

**JOB# 9
NORTH DAKOTA**

DEPARTMENT OF TRANSPORTATION

SHE-3-057(048)000

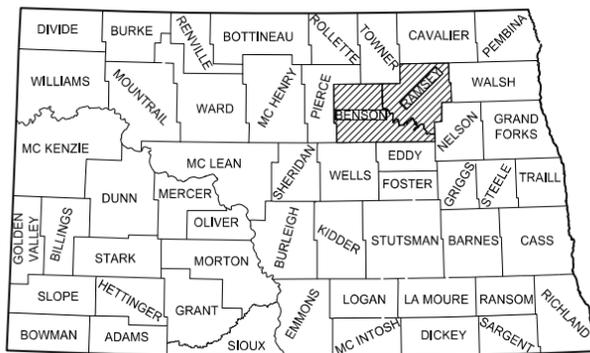
FHWA Partial Involvement
Benson County & Ramsey County
Surveillance Camera System,
Environmental Sensor Station, and Gate Installation

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	18753	1	1

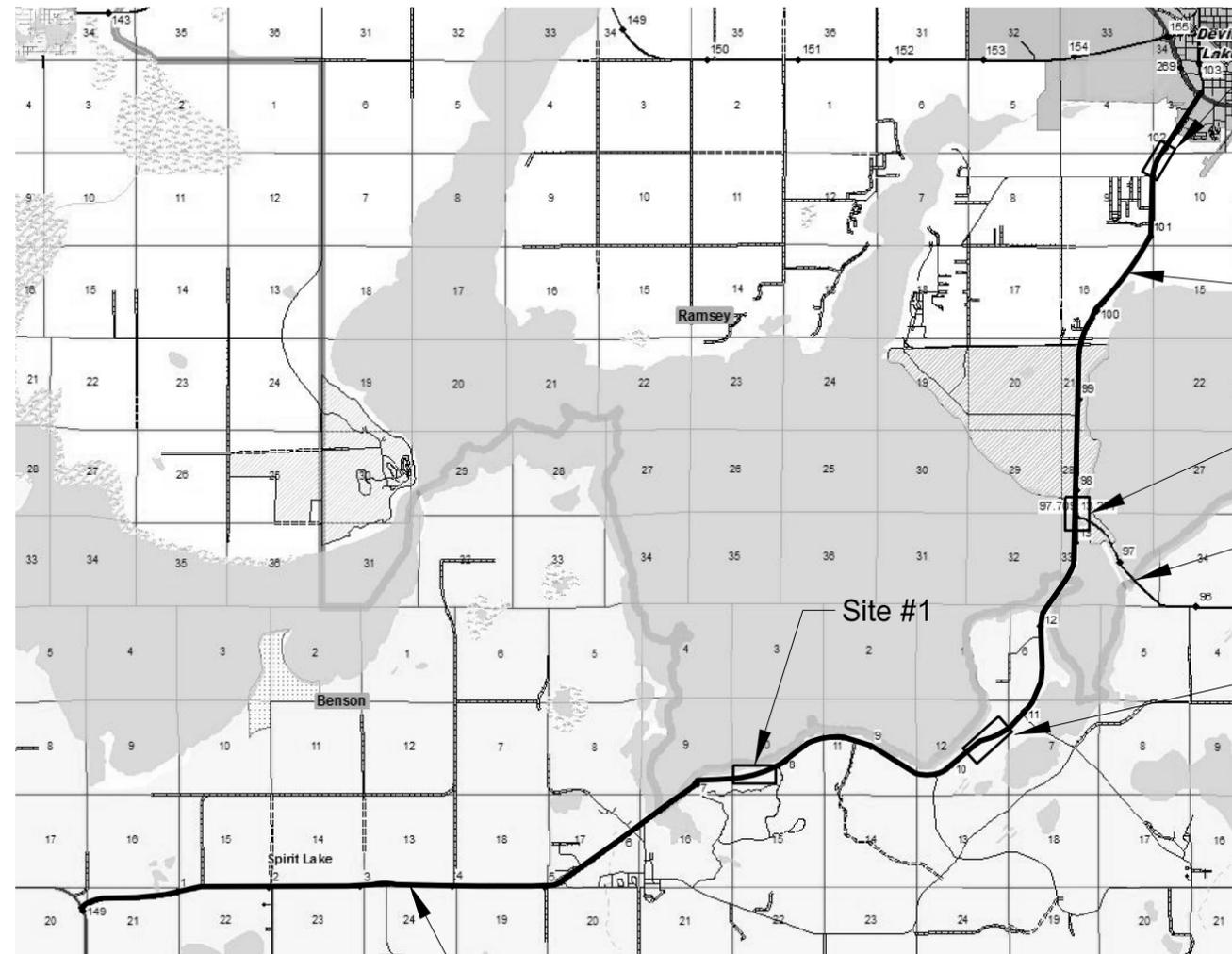
GOVERNING SPECIFICATIONS:

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

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SHE-3-057(048)000		

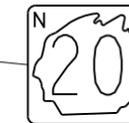


STATE COUNTY MAP



Site #4 & Site #5

LEGAL DESCRIPTION
T153N R64W - 32,28,21,16,10,9,3 T152N R64W - 6,7
T152N R65W - 19,18,17,16,12,11,10,9
T152N R66W - 23,22,21,15,14,13



Site #3



Site #2



DESIGNERS

Erik Minge /s/

Scott Petersen /s/

Jacob Nordick /s/

Mark Wagner /s/

Nick Grae /s/

APPROVED DATE 6/20/2013

Bradley Darr /s/
OFFICE OF PROJECT DEVELOPMENT
ND DEPARTMENT OF TRANSPORTATION

I hereby certify that the attached plans were prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of ND.

APPROVED DATE 6/19/2013

Erik D. Minge /s/
SRF CONSULTING GROUP, INC.

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SHE-3-057(048)000	2	1

TABLE OF CONTENTS

<u>Section No.</u>	<u>Sheet No.</u>	<u>Description</u>
1	1	Title Sheet
2	1	Table of Contents, List of Standard Drawings, List of Special Provisions
4	1-2	Scope of Work
6	1	Notes
6	2	Environmental Commitments
8	1	Estimate of Quantities
30	1	Existing Typical
100	1	Traffic Control Device List
110	1	Sign Summary
110	2	Sign Details
160	1-5	ITS Improvements - Proposed ITS Layout Sites 1-5
160	6-10	ITS Details - Drop Arm Road Closure Gate
160	11	ITS Details - Detail for Installation of ITS Hardware Near Riprap
160	12	ITS Details - Feed Point & Trench Details
160	13	ITS Details - ESS Details
160	14	ITS Details - ESS Sensors, Cabinet Foundation and Working Slab
160	15	ITS Details - Communications Schematics

LIST OF STANDARD DRAWINGS

<u>Standard No.</u>	<u>Description</u>
D-20-1, 2, 3	NDDOT Abbreviations
D-20-10	NDDOT Utility Company Abbreviations
D-20-20, 21	Line Styles
D-20-30, 31, 32	Symbols
D-704-7, 8	Breakaway Systems for Construction Zone Signs
D-704-9, 10, 11, 12, 12A	Construction Sign Details
D-704-13	Barricade Details and Channelizing Devices
D-704-14	Construction Sign and Barricade Assembly Details
D-704-19, 24	Construction Sign and Barricade Location Details
D-704-50	Portable Sign Support Assembly
D-754-1	Pipe of W-Shape Assembly Details
D-754-13	Structural Details W-Shape Supports
D-754-14	Wind Beams and Anchor Plates for W-Shape Supports
D-754-23	Assembly Details
D-770-1	Concrete Foundations - Traffic Signals and Highway Lighting
D-770-3	Pull Box Details
D-772-7	Flashing Beacon
D-900-3	Road Closure Gate Detail

SPECIAL PROVISIONS

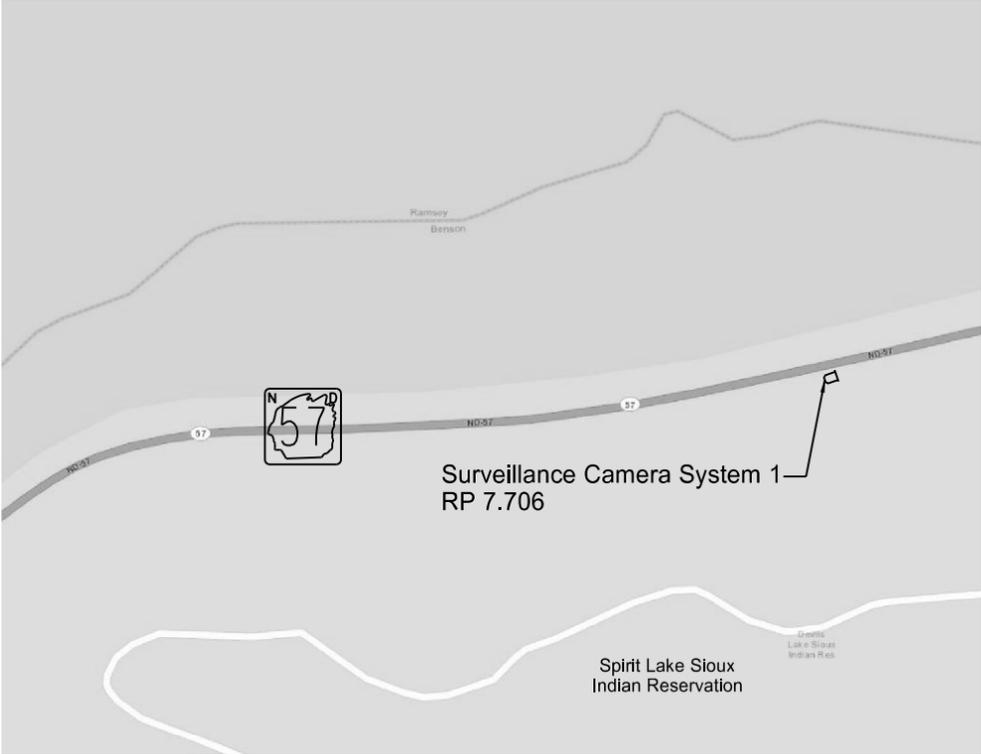
<u>No.</u>	<u>Description</u>
SP 686(08)	TERO
SP 1011(08)	HWY 57 INTELLIGENT TRANSPORTATION SYSTEMS IMPROVEMENTS

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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Table of Contents

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	4	1

Site #1



Site #2

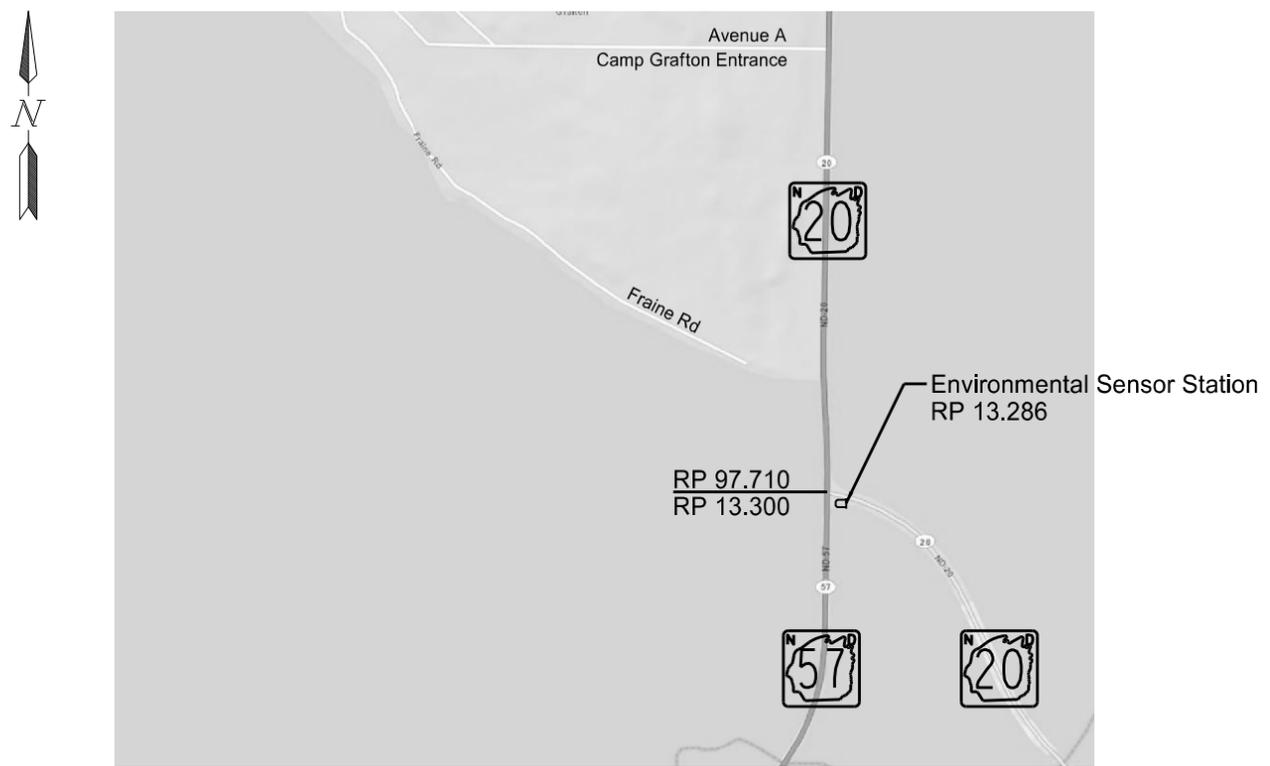


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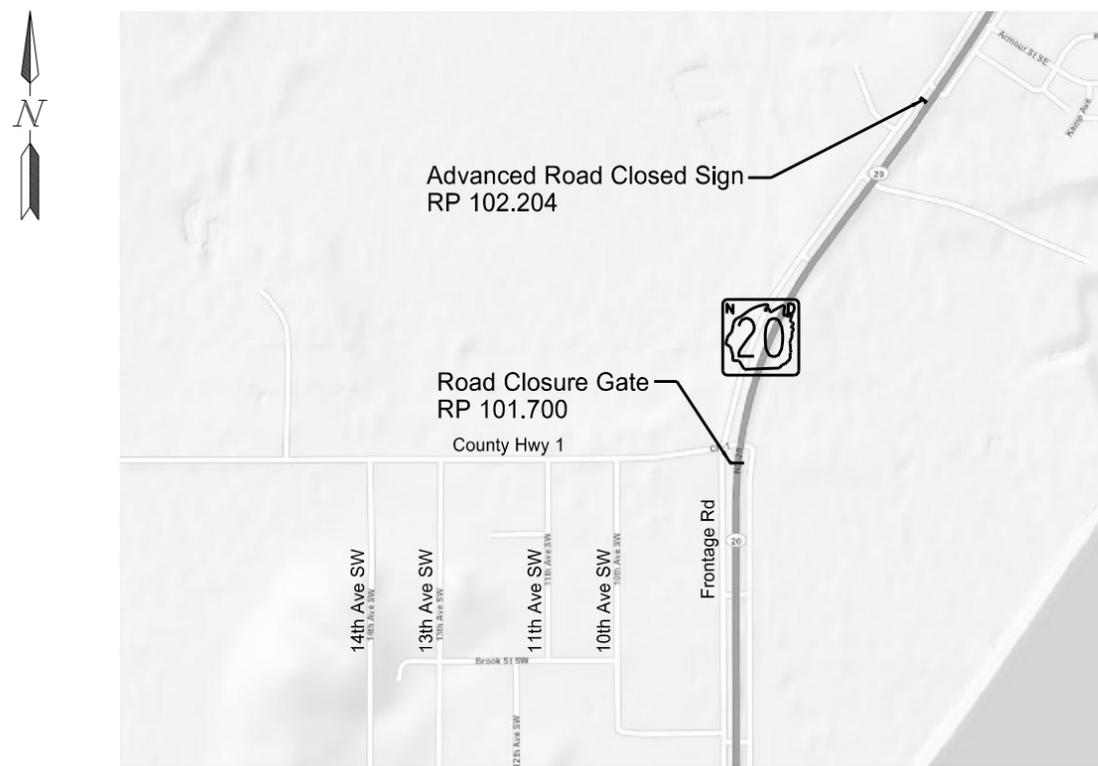
ND Hwy 57 / Hwy 20
ITS Improvements
Scope of Work

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	4	2

Site #3



Site #4 & Site #5



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ND Hwy 57 / Hwy 20
ITS Improvements
Scope of Work

NOTES

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SHE-3-057(048)000	6	1

100-P01 COORDINATION OF PROJECTS: It is the contractor's responsibility to coordinate work with other construction projects in the project areas. Coordinate with the Engineer to install in-pavement sensors after the following paving projects have been completed in the areas of concern: 3-020(101)096 SER, PCN: 18743; 3-020(102)101 STU, PCN: 18744; 3-057(052)012 SER, PCN: 19634.

704-P01 TRAFFIC CONTROL: The traffic control for this project shall consist of a temporary shoulder closure at each site, as well as lane closures for installation of intrusive sensors. The traffic control devices list has been developed using 3 setups for shoulder closures and 1 setup for lane closures at any one given time of the following layouts on the Standard Drawing for traffic control:

D-704-24 Layout Type HH, Layout Type S, or Layout Type R for Shoulder Work
D-704-19 Layout Type F for Lane Closures

It is assumed that the three traffic control device setups can be moved from site to site. Flagging has been included for use during the unloading and loading of equipment and materials. Speed limit shall be reduced to 45 mph for all shoulder closures.

Quantities for traffic control have been included for work at four locations. The required traffic control signs and devices are included in the "Traffic Control Devices List" and will be measured and paid for at the Contract Unit Price for each device. Additional devices required to accommodate operations at more than three locations shall be the Contractor's responsibility.

708-P01 TRENCHING AND SEEDING ETC: The entire area which is disturbed by the trenching shall be mulched and seeded with Type B Class II seeding. The costs associated with salvaged base, topsoil, seeding, and mulching shall not be bid separately but shall be included in the price bid for the respective system: "Install ESS Station/RWIS", "Surveillance Camera System", "Road Closure Gate - 33 Ft", or "Flashing Beacon - Post Mounted".

708-P02 TEMPORARY EROSION CONTROL: Temporary erosion control has been provided for placement prior to disturbing the topsoil or as indicated by the engineer (to be used in conjunction with section 110 of the Standard Specifications).

Temporary Erosion Control for installation of gate arms, surveillance camera systems, and ESS towers: Fiber Rolls 12in adjacent to the installation of sign or tower. Place Fiber Rolls 12in at the edge of disturbed areas where surface runoff leaves the site. Minimum placement of fiber rolls on 20 feet each side of sign or tower.

Payment for the Fiber Rolls shall be under bid item "Fiber Rolls 12in".

754-P05 FEED POINT: The feed point cabinet foundation shall be constructed according to standard drawing D-770-1 "Feed Point Cabinet Foundation Pad Mount." All work necessary to construct the feed point cabinets, including concrete foundations, shall be included in the bid price for "Install ESS Station/RWIS", "Surveillance Camera System", "Road Closure Gate - 33 Ft", or "Flashing Beacon - Post Mounted".

A switch box shall be provided at the feed point.

Steel conduit shall be provided at all locations above ground.

770-P01 MULTIPLE UNDERGROUND CABLE: The plans call for using Multiple Underground Cable 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 as shown in the plans for the Multiple Underground Cable.

The conduit size shall be as specified in the National Electric Code. All materials, equipment, and labor required to install conduit and conductors shall not be bid separately, but shall be included for the price bid for the "Install ESS Station/RWIS", "Surveillance Camera System", "Road Closure Gate - 33 Ft", or "Flashing Beacon - Post Mounted".

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ITS Details
ND Hwy 57 / Hwy 20
ITS Improvements
General Notes

ENVIRONMENTAL COMMITMENTS

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

Based on the NEPA documentation, no environmental commitments have been identified beyond what is covered by the NDDOT's Standard Specification of Road and Bridge Construction.

Wetland Number	Location	Long/Lat (Dec. Deg.)	Cowardin Classification	Wetland Type	Wetland Feature	Wetland Size (Acres)	Wetlands Protected Under E.O. 11990	USACE Jurisdictional Wetlands	Impacts to Wetland (Acres)	
									Temp.	Perm.
3	S16, T153N, R64W	-98.885847W 48.071670N	L2EM	Devils Lake	Natural	0.04	X	X	0.00	0.00
4	S16, T153N, R64W	-98.887697W 48.070266N	PEMH	Roadway Ditch	Natural	1.71	X	X	0.00	0.00
5	S21, T153N, R64W	-98.893706W 48.051775N	L2EM	Devils Lake	Natural	3.78	X	X	0.00	0.00
6	S6, T152N, R64W	-98.902449W 48.017286N	PEMH	Roadway Ditch	Natural	4.24	X	X	0.00	0.00
7	S6, T152N, R64W	-98.901899W 48.013616N	PEMH	Roadway Ditch	Natural	0.46	X	X	0.00	0.00
8	S6, T152N, R64W	-98.901838W 48.012639N	PEMH	Roadway Ditch	Natural	0.45	X	X	0.00	0.00
9	S6, T152N, R64W	-98.901972W 48.011184N	PEMH	Roadway Ditch	Natural	0.51	X	X	0.00	0.00
10	S6, T152N, R64W	-98.902628W 48.009607N	PEMH	Roadway Ditch	Natural	0.24	X	X	0.00	0.00
11	S6, T152N, R64W	-98.903423W 48.008418N	PEMH	Roadway Ditch	Natural	0.24	X	X	0.00	0.00
12	S7, T152N, R64W	-98.904201W 48.007388N	L2EM	Devils Lake	Natural	2.34	X	X	0.00	0.00
13	S16, T152N, R65W	-98.995978W 47.987866N	PEMH	Roadway Ditch	Natural	0.14	X	X	0.00	0.00
14	S16, T152N, R65W	-98.995318W 47.987845N	PEMH	Roadway Ditch	Natural	2.07	X	X	0.00	0.00
15	S15, T152N, R65W	-98.994775W 47.987930N	L2EM	Devils Lake	Natural	5.70	X	X	0.00	0.00
16	S10, T152N, R65W	-98.963415W 47.997134N	PEMH	Roadway Ditch	Natural	2.06	X	X	0.00	0.00
17	S11, T152N, R65W	-98.952829W 48.001278N	PEMH	Roadway Ditch	Natural	1.33	X	X	0.00	0.00
18	S11, T152N, R65W	-98.945608W 48.000862N	PEMH	Roadway Ditch	Natural	2.20	X	X	0.00	0.00
19	S11, T152N, R65W	-98.934821W 47.997290N	PEMH	Roadway Ditch	Natural	1.98	X	X	0.00	0.00
20	S12, T152N, R65W	-98.930707W 47.995624N	PEMH	Roadway Ditch	Natural	2.12	X	X	0.00	0.00
21	S12, T152N, R65W	-98.926698W 47.995353N	PEMH	Basin	Natural	6.09	X	X	0.00	0.00
22	S12, T152N, R65W	-98.920835W 47.998341N	PEMH	Roadway Ditch	Natural	0.18	X	X	0.00	0.00
23	S12, T152N, R65W	-98.915034W 48.001119N	PEMH	Roadway Ditch	Natural	0.38	X	X	0.00	0.00
24	S12, T152N, R65W	-98.914512W 48.001287N	L2EM	Devils Lake	Natural	4.17	X	X	0.00	0.00
25	S17, T152N, R64W	-98.905129W 48.005976N	L2EM	Devils Lake	Natural	0.20	X	X	0.00	0.00
Totals						42.63			0.00	0.00

*A wetland Jurisdictional Determination was issued by the USACE on 12/2009; NWO-2009-03047-BIS and NOW-2009-03091-BIS.

PERMITS REQUIRED:

Non-Building Situation Floodplain Development Permit (Spirit Lake Nation)

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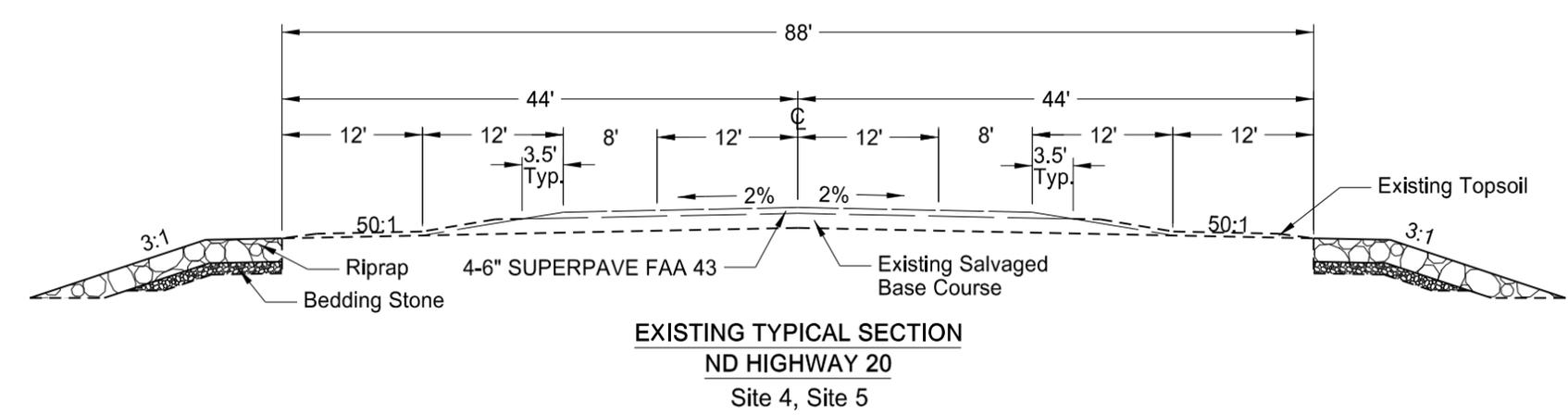
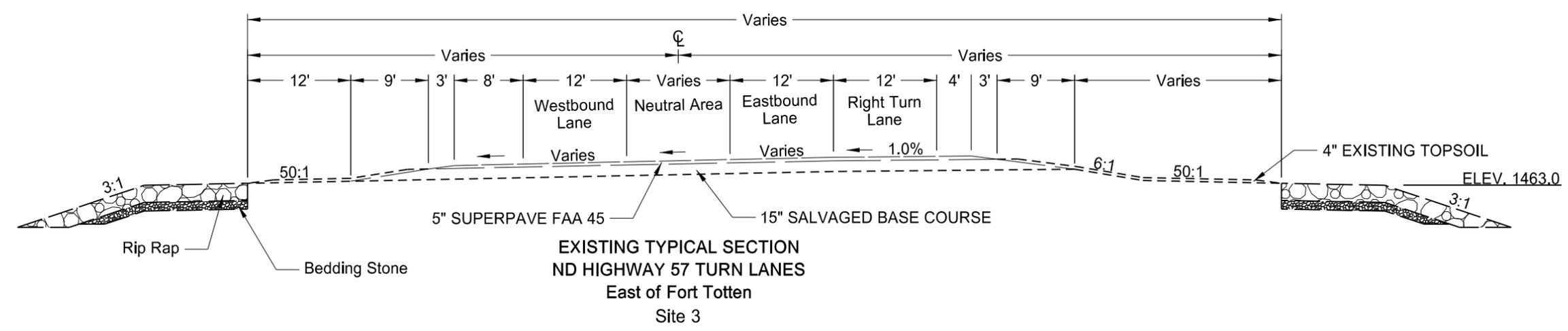
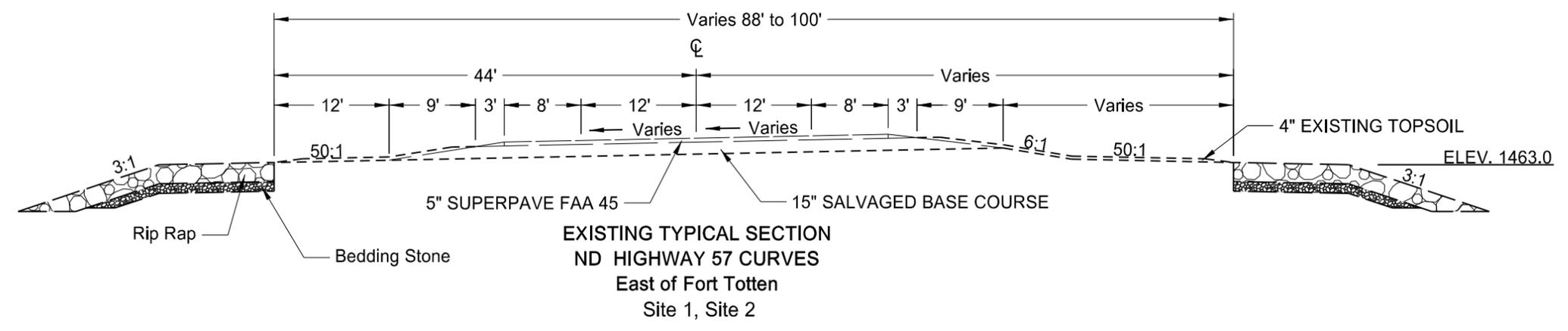
ITS Details
ND Hwy 57 / Hwy 20
ITS Improvements
Environmental Commitments

ESTIMATE OF QUANTITIES

<u>SPEC</u>	<u>CODE</u>	<u>ITEM DESCRIPTION</u>	<u>UNIT</u>	<u>QTY</u>
103	100	CONTRACT BOND	L SUM	1
702	100	MOBILIZATION	L SUM	1
704	100	FLAGGING	MHR	50
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1332
704	1067	TUBULAR MARKERS	EA	60
708	1430	FIBER ROLLS 12IN	LF	220
772	2110	FLASHING BEACON - POST MOUNTED	EA	1
772	9150	INSTALL ESS STATION/RWIS	L SUM	1
772	9235	COMMUNICATION SYSTEM	L SUM	1
772	9300	SURVEILLANCE CAMERA SYSTEM	EA	2
980	812	ROAD CLOSURE GATE - 33 FT	EA	1

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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Quantities



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ND Hwy 57 / Hwy 20
ITS Improvements
Existing Typicals

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
N.D.	SHE-3-057(048)000	110	1

Sta/RP	Sign No.	Assembly No.	Flat Sheet For Signs		Sign Support Length				Support Size	Max Post Len	Sleeve Length				Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments
			3A SF	2 SF	1st LF	2nd LF	3rd LF	4th LF		LF	1st LF	2nd LF	3rd LF	4th LF								
HWY 57																						
102.204 Lt	SN 1		29.3		12.9	13.3	12.1		2.25 x 2.25 12 ga	14.2	3.6	4.0	2.8		2 x 2 12 ga	3	4	3 x 3 7 ga			3	
Sub Total			29.3	0.0	Total 38.3											Total 12			0	0	3	
Grand Total			29.3	0.0	Total 38.3											Total 12			0	0	3	

Basis of Estimate
Sign Support Lengths

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

- Areas where parking and/or pedestrian movement will occur - 84"
- Urban/rural expressway and freeway - 84" (Offset - 60")
- Rural Roadway - 60"
- Bike route - 60"

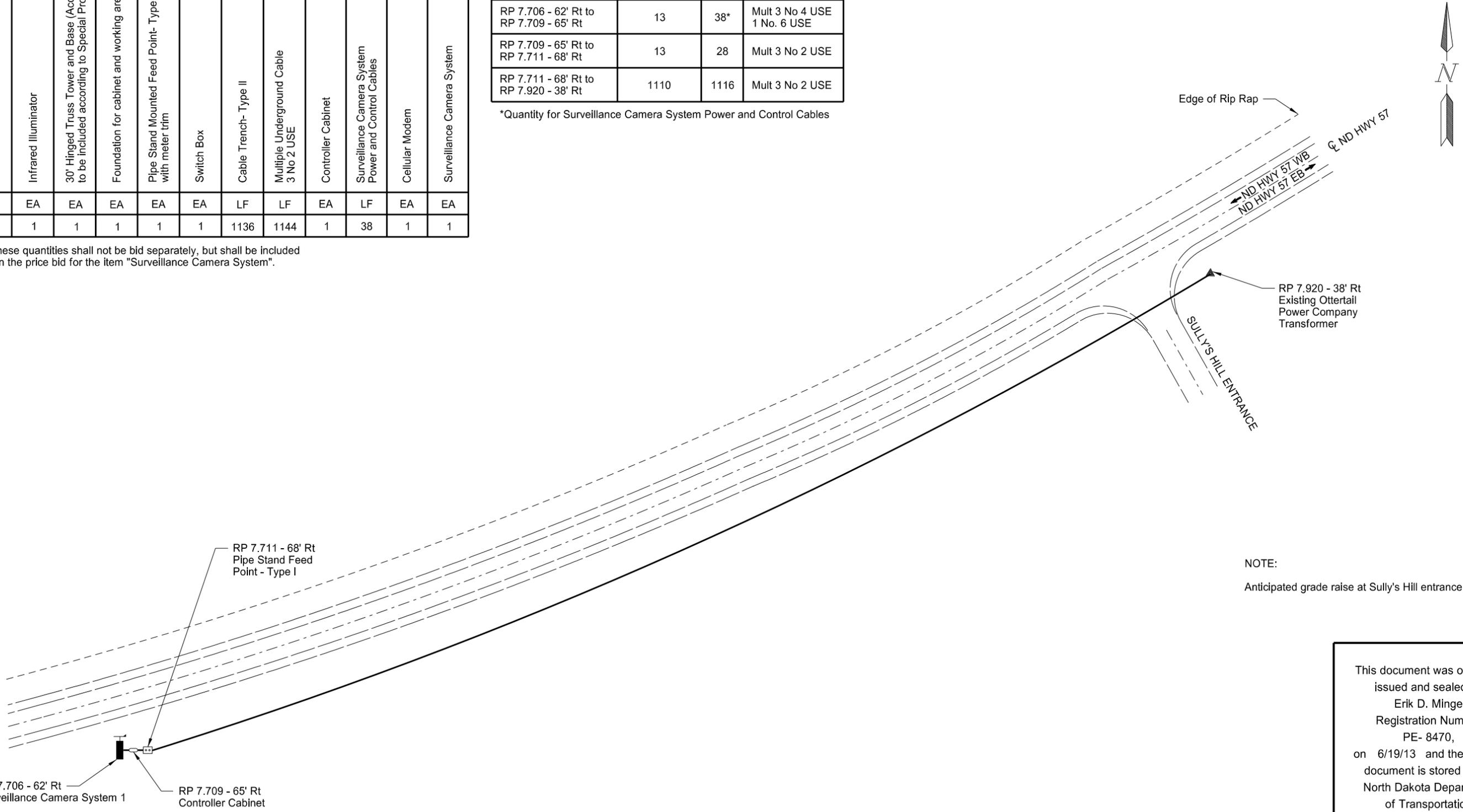
<p>This document was originally issued and sealed by Erik D. Minge, Registration Number 8470, on 6/19/2013 and the original document is stored at the North Dakota Department of Transportation</p>	<p>Sign Summary Perforated Tube</p>
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Quantities (A)											
PTZ Camera	Infrared Illuminator	30' Hinged Truss Tower and Base (Accessories to be included according to Special Provision)	Foundation for cabinet and working area slab	Pipe Stand Mounted Feed Point- Type I with meter trim	Switch Box	Cable Trench- Type II	Multiple Underground Cable 3 No 2 USE	Controller Cabinet	Surveillance Camera System Power and Control Cables	Cellular Modem	Surveillance Camera System
EA	EA	EA	EA	EA	EA	LF	LF	EA	LF	EA	EA
1	1	1	1	1	1	1136	1144	1	38	1	1

Circuit 1			
RP	Cable Trench	Cable	Cable Runs
	LF	LF	TYPE
RP 7.706 - 62' Rt to RP 7.709 - 65' Rt	13	38*	Mult 3 No 4 USE 1 No. 6 USE
RP 7.709 - 65' Rt to RP 7.711 - 68' Rt	13	28	Mult 3 No 2 USE
RP 7.711 - 68' Rt to RP 7.920 - 38' Rt	1110	1116	Mult 3 No 2 USE

*Quantity for Surveillance Camera System Power and Control Cables

(A) These quantities shall not be bid separately, but shall be included in the price bid for the item "Surveillance Camera System".



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Proposed ITS Layout
ND Hwy 57 / Hwy 20
ITS Improvements
Site 1

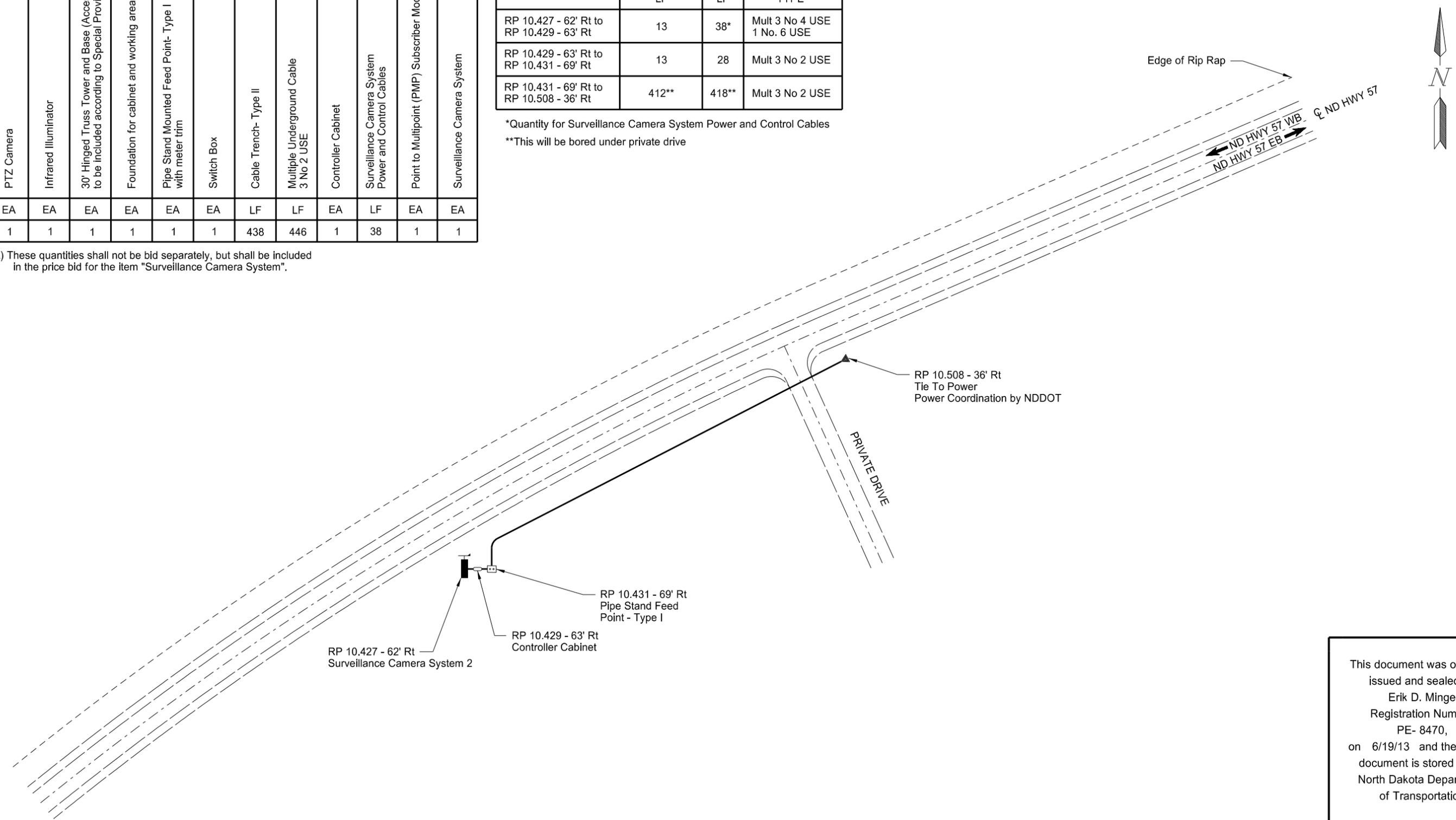
Contact Wayne Thompson, Otter Tail Power (218-739-8200) to coordinate electric service work and connection. Contractor shall contact Otter Tail Power to schedule work a minimum of four weeks prior to electric service connection.

Quantities (A)											
PTZ Camera	Infrared Illuminator	30' Hinged Truss Tower and Base (Accessories to be included according to Special Provision)	Foundation for cabinet and working area slab	Pipe Stand Mounted Feed Point- Type I with meter trim	Switch Box	Cable Trench- Type II	Multiple Underground Cable 3 No 2 USE	Controller Cabinet	Surveillance Camera System Power and Control Cables	Point to Multipoint (PMP) Subscriber Module	Surveillance Camera System
EA	EA	EA	EA	EA	EA	LF	LF	EA	LF	EA	EA
1	1	1	1	1	1	438	446	1	38	1	1

Circuit 1			
RP	Cable Trench	Cable	Cable Runs
	LF	LF	TYPE
RP 10.427 - 62' Rt to RP 10.429 - 63' Rt	13	38*	Mult 3 No 4 USE 1 No. 6 USE
RP 10.429 - 63' Rt to RP 10.431 - 69' Rt	13	28	Mult 3 No 2 USE
RP 10.431 - 69' Rt to RP 10.508 - 36' Rt	412**	418**	Mult 3 No 2 USE

*Quantity for Surveillance Camera System Power and Control Cables
 **This will be bored under private drive

(A) These quantities shall not be bid separately, but shall be included in the price bid for the item "Surveillance Camera System".



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Proposed ITS Layout
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Site 2

Contact Wayne Thompson, Otter Tail Power (218-739-8200) to coordinate electric service work and connection. Contractor shall contact Otter Tail Power to schedule work a minimum of four weeks prior to electric service connection.

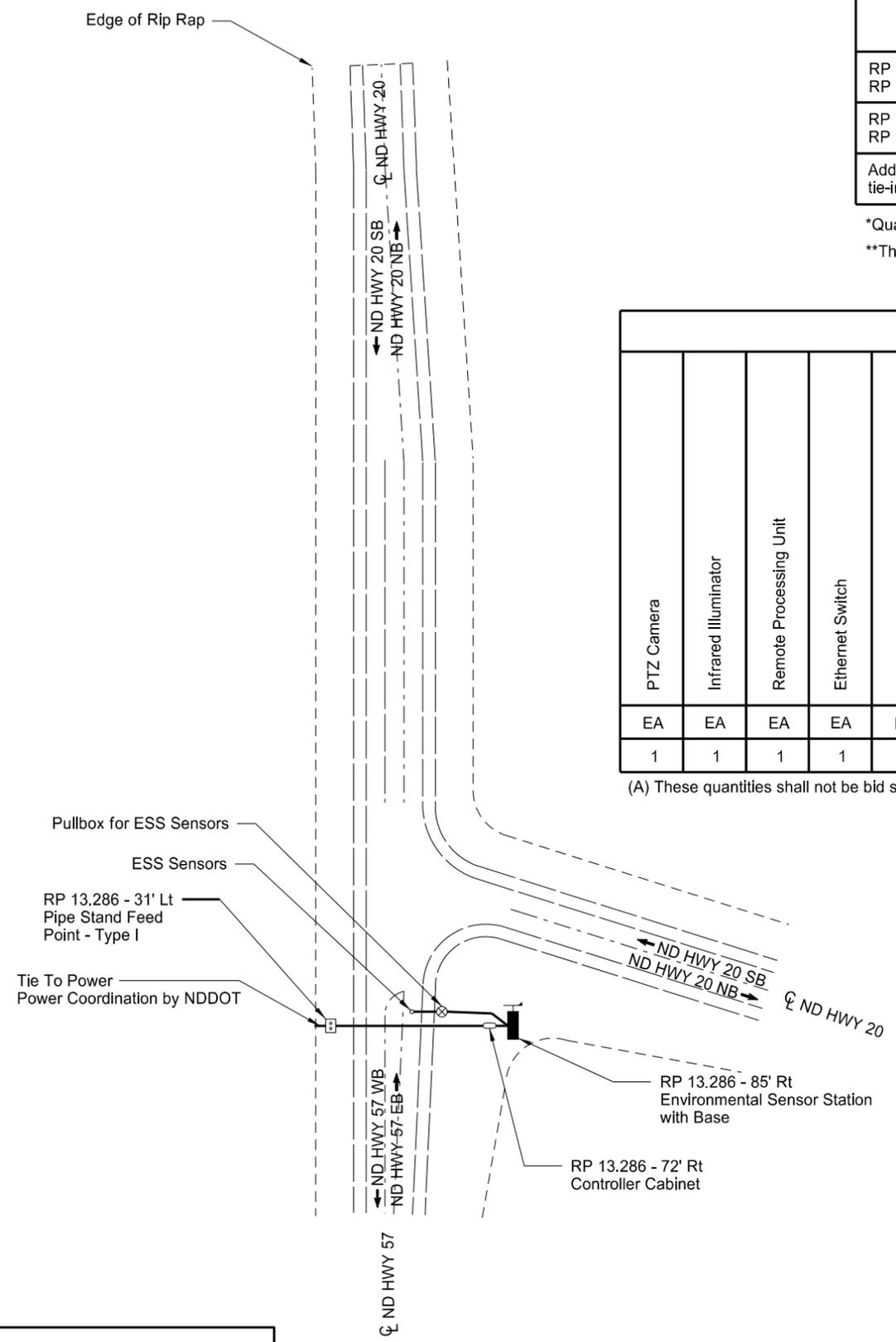
Circuit 1			
RP	Cable Trench	Cable	Cable Runs
	LF	LF	TYPE
RP 13.286 - 85' Rt to RP 13.286 - 72' Rt	15	40*	Mult 3 No 4 USE 1 No. 6 USE
RP 13.286 - 72' Rt to RP 13.286 - 31' Lt	101**	116**	Mult 3 No 2 USE
Additional for power tie-in by utility company	10	16	Mult 3 No 2 USE

*Quantity for ESS Power and Control Cables
 **This will be bored under ND Hwy 57



Quantities (A)																							
PTZ Camera	Infrared Illuminator	Remote Processing Unit	Ethernet Switch	Temperature/Relative Humidity Sensor	Passive Pavement Sensor	Subsurface Temperature Probe	Deep Subsurface Temperature Probe	Precipitation Occurrence Sensor	Ultrasonic Wind Speed/Direction Sensor	Barometric Pressure Sensor	Chemical Concentration Sensor	Radiation Sensor	Microwave Vehicle Detection System	30' Hinged Truss Tower and Base (Accessories to be included according to Special Provision)	Foundation for cabinet and working area slab	Pipe Stand Mounted Feed Point- Type I with meter trim	Switch Box	Cable Trench- Type II	Multiple Underground Cable 3 No 2 USE	Controller Cabinet	ESS Power and Control Cables	Point to Multipoint (PMP) Subscriber Module	Install ESS Station/RWIS
EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	LF	EA	LF	EA	LSUM
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	126	132	1	40	1	1

(A) These quantities shall not be bid separately, but shall be included in the price bid for the item "Install ESS Station/RWIS".



Contact Wayne Thompson, Otter Tail Power (218-739-8200) to coordinate electric service work and connection. Contractor shall contact Otter Tail Power to schedule work a minimum of four weeks prior to electric service connection.

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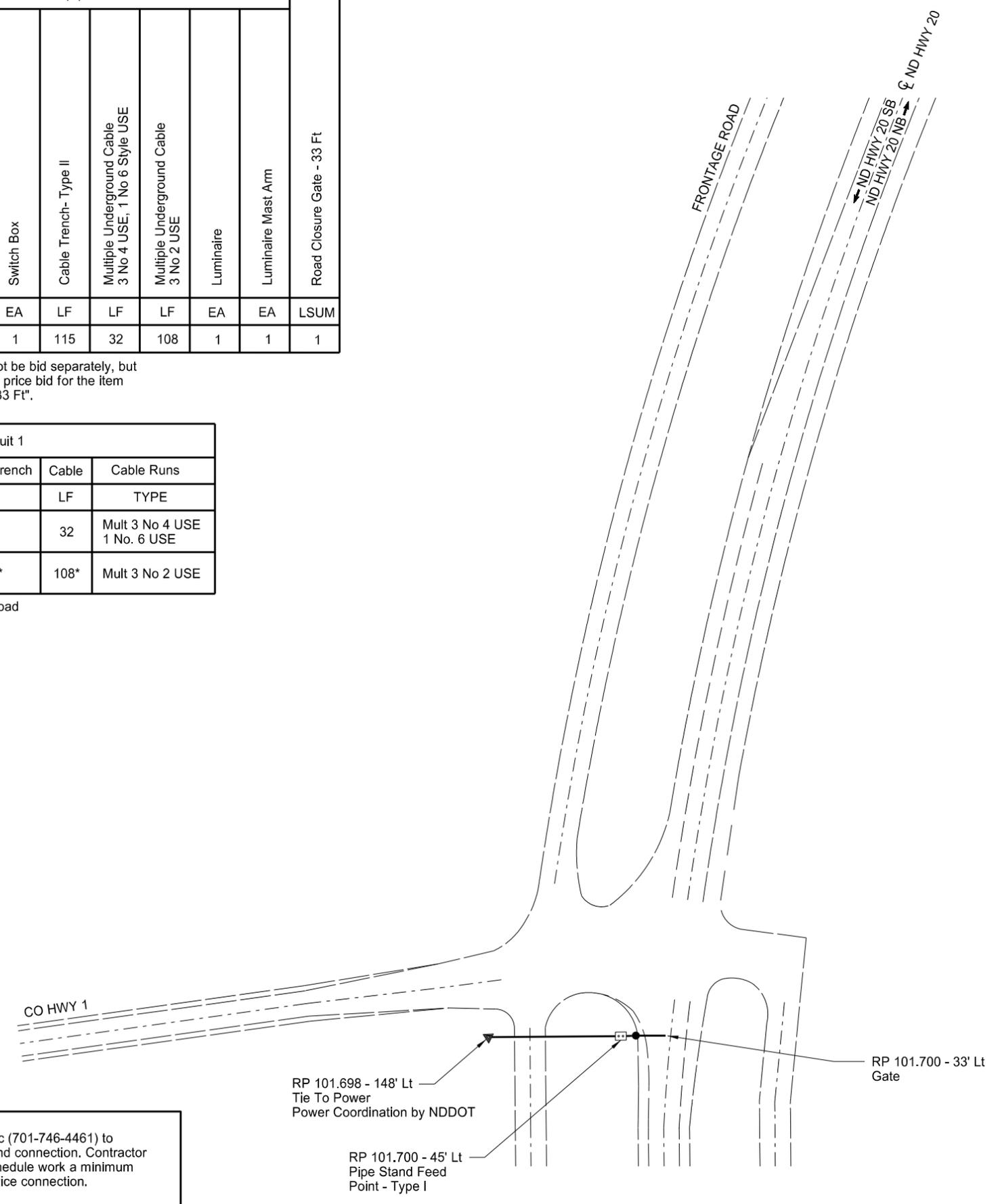
Proposed ITS Layout
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Site 3

Quantities (A)										
Gate - 33 Ft	Gate Flasher Assembly	Battery Backup for Gate Flasher Assembly	Pipe Stand Mounted Feed Point- Type I with meter trim	Switch Box	Cable Trench- Type II	Multiple Underground Cable 3 No 4 USE, 1 No 6 Style USE	Multiple Underground Cable 3 No 2 USE	Luminaire	Luminaire Mast Arm	Road Closure Gate - 33 Ft
EA	EA	EA	EA	EA	LF	LF	LF	EA	EA	LSUM
1	1	1	1	1	115	32	108	1	1	1

(A) These quantities shall not be bid separately, but shall be included in the price bid for the item "Road Closure Gate - 33 Ft".

Circuit 1			
RP	Cable Trench	Cable	Cable Runs
	LF	LF	TYPE
RP 101.700 - 33' Lt to RP 101.700 - 45' Lt	12	32	Mult 3 No 4 USE 1 No. 6 USE
RP 101.700 - 45' Lt to RP 101.698 - 148' Lt	103*	108*	Mult 3 No 2 USE

*This will be bored under frontage road



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Contact Todd Herz, Nodak Electric (701-746-4461) to coordinate electric service work and connection. Contractor shall contact Nodak Electric to schedule work a minimum of four weeks prior to electric service connection.

Proposed ITS Layout
ND Hwy 57 / Hwy 20
ITS Improvements
Site 4

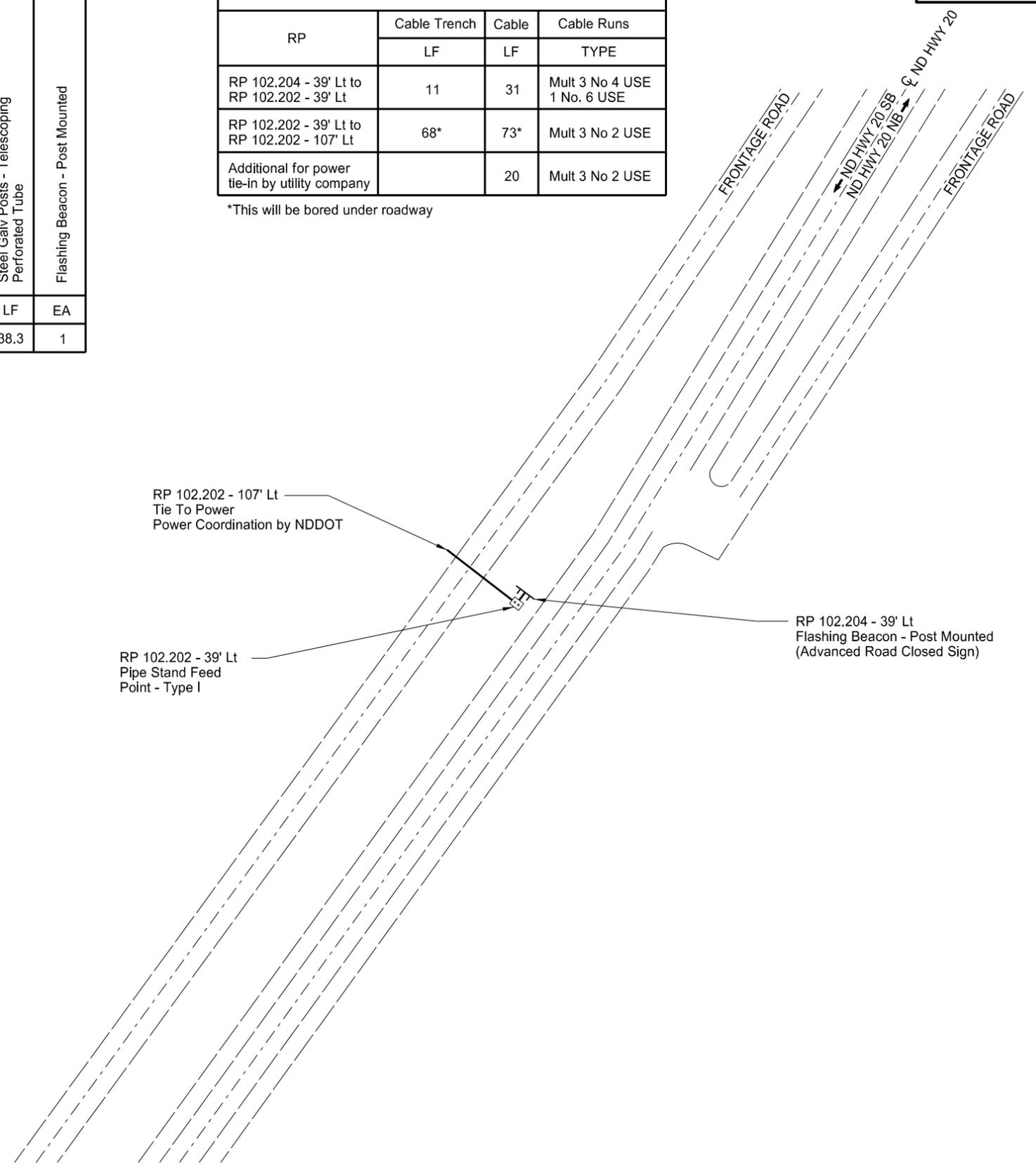
Quantities (A)									Flashing Beacon - Post Mounted
Sign Panel	Beacon with Flasher (B)	Sign Panel Support	Pipe Stand Mounted Feed Point- Type I with meter trim	Cable Trench- Type II	Multiple Underground Cable 3 No 4 USE, 1 No 6 Style USE	Multiple Underground Cable 3 No 2 USE	Flat Sheet for Signs - Type 3A Refl Sheeting	Steel Galv Posts - Telescoping Perforated Tube	
EA	EA	EA	EA	LF	LF	LF	SF	LF	EA
1	1	1	1	79	31	93	29.3	38.3	1

Circuit 1			
RP	Cable Trench	Cable	Cable Runs
	LF	LF	TYPE
RP 102.204 - 39' Lt to RP 102.202 - 39' Lt	11	31	Mult 3 No 4 USE 1 No. 6 USE
RP 102.202 - 39' Lt to RP 102.202 - 107' Lt	68*	73*	Mult 3 No 2 USE
Additional for power tie-in by utility company		20	Mult 3 No 2 USE

*This will be bored under roadway

(A) These quantities shall not be bid separately, but shall be included in the price bid for the item "Flashing Beacon - Post Mounted".

(B) Beacon shall be 12" amber LED.

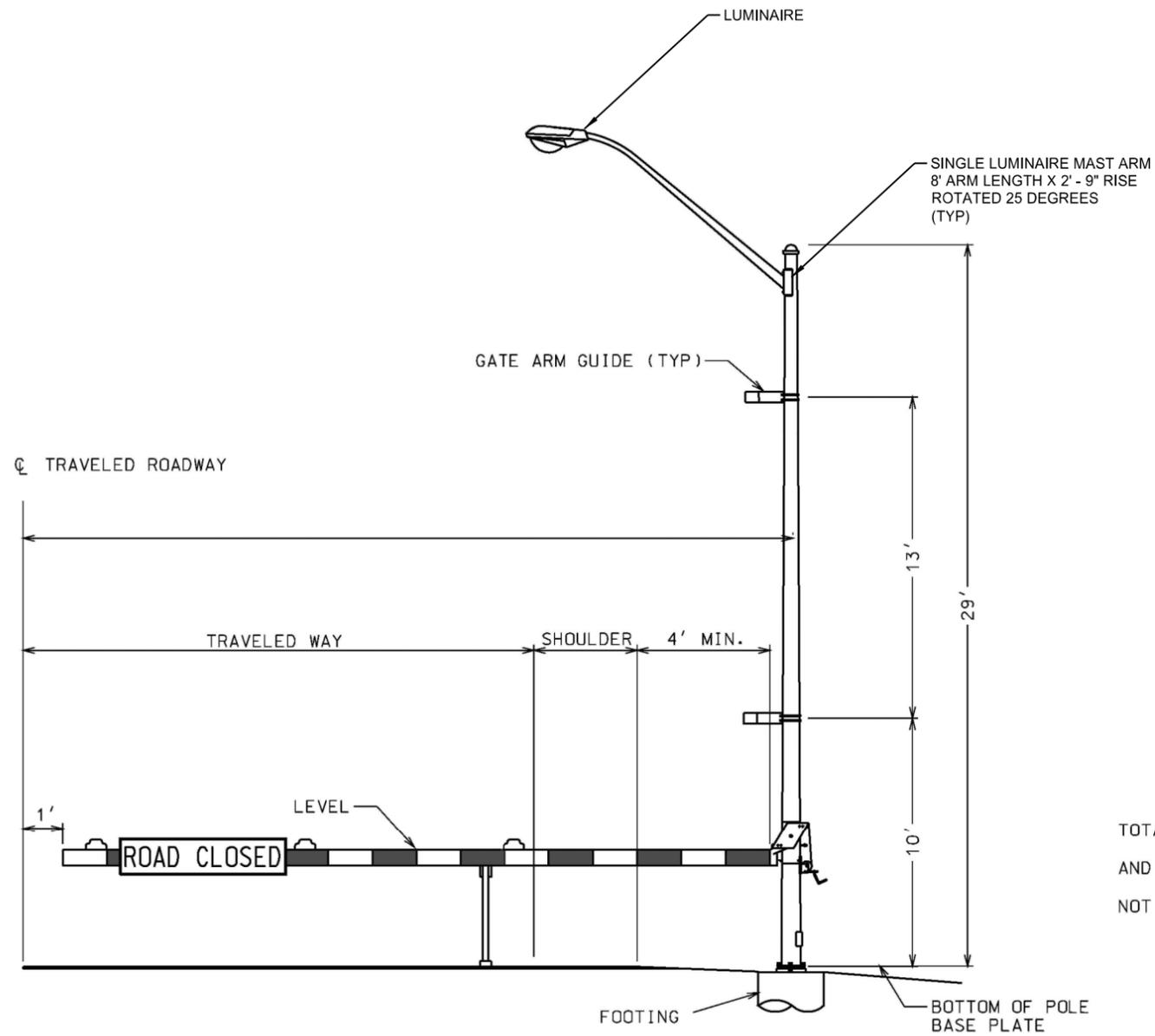


Contact Wayne Thompson, Otter Tail Power (218-739-8200) to coordinate electric service work and connection. Contractor shall contact Otter Tail Power to schedule work a minimum of four weeks prior to electric service connection.

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Proposed ITS Layout
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Site 5

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	160	6



TOTAL WEIGHT OF THE LUMINAIRE POLE, LUMINAIRE, AND HARDWARE FOR THE ROAD CLOSURE GATE SHALL NOT EXCEED 1,000 POUNDS

NOTE: PLACE THE "ROAD CLOSED" SIGN ON CENTER OF THE THROUGH LANE THE SIGN IS BLACK ON WHITE

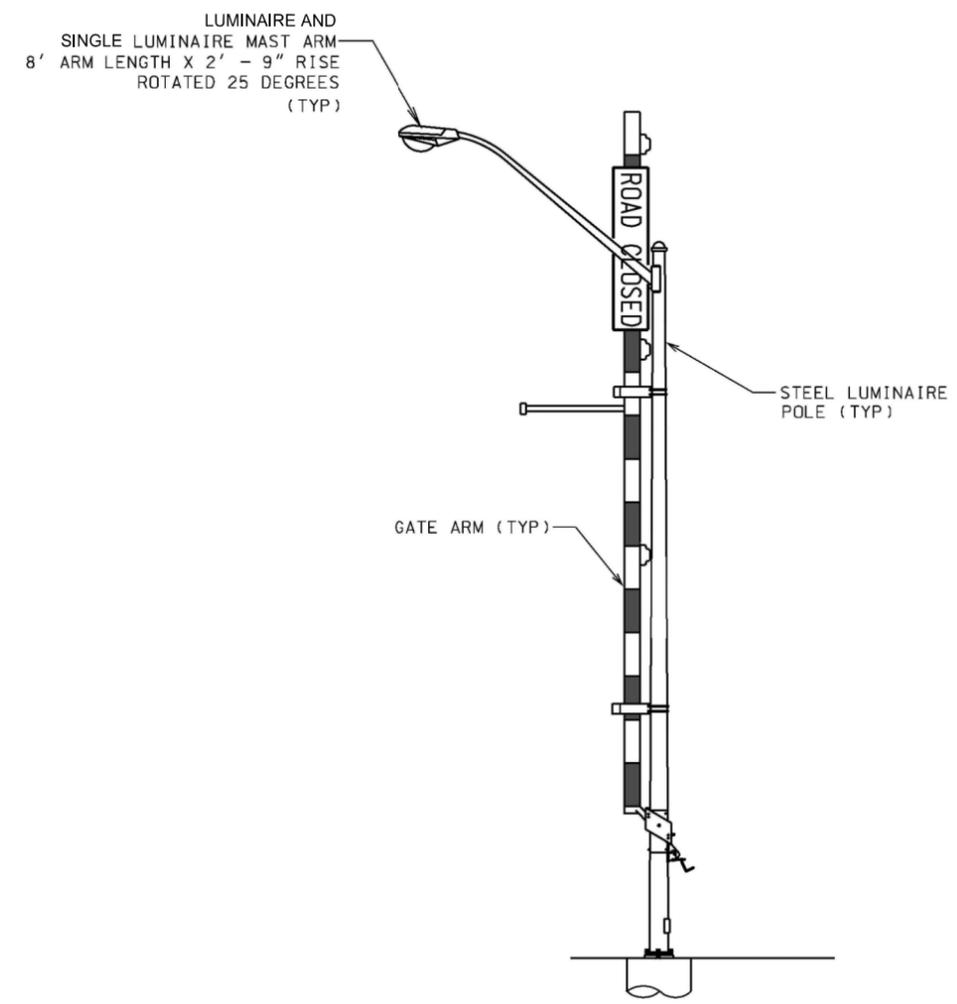
TYPICAL LOWERED POSITION

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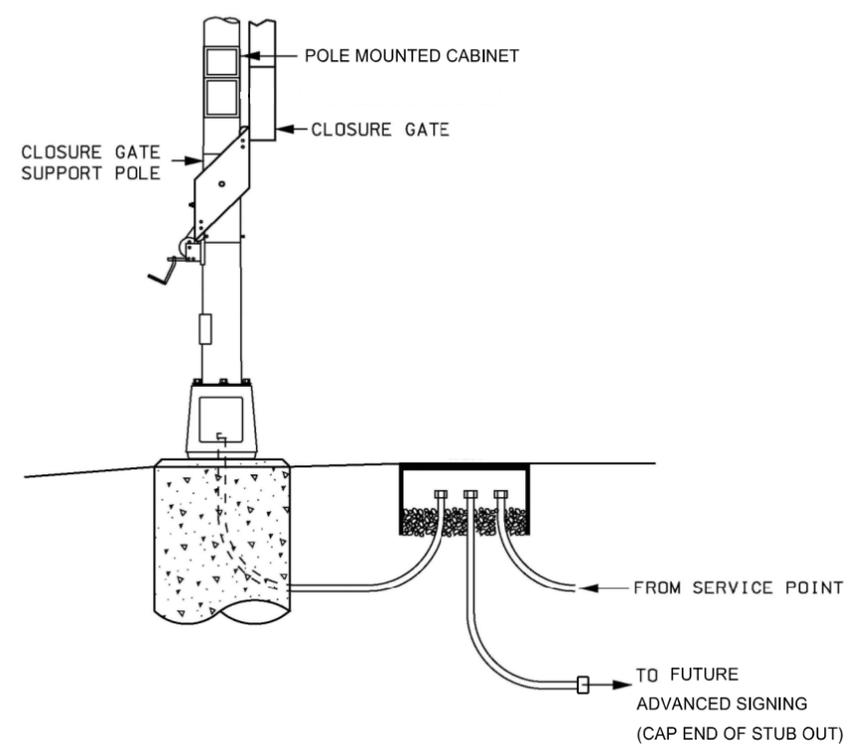
ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Drop Arm Road Closure Gate

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	160	7

DROP ARM ROAD CLOSURE GATE



TYPICAL RAISED POSITION

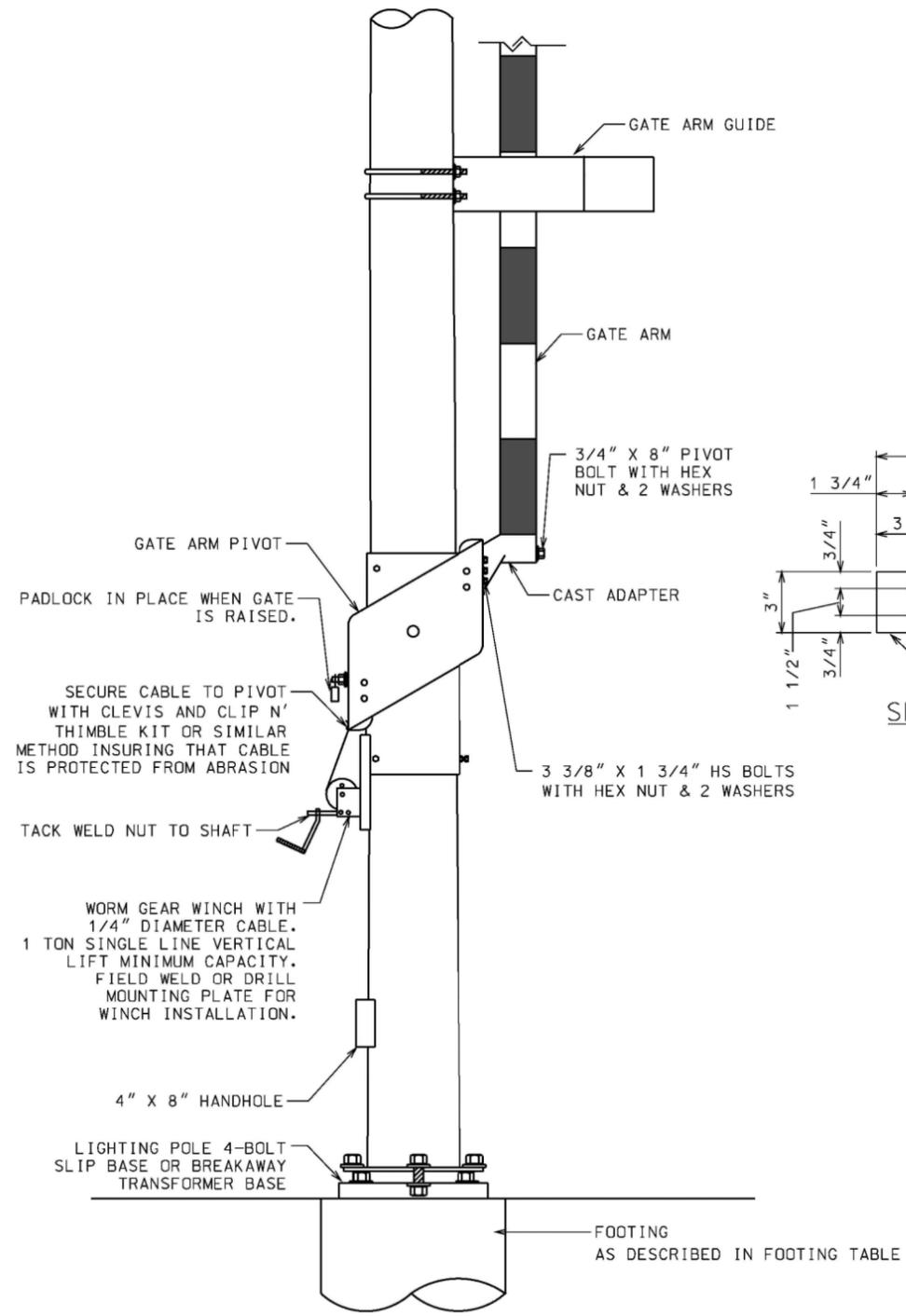


TYPICAL ELECTRICAL EQUIPMENT CONFIGURATION

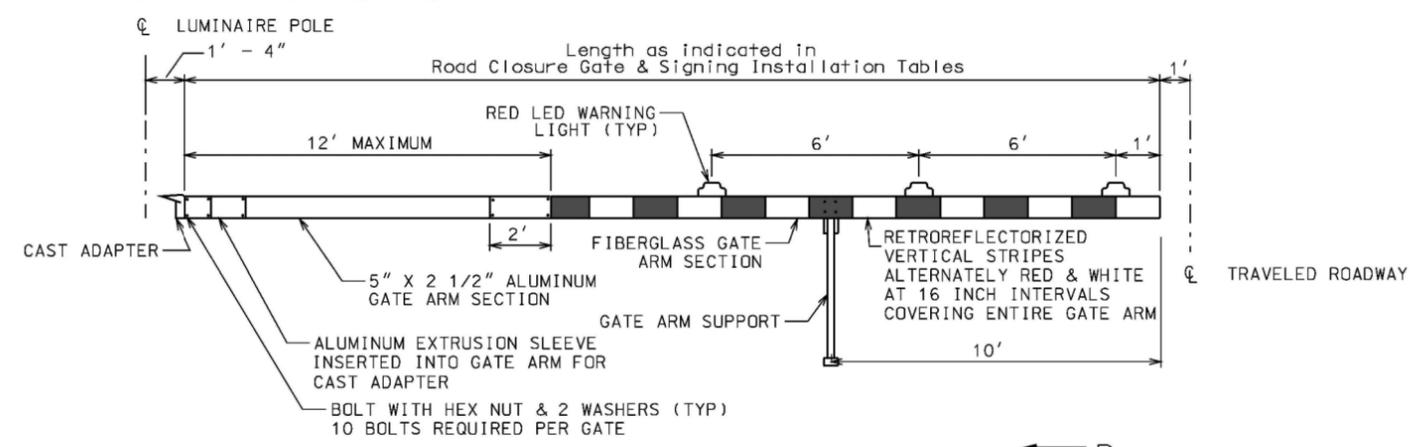
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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Drop Arm Road Closure Gate

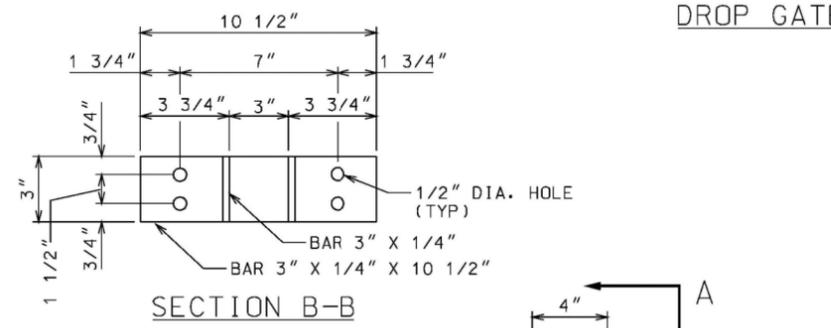
DROP ARM ROAD CLOSURE GATE



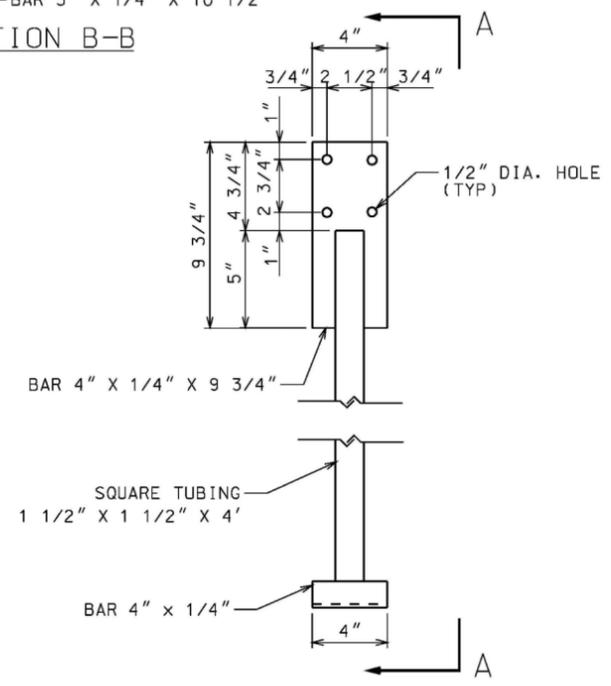
DROP GATE PIVOT ASSEMBLY



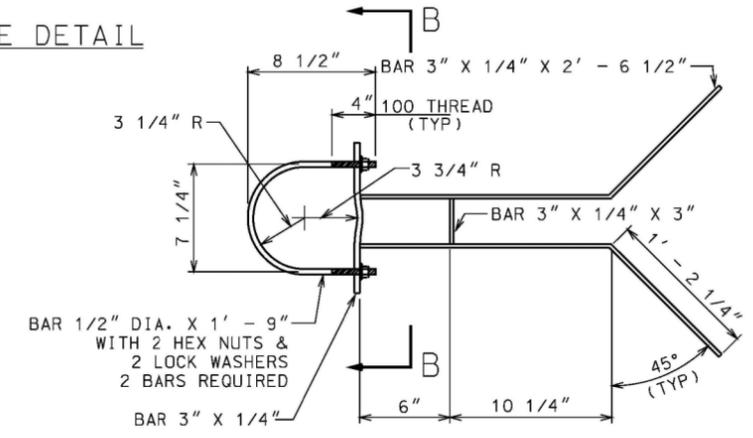
DROP GATE DETAIL



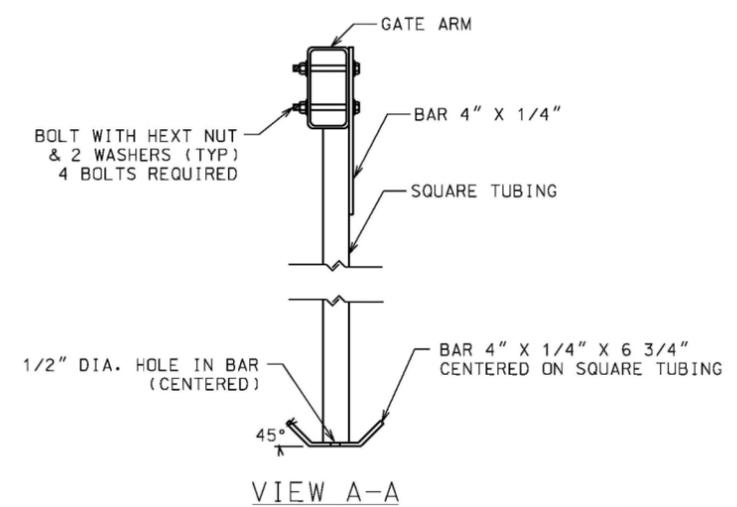
SECTION B-B



DROP GATE ARM SUPPORT DETAIL



DROP GATE ARM GUIDE DETAIL



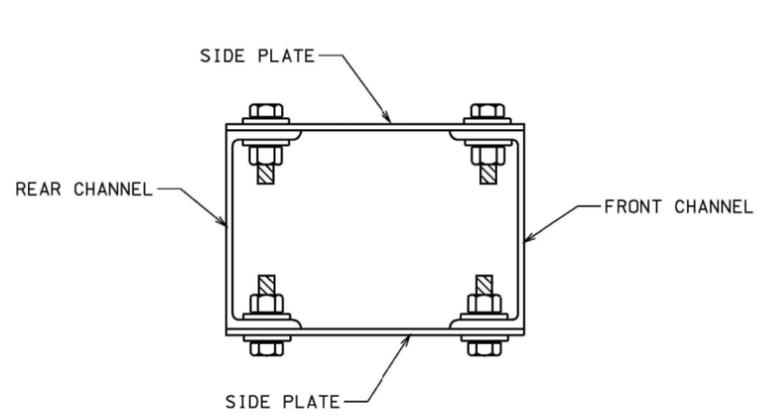
VIEW A-A

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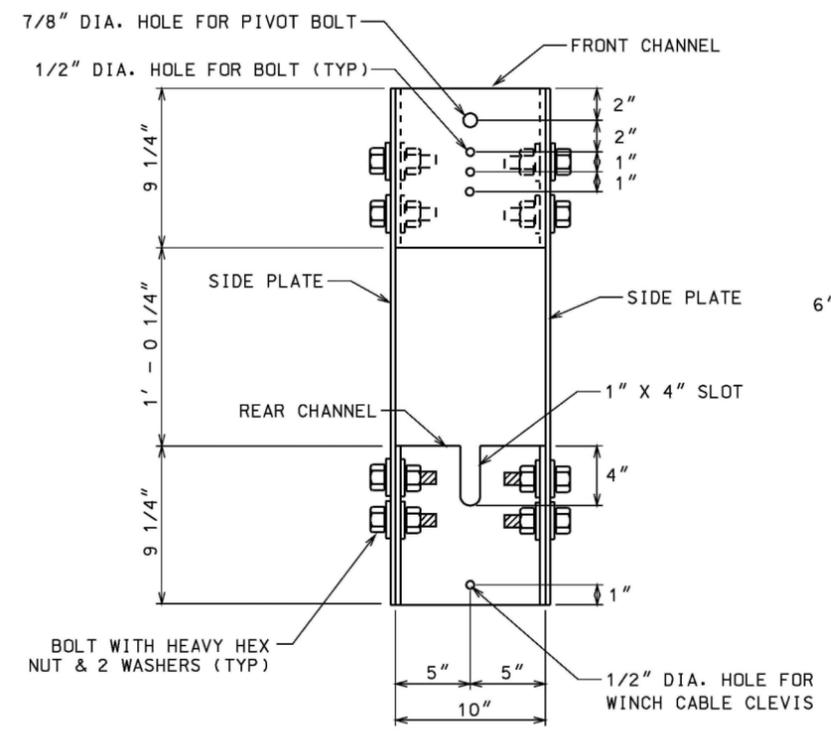
ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Drop Arm Road Closure Gate

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	160	9

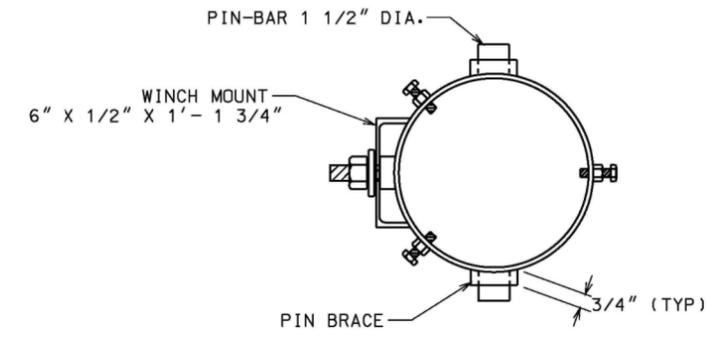
DROP ARM ROAD CLOSURE GATE



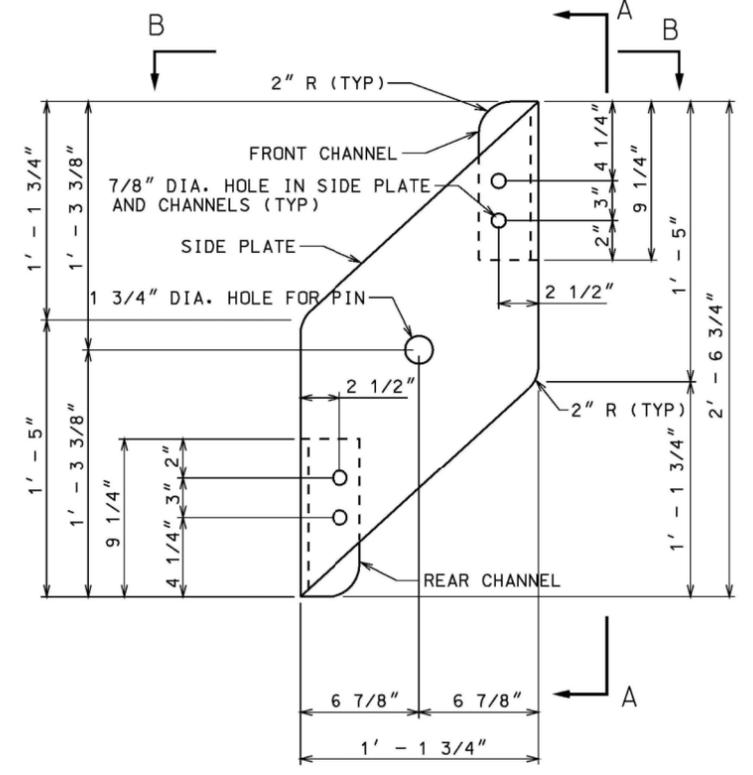
VIEW B-B



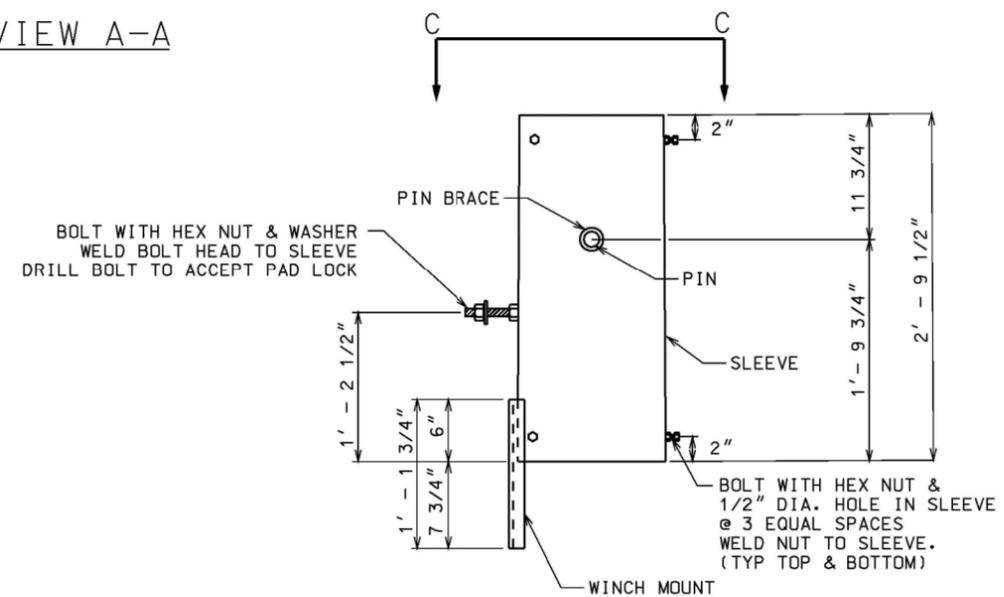
VIEW A-A



VIEW C-C



SIDE PLATE DETAIL

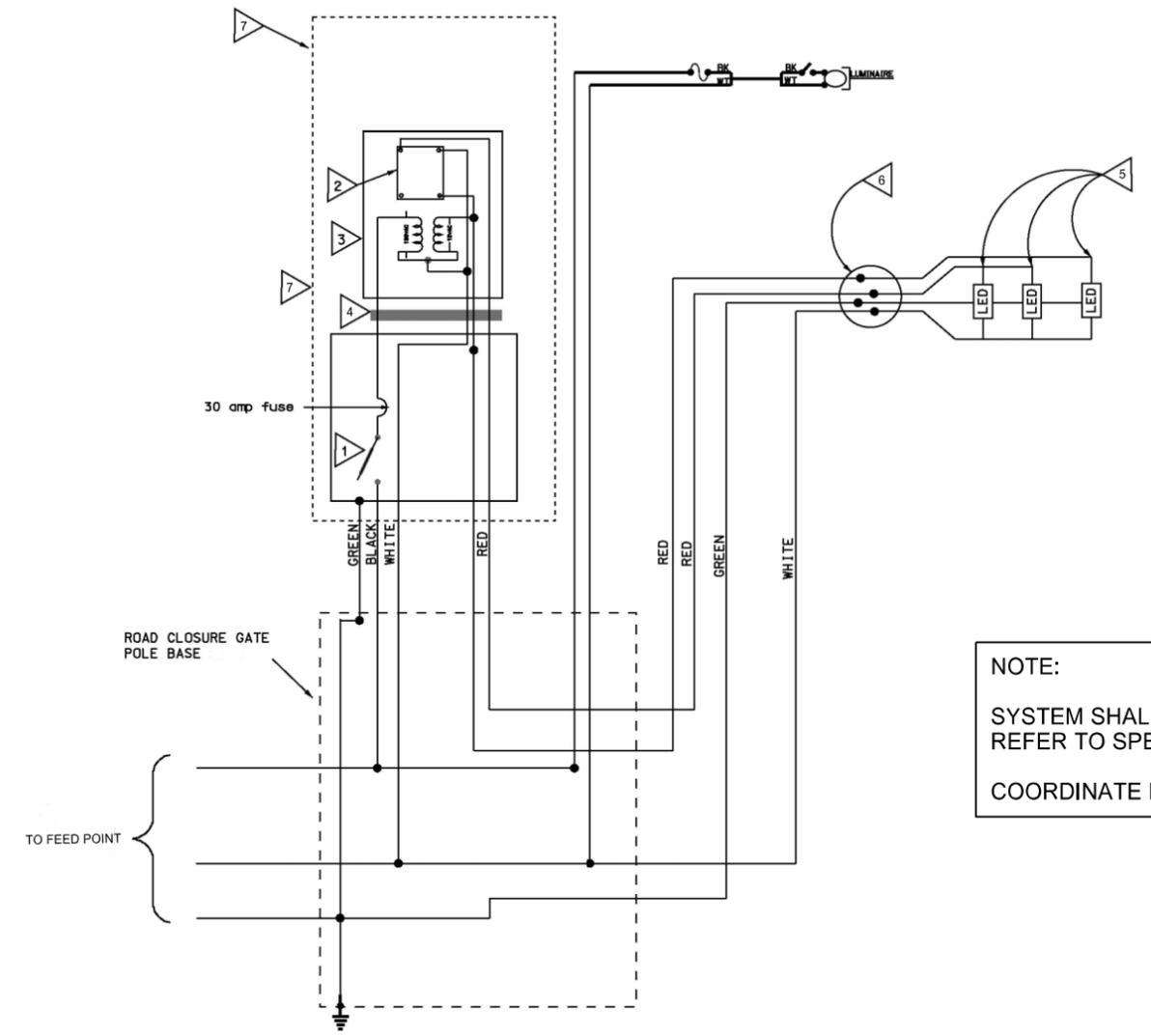


PIVOT SLEEVE DETAIL

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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Drop Arm Road Closure Gate

NOT TO SCALE



NOTE:
 SYSTEM SHALL INCORPORATE BATTERY BACKUP FOR THE FLASHERS.
 REFER TO SPECIAL PROVISIONS (NOT SHOWN).
 COORDINATE BATTERY LOCATION WITH THE ENGINEER.

- 1 30 AMP SAFETY SWITCH IN A NEMA 3R LOCKABLE ENCLOSURE. DPST FOR ROAD CLOSURE DROP GATE APPLICATIONS.
- 2 CUBE FLASHER
- 3 120/240 VOLT PRIMARY, 12/24 VOLT SECONDARY TRANSFORMER, BUCK AND BOOST, MOUNTED IN LOCKABLE NEMA 3R ENCLOSURE.
- 4 CONDUCTORS ARE #6 AWG IN 2" RIGID STEEL CONDUIT.

- 5 12vac LED GATE LIGHTS. 3 LAMP ASSEMBLIES SHALL BE MOUNTED ON EACH GATE.
- 6 THE CONTRACTOR SHALL INSTALL 2 CONDUCTOR NO. 14 AWG. "SO" CORD. CONNECTION OF THE "SO" CORD SHALL BE MADE IN A JUNCTION BOX MOUNTED ON THE GATE POST. THE JUNCTION BOX SHALL BE BANDED TO THE POST AND SHALL BE RAIN TIGHT AND WEATHERPROOF.
- 7 THE NEMA 3R CABINET ENCLOSURE AND RIGID STEEL CONDUIT SHALL BE MOUNTED TO THE GATE POLE

NOTE:
 All circuits shall be bonded in accordance with the NATIONAL ELECTRICAL CODE. Quantities for bonding conductors are not included in these plans.

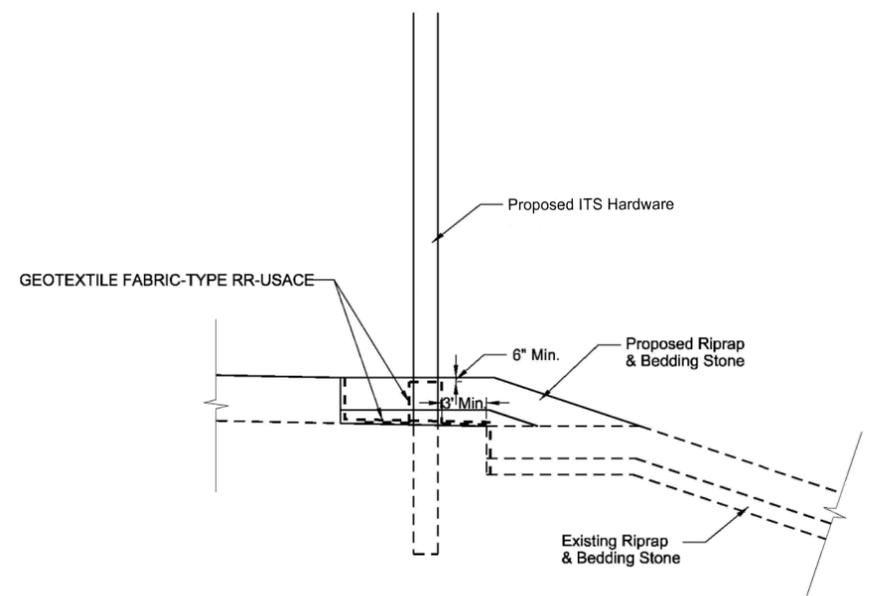
- LEGEND:
- FUSE: 8 amp, Non-Time Delay or 3 1/2 amp, Dual Element
 - LUMINAIRE: 250 watt High Pressure Sodium Lamp

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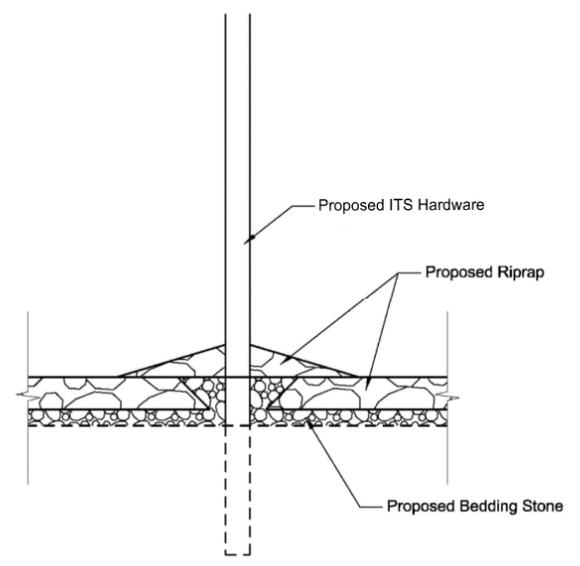
ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Gate Wiring Diagram

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	160	11

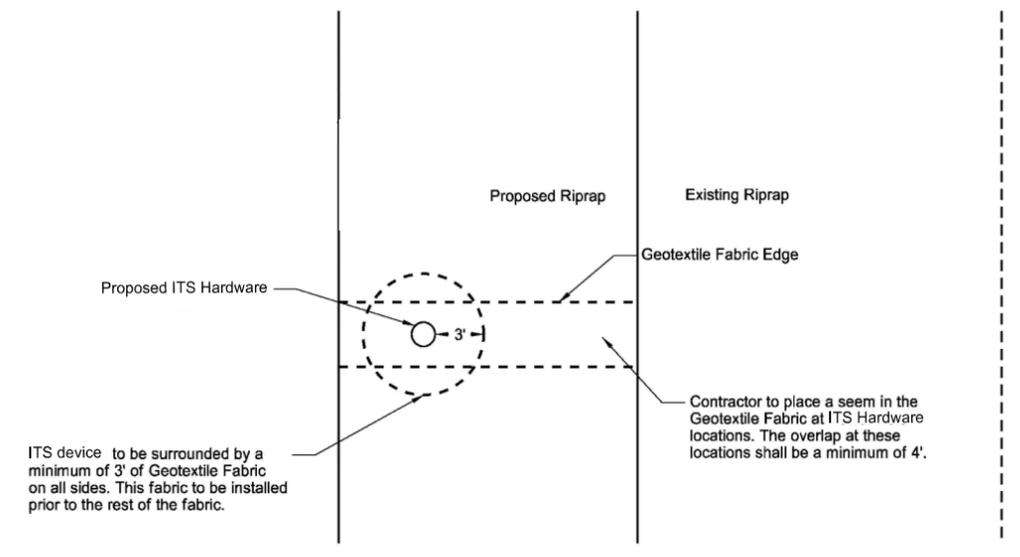
NOT TO SCALE



SECTION VIEW FOR FABRIC PLACEMENT
 Geotextile Fabric to be wrapped around the pole up to a minimum of 6" from the top of the finished grade of the Riprap.



SECTION VIEW FOR RIPRAP PLACEMENT
 Contractor shall backfill around the ITS Hardware with Bedding Stone to the finished grade shown on the cross sections to minimize the voids in those areas. Additional Riprap shall be placed above the final grade in these areas to the satisfaction of the Engineer.



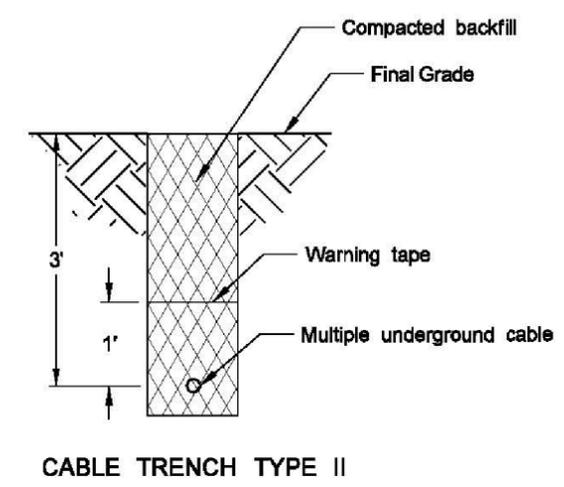
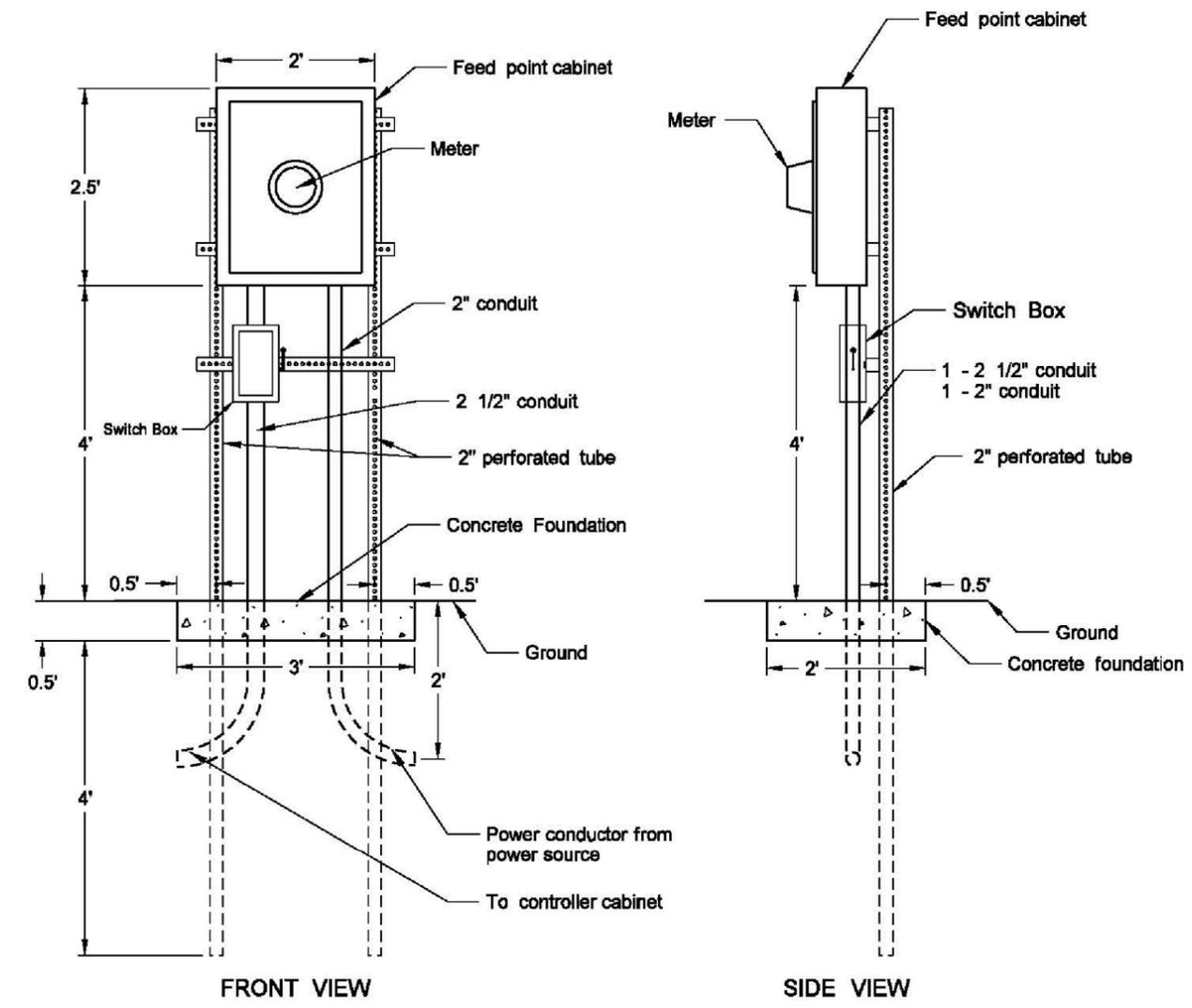
PLAN VIEW
 Geotextile Fabric to surround the pole a minimum of 3' in all directions.

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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Detail for Installation of
 ITS Hardware Near Riprap

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SHE-3-057(048)000	160	12

NOT TO SCALE



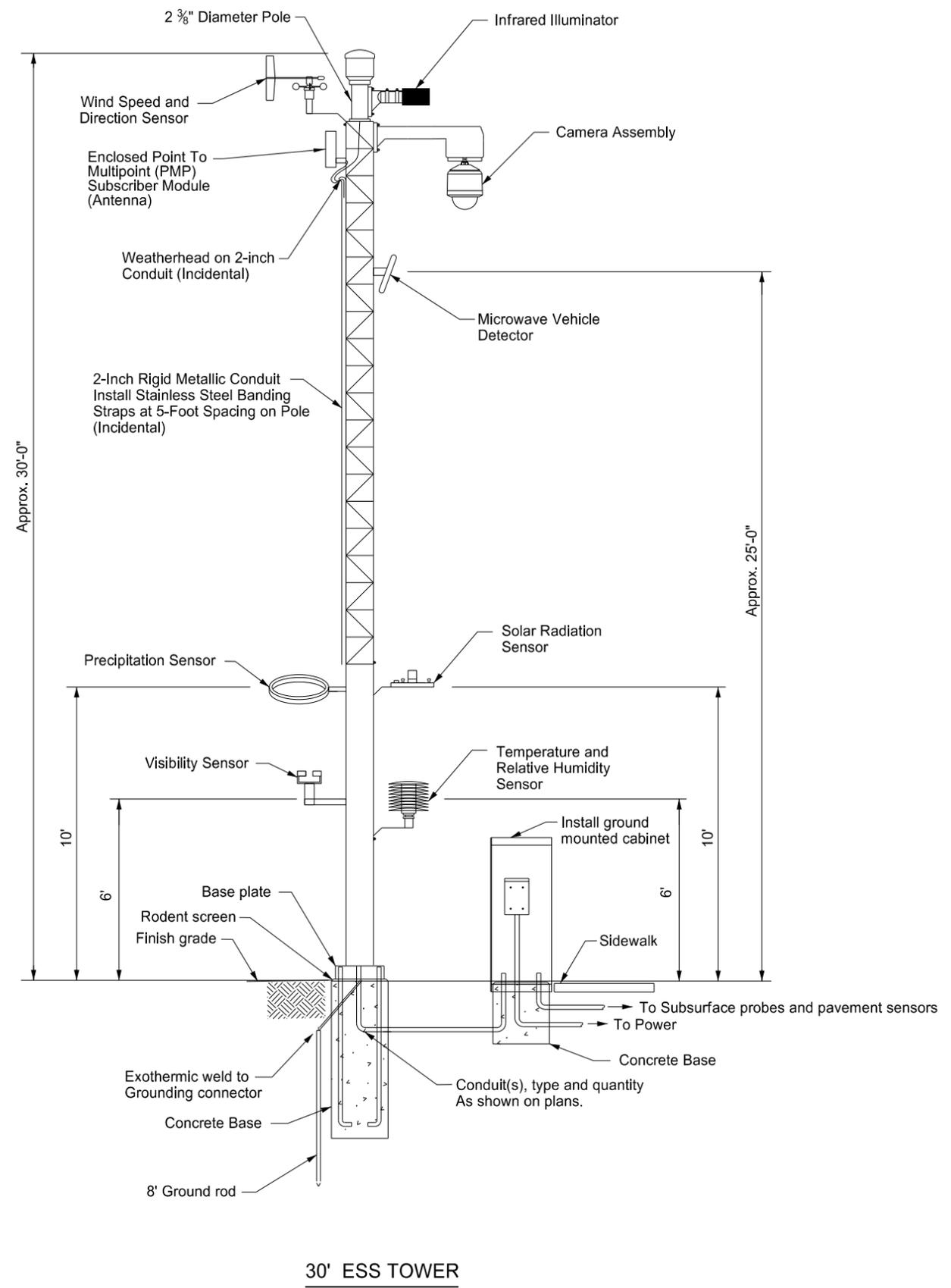
CABLE TRENCH TYPE II

Pipe Stand Mounted Feed Point- Type I

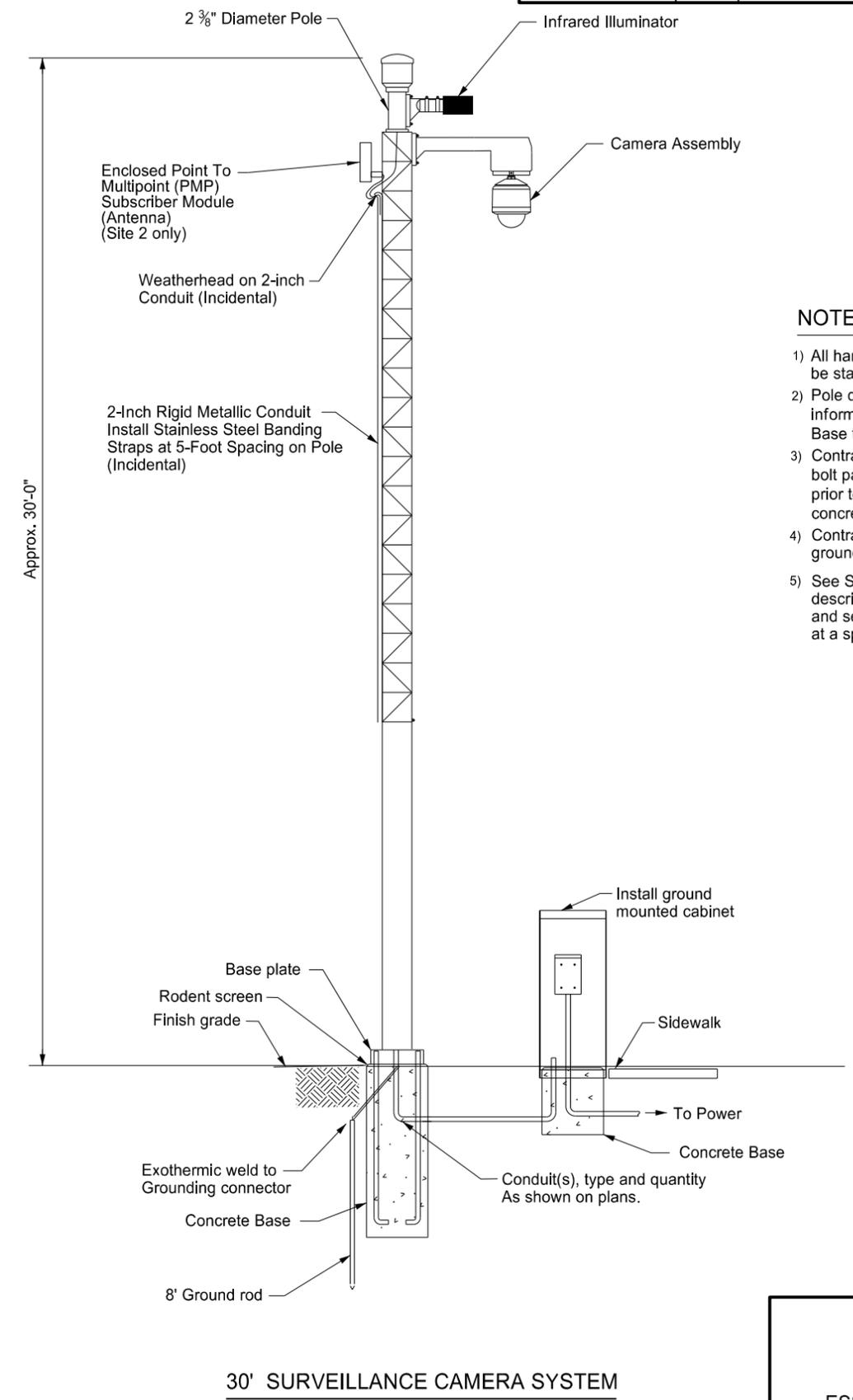
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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 Feed Point & Trench Details

NOT TO SCALE



30' ESS TOWER



30' SURVEILLANCE CAMERA SYSTEM

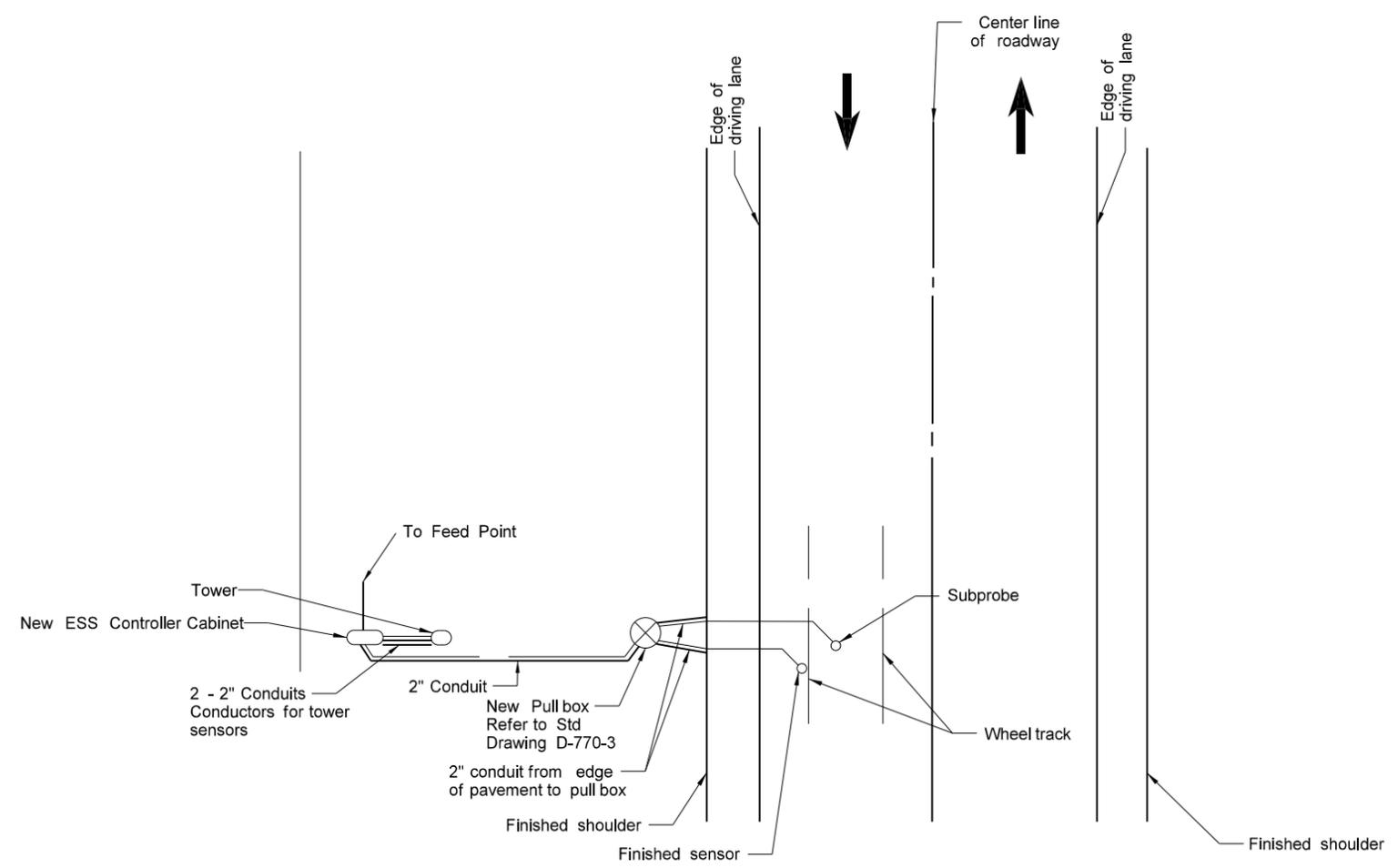
NOTES

- 1) All hardware and fasteners shall be stainless steel.
- 2) Pole drawings shown for bidding information purposes only. Base to be contractor designed.
- 3) Contractor shall confirm bolt pattern of foldover ESS tower prior to construction of concrete base.
- 4) Contractor shall install grounding lug as shown.
- 5) See Special Provisions for description of equipment and sensors to be installed at a specific site

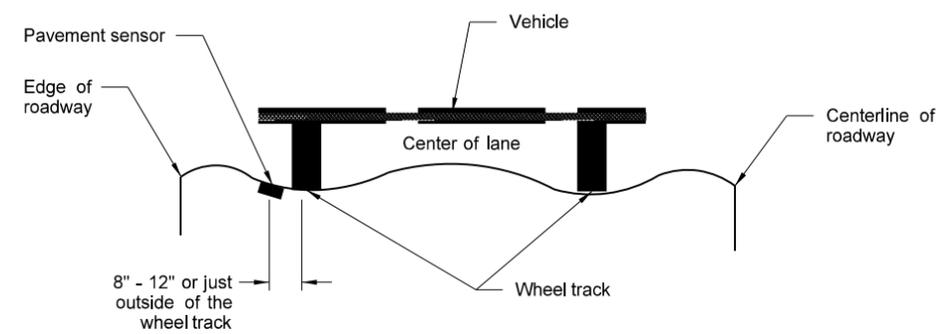
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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 ESS/Surveillance Camera System Details

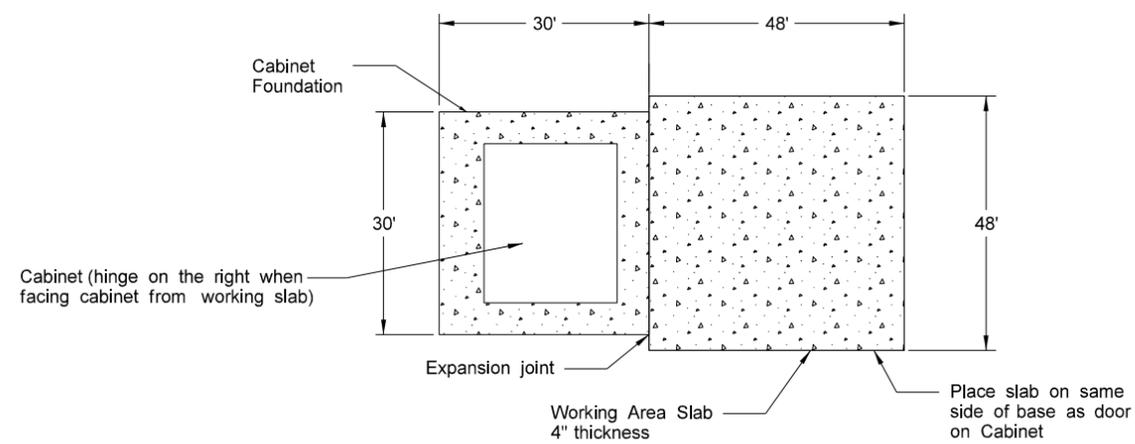
NOT TO SCALE



ESS SENSOR PLACEMENT



ESS SENSOR PLACEMENT IN A LANE

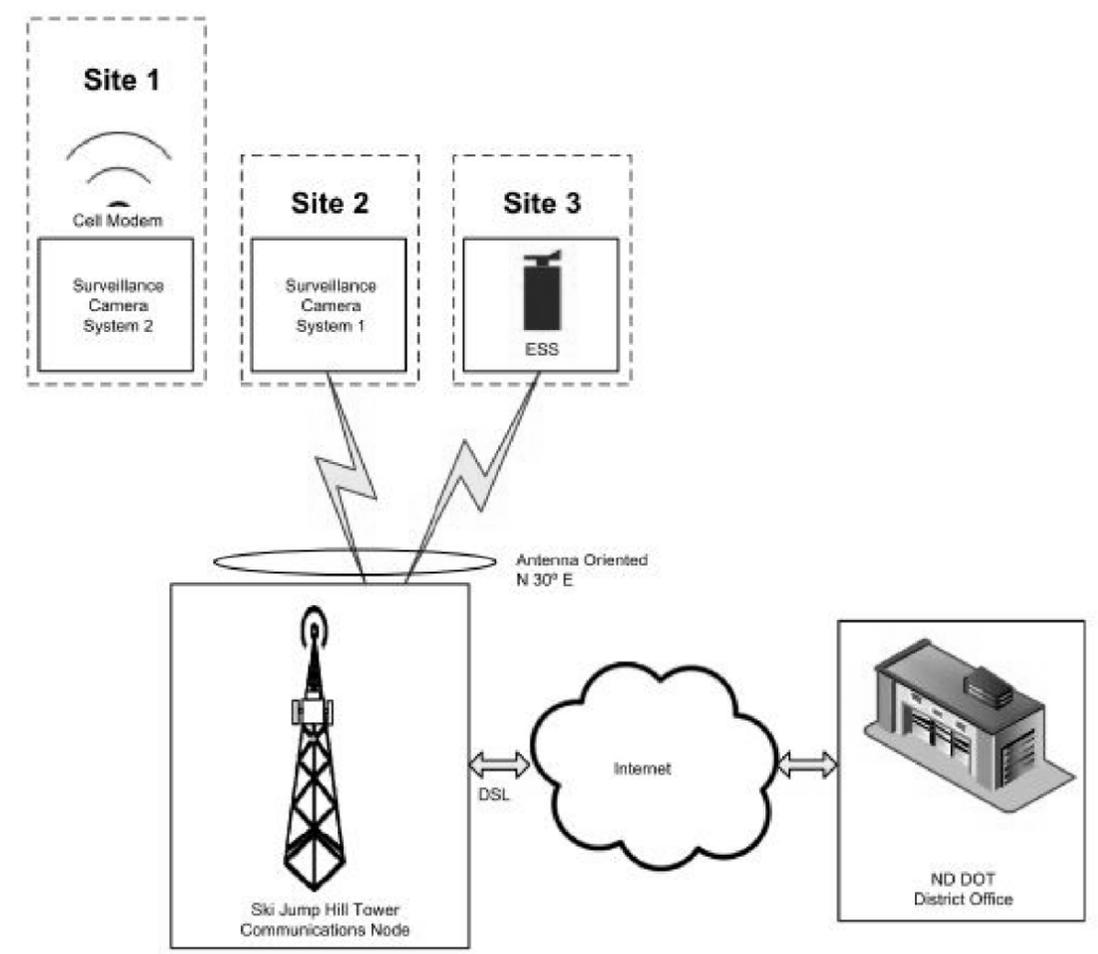
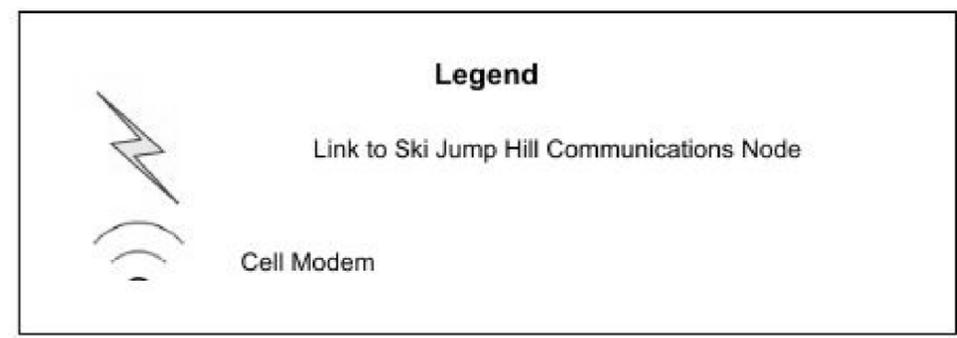


CABINET FOUNDATION AND WORKING SLAB

The Working Area Slab shall be installed where shown on the plans, and shall not be bid separately but shall be included in the price bid for "ESS STATION/RWIS" and "Surveillance Camera System".

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ITS Details
 ND Hwy 57 / Hwy 20
 ITS Improvements
 ESS Sensors,
 Cabinet Foundation and Working Slab



SEE SPECIAL PROVISIONS
FOR RADIO INSTALLATION
REQUIREMENTS ON SKI
JUMP HILL TOWER.

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ITS Details
ND Hwy 57 / Hwy 20
ITS Improvements
Communications Schematic

NDDOT ABBREVIATIONS

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
REVISIONS	
DATE	CHANGE
04-20-11	Added Items

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NDDOT ABBREVIATIONS

D-20-2

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
REVISIONS	
DATE	CHANGE
04-20-11	Added Items

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NDDOT ABBREVIATIONS

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
06-15-10	
REVISIONS	
DATE	CHANGE
04-20-11	Added Items

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NDDOT UTILITY COMPANY ABBREVIATIONS

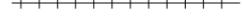
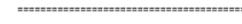
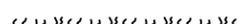
D-20-10

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

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Line Styles

	Subgrade Reinforcement		Existing Railroad Switch		Sheet Piling
	Existing Down Guy Wire Down Guy		Overhead Sign Structure Cantilever		W-Beam w Posts
	Existing Fence		24 Inch Pipe		Existing W-Beam Guardrail with Posts
	Existing Railroad		Reinforced Concrete Pipe		Exst Wet Area-Vegetation Break
	Existing Sanitary Sewer		Signal Head with Mast Arm		Existing Wetland Delineated
	Existing Sanitary Force Main		Existing Signal Head with Mast Arm		
	Existing Storm Drain		Tie Bar at Random Spacing		
	Existing Storm Drain Force Main		3-Cable w Posts		
	Fence		Existing 3-Cable w Posts		
	Silt Fence		Site Boundary		
	Existing Field Line		Fiber Rolls		
	Exst Flow		Doweled Joint		
	Flow		Tie Bar 30 Inch 4 Foot Center to Center		
	Existing Culvert		Tie Bar 18 Inch 3 Foot Center to Center		
	Existing Curb		Existing Berm, Dike, Pit, or Earth Dam		
	Existing Valley Gutter		Existing Ditch Block		
	Existing Driveway Gutter		Depression Contours		
	Existing Curb and Gutter		Existing City Corporate Limits or Reservation Boundary		
	Existing Mountable Curb and Gutter		Gravel Pit - Borrow Area		
	Existing Double Micro Loop Detector		Existing Tree Boundary		
	Micro Loop Detector Double		Tree Row		
	Existing Overhead Sign Structure		Existing Brush or Shrub Boundary		
	Existing Micro Loop Detector		Existing Retaining Wall		
	Micro Loop Detector		Existing Planter or Wall		
	Existing Overhead Sign Structure Cantilever		Retaining Wall (Plan View)		

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4-20-11	
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Symbols

	North Arrow (Half Scale)		Attenuation Device		Existing Railroad Battery Box		Existing Delineator Type E
	Truck Mounted Attenuator		Diamond Grade Delineator Type A		Existing Bush or Shrub		Existing EFB Misc
	Type I Barricade		Diamond Grade Delineator Type B		Existing Gas Cap or Stub		Existing Flashing Beacon
	Type II Barricade		Diamond Grade Delineator Type C		Existing Sanitary Cap or Stub		Existing Pipe Mounted Flasher
	Type III Barricade		Diamond Grade Delineator Type D		Existing Storm Drain Cap or Stub		Existing Pad Mounted Feed Point
	Catch Basin		Diamond Grade Delineator Type E		Existing Water Cap or Stub		Existing Pipe Mounted Feed Point with Pad
	Cairn or Stone Circle		Flexible Delineator		Existing Sanitary Cleanout		Existing Pole Mounted Feed Point
	Video Detection Camera		Flexible Delineator Type A		Existing Concrete Foundation		Existing Railroad Frog
	Storm Drain Cap or Stub		Flexible Delineator Type B		Existing Traffic Signal Controller		Existing Snow Gate 18
	Corrugated Metal End Section 18 Inch		Flexible Delineator Type C		Existing Pad Mounted Signal Controller		Existing Snow Gate 28
	Corrugated Metal End Section 24 Inch		Flexible Delineator Type D		Existing Sixteenth Section Corner		Existing Snow Gate 40
	Corrugated Metal End Section 30 Inch		Flexible Delineator Type E		Existing Quarter Section Corner		Existing Headwall
	Corrugated Metal End Section 36 Inch		Delineator Type A		Existing Section Corner		Existing Pedestrian Head with Number
	Corrugated Metal End Section 42 Inch		Delineator Type A Reset		Existing Railroad Crossbuck		Existing Signal Head
	Corrugated Metal End Section 48 Inch		Delineator Type B		Existing Satellite Dish		Existing Sprinkler Head
	Concrete Foundation		Delineator Type B Reset		Existing Fuel Dispensers		Existing Fire Hydrant
	Ground Connection Conductor		Delineator Type C		Existing Flexible Delineator Type A		Existing Catch Basin Drop Inlet
	Neutral Connection Conductor		Delineator Type D		Existing Flexible Delineator Type B		Existing Curb Inlet
	Phase 1 Connection Conductor		Delineator Type E		Existing Flexible Delineator Type C		Existing Manhole Inlet
	Phase 2 Connection Conductor		Delineator Drums		Existing Flexible Delineator Type D		Existing Junction Box
	Traffic Cone		Spot Elevation		Existing Flexible Delineator Type E		
	Signal Controller		Existing Access Control Arrow		Existing Delineator Type A		
	Pad Mounted Signal Controller		Existing Artifact		Existing Delineator Type B		
	Alignment Data Point		Existing Flashing Beacon		Existing Delineator Type C		
	Emergency Vehicle Detector		Existing Benchmark		Existing Delineator Type D		

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REVISIONS	
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Symbols

D-20-31

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

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Symbols

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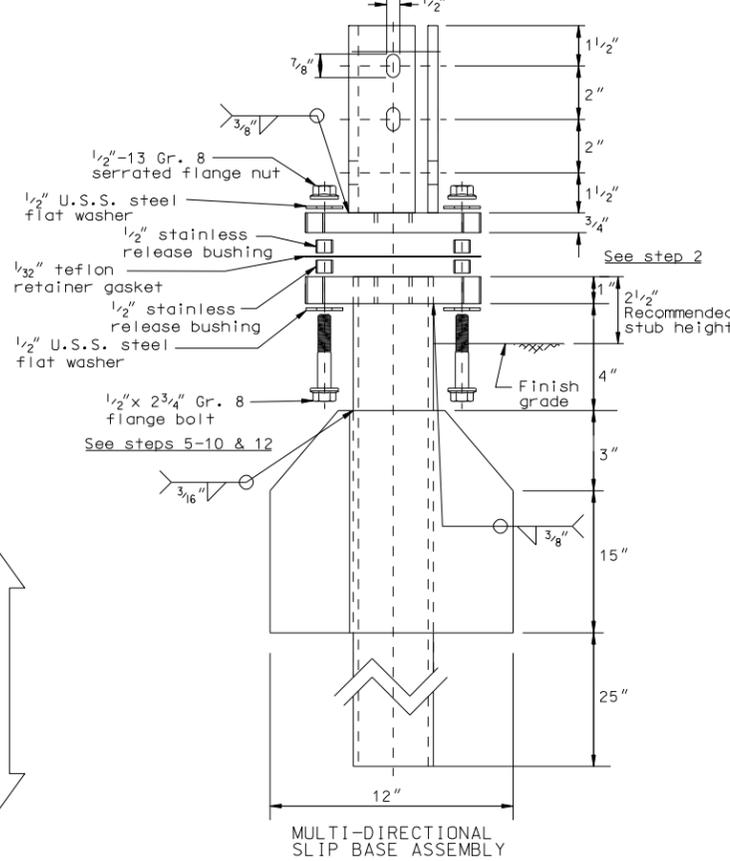
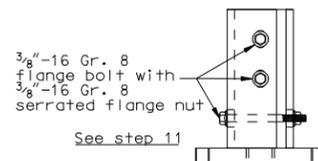
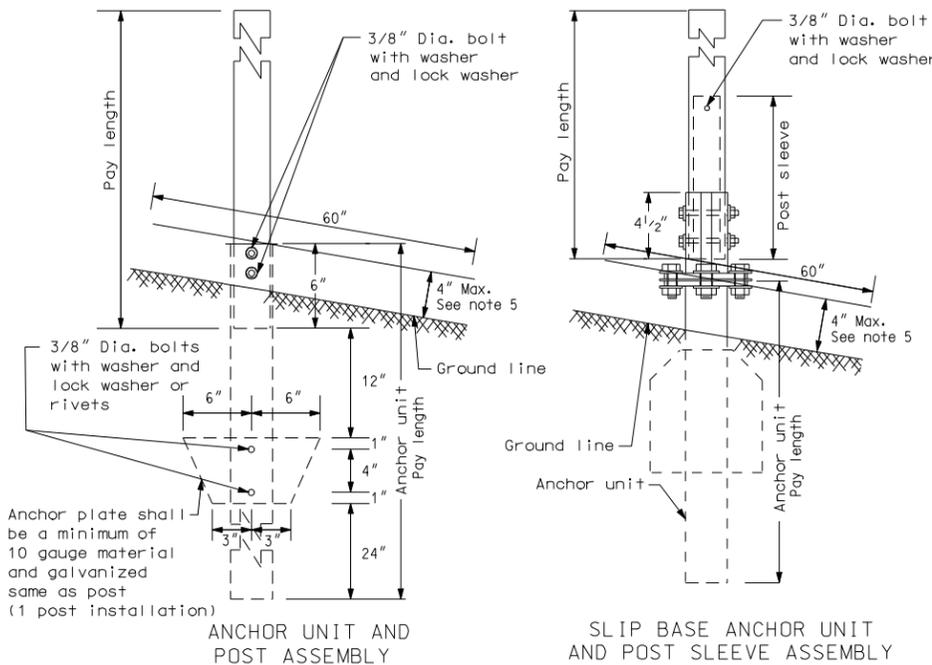
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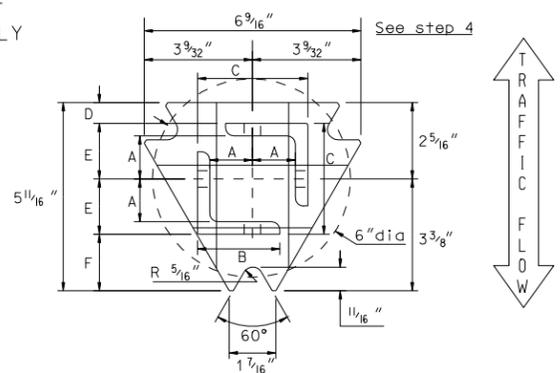
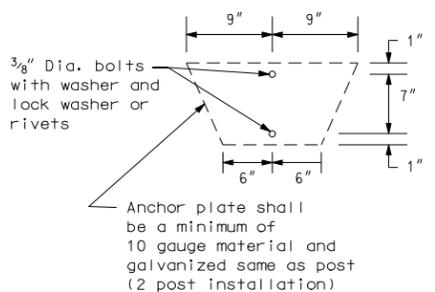
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

PERFORATED TUBE



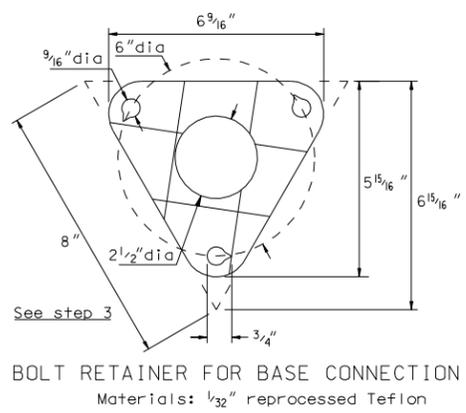
- Notes
1. Slip base bolts shall be torqued as specified by the manufacturer.
 2. The 2 3/16" size 10 gauge is shown as 2.19" size on the plans. The 2 1/2" size 10 gauge is shown as 2.51" size on the plans.
 3. Anchor for 2", 2 1/4", and 2 1/2" posts.
 4. Anchor material shall be 7 gauge H.R.P.O. Commercial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



TOP POST RECEIVER DATA TABLE

Square Post Sizes	A	B	C	D	E	F
2 3/16" x 10 Ga. Square Post	1 3/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 7/8"
2 1/2" x 10 Ga. Square Post	1 3/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"

2 3/16" x 10 gauge may be inserted into 2 1/2" x 10 gauge for additional wind load.



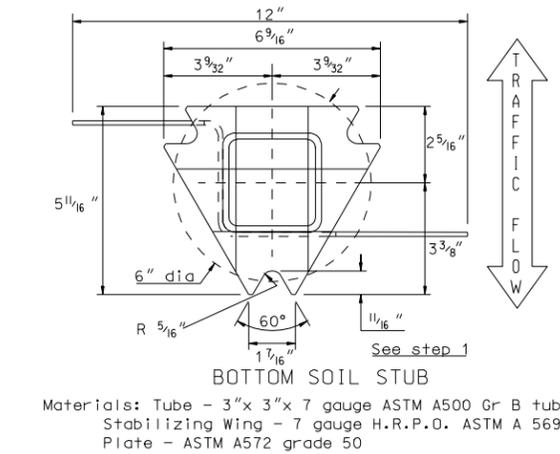
Telescoping Perforated Tube

Number of Posts	Telescoping Perforated Tube					
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness 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			B	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	10			Yes	
2	2 1/4	12	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	

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

MULTI-DIRECTIONAL SLIP BASE ASSEMBLY

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



Telescoping Perforated Tubes

Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. 4	Cross Sect. Area In. 2	Section Modulus In. 3
1 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 3/16 x 2 3/16	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
4 x 4	0.250	1/4	6.600	3.040	1.940	1.050

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
 11-21-02
REVISIONS

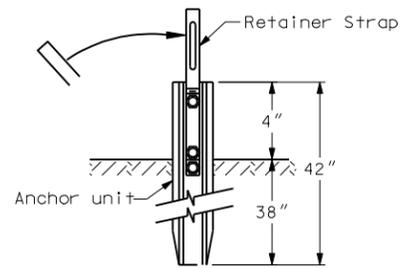
DATE	CHANGE
12-01-04	PE stamp added

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BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

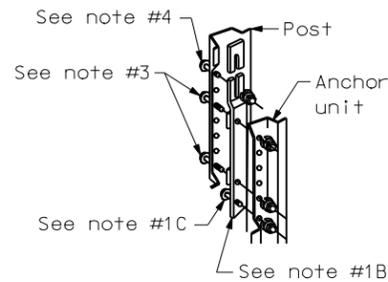
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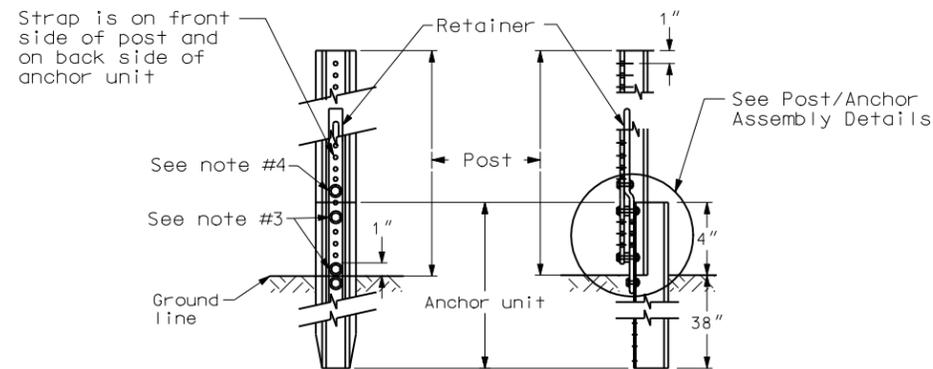
Anchor Unit & Strap Assembly Detail

STEPS OF INSTALLATION

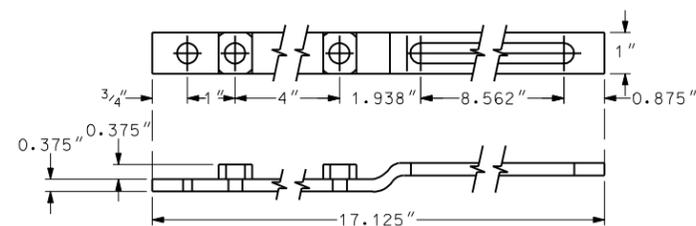
1. A) Drive anchor unit to within 12" of ground level.
B) Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.
C) Assemble strap to back of anchor unit using 3/8"-16 UNC x 2.0" long bolt, lock washer and nut.
D) Rotate strap 90° to left.
2.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



Post/Anchor Assembly Details



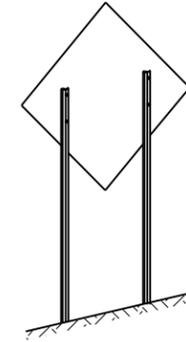
Front View Side View Sign Post Assembly Detail



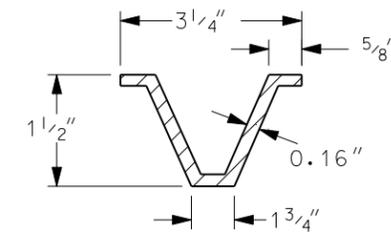
Retainer/Spacer Strap Detail

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

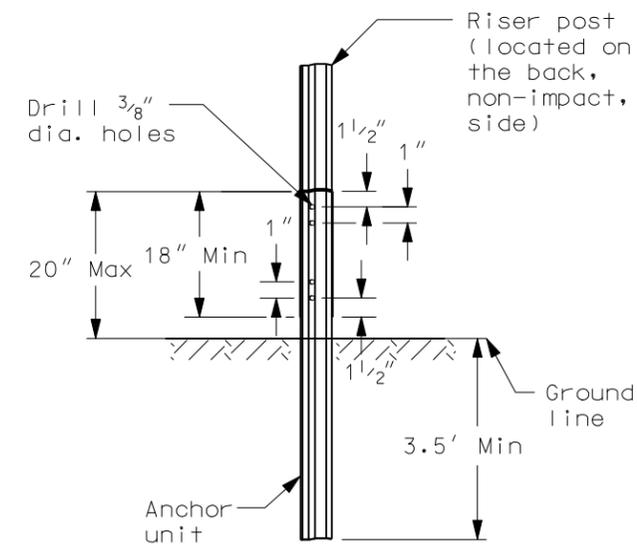
3 LB/FT U POSTS



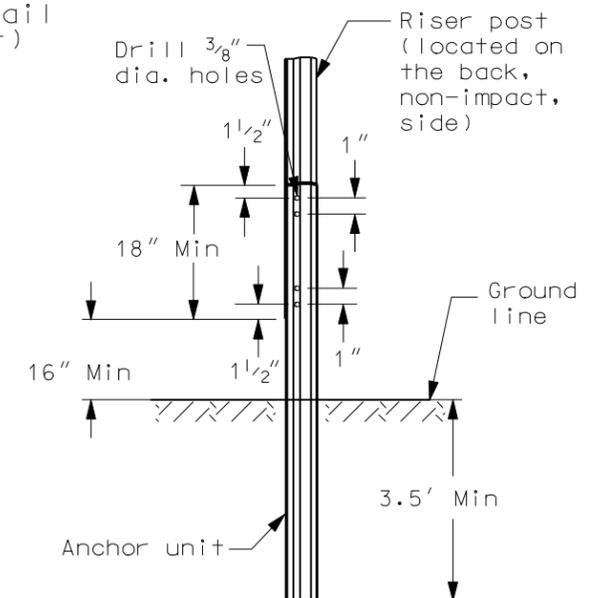
Typical Installation



U-Post Detail (3 lb/ft)



U-Channel Splice Option 1



U-Channel Splice Option 2

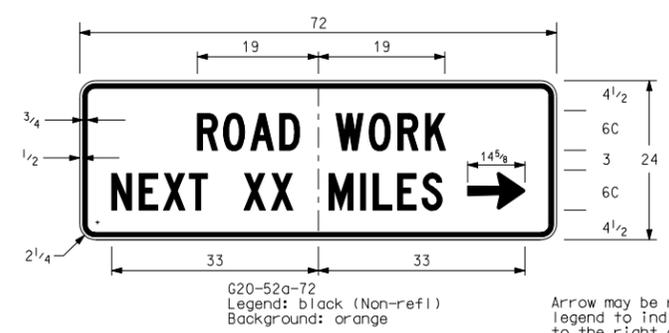
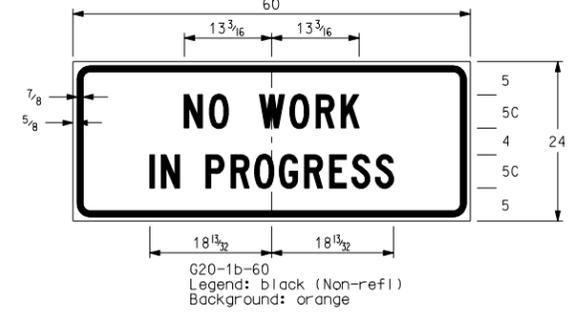
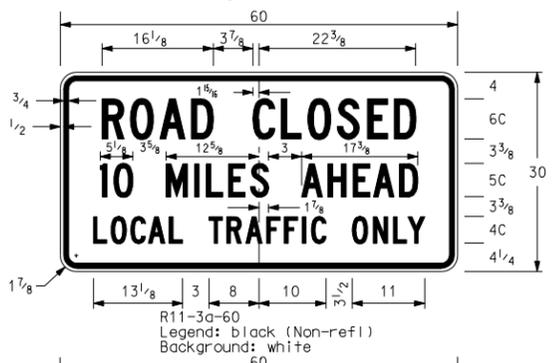
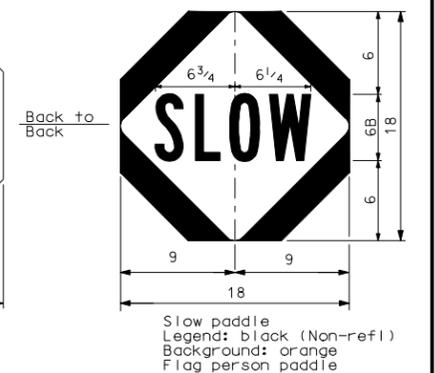
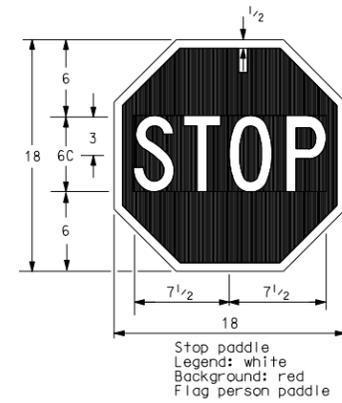
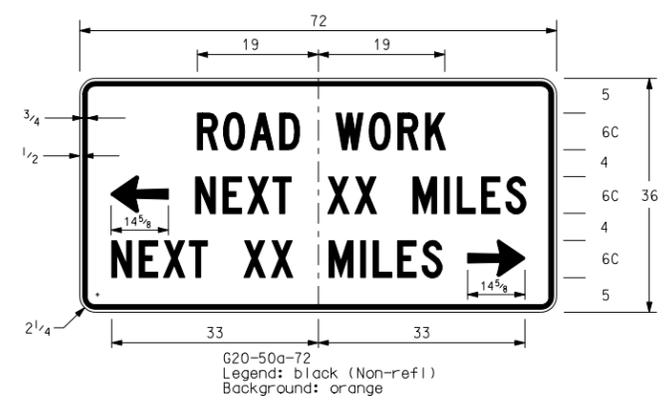
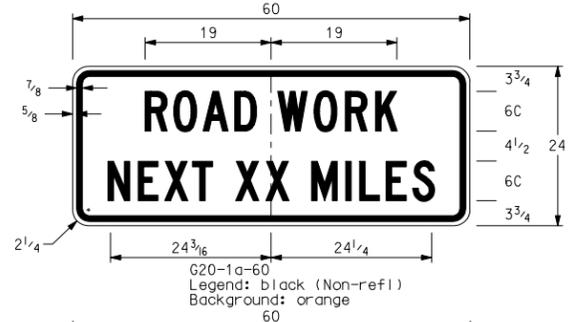
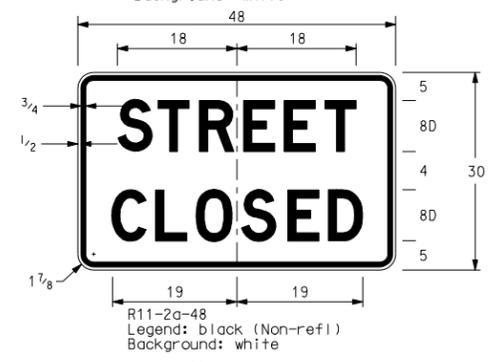
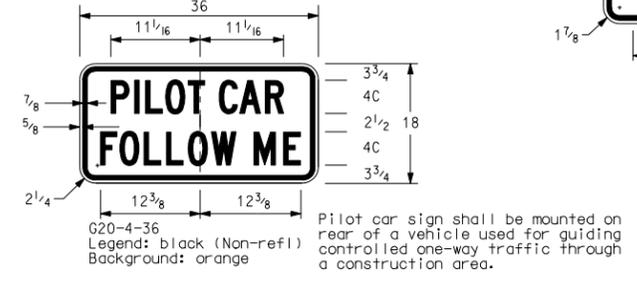
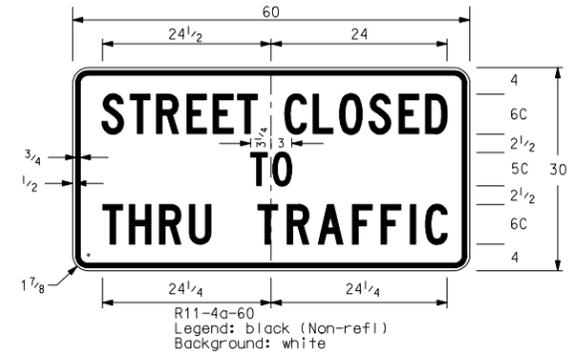
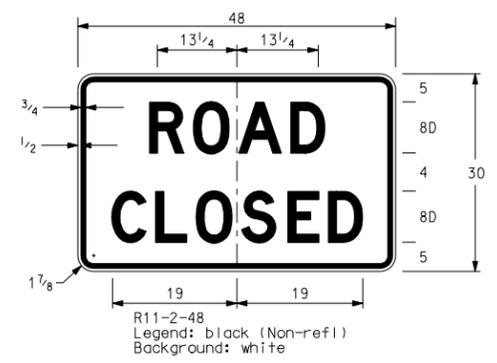
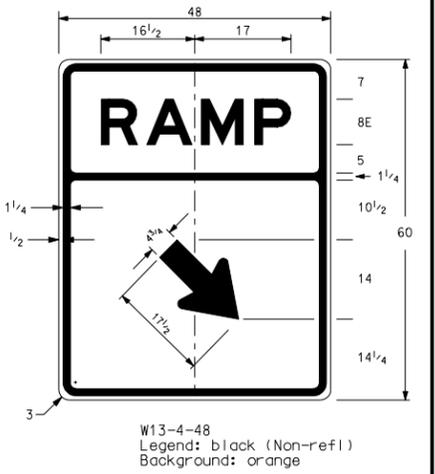
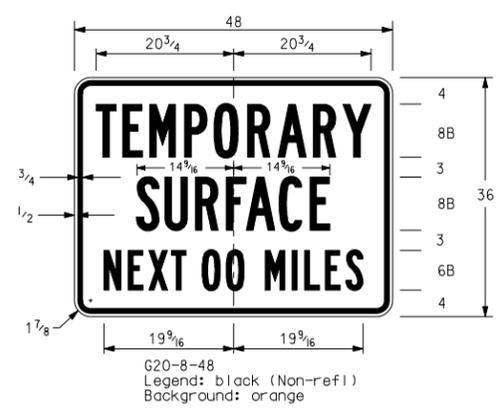
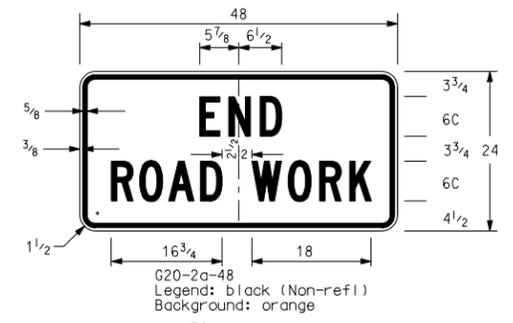
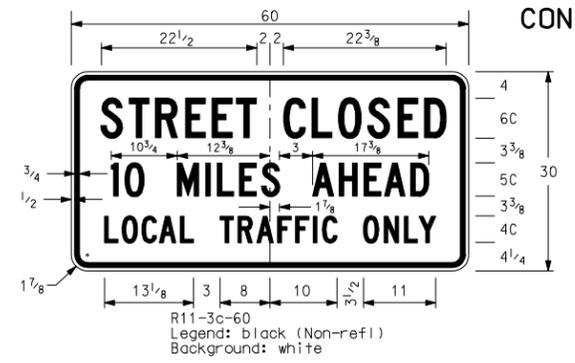
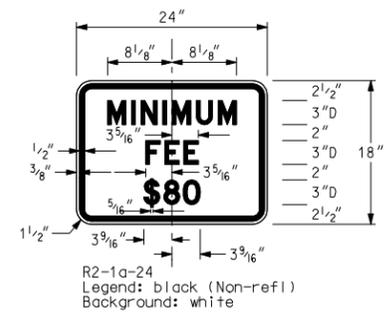
Notes

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

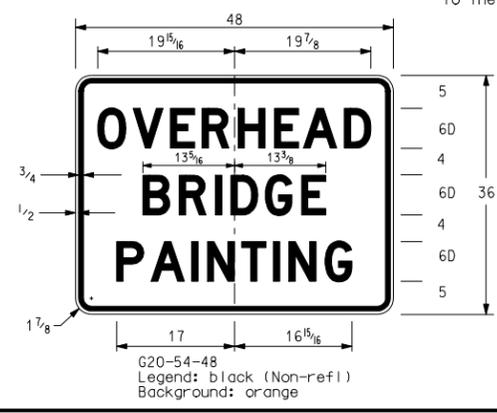
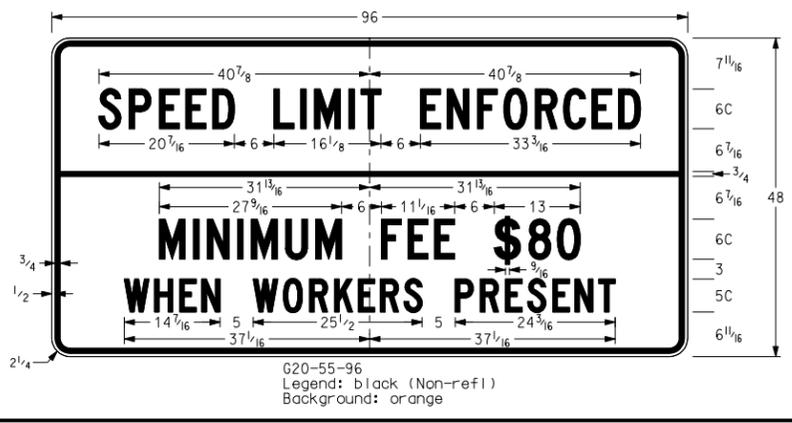
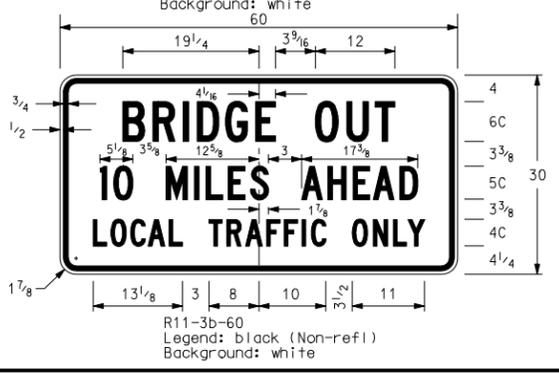
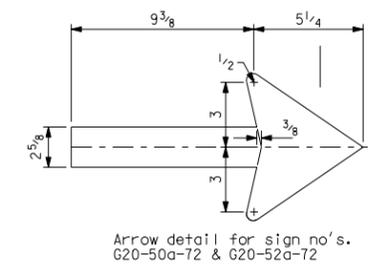
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-28-93	
REVISIONS	
DATE	CHANGE
03-07-01	Revised U-post details
11-21-02	Deleted perforated tube
05-08-03	Revised U-Channel splice
12-01-04	PE stamp added
06-29-05	Revised flanged channel note

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CONSTRUCTION SIGN DETAILS



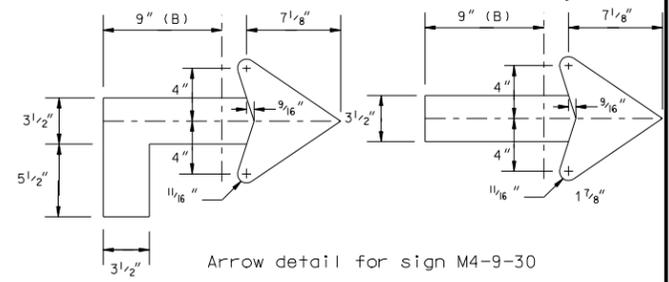
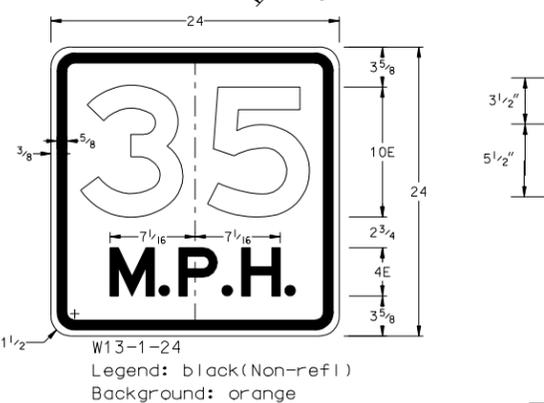
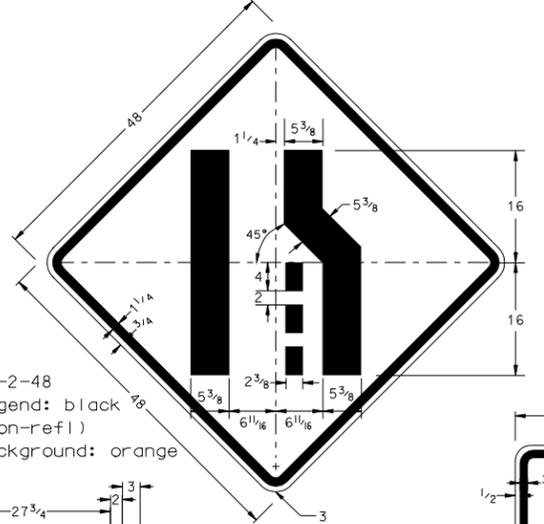
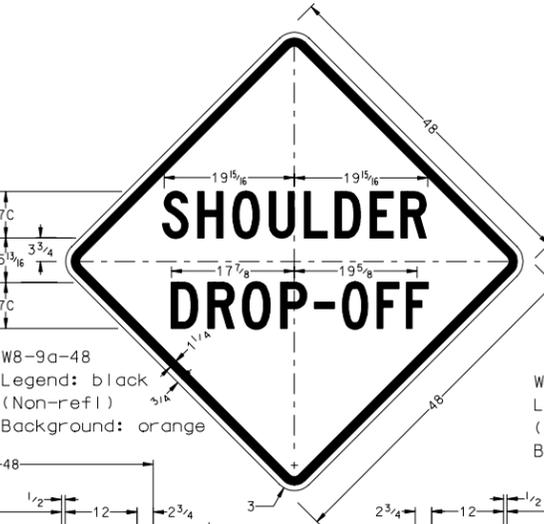
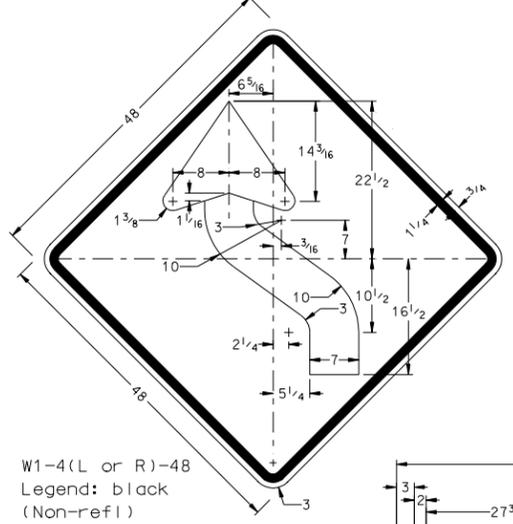
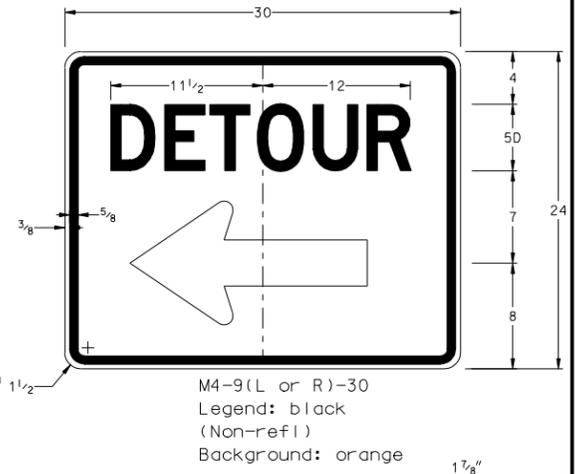
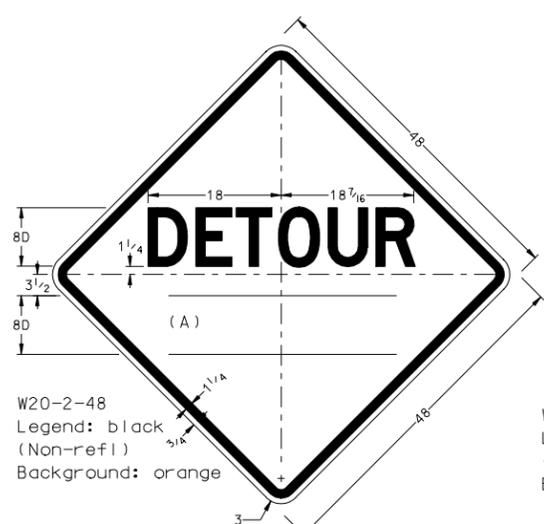
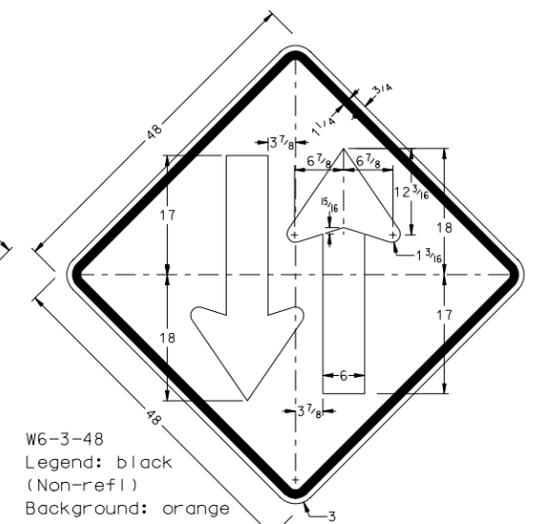
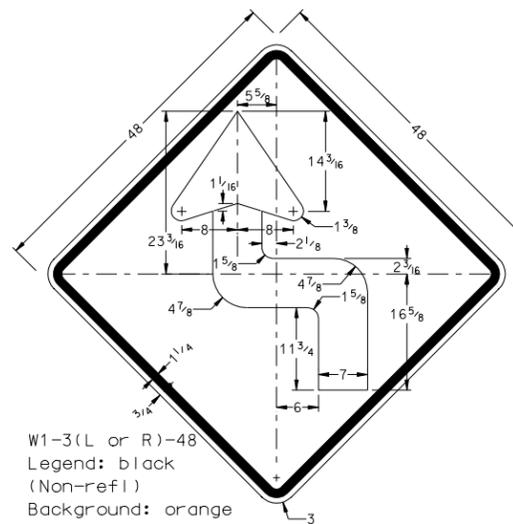
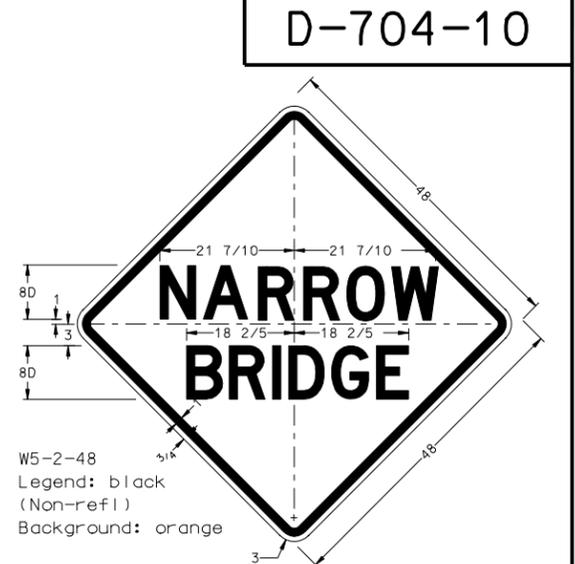
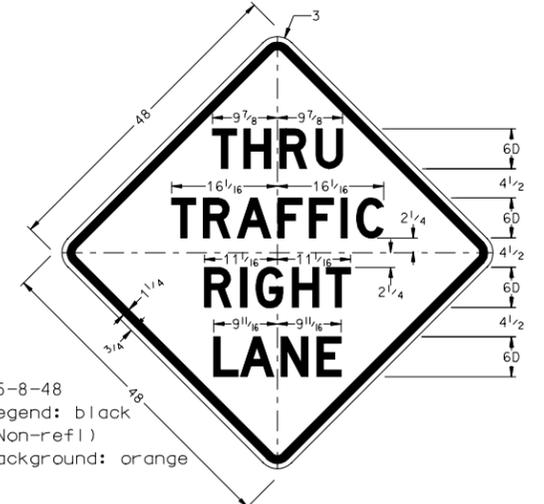
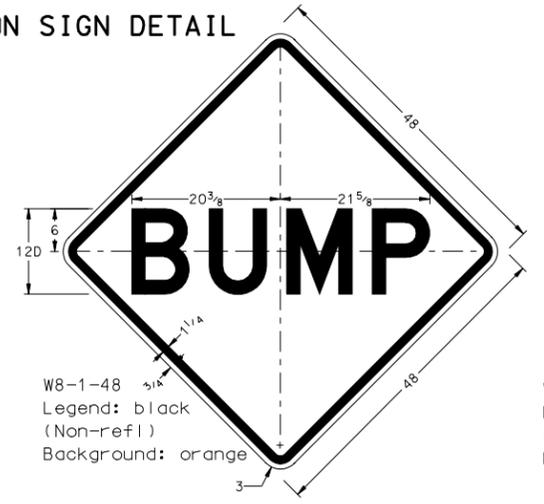
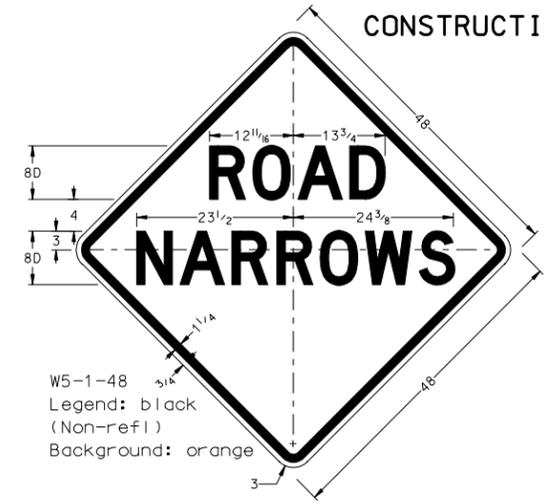
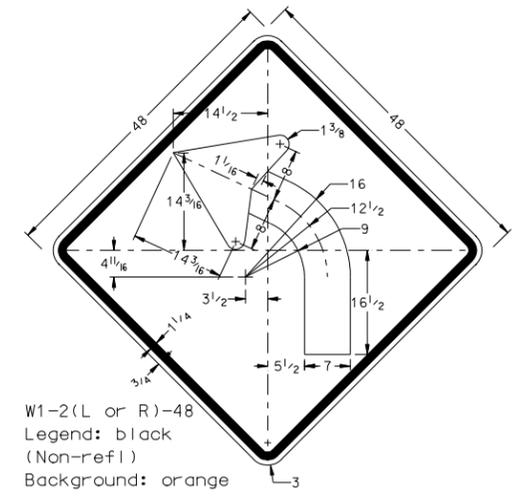
Arrow may be right or left of legend to indicate construction to the right or left.



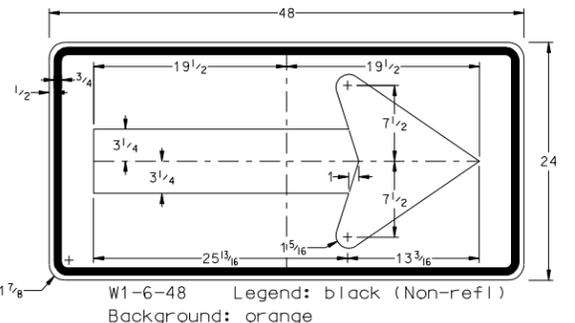
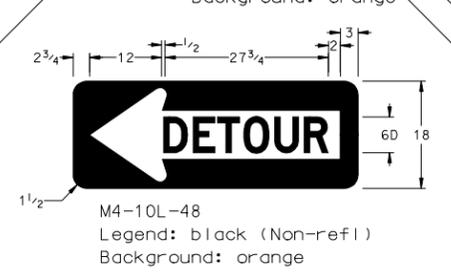
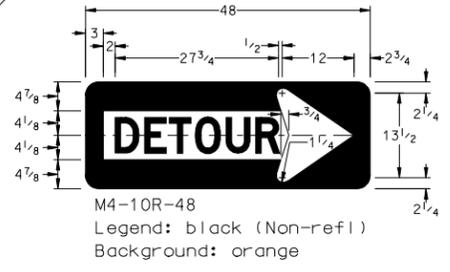
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
05-01-92	General revision
07-26-95	Added signs G20-1a, G20-50a, R2-1a
03-04-96	Remove G20-2-60
10-18-01	G20-1b-60
01-30-03	Pavement end sign
07-25-04	Revised Fee Sign
04-01-04	Revised G20-55-96 sign
08-04-04	Deleted W8-3-48, Added Slow paddle
12-01-04	PE stamp added
07-11-05	Revised G20-4

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CONSTRUCTION SIGN DETAIL



(A) See table on standard D-704-12 for messages and dimensions.
(B) Dimension shall be 3" when arrow is placed vertically.

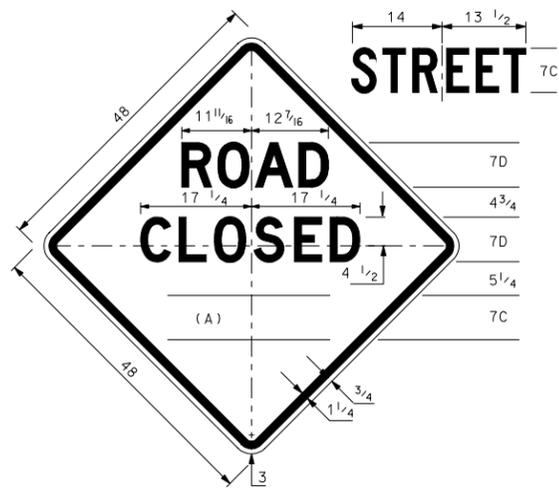


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-03-87	Detour no.
12-01-88	Shoulder drop off
05-01-88	General revisions
02-03-95	W8-9a-48
03-04-96	Remove W20-1-48
05-01-00	W5-8-48, W5-9-48
11-07-00	Add W5-2-48
01-06-04	W4-9-30 to M4-9-30
08-04-04	add arrow detail
12-01-04	General revisions
07-11-05	PE stamp added
	Revised W8-9a and W4-2

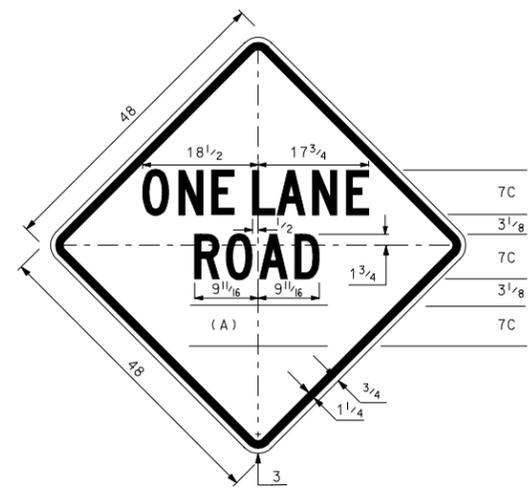
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CONSTRUCTION SIGN DETAIL

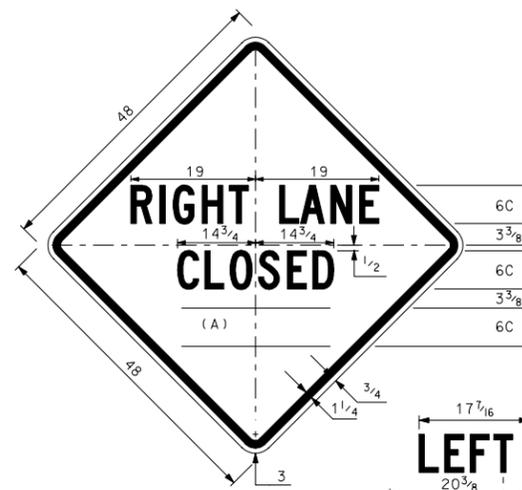
D-704-11



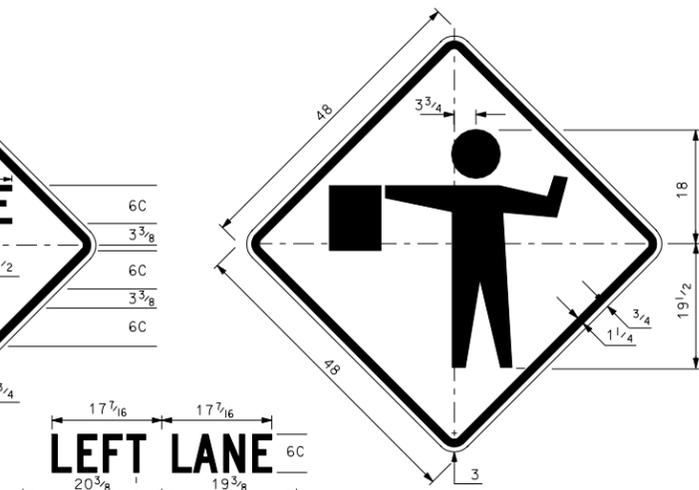
W20-3-48
Legend: black
(Non-refl)
Background: orange



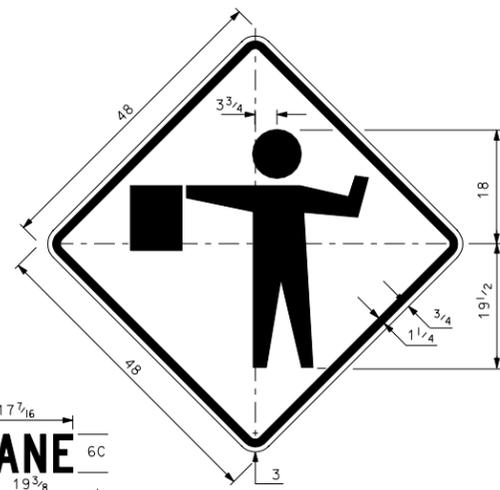
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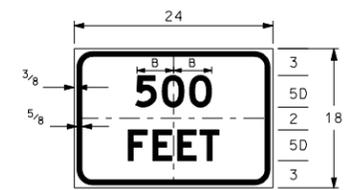
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(Non-refl)
Background: orange



W20-7a-48
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(Non-refl)
Background: orange



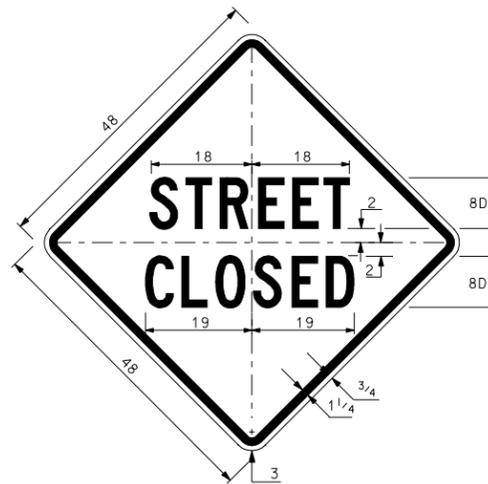
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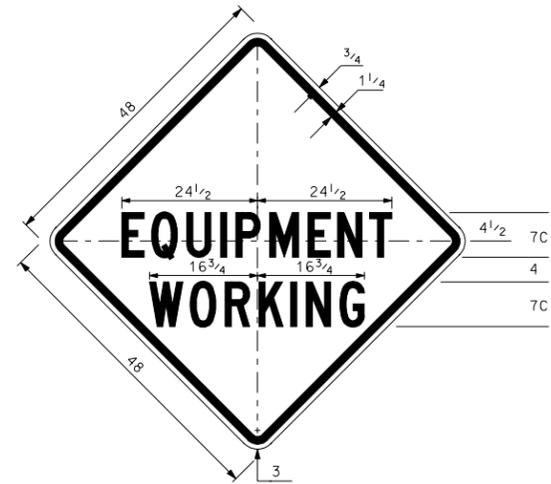
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SIGN	DIMENSION B (INCHES)
500'	6
1000'	7 3/8
1500'	7 3/8

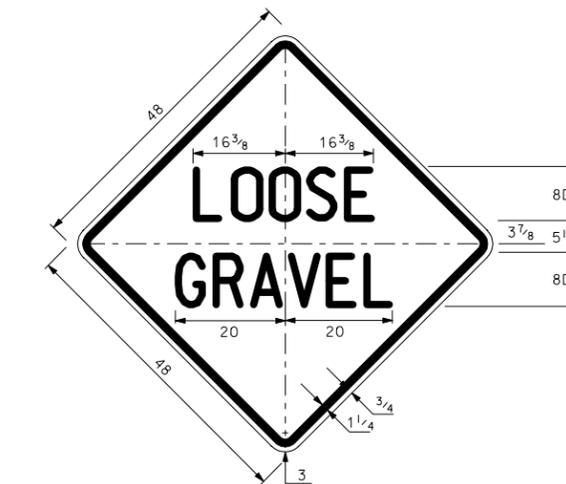
For use with
W20-7a-48 &
W21-1a-48



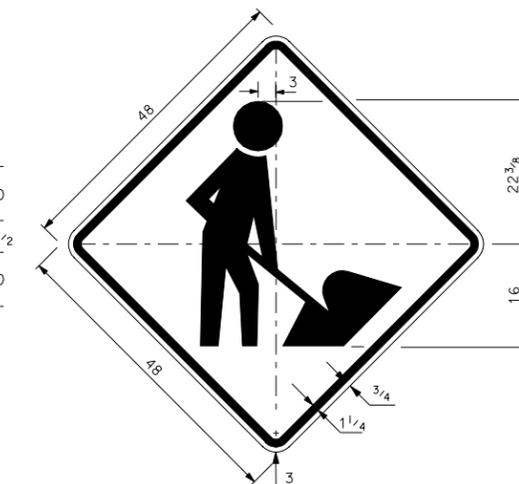
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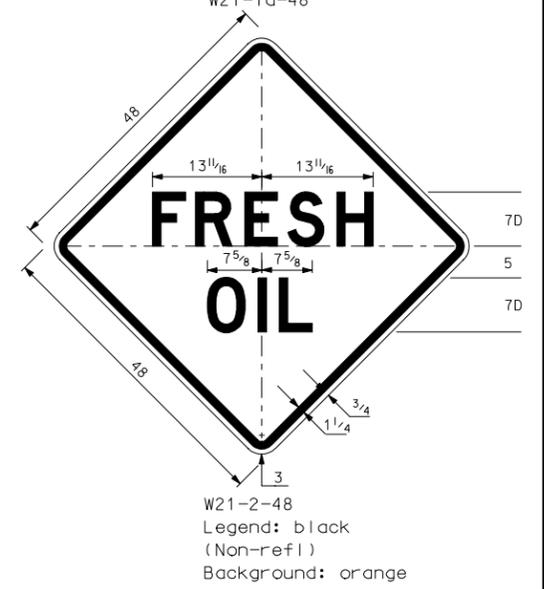
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W8-7-48
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Background: orange



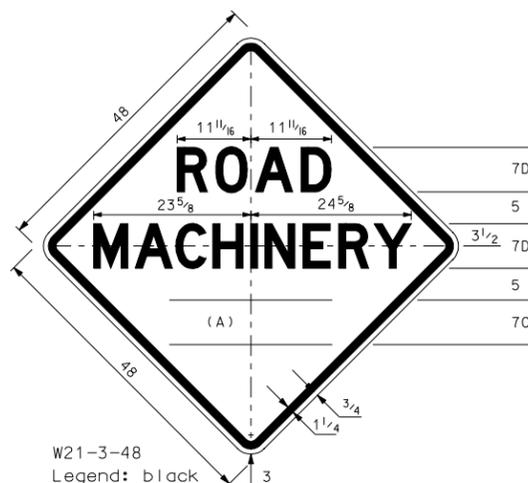
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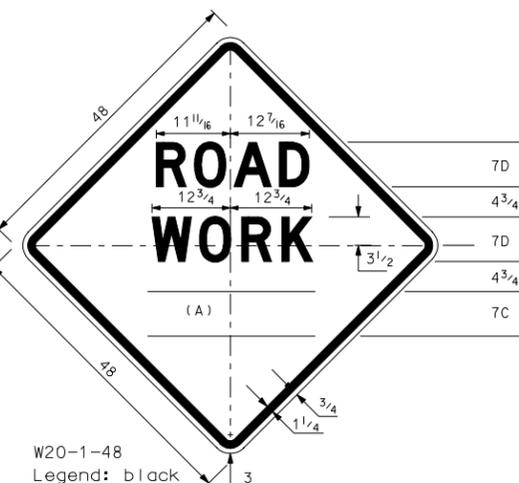
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Background: orange



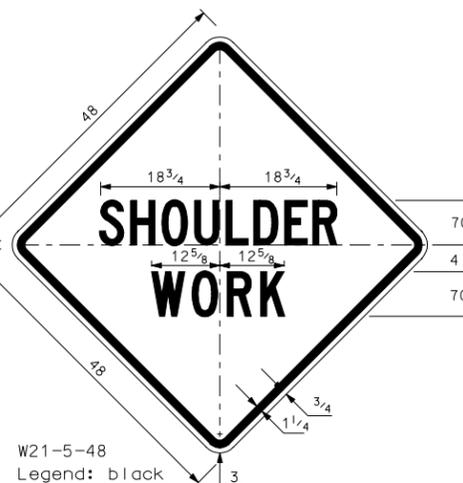
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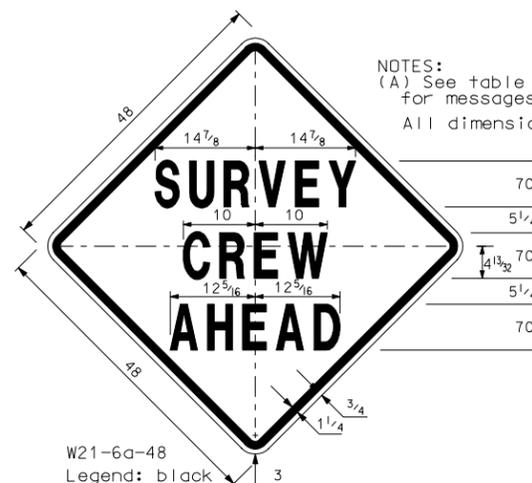
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(Non-refl)
Background: orange



W20-1-48
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(Non-refl)
Background: orange



W21-5-48
Legend: black
(Non-refl)
Background: orange



W21-6a-48
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(Non-refl)
Background: orange

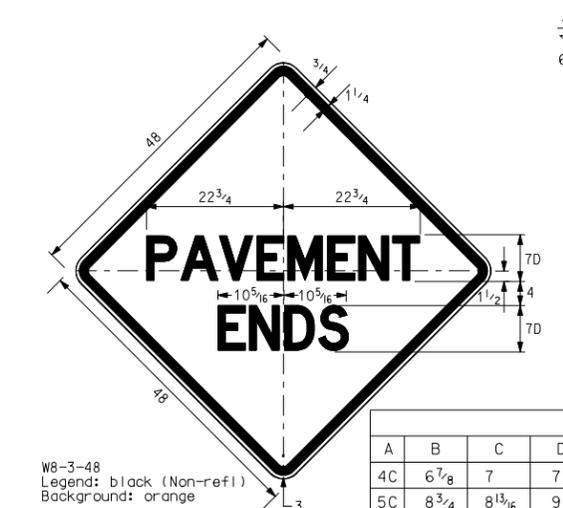
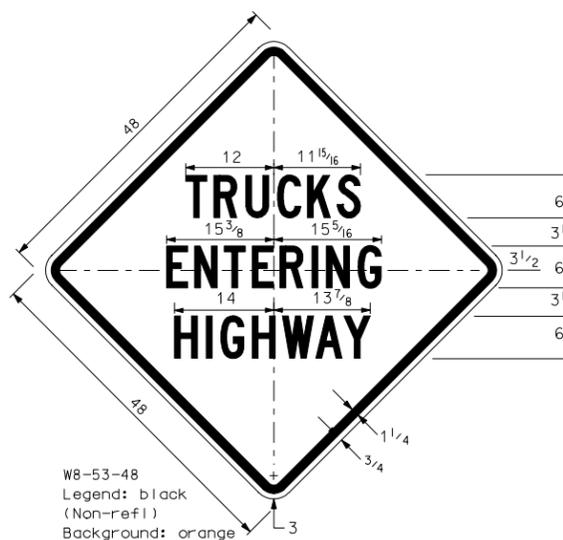
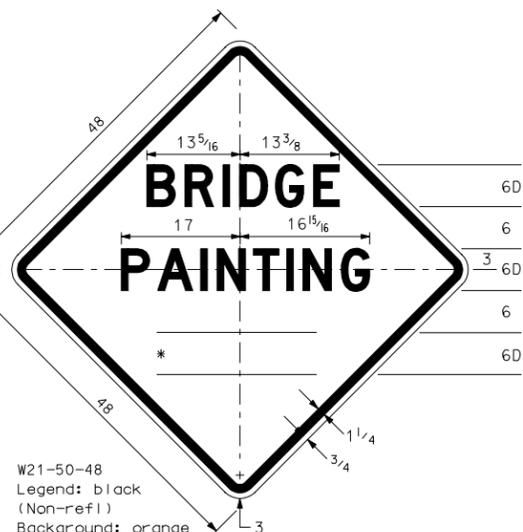
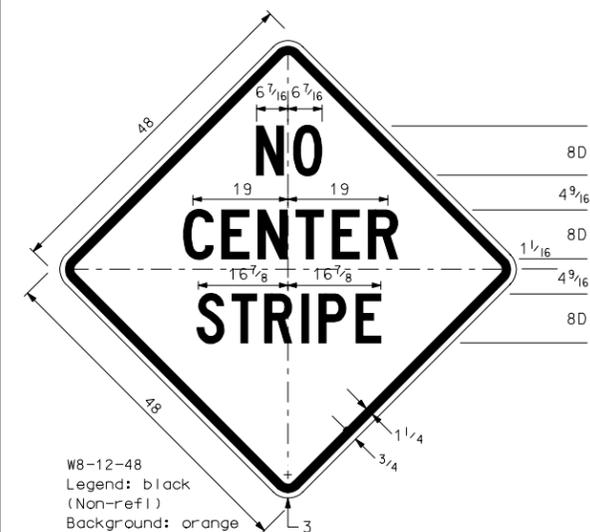
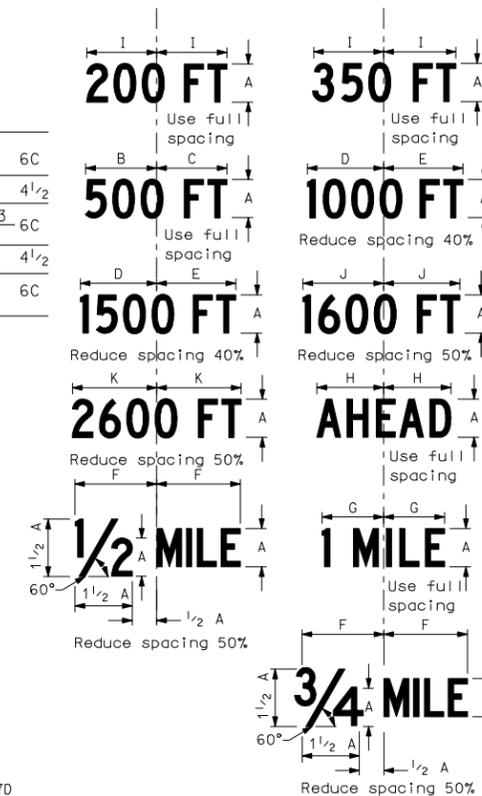
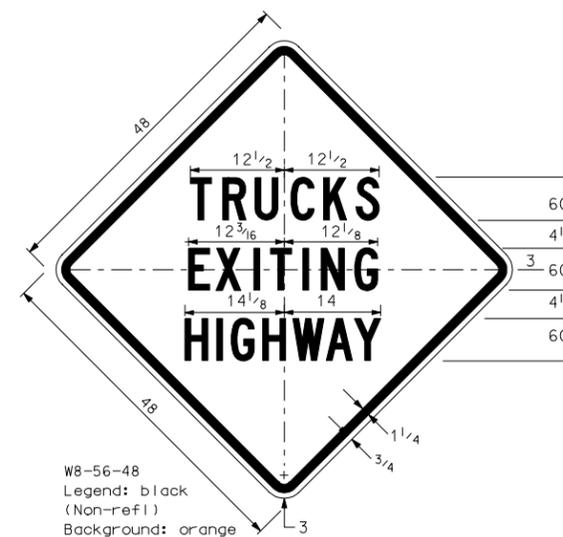
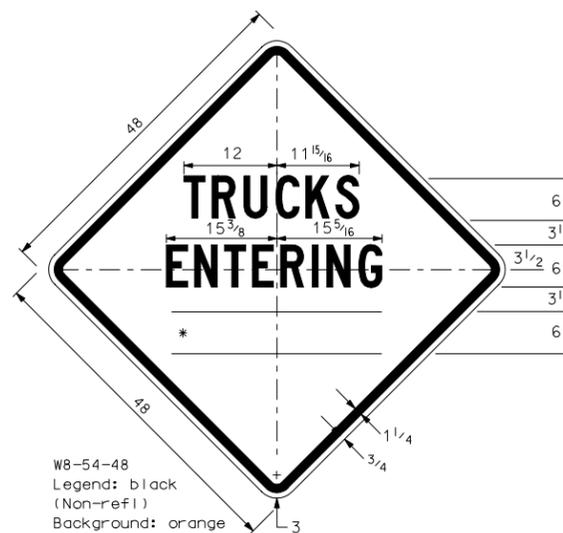
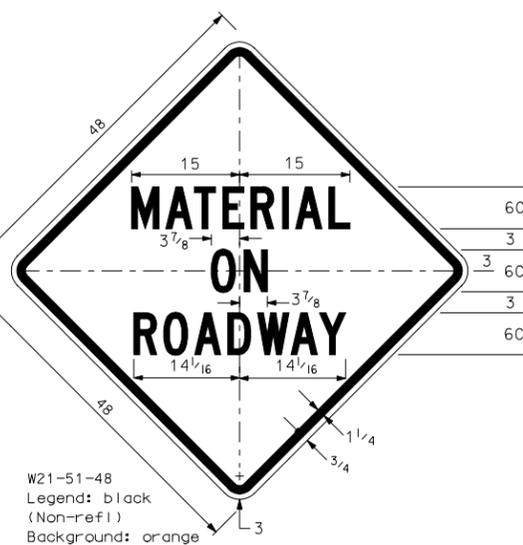
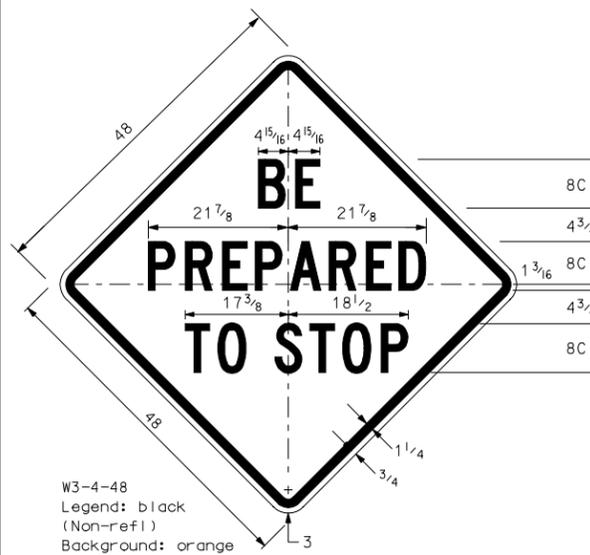
NOTES:
(A) See table on standard D-704-12
for messages and dimensions.
All dimensions are in inches

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
05-01-92	General revisions
06-09-95	Chg 7D to 7C(Dwg)
	W20-3, W21-3 & W21-4
05-26-98	Add W7-7-48
11-06-00	Rev W20-52-54
01-25-01	W21-6a-48
07-25-03	Rev W21-4 to W20-1
08-05-04	General revisions
12-01-04	PE stamp added
07-11-05	Revised W21-3, W20-1, W20-7a, W21-1a and W20-7k

This document was originally issued and sealed by Mark S Gaydos, Registration Number PE-4518, on 07/11/05 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN DETAIL

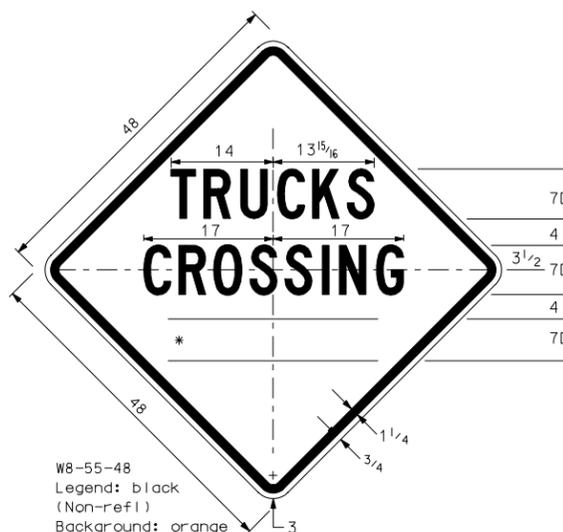
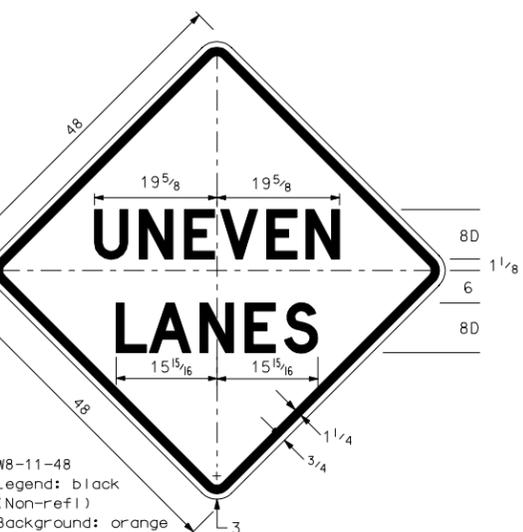
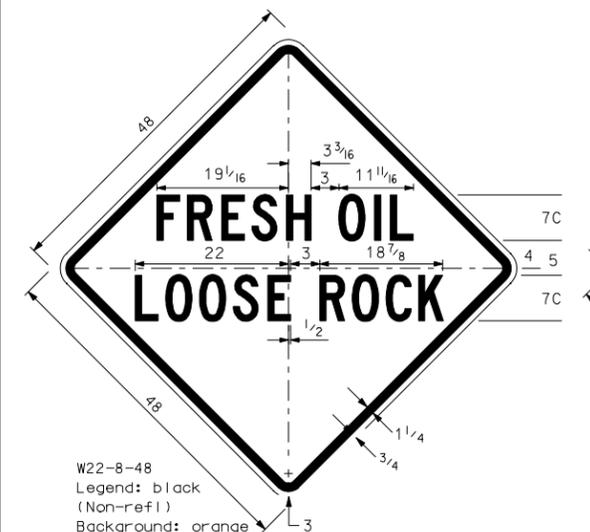
D-704-12



* DIMENSIONS (INCHES)

	A	B	C	D	E	F	G	H	I	J	K
4C	6 7/8	7	7 1/2	8	8 5/16	6 1/16	7	8 5/16	9 1/8	9 3/4	
5C	8 3/4	8 13/16	9 3/8	10	10 7/16	7 5/8	8 3/4	10 1/16	11 1/16	12 3/16	
6C	10 3/8	10 1/2	11 1/4	12	12 1/2	9 1/8	10 1/2	12 1/2	13 3/4	14 5/8	
7C	12	12 3/16	13 1/8	14	14 9/16	10 5/8	12 1/4	14 9/16	15	15 5/8	
8C	13 3/4	14	15	16	16 5/8	12 1/8	14	16 3/4	18 1/4	19 1/2	
4D	8 1/8	8 5/8	8 1/2	9	9	7 3/16	8 1/16	9 3/4	10 3/4	11 3/8	
5D	10 3/16	10 13/16	11 5/8	11 1/4	11 1/4	9 1/2	10 7/8	12 1/8	13 1/4	14 1/4	
6D	12 3/16	12 15/16	13 3/4	13 1/2	13 1/2	11 13/16	13 1/8	14 9/16	14 7/8	15 1/2	
7D	14 1/4	15 1/8	14 7/8	15 3/4	15 3/4	13 1/16	15 1/2	15 1/8	15 1/2	16 7/8	
8D	16 1/4	17 1/4	17	18	18	14 3/8	17 7/16	19 1/4	17 3/4	19 5/16	

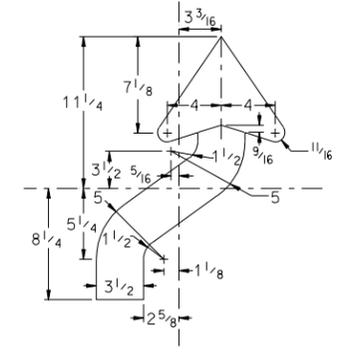
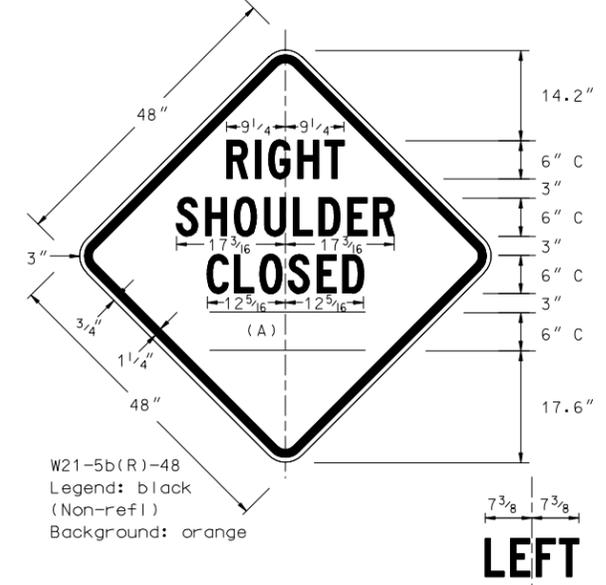
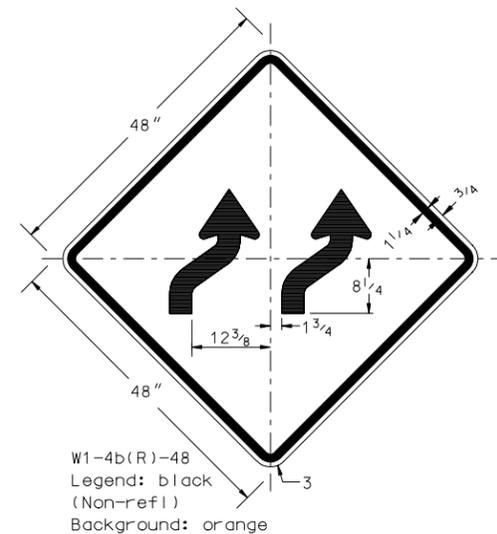
Standard signs that are shown in the construction sign and barricade location details shall be fabricated in the shape, color, and dimensions as shown in the standard signs layout booklet.



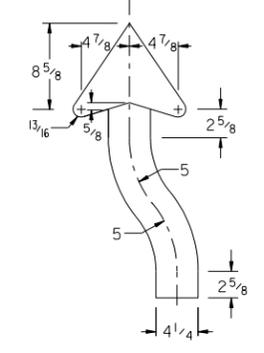
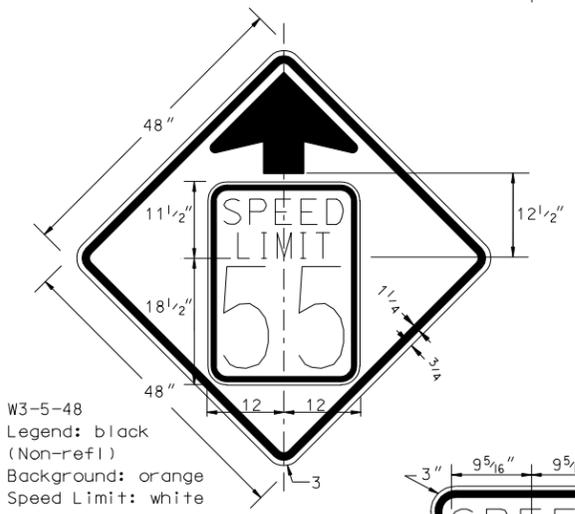
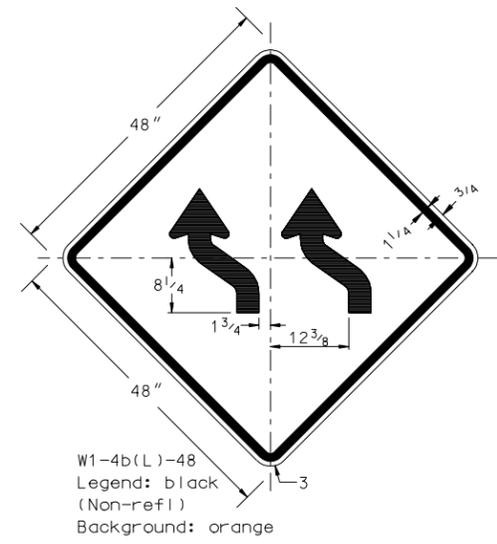
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
12-01-88	Uneven pavement
05-01-92	General revisions
01-24-95	W8-12-48
02-03-95	W8-11-48
06-15-95	General revisions
05-19-98	Added 3/4 mile
05-26-99	Added W8-56-48
08-05-04	Deleted slow paddle added W8-3-48
12-01-04	PE stamp added
07-11-05	Changed W20-7b to W3-4, Revised W8-11 and W8-12

This document was originally issued and sealed by Mark S Gaydos, Registration Number PE-4518, on 07/11/05 and the original document is stored at the North Dakota Department of Transportation

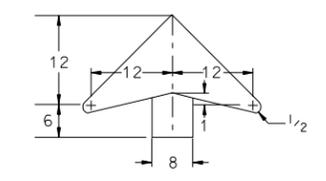
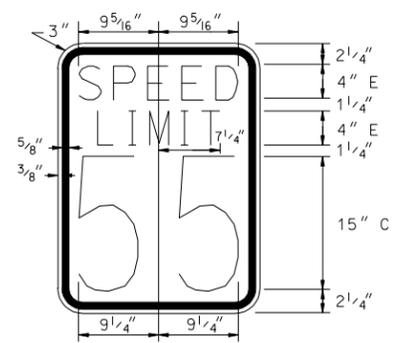
CONSTRUCTION SIGN DETAIL



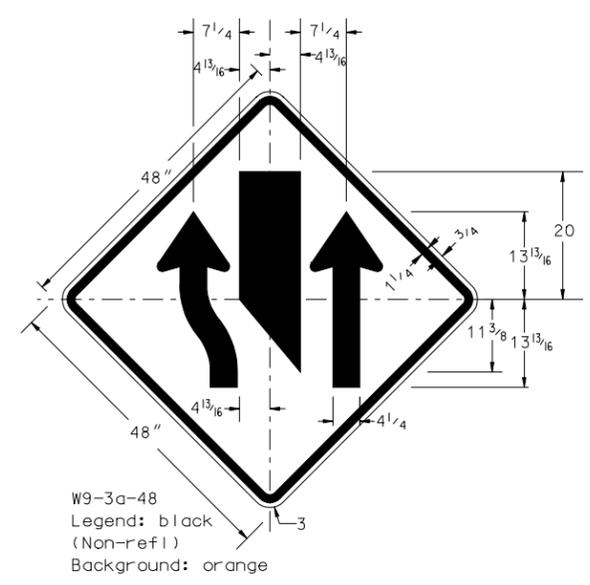
Arrow detail for sign M1-4b(R or L)-48



Arrow detail for sign M9-3a-48



Arrow detail for sign W3-5-48

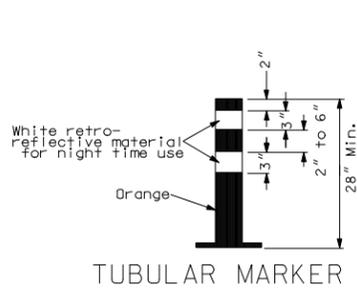


(A) See table on standard D-704-12 for messages and dimensions.

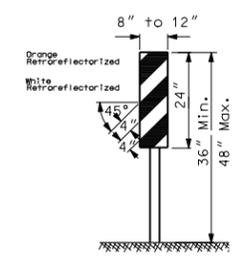
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-12-02	
REVISIONS	
DATE	CHANGE
04-01-04	Added W21-5b-48
08-06-04	General revisions
12-01-04	PE stamp added
06-14-05	Added W3-5-48

This document was originally issued and sealed by MARK S GAYDOS, Registration Number PE-4518, on 06/14/05 and the original document is stored at the North Dakota Department of Transportation

BARRICADE DETAILS AND CHANNELIZING DEVICES

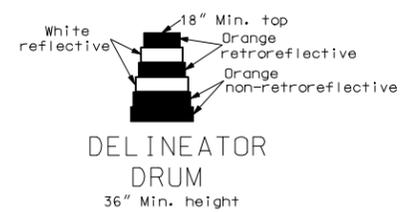


TUBULAR MARKER



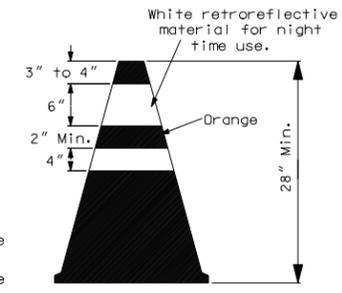
VERTICAL PANEL

(Retroreflective sheeting shall be placed on both sides)
NOTE: Vertical panels used on the expressways or other high speed roadways shall be 12" by 24"

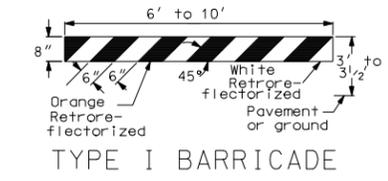


DELINEATOR DRUM

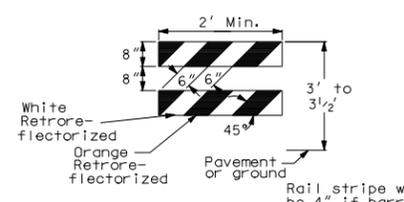
The markings on drums shall be orange and white stripes 4 to 6 inches wide. There shall be at least two orange and two white stripes. Where drums have ribs or indentations, there shall be no retroreflective sheeting in this area. This space shall be no more than 2 inches wide. The drum surface shall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



CONE

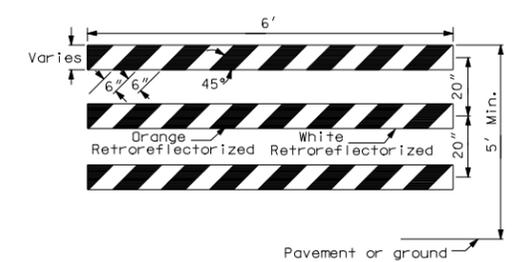


TYPE I BARRICADE



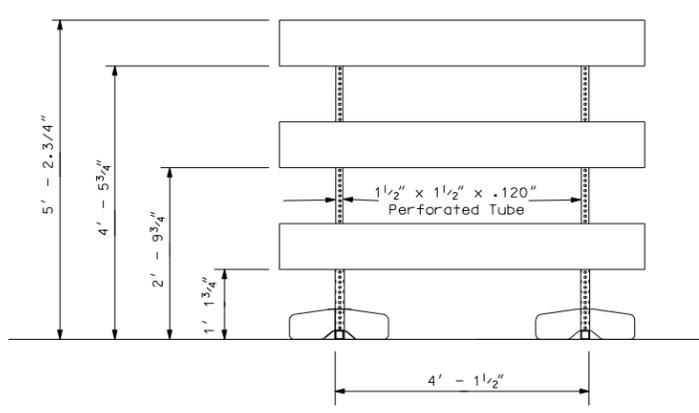
TYPE II BARRICADE

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

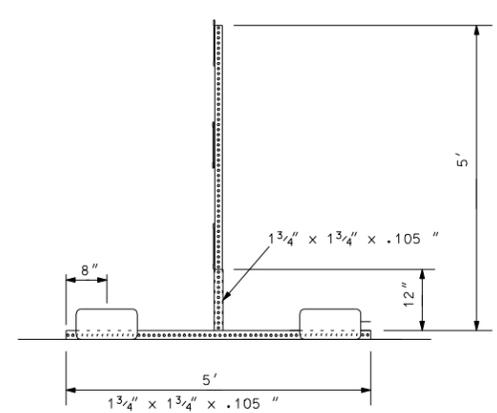


TYPE III BARRICADE

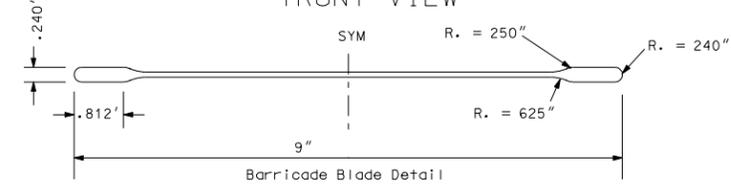
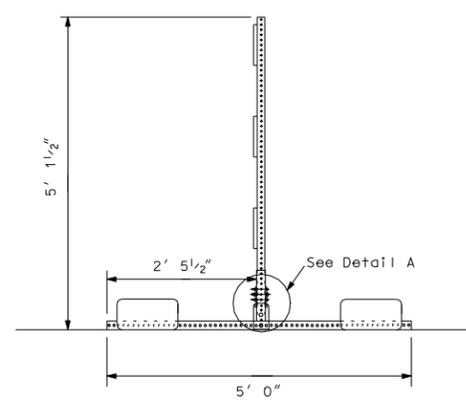
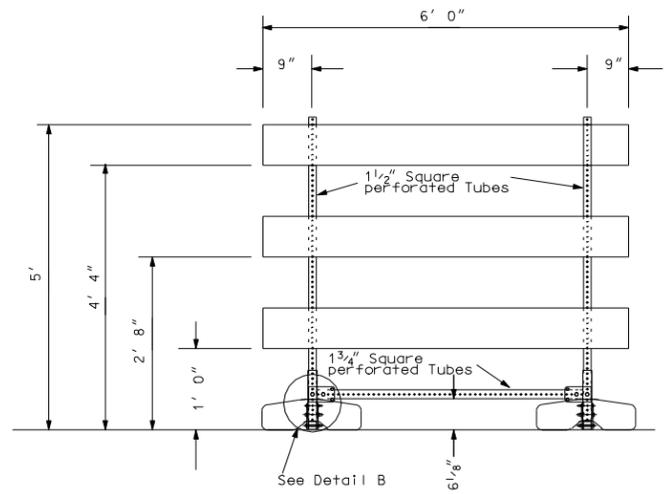
BARRICADES:
Number of retroreflective rail faces:
Type I - 2 (One each direction)
Type II - 4 (Two each direction)
Type III - 6 (Three in each direction)



FRONT VIEW



END VIEW

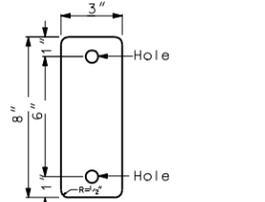


Ballast = 45lb sandbag at the end of each leg.
Barricade blade fastened to vertical supports with 2" corner bolts.
Vertical portion of leg is welded to horizontal portion on all four sides.
Masts slide inside vertical portion of legs. No bolts or fastenings devices used.

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

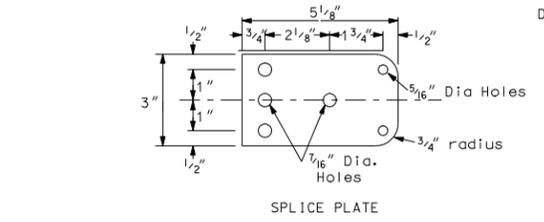
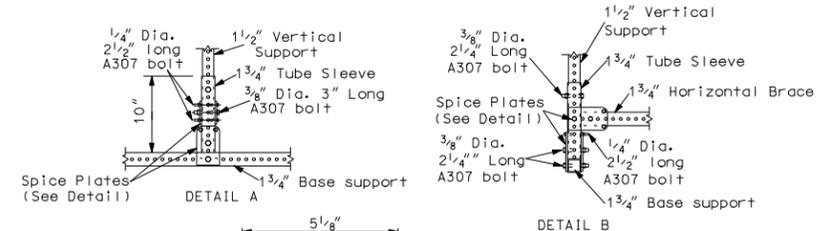


ACRYLIC PLASTIC REFLECTOR



DELINEATOR REFLECTOR

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



SPLICE PLATE

BARRICADE ASSEMBLY DETAIL
(Use when Plastic I-Beam w/ 1 1/2" Hollow Core Flanges or 1" x 8" x 72" wood boards.)

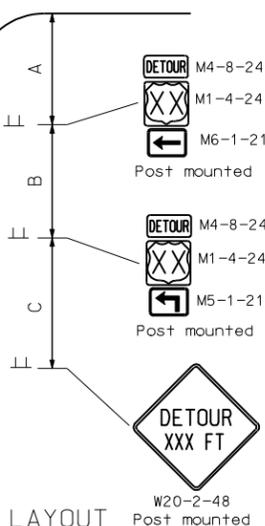
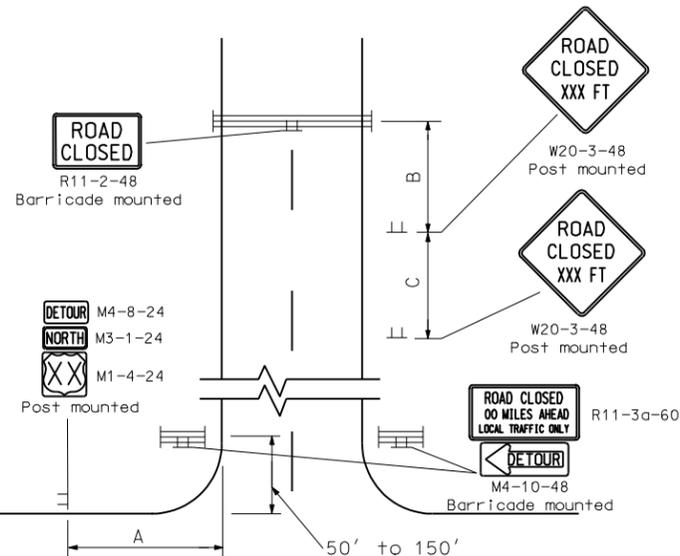
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-03-87	Type sheeting
10-01-87	Delineator drum note
06-08-88	Barricade type III
06-01-92	General revision
06-10-93	General revision
09-23-93	Vertical panel
06-09-95	Reflective sheeting
03-01-02	Barricade type III assembly details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

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

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Notes

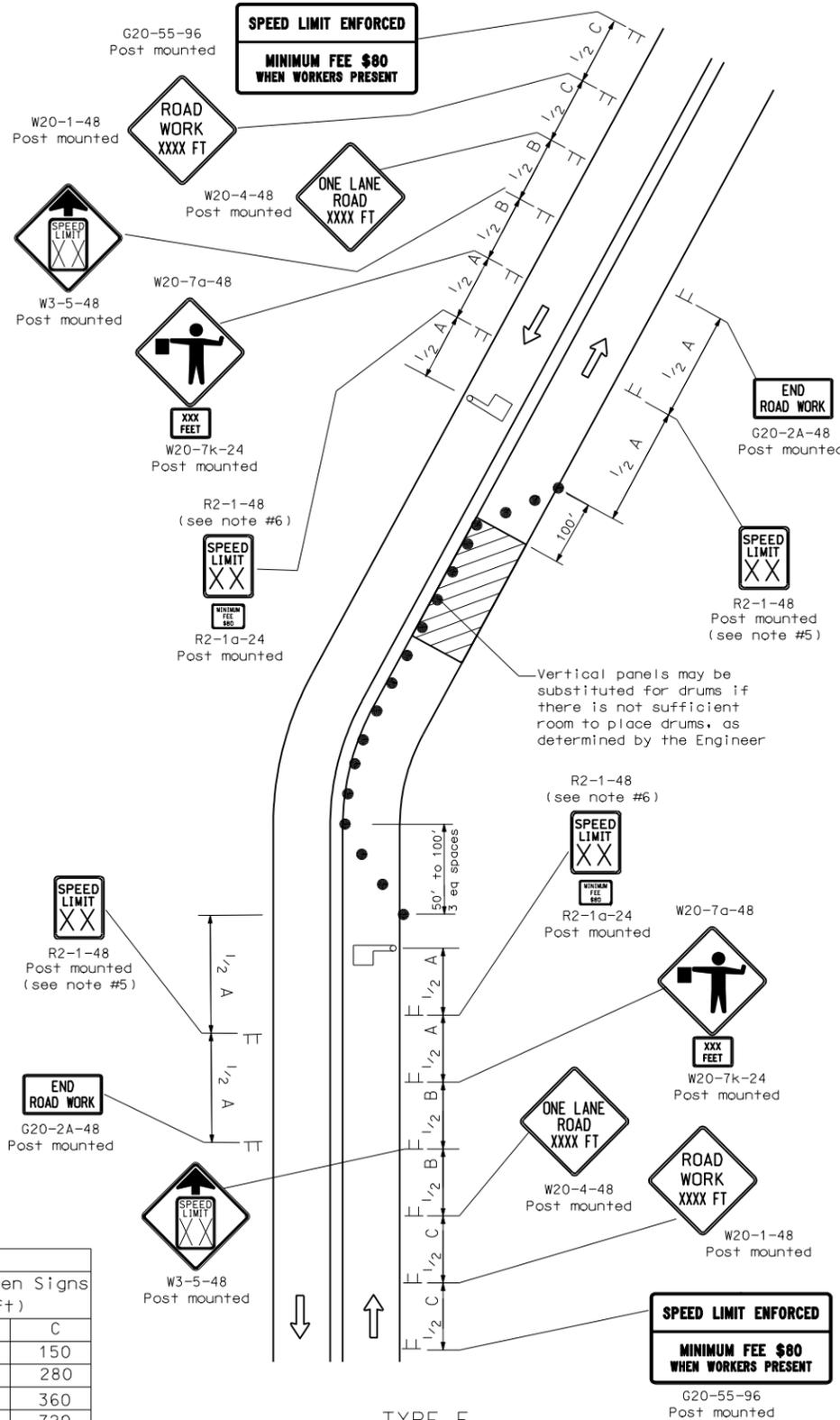
- Variables
 S = Numerical value of speed limit or 85th percentile.
 W = The width of taper
 L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
- Barricade shown to be placed on roadway shall be on a moveable assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar. Sign shown to be placed on the roadway shall be placed on skid mounted assemblies.
- Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
- Sequencing Arrow Panels
 Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface. Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less). Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less). Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.
- G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used.



TYPE E
CONSTRUCTION SIGN LAYOUT

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

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



TYPE F
CONSTRUCTION SIGN LAYOUT

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

KEY

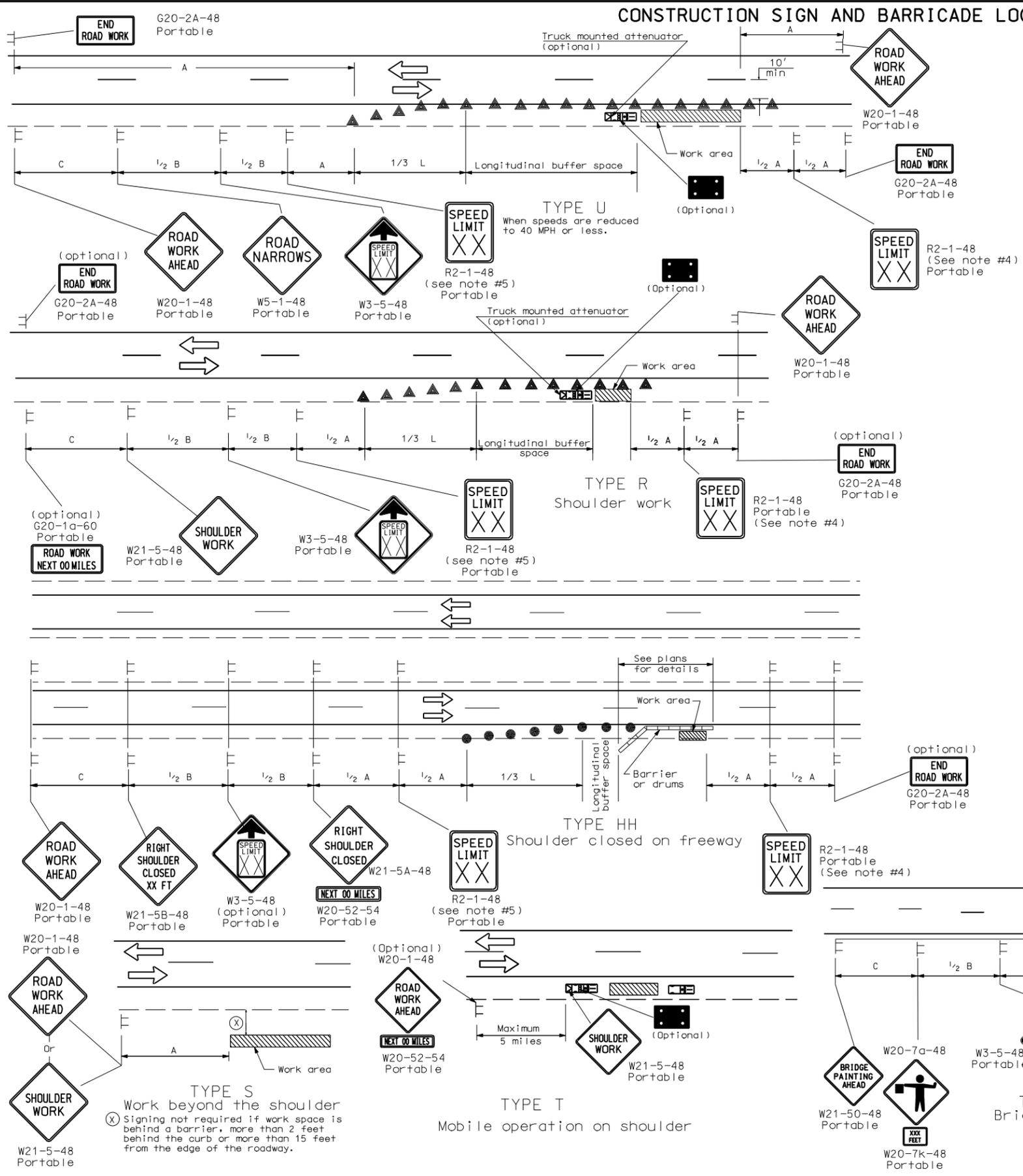
- Delineator Drum
- ┌ Type A Delineator
- ┐ Sign
- ▲ Cone
- ┌ Type I Barricade
- ┌ Type II Barricade
- ┌ Type III Barricade
- ┐ Flagger
- ∞ Sequencing Arrow Panel
- ▨ Work/Hazard Area

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
07-19-02	Reversed End Road Work & Speed Limit Signs
07-25-03	Revised R2-1a and W20-1
01-16-04	Revised type F
04-01-04	Revised fee sign & warning sign spacing. Rev. note 6, add note 12
12-01-04	PE stamp added
06-29-05	Added W3-5 to type F, Rev. Adv. Warning Table, Rev. Note 6
04-05-06	Showed signing for opposite direction
02-16-07	Added W3-5-48 to opposite direction of Type F layout

This document was originally issued and sealed by MARK S GAYDOS Registration Number PE-4518, on 02/16/2007 and the original document is stored at the North Dakota Department of Transportation

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

- Notes
- Variables
 S = Numerical value of speed limit or 85th percentile.
 W = The width of the taper.
 L = Minimum length of taper, or $S \times W$ 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.
 - Delineator drums, or cones used for tapering traffic shall be spaced at dimension "S". Delineator drums, or cones used for tangents shall be spaced at 2 times "S".
 - Sequencing Arrow Panels
 Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph and 750 ADT or less).
 Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph and 5000 ADT or less).
 Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph and 5000 ADT).
 The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $1/2 B$.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings as specified in section 704.03 C.



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

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

KEY

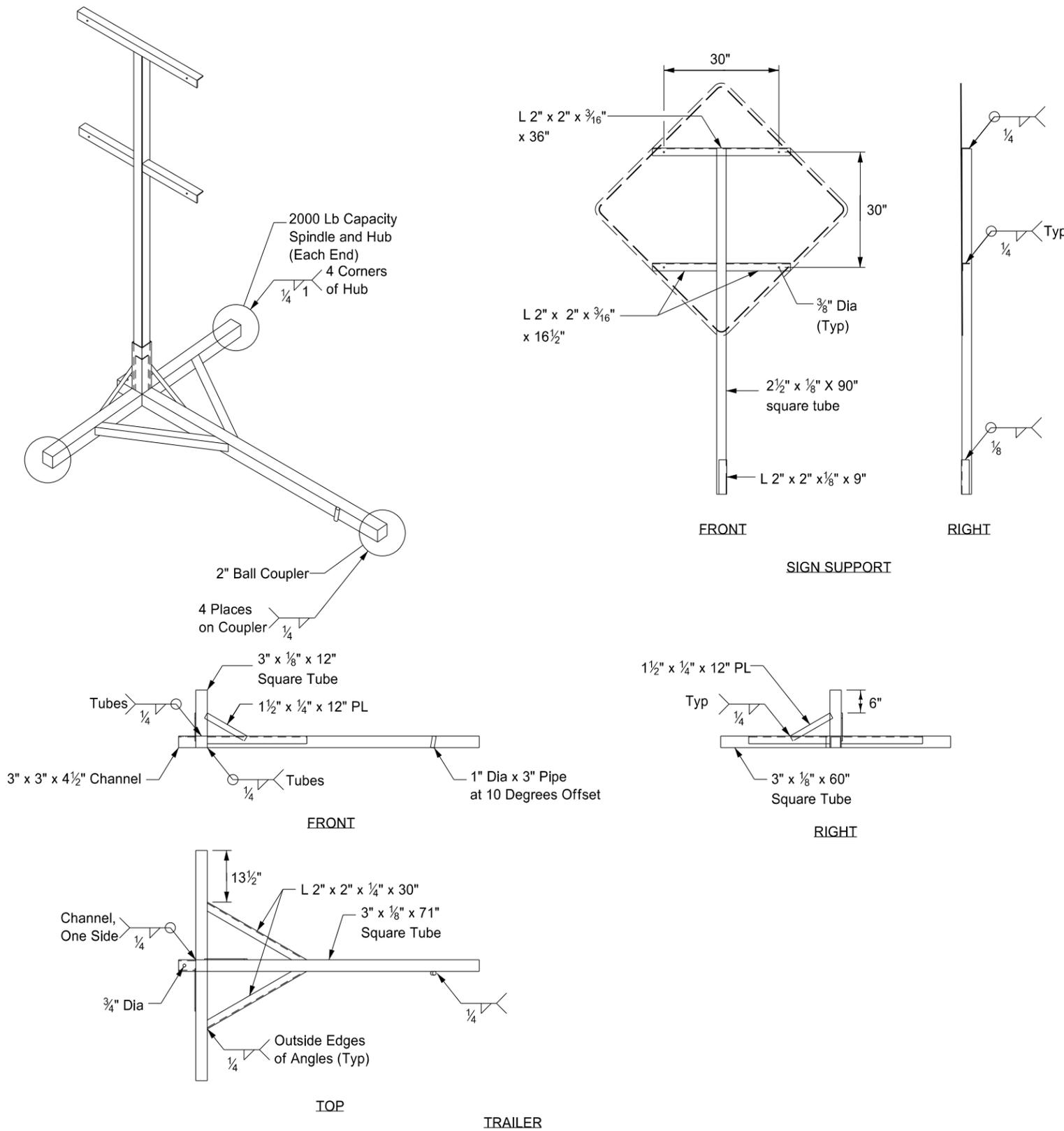
- Type I barricade
- Type II barricade
- Type III barricade
- Sign
- Delineator drum
- Cones
- Work area
- Flagger
- Sequencing arrow panel
- Type A delineator or vertical panels back to back

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
10-01-99	General revisions
10-04-99	Type HH barrier
11-15-99	Add taper width & note
03-15-01	Revised note 2
07-19-02	Reversed End Road Work & Speed Limit signs
07-25-03	Revised R2-1a and W20-1
04-01-04	Removed fee sign & rev warning & buffer spacing rev note 5
12-01-04	PE Stamp added
06-29-05	Replaced R2-5a with W3-5 Rev. Adv. Warning Table, Rev. Note 5

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



Notes:

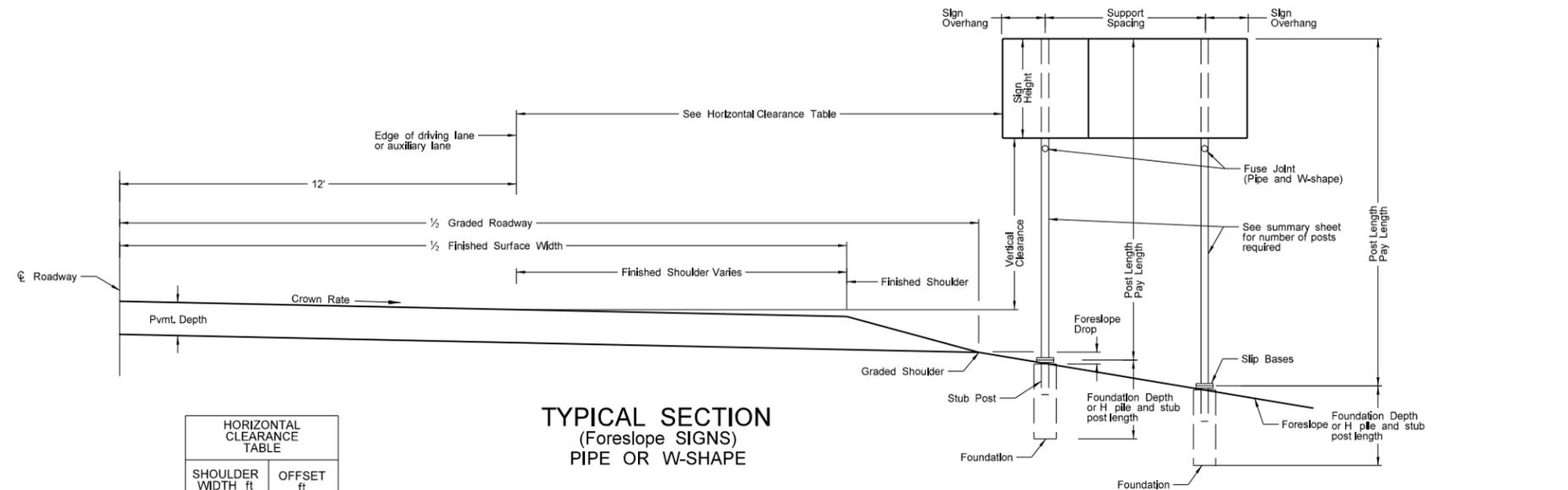
- ① The maximum weight of the assembly is 250 pounds.
- ② Use a 14" wheel and tire.
- ③ Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
- ④ Other NCHRP 350 crash tested assemblies are acceptable.

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

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

PIPE OR W-SHAPE ASSEMBLY DETAILS

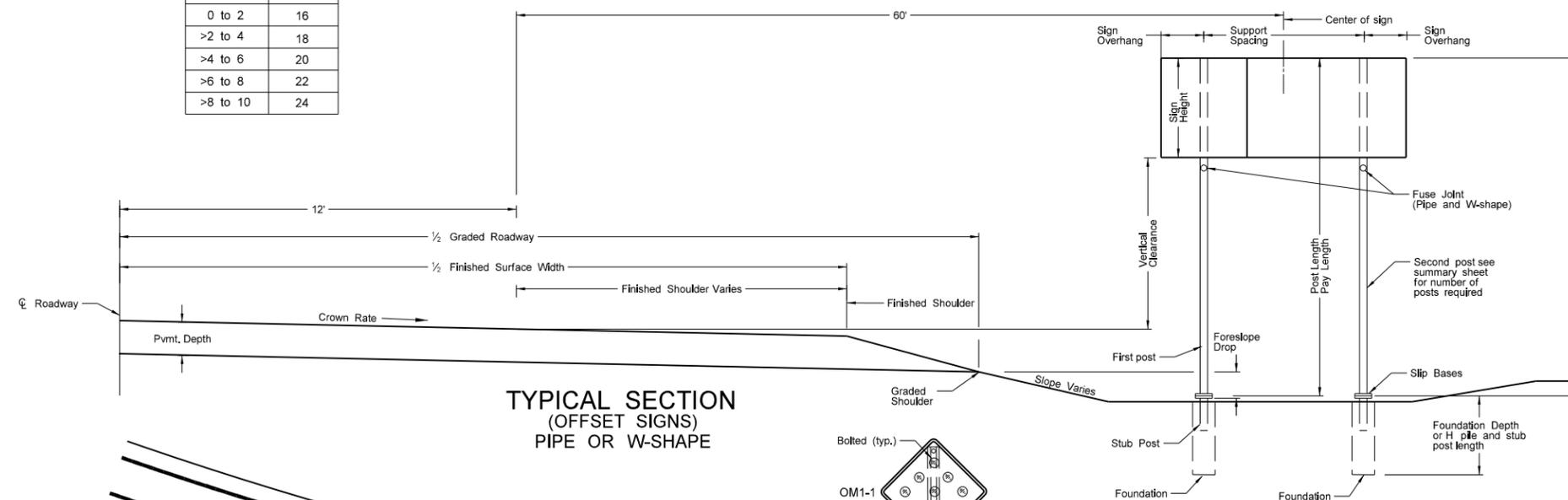
D-754-1



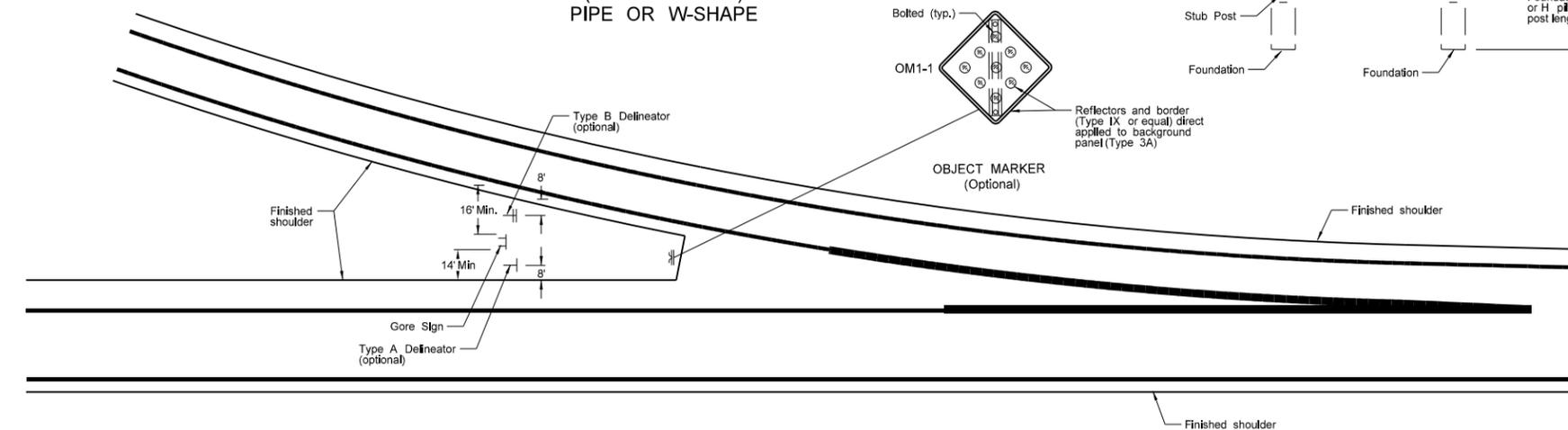
HORIZONTAL CLEARANCE TABLE

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

TYPICAL SECTION (FORESLOPE SIGNS) PIPE OR W-SHAPE



TYPICAL SECTION (OFFSET SIGNS) PIPE OR W-SHAPE



EXIT RAMP GORE SIGN PLACEMENT

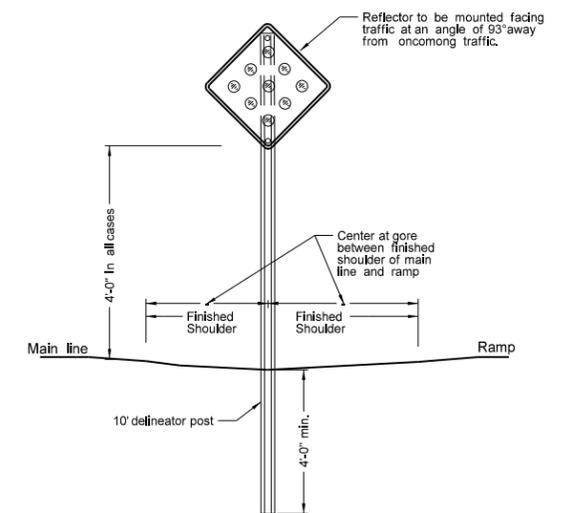
NOTES:

MINIMUM VERTICAL CLEARANCE:
 Signs installed at the side of the road in rural districts shall be at least 5 feet measured from the bottom of the sign to the edge of driving lane, or Auxiliary Lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7 feet.

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

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

Signs may be placed a maximum of 6" above the vertical clearance specified above.

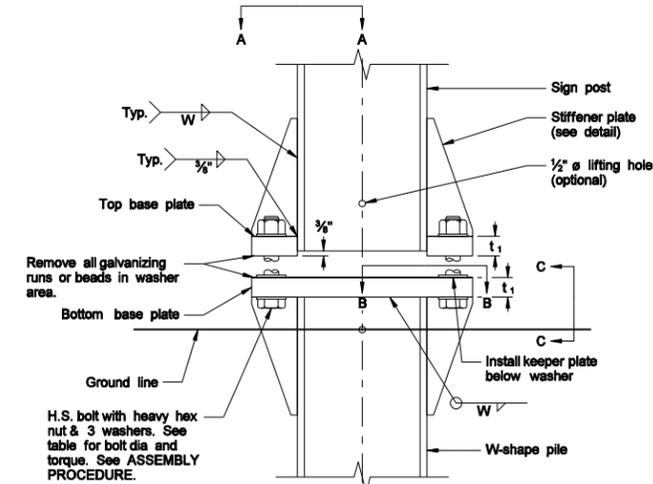


OBJECT MARKER INSTALLATION
 (Posts shall conform to section 894.06 of Standard Specifications.)

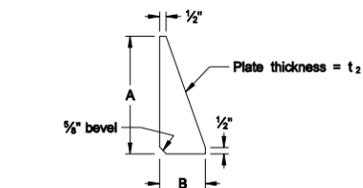
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

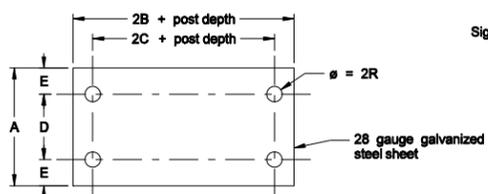
STRUCTURAL DETAILS
W-SHAPE SUPPORTS



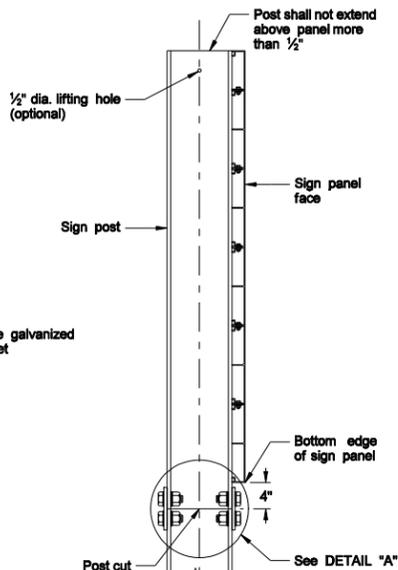
SIGN POST ELEVATION



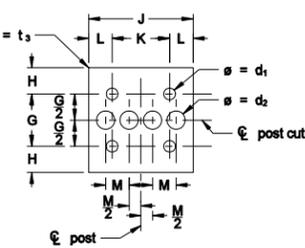
STIFFENER PLATE DETAIL



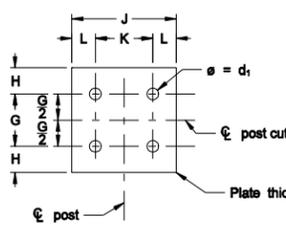
KEEPER PLATE



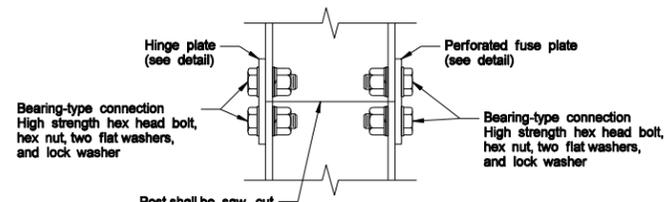
FUSE JOINT
(SIDE VIEW)



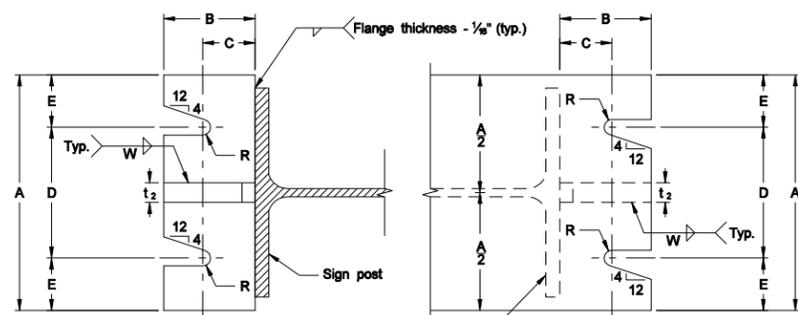
PERFORATED FUSE
PLATE DETAIL



HINGE PLATE
DETAIL



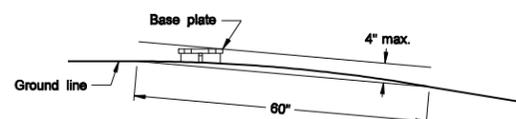
DETAIL "A"



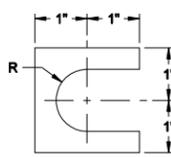
SECTION A-A

SECTION B-B

Sections shown are for installations on right shoulder and in gore. Installations on the left shoulder shall have the plate slot bevels reversed.

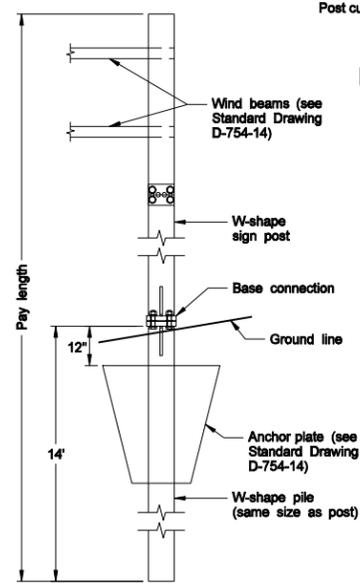


SECTION C-C

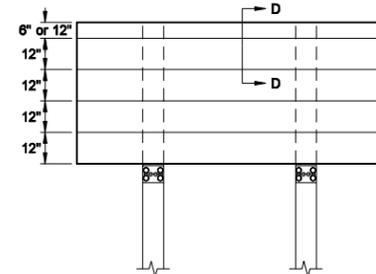


SHIM DETAIL

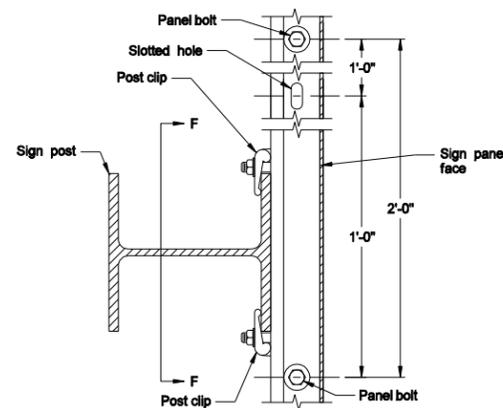
Furnish 2 - .012"± thick and 2 - .032"± thick shims per post. Shims shall be fabricated from brass shim stock or strip conforming to ASTM B36.



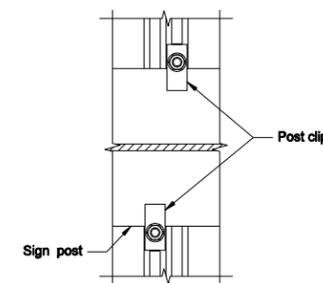
SIGN SUPPORT DETAIL



TYPICAL PANEL MOUNTING

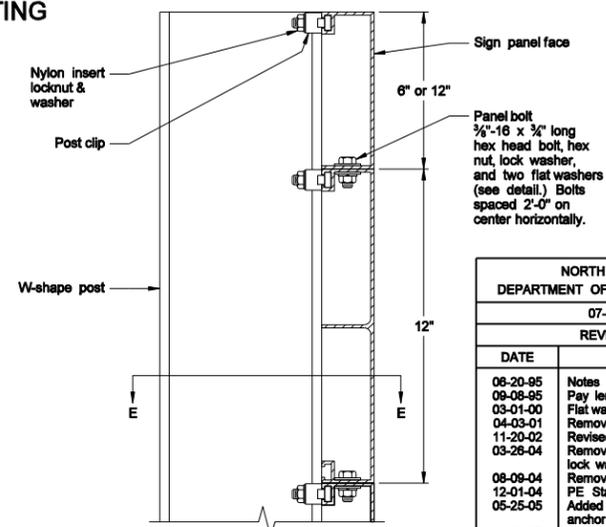


SECTION E-E

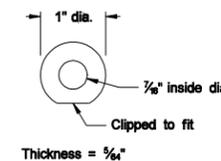


SECTION F-F

Note: Post clips shall be installed on both sides of each post at each panel joint as indicated.



SECTION D-D



FLAT WASHER DETAIL

W-SHAPE POST AND PILE SIZE	BASE CONNECTION DIMENSIONS										FUSE AND HINGE PLATE DIMENSIONS									
	BOLT SIZE AND TORQUE	A	B	C	D	E	t ₁	t ₂	W	R	G	H	J	K	L	M	d ₁	d ₂	t ₃	BOLT DIA.
W4x13	3/4" ø x 3 1/2" Torque = 600 in-lb	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	5/32"	2"	1 1/4"	4"	2 1/4"	7/8"	1"	1 1/8"	3/4"	3/8"	5/8"
W5x16	3/4" ø x 3 1/2" Torque = 600 in-lb	6"	2 1/2"	1 1/2"	3 1/2"	1 1/4"	1"	1/2"	1/4"	5/32"	2 1/2"	1 1/4"	5"	2 3/4"	1 1/8"	1 1/8"	1 1/8"	7/8"	3/8"	3/4"
W6x20	7/8" ø x 4 1/4" Torque = 800 in-lb	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	5/32"	2 1/2"	1 1/4"	6"	3 1/2"	1 1/4"	1 3/8"	1 3/8"	1 1/8"	3/8"	3/4"
W8x24	7/8" ø x 4 1/4" Torque = 800 in-lb	8"	3"	1 3/4"	4"	2"	1 1/4"	1/2"	1/4"	5/32"	2 1/2"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	1 1/2"	1 5/8"	1 1/4"	1/2"	7/8"
W8x28	1" ø x 5" Torque = 1000 in-lb	8"	3"	2"	4"	2"	1 1/2"	3/4"	5/16"	7/32"	2 1/2"	1 1/2"	6 1/2"	3 1/2"	1 1/2"	1 5/8"	1 1/8"	1 1/4"	1/2"	1"
W8x31	1 1/8" ø x 5" Torque = 1200 in-lb	9"	3 1/2"	2"	5"	2"	1 1/2"	3/4"	5/16"	9/32"	3"	1 1/4"	8"	5 1/2"	1 1/4"	2"	1 1/8"	1 1/2"	1/2"	1"
W10x39	1 1/8" ø x 5" Torque = 1200 in-lb	9"	3 1/2"	2"	5"	2"	1 1/2"	3/4"	5/16"	9/32"	3"	1 1/4"	8"	5 1/2"	1 1/4"	1 7/8"	1 1/8"	1 1/2"	1/2"	1 1/8"

NOTES:

Structural steel shall conform to Section 894.05 B.6 of the Standard Specifications. High strength bolts shall conform to ASTM A-325.

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

Perforated fuse plate shall be installed on side of post facing traffic.

All posts shall be saw cut. Plates may be sheared or flame cut using a mechanically guided cutting torch in accordance with Section 754.03 E.6.b of the Standard Specifications. Edge preparation shall be in accordance with Section 754.03 E.6.c of the Standard Specifications.

ASSEMBLY PROCEDURE:

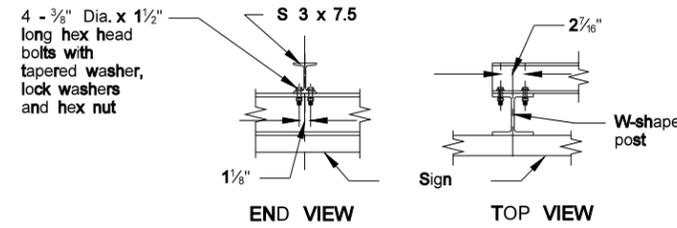
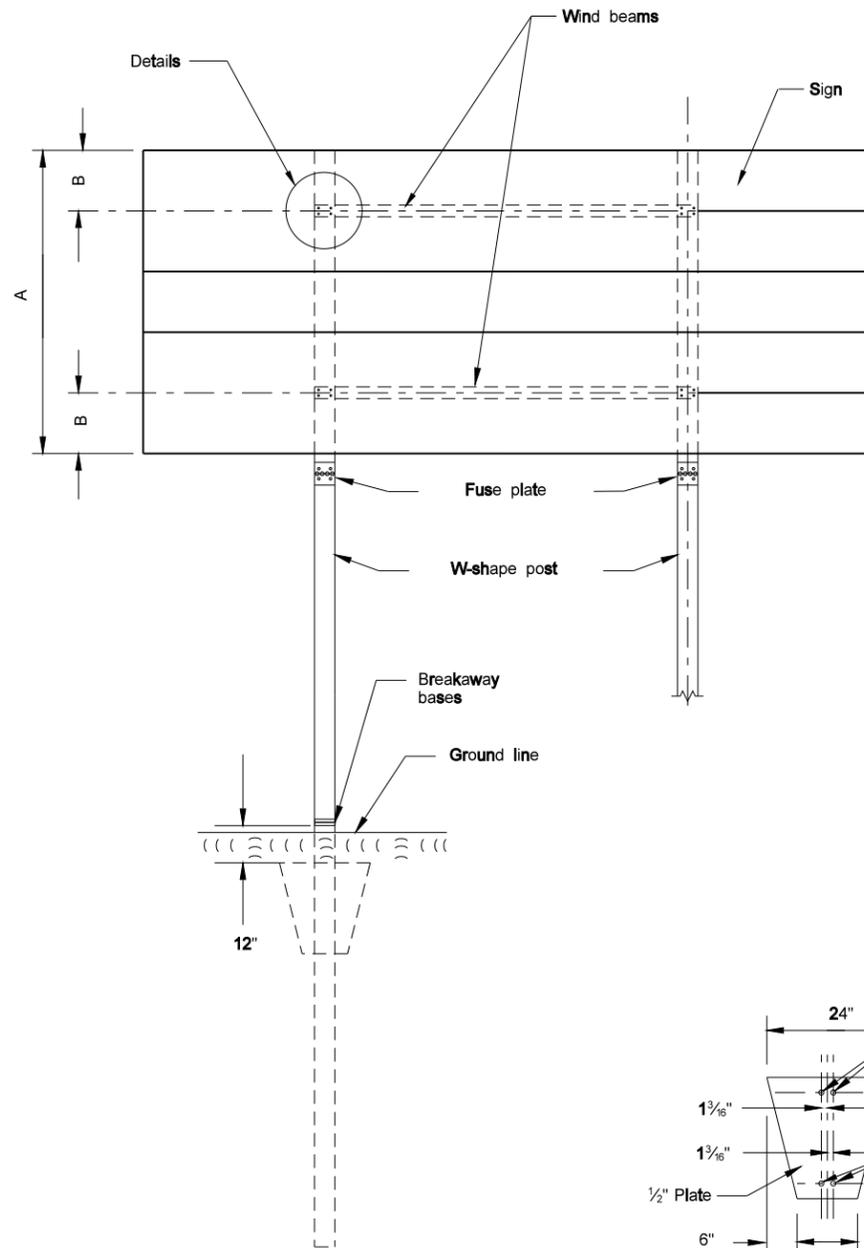
1. Assemble base plates together with bolts and with one flat washer between top base plate and the keeper plate.
2. Shim as required to plumb post.
3. Tighten all base connection bolts the maximum possible with 12" to 15" wrench to bed washers and shims and to clean bolt threads.
4. Loosen each bolt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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 07-15-94	
REVISIONS	
DATE	CHANGE
06-20-95	Notes
09-08-95	Pay length
03-01-00	Flat washers
04-03-01	Remove splice plate
11-20-02	Revised note
03-26-04	Removed lock tile and added lock washer
06-09-04	Removed stub post
12-01-04	PIE Stamp added
05-25-05	Added wind beams and anchor plates
04-23-07	Revised details and notes

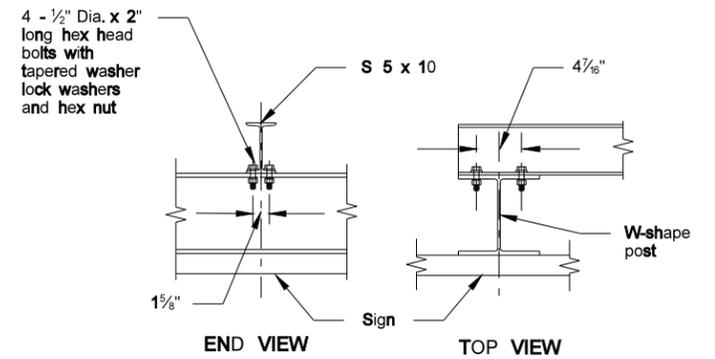
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WIND BEAMS AND ANCHOR PLATES
FOR W-SHAPE SUPPORTS

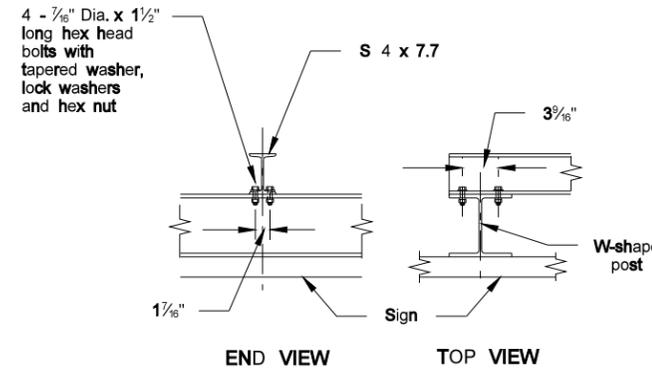
D-754-14



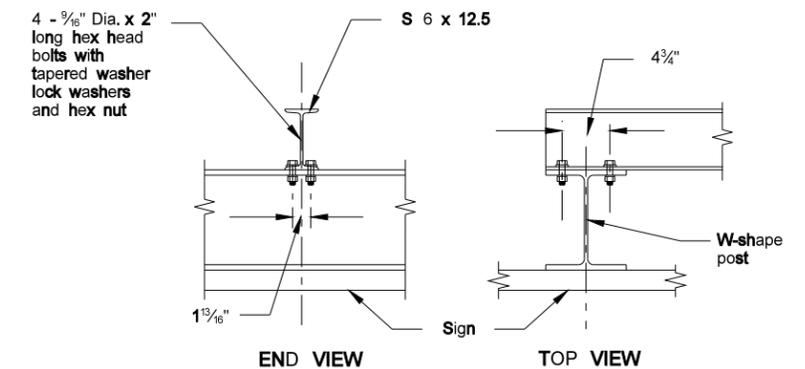
DETAIL
W4-13 or W5-16



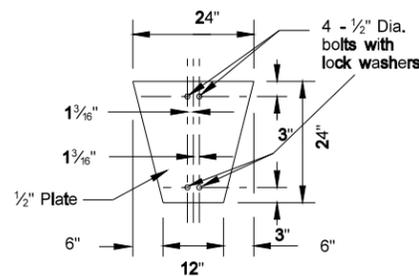
DETAIL
W8-31



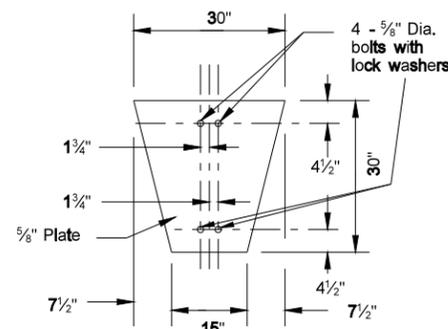
DETAIL
W6-20, W8-24 & W8-28



DETAIL
W10-39

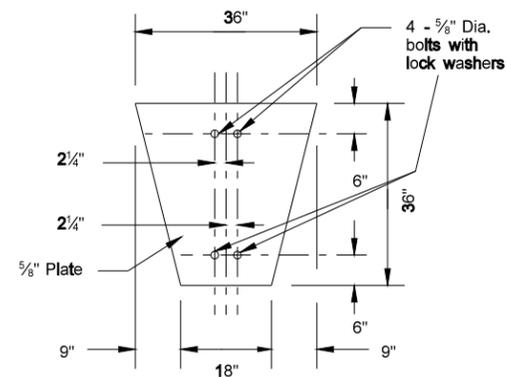


W4-13
& W5-16



W6-20, W8-24
& W8-28

ANCHOR PLATE DETAIL



W8-31 & W10-39

The B distance is calculated by the following formula, $b=A/4$.

The wind beam shall conform to section 894.05 B.6.

The bolts shall conform to requirements of ASTM A-307 and galvanized according to AASHTO M-232.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
05-25-05	
REVISIONS	
DATE	CHANGE
06-29-05	Revised bolt requirements
04-23-07	General revisions

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Registration Number
PE- 4518 ,
on 04/23/07 and the original document is stored at the
North Dakota Department
of Transportation

NOTES:

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

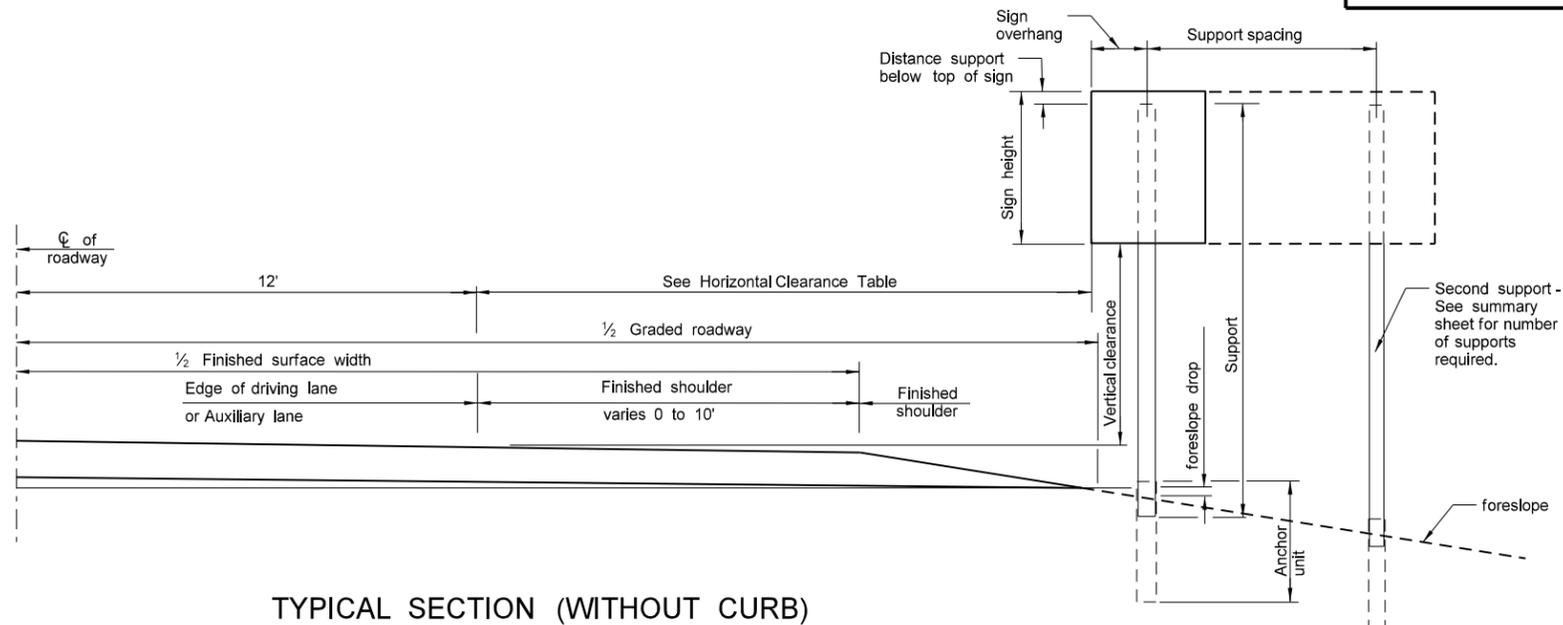
2. Minimum Vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least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

Directional signs on expressways and freeways shall be installed with a minimum height of 7'. If the secondary sign is mounted below another sign, the major sign shall be installed at least 8' and the secondary sign shall be installed at least 5' above the edge of the driving lane. All route signs, warning signs, and regulatory signs on expressways and freeways shall be at least 7' above the edge of the driving lane. Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.

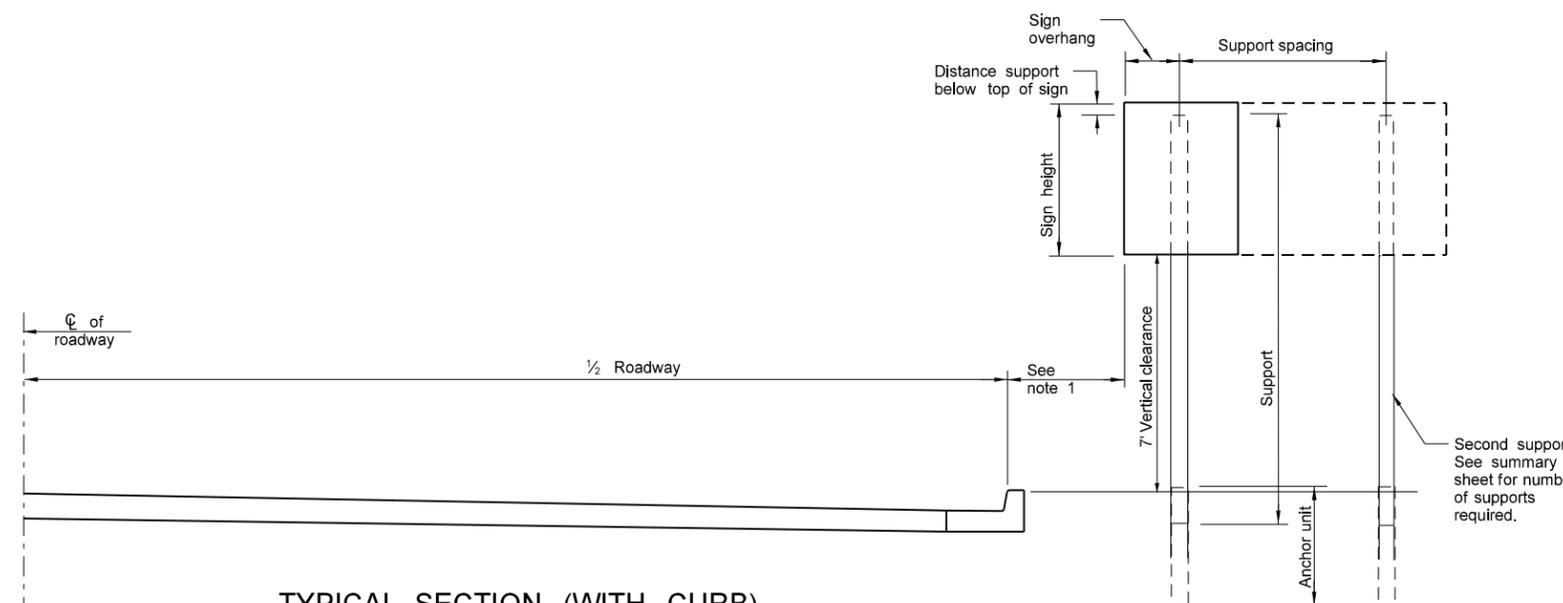
The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.

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

ASSEMBLY DETAILS

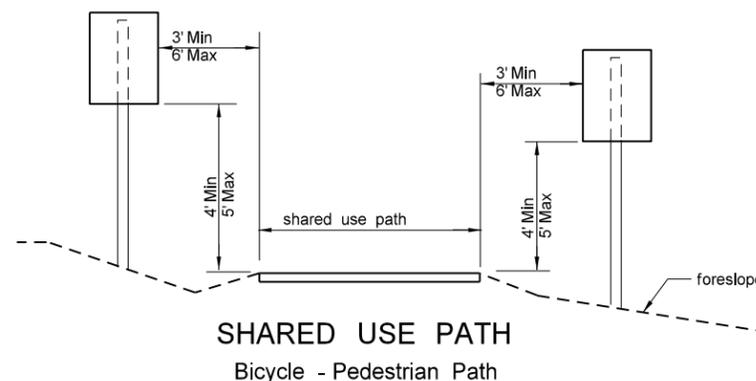


TYPICAL SECTION (WITHOUT CURB)



TYPICAL SECTION (WITH CURB)

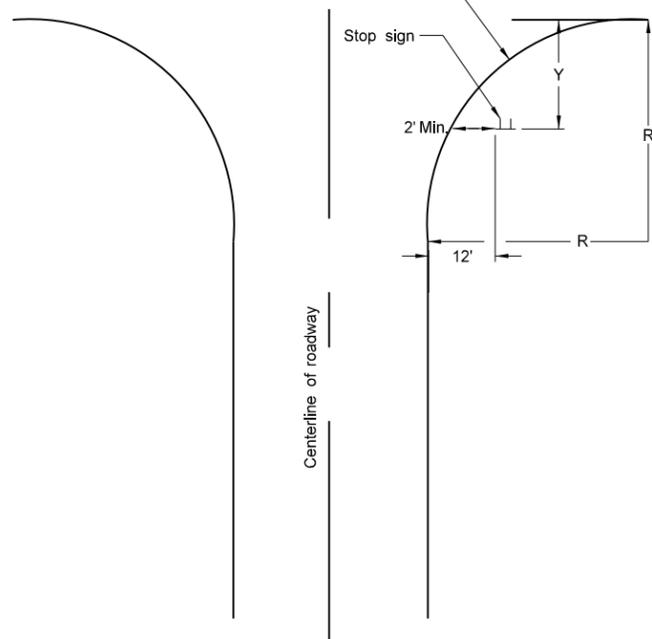
Residential or Business District



SHARED USE PATH

Bicycle - Pedestrian Path

Face of curb or edge of driving lane



STOP SIGN LOCATION WIDE THROAT INTERSECTION

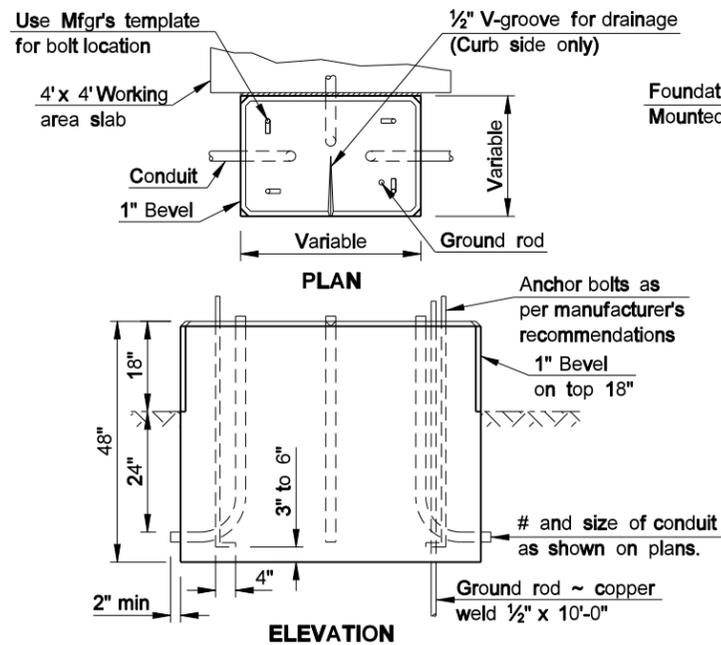
Note: This layout is to be used for the placement of "Stop" signs.

R=Radius	Y-Max	Y-Min
40'	50'	15'
45'	50'	18'
50'	50'	21'
55'	50'	25'
60'	50'	28'
65'	50'	32'
70'	50'	35'
75'	50'	39'
80'	50'	43'

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

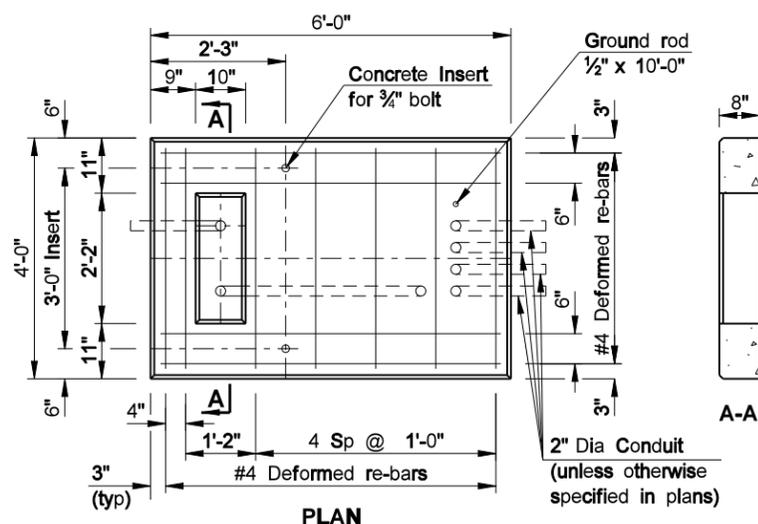
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

**CONCRETE FOUNDATIONS
(TRAFFIC SIGNALS & HIGHWAY LIGHTING)**

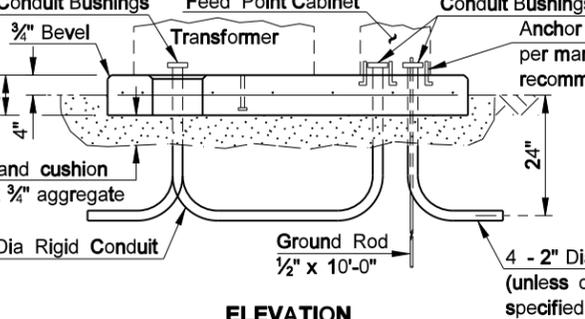


CONTROLLER CABINET FOUNDATION PAD MOUNT

The Controller Cabinet Foundation shall be bid as Concrete Foundation - Traffic Signals.

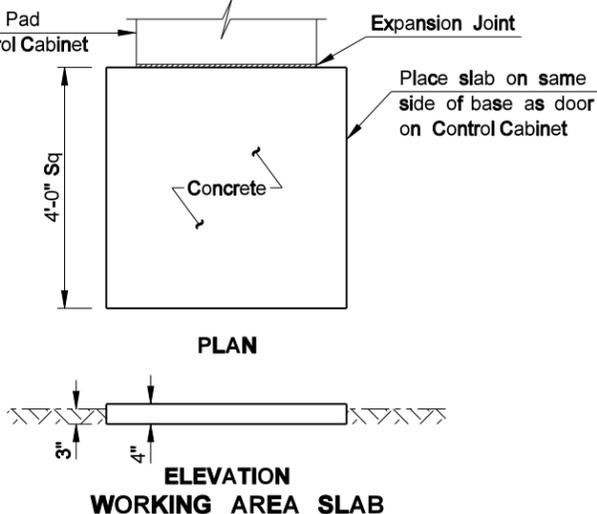


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

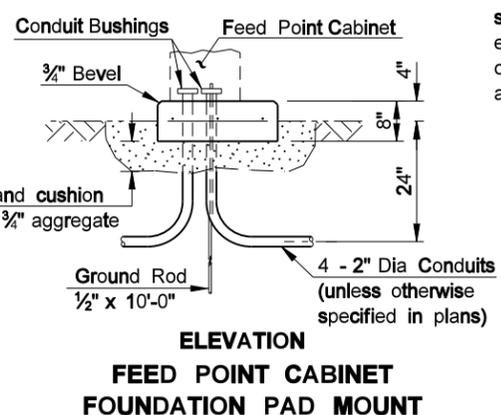
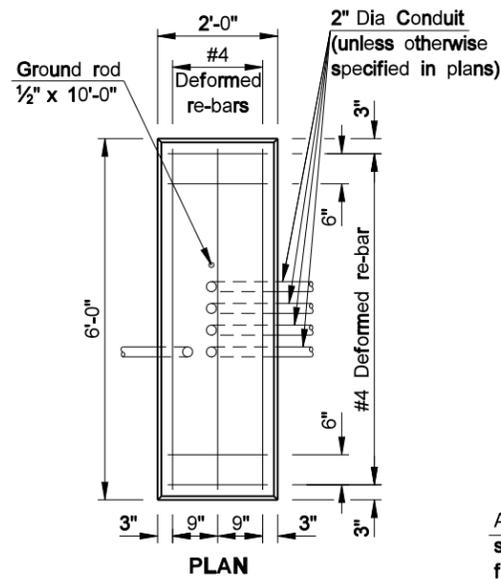


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

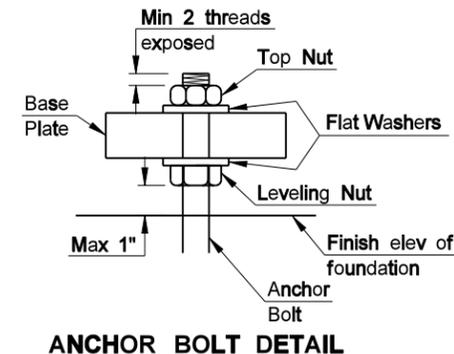
The Transformer & Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type A.



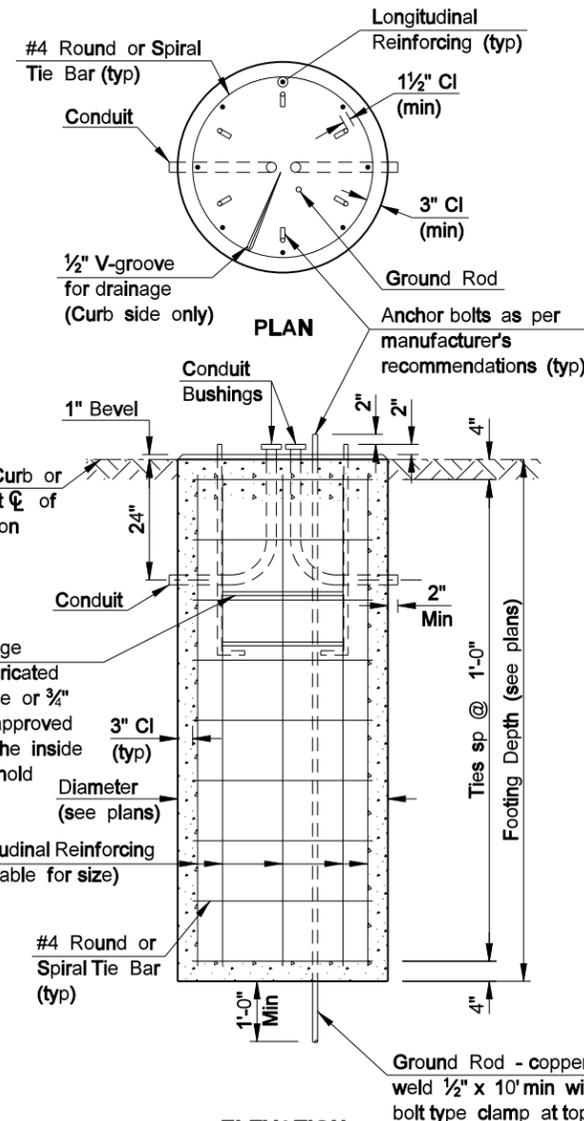
The Working Area Slab shall be installed where shown on the plans and shall not be bid separately but shall be included in the price bid for Concrete Foundation - Traffic Signals.



The Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type B.



ANCHOR BOLT DETAIL



LIGHT & SIGNAL STANDARD FOUNDATION

NOTES:
LIGHT & SIGNAL STANDARD FOUNDATIONS: See plans for conduit size, number of bends and correct position for each foundation. When conduit does not continue beyond the foundation, conduit with a 105° bend and bushings on both ends may be substituted for the 90° bends shown. See plans for correct size & location of foundations. The grade and exact location shall be established by the Engineer in the field. All reinforcing shall be Grade 60. Tie bars shall have a minimum of a 12" lap. Reinforcing may be omitted for Type I, II, V, VI & VII signal standard foundations if the anchor bolts extend to within 3" to 6" above the bottom of the foundation. A minimum of 6 anchor bolts shall be used for cantilevered structures.

CONTROLLER CABINET FOUNDATION PAD MOUNT FOUNDATION: See plans for the number of 90° bends per foundation and correct positioning. The foundation for Pad Mounted Controller Cabinet shall be of sufficient size so that there is a minimum of 3" of clearance from the outside edge of cabinet to the outside edge of the foundation on any side. The contractor shall ensure a water-tight seal between the controller cabinet and the foundation by caulking, except for V-groove.

WORKING AREA SLAB: The materials and preparation of this slab shall be as approved by the Engineer in the field.

TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

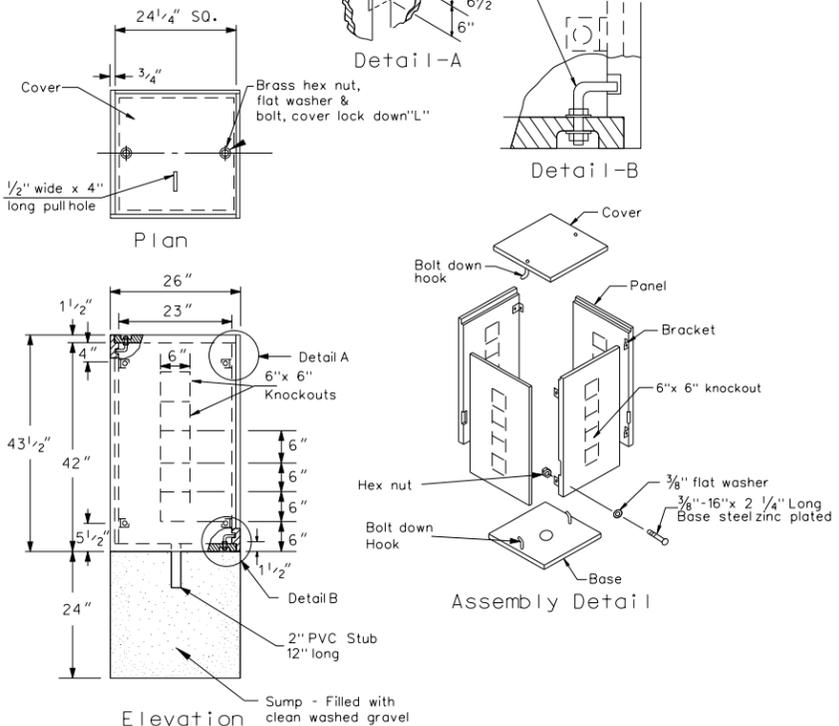
FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

LIGHT & SIGNAL FOUNDATION TABLE	
FOOTING DEPTH (ft)	LONGITUDINAL REINFORCING
≤ 12	8 - #5
13 - 14	8 - #6
15 - 16	8 - #7
17 - 19	8 - #8

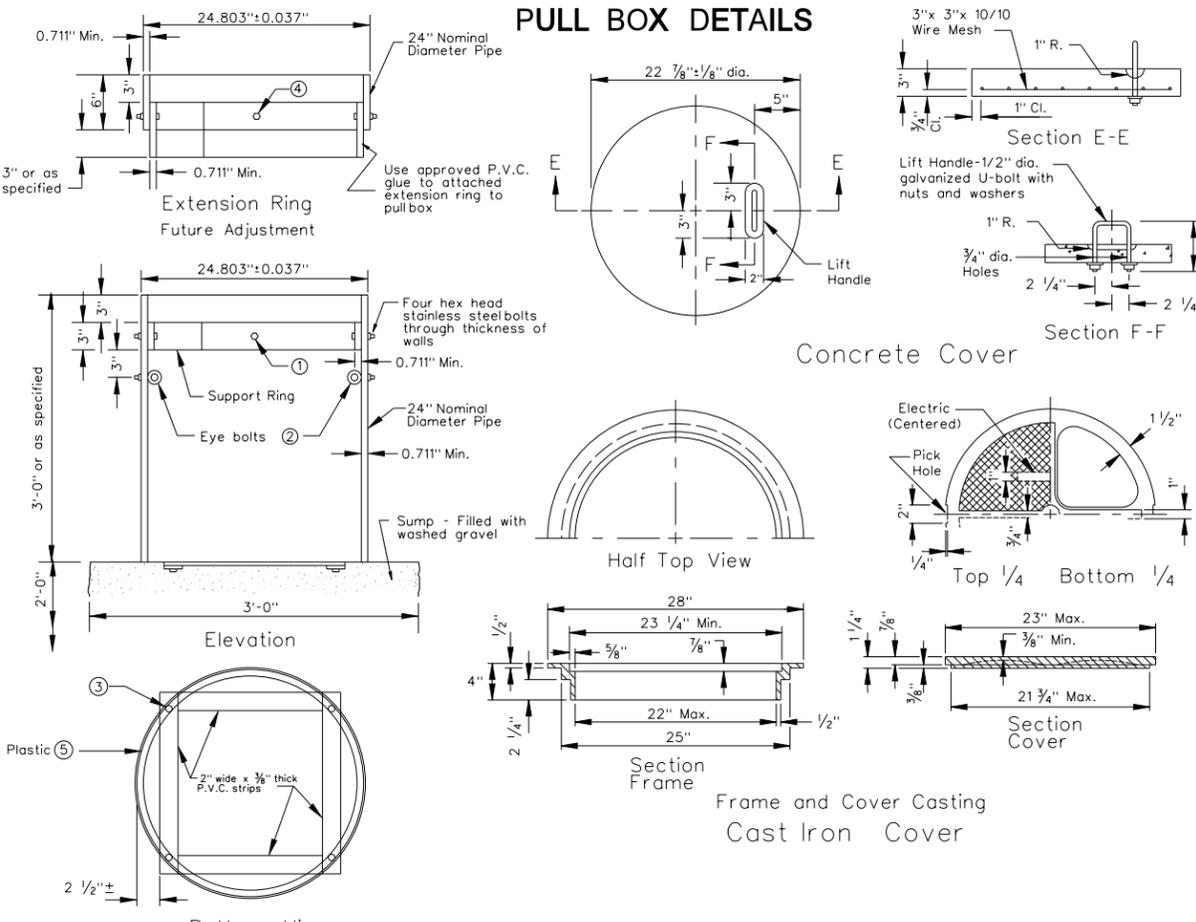
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
6-15-10	
REVISIONS	
DATE	CHANGE

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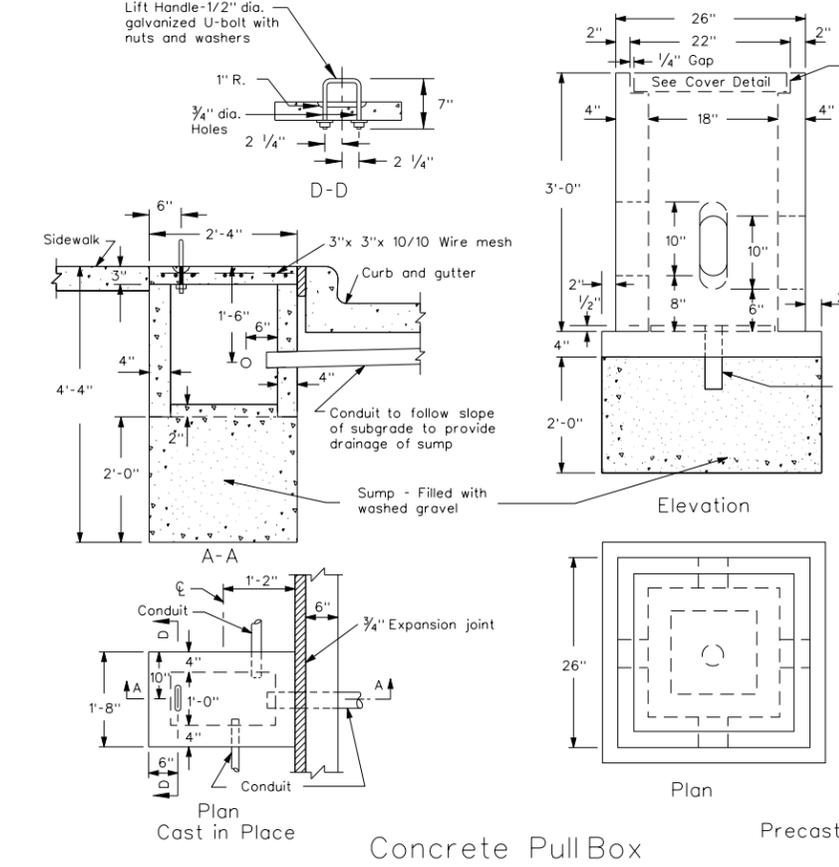
NOTE: Fiberglass pull box is composed of fiberglass skins and reinforced mortar structural elements in combination with polyurethane foam cells.



Fiberglass Pull Box



PVC Pull Box

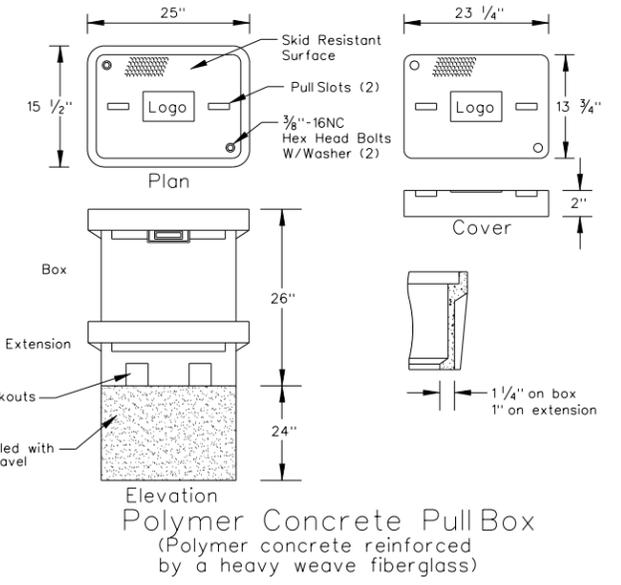


Concrete Pull Box

Precast Concrete

Precast Concrete Pull Box Cover Detail

- PVC PULL BOX NOTES:**
- Attach split 24" nominal diameter PVC cover support ring with four 3/8" dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.
 - Two type 2 shoulder eye bolts, 3/8" dia. x 1 1/4" shank length with hex nuts 180 degrees apart (for lifting pull box and supporting electric cable).
 - Four 1/4" x 1 1/4" long galvanized lag screws, screw assembly together.
 - Attach split 24" nominal diameter PVC cover support extension ring with four 3/8" dia. x 2" long stainless steel hex. head bolts with nuts at 90 degrees apart.
 - Bolt assembly together.
 - Conduit holes located in barrel section shall be sized no more than 1" larger than size of conduit being used.
 - After pull box & conduit installation all inside walls & cover shall be made water tight to the satisfaction of the Engineer.
 - PVC pipe to meet requirements of ASTM F679T-1 or equal.
 - Hex head bolts and nuts shall be austenitic stainless steel. Other fasteners to be galvanized as per AASHTO M-232.
 - Concrete cover shall be coated on top and sides with and approved epoxy coating. The epoxy protective coating shall be light gray, clear, or neutral in color and shall be applied as recommended by the manufacturer. The surfaces of the concrete to which the epoxy protective coating is applied, shall be cleaned by wire brush and shall be dry before application.
 - Cast Iron Cover: Cover castings shall be gray iron as per AASHTO M 105, class 35B.

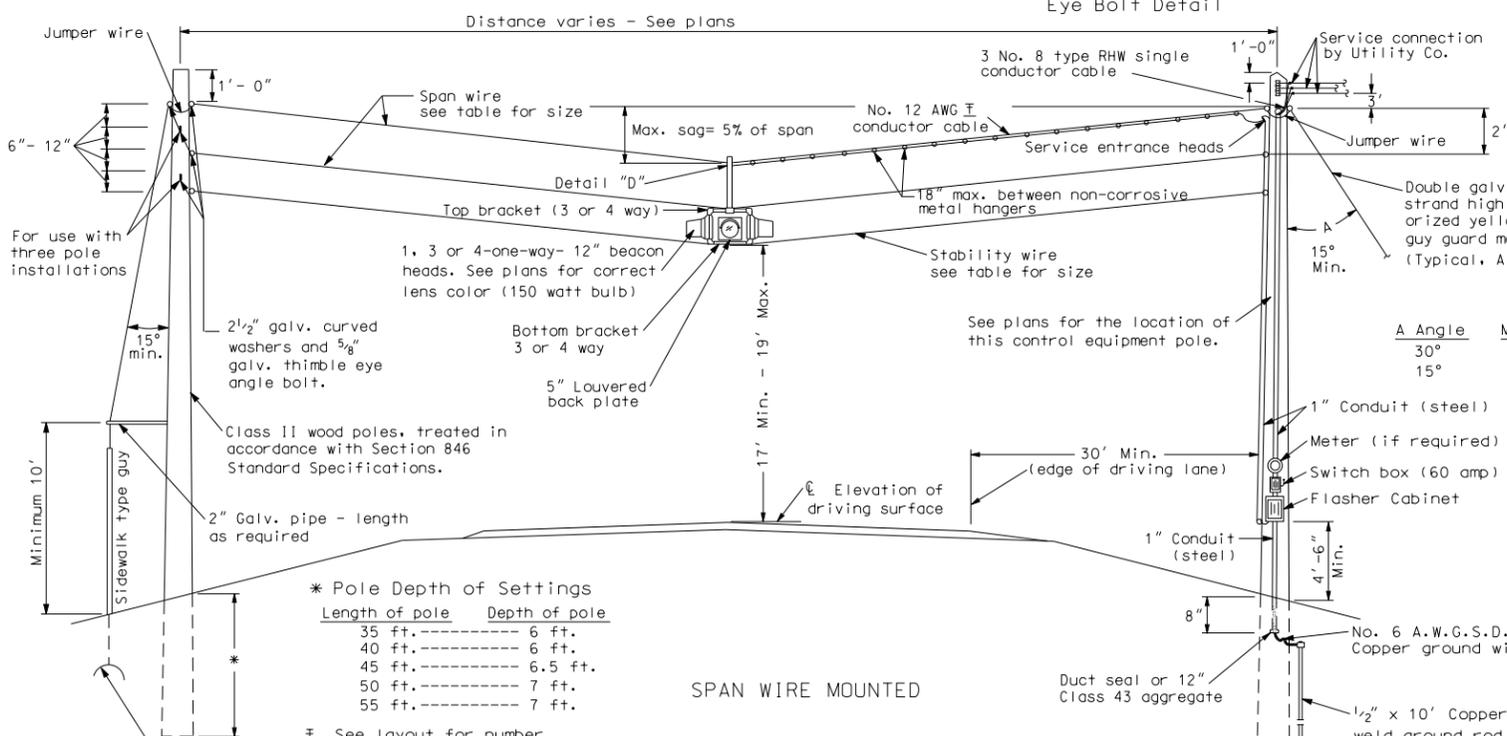
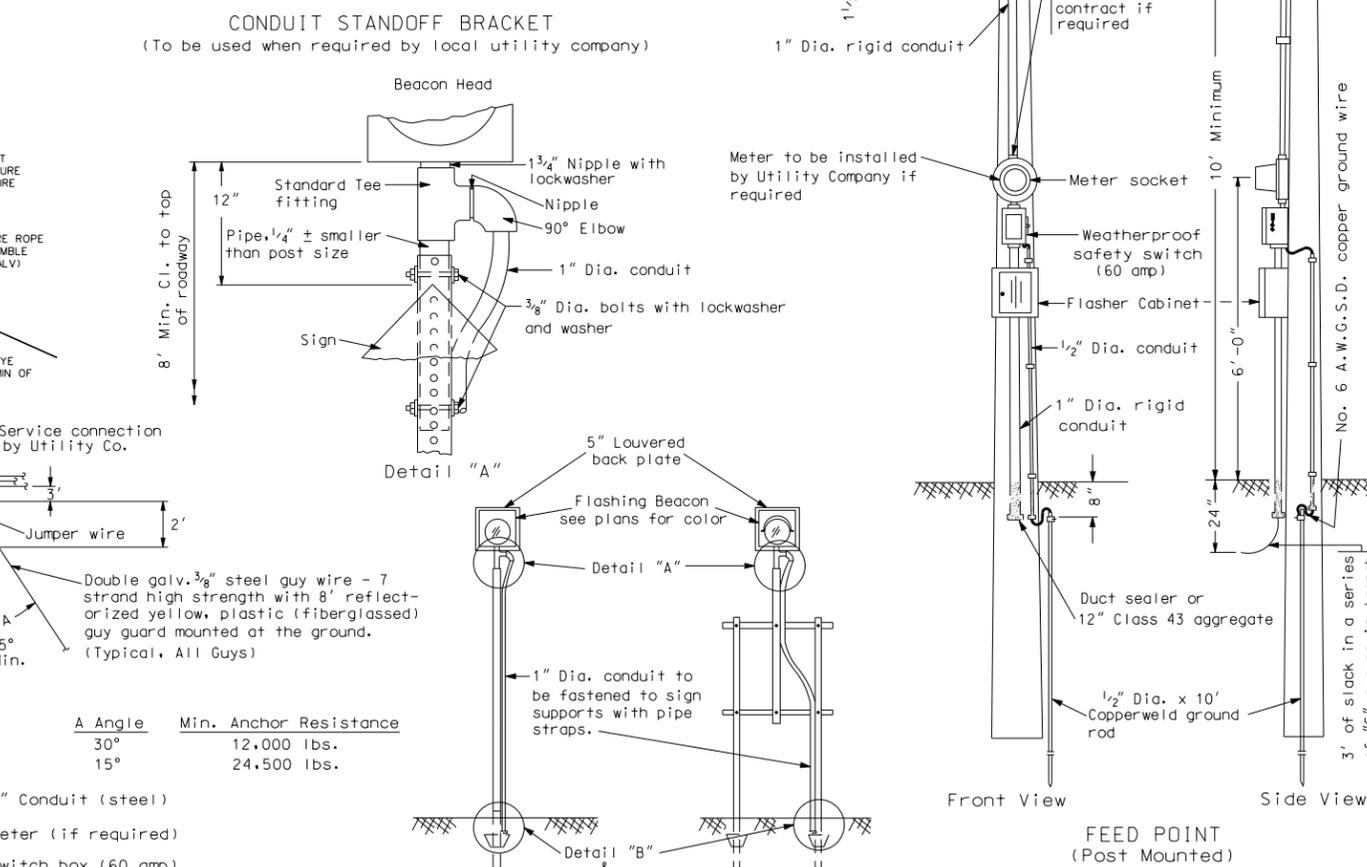
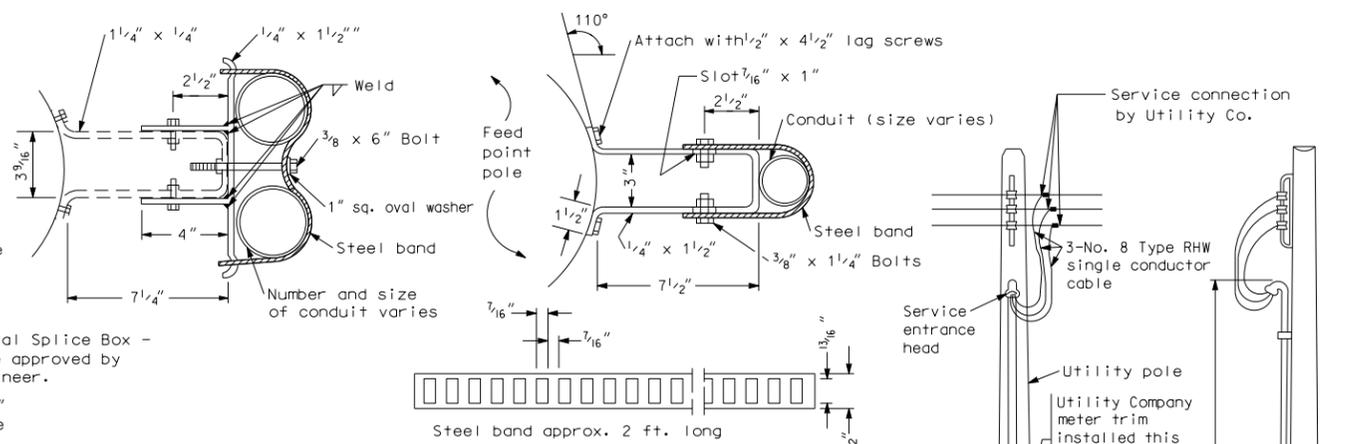
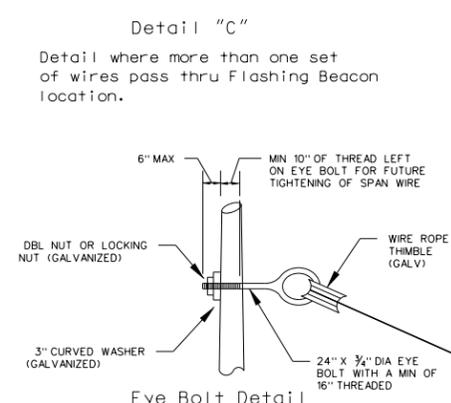
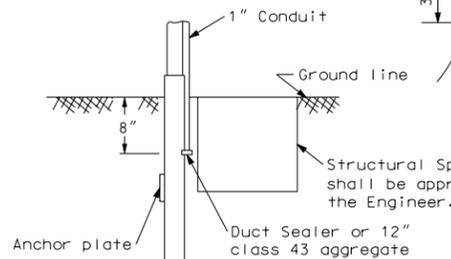
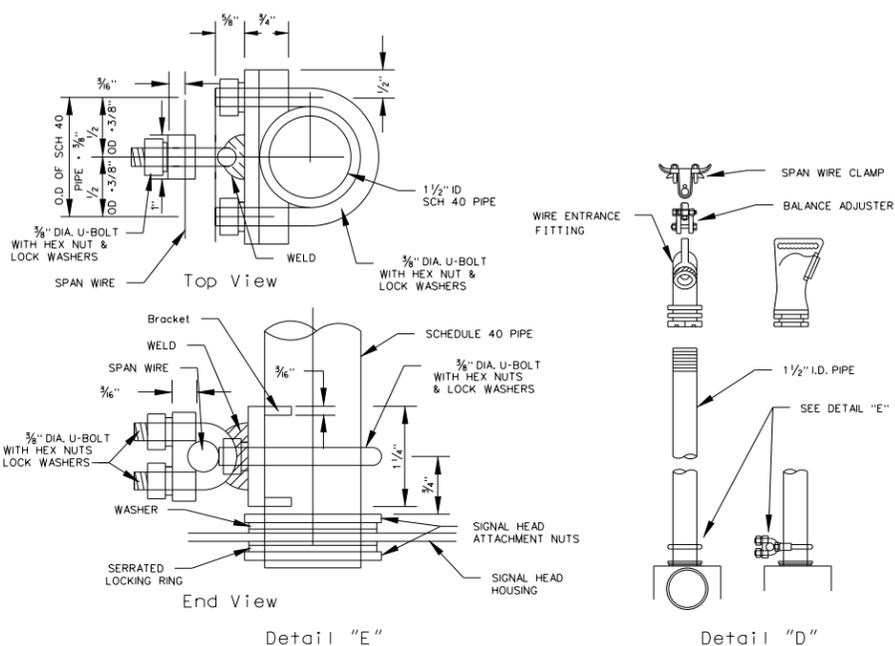


NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
04-26-94	Add NEENAH cover
10-11-94	Lift handle & polymer
03-20-95	Concrete pull box
	Add PVC pull box
05-28-99	Pull box cover thickness
06-08-99	Rural pull box detail
09-14-99	Added cast iron cover
12-01-04	PE Stamp added

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SPAN LENGTHS & SIZE OF SPAN WIRE								
Number of Beacon Heads Per Span	3/8" Span wire 1/8" Stability wire		3/8" Span wire 3/8" Stability wire		1/2" Span wire 1/2" Stability wire		5/8" Span wire 5/8" Stability wire	
	Max. Length		Max. Length		Max. Length		Max. Length	
	High Strength	Extra High Strength						
1	140'	170'	150'	180'	160'	195'	170'	210'
2	110'	140'	130'	160'	150'	185'	160'	200'
3	85'	115'	110'	140'	140'	170'	160'	195'
4	68'	90'	90'	120'	125'	160'	150'	185'

FLASHING BEACON



* Pole Depth of Settings

Length of pole	Depth of pole
35 ft.	6 ft.
40 ft.	6 ft.
45 ft.	6.5 ft.
50 ft.	7 ft.
55 ft.	7 ft.

† See layout for number

NOTE: The contractor shall maintain the required 17 to 19 ft. flashing beacon height over the roadway for a minimum period of 90 calendar days after installation unless written permission is granted by the Engineer to waive the 90 day requirement. The cost of maintaining the signal head elevation shall not be bid separately but shall be included in the price bid for flashing beacon.

NOTE: Flasher shall be operated on 120 volts.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-1-86	
REVISIONS	
DATE	CHANGE
08-01-90	Depth of pole
05-01-92	General revisions
09-07-95	Back plates & detail D
08-15-96	Add span wire
06-18-03	Minor revisions
12-01-04	PE Stamp added

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ROAD CLOSURE GATE DETAIL

LOCATION: Interstate mainline gate post shall be located approximately 20 feet beyond the in-place gore exit sign. Interstate ramp gate post shall be located approximately 20 feet beyond the end of the outside ramp radius. Other roadway locations shall be as directed by the Engineer in the field.

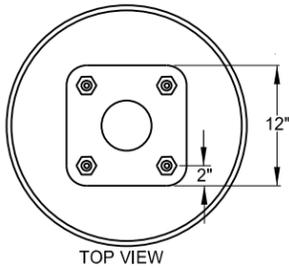
GATE: Gate shall be constructed of 2 inch square aluminum tubing conforming to ASTM B-308. The wall thickness shall be 0.125 inches.

GENERAL: All fittings and accessories shall be galvanized. Cable shall be 3/8 inch diameter and galvanized.

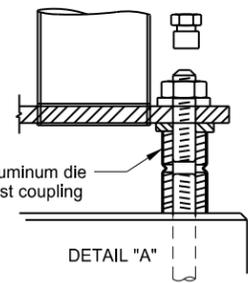
TUBING: Tubing shall be covered with red and white reflectorized tape in all areas which face traffic except the 4-1" taper area.

SIGNS: Hinged W20-3-48 signs shall be installed on both sides of the roadway 1/2 mile in advance of the mainline closure gate. Sign supports shall have provisions for mounting type B high intensity flashing warning lights.

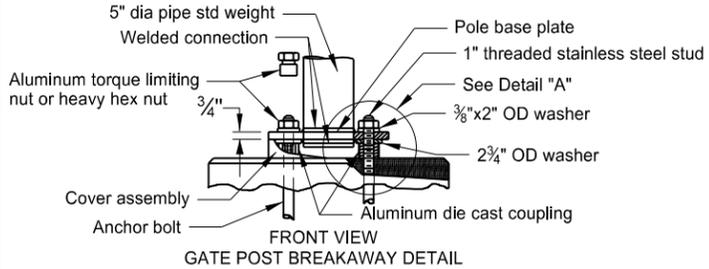
ANCHOR PLATE: Anchor plates shall be a minimum of 10 gauge material and galvanized same as post.



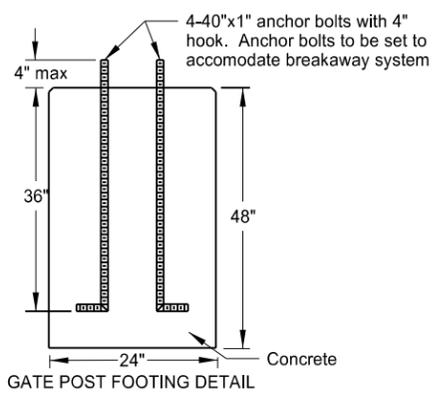
TOP VIEW



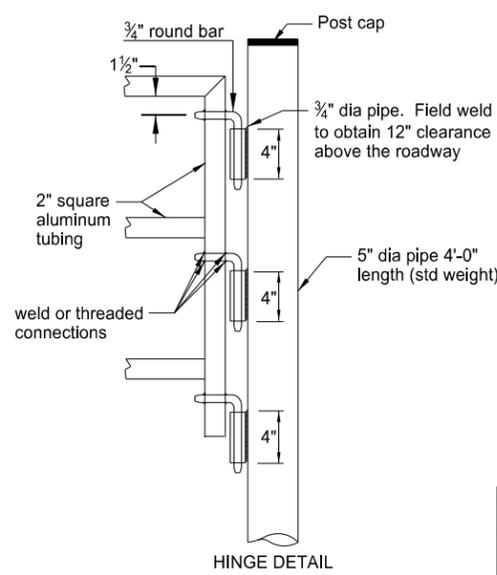
DETAIL "A"



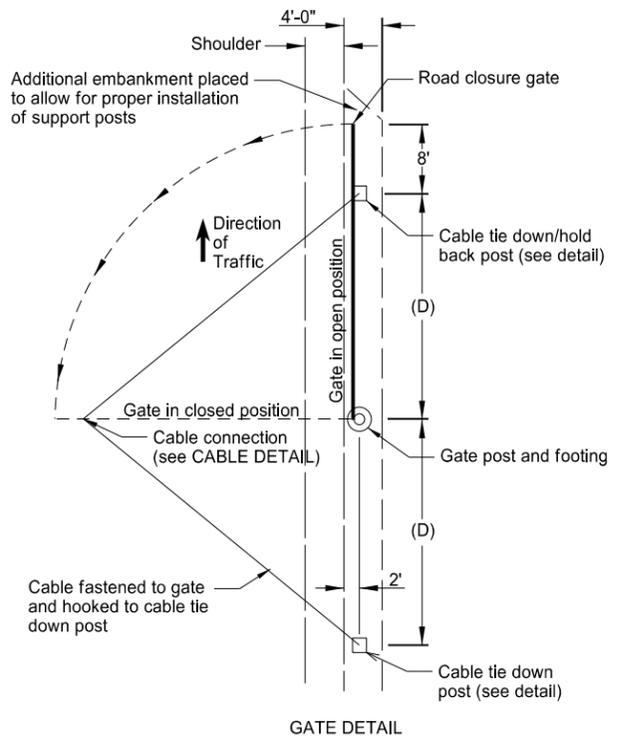
FRONT VIEW GATE POST BREAKAWAY DETAIL



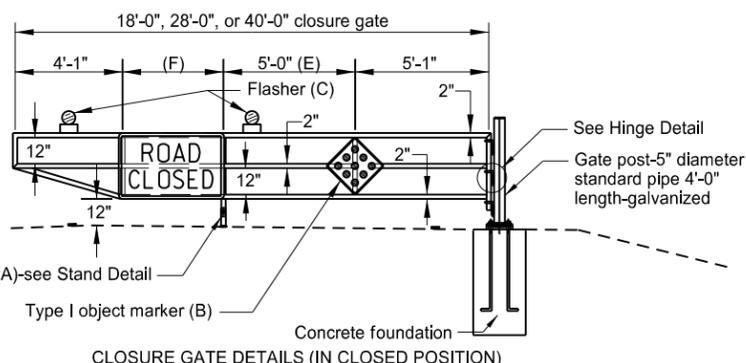
GATE POST FOOTING DETAIL



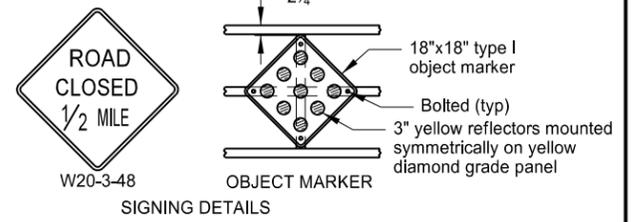
HINGE DETAIL



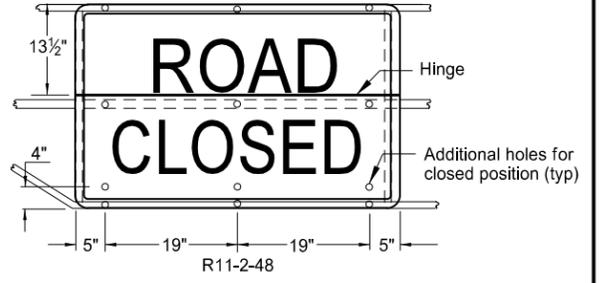
GATE DETAIL



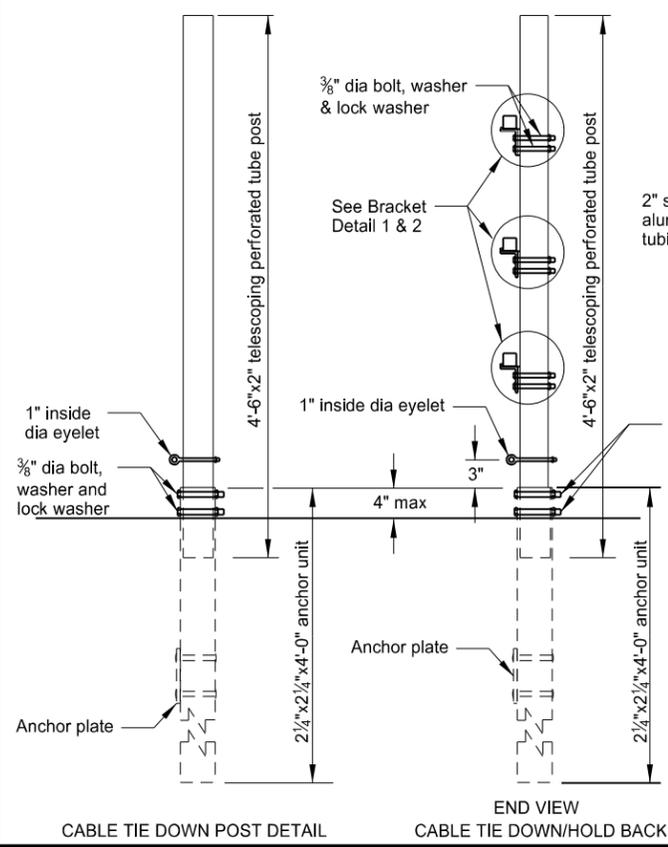
CLOSURE GATE DETAILS (IN CLOSED POSITION)



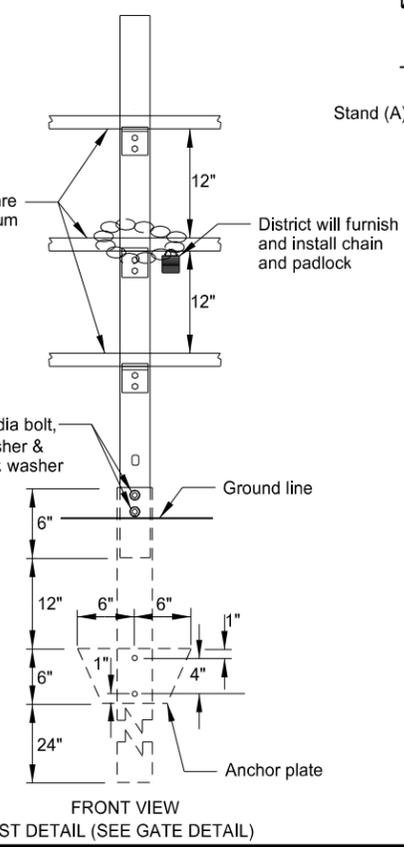
OBJECT MARKER SIGNING DETAILS



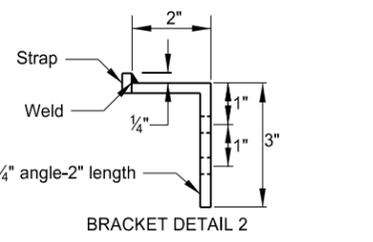
R11-2-48



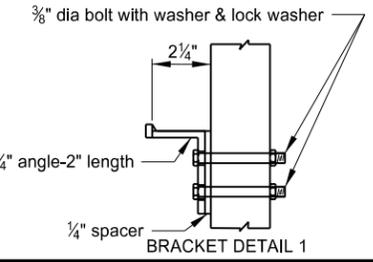
CABLE TIE DOWN POST DETAIL



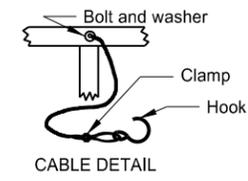
CABLE TIE DOWN/HOLD BACK POST DETAIL (SEE GATE DETAIL)



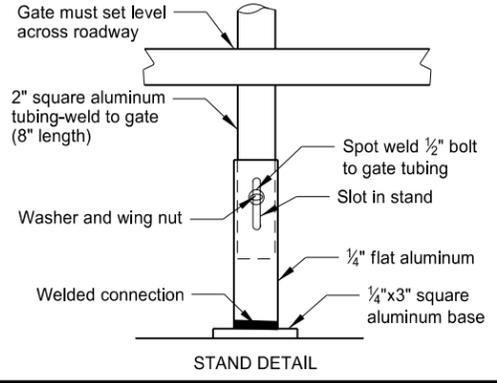
BRACKET DETAIL 2



BRACKET DETAIL 1



CABLE DETAIL



STAND DETAIL

Telescoping Perforated Tubes						
Tube Size (Inch)	Wall Thickness (Inch)	US Standard Gauge	Weight Per Foot (Lbs)	Moment of Inertia (Inch)	Gross Section Area (Inch)	Section Modulus (Inch)
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

CLOSURE GATE DETAIL TABLE						
Closure Gate Width	A No. of Stands Required	B No. of Type I Object Markers	C No. of Type "B" High Intensity Flashing Warning Lights	D Distance To Tie-Downs	E Additional Vertical Supports @ 5'-0" Centers	F Vertical Support Spacing
18'-0"	1	1	2	10'	0	3'-10"
28'-0"	2	3	2	20'	2	3'-10"
40'-0"	3	5	3	30'	4	5'-10"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-20-11	
REVISIONS	
DATE	CHANGE

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/20/11 and the original document is stored at the North Dakota Department of Transportation