

DESIGN DATA				
Traffic	Average Daily			
Current 2021	Pass: 16335	Trucks: 3,840	Total: 20,175	
Forecast 2041	Pass: 24,340	Trucks: 2395	Total: 26,735	
Clear Zone Distance: 34'		Design Speed: 75		
Minimum Sight Dist. for Stopping:		Bridges:		
Limited Access Control				
Pavement Design Life (years)				
Design Accumulated One-way		ESALs:		

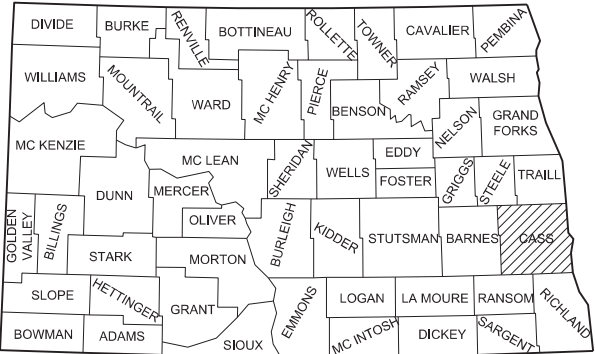
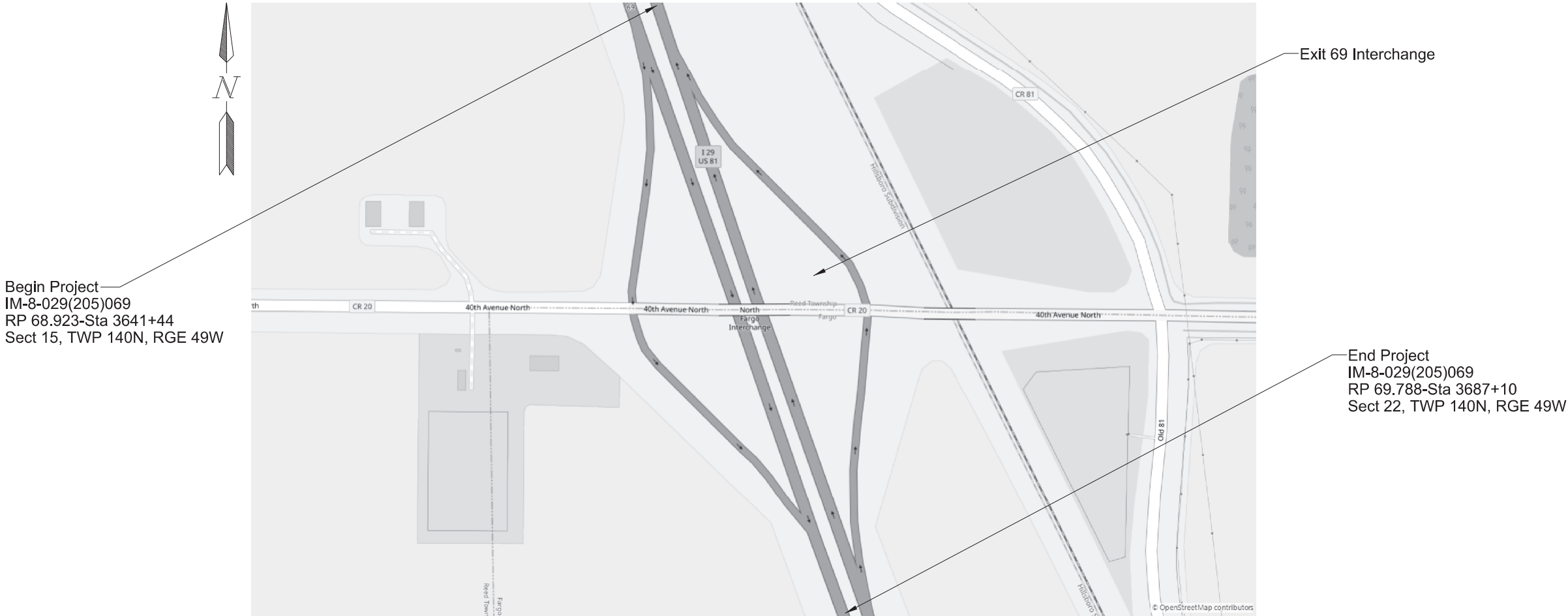
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

IM-8-029(205)069
Cass County
Exit 69 Interchange
Lighting

	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	23271	1	1

GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	1/1/2022
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
IM-8-029(205)069	.865	.865



DESIGNER Neal Bauer
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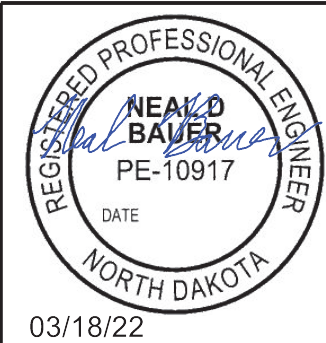
ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT
Hoff, Kirk J.
03/18/22

NDDOT Design Division

Professional Engineer Seal for James Douglas, PE-4288, dated 03/17/2022.

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Scope of Work
High Mast Lighting
I-29 Exit 69 Interchange
Fargo

NOTES

- 107-P01 E-file Federal Aviation Administration (FAA) form 7460-2 at least 10 days prior to start of construction (7460-2, Part 1) and within 5 days after the construction reaches it greatest height (7460-2, part 2).
- 203-P01 BORROW PIT CLUE: It may be possible to utilize borrow from the NE quadrant of this interchange. This material is located between the entrance ramp and I29, in Township 140N, Range 49W, Section 15. The pit is not cleared per section 107.05 of the Standard Specifications. If the Contractor chooses to use this clue, the NDDOT will complete the environmental and cultural review to satisfy the requirements of section 107.05. Do not disturb the borrow pit until the Certificate of Approval is issued. The Contractor assumes all responsibility if the clue is denied after the cultural review if they chose to use this pit. If the contractor uses borrow from this pit clue payment for “TOPSOIL,” “SEEDING CLASS II,” and “HYDRAULIC MULCH” will be measured and paid for using the unit prices bid for these items.
- If the Contractor chooses to obtain borrow from another suitable location include all costs of obtaining, opening, and restoring the site in the unit price bid for “BORROW-EXCAVATION.”.

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	4000K ±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)	3.0:1-4.0:1
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 40K MVOLT HGR AW DFD
Holophane High Mast LED	HMLED4 P3 40K 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.



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NOTES

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 Fargo District.

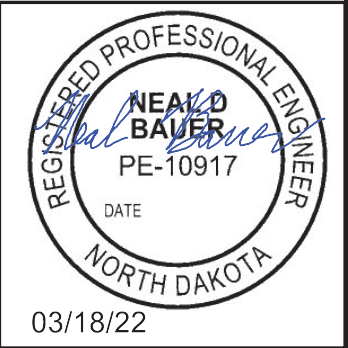
Fargo District Office
503 38th St S
Fargo ND

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 RODENT SREEN: Instead of wire mesh sheet, wrap wire mesh around the outside of anchor bolts. Include all costs to install the wire mesh “Rodent Screen” in the item “Concrete Foundation-High Mast Lighting”.

770-P07 Red Flashing Obstruction Light: Each high mast pole will require a red flashing obstruction light. As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 M, Obstruction Marking and Lighting, red lights-Chapters 4, 5 (Red), &15. Include all costs for to install the “Red Flashing Obstruction Light” in the item “LED Luminaire - High Mast”.



ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	8	1

SPEC	CODE	ITEM DESCRIPTION	UNIT	MAINLINE	TOTAL
----	----	-----	----	-----	-----
103	0100	CONTRACT BOND	L SUM	1	1
203	0101	COMMON EXCAVATION-TYPE A	CY	6	6
203	0109	TOPSOIL	CY	641	641
203	0140	BORROW-EXCAVATION	CY	2,670	2,670
251	0200	SEEDING CLASS II	ACRE	1.3	1.3
251	2000	TEMPORARY COVER CROP	ACRE	1.3	1.3
253	0201	HYDRAULIC MULCH	ACRE	2.6	2.6
260	0200	SILT FENCE SUPPORTED	LF	1,150	1,150
260	0201	REMOVE SILT FENCE SUPPORTED	LF	1,150	1,150
622	0040	STEEL PILING HP 12 X 53	LF	3,000	3,000
702	0100	MOBILIZATION	L SUM	1	1
704	0100	FLAGGING	MHR	60	60
704	1000	TRAFFIC CONTROL SIGNS	UNIT	2,053	2,053
704	1052	TYPE III BARRICADE	EA	2	2
704	1060	DELINEATOR DRUMS	EA	76	76
704	1067	TUBULAR MARKERS	EA	90	90
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	2	2
714	4100	PIPE CONDUIT 18IN	LF	18	18
770	0030	CONCRETE FOUNDATION-HIGH MAST LIGHTING	EA	10	10
770	0060	CONCRETE FOUNDATION-FEED POINT-TYPE B	EA	1	1
770	0220	CABLE TRENCH-TYPE II	LF	9,515	9,515
770	0350	3IN DIAMETER RIGID CONDUIT	LF	804	804
770	0370	4IN DIAMETER RIGID CONDUIT	LF	32	32
770	0483	MULTIPLE UNDERGROUND CABLE 4N02 STYLE USE	LF	1,431	1,431
770	0485	MULTIPLE UNDERGROUND CABLE 4N04 STYLE USE	LF	4,869	4,869
770	0486	MULTIPLE UNDERGROUND CABLE 4N06 STYLE USE	LF	4,530	4,530
770	0745	FEED POINT-TYPE IV-PAD MOUNTED	EA	1	1
770	3708	HIGH MAST LIGHTING ASSEMBLY TYPE HM-90-4	EA	4	4
770	3710	HIGH MAST LIGHTING ASSEMBLY TYPE HM-90-10	EA	4	4
770	3733	HIGH MAST LIGHTING ASSEMBLY TYPE HM-140-4	EA	2	2
770	4280	LED LUMINAIRE - HIGH MAST	EA	64	64

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SPEC	CODE	BID ITEM	QTY	UNIT
Use or Location		Rate or Station		
770	0030	CONCRETE FOUNDATION-HIGH MAST LIGHTING	QTY	UNIT
*** Concrete for access slabs		1.2 CY / LOCATION = 12 CY TOTAL		
*** Aggregate for access slabs		1.875 Tons per CY = 22.5 TONS TOTAL		
203	0140	BORROW-EXCAVATION	QTY	UNIT
Borrow - Excavation			2670	CY
*** Water Required for Project		10 Gal / CY for Borrow - 26,700 Gal		
*** Include the cost for this work in in the unit price bid for the corresponding Spec & Code				



Basis of Estimate

High Mast Lights
I-29

Earthwork Summary				
Location	Topsoil (Pay Item)	Common Excavation Type A (Pay Item)	Embankment *	Borrow Excavation (Pay Item)
	CY	CY	CY	CY
	A	B	C	D=C-B
High Mast Light 1 (PRSR1-1)	55	0	211	211
High Mast Light 2 (PRSR2)	61	0	212	212
High Mast Light 3 (PRSR3)	46	0	167	167
High Mast Light 4 (PRSR4)	57	0	204	204
High Mast Light 5 (PRSR5)	23	0	43	43
High Mast Light 6 (PRSR6)	37	0	118	118
High Mast Light 7 (PRSR7)	68	0	220	220
High Mast Light 8 (PRSR8)	55	0	174	174
High Mast Light 9 (PRSR9)	109	6	459	453
High Mast Light 10 (PRSR10)	129	0	868	868
	641	6	2676	2670

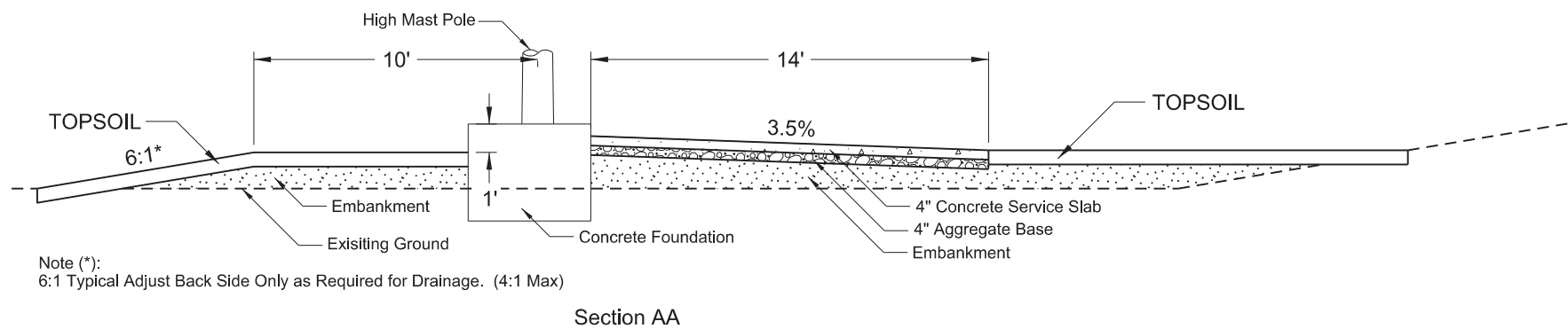
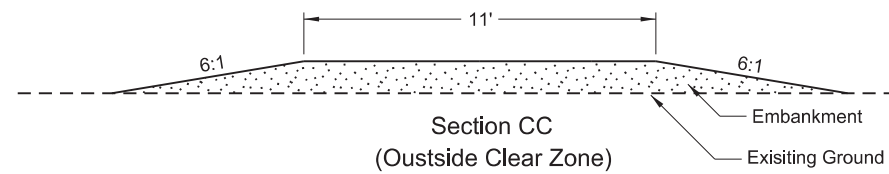
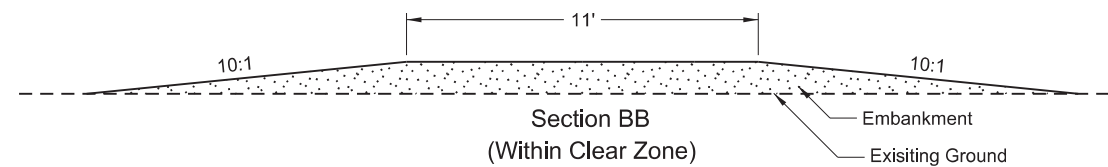
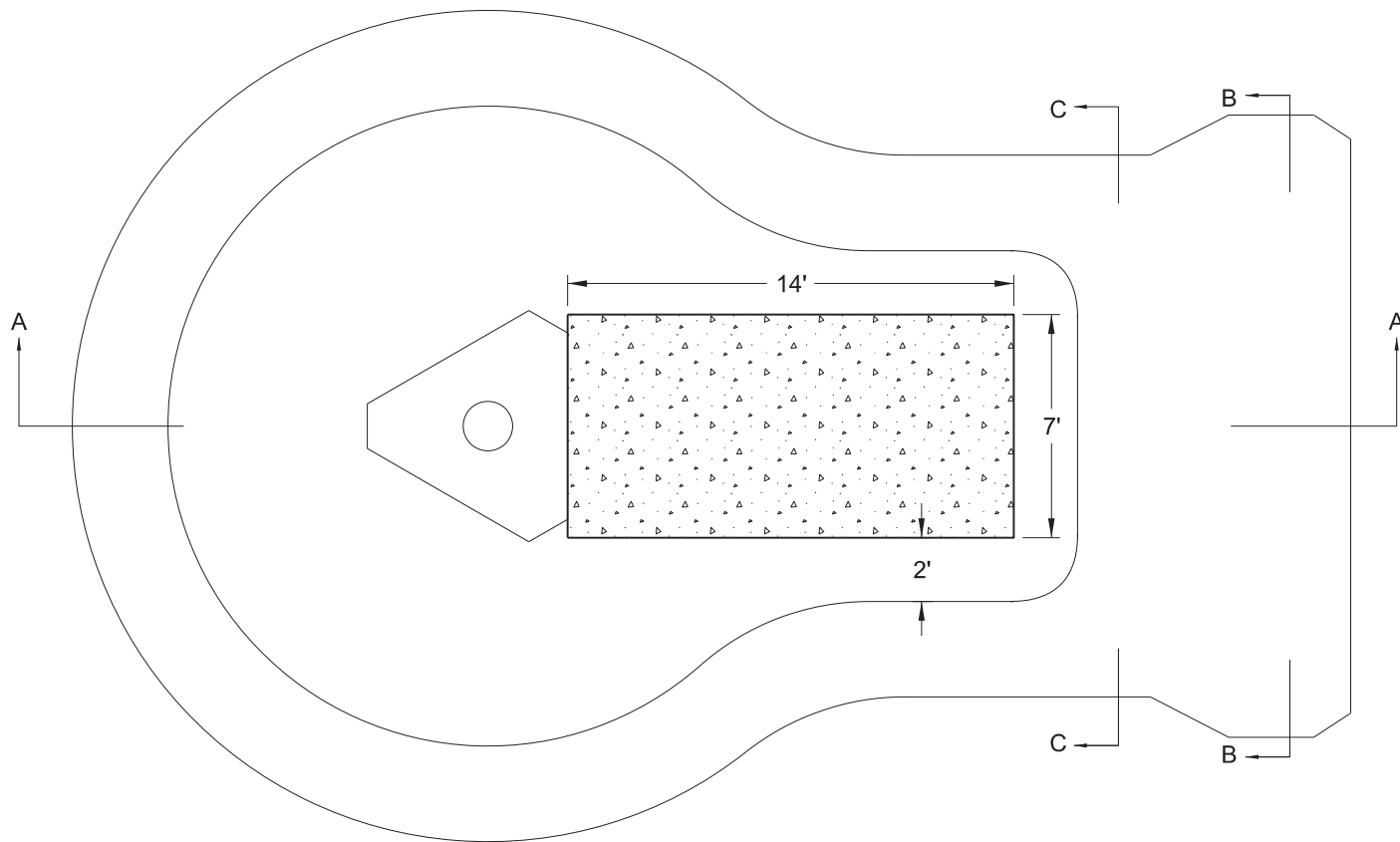
* 25% volume was added to embankment volume to allow for shrinkage



Earthwork Summary

High Mast Lights
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	ND	IM-8-029(205)069	20	1



Foundation Details

High Mast Lights
I-29

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	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)	(*)		Applicable Backfill
													End Sections		
													Begin	End	
				In	Bid Item	LF		In	Type		In	SY	EA	EA	
PRSR4 - 1+11 (HM 4)	9	PRSR4 - 1+11 (HM 4)	-9	18	Pipe Conduit	18	Reinforced Concrete Pipe - Class III(barrel length = 10 LF)	18				298	FES	FES	Specification 714.04 A

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

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

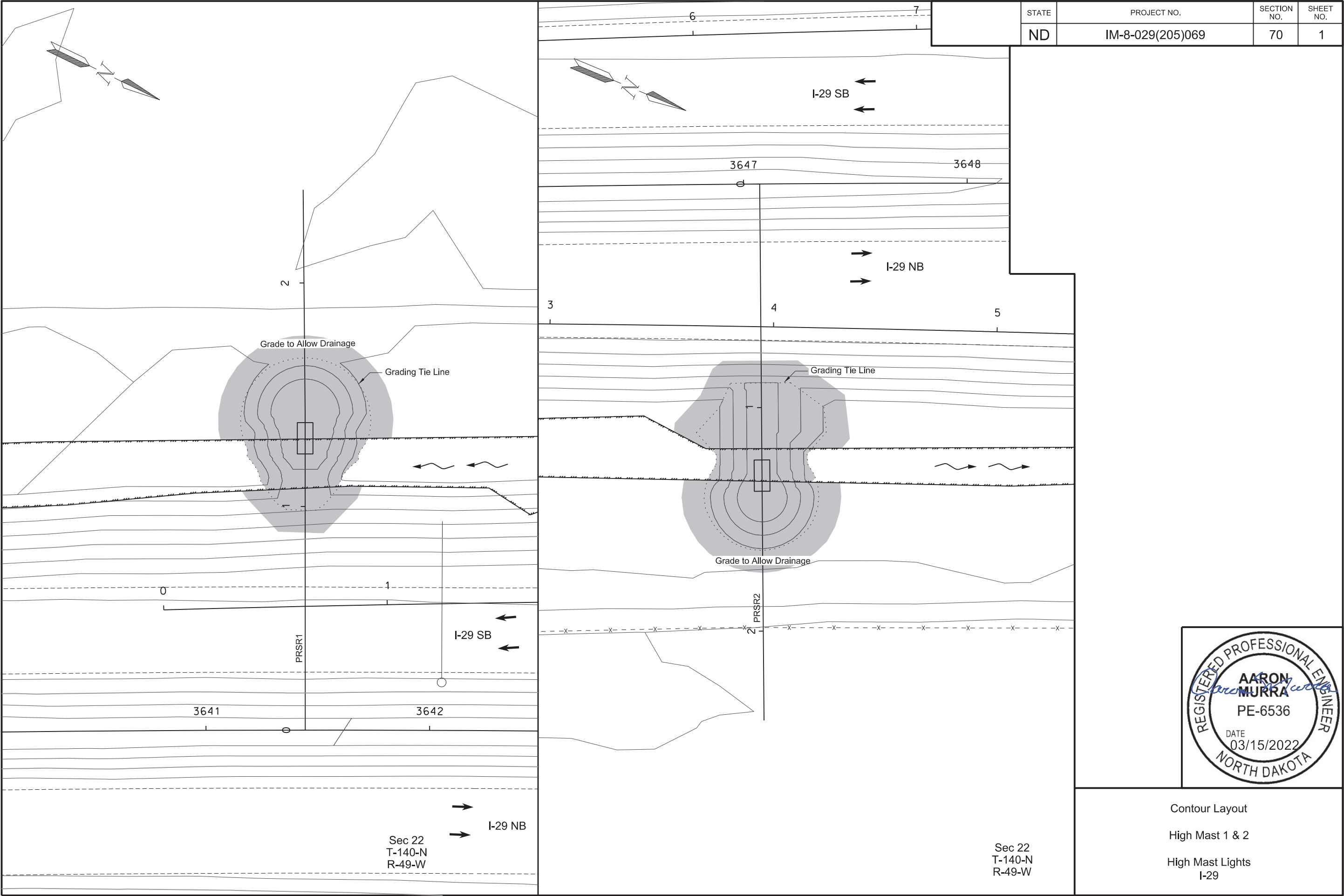
Spiral Ribs: 3/4 = 3/4"x3/4"@7-1/2"
1 = 3/4"x1"@11-1/2"

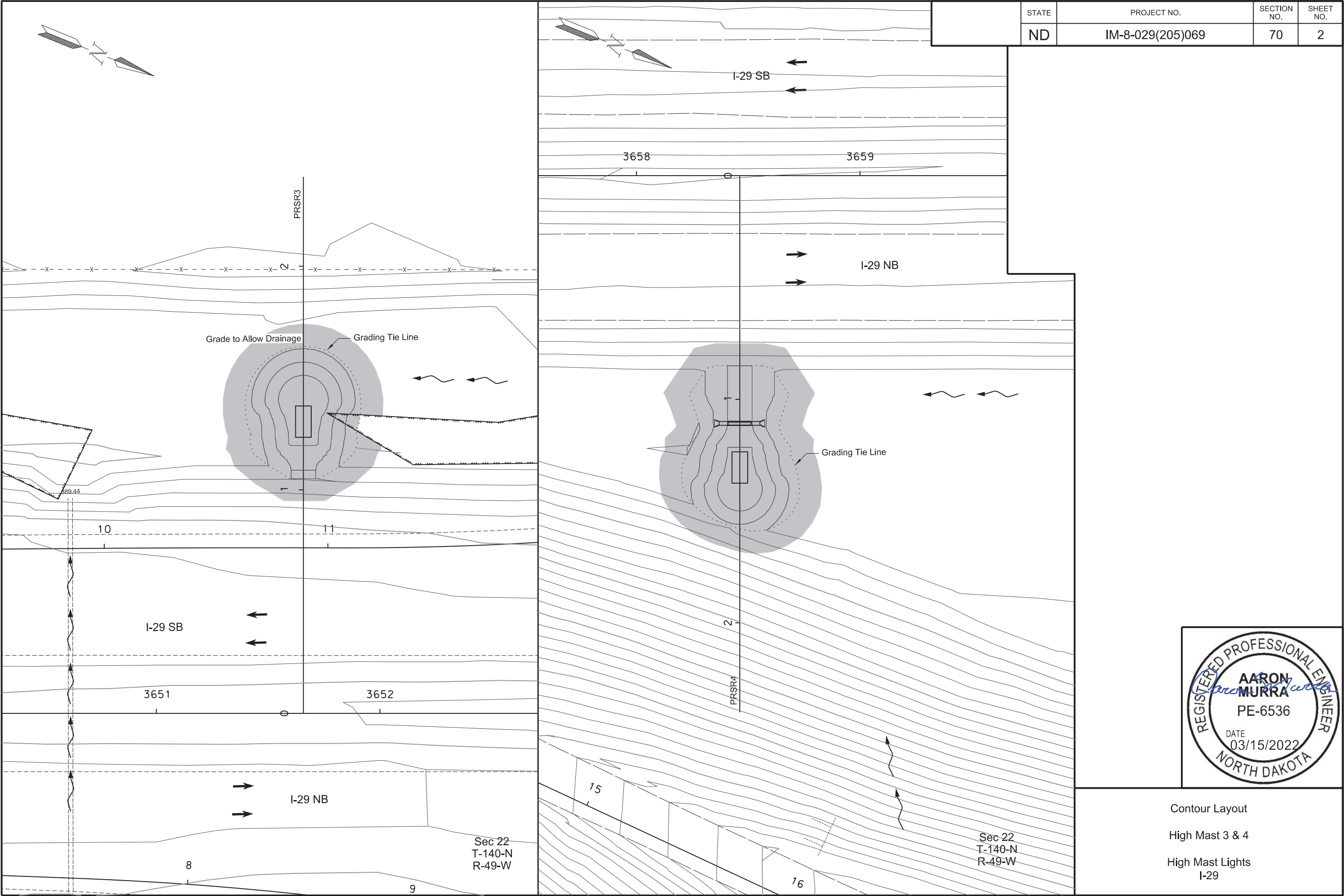
(*) End sections are measured and paid for separately for pipe extensions.
FES = Flared End Section
TES = Traversable End Section

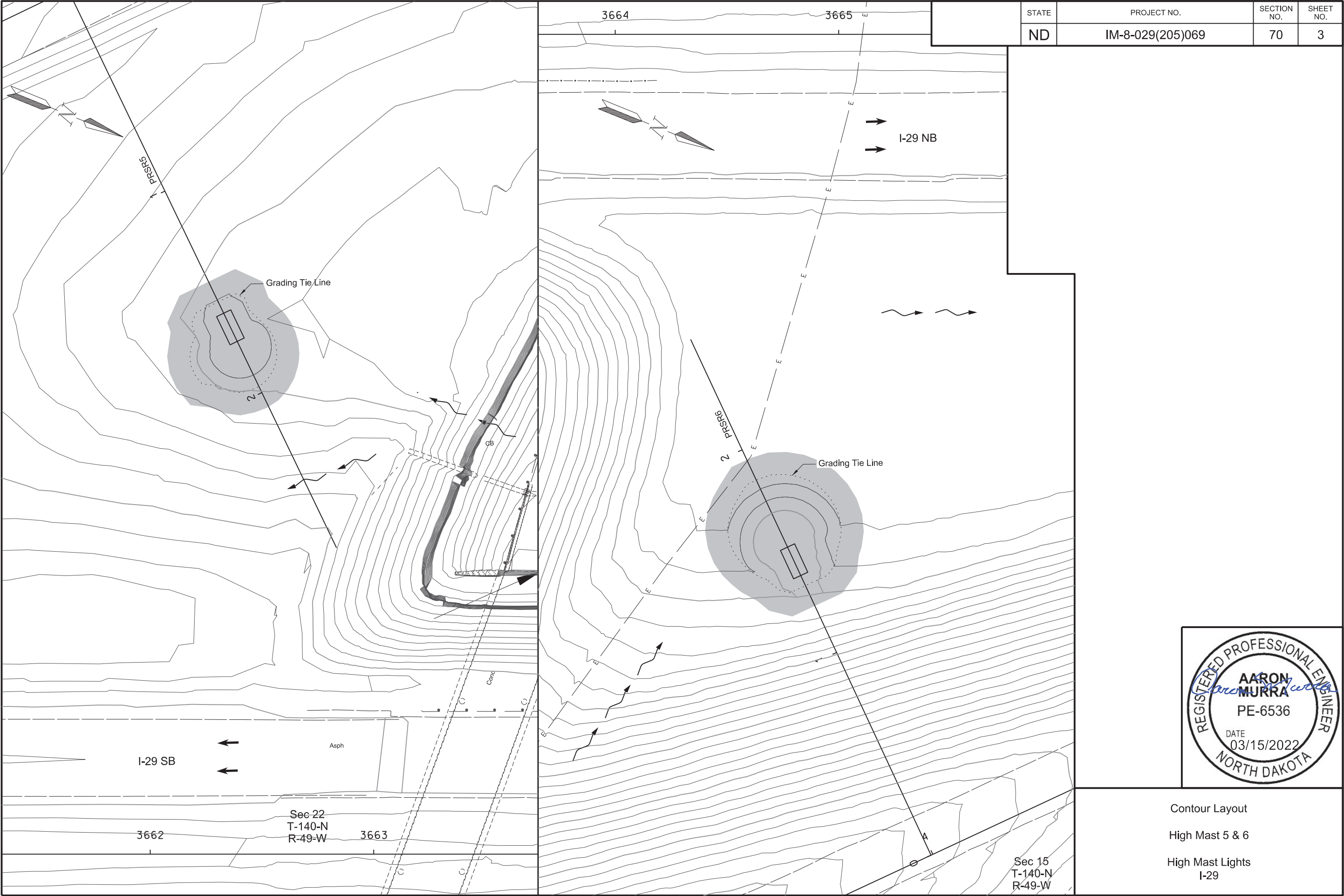


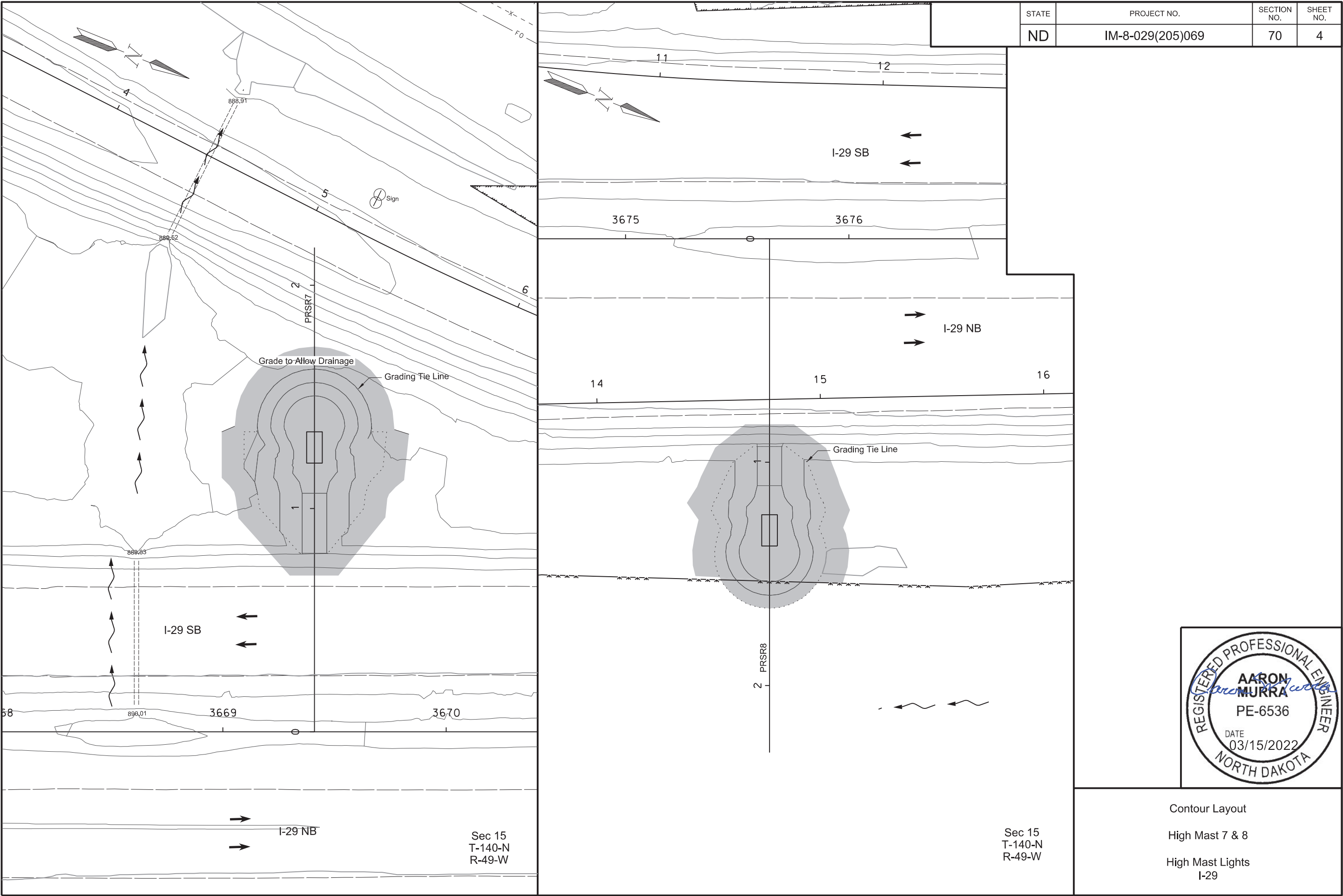
Allowable Pipe List

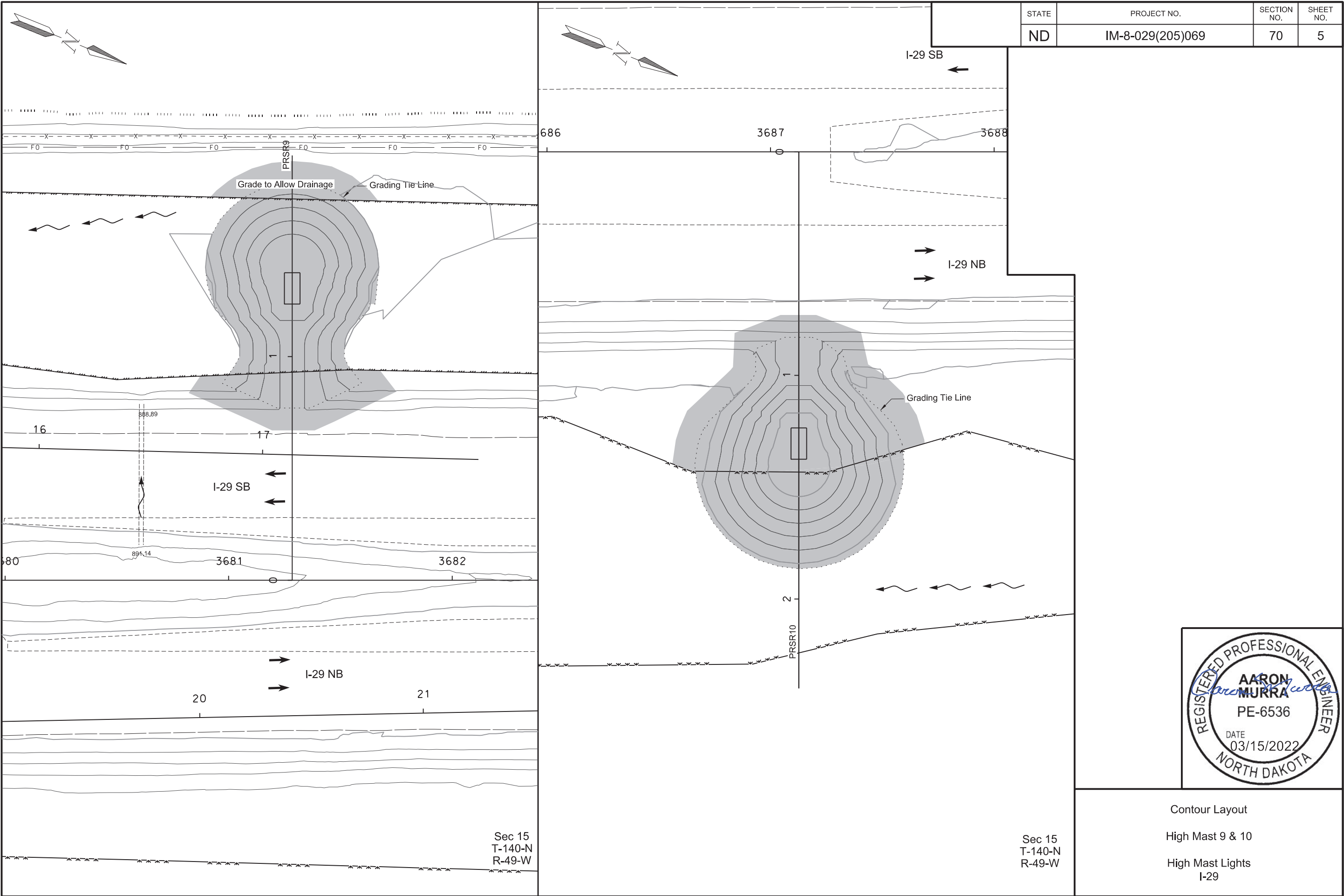
High Mast Lights
I-29











Wetland Impact Table									
Wetland Number	Location	Wetland Type	Wetland Feature	USACE Jurisdictional Wetlands	Wetland Impact			Wetland Mitigation	
					Wetland Impacts Acre(s)			USACE/11990 Bank	
					Temp.	Perm. (Fill/Drain)	Perm. (Cut)	Location	Acre(s)
1a	S 22 T140N R49W	PEMAx	Ditch	Yes	0.000	0.010		Kirkeby/Schuster Bank	0.01
1b	S 22 T140N R49W	PEMAx	Ditch	Yes	-	-			
1c	S 22 T140N R49W	PEMAx	Ditch	Yes	-	-			
1d	S 22 T140N R49W	PEMCx	Ditch	Yes	0.000	0.020		Kirkeby/Schuster Bank	0.02
1e	S 15 T140N R49W	PEMCx	Ditch	Yes	-	-			
1f	S 15 T140N R49W	PEMCx	Ditch	Yes	-	-			
1g	S 15 T140N R49W	PEMCx	Ditch / NDDOT Wetland Mitigation Site	Yes	0.040	0.080		Kirkeby/Schuster Bank	0.08
2	S 15 T140N R49W	PEMAx	Ditch	Yes	0.040	0.110		Kirkeby/Schuster Bank	0.11
Totals					0.080	0.220			0.22

¹ NDDOT requests a preliminary jurisdictional determination and assumes all wetlands are jurisdictional for permitting purposes.

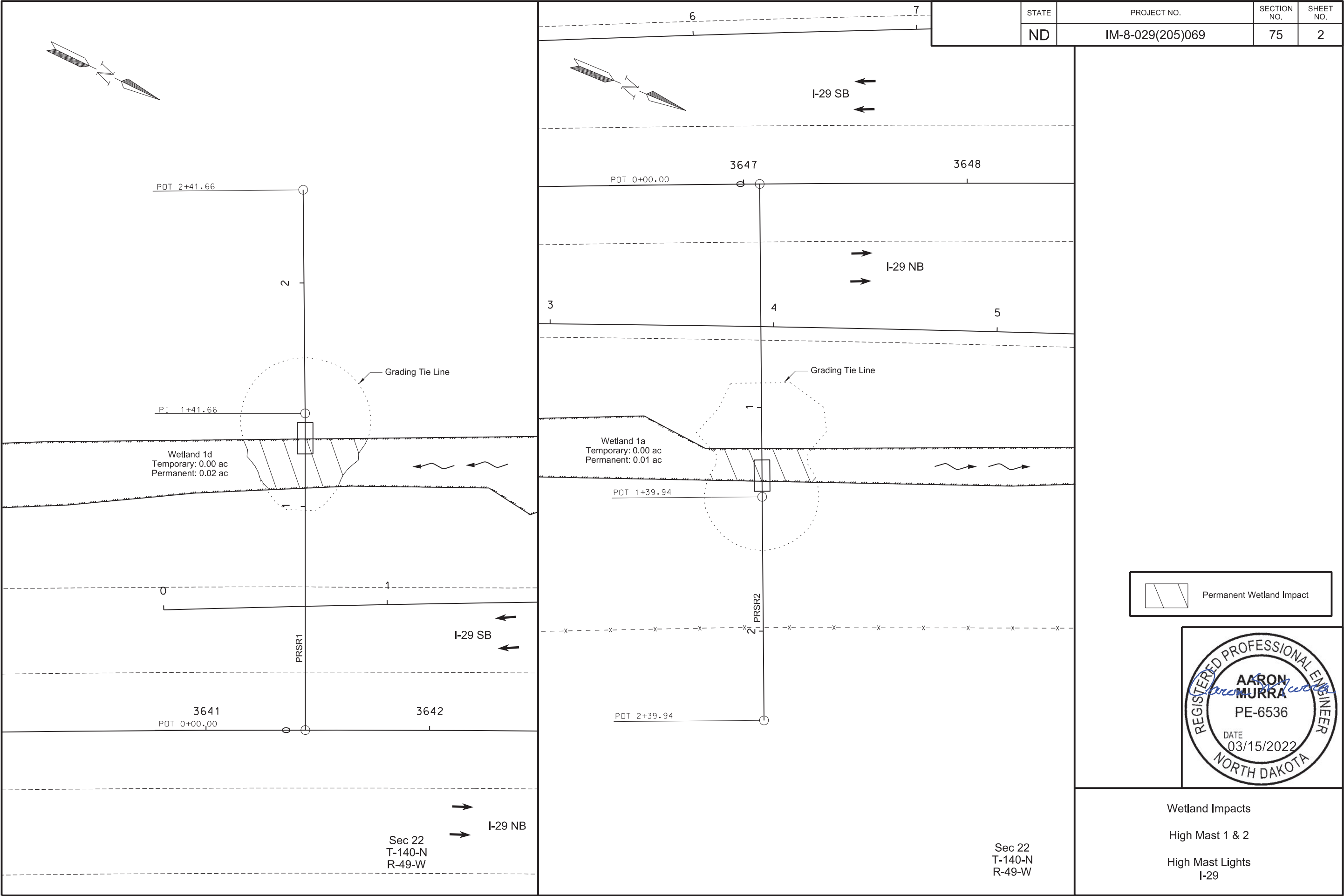
Impact Summary Table			
Permanent Impact Summary		Temporary Impacts and Additional Information	
Wetland Type	Total Acre(s)	WaterType	Total Acre(s)
Natural/JD (Fill/Drain)		Temporary Wetland JD	0.080
Natural/Non-JD (Fill/Drain)		Non-JD Wetland Temporary	
Artificial/JD (Fill/Drain)	0.220		
Artificial /Non-JD (Fill/Drain)		Permanent OW	
Total	0.220	Temporary OW	
JD Natural (Cut)		Permanent OW-d	
JD Artificial (Cut)		Temporary OW-d	
Non-JD Natural (Cut)			
Non-JD Artificial (Cut)			
Total	0.000		

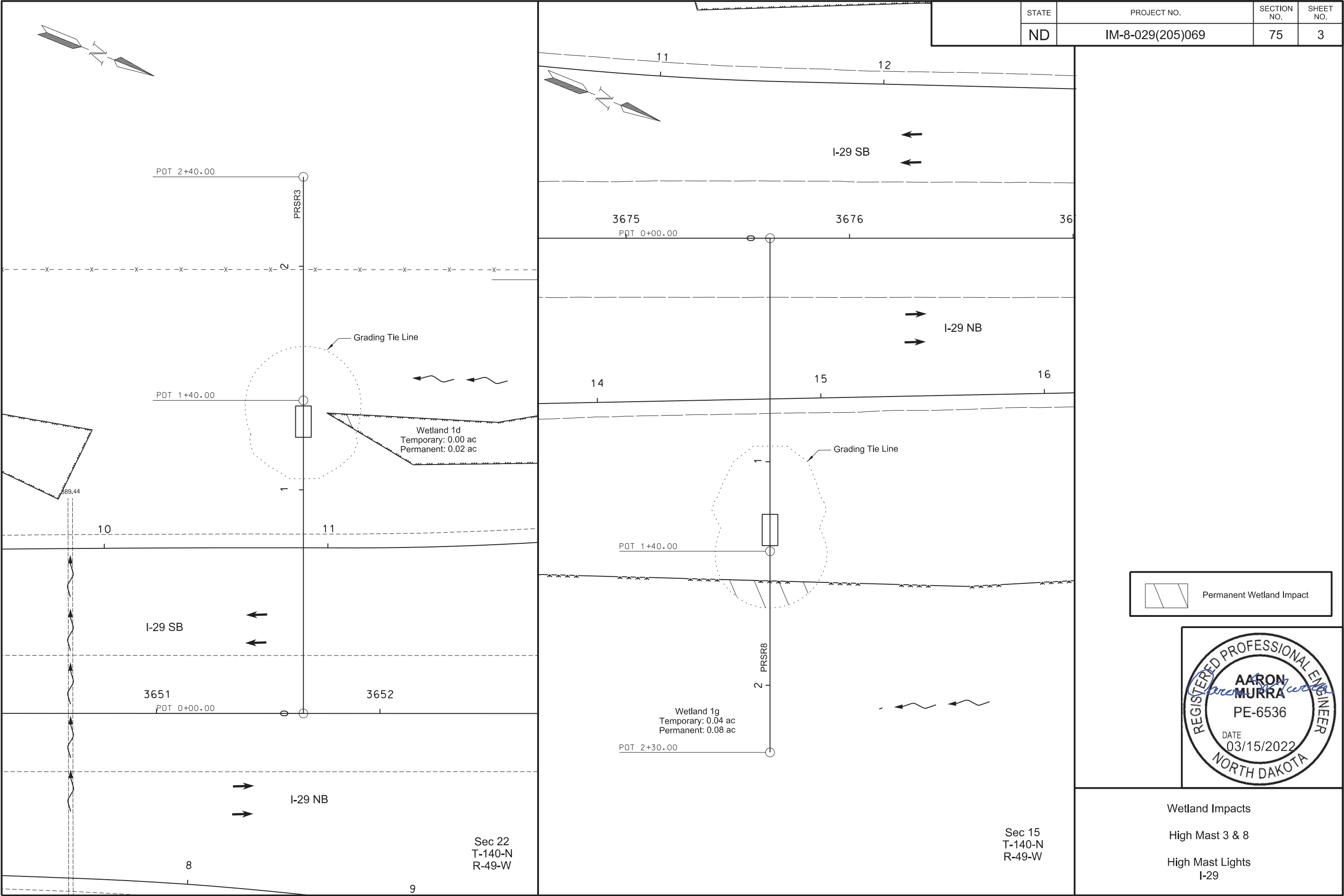
Mitigation Summary Table						
	Location	Ditch Shift Acre(s)	Onsite Acre(s)	11990 Bank Acre(s)	USACE/11990 Bank Acre(s)	USFWS Bank Acre(s)
USACE Only						
EO 11990 Only						
USACE/11990	Kirkeby/Schuster Bank				0.22	
USFWS						
Total		0	0	0	0.22	0

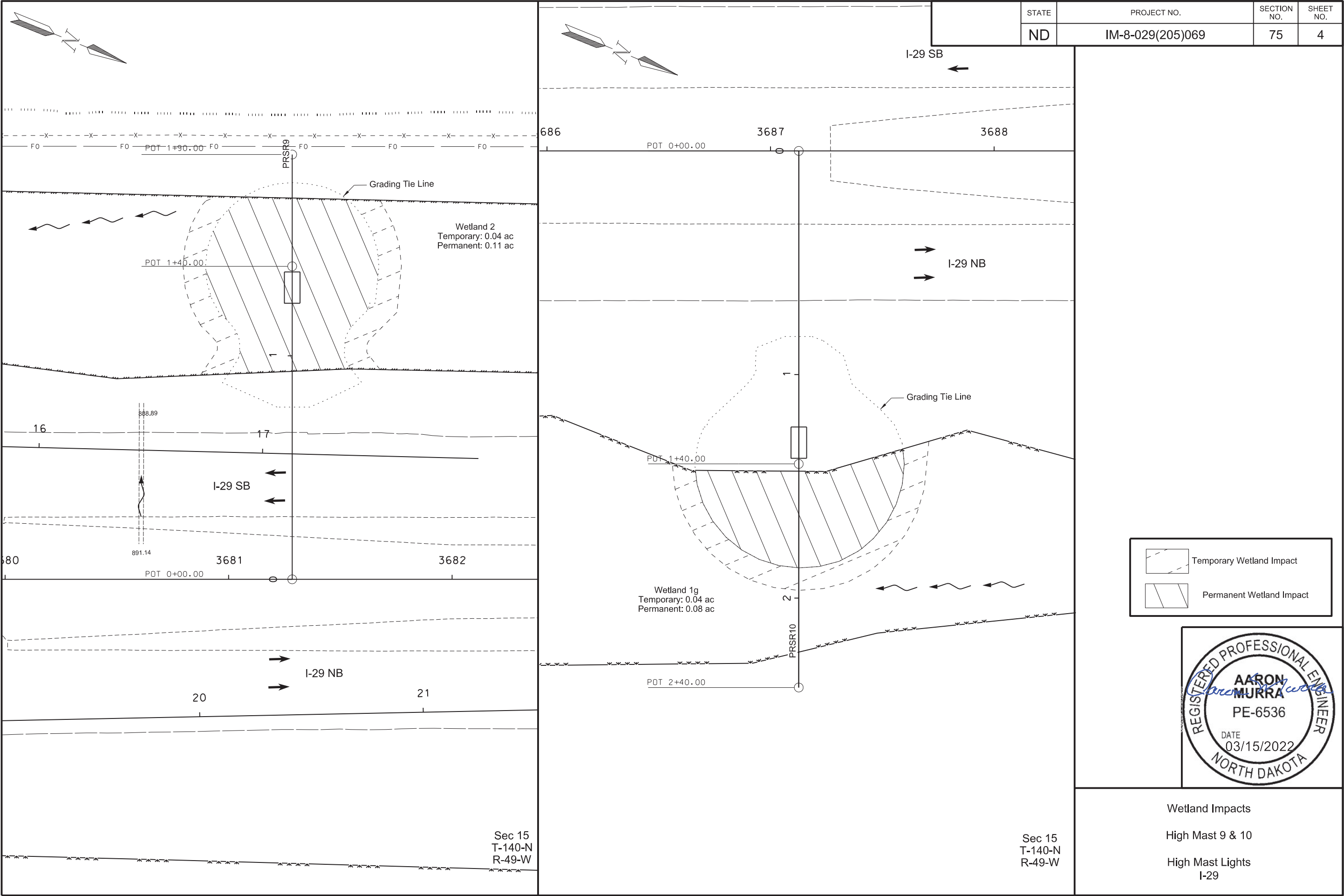


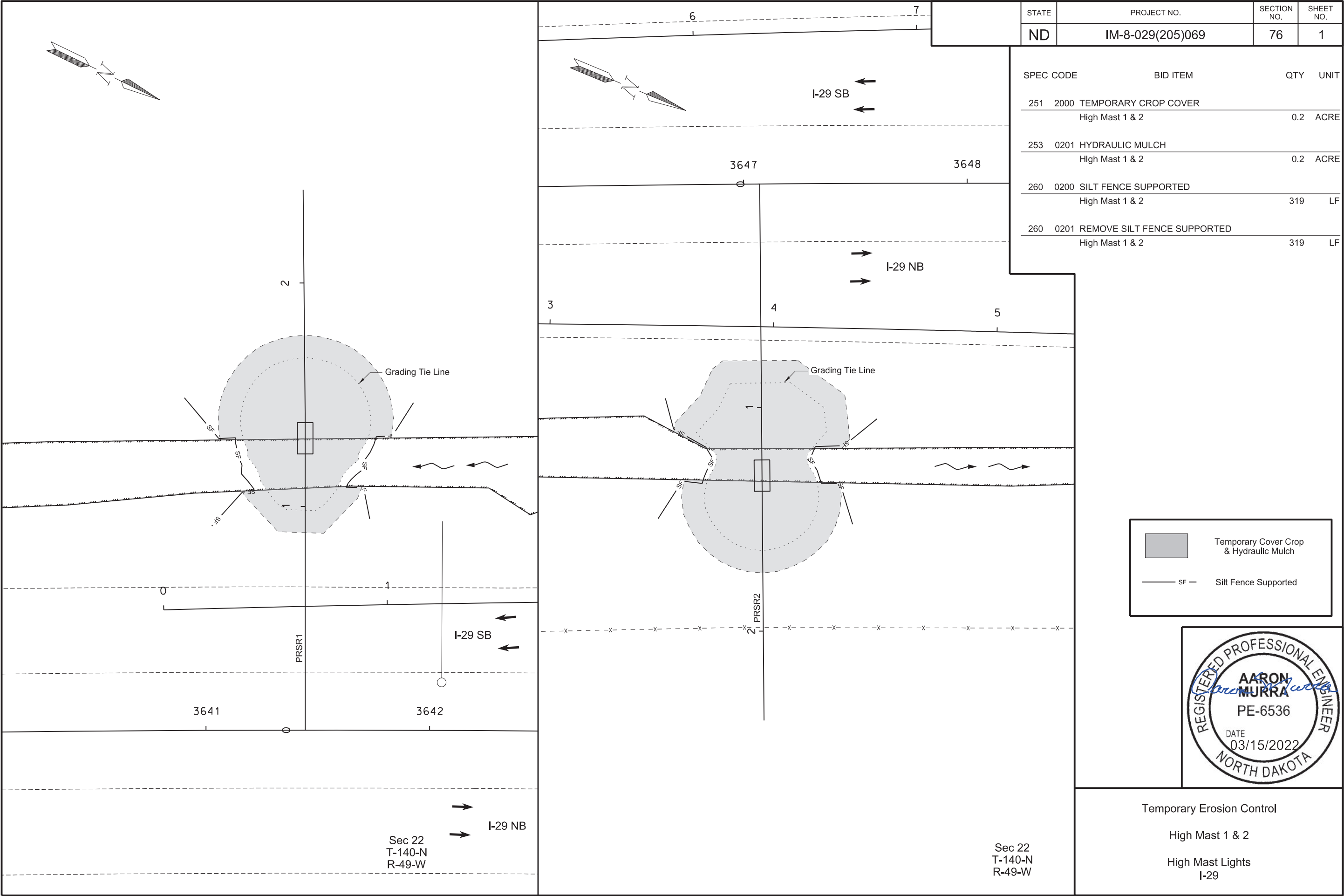
Wetland Impacts

High Mast Lights
I-29









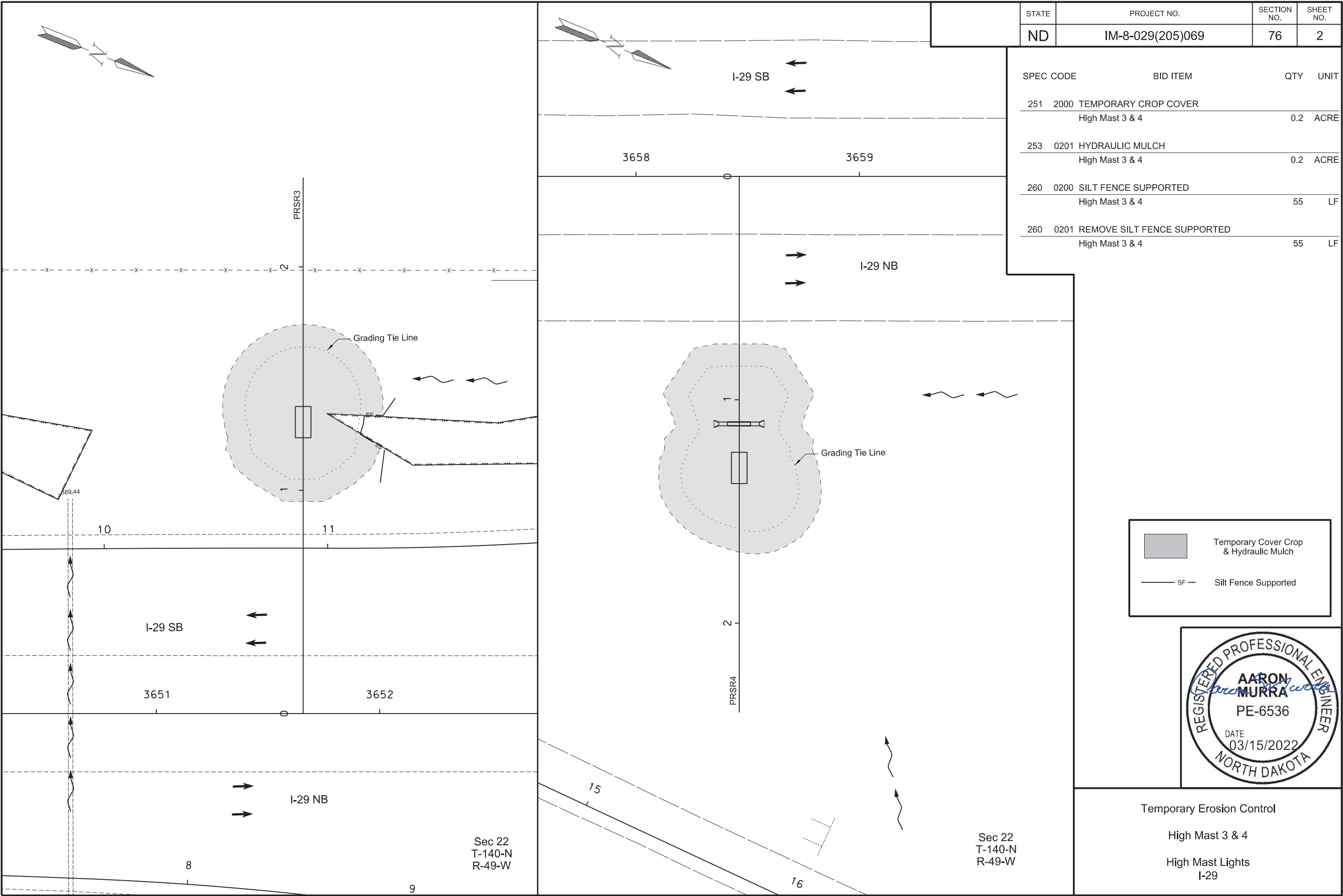
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	76	1
SPEC CODE	BID ITEM	QTY	UNIT
251 2000	TEMPORARY CROP COVER		
	High Mast 1 & 2	0.2	ACRE
253 0201	HYDRAULIC MULCH		
	High Mast 1 & 2	0.2	ACRE
260 0200	SILT FENCE SUPPORTED		
	High Mast 1 & 2	319	LF
260 0201	REMOVE SILT FENCE SUPPORTED		
	High Mast 1 & 2	319	LF
Temporary Erosion Control			
High Mast 1 & 2			
High Mast Lights			
I-29			

Temporary Cover Crop & Hydraulic Mulch

SF

Silt Fence Supported





STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	76	2

SPEC CODE	BID ITEM	QTY	UNIT
251 2000	TEMPORARY CROP COVER		
	High Mast 3 & 4	0.2	ACRE
253 0201	HYDRAULIC MULCH		
	High Mast 3 & 4	0.2	ACRE
260 0200	SILT FENCE SUPPORTED		
	High Mast 3 & 4	55	LF
260 0201	REMOVE SILT FENCE SUPPORTED		
	High Mast 3 & 4	55	LF

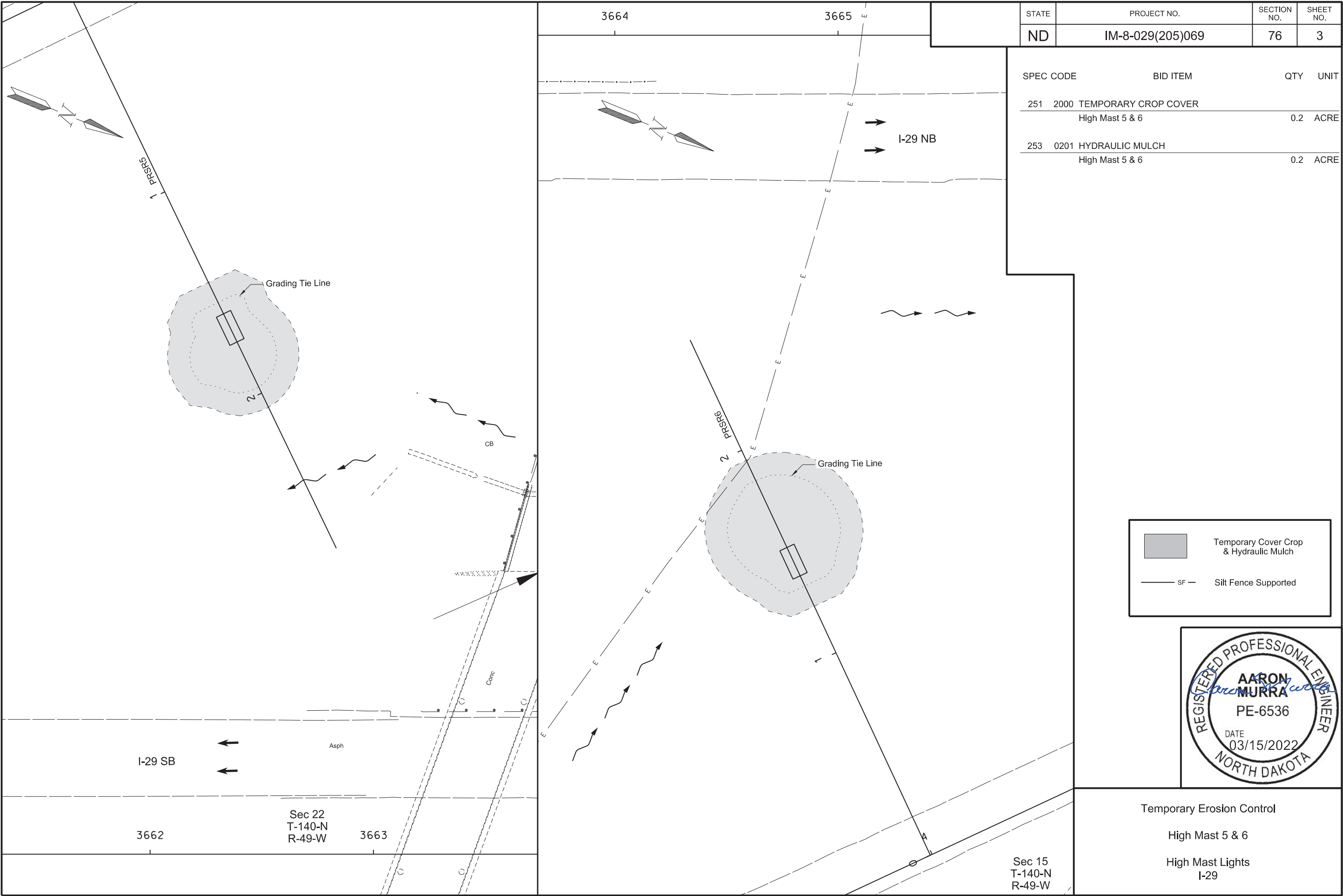
Temporary Cover Crop & Hydraulic Mulch

SF

Silt Fence Supported



Temporary Erosion Control
High Mast 3 & 4
High Mast Lights I-29



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	76	3

SPEC CODE	BID ITEM	QTY	UNIT
251	2000 TEMPORARY CROP COVER		
	High Mast 5 & 6	0.2	ACRE
253	0201 HYDRAULIC MULCH		
	High Mast 5 & 6	0.2	ACRE

Temporary Cover Crop & Hydraulic Mulch

SF

Silt Fence Supported



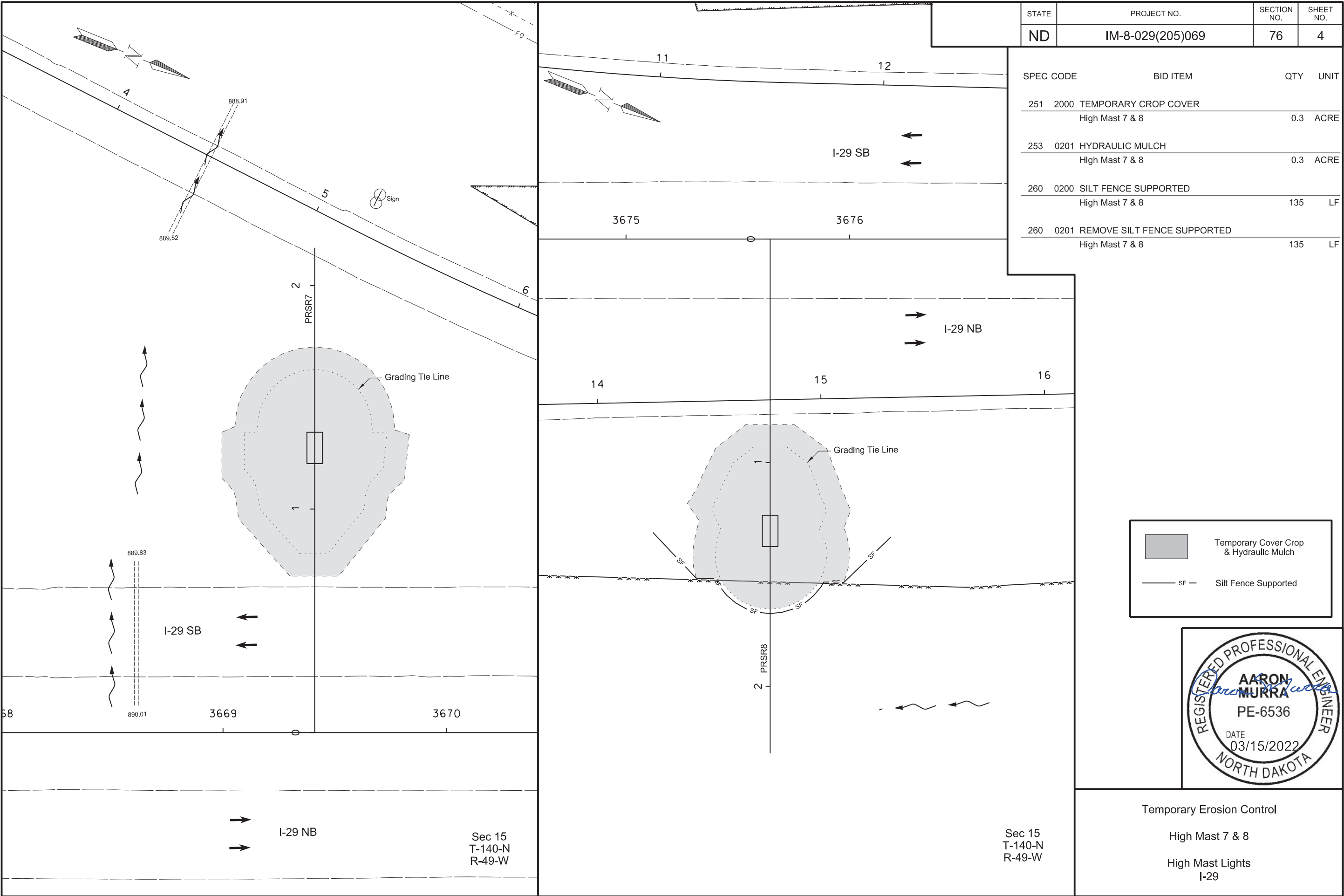
Temporary Erosion Control

High Mast 5 & 6

High Mast Lights

I-29

Sec 15
T-140-N
R-49-W



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	76	4

SPEC CODE	BID ITEM	QTY	UNIT
251 2000	TEMPORARY CROP COVER		
	High Mast 7 & 8	0.3	ACRE
253 0201	HYDRAULIC MULCH		
	High Mast 7 & 8	0.3	ACRE
260 0200	SILT FENCE SUPPORTED		
	High Mast 7 & 8	135	LF
260 0201	REMOVE SILT FENCE SUPPORTED		
	High Mast 7 & 8	135	LF

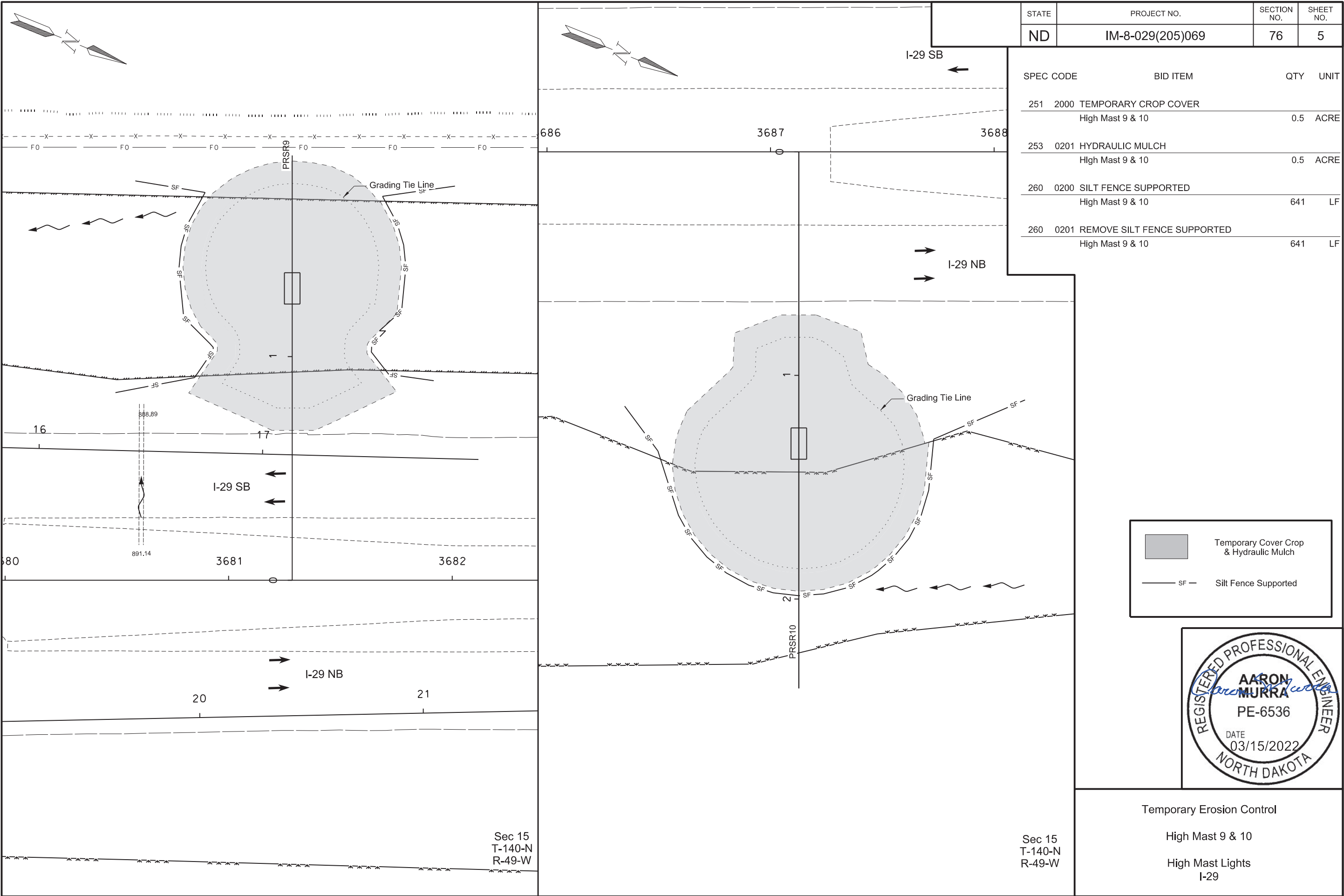
Temporary Cover Crop & Hydraulic Mulch

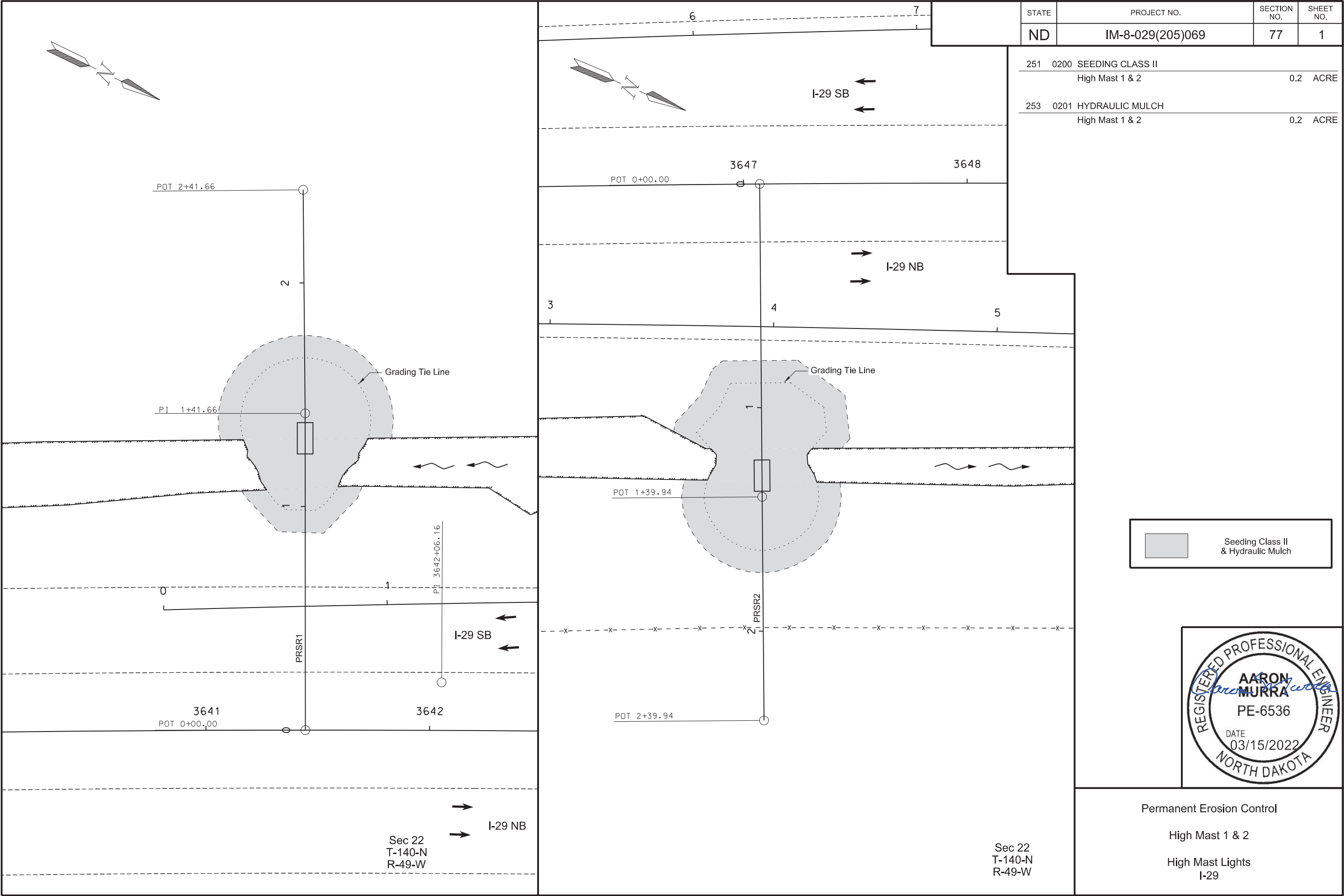
SF

Silt Fence Supported



Temporary Erosion Control
High Mast 7 & 8
High Mast Lights I-29





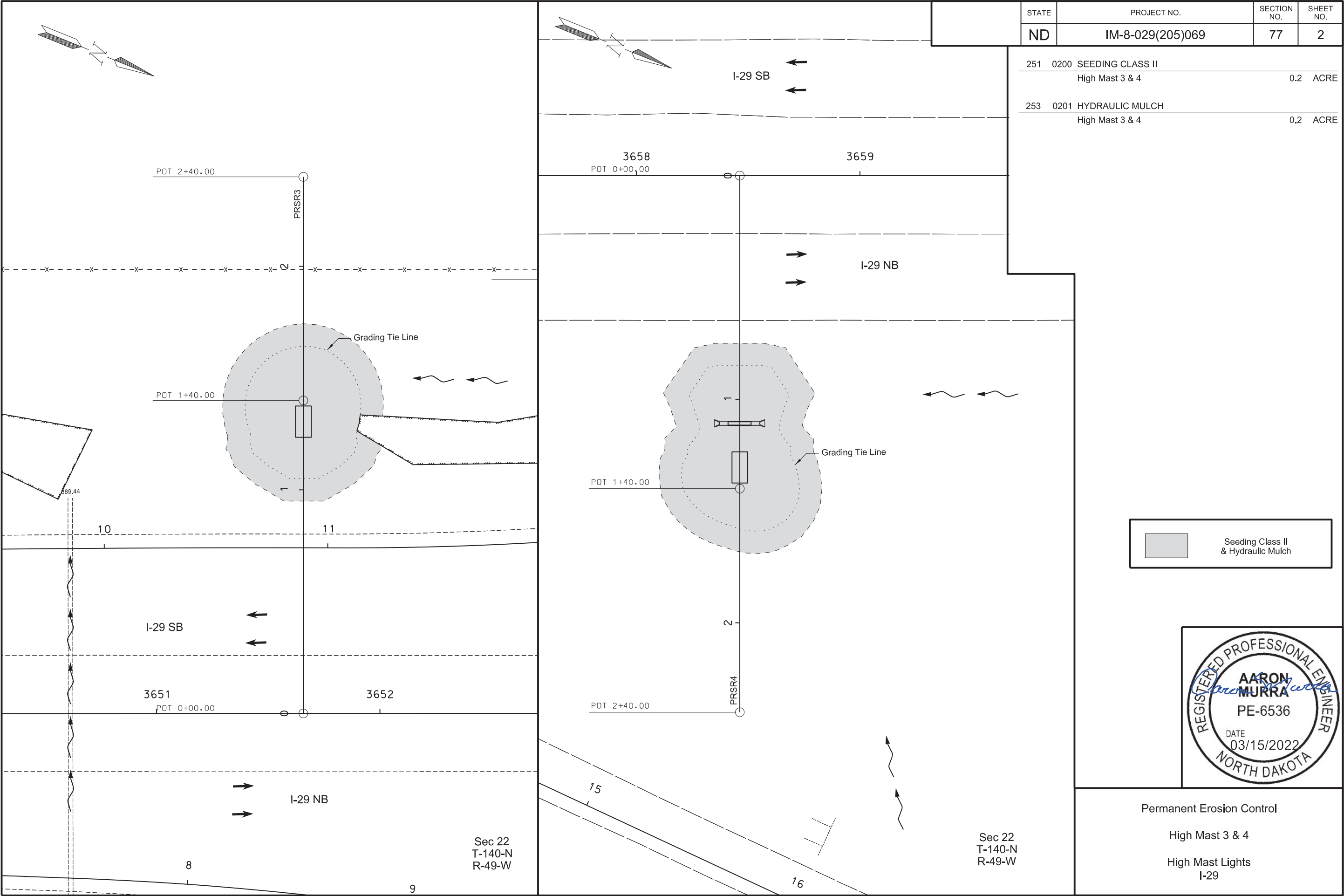
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	77	1

251	0200	SEEDING CLASS II		
		High Mast 1 & 2	0.2	ACRE
253	0201	HYDRAULIC MULCH		
		High Mast 1 & 2	0.2	ACRE

Seeding Class II
& Hydraulic Mulch



Permanent Erosion Control
High Mast 1 & 2
High Mast Lights
I-29



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	77	2

251	0200	SEEDING CLASS II		
		High Mast 3 & 4	0.2	ACRE
253	0201	HYDRAULIC MULCH		
		High Mast 3 & 4	0.2	ACRE

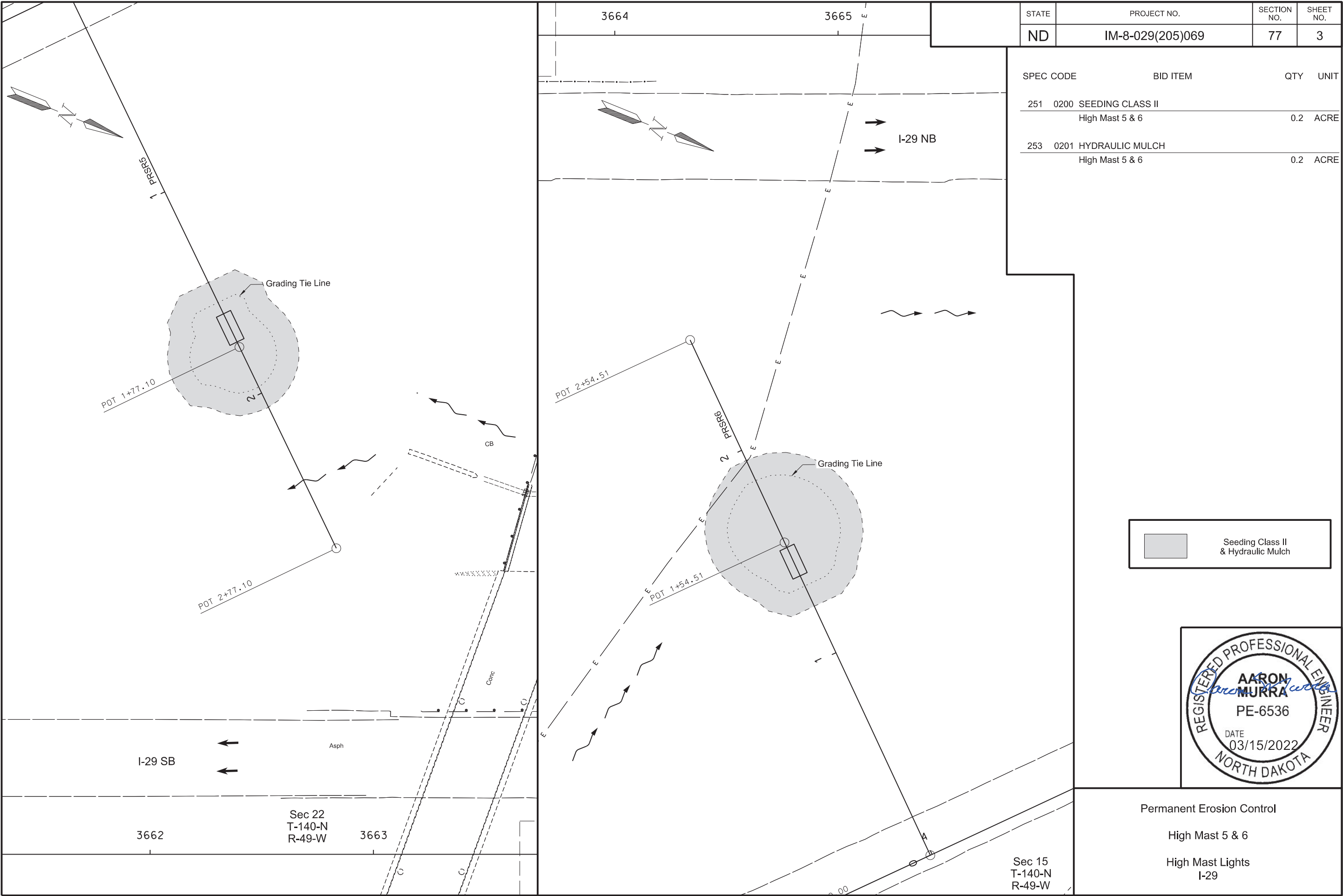
Seeding Class II
& Hydraulic Mulch

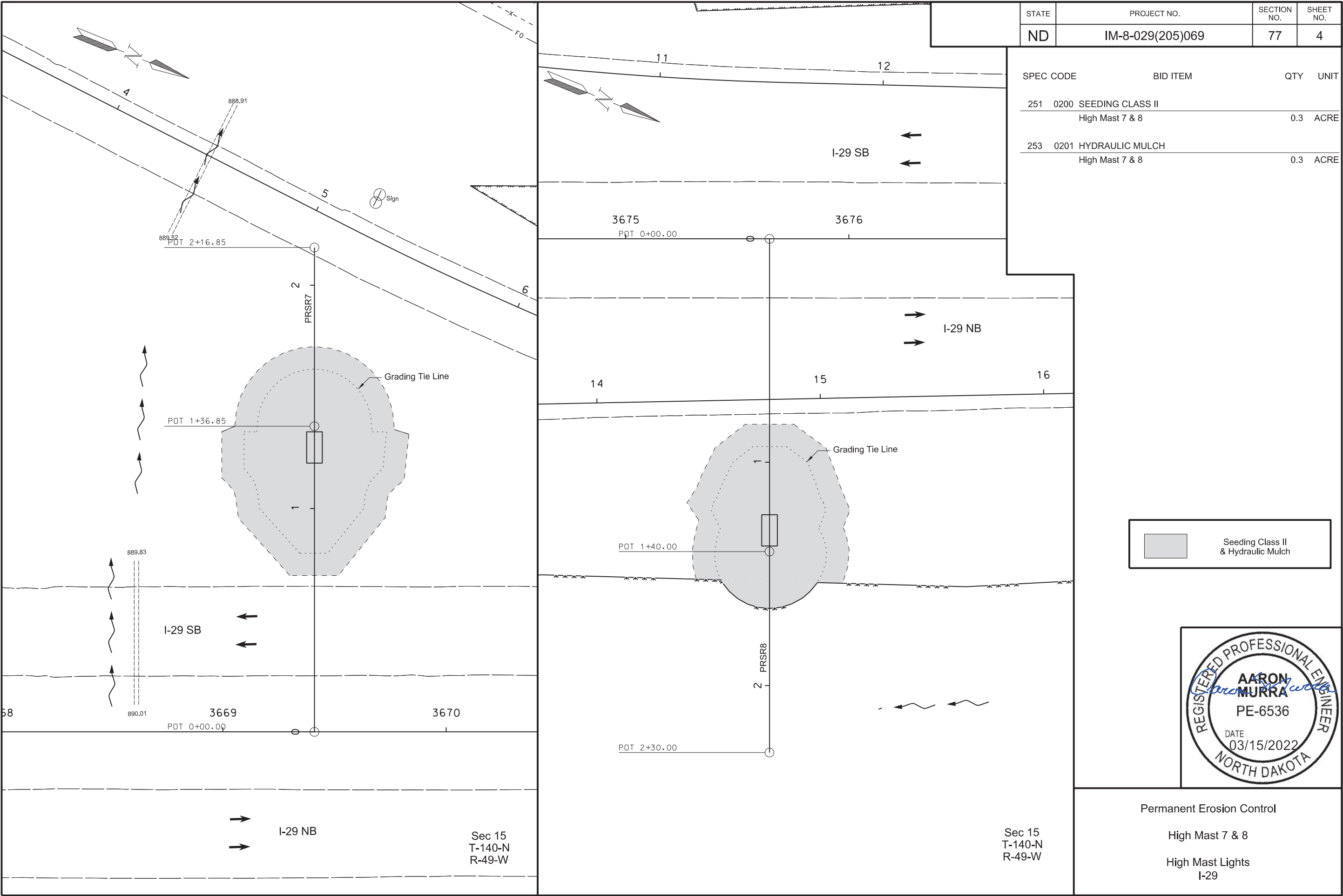


Permanent Erosion Control

High Mast 3 & 4

High Mast Lights
I-29





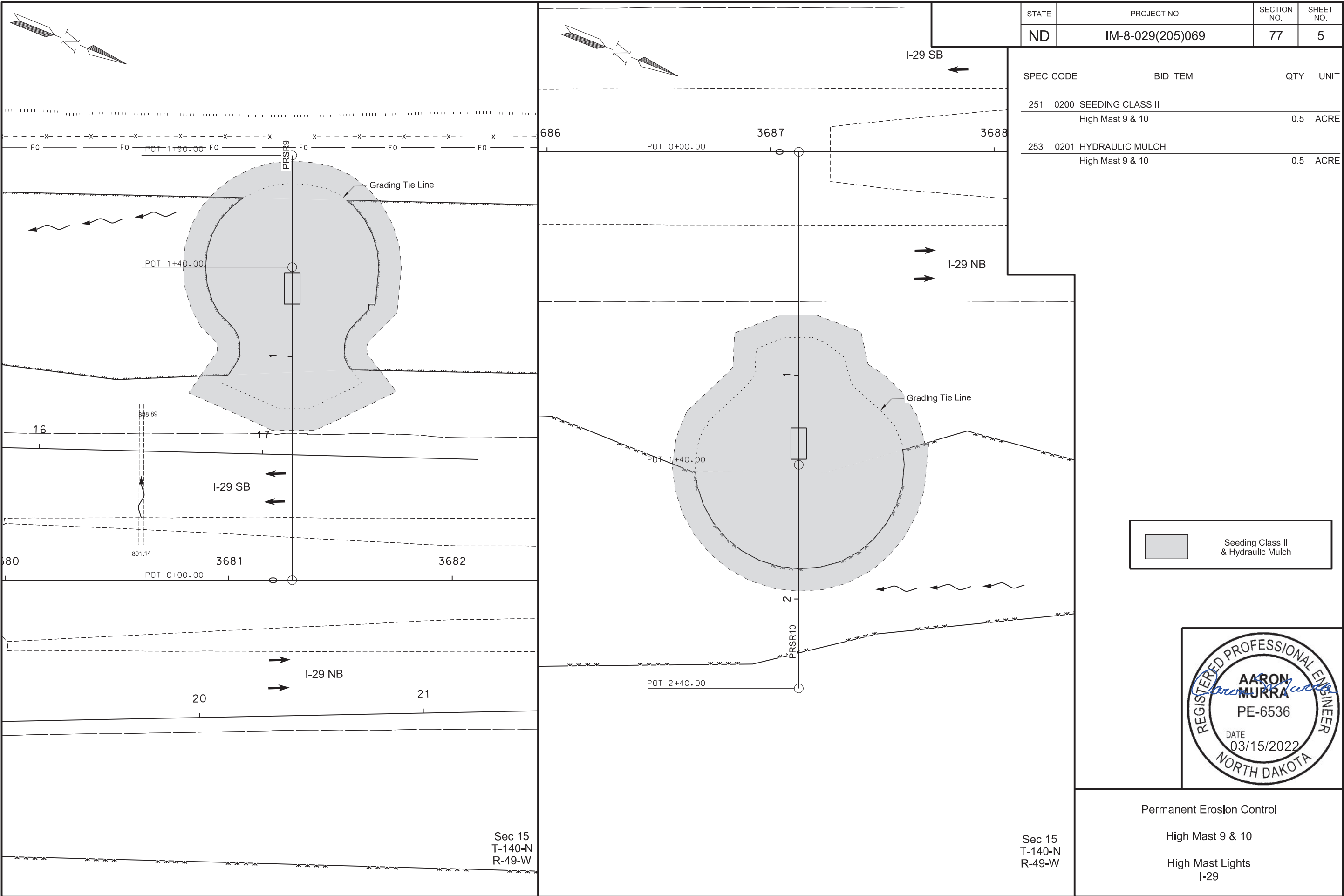
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	77	4

SPEC CODE	BID ITEM	QTY	UNIT
251 0200 SEEDING CLASS II	High Mast 7 & 8	0.3	ACRE
253 0201 HYDRAULIC MULCH	High Mast 7 & 8	0.3	ACRE

Seeding Class II
& Hydraulic Mulch



Permanent Erosion Control
High Mast 7 & 8
High Mast Lights
I-29



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	77	5

SPEC CODE	BID ITEM	QTY	UNIT
251 0200 SEEDING CLASS II	High Mast 9 & 10	0.5	ACRE
253 0201 HYDRAULIC MULCH	High Mast 9 & 10	0.5	ACRE

Seeding Class II
& Hydraulic Mulch



Permanent Erosion Control
High Mast 9 & 10
High Mast Lights
I-29

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - EXIT 69 INTERCHANGE										STATE	PROJECT NO.		SECTION NO.	SHEET NO.	
										ND	IM-8-029(205)069		81	1	
HORIZONTAL ALIGNMENT				CURVE DATA		US PUBLIC LAND SURVEY DATA				SURVEY CONTROL POINTS					
PNT	STATION	NORTHING	EASTING	ARC DEFINITION		DESC.	SEC-TWP-RGE	NORTHING	EASTING	PNT	NORTHING	EASTING	ELEV	STATION	OFFSET
										CONTROL POINT DESCRIPTION					
POT	3608+11.85	478,520.96	2,882,621.14	CURVE C13		NW	SEC COR Sec 22 T-140-N R-49-W	483362.29	2877505.78						
PC	3634+98.90	480,869.13	2,881,314.87	PI 3642+05.63		N ¼	COR Sec 22 T-140-N R-49-W	483455.7	2880150.17	GPS*29-3	483326.48	2879553.21	895.40	3664+41.17	624.55 LT
PI	3642+05.63	481,486.73	2,880,971.31	Delta = 7° 03' 29.99" (RT)		NW	SEC COR Sec 23 T-140-N R-49-W	483549.12	2882794.65						
PT	3649+10.57	482,141.86	2,880,706.24	Da = 0° 30' 00"		W ¼	COR Sec 15 T-140-N R-49-W	486005.24	2877386.32	GPS*29-5	498426.40	2871699.06	892.99	3835+94.96	393.33 RT
SL X-ing	3663+28.79	483,456.57	2,880,174.31	R = 11,459.15'		W ¼	COR Sec 14 T-140-N R-49-W	486196.2	2882659.72						
QtL X-ing	3664+01.96	483,524.38	2,880,146.87	L = 1,411.67'		NW	SEC COR Sec 15 T-140-N R-49-W	488648.09	2877267.29	GPS*29-6	511562.20	2865162.99	885.43	3985+26.26	194.20 RT
QtL X-ing	3691+45.84	486,067.95	2,879117.74	T = 706.73'		N ¼	COR Sec 15 T-140-N R-49-W	488745.56	2879895.94						
PC	3694+08.22	486,311.18	2,879,019.32			NW	SEC COR Sec 14 T-140-N R-49-W	488843.04	2882524.85	GPS*29-4	490573.74	2877146.89	893.54	3740+47.03	348.96 RT
PI	3701+14.81	486,966.18	2,878,754.30	CURVE C19		NW	SEC COR Sec 16 T-140-N R-49-W	488395.25	2871994.99						
PT	3708+19.60	487,583.66	2,878,410.82	PI 3701+14.81		N ¼	COR Sec 16 T-140-N R-49-W	488520.98	2874632.04	RTK*50	484245.99	2879644.92	891.86	3672+59.15	194.65 RT
				Delta = 7° 03' 24.86" (LT)		W ¼	COR Sec 9 T-140-N R-49-W	491030.24	2871851.39						
				Da = 0° 30' 00"		W ¼	COR Sec 10 T-140-N R-49-W	491283.65	2877126.81	RTK*51	485239.36	2879242.35	891.59	3683+31.00	195.25 LT
				R = 11,459.16'		NW	SEC COR Sec 9 T-140-N R-49-W	493664.99	2871707.96						
				L = 1,411.38'		N ¼	COR Sec 9 T-140-N R-49-W	493791.92	2874347.14	RTK*52	486233.22	2878840.17	892.01	3694+03.15	195.31 LT
				T = 706.58'		NW	SEC COR Sec 10 T-140-N R-49-W	493918.99	2876986.36						
						W ¼	COR Sec 4 T-140-N R-49-W	496362.72	2871560.35	RTK*53	487184.10	2878404.02	891.98	3704+67.69	194.87 LT
						W ¼	COR Sec 3 T-140-N R-49-W	496576.49	2876855.62						
						NW	SEC COR Sec 5 T-140-N R-49-W	498533.97	2866159.50	RTK*54	488048.64	2877929.16	892.13	3714+60.08	194.90 LT
						N ¼	COR Sec 5 T-140-N R-49-W	498647.30	2868791.63						
						NW	SEC COR Sec 4 T-140-N R-49-W	498763.82	2871428.81	RTK*55	488991.35	2877406.99	887.70	3725+37.75	192.96 LT
						N ¼	COR Sec 4 T-140-N R-49-W	498870.62	2874082.98						
						NW	SEC COR Sec 3 T-140-N R-49-W	498977.48	2876737.18	RTK*56	490028.82	2876883.28	889.16	3736+98.98	146.30 LT
						SW	SEC COR Sec 33 T-141-N R-49-W	498570.15	2866918.87						
						S ¼	COR Sec 33 T-141-N R-49-W	498685.38	2869588.22	RTK*57	490955.93	2876367.77	887.10	3742+59.77	146.12 LT
						SW	SEC COR Sec 34 T-141-N R-49-W	498796.23	2872258.52						
						W ¼	COR Sec 33 T-141-N R-49-W	501220.20	2866809.02	RTK*58	491741.83	2875931.36	887.46	3756+58.71	145.46 LT
						C ¼	COR Sec 33 T-141-N R-49-W	501335.30	2869468.42						
						W ¼	COR Sec 34 T-141-N R-49-W	501450.61	2872126.81	RTK*59	492928.27	2875271.56	886.58	3770+16.27	145.31 LT
						NW	SEC COR Sec 33 T-141-N R-49-W	503867.01	2866699.30	RTK*60	493805.53	2874783.74	886.40	3780+20.04	145.17 LT
						N ¼	COR Sec 33 T-141-N R-49-W	503986.24	2869348.46	All coordinates and measurements on this document derived from the International Foot definition.					
						NW	SEC COR Sec 34 T-141-N R-49-W	504106.21	2871997.21						
						W ¼	COR Sec 28 T-141-N R-49-W	506507.47	2866578.34						
						☐ Assumed Coordinates				INITIALIZING BENCH MARK CORS SYSTEM		REGISTERED PROFESSIONAL LAND SURVEYOR JOHN STEARNS LS-10169 DATE NORTH DAKOTA 03/10/22			
						☒ All coordinates on this sheet are Cass County ground coordinates. They are derived from the "North Dakota Coordinate System of 1983", NAD83(OPUS), South Zone Combination factor (cf) = 0.9998875				☒ NAVD-88					
										☐ NGVD-29					
NOTES: SURVEY DATA PER 2010 NDDOT PROJECT# IM-8029(089)069										☒ ENGLISH UNITS					
										☐ METRIC UNITS					

Beginning chain PRSR1 description

Point N 481,441.7738 E 2,881,017.1380 Sta 0+00.00

Course from POINT to 254 S 66°07' 08.75" W Dist 141.6582

Point N 481,380.0353 E 2,880,889.6413 Sta 1+41.66

Course from POINT to 255 S 65°37' 51.41" W Dist 100.0000

Point N 481,335.6874 E 2,880,800.0128 Sta 2+41.66

Ending chain PRSR1 description

Beginning chain PRSR2 description

Point PRSR21 N 481,954.0663 E 2,880,784.2391 Sta 0+00.00

Course from PRSR21 to PRSR23 N 66° 56' 34.24" E Dist 139.9363

Point PRSR23 N 482,008.8723 E 2,880,912.9965 Sta 1+39.94

Course from PRSR23 to PRSR24 N 66° 56' 34.24" E Dist 100.0000

Point PRSR24 N 482,048.0372 E 2,881,005.0080 Sta 2+39.94

Ending chain PRSR2 description

Beginning chain PRSR3 description

Point PRSR31 N 482,378.4056 E 2,880,610.5346 Sta 0+00.00

Course from PRSR31 to PRSR33 S 67° 58' 17.60" W Dist 140.0000

Point PRSR33 N 482,325.8963 E 2,880,480.7550 Sta 1+40.00

Course from PRSR33 to PRSR34 S 67° 58' 17.60" W Dist 100.0000

Point PRSR34 N 482,288.3896 E 2,880,388.0552 Sta 2+40.00

Ending chain PRSR3 description

STATE

PROJECT NO.

SECTION NO.

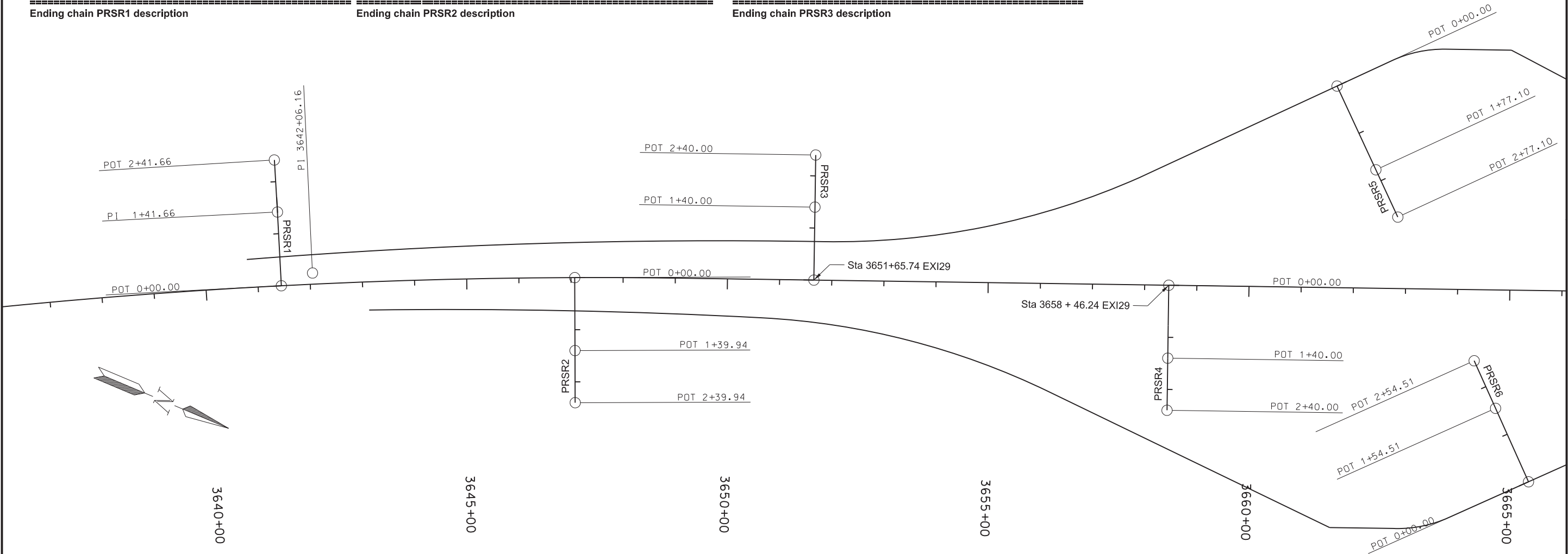
SHEET NO.

ND

IM-8-029(205)069

82

1



Beginning chain PRSR5 description

Point PRSR51 N 483,158.0048 E 2,879,877.9694 Sta 0+00.00

Course from PRSR51 to PRSR53 N 42° 15' 56.97" E Dist 177.0976

Point PRSR53 N 483,289.0628 E 2,879,997.0802 Sta 1+77.10

Course from PRSR53 to PRSR54 N 42° 15' 56.97" E Dist 100.0000

Point PRSR54 N 483,363.0660 E 2,880,064.3373 Sta 2+77.10

Ending chain PRSR5 description

Beginning chain PRSR6 description

Point PRSR61 N 483,791.2417 E 2,880,434.9597 Sta 0+00.00

Course from PRSR61 to PRSR63 S 42° 58' 36.43" W Dist 154.5069

Point PRSR63 N 483,678.1998 E 2,880,329.6320 Sta 1+54.51

Course from PRSR63 to PRSR64 S 42° 58' 36.43" W Dist 100.0000

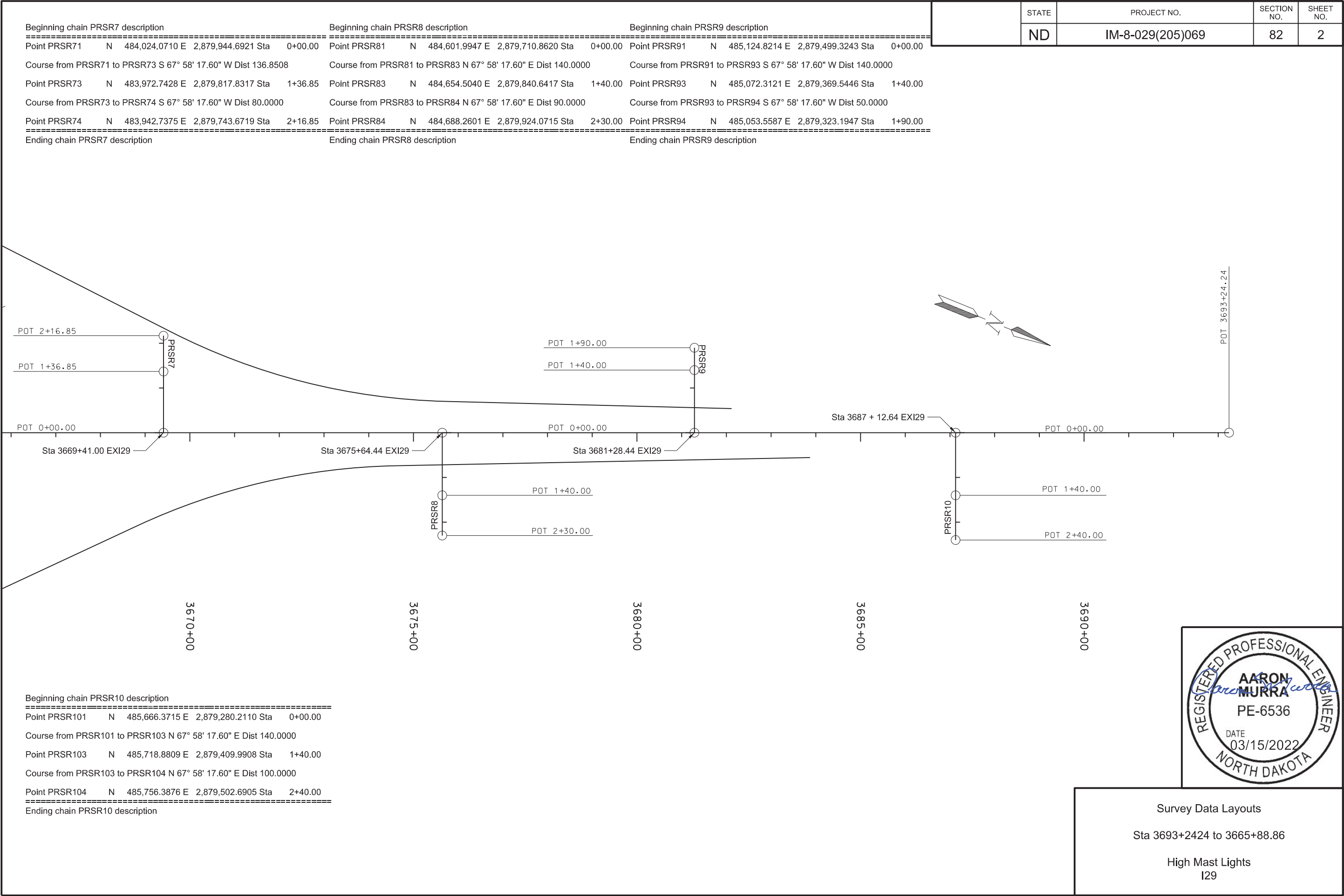
Point PRSR64 N 483,605.0368 E 2,880,261.4618 Sta 2+54.51

Ending chain PRSR6 description

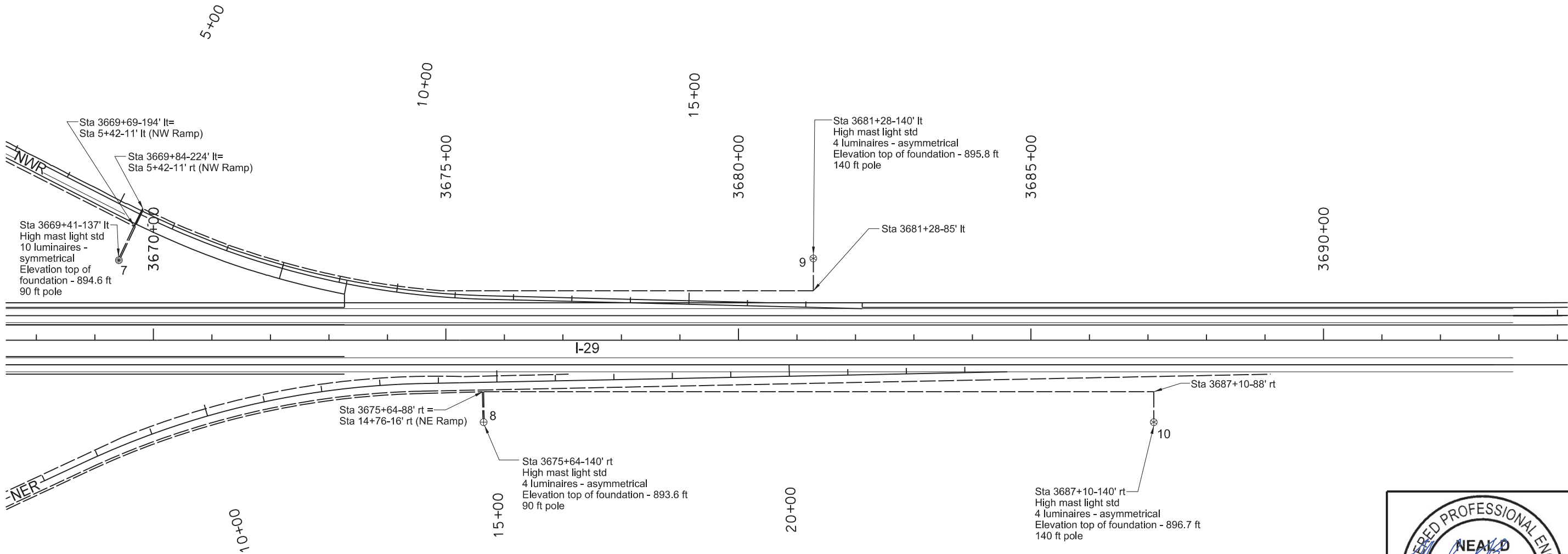
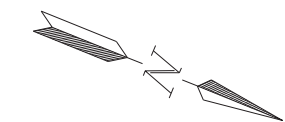


Survey Data Layouts

High Mast Lights
I29



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	140	2



03/18/22

High Mast Lighting System
High Mast Lighting Layout
I-29 Exit 69 Interchange
Fargo

Light Std Number	Station	Cable Trench	Conduit Runs		Cable Runs	
		LF	LF	Dia	LF	Type
1 3	Sta 3641+44-140' lt to Sta 3649+30-157' lt to Sta 3651+66-140' lt	792 232			1040	4 No. 4 USE
2 4	Sta 3647+07-82' rt to Sta 3647+07-82' rt to Sta 3657+73-299' rt to Sta 3657+87-266' rt to Sta 3658+46-140' rt	54 1162 135	36	3"	1303	4 No. 6 USE
3 5	Sta 3651+66-140' lt to Sta 3651+66-85' lt to Sta 3661+58-395' lt to Sta 3661+73-365' lt to Sta 3661+40-227' lt	51 1053 150	33	3"	1304	4 No. 4 USE
4 FP	Sta 3658+46-140' rt to Sta 3658+46-72' rt to Sta 3660+11-72' rt to Sta 3660+36-109' rt to Sta 3662+28-75' rt to Sta 3662+28-75' lt to Sta 3663+64-421' lt to Sta 3664+43-393' lt to Sta 3664+94-374' lt to Sta 3665+77-344' lt to Sta 3666+58-502' lt	64 165 195 372 84 88	44 150 54 176	3" 3" 3" 3"	1411	4 No. 6 USE
5 FP	Sta 3662+40-227' lt to Sta 3663+64-421' lt to Sta 3664+43-393' lt to Sta 3664+94-374' lt to Sta 3665+77-344' lt to Sta 3666+58-502' lt	226 84 87	54 176	(A) (A)	646	4 No. 2 USE
10 8	Sta 3687+10-140' rt to Sta 3687+10-88' rt to Sta 3675+64-88' rt to Sta 3675+64-140' rt	48 1146 48			1258	4 No. 4 USE
9 7	Sta 3681+28-140' lt to Sta 3681+28-85' lt to Sta 3669+84-224' lt to Sta 3669+69-194' lt to Sta 3669+41-137' lt	51 1029 59	34	3"	1189	4 No. 6 USE
8 6	Sta 3675+64-140' rt to Sta 3675+64-88' rt to Sta 3665+48-383' rt to Sta 3665+36-352' rt to Sta 3664+76-227' rt	48 1037 134	32	4"	1267	4 No. 4 USE
7 FP	Sta 3669+41-137' lt to Sta 3669+84-224' lt to Sta 3665+97-383' lt to Sta 3666+58-502' lt	59 416	133	3"	627	4 No. 6 USE
6 FP	Sta 3664+76-227' rt to Sta 3664+76-72' rt to Sta 3664+76-72' lt to Sta 3664+76-142' lt to Sta 3665+97-383' lt to Sta 3666+58-502'lt	151 70 225	144 176	3" (A)	785	4 No. 2 USE

(A) Conduit installed on previous run.

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	140	3

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 IV- Pad Mounted	High Mast Lighting Assembly Type HM-90-4	High Mast Lighting Assembly Type HM-90-10	High Mast Lighting Assembly Type HM-140-4	LED Luminaire - High Mast
EA	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
1	9515	804	32	1431	4869	4530	1	4	4	2	64

High Mast Light Standards						
No.	Hwy	RP	Station	Circuit	IES-Type	Pole Ht.
1	I-29	68.967	3641+44-140' lt	1	Asym	140'
2	I-29	69.073	3647+07-140' rt	2	Asym	140'
3	I-29	69.149	3651+66-140' lt	1	Asym	90'
4	I-29	69.289	3658+46-140' rt	2	Sym	90'
5	I-29	69.364	3662+40-227' lt	1	Sym	90'
6	I-29	69.408	3664+76-227' rt	4	Sym	90'
7	I-29	69.496	3669+41-137' lt	3	Sym	90'
8	I-29	69.614	3675+64-140' rt	4	Asym	90'
9	I-29	69.721	3681+28-140' lt	3	Asym	75'
10	I-29	69.831	3687+10-140' rt	4	Asym	65'



03/18/22

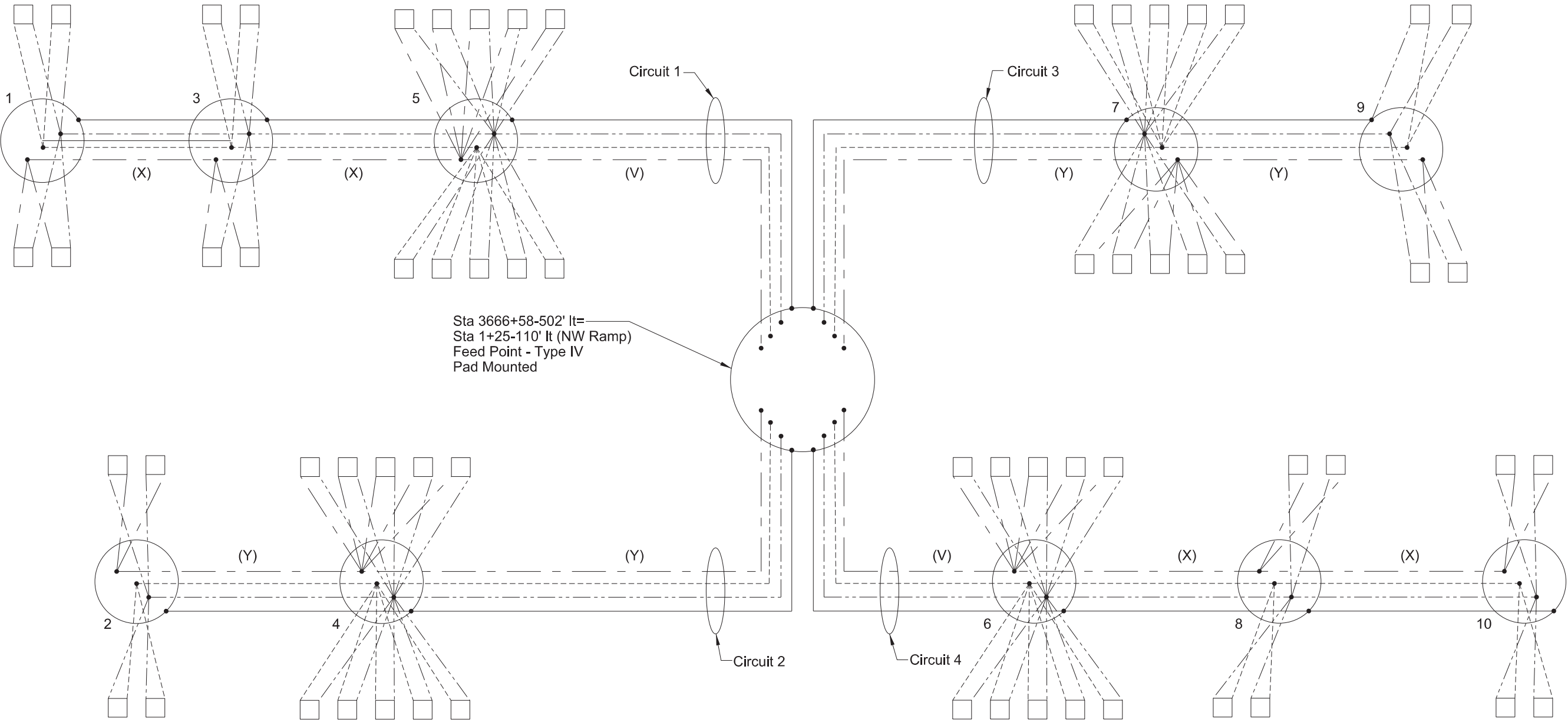
High Mast Lighting System

High Mast Lighting Cable Runs and Quantities

I-29 Exit 69 Interchange

Fargo

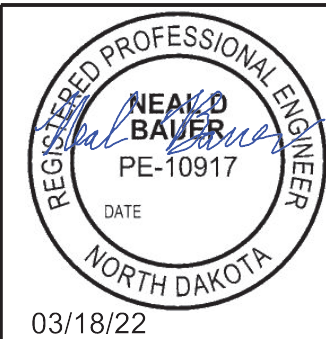
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	140	4



Sta 3666+58-502' It=
Sta 1+25-110' It (NW Ramp)
Feed Point - Type IV
Pad Mounted

Legend

- Ground Conductor
- Neutral 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



High Mast Lighting System
Lighting Schematic - Feed Point
I-29 Exit 69 Interchange
 Fargo

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	IM-8-029(205)069	140	5

NOTE:

The estimated quantities shown are for informational purposes only. All materials including concrete, reinforcing steel, expansion joint filler, wire fabric, and all labor required to build the footing and service slab will be included in the unit price bid item "Concrete Foundation-High Mast Lighting."

Estimated quantities (one foundation and sevice slab)
Class AE-3 Concrete 16.8 CY
*Reinforcing Steel 958 LBS
Piling (HP12 x 53) 300 LF

*Includes wire fabric.

For double acting or single acting diesel hammers, calculate the bearing resistance of piles by the following formula:

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

Where:

ΦR_n = Nominal pile bearing resistance, in pounds. The Φ factor is included in equation.
W = Weight of striking parts (ram), in pounds.
M = Weight of parts being driven, in pounds. Includes pile weight, anvil (if any), driving cap, etc.
E = Energy per blow, in foot-pounds.
S = Average penetration of pile in inches per blow for last ten blows.

For single acting hammers, calculate E by multiplying observed stroke (ft) and W (lbs).

Drive all piling to a bearing of 130 tons. Drive piling with a diesel hammer with an operational energy and ram weight (minimum of 4,000 pounds) of at least 50,838 foot-pound-tons computed by the formula:

$$W(E-22, 176) + 0.711 E$$

W = Weight of the ram (tons)
E = Rated hammer energy

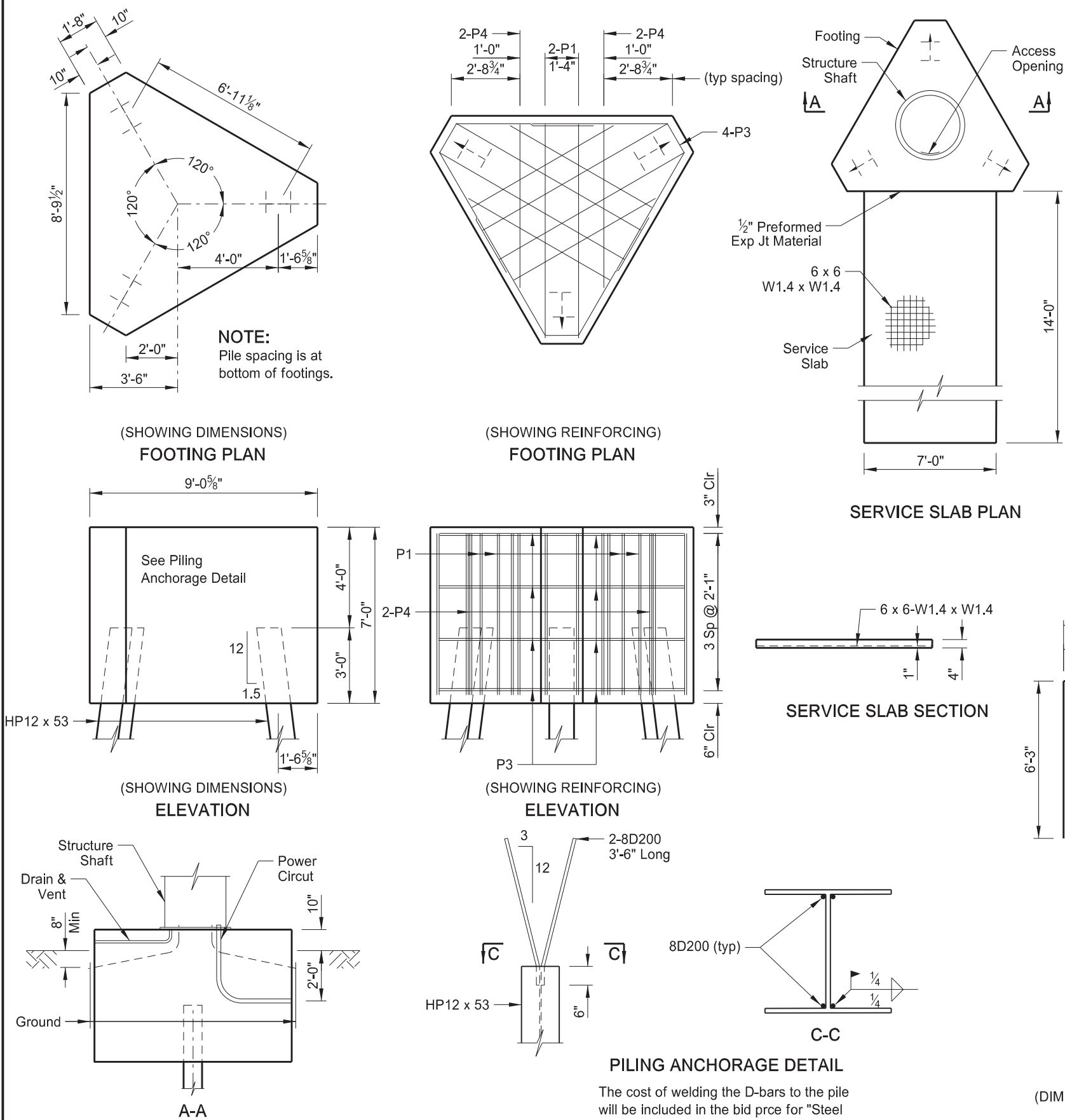
Run the hammer at an energy that produces a penetration at bearing between ½" and 3 inches in the last 10 blows.

The cost of furnishing and driving piles are included in the unit price bid item "Steel Piling HP12x53".

See pole shop drawings for anchorage details.

LOCATIONS:

Sta 3641+44 - 140' Lt
Sta 3647+07 - 140' Rt
Sta 3651+66 - 140' Lt
Sta 3658+46 - 140' Rt
Sta 3662+40 - 227' Lt
Sta 3664+76 - 227' Rt
Sta 3669+41 - 137' Lt
Sta 3675+64 - 140' Rt
Sta 3681+28 - 140' Lt
Sta 3687+10 - 140' Rt



BAR LIST- ONE FOOTING				
MARK	NO.	SIZE	LENGTH	SHAPE
P1	12	6	21'-0"	BENT
P3	12	6	12'-0"	BENT
P4	12	6	19'-0"	BENT

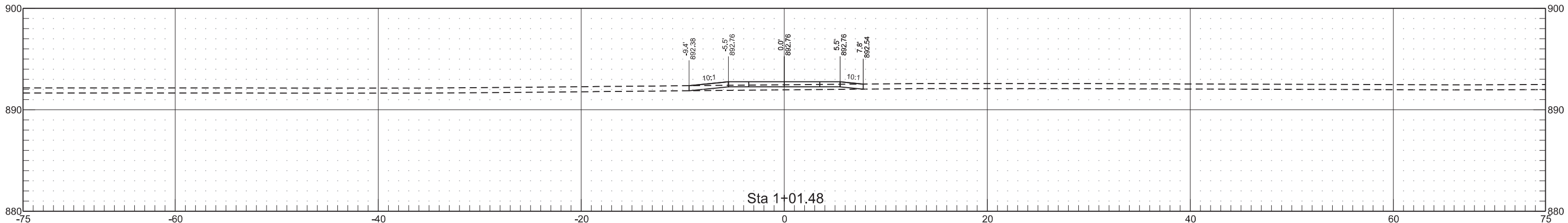
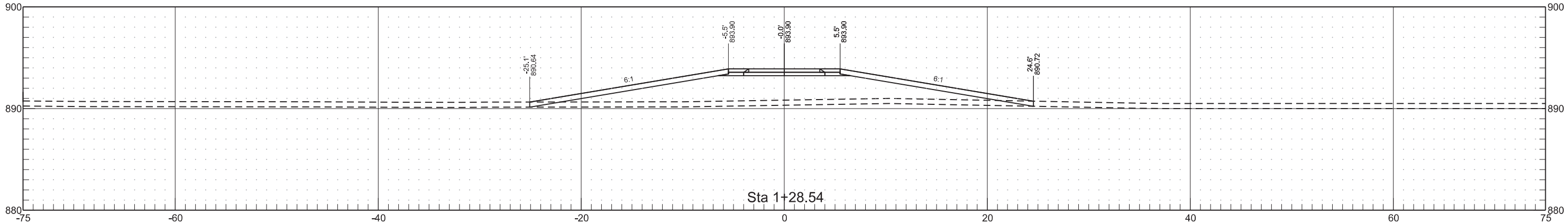
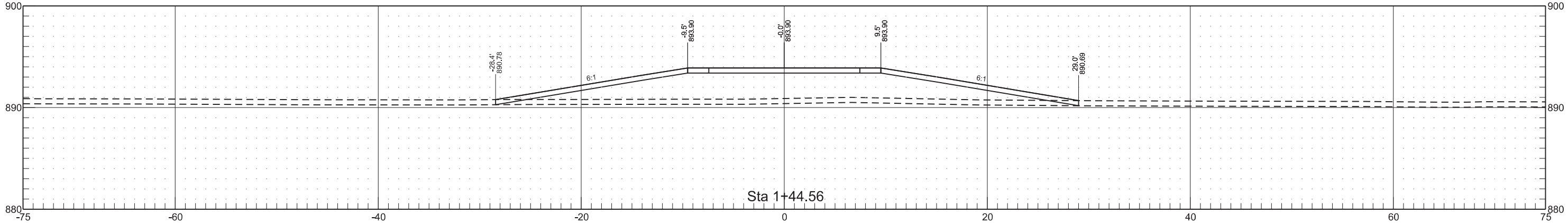
BRIDGE BID ITEMS			UNIT	QUANTITY
770	0030	CONCRETE FOUNDATION-HIGH MAST LIGHTING	EA	10
622	0040	STEEL PILING HP 12 X 53	LF	3,000



I-29 EXIT 69
FARGO

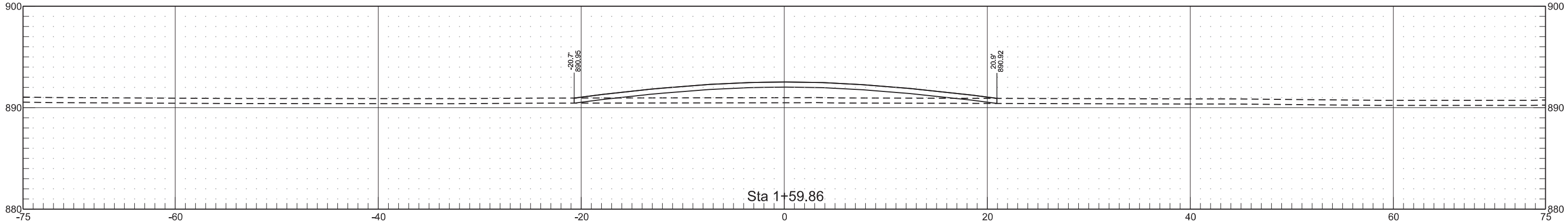
HIGH MAST TOWER
FOOTING WITH PILING

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	1



PRSR1

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	2



PRSR2

STATE

PROJECT NO.

SECTION NO.

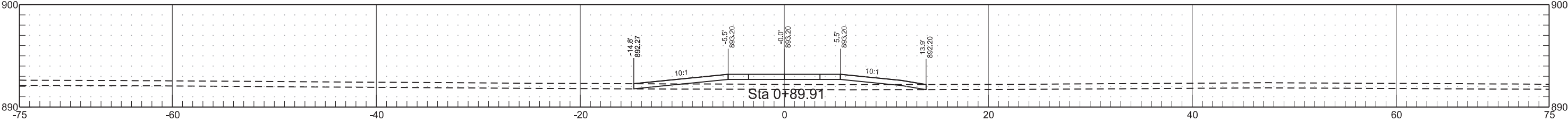
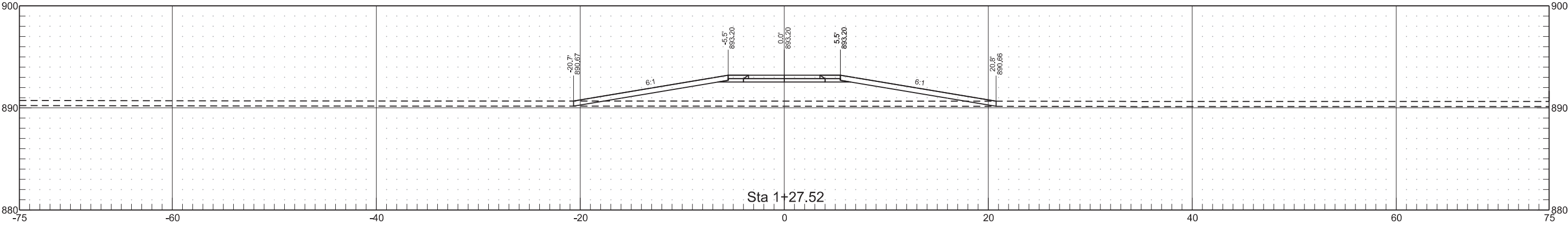
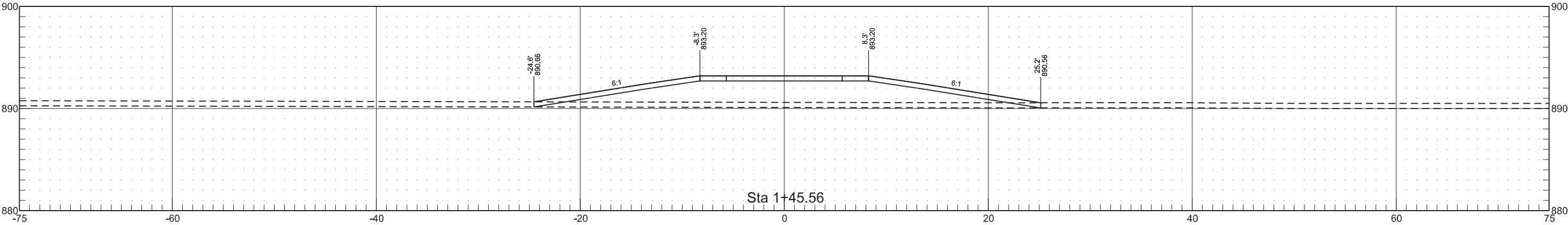
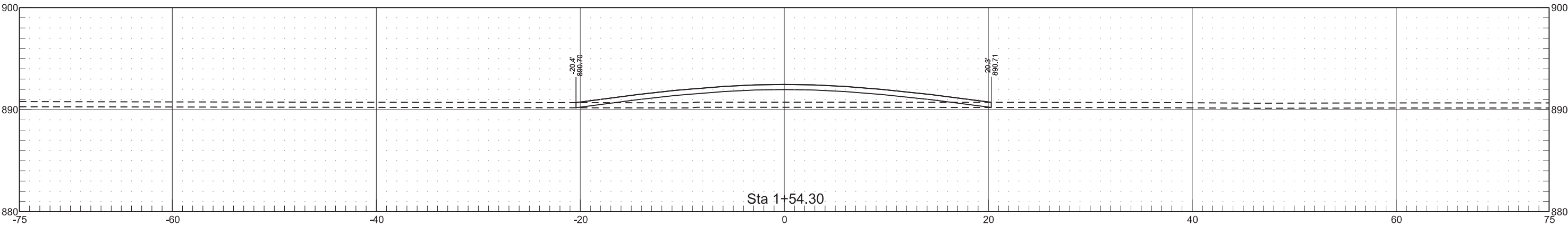
SHEET NO.

ND

IM-8-029(205)069

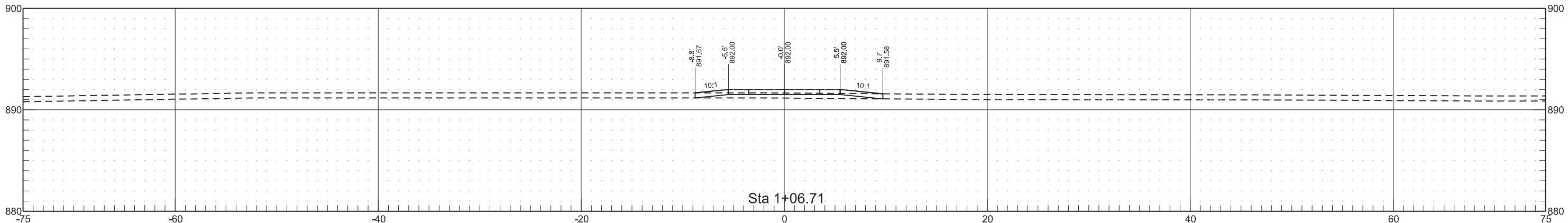
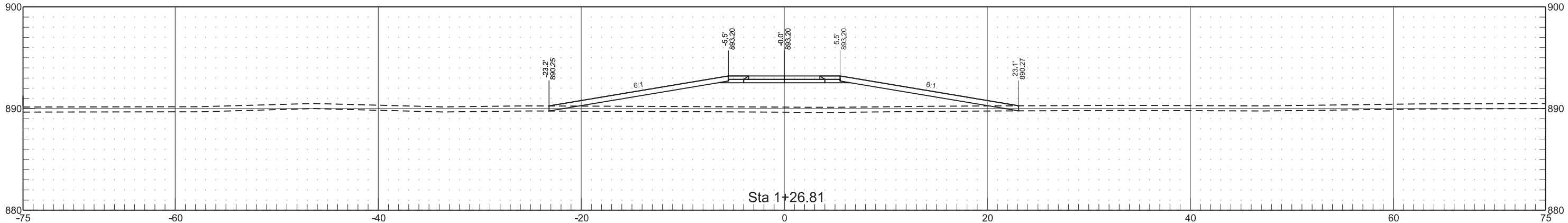
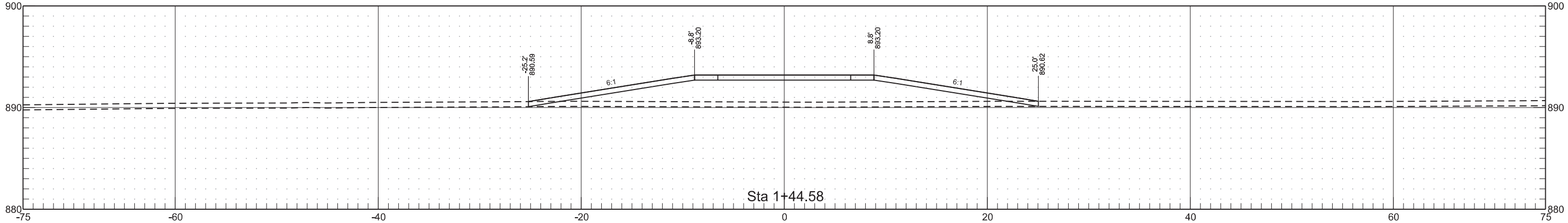
200

3



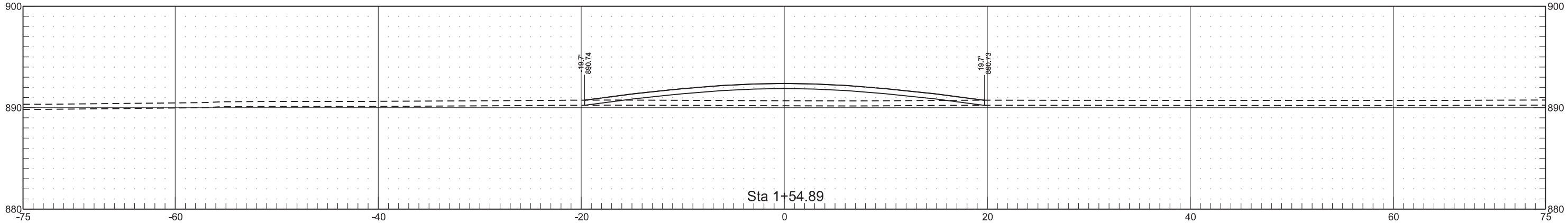
PRSR3

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	4



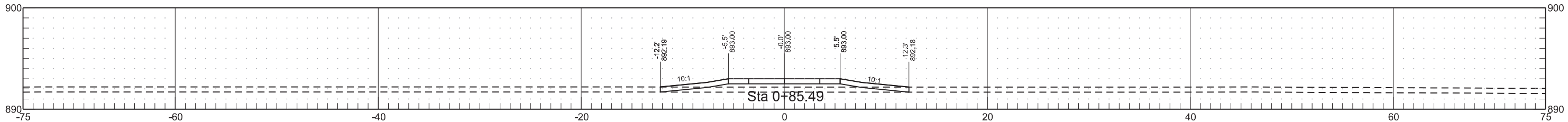
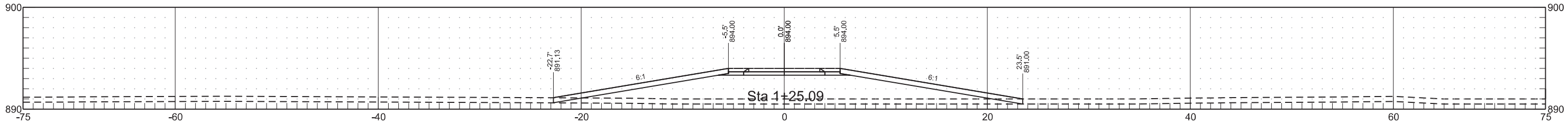
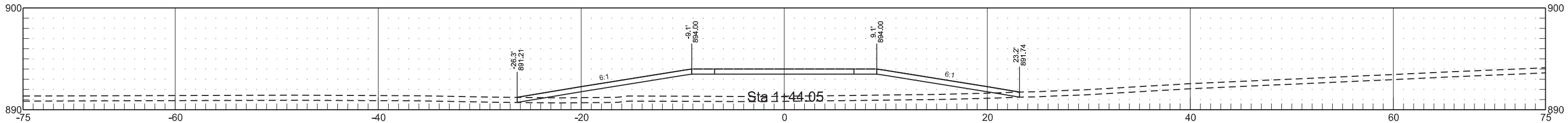
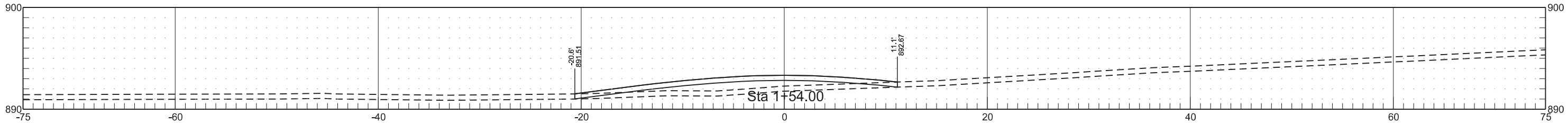
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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	5

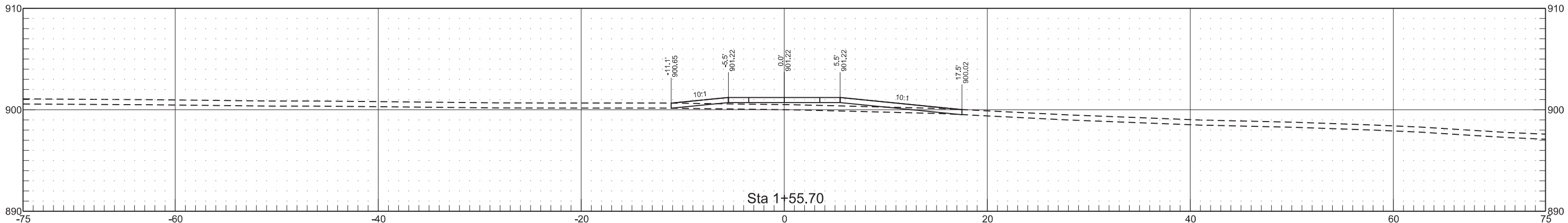
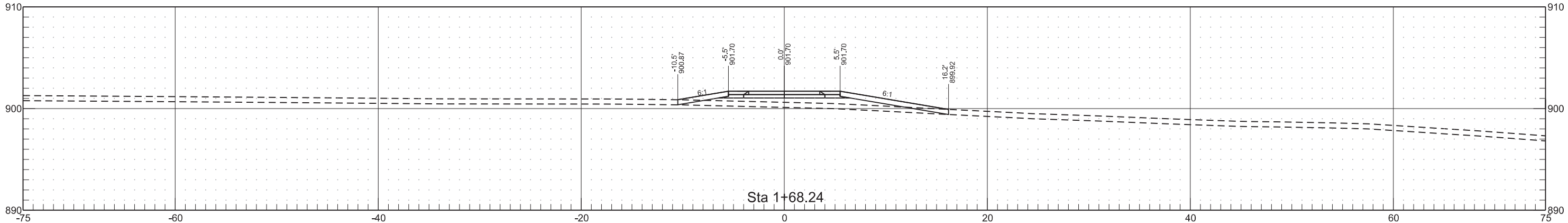
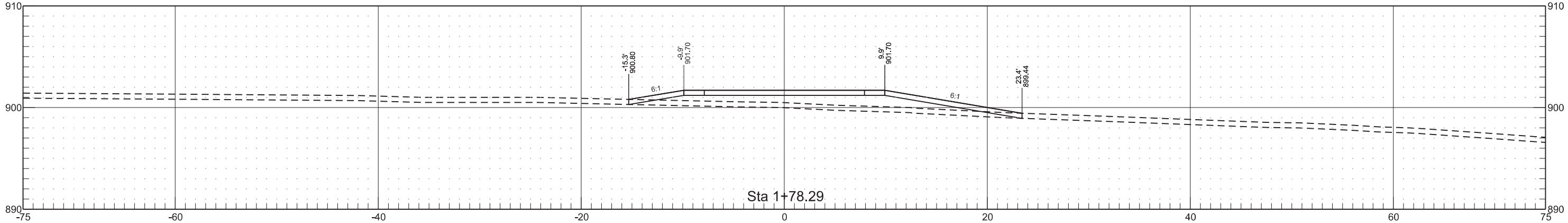


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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
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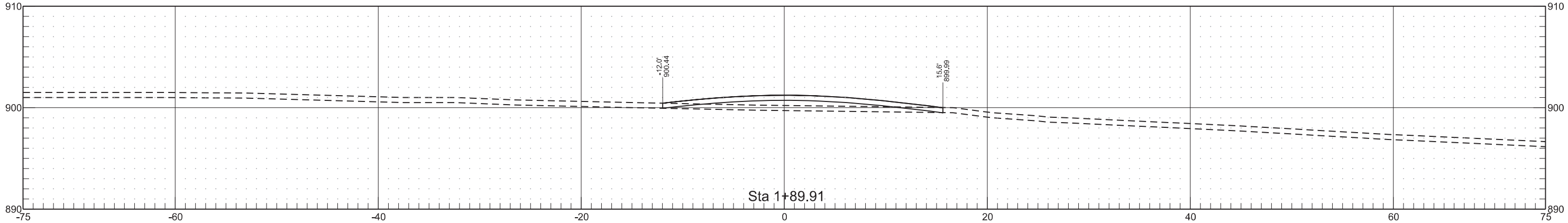


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	ND	IM-8-029(205)069	200	7

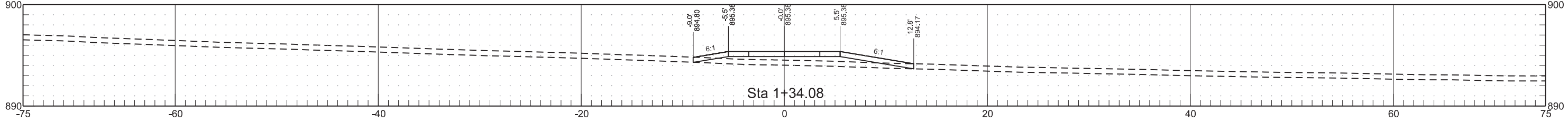
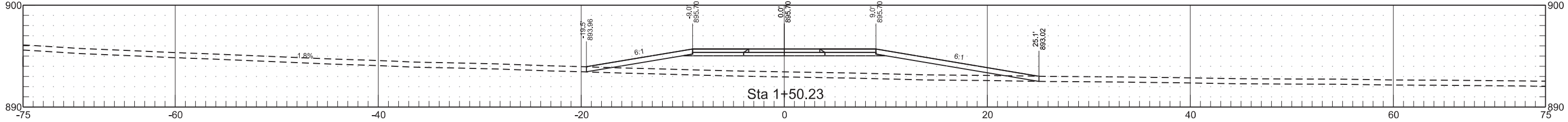
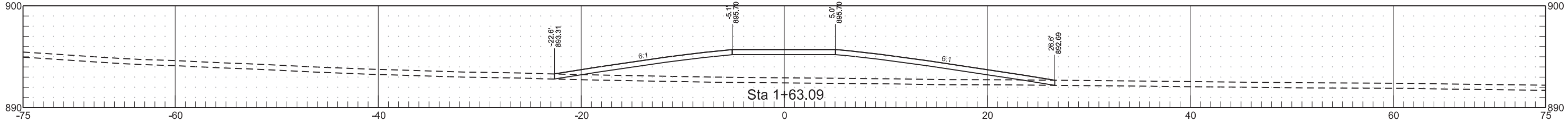
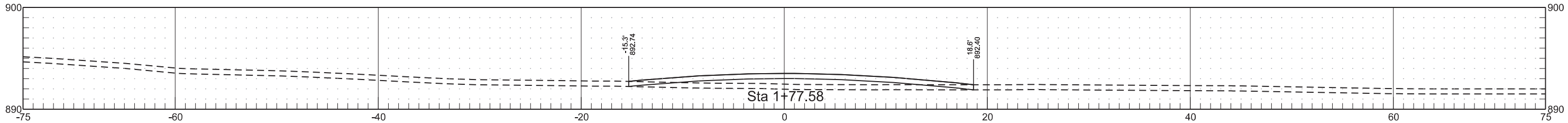


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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	8



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	9



PRSR7

STATE

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SECTION
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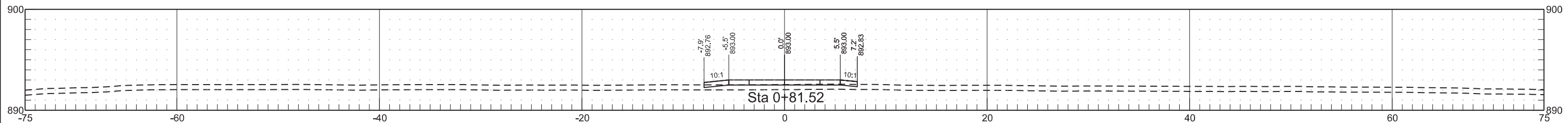
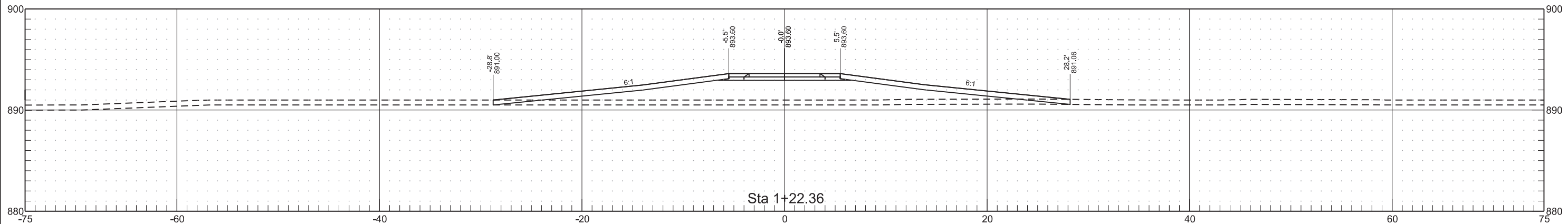
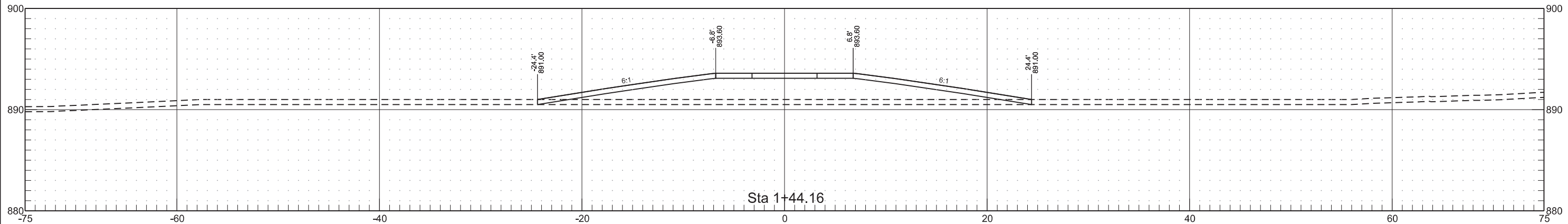
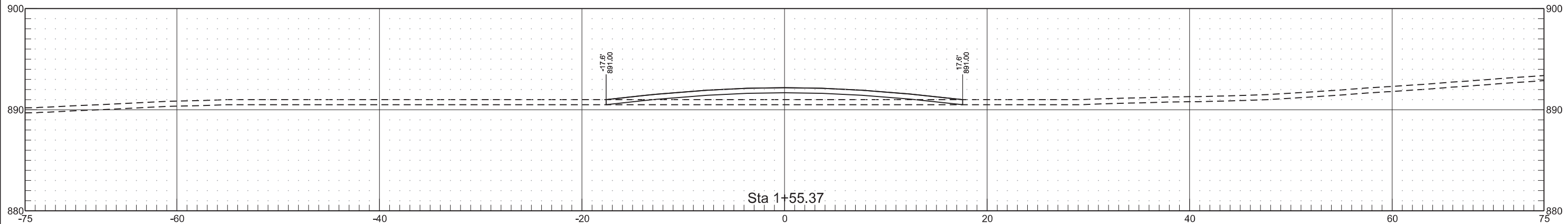
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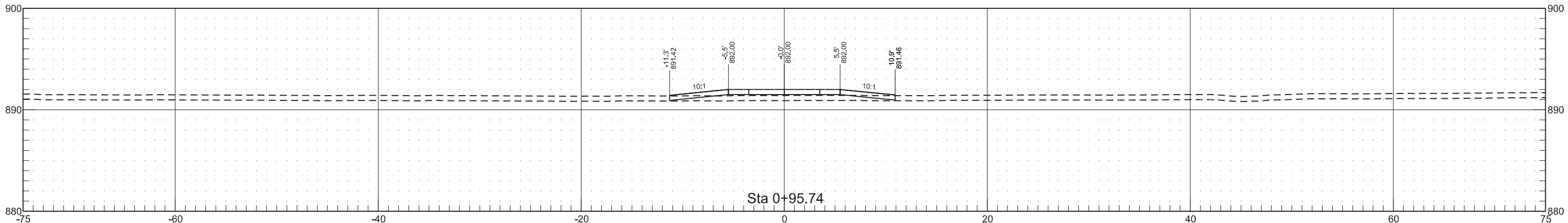
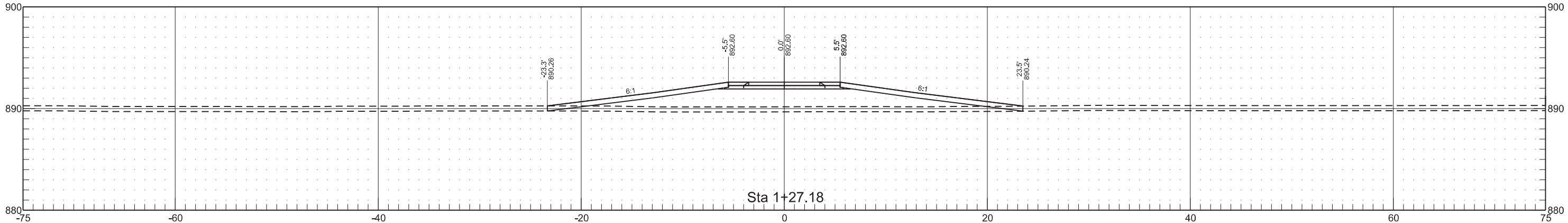
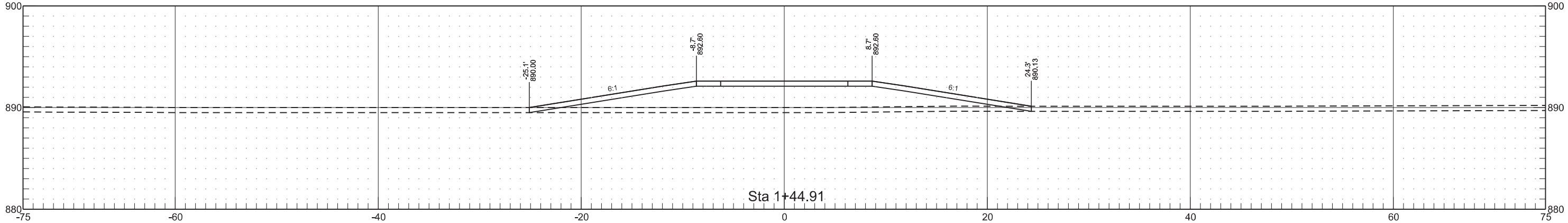
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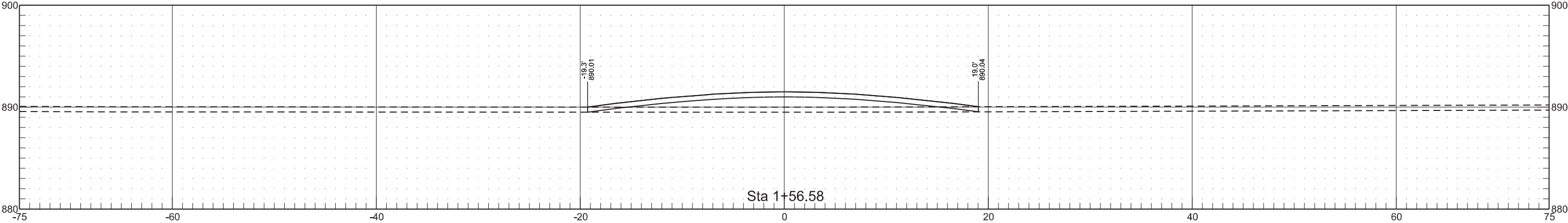
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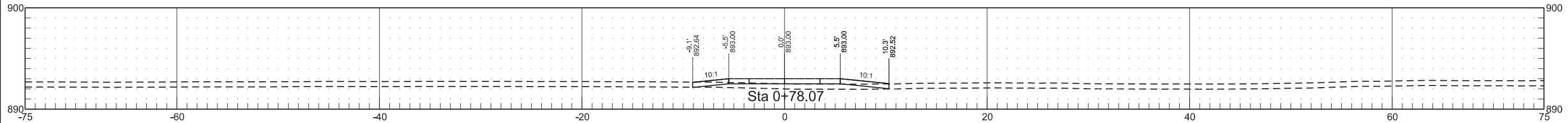
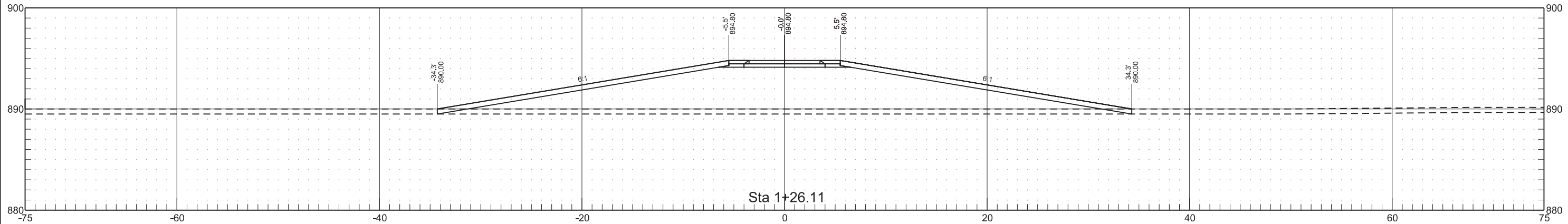
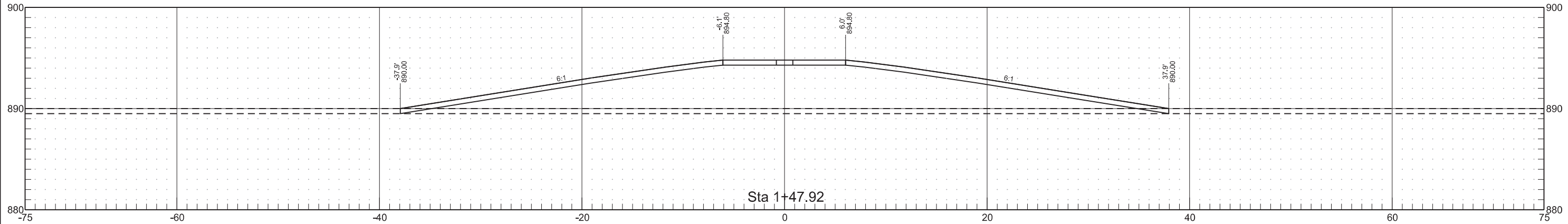
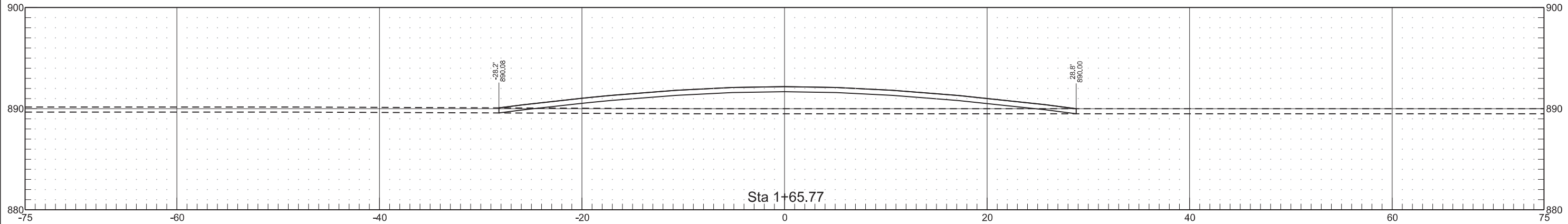
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	ND	IM-8-029(205)069	200	11



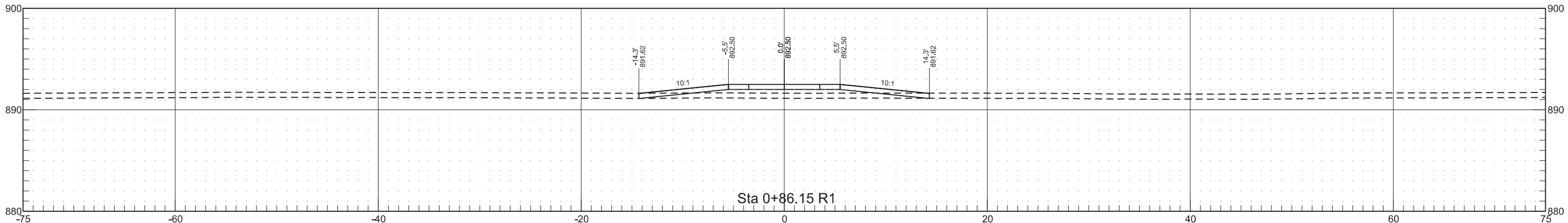
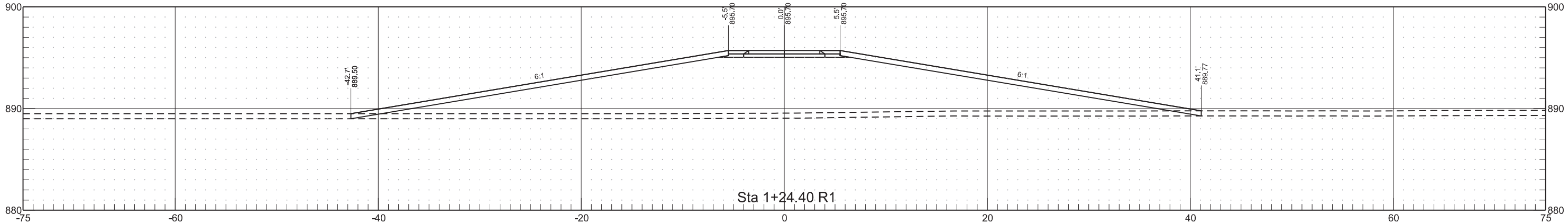
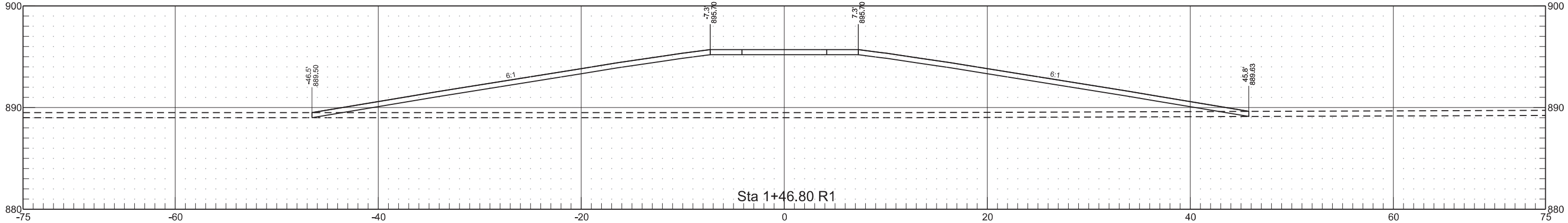
PRSR8

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	12



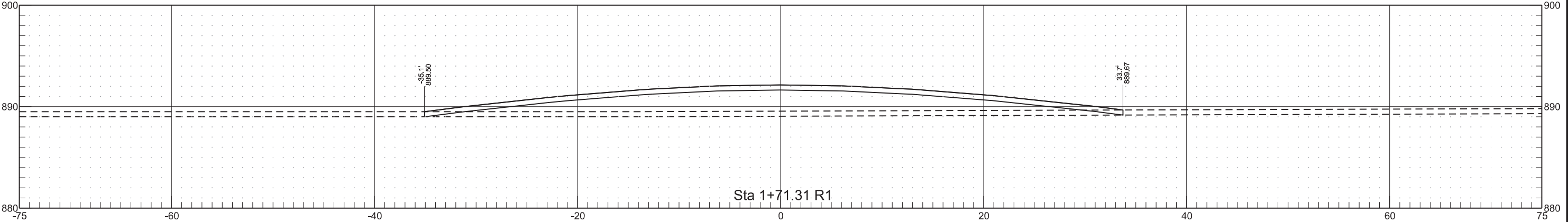


	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	14



PRSR10

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	IM-8-029(205)069	200	15



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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.	C Gdrl	cable guardrail	Culv	culvert	FOS	factor of safety
Abn	abandoned	Calc	calculate	C&G	curb & gutter	Fed	Federal
Abut	abutment	CIP	cast iron pipe	CI	curb inlet	FP	feed point
Adj	adjusted	CB	catch basin	CR	curb ramp	Fn	fence
Aggr	aggregate	CRS	cationic rapid setting	C	cut	Fn P	fence post
Ahd	ahead	C Gd	cattle guard	Dd Ld	dead load	FO	fiber optic
ARV	air release valve	C To C	center to center	Defl	deflection	FD	field drive
Align	alignment	CL or C	centerline	Defm	deformed	F	fill
Al	alley	Ch	chain	DInt	delineate	FAA	fine aggregate angularity
Alt	alternate	Ch Blk	chain-link	DIntr	delineator	FH	fire hydrant
Alum	aluminum	Ch Ch	channel block	Depr	depression	Fl	flange
ADA	Americans with Disabilities Act	Chk	channel change	Desc	description	FIRD	flared
&	and	Chsld	check	Det	detail	FES	flared end section
Appr	approach	Cir	chiseled	DWP	detectable warning panel	F Bcn	flashing beacon
Approx	approximate	Cl	circle	Dtr	detour	FA	flight auger sample
ACP	asbestos cement pipe	Clnt	class	Dia or $\varnothing$	diameter	FL	flow line
Asph	asphalt	Clr	clean-out	Dir	direction	Ftg	footing
AC	asphalt cement	Cl&gr	clear	Dist	distance	FM	force main
Assmd	assumed	Comb.	clearing & grubbing	DM	disturbed material	Fnd	found
@	at	Coml	combination	DB	ditch block	Fdn	foundation
Atten	attenuation	Compr	commercial	DG	ditch grade	Frac	fractional
ATR	automatic traffic recorder	CADD	compression	Dbl	double	Frwy	freeway
Ave	Avenue	Conc	computer aided drafting & design	Dn	down	Frt	front
Avg	average	CECB	concrete	Dwg	drawing	FF	front face
ADT	average daily traffic	Cond	concrete erosion control blanket	Dr	drive	F Disp	fuel dispenser
		Const	conductor	Drwy	driveway	FFP	fuel filler pipes
		Cont	construction	DI	drop inlet	FLS	fuel leak sensor
		CSB	continuous	D	dry density	Furn	furnish/ed
		Contr	continuous split barrel sample	DSDS	dynamic speed display sign		
		Contr	contraction				
Bk	back	CP	contractor				
BF	back face	Coord	control point	Ea	each		
Balc	balcony	Cor	coordinate	Esmt	easement		
B Wire	barbed wire	Corr	corner	E	East		
Barr	barricade	CAES	corrected	EB	Eastbound		
Btry	battery	CAP	corrugated aluminum end section	Elast	elastomeric		
BI	beehive inlet	CMES	corrugated aluminum pipe	EL	electric locker		
Beg	begin	CMP	corrugated metal end section	E Mtr	electric meter		
BG	below grade	CPVCP	corrugated metal pipe	Elec	electric/al		
BM	bench mark	CSES	corrugated poly-vinyl chloride pipe	EDM	electric/al		
Bkwy	bikeway	CSFES	corrugated steel end section	Elev or El	electronic distance meter		
Bit	bituminous	CSP	corrugated steel flared end section	Ellipt	elevation		
Blk	block	CSTES	corrugated steel pipe	Embankment	elliptical		
BH	bore hole	Co	corrugated steel traversable end section	Emuls	embankment		
Bot	bottom	Crse	County	ES	emulsion/emulsified		
Blvd	Boulevard	Ct	course	Engr	end section		
Bndry	boundary	Xarm	Court	ESS	engineer		
Brkwy	breakaway	Xbuck	cross arm	Eq	environmental sensor station		
Br	bridge	Xsec	cross buck	Evgr	equal		
Bldg	building	Xing	cross sections	Exc	evergreen		
Bus.	business	Xrd	crossing	Exst	excavation		
BV	butterfly valve	Crn	crossroad	Exp	existing		
Byp	bypass		crown	Expy	expansion		
				E	Expressway		
				Extru	external of curve		
					extruded		

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NDDOT ABBREVIATIONS

D-101-2

Galv	galvanized	Ln	lane	Obsc	obscure(d)	Qty	quantity
Gar	garage	Lg	large	Ocpd	occupied	Qtr	quarter
Gs L	gas line	Lat	latitude	Ocpy	occupy		
G Reg	gas line regulator	Lt	left	O/s	offset		
GMV	gas main valve	Lens	lenses	OC	on center	Rad or R	radius
G Mtr	gas meter	Lvl	level	C	one dimensional consolidation	RR	railroad
GSV	gas service valve	LvIng	leveling	OC	organic content	Rlwy	railway
GVP	gas vent pipe	Lht	light	Orig	original	Rsd	raised
GV	gate valve	LP	light pole	O To O	out to out	RC	rapid curing
Ga	gauge	Ltg	lighting	OD	outside diameter	Rec	record
Gov	government	Liq	liquid	OH	overhead	Rcy	recycle
Grd	graded/grade	LL	liquid limit			RAP	recycled asphalt pavement
Grnd	ground	Loc	location			RPCC	recycled portland cement concrete
GWM	ground water monitor	Long.	longitude	PMT	pad mounted transformer	Ref	reference
Gdrl	guardrail	Lp	loop	Pg	pages	R Mkr	reference marker
Gtr	gutter	LD	loop detector	Pntd	painted	RM	reference monument
		Lum	luminaire	Pr	pair	RP	reference point
				Pnl	panel	Refl	reflectorized
H Plg	H piling			Pk	park	RCB	reinforced concrete box
Hdwl	headwall	Mb	mailbox	PSD	passing sight distance	RCES	reinforced concrete end section
Ht	height	ML	main line	Pvmt	pavement	RCFES	reinforced concrete flared end section
Hel	helical	MH	manhole	Ped	pedestal	RCP	reinforced concrete pipe
HDPE	high density polyethylene	Mkd	marked	Ped	pedestrian	RCPS	reinforced concrete pipe sewer
HM	high mast	Mkr	marker	PPP	pedestrian pushbutton post	RCTES	reinforced concrete traversable end section
HP	high pressure	Mkg	marking	Pen.	penetration	Reinf	reinforcement
HPS	high pressure sodium	MA	mast arm	Perf	perforated	Res	reservation
Hwy	highway	Matl	material	Per.	perimeter	Res	residence
Hor	horizontal	Max	maximum	Perm	permanent	Ret	retaining
HBP	hot bituminous pavement	MC	meander corner	PL	pipeline	Rev	reverse
HMA	hot mix asphalt	Meas	measure	Pl	place	Rt	right
Hyd	hydrant	Mdn	median	P&P	plan & profile	R/W	right of way
Ph	hydrogen ion content	MD	median drain	PL	plastic limit	Riv	river
		MC	medium curing	Pl or $\overline{P}$	plate	Rd	road
		MGS	Midwest Guardrail System	Pt	point	Rdbd	road bed
Id	identification	MM	mile marker	PE	polyethylene	Rdwy	roadway
Incl	inclinometer tube	MP	mile post	PVC	polyvinyl chloride	RWIS	roadway weather information system
IMH	inlet manhole	Min	minimum	PCC	Portland Cement concrete	Rk	rock
ID	inside diameter	Misc	miscellaneous	PP	power pole	Rt	route
Inst	instrument	Mon	monument	Preempt	preemption		
Intchg	interchange	Mnd	mound	Prefab	prefabricated		
Intmdt	intermediate	Mtbl	mountable	Prfmd or Pref	preformed		
Intscn	intersection	Mtd	mounted	Prep	preperation		
Inv	invert	Mtg	mounting	Press.	pressure		
IP	iron pipe	Mk	muck	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		
Jt	joint	Neop	neoprene				
Jct	junction	Ntwk	network				
		N	North				
		NE	North East				
		NW	North West				
		NB	Northbound				
		No. or #	number				

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KIRK J. HOFF

REGISTERED

PROFESSIONAL

PE-4683

ENGINEER

NORTH DAKOTA

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NDDOT ABBREVIATIONS

D-101-3

Salv	salvage(d)	Tel	telephone
San	sanitary sewer line	Tel B	Telephone Booth
Sec	section	Tel P	telephone pole
SL	section line	Tv	television
Sep	separation	Temp	temperature
Seq	sequence	Temp	temporary
Serv	service	TBM	temporary bench mark
Sht	sheet	T	thinwall tube sample
Shtng	sheeting	Ts	topsoil
Shldr	shoulder	Traf	traffic
Sw or Sdwk	sidewalk	TSCB	traffic signal control box
SD	sight distance	Tr	trail
SN	sign number	Transf	transformer
Sig	signal	Trans	transition
Sgl	single	TT	transmission tower
SRCP	slotted reinforced concrete pipe	TES	traversable end section
SC	slow curing	Trans	transverse
SS	slow setting	Trtd	treated
Sm	small	Trmt	treatment
S	South	Qc	triaxial compression
SE	South East	TERO	tribal employment rights ordinance
SW	South West	Tpl	triple
SB	Southbound	Typ	typical
Sp	spaces		
Spcl	special	Qu	unconfined compressive strength
SA	special assembly	Ugrnd	underground
SP	special provisions	Util	utility
G	specific gravity		
Spk	spike		
SB	split barrel sample	VG	valley gutter
SH	sprinkler head	Vap	vapor
SV	sprinkler valve	Vert	vertical
Sq	square	VCP	vitrified clay pipe
Stk	stake	Vol	volume
Std	standard		
N	standard penetration test		
Std Specs	standard specifications	Wkwy	walkway
Stm L	steam line	W	water content
SEC	steel encased concrete	WGV	water gate valve
SMA	stone matrix asphalt	WL	water line
SSD	stopping sight distance	WM	water main
SD	storm drain	WMV	water main valve
St	street	W Mtr	water meter
SPP	structural plate pipe	WSV	water service valve
SPPA	structural plate pipe arch	WW	water well
Str	structure	Wrng	wearing
Subd	subdivision	WIM	weigh in motion
Sub	subgrade	W	west
Sub Prep	subgrade preparation	WB	westbound
Ss	subsoil	Wrng	wiring
SS	supplement specification	W/	with
Supp	supplemental	W/o	without
Surf	surfacing	WC	witness corner
Surv	survey		
Sym	symmetrical		

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MEASUREMENTS

ac	acres
A	ampere
Bd Ft	board feet
Cd	candela
cm	centimeter
C	coulomb
CF	cubic feet
m3	cubic meter
m3/s	cubic meters per second
CY	cubic yard
CY/mi	cubic yards per mile
D or Deg	degree
F	Fahrenheit
F	farad
ft	feet/foot
Gal	gallon
G	giga
Ha	hectare
H	henry
Hz	hertz
hr	hour(s)
in	inch
J	joule
K	kelvin
kN	kilo newton
kPa	kilo pascal
kg	kilogram
kg/m3	kilogram per cubic meter
km	kilometer
K	Kip(s)
LF	linear foot
L	litre
Lm	lumen
L sum	lump sum
Lx	lux
M Hr	man hour
M	mega
m	meter
m/s	meters per second
mi	mile
mL	milliliter
mm	millimeter
mm/hr	millimeters per hour
n	nano
N	newton
Pa	pascal
lb	pounds
sec	seconds
S	siemens
SF	square feet
km2	square kilometer
m2	square meter
SY	square yard
Sta Yd	station yards
SI	Systems International

T	tesla
T/mi	tons per mile
V	volt
W	watt
Wb	weber

SURVEY DESCRIPTIONS

Az	azimuth
Bs	backsight
Brg	bearing
BP Cap	blue plastic cap
BS	both sides
BC	brass cap
CS	curve to spiral
Eq	equation
E	external of curve
FS	far side
FB	field book
Fs	foresight
Geod	geodetic
GIS	Geographical Information System
GPS	Global Positioning System
HI	height of instrument
IM	iron monument
I Pn	iron pin
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
L	length of curve
LC	long chord
LB	level book
Mer	meridian
M	mid ordinate of curve
NGS	National Geodetic Survey
NS	near side
Obsn	observation
Off Loc	office location
OP Cap	orange plastic cap
PK	Parker-Kalon nail
P Cap	plastic cap
PP Cap	pink plastic cap
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
RTP	random traverse point
Rge	range
RP Cap	red plastic cap
SC	spiral to curve
ST	spiral to tangent
Sta	station
SE	superelevation
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Twp	township
TB	transit book
TP	traverse point
TP	turning point
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
VC	vertical curve
WGS	World Geodetic System
YP Cap	yellow plastic cap
Z	zenith

SOIL TYPES

Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Co S	coal slack
C Gr	coarse gravel
CS	coarse sand
FS	fine sand
Gr	gravel
Lig Co	lignite coal
Lig Sl	lignite slack
Lm	loam
Rk	rock
Sd	sand
Sdy Cl	sandy clay
Sdy Cl Lm	sandy clay loam
Sdy Fl	sandy fill
Sdy Lm	sandy loam
Sc	scoria
Sh	shale
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
04-23-18 09-20-18 12-18-20	General Revisions General Revisions General Revisions

KIRK J. HOFF

REGISTERED

PROFESSIONAL

PE-4683

ENGINEER

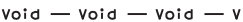
NORTH DAKOTA

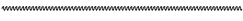
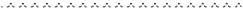
12 18 2020

LINE STYLES

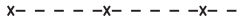
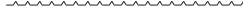
D-101-20

Existing Topography

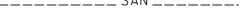
	Existing Ground Void
	Existing Cemetary Boundary
	Existing Box Culvert Bridge
	Existing Concrete Surface
	Existing Drainage Structure
	Existing Gravel Surface
	Existing Riprap
	Existing Dirt Surface
	Existing Asphalt Surface
	Existing Tie Point Line
	Existing Railroad Centerline
	Existing Guardrail Cable
	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
	Existing High Tension Cable Guardrail
	Existing High Tension Cable Guardrail with Posts

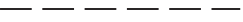
Proposed Topography

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

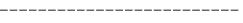
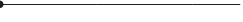
Existing Utilities

	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	
07-01-14	
REVISIONS	
DATE	CHANGE
09-23-16	Added and Revised Items, Organized by Functional Groups General Revisions
12-18-20	

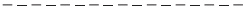


12 18 2020

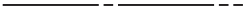
LINE STYLES

D-101-21

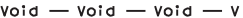
Right Of Way

	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

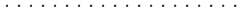
Boundary Control

	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)
	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
	Geogrid
	Geotextile Fabric Type R
	Geotextile Fabric Type R1
	Geotextile Fabric Type RR
	Geotextile Fabric Type S
	Subgrade Reinforcement

Countours

	Depression Contours
	Supplemental Contour

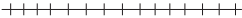
Profile

	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

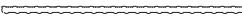
Bridge Details

	Small Hidden Object
	Large Hidden Object
	Phantom Object
	Existing Conditions Object
	Centerline Main
	Centerline Secondary
	Excavation Limits
	Proposed Ground
	Sheet Piling

Erosion Control

	Limits of Const Transition Line
	Bale Check
	Rock Check
	Floating Silt Curtain
	Silt Fence
	Excavation Limits
	Fiber Rolls

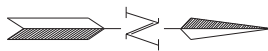
Environmental

	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 12-18-20	Added and Revised Items, Organized by Functional Groups General Revisions	

SYMBOLS

D-101-30

 North Arrow (Half Scale)

 Alignment Data Point

 Alignment Monument

 Spot Elevation

 Existing Miscellaneous Spot

 Existing Access Control Arrow

 Existing Benchmark

 Reset USGS Marker

 Iron Monument Found

 Iron Pin R/W Monument

 Property Corner

 Iron Pin Reference Monument

   Right of Way Marker (Exst, Ppsd, Reset)

 Existing Federal Reference Corner

    Existing Section Corner (Full, Quarter, Sixteenth, Meander)

 Existing Witness Corner

   Existing Control Point (CP, GPS-RTK, TRI)

 Existing Traverse PI Aerial Panel

 Existing Reference Marker Point NGS

 Existing EFB Misc

 Existing Bush or Shrub

 Existing Large Evergreen Tree

 Existing Small Evergreen Tree

 Existing Large Tree

 Existing Small Tree

 Existing Tree Trunk

 Cairn or Stone Circle

 Existing Artifact

 Existing Satellite Dish

 Existing Weather Station

 Existing Windmill or Tower

 Reinforced Pavement

 Continuous Split Barrel Sample

 Flight Auger Sample

 Split Barrel Sample

 Thinwall Tube Sample

 Standard Penetration Test

 Inclinometer Tube

 Excavation Unit

 Existing Ground Water Well Bore Hole

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE
12-18-20	General Revisions



12 18 2020

SYMBOLS

D-101-31

	Flexible Delineator		Highway Sign (Exst, Ppsd)
	Flexible Delineator Type A (Exst, Ppsd)		Mile Post Type A (Exst-Ppsd-Reset)
	Flexible Delineator Type B (Exst, Ppsd)		Mile Post Type B (Exst, Ppsd)
	Flexible Delineator Type C (Exst, Ppsd)		Mile Post Type C (Exst, Ppsd)
	Flexible Delineator Type D (Exst, Ppsd)		Object Marker Type I (Exst, Ppsd)
	Flexible Delineator Type E (Exst, Ppsd)		Object Marker Type II (Exst, Ppsd)
	Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)		Object Marker Type III (Exst, Ppsd)
	Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)		Existing Reference Marker
	Delineator Type C (Exst, Ppsd, Diamond Grade)		Road Closure Gate 18 Ft (Exst, Ppsd)
	Delineator Type D (Exst, Ppsd, Diamond Grade)		Road Closure Gate 28 Ft (Exst, Ppsd)
	Delineator Type E (Exst, Ppsd, Diamond Grade)		Road Closure Gate 40 Ft (Exst, Ppsd)
	Barricade (Type I, Type II, Type III)		Existing Railroad Battery Box
	Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)		Existing RR Profile Spot
	Attenuation Device		Existing Railroad Crossbuck
	Truck Mounted Attenuator		Existing Railroad Frog
	Delineator Drums		Existing Mailbox (Private, Federal)
	Flagger		
	Tubular Marker		
	Traffic Cone		
	Back to Back Vertical Panel Sign		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE
12-18-20	General Revisions



12 18 2020

SYMBOLS

D-101-32

	Existing Luminaire			High Mast Light Standard 3 Luminaire (Exst, Ppsd)		Existing Traffic Signal Standard			
	Luminaire LED			High Mast Light Standard 4 Luminaire (Exst, Ppsd)				Pull Box (Exst-Ppsd-Undefined)	
	Existing Light Standard Luminaire			High Mast Light Standard 5 Luminaire (Exst, Ppsd)				Intelligent Transportation Pull Box (Exst, Ppsd)	
	Relocate Light Standard			High Mast Light Standard 6 Luminaire (Exst, Ppsd)				Transformer (Exst, Ppsd)	
	Light Standard Light LED Luminaire			High Mast Light Standard 7 Luminaire (Exst, Ppsd)				Power Pole (Exst-Ppsd-with Transformer)	
	Light Standard 35 Watt High Pressure Sodium Vapor Luminaire			High Mast Light Standard 8 Luminaire (Exst, Ppsd)				Wood Pole (Exst, Ppsd)	
	Light Standard 50 Watt High Pressure Sodium Vapor Luminaire			High Mast Light Standard 9 Luminaire (Exst, Ppsd)				Pedestrian Push Button Post (Exst, Ppsd)	
	Light Standard 70 Watt High Pressure Sodium Vapor Luminaire			High Mast Light Standard 10 Luminaire (Exst, Ppsd)				Existing Pole	
	Light Standard 100 Watt High Pressure Sodium Vapor Luminaire			Overhead Sign Structure Load Center (Exst, Ppsd)				Existing Telephone Pole	
	Light Standard 150 Watt High Pressure Sodium Vapor Luminaire			Traffic Signal Controller (Exst, Ppsd)				Existing Post	
	Light Standard 200 Watt High Pressure Sodium Vapor Luminaire			Pad Mounted Traffic Signal Controller (Exst, Ppsd)					Connection Conductor (Ground, Neutral, Phase 1, Phase 2)
	Light Standard 250 Watt High Pressure Sodium Vapor Luminaire			Flashing Beacon (Exst, Ppsd)					
	Light Standard 310 Watt High Pressure Sodium Vapor Luminaire			Concrete Foundation (Exst, Ppsd)					
	Light Standard 400 Watt High Pressure Sodium Vapor Luminaire			Pipe Mounted Flasher (Exst, Ppsd)					
	Light Standard 700 Watt High Pressure Sodium Vapor Luminaire			Pad Mounted Feed Point (Exst, Ppsd)					
	Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire			Pipe Mounted Feed Point with Pad (Exst, Ppsd)					
	Emergency Vehicle Detector			Pole Mounted Feed Point (Exst, Ppsd)					
	Video Detection Camera			Junction Box (Exst, Ppsd)					
				Existing Pedestrian Head with Number					
				Existing Signal Head					
				Pole Mounted Head					
				Existing Lighting Standard Pole					

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14 REVISIONS	
DATE	CHANGE
12-18-20	General Revisions



12 18 2020

SYMBOLS

D-101-33

			Existing Manhole (Electrical, Gas, Telephone)		Cap or Stub Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water
			Water Manhole (Exst, Exst with Valve)		Existing Pedestal Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined
			Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)		Existing Pipe Vent Gas, Fuel, Sanitary, Storm Drain, Water, Undefined
			Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)		Valve Exst Gas, Exst Water, Ppsd Water, Exst Undefined
			Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)		Pump Sanitary, Storm Drain, Exst Water
			Force Main Storm Drain Manhole (Exst, Exst with Valve)		Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)		Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)
			Existing Water Appurtenance		Existing Utility Marker
			Sprinkler Head (Exst, Ppsd)		Existing Meter
			Fire Hydrant (Exst, Ppsd)		Existing Fuel Dispensers
			Cleanout (Exst Sanitary, Underdrain)		Existing Fuel Filler Pipes
			Existing Catch Basin Inlet (Round, Square)		Existing Fuel Leak Sensors
			Existing Curb Inlet (Round, Square)		
			Existing Slotted Reinforced Concrete Pipe		
			Catch Basin (Riser 30 Inch, Beehive, Type A)		
			Inlet Mountable Curb (Type A, Type B)		
			Inlet Saddle Base (Type 1, Type 2)		
			Inlet Special (Catch Basin, Type 1, Type A)		
			Inlet (Tee, Type 1, Type 2, Type 2 Double)		
			Median Drain		
			Headwall (Exst, Ppsd, Ppsd Single with Vegetation Barrier, Ppsd Double with Vegetation Barrier)		

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
12-18-20	General Revisions Sheet added - Continued from D-101-32

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA
12 18 2020

Cross Section Legend

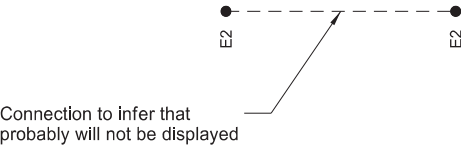
Description	Longitudinal Parallel to Roadway	Transverse Perpendicular to Roadway*
Cable Line	● CBL1	● CBL2
Conduit Line	● CDU1	● CDU2
Electric Line	● E1	● E2
Fiber Optic Line	● F1	● F2
Gas Main Line	● GM1	● GM2
Gas Service Line	● GS1	● GS2
Gas Transmission Line	● GT1	● GT2
Fuel Pipeline	● PL1	● PL2
Sanitary 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.



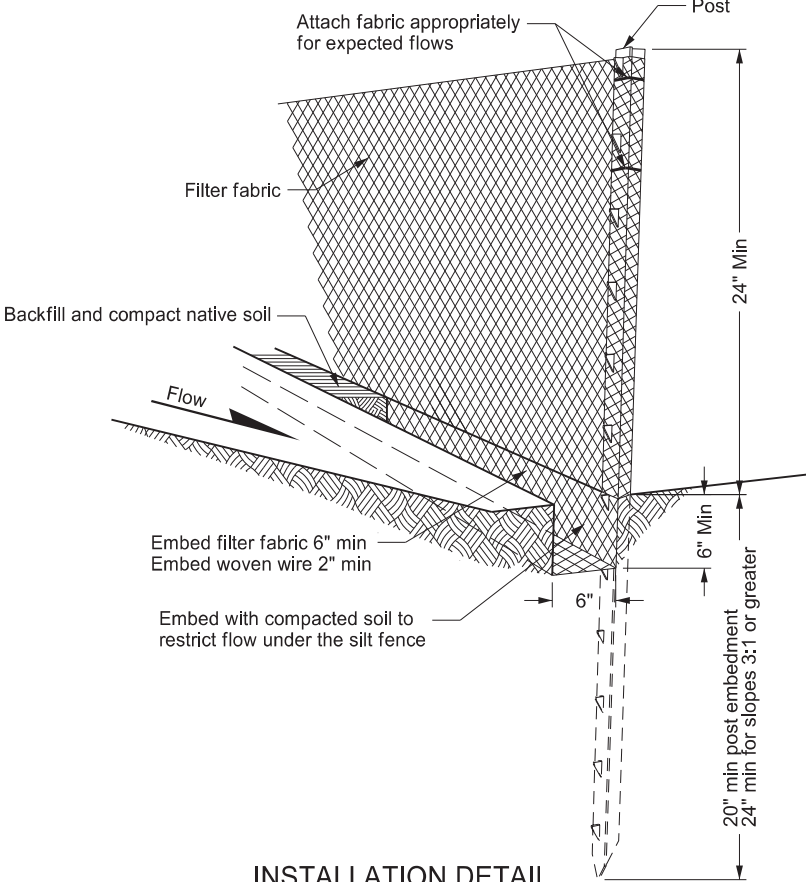
On the right side of most cross sections there is a earthwork table. The following example (values not related to project) details the earthwork table layout.

Cut Area	CA: 34.34 SF
Fill Area	FA: 0.017 SF
Cut Volume	CV: 64.44 CY
Fill Volume	FV: 0.031 CY
Mass Ordinate	MO: 65.13 CY

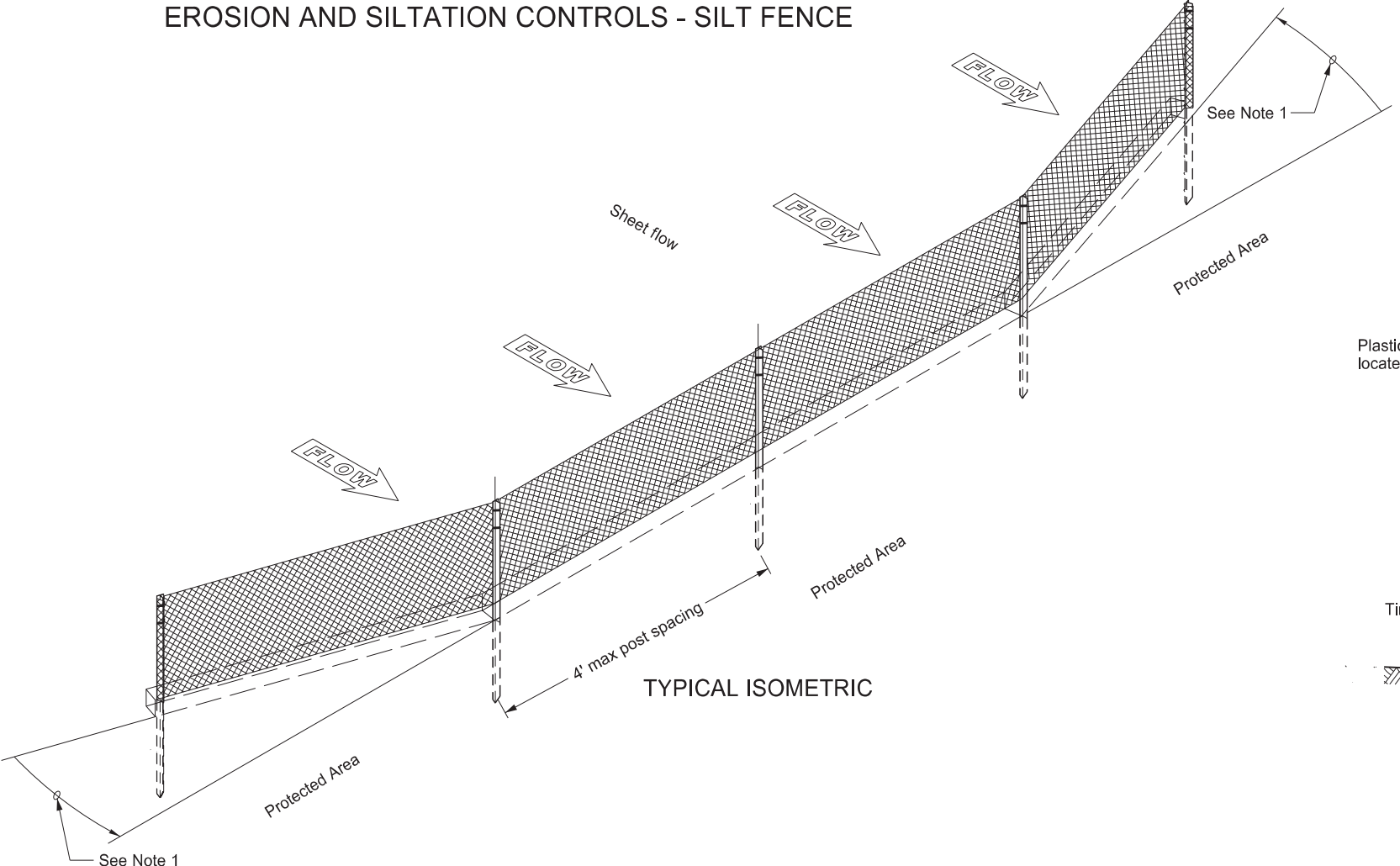
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-18	
REVISIONS	
DATE	CHANGE

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

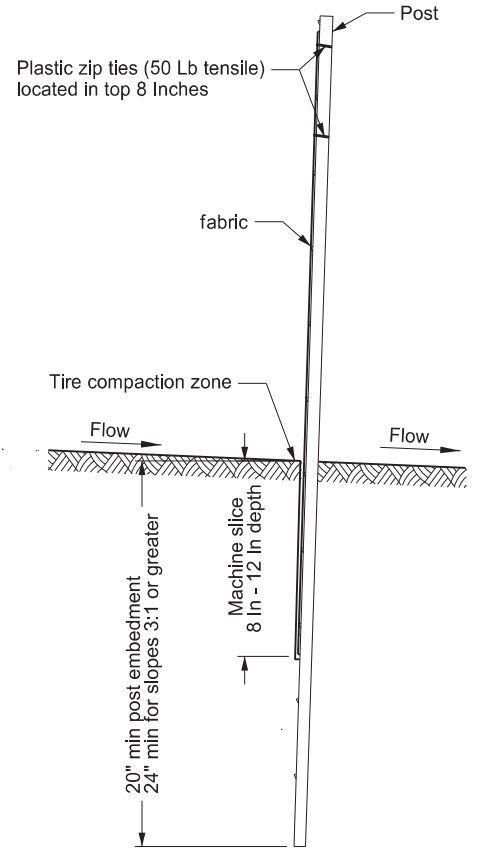
EROSION AND SILTATION CONTROLS - SILT FENCE



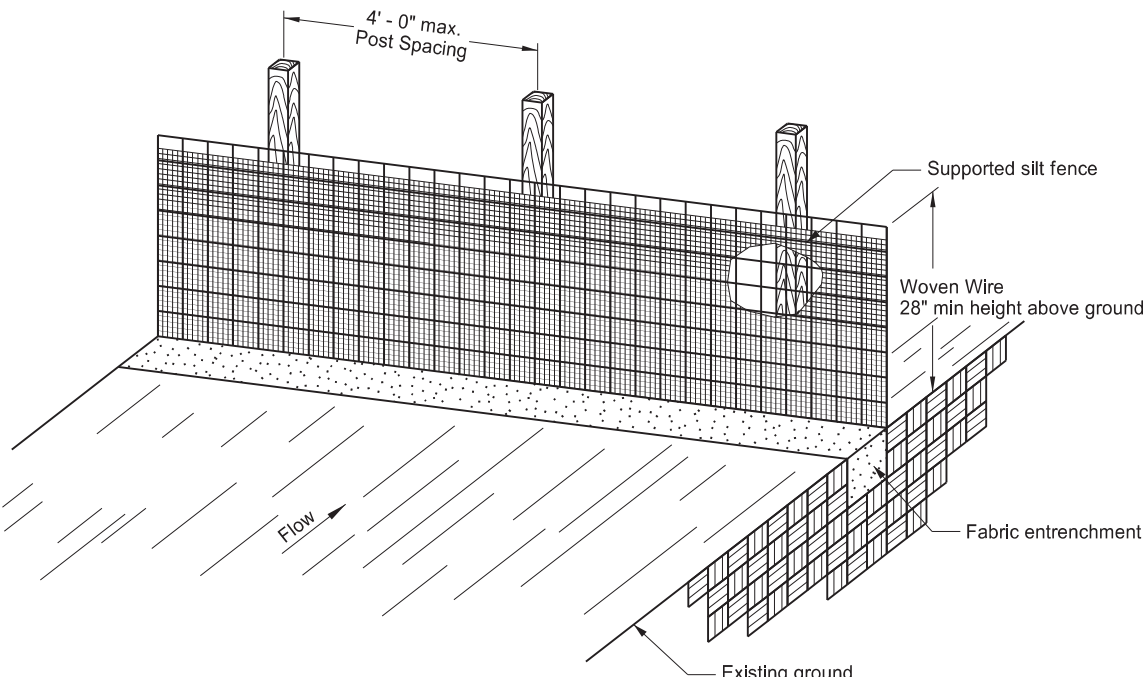
INSTALLATION DETAIL



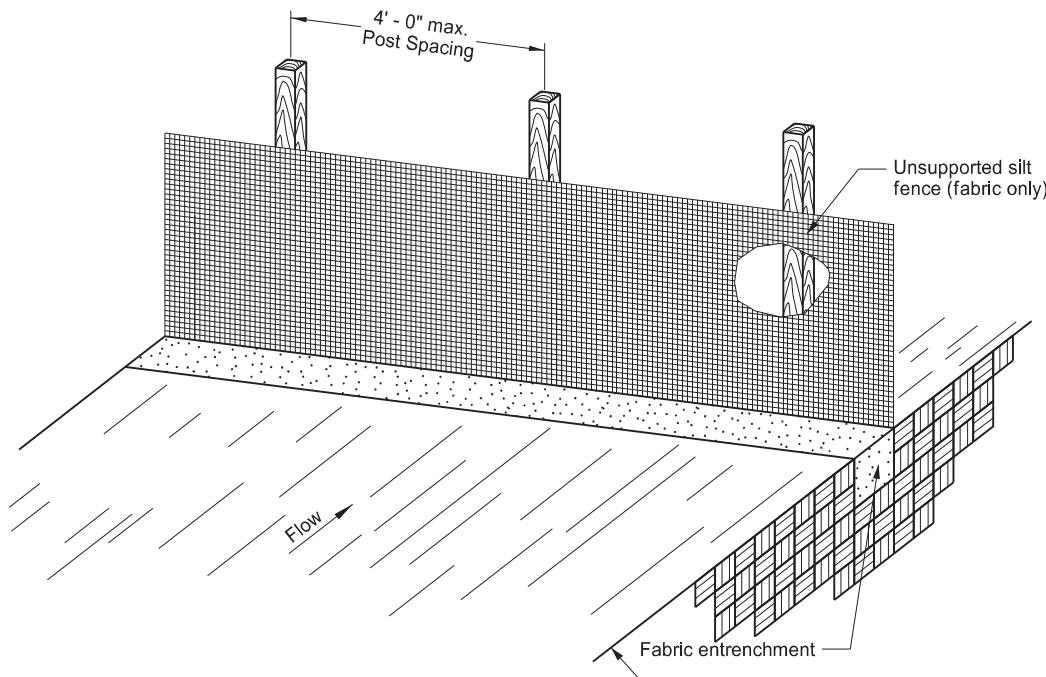
TYPICAL ISOMETRIC



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-704-5

Notes:

1. Post mount sign a distance of $\frac{1}{2}A$ 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.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION		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
8-22-12		
REVISIONS		
DATE	CHANGE	
7-18-14 9-27-17 8-30-18 10-03-19	Revise sheeting to type IV. Updated to active voice. Updated sign number in note 1. New Design Engineer PE Stamp.	

CONSTRUCTION SIGN DETAILS
PROJECT FUNDING SIGN

D-704-6

SIGN NUMBER	I2-5-96				
WIDTH X HEIGHT	8'-0" x 4'-0"				
BORDER WIDTH	1.25" (inset 0.75")				
CORNER RADIUS	3"				
MOUNTING	Ground				
BACKGROUND	TYPE: XI Reflective				
	COLOR: White				
LEGEND/BORDER	TYPE: Non-reflective				
	COLOR: Black				

SYMBOL	X	Y	WID	HT	ANGLE
ND_CIRCLE_LOGO	6	22.8	18	18	0
	44.2	4.2	7.5	8.6	0

STATION(S):

AREA: 32.0 Sq.Ft.

Diagram showing the sign layout with dimensions and letter locations. The sign is 8'-0" wide and 4'-0" high. The text 'YOUR HIGHWAY DOLLARS AT WORK' is centered. The text 'FUNDED BY (A)' is centered below the main text. The NDDOT logo is on the left. Dimensions are provided in inches and centimeters. Letter locations are given relative to the lower left corner.

Dimensions are in inches,tenths

Letter locations are panel edge to lower left corner

PANEL STYLE: ND_Reg_48_Large.ssi

LETTER POSITION (X)										LENGTH	SIZE	SERIES
Y	O	U	R	H	I	G	H	W	A	Y		
33.5	38.1	42.8	47.5	55.4	60.1	62.1	66.7	70.9	75.8	80	50.3	6 C 2000
D	O	L	L	A	R	S	A	T	W	O	R	K
27.4	31.8	36.5	40.4	43.9	48.5	52.6	60.5	64.7	72.2	77.5	82.3	86.6
F	U	N	D	E	D	B	Y					
35.5	38.1	41.2	44.3	47.4	50.1	55.3	57.9				25	4 C 2000

(A)

FUNDING SOURCE MESSAGE VARIATIONS
FEDERAL
STATE
FEDERAL - STATE
FEDERAL - LOCAL
FEDERAL - STATE - LOCAL
STATE - LOCAL

Use a horizontal spacing of 3" between words and hyphens. Center message horizontally in sign panel.

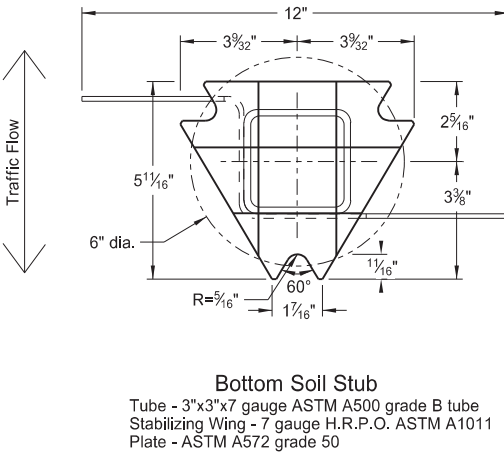
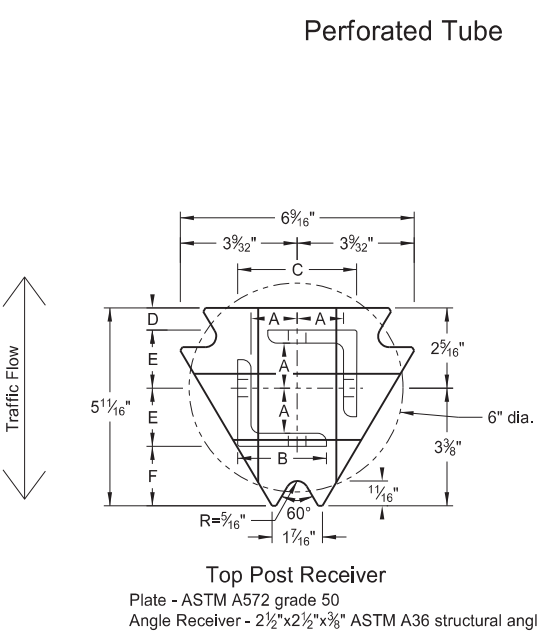
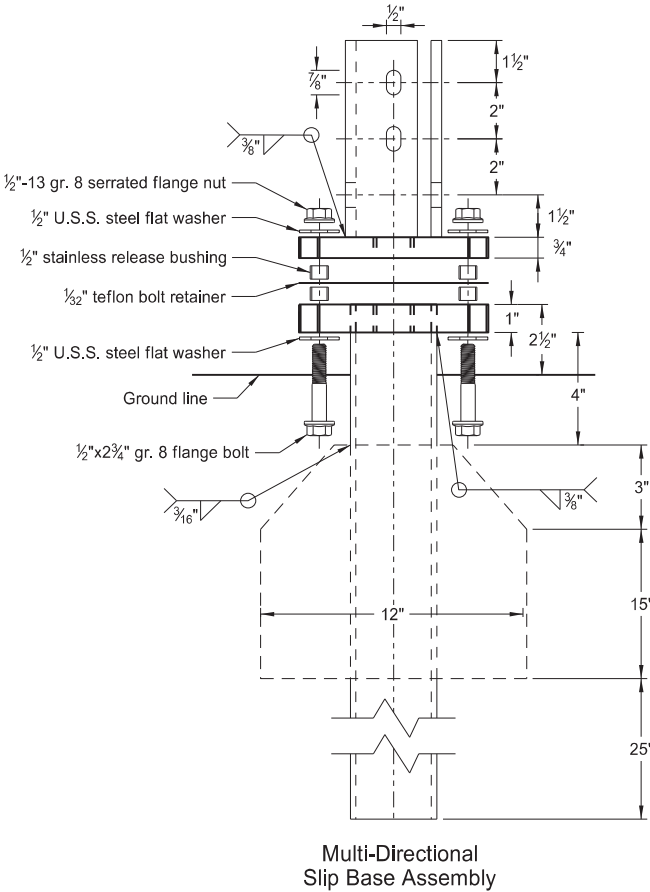
- Notes:
- 1) Contact the Communications Division of the NDDOT to obtain a copy of the image for the NDDOT Logo.
 - 2) Contact Project Engineer for funding source message.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-08-21	
REVISIONS	
DATE	CHANGE

12/08/21

Perforated Tube

- 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.

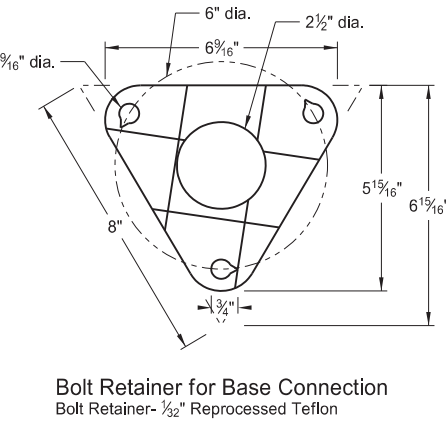
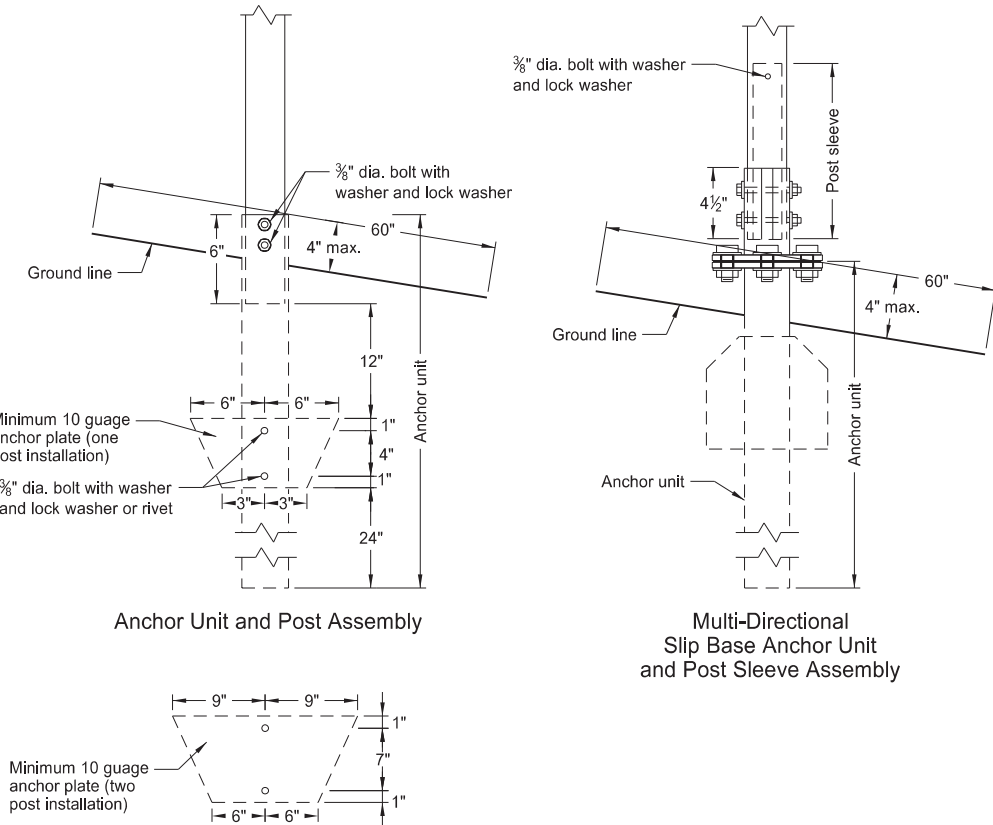


Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No	2 1/4
2	2 1/4	12			No	2 1/2
2	2 1/2	12			Yes	
2	2 1/2	12			Yes	
2	2 1/4	10	2	12	Yes	
2	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/2	12			Yes	
3 & 4	2 1/2	10			Yes	
3 & 4	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/4	12	2	12	Yes	
3 & 4	2 1/2	10	2 3/16	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
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/8 x 2 3/8	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.785

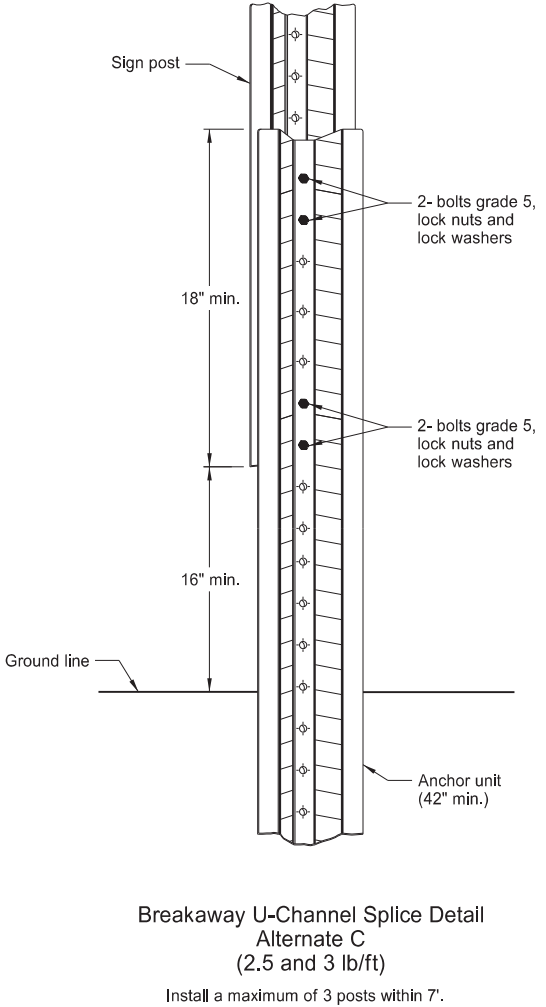
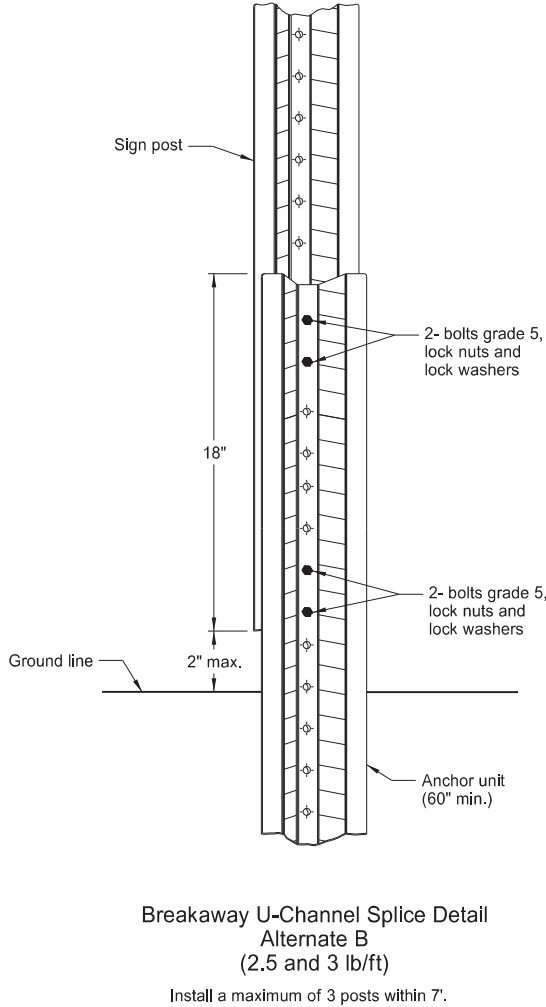
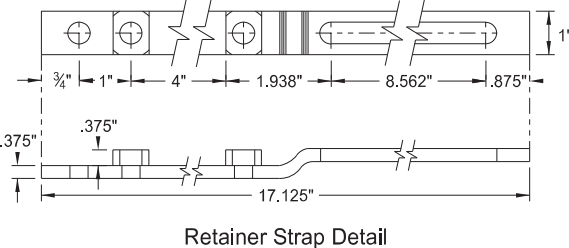
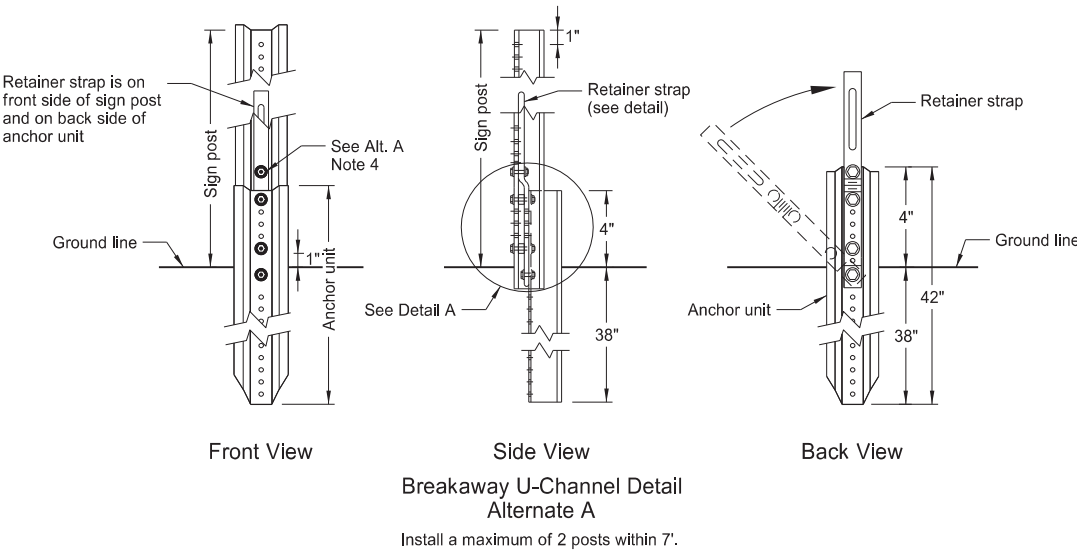
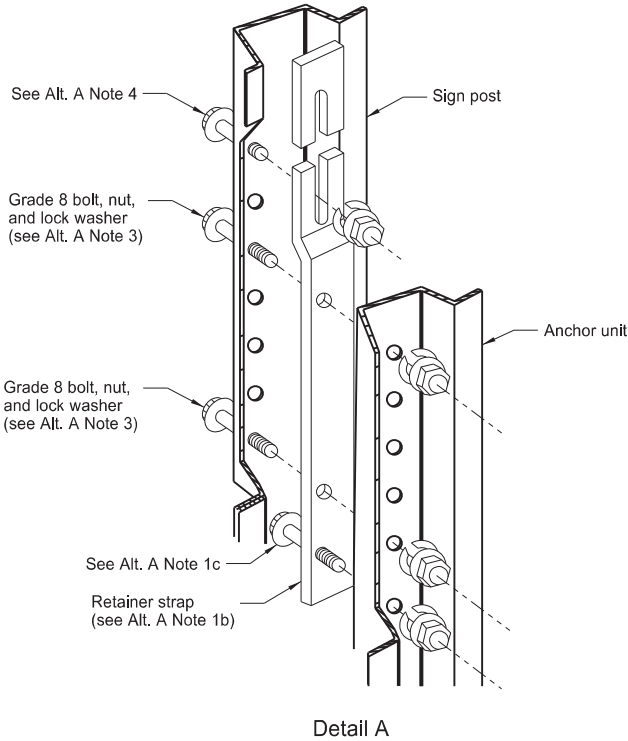
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 5/16"	2 1/2"	3 1/2"	2 5/32"	1 33/64"	1 7/8"
2 1/2"x10 ga.	1 3/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

- (A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.
- (B) For additional wind load, insert the 2 3/8"x10 ga. into 2 1/2"x10 ga.



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

U-Channel Post



Alternate A Steps of Installation:

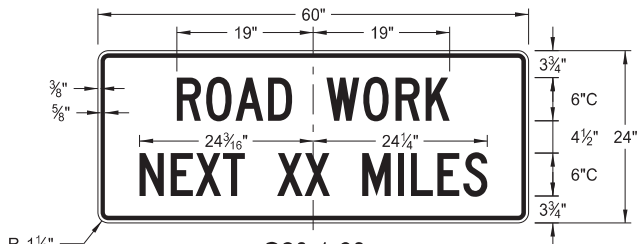
- a) Drive anchor unit to within 12" of ground level.
b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
- a) Drive anchor unit to 4" above ground.
b) Rotate strap to vertical position.
- 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.
- Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
- 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 10-03-19	Updated to active voice New Design Engr PE Stamp

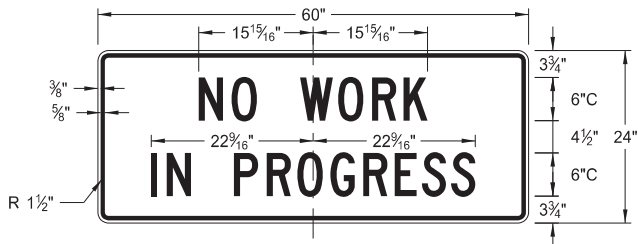
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CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

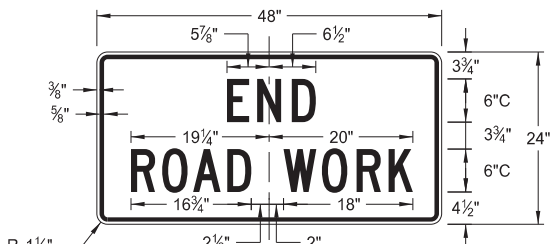
D-704-9



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



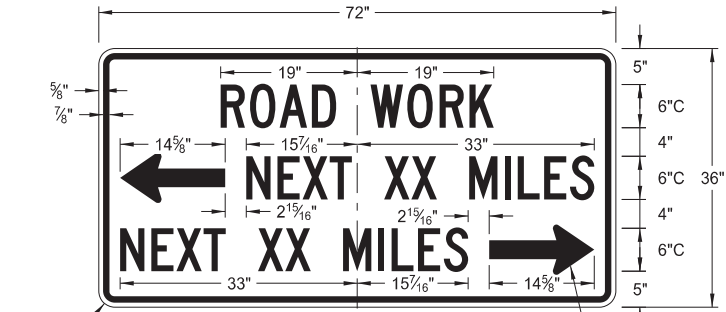
G20-1b-60
Legend: black (non-refl)
Background: orange



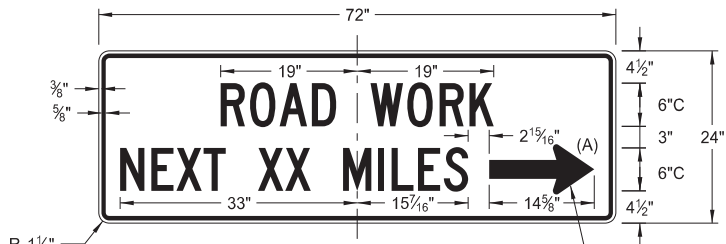
G20-2-48
Legend: black (non-refl)
Background: orange



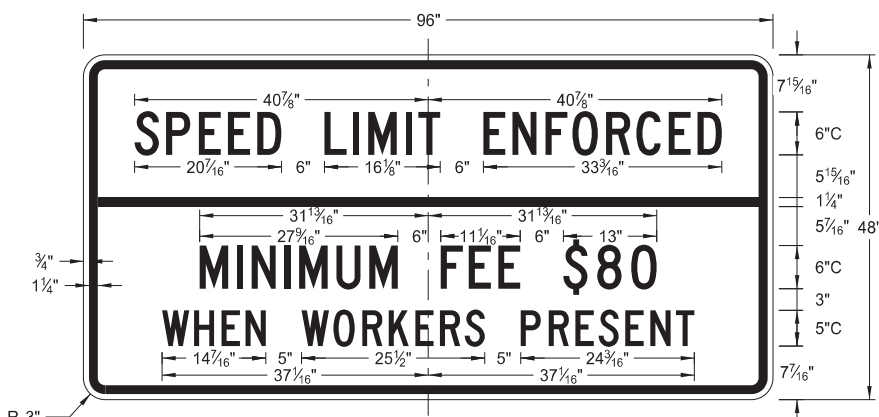
G20-4b-36
Legend: black (non-refl)
Background: orange



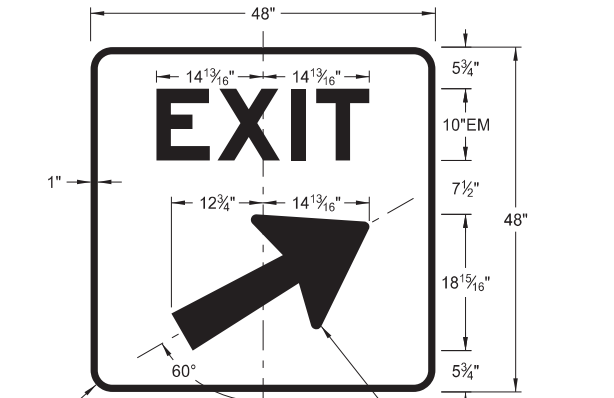
G20-50a-72
Legend: black (non-refl)
Background: orange



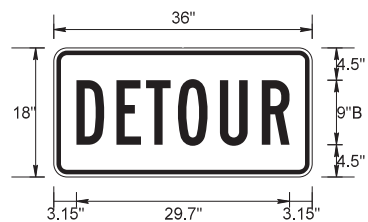
G20-52a-72
Legend: black (non-refl)
Background: orange



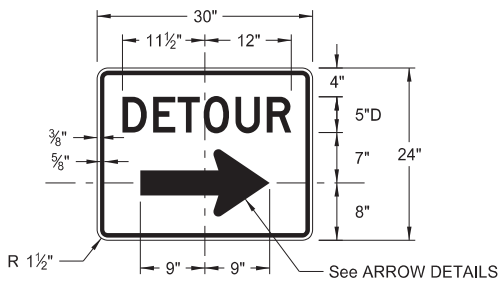
G20-55-96
Legend: black (non-refl)
Background: orange



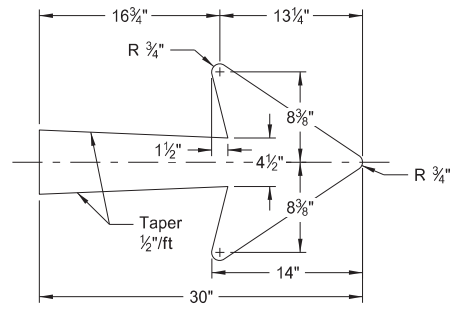
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



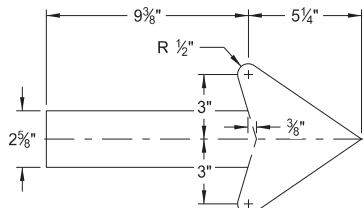
M4-8-36
Legend: black (non-refl)
Background: orange



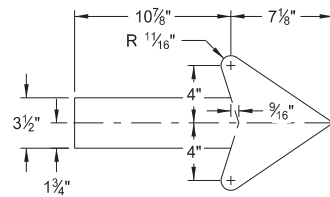
M4-9(L or R)-30 & M4-9-30
Legend: black (non-refl)
Background: orange



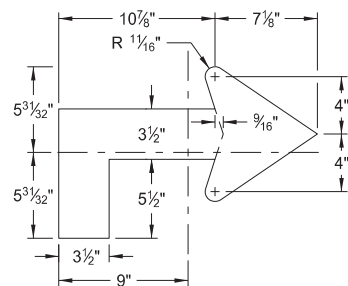
E5-1-48



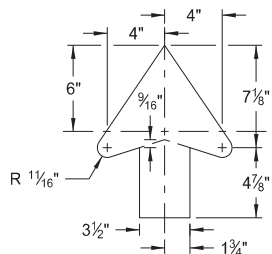
G20-50a-72
G20-52a-72



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



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



M4-9-30
Straight

ARROW DETAILS

NOTES:

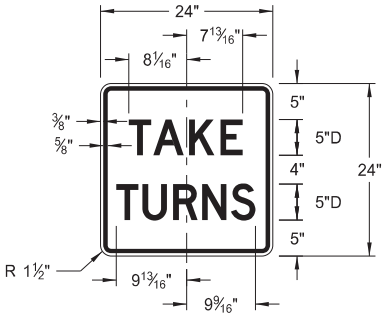
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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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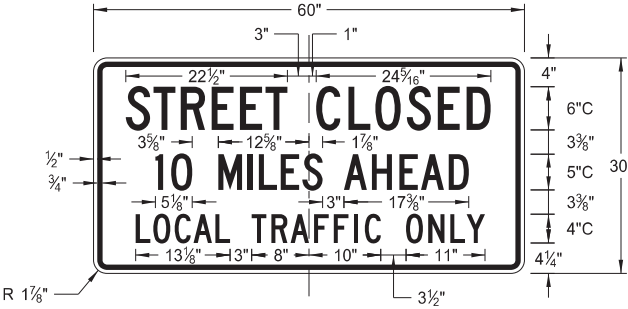
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

D-704-10



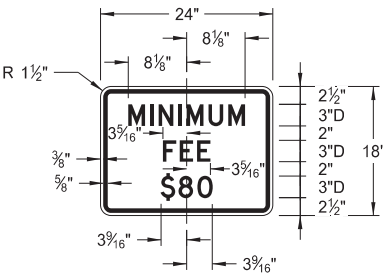
R1-50P-24

Legend: black (non-refl)
Background: white



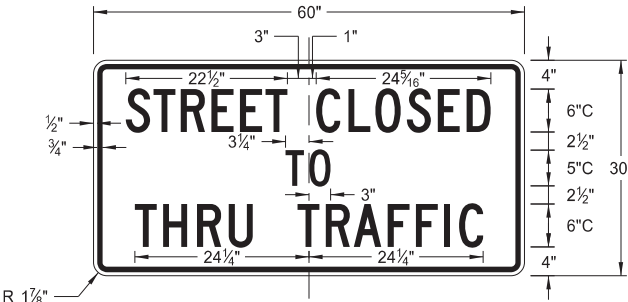
R11-3c-60

Legend: black (non-refl)
Background: white



R2-1aP-24

Legend: black (non-refl)
Background: white



R11-4a-60

Legend: black (non-refl)
Background: white



R11-2a-48

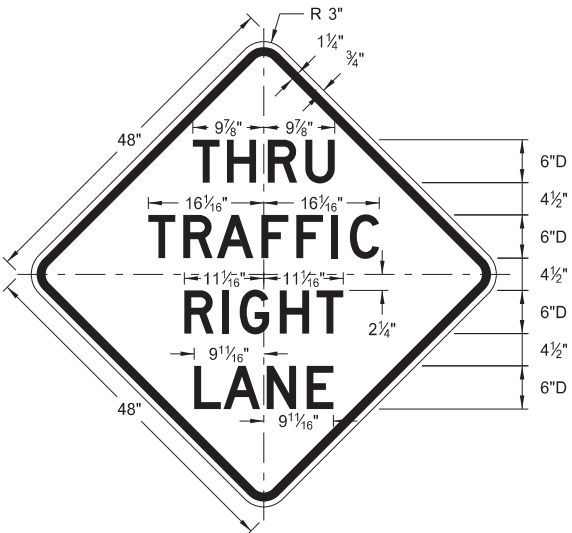
Legend: black (non-refl)
Background: white

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

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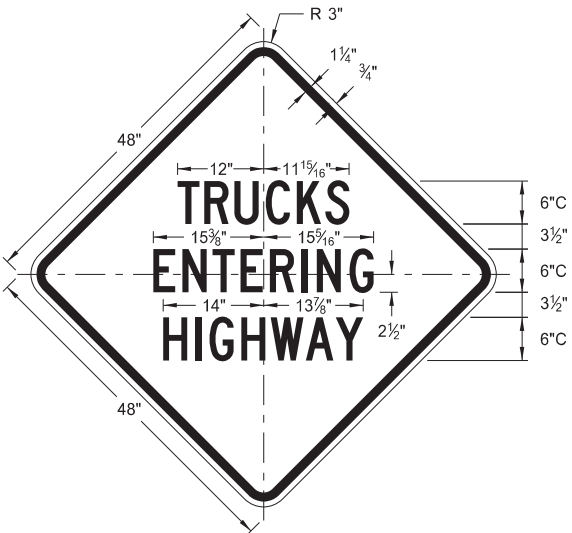
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

D-704-11



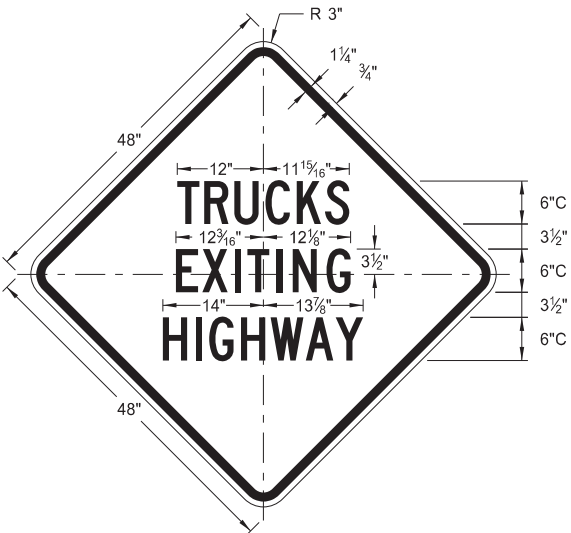
W5-8-48

Legend: black (non-refl)
Background: orange



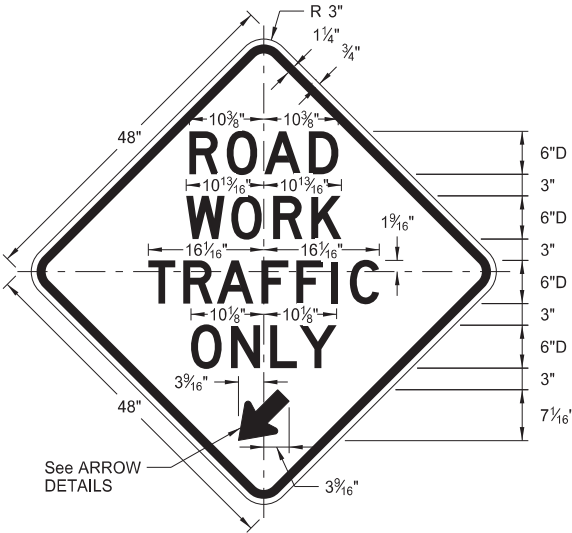
W8-53-48

Legend: black (non-refl)
Background: orange



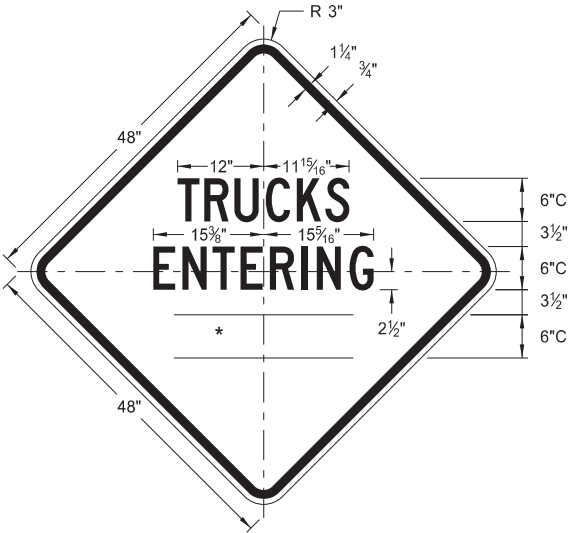
W8-56-48

Legend: black (non-refl)
Background: orange



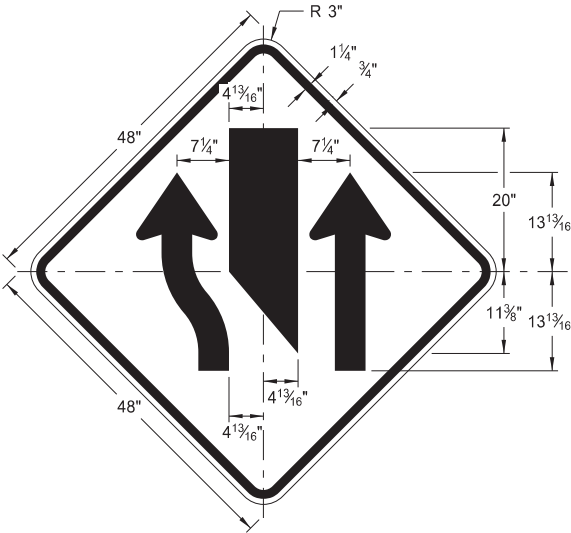
W5-9-48

Legend: black (non-refl)
Background: orange



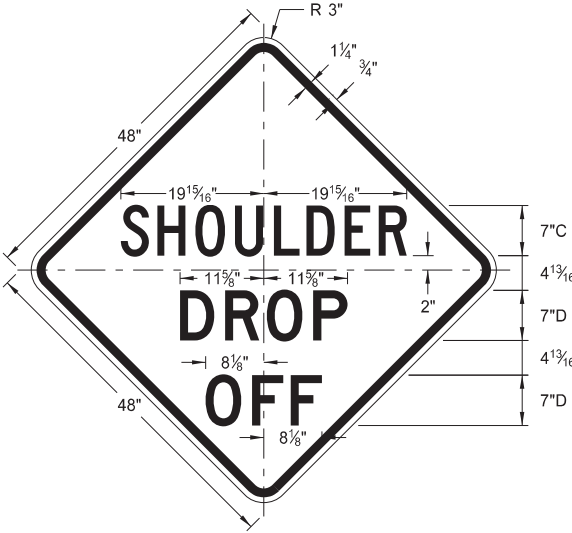
W8-54-48

Legend: black (non-refl)
Background: orange



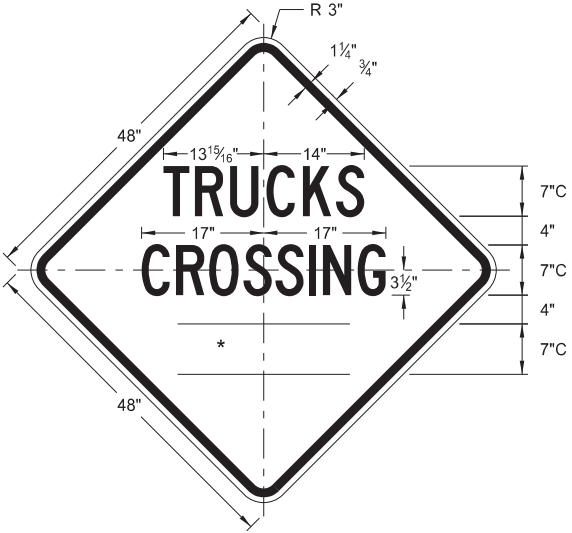
W9-3a-48

Legend: black (non-refl)
Background: orange



W8-9a-48

Legend: black (non-refl)
Background: orange

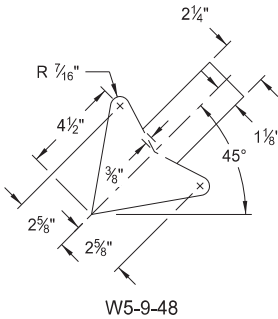


W8-55-48

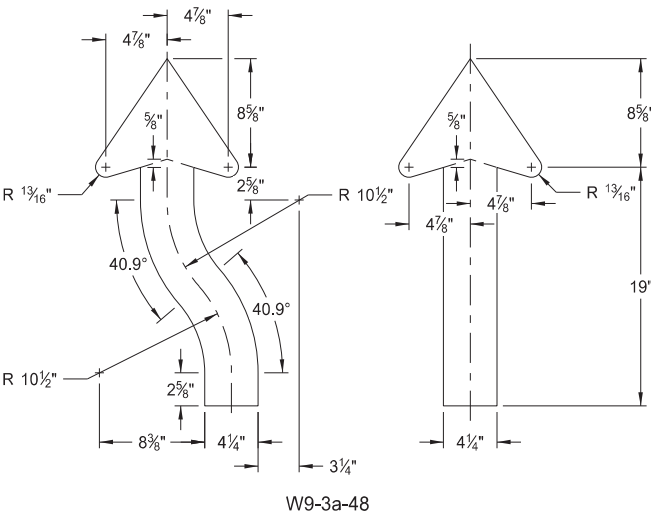
Legend: black (non-refl)
Background: orange

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

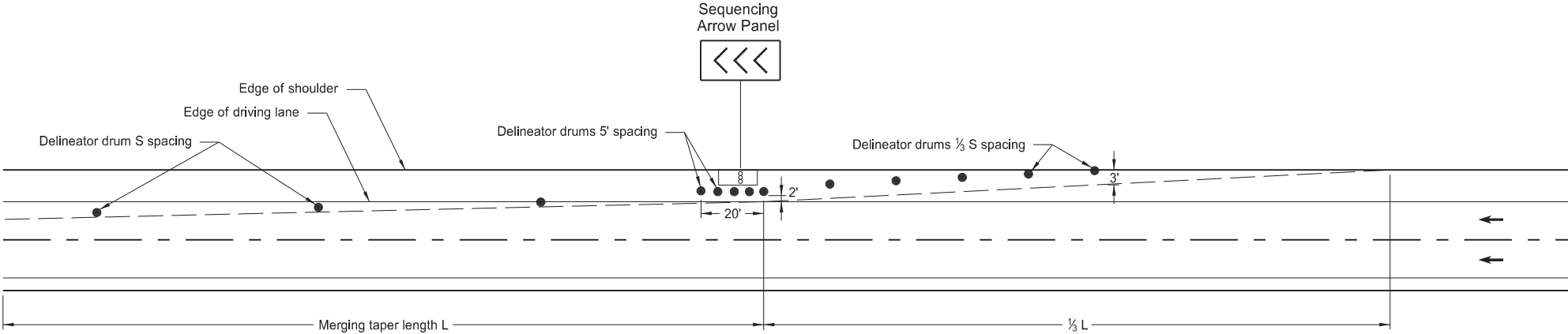
ARROW DETAILS

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

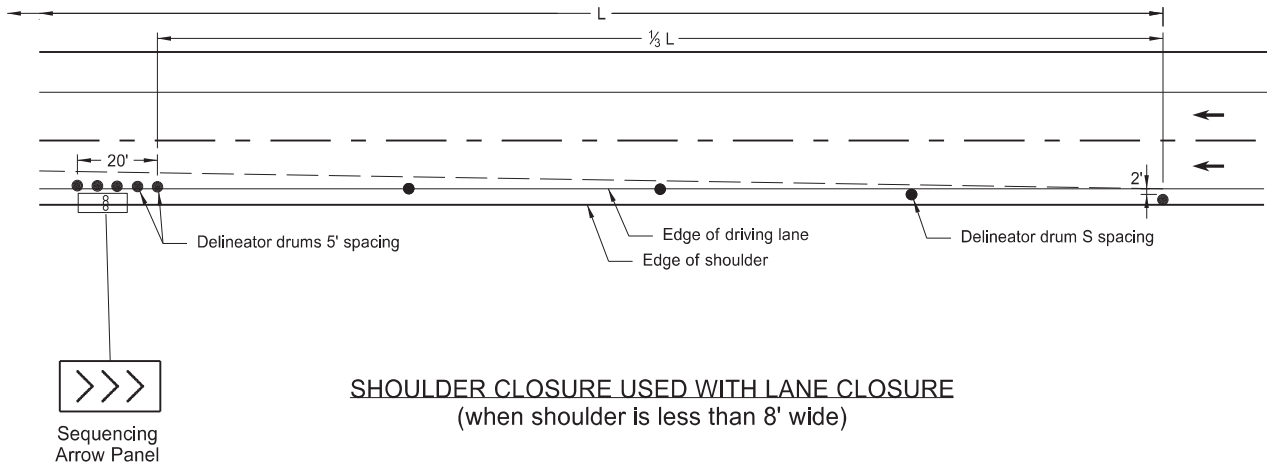
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SHOULDER CLOSURE TAPERS

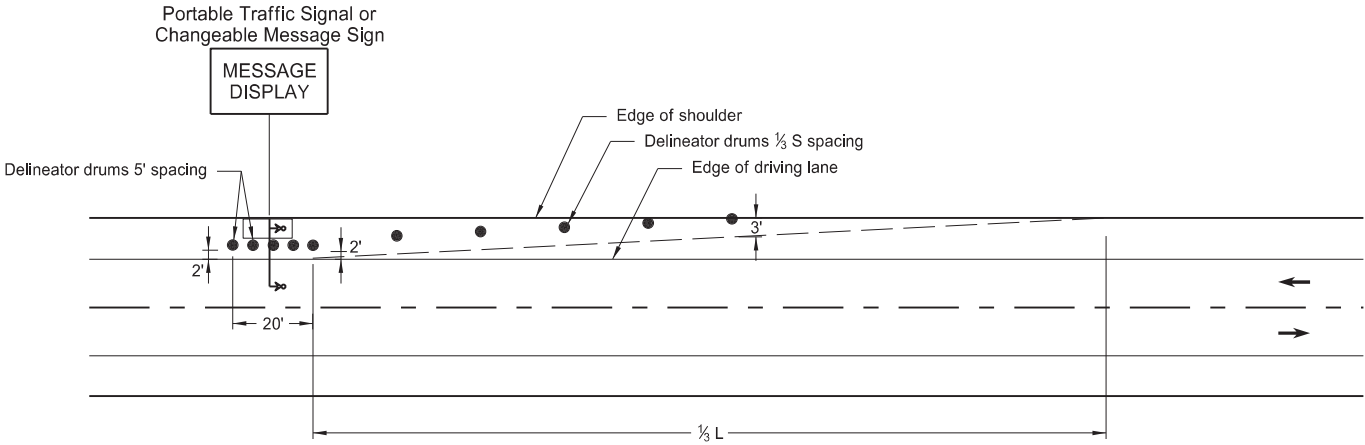
D-704-12



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
- LT Portable Traffic Signal

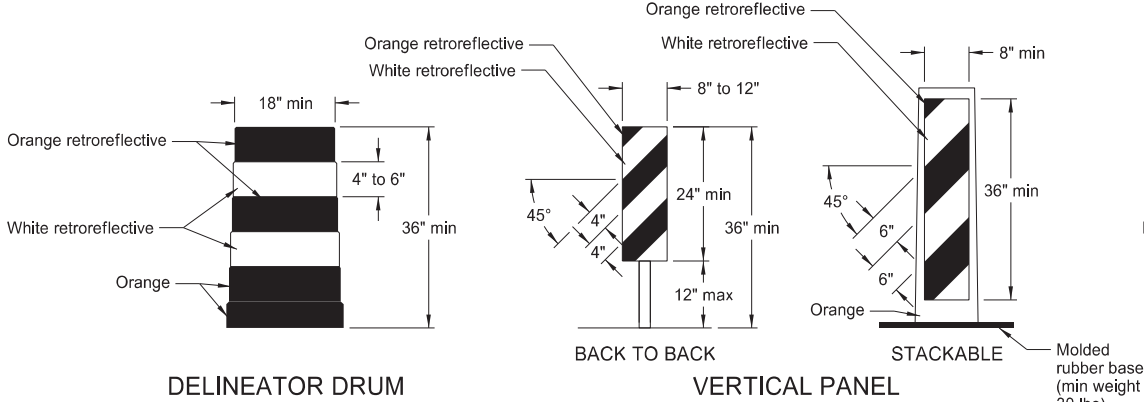
Notes:

- 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)
- If a shoulder taper is used, use a length of approximately $1/3L$. If a shoulder is used as a travel lane, use a normal merging or shifting taper.
- 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

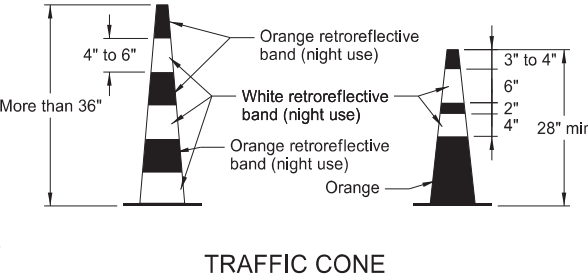
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BARRICADE AND CHANNELIZING DEVICE DETAILS

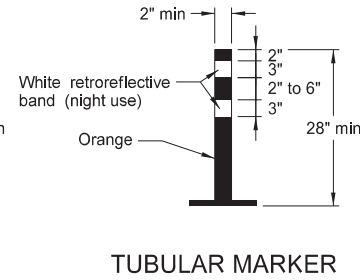


Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectORIZED spaces between the horizontal orange and 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.

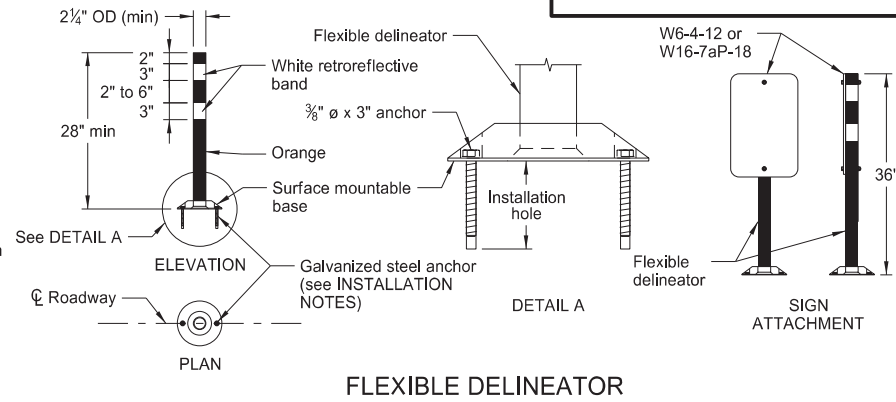
Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective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



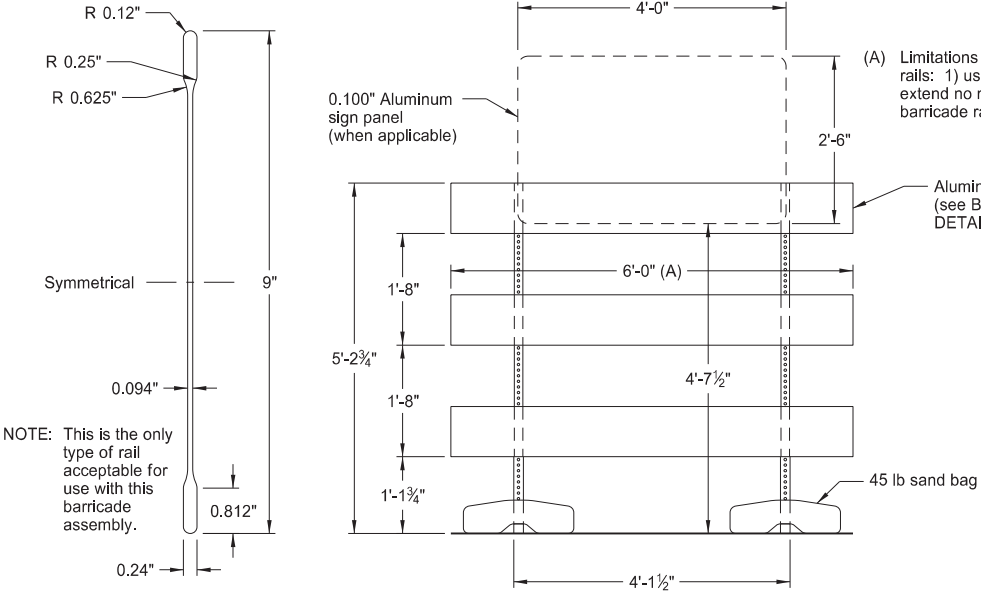
Provide retroreflectORIZATION of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectORIZED space between the orange and white stripes.



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.



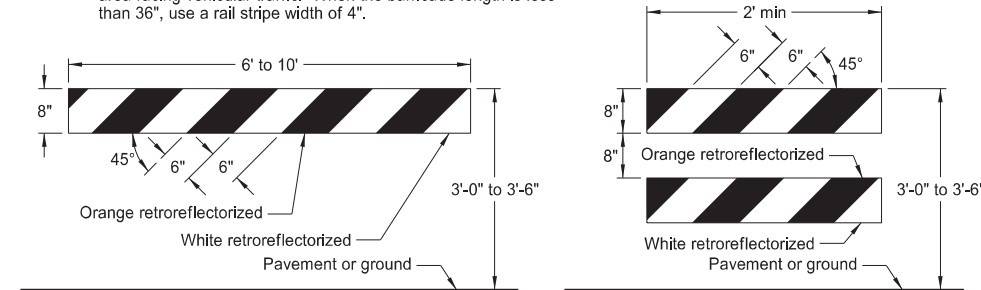
- INSTALLATION NOTES:
1. Drill installation holes to diameter and depth required by manufacturer's specifications.
 2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
 3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl.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



BARRICADE BLADE DETAIL

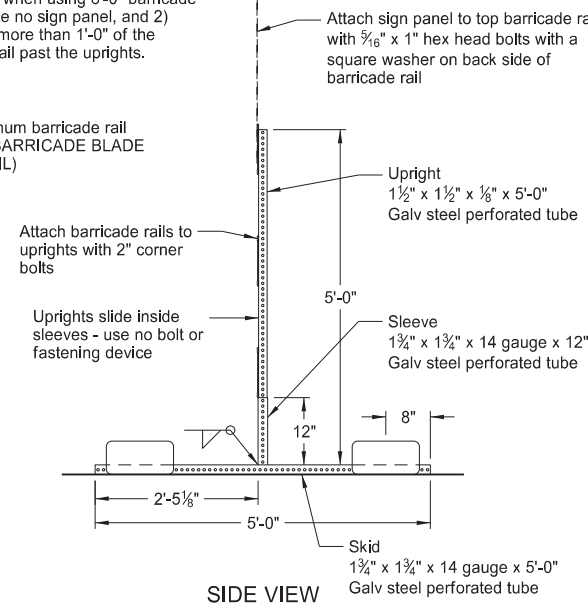
BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

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".

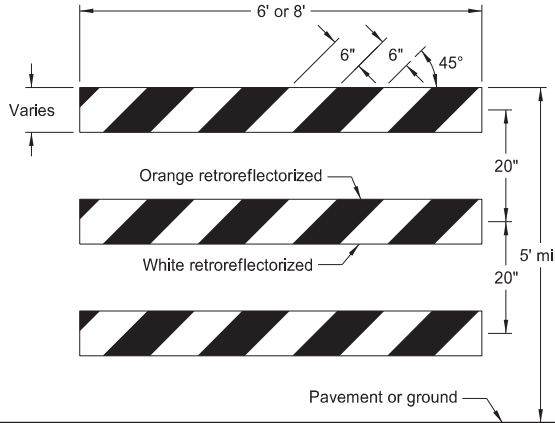


TYPE I BARRICADE

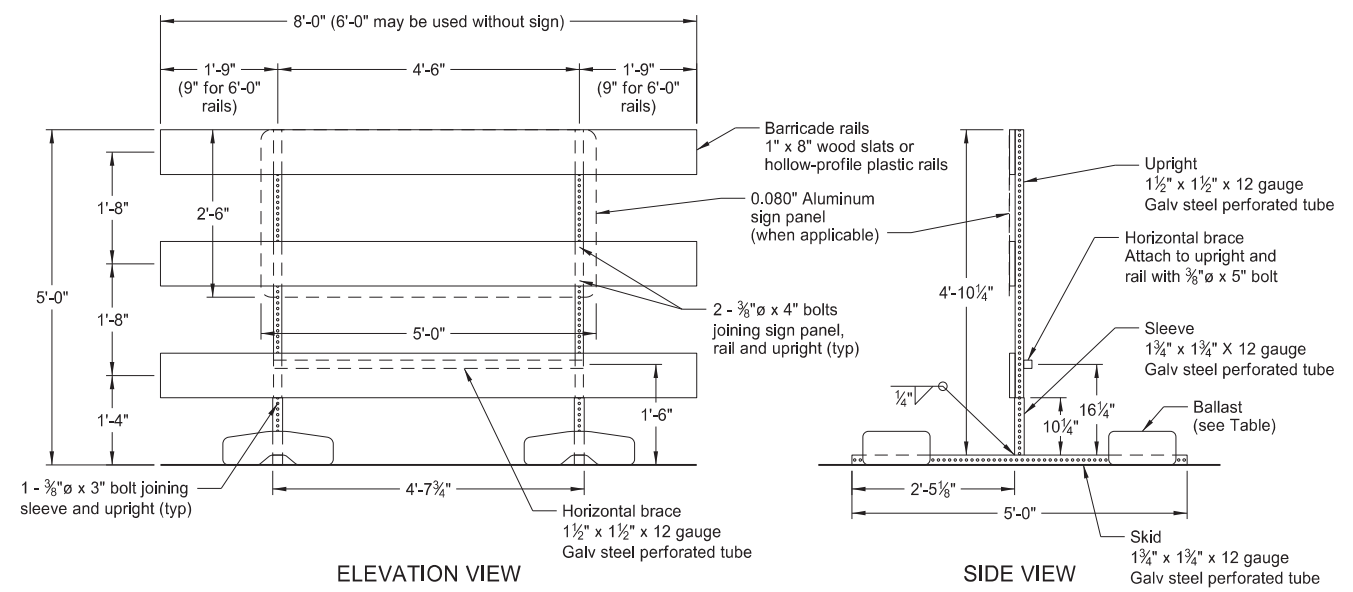
TYPE II BARRICADE
BARRICADE RAIL DETAILS



SIDE VIEW



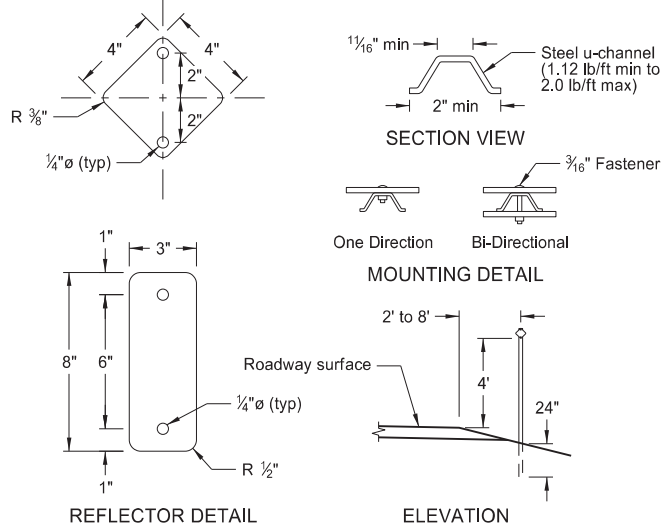
TYPE III BARRICADE



ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW



REFLECTOR DETAIL

ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

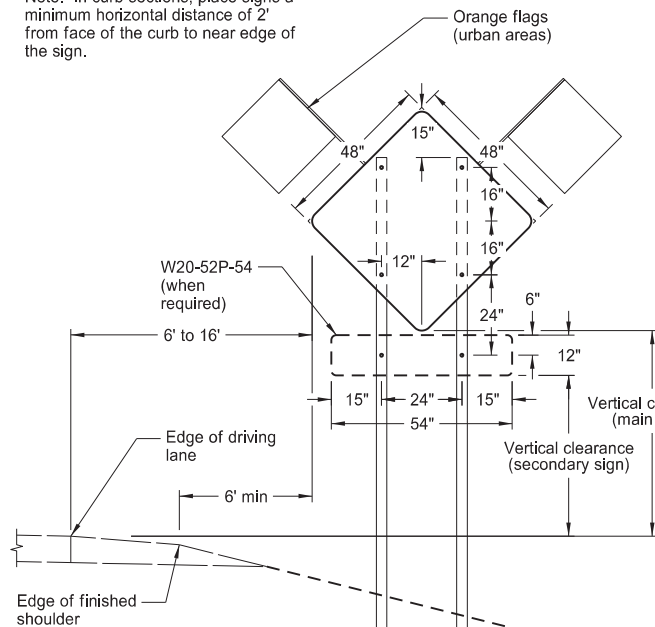
Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

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

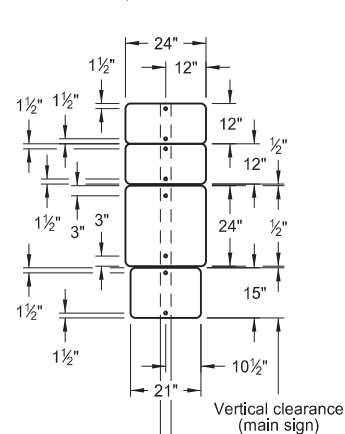
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

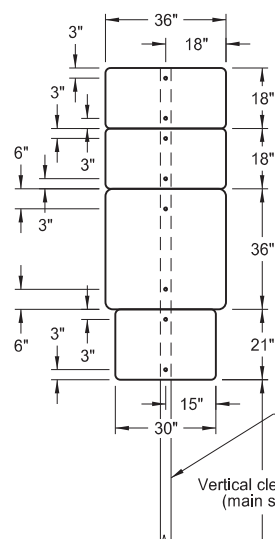
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



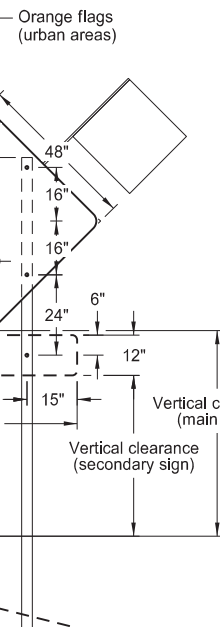
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



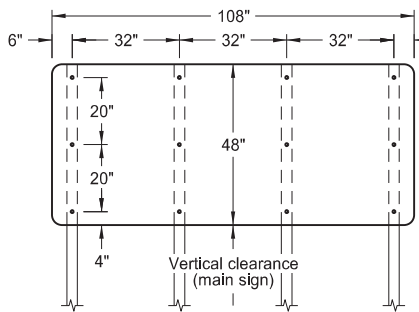
24" x 24"
ROUTE MARKER
ASSEMBLY



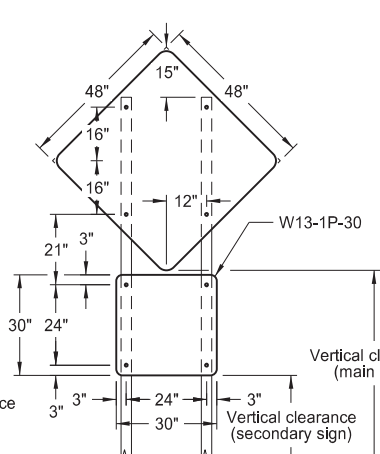
36" x 36"
ROUTE MARKER
ASSEMBLY



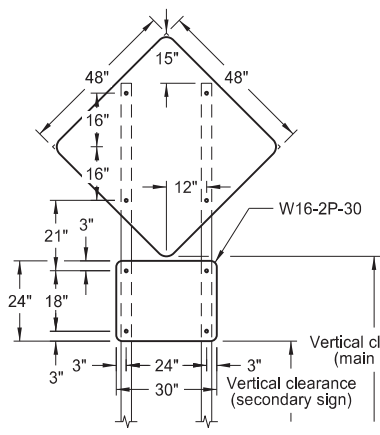
18" x 18"
DIAMOND SIGN



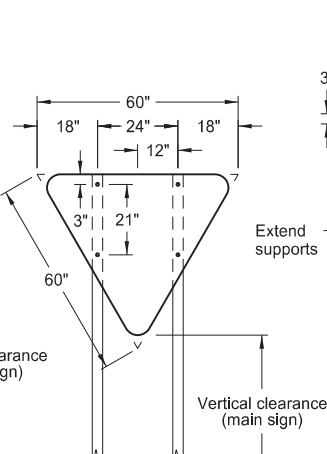
108" x 48" SIGN



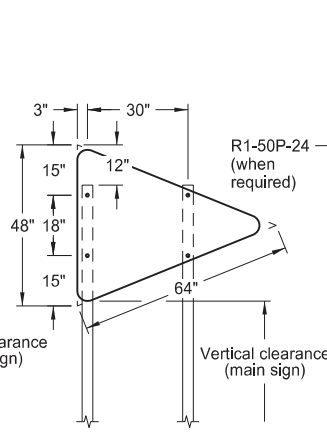
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



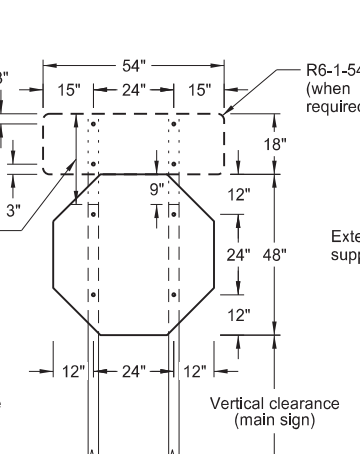
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



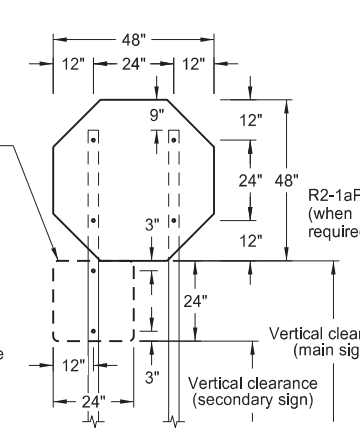
R1-2-60 - YIELD SIGN



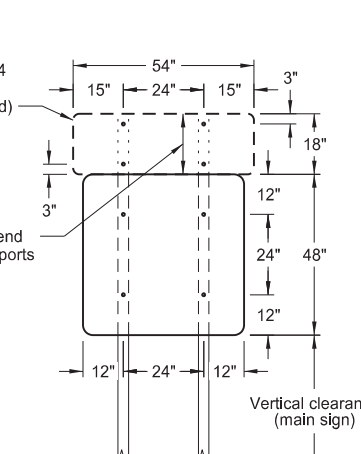
W14-3-64 - PENNANT SIGN



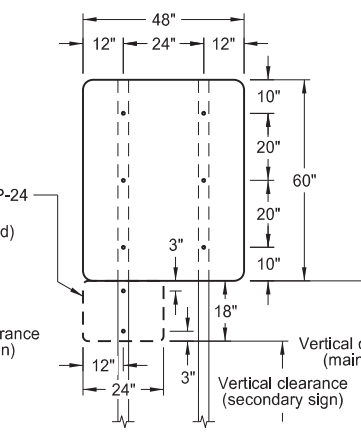
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



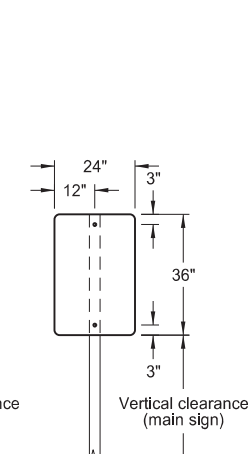
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



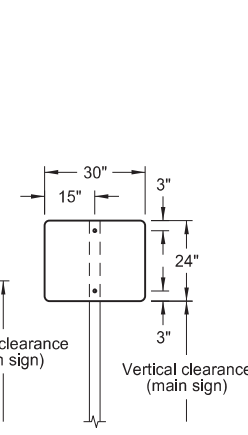
48" x 48" SIGN
(with R6-1-54 sign as required)



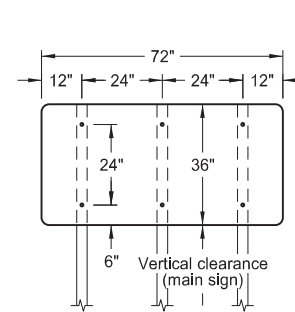
48" x 48" SIGN
(with R2-1aP-24 sign as required)



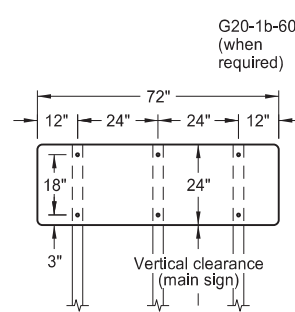
24" x 36" SIGN



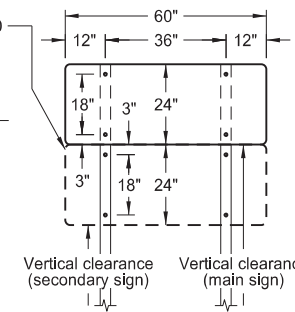
30" x 24" SIGN



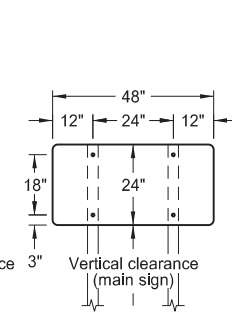
72" x 36" SIGN



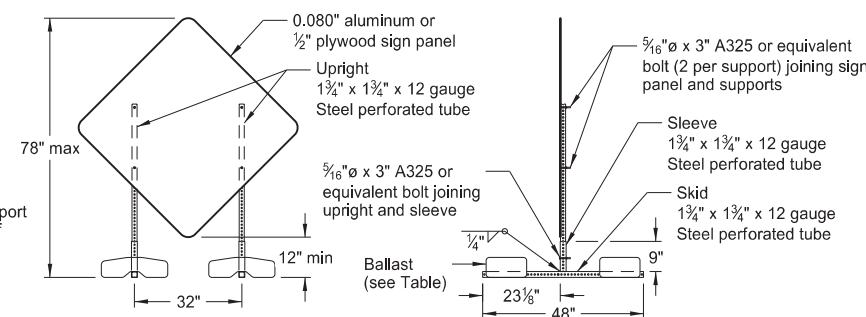
72" x 24" SIGN



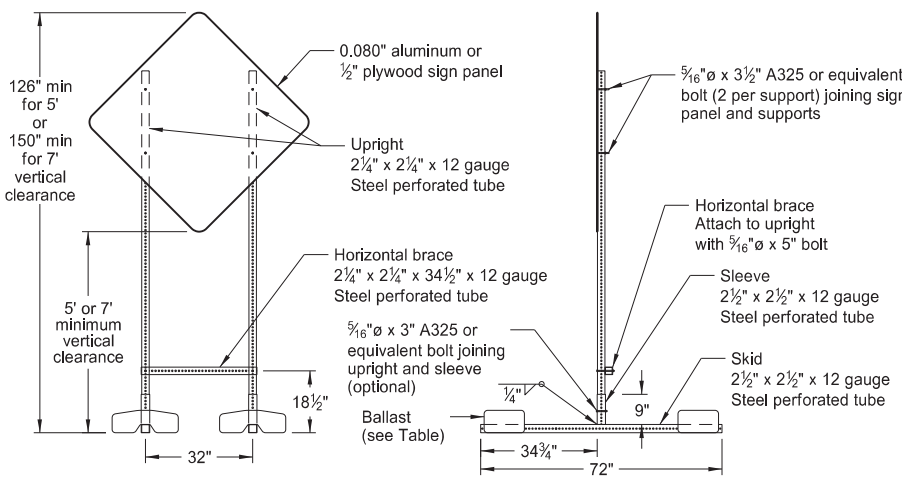
60" x 24" SIGN



48" x 24" SIGN



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 ⅝" 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 unforeseen 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

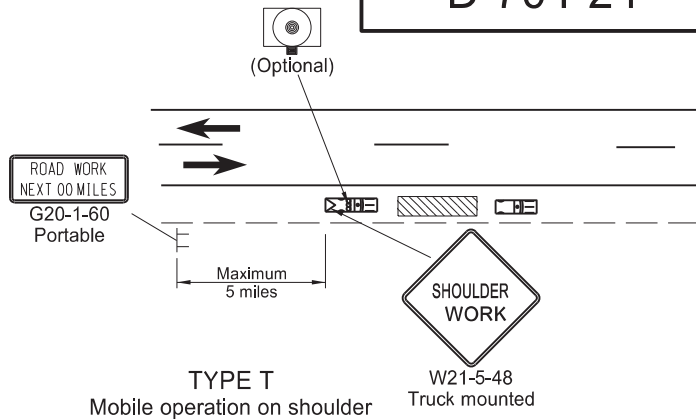
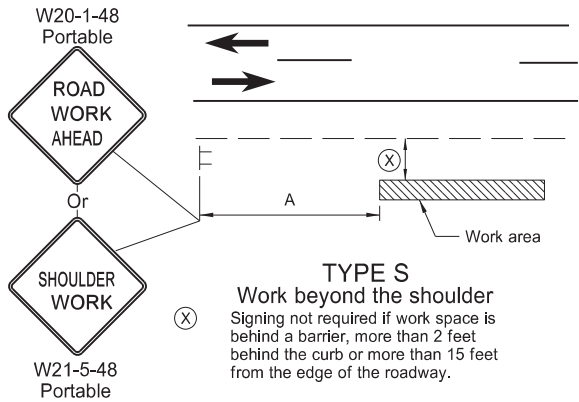
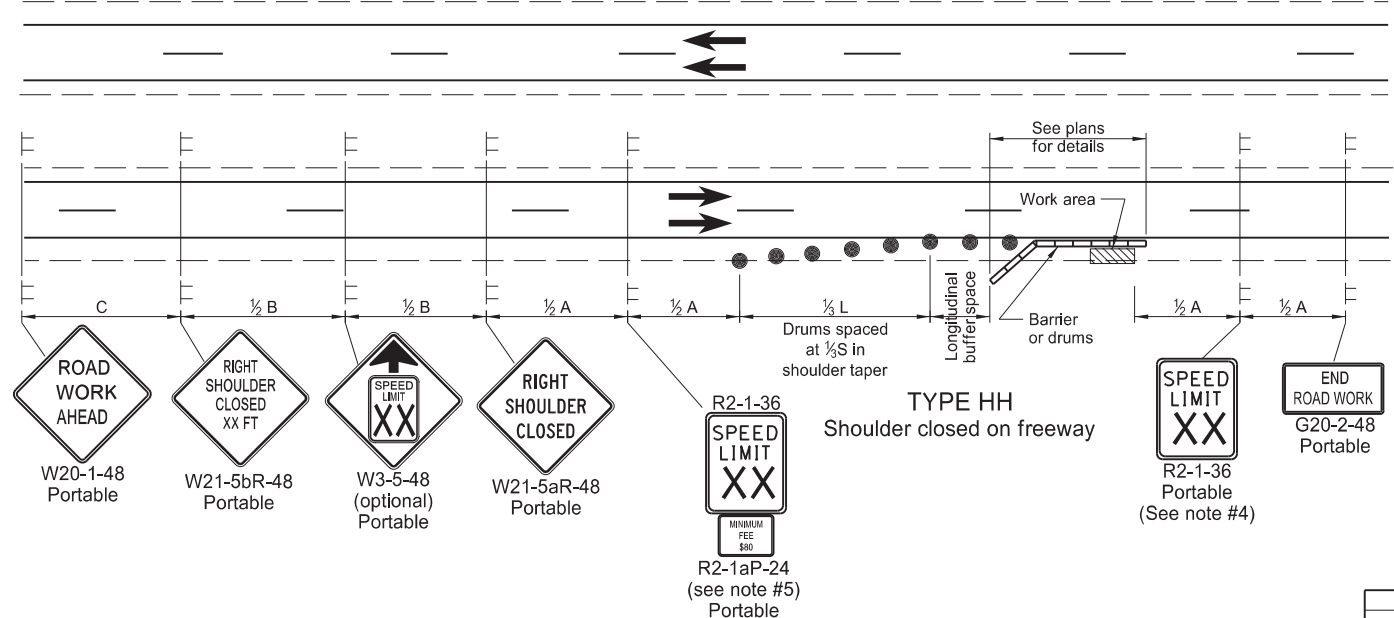
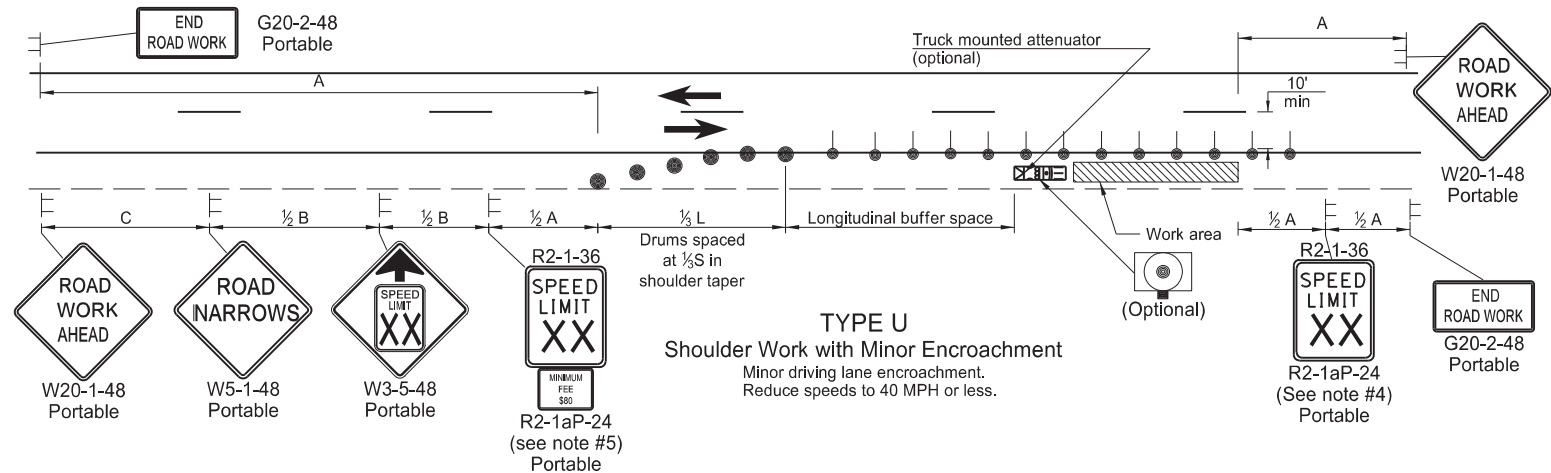
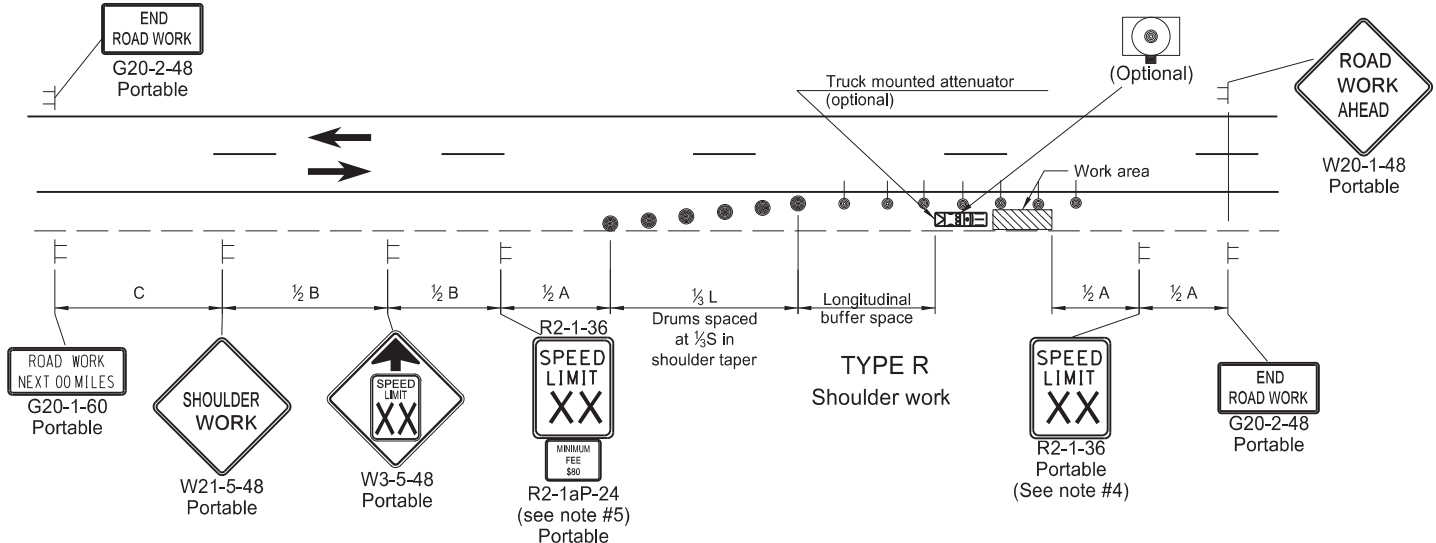
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

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

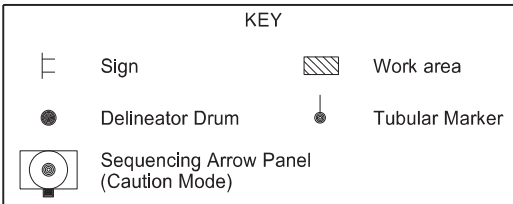
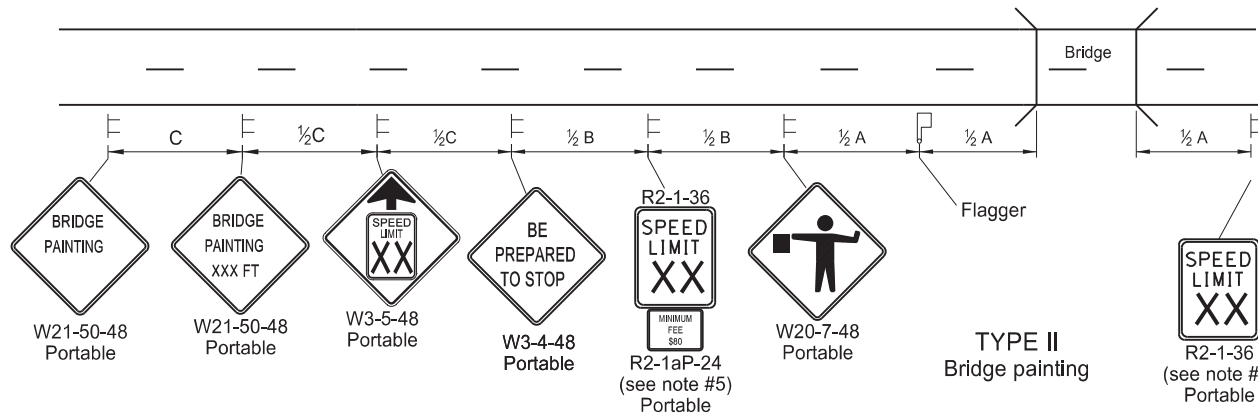
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Kirk J Hoff,
Registration Number
PE-4683,
on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS



- Notes
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of the taper in feet.
 - L = Minimum length of taper, $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
 - Sequencing Arrow Panels
 - 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).
 - Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
 - 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 1/2 B.
 - 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.
 - Cover existing speed limit signs within a reduced speed zone.
 - As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
 - Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

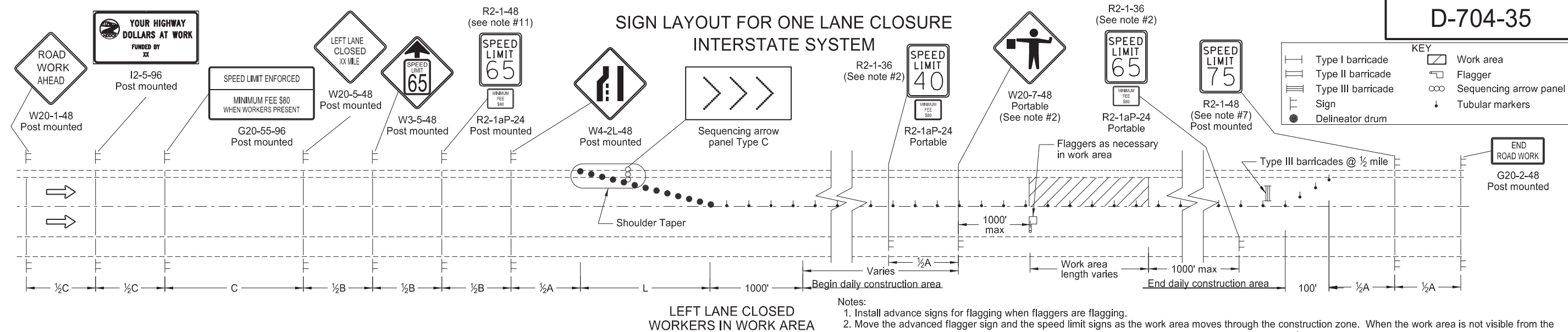


ADVANCE WARNING SIGN SPACING				
Road Type	Distance Between Signs			
	A	B	C	
Urban - Low Speed (30 mph or less)	150	150	150	
Urban - Low Speed (over 30 to 40 mph)	280	280	280	
Urban - High Speed (over 40 mph to 50 mph)	360	360	360	
Rural - High Speed (over 50 mph to 65 mph)	720	720	720	
Urban Expressway 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	

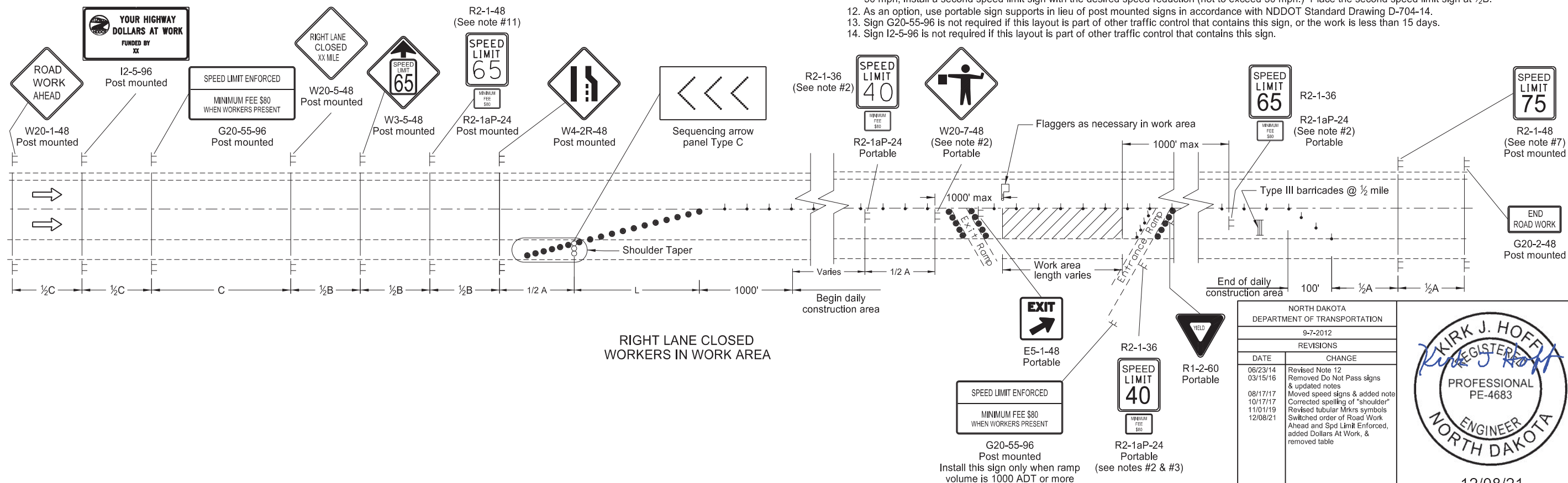
Longitudinal Buffer Space	
Speed (mph)	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
8-17-17 11-01-19	Updated notes & revised signs Revised drum spacing & signs nos.

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Kirk J Hoff,
Registration Number
PE- 4683,
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of Transportation



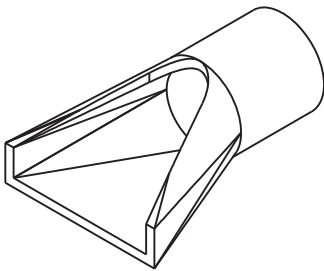
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance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



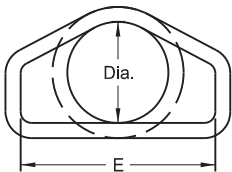
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-7-2012	
REVISIONS	
DATE	CHANGE
06/23/14	Revised Note 12
03/15/16	Removed Do Not Pass signs & updated notes
08/17/17	Moved speed signs & added note
10/17/17	Corrected spelling of "shoulder"
11/01/19	Revised tubular Mtrks symbols
12/08/21	Switched order of Road Work Ahead and Spd Limit Enforced, added Dollars At Work, & removed table



FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0 ⁷ / ₈ "	6'-0 ⁷ / ₈ "	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2 ¹ / ₄ "
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2 ¹ / ₂ "
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2 ³ / ₄ "
24	0'-9 ¹ / ₂ "	3'-7 ¹ / ₂ "	2'-6"	6'-1 ¹ / ₂ "	4'-0"	3"
27	0'-10 ¹ / ₂ "	4'-0"	2'-1 ¹ / ₂ "	6'-1 ¹ / ₂ "	4'-6"	3 ¹ / ₂ "
30	1'-0"	4'-6"	1'-7 ³ / ₄ "	6'-1 ³ / ₄ "	5'-0"	3 ¹ / ₂ "
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4 ¹ / ₂ "
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9 ¹ / ₂ "	8'-2 ¹ / ₄ "	7'-6"	5 ¹ / ₂ "
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5 ¹ / ₂ "
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6 ¹ / ₂ "
84	3'-0"	7'-6 ¹ / ₂ "	1'-9"	9'-3 ¹ / ₂ "	10'-0"	6 ¹ / ₂ "
90	3'-5"	7'-3 ¹ / ₂ "	2'-0"	9'-3 ¹ / ₄ "	11'-0"	6 ¹ / ₂ "

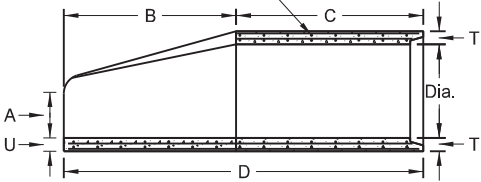


PERSPECTIVE

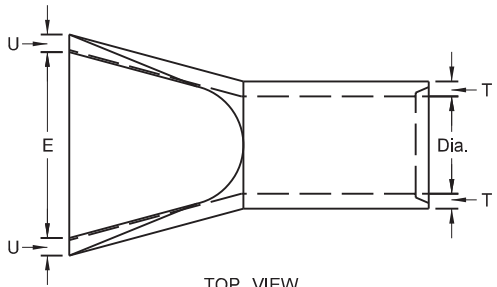


END VIEW

Standard Reinforcement for Class III pipe reinforced as per AASHTO M170



SIDE VIEW



TOP VIEW

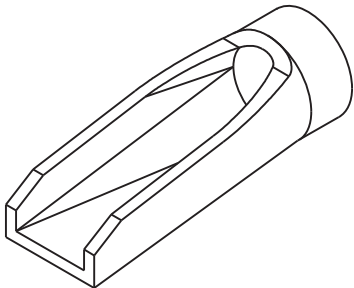
NOTES:

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.

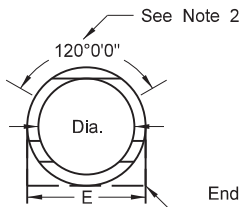
REINFORCED CONCRETE PIPE - FLARED END SECTION

Reinforcement to be equivalent to Class III RCP

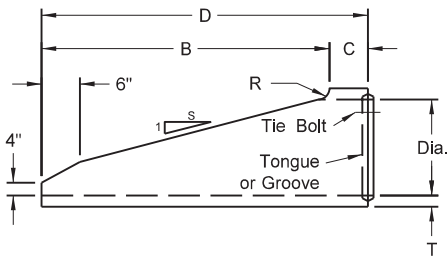
TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7 ¹ / ₂ "	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3 ¹ / ₂ "	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



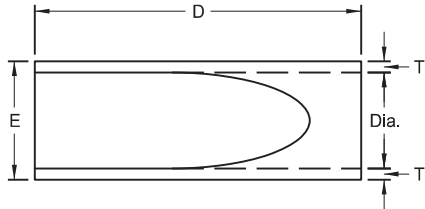
PERSPECTIVE



END VIEW



SIDE VIEW



TOP VIEW

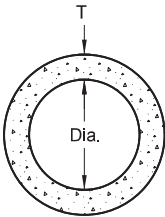
NOTES (Traversable End Section):

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.

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION

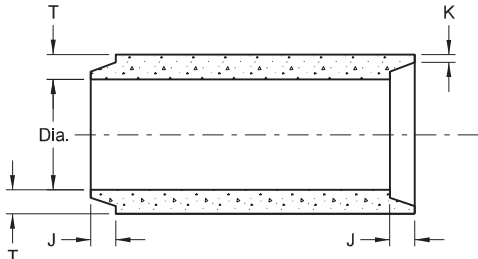
Reinforcement to be equivalent to Class III RCP

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 Min.	Minimum Wall Thickness (T)	
Dia	Sq. ft.	Lbs.	In.	In.	In.	
12	0.79	92	1 ⁵ / ₈ -2 ³ / ₈	³ / ₄	2	
15	1.23	127	1 ³ / ₈ -2 ³ / ₄	⁷ / ₈	2 ¹ / ₄	
18	1.77	168	1 ¹ / ₈ -2 ¹ / ₂	1	2 ¹ / ₂	
21	2.40	214	1 ¹ / ₈ -3 ¹ / ₈	1 ¹ / ₈	2 ³ / ₄	
24	3.14	265	2 ³ / ₄ -3 ¹ / ₄	1 ¹ / ₈	3	
27	3.98	322	2 ³ / ₄ -4	1 ¹ / ₄	3 ¹ / ₄	
30	4.91	384	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₄	3 ¹ / ₂	
33	5.94	452	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₂	3 ³ / ₄	
36	7.07	524	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₂	4	
42	9.62	685	3 ¹ / ₄ -4 ¹ / ₄	1 ³ / ₄	4 ¹ / ₂	
48	12.57	685	3 ¹ / ₄ -4 ¹ / ₄	1 ¹ / ₈	5	
54	15.90	1070	4 ¹ / ₈ -5 ¹ / ₄	2	5 ¹ / ₂	
60	19.63	1296	4 ¹ / ₂ -5 ¹ / ₂	2 ¹ / ₄	6	
66	23.76	1542	5-6	2 ⁵ / ₈	6 ¹ / ₂	
72	28.27	1810	5 ⁵ / ₈ -6 ³ / ₄	2 ⁵ / ₈	7	
78	33.18	2098	6 ¹ / ₄ -7 ¹ / ₄	2 ⁵ / ₈	7 ¹ / ₂	
84	38.48	2410	5 ⁵ / ₈ -7 ¹ / ₄	3 ³ / ₈	8	
90	44.18	2793	6 ³ / ₄ -8 ¹ / ₂	3 ³ / ₈	8 ¹ / ₂	
96	50.27	3092	7-8 ¹ / ₄	3 ¹ / ₂	9	
102	56.75	3466	7-8 ¹ / ₄	3 ¹ / ₂	9 ¹ / ₂	
108	63.62	3864	7 ¹ / ₄ -8 ¹ / ₂	3 ³ / ₄	10	

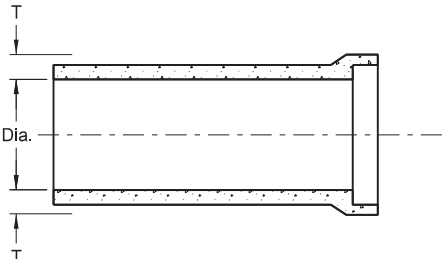


END VIEW

CIRCULAR PIPE

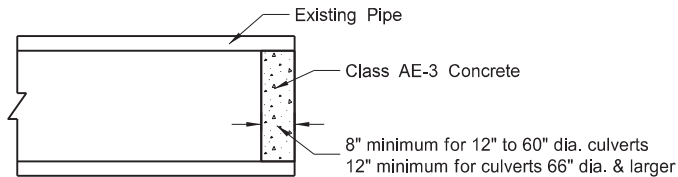


TONGUE & GROOVE JOINT



BELL & SPIGOT JOINT

JOINTS FOR REINFORCED CONCRETE PIPE

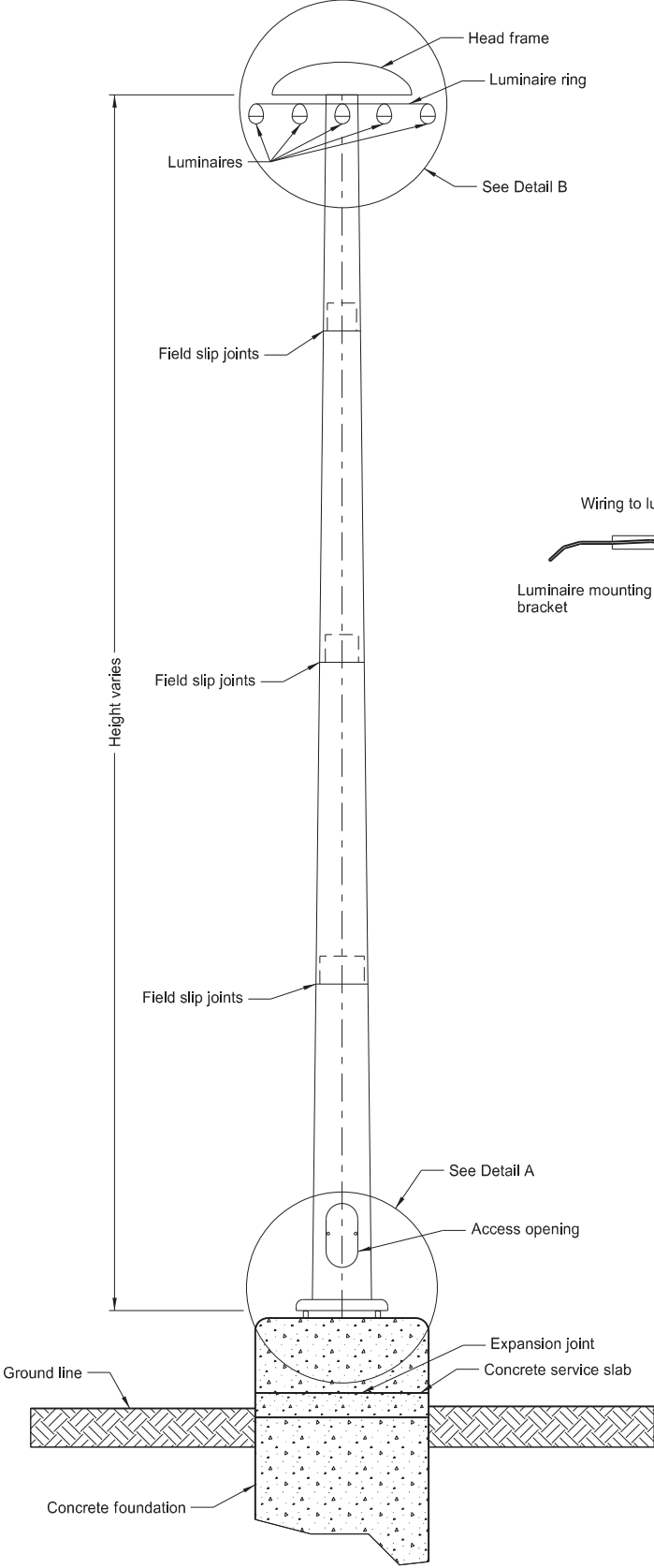


CONCRETE PIPE PLUG

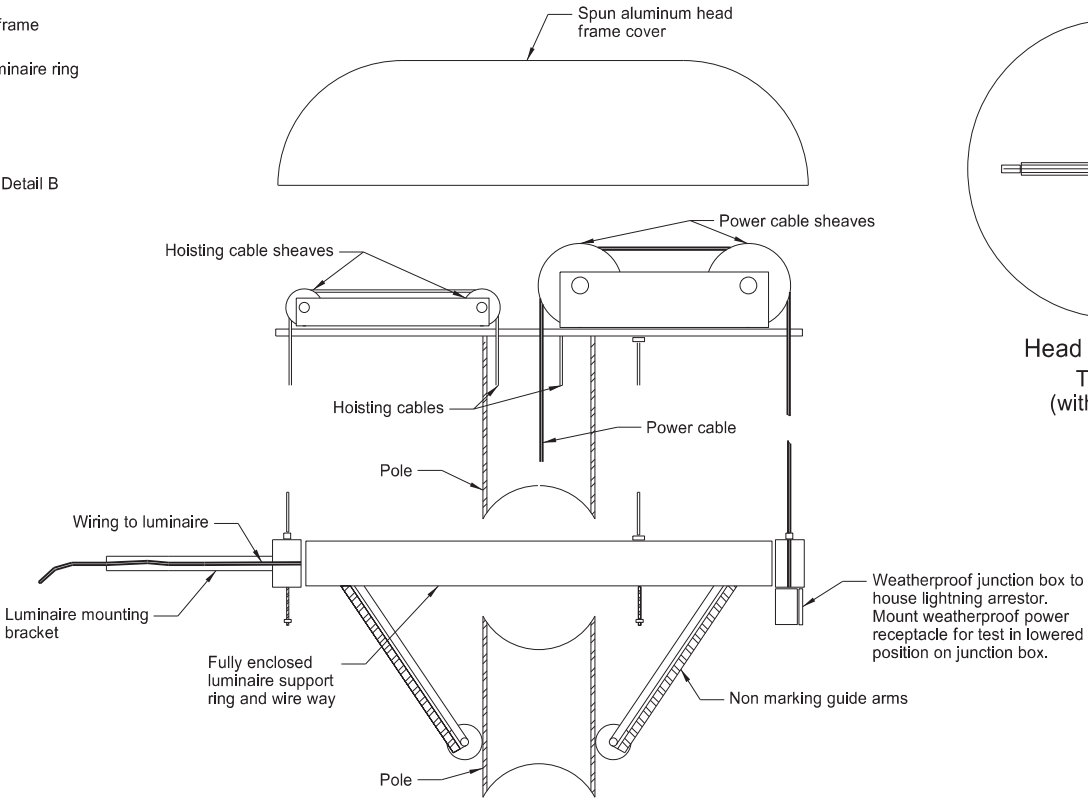
SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

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

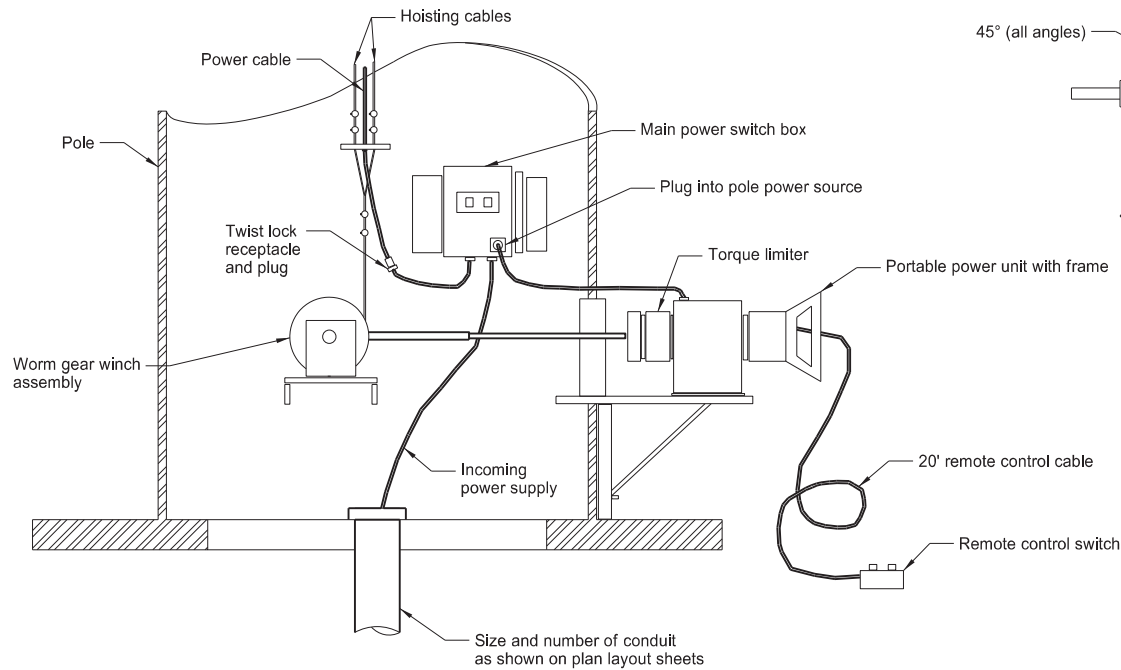
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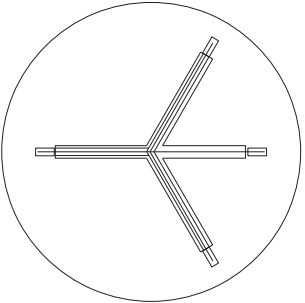
High Mast Lighting Pole Detail



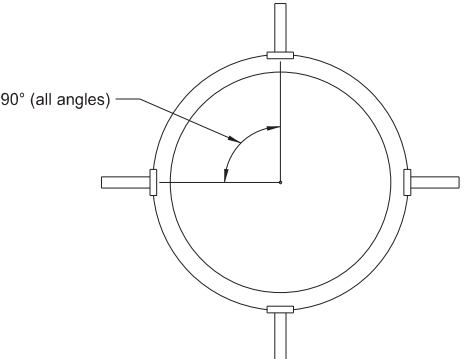
Detail B
Head Frame and Luminaire Ring
(section through pole)



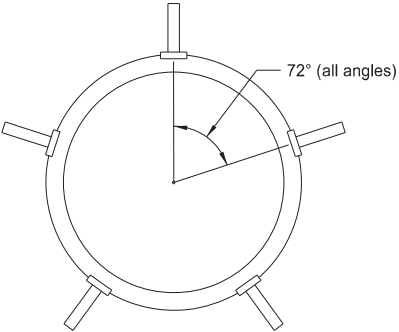
Detail A
Lowering Device
(section through base)



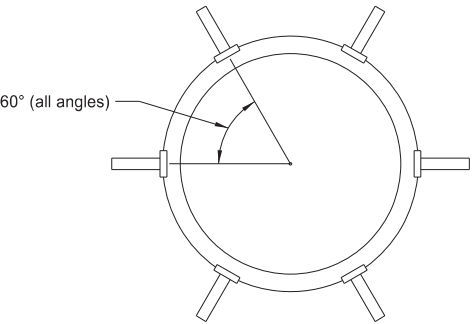
Head Frame Detail
Top View
(without cover)



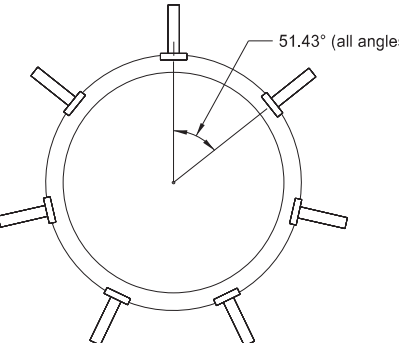
For 4 Luminaires



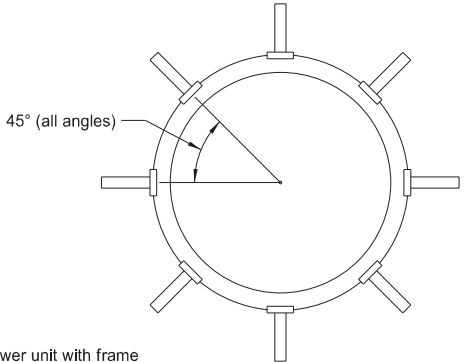
For 5 Luminaires



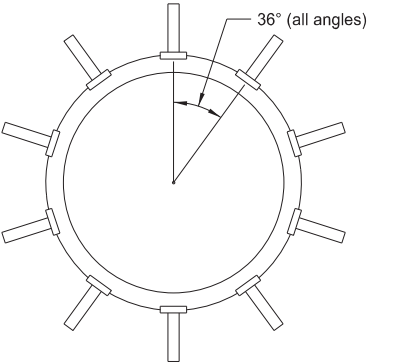
For 6 Luminaires



For 7 Luminaires



For 8 Luminaires

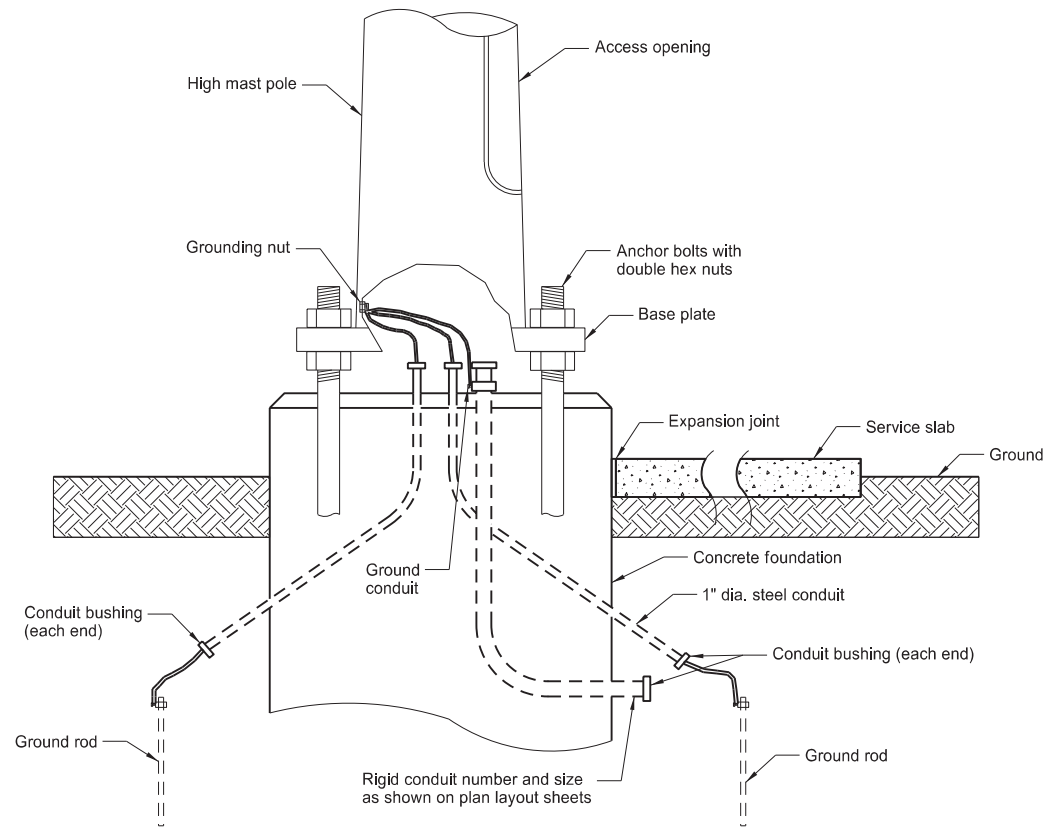


For 10 Luminaires

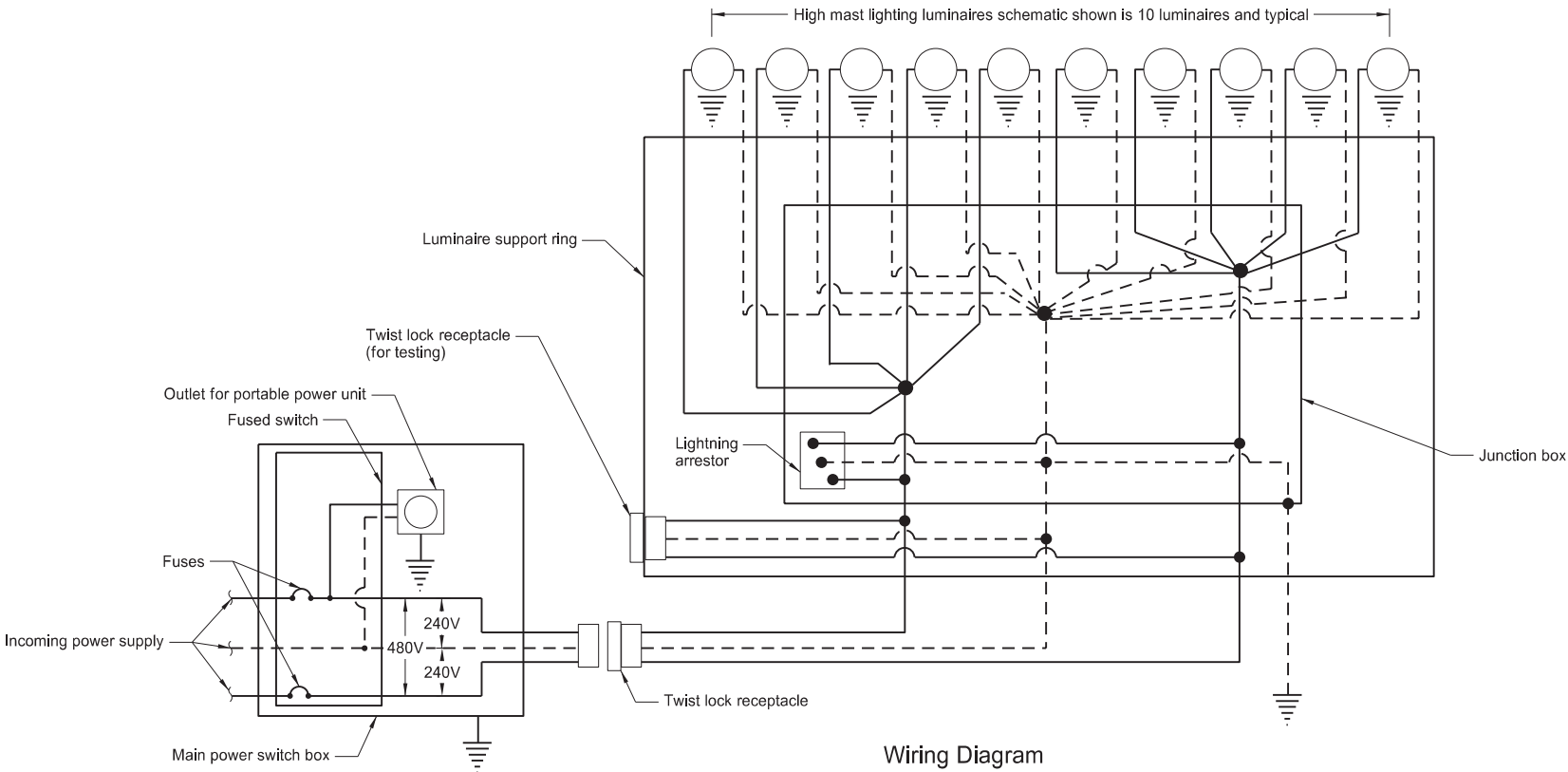
Luminaire Support Ring Details

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.

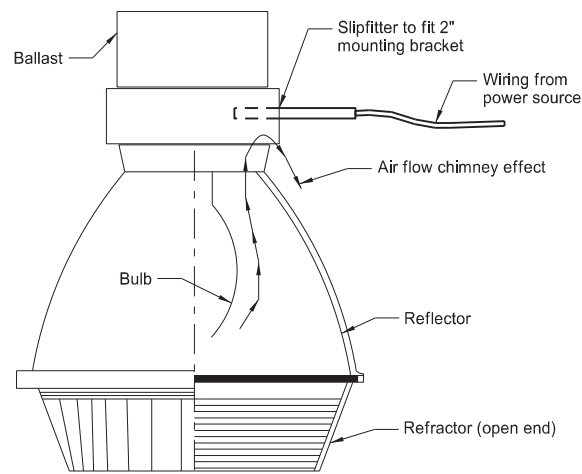
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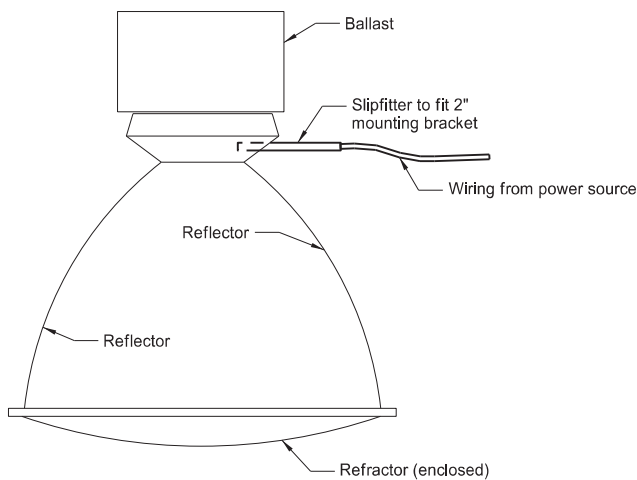
Conduit and Grounding Detail at Base



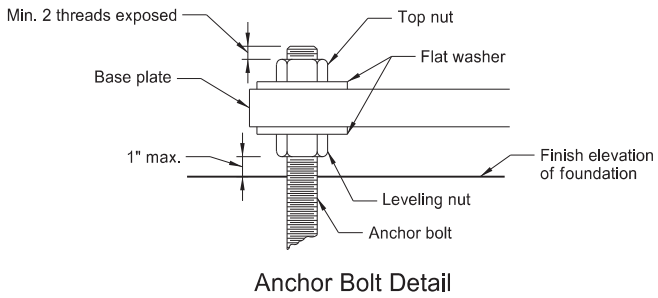
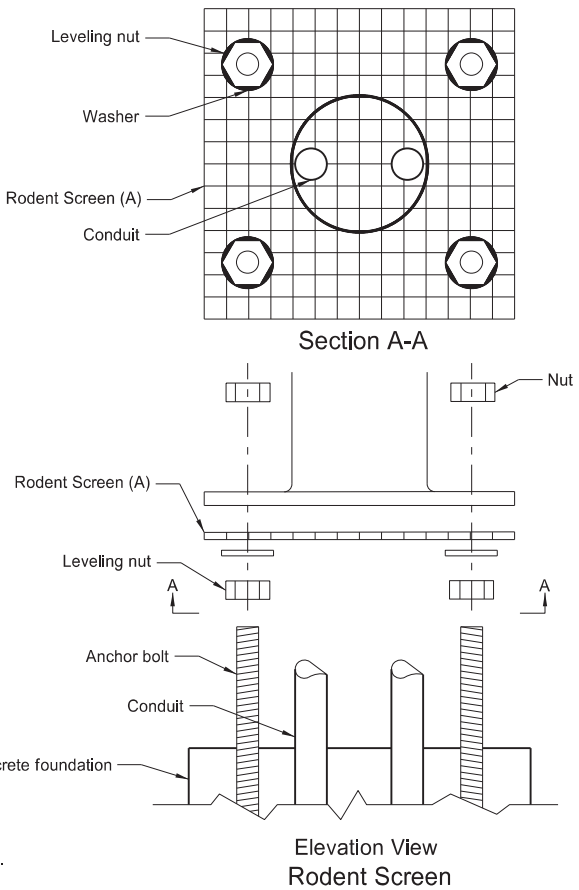
Wiring Diagram



Typical Luminaire Details
(1000 watt)



(A) 1/4"x1/4" galvanized steel welded wire fabric (wire dia. 0.025") cut same size as base plate and form tightly around the conduit.



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

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