DESIGN DATA - CROSSROADS				
Traffic	Average Daily			
Current 2020	Pass: 5325	Trucks: 735	Total: 6060	
Forecast 2040	Pass: 5860	Trucks: 810	Total: 6670	
Clear Zone Distance: Use Existing		Design Speed: 45 mph		
Minimum Sight Dist. for Stopping:		Bridges:		
Sight Dist. for No Passing Zone:				
Pavement Design Life 20 (years)				
Design Accumulated One-way Flexible ESALs: 1,703,766 WB On-Ramp Right Turn Lane 1,365,527 WB Off-Ramp Realignment				

	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	22839	1	1

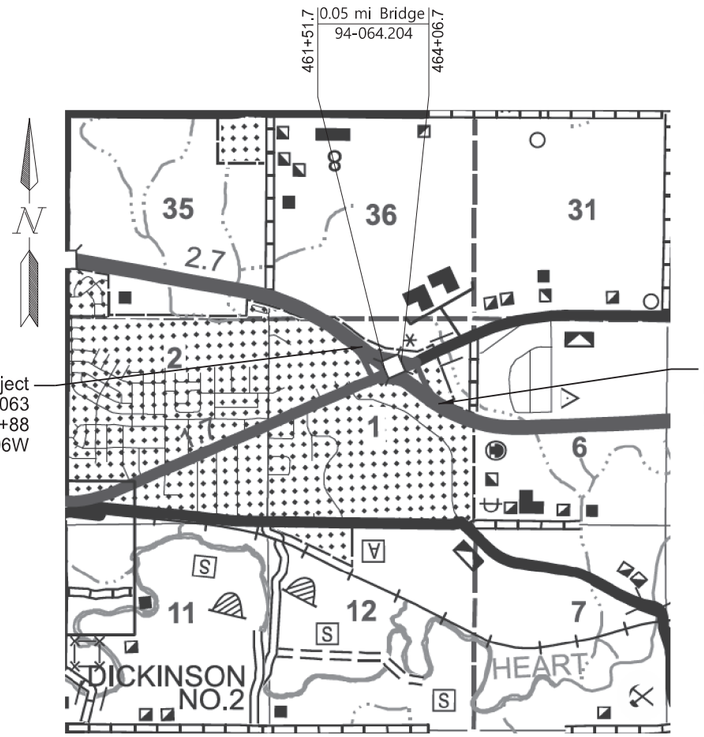
JOB # 29
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

IM-5-094(147)063)

Stark County
Exit 64 Interchange
Ramp Realignment, Lighting, and Turn Lanes

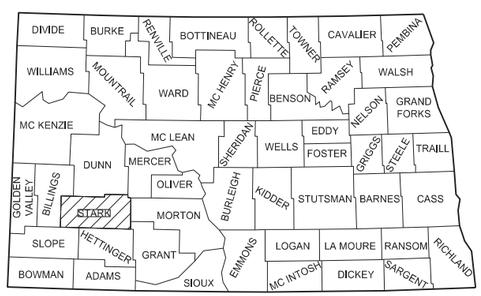
GOVERNING SPECIFICATIONS:
2020 Standard Specifications adopted by the North Dakota Department of Transportation and the Supplemental Specifications effective on the date the project is advertised.

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
IM-5-094(147)063	0.844	0.844



Begin Project
IM-5-094(147)063
RP 63.804-Sta 3368+88
Sect 1, Twp 139N, Rge 96W

End Project
IM-5-094(147)063
RP 64.648-Sta 3413+42
Sect 1, Twp 139N, Rge 96W



STATE COUNTY MAP

DESIGNER
Travis Miller
DESIGNER
Sara Cahlin
DESIGNER

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT
Orn, Chad M.
09 03 2020
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NDDOT DESIGN DIVISION
JAMES D. DOUGLASS SMITH
REGISTERED
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ENGINEER
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09/01/20

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PLAN SECTIONS

SPECIAL PROVISIONS

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LIST OF STANDARD DRAWINGS

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Begin Project
IM-5-094(147)063
RP 63.804-Sta 3368+88
Sect 1, Twp 139N, Rge 96W

- Reconstruction for Superelevation Transition
- Off-Ramp Realignment
- Ramp Removal
- Right Turn Lane Construction
- Remove and Replace Approach Slabs and Subcuts
- Removal of Bituminous Surface
- 3" Mill and 3" Overlay
- High mast Light std

End Project
IM-5-094(147)063
RP 64.648-Sta 3413+42
Sect 1, Twp 139N, Rge 96W

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SARA A. CAHILL
PE-8397
DATE
09/30/20
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Scope of Work

Ramp Realignment

Exit 64 Interchange

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100-P01 TIED PROJECT: This plan set and project includes overlapping limits and work activities with project NHU-5-094(114)907, PCN 21175. See plans for specific project activities and limits. Traffic control devices will be paid for separately between projects.

105-200 UTILITY COORDINATION: A utility coordination meeting is required.

105-P01 UTILITY COORDINATION – MONTANA DAKOTA UTILITIES: A gas pipe runs underneath the proposed ramp at STA 6+08 and under the existing ramp at STA 26+41. The pipeline is 36 inches below surface at STA 26+41 – 65 Lt and 44 inches below the surface at STA 26+41 – 66 Rt. Protect in place this pipe. 48 hour minimum notice must be given to the MDU contact below before digging in this area.

Kevin Busscher
Field Operations Supervisor – Gas
1133 W. Broadway
Dickinson, ND 58601
Office: 701-456-7149 | Cell: 701-260-1469
Email: kevin.busscher@mdu.com

105-P02 UTILITY COORDINATION – CONSOLIDATED TELECOM: A fiber line runs alongside the crossroad from STA 454+04 to STA 473+10 at an offset of 77 Rt. The approximate depths of the fiber line are shown in the cross sections for the work area. Protect in place this fiber line. 48 hour minimum notice must be given to the Consolidated Telecom contact below before digging in this area.

Tony Pravus, Manager
507 South Main
Dickinson, ND 58602-1408
DESK 701-483-7454
CELL 701-260-4258
Email: tony@consolidatednd.com

107-P01 MAINTAINING TRAFFIC –DROP-OFFS: If, at the end of the work-day, drop-offs greater than 2 inches or slopes steeper than 4:1 exist between the edge of a traffic lane and the outside edge of the proposed roadway, perform one of the following actions:

- Construct a traversable wedge in the area of the drop-off or steep slope; or
- Close the lane adjacent to the drop-off or steep slope and provide 24-hour flagging or pilot car operations.

When constructing a wedge, construct a wedge composed of aggregate or earthen materials with a 4:1 or flatter slope along the entire length of the area. Compact materials using Type C compaction, as specified in 203.04 E.4, "Compaction Control Type C".

Install stackable vertical panels that meet the requirements of Section 704.03 H, "Stackable Vertical Panels", along the edge of the driving lane closest to the wedge.

The Engineer will measure stackable vertical panels as specified in Section 704.05, "Method of Measurement" and will pay for panels as specified in Section 704.06, "Basis of Payment".

The Engineer will not measure material used to construct the wedge. Include the cost of materials, equipment, labor, and incidentals required for this operation in the price bid for "COMMON EXCAVATION-TYPE A".

If a 4:1 or flatter wedge is not installed, provide 24 hour flagging or pilot car operations and associated traffic control at no additional cost to the Department.

The requirements of Section 704.04 O, "Traffic Control for Uneven Pavement" apply to drop-offs created by milling or the placement of hot mix asphalt.

203-010 SHRINKAGE: 25% percent additional volume is included for shrinkage in earth embankment.

253-P01 HYDRAULIC MULCH: Drill seed into the ground prior to placing the hydraulic mulch.

261-P01 PERMANENT FIBER ROLLS: If fiber rolls are to remain on the project, use fiber rolls that are composed of netting that meets either of the following:

- Plastic or natural fiber photodegradable netting that has a life expectancy between 12 to 24 months.
- 100 percent biodegradable jute netting that has a life expectancy between 6 to 12 months.

401-P01 PRIME COAT: Include all cost to place blotter material CL 44 in the contract unit price for "PRIME COAT".

704-200 PRECAST CONCRETE MEDIAN BARRIERS – STATE FURNISHED: Obtain 53 barriers from the Belfield Section Yard. Return barriers to the Belfield Section Yard.

Install any missing markers on the barriers before traffic use. Include the cost of the markers in the contract unit

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price bid for "Precast Concrete Median Barrier – State Furnished".

Some 4 inch x 4 inch boards are available at the return location. Provide any additional 4 inch x 4 inch boards necessary to stack barriers. The boards become property of the Department. Include the cost for boards in the contract unit price for "Precast Concrete Median Barrier - State Furnished".

704-450 LANE CLOSURE - SIGNAL CONTROL/FLAGGING CONTROL: Install either the signal controlled lane closure on Standard D-704-16 or the flagging controlled lane closure on Standard D-704-17.

Obtain an electrical source for traffic signals. Solar powered signals may be used. Place generators a minimum of 60 feet from the roadway centerline, unless the generator and signal are part of a trailer mounted unit.

Place utility poles and equipment a minimum of 60 feet from the roadway centerline and place power conductors a minimum of 6 inches below the ground surface. Remove poles after they are no longer necessary.

The Engineer will measure individual traffic control devices, other than the signal system and flaggers, shown on the standards. Payment will be made at the respective contract unit price.

Include the cost of either a traffic signal system or flaggers in the contract unit price for "Lane Closure – Signal Control/Flagging Control".

704-P01 TRAFFIC CONTROL: Provide traffic control consisting of a temporary lane closure, signals and flagging.

Traffic control device quantities are based on a project length and the list below. Provide additional devices at no additional cost to the Department.

1. Standard D-704-12;
2. Standard D-704-16;
3. Standard D-704-19;
4. Standard D-704-20, layout G;
5. Standard D-704-22, layouts K and L; and
6. Standard D-704-23, layout P;
7. Standard D-704-26, layouts BB, CC, EE, and GG;
8. Standard D-704-35.

Maintain traffic on the existing WB off-ramp until the final lift of HMA of the new WB off-ramp is completed.

Only use the one lane closure on the interstate for unloading high mast components and while reconstructing the WB off-ramp transition where the new ramp alignment ties into the existing ramp. The one lane closure must come down at the end of each working day and cannot be used more than 4 working days without prior approval from the Engineer.

704-P02 TRAFFIC CONTROL – RAMP TRANSITION: Complete the reconstruction of the ramp transition half the ramp width at a time during daylight hours using flaggers for traffic control. If the backfill is not complete, temporarily fill the work area prior to nightfall and resume work the next day.

704-P03 ATTENUATION DEVICE TYPE B: Install a liquid filled attenuation device that is 2.5' wide at the end of each approach slab prior to permanent guardrail installation. Attach this device to the connection plate on the approach slab barrier. Do not drill new holes in the barrier.

Before installing devices, provide the Engineer a Certificate of Compliance stating that the devices meet NCHRP Report 350, MASH 2009, or MASH 2016, and a copy of an eligibility letter from FHWA.

Use devices rated for the MPH designation used in the item description.

Install devices according to the manufacturer's specifications.

Liquid filled attenuators may not be deployed in any portion of the months of January, February, and December, nor before the 15th of March.

If liquid filled attenuation devices are deployed after the 15th of March or in any portion of the months of April, October or November, include calcium magnesium acetate or potassium acetate in the liquid filled barrier solution. Mix the anti-icing chemicals with water as recommended by the anti-icing chemical manufacturer to protect the barrier from freezing to a temperature of 0°F. Contact the Engineer and the NDDOT Environmental and Transportation Services Division in the case of a spill leaving the roadway. Dispose of the mixture inside the device as specified in Section 107.17, "Removed Material".

Provide a full replacement set of attenuators available to the project. If the replacement devices are installed, have a set of replacement devices available to the project within 3 calendar days.

Immediately replace any damaged pieces. The Department will reimburse the Contractor for damaged pieces based on the invoice price plus 10 percent. All other costs associated with installing and maintaining replacement pieces will be at no additional cost to the Department.

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714-P01 PIPE BEND: Pipe bend is required at the following location:

Location	Type	Degree Bend
Sta 24+23 (NE_Ramp)	30 IN RCP	130 Degree

762-050 PAVEMENT MARKING: If the Engineer and Contractor agree, plan quantity will be used as the measurement for payment for pavement marking items.

900-P01 SETTLEMENT PLATE: The Engineer will establish the elevation of the settlement plates via a level loop (GPS is not allowed) starting from a benchmark location. Establish the benchmark prior to construction of the embankment and located in an area unaffected by construction activities. Include the cost of all work related to Settlement Plates in the price bid for "SETTLEMENT PLATE."

900-P02 SETTLEMENT PLATE: The Engineer will survey (via level loop; GPS is not allowed) the settlement plates and fill height (as applicable) according to the following intervals:

i. Immediately after settlement plate installation
ii. After every new riser pipe section is placed
iii. Every three days during fill operations
iv. After completion of embankment, weekly until project completion

970-P01 REPLANT TREE: Remove and replant trees located south of the existing WB off-ramp as shown in the Removals and Plan and Profile layouts of the plans to allow for the re-alignment of the WB off-ramp.

Remove the trees with a solid ball of earth around the roots. Provide a ball with a diameter not less than 10 times the diameter of the trunk of the tree measured 1 ft above the surface of the ground. Provide a ball depth not less than 60% of its diameter for balls up to 48 in diameter. For balls over 48 in diameter provide a ball with sufficient depth to maintain a solid structure and to encompass all the feeding roots under the ball area. Use a mechanical tree spade to replant the trees. Replant trees the same day they are removed from their existing location.

Prior to placing topsoil within the tree pits rototill the bottom of the tree pit to a minimum 6" depth within. Break up large clumps, remove any extraneous material, and re-shape the subgrade prior to placing topsoil.

Water the root ball of the tree thoroughly prior to removal to keep the root ball intact and reduce as much soil loss as possible during transports. Maintain the ball as a solid unit when moving the tree. Keep the ball moist at all times during transplanting operations.

Take care to prevent injury to the tree during the transplanting operation. Protect all parts of the tree. Tie branches out of the way of possible injury. Do not attach chains, cables, or heavy ropes to the trunk or branches without protective padding adequate to prevent bruising or other injury.

Replant the trees so the new spacing matches the existing tree spacing of the remaining trees. When positioning the tree in the new hole, place it 2-3" higher than the original grade to allow for settling. Water the newly transplanted trees so the original soil ball and surrounding soil is saturated to a depth of 12". Apply water slowly to entire area, allowing adequate penetration.

Stake the trees with 2" x 2" pressure treated tree stakes or painted T-shaped steel posts securely inserted to a 3' depth and outside the root system. Extend a galvanized guy wire from the tree stake to a polypropylene strap (or equal) around the tree trunk.

Provide mulch materials that are free of all foreign debris. Keep mulch 6" away from the tree trunks. Provide mulch samples to the Project Engineer for approval. Obtain approval for mulch material prior to mulch installation. Mulch material installed without prior approval will be removed from the project. Cover the disturbed surface area of plant beds and pits evenly and uniformly to a 4" depth with bark mulch or as directed by the Engineer. Insure that all plant pits and beds are entirely free of weed or grass growth and free of live roots at the time mulch is applied.

Protect and care for the trees until October 15th 2021. Water them weekly during dry weather or as otherwise directed. Protect the trees from damage and from diseases and insect pests. Replace any trees that die or become damaged at no additional cost. Trees are considered dead when the main leader dies back, or 25% of the crown is dead. Remove the designated dead plant material immediately; replace the trees as soon as possible in accordance with the planting dates and weather conditions.

Include the cost for all equipment, fertilizer, topsoil, mulch, materials, and labor required to remove and replant, maintain and water the trees in the unit price "Replant Trees."

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NOTES

SECTION 140

770-P01 MULTIPLE UNDERGROUND CABLE: The plans call for using Multiple Underground Cable and Conduit in various locations. In lieu of the Multiple Underground Cable, the contractor may furnish and install rigid conduit and single RHW conductors of the same size for the Multiple Underground Cable.

Install conduit size as specified by the National Electric Code. If the contractor chooses to use the conduit and single conductors, the cost to furnish and install conduit, conductors, and pull boxes shall be included in the item “Multiple Underground Cable”.

770-P02 LED LUMINAIRE – HIGH MAST: Provide luminaires that meets the following:

Light Source	LED
Light Output	55,000 lm to 65,000 lm
Driver	850 mA to 1100 mA
Wattage	400W to 600W
Color Temperature	3000K ±300K
Operating Temperature Range	-40°C to +40°C
Luminaire Housing	Die Cast Aluminum
Vibration Testing	ANSI/NEMA C136.31 Level 2, 3 G
Surge Suppression Rating	ANSI/IEEE C62.41 Cat C
Outdoor rating for housing, wiring, and drivers	ANSI C136.25 IP-65
Qualified with Design Lights Consortium	Yes

Provide a cast aluminum slip fitter housing that accommodates a 2-inch horizontal pipe bracket and that is adjustable 3 degrees above and below the bracket axis for leveling. Provide means to prevent the twisting of the luminaire about the bracket. Include terminal boards in the housing.

Provide an effective projected area of a luminaire less than 2.2 square feet. Provide a luminaire with a maximum weight of 62 pounds.

Provide a symmetrical luminaire that has a maximum beam angle of between 55 degrees and 60 degrees. Provide asymmetrical luminaires that have a Type III medium distribution.

The high mast lighting system was designed using these values:

Roadway Classification	Principal Arterial
Average Maintained Illuminance	0.8 foot-candles
Illuminance Uniformity Ratio (avg/min)	3.0:1
Minimum Illuminance	0.2 foot-candles
Light Loss Factor	0.81

Provide the high mast luminaires listed below or an approved equal.

Company	Catalog Number
Holophane High Mast LED	HMLED4 P3 30K MVOLT HGR AW DFD
Holophane High Mast LED	HMLED4 P3 30K MVOLT HGR MAS DFD

Include all cost associated with the LED luminaire in the bid price for “LED Luminaire – High Mast”.

770-P03 HIGH MAST TOWER LABELING: Provide labels on every high mast tower with the following specifications:

- Outdoor rated permanent backing material
- Protective coating
- Outdoor rated Permanent Adhesive
- 1” letters, 3”x12” total size
- 5-year life span
- 5 total with the High Mast Number printed on each. Refer to the High Mast Light Standards charts in the plans for the High Mast Number.

Install the label 2” above the hand hole cover and level with the foundation. Ensure the surface is clean of dirt or debris. If needed, sand the area to remove any surface rust. Ensure the label is securely fastened to the surface.

Include all costs for purchasing and installing the labels in the item “LED Luminaire - High Mast”.

770-P04 PORTABLE POWER UNIT: Provide new portable power units according to Standard Specifications Section 895.13 H.7 “Portable Power Unit”. Deliver units to the Dickinson District.

Dickinson District Office
1700 Third Avenue West, Suite 101, Dickinson ND

Include the cost of the portable power units in the item “High Mast Lighting Assembly Type HM-140-4”.

770-P05 ANCHOR BOLTS: Tighten anchor bolts according to Section 754.04.D.5.c “Anchor Bolt Tightening”.

770-P06 EXISTING INTERCHANGE LIGHTING: The existing interchange lighting shall remain operational until the high mast lighting system is installed. The lights at the intersection of I-94 business loop may be disconnected when constructing

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the northeast ramp. Include all costs to keep operational in the item “Remove Lighting System”.

770-P07 LED LUMINAIRE: Provide the luminaire listed below or an approved equal for the vertical lift snow gate light standards.

Company	**Catalog Number**
American Electric Lighting	ATB2 60LEDE70 MVOLT R3 3K

Provide the LED luminaire with photocontrol. The LED luminaire shall operate on 120v.

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ENVIRONMENTAL NOTES

ENVIRONMENTAL NOTES (EN): The North Dakota Department of Transportation have made environmental commitments to secure approval of this project. The following environmental notes are requirements to comply with these commitments:

EN-1 TEMPORARY WETLAND IMPACT: Temporary impact areas within wetlands and or other waters are incorporated into the plans for this project. Remove temporary fill placed and sedimentation in wetlands or other waters. Restore these wetlands to preconstruction contours.

EN-2 WETLAND MITIGATION: Wetland mitigation is required for unavoidable permanent wetland impacts. The wetland mitigation plan is incorporated into the plans for this project. After completion of the mitigation area, the Engineer will complete the Onsite Mitigation Certification Form SFN 61042. Any sedimentation occurring within the mitigation area will be removed.

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ESTIMATE OF QUANTITIES

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SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
103	0100	CONTRACT BOND	L SUM	0.22	0.22
201	0330	CLEARING & GRUBBING	L SUM	1	1
202	0128	REMOVE AGGREGATE BASE	TON	1,618	1,618
202	0135	REMOVAL OF BITUMINOUS SURFACING	TON	2,144	2,144
202	0169	REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	1	1
203	0101	COMMON EXCAVATION-TYPE A	CY	745	745
203	0109	TOPSOIL	CY	3,667	3,667
203	0113	COMMON EXCAVATION-WASTE	CY	16,228	16,228
203	0119	TOPSOIL-IMPORTED	CY	170	170
203	0138	COMMON EXCAVATION-SUBCUT	CY	195	195
203	0140	BORROW-EXCAVATION	CY	56,526	56,526
216	0100	WATER	M GAL	720	720
251	0200	SEEDING CLASS II	ACRE	6.3	6.3
251	2000	TEMPORARY COVER CROP	ACRE	6.3	6.3
253	0201	HYDRAULIC MULCH	ACRE	12.7	12.7
260	0100	SILT FENCE UNSUPPORTED	LF	356	356
260	0101	REMOVE SILT FENCE UNSUPPORTED	LF	356	356
261	0112	FIBER ROLLS 12IN	LF	9,492	9,492
261	0113	REMOVE FIBER ROLLS 12IN	LF	3,219	3,219
302	0120	AGGREGATE BASE COURSE CL 5	TON	6,742	6,742
401	0050	TACK COAT	GAL	983.1	983.1
401	0060	PRIME COAT	GAL	1,644	1,644
411	0116	MILLING PAVEMENT SURFACE - 3 INCH	SY	9,123	9,123
430	0045	SUPERPAVE FAA 45	TON	3,244	3,244
430	1000	CORED SAMPLE	EA	17	17
430	5803	PG 58S-28 ASPHALT CEMENT	TON	89.3	89.3
430	5818	PG 58H-34 ASPHALT CEMENT	TON	105.5	105.5
602	1135	BRIDGE APPROACH SLAB-REMOVE & REPLACE	SY	171.2	171.2
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,388	1,388
702	0100	MOBILIZATION	L SUM	0.22	0.22
704	0100	FLAGGING	MHR	300	300
704	1000	TRAFFIC CONTROL SIGNS	UNIT	3,262	3,262
704	1018	LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL	EA	1	1

ESTIMATE NUMBER: 20857 ESTIMATE TYPE: FINAL FINALIZED: Y RUN DATE: 10/09/2020 TIME: 10:56:10

ESTIMATE OF QUANTITIES

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SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
704	1039	ATTENUATION DEVICE-TYPE B-45	EA	4	4
704	1052	TYPE III BARRICADE	EA	5	5
704	1060	DELINEATOR DRUMS	EA	66	66
704	1067	TUBULAR MARKERS	EA	58	58
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	2	2
704	1500	OBLITERATION OF PAVEMENT MARKING	SF	300	300
704	3510	PRECAST CONCRETE MED BARRIER-STATE FURNISHED	EA	53	53
706	0400	FIELD OFFICE	EA	0.22	0.22
706	0500	AGGREGATE LABORATORY	EA	0.22	0.22
706	0550	BITUMINOUS LABORATORY	EA	0.22	0.22
706	0600	CONTRACTOR'S LABORATORY	EA	0.22	0.22
709	0100	GEOSYNTHETIC MATERIAL TYPE G	SY	760	760
714	0820	PIPE CONC REINF 30IN CL III	LF	59	59
714	3030	END SECT-CONC REINF 30IN	EA	1	1
748	0141	CURB & GUTTER-TYPE 1 SPECIAL	LF	60	60
754	0110	FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING	SF	82	82
754	0112	FLAT SHEET FOR SIGNS-TYPE IV REFL SHEETING	SF	58	58
754	0168	DELINEATORS-TYPE D	EA	3	3
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	235	235
754	0210	GALV STEEL POST-STANDARD PIPE	LF	92.4	92.4
754	0214	GALV STEEL POSTS-W-SHAPE POSTS(TWO OR MORE)	LF	60	60
754	0534	PANEL FOR SIGNS-TYPE IV REFLECTIVE SHEETING	SF	63	63
754	0592	RESET SIGN PANEL	EA	1	1
754	1100	CLASS AE CONCRETE-SIGN FOUNDATIONS	CY	1.9	1.9
762	0112	EPOXY PVMT MK MESSAGE	SF	64	64
762	0113	EPOXY PVMT MK 4IN LINE	LF	10,570	10,570
762	0115	EPOXY PVMT MK 8IN LINE	LF	406	406
762	0117	EPOXY PVMT MK 24IN LINE	LF	178	178
762	0420	SHORT TERM 4IN LINE-TYPE R	LF	550	550
762	0426	SHORT TERM 24IN LINE-TYPE R	LF	24	24
764	0131	W-BEAM GUARDRAIL	LF	308	308
764	0145	W-BEAM GUARDRAIL END TERMINAL	EA	4	4
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	258	258

ESTIMATE NUMBER: 20857 ESTIMATE TYPE: FINAL FINALIZED: Y RUN DATE: 10/09/2020 TIME: 10:56:10

ESTIMATE OF QUANTITIES

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SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
764	2081	REMOVE END TREATMENT & TRANSITION	EA	4	4
770	0030	CONCRETE FOUNDATION-HIGH MAST LIGHTING	EA	10	10
770	0060	CONCRETE FOUNDATION-FEED POINT-TYPE B	EA	2	2
770	0220	CABLE TRENCH-TYPE II	LF	9,566	9,566
770	0330	2IN DIAMETER RIGID CONDUIT	LF	77	77
770	0350	3IN DIAMETER RIGID CONDUIT	LF	180	180
770	0370	4IN DIAMETER RIGID CONDUIT	LF	285	285
770	0483	MULTIPLE UNDERGROUND CABLE 4NO2 STYLE USE	LF	3,310	3,310
770	0485	MULTIPLE UNDERGROUND CABLE 4NO4 STYLE USE	LF	4,338	4,338
770	0486	MULTIPLE UNDERGROUND CABLE 4NO6 STYLE USE	LF	2,453	2,453
770	0735	FEED POINT-TYPE II-PAD MOUNTED	EA	2	2
770	3733	HIGH MAST LIGHTING ASSEMBLY TYPE HM-140-4	EA	6	6
770	3755	HIGH MAST LIGHTING ASSEMBLY TYPE HM-160-6	EA	1	1
770	3757	HIGH MAST LIGHTING ASSEMBLY TYPE HM-160-8	EA	3	3
770	4280	LED LUMINAIRE - HIGH MAST	EA	54	54
770	4525	REVISE LIGHTING SYSTEM	EA	1	1
770	4567	REMOVE LIGHTING SYSTEM	EA	1	1
900	0100	SETTLEMENT PLATE	EA	2	2
970	1025	REPLANT TREES	EA	7	7

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	10	1

		WB Off-Ramp		I-94B		EB Right Turn Lane		WB Right Turn Lane		Guardrail		Subcut		
		STA 0+00 to STA 12+18		STA 454+04 to STA 461+33 STA 464+27 to STA 473+10		STA 454+88 to STA 458+46		STA 468+31 to STA 471+96		STA 459+27 to STA 466+52		STA 460+39.2 to STA 461+31.7 STA 464+26.7 to STA 465+19.2		
BID ITEM	UNIT	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Width (ft)	Quantity at location	Total Quantity
Aggregate Base Course CL 5 @ 1.5 Ton/CY +25%	TON	25	4965	-	-	-	-	17	153	Varies	322	36	1302	6742
Removal of Aggregat Base @ 1.5 Ton/CY	TON	25	846	-	-	Varies	532	7.8	94	-	-	36	146	1618
Removal of Bituminous Surfacing @ 2 Ton/CY	TON	24	1748	-	-	Varies	280	4	34	-	-	36	82	2144
Tack Coat @ 0.05 Gal/SY (1st Lift)	GAL	24	162.4	Varies	501.8	-	-	17	34.4	Varies	19	36	38	755.6
Tack Coat @ 0.05 Gal/SY (2nd Lift)	GAL	23	156.0	-	-	-	-	16.5	33.5	-	-	36	38	227.5
Milling Pavement Surface - 3 Inch	SY	-	-	Varies	9244	-	-	-	-	-	-	-	-	9244
Superpave FAA 45 @ 2 Ton/CY	TON	24	1216	Varies	1521	-	-	16	163	Varies	91	36	253	3244
PG 58H-34 Asphalt Cement @ 6% HMA*	TON	-	39.8	-	49.8	-	-	-	5.3	-	3.0	-	7.6	105.5
PG 58S-28 Asphalt Cement @ 6% HMA*	TON	-	33.2	-	41.5	-	-	-	4.5	-	2.5	-	7.6	89.3
Prime Coat @ 0.35 Gal/SY	GAL	24	1137.0	-	-	-	-	17	241.0	-	-	36	266.0	1644.0
Blotter Material CL 44**	TON	24	32.5	-	-	-	-	17	6.9	-	-	36	7.6	47.0

*See Section 30 for where asphalt cement is used.

**For estimating purposes only - not to be bid separately.

Water

25 Mgal/Mile for Dust Palliative

20 Gal/Ton for Aggregates

Earthwork Summary

Location	Common Excavation Type A (Pay Item)	Common Excavation Subcut (Pay Item)	Common Excavation Waste (Pay Item)	Embankment *	Borrow Excavation (Pay Item)	Topsoil (Pay Item)
	CY	CY	CY	CY	CY	CY
High Mast Lighting		0	0			0
WB Off Ramp	0	0	16,228	56,205		2,931
W Guardrail	0	0	0	74		74
E Guardrail	0	0	0	616		134
WB Right Turn Lane	243	0	0	366		147
EB Right Turn Lane	502	0	0	10		382
Subcut	0	195	0	0		0
Total	745	195	16,228	57,271	56,526	3,667

* 25% volume was added to embankment volumes to allow for shrinkage.

HMA Cored Samples

Specification Section	A	B		C	Quantity (A x B x C)	Quantity (1 per mile)	Unit
	Distance (Ft)/1000	Lanes	Joints	Lifts			
430.04 I.2.b(1), "General" Ramp	1	1	N/A	3	3	N/A	EA
430.04 I.2.b(1), "General" Crossroad	2	2	N/A	2	8	N/A	EA
430.04 I.2.b(1), "General" WB Turn	1	1	N/A	3	3	N/A	EA
SSP 4 Longitudinal Joint Density in HMA Pavements (Centerline)	1	N/A	1	2	2	N/A	EA
430.04 I.2.b(2), "Pavement Thickness Determination Cores" - Ramp					N/A	1	EA
				Totals	16	1	EA

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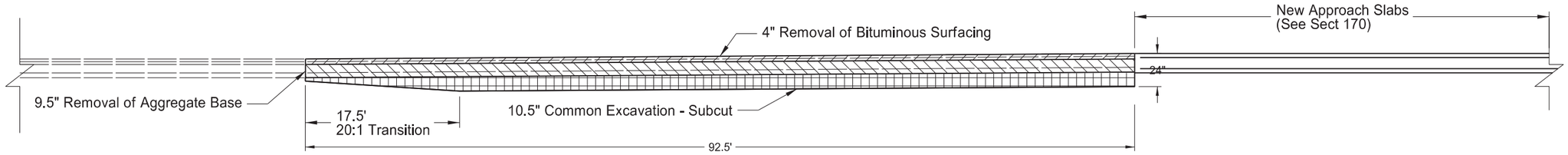
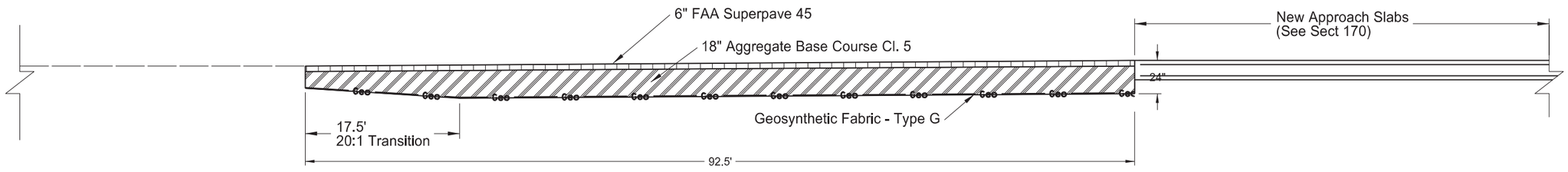
Basis of Estimate

Ramp Realignment

Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	20	1





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Subcut

Ramp Realignment

Exit 64 Interchange

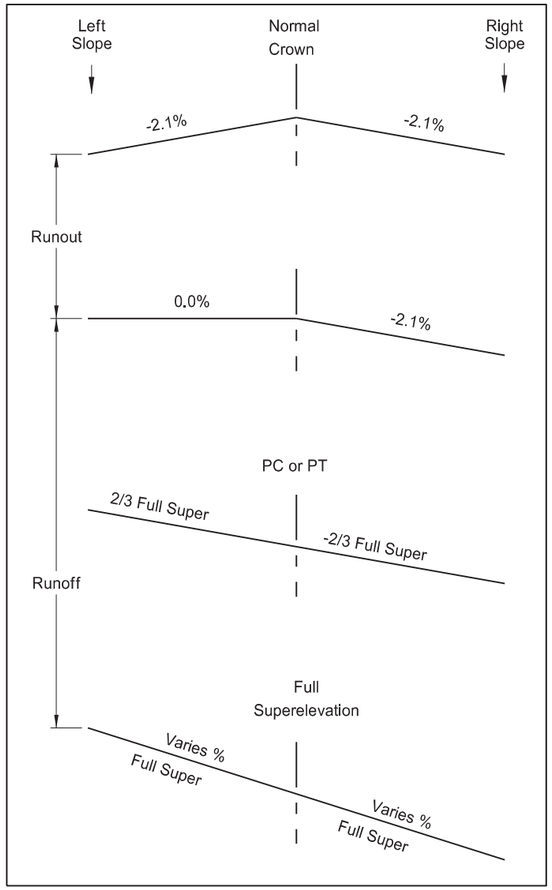
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	20	2

P.C. Station 1+15.45
P.I. Station 3+76.65
Delta = 20° 40' 27.91" (LT)
Degree = 4° 00' 03.97"
Tangent = 261.1986
Length = 516.7167
Radius = 1432.0000
External = 23.6266
P.T. Station 6+32.16

Station	Left Slope	Right Slope
0+00.00	-2.1	0.39
0+69.96	-2.1	0.39
1+79.45	-6.0	6.0
5+68.16	-6.0	2.1
6+92.96	-2.1	0.0
8+27.36	-2.1	-2.1
8+61.27	-2.1	-2.1

P.C. Station 10+90.38
P.I. Station 12+82.15
Delta = 15° 18' 04.33" (RT)
Degree = 4° 00' 48.36"
Tangent = 191.7659
Length = 381.2496
Radius = 1427.6000
External = 12.8221
P.T. Station 14+71.63

Station	Left Slope	Right Slope
8+95.18	-2.1	-2.1
9+32.38	-2.1	0.0
10+29.58	-2.1	2.1
11+54.38	-6.0	6.0



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Note: Calculations based on AASHTO method five. A design speed of 60 mph and maximum superelevation of 6% were used.

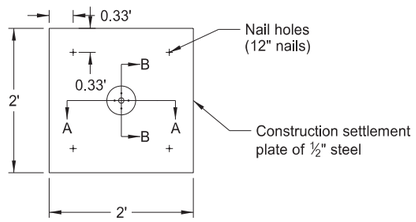
Superelevation Table

Ramp Realignment

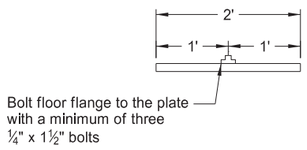
Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	20	3

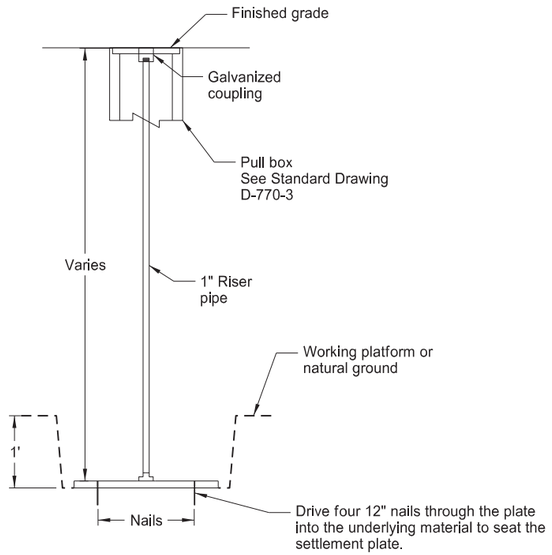
Settlement Plate Plan View



Section A-A

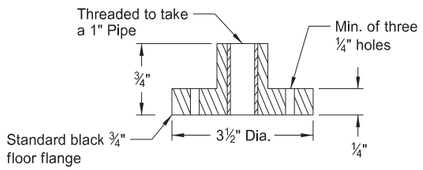


Settlement Plate Installation



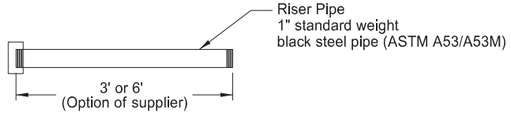
Section B-B

(Not to scale)



Riser Pipe & Coupling

(Not to scale)



Notes:

1. Notify the Engineer prior to settlement plate installation.
2. Install the settlement plate at Sta 3+00, 9' Lt and Sta 3+00, 24' Rt
3. Install settlement plate on a smooth and level surface and prior to the addition of any fill material.
4. Install settlement plate in position and extend pipes in sections as the embankment is placed. Notify the Engineer when the pipe is to be extended. Submit a date and exact length of pipe added each time the pipe is extended.
5. Install pull box flush with proposed ground.
6. Maintain settlement plate and pull box until project completion. Any damage to the plate will be repaired/replaced at Contractor's expense.

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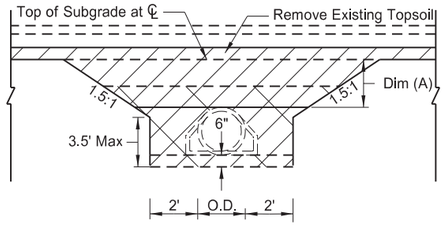
Settlement Plate Detail

Ramp Realignment

Exit 64 Interchange

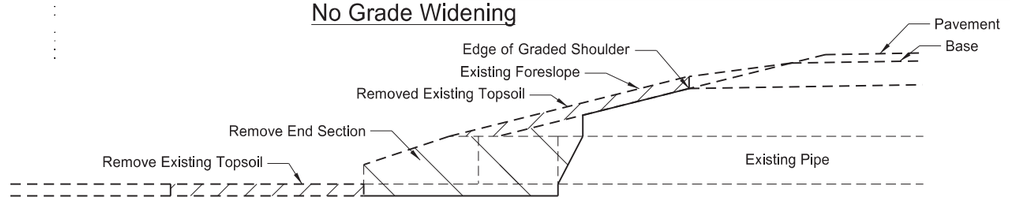
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	20	4



Removal Detail

Side View

No Grade Widening

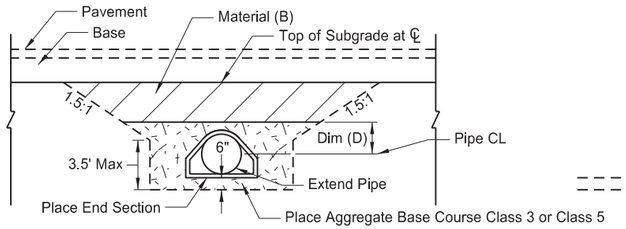


Removal Section

Cross Section View

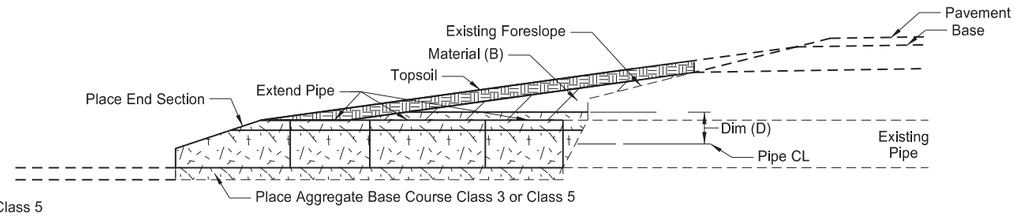
Pay Items
1) Pipe*
2) Remove End Section and Place New End Section

*Included in Pipe Pay Item
1) Pipe
2) Aggregate Base Course Class 3 or Class 5
3) Embankment
4) Topsoil
5) Seeding
6) Mulch



Backfill Detail

Side View (Topsoil not shown)



Proposed Section

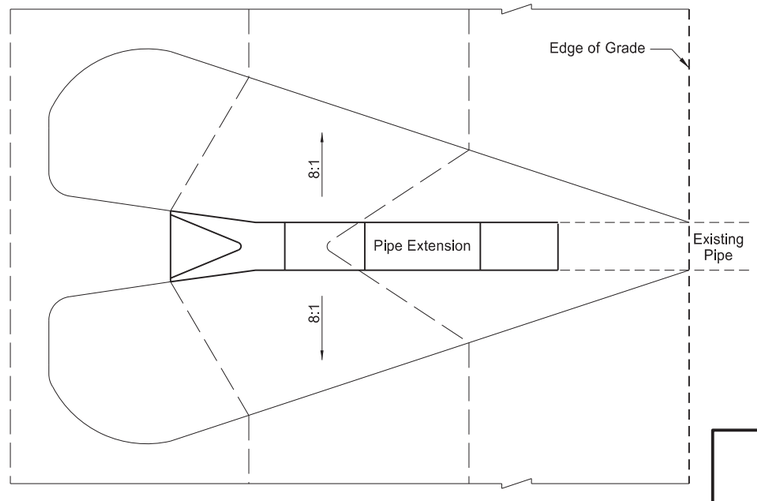
Cross Section View

Pipe Materials	Dim (A)<=4 Feet Material (B)	Backfill Dimension Dim (D)
Concrete	Embank or Aggr	0.5 O.D.
Metal	Embank or Aggr	0.5 O.D.+1 Foot

Pipe Materials	Dim (A)>4 Feet Material (B)	Backfill Dimension Dim (D)
Concrete	Embankment	0.5 O.D.
Metal	Embankment	0.5 O.D.+1 Foot

NOTES:
1. Embankment may be either Borrow Excavation or Common Excavation.

2. Aggregate may be either Class 3 or Class 5 Aggregate Base Course.



Proposed Section

Plan View

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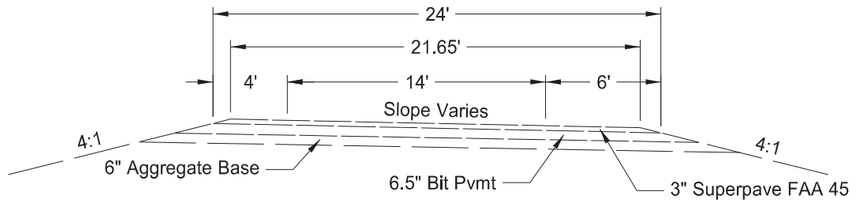
Mainline Centerline Pipe Extension Detail

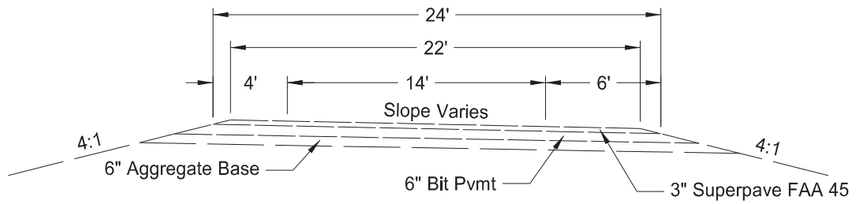
Ramp Realignment

Exit 64 Interchange

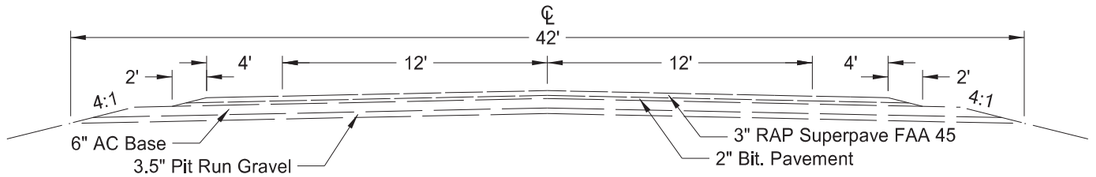
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	30	1



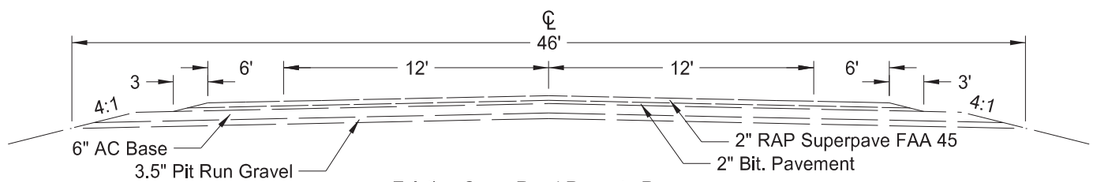
Existing WB Ramp Off-Ramp
Sta 10+02.68 to Sta 32+58.46



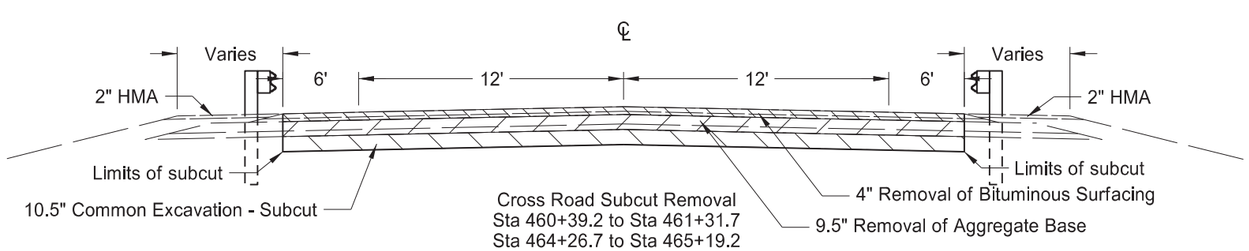
Existing EB Ramp On-Ramp
Sta 50+00 to Sta 76+27.40



Existing Cross Road Outward from Ramps
Sta 454+04 to Sta 456+54.91
Sta 468+61.83 to Sta 473+10



Existing Cross Road Ramp to Ramp
Sta 456+54.91 to Sta 461+31.7
Sta 464+26.7 to Sta 468+61.83



Cross Road Subcut Removal
Sta 460+39.2 to Sta 461+31.7
Sta 464+26.7 to Sta 465+19.2

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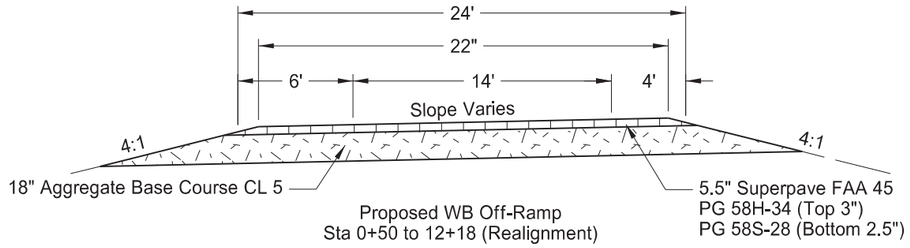
Existing and Removals Typical Sections

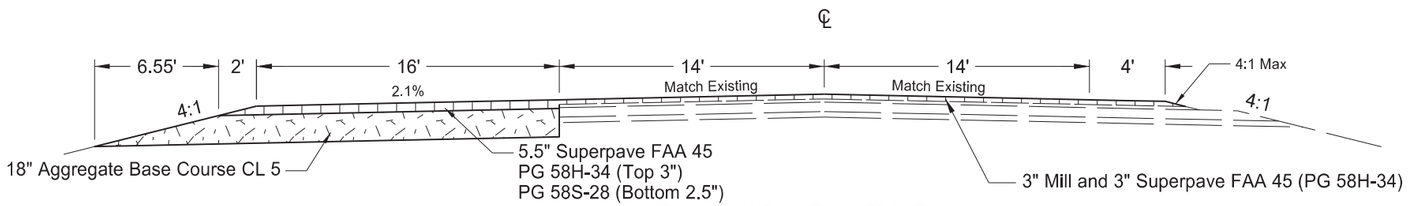
Ramp Realignment

I-94 Exit 64 Interchange

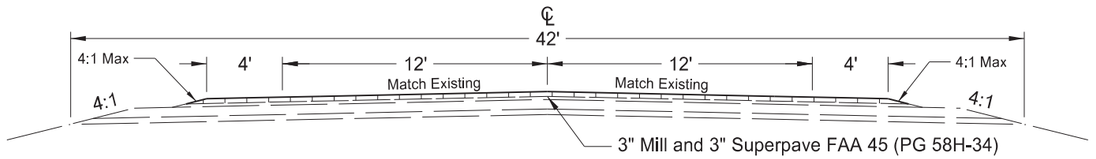
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	30	2



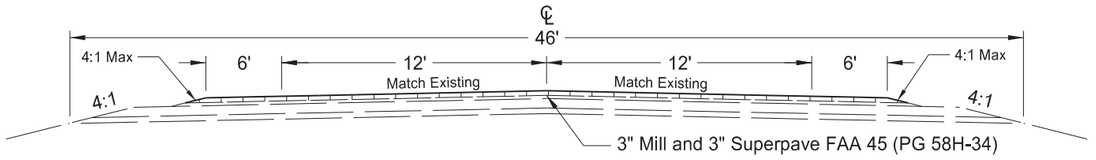
Proposed WB Off-Ramp
Sta 0+50 to 12+18 (Realignment)



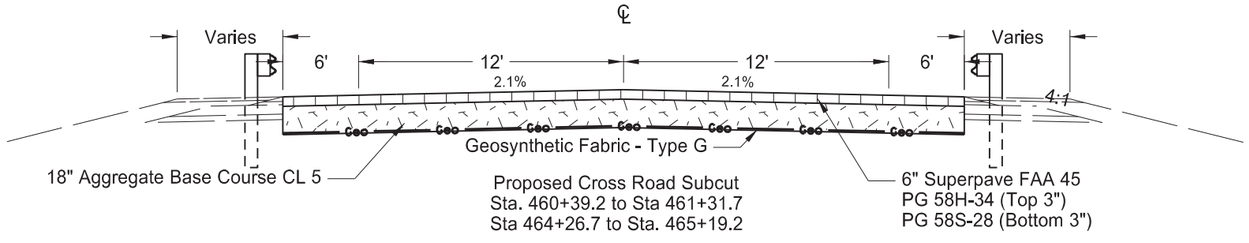
Proposed WB On-Ramp Right Turn Lane
Sta. 468+40.82 to Sta. 471+95.58



Proposed Cross Road Outward from Ramps
Sta. 454+04 to Sta. 456+54.91
Sta. 468+61.83 to Sta. 473+10



Proposed Cross Ramp to Ramp
Sta. 456+54.91 to Sta 461+31.7
Sta 464+26.7 to Sta. 468+61.83



Proposed Cross Road Subcut
Sta. 460+39.2 to Sta 461+31.7
Sta 464+26.7 to Sta. 465+19.2

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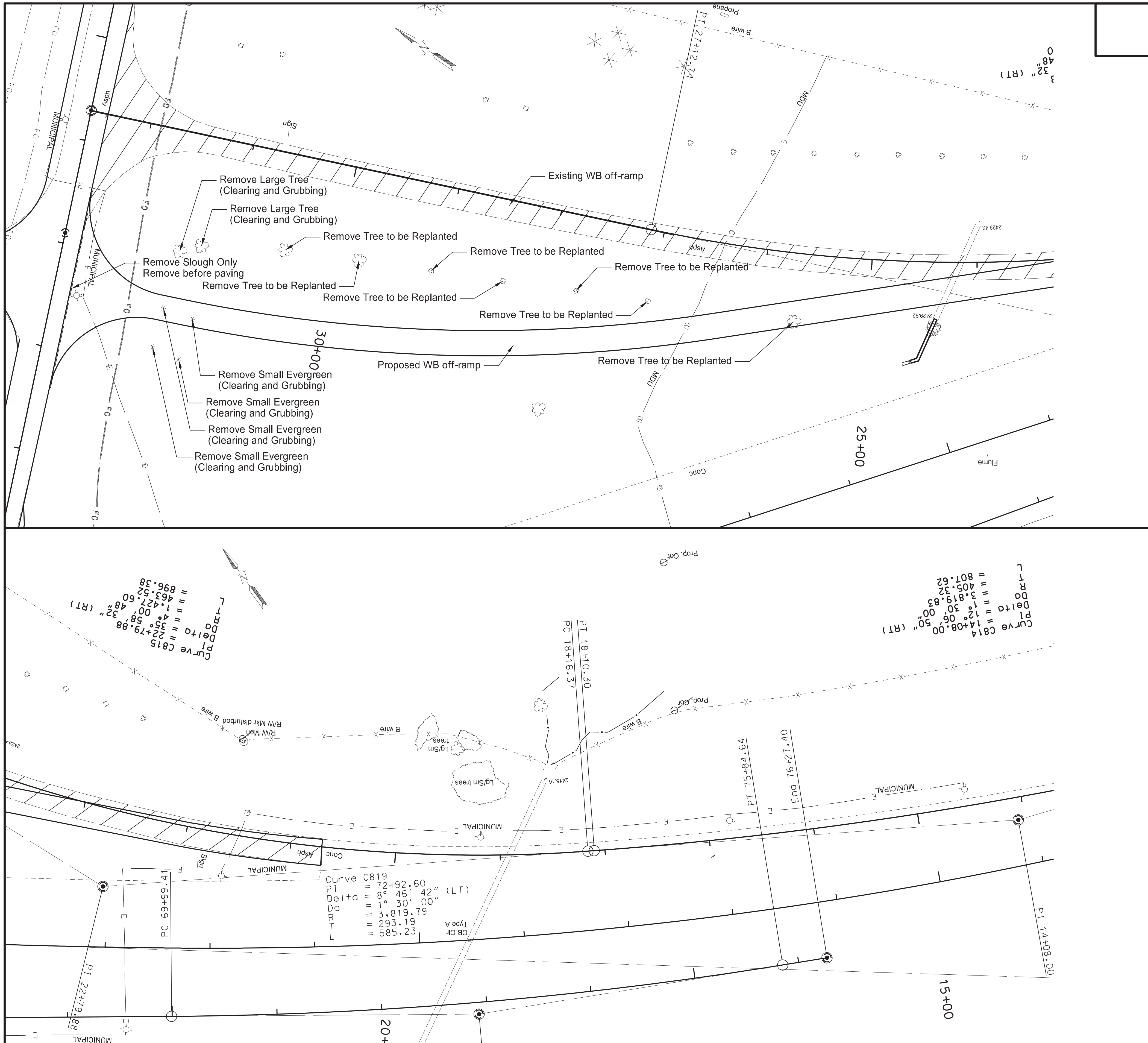
Proposed Typical Sections

Ramp Realignment

I-94 Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	40	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	128	REMOVE AGGREGATE BASE	TON	846
202	135	REMOVAL OF BITUMINOUS SURFACING	TON	1748



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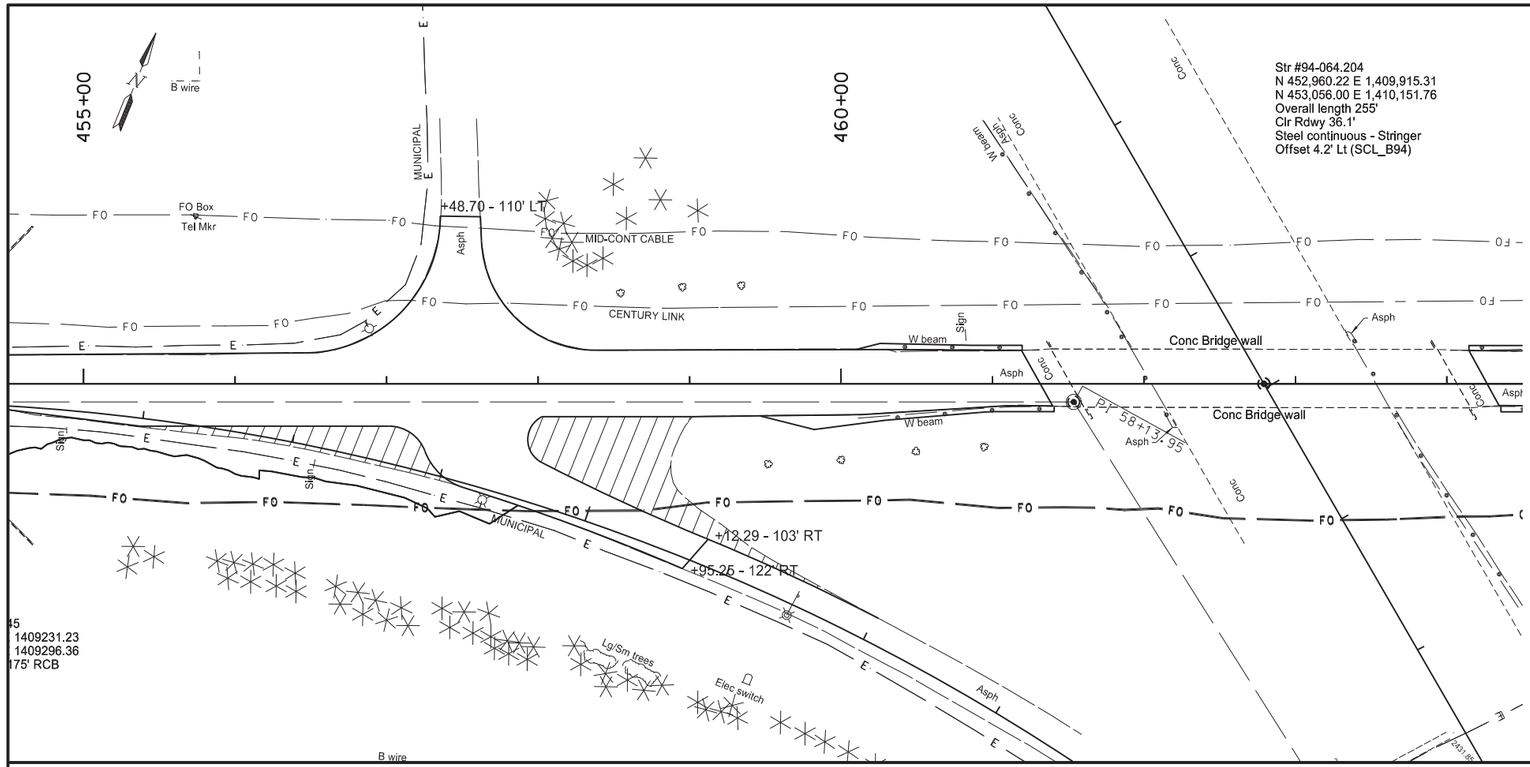
Removals WB Off-Ramp

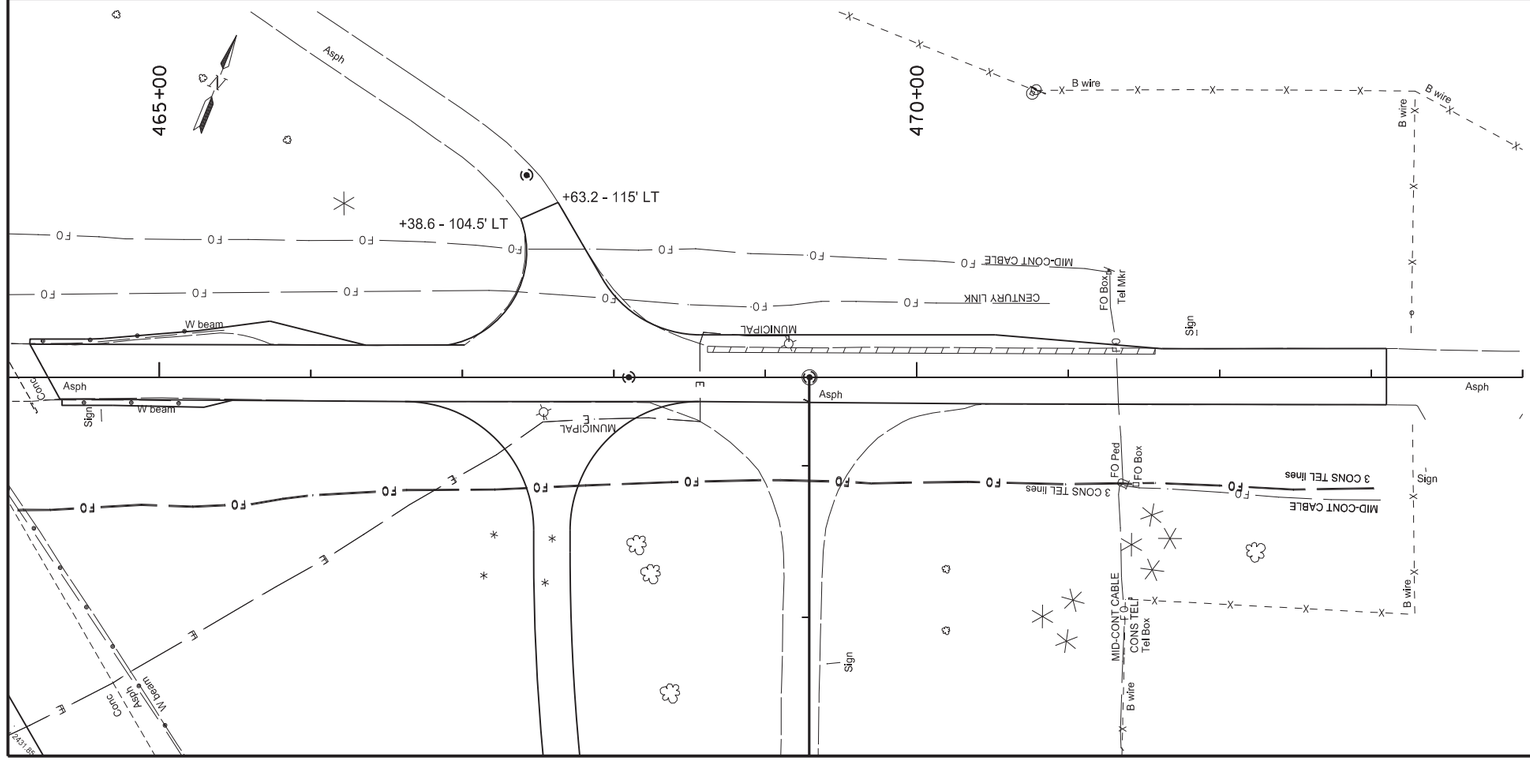
Ramp Realignment

Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	40	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	128	REMOVE AGGREGATE BASE	TON	626
202	135	REMOVAL OF BITUMINOUS SURFACIN	TON	314





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Removals Crossroad

Ramp Realignment

Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	51	1

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation (Pay Item)			Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	Geosynthetic Material Type G (Pay Item)	(*) End Sections		Applicable Backfill
				In	Bid Item	LF		In	Type		In	SY	Begin EA	End EA	
8+41	69.8 RT	8+12	33.5 RT	30	Pipe Conc Reinf 30IN CL III (Extension)	59	Reinforced Concrete Pipe - Class III **(barrel length = 58 LF)**	30					TES	-	Section 20 Sheet 4

Coatings: **Z** = Zinc
A = Aluminum
P = Polymeric (over Zinc or Aluminum)

Corrugations: **2** = 2-2/3"x1/2"
3 = 3"x1"
5 = 5"x1"

Spiral Ribs: **3/4** = 3/4"x3/4"@7-1/2"
1 = 3/4"x1"@11-1/2"

(*) End sections are measured and paid for separately for pipe extensions.
FES = Flared End Section
TES = Traversable End Section

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Pipe List

Ramp Realignment

Exit 64 Interchange

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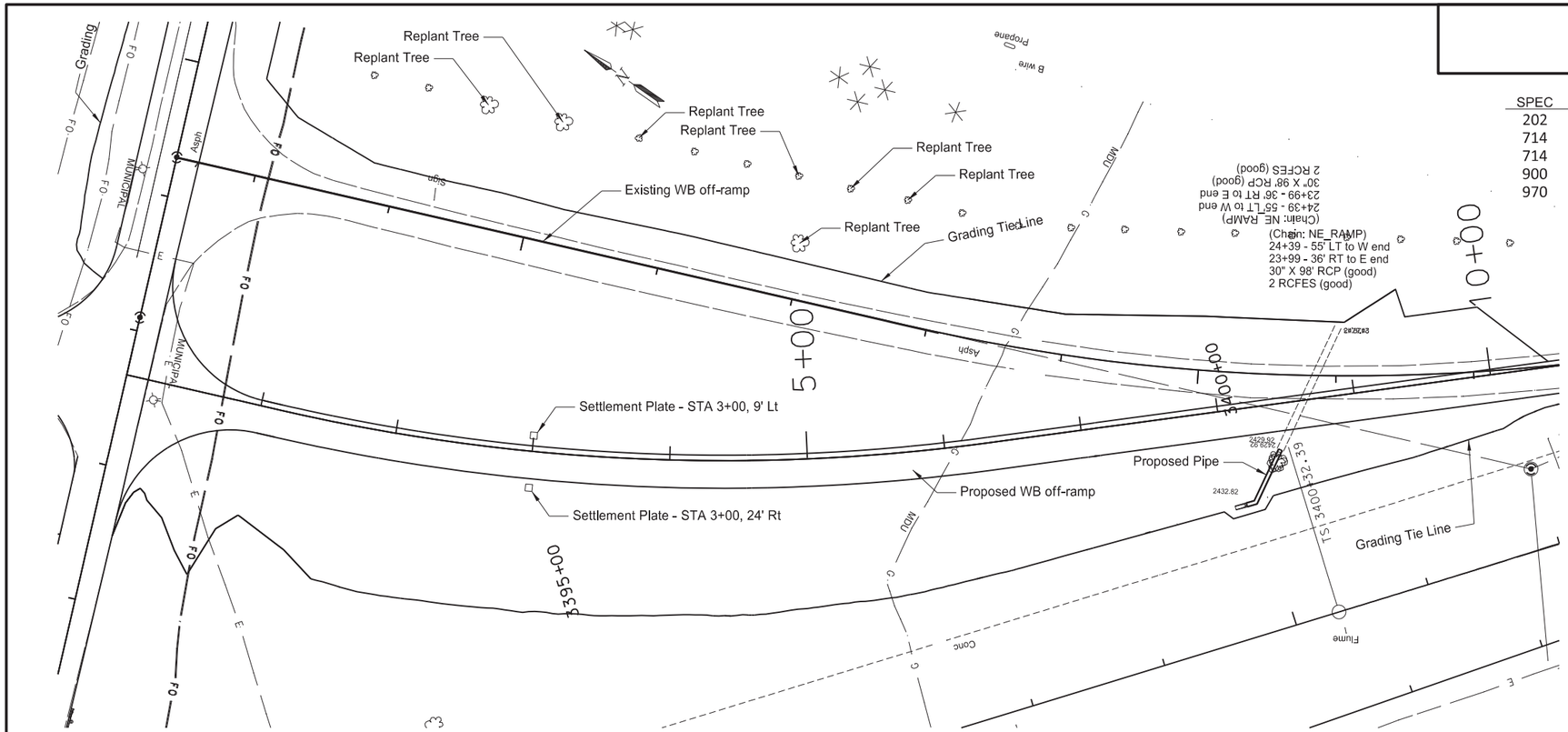
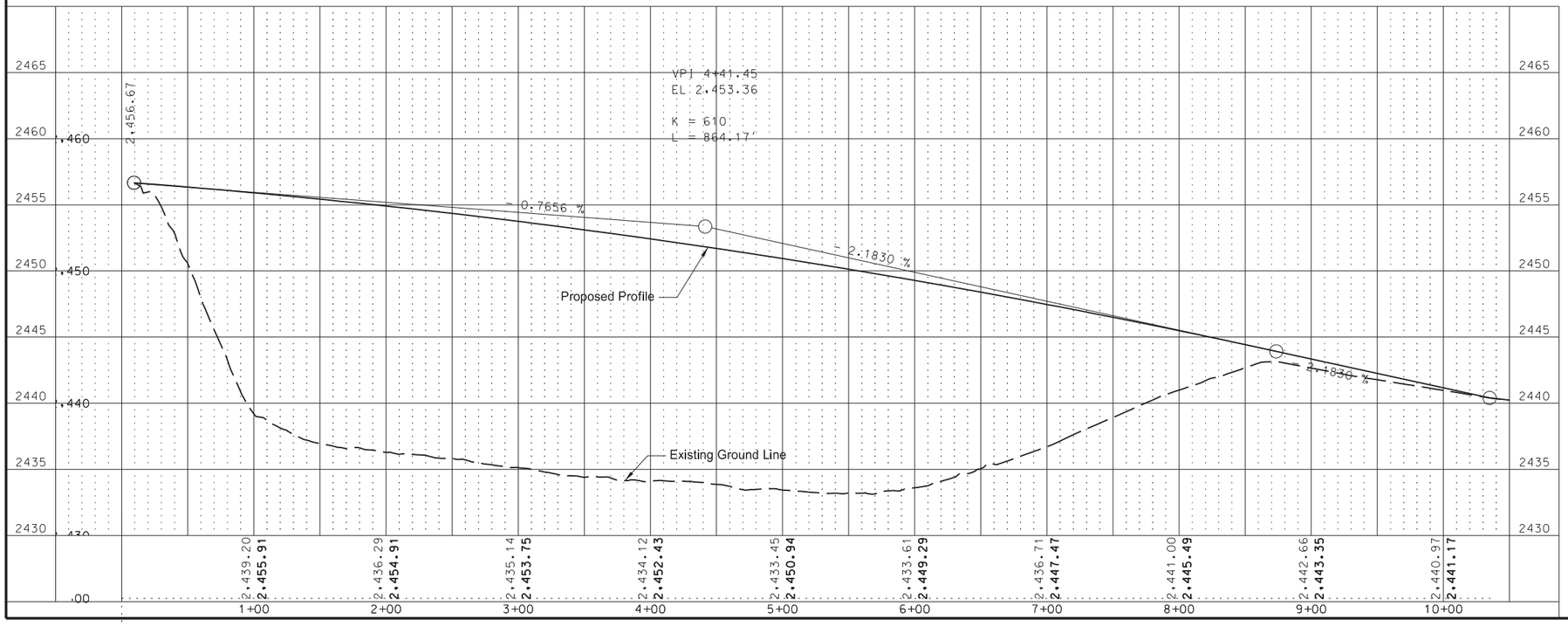
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	60	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	169	REMOVAL OF END SECTION-ALL TYPES & SIZES	EA	1
714	820	PIPE CONC REINF 30IN CL III	LF	59
714	3030	END SECT-CONC REINF 30IN	EA	1
900	100	SETTLEMENT PLATE	EA	2
970	1025	REPLANT TREES	EA	7



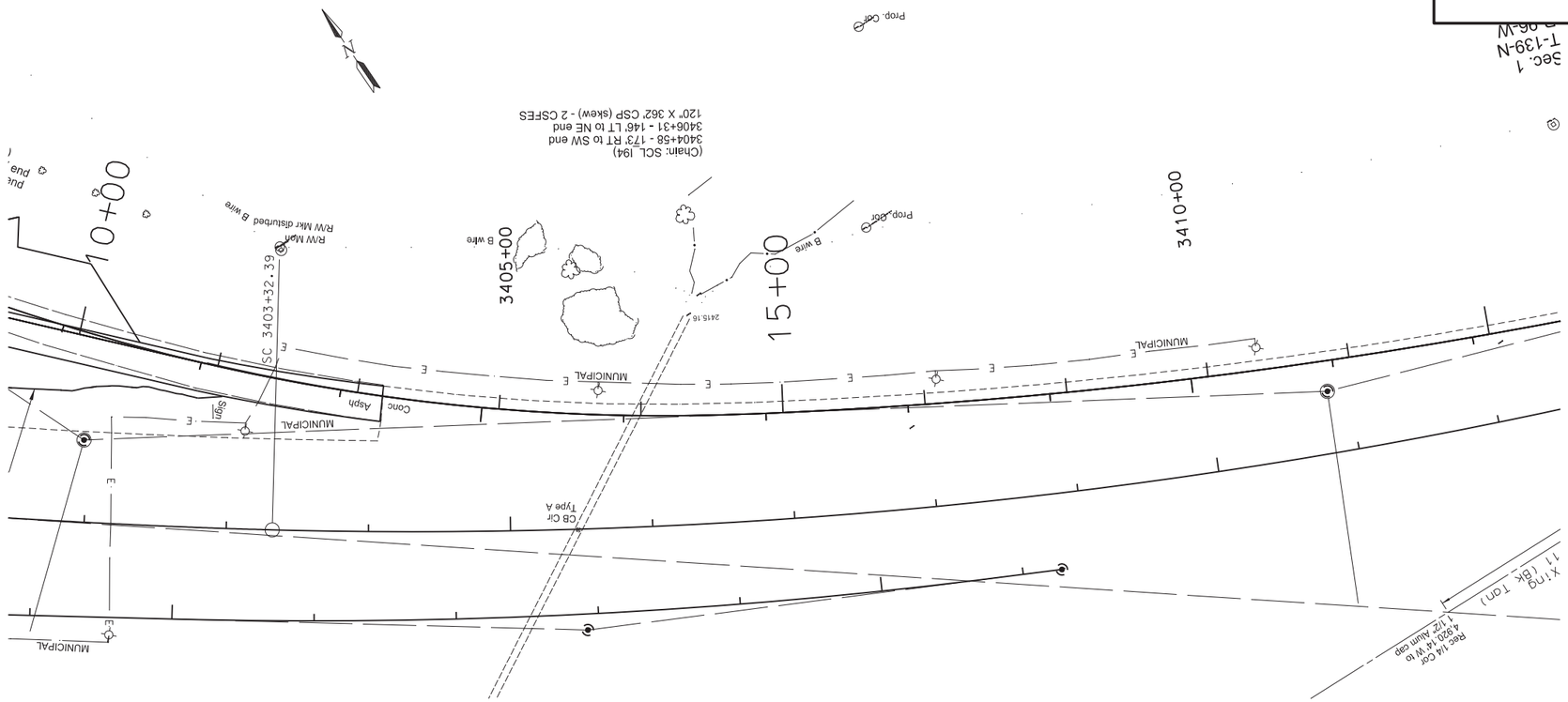


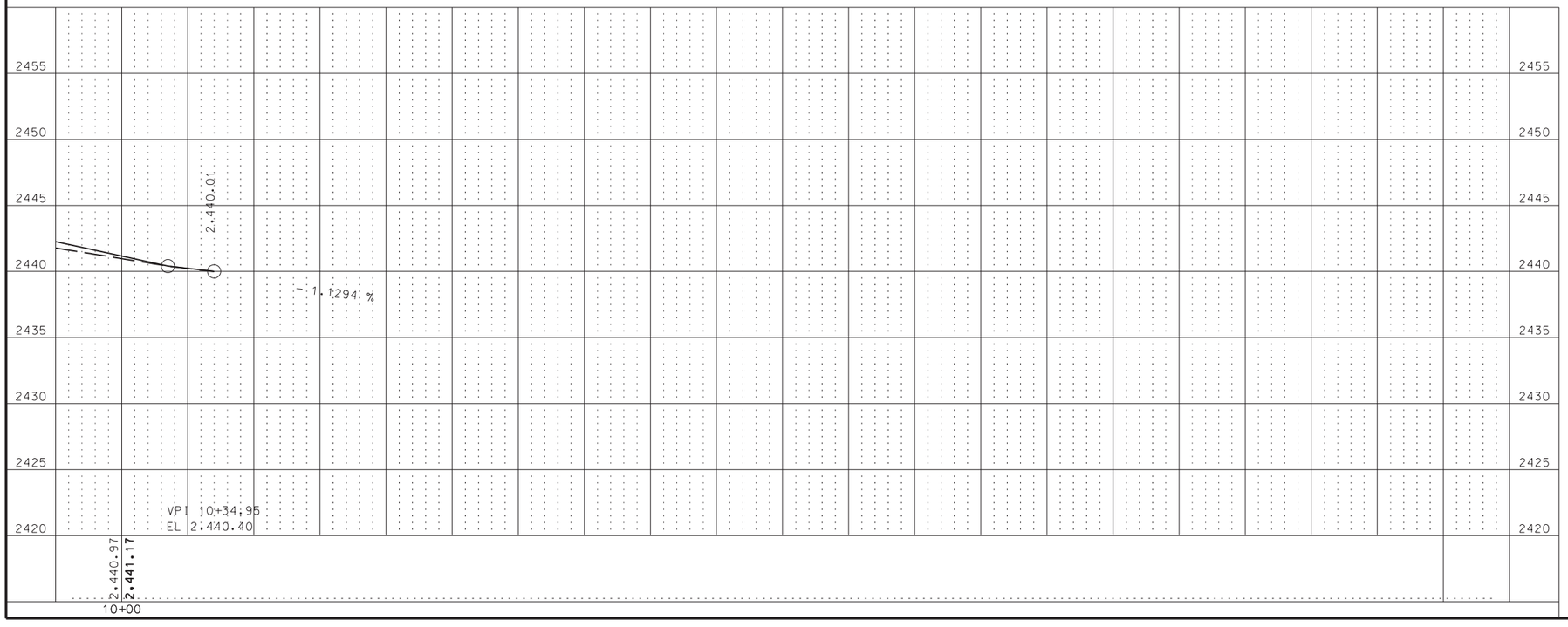
Plan and Profile WB Off-Ramp

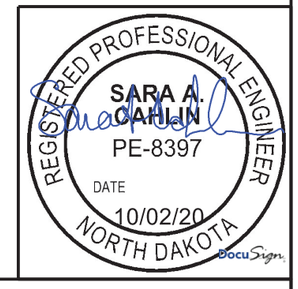
Ramp Realignment

Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	60	2







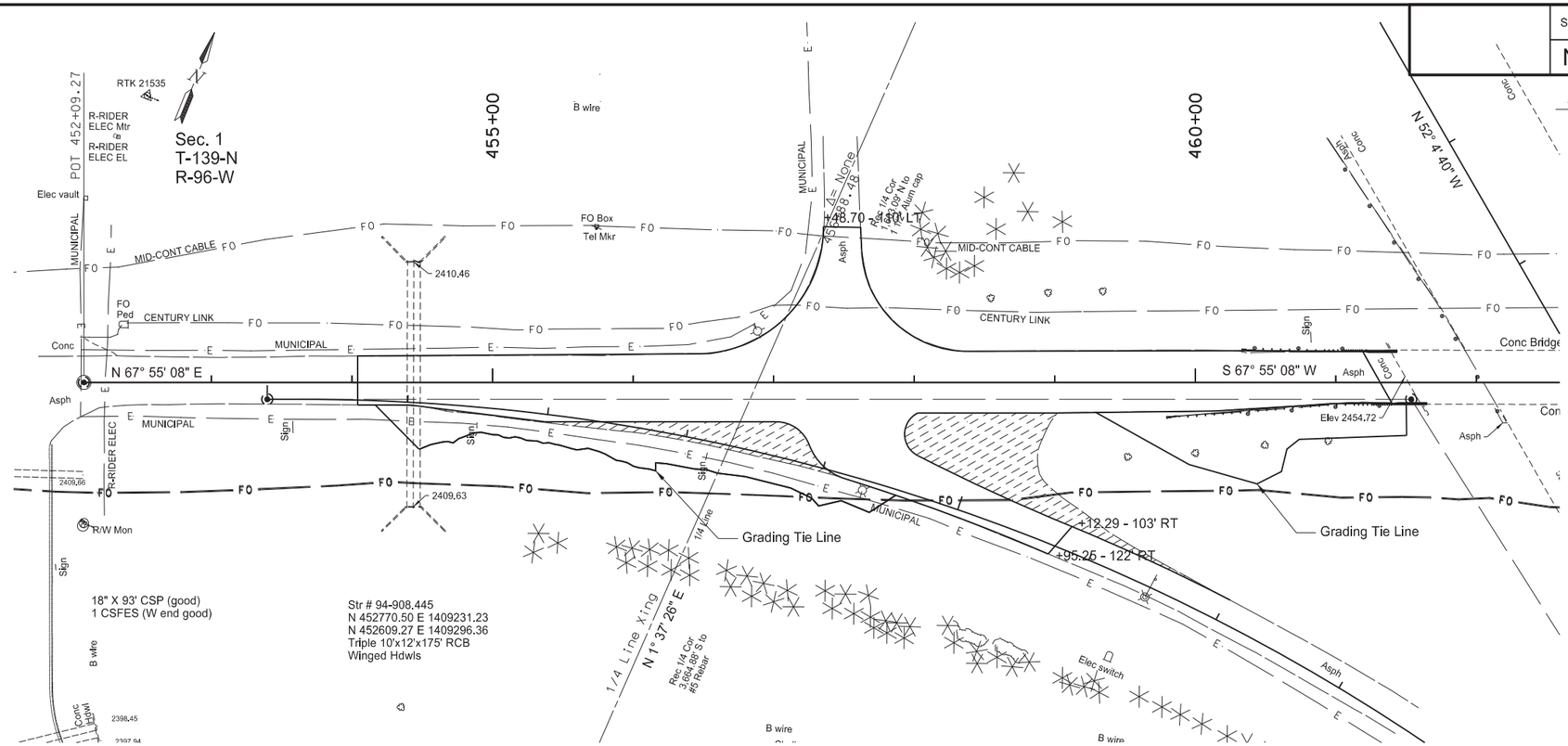
Plan and Profile WB Off-Ramp

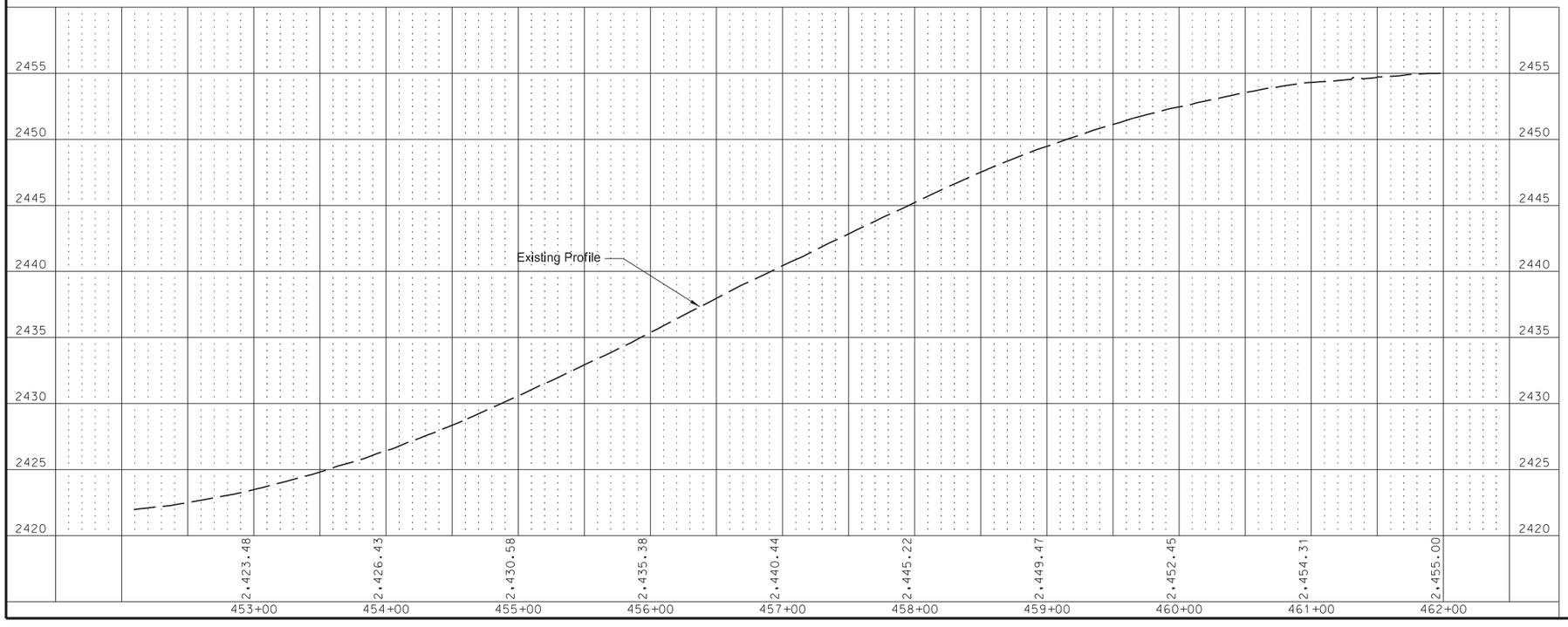
Ramp Realignment

Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	60	3

SPEC	CODE	BID ITEM	UNIT	QUANTITY
203	119	TOPSOIL-IMPORTED	CY	170





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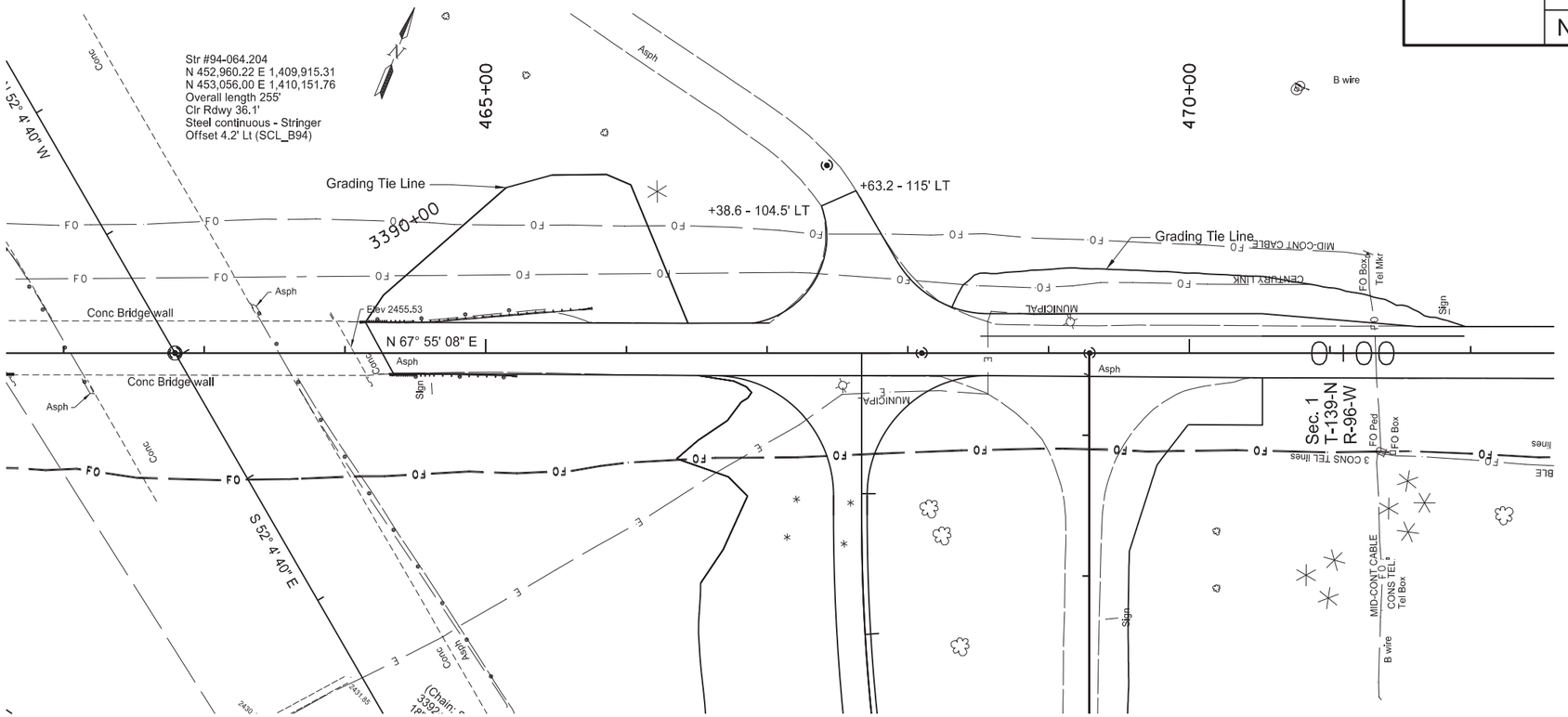
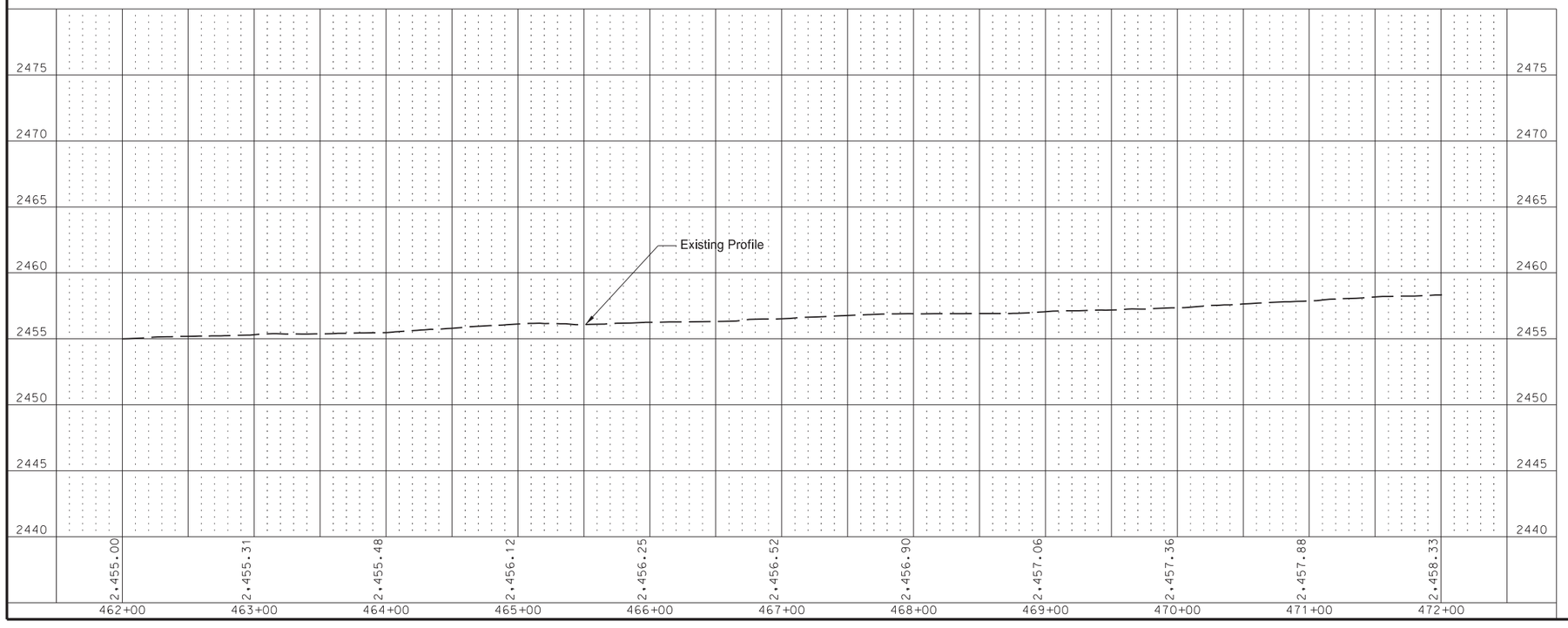
Plan and Profile Crossroad

Ramp Realignment

Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	60	4





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Exit 64 Interchange

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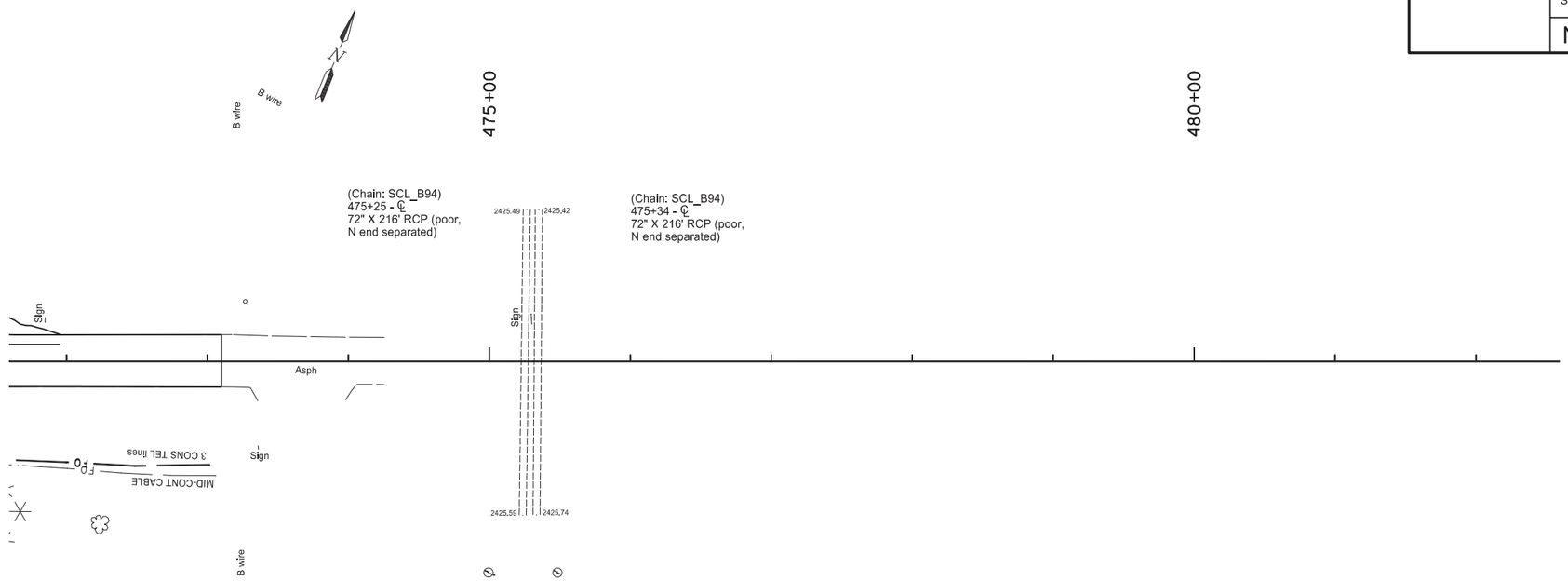
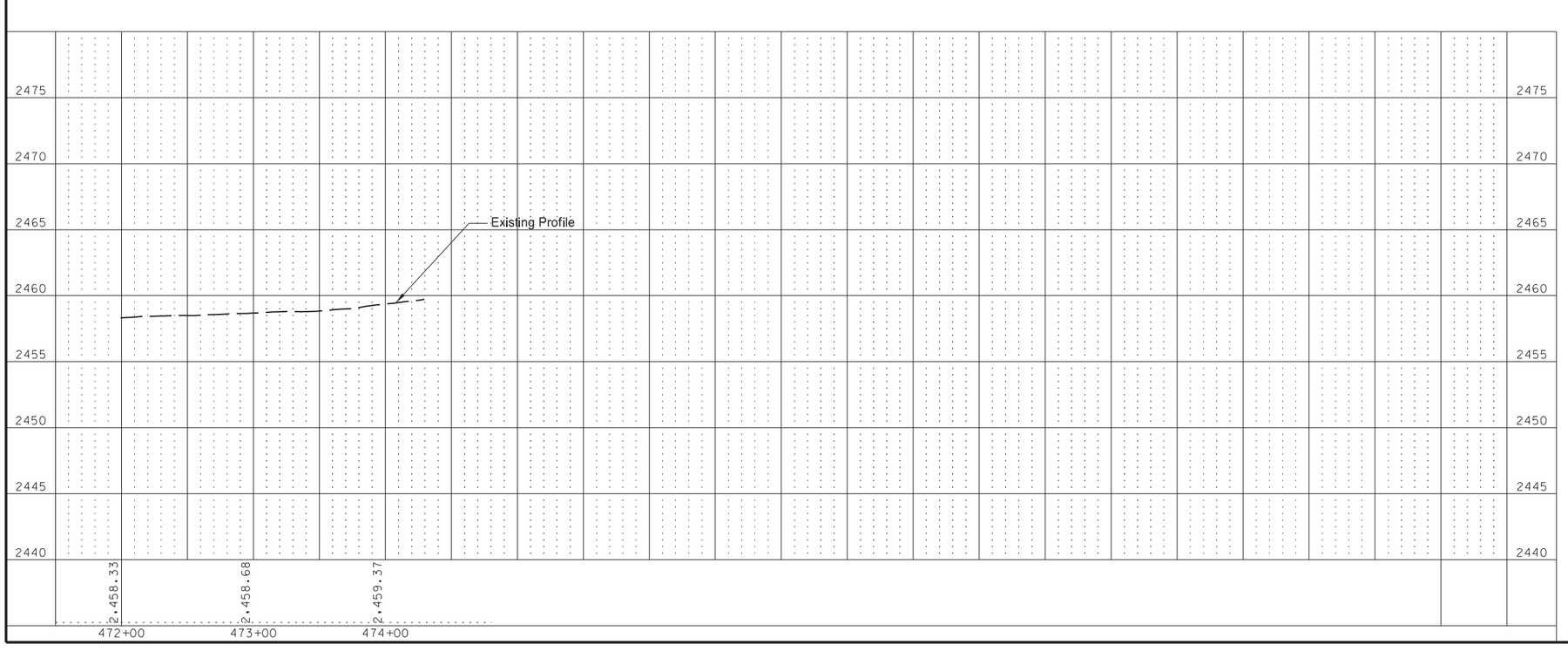
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	60	5





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Plan and Profile Crossroad

Ramp Realignment

Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	75	1

Wetland Impact Table

Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands	Wetland Impacts Acre(s)			USFWS Easement Impacts Acre(s)		Wetland Mitigation											
										Mitigation Required			USACE/11990 Bank		11990 Bank		USFWS Bank		Onsite			
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Temp.	Perm.	EO 11990	USACE	USFWS	Location	Acre(s)	Location	Acre(s)	Location	Acre(s)	Mitigation Location; Ratio	Acre(s)	Constructed Site #	Constructed Size Acre(s)
1a	NW 1/4 S1 T139N R96W	Natural	Linear/Slope Wetland	YES	0.000	0.000															
1b	NW 1/4 S1 T139N R96W	Natural	Linear/Slope Wetland	YES	0.000	0.000															
2	NE 1/4 S1 T139N R96W	Natural	Linear/Slope Wetland	YES	0.000	0.000															
3	NE 1/4 S1 T139N R96W	Created	PEMB	NO	0.002	0.000				N*	N*										
4	NE 1/4 S1 T139N R96W	Created	PEMB	NO	0.070	0.587				N*	N*										
				Totals	**0.072**	**0.587**															

*Impacted wetlands are assumed not Jurisdictional for 404 Permitting Purposes

Impact Summary Table

Permanent Impact Summary		Temporary Impacts and additional information	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres)
Natural/JD (Fill/Drain)	0.000	Temporary JD	0.072
Natural/Non-JD	0.000	Non-JD Temporary	0.000
Created/JD (Fill/Drain)	0.000	Permanent JD > 0.10	0.000
Created /Non-JD (Fill/Drain))	0.587	Permanent OW	0
Total	0.587	Temporary OW	0
JD Natural (Cut)	0.000		
JD Created (Cut)	0.000		
Non-JD Natural (Cut)	0.000		
Non-JD Created (Cut)	0.000		
Total	0.000		

Mitigation Summary Table

	Location	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only					
EO 11990 Only					
USACE/11990					
USFWS					
	Total	0	0	0.000	0

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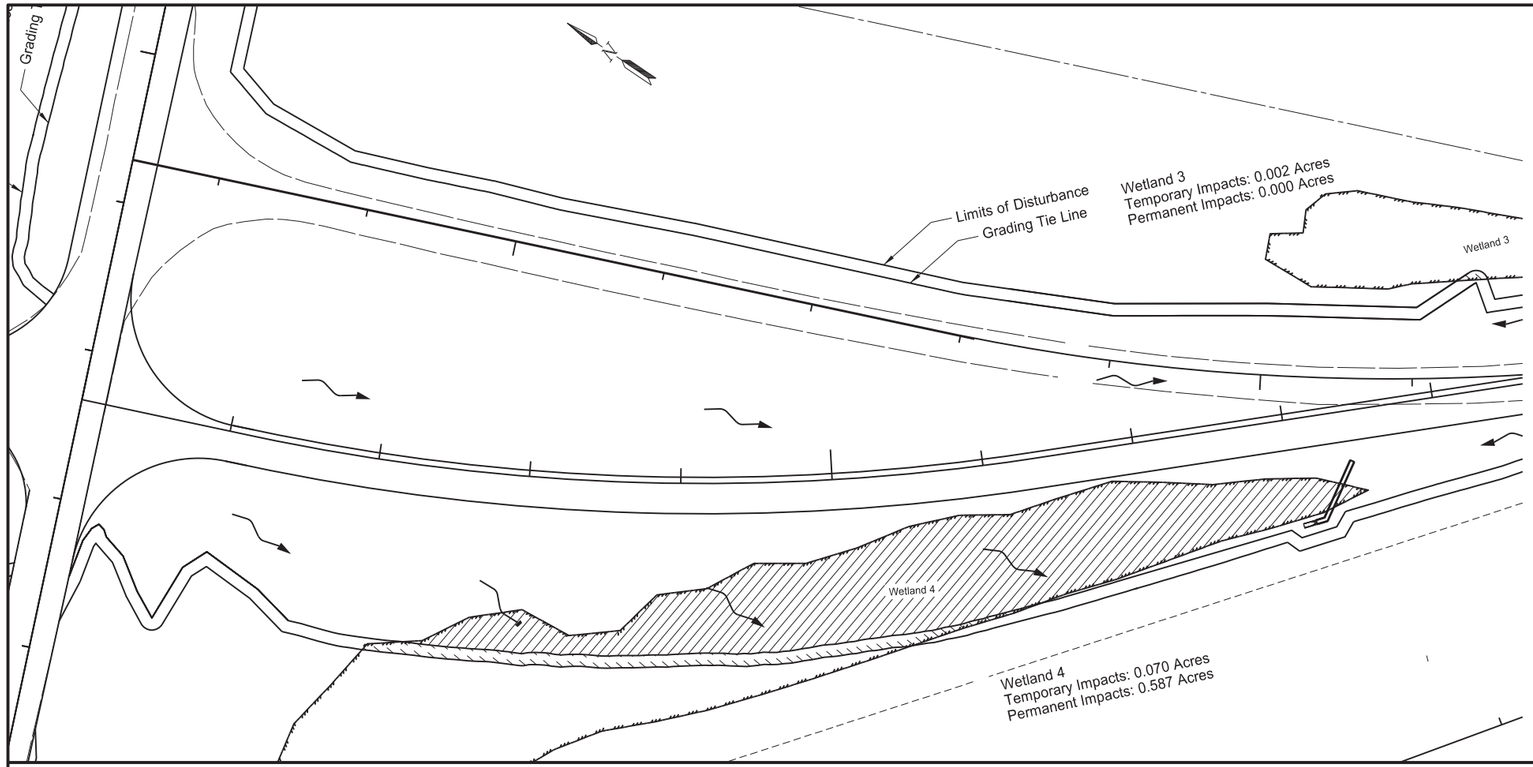
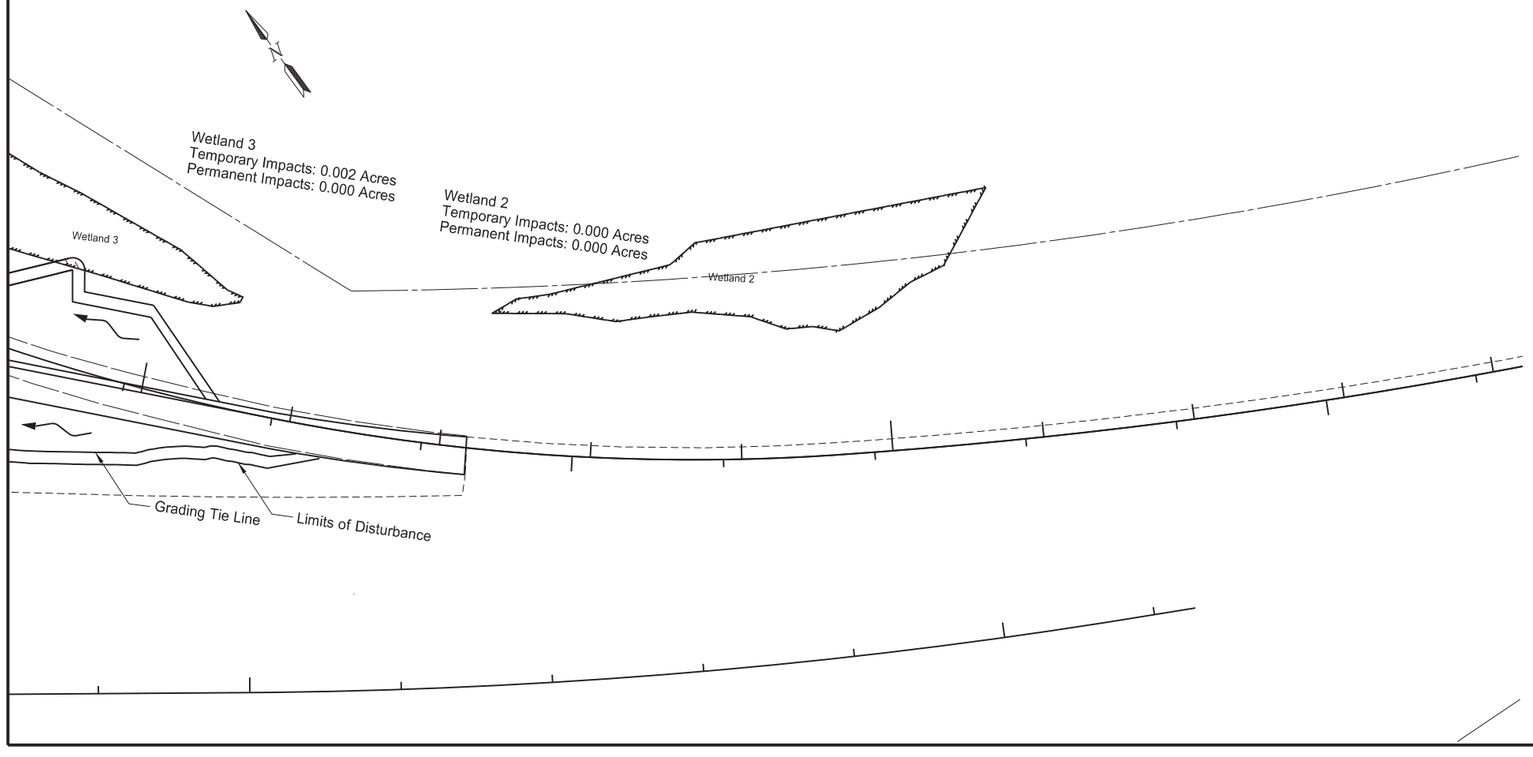
Wetland Impacts

Ramp Realignment

Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	75	2





Permanent Wetland Impacts

Temporary Wetland Impacts

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Wetland Impacts WB Off-Ramp

Ramp Realignment

Exit 64 Interchange

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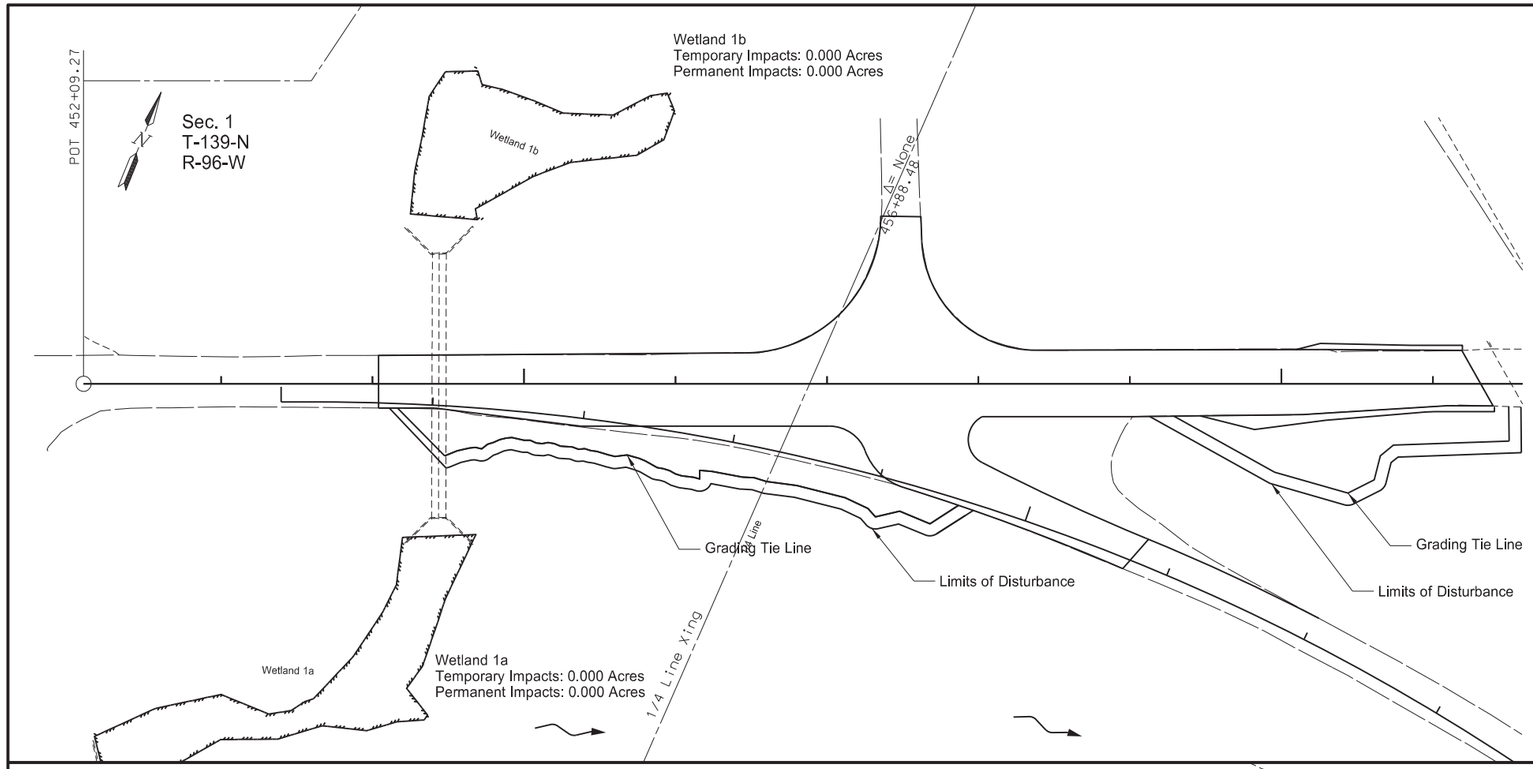
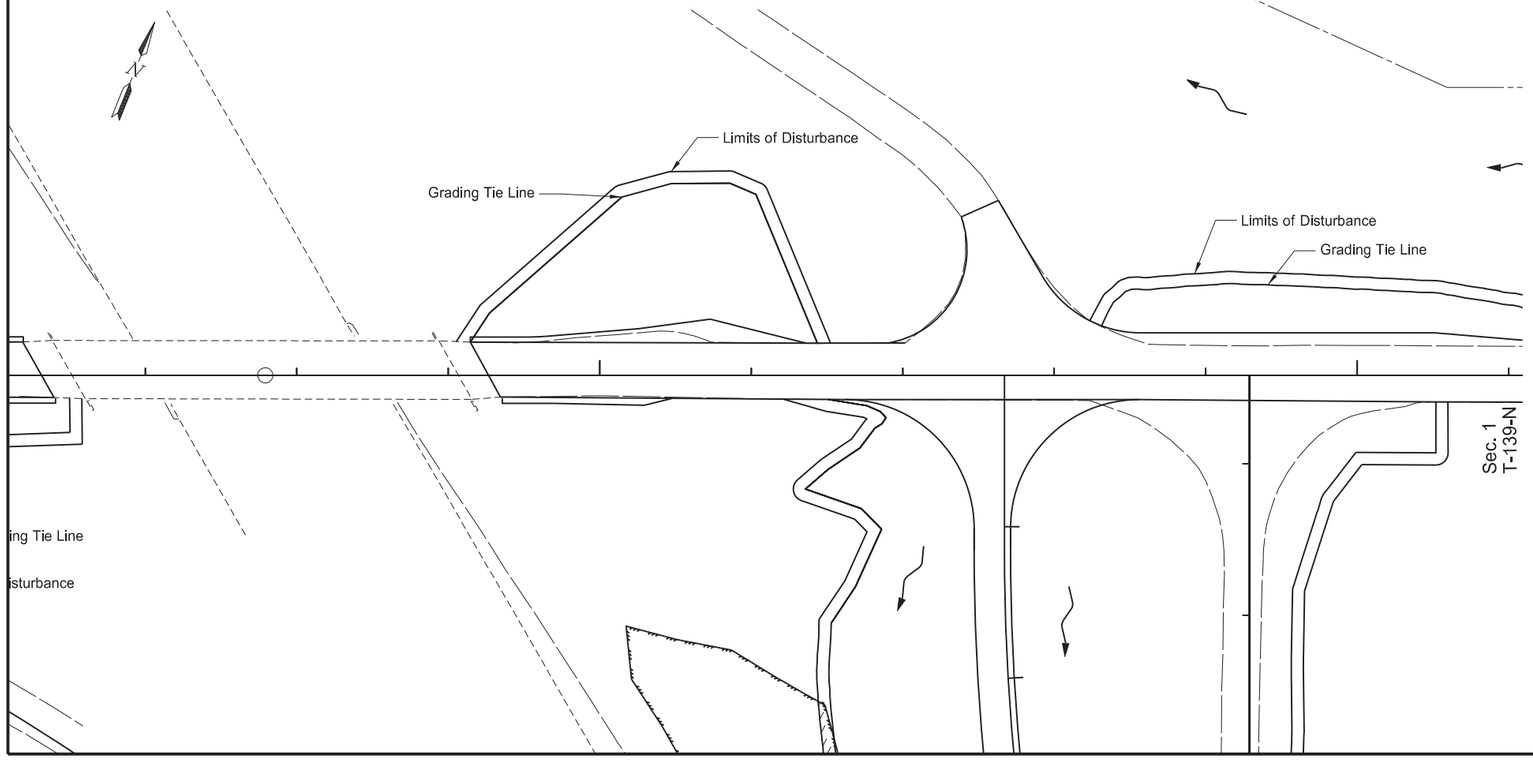
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	75	3





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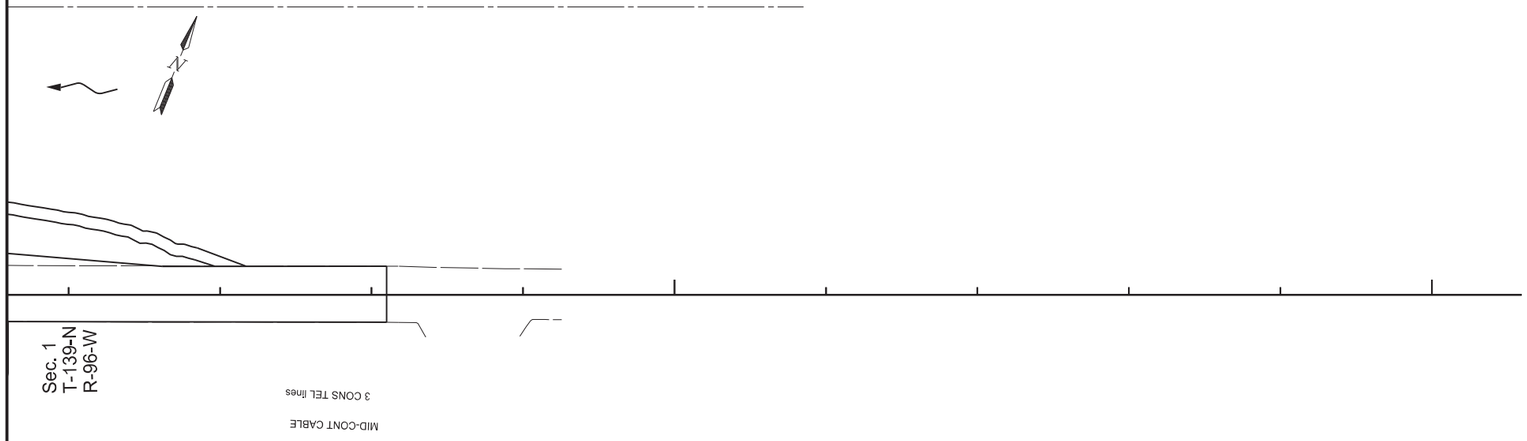
Wetland Impacts Crossroad

Ramp Realignment

Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	75	4



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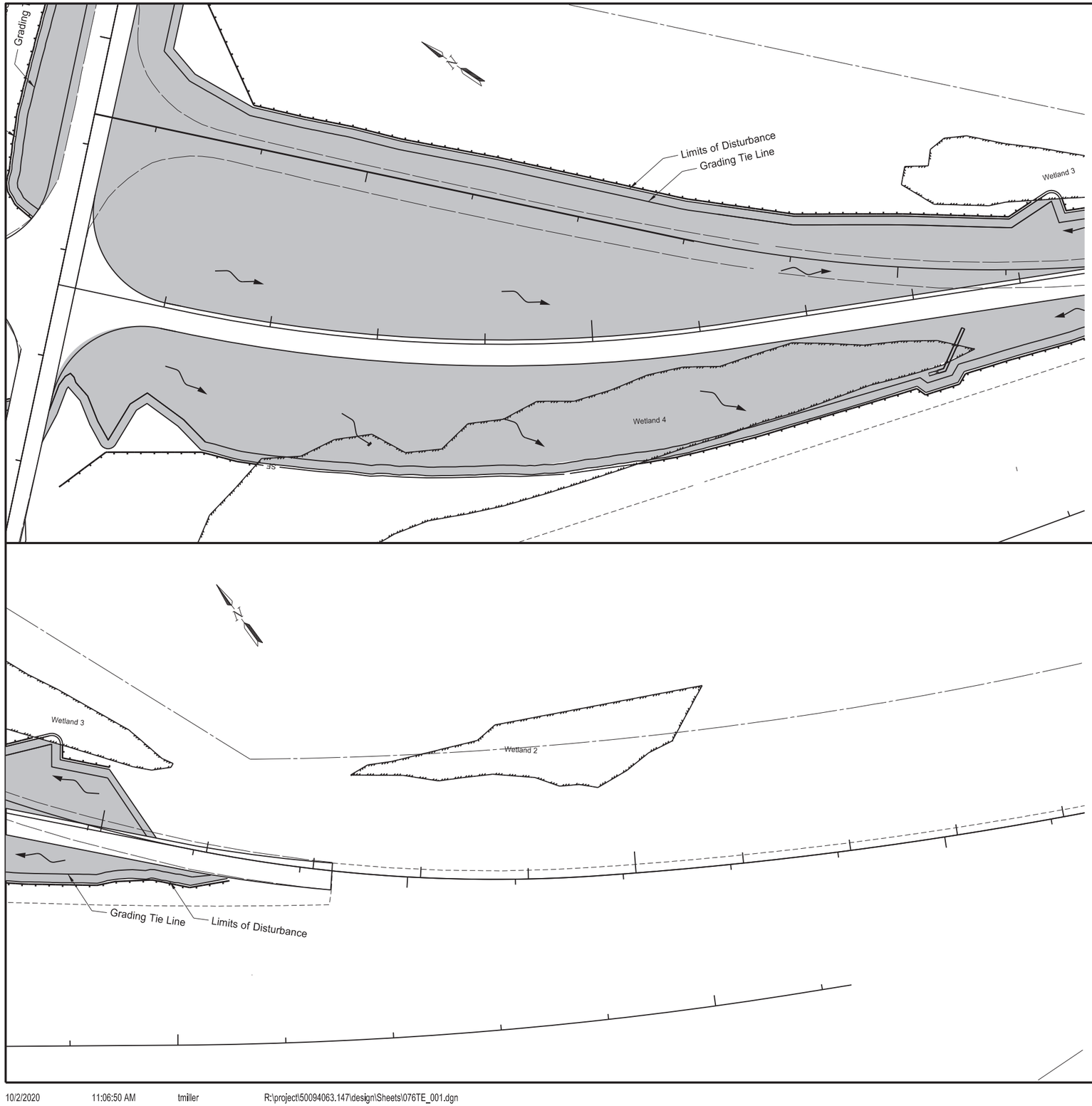
Wetland Impacts Crossroad

Ramp Realignment

Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	76	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	2000	TEMPORARY COVER CROP	ACRE	4.96
253	201	HYDRAULIC MULCH	ACRE	4.96
260	100	SILT FENCE UNSUPPORTED	LF	356
260	201	REMOVE SILT FENCE SUPPORTED	LF	356
261	112	FIBER ROLLS 12IN	LF	1750
261	113	REMOVE FIBER ROLLS 12IN	LF	1750



SF SF — Silt Fence

Fiber Rolls

Temporary Cover Crop & Hydro-Mulch

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Temporary Erosion Control WB Off-Ramp

Ramp Realignment

Exit 64 Interchange

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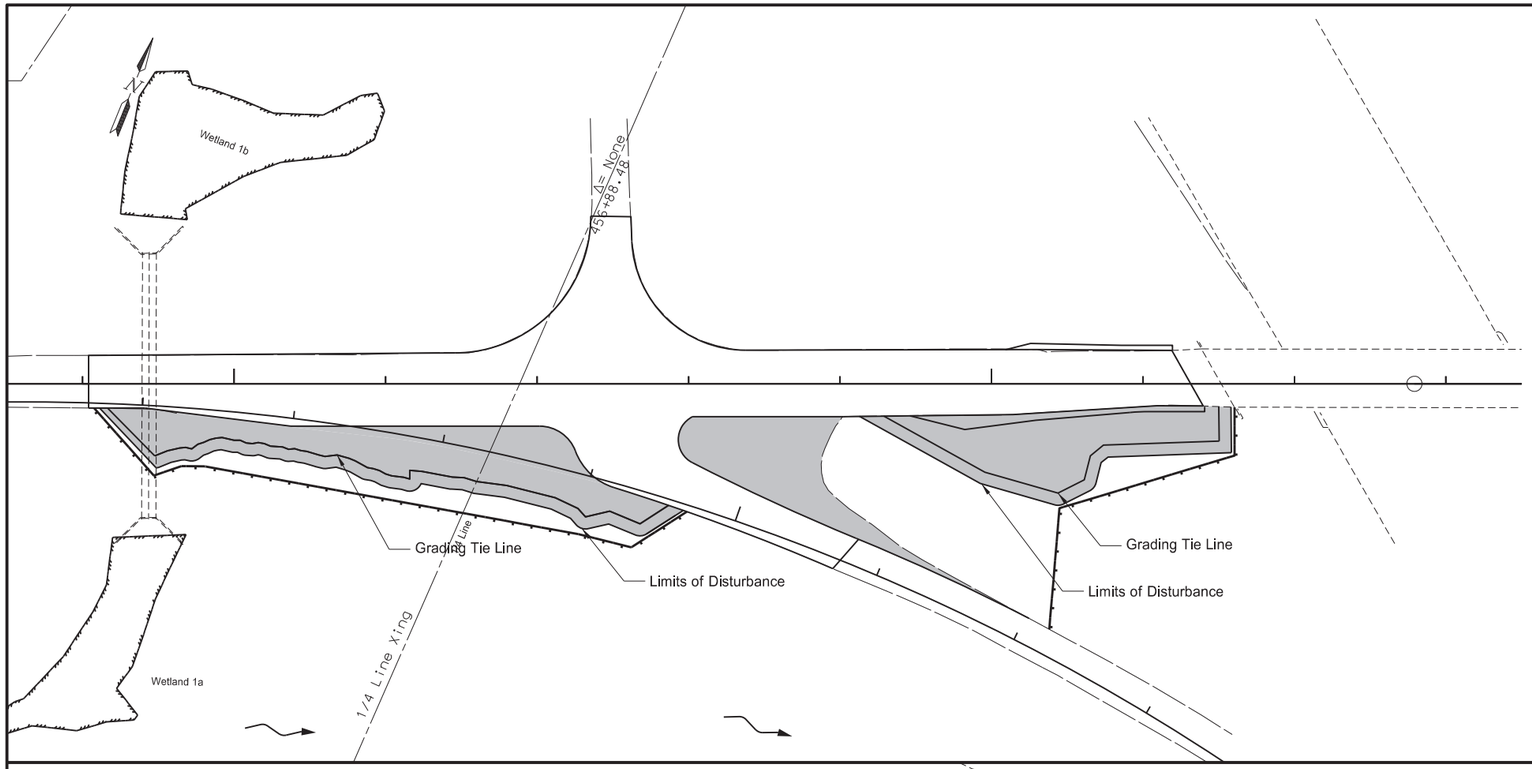
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	76	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	2000	TEMPORARY COVER CROP	ACRE	1.38
253	201	HYDRAULIC MULCH	ACRE	1.38
261	112	FIBER ROLLS 12IN	LF	1469



SF SF — Silt Fence

Fiber Rolls

Temporary Cover Crop & Hydro-Mulch

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Temporary Erosion Control Crossroad

Ramp Realignment

Exit 64 Interchange

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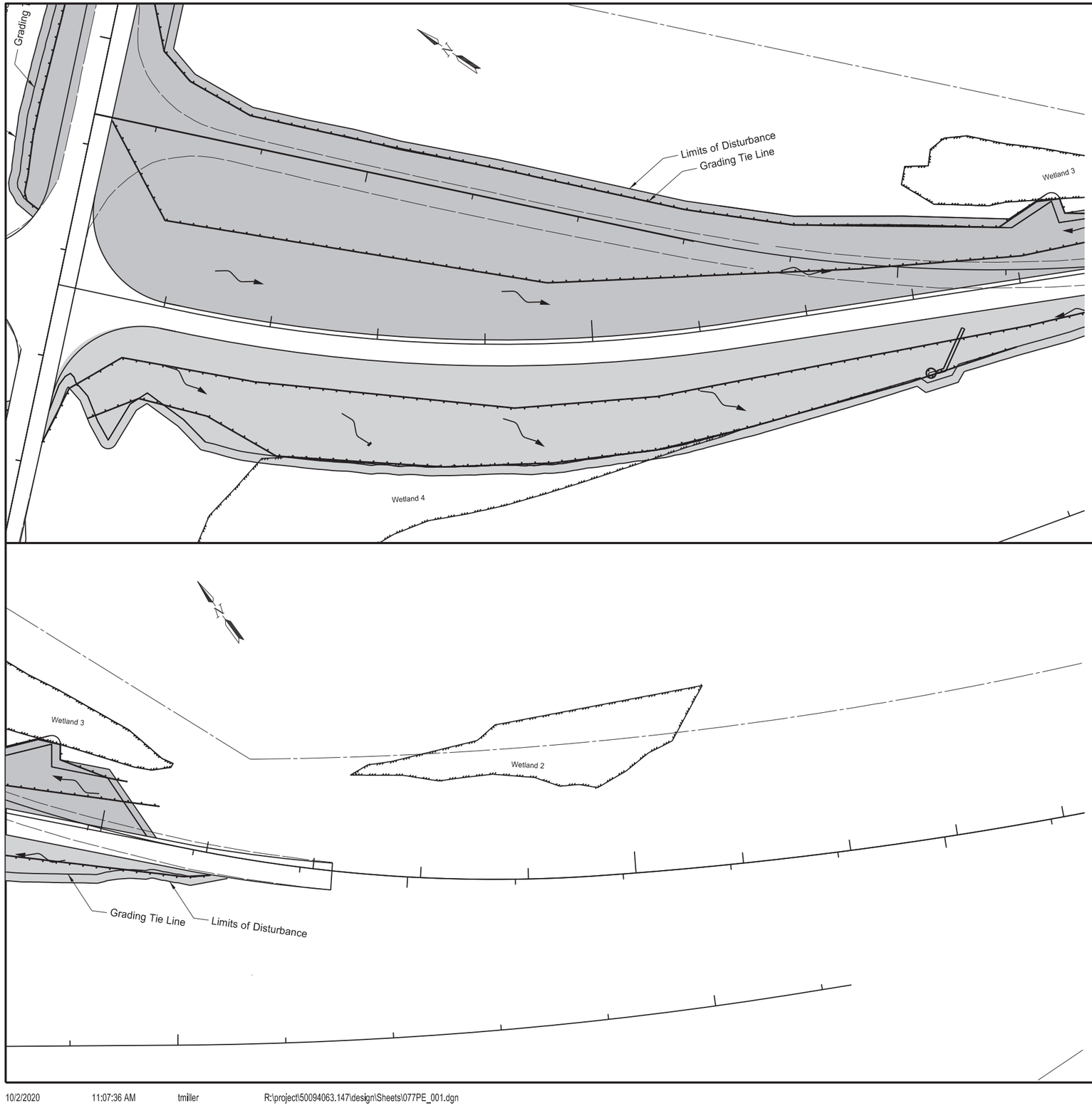
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	77	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	200	SEEDING CLASS II	ACRE	4.96
253	201	HYDRAULIC MULCH	ACRE	4.96
261	112	FIBER ROLLS 12IN	LF	4155



Fiber Rolls

Seeding Class II & Hydro-Mulch

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Permanent Erosion Control WB Off-Ramp

Ramp Realignment

Exit 64 Interchange

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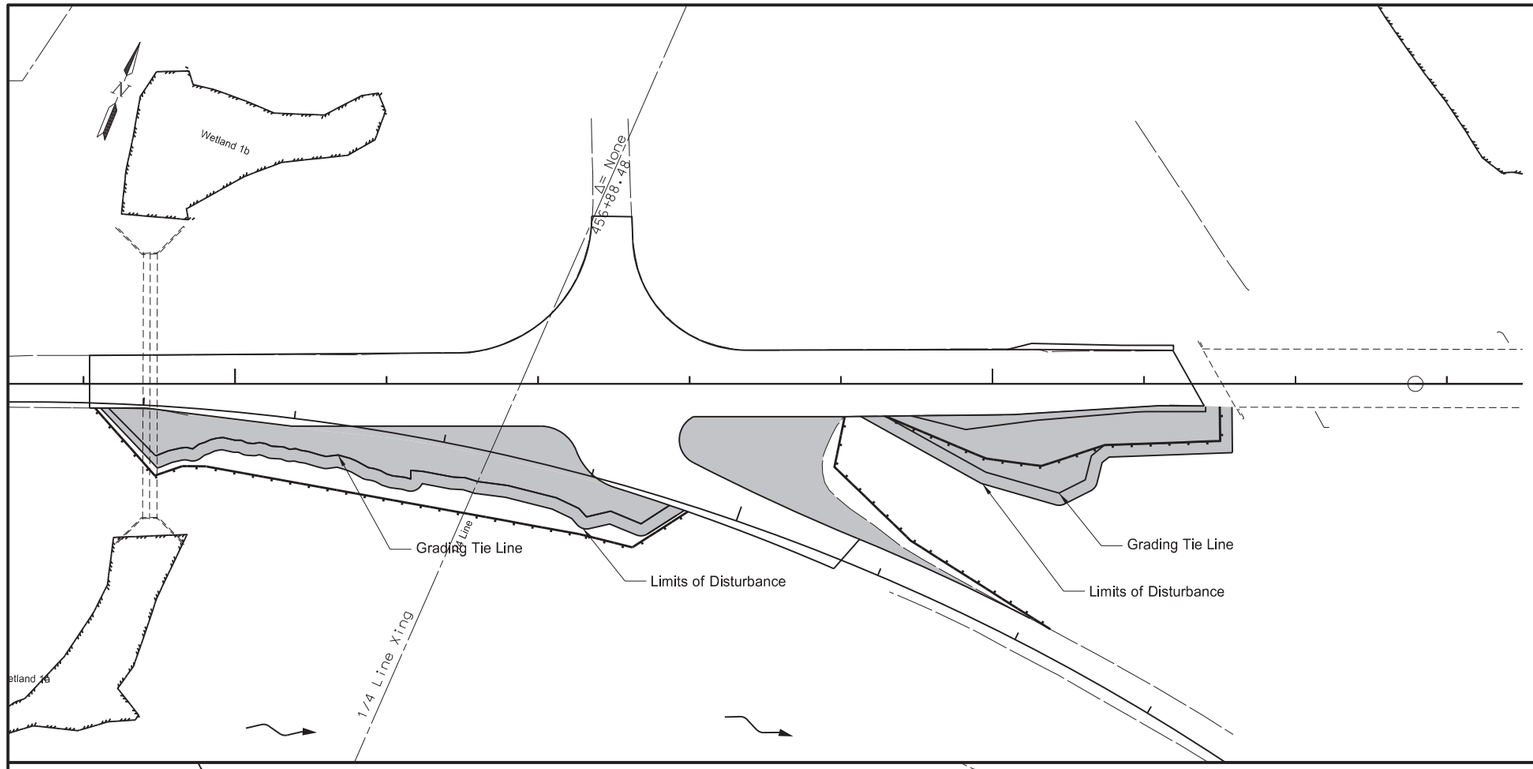
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	77	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
251	200	SEEDING CLASS II	ACRE	1.38
253	201	HYDRAULIC MULCH	ACRE	1.38
261	112	FIBER ROLLS 12IN	LF	2118



Fiber Rolls

Seeding Class II & Hydro-Mulch

REGISTERED PROFESSIONAL ENGINEER
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Permanent Erosion Control Crossroad

Ramp Realignment

Exit 64 Interchange

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - Dickinson I 94, Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
Interstate 94 (Chain: SCL_I94)			
Begin	3345+55.20	455,163.97	1,406,219.27
PC	3346+54.60	455,144.19	1,406,316.68
PI C800	3360+00.59	454,876.25	1,407,635.73
Twp line Xing	739.68' from PI (Ahd Tan)	454,421.65	1,408,219.23
PT	3372+98.64	454,049.02	1,408,697.51
1/4 line Xing	3383+26.00	453,417.61	1,409,507.94
Station equation I 94 (Chain: SCL_I94) & I 94B (Chain: SCL_B94)			
I 94	3389+97.12	453,005.15	1,410,037.35
I 94 Business loop	462+79.20	453,005.15	1,410,037.35
TS	3400+32.39	452,368.88	1,410,854.02
SC	3403+32.39	452,187.63	1,411,093.05
1/4 line Xing	3411+61.11 (Bk Tan)	451,675.18	1,411,744.40
PI SCS802	462+79.20	451,442.88	1,412,042.58
Twp line Xing	218.97' from PI (Ahd Tan)	451,443.84	1,412,089.41
CS	3426+39.02	451,471.57	1,413,248.99
ST	3429+39.02	451,473.80	1,413,548.96
End	3450+05.82	451,516.23	1,415,615.33
Interstate 94 Business loop (Chain: SCL_B94)			
Begin	452+09.27	452,602.94	1,409,045.90
I 94	462+79.20	453,005.15	1,410,037.35
Station equation I 94 B (Chain: SCL_B94) & NW Ramp (Chain: NW_RAMP)			
I 94 B	468+09.88	453,204.64	1,410,529.11
NW Ramp	63+52.68	453,204.64	1,410,529.11
Station equation I 94 B (Chain: SCL_B94) & NE Ramp (Chain: NE_RAMP)			
I 94 B	469+29.20	453,249.50	1,410,639.68
NE Ramp	32+58.46	453,249.50	1,410,639.68
End	485+68.78	453,865.84	1,412,158.99

CURVE DATA

ARC DEFINITION

C800

PI STA	= 3360+00.59
Delta	= 26° 26' 24" RT
D_a	= 1° 00' 00"
R	= 5,729.65'
T	= 1,345.99'
L	= 2,644.04'

SCS802

PI STA	=3415+39.09
Delta	=39° 05' 54" LT
D_a	=1° 30' 00"
R	=3,819.83'
L_s	=300.00'
S_c	=2° 15' 00"
T_s	=1,506.70'
L	=2,306.63'

US PUBLIC LAND SURVEY DATA

CORNER	IRN	NORTHING	EASTING
T-139-N R-95-W			
NW Cor Sec 6	1-A	454,313.56	1,412,171.91
W 1/4 Cor Sec 6	1-B	451,662.73	1,412,095.43
SW Cor Sec 6	1-C	449,023.03	1,412,022.86
N 1/4 Cor Sec 6	2-A	454,238.67	1,414,494.16
Center Sec 6	2-B	451,574.46	1,414,426.97
T-139-N R-96-W			
NW Cor Sec 1	11-A	454,457.92	1,406,897.69
W 1/4 Cor Sec 1	11-B	451,849.61	1,406,827.36
SW Cor Sec 1	11-C	449,216.04	1,406,748.80
S 1/4 Cor Sec 1	12-C	449,119.67	1,409,386.10
T-140-N R-95-W			
NW Cor Sec 6	3-A	454,158.80	1,417,131.95
T-140-N R-96-W			
S 1/4 Cor Sec 36	12-N	454,385.52	1,409,535.38

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	ALIGNMENT	MONUMENT DESCRIPTION
PRIMARY CONTROL							
GPS 1	454,378.19	1,413,783.68	2,504.29	3432+33	2899' Lt	SCL_I94	Aluminum cap stamped "ND DOT CONTROL"
GPS 3	446,346.59	1,392,350.12	2,411.85	N/A	N/A	SCL_I94	Aluminum cap stamped "ND DOT CONTROL GPS1"
GPS 6	451,329.96	1,416,081.05	2,566.62	N/A	N/A	SCL_I94	Aluminum cap stamped "LS1139"
SECONDARY CONTROL							
RTK 21535	452,808.92	1,409,010.97	2,422.09	3383+08	786' Rt	SCL_I94	
BM RS0302 M 492 1982	449,732.29	1,401,478.86	2,409.80	N/A	N/A	SCL_I94	
BM RS0299 0 494 1982	451,671.87	1,413,544.86	2,487.74	3429+39	198' Lt	SCL_I94	
BM RS0298 J492 1982	451,730.61	1,416,406.74	2,539.73	N/A	N/A	SCL_I94	
BM RS0297 H 492 1982	451,850.49	1,422,261.09	2,499.72	N/A	N/A	SCL_I94	
BM RS0296 G 492 1982	451,274.01	1,428,722.17	2,496.77	N/A	N/A	SCL_I94	
BM RS0295 F 492 1982	450,100.42	1,435,060.65	2,482.68	N/A	N/A	SCL_I94	
BM RS0294 E 492 1982	448,816.05	1,439,984.88	2,379.05	N/A	N/A	SCL_I94	
BM RS0293 D 492 1982	449,904.54	1,444,395.33	2,412.68	N/A	N/A	SCL_I94	
BM RS0292 C 492 1982	449,853.96	1,448,557.13	2,424.49	N/A	N/A	SCL_I94	
BM RS0290 B 492 1982	448,097.49	1,453,582.62	2,429.02	N/A	N/A	SCL_I94	

NOTES: Sheet 1 of 2

Date Survey Completed 07/01/2020

☐ Assumed Coordinates

☒ All coordinates on this sheet are Stark County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota South Zone Combination Factor (cf) = 0.9998175

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

INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

☒ NAVD-88
☐ _____

☒ GEOID12B ☐ _____
☐ GEOID18

REGISTERED PROFESSIONAL LAND SURVEYOR
KRISTOFOR JOHNSON
LS-10169
DATE
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PRELIMINARY SURVEY COORDINATE AND CURVE DATA - Dickinson I 94, Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	81	2

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
Northeast Ramp (Chain: NE_RAMP)			
Begin	10+00.00	451,712.99	1,412,145.30
PC	10+02.68	451,713.90	1,412,142.78
PI C814	14+08.00	451,851.40	1,411,761.49
PT	18+10.30	452,065.84	1,411,417.55
PC	18+16.37	452,069.05	1,411,412.40
PI C815	22+79.88	452,314.29	1,411,019.07
PT	27+12.74	452,743.81	1,410,844.82
End/I 94 B	32+58.46	453,249.50	1,410,639.68
Northwest Ramp (Chain: NW_RAMP)			
Begin	40+00.00	454,275.69	1,408,480.88
PC	40+62.08	454,240.24	1,408,531.84
PI C809	41+53.23	454,188.17	1,408,606.66
PT	42+44.37	454,133.75	1,408,679.78
PC	50+04.93	453,679.69	1,409,289.94
PI C810	53+13.35	453,495.56	1,409,537.36
PT	56+12.49	453,429.55	1,409,838.63
PC	61+83.56	453,307.33	1,410,396.46
PI C811	62+04.07	453,302.94	1,410,416.49
PT	62+23.71	453,289.45	1,410,431.95
End/I 94 B	63+52.68	453,204.64	1,410,529.11
Southeast Ramp (Chain: SE_RAMP)			
Begin	50+00.00	452,640.84	1,409,171.26
PC	50+23.52	452,649.69	1,409,193.06
PI C818	58+13.95	452,946.82	1,409,925.50
PT	64+68.11	452,485.68	1,410,567.47
PC	69+99.41	452,175.72	1,410,998.98
PI C819	72+92.60	452,004.68	1,411,237.10
PT	75+84.64	451,871.97	1,411,498.54
End	76+27.40	451,852.62	1,411,536.67

CURVE DATA

ARC DEFINITION

C814		C815	
PI STA	= 14+08.00	PI STA	= 22+79.88
Delta	= 12° 06' 50" RT	Delta	= 35° 58' 32" RT
D_a	= 1° 30' 00"	D_a	= 4° 00' 48"
R	= 3,819.83'	R	= 1,427.60'
T	= 405.32'	T	= 463.52'
L	= 807.62'	L	= 896.38'

C809		C811	
PI STA	= 41+53.23	PI STA	= 62+04.07
Delta	= 1° 49' 22" RT	Delta	= 28° 45' 31" RT
D_a	= 1° 00' 00"	D_a	= 71° 37' 11"
R	= 5,729.65'	R	= 80.00'
T	= 91.15'	T	= 20.51'
L	= 182.29'	L	= 40.15'

C810	
PI STA	= 53+13.35
Delta	= 24° 17' 51" LT
D_a	= 3° 59' 57"
R	= 1,432.69'
T	= 308.42'
L	= 607.56'

C818		C819	
PI STA	= 58+13.95	PI STA	= 72+92.60
Delta	= 57° 46' 18" RT	Delta	= 8° 46' 42" LT
D_a	= 3° 59' 57"	D_a	= 1° 30' 00"
R	= 1,432.69'	R	= 3,819.79'
T	= 790.43'	T	= 293.19'
L	= 1,444.59'	L	= 585.23'

REFERENCE MARKERS

R Mkr #	NORTHING	EASTING	STATION	OFFSET	ALIGNMENT
63	455,477.33	1,404,320.27	N/A	N/A	SCL_I94
63	455,617.02	1,404,350.07	N/A	N/A	SCL_I94
64	453,605.48	1,409,155.93	3379+33	68' Rt	SCL_I94
64	453,695.40	1,409,294.51	3379+87	88' Lt	SCL_I94

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	STATION	OFFSET	MONUMENT DESCRIPTION

NOTES: Sheet 2 of 2

Date Survey Completed 07/01/2020

☐ Assumed Coordinates

☒ All coordinates on this sheet are Stark County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota South Zone Combination Factor (cf) = 0.9998175

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

INITIALIZING BENCH MARK
NDGPS Stations (OPUS)

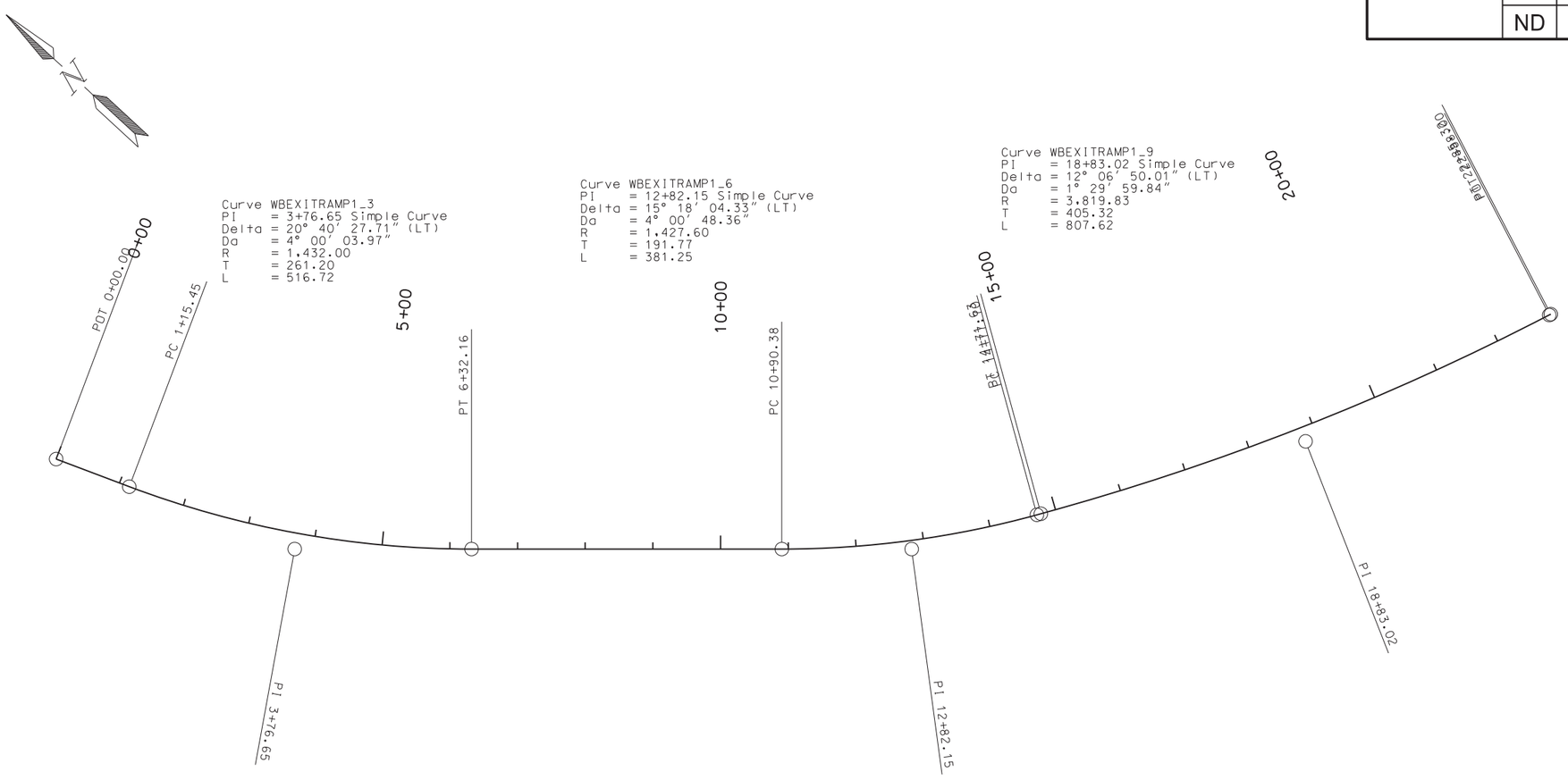
☒ NAVD-88
☐ _____

☒ GEOID12B ☐ _____
☐ GEOID18

REGISTERED PROFESSIONAL LAND SURVEYOR
KRISTOFOR JOHNSON
LS-10169
DATE 08/03/20
NORTH DAKOTA
DocuSign

8/3/2020 10:35:19 AM kjjohnson R:\project\50094063.147\survey\Final\081CD_002.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	82	1



Point WBEXITRAMP11 N 453,188.5735 E 1,410,489.5030 Sta 0+00.00

Course from WBEXITRAMP11 to PC WBEXITRAMP1 3 S 22° 04' 52.44" E Dist 115.4480

Curve Data

Curve WBEXITRAMP1 3
P.I. Station 3+76.65 N 452,839.5533 E 1,410,631.0923
Delta = 20° 40' 27.71" (LT)
Degree = 4° 00' 03.97"
Tangent = 261.1986
Length = 516.7167
Radius = 1,432.0000
External = 23.6266
Long Chord = 513.9181
Mid. Ord. = 23.2431
P.C. Station 1+15.45 N 453,081.5934 E 1,410,532.9023
P.T. Station 6+32.16 N 452,647.7666 E 1,410,808.4128
C.C. N 453,619.9120 E 1,411,859.8677
Back = S 22° 04' 52.44" E
Ahead = S 42° 45' 20.15" E
Chord Bear = S 32° 25' 06.29" E

Course from PT WBEXITRAMP1 3 to PC WBEXITRAMP1 6 S 42° 45' 20.15" E Dist 458.2181

Curve Data

Curve WBEXITRAMP1 6
P.I. Station 12+82.15 N 452,170.5119 E 1,411,249.6690
Delta = 15° 18' 04.33" (LT)
Degree = 4° 00' 48.36"
Tangent = 191.7659
Length = 381.2496
Radius = 1,427.6000
External = 12.8221
Long Chord = 380.1177
Mid. Ord. = 12.7080
P.C. Station 10+90.38 N 452,311.3171 E 1,411,119.4844
P.T. Station 14+71.63 N 452,069.0527 E 1,411,412.3964
C.C. N 453,280.4755 E 1,412,167.7086
Back = S 42° 45' 20.15" E
Ahead = S 58° 03' 24.47" E
Chord Bear = S 50° 24' 22.31" E

Course from PT WBEXITRAMP1 6 to PC WBEXITRAMP1 9 S 58° 03' 24.47" E Dist 6.0689

Curve Data

Curve WBEXITRAMP1 9
P.I. Station 18+83.02 N 451,851.3962 E 1,411,761.4892
Delta = 12° 06' 50.01" (LT)
Degree = 1° 29' 59.84"
Tangent = 405.3191
Length = 807.6163
Radius = 3,819.8300
External = 21.4439
Long Chord = 806.1129
Mid. Ord. = 21.3241
P.C. Station 14+77.70 N 452,065.8417 E 1,411,417.5463
P.T. Station 22+85.32 N 451,713.9041 E 1,412,142.7759
C.C. N 455,307.2463 E 1,413,438.5356
Back = S 58° 03' 24.47" E
Ahead = S 70° 10' 14.48" E
Chord Bear = S 64° 06' 49.48" E

Course from PT WBEXITRAMP1 9 to WBEXITRAMP111 S 70° 11' 26.86" E Dist 2.6809

Point WBEXITRAMP111 N 451,712.9956 E 1,412,145.2981 Sta 22+88.00

REGISTERED PROFESSIONAL ENGINEER
SARA A. CAHLIN
PE-8397
DATE
09/01/20
NORTH DAKOTA
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Chain Layouts WB Off-Ramp

Ramp Realignment

Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	**48"x48"**	**EXIT GORE**	**1**	**35**	**35**
G20-1-60	60"x24"	ROAD WORK NEXT __ MILES		28	
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)		18	
G20-2-48	**48"x24"**	**END ROAD WORK**	**3**	**26**	**78**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-10-108	**108"x48"**	**CONTRACTOR SIGN**	**2**	**70**	**140**
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		36	
G20-55-96	**96"x48"**	**SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT**	**4**	**59**	**236**
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)		7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)		7	
R1-1-48	**48"x48"**	**STOP**	**4**	**32**	**128**
R1-2-60	60"x60"	YIELD		29	
R2-1-36	**36"x48"**	**SPEED LIMIT __ (Portable only)**	**5**	**30**	**150**
R2-1-48	**48"x60"**	**SPEED LIMIT __**	**6**	**39**	**234**
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**14**	**10**	**140**
R3-2-48	48"x48"	NO LEFT TURN		35	
R4-1-36	**36"x48"**	**DO NOT PASS (Portable only)**	**2**	**30**	**60**
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	**48"x60"**	**KEEP RIGHT**	**1**	**39**	**39**
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)		14	
R7-1-12	12"x18"	NO PARKING ANY TIME		11	
R10-6-24	**24"x36"**	**STOP HERE ON RED**	**2**	**16**	**32**
R11-2-48	48"x30"	ROAD CLOSED (Mounted on barricade)		12	
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)		12	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)		15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT		35	
W1-4-48	**48"x48"**	**REVERSE CURVE RIGHT or LEFT**	**3**	**35**	**105**
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD		35	
W3-3-48	**48"x48"**	**SIGNAL AHEAD**	**2**	**35**	**70**
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**10**	**35**	**350**
W4-2-48	**48"x48"**	**LANE ENDS RIGHT or LEFT**	**4**	**35**	**140**
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		35	
W8-1-48	**48"x48"**	**BUMP**	**1**	**35**	**35**
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-11-48	**48"x48"**	**UNEVEN LANES**	**2**	**35**	**70**
W8-12-48	48"x48"	NO CENTER LINE		35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	**48"x48"**	**TRUCKS ENTERING AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
W8-55-48	**48"x48"**	**TRUCKS CROSSING AHEAD or __ FT or _ MILE**	**2**	**35**	**70**
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		35	
W13-1P-30	30"x30"	__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)		14	
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	**30"x24"**	**__ FEET PLAQUE (Mounted on warning sign post)**	**4**	**10**	**40**
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**10**	**35**	**350**
W20-2-48	48"x48"	DETOUR AHEAD or __FT or __MILE		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT or _ MILE		35	
W20-4-48	**48"x48"**	**ONE LANE ROAD AHEAD or __ FT or _ MILE**	**6**	**35**	**210**
W20-5-48	**48"x48"**	**RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE**	**4**	**35**	**140**
W20-7-48	**48"x48"**	**FLAGGER**	**5**	**35**	**175**
W20-8-18	**18"x18"**	**STOP - SLOW PADDLE Back to Back**	**5**	**5**	**25**
W20-52P-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1-48	48"x48"	WORKERS		35	
W21-2-48	**48"x48"**	**FRESH OIL**	**2**	**35**	**70**
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE		35	
W21-5-48	**48"x48"**	**SHOULDER WORK**	**2**	**35**	**70**

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT or _ MILE		35	
W21-6-48	48"x48"	SURVEY CREW		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W21-52-48	48"x48"	PAVEMENT BREAKS		35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**3262**

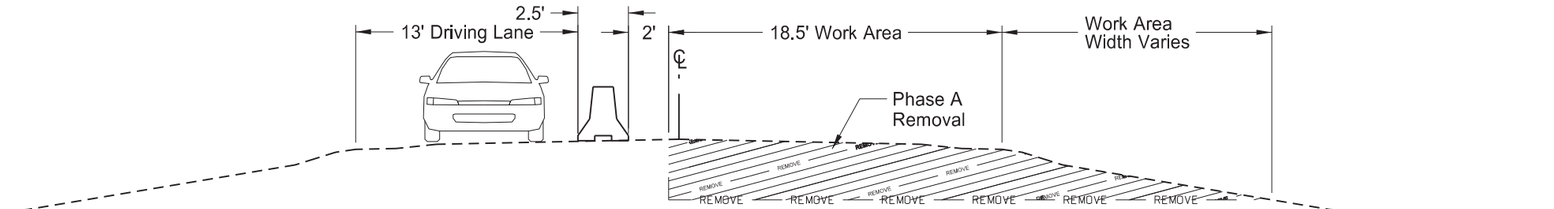
SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	**FLAGGING**	**MHR**	**300**
704-1018	**LANE CLOSURE-SIGNAL CONTROL/FLAGGING CONTROL**	**EACH**	**1**
704-1035	ATTENUATION DEVICE-TYPE B-25	EACH	
704-1039	**ATTENUATION DEVICE-TYPE B-45**	**EACH**	**4**
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**5**
704-1060	**DELINEATOR DRUMS**	**EACH**	**66**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**58**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1080	STACKABLE VERTICAL PANELS	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**	**2**
704-1500	**OBLITERATION OF PVMT MK**	**SF**	**300**
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	**PRECAST CONCRETE MED BARRIER - STATE FURNISHED**	**EACH**	**53**
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	**SHORT TERM 4IN LINE - TYPE R**	**LF**	**550**
762-0426	**SHORT TERM 24IN LINE-TYPE R**	**LF**	**24**
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	

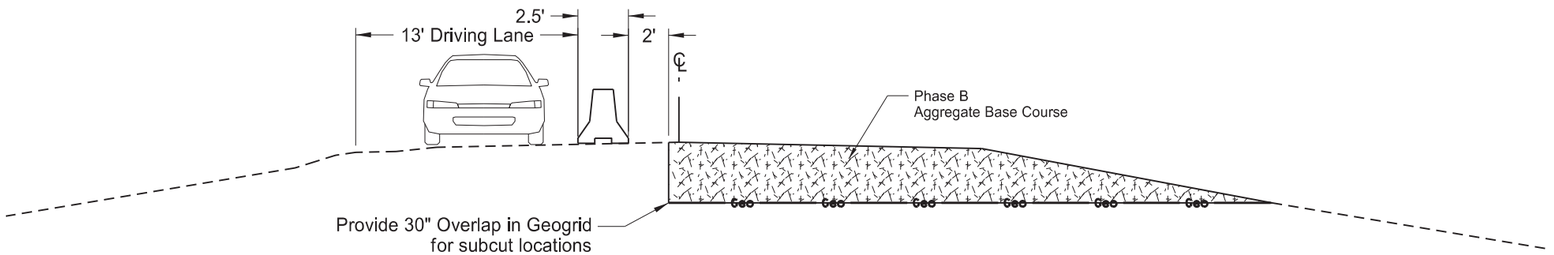
NOTE:
If additional signs are required, units will be calculated using the formula from Section III-18.06 of the Design Manual.
http://www.dot.nd.gov/

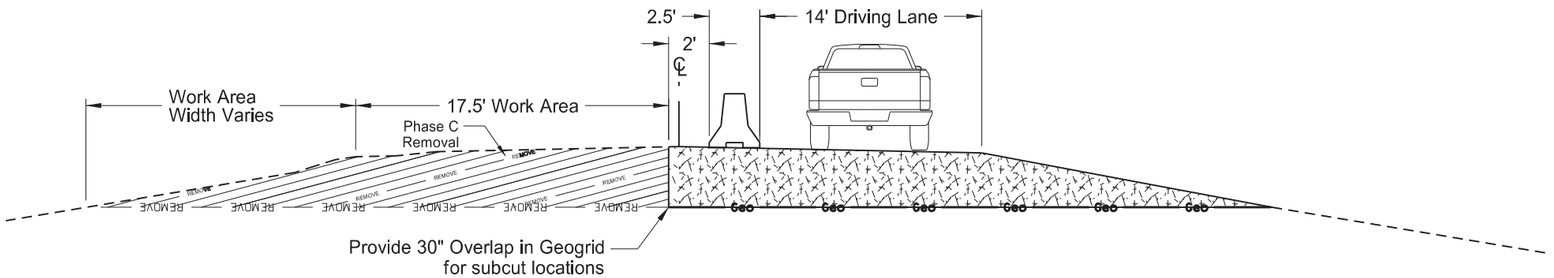
REGISTERED PROFESSIONAL ENGINEER
SARA A. CAHLIN
PE-8397
DATE
10/02/20
NORTH DAKOTA
DocuSign

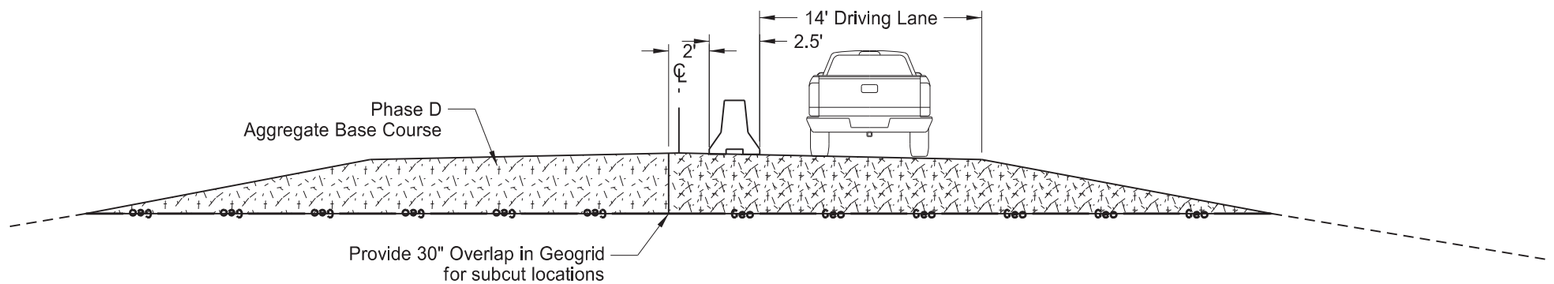
Traffic Control Devices List

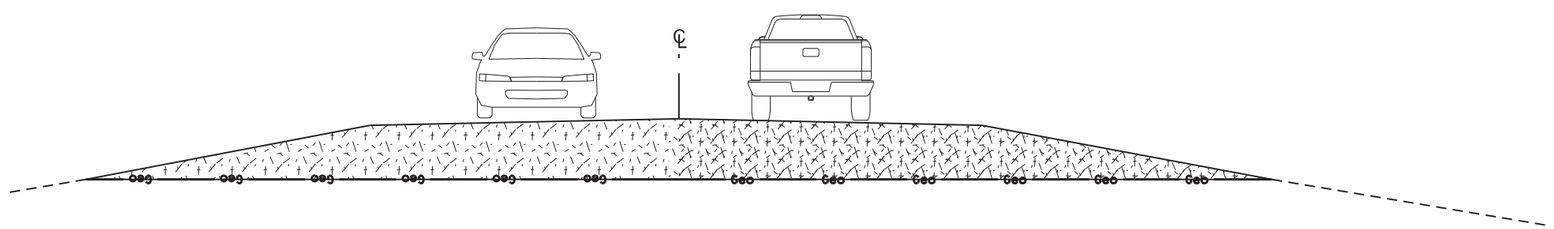
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	100	2











Drawing not to scale

REGISTERED PROFESSIONAL ENGINEER
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NORTH DAKOTA
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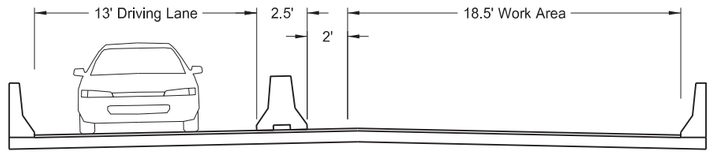
Work Zone Traffic Control Phasing
Subcut and Bridge Approach Slab Installation

Ramp Realignment

Exit 64 Interchange

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	100	3



REGISTERED PROFESSIONAL ENGINEER
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10/02/20
NORTH DAKOTA
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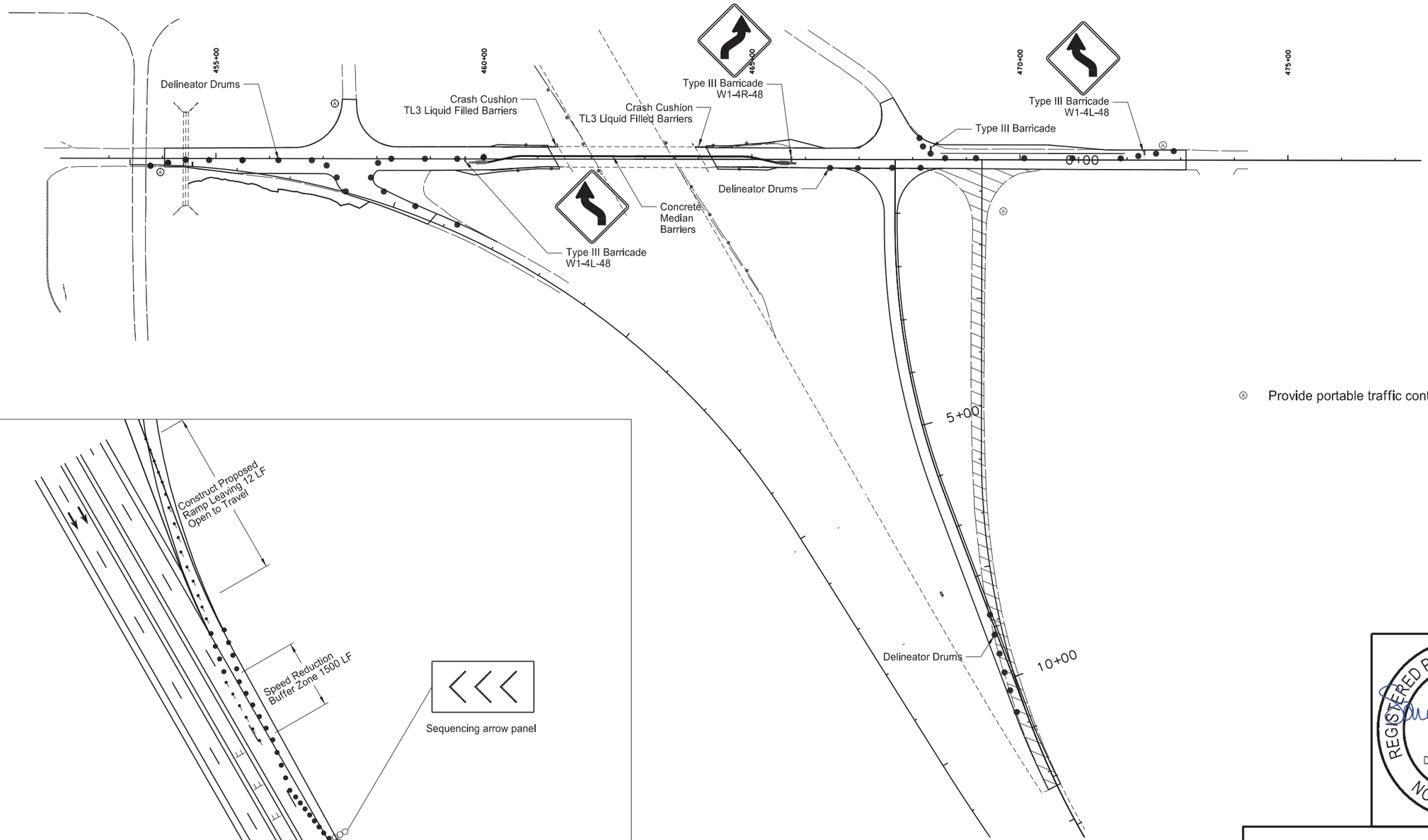
Work Zone Traffic Control Phasing
Bridge Work Zone Phasing

Ramp Realignment

Exit 64 Interchange

Drawing not to scale

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	100	4



Ⓐ Provide portable traffic control signal

See Standard D-704-23 for Details

Note:
Mirror traffic control devices when working on the opposite lane.

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10/02/20
NORTH DAKOTA
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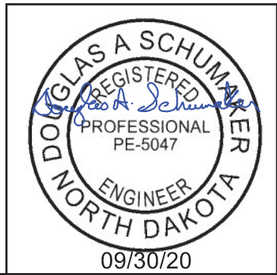
Traffic Control Layout

Ramp Removals

Exit 64 Interchange

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
N.D.	IM-5-094(147)063	110	1

Station / RP	Sign No.	Assembly No.	Flat Sheet For Signs IV SF	Flat Sheet For Signs XI SF	Sign Support Length 1st LF	2nd LF	3rd LF	4th LF	Vert Clear-ance FT	Support Size	Max Post Len LF	Sleeve Length 1st LF	2nd LF	3rd LF	4th LF	Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
I-94 Business/Co Rd 10																							
454+89 Rt		387	16.4		13.3	13.8			5.0	2.5 x 2.5 10 ga	15.3						2	4	3 x 3 7 ga			2	
456+52 Rt		17		16.0	12.2	12.7			5.0	2.5 x 2.5 10 ga	13.9						2	4	3 x 3 7 ga			2	
459+22 Rt		379	8.2		13.3				5.0	2.5 x 2.5 10 ga	15.3						1	4	3 x 3 7 ga			1	
466+56 Rt		17		16.0	12.2	12.7			5.0	2.5 x 2.5 10 ga	13.9						2	4	3 x 3 7 ga			2	
469+14 Lt		17		16.0	12.5	13.0			5.0	2.5 x 2.5 10 ga	13.9						2	4	3 x 3 7 ga			2	
470+14 Rt		371	6.0		12.5				5.0	2.25 x 2.25 12 ga	12.9						1	4	2.5 x 2.5 12 ga				
471+85 Lt		387	16.4		13.3	13.8			5.0	2.5 x 2.5 10 ga	15.3						2	4	3 x 3 7 ga			2	
472+14 Rt					12.5				5.0	2.5 x 2.5 12 ga	13.3						1	4	3 x 3 7 ga	1			
474+39 Rt		9		5.0	12.0				5.0	2.25 x 2.25 12 ga	15.0						1	4	2.5 x 2.5 12 ga				
Sub Total			47.0	53.0		**Total**	179.8										**Total**	56.0		1	0	11	
Grand Total			**47.0**	**53.0**		**Total**	**179.8**										**Total**	**56**	**0**	**1**	**0**	**11**	



09/30/20

Sign Summary
Perforated Tube

Exit 64 Interchange
Dickinson

I-94

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	N.D.	IM-5-094(147)063	110	2

Station / RP	Sign / Assembly No.	Flat Sheet For Signs IV SF	Flat Sheet For Signs XI SF	Panel For Signs IV SF	Panel For Signs XI SF	Overlay Panel IV SF	Overlay Panel XI SF	Vert Clear-ance FT	Galv Steel Sheet Standard Pipe 1st LF	Galv Steel Sheet Standard Pipe 2nd LF	Size	Galv Steel Post W-Shape Posts 1st LF	Galv Steel Post W-Shape Posts 2nd LF	Galv Steel Post W-Shape Posts 3rd LF	Max Post Len LF	Post Space FT	Revise Fuse Joint EA	Std Pipe Fdn Dia FT	Std Pipe Fdn Dep FT	Std Pipe Fdn Vol CY	W-Shape Pile LF	Remove Sign Fdns Conc Fdn EA	Remove Sign Fdns W-Shape Pile EA	Reset Sign Panel EA	Reset Sign Support EA	Stub Post EA	Multi Dir Base EA	Comments
I-94 WB Off-Ramp																												
0+35 Rt	S.A.A		20.0					7.0	15.3		3.5				15.6			1.3	6.5	0.3								
0+66 Rt	S.A.B.		16.0					7.0	15.3		3.5				15.6			1.3	6.5	0.3								
2+35 Lt	SN 1			30.0				7.0			W4x13	15.3	16.2		24.4	3.8					28							
2+66 Rt	S.A.C.		8.8					7.0	13.8		3.5				21.2			1.3	5.0	0.3								
4+35 Lt	S.A.D.	10.6						7.0	15.4		3.5				19.7			1.3	5.5	0.3								
11+03 Rt	SN 2			32.5				7.0	16.3	16.3	4.0				16.9	3.3		1.3	7.0	0.7								
Sub Total		10.6	44.8	62.5					**Total** 92.4			**Total** 31.5								1.9	28	0	0	0	0	0	0	
Grand Total		**10.6**	**44.8**	**62.5**					**Total** **92.4**			**Total** **31.5**								**1.9**	**28**	**0**	**0**	**0**	**0**	**0**	**0**	

09/30/20

Sign Summary
Round Steel Pipe & W-Shape

Exit 64 Interchange
Dickinson

I-94

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	110	3

N

I-94 WB

I-94 EB

I-94 Business Route

Sta 2+35 Lt
Sign 2
BUSINESS 94 WEST
Dickinson

Sta 48+15 Rt
Remove

Sta 0+35 Lt
Special Assembly A
R6-1R-54 ONE WAY ONE WAY R6-1L-54
R1-1-48 STOP

Sta 0+66 Rt
Special Assembly B
R6-1R-54 ONE WAY ONE WAY R6-1L-54
R5-1-48 DO NOT ENTER

Sta 469+14 Lt
Assembly 17
R3-2-48

Sta 470+14 Rt
Assembly 371
M3-2-24 (yellow legend on blue background) EAST
M1-6-24 STARK 10 COUNTY

Sta 470+17 Lt
Remove

Sta 471+85 Lt
Remove
EAST WEST
INTERSTATE NORTH DAKOTA 94

Sta 472+52 Lt
Assembly 387
M3-2-24 (white legend on blue background) EAST WEST M3-4-24 (white legend on blue background)
M1-1-24 INTERSTATE NORTH DAKOTA 94 M1-1-24
M6-3-21 (white legend on blue background) M6-2R-21 (white legend on blue background)

Sta 472+14 Rt
Reset sign from Sta 473+28 Rt on new support
BEGIN SCENIC BYWAY

Co Rd 10

SPEED LIMIT 55
Sta 475+46 Rt
Remove

SPEED LIMIT 55 R2-1-24
Sta 474+39 Rt
Assembly 9

STARK 10 COUNTY
Sta 471+48 Rt
Remove

ONE WAY ONE WAY
STOP
Sta 31+79 Rt
Remove sign, support and foundation (x1)

ONE WAY ONE WAY
DO NOT ENTER
Sta 31+19 Lt
Remove sign, support and foundation (x1)

BUSINESS 94 WEST
Dickinson
Sta 30+70 Rt
Remove sign, support and footings (x2)

WRONG WAY
Sta 28+91 Lt
Remove sign, support and foundation (x1)

Sta 28+45 Rt
Remove sign, support and foundation (x1)

D9-3-30
M6-1L-30 (white legend on blue background)
Sta 4+35 Lt
Special Assembly D

EXIT 40 MPH
Sta 21+01 Rt
Remove sign, support and foundation (

Sta 466+56 Rt
Assembly 17
R3-1-48

Sta 2+66 Rt
Special Assembly C
WRONG WAY R5-1a-42

Sta 456+52 Rt
Remove

R3-2-48
Sta 456+52 Rt
Assembly 17

M3-4-24 (white legend on blue background) WEST INTERSTATE NORTH DAKOTA 94
M1-1-24
M5-1L-21 (white legend on blue background)
Sta 459+22 Rt
Assembly 379

WEST INTERSTATE NORTH DAKOTA 94
Sta 459+22 Rt
Remove

WEST EAST INTERSTATE NORTH DAKOTA 94
Sta 454+89 Rt
Remove

M3-4-24 (white legend on blue background) WEST EAST M3-2-24 (white legend on blue background)
M1-1-24 INTERSTATE NORTH DAKOTA 94 M1-1-24
M6-3-21 (white legend on blue background) M6-2R-21 (white legend on blue background)
Sta 454+89 Rt
Assembly 387

EXIT 64
Sta 21+85 Lt
Remove sign, support and foundation (x2)

Sign 1
EXIT 64
Sta 11+03 Rt

0+00
5+00
10+00
15+00
20+00

See Detail

Delineator Detail
40'
40'

SPEC	CODE	BID ITEM	QTY	UNIT
754	0168	DELINEATORS-TYPE D Exit ramp curve	3	EA

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Sign Layout

Exit 64 Interchange
Dickinson

I-94

9/30/2020 12:00:01 PM jallery R:\project\50094063.147\traffic\Addendum\110SN_003_LSign_SignLayout.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	110	4

SIGN NUMBER	Sign 1
WIDTH X HEIGHT	6'-6" x 5'-0"
BORDER WIDTH	1.5" (inset 0")
CORNER RADIUS	6"
MOUNTING	Ground
BACKGROUND	TYPE: IV Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: IV Reflective
	COLOR: White

SYMBOL	X	Y	WID	HT	ANGLE
ND_12IN_TYPE A	48.5	5.5	18.2	30	315

STATION(S): 11+03 Rt

AREA: 32.5 Sq.Ft.

Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

PANEL STYLE: ND_Fwy_Gore.xsl

LETTER POSITION (X)																		LENGTH	SIZE	SERIES
E	X	I	T															44.4	12	E 2000
16.8	29.6	45.4	52.2																	
6	4																	34	18	E 2000
7.2	24.3																			

SIGN NUMBER	Sign 2
WIDTH X HEIGHT	7'-6" x 4'-0"
BORDER WIDTH	1" (inset 0")
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: IV Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: IV Reflective
	COLOR: White

SYMBOL	X	Y	WID	HT	ANGLE
M1_2	19.7	22	18	18	0
ND_8IN_TYPE D	8.7	8	8	12	90

STATION(S): 2+35 Lt

AREA: 30.0 Sq.Ft.

Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

PANEL STYLE: ND_Fwy_Destination.xsl

LETTER POSITION (X)																		LENGTH	SIZE	SERIES
W	E	S	T															24.7	8,7	D 2000
45.7	54.7	60.2	66																	
D	i	c	k	i	n	s	o	n										52.6	8/6	D 2000
28.7	37	40.5	47	53.8	57.9	64.4	69.5	76.6												

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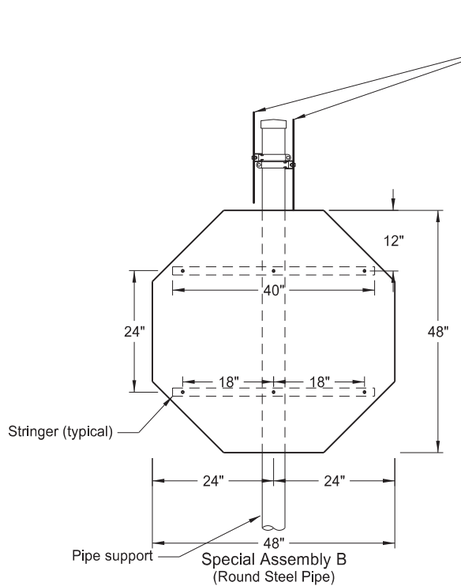
09/30/20

Sign Details

Exit 64 Interchange
Dickinson

I-94

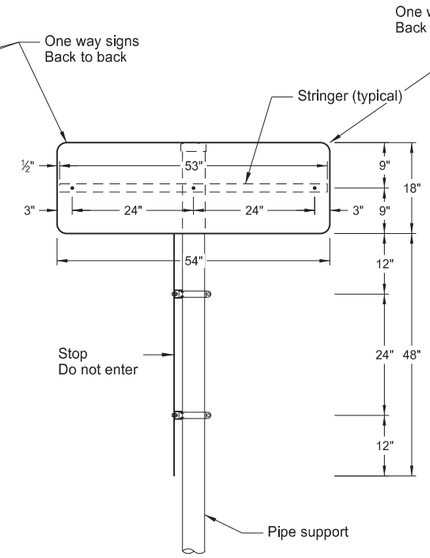
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	110	5

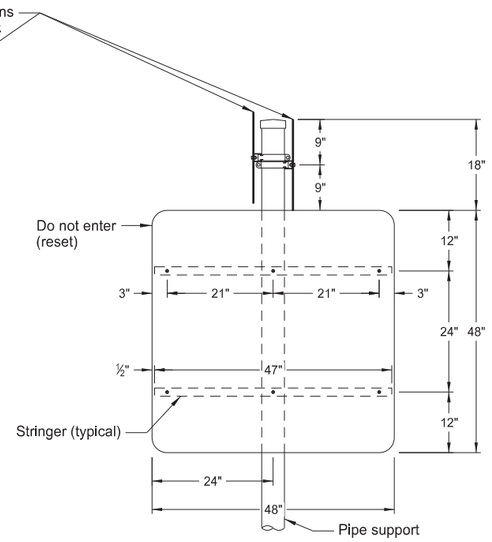


Special Assembly B
(Round Steel Pipe)

Sta 0+35 Rt

Pay Area: 20 Sq Ft

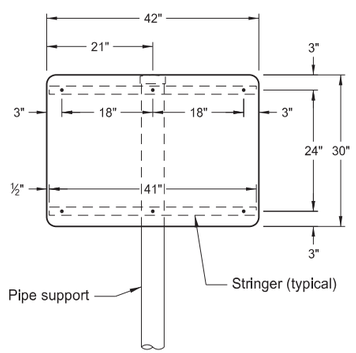




Special Assembly B
(Round Steel Pipe)

Sta 0+66 Rt

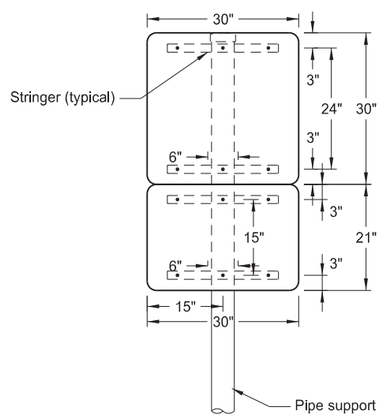
Pay Area: 20.2 Sq Ft



Special Assembly C
(Round Steel Pipe)

Sta 2+66 Rt

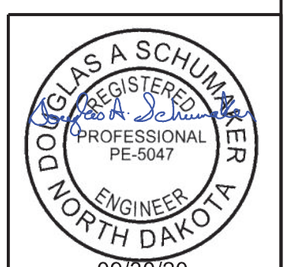
Pay Area: 8.8 Sq Ft



Special Assembly D
(Round Steel Pipe)

Sta 4+35 Rt

Pay Area: 10.6 Sq Ft



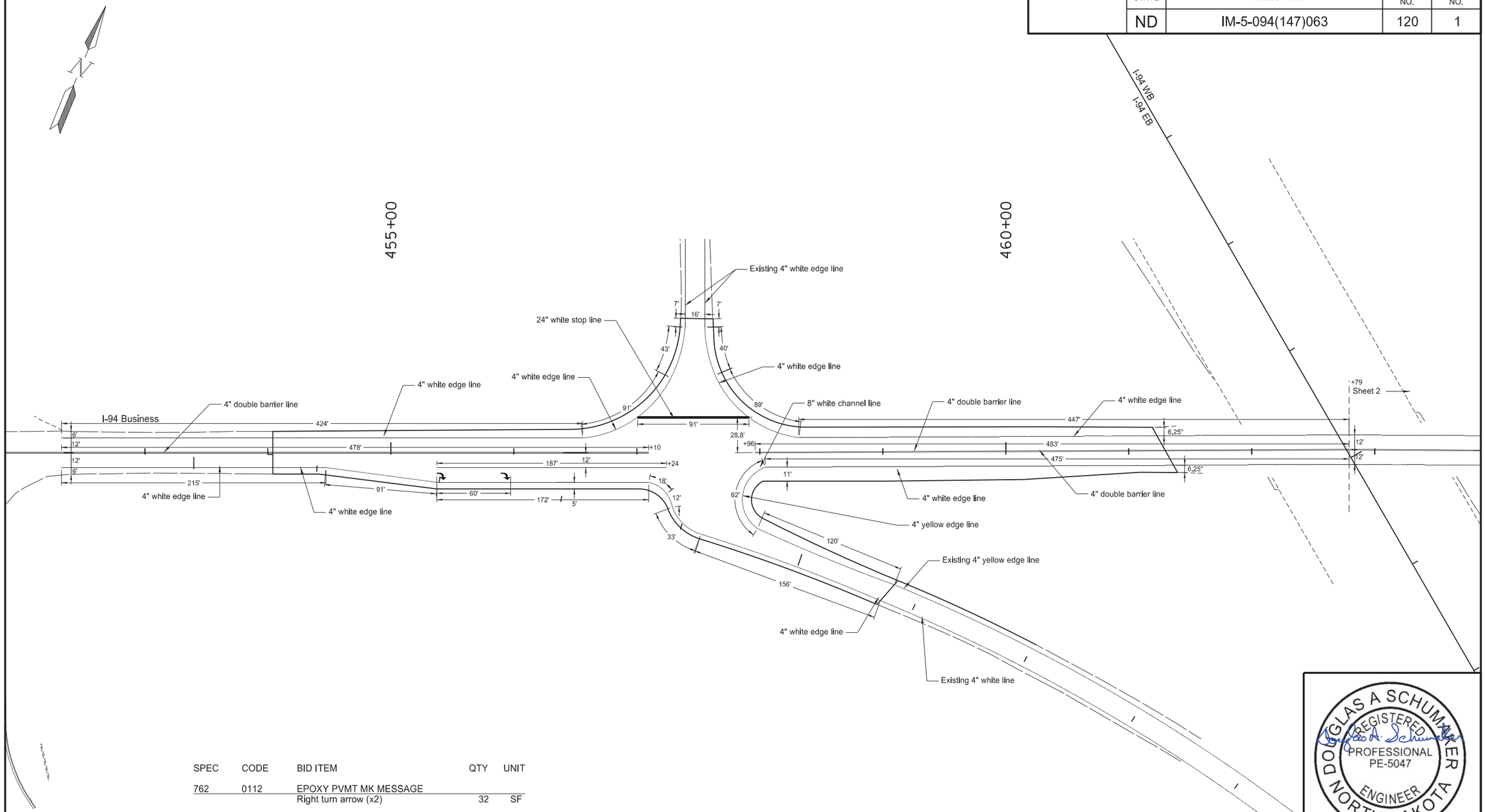
09/30/20

Sign Assemblies

Exit 64 Interchange
Dickinson

I-94

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	120	1



SPEC	CODE	BID ITEM	QTY	UNIT
762	0112	EPOXY PVMT MK MESSAGE		
		Right turn arrow (x2)	32	SF
762	0113	EPOXY PVMT MK 4IN LINE		
		4" white edge line	2320	LF
		4" yellow edge line	182	
		4" yellow double barrier line	1922	LF
		Total	4424	LF
762	0115	EPOXY PVMT MK 8IN LINE		
		8" white channel line	187	LF
762	0117	EPOXY PVMT MK 24IN LINE		
		24" white stop line	91	LF

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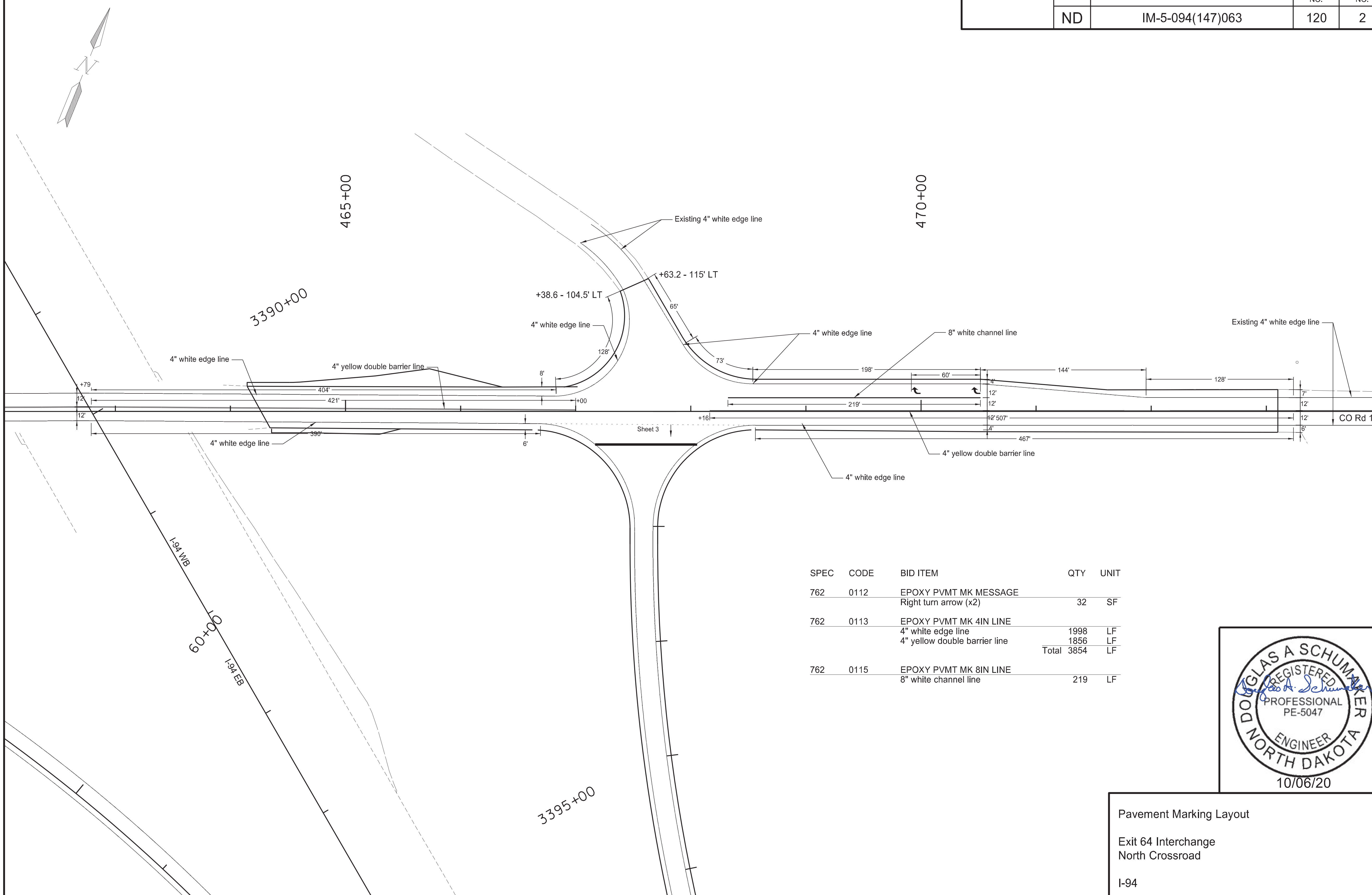
Pavement Marking Layout

EB On-Ramp
Exit 64 Interchange

I-94

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	120	2



SPEC	CODE	BID ITEM	QTY	UNIT
762	0112	EPOXY PVMT MK MESSAGE		
		Right turn arrow (x2)	32	SF
762	0113	EPOXY PVMT MK 4IN LINE		
		4" white edge line	1998	LF
		4" yellow double barrier line	1856	LF
		Total	3854	LF
762	0115	EPOXY PVMT MK 8IN LINE		
		8" white channel line	219	LF

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10/06/20

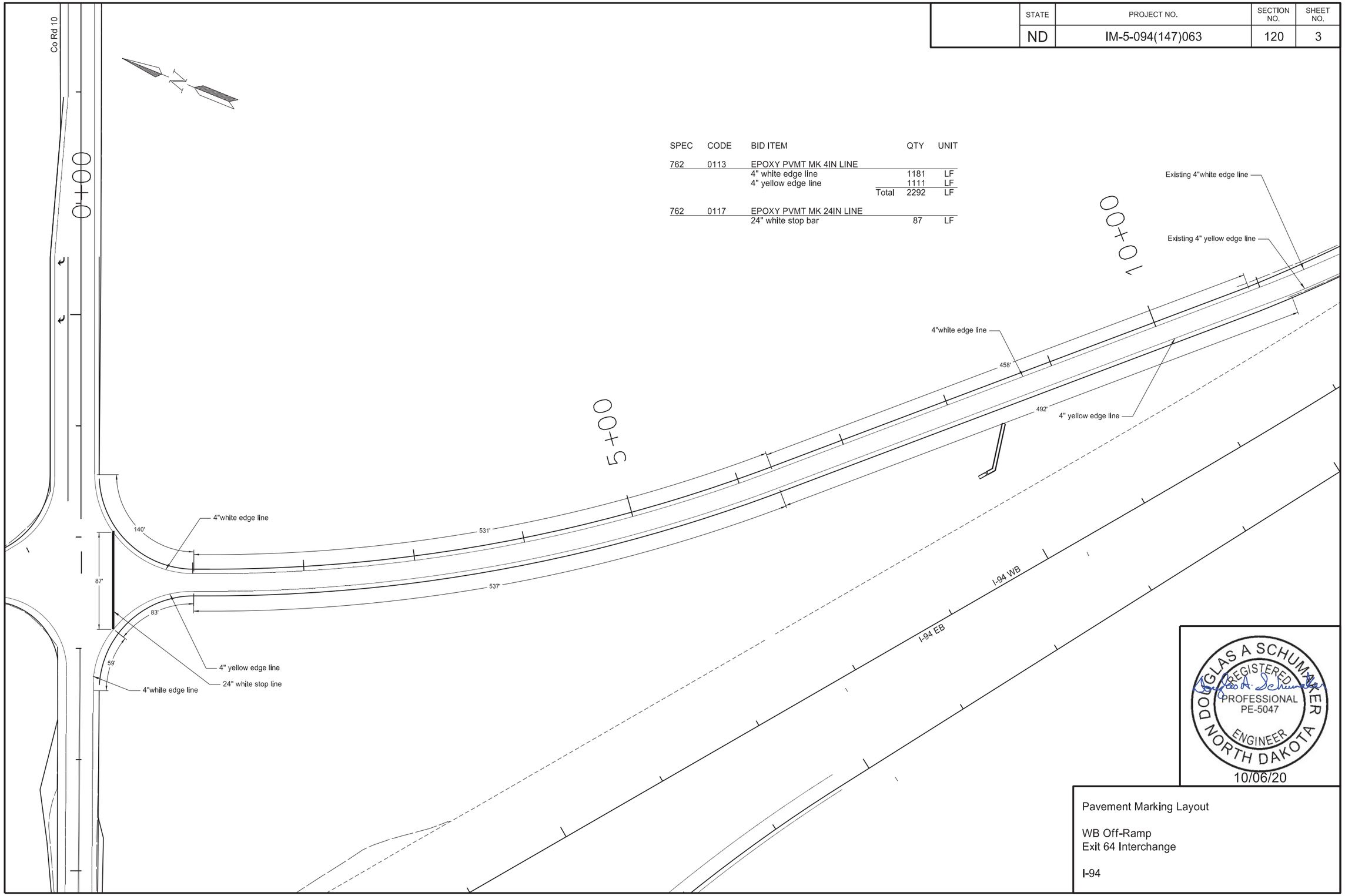
Pavement Marking Layout

Exit 64 Interchange
North Crossroad

I-94

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	120	3

SPEC	CODE	BID ITEM		QTY	UNIT
762	0113	EPOXY PVMT MK 4IN LINE			
		4" white edge line		1181	LF
		4" yellow edge line		1111	LF
			Total	2292	LF
762	0117	EPOXY PVMT MK 24IN LINE			
		24" white stop bar		87	LF



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10/06/20

Pavement Marking Layout

WB Off-Ramp
Exit 64 Interchange

I-94

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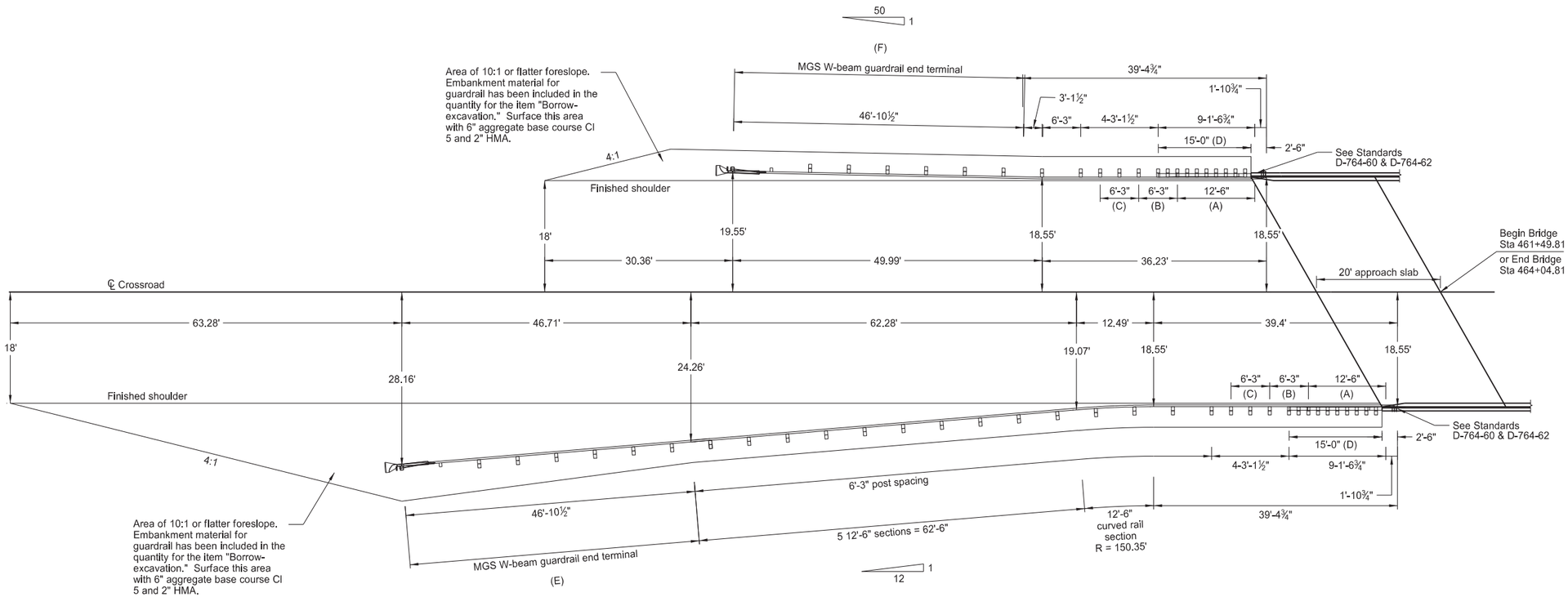
23 USC § 409 Documents
NDDOT Reserves All Objections

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	130	1



(A) Thrie beam rail section (double thickness)

(B) Thrie beam rail section

(C) Asymmetrical W-Thrie beam transition section

(D) Curb & gutter - type 1 special. Install in accordance with Standard Drawing D-748-1, except for height transitions on each end as shown on Standard Drawing D-764-60.

(E) Install a FLEAT end terminal at this location. See Standard D-764-38.

(F) Install either a MASH SKT or a MASH SoftStop Terminal at this location.

If a MASH SKT is installed, install the end terminal as shown above. See Standard D-764-51.

If a MASH SoftStop is installed, install it with the offset as shown on Standard D-764-50. Additional guardrail embankment required is at the contractor's expense.

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Thrie/MGS W-Beam Guardrail Layout
At Both Ends of Bridge

East Dickinson Interchange Crossroad
RP 64.240

I-94

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MGS W-BEAM GUARDRAIL SUMMARY OF QUANTITIES

THRIE/MGS W-BEAM GUARDRAIL AT BRIDGE ENDS

LOCATION	(A) 5/8" Ø x 18" LONG GUARD-RAIL BOLT	(A) 6" x 8" x 6'-0" TIMBER POST	(A) 6" x 8" x 14" TIMBER BLOCK	(A) 5/8" Ø x 1 1/4" LONG GUARD-RAIL BOLT	(A) 12'- 6" STRAIGHT W-BEAM RAIL SECTION	(A) 12'- 6" CURVED W-BEAM RAIL SECTION	(A) REFL-ECTOR-IZED PLATES	(A) 6" x 8" x 7' WOOD POST	(A) 6" x 8" x 19" WOOD OFF-SET BLOCK	(A) 6'-3" W-THRIE BEAM TRANS-ITION SECTION	(A) 6'-3" THRIE BEAM SECTION	(A) 12'-6" DOUBLE THRIE BEAM SECTION	(A) 2'-6" THRIE BEAM TERM-INAL CON-NECTOR	(A) 7/8" Ø x 15" LONG HEX HEAD BOLT	(A) JERSEY BARRIER TO THRIE BEAM CONN-ECTOR PLATE
	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH	EACH
Sta 460+28.72 to 461+42.89 Rt	38	21	15	100	6	1	8	6	12	1	1	1	1	5	1
Sta 460+82.33 to 461+21.73 Lt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 464+32.89 to 464+72.29 Rt	26	9	3	52	1		5	6	12	1	1	1	1	5	1
Sta 464+11.73 to 465+25.90 Lt	38	21	15	100	6	1	8	6	12	1	1	1	1	5	1
TOTAL	128	60	36	304	14	2	26	24	48	4	4	4	4	20	4

SPEC	CODE	BID ITEM	QTY	UNIT
748	0141	CURB & GUTTER-TYPE 1 SPECIAL		
		Sta 461+25.39 to 461+40.39 Rt	15	LF
		Sta 461+04.23 to 461+19.23 Lt	15	LF
		Sta 464+35.39 to 464+50.39 Rt	15	LF
		Sta 464+14.23 to 464+29.23 Lt	15	LF
		Total	60	LF
764	0131	W-BEAM GUARDRAIL		
		Sta 460+28.72 to 461+42.89 Rt	114.4	LF
		Sta 460+82.33 to 461+21.73 Lt	39.4	LF
		Sta 464+32.89 to 464+72.29 Rt	39.4	LF
		Sta 464+11.73 to 465+25.90 Lt	114.4	LF
		Total	307.6	LF
764	0145	W-BEAM GUARDRAIL END TERMINAL		
		Sta 459+82.01 to 460+28.72 Rt	1	Ea
		Sta 460+35.47 to 460+82.33 Lt	1	Ea
		Sta 464+72.29 to 465+19.15 Rt	1	Ea
		Sta 465+25.90 to 465+72.61 Lt	1	Ea
		Total	4	Ea

SPEC	CODE	BID ITEM	QTY	UNIT
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS		
		Sta 460+88.28 to 461+52.56 Rt	89.4	LF
		Sta 460+92.66 to 461+32.06 Lt	39.4	LF
		Sta 464+22.56 to 464+61.96 Rt	39.4	LF
		Sta 464+02.06 to 464+66.34 Lt	89.4	LF
		Total	257.6	LF
764	2081	REMOVE END TREATMENT & TRANSITION		
		Sta 460+38.45 to 460+88.28 Rt	1	Ea
		Sta 460+42.66 to 460+92.66 Lt	1	Ea
		Sta 464+61.96 to 465+11.96 Rt	1	Ea
		Sta 464+66.34 to 465+16.17 Lt	1	Ea
		Total	4	Ea

(A) Include these items in the contract unit price bid for "W-Beam Guardrail".

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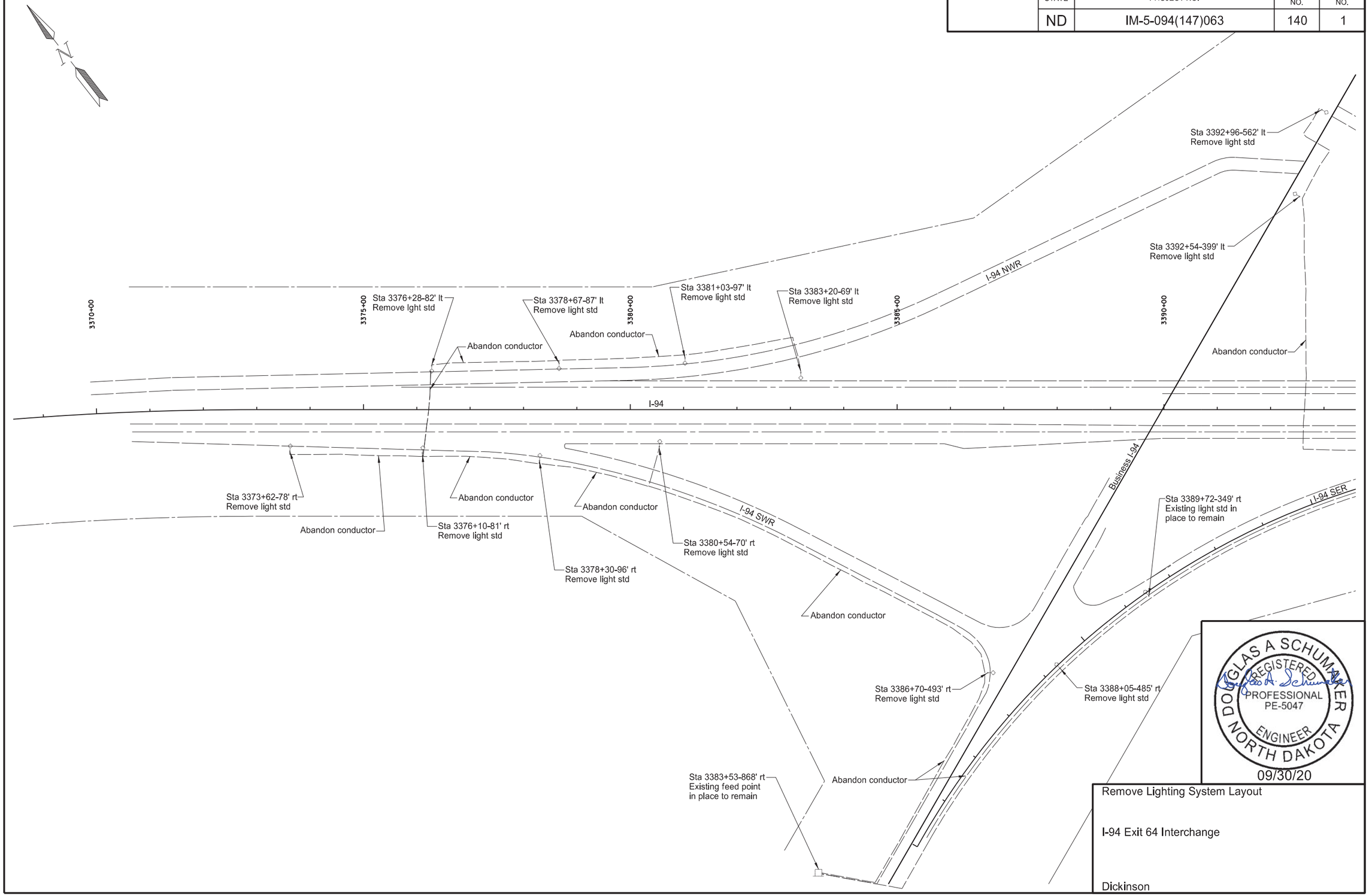
08/31/20

Thrie/MGS W-Beam Guardrail Quantities

East Dickinson Interchange Crossroad RP 64.240

I-94

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	1



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09/30/20

Remove Lighting System Layout

I-94 Exit 64 Interchange

Dickinson

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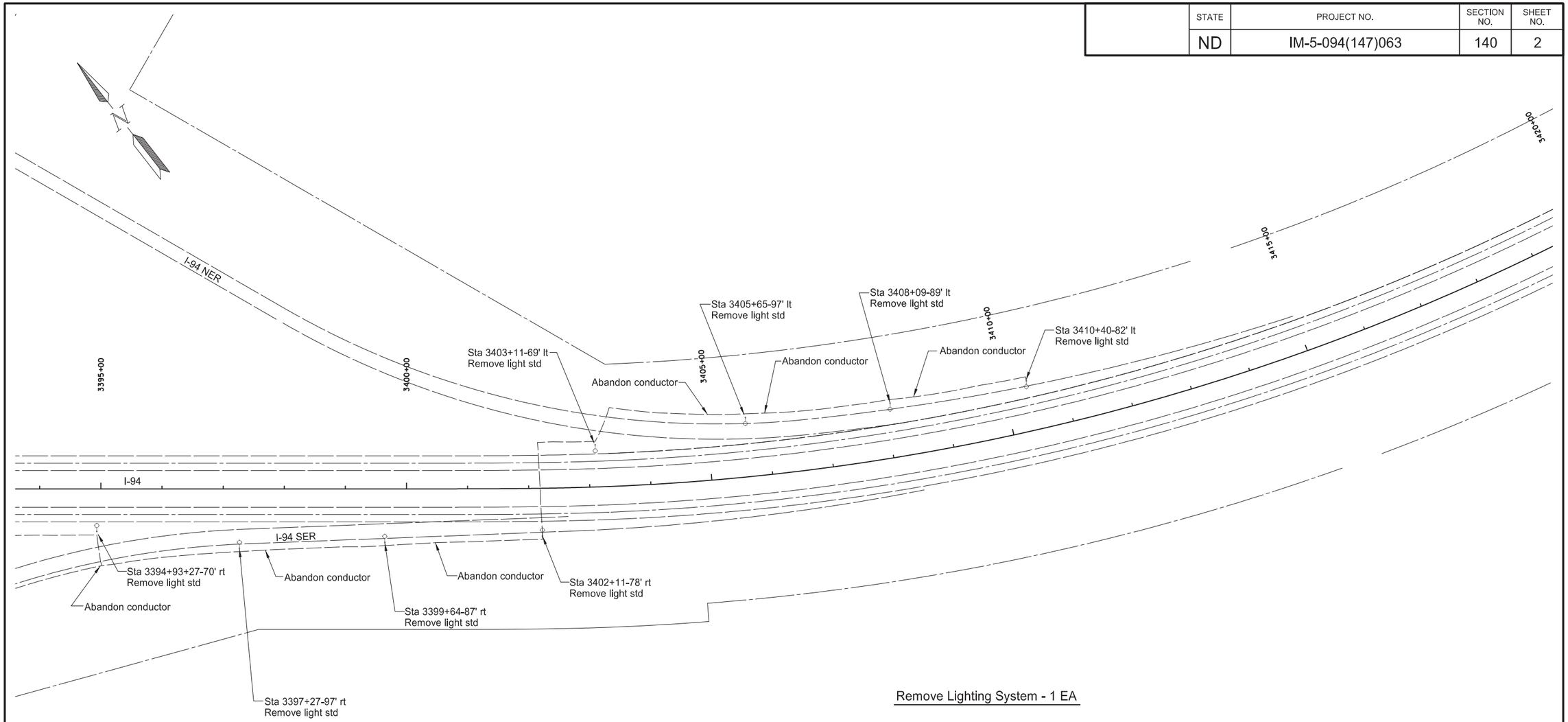
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	2



Remove Lighting System - 1 EA

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09/30/20

Remove Lighting System Layout

I-94 Exit 64 Interchange

Dickinson

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	3

N

Sta 3368+88-131' lt
High mast light std
140' pole
4 luminaires - asymmetrical

Sta 3381+34-165' lt
High mast light std
140' pole
4 luminaires - asymmetrical

Sta 3388+28-349' lt =
Sta 464+97-321' lt I-94 B

Sta 3392+76-740' lt =
Sta 471+09-42' lt I-94 B

Sta 3394+35-703' lt =
Sta 471+09-28' rt I-94 B

Sta 3392+73-562' lt =
Sta 469+04-42' lt I-94 B

Sta 3388+70-260' lt =
Sta 464+41-240' lt I-94 B
High mast light std
160' pole
6 luminaires - symmetrical

Sta 3375+20-140' rt
High mast light std
140' pole
4 luminaires - asymmetrical

Sta 3379+76-148' rt

Sta 3384+19-320' rt

Sta 3384+66-226' rt
High mast light std
160' pole
8 luminaires - symmetrical

Sta 3384+76-812' rt =
Sta 453+15-46' lt I-94 B

Sta 3383+83-863' rt =
Sta 452+09-128' lt I-94 B
Install feed point -
pad mtd

Sta 3384+23-907' rt =
Sta 452+09-44' lt I-94 B

Sta 3384+38-942' rt =
Sta 452+09-31' rt I-94 B

Sta 3389+86-236' rt =
Sta 460+69-108' rt I-94 B
High mast light std
160' pole
8 luminaires - symmetrical

Sta 3390+35-312' rt =
Sta 460+28-108' rt I-94 B

1 2 3 4 5 6

3370+00 3375+00 3380+00 3385+00 3390+00

455+00 460+00 465+00 470+00

I-94 NWR I-94 NER I-94 SWR I-94 SER Business I-94 I-94

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High Mast Lighting System

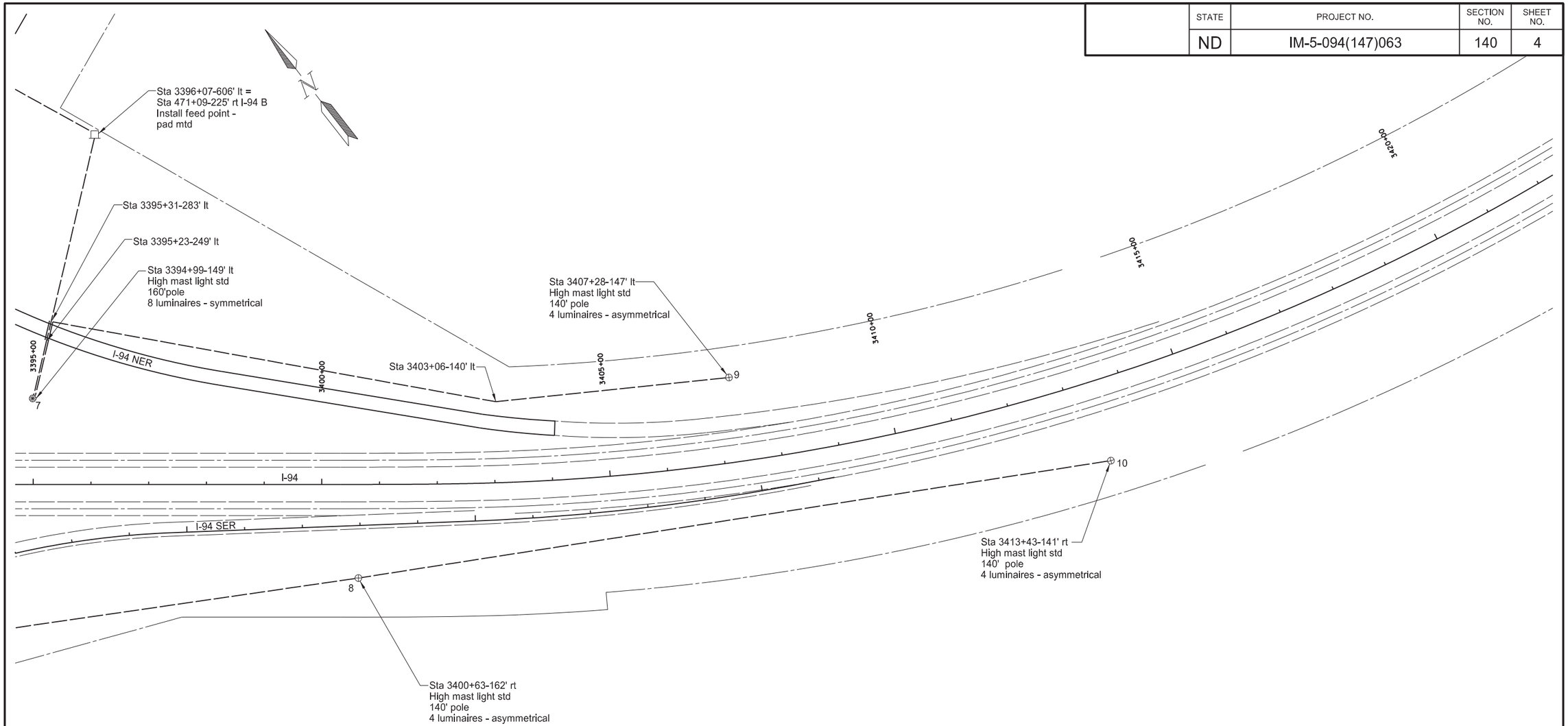
Hight Mast Lighting Layout

I-94 Exit 64 Interchange

Dickinson

9/30/2020 10:21:43 AM nbauer R:\project\50094063.147\traffic\140LT_003_LHM.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	4



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09/30/20

High Mast Lighting System

Hight Mast Lighting Layout

I-94 Exit 64 Interchange

Dickinson

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	5

Light Std Number	Station	Cable Trench	Conduit Runs		Cable Runs	
		LF	LF	Dia	LF	Type
1 3	Sta 3368+88-131' lt to Sta 3381+34-165' lt	1250			1264	4 No. 4 USE
3 5	Sta 3381+34-165' lt to Sta 3388+28-349' lt to Sta 3388+70-260' lt	715	96	4"	825	4 No. 4 USE
5 FP	Sta 3388+70-260' lt to Sta 3388+28-349' lt to Sta 3392+73-562' lt to Sta 3392+76-740' lt to Sta 3394+35-703' lt to Sta 3396+07-606' lt	 494 205 193	 70	 (A) 3"	1078	4 No. 2 USE
9 7	Sta 3407+28-147' lt to Sta 3403+06-140' lt to Sta 3395+31-283' lt to Sta 3395+23-249' lt to Sta 3394+99-149' lt	 403 783 100	 35	 3"	932	4 No. 6 USE
7 FP	Sta 3394+99-149' lt to Sta 3395+23-249' lt to Sta 3395+31-283' lt to Sta 3396+07-606' lt	 100 329	 35	 A"	479	4 No. 6 USE
2 4	Sta 3375+20-140' rt to Sta 3379+76-148' rt to Sta 3384+19-320' rt to Sta 3384+66-226' rt	 448 475	 102	 4"	1042	4 No. 6 USE
4 FP	Sta 3384+66-226' rt to Sta 3384+19-320' rt to Sta 3384+76-812' rt to Sta 3383+83-863' rt	 664 132	 	 (A) 	922	4 No. 4 USE
10 8	Sta 3413+43-141' rt to Sta 3400+63-162' rt	1313			1327	4 No. 4 USE
8 6	Sta 3381+34-165' rt to Sta 3388+28-349' rt to Sta 3389+86-236' rt	1037	87	4"	1138	4 No. 2 USE
6 FP	Sta 3389+86-236' rt to Sta 3390+35-312' rt to Sta 3384+38-942' rt to Sta 3384+23-907' rt to Sta 3383+83-863' rt	 844 81	 75	 (A) 3"	1094	4 No. 2 USE

(A) Conduit installed on previous run.

High Mast Lighting Quantities											
Concrete Foundation - Feed Point - Type B	Cable Trench - Type II	3" Dia Rigid Conduit	4" Dia Rigid Conduit	Multiple Underground Cable 4 No. 2 Style USE	Multiple Underground Cable 4 No. 4 Style USE	Multiple Underground Cable 4 No. 6 Style USE	Feed Point - Type II - Pad Mounted	High Mast Lighting Assembly Type HM-140-4	High Mast Lighting Assembly Type HM-160-6	High Mast Lighting Assembly Type HM-160-8	LED Luminaire - High Mast
EA	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
2	9566	180	285	3310	4338	2453	2	6	1	3	54

High Mast Light Standards				
No.	Station	Circuit	IES-Type	Pole Ht.
1	3368+88-131' lt	1	Asym	140'
2	3375+20-140' rt	3	Asym	140'
3	3381+34-165' lt	1	Asym	140'
4	3384+66-226' rt	3	Sym	160'
5	3388+70-260' lt	1	Sym	160'
6	3389+86-236' rt	4	Sym	160'
7	3394+99-149' lt	2	Sym	160'
8	3400+63-162' rt	4	Asym	140'
9	3407+28-147' lt	2	Asym	140'
10	3413+43-141' rt	4	Asym	140'

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High Mast Lighting System

High Mast Lighting Cable Runs and Quantities

I-94 Exit 64 Interchange

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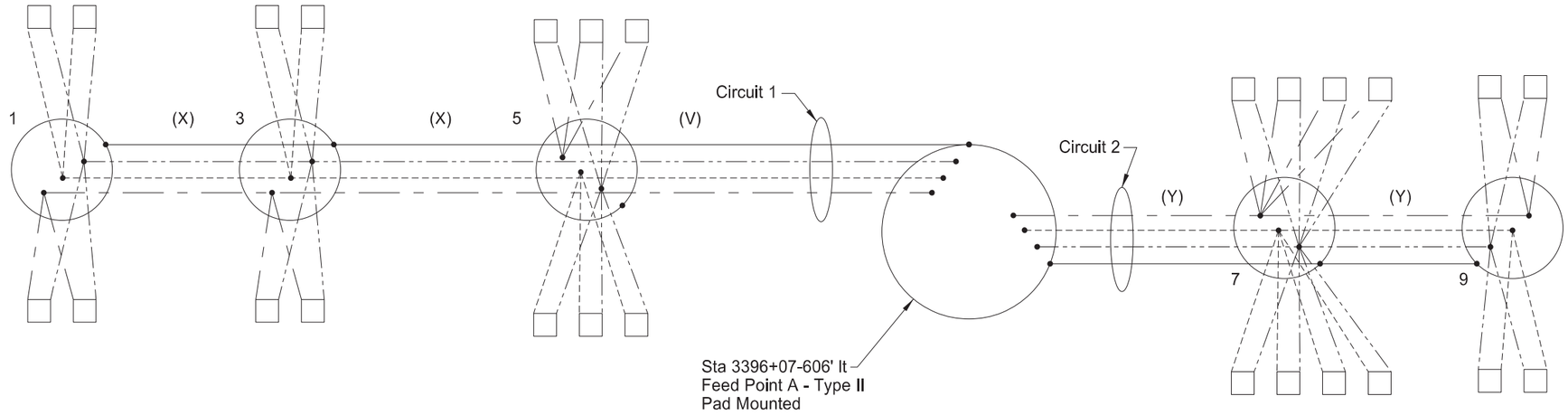
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	6



Legend

Ground Conductor	
Nuetral Conductor	
Phase Conductor	
Phase Conductor	
(V)	4 No. 2 USE
(X)	4 No. 4 USE
(Y)	4 No. 6 USE
	LED High Mast Luminaire 240v x 480v operated on 240v
	High Mast Light Standard
5	High mast Light Standard Number

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High Mast Lighting System

Lighting Schematic - Feed Point A

I-94 Exit 64 Interchange

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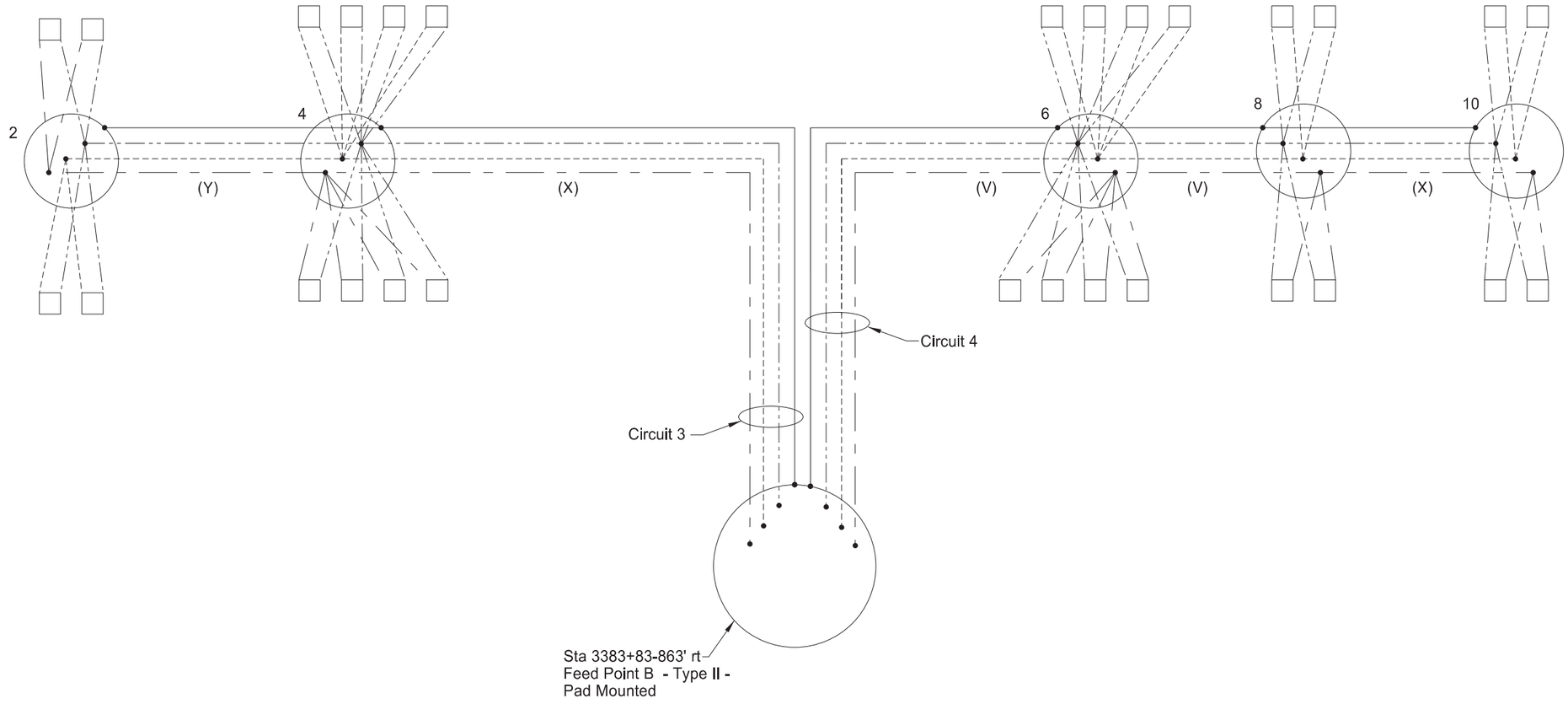
9/30/2020 10:21:48 AM nbauer R:\project\50094063.147\traffic\140LT_006_DHMDET.dgn

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	7



Legend

Ground Conductor	LED High Mast Luminaire 240v x 480v operated on 240v
Nuetral Conductor	
Phase Conductor	
Phase Conductor	High Mast Light Standard
(V) 4 No. 2 USE	
(X) 4 No. 4 USE	
(Y) 4 No. 6 USE	4 High mast Light Standard Number

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High Mast Lighting System

Lighting Schematic - Feed Point B

I-94 Exit 64 Interchange

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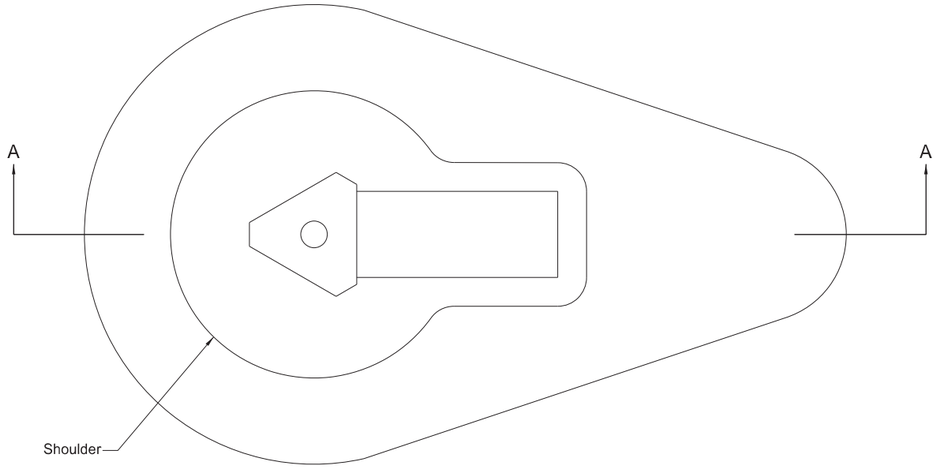
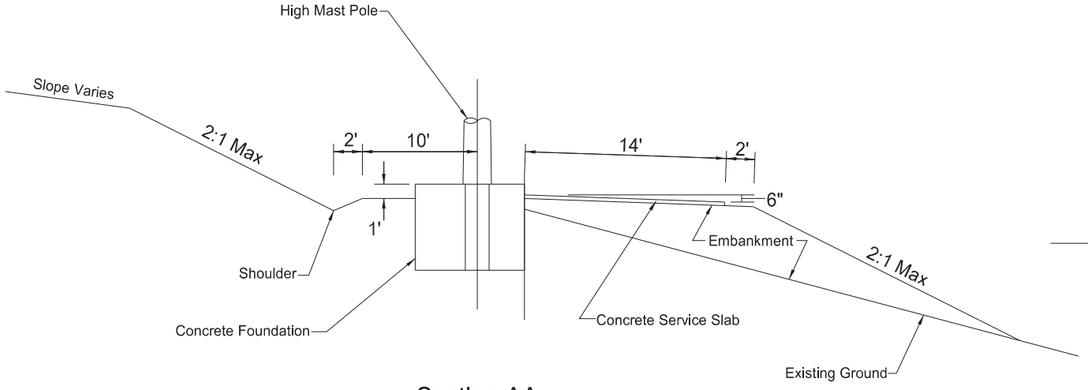
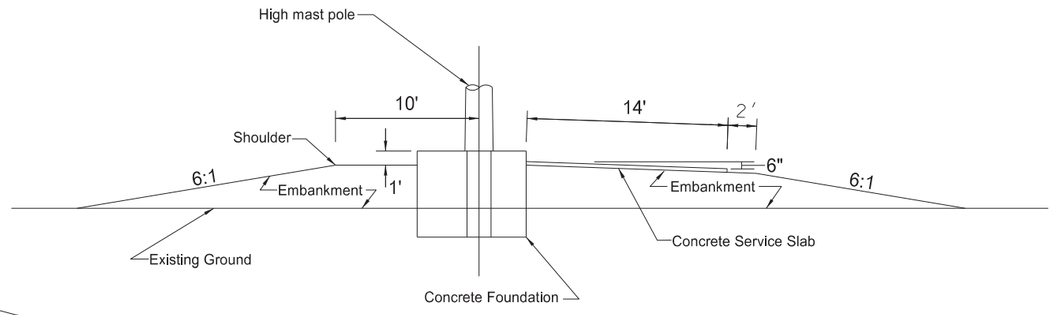
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	8



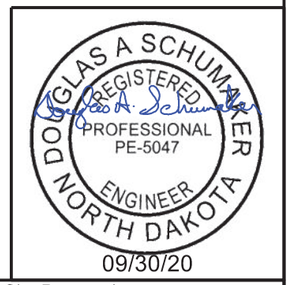
Plan View



Section AA
Cut Section



Section AA
Fill Section



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High Mast Lighting Site Preparation

Various Locations

I-94 Exit 64 Interchange

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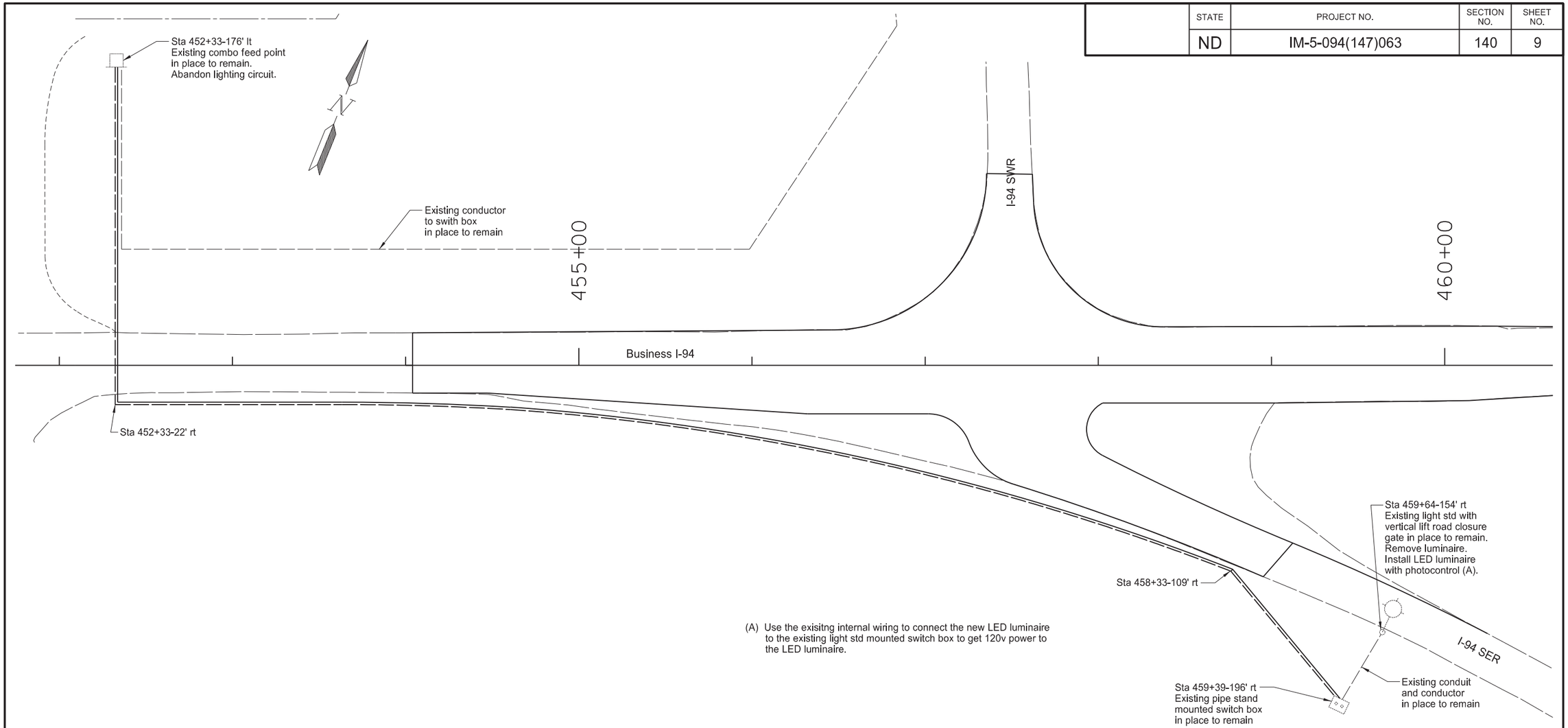
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	9



(A) Use the exisitng internal wiring to connect the new LED luminaire to the existing light std mounted switch box to get 120v power to the LED luminaire.

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Revise Lighting System

Revise Lighting Layout

I-94 Exit 64 Interchange

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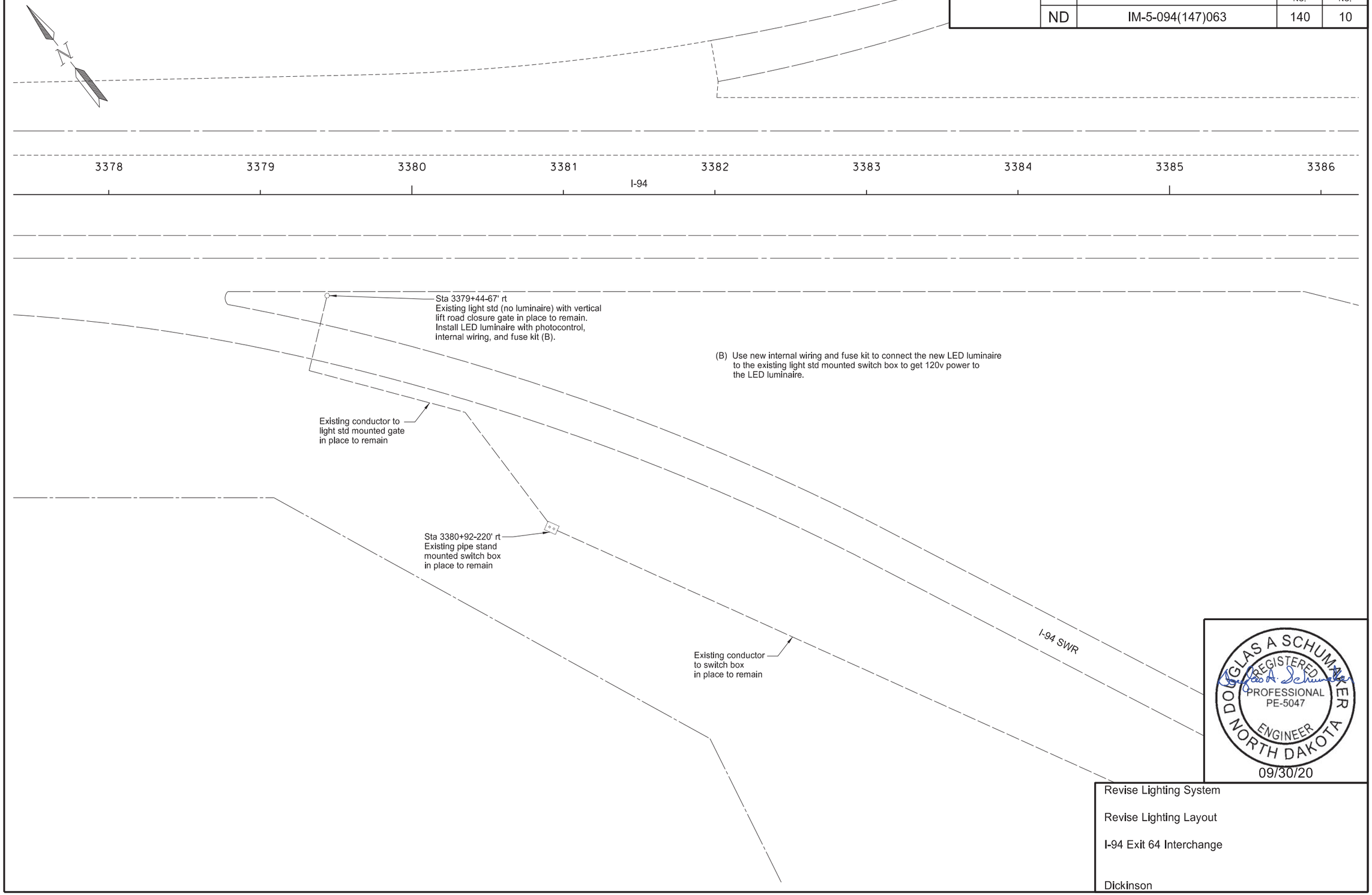
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	10



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Revise Lighting System

Revise Lighting Layout

I-94 Exit 64 Interchange

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-5-094(147)063	140	11

	STATION	CONDUIT RUNS		CABLE RUNS	
		LF	DIA	LF	Type
Feed point	452+33-176' lt to			1948	(2) No. 6 RHW
Bend	452+33-22' rt to	197'	2"	974	(1) No. 6 THW
Bend	458+33-109' rt to	656'	2"		
Swicth Box	459+39-196' rt	99'	2"		

QUANTITIES (A)									
2" Dia Rigid Conduit	Underground Conductor No 6 - Type RHW	Underground Conductor No 6 - Type THW	No 12 AWG - Type THWN/THHN Conductor (B)	Fuse Kit	LED Luminaire	Photocontrol	Remove Luminaire		Revise Lighting System
LF	LF	LF	LF	EA	EA	EA	EA		EA
996	3916	1958	150	1	2	2	1		1

(A) Do not bid separately but include in the item "Revise Lighting System".

(B) Light standard internal wiring.

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Revise Lighting System

Revise Lighting Runs and Quantities

I-94 Exit 64 Interchange

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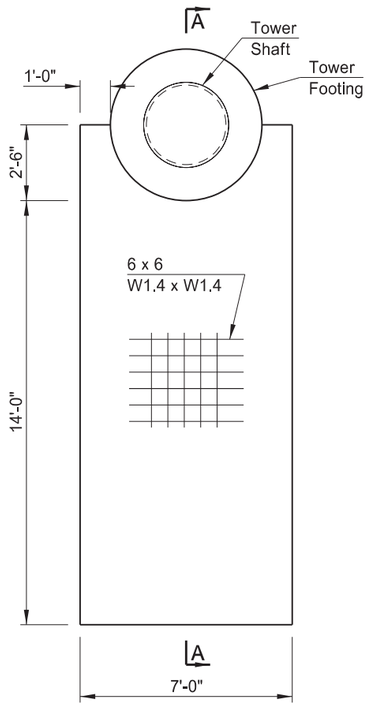
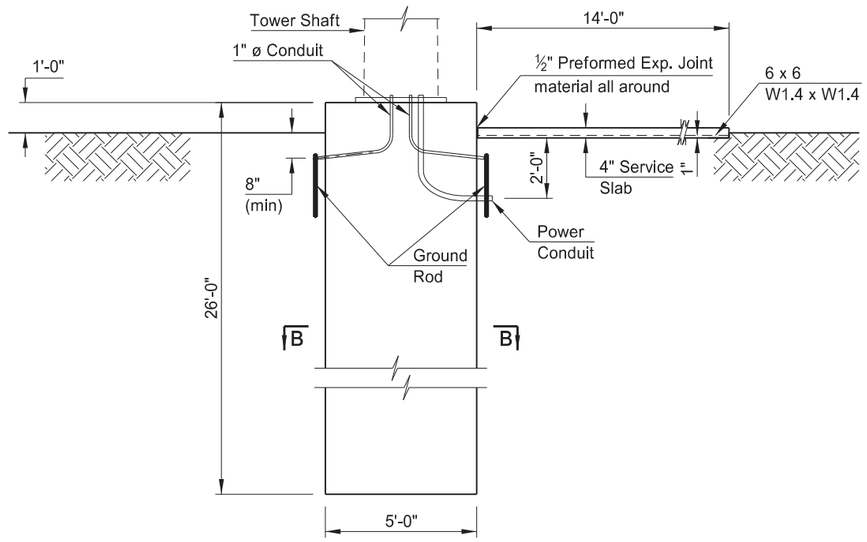
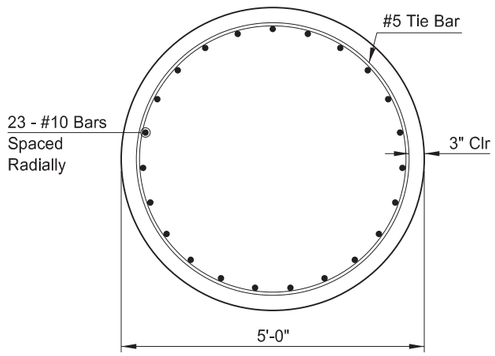
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	140	12



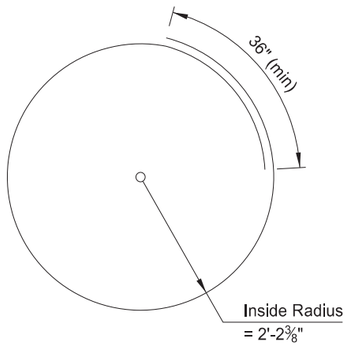
SERVICE SLAB PLAN



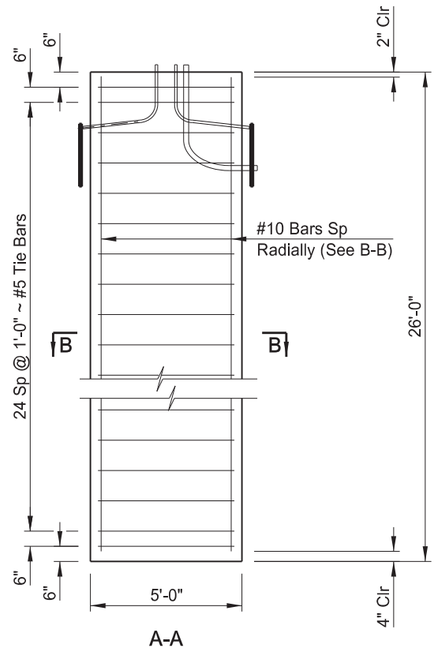
A-A



B-B



#5 TIE BAR



A-A

NOTES:

Include the concrete, reinforcing steel, wire fabric, expansion joint filler, and labor required to build the foundation and service slab in the bid item "Concrete Foundation - High Mast Lighting."

If temporary casing is required to build the shaft remove the temporary casing as the concrete is placed. Include the material and labor required for the temporary casing in the bid item "Concrete Foundation - High Mast Lighting."

CLASS AE CONCRETE - SIGN FOUNDATIONS: The class AE Concrete that is used will meet all requirements specified in section 602. Cast all drilled shafts continuously with no construction joints. Provide Grade 60 reinforcing steel that meets the requirements of Section 612. Include the concrete, reinforcing bars, excavation, and labor required to build the sign foundations in the pay item "Concrete Foundation - High Mast Lighting."

Estimated quantities (one foundation and service slab)

Class AE-3 Concrete	20.2	CY
* Reinforcing Steel	3,023	LBS

The see pole shop drawings for anchorage details.

* Includes wire fabric.

HIGH MAST LIGHT FOUNDATION		
No.	STATION/OFFSET	POLE HEIGHT
1	3368+88 - 131' Lt	140'
2	3375+20 - 140' Rt	140'
3	3381+34 - 165' Lt	140'
4	3384+66 - 226' Rt	160'
5	3388+70 - 260' Lt	160'
6	3389+86 - 236' Rt	160'
7	3394+99 - 149' Lt	160'
8	3400+63 - 162' Rt	140'
9	3407+28 - 147' Lt	140'
10	3413+43 - 141' Rt	140'

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08/31/20

BRIDGE BID ITEMS

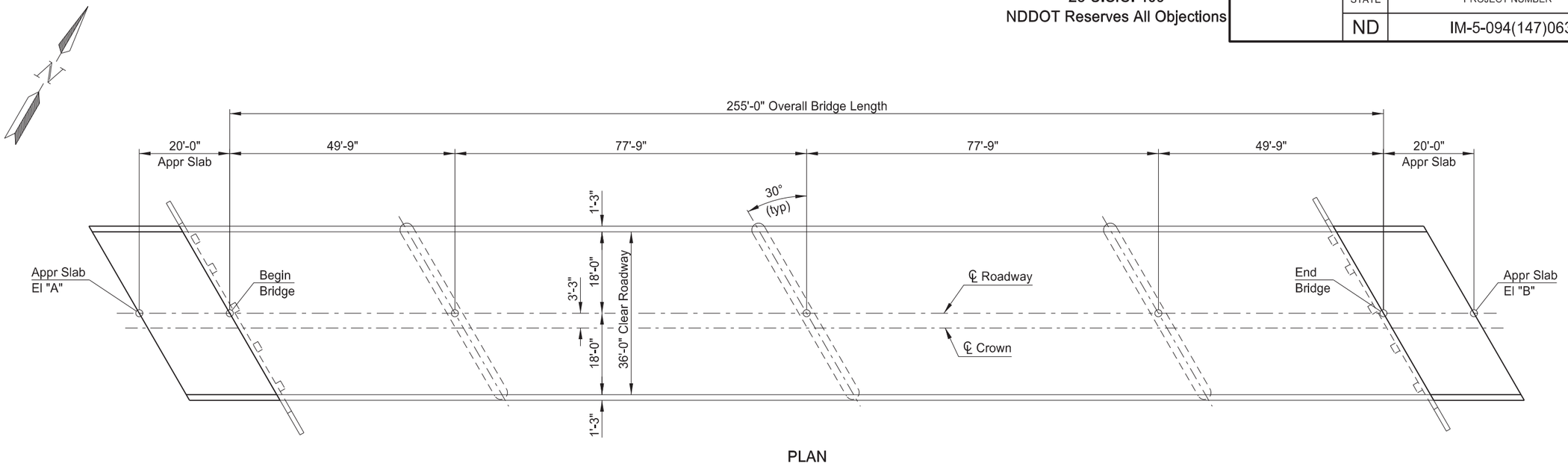
SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
770	0030	CONCRETE FOUNDATION-HIGH MAST LIGHTING	EA	10

I-94/EAST DICKINSON INTERCHANGE

CONCRETE FOUNDATION
HIGH MAST LIGHTING DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	170	1



PLAN

NOTE:

100 SCOPE OF WORK: Work at this site consists removing and replacing approach slabs and penetrating water repellant treatment.

APPROACH SLAB ELEVATIONS	
El "A"	0.15' lower than Begin Bridge
El "B"	0.04' higher than End Bridge

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
602	1135	BRIDGE APPROACH SLAB-REMOVE & REPLACE	SY	171.2
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	1,388

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I-94/EAST DICKINSON INTERCHANGE

BRIDGE LAYOUT

ND DEPARTMENT OF TRANSPORTATION
BRIDGE DIVISION
08/31/20
DocuSign

23 U.S.C. 409
NDDOT Reserves All Objections

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
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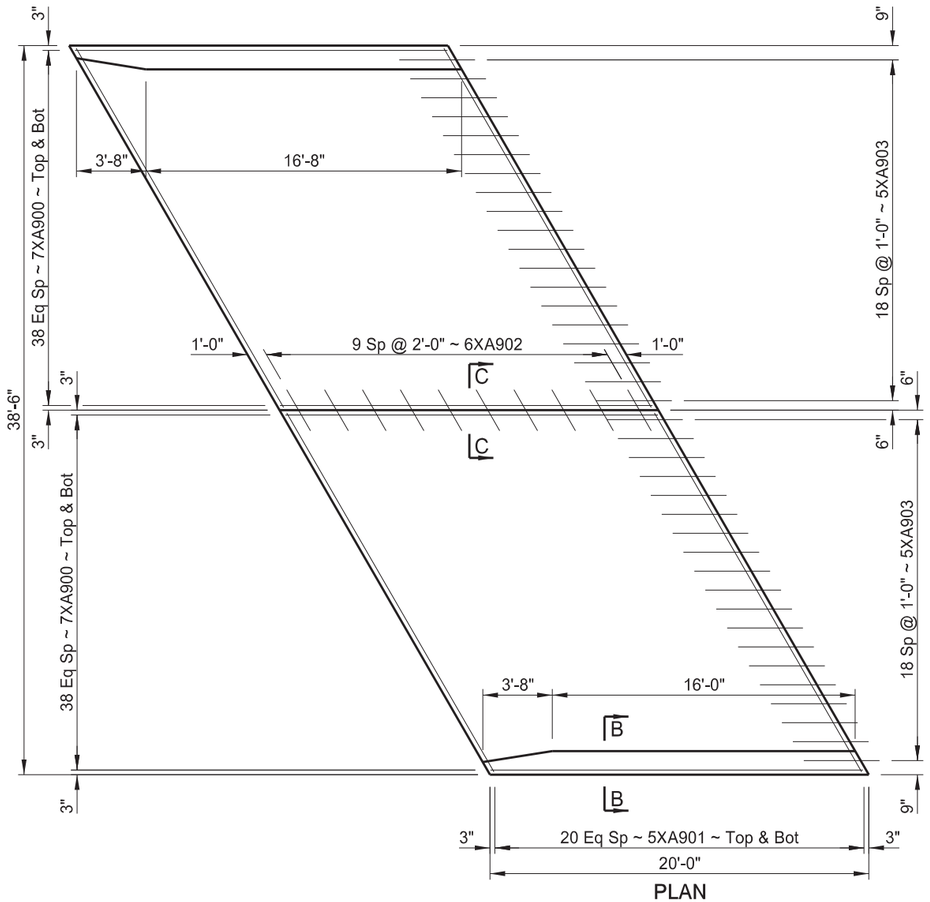
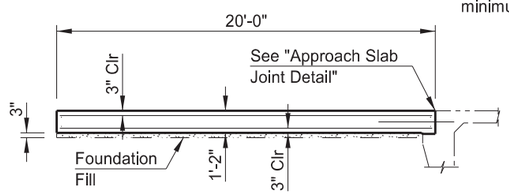
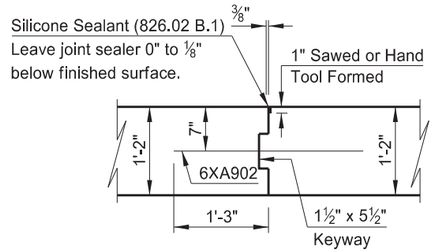


PLAN

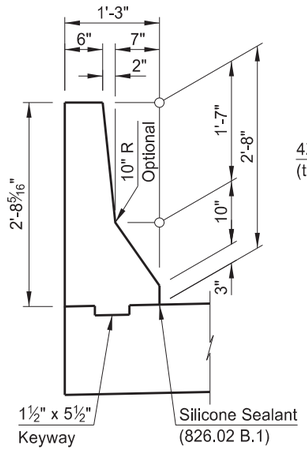


A-A

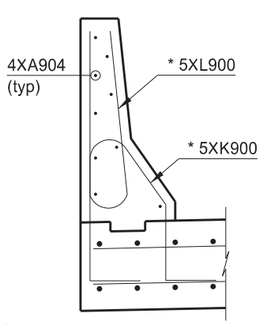
** Length may vary depending on manufacturer's recommendations for anchorage. Length based on 1 foot minimum anchorage length.



C-C



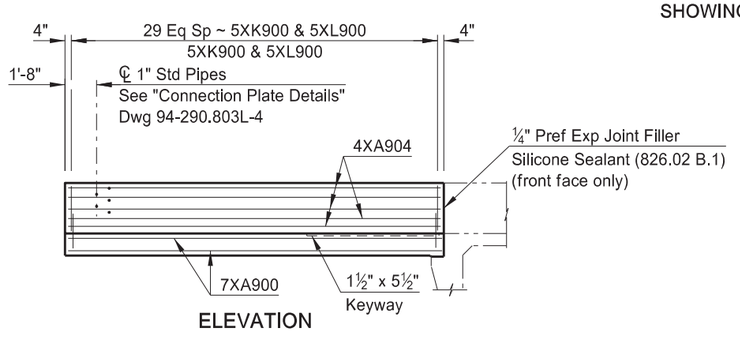
SHOWING DIMENSIONS



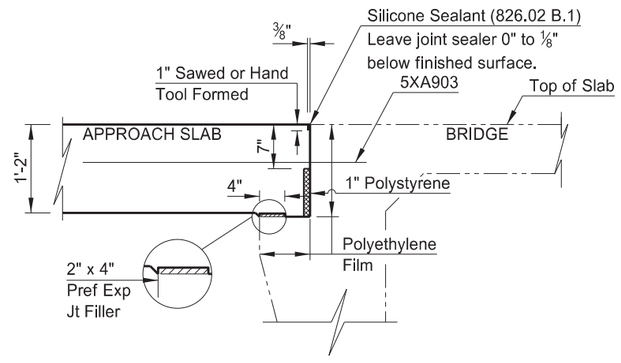
* Provide a 1½" clearance to the barrier reinforcing.

SHOWING REINFORCING

B-B



ELEVATION



APPROACH SLAB JOINT DETAIL

SKEW ANGLE = 30°

BAR LIST - ONE SLAB

SIZE	MARK	NO.	LENGTH
7	XA900	156	19'-8"
5	XA901	84	21'-10"
6	XA902	10	2'-6"
5	XA903	38	** 4'-0"
4	XA904	18	19'-8"
5	XK900	60	5'-7"
5	XL900	60	5'-0"

ESTIMATED MATERIAL QUANTITIES

REINFORCING STEEL (LBS)	CONCRETE (CY)
9,279	36.3

NOTE:

See Dwg 94-290.803L-4 for Notes, Connection Plate Details and Bent Bar Details.

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QUANTITIES	(ONE SLAB)
APPROACH SLAB	85.6 SY

I-94/EAST DICKINSON INTERCHANGE

(WEST SLAB)

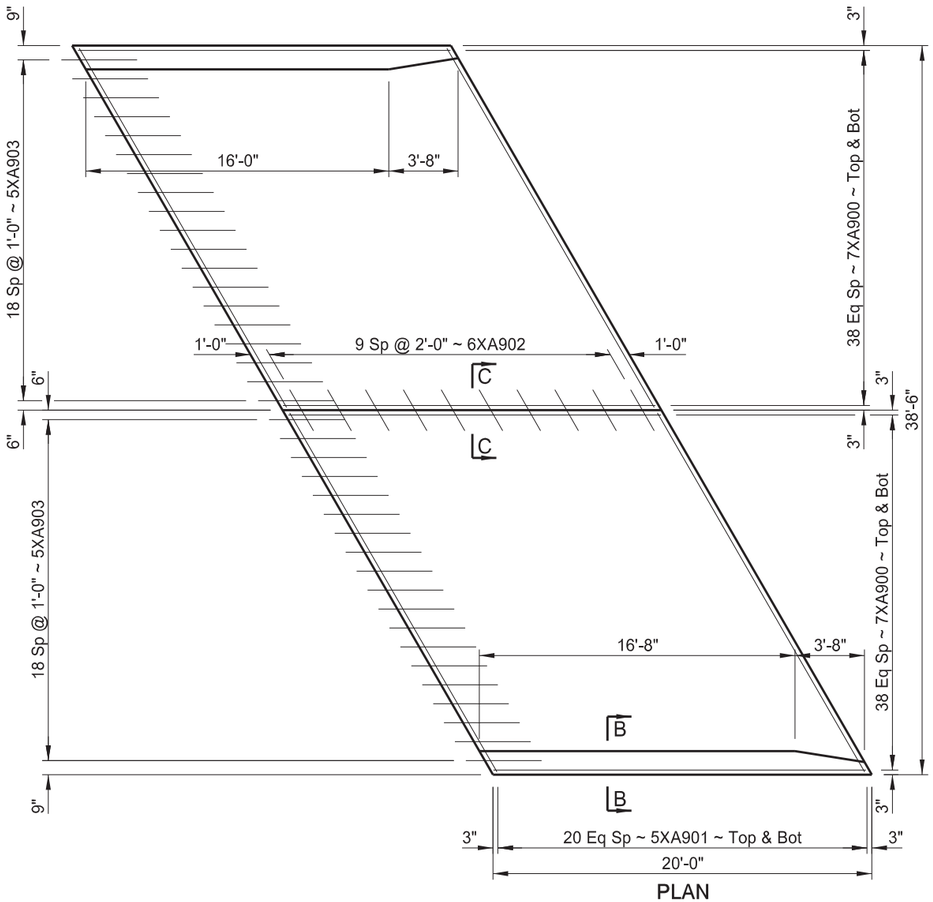
APPROACH SLAB DETAILS

23 U.S.C. 409
NDDOT Reserves All Objections

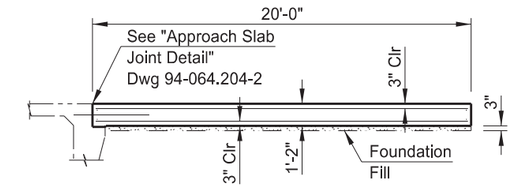
	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	IM-5-094(147)063	170	3

NOTE:

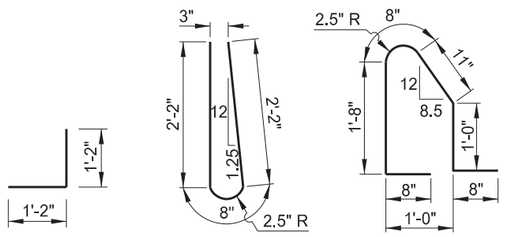
See Dwg 94-290.803L-3 for Sections B-B and C-C.



PLAN



A-A



XB901 XL900 XK900

BENT BAR DETAILS

NOTES:

The estimated material quantities shown are for information purposes only. Include the concrete, reinforcing bars, polyethylene film, preformed joint filler, polystyrene, silicone sealant, foundation fill, connection plates and pipes, and labor required to build the approach slabs, curbs and barriers in the pay item "Bridge Approach Slab-Remove and Replace." Include the dowel bars in the concrete pavement pay item. Use Class AE-3 concrete and Grade 60 reinforcing steel. Provide reinforcing steel that meets the requirements of Section 612. Use polyethylene film that meets the requirements of ASTM C171.

The bar marks beginning with an "X" indicate an epoxy coated bar. The dimensions shown in the "Bent Bar Details" are out to out.

Install 5XA903 bars according to manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage (16k min. ultimate pullout), and that meets the requirements of Section 806.02. Provide a minimum anchorage length of 1 foot.

SKEW ANGLE = 30°

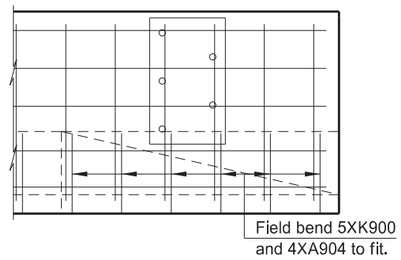
BAR LIST - ONE SLAB

SIZE	MARK	NO.	LENGTH
7	XA900	156	19'-8"
5	XA901	84	21'-10"
6	XA902	10	2'-6"
5	XA903	38	** 4'-0"
4	XA904	18	19'-8"
5	XK900	60	5'-7"
5	XL900	60	5'-0"

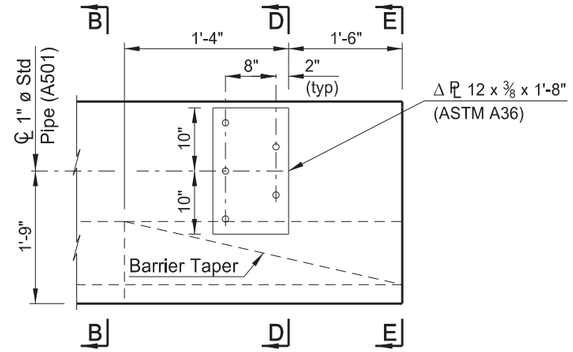
ESTIMATED MATERIAL QUANTITIES

REINFORCING STEEL (LBS)	CONCRETE (CY)
9,279	36.3

** Length may vary depending on manufacturer's recommendations for anchorage. Length based on 1 foot a minimum anchorage length.



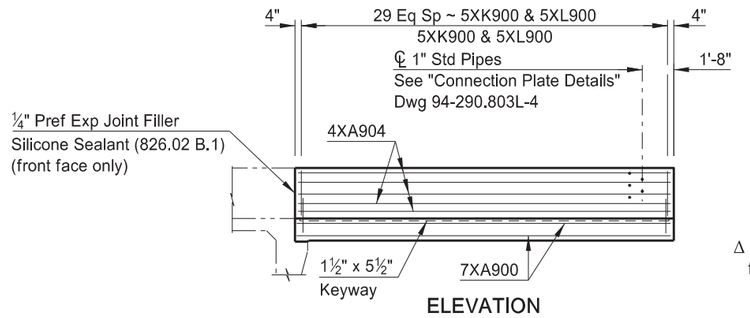
SHOWING REINFORCING



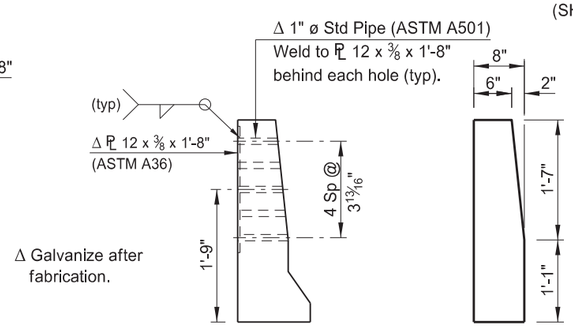
SHOWING DIMENSIONS

(SHOWING BACK FACE & JERSEY BARRIER TRANSITION)

CONNECTION PLATE DETAILS



ELEVATION



Δ Galvanize after fabrication.

D-D E-E

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DATE
NORTH DAKOTA
08/31/20

QUANTITIES	(ONE SLAB)
APPROACH SLAB	85.6 SY

I-94/EAST DICKINSON INTERCHANGE

(EAST SLAB)

APPROACH SLAB DETAILS

NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Ac	acres
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
A	ampere
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
ATR	automatic traffic recorder
Ave	Avenue
Avg	average
ADT	average daily traffic
Az	azimuth
Bk	back
BF	back face
Bs	backsight
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
Brg	bearing
BI	beehive inlet
Beg	begin
BG	below grade
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
Bd Ft	board feet
BH	bore hole
BS	both sides
Bot	bottom
Blvd	Boulevard
Bndry	boundary
BC	brass cap
Brkwy	breakaway
Br	bridge
Bldg	building
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
Cd	candela
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
CI or ℄	centerline
Cm	centimeter
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Co S	coal slack
C Gr	coarse gravel
CS	coarse sand
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
CECB	concrete erosion control blanket
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSFES	corrugated steel flared end section
CSP	corrugated steel pipe
CSTES	corrugated steel traversable end section
C	coulomb
Co	County
Crse	course
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	Crossroad
Crn	crown
CF	cubic feet
M3	cubic meter
M3/s	cubic meters per second
CY	cubic yard
Cy/mi	cubic yards per mile
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
CS	curve to spiral
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Deg or D	degree
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia or ø	diameter
Dir	direction
Dist	distance
DM	disturbed material
DB	ditch block
DG	ditch grade
Dbl	double
Dn	down
Dwg	drawing
Dr	drive
Drwy	driveway
DI	drop inlet
D	dry density
DSDS	dynamic speed display sign
Ea	each
Esmt	easement
E	East
EB	Eastbound
Elast	elastomeric
EL	electric locker
E Mtr	electric meter
Elec	electric/al
EDM	electronic distance meter
Elev or El	elevation
Ellipt	elliptical
Emb	embankment
Emuls	emulsion/emulsified
ES	end section
Engr	engineer
ESS	environmental sensor station
Eq	equal
Eq	equation
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
F	Fahrenheit
FS	far side
F	farad
Fed	Federal
FP	feed point
Ft	feet/foot
Fn	fence
Fn P	fence post
FO	fiber optic
FB	field book
FD	field drive
F	fill
FAA	fine aggregate angularity
FS	fine sand
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
Fs	foresight

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 09/20/18 and the original document is stored at the North Dakota Department of Transportation

NDDOT ABBREVIATIONS

D-101-2

Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser
FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed
Gal	gallon
Galv	galvanized
Gar	garage
Gs L	gas line
G Reg	gas line regulator
GMV	gas main valve
G Mtr	gas meter
GSV	gas service valve
GVP	gas vent pipe
GV	gate valve
Ga	gauge
Geod	geodetic
GIS	Geographical Information System
G	giga
GPS	Global Positioning System
Gov	government
Grd	graded/grade
Gr	gravel
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ha	hectare
Ht	height
HI	height of instrument
Hel	helical
H	henry
Hz	hertz
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
HMA	hot mix asphalt
Hr	hour(s)
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
In or "	inch
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IM	iron monument
I Pn	Iron Pin
IP	iron Pipe
Jt	joint
J	joule
Jct	junction
K	kelvin
Kn	kilo newton
Kpa	kilo pascal
Kg	kilogram
Kg/m3	kilogram per cubic meter
Km	kilometer
K	Kip(s)
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
Ln	lane
Lg	large
Lat	latitude
Lt	left
L	length of curve
Lens	lenses
Lvl	level
LB	level book
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Lig Co	lignite coal
Lig Sl	lignite slack
LF	linear foot
Liq	liquid
LL	liquid limit
L	litre
Lm	loam
Loc	location
LC	long chord
Long.	longitude
Lp	loop
LD	loop detector
Lm	lumen
Lum	luminaire
L Sum	lump sum
Lx	lux
Mb	mailbox
ML	main line
M Hr	man hour
MH	manhole
Mkd	marked
Mkr	marker
Mkg	marking
MA	mast arm
Matl	material
Max	maximum
MC	meander corner
Meas	measure
Mdn	median
MD	median drain
MC	medium curing
M	mega
Mer	meridian
M	meter
M/s	meters per second
M	mid ordinate of curve
MGS	Midwest Guardrail System
Mi	mile
MM	mile marker
MP	mile post
Ml	milliliter
Mm	millimeter
Mm/hr	millimeters per hour
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Mun	municipal
N	nano
NGS	National Geodetic Survey
NS	near side
Neop	neoprene
Ntwk	network
N	newton
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number
Obsc	obscure(d)
Obsn	observation
Ocpd	occupied
Ocpy	occupy
Off Loc	office location
O/s	offset
OC	on center
C	one dimensional consolidation
OC	organic content
Orig	original
O To O	out to out
OD	outside diameter
OH	overhead
PMT	pad mounted transformer
Pg	pages
Pntd	painted
Pr	pair
Pnl	panel
Pk	park
PK	Parker-Kalon nail
Pa	pascal
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal
Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
P Cap	plastic cap
Pl or ℙ	plate
Pt	point
PCC	point of compound curve
PC	point of curve
PI	point of intersection
PRC	point of reverse curvature
PT	point of tangent
POC	point on curve
POT	point on tangent
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
Lb or #	pounds
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd or Pref	preformed
Prep	preperation
Press.	pressure

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT ABBREVIATIONS

D-101-3

PRV	pressure relief valve
Prestr	prestressed
Pvt	private
PD	private drive
Prod.	production/produce
Prog	programmed
Prop.	property
Prop Ln	property line
Ppsd	proposed
PB	pull box
Qty	quantity
Qtr	quarter
Rad or R	radius
RR	railroad
Rlwy	railway
Rsd	raised
RTP	random traverse point
Rge or R	range
RC	rapid curing
Rec	record
Rcy	recycle
RAP	recycled asphalt pavement
RPCC	recycled portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
RP	reference point
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCFES	reinforced concrete flared end section
RCTES	reinforced concrete traversable end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
Reinf	reinforcement
Res	reservation
Rs	residence
Ret	retaining
Rev	reverse
Rt	right
R/W	right of way
Riv	river
Rd	road
Rdbd	road bed
Rdwy	roadway
RWIS	roadway weather information system
Rk	rock
Rt	route
Salv	salvage(d)
Sd	sand
Sdy Cl	sandy clay
Sdy Cl Lm	sandy clay loam
Sdy Fl	sandy fill
Sdy Lm	sandy loam
San	sanitary sewer line
Sc	scoria
Sec	seconds
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sh	shale
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw or Sdwk	sidewalk
S	siemens
SD	sight distance
SN	sign number
Sig	signal
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam
Sgl	single
SRCP	slotted reinforced concrete pipe
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SC	spiral to curve
ST	spiral to tangent
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
SF	square feet
Km2	square kilometer
M2	square meter
SY	square yard
Stk	stake
Std	standard
N	standard penetration test
Std Specs	standard specifications
Sta	station
Sta Yd	station yards
Stm L	steam line
SEC	steel encased concrete
SMA	stone matrix asphalt
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SE	superelevation
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical
SI	systems international
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	tesla
T	thinwall tube sample
T/mi	tons per mile
Ts	topsoil
Twp or T	township
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
TB	transit book
Trans	transition
TT	transmission tower
TES	traversable end section
Trans	transverse
Trav	traverse
TP	traverse point
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
TP	turning point
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VC	vertical curve
VCP	vitrified clay pipe
V	volt
Vol	volume
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
W	watt
Wrng	wearing
Wb	weber
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner
WGS	world geodetic system
Z	zenith

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM	702 Communications
ACCENT	Accent Communications
AGASSIZ WU	Agassiz Water Users Incorporated
AGC	Assiociated General Contractors of America
All PI	Alliance Pipeline
ALL SEAS WU	All Seasons Water Users Association
AMOCO PI	Amoco Pipeline Company
AMRDA HESS	Amerada Hess Corporation
AT&T	AT&T Corporation
B PAW	Bear Paw Energy Incorporated
BAKER ELEC	Baker Electric
BASIN ELEC	Basin Electric Cooperative Incorporated
BEK TEL	Bek Communications Cooperative
BELLE PL	Belle Fourche Pipeline Company
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe Railway
BOEING	Boeing
BRNS RWD	Barnes Rural Water District
BURK-DIV ELEC	Burke-Divide Electric Cooperative
BURL WU	Burleigh Water Users
Cable One	Cable One
CABLE SERV	Cable Services
CAP ELEC	Capital Electric Cooperative Incorporat
CASS CO ELEC	Cass County Electric Cooperative
CASS RWU	Cass Rural Water Users Incorporated
CAV ELEC	Cavalier Rural Electric Cooperative
CBLCOM	Cablecom Of Fargo
CENEX PL	Cenex Pipeline
CENT PL WATER DIST	Central Pipe Line Water District
CENT PWR ELEC	Central Power Electric Cooperative
COE	Corps of Engineers
CONS TEL	Consolidated Telephone
CONT RES	Continental Resource Inc
CPR	Canadian Pacific Railway
D O E	Department Of Energy
DAK CARR	Dakota Carrier Network
DAK CENT TEL	Dakota Central Telephone
DAK RWD	Dakota Rural Water District
DGC	Dakota Gasification Company
DICKEY R NET	Dickey Rural Networks
DICKEY RWU	Dickey Rural Water Users Association
DICKEY TEL	Dickey Telephone
DNRR	Dakota Northern Railroad
DOME PL	Dome Pipeline Company
DVELEC	Dakota Valley Electric Cooperative
DVMW	Dakota, Missouri Valley & Western
ENBRDG	Enbridge Pipelines Incorporated
ENVENTIS	Enventis Telephone
FALK MNG	Falkirk Mining Company
FHWA	Federal Highway Administration
G FKS-TRL WD	Grand Forks-traill Water District
GETTY TRD & TRAN	Getty Trading & Transportation
GLDN W ELEC	Golden West Electric Cooperative
GRGS CO TEL	Griggs County Telephone
GTR RAMSEY WD	Greater Ramsey Water District
GT PLNS NAT GAS	Great Plains Natural Gas Company
HALS TEL	Halstad Telephone Company
IDEA1	Idea1
INT-COMM TEL	Inter-Community Telephone Company
KANEB PL	Kaneb Pipeline Company
KEM ELEC	Kem Electric Cooperative Incorporated
KOCH GATH SYS	Koch Gathering Systems Incorporated
LKHD PL	Lakehead Pipeline Company
LNGDN RWU	Langdon Rural Water Users Incorporated
LWR YELL R ELEC	Lower Yellowstone Rural Electric
MCKNZ CON	McKenzie Consolidated Telcom
MCKNZ ELEC	McKenzie Electric Cooperative
MCKNZ WRD	McKenzie County Water Resource District
MCLEOD	McLeod USA
MCLN ELEC	McLean Electric Cooperative
MCLN-SHRDN R WAT	McLean-Sheridan Rural Water
MDU	Montana-dakota Utilities
MID-CONT CABLE	Mid-Continent Cable
MIDSTATE TEL	Midstate Telephone Company
MINOT CABLE	Minot Cable Television
MINOT TEL	Minot Telephone Company
MISS VALL COMM	Missouri Valley Communications
MISS W W S	Missouri West Water System
MNKOTA PWR	Minnkota Power
MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative
MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative
MRE LBTY TEL	Moore & Liberty Telephone
MUNICIPAL	City Water And Sewer
MUNICIPAL	City Of '.....'
N CENT ELEC	North Central Electric Cooperative
N VALL W DIST	North Valley Water District
ND PKS & REC	North Dakota Parks And Recreation
ND TEL	North Dakota Telephone Company
NDDOT	North Dakota Department of Transportation
NDSU SOIL SCI DEPT	NDSU Soil Science Department
NEMONT TEL	Nemont Telephone
NODAK R ELEC	Nodak Rural Electric Cooperative
NOON FRMS TEL	Noonan Farmers Telephone Company
NPR	Northern Plains Railroad
NSP	Northern States Power
NTH PRAIR RW	Northern Prairie Rural Water Association
NTHN BRDR PL	Northern Border Pipeline
NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated
NTHWSTRN REF	Northwestern Refinery Company
NW COMM	Northwest Communication Cooperation
NWRWD	Northwest Rural Water District
ONEOK	Oneok gas
OSHA	Occupational Safety and Health Administration
OTTR TL PWR	Otter Tail Power Company
P L E M	Prairielands Energy Marketing
POLAR COM	Polar Communications
PVT ELEC	Private Electric
QWEST	Qwest Communications
R&T W SUPPLY	R & T Water Supply Association
RED RIV TEL	Red River Rural Telephone
RESVTN TEL	Reservation Telephone
ROBRTS TEL	Roberts Company Telephone
R-RIDER ELEC	Roughrider Electric Cooperative
RRVW	Red River Valley & Western Railroad
S CENT REG WD	South Central Regional Water District
S E W U	South East Water Users Incorporated
SCOTT CABLE	Scott Cable Television Dickinson
SHERDN ELEC	Sheridan Electric Cooperative
SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
SKYTECH	Skyland Technologies Incorporated
SLOPE ELEC	Slope Electric Cooperative Incorporated
SOURIS RIV TELCOM	Souris River Telecommunications
ST WAT COMM	State Water Commission
STATE LN WATER	State Line Water Cooperative
STER ENG	Sterling Energy
STUT RWU	Stutsman Rural Water Users
SW PL PRJ	Southwest Pipeline Project
T M C	Turtle Mountain Communications
TCI	TCI of North Dakota
TESORO HGH PLNS PL	Tesoro High Plains Pipeline
TRI-CNTY WU	Tri-County Water Users Incorporated
TRL CO RWU	Traill County Rural Water Users
UNTD TEL	United Telephone
UPPR SOUR WUA	Upper Souris Water Users Association
US SPRINT	U.S. Sprint
USAF MSL CABLE	U.S.A.F. Missile Cable
USFWS	US Fish and Wildlife Service
USW COMM	U.S. West Communications
VRNDRY ELEC	Verendrye Electric Cooperative
W RIV TEL	West River Telephone Incorporated
WEB	W. E. B. Water Development Association
WILLI RWA	Williams Rural Water Association
WILSTN BAS PL	Williston Basin Interstate Pipeline Company
WLSH RWD	Walsh Water Rural Water District
WOLVRTN TEL	Wolverton Telephone
XLENER	Xcel Energy
YSVR	Yellowstone Valley Railroad

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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04-23-18	General Revisions
09-20-18	General Revisions

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Line Styles

D-101-20

Existing Topography

- Existing Ground Void
- Existing Cemetary Boundary
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Existing Gravel Surface
- Existing Riprap
- Existing Dirt Surface
- Existing Asphalt Surface
- Existing Tie Point Line
- Existing Railroad Centerline
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Existing Fence
- Existing Railroad
- Existing Field Line
- Exst Flow
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter
- Existing 3-Cable w Posts
- Site Boundary
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Existing Tree Boundary
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Existing W-Beam Guardrail with Posts
- Existing Railroad Switch
- Gravel Pit - Borrow Area
- Existing Wet Area-Vegetation Break

Proposed Topography

- 3-Cable w Posts
- Flow
- Fence
- Remove Line
- Wall
- Retaining Wall (Plan View)
- W-Beam w Posts

Existing Utilities

- Existing Electrical
- Existing Fiber Optic Line
- Existing TV Fiber Optic
- Existing Gas Pipe
- Existing Overhead Utility Line
- Existing Power
- Existing Fuel Pipeline
- Existing Undefined Above Ground Pipe Line
- Existing Sanitary Sewer
- Existing Sanitary Force Main
- Existing Storm Drain
- Existing Storm Drain Force Main
- Existing Culvert
- Existing Telephone Line
- Existing TV Line
- Existing Water or Steam Line
- Existing Under Drain
- Existing Slotted Drain
- Existing Conduit
- Existing Conductor
- Existing Down Guy Wire Down Guy
- Existing Underground Vault or Lift Station

Proposed Utilities

- 24 Inch Pipe
- Reinforced Concrete Pipe
- Under Drain
- Edge Drain

Traffic Utilities

- Conductor
- Fiber Optic
- Existing Loop Detector
- Existing Double Micro Loop Detector
- Micro Loop Detector Double
- Existing Micro Loop Detector
- Micro Loop Detector
- Signal Head with Mast Arm
- Existing Signal Head with Mast Arm

Sign Structures

- Existing Overhead Sign Structure
- Existing Overhead Sign Structure Cantilever
- Overhead Sign Structure Cantilever

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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09-23-16	Added and Revised Items, Organized by Functional Groups

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Line Styles

D-101-21

Right Of Way

- Easement
- Existing Easement
- Right of Way
- Existing Right of Way
- Existing Right of Way Railroad
- Existing Right of Way Not State Owned
- Existing Government Lot Line
- Existing Adjacent Block Lines
- Existing Adjacent Lot Lines
- Existing Adjacent Property Line
- Existing Adjacent Subdivision Lines
- Sight Distance Triangle Line
- Dimension Leader

Boundary Control

- Existing City Corporate Limits or Reservation Boundary
- Existing State or International Line
- Existing Township
- Existing County
- Existing Section Line
- Existing Quarter Section Line
- Existing Sixteenth Section Line
- Existing Centerline
- Tangent Line

Cross Sections and Typicals

- Existing Ground
- Existing Topsoil (Cross Section View)
- Existing Ground Void (Not Surveyed) (void — void — void — v)
- Existing Concrete
- Existing Aggregate (Cross Section View)
- Existing Curb and Gutter (Cross Section View)
- Existing Asphalt (Cross Section View)
- Existing Reinforcement Rebar

Geotechnical

- Geotextile Fabric Type D (D — D)
- Geogrid (Geo — Geo)
- Geotextile Fabric Type R (R — R)
- Geotextile Fabric Type R1 (R — R)
- Geotextile Fabric Type RR (RR — RR)
- Geotextile Fabric Type S (S — S)
- Subgrade Reinforcement
- Failure Line

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

- Centerline Pavement Marking
- Barrier with Centerline Pavement Marking
- Barrier Pavement Marking
- Stripe 4 IN Dotted Extension White
- Stripe 8 IN Dotted Extension White
- Stripe 8 IN Lane Drop

Pavement Joints

- Doweled Joint
- Tie Bar 30 Inch 4 Foot Center to Center
- Tie Bar 18 Inch 3 Foot Center to Center
- Tie Bar at Random Spacing

Bridge Details

- Hidden Object
- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Centerline Main
- Centerline
- Existing Ground (Details)
- Existing Conditions
- Sheet Piling

Erosion Control

- Limits of Const Transition Line
- Bale Check
- Rock Check
- Floating Silt Curtain (S — S)
- Silt Fence (SF — SF)
- Excavation Limits
- Fiber Rolls

Environmental

- Wetland Mitigation
- Existing Wetland Easement USFWS
- Existing Wetland Jurisdictional
- Existing Wetland
- Tree Row

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
09-23-16	Added and Revised Items, Organized by Functional Groups

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930, on 09/23/16 and the original document is stored at the North Dakota Department of Transportation

Symbols

D-101-30

North Arrow (Half Scale)

Truck Mounted Attenuator

Type I Barricade

Type II Barricade

Type III Barricade

Catch Basin

Cairn or Stone Circle

Video Detection Camera

Storm Drain Cap or Stub

Corrugated Metal End Section 18 Inch

Corrugated Metal End Section 24 Inch

Corrugated Metal End Section 30 Inch

Corrugated Metal End Section 36 Inch

Corrugated Metal End Section 42 Inch

Corrugated Metal End Section 48 Inch

Concrete Foundation

Ground Connection Conductor

Neutral Connection Conductor

Phase 1 Connection Conductor

Phase 2 Connection Conductor

Traffic Cone

Signal Controller

Pad Mounted Signal Controller

Alignment Data Point

Emergency Vehicle Detector

Attenuation Device

Diamond Grade Delineator Type A

Diamond Grade Delineator Type B

Diamond Grade Delineator Type C

Diamond Grade Delineator Type D

Diamond Grade Delineator Type E

Flexible Delineator

Flexible Delineator Type A

Flexible Delineator Type B

Flexible Delineator Type C

Flexible Delineator Type D

Flexible Delineator Type E

Delineator Type A

Delineator Type A Reset

Delineator Type B

Delineator Type B Reset

Delineator Type C

Delineator Type D

Delineator Type E

Delineator Drums

Spot Elevation

Existing Access Control Arrow

Existing Artifact

Existing Flashing Beacon

Existing Benchmark

Existing Railroad Battery Box

Existing Bush or Shrub

Existing Gas Cap or Stub

Existing Sanitary Cap or Stub

Existing Storm Drain Cap or Stub

Existing Water Cap or Stub

Existing Sanitary Cleanout

Existing Concrete Foundation

Existing Traffic Signal Controller

Existing Pad Mounted Signal Controller

Existing Sixteenth Section Corner

Existing Quarter Section Corner

Existing Section Corner

Existing Railroad Crossbuck

Existing Satellite Dish

Existing Fuel Dispensers

Existing Flexible Delineator Type A

Existing Flexible Delineator Type B

Existing Flexible Delineator Type C

Existing Flexible Delineator Type D

Existing Flexible Delineator Type E

Existing Delineator Type A

Existing Delineator Type B

Existing Delineator Type C

Existing Delineator Type D

Existing Delineator Type E

Existing EFB Misc

Existing Flashing Beacon

Existing Pipe Mounted Flasher

Existing Pad Mounted Feed Point

Existing Pipe Mounted Feed Point with Pad

Existing Pole Mounted Feed Point

Existing Railroad Frog

Existing Snow Gate 18

Existing Snow Gate 28

Existing Snow Gate 40

Existing Headwall

Existing Pedestrian Head with Number

Existing Signal Head

Existing Sprinkler Head

Existing Fire Hydrant

Existing Catch Basin Drop Inlet

Existing Curb Inlet

Existing Manhole Inlet

Existing Junction Box

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 07/01/14 and the original document is stored at the North Dakota Department of Transportation

Symbols

D-101-31

- Existing Light Standard
- Existing High Mast Light Standard 10 Luminaire
- Existing High Mast Light Standard 3 Luminaire
- Existing High Mast Light Standard 4 Luminaire
- Existing High Mast Light Standard 5 Luminaire
- Existing High Mast Light Standard 6 Luminaire
- Existing High Mast Light Standard 7 Luminaire
- Existing High Mast Light Standard 8 Luminaire
- Existing High Mast Light Standard 9 Luminaire
- Existing Overhead Sign Structure Load Center
- Existing Luminaire
- Existing Light Standard Luminaire
- Existing Federal Mailbox
- Existing Private Mailbox
- Existing Meander Section Corner
- Existing Meter
- Existing Electrical Manhole
- Existing Gas Manhole
- Existing Sanitary Manhole
- Existing Sanitary Force Main Manhole
- Existing Sanitary Manhole with Valve
- Existing Storm Drain Manhole
- Existing Force Main Storm Drain Manhole
- Existing Force Main Storm Drain Manhole with Valve
- Existing Telephone Manhole
- Existing Manhole with Valve Water
- Existing Water Manhole
- Existing Mile Post Type A
- Existing Mile Post Type B
- Existing Mile Post Type C
- Existing Reference Marker
- Existing RW Marker
- Existing Utility Marker
- Iron Monument Found
- Iron Pin R/W Monument
- Existing Object Marker Type I
- Existing Object Marker Type II
- Existing Object Marker Type III
- Existing Electrical Pedestal
- Existing Telephone Pedestal
- Existing Fiber Optic Telephone Pedestal
- Existing TV Pedestal
- Existing Fiber Optic TV Pedestal
- Existing Fuel Filler Pipes
- Existing Traverse PI Aerial Panel
- Existing Pole
- Existing Power Pole
- Existing Power Pole with Transformer
- Existing Telephone Pole
- Existing Wood Pole
- Existing Post
- Existing Pedestrian Push Button Post
- Existing Control Point CP
- Existing Control Point GPS-RTK
- Existing Control Point TRI
- Existing Reference Marker Point NGS
- Existing Pull Box
- Existing Intelligent Transportation Pull Box
- Existing Water Pump
- Existing Slotted Reinforced Concrete Pipe
- Existing RR Profile Spot
- Existing Fuel Leak Sensors
- Existing Highway Sign
- Existing Miscellaneous Spot
- Existing Lighting Standard Pole
- Existing Traffic Signal Standard
- Existing Transformer
- Existing Large Evergreen Tree
- Existing Small Evergreen Tree
- Existing Large Tree
- Existing Small Tree
- Existing Tree Trunk
- Existing Pad Mounted Traffic Signal Control Box
- Existing Undefined Manhole
- Existing Undefined Pull Box
- Existing Undefined Pedestal
- Existing Undefined Valve
- Existing Undefined Pipe Vent
- Existing Gas Valve
- Existing Water Valve
- Existing Fuel Pipe Vent
- Existing Gas Pipe Vent
- Existing Sanitary Pipe Vent
- Existing Storm Drain Pipe Vent
- Existing Water Pipe Vent
- Existing Weather Station
- Existing Ground Water Well Bore Hole
- Existing Windmill or Tower
- Existing Witness Corner
- Flashing Beacon
- Flagger
- Pipe Mounted Flasher
- Sanitary Force Main with Valve

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 07/01/14 and the original document is stored at the North Dakota Department of Transportation

Symbols

D-101-32

- Pad Mounted Feed Point
- Pipe Mounted Feed Point with Pad
- Pole Mounted Feed Point
- Headwall
- Double Headwall with Vegitation Barrier
- Single Headwall with Vegitation Barrier
- Pole Mounted Head
- Sprinkler Head
- Fire Hydrant
- Inlet Type 1
- Inlet Type 2
- Double Inlet Type 2
- Inlet Grate Type 2
- Junction Box
- High Mast Light Standard 10 Luminaire
- High Mast Light Standard 3 Luminaire
- High Mast Light Standard 4 Luminaire
- High Mast Light Standard 5 Luminaire
- High Mast Light Standard 6 Luminaire
- High Mast Light Standard 7 Luminaire
- High Mast Light Standard 8 Luminaire
- High Mast Light Standard 9 Luminaire
- Relocate Light Standard
- Overhead Sign Structure Load Center
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 175 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 200 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 250 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 310 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 50 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 70 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Manhole
- Manhole 48 Inch
- Sanitary Force Main Manhole
- Sanitary Sewer Manhole
- Storm Drain Manhole
- Storm Drain Manhole with Inlet
- Reset Mile Post
- Mile Post Type A
- Mile Post Type B
- Mile Post Type C
- Right of Way Marker
- Tubular Marker
- Alignment Monument
- Iron Pin Reference Monument
- Object Marker Type I
- Object Marker Type II
- Object Marker Type III
- Caution Mode Arrow Panel
- Back to Back Vertical Panel Sign
- Double Direction Arrow Panel
- Left Directional Arrow Panel
- Right Directional Arrow Panel
- Sequencing Arrow Panel
- Truck Mounted Arrow Panel
- Power Pole
- Wood Pole
- Pedestrian Push Button Post
- Property Corner
- Pull Box
- Intelligent Transportation Pull Box
- Sanitary Pump
- Storm Drain Pump
- Reinforced Pavement
- Reinforced Concrete End Section 15 Inch
- Reinforced Concrete End Section 18 Inch
- Reinforced Concrete End Section 24 Inch
- Reinforced Concrete End Section 30 Inch
- Reinforced Concrete End Section 36 Inch
- Reinforced Concrete End Section 42 Inch
- Reinforced Concrete End Section 48 Inch
- Reinforced Concrete End Section 54 Inch
- Reset Right of Way Marker
- Reset USGS Marker
- Right of Way Markers
- Riser 30 Inch
- Continuous Split Barrel Sample (CSB)
- Flight Auger Sample (FA)
- Split Barrel Sample (SB)
- Thinwall Tube Sample
- Highway Sign
- SNOW GATE 18 FT
- SNOW GATE 28 FT
- SNOW GATE 40 FT
- Standard Penetration Test (N)
- Transformer
- Inclinometer Tube (Incl)
- Underdrain Cleanout
- Excavation Unit
- Water Valve

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE- 2930 , on 07/01/14 and the original document is stored at the North Dakota Department of Transportation

Cross Section Legend

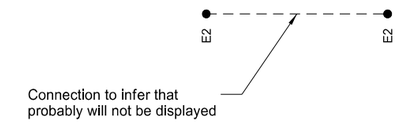
D-101-40

Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Cable Line	CBL1	CBL2
Conduit Line	CDU1	CDU2
Electric Line	E1	E2
Fiber Optic Line	F1	F2
Gas Main Line	GM1	GM2
Gas Service Line	GS1	GS2
Gas Transmission Line	GT1	GT2
Fuel Pipeline	PL1	PL2
Sanitary Sewer Force Main	SSF1	SSF2
Sanitary Sewer	SS1	SS2
Steam Line	STE1	STE2
Storm Drain (Assumed Depth)	SD1	SD2
Telephone Line	T1	T2
TV Line	TV1	TV2
Water Main Line	WM1	WM2
Water Service Line	WS1	WS2

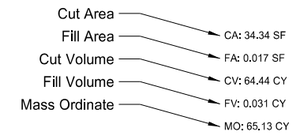
Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Overhead Power Transmission Line	OHT1	OHT2
Overhead Line	OH1	OH2

When storm drain invert elevations are NOT used to draw pipe, they will appear as shown to the left. When invert elevations are used to draw pipe, they will be a cross section similar to the graphics shown below.

* Usually the transverse utilities are shown on a cross section with 2 or more symbols. The utility runs from one symbol to the other, but the connection may not be shown.



On the right side of most cross sections there is a earthwork table. The following example (values not related to project) details the earthwork table layout.

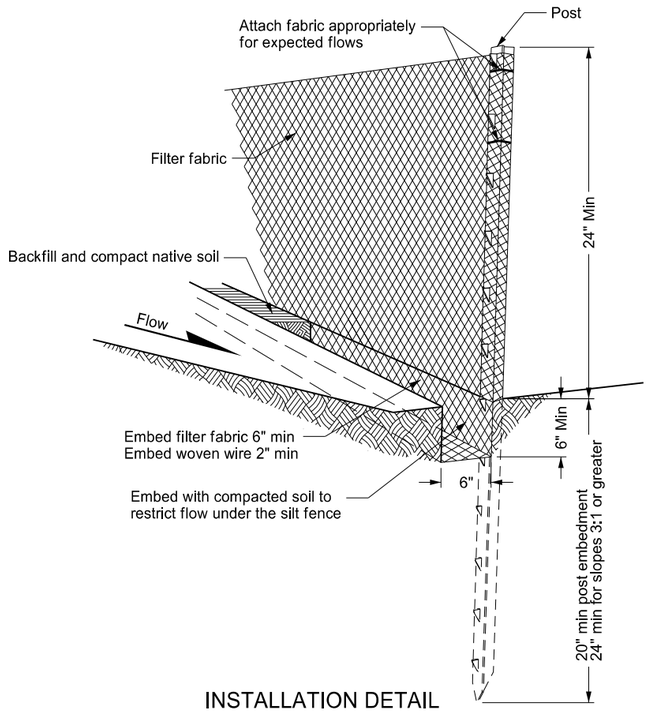


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-18	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930 on 9/20/18 and the original document is stored at the North Dakota Department of Transportation

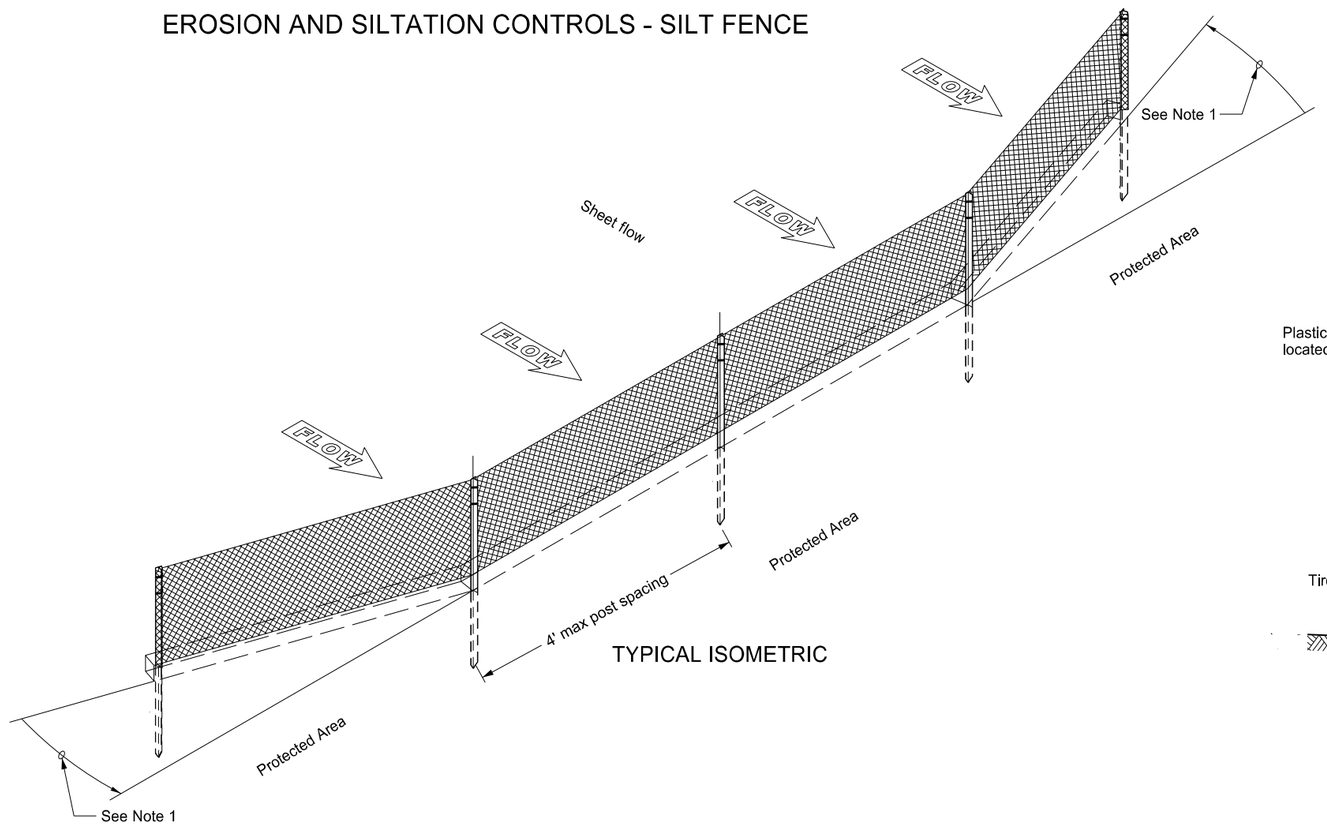
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1

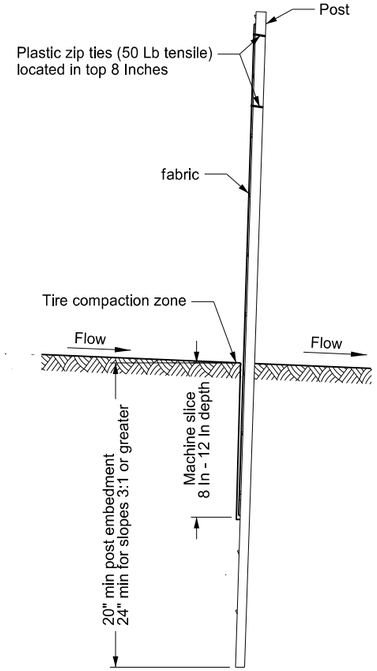


INSTALLATION DETAIL

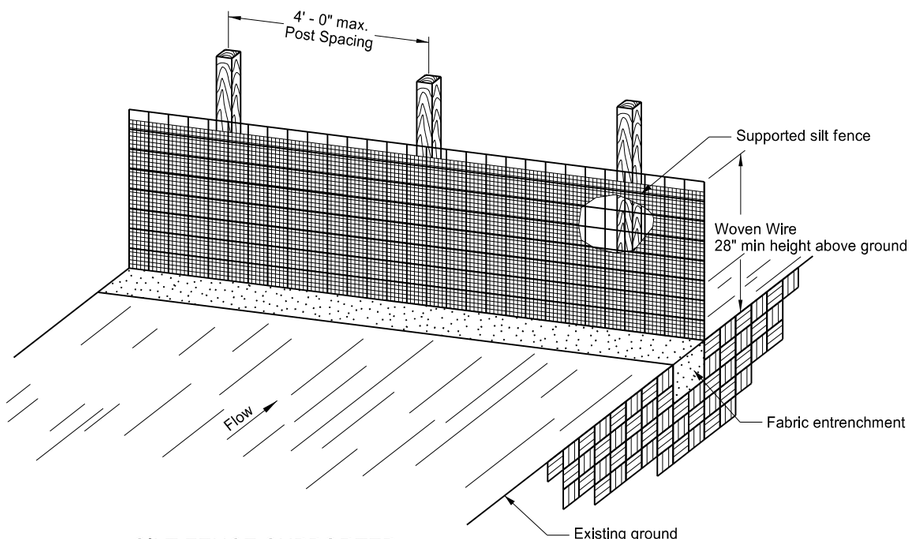
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



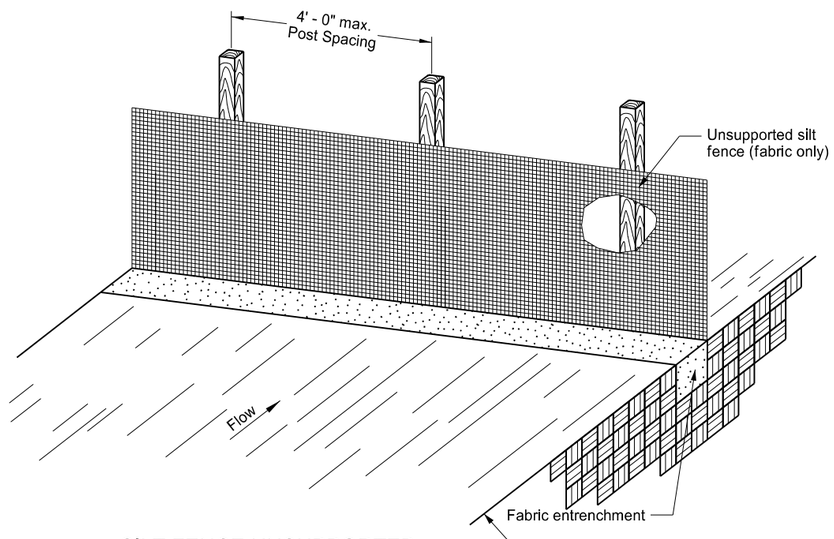
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



SILT FENCE UNSUPPORTED

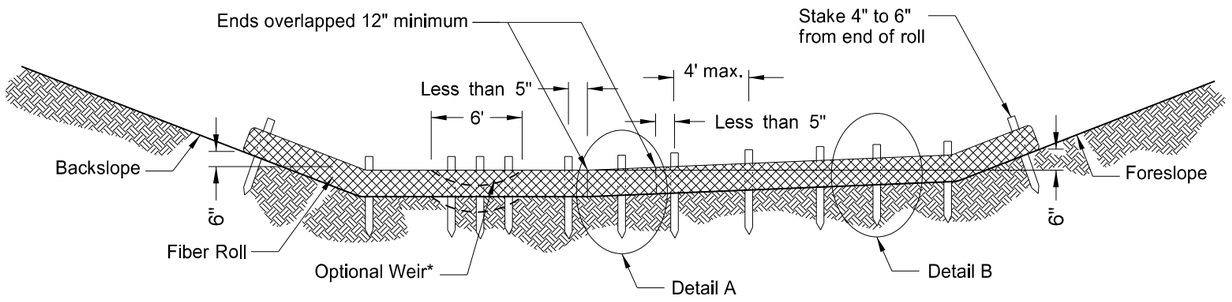
NOTES:
1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Place splices outside low spots.
3. Install silt fencing parallel to contour lines.
4. Do not embed silt fence when placed in standing water.
5. Silt fence material does not need to reach the top of woven wire support.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16 08-27-19	Revised details & added new ones. New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

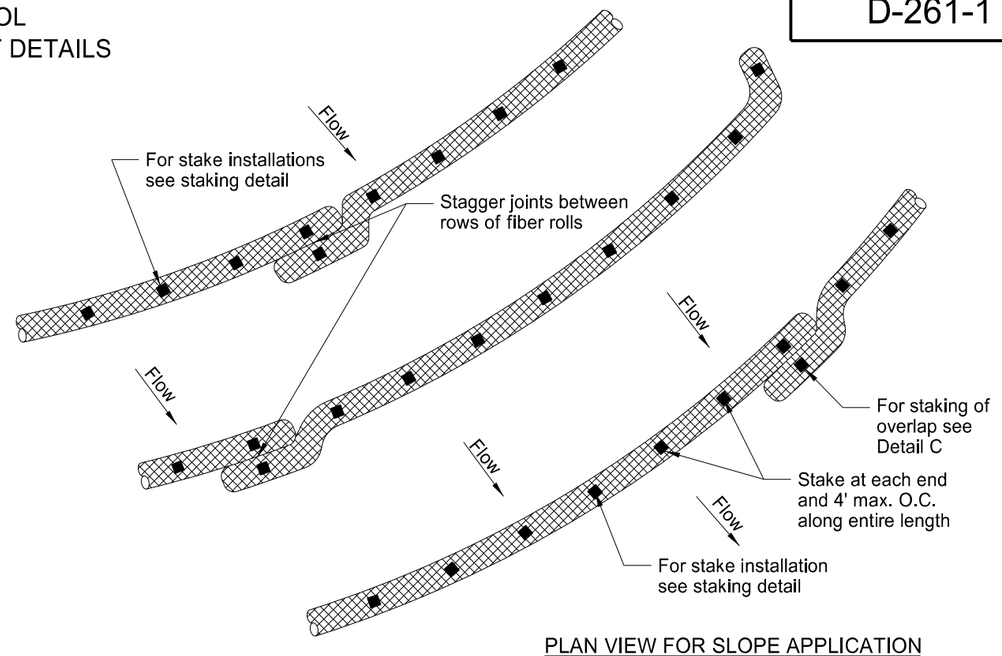
D-261-1

EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

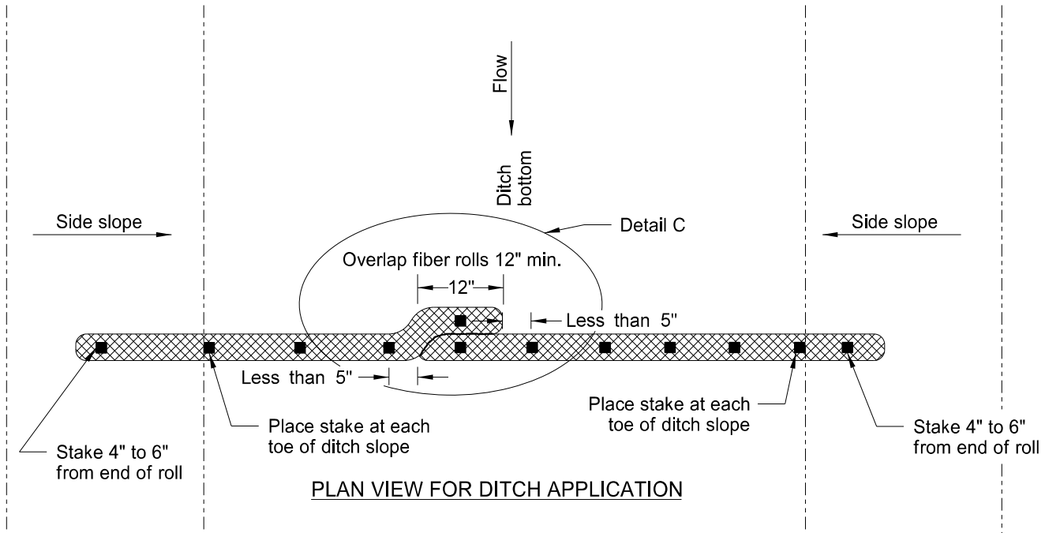


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

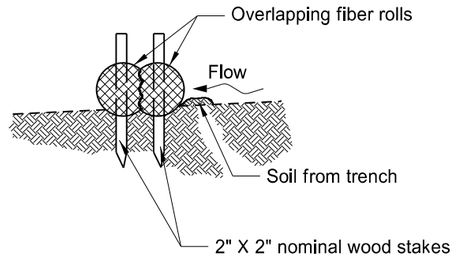
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



PLAN VIEW FOR SLOPE APPLICATION

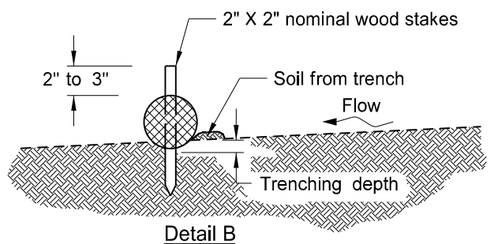


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

11-18-10

REVISIONS

DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1
08-27-19	New Design Engineer PE Stamp

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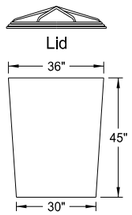
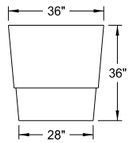
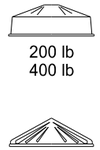
ATTENUATION DEVICE

D-704-1

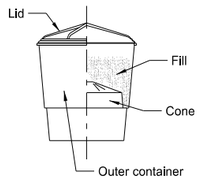




Outer Containers

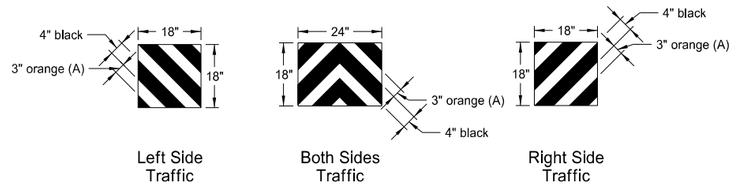


Cones



Typical Assembly

Typical Module
Construction Detail

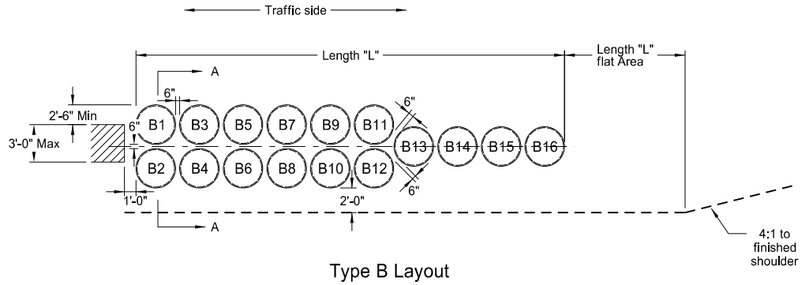


Left Side Traffic | Both Sides Traffic | Right Side Traffic

Reflective Sheet Detail

Note:
Apply Type IV reflective sheeting (as specified in the NDDOT Standard Specifications) directly to the outer container of the last attenuation device facing traffic, following the details above. Or apply the sheet to a metallic sheet and attach it to the container with approved fasteners.

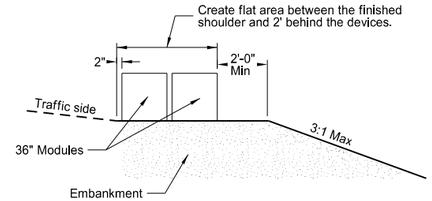
(A) Use 3" orange sheeting for temporary installations, and 3" yellow sheeting for permanent installations.



Type B Layout

Note:
Angle attenuation devices 10 degrees towards traffic when placed at piers offset from roadway.

Fill Chart					
	Module Weights (LBS)				
	200	400	700	1400	2100
Distance from top edge	8½"	5"	4"	3"	0"



Section A-A
(Type B Layout)

Type B Attenuation Device											
Module Number	Dash Number										
	75	70	65	60	55	50	45	40	35	30	25
	Module Weights (LBS)										
B1	2100										
B2	2100										
B3	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B4	2100	2100	2100	2100	2100	2100	2100	2100	2100		
B5	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B6	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B7	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B8	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400
B9	700	700	700	700	700	700	700	700	700	700	700
B10	700	700	700	700	700	700	700	700	700	700	700
B11	700	700	700	700	700	700	700	700	700	700	700
B12	700	700	700	700	700	700	700	700	700	700	700
B13	700	700	700	700	700	700	700	700	700	700	700
B14	400	400	400	400	400	400	400	400	400	400	400
B15	400	400	400	400	400	400	400	400	400	400	400
B16	200	200	200	200	200	200	200	200	200	200	200
Length (L)	34.2'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	30.7'	27.2'	27.2'
Module Weights (LBS)	Replacement Module										
2100	1	1	1	1	1	1	1	1	1		
1400	1	1	1	1	1	1	1	1	1	1	1
700	2	2	2	2	2	2	2	2	2	2	2
400	1	1	1	1	1	1	1	1	1	1	1
200	2	2	2	1	1	1	1	1	1	1	1

Notes:

1. Materials
   A) Use modules manufactured from frangible polyethylene material which shatters upon impact.
   B) Fill modules with class 43 aggregate meeting NDDOT Standard Specifications aggregate requirements. Use fill with a unit weight of at least 100 pounds per cubic foot. Use fill with a moisture content of 2% or less when left over winter.

2. Modules
   Provide modules in two sizes containing volumes of either 2, 4, 7, 14, or 21 cubic feet minimum.
   A) Provide three components for 2, 4, or 7 cubic foot module containers:
      1) A 14 C.F., yellow outer container.
      2) A black lid securely locking over the top lip of the container.
      3) A variable cone-shaped supporting insert capable of supporting 200, 400, or 700 pounds of sand mass to allow for three sizes of modules. Place cone inserts inside the 14 cubic foot container.
   B) Provide two components for the 14 cubic foot module container:
      1) A 14 C.F., yellow outer container.
      2) A black lid securely locking over the top lip of the container.
   C) Provide two components for the 21 cubic foot module container:
      1) A 36" height X 36" width yellow outer container.
      2) A black lid which locks securely over the top of the container.

3. For temporary installations use Energite or Fitch attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal modules. As an option, place attenuation devices on 3½" maximum thickness pallets to facilitate maintenance.

4. For permanent installations use Barrel Attenuation Device consisting of one-piece outer sand container modules with separate detachable lid. Energite attenuation barrels manufactured by Energy Absorption Systems of Chicago, IL, TrafFix barrels manufactured by TrafFix Devices, Inc. of San Clemente, CA, or approved equal meet these requirements.

5. The Typical Module Construction Detail and Type B Layout are based on the Energite Crash Cushion manufactured by Energy Absorption. Provide any required layouts and details from other sand filled attenuation module manufacturers which differ from those shown here.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
7-18-14	Revised sheeting in reflective sheet detail
9-27-17	Update to active voice
10-03-19	New Design Engr PE Stamp

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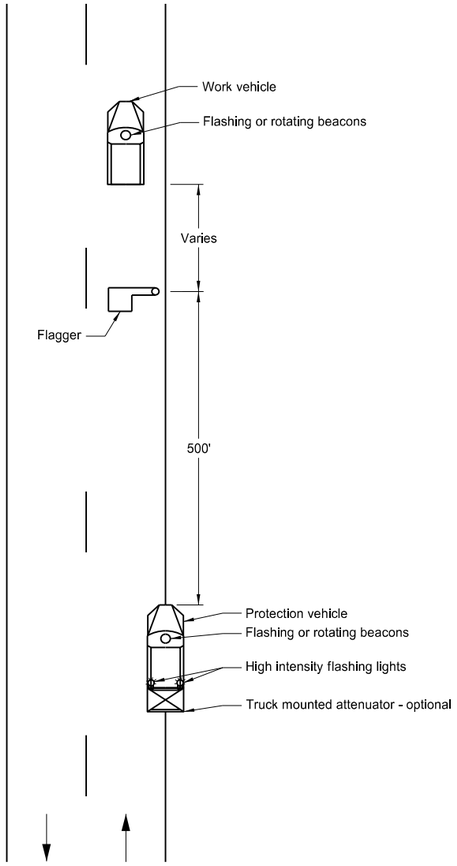
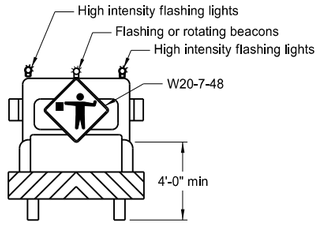
TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

D-704-2

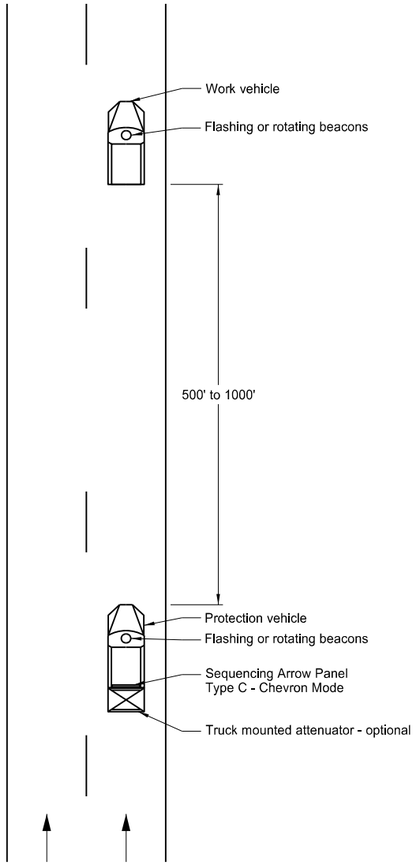
Two Lane, Two Way Roadways

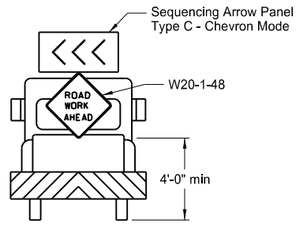




Typical Protection Vehicle

Multilane Roadways





Typical Protection Vehicle

Notes:

1. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.

2. Display a 360 degree rotating, flashing, oscillating or strobe light on the shadow vehicle. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.

3. Use these layouts during daylight hours and in areas of good visibility only.

4. Use flagger to protect the work area and warn oncoming traffic for two lane, two way roadway.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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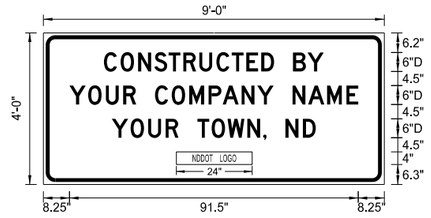
CONSTRUCTION SIGN DETAIL

D-704-5

SIGN NUMBER	G20-10-108
WIDTH x HEIGHT	9'-0" x 4'-0"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: IV Reflective
	COLOR: Fluorescent Orange
LEGEND/BORDER	TYPE: Non-Refl
	COLOR: Black

SYMBOL	X	Y	WID	HT	ANGLE
	42.1	6.2	24	4	0

STATION(S): AREA: 36.0 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITION (X)																			LENGTH	SIZE	SERIES
C	O	N	S	T	R	U	C	T	E	D		B	Y						69.7	6	D 2000
19.2	24.5	30	35.1	39.7	44.3	49.4	54.8	59.7	64.3	69	73.1	79.1	83.7								
Y	O	U	R		C	O	M	P	A	N	Y		N	A	M	E			91.5	6	D 2000
8.3	14.2	19.8	25.3	29.4	35.4	40.7	46.2	52.4	56.8	62.8	67.8	72.9	78.9	83.9	89.9	96					
Y	O	U	R		T	O	W	N	,		N	D							64.6	6	D 2000
21.7	27.6	33.2	38.7	42.8	48.8	53.3	58.4	64.6	69.6	70.7	76.7	82.2									

Notes:

1. Post mount sign a distance of ½A following the End Road Work (G20-2-48) sign (maximum 2 signs per project.)

2. Use sign on rural projects with a 30 day or longer duration (not required on seal coats or other short duration projects.)

3. Do not place sign in urban areas or within city limits.

Advance Warning Sign Spacing (A)			
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

8-22-12

REVISIONS

DATE	CHANGE
7-18-14	Revise sheeting to type IV.
9-27-17	Updated to active voice.
8-30-18	Updated sign number in note 1.
10-03-19	New Design Engineer PE Stamp.

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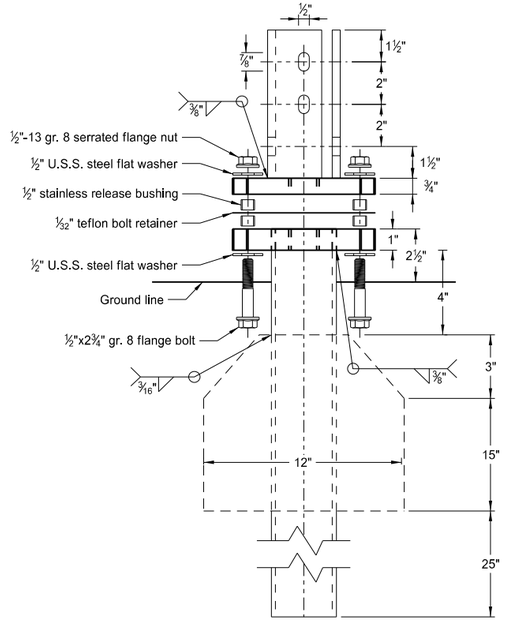
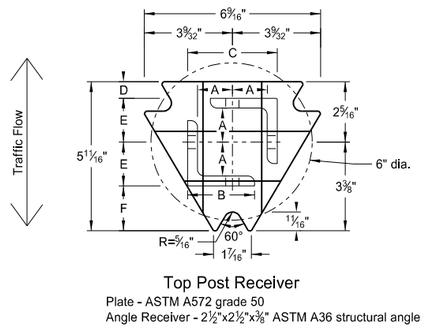
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

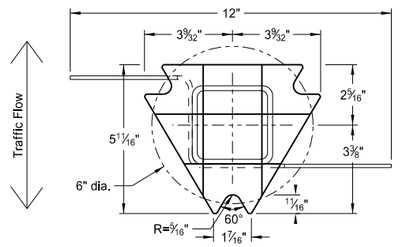


Multi-Directional
Slip Base Assembly

Perforated Tube



Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

Notes:

1. Torque slip base bolts as specified by manufacturer.
2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
4. In concrete sidewalk, use same anchor without wings.
5. Provide more than 7' between the first and fourth posts of a four post sign.

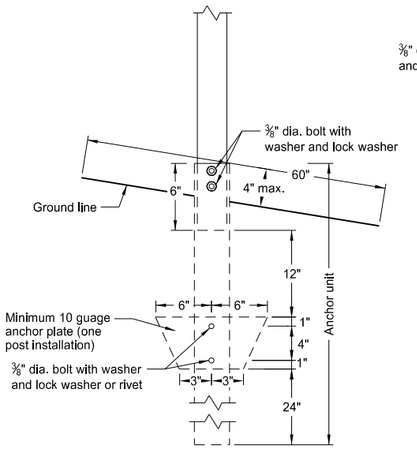
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½	12			Yes	
2	2½	12			Yes	
2	2¼	10	2	12	Yes	
2	2½	12	2¼	12	Yes	
3 & 4	2½	12			Yes	
3 & 4	2½	10			Yes	
3 & 4	2½	12	2¼	12	Yes	
3 & 4	2¼	12	2	12	Yes	
3 & 4	2½	10	2³⁄₁₆	10	Yes	

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia $in.^4$	Cross Sec. Area $in.^2$	Section Modulus $in.^3$
1½ x 1½	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
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2³⁄₁₆ x 2³⁄₁₆	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

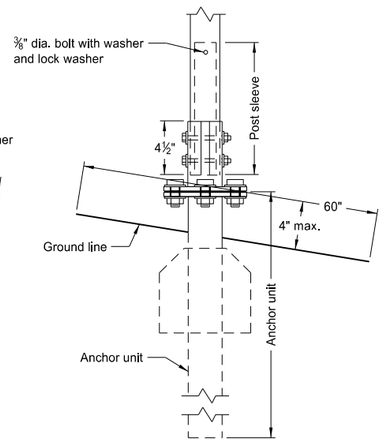
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2³⁄₁₆"x10 ga.	1⁹⁄₆₄"	2½"	3¹⁄₃₂"	25⁄₃₂"	1³³⁄₆₄"	1⅞"
2½"x10 ga.	1⁹⁄₃₂"	2½"	3⁵⁄₁₆"	⅝"	1²¹⁄₃₂"	1¾"

(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

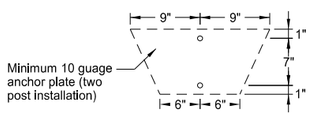
(B) For additional wind load, insert the 2³⁄₁₆"x10 ga. into 2½"x10 ga.

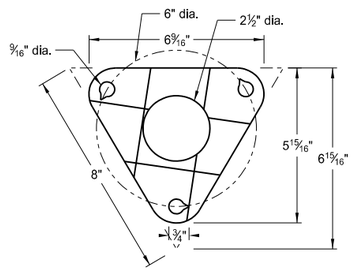


Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly





Bolt Retainer for Base Connection
Bolt Retainer- 1⁄32" Reprocessed Teflon

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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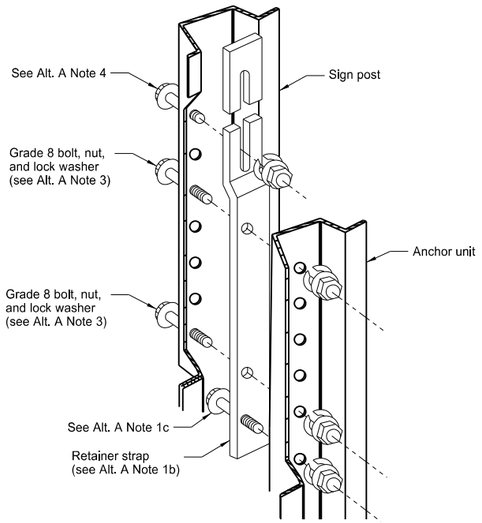
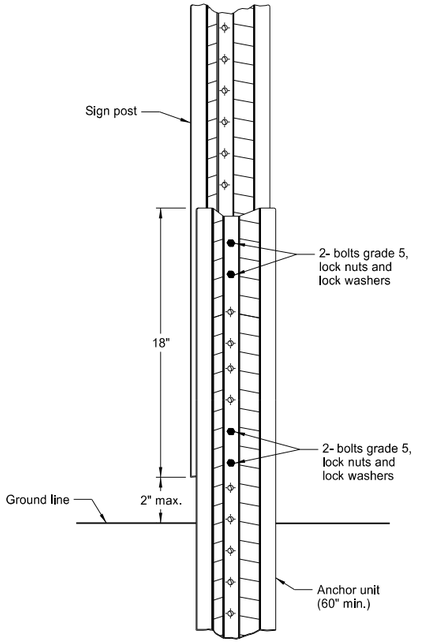
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

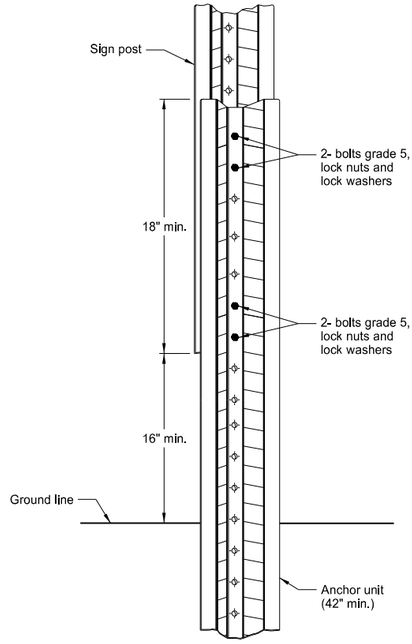


Detail A



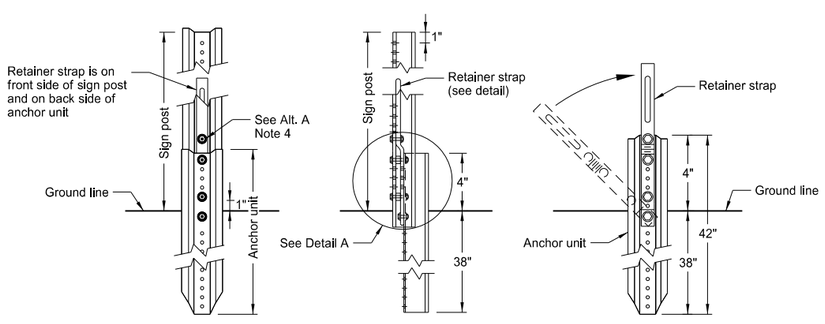
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



Breakaway U-Channel Splice Detail
Alternate C
(2.5 and 3 lb/ft)

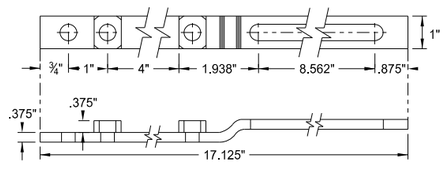
Install a maximum of 3 posts within 7'.



Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
   c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
   d) Rotate strap 90° to left.
2. a) Drive anchor unit to 4" above ground.
   b) Rotate strap to vertical position.
3. a) Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
   b) Alternately tighten two connector bolts.
4. Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
5. Properly nest base post, strap, and sign post. 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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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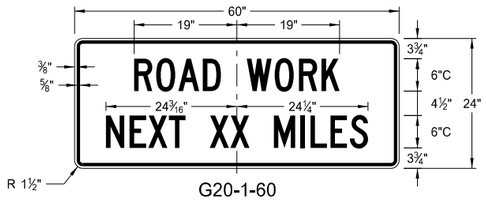
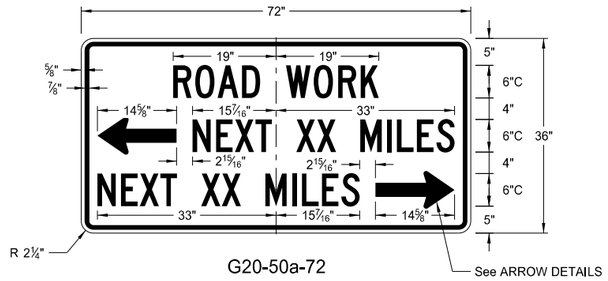
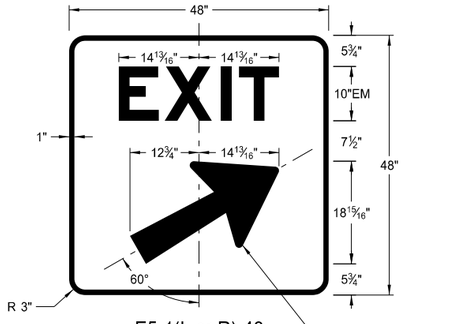
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



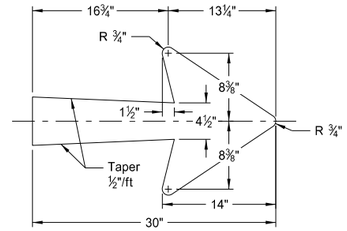
G20-1-60
Legend: black (non-refl)
Background: orange



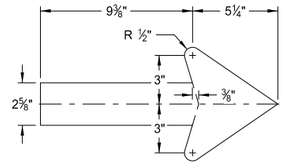
G20-50a-72
Legend: black (non-refl)
Background: orange



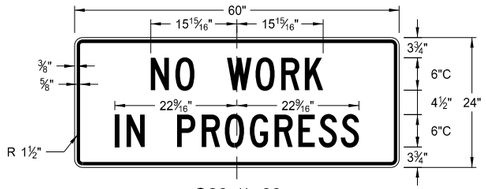
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



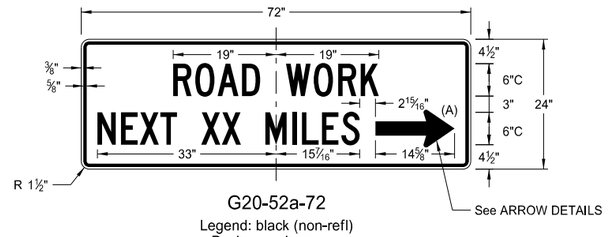
E5-1-48



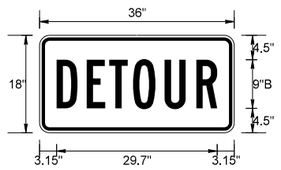
G20-50a-72
G20-52a-72



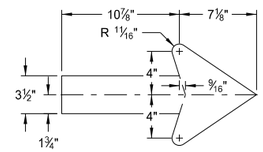
G20-1b-60
Legend: black (non-refl)
Background: orange



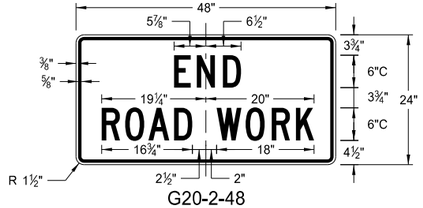
G20-52a-72
Legend: black (non-refl)
Background: orange



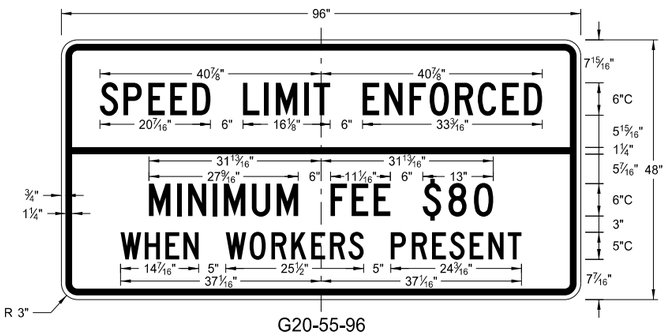
M4-8-36
Legend: black (non-refl)
Background: orange



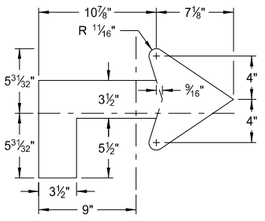
M4-9(L or R)-30
Right or Left



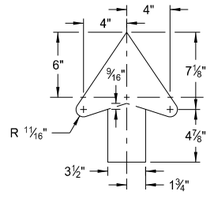
G20-2-48
Legend: black (non-refl)
Background: orange



G20-55-96
Legend: black (non-refl)
Background: orange

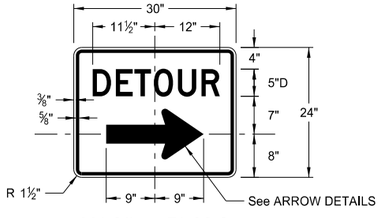


M4-9(L or R)-30
Advanced Right or Left



M4-9-30
Straight

G20-4b-36
Legend: black (non-refl)
Background: orange



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

ARROW DETAILS

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
8-17-17 10-03-19	Added sign & background color New Design Engineer PE Stamp

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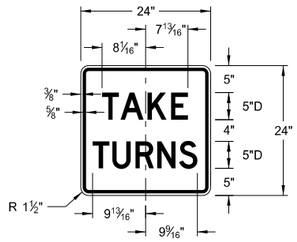
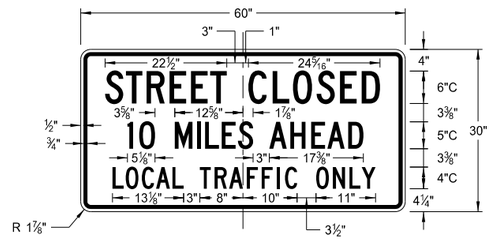
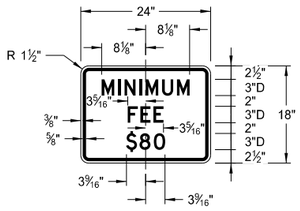
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



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



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



R2-1aP-24
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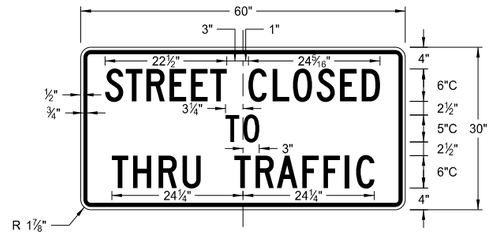
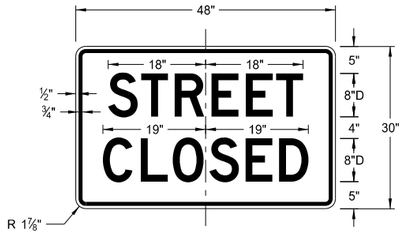
Background: white



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

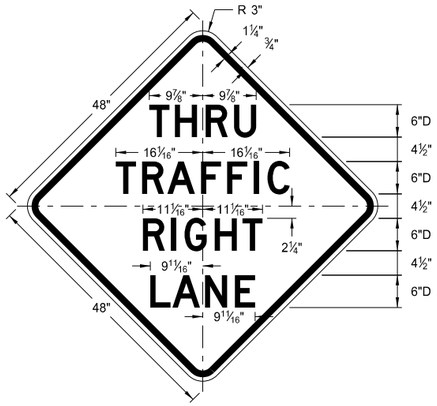


R11-2a-48
Legend: black (non-refl)
Background: white

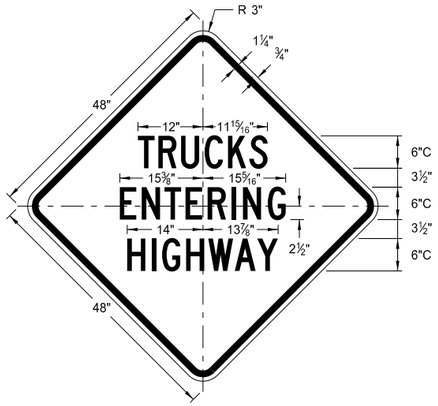
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

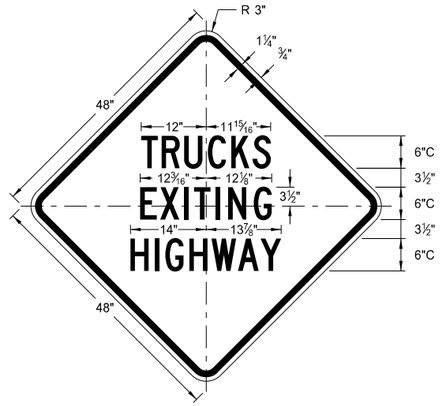
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W5-8-48
Legend: black (non-refl)
Background: orange



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



W8-56-48
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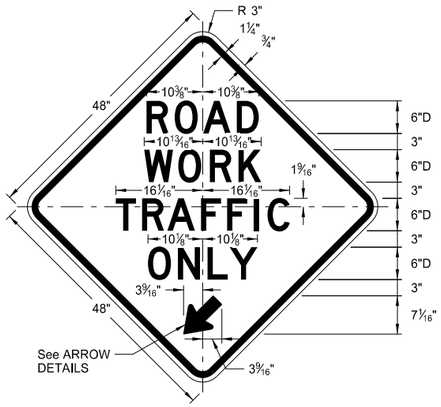
Background: orange



W5-9-48
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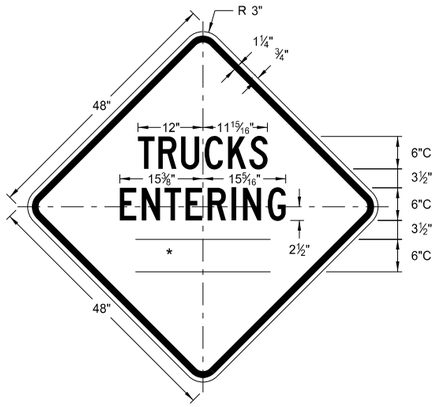
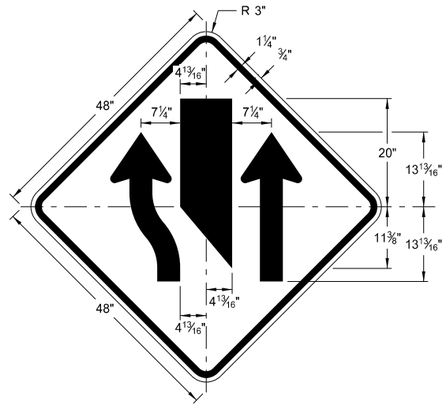
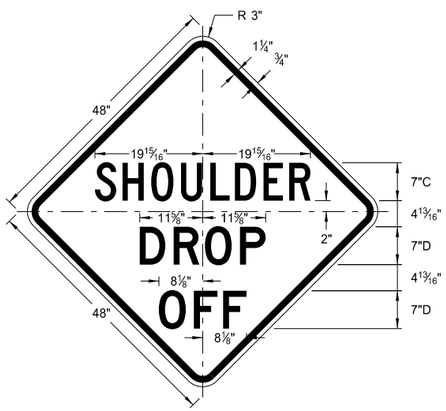
Background: orange



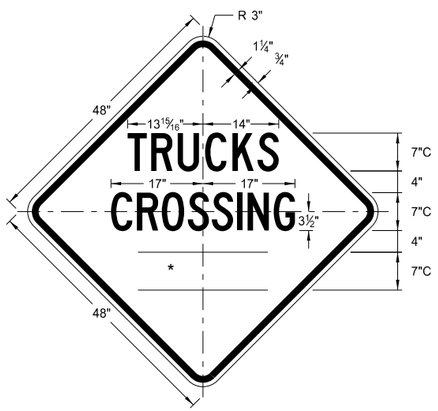
W8-54-48
Legend: black (non-refl)
Background: orange



W9-3a-48
Legend: black (non-refl)
Background: orange



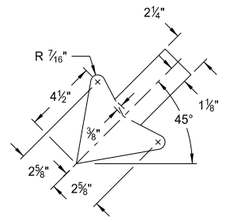
W8-9a-48
Legend: black (non-refl)
Background: orange



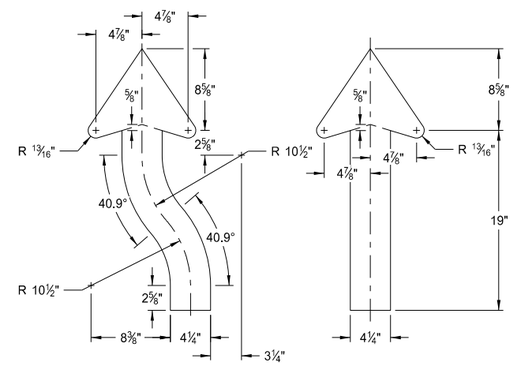
W8-55-48
Legend: black (non-refl)
Background: orange

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



W5-9-48



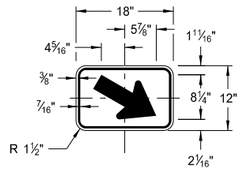
W9-3a-48

ARROW DETAILS

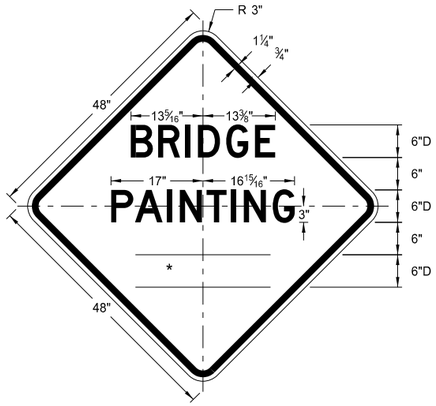
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17 5-31-18 10-03-19	Updated sign number Revised sign and arrow details New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

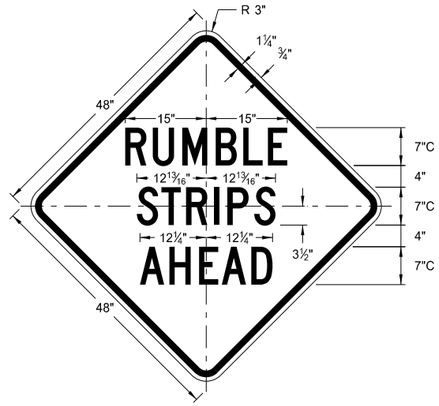
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W16-7aP-18
Legend: black (non-refl)
Background: orange



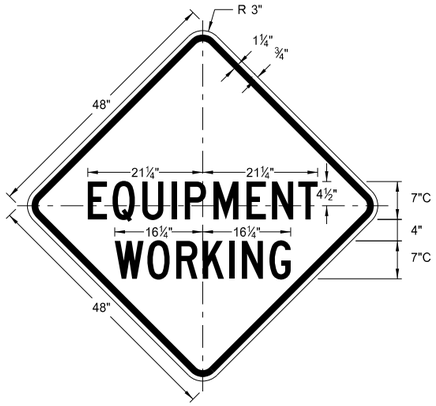
W21-50-48
Legend: black (non-refl)
Background: orange



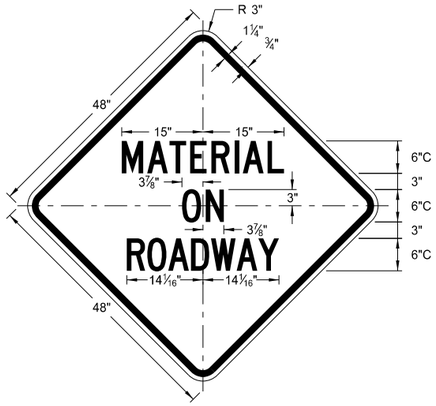
W21-53-48
Legend: black (non-refl)
Background: orange

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

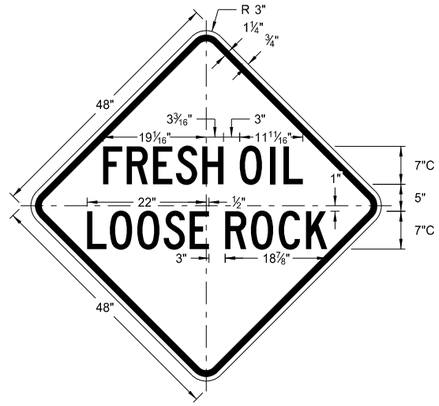
* DISTANCE MESSAGES



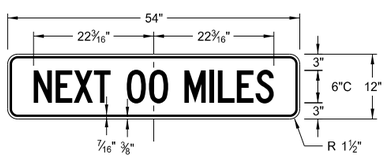
W20-51-48
Legend: black (non-refl)
Background: orange



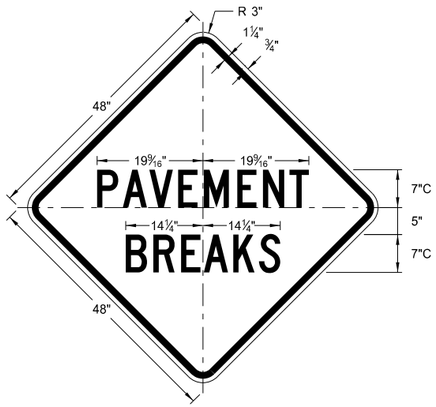
W21-51-48
Legend: black (non-refl)
Background: orange



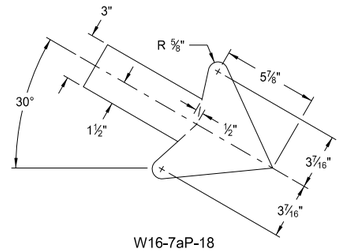
W22-8-48
Legend: black (non-refl)
Background: orange



W20-52P-54
Legend: black (non-refl)
Background: orange



W21-52-48
Legend: black (non-refl)
Background: orange



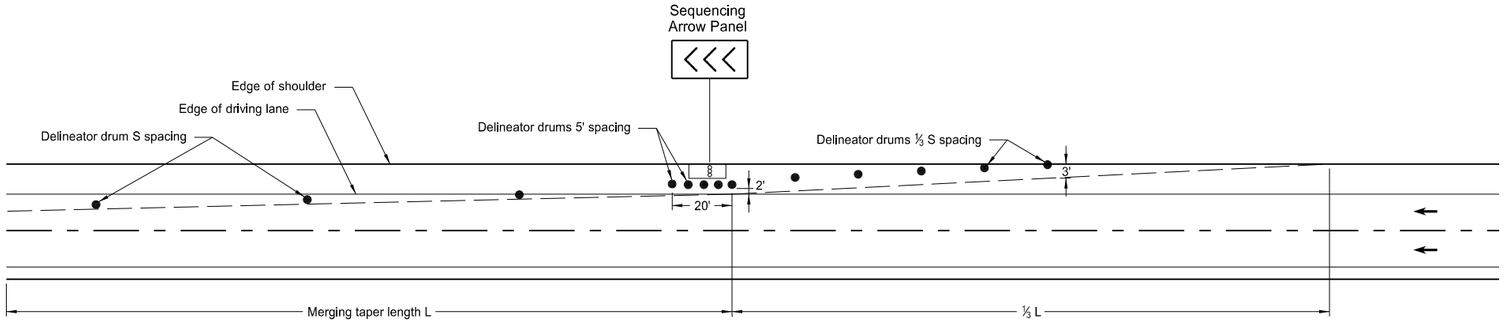
W16-7aP-18

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
5-31-18	
REVISIONS	
DATE	CHANGE
11-01-19	Added details for sign W16-7aP-18.

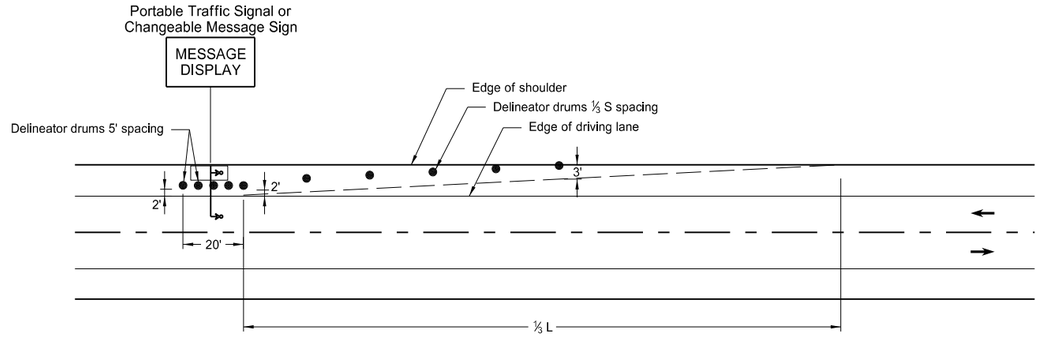
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

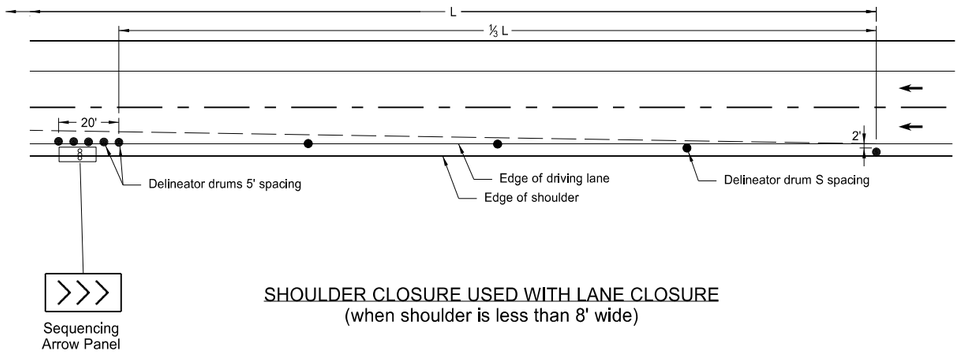
SHOULDER CLOSURE TAPERS

D-704-12



SHOULDER CLOSURE WITH LANE CLOSURE
(when shoulder is 8' or wider)





SHOULDER CLOSURE USED WITH LANE CLOSURE
(when shoulder is less than 8' wide)

PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

KEY

● Delineator Drum	∞ Sequencing Arrow Panel
° Message Display	Portable Traffic Signal

Notes:

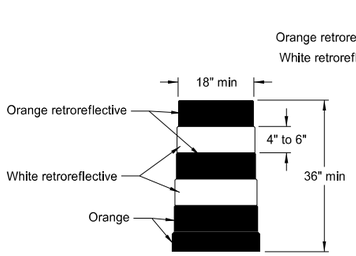
1. S = Posted Speed Limit in mph
   W = Width of offset in feet
   L = Taper length in feet
   L = $WS^2/60$ (40mph or less)
   L = WS (45mph or more)
2. If a shoulder taper is used, use a length of approximately ⅓L. If a shoulder is used as a travel lane, use a normal merging or shifting taper.
3. When paved shoulders of 8 foot width or more are closed, use channelizing devices to close shoulder in advance, to delineate beginning of work space, and to direct vehicular traffic to remain within the traveled way.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-25-19	Added L dimension to detail

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/25/19 and the original document is stored at the North Dakota Department of Transportation

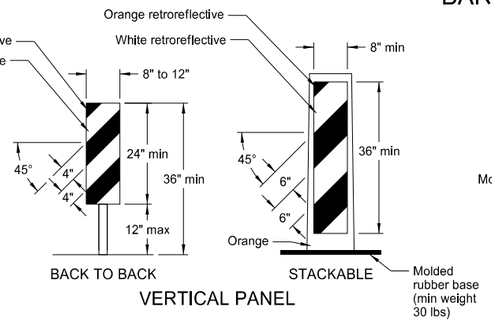
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



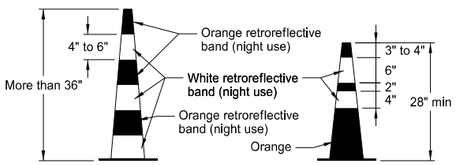
DELINEATOR DRUM

Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectorized spaces between the horizontal orange and white stripes. Avoid placement of stripes on drum ribs or indentations. Use closed top drums that will not allow collection of debris. Do not place ballast on the top of drum.



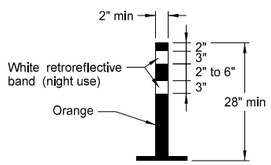
VERTICAL PANEL

Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, use a stripe width of 6 inches.



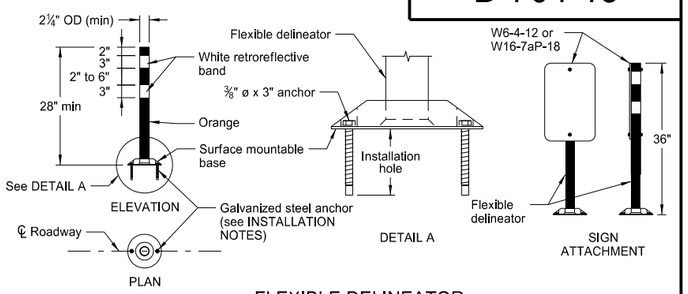
TRAFFIC CONE

Provide retroreflectorization of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectorized space between the orange and white stripes.



TUBULAR MARKER

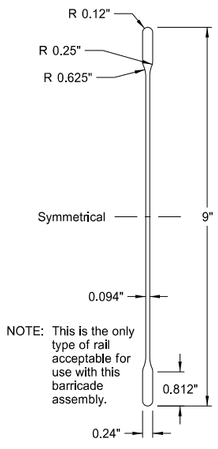
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



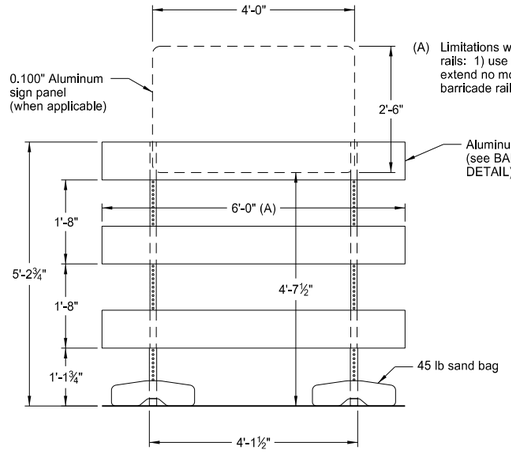
FLEXIBLE DELINEATOR

INSTALLATION NOTES:

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

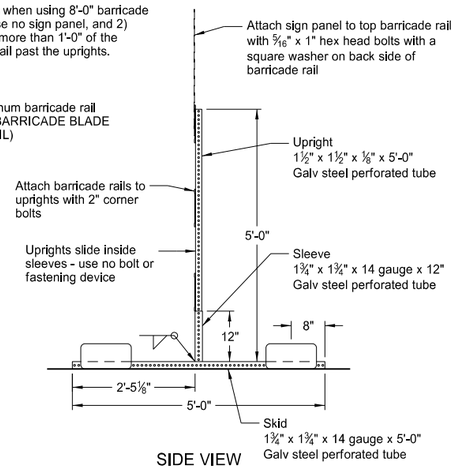


BARRICADE BLADE DETAIL



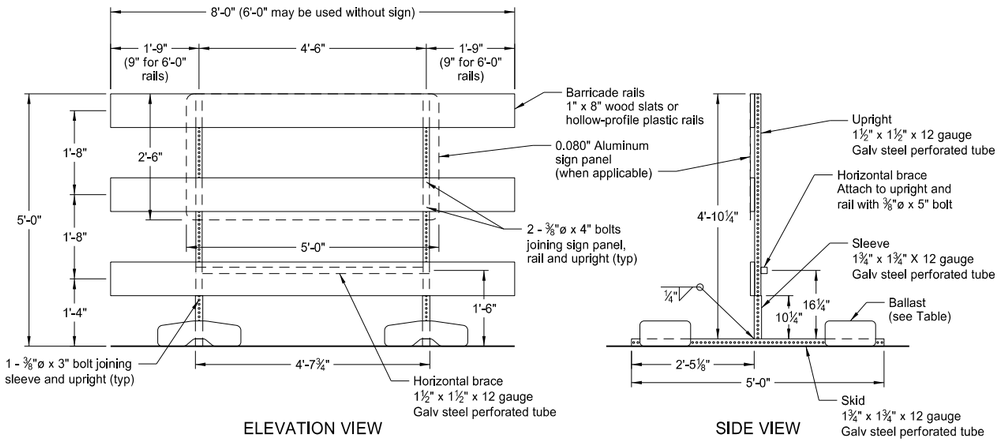
ELEVATION VIEW

(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.



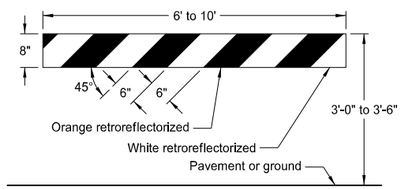
SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

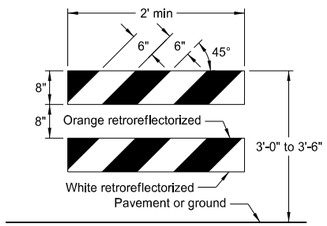


BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

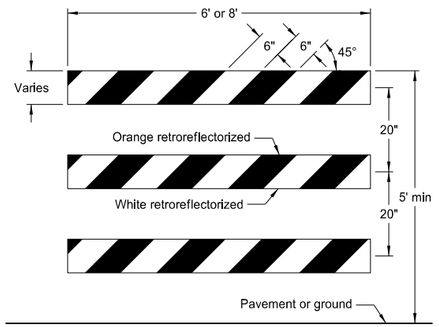
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", use a rail stripe width of 4".



TYPE I BARRICADE

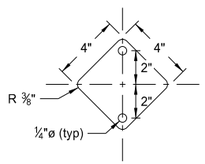


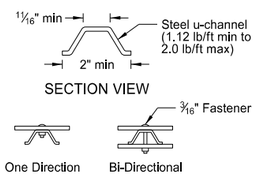
TYPE II BARRICADE

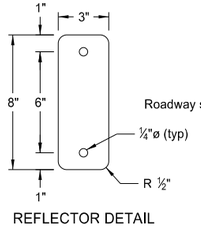


TYPE III BARRICADE

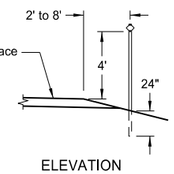
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

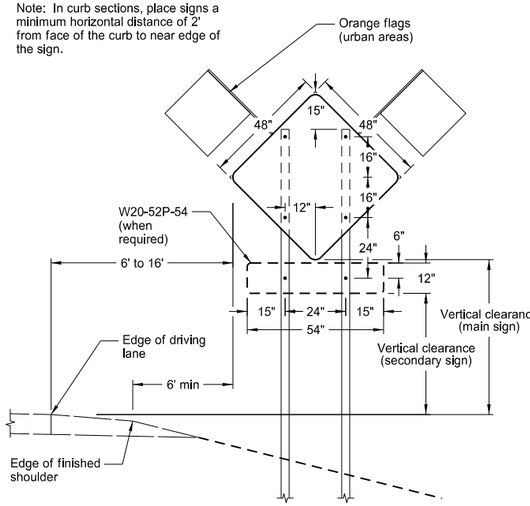
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice Revised details for Flexible Delineator

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

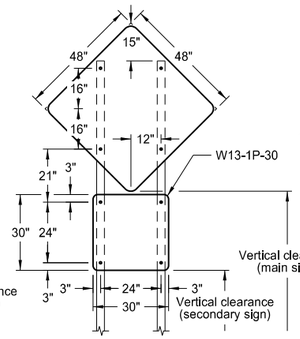
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

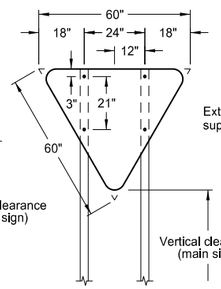
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



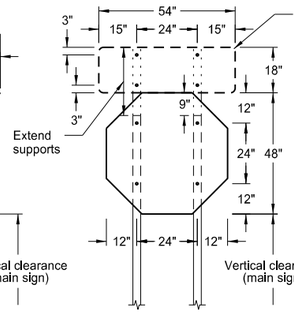
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



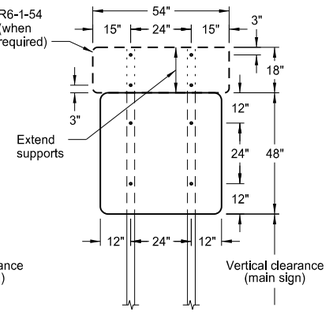
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



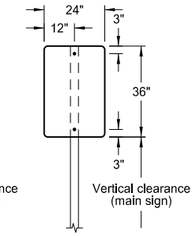
R1-2-60 - YIELD SIGN



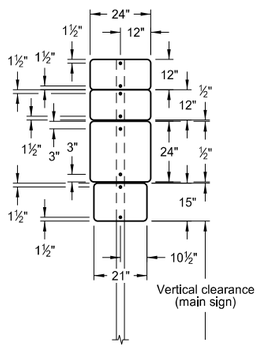
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



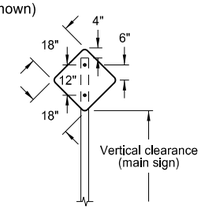
48" x 48" SIGN
(with R6-1-54 sign as required)



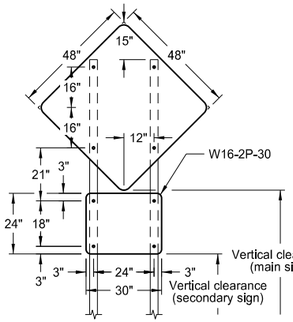
24" x 36" SIGN



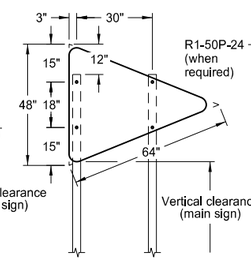
24" x 24"
ROUTE MARKER
ASSEMBLY



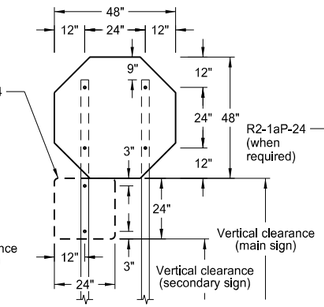
18" x 18"
DIAMOND SIGN



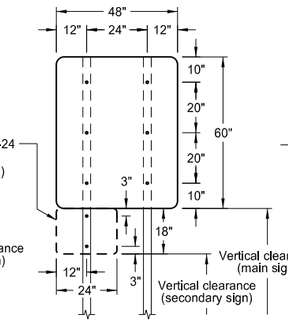
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



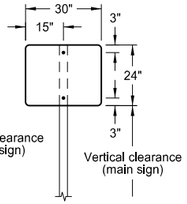
W14-3-64 - PENNANT SIGN



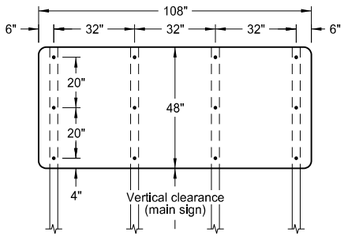
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



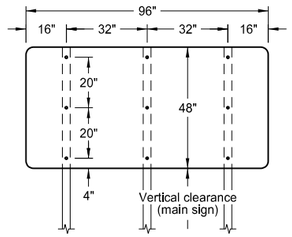
48" x 48" SIGN
(with R2-1aP-24 sign as required)



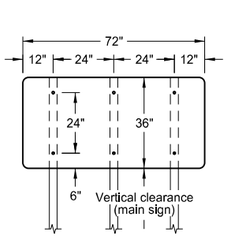
30" x 24" SIGN



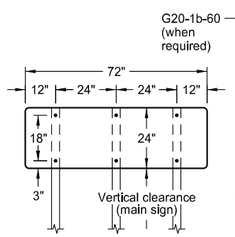
108" x 48" SIGN



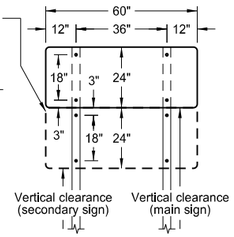
96" x 48" SIGN



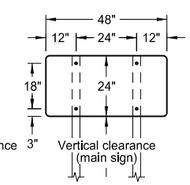
72" x 36" SIGN



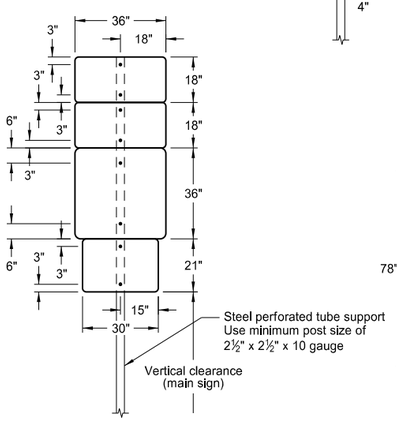
72" x 24" SIGN



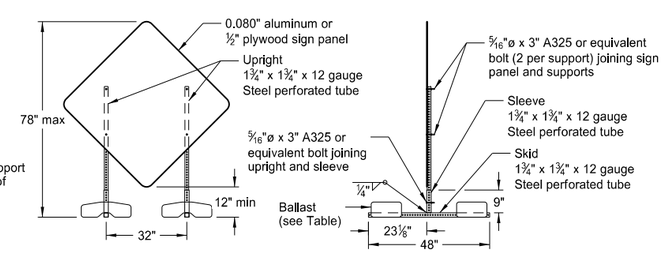
60" x 24" SIGN



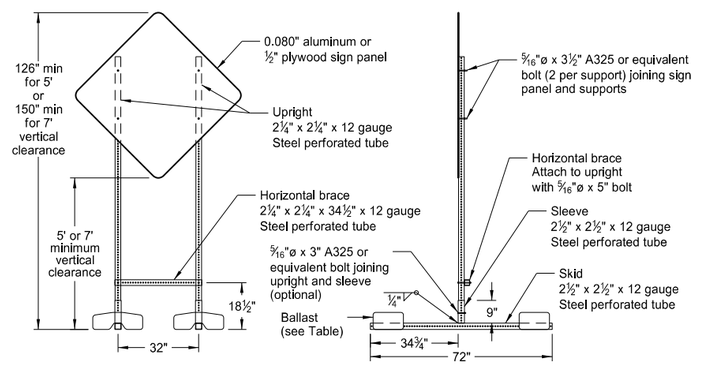
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

   Place signs over 50 square feet on 2½" x 2½" perforated tube supports as a minimum.

   Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.

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

3. Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)

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

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

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

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

   Provide a minimum clearance of 7'-0" from the ground at the post for signs with an area exceeding 50 square feet.

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

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

   Restrict signs mounted on portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT details to a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-4-13

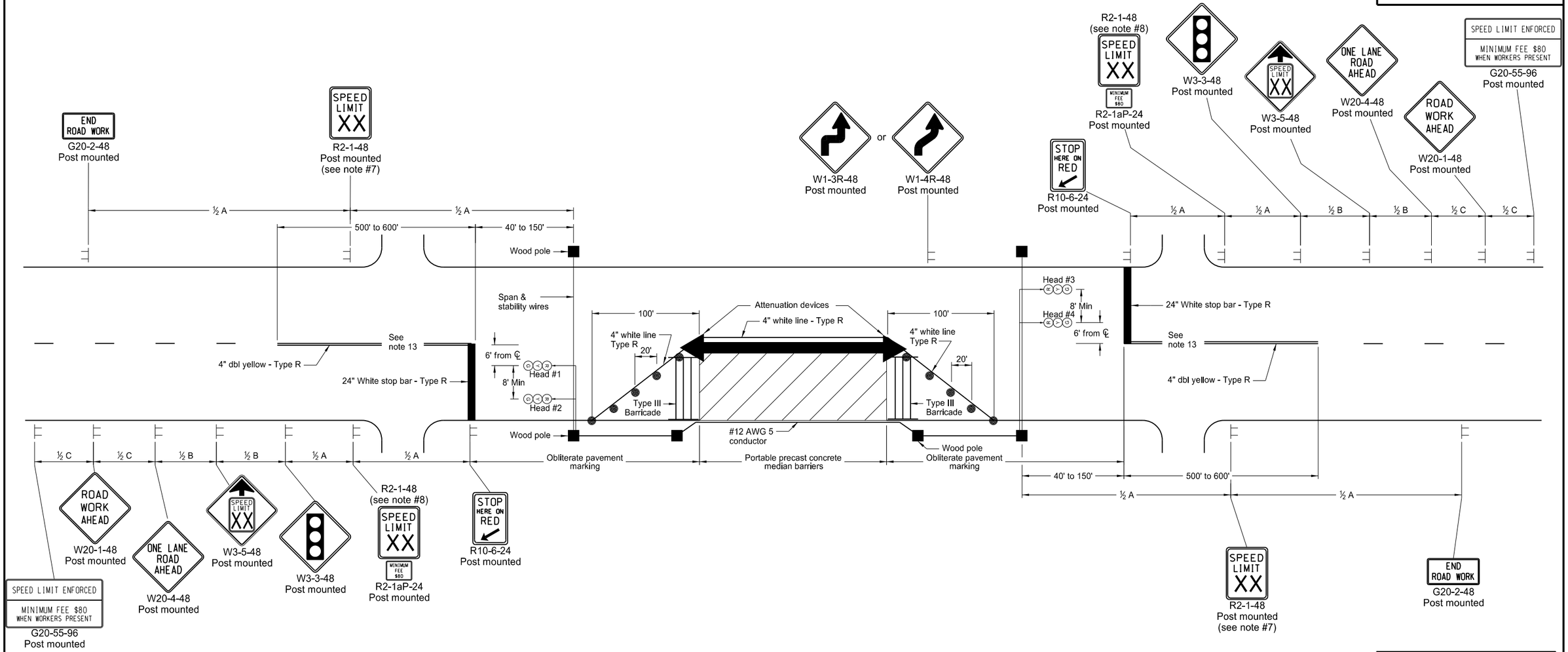
REVISIONS

DATE	CHANGE
11-14-13	Revised Note 6
9-27-17	Updated to active voice
11-01-19	Revised 60"x24" sign detail

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

LANE CLOSURE ON A TWO LANE ROAD USING TRAFFIC CONTROL SIGNALS

D-704-16



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

SUGGESTED TIMING AND SIGNAL SEQUENCE						
Heads 1 & 2	Green	Yellow	Red			
Heads 3 & 4	Red			Green	Yellow	Red
Time Cycle = 90 seconds	18.0	4.5	22.5	18.0	4.5	22.5
Percent of Cycle	20	5	25	20	5	25

Notes

1. Span conductor overhead between poles except on bridges, where it may alternately be attached and supported by the bridge structure. When conductor is supported by the bridge structure, attach conductor to avoid interference with bridge construction. Attach conductor on either side of bridge as determined by field personnel.
2. Locate controller on a wood pole in the cable run between signal heads for through traffic movements.
3. The timing schedule is suggested trial setting. Check signals in operation frequently to obtain the most efficient timing schedule.
4. Place wood poles a minimum of 16 feet from edge of driving lane. Provide a minimum 16 to 19 feet clearance from the center line of the roadway to the bottom of traffic signal heads suspended over the roadway.
5. Place traffic signal heads with 12 inch red, yellow and green lenses and 5 inch louvered backplates.
6. See standard drawing "Span Wire Mounted Traffic Signals" for interim traffic construction details.
7. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
8. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½ B.
9. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
10. Cover existing speed limit signs within a reduced speed zone.
11. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
13. Continue double yellow centerline thru private drives.
14. Sign G20-55-96 is not required if layout is part of other traffic control or if work is less than 15 days.
15. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
16. As an option, use solar powered signals instead of wood pole signal system.

KEY

- Work Area
- Type III Barricade
- Sign
- Delineator Drum
- Wood Pole

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
11-20-15	Revised Note 6. Renumbered Minimum Fee plaque.
8-17-17	Revised notes & added note
11-01-19	Revise sign Nos & pvmt mkg type

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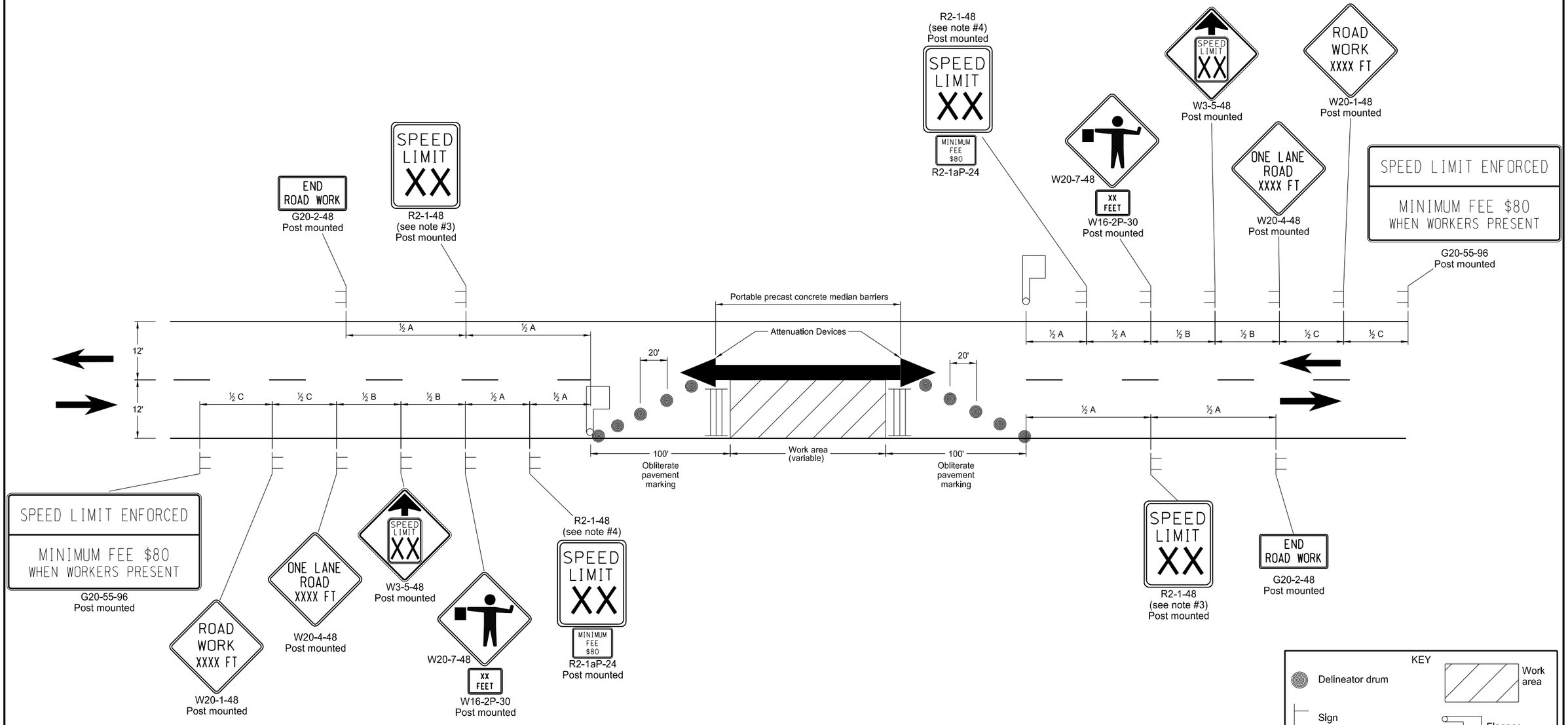
SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



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

Notes
1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Remove existing striping as required. Use back to back delineators when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Place back to back vertical panels when roadways have steep slopes and alignment is not visible to approaching traffic.
3. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
4. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½B.
5. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
6. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
7. Cover existing speed limit signs within a reduced speed zone.
8. Sign G20-55-96 is not required if layout is part of other traffic control or if work is less than 15 days.
9. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17 11-01-19	Note update & sign numbers Removed signs & revised note

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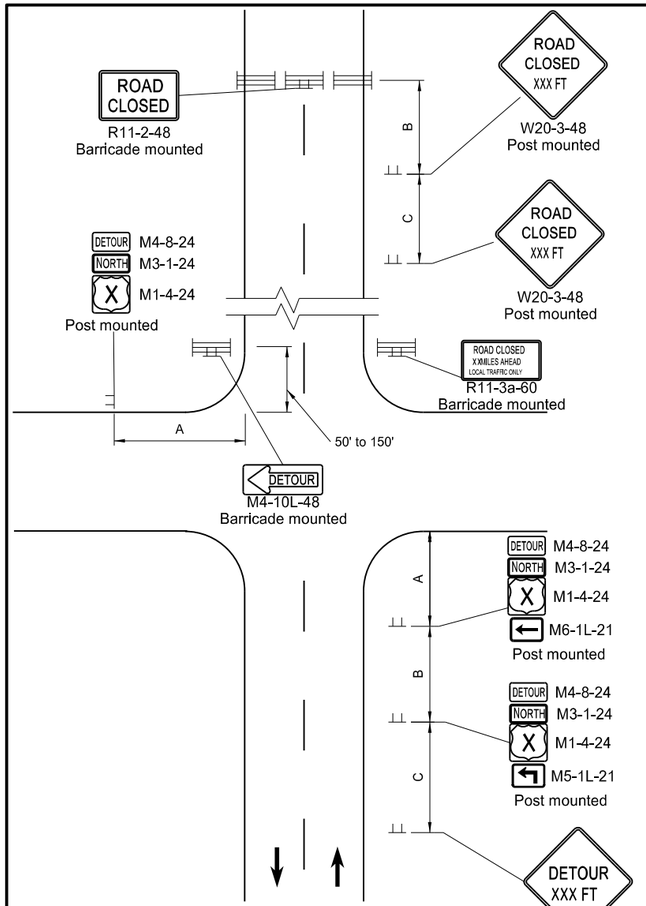
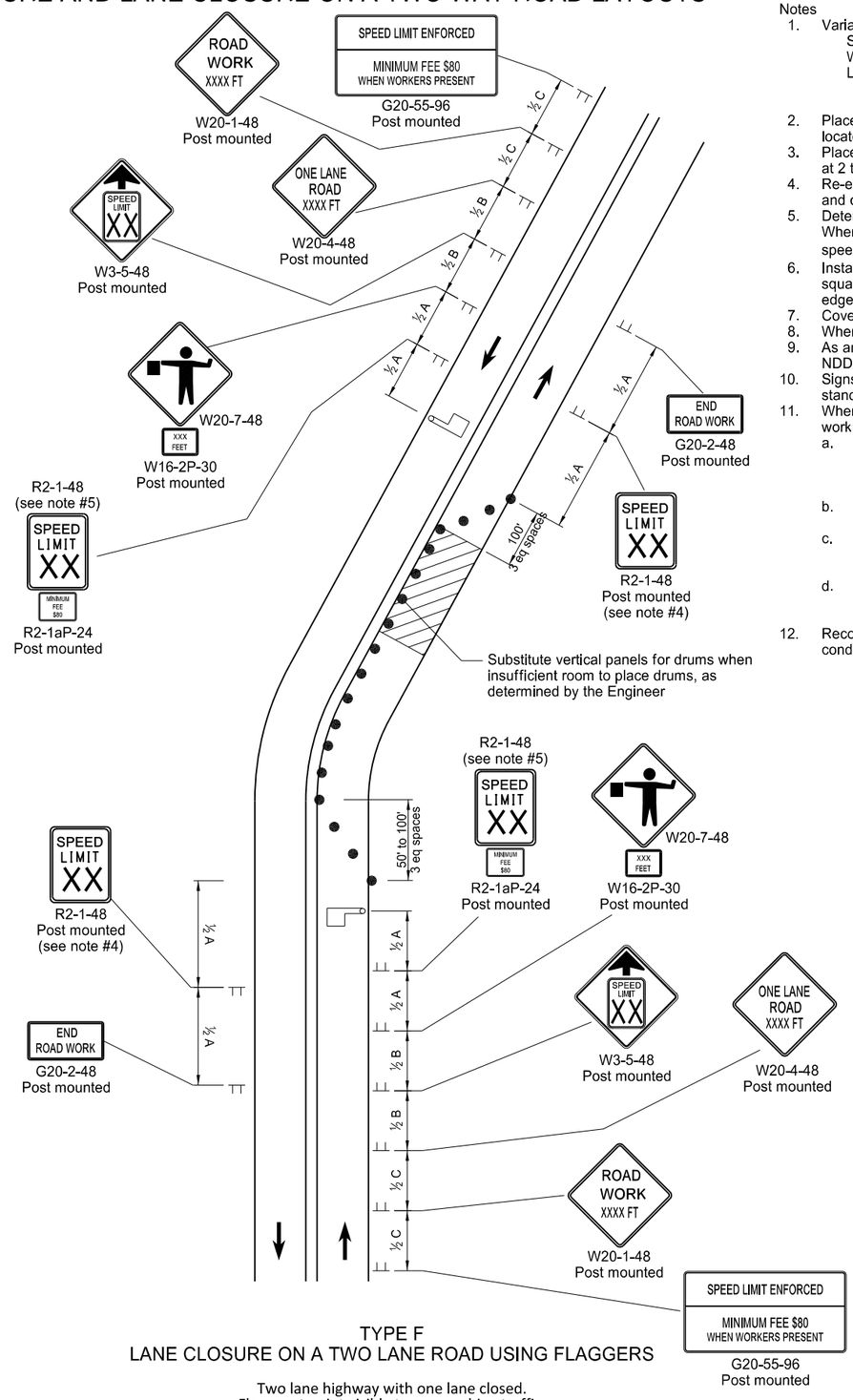
ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19



TYPE E
ROAD CLOSURE WITH OFF-SITE DETOUR

Road closed beyond detour point.
Signing shown for one direction only.
Install and maintain signs shown in plans.



TYPE F
LANE CLOSURE ON A TWO LANE ROAD USING FLAGGERS

Two lane highway with one lane closed.
Flagger at point visible to approaching traffic.

Notes
1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of taper in feet
   L = Minimum length of taper in feet. S x W for freeways, expressways, and roads with speeds of 45 mph or greater, or W x $S^2/60$ for urban, residential, and streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when located on the roadway.
3. Place delineator drums for tapering traffic at 3 equal spaces and for tangents space them at 2 times dimension "S".
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. Determine the reduced speed limit based on the in place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place second speed limit sign at ½B.
6. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
7. Cover existing speed limit signs within a reduced speed zone.
8. Where necessary, safe speed to be determined by the Engineer.
9. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
10. Signs G20-55-96 or R2-1aP-24 are not required when pilot car operation is used, if this standard is part of other traffic control layouts, or if work is less than 15 days.
11. When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
    a. Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.)
    b. Place "Do Not Stop on Tracks" sign (R8-8-24) near cross buck in each direction while lane closure is near tracks.
    c. Extend buffer space between work zone and lane closure transition upstream of the highway-rail grade crossing to prevent flagging queue from extending across highway-rail grade crossing.
    d. If queuing extends across highway-rail crossing, provide flagger at crossing to prevent vehicles from stopping within the crossing (even when automatic warning devices are in place.)
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

KEY

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
3-13-14	Revised Sign Cell "ROAD WORK XXX FT".
8-17-17	Update notes & sign numbers.
11-01-19	Revised signs, sign #s and notes.

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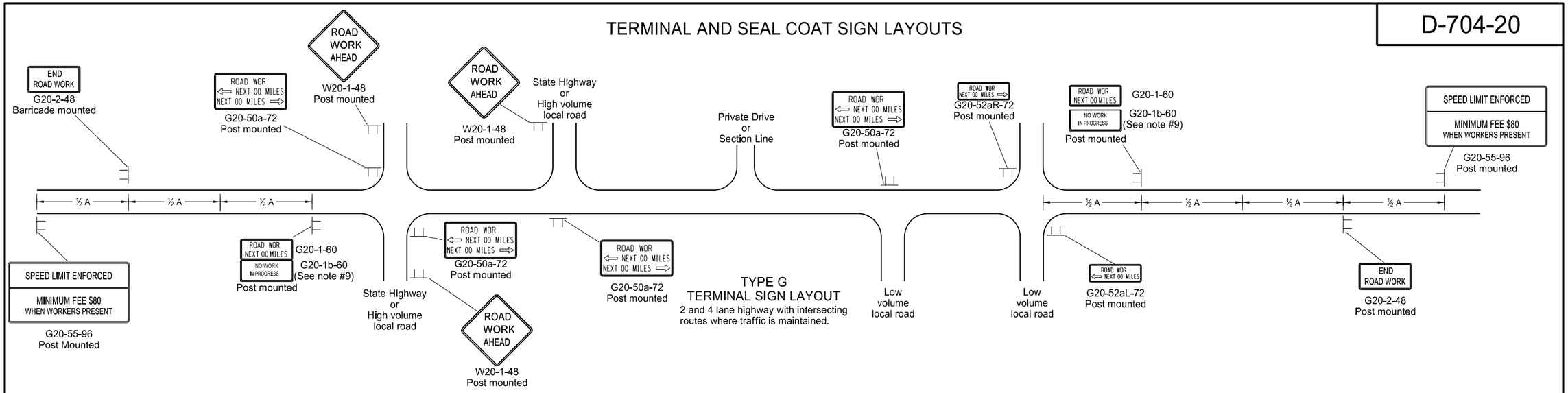
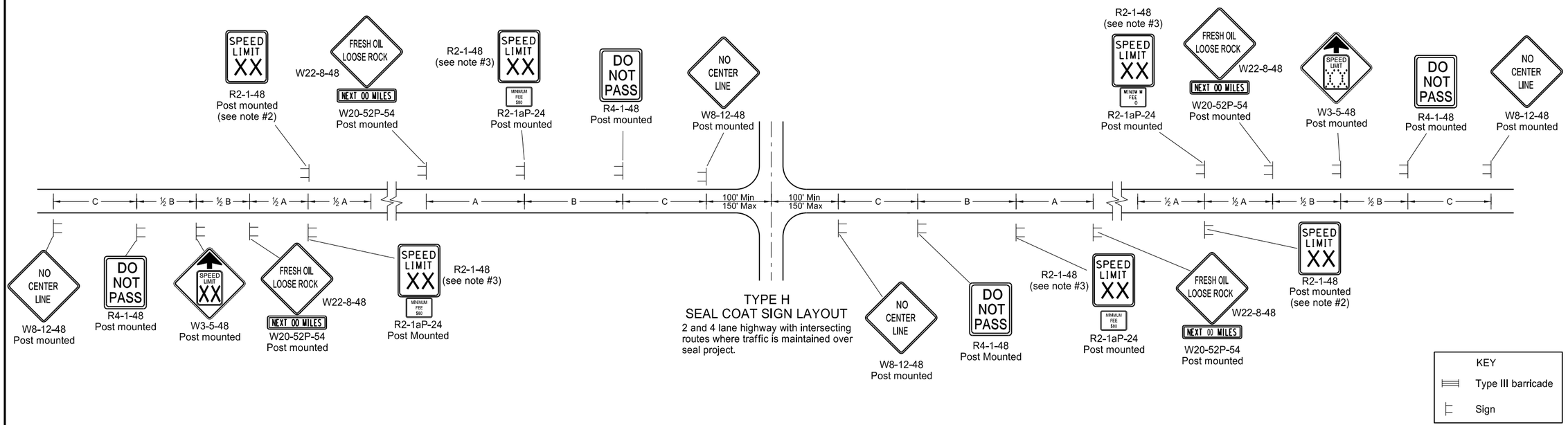
TERMINAL AND SEAL COAT SIGN LAYOUTS

D-704-20





1. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
2. Determine the exact speed limit in the field, based on location and conditions.
3. Determine the reduced speed limit based on the in place speed limit before construction. Where speed limit reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 MPH.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. On seal coat projects, place signs R2-1-48, R2-1aP-24, R4-1-48, W22-8-48 and W20-52P-54 after all important intersections and at five mile intervals. Place sign W8-12-48 after all important intersections and at 2 mile intervals until short term center line pavement marking is placed.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Drawing D-704-14.
8. Cover or remove speed limit signs from layout Type H when loose aggregate is removed.
9. Install sign G20-1b-60 when work is suspended for winter.
10. Use other traffic control layouts in immediate work areas. Place sign R2-1aP-24 below speed limit signs in reduced speed limit work areas.
11. Sign G20-55-96 is not required if work is less than 15 days.
12. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

9-27-13

REVISIONS

DATE	CHANGE
8-17-17	Updated notes & sign numbers.
11-01-19	Note & sign updates.

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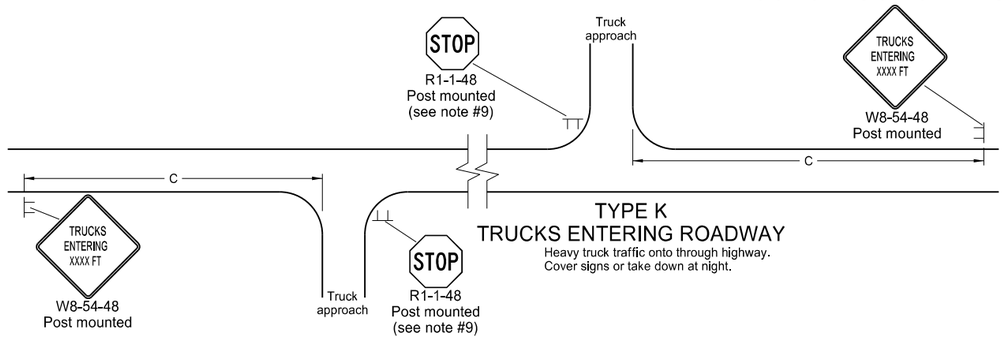
CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

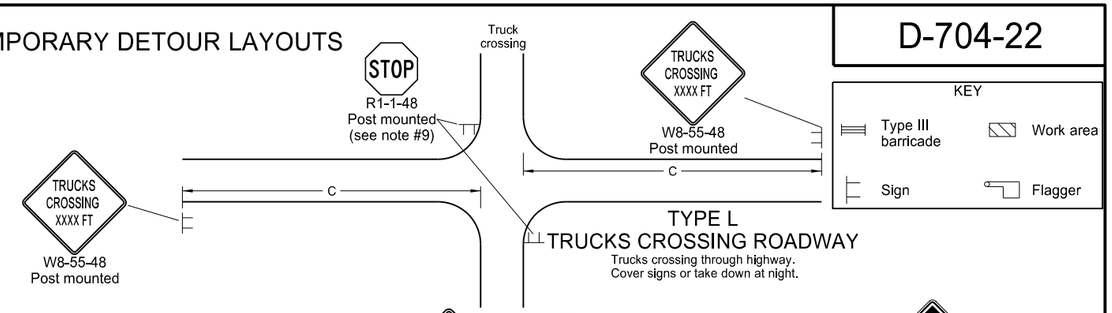
D-704-22

KEY
- Type III barricade
- Work area
- Sign
- Flagger



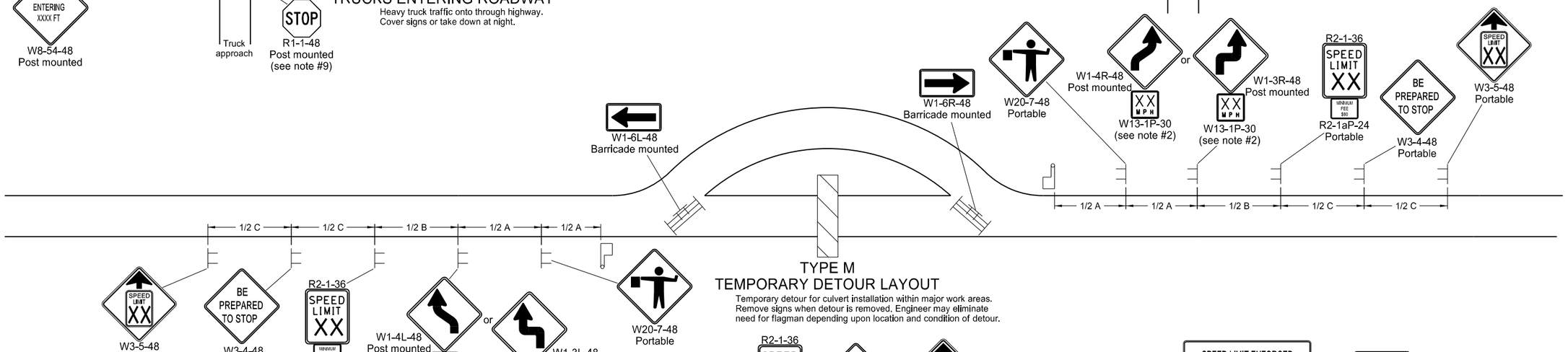
TYPE K
TRUCKS ENTERING ROADWAY

Heavy truck traffic onto through highway.
Cover signs or take down at night.



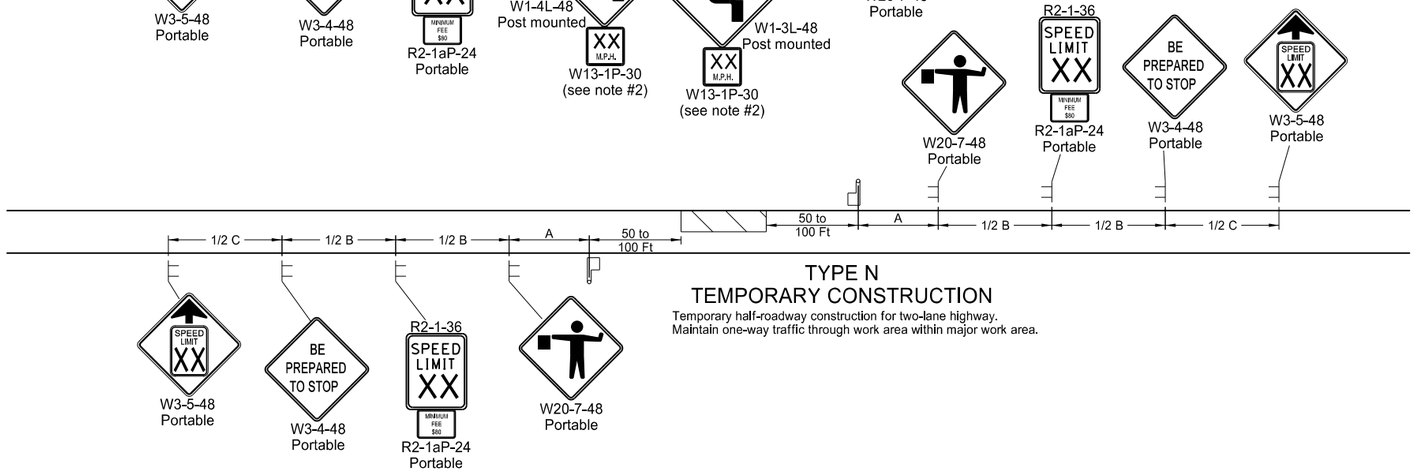
TYPE L
TRUCKS CROSSING ROADWAY

Trucks crossing through highway.
Cover signs or take down at night.



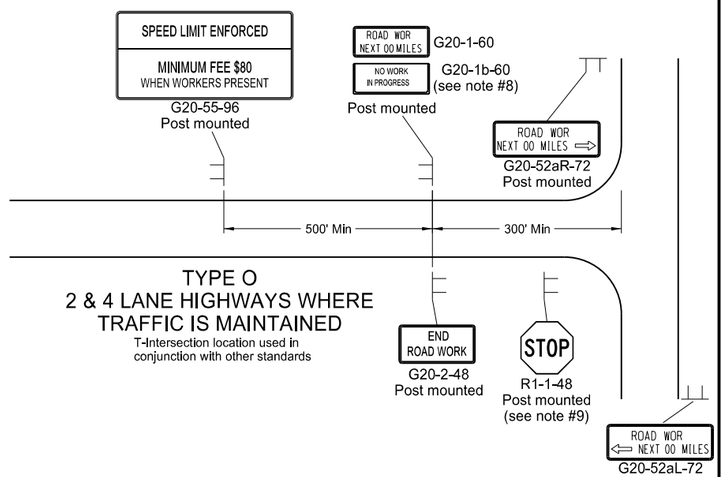
TYPE M
TEMPORARY DETOUR LAYOUT

Temporary detour for culvert installation within major work areas.
Remove signs when detour is removed. Engineer may eliminate need for flagman depending upon location and condition of detour.



TYPE N
TEMPORARY CONSTRUCTION

Temporary half-roadway construction for two-lane highway.
Maintain one-way traffic through work area within major work area.



TYPE O
2 & 4 LANE HIGHWAYS WHERE TRAFFIC IS MAINTAINED

T-Intersection location used in conjunction with other standards

Notes
1. Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
2. Where necessary, safe speed to be determined by the Engineer.
3. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
8. Install sign G20-1b-60 when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.
10. Sign G20-55-96 is not required if layout is part of other traffic control or if work is less than 15 days.
11. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

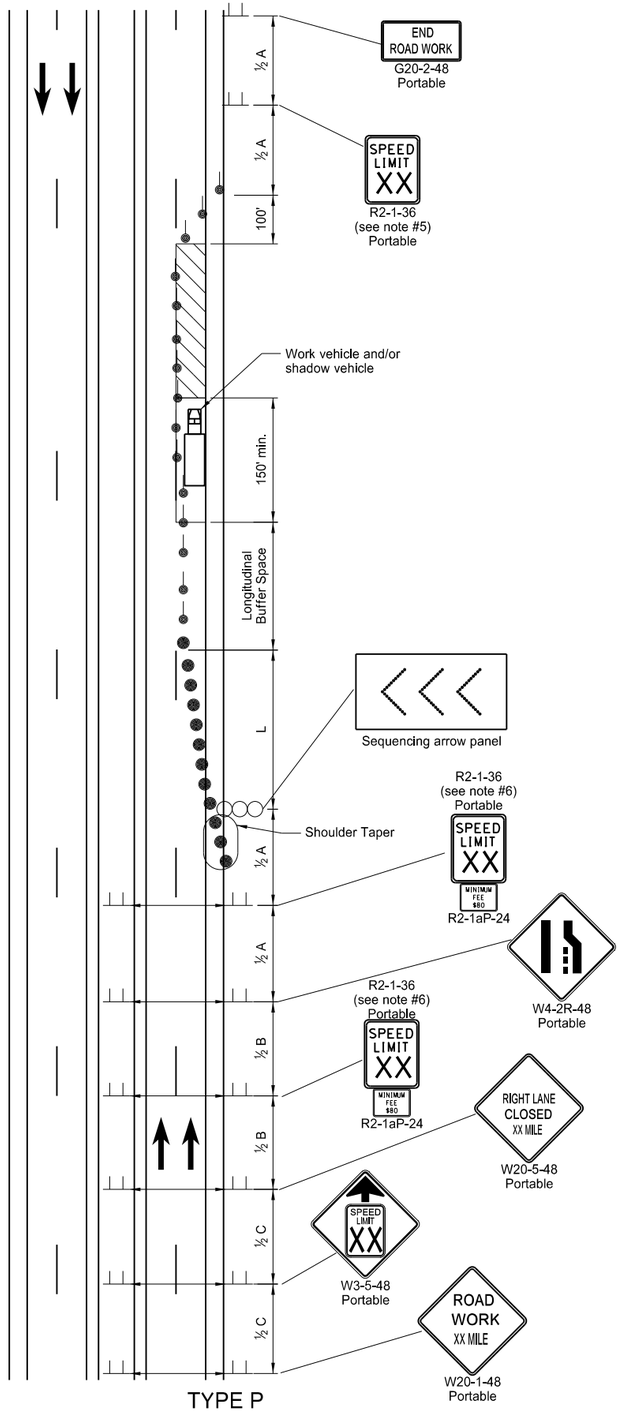
REVISIONS

DATE	CHANGE
8-17-17	Update notes & sign numbers
11-01-19	Revised sign numbers & note 7

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

SHORT TERM URBAN DETOUR AND LANE CLOSURE ON A DIVIDED HIGHWAY LAYOUTS

D-704-23

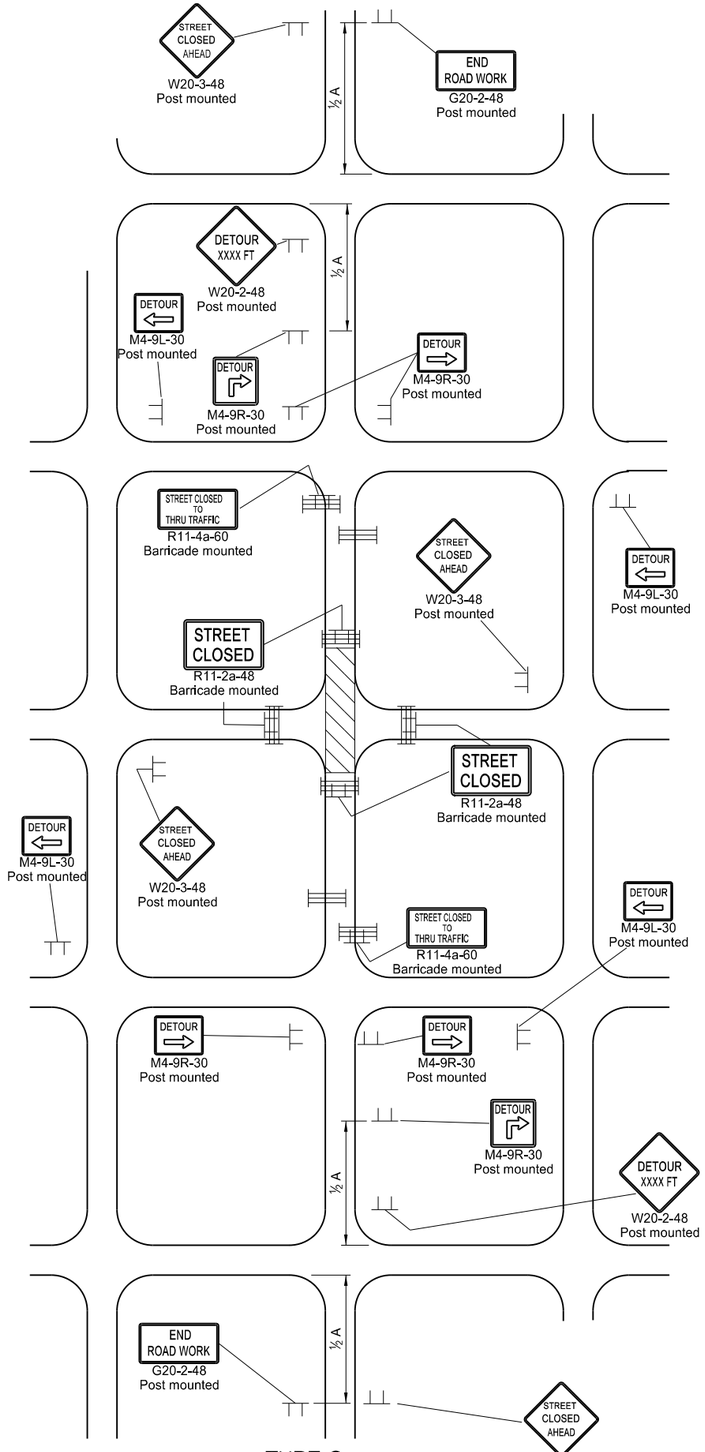


TYPE P

STATIONARY LANE CLOSURE ON A DIVIDED HIGHWAY

4 lane divided roadway where ½ of roadway is closed.

Short-term (more than 1 hour within a single daylight period.)



TYPE Q

DETOUR FOR A CLOSED STREET

Where city streets are used for detouring traffic.

Urban projects do not require the G20-55-96 and R2-1aP-24 signs.

Notes

1. Variables
   - S = Numerical value of speed limit or 85th percentile.
   - W = The width of taper in feet
   - L = Minimum length of taper, 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. Place barricades on moveable assemblies and signs on portable assemblies when located on roadway.
3. Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
4. Place Sequencing Arrow Panels at the beginning of taper. Where shoulder width does not provide sufficient room, move panel closer to the work area and place on roadway surface.
   - Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   - Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   - Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
5. Re-established speed limit. Determine exact speed limit in the field, dependent on location and conditions.
6. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
7. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
8. Cover existing speed limit signs within a reduced speed zone.
9. Covered (when approved by engineer) or obliterated payment marking measured as as Obliteration of Pavement Marking.
10. Change intersection control on detour for Type Q when determined necessary by the engineer.
11. Engineer to determine safe speed where necessary. When parking is present, place signs so they are entirely visible above parked vehicles or at the edge of the parking area so they are visible to oncoming traffic.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
13. Recommend using 40 mph speed limit in vicinity of workers for Layout Type P, unless location and conditions dictate otherwise.

KEY

Type III barricade	Work area
Sign	Sequencing arrow panel
Delineator Drum	Tubular Markers

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

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

9-27-13

REVISIONS

DATE	CHANGE
8-17-17	Removed Speed limit signs, & updated notes & sign numbers.
11-01-19	Revised sign numbers & note.

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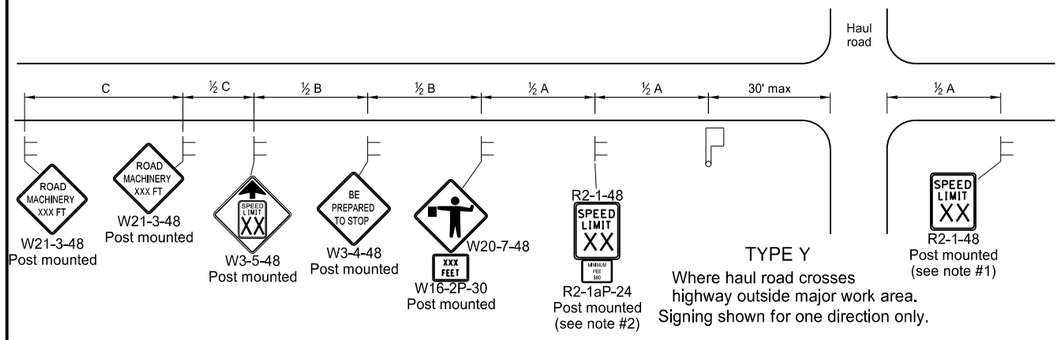
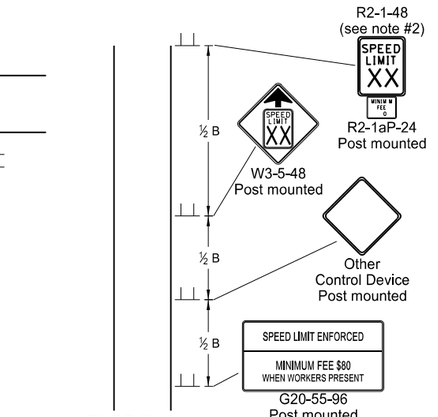
MISCELLANEOUS SIGN LAYOUTS

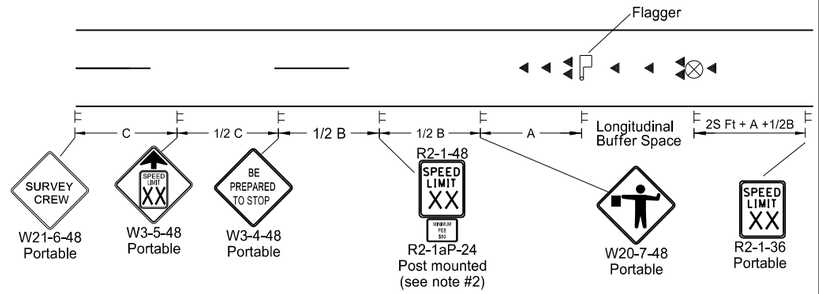
D-704-26



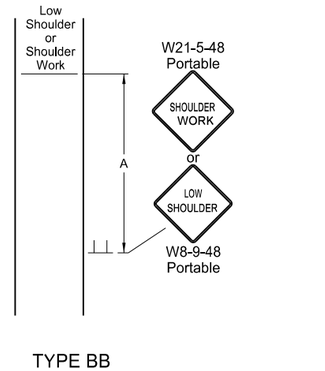
TYPE Y
Where haul road crosses highway outside major work area.
Signing shown for one direction only.



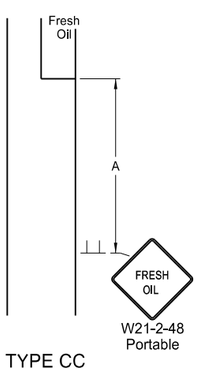
TYPE Z
Where speed zone is needed
Signing shown for one direction only.



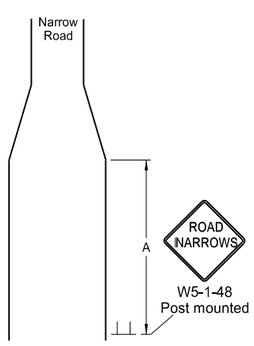
TYPE AA
Where survey crew is used
Signing shown for one direction only.



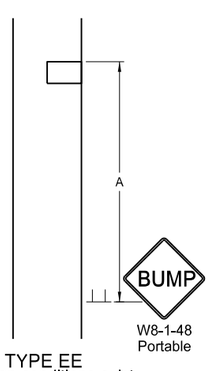
TYPE BB
Within major work area where sign conditions exist



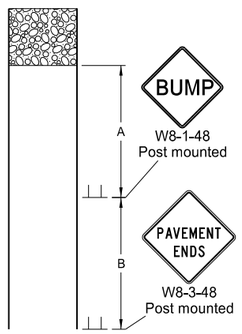
TYPE CC
Where sign conditions exist



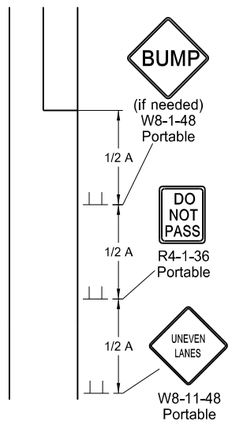
TYPE DD
Where sign conditions exist



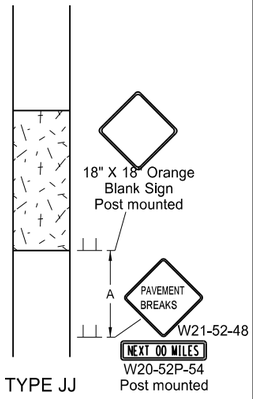
TYPE EE
Where sign conditions exist



TYPE FF
Where sign conditions exist
Signing shown for one direction only.



TYPE GG
Where elevation difference exists between lanes

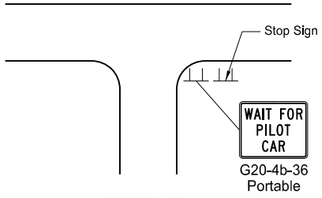


TYPE JJ
For break in pavement.
Install signs when conditions exist and remove when not applicable.
Signing shown for one direction only.

KEY

Flagger	Sign
Cones	Survey Equipment

S = Numerical value of speed limit or 85th percentile.



TYPE KK
At major intersections within pilot car control area

Notes
1. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
2. Determine reduced speed limit based on in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
3. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
4. Cover existing speed limit signs within reduced speed zones.
5. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
6. Sign G20-55-96 is not required if this standard is part of other traffic control layouts, or work is less than 15 days.
7. When pilot car operation is used, place sign G20-4b-36 "Wait For Pilot Car" at major intersections within pilot car control area.
8. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
9. Layouts shown for one direction only.

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

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

* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
8-17-17	Added speed limit signs. Updated notes & sign numbers
11-01-19	Revised note 5 & sign numbers

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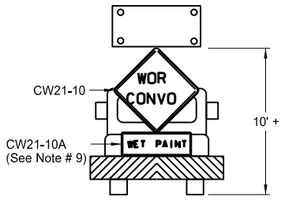
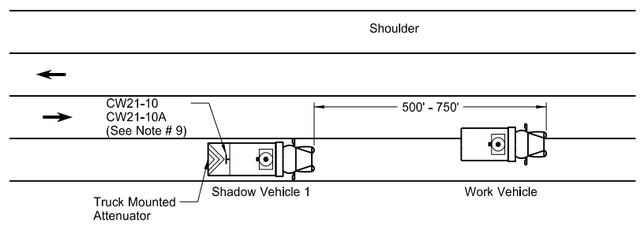
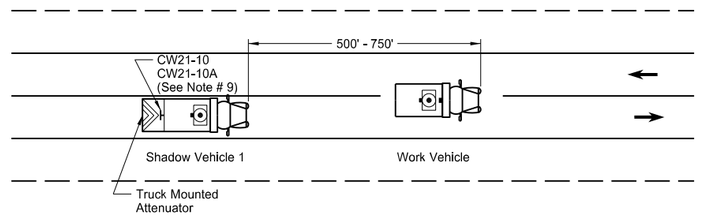
MOBILE OPERATION
(PAVEMENT MARKING)



Typical Shadow Vehicle 1
Two-Way Roaday

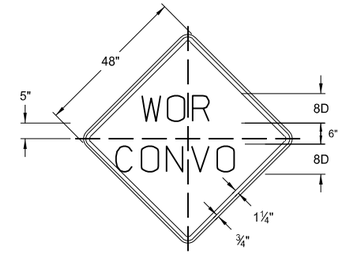


Two-Way Roadway with Paved Shoulders

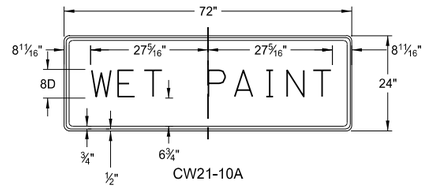


Two-Way Roadway without Paved Shoulders

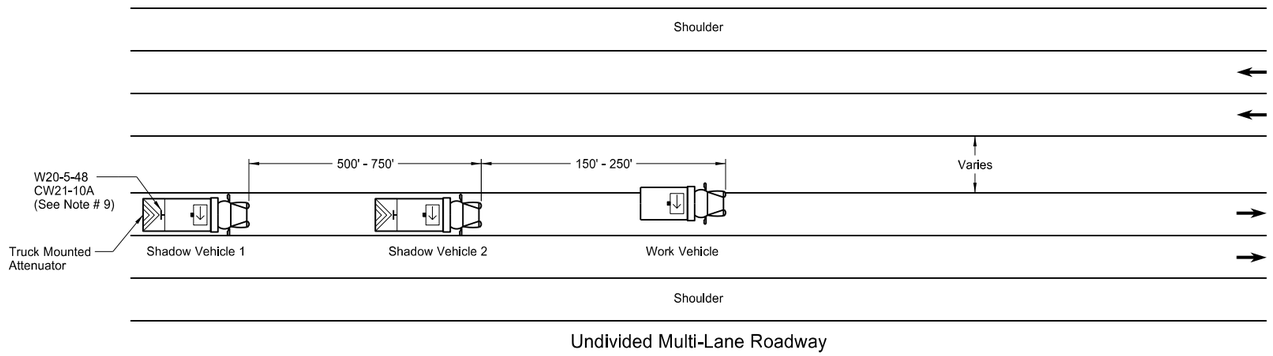
Sign Details



CW21-10

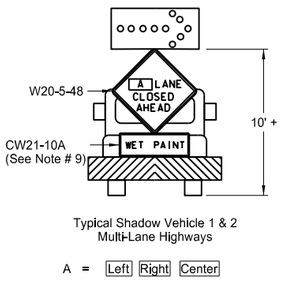


CW21-10A



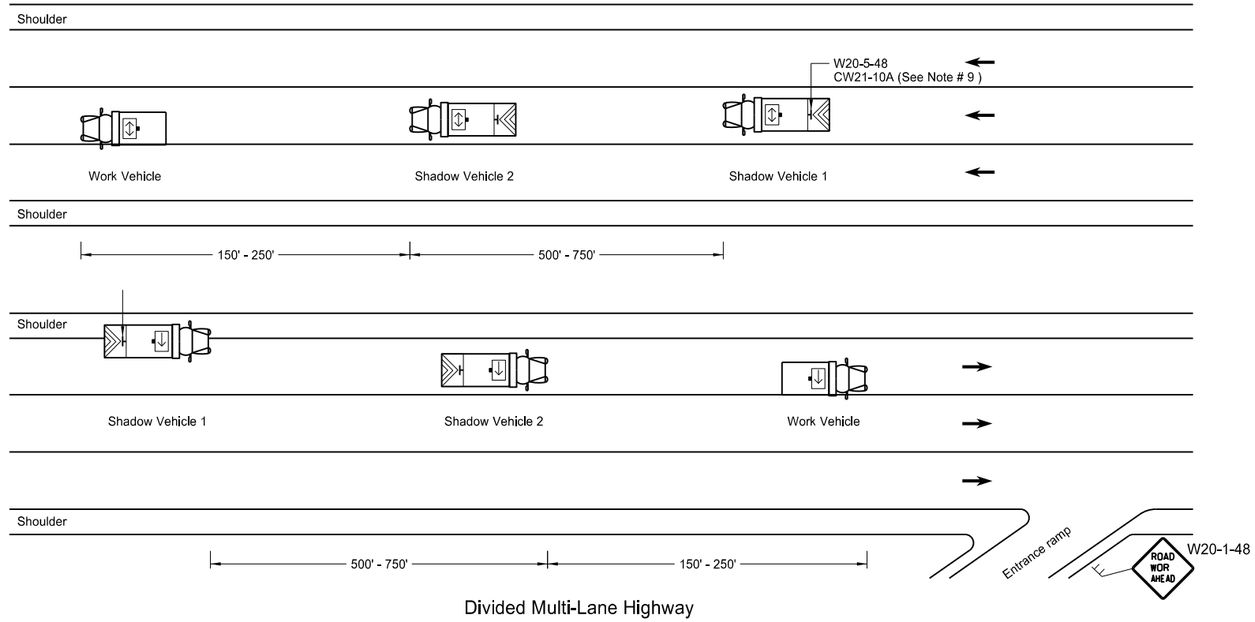
Undivided Multi-Lane Roadway

Notes
1. Use additional vehicles you choose to be in the convoy with truck mounted attenuators, at your own expense.
2. Display yellow rotating beacons or stobe lights on shadow and work vehicles, unless otherwise stated in the plans.
3. Use Type B or Type C flashing arrow panels controlled from inside the vehicle.
4. Provide each vehicle with two-way electronic communication capability.
5. Move shadow vehicle 1 first to shadow other convoy vehicles when convoy changes lane.
6. Vary vehicle spacing between shadow vehicle 1 and shadow vehicle 2 based on sight distance restrictions. Motorists approaching the work convoy need to see trail vehicle in time to slow down and/or change lanes as they approach shadow vehicle.
7. Sign Colors
   Letters = Black
   Border = Black
   Background = Orange
8. As an option, use shadow vehicle 2 the paint tender vehicle.
9. Use sign CW21-10A only during painting operation.
10. Pull over work and shadow vehicles periodically to allow motor vehicle traffic to pass on two lane - two way roadways.



Typical Shadow Vehicle 1 & 2
Multi-Lane Highways

A = Left Right Center



Divided Multi-Lane Highway

KEY

- Sign
- Truck mounted attenuator
- Flashing arrow panels:
  - Right directional
  - Left directional
  - Double arrow directional
  - Caution Mode

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
6-18-14	Removed shadow vehicle 2 on two lane roadways
9-27-17	Updated to active voice
11-08-19	Changed Standard Heading

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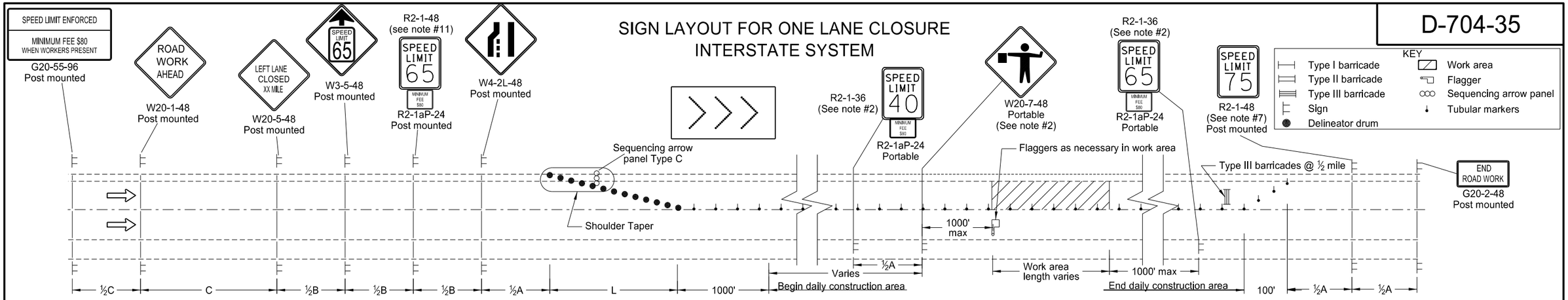
D-704-35

SIGN LAYOUT FOR ONE LANE CLOSURE INTERSTATE SYSTEM



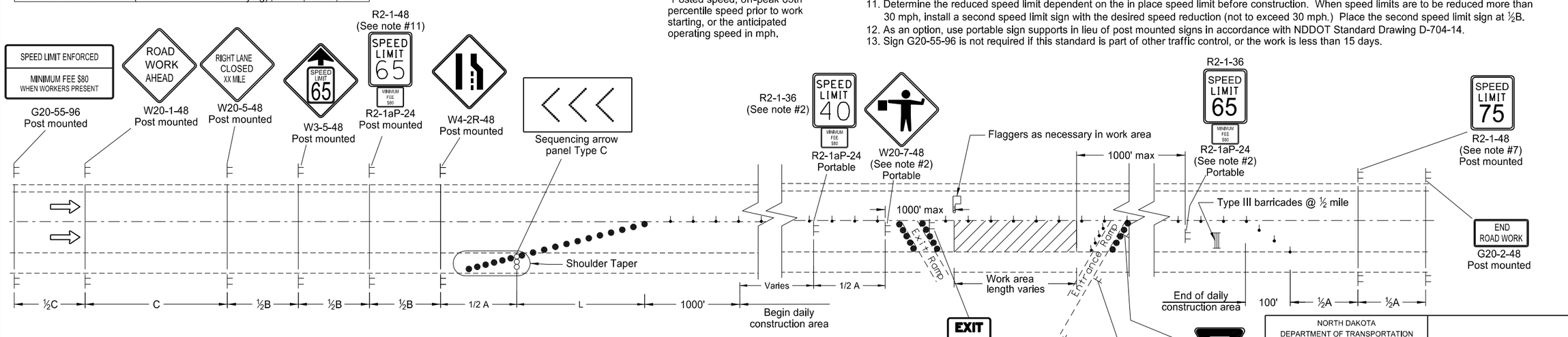
LEFT LANE CLOSED
WORKERS IN WORK AREA

ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
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

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

*Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.

Notes:
1. Install advance signs for flagging when flaggers are flagging.
2. Move the advanced flagger sign and the speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Space the 40 mph speed limit sign at ½A in advance of the flagger sign and move the 65 mph speed limit sign. Cover or remove the 40 mph speed limit and Minimum Fee $80 signs and the 65 mph speed limit sign upon completion of the work day or when workers are not present.
3. RAMPS: When the work area encompasses an entrance ramp, install a 40 mph speed limit sign on the ramp and cover any existing yield sign. Install new yield sign as necessary. Remove the ramp speed limit sign when the main line 40 mph speed zone is moved past the ramp.
4. Variables:
   S=Numerical value of speed limit or 85th percentile
   W=The width of taper.
   L=Minimum length of taper, or SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater, or
   WxSxS/60 for urban, residential, and other streets with speeds of 40 mph or less.
5. Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
6. Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or 5000 ADT or greater).
7. Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
8. Cover existing speed limit signs within a reduced speed zone.
9. Upon approval, the Engineer will measure obliterated or covered pavement marking as Obliteration of Pavement Marking.
10. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp.
11. Determine the reduced speed limit dependent on the in place speed limit before construction. When speed limits are to be reduced more than 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
12. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
13. Sign G20-55-96 is not required if this standard is part of other traffic control, or the work is less than 15 days.



RIGHT LANE CLOSED
WORKERS IN WORK AREA

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-7-2012	
REVISIONS	
DATE	CHANGE
6/23/2014	Revised Note 12.
3/15/2016	Removed Do Not Pass signs and updated notes.
8/17/2017	Moved speed signs. Added note.
10/17/2017	Corrected spelling of "shoulder".
11/01/2019	Revised tubular Mrkrs symbols.

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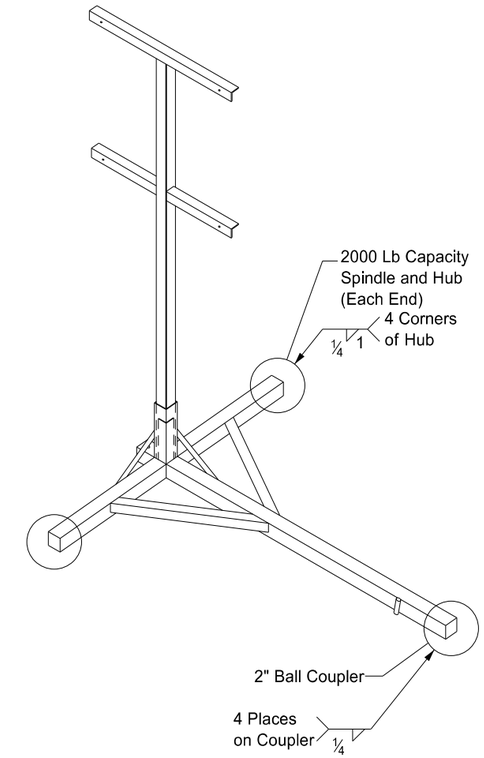
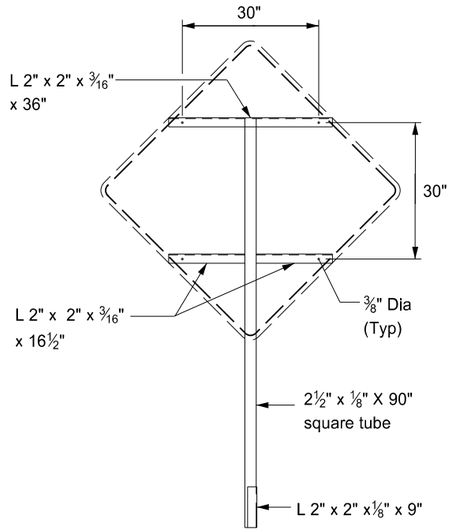
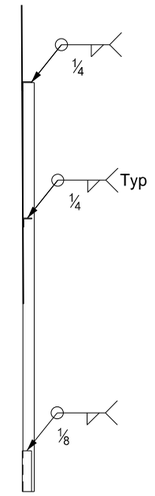
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



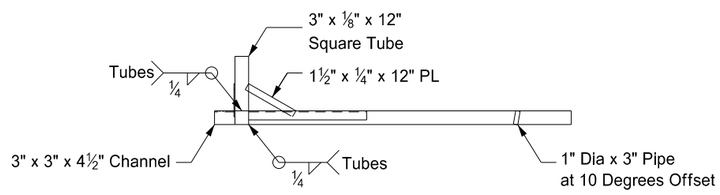


FRONT

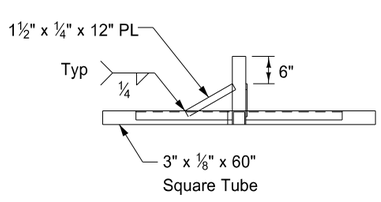


RIGHT

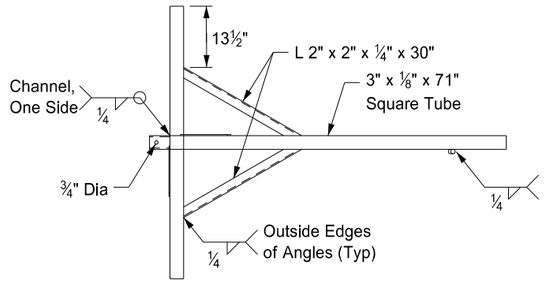
SIGN SUPPORT



FRONT



RIGHT



TOP

TRAILER

Notes:

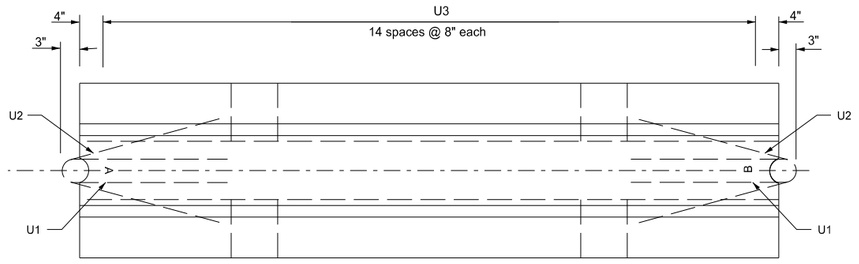
1. The maximum weight of the assembly is 250 pounds.
2. Use a 14" wheel and tire.
3. Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
4. Other NCHRP 350 crash tested assemblies are acceptable.

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

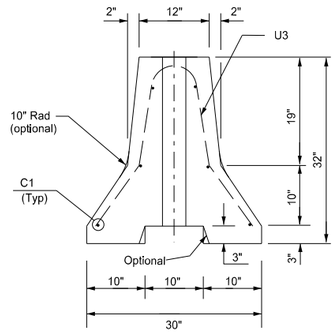
This document was originally issued and sealed by Roger Weigel Registration Number PE-2930, on 11/23/10 and the original document is stored at the North Dakota Department of Transportation

PORTABLE PRECAST CONCRETE MEDIAN BARRIER
(TEMPORARY USAGE)

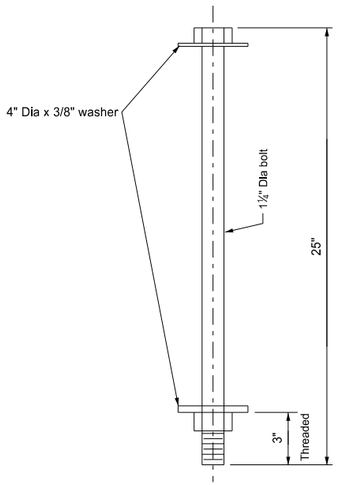
D-704-51



Plan View



End View

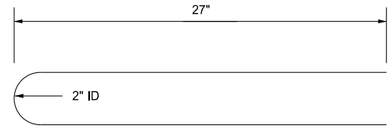


Connecting Bolt Detail

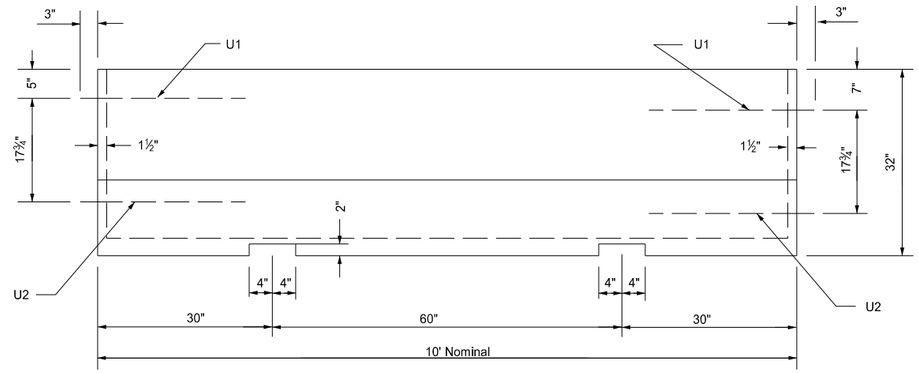
(One per 10 Ft section)

Notes:

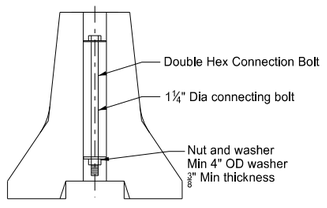
1. Galvanize all exposed hardware as per ASTM A153, except for the loop inserts.
2. Use AAE-3 Concrete.
3. Provide steel in accordance with Section 612 of NDDOT Standard Specifications.
4. Imprint barrier ends A and B as shown with 4 inch letters. Field match A end with B end.
5. Place barrier markers at the center of the barrier at 20' centers.
6. Connect barrier sections with 1 $\frac{1}{4}$" Dia A-307 double hex connecting bolt. Maintain bottom nut and washer connection for duration of barrier installation.
7. Place barrier to minimize openings between individual sections.



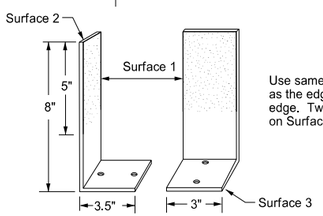
U1 Bar Detail



Side View

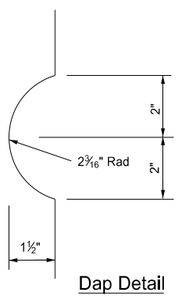


Bolt Connection Detail

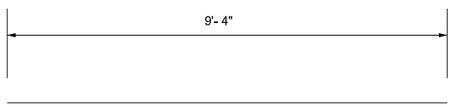


Use same color reflective faces as the edge line along barrier edge. Two way reflective on Surface 1 & 2.

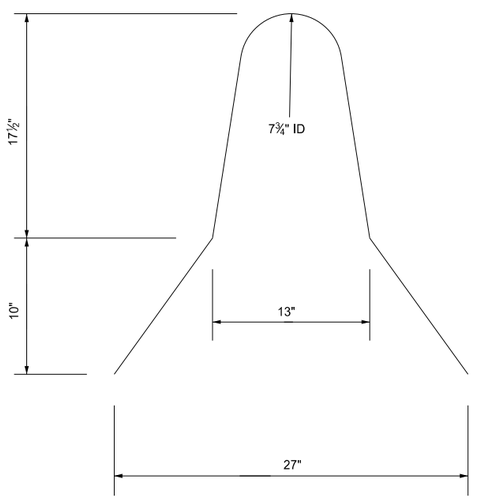
Barrier Marker Detail



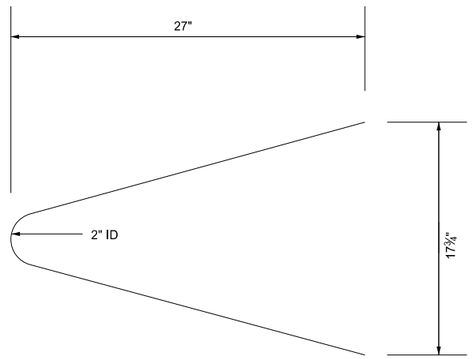
Dap Detail



C1 Bar Detail



U3 Bar Detail



U2 Bar Detail

Marker Body
Use high impact,weatherable engineering thermo-plastic material conforming to the following:

Property	Result	ASTM Test Method
Thickness (min)	.090"	——
Tensile strength (min psi) @ yield	5,500	D638
Impact strength @ -20°F (ft-lbs/in of notch)	3.2	D256 Method A
Impact strength @ 73°F (ft-lbs/in of notch)	14.0	D256 Method A
Flexural strength, PSI ¼" @ 73°F	8,000	D790
Flexural modulus, PSI ¼" @ 73°F	300,000	D790
Elongation @ yield	30%	D638

Reflective Tape
Use retroreflective, acrylic microprism material with acrylic backing, 3" wide, providing the following minimum optical performance with an observation angle of 0.1° measured in candlepower for the reflector:

Entrance Angle	Specific Intensity
Yellow - 4"	136
White - 4"	200

Adhesive
Use factory applied solid butyl rubber ⅛" thick, 2" wide on 2¼" wide release paper on surface 3 to temporarily mount markers to portable concrete barrier.

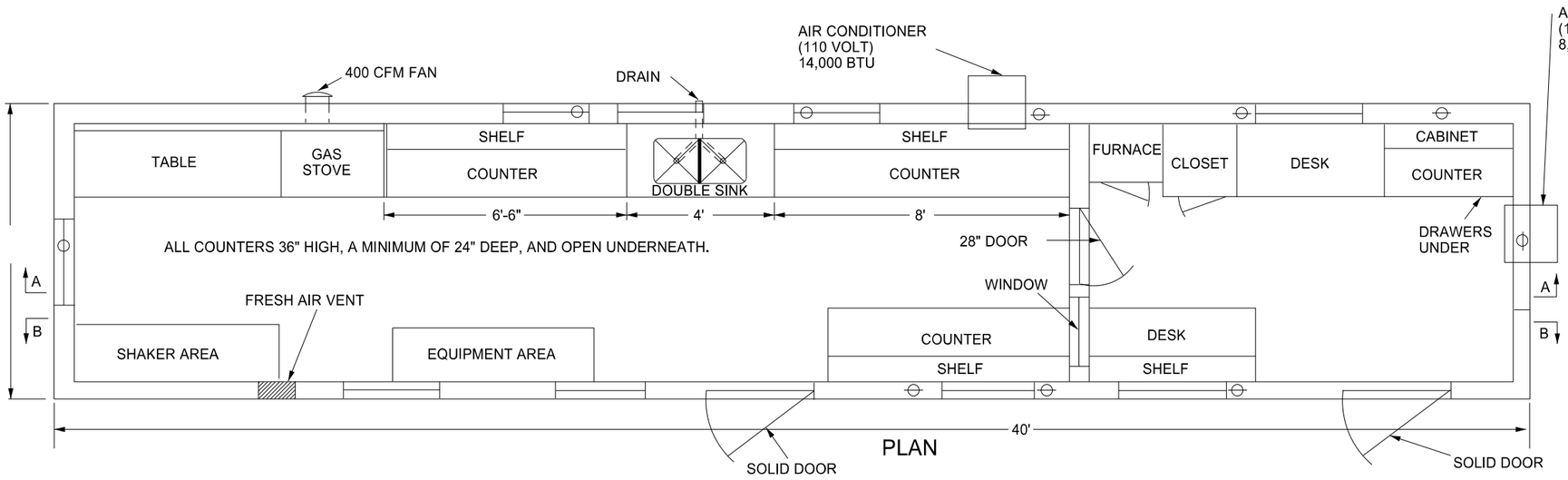
Bar List				
Mark	Size	No.	Length	Shape
C1	4	6	9'- 4"	Straight
U1	4	2	4'- 8"	Bent
U2	4	2	4'- 10¼"	Bent
U3	4	15	5'- 4"	Bent

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-20-12	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
11-01-19	New Design Engr PE Stamp

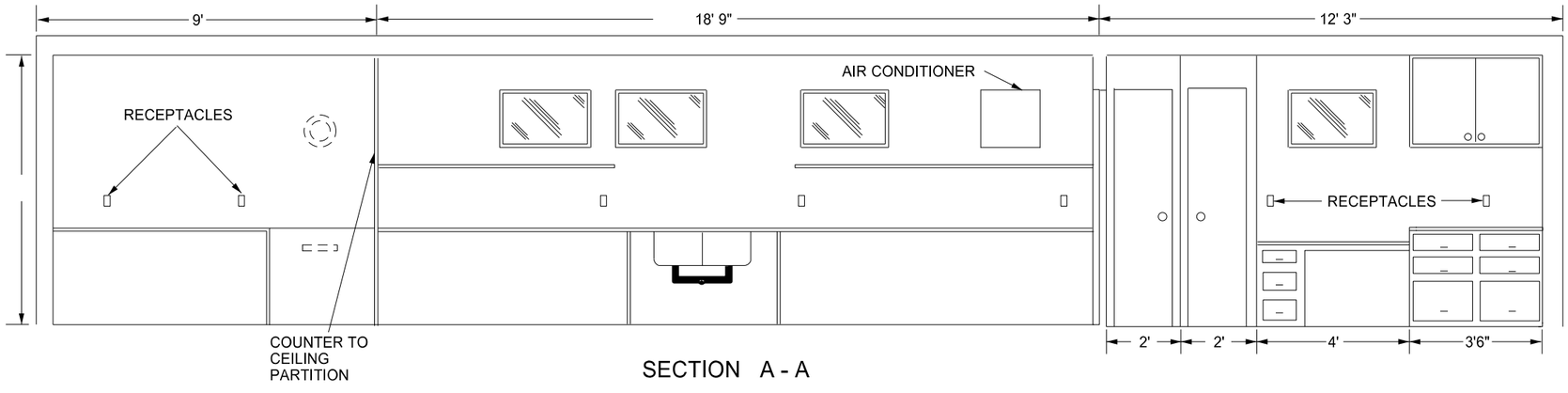
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

BITUMINOUS LABORATORY

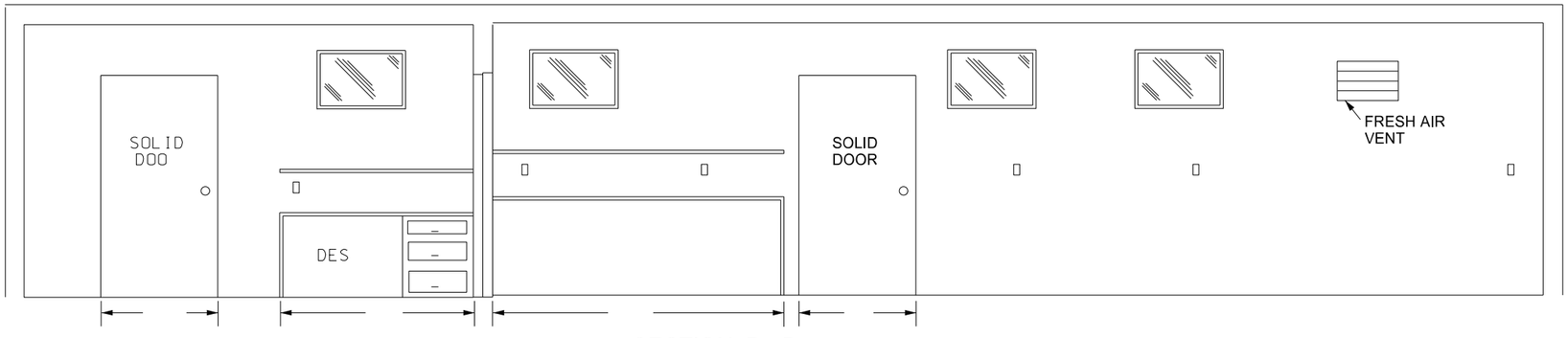
D-706-1



PLAN



SECTION A - A



SECTION B - B

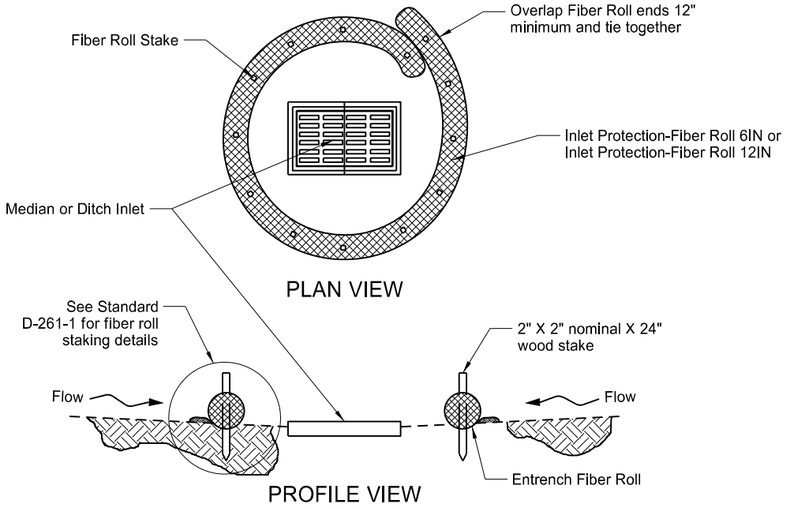
Provide a laboratory with the following:

1. A 1'x1' shelf at 36" above the regular countertop.
2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of ½ inch.
3. An exhaust fan capable of removing inside air at a rate of 400 CFM.
4. Fresh air vent hinged to open or close manually.
5. 24" x 48" table capable of holding a 200 lb masonry saw with a minimum clearance of 36" above the table.
6. A water supply tank with a capacity of 500 gallons and a 20 gallon capacity pressure tank on the pump.
7. Heavy duty type locks, latches, and hinges for doors made to withstand the intense use in service.
8. A wall between the office and the work area properly insulated to prevent the transmission of heat and noise.
9. The steel cable tie downs and ground anchors at each corner of the lab.
10. Electrical service entrance wired for 100 amps and separate circuits for air conditioners. Space convenience outlets in counter areas a minimum of four feet apart.

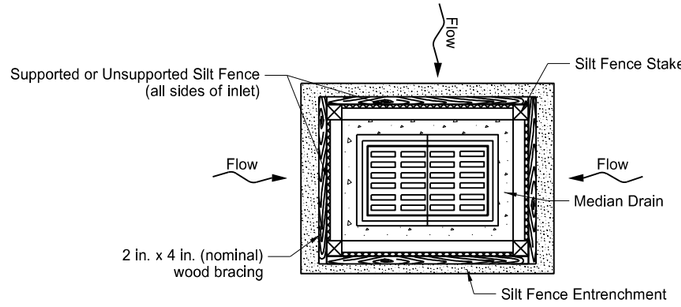
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.
08-27-19	New Design Engineer PE Stamp

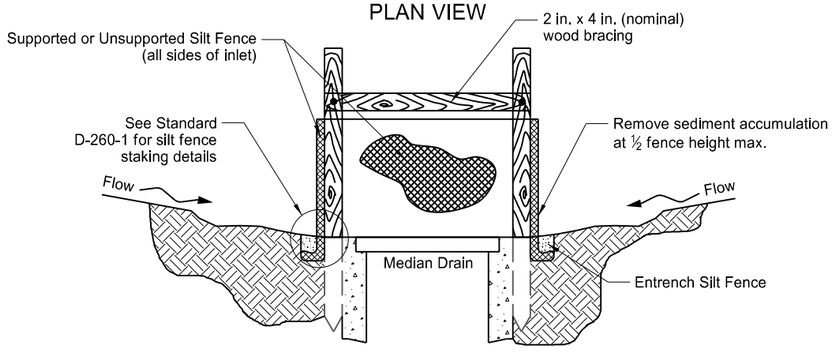
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION

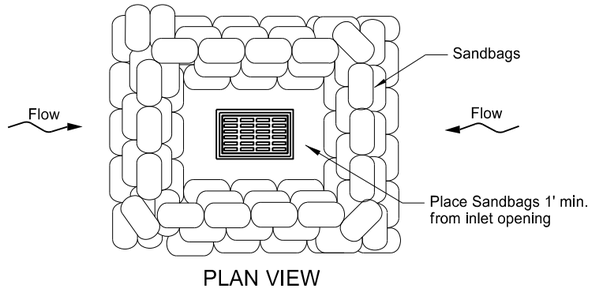


FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)

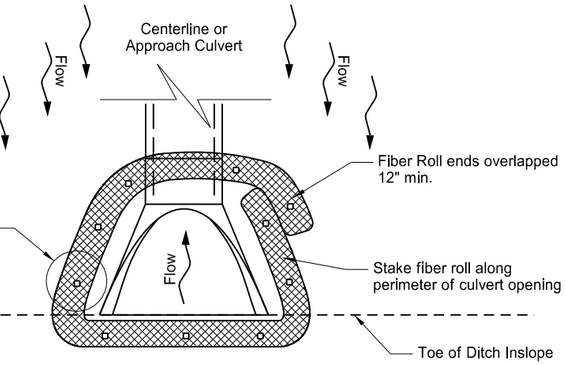




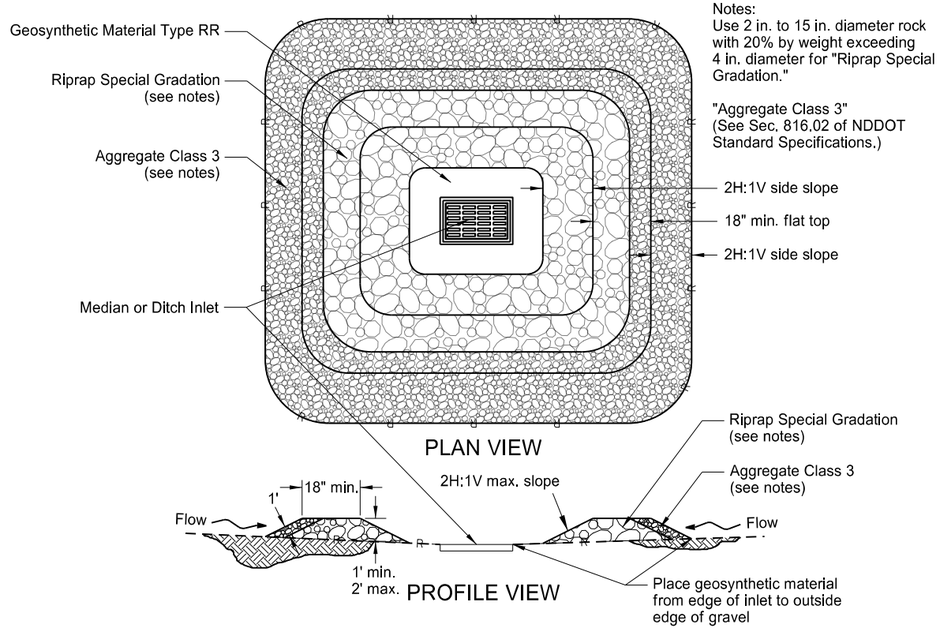
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



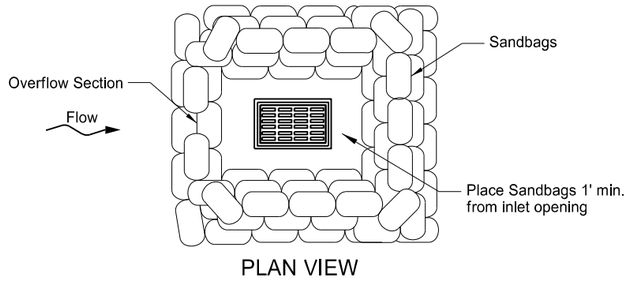
SANDBAG PROTECTION (LOW POINT)



FIBER ROLL PROTECTION (INLET OF CULVERT)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



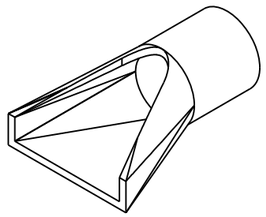
SANDBAG PROTECTION (ON SLOPE)

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

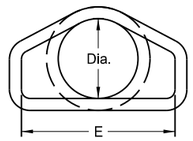
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8-27-19 and the original document is stored at the North Dakota Department of Transportation

REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

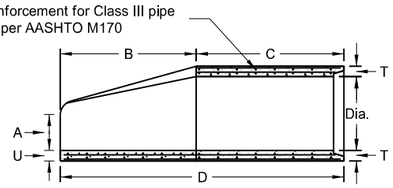
FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2¾"
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"
27	0'-10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	3¼"
30	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	3½"
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4½"
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5½"
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6½"
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	6½"
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	6½"



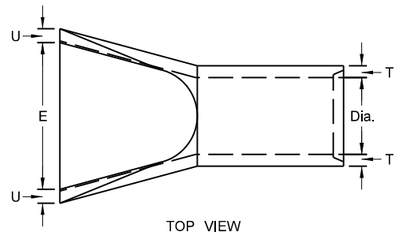
PERSPECTIVE



END VIEW



SIDE VIEW



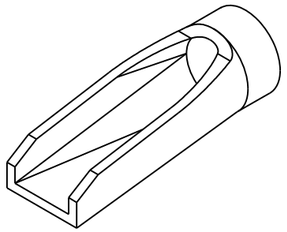
TOP VIEW

REINFORCED CONCRETE PIPE - FLARED END SECTION
Reinforcement to be equivalent to Class III RCP

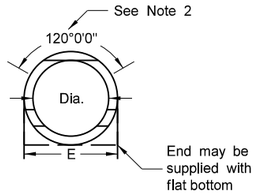
NOTES:

1. All reinforcing steel shall meet AASHTO M170 requirements.
2. 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.
3. Laying length of pipe: 12" to 66" (incl.) = not less than 4 feet
   66" to 108" (incl.) = not less than 6 feet
4. Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drain or sanitary sewers.
5. For Class IV and Class V reinforced concrete pipe and end section sizes which do not have reinforcement specified by AASHTO M170, shop drawings and design calculations shall be prepared and sealed by a Professional Engineer and submitted for the Engineer's review.

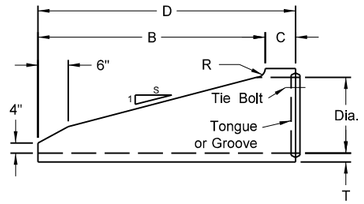
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7½"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



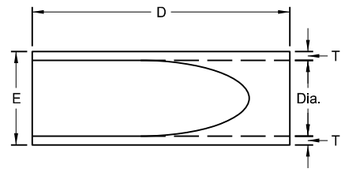
PERSPECTIVE



END VIEW



SIDE VIEW



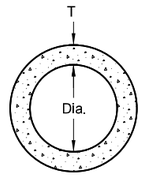
TOP VIEW

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION
Reinforcement to be equivalent to Class III RCP

NOTES (Traversable End Section):

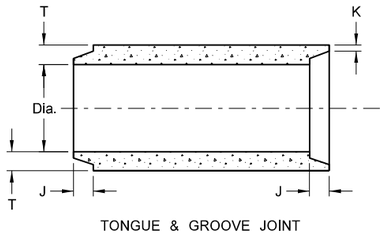
1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
2. Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

All Classifications of Round Concrete Pipe					
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)
Dia	Sq. ft.	Lbs.	In.	In.	In.
12	0.79	92	1⅛-2⅛	¾	2
15	1.23	127	1⅛-2¼	⅞	2¼
18	1.77	168	1⅛-2⅛	1	2½
21	2.40	214	1⅛-3⅛	1⅛	2¾
24	3.14	265	2¾-3¾	1⅛	3
27	3.98	322	2¾-4	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	3⅞-4¾	1⅞	5
54	15.90	1070	4⅛-5¼	2	5½
60	19.63	1296	4½-5½	2¼	6
66	23.76	1542	5-6	2⅝	6½
72	28.27	1810	5⅛-6¾	2⅞	7
78	33.18	2098	6¼-7¼	2⅞	7½
84	38.48	2410	5⅛-7¾	3⅜	8
90	44.18	2793	6¾-8½	3⅛	8½
96	50.27	3092	7-8¼	3½	9
102	56.75	3466	7-8¼	3½	9½
108	63.62	3864	7¼-8½	3¾	10

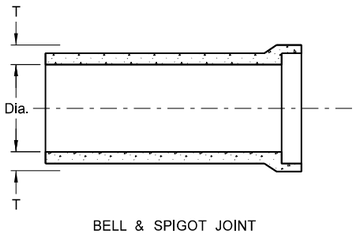


END VIEW

CIRCULAR PIPE

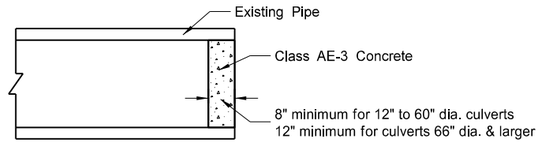


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE



CONCRETE PIPE PLUG

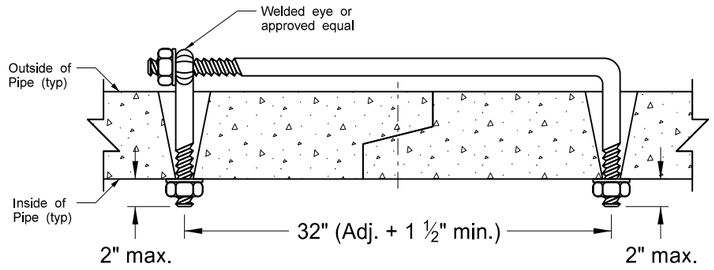
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-12-14	
REVISIONS	
DATE	CHANGE
01-21-15	Revised Note 5
11-21-16	Revised End Section Dimensions
09-18-19	Updated Perspective View Details

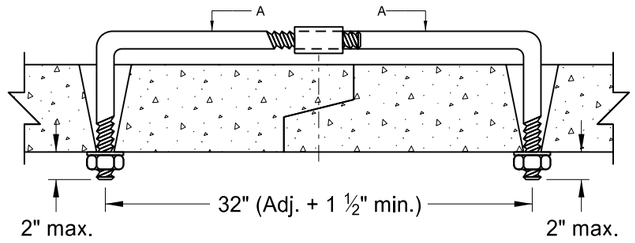
This document was originally issued and sealed by Jon Ketterling Registration Number PE-4684, on 9/18/19 and the original document is stored at the North Dakota Department of Transportation

CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

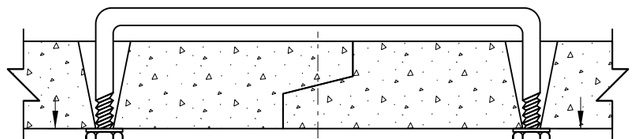
D-714-22



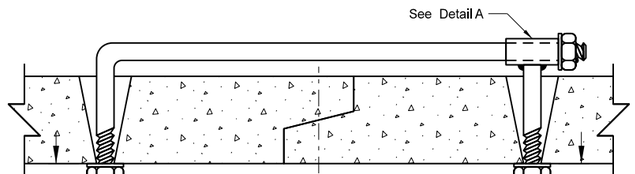
EYE BOLT TIE (PIPES ONLY)



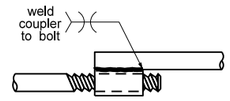
ADJUSTABLE TIE (RCB AND PIPES ONLY)



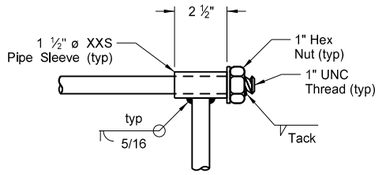
U BOLT TIE (RCB, PIPES, OR CATTLE PASSES)



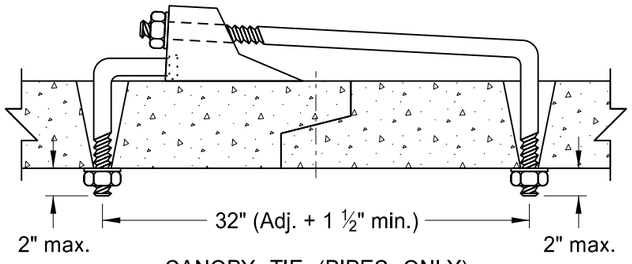
WELDED TIE (RCB AND PIPES ONLY)



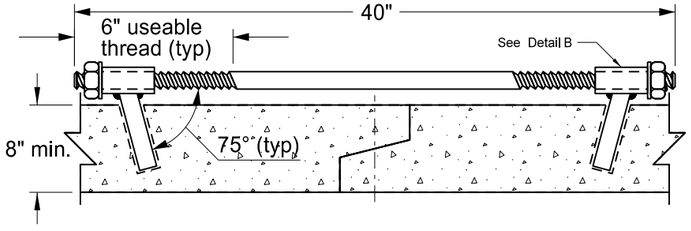
SECTION A-A



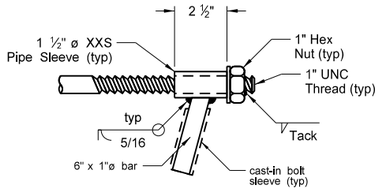
DETAIL A



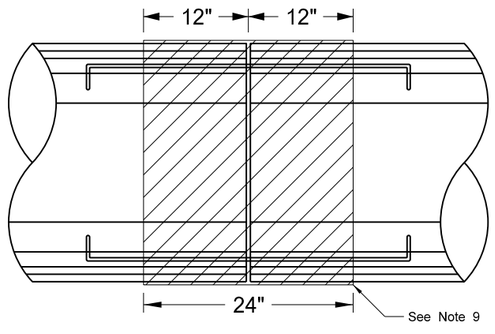
CANOPY TIE (PIPES ONLY)



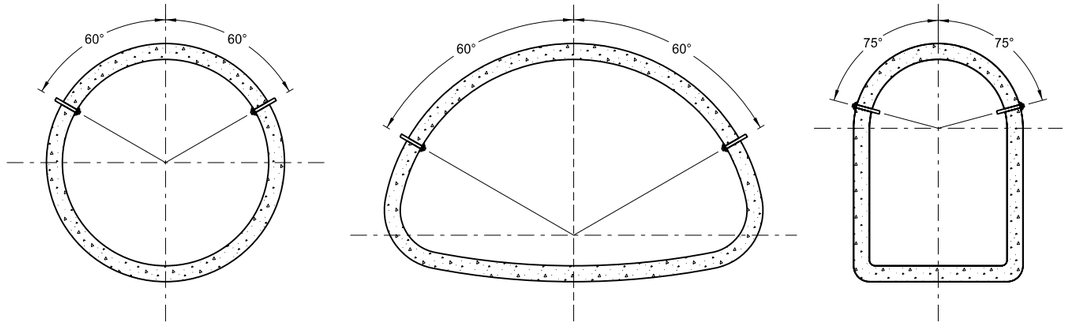
HIDDEN TIE (RCB ONLY)



DETAIL B



PLAN VIEW



END VIEW

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ø	XXS Pipe Sleeve Inner ø
18" - 24"	⅝" See note 2	¾"
30" - 66"	¾"	1"
72" - 78"	1"	1 ¼"
RCB/Cattle Pass		

NOTES:

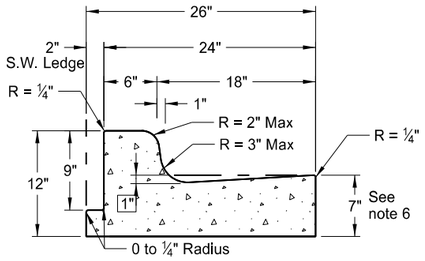
1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
2. Cattle Pass and Jacked and Bored pipes shall have pipe ties inserted from the inside of the pipes and grouted into place. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
3. Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Where nuts and washers are not used, the tie bars shall be inserted and grouted into place.
4. Ties are only for holding pipe or RCB sections together, not for pulling sections tight.
5. Tie bolt assembly shall be hot dip galvanized in accordance with AASHTO M232.
6. Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Holes shall have a diameter ¼" larger than the diameter of the thread. Holes in precast RCB's shall contain cast-in bolt sleeves with an inside diameter of 1 ¼".
7. The contractor has the option of selecting the type of tie bolt used from those shown.
8. The cost of precasting or drilling the required holes and furnishing and installing the tie bolts shall be included in the price bid for the appropriate conduit or RCB pay item.
9. All centerline and approach RCP culvert joints shall be tied. Storm drain systems shall have the first three joints including the end section of all free ends tied. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
10. Place joint wrap prior to installing ties. Overlap the joint by 12" in both directions.
11. Tie bolts shall conform to ASTM A 36. Nuts shall be be heavy hex and conform to ASTM A 563. Washers shall conform to ASTM F 436, Type 1. Welded pipe sleeves and cast-in bolt sleeves shall conform to ASTM A 53, Grade B.
12. RCB tie locations shall be as shown on the plans.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
3-18-14	
REVISIONS	
DATE	CHANGE
7-21-15	Note 8
6-6-17	Notes 2-11, Table, Title, Lables

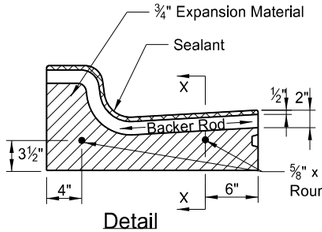
This document was originally issued and sealed by Jonathan David Ketterling, Registration Number PE-4684, on 6/6/2017 and the original document is stored at the North Dakota Department of Transportation

Curb & Gutter and Valley Gutter

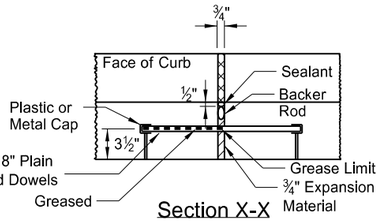
D-748-1



Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk, Median, or Parking Lot.
(Sec. A shown. See Sec B for additional details.)

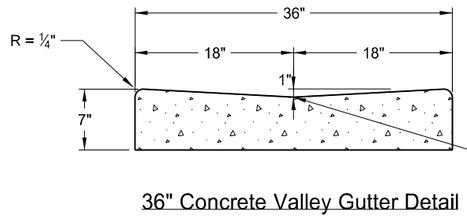


Detail

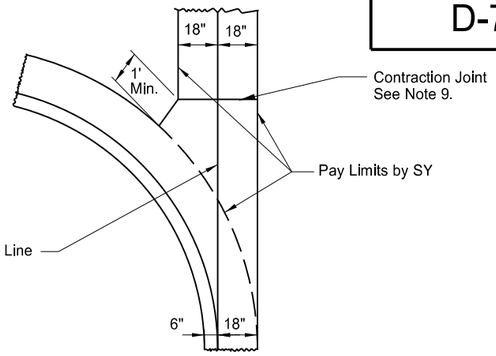


Section X-X

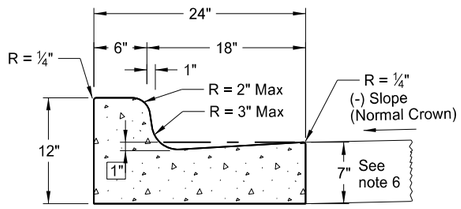
Isolation Joint



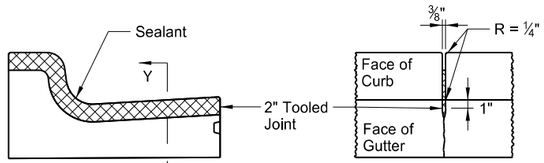
36" Concrete Valley Gutter Detail



36" Concrete Valley Gutter Plan



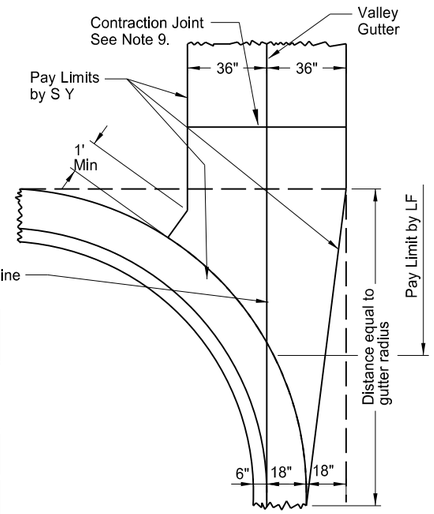
Curb & Gutter Type 1 (Sec. A)



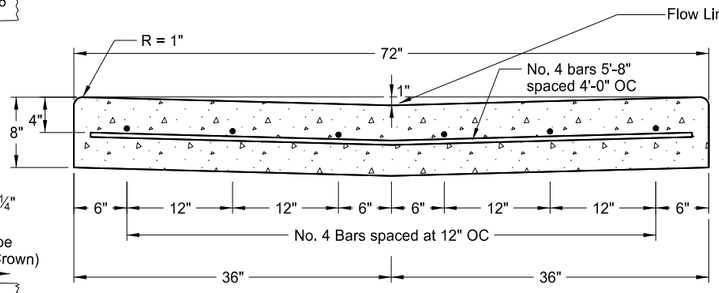
Detail
(10' Max Spacing)

Section Y-Y

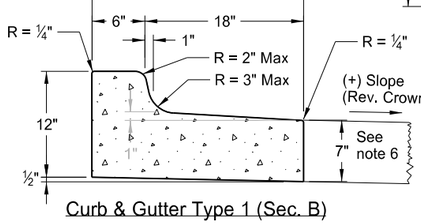
Contraction Joint



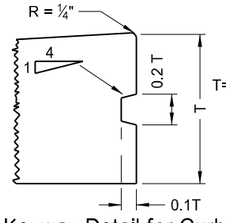
72" Concrete Valley Gutter Plan



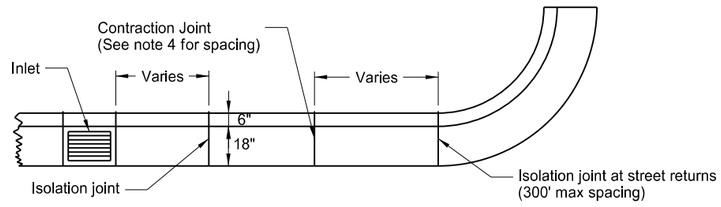
72" Concrete Valley Gutter Detail



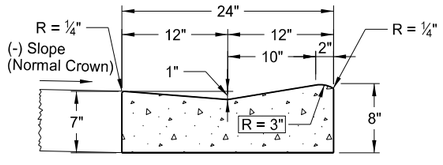
Curb & Gutter Type 1 (Sec. B)



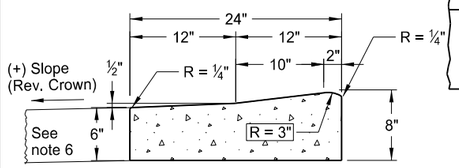
Keyway Detail for Curb & Gutter
(To be used with PCC Pavement and Drives)



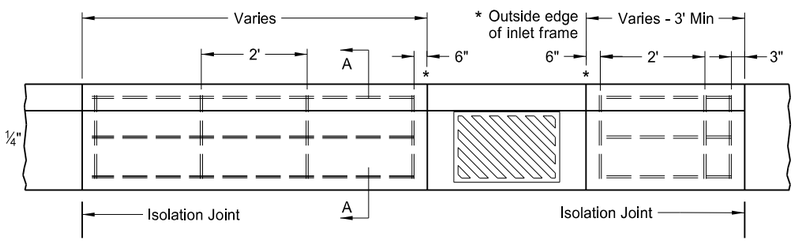
Joint Location Detail



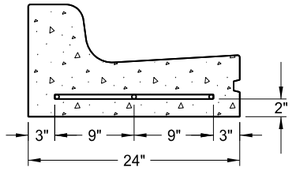
Mountable Curb & Gutter Type 1 (Sec. A)



Mountable Curb & Gutter Type 1 (Sec. B)



Curb & Gutter Reinforcing at Inlets



Section A-A

NOTE: Use #4 deformed reinforcing bars without splices. Include all costs for reinforcing bars at inlet locations (even inlets located on radii) in the price bid for "Curb and Gutter - Type 1." Extend reinforcement to the second joint (rebar placed through the first joint) in cases where the 3' min. panel length cannot be obtained.

NOTES:

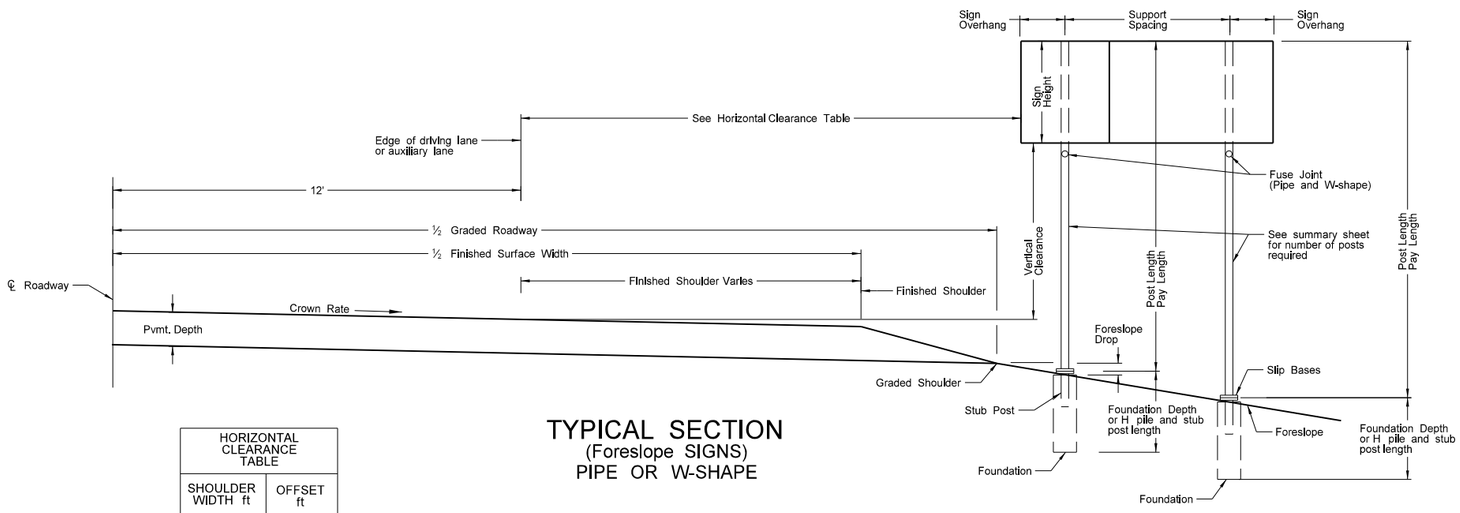
1. Use Curb and Gutter Type 1 (Sec. A & B). Use section "A" with (-) pavement slopes and section "B" with (+) pavement slopes.
2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
3. Isolation Joints: Use ¾" expansion joint filler for isolation joint material. Form the backer rod and joint sealant opening with a pre-cut piece of wood or other material approved by the engineer. Dowel supports are not required on the second pour at a cold joint. Install plastic or metal caps and greased dowels in the cold joint for the second pour.
4. Joint Spacing: For hot bituminous pavements use a 10' max joint spacing for the curb and gutter with panels on each side of the inlets. For concrete pavements match the joint spacing for the curb and gutter to the pavement joint on PCC Pavements (approximately 15' spacing.)
5. Joint sealing: Seal contraction and isolation joints as shown in the details. Use joint sealant for contraction joints that conforms to section 826.02B. Use sealant for expansion joints specified in note 3 above. Tool and install sealant in accordance with the manufacturer's recommendations.
6. Face of Gutter Depth: For hot bituminous pavement use 7" gutter depth as shown. For PCC pavements, match the gutter depth to the depth of adjacent PCC pavement or to construct a 7" depth as shown.
7. Tie curb and gutter to abutting PCC pavement with No. 3 bars, 1'-6" in length, spaced at 4' centers.
8. On street returns and other locations where new curb and gutter ends and does not abut existing curb and gutter, taper the last two (2) feet of the curb from 6" in height to 0". Install a 1/2" premolded full depth isolation joint, the same shape as the curb and gutter just ahead of the taper. Install an 18" tie bar across the joint.
9. Valley Gutter Joints: Form, saw, or score ⅛" min. to ⅜" max. width contraction joints (a minimum 2" depth) at approx 10' intervals. Seal the joints with hot poured elastic type joint sealer (Section 826.02A.2 of the Standard Specifications.) Include all costs for the joint and sealant in the price bid for Valley Gutter.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-7-2013	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engr PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8-27-19 and the original document is stored at the North Dakota Department of Transportation

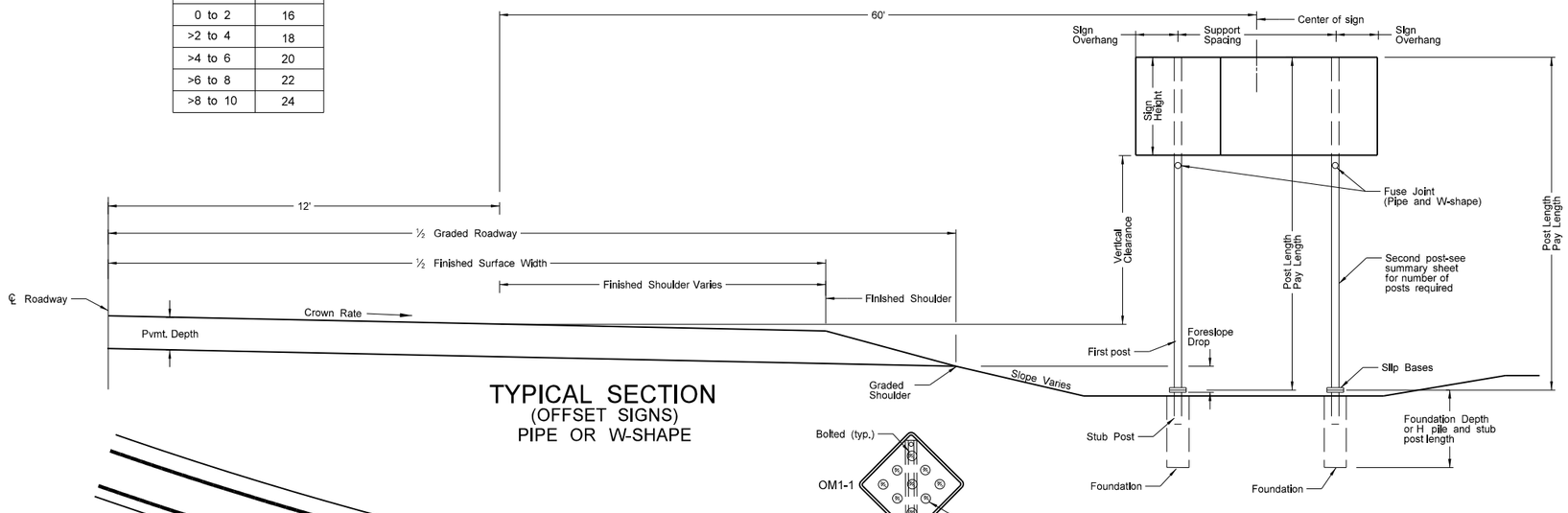
PIPE OR W-SHAPE ASSEMBLY DETAILS

D-754-1



TYPICAL SECTION
(Foreslope SIGNS)
PIPE OR W-SHAPE

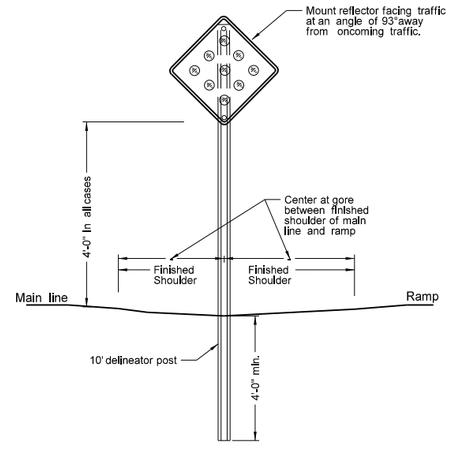
HORIZONTAL CLEARANCE TABLE	
SHOULDER WIDTH ft	OFFSET ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24



TYPICAL SECTION
(OFFSET SIGNS)
PIPE OR W-SHAPE

OBJECT MARKER
(Optional)

EXIT RAMP
GORE SIGN PLACEMENT



OBJECT MARKER INSTALLATION

NOTES:

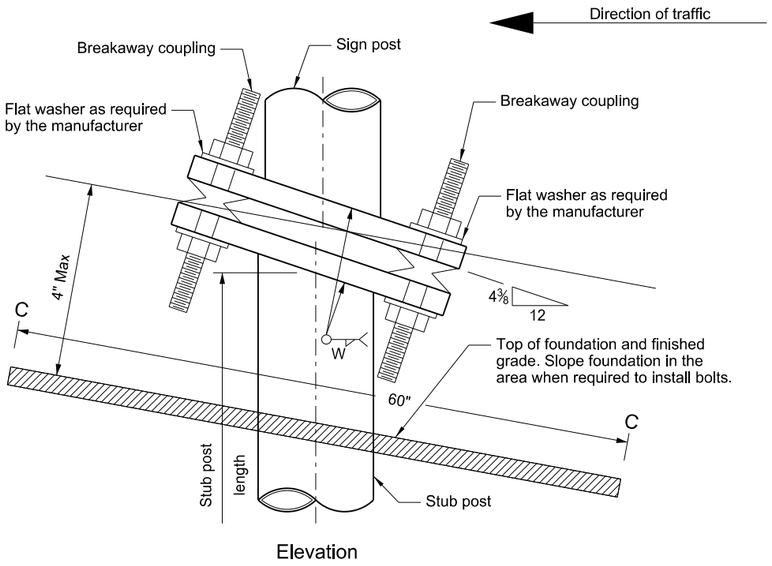
MINIMUM VERTICAL CLEARANCE:
Install signs with a minimum 5 foot vertical clearance from bottom of sign to top edge of the driving lane or auxiliary lane in rural locations. Provide a minimum 7 foot vertical clearance where parking or pedestrian movements occur. Install signs with a minimum 7 foot vertical clearance on freeways, expressways, and multi-lane conventional roadways.

A vertical clearance of 5 feet is acceptable where signs are placed a minimum of 30 feet from the edge of the traveled way.

Place signs a maximum of 6" above the vertical clearance specified above.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
7-18-14	Modify notes and update reflective sheeting for object marker. Add correct section number for object marker post.
8-30-18	Updated notes to active voice.

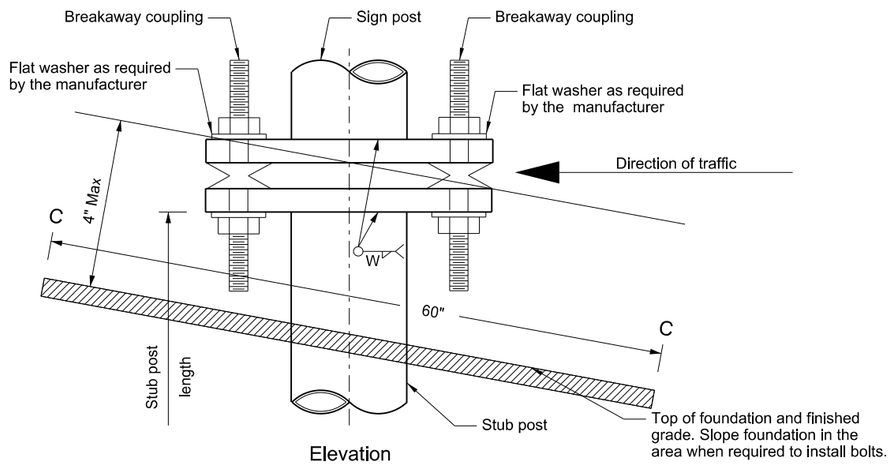
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 8-30-2018 and the original document is stored at the North Dakota Department of Transportation



Elevation

Single Post Sign and Stub Post
Type A

Breakaway Coupler System for Standard Pipe Stub Post

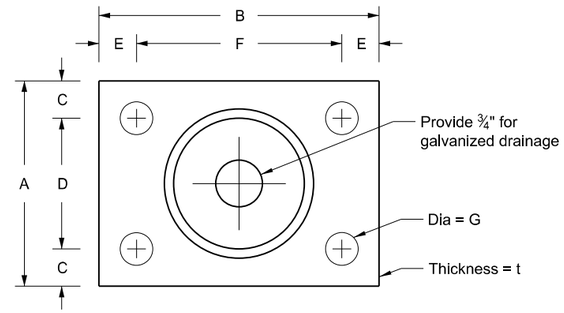


Elevation

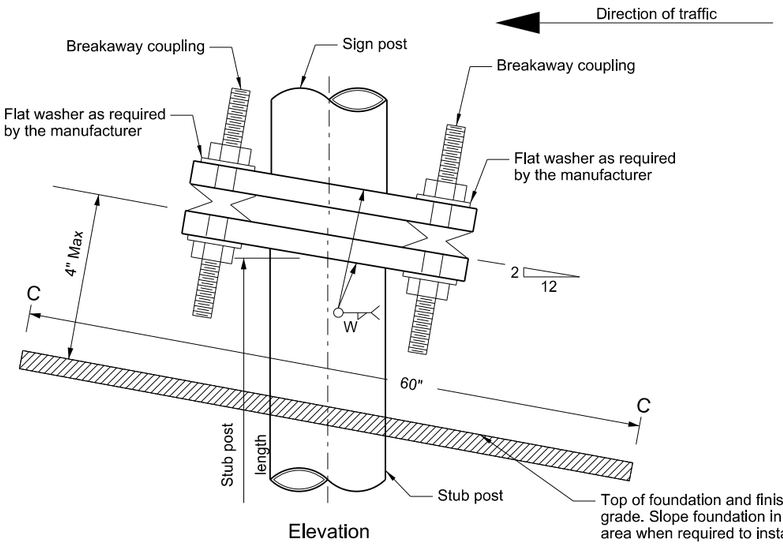
Two or More Post Sign and Stub Post
For two post signs with 8' or more post spacing and all three or more post signs
Type C

Notes:

1. In lieu of the breakaway base system on standards D-754-3 and D-754-4, use a breakaway coupler system. Manufacture the breakaway coupler system from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
2. Fuse Joint Cuts - For steel posts cut after galvanizing, either galvanize cut after fabrication, or treat cut surface in accordance with ASTM A780. Aluminum posts need no treatment.
3. Shim as required to plumb post.
4. Tighten all bolts the maximum possible with 12" to 15" wrench.

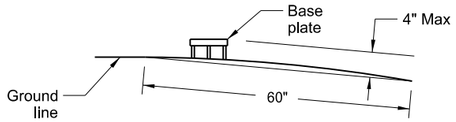


Plan Base Plate



Elevation

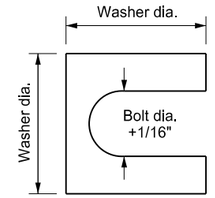
Two Post Sign and Stub Post
For signs with less than 8' post spacing
Type B



Section C - C

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

Dimension / Nom. Pipe Size	Base Table Data: Breakaway Coupling	A	B	C	D	E	F	G	t	W	Stub Post Length
Steel											
3½"	½" x 4½"	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/16"	¾"	⅜"	1'-6"
4"	⅝" x 4½"	5½"	8¾"	1"	3½"	1"	6¾"	11/16"	¾"	⅜"	1'-6"
5"	¾" x 5¼"	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/16"	1"	7/16"	2'-0"
6"	1" x 5¼"	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	1 1/16"	1¼"	7/16"	2'-0"
8"	1" x 5¼"	9½"	13¼"	1⅜"	6¾"	1⅜"	10½"	1 1/16"	1¼"	7/16"	2'-6"
10"	1" x 5¼"	11¾"	15¼"	1⅜"	9"	1⅜"	12½"	1 1/16"	1¼"	½"	3'-0"
12"	1" x 7"	13¾"	18"	1⅝"	10 ½"	1⅝"	14¾"	1 1/16"	1½"	½"	3'-0"
Aluminum											
3½"	½" x 4½"	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/16"	¾"	⅜"	1'-6"
4"	⅝" x 4½"	5½"	8¾"	1"	3½"	1"	6¾"	11/16"	1"	7/16"	1'-6"
5"	¾" x 5¼"	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/16"	1"	½"	2'-0"
6"	1" x 5¼"	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	1 1/16"	1¼"	½"	2'-0"
8"	1" x 5¼"	9½"	13¼"	1⅜"	6¾"	1⅜"	10½"	1 1/16"	1¼"	½"	2'-6"
10"	1" x 5¼"	11¾"	15¼"	1⅜"	9"	1⅜"	12½"	1 1/16"	1½"	7/16"	3'-0"
12"	1" x 7"	13¾"	18"	1⅝"	10¼"	1⅝"	14¾"	1 1/16"	1¾"	11/16"	3'-0"



Shim Detail

Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-2018 8-29-2019	Updated notes to active voice. New Design Engineer PE Stamp.

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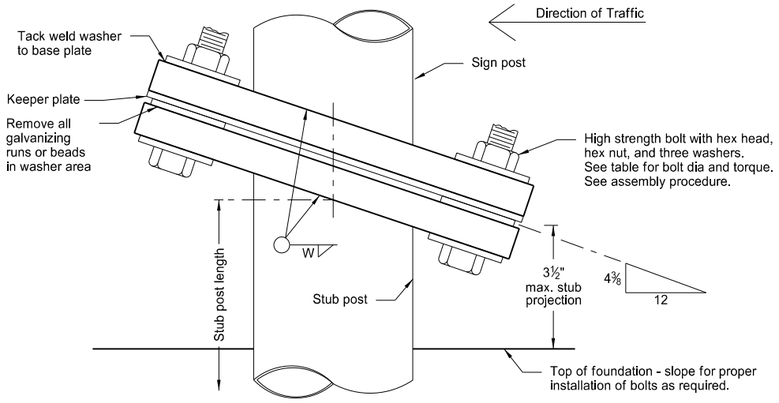
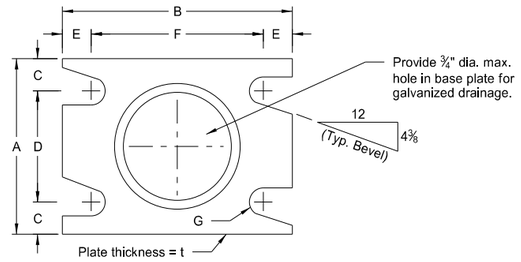
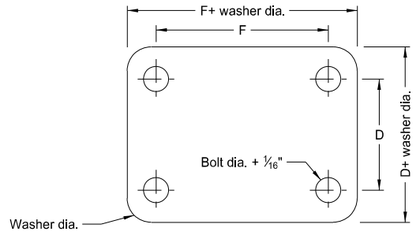
Breakaway System for Standard Pipe Stub Post



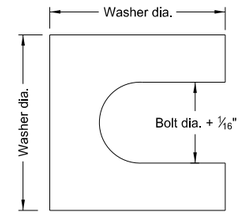
Stub Post Connection - Type A
Elevation View
(Single Post)



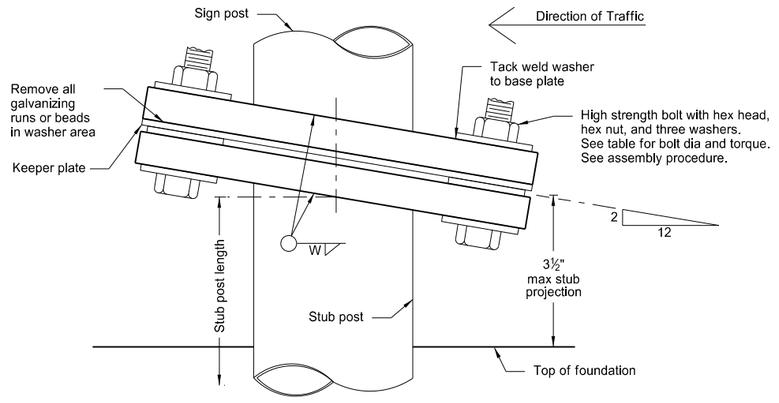
Base Plate Plan View
Place bevel toward roadway on approach side and away on the other side.



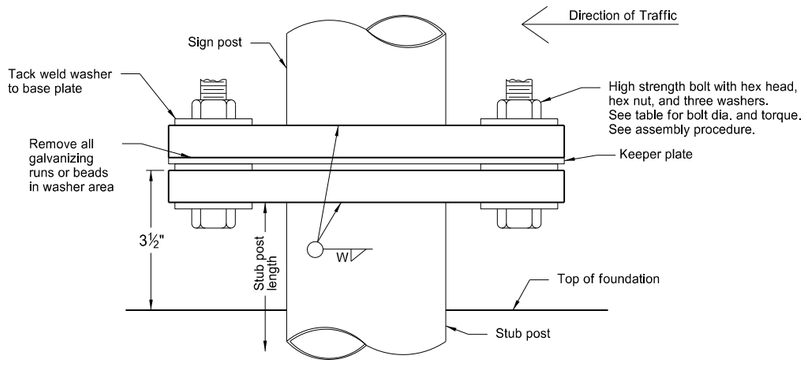
Keeper Plate Detail
Place keeper plate above center washer between top and bottom slip bases. Fabricate keeper plate from 28 gauge material and galvanize after fabrication in conformance with ASTM A653 G60 coating.



Shim Detail
Furnish 2 each ±.012" thick and 2 each ±.032" thick shims per post. Fabricate shims from brass shim stock or strip in conformance with ASTM B36.



Stub Post Connection - Type B
Elevation View
(Two Posts)



Stub Post Connection - Type C
Elevation View
(Two Posts)

Base Data Table												
Nominal Post Size dia.	Bolt Size (dia. x length)	Base Bolt Torque ft. lb.	A	B	C	D	E	F	G	t	W	Stub Post Length
Steel												
3½"	½"x2½"	12	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/32"	¾"	⅜"	1'-6"
4"	⅝"x2¾"	29	5½"	8¾"	1"	3½"	1"	6¾"	11/32"	¾"	⅜"	1'-6"
5"	¾"x3½"	46	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/32"	1"	7/16"	2'-0"
6"	1"x4¼"	61	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	17/32"	1¼"	7/16"	2'-0"
Aluminum												
3½"	½"x2½"	12	5½"	8⅜"	13/16"	3⅞"	13/16"	6¾"	9/32"	¾"	⅜"	1'-6"
4"	⅝"x2¾"	29	5½"	8¾"	1"	3½"	1"	6¾"	11/32"	1"	7/16"	1'-6"
5"	¾"x3½"	46	6½"	10"	1⅛"	4¼"	1⅛"	7¾"	13/32"	1"	½"	2'-0"
6"	1"x4¼"	61	7½"	11¾"	1⅜"	4¾"	1⅜"	9"	17/32"	1¼"	½"	2'-0"

Notes:
Tack weld aluminum base plate washers to the base, when the base plate is aluminum.

Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

Assembly Procedure:
1. Assemble post to stub with bolts and one flat washer between base plate and keeper plate.
2. Shim as required.
3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads, then loosen.
4. Retighten bolts in a systematic order to prescribed torque. (see table)
5. Loosen each bolt and fill the gaps between the thread and mating surface with thread locking liquid resin, conforming to ASTM D5363-03 (2008), forming solid, one part assemblies secure from vibration, pressure, and corrosion.
6. Retighten each bolt to prescribed torque in the same order as initial retightening.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-21-11	
REVISIONS	
DATE	CHANGE
2-28-14	Removed lower post and foundation details.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

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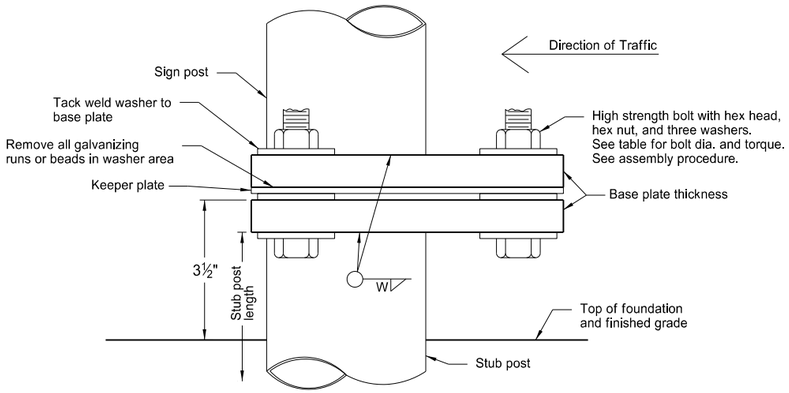
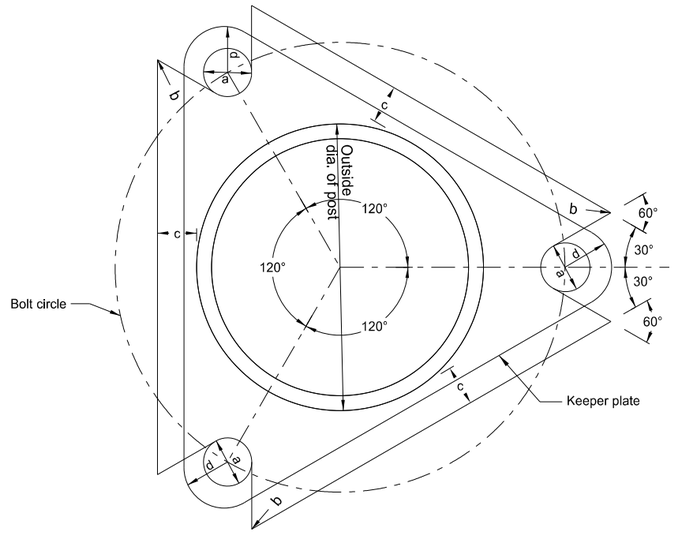
Multi-Directional Breakaway System for Standard Pipe Stub Post

D-754-4



Stub Post Connection - Type D
Elevation View
(Single Post)

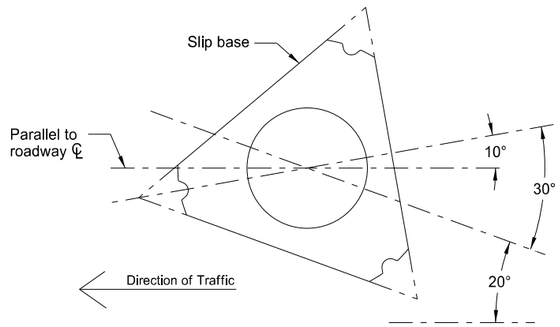


Stub Post Detail
Top View

Notes:
Tack weld aluminum base plate washers to the base, when the base plate is fabricated from aluminum.

Use standard drawing D-754-6 for fuse plate, hinge plate, and foundation details.

Assembly Procedure:
1. Assemble post to stub with bolts and one flat washer between base plates and keeper plate.
2. Shim as required.
3. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and shims to clean bolt threads, then loosen.
4. Retighten bolts in a systematic order to prescribed torque. (see table)
5. Loosen each bolt and apply thread locking liquid resin conforming to ASTM D5363-03 (2008). Fill gaps between thread and mating surface with thread locker to form solid, one part assemblies secure from vibration, pressure, and corrosion.
6. Retighten each bolt to prescribed torque in the same order as initial retightening.



Slip Base Orientation
Top View

Shim Detail

Furnish 2 each ±.012" thick and 2 each ±.032" thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

Base Data Table

Nominal Post Size dia.	Outside Post dia.	Bolt Circle	a rad.	b rad.	c rad.	Bolt Size (dia. x length)	Base Plate Thickness	W	Base Bolt Torque ft. lb.	d rad.	Stub Post Length
Steel											
3½"	4"	7"	1 1/16"	⅛"	1⅛"	1"x4"	1¼"	5/16"	55	1⅛"	1'-6"
4"	4.5"	7½"	1 1/16"	⅛"	1⅛"	1"x4½"	1½"	⅜"	98	1⅛"	1'-6"
5"	5.563"	9½"	1 5/16"	⅛"	1⅛"	1¼"x5"	1½"	⅜"	167	1⅜"	2'-0"
Aluminum											
3½"	4"	7"	13/16"	⅛"	⅞"	¾"x3½"	1"	5/16"	43	⅞"	1'-6"
4"	4.5"	7½"	13/16"	⅛"	¾"	¾"x4"	1¼"	5/16"	76	⅞"	1'-6"
5"	5.563"	9½"	1 1/16"	⅛"	1⅛"	1"x4"	1¼"	5/16"	98	1⅛"	2'-0"
6"	6.625"	10¼"	1 1/16"	⅛"	¾"	1"x4½"	1½"	⅜"	134	1⅛"	2'-0"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

2-28-14

REVISIONS

DATE	CHANGE
8-30-18 8-29-19	Updated notes to active voice. New Design Engineer PE Stamp.

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FOUNDATION DATA FOR STEEL SUPPORTS

D-754-5

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 4"	4' - 6"	0.23	0.47	4' - 2"	5	6	12	3	6	12
1' - 4"	5' - 0"	0.26	0.52	4' - 8"	5	6	12	3	7	14
1' - 4"	5' - 6"	0.28	0.57	5' - 2"	5	6	12	3	8	16
1' - 4"	6' - 0"	0.31	0.62	5' - 8"	5	6	12	3	8	16
1' - 4"	6' - 6"	0.34	0.67	6' - 2"	5	6	12	3	9	18
1' - 4"	7' - 0"	0.36	0.72	6' - 8"	5	6	12	3	9	18
1' - 4"	7' - 6"	0.39	0.78	7' - 2"	5	6	12	3	10	20
1' - 4"	8' - 0"	0.41	0.83	7' - 8"	5	6	12	3	11	22
1' - 4"	8' - 6"	0.44	0.88	8' - 2"	5	6	12	3	11	22
1' - 4"	9' - 0"	0.47	0.93	8' - 8"	5	6	12	3	12	24
1' - 4"	9' - 6"	0.49	0.98	9' - 2"	5	6	12	3	12	24
1' - 4"	10' - 0"	0.52	1.03	9' - 8"	5	6	12	3	13	26
1' - 4"	10' - 6"	0.54	1.09	10' - 2"	5	6	12	3	14	28
1' - 4"	11' - 0"	0.57	1.14	10' - 8"	5	6	12	3	14	28
1' - 4"	11' - 6"	0.59	1.19	11' - 2"	5	6	12	3	15	30
1' - 4"	12' - 0"	0.62	1.24	11' - 8"	5	6	12	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
1' - 9"	4' - 6"	0.40	0.80	4' - 2"	5	10	20	3	6	12
1' - 9"	5' - 0"	0.45	0.89	4' - 8"	5	10	20	3	7	14
1' - 9"	5' - 6"	0.49	0.98	5' - 2"	5	10	20	3	8	16
1' - 9"	6' - 0"	0.53	1.07	5' - 8"	5	10	20	3	8	16
1' - 9"	6' - 6"	0.58	1.16	6' - 2"	5	10	20	3	9	18
1' - 9"	7' - 0"	0.62	1.25	6' - 8"	5	10	20	3	9	18
1' - 9"	7' - 6"	0.67	1.34	7' - 2"	5	10	20	3	10	20
1' - 9"	8' - 0"	0.71	1.43	7' - 8"	5	10	20	3	11	22
1' - 9"	8' - 6"	0.76	1.51	8' - 2"	5	10	20	3	11	22
1' - 9"	9' - 0"	0.80	1.60	8' - 8"	5	10	20	3	12	24
1' - 9"	9' - 6"	0.85	1.69	9' - 2"	5	10	20	3	12	24
1' - 9"	10' - 0"	0.89	1.78	9' - 8"	5	10	20	3	13	26
1' - 9"	10' - 6"	0.94	1.87	10' - 2"	5	10	20	3	14	28
1' - 9"	11' - 0"	0.98	1.96	10' - 8"	5	10	20	3	14	28
1' - 9"	11' - 6"	1.02	2.05	11' - 2"	5	10	20	3	15	30
1' - 9"	12' - 0"	1.07	2.14	11' - 8"	5	10	20	3	15	30

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 0"	4' - 6"	0.52	1.05	4' - 2"	6	10	20	3	6	12
2' - 0"	5' - 0"	0.58	1.16	4' - 8"	6	10	20	3	7	14
2' - 0"	5' - 6"	0.64	1.28	5' - 2"	6	10	20	3	8	16
2' - 0"	6' - 0"	0.70	1.40	5' - 8"	6	10	20	3	8	16
2' - 0"	6' - 6"	0.76	1.51	6' - 2"	6	10	20	3	9	18
2' - 0"	7' - 0"	0.81	1.63	6' - 8"	6	10	20	3	9	18
2' - 0"	7' - 6"	0.87	1.75	7' - 2"	6	10	20	3	10	20
2' - 0"	8' - 0"	0.93	1.86	7' - 8"	6	10	20	3	11	22
2' - 0"	8' - 6"	0.99	1.98	8' - 2"	6	10	20	3	11	22
2' - 0"	9' - 0"	1.05	2.09	8' - 8"	6	10	20	3	12	24
2' - 0"	9' - 6"	1.11	2.21	9' - 2"	6	10	20	3	12	24
2' - 0"	10' - 0"	1.16	2.33	9' - 8"	6	10	20	3	13	26
2' - 0"	10' - 6"	1.22	2.44	10' - 2"	6	10	20	3	14	28
2' - 0"	11' - 0"	1.28	2.56	10' - 8"	6	10	20	3	14	28
2' - 0"	11' - 6"	1.34	2.68	11' - 2"	6	10	20	3	15	30
2' - 0"	12' - 0"	1.40	2.79	11' - 8"	6	10	20	3	15	30
2' - 0"	12' - 6"	1.45	2.91	12' - 2"	6	10	20	3	16	32
2' - 0"	13' - 0"	1.51	3.03	12' - 8"	6	10	20	3	17	34
2' - 0"	13' - 6"	1.57	3.14	13' - 2"	6	10	20	3	17	34
2' - 0"	14' - 0"	1.63	3.26	13' - 8"	6	10	20	3	18	36
2' - 0"	14' - 6"	1.69	3.37	14' - 2"	6	10	20	3	18	36
2' - 0"	15' - 0"	1.75	3.49	14' - 8"	6	10	20	3	19	38

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 4"	4' - 6"	0.71	1.43	4' - 2"	6	14	28	3	6	12
2' - 4"	5' - 0"	0.79	1.58	4' - 8"	6	14	28	3	7	14
2' - 4"	5' - 6"	0.87	1.74	5' - 2"	6	14	28	3	8	16
2' - 4"	6' - 0"	0.95	1.90	5' - 8"	6	14	28	3	8	16
2' - 4"	6' - 6"	1.03	2.06	6' - 2"	6	14	28	3	9	18
2' - 4"	7' - 0"	1.11	2.22	6' - 8"	6	14	28	3	9	18
2' - 4"	7' - 6"	1.19	2.38	7' - 2"	6	14	28	3	10	20
2' - 4"	8' - 0"	1.27	2.53	7' - 8"	6	14	28	3	11	22
2' - 4"	8' - 6"	1.35	2.69	8' - 2"	6	14	28	3	11	22
2' - 4"	9' - 0"	1.43	2.85	8' - 8"	6	14	28	3	12	24
2' - 4"	9' - 6"	1.50	3.01	9' - 2"	6	14	28	3	12	24
2' - 4"	10' - 0"	1.58	3.17	9' - 8"	6	14	28	3	13	26
2' - 4"	10' - 6"	1.66	3.33	10' - 2"	6	14	28	3	14	28
2' - 4"	11' - 0"	1.74	3.48	10' - 8"	6	14	28	3	14	28
2' - 4"	11' - 6"	1.82	3.64	11' - 2"	6	14	28	3	15	30
2' - 4"	12' - 0"	1.90	3.80	11' - 8"	6	14	28	3	15	30
2' - 4"	12' - 6"	1.98	3.96	12' - 2"	6	14	28	3	16	32
2' - 4"	13' - 0"	2.06	4.12	12' - 8"	6	14	28	3	17	34
2' - 4"	13' - 6"	2.14	4.28	13' - 2"	6	14	28	3	17	34
2' - 4"	14' - 0"	2.22	4.43	13' - 8"	6	14	28	3	18	36
2' - 4"	14' - 6"	2.30	4.59	14' - 2"	6	14	28	3	18	36
2' - 4"	15' - 0"	2.38	4.75	14' - 8"	6	14	28	3	19	38
2' - 4"	15' - 6"	2.45	4.91	15' - 2"	6	14	28	3	20	40
2' - 4"	16' - 0"	2.53	5.07	15' - 8"	6	14	28	3	20	40
2' - 4"	16' - 6"	2.61	5.23	16' - 2"	6	14	28	3	21	42
2' - 4"	17' - 0"	2.69	5.38	16' - 8"	6	14	28	3	21	42
2' - 4"	17' - 6"	2.77	5.54	17' - 2"	6	14	28	3	22	44
2' - 4"	18' - 0"	2.85	5.70	17' - 8"	6	14	28	3	23	46

Foundation Diameter	Foundation			Vertical Reinforcing Steel				Horizontal Tie Bars		
	Depth	Conc. Vol. for 1 Post (CU YDS)	Conc. Vol. for 2 Posts (CU YDS)	Length of Each Bar	Size	No. Bars for 1 Post	No. Bars for 2 Posts	Size	No. Bars for 1 Post	No. Bars for 2 Posts
2' - 6"	4' - 6"	0.82	1.64	4' - 2"	6	16	32	3	6	12
2' - 6"	5' - 0"	0.91	1.82	4' - 8"	6	16	32	3	7	14
2' - 6"	5' - 6"	1.00	2.00	5' - 2"	6	16	32	3	8	16
2' - 6"	6' - 0"	1.09	2.18	5' - 8"	6	16	32	3	8	16
2' - 6"	6' - 6"	1.18	2.36	6' - 2"	6	16	32	3	9	18
2' - 6"	7' - 0"	1.27	2.55	6' - 8"	6	16	32	3	9	18
2' - 6"	7' - 6"	1.36	2.73	7' - 2"	6	16	32	3	10	20
2' - 6"	8' - 0"	1.45	2.91	7' - 8"	6	16	32	3	11	22
2' - 6"	8' - 6"	1.55	3.09	8' - 2"	6	16	32	3	11	22
2' - 6"	9' - 0"	1.64	3.27	8' - 8"	6	16	32	3	12	24
2' - 6"	9' - 6"	1.73	3.45	9' - 2"	6	16	32	3	12	24
2' - 6"	10' - 0"	1.82	3.64	9' - 8"	6	16	32	3	13	26
2' - 6"	10' - 6"	1.91	3.82	10' - 2"	6	16	32	3	14	28
2' - 6"	11' - 0"	2.00	4.00	10' - 8"	6	16	32	3	14	28
2' - 6"	11' - 6"	2.09	4.18	11' - 2"	6	16	32	3	15	30
2' - 6"	12' - 0"	2.18	4.36	11' - 8"	6	16	32	3	15	30
2' - 6"	12' - 6"	2.27	4.55	12' - 2"	6	16	32	3	16	32
2' - 6"	13' - 0"	2.36	4.73	12' - 8"	6	16	32	3	17	34
2' - 6"	13' - 6"	2.45	4.91	13' - 2"	6	16	32	3	17	34
2' - 6"	14' - 0"	2.55	5.09	13' - 8"	6	16	32	3	18	36
2' - 6"	14' - 6"	2.64	5.27	14' - 2"	6	16	32	3	18	36
2' - 6"	15' - 0"	2.73	5.45	14' - 8"	6	16	32	3	19	38
2' - 6"	15' - 6"	2.82	5.64	15' - 2"	6	16	32	3	20	40
2' - 6"	16' - 0"	2.91	5.82	15' - 8"	6	16	32	3	20	40
2' - 6"	16' - 6"	3.00	6.00	16' - 2"	6	16	32	3	21	42
2' - 6"	17' - 0"	3.09	6.18	16' - 8"	6	16	32	3	21	42
2' - 6"	17' - 6"	3.18	6.36	17' - 2"	6	16	32	3	22	44
2' - 6"	18' - 0"	3.27	6.54	17' - 8"	6	16	32	3	23	46
2' - 6"	18' - 6"	3.36	6.73	18' - 2"	6	16	32	3	23	46
2' - 6"	19' - 0"	3.45	6.91	18' - 8"	6	16	32	3	24	48
2' - 6"	19' - 6"	3.55	7.09	19' - 2"	6	16	32	3	24	48
2' - 6"	20' - 0"	3.64	7.27	19' - 8"	6	16	32	3	25	50

NOTES:

1. Use Grade 60 reinforcing steel.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-3-13

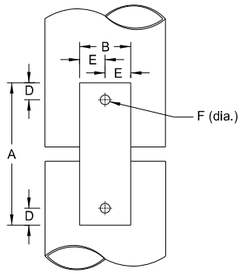
REVISIONS

DATE	CHANGE
8-30-18 8-29-19	Updated notes to active voice. New Design Engineer PE Stamp.

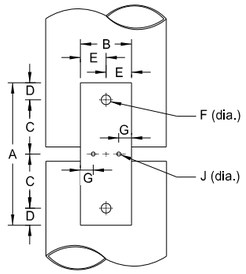
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

Hinge Plate, Fuse Plate and Foundation Details for Standard Pipe

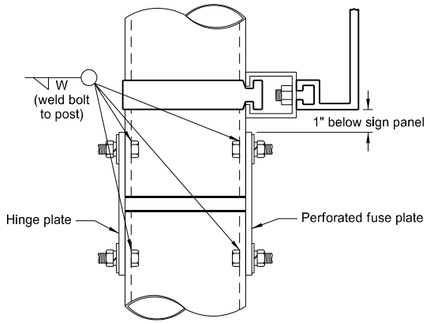
D-754-6



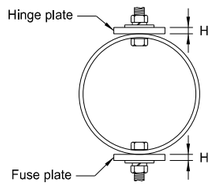
Hinge Plate



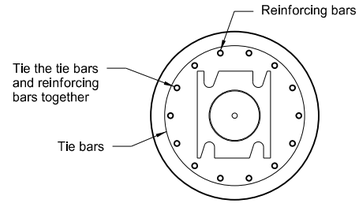
Perforated Fuse Plate



Side View

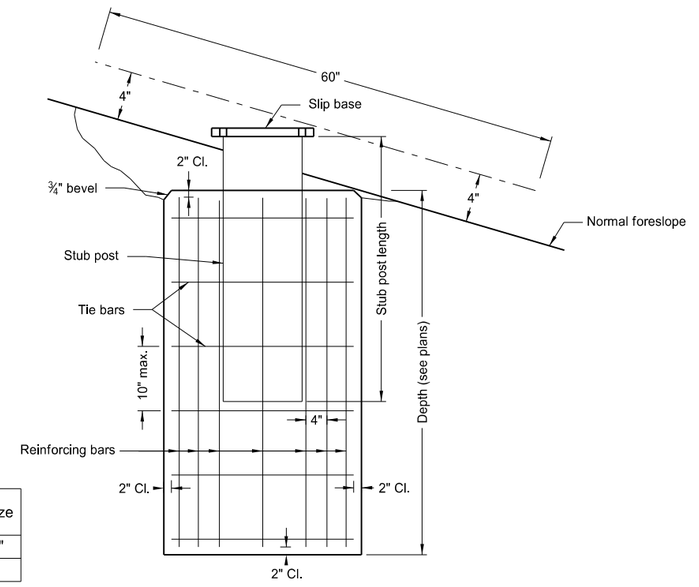


Top View



Top View

See standard drawing D-754-5 for size, number, and length of rebar. Use 3 bolt base plate for Type D.



Foundation

Front View

Foundation detail for breakaway base with stub post connection.

Foundation diameter	Post Size
1'-4"	3½"-4"
1'-9"	5"-6"

Notes:
Fuse Joint Cuts - For steel posts cut after galvanizing, either galvanize cut after fabrication, or treat cut surface in accordance with ASTM A780. Aluminum posts need no treatment.

Use standard drawings D-754-2, D-754-3 and D-754-4 for information on breakaway base details.

Maintain the 4" vertical height and 60" diameter horizontal clearance of the break-away base at each post location.

Assembly Procedure:
1. Assemble hinge plate to post with bolts and one flat washer and lock washer under nut.

2. Tighten all bolts the maximum possible with 12" to 15" wrench.

Round Metal Posts							
Dimensions				Properties			
Nominal dia. in.	Outside dia. in.	Inside dia. in.	Wall Thickness in.	Weight per Foot Pound	Moment of Inertia in.^{4}	Cross Sec. Area in.^{2}	Section Diameter in.^{2}
Steel							
3½	4.000	3.548	.226	9.11	4.788	2.680	2.394
4	4.500	4.026	.237	10.79	7.233	3.174	3.215
5	5.563	5.047	.258	14.62	15.16	4.300	5.449
6	6.625	6.065	.280	18.97	28.14	5.581	8.495
Aluminum							
3½	4.000	3.548	.226	3.151	4.788	2.680	2.394
4	4.500	4.026	.237	3.733	7.232	3.174	3.214
5	5.563	5.047	.258	5.057	15.16	4.300	5.451
6	6.625	6.065	.280	6.564	28.14	5.581	8.496

Nominal Pipe Size dia.	Fuse and Hinge Plate Data										
	Bolt Size	A	B	C	D	E	F	G	H	I	J
3½"	½"ø x 1½"	5"	1¾"	1 11/16"	13/16"	⅞"	9/16"	15/32"	¼"	13/32"	7/16"
4"	⅝"ø x 1½"	5¾"	2"	1⅞"	1"	1"	1 1/16"	17/32"	⅜"	15/32"	9/16"
5"	⅝"ø x 1¾"	5¾"	2"	1⅞"	1"	1"	1 1/16"	9/16"	½"	7/16"	⅝"
6"	¾"ø x 2¼"	6¼"	2¼"	2"	1⅛"	1⅛"	13/16"	⅝"	½"	½"	⅝"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
8-30-18 8-29-19	Updated notes to active voice. New Design Engineer PE Stamp.

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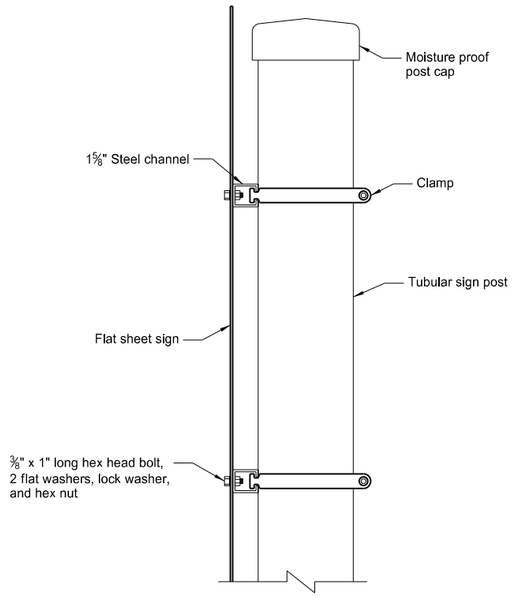
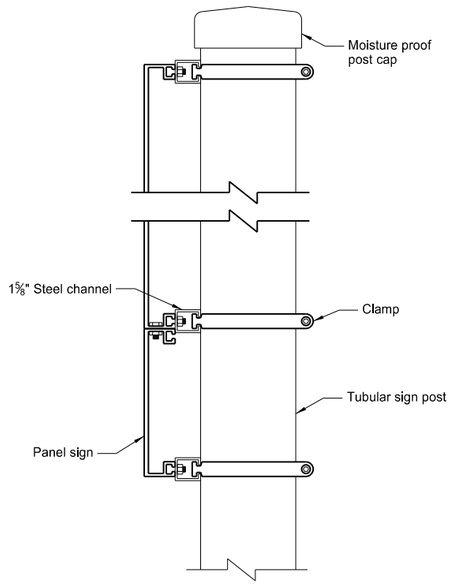
PIPE SUPPORT AND SIGN MOUNTING DETAILS

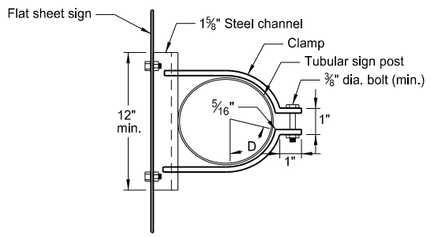
D-754-7



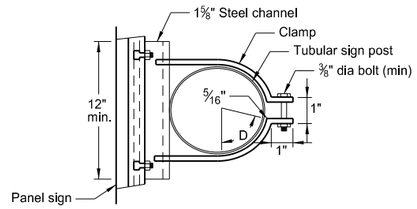
Side View



Side View



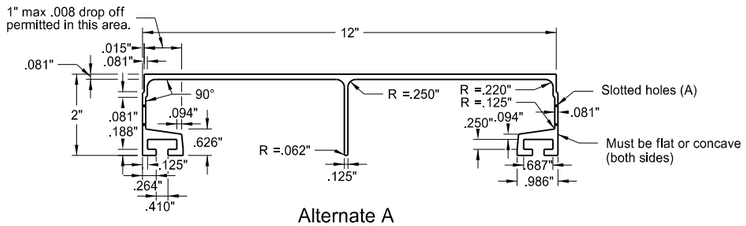
Top View



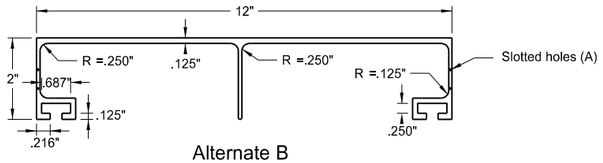
Top View

Flat Sheet Sign Clamp Mounting Details

Panel Sign Clamp Mounting Details



Alternate A
12" Extruded Panel



Alternate B
12" Extruded Panel

Slotted Hole Detail

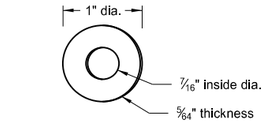
6" Extruded Panel

Aluminum Panel Details

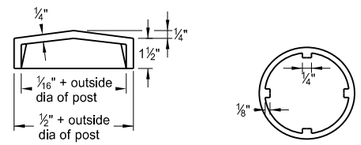
(A) Punch slotted holes in aluminum panels at 1'-0" on center, space from end as listed below:

12" even length panels	4'-0" etc.
9" odd + 6" length panels	5'-6" etc.
6" odd length panels	5'-0" etc.
3" even + 6" length panels	4'-6" etc.

Wall thickness = .078" unless specified otherwise.
All inside and outside corners = .031" radius unless specified otherwise.



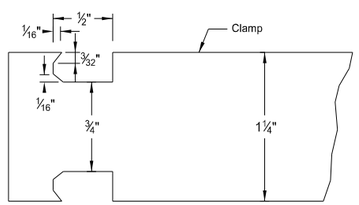
Flat Washer Detail



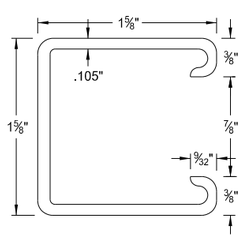
Side View Top View

Post Cap Detail

Furnish post caps for all steel or aluminum posts or weld a ⅛" plate all around.



Clamp Detail



Steel Channel Detail

Post Size dia	Clamp Gauge min
3½" to 5"	11
6" to 12"	10

Post Size dia (in)	D (in)
3½	3
4	3 3/16
5	5⅛
6	7 7/16
8	13 1/16
10	20¾
12	29⅝

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-21-14	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice, defined bolt & washers for fastening sign.
8-29-19	New Design Engineer PE Stamp.

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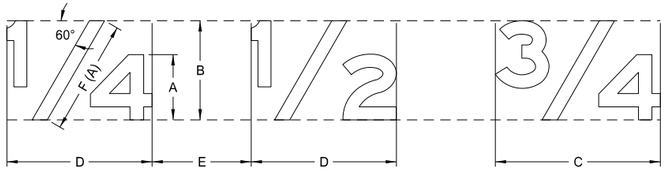
LETTER AND ARROW DETAILS

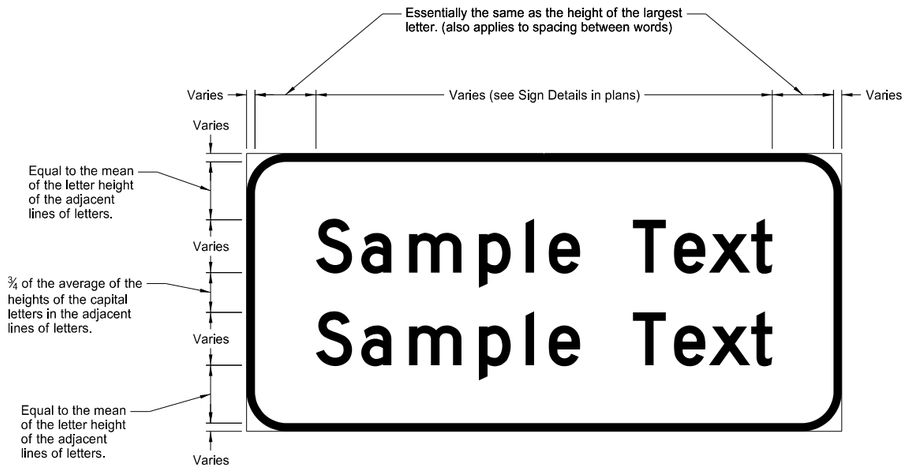
D-754-9



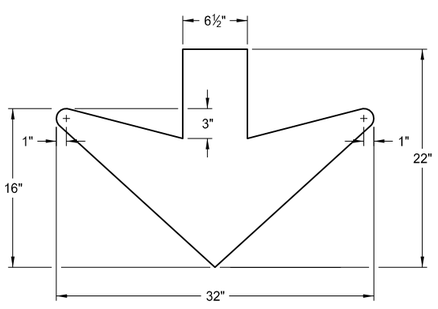
DETERMINE SIZE OF THE FRACTION AS FOLLOWS:

SYMBOL	TITLE	RATIO TO HEIGHT OF CAPITAL OR UPPER CASE
A	Letter height	1.0 of capital or upper case
B	Fraction height	1.5 X A
C	Fraction width	2.5 X A
D	Fraction width	2 X A
E	Space to next character	1 to 1.5 X A
F(A)	Length of diagonal	1.75 X A

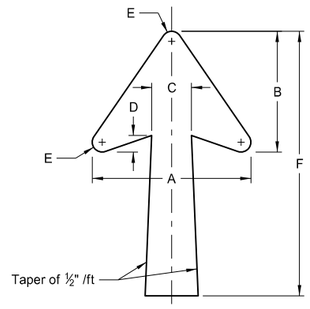
(A) Center diagonal stroke of fraction optically.



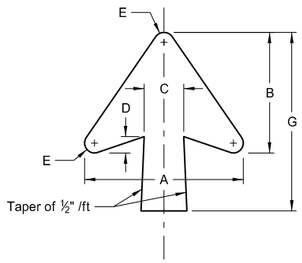
TYPICAL SPACING



DOWN ARROW



TYPE A

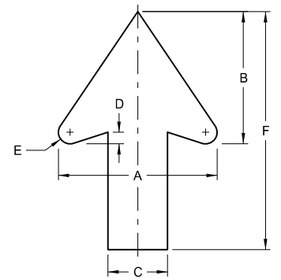


TYPE B

DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F	G
ND_6IN	6"	12"	9.125"	3"	1"	0.625"	20"	13.5"
ND_8IN	8"	15.125"	11.563"	3.75"	1.313"	0.813"	25"	17"
ND_10IN	10"	18.25"	14"	4.5"	1.5"	0.75"	30"	20"
ND_12IN	12"							
ND_13IN	13.3"							
ND_16IN	16"	22.25"	17"	5.375"	1.75"	1"	35"	25"
ND_20IN	20"							

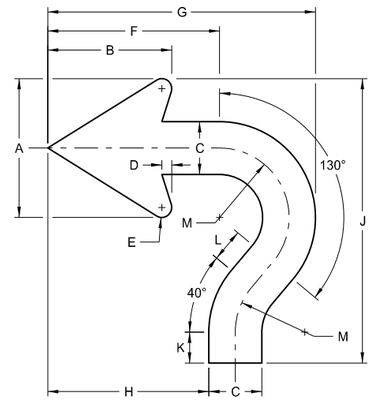
NOTE: Arrow size on gore signs is based on the letter size of "EXIT".

NOTE: Measure rotation angle of arrows counterclockwise from positions shown in details.



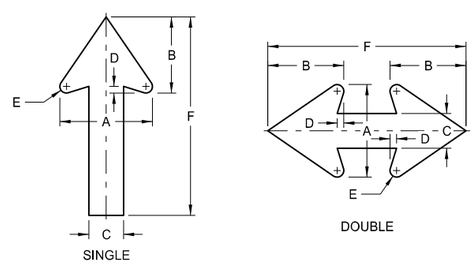
TYPE D

DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F
ND_2IN	2"	2"	1.625"	0.75"	0.125"	0.125"	3"
ND_4IN	4"	4"	3.313"	1.5"	0.25"	0.25"	6"
ND_6IN	6"	6"	4.875"	2.25"	0.375"	0.375"	9"
ND_8IN	8"	8"	6.625"	3"	0.5"	0.5"	12"
ND_10IN	10"	10"	8.375"	3.75"	0.75"	0.75"	15"
ND_12IN	12"	12"	10"	4.5"	0.875"	0.875"	18"



ROUNDABOUT

DESIGNATION	LETTER SIZE (Upper Case)	A	B	C	D	E	F	G	H	J	K	L	M
ND_6IN	6"	5.25"	4.688"	2"	0.375"	0.375"	6.5"	10.125"	6.094"	10.75"	1.168"	1.25"	2.625"
ND_8IN	8"	7"	5.75"	2.625"	0.5"	0.5"	8.688"	13.5"	8.166"	14.333"	1.557"	1.667"	3.5"



SPECIAL

DESIGNATION	A	B	C	D	E	F	USES
ND_0.75IN	2"	1.625"	0.75"	0.125"	0.125"	7.75"	Parking Signs (Regulatory)
ND_2.625IN	7"	5.75"	2.625"	0.5"	0.5"	15"	Frontage Road Signs

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

8-3-11

REVISIONS

DATE	CHANGE
7-8-14	Revised gore sign and added 4" D & D arrow
5-4-16	Revised Distance & Destination and Typical Spacing details
4-23-18	Revised arrow details
8-30-18	Updated notes to active voice.
8-29-19	New Design Engr PE Stamp.

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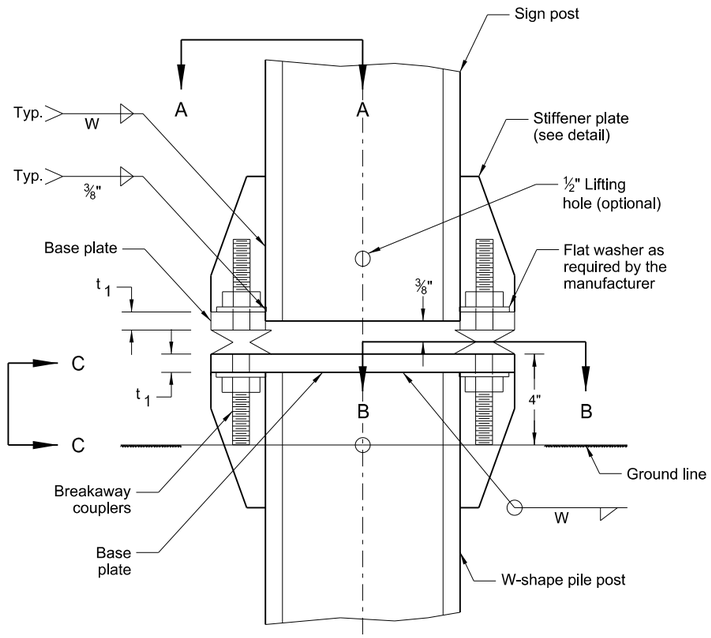
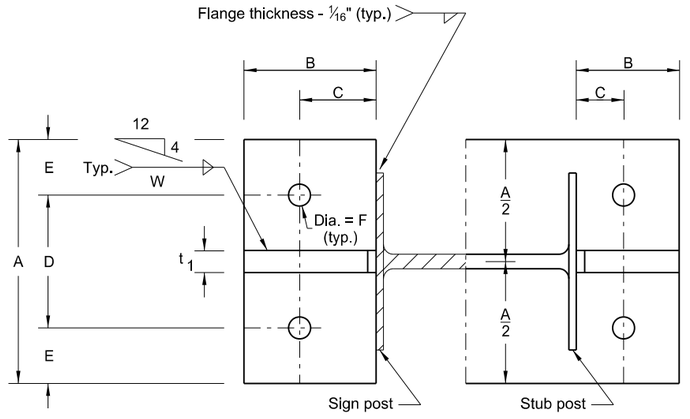
Breakaway Coupler System
Structural Details
for W-Shape Supports

D-754-12



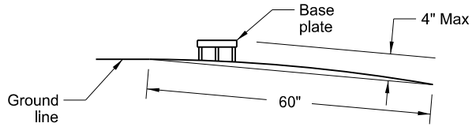
Sign Post and Stub Post
Elevation



Section A - A Section B - B
(See Table for Dimensions)

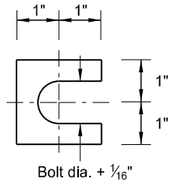
Notes:

1. Use either the breakaway base system shown on standard D-754-13 or a breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements as specified by DENT BREAKAWAY IND., INC. which meets the requirements of NCHRP Report 350.
2. Use structural steel conforming to Sec. 894.03 B.6 and high strength bolts conforming to ASTM - A325. Refer to "Sign Summary" sheet for specific data on each individual sign installation.
3. Use manufacturer's recommendations for assembly procedures.

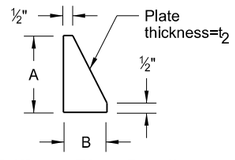


Section C - C

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



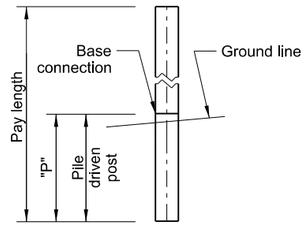
Shim Detail



Stiffener Plate Detail
(See Table for Dimensions)

Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Fabricate shims from brass shim stock or strip conforming to ASTM B36.

Sections shown are for installations on right shoulder and in gore. Plate slot bevels are opposite hand from that shown for installations on left shoulder.



W-Shape - Pile Footing

W-Shape Post & Pile Size	Base Connection Data										Footing Data
	Bolt Size	A	B	C	D	E	t_1	t_2	W	F	W-Shape Pile Post "P"
W4X13	¾" x 5¼"	6"	2½"	1½"	3½"	1¼"	1"	½"	¼"	13/16"	14'
W5X16											14'
W6X20	⅞" x 5¼"	8"	3"	1¾"	4"	2"	1¼"	½"	¼"	15/16"	14'
W8X24											14'
W8X28	1" x 5¼"	8"	3"	2"	4"	2"	1½"	¾"	5/16"	1 1/16"	14'

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-2013	
REVISIONS	
DATE	CHANGE
7-8-14	Revised notes 2 and 3.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

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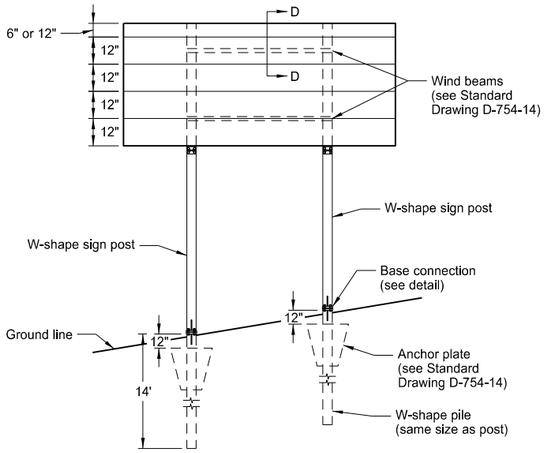
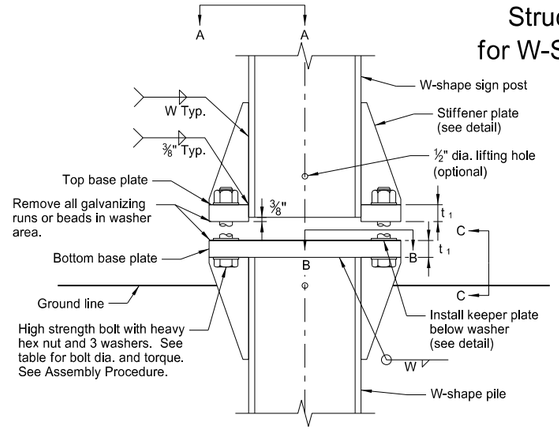
Breakaway System Structural Details for W-Shape Supports

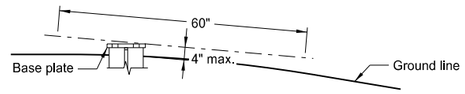
D-754-13



Typical Panel Mounting on W-shape Sign Posts



Base Connection Detail



Section C-C
Stub Height Requirements

Maximum projection of base plate limits are defined as a line 4" parallel to any chord, which is perpendicular to, or aligned radially to, the center line of the highway and has the chord's end points on the ground surface on opposite sides of the stub post.

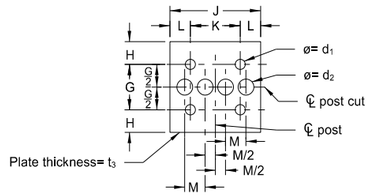
Notes:

Use structural steel conforming to Section 894.03 B.6 of the Standard Specifications and high strength bolts conforming to ASTM A325.

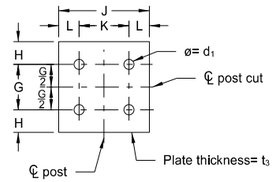
Refer to Sign Summary sheet for specific data on individual sign installation.

Install perforated fuse plate on side of post facing traffic.

Saw cut posts. Shear or flame cut plates using a mechanically guided cutting torch in accordance with Section 754.04 D.4.b of the Standard Specifications. Prepare edge in accordance with Section 754.04 D.4.c of the Standard Specifications.



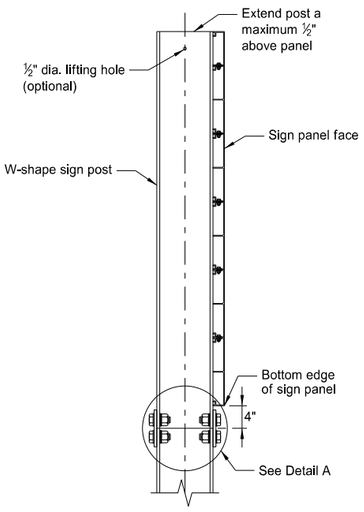
Perforated Fuse Plate



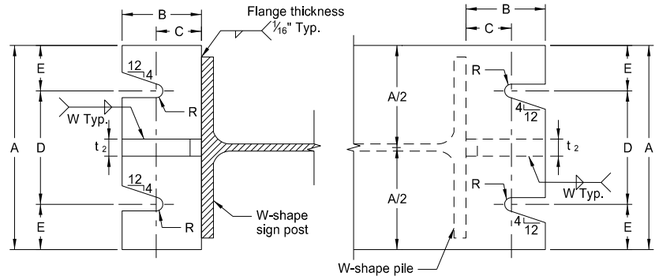
Hinge Plate

Assembly Procedure:

1. Assemble base plates with bolts and one flat washer between top base plate and keeper plate.
2. Shim as required to plumb post.
3. Tighten all base connection bolts the maximum possible with 12" to 15" wrench to bed washers and shims and clean bolt threads.
4. Loosen each bolt in turn and retighten in systematic order to the prescribed torque (see table).
5. Assemble perforated fuse and hinge plates to post with bolts and one flat washer and lock washer under nut.

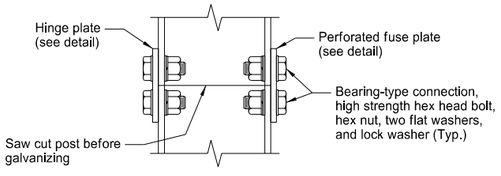


Fuse Joint
(Side View)

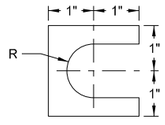


Section A-A Section B-B

Sections shown for installations on right shoulder. Reverse plate slot bevels for installations on left shoulder.

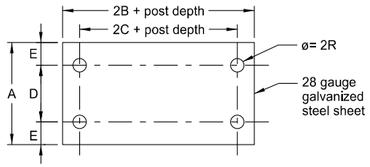


Detail A

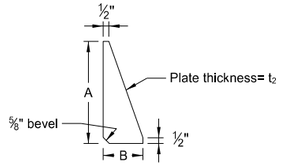


Shim Detail

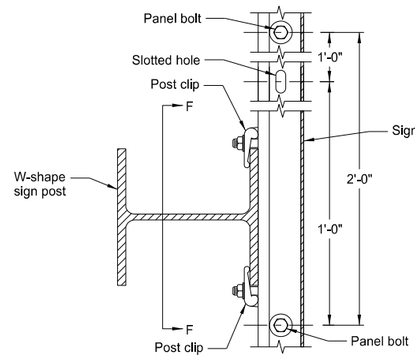
Furnish 2 each .012"± thick and 2 each .032"± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.



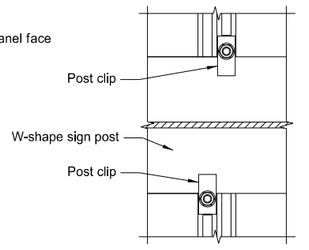
Keeper Plate



Stiffener Plate

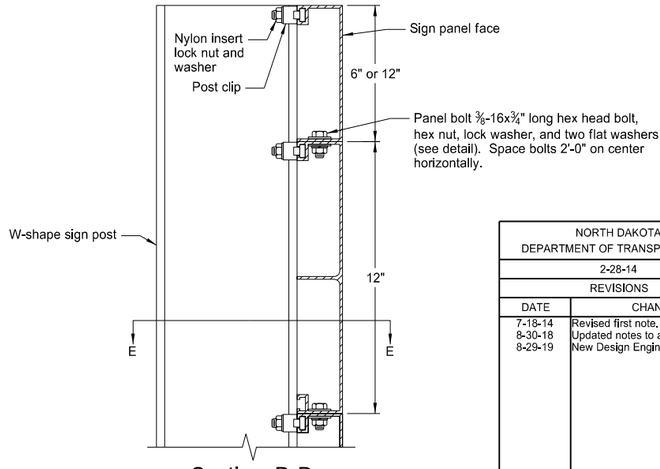


Section E-E

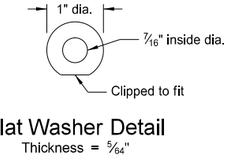


Section F-F

Install post clips on both sides of each post at each panel joint indicated.



Section D-D



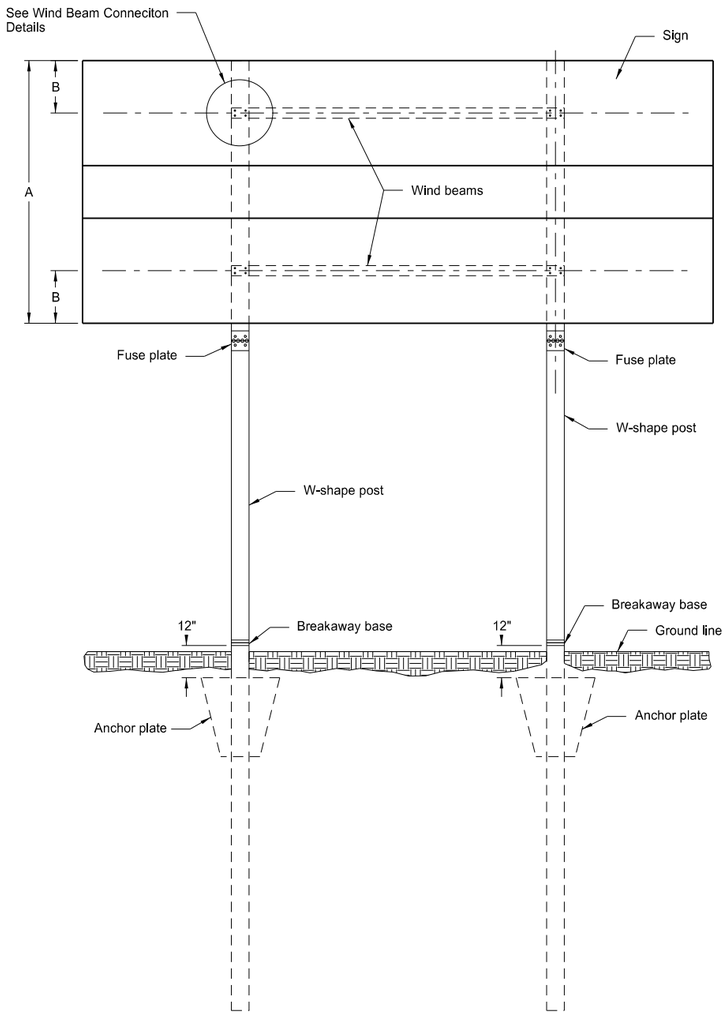
Flat Washer Detail
Thickness = 5/64"

W-Shape Post and Pile Size	Base Connection Dimensions										Fuse and Hinge Plate Dimensions									
	Bolt Size and Torque	A	B	C	D	E	t_1	t_2	W	R	G	H	J	K	L	M	d_1	d_2	t_3	Bolt dia.
W4x13	¾" ø x 3½" Torque = 600 in-lb	6"	2½"	1½"	3½"	1¼"	1"	½"	¼"	13/32"	2"	1¼"	4"	2¼"	⅞"	1"	11/16"	¾"	⅜"	⅝"
W5x16	¾" ø x 3½" Torque = 600 in-lb	6"	2½"	1½"	3½"	1¼"	1"	½"	¼"	13/32"	2½"	1¼"	5"	2¾"	1⅛"	1⅛"	13/16"	⅞"	⅜"	¾"
W6x20	⅞" ø x 4¼" Torque = 800 in-lb	8"	3"	1¾"	4"	2"	1¼"	½"	¼"	15/32"	2½"	1¼"	6"	3½"	1¼"	1⅜"	13/16"	1⅛"	⅜"	¾"
W8x24	⅞" ø x 4¼" Torque = 800 in-lb	8"	3"	1¾"	4"	2"	1¼"	½"	¼"	15/32"	2½"	1½"	6½"	3½"	1½"	1½"	15/16"	1¼"	½"	⅞"
W8x28	1" ø x 5" Torque = 1000 in-lb	8"	3"	2"	4"	2"	1½"	¾"	5/16"	17/32"	2½"	1½"	6½"	3½"	1½"	1⅝"	1⅛"	1⅛"	½"	1"
W8x31	1⅛" ø x 5" Torque = 1200 in-lb	9"	3½"	2"	5"	2"	1½"	¾"	5/16"	19/32"	3"	1¾"	8"	5½"	1¼"	2"	1⅛"	1½"	½"	1"
W10x39	1⅛" ø x 5" Torque = 1200 in-lb	9"	3½"	2"	5"	2"	1½"	¾"	5/16"	19/32"	3"	1¾"	8"	5½"	1¼"	1⅞"	1⅜"	1⅜"	½"	1⅛"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
7-18-14	Revised first note.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

WIND BEAMS AND ANCHOR PLATES FOR W-SHAPE SUPPORTS



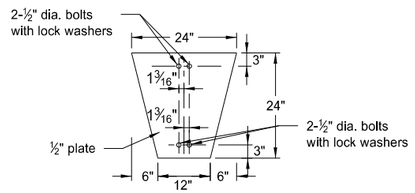
ASSEMBLY DETAIL FOR WIND BEAMS AND ANCHOR PLATES

Notes:

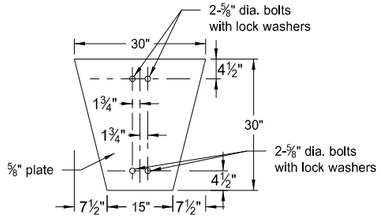
Calculate the B distance using the formula, B=A/4.

Use wind beam conforming to Section 894.03 B.6 of the Standard Specifications.

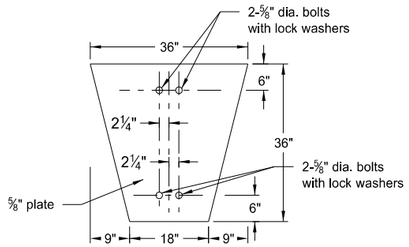
Use bolts conforming to ASTM A307 and galvanized according to ASTM A153.



W4-13 & W5-16

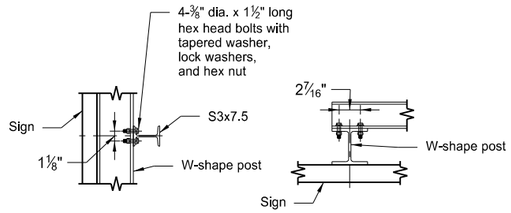


W6-20, W8-24 & W8-28



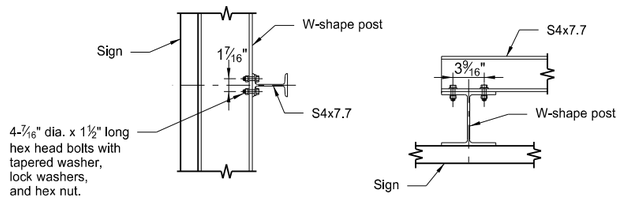
W8-31 & W10-39

ANCHOR PLATE DETAILS



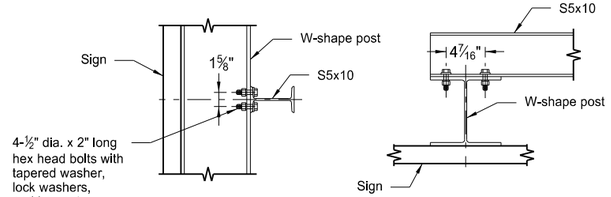
End View Top View

W4-13 & W5-16



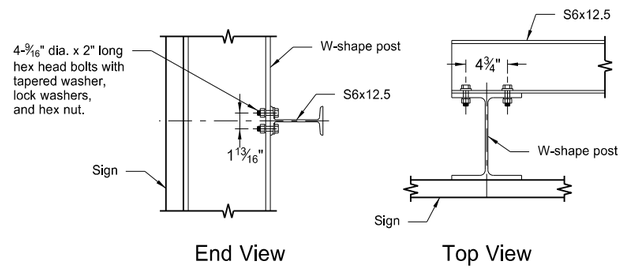
End View Top View

W6-20, W8-24 and W8-28



End View Top View

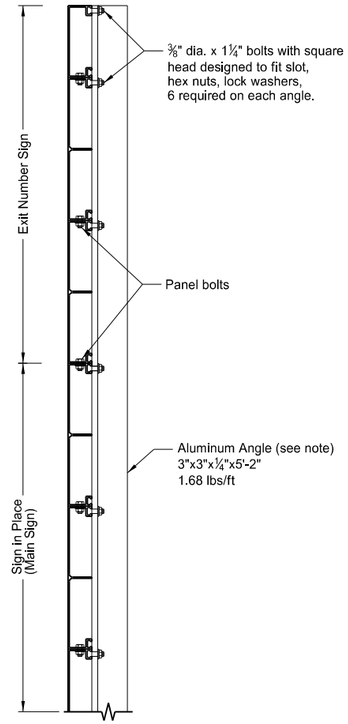
W8-31



End View Top View

W10-39

WIND BEAM CONNECTION DETAILS



ASSEMBLY DETAIL FOR EXIT NUMBER SIGNS

Note: Use two aluminum angles on each sign. Vary distance between angles dependent on post spacing of sign in place. Place angles as near as possible to posts. The Engineer will determine exact location.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised second note.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

Notes:

1. Curbed Roadways: Use a 3' clearance from face of the curb except where right of way or sidewalk width is limited; Use a minimum 2' clearance. Increase the horizontal clearance if required to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

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

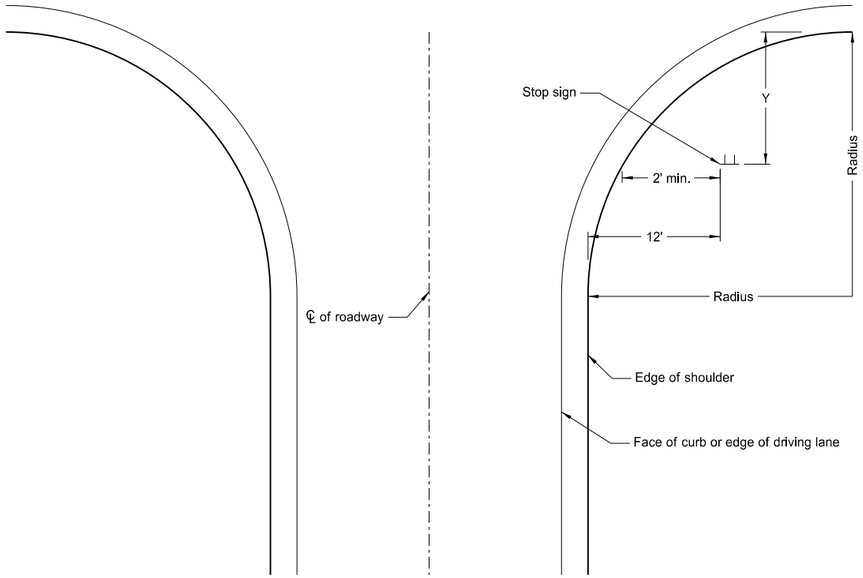
   Install signs on expressways a minimum height of 7'.

   Install adopt-a-highway signs on Freeways at least 7' above the edge of the driving lane.

   Maximum vertical clearance is 6" greater than the minimum vertical clearance.

3. Offset signs: Use a vertical clearance of 5' above the edge of the driving lane for signs placed 30 feet or more from the edge of the traveled way.

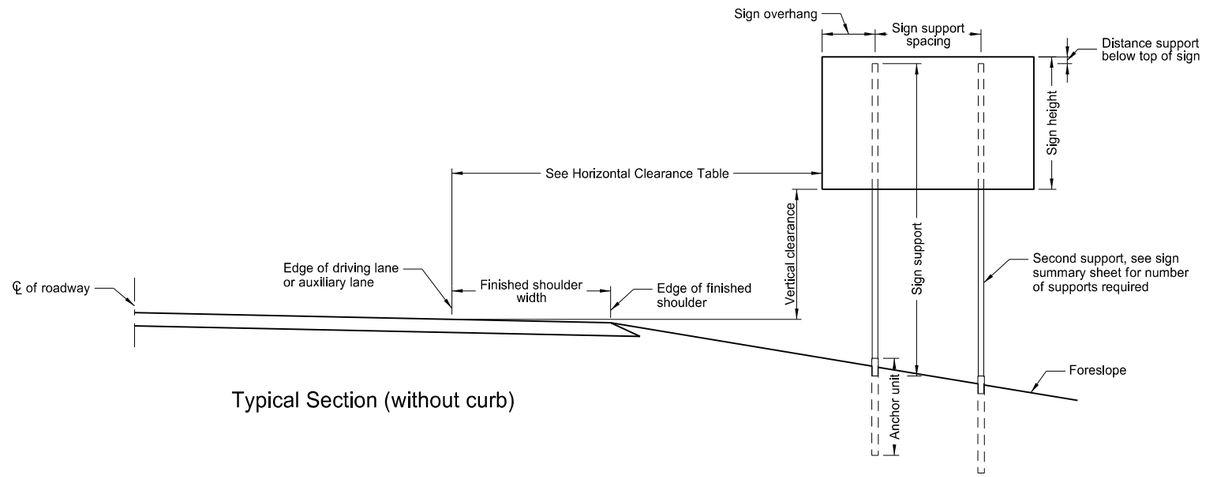
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.



Stop Sign Location
Wide Throat Intersection

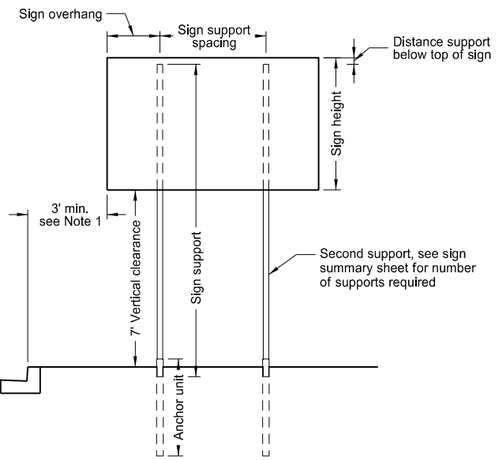
Use layout for the placement of "Stop" signs.

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



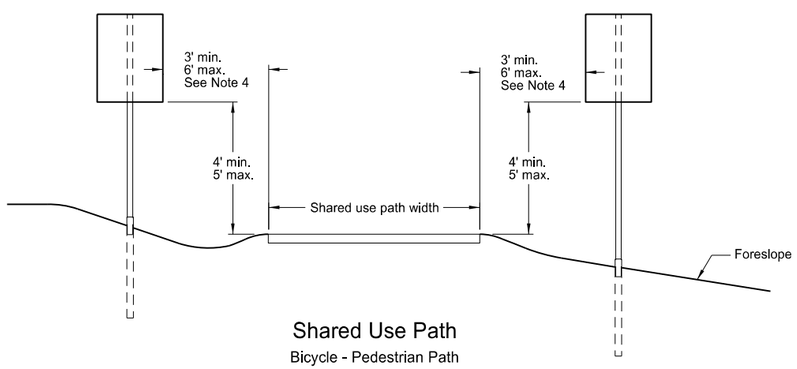
Typical Section (without curb)

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



Typical Section (with curb)

Residential or Business District



Shared Use Path

Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

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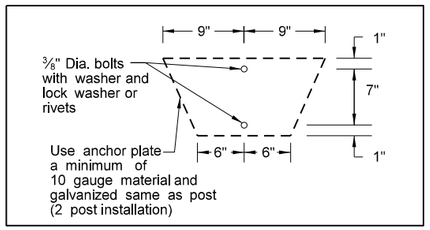
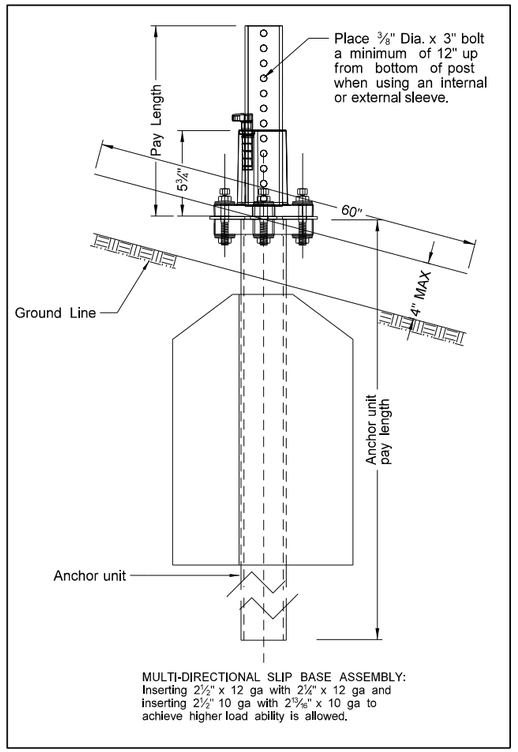
Mounting Details Perforated Tube

D-754-24

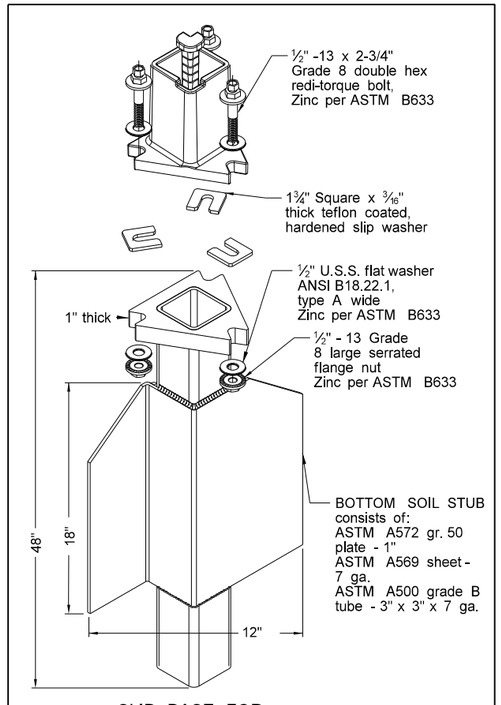
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2½(D)	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2½(D)	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2½(D)	12	Yes		7
3 & 4	2½	10	2⅜16	10	Yes		7

(B) - Provide a shim as specified by the manufacturer when placing 2½", 12 gauge posts in standard soils without breakaway bases. Provide breakaway base when placing the support in weak soils. The Engineer will determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

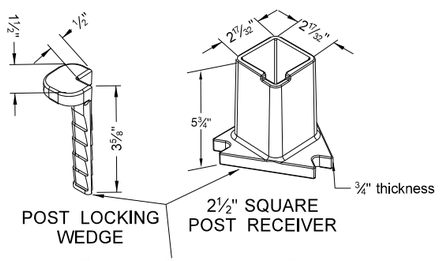




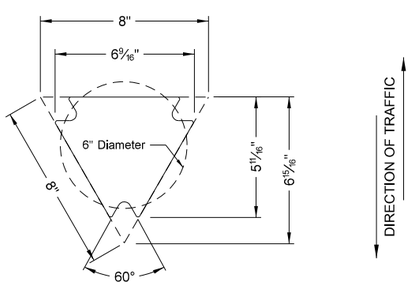
MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
Inserting 2½" x 12 ga with 2¼" x 12 ga and inserting 2½" 10 ga with 2⅜16" x 10 ga to achieve higher load ability is allowed.



SLIP BASE FOR 2½" POST



Ductile Iron Casting class 65-45-12.
Hot Dip Galvanize ASTM A153



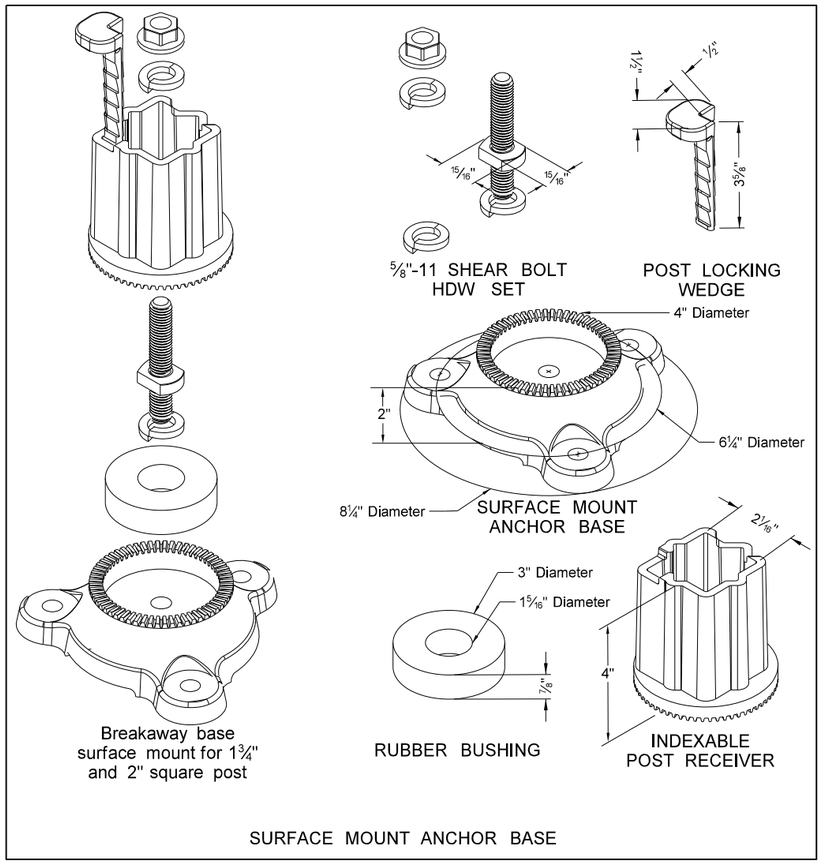
SLIP BASE DETAIL

Properties of 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 Modulud In.³
1½ x 1½	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
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2⅜16 x 2⅜16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2 ⅜16" size 10 gauge is shown as 2.19" size on the plans;
The 2½" size is shown as 2.51" size on the plans.

NOTE:

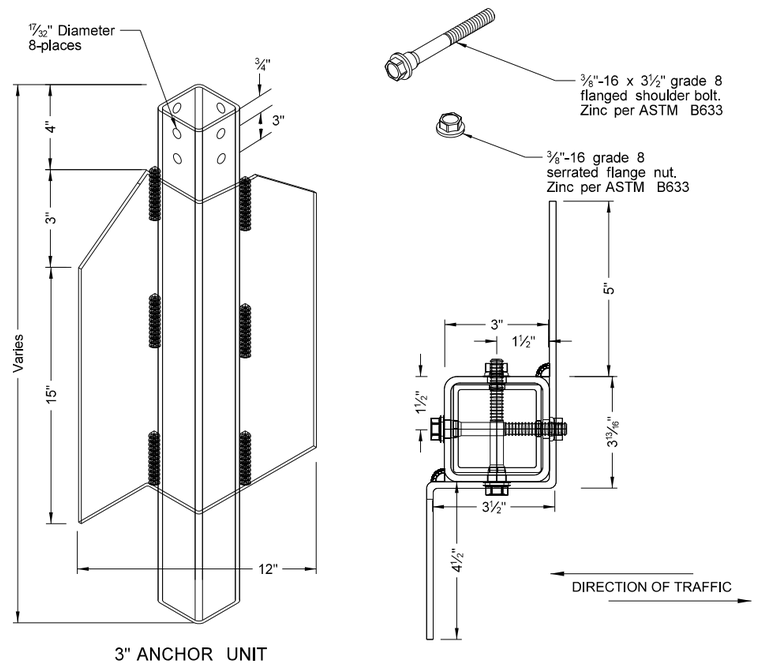
1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Provide 7 guage HRPO commmercial quality ASTM A569 and 3" x 3" x 7" guage ASTM A500 grade B anchor material with 43.9 KSI yield strength and 59.3 KSI tensile strength. Hot dip galvanize anchor per ASTM A123/153. Tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless ortherwise noted.
3. Eliminate wings when anchor is used in concrete sidewalk.
4. Provide a minimum 8' distance between the first and fourth post on four post signs.
5. Install in accordance with manufacturers recommendation.
6. Use a minimum ½" diameter x 4" grade 8 concrete fastener for surface mount breakaway base.



SURFACE MOUNT ANCHOR BASE

SHOULDER BOLT

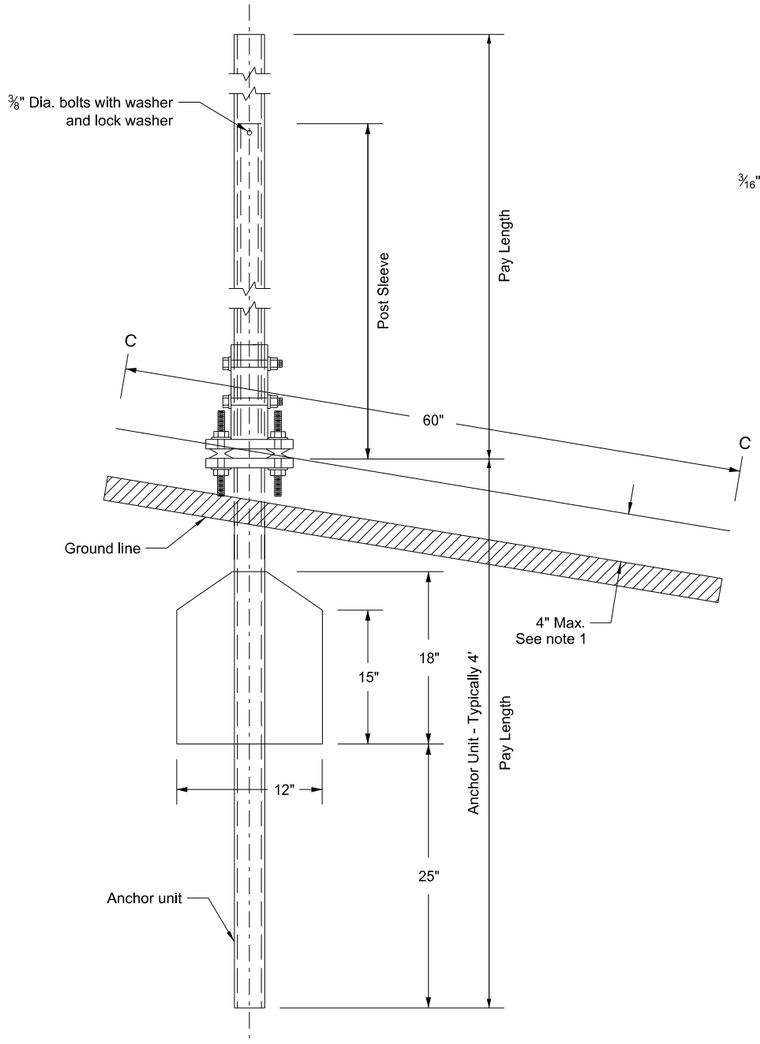
Shimming agent to reduce tolerance between 3" anchor unit and 2½" post.
(use standard ⅜" diameter grade 8 bolt with proper shim)

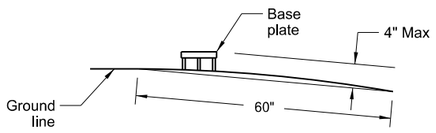


3" ANCHOR UNIT

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683 on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

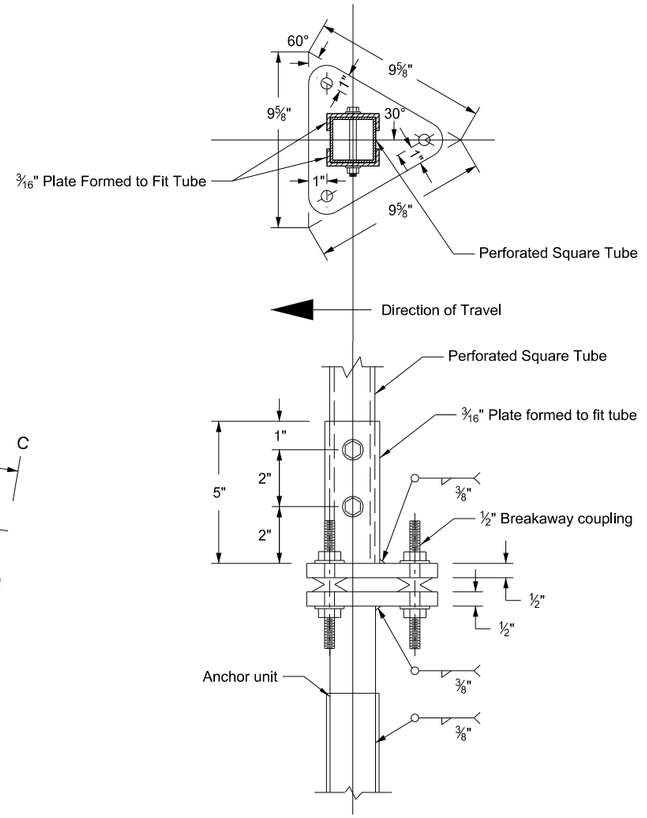




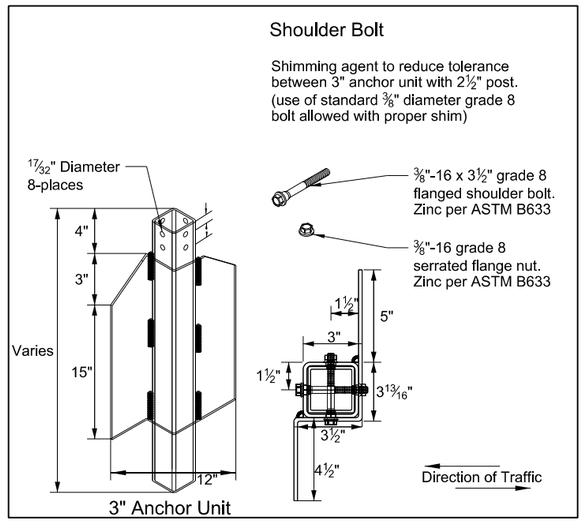
Section C-C

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

Breakaway Coupler System for Perforated Tubes



Base Plate with Breakaway Coupler



3" Anchor Unit

Notes:

1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Use anchor unit of the same size and specification as the post.
3. Provide a minimum 8' distance between the first and fourth post on four post signs.
4. Use the breakaway base system on standard D-754-24 or the breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

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

(B) - 2½" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

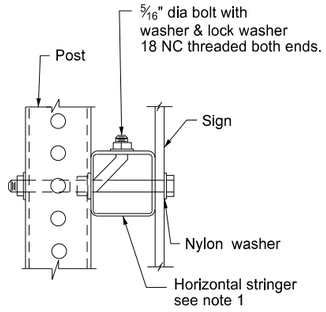
(C) - 3" anchor unit

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

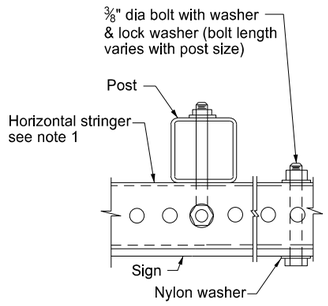
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

Mounting Details Perforated Tube

D-754-25

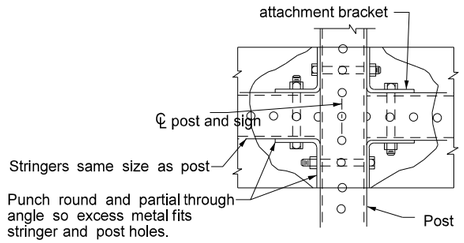


Side View



Top View

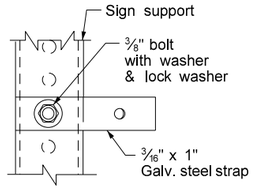
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)



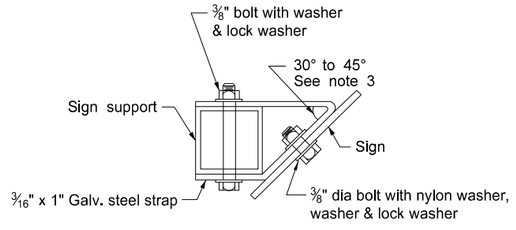
STREET NAME SIGNS AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR BACK TO BACK MOUNTING

Note:

1. Horizontal stringers - Use perforated tubes or 1¾" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel z bar stringers.
2. Use minimum outside diameter 15/16" ±1/16" and 10 gauge thick metal washers on sign face.
3. Place No Parking signs with directional arrows at a 30 to 45 degree angle with the line of traffic flow. Turning the support to the correct angle for No Parking signs requiring the above angles is allowed. If the No Parking sign is placed with another sign that requires placement at a 90 degree angle with the line of traffic flow, use the detailed angle strap to mount the No Parking sign. Use flat washers and lock washers with all nylon washers.
4. Punching the sign backing and placing the bolt through the sign, the stringer and the post is allowed in lieu of using the bent bolt to attach the post to the stringer.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.

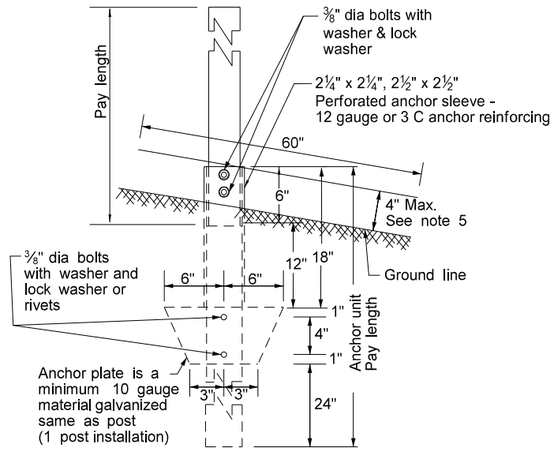


Side View



Top View

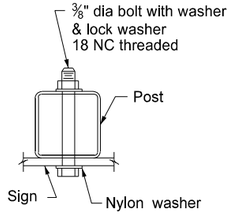
STRAP DETAIL



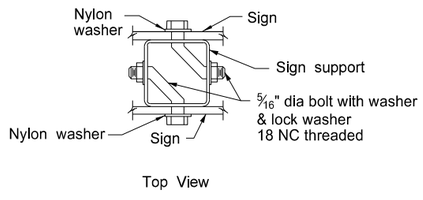
ANCHOR UNIT AND POST ASSEMBLY

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

(B) - When placing 2½", 12 gauge posts in standard soils without breakaway bases, provide a shim as specified by the manufacturer. Provide breakaway base when placing the support in weak soils. Engineer will determine if soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

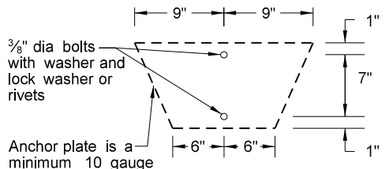


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



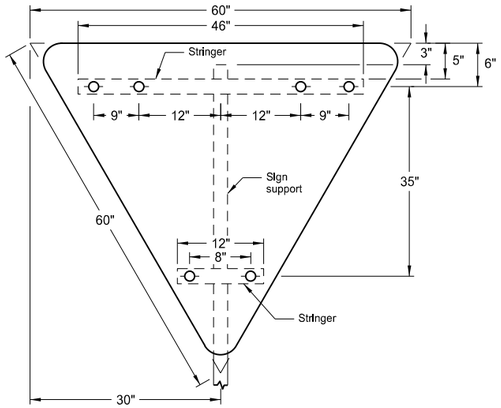
Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In.⁴	Cross Sect. area In.²	Section Modulus In.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans.
The 2½" size is shown as 2.51" size on the plans.

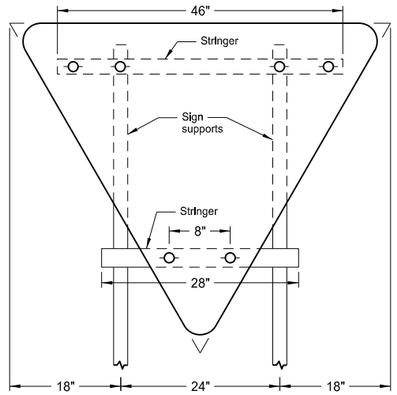
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
7-8-14	Revised Note 3.
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683 , on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

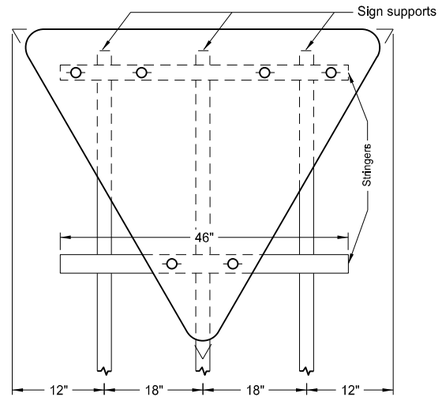
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

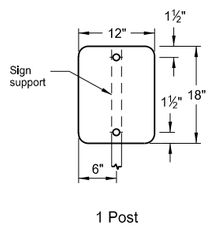


3 Posts

Assembly No. 6

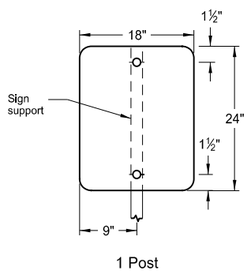
Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



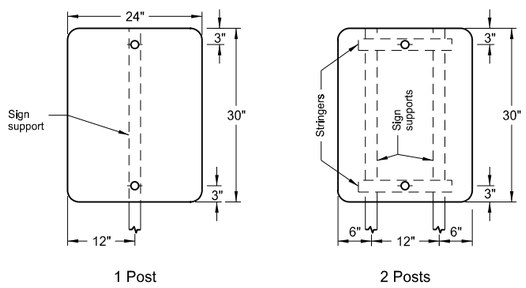
1 Post

Assembly No. 7



1 Post

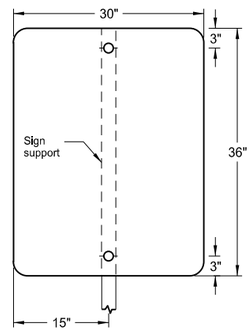
Assembly No. 8



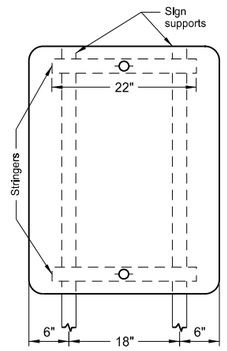
1 Post

2 Posts

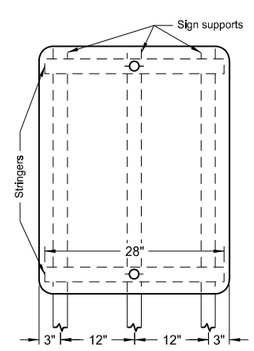
Assembly No. 9



1 Post

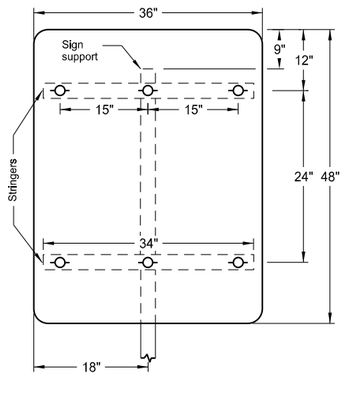


2 Posts

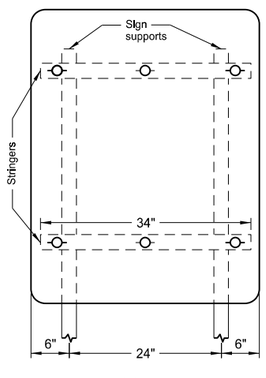


3 Posts

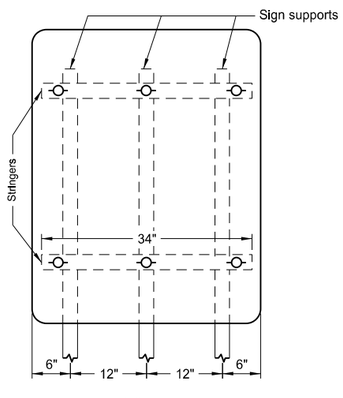
Assembly No. 10



1 Post



2 Posts



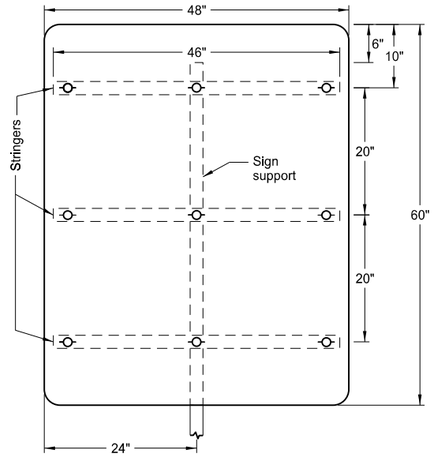
3 Posts

Assembly No. 11

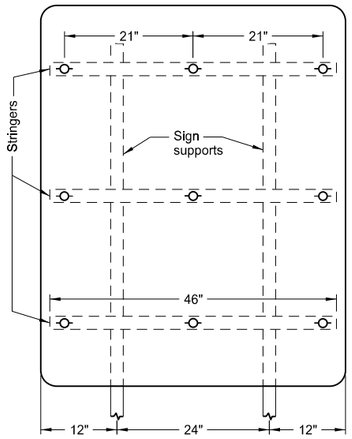
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18 8-30-19	Updated notes to active voice. New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

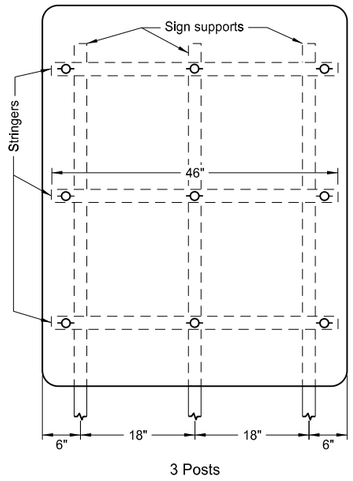
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post

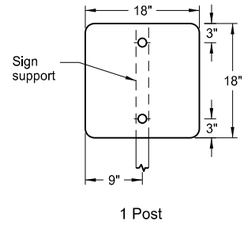


2 Posts



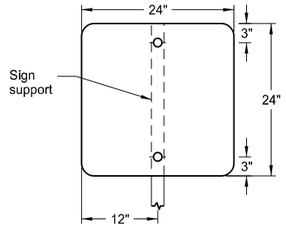
3 Posts

Assembly No. 12

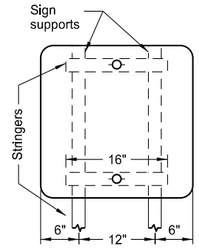


1 Post

Assembly No. 13

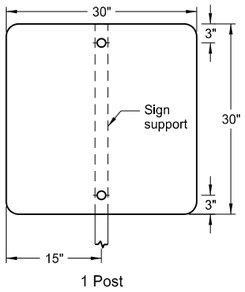


1 Post

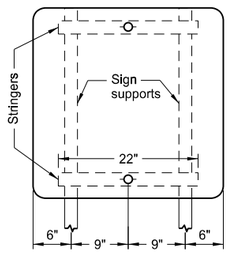


2 Posts

Assembly No. 14

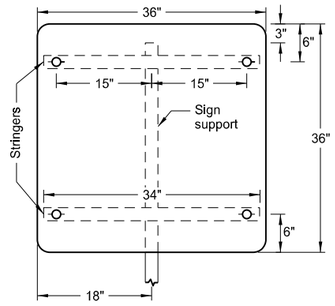


1 Post

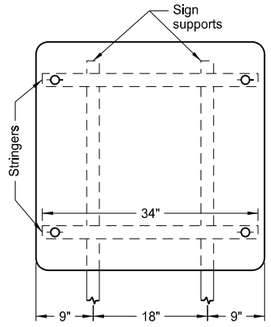


2 Posts

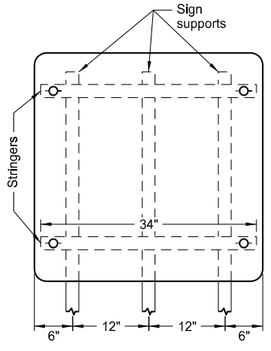
Assembly No. 15



1 Post

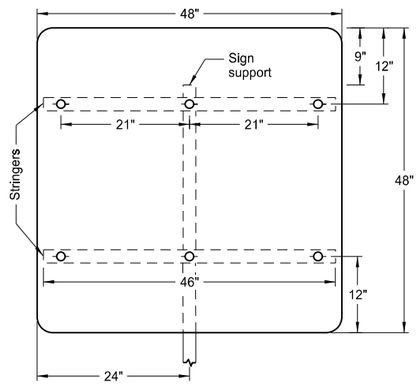


2 Posts

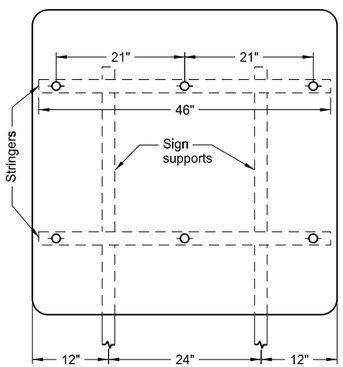


3 Posts

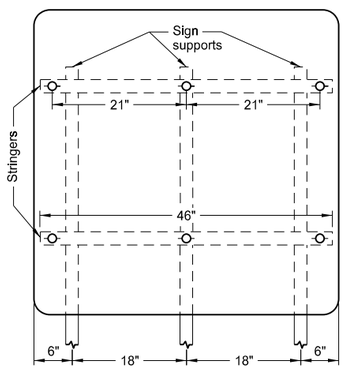
Assembly No. 16



1 Post



2 Posts



3 Posts

Assembly No. 17

Notes:

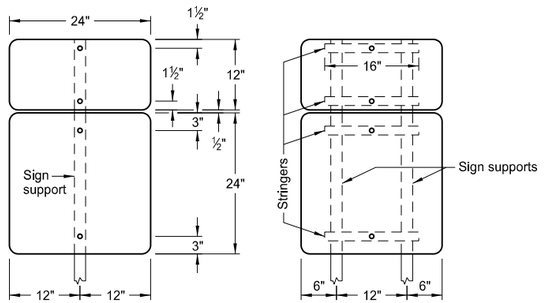
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & changed Assembly 16 post spacing.
8-30-19	New Design Engineer PE Stamp.

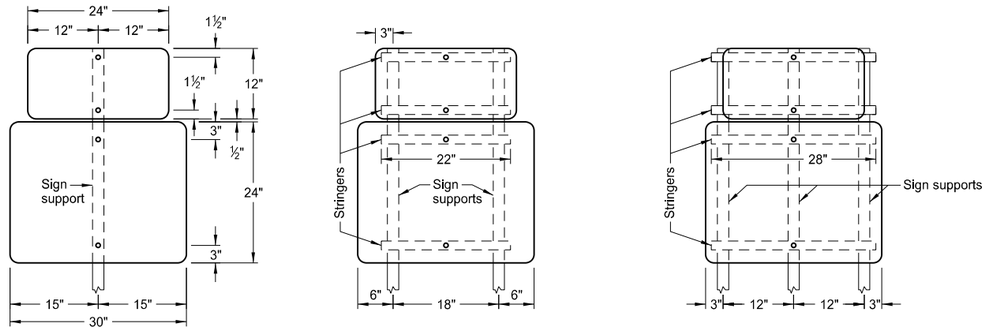
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-51



1 Post 2 Posts

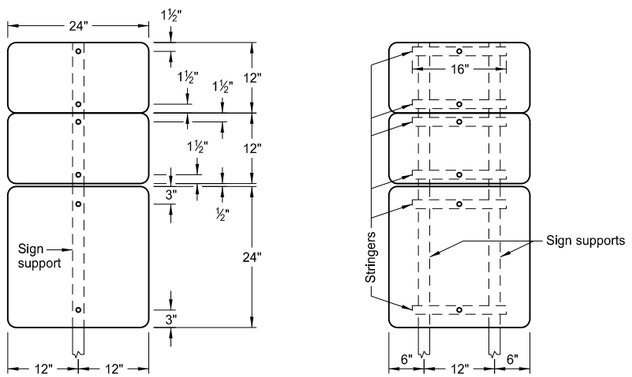


1 Post 2 Posts 3 Posts

ASSEMBLY NO. 371 ASSEMBLY NO. 372

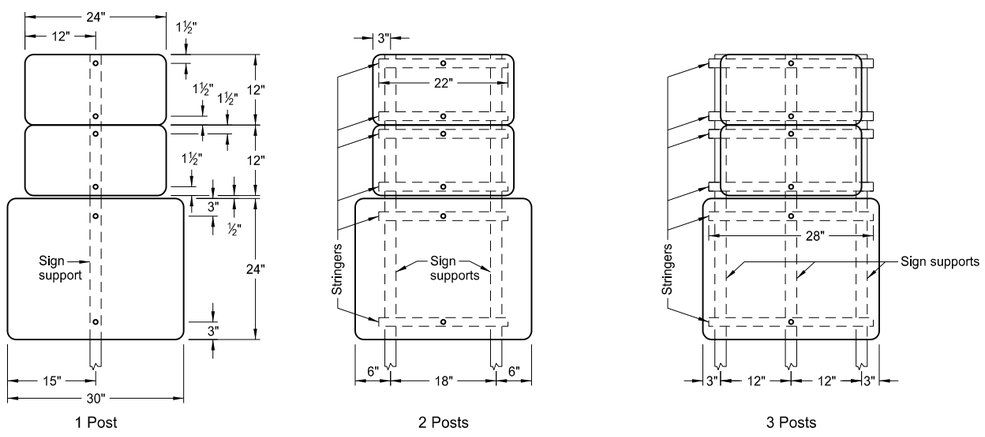
Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



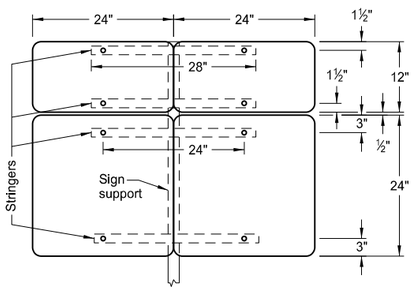
1 Post 2 Posts 3 Posts

ASSEMBLY NO. 373

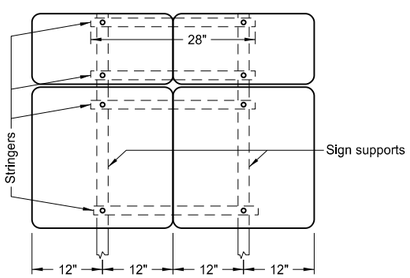


1 Post 2 Posts 3 Posts

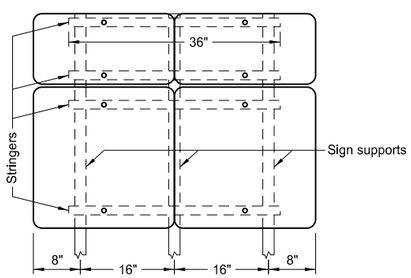
ASSEMBLY NO. 374



1 Post



2 Posts



3 Posts

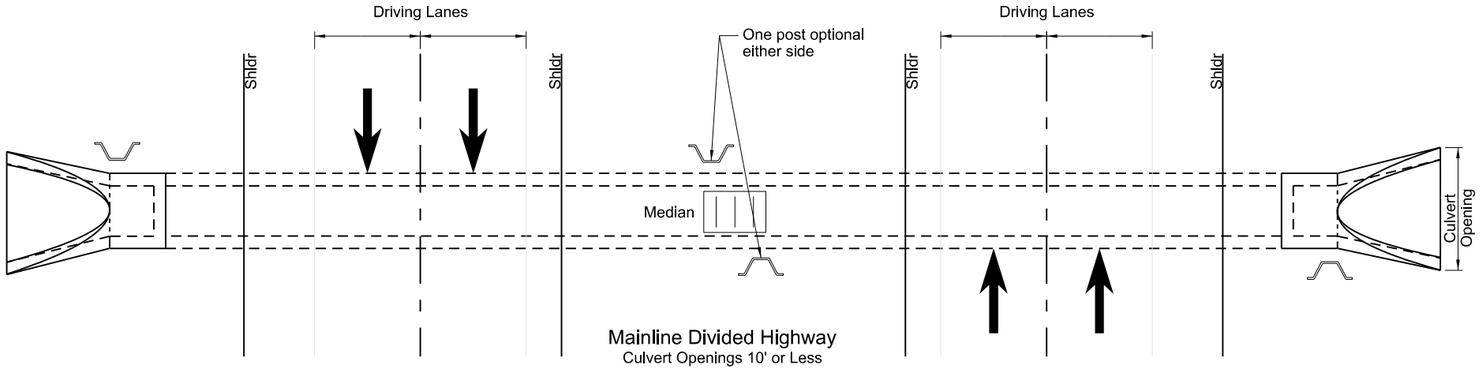
ASSEMBLY NO. 375

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18 9-04-19	Updated notes to active voice. New Design Engineer PE Stamp.

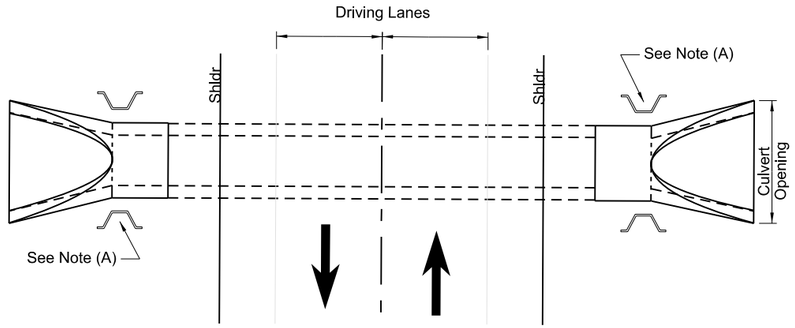
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

OBJECT MARKERS - CULVERTS

D-754-83

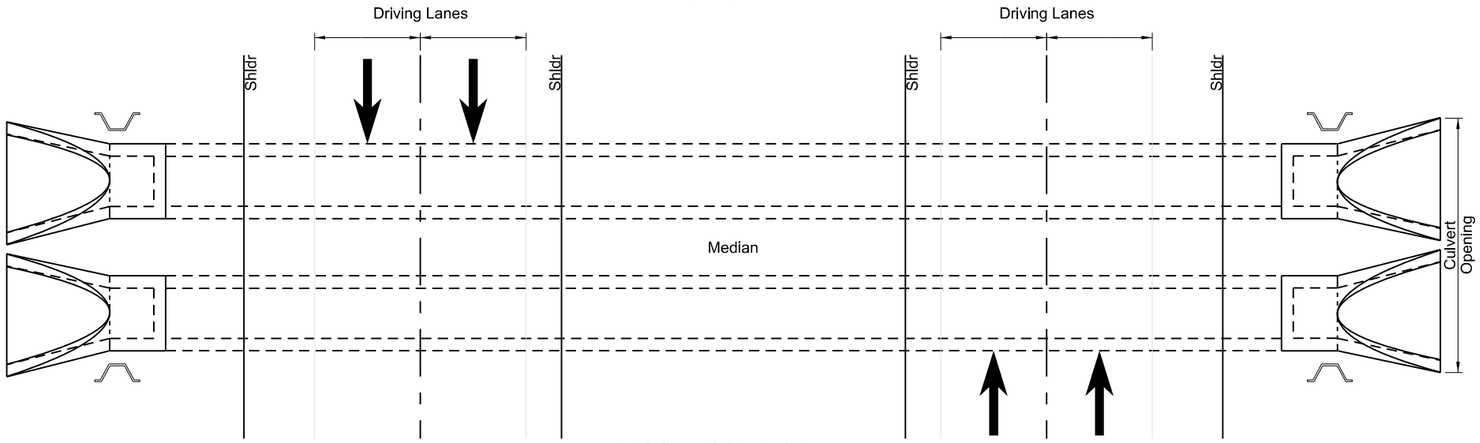


Mainline Divided Highway
Culvert Openings 10' or Less

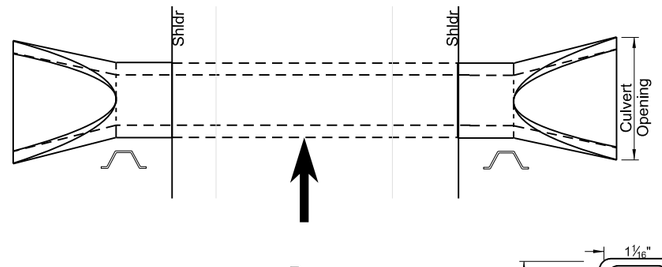


Two-Lane Highway

(A) Install additional marker where multiple pipe installations have a width of greater than 10'.

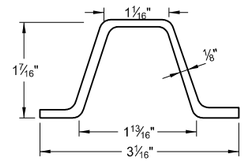


Mainline Divided Highway
Culvert Openings Greater than 10'
Multiple Installations

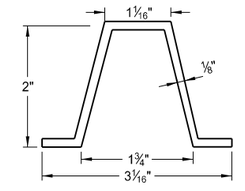


Ramp

Post Location



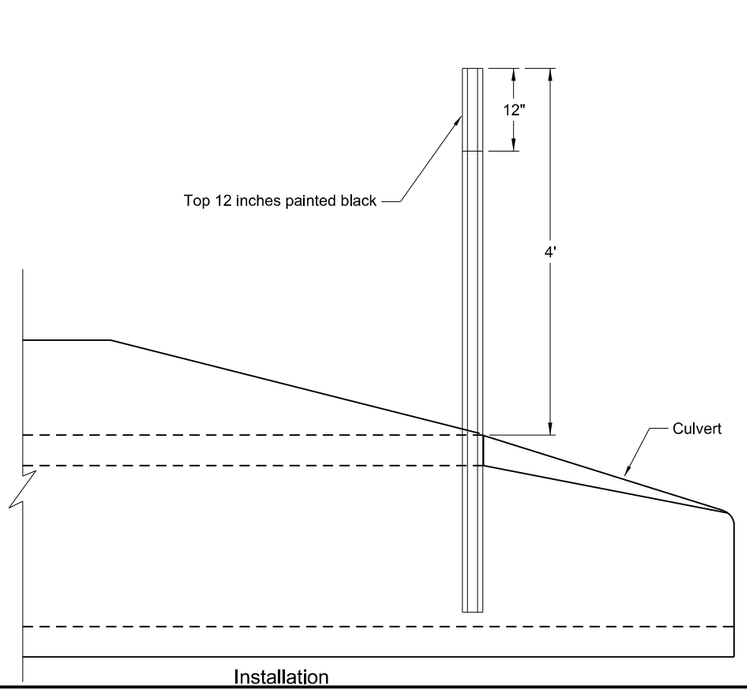
Steel Post Detail
Approx. 2.0 lbs/ft



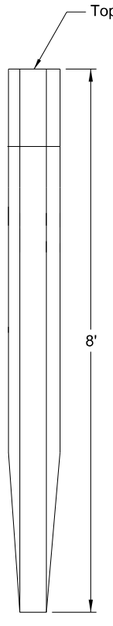
Aluminum Post Detail
Approx. 0.88 lbs/ft

Notes:

Mark each end of culverts crossing the roadway within the right-of-way with a post. Install posts in front of culvert in direction of travel along the side of culvert and one foot from culvert opening unless shown otherwise in plans.



Installation



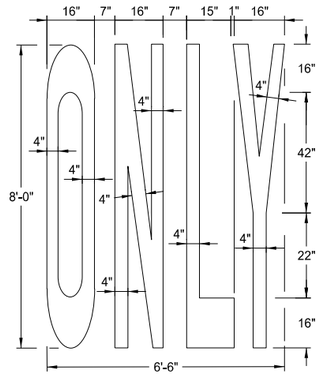
U-Type Post

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-05-13	
REVISIONS	
DATE	CHANGE
7-7-14	Revised Notes
8-30-18	Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.

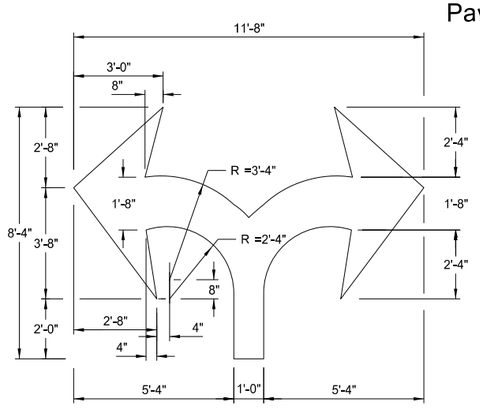
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

Pavement Marking Message Details

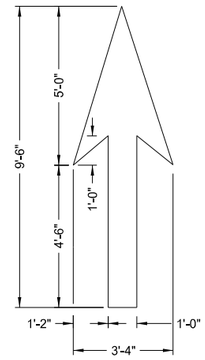
D-762-1



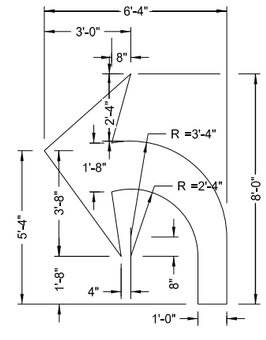
22 S. F.



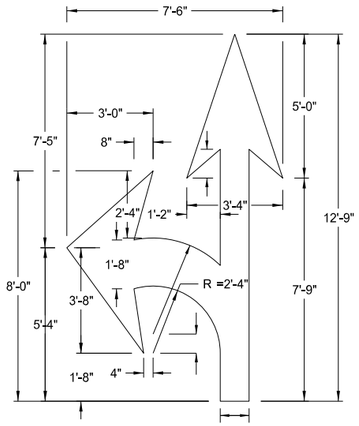
29 S. F.



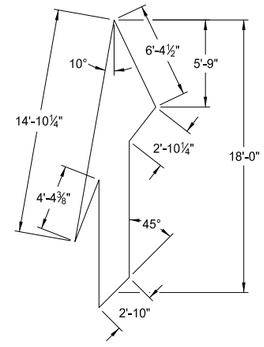
12 S. F.



16 S. F.

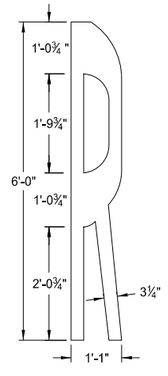


27 S. F.

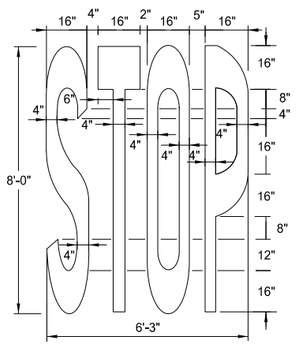


41 S. F.

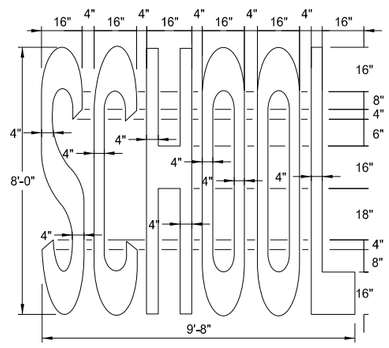
Note: Rotate merge arrow 20° from edge of roadway.



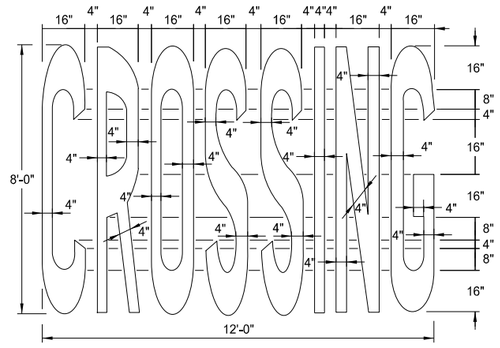
4 S. F.



22 S. F.



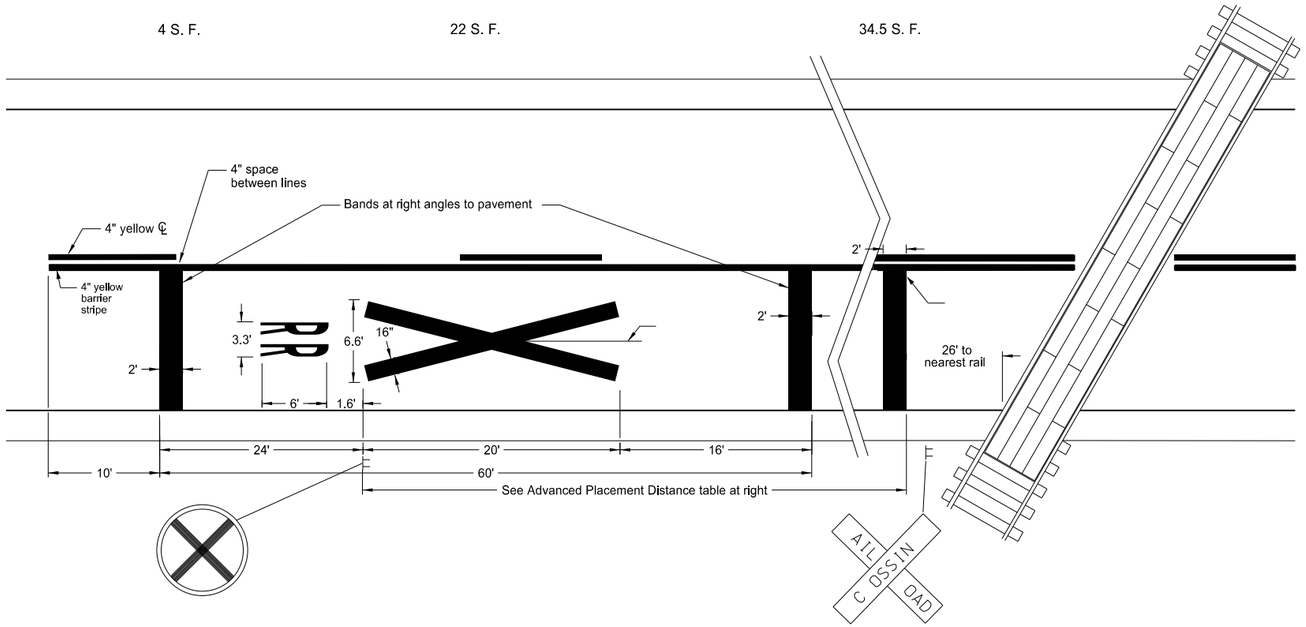
34.5 S. F.

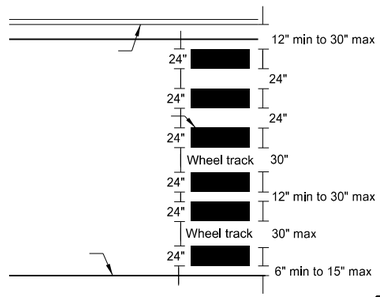


46 S. F.

Speed Limit	Chevron Width	Chevron Spacing 45° to Traffic
0-25 mph	8"	5'
30-40 mph	8"	15'
45 mph and above	12"	25'

Chevron Crosshatching Table





Advance Placement Distance for Railroad Warning Signs	
Posted or 85th Percentile Speed	Advance Distance
20 mph	min. 100 ft
25 mph	min. 100 ft
30 mph	min. 100 ft
35 mph	min. 100 ft
40 mph	125 ft
45 mph	175 ft
50 mph	250 ft
55 mph	325 ft
60 mph	400 ft
65 mph	475 ft
70 mph	550 ft

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

12-6-11

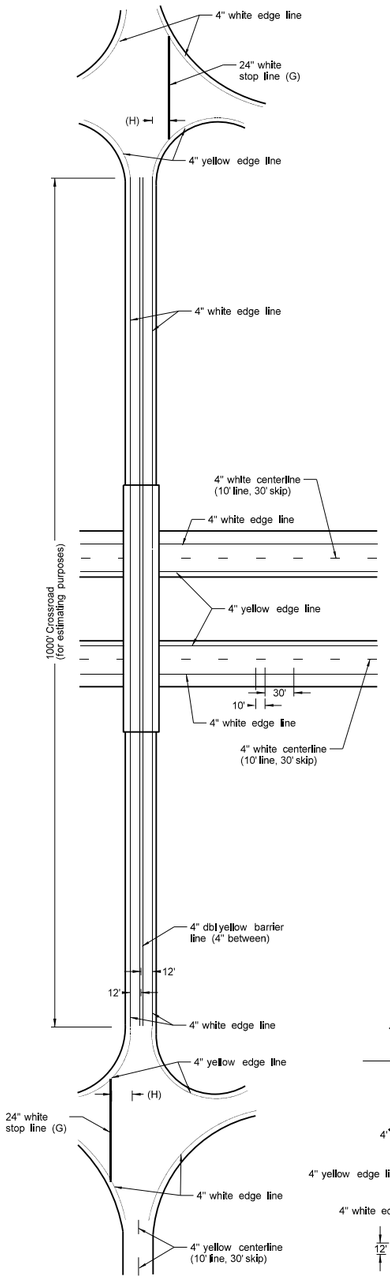
REVISIONS

DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.
01-28-2020	Revised min Stop Bar distance to rail.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 1/28/2020 and the original document is stored at the North Dakota Department of Transportation

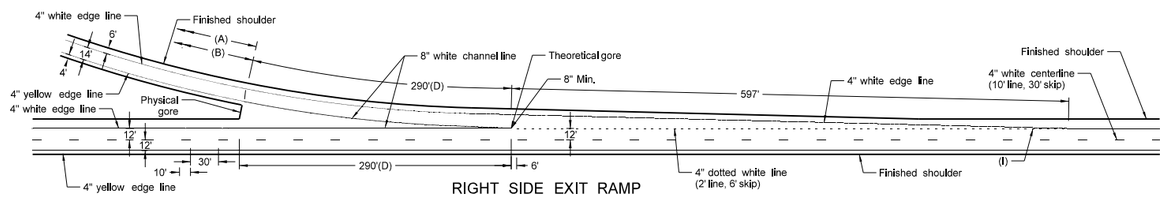
INTERSTATE PAVEMENT MARKING
4 LANE DIVIDED HIGHWAY

D-762-2



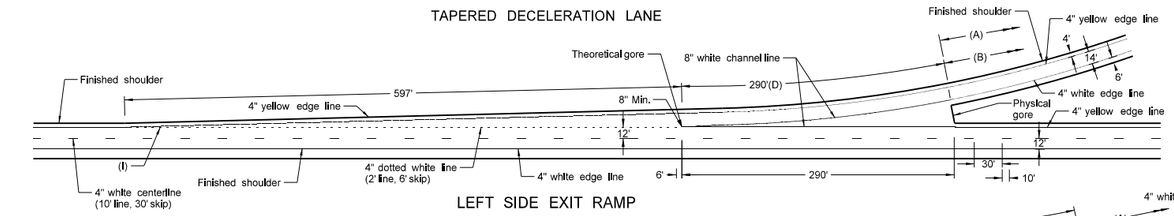
CROSS-ROAD & STRUCTURE

Engineer will determine length striped.



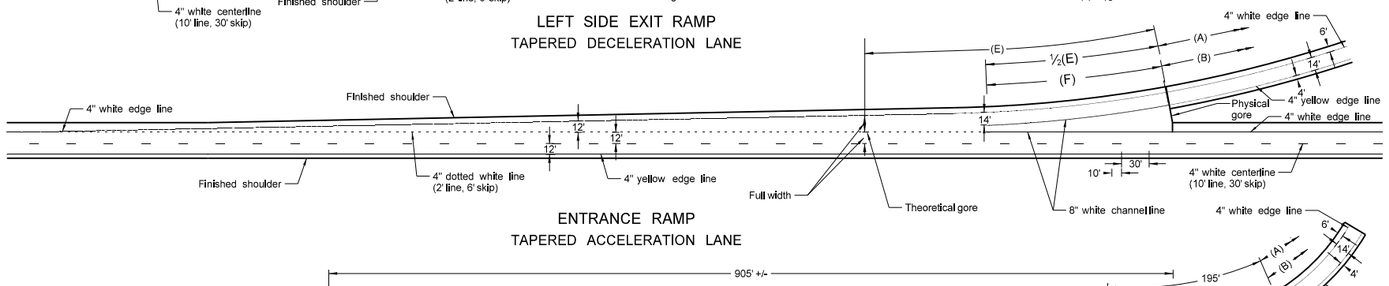
RIGHT SIDE EXIT RAMP

TAPERED DECELERATION LANE



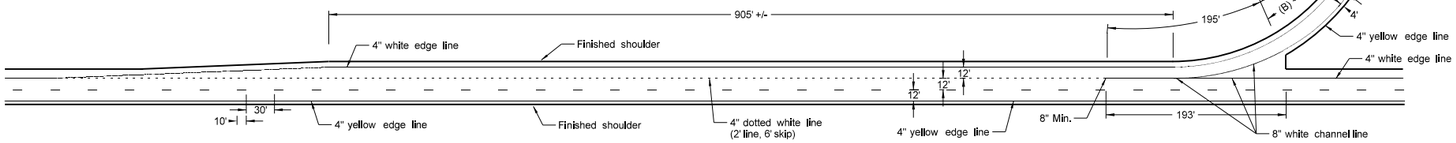
LEFT SIDE EXIT RAMP

TAPERED DECELERATION LANE



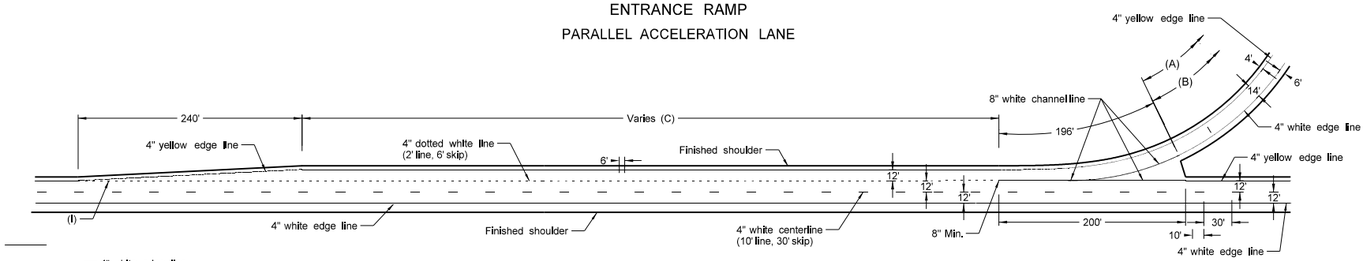
ENTRANCE RAMP

TAPERED ACCELERATION LANE



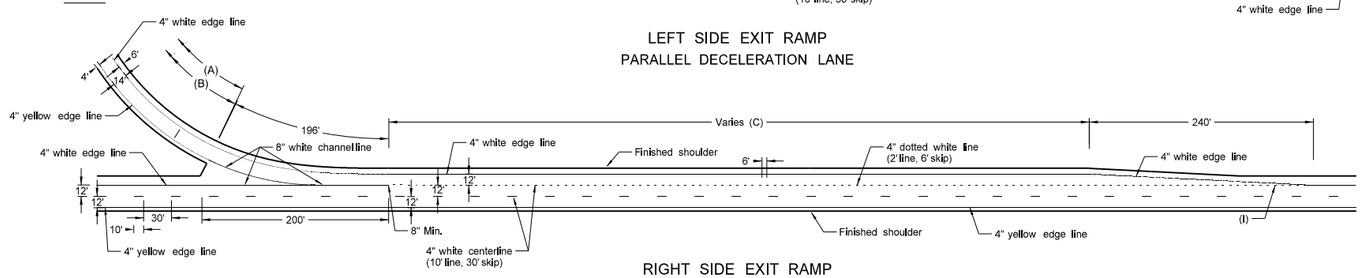
ENTRANCE RAMP

PARALLEL ACCELERATION LANE



LEFT SIDE EXIT RAMP

PARALLEL DECELERATION LANE



RIGHT SIDE EXIT RAMP

PARALLEL DECELERATION LANE

NOTE:

(A) 4" White edge line
(B) 4" Yellow edge line
(C) Assume "varies" equals 790' for purpose of estimate. Place pavement marking from beginning of taper to the 8" line.
(D) Beginning of physical gore to theoretical gore.
(E) If the distace is less than 350' extend the 8" channel line to the theoretical gore, otherwise use 195'.
(F) Use 195' for estimating purposes.
(G) Not required for gravel surface crossroad approaches.
(H) 4' minimum, 15' maximum from nearest edge of intersection traveled way.
(I) Extend dotted line until it touches the edgeline.

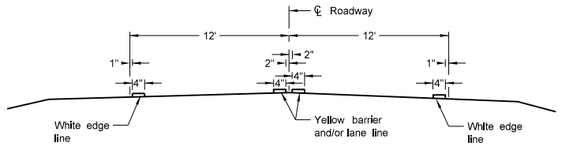
BASIS OF ESTIMATE		
LOCATION	ITEM	
Right or Left Side Exit Ramp TAPERED	8" White channel line	580 LF
	24" White stop line	60 LF
	4" White dotted line	148 LF
	4" White edge line	1115 LF
	4" Yellow edge line	1075 LF
Entrance Ramp TAPERED	8" White channel line	390 LF
	4" White dotted line	258 LF
	4" White edge line	1270 LF
	4" Yellow edge line	1075 LF
Right or Left Side Exit Ramp PARALLEL	8" White channel line	396 LF
	24" White stop line	60 LF
	4" White dotted line (C)	258 LF
	4" White edge line	1115 LF
	4" Yellow edge line	1075 LF
Entrance Ramp PARALLEL	8" White channel line	388 LF
	4" White dotted line	283 LF
	4" White edge line	1275 LF
	4" Yellow edge line	1075 LF
Main Line (Both Roadways)	4" White lane line, 10' line, 30' skip	2640 LF/MI
	4" White edge line	10,560 LF/MI
	4" Yellow edge line	10,560 LF/MI
Cross Road	4" White edge line	2000 LF
	4" Dbl yellow barrier line (4" between)	2000 LF

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-3-11	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
10-25-19	Replaced "2' Max" dim with note (I).

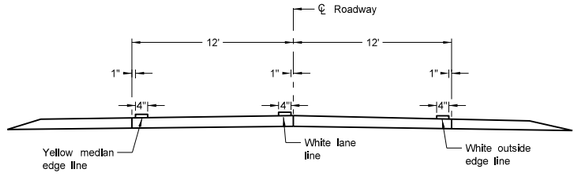
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 10/25/19 and the original document is stored at the North Dakota Department of Transportation

PAVEMENT MARKING

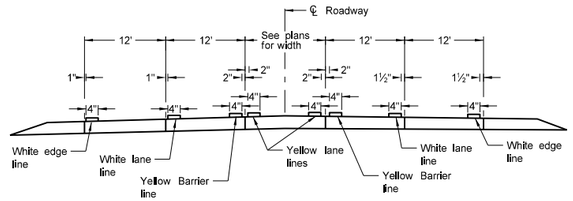
D-762-4



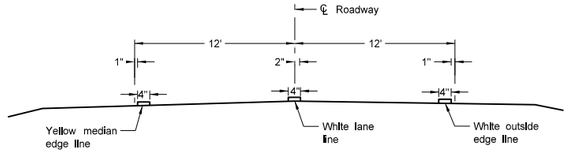
Two Lane Two Way
RURAL ROADWAY



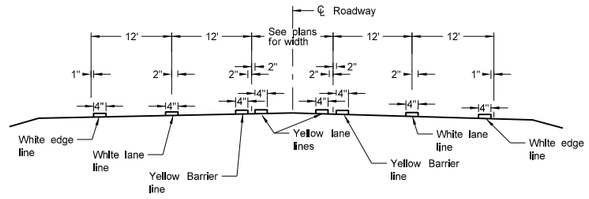
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



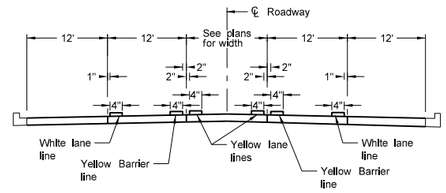
RURAL FIVE LANE ROADWAY
Concrete Section



Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



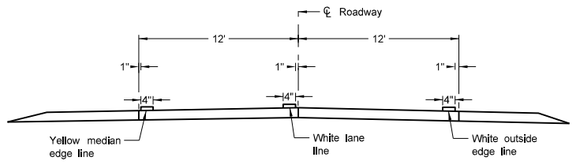
RURAL FIVE LANE ROADWAY
Asphalt Section



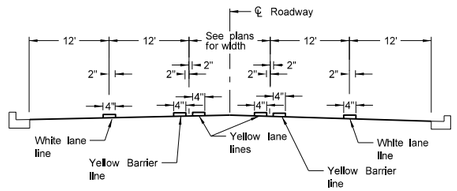
URBAN FIVE LANE SECTION
Concrete Section

NOTES:

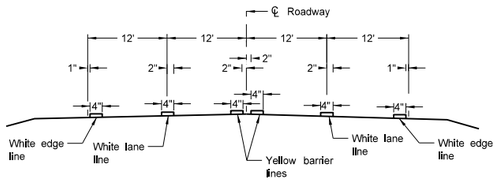
1. Continue edge lines through private drives and field drives. Break edge lines for intersections.



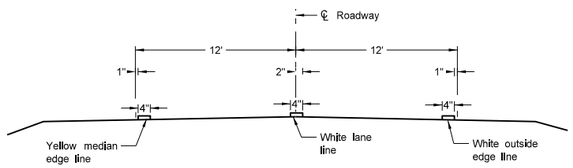
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



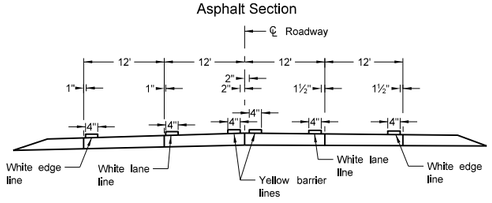
URBAN FIVE LANE SECTION
Asphalt Section



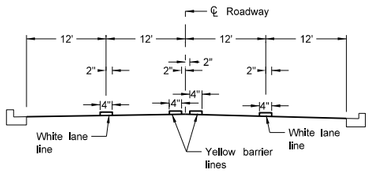
RURAL FOUR LANE ROADWAY
Asphalt Section



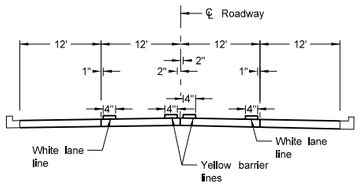
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



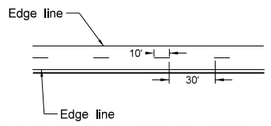
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



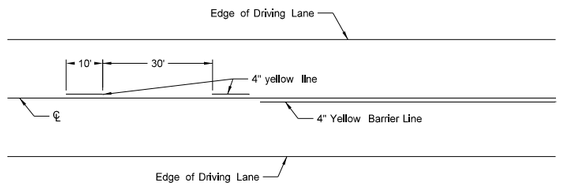
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17 08-27-19	Updated to active voice. New Design Engineer PE Stamp.

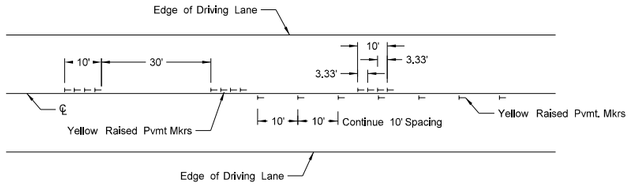
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/27/19 and the original document is stored at the North Dakota Department of Transportation

SHORT-TERM PAVEMENT MARKING

D-762-11

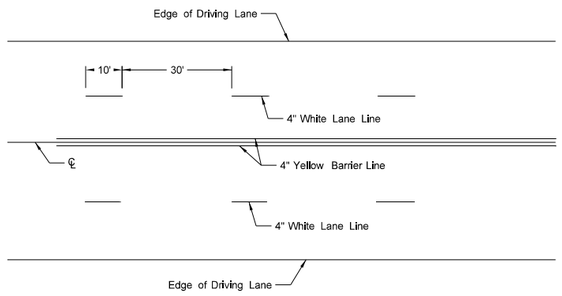


Painted or Tape Lines

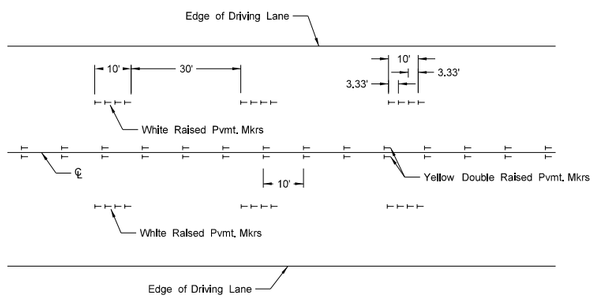


Raised Pavement Markers

TWO-LANE TWO-WAY ROADWAY

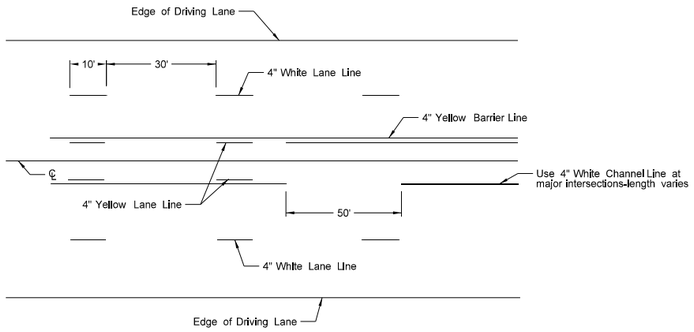


Painted or Tape Lines

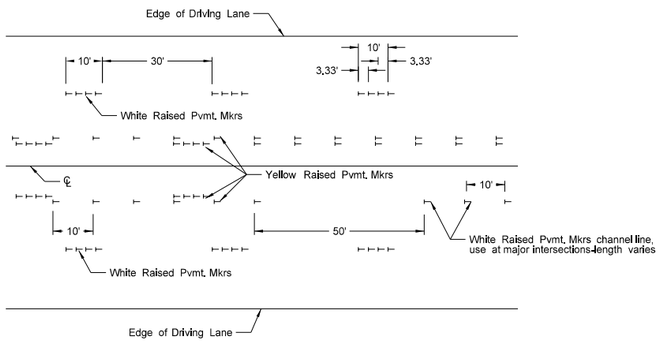


Raised Pavement Markers

FOUR LANE ROADWAY

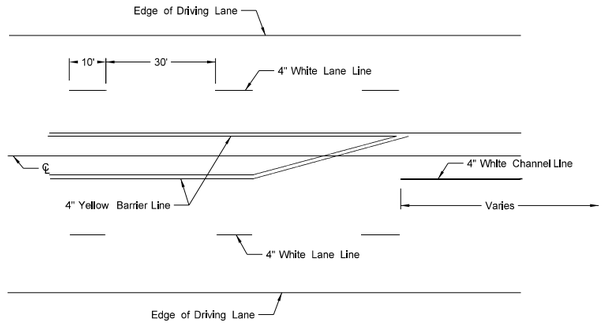


Painted or Tape Lines

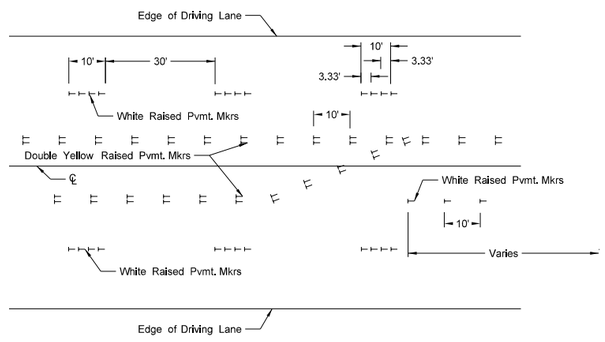


Raised Pavement Markers

FIVE LANE ROADWAY TWO WAY LEFT TURN



Painted or Tape Lines



Raised Pavement Markers

FIVE LANE ROADWAY WITH MARKED ISLANDS

NOTES:

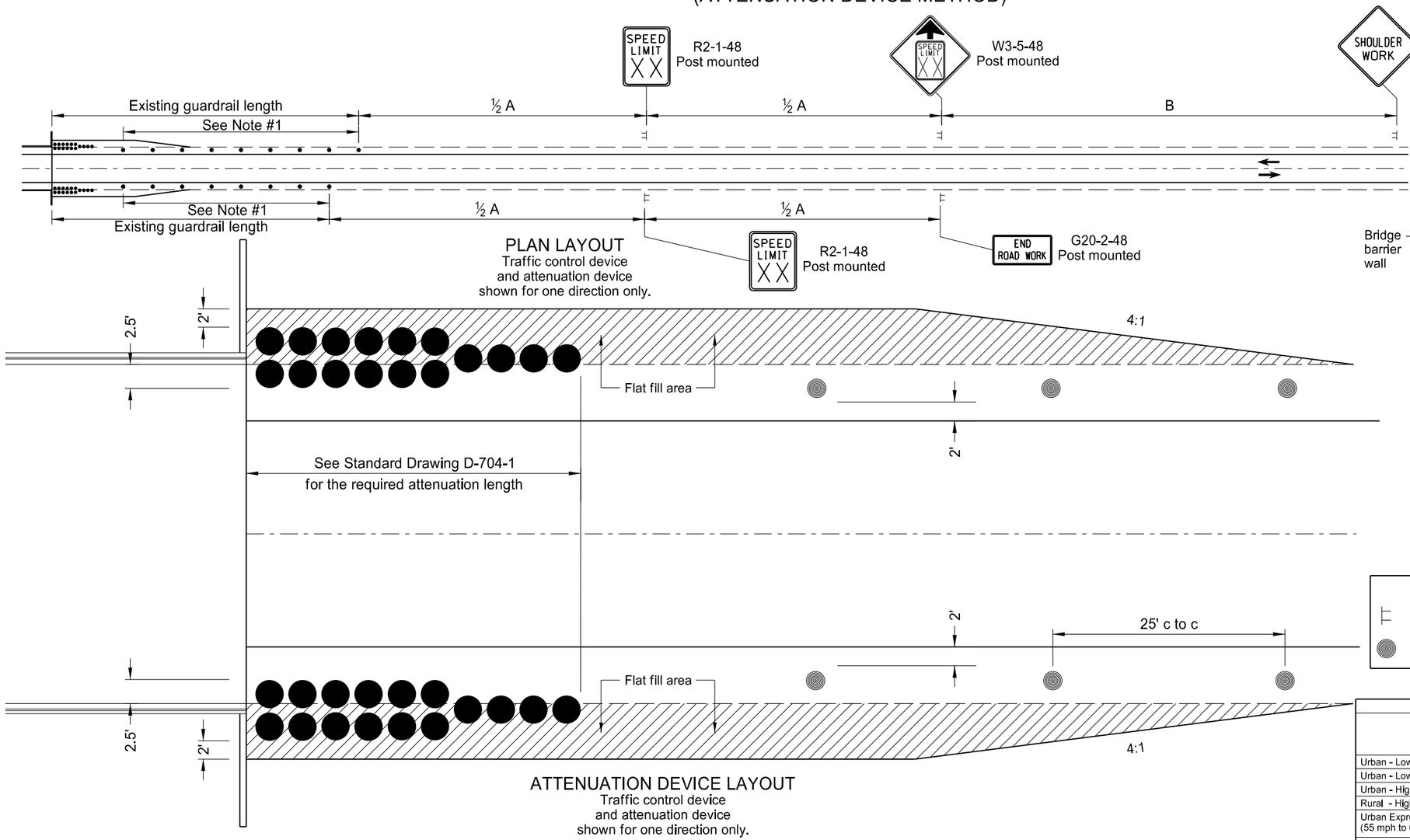
1. Place no passing zones on two-lane two-way roadways as shown. In lieu of short term no passing zone pavement markings, place no passing zone signs. Replace no passing zone signs with short term no passing zone pavement marking within three days.
2. Place short term center line stripe (paint) on top lift to match exact placement of permanent stripe.
3. Remove raised markers and tape markings after permanent pavement marking is installed.

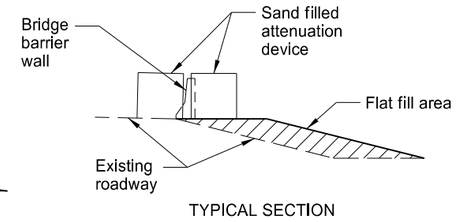
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
3-29-16	Re-numbered to be D-762-11 (previously was D-762-6)
10-17-17	Updated to active voice.
8-27-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 8/27/19 and the original document is stored at the North Dakota Department of Transportation

D-764-20

SHORT TERM END TREATMENT FOR BRIDGES
(ATTENUATION DEVICE METHOD)





KEY

- Sign
- Attenuation Module
- Delineator drum

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

Notes

1. If the shoulder width is less than 3', the vertical panels shall be used and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the foreslope of the shoulder.
2. If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.
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 shall be placed at ½ B.
4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
5. Existing speed limit signs within a reduced speed zone shall be covered.

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

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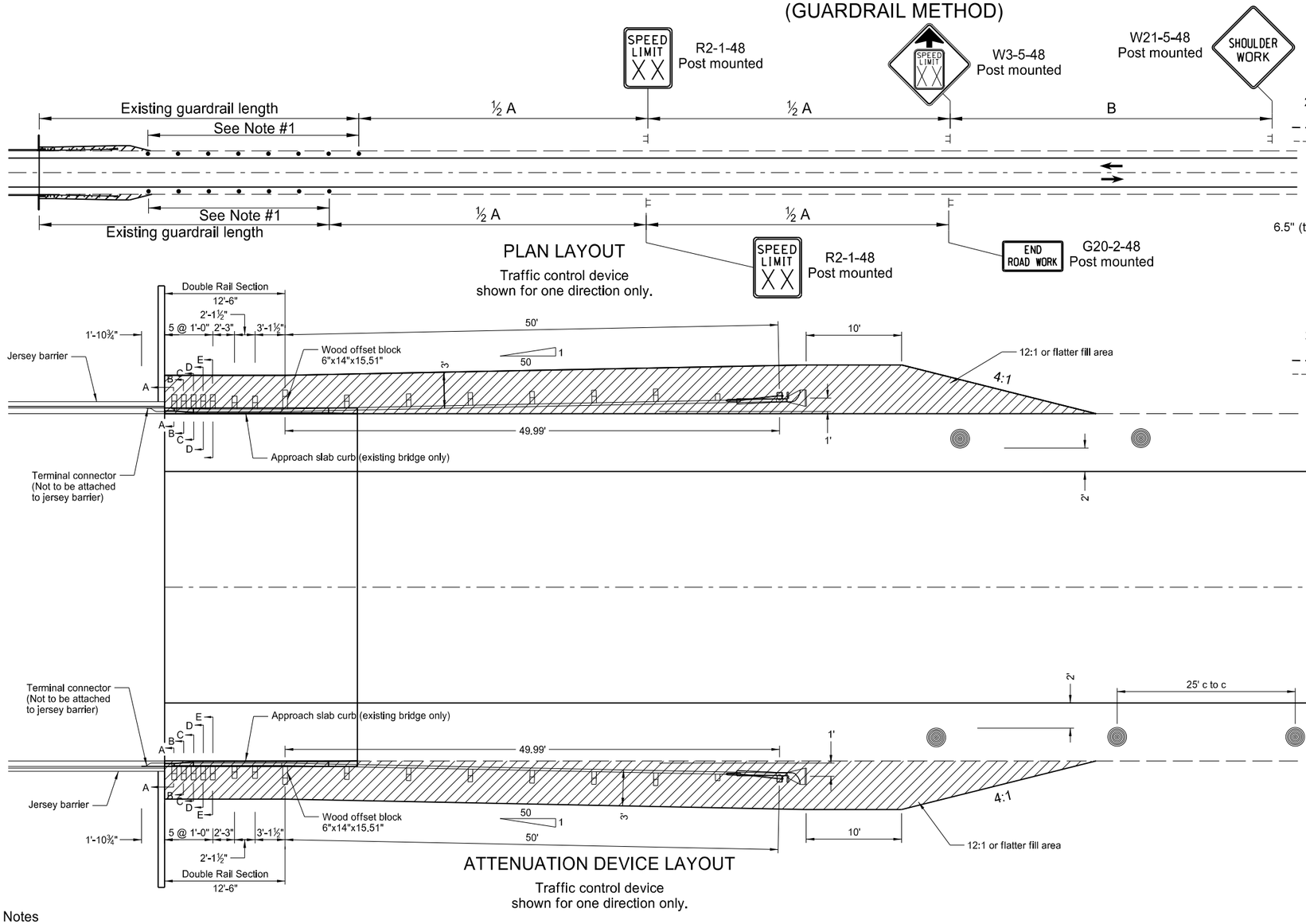
SHORT TERM END TREATMENT FOR BRIDGES (GUARDRAIL METHOD)

D-764-21

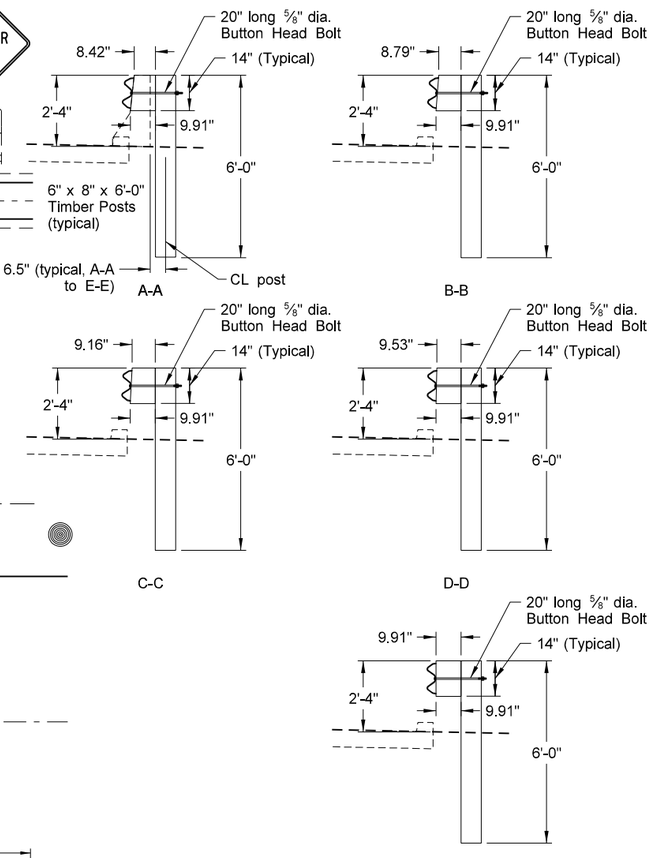


PLAN LAYOUT

Traffic control device shown for one direction only.

ATTENUATION DEVICE LAYOUT

Traffic control device shown for one direction only.



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

Notes

1. If the shoulder width is less than 3', vertical panels shall be used in place of delineator drums and placed as far from the driving lane as possible and still be on the finished shoulder. When there is no shoulder, the vertical panels shall be placed as near as possible to the driving lane on the foreslope of the shoulder.
2. If the bridge is within construction zone signing, the reduced speed ahead sign can be eliminated.
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 shall be placed at ½ B.
4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
5. Existing speed limit signs within a reduced speed zone shall be covered.

KEY

Sign — Delineator drum

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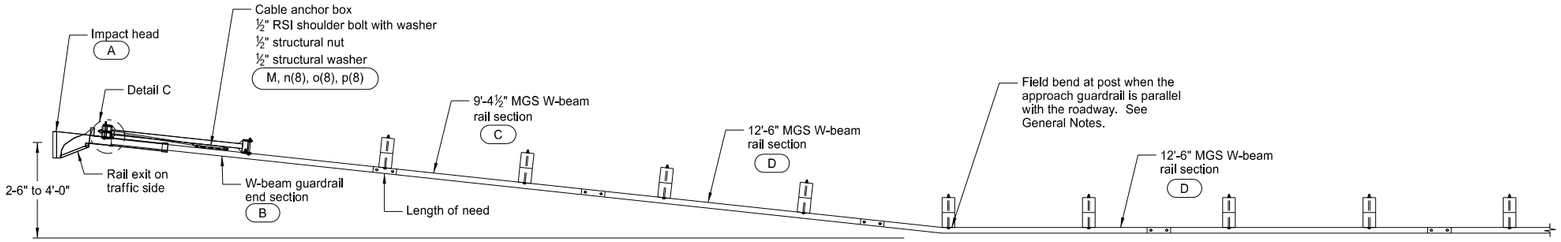
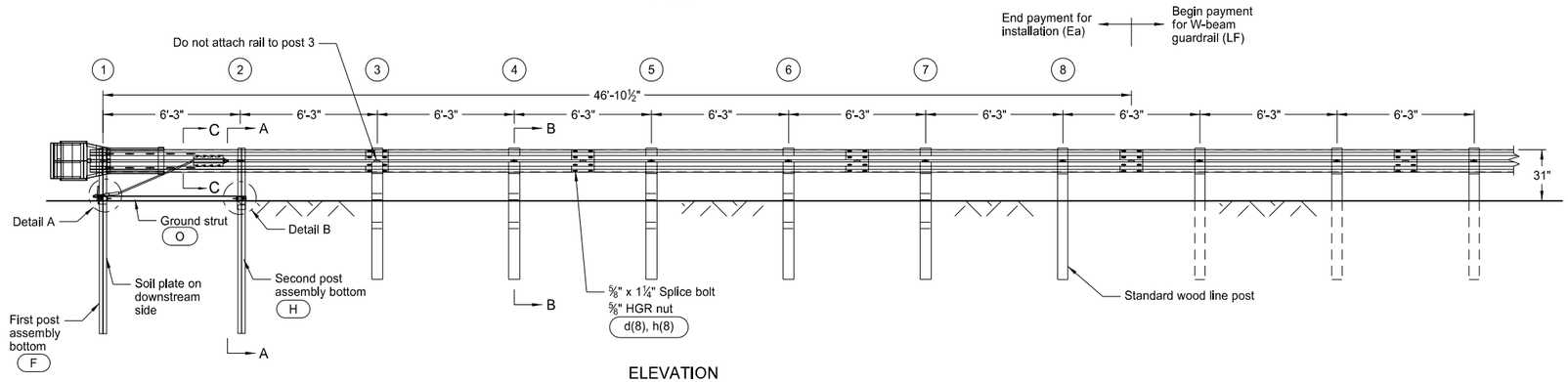
MGS FLARED ENERGY ABSORBING TERMINAL - WOOD POST

D-764-38



PLAN



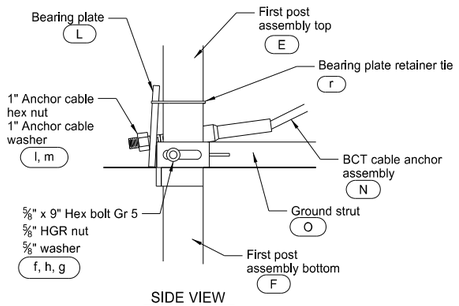
ELEVATION

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	F3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4½" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	UHP1A	FIRST POST ASSEMBLY TOP	1
F	HP1B	FIRST POST ASSEMBLY BOTTOM	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
J	UP671	WOOD CRT POST	5
K	P675	WOOD BLOCKOUT OR RECYCLE EQUIVALENT	5
L	E750	BEARING PLATE	1
M	S760	CABLE ANCHOR BOX	1
N	E770	BCT CABLE ANCHOR ASSEMBLY	1
O	S785	GROUND STRUT HINGED POST	1
		HARDWARE	
a	B5160304A	5/16" x 3" HEX BOLT A325	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	5/8" Dia x 1¼" SPLICE BOLT	33
e	B581802	5/8" Dia X 18" HGR BOLT	5
f	B580904A	5/8" Dia x 9" HEX BOLT GRD 5	1
g	W050	5/8" WASHER	7
h	N050	5/8" Dia HGR NUT	39
j	B340854A	¾" Dia x 8½" HEX BOLT GRD A449	1
k	N030	¾" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	½" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	½" STRUCTURAL NUT	8
p	W012A	½" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

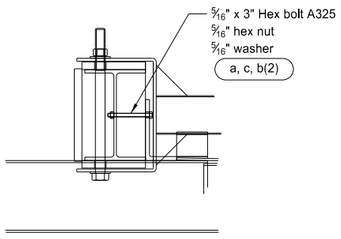
NOTE: Standard wood line post, block, and associated hardware not included in Bill of Materials Table.

GENERAL NOTES:

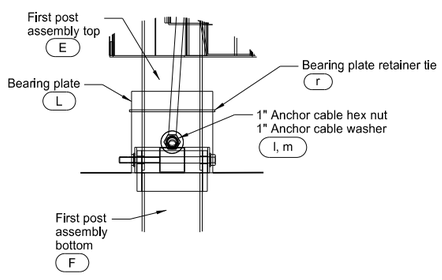
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts 1 and 2.
2. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
3. Flare the Flared Energy Absorbing Terminal when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, ensure the Flared Energy Absorbing Terminal has only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, ensure the Flared Energy Absorbing Terminal is turned parallel to the roadway.
4. Ensure the lower sections of the posts do not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
5. Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, the backfill material must be compacted to prevent settlement.
6. The breakaway cable assembly must be taut. Use a locking device (vice grips or channel lock pliers) to prevent cable from twisting when tightening nuts.
7. "Toe nail" the wood blockouts to the rectangular wood posts. Use two 20 penny galvanized nails.



SIDE VIEW

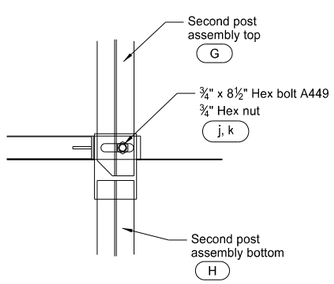


DETAIL C
Post 1 (Impact Head connection)

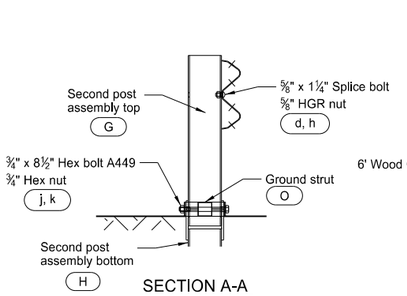


FRONT VIEW

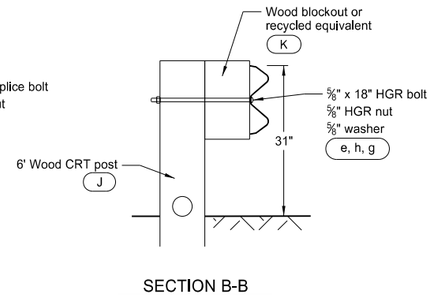
DETAIL A
Post 1



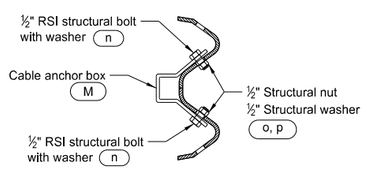
DETAIL B
Post 2



SECTION A-A
Post 2



SECTION B-B
Posts 3 through 7



SECTION C-C

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
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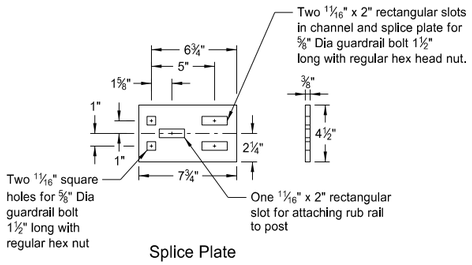
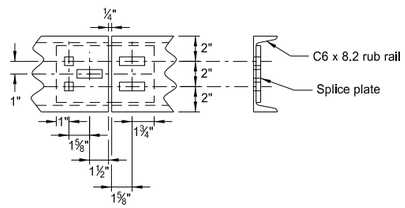
MGS W-BEAM GUARDRAIL GENERAL DETAILS

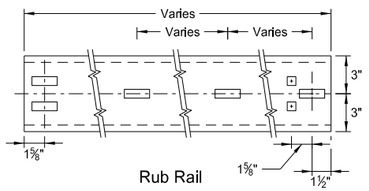
D-764-40



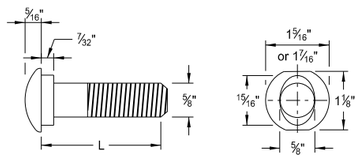
Splice Plate



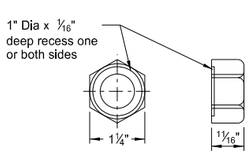
Splice Detail



C6x8.2 RUB RAIL AND SPLICE PLATE

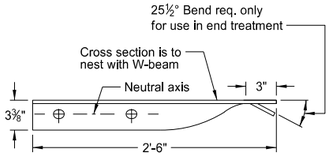


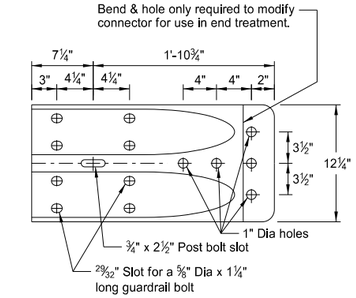
5/8" Diameter Guardrail Bolt	
L	Thread Length
1¼"	Full length thread
2"	1¾" Min thread length
9½"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



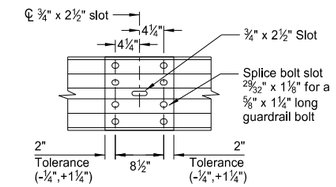
5/8" Dia recess nut

5/8" GUARDRAIL BOLT & RECESS NUT



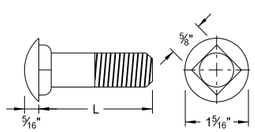


W BEAM TERMINAL CONNECTOR



SPLICE DETAIL

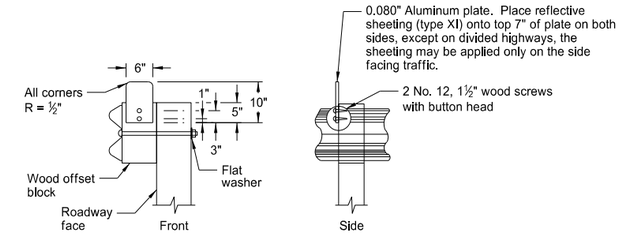
NOTE: Do not install center bolt in the ¾" x 2½" slot at mid span splices.



5/8" Diameter Carriage Bolt	
L	Thread Length
1½"	Full length thread
3"	1½" Min thread length
11"	1¾" Min thread length
13"	1¾" Min thread length

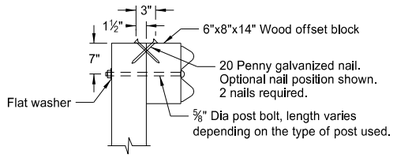
5/8" Dia hex nut

5/8" CARRIAGE BOLT & NUT

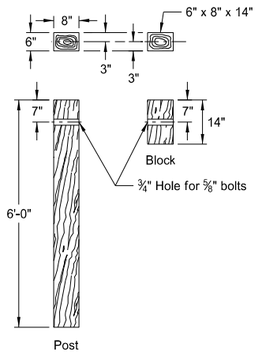


REFLECTORIZED PLATE DETAIL

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

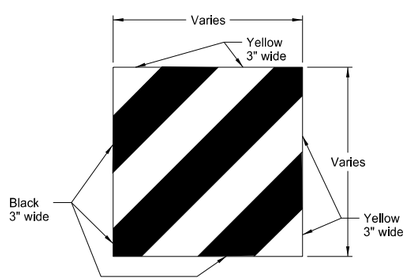


TYPICAL WOOD POST ATTACHMENT DETAIL

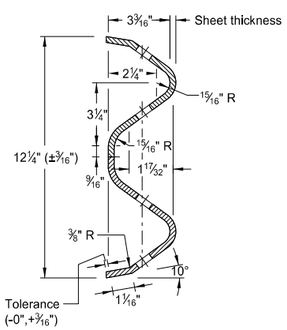


6" x 8" WOOD POST & BLOCK

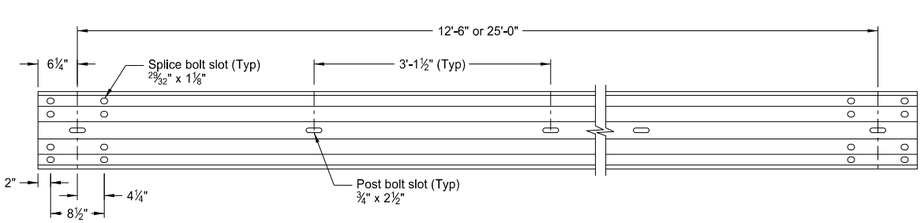
NOTE: Where soil conditions require, alternate lengths may be specified, in 6" increments.



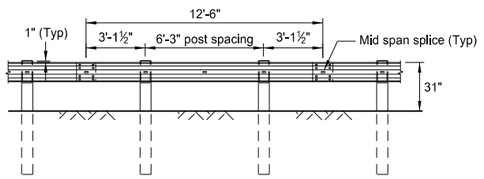
IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION



STANDARD MGS GUARDRAIL PANEL



STANDARD MGS GUARDRAIL SYSTEM

NOTES:

1. Begin reflector plates at the first post and space at 25' centers on guardrail less than 250' length and at 50' centers for guardrail over 250' length. Provide the reflector the same color as the pavement marking adjacent to it unless noted otherwise on the plans.
2. Replacing bituminous material at guardrail post: Dispose all excess earth from excavations for guard posts as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. Fit the Object Marker within the vertical edges of the Impact Plate. Provide type XI retroreflective sheeting meeting the requirements of Section 894.02.E of the standard specifications. Apply the sheeting to 0.100 Aluminum sheeting meeting the requirements of Section 894.01.A. Attach the Object Marker to the Impact Head Plate with rivets or other attachment device. Ensure the rivets or attachment device are non-rust. Slope the stripes downward toward the roadway side.
4. Guardrail installation height tolerance = ±1".

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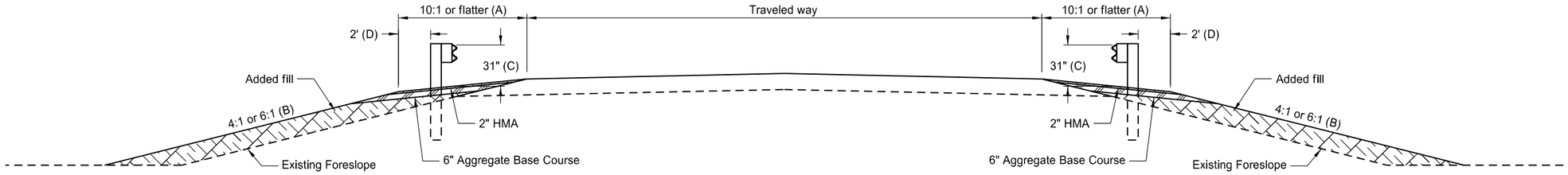
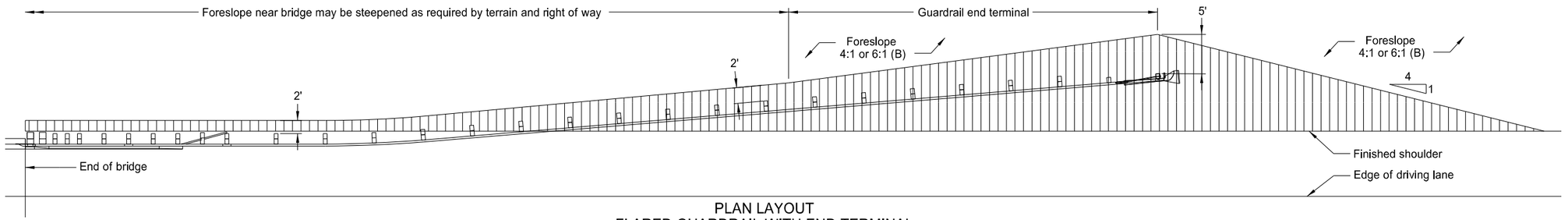
D-764-48

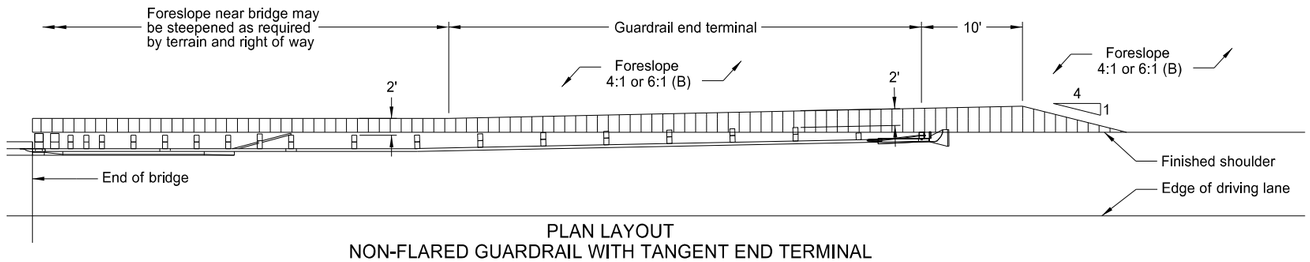
TYPICAL GRADING AT BRIDGE ENDS WITH MGS W-BEAM GUARDRAIL



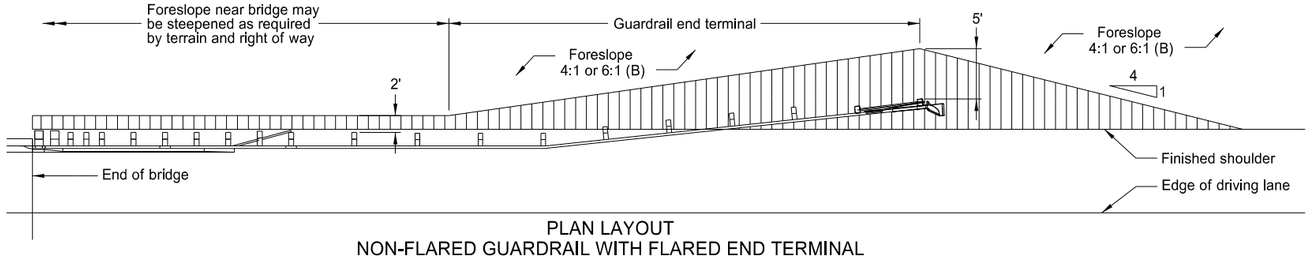
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

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

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

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE

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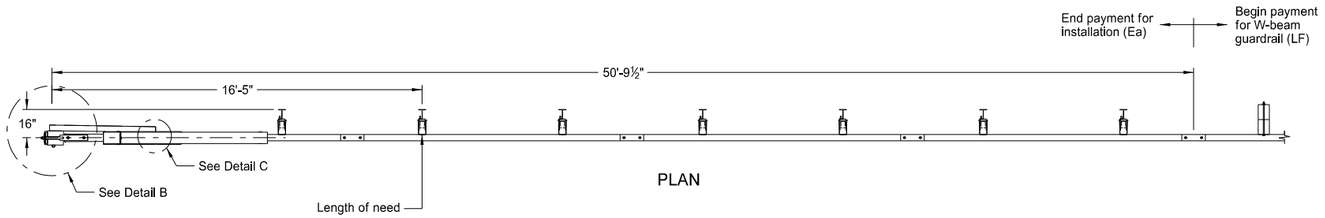
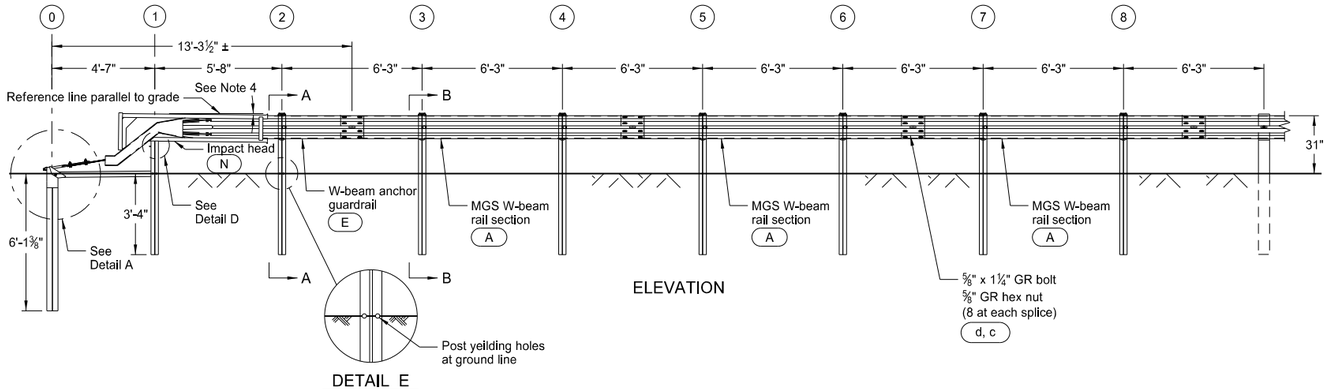
MASH SOFTSTOP END TERMINAL - STEEL POST

D-764-50



PLAN

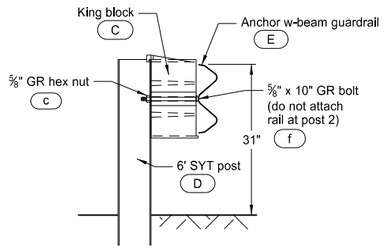


ELEVATION

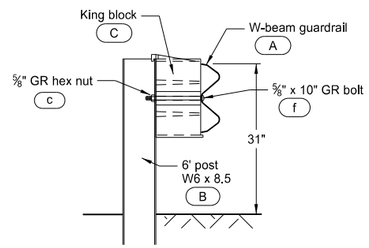
DETAIL E
Posts 1 & 2

GENERAL NOTES:

1. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
2. The SoftStop can be flared at a rate of 25:1 or flatter.
3. Do not curve the guardrail within the SoftStop under any circumstances.
4 It is acceptable to install the SoftStop impact head parallel to the grade line or with an upward tilt. See softstop assembly manual for specific details.

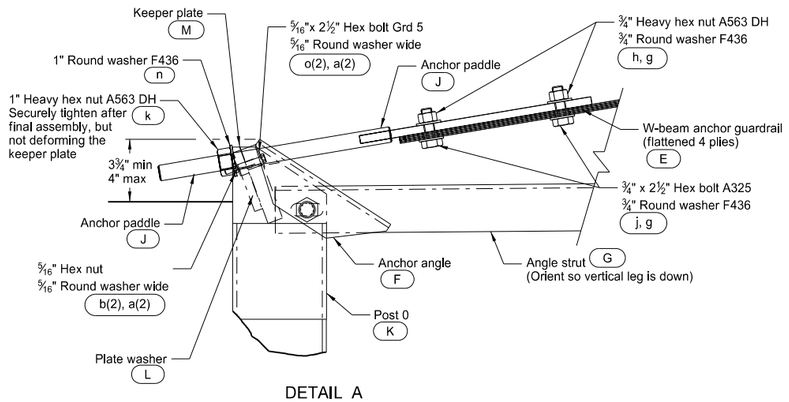


SECTION A-A
Post 2

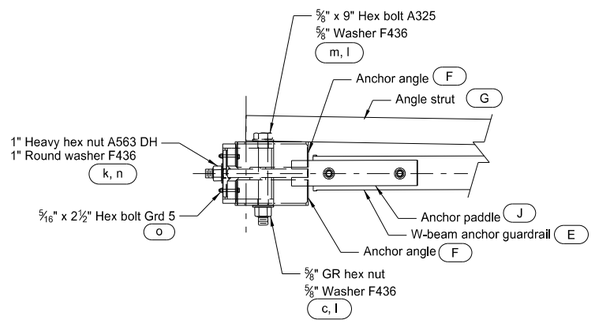


SECTION B-B
Posts 3 through 8

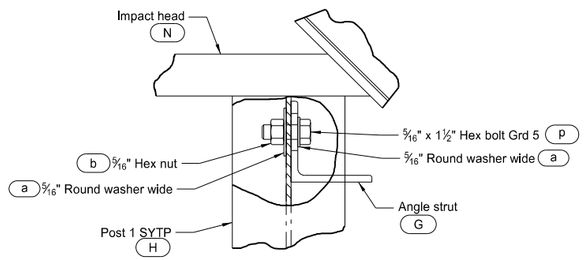
ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	000011	12 / 12'-6" / 3'-1½" / S MGS W-BEAM RAIL SECTION	3
B	000533	6'-0" STEEL POST W6 x 8.5	6
C	006777	KING BLOCK 4" X 7½" X 1'-2"	7
D	015000	6'-0" SYT POST / 8.5 / 31" GR HT	1
E	015200	SFST - ANCHOR GUARDRAIL 12'-6"	1
F	015201	SFST - ANCHOR ANGLE	2
G	015202	SFST - ANGLE STRUT	1
H	015203	SFST - POST #1 SYTP	1
J	015204	SFST - ANCHOR PADDLE	1
K	015205	SFST - POST #0	1
L	015206	SFST - PLATE WASHER	1
M	015207	SFST - KEEPER PLATE	1
N	015208	SFST - IMPACT HEAD	1
		HARDWARE	
a	003240	5/16" ROUND WASHER WIDE	6
b	003245	5/16" HEX NUT	3
c	003340	⅝" GR HEX NUT	41
d	003360	⅝" x 1¼" GR BOLT	32
e	003391	⅝" x 1¾" HEX BOLT A325	1
f	003500	⅝" x 10" GR BOLT A307	7
g	003701	¾" ROUND WASHER F436	4
h	003704	¾" HVY HEX NUT A563 DH	2
j	003717	¾" x 2½" HEX BOLT A325	2
k	003908	1" HVY HEX NUT A563 DH	1
l	004372	⅝" WASHER F436	4
m	004489	⅝" x 9" HEX BOLT A325	1
n	004902	1" ROUND WASHER F436	1
o	105285	5/16" x 2½" HEX BOLT GRD 5	2
p	105286	5/16" x 1½" HEX BOLT GRD 5	1



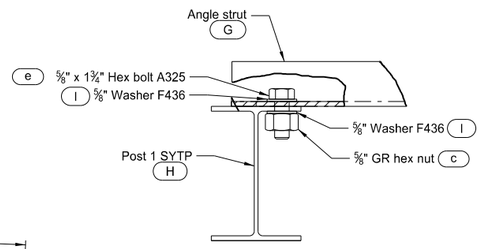
DETAIL A
Post 0



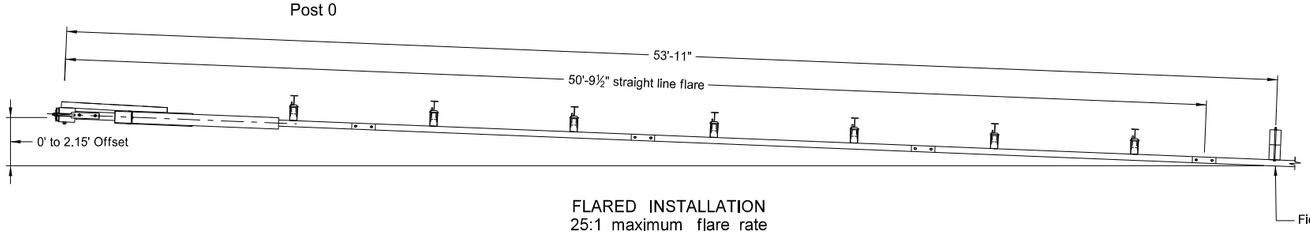
DETAIL B
Post 0



DETAIL D
Post 1



DETAIL C
Post 1
(shown near ground)



FLARED INSTALLATION
25:1 maximum flare rate

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
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DATE	CHANGE

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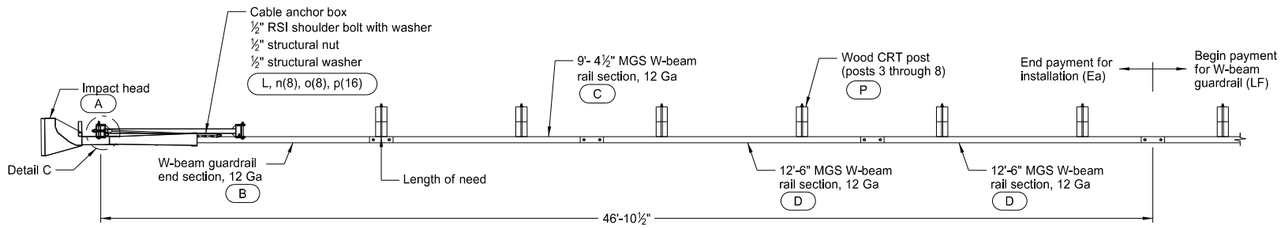
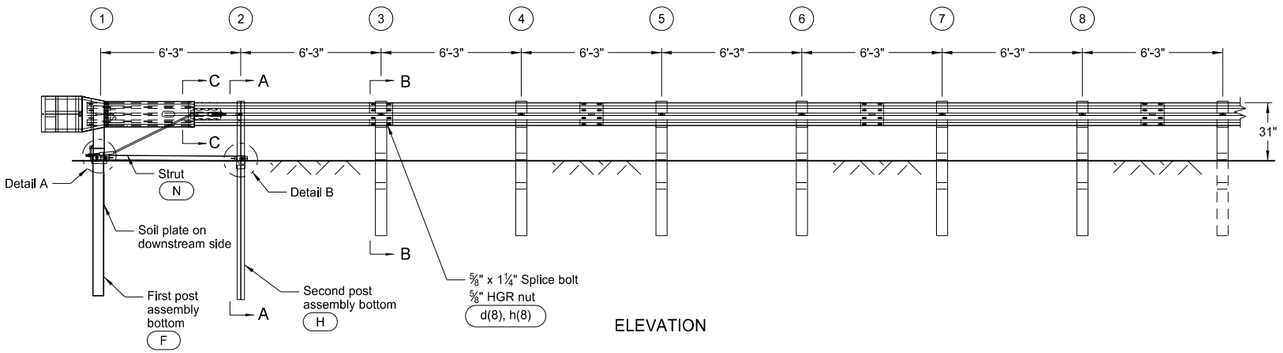
MASH SEQUENTIAL KINKING TERMINAL - WOOD POST

D-764-51



PLAN

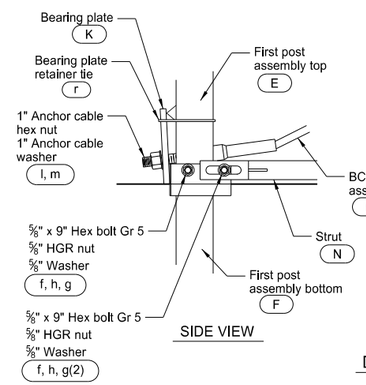


ELEVATION

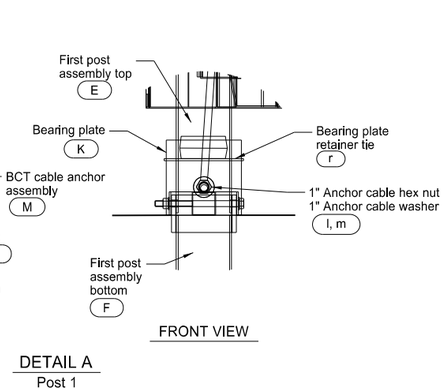
GENERAL NOTES:

1. Galvanize all bolts, nuts, cable assemblies, cable anchors, and bearing plates.
2. The MSKT can be flared at a rate of up to 25:1 to prevent the impact head from encroaching on the shoulder.
3. Ensure the lower sections of the posts do not protrude more than 4" above the ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
4. Install the lower section of the hinged posts without the upper post attached. If the post is placed in a drilled hole, the backfill material must be compacted to prevent settlement.
5. The breakaway cable assembly must be taut. Use a locking device (vice grips or channel lock pliers) to prevent the cable from twisting when tightening nuts.
6. "Toe nail" the wood blockouts to the rectangular wood posts at post 3 through post 8. Use two 20 penny galvanized nails.

ITEM	ITEM NO.	BILL OF MATERIALS	QTY
A	MS3000	IMPACT HEAD	1
B	SF1303	W-BEAM GUARDRAIL END SECTION, 12 Ga	1
C	G12025	9'-4½" MGS W-BEAM RAIL SECTION, 12 Ga	1
D	G1203A	12'-6" MGS W-BEAM RAIL SECTION, 12 Ga	2
E	MTPHP1A	FIRST POST ASSEMBLY TOP (6" X 6" X⅛" Tube)	1
F	MTPHP1B	FIRST POST ASSEMBLY BOTTOM (6' W6X15)	1
G	UHP2A	SECOND POST ASSEMBLY TOP	1
H	HP2B	SECOND POST ASSEMBLY BOTTOM	1
K	E750	BEARING PLATE	1
L	S760	CABLE ANCHOR BOX	1
M	E770	BCT CABLE ANCHOR ASSEMBLY	1
N	MS785	STRUT	1
P	UP671	6' WOOD CRT POST	6
R	P675	WOOD BLOCKOUT OR RECYCLED EQUIVALENT	6
HARDWARE			
a	B5160104A	5/16" x 1" HEX BOLT GR 5	2
b	W0516	5/16" WASHER	4
c	N0516	5/16" HEX NUT	2
d	B580122	⅝" Dia x 1¼" SPLICE BOLT	33
e	B581802	⅝" Dia x 18" HGR BOLT (POSTS 3 THRU 8)	6
f	B580904A	⅝" x 9" HEX BOLT GR 5	2
g	W050	⅝" WASHER	9
h	N050	⅝" Dia HGR NUT	35
j	B340854A	¾" Dia x 8½" HEX BOLT GRD A449	1
k	N030	¾" Dia HEX NUT	1
l	N100	1" ANCHOR CABLE HEX NUT	2
m	W100	1" ANCHOR CABLE WASHER	2
n	SB12A	½" RSI SHOULDER BOLT WITH WASHER	8
o	N012A	½" STRUCTURAL NUT	8
p	W012A	½" STRUCTURAL WASHER	8
r	CT-100ST	BEARING PLATE RETAINER TIE	1

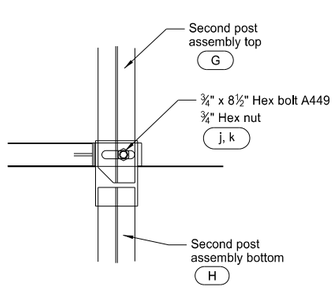


SIDE VIEW



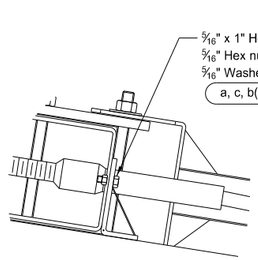
FRONT VIEW

DETAIL A
Post 1

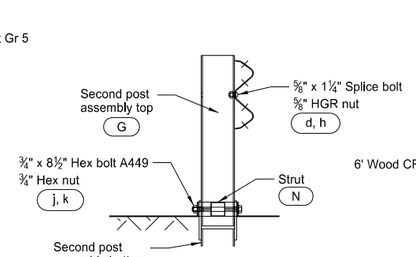


SIDE VIEW

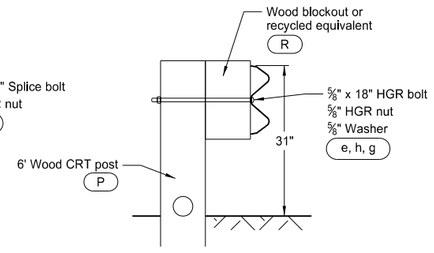
DETAIL B
Post 2



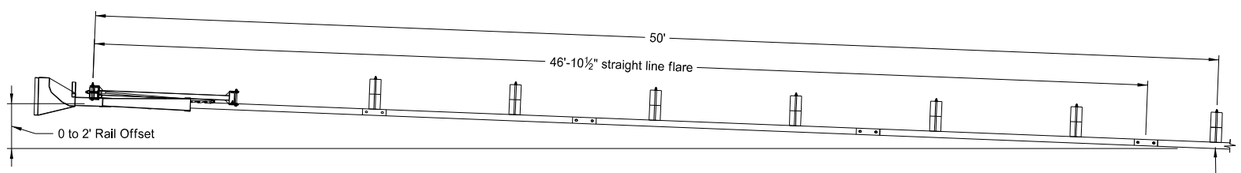
DETAIL C
Post 1 (Impact Head connection)



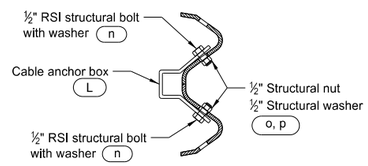
SECTION A-A
Post 2



SECTION B-B
Posts 3 through 8



FLARED INSTALLATION
25:1 maximum flare rate



SECTION C-C

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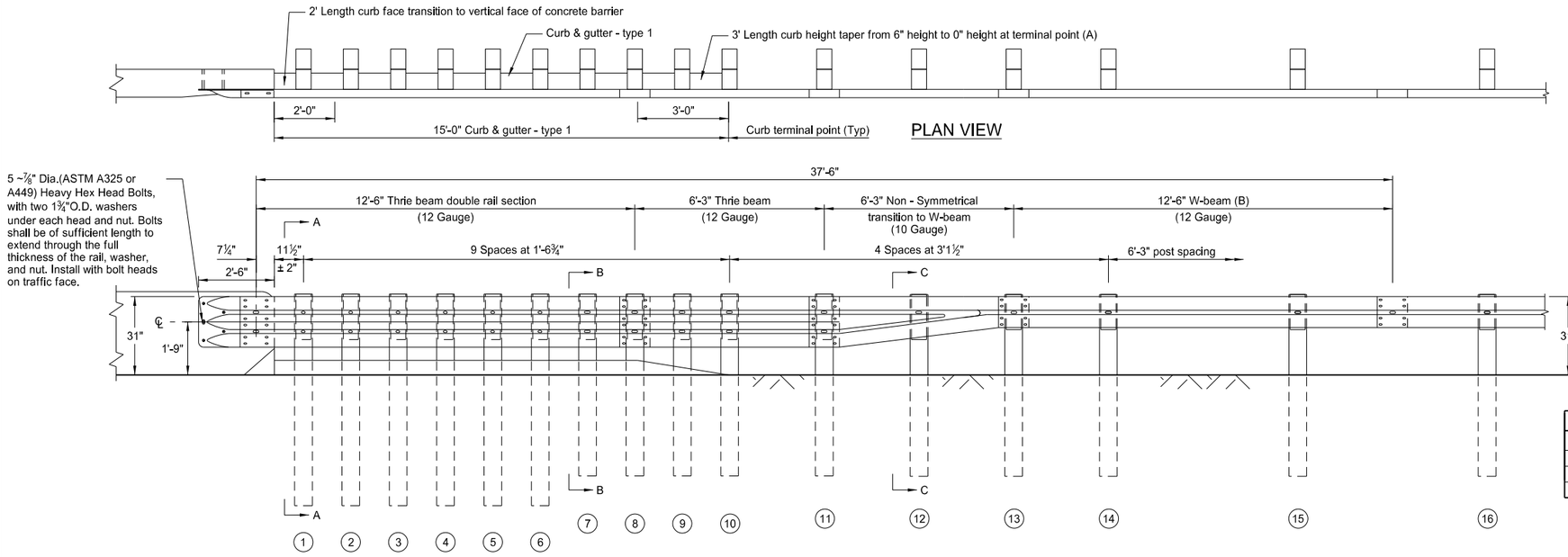
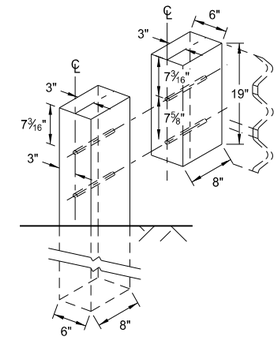
MGS W-BEAM TRANSITION WITH APPROACH CURB TO CONCRETE SINGLE SLOPE OR JERSEY BARRIER

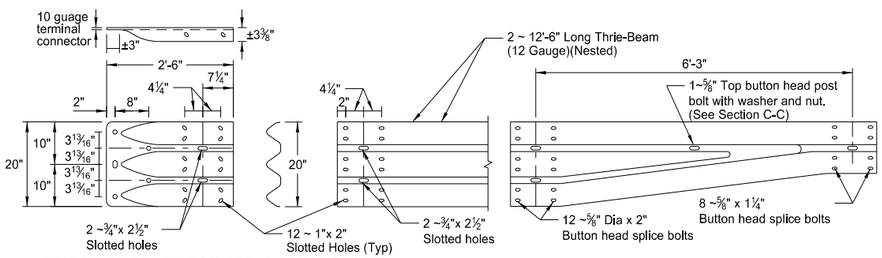
D-764-60





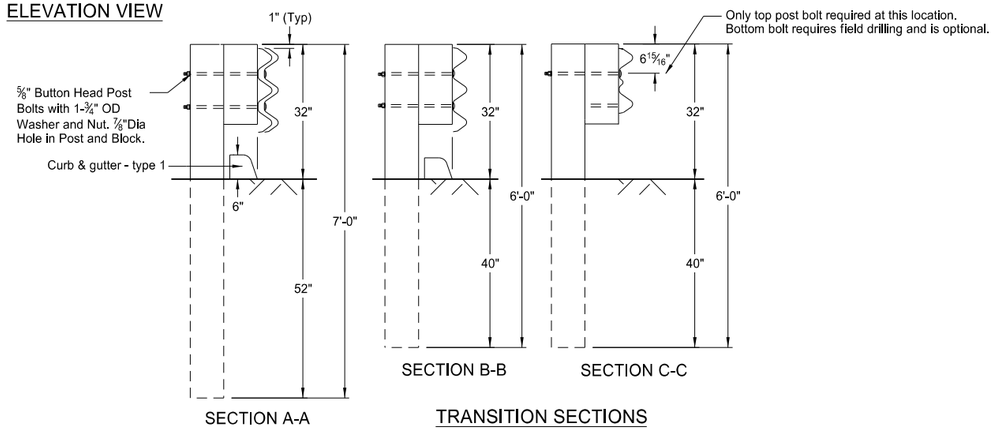
WOOD BLOCK
TO RECTANGULAR WOOD POST
(At posts 1 to 11)

TRANSITION POST AND TIMBER BLOCKOUT SIZING		
POST NO.	POST SIZE	BLOCKOUT SIZE
1-6	6" X 8" X 7'-0" long	6" X 8" X 19"
7-12	6" X 8" X 6'-0" long	6" X 8" X 19"
13-16	6" X 8" X 6'-0" long	6" X 8" X 14"

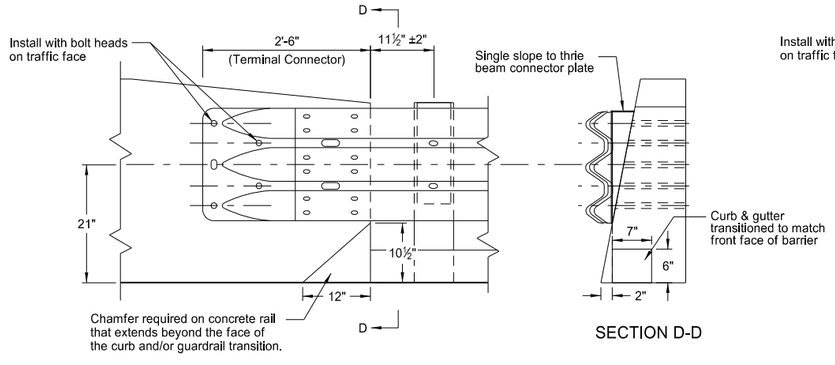


THRIE-BEAM TERMINAL CONNECTION

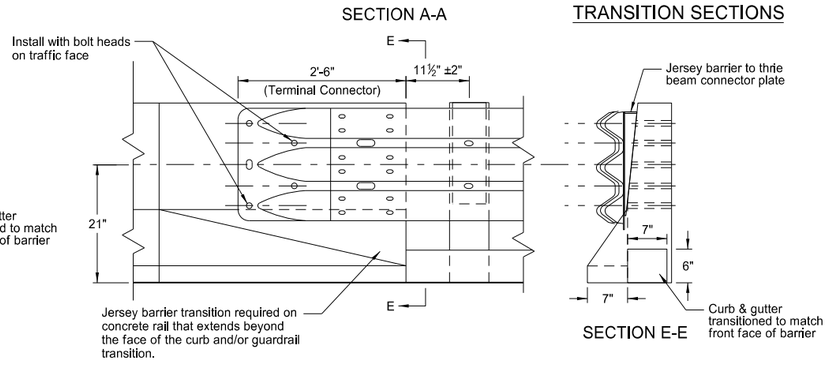
NON - SYMMETRICAL TRANSITION TO W-BEAM (10 GAUGE)



TRANSITION SECTIONS



CONNECTION TO CONCRETE SINGLE SLOPE BRIDGE RAIL AND TRAFFIC BARRIERS



CONNECTION TO CONCRETE JERSEY BARRIER BRIDGE RAIL AND TRAFFIC BARRIERS

(A) Where curb is required to continue past 15' length, taper the curb down to 3" height at the terminal point shown above, instead of 0" height. Between posts 10 and 16 the curb must be 3" height.

(B) Install a 12'-6" length W-beam double rail section at this location where curb extends past 15' length.

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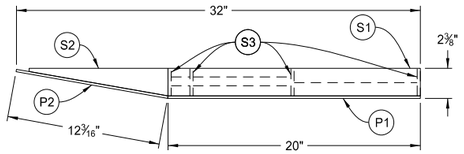
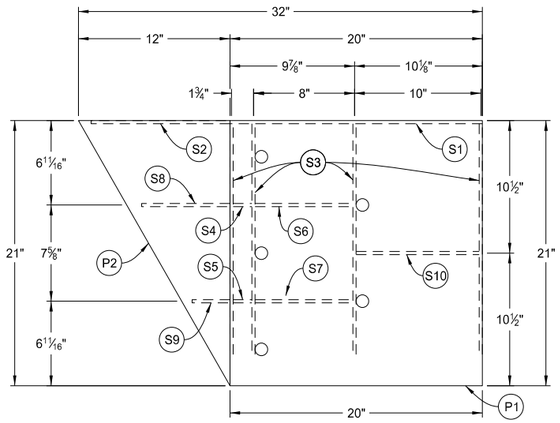
JERSEY BARRIER TO THRIE BEAM CONNECTOR PLATE DETAILS

D-764-62

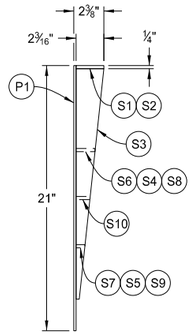


PLAN

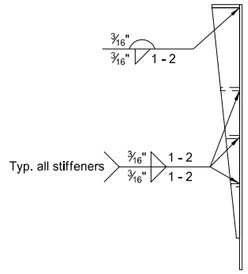
NOTE: Assembly Detail is shown for guardrail installation on right hand side of entrance end of bridge barrier. Mirror for opposite side installation.



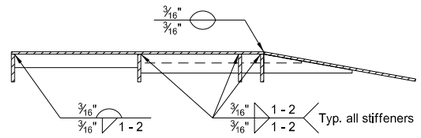
ELEVATION



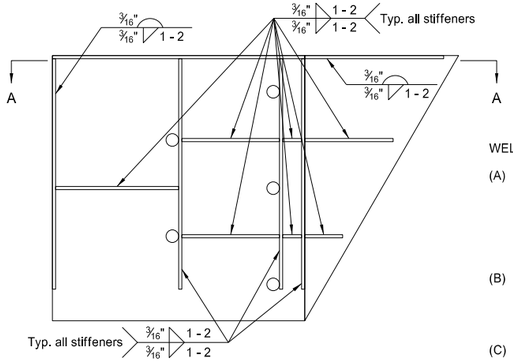
END



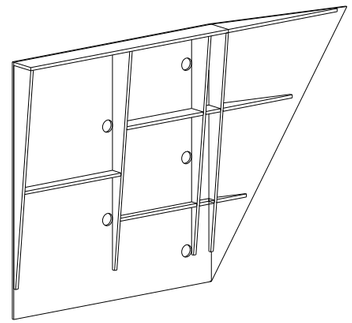
END



SECTION A-A



ELEVATION



PICTORIAL DRAWING
(Showing Back of Connector Plate)

WELDING INSTRUCTIONS:

(A) Stiffeners located on the outside edges of the cover plates shall be welded as follows:
3⁄16" continuous back weld on exterior sides and 3⁄16" fillet weld 1" long spaced at 2" center-to-center on interior sides.

(B) Stiffeners located on the inside of the cover plates shall be welded as follows:
3⁄16" fillet weld 1" long spaced at 2" center-to-center.

(C) Cover plates P1 and P2 shall be welded together with a 3⁄16" continuous back weld on both sides.

(D) Weld components with E60 rod.

ASSEMBLY DETAIL
(Front View)

WELDING DETAIL
(Back View)

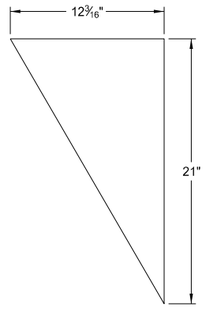


PLATE P2
Quantity: 1

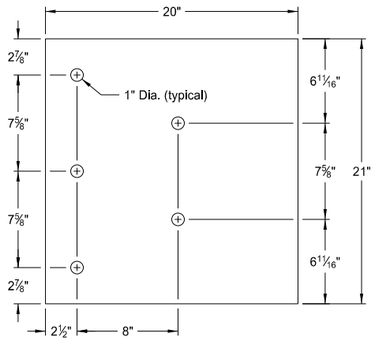
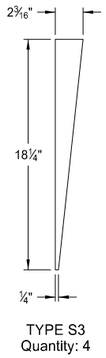


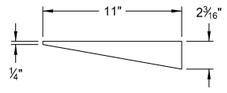
PLATE P1
Quantity: 1

COVER PLATES

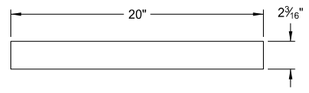


TYPE S3
Quantity: 4

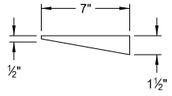
VERTICAL PLATES



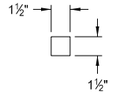
TYPE S2
Quantity: 1



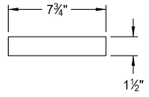
TYPE S1
Quantity: 1



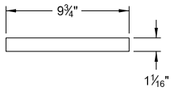
TYPE S8
Quantity: 1



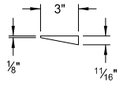
TYPE S4
Quantity: 1



TYPE S6
Quantity: 1



TYPE S10
Quantity: 1



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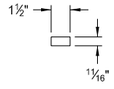

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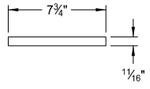

TYPE S7
Quantity: 1

HORIZONTAL PLATES

STIFFENER PLATES

NOTES:

1. Cover plates P1 and P2 shall be fabricated from 3⁄16" thick ASTM A36 Grade structural steel.
2. Stiffener plates shall be fabricated from ¼" thick ASTM A36 Grade structural steel.
3. Connector plate shall be galvanized in accordance with AASHTO M111.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
7-14-17	
REVISIONS	
DATE	CHANGE

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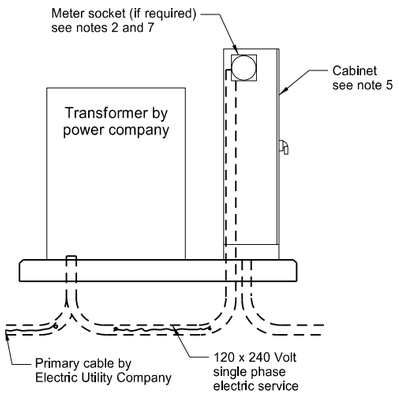
FEED POINTS
(ROADWAY LIGHTING)



Elevation

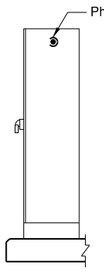
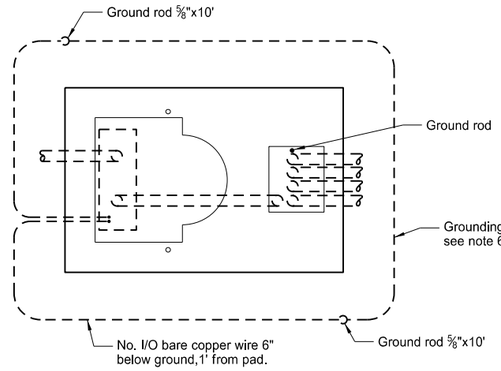
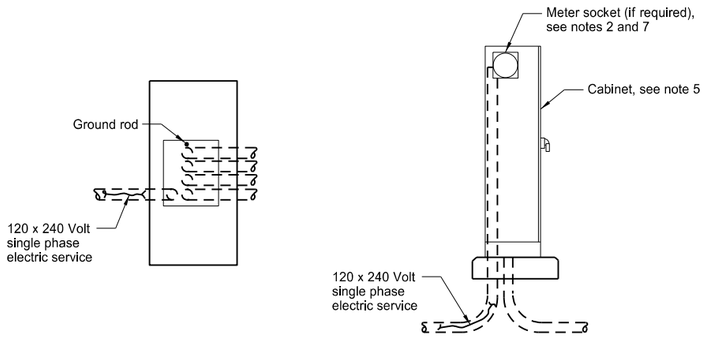


Photo Cell
Mounting Detail



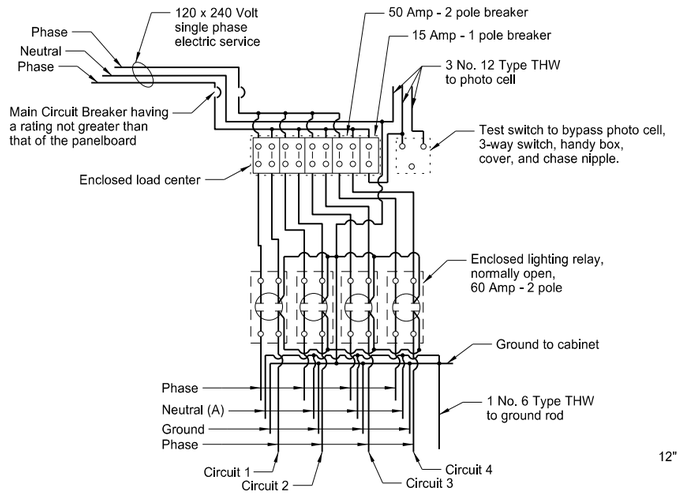
Plan

Transformer and Feed Point Cabinet Pad Mounted



Plan Elevation

Feed Point Cabinet Pad Mounted



Feed Point Type IV

Provide Type I feed point similar to Type IV, except with one electrical circuit, one 50 Amp - 2 pole breakers, and one lighting relay, normally open.

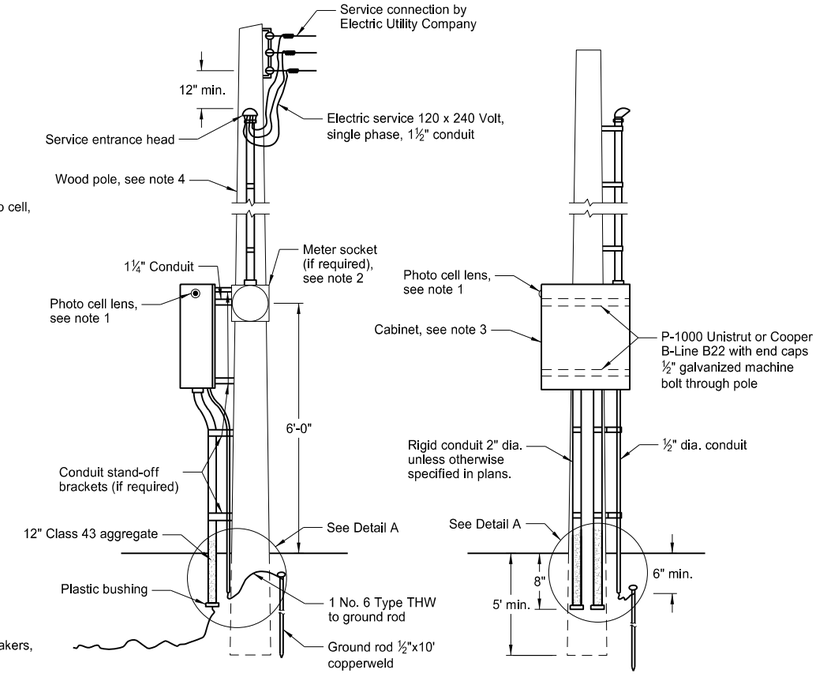
Provide Type II feed point similar to Type IV, except with two electrical circuit, two 50 Amp - 2 pole breakers, and two lighting relays, normally open.

Provide Type III feed point similar to Type IV, except with three electrical circuits, three 50 Amp - 2 pole breakers, and three lighting relays, normally open.

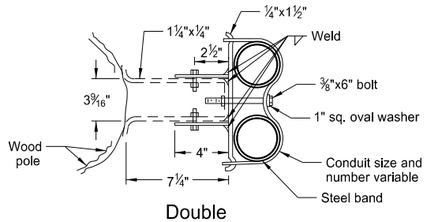
(A) Install when festoon circuit is required.

Detail A

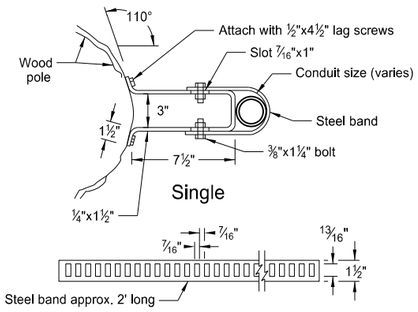
Use this detail for a continuous run of conduit from the feed point to the first light standard.



Feed Point Pole Mounted



Double



Single

Conduit Standoff Bracket

Omission of conduit standoff brackets allowed when not required by local utility company.

Notes:

1. Photo Cell: Furnish and install the photoelectric cell. Face photo lens north.
2. Meter Socket: Install meter socket and trim if the meter is required by local Utility Company. Meter furnished and installed by Utility Company.
3. Pole Mounted Cabinet: Provide cabinet with lock drip shield, factory installed steel backing, stainless steel hardware, and side hinge door. Shop coat cabinet with one coat of primer and two coats of exterior gray enamel.

   Provide 30" high x 24" wide x 8" deep Type I and II feed points. Provide 30" high x 42" wide x 10" deep or 36" high x 36" wide x 10" deep Type III and IV feed points.
4. Wood Pole: Provide minimum 20' Class VII full length penta pressure treated wood pole. (if required, see layout sheets)
5. Pad Mounted Cabinet: Provide 56" high x 26" wide x 14" deep weatherproof cabinet. Minimum 12 gauge steel or aluminum with provisions for padlock. Provide steel cabinet with one coat of primer and two coats of exterior dark green enamel.
6. Grounding Grid: Provide grounding grid with a maximum ground resistance of 25 ohms, using one or more ⅝"x10' copperweld ground rods in parallel or series at two corners. Provide a minimum distance between ground unit assemblies of 6'0".
7. Meter Location: Do not mount the meter (if required) on the same side of the cabinet as the photo cell.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
7-8-14 10-17-17 8-28-19	Revised note 3. Updated to active volce. New Design Engineer PE Stamp.

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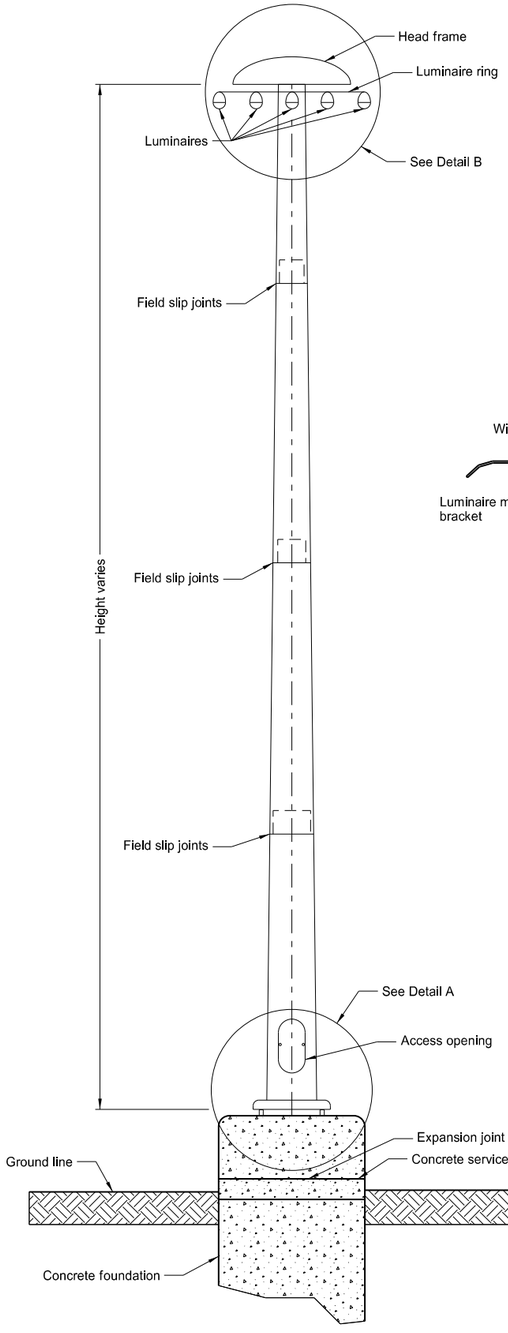
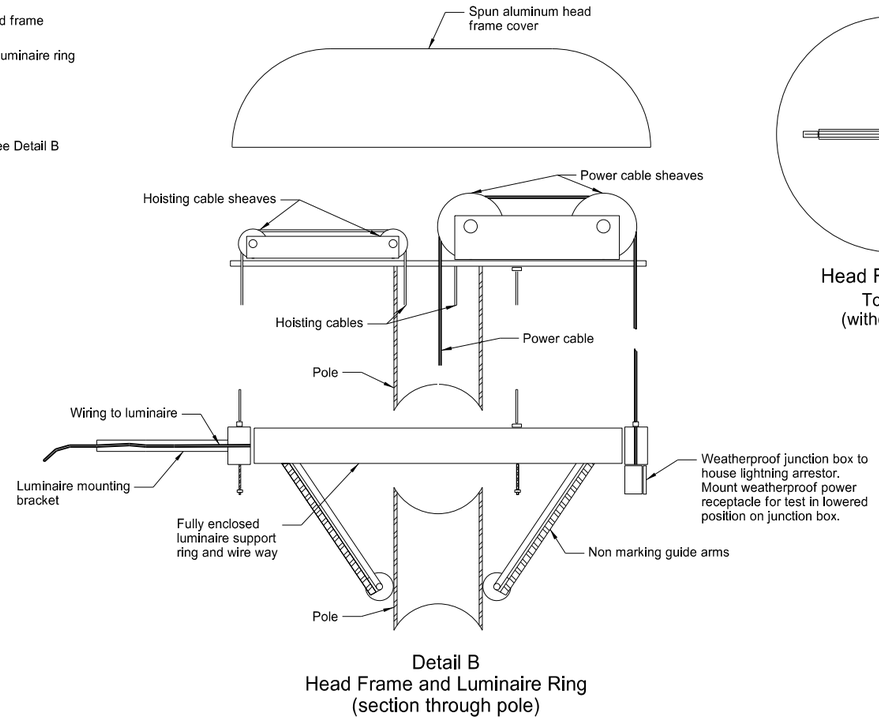
HIGH MAST LIGHTING

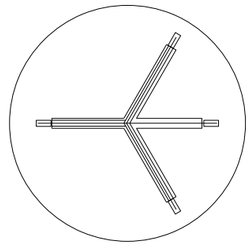
D-770-8



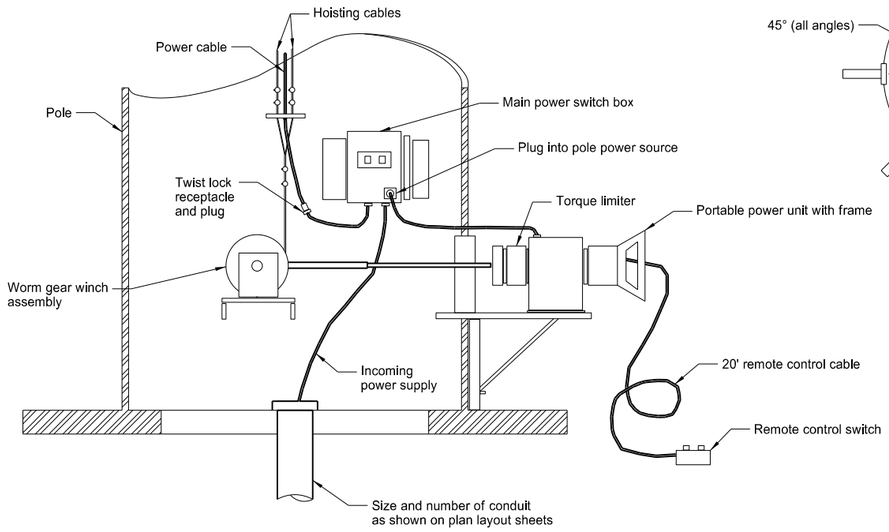
High Mast Lighting Pole Detail



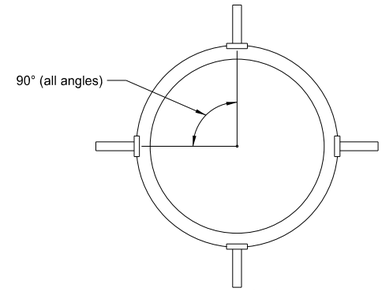
Detail B
Head Frame and Luminaire Ring
(section through pole)



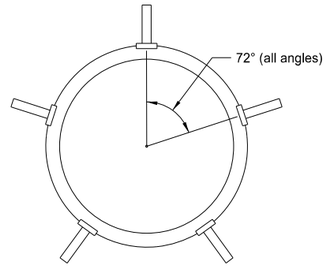
Head Frame Detail
Top View
(without cover)



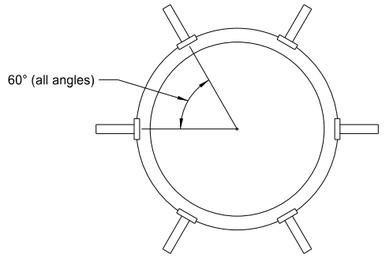
Detail A
Lowering Device
(section through base)



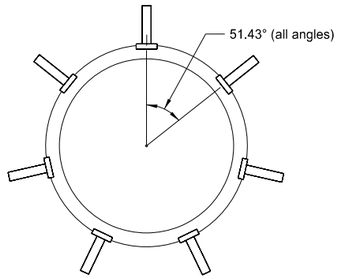
For 4 Luminaires



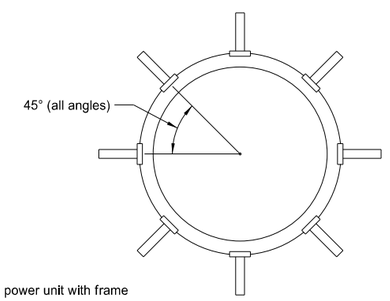
For 5 Luminaires



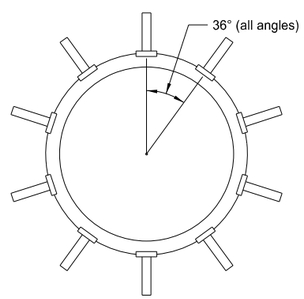
For 6 Luminaires



For 7 Luminaires



For 8 Luminaires



For 10 Luminaires

Luminaire Support Ring Details

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
10-17-17 8-28-19	Updated to active voice. New Design Engineer PE Stamp.

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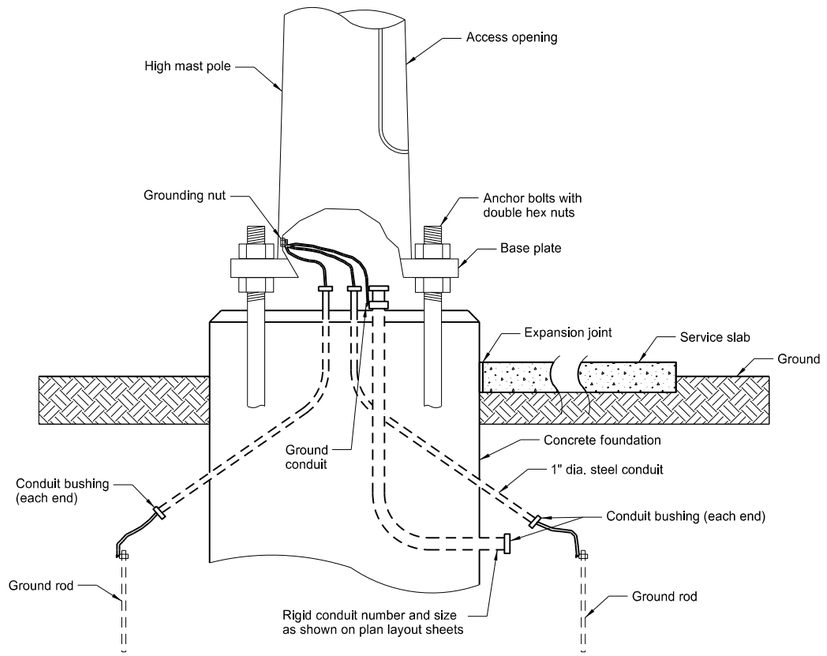
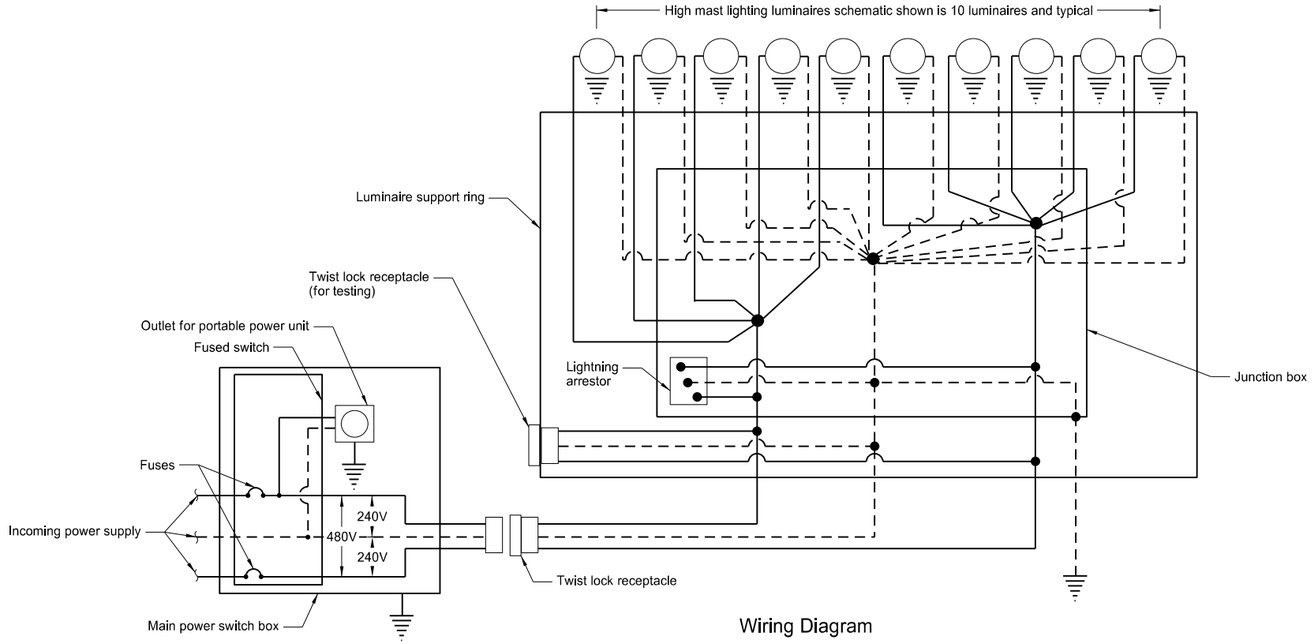
HIGH MAST LIGHTING

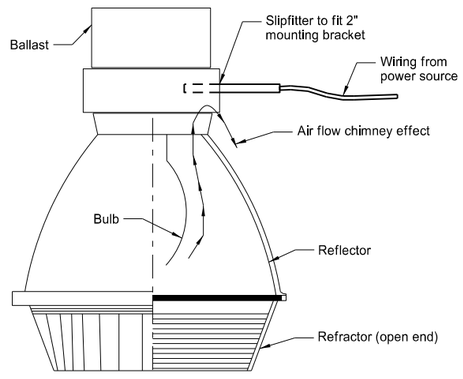
D-770-9

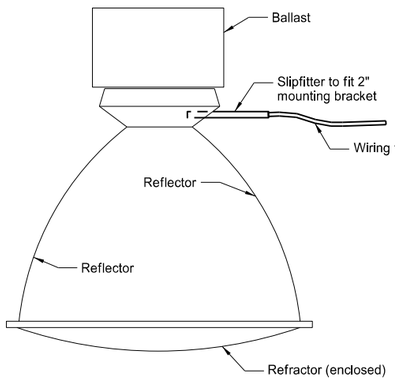


Conduit and Grounding Detail at Base

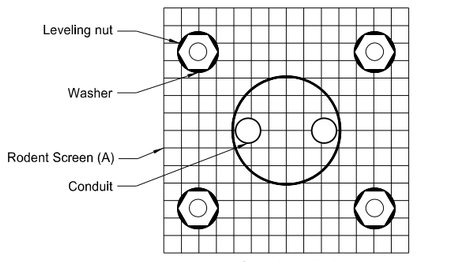


Wiring Diagram

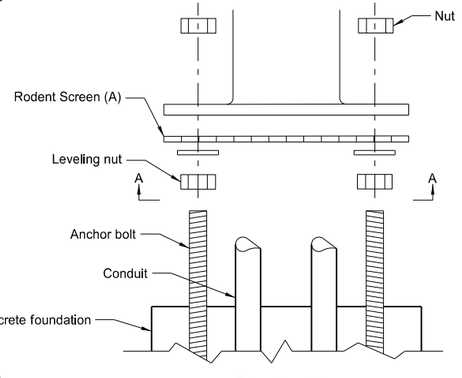




Typical Luminaire Details
(1000 watt)

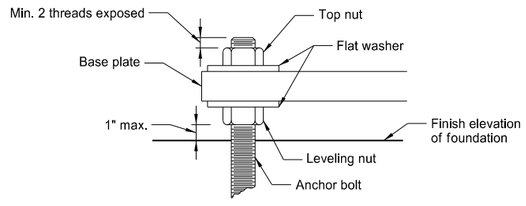


Section A-A



Elevation View
Rodent Screen

(A) ¼"x¼" galvanized steel welded wire fabric (wire dia. 0.025") cut same size as base plate and form tightly around the conduit.



Anchor Bolt Detail

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-8-13	
REVISIONS	
DATE	CHANGE
8-28-19	New Design Engineer PE Stamp.

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