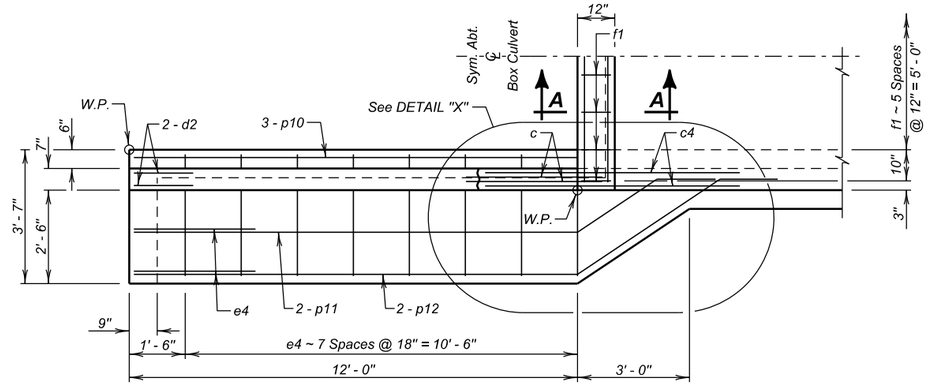
DETAIL "X"
(At Bottom Slab)



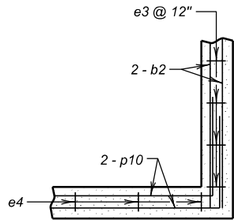
SECTION A - A
(At Top Slab)



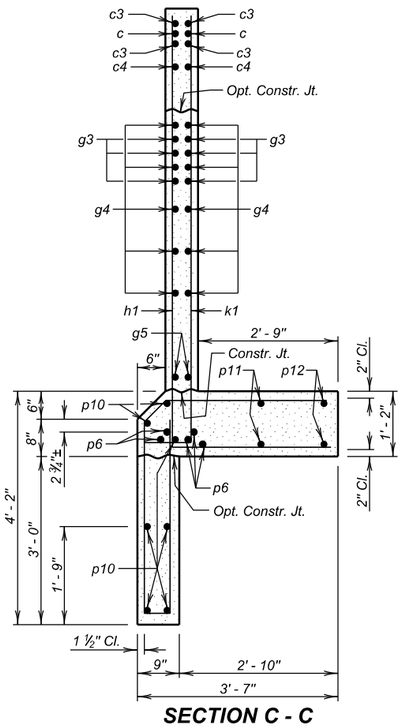
SECTION B - B



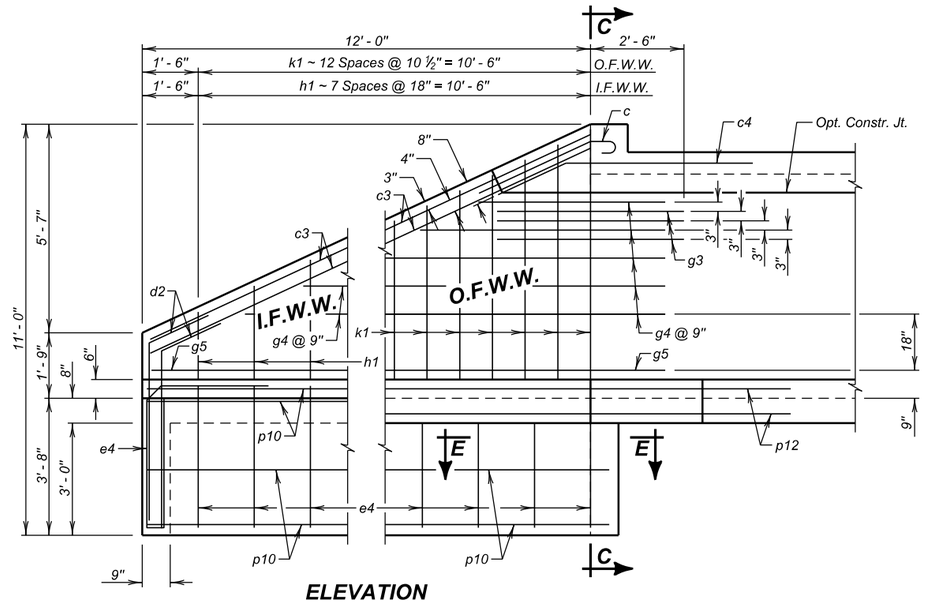
HALF PLAN



SECTION E - E



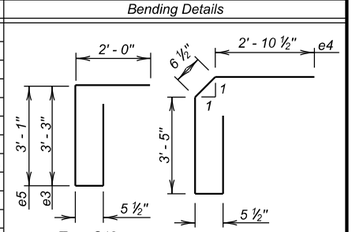
SECTION C - C

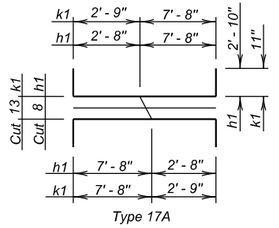


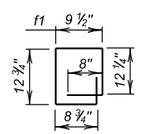
ELEVATION

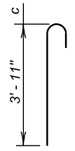
REINFORCING SCHEDULE

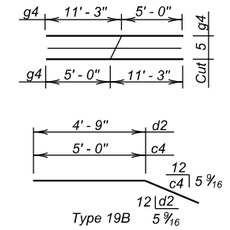
Mk.	No.	Size	Length	Type	Bending Details
a1	4	6	6' - 9"	Str.	
b2	6	6	6' - 3"	Str.	
c	4	5	4' - 6"	1A	
c3	8	5	13' - 0"	Str.	
c4	4	5	7' - 0"	19B	
d2	8	5	6' - 6"	19B	
e3	7	4	8' - 9"	S12	
e4	20	4	10' - 9"	S12A	
f1	8	4	5' - 0"	S6A	
g3	12	5	5' - 0"	Str.	
◊ g4	10	4	16' - 3"	Str.	
g5	4	4	13' - 9"	Str.	
◊ h1	8	4	16' - 0"	17A	
◊ k1	13	4	12' - 3"	17A	
p6	10	6	7' - 0"	Str.	
✳ p10	14	4	14' - 6"	Str.	
✳ p11	4	4	16' - 0"	Str.	
✳ p12	4	4	18' - 0"	Str.	
OUTLET APRON					
e5	5	4	8' - 6"	S12	
u5	5	4	11' - 9"	Str.	
u6	16	4	4' - 9"	Str.	











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

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Outlet	8.8	1251	4.5
Outlet Apron	1.5	118	1.5

LEGEND FOR PLACING RE-STEEL

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

SITE 2
ALTERNATE A

OUTLET DETAILS

FOR

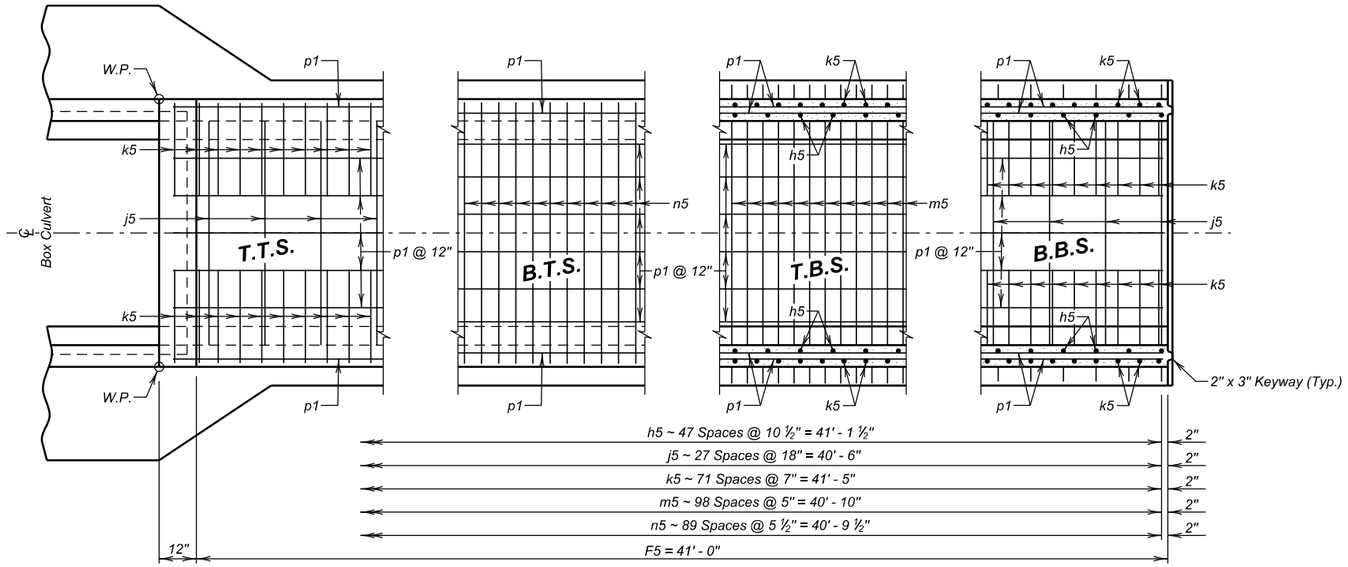
6' X 6' BOX CULVERT (C.I.P.)

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 233 + 17.00 — SEC. 28-T23N-R20E
STR. NO. 16-177-011 — EM 0012(206)112
HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

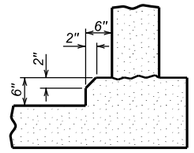
DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	MG	Steve A. Johnson BRIDGE ENGINEER
CORS05HW	05HWGC04		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E41	E60



PLAN

(Outlet End shown, Inlet similar by rotation)



OPTIONAL FILLET DETAIL

(At Bottom Slab)

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

OPTIONAL POUR - BOTTOM SLAB

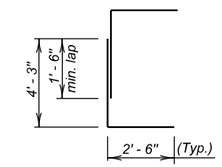
The Bottom Slab may be poured continuously, at the option of the Contractor, with the use of a Preformed Metal keyway conforming to the keyway dimensions and location as shown on the plans. The keyway length will be full width of the bottom slab. Care will be taken to maintain proper alignment of the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

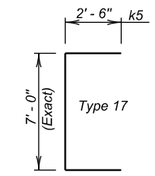
REINFORCING SCHEDULE

(For 2 - F5 Barrel End Sections)

Mk.	No.	Size	Length	Type	Bending Details
h5	192	4	7' - 9"	17A	
j5	112	4	6' - 0"	Str.	
k5	288	4	12' - 0"	17	
m5	198	4	8' - 0"	Str.	
n5	180	4	7' - 0"	Str.	
p1	92	4	41' - 6"	Str.	
△ z1	20	5	3' - 6"	Str.	



OPTIONAL k5 SPLICE DETAIL
Contractor may use optional reinforcing steel splice, as shown. The cost of the additional reinforcing steel shall be borne by the Contractor.



NOTES:

All dimensions are out to out of bars.

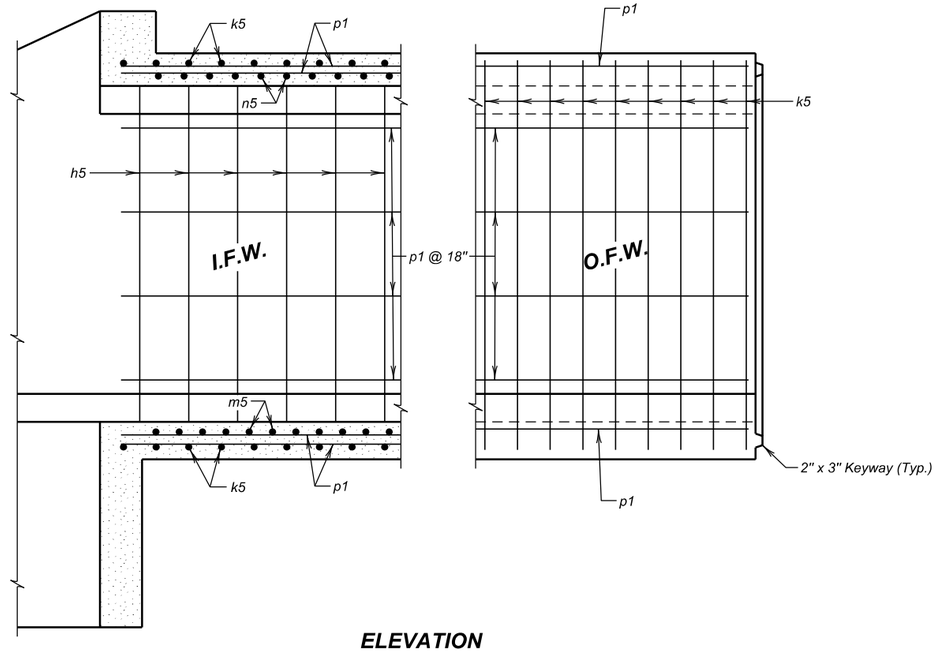
Request for additional reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.

ESTIMATED QUANTITIES

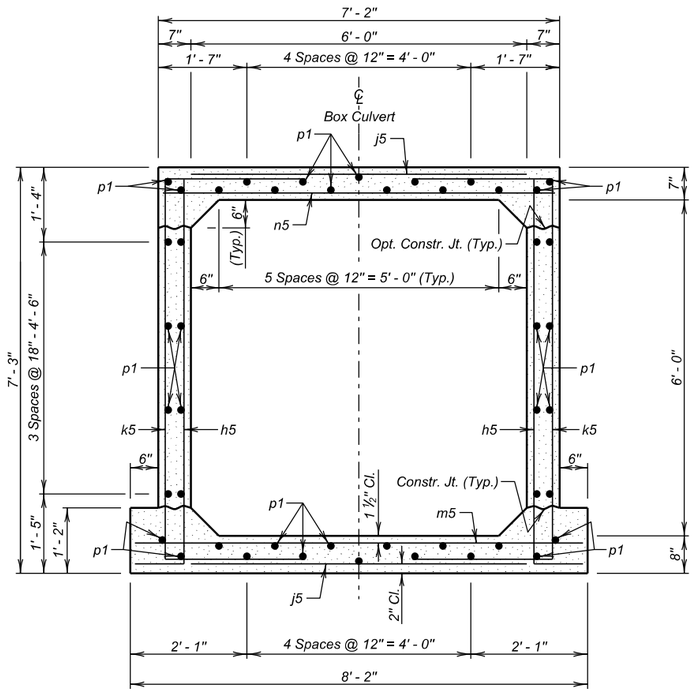
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu.Yd.	Lb.	Cu.Yd.
2 - F5 Barrel End Sections @ 41' - 0"	53.6	8275	16.6

LEGEND FOR PLACING RE-STEEL

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



ELEVATION



F5 BARREL SECTION

(5' - 0" Maximum Fill)

SITE 2
ALTERNATE A

F5 BARREL END SECTION DETAILS (41' - 0")

FOR

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

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 233 + 17.00 — SEC. 28-T23N-R20E
STR. NO. 16-177-011 — EM 0012(206)112
HL-93

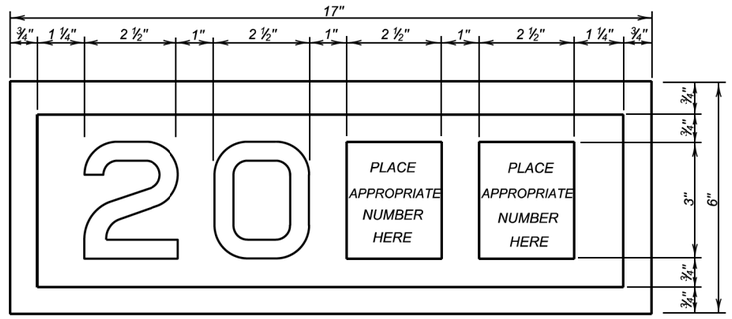
CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGC05		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E42	E60



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.

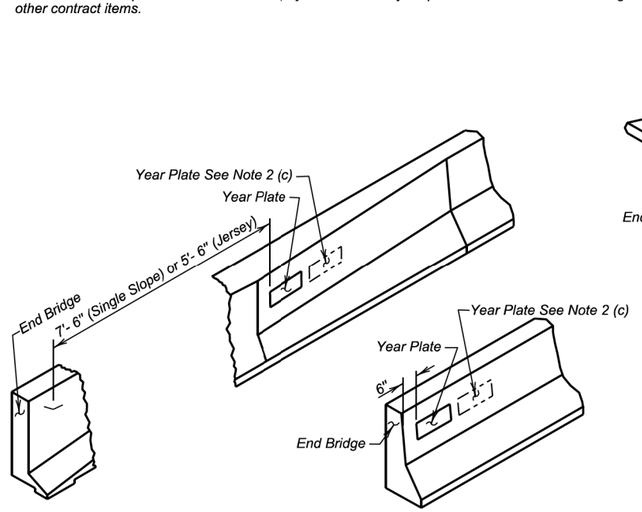
2. Year plates will be located on structure(s) as follows:

   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.

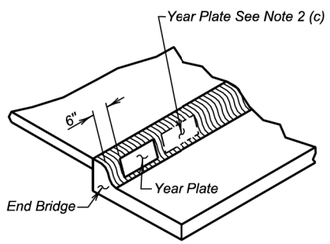
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with 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.

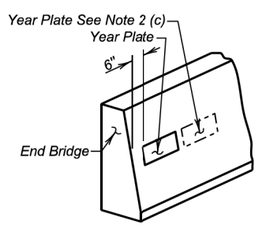


BARRIER
(With Endblock)



TYPE B CURB

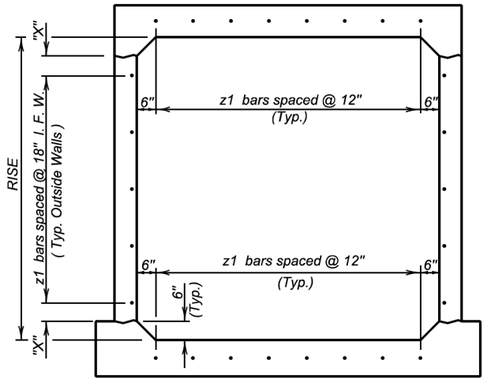
JERSEY BARRIER



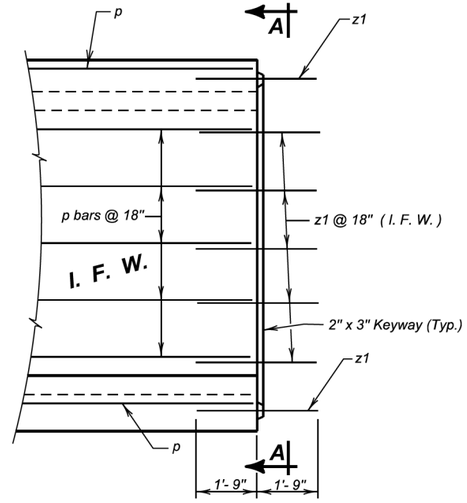
SINGLE SLOPE BARRIER

January 22, 2021

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



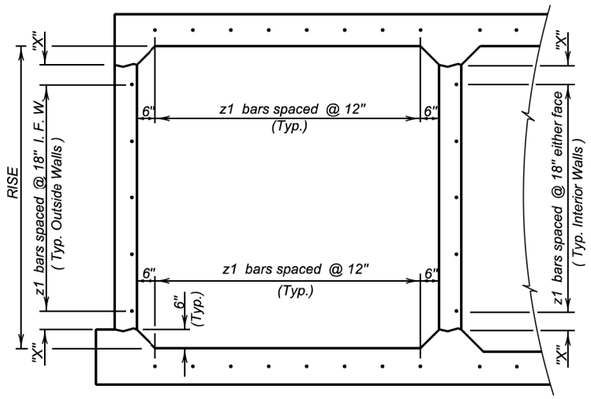
TYPICAL SINGLE BARREL VIEW A - A



ELEVATION

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

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



TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

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

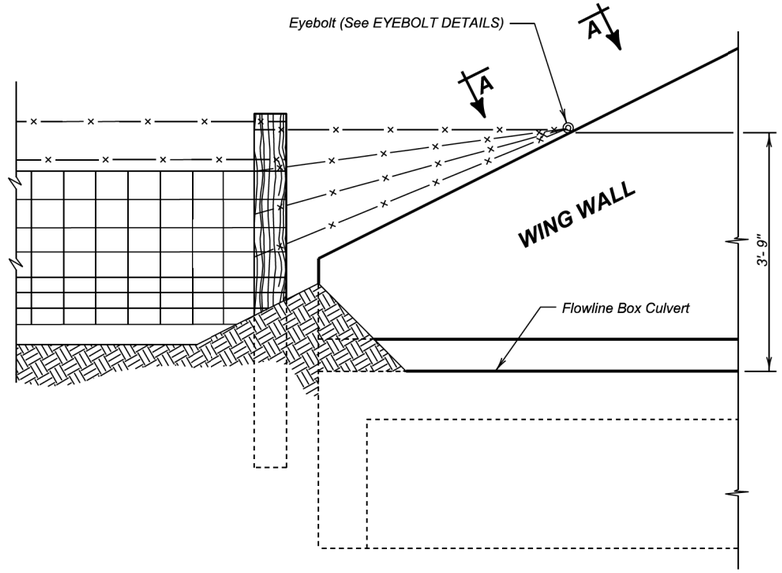
2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

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

SITE 2
ALTERNATE A

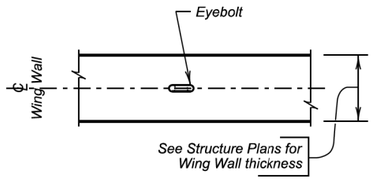
6' X 6' BOX CULVERT (C.I.P.)
STR. NO. 16-177-011
MAY 2022



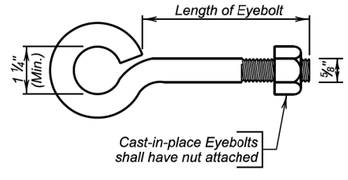
DETAIL FOR FENCE ANCHORS

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

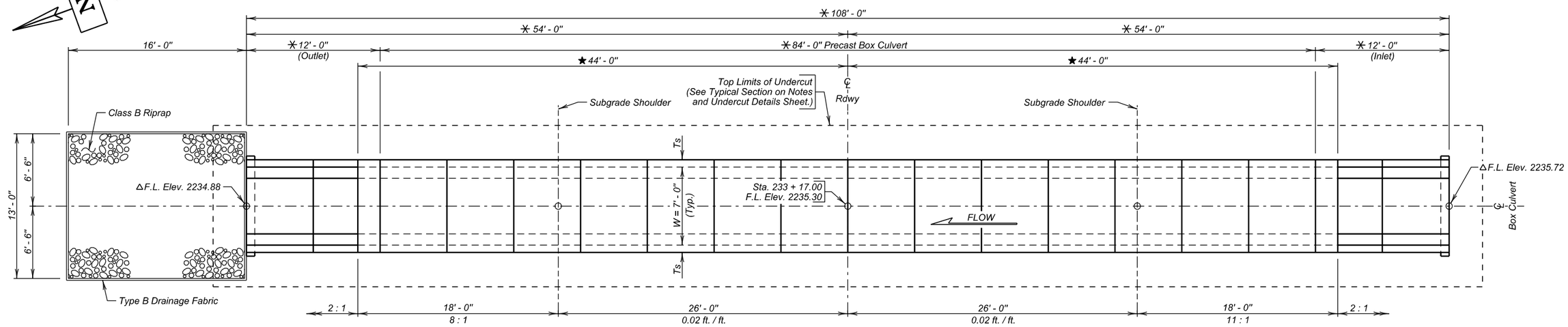
SITE 2
ALTERNATE A

6' X 6' BOX CULVERT (C.I.P.)
STR. NO. 16-177-011
MAY 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 clear zone.
△ Based on dimensions shown.

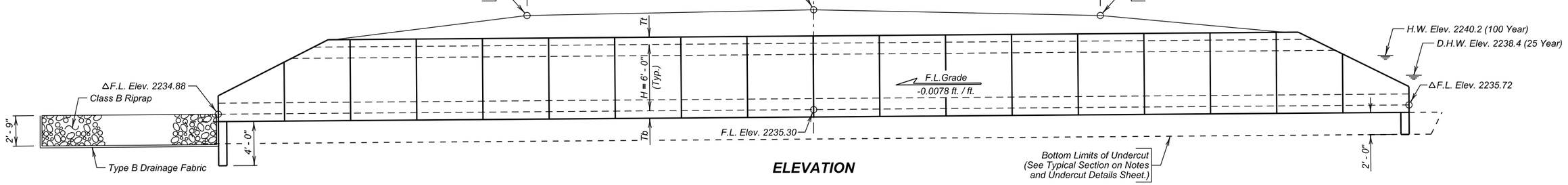
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E44	E60



PLAN

LEGEND

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



ELEVATION

INDEX OF CULVERT SHEETS-

HYDRAULIC DATA

Q_d	84 cfs
A_d	9 sq ft
V_d	9.5 fps
Q_F	84 cfs
Q_{100}	183 cfs
Q_{OT}	>Q_{100}
V_{max}	11.8 fps

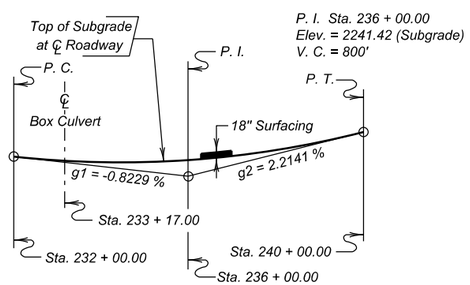
Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2238.4.

Q_{OT} = Overtopping discharge and frequency > Q_{100} year recurrence interval. El. 2245.1 @ Sta. 233 + 61.00 ±.

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. 2240.2.

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



P. I. Sta. 236 + 00.00
Elev. = 2241.42 (Subgrade)
V. C. = 800'

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
⧋	Structure Excavation, Box Culvert	Cu. Yd.	29.1
	Box Culvert Undercut	Cu. Yd.	113
≠	Class B Riprap	Ton	29.7
	Type B Drainage Fabric	Sq. Yd.	41
	7' X 6' Precast Concrete Box Culvert, Furnish	Ft.	84
	7' X 6' Precast Concrete Box Culvert, Install	Ft.	84
	7' X 6' Precast Concrete Box Culvert End Section, Furnish	Each	2
	7' X 6' Precast Concrete Box Culvert End Section, Install	Each	2

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

SITE 2
ALTERNATE B

GENERAL DRAWING AND QUANTITIES

FOR

7' X 6' BOX CULVERT (PRECAST)

OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 233 + 17.00 — SEC. 28-T23N-R20E
STR. NO. 16-177-011 — EM 0012(206)112
PCN 05HW — HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

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

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	MG	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGC08		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E45	E60

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 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the box culvert. If other construction loads in excess of legal load are anticipated by the Contractor, the Contractor will submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.*
3. *The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with 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 feet and include all subsequent fill heights up to and including the maximum fill height of 5 feet 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 brown gray silt clay. Groundwater was encountered in the borings at an average elevation of 2235.7 during the subsurface investigation conducted in April 2020. Dewatering wil be required for the construction of the RCBC. All costs incurred for dewatering will be incidental to other contract items.*

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 a type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.*

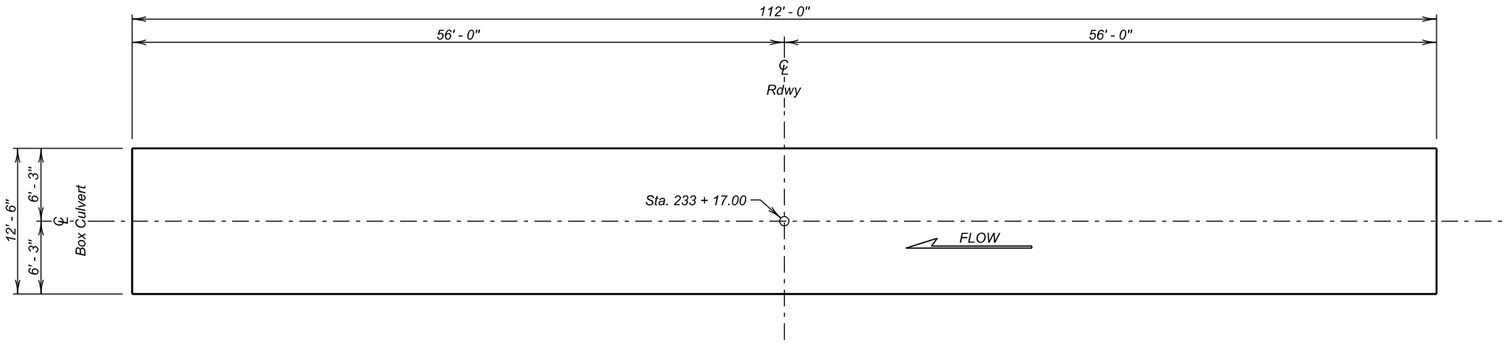
SHOP PLANS

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

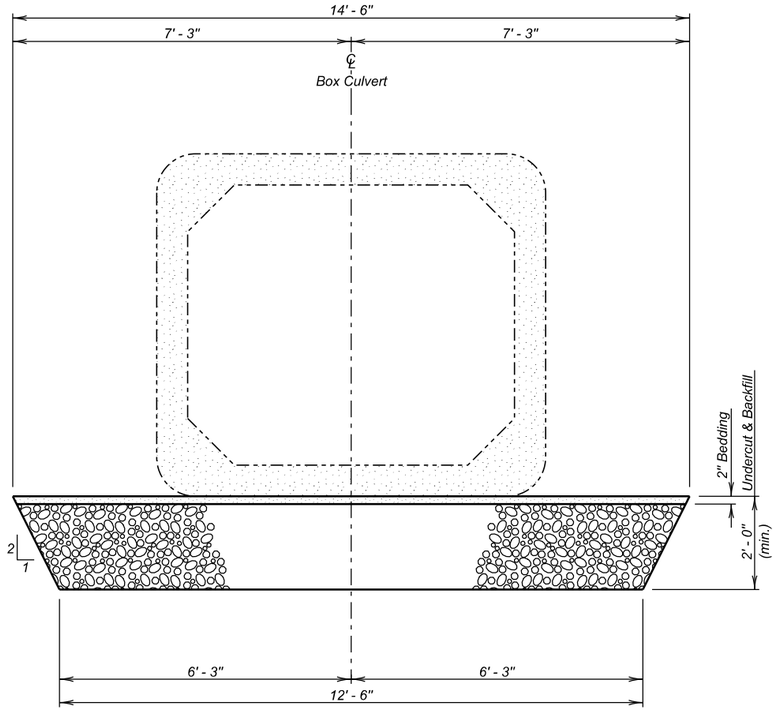
ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
⌀	Box Culvert Undercut	Cu. Yd.	113

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



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SITE 2
ALTERNATE B

NOTES AND UNDERCUT DETAILS

FOR

7' X 6' BOX CULVERT (PRECAST)

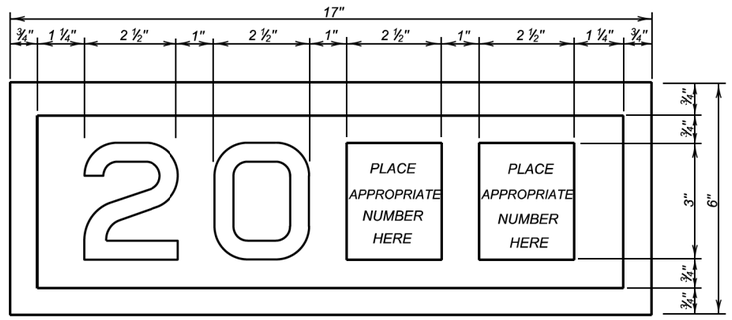
OVER TRIB. TO HAY CREEK — 0° SKEW
STA. 233 + 17.00 — SEC. 28-T23N-R20E
STR. NO. 16-177-011 — EM 0012(206)112
HL-93

CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
CM	BR	MG	BRIDGE ENGINEER
CORS05HW	05HWGC09		



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.

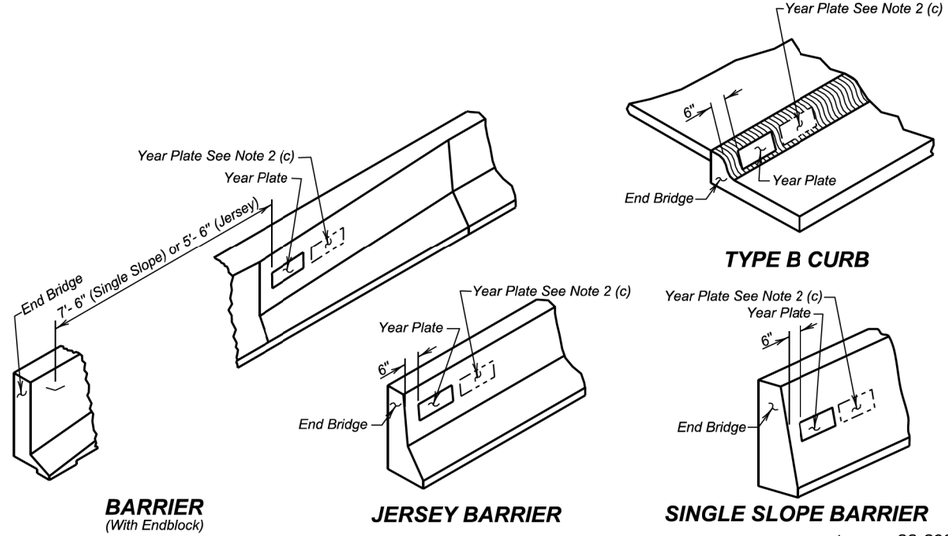
2. Year plates will be located on structure(s) as follows:

   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.

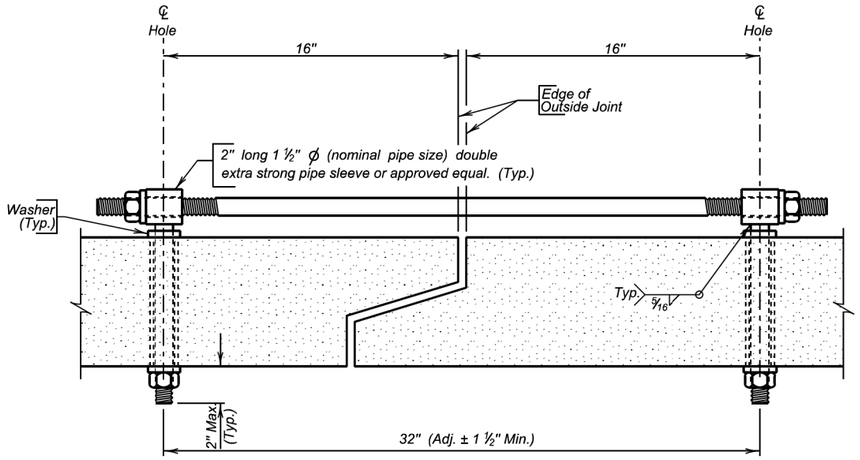
   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

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 ϕ 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".

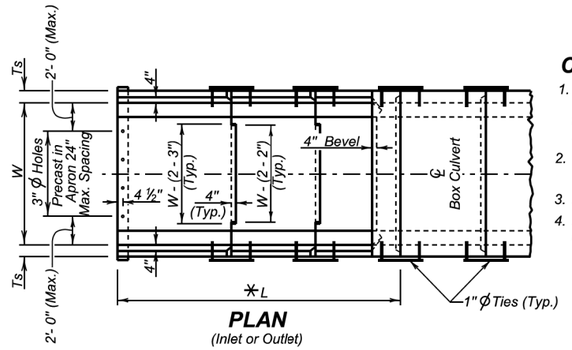
March 21, 2016

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

SITE 2
ALTERNATE B

7' X 6' BOX CULVERT (PRECAST)
STR. NO. 16-177-011
MAY 2022

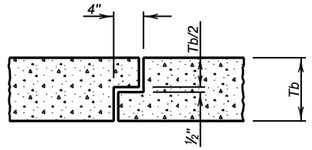
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E47	E60



PLAN
(Inlet or Outlet)

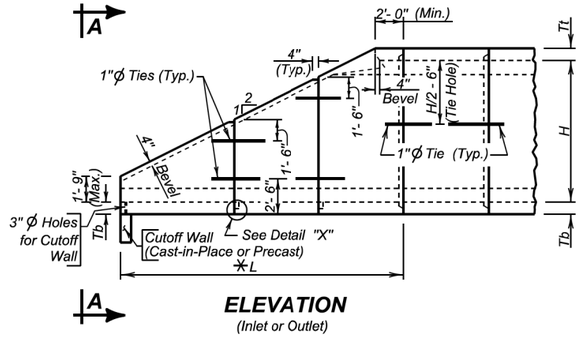
CUTOFF WALL

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.*

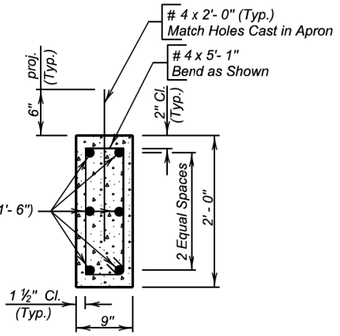


DETAIL " X "

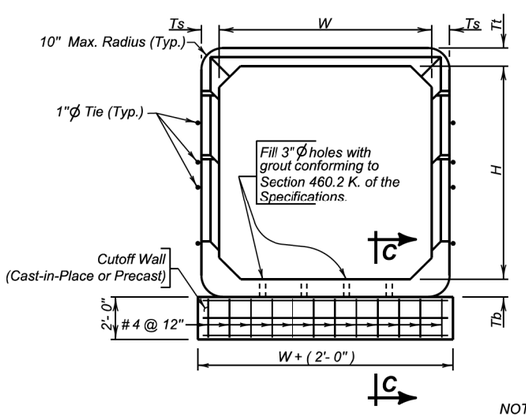
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.



ELEVATION
(Inlet or Outlet)



SEC. C - C



VIEW A - A

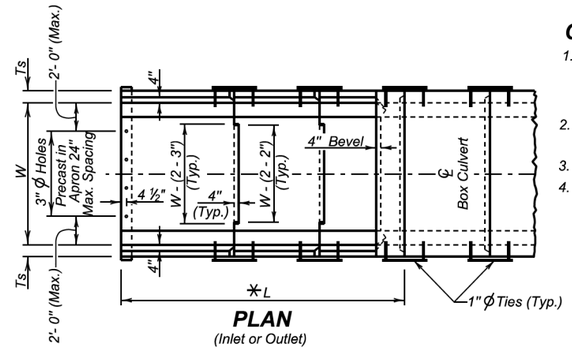
LEGEND

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

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

June 26, 2015

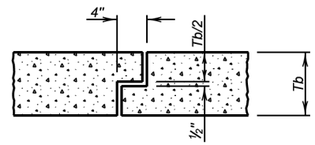
Published Date: 2024	SDDOT	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'–0" CUTOFF WALL	PLATE NUMBER 560.10
			Sheet 1 of 1



PLAN
(Inlet or Outlet)

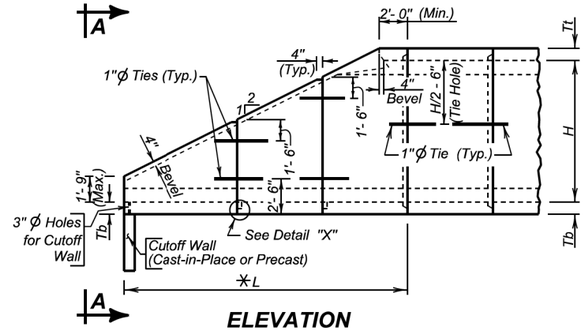
CUTOFF WALL

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.*

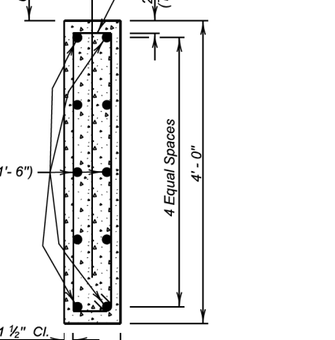


DETAIL " X "

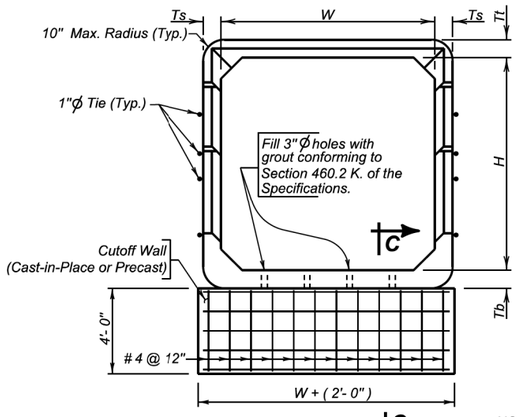
NOTE: Joint details may vary from that shown, according to the manufacturer's design. Submit details with shop plans for approval.



ELEVATION
(Inlet or Outlet)



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
L = Length of End Section

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

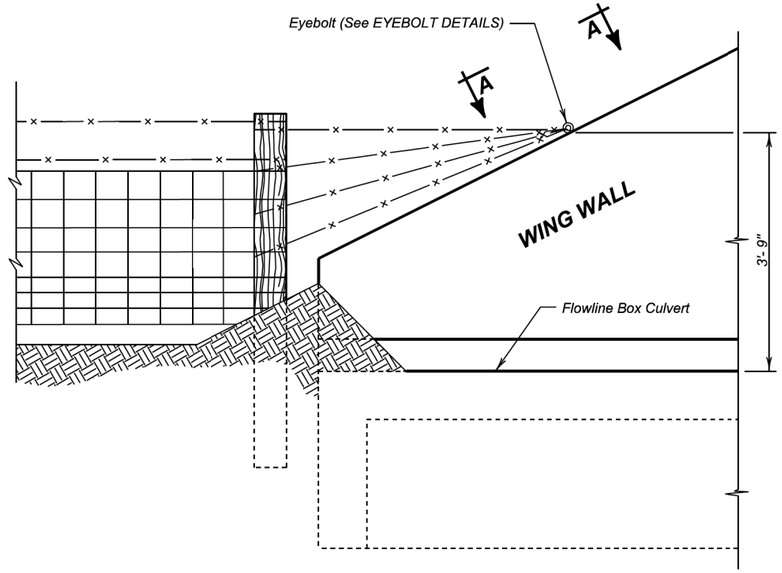
June 26, 2015

Published Date: 2024	SDDOT	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'–0" CUTOFF WALL	PLATE NUMBER 560.11
			Sheet 1 of 1

SITE 2
ALTERNATE B

7' X 6' BOX CULVERT (PRECAST)
STR. NO. 16-177-011
MAY 2022

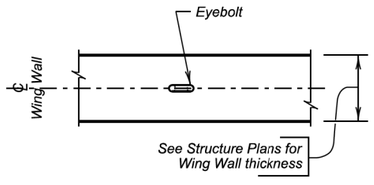
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E48	E60



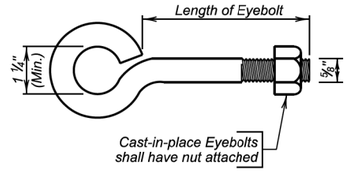
DETAIL FOR FENCE ANCHORS

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

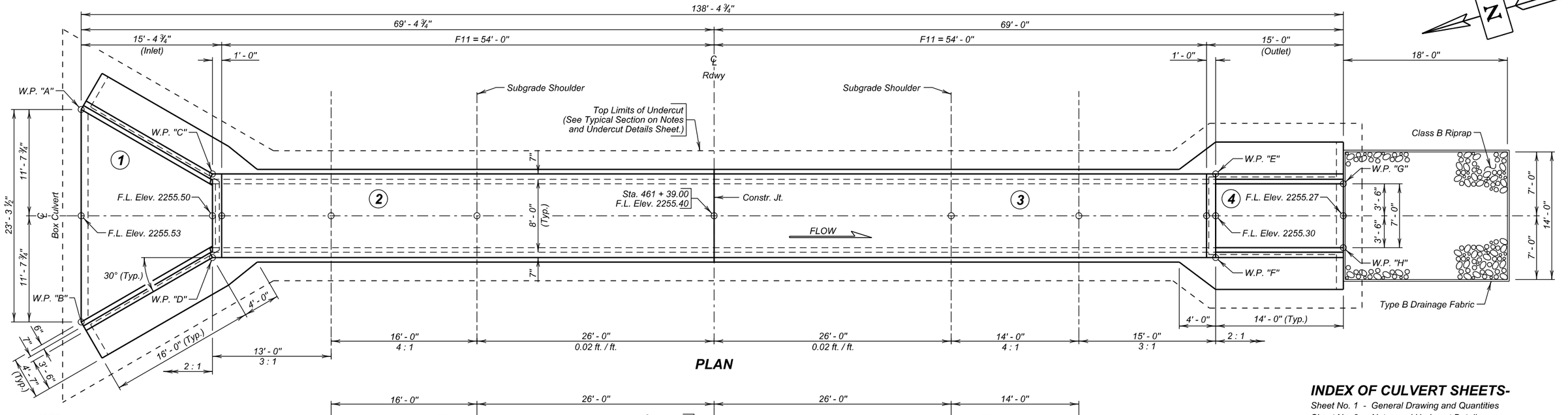
SITE 2
ALTERNATE B

7' X 6' BOX CULVERT (PRECAST)
STR. NO. 16-177-011
MAY 2022

5 OF 5

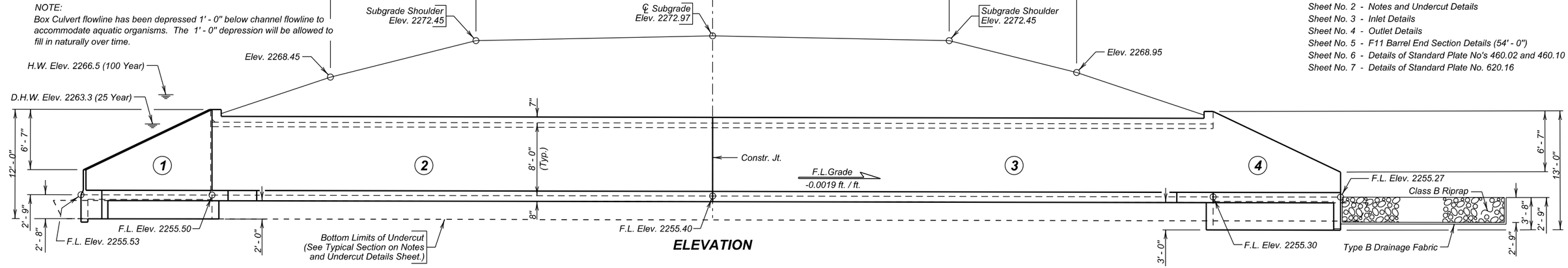
The elevations shown in these plans are based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAVD88).

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E49	E60



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

INDEX OF CULVERT SHEETS-

HYDRAULIC DATA

Q_d	343 cfs
A_d	31 sq ft
V_d	11.2 fps
Q_F	343 cfs
Q_{100}	624 cfs
Q_{OT}	>Q_{100}
V_{max}	13.6 fps

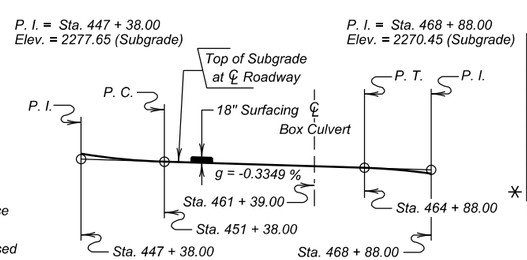
Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2263.3.

Q_{OT} = Overtopping discharge and frequency > Q_{100} year recurrence interval. El. 2272.4 @ Sta. 466 + 43.00 Lt. ±

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. 2266.5.

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



GRADELINE DATA

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Class A45 Concrete, Box Culvert	Cu. Yd.	129.5
Reinforcing Steel	Lb.	20214
Structure Excavation, Box Culvert	Cu. Yd.	50
Box Culvert Undercut	Cu. Yd.	196
Type B Drainage Fabric	Sq. Yd.	48
Class B Riprap	Ton	35.9

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

TABLE OF WORKING POINTS

W. P.	STATION	OFFSET
"A"	461 + 50.65	69.40' Lt.
"B"	461 + 27.35	69.40' Lt.
"C"	461 + 43.58	55.00' Lt.
"D"	461 + 34.42	55.00' Lt.
"E"	461 + 43.58	55.00' Rt.
"F"	461 + 34.42	55.00' Rt.
"G"	461 + 42.50	69.00' Rt.
"H"	461 + 35.50	69.00' Rt.

SITE 3
ALTERNATE A

GENERAL DRAWING AND QUANTITIES

FOR

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

OVER TRIB. TO HUMP CREEK — 0° SKEW
STA. 461 + 39.00 — SEC. 30-T23N-R21E
STR. NO. 16-219-017 — EM 0012(206)112
PCN 05HW — HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

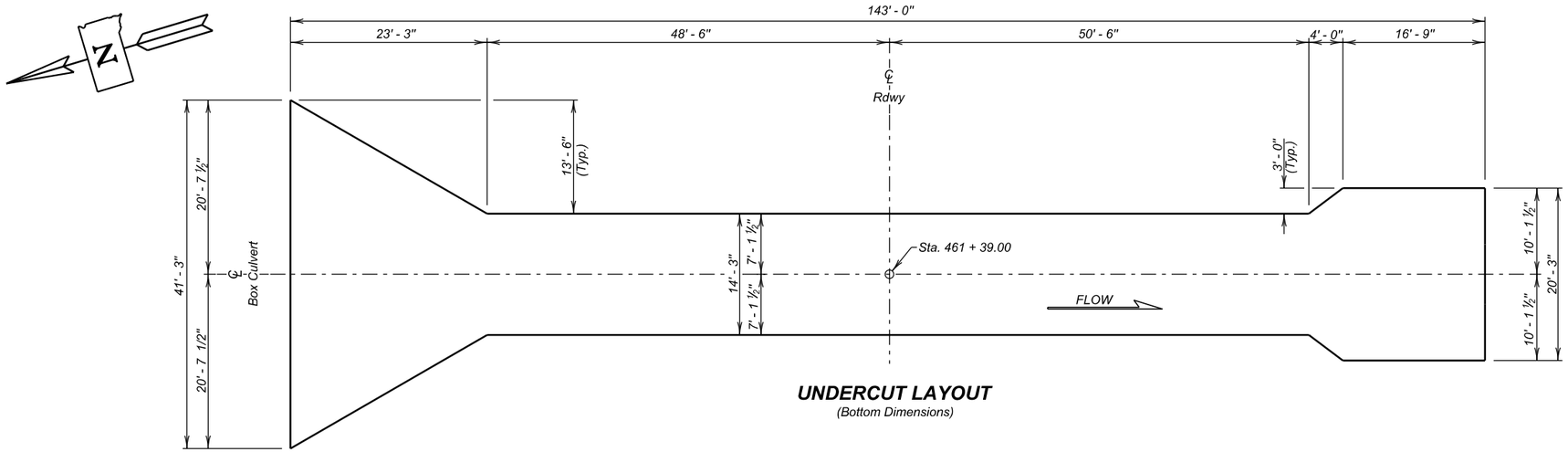
1 OF 7

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

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BR	CM	MG/CRW	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGD01		

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.	EM 0012(206)112	E50	E60



UNDERCUT LAYOUT
(Bottom Dimensions)

TYPICAL SECTION
(For Limits of Undercut)

SPECIFICATIONS

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

GENERAL NOTES

1. Design Live Load: HL-93 and construction loading consisting of one 7' - 6" gage axle with gross axle weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 ft. of fill has been placed over the box culvert. Other construction loads in excess of legal load must be submitted thru proper channels to the Office of Bridge Design for analysis.
2. The design of the barrel section is based on a minimum fill height of 2 feet and includes all subsequent fill heights up to and including the maximum fill height of 11 ft. (F11).
3. Design Material Strengths: Concrete $f'c$ = 4500 p.s.i.
   Reinforcing Steel fy = 60000 p.s.i.
4. High sulfate levels are likely to be encountered on this project. All concrete will be Class A45 Concrete, Box Culvert conforming to Section 460 of the Construction Specifications, with the following modifications: the type of cement will be either a Type V or Type II with 20 to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.
5. All reinforcing steel will conform to ASTM A615 Grade 60.
6. All lap splices shown are contact lap splices unless noted otherwise.
7. All exposed edges will be chamfered ¾ inch unless noted otherwise in the plans.
8. Use 1 inch clear cover on all reinforcing steel EXCEPT as shown.
9. The Contractor will imprint on the structure the date of construction as specified and detailed on Standard Plate No. 460.02.
10. Care will be taken to establish Working Points (W.P.) as shown on the wings.
11. Circled numbers in PLAN and ELEVATION views on the General Drawing are section I.D. Numbers (see SDDOT Materials Manual).
12. Cost of Preformed Expansion Joint Filler used in apron construction will be incidental to the other contract items.
13. Soils below the bottom of the proposed RCBC consist of brown gray silt clay. Groundwater was encountered in the borings at an average elevation of 2257.9 during the subsurface investigation conducted in April 2020. Dewatering will be required during construction. All costs incurred for dewatering will be incidental to other contract items.

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
⌀	Box Culvert Undercut	Cu. Yd.	196

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

SITE 3
ALTERNATE A
NOTES AND UNDERCUT DETAILS
FOR
8' X 8' BOX CULVERT (C.I.P.)

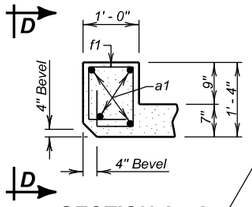
OVER TRIB. TO HUMP CREEK — 0° SKEW
STA. 461 + 39.00 — SEC. 30-T23N-R21E
STR. NO. 16-219-017 — EM 0012(206)112
HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

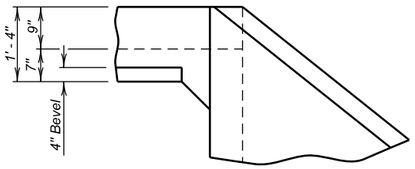
DESIGNED BY	CK. DES. BY	DRAFTED BY	
BR	CM	CRW	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGD02		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E51	E60

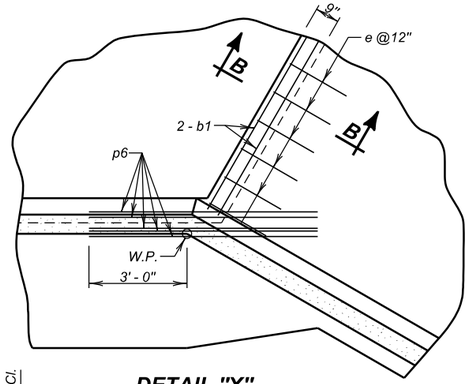
NOTE:
Apron will NOT be built monolithic with the Box Culvert.



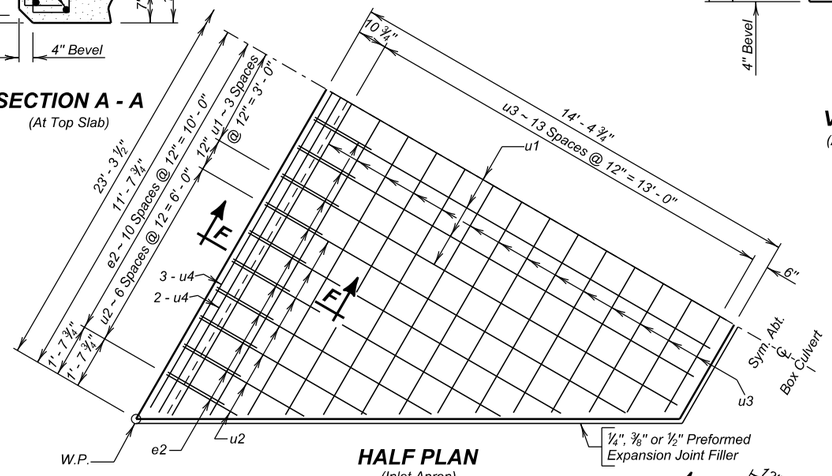
SECTION A - A
(At Top Slab)



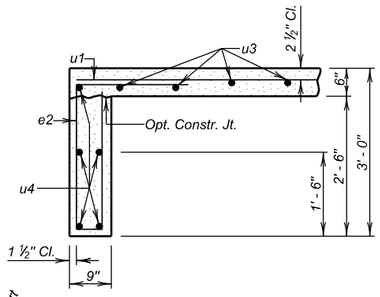
VIEW D - D
(At Exterior Wall)



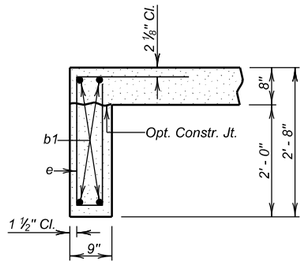
DETAIL "X"
(At Bottom Slab)



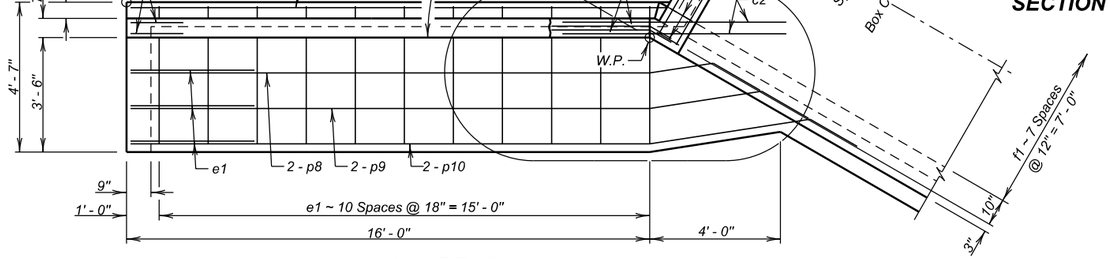
HALF PLAN
(Inlet Apron)



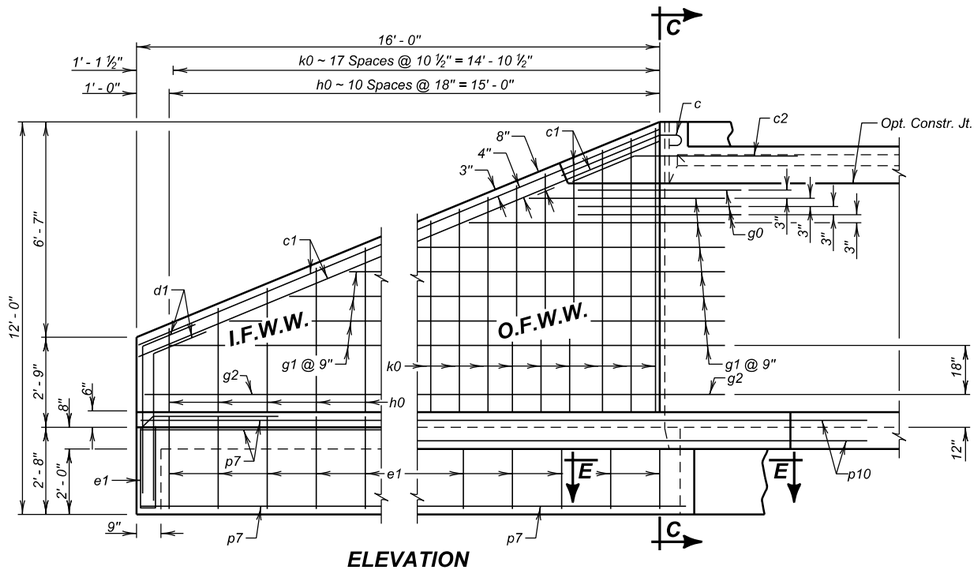
SECTION F - F



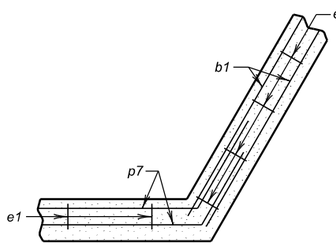
SECTION B - B



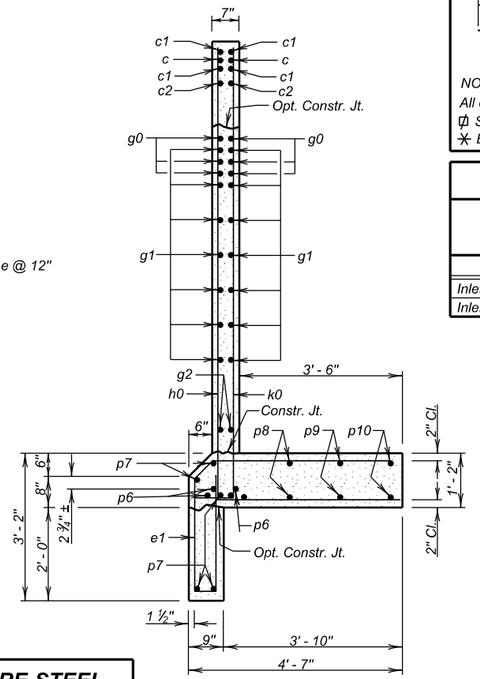
HALF PLAN



ELEVATION



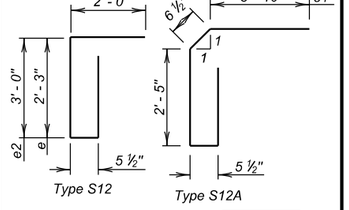
SECTION E - E

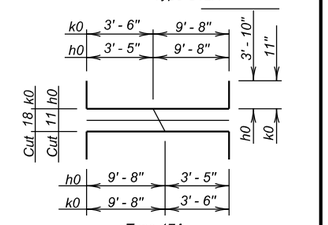


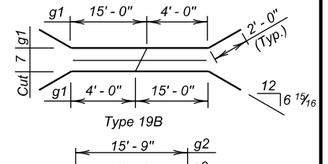
SECTION C - C

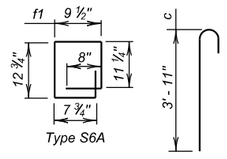
REINFORCING SCHEDULE

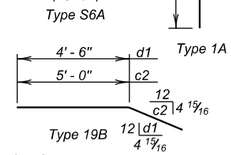
	Mk.	No.	Size	Length	Type	Bending Details
	a1	4	6	8' - 9"	Str.	
	b1	4	6	7' - 3"	Str.	
*	c	4	5	4' - 6"	1A	
	c1	8	5	17' - 3"	Str.	
	c2	4	5	7' - 0"	19B	
	d1	8	5	6' - 3"	19B	
	e	8	4	6' - 9"	S12	
	e1	28	4	9' - 9"	S12A	
	f1	10	4	4' - 9"	S6A	
	g0	12	5	5' - 0"	19B	
⌀	g1	14	4	23' - 0'	19B	
	g2	4	4	17' - 9"	19B	
⌀	h0	11	4	20' - 9"	17A	
⌀	k0	18	4	15' - 0"	17A	
	p6	10	6	7' - 0"	Str.	
*	p7	10	4	18' - 6"	Str.	
*	p8	4	4	19' - 6"	Str.	
*	p9	4	4	21' - 0"	Str.	
*	p10	4	4	22' - 6"	Str.	
	INLET APRON					
	e2	21	4	8' - 3"	S12	
	u1	7	4	14' - 0"	Str.	
⌀	u2	7	4	15' - 3"	Str.	
⌀	u3	7	4	28' - 9"	Str.	
	u4	5	4	22' - 3"	Str.	

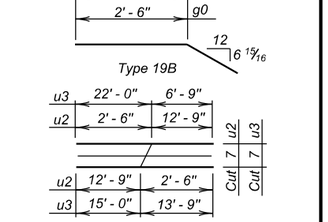












NOTES:
All dimensions are out to out of bars.
⌀ See cutting diagram.
* Bend in field as necessary to fit.

ESTIMATED QUANTITIES

ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu. Yd.	Lb.	Cu. Yd.
Inlet	15	1645	7.2
Inlet Apron	5.6	461	5.6

LEGEND FOR PLACING RE-STEEL

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

SITE 3
ALTERNATE A

INLET DETAILS

FOR

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

OVER TRIB. TO HUMP CREEK
STA. 461 + 39.00
STR. NO. 16-219-017

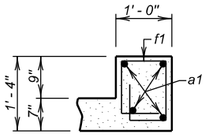
0° SKEW
SEC. 30-T23N-R21E
EM 0012(206)112
HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

3 OF 7

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BR	CM	CRW	Steven A Johnson BRIDGE ENGINEER
CORS05HW	05HWGD03		

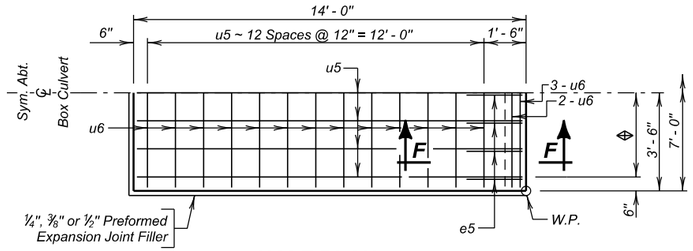
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E52	E60



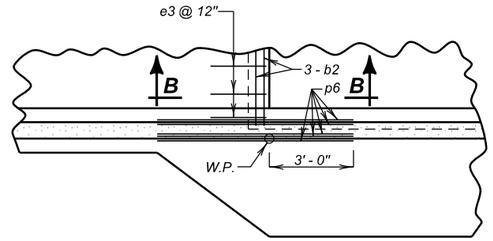
SECTION A - A
(At Top Slab)

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

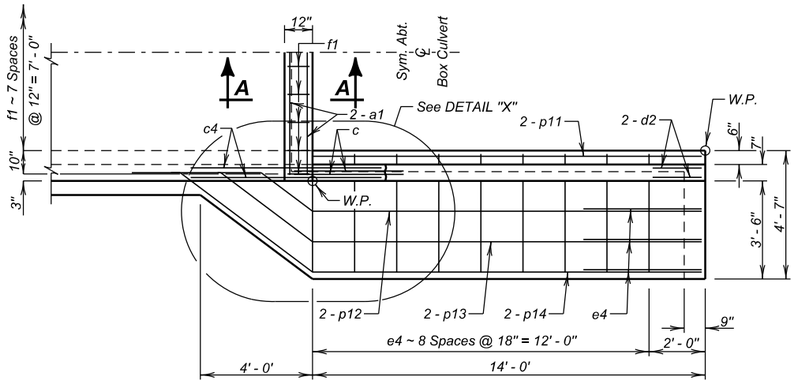
◈ e5 & u5 ~ 3 Spaces @ 12" = 3' - 0"



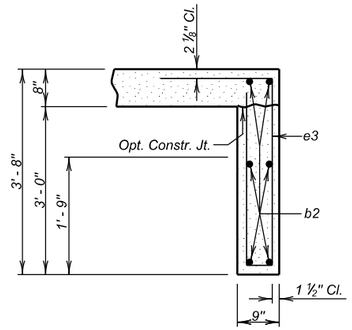
HALF PLAN
(Outlet Apron)



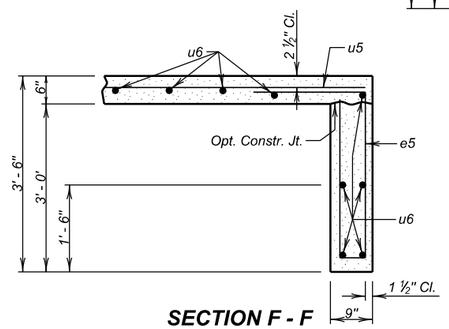
DETAIL "X"
(At Bottom Slab)



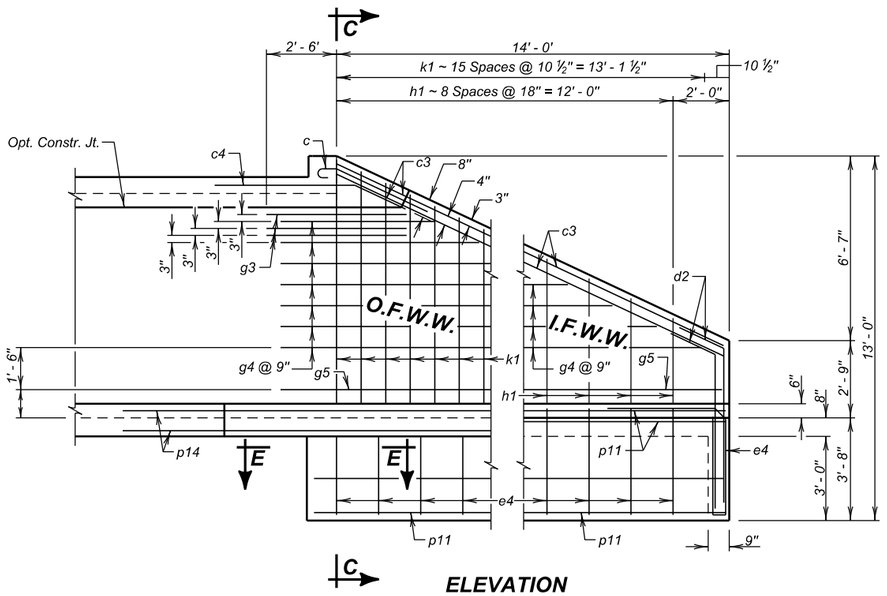
HALF PLAN



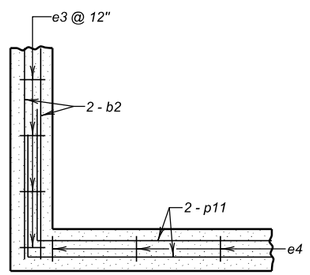
SECTION B - B



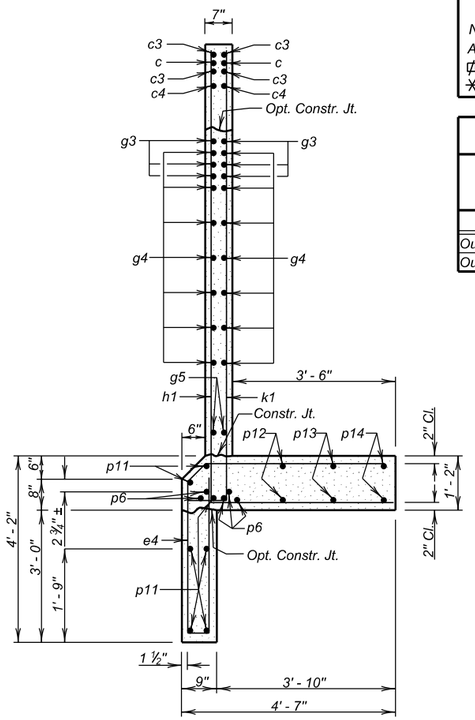
SECTION F - F



ELEVATION



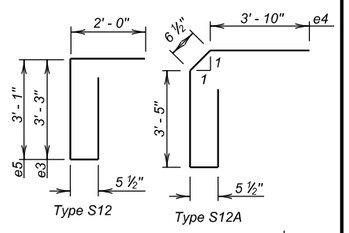
SECTION E - E



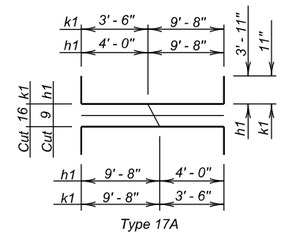
SECTION C - C

REINFORCING SCHEDULE

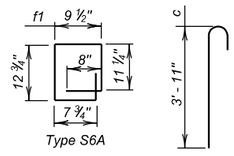
	Mk.	No.	Size	Length	Type	Bending Details
	a1	4	6	8' - 9"	Str.	
	b2	6	6	8' - 3"	Str.	
✳	c	4	5	4' - 6"	1A	
	c3	8	5	15' - 3"	Str.	
	c4	4	5	7' - 0"	19B	
	d2	8	5	7' - 3"	19B	
	e3	9	4	8' - 9"	S12	
	e4	24	4	11' - 9"	S12A	
	f1	10	4	4' - 9"	S6A	
	g3	12	5	5' - 0"	Str.	
◫	g4	14	4	20' - 6'	Str.	
	g5	4	4	15' - 9"	Str.	
◫	h1	9	4	21' - 6"	17A	
◫	k1	16	4	15' - 0"	17A	
	p6	10	6	7' - 0"	Str.	
✳	p11	14	4	16' - 6"	Str.	
✳	p12	4	4	17' - 9"	Str.	
✳	p13	4	4	19' - 9"	Str.	
✳	p14	4	4	21' - 6"	Str.	
	OUTLET APRON					
	e5	7	4	8' - 6"	S12	
	u5	7	4	13' - 9"	Str.	
	u6	18	4	6' - 9"	Str.	



Type S12 Type S12A

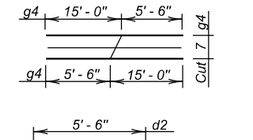


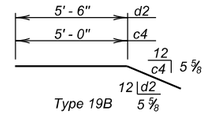
Type 17A



Type S6A

Type 1A





Type 19B

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	14.7	1638	7.8
Outlet Apron	2.5	185	2.5

LEGEND FOR PLACING RE-STEEL

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

SITE 3
ALTERNATE A

OUTLET DETAILS

FOR

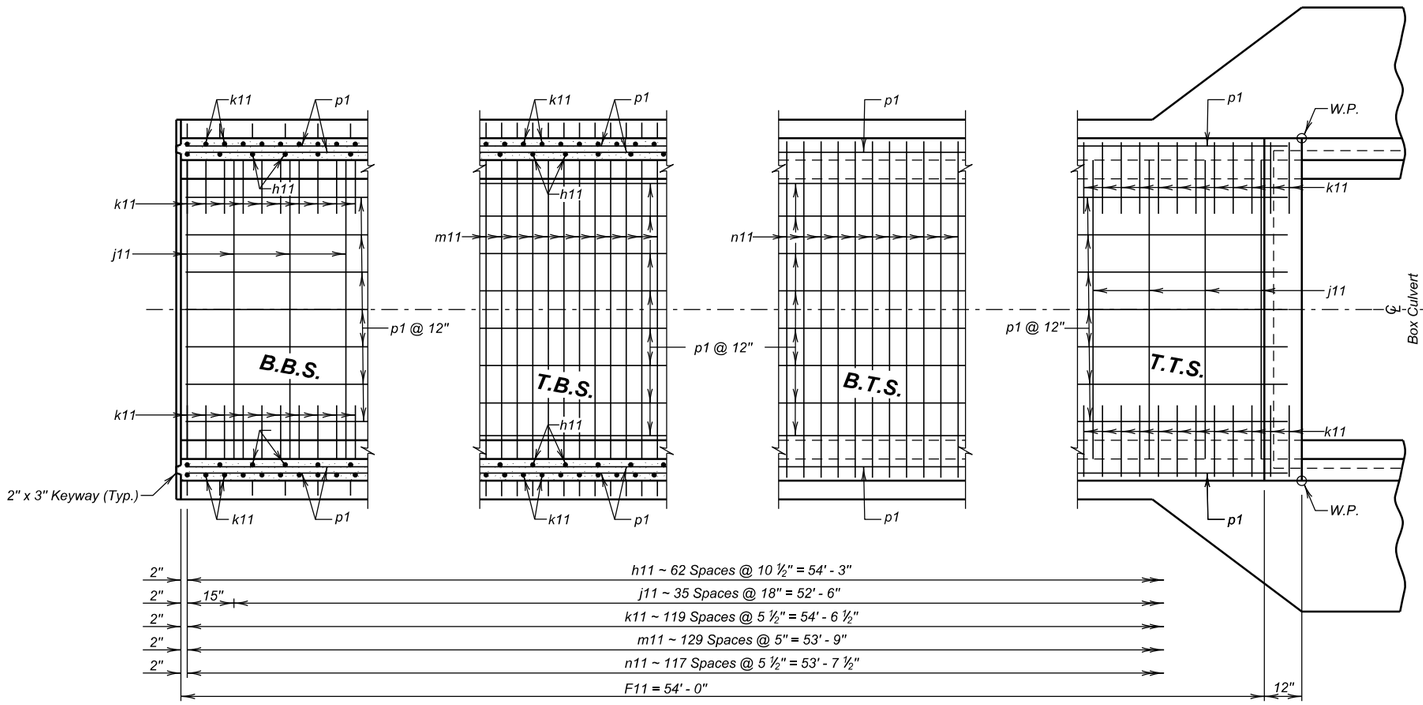
8' X 8' BOX CULVERT (C.I.P.)

OVER TRIB. TO HUMP CREEK — 0° SKEW
STA. 461 + 39.00 — SEC. 30-T23N-R21E
STR. NO. 16-219-017 — EM 0012(206)112
HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
MAY 2022

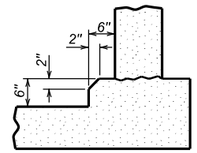
DESIGNED BY	CK. DES. BY	DRAFTED BY	
BR	CM	CRW	Steve A. Johnson BRIDGE ENGINEER
CORS05HW	05HWGD04		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E53	E60



PLAN

(Outlet End shown, Inlet similar by rotation)



OPTIONAL FILLET DETAIL

(At Bottom Slab)

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

OPTIONAL POUR - BOTTOM SLAB

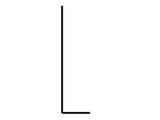
The Bottom Slab may be poured continuously, at the option of the Contractor, with the use of a Preformed Metal keyway conforming to the keyway dimensions and location as shown on the plans. The keyway length will be full width of the bottom slab. Care will be taken to maintain proper alignment of the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

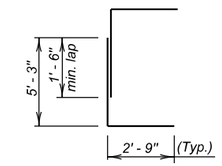
REINFORCING SCHEDULE

(For 2 - F11 Barrel End Sections)

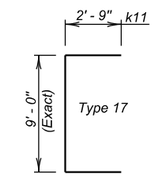
Mk.	No.	Size	Length	Type	Bending Details
h11	252	4	9' - 6"	17A	
j11	148	4	8' - 0"	Str.	
k11	480	4	14' - 6"	17	
m11	260	5	10' - 0"	Str.	
n11	236	5	9' - 0"	Str.	
p1	116	4	54' - 6"	Str.	
△ z1	26	5	3' - 6"	Str.	



Type 17A



OPTIONAL k11 SPLICE DETAIL
Contractor may use optional reinforcing steel splice, as shown. The cost of the additional reinforcing steel shall be borne by the Contractor.



Type 17

NOTES:

All dimensions are out to out of bars.

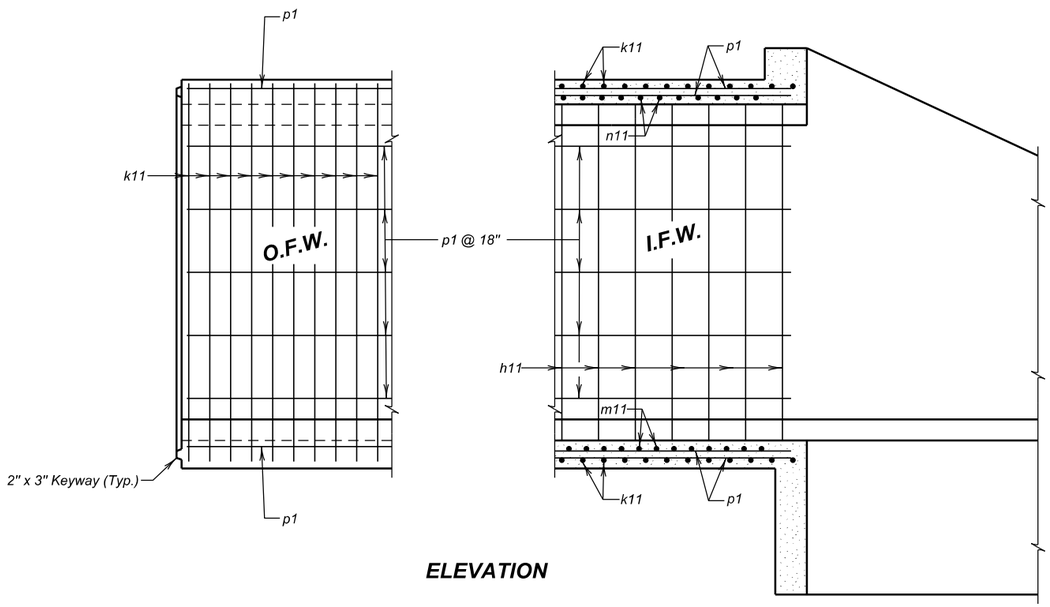
Request for additional reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.

ESTIMATED QUANTITIES

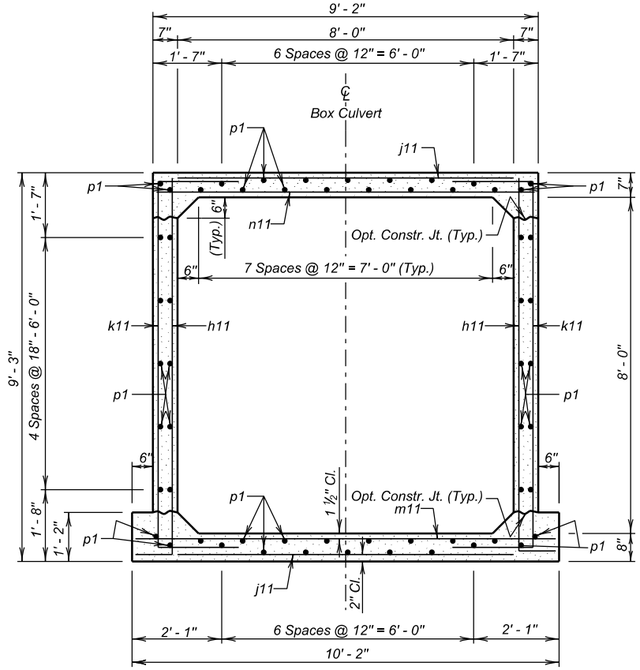
ITEM	Class A45 Concrete, Box Culvert	Reinforcing Steel	Structure Excavation, Box Culvert
UNIT	Cu.Yd.	Lb.	Cu.Yd.
2 - F11 Barrel End Sections @ 54' - 0"	91.4	16285	27.2

LEGEND FOR PLACING RE-STEEL

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



ELEVATION



F11 BARREL SECTION

(11' - 0" Maximum Fill)

SITE 3
ALTERNATE A

F11 BARREL END SECTION DETAILS (54' - 0")

FOR

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

OVER TRIB. TO HUMP CREEK — 0° SKEW
STA. 461 + 39.00 — SEC. 30-T23N-R21E
STR. NO. 16-219-017 — EM 0012(206)112
HL-93

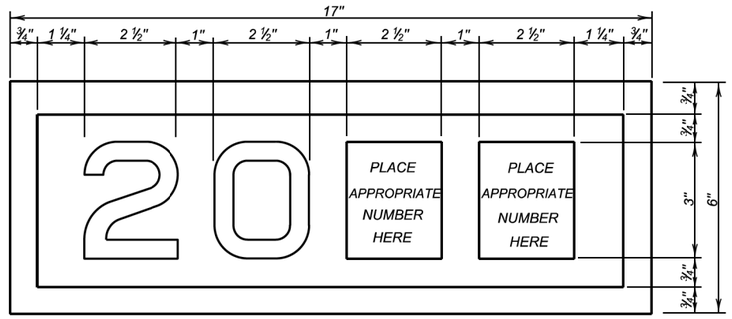
CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

MAY 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BR	CM	CRW	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGD05		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E54	E60



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.

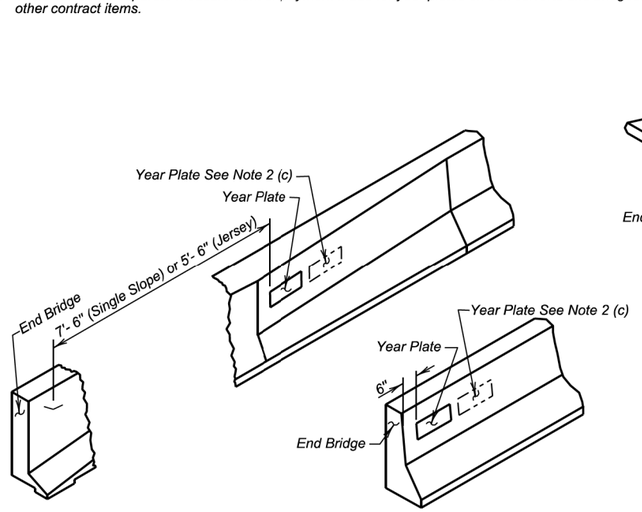
2. Year plates will be located on structure(s) as follows:

   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.

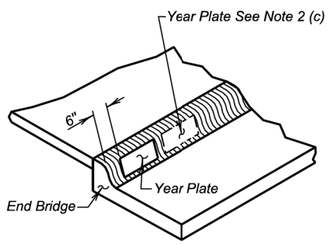
   b. On bridges with six (6) inch curbs, "Jersey" shaped barriers with no endblocks, or "Single Slope" shaped barriers with no endblocks, the year plate will be centered vertically on the curb face approximately six (6) inches from the end of the bridge, or as designated by the Engineer. On bridges with 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.

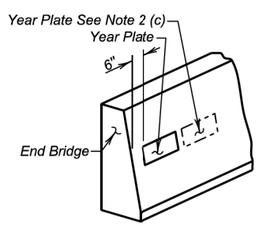


BARRIER
(With Endblock)



TYPE B CURB

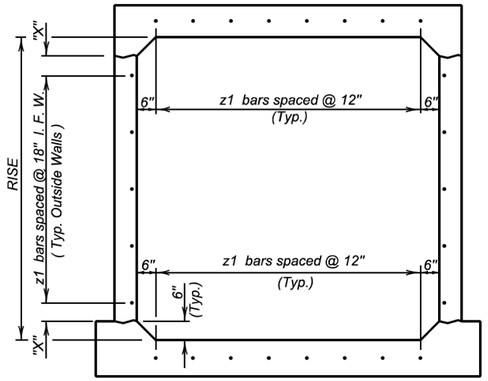
JERSEY BARRIER



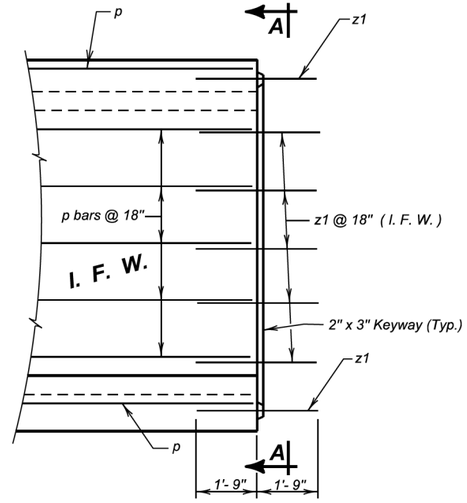
SINGLE SLOPE BARRIER

January 22, 2021

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



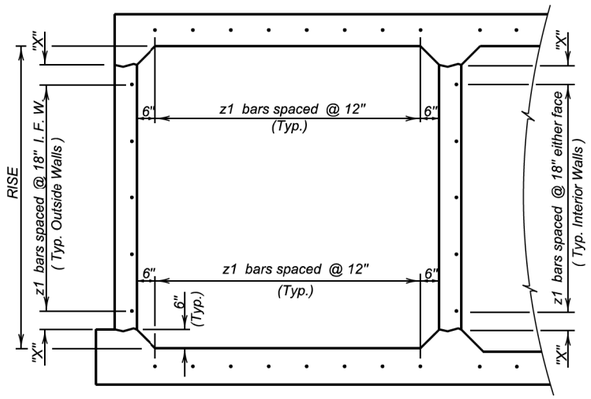
TYPICAL SINGLE BARREL VIEW A - A



ELEVATION

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

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



TYPICAL MULTIPLE BARREL VIEW A - A

GENERAL NOTES:

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

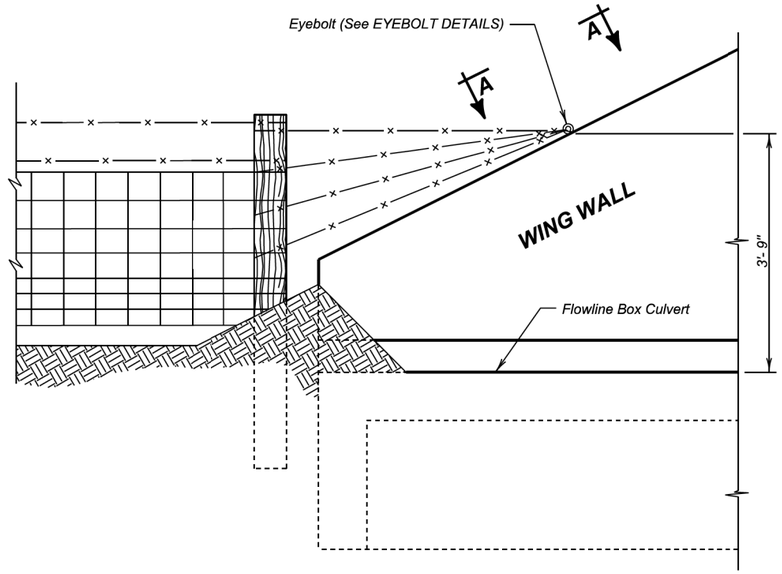
2. Drainage Fabric Protection will be placed in accordance with Section 422, or Section 560, whichever is applicable.

June 1, 2022

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

SITE 3
ALTERNATE A

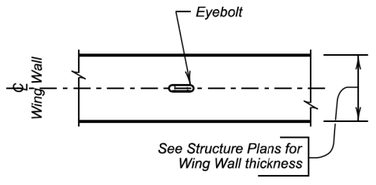
8' X 8' BOX CULVERT (C.I.P.)
STR. NO. 16-219-017
JUNE 2022



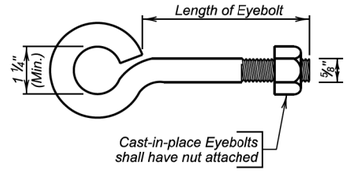
DETAIL FOR FENCE ANCHORS

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

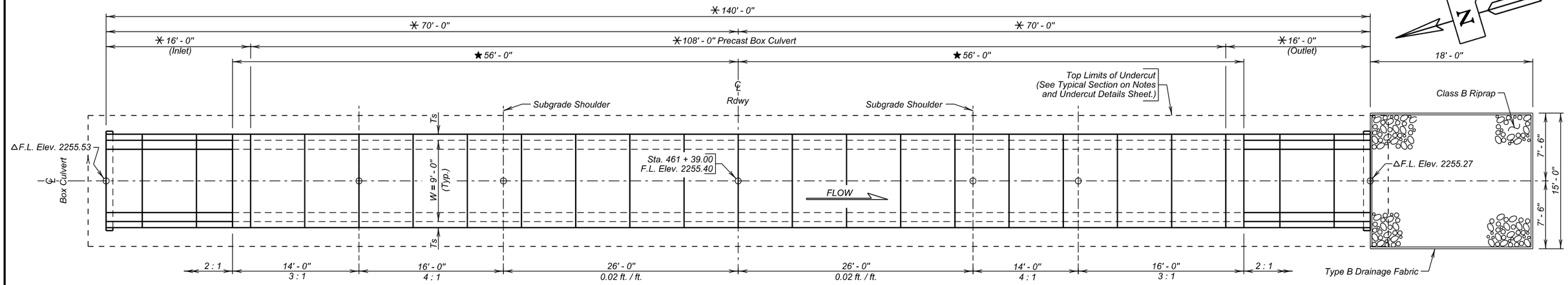
SITE 3
ALTERNATE A

8' X 8' BOX CULVERT (C.I.P.)
STR. NO. 16-219-017
JUNE 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.

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E56	E60

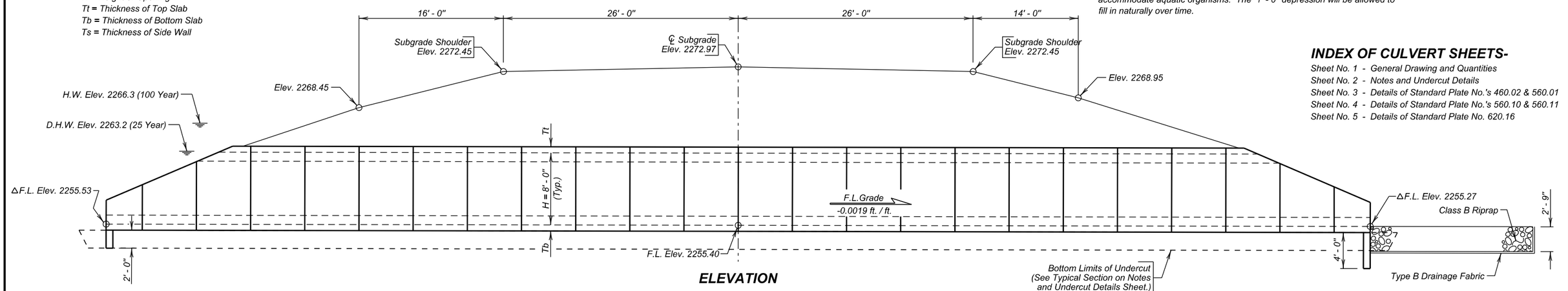


PLAN

LEGEND

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

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.



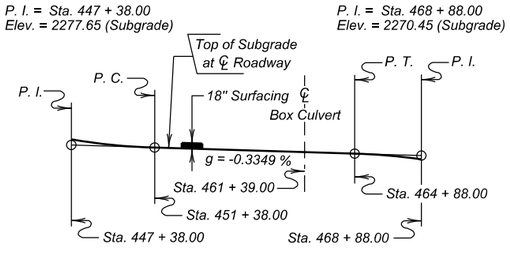
ELEVATION

INDEX OF CULVERT SHEETS-

HYDRAULIC DATA

Q_d	343 cfs
A_d	32 sq ft
V_d	10.7 fps
Q_F	343 cfs
Q_{100}	624 cfs
Q_{OT}	>Q_{100}
V_{max}	13.1 fps

Q_d = Design discharge for the proposed culvert based on 25 year frequency. El. 2263.2.
Q_{OT} = Overtopping discharge and frequency > Q_{100} year recurrence interval. El. 2272.4 @ Sta. 466 + 43.00 Lt. ±.
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. 2266.3.
V_{max} = Maximum computed outlet velocity for the proposed culvert, based on 100 year frequency.



GRADELINE DATA

ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
∡	Structure Excavation, Box Culvert	Cu. Yd.	44
	Box Culvert Undercut	Cu. Yd.	167
≠	Class B Riprap	Ton	38.5
	Type B Drainage Fabric	Sq. Yd.	50
	9' X 8' Precast Concrete Box Culvert, Furnish	Ft.	108
	9' X 8' Precast Concrete Box Culvert, Install	Ft.	108
	9' X 8' Precast Concrete Box Culvert End Section, Furnish	Each	2
	9' X 8' Precast Concrete Box Culvert End Section, Install	Each	2

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

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

SITE 3
ALTERNATE B

GENERAL DRAWING AND QUANTITIES

FOR

9' X 8' BOX CULVERT (PRECAST)

OVER TRIB. TO HUMP CREEK — 0° SKEW
STA. 461 + 39.00 — SEC. 30-T23N-R21E
STR. NO. 16-219-017 — EM 0012(206)112
PCN 05HW — HL-93

CORSON COUNTY

S. D. DEPT. OF TRANSPORTATION

JUNE 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BR	CM	MG/CRW	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGD08		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E57	E60

SPECIFICATIONS

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

GENERAL NOTES

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

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 and construction loading consisting of one 7' - 6" gage axle with gross weight = 95,850 lbs. The construction load will not be applied until a minimum of 4 feet of fill has been placed over the box culvert. If other construction loads in excess of legal load are anticipated by the Contractor, the Contractor will submit a design analysis for the anticipated construction loading, through the proper channels, to the Office of Bridge Design for approval.*
3. *The box culvert will be load rated in accordance with the AASHTO Manual for Bridge Evaluation, 2018 Edition with 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 11 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 brown gray silt clay. Groundwater was encountered in the borings at an average elevation of 2257.9 during the subsurface investigation conducted in April 2020. Dewatering will be required during construction. All costs incurred for dewatering will be incidental to other contract items.*

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 a type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Construction Specifications.*

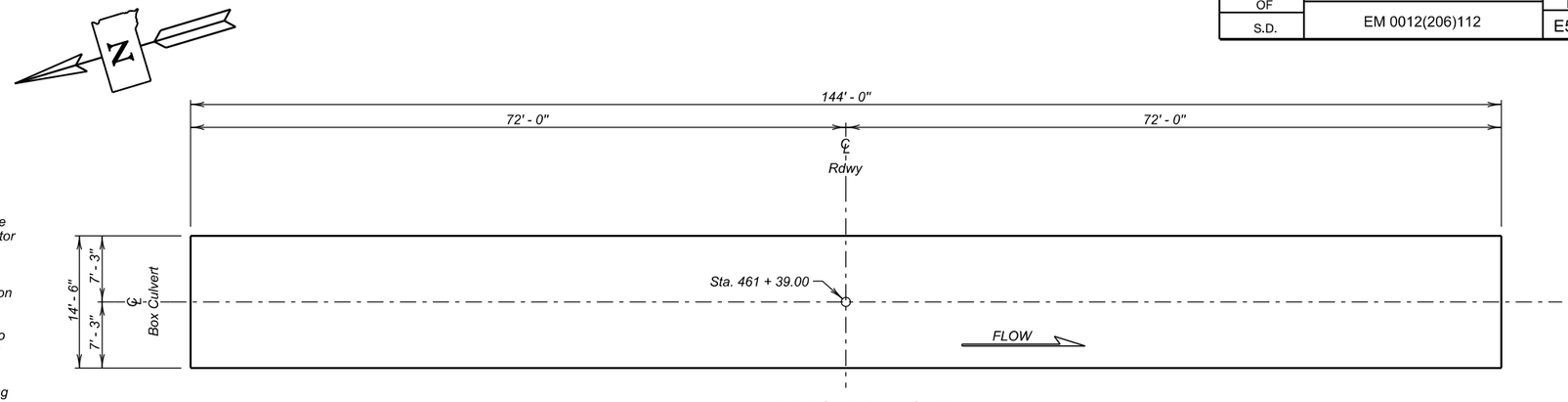
SHOP PLANS

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

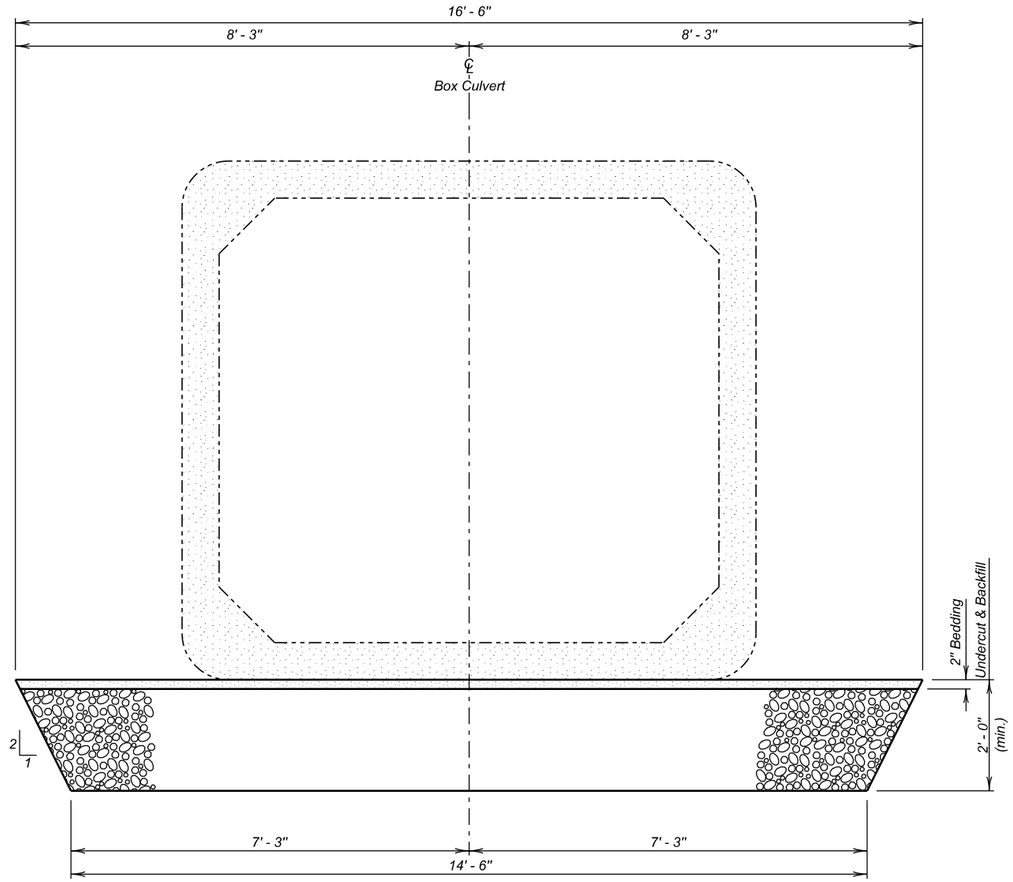
ESTIMATED QUANTITIES

	ITEM	UNIT	QUANTITY
⌀	Box Culvert Undercut	Cu. Yd.	167

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



UNDERCUT LAYOUT
(Bottom Dimensions)



TYPICAL SECTION
(For Limits of Undercut)

SITE 3
ALTERNATE B

NOTES AND UNDERCUT DETAILS

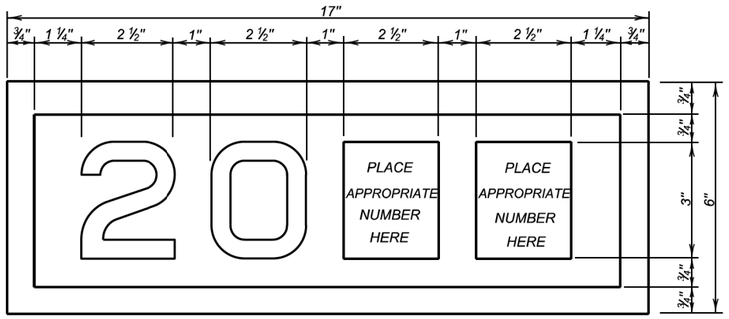
FOR

9' X 8' BOX CULVERT (PRECAST)

OVER TRIB. TO HUMP CREEK — 0° SKEW
STA. 461 + 39.00 — SEC. 30-T23N-R21E
STR. NO. 16-219-017 — EM 0012(206)112
HL-93

CORSON COUNTY
S. D. DEPT. OF TRANSPORTATION
JUNE 2022

DESIGNED BY	CK. DES. BY	DRAFTED BY	
BR	CM	CRW	Steve A Johnson BRIDGE ENGINEER
CORS05HW	05HWGD09		



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.

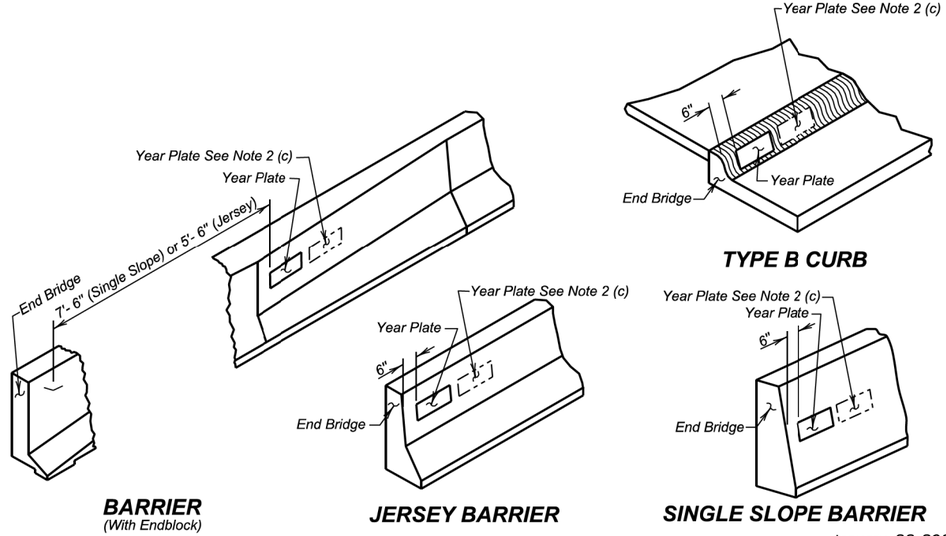
2. Year plates will be located on structure(s) as follows:

   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.

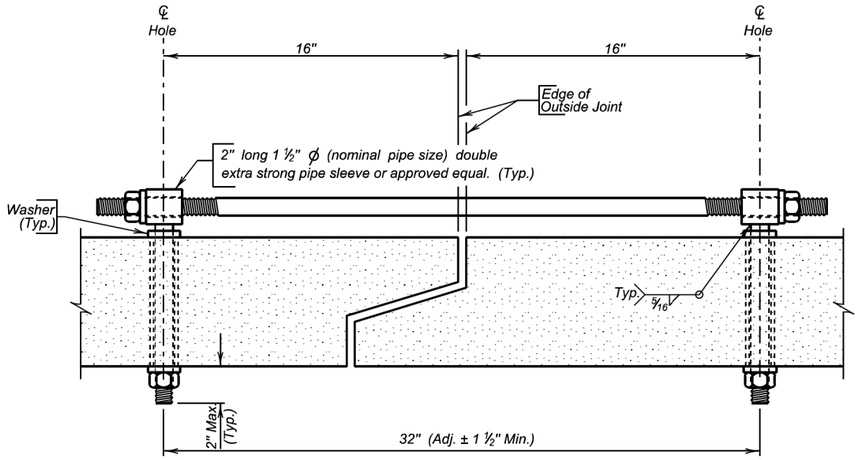
   c. When the plans specify that both the original date of construction and the date of reconstruction are to be shown, one date will be placed as listed above and the other located adjacent to it. Both year plates will be shown at each end of the bridge on opposite sides.

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".

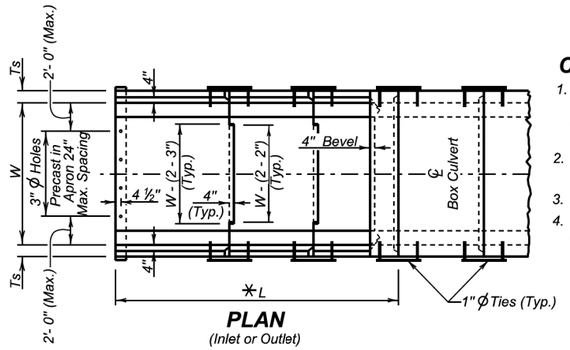
March 21, 2016

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

SITE 3
ALTERNATE B

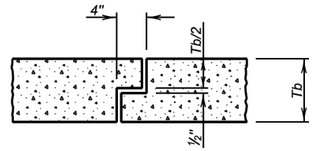
9' X 8' BOX CULVERT (PRECAST)
STR. NO. 16-219-017
JUNE 2022

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	EM 0012(206)112	E59	E60



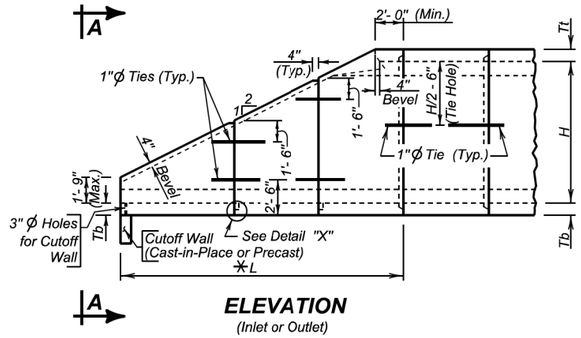
CUTOFF WALL

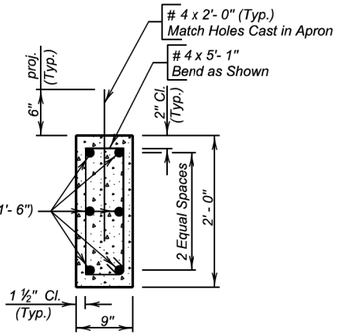
1. All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
2. Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section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

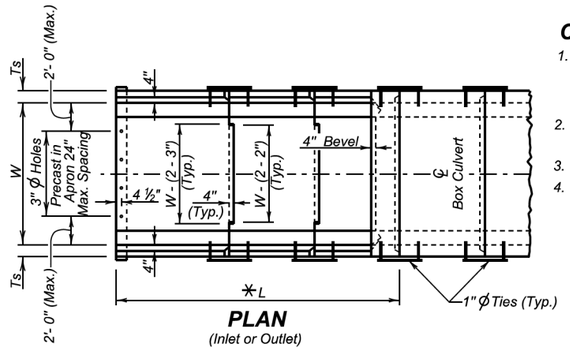
LEGEND

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

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

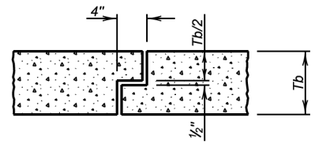
June 26, 2015

Published Date: 2024	SDDOT	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 2'–0" CUTOFF WALL	PLATE NUMBER 560.10
			Sheet 1 of 1



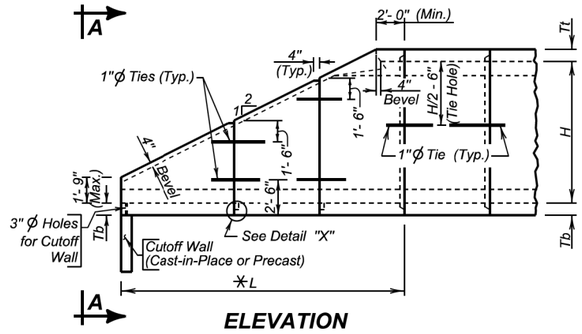
CUTOFF WALL

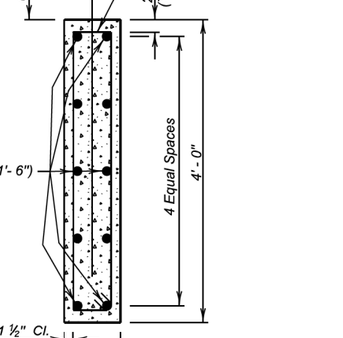
1. All costs associated with furnishing and installing the Cutoff Wall, whether precast or cast-in-place, shall be incidental to the contract unit price per each for "Precast Box Culvert End Section, Furnish".
2. Concrete for cast-in-place cutoff wall shall be Class M6 concrete in accordance with Section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

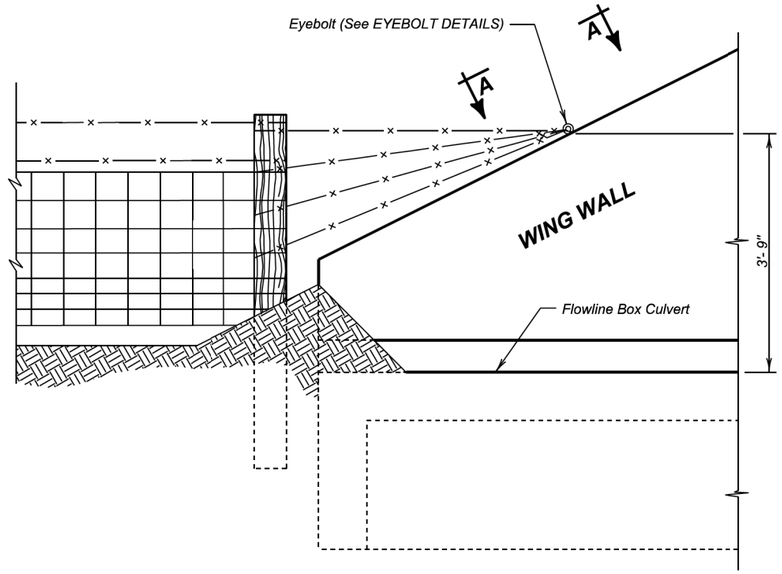
NOTES:
See GENERAL DRAWING for W and H dimensions.
Tt, Tb, L, and Ts dimensions shall be furnished by the Contractor.
⚹ Length and number of units may vary from that shown.

June 26, 2015

Published Date: 2024	SDDOT	PRECAST SINGLE BOX CULVERT SLOPED END SECTION DETAILS WITH 4'–0" CUTOFF WALL	PLATE NUMBER 560.11
			Sheet 1 of 1

SITE 3
ALTERNATE B

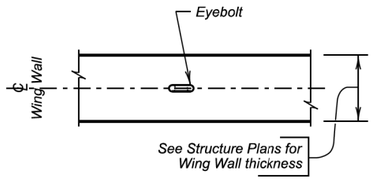
9' X 8' BOX CULVERT (PRECAST)
STR. NO. 16-219-017
JUNE 2022



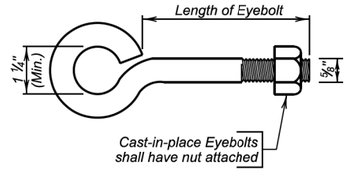
DETAIL FOR FENCE ANCHORS

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 3
ALTERNATE B

9' X 8' BOX CULVERT (PRECAST)
STR. NO. 16-219-017
JUNE 2022