DESIGN DATA				
Traffic	Average Daily			Max.Hr.
Current 2013	Pass: N/A	Trucks: N/A	Total: 90	N/A
Forecast 2033	Pass: N/A	Trucks: N/A	Total: 108	N/A
Clear Zone Distance: 18'		Design Speed: 55 M.P.H		
Minimum Sight Dist. for Stopping: 495'		Bridges: STA		
Minimum Sight Dist. for Safe Passing: N/A		Bridge Design LRFD-HL93		
Sight Dist. for No Passing Zone: N/A				
Pavement Design Life (years)				

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	19203	1	1

JOB# 12
SARGENT COUNTY, NORTH DAKOTA
PLANS FOR

FEDERAL AID PROJECT NUMBER BRC-4120(057)
STRUCTURE NUMBER 41-123-20.0

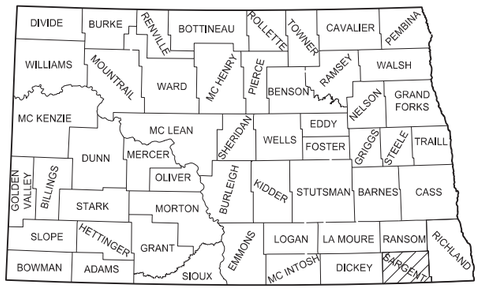
FHWA LIMITED INVOLVEMENT

PROJECT CONSISTS OF THE REPLACEMENT OF BRIDGE STRUCTURE WITH ONE LINE OF 16'X7 FOOT RCBC AND APPROXIMATELY 800 FT. OF ROAD GRADING AND INCIDENTALS LOCATION 4 MILES SOUTH AND 1.5 MILES WEST OF RUTLAND

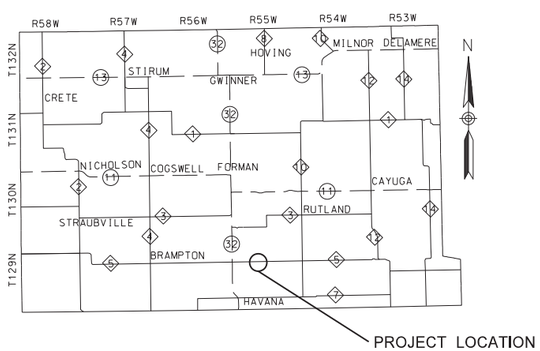
GOVERNING SPECIFICATIONS:

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

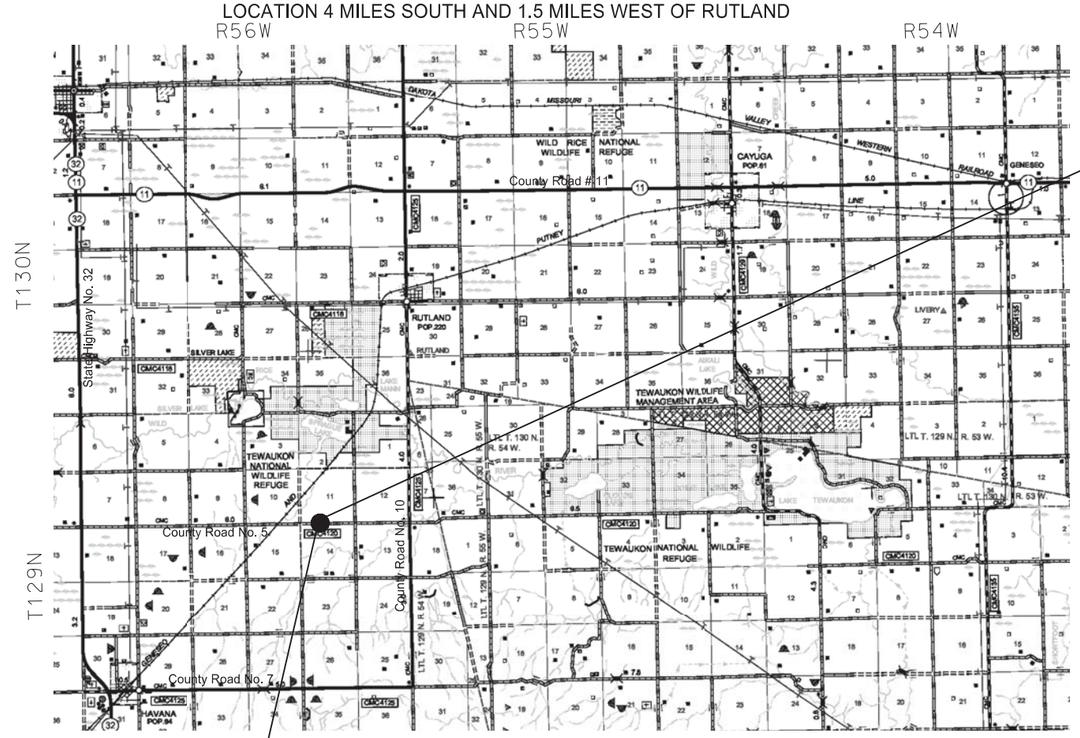
PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
BRC-4120(057)	0.152	0.152



SKETCH MAP OF NORTH DAKOTA SHOWING COUNTIES



SKETCH MAP OF SARGENT COUNTY



End Project BRC-4120(057)
Station 14+00.00
N= -3486.6617
E= 340.8925
952.25' East of the SW Corner of Section 11, T129N R56W

Begin Project BRC-4120(057)
Station 6+00.00
N= -3479.9202
E= -459.0791
152.25' East of the SW Corner of Secion 11, T129N R56W

N

Sargent County Commission
Bill Anderson
David Jacobson - Chair
Mike Walstead
Jerry Waswick
Steven Wyum

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DESIGNERS

Damon K. DeVillers, PE

Tim Pearson

Harriet Erckenbrack

P.S.&E. CORRECTIONS MADE DATE 8-13
SURVEYED DATE 12-10
DESIGNED DATE 8-13

I hereby certify that the attached 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 ND.

APPROVED DATE 09/03/2013

Damon K. DeVillers /s/
INTERSTATE ENGINEERING

W10-152

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Standard No.	Description
D-203-8	Section Line and Private Drive Approaches (Rural)
D-704-7	Breakaway Systems for Construction Zone Signs
D-704-8	Breakaway Systems for Construction Zone Signs
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D-704-20	Construction Sign and Barricade Location Details
D-704-22	Construction Sign and Barricade Location Details
D-708-2	Erosion and Siltation Controls
D-708-5	Erosion and Siltation Control Blanket Installation
D-708-6	Erosion Control Median or Ditch Inlet Protection
D-708-7	Erosion Control Fiber Roll Staking Details
D-714-01	Reinforced Concrete Pipe Culvert and End Section
D-714-04	Corrugated Steel Pipe Culverts and End Sections (Round Pipe)
D-754-82	Object Markers

LIST OF SPECIAL PROVISIONS (SP)

SP #	Description
SP 1010(08)	Temporary Erosion and Sediment Best Management Practice
SP 1101(08)	Split Sampling and Testing Requirements for Aggregate Base
SP 1282(08)	Permits & Environmental Considerations

NOTES

105-P01 CONTROL OF WORK:

1. Utility Locations: Utility locations shown on the plans are approximate. It shall be the Contractor's responsibility to contact all utilities for verification of locations prior to construction in any area**. ND One Call 1-800-795-0555**.

2. The Contractor shall confine his activities to the project right-of-way and construction easement areas as shown on the plan and profile sheets. The Contractor shall be responsible for damages incurred if his equipment or construction activities digress from the project right-of-way and construction easement areas.

107–P01 HAUL ROADS:

1. The Contractor is referred to Section 39-12-05.3 of the North Dakota Century Code, which pertains to weight limits. A portion of Paragraph #2 of this section of the code reads: "The gross weight on state highways may not exceed one hundred five thousand five hundred pounds (47,854.00 kilograms) unless otherwise posted and on all other highways the gross weight may not exceed eighty thousand pounds (36,287.39 kilograms) unless designated by local authorities for highways under their jurisdiction for gross weights not to exceed one hundred five thousand five hundred pounds (47,854.00 kilograms)..."

2. Any haul road repair deemed necessary by the Owner or the Engineer to designated haul roads occurring after the pre-haul inspection and as a result of the Contractors hauling and in accordance with the specifications will be paid for according to Section 107.05 B.7. Any repair required because of overload or over speed hauling will be paid for by the Contractor at no additional cost to the Owner.

3. Contractors shall check with the Sargent County Highway Department, (701-680-1480) for the load limits on roads that will be considered for use as "haul roads" for this project. The Contractor shall contact the appropriate State, County, Township and City officials to determine if there are any No Haul Routes prior to preparing a bid for this project.

4. It shall be the contractor's responsibility to investigate the suitability of routes with the agency having control of the road prior to submitting a bid.

5. The Contractor is reminded that the speed limit for trucks on Sargent County Roads is 40 mph. This will be strictly enforced.

202-P01 REMOVAL OF STRUCTURE:

1. The existing structure to be removed at Station 10+30 consists of a single span bridge 26 feet in length. The bridge has timber stringers, timber deck, and timber abutments with timber piling and timber wing walls.

2. The Contractor shall remove and salvage the timber decking and timber stringers, the timber from the abutments and from the wingwalls for Sargent County. The Contractor shall remove all nails, bolts and screws from the timber material to be salvaged and neatly stack all of the salvageable material. The Contractor shall load the salvaged materials onto a trailer supplied by Sargent County.

3. All other non-salvaged materials will become the property of the Contractor and disposed of off the right-of-way.

4. The Contractor shall arrange for and secure a suitable disposal site. The Contractor shall obtain any permits and site releases for the disposal site(s).

5. Any piling not fully removed shall be cut of a minimum of one foot below the bottom of the channel / class 2 excavation.

6. All costs for removal, salvage, stacking loading, removing nails, bolts and screws from the salvageable material and the removal and disposal of the remaining no salvageable portions of the structure shall be included in the price bid for "Removal of Structure" including items listed as environmental commitments.

203-P01 EXCAVATION AND EMBANKMENT:

1. The topsoil shall be stripped to its full depth. The topsoil depth was estimated to be 6 inches for the overall average. Topsoil will not be measured separately and will be paid at plan quantity. All costs to salvage, stockpile, and replace the topsoil shall be included in the unit price bid for "Topsoil." The bid item shall include topsoil for the temporary bypass area.

2. Common Excavation: Measurement for Common Excavation shall to be in accordance with Section 203.03B of the Standard Specifications (Contract Quantity).

3. After removing topsoil from original ground under all roadbed embankment areas, an additional one-foot shall be scarified and re-compacted. All scarifying and re-compacting shall be included in price bid for "Common Excavation – Type B."

4. In accordance with Section 107.04 of the Specifications, the Contractor is reminded that the material source approval process applies to all material sources including contractor option borrow sources. Clearance shall be obtained before work begins.

5. Placement of embankment shall be in accordance with Section 203.02H of the Standard Specifications (Compaction Control, Type B). A shrinkage factor of 35% was applied to the embankment material.

6. Borrow-Excavation shall be contractor option.

7. Borrow sources shall be stripped of topsoil and vegetation before it is cross sectioned. Erosion and sediment control devised required at contractor option sites shall be included in the price for "Borrow – Excavation".

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NOTES

8. The Contractor shall spread the topsoil evenly over the entire disturbed right-of-way and construction easement areas, except the 36-foot roadbed, approaches, and riprap.

210-P01 STRUCTURAL EXCAVATION, STRUCTURAL FILL, AND FOUNDATION PREPARATION:

1. **Class 1 Excavation** shall be to the limits shown on the plan typical box culvert layout drawing. The quantity of Class 1 Excavation within the excavation limits is estimated at 240 cubic yards. All material not considered suitable for the roadbed shall be used to fill the road inslopes unless the material is deemed waste excavation by the engineer. It is assumed that this material will be suitable for use in embankment areas. Payment for all Class 1 Excavation to the limits shown on the plans will be Lump Sum. The price bid for Class 1 Excavation shall include the costs for placement of this material in embankment areas. The embankment shall meet the requirements of Section 203.02H Compaction Control Type B.

2. **Class 2 Excavation** shall be to the limits shown on the plan typical box culvert layout drawing. The quantity of Class 2 Excavation within the limits is estimated at 300 cubic yards. All material not considered suitable for the roadbed shall be used to fill the road inslopes unless the material is deemed waste excavation by the engineer. It is assumed that this material will be suitable for use in embankment areas. Payment for all Class 2 Excavation to the limits shown on the plans will be Lump Sum. The price bid for Class 2 Excavation shall include the costs for placement of this material in embankment areas. The embankment shall meet the requirements of Section 203.02H Compaction Control Type B.

3. **Channel Excavation** shall be excavated to the limits shown on the typical box culvert layout drawing. Excavation necessary to place riprap is included in these limits. The quantity of Channel Excavation within the limits is estimated at 50 cubic yards. It is assumed that this material will be suitable for use in embankment areas. All material not considered suitable for the roadbed shall be used to fill the road inslopes unless the material is deemed waste excavation by the engineer. Payment for all Channel Excavation to the limits shown on the plans will be Lump Sum. The price bid for Channel Excavation shall include the costs for placement of this material in embankment areas. The embankment shall meet the requirements of section 203.02H Compaction Control Type B.

4. **Foundation Fill** shall be Class 3, and in accordance with Section 210.02 B.2 of the Standard Specifications. Foundation fill shall be placed in lifts not to exceed six (6) inches, compacted with a mechanical tamper. Water shall be added to the fill as needed or as directed by the Engineer and shall be included in the price bid for Foundation Fill. Ordinary compaction shall apply for the foundation fill (not specified density).

5. **Select Backfill** adjacent to and over the box culvert shall be Class 3 in accordance with Section 210.02 B.1 and Section 816.03 of the Standard Specifications, placed to the limits shown on the plans. The select backfill shall be placed in lifts not to exceed six (6) inches, compacted with a mechanical tamper. Moisture and density controls for specified density shall be in accordance with Section 203.02G of the Standard Specifications.

6. **Foundation Preparation:** The contractor shall note that flowing or standing water is present in the channel at this location. The water level fluctuates throughout the year. Bidders shall include all costs generated due to site conditions into associated bid items when bidding this project. No additional compensation nor revisions to the completion date will be made due to fluctuations in the water level.

7. **Waste Excavation:** All material from the structural and channel excavation not useable as embankment material shall be removed and disposed of at a site obtained by the Contractor. The Contractor is responsible for obtaining any and all permits needed for waste disposal and shall full responsibility for complying with the requirements of said permits and with all applicable laws. The Contractor shall be responsible for restoring the waste disposal areas to satisfactory condition and any seeding required. This shall be included in the price bid for excavation with no direct compensation therefore. The Contractor shall be required to obtain a site release for the disposal site.

606-P01 PRECAST REINFORCED CONCRETE BOX CULVERT:

1. The structure shall be one line of precast single cell 16'x7' RCBC. The culvert shall be 60 feet long from inside of the parapet to inside of the parapet. The Contractor shall submit shop drawings as per Section 606.04 of the Standard Specifications:

2. The end sections shall include a reinforced concrete parapet on the top of the roof and a reinforced concrete cutoff wall below the floor. The parapet shall be one (1) foot by one (1) foot and shall be as long as the barrel section's outside width. The cutoff walls shall be placed under the end of the end sections and shall be a minimum of one (1) foot thick, and three (3) feet, two (2) inches deep. The cutoff walls shall extend three (3) feet beyond the edges of outside box culvert walls.

3. A flexible sealant compound shall be placed in every joint of the precast concrete box culvert. A joint sealant compound shall be installed as per the manufacturer's recommendations. The flexible sealant shall be installed in addition to the geotextile fabric required in Section 606.04 of the Standard Specifications. Costs for the material and its installation shall be included in the price bid for the precast reinforced concrete box culvert.

4. Each precast reinforced concrete box culvert section shall be secured with four tie bolts per joint.

5. All costs associated with completing these items as detailed shall be included in the price bid for the precast units.

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NOTES

6. Box Culvert Design Moments

MOMENTS DUE TO HL93 TRUCK LOADING IMPACT = 0%

16 FT x 7 FT X SINGLE CELL BOX WITH 2.0 to 2.65 ft FT OF OVERFILL

COMPONENT	LOCATION	Max Mu (KIP-FT/FT)	Min Mu (KIP FT/FT)
TOP SLAB	EXTERIOR CORNER	5.53	-7.13
	MIDSPAN	39.56	10.26
	INTERIOR CORNER	3.43	-10.80
WALL	TOP CORNER	-5.20	-19.10
	MID HEIGHT	-5.03	-16.94
	BOTTOM CORNER	-6.05	-16.54
BOTTOM SLAB	EXTERIOR CORNER	-0.99	-4.74
	MIDSPAN	30.93	11.51
	INTERIOR CORNER	-2.52	-8.06

NOTES

1.Moments labeled as moments at the corners are the moments at the intersection of the haunch and the regular depth member in accordance with section 12.11.4.2 of the AASHTO LRFD Bridge Design Specifications 5th Edition

BASIS OF DESIGN
Top slab thickness = 10 inches
Bottom thickness = 10 inches
Wall thickness = 8 inches
Haunches = 12 inches

704-P01 TRAFFIC CONTROL

Construction signing for the project shall be provided and maintained by the Contractor as per Section 704 of the Standard Specifications, attached Standard Drawings, and the MUTCD Manual.

A detour is planned for this project as shown in Section 100 of the plans..

708-P01 PERMANENT EROSION CONTROL

1. **ROCK RIPRAP:**

   A. Any shaping necessary to prepare for the riprap placement shall be included in the price bid for "Riprap- Loose Rock". Riprap shall be paid for by the Cubic Yard (C.Y.) as shown on the Plans unless otherwise directed by the Engineer in the field. All riprap shall conform to Section 708.04 of the Standard Specifications. Geotextile filter fabric shall be installed under the Rock Riprap and shall be included in the price bid for "Riprap- Loose Rock."

2. **FIBER ROLLS:**
   After replacement of the topsoil, fiber rolls shall be installed at the locations shown on the Plan and Profile or as designated by the Engineer in the field, and in accordance with plan details and the standard specifications.

3. **EROSION CONTROL BLANKET:**
   An estimated quantity of erosion control blanket has been included in the plans to be placed at erosion critical locations primarily around the structure as directed by the engineer.

4. **SEEDING:**

   A. Seeding shall cover the entire disturbed right-of-way & construction easement areas except the 36-foot roadbed. Seeding shall be Type B CL V in accordance with Section 708 of the Standard Specifications. Payment for seeding shall be per mile.

TYPE B, CLASS V

GRASS SPECIES	VARIETY	POUNDS PURE LIVE SEED PER ACRE
Western Wheatgrass	Rodan or Rosanna	10
Slender Wheatgrass	Revenue or Primar	4
Pubescent Wheatgrass	Mandan 906 or Greenleaf	10
Alfalfa		6
Total		30

   B. Mulching shall be required for the majority of the project limits to be seeded. The estimated quantity for acres of mulch shall be considered advisory only; all disturbed areas to be seeded may not require mulch: (Slopes to steep to property to secure the mulch will either be seeded only or ECB may be used.)

   C. A cover crop is required as per Section 708.02C.1.a (4) and shall be included in the price bid for “Seeding-Type B CL V”. Should a temporary cover crop (CL VI) need to be seeded during the summer months, payment will be made at the bid price per mile for "Temporary Cover Crop CL VI".

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NOTES

5. **TEMPORARY EROSION CONTROL MEASURES:**

A. During the course of the project, the installation of silt fence unsupported will be required according to Standard Drawing D-708-2. This fencing will be placed at various locations along the project as shown in the plans or as required for permit compliance. Silt fence unsupported shall be paid for by the linear foot, complete, in place and accepted by the engineer.

B. The Field Engineer may allow this fencing to be reused as construction advances. If

C. fencing is reused in different locations, the Contractor will be paid the unit price bid for "Silt fence unsupported" each time the fence is relocated. The fencing to be placed shall be on-site before the stripping of topsoil may begin. Approximately 200 lineal feet of fence has been added to the estimated quantities to be used if needed. Payment will be made only for the amount of silt fence actually installed.

D. The Contractor shall be responsible for maintaining the silt fence throughout the duration of the project. This shall include the removal of sediment and the repair of the silt fence as directed by the Engineer. All costs associated with this work shall be included in the price bid for silt fence.

E. A Storm Water Runoff Permit will be required from the ND Department of Health as detailed in the project proposal. Any additional temporary erosion controls required due to this permit, directed by the engineer, or needed due to site conditions shall be installed and paid for under the conditions of Specification 110 unless bid items are used. Devises required for contractor option borrow sites shall be include in the price bid for “Borrow – Excavation”.

709-P01 GEOTEXTILE FABRIC – TYPE R1

Box Culvert - Reinforcement fabric shall be placed parallel to the roadway centerline. If more than one piece of fabric is used to meet the required length, then the joint must be sewn. Adjacent strips of fabric shall be butted. All fabric must be taut and pinned with a 6” (min) pin, peg, or staple every 15’ along all edges and on all corners prior to placing fill on the fabric. The required R1 fabric for the box culvert installation shall be included in the price bid for the RCBC.

Roadway - Reinforcement fabric placed on the subgrade under the aggregate base shall follow the requirements of Section 709 of the Standard Specifications and shall be paid for by the SY.

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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ENVIRONMENTAL COMMITMENTS

ENVIRONMENTAL COMMITMENTS: Sargent County, the North Dakota Department of Transportation, and the Federal Highway Administration have made environmental commitments to various public agencies and the public to secure approval of this project. The environmental commitments are as follows:

Commitment No. 1: Avoid creek channel changes and placement of fill in wetlands to the fullest extent possible. The Tewaukon Channel No. 1 a tributary to the Wild Rice River channel is the only identified wetland.

Action taken/required: No channel changes will be constructed. Wetland impacts will be avoided by the project design No net fill will be placed below the ordinary high water line of the channel resulting in no net loss to mitigate for.

Commitment No. 2: A storm discharge permit is required if more than one acre is disturbed.

Action taken/required: The Contractor will be required to obtain a storm water discharge permit from the North Dakota Department of Health and shall comply with the requirements contained in the permit.

Commitment No. 3: Aquatic nuisance species (ANS) is a concern of the ND Game & Fish Department.

Action taken/required: The contractor, including any and all subcontractors or others involved in this project, will be required to take appropriate and reasonable precautions to prevent the introduction of ANS into the state's waters or the movement of ANS within North Dakota or between North Dakota waters. These ANS precautions extend to any and all vehicles, vessels, trailers, pumps, and such equipment that will be used in the waters of the state. The contractor will provide the Department a reasonable opportunity to inspect any and all vehicles, vessels, pumps, and equipment that will be used in the waters of the state prior to those items being launched or placed in the waters of the state.

The contractor shall contract Mr. Lynn Schlueter, Special Project Biologist for the Department at his Devils Lake Office (701-662-3617) for equipment inspections or any additional information regarding ANS prior to starting work on the project.

Commitment No. 4: A US Army Corps of Engineers Section 404 Permit is required.

Action taken/required: A permit application has been obtained from the USACE. The Contractor shall comply with all requirements listed in the permit obtained.

Commitment No. 5: No work shall be allowed in the channel from April 15th to June 1st.

Action taken/required: No construction or demolition activities are to take place in the channel from April 15th to June 1st.

Commitment No. 6: Fill material placed below the ordinary high water mark must be free of top soils, decomposable material and persistent organic compounds. All temporary fills must be removed.

Action taken/required: The contractor shall comply with these requirements.

Commitment No. 7: The existing structure shall not be removed before July 15th unless the Contractor uses alternative measures to prevent migratory birds from nesting prior to construction.

Action taken/required: The contractor shall comply with this requirement.

Commitment No. 8: Proper disposal of materials associated with the removal of the bridge will occur to prevent contamination of the waterway.

Action taken/required: It will be the contractor's responsibility that waste materials from the bridge removal are disposed of in a proper manner.

Identified Permits Required

1. A 404 Permit from the U.S. Army Corps of Engineers.(has been obtained)
2. Storm water construction permit from North Dakota Department of Health. (Contractor to obtain) – Owner of permit shall be listed as Sargent County

Wetland Number	Location	Long/Lat	Cowardin Classification	Wetland Type	Wetland Feature	Wetland Size (acres)	Wetland Protected Under E.O. 11990	USACE Jurisdictional Wetlands	Wetland Impacts	
									Temp.	Perm.
1	SW ¼ Sec. 11 T129N R55W & NW ¼ Sec. 14 T129N R55W	N 45° 99' 33" W 97° 54' 86"	R4	Channel	Artificial	0.1	no	yes	0.02	0.02
2	SW1/4 Sec 11, T129N, R55W	N 45° 59' 37" W 97° 32' 52"	PEMA	Basin	Natural	0.2	Yes	Yes	0	0
3	NW ¼ Sec 14, T129N, R55W	N 45° 59' 34" W 97° 32' 49"	PEMC	Basin	Natural	0.2	yes	yes	0	0

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ESTIMATED QUANTITIES

SPEC	CODE	DESCRIPTION	UNIT	NO. OF UNITS
103	0100	CONTRACT BOND	L SUM	1
202	0105	REMOVAL OF STRUCTURE	L SUM	1
202	0170	REMOVAL OF CULVERTS-ALL TYPES & SIZES	LF	17
203	0102	COMMON EXCAVATION-TYPE B	CY	129
203	0109	TOPSOIL	CY	895
203	0140	BORROW-EXCAVATION	CY	5,000
210	0101	CLASS I EXCAVATION	L SUM	1
210	0111	CLASS 2 EXCAVATION	L SUM	1
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0200	SELECT BACKFILL	CY	1,060
210	0210	FOUNDATION FILL	CY	360
210	0411	FOUNDATION PREPARATION	L SUM	1
216	0100	WATER	M GAL	65
302	0160	AGGREGATE BASE COURSE CL 13	TON	950
606	1607	16FT X 7FT PRECAST RCB CULVERT	LF	60
606	5607	16FT X 7FT PRECAST RCB END SECTION	EA	2
702	0100	MOBILIZATION	L SUM	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1018
704	1052	TYPE III BARRICADE	EA	10
708	1020	RIPRAP-LOOSE ROCK	CY	65
708	1322	SILT FENCE UNSUPORTED	LF	1,180
708	1332	REMOVAL SILT FENCE UNSUPPORTED	LF	1,180
708	1430	FIBER ROLLS 12IN	LF	560
708	1431	REMOVAL FIBER ROLL 12IN	LF	90
708	2281	SEEDING-TYPE B-CL V	MILE	0.152
708	5201	TEMPORARY COVER CROP CL VI	MILE	0.152
708	5500	MULCHING	ACRE	1.8
708	5650	ECB TYPE 1	SY	150
714	4099	PIPE CONDUIT 18IN - APPROACH	LF	66
754	0803	OBJECT MARKER - TYPE III	EA	4

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BASIS OF ESTIMATE

203 BORROW – EXCAVATION

35% has been added to the quantity for shrinkage

210 SELECT BACKFILL

25% has been added to the quantity for shrinkage

216 WATER

Common Excavation	6 gal/CY
Borrow	6 gal/CY
Dust Palliative	25 Mgal/Mile
Aggregate Base Course	30 gal/Ton

302 AGGREGATE BASE COURSE CL5

6” Depth, 32’ Top Width. 2’ Sloughs	1.875 Ton/CY

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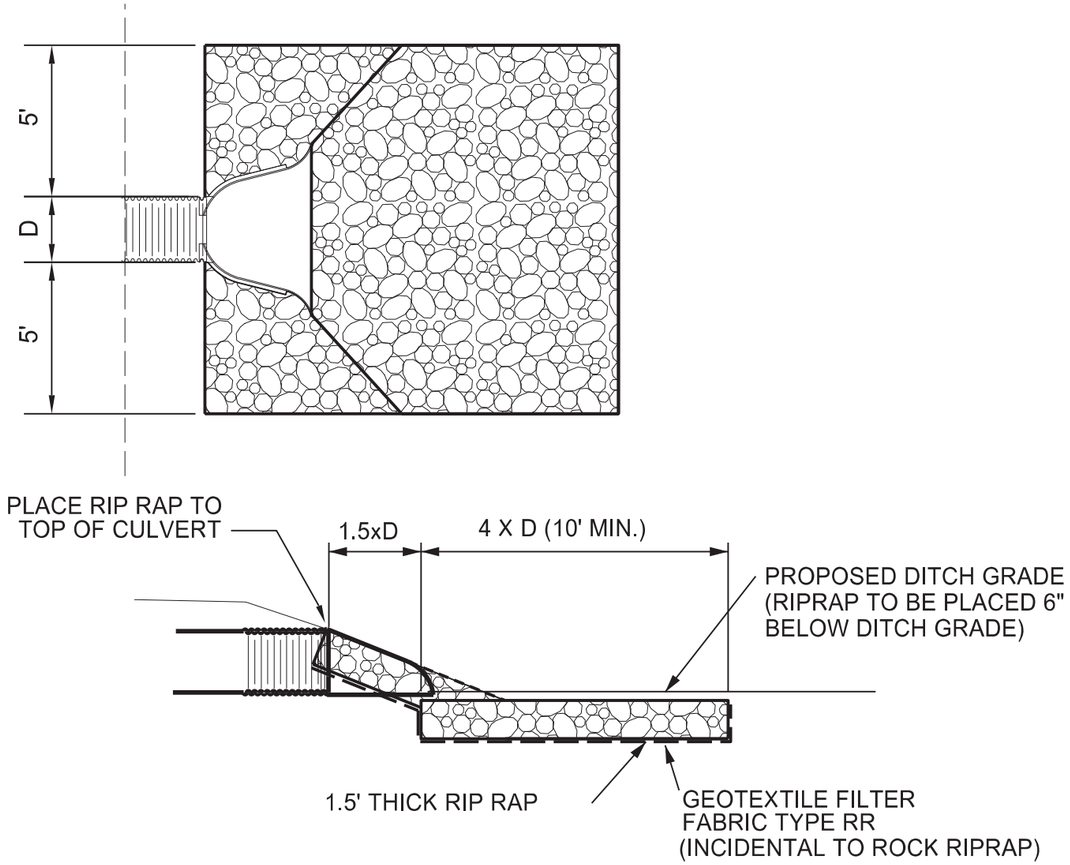
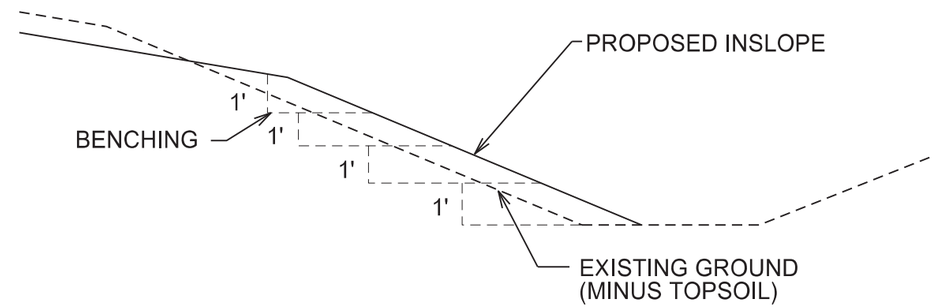
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	20	1



SECTION A-A

N.T.S.



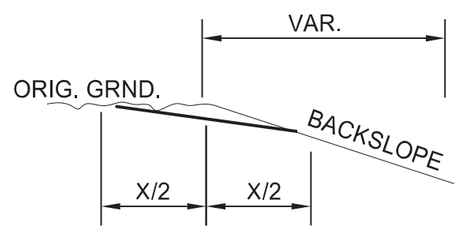
BENCHING TYPICAL SECTION

N.T.S.

RIPRAP AT CULVERT ENDS		
SIZE OF CULVERT	QUANTITY OF RIPRAP	QUANTITY OF FILTER FABRIC
(in.)	(CY)	(SY)
12	7.0	14.1
15	7.4	14.8
18	7.8	15.7
24	8.7	17.3
30	9.5	19.1
36	11.9	23.8
48	17.1	34.2

RIP RAP AT CULVERT ENDS

N.T.S.



BACKSLOPE ROUNDING WHERE X = 10'
UNLESS RESTRICTED BY HEIGHT OF BACKSLOPE

BACKSLOPE ROUNDING

N.T.S.

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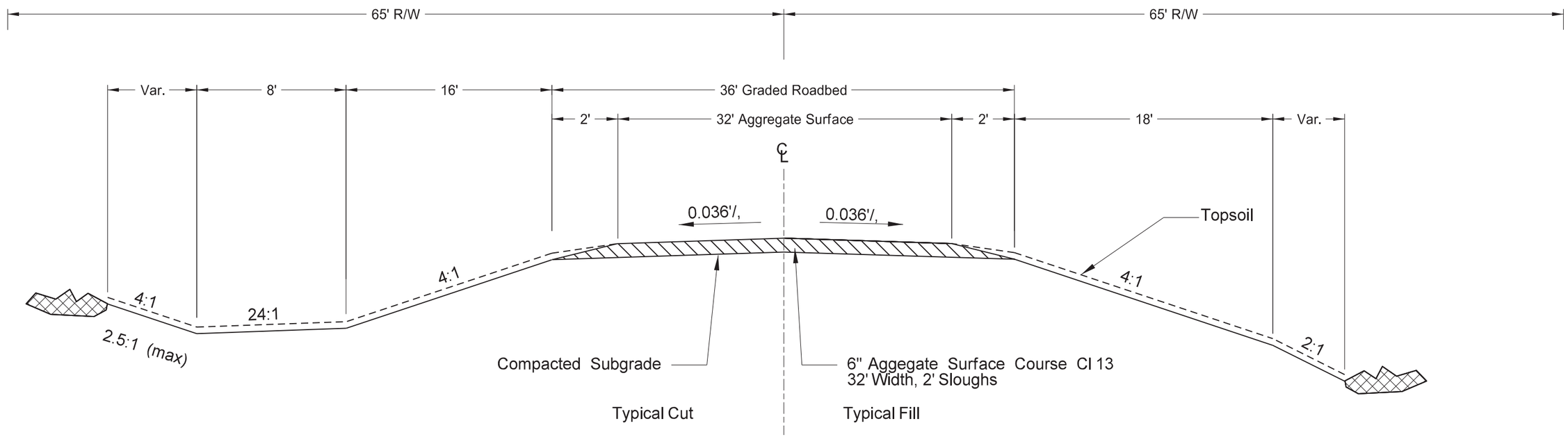
Details

Sargent County North Dakota

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	30	1



Proposed Typical Section

N.T.S.

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Note: Ditch bottom elevations & grades shown on cross-sections are to subgrade. add 6" to elevations for finished grade.

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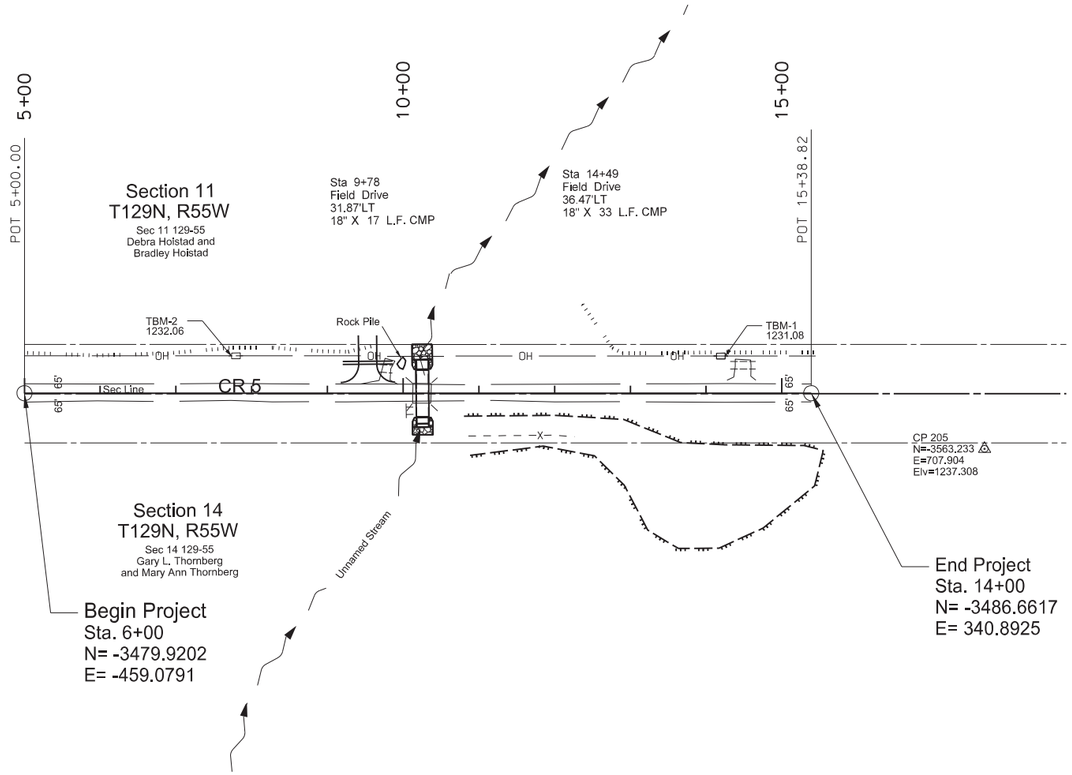
Typical Section

Sargent County North Dakota

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	60	1



Remove Culverts - All Types and Sizes

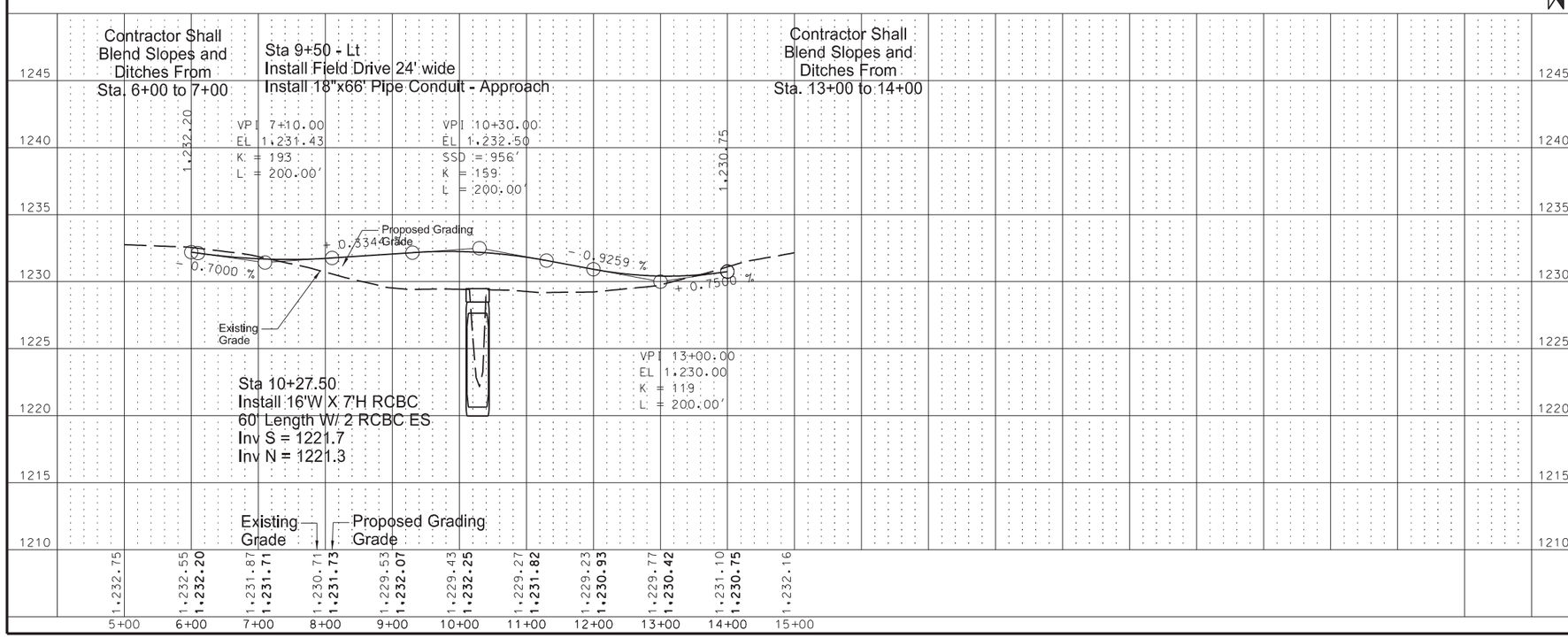
Sta 9+77 - Lt	17 LF

18IN Pipe Conduit - Approach

Sta 9+50 - Lt	66 LF

Object Marker-Type III

Sta 10+17 - Lt	1 EA
Sta 10+17 - Rt	1 EA
Sta 10+37 - Lt	1 EA
Sta 10+37 - Rt	1 EA



N

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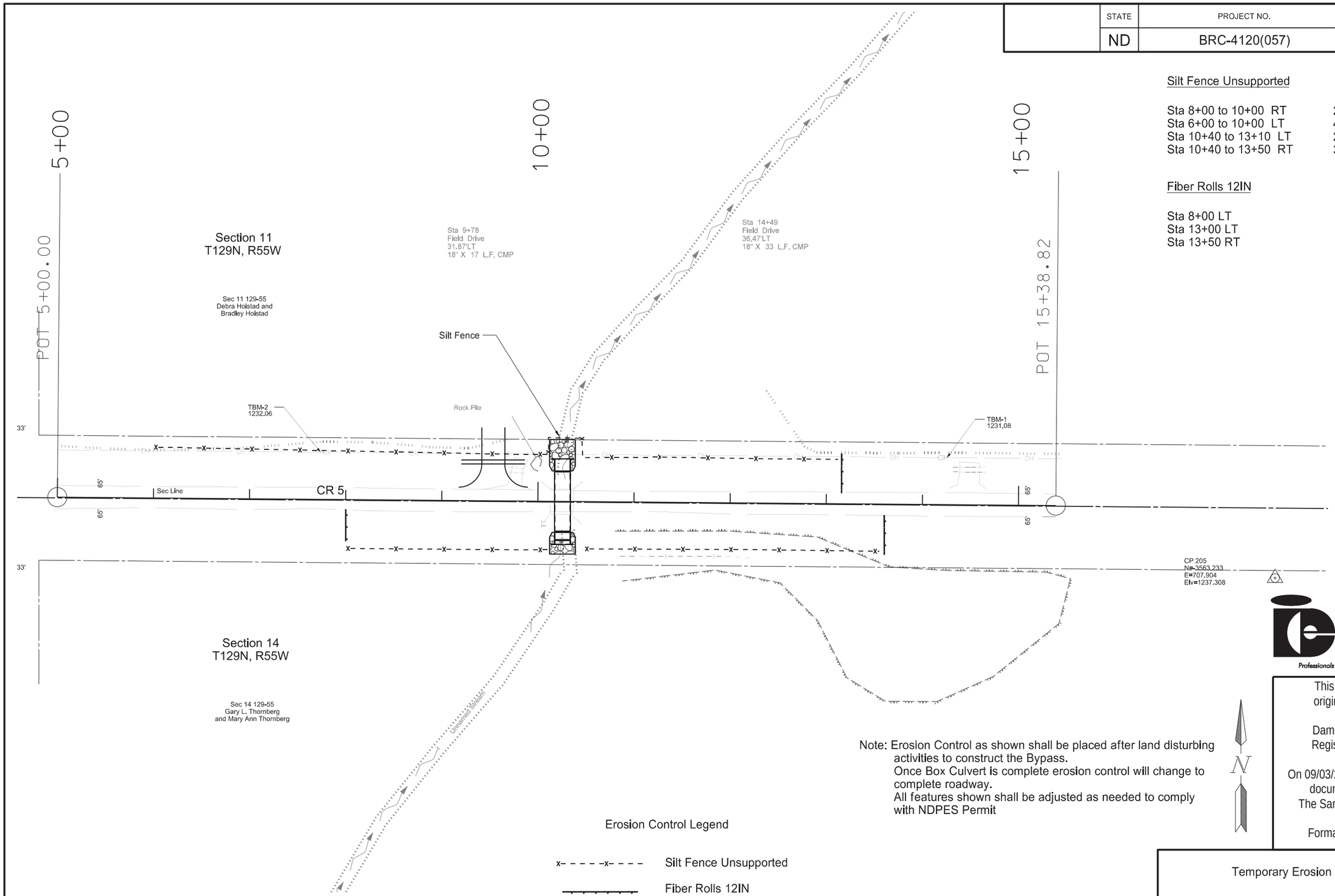
Plan and Profile

Sargent County North Dakota

W1000152

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	75	1



Silt Fence Unsupported

Sta 8+00 to 10+00 RT	200 LF
Sta 6+00 to 10+00 LT	400 LF
Sta 10+40 to 13+10 LT	270 LF
Sta 10+40 to 13+50 RT	310 LF

Fiber Rolls 12IN

Sta 8+00 LT	30 LF
Sta 13+00 LT	30 LF
Sta 13+50 RT	30 LF

Note: Erosion Control as shown shall be placed after land disturbing activities to construct the Bypass.
Once Box Culvert is complete erosion control will change to complete roadway.
All features shown shall be adjusted as needed to comply with NDPES Permit

N

Erosion Control Legend

x- - - - -x- - - - Silt Fence Unsupported

Fiber Rolls 12IN

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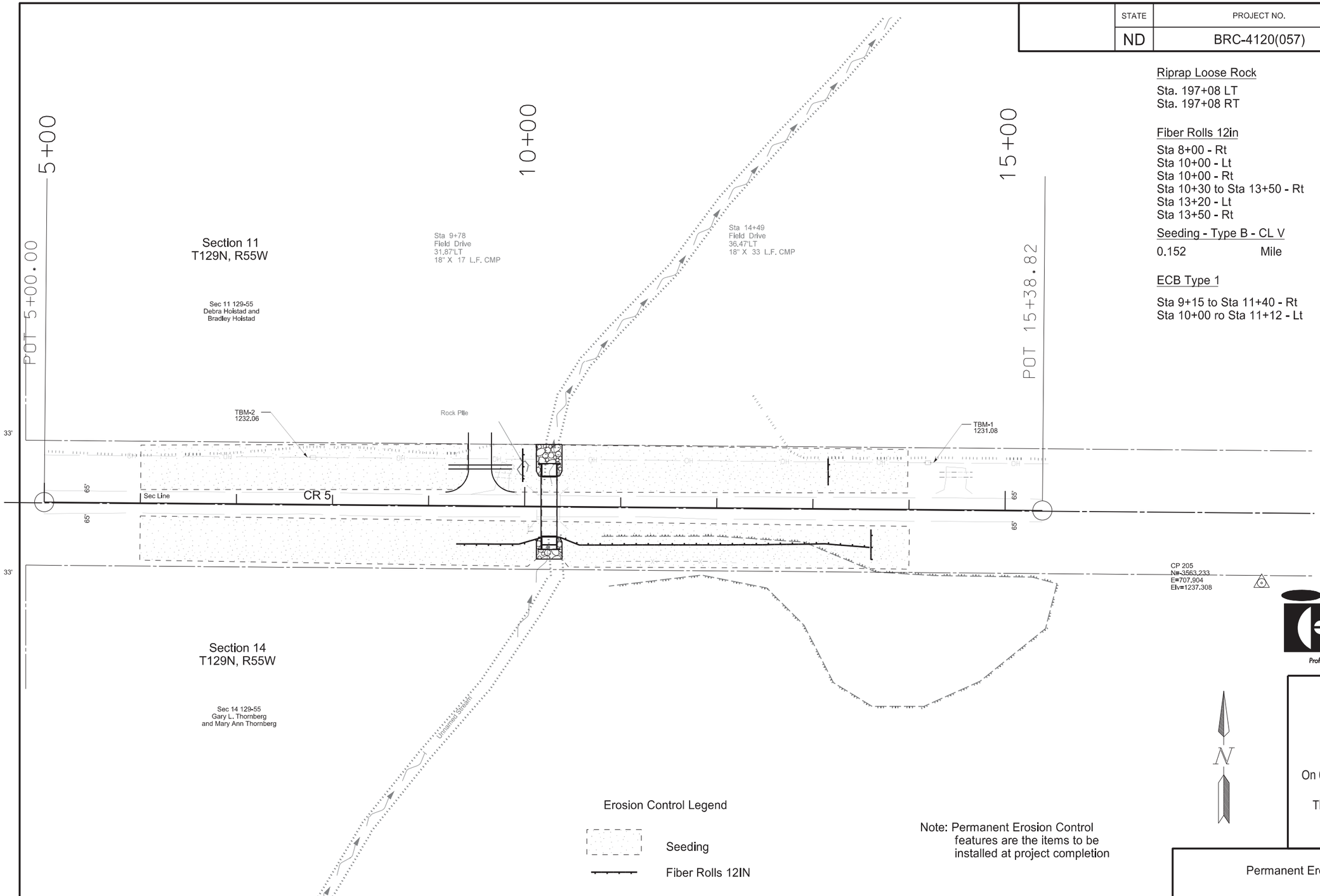
Temporary Erosion Control

Sargent County North Dakota

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	75	2



Riprap Loose Rock

Sta. 197+08 LT	30CY
Sta. 197+08 RT	35CY

Fiber Rolls 12in

Sta 8+00 - Rt	30 LF
Sta 10+00 - Lt	30 LF
Sta 10+00 - Rt	30 LF
Sta 10+30 to Sta 13+50 - Rt	320 LF
Sta 13+20 - Lt	30 LF
Sta 13+50 - Rt	30 LF

Seeding - Type B - CL V

0.152 Mile

ECB Type 1

Sta 9+15 to Sta 11+40 - Rt	100 SY
Sta 10+00 ro Sta 11+12 - Lt	50 SY

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Erosion Control Legend

Seeding

Fiber Rolls 12IN

Note: Permanent Erosion Control features are the items to be installed at project completion

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Permanent Erosion Control

Sargent County North Dakota

7:26:38 AM Shelley.Terfehr Q:\2010\W10s\W1000152\CADD\Design\SHEETS\075WL_002_ WetlandsSeeding.dgn

SURVEY COORDINATE AND CURVE DATA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
5002	5+00	-3479.0775	-559.0755
5003	15+38.82	-3487.8315	479.7120

CURVE DATA

ARC DEFINITION	

US PUBLIC LAND SURVEY DATA

DESC. SEC-TWP-RGE	NORTHING	EASTING
GPS10	10000	10000
SWSCOR 11-129-55 RR SPK	-3479.4140	-611.3290
SESCOR 11-129-55	-3523.6710	4668.5060

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	CONTROL POINT DESCRIPTION
CP 101	1802.7950	22818.3750	1191.0880	262+34.64		
CP 205	-3563.2330	707.9040	1237.3080	17+70		

BENCH MARKS

BM 1	18293.70	86930.01	2055.716	258+79.69	USGS U246

All coordinates and measurements on this document derived from the International Foot definition.

INITIALIZING BENCH MARK

- [X] NAVD-88
- [ ] NGVD-29

- [X] ENGLISH UNITS
- [ ] METRIC UNITS

- [X] Assumed Coordinates
- [ ] All coordinates on this sheet are County ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83(2011), North Zone Combination factor (cf) = 0.99984863

NOTES:

Date Survey Completed 11/12

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Revised

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	100	1

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**	**2**	**19**	**38**
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)**	**10**	**7**	**70**
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	**24"x12"**	**WEST (Mounted on route marker post)**	**12**	**7**	**84**
M4-8-24	**24"x12"**	**DETOUR (Mounted on route marker post)**	**22**	**7**	**154**
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)**	**6**	**7**	**42**
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)**	**8**	**7**	**56**
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)**	**8**	**7**	**56**
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		28	
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
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**	**2**	**35**	**70**
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	
M1-6-24		**County Route Marker**	**22**	**14**	**308**

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**1018**

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	
704-3501	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/

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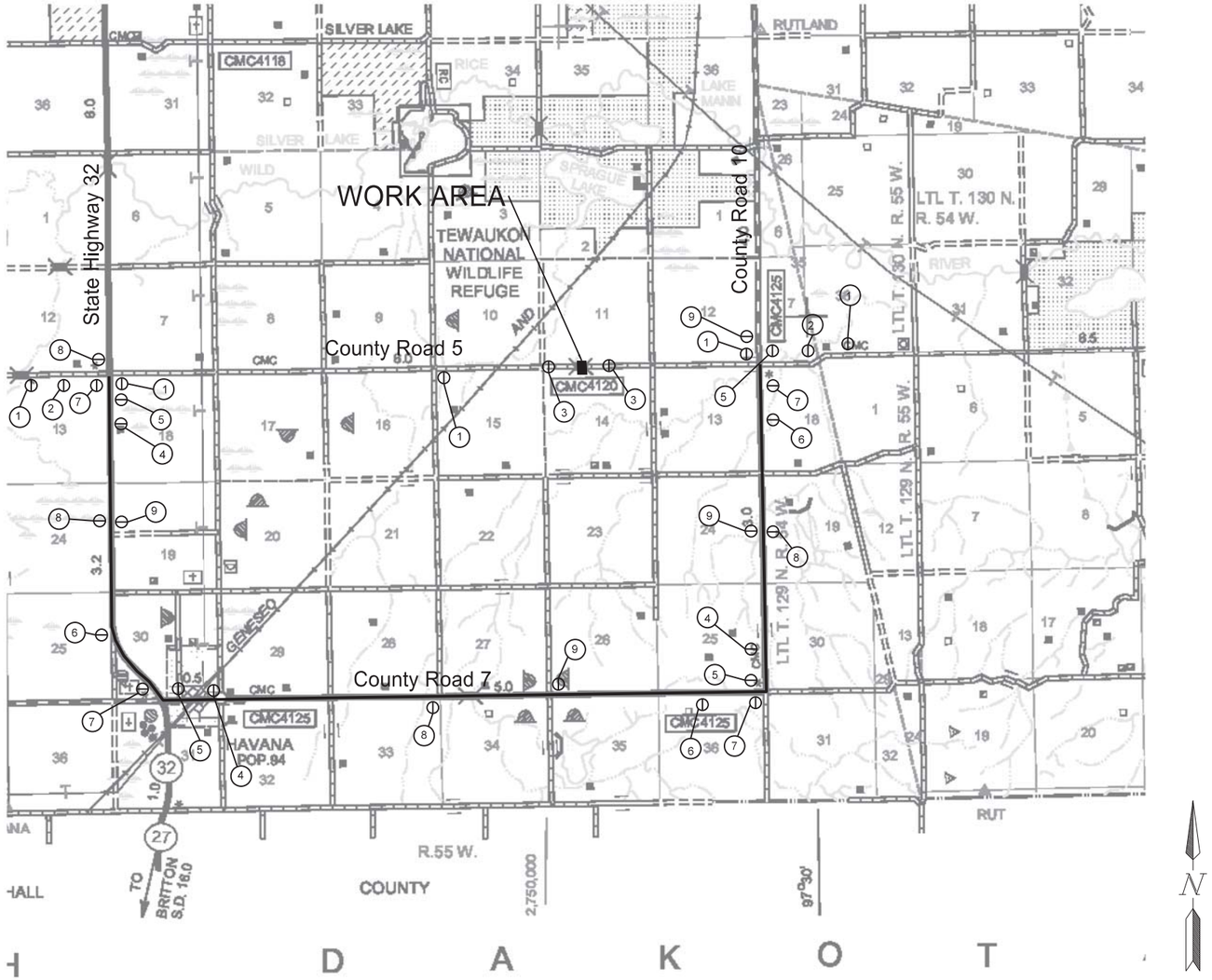
Traffic Control Devices List

Sargent County, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	100	2



1. W20-3-48 "Road Closed Ahead" with Type III Barricade Mounted (1 Barricade Postmount)
2. W20-2-48 "Detour 2000 Feet" Post Mounted
3. R11-2-48 "Road Closed" Type III Barricade Mounted (3 Barricades)
4. M4-8-24 "Detour" M3-3-24 "West" M1-6-24 "County Road #5" M5-1-21 "◄┐" or "┌►" Post Mounted
5. M4-8-24 "Detour" M3-3-24 "West" M1-6-24 "County Road #5" M6-1-21 "◄—" or "—►"
6. M4-8-24 "Detour" M3-3-24 "East" M1-6-24 "County Road #5" M5-1-21 "◄┐" or "┌►" Post Mounted
7. M4-8-24 "Detour" M3-3-24 "East" M1-6-24 "County Road #5" M6-1-21 "◄—" or "—►"
8. M4-8-24 "Detour" M3-3-24 "East" M1-6-24 "County Road #5" M6-3-21 "↑"
9. M4-8-24 "Detour" M3-3-24 "West" M1-6-24 "County Road #5" M6-3-21 "↑"

The construction signing layout is for informational purposes only. Traffic control signing shall be installed as per MUTCD manual and/or standard drawings.

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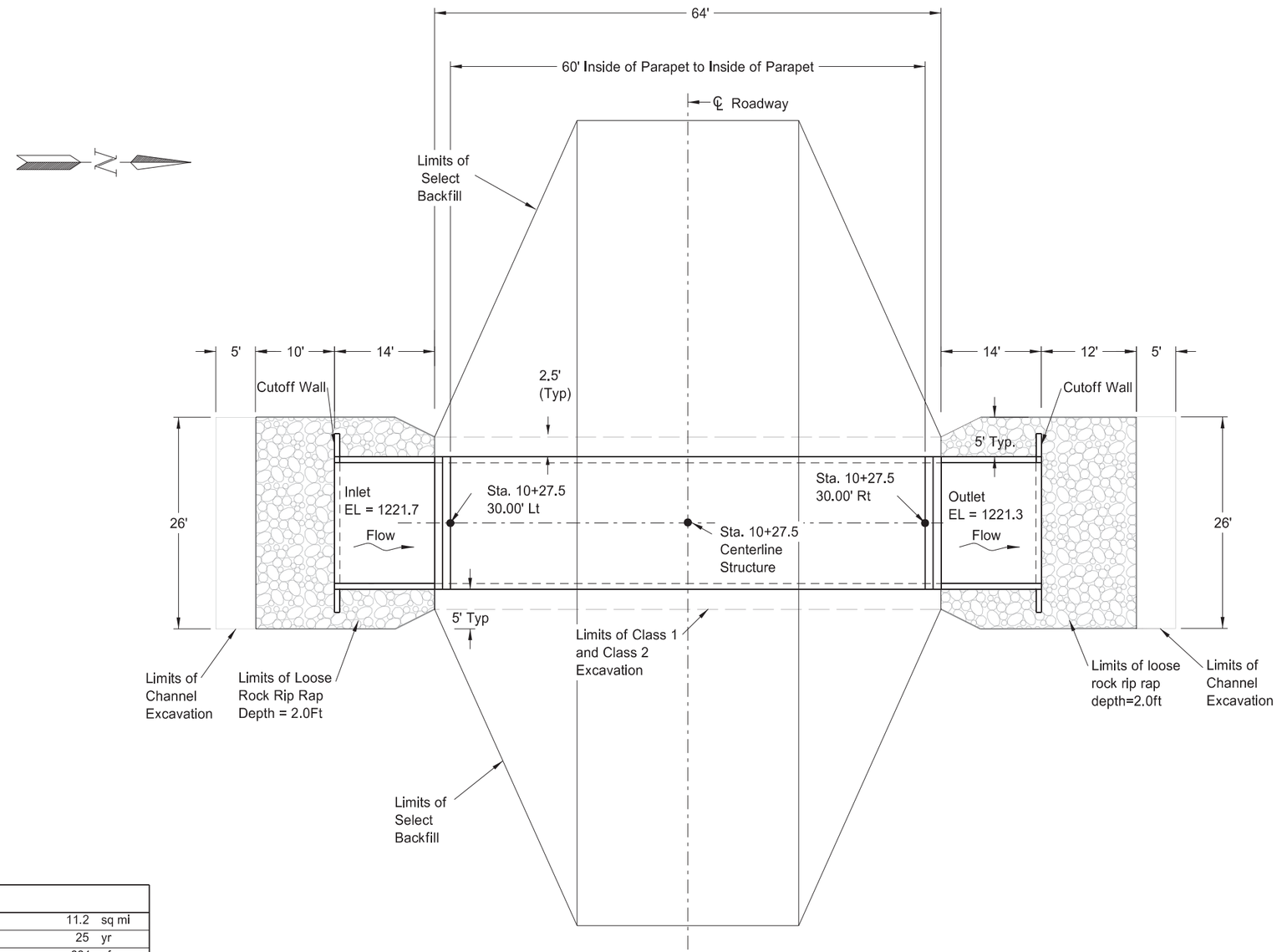
Traffic Control Layout

Sargent County North Dakota

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	170	1



HYDRAULIC DESIGN DATA:

Drainage Area (Contributing)	11.2	sq mi
Design Frequency	25	yr
Design Discharge	631	cfs
Design Stage	1228.97	ft
Stream Gradient	0.10	ft/ft
Waterway Provided Below Design Stage	112	sq ft
Avg. Velocity Of Flow In Natural Channel	4.74	fps
Depth Of Flow	7	ft
Velocity Of Flow Thru Culvert	4.8	fps
Freeboard Provided	0	ft (min.)
100 Year Frequency Discharge	903	cfs
100 Year Frequency Stage	1230.69	cfs
Maximum Observed Stage	UNKNOWN	cfs
Maximum Recorded Discharge	UNKNOWN	cfs
Frequency Of Maximum Flood	UNKNOWN	yr
Minimum Water Elevation	Dry	ft

BOX CULVERT BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
210	0101	CLASS 1 EXCAVATION	L SUM	1
210	0111	CLASS 2 EXCAVATION	L SUM	1
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0200	SELECT BACKFILL	CY	1060
210	0210	FOUNDATION FILL	CY	360
210	0411	FOUNDATION PREPARATION	L SUM	1
708	1020	RIPRAP - LOOSE ROCK	CY	65

Note:

1. Place riprap to match box culverts. top of riprap shall be one (1) foot below existing channel elevation.
2. Geotextile filter fabric RR to be included in price bid for rock rip rap.
3. Geotextile type R1 & S1 fabric to be included in the price bid for Foundation Fill.
4. Select backfill shall meet class 3 as specified in section 816 of the standard specifications.

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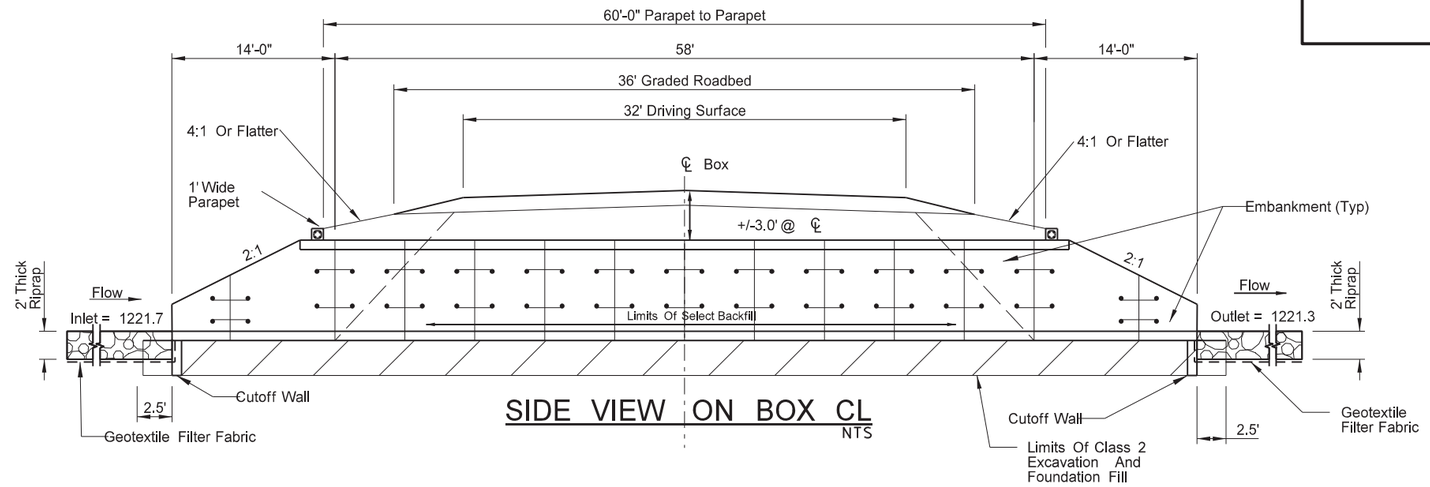
Box Culvert Layout

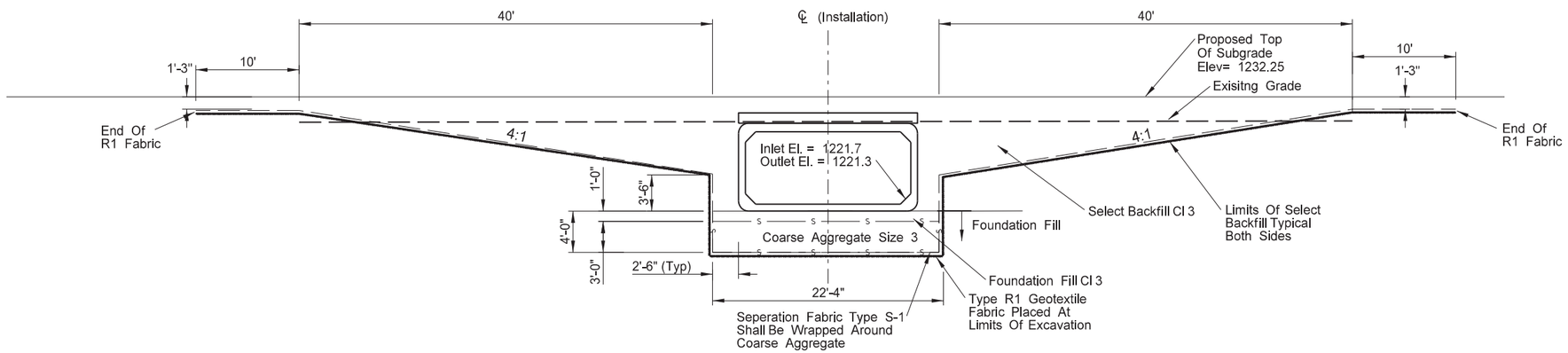
16' x 7' RCBC

Sargent County, North Dakota

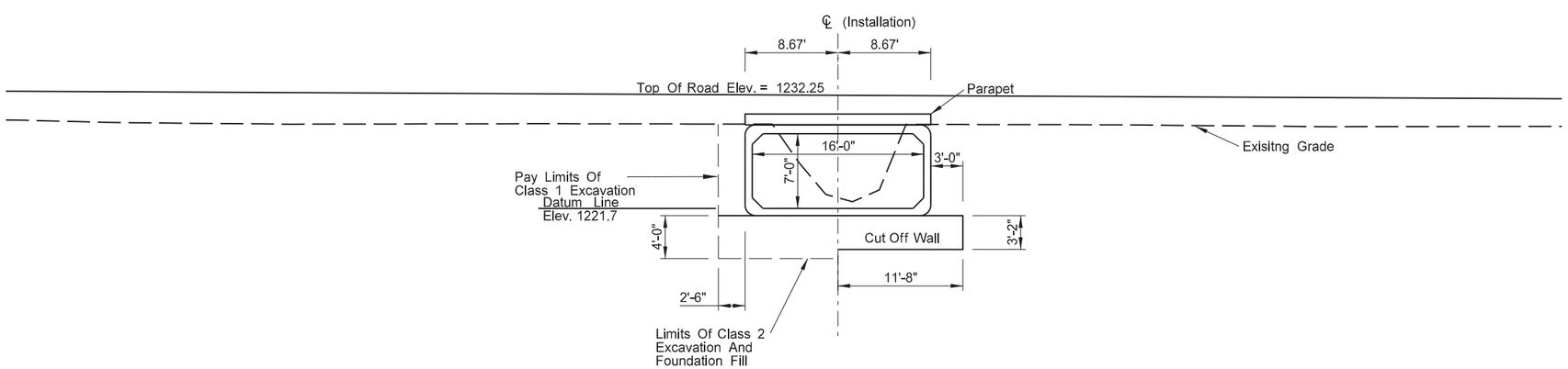
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	BRC-4120(057)	170	2



SIDE VIEW ON BOX CL
NTS



END VIEW SHOWING FOUNDATION FILL
NTS



END VIEW
NTS

Note:

Geotextile type r1 & s1 fabric to be incidental to the box culvert bid item.

Select backfill shall meet cl 3 as specified in Section 816 of the standard specifications.

INTERSTATE ENGINEERING
Professionals you need, people you trust

This document was originally issued and sealed by Damon K. DeVillers, Registration Number PE-3523, On 09/03/2013 and the original document is stored at The Sargent County Court House Forman, North Dakota

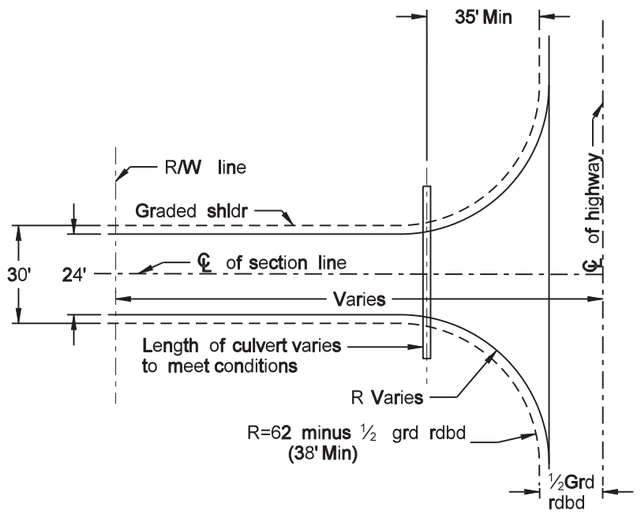
Excavation Limits & Foundation Fill

16' x 7' RCBC

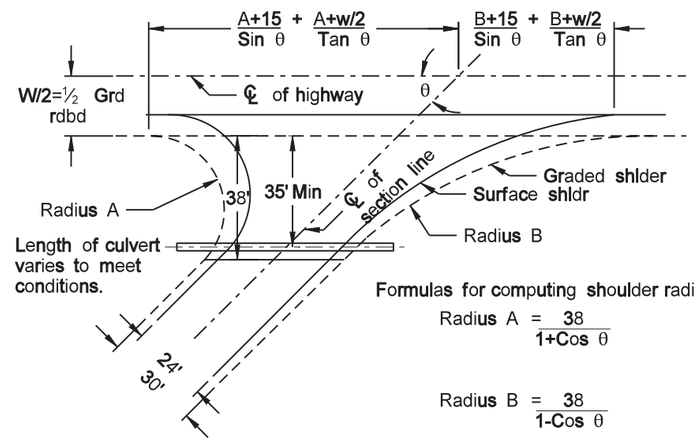
Mountrail County, North Dakota

SECTION LINE & PRIVATE DRIVE APPROACHES (RURAL)

D-203-08



PLAN VIEW SECTION LINE APPROACH (WITHOUT SKEW)

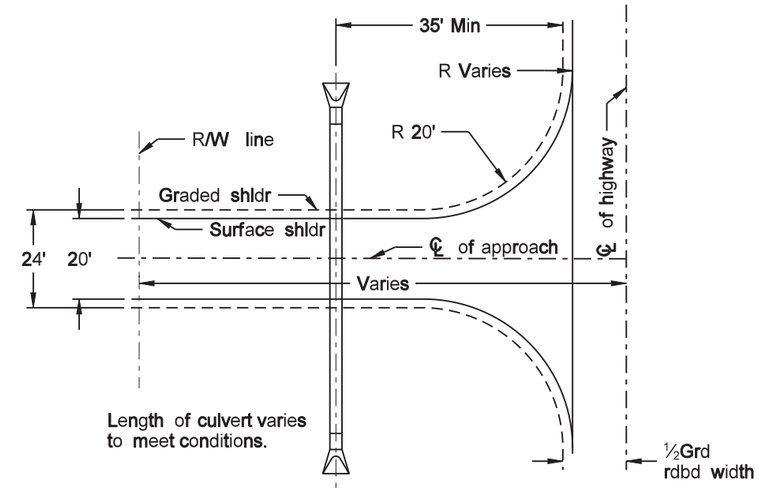


Formulas for computing shoulder radii

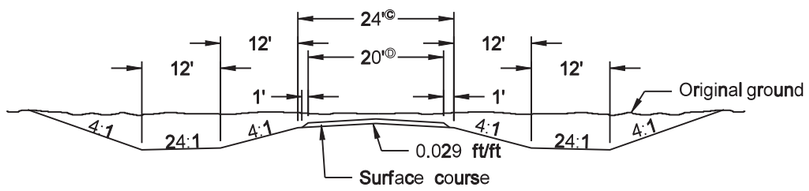
$$\text{Radius A} = \frac{38}{1+\cos\theta}$$

$$\text{Radius B} = \frac{38}{1-\cos\theta}$$

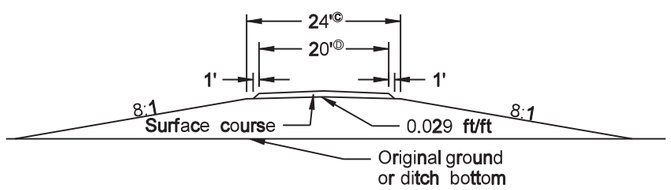
PLAN VIEW SECTION LINE APPROACH (SKEWED)



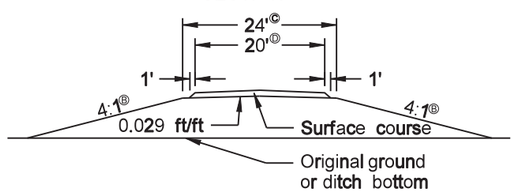
PLAN VIEW PRIVATE DRIVE APPROACH



SECTION A-A



SECTION B-B



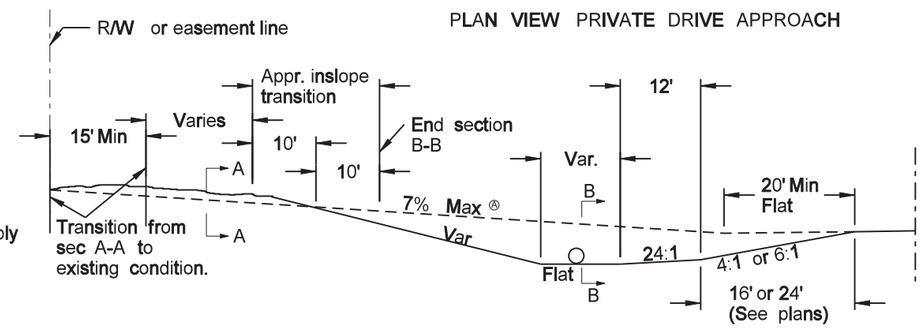
SECTION C-C

NOTES:

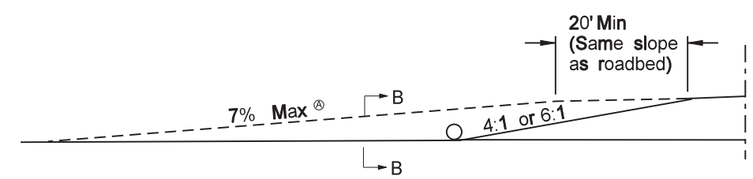
1. Dimensions shown for surfacing are for aggregate surface course or bituminous surface constructed with grading contract.
2. Approach grades and typical sections apply to both private drives and section line approaches.
3. Pipes shall be installed per Manufacturer's recommendations. Deflection testing may be performed at the discretion of the Engineer.

FOOT NOTES

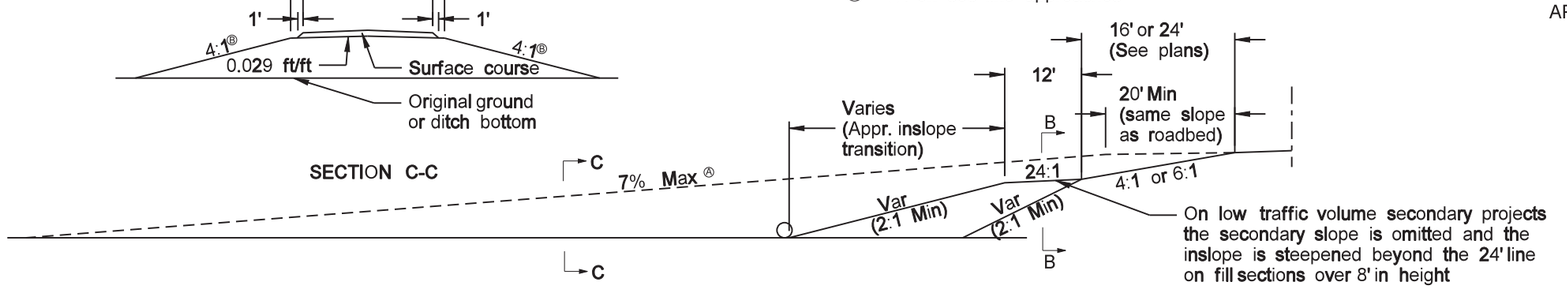
Ⓐ 10% Max on field drives
Ⓑ 3:1 Slope - 20' to 30' fill
2:1 Slope on fills over 30'
Ⓒ 30' on sec. line approaches
Ⓓ 24' on sec line approaches



APPROACH GRADE ON CUT SECTION



APPROACH GRADE ON FILL SECTION 12 FEET OR LESS



APPROACH GRADE ON FILL SECTION OVER 12 FEET

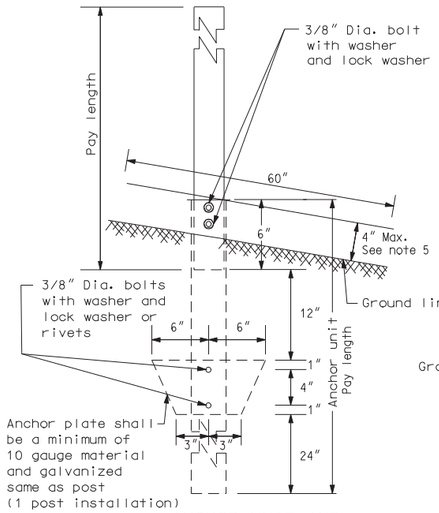
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
06-03-03	Revised roadway crown
12-01-04	PE Stamp added
04-05-06	General revisions
12-08-08	Format revisions/added Note 3

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 12/08/2008 and the original document is stored at the North Dakota Department of Transportation

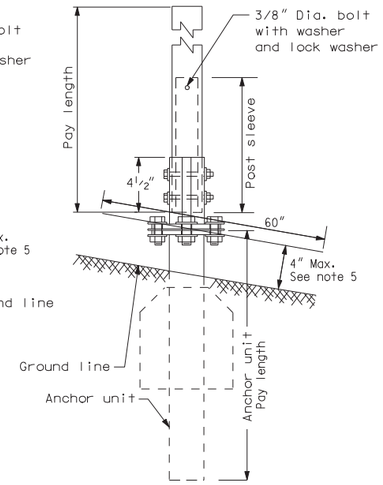
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

PERFORATED TUBE

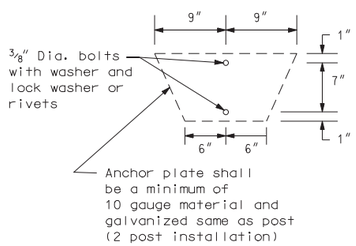
D-704-7

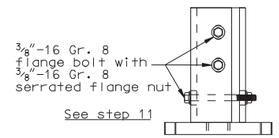


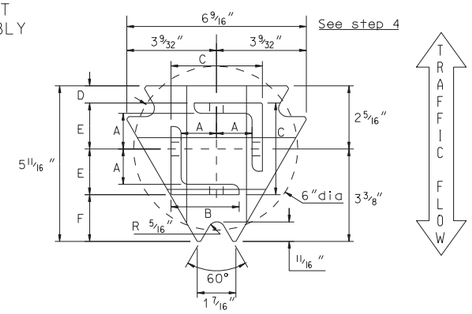
ANCHOR UNIT AND POST ASSEMBLY



SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY





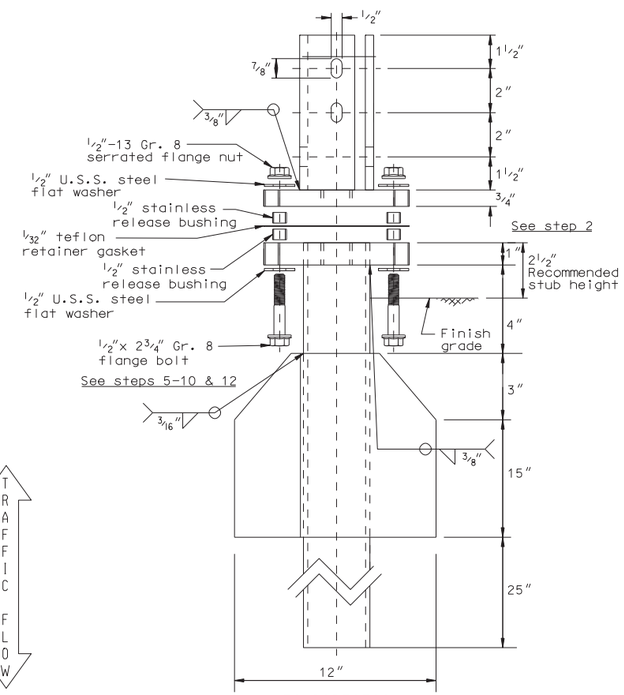


TOP POST RECEIVER

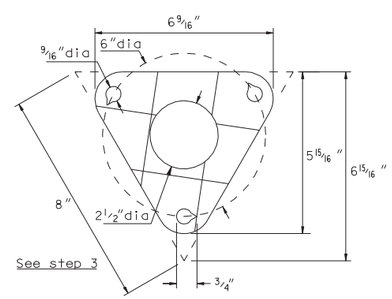
Materials: Plate - ASTM A572 grade 50
Angle receiver - $2\frac{1}{2}$"x $2\frac{1}{2}$"x $\frac{3}{8}$" ASTM A36 structural angle

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.

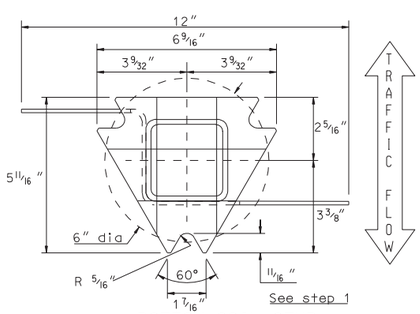


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY



BOLT RETAINER FOR BASE CONNECTION

Materials: $\frac{1}{32}$" reprocessed Teflon



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

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.

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.
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.

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.

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

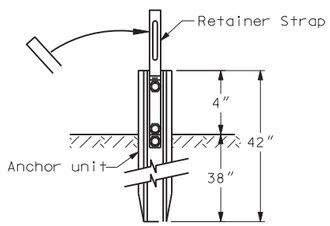
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-02	
REVISIONS	
DATE	CHANGE
12-01-04	PE stamp added

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

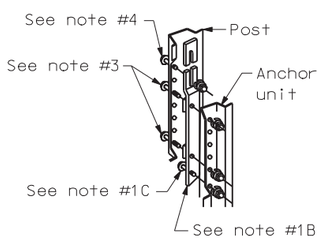
FLANGED CHANNEL



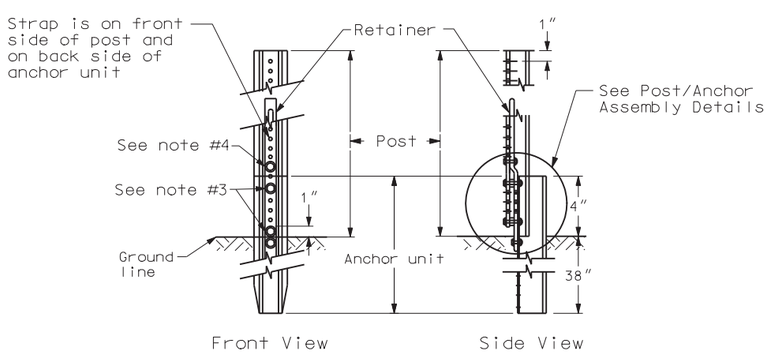
Anchor Unit & Strap Assembly Detail

STEPS OF INSTALLATION

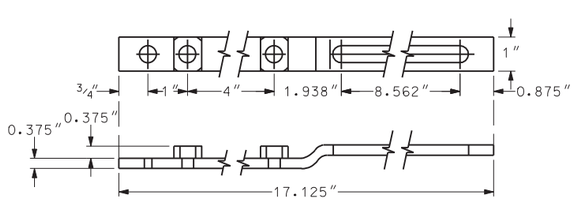
1. A) Drive anchor unit to within 12″ of ground level.
   B) Proper assembly established by lining up the top ¾″ slot of retainer spacer strap with top hole of anchor unit.
   C) Assemble strap to back of anchor unit using ⅜″-16 UNC x 2.0″ long bolt, lock washer and nut.
   D) Rotate strap 90° to left.
2. A) Drive anchor unit to 4″ dimension.
   B) Rotate strap to vertical position.
3. A) Place ⅜″-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 ¾″ slot in the strap).
   B) Alternately tighten two connector bolts.
4. A) Complete assembly by tightening ⅜″-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



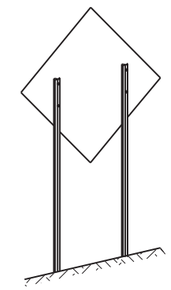
Sign Post Assembly Detail



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

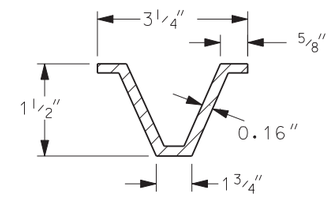
3 LB/FT U POSTS



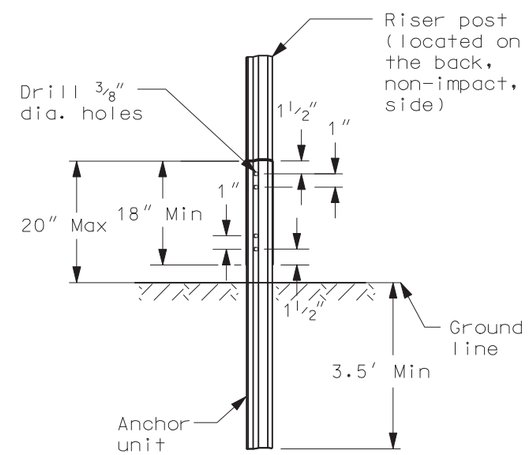
Typical Installation

Notes

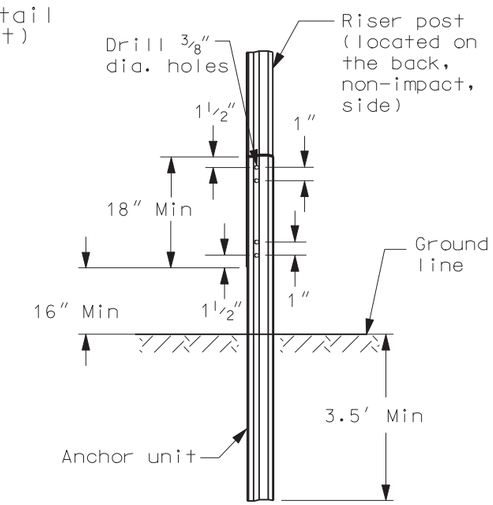
1. Use 3 lb/ft riser anchor units and risers
2. Driven riser posts shall be at least 7′ long and embedded at least 3.5′.
3. A splice shall overlap a minimum of 18″.
4. Use 4 bolts ⅝″ diameter with washers and nuts. Two at top and two at bottom of splice.
5. Anchor unit for guy wires shall be no more than 4″ above ground and embedded at least 3.5′.



U-Post Detail (3 lb/ft)



U-Channel Splice Option 1



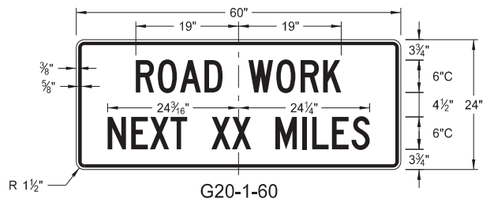
U-Channel Splice Option 2

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

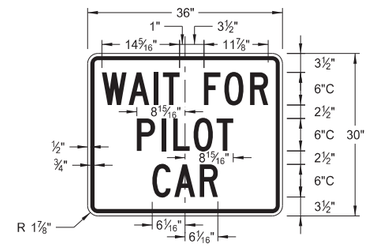
This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 06/29/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

D-704-9



G20-1-60
Legend: black (non-refl)
Background: orange



G20-4b-36
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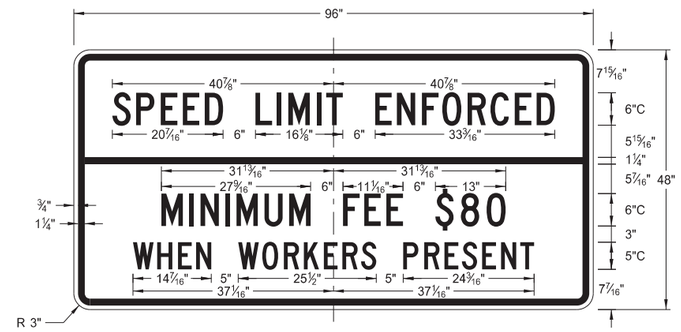
Background; orange



G20-55-96
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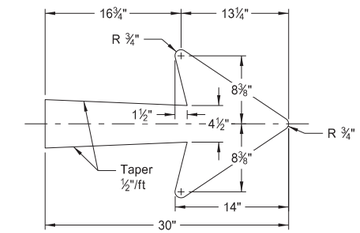
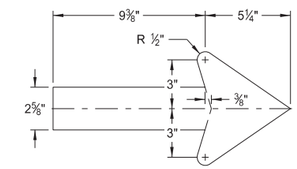
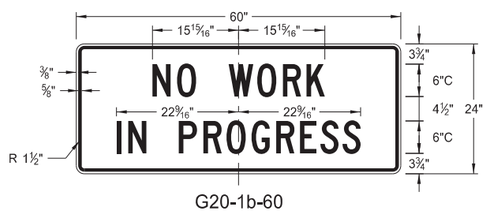


E5-1-48



G20-50a-72
G20-52a-72



G20-1b-60
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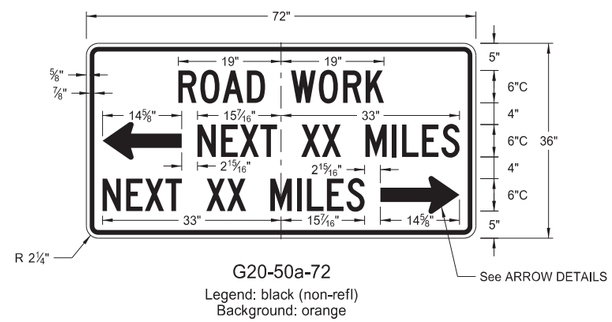
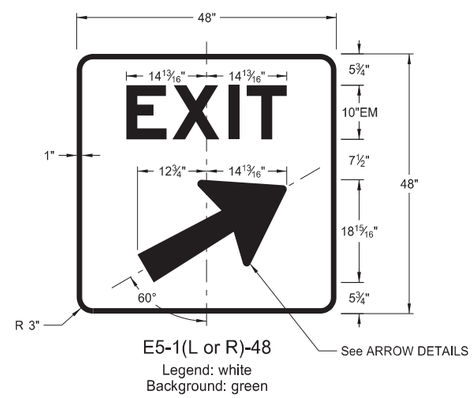
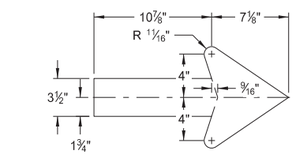


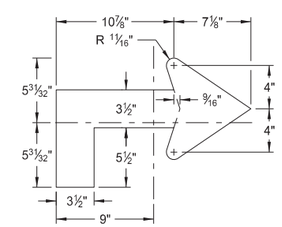
G20-50a-72
Legend: black (non-refl)
Background: orange



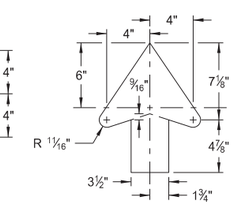
E5-1(L or R)-48
Legend: white
Background: green



M4-9(L or R)-30
Right or Left

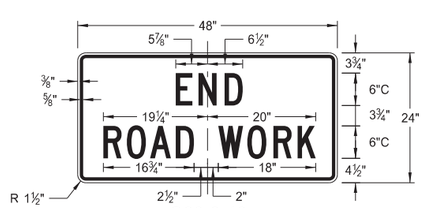


M4-9(L or R)-30
Advanced Right or Left



M4-9-30
Straight

ARROW DETAILS



G20-2-48
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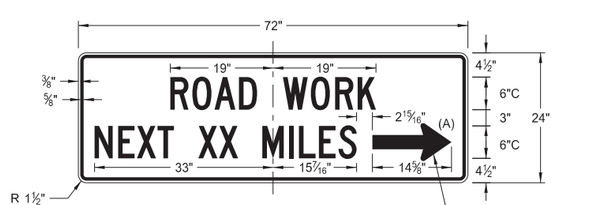
Background: orange



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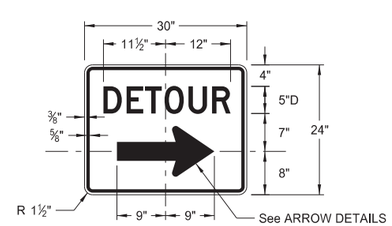
Background: orange



M4-9(L or R)-30 &
M4-9-30
Legend: black (non-refl)
Background: orange

NOTES:

(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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

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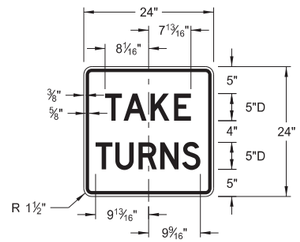
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50-24
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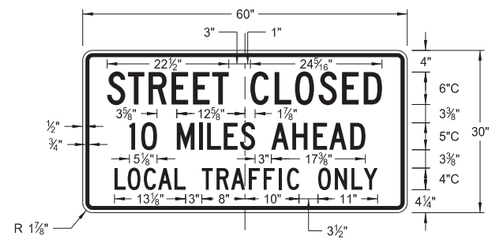
Background: white



R11-3c-60
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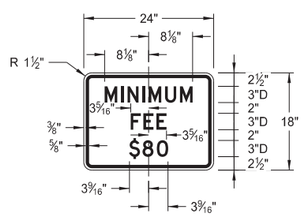

R2-1a-24
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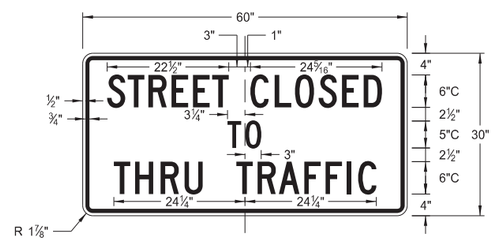

R11-4a-60
Legend: black (non-refl)
Background: white

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

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

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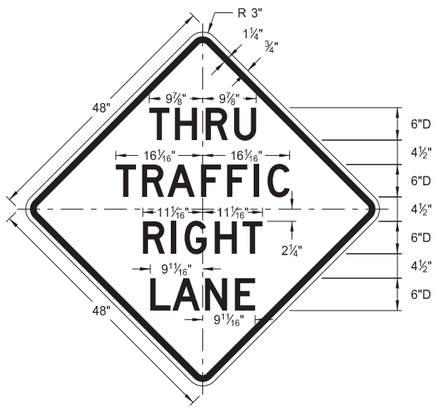
D-704-11

CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W5-8-48
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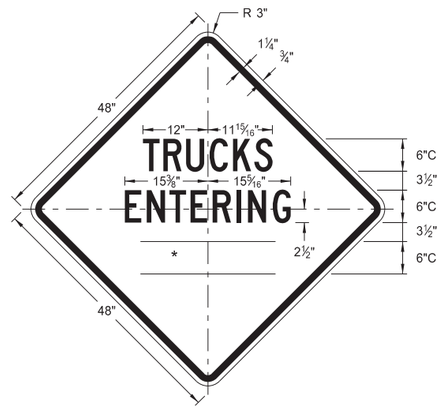
Background: orange



W8-54-48
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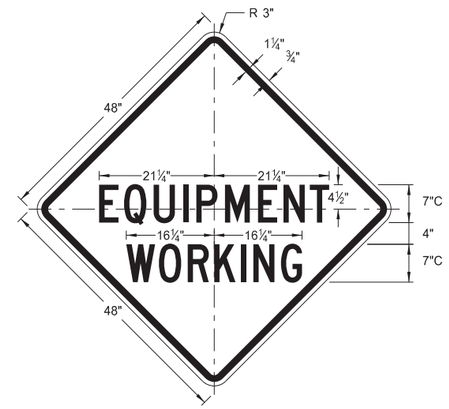
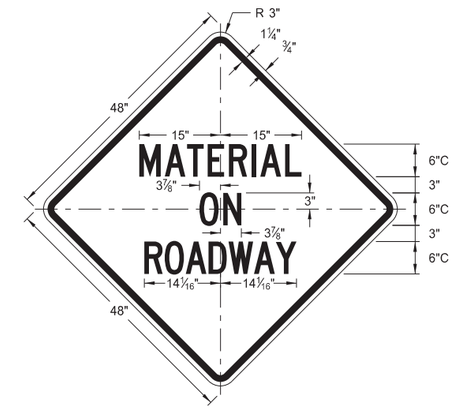
Background: orange



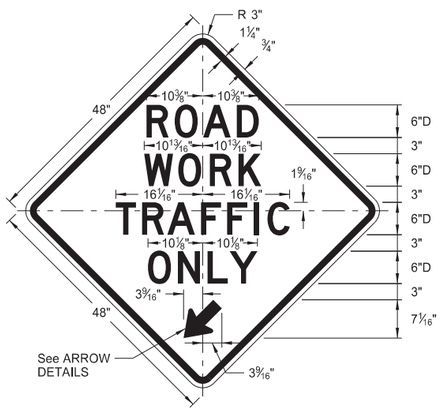
W20-51-48
Legend: black (non-refl)
Background: orange



W21-51-48
Legend: black (non-refl)
Background: orange

WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



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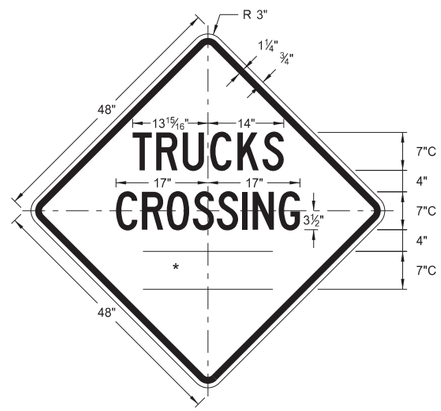

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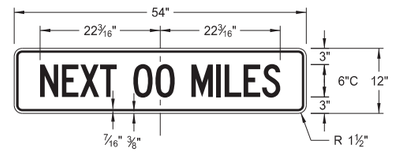

W20-52-54
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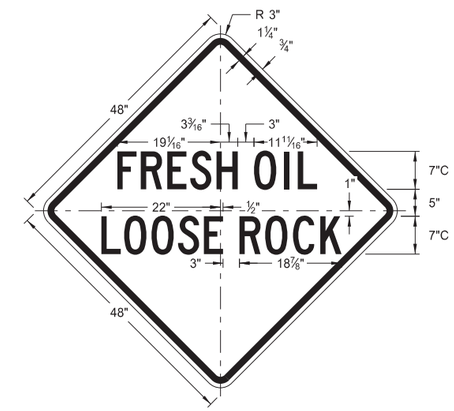
Background: orange



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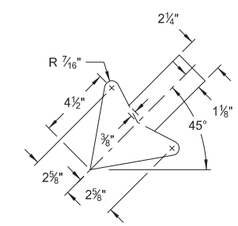
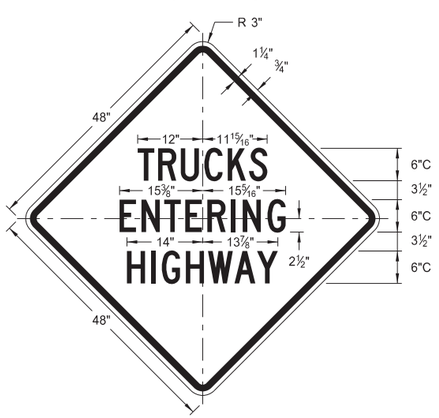
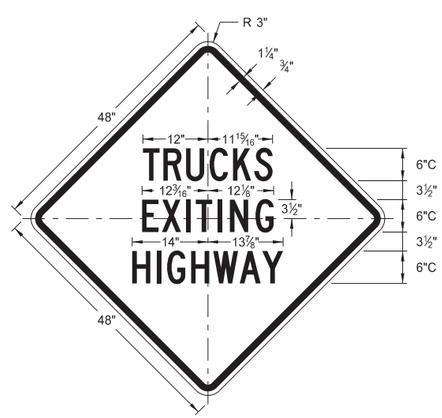


W5-9-48

ARROW DETAILS



W8-53-48
Legend: black (non-refl)
Background: orange



W8-56-48
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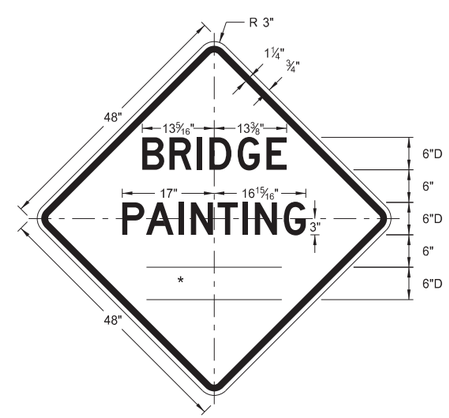
Background: orange



W21-50-48
Legend: black (non-refl)
Background: orange

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

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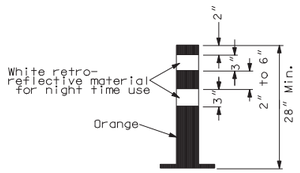
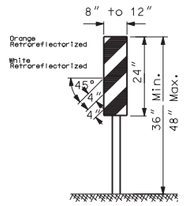
BARRICADE DETAILS AND CHANNELIZING DEVICES

D-704-13



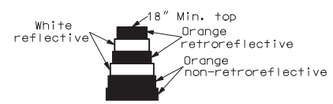
TUBULAR MARKER



VERTICAL PANEL

(Retroreflective sheeting shall be placed on both sides)

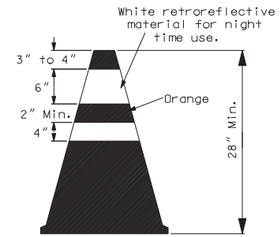
NOTE: Vertical panels used on the expressways or other high speed roadways shall be 12" by 24"



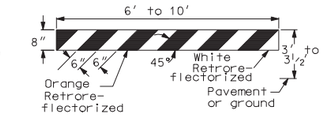
DELINEATOR DRUM

36" Min. height

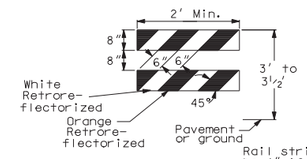
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retroreflectorized sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall be prepared as recommended by the sheeting manufacturer before retro reflective sheeting is applied



CONE

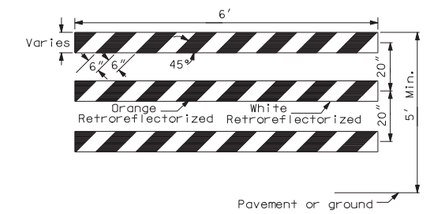


TYPE I BARRICADE



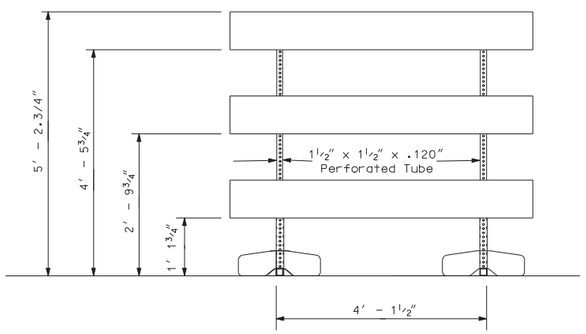
Rail stripe width shall be 4" if barricade length is less than 36".

TYPE II BARRICADE

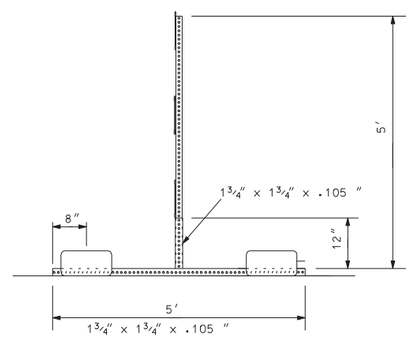


TYPE III BARRICADE

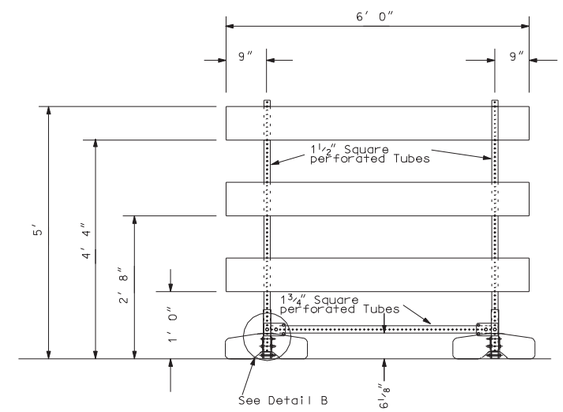
BARRICADES:
Number of retroreflectorized rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III- 6 (Three in each direction)

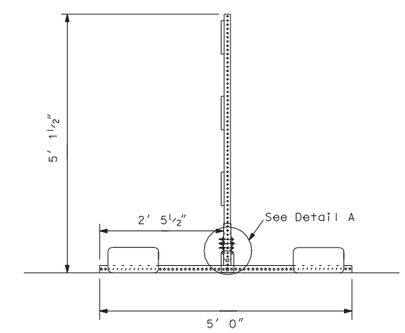


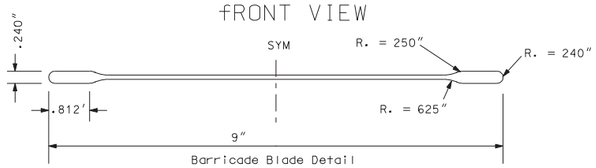
FRONT VIEW



END VIEW







Barricade Blade Detail

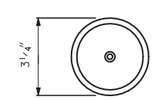
Ballast = 45lb sandbag at the end of each leg.

Barricade blade fastened to vertical supports with 2" corner bolts.

Vertical potion of leg is welded to horizontal portion on all four sides.

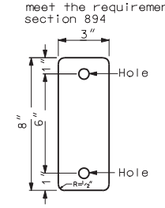
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

BARRICADE ASSEMBLY DETAIL
(Use when aluminum blade as detailed above)



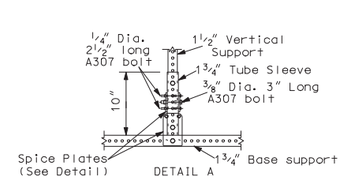
ACRYLIC PLASTIC REFLECTOR

Delineator reflector shall meet the requirements of section 894

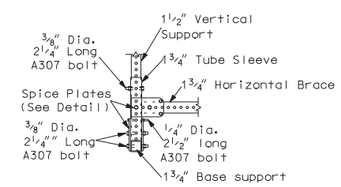


DELINEATOR REFLECTOR

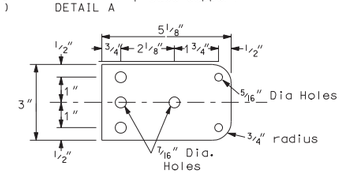
3"x8"- 18 Gauge galvanized steel sheet or 0.080" aluminum plate with white retroreflective sheeting (Type 3A or 3B) as specified in section 894 of the Standard Specifications.



DETAIL A



DETAIL B



SPLICE PLATE

BARRICADE ASSEMBLY DETAIL
(Use when Plastic I-Beam w/ 1½" Hollow Core Flanges or 1" x 8" x72" wood boards.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-03-87	Type sheeting
10-01-87	Delineator drum note
06-08-88	Barricade type III
06-01-92	General revision
06-10-93	General revision
09-23-93	Vertical panel
06-09-95	Reflective sheeting
03-01-02	Barricade type III assembly details
04-01-02	Type III barricade
12-01-04	PE stamp added
06-29-05	Revised Type II barricade stripe

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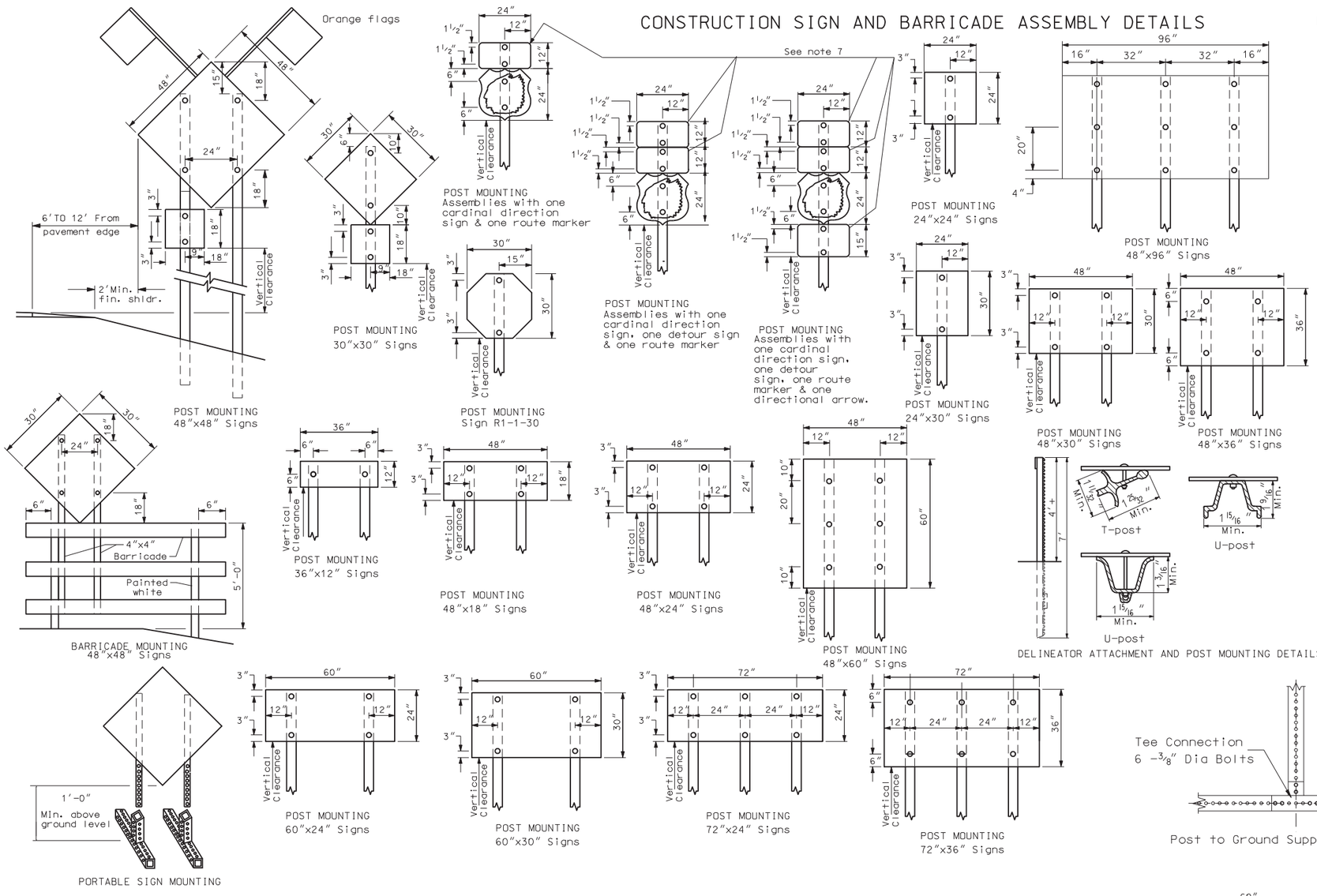
D-704-14

CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS



NOTES:

1. Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.

2. Barricade Mounting Signs: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4"x4" min. SFS or equivalent steel posts. All barricades and barricade mounted signs shall be assembled with 3/8" bolts.

3. Sign Supports: Sign supports shall be 4"x4" min. SFS or equivalent steel post. The anchor for steel supports shall have a stub height of 4" or less. Wood posts more than 4"x4" shall be breakaway. Sign supports shall be imbedded to a sufficient depth so that signs will remain plumb throughout duration of project. It is suggested that wood posts have a min. depth of embedment of 5' and steel posts be embedded a min. 3'-6".
   Material: All signs shall be 0.100" aluminum, 12 gauge steel, 1/2" plywood or other approved material.
   Holes: All holes to be punched round for 3/8" bolts.

4. Alternate Messages: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate without a border and this plate installed and removed as required.

5. Advance Warning Flashing or Sequencing Arrow Panels: The minimum mounting height shall be 7 feet above the roadway to the bottom of the panel, except on vehicle mounted panels which shall be as high as practicable.

6. Delineator Posts: Typical fence post sections are shown in Attachment Details. Other types of metal fence posts may be substituted upon approval of the engineer. These substituted posts shall have reflectors attached similar to the ones shown.

7. Route Marker Auxiliary Signs: The route marker auxiliary signs such as the cardinal direction and directional arrows shall have background colors the same as the route marker they are used with (Interstate route markers, blue background, US and State route markers, white background, Interstate Business loop and spur, green background, and County route markers, blue background).

8. Vertical Clearance: Post mounted signs placed in rural areas shall have a vertical clearance of at least 5 feet measured from the bottom of the sign to the near edge of the driving lane. In business, commercial and residential districts where parking and/or pedestrian movement is likely to occur or where other obstructions to view, the distance between the bottom of the sign to the near edge of the driving lane shall be at least 7 feet. The height to the bottom of secondary signs mounted below another sign may be 1 foot less than the appropriate height specified. Large signs having an area exceeding 50 square feet that are installed on multiple breakaway posts shall be mounted a minimum of 7 feet above the ground.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-01-88	Sign assembly
05-01-92	Sign assembly
03-30-93	Sign supports note
03-04-96	Sign height
08-15-96	Note 8
07-10-97	Note revision
07-31-98	Note & portable sign
10-01-99	Skid mounted sign
02-07-03	Vertical clearance note
11-30-04	Third post added to some signs
12-01-04	PE stamp added

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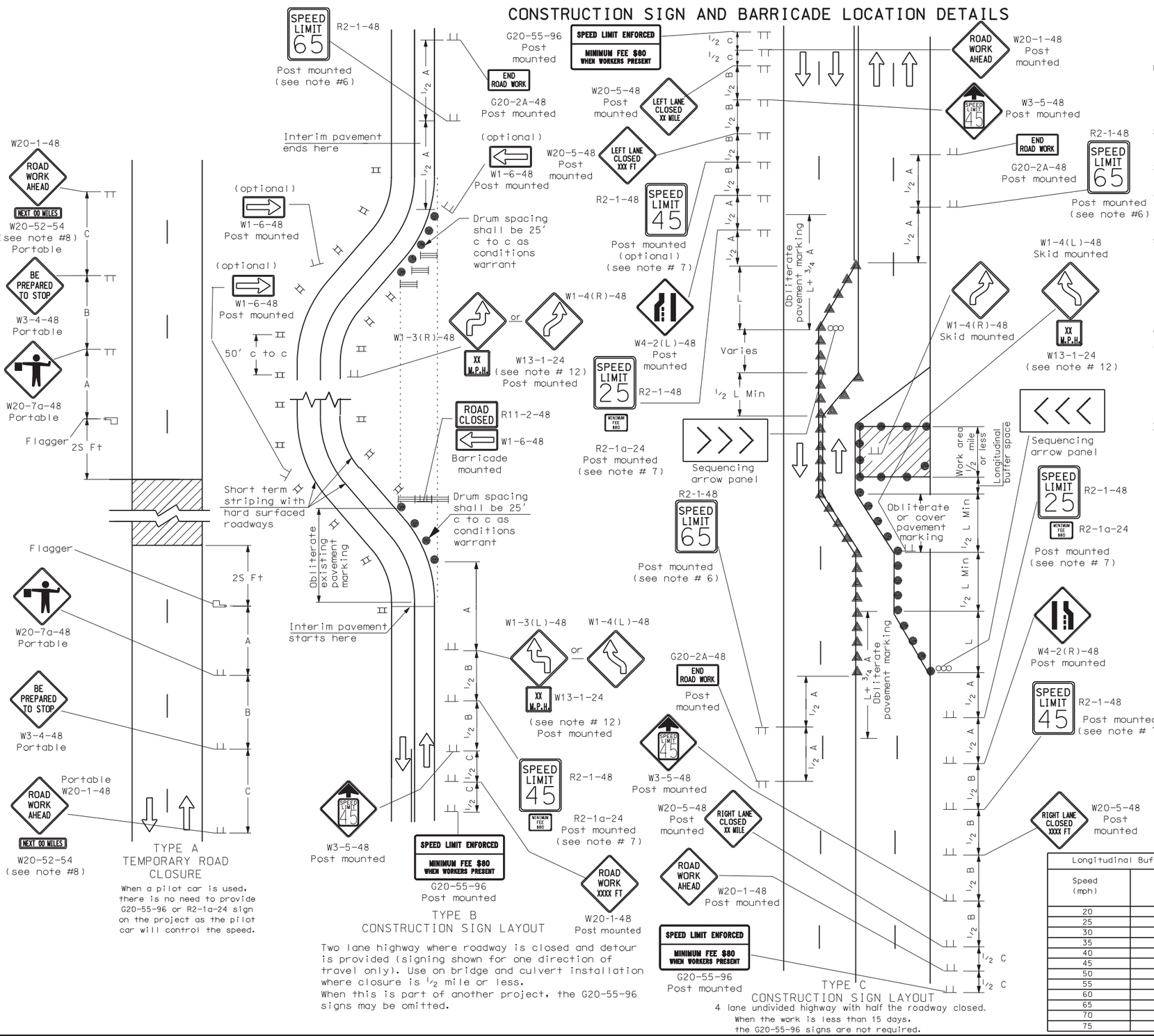
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-15



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. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on roadway shall be placed on skid mounted assemblies.
3. Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
4. Existing striping shall be removed as required. Delineators will only be used when foreslope is 1V:4H or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways has steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
5. Sequencing Arrow Panels
   Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface.
   Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).
   Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
   Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
6. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
7. 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.
8. Use when work area is 1 mile or longer.
9. 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.
10. Existing speed limit signs within a reduced speed zone shall be covered.
11. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
12. Where necessary, safe speed to be determined by the Engineer.
13. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.

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 40 mph)	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

KEY

- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Cones
- Work area
- Flagger
- Sequencing arrow panel
- Type A delineator or vertical panels back to back

Longitudinal Buffer Space

Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

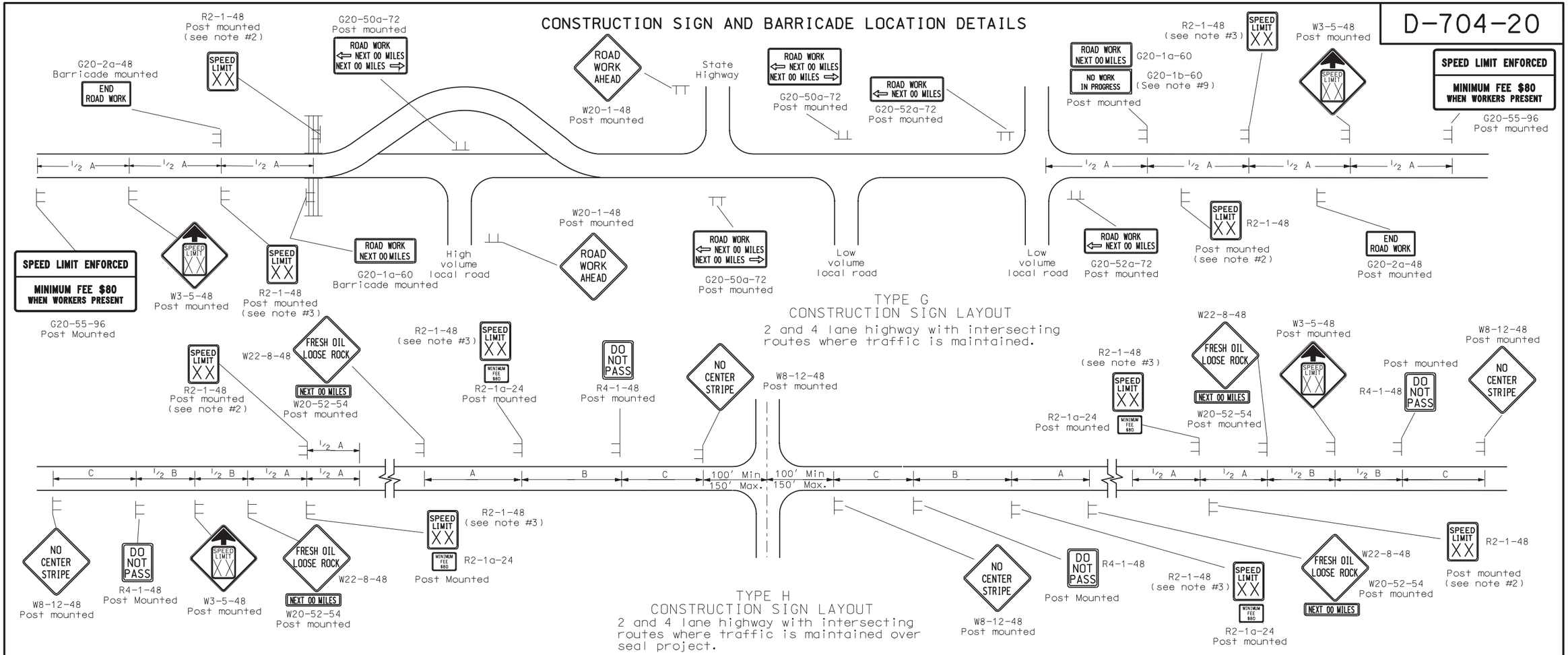
REVISIONS

DATE	CHANGE
01-05-01	Revised note 3
07-19-02	Reversed End Road Work & Speed Signs
07-25-03	Revised R2-1, R2-1a and W20-1
04-01-04	Change Fee Sign, Warning & Buffer Spacing
12-18-03	Relocated reverse curve
12-01-04	PE stamp added
06-29-05	Revised W4-2, Replaced R2-5a with W3-5, Rev. Adv. Warning Table, Rev. Note 7.
07-05-05	Changed W20-7b to W3-4

This document was originally issued and sealed by Mark S Gaydos Registration Number PE-4518, on 07/05/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-20



TYPE G
CONSTRUCTION SIGN LAYOUT

2 and 4 lane highway with intersecting routes where traffic is maintained.

TYPE H
CONSTRUCTION SIGN LAYOUT

2 and 4 lane highway with intersecting routes where traffic is maintained over seal project.

1. Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
2. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
3. 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 ½ B.
4. 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.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Sign no. R2-1-48, R2-1a-24, R4-1-48, W22-8-48, W20-52-54, and W8-12-48 shall be placed just after all important intersections and every five miles in either direction. Sign no W8-12-48 shall be placed when traffic volumes are 750 ADT or less. No short term markings are placed when this condition exists.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. Type H construction sign traffic control shall have the speed limit signs covered or removed once the loose aggregate has been removed.
9. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
10. The layouts show the signs needed before work begins. The requirements at the actual work areas will require the use of other standards. If the speed limit is reduced in the work areas, the speed limit signs shall have the R2-1a-24 sign placed below.

KEY

- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Cones
- Work area
- Flagger
- Sequencing arrow panel
- Type A delineator or vertical panels back to back

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 40 mph)	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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

DATE	CHANGE
08-15-96	Revise flag note
10-01-99	General revisions
10-18-01	Added note 8 & 9
07-19-02	Rev. end road work & speed limit sign
07-25-03	Rev. R2-1a & W20-1
04-01-04	Rev. fee sign & warning sign spacing Rev note 3, add note 10
12-01-04	PE Stamp added
06-29-05	Added W3-5 to Type H and Type G. Rev. Adv. Warning Table. Rev. Note 3
04-05-06	Corrected sign W3-5

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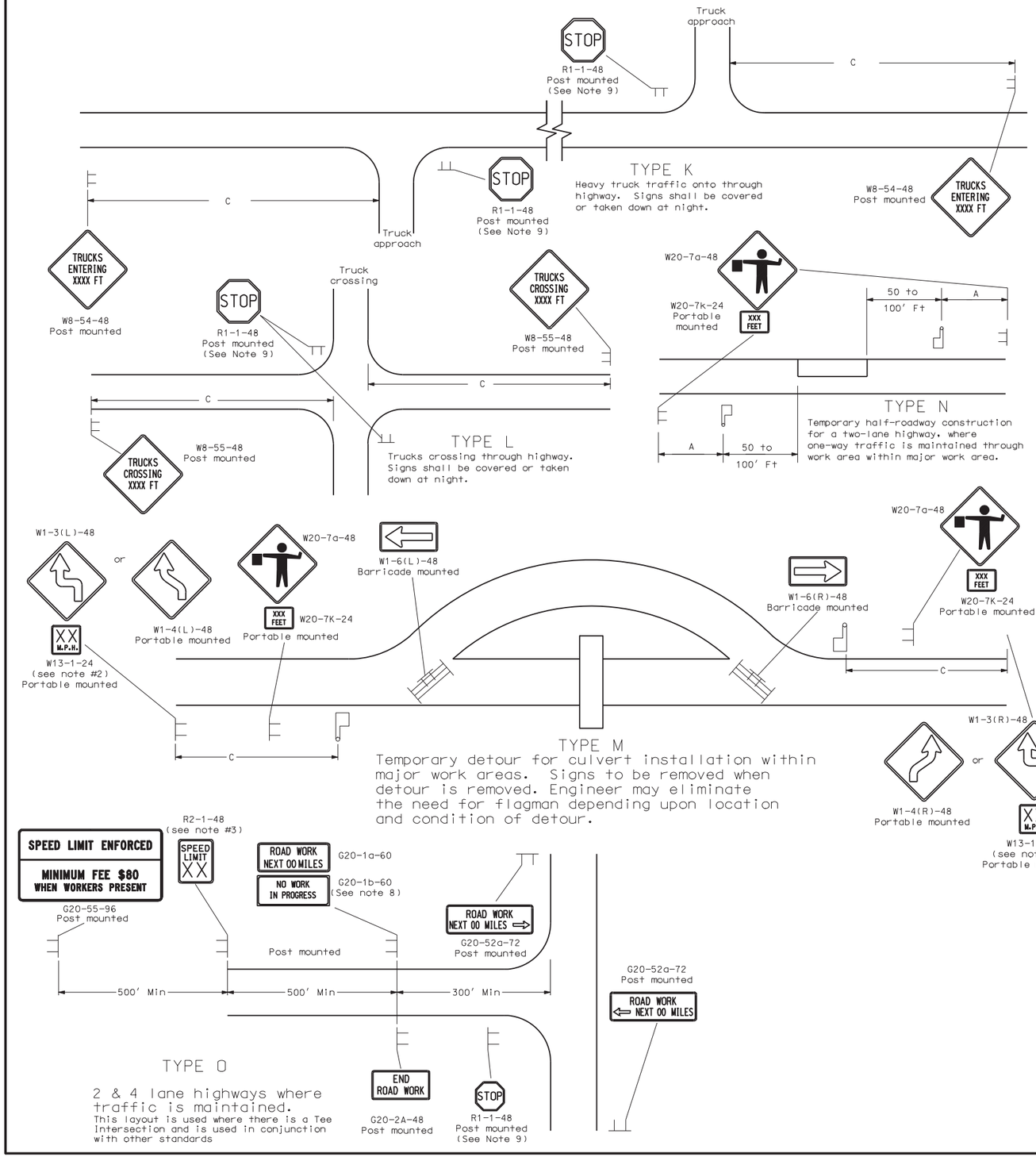
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

D-704-22



Notes

1. Barricade shown to be placed on roadway shall be on a moveable assembly. on the top of the top barricade bar. Sign shown to be placed on the roadway Sign to be mounted on barricades shall be mounted with the sign bottom shall be placed on skid mounted assemblies.
2. Where necessary, safe speed to be determined by the Engineer.
3. 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 ½ B.
4. 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.
5. Existing speed limit signs within a reduced speed zone shall be covered.
6. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
7. The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
8. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.

KEY

- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Cones
- Work area
- Flagger
- Sequencing arrow panel
- Type A delineator or vertical panels back to back

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
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Urban - Low Speed (over 30 to 40 mph)	280	280	280
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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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-1-86

REVISIONS

DATE	CHANGE
09-30-93	General revisions
06-21-95	General revisions
08-15-96	Revise flag note
10-01-99	General revisions
02-02-00	W8-55-48
10-17-02	Deleted Work In Progress Sign
07-25-03	Revised R2-1a
04-01-04	Revised fee sign & Warning sign spacing. Revised note 3
12-01-04	PE stamp added
02-14-05	Added note 9 and revised stop sign size
06-29-05	Rev. Adv. Warning Table. Rev. Note 3

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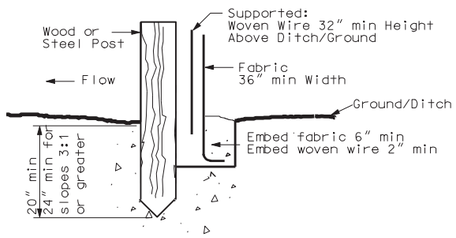
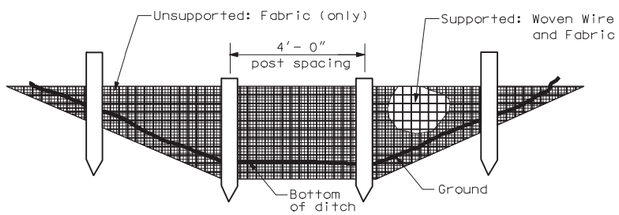
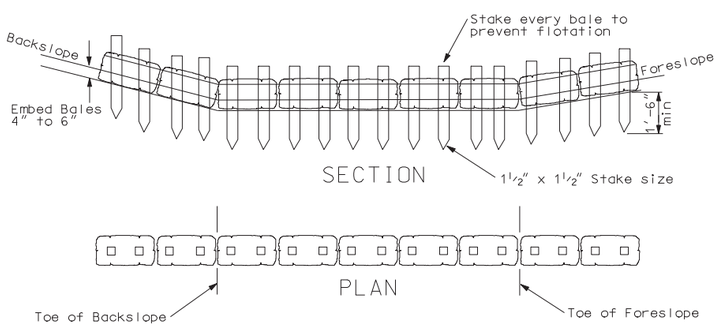
EROSION AND SILTATION CONTROLS

D-708-2

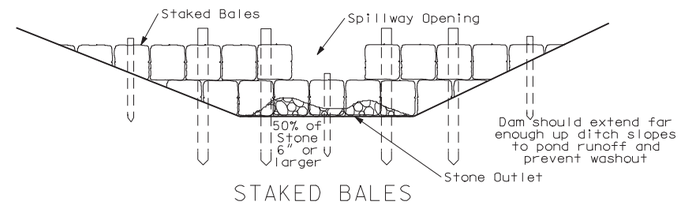




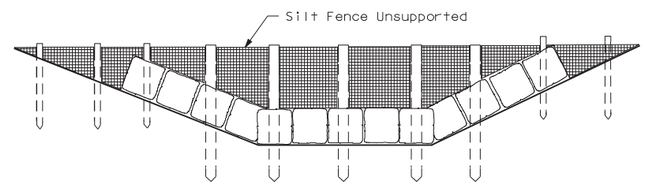
SILT FENCE
Supported and Unsupported



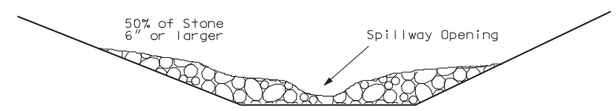
"TYPE A"



STAKED BALES

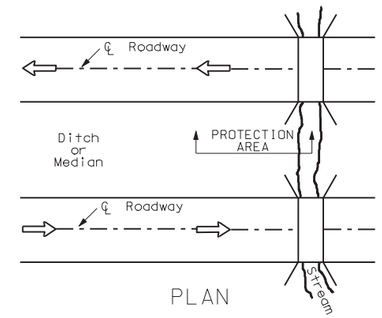


FENCE-BACKED BALES

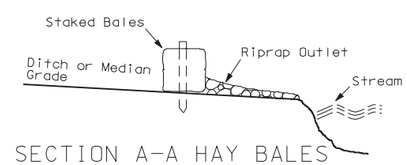


GRADED STONE

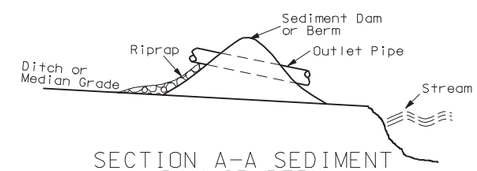
DITCH EROSION DAMS



PLAN

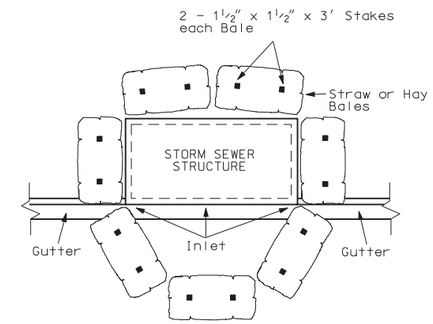


SECTION A-A HAY BALES

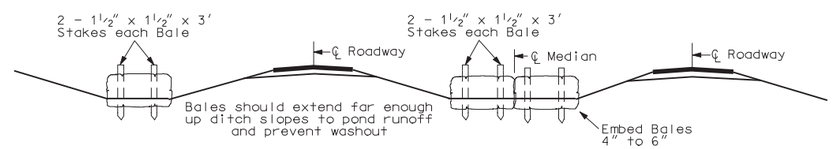


SECTION A-A SEDIMENT DAM OR BERM

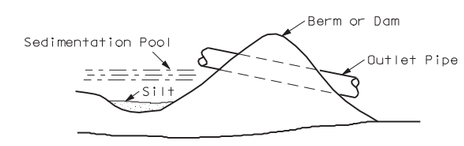
MEDIAN OR DITCH PROTECTION AT STREAM CROSSING



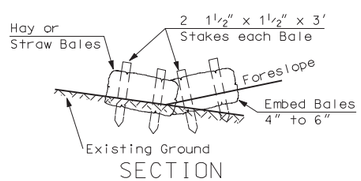
STORM SEWER INLET EROSION & SILTATION BARRIER



SECTION



SMALL SEDIMENT DAM OR BERM



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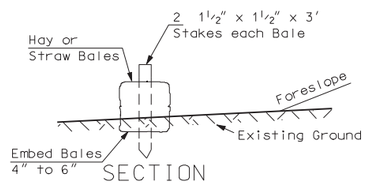
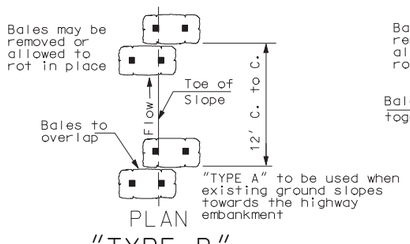
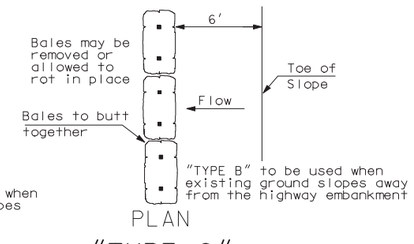


SECTION



PLAN

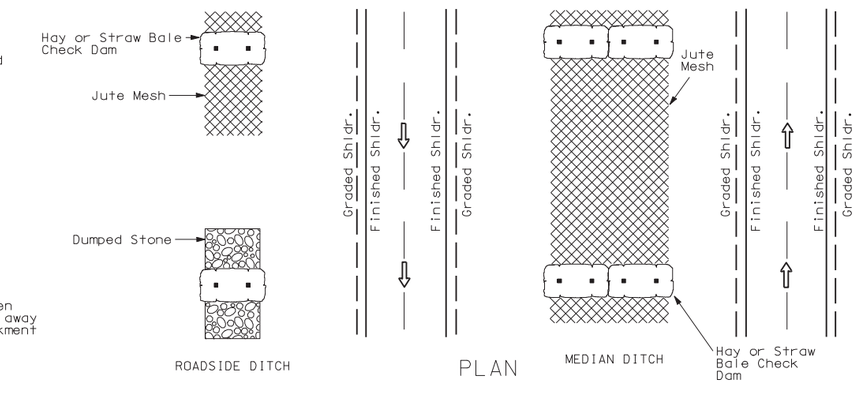
"TYPE B"



PLAN

"TYPE C"

BALED HAY OR STRAW EROSION CHECKS



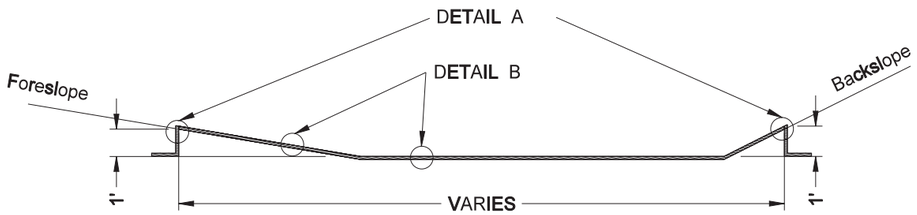
STONE, JUTE, MESH, OR SOD
DITCH & MEDIAN EROSION CONTROL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
09-04-92	Ditch check
09-16-92	Sediment cont. fencing
01-31-95	General revisions
10-09-02	Sediment fence
01-24-04	Silt fence
02-06-04	Rev silt fence details
12-01-04	PE Stamp added

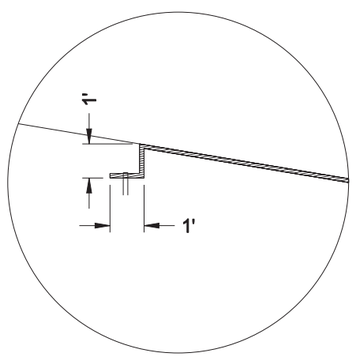
This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 12/01/04 and the original document is stored at the North Dakota Department of Transportation

EROSION AND SILTATION CONTROL BLANKET INSTALLATION

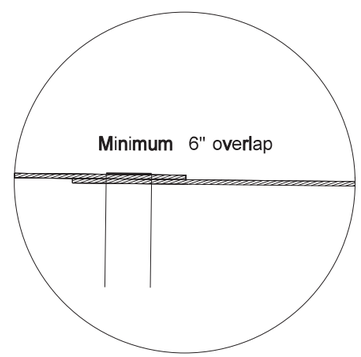
D-708-5



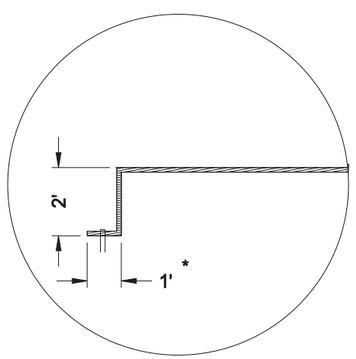
DITCH



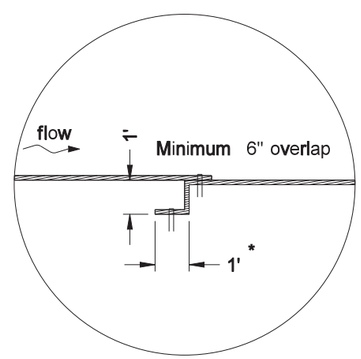
DETAIL A



DETAIL B

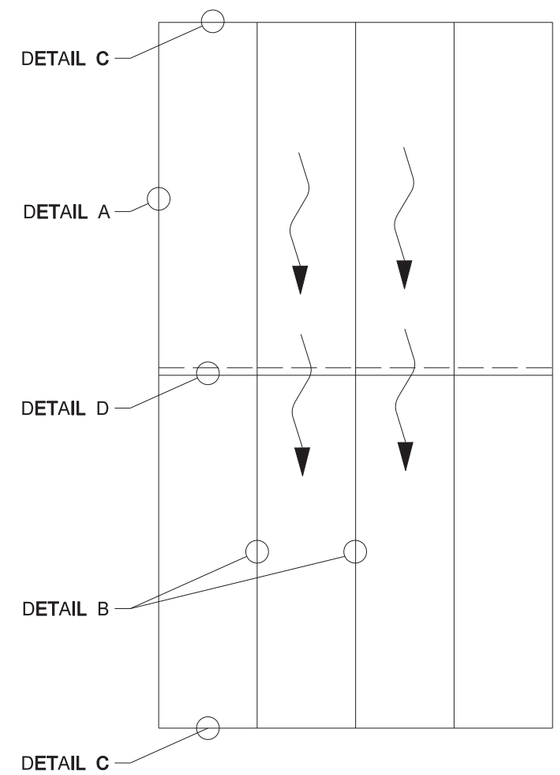


DETAIL C



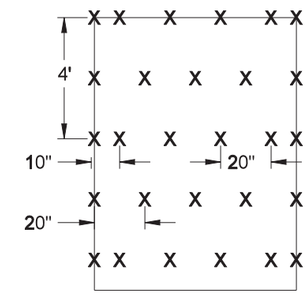
DETAIL D

* This tie may be placed ahead or back.

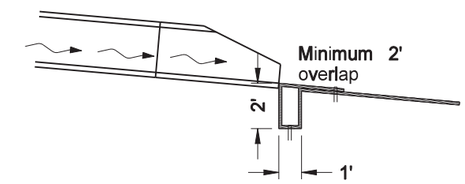


BLANKET LAYOUT

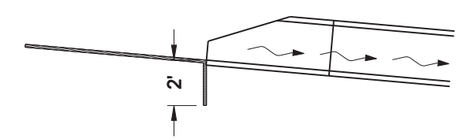
Note: Beginning and ending of erosion control blanket areas shall be installed as DETAIL C.



STAPLE PATTERN: 3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



PIPE OUTLETS



PIPE INLETS

INSTALLATION AT PIPE ENDS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-13-06	
REVISIONS	
DATE	CHANGE

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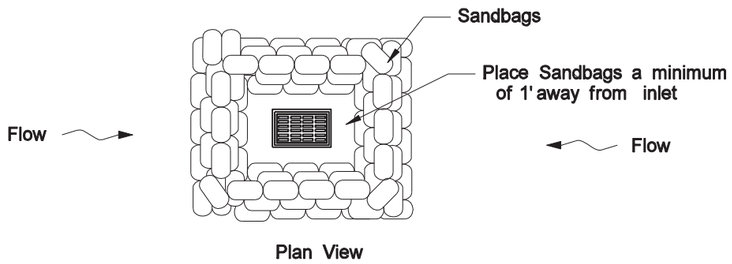
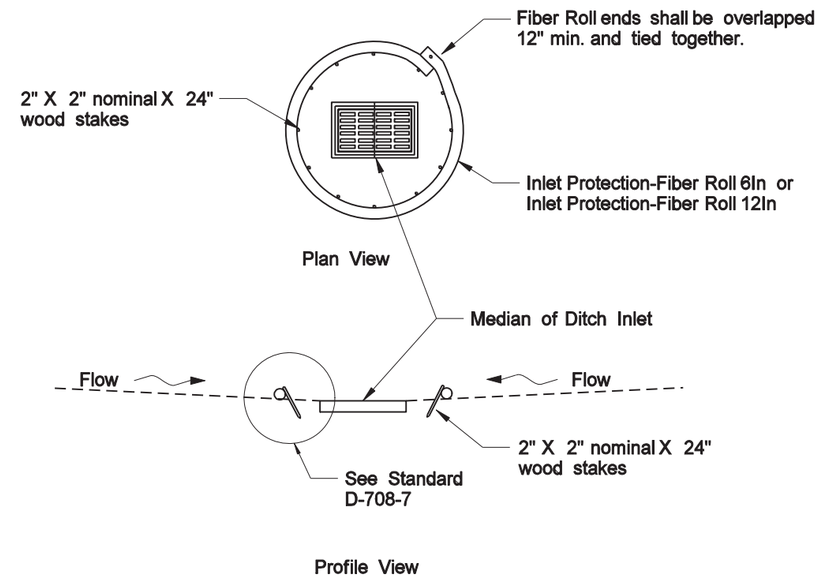
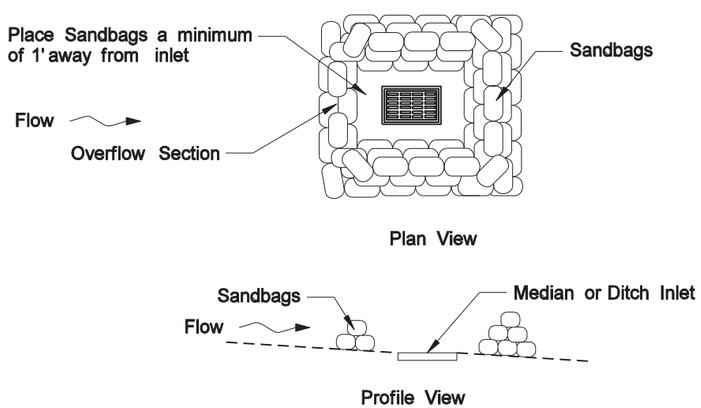
EROSION CONTROL
MEDIAN OR DITCH INLET PROTECTION

D-708-6

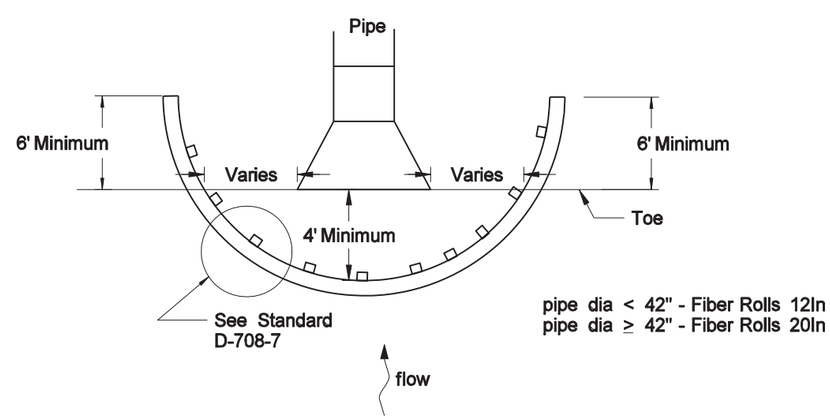


SANDBAG PROTECTION
LOW POINT





SANDBAG PROTECTION
ON SLOPE



pipe dia < 42" - Fiber Rolls 12In
pipe dia ≥ 42" - Fiber Rolls 20In

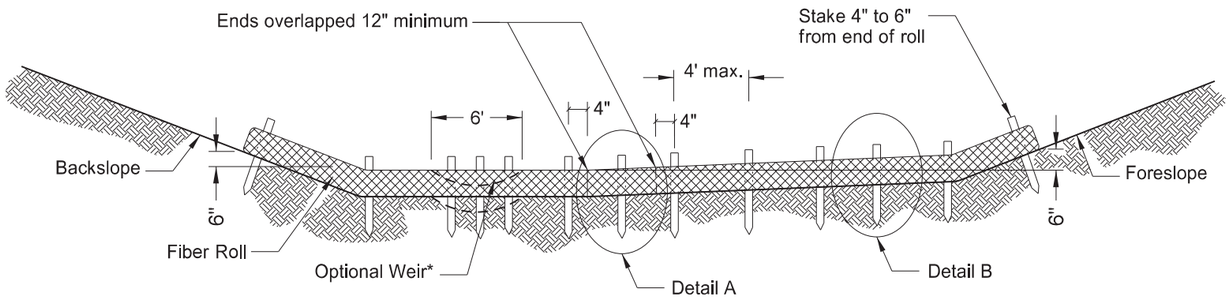
FIBER ROLL PROTECTION
INLET OF PIPE END

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-13-06	
REVISIONS	
DATE	CHANGE
12-14-07	Added 12" Fiber roll overlap, option of butting fiber roll ends removed.

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 12/14/07 and the original document is stored at the North Dakota Department of Transportation

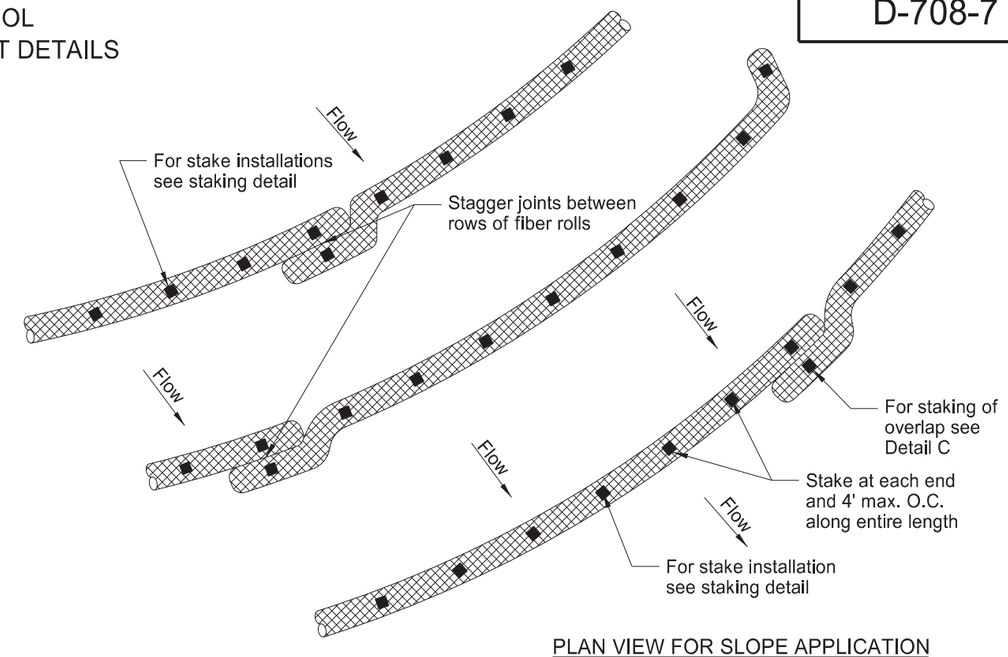
D-708-7

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

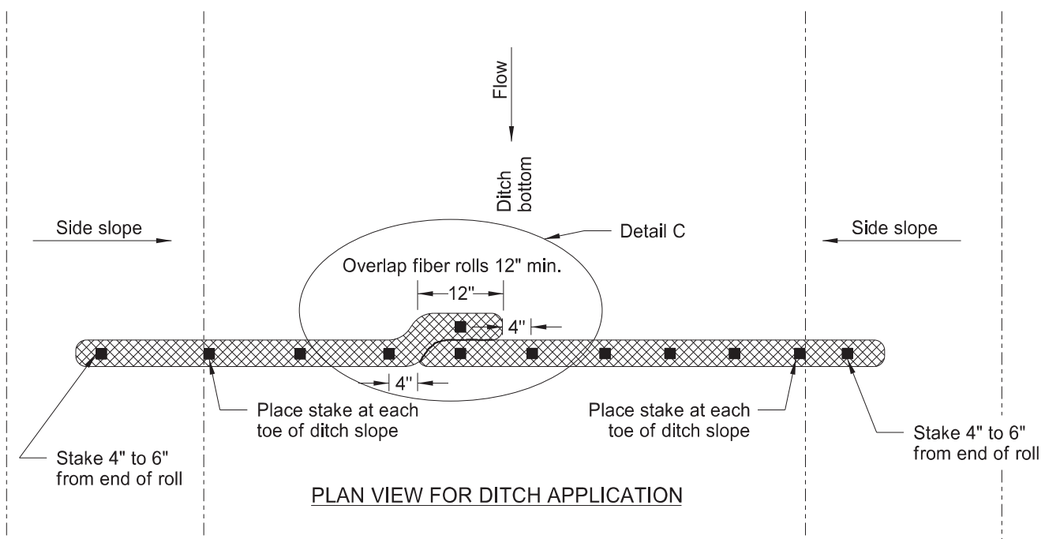


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

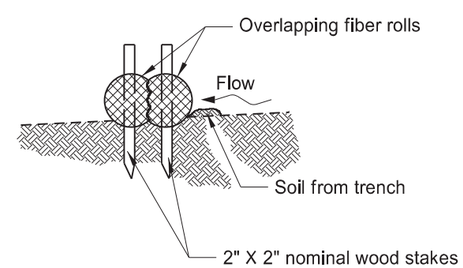
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

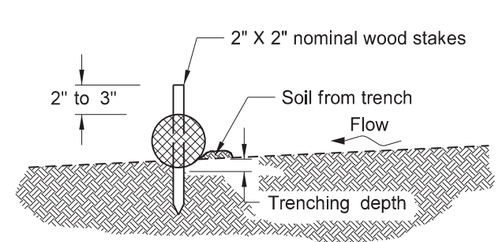


PLAN VIEW FOR DITCH APPLICATION



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"

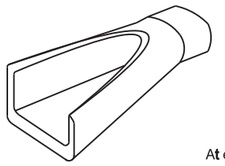
NOTE: Runoff must not be allowed to run under or around roll.

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.

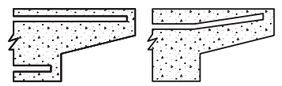
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 06/10/13 and the original document is stored at the North Dakota Department of Transportation

REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS

D-714-01

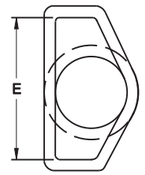


PERSPECTIVE

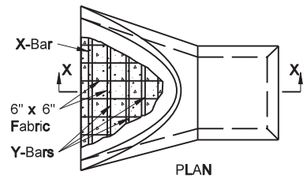


ARRANGEMENT FOR REINFORCEMENT

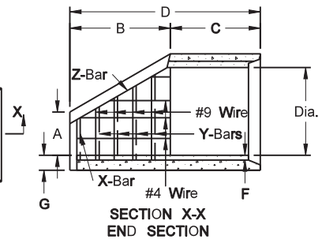
At end of 36" to 106" pipe. At end of 12" to 33" pipe.



END VIEW



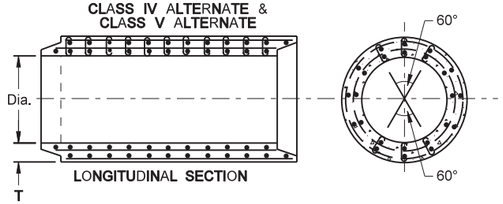
PLAN



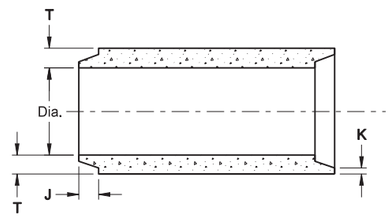
SECTION X-X
END SECTION
Equivalent to Class III Pipe

END SECTION										
TERMINAL DIMENSIONS								REINFORCING STEEL		
DIA	A	B	C	D	E	F	G	X	Y	Z
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"	2"	2-1/4" x 2'	6-1/4"x 2' @ 6"c.c.	2-1/4"x 4'
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"	2¼"	2-1/4" x 2½'	6-1/4"x 2½' @ 6"c.c.	2-3/8"x 4'
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"	2½"	2-3/8" x 3'	6-1/4"x 3' @ 6"c.c.	2-3/8"x 4'
21	0'-9"	3'-0"	3'-1½"	6'-1½"	3'-6"	2¾"	2¾"	2-3/8" x 3½'	8-1/4"x 3½' @ 6"c.c.	2-3/8"x 5'
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"	3"	2-1/2" x 4'	8-3/8"x 4' @ 8"c.c.	2-3/8"x 6'
27	0'-10½"	4'-1½"	2'-0"	6'-1½"	4'-6"	3¼"	3¼"	2-1/2 " x 5'	8-3/8"x 5' @ 9"c.c.	2-3/8"x 6'
30	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	3½"	3½"	2-1/2 " x 5'	12-3/8"x 5' @ 8"c.c.	2-1/2"x 6'
36	1'-3"	5'-3"	2'-10¾"	8'-1¾"	6'-0"	4"	4"	2-1/2 " x 6'	12-3/8"x 6' @ 6"c.c.	2-1/2"x 8'
42	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4½"	4½"	2-1/2" x 7'	12-1/2"x 7' @ 9"c.c.	2-1/2"x 8'
48	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"	5"	2-1/2" x 8'	16-1/2"x 8' @ 8"c.c.	2-1/2"x 8'
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"	5½"	2-1/2" x 8'	16-1/2"x 8' @ 7"c.c.	2-1/2"x 8'
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	6"	5"	2-1/2" x 9'	16-1/2"x 9' @ 6"c.c.	2-1/2"x 9'
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	6½"	5½"	2-1/2" x 9'	22-1/2"x 9' @ 6"c.c.	2-1/2"x 9'
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	7"	6"	2-1/2" x 10'	24-1/2"x 10' @ 6"c.c.	2-1/2"x 9'
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	7½"	6½"	2-1/2" x 10'	28-1/2"x 10' @ 6"c.c.	2-1/2"x 10'
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	8"	6½"	4-1/2" x 10'	28-1/2"x 10' @ 6"c.c.	4-1/2"x 10'
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	8½"	6½"	4-1/2" x 11'	28-1/2"x 11' @ 6"c.c.	4-1/2"x 10'

CLASS IV ALTERNATE &
CLASS V ALTERNATE

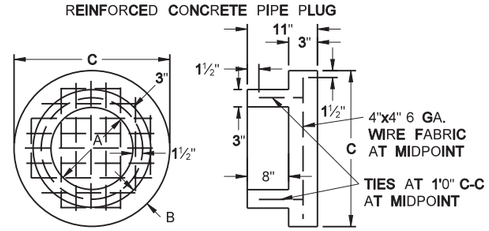


LONGITUDINAL SECTION

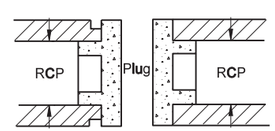


		All Classifications of Round Concrete Pipe				CLASS IV ALTERNATE								CLASS V ALTERNATE						
						D-LOAD TO PRODUCE A 0.01 INCH CRACK														
						2000								3000						
						D-LOAD TO PRODUCE ULTIMATE LOAD														
						3000								3750						
Internal Dia.of pipe in inches	Cross-Sectional Water Area	Weight per lin. foot of Pipe Std. Wall	Joint J. Groove End Min./Max.	Joint K. Tongue End Min.	Minimum Wall Thickness (T)	5000 P.S.I.						Height of Fill Normal Backfill		5000 P.S.I.						Height of Fill Normal Backfill
						Inner Cage	Ellip Cage	Outer Cage	Shear Steel					Inner Cage	Ellip Cage	Outer Cage	Shear Steel			
						Ai	Ae	Ao	N	S	Ar			Ai	Ae	Ao	N	S	Ar	
Dia	Sq. ft.	Lbs.	In.	In.	In.	Sq.in	Sq.in	Sq.in	No.	In.	Sq.in	Ft.		Sq.in	Sq.in	Sq.in	No.	In.	Sq.in	Ft.
12	0.79	92	1⅝-2⅜	¾	2															
15	1.23	127	1¾-2¾	⅞	2¼															
18	1.77	168	1⅞-2⅞	1	2½															
21	2.40	214	1⅞-3⅛	1⅛	2¾															
24	3.14	265	2⅜-3¾	1⅛	3															
27	3.98	322	2½-4	1¼	3¼															
30	4.91	384	3¼-4¼	1¼	3½															
33	5.94	452	3¼-4¼	1½	3¾															
36	7.07	524	3¼-4¼	1½	4															
42	9.62	685	3¾-4¾	1¾	4½															
48	12.57	685	3⅝-4¾	1⅞	5									.66	.33	.50	8	4	.22	24-35
54	15.90	1070	4⅛-5¼	2	5½									.74	.37	.56	9	4	.22	24-35
60	19.63	1296	4½-5½	2¼	6	.54	.27	.41	7	6	.22	16-24		.82	.41	.62	7	6	.22	24-35
66	23.76	1542	5-6	2⅝	6½	.60	.30	.45	8	6	.22	16-24		.88	.44	.66	8	6	.22	24-35
72	28.27	1810	5⅝-6¾	2⅞	7	.64	.32	.48	8	6	.23	16-24		.96	.48	.72	8	6	.23	24-35
78	33.18	2098	6⅛-7¼	2⅞	7½	.70	.35	.53	9	6	.25	16-24		1.04	.52	.78	9	6	.25	24-35
84	38.48	2410	5⅝-7¾	3⅛	8	.76	.38	.57	10	6	.28	16-24		1.12	.56	.84	10	6	.28	24-35
90	44.18	2793	6¾-8½	3⅛	8½	.82	.43	.62	11	6	.31	16-24		1.20	.65	.90	11	6	.31	24-35
96	50.27	3092	7-8¼	3½	9	.88	.46	.66	11	6	.34	16-24		1.32		.99	11	8	.34	24-35
102	56.75	3466	7-8¼	3½	9½	.94	.52	.71	12	6	.37	16-24		1.42		1.07	12	8	.37	24-35
108	63.62	3864	7⅛-8½	3¾	10	1.02	.57	.76	12	6	.40	16-24								

REINFORCED CONCRETE PIPE PLUG

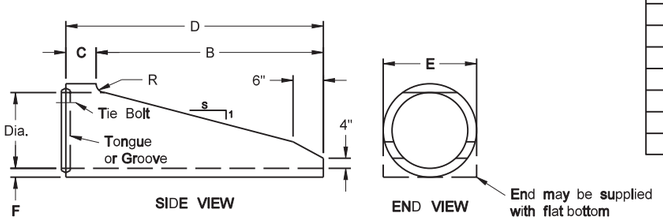


CONCRETE SHALL CONFORM TO STRENGTH REQUIREMENTS FOR REINFORCED CONCRETE PIPE CULVERTS, CL. II.



CONCRETE PIPE PLUG			
DIMENSIONS (in inches)			
PIPE DIAMETER	A	B	C
15	8	2.25	19.5
18	11	3.0	23.0
21	14	3.25	26.5
24	17	3.50	30.0
27	20	3.75	33.5
30	23	4.0	37.0
33	26	4.25	40.5
36	29	4.50	44.0
42	35	5.0	51.0
48	41	5.50	58.0

TRAVERSABLE END SECTION



SIDE VIEW END VIEW

TRAVERSABLE END SECTION							
DIA	B	C	D	E	F	R	S
15"	4'	9"	4'-9"	1'-7½"	2¼"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	2½"	3"	6
24"	6'	1'	7'	2'-6"	3"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	3½"	4
36"	7'-6"	15"	7'-3"	3'-8"	4"	3"	4

NOTES (Traversable End Section):

1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
2. Reinforcement per class II RCP with double reinforcement in the upper 120° of the full barrel portion.

NOTES:

1. All reinforcement shall be electrically welded cold drawn steel wire fabric.
2. Circular reinforcement shall lap in accordance to AASHTO M170.
3. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
4. Laying length of pipe: 12" to 66" (incl.) = not less than 4 feet
   66" to 108" (incl.) = not less than 6 feet
5. Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drain or sanitary sewers.
6. Welded steel wire fabric may be substituted for the reinforcing steel bars but must match the area of steel provided by the bars and the lap of the fabric must be in accordance with AASHTO specifications
7. All Reinforcing Steel shall meet AASHTO M170 requirements.

Ai, Ae, Ao = Minimum circumferential reinforcement required in square inches per lineal foot of pipe.
Ar = Minimum radial reinforcement required in square inches per square foot of pipe.
N = Minimum number of rows of radial reinforcement at top and bottom of pipe.
S = Maximum circumferential spacing of rows of radial reinforcing.

SEE STANDARD D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

10-1-86

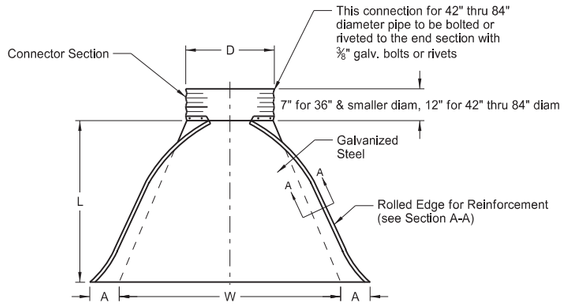
REVISIONS

DATE	CHANGE
11-05-86	Note added
07-17-87	Added pipe plug detail
09-01-88	Reinforcement cage
03-10-95	General revisions
12-23-98	Note # 6, 30° FES
12-01-04	PE stamp added
12-08-08	Major Revisions

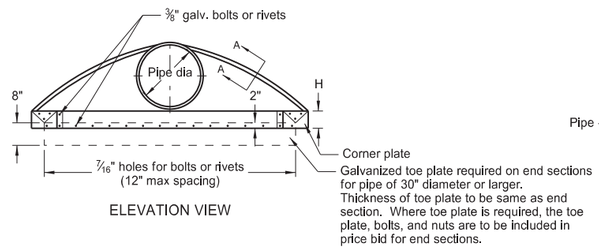
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674, on 12/18/2008 and the original document is stored at the North Dakota Department of Transportation

ROUND CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

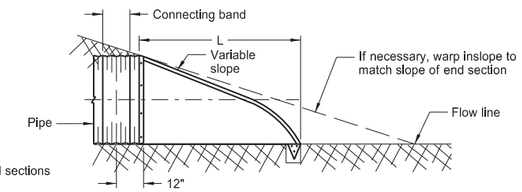
D-714-4



PLAN VIEW



ELEVATION VIEW



TYPICAL CROSS SECTION
(showing connector section)

* * PIPE DIA.	GALV. THICK.	END SECTION DIMENSIONS					APPROX. SLOPE	BODY
		A	B	H	L	W		
IN	IN	IN	IN	IN	IN	IN	RATE	PIECE
15	0.064	7	8	6	26	30	2½:1	1
18	0.064	8	10	6	31	36	2½:1	1
24	0.064	10	13	6	41	48	2½:1	1
30	0.079	12	16	8	51	60	2½:1	1 or 2
36	0.079	14	19	9	60	72	2½:1	2
42	0.109	16	22	11	69	84	2½:1	2
48	0.109	18	27	12	78	90	2½:1	2
54	0.109	18	30	12	84	102	2:1	2
* 60	0.109	18	33	12	87	114	1¾:1	3
* 66	0.109	18	36	12	87	120	1½:1	3
* 72	0.109	18	39	12	87	126	1 1/3 :1	3
* 78	0.109	18	42	12	87	132	1¼:1	3
* 84	0.109	18	45	12	87	138	1 1/6 :1	3

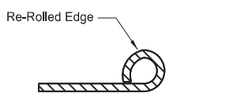
* These sizes have 0.109" sides and 0.138" center panels.

* * Pipe diameter is equal to dimension "D" of end section.

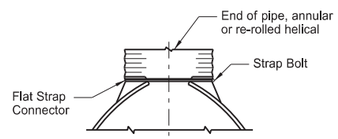
Manufacturers tolerances of above dimensions will be allowed.

Splices to be the lap riveted type.

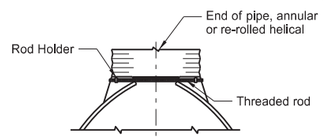
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" dia. galv. bolts or rivets. Nuts to be torqued to 25 foot-lbs ±.



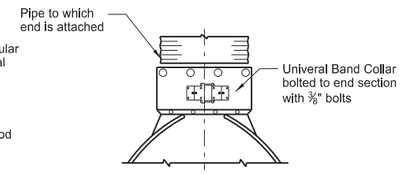
SECTION A-A



TYPE #1
For circular pipes with diameter 24" & smaller



TYPE #2
For circular pipes with diameter 30" through 36"

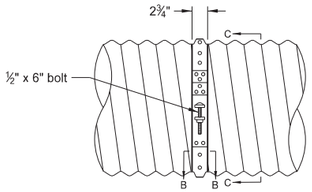


TYPE #3
For all pipe sizes

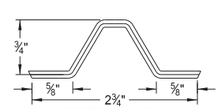
COUPLING BAND DIMENSIONS				
COUPLING TYPE	CORRUGATION PITCH x DEPTH	PIPE SIZE	COUPLING BAND LENGTH	MIN. BAND THICKNESS
Hat Band	2⅔" x ½"	12" - 48"	2¾"	.064"
Annular Band	2⅔" x ½"	12" - 72"	12"	.052"
		78" - 84"	12"	.079"
	3" x 1"	48" - 120"	14"	.052"
Hugger Band	2⅔" x ½" Rerolled End	12" - 72"	10½"	.052"
		78" - 84"	10½"	.079"
	3" x 1" Rerolled End	48" - 120"	10½"	.052"
	5" x 1" Rerolled End	48" - 120"	12"	.064"

NOTES:

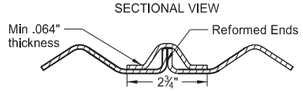
1. Pipes and connecting bands shall conform to applicable sections of NDDOT Standard Specifications and to AASHTO M-36.
2. Top edge of all end sections to have rolled edges for reinforcement (see Section A-A). The reinforced edges are to be supplemented with 2" x 2" x ¼" galv. angle for 60" through 72" dia. and 2½" x 2½" x ¼" galv. angle for 78" and 84" dia.. Angles to be attached by galv. ⅜" dia. bolts and nuts. Angles are to extend from pipe to the corner wing bend.
3. Elongated pipes shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.
4. Coupling bands shall be two-piece for pipes larger than 36" as shown in Section C-C & D-D details. For pipes 36" and smaller, a one-piece band is acceptable.
5. ½" x 8" bolts may be used as a substitute for the ½" x 6" bolts shown in the details.
6. Coupling bands wider than 14" may be used if a minimum of four ½" bolts with maximum spacing of 5½" are used for the connection.
7. Length of spot welds shall be minimum ½".



SIDE VIEW

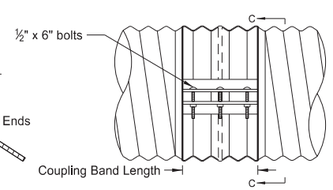


SECTIONAL VIEW

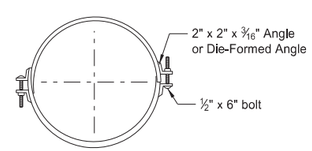


SECTION B-B

HAT BAND FOR FLANGED END PIPE

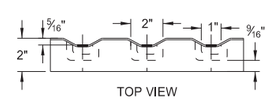


SIDE VIEW

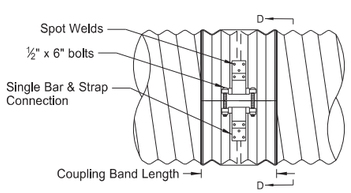


SECTION C-C
Angle Connection

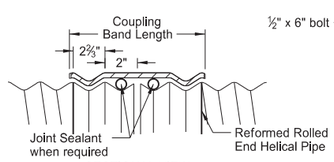
ANNULAR BAND



TOP VIEW
Die-Formed Angle Connector

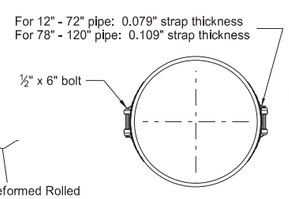


SIDE VIEW

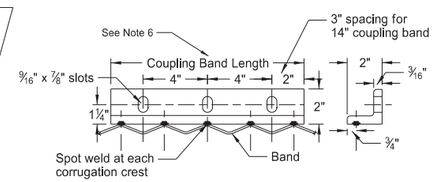


SECTIONAL VIEW

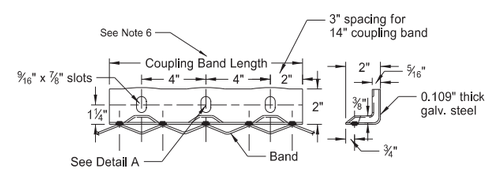
HUGGER COUPLING BAND



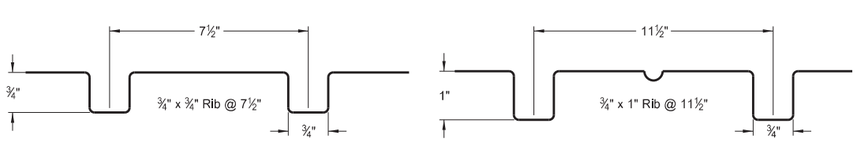
SECTION D-D
Bar & Strap Connection



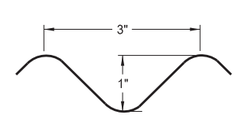
SIDE VIEW
END VIEW
2" x 2" x 3/16" Angle Connector



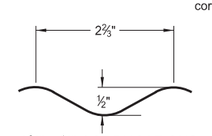
SIDE VIEW
END VIEW
Die-Formed Angle Connector



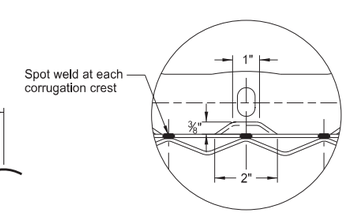
SPIRAL RIB CORRUGATIONS



3" x 1" CORRUGATIONS
(5"X1" corrugation may be used in lieu of 3"x1")



2⅔" x ½" CORRUGATIONS



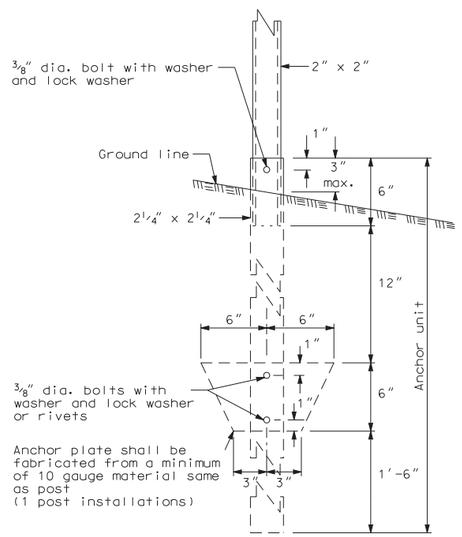
Detail A

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
08-06-13	
REVISIONS	
DATE	CHANGE

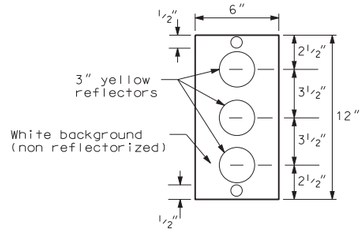
This document was originally issued and sealed by Terrence R. Udland, Registration Number PE- 2674 , on 08/06/2013 and the original document is stored at the North Dakota Department of Transportation

OBJECT MARKERS

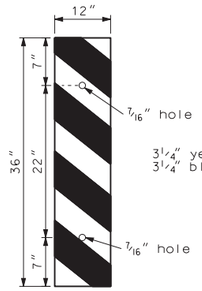
D-754-82



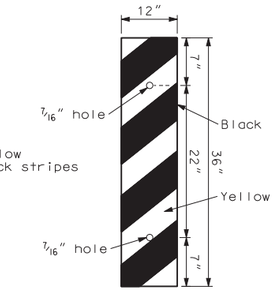
ANCHOR UNIT AND
POST PERFORATED TUBE ASSEMBLY



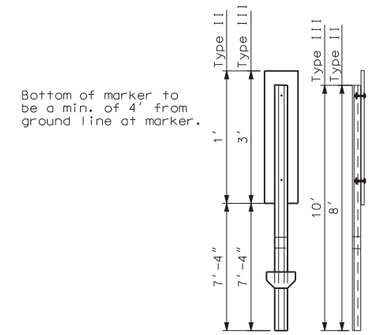
OM2-1V 6" x 12"
Object marker
Type II

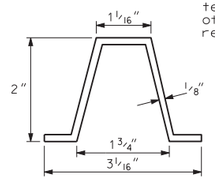


OM-3L Object marker left
12" x 36"
Type III

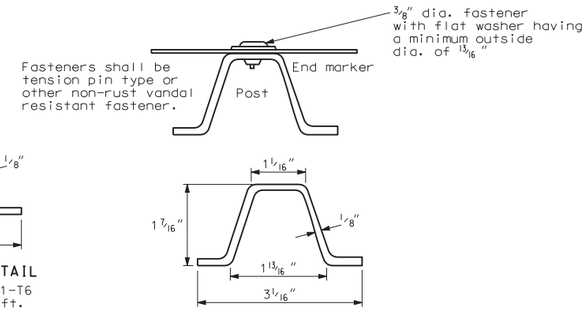


OM-3R Object marker right
12" x 36"
Type III





ALUMINUM POST DETAIL
Aluminum alloy 6061-T6
approx. 0.88 lb./ft.



STEEL POST DETAIL
approx. 2 lb./ft.

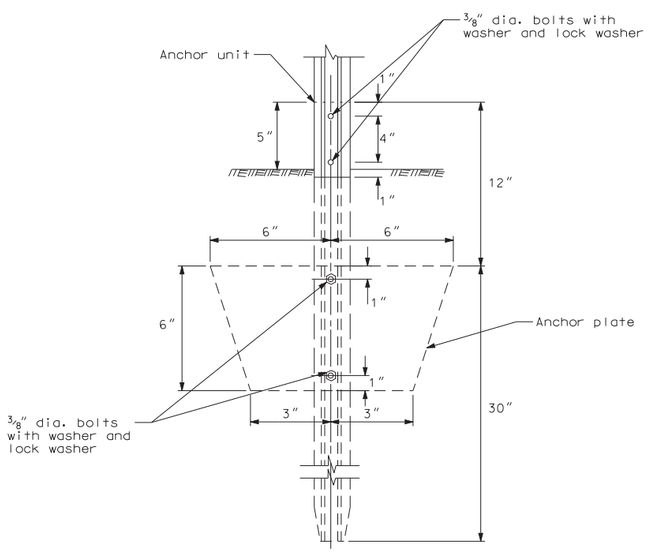
Notes:

1. The white background shall be given two coats of enamel conforming to the requirement of the manufacturer. Sign faces shall be fabricated in conformance to the requirements of Section 754.03 of the Standard Specifications. The reflective sheeting shall be Type III conforming to the requirements of Section 894.02 of the Standard Specifications. The item object markers will be measured by the number of sign markers installed complete in place. Back to back mountings require two sign markers. The 3" yellow reflector shall conform to the requirements of Section 894.06 B.2 of the Standard Specifications. Object markers to be mounted vertically on steel posts in front of the bridge railing on each side of highway, to mark the horizontal clearance on all bridges where distance between wheel guards is les than approach width. All sign backing material shall be .100 inch sheet aluminum. All signs have reflectorized background unless shown otherwise on the plans. In no case is the color black reflectorized. In lieu of the white painted background of the Type II object marker, a Type II reflective sheet may be substituted.

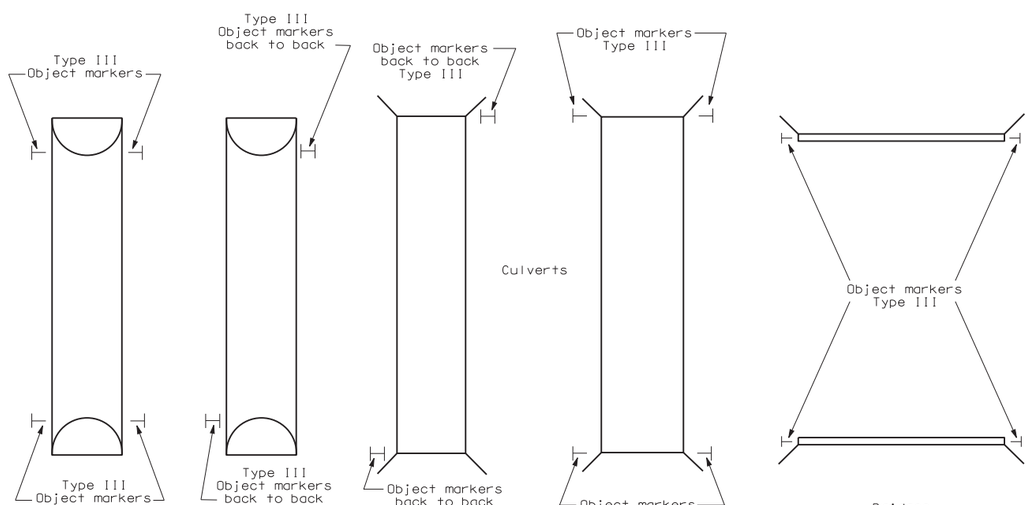
2. Posts shall conform to Section 894.05 B of the Standard Specifications. Steel posts shall be galvanized in accordance with AASHTO M-183 and M-232.

3. County Roads: Counties may adjust placement height of object markers based on an engineering review. On low volume county roads, the height of object markers within 8' of the shoulder of the roadway may be as low as 1' measured from the surface of the nearest traffic lane to the bottom of the marker.

4. Object markers are not required if approach guardrail is installed with reflectors and end treatment with delineation.



ANCHOR UNIT AND
POST ASSEMBLY
2# post or aluminum 0.88 lb./ft.



Pipe culverts greater than 10'

Pipe culverts 10' max.

Box culverts 10' max.

Box culverts greater than 10'

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-01-89	Type II hazard markers
10-25-89	Note change
09-30-91	Note change
07-08-03	Hazard to object markers
12-01-04	PE Stamp added
02-18-05	Added notes 3 & 4
04-23-07	Revised sign number for object markers

This document was originally issued and sealed by MARK S. GAYDOS Registration Number PE- 4518, on 04/23/07 and the original document is stored at the North Dakota Department of Transportation