

SECTION B: GRADING PLANS

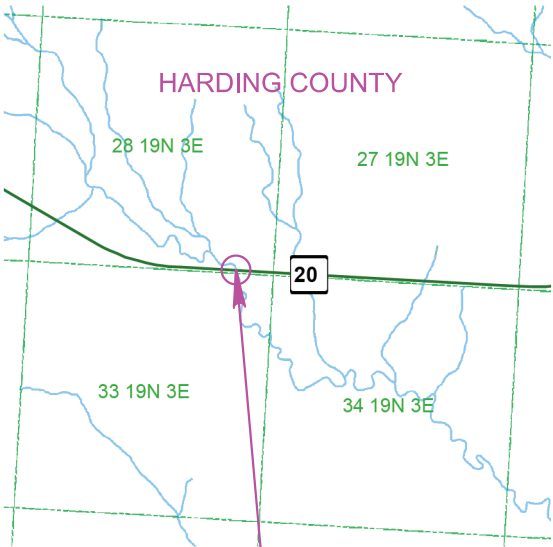
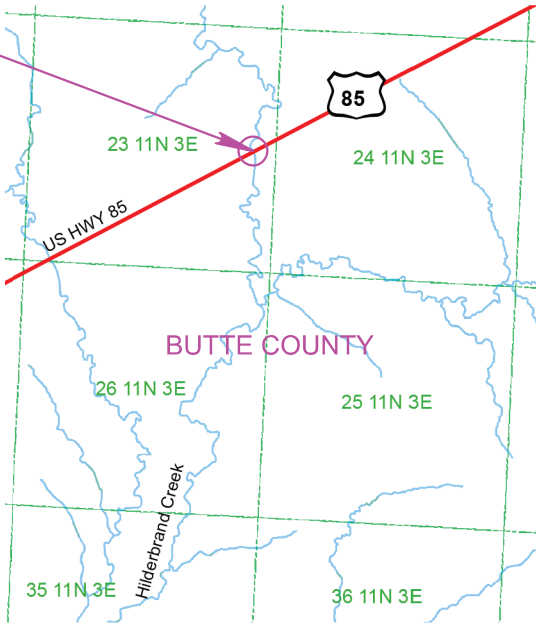
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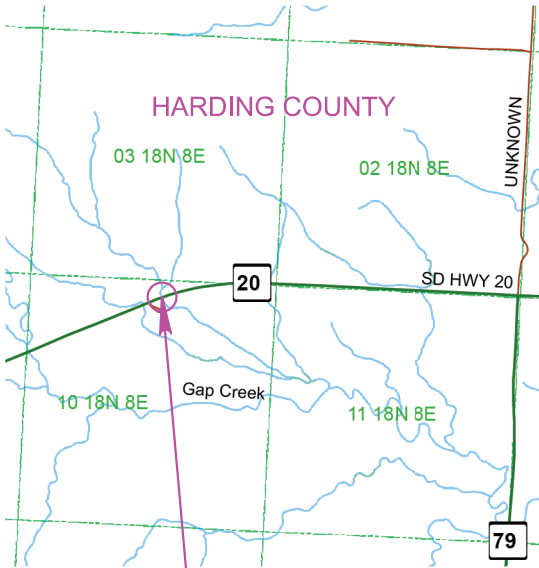
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NH-P 0042(89)
US 85 MRM 75.00+0.286



NH-P 0042(89)
SD 20 MRM 16.00+0.803



NH-P 0042(89)
SD 20 MRM 50.00+0.248



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SECTION B ESTIMATE OF QUANTITIES

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
004E0030	Maintenance of Traffic Diversion(s)	Lump Sum	LS
009E0010	Mobilization	Lump Sum	LS
009E3230	Grade Staking	0.228	Mile
009E3250	Miscellaneous Staking	0.228	Mile
009E3280	Slope Staking	0.228	Mile
009E3290	Structure Staking	1	Each
009E3301	Engineer Directed Surveying/Staking	40.0	Hour
009E4200	Construction Schedule, Category II	Lump Sum	LS
100E0100	Clearing	Lump Sum	LS
110E0600	Remove Fence	2,025	Ft
110E0707	Remove High Tension 4 Cable Guardrail	790	Ft
110E0749	Remove High Tension 4 Cable Guardrail Anchor Assembly	4	Each
110E1010	Remove Asphalt Concrete Pavement	4,862.0	SqYd
120E0010	Unclassified Excavation	11,119	CuYd
120E0600	Contractor Furnished Borrow	17,499	CuYd
120E1000	Muck Excavation	53	CuYd
120E2000	Undercutting	4,227	CuYd
120E6100	Water for Embankment	335.8	MGal
250E0020	Incidental Work, Grading	Lump Sum	LS
270E0110	Salvage and Stockpile Granular Material	3,644.4	Ton
421E0100	Pipe Culvert Undercut	58	CuYd
450E0202	48" RCP Class 2, Furnish	160	Ft
450E0210	48" RCP, Install	160	Ft
450E2036	48" RCP Flared End, Furnish	4	Each
450E2037	48" RCP Flared End, Install	4	Each
450E4768	24" CMP 14 Gauge, Furnish	160	Ft
450E4770	24" CMP, Install	160	Ft
450E5015	24" CMP Elbow, Furnish	2	Each
450E5016	24" CMP Elbow, Install	2	Each
450E5215	24" CMP Flared End, Furnish	1	Each
450E5216	24" CMP Flared End, Install	1	Each
450E5251	78" CMP Flared End, Furnish	2	Each
450E5252	78" CMP Flared End, Install	2	Each
450E5310	24" CMP Sloped End, Furnish	1	Each
450E5311	24" CMP Sloped End, Install	1	Each
450E8910	Cleanout for Culvert Treatment	1	Each
450E9244	Slipline 84" Pipe	140	Ft
462E0250	Cellular Grout	93.6	CuYd
600E0200	Type II Field Laboratory	1	Each
620E0020	Type 2 Right-of-Way Fence	1,899	Ft
620E0520	Type 2 Temporary Fence	1,624	Ft
620E1020	2 Post Panel	9	Each
620E1030	3 Post Panel	13	Each
720E1010	PVC Coated Bank and Channel Protection Gabion	31.5	CuYd
831E0110	Type B Drainage Fabric	254	SqYd

GRADING OPERATION

Water for Embankment is estimated at the rate of 15 gallons of water per cubic yard of Embankment minus Waste.

The estimated cubic yards of excavation and/or embankment required to construct outlet ditches, ditch blocks, and approaches are included in the earthwork balance notes on the profile sheets.

Special ditch grades and other sections of the roadway different than the typical section(s) will be constructed to the limits shown on the cross sections. If significant changes to the cross sections are necessary during construction, the Engineer will contact the Designer for the proposed change.

Generally, all shallow inlet and outlet ditches as noted on the plan sheets will be cut with a 10-foot wide bottom with 5:1 backslopes. However, the Engineer may direct the Contractor to adjust the ditch width for proper alignment with the drainage structure.

Temporary fence and/or permanent fence will be placed ahead of the grading operation unless otherwise directed by the Engineer.

TYPE II FIELD LABORATORY

The Contractor will provide high-speed broadband internet connection to the field lab. The multiport internet connection may be hardwired, through a cellular method, or other approved service that allows Wi-Fi connection. Prior to obtaining the internet connection, the Contractor will submit the internet connection’s technical data to the Area Office to check for compatibility with the state’s computer equipment. The Contractor’s personnel are prohibited from using the internet connection unless pre-approved by the Project Engineer. The internet service will be incidental to the contract unit price per each for “Type II Field Laboratory”.

UTILITIES

The Contractor will be aware that the existing utilities shown in the plans were surveyed prior to the design of this project and might have been relocated or replaced by a new utility facility prior to construction of this project, might be relocated or replaced by a new utility facility during the construction of this project, or might not require adjustment and may remain in its current location. The Contractor will contact each utility owner and confirm the status of all existing and new utility facilities. The utility contact information is provided elsewhere in the plans or bidding documents.

CLEARING

Before clearing activities begin, the Contractor will contact the Engineer to determine the limits of clearing for the project. If the trees or shrubs that are suppose to remain within the limits of work are damaged or destroyed by the Contractor, the Contractor will replace them with the same size and type at the Contractor’s expense.

Slash and non-merchantable timber will be disposed of by chipping, burning, or burying. All residue from chipping or burning will be buried. Burial pits will be at locations approved by the Engineer. The Contractor will follow the prescribed burning provisions of the Fire Plan in his/her preparation for and conduction of all burning operations. Location of slash piles and all other aspects of slash disposal by burning must be approved in advance by the Engineer.

Stumps from right-of-way clearing will be buried at locations approved by the Engineer.

General Geology

The Ludlow Formation, Hell Creek Formation and Pierre Shale underlies the project areas. At the US85 site, the Pierre Shale is covered by a varying thickness of Quaternary Alluvium. The South Dakota Geological Survey describes the formations that will be encountered on the project as outlined below:

Quaternary Alluvium deposits consist of clay to boulder sized clasts with locally abundant organic material. Alluvial materials may be encountered within drainages adjacent mainline at Site 1: US 85 MRM 75.00+0.286.

The *Ludlow Formation* consists of white, tan, yellow, and gray cross-bedded, fine to medium grained, silty sandstone interbedded with locally bentonitic, gray siltstone, claystone, and sandy to silty claystone. Characterized by uranium bearing lignite beds and “clinker” beds formed by burning coal beds. The Ludlow Formation will be encountered at Site 5: SD20 MRM 50.00+0.248

The *Hell Creek Formation* consists of somber gray, tan, and rust colored shale and thinly laminated sandstone. The Hell Creek Formation will be encountered at Site 4: SD20 MRM 16.00+0.803

The *Pierre Shale* consists of blue gray to dark gray, fissile to blockly shale with persistent beds of bentonite, black organic shale, and light-brown chalky shale. Contains minor sandstone, conglomerate, and abundant carbonate and ferruginous concretions. The Pierre Shale may be encountered at Site 1: MRM 75.00+0.286.

General Geology

Some cut sections may encounter thicker beds of sandstone, siltstone, and claystone ledge rock. Since the durability of these rocks units can vary with the degree of weathering, extra effort may be required to complete the excavation. Most of the material encountered should be able to be excavated using conventional methods associated with normal Unclassified Excavation. Blasting is not anticipated. Muck Excavation will be required at the areas shown in the plans or as directed by the Engineer.

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TRAFFIC DIVERSION – US85

The traffic diversion is located on US 85 at Sta. 27+74. The traffic diversion will be constructed according to Section 4.5 A of the Specifications. Installation and removal of the traffic diversion will meet all requirements as set forth in the South Dakota Surface Water Quality Standards.

The traffic diversion located at Stations 27+74 will be constructed according to the geometric layouts shown in the plans with the temporary drainage structure(s) provided in the following table. The temporary structure sizes are designed to pass the design flood frequency flows without overtopping the traffic diversion grade, to minimize potential upstream flooding, and are sized to meet FEMA (Federal Emergency Management Agency) requirements where applicable. The structure(s) will be placed at the flowline elevation and location as stated in the “Table of Temporary Drainage Structures in Traffic Diversions”. If the Contractor proposes to use a different size drainage structure and/or a different geometric layout for the temporary diversion, the proposal must be submitted to the Engineer during the project preconstruction meeting. This information will be forwarded to the DOT Hydraulics Office for review. Construction of the traffic diversion(s) will not be allowed until approval of the proposal is obtained from the Hydraulics Office.

Table of Temporary Drainage Structures in Traffic Diversions

Traffic Diversion Location	Design Flood Frequency	* Flowline Elevation	Ordinary High Water Elevation	Temporary Structure Option 1
4+60	2 year	2969.8	2975.7	2-42” CMP

* The flowline elevation is at the inlet of the traffic diversion.

SHRINKAGE FACTOR: Embankment +30%

TABLE OF EXCAVATION QUANTITIES BY BALANCES

			Excavation	* Undercut	* Muck Exc.	* Contractor Furnished Borrow Exc.	Total Excavation	** Waste
			(CuYd)	(CuYd)	(CuYd)	(CuYd)	(CuYd)	(CuYd)
SD 20	306+15 to 27+05	316+75	1178	3523	53	6711	11465	53
US 85		28+45	404	704	0	2044	3152	0
US 85 Div.	0+00	9+49		0	0	8744	8744	0
Totals:			1582	4227	53	17499	23361	53

* The quantities for these items are in the Estimate of Quantities under their respective contract items.

** The quantities for these items are for information only.

TABLE OF UNCLASSIFIED EXCAVATION

	(CuYd)
Excavation	1582
Undercut	4227
Topsoil	2596
Exc. for Deep Pipe & RCBC Removal	364
Added Traffic Diversion Excavation	422
Salvaged Granular Base Material (from cut sections)	249
Salvaged Granular Base Material (from fill sections)	1679
Total	11119

Costs to provide temporary drainage structures will be incidental to the contract lump sum price for “Maintenance of Traffic Diversion(s)”.

Traffic diversions in waterways will be constructed such that erodible material placed below the ordinary high water elevation will be lined with a 2-foot thick layer of class B riprap. Type B drainage fabric will be placed under the riprap and under any diversion embankment that is placed in a wetland as shown in the construction plans. In the event flowing water is present, only riprap will be allowed to be placed or removed below the ordinary high water elevation. The quantity of riprap used in the traffic diversion is included in the quantity for “Class B Riprap” in Section E-Structures estimate of quantities. The quantity of riprap used for the traffic diversion will be reused as riprap for the structure and all costs incurred to place and remove the riprap at the traffic diversion and subsequently place the riprap at the structure will be incidental to the contract unit price per ton for “Class B Riprap”. The traffic diversions will be built in close conformity to the plan gradeline. Unless otherwise shown in the plans, the traffic diversions will be removed such that the original ground surface contours and elevations are restored and the hydraulic capacity of the waterway is maintained. The removal will be done in such a manner that there is minimal disturbance to the channel bed.

The removed traffic diversion embankment will be used in the mainline embankment unless otherwise approved by the Engineer.

Traffic Diversion Excavation as shown on the plans profile sheets is the excavation required to construct the traffic diversion portion that is located inside the mainline cross section work limits. The Traffic Diversion Excavation

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quantity is included in the mainline excavation quantity in the Table of Excavation Quantities by Balances and in the Table of Unclassified Excavation.

Traffic Diversion Borrow, as shown on the plans profile sheets, is obtained from the mainline excavation from outside of the traffic diversion cross section work limits. The Traffic Diversion Borrow quantity is included in the mainline excavation quantity in the Table of Excavation Quantities by Balances and in the Table of Unclassified Excavation.

Added Traffic Diversion Excavation as shown on the plans profile sheets is the excavation required to construct the traffic diversion portion that is located outside the mainline cross section work limits. The Added Traffic Diversion Excavation quantity is added to the unclassified excavation quantity in the Table of Unclassified Excavation.

TABLE OF TRAFFIC DIVERSION RIPRAP AND DRAINAGE FABRIC

Station	L/R	Ordinary High Water Elevation	Traffic Diversion Riprap (Ton)	Section E Class B Riprap (Ton)	Type B Drainage Fabric (SqYd)
27+74		2975.7	65.8	174.5	169
		Totals	65.8	174.5	169

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PROCEDURES FOR DETERMINING UNCLASSIFIED EXCAVATION QUANTITY

When plan quantities are used for payment, the Unclassified Excavation quantity will be used for final payment and the plans quantity of Topsoil and salvaged surfacing items listed in the Table of Unclassified Excavation will not be adjusted according to field measurements.

The following paragraphs are general earthwork information and information in regard to computing the Unclassified Excavation quantity when final cross sections are taken in the field:

The Unstable Material Excavation quantity is included in the Excavation quantity listed in the Table of Unclassified Excavation. When finaling a project, the Unstable Material Excavation quantity will be added to the Excavation quantity to compute the Unclassified Excavation quantity.

The Topsoil quantity in the Table of Unclassified Excavation is an estimate. When finaling a project, the total quantity of field measured Topsoil will be used in place of the estimated Topsoil quantity. The quantity of Topsoil from the cuts will be paid for twice as Unclassified Excavation, as it will be in both the Excavation and Topsoil quantities. This will be full compensation for Excavation, which includes necessary undercutting to provide space for placement of topsoil.

The Excavation quantities from individual balances and the Table of Unclassified Excavation have been reduced by the volume of in place surfacing that will be removed and/or salvaged.

Salvaged Granular Base Material will be paid for at the contract unit price per ton and is also included in and paid for once as Unclassified Excavation. As shown in the Table of Unclassified Excavation, the estimated quantity of 1679 cubic yards of Salvaged Granular Base Material from fill sections will be added to the Excavation quantity to determine the Unclassified Excavation quantity. When finaling a project, the quantities of Salvaged Granular Base Material from fill sections will not be adjusted according to field measurements. The quantity of Salvaged Granular Base Material from cut sections will not be added to the Excavation quantity as it is already in the cuts on the final cross sections.

The volume of in place Asphalt Surfacing removed will NOT be paid for as Unclassified Excavation.

The Excavation quantities from individual balances and the table above have been reduced by the volume of in place asphalt pavement that will be removed.

When finaling a project, the estimated quantity of 770 cubic yards of Asphalt Pavement removed from the cut sections will be subtracted from the Unclassified Excavation quantity for final payment. The quantity of Asphalt Pavement from cut sections subtracted from the Unclassified Excavation quantity will be plans quantity and will not be adjusted according to field measurements.

WASTE EXCAVATION

The quantity of waste in the Table of Excavation Quantities by Balances that is muck excavation or excess excavation material will be disposed of at a Contractor furnished site acceptable to the Engineer.

UNDERCUTTING

In all grading sections the earthen subgrade will be undercut 2 feet below the earthen subgrade surface. The undercut material or other suitable material, as directed by the Engineer, will then be replaced and compacted to the density specified for the section being constructed.

Shallow embankment sections, fills less than 2 feet in height measured at the finished subgrade shoulders, will be undercut to ensure a minimum 2-foot height of earth embankment for the entire width of roadbed. The upper 6 inches of undercut material that consists of topsoil with a high humus content will be used as topsoil, placed in the fill slopes outside the shoulders of the earthen subgrade, or placed in the lower portion (below 4 foot depth) in fills which are greater than 4 feet in height. The remaining undercut soil and soil obtained from adjacent excavation (excluding the upper 6 inches) will then be replaced and compacted to the density specified for the section being constructed.

The plan shown quantity will be the basis of payment. However, if there are additional areas of undercut other than what is shown in the plans, the Engineer will direct removal of these areas and the additional areas will be measured according to the Engineer.

TABLE OF UNDERCUTTING LOCATIONS RURAL

	Station	to	Station
SD 20	306+00		316+75
US 85	27+00		28+50

UNSTABLE MATERIAL EXCAVATION

The areas of unstable material excavation are drawn on the cross sections with a normal depth of 2 feet. The estimated quantity of 375 cubic yards of unstable material excavation will be paid for at the contract unit price per cubic yard for “Unclassified Excavation”.

All areas designated as Unstable will be excavated. The unstable material excavated on this project will be placed outside the subgrade shoulder in fill sections or stockpiled and used as topsoil.

Field measurement of unstable material excavation will not be made. However, if there are additional areas of unstable material excavation other than what is shown in the plans, the Engineer will direct removal of these areas and the additional areas will be measured according to the Engineer.

TABLE OF UNSTABLE MATERIAL EXCAVATION

	Station	to	Station	L/R	Depth (Ft)	Quantity (CuYd)
SD20	308+50		312+50	L	2	401
SD20	311+00		311+50	R	2	119
Total:						520

MUCK EXCAVATION

The areas of muck excavation are drawn on the cross sections with a normal depth of 3 feet. The estimated quantity of 53 cubic yards of muck excavation will be paid for at the contract unit price per cubic yard for “Muck Excavation”.

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Muck excavation consists of the removal of highly organic and/or highly saturated material from the designated areas shown on the cross sections. Highly organic muck material will not be used in the embankment but may be used as topsoil. Non-organic muck material may be used as embankment outside of the fill subgrade shoulder if it is properly handled and dried prior to placement in the embankment.

Field measurement of muck excavation will not be made unless the Engineer orders additional excavation, or when the Engineer determines, in accordance with Section 120.3 A.1 of the Specifications, that the classification of excavation be changed.

If the areas designated as muck excavation can be removed with similar equipment and procedures as used for unclassified excavation, the material will be measured and paid for as “Unclassified Excavation”.

TABLE OF MUCK EXCAVATION

	Station	to	Station	L/R	Depth (Ft)	Quantity (CuYd)
US 20	316+00		316+25	L	3	53
Total:						53

SALVAGE AND STOCKPILE GRANULAR BASE MATERIAL – US85

An estimated 470.7 tons (249.0 Cubic Yards) granular base material will be salvaged from the entire length of the existing highway and stockpiled at a site furnished by the Contractor and satisfactory to the Engineer.

The quantity of salvage granular base material may vary from the plans. No adjustment will be made to the contract unit price for variations of the quantity of “Salvage and Stockpile Granular Material.”

It is estimated that there are 177.9 cubic yards of salvageable material per station. This rate was used to compute the unclassified excavation quantities. The rate of salvageable material is based on a 40-foot width.

The following table is furnished for information only.

	MRM	Distance from Centerline (Feet)		Thickness of Granular Material (Inches)
US 85	75.00+0.286	Lt.	Rt.	15
Average Thickness:				15

SALVAGE AND STOCKPILE GRANULAR BASE MATERIAL – SD20

An estimated 3173.7 tons (1679.2 Cubic Yards) granular base material will be salvaged from the entire length of the existing highway and stockpiled at a site furnished by the Contractor and satisfactory to the Engineer.

The quantity of salvage granular base material may vary from the plans. No adjustment will be made to the contract unit price for variations of the quantity of “Salvage and Stockpile Granular Material.”

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SALVAGE AND STOCKPILE GRANULAR BASE MATERIAL – SD20
(CONTINUED)

It is estimated that there are 158.4 cubic yards of salvageable material per station. This rate was used to compute the unclassified excavation quantities. The rate of salvageable material is based on a 36-foot width.

The following table is furnished for information only.

	MRM	Distance from Centerline (Feet)		Thickness of Granular Material (Inches)
		Lt.	Rt.	
SD 20	50.00+0.248	18	18	14
Average Thickness:				14

CONTRACTOR FURNISHED BORROW EXCAVATION

The Contractor will provide a suitable site for Contractor furnished borrow excavation material. The Contractor is responsible for obtaining all required permits and clearances for the borrow site. The borrow material will be approved by the Engineer. The plans quantity for “Contractor Furnished Borrow Excavation” as shown in the Estimate of Quantities will be the basis of payment for this item.

Restoration of the Contractor furnished borrow excavation site will be the responsibility of the Contractor.

EXCAVATION FOR DEEP BOX CULVERT REMOVAL

Included in the quantity of “Unclassified Excavation” are 364 cubic yards of excavation for removal of deep box culverts. Deep box culverts are existing mainline box culverts at depths of 10 feet or greater (measured from the flow line to the lowest elevation of either the existing ground line, undercut line, or bottom of removed or salvaged surfacing).

All work necessary to excavate and backfill the deep box culverts including labor, equipment, and incidentals will be incidental to the contract unit price per cubic yard for “Unclassified Excavation”. Payment for deep box culvert excavation will be based only on plans quantity and measurement of these excavation quantities during construction will not be performed.

The excavation quantities for deep box culverts are not included with the earthwork balance quantities on the plans profile sheets. The quantities computed for excavation of the deep box culverts are based on the limits shown in the drawing below.

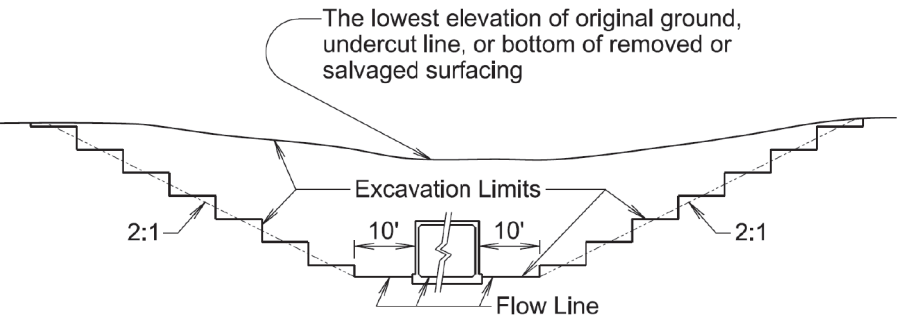


TABLE OF EXCAVATION FOR DEEP BOX CULVERT REMOVAL

Station	Type	Quantity (CuYd)
* 27+74	RCBC	364
Total:		364

* The excavation quantity includes excavation for the installation of the new RCBC at US 85 Station 27+74.

PIPE CULVERT UNDERCUT

The table includes undercut for 36 inch and larger pipe culverts. The depth of undercut is an estimate and the actual depth necessary will be determined during construction. Pipes listed may or may not require undercutting and pipes not listed may require undercutting. The Engineer will determine which pipe will be undercut in accordance with Section 421 of the Specifications.

Station	Undercut Depth (Ft)	Pipe Culvert Undercut (CuYd)
311+13	1	28.8
311+37	1	28.8
Total:		57.6

The table below contains the rate for one-foot depth of pipe culvert undercut per foot of pipe length and should be used as an aid in determining the actual amount of undercut to be performed during construction. The table is derived from the drawing below and conforms to the Specifications. When calculating pipe culvert undercut, the length of pipe ends should be included in the overall pipe length.

Storm sewer and approach pipes do not require undercutting unless specified otherwise in these plans.

Pipe Diameter (In)	Round Pipe Undercut Rate for 1' Depth (CuYd/Ft)	Arch Pipe Undercut Rate for 1' Depth (CuYd/Ft)
24	0.2407	0.2577
30	0.2623	0.2847
36	0.2840	0.3110
42	0.3056	0.3337
48	0.3272	0.3596
54	0.3488	0.3827
60	0.3704	0.4105
66	0.3920	---
72	0.4136	0.4630
78	0.4352	---
84	0.4568	0.5123
90	0.4784	---

INCIDENTAL WORK, GRADING

	Station	L/R	Remarks
US 85	27+74		12'x12' – 125' RCBC
US 20	412+22	L	24" – 164' CMP Downspout
US 20	311+25		30" – 57' CMP
US 20	316+05		7'x7' End Sections

TABLE OF ASPHALT CONCRETE PAVEMENT REMOVAL

	Station	to	Station	Quantity (SqYd)
US 85	27+05		28+45	622
SD 20	306+15		316+75	4240
Total:				4862

CORRUGATED METAL PIPE

Corrugated metal pipes will have 2 ⅜-inch x ½-inch corrugations for 42-inch and smaller round pipe and 48-inch and smaller arch pipe unless otherwise stated in the plans. Corrugated metal pipes will have 3-inch x 1-inch or 5-inch x 1-inch corrugations for 48-inch and larger round pipe and 54-inch and larger arch pipe unless otherwise stated in the plans.

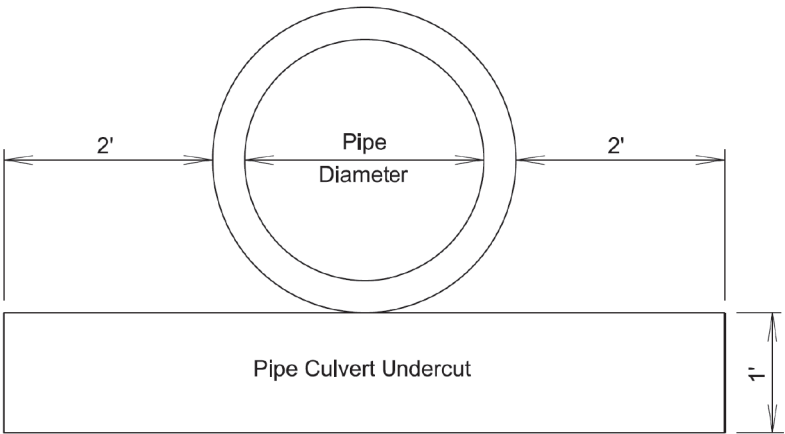
Areas within the project have soils that are highly corrosive to steel. Corrugated metal pipe in these areas will be polymer coated 14 gauge steel as specified in the Table of Pipe Quantities. Any required connection bands, elbows, tees, crosses, wyes, reducers, and transitions will also be polymer coated. The connection bands will be 24 inches wide. All polymer coated corrugated metal pipe and components will be in conformance with AASHTO M245. Riveted pipe will not be allowed.

All damage to the polymer coating will be repaired in accordance with the manufacturer's recommendations prior to installation of the pipe.

All costs associated with the polymer coating including repair of polymer coating will be incidental to the corresponding CMP contract items.

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CORRUGATED METAL PIPE (CONTINUED)

Metal pipe end sections connected to polymer coated CMP or HDPE will be aluminum-coated (Type 2) in accordance with AASHTO M36 as specified in the Table of Pipe Quantities. All costs associated for gauge, coating, and connections will be incidental to the corresponding CMP End Section contract items

PIPE FOR DOWNSPOUTS

The substitution of Class 2 reinforced concrete pipe, high density polyethylene pipe, polypropylene pipe, or steel reinforced polyethylene pipe for corrugated metal downspout pipes is not allowed.

CLEANOUT FOR CULVERT TREATMENT

This note is to be used if pipe culverts are to be cleaned out in preparation of a following rehabilitation treatment.

Cleanout of pipe culvert will be done in advance of the culvert lining.

Material in existing pipe culvert will be cleaned out by water flushing or other approved methods.

Material removed from the pipe culvert will become property of the Contractor for disposal.

The Contractor will implement appropriate sediment control measures prior to water flushing to prevent discharges from the project boundaries.

The pipe culvert will be cleaned to the satisfaction of the Engineer.

All costs to dewater, clean pipe, and dispose of removed materials will be incidental to the contract unit price per each for "Cleanout Pipe Culvert".

SLIPLINE PIPE

The Contractor will furnish and install slipliner pipe at locations specified in the Table of Slipline Pipe. This work consists of slipping a pipe liner inside existing pipe and grouting the void between the liner and the existing pipe.

The Contractor will submit a proposed procedure for sliplining pipes, including the grouting procedure, to the Engineer at least two weeks prior to beginning this work.

Slipliner pipe will conform to one of the following types:

1. Closed Profile HDPE:

Closed profile HDPE pipe will meet the requirements of ASTM F894 and will have a cell classification of 345464C in accordance with ASTM D3350. The pipe will have a minimum Ring Stiffness Constant (RSC) classification of 160 lb/ft as defined in ASTM F894. Pipe joints will be in accordance with the pipe manufacturer's recommendations and as approved by the Engineer.

2. Solid Wall HDPE:

Solid wall HDPE pipe will meet the requirements of ASTM F714 (SDR 32.5) and will have a cell classification of 445574C in accordance with ASTM D3350. Pipe joints may be grooved press-on joints or heat fused as approved by the Engineer. Heat fused joints will be fused in accordance with the pipe

manufacturer's recommendations by an experienced operator of the heat fusion equipment.

3. PVC:

PVC pipe will meet the requirements of ASTM F949 or ASTM D1784 with a cell classification of 12454. Pipe joints will be elastomeric seals (gaskets) in accordance with the requirements of ASTM F477.

4. Spirally Wound PVC:

Spirally wound PVC slipliner will meet the requirements of ASTM F949 with minimum pipe stiffness of 46 psi. Pipe joints will be in accordance with the pipe manufacturer's recommendations and as approved by the Engineer.

5. Polypropylene Pipe (PP):

Polypropylene pipe will meet or exceed the requirements of ASTM F2736 (12 inch to 30 inch diameter) or will meet or exceed the requirements of ASTM F2764 (30 inch to 60 inch diameter) with minimum pipe stiffness of 46 psi. Pipe joints will be in conformance with ASTM D3212.

6. Steel Reinforced Polyethylene:

Steel reinforced polyethylene pipe will meet the requirements of ASTM F2562. Pipe joints will be in accordance with the pipe manufacturer's recommendations and as approved by the Engineer.

The diameter specified in the bid item description is the diameter of the existing pipe to be sliplined. The Contractor will provide the largest diameter slipliner pipe that will fit into the existing pipe to maximize flow capacity.

Slipliner pipe will have a smooth interior surface.

Slipliner pipe will be joined into a continuous length with joints that are adequate for pushing, pulling, or winding the liner pipe through the existing pipe. The joints will not allow seepage during pressure grouting. To allow for unrestricted insertion of the liner, the outside diameter of the liner pipe will not be increased at the joints.

Prior to sliplining, the Contractor will clean the existing pipe of all debris, silt, and obstructions to ensure that the slipliner pipe can be inserted, the grout will flow to all voids, and the inserted slipliner pipe will not be set upon or irregularly supported by such material. Cleaning will be accomplished by the use of jet rodding equipment or other approved methods.

The slipliner pipe will be inserted into the existing pipe by pushing, pulling, or winding methods that do not damage the slipliner pipe. The slipliner pipe will be clean and substantially dry before insertion.

To minimize the change in flowline, slipliner pipe will be held down during the grouting operation. This may be accomplished by attaching fasteners or blocks at the top of the pipe, adding weight to the inside of the slipliner pipe, placing multiple grout lifts, or other means as approved by the Engineer.

Bulkheads will be constructed at each end of the pipe. Each bulkhead will be constructed to withstand the pressure of the grouting operation. The bulkhead will extend from the end of the existing pipe inward a minimum depth of 18 inches. The bulkhead will be free from leaks and the exterior surface will be given a smooth trowel finish. The bulkhead at the inlet end will be finished with a 45 degree mitered bevel transition between the existing pipe and the inside of the slipliner pipe with the slipliner pipe face pushed inside the existing pipe face.

Pressure grouting will be done to ensure all the voids are filled between the slipliner pipe and the existing pipe including all breaks or holes in and around the existing pipe. Grouting pressures used will ensure all voids are filled, but

do not collapse or deform the slipliner pipe more than 5 percent of the diameter. Multiple grout lifts may be necessary to minimize pipe deflection for 60-inch diameter and larger pipe in accordance with the pipe manufacturer's recommendations.

The grout will be a cellular grout (grout with pre-generated foam) with a minimum 28-day compressive strength of 100 pounds per square inch. If water is not present within the sliplined pipe a low-density grout with a minimum of 30 pounds per cubic foot wet density may be used. When it is not possible to dewater the existing pipe or keep water out of the annular space during grouting, a high-density grout with a minimum of 70 pounds per cubic foot will be used which may include approved sand. The foaming agent used will meet the requirements of ASTM C869 when tested in accordance with ASTM C796.

Both of the cellular grout mix designs will be submitted to the SDDOT Concrete Engineer for approval prior to use. The mix design submittal will include the base cement slurry mix per cubic yard, expansion factor from the foaming agent, and the cellular grout wet density (pounds per cubic foot).

The Contractor will install a bypass valve adjacent to the location where the pressure grouting hose is attached for obtaining samples to be checked for wet density. The wet density of the cellular grout will be checked by the Contractor to verify the proper minimum wet density before the cellular grout filling operations begin and at a minimum once every two hours during production. The SDDOT will document the results of the density checks.

Cellular grout will be wasted until the cellular grout meets the minimum wet density required; however, if 0.5 cubic yards or more of base cement slurry is wasted trying to meet density requirements, then that quantity will not be included for payment.

If grout holes are utilized, cylindrical wooden plugs or other approved plugs will be inserted to plug holes until the grout has set. After the plugs are removed the holes will be filled with concrete.

The quantity of cellular grout was estimated based on void quantity between the slipliner pipe and the existing pipe, and an additional quantity for the void volume outside the existing pipe.

The quantity of base cement slurry ordered will be approved by the Engineer. The quantity of base cement slurry needed will be calculated to the nearest tenth of a cubic yard using the approved mix design, expansion factor of the foaming agent, and estimated amount of cellular grout. The quantity for payment to the nearest tenth of a cubic yard of "Cellular Grout" is a calculated quantity based on the amount of base cement slurry used on the project to the nearest tenth of a cubic yard, expansion factor of the foaming agent, and approved mix design.

All costs for furnishing and installing the slipliner pipe, including work area excavation, backfilling, and incidentals necessary to satisfactorily complete the work will be included in the contract unit price per foot for the corresponding contract item for "Slipline 84" Pipe". Cost to clean the culvert for sliplining will be paid for at the contract unit price per each for "Cleanout for Culvert Treatment".

All costs for furnishing and installing the cellular grout including bulkhead construction, inlet bevel construction, and incidentals necessary to satisfactorily complete the work will be included in the contract unit price per cubic yard for "Cellular Grout".

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B6	B30
Plotting Date:		08/21/2025	Revised 08/21/25 DG

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TRRC-1903

TABLE OF SLIPLINE PIPE

Highway	Station	Slipliner Minimum Inside Dia. (In)	Slipline 84" Pipe (Ft)	*Cellular Grout (CuYd)
SD20 MRM 50	316+05	70.9	140	93.61
		Totals:	140	93.61

*The quantity at each location includes an additional 15% to account for void volume outside the existing pipe.

CELLULAR GROUT

The Contractor will submit a proposed grouting procedure to the Engineer at least two weeks prior to beginning this work.

Bulkheads will be constructed at each end of the pipe. Each bulkhead will be constructed to withstand the pressure of the grouting operation. The bulkhead will extend from the end of the existing pipe inward a minimum depth of 18 inches and will be free from leaks.

Pressure grouting will be done to ensure all the voids are filled including all breaks or holes in and around the existing pipe.

The grout will be a cellular grout (grout with pre-generated foam) with a minimum 28-day compressive strength of 100 pounds per square inch. If water is not present within the pipe a low-density grout with a minimum of 30 pounds per cubic foot wet density may be used. When it is not possible to dewater the existing pipe, a high-density grout with a minimum of 70 pounds per cubic foot will be used which may include approved sand. The foaming agent used will meet the requirements of ASTM C869 when tested in accordance with ASTM C796.

Both of the cellular grout mix designs will be submitted to the SDDOT Concrete Engineer for approval prior to use. The mix design submittal will include the base cement slurry mix per cubic yard, expansion factor from the foaming agent, and the cellular grout wet density (pounds per cubic foot).

The Contractor will install a bypass valve adjacent to the location where the pressure grouting hose is attached for obtaining samples to be checked for wet density. The wet density of the cellular grout will be checked by the

Contractor to verify the proper minimum wet density before the cellular grout filling operations begin and at a minimum once every two hours during production. The SDDOT will document the results of the density checks.

Cellular grout will be wasted until the cellular grout meets the minimum wet density required; however, if 0.5 cubic yards or more of base cement slurry is wasted trying to meet density requirements, then that quantity will not be included for payment.

If grout holes are utilized, cylindrical wooden plugs or other approved plugs will be inserted to plug holes until the grout has set. After the plugs are removed the holes will be filled with concrete.

The quantity of cellular grout was estimated based on volume of the existing pipe and voids outside the existing pipe.

The quantity of base cement slurry ordered will be approved by the Engineer. The quantity of base cement slurry needed will be calculated to the nearest

tenth of a cubic yard using the approved mix design, expansion factor of the foaming agent, and estimated amount of cellular grout. The quantity for payment to the nearest tenth of a cubic yard of “Cellular Grout” is a calculated quantity based on the amount of base cement slurry used on the project to the nearest tenth of a cubic yard, expansion factor of the foaming agent, and approved mix design.

All costs for furnishing and installing the cellular grout including bulkhead construction, inlet bevel construction, and incidentals necessary to satisfactorily complete the work will be included in the contract unit price per cubic yard for “Cellular Grout”.

REINFORCED CONCRETE PIPE

High sulfate levels are likely to be encountered on this project. The type of cement will be either type V or type II with 20% to 25% Class F Modified Fly Ash substituted for cement in accordance with Section 605 of the Specifications. The Water/Cementitious material ratio will not exceed 0.45 as defined in Section 460.3 C of the Specifications. The mix will be as per the fabricator's design; however, minimum compressive strength will not be less than 4500 psi at 28 days. The pipe must be marked in an acceptable way to designate meeting requirements for sulfate resistance.

CONCRETE PIPE CONNECTIONS

Pipe connections to existing pipes, manholes, junction boxes, and drop inlets will be done by breaking a hole into the existing structure and inserting the pipe. A concrete collar will then be poured around the pipe in the area of the connection.

When it is not possible to use a normal pipe joint (male-female ends), connections to existing pipe will be made by placing a 2’ wide by 6" thick M6 concrete collar around the outside of the connection. The concrete collar will be reinforced with 6x6 W2.9 x W2.9 wire mesh.

All costs for constructing the concrete collars including materials and labor will be incidental to the contract unit price per foot for the corresponding pipe contract item.

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B7	B30

Plotting Date: 08/11/2025

PIPE COVER

The earthen subgrade cover for some pipe installations is less than one foot. The Contractor will take the necessary precautions to ensure the structural properties of the pipes are not damaged after installation and prior to the placement of final surfacing. Any additional costs for preventing damage to these pipes will be incidental to the contract unit price per foot for the corresponding pipe installation contract item.

TEMPORARY FENCE

The Contractor will verify the location of the temporary fence with the landowner prior to installation of the fence.

TABLE OF PVC COATED BANK AND CHANNEL PROTECTION GABIONS AND DRAINAGE FABRIC

Highway	Station	L/R	PVC Coated Bank and Channel Protection Gabion (CuYd)	Type B Drainage Fabric (SqYd)
US20	412+22	L	4.5	15
US20	316+05	R	27.0	70
		Totals:	31.5	85

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TABLE OF GUARDRAIL

Location	Remove 4 Cable Tension Cable Guardrail (Ft)	Remove High Tension Cable Guardrail Anchor Assembly (Each)
Structure No. 10-169-215		
Begin Bridge Lt.	395	2
Begin Bridge Rt.	395	2
Totals:	790	4

TABLE OF SUPERELEVATION

Station	to	Station	
306+15		311+70	- Normal Crown Section
311+70		313+35	- Superelevation Transition
313+35		316+33	- 5730' Radius Curve Right .034'/' Superelevation Rate Point of Rotation at Centerline
316+33		316+75	- Superelevation Transition
316+75			- Normal Crown Section

TABLE OF CONSTRUCTION STAKING

(See Special Provision for Contractor Staking)

Roadway and Description	Begin Station	End Station	Number of Lanes	Length (Ft)	Grade Staking				Miscellaneous Staking Quantity (Mile)	Slope Staking Quantity (Mile)	Structure Staking Quantity (Each)
					Length (Mile)	Lane Factor	*Sets of Stakes	**Grade Staking Quantity (Mile)			
US 85 (2 Lanes AC Pavement)	27+05	28+45	2	140	0.027	1	1	0.027	0.027	0.027	
Str No 10-169-215											1
SD 20 MRM 50 (2 Lanes AC Pavement)	306+15	316+75	2	1060	0.201	1	1	0.201	0.201	0.201	
Totals:								0.228	0.228	0.228	1

- * 1 = Blue Top Stakes Only (Asphalt Concrete Pavement)
2 = Blue Top and Paving Hub Stakes (PCC Pavement)
- ** Grade Staking Quantity = (Length) x (Lane Factor) x (Sets of Stakes)

TABLE OF PIPE QUANTITIES

Station	Offset (L/R)	Reinforced Concrete						Corrugated Metal									
		Circular			Circular Flared End			Circular			Circular Elbow		Circular Sloped End			Circular Flared End	
		48" Cl. 2			48"			24" 14 Ga			24"		24"			24"	78"
	Ft				Each			Ft			Each		Each			Each	Each
US20 MRM 16.00+0.803																	
412+17 - 118.1' L to 413+74 - 47.7' L								160			2		1			1	
US20 MRM 50.00+0.248																	
311+13 - 48.3' L to 311+13 - 47.9' R		80			2												
311+37 - 48.3' L to 311+37 - 47.9' R		80			2												
316+05 - 69.5' L to 316+05 - 69.5' R																	2
Total:		160			4			160			2		1			1	2

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B8	B30
Plotting Date: 08/21/2025 Revised 08/21/25 DG			

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TABLE OF FENCE QUANTITIES

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B9	B30

Plotting Date: 08/11/2025

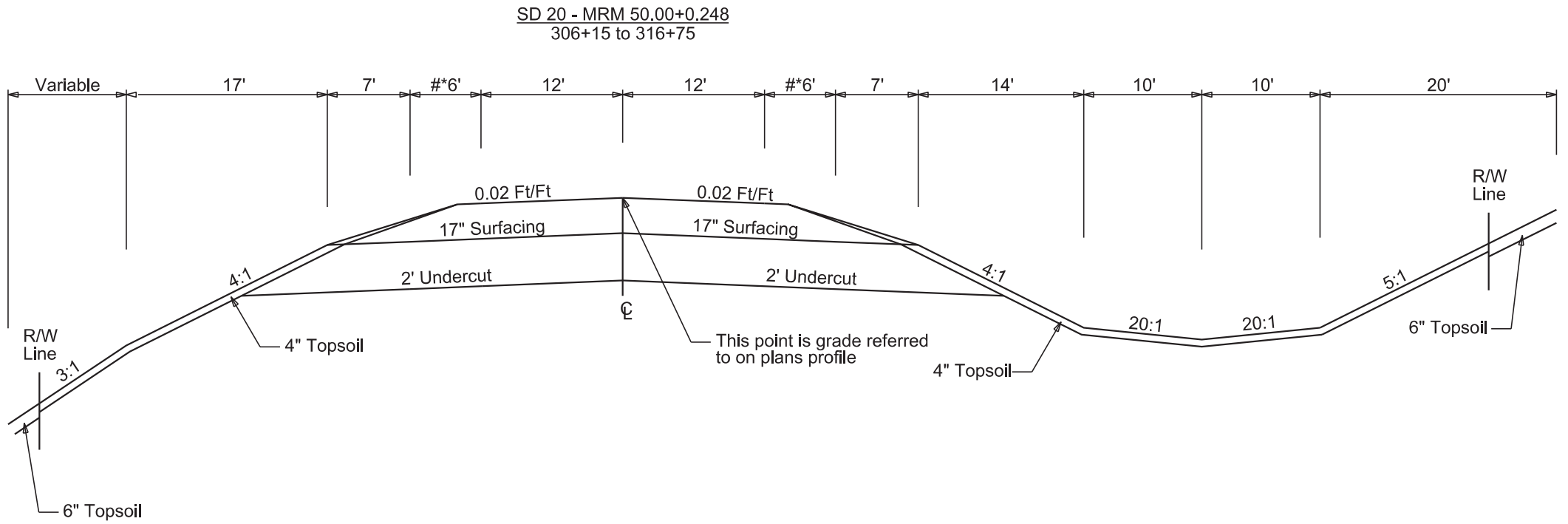
Station to Station		Side (L/R)	Right-of-Way Fence					Temporary Fence			Post Panels		Gates (for information purposes only)				Fence	
			Type 2					Type 2			2 Post	3 Post	Barb Wire 16'					
			(Ft)					(Ft)			(Each)	(Each)	(Each)					Remove (Ft)
US85 24+69	30+80	L	619					653			4	4					619	
US85 27+00	28+50	R	230					275			4	3					230	
US20 313+00	316+75	L	375					545				3	1				401	
US20 315+50	316+75	R	125					151			1	1					225	
US20 409+00	414+50	L	550									2					550	
TOTALS:			1899					1624			9	13	1				2025	

Post Type and Sequence:
Right-of-way fence will be
constructed using alternate
wood and steel posts except
as noted.

TYPICAL GRADING SECTION

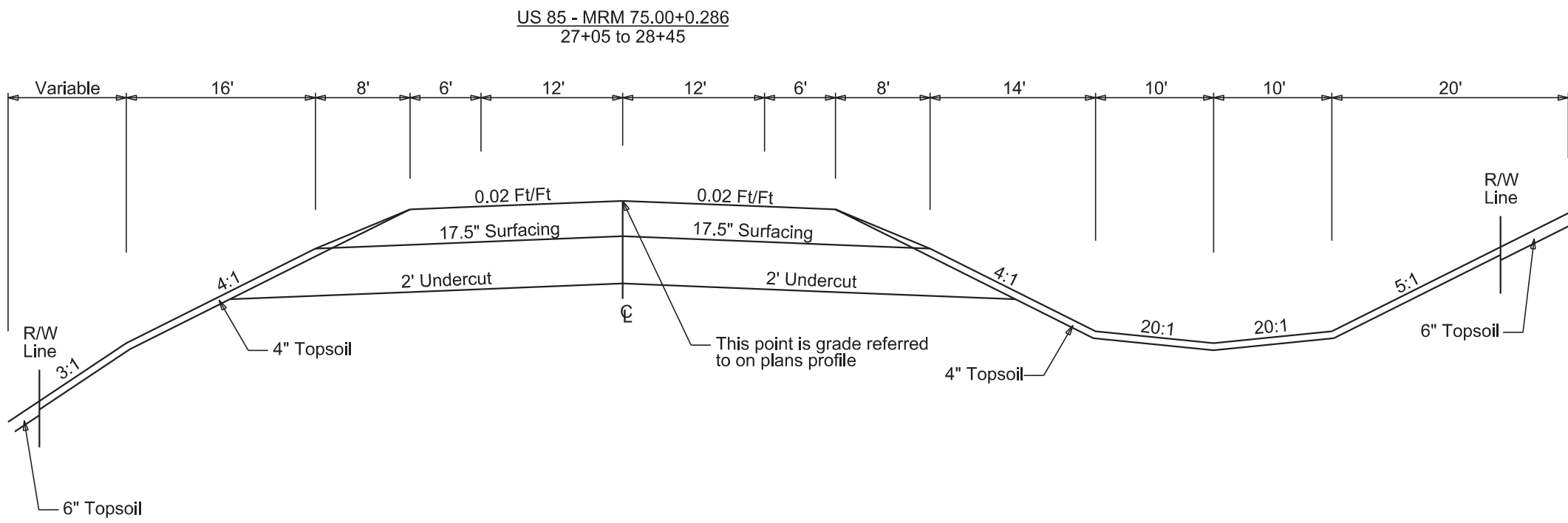
STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B10	B30

Plotting Date: 08/11/2025



Ultimate Future Shoulder Width

Transitions:
* 306+15 to 306+50: 2' to 6'
316+40 to 316+75: 6' to 2'



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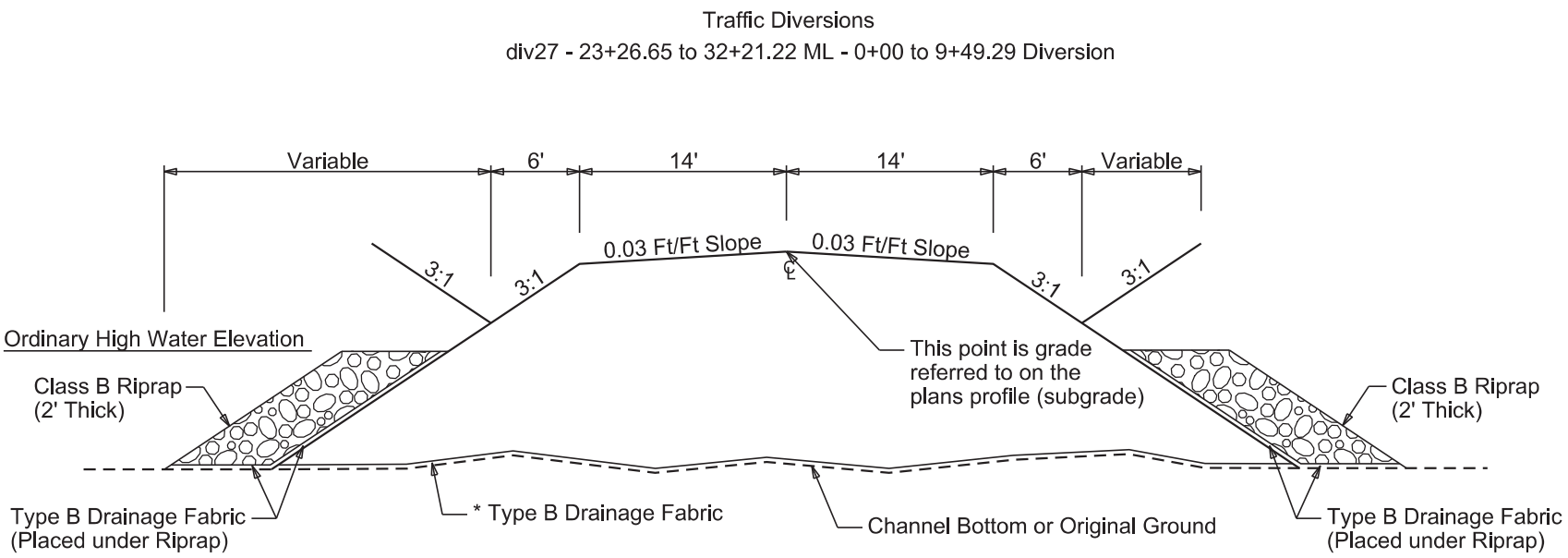
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TYPICAL GRADING SECTION

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B11	B30

Plotting Date: 08/11/2025



* Place Type B Drainage Fabric under embankment that is placed in wetland areas as shown in Section B.

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HORIZONTAL ALIGNMENT DATA

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B12	B30

Plotting Date: 08/11/2025

US 85 – MRM 75.286

Type	Station		Northing	Easting
POB	10+00.00		410595.727	1005299.327
		TL= 3549.05		
		N 61°39'50" E		
POE	45+49.05		412280.260	1008423.123

SD 20 – MRM 16.803

Type	Station		Northing	Easting
POB	400+00.00		657111.427	1006284.149
		TL= 2053.03		
		S 87°32'56" E		
POE	420+53.03		657023.627	1008335.302

SD 20 – MRM 50.00+0.248

Type	Station		Northing	Easting
POB	300+00.00		638573.014	1166625.261
		TL= 1301.57		
		N 66°59'14" E		
PC	313+01.57		639081.845	1167823.247
PI	323+10.28	R = 5730.00	639476.189	1168751.687
PT	332+98.54		639529.765	1169758.978
		TL= 1.56		
		N 86°57'19" E		
POE	333+00.10		639529.848	1169760.538

div27

Type	Station		Northing	Easting
PC	0+00.00		411225.413	1006467.017
PI	1+22.27	R = 400.00	411283.447	1006574.635
PRC	2+37.32		411391.733	1006631.414
PI	5+07.06	R = 400.00	411630.625	1006756.676
PRC	7+11.96		411604.033	1007025.103
PI	8+34.23	R = 400.00	411591.979	1007146.776
PT	9+49.29		411650.013	1007254.394

The coordinates shown on this sheet are based on the South Dakota State Plane Coordinate System. North Zone (NAD 83/11); epoch 20 2010.00; Geoid 12A; SF = 0.99979580 (US85), SF = 0.99983601 (SD20 MRM 16), SF = 0.99983478 (SD20 MRM 50)

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CONTROL DATA

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B13	B30

Plotting Date: 08/11/2025

HORIZONTAL AND VERTICAL CONTROL POINTS						
POINT	STATION	OFFSET	DESCRIPTION	NORTHING	EASTING	ELEVATION
20 005.67			REFERENCE MARKER AC7856	650775.714	959315.578	3136.74
20 016.45			REFERENCE MARKER AI3964	657288.104	1005492.112	3082.44
20 018.00			REFERENCE MARKER AI3965	656875.084	1013587.899	3083.67
20 043.54			REFERENCE MARKER AC7918	639844.008	1134322.23	2951.53
20 049.20			REFERENCE MARKER AI4014	637035.806	1162967.738	3137.98
20 050.20	313+17.77	98.63	REFERENCE MARKER AI4015	638997.266	1167876.473	3085.49
20 051.10			REFERENCE MARKER AI4016	639557.246	1172436.781	3074.02
20 061.46			REFERENCE MARKER AC7943	632416.333	1225548.523	2974.94
85 066.30			REFERENCE MARKER AI0149	383973.075	969372.768	3037.30
85 074.90			REFERENCE MARKER AI0153	410612.587	1005120.956	3020.37
85 075.85			REFERENCE MARKER AI0154	412878.649	1009324.026	3027.34
85 076.98			REFERENCE MARKER AC7960	415585.573	1014759.662	3111.92
85 091.85			REFERENCE MARKER AI0168	476529.533	1052139.451	2930.26
A 32			REFERENCE MARKER QT0327	649709.867	1060454.084	2884.69
J32 RESET			REFERENCE MARKER QT0366	657085.928	1009263.736	3058.90

The coordinates shown on this sheet are based on the South Dakota State Plane Coordinate System. North Zone (NAD 83/11); epoch 20 2010.00; Geoid 12A; SF = 0.99979580 (US85), SF = 0.99983601 (SD20 MRM 16), SF = 0.99983478 (SD20 MRM 50)
The elevations shown on this sheet are based on NAVD 88.

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LEGEND

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B14	B30

Plotting Date: 08/11/2025

Anchor		Mailbox		Subsurface Utility Exploration Test Hole		State and National Line	
Antenna		Manhole Electric		Telephone Fiber Optics		County Line	
Approach		Manhole Gas		Telephone Junction Box		Section Line	
Assumed Corner		Manhole Miscellaneous		Telephone Pole		Quarter Line	
Azimuth Marker		Manhole Sanitary Sewer		Television Cable Jct Box		Sixteenth Line	
BBQ Grill/ Fireplace		Manhole Storm Sewer		Television Tower		Property Line	
Bearing Tree		Manhole Telephone		Test Wells/Bore Holes		Construction Line	
Bench Mark		Manhole Water		Traffic Sign Double Face		ROW Line	
Box Culvert		Merry-Go-Round		Traffic Sign One Post		New ROW Line	
Bridge		Microwave Radio Tower		Traffic Sign Two Post		Cut and Fill Limits	
Brush/Hedge		Miscellaneous Line		Traffic Signal		Control of Access	
Buildings		Miscellaneous Property Corner		Trash Barrel		New Control of Access	
Bulk Tank		Miscellaneous Post		Tree Belt		Proposed ROW	
Cattle Guard		Overhang Or Encroachment		Tree Coniferous		(After Property Disposal)	
Cemetery		Overhead Utility Line		Tree Deciduous			
Centerline		Parking Meter		Tree Stumps		Drainage Arrow	
Cistern		Pedestrian Push Button Pole		Triangulation Station			
Clothes Line		Pipe With End Section		Underground Electric Line		Remove Concrete Pavement	
Concrete Symbol		Pipe With Headwall		Underground Gas Line		Remove Concrete Driveway Pavement	
Control Point		Pipe Without End Section		Underground High Pressure Gas Line		Remove Asphalt Concrete Pavement	
Creek Edge		Playground Slide		Underground Sanitary Sewer		Remove Concrete Sidewalk	
Curb/Gutter		Playground Swing		Underground Storm Sewer		Remove Concrete Median Pavement	
Curb		Power And Light Pole		Underground Tank		Remove Concrete Curb and/or Gutter	
Dam Grade/Dike/Levee		Power And Telephone Pole		Underground Telephone Line			
Deck Edge		Power Meter		Underground Television Cable		Detectable Warning	
Ditch Block		Power Pole		Underground Water Line		Pedestrian Push Button Pole	
Doorway Threshold		Power Pole And Transformer		Water Fountain		and 30" x 48" Clear Space	
Drainage Profile		Power Tower Structure		Water Hydrant		with 1.5% slope	
Drop Inlet		Propane Tank		Water Meter			
Edge Of Asphalt		Property Pipe		Water Tower			
Edge Of Concrete		Property Pipe With Cap		Water Valve			
Edge Of Gravel		Property Stone		Water Well			
Edge Of Other		Public Telephone		Weir Rock			
Edge Of Shoulder		Railroad Crossing Signal		Windmill			
Electric Transformer/Power Junction Box		Railroad Milepost Marker		Wingwall			
Fence Barbwire		Railroad Profile		Witness Corner			
Fence Chainlink		Railroad ROW Marker					
Fence Electric		Railroad Signs					
Fence Miscellaneous		Railroad Switch					
Fence Rock		Railroad Track					
Fence Snow		Railroad Trestle					
Fence Wood		Rebar					
Fence Woven		Rebar With Cap					
Fire Hydrant		Reference Mark					
Flag Pole		Retaining Wall					
Flower Bed		Riprap					
Gas Valve Or Meter		River Edge					
Gas Pump Island		Rock And Wire Baskets					
Grain Bin		Rockpiles					
Guardrail		Satellite Dish					
Gutter		Septic Tank					
Guy Pole		Shrub Tree					
Haystack		Sidewalk					
Highway ROW Marker		Sign Face					
Interstate Close Gate		Sign Post					
Iron Pin		Slough Or Marsh					
Irrigation Ditch		Spring					
Lake Edge		Stream Gauge					
Lawn Sprinkler		Street Marker					

US 85 - MRM 75.00+0.286

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B15	B30

Plotting Date: 08/11/2025

Remove High Tension 4 Cable Guardrail
at the following locations:
25+32 to 29+26 R
26+21 to 30+16 L

Remove High Tension 4 Cable
Guardrail Anchor Assembly
at the following locations:
25+32 L
26+21 R
29+26 R
30+16 L

27+74
Take Out 12'x12'-125' RCBC
(Incidental Work, Grading)

27+74 (22.34 sq mi)
Install 12'x12'-144' 3 3/8" RCBC
(See Section E)

Sec 23 - T11N - R3E

Ralph Crago & Becky Crago
The SE1/4 of Section 23 -
Township 11 North - Range 3 East of the B.H.M.,
except Lot H1 therein
Parcel 1
0.01 ac, R.O.W.
(526 sq ft), more or less

BEGIN GRADING
Station 27+05

div27
PI 1+22.27
N 411283.45
E 1006574.64
Del 33°59'38" L
Dc 14°19'26"
T 122.27'
L 237.32'
R 400.00'

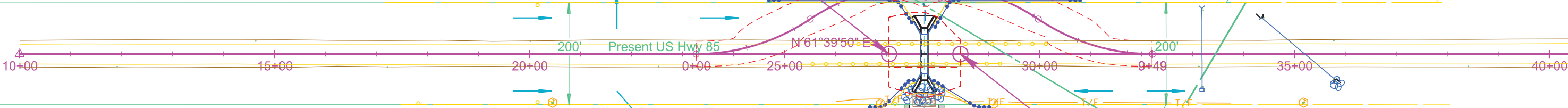
div27
PI 5+07.06
N 411630.63
E 1006756.68
Del 67°59'15" R
Dc 14°19'26"
T 269.74'
L 474.64'
R 400.00'

div27
PI 8+34.23
N 411591.98
E 1007146.78
Del 33°59'38" L
Dc 14°19'26"
T 122.27'
L 237.32'
R 400.00'

Ralph Crago & Becky Crago
The S1/2 NE1/4 of Section 23 -
Township 11 North - Range 3
East of the B.H.M.,
except Lot H1 in the NE1/4
Parcel A1

S1/2 NE1/4

30+80 L
End type 2 fence



END GRADING
Station 28+45

Parcel 1
24+69.00 to 27+65.37 L
Temporary Easement containing
0.3 ac, more or less

Parcel 1
27+35.30 to 28+12.30 R
Temporary Easement containing
0.1 ac, more or less

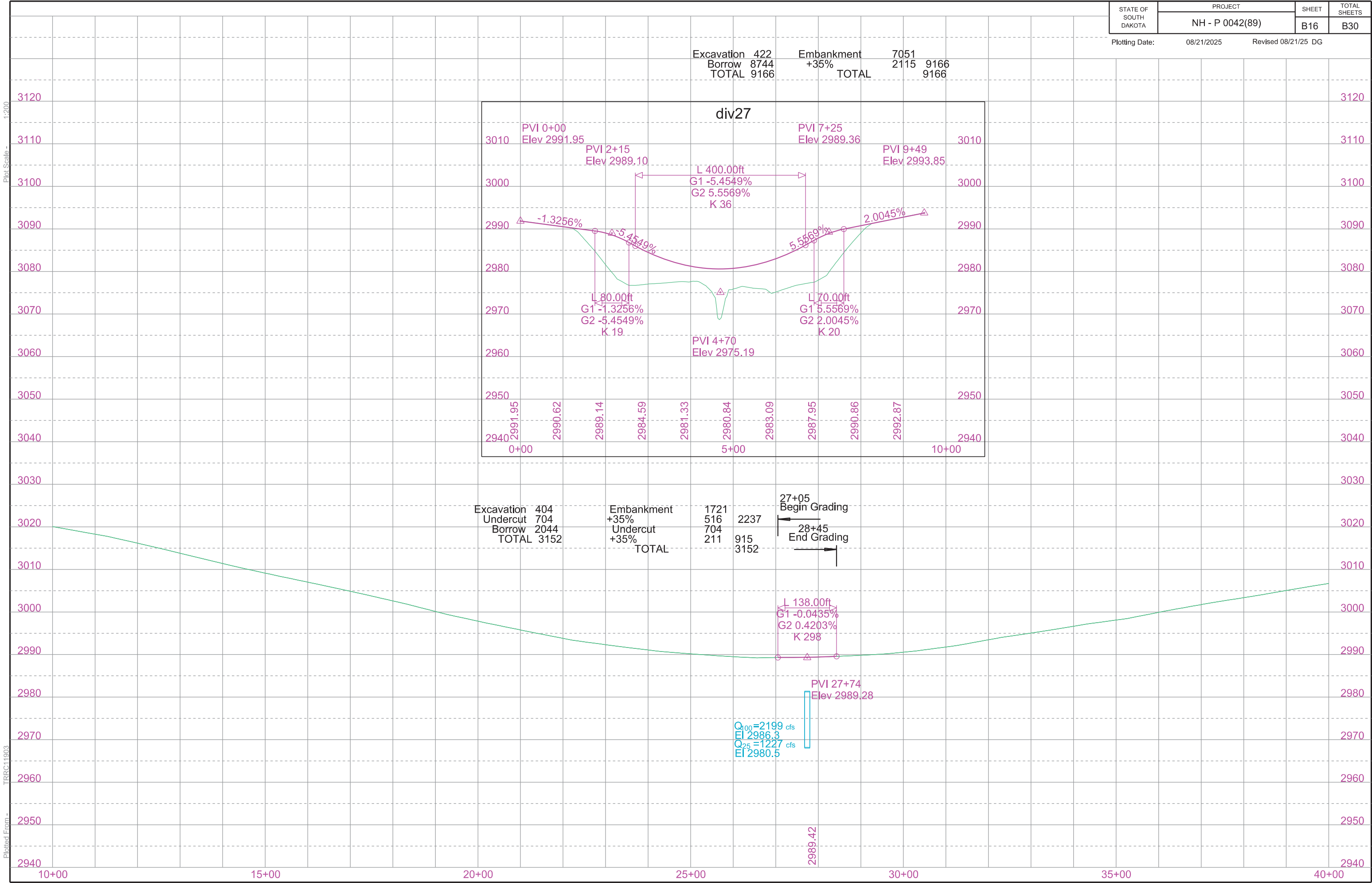
Parcel A1
27+65.37 to 30+80.00 L
Temporary Easement containing
0.6 ac, more or less

Plot Scale - 1:200

Plotted From - TRRC11903

Plot Scale - 1:200

File - U:\trc\proj\baue07\NU1010.dgn



Plot Scale - 1:200

Plotted From - TRRC11903

410+24
Retain 8'x8'-271' RCBC

410+24 L
Replace 8'x8' RCBC
Inlet Apron
(See Section E)

412+22 L
Take Out 24"-164' CMP Downspout
(Incidental Work, Grading)

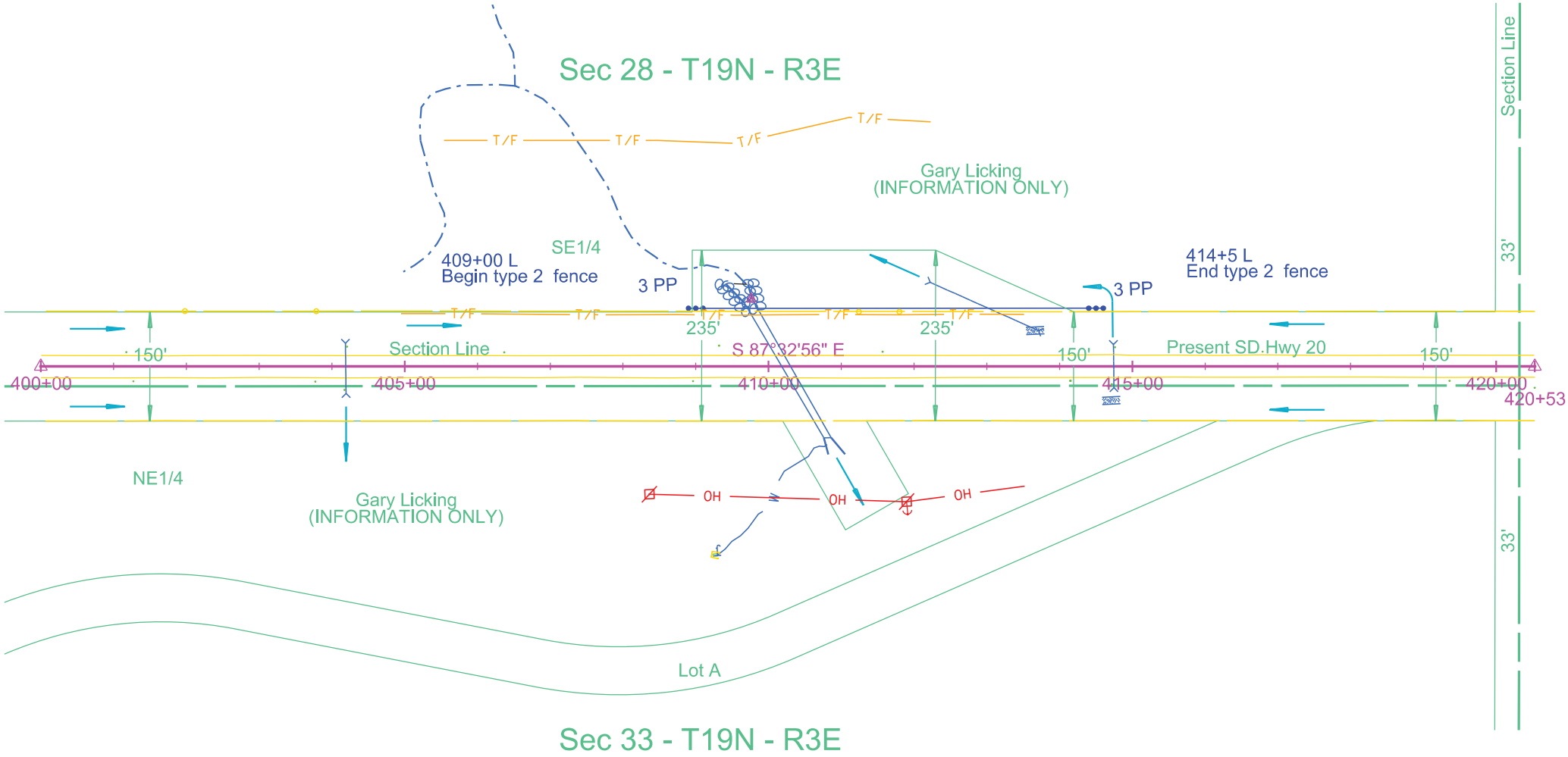
412+17-118.1' L to 413+74-47.7' L
Install 24" - 160' CMP (24' & 112' & 24')
And 2 - 7.5° Elbows
& 1 CMP Sloped End
& 1 CMP Flared End

SD 20 - MRM 16.00+0.803

412+23 L
Install Bank and Channel
Protection Gabions
(4.5 CuYd)

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B17	B30

Plotting Date: 08/11/2025



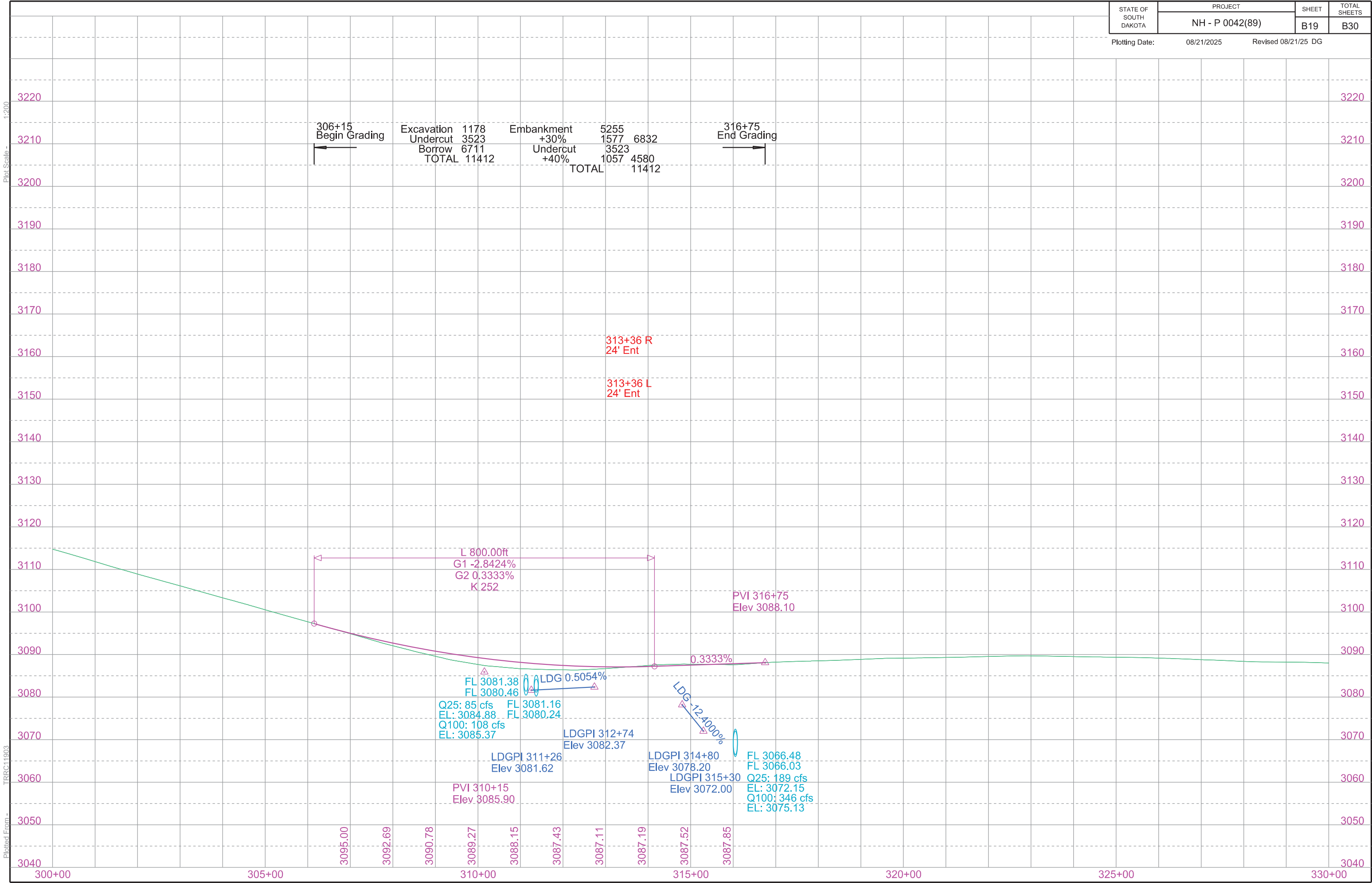
STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B18	B30

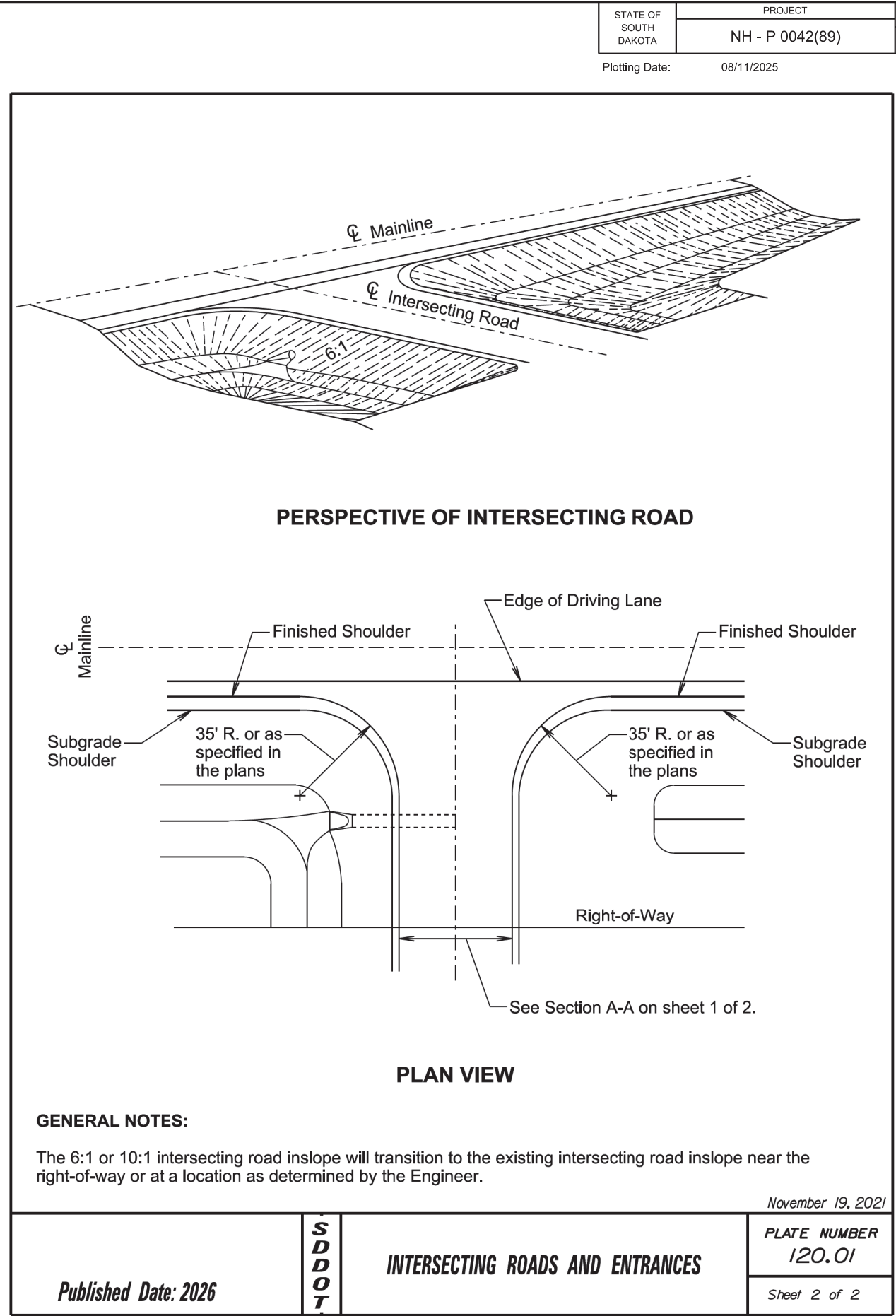
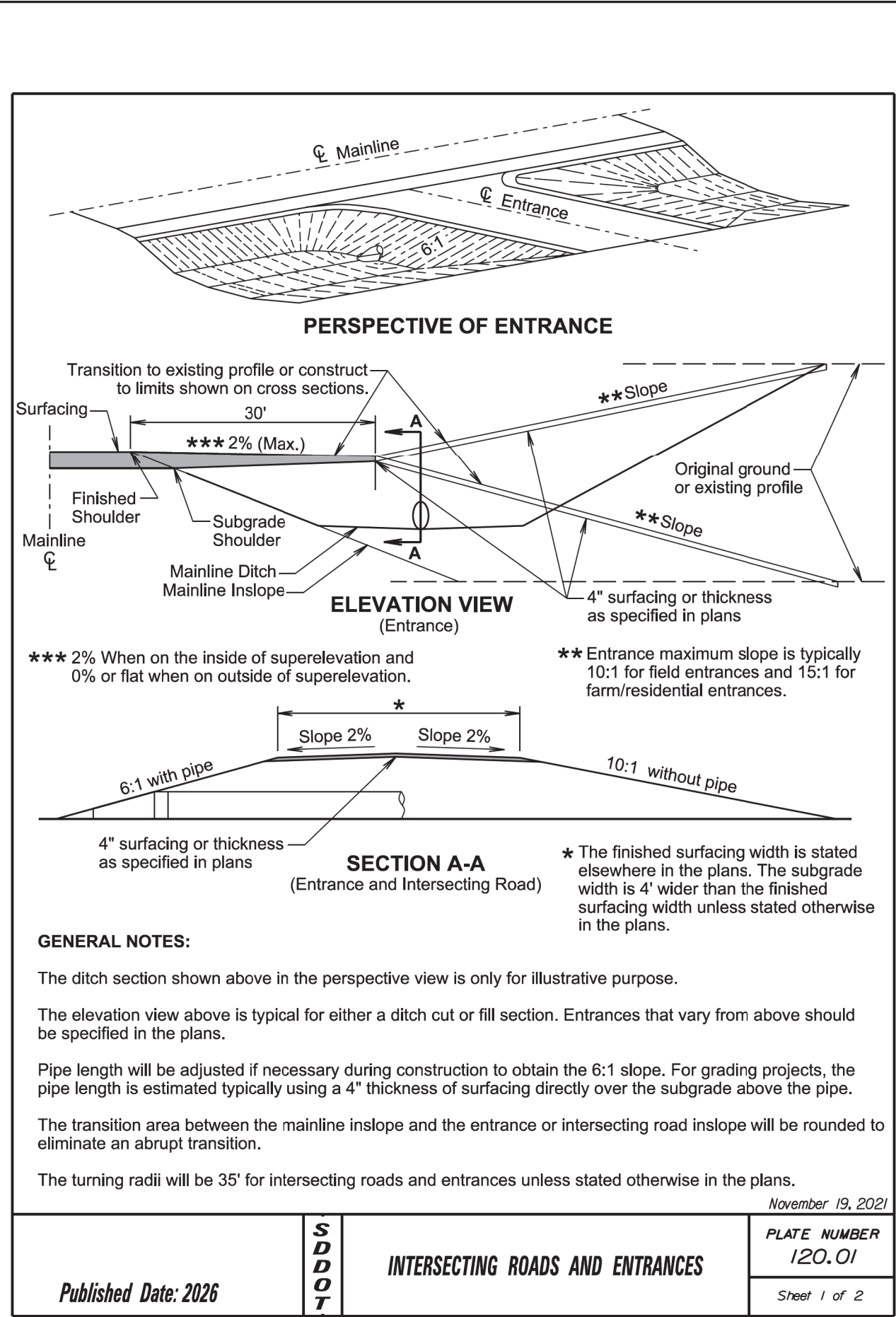
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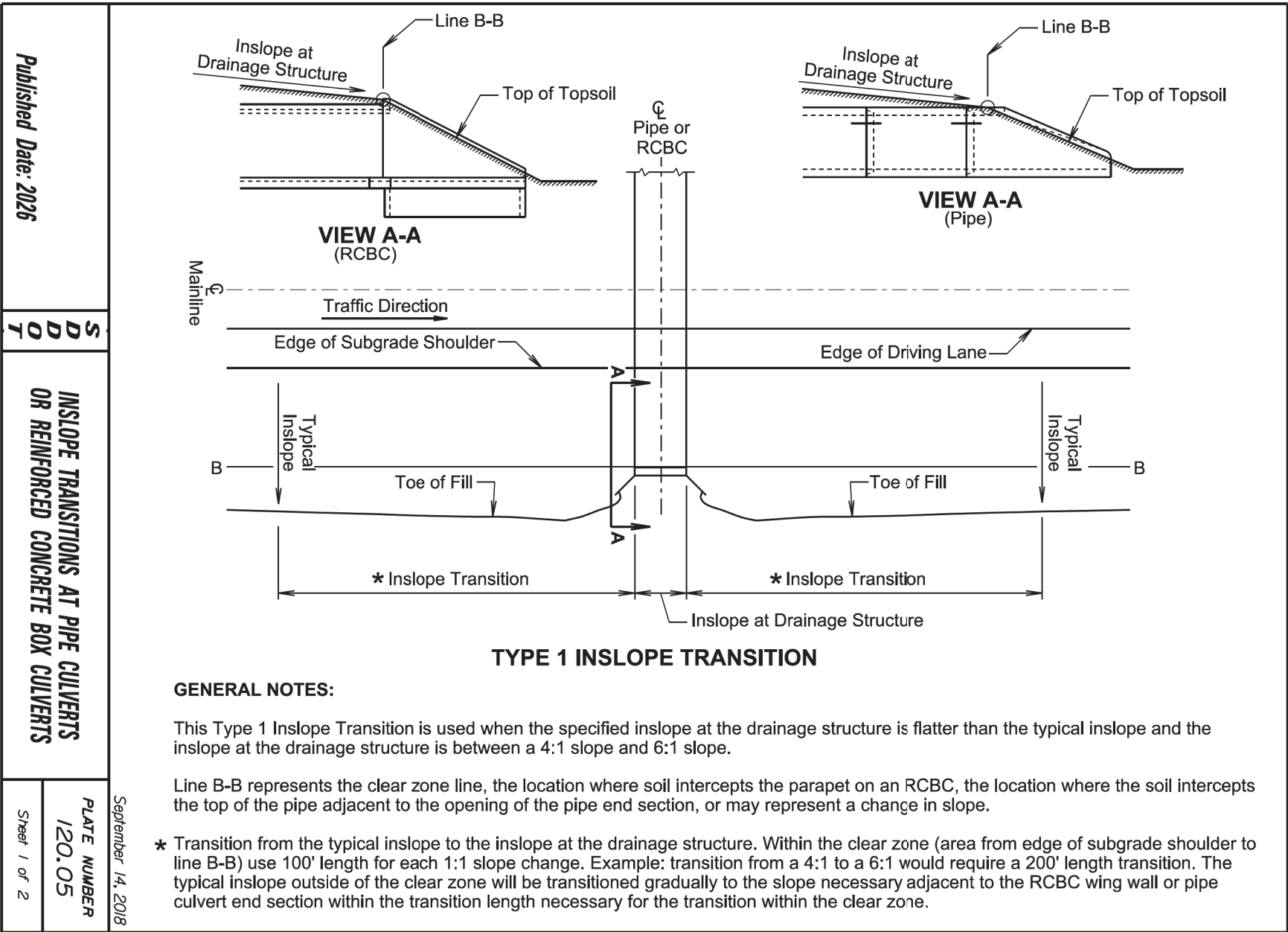
TRRC11903

Plotted From -



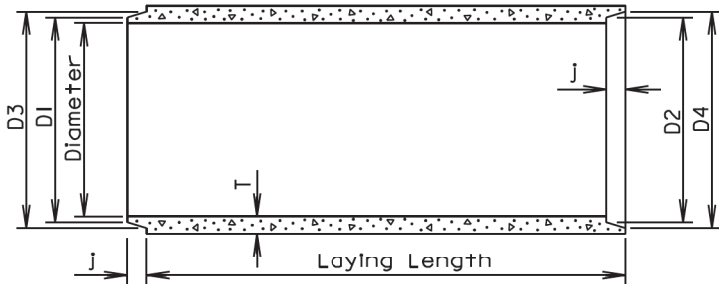




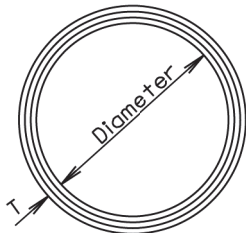


TOLERANCES IN DIMENSIONS

Diameter: $\pm 1.5\%$ for 24" Dia. or less and $\pm 1\%$ or $\frac{3}{8}$ " whichever is more for 27" Dia. or greater.
Diameters at joints: $\pm \frac{3}{16}$ " for 30" Dia. or less and $\pm \frac{1}{4}$ " for 36" or greater.
Length of joint (J): $\pm \frac{1}{4}$ ".
Wall thickness (T): not less than design T by more than 5% or $\frac{3}{16}$ ", whichever is greater.
Laying length: shall not underrun by more than $\frac{1}{2}$ ".



LONGITUDINAL SECTION



END VIEW

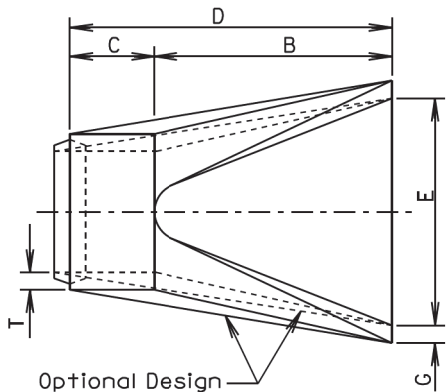
GENERAL NOTES:

Construction of R.C.P. shall conform to the requirements of Section 990 of the Specifications.
Not more than 2 four-foot sections shall be permitted near the ends of any culvert. Four-foot lengths shall be used only to secure the required length of culvert.

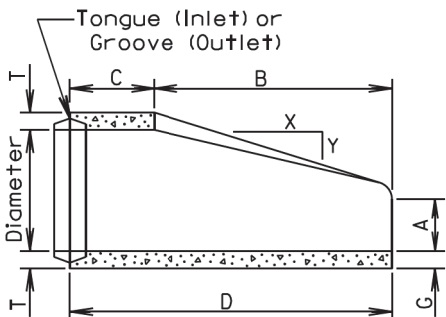
Diam. (in.)	Approx. Wt. /Ft. (lb.)	T (in.)	J (in.)	D1 (in.)	D2 (in.)	D3 (in.)	D4 (in.)
12	92	2	1 3/4	13 1/4	13 5/8	13 7/8	14 1/4
15	127	2 1/4	2	16 1/2	16 7/8	17 1/4	17 5/8
18	168	2 1/2	2 1/4	19 5/8	20	20 3/8	20 3/4
21	214	2 3/4	2 1/2	22 7/8	23 1/4	23 3/4	24 1/8
24	265	3	2 3/4	26	26 3/8	27	27 3/8
27	322	3 1/4	3	29 1/4	29 5/8	30 1/4	30 5/8
30	384	3 1/2	3 1/4	32 3/8	32 3/4	33 1/2	33 7/8
36	524	4	3 3/4	38 3/4	39 1/4	40	40 1/2
42	685	4 1/2	4	45 1/8	45 5/8	46 1/2	47
48	867	5	4 1/2	51 1/2	52	53	53 1/2
54	1070	5 1/2	4 1/2	57 7/8	58 3/8	59 3/8	59 7/8
60	1296	6	5	64 1/4	64 3/4	66	66 1/2
66	1542	6 1/2	5 1/2	70 5/8	71 1/8	72 1/2	73
72	1810	7	6	77	77 1/2	79	79 1/2
78	2098	7 1/2	6 1/2	83 3/8	83 7/8	85 5/8	86 1/8
84	2410	8	7	89 3/4	90 1/4	92 1/8	92 5/8
90	2740	8 1/2	7	95 3/4	96 1/4	98 7/8	98 5/8
96	2950	9	7	102 1/8	102 5/8	104 1/2	105
102	3075	9 1/2	7 1/2	109	109 1/2	111 1/2	112
108	3870	10	7 1/2	115 1/2	116	118	118 1/2

June 26, 2015

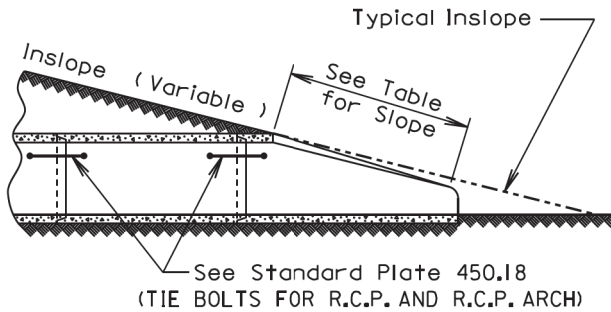
Published Date: 2026	S D D O T	REINFORCED CONCRETE PIPE	PLATE NUMBER 450.01
			Sheet 1 of 1



TOP VIEW



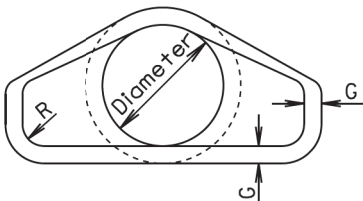
LONGITUDINAL SECTION



SLOPE DETAIL

GENERAL NOTES:

Lengths of concrete pipe shown on plan sheets are between flared ends only.
Construction of R.C.P. Flared End shall conform to the requirements of Section 990 of the Specifications.



END VIEW

Dia. (in.)	Approx. Wt. of Section (lbs.)	Approx. Slope (X to Y)	T (in.)	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	G (in.)	R (in.)
12	530	2.4: 1	2	4	24	48 7/8	72 7/8	24	2	1 1/2
15	740	2.4: 1	2 1/4	6	27	46	73	30	2 1/4	1 1/2
18	990	2.3: 1	2 1/2	9	27	46	73	36	2 1/2	1 1/2
21	1280	2.4: 1	2 3/4	9	36	37 1/2	73 1/2	42	2 3/4	1 1/2
24	1520	2.5: 1	3	9 1/2	43 1/2	30	73 1/2	48	3	1 1/2
27	1930	2.5: 1	3 1/4	10 1/2	49 1/2	24	73 1/2	54	3 1/4	1 1/2
30	2190	2.5: 1	3 1/2	12	54	19 3/4	73 3/4	60	3 1/2	1 1/2
36	4100	2.5: 1	4	15	63	34 3/4	97 3/4	72	4	1 1/2
42	5380	2.5: 1	4 1/2	21	63	35	98	78	4 1/2	1 1/2
48	6550	2.5: 1	5	24	72	26	98	84	5	1 1/2
54	8240	2: 1	5 1/2	27	65	33 1/4	98 1/4	90	5 1/2	1 1/2
60	8730	1.9: 1	6	35	60	39	99	96	5	1 1/2
66	10710	1.7: 1	6 1/2	30	72	27	99	102	5 1/2	1 1/2
72	12520	1.8: 1	7	36	78	21	99	108	6	1 1/2
78	14770	1.8: 1	7 1/2	36	90	21	111	114	6 1/2	1 1/2
84	18160	1.6: 1	8	36	90 1/2	21	111 1/2	120	6 1/2	1 1/2
90	20900	1.5: 1	8 1/2	41	87 1/2	24	111 1/2	132	6 1/2	6

June 26, 2015

Published Date: 2026	S D D O T	R. C. P. FLARED ENDS	PLATE NUMBER 450.10
			Sheet 1 of 1

5° to 45° Elbow			50° to 90° Elbow			90° Elbow				
Diameter	A	L	Diameter	A	L	Diameter	A	B	C	L
Inches	Feet	Feet	Inches	Feet	Feet	Inches	Inches			Feet
12	1	2	12	2	4	12	25½	11	18½	4
15	1	2	15	2	4	15	26½	12	18	4
18	1	2	18	2	4	18	27	14	17	4
21	2	4	21	2	4	21	27	15	16½	4
24	2	4	24	2	4	24	27½	16	16	4
27	2	4	27	2	4	27	27½	17	15½	4
30	2	4	30	3	6	30	40	19	26½	6
33	2	4	33	3	6	33	40	20	26	6
36	2	4	36	3	6	36	40½	21	25½	6
42	2	4	42	3	6	42	41	23	24½	6
48	2	4	48	4	8	48	53½	26	35	8
54	3	6	54	4	8	54	54	28	34	8
60	3	6	60	4	8	60	54½	31	32½	8
66	3	6	66	4	8	66	54	33	31½	8
72	3	6	72	5	10	72	67½	36	42	10
78	3	6	78	5	10	78	68	39	40½	10
84	3	6	84	5	10	84	68½	41	39½	10
90	3	6	90	6	12	90	70	46	37	10
96	3	6	96	6	12	96	82	46	49	12

FABRICATED ELBOW LENGTHS FOR ALL CORRUGATIONS

GENERAL NOTES:

All dimensions shown are nominal.

L = Linear Feet of C.M.P. required to fabricate fitting.

June 26, 2001

S
D
D
O
T

C.M.P. FABRICATED LENGTHS FOR ELBOWS

PLATE NUMBER
450.32

Sheet 1 of 1

Published Date: 2026

Alternate Type Connector Sections may be used with approval of the Engineer.

PLAN

ELEVATION

TUBING ATTACHMENT DETAILS
SECTION A-A

TYPICAL CROSS-SECTION

GENERAL NOTES:

All 3 pc. bodies shall have 12 Ga. sides and 10 Ga. center panels. Width of center panels shall be greater than 20% of the pipe periphery. Multiple panel bodies to have lap seams tightly joined by 3/8" Dia. galvanized rivets or bolts.

For 60" through 84" sizes, reinforced edges shall be supplemented with galvanized stiffener angles. The angles will be 2" x 2" x 1/4" for 60" through 72" diameters and 2 1/2" x 2 1/2" x 1/4" for 78" and 84" diameters. The angles shall be attached by 3/8" diameter galvanized nuts and bolts.

Rivets and Bolts shall be 3/8" Dia. Min. for 10 Ga. and 12 Ga. sheet, and 5/16" Dia. Min. for 14 Ga. and 16 Ga. sheets. Tighten nuts with torque wrench to 25 lbs. torque.

March 31, 2000

Dia. D (in.)	Ga.	DIMENSIONS (in.)					Approx. Slope	Body
		A	B	H	L	W		
12	16	6	6	6	21	24	2½:1	1 Pc.
15	16	7	8	6	26	30	2½:1	1 Pc.
18	16	8	10	6	31	36	2½:1	1 Pc.
21	16	9	12	6	36	42	2½:1	1 Pc.
24	16	10	13	6	41	48	2½:1	1 Pc.
30	14	12	16	8	46	60	2½:1	1 Pc.
36	14	14	19	9	51	72	2½:1	2 Pc.
42	12	16	22	11	60	84	2½:1	2 Pc.
48	12	18	27	12	69	90	2¼:1	2 Pc.
54	12	18	30	12	78	102	2:1	3 Pc.
60	12	18	33	12	84	114	1¾:1	3 Pc.
66	12	18	36	12	87	120	1½:1	3 Pc.
72	12	18	39	12	87	126	1½:1	3 Pc.
78	12	18	42	12	87	132	1¼:1	3 Pc.
84	12	18	45	12	87	138	1⅙:1	3 Pc.

STANDARD CONNECTIONS

For 30" through 84"

Alternate for all sizes

For 12" through 24" only

SECTION A-A (alternate)

SECTION A-A (alternate)

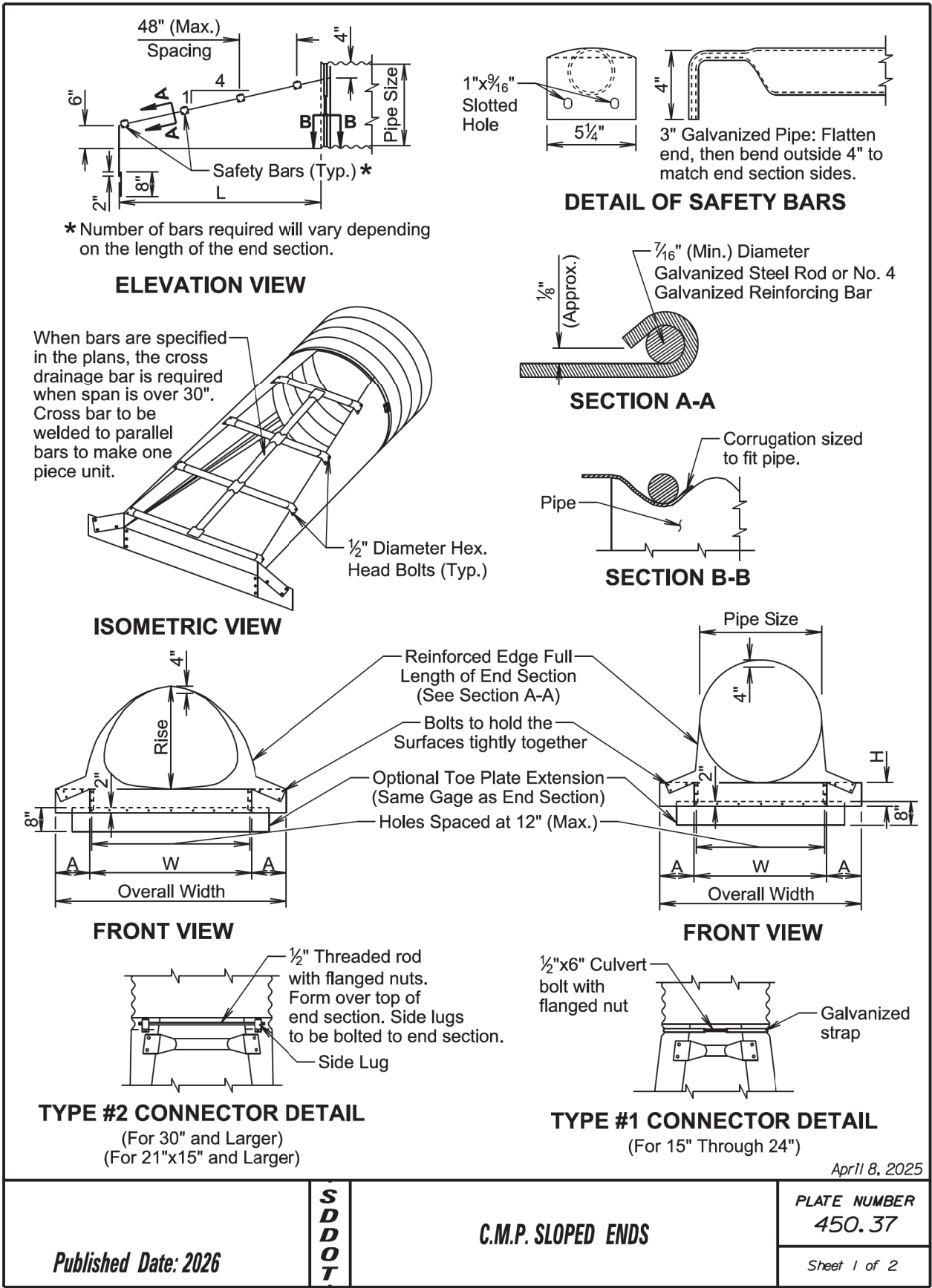
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C.M.P. FLARED ENDS

PLATE NUMBER
450.35

Sheet 1 of 1

Published Date: 2026



ARCH C.M.P. SLOPED ENDS										
Equiv. Dia. (Inch)	(Inches)		(Min.) Thick.	Dimensions (Inches)			L Dimensions			
	Span	Rise	Inch	Gage	A	H	W	Overall Width	Slope	Length (Inch)
18	21	15	.064	16	8	6	27	43	4:1	20
21	24	18	.064	16	8	6	30	46	4:1	32
24	28	20	.064	16	8	6	34	50	4:1	40
30	35	24	.079	14	12	9	41	65	4:1	56
36	42	29	.109	12	12	9	48	72	4:1	76
42	49	33	.109	12	16	12	55	87	4:1	92
48	57	38	.109	12	16	12	63	95	4:1	112
54	64	43	.109	12	16	12	70	102	4:1	132
60	71	47	.109	12	16	12	77	109	4:1	148
72	83	57	.109	12	16	12	89	121	4:1	188

CIRCULAR C.M.P. SLOPED ENDS									
Pipe Dia. (Inch)	(Min.) Thick.	Dimensions (Inches)			L Dimensions				
	Inch	Gage	A	H	W	Overall Width	Slope	Length (Inch)	
15	.064	16	8	6	21	37	4:1	20	
18	.064	16	8	6	24	40	4:1	32	
21	.064	16	8	6	27	43	4:1	44	
24	.064	16	8	6	30	46	4:1	56	
30	.109	12	12	9	36	60	4:1	80	
36	.109	12	12	9	42	66	4:1	104	
42	.109	12	16	12	48	80	4:1	128	
48	.109	12	16	12	54	86	4:1	152	
54	.109	12	16	12	60	92	4:1	176	
60	.109	12	16	12	66	98	4:1	200	

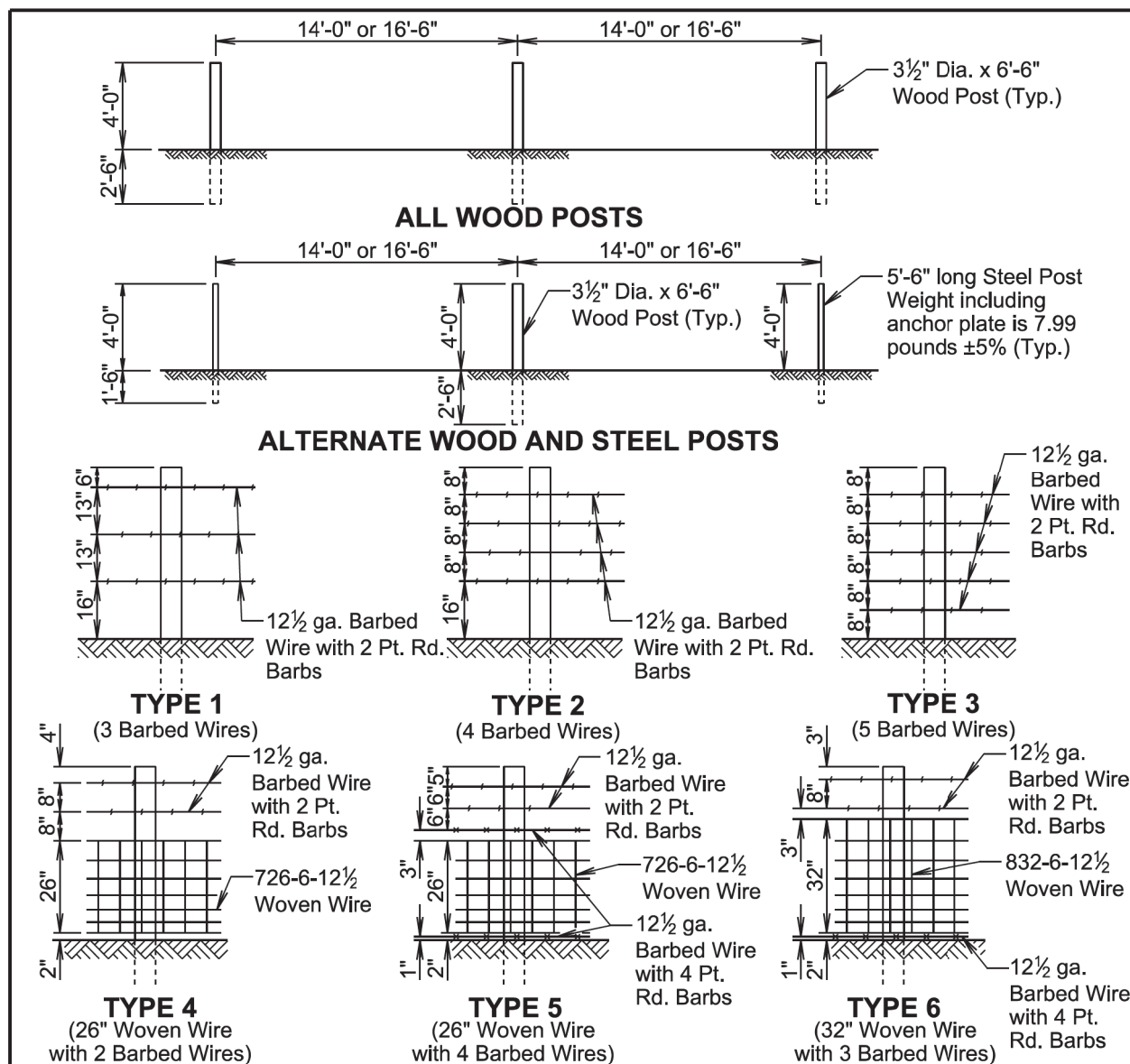
GENERAL NOTES:

- Safety bars will be provided when specified in the plans.
- Sloped ends will be fabricated from galvanized steel and will conform to the requirements of the Specifications.
- Safety bars will be fabricated from steel schedule 40 pipe in conformance with ASTM A53, grade B or HSS 3.5x.216 in conformance with ASTM A500, grade B or C.
- Slotted holes for safety bar attachment will be provided for all end sections.
- Attachment to circular pipes 15" through 24" diameter will be made with Type #1 straps. All other sizes will be attached with Type #2 rods and lugs.
- When stated in the plans, optional toe plate extension will be punched and bolted to end section apron lip with 3/8" diameter galvanized bolts. Steel for toe plate extension will be same gauge as end section. Dimensions will be overall width less 6" by 8" high.
- Installation will be performed in accordance with the Specifications.
- Cost of all work and materials required for fabrication and installation of sloped ends will be incidental to the bid items for the various sizes of sloped ends.

April 8, 2025

Published Date: 2026	S D D O T	C.M.P. SLOPED ENDS	PLATE NUMBER 450.37
			Sheet 2 of 2

Plotting Date: 08/11/2025



TYPE OF FENCE		LINE POST SPACING	BARBED WIRE		WOVEN WIRE
			WIRE GAGE	NUMBER AND SHAPE OF BARBS	STYLE OR DESIGN NO.
TYPE	DESCRIPTION				
1	3 Barbed Wires	16'-6"	12½	2 Point Round	—
2	4 Barbed Wires	16'-6"	12½	2 Point Round	—
3	5 Barbed Wires	16'-6"	12½	2 Point Round	—
4	26" Woven Wire with 2 Barbed Wires	14'-0"	12½	2 Point Round	726-6-12½
5	26" Woven Wire with 4 Barbed Wires	14'-0"	12½	2 wires with 2 Pt. Rd. 2 wires with 4 Pt. Rd.	726-6-12½
6	32" Woven Wire with 3 Barbed Wires	14'-0"	12½	2 wires with 2 Pt. Rd. 1 wire with 4 Pt. Rd.	832-6-12½

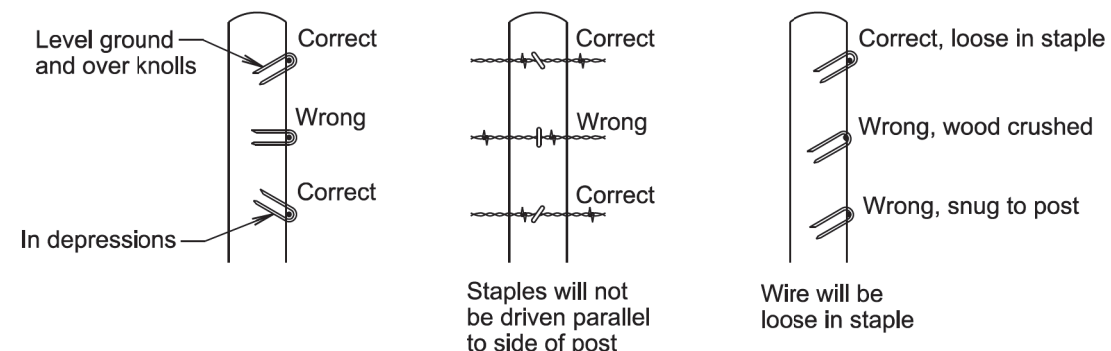
GENERAL NOTES:

Fence types designated on the plans that are followed by the letter S will have smooth (barbless) wires.

When type 5S or 6S is designated the bottom wire may be barbed, smooth, or left off.

All radius of curvature stated for
fence are at centerline of roadway.

April 8, 2025



STAPLE INSTALLATION

GENERAL NOTES:

The Right-of-Way fence will consist of barbed wire or a combination of woven wire and barbed wire. The barbed wire and/or woven wire will be fastened to all wood posts or fastened to alternating wood and steel posts. Only wood posts will be used for brace panels. Gates will be of the type designated in the plans or as otherwise directed by the Engineer. Fence will be constructed conforming to the details on the standard plates and in the plans unless otherwise directed by the Engineer.

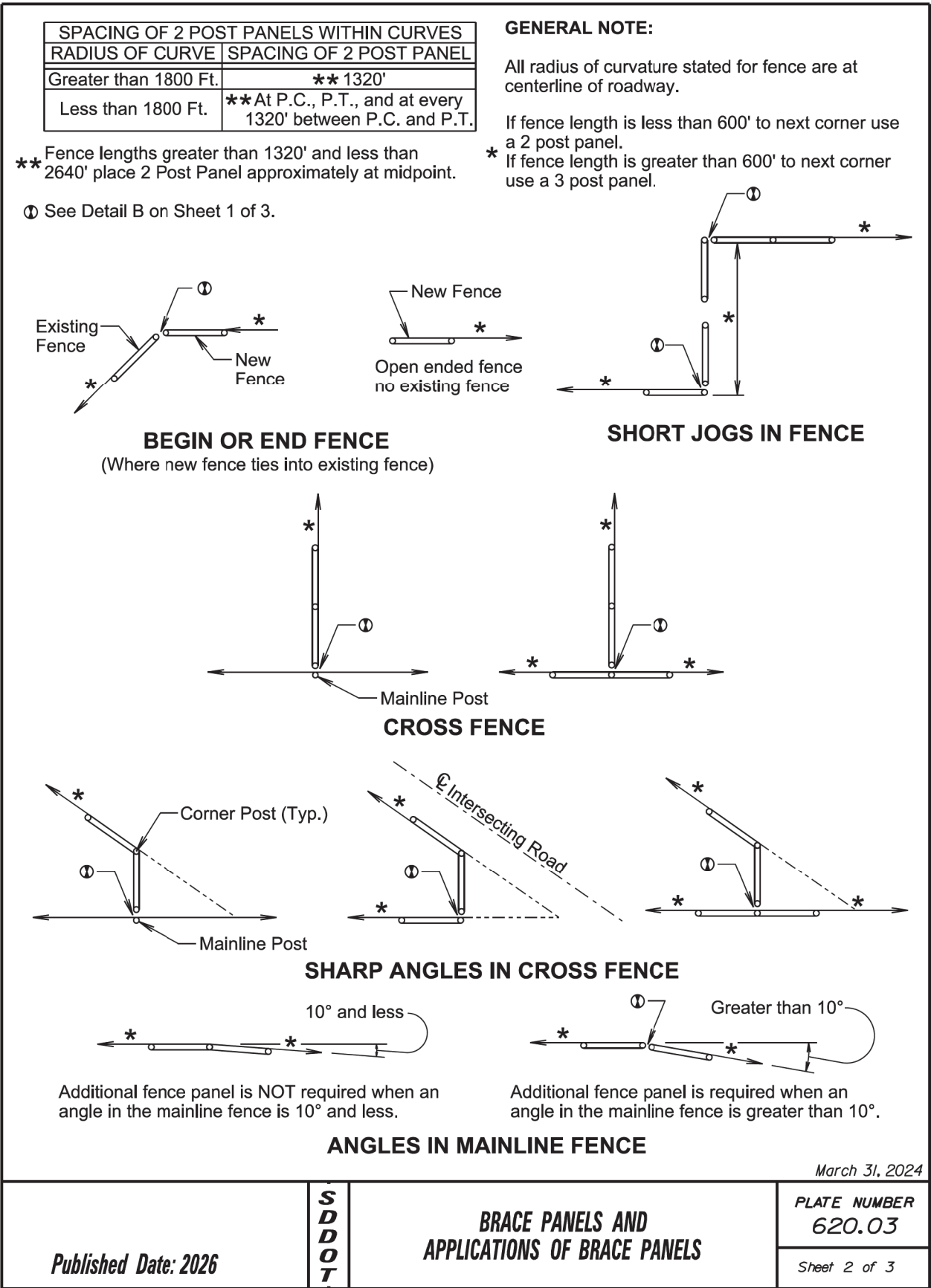
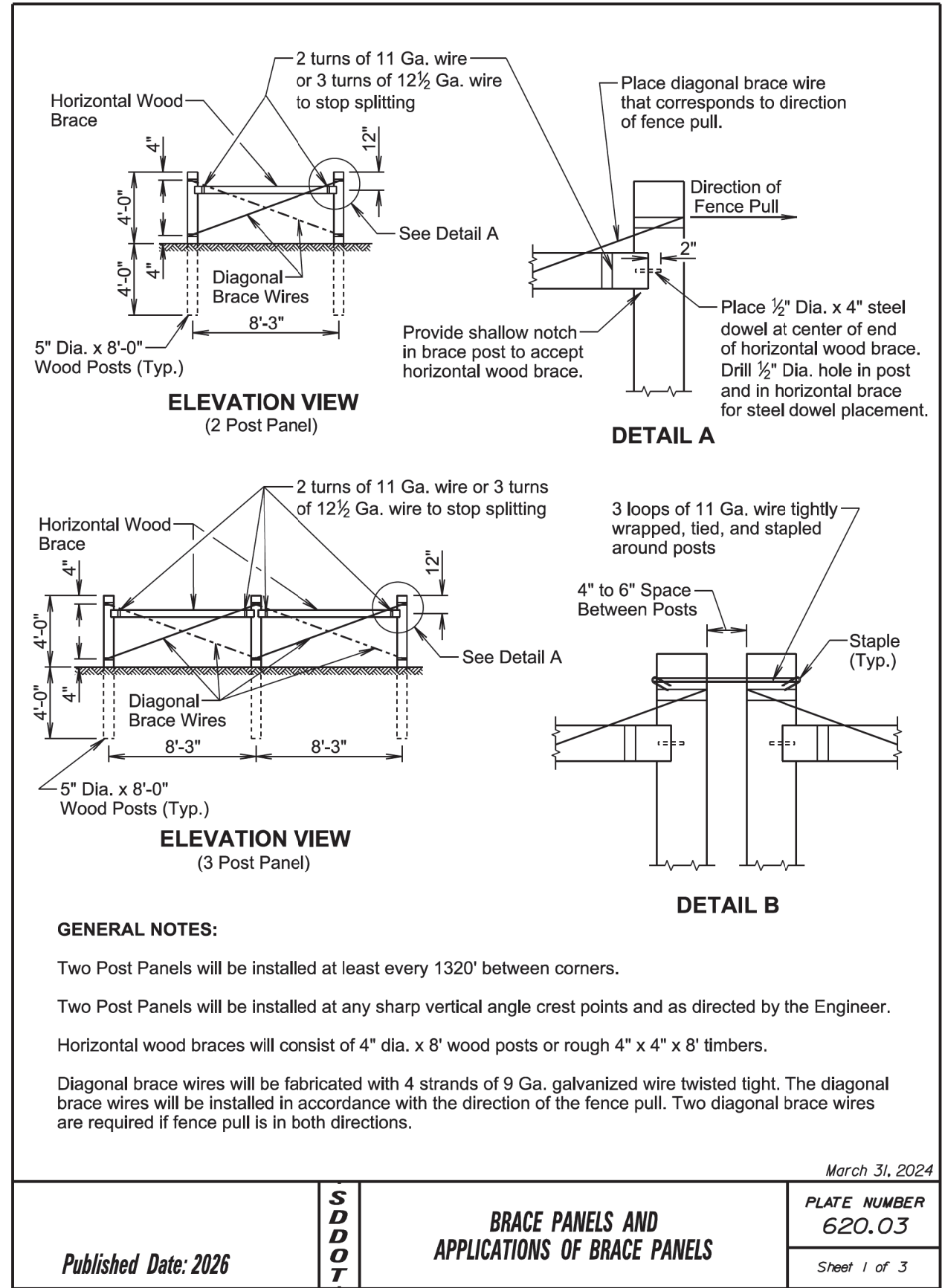
Right-of-Way fence on Interstate Projects will be constructed one foot within the Interstate Right-of-Way lines except at bridge openings, cattle passes, and as otherwise directed by the Engineer.

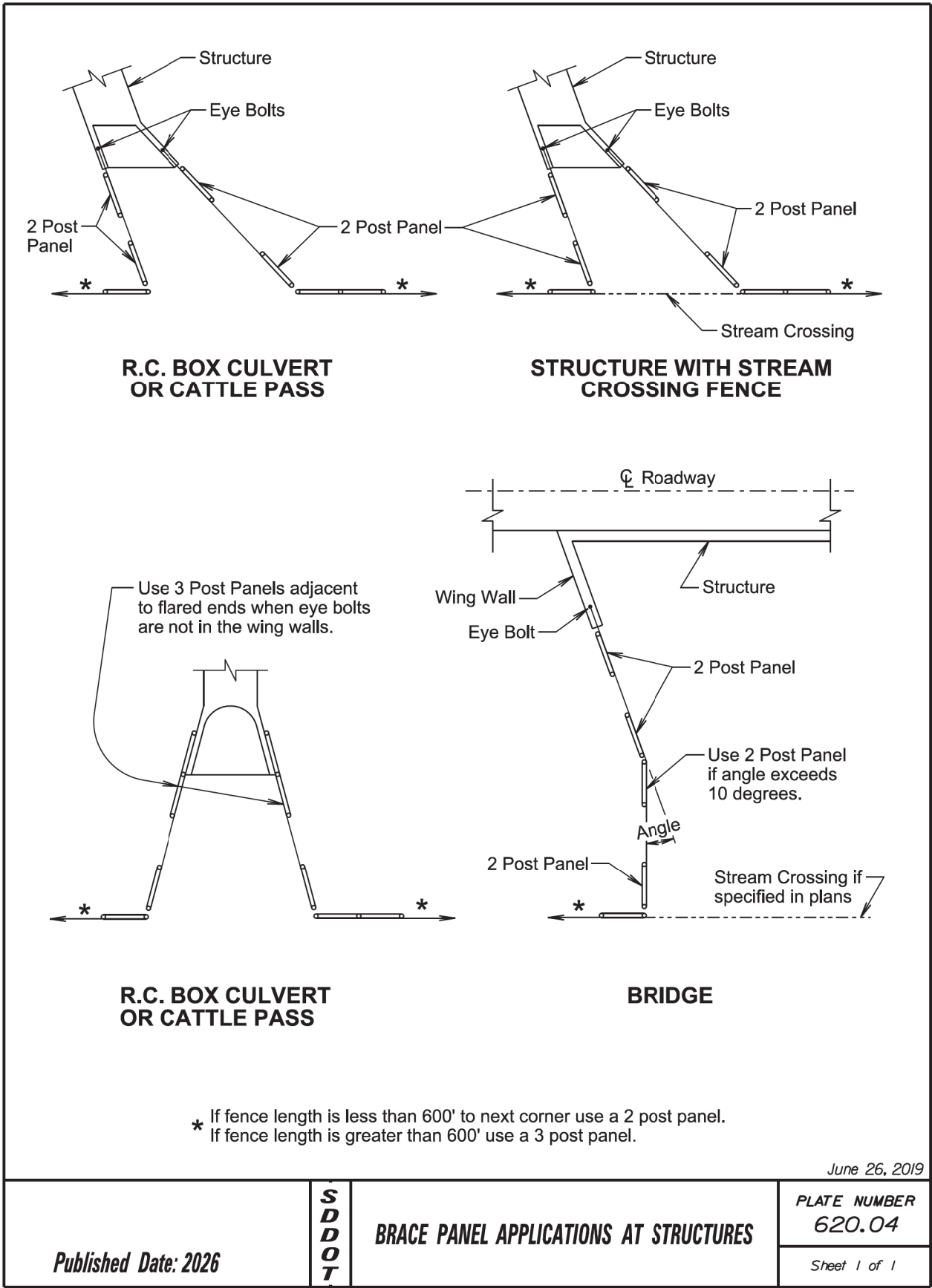
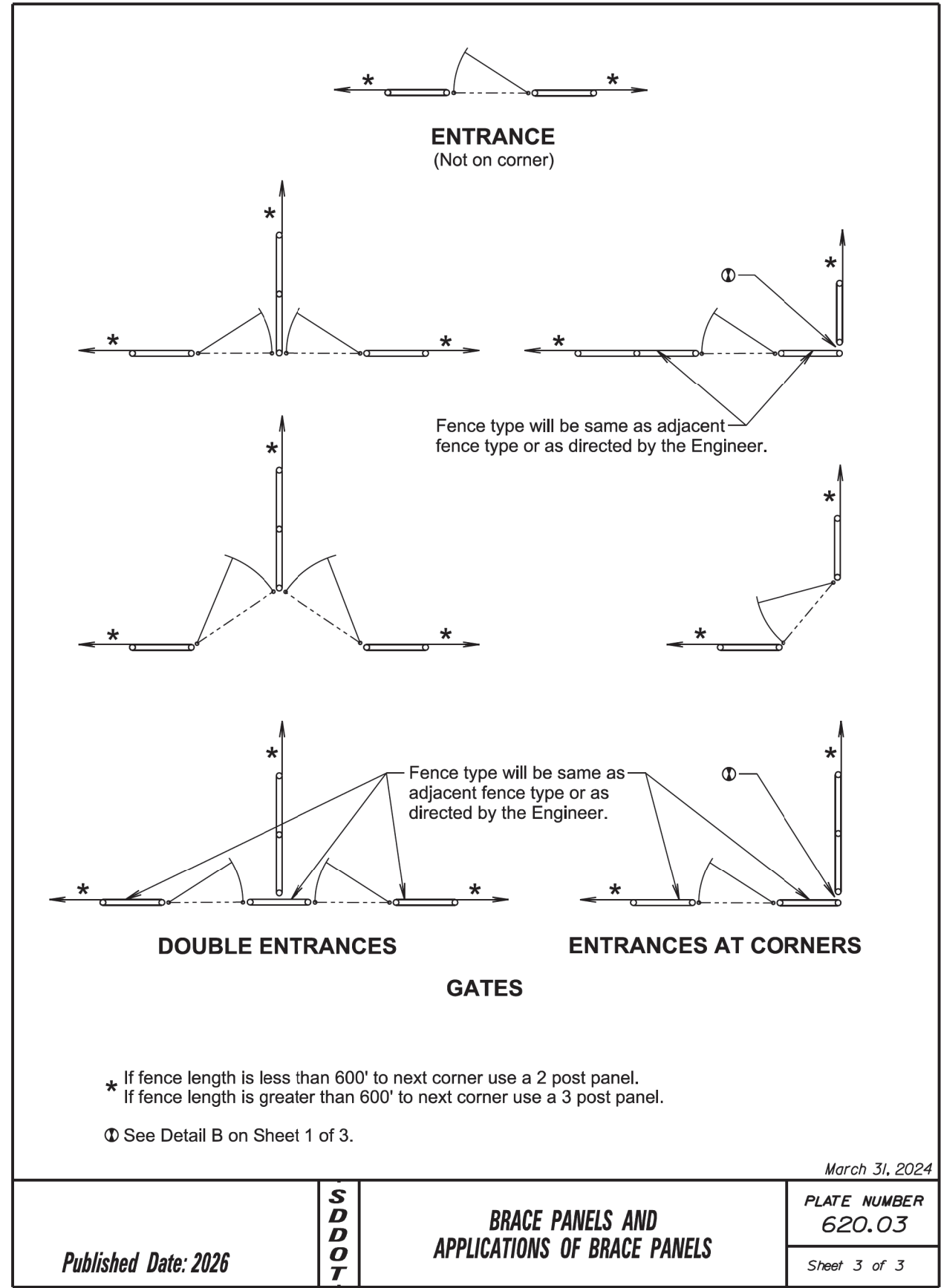
Right-of-Way fence other than on Interstate Projects will be constructed within one foot of the Right-of-Way on the Landowner's side except at bridge openings, cattle passes, and as otherwise directed by the Engineer.

Barbs will be fabricated from zinc coated 14 ga. wire. Two point barbs will be wrapped twice around one main strand at four-inch spacings and the four point barbs will be interlocked and wrapped around both main strands at five-inch spacings.

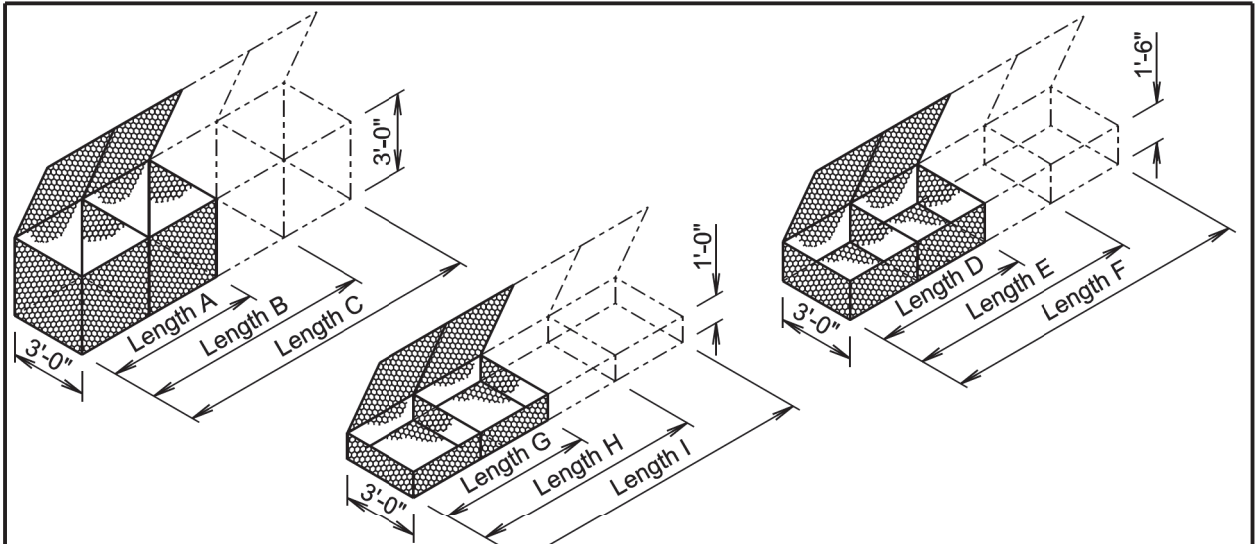
The gages of wire and wood post lengths and sizes are the minimum acceptable unless otherwise specified in the plans. The tolerances for steel posts will be as stated in AASHTO M281. Woven wire will conform to design and specifications of ASTM A116 and barbed wire will conform to ASTM A121.

<i>Published Date: 2026</i>	S D D O T	STAPLE INSTALLATION AND GENERAL RIGHT-OF-WAY FENCE NOTES	PLATE NUMBER 620.02
			Sheet 1 of 1









GABION DETAILS

STANDARD SIZES					
SIZE	LENGTH	WIDTH	HEIGHT	NUMBER OF CELLS	CAPACITY (Cu. Yd.)
A	6'-0"	3'-0"	3'-0"	2	2.0
B	9'-0"	3'-0"	3'-0"	3	3.0
C	12'-0"	3'-0"	3'-0"	4	4.0
D	6'-0"	3'-0"	1'-6"	2	1.0
E	9'-0"	3'-0"	1'-6"	3	1.5
F	12'-0"	3'-0"	1'-6"	4	2.0
G	6'-0"	3'-0"	1'-0"	2	0.7
H	9'-0"	3'-0"	1'-0"	3	1.0
I	12'-0"	3'-0"	1'-0"	4	1.3

GENERAL NOTES:

Above dimensions subject to mill tolerances.

Lacing and internal connecting wire will be 0.0866 inch diameter steel wire ASTM A641, Class 3 soft temper measured after galvanizing and for PVC coated gabions will be 0.0866 inch diameter steel wire measured after galvanizing but before PVC coating.

The lacing procedure is as follows:

1. Cut a length of lacing wire approximately 1½ times the distance to be laced but not exceeding 5 feet.
2. Secure the wire terminal at the corner by looping and twisting.
3. Proceed lacing with alternating single and double loops at a spacing not to exceed 6 inches.
4. Securely fasten the other lacing wire terminal.

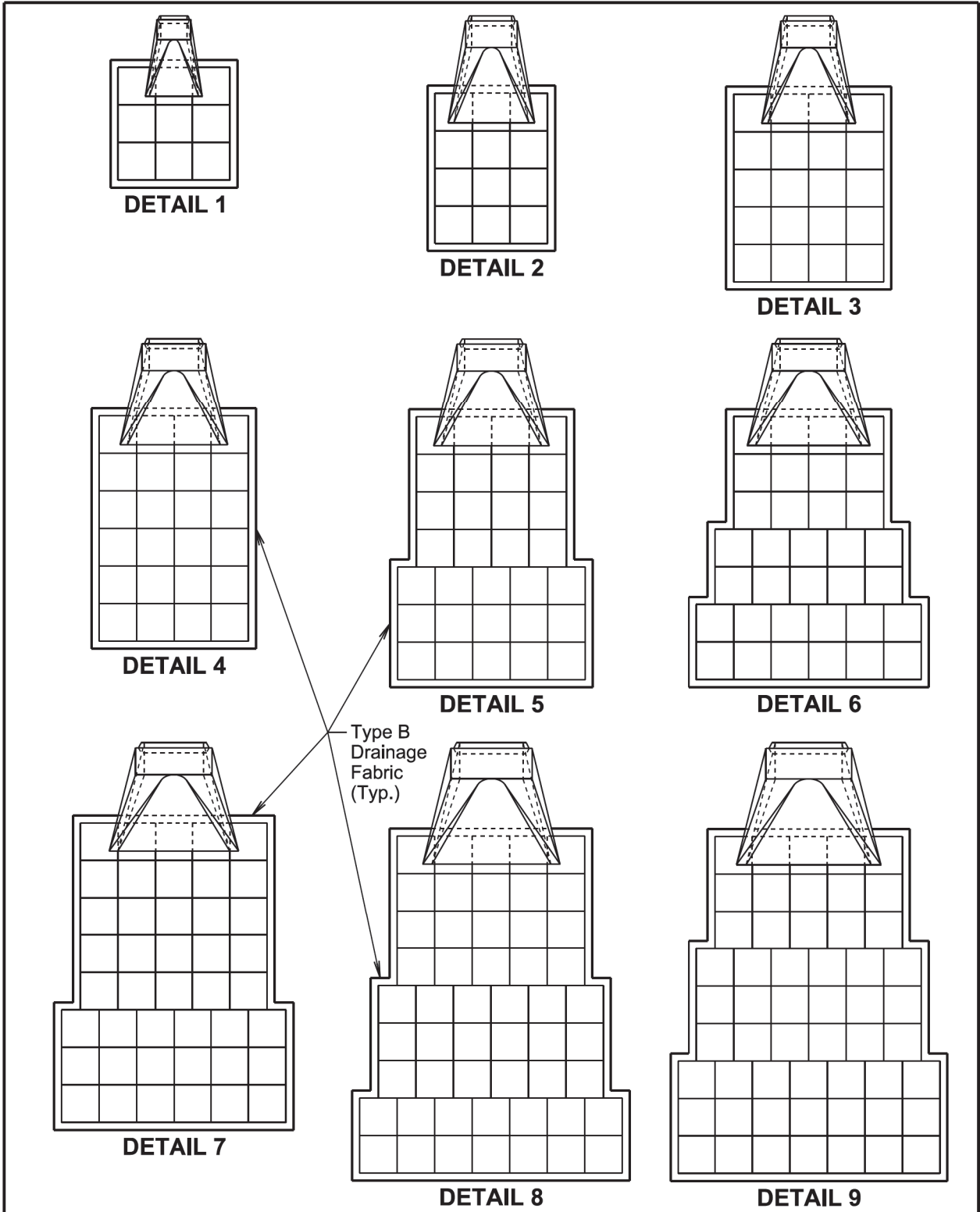
Wire lacing or interlocking type fasteners will be used for gabion assembly and final construction of gabion structures. Interlocking fasteners for galvanized gabions will be high tensile 0.120 inch diameter galvanized steel wire measured after galvanizing. The galvanizing will conform to ASTM A641-92, Class 3 coating. Fasteners will also be in accordance with ASTM A764, Class II, Type III.

Interlocking fasteners for PVC coated gabions will be high tensile 0.120 inch diameter stainless steel wire conforming to ASTM A313, Type 302, Class 1. The spacing of the interlocking fasteners during all phases of assembly and construction will not exceed 6 inches.

All fasteners will be placed where the mesh weaves around the selvage wire at the vertical and horizontal joints.

February 14, 2020

Published Date: 2026	S D D O T	BANK AND CHANNEL PROTECTION GABIONS	
		PLATE NUMBER 720.01	
		Sheet 1 of 1	



February 14, 2020

Published Date: 2026	S D D O T	BANK AND CHANNEL PROTECTION GABION PLACEMENT UNDER PIPE END SECTIONS	
		PLATE NUMBER 720.03	
		Sheet 1 of 2	

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	NH - P 0042(89)	B30	B30

Plotting Date: 08/11/2025

		* ESTIMATED QUANTITIES			
		Detail	Pipe Diameter (Inches)	Gabion (Cu. Yd.)	Type B Drainage Fabric (Sq. Yd.)
RCP, RCP Arch, CMP, and CMP Arch	1	12, 18, and 24	4.5	15	
	2	30 and 36	6.0	19	
	3	42	10.0	29	
	4	48 and 54	12.0	34	
	5	60	15.5	43	
	6	66	17.0	47	
	7	72	21.5	57	
	8	78	26.0	68	
	9	84	27.0	70	

GENERAL NOTES:

Gabions at outlets of CMP and RCP will be placed under the end section a distance of 2 feet from the outlet end. For CMP end section installations, the upper fabric of the gabions will be modified to accommodate the metal end section as approved by the Engineer.

- * Gabion and type B drainage fabric quantities on this standard plate are based on standard gabion sizes D, E, and F as depicted on standard plate 720.01.

Type B drainage fabric will be placed under the gabions and around the exterior sides (perimeter) of the gabions as approved by the Engineer. The type B drainage fabric will be in conformance with Section 831 of the Specifications. Measurement and payment of the type B drainage fabric will be in conformance with Section 720 of the Specifications.

February 14, 2020

Published Date: 2026	S D D O T	BANK AND CHANNEL PROTECTION GABION PLACEMENT UNDER PIPE END SECTIONS	PLATE NUMBER 720.03
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