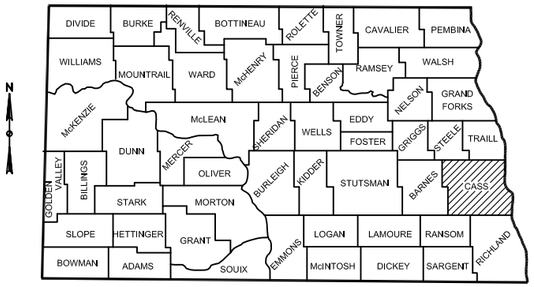
	STATE	PROJECT NUMBER	PCN	SHEET NUMBER	TOTAL SHEETS
	ND	TB1309	-	1	35

CASS COUNTY, NORTH DAKOTA
PLANS FOR PROJECT
PROJECT NUMBER TB1309
STRUCTURE # 09-104-30.0
STRUCTURE, GUARDRAIL & INCIDENTALS



STATE OF NORTH DAKOTA
SHOWING COUNTIES

Traffic ~ 42ND STREET SE		Passenger	Trucks	Total	Est. 30th Max. Hr.
Current Traffic	2014	NA	NA	<100	NA
Forecast Traffic	2034	NA	NA	<100	NA

Design Speed: 40 MPH
Minimum Sight Dist. for Stopping: 305 Feet

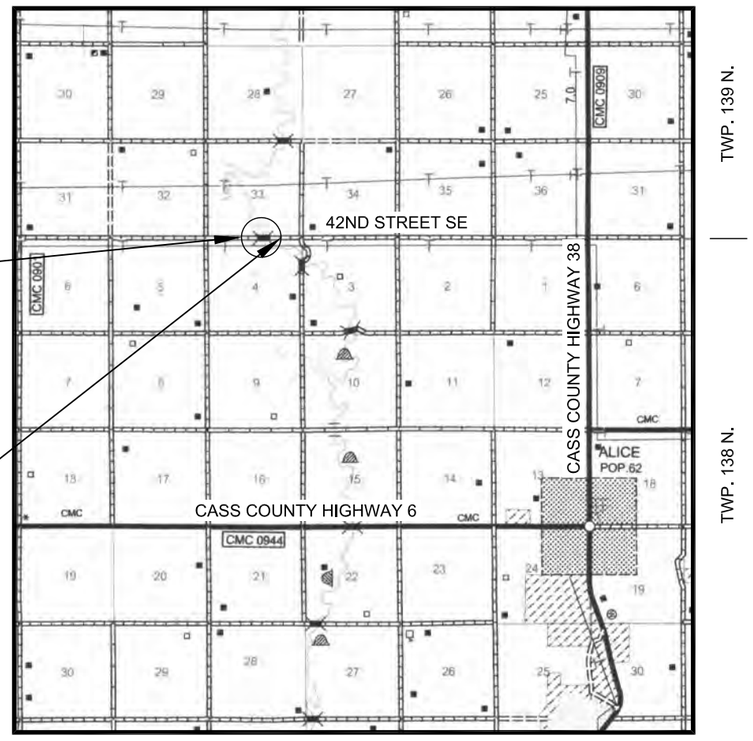
BRIDGE DESIGN & LOADING INFORMATION

Load Resistance and Factor Design (HL-93)
15 PSF Future Wearing Surface

Projects consists of the construction of a 124 foot, 3-span concrete bridge, approach grading, guardrail installation, and incidentals.

BEGIN PROJECT TB1309
Sta. 10+00 = A Point Approximately 2 Feet North and 2,682 Feet East of the Northwest Corner of Sec. 4, Twp. 138 N., Rge. 55 W.

END PROJECT TB1309
Sta. 19+00 = A Point Approximately 2 Feet North and 1,713 Feet West of the Northeast Corner of Sec. 4, Twp. 138 N., Rge. 55 W.



GOVERNING SPECIFICATIONS

Standard Specifications for Road and Bridge Construction, adopted by the North Dakota Department of Transportation, October 2008; Standard Drawings currently in effect; and other Contract Provisions submitted herein.

PROJECT LENGTH

PROJECT \ DESCRIPTION	GROSS MILES	NET MILES
TB1309 \ 42ND STREET SE	0.170	0.170

PS&E Corrections Made: February 2014
Surveyed & Designed Date: October/November 2013

DESIGNER DUSTY KINNISCHTZKE, PE
DESIGNER JORDAN GERBER
DESIGNER TAYLOR OLSON
DESIGNER
DESIGNER

APPROVED DATE 02/21/2014
JASON P. BENSON /s/
JASON P. BENSON
ND REG. NO. 7490

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CERTIFICATION
I HEREBY CERTIFY THAT THESE PLANS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF NORTH DAKOTA.

MATT LANGE /s/
KADRMAS, LEE & JACKSON, INC.
DATE 02/21/2014 REGISTRATION NUMBER PE- 6870

KLJ
3203 32nd Ave. S Suite 201
P.O. BOX 9767
FARGO, ND 58106-9767
(701) 232-5353, FAX (701) 232-5354

	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	2

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3	Scope of Work
4	Plan Notes & Basis of Estimate
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7	Typical Section
8	Plan & Profile
9	Wetland Impacts
10	Temporary Erosion Control
11	Permanent Erosion Control
12	Bridge Layout
13	Structural Notes
14	Boring Log
15	Piling Layout, Bearing Elevations, & Screed Elevations
16	Abutment Details
17	Pier Details
18	Pre-tensioned 21” Pre-stressed Box Beam
19	Slab Layout
20	End Wall & Pier Diaphragm Details
21	Slab Section
22	Concrete Barrier I
23	Concrete Barrier II
24	Guardrail Layout
25	Guardrail Details & Thrie Beam Transition
26	Traffic Control Devices List
27	Traffic Control Signing Layout
28	Sign Summary
29	Sign Layout
30-35	Cross Sections

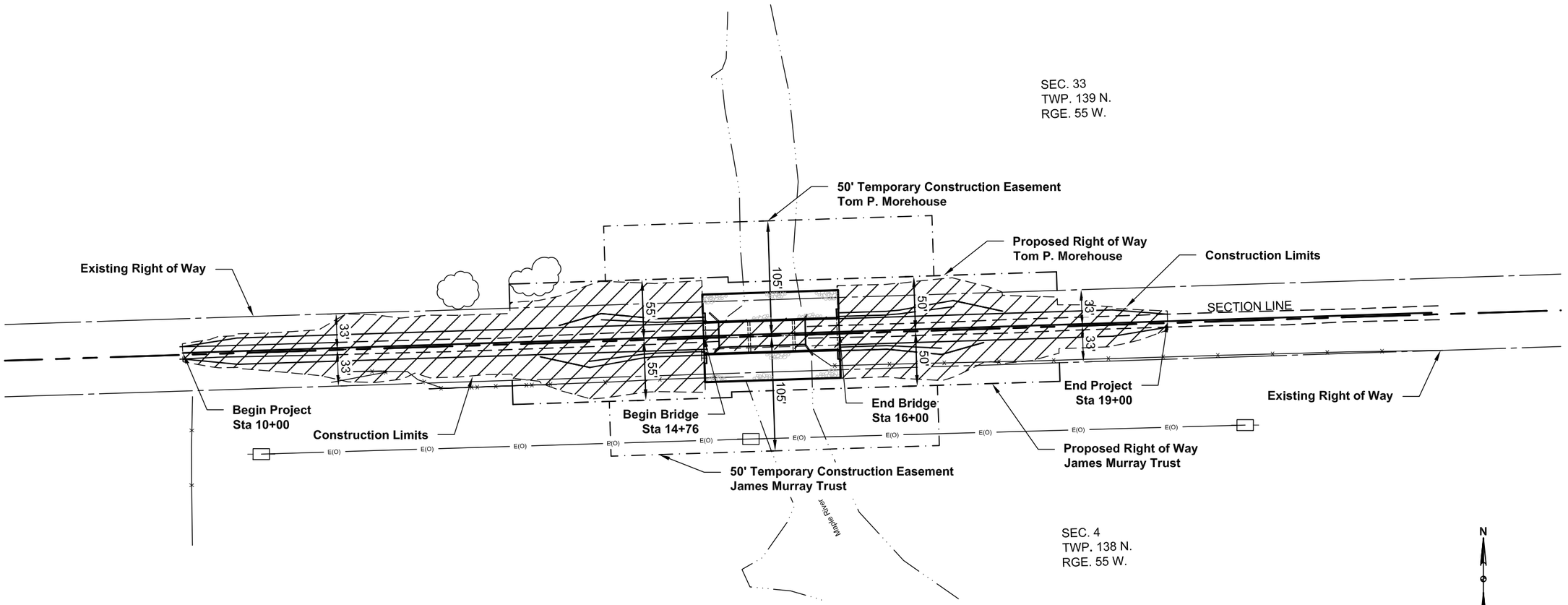
LIST OF STANDARD DRAWINGS

Standard No.	Description
D-622-1	Pile Splice Details
D-704-7	Breakaway Systems for Construction Zone Signs Perforated Tube
D-704-8	Breakaway Systems for Construction Zone Signs
D-704-10	Construction Sign Details Regulatory Signs
D-704-13	Barricade and Channelizing Device Details
D-704-14	Construction Sign Punching and Mounting Details
D-704-19	Road Closure and Lane Closure Two Land Roadway
D-708-4	Bridge Approach Slab Drainage Detail
D-708-7	Erosion Control Fiber Roll Placement Details
D-754-23	Assembly Details
D-754-24A	Breakaway Coupler System for Perforated Tubes
D-754-27	Sign Assemblies
D-764-1	W-Beam Guardrail – General Details
D-764-6	Flared Energy Absorbing Terminal
D-764-22	Typical Grading at Bridge Ends with W-Beam Guardrail

SPECIAL PROVISIONS

SP #	Description
SP 1349(08)	Federal Migratory Bird Treaty Act

	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	3



CONSTRUCTION LIMITS

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TB1309

CASS COUNTY, NORTH DAKOTA

KLJ

SCOPE OF WORK

DRWN. BY	CHK'D BY	PROJECT NO.
KS	ML	14313109

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STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	4

PLAN NOTES

100-P01 **UTILITIES:** Notice shall be given to the utility companies a minimum of 2 weeks prior to work on the project. Utilities that the Engineer has been made aware of are shown on the plans. Other utilities may exist that are not shown. Power lines, telephone cables, rural water lines, and other utilities may be encountered on this project. The Contractor shall be responsible to verify the locations and to notify all utility and pipeline companies to have the locations flagged and marked prior to beginning construction. Any charges by the utility companies for locates shall be paid by the contractor. The contractor will be liable for any costs resulting from damage to utilities or pipelines.

Utility companies will move or adjust conflicting facilities in conjunction with or prior to the roadway construction. The Contractor will not be responsible for costs associated with the moving or adjustment of utilities on the project right of way.

107-P01 **HAUL ROADS:** The contractor shall contact the appropriate Tribal, State, County, Township or City officials to determine if there are any No Haul Routes or Restricted Routes prior to preparing a bid for this project. The gross vehicle weight on all county, tribal, and township roads shall not exceed legal load limits unless approved by the local agency.

200-P01 **SHRINKAGE:** An additional 35 percent volume is included for shrinkage in earth embankment.

201-P01 **CLEARING & GRUBBING:** Removal and replacement of topsoil from excavation areas and embankment areas will be included in the price bid for “CLEARING AND GRUBBING”. Total topsoil from clearing and grubbing areas is approximately 440 CY from the project limits. The contractor shall remove and stockpile the existing topsoil (4” minimum) from the entire construction area. Prior to seeding, the contractor shall replace the topsoil to all disturbed construction areas. The contractor shall make arrangements for topsoil storage areas where sufficient room is not available on the existing right of way. The contractor will not be reimbursed for additional handling of topsoil that must be moved to provide additional excavation area between the plan back slope and the right of way line.

203-P01 **BORROW:** Borrow material shall be obtained from a borrow site located by the contractor and approved by the engineer. The price bid for “BORROW-EXCAVATION” shall include all royalties, utility and fencing adjustments, environmental and cultural clearances, erosion control measures, site restoration, and any other costs associated with obtaining, transporting, and placing borrow material. The quantity for “BORROW-EXCAVATION” shall be measured for payment by cross section of the borrow area. The volume of borrow will be computed by the prismoidal method.

If more borrow is placed than is required and causes a waste of suitable excavation material, the quantity of waste will be deducted from the volume measured in the borrow area. Section 104.03 B “Increased or Decreased Quantities” shall not apply to the borrow excavation quantity. The contractor shall bid the item “BORROW-EXCAVATION” accordingly.

203-P02 **COMPACTION:** Embankment shall be placed and compacted in accordance with Section 203.02 H of the Standard Specifications.

203-P03 **COMMON EXCAVATION-TYPE B:** All costs associated with excavating, hauling, placing, and compacting the excavated material shall be included in the bid item “COMMON EXCAVATION-TYPE B”. “COMMON EXCAVATION-TYPE B” shall be paid for in accordance to Section 203.03 B of the Standards Specifications (Contract Quantity Payment).

704-P01 **CONSTRUCTION SIGNING:** The contractor shall furnish and install the necessary signing shown on the Traffic Control Signing Layout, and on Standard Drawing D-704-19, Type E, as required by their construction operation. All costs associated with installing and maintaining traffic control according to specifications, and as stated above shall be included in the unit price bid for “TRAFFIC CONTROL SIGNS”.

704-P02 **EXISTING SIGNS:** Currently there are two “Weight Limit 2 Tons Per Axle 5 Tons Gross” signs installed in and around the project limits. All signs shall be removed and salvaged by the Contractor and stockpiled on-site for Cass County. All costs associated with salvaging the signs shall be included in the price bid for ”TRAFFIC CONTROL SIGNS”.

708-P01 **SEEDING:** Seeding Type B Class V shall meet the requirements of Section 708 of the Standard Specifications. Except that the minimum amount of live seed per acre shall be modified as follows:

A-1 Pasture Mix
Meadow Bromegrass - 25%
Intermediate Wheatgrass - 25%
Crested Wheatgrass - 25%
Tetraploid Int. Ryegrass - 10%
Creeping Alfalfa - 15%

80 lbs of Seed and 20 lbs of Rye per acre.

Basis of payment for seeding shall be actual field measurements. No adjustment to unit prices will be made for the increase or decrease in Seeding or Mulching. All costs for labor, equipment and materials necessary to complete the work will be included in the bid price for "SEEDING-TYPE B-CL V" and "MULCHING".
Seeding shall cover all the disturbed areas of the right-of-way, excepting the roadbed.

708-P02 **MULCHING:** All excavation and embankment areas shall be stabilized with mulch after the completion of the earth moving operation.

708-P03 **TEMPORARY EROSION CONTROL:** Temporary erosion control has been provided for placement prior to disturbing the topsoil. Erosion control locations are subject to the Contractor's earth moving operations and site conditions at time of construction.

BASIS OF ESTIMATE

MAINLINE			
QUANTITY PER MILE	**WIDTH**	**UNIT**	**DESCRIPTION**
-	-	M GAL	Water (10 Gal/CY of Borrow & 20 Gal/Ton of Aggregate Surface Course CL 13 & 10 M GAL for Dust Palliative)
3,178	24’	TON	Aggregate Surface Course CL 13 (1.875 Ton/CY)

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TB1309
CASS COUNTY, NORTH DAKOTA

PLAN NOTES & BASIS OF ESTIMATE

DRWN. BY	CHKD. BY	PROJECT NO.
KS	ML	14313109

	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	5

ENVIRONMENTAL COMMITMENTS

ENVIRONMENTAL COMMITMENTS: Cass County, has made several environmental commitments to various agencies and the public in order to secure approval of this project. The environmental commitments are as follows:

Commitment No. 1: Disturbed areas will be returned to pre-construction conditions following construction.

Action taken/required: *All disturbed areas will be reseeded upon completion of construction to match the surrounding vegetation. BMPs will be implemented to minimize the likelihood of invasive plant species while vegetation is being established.*

Commitment No. 2: Erosion and sediment control devices will be used as needed during construction.

Action taken/required: *Contract documents require the contractor to install and maintain erosion and sediment control devices. The contractor will be required to obtain a NDPDES Permit from the North Dakota Department of Health prior to construction. As part of the NDPDES Permit, the contractor must have a plan for erosion and sediment control during and post construction.*

Commitment No. 3: Erosion control measures will be placed adjacent to shallow water wetlands to isolate the construction site from the main body of the wetland and minimize the adverse effects of sedimentation.

Action taken/required: *The contractor will include these measures in the erosion and sediment control plan as part of the NDPDES Permit.*

Commitment No. 4: Fugitive dust emissions created during construction would be minimized.

Action Taken/Required: *The Contractor will implement BMPs, such as using water as a palliative, to control dust during construction as appropriate.*

Commitment No. 5: All efforts will be made to avoid disturbances from February 1 through July 15 in order to avoid impacts to migratory birds during the breeding and nesting season.

Action taken/required: *The bridge shall not be removed from February 1 through July 15 unless the contractor uses alternative measures to prevent migratory birds from nesting prior to the migratory bird breeding and nesting season. This may include clearing & grubbing or netting prior to the nesting season.*

Commitment No. 6: Impacts to wetlands will be mitigated.

Action taken/required: *Per USACE guidelines, mitigation is not required for river-system wetland impacts less than 0.10 acres. Therefore, mitigation will not be required for the 0.08 acres of permanent riverine wetland impacts associated with this project.*

Wetland Number	Location	LAT/LONG (Dec. Deg.)	Cowardin Class	Wetland Type	Wetland Size (acres)	Wetland Feature	USACE Jurisdictional Wetlands	Impacts to Wetlands		Impacts to Open Water	
								Temp.	Perm.	Temp.	Perm.
1	Sec 33, T139N, R55W	-97.624799° W 46.803789° N	PEMCx	Road Ditch	0.88	Artificial	No	0.00	0.00	-	-
2	Sec 33, T139N, R55W	-97.627669° W 46.803646° N	PEMA	Basin	0.97	Natural	Yes	0.00	0.00	-	-
3	Sec 4, T138N, R55W	-97.625056° W 46.803664° N	PEMC	Maple River	0.36	Natural	Yes	0.17	0.08	-	-
4	Sec 33, T139N, R55W	-97.628362° W 46.803787° N	PEMAx	Road Ditch	0.07	Artificial	Yes	0.05	0.00	-	-
5	Sec 33, T139N, R55W	-97.629196° W 46.803890° N	PEMC	Oxbow	0.18	Natural	Yes	0.01	0.00	-	-
Open Water 1	Sec 33, T139N, R55W	-97.627466° W 46.803817° N	-	Maple River	0.16	Natural	Yes	-	-	0.00	0.07
TOTALS:					**2.62**			**0.23**	**0.08**	**0.00**	**0.07**

*A preliminary wetland Jurisdictional Determination was issued by the USACE on 12/02/2013; NWO-2013-2244-BIS

Required Permits:

North Dakota Department of Health — *NDPDES Permit*
Status: To be obtained by the contractor prior to construction

United States Army Corps of Engineers — *Section 404 Permit*
Status: To be obtained for the project.

Cass County — *Non-Building Floodplain Permit*
Status: Has been obtained for the project.

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CASS COUNTY, NORTH DAKOTA

ENVIRONMENTAL COMMITMENTS

DRWN. BY KS | CHKD. BY ML | PROJECT NO. 14313109

STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	6

ESTIMATE OF QUANTITIES

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
103	0100	CONTRACT BOND	L SUM	1
201	0330	CLEARING & GRUBBING	L SUM	1
202	0105	REMOVAL OF STRUCTURE	L SUM	1
203	0102	COMMON EXCAVATION-TYPE B	CY	555
203	0140	BORROW-EXCAVATION	CY	1,630
210	0101	CLASS I EXCAVATION	L SUM	1
210	0111	CLASS 2 EXCAVATION	L SUM	1
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0201	FOUNDATION PREPARATION	EA	1
216	0100	WATER	M GAL	37
302	0356	AGGREGATE SURFACE COURSE CL 13	TON	559
602	0130	CLASS AAE-3 CONCRETE	CY	125.9
602	1130	CLASS AE-3 CONCRETE	CY	126.6
604	9600	PRESTRESSED BOX BEAM-21 IN	LF	476.0
612	0115	REINFORCING STEEL-GRADE 60	LBS	10,150
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	31,886
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	958
622	0012	STEEL H-PILE TIPS 10 X 42	EA	8
622	0014	STEEL H-PILING POINTS 12 X 53	EA	8
622	0020	STEEL PILING HP 10 X 42	LF	580
622	0040	STEEL PILING HP 12 X 53	LF	480
702	0100	MOBILIZATION	L SUM	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	258
704	1052	TYPE III BARRICADE	EA	10
708	1020	RIPRAP-LOOSE ROCK	CY	547
708	1430	FIBER ROLLS 12IN	LF	2,065
708	1431	REMOVAL FIBER ROLLS 12IN	LF	1,195
708	2280	SEEDING-TYPE B-CL V	ACRE	0.60
708	5500	MULCHING	ACRE	0.60
708	5660	TRM TYPE 1	SY	110
709	0600	GEOTEXTILE FABRIC-TYPE RR	SY	1,094
752	0922	FENCE REMOVE & RESET	LF	595
754	0110	FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING	SF	10
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	35.2
764	0131	W-BEAM GUARDRAIL	LF	200
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4

EARTHWORK SUMMARY

EMBANKMENT (CY)	COMMON EXCAVATION (CY)	BORROW REQUIRED (CY)
2,185	555	1,630

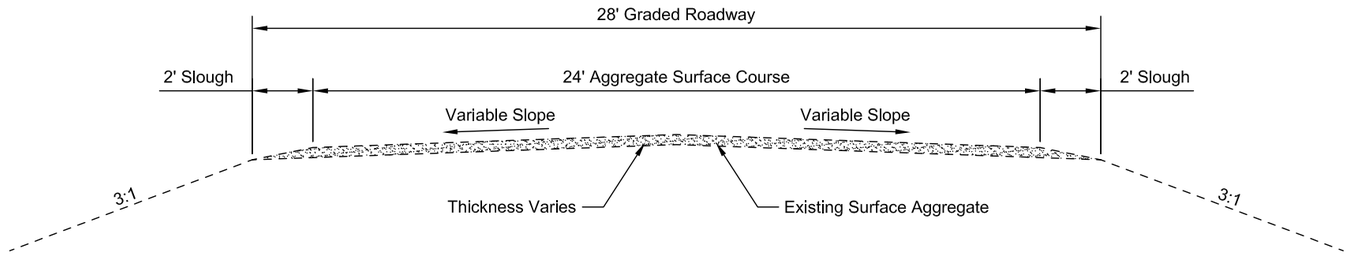
Volume includes 35% shrinkage and losses.

TB1309
CASS COUNTY, NORTH DAKOTA

ESTIMATE OF QUANTITIES & EARTHWORK SUMMARY

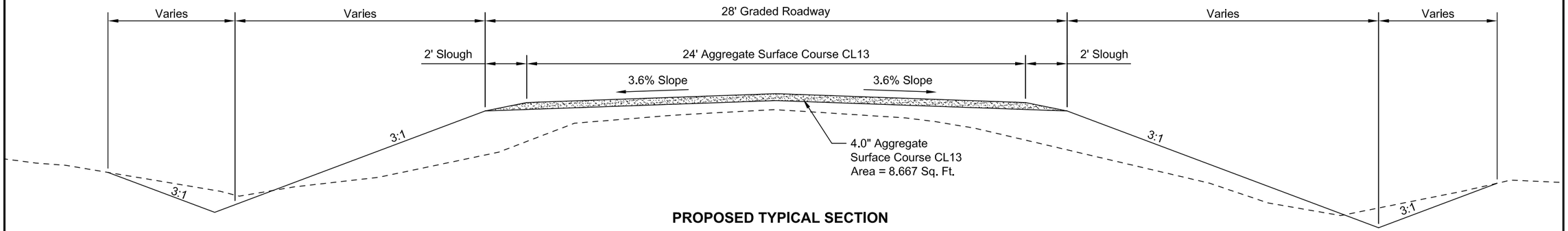
DRWN. BY	CHKD. BY	PROJECT NO.
JL	ML	14313109

	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	7



EXISTING TYPICAL SECTION

STA. 10+00 TO 19+00



PROPOSED TYPICAL SECTION

STA. 10+00 TO 19+00

DITCH GRADE LT & RT

STA. 13+00 TO 14+76
STA. 16+00 TO 18+00

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CASS COUNTY, NORTH DAKOTA

TYPICAL SECTION

DRWN. BY	CHK'D BY	PROJECT NO.
KS	ML	14313109

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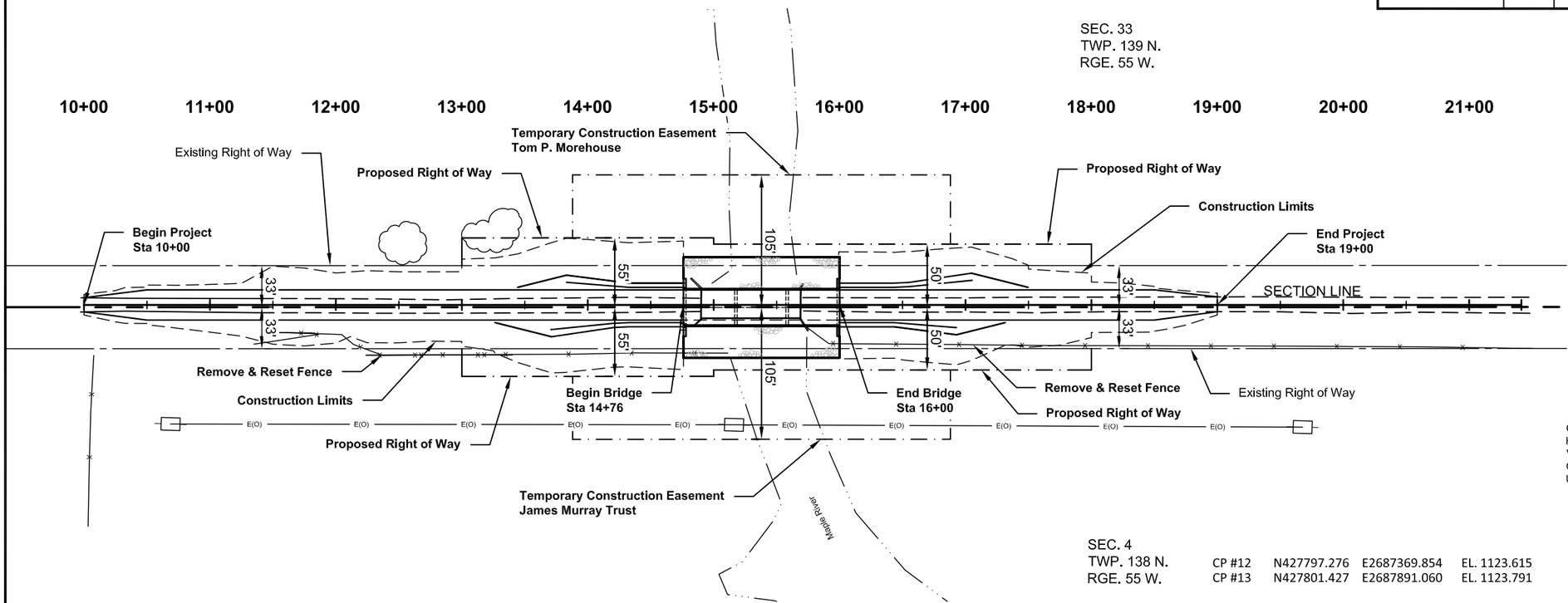
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	8

SEC. 33
TWP. 139 N.
RGE. 55 W.

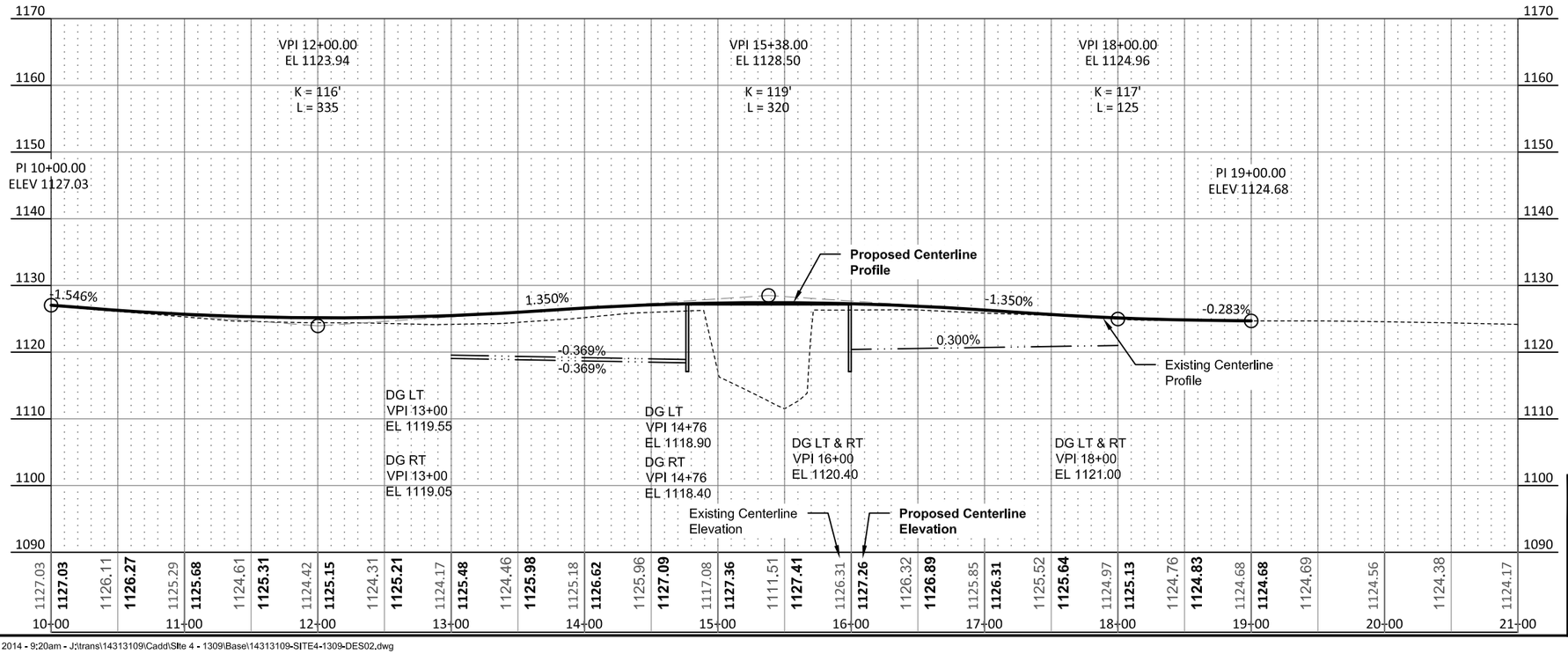
REMOVE & RESET FENCE
STA. 11+35 TO 15+10 RT 380 LF
STA. 15+70 TO 17+75 RT 215 LF
595 LF

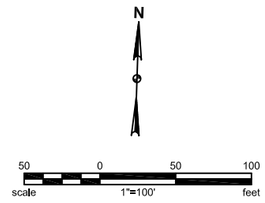


SEC. 4
TWP. 138 N.
RGE. 55 W.

CP #12	N427797.276	E2687369.854	EL. 1123.615
CP #13	N427801.427	E2687891.060	EL. 1123.791

COORDINATE SYSTEM: US STATE PLANE 1983 ND SOUTH 3302
HORIZ. DATUM: NAD 83 (CORS 96) OPUS
VERT. DATUM: NAVD 88
GEOID MODEL: GEOID 12A
UNITS: INTERNATIONAL FEET





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CASS COUNTY, NORTH DAKOTA

PLAN & PROFILE
STA. 10+00 TO STA. 19+00

DRWN. BY	CHK'D BY	PROJECT NO.
KS	ML	14313109

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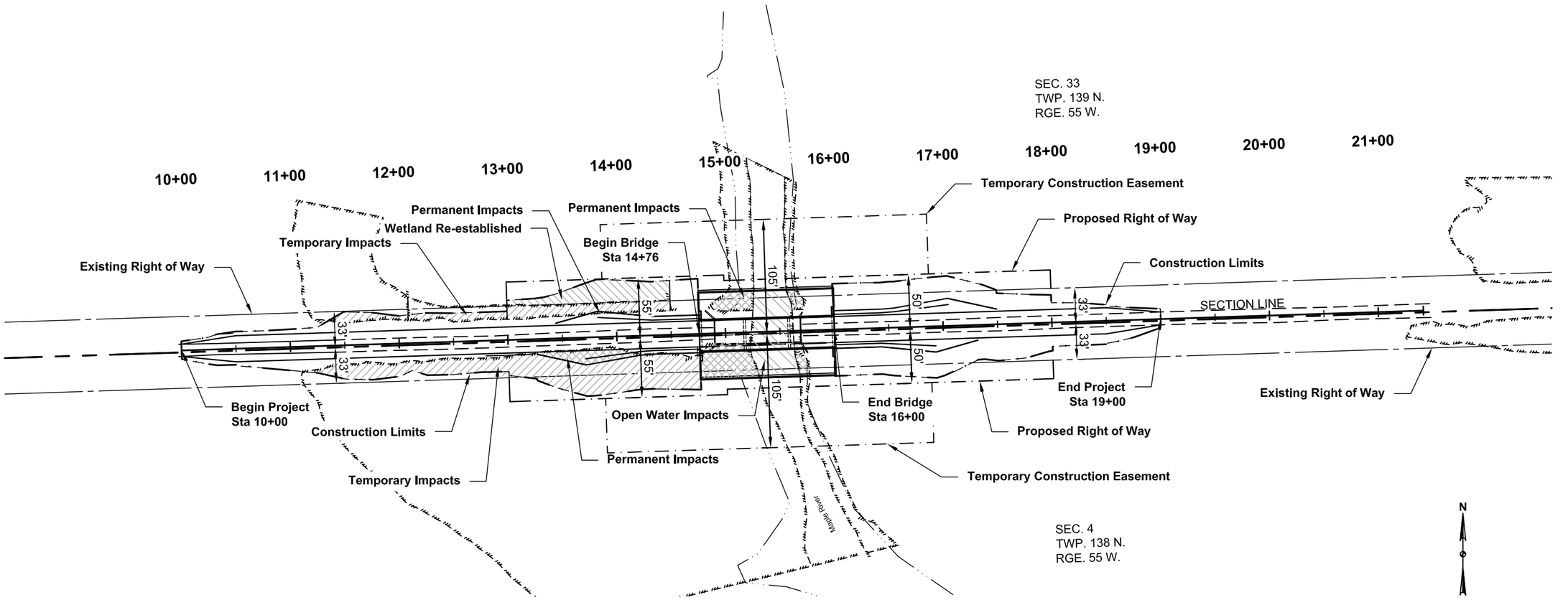
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	9



OPEN WATER IMPACTS
(0.07 ACRES)

WETLAND RE-ESTABLISHED
(0.05 ACRES)

TEMPORARY WETLAND IMPACT
(0.23 ACRES)

PERMANENT WETLAND IMPACT
(0.08 ACRES)

DELINEATED WETLANDS

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CASS COUNTY, NORTH DAKOTA

WETLAND IMPACTS
STA. 10+00 TO 19+00

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KS	ML	14313109

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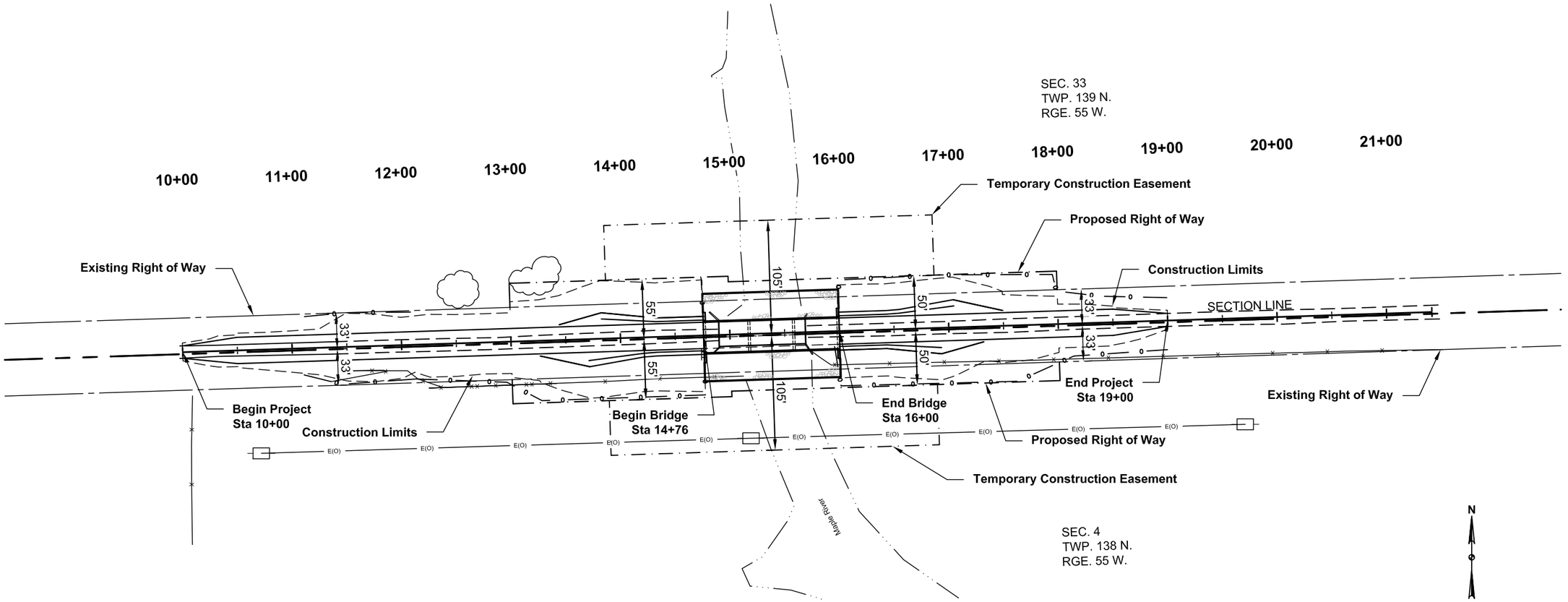
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	10



FIBER ROLLS 12IN (TEMPORARY)

STA 11+10 TO 12+10 ~ LT	100 LF
STA 11+10 TO 14+76 ~ RT	410 LF
STA 16+00 TO 19+00 ~ LT	345 LF
STA 16+00 TO 19+00 ~ RT	340 LF
	1,195 LF

0 FIBER ROLLS 12 IN

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TB1309
CASS COUNTY, NORTH DAKOTA

TEMPORARY EROSION CONTROL STA. 10+00 TO 19+00

DRWN. BY	CHK'D BY	PROJECT NO.
KS	ML	14313109

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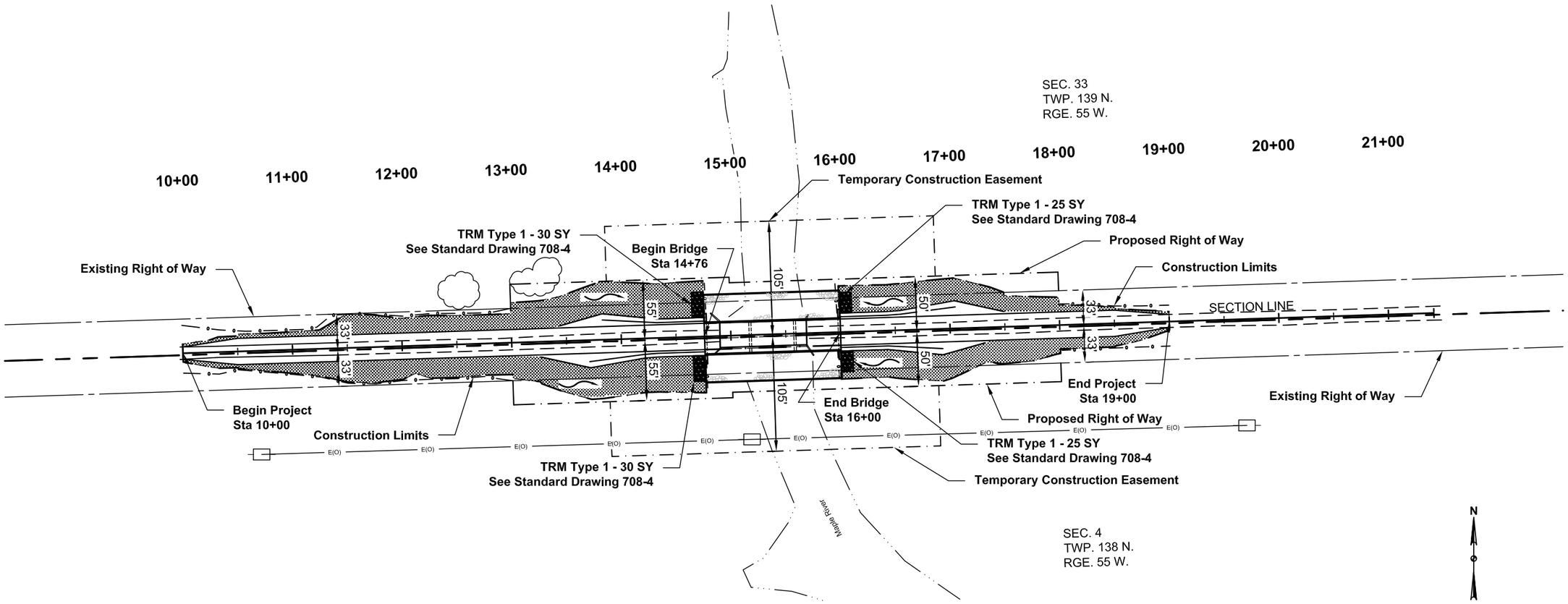
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	11



SEEDING TYPE-B CL-V
MULCHING

RIPRAP-LOOSE ROCK

FIBER ROLLS 12 IN

TRM TYPE 1

FIBER ROLLS 12IN(PERMANENT)	
STA 10+00 TO 13+00 ~ LT	305 LF
STA 10+00 TO 13+00 ~ RT	305 LF
STA 14+76 ~ LT	15 LF
STA 14+76 ~ RT	15 LF
STA 16+00 ~ LT	15 LF
STA 16+00 ~ RT	15 LF
STA 18+00 TO 19+00 ~ LT	100 LF
STA 18+00 TO 19+00 ~ RT	100 LF
	870 LF

SEEDING-TYPE B-CL II	
STA 10+00 TO 14+76	0.38 ACRE
STA 16+00 TO 19+00	0.22 ACRE
	0.60 ACRE

MULCHING	
STA 10+00 TO 14+76	0.38 ACRE
STA 16+00 TO 19+00	0.22 ACRE
	0.60 ACRE

TRM TYPE 1	
STA 14+65 TO 14+76 ~ RT	30 SY
STA 14+65 TO 14+76 ~ RT	30 SY
STA 16+00 TO 16+11 ~ LT	25 SY
STA 16+00 TO 16+11 ~ LT	25 SY
	110 SY

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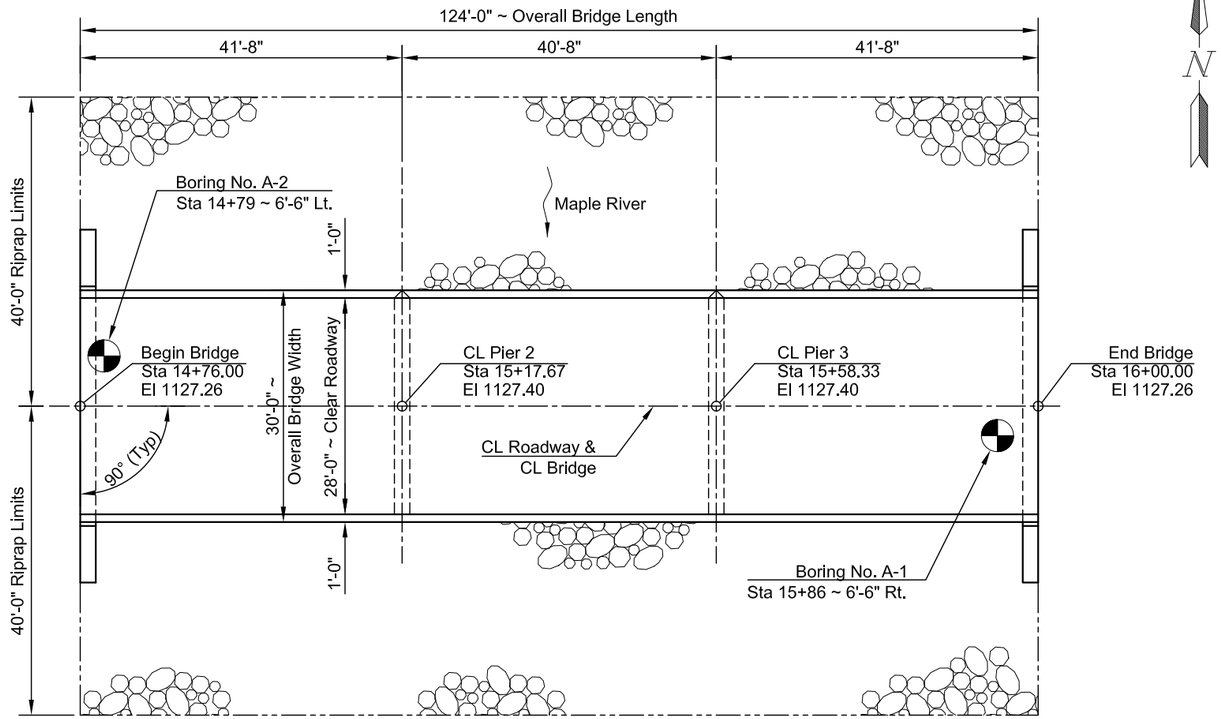
TB1309
CASS COUNTY, NORTH DAKOTA

PERMANENT EROSION CONTROL STA. 10+00 TO 19+00

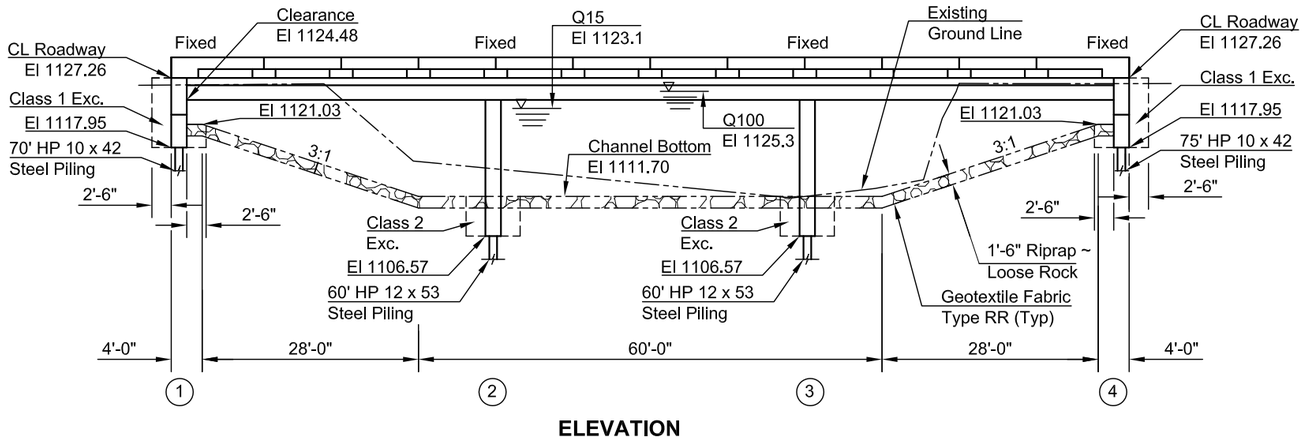
DRWN. BY	CHK'D BY	PROJECT NO.
KS	ML	14313109

Feb 21, 2014 - 9:19am - J:\trans\14313109\Cadd\Site 4 - 1309\Base\14313109_075_003.dwg

	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	12



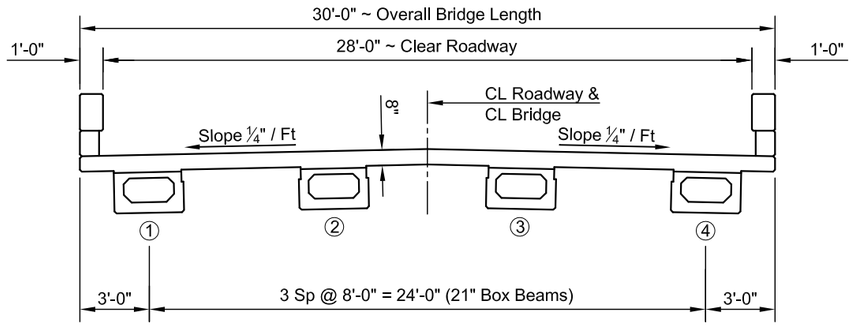
PLAN



ELEVATION

STRUCTURAL QUANTITIES ONLY

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0101	CLASS 1 EXCAVATION	L SUM	1
210	0111	CLASS 2 EXCAVATION	L SUM	1
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0201	FOUNDATION PREPARATION	EA	1
602	0130	CLASS AAE-3 CONCRETE	CY	125.9
602	1130	CLASS AE-3 CONCRETE	CY	126.6
604	9600	PRESTRESSED BOX BEAM-21 IN	LF	476.0
612	0115	REINFORCING STEEL-GRADE 60	LBS	10,150
612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	LBS	31,886
616	0364	STRUCTURAL STEEL M270-GRADE 36	LBS	958
622	0012	STEEL H-PILE TIPS 10 X 42	EA	8
622	0014	STEEL H-PILING POINTS 12 X 53	EA	8
622	0020	STEEL PILING HP 10 X 42	LF	580
622	0040	STEEL PILING HP 12 X 53	LF	480
708	1020	RIPRAP-LOOSE ROCK	CY	547
709	0600	GEOTEXTILE FABRIC-TYPE RR	SY	1094



TYPICAL SECTION

HYDRAULIC DATA:

Drainage Area	552	sq mi
Design Frequency	15	yr
Design Discharge	4,134	cfs
Stream Gradient	0.001	ft/ft
Waterway Provided Below Design Stage	1,331	sq ft
Waterway Provided Below Clearance	1,491	sq ft
Average Velocity of Flow in Natural Channel	3.98	fps
Depth of Flow	11.4	ft
Velocity of Flow Under Bridge	4.2	fps
Freeboard Provided	1.3	ft
100-Year Frequency Discharge	8,321	cfs
100-Year Frequency Stage (Downstream)	1124.5	
Maximum Recorded Stage	Unknown	
Minimum Water Elevation	Unknown	

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TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

BRIDGE LAYOUT

DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

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STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	13

STRUCTURAL NOTES

100-P01 **SCOPE OF WORK:** This work consists of removing an existing 80-foot, double span timber bridge and replacing it with a concrete bridge over the Maple River near the city of Alice. The bridge will be a 124-foot, triple span concrete structure with prestressed box beams having a clear roadway width of 28'-0".

100-P02 **GENERAL:** The cost of furnishing and placing preformed expansion joint filler and other miscellaneous items shall be included in the price bid for "CLASS AE-3 CONCRETE".

202-P01 **REMOVAL OF STRUCTURE:** The existing structure is an 80' long double span timber bridge. The abutments and piers are timber and consist of timber piling.

The lump sum bid item, "REMOVAL OF STRUCTURE" shall include all work required to remove all existing bridge components and hazard markers in accordance with the Standard Specifications. All materials removed shall become property of the contractor and shall be disposed of properly off the right-of-way.

210-P01 **EXCAVATION:** The excavation at the abutments, as shown, shall be included in the lump sum bid item, "CLASS 1 EXCAVATION". The excavation at the pier shall be included in the lump sum bid item, "CLASS 2 EXCAVATION".

210-P02 **CHANNEL EXCAVATION:** Any unsuitable or excess channel excavation material shall be disposed of at a location outside the right-of-way determined by the contractor and acceptable to the engineer. All costs associated with excavating, hauling, depositing, and leveling the material shall be included in the unit price bid for "CHANNEL EXCAVATION".

602-P01 **DECK CONCRETE:** Beams and girders have slight variations in the anticipated camber. Building the deck to the designated thickness will require slight adjustments in deck elevation and/or riser dimensions. These adjustments result in minor concrete quantity discrepancies. The contractor shall consider this quantity discrepancy when bidding the unit price for "CLASS AAE-3 CONCRETE". Only the plan quantity of "CLASS AAE-3 CONCRETE" will be paid.

602-P02 **CONCRETE DECK SLAB CURING:** The deck shall be cured by the wet-cure method. The surface shall be kept moist between the final finish and the beginning of the wet-cure by means of a light fog spray. The wet-cure material shall be placed and the wet-cure started no later than 30 minutes after the finish of the completed area unless directed otherwise by the engineer. The wet-cure method shall consist of covering the deck with a double thickness of burlap or a geotextile fabric capable of retaining moisture. The burlap or fabric shall be kept continuously moist for the next seven days. The burlap or fabric shall be moistened at a minimum of every four hours. If conditions exist such as strong winds or high temperature, causing the burlap or fabric to become dry, the watering rate shall be increased. Covering the deck with a waterproof material such as polyethylene or the use of curing compounds will not be allowed. If fly ash is used as a cement substitute in excess of 10 percent by weight, the wet-cure period shall be increased from seven days to ten days.

No work shall be done on the deck while the wet-cure is in progress, including forming the barriers. No vehicles or equipment not required in the curing process shall be on the deck.

602-P03 **DECK TINING:** The metal tine finish shall be stopped 18 inches from the edge of the deck and 6 inches from the beginning and end of the deck.

602-P04 **SURFACE FINISH:** Surface Finish "C" will be required on both vertical faces of the deck, outside faces of the fascia girders, top face of the abutment wings, and all exposed vertical faces of the abutments, abutment wings, and piers. Surface Finish "D" (excluding sandblasting) may be substituted for Surface Finish "C" at the contractor's expense.

602-P05 **DIAPHRAGMS & ENDWALLS:** The endwall and pier diaphragm concrete shall be placed at the same time as the deck concrete.

612-P01 **REINFORCING STEEL:** Dimensions for bent bars are given out to out and to tangent intersections unless otherwise noted. Fabrications and tolerances shall be in accordance with the CRSI Manual of Standard Practice.

616-P01 **STRUCTURAL STEEL:** Structural Steel shall be AASHTO M 270, Grade 36T2, except the requirement for the Charpy V-Notch test is waived.

622-P01 **PILING:** The piling shall meet AASHTO M 270, Grade 50.

622-P02 **PILING:** Piling shall be driven with a steam, air, or diesel hammer capable of producing an energy and ram weight not less than 46,667 foot-pound-tons, as computed by the formula W (E-18,018) + 0.518 E, where W is the weight of the ram in tons and E is the rated hammer energy. In no case shall the ram weight be less than 2,750 pounds. It is the contractor's responsibility to determine the type and size of pile hammer that will provide the specified bearing under the actual conditions encountered in the field.

622-P03 **STEEL H-PILE TIPS:** Steel H-pile tips shall be cast-in-one-piece steel in accordance with ASTM A 148 Grade 90-60. The tips shall have sufficient flange and continuous web vertical back-ups to ensure proper alignment and fitting to the pile. They shall provide full bearing for the piles. The soil or rock bearing surfaces of the tips shall be sloped downward toward the web with a minimum of 15 degrees, but not to exceed 30 degrees to the horizontal under the flanges. The sloped surfaces of the points shall terminate so as to form a flat surface which does not exceed one fourth of the flange width. The surfaces may have individual or continuous cutting teeth. The ends of the piles shall be prepared and welded to the pile tips in accordance with the manufacturer's recommendations. All labor, equipment, and materials required for the completion of this work shall be included in the price bid for "STEEL H - PILE TIPS 10 X 42" and "STEEL H – PILING POINTS 12 X 53".

708-P01 **RIPRAP:** Any excavation required to place the riprap shall be included in the price bid for "RIPRAP-LOOSE ROCK".

DESIGN STRENGTHS:

F'c	3,000 PSI	Class AE-3 Concrete (Required Minimum 28 Day Concrete Strength)
F'c	4,000 PSI	Class AAE-3 Concrete (Required Minimum 28 Day Concrete Strength)
Fy	60,000 PSI	Grade 60 Reinforced Steel
F'c	5,500 PSI	Prestressed Girder Concrete

Load Resistance and Factor Design (HL-93)
15 PSF Future Wearing Surface

SHOP DRAWINGS: The contractor shall submit the following shop drawings to KLJ, PO Box 190, West Fargo, ND 58078:

Prestressed Concrete Box Girders

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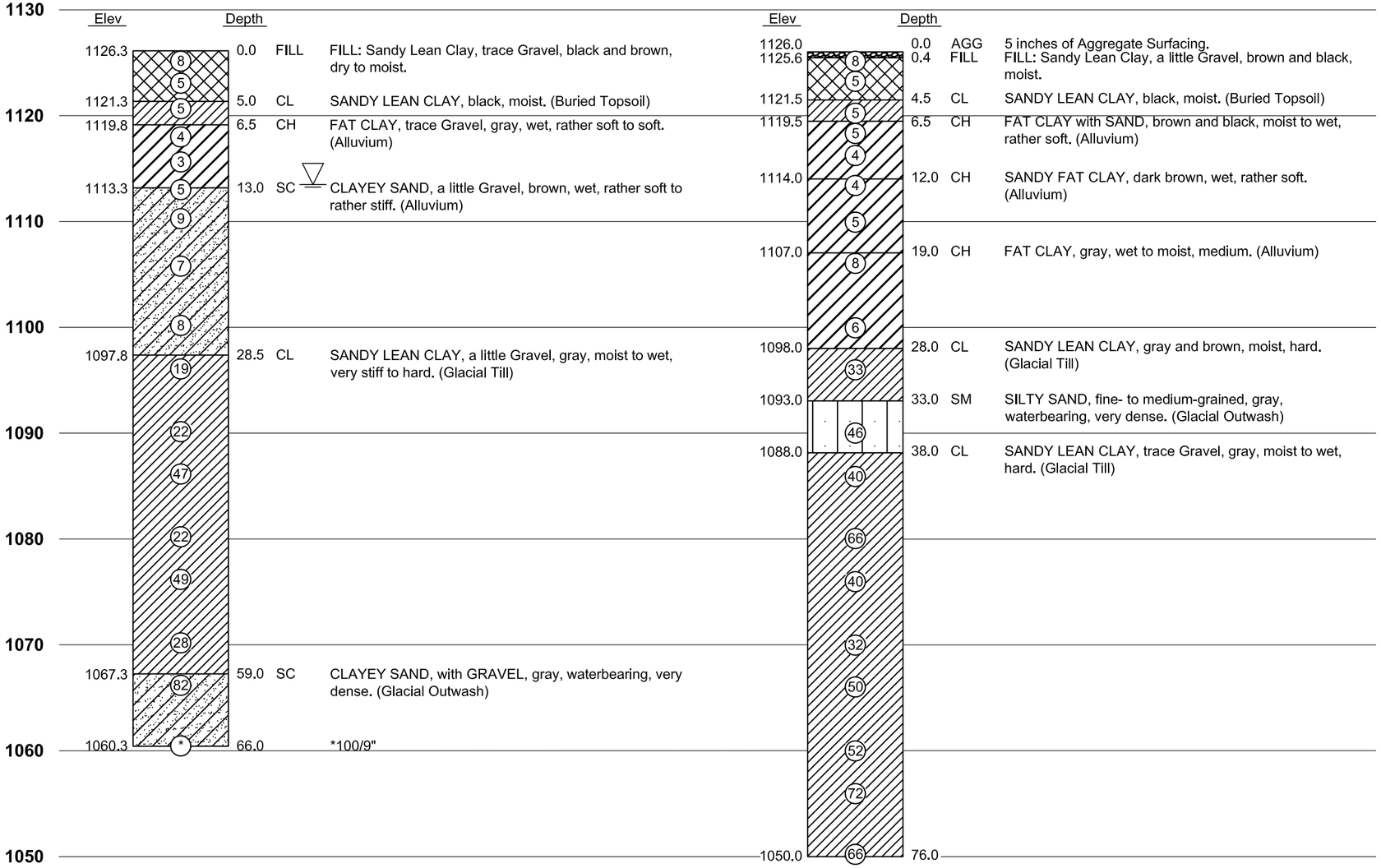
TB1309
CASS COUNTY, NORTH DAKOTA

KLJ

STRUCTURAL NOTES

DRWN. BY	CHKD. BY	PROJECT NO.
BJJ	JMG	14313109

STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	14



BORING A-1
Sta 15+86 - 6'-6" Rt. of C.L. Roadway
Drilling Date: 5/15/13

BORING A-2
Sta 14+79 - 6'-6" Lt. of C.L. Roadway
Drilling Date: 5/15/13

NOTES:

Water observed at a depth of 13 feet at Boring A-1. Water level not determined at Boring A-2 due to the use of mud rotary drilling fluids below a depth of 30 feet.

The encircled numbers indicate the number of blows per foot recorded in a standard penetration test.

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TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

BORING LOG

DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

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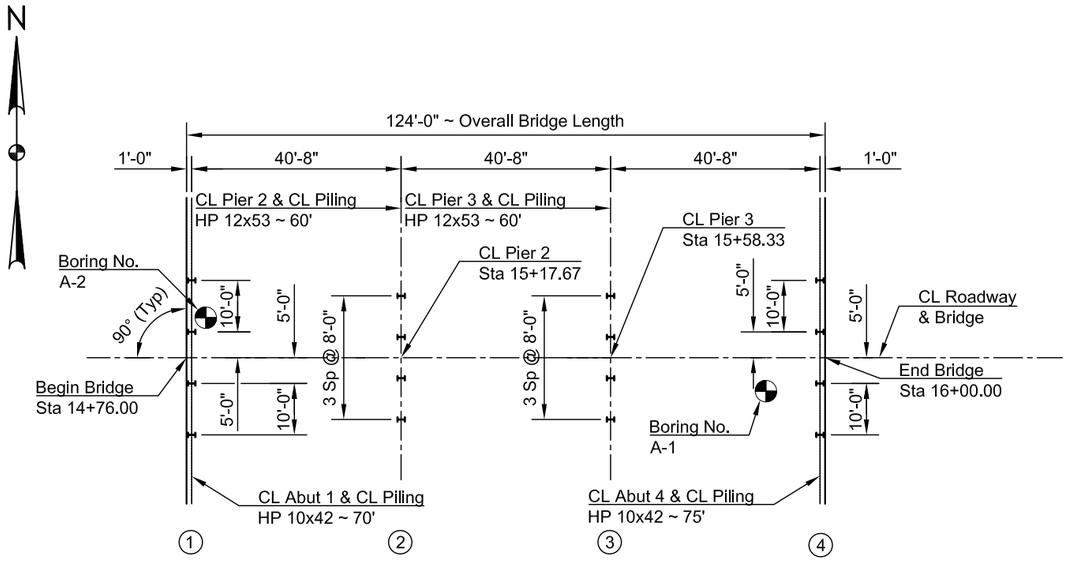
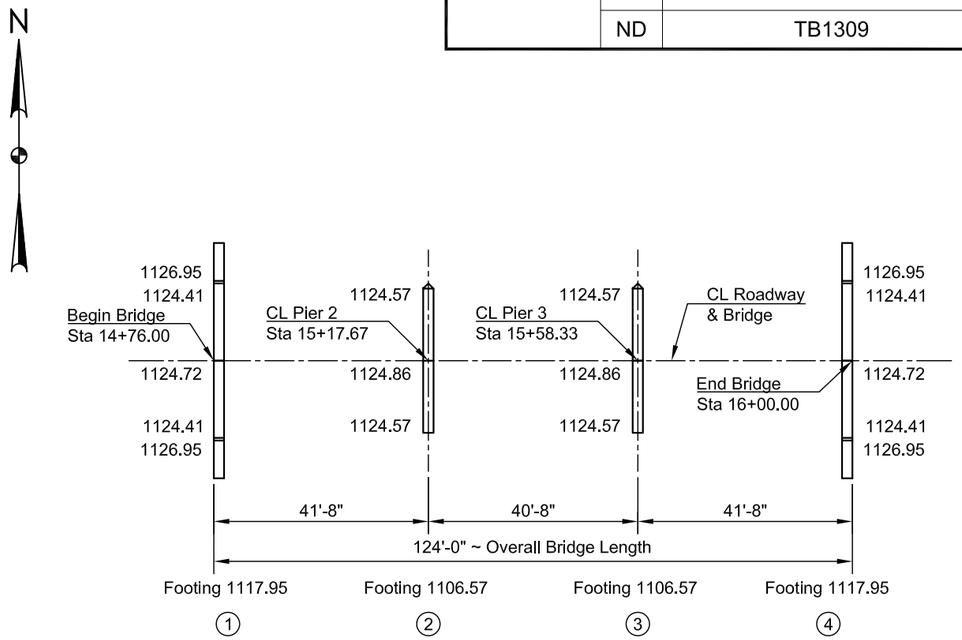
STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	15



PILING LAYOUT

HP 10x42 piles shall be driven to 105 tons.
HP 12x53 piles shall be driven to 130 tons.



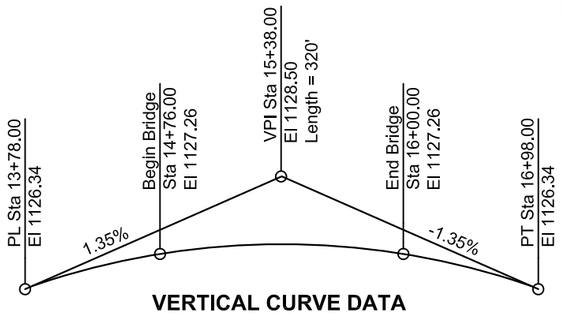
BEARING ELEVATIONS

Elevations shown are to top of finished concrete.

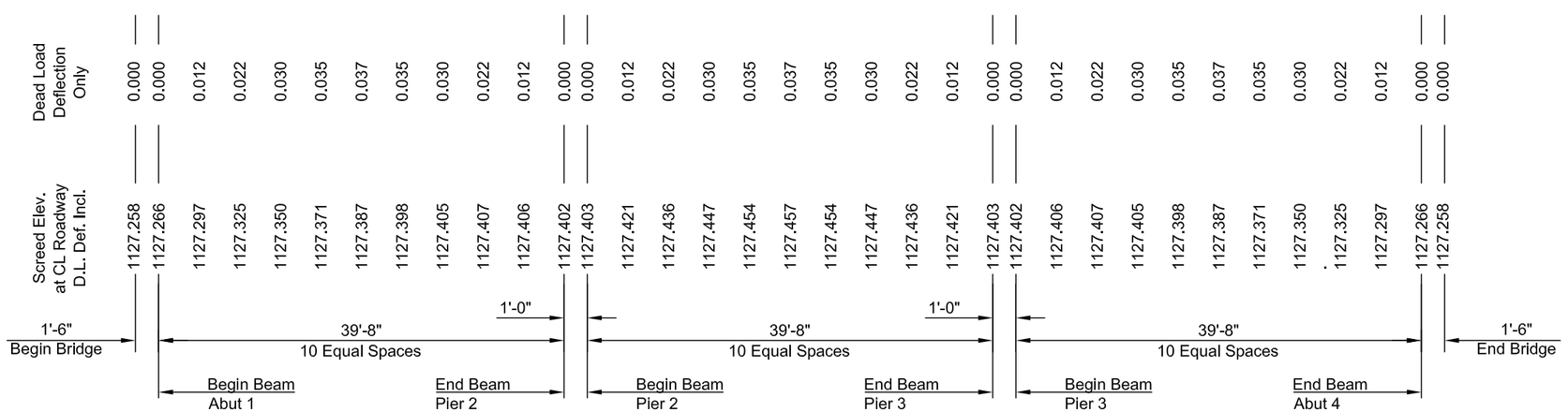
NOTE:

For double acting or single acting diesel hammers, the safe bearing value of piles shall be determined by the following formula:

$$P = \frac{4.5E}{S + 0.2} \times \frac{W + 0.2M}{W + M}$$



VERTICAL CURVE DATA AT PROFILE GRADE LINE



SCREED ELEVATIONS

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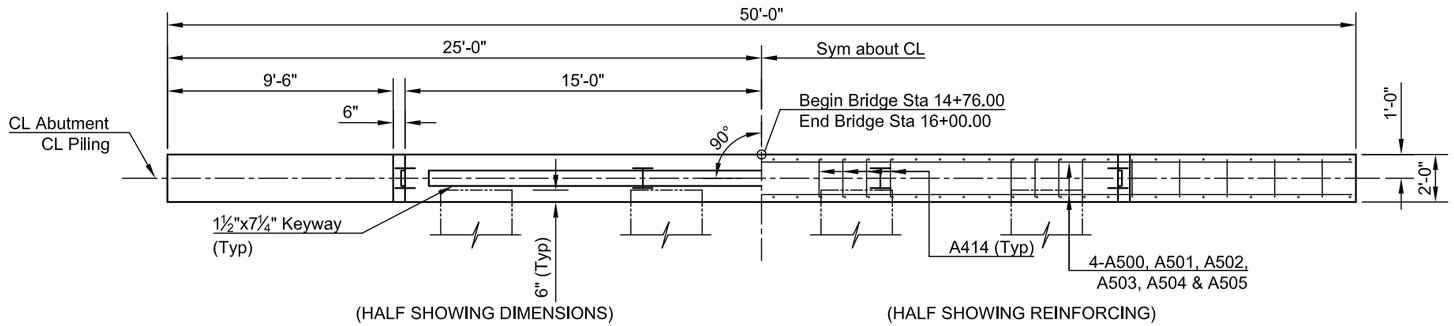
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

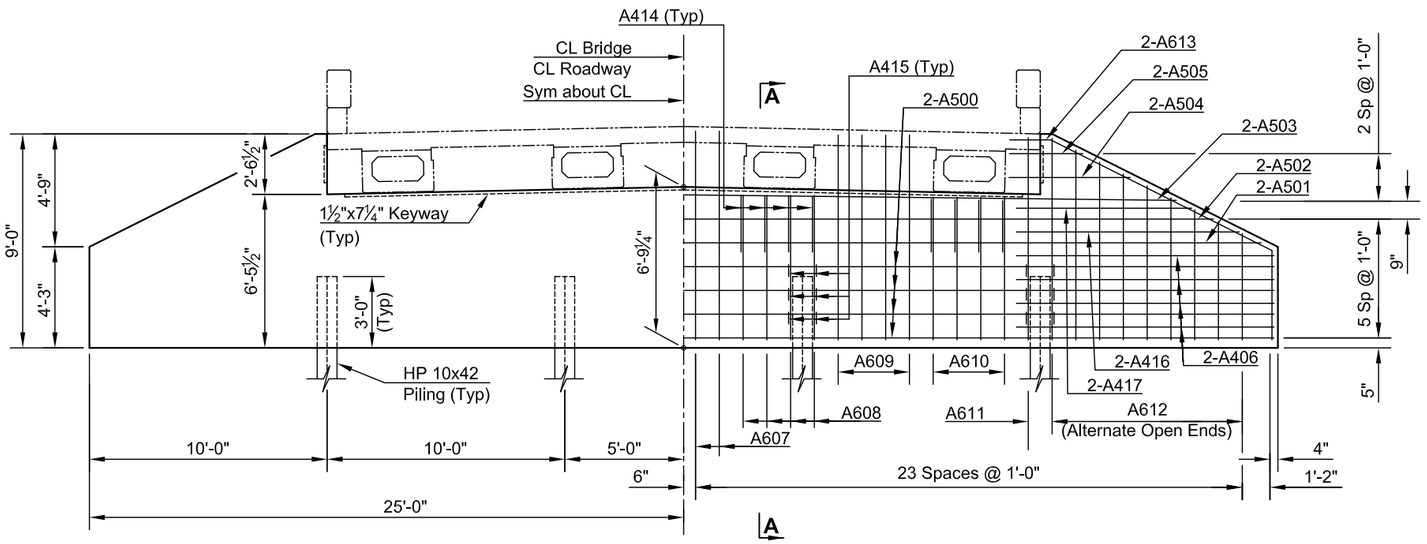
PILING LAYOUT, BEARING ELEVATIONS, & SCREED ELEVATIONS

DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

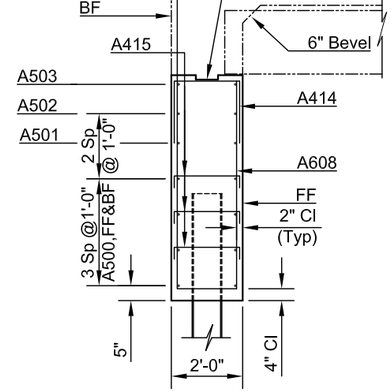
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	16



PLAN



ELEVATION

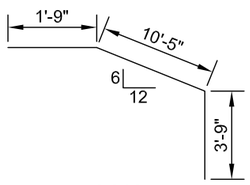


A-A

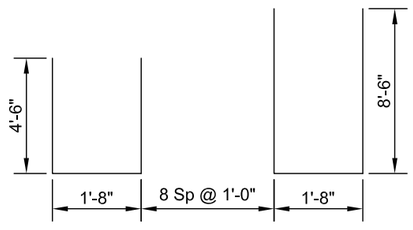
NOTES:
1. FF = Front Face
2. BF = Back Face

BILL OF REINFORCEMENT (ONE ABUTMENT)

Bar	No.	Size	Length	Shape	Location
A500	8	5	49'-8"	——	Abutment Wall Horizontal
A501	2	5	48'-7"	——	Abutment Wall Horizontal
A502	2	5	44'-7"	——	Abutment Wall Horizontal
A503	2	5	41'-7"	——	Abutment Wall Horizontal
A504	4	5	5'-1"	——	Wingwall Horizontal
A505	4	5	3'-1"	——	Wingwall Horizontal
A406	16	4	10'-10"	——	Wingwall Horizontal
A607	4	6	19'-2"	⌊	Abutment Wall Vertical
A608	8	6	16'-5"	⌊	Abutment Wall Vertical
A609	8	6	18'-10"	⌊	Abutment Wall Vertical
A610	8	6	16'-2"	⌊	Abutment Wall Vertical
A611	2	6	18'-8"	⌊	Abutment Wall Vertical
A612	2	6	132'-0"	Set	Wingwall Vertical
A613	4	6	15'-11"	⌒	Wingwall Edge
A414	16	4	4'-8"	⌊	Abutment Beam Seat
A415	24	4	2'-8"	⌊	Vertical Pile
A416	4	4	9'-4"	——	Wingwall Horizontal
A417	4	4	7'-4"	——	Wingwall Horizontal



A613



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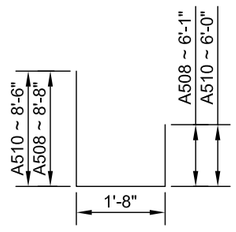
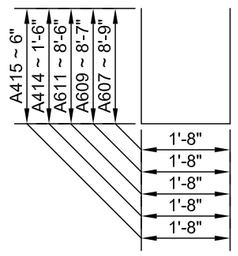


A608 & A610



A607, A609, A611, A613, A414 & A415

QUANTITIES	(ONE ABUTMENT)
CLASS AE-3 CONCRETE	24.7 CY
REINFORCING STEEL-GRADE 60	2,264 LBS

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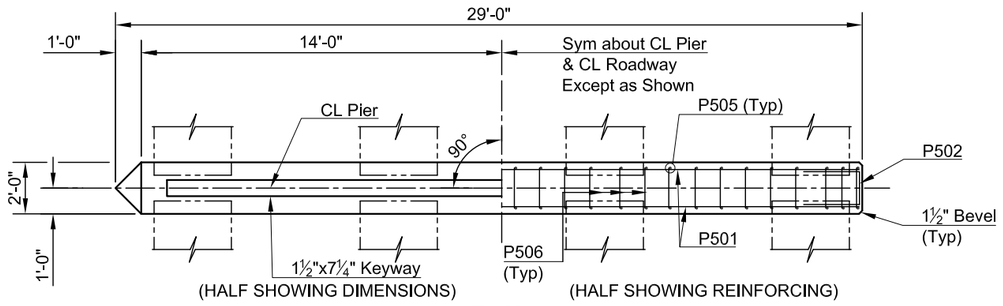
TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

ABUTMENT DETAILS

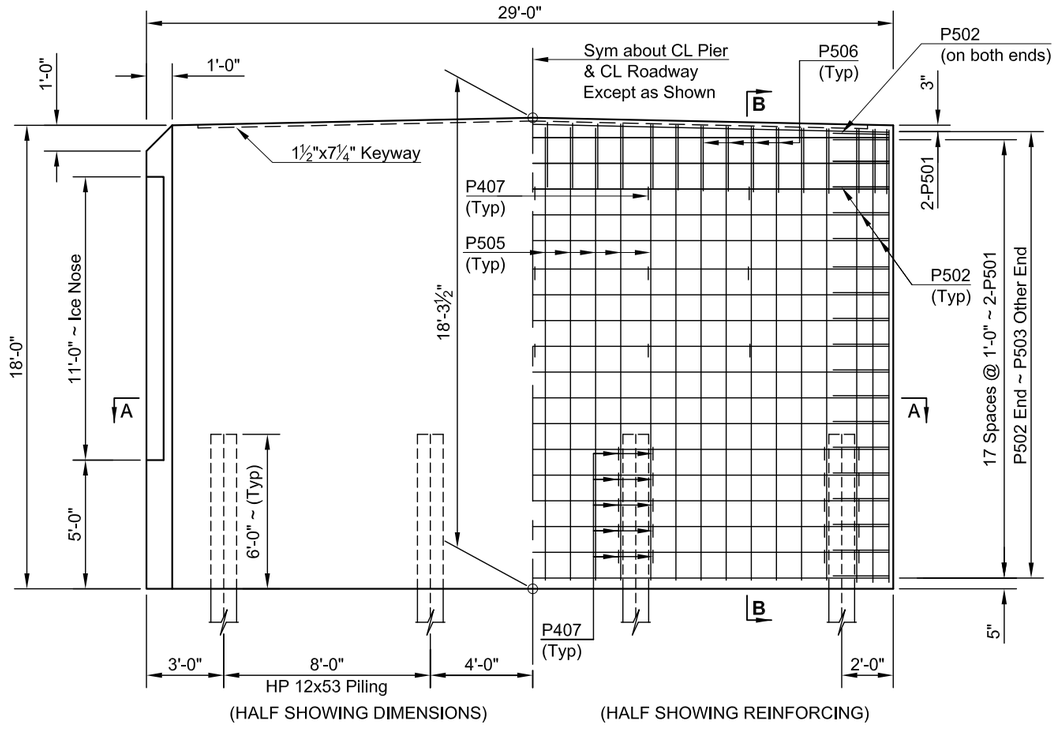
DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

Feb 21, 2014 - 9:35am - J:\trans\14313109\Cadd\Site 4 - 1309\Bridge\170BR_005_ABUT.dwg

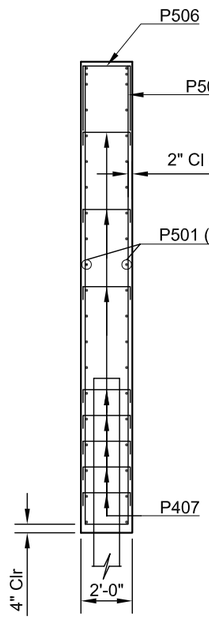
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	17



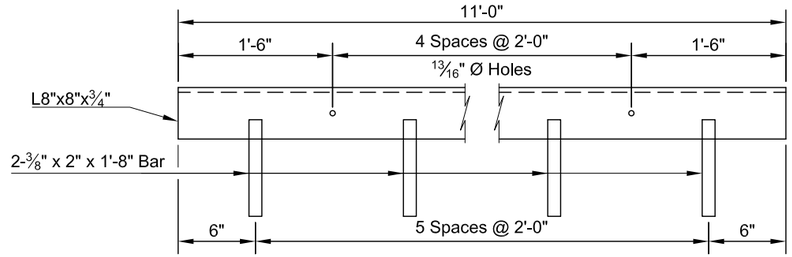
PLAN

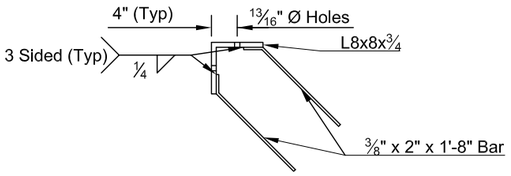


ELEVATION



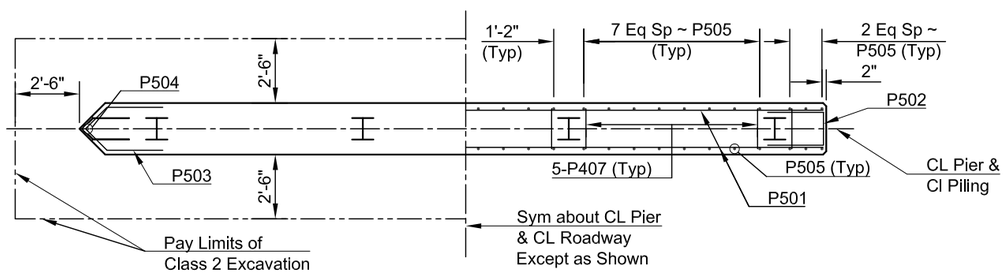
B-B



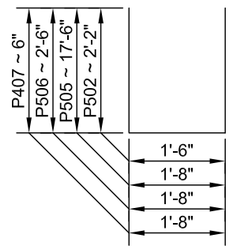


Galvanize in accordance with
AASHTO M 111 after fabrication.

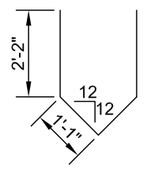
ICE NOSE DETAILS



A-A



P502, P505, P506 & P407



P503

BILL OF REINFORCEMENT (ONE PIER)

Bar	No.	Size	Length	Shape	Location
P501	38	5	27'-8"	———	Horizontal
P502	20	5	5'-10"	⌊——⌋	Pier End Horizontal
P503	18	5	6'-6"	⌊——<	Ice Nose Horizontal
P504	1	5	16'-6"	———	Ice Nose Vertical
P505	30	5	36'-8"	⌊——⌋	Vertical
P506	30	5	6'-8"	⌊——⌋	Vertical Under Beam
P407	55	4	2'-8"	⌊——⌋	Vertical Pile

QUANTITIES (ONE PIER)

CLASS AE-3 CONCRETE	38.6 CY
REINFORCING STEEL-GRADE 60	2,811 LBS
STRUCTURAL STEEL M270-GRADE 36	479 LBS

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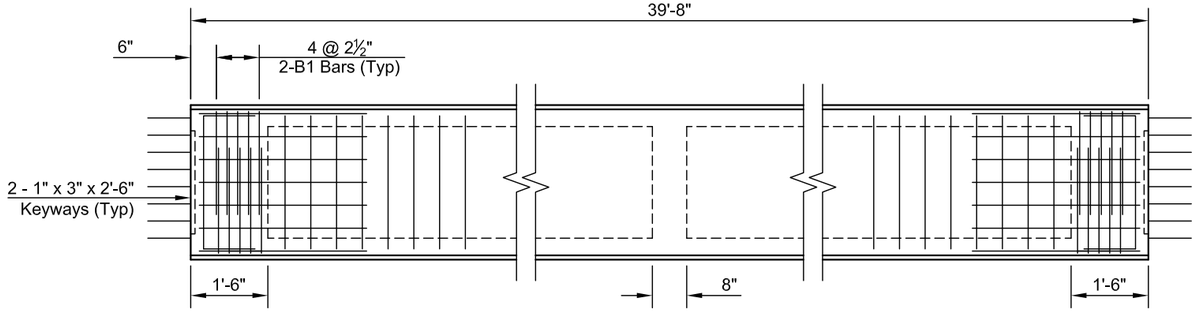
TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

PIER DETAILS

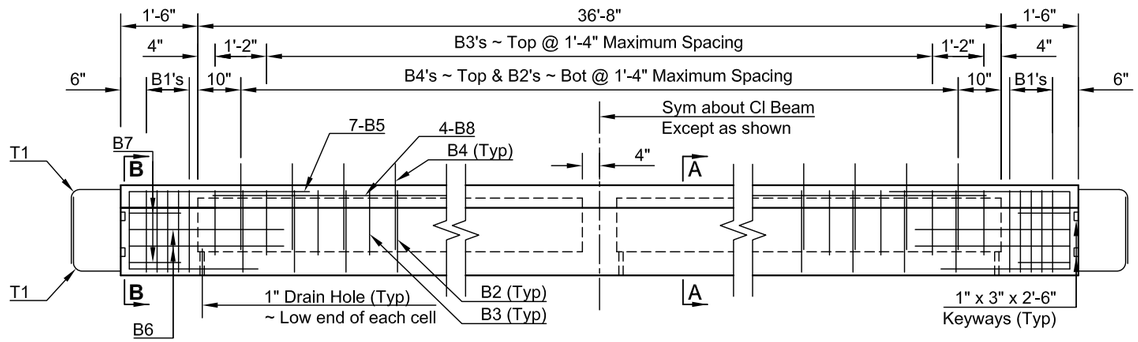
DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

Feb 21, 2014 - 9:36am - J:\trans\14313109\Cadd\Site 4 - 1309\Bridge\170BR_006_PIER.dwg

STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	18

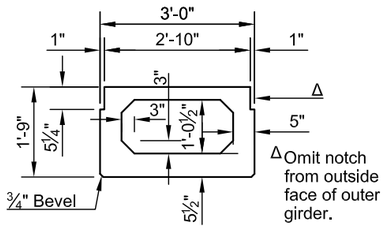


PLAN

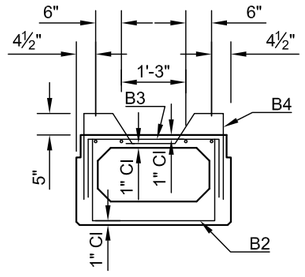


* Welded wire fabric with minimum circumferential steel area of 0.15 sq in per ft may be substituted for B2's and B3's.

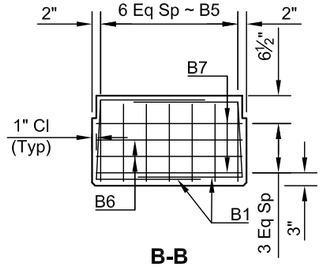
ELEVATION



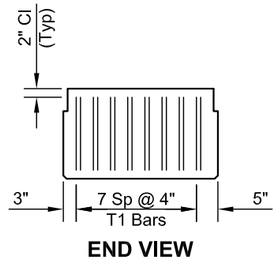
A-A
(Showing Typical Dimensions)



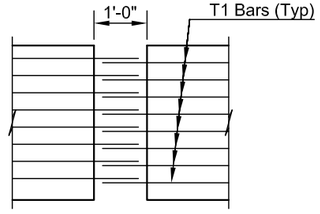
A-A
(Showing Reinforcing)



B-B



END VIEW



GIRDER END PLAN AT PIER

NOTES:

At least 14 days prior to the forming and pouring of any girders, the contractor shall submit shop drawings to the Engineer for review. The shop drawings shall include the total initial prestress force and the losses in the prestress due to elastic shortening, shrinking or creeping of concrete and the relaxation of steel stress as determined by the contractor for their method of stressing.

Shop drawings shall show strand layout, pull down locations, tensioning forces, elongation and any proposed changes in reinforcing steel.

The girders shall be poured in all steel forms.

All reinforcing steel shall be grade 60 and shall have a clearance of 1" unless otherwise noted.

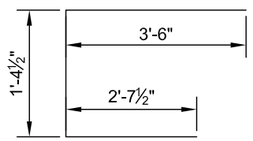
Minor changes to the shape of the girder and to reinforcing steel may be made to accommodate the forms of various contractors and their construction methods with the approval of the Engineer.

The tops of the beams shall be rough floated and broomed transversely for bond.

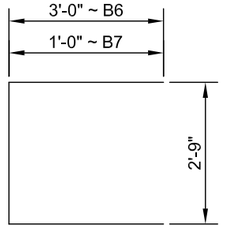
Provide handling hooks or devices as required by the contractor. Hooks or devices provided will be subject to approval of the Engineer and shall be installed within 4'-0" of the end of beam.

BAR LIST ~ ONE BEAM

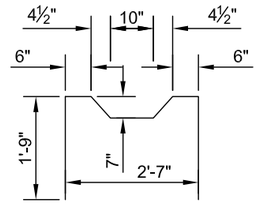
	MARK	SIZE	NO.	LENGTH	SHAPE
	B1	4	20	5'-7"	BENT
*	B2	4	34	5'-9"	BENT
*	B3	4	35	5'-0"	BENT
	B4	4	34	6'-9"	BENT
	B5	5	14	7'-6"	BENT
	B6	4	4	8'-9"	BENT
	B7	4	4	4'-9"	BENT
	B8	4	4	45'-4"	STR
**	T1	4	32	4'-5"	STR



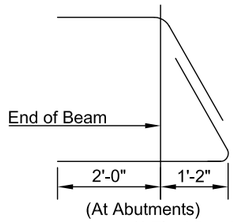
B5



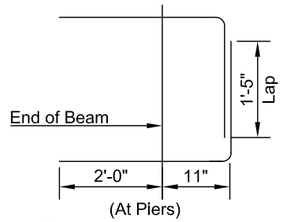
B6 & B7



B4



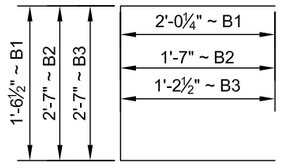
(At Abutments)



(At Piers)

** Field Bend as Shown (Grade 40)

T1



B1, B2 & B3

BENT BAR DETAILS

PRESTRESSING DATA					
C.G.	FINAL FORCE	DESIGN STRENGTH	ACCEPTANCE STRENGTH	WEIGHT (TONS)	BEAM LENGTH
4.25	671.4 k	4,000 psi (Min)	5,500 psi (Min)	10.0	39'-8"
4.50	687.6 k				
4.75	704.7 k				

BEAM SECTION DATA
WT = 472 LBS/FT + 1,212 FOR END BLOCKS
CROSS SEC. AREA AT CL SPAN = 438.5 IN^2
C.G. (FROM BOTTOM) = 9.44 IN
I = 22,405 IN^4
S_B = 2,373 IN^3

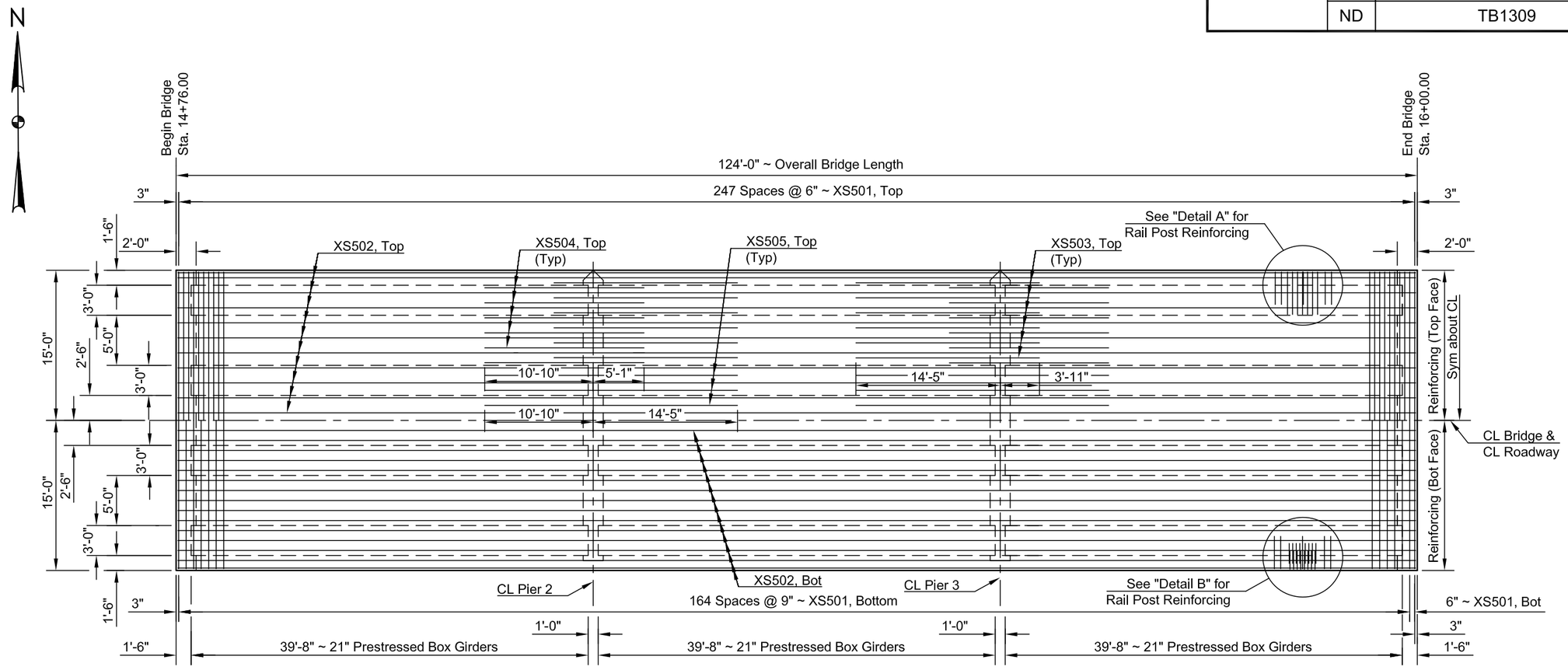
QUANTITIES	
PRESTRESSED BOX BEAM-21IN	476.0 LF

TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

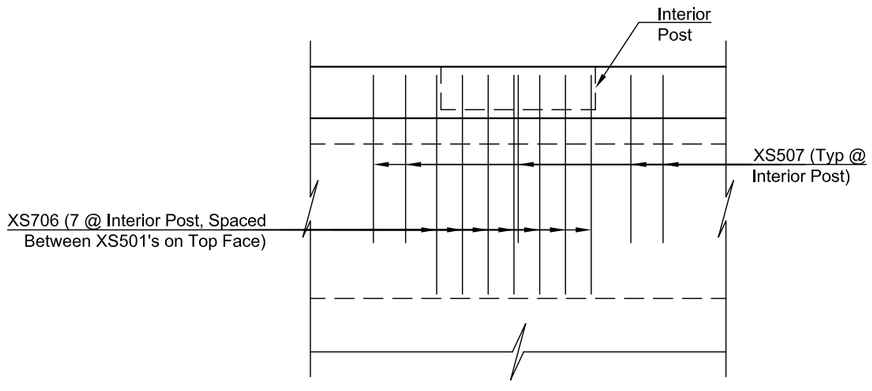
PRE-TENSIONED 21" PRESTRESSED BOX BEAM

DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

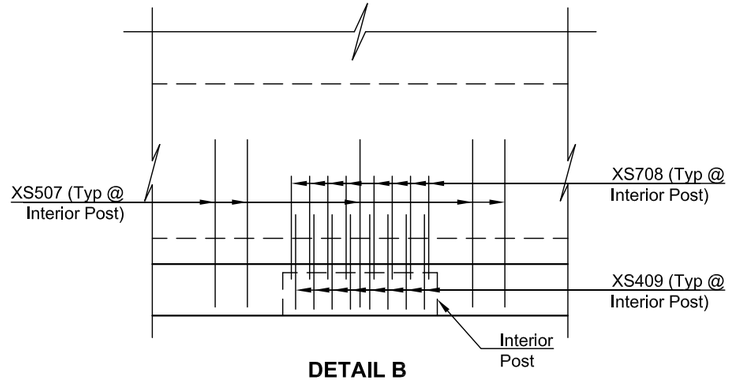
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	19



PLAN



DETAIL A



DETAIL B

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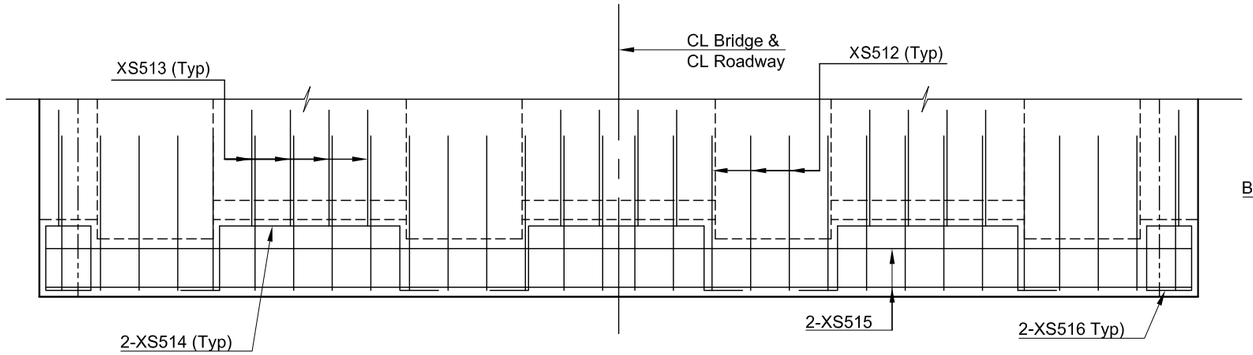
TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

SLAB LAYOUT

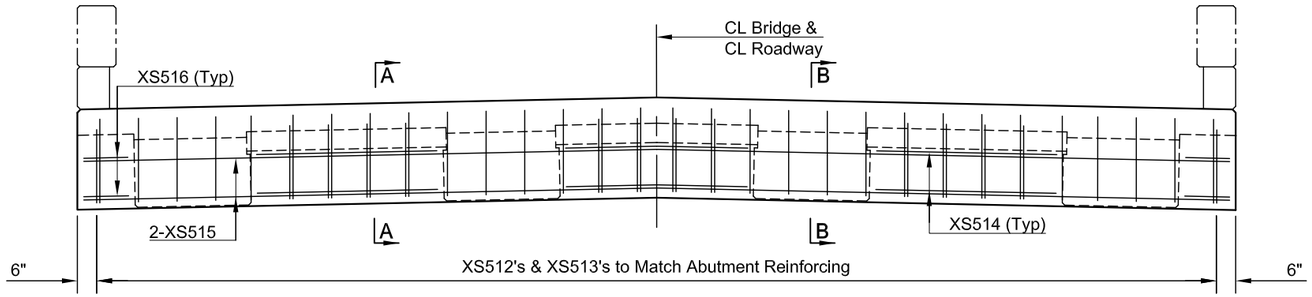
DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

Feb 21, 2014 - 9:38am - J:\trans\14313109\Cadd\Site 4 - 1309\Bridge\170BR_008_SLABLO.dwg

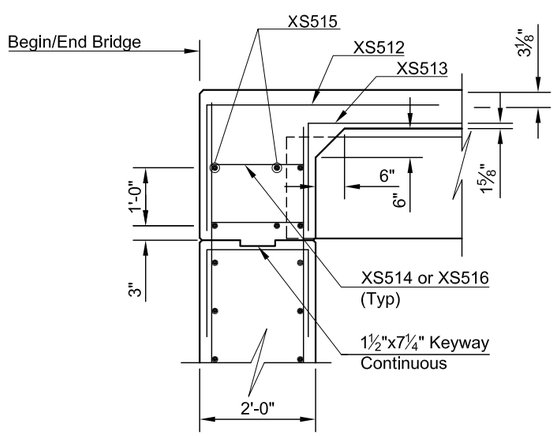
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	20



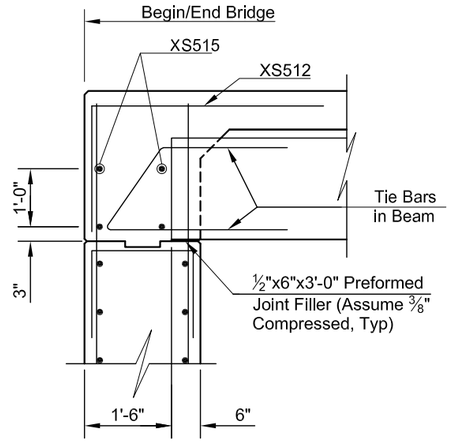
ENDWALL PLAN



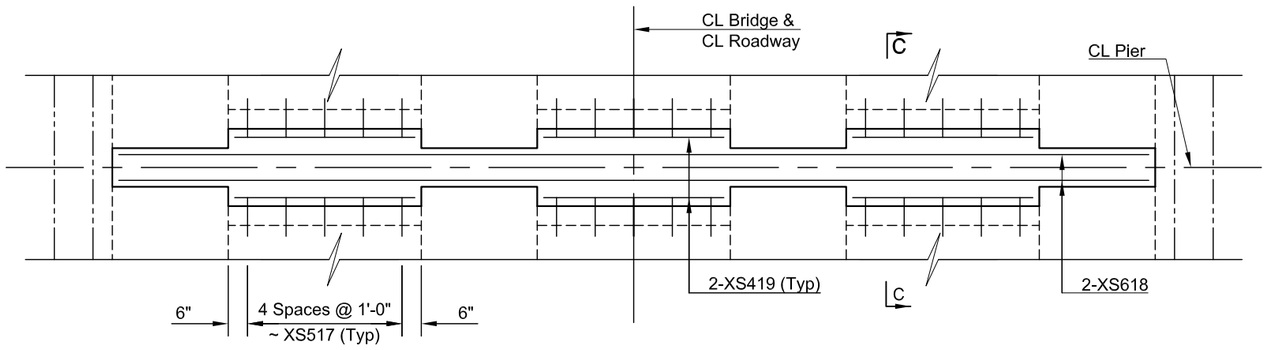
ENDWALL ELEVATION



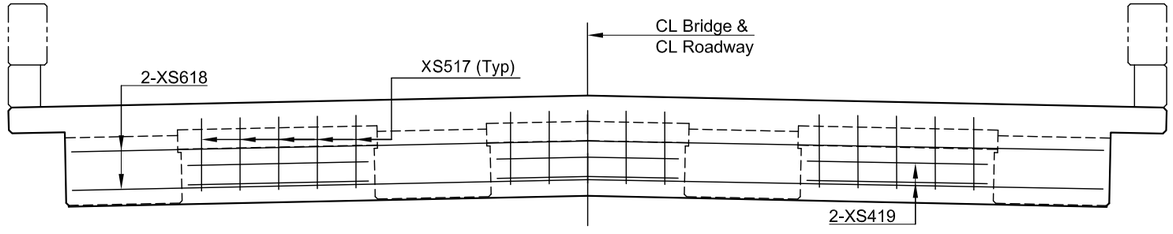
SECTION A-A



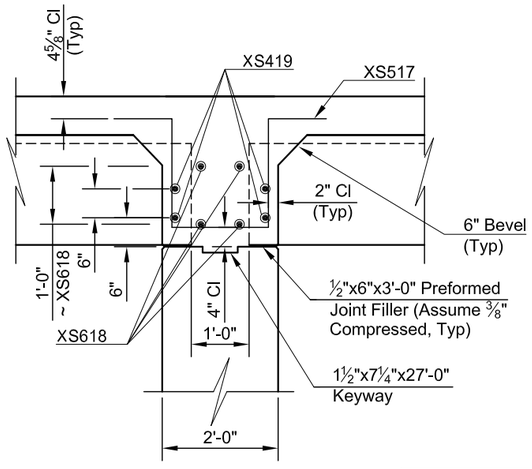
SECTION B-B



PIER DIAPHRAGM PLAN



PIER DIAPHRAGM ELEVATION



SECTION C-C

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TB1309

CASS COUNTY, NORTH DAKOTA

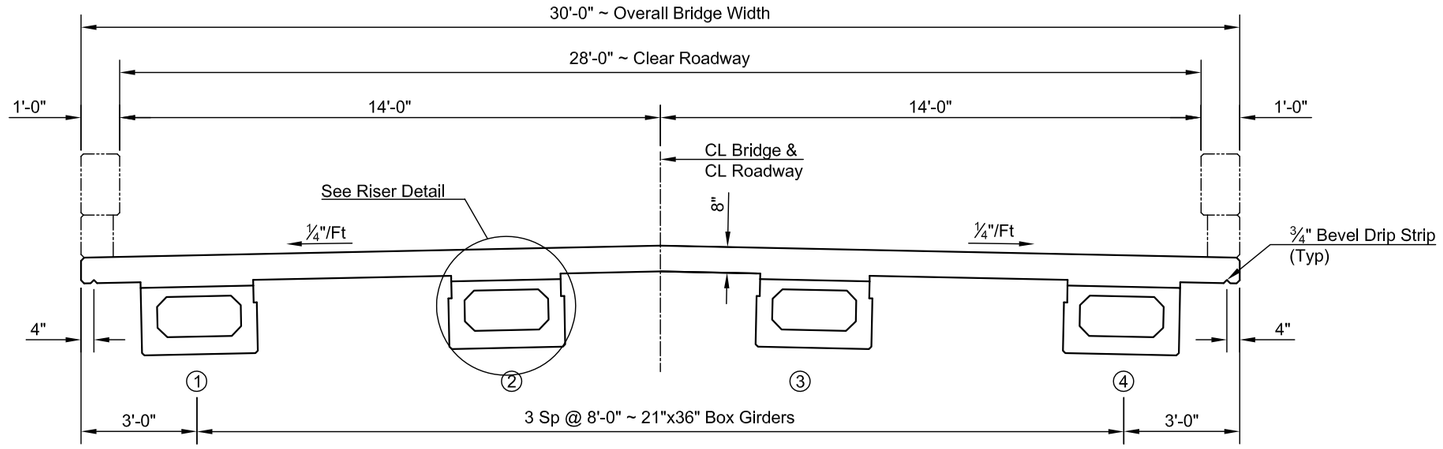
BRIDGE #09-104-30.0

ENDWALL & PIER DIAPHRAGM DETAILS

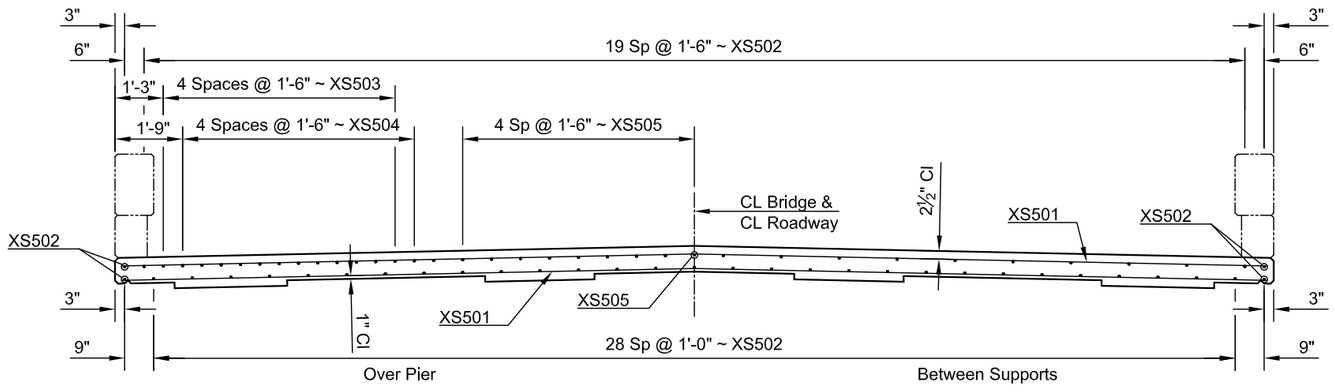
DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

Feb 21, 2014 - 9:39am - J:\trans\14313109\Cadd\Site 4 - 1309\Bridge\170BR_009_ENDWALL.dwg

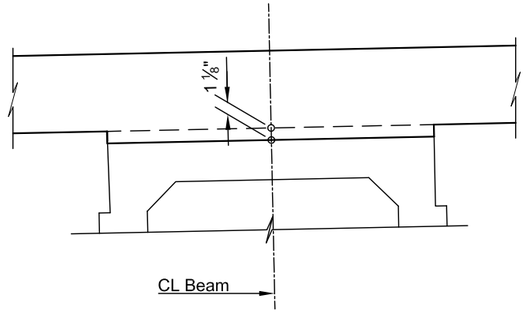
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	21



SLAB SECTION
(Showing Dimensions)



SLAB SECTION
(Showing Reinforcing)



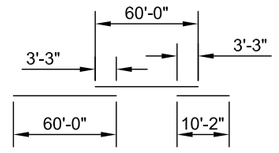
RISER DETAIL

NOTES:

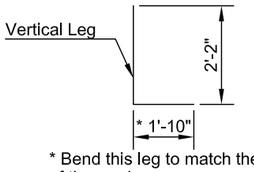
1. The 1⅛" dimension shown on the riser detail is located at the supports. The anticipated midspan riser is ½". The riser shall be adjusted to maintain the 8" slab thickness.
2. An "X" preceding a bar designation indicates an epoxy coated bar.
3. The XS502 bars shall be turned end for end so that the splice locations are staggered.

BILL OF REINFORCEMENT (SUPERSTRUCTURE)

Bar	No.	Size	Length	Shape	Location
XS501	413	5	29'-8"	———	Transverse Top & Bottom
XS502	53	5	130'-2"	———	Longitudinal Top & Bottom
XS503	20	5	18'-4"	———	Longitudinal Top
XS504	20	5	15'-11"	———	Longitudinal Top
XS505	18	5	25'-3"	———	Longitudinal Top
XS706	154	7	4'-3"	———	Transverse Top @ Posts
XS507	110	5	6'-11"	⌊	Post Reinforcing
XS708	196	7	7'-6"	⊂	Post Reinforcing
XS409	196	4	4'-0"	⌊	Post Reinforcing
XS710	16	7	9'-4"	⊂	Post Reinforcing
XS711	4	7	5'-7"	⌊	Post Reinforcing
XS512	60	5	6'-1"	⌊	Vertical End Beam
XS513	28	5	4'-10"	⌊	Vertical End Beam
XS514	12	5	10'-0"	⌐	Horizontal End Beam
XS515	8	5	29'-8"	———	Horizontal End Beam
XS516	8	5	6'-8"	⌐	Horizontal End Beam
XS517	30	5	7'-4"	⌐	Vertical Pier Diaphragm
XS618	8	6	26'-8"	———	Horizontal Pier Diaphragm
XS419	24	4	4'-8"	———	Horizontal Pier Diaphragm

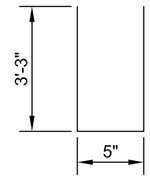


XS502

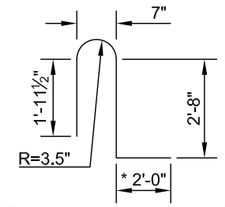


* Bend this leg to match the slope of the roadway.

XS409

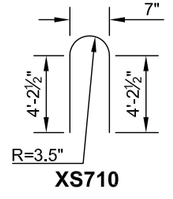


XS507

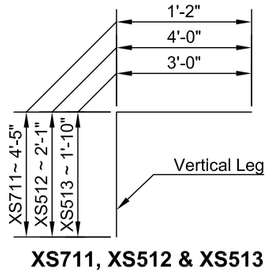


* Bend this leg to match the slope of the roadway.

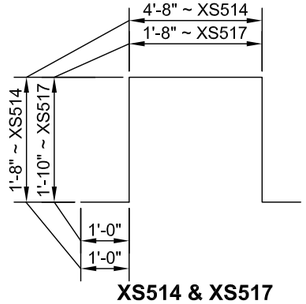
XS708



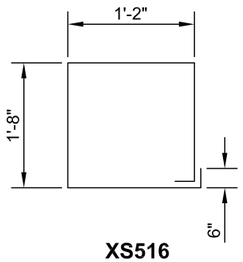
XS710



XS711, XS512 & XS513



XS514 & XS517



XS516

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QUANTITIES	
CLASS AAE-3 CONCRETE	108.7 CY
REINFORCING STEEL-GRADE 60-EPOXY COATED	28,749 LBS

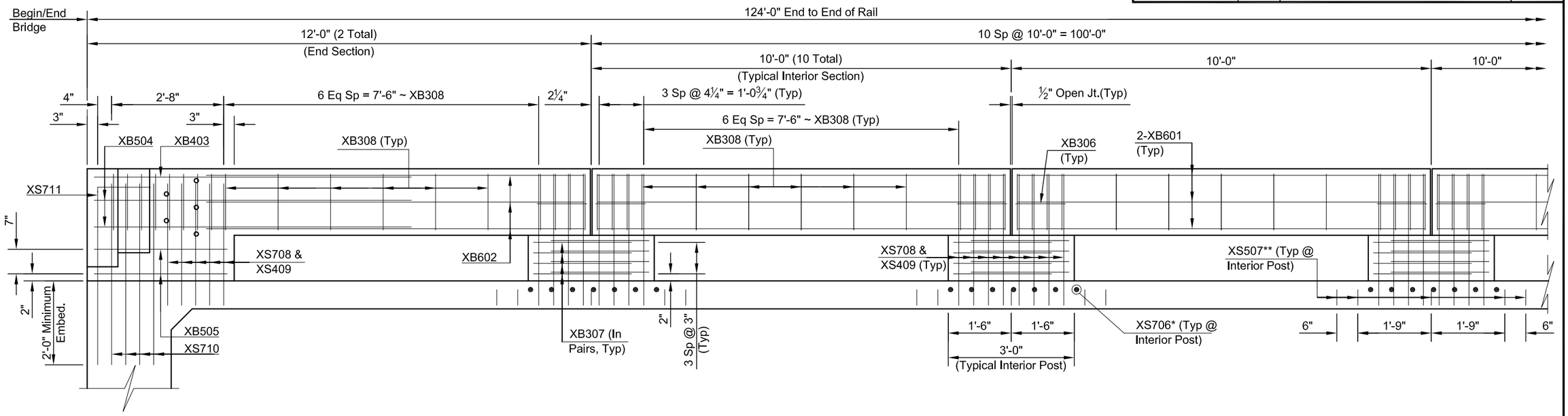
TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

KLJ

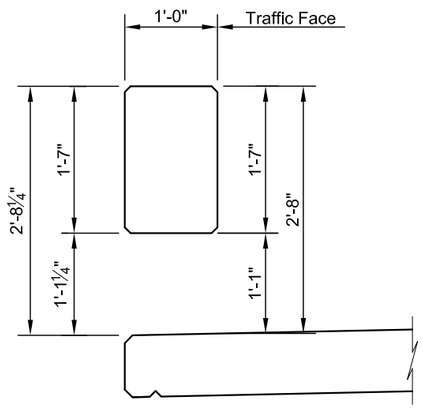
SLAB SECTION

DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

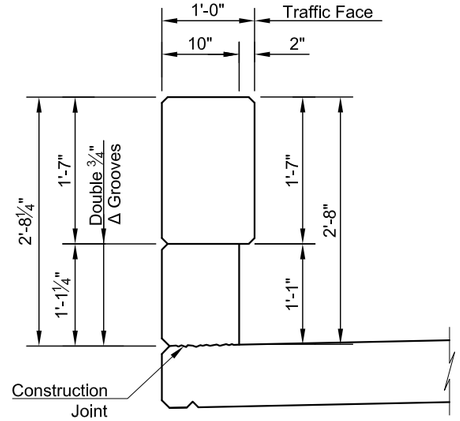
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	22



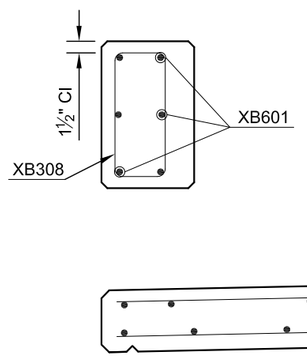
PARTIAL ELEVATION
(Along Traffic Face)



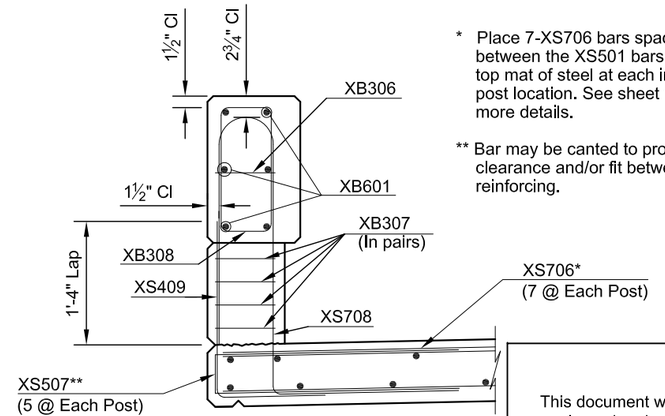
TYPICAL SECTION BETWEEN POSTS
(Showing Dimensions)



TYPICAL POST
(Showing Dimensions)



TYPICAL SECTION BETWEEN POSTS
(Showing Reinforcing)



* Place 7-XS706 bars spaced between the XS501 bars on the top mat of steel at each interior post location. See sheet 19 for more details.

** Bar may be canted to provide clearance and/or fit between reinforcing.

TYPICAL POST
(Showing Reinforcing)

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TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

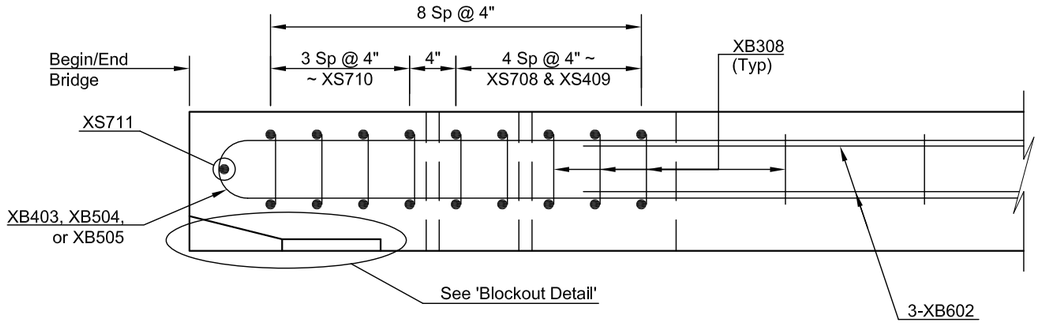
KLJ

CONCRETE BARRIER I

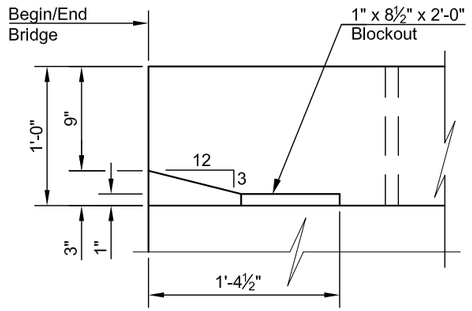
DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

Feb 21, 2014 - 9:41am - J:\trans\14313109\Cadd\Site 4 - 1309\Bridge\170BR_011_BARR1.dwg

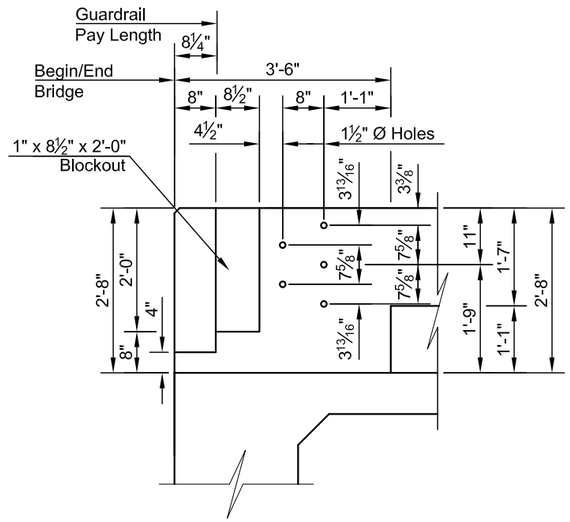
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	23



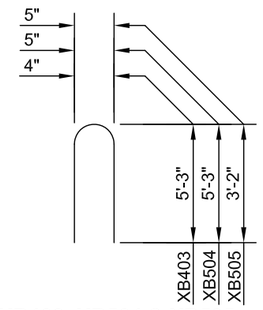
BARRIER END SECTION PLAN



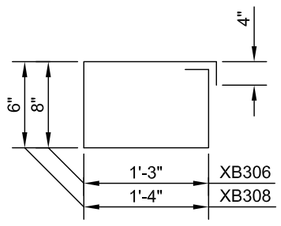
BLOCKOUT DETAIL
(Plan)



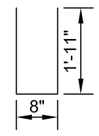
BLOCKOUT DETAIL
(Elevation, Along Traffic Face)



XB403, XB504 & XB505



XB306 & XB308



XB307

BILL OF REINFORCEMENT (BARRIERS)

Bar	No.	Size	Length	Shape	Location
XB601	120	6	9'-7"		Horizontal, Interior Section
XB602	24	6	9'-0"		Horizontal, End Section
XB403	4	4	10'-8"		Horizontal, End Section
XB504	8	5	10'-8"		Horizontal, End Section
XB505	8	5	6'-6"		Horizontal, End Section
XB306	44	3	4'-6"		Post Tie
XB307	176	3	4'-6"		Post Tie
XB308	332	3	4'-4"		Barrier Tie

QUANTITIES

CLASS AAE-3 CONCRETE	17.2 CY
REINFORCING STEEL-GRADE 60-EPOXY COATED	3,137 LBS

NOTE:

An "X" preceding a bar designation indicates an epoxy coated bar.

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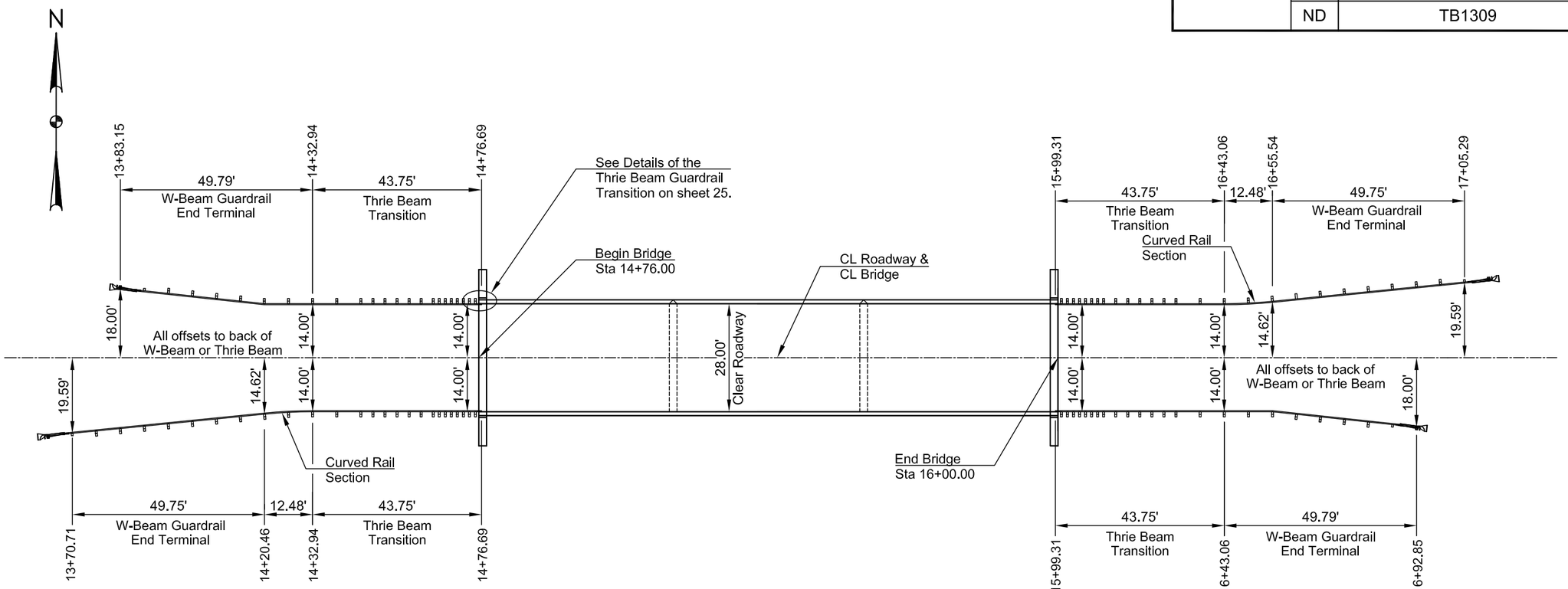
TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

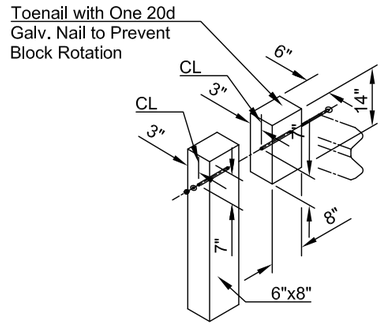
CONCRETE BARRIER II

DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

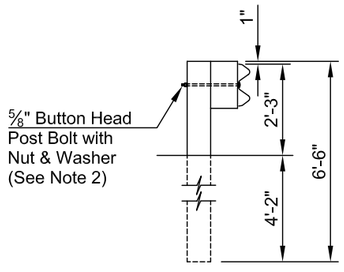
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	24



GUARDRAIL STAKING DIAGRAM



POST & BLOCK DETAILS



POST DIMENSIONS

NOTES:

1. Rail element shall meet the requirements of Standard Drawing D-764-1.
2. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1¾" O.D. washer and not more than 1" beyond it.

   Button head "splice" bolts (ASTM A307) are ⅝"Ø with a ⅝"Ø recessed nut (ASTM A563).
3. All hardware (bolts, nuts, and washers) shall be galvanized in accordance with AASHTO M232. Hardware shall not be measured for separate payment but shall be included in the unit price bid for "W-BEAM GUARDRAIL".
4. Guardrail posts shall not be set in concrete.
5. Refer to Standard Drawing D-764-1 for additional details except as follows. Omit Standard Drawing D-764-1 post length of 6'-0" and use 6'-6" post length for all posts.
6. An additional 92 Tons of "AGGREGATE SURFACE COURSE CL 13" has been provided for guardrail widening.

QUANTITIES	
W-BEAM GUARDRAIL	200.0 LF
W-BEAM GUARDRAIL END TERMINAL	4 EA

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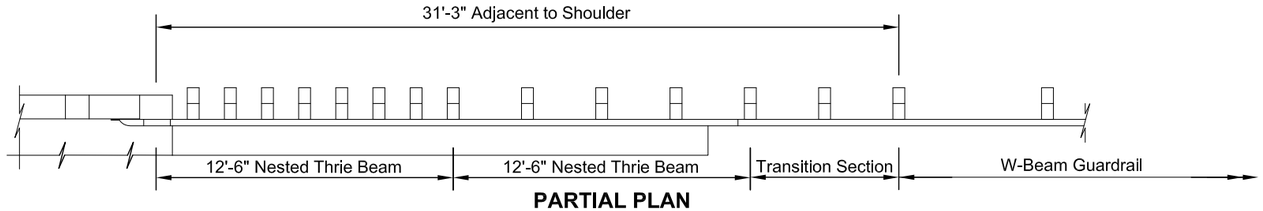
TB 1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

GUARDRAIL LAYOUT

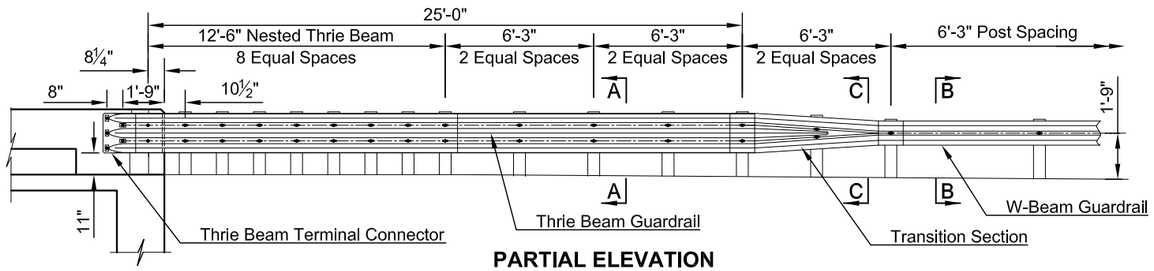
DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

Feb 21, 2014 - 9:29am - J:\trans\14313109\Cadd\Site 4 - 1309\Bridge\130GR_001_GDRL.dwg

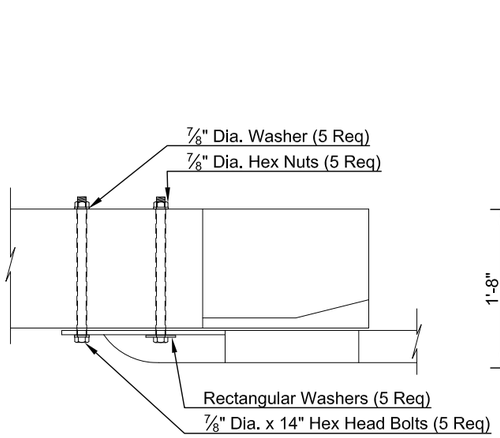
	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	25



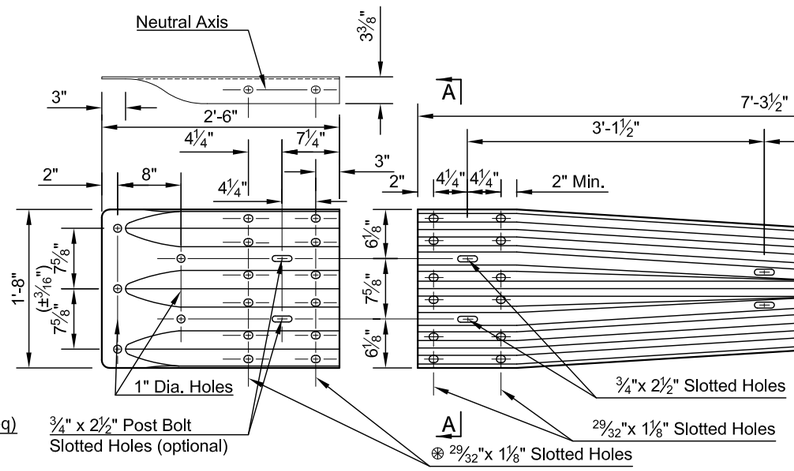
PARTIAL PLAN



PARTIAL ELEVATION

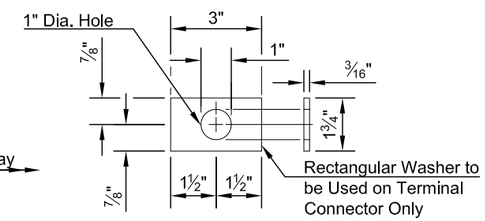


DETAIL BRIDGE ATTACHMENT

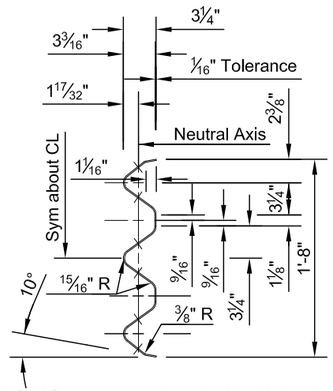


TERMINAL CONNECTOR

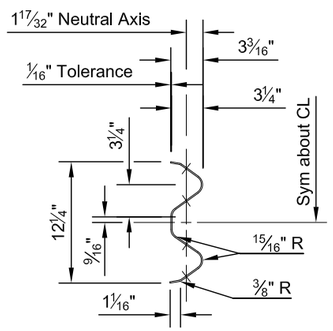
ELEVATION
TRANSITION SECTION
(From Thrie Beam to W-Beam Rail)



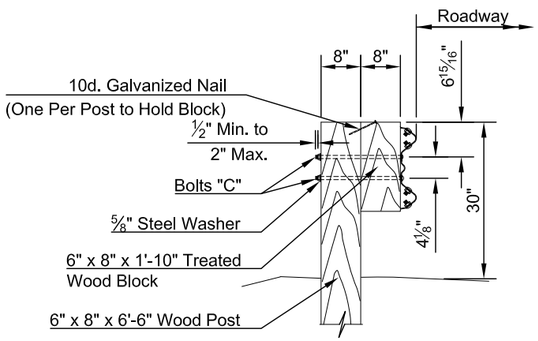
RECTANGULAR WASHER
(Other Approved Washer May Be Used)



SECTION A-A THRU RAIL ELEMENT
TYPICAL THRIE BEAM



SECTION B-B THRU RAIL ELEMENT
TYPICAL W-BEAM



SECTION C-C (WOOD POST)

GENERAL NOTES:

Rail element shall be #10 or #12 U.S. Standard Gauge except where specific gauge is required, such as at end terminal or bullnose sections.

Galvanized steel rail elements shall be used. All post rail fittings and anchor bolts shall be galvanized in accordance with Standard Specifications.

Guardrail parts furnished under this specification shall be interchangeable with similar parts regardless of the source or manufacturer.

When radius is less than 150', rails are to be shop curved.

Terminal connector shall be 10 gauge steel. The connector has the same section as Thrie beam guardrail. Terminal connector shall be subsidiary to the bid item "W-Beam Guardrail".

All guardrail splices, including special end shoes, shall be lapped in the direction of traffic. Where traffic is temporarily carried in the direction opposite of the final configuration, the rail splices shall be lapped in the direction of the permanent traffic.

Bridge rail transition shall consist of one 25'-0" Thrie beam section, one 12'-6" Thrie beam section nested in back of 25'-0" section, one Thrie beam to W-beam transition section, posts located as shown, and all associated hardware. The remainder of the guardrail shall be W-beam with 6'-3" post spacing and may be furnished in either 12'-6" or 25'-0" sections.

All material and work required for this construction shall be included in the pay item "W-Beam Guardrail."

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TB1309
CASS COUNTY, NORTH DAKOTA
BRIDGE #09-104-30.0

GUARDRAIL DETAILS & THRIE BEAM TRANSITION

DRWN. BY	CHK'D BY	PROJECT NO.
BJJ	JMG	14313109

STATE	PROJECT NO.	SHEET NO.
ND	TB1309	26

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)		6	
G20-1a-60	60"x24"	ROAD WORK NEXT __ MILES		34	
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)		26	
G20-2a-48	48"x24"	END ROAD WORK		19	
G20-4-36	36"x18"	PILOT CAR FOLLOW ME		18	
G20-10-108	108"x48"	CONTRACTOR SIGN		64	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		37	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		30	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT		59	
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR ARROW RIGHT or LEFT		23	
M5-1-21	21"x15"	ARROW AHD AND RT or LT(Mounted on route marker post)		7	
M5-2-21	21"x15"	ARROW AHD UP & RT or LT (Mounted on route marker post)		7	
M6-1-21	21"x15"	ARROW RT or LT (Mounted on route marker post)		7	
M6-2-21	21"x15"	ARROW UP & RT or LT (Mounted on route marker post)		7	
M6-3-21	21"x15"	ARROW AHD (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-1a-18	18"x18"	STOP and SLOW PADDLE Back to Back		5	
R1-2-60	60"x60"	YIELD		29	
R2-1-48	48"x60"	SPEED LIMIT __		39	
R2-1a-24	24"x18"	MINIMUM FEE $80 (Mounted on Speed Limit post)		10	
R3-7-48	48"x48"	LEFT or RIGHT LANE MUST TURN LEFT or RIGHT		35	
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT SYMBOL		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-36	36"x12"	ONE WAY RIGHT or LEFT		13	
R7-1-12	12"x18"	NO PARKING		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	**48"x30"**	**ROAD CLOSED**	**2**	**28**	**56**
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	**60"x30"**	**ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY**	**2**	**31**	**62**
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC		31	
W1-3-48	48"x48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW		35	
W1-4-48	48"x48"	RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-6-48	48"x24"	LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD SYMBOL		35	
W3-3-48	48"x48"	SIGNAL AHEAD SYMBOL		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	48"x48"	SPEED REDUCTION AHEAD		35	
W4-2-48	48"x48"	RIGHT or LEFT LANE TRANSITION SYMBOL		35	
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC SYMBOL		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-9a-48	48"x48"	SHOULDER DROP-OFF		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER STRIPE		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT.		35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT.		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W12-2-48	48"x48"	LOW CLEARANCE SYMBOL		35	
W13-1-24	24"x24"	__ MPH ADVISORY SPEED PLATE (Mounted on warning sign post)		11	
W13-4-48	48"x60"	RAMP ARROW		39	
W14-3-48	48"x36"	NO PASSING ZONE		23	
W20-1-48	48"x48"	ROAD WORK AHEAD or _FT or _ MILE		35	
W20-2-48	48"x48"	DETOUR AHEAD or __ FT		35	
W20-3-48	**48"x48"**	**ROAD or STREET CLOSED AHEAD or __ FT.**	**4**	**35**	**140**
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT.		35	
W20-5-48	48"x48"	RIGHT or LEFT LANE CLOSED AHEAD or __ FT.		35	
W20-7a-48	48"x48"	FLAGGING SYMBOL		35	
W20-7k-24	24"x18"	__ FEET (Mounted on warning sign post)		10	
W20-8-48	48"x48"	STREET CLOSED		35	
W20-51-48	48"x48"	EQUIPMENT WORKING		35	
W20-52-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1a-48	48"x48"	WORKERS SYMBOL		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT		35	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT.		35	
W21-6a-48	48"x48"	SURVEY CREW AHEAD		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT.		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
	24"x24"	TAKE TURNS (6" D letters) (Mounted on stop sign post)		11	

SPECIAL SIGNS

SPEC & CODE			
704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**258**

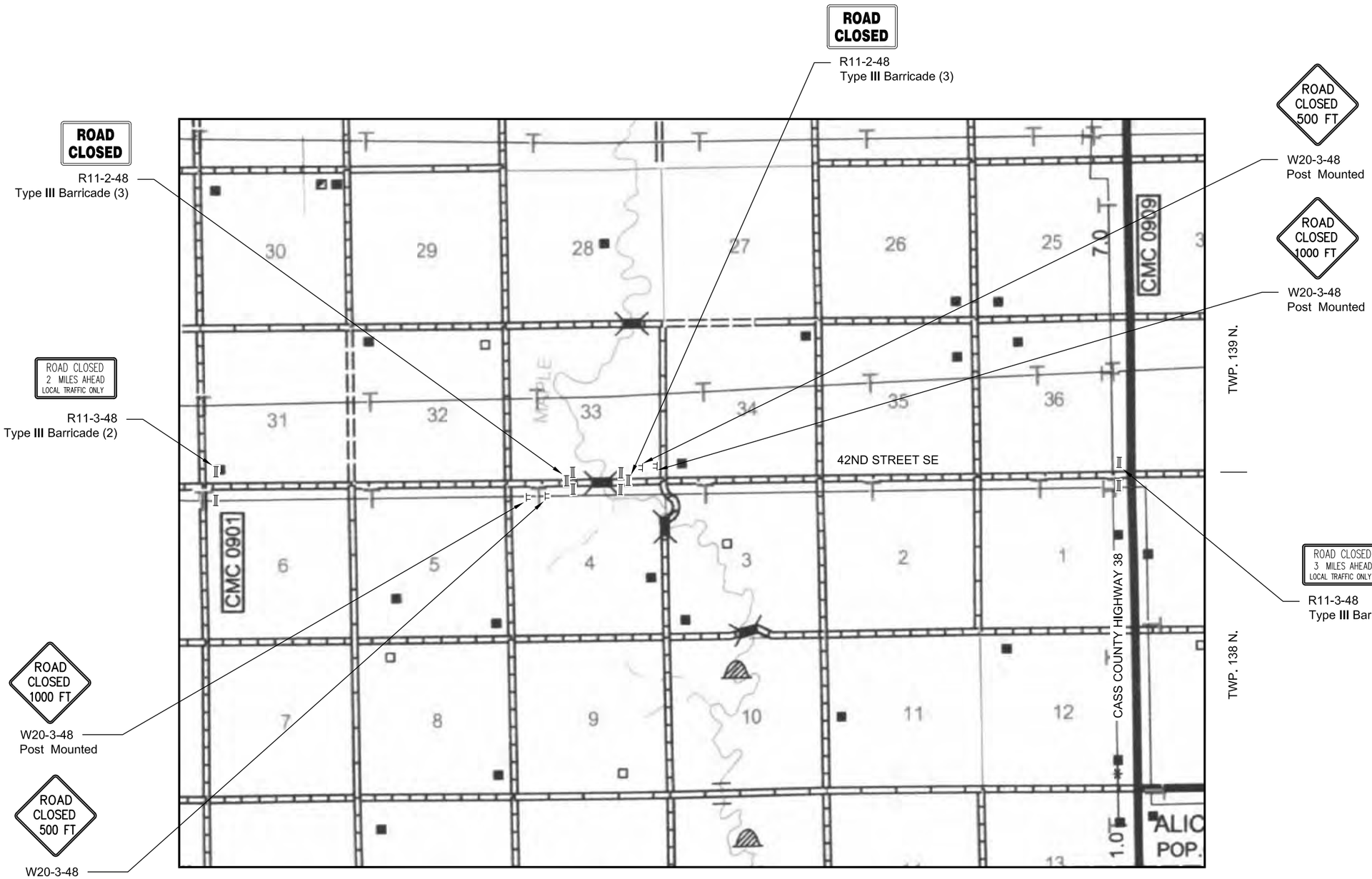
SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH	
704-1043	ATTENUATION DEVICE-TYPE B-65	EACH	
704-1044	ATTENUATION DEVICE-TYPE B-70	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1051	TYPE II BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**10**
704-1060	DELINEATOR DRUMS	EACH	
704-1065	TRAFFIC CONES	EACH	
704-1067	TUBULAR MARKERS	EACH	
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	
704-1088	SEQUENCING ARROW PANEL - TYPE C - CROSSOVER	EACH	
704-1095	TYPE B FLASHERS	EACH	
704-1185	PILOT CAR	HR	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	
762-1500	OBLITERATION OF PVMT MK	SF	
772-2110	FLASHING BEACON - POST MOUNTED	EACH	

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-19.06 of the Design Manual.
http://www.dot.nd.gov/

This document was originally issued and sealed by Matt Lange Registration Number PE-6870, on 02/21/2014 and the original document is stored at the Cass County Highway Department, West Fargo, ND.

Traffic Control Devices List

	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	27



The sign layout as shown is for general information purposes only. The contractor will be required to conform to MUTCD and the Standard Drawings when installing the traffic control signing.

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TB1309
CASS COUNTY, NORTH DAKOTA

TRAFFIC CONTROL SIGNING

DRWN. BY	CHK'D BY	PROJECT NO.
KS	ML	14313109

Feb 21, 2014 - 9:14am - J:\trans\14313109\Cadd\Site 4 - 1309\Plans\14313109_100WZ_002.dwg

STATE	PROJECT NO.	SHEET NO.
N.D.	TB1309	28

Sta/RP	Sign No.	Assembly No.	Flat Sheet For Signs IV SF	Flat Sheet For Signs XI SF	Sign Support Length 1st LF	2nd LF	3rd LF	4th LF	Support Size	Max Post Len LF	Sleeve Length 1st LF	2nd LF	3rd LF	4th LF	Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
11+76 Rt	R2-1	9		5.0	13.6				2.25 x 2.25 12 ga	15.0						1	4	2.5 x 2.5 12 ga				
19+00 Lt	R2-1	9		5.0	13.6				2.25 x 2.25 12 ga	15.0						1	4	2.5 x 2.5 12 ga				
Sub Total			0.0	10.0		**Total**	27.2									**Total**	8		0	0	0	
Grand Total			0.0	10.0		**Total**	27.2									**Total**	8		0	0	0	

Basis of Estimate
Sign Support Lengths

The sign support lengths have been calculated using the following vertical clearances:

Rural Roadway - 60"

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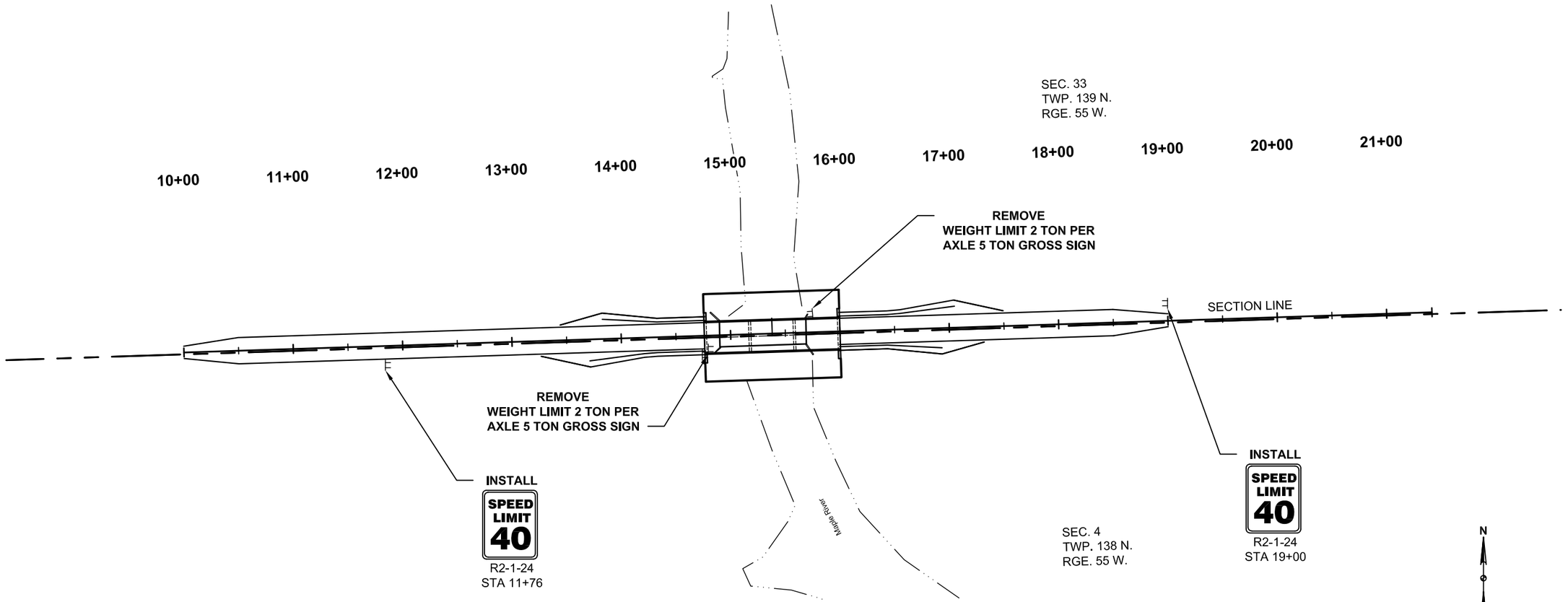
Sign Summary
Perforated Tube

	STATE	PROJECT NO.	SHEET NUMBER
	ND	TB1309	29



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TB1309

CASS COUNTY, NORTH DAKOTA

KLJ

SIGNING LAYOUT

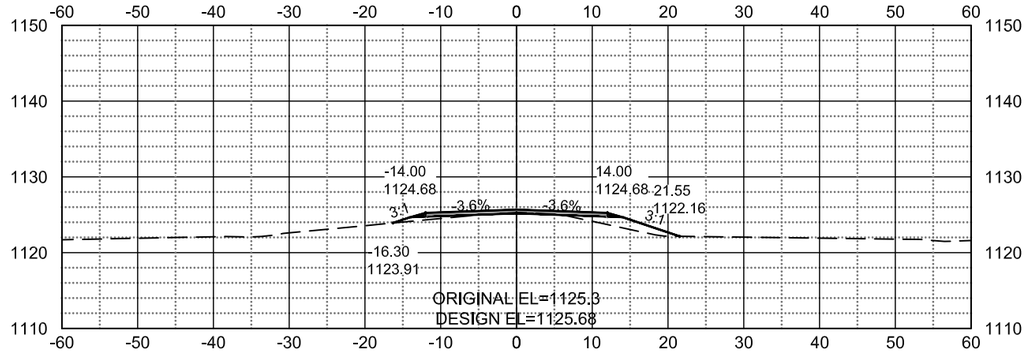
DRWN. BY	CHK'D BY	PROJECT NO.
KS	ML	14313109

Feb 21, 2014 - 9:15am - J:\trans\14313109\Cadd\Site 4 - 1309\Plans\14313109_110SN_002.dwg

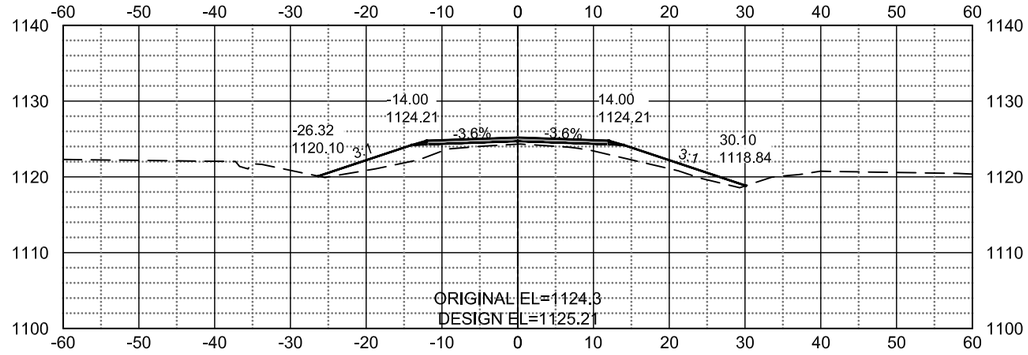
CROSS-SECTIONS

STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	30

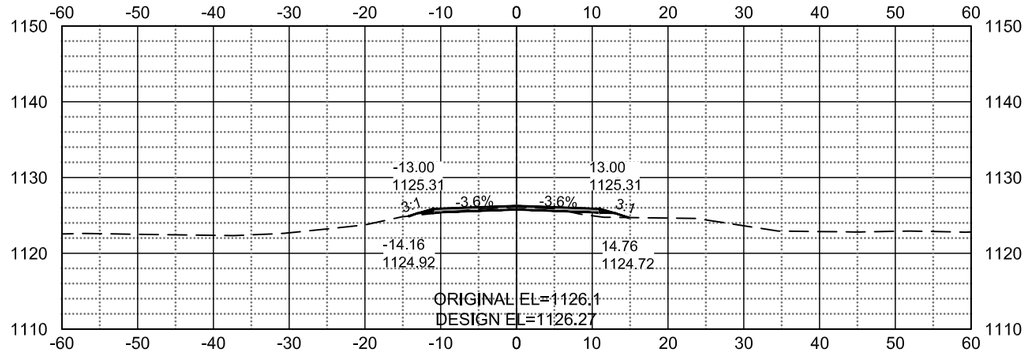
11+00.00



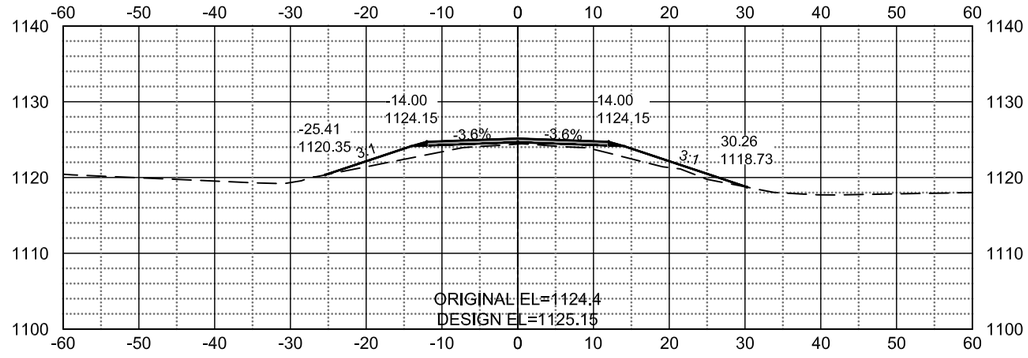
12+50.00



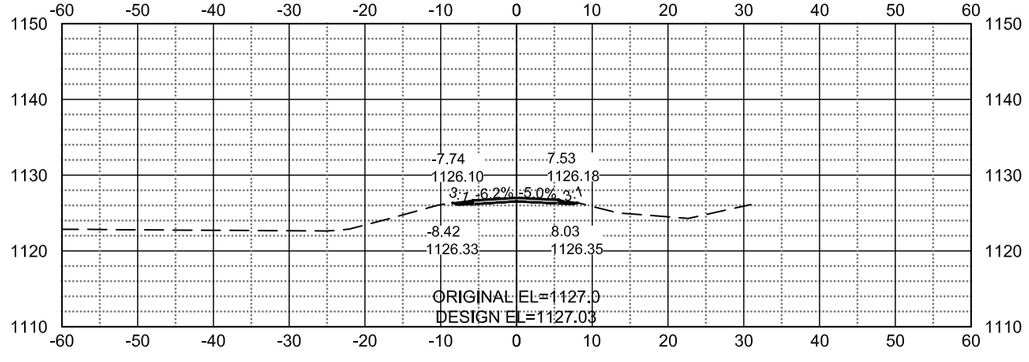
10+50.00



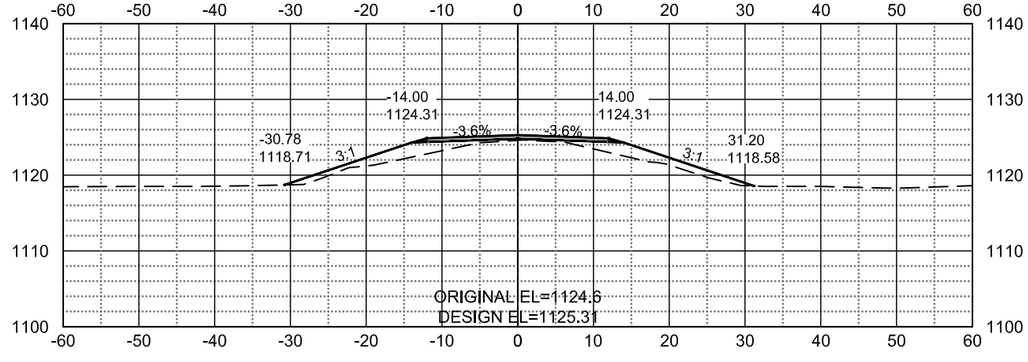
12+00.00



10+00.00



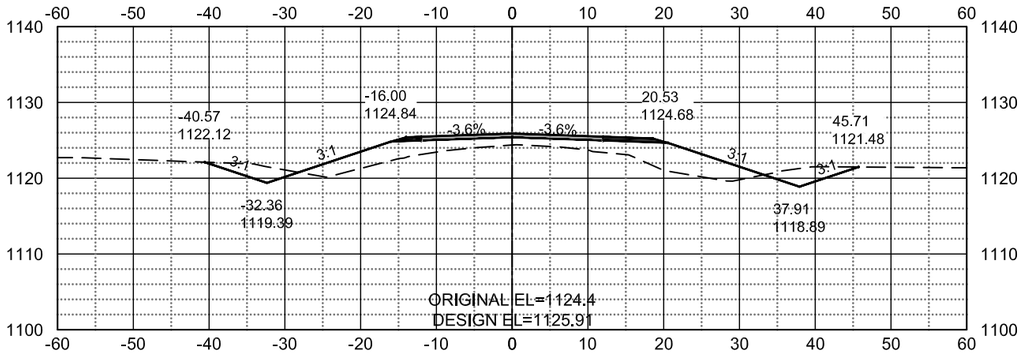
11+50.00



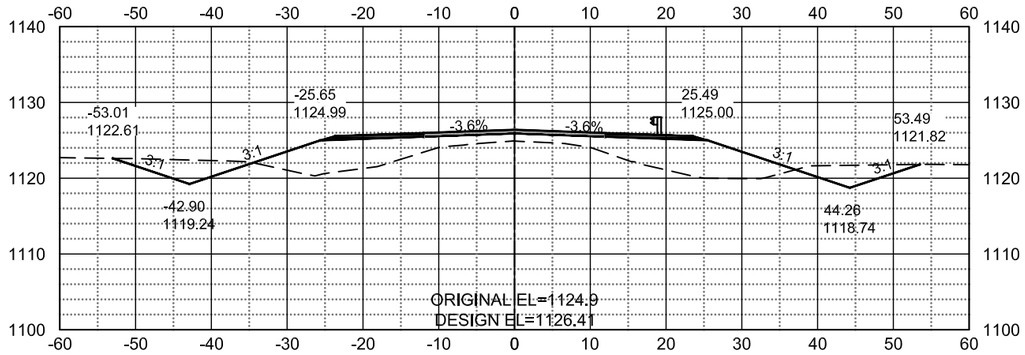
CROSS-SECTIONS

STATE	PROJECT NO.	SHEET NUMBER
ND	TB1309	31

13+44.48



13+83.08



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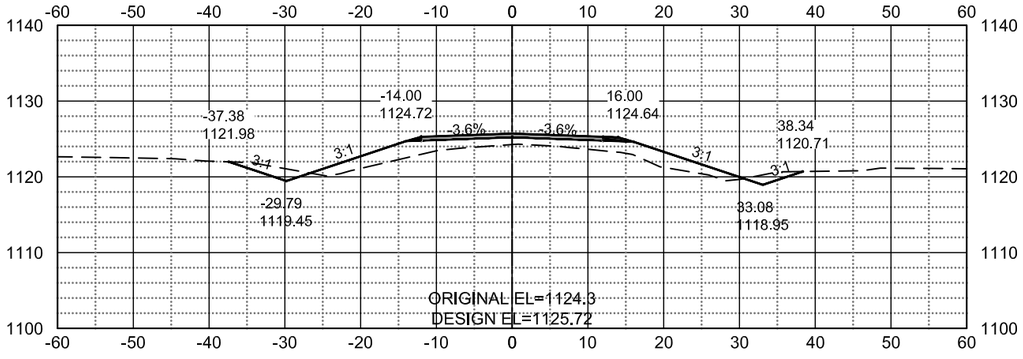

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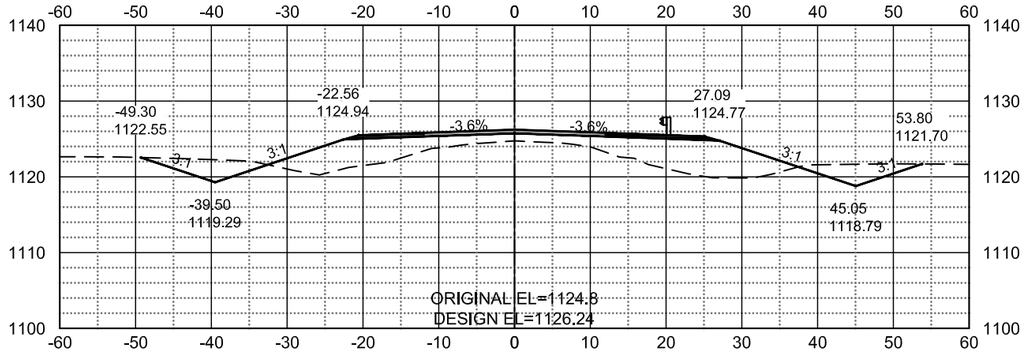

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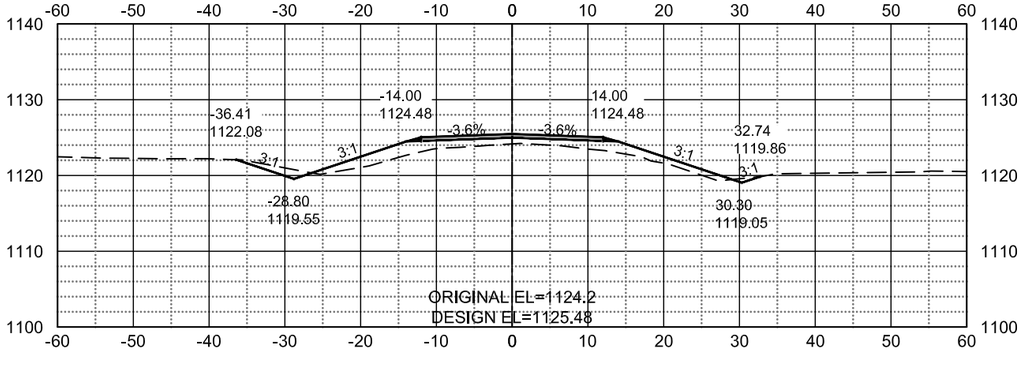

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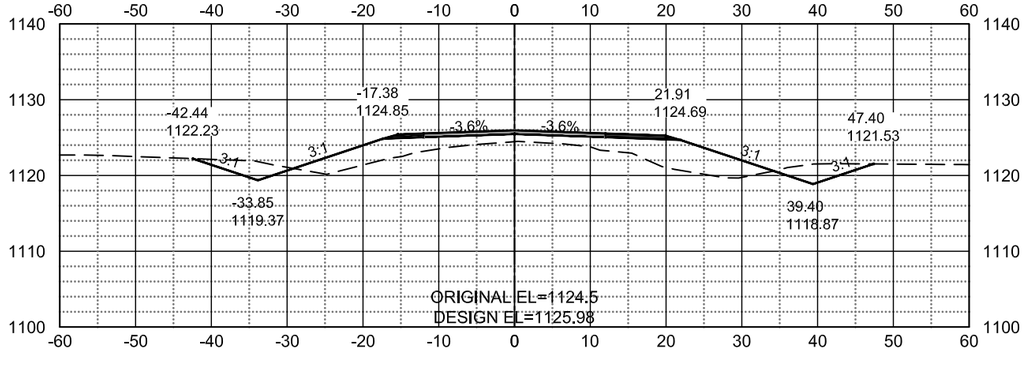

CROSS-SECTIONS

STATE	PROJECT NO.	SHEET NUMBER
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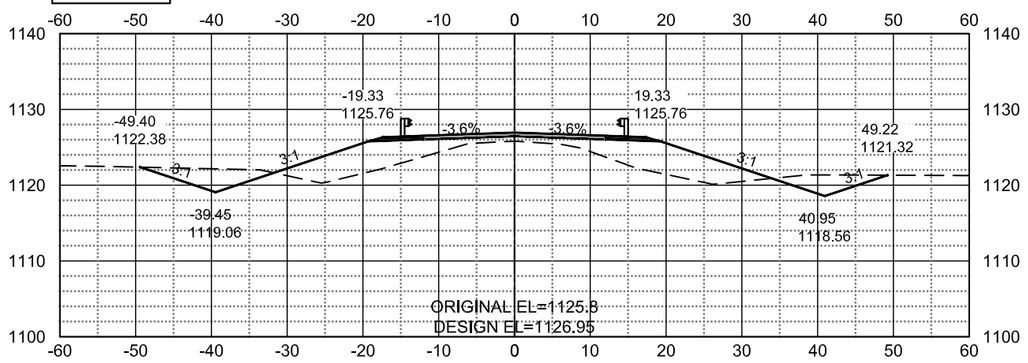

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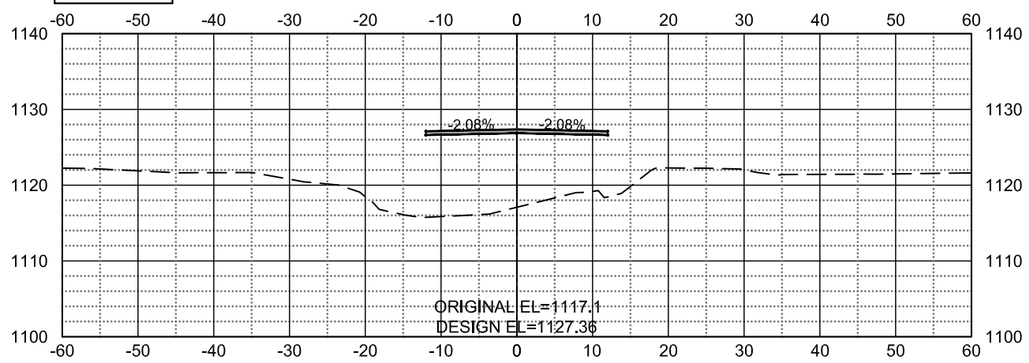

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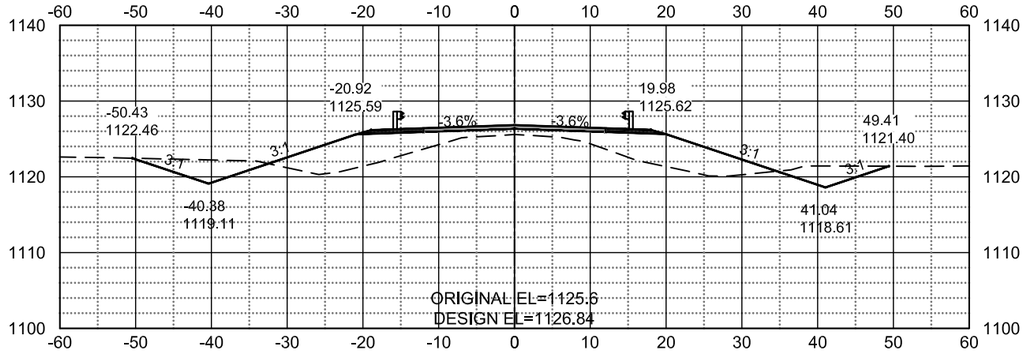

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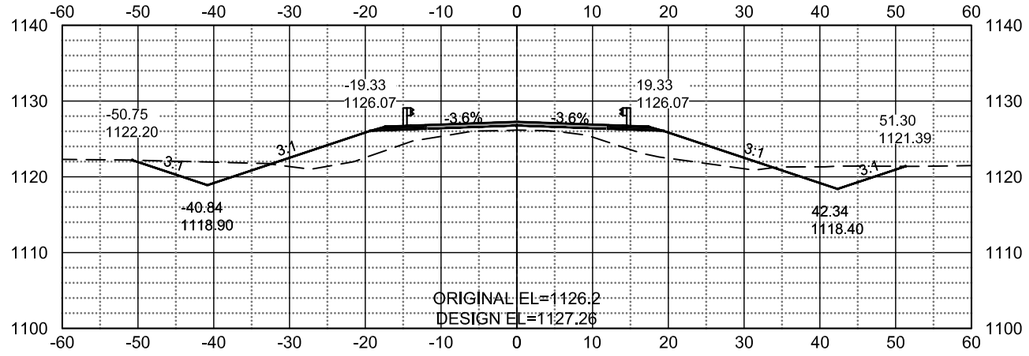

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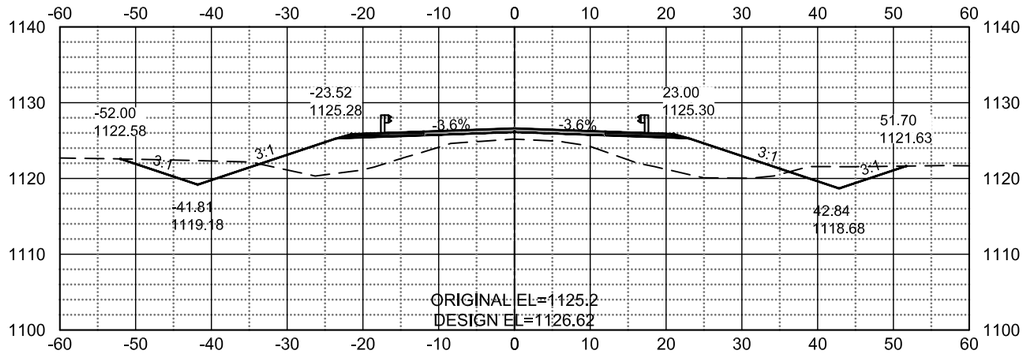

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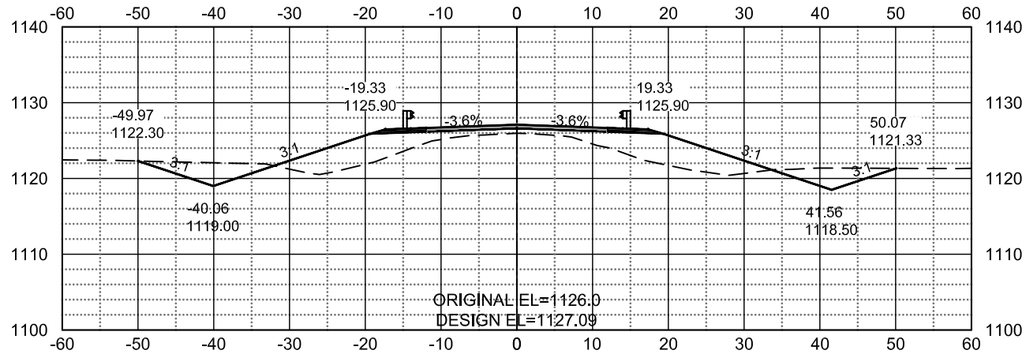

CROSS-SECTIONS

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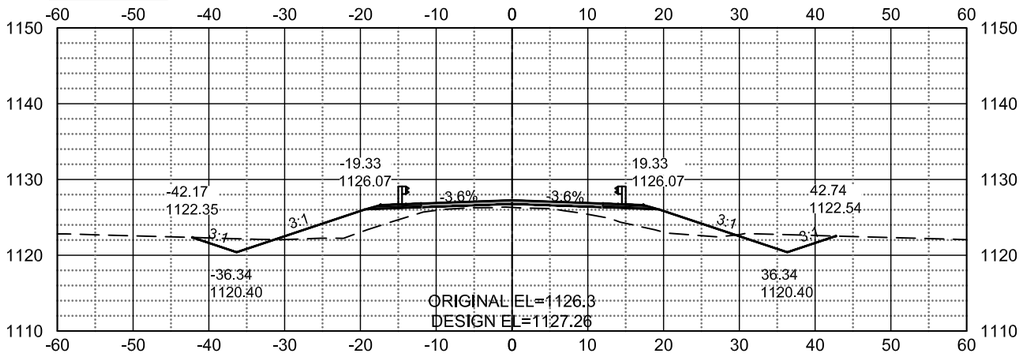

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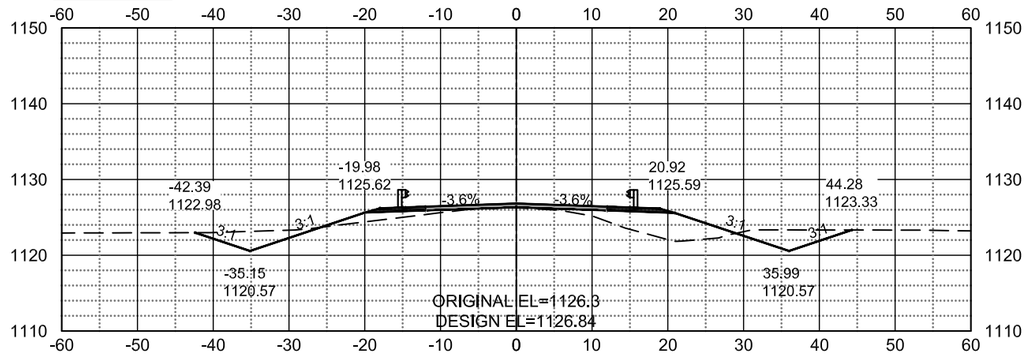

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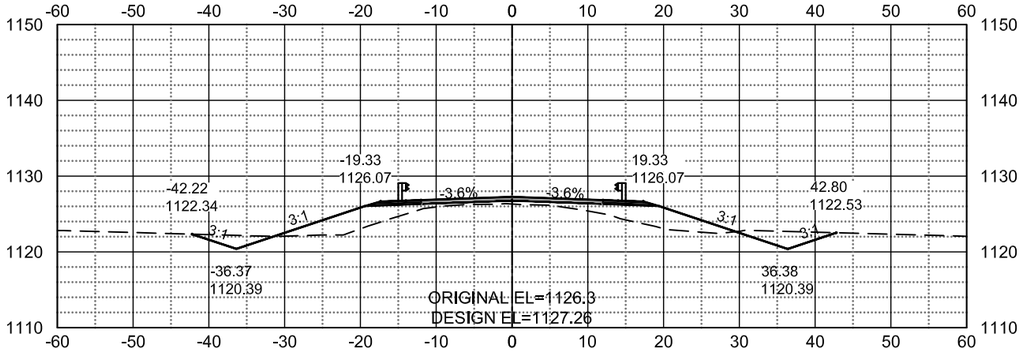

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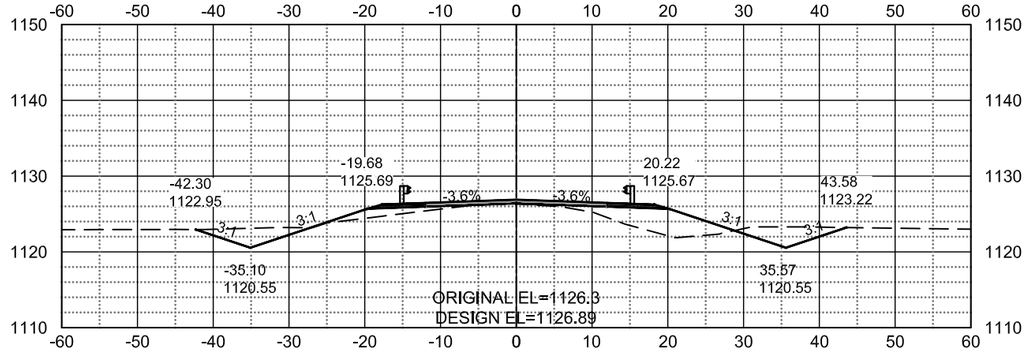

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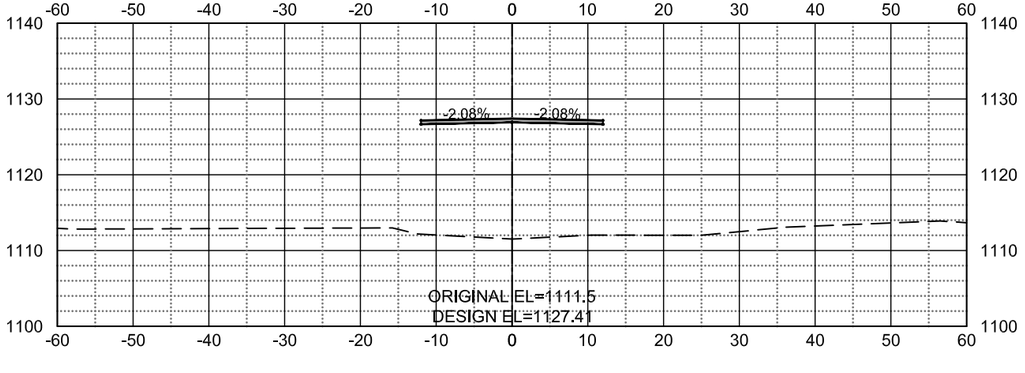

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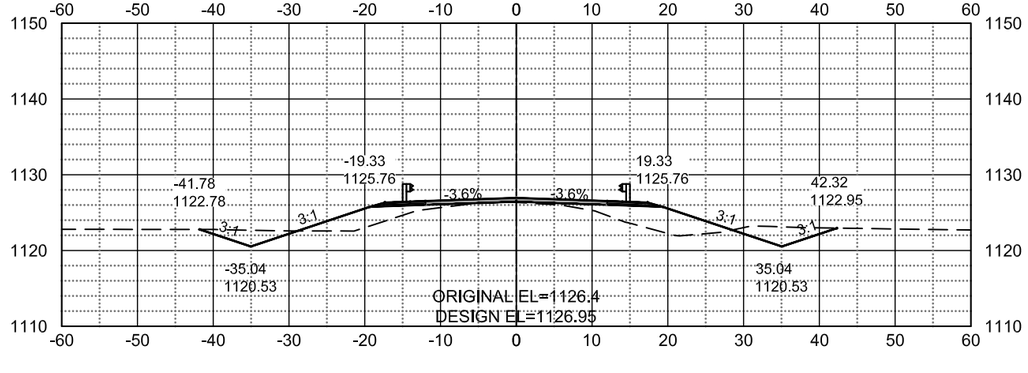

CROSS-SECTIONS

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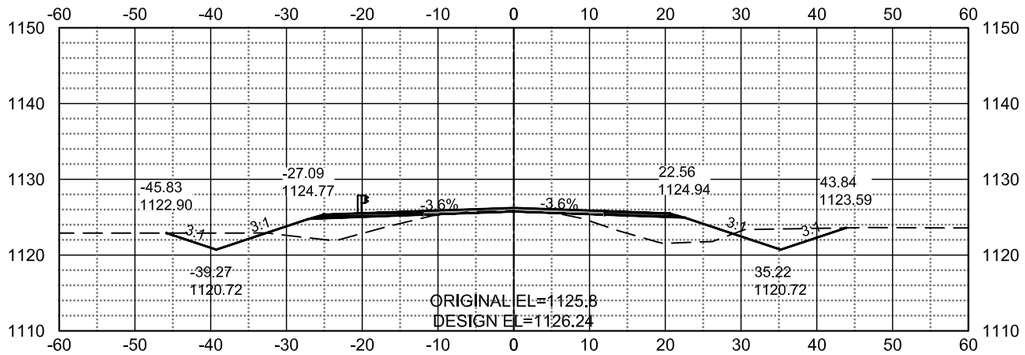

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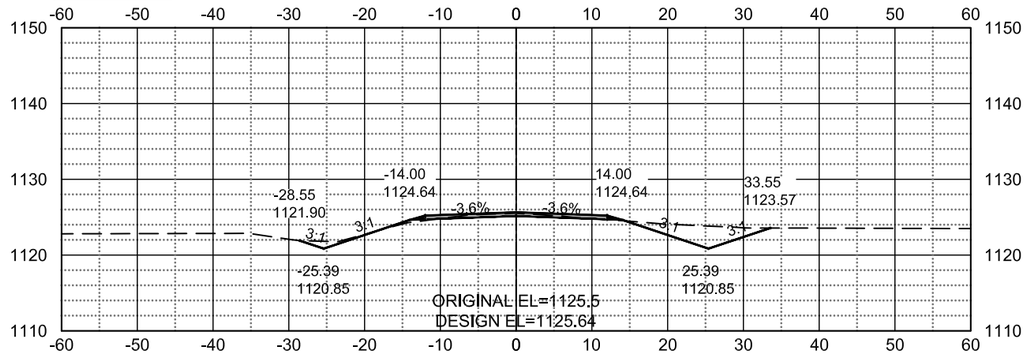

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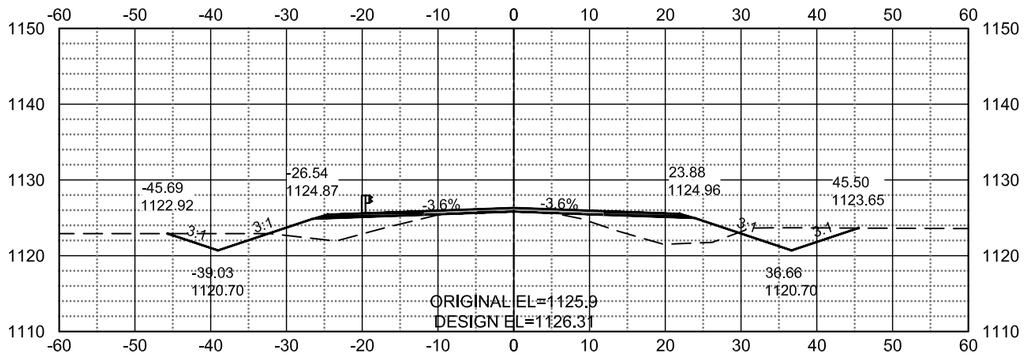

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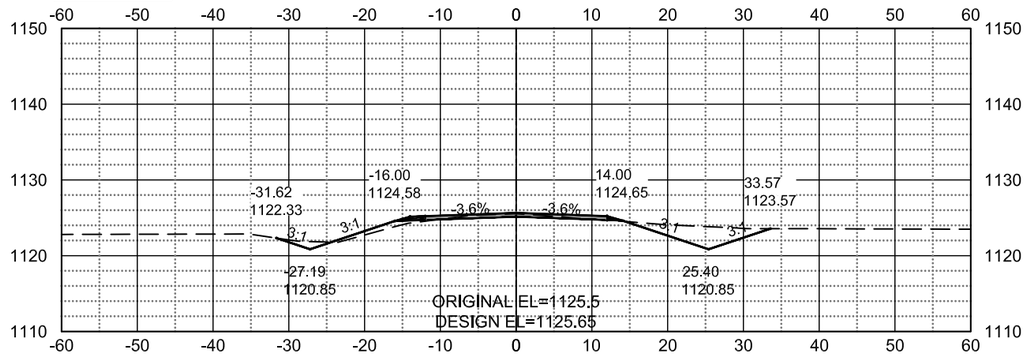

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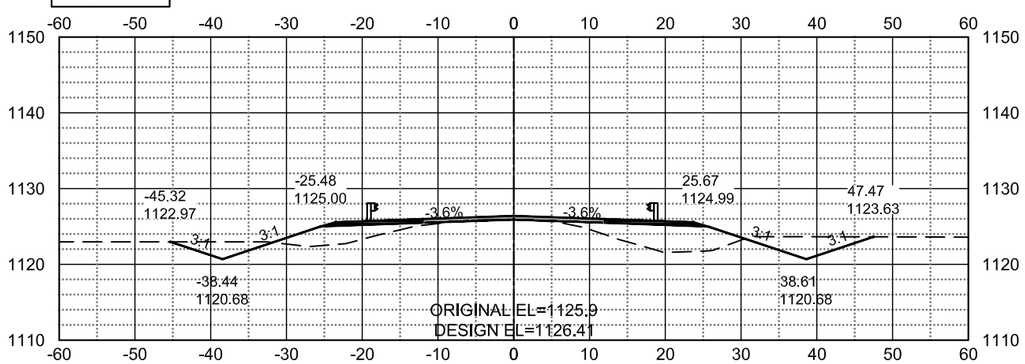

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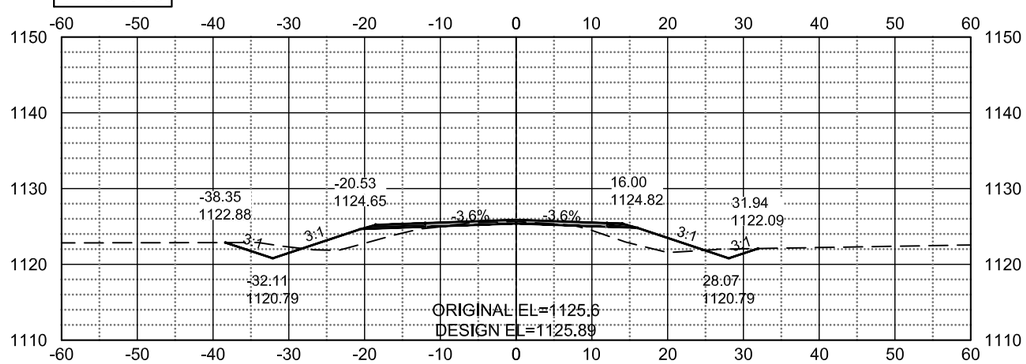

CROSS-SECTIONS

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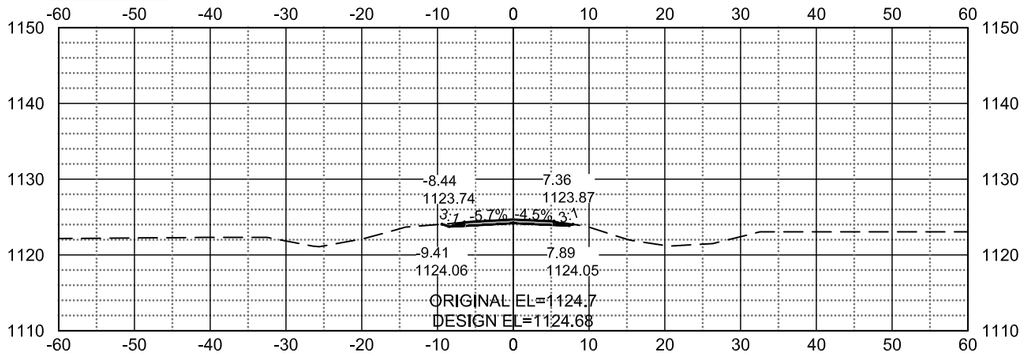

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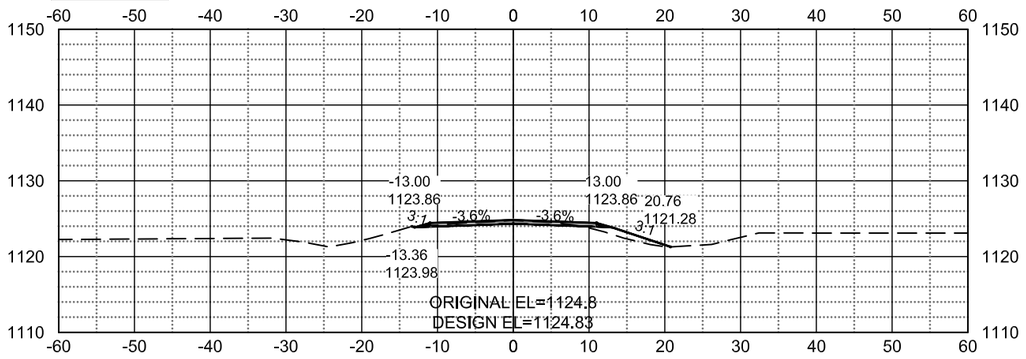

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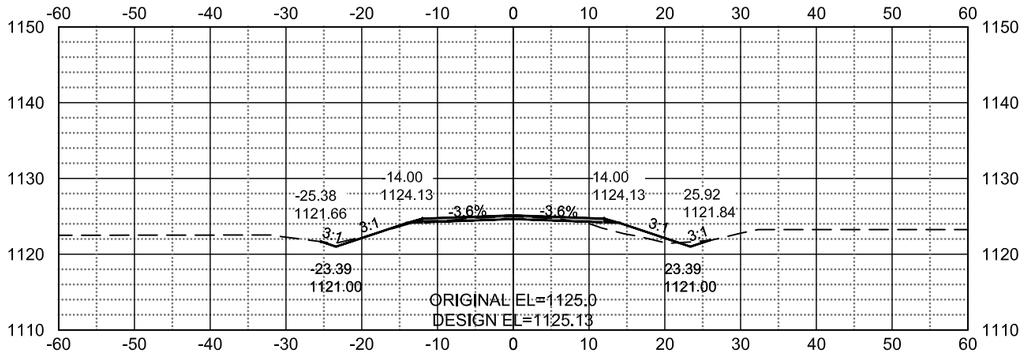
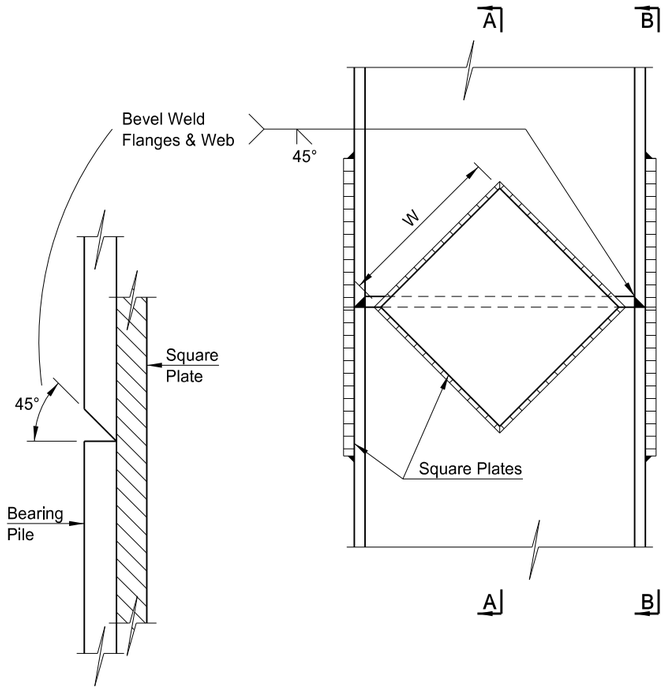


PILE SPLICE DETAILS

D-622-1

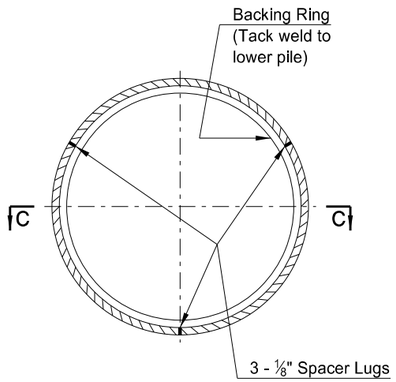


ENLARGED VIEW

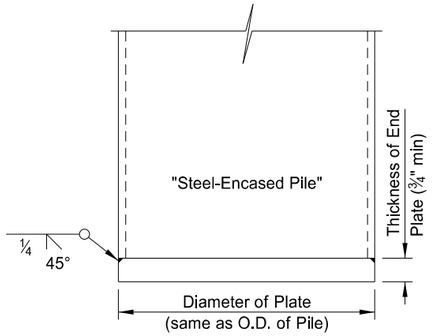
B-B

A-A

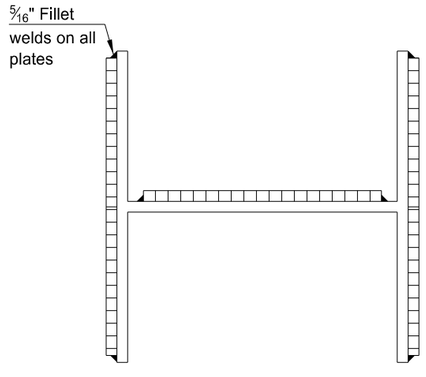
Flame scarf inside of both flanges and one side of web of upper section.



Backing Ring may be made from pile cut-offs or other material of a like quality.

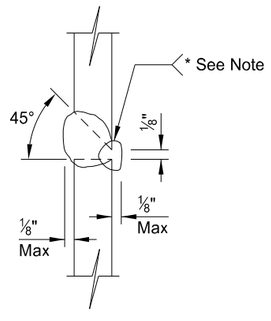


END PLATE DETAIL

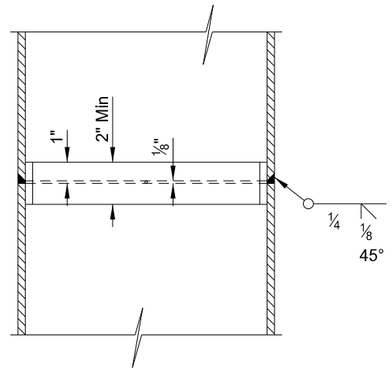


PILE	8"	10"	12"	14"
"F" FLANGE	5"	6½"	8"	10"
"W" WEB	4"	5½"	6½"	8"

H-PILE SPLICE DETAIL

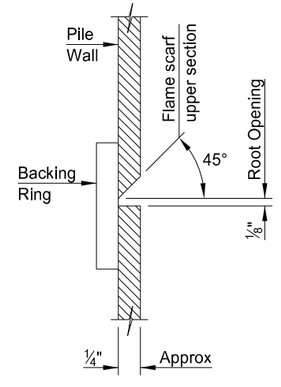


ALTERNATE H-PILE SPLICE DETAIL



C-C

STEEL-ENCASED CONCRETE PILE SPLICE DETAIL



ENLARGED VIEW

NOTES:

Steel H-Pile may be spliced with complete penetration groove welds in both flanges and web in lieu of using the reinforcing plates.

AWS classification E7OXX Low Hydrogen Electrodes shall be used.

* Welds made without the use of backing material shall have the root gouged to sound metal and welded from the second side.

All welding shall conform to the current AASHTO/AWS D1.5 Bridge Welding Code.

The thickness of the steel square plates shall at a minimum be as thick as the flanges and web of the pile being spliced.

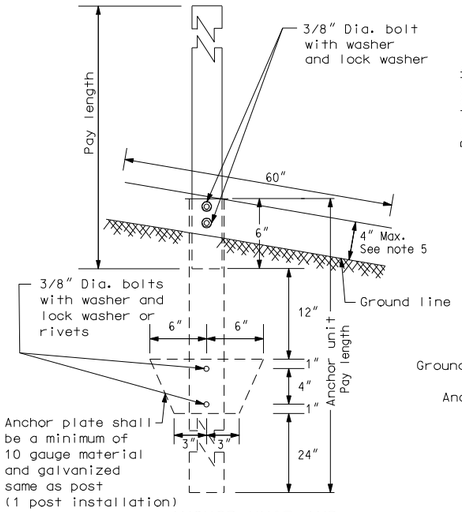
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
09/14/11	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Terrence R. Udland, Registration Number PE-2674, on 09/14/11 and the original document is stored at the North Dakota Department of Transportation

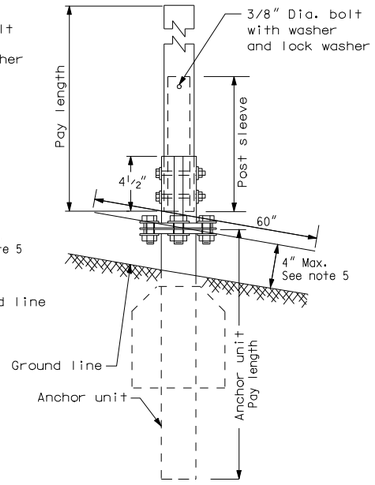
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

PERFORATED TUBE

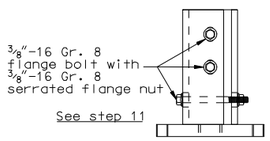
D-704-7

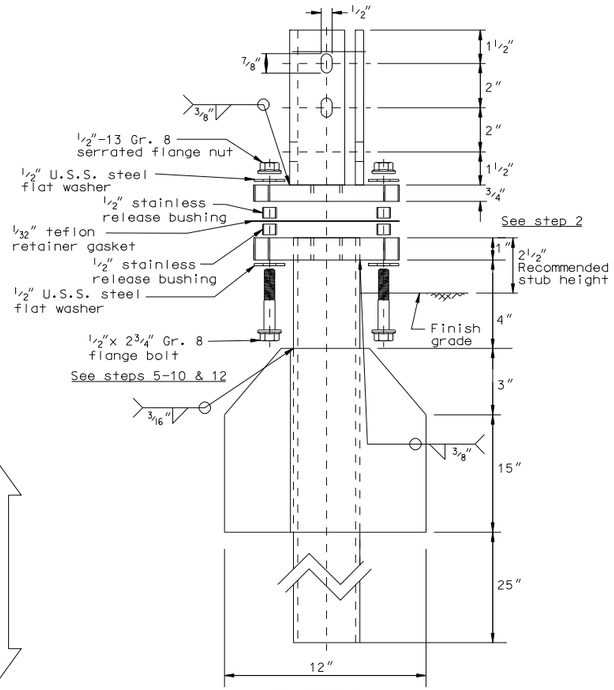


ANCHOR UNIT AND POST ASSEMBLY

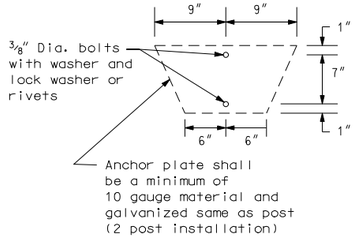


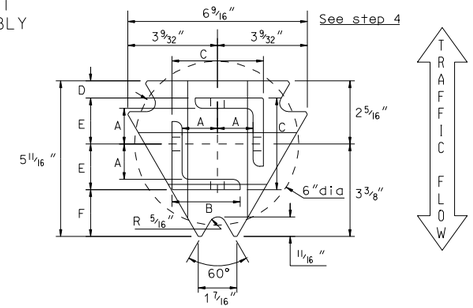
SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY





MULTI-DIRECTIONAL SLIP BASE ASSEMBLY



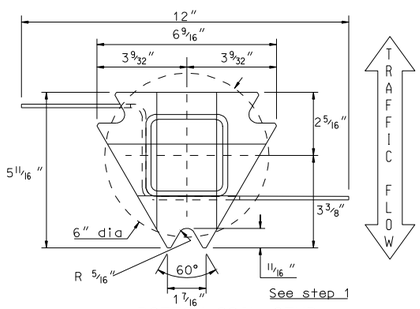


TOP POST RECEIVER

Materials: Plate - ASTM A572 grade 50
Angle receiver - $2\frac{1}{2}$"x $2\frac{1}{2}$"x $\frac{3}{8}$" ASTM A36 structural angle

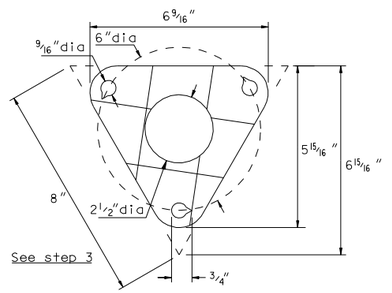
TOP POST RECEIVER DATA TABLE						
Square Post Sizes	A	B	C	D	E	F
$2\frac{3}{16}$" x 10 Ga. Square Post	$1\frac{9}{64}$"	$2\frac{1}{2}$"	$3\frac{1}{32}$"	$\frac{25}{32}$"	$1\frac{33}{64}$"	$1\frac{7}{8}$"
$2\frac{1}{2}$" x 10 Ga. Square Post	$1\frac{9}{32}$"	$2\frac{1}{2}$"	$3\frac{5}{16}$"	$\frac{5}{8}$"	$1\frac{21}{32}$"	$1\frac{3}{4}$"

$2\frac{3}{16}$" x 10 gauge may be inserted into $2\frac{1}{2}$" x 10 gauge for additional wind load.



BOTTOM SOIL STUB

Materials: Tube - 3"x 3"x 7 gauge ASTM A500 Gr B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A 569
Plate - ASTM A572 grade 50



BOLT RETAINER FOR BASE CONNECTION

Materials: 1/32" reprocessed Teflon

MULTI-DIRECTIONAL SLIP BASE ASSEMBLY	
STEP	INSTALLATION PROCEDURE
1.	Install bottom soil anchor stub plumb and squared up with road, with point of plate facing oncoming traffic.
2.	Depth of imbedment to leave $2\frac{1}{2}$" from grade to top of anchor plate.
3.	Place teflon bolt retainer gasket on top of bottom plate (make sure that notches in holes are pointing counter clockwise).
4.	Place top post receiver on to retainer gasket, properly indexed so that angle receivers are squared up with road.
5.	Slide 1 each $\frac{1}{2}$" flat washer on to 1 each inverted $\frac{1}{2}$"-13 gr. 8 flange bolt, followed by 1 each stainless steel release bushing.
6.	Insert above bolt with washer and bushing up through notched points of top and bottom plates, passing through hole in gasket.
7.	Slide second bushing down on to above bolt until it rests on top of gasket followed by second washer.
8.	Complete by threading $\frac{1}{2}$"-13 gr. 8 serrated flange nut snugly down against top of washer.
9.	Repeat steps 5,6,7 & 8 at the two remaining notched triangle points.
10.	Insert sign post into angle receivers on top half until post(s) bottom out. *NOTE: Where higher wind load is desired, insert the next size smaller square post inside bottom of main upright post (Minimum of 48", not to exceed beyond bottom edge of sign).
11.	Secure posts into receivers using 3 each $\frac{3}{8}$"-16 gr. 8 flange bolts and 3 each $\frac{3}{8}$"-16 serrated flange nuts in receiver slots (top 2 bolts should be parallel to highway) do not tighten nuts until all bolts are in place.
12.	After all sub-assembly hardware is tightened, then torque the three $\frac{1}{2}$"-13 nuts to 42 ft-lbs, in a circular pattern until all bolt assemblies reach the required torque. *NOTE: On multi-leg installations, be sure that all anchors are squared and lined up with each other.

Notes
1. Slip base bolts shall be torqued as specified by the manufacturer.
2. The $2\frac{3}{16}$" size 10 gauge is shown as 2.19" size on the plans. The $2\frac{1}{2}$" size 10 gauge is shown as 2.51" size on the plans.
3. Anchor for 2", $2\frac{1}{4}$", and $2\frac{1}{2}$" posts.
4. Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3"x 3"x 7 gauge ASTM A500 Grade B. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/A153. All tolerances on anchor unit and slip base bottom assembly are ± 0.005 unless otherwise noted.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
6. When used in concrete sidewalk, anchor shall be the same except without the wings.
7. Four post signs shall have over 8' between the first and fourth posts.

Telescoping Perforated Tubes							
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia $In.^4$	Cross Sect. area $In.^2$	Section Modulus $In.^3$
$1\frac{1}{2}$ x $1\frac{1}{2}$	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
$2\frac{1}{4}$ x $2\frac{1}{4}$	0.105	12	2.773	0.561	0.695	0.499
$2\frac{3}{16}$ x $2\frac{3}{16}$	0.135	10	3.432	0.605	0.841	0.590
$2\frac{1}{2}$ x $2\frac{1}{2}$	0.105	12	3.141	0.804	0.803	0.643
$2\frac{1}{2}$ x $2\frac{1}{2}$	0.135	10	4.006	0.979	1.010	0.785
4 x 4	0.250	$\frac{1}{4}$	6.600	3.040	1.940	1.050

Telescoping Perforated Tube						
Number of Posts	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.
1	2	12			No	$2\frac{1}{4}$
1	$2\frac{1}{4}$	12			No	$2\frac{1}{2}$
1	$2\frac{1}{2}$	12			B	3
1	$2\frac{1}{2}$	10			Yes	
1	$2\frac{1}{4}$	12	2	12	Yes	
1	$2\frac{1}{2}$	12	$2\frac{1}{4}$	12	Yes	
2	2	12			No	$2\frac{1}{4}$
2	$2\frac{1}{4}$	12			No	$2\frac{1}{2}$
2	$2\frac{1}{2}$	12			Yes	
2	$2\frac{1}{2}$	10			Yes	
2	$2\frac{1}{4}$	12	2	12	Yes	
2	$2\frac{1}{2}$	12	$2\frac{1}{4}$	12	Yes	
3 & 4	$2\frac{1}{2}$	12			Yes	
3 & 4	$2\frac{1}{2}$	10			Yes	
3 & 4	$2\frac{1}{2}$	12	$2\frac{1}{4}$	12	Yes	
3 & 4	$2\frac{1}{4}$	12	2	12	Yes	
3 & 4	$2\frac{1}{2}$	10	$2\frac{3}{16}$	10	Yes	

B - The $2\frac{1}{2}$", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.

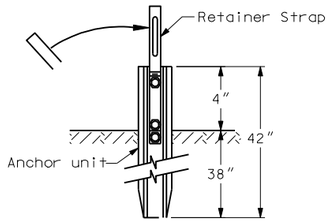
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-02	
REVISIONS	
DATE	CHANGE
12-01-04	PE stamp added

This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

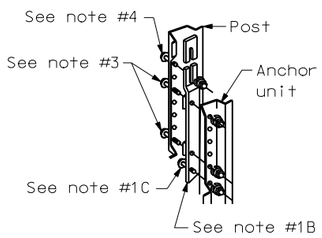
FLANGED CHANNEL



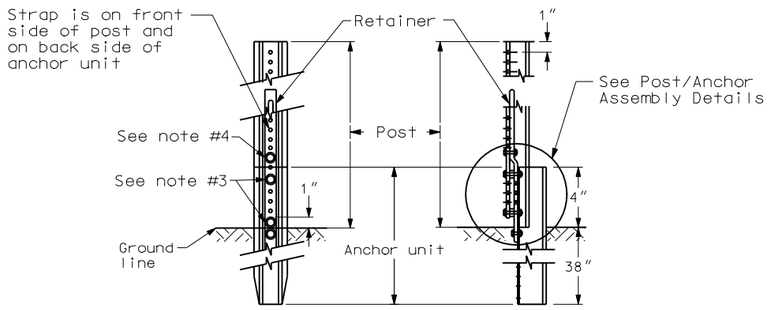
Anchor Unit &
Strap Assembly Detail

STEPS OF INSTALLATION

1. A) Drive anchor unit to within 12″ of ground level.
   B) Proper assembly established by lining up the top 3/4″ slot of retainer spacer strap with top hole of anchor unit.
   C) Assemble strap to back of anchor unit using 3/8″-16 UNC x 2.0″ long bolt, lock washer and nut.
   D) Rotate strap 90° to left.
2. A) Drive anchor unit to 4″ dimension.
   B) Rotate strap to vertical position.
3. A) Place 3/8″-16 UNC x 2″ bolt, lock washer & nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit (this coincides with the bottom 3/4″ slot in the strap).
   B) Alternately tighten two connector bolts.
4. A) Complete assembly by tightening 3/8″-16 UNC x 2″ long retainer bolt (this fastens sign post to retainer spacer strap).
5. The base post, strap & sign post shall be properly nested. Proper nesting occurs when all flat surfaces of the base post, strap and sign post at the bolts have full contact across the entire width.

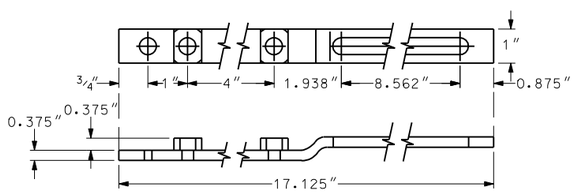


Post/Anchor
Assembly Details



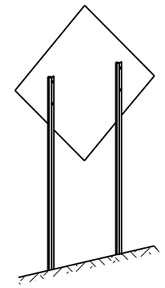
Front View Side View

Sign Post Assembly Detail

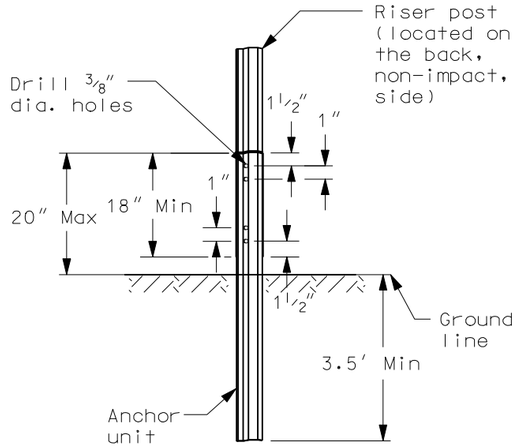


Retainer/Spacer Strap Detail

CHANNEL SIZE IN.	WALL THICKNESS IN.	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN.4	CROSS SECT. AREA IN. SQ.	SECTION MODULUS IN.3
1.516 x 3.125"	.116	2.00	.179	.590	.225
1.532 x 3.125"	.124	2.25	.201	.648	.254
1.562 x 3.125"	.132	2.50	.233	.748	.289
1.578 x 3.125"	.140	2.75	.271	.819	.329
1.750 x 3.500"	.150	3.00	.372	.918	.403
1.750 x 3.500"	.175	4.00	.500	1.190	.560



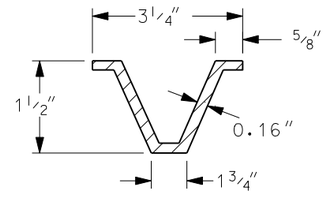
Typical
Installation



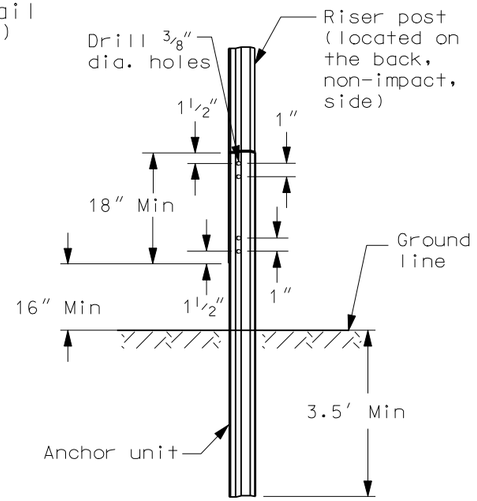
U-Channel Splice
Option 1

3 LB/FT U POSTS

Notes
1. Use 3 lb/ft riser anchor units and risers
2. Driven riser posts shall be at least 7′ long and embedded at least 3.5′.
3. A splice shall overlap a minimum of 18″.
4. Use 4 bolts 5/16″ diameter with washers and nuts. Two at top and two at bottom of splice.
5. Anchor unit for guy wires shall be no more than 4″ above ground and embedded at least 3.5′.



U-Post Detail
(3 lb/ft)

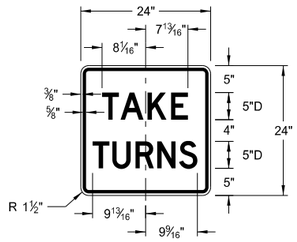


U-Channel Splice
Option 2

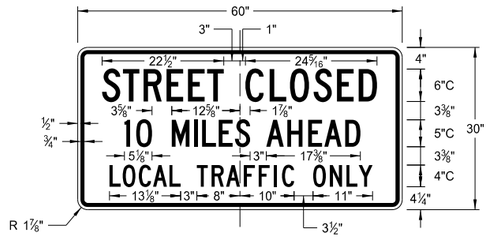
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-28-93	
REVISIONS	
DATE	CHANGE
03-07-01	Revised U-post details
11-21-02	Deleted perforated tube
05-08-03	Revised U-Channel splice
12-01-04	PE stamp added
06-29-05	Revised flanged channel note

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

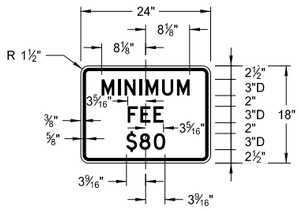
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



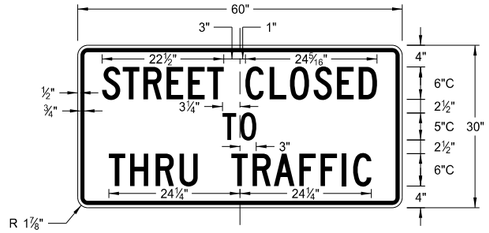
R1-50-24
Legend: black (non-refl)
Background: white



R11-3c-60
Legend: black (non-refl)
Background: white



R2-1a-24
Legend: black (non-refl)
Background: white



R11-4a-60
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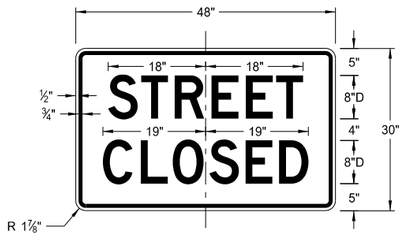
Background: white



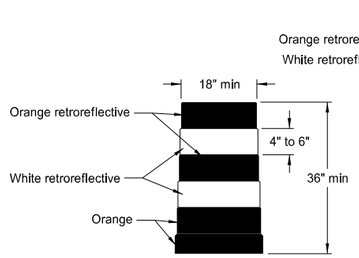
R11-2a-48
Legend: black (non-refl)
Background: white

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8/13/13 and the original document is stored at the North Dakota Department of Transportation

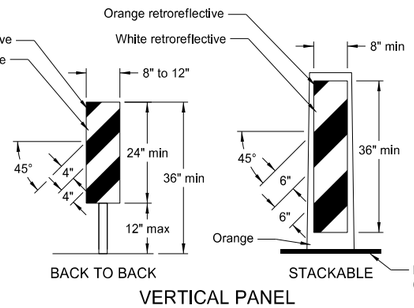
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



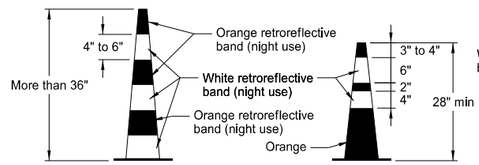
DELINEATOR DRUM

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.



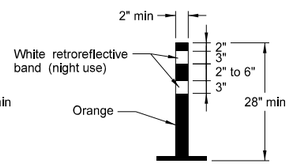
VERTICAL PANEL

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward in the direction vehicular traffic is to pass. Retroreflective sheeting shall be placed on both sides of panel and shall have a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used.



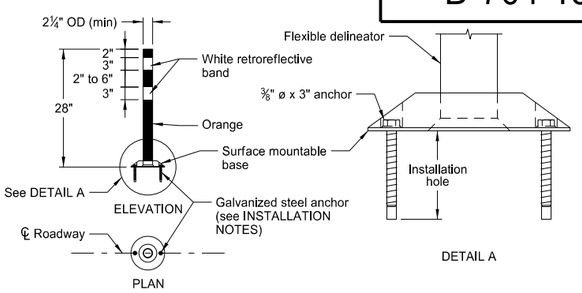
TRAFFIC CONE

Retroreflectorization of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized space between the orange and white stripes shall not exceed 3" wide.



TUBULAR MARKER

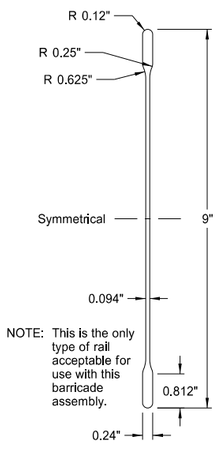
Retroreflectorization of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



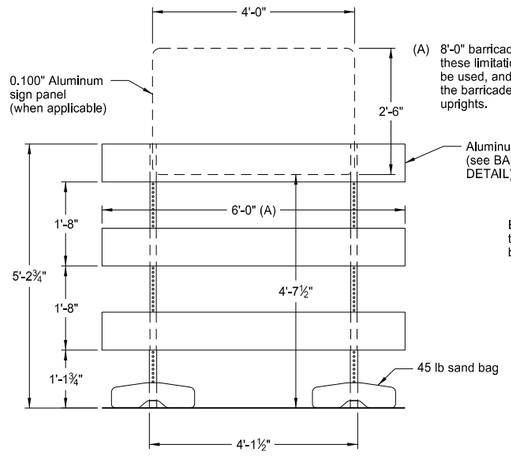
FLEXIBLE DELINEATOR

INSTALLATION NOTES:

1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl. Butyl shall be removed as close as possible to pavement surface.

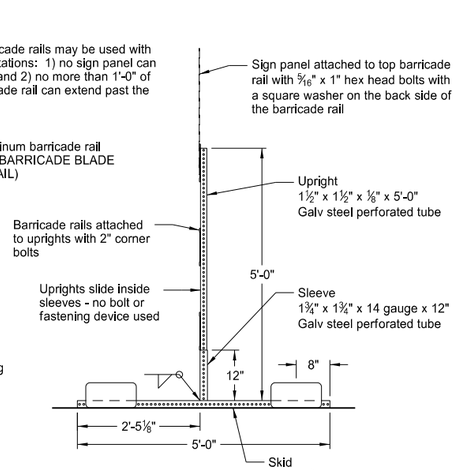


BARRICADE BLADE DETAIL



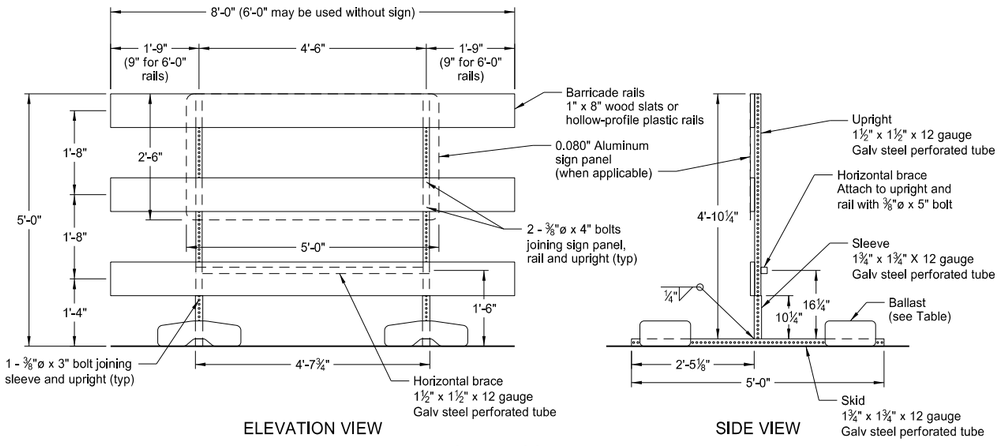
ELEVATION VIEW

(A) 8'-0" barricade rails may be used with these limitations: 1) no sign panel can be used, and 2) no more than 1'-0" of the barricade rail can extend past the uprights.



SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

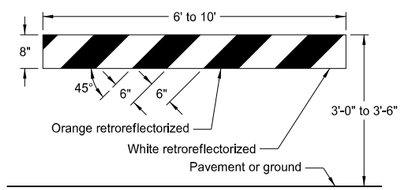


ELEVATION VIEW

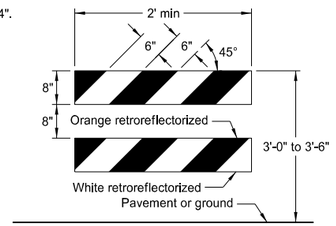
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

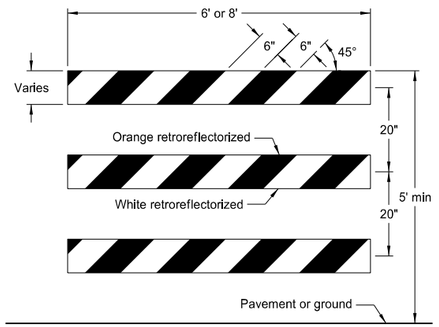
NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".



TYPE I BARRICADE

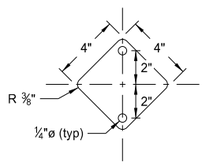


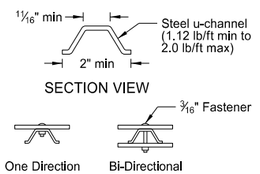
TYPE II BARRICADE

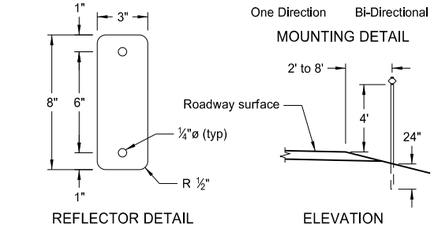


TYPE III BARRICADE

BARRICADE RAIL DETAILS







DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

Without Sign	4 - 25 lb sandbags
With Sign	6 - 25 lb sandbags

Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

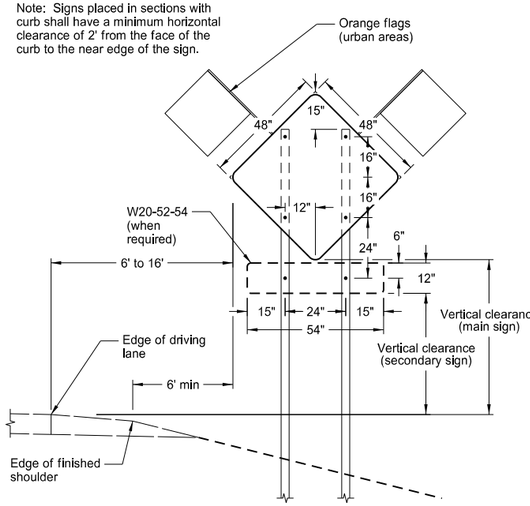
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 10/3/13 and the original document is stored at the North Dakota Department of Transportation

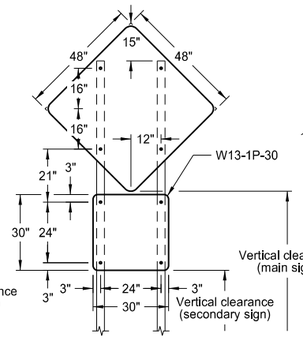
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

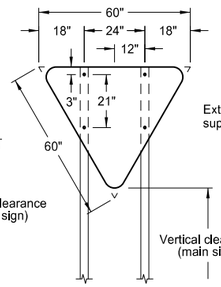
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



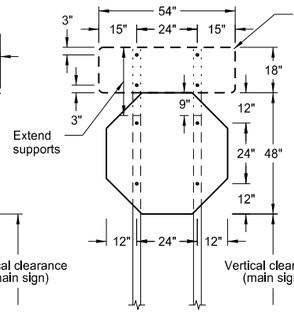
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



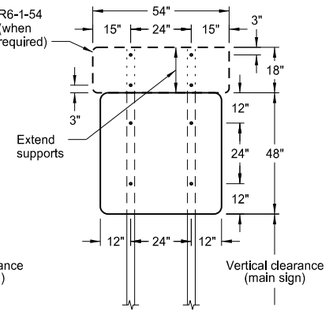
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



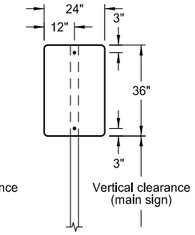
R1-2-60 - YIELD SIGN



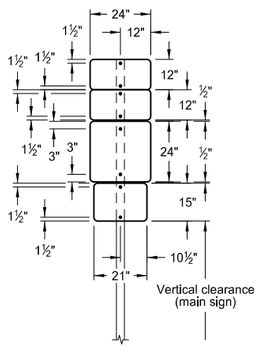
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



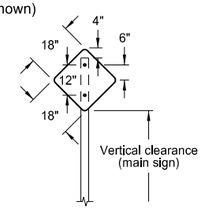
48" x 48" SIGN
(with R6-1-54 sign as required)



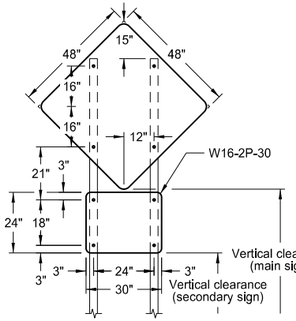
24" x 36" SIGN



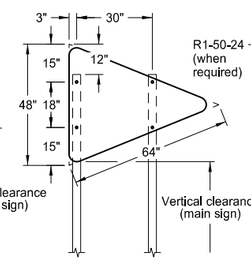
24" x 24"
ROUTE MARKER
ASSEMBLY



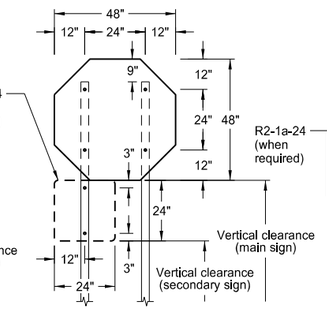
18" x 18"
DIAMOND SIGN



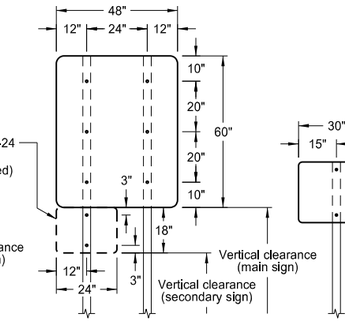
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



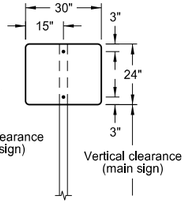
W14-3-64 - PENNANT SIGN



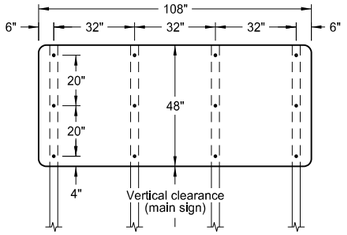
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



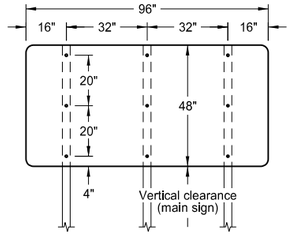
48" x 48" SIGN
(with R2-1a-24 sign as required)



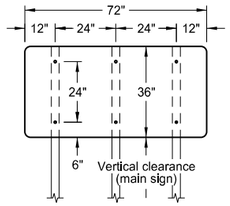
30" x 24" SIGN



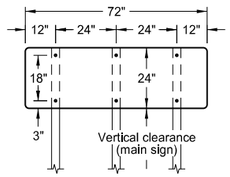
108" x 48" SIGN



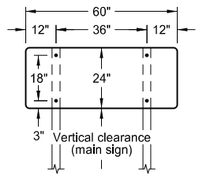
96" x 48" SIGN



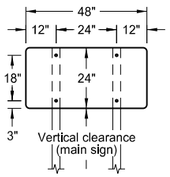
72" x 36" SIGN



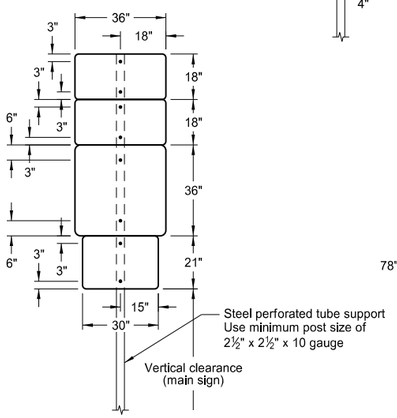
72" x 24" SIGN



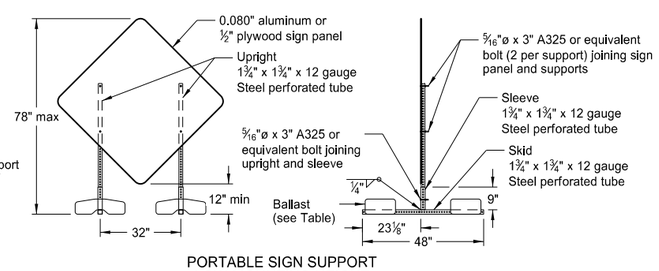
60" x 24" SIGN



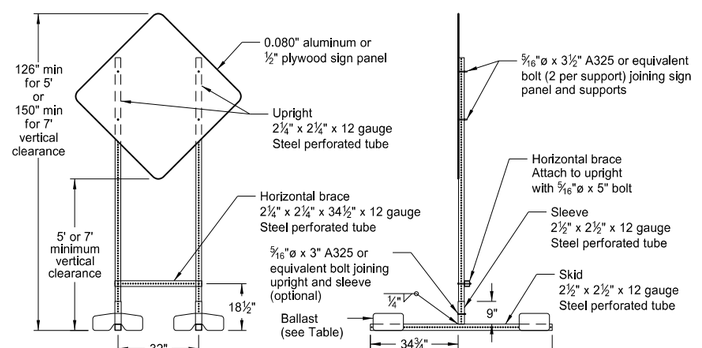
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Supports shall be galvanized or painted. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, the minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes are based on a wind speed of 55 MPH.

   Signs over 50 square feet should be installed on 2½" x 2½" perforated tube supports as a minimum.

   Guy wires shall not be attached to sign supports. Wind beams may be attached to u-posts behind the sign panels.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. All holes to be punched round for ⅜" bolts.

3. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate (without a border) and installed and removed as required. (i.e. "Left" and "Right" message on a lane closure sign)

4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

   Interstate - white legend on blue background
   Interstate Business Loop - white legend on green background
   US and State - black legend on white background
   County - yellow legend on blue background

5. Vertical Clearance: Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.

   The vertical clearance to secondary signs is 1'-0" less than the vertical clearance as stated above.

   Large signs having an area exceeding 50 square feet shall have a minimum clearance of 7'-0" from the ground at the post.

6. Portable Signs: Provide portable signs that meet the vertical clearance as stated above. Use portable signs when it is necessary to place signs within the pavement surface.

   When portable signs are used for 5 days or less, low-mounting height (minimum 12" vertical clearance) sign supports may be used as long as the view of the sign is not obstructed. Time delays caused by unforseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. The R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 may be used for longer than 5 days.

   Signs mounted to the portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT Details shall have a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

Sign Panel Mounting Height (ft)	Number of 25 lb sandbags for 4' x 4' sign panel
1'	6
5'	8
7'	10

Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6.

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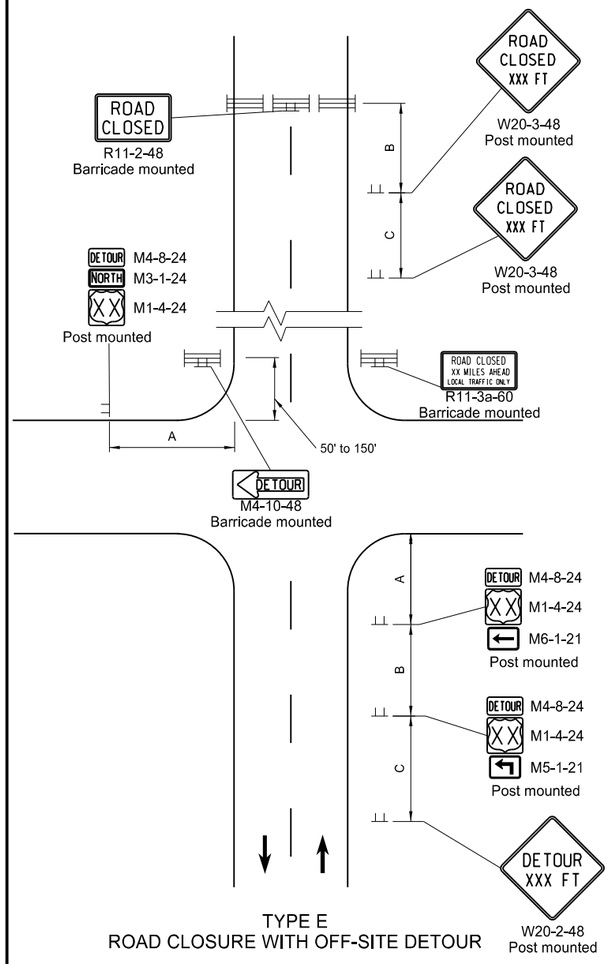
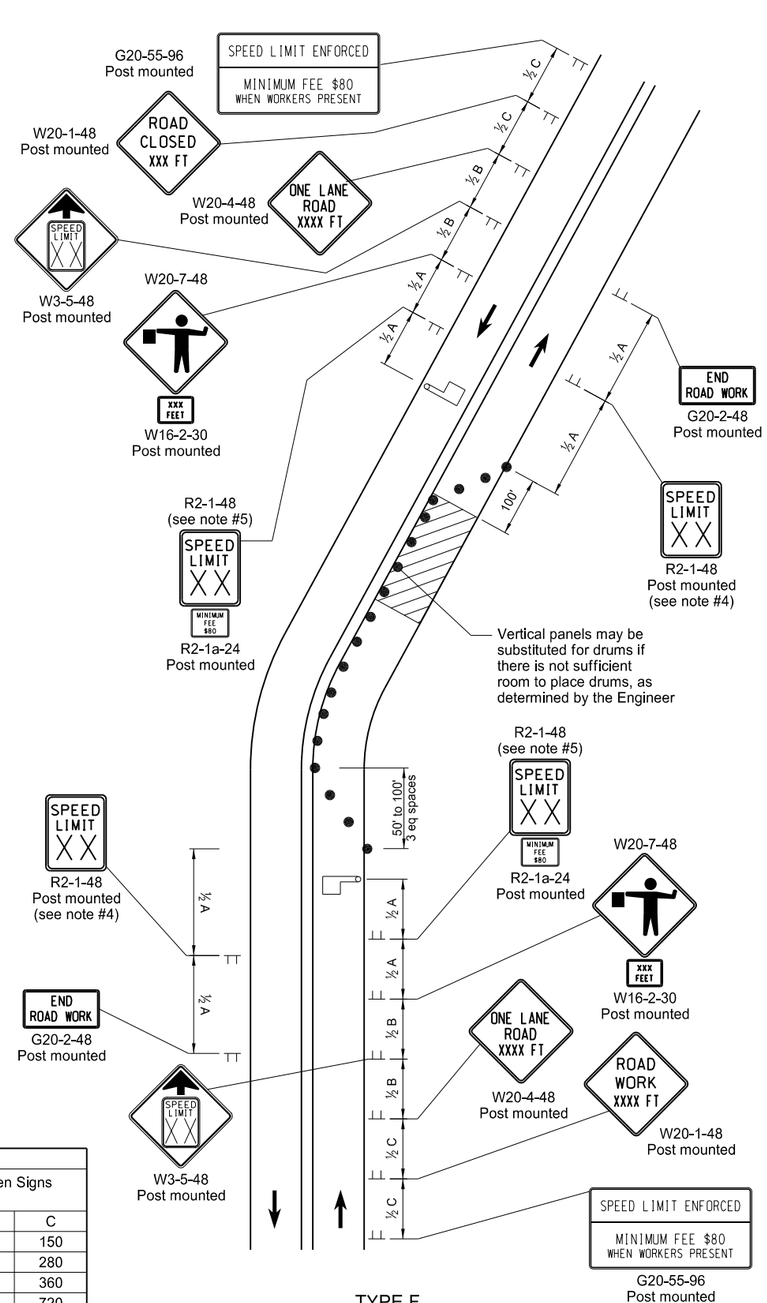
ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19



TYPE E
ROAD CLOSURE WITH OFF-SITE DETOUR

Used where a road is closed beyond a detour point. Signing shown for one direction only. Sign not shown on detour shall be shown in plans and installed and maintained by the contractor.



TYPE F
LANE CLOSURE ON A TWO LANE ROAD USING FLAGGERS

Two lane highway with one lane closed. Flagger is at a point where it is visible to approaching traffic.

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

Notes

1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper
   L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or
   W x S^2/60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
3. Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
5. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
6. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
7. Existing speed limit signs within a reduced speed zone shall be covered.
8. Where necessary, safe speed to be determined by the Engineer.
9. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
10. G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used, if this standard is part of other traffic control layouts, or the work is less than 15 days.
11. When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
    a. Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.)
    b. A "Do Not Stop on Tracks" sign (R8-8-24) should be placed near the cross buck in each direction while the lane closure is in the vicinity of the tracks.
    c. A buffer space between the work zone and the lane closure transition should be extended upstream of the highway-rail grade crossing so a queue created by the flagging operation will not extend across the highway-rail grade crossing.
    d. If the queuing of vehicles across active rail tracks cannot be avoided, a flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing, even if automatic warning devices are in place.

KEY

- Delineator Drum
- Type III Barricade
- Flagger
- Sign
- Work/Hazard Area

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE

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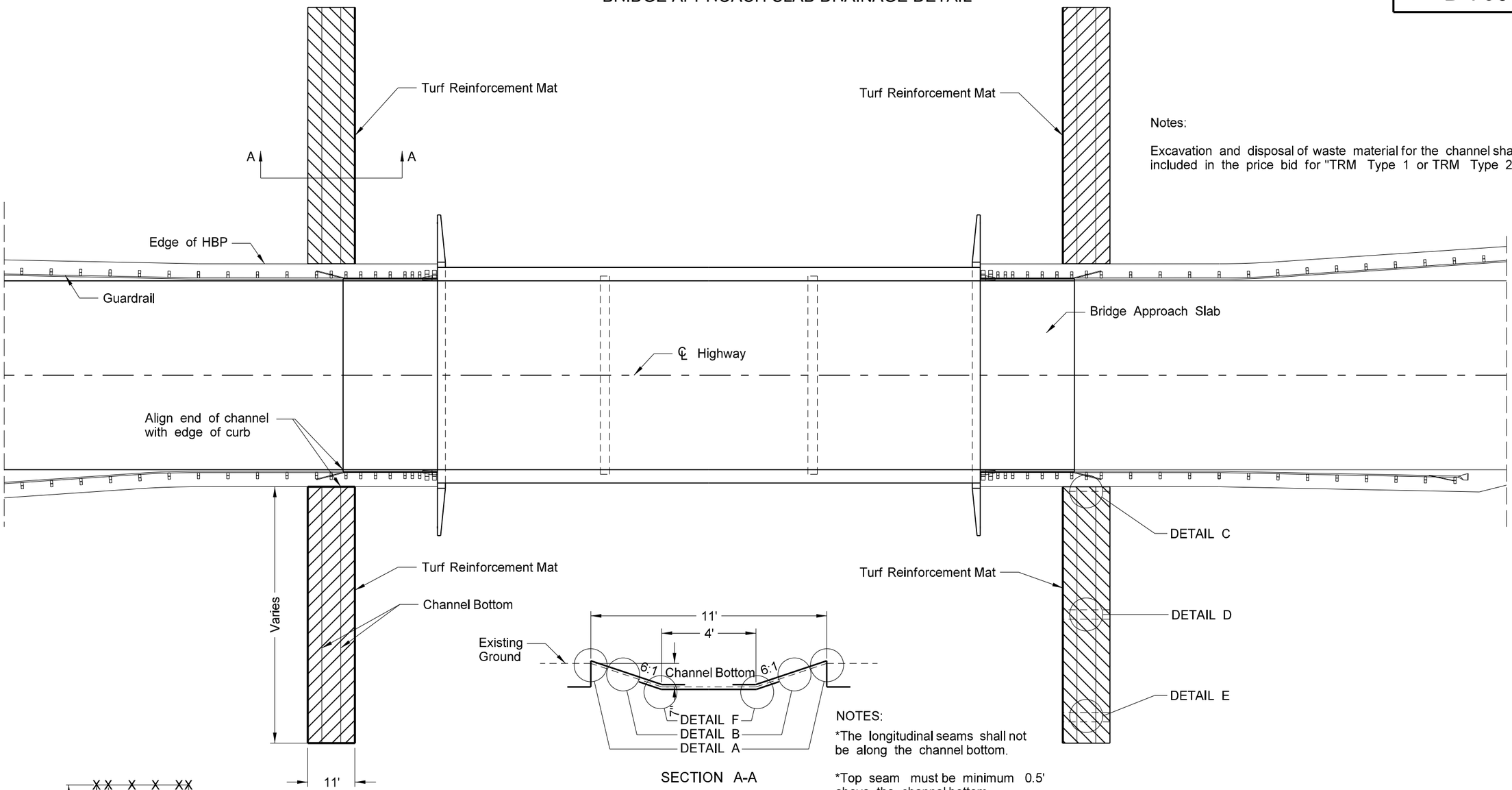
BRIDGE APPROACH SLAB DRAINAGE DETAIL

D-708-4



Notes:

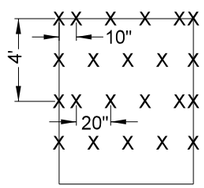
Excavation and disposal of waste material for the channel shall be included in the price bid for "TRM Type 1 or TRM Type 2".

SECTION A-A

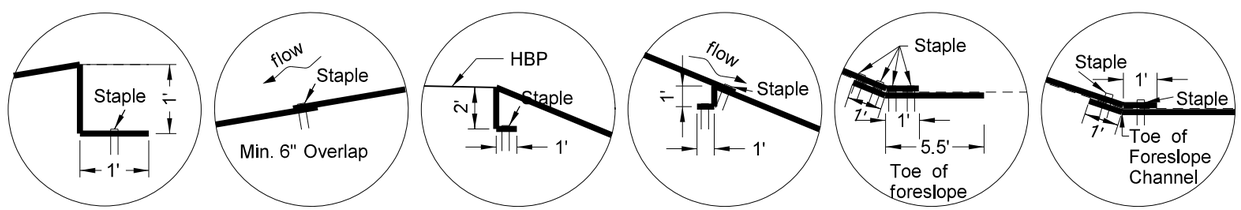
NOTES:

*The longitudinal seams shall not be along the channel bottom.

*Top seam must be minimum 0.5' above the channel bottom.



STAPLE PATTERN: 3.8 staples per square yard.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE

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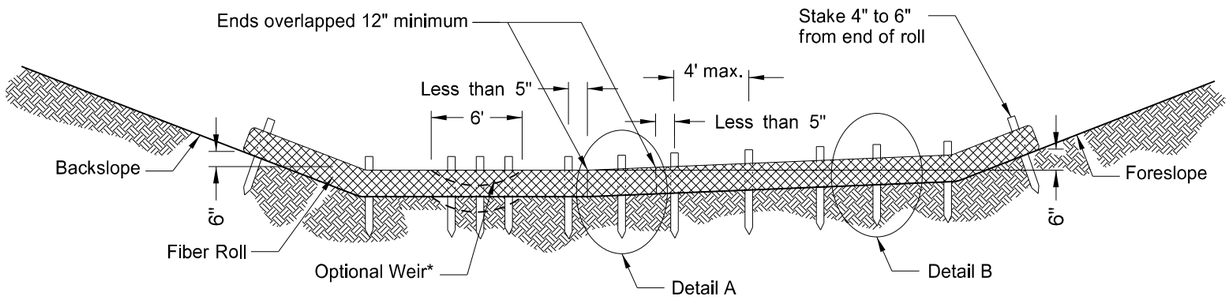
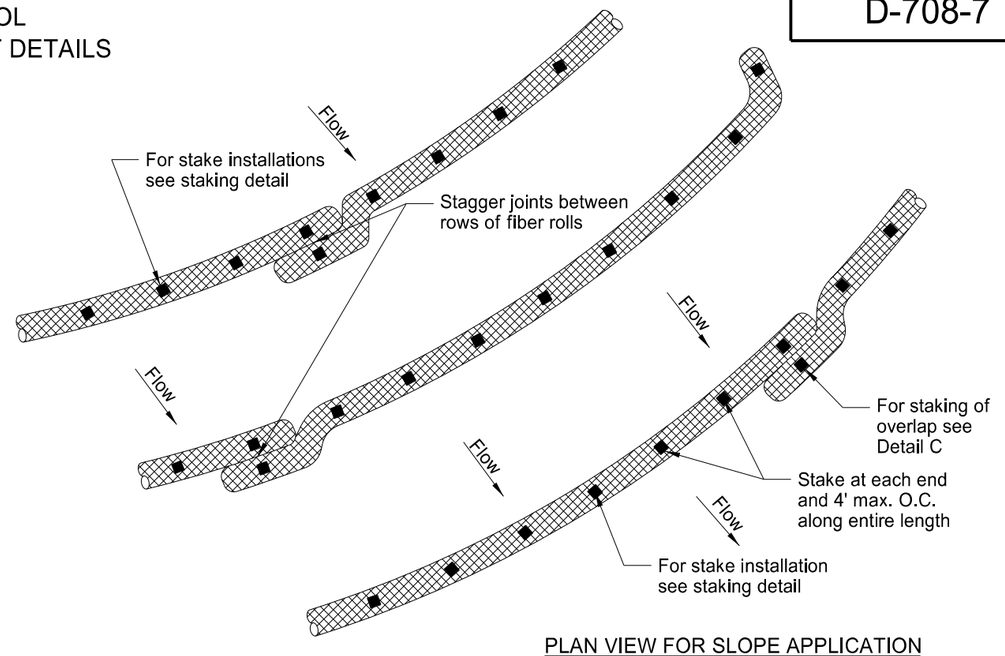
D-708-7

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

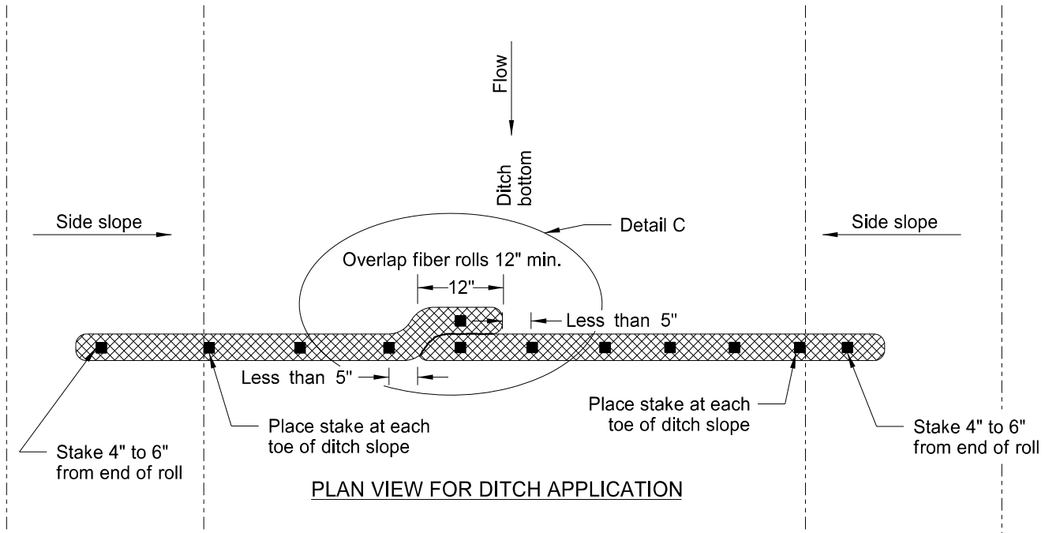


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up on adjacent property.

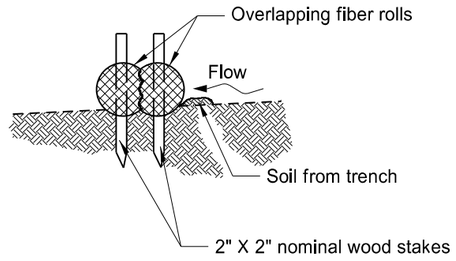
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

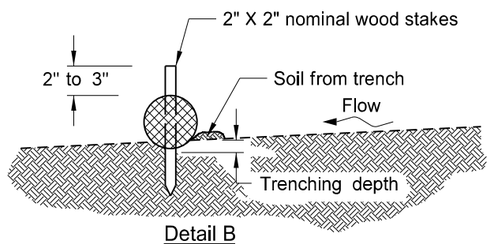


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

NOTE: Runoff must not be allowed to run under or around roll.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.

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PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

Notes:

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

2. Minimum vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7'.

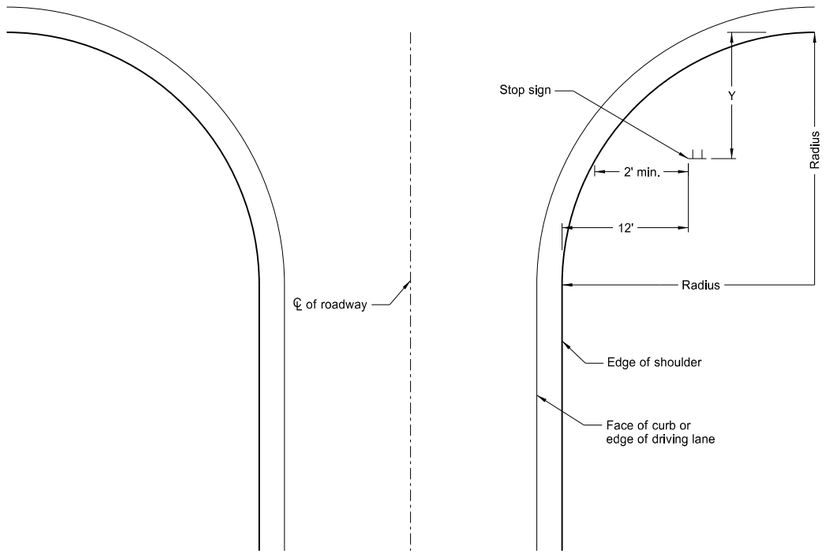
   Directional signs on expressways shall be installed with a minimum height of 7'. If the secondary sign is mounted below another sign, the major sign shall be installed at least 8' and the secondary sign shall be installed at least 5' above the edge of the driving lane.

   All route signs, warning signs, and regulatory signs on expressways shall be at least 7' above the edge of the driving lane.

   Adopt-a-highway signs installed on Freeways shall be at least 7' above the edge of the driving lane.

   The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

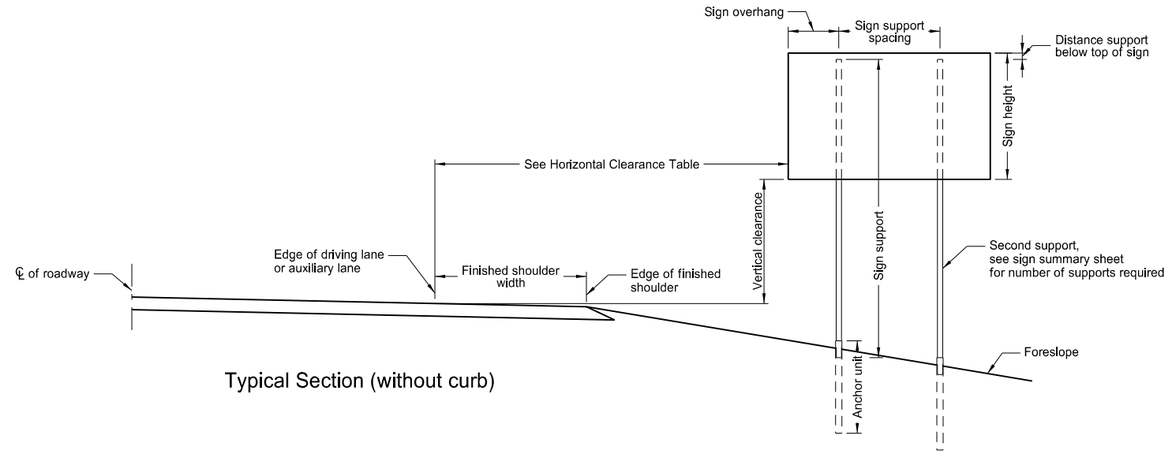
3. Offset signs: Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.



Stop Sign Location
Wide Throat Intersection

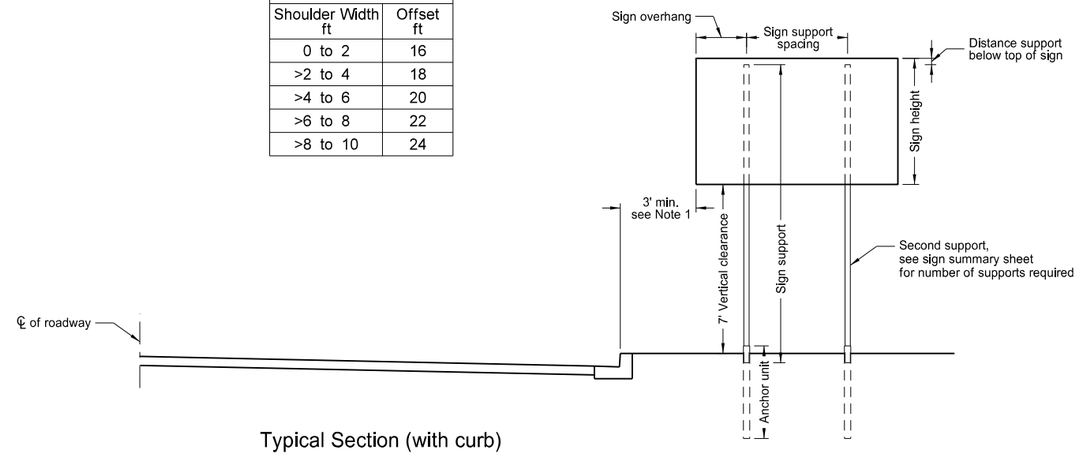
This layout is to be used for the placement of "Stop" signs.

Radius ft.	Y-max. ft.	Y-min. ft.
40	50	15
45	50	18
50	50	21
55	50	25
60	50	28
65	50	32
70	50	35
75	50	39
80	50	43



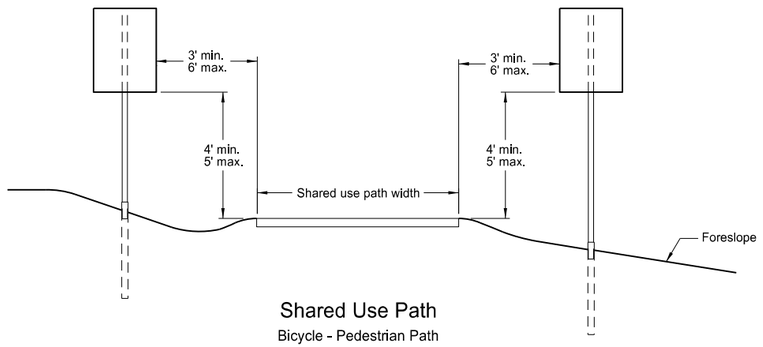
Typical Section (without curb)

Horizontal Clearance Table	
Shoulder Width ft	Offset ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24



Typical Section (with curb)

Residential or Business District



Shared Use Path

Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE

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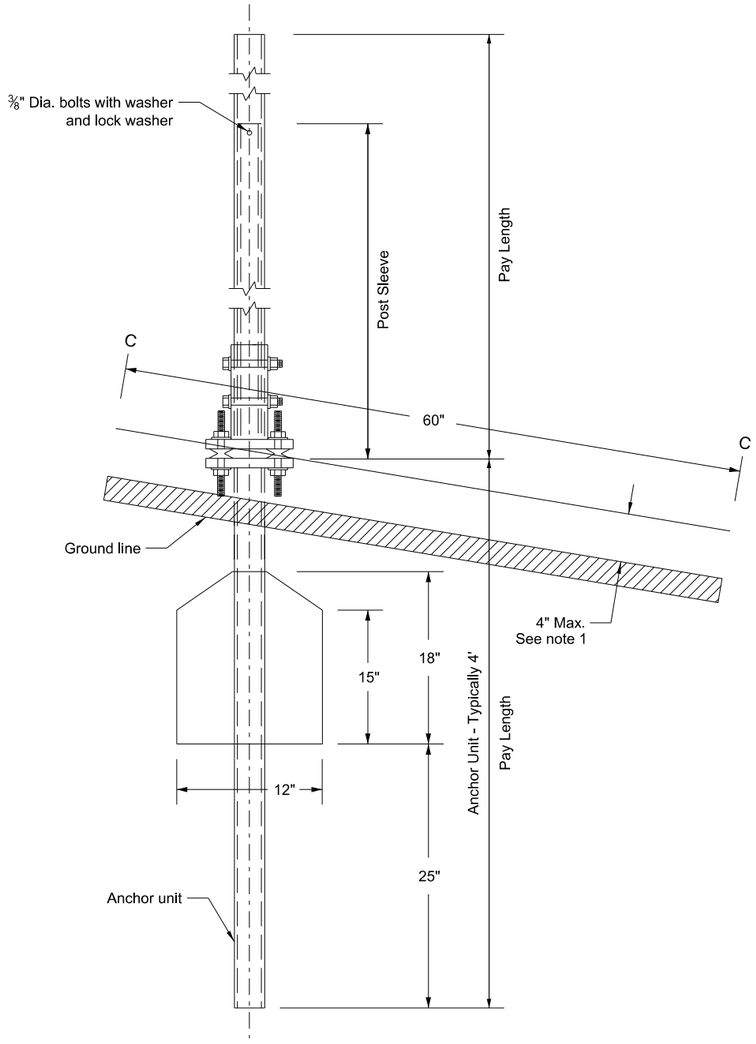
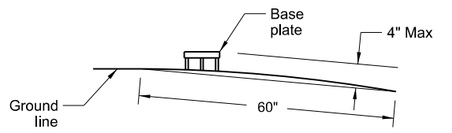
D-754-24A

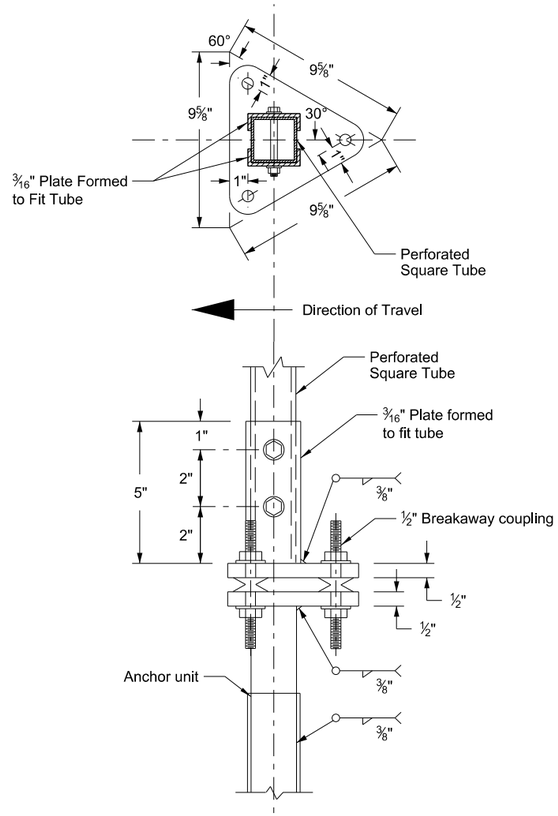
Breakaway Coupler System for Perforated Tubes



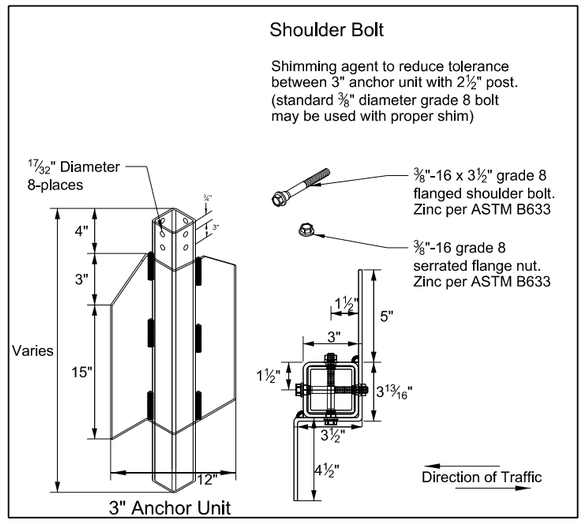


Section C-C

Max. protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.



Base Plate with Breakaway Coupler



3" Anchor Unit

Notes:

1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
2. Anchor unit shall be the same size as the post and shall have the same specification as the post.
3. Four post signs shall have over 8' between the first and fourth post.
4. In lieu of the breakaway base system on standard D-754-24 the breakaway coupling system may be used. The breakaway coupler system shall be manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Guage
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2	12	Yes		7
3 & 4	2½	10	2 3/16	10	Yes		7

(B) - The 2½" 12 gauge posts do not need breakaway bases when placed in standard soils. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.

(C) - 3" anchor unit

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE

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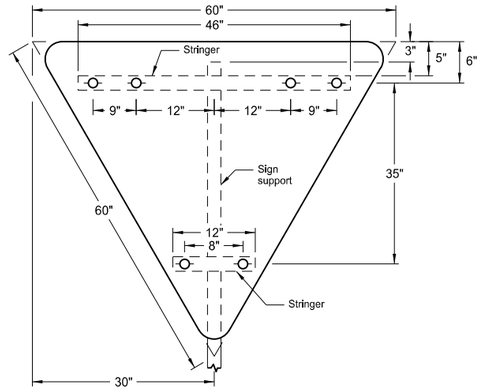
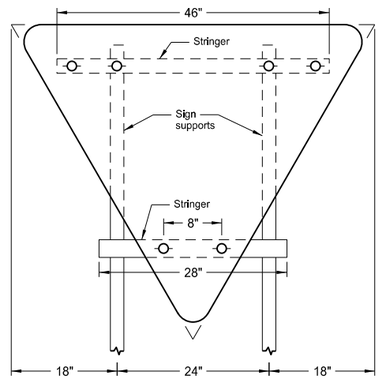
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

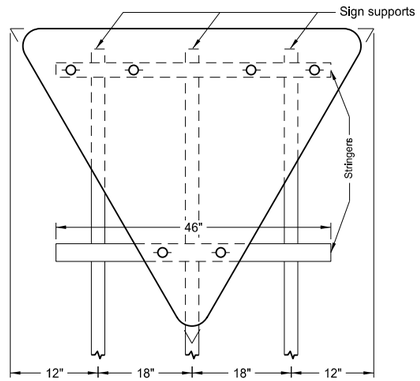
D-754-27



1 Post



2 Posts



3 Posts

Assembly No. 6

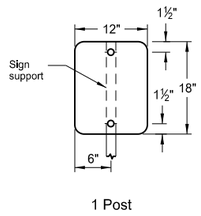
Notes:

1. See Standard D-754-25 for mounting details.

2. The minimum sign backing material thickness shall be 0.100 inch.

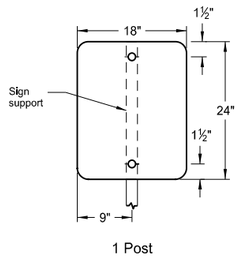
3. Perforated square tube stringer shall be 1½" x 1½".

4. All holes shall be punched round for ⅜" bolt.



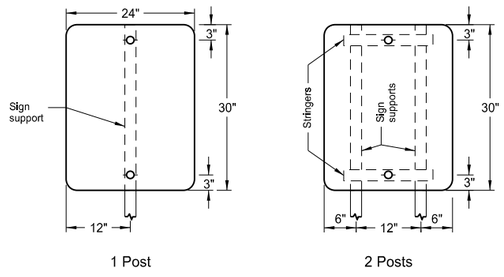
1 Post

Assembly No. 7



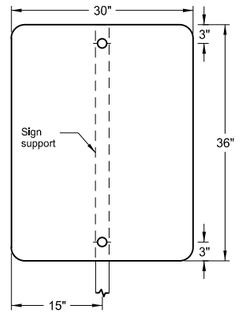
1 Post

Assembly No. 8

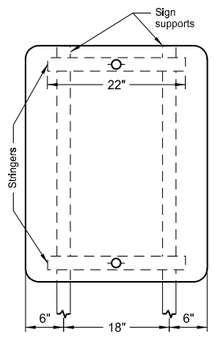


1 Post 2 Posts

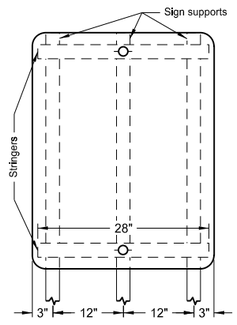
Assembly No. 9



1 Post

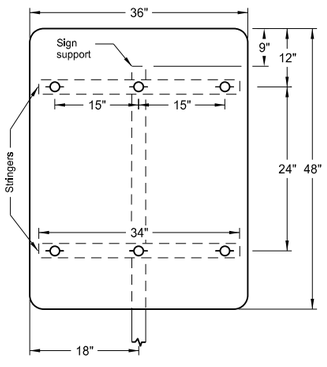


2 Posts

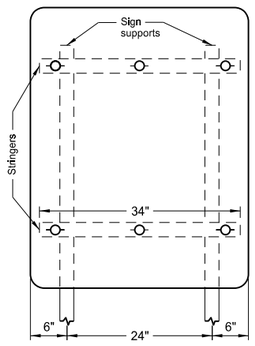


3 Posts

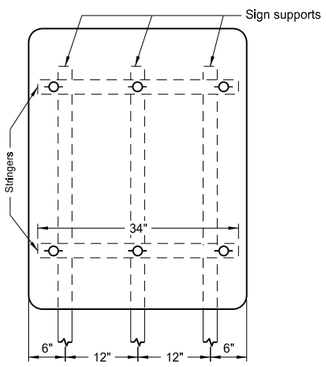
Assembly No. 10



1 Post



2 Posts



3 Posts

Assembly No. 11

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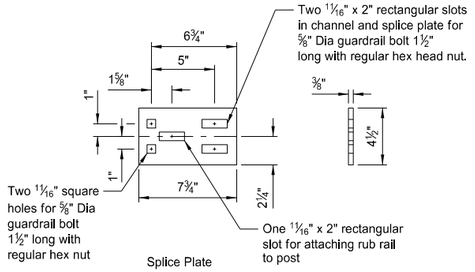
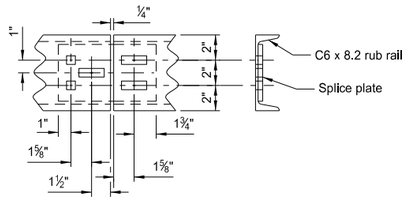
W-BEAM GUARDRAIL GENERAL DETAILS

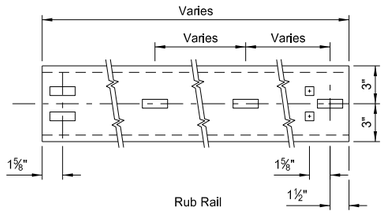
D-764-1



Splice Plate

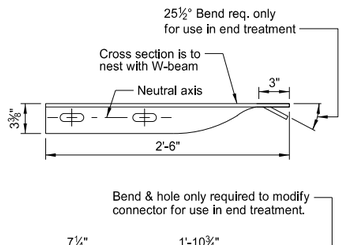


Splice Detail

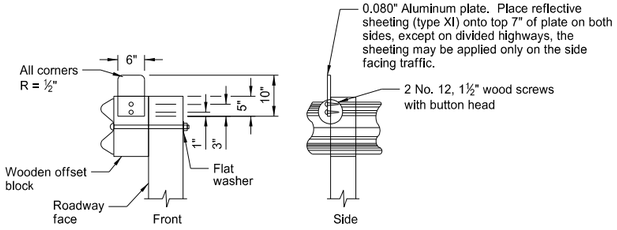


Rub Rail

C6x8 RUB RAIL AND SPLICE PLATE

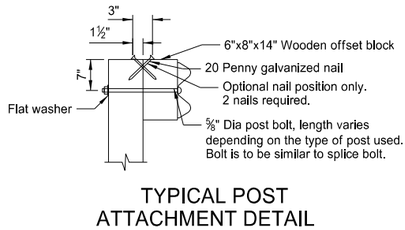


W BEAM TERMINAL CONNECTOR

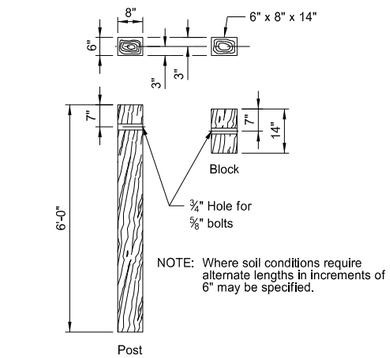


REFLECTORIZED PLATE DETAIL

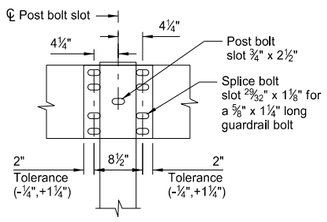
Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.



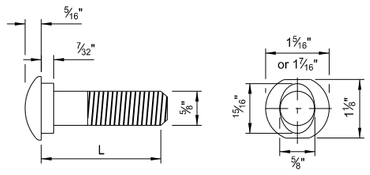
TYPICAL POST ATTACHMENT DETAIL



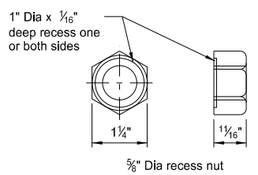
6"x8" TIMBER POST & BLOCK



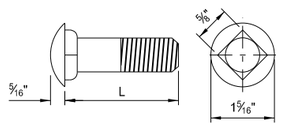
SPLICE DETAIL



5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length

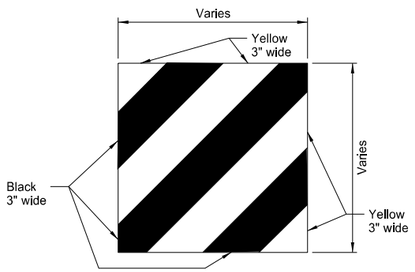


5/8" GUARDRAIL BOLT & RECESS NUT

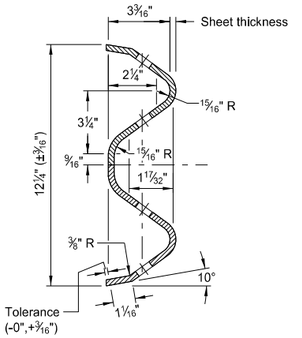


5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length

5/8" CARRIAGE BOLT & NUT



IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION

NOTES:

1. Reflectorized plates: Reflector plates shall begin at the first post and be spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
2. Manner of replacing bituminous material at guardrail post: All excess earth from excavations for guard posts shall be disposed of as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. The Object Marker shall fit within the vertical edges of the Impact Plate. The retroreflective sheeting shall be type XI sheeting meeting the requirements of Section 894.02.B of the standard specifications. The sheeting shall be applied to 0.100 Aluminum sheeting meeting the requirements Section 894.01.A. The Object Marker shall attach to the Impact Head Plate with rivets or some other attachment device. The rivets or attachment device shall be non-rust. The stripes shall slope downward toward the roadway side.
4. Guardrail installation height tolerance = - 1/4" , + 1".

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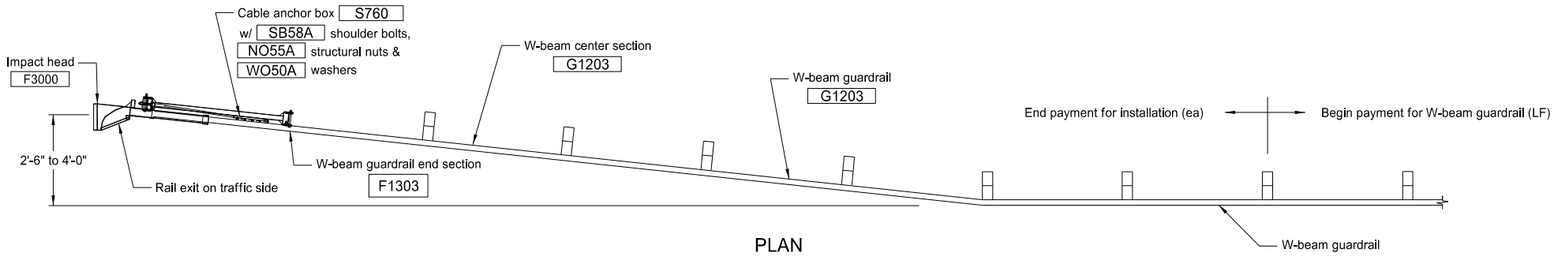
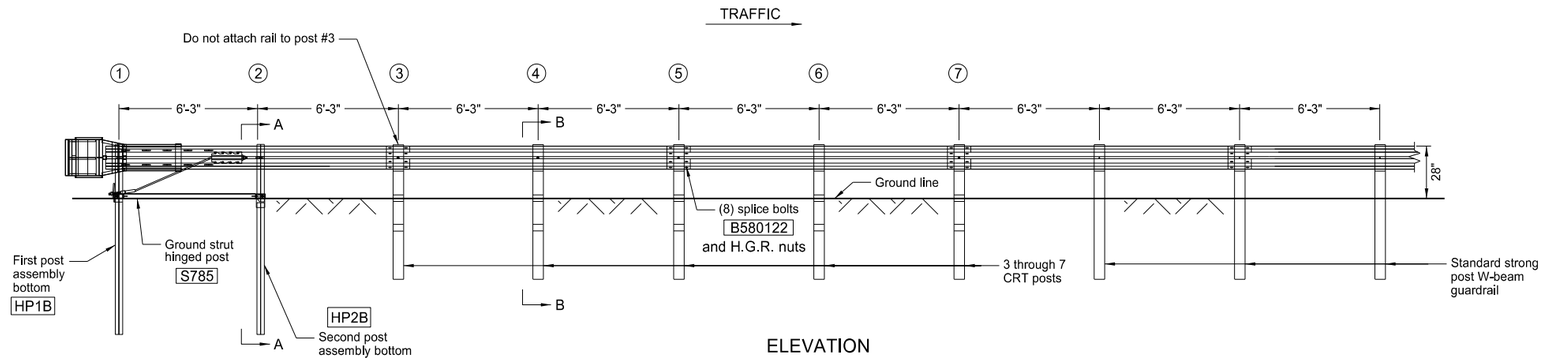
FLARED ENERGY ABSORBING TERMINAL

D-764-6



PLAN

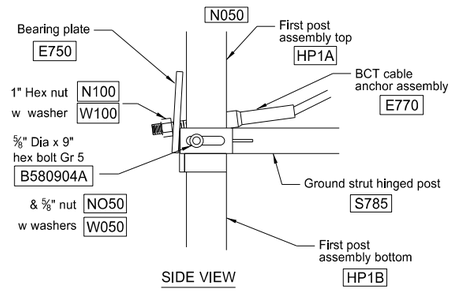


ELEVATION

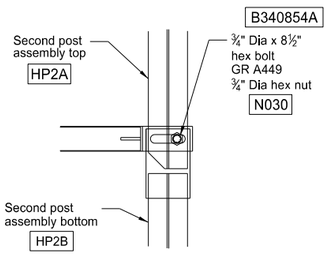
ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA
G1203	2	W-BEAM GUARDRAIL, 12 GA
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT OR RECYCLED EQUIVALENT
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
		HARDWARE (ALL DIMENSIONS IN INCHES)
B140404	2	¼ Dia x 4 HEX BOLT
WO14	4	¼ WASHER
N014	2	¼ HEX NUT
B580122	17	⅝ Dia x 1¼ SPLICE BOLT
B581802	4	⅝ Dia x 10 H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	⅝ Dia x 9 HEX BOLT GR 5
W050	5	⅝ WASHER
N050	22	⅝ Dia H.G.R. NUT
B340854A	1	¾ Dia x 8½ HEX BOLT GR A449
NO30	1	¾ Dia HEX NUT
N100	2	1 ANCHOR CABLE HEX NUT
W100	2	1 ANCHOR CABLE WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	½ A325 STRUCTURAL NUT
W050A	16	1 1/16 OD x 9/16 ID A325 STR. WASHER

GENERAL NOTES

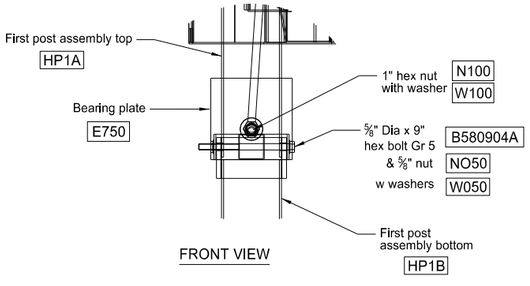
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts #1 and #2.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord). Site grading may be necessary to meet this requirement.
4. Lower post sections shall not be driven with the upper post attached. If the the post is placed in a drilled hole, the backfill material must be satisfactory compacted to prevent settlement.
5. When rock is encountered during excavation, a 12" diameter post hole 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2½" deep to provide drainage. The soil tubes shall be field cut to length, placed in the hole and back filled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly shall be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
7. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The nail shall be 20 penny and galvanized.
8. The Flared Energy Absorbing Terminal shall be flared only when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, the Flared Energy Absorbing Terminal shall have only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, the Flared Energy Absorbing Terminal shall be turned parallel to the roadway.



SIDE VIEW

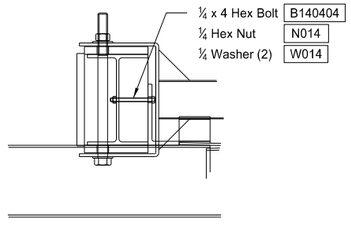


SIDE VIEW DETAIL OF POST #2

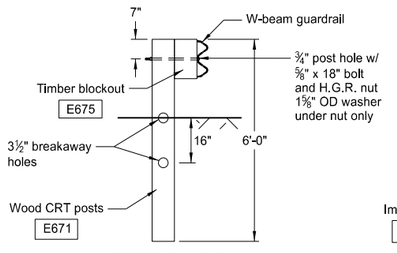


FRONT VIEW

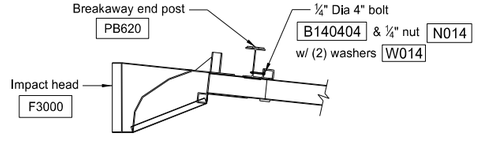
POST #1 CONNECTION DETAILS



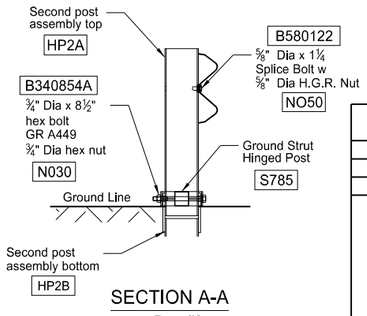
IMPACT HEAD CONNECTION DETAIL



SECTION B-B
POST 3 THRU 7



IMPACT HEAD CONNECTING DETAIL



SECTION A-A
at Post #2

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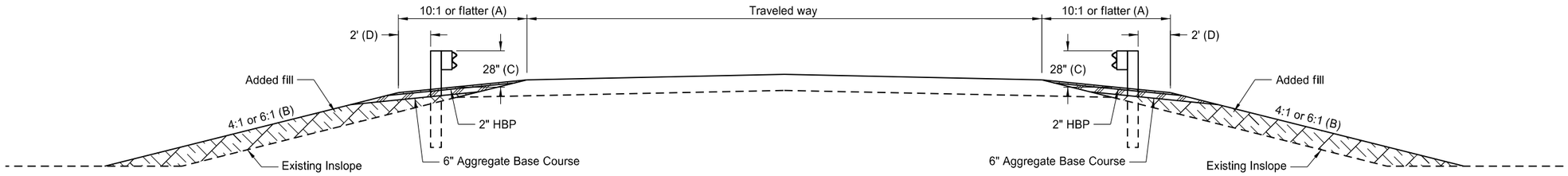
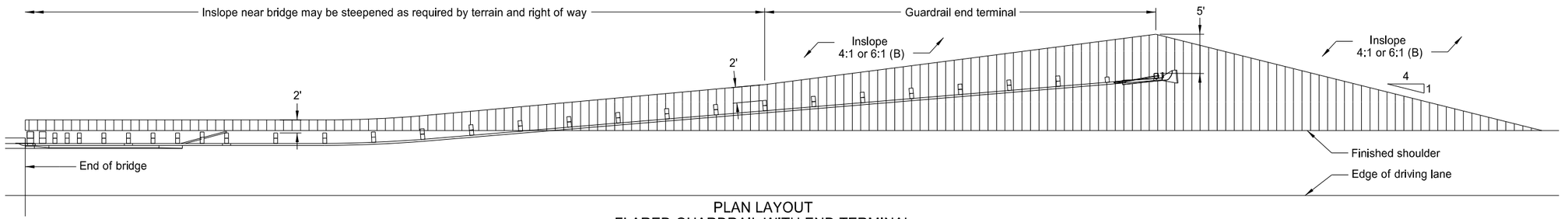
D-764-22

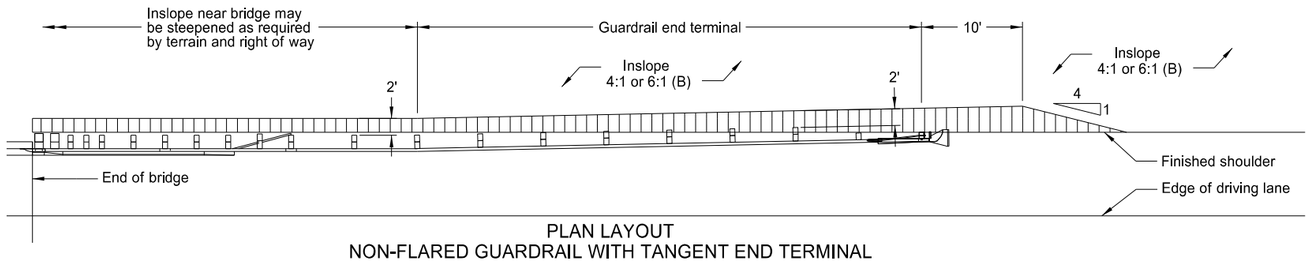
TYPICAL GRADING AT BRIDGE ENDS WITH W-BEAM GUARDRAIL



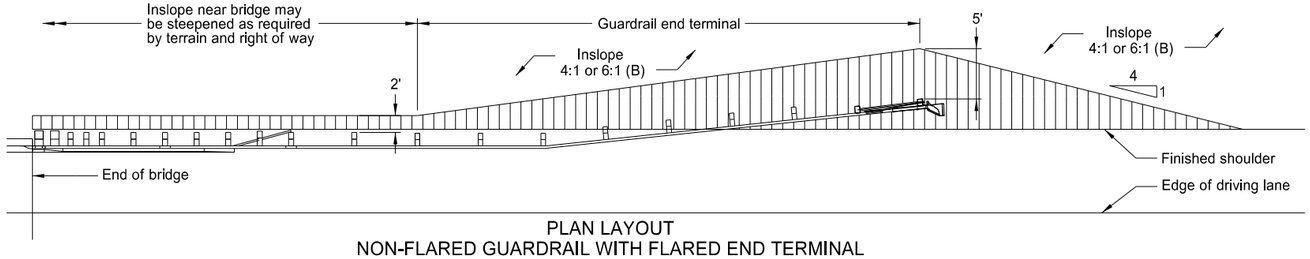
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

(A) Slope flatter than 10:1 may be required to provide proper guardrail height.

(B) Where normal inslope is 4:1 the added fill shall be 4:1. Where normal inslope is 6:1 the added fill shall be 6:1.

(C) Measured from top of guardrail to top of surfacing at front face of guardrail.

(D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

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