

DESIGN DATA			
Traffic: I-94B	Average Daily		
Current: 2014	Pass: 16,035	Trucks: 460	Total: 16,495
Forecast	Pass:	Trucks:	Total:
Clear Zone Distance: 16 feet	Design Speed: 40 mph		
Minimum Sight Dist. for Stopping:	Bridges:		
Sight Dist. for No Passing Zone:			
Pavement Design Life (years)			
Design Accumulated One-way	ESALs:		

STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	20591	1	1

JOB # 3
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

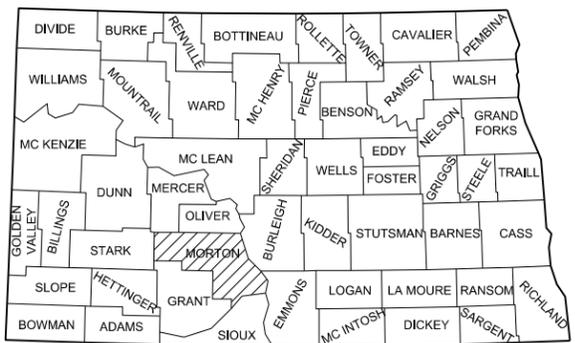
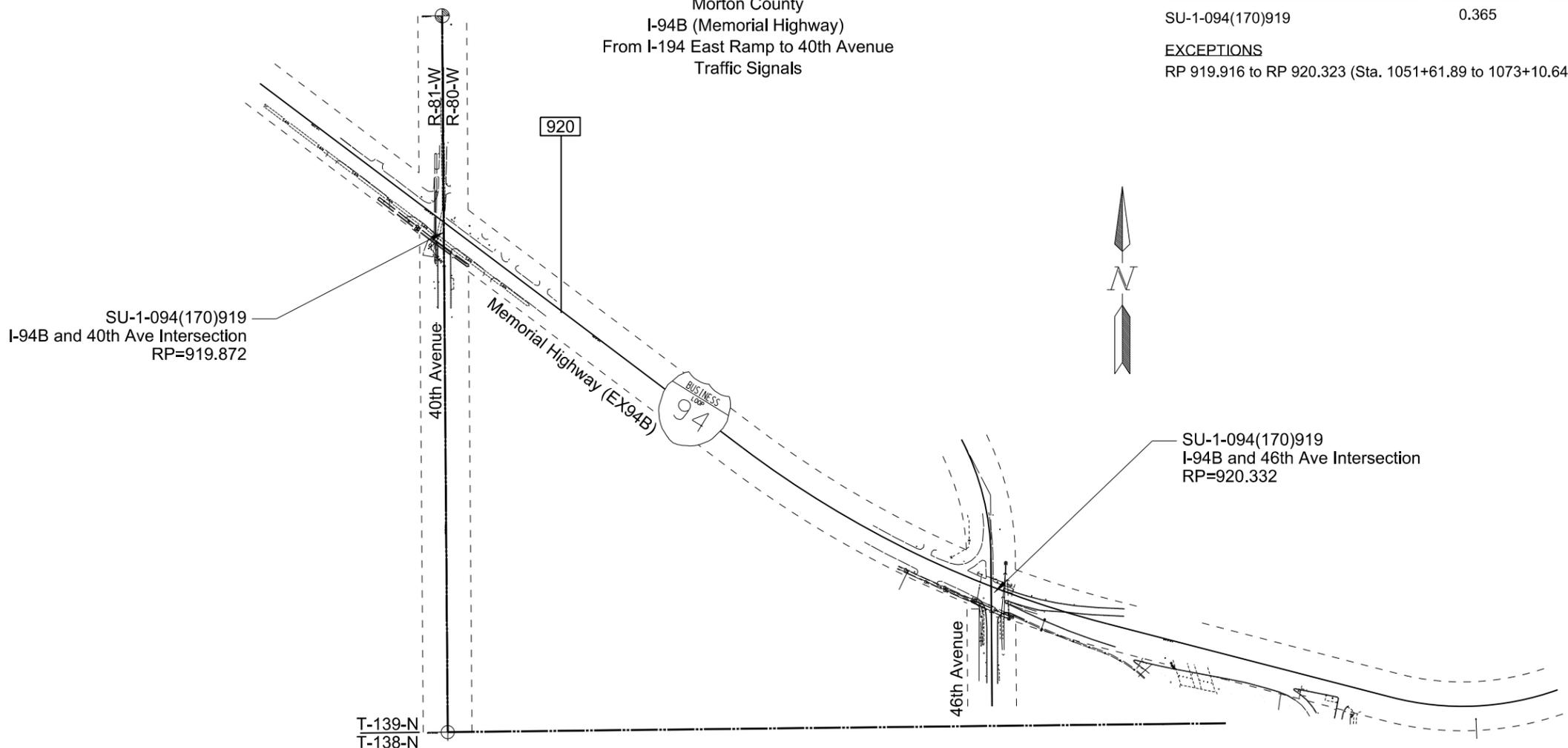
SU-1-094(170)919 & PCN 20591
T 139 N, R 80 W, Section 31

GOVERNING SPECIFICATIONS:
2014 Standard Specifications adopted by the North Dakota Department of Transportation and the Supplemental Specifications effective on the date the project is advertised.

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
SU-1-094(170)919	0.365	0.772

EXCEPTIONS
RP 919.916 to RP 920.323 (Sta. 1051+61.89 to 1073+10.64)

Morton County
I-94B (Memorial Highway)
From I-194 East Ramp to 40th Avenue
Traffic Signals



STATE COUNTY MAP

DESIGNERS
Adam McGill, P.E.
Mathew Hedger, E.I
Matt Ruder, P.E.
Matt VonHaden, P.E.
John Duncan, P.E.

APPROVED DATE <u>09/10/15</u>
<u>Robert Fode /s/</u>
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 <u>09/03/15</u>
<u>Adam McGill /s/</u>

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Adam McGill
Registration Number
PE- 7565,
on 09/03/15 and the original document is stored at the North Dakota Department of Transportation

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	15	Traffic Signal Quantities

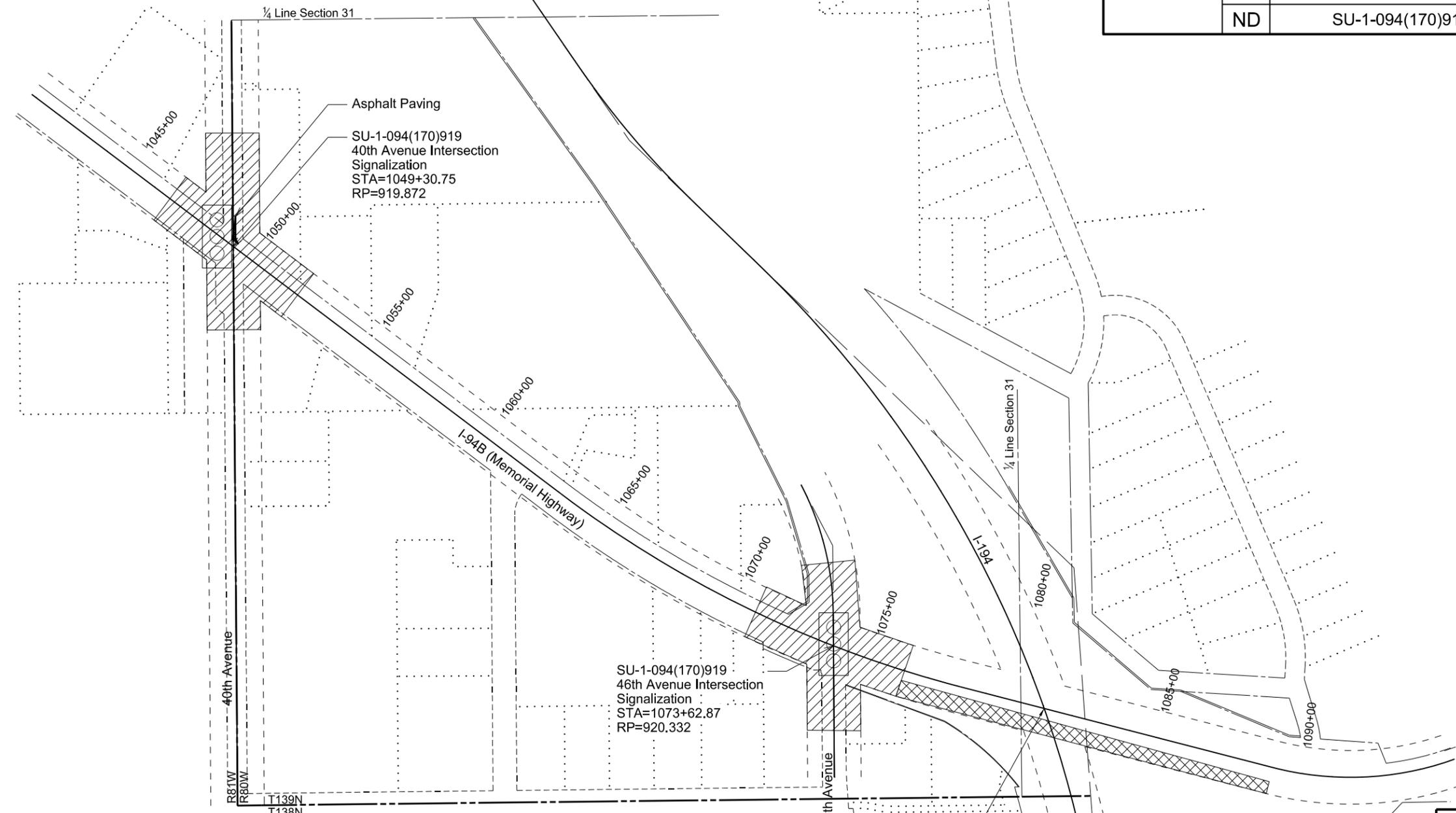
LIST OF STANDARD DRAWINGS

<u>Standard No.</u>	<u>Description</u>
D101-1, 2, 3	NDDOT Abbreviations
D101-10	NDDOT Utility Company and Organization Abbreviations
D101-20, 21	Line Styles
D101-30, 31, 32	Symbols
D704-07	Breakaway Systems For Construction Zone Signs - Perforated Tube
D704-08	Breakaway Systems For Construction Zone Signs - U-Channel Post
D704-09	Construction Sign Details - Terminal and Guide Signs
D704-10	Construction Sign Details - Regulatory Signs
D704-11	Construction Sign Details - Warning Signs
D704-12	Shoulder Closure Tapers
D704-13	Barricade and Channelizing Device Details
D704-14	Construction Sign Punching and Mounting Details
D704-23	Short Term Urban Detour and Lane Closure on a Divided Highway Layouts
D704-24	Shoulder Closures and Bridge Painting Layouts
D704-25	Lane Closures on Urban Streets Layouts
D704-50	Portable Sign Support Assembly
D748-01	Curb & Gutter and Valley Gutter
D750-03	Curb Ramp Details
D754-23	Perforated Tube Assembly Details
D754-24, 25	Mounting Details Perforated Tube
D754-24A	Breakaway Coupler System for Perforated Tubes
D754-27	Sign Punching, Stringer, and Support Location Details Regulatory, Warning and Guide Signs
D754-28	Sign Punching, Stringer, and Support Location Details Regulatory, Warning and Guide Signs
D754-80	Light Standard, Signal Standard, and Span Wire Mounted Sign Assembly Detail
D762-01	Pavement Marking Message Details
D762-04	Pavement Marking
D770-01	Concrete Foundations (Traffic Signals & Highway Lighting)
D770-02	Feed Points (Roadway Lighting)
D770-02A	Combination Feed Point Details
D770-03	Pull Box Details
D770-04	Lighting and Signal Details
D772-01	Feed Point - Traffic Signals
D772-02	Traffic Signal Standards
D772-03	Traffic Signal Standards (Mast Arm Type)
D772-04	Traffic Signal Head Mounting
D772-06	Span Wire Mounted Traffic Signals

LIST OF SPECIAL PROVISIONS (SP)

<u>SP #</u>	<u>Description</u>
SP 201(14)	Interconnect Cable (Hybrid)
SP 200(14)	Video Vehicle Detection System

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	4	1



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Scope of Work
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	6	1

NOTES

SECTION 40

- 202-P01 REMOVAL OF CONCRETE: All costs associated with saw cutting and removal of concrete pavement and curb and gutter shall be paid for under item "Removal of Concrete."
- 202-P02 REMOVAL OF ASPHALT: All costs associated with saw cutting and removal of asphalt shall be paid for under item "Remove Bituminous Surfacing."

SECTION 70

- 253-P01 SITE RESTORATION: Areas disturbed by installation of the Traffic Signal System and Lighting System shall have turf restored by Hydraulic Mulch. The hydraulic mulch shall be combined with Seeding Class II and applied in a single application. The costs for topsoil, seeding, and hydraulic mulch shall be included in the price bid for "Lighting System" and "Traffic Signal System".
- 261-P02 FIBER ROLL 12IN: A quantity of 200 LF of Fiber Rolls 12IN is provided for temporary erosion control for the Traffic Signals System and Lighting System. Place fiber rolls at the edge of disturbed areas where surface runoff leaves the site adjacent for the installation of the signal bases, lighting bases, cabinet bases, pullboxes, and boring pits as directed by the Engineer. Fiber rolls shall also be placed at culvert aprons and around storm inlets. Installation and removal shall be included in the price bid for "Fiber Roll 12IN".

SECTION 100

- 704-P01 TRAFFIC CONTROL: The traffic control has been developed using the following layouts on the Standard Drawings for traffic control:

D-704-23, type P: For traffic signal installation.
D-704-24, type U: For traffic signal installation.

At least one lane in each direction shall be open to traffic at all times.

All lane closures shall be coordinated with the Engineer at least 24 hours in advance. The lane closure traffic control shall not be used overnight. The traffic lanes shall be opened when work for the day is complete.

SECTION 140

- 770-P01 FEED POINT: Meter trim for lighting and traffic signals furnished by the Contractor shall meet the requirements of the local utility companies. The cost of the meter trim shall not be bid separately but shall be included in the price bid for other items. Feed point cabinets shall be stainless steel.
- 770-P02 PULL BOXES: Pull boxes shall be polymer concrete with covers and shall conform to the polymer concrete pull box detail included in the plans.

- 770-P03 CONDUIT: Below grade conduit shall be schedule 40 pvc. Below grade conduit at street and driveway crossings shall be schedule 80 pvc. All above grade conduit shall be galvanized rigid steel. Conduit shall be as manufactured by Republic Steel Company, Youngstown, Triangle, Wheatland, Carlon, Johns-Manville or equal. Provide all required fittings as necessary for a complete and working system.
- 770-P04 LOW VOLTAGE POWER CONDUCTORS AND CABLE: Conductor shall be provided as called out on the drawings. Conductor shall be copper. Aluminum is not allowed. Manufacturers shall be Anaconda, Cyprus Wire and Cable Company (Rome), General Electric Company, Pirelli or equal.
- 770-P05 LED LUMINAIRE - 135 WATT: The LED luminaire - 135 watt shall be furnished and installed as shown on the plans. The luminaire shall have a 700 mA drive current and produce a minimum of 14000 delivered lumens. Have a CCT of 4000K and a 0.96 LLD at 50K hours at 25 deg. C. The luminaire shall be IES Type III Roadway distribution. The luminaire shall be provided with on board photocell control. Prior approved manufacturers shall be American Electric Lighting Autobahn series ATB2, Cooper Streetworks Navion Series, and Hubbell Lighting RL Roadway series.

The LED luminaire 135 watt shall operate on 240 volts.

The LED luminaires - 135 watt will not be measured. All labor, equipment, and materials necessary to complete the installation shall be included in the bid price for "LIGHTING SYSTEM."
- 772-P01 SPLICES & CONDUCTORS IN TRAFFIC STANDARD BASES, HAND HOLES, ETC.: Spliced or pulled through conductors shall have sufficient slack to extend a minimum of 18 inches outside of the enclosure. All above grade splices utilizing wire nuts shall be installed in their bases, hand holes, etc., with the wire nuts pointing up.

Terminal blocks in signal standard bases shall be attached to a plastic plate with the minimum thickness of 3/8". The plate shall be a minimum of 2" larger than the terminal block on all sides. The termination shall be coated with red insulating varnish with a dielectric strength of 2100 volts/mil. The varnish shall be applied immediately after the terminations have been made.

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	6	2

NOTES

SECTION 150

772-P02 VIDEO DETECTION SYSTEM: The video detection system shall be Autoscope Encore manufactured by Econolite.

A video monitor shall be included in the controller cabinet for viewing the video.

The contractor shall provide a spare video detection camera, video detection processor, and camera interface panel. The Contractor shall be responsible for coordinating with the Jeff Wright, public works director, at 701-667-3240 and delivering the spare camera.

The cost for the video monitor and spare equipment shall be included in the item "Traffic Signals System."

772-P03 CONTROLLER TYPE 1: The controller shall be a NEMA TS-2, Type 1 controller and manufactured by Econolite. The traffic counting capability of the controller shall be fully operational.

The cost of the Controller Type 1 shall be included in the item "Traffic Signals System."

772-P04 ADDITIONAL CONDUIT: The contractor shall install one additional 2-inch diameter conduit in the new controller foundation. The conduit shall face north. The conduit shall be capped underground and capped in the controller cabinet with a 2" expandable metal plug and labeled which direction the conduit is facing. The cost for the additional conduit shall be included in the item "Traffic Signals System."

772-P05 ACCESSIBLE PEDESTRIAN SIGNALS (APS) PUSHBUTTON AND SIGN: Shall include the features, installation procedures, and be compliant with the following:

A. Features:

1. Rapid tick WALK indication, no more than 2-5dBA above ambient sound
2. Vibrotactile WALK indication
3. Speaker and vibrotactile indication located at pushbutton
4. Pushbutton locator tone
5. Tactile arrow on each device aligned in direction of travel on the crosswalk
6. The APS shall be the wire system

B. Installation Procedures

1. APS should be reachable from the level landing of the curb ramp for the crossing or from a level surface with an accessible path to the ramp (MUTCD Section 4D.08 and Proposed PROWAG).
2. APS should be within 5 feet of the crosswalk line furthest from the center of the intersection and within 10 feet of the curb (MUTCD Section 4E.08).
3. Tactile arrow shall be aligned with parallel to the direction of travel on the crosswalk (MUTCD Section 4E.12, PR).

4. Pushbutton required to be located within reach range for wheelchair users (Proposed PROWAG, R406).

C. Code Compliance:

1. Functionality: MUTCD 2009 – 4E
2. Temperature and Humidity: NEMA TS 2
3. Transient Voltage Protection: NEMA TS 2
4. Transient Suppression: IEC 61000-4-4, IEC 61000-4-5
5. Electronic Noise: FCC Title 47, Part 15, Class A
6. Mechanical Shock and Vibration: Nema TS 2
7. EN4 PBS Enclosure: NEMA 250 – Type 4X
8. Electrical Reliability: NEMA TS 4

772-P06 EMERGENCY VEHICLE PRE-EMPTION: The EVP equipment shall be fully compatible with the other EVP equipment used within the City of Mandan. The confirmation light shall be at the same location on the mast arm as the EVP detector.

772-P07 RED SIGNAL ENFORCEMENT LIGHTS: All signal heads shall be equipped with Red Signal Enforcement lights facing away from oncoming traffic to assist law enforcement in enforcing red phase violations.

Red Signal Enforcement lights shall activate simultaneously with red light phase and be visible downstream from signal head. Red Signal Enforcement lights shall be Blue in color.

772-P08 CONTROLLER INTERCONNECT: The cost of interconnection between traffic controllers shall be included in the item "Traffic Signals System."

772-P09 REMOVE TRAFFIC SIGNAL SYSTEM: The removed Traffic Signal System shall become property of the City of Mandan. The Contractor shall be responsible for coordinating with the Jeff Wright, public works director, at 701-667-3240 and delivering the salvaged Traffic Signal System to the Public Works yard in Mandan.

772-P10 TRAFFIC SIGNAL POLES: New traffic signal poles shall be galvanized steel. Galvanizing shall be in accordance with AASHTO Specification M111 (ASTM A123).

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ENVIRONMENTAL COMMITMENTS

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-1-094(170)919	6	3

ENVIRONMENTAL COMMITMENTS (EC): The North Dakota Department of Transportation and the Federal Highway Administration have made environmental commitments to secure approval of this project. The environmental commitments are as follows:

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

Wetland Number	Cowardin Classification	Wetland Type	Wetland Size (acres)	Wetland Feature	USACE Jurisdictional Wetlands	Impacts to Wetlands	
						Temp.	Perm.
NO WETLANDS PRESENT							
TOTALS:			0.00		0.00	0.00	

ESTIMATE OF QUANTITIES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	8	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
103	0100	CONTRACT BOND	L SUM	1
202	0112	REMOVAL OF CONCRETE	SY	29
202	0132	REMOVAL OF BITUMINOUS SURFACING	SY	25.5
261	0112	FIBER ROLL 12IN	LF	200
302	0120	AGGREGATE BASE COURSE CL 5	TON	80.72
430	0500	COMMERCIAL GRADE HOT MIX ASPHALT	TON	24.78
430	1000	CORED SAMPLE	EA	1
702	0100	MOBILIZATION	L SUM	1
704	0100	FLAGGING	MHR	60
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1175
704	1060	DELINEATOR DRUMS	EA	41
704	1067	TUBULAR MARKERS	EA	11
704	1087	SEQUENCING ARROW PANEL-TYPE C	EA	1
704	1500	OBLITERATION OF PAVEMENT MARKING	SF	370
748	0140	CURB & GUTTER-TYPE 1	LF	40.5
750	0115	SIDEWALK CONCRETE 4IN	SY	27.3
750	2115	DETECTABLE WARNING PANELS	SF	30
754	0110	FLAT SHEET FOR SIGNS-TYPE XI REFL SHEETING	SF	60
754	0112	FLAT SHEET FOR SIGNS-TYPE IV REFL SHEETING	SF	86
754	0206	STEEL GALV POSTS-TELESCOPING PERFORATED TUBE	LF	29
754	0592	RESET SIGN PANEL	EA	1
762	0110	EPOXY PVMT MK 4IN LINE-GROOVED	LF	1251
762	0131	EPOXY PVMT MK 6IN LINE-GROOVED	LF	193
762	0132	EPOXY PVMT MK 8IN LINE-GROOVED	LF	576
762	0135	EPOXY PVMT MK 24IN LINE-GROOVED	LF	204
762	0136	EPOXY PVMT MK MESSAGE-GROOVED	SF	257
770	0001	LIGHTING SYSTEM	EA	1
772	0001	TRAFFIC SIGNALS SYSTEM	EA	1
772	2790	TRAFFIC SIGNAL SYSTEM - SPAN WIRE MOUNTED	EA	1
772	3125	REMOVE TRAFFIC SIGNAL SYSTEM	EA	1

BASIS OF ESTIMATE

40th Ave Intersection Removals		
Description	Unit	Quantity
804 LF of 4 IN Painted Lines	SF	268
Sign Panel	Each	2.00
114.75 FT x 2 FT Bituminous Surface	SY	25.50

46th Ave Intersection Removals		
Description	Unit	Amount
2 FT x 6 FT Continental cross walk bars, 7 each	SF	84
27 LF of 4 IN Double Yellow Barrier	SF	18
Sign, support, and foundation	Each	4
Sign Panel	Each	1
Existing Wire Span Signal System	Each	1
Curb & Gutter	LF	41
Concrete	SY	29

Paving Area	
SY	106.18

Asphalt Volume @ 4in Thickness	
CY	11.80

Aggregate Base Course CL 5 @ 12in Thickness	
CY	35.39

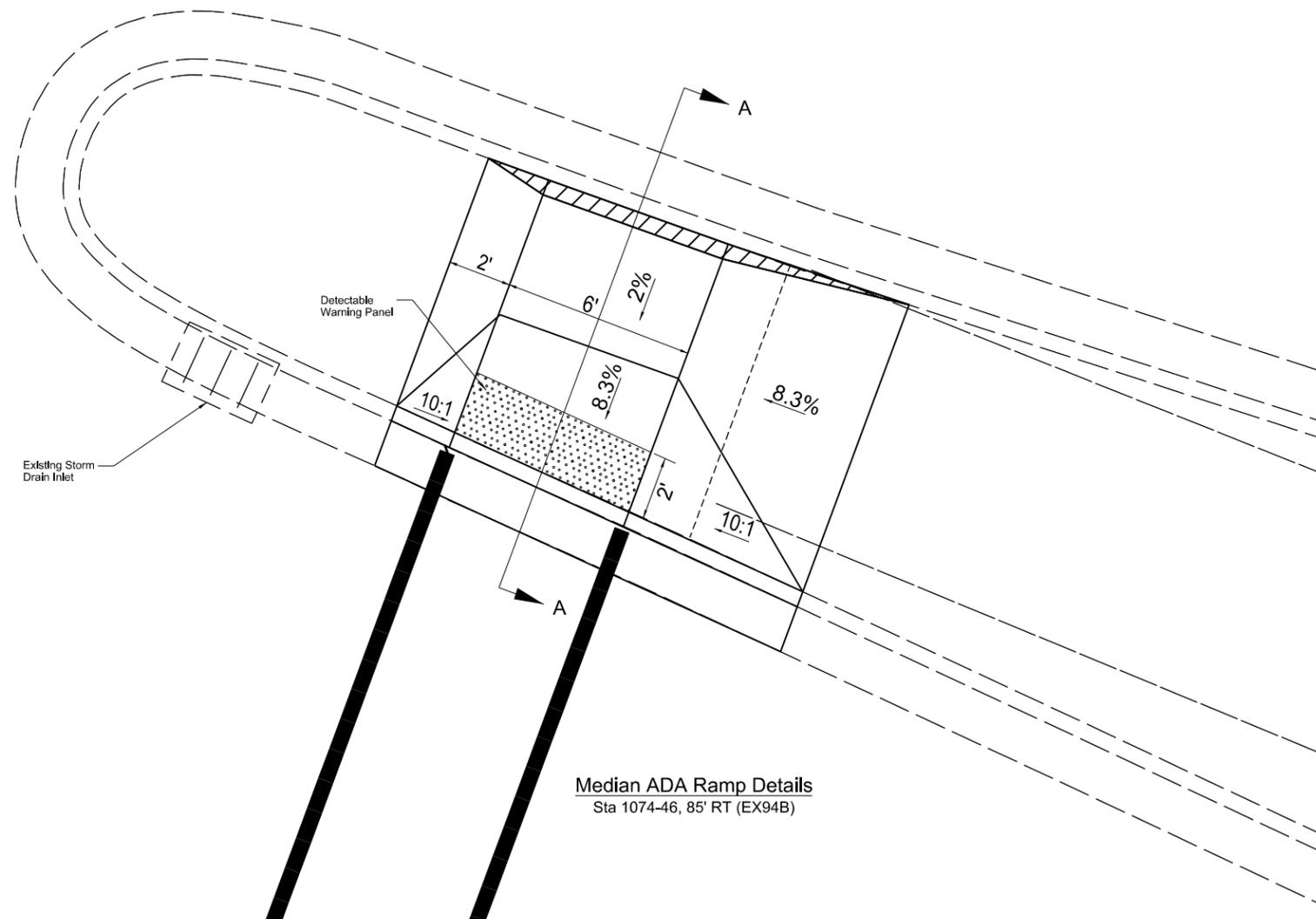
40th Ave Intersection HBP Quantities		
Material	Unit	Quantity
Aggregate Base Course CL 5 @ 1.875 Ton/CY	Ton	80.72
Commercial Grade Hot Mix Asphalt @ 2 Ton/CY	Ton	24.78

Pavement Marking Summary		
Description	Unit	Quantity
EPOXY PVMT MK MESSAGE-GROOVED (Right, left, Thru/Turn Arrows)	SF	257
EPOXY PVMT MK 4IN LINE-GROOVED (Yellow Centerline, White Edgeline)	LF	1251
EPOXY PVMT MK 8IN LINE-GROOVED (Right and Left Turn Lanes)	LF	572
EPOXY PVMT MK 12IN LINE-GROOVED (Crosswalk)	LF	193
EPOXY PVMT MK 24IN LINE-GROOVED (Stopbars)	LF	206

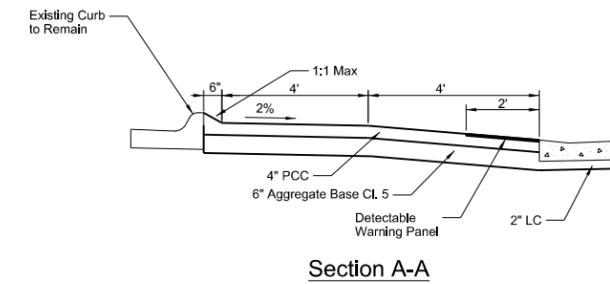
46th Ave Intersection Curb Ramps		
Description	Unit	Quantity
SIDEWALK CONCRETE 4IN	SY	27.3
CURB & GUTTER-TYPE 1	LF	40.5
DETECTABLE WARNING PANELS	SF	30

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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	20	1



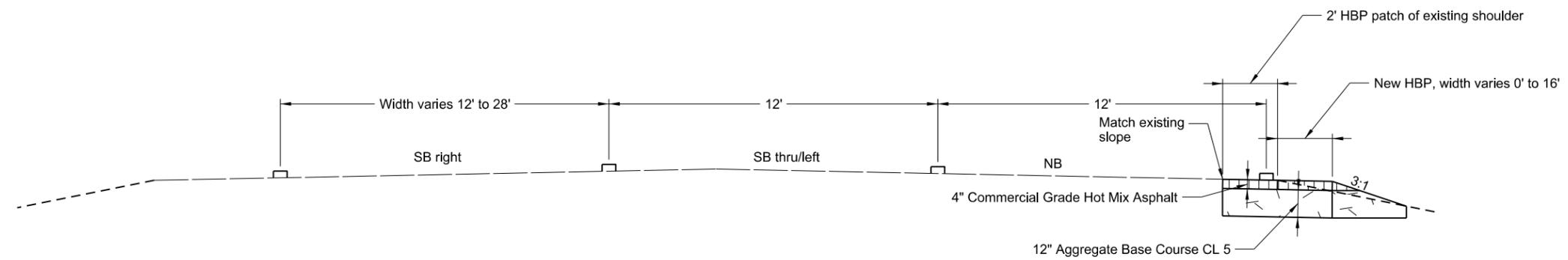
Median ADA Ramp Details
Sta 1074-46, 85' RT (EX94B)



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ADA Details
46th Ave Intersection
Memorial Highway Signalization
Mandan, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-1-094(170)919	30	1



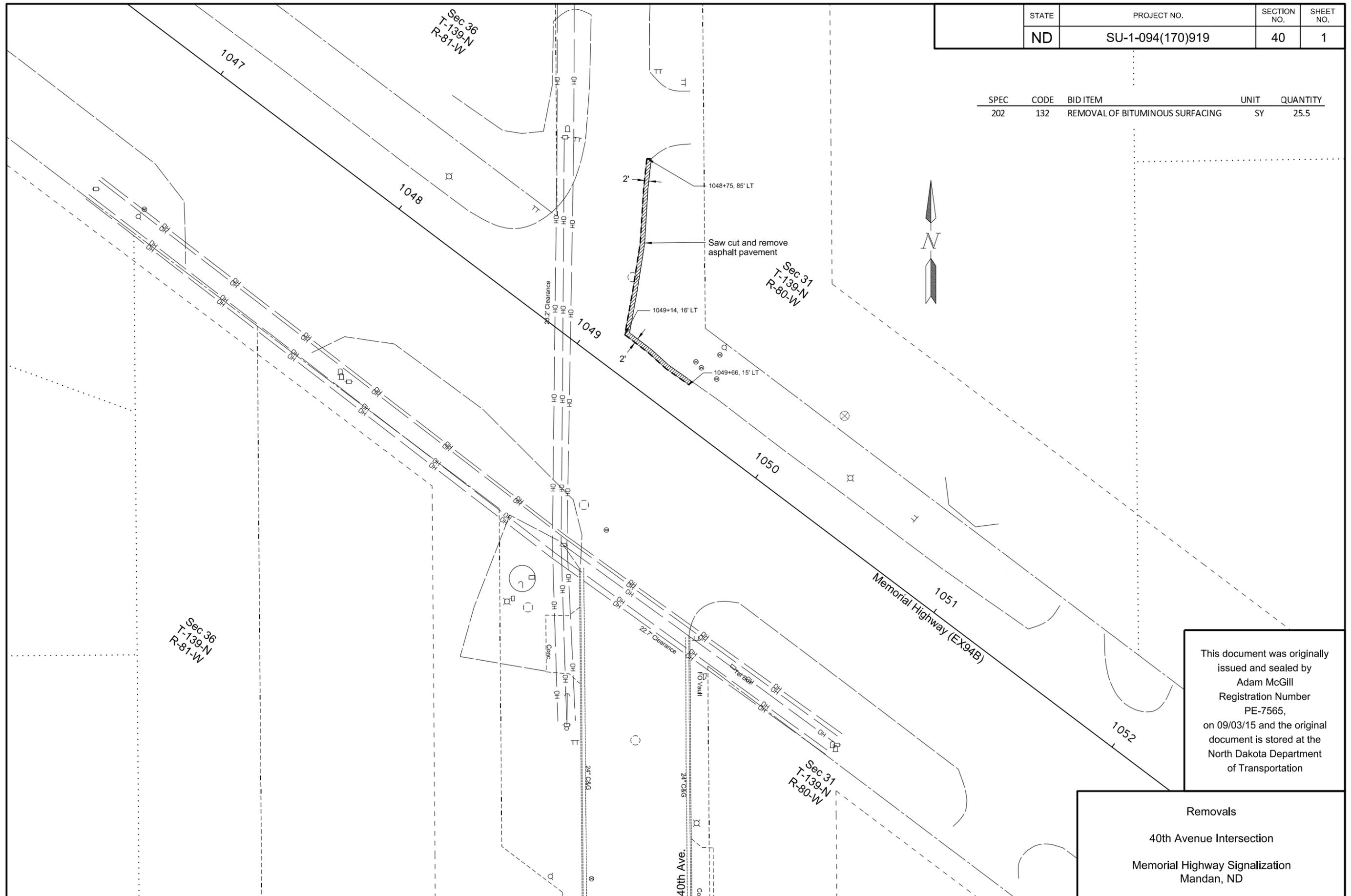
40th Avenue Proposed Typical Section
 Sta 1048+77, 86' LT to 1049+39, 17' LT (EX94B)

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Proposed Typical Section
 40th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	40	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	132	REMOVAL OF BITUMINOUS SURFACING	SY	25.5

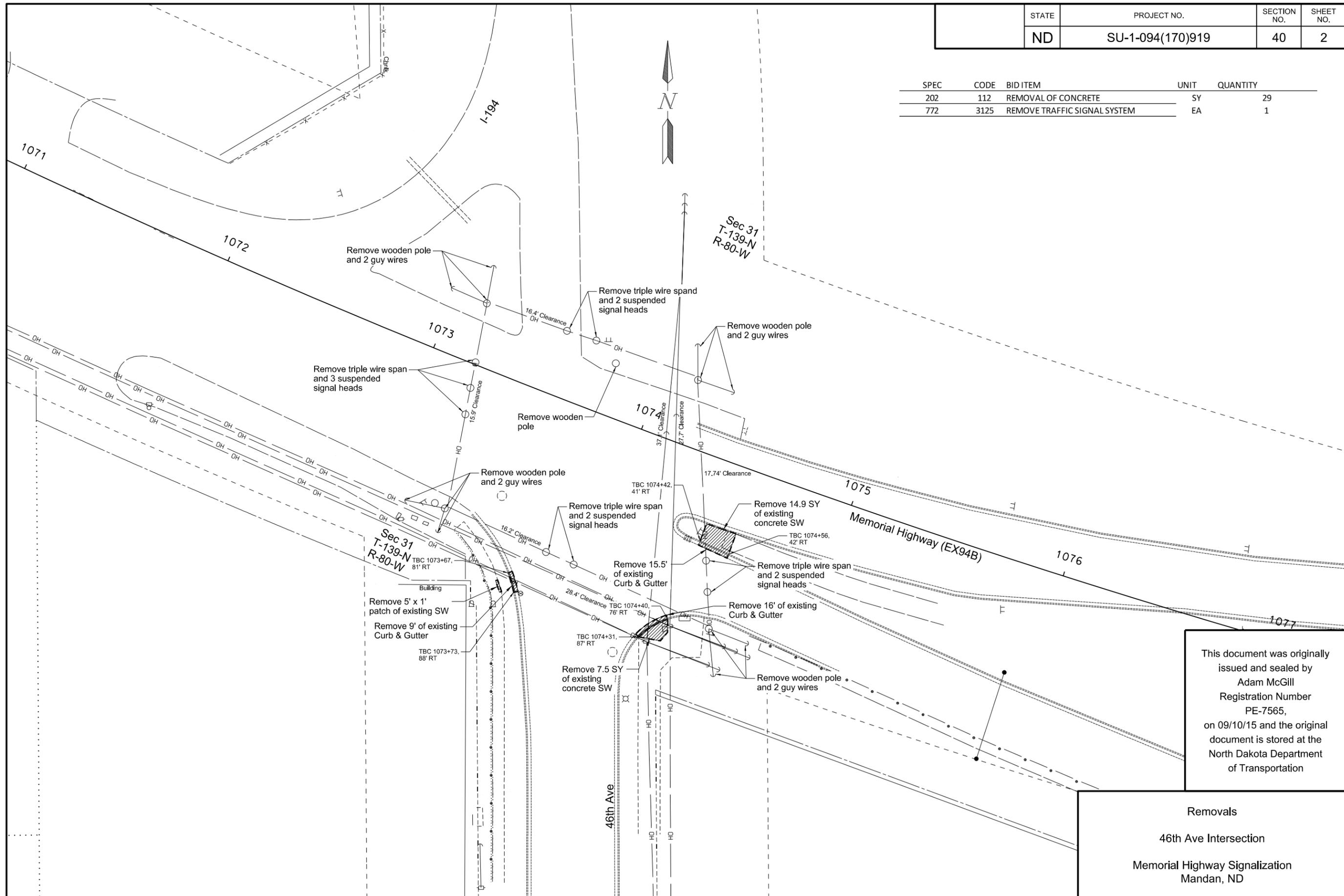


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Removals
 40th Avenue Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	40	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
202	112	REMOVAL OF CONCRETE	SY	29
772	3125	REMOVE TRAFFIC SIGNAL SYSTEM	EA	1



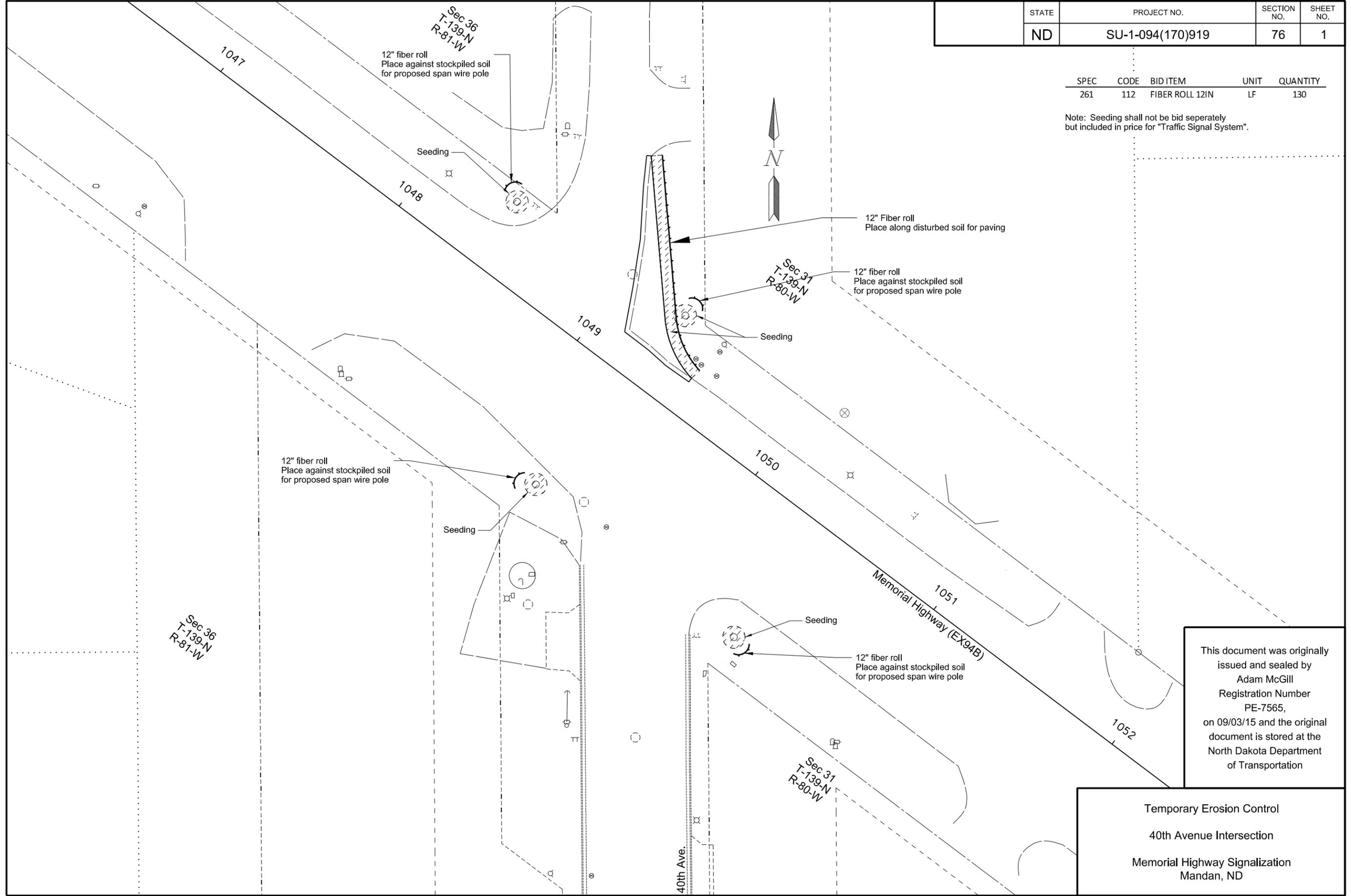
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Removals
 46th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	76	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
261	112	FIBER ROLL 12IN	LF	130

Note: Seeding shall not be bid separately but included in price for "Traffic Signal System".



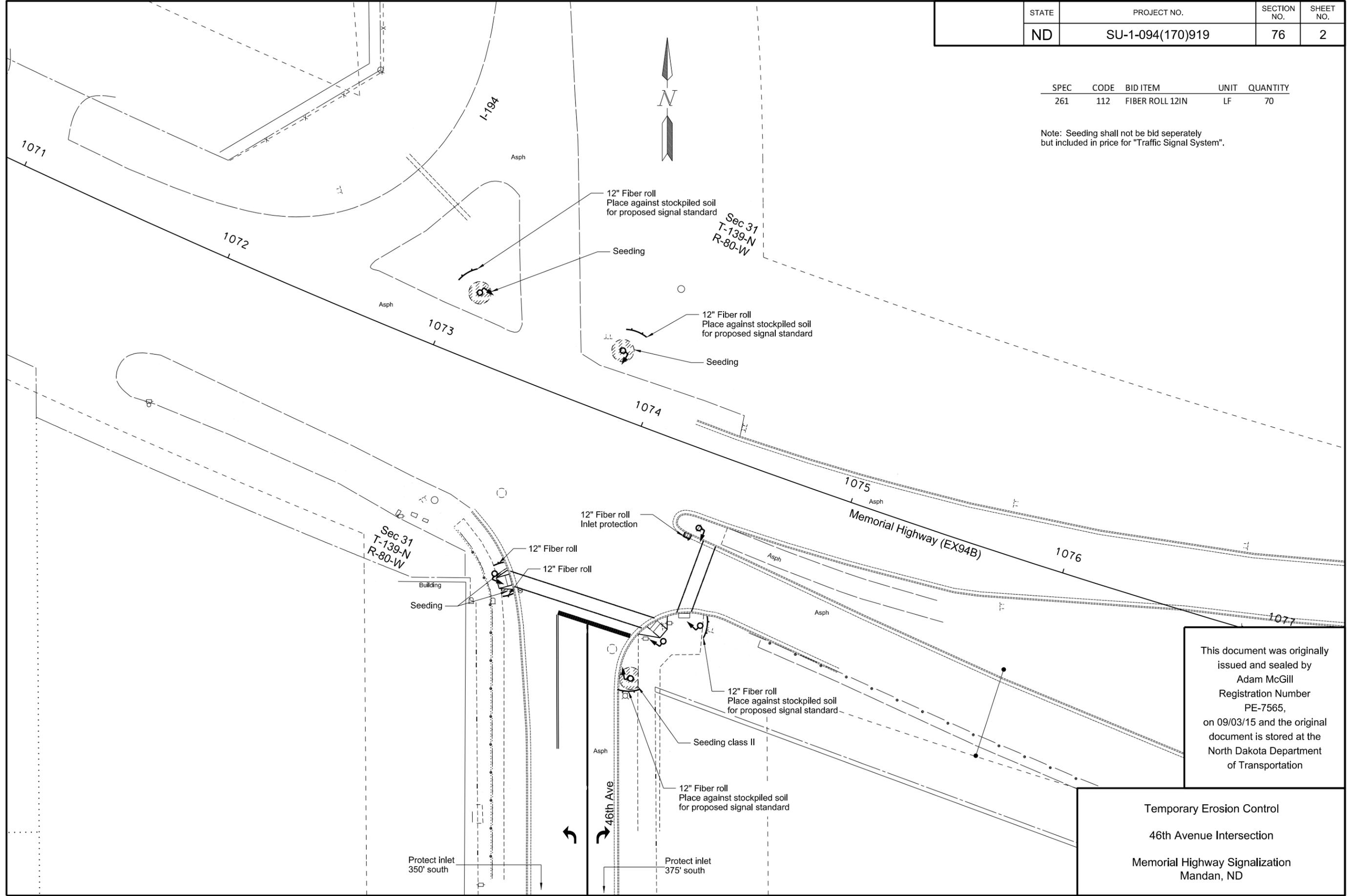
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Temporary Erosion Control
 40th Avenue Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	76	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
261	112	FIBER ROLL 12IN	LF	70

Note: Seeding shall not be bid seperately but included in price for "Traffic Signal System".



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Temporary Erosion Control
 46th Avenue Intersection
 Memorial Highway Signalization
 Mandan, ND

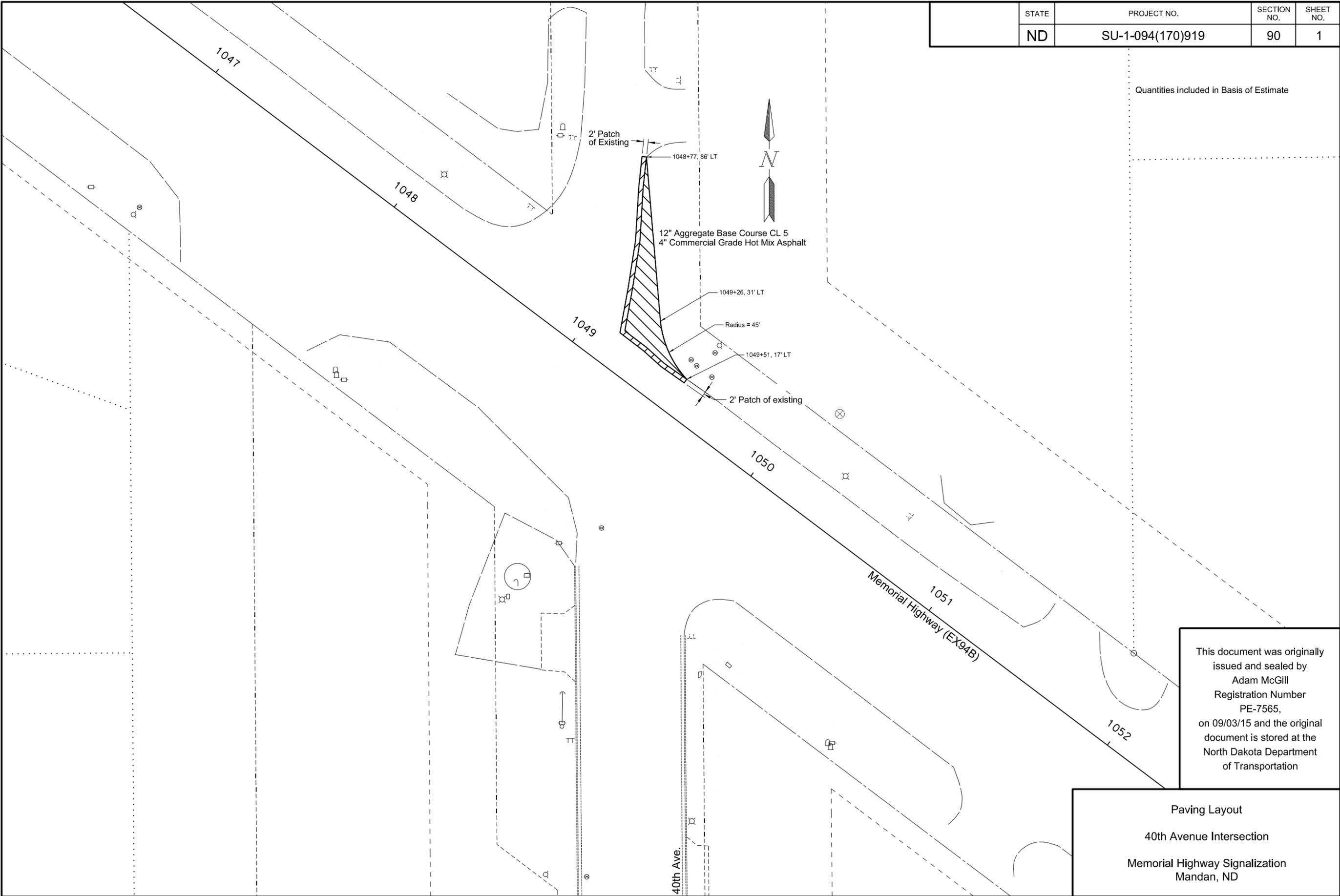
PRELIMINARY SURVEY COORDINATE AND CURVE DATA - MEMORIAL HIGHWAY SIGNAL UPGRADES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	81	1

HORIZONTAL ALIGNMENT				CURVE DATA		US PUBLIC LAND SURVEY DATA				SURVEY CONTROL POINTS					
PNT	STATION	NORTHING	EASTING	ARC DEFINITION		DESC.	SEC-TWP-RGE	NORTHING	EASTING	PNT	NORTHING	EASTING	ELEV	STATION	OFFSET
										CONTROL POINT DESCRIPTION					
Memorial Highway (EX94B)															
PI 1008	1040+82.46	418561.40	1883356.16	Curve C3	Curve C4	SW Cor Sec 31 T-139-N R-80-W		416175.80	1884048.57	PRIMARY CONTROL					
Sta 1049+30.75 = Intr EX40		418051.25	1884033.91	PI STA= 1070+71.11	PI STA= 1092+17.26	Witness Corner W 1/4 Cor Sec 31 T-139-N R-80-W		418778.20	1884061.19						
PI 1009	1049+30.75	418051.25	1884033.91	Delta = 22° 31' 00" LT	Delta = 34° 10' 41" LT	S 1/4 Cor Sec 31 T-139-N R-80-W		416205.72	1886686.92	GPS 2	416765.23	1885770.29	1638.40	1070+84.13	62.57 RT
PC C3	1063+10.75	417221.35	1885743.99	D _c = 1° 30' 00"	D _c = 5° 30' 00"					#6 Steel Rebar					
PI C3	1070+71.11	416764.08	1885743.98	R = 3819.72'	R = 1041.74'					GPS 3	416921.41	1886085.41	1636.13	1073+14.58	206.99 LT
Sta 1073+62.87 = Intr EX46		416711.63	1886053.08	T = 760.37'	T = 320.21'					#6 Steel Rebar					
PT C3	1078+11.86	416574.91	1886480.28	L = 1501.11'	L = 621.32'					GPS 4	417807.62	1884000.61	1638.78	1050+50.66	214.68 RT
Sta 1081+02.72 = Intr EX194		416501.72	1886761.94							#6 Steel Rebar					
PC C4	1088+97.06	416303.47	1887531.14												
PI C4	1092+17.26	416223.56	1887841.22												
PT C4	1095+18.37	416331.60	1888142.64												
				SCS S1	SCS S2	SECONDARY CONTROL									
I-194 (EX194)				PI STA= 7+20.78	PI STA= 27+90.85										
PI 1000	0+00.00	419001.24	1884957.35	Delta = 11° 39' 10" LT	Delta = 41° 59' 40" RT										
TS SCS S1	3+28.40	418730.78	1885143.62	D _c = 2° 00' 00"	D _c = 1° 30' 00"										
SC SCS S1	5+28.40	418567.41	1885258.96	R = 2864.79'	R = 3819.72'										
PI SCS S1	7+20.78	418407.62	1885366.18	L _c = 200.00'	L _c = 200.00'										
CS SCS S1	9+11.04	418276.15	1885506.68	S _c = 2° 00' 00"	S _c = 1° 30' 00"										
ST SCS S1	11+11.04	418136.08	1885649.42	T _c = 392.38'	T _c = 1566.21'										
TS SCS S2	12+24.65	418057.45	1885731.43	L = 382.64'	L = 2599.63'										
SC SCS S2	14+24.65	417917.80	1885874.59												
PI SCS S2	27+90.85	416973.58	1886862.01												
Sta 31+09.40 = Intr EX94B		416501.72	1886761.94												
CS SCS S2	40+24.28	415610.92	1886960.66												
ST SCS S2	42+24.28	415411.61	1886977.10												
PI 1007	59+00.46	413739.95	1887100.25	Curve C5											
				PI STA= 4607+76.86											
46 Avenue SE (EX46)				Delta = 27° 07' 45" LT											
PI 1018	4600+00.00	416270.96	1886056.33	D _c = 6° 00' 00"											
Sta 4604+40.68 = Intr EX94B		416711.63	1886053.08	R = 954.93'											
PC C5	4605+46.46	416817.40	1886052.31	T = 230.40'											
PI C5	4607+76.86	417047.79	1886050.61	L = 452.15'											
PT C5	4609+98.61	417252.06	1885944.04												
NOTES:				Date Survey Completed 03/17/2015		<input type="checkbox"/> Assumed Coordinates <input checked="" type="checkbox"/> All coordinates on this sheet are Morton County ground coordinates. They are derived from the NAD83(2011) reference frame; North Dakota South Zone Combination Factor (cf) = 0.9998485				All coordinates and measurements on this document derived from the International Foot definition.			This document was originally issued and sealed by William L Farrier Registration Number LS-9442, on 09/03/15 and the original document is stored at the North Dakota Department of Transportation		
						<input type="checkbox"/> INITIALIZING BENCH MARK NDGPS Stations (OPUS) <input checked="" type="checkbox"/> NAVD-88 <input type="checkbox"/> NGVD-29 <input type="checkbox"/> GEOID 09 <input type="checkbox"/> _____ <input checked="" type="checkbox"/> GEOID 12A									

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	90	1

Quantities included in Basis of Estimate



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Paving Layout
 40th Avenue Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
N.D.	SU-1-094(170)919	110	1

Sta/RP	Sign No.	Assembly No.	Flat Sheet For Signs		Sign Support Length				Support Size	Max Post Len LF	Sleeve Length				Sleeve Size	Anchor EA	Anchor LF	Anchor Size	Reset Sign Panel EA	Reset Sign Support EA	Break-Away EA	Comments	
			IV SF	XI SF	1st LF	2nd LF	3rd LF	4th LF			1st LF	2nd LF	3rd LF	4th LF									
1048+40 Lt	R3-8	15		6.3		11.0				2.25 x 2.25 12 ga	11.6					1	4	2.5 x 2.5 12 ga					
1048+86 Rt	R1012	10		7.5																		Mount on Span Wire	
1049+79 Rt	R1012	10		7.5																		Mount on Span Wire	
1050+71 Rt	R711a	8		3.0																		Mount on Light Standard	
1050+72 Rt	R3-8	15		6.3																		Mount on Light Standard	
1073+12 Lt	SN 1		20.0																			Mount on Mast Arm	
1073+12 Rt	R1012	10		7.5																		Mount on Mast Arm	
1073+78 Lt	SN 2		23.0																			Mount on Mast Arm	
1074+13 Rt	R1012	10		7.5																		Mount on Mast Arm	
1074+29 Rt	SN 2		23.0																			Mount on Mast Arm	
1074+40 Rt	R3-5A	10		7.5															1			Mount on Signal	
1074+54 Rt	SN 1		20.0																			Mount on Mast Arm	
1074+63 Rt	R3-8	15		6.3	9.7					2.25 x 2.25 12 ga	11.6					1	4	2.5 x 2.5 12 ga					
Sub Total			86.0	59.4		Total	20.7									Total	8			1	0	0	
Grand Total			86.0	59.4		Total	20.7									Total	8			1	0	0	

Basis of Estimate
Sign Support Lengths

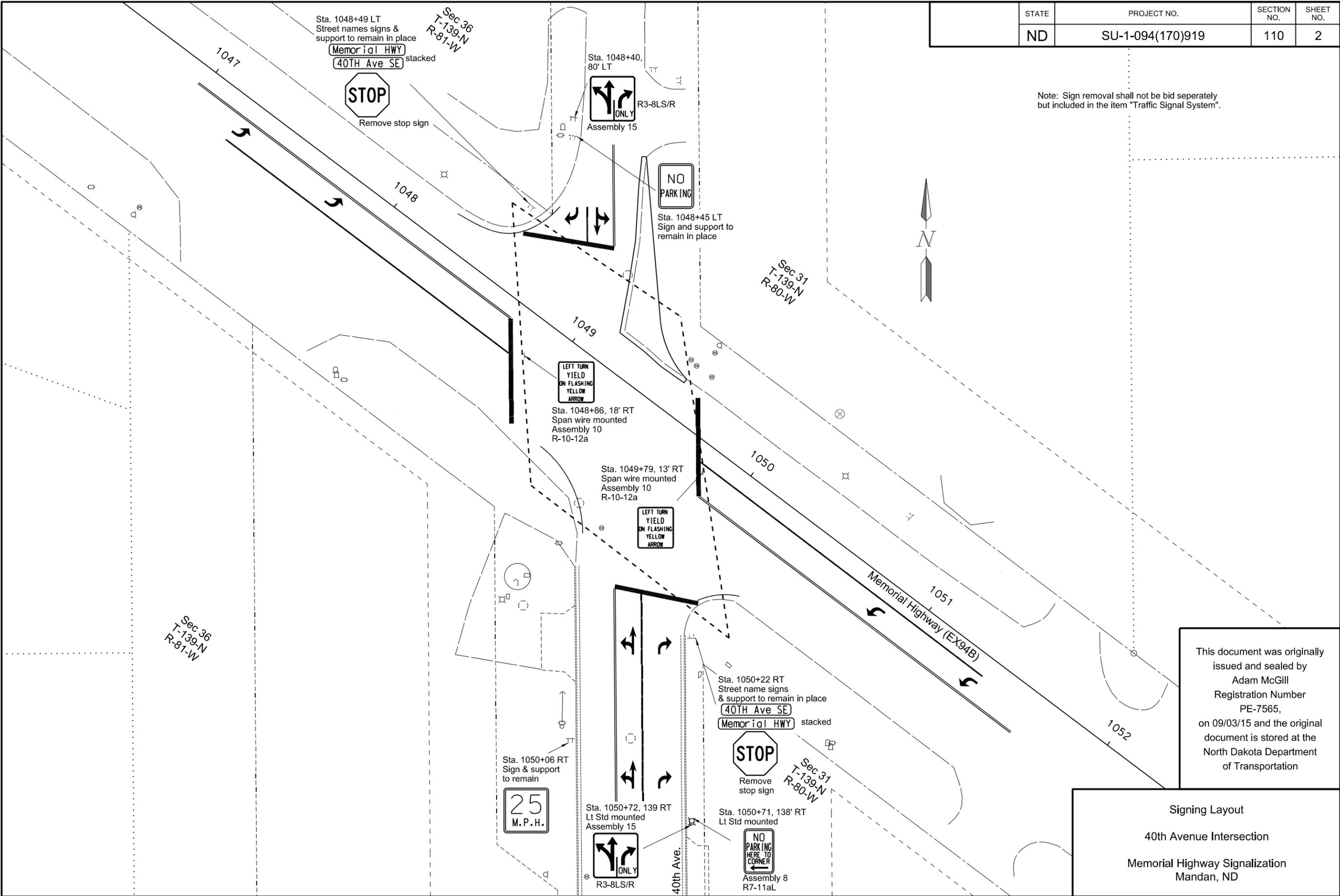
The sign support lengths have been calculated using the following vertical clearances:

Urban/rural expressway and freeway - 84" (Offset - 60")

<p>This document was originally issued and sealed by Adam McGill, Registration Number PE-7565, on 9/3/2015 and the original document is stored at the North Dakota Department of Transportation</p>	<p>Sign Summary Perforated Tube</p> <p>Memorial Highway Signalization</p> <p>Mandan, ND</p>
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STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	110	2

Note: Sign removal shall not be bid separately but included in the item "Traffic Signal System".

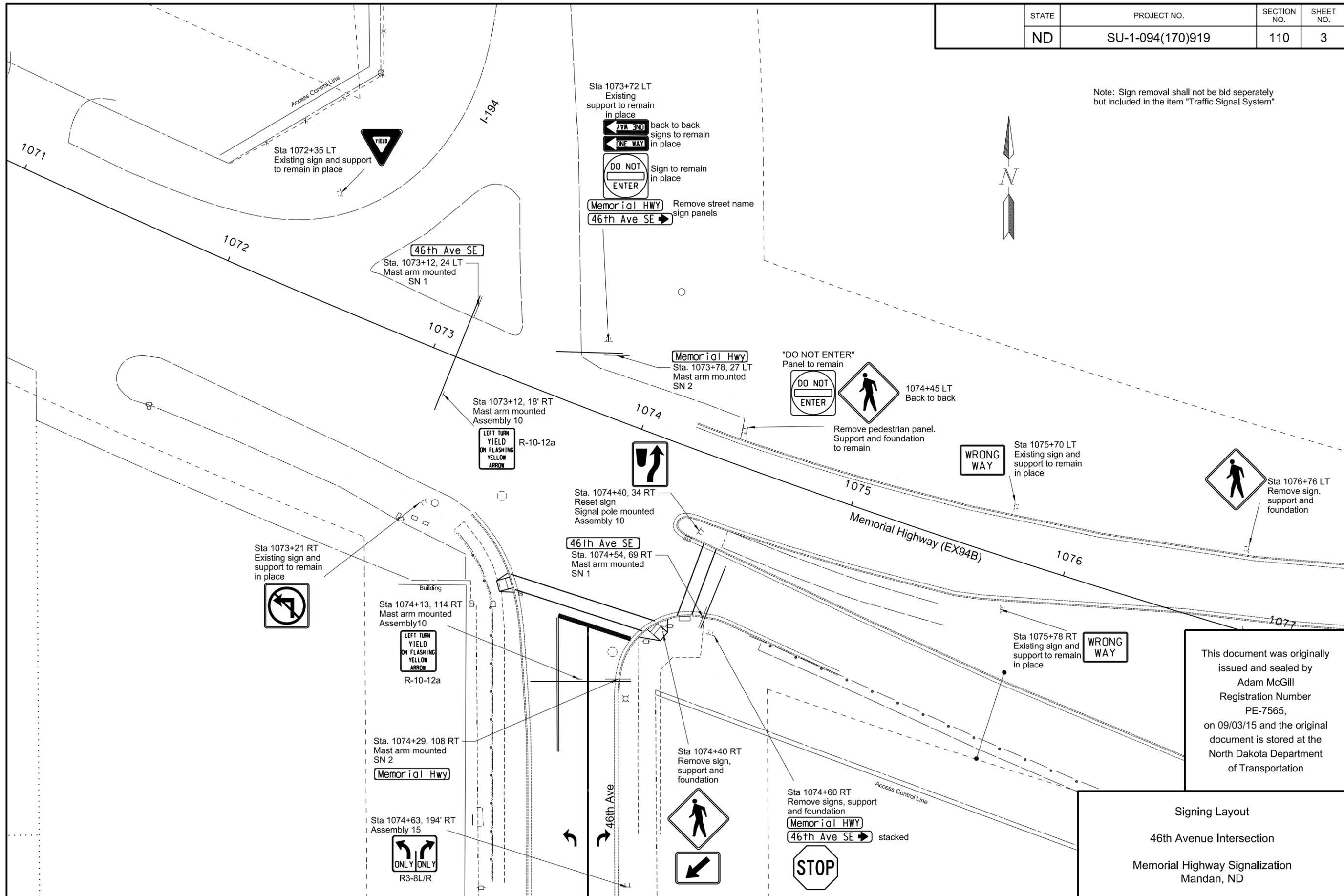


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Signing Layout
 40th Avenue Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	110	3

Note: Sign removal shall not be bid separately but included in the item "Traffic Signal System".

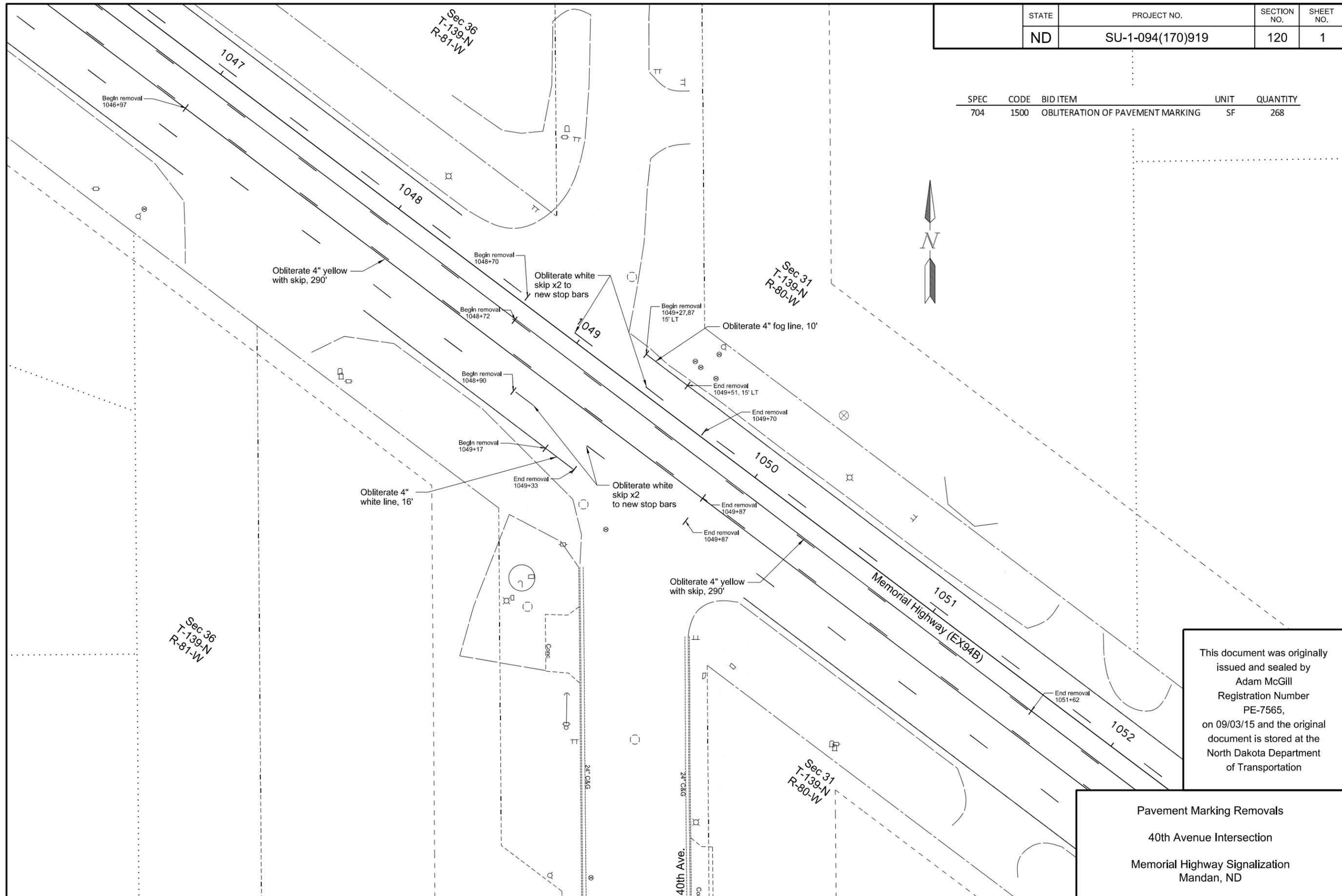


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Signing Layout
 46th Avenue Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	120	1

SPEC	CODE	BID ITEM	UNIT	QUANTITY
704	1500	OBLITERATION OF PAVEMENT MARKING	SF	268

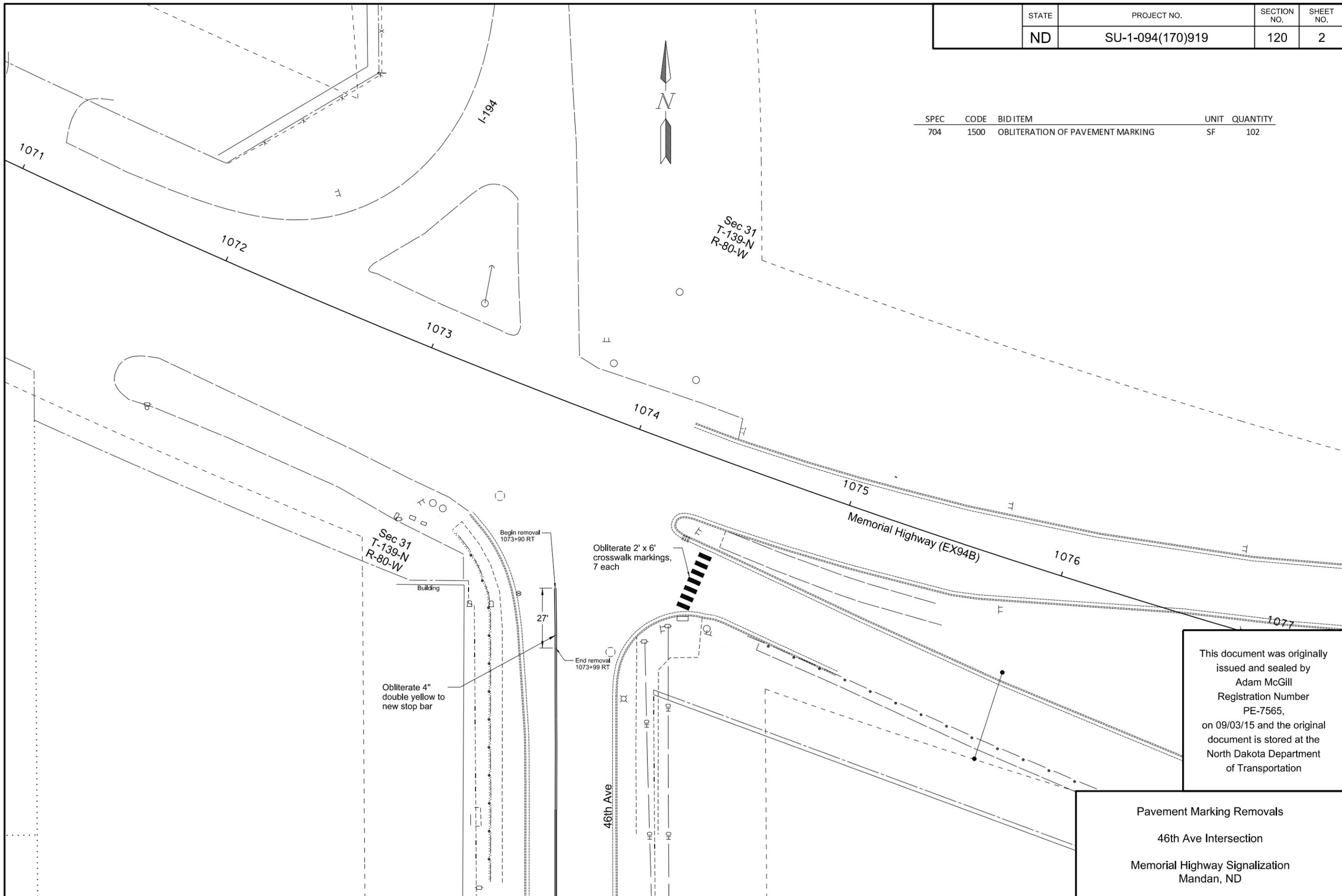


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Pavement Marking Removals
40th Avenue Intersection
Memorial Highway Signalization
Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	120	2

SPEC	CODE	BID ITEM	UNIT	QUANTITY
704	1500	OBLITERATION OF PAVEMENT MARKING	SF	102

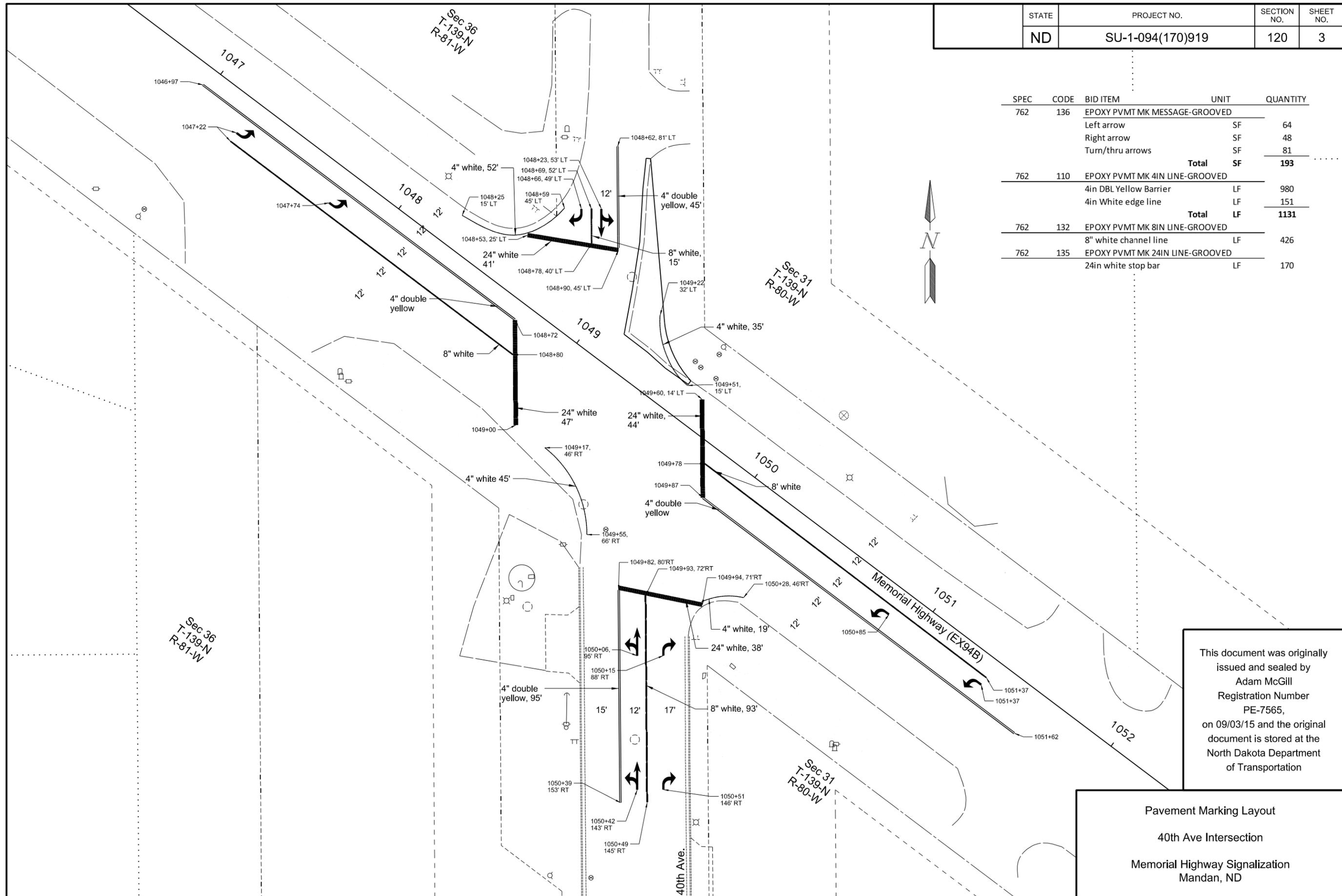


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Pavement Marking Removals
 46th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	120	3

SPEC	CODE	BID ITEM	UNIT	QUANTITY
762	136	EPOXY PVMT MK MESSAGE-GROOVED		
		Left arrow	SF	64
		Right arrow	SF	48
		Turn/thru arrows	SF	81
		Total	SF	193
762	110	EPOXY PVMT MK 4IN LINE-GROOVED		
		4in DBL Yellow Barrier	LF	980
		4in White edge line	LF	151
		Total	LF	1131
762	132	EPOXY PVMT MK 8IN LINE-GROOVED		
		8" white channel line	LF	426
762	135	EPOXY PVMT MK 24IN LINE-GROOVED		
		24in white stop bar	LF	170

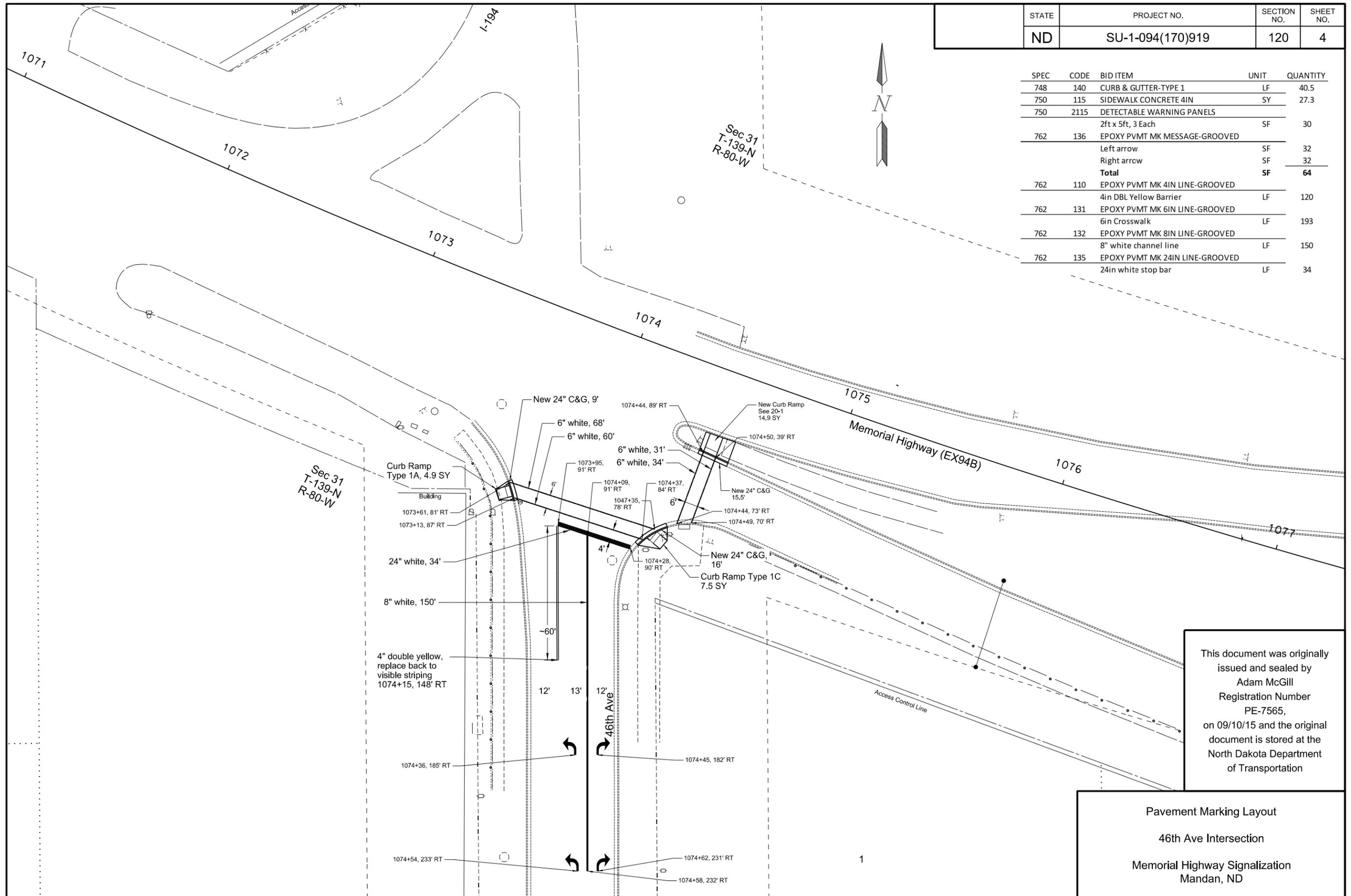


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Pavement Marking Layout
40th Ave Intersection
Memorial Highway Signalization
Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	120	4

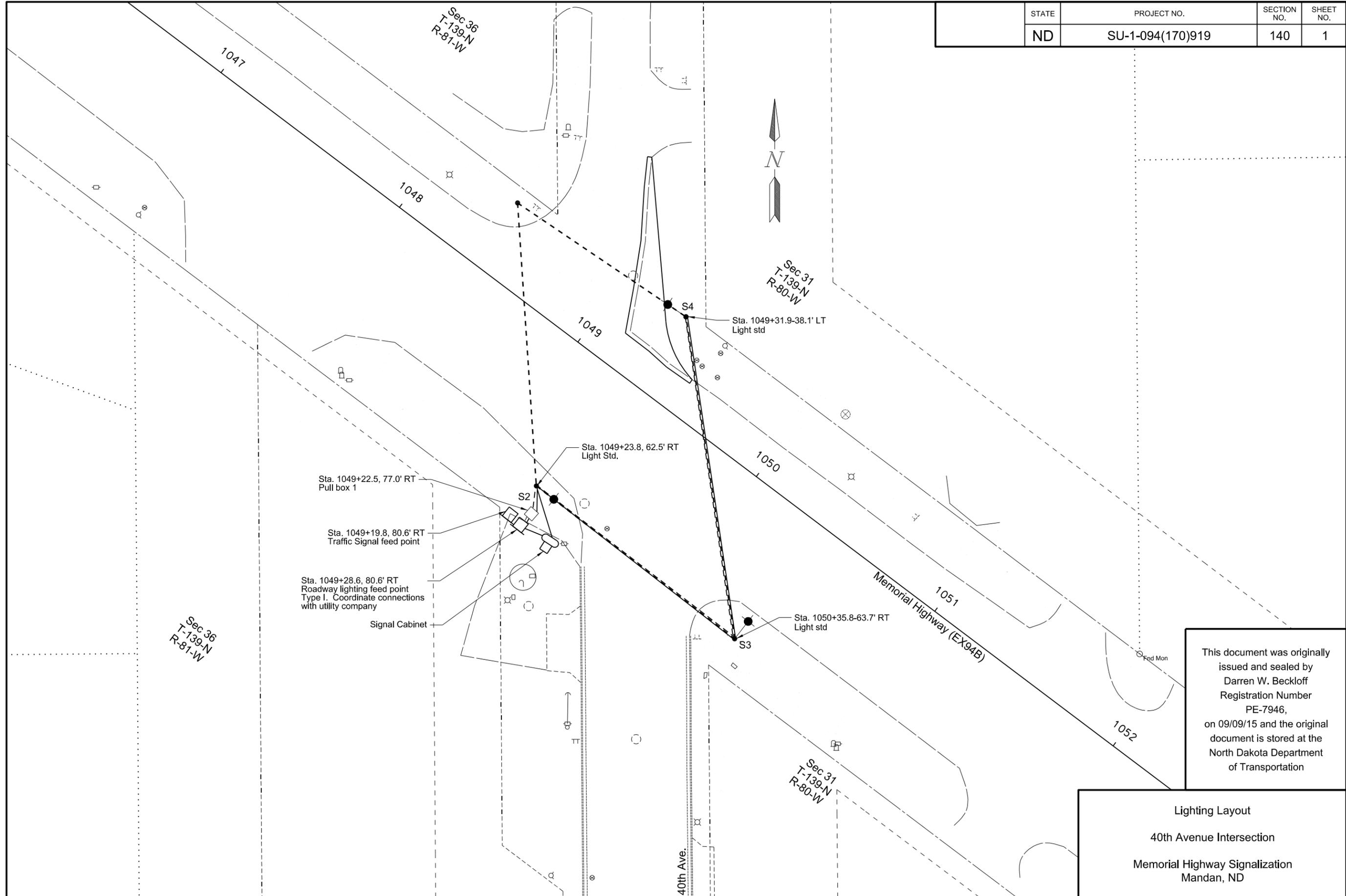
SPEC	CODE	BID ITEM	UNIT	QUANTITY
748	140	CURB & GUTTER-TYPE 1	LF	40.5
750	115	SIDEWALK CONCRETE 4IN	SY	27.3
750	2115	DETECTABLE WARNING PANELS		
		2ft x 5ft, 3 Each	SF	30
762	136	EPOXY PVMT MK MESSAGE-GROOVED		
		Left arrow	SF	32
		Right arrow	SF	32
		Total	SF	64
762	110	EPOXY PVMT MK 4IN LINE-GROOVED		
		4in DBL Yellow Barrier	LF	120
762	131	EPOXY PVMT MK 6IN LINE-GROOVED		
		6in Crosswalk	LF	193
762	132	EPOXY PVMT MK 8IN LINE-GROOVED		
		8" white channel line	LF	150
762	135	EPOXY PVMT MK 24IN LINE-GROOVED		
		24in white stop bar	LF	34



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Pavement Marking Layout
 46th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND

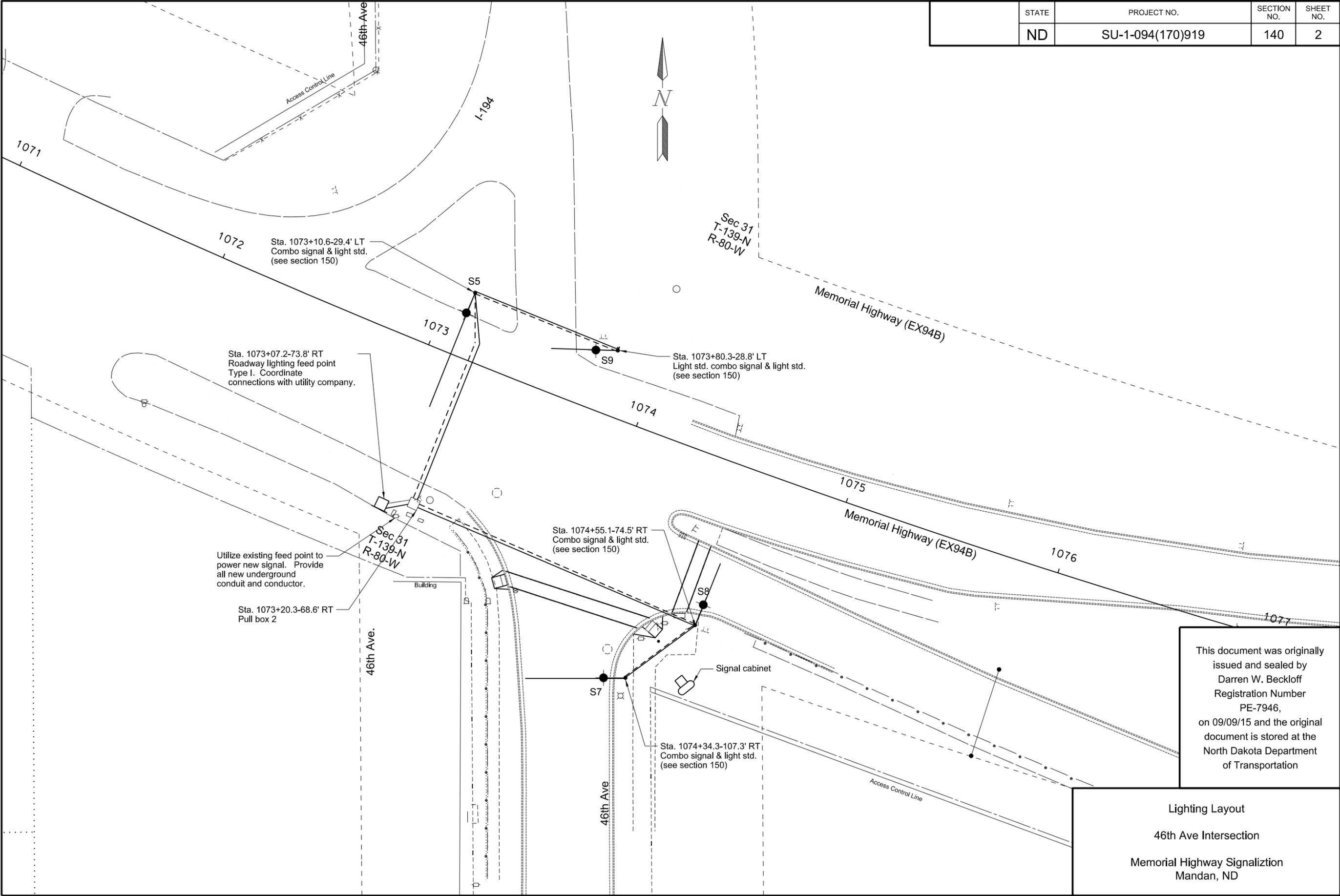
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	140	1



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Lighting Layout
 40th Avenue Intersection
 Memorial Highway Signalization
 Mandan, ND

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-1-094(170)919	140	2



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Lighting Layout
 46th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND

Light Standards				
Station	Conduit Runs		Cable Runs	
	LF	DIA	LF	TYPE
1049+28.6-80.6'			46	(2) #6 RHW
1049+29.3-74.0' rt	7	2"	23	(1) #6 THW
1049+29.3-74.0' rt to 1049+23.8-62.5' rt	15	2"	50 25	(2) #6 RHW (1) #6 THW
1049+23.8-62.5' rt to 1050+35.8-63.7' rt	112	2"	240 120	(2) #6 RHW (1) #6 THW
1050+35.8-63.7' rt to 1049+31.9-38.1' lt	146	2"	308 154	(2) #6 RHW (1) #6 THW

Light Standards				
Station	Conduit Runs		Cable Runs	
	LF	DIA	LF	TYPE
1073+07.2-73.8' rt to 1073+20.3-68.6' rt	15	2"	62 31	(2) #6 RHW (1) #6 THW
1073+20.3-68.6' rt to 1074+55.1-74.5' rt	138	2"	296 148	(2) #6 RHW (1) #6 THW
1074+55.1-74.5' rt to 1074+34.3-107.3' rt	41	2"	98 49	(2) #6 RHW (1) #6 THW
1073+20.3-68.6' rt to 1073+10.6-29.4' lt	99	2"	218 109	(2) #6 RHW (1) #6 THW
1073+10.6-29.4' lt to 1073+80.3-28.8' lt	69	2"	154 77	(2) #6 RHW (1) #6 THW

Light Standards						
No.	Station	Wattage	IES-Type	Mounting	Pole Ht.	Mast Arm
S2	1049+23.8-62.5' rt	135	III	Signal Standard Extension	30	6
S3	1050+35.8-63.7' rt	135	III	Signal Standard Extension	30	6
S4	1049+31.9-38.1' lt	135	III	Signal Standard Extension	30	6
S5	1073+10.6-29.4' lt	135	III	Signal Standard Extension	30	6
S7	1074+34.3-107.3' rt	135	III	Signal Standard Extension	30	6
S8	1074+55.1-74.5' rt	135	III	Signal Standard Extension	30	6
S9	1073+80.3-28.8' lt	135	III	Signal Standard Extension	30	6

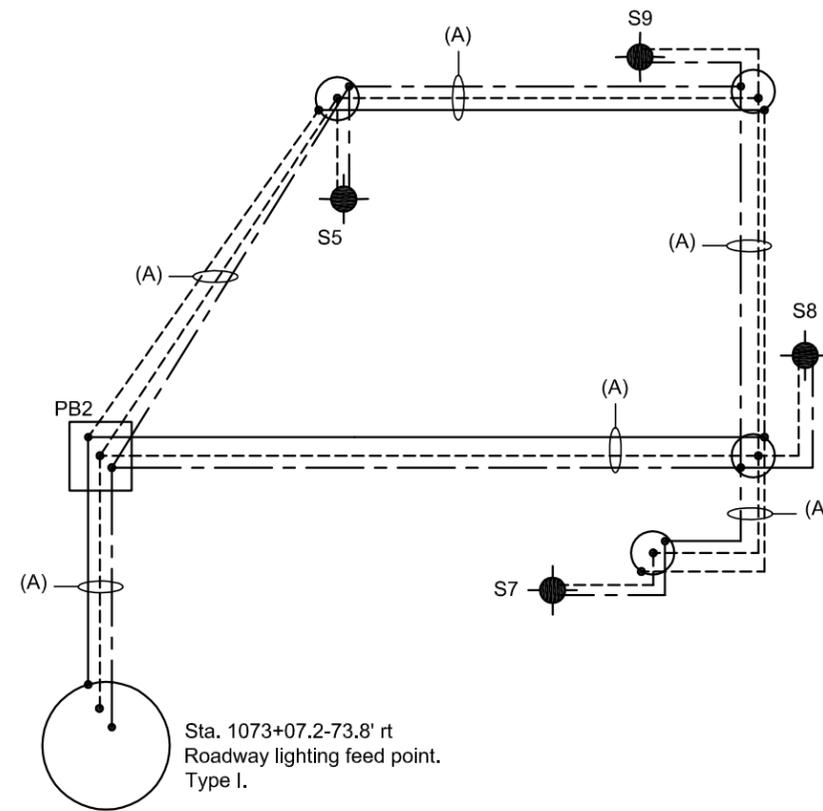
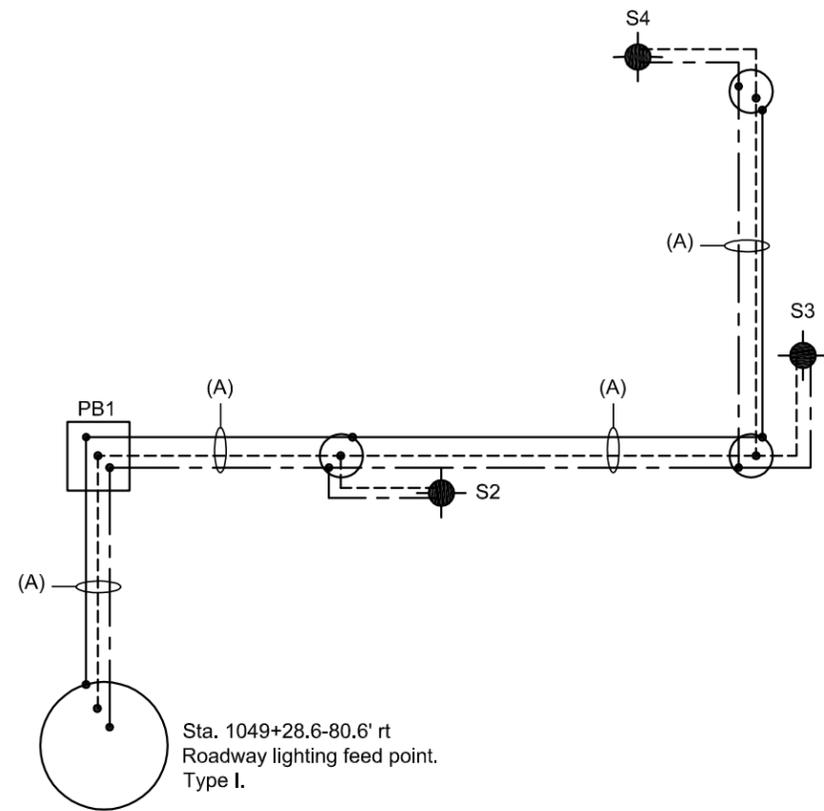
MEMORIAL HWY. QUANTITIES (A)									
PULL BOX	CABLE TRENCH - TYPE I	2IN DIAMETER RIGID CONDUIT	UNDERGROUND CONDUCTOR NO6 - TYPE RHW	UNDERGROUND CONDUCTOR NO6 - TYPE THW	FEED POINT - TYPE I - PAD MOUNTED	TRAFFIC SIGNAL FEED POINT - PAD MOUNTED	LT STD 6FT MA 30FT MT HT	LED LUMINAIRE - 135 WATT	LIGHTING SYSTEM
EA	LF	LF	LF	LF	EA	EA	EA	EA	EA
2	651	642	1472	736	2	1	7	7	1

(A) These items shall not be bid separately but shall be included in the bid price for the "LIGHTING SYSTEM".

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Lighting Quantities
Memorial Highway Signalization
Mandan, ND

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-1-094(170)919	140	4

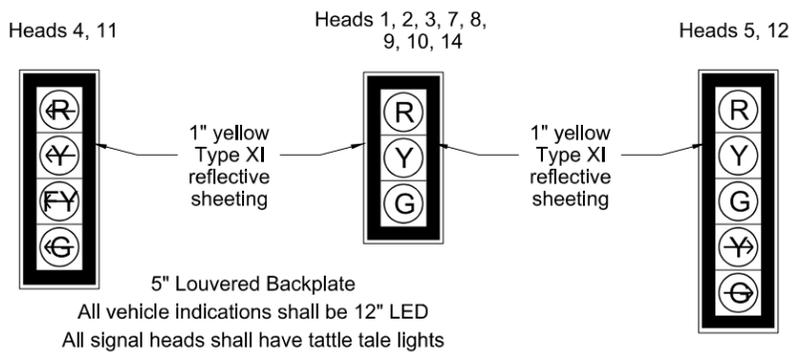


LEGEND	
	Roadway Luminaire ??? Watt
	Light Standard
	Feed Point
##	Light Standard number
	Pull Box
	Phase Conductor
	Phase Conductor
	Ground Conductor

WIRE LEGEND
(A) 2 - #6 AWG CU 1 - #6 AWG CU GND

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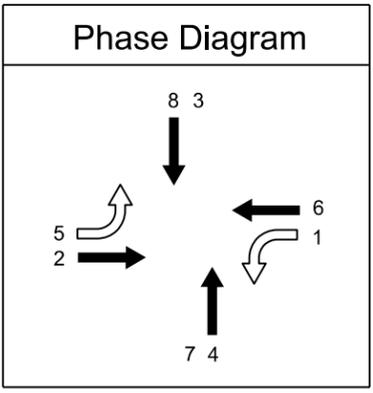
Lighting Schematic
Memorial Highway Signalization
Mandan, ND



CONDUCTORS	CABLE 1 and 3 (NO.14 AWG 12 Conductors)				INDICATION
	Phase	Head	Phase	Head	
1	6		2		Spare (Walk)
2	6	1, 2, 3	2	8, 9, 10	Red
3	6	1, 2, 3	2	8, 9, 10	Yellow
4	6	1, 2, 3	2	8, 9, 10	Green
5	1	4	5	11	Flashing Yellow Arrow
6	4		8		Spare (Red)
7	1	4	5	11	Red Arrow
8	1	4	5	11	Green Arrow
9					Ground
10					Neutral
11	1	4	5	11	Yellow Arrow
12					

CONDUCTORS	CABLE 2 and 4 (NO.14 AWG 12 Conductors)				INDICATION
	Phase	Head	Phase	Head	
1	8		4		Spare (Walk)
2	3		7		Flashing Yellow Arrow
3	(5) 8	5, 7	(1) 4	12, 14	Red
4	8		4		Spare (Don't Walk)
5	(5) 8	5, 7	(1) 4	12, 14	Yellow
6	(5) 8	5, 7	(1) 4	12, 14	Green
7					Ground
8					Neutral
9	(5)	5	(1)	12	Green Arrow
10	6		2		Spare (Don't Walk)
11					Green Arrow
12	(5)	5	(1)	12	Yellow Arrow

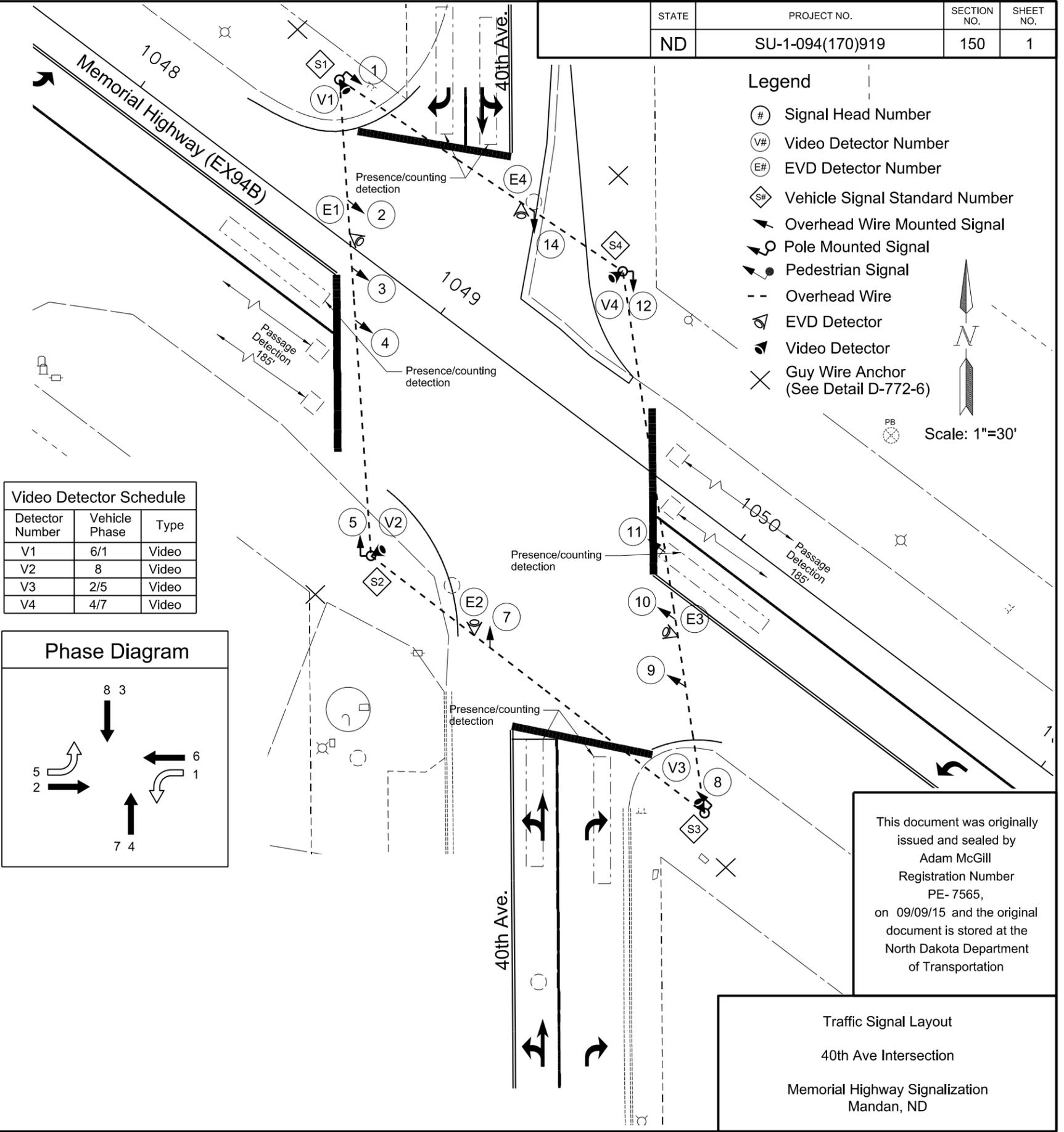
Video Detector Schedule		
Detector Number	Vehicle Phase	Type
V1	6/1	Video
V2	8	Video
V3	2/5	Video
V4	4/7	Video



Legend

- ⊙ # Signal Head Number
- ⊙ V# Video Detector Number
- ⊙ E# EVD Detector Number
- ⊙ S# Vehicle Signal Standard Number
- ↗ Overhead Wire Mounted Signal
- ↖ Pole Mounted Signal
- ↘ Pedestrian Signal
- - - Overhead Wire
- ⊙ EVD Detector
- ⊙ Video Detector
- ⊙ Guy Wire Anchor (See Detail D-772-6)

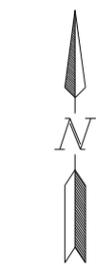
Scale: 1"=30'



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Traffic Signal Layout
40th Ave Intersection
Memorial Highway Signalization
Mandan, ND

- Legend
- Ⓝ Overhead Cable Number
 - Ⓢ Conduit Run
 - Ⓢ# Vehicle Signal Standard Number

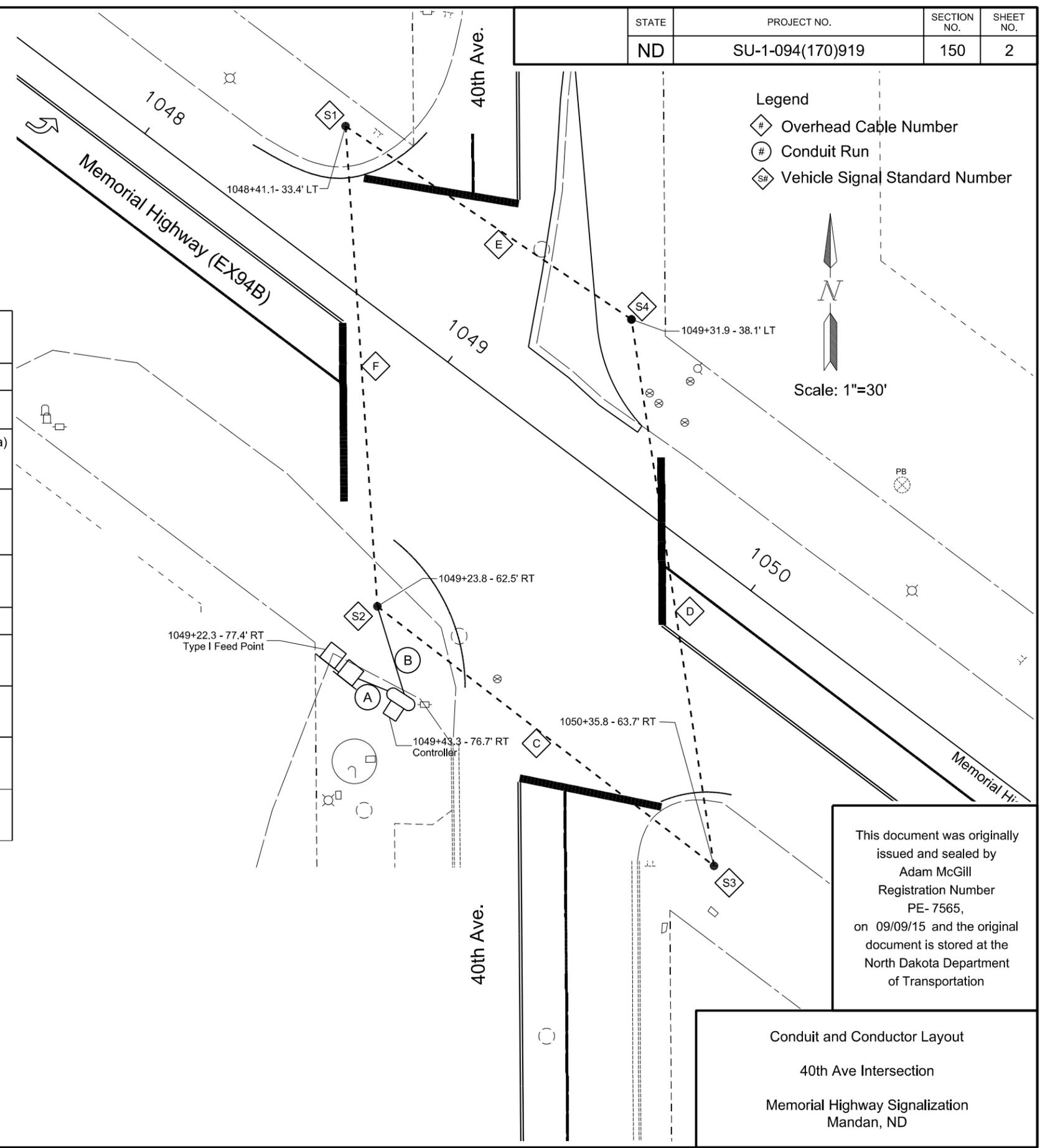


Scale: 1"=30'

STATION	CONDUIT RUNS			CABLE RUNS	
	Run	LF	(Qty) Dia	LF	Type
1048+96.6 - 67.3 RT to 1049+10.5 - 71.2 RT	A	15	(1) 2"	30 15	(2) No.6 RWH Power Supply (1) No. 6 THW Power Supply
1049+10.5 - 71.2 RT to 1049+23.8 - 62.5 RT	B	16	(1) 3"	64 64 64	(4) Cables 1, 2, 3, & 4 - 12 Conductor (a) (4) Video Coaxial & Video Power (c) (4) EVD Cable (d)

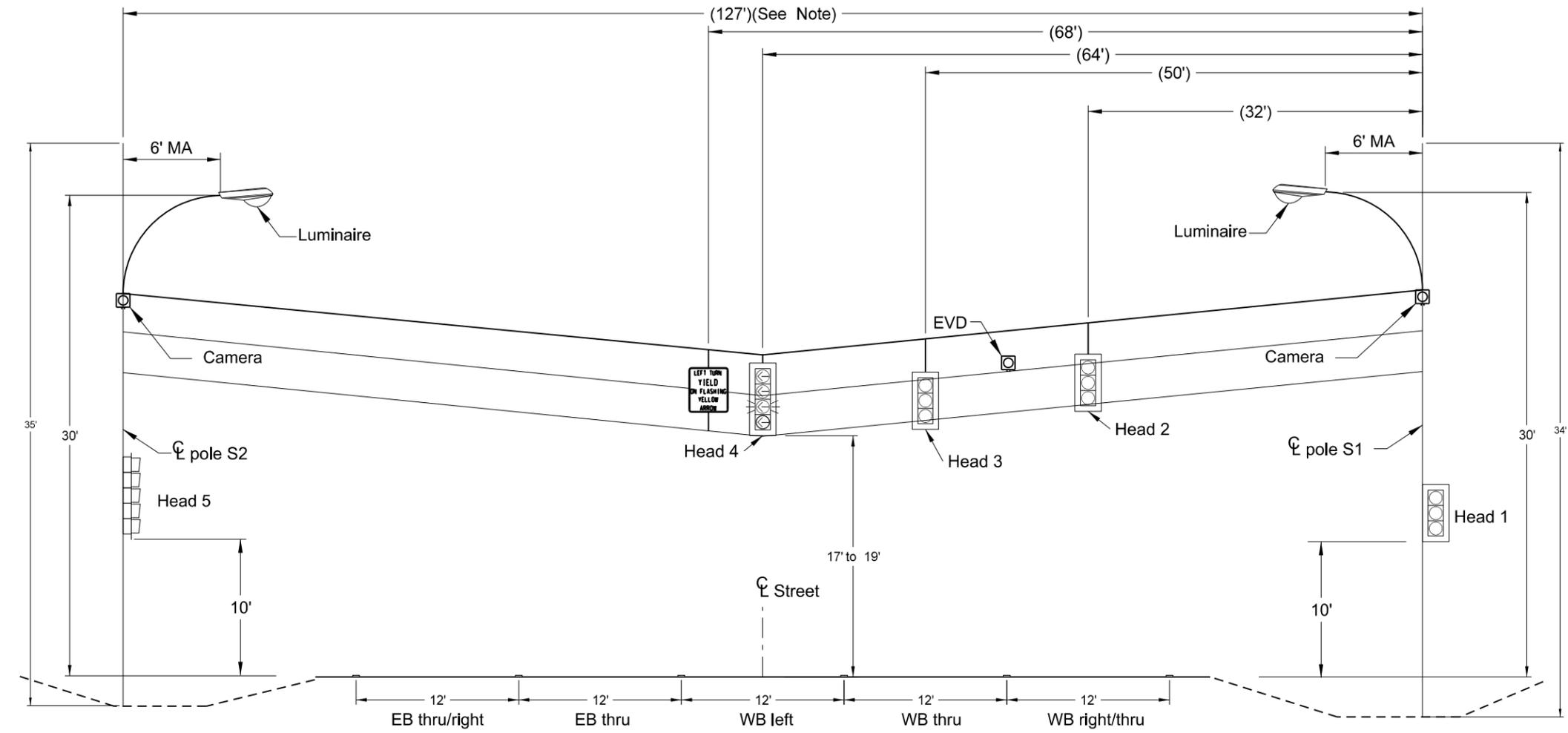
STATION	OVERHEAD RUNS			CABLE RUNS	
	Run	LF	Qty	LF	Type
1049+23.8 - 62.5 RT to 1050+35.8 - 63.7 RT	C	112	3	336 336 336	(3) Cable 3, 4, & 1 - 12 Conductor (a) (3) Video Coaxial & Video Power (c) (3) EVD Cable (d)
1050+35.8 - 63.7 RT to 1049+31.9 - 38.1 LT	D	146	2	292 292 292	(2) Cable 4 & 1 - 12 Conductor (a) (2) Video Coaxial & Video Power (c) (2) EVD Cable (d)
1049+31.9 - 38.1 LT to 1048+41.1 - 33.4 LT	E	91	1	91 91 91	(1) Cable 1 - 12 Conductor (a) (1) Video Coaxial & Video Power (c) (1) EVD Cable (d)
1048+41.1 - 38.1 LT to 1049+23.8 - 62.5 RT	F	127		0 0 0	Empty

- (a) Indicator Cable (No. 14 AWG 12 Conductor, see sheet 1)
- (b) Pedestrian Pushbutton Cable
- (c) Video Detection - (As Required by Manufacturer)
- (d) Emergency Vehicle Detector Cable
- (e) Interconnect Cable
- (f) Pedestrian Signal Cable



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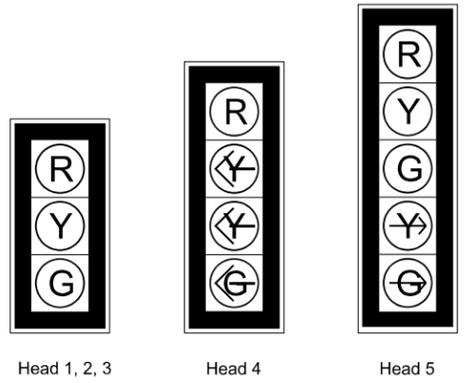
Conduit and Conductor Layout
40th Ave Intersection
Memorial Highway Signalization
Mandan, ND



Signal Standards: S1, S2 WB View
 Note: Dimensions in parenthesis () are normal to span wire.

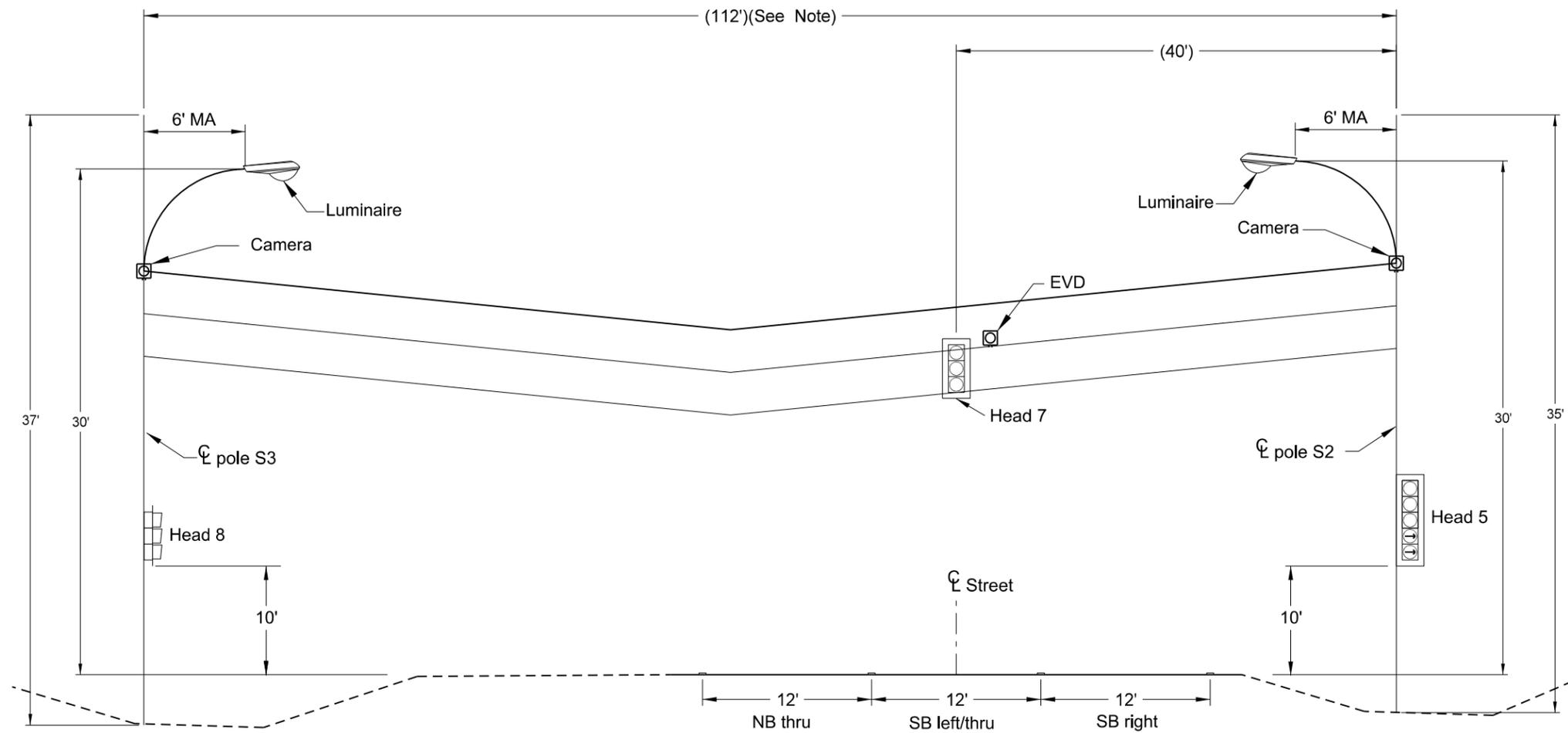
POLE DEPTH OF SETTING	
Length of Pole (ft)	Depth of Pole (ft)
35	6
40	6
45	6.5
50	7
55	7.5

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TRAFFIC SIGNAL POLE & LUMINAIRE SCHEDULE									
POLE	COORDINATES FOR CENTER OF POLE		LUMINAIRE (POLE MOUNT)						
	STATION	OFFSET	MODEL	ARM LENGTH	TYPE	VOLTS	OPTICS	TILT	
S1	1048+41.0	-33.4	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree	
S2	1049+23.8	62.5	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree	

Traffic Signal Profiles
 40th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND

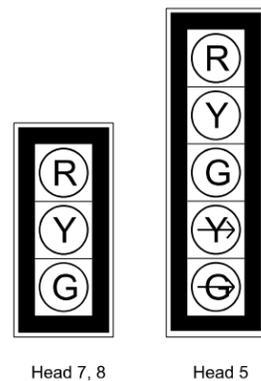


Signal Standards: S2, S3 SB View

Note: Dimensions in parenthesis () are normal to span wire.

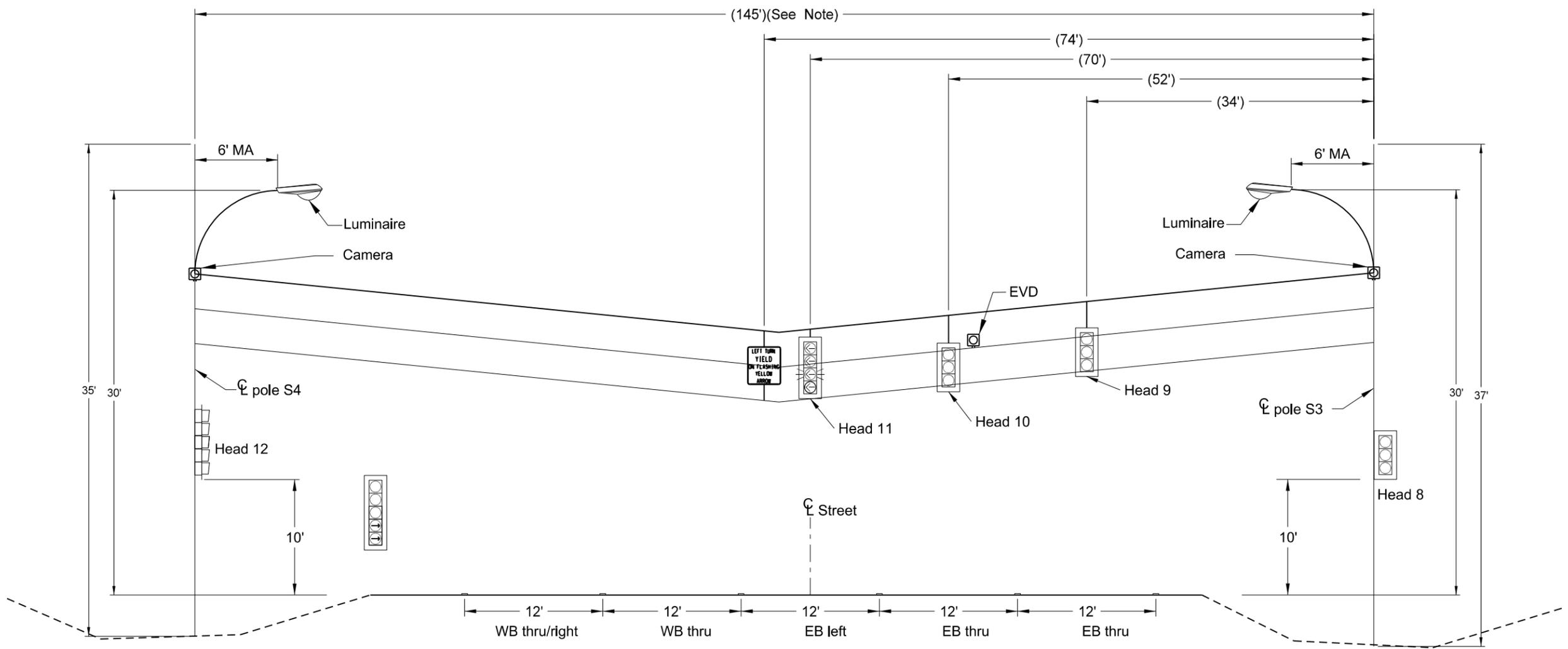
POLE DEPTH OF SETTING	
Length of Pole (ft)	Depth of Pole (ft)
35	6
40	6
45	6.5
50	7
55	7.5

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TRAFFIC SIGNAL POLE & LUMINAIRE SCHEDULE									
POLE	COORDINATES FOR CENTER OF POLE		LUMINAIRE (POLE MOUNT)						
	STATION	OFFSET	MODEL	ARM LENGTH	TYPE	VOLTS	OPTICS	TILT	
S2	1049+23.8	62.5	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree	
S3	1050+35.8	63.7	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree	

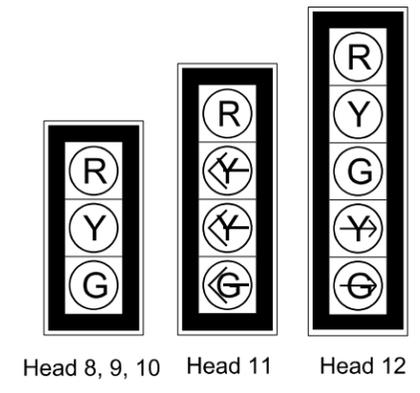
Traffic Signal Profiles
40th Ave Intersection
Memorial Highway Signalization
Mandan, ND



Signal standards S3, S4 EB View
 Note: Dimensions in parenthesis () are normal to span wire.

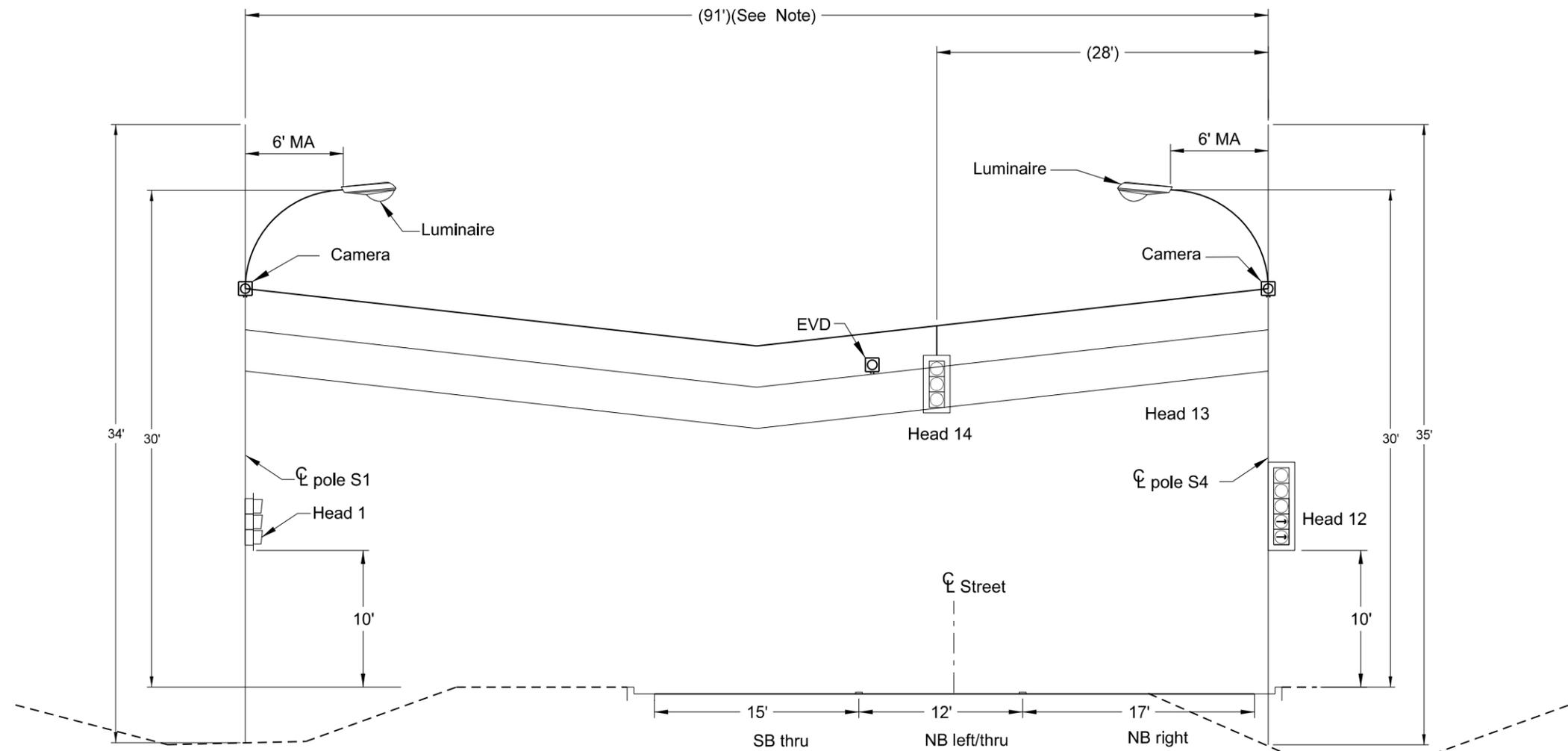
POLE DEPTH OF SETTING	
Length of Pole (ft)	Depth of Pole (ft)
35	6
40	6
45	6.5
50	7
55	7.5

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TRAFFIC SIGNAL POLE & LUMINAIRE SCHEDULE								
POLE	COORDINATES FOR CENTER OF POLE		LUMINAIRE (POLE MOUNT)					
	STATION	OFFSET	MODEL	ARM LENGTH	TYPE	VOLTS	OPTICS	TILT
S3	1050+35.8	63.7	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree
S4	1049+31.9	-38.1	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree

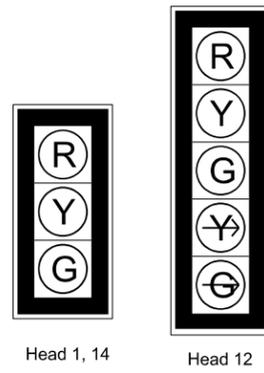
Traffic Signal Profiles
 40th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND



Signal Standards S1, S4 NB View
 Note: Dimensions in parenthesis () are normal to span wire.

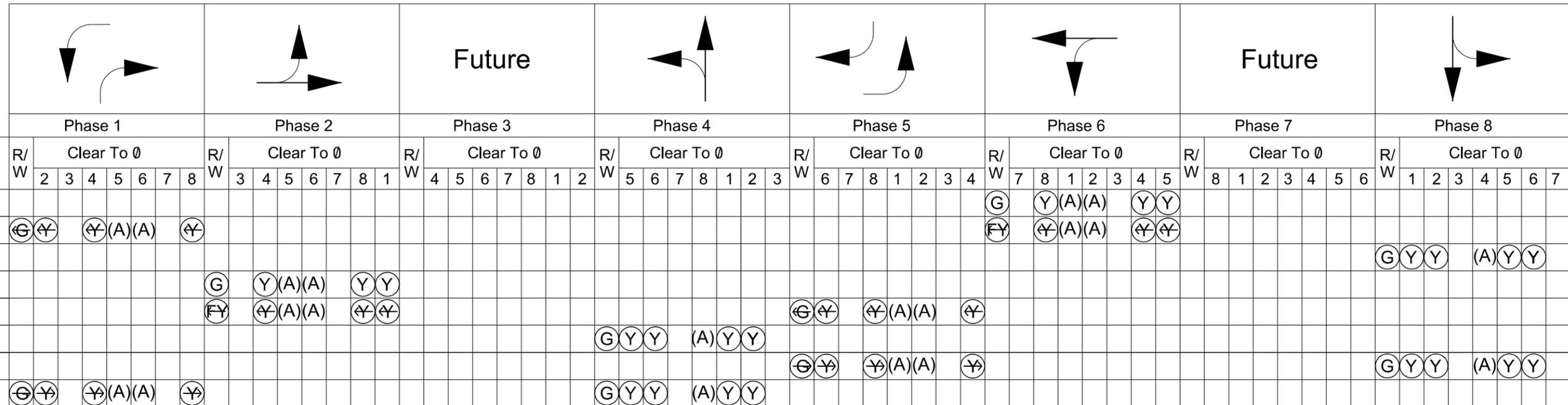
POLE DEPTH OF SETTING	
Length of Pole (ft)	Depth of Pole (ft)
35	6
40	6
45	6.5
50	7
55	7.5

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TRAFFIC SIGNAL POLE & LUMINAIRE SCHEDULE								
POLE	COORDINATES FOR CENTER OF POLE		LUMINAIRE (POLE MOUNT)					
	STATION	OFFSET	MODEL	ARM LENGTH	TYPE	VOLTS	OPTICS	TILT
S1	1048+41.1	-33.4	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree
S4	1049+31.9	-38.1	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree

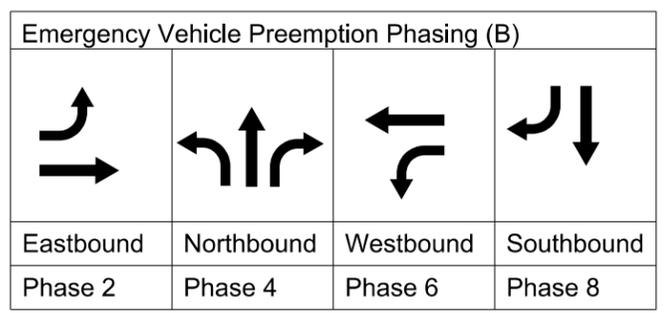
Traffic Signal Profiles
 40th Ave Intersection
 Memorial Highway Signalization
 Mandan, ND



Blank Squares Denote a Red Indication.
 (A) When one phase is on alone any nonconflicting phase may start timing concurrently without a clearance interval (See Chart A).

On Phase	Non-Conflicting Phase Allowed to Time Concurrently
1	5
2	6
4	8
5	1
6	2
8	4

40th Avenue and Memorial Highway - AM Peak	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
BASIC INTERVALS (OR FUNCTIONS)								
Minimum Initial	8.0	8.0		8.0	8.0	8.0		8.0
Maximum (Maximum Green or Ext Limit)	11.4	39.4		19.9	11.4	39.4		19.9
Yellow Change	4.6	4.6		4.1	4.6	4.6		4.1
Red Clearance	2.0	2.0		2.0	2.0	2.0		2.0
Walk								
Pedestrian Clearance								
Added Initial Per Actuation								

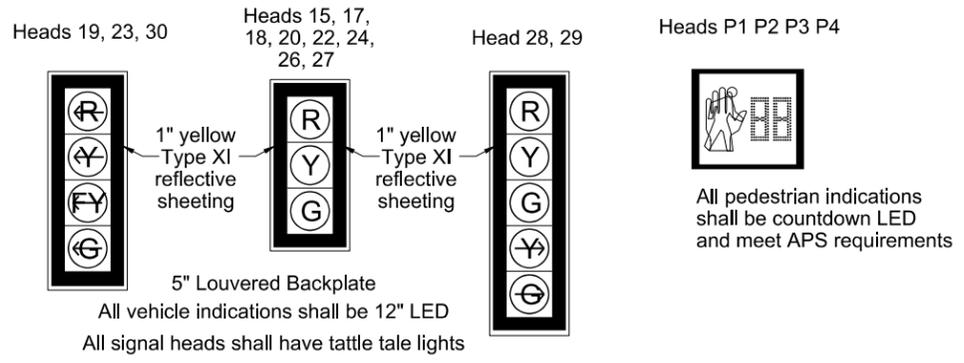


(B) No pedestrian signal during EVP phasing

40th Avenue and Memorial Highway - PM Peak	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
BASIC INTERVALS (OR FUNCTIONS)								
Minimum Initial	8.0	8.0		8.0	8.0	8.0		8.0
Maximum (Maximum Green or Ext Limit)	11.4	39.4		19.9	11.4	39.4		19.9
Yellow Change	4.6	4.6		4.1	4.6	4.6		4.1
Red Clearance	2.0	2.0		2.0	2.0	2.0		2.0
Walk								
Pedestrian Clearance								
Added Initial Per Actuation								

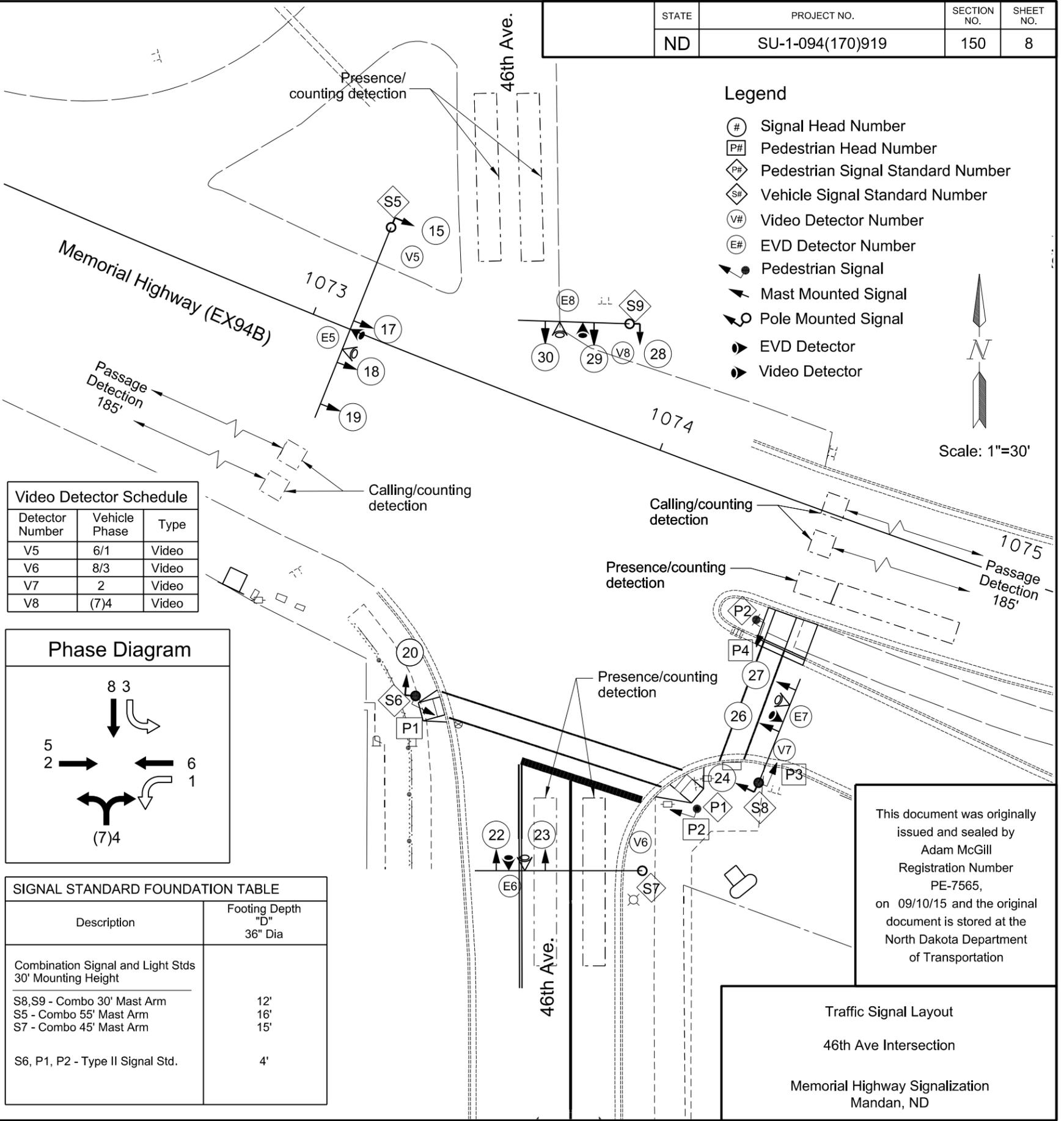
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Traffic Signal Phasing
 40th Avenue Intersection
 Memeorial Highway Signalization
 Mandan, ND

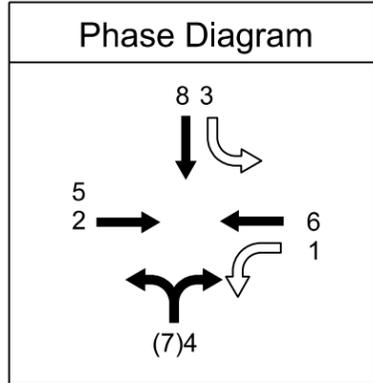


CONDUCTORS	CABLE 5 and 8 (NO.14 AWG 20 Conductors)				INDICATION
	Cable 5		Cable 8		
	Phase	Head	Phase	Head	
1	6		2	P2	Walk
2					Neutral
3	6	15,17,18	2	24,26,27	Red
4					Ground
5	6	15,17,18	2	24,26,27	Yellow
6	6	15,17,18	2	24,26,27	Green
7	1	19			Flashing Yellow Arrow
8			8	22	Red
9			2	22	Don't Walk
10			8	P2	Yellow
11			8	22	Green
12			8	P3, P4	Walk
13	1	19			Red Arrow
14	1	19			Green Arrow
15			8	P3, P4	Don't Walk
16			3	23	Green Arrow
17			3	23	Flashing Yellow Arrow
18	1	19			Yellow Arrow
19			3	23	Yellow Arrow
20			3	23	Red Arrow

CONDUCTORS	CABLE 6 and 9 (NO.14 AWG 12 Conductors)				INDICATION
	Cable 6		Cable 9		
	Phase	Head	Phase	Head	
1	8	20	4	28, 29	Red
2	8	20	4	28, 29	Yellow
3	8	20	4	28, 29	Green
4			7	30	Flashing Yellow Arrow
5	6	P1			Walk
6			7	30	Red Arrow
7			7	30	Cable 6: Ground, Cable 9: Green Arrow
8	6	P1			Cable 6: Don't Walk, Cable 9: Ground
9			1	28, 29	Green Arrow
10					Neutral
11			7	30	Yellow Arrow
12			1	28, 29	Yellow Arrow



Detector Number	Vehicle Phase	Type
V5	6/1	Video
V6	8/3	Video
V7	2	Video
V8	(7)4	Video



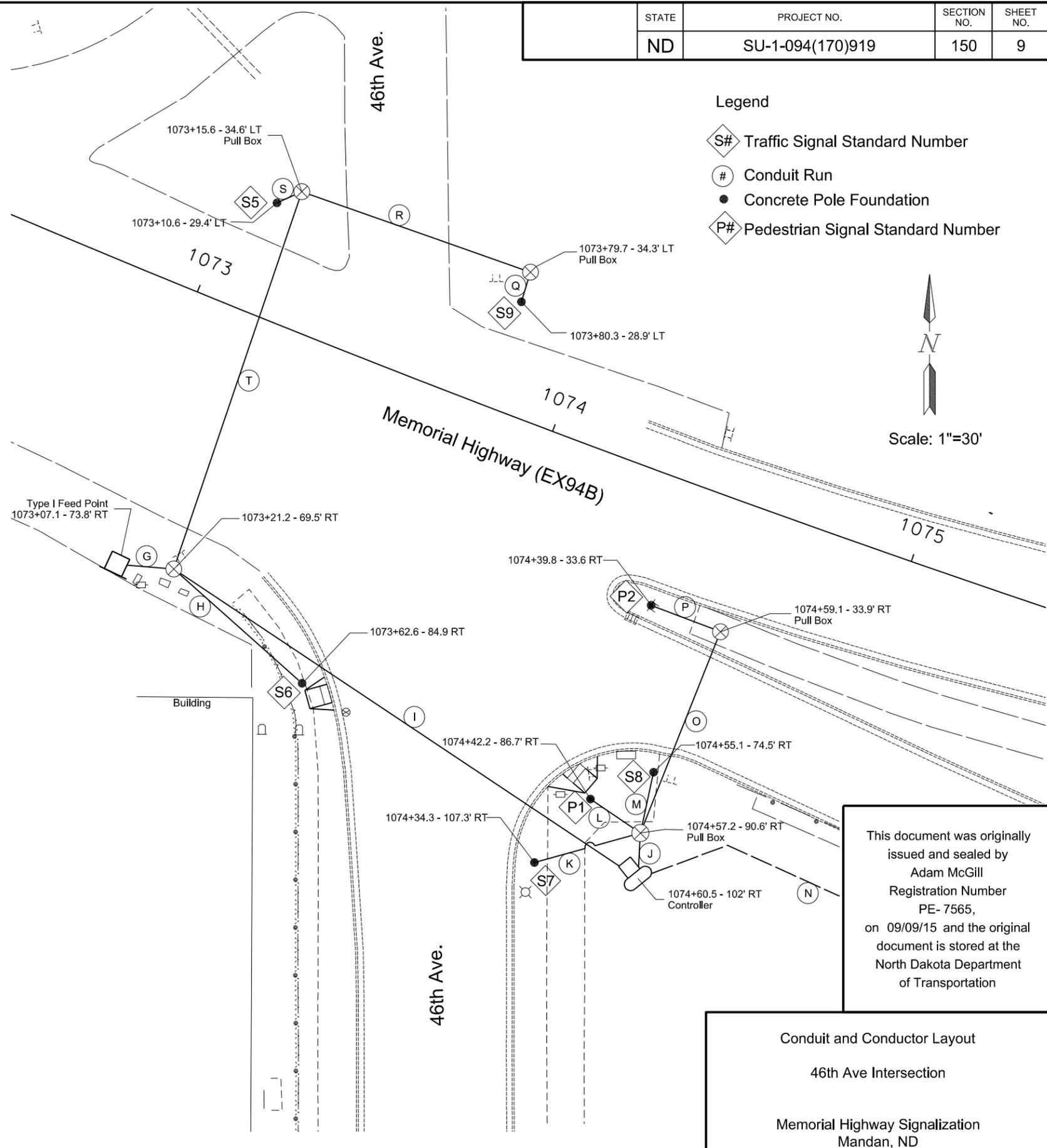
Description	Footing Depth "D" 36" Dia
Combination Signal and Light Stds 30' Mounting Height	
S8, S9 - Combo 30' Mast Arm	12'
S5 - Combo 55' Mast Arm	16'
S7 - Combo 45' Mast Arm	15'
S6, P1, P2 - Type II Signal Std.	4'

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Traffic Signal Layout
46th Ave Intersection
Memorial Highway Signalization
Mandan, ND

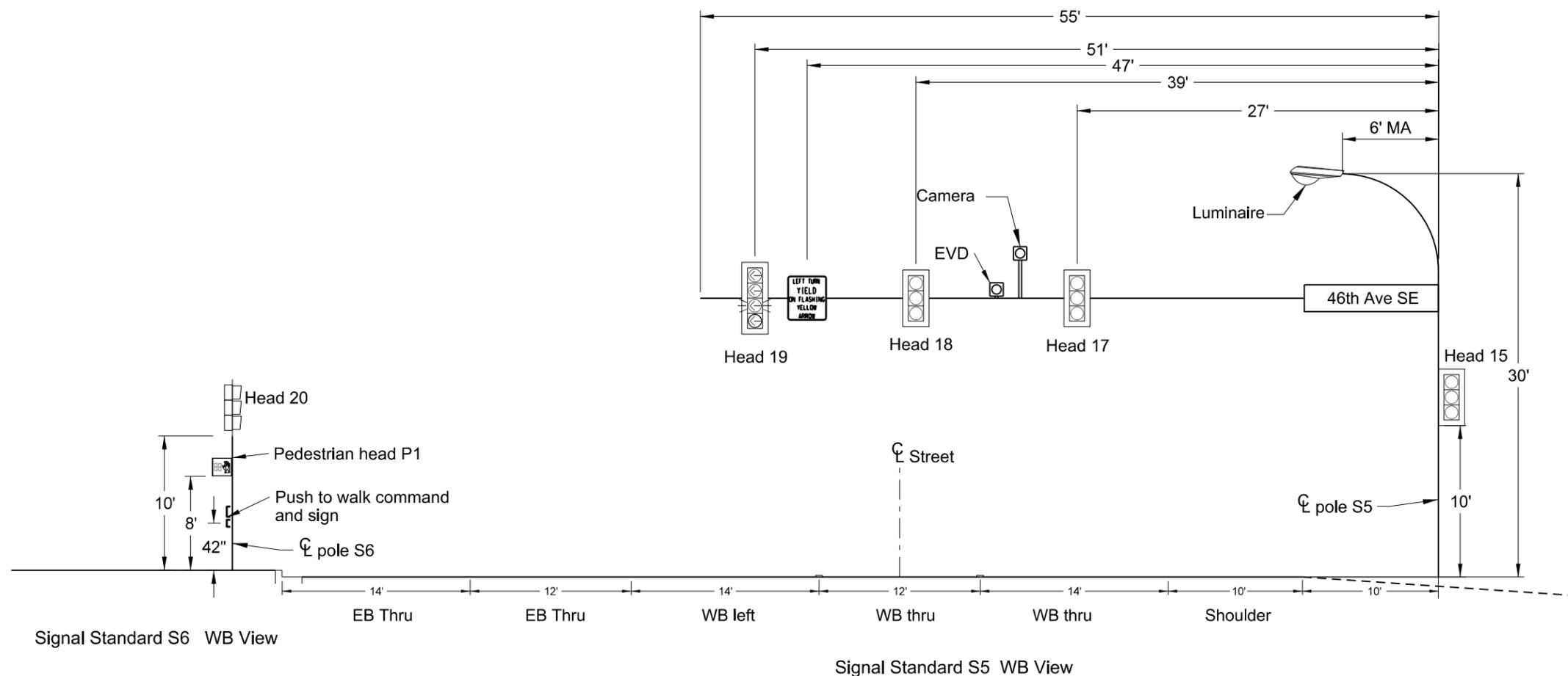
STATION	CONDUIT RUNS			CABLE RUNS	
	Run	LF	(Qty) Dia	LF	Type
1073+07.1 - 73.8' RT to 1073+21.2 - 69.5' RT	G	15	(1) 2"	30	(2) No. 6 RHW (1) No. 6 THW
1073+21.2 - 69.5' RT to 1073+62.6 - 84.9' RT	H	45	(1) 3"	45	(1) Cable 6 - 12 Conductor (a) (1) No. 16 AWG - 2 Conductor (b) (1) No. 16 AWG - 3 Conductor (f)
1073+21.2 - 69.5' RT to 1074+60.5 - 102' RT	I	146	(2) 3" (1) 3" Spare	146 146 146 146 292 292 146	(1) Cable 5 - 12 Conductor (a) (1) Cable 6 - 12 Conductor (a) (1) Cable 9 - 12 Conductor (a) (1) No. 16 AWG - 2 Conductor (b) (1) No. 16 AWG - 3 Conductor (f) (2) Video Coaxial & Video Power (c) (2) EVD Cable (d) (2) No. 6 RHW (1) No. 6 THW
1074+57.2 - 90.6' RT to 1074+60.5 - 102' RT	J	12	(2) 3"	12 24 36 24 24	(1) Cable 8 - 20 Conductor (a) (2) No. 16 AWG - 2 Conductor (b) (3) No. 16 AWG - 3 Conductor (f) (2) Video Coaxial & Video Power (c) (2) EVD Cable (d)
1074+57.2 - 90.6' RT to 1074+34.3 - 107.3' RT	K	29	(1) 3"	29 29 29	(1) Cable 8 - 20 Conductor (a) (1) No. 16 AWG - 2 Conductor (b) (1) No. 16 AWG - 3 Conductor (g)
1074+57.2 - 90.6' RT to 1074+42.2 - 86.7' RT	L	16	(1) 3"	16 16	(1) No. 16 AWG - 2 Conductor (b) (1) No. 16 AWG - 3 Conductor (f)
1074+57.2 - 90.6' RT to 1074+55.1 - 74.5' RT	M	17	(2) 3"	17 17 17 17	(1) Cable 8 - 20 Conductor (a) (1) No. 16 AWG - 2 Conductor (b) (1) No. 16 AWG - 3 Conductor (f) (1) Video Coaxial & Video Power (c) (1) EVD Cable (d)
1074+60.5 - 102' RT to 1087+72 - 98' RT	N	1331	(1) 2"	1331	Interconnect Cable
1074+57.2 - 90.6' RT to 1074+59.1 - 33.9' RT	O	57	(1) 2" (1) 3" Spare	57 57	(1) No. 16 AWG - 2 Conductor (b) (1) No. 16 AWG - 3 Conductor (f)
1074+59.1 - 33.9' RT to 1074+39.8 - 33.6' RT	P	20	(1) 2"	20 20	(1) No. 16 AWG - 2 Conductor (b) (1) No. 16 AWG - 3 Conductor (f)
1073+79.7 - 34.3' LT to 1073+80.3 - 28.9' LT	Q	8	(1) 3"	8 8 8	(1) Cable 9 - 12 Conductor (a) (1) Video Coaxial & Video Power (c) (1) EVD Cable (d)
1073+15.6 - 34.6' LT to 1073+79.7 - 34.3' LT	R	66	(1) 3" (1) 3" Spare	66 66 66	(1) Cable 9 - 12 Conductor (a) (1) Video Coaxial & Video Power (c) (1) EVD Cable (d)
1073+15.6 - 34.6' LT to 1073+10.6 - 29.4' LT	S	7	(1) 3"	7 7 7	(1) Cable 5 - 12 Conductor (a) (1) Video Coaxial & Video Power (c) (1) EVD Cable (d)
1073+15.6 - 34.6' LT to 1073+21.2 - 69.5' RT	T	104	(2) 3" (1) 3" Spare	104 104 208 208	(1) Cable 5 - 12 Conductor (a) (1) Cable 9 - 12 Conductor (a) (2) Video Coaxial & Video Power (c) (2) EVD Cable (d)

- (a) Indicator Cable (No. 14 AWG 12 and 20 Conductor, see sheet 1)
- (b) Pedestrian Pushbutton Cable
- (c) Video Detection - (As Required by Manufacturer)
- (d) Emergency Vehicle Detector Cable
- (e) Interconnect Cable
- (f) Pedestrian Signal Cable



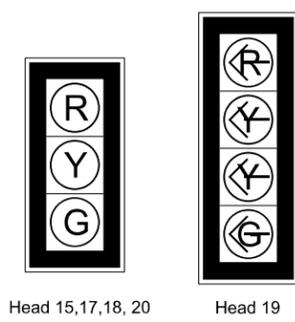
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Conduit and Conductor Layout
46th Ave Intersection
Memorial Highway Signalization
Mandan, ND



Signal Standard S6 WB View

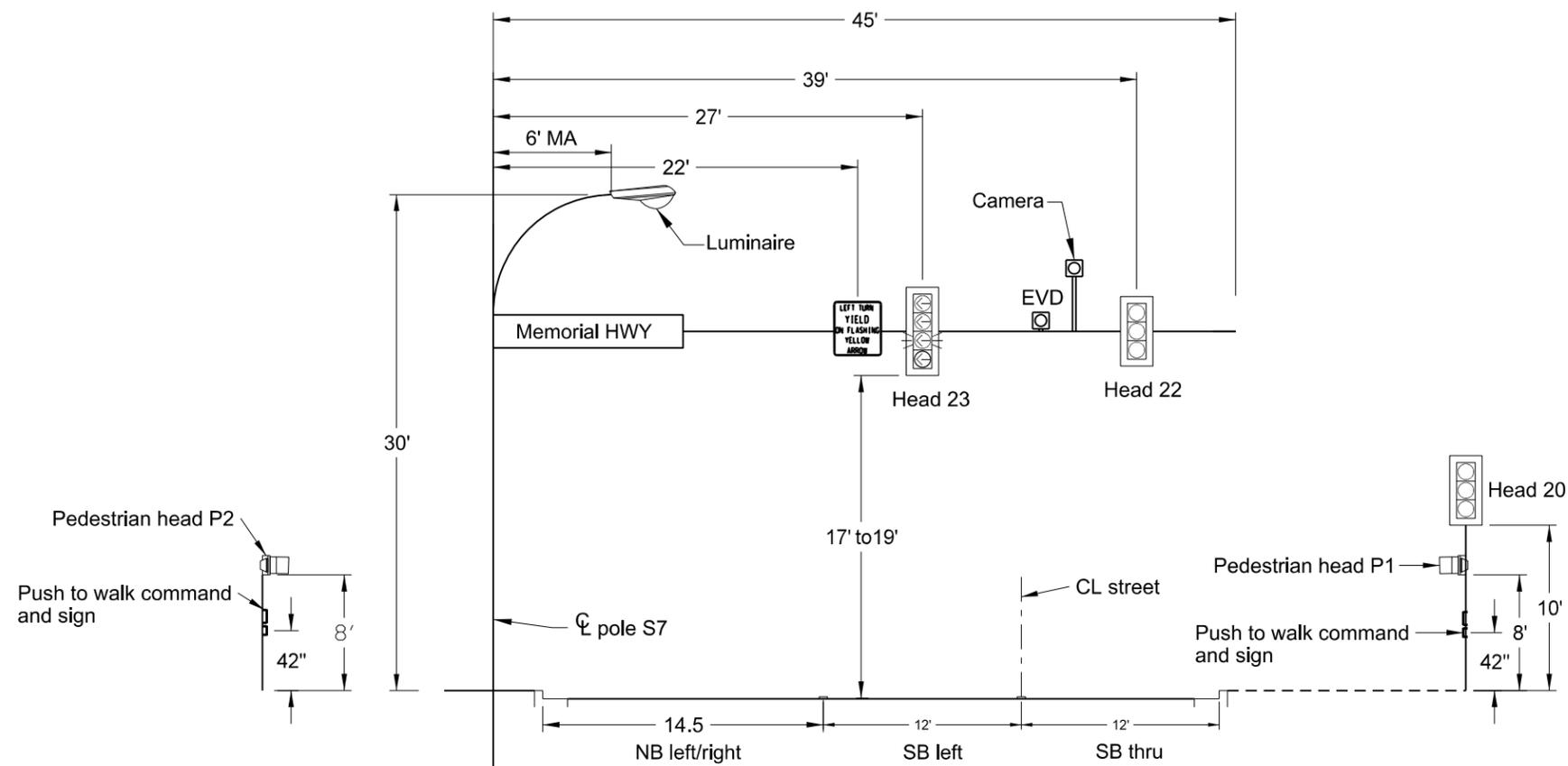
Signal Standard S5 WB View



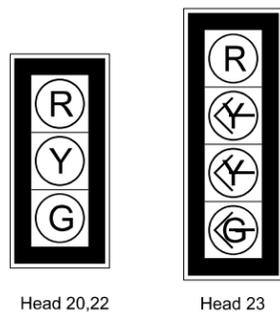
TRAFFIC SIGNAL POLE & LUMINAIRE SCHEDULE									
POLE	MAST ARM LENGTH (FT)	COORDINATES FOR CENTER OF DRILLED SHAFT FOUNDATION		LUMINAIRE (POLE MOUNT)					
		STATION	OFFSET	MODEL	ARM LENGTH	TYPE	VOLTS	OPTICS	TILT
S5	55	1073+10.6	-29.4	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree

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Traffic Signal Profiles
46th Ave Intersection
Memorial Highway Signalization
Mandan, ND



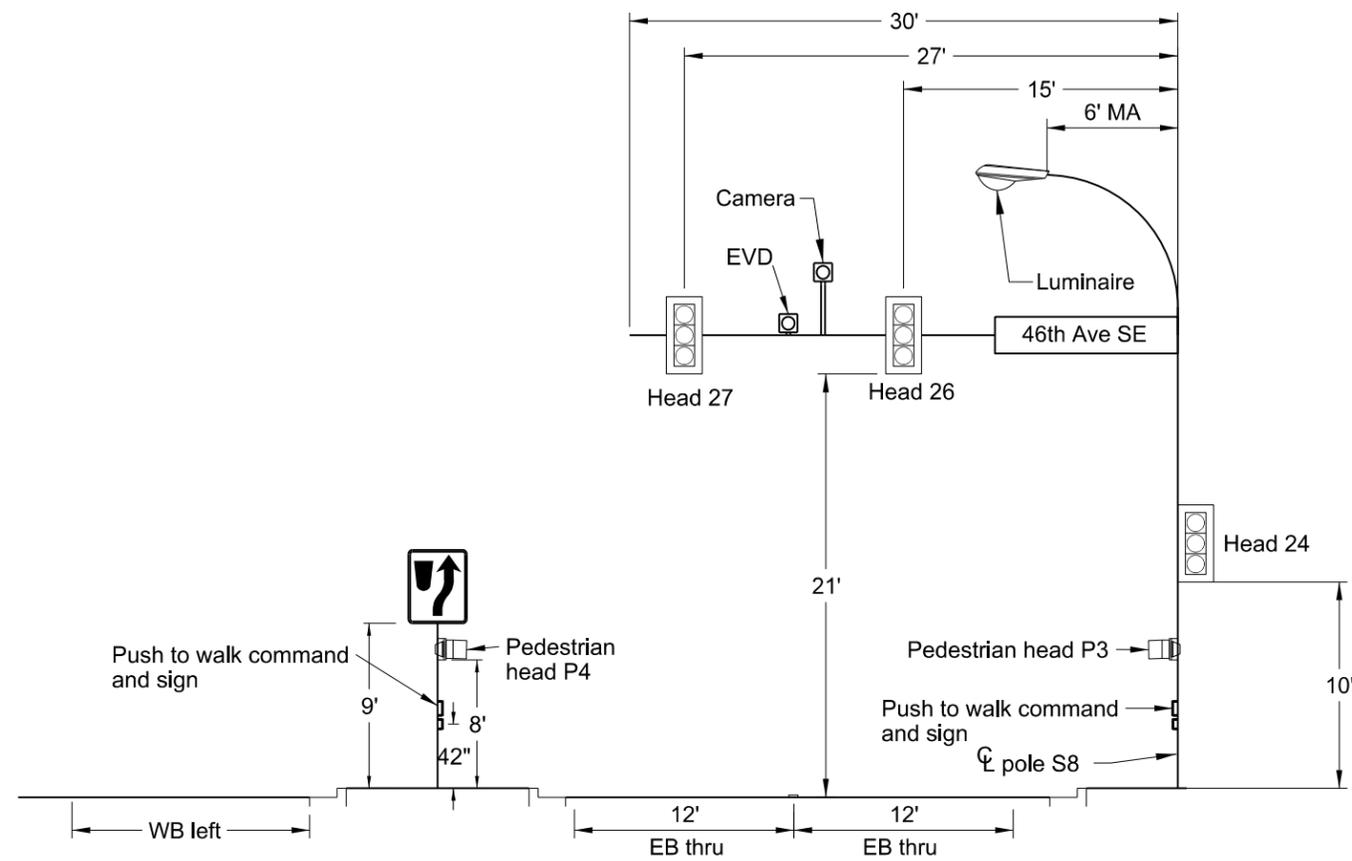
Signal Standard S7 SB View



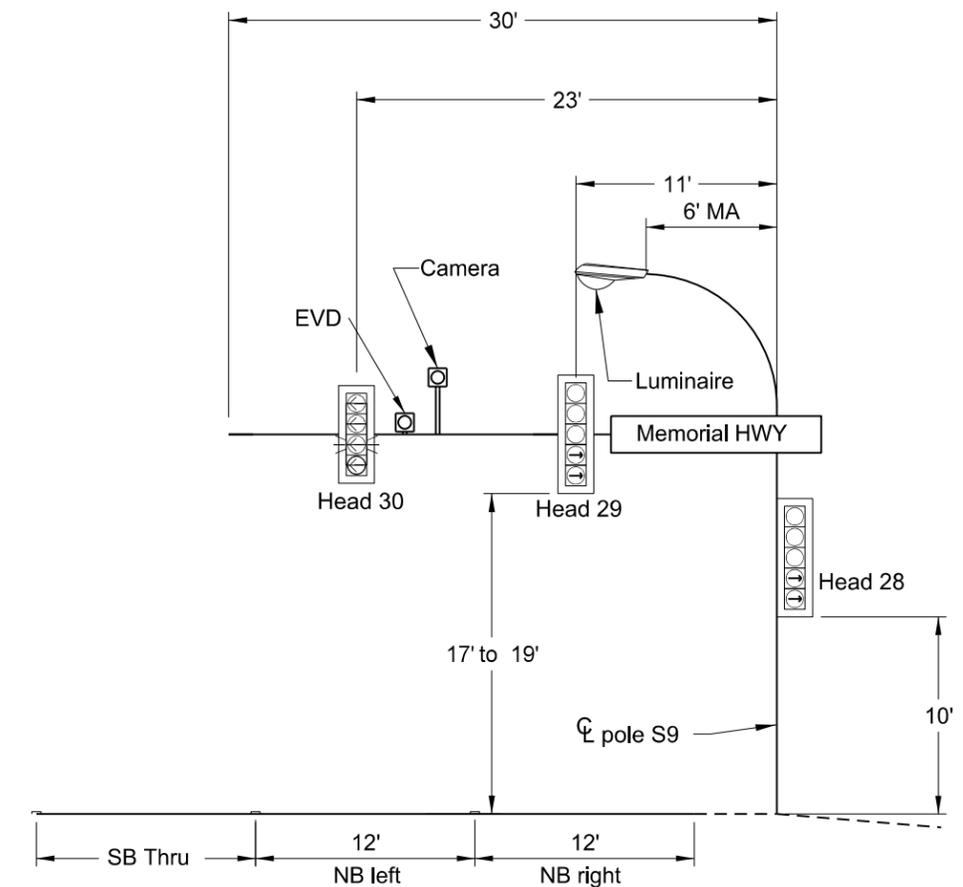
TRAFFIC SIGNAL POLE & LUMINAIRE SCHEDULE									
POLE	MAST ARM LENGTH (FT)	COORDINATES FOR CENTER OF DRILLED SHAFT FOUNDATION		LUMINAIRE (POLE MOUNT)					
		STATION	OFFSET	MODEL	ARM LENGTH	TYPE	VOLTS	OPTICS	TILT
S7	45	1074+34.3	107.3	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree

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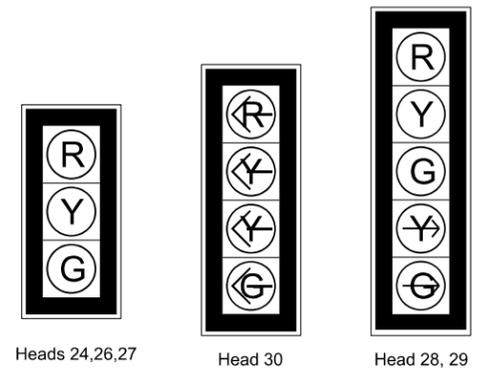
Traffic Signal Profiles
46th Ave Intersection
Memorial Highway Signalization
Mandan, ND



Signal Standard S8 EB View



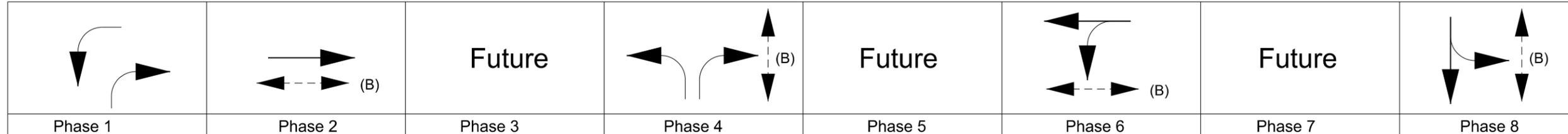
Signal Standard S9 NB View



TRAFFIC SIGNAL POLE & LUMINAIRE SCHEDULE									
POLE	MAST ARM LENGTH (FT)	COORDINATES FOR CENTER OF DRILLED SHAFT FOUNDATION		LUMINAIRE (POLE MOUNT)					
		STATION	OFFSET	MODEL	ARM LENGTH	TYPE	VOLTS	OPTICS	TILT
S8	30	1074+55.1	74.5	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree
S9	30	1073+80.3	-28.9	COBRA HEAD	6'	LED	240 VAC	IES TYPE III	8 degree

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Traffic Signal Profiles
46th Avenue Intersecton
Memorial Highway Signalization
Mandan, ND



Head #	Phase 1								Phase 2								Phase 3								Phase 4								Phase 5								Phase 6								Phase 7								Phase 8								
	R/W	Clear To Ø							R/W	Clear To Ø							R/W	Clear To Ø							R/W	Clear To Ø							R/W	Clear To Ø							R/W	Clear To Ø							R/W	Clear To Ø															
	2	3	4	5	6	7	8	3	4	5	6	7	8	1	4	5	6	7	8	1	2	5	6	7	8	1	2	3	6	7	8	1	2	3	4	7	8	1	2	3	4	5	8	1	2	3	4	5	6	1	2	3	4	5	6	7									
15, 17, 18																																																																	
30																																																																	
19	Ⓞ	Ⓞ																																																															
20, 22																																																																	
23																																																																	
24, 26, 27																																																																	
28, 29	Ⓞ	Ⓞ																																																															

Blank Squares Denote a Red Indication.
 (A) When one phase is on alone any nonconflicting phase may start timing concurrently without a clearance interval (See Chart A).
 (B) Upon pedestrian actuation only.

Intersection	AM Offset (s) 0700 to 0900	PM Offset (s) 1600 to 1800	OP Offset (s) Off Peak
40th Avenue	N/A	N/A	N/A
46th Avenue	0	0	N/A
I-194 NB Off-Ramp	84	6	N/A

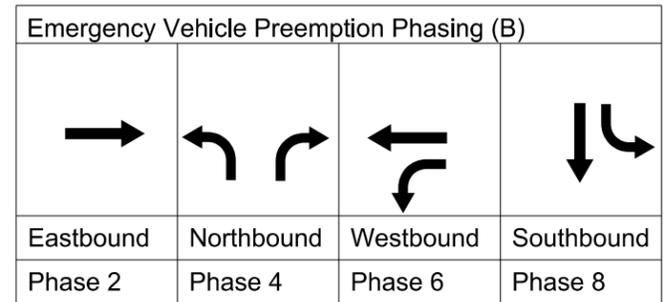
Coordinated Cycle Length = 90

Off Peak Operation
 0000 to 0500 = Semi-actuated, uncoordinated, Memorial Hwy rest on green
 0500 to 0700 = Semi-actuated, uncoordinated, Memorial Hwy rest on green
 0900 to 1600 = Semi-actuated, uncoordinated, Memorial Hwy rest on green
 1800 to 0000 = Semi actuated, uncoordinated, Memorial Hwy rest on green

46th Avenue and Memorial Highway - AM Peak	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
BASIC INTERVALS (OR FUNCTIONS)								
Minimum Initial	8.0	8.0		8.0		8.0		8.0
Maximum (Maximum Green or Ext Limit)	8.0	30.1		35.0		44		35.0
Yellow Change	4.0	3.9		4.0		4.0		4.0
Red Clearance	2.0	2.0		2.0		2.0		2.0
Walk		7.0		7.0		7.0		7.0
Pedestrian Clearance		12.0		3.0		12.0		3.0
Added Initial Per Actuation								

46th Avenue and Memorial Highway - PM Peak	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
BASIC INTERVALS (OR FUNCTIONS)								
Minimum Initial	8.0	8.0		8.0		8.0		8.0
Maximum (Maximum Green or Ext Limit)	9.0	30.1		33.0		45.0		33.0
Yellow Change	4.0	3.9		4.0		4.0		4.0
Red Clearance	2.0	2.0		2.0		2.0		2.0
Walk		7.0		7.0		7.0		7.0
Pedestrian Clearance		12.0		3.0		12.0		3.0
Added Initial Per Actuation								

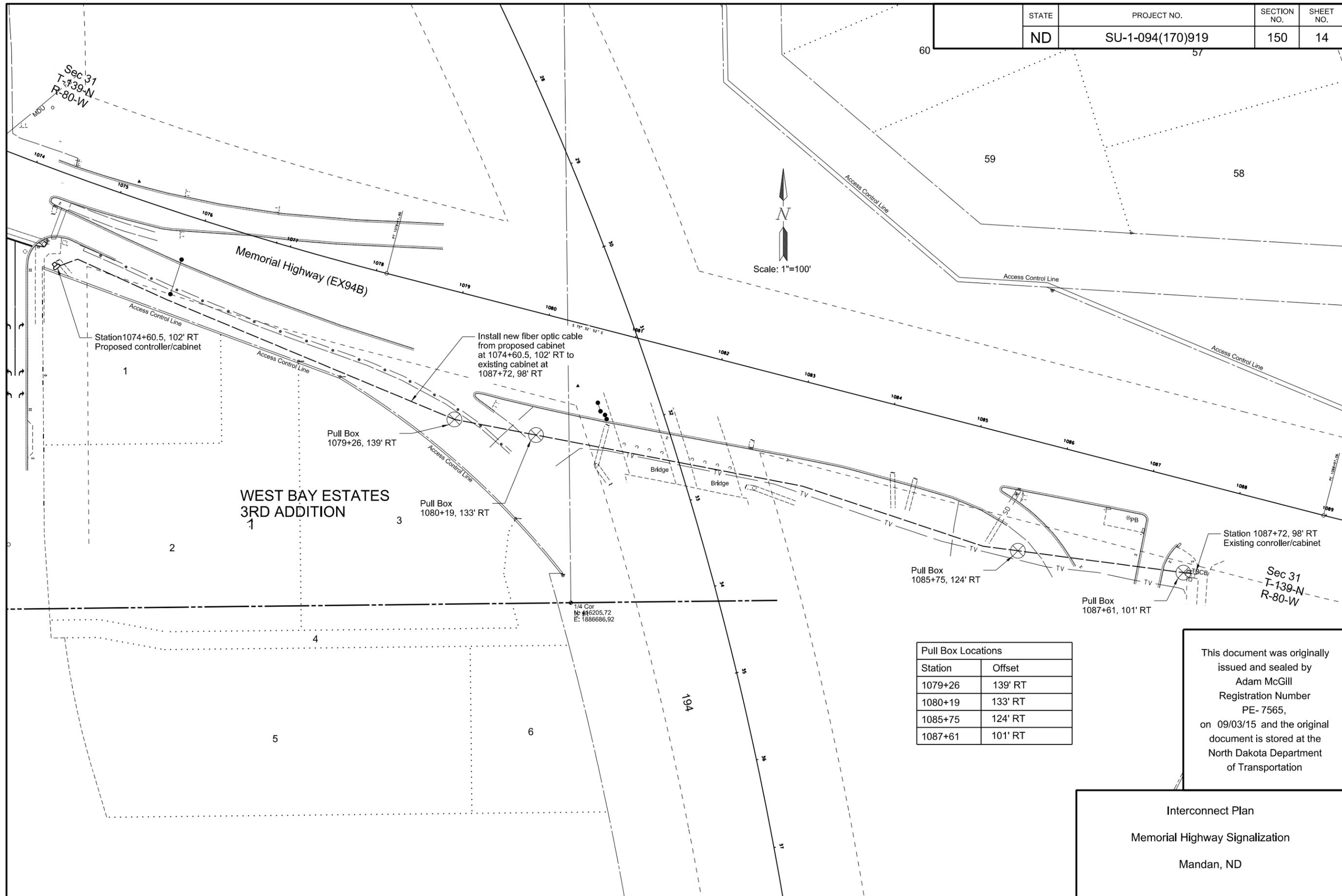
Chart A	
On Phase	Non-Conflicting Phase Allowed to Time Concurrently
2	6
4	8
6	2
8	4



(B) No pedestrian signal during EVP phasing

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Traffic Signal Phasing
 46th Avenue Intersection
 Memeorial Highway Signalization
 Mandan, ND



Station 1074+60.5, 102' RT
Proposed controller/cabinet

Install new fiber optic cable
from proposed cabinet
at 1074+60.5, 102' RT to
existing cabinet at
1087+72, 98' RT

Pull Box
1079+26, 139' RT

Pull Box
1080+19, 133' RT

Pull Box
1085+75, 124' RT

Pull Box
1087+61, 101' RT

Station 1087+72, 98' RT
Existing controller/cabinet

**WEST BAY ESTATES
3RD ADDITION**

Pull Box Locations	
Station	Offset
1079+26	139' RT
1080+19	133' RT
1085+75	124' RT
1087+61	101' RT

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Interconnect Plan
Memorial Highway Signalization
Mandan, ND

40th Avenue and Memorial Highway *		
Materials	Quantity	Unit
No. 14 AWG 12 Conductor	783	LF
No. 14 AWG, 5 Conductor	2272	LF
No. 14 AWG, 7 Conductor	1359	LF
Emergency Vehicle Detection Cable	1064	LF
Video Coaxial & Video Power	883	LF
No. 6 THW Power Supply	15	LF
No.6 RWH Power Supply	3	LF
Combination Feed Point	1	EA
Signal Controller and Cabinet	1	EA
2" Diameter Rigid Conduit	15	LF
3" Diameter Rigid Conduit	16	LF
1/2" Stability wire - 7 strand steel	501	LF
1/2" Span wire - 7 strand steel	1002	LF
Double galv. 3/8" steel guy wire - 7 strand	210	LF
33 foot Class II wood poles	2	EA
32 foot Class II wood poles	2	EA
1- way 3 section head w/ 12 inch LED - MA Mounted	6	EA
1- way 3 section head w/ 12 inch LED - Post Mounted	2	EA
1-way 4 section head w/ 12 inch LED - MA Mounted	2	EA
1-way 5 section head w/ 12 inch LED - MA Mounted	2	EA
1-way 5 section head w/ 12 inch LED - Post Mounted	2	EA

* These items shall not be bid separately but shall be included in the bid price for "Traffic Signal System – Span Wire Mounted"

46th Avenue and Memorial Highway **		
Materials	Quantity	Unit
No. 14 AWG 20 Conductor	29	LF
No. 14 AWG 12 Conductor	621	LF
No. 14 AWG, 3 Conductor	52	LF
No. 14 AWG, 5 Conductor	366	LF
No. 14 AWG, 7 Conductor	214	LF
No. 16 AWG - 2 Conductor	336	LF
No. 16 AWG - 3 Conductor	348	LF
Emergency Vehicle Detection Cable	994	LF
Video Coaxial & Video Power	994	LF
Interconnect Cable	1331	LF
No. 6 THW Power Supply	15	LF
No.6 RWH Power Supply	3	LF
Combination Feed Point	1	EA
Signal Controller and Cabinet	1	EA
2" Diameter Rigid Conduit	1423	LF
3" Diameter Rigid Conduit	1102	LF
Pull Box	5	EA
55 foot MA SIG STD - Type IV	1	EA
45 foot MA SIG STD - Type IV	1	EA
30 foot MA SIG STD - Type IV	2	EA
Combo 30 foot MA SIG & Lt STD - Type C	3	EA
Combo 35 foot MA SIG & Lt STD - Type C	1	EA
1- way 3 section head w/ 12 inch LED - MA Mounted	5	EA
1- way 3 section head w/ 12 inch LED - Post Mounted	3	EA
1-way 4 section head w/ 12 inch LED - MA Mounted	3	EA
1-way 5 section head w/ 12 inch LED - MA Mounted	1	EA
1-way 5 section head w/ 12 inch LED - Post Mounted	1	EA
Accessible Pedestrian Signal Head (Countdown and Audible)	4	EA
Accessible Pedestrian Push Buttons and Signs	4	EA

**These items shall not be bid separately but shall be included in the bid price for "Traffic Signal System"

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Traffic Signal Quantities
40th and 46th Avenue Intersections
Memorial Highway Signalization
Mandan, ND

NDDOT ABBREVIATIONS

? This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.

Abn abandoned
 Abut abutment
 Ac acres
 Adj adjusted
 Aggr aggregate
 Ahd ahead
 ARV air release valve
 Align alignment
 Al alley
 Alt alternate
 Alum aluminum
 ADA Americans with Disabilities Act
 A ampere
 & and
 Appr approach
 Approx approximate
 ACP asbestos cement pipe
 Asph asphalt
 AC asphalt cement
 Assmd assumed
 @ at
 Atten attenuation
 ATR automatic traffic recorder
 Ave Avenue
 Avg average
 ADT average daily traffic
 Az azimuth
 Bk back
 BF back face
 Bs backsight
 Balc balcony
 B Wire barbed wire
 Barr barricade
 Btry battery
 Brg bearing
 BI beehive inlet
 Beg begin
 BM bench mark
 Bkwy bikeway
 Bit bituminous
 Blk block
 Bd Ft board feet
 BH bore hole
 BS both sides
 Bot bottom
 Blvd Boulevard
 Bndry boundary
 BC brass cap
 Brkwy breakaway
 Br bridge
 Bldg building

BV butterfly valve
 Byp bypass
 C Gdrl cable guardrail
 Calc calculate
 Cd candela
 CIP cast iron pipe
 CB catch basin
 CRS cationic rapid setting
 C Gd cattle guard
 C To C center to center
 Cl or C centerline
 Cm centimeter
 Ch chain
 Chnlk chain-link
 Ch Blk channel block
 Ch Ch channel change
 Chk check
 Chsld chiseled
 Cir circle
 Cl class
 Cl clay
 Cl F clay fill
 Cl Hvy clay heavy
 Cl Lm clay loam
 Clnt clean-out
 Clr clear
 Cl&gr clearing & grubbing
 Co S coal slack
 Comb. combination
 Coml commercial
 Compr compression
 CADD computer aided drafting & design
 Conc concrete
 Cond conductor
 Const construction
 Cont continuous
 CSB continuous split barrel sample
 Contr contraction
 Contr contractor
 CP control point
 Coord coordinate
 Cor corner
 Corr corrected
 CAES corrugated aluminum end section
 CAP corrugated aluminum pipe
 CMES corrugated metal end section
 CMP corrugated metal pipe
 CPVCP corrugated poly-vinyl chloride pipe
 CSES corrugated steel end section
 CSP corrugated steel pipe
 C coulomb
 Co County
 Crse course
 C Gr course gravel
 CS course sand

Ct Court
 Xarm cross arm
 Xbuck cross buck
 Xsec cross sections
 Xing crossing
 Xrd Crossroad
 Crn crown
 CF cubic feet
 M3 cubic meter
 M3/s cubic meters per second
 CY cubic yard
 Cy/mi cubic yards per mile
 Culv culvert
 C&G curb & gutter
 CI curb inlet
 CR curb ramp
 CS curve to spiral
 C cut
 Dd Ld dead load
 Defl deflection
 Defm deformed
 Deg or D degree
 DInt delineate
 DIntr delineator
 Depr depression
 Desc description
 Det detail
 DWP detectable warning panel
 Dtr detour
 Dia diameter
 Dir direction
 Dist distance
 DM disturbed material
 DB ditch block
 DG ditch grade
 Dbl double
 Dn down
 Dwg drawing
 Dr drive
 Drwy driveway
 DI drop inlet
 D dry density
 Ea each
 Esmt easement
 E East
 EB Eastbound
 Elast elastomeric
 EL electric locker
 E Mtr electric meter
 Elec electric/al
 EDM electronic distance meter
 Elev or El elevation
 Ellipt elliptical
 Emb embankment
 Emuls emulsion/emulsified

ES end section
 Engr engineer
 ESS environmental sensor station
 Eq equal
 Eq equation
 Evgr evergreen
 Exc excavation
 Exst existing
 Exp expansion
 Expy Expressway
 E external of curve
 Extru extruded
 FOS factor of safety
 F Fahrenheit
 FS far side
 F farad
 Fed Federal
 FP feed point
 Ft feet/foot
 Fn fence
 Fn P fence post
 FO fiber optic
 FB field book
 FD field drive
 F fill
 FAA fine aggregate angularity
 FS fine sand
 FH fire hydrant
 Fl flange
 Flrd flared
 FES flared end section
 F Bcn flashing beacon
 FA flight auger sample
 FL flow line
 Ftg footing
 FM force main
 Fs foresight
 Fnd found
 Fdn foundation
 Frac fractional
 Frwy freeway
 Frt front
 FF front face
 F Disp fuel dispenser

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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NDDOT ABBREVIATIONS

D-101-2

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

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NDDOT ABBREVIATIONS

D-101-3

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

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM 702 Communications
 ACCENT Accent Communications
 AGASSIZ WU Agassiz Water Users Incorporated
 AGC Associated General Contractors of America
 AII PI Alliance Pipeline
 ALL SEAS WU All Seasons Water Users Association
 AMOCO PI Amoco Pipeline Company
 AMRDA HESS Amerada Hess Corporation
 AT&T AT&T Corporation
 B PAW Bear Paw Energy Incorporated
 BAKER ELEC Baker Electric
 BASIN ELEC Basin Electric Cooperative Incorporated
 BEK TEL Bek Communications Cooperative
 BELLE PL Belle Fourche Pipeline Company
 BLM Bureau of Land Management
 BNSF Burlington Northern Santa Fe Railway
 BOEING Boeing
 BRNS RWD Barnes Rural Water District
 BURK-DIV ELEC Burke-Divide Electric Cooperative
 BURL WU Burleigh Water Users
 Cable One Cable One
 CABLE SERV Cable Services
 CAP ELEC Capital Electric Cooperative Incorporat
 CASS CO ELEC Cass County Electric Cooperative
 CASS RWU Cass Rural Water Users Incorporated
 CAV ELEC Cavalier Rural Electric Cooperative
 CBLCOM Cablecom Of Fargo
 CENEX PL Cenex Pipeline
 CENT PL WATER DIST Central Pipe Line Water District
 CENT PWR ELEC Central Power Electric Cooperative
 COE Corps of Engineers
 CONS TEL Consolidated Telephone
 CONT RES Continental Resource Inc
 CPR Canadian Pacific Railway
 D O E Department Of Energy
 DAK CARR Dakota Carrier Network
 DAK CENT TEL Dakota Central Telephone
 DAK RWD Dakota Rural Water District
 DGC Dakota Gasification Company
 DICKEY R NET Dickey Rural Networks
 DICKEY RWU Dickey Rural Water Users Association
 DICKEY TEL Dickey Telephone
 DNRR Dakota Northern Railroad
 DOME PL Dome Pipeline Company
 DVELEC Dakota Valley Electric Cooperative
 DVMW Dakota, Missouri Valley & Western
 ENBRDG Enbridge Pipelines Incorporated
 ENVENTIS Enventis Telephone
 FALK MNG Falkirk Mining Company
 FHWA Federal Highway Administration
 G FKS-TRL WD Grand Forks-traill Water District
 GETTY TRD & TRAN Getty Trading & Transportation
 GLDN W ELEC Golden West Electric Cooperative
 GRGS CO TEL Griggs County Telephone

GT PLNS NAT GAS Great Plains Natural Gas Company
 HALS TEL Halstad Telephone Company
 IDEA1 Idea1
 INT-COMM TEL Inter-Community Telephone Company
 KANEB PL Kaneb Pipeline Company
 KEM ELEC Kem Electric Cooperative Incorporated
 KOCH GATH SYS Koch Gathering Systems Incorporated
 LKHD PL Lakehead Pipeline Company
 LNGDN RWU Langdon Rural Water Users Incorporated
 LWR YELL R ELEC Lower Yellowstone Rural Electric
 MCKNZ CON McKenzie Consolidated Telcom
 MCKENZIE ELEC McKenzie Electric Cooperative
 MCKNZ WRD McKenzie County Water Resource District
 MCLEOD McLeod USA
 MCLN ELEC McLean Electric Cooperative
 MCLN-SHRDN R WAT McLean-Sheridan Rural Water
 MDU Montana-dakota Utilities
 MID-CONT CABLE Mid-Continent Cable
 MIDSTATE TEL Midstate Telephone Company
 MINOT CABLE Minot Cable Television
 MINOT TEL Minot Telephone Company
 MISS W W S Missouri West Water System
 MNKOTA PWR Minnkota Power
 MOR-GRAN-SOU ELEC Mor-gran-sou Electric Cooperative
 MOUNT-WILLI ELEC Mountrail-williams Electric Cooperative
 MRE LBTY TEL Moore & Liberty Telephone
 MUNICIPAL City Water And Sewer
 MUNICIPAL City Of '.....'
 N CENT ELEC North Central Electric Cooperative
 N VALL W DIST North Valley Water District
 ND PKS & REC North Dakota Parks And Recreation
 ND TEL North Dakota Telephone Company
 NDDOT North Dakota Department of Transportation
 NDSU SOIL SCI DEPT NDSU Soil Science Department
 NEMONT TEL Nemont Telephone
 NODAK R ELEC Nodak Rural Electric Cooperative
 NOON FRMS TEL Noonan Farmers Telephone Company
 NPR Northern Plains Railroad
 NSP Northern States Power
 NTH PRAIR RW Northern Prairie Rural Water Association
 NTHN BRDR PL Northern Border Pipeline
 NTHN PLNS ELEC Northern Plains Electric Cooperative Incorporated
 NTHWSTRN REF Northwestern Refinery Company
 NW COMM Northwest Communication Cooperation
 ONEOK Oneok gas
 OSHA Occupational Safety and Health Administration
 OTTR TL PWR Otter Tail Power Company
 P L E M Prairielands Energy Marketing
 POLAR COM Polar Communications
 PVT ELEC Private Electric
 QWEST Qwest Communications
 R&T W SUPPLY R & T Water Supply Association
 RAMSEY R SEW Ramsey Rural Sewer Association
 RAMSEY RW Ramsey Rural Water Association
 RAMSEY UTIL Ramsey County Rural Utilities

RED RIV TEL Red River Rural Telephone
 RESVTN TEL Reservation Telephone
 ROBRTS TEL Roberts Company Telephone
 R-RIDER ELEC Roughrider Electric Coop
 RRVW Red River Valley & Western Railroad
 RSR ELEC R.S.R. Electric Cooperative
 S E W U South East Water Users Incorporated
 SCOTT CABLE Scott Cable Television Dickinson
 SHERDN ELEC Sheridan Electric Cooperative
 SHEYN VLY ELEC Sheyenne Valley Electric Cooperative
 SKYTECH Skyland Technologies Incorporated
 SLOPE ELEC Slope Electric Cooperative Incorporated
 SOURIS RIV TELCOM Souris River Telecommunications
 ST WAT COMM State Water Commission
 STATE LN WATER State Line Water Cooperative
 STER ENG Sterling Energy
 STUT RWU Stutsman Rural Water Users
 SW PL PRJ Southwest Pipeline Project
 T M C Turtle Mountain Communications
 TCI TCI of North Dakota
 TESORO GHG PLNS PL Tesoro High Plains Pipeline
 TRI-CNTY WU Tri-County Water Users Incorporated
 TRL CO RWU Traill County Rural Water Users
 UNTD TEL United Telephone
 UPPR SOUR WUA Upper Souris Water Users Association
 US SPRINT U.S. Sprint
 USAF MSL CABLE U.S.A.F. Missile Cable
 USFWS US Fish and Wildlife Service
 USW COMM U.S. West Communications
 VRNDRY ELEC Verendrye Electric Cooperative
 W RIV TEL West River Telephone Incorporated
 WEB W. E. B. Water Development Association
 WILLI RWA Williams Rural Water Association
 WILSTN BAS PL Williston Basin Interstate Pipeline Company
 WLSH RWD Walsh Water Rural Water District
 WOLVRTN TEL Wolverton Telephone
 XLENER Xcel Energy
 YSVR Yellowstone Valley Railroad

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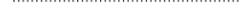
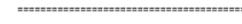
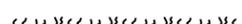
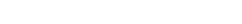
Line Styles

.....	Limits of Const Transition Line	—— s —— s ——	Floating Silt Curtain	—— ——— ———	Existing Aggregate (Cross Section View)	- - - - -	Existing Centerline
.....	Bale Check	—— ——— T ——	Existing Telephone Line	—— ——— ———	Existing Curb and Gutter (Cross Section View)	- - - - -	Supplemental Contour
.....	Rock Check	—— ——— TV ——	Existing TV Line	—— ——— ———	Existing Riprap	—— - - - - -	Right of Way
.....	Sight Distance Triangle Line	Void — void — void — v	Existing Assumed Ground (Not Surveyed)	—— ——— ———	Existing Underground Vault or Lift Station	—— - - - - -	Existing Right of Way
- - - - -	Small Hidden Object	Void — void — void — v	Tentative Ground Line	—— ——— ———	Tangent Line	—— - - - - -	Existing Right of Way Railroad
- - - - -	Dimension Leader	—— ——— w ——	Existing Water or Steam Line	- - - - -	Hidden Object	- - - - -	Failure Line
- - - - -	Existing Ground	=====	Existing Under Drain	—— ——— ———	Existing Dirt Surface	- - - - -	Existing Conditions
- - - - -	Existing Topsoil (Cross Section View)	=====	Under Drain	—— ——— ———	Existing Conduit	- - - - -	Existing Ground (Details)
—— ——— ———	Large Hidden Object	=====	Wall	—— ——— ———	Topsoil Profile	—— - - - - -	Existing Sixteenth Section Line
—— ——— ———	Edge Drain	=====	Existing Slotted Drain	- - - - -	Existing Conductor	- - - - -	Existing Right of Way Not State Owned
—— D —— D ——	Geotextile Fabric Type D	—— + —— + ——	Existing Cemetary Boundary	- - - - -	Conductor	- - - - -	Phantom Object
—— ——— E ——	Existing Electrical	—— ——— ———	Centerline Pavement Marking	- - - - -	Fiber Optic	- - - - -	Centerline Main
—— ——— FO ——	Existing Fiber Optic Line	=====	Barrier with Centerline Pavement Marking	- - - - -	Existing Loop Detector	-	Existing Guardrail Cable
—— ——— FO ——	Existing TV Fiber Optic	=====	Barrier Pavement Marking	- - - - -	Subgrade, Subcut or Ditch Grade	— • — • — • — •	Existing Guardrail Metal
—— ——— G ——	Existing Gas Pipe	- - - - -	Stripe 4 IN Dotted Extension White	—— ——— ———	Existing Asphalt Surface	—— . —— . —— . —— . ——	Existing Edge of Water
—— Geo —— Geo ——	Geogrid	- - - - -	Stripe 8 IN Dotted Extension White	—— ——— ———	Existing Asphalt (Cross Section View)	- - - - -	Excavation Limits
—— ——— OH ——	Existing Overhead Utility Line	- - - - -	Stripe 8 IN Lane Drop	—— ——— ———	Existing Reinforcement Rebar	—— . . . —— . . . —— . . . —— . . . ——	Existing Government Lot Line
—— ——— P ——	Existing Power	—— v v v ——	Wetland Mitigation	—— ——— ———	Existing Tie Point Line	.....	Existing Adjacent Block Lines
—— ——— PL ——	Existing Fuel Pipeline	- - - - -	Existing Box Culvert Bridge	—— ——— ———	Existing State or International Line	.....	Existing Adjacent Lot Lines
—— ——— PL ——	Existing Undefined Above Ground Pipe Line	- - - - -	Existing Concrete Surface	—— ——— ———	Existing Quarter Section Line	.....	Existing Adjacent Property Line
—— ——— R —— R ——	Geotextile Fabric Type R	- - - - -	Existing Drainage Structure	—— ——— ———	Existing County	.....	Existing Adjacent Subdivision Lines
—— ——— R —— R ——	Geotextile Fabric Type R1	- - - - -	Easement	—— ——— ———	Existing Section Line	.....
—— REMOVE —— REMOVE ——	Remove Line	- - - - -	Existing Concrete	—— ——— ———	Existing Township	.....
—— RR —— RR ——	Geotextile Fabric Type RR	- - - - -	Existing Easement	—— ——— ———	Existing Railroad Centerline	
—— ——— S —— S ——	Geotextile Fabric Type S	—— ——— ———	Existing Gravel Surface	—— ——— ———	Centerline	

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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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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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Symbols

	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		Iron Monument Found		Existing Pull Box		Existing Gas Pipe Vent
	Existing Overhead Sign Structure Load Center		Iron Pin R/W Monument		Existing Intelligent Transportation Pull Box		Existing Sanitary Pipe Vent
	Existing Luminaire		Existing Object Marker Type I		Existing Water Pump		Existing Storm Drain Pipe Vent
	Existing Light Standard Luminaire		Existing Object Marker Type II		Existing Slotted Reinforced Concrete Pipe		Existing Water Pipe Vent
	Existing Federal Mailbox		Existing Object Marker Type III		Existing RR Profile Spot		Existing Weather Station
	Existing Private Mailbox		Existing Electrical Pedestal		Existing Fuel Leak Sensors		Existing Ground Water Well Bore Hole
	Existing Meander Section Corner		Existing Telephone Pedestal		Existing Highway Sign		Existing Windmill or Tower
	Existing Meter		Existing Fiber Optic Telephone Pedestal		Existing Miscellaneous Spot		Existing Witness Corner
	Existing Electrical Manhole		Existing TV Pedestal		Existing Lighting Standard Pole		Flashing Beacon
	Existing Gas Manhole		Existing Fiber Optic TV Pedestal		Existing Traffic Signal Standard		Flagger
	Existing Sanitary Manhole		Existing Fuel Filler Pipes		Existing Transformer		Pipe Mounted Flasher
	Existing Sanitary Force Main Manhole		Existing Traverse PI Aerial Panel		Existing Large Evergreen Tree		Sanitary Force Main with Valve
	Existing Sanitary Manhole with Valve		Existing Pole		Existing Small Evergreen Tree		
	Existing Storm Drain Manhole		Existing Power Pole		Existing Large Tree		
	Existing Force Main Storm Drain Manhole		Existing Power Pole with Transformer		Existing Small Tree		
	Existing Force Main Storm Drain Manhole with Valve				Existing Tree Trunk		
	Existing Telephone Manhole				Existing Pad Mounted Traffic Signal Control Box		

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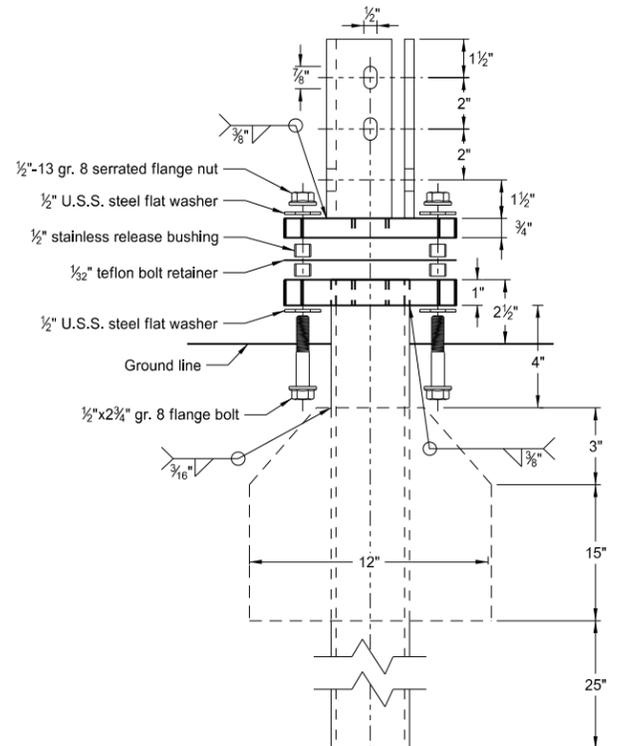
Symbols

D-101-32

 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  Alignment Monument  Iron Pin Reference Monument	 Object Marker Type I  Object Marker Type II  Object Marker Type III  Caution Mode Arrow Panel  Back to Back Vertical Panel Sign  Double Direction Arrow Panel  Left Directional Arrow Panel  Right Directional Arrow Panel  Sequencing Arrow Panel  Truck Mounted Arrow Panel  Power Pole  Wood Pole  Pedestrian Push Button Post  Property Corner  Pull Box  Intelligent Transportation Pull Box  Sanitary Pump  Storm Drain Pump  Reinforced Pavement  Reinforced Concrete End Section 15 Inch  Reinforced Concrete End Section 18 Inch  Reinforced Concrete End Section 24 Inch  Reinforced Concrete End Section 30 Inch  Reinforced Concrete End Section 36 Inch  Reinforced Concrete End Section 42 Inch	 Reinforced Concrete End Section 48 Inch  Reinforced Concrete End Section 54 Inch  Reset Right of Way Marker  Reset USGS Marker  Right of Way Markers  Riser 30 Inch  Continuous Split Barrel Sample  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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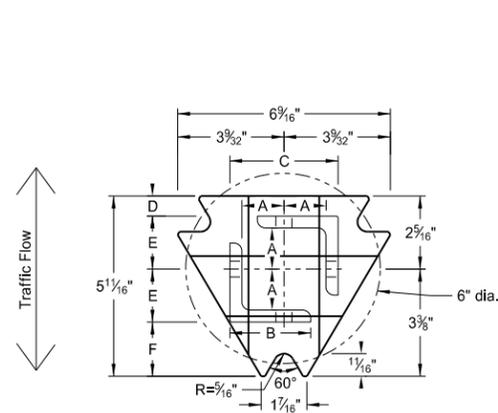
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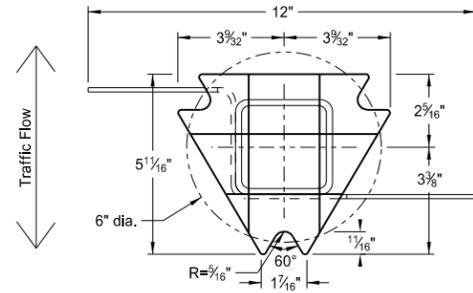


Multi-Directional Slip Base Assembly

Perforated Tube



Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2 1/2"x2 1/2"x3/8" ASTM A36 structural angle



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

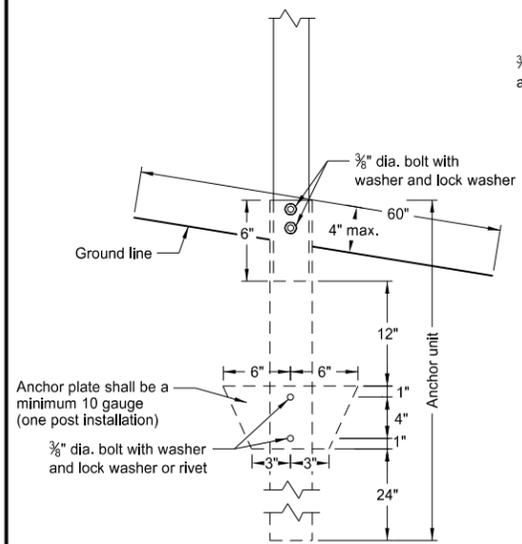
Notes:

1. Slip base bolts shall be torqued as specified by the manufacturer.
2. Anchor shall have a yield strength of 43.9 KSI and tensile strength of 59.3 KSI.
3. The 4" vertical clearance is required for the anchor or breakaway base. The 4"x60" measurement shall be made above and below post location and also back and ahead of the post.
4. When used in concrete sidewalk, anchor shall be same except without the wings.
5. Four post signs shall have over 7' between the first and the fourth posts.

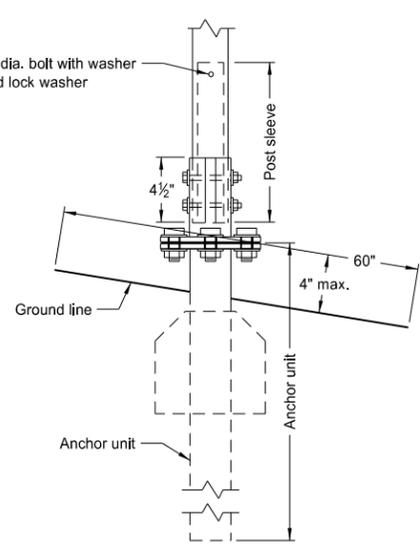
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No	2 1/4
2	2 1/4	12			No	2 1/2
2	2 1/2	12			Yes	
2	2 1/2	12			Yes	
2	2 1/4	10	2	12	Yes	
2	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/2	12			Yes	
3 & 4	2 1/2	10			Yes	
3 & 4	2 1/2	12	2 1/4	12	Yes	
3 & 4	2 1/4	12	2	12	Yes	
3 & 4	2 1/2	10	2 3/16	10	Yes	

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in. ⁴	Cross Sec. Area in. ²	Section Modulus in. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 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

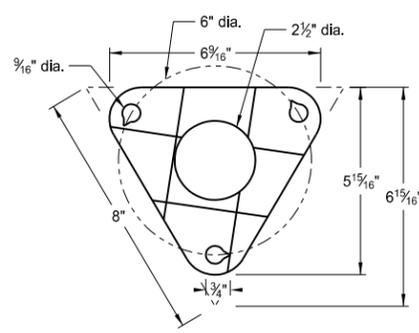
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 1/8"
2 1/2"x10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"



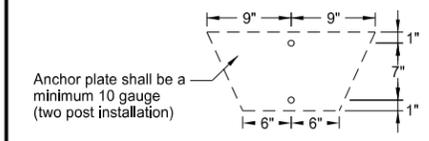
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



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



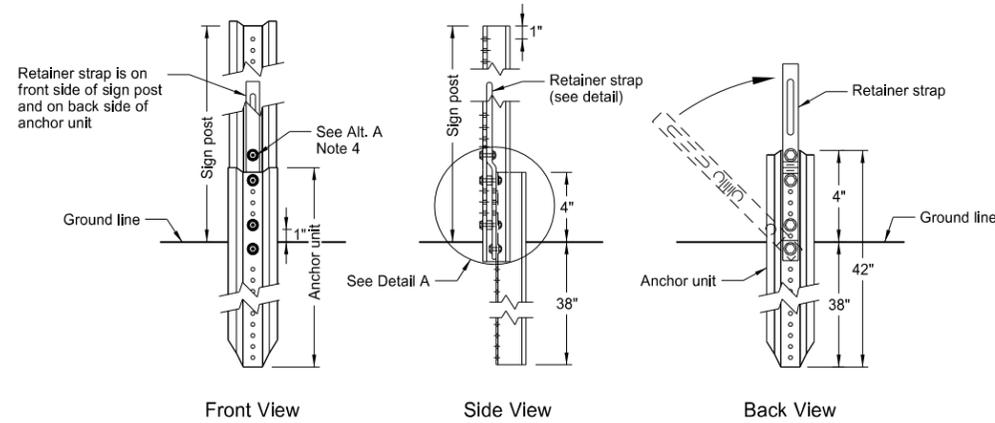
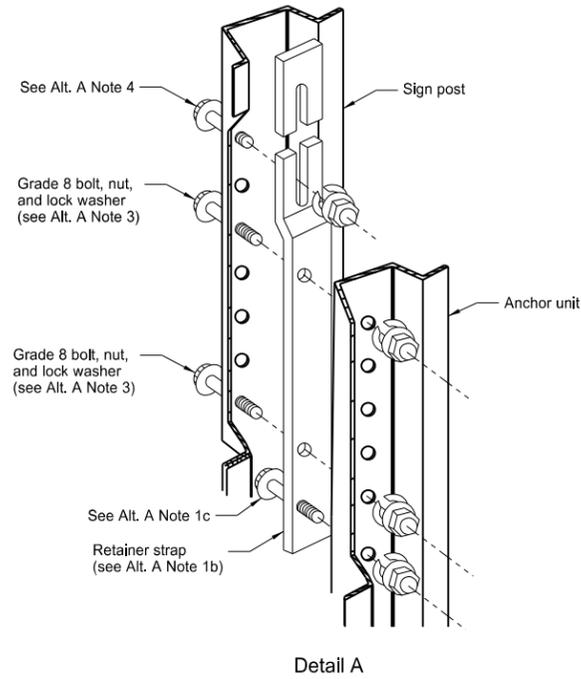
Anchor plate shall be a minimum 10 gauge (two post installation)

- (A) The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak.
(B) The 2 3/16"x10 ga. may be inserted into 2 1/2"x10 ga. for additional wind load.

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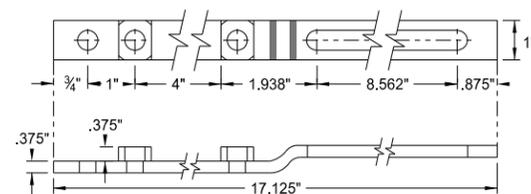
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U-Channel Post

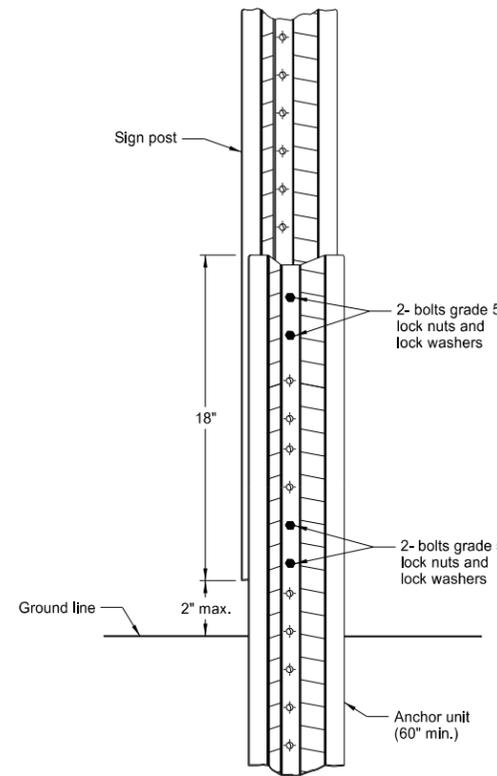


Breakaway U-Channel Detail Alternate A

A maximum of 2 posts shall be installed within 7'.

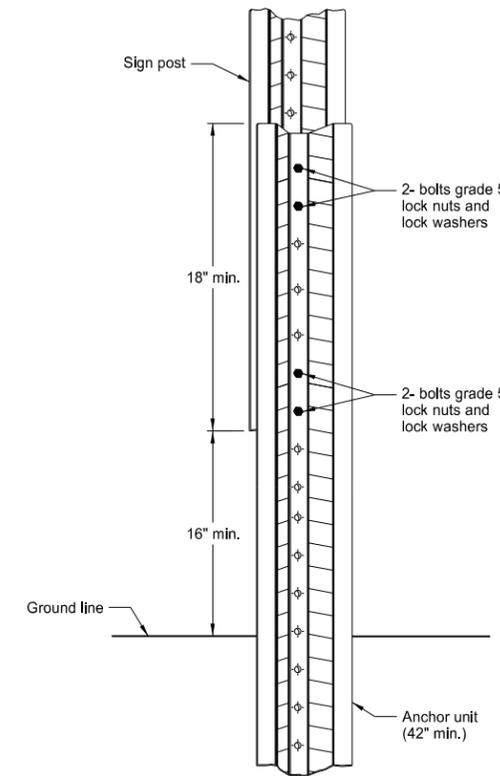


Retainer Strap Detail



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

A maximum of 3 posts shall be installed within 7'.



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

A maximum of 3 posts shall be installed within 7'.

Alternate A Steps of Installation:

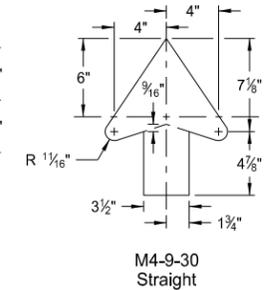
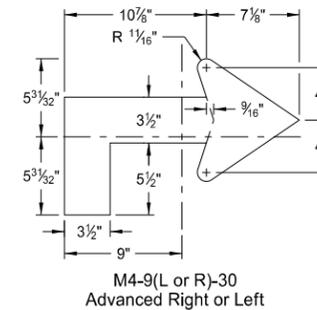
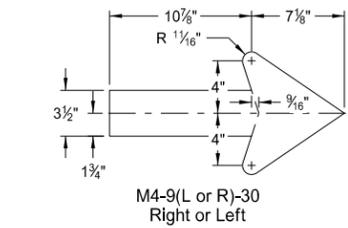
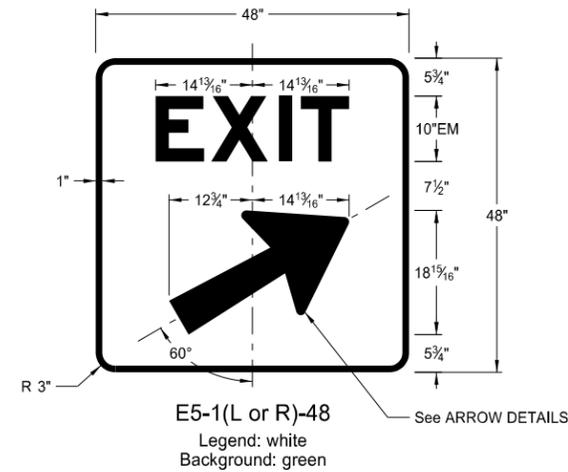
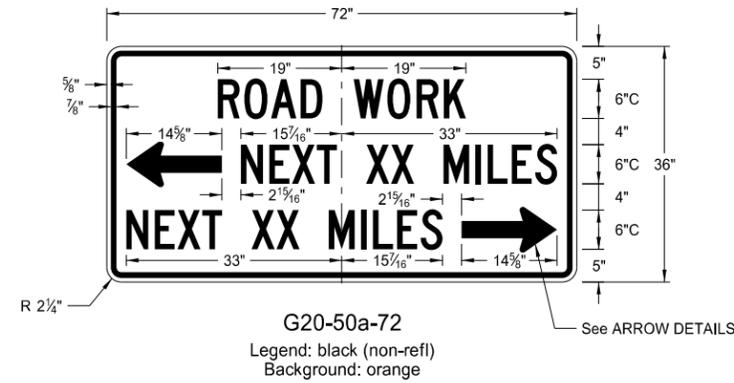
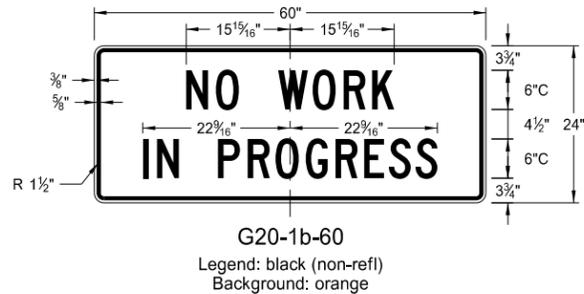
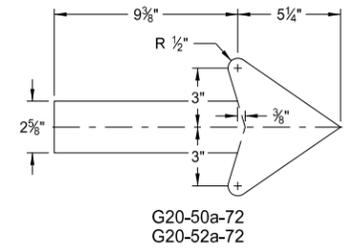
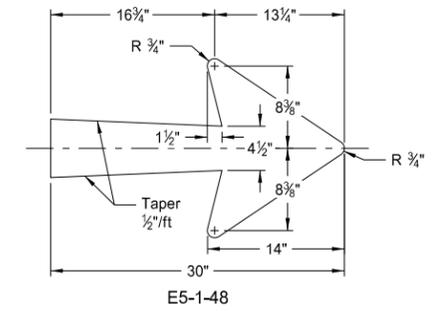
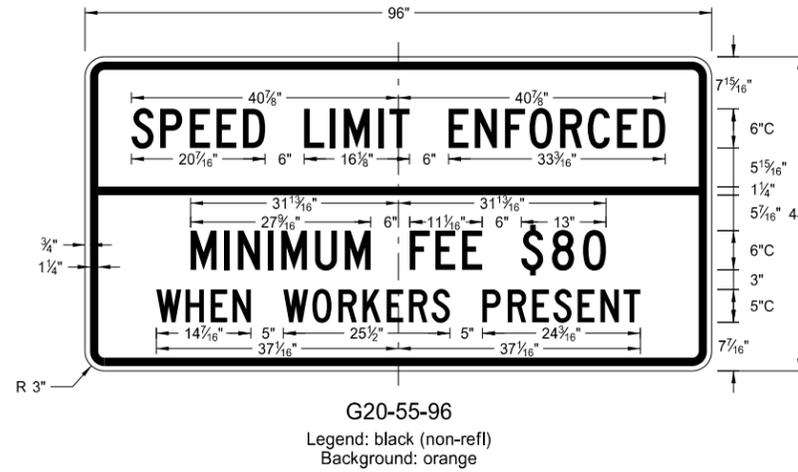
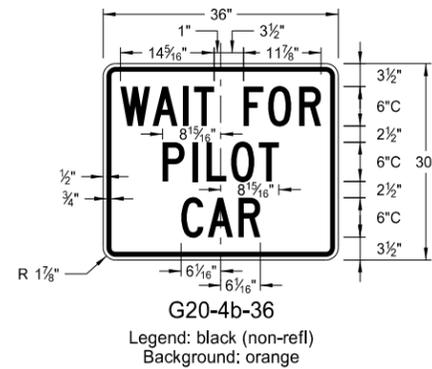
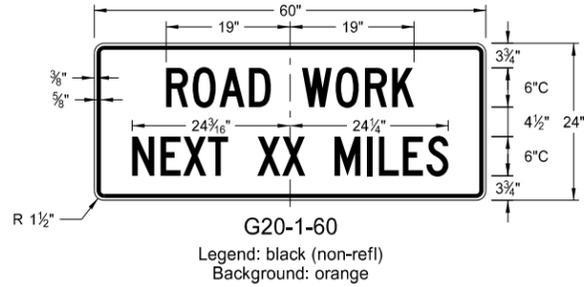
1. a) Drive anchor unit to within 12" of ground level.
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
2. a)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

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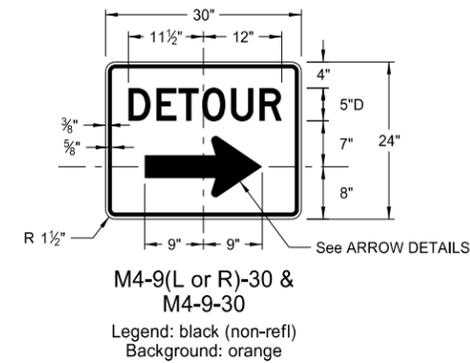
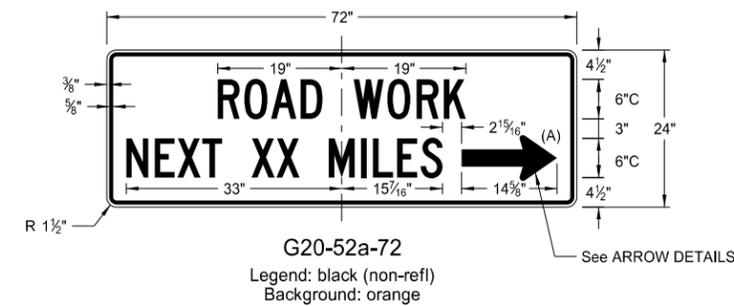
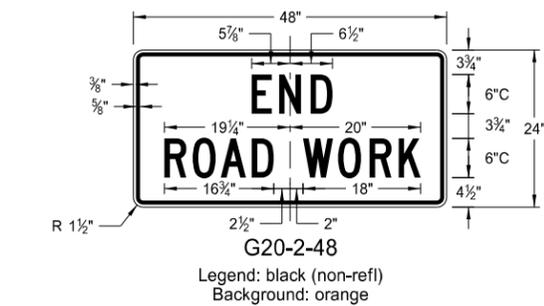
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CONSTRUCTION SIGN DETAILS
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS



NOTES:

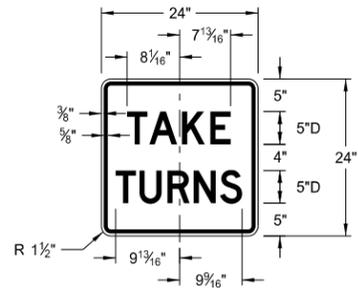
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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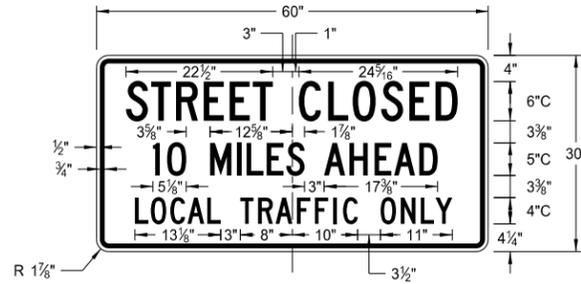
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CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

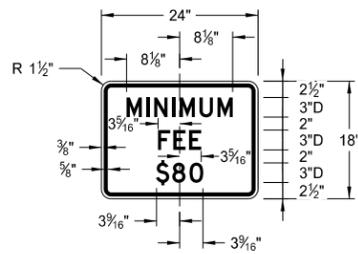
D-704-10



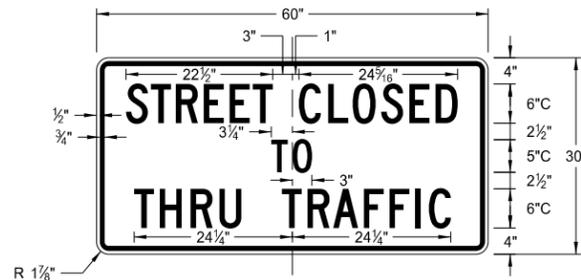
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R11-3c-60
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R2-1a-24
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R11-4a-60
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R11-2a-48
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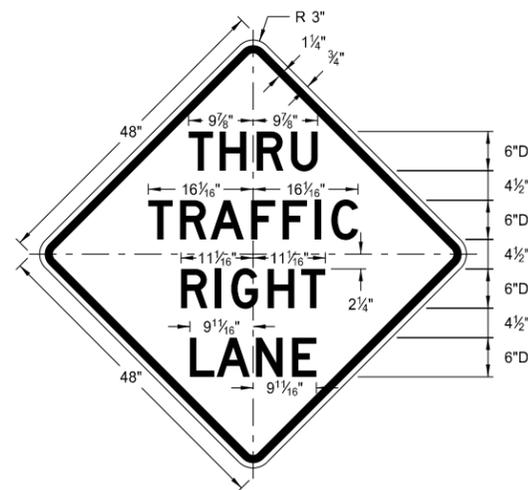
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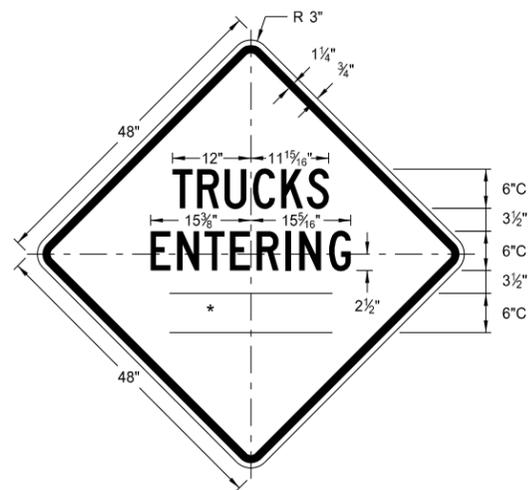
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

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

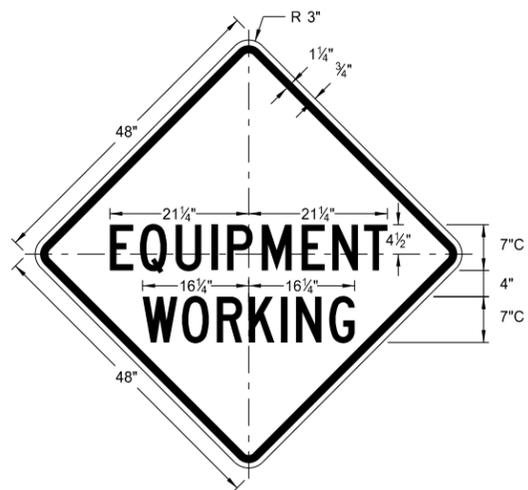
* DISTANCE MESSAGES



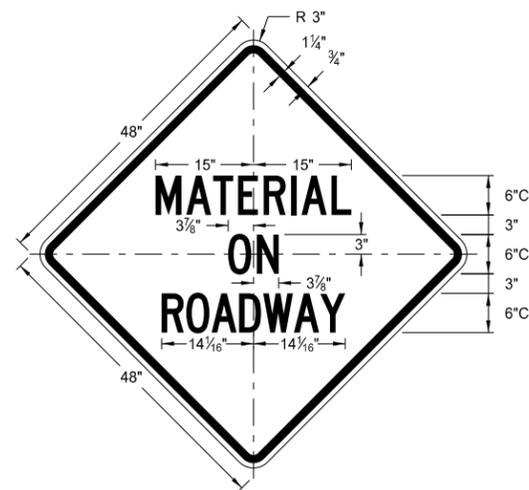
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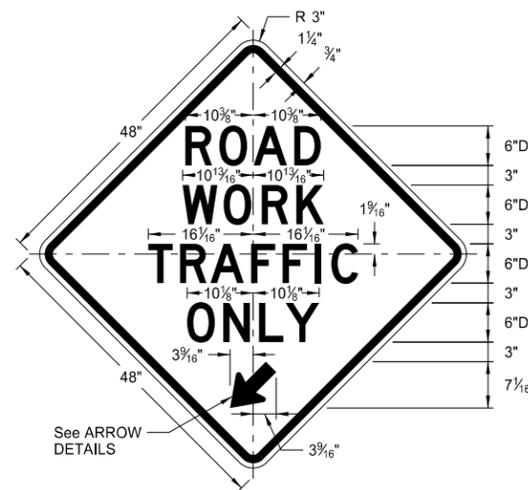
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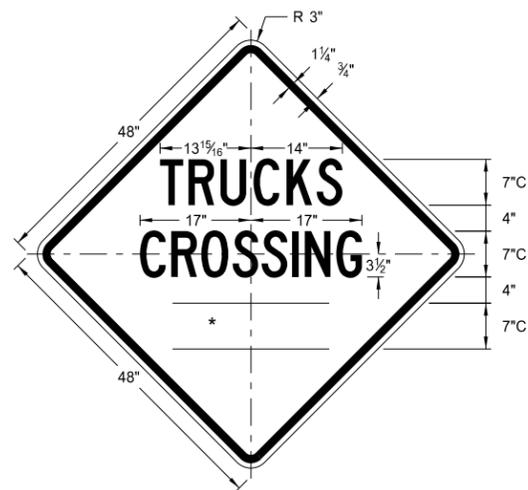
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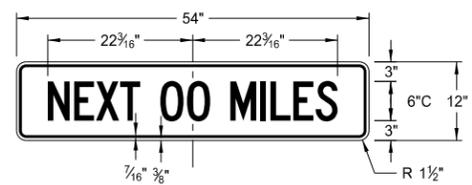
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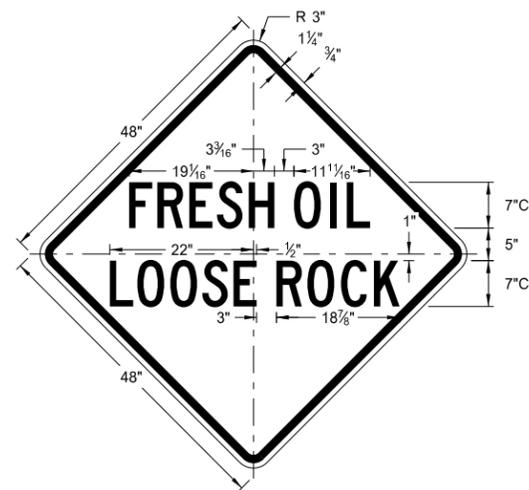
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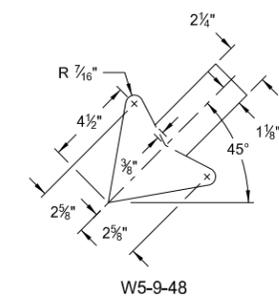
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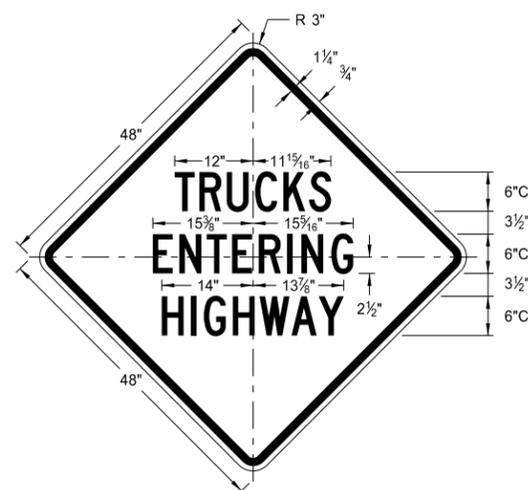
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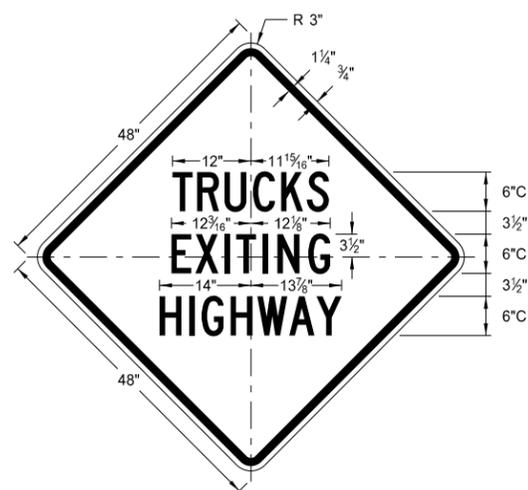
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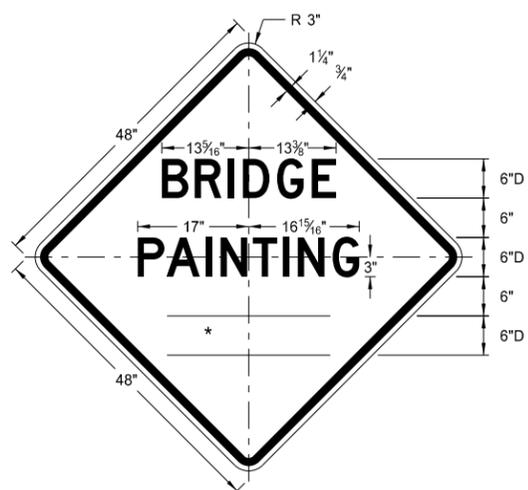
W5-9-48
ARROW DETAILS



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



W8-56-48
Legend: black (non-refl)
Background: orange



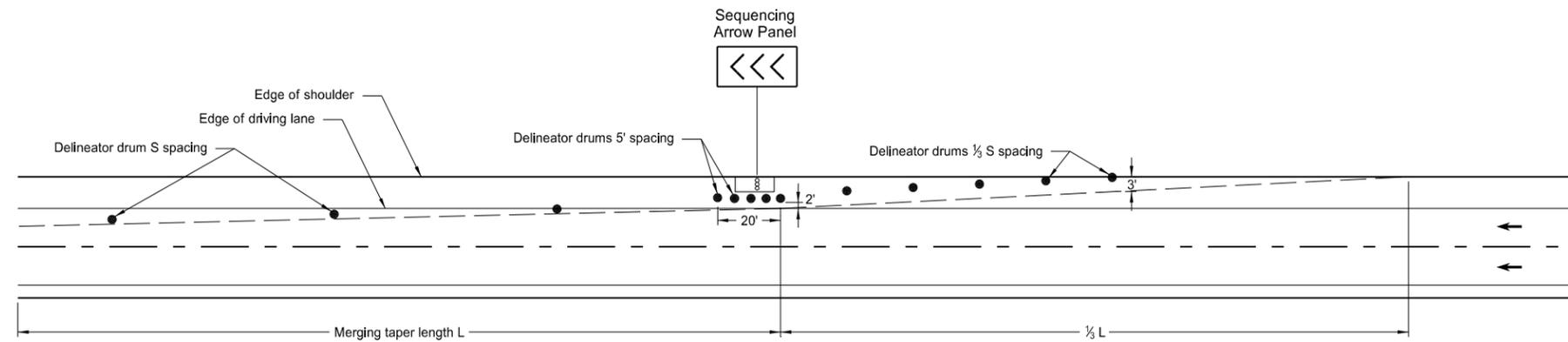
W21-50-48
Legend: black (non-refl)
Background: orange

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

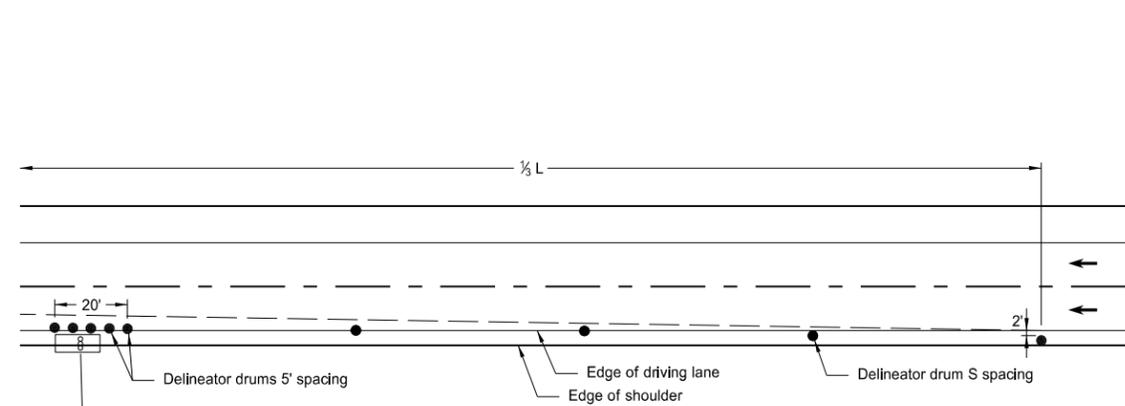
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SHOULDER CLOSURE TAPERS

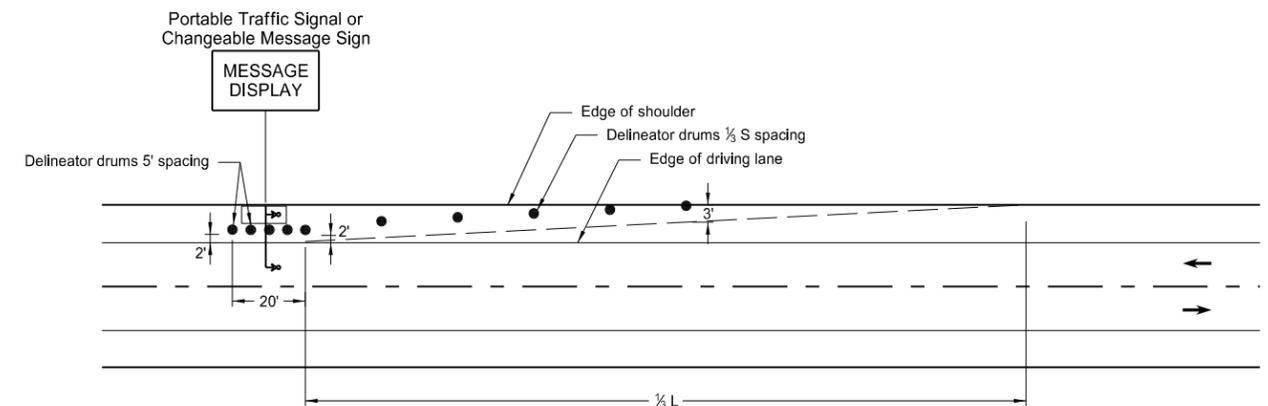
D-704-12



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



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



PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

KEY	
● Delineator Drum	∞ Sequencing Arrow Panel
• Message Display	↳ Portable Traffic Signal

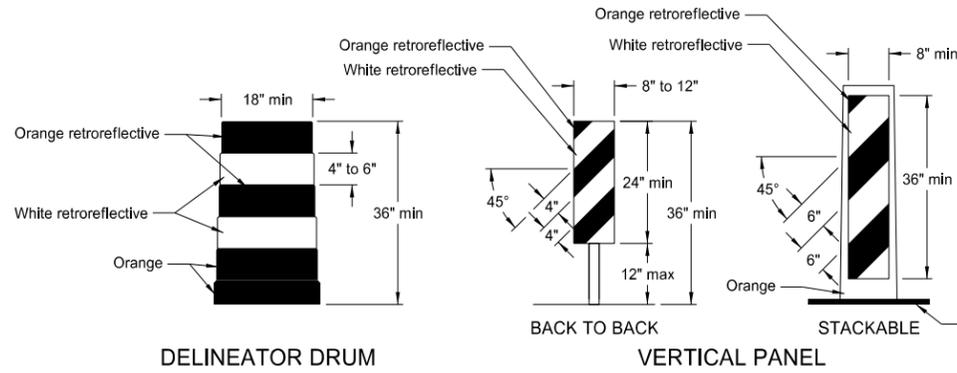
Notes:

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

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

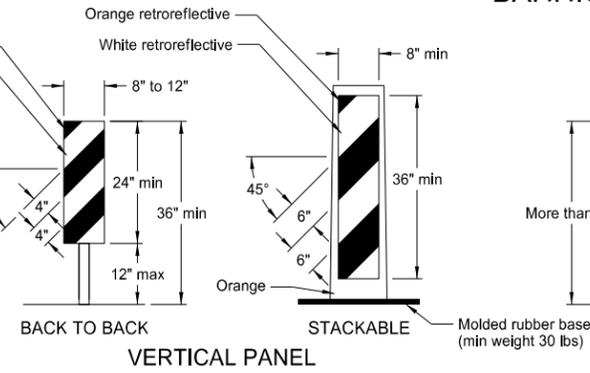
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BARRICADE AND CHANNELIZING DEVICE DETAILS



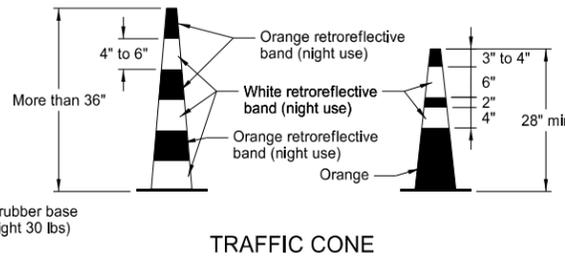
DELINEATOR DRUM

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4\"/>



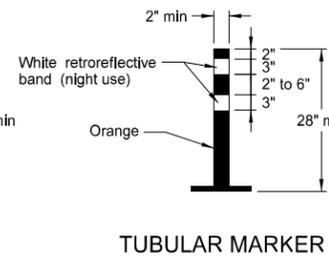
VERTICAL PANEL

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



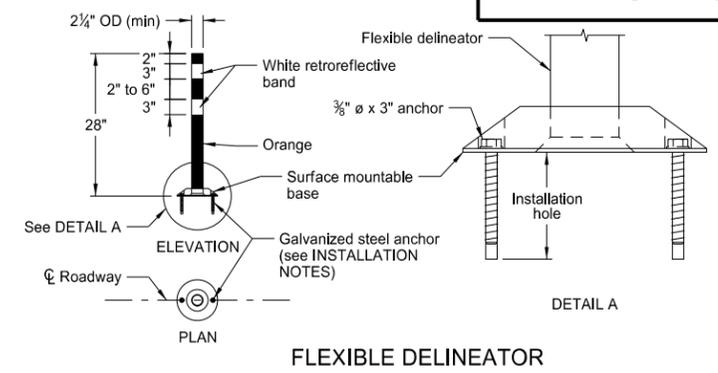
TRAFFIC CONE

RetroreflectORIZATION of cones more than 36\"/>



TUBULAR MARKER

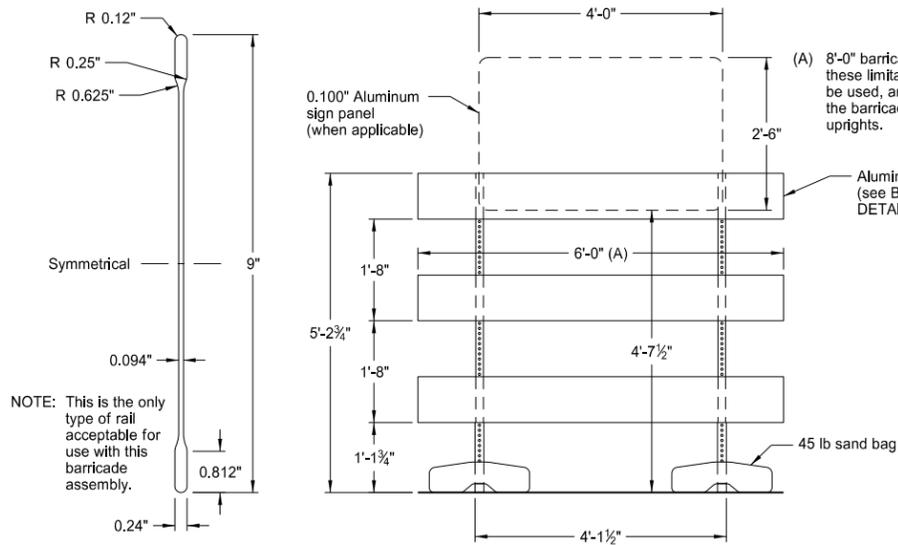
RetroreflectORIZATION of tubular markers more than 42\"/>



FLEXIBLE DELINEATOR

INSTALLATION NOTES:

1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8\"/>

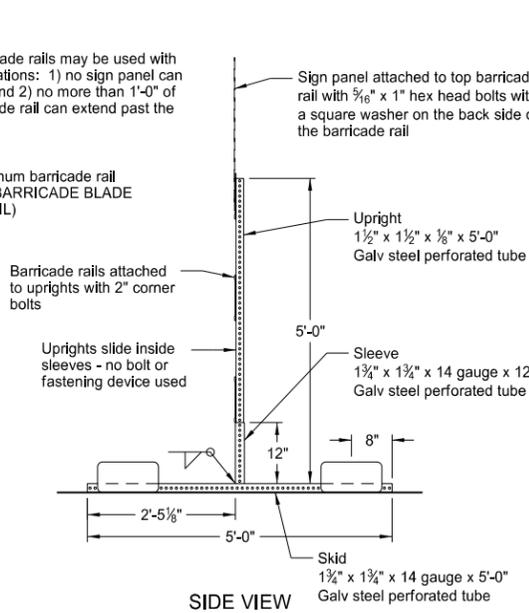


BARRICADE BLADE DETAIL

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

NOTE: This is the only type of rail acceptable for use with this barricade assembly.

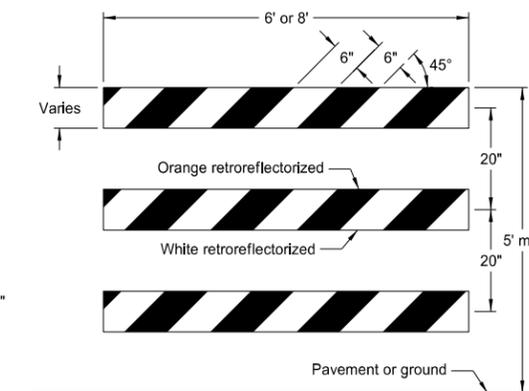


ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW

SIDE VIEW

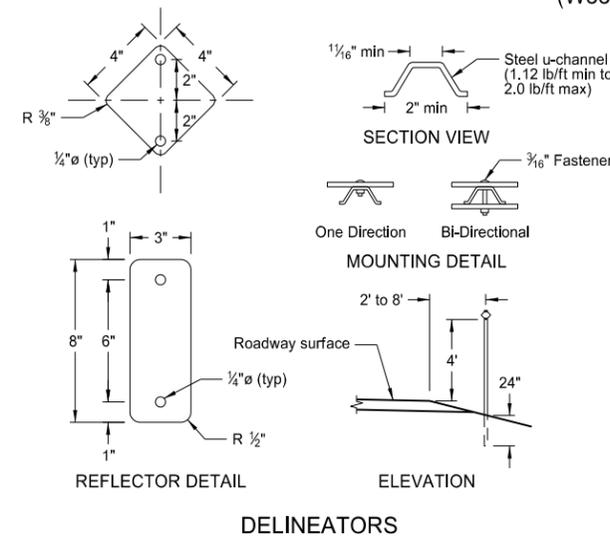


TYPE I BARRICADE

TYPE II BARRICADE

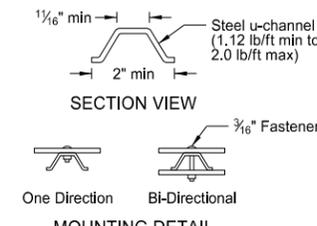
BARRICADE RAIL DETAILS

TYPE III BARRICADE



REFLECTOR DETAIL

DELINEATORS



MOUNTING DETAIL

MINIMUM BALLAST (For each side of barricade support)

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

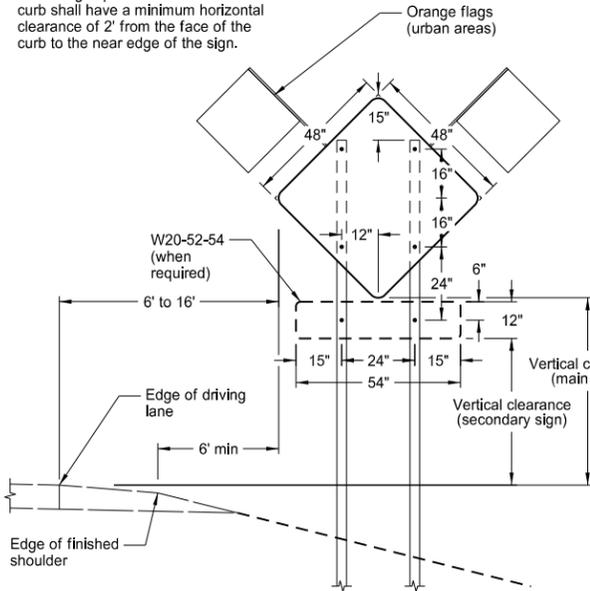
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

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

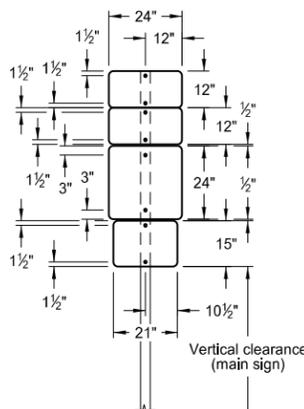
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

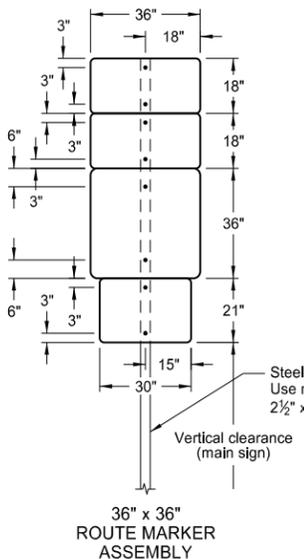
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



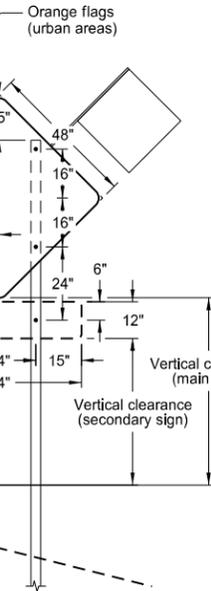
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



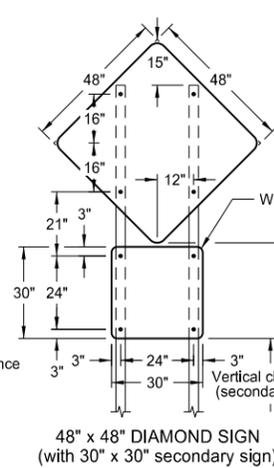
24" x 24" ROUTE MARKER ASSEMBLY



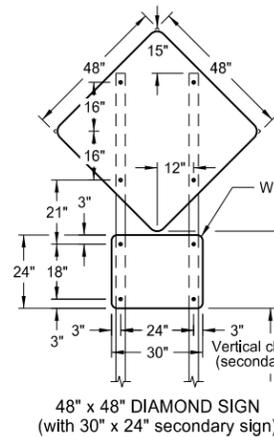
36" x 36" ROUTE MARKER ASSEMBLY



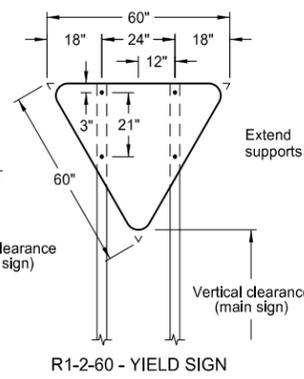
18" x 18" DIAMOND SIGN



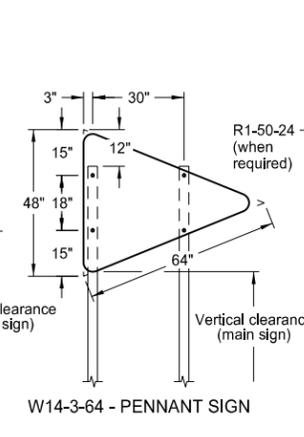
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



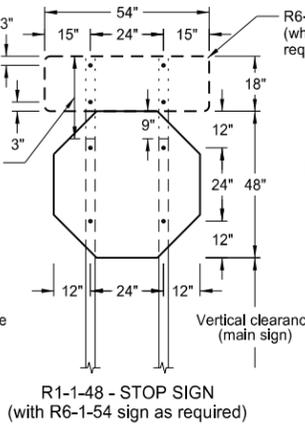
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



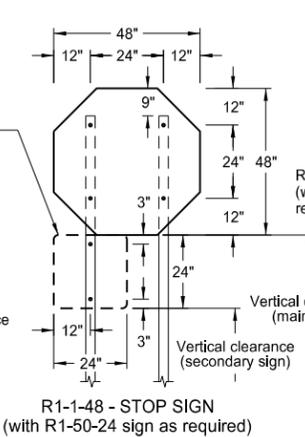
R1-2-60 - YIELD SIGN



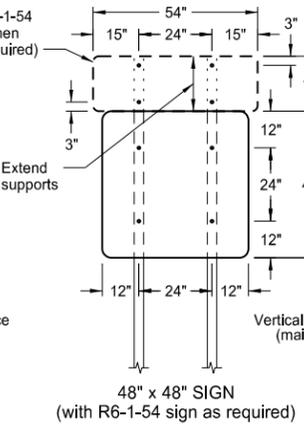
W14-3-64 - PENNANT SIGN



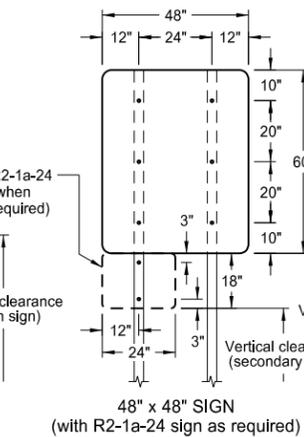
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



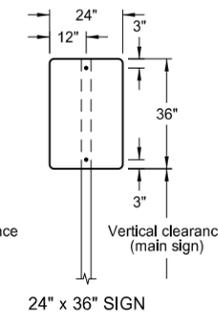
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



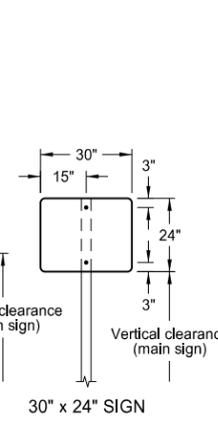
48" x 48" SIGN
(with R6-1-54 sign as required)



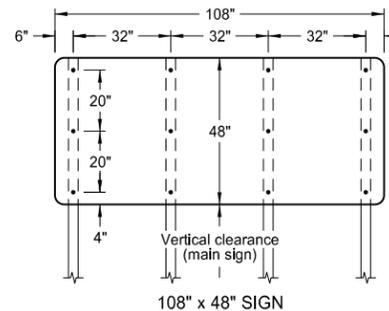
48" x 48" SIGN
(with R2-1a-24 sign as required)



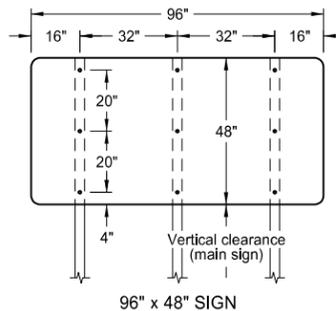
24" x 36" SIGN



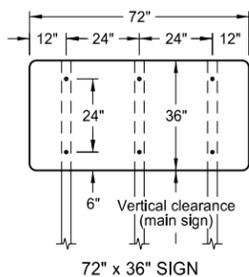
30" x 24" SIGN



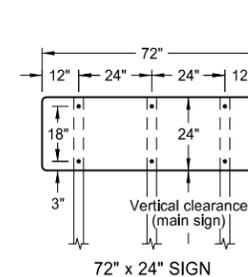
108" x 48" SIGN



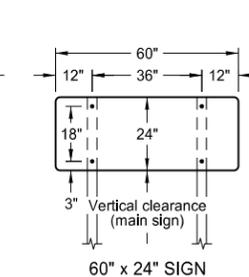
96" x 48" SIGN



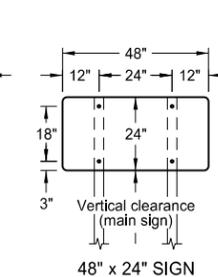
72" x 36" SIGN



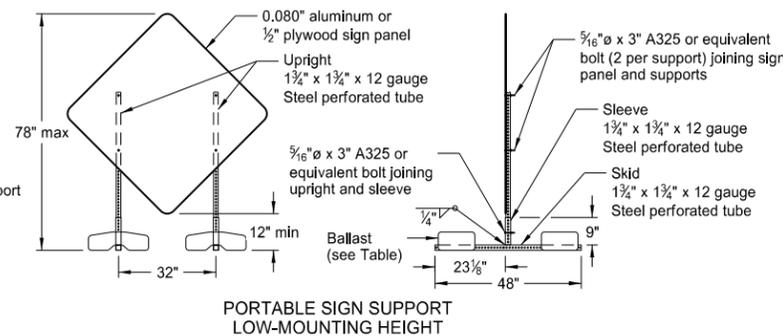
72" x 24" SIGN



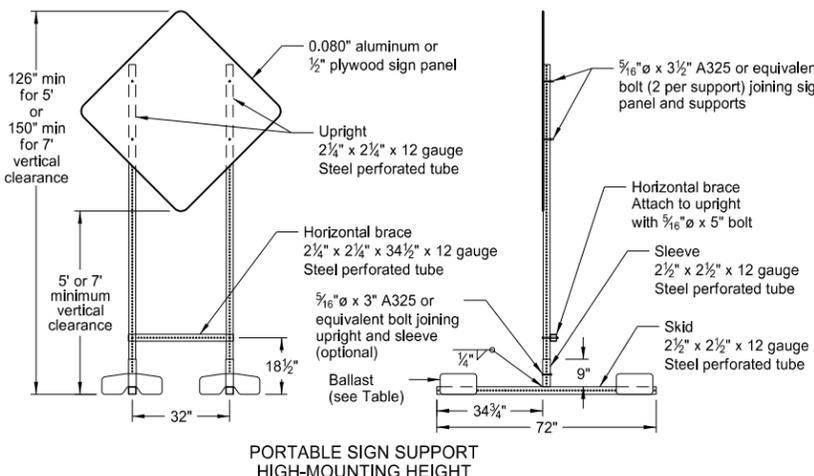
60" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

Signs over 50 square feet should be installed on 2 1/2" x 2 1/2" perforated tube supports as a minimum.

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

2. Sign Panels: Provide sign panels made of 0.100" aluminum, 1/2" plywood, or other approved material, except where noted. All holes to be punched round for 3/8" bolts.

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

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

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

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

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

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

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

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

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

MINIMUM BALLAST
(For each side of sign support base)

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

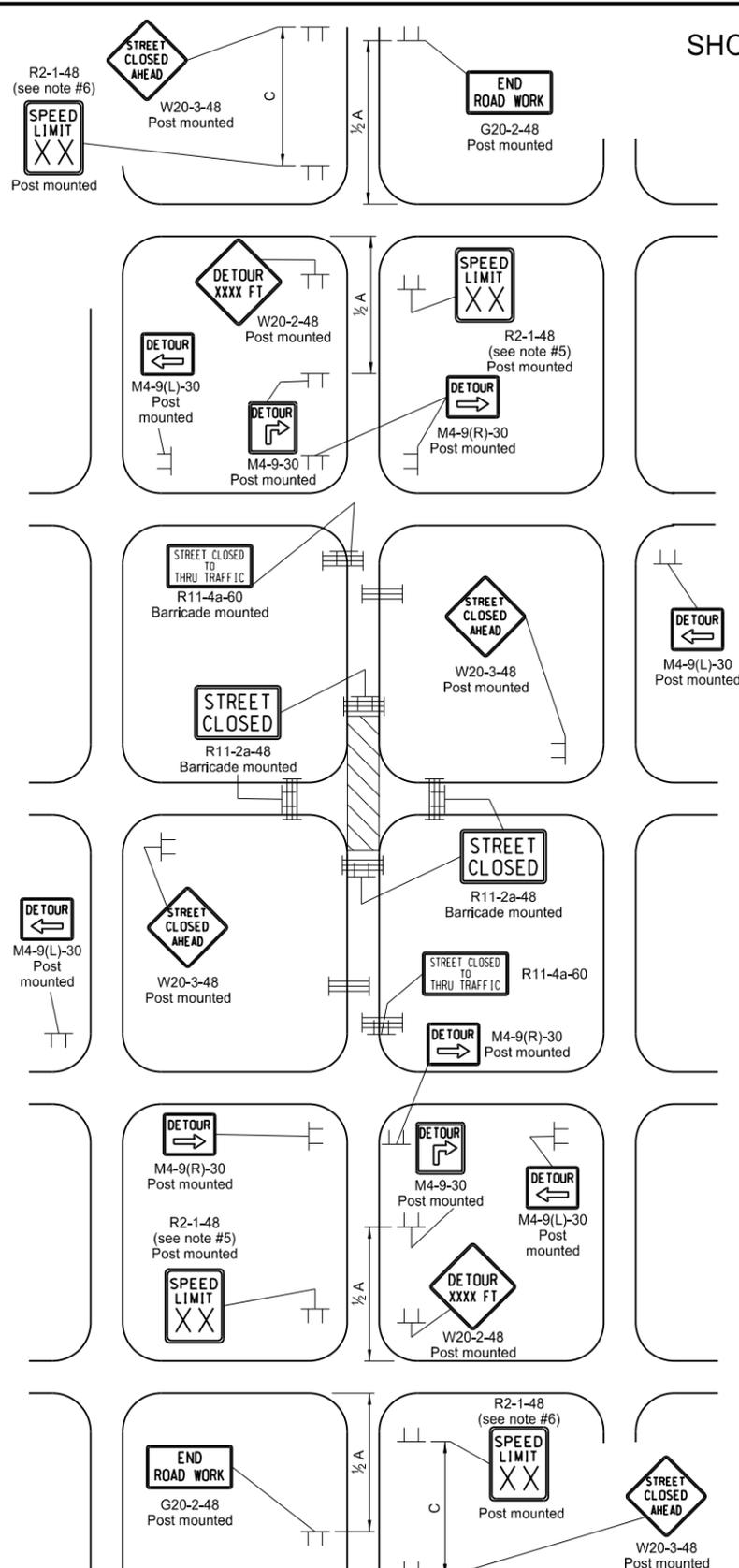
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

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

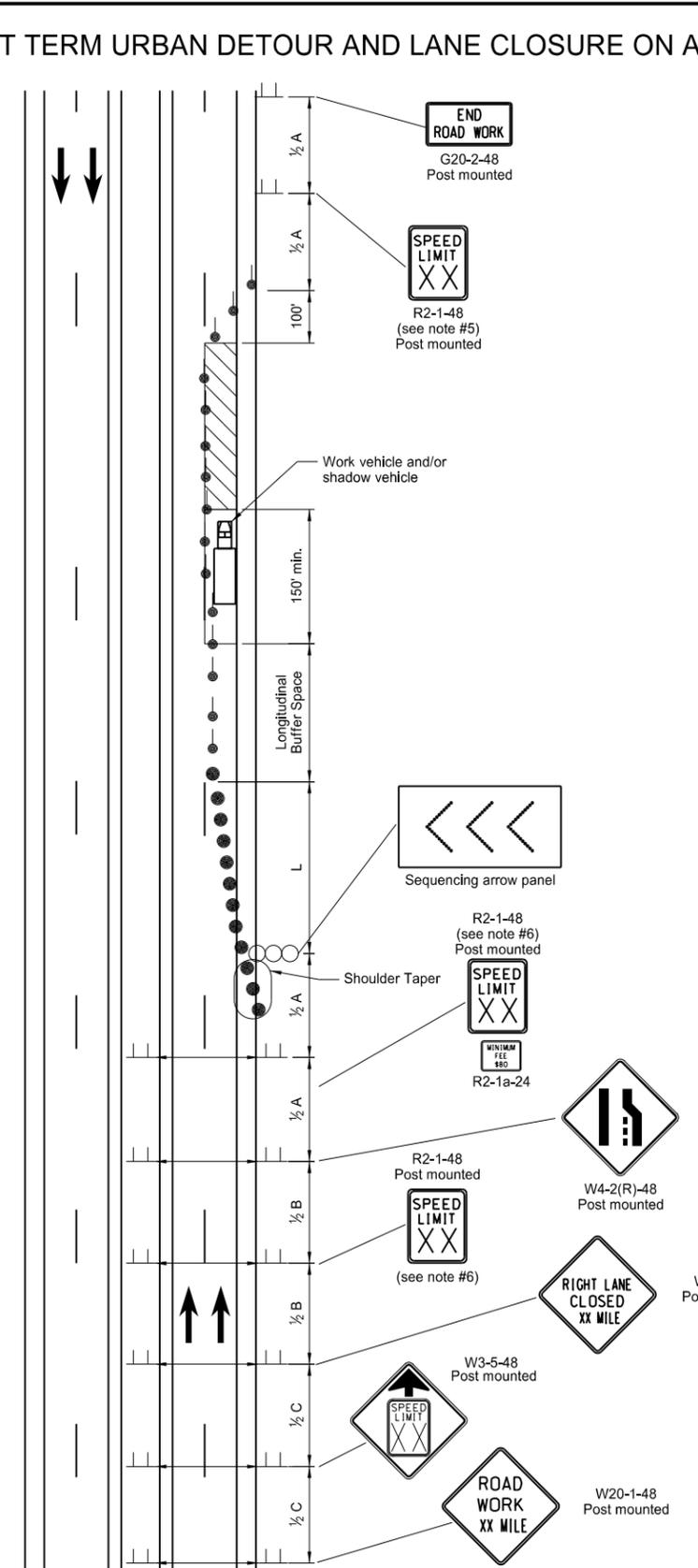
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SHORT TERM URBAN DETOUR AND LANE CLOSURE ON A DIVIDED HIGHWAY LAYOUTS

D-704-23



TYPE Q
DETOUR FOR A CLOSED STREET
 Where city streets are used for detouring traffic.
 Urban projects do not require the G20-55-96 and R2-1a-24 signs.



TYPE P
STATIONARY LANE CLOSURE ON A DIVIDED HIGHWAY
 4 lane divided roadway where 1/2 of roadway is closed.
 Short-term (more than 1 hour within a single daylight period.)

- Notes
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of 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.
 - Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
 - Delinicator drums used for tapering traffic shall be spaced at dimension "S". Delinicator drums or tubular markers used for tangents shall be spaced at 2 times "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 or less and 750 ADT or less).
 - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 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.
 - Intersection control for Type Q may have to be changed on detour. The Engineer in the field shall determine what control is necessary.
 - Where necessary, safe speed to be determined by the Engineer. When parking is present, signs shall be placed so they are entirely visible above parked vehicles or placed at the edge of the parking area so they are visible to oncoming traffic. These signs may be skid mounted when placed on the roadway surface.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

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

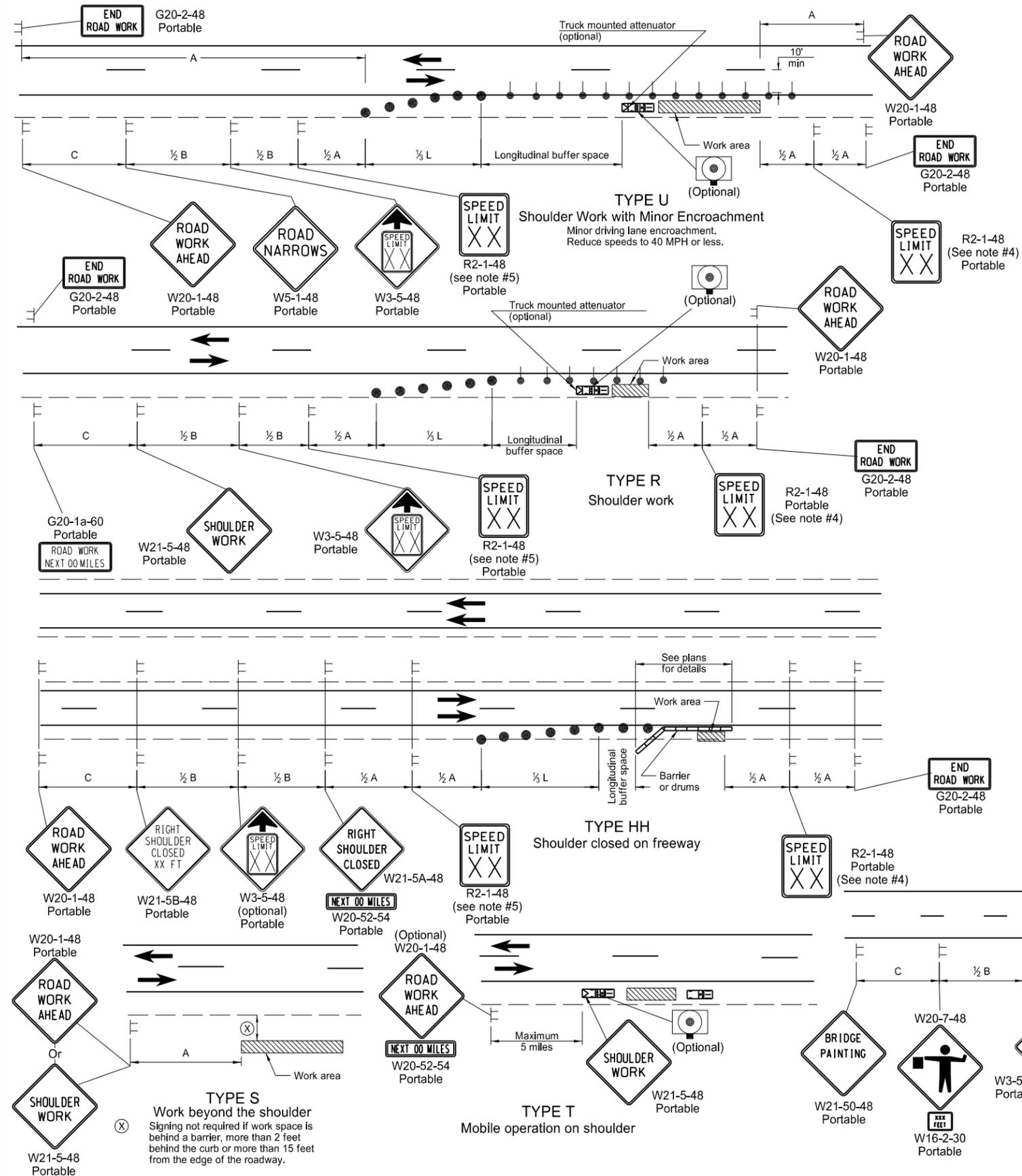
KEY	
	Type III barricade
	Sign
	Delineator Drum
	Work area
	Sequencing arrow panel
	Tubular Markers

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

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SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

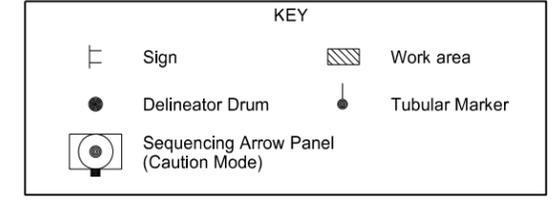
D-704-24



- 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 used for tapering traffic shall be spaced at dimension "S".
Delineator drums or tubular markers 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 or less and 750 ADT or less).
Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 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 $\frac{1}{2}B$.
 - 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 signs in accordance with the NDDOT Standard Specifications.

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

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

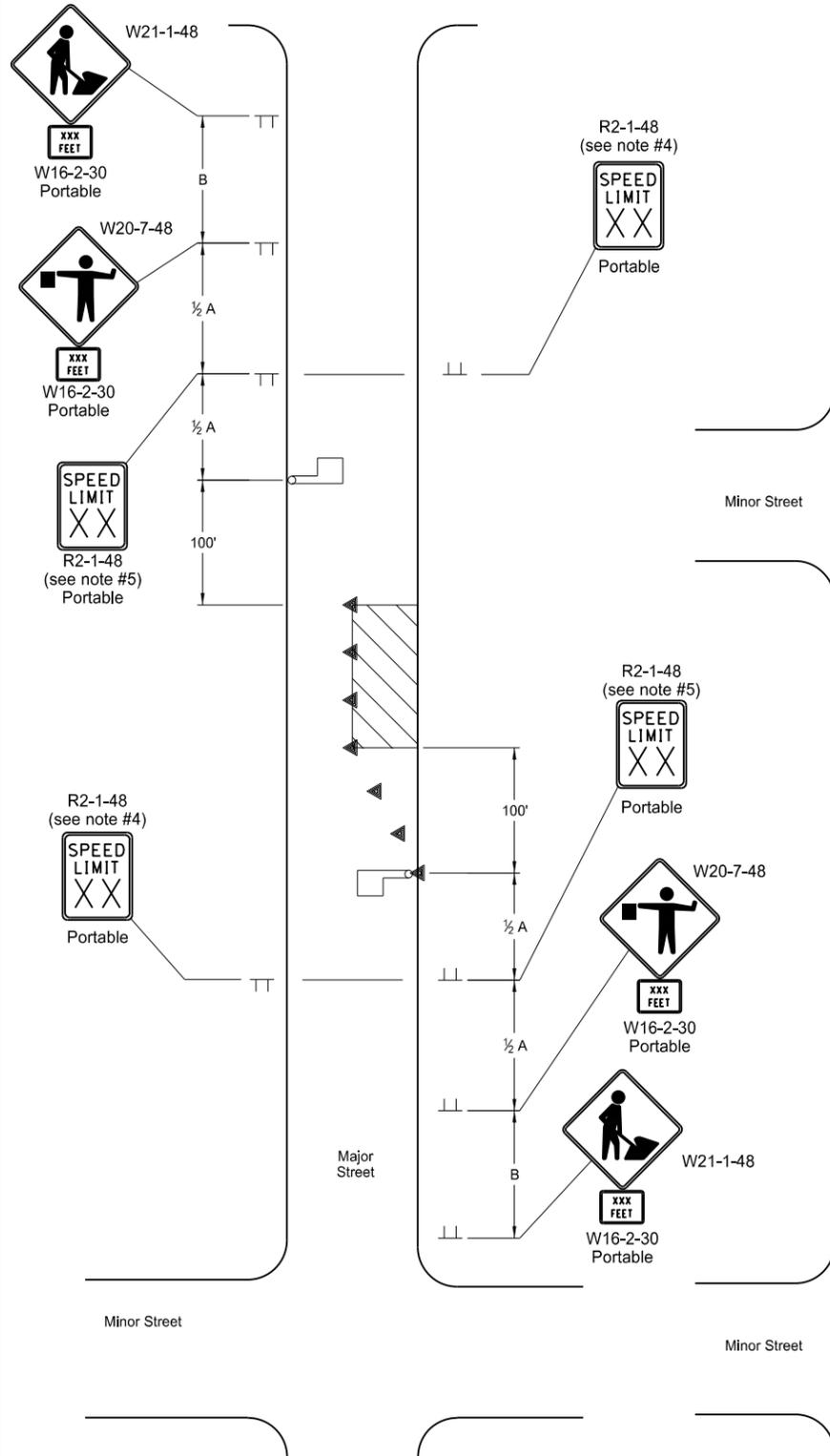


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9-27-13	
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DATE	CHANGE

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 of Transportation

LANE CLOSURES ON URBAN STREETS LAYOUTS

D-704-25

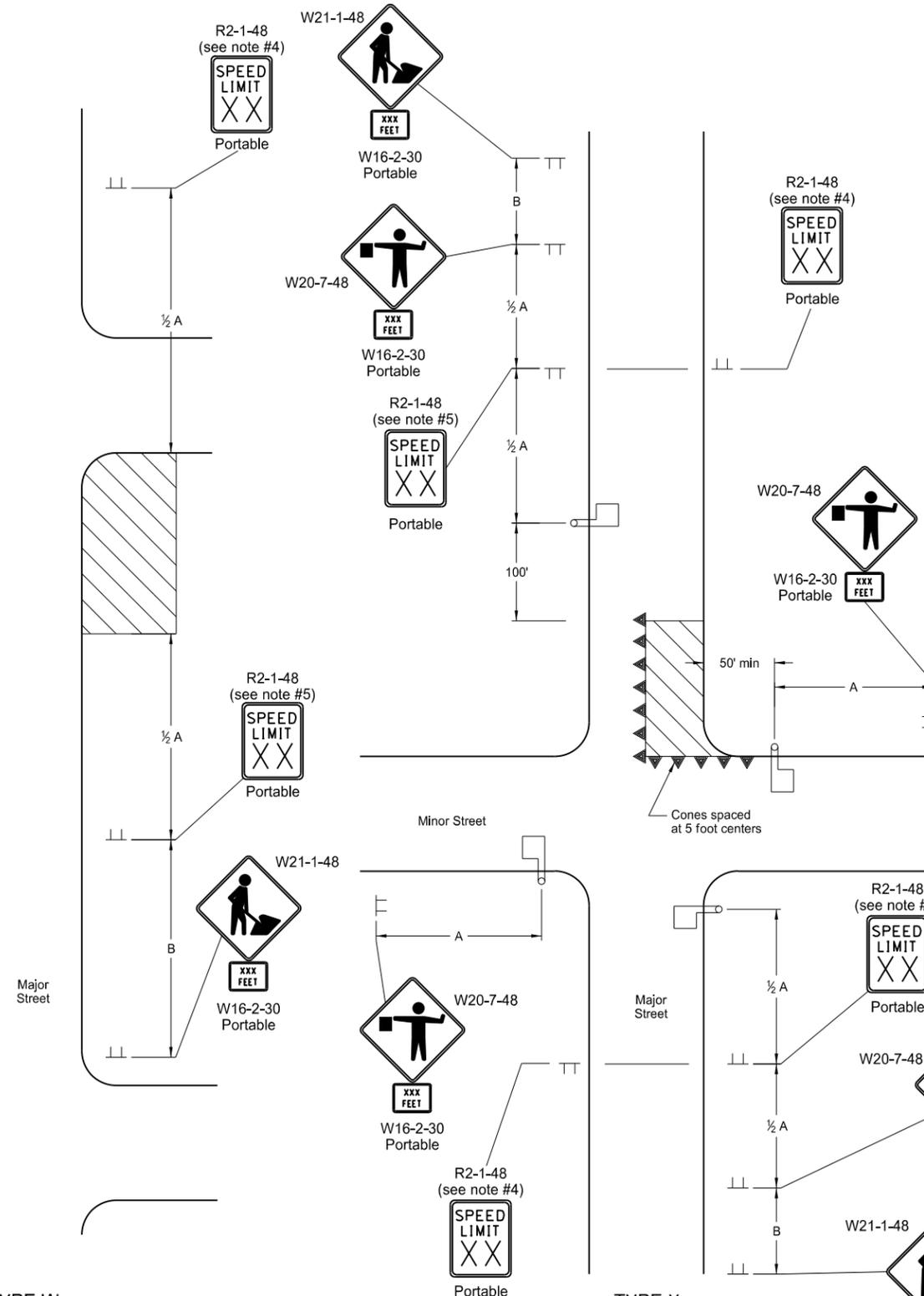


TYPE V
LANE CLOSURE ON URBAN STREET

When portion of roadway is closed to traffic only during daylight hours (mid block location).

TYPE W
WORK BEYOND CURB ON URBAN STREET

When work area is outside of driving lane and no closure is necessary

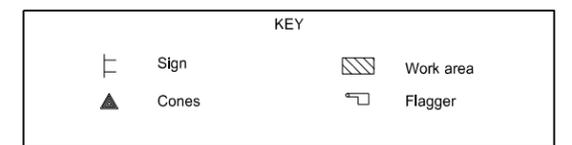


TYPE X
LANE CLOSURE NEAR INTERSECTION ON URBAN STREET

When portion of roadway is closed to traffic only during daylight hours (end block location).

- Notes
1. For Type V: The contractor will be allowed to work only on one side of the roadway at a time so as not to block off any more than one lane of traffic.
 2. When parking is present, the signs shall be placed so they are entirely visible above the parked vehicles or placed at the edge of the parking area so they are visible to oncoming traffic. These signs may be skid mounted when placed on the roadway surface.
 3. Delineator cones used for tapering traffic shall be placed at 3 equal spaces. Delineator cones for tangents shall be spaced at dimension "S". "S" = the numerical value of speed limit.
 4. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 5. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
 6. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 7. Existing speed limit signs within a reduced speed zone shall be covered.
 8. Where necessary, safe speed to be determined by the Engineer.
 9. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
 10. Urban projects do not need the G20-55-96 and R2-1a-24 signs.

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

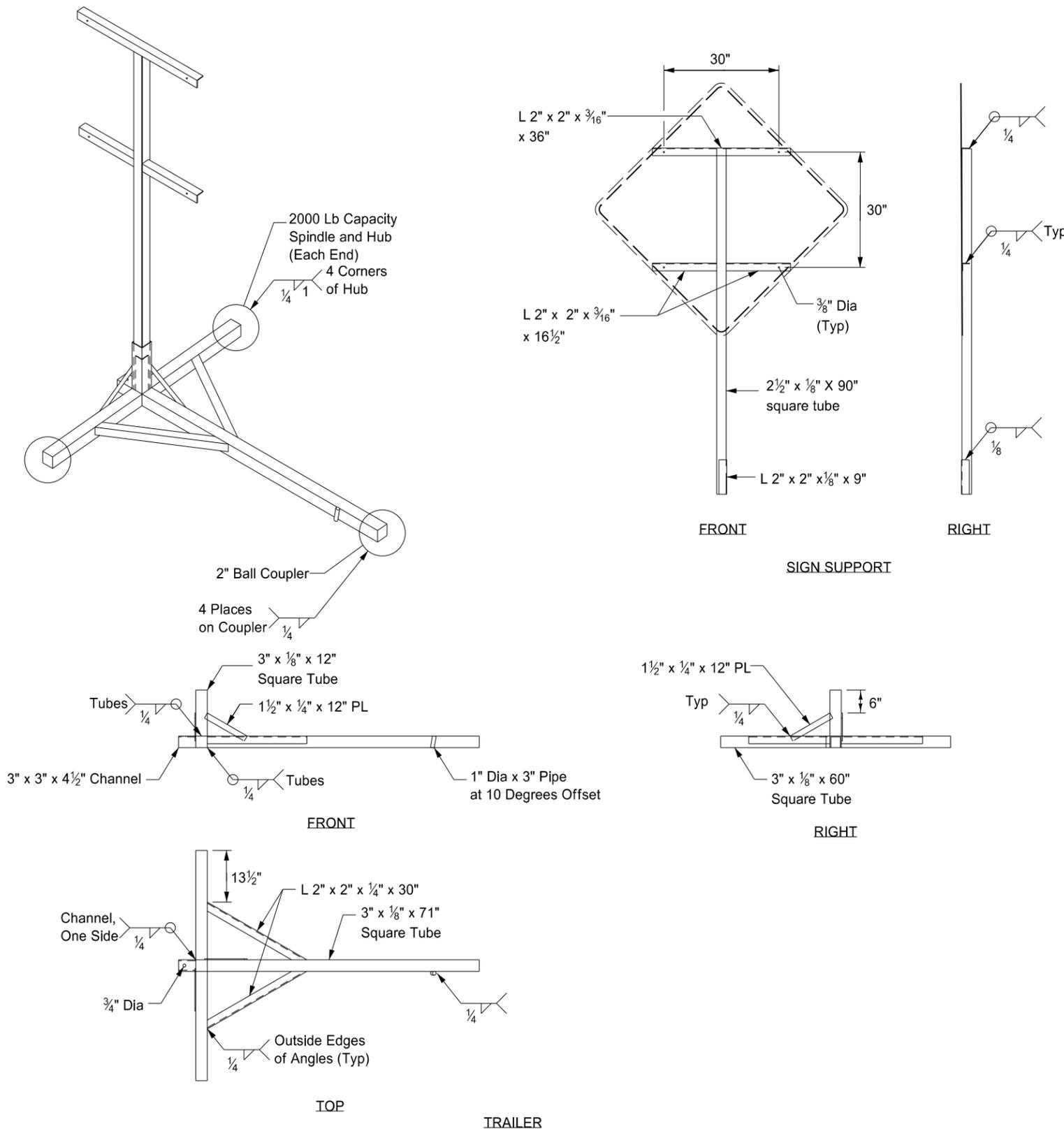


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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



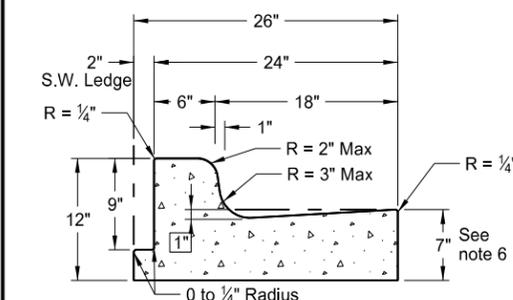
Notes:

- 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.

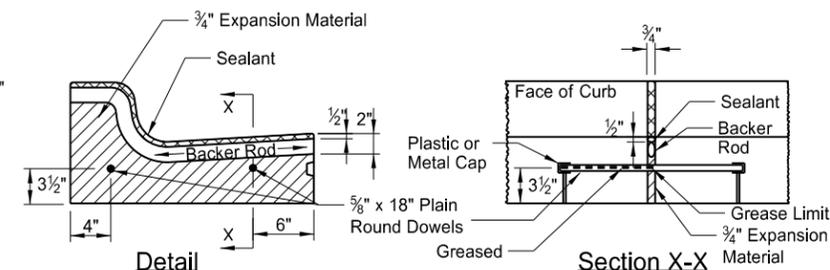
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11-23-10	
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DATE	CHANGE

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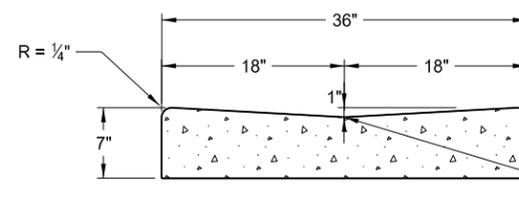
Curb & Gutter and Valley Gutter



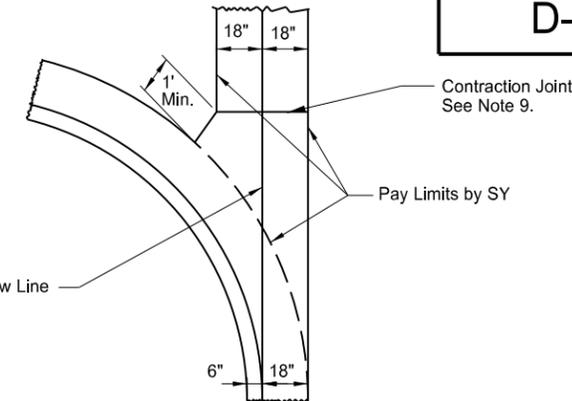
Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk,
Median, or Parking Lot.
(Sec. A shown. See Sec B for
additional details.)



Isolation Joint



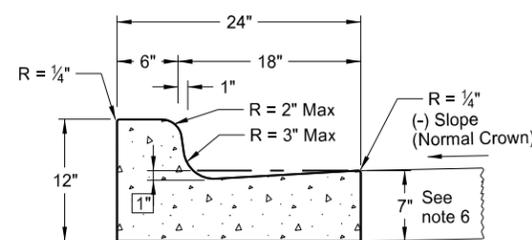
36" Concrete Valley Gutter Detail



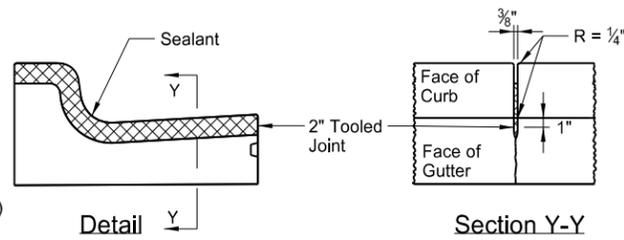
36" Concrete Valley Gutter Plan

NOTES:

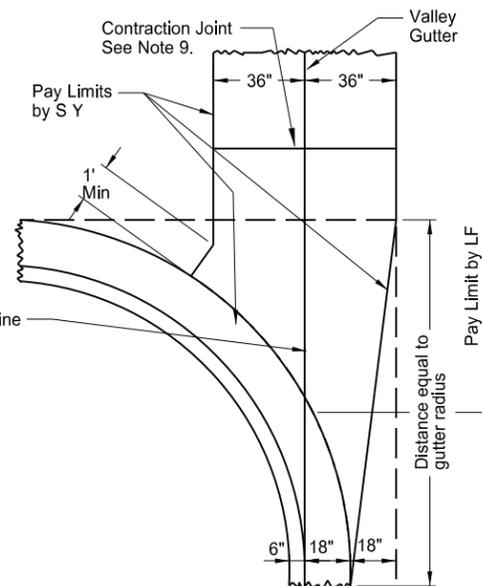
1. Curb and Gutter Type 1 (Sec. A & B) to be used. Section "A" to be used with (-) pavement slopes and section "B" to be used with (+) pavement slopes.
2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
3. Isolation Joints: Isolation joint material shall be 3/4" preformed expansion joint filler conforming to the standard specifications. The opening for the backer rod and joint sealant shall be formed by a pre-cut piece of wood or other material approved by the engineer. Dowel supports are not required on the second pour at a cold joint, plastic or metal caps and greased dowels shall be installed in the cold joint for the second pour.
4. Joint Spacing: For hot bituminous pavements the joint spacing for the curb and gutter shall be 10' max. with the panels on each side of the inlets. For concrete pavements the joint spacing for the curb and gutter shall match the pavement joint on PCC Pavements of approximately 15' spacing.
5. Joint sealing: All contraction and isolation joints shall be sealed as shown in the details. The joint sealant for contraction joints shall conform to section 826.02B. The sealant for expansion joints shall be as specified in note 3 above. The sealant shall be tooled and installed in accordance with the manufacturer's recommendations.
6. Depth of Face of Gutter: For hot bituminous pavement the depth of gutter shall be 7" as shown. For PCC pavements, the Contractor has the option to match the depth of gutter to the depth of the adjacent PCC pavement or to construct a 7" depth as shown.
7. When the curb and gutter abuts PCC pavement, it shall be tied to the PCC pavement. The tie bar shall consist of a No. 3 bar, 1'-6" in length spaced 4' center to center.
8. On street returns and other locations where the new curb and gutter ends and does not abut existing curb and gutter, the end two (2) feet of the curb shall be tapered from 6" in height to 0". A 1/2" preformed isolation joint which is full depth and the same shape as the curb and gutter shall be installed just ahead of the taper. An 18" tie bar shall be installed across the joint.
9. Valley Gutter Joints: Contraction joints are required at approx. 10' intervals. The contraction joints shall be 1/8" min. to 3/8" max. in width. The joints shall be formed by sawing or scoring to a minimum depth of 2". The joint sealant shall be a hot poured elastic type joint sealer in accordance with Section 826.02A.2 of the Standard Specifications. The joint and sealant shall be included in the price bid for Valley Gutter.



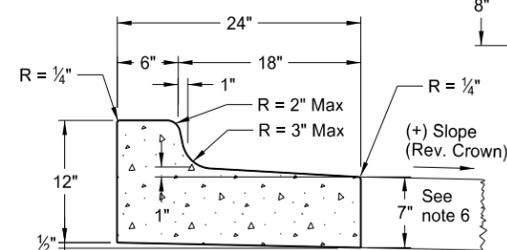
Curb & Gutter Type 1 (Sec. A)



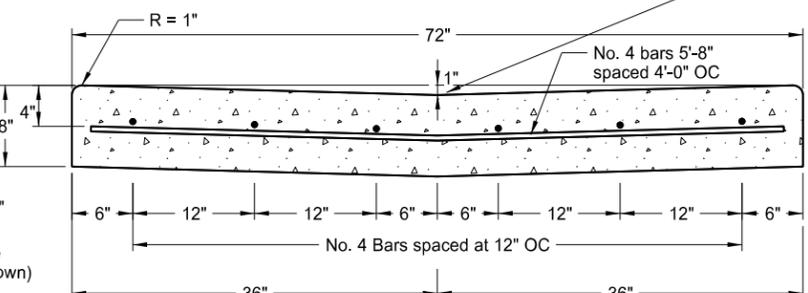
Contraction Joint
(10' Max Spacing)



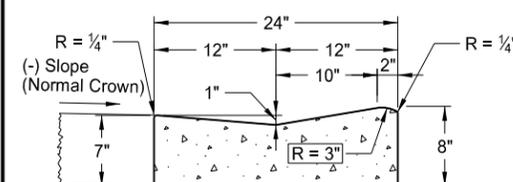
72" Concrete Valley Gutter Detail



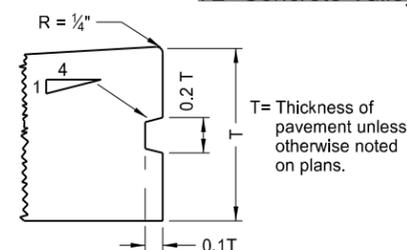
Curb & Gutter Type 1 (Sec. B)



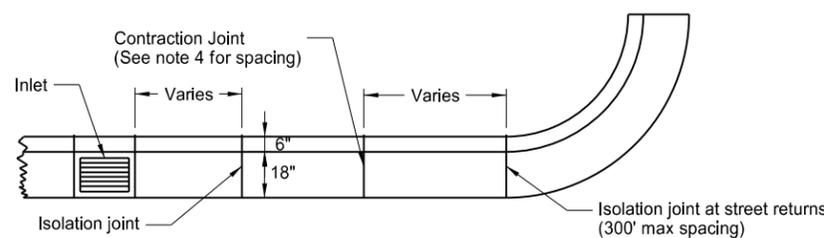
72" Concrete Valley Gutter Detail



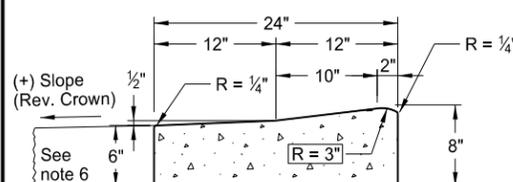
Mountable Curb & Gutter Type 1 (Sec. A)



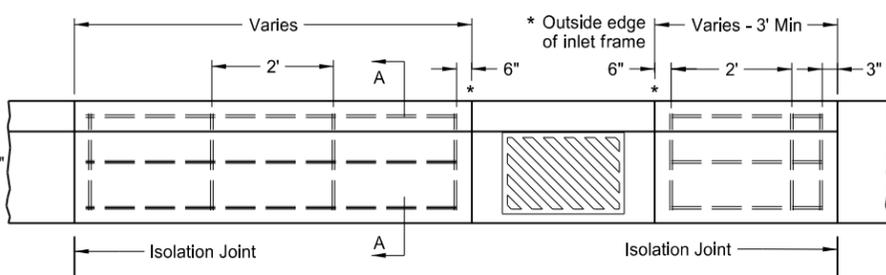
Keyway Detail for Curb & Gutter
(To be used with PCC Pavement and Drives)



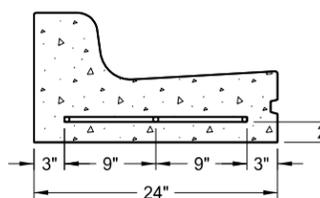
Joint Location Detail



Mountable Curb & Gutter Type 1 (Sec. B)



Curb & Gutter Reinforcing at Inlets



Section A-A

NOTE: All bars shall be #4 deformed reinforcing bars. Splices will not be permitted. Reinforcing bars at inlet locations will not be paid for separately, but shall be included in the price bid for "Curb and Gutter - Type 1." This includes inlets located on radii. The reinforcement shall be extended to the second joint (rebar placed through the first joint) in cases where the 3' min. panel length cannot be obtained.

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CURB RAMP DETAILS

D-750-3

+More Right of Way

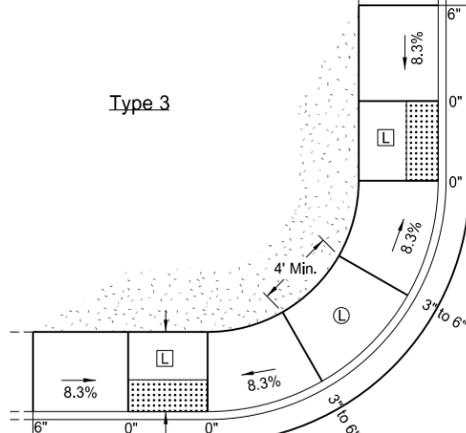
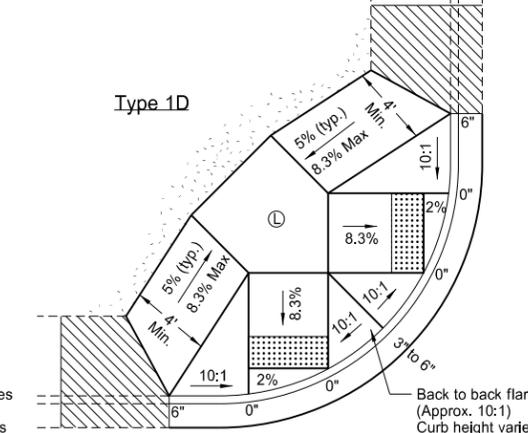
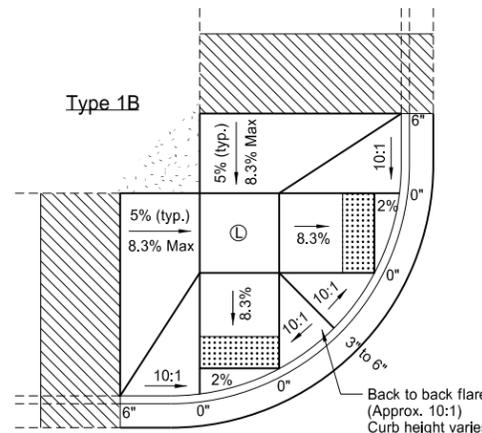
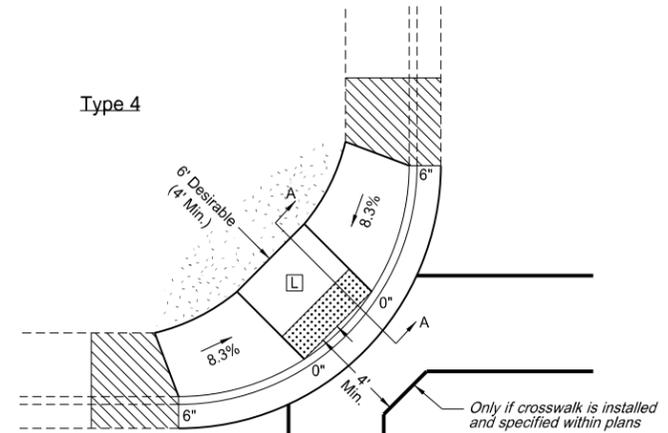
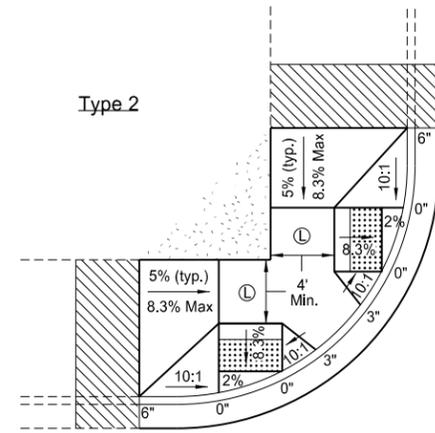
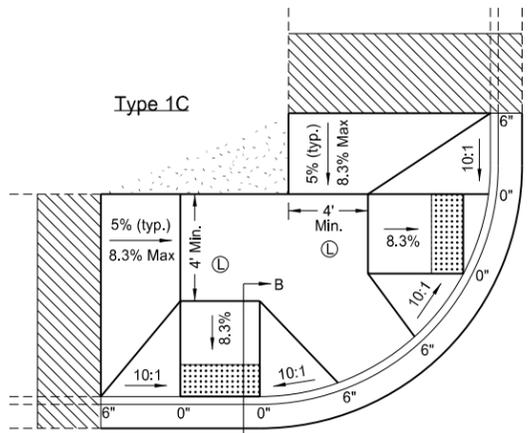
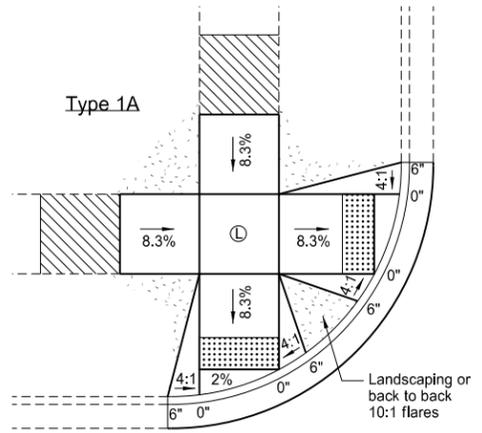
Less Right of Way

NOTES:

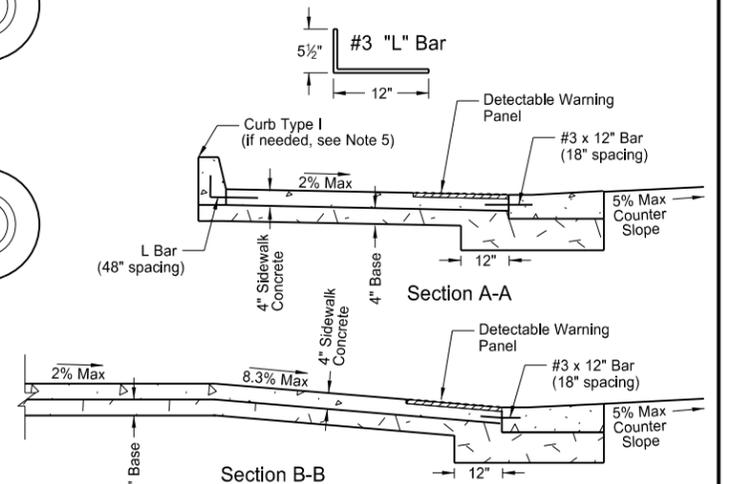
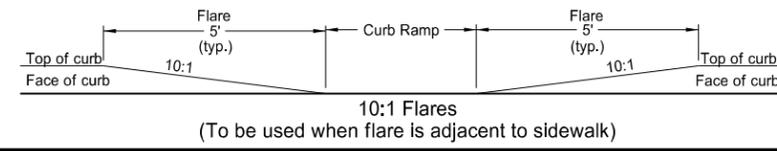
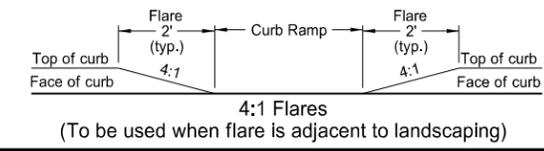
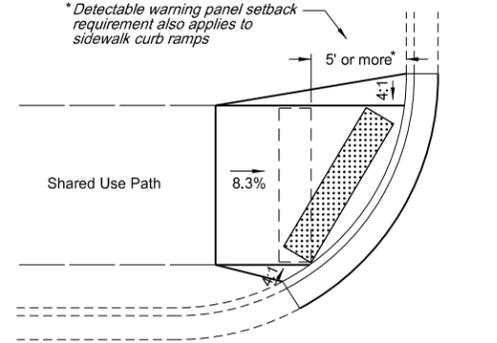
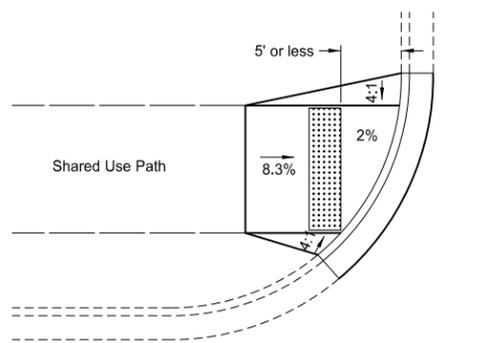
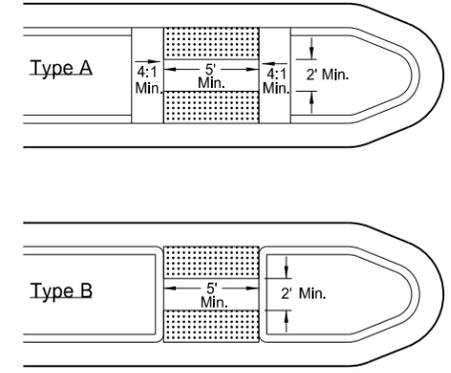
- Ramp width is defined as the useable portion of the ramp, excluding flares if used.
Curb ramp width should match the existing sidewalk width, 4' width minimum.
Ramp width for shared-use paths should match the existing shared use path width.
Ramp length shall be maximum of 15'.
- Landings shall be a minimum of 4' x 4' and shall have a max 2% slope in any direction. Landings are desirably 5' x 5' or larger.
- Detectable warning panels shall match the ramp width. Radial panels may also be used. The detectable warning panel may be located within the lower landing.
- The pedestrian access route shall be continuous 4' min. width. Max 2% cross slope applies to all concrete, excluding flares.
- Landscaping is preferred to modify existing ground slope changes as needed. If not possible, such as adjacent buildings, a vertical curb may be used as shown in the detail below. The curb will be paid for at the unit price bid for the item "Curb - Type I" per lineal foot.

LEGEND:

- : Detectable Warning Panel
- : Landscaping
- : Transitional tie-in segment if needed for retrofits. Max grade slope 8.3%.
- : Upper Landing
- : Lower Landing
- 0", 3", or 6" : Curb Height
- 8.3% : All slopes shown are max grades. Flatter slopes may be used.



Median Refuge Islands (Cut-Through)



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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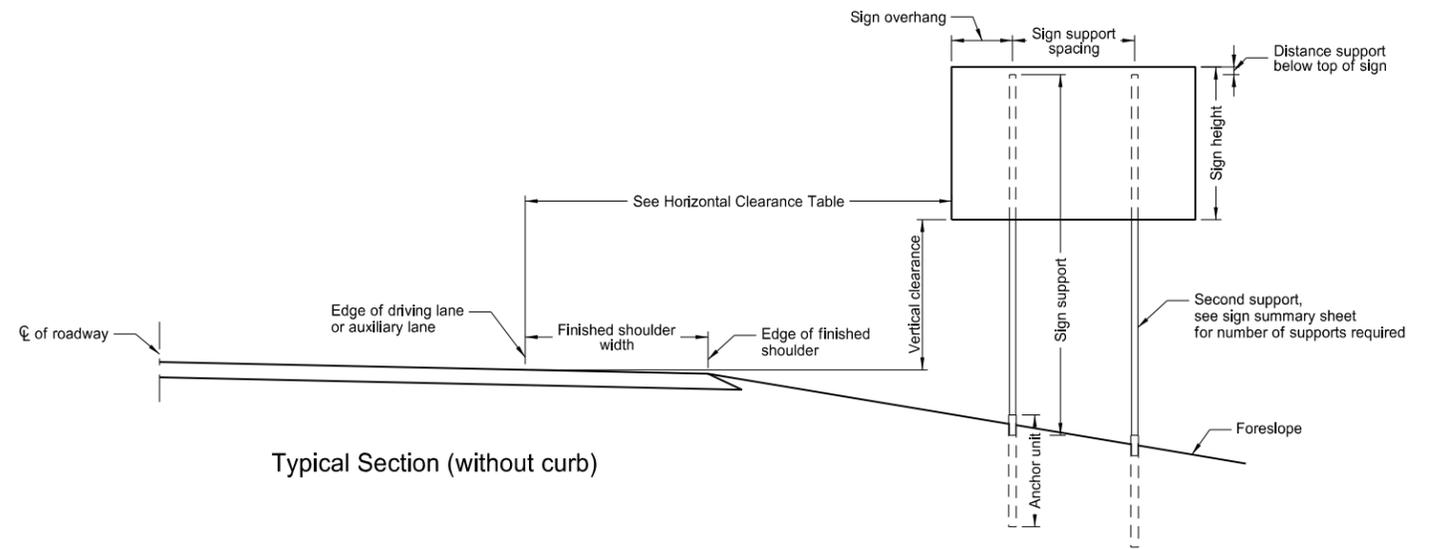
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PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

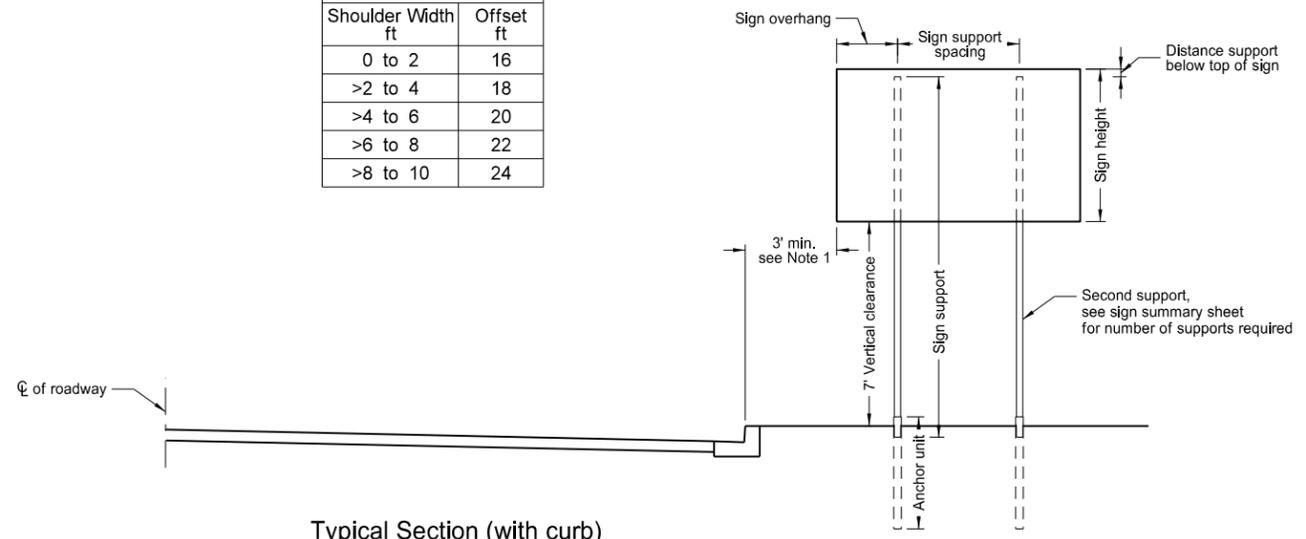
Notes:

1. Curbed Roadways: The clearance from the face of the curb should be 3' except where right of way or sidewalk width is limited, a minimum clearance of 2' shall be provided. The horizontal clearance may need to be increased to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.
2. Minimum vertical clearance: Signs installed at the side of the road in rural districts shall be at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane. Where parking or pedestrian movements occur, the clearance to the bottom of the sign shall be at least 7'.
- Signs on expressways shall be installed with a minimum height of 7'.
- Adopt-a-highway signs installed on Freeways shall be at least 7' above the edge of the driving lane.
- The vertical clearance shall have a maximum height of 6" above the vertical clearance specified above.
3. Offset signs: Where signs are placed at least 30 feet or more from the edge of the traveled way, the height to the bottom of such sign shall be 5' above the edge of the driving lane.
4. The clearance from edge of shared use path to edge of sign should be 3' except where width is limited, a minimum clearance of 2' shall be provided.

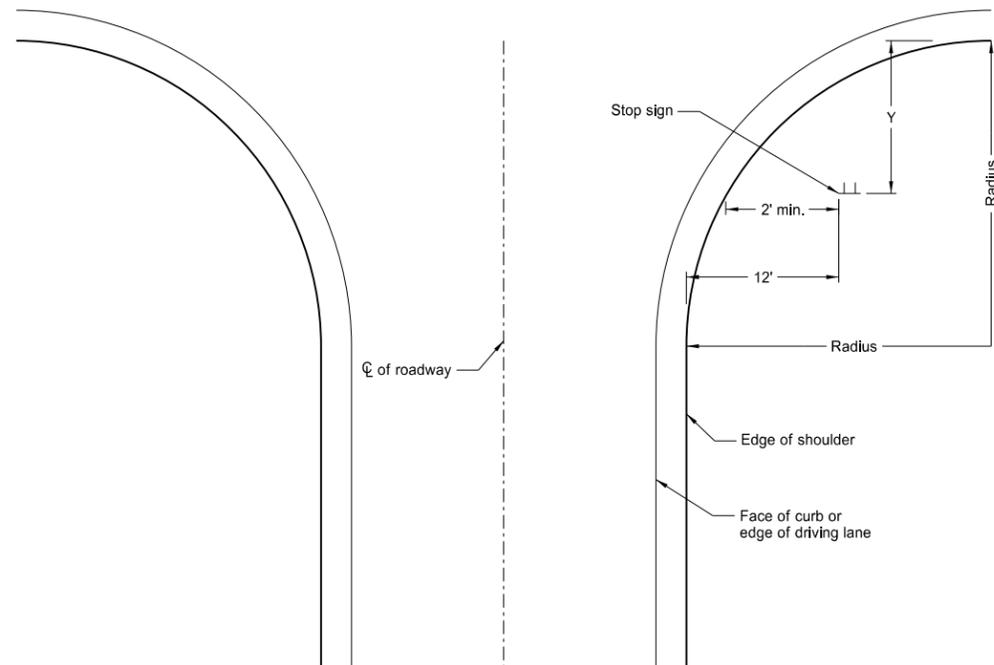


Typical Section (without curb)

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



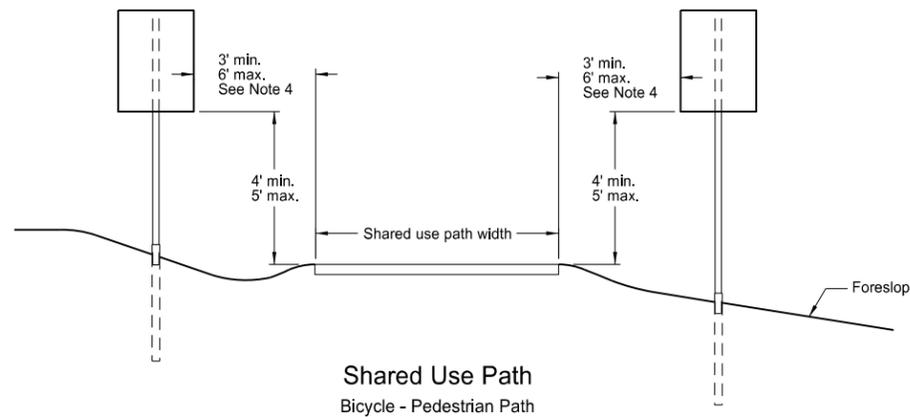
Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection

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

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



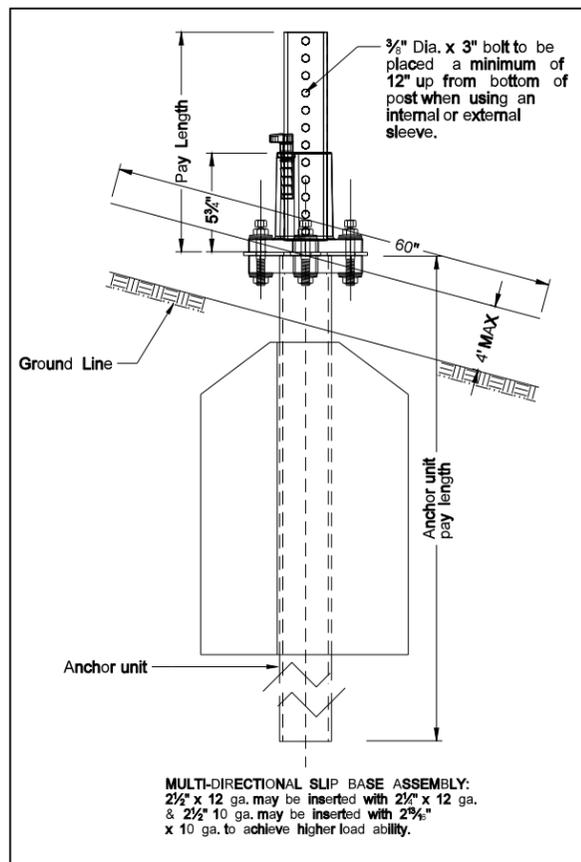
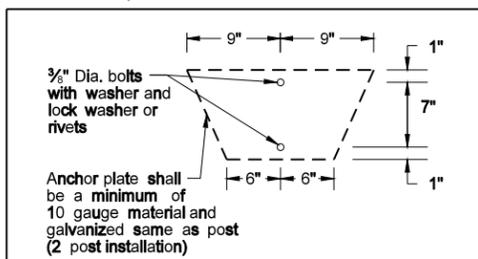
Shared Use Path
Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
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7-8-14	Revised note 2, added note 4.

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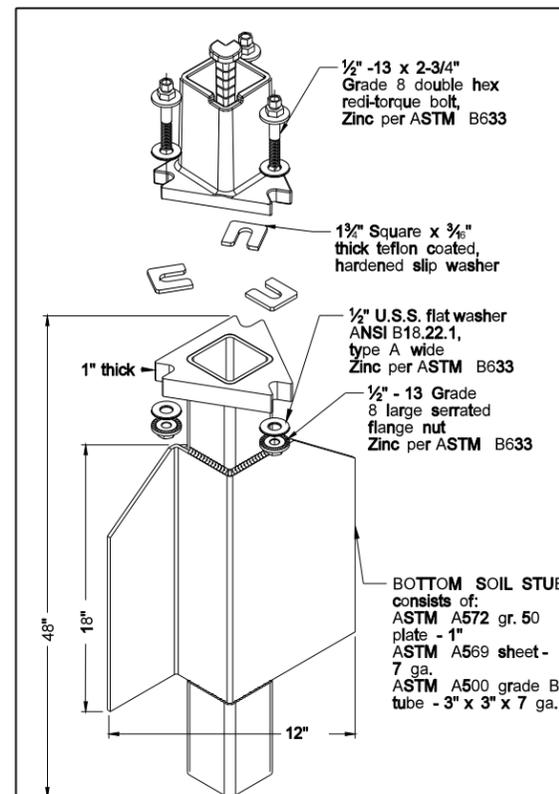
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/2	12
1	2 1/2	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/2	12	2 1/2(D)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

(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.
 (C) - 3" anchor unit
 (D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.

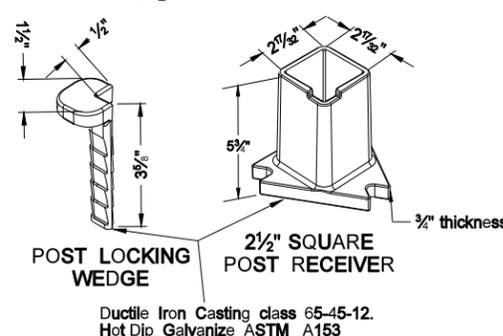


MULTI-DIRECTIONAL SLIP BASE ASSEMBLY:
 2 1/2" x 12 ga. may be inserted with 2 1/2" x 12 ga. & 2 1/2" 10 ga. may be inserted with 2 3/8" x 10 ga. to achieve higher load ability.

Mounting Details Perforated Tube

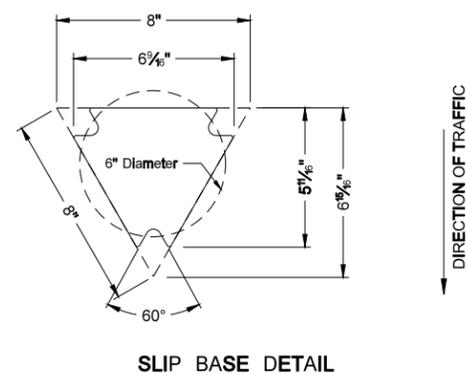


SLIP BASE FOR 2 1/2" POST



2 1/2" SQUARE POST RECEIVER

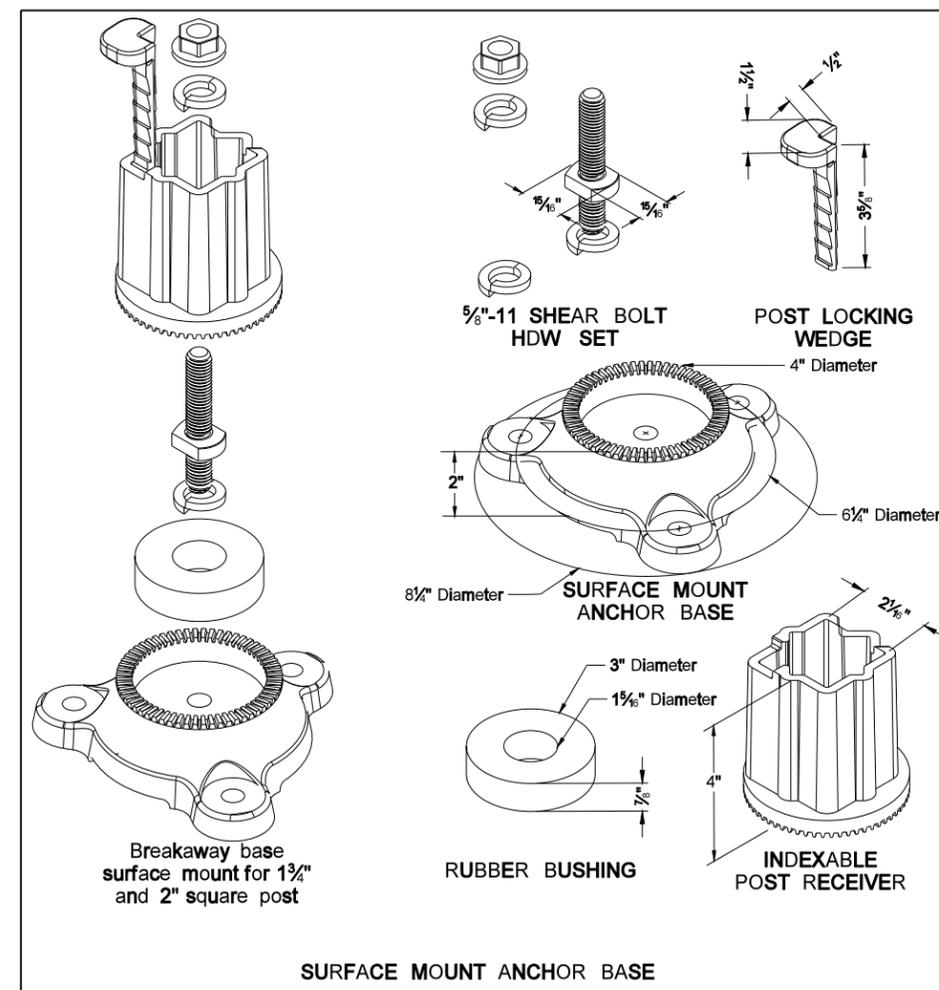
Ductile Iron Casting class 65-45-12. Hot Dip Galvanize ASTM A153



SLIP BASE DETAIL

Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section 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 1/2 x 2 1/2	0.105	12	2.773	0.561	0.695	0.499
2 3/8 x 2 3/8	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783

The 2 3/8" size 10 gauge is shown as 2.19" size on the plans; The 2 1/2" size is shown as 2.51" size on the plans.



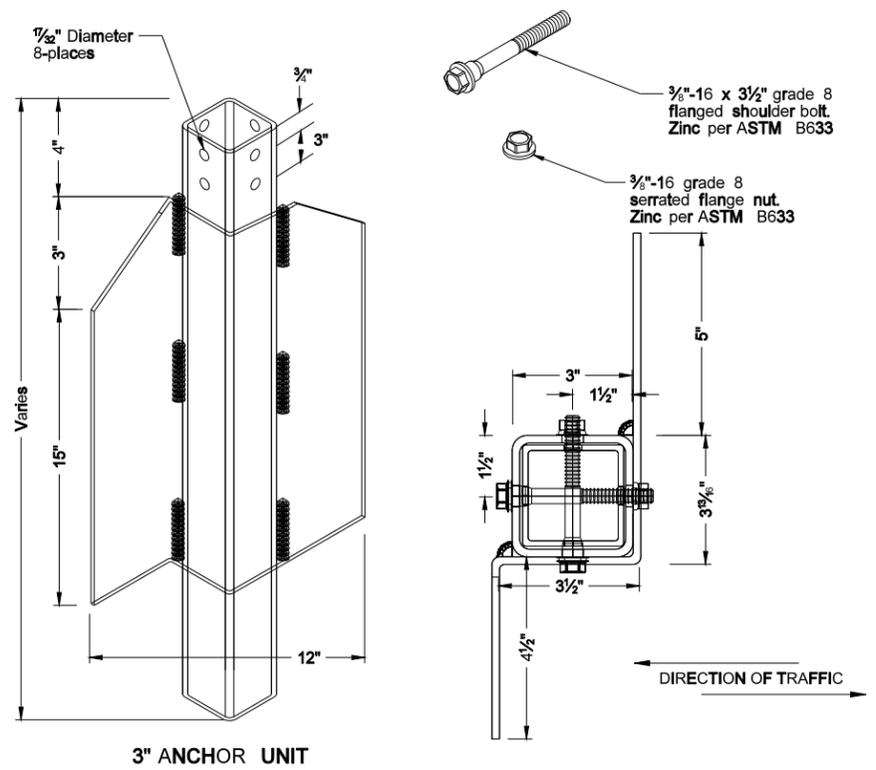
SURFACE MOUNT ANCHOR BASE

NOTE:

- 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.
- 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 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/153. All tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless otherwise noted.
- When used in concrete sidewalk, anchor shall be the same concept without the wings.
- Four post signs shall have over 8" between the first and fourth posts.
- Installation procedures as per manufacturers recommendation.
- Concrete fasteners for surface mount breakaway base shall be a minimum 1/2" diameter x 4" grade 8.

SHOULDER BOLT

Shimming agent to reduce tolerance between 3" anchor unit and 2 1/2" post. (standard 3/8" diameter grade 8 bolt may be used with proper shim)



3" ANCHOR UNIT

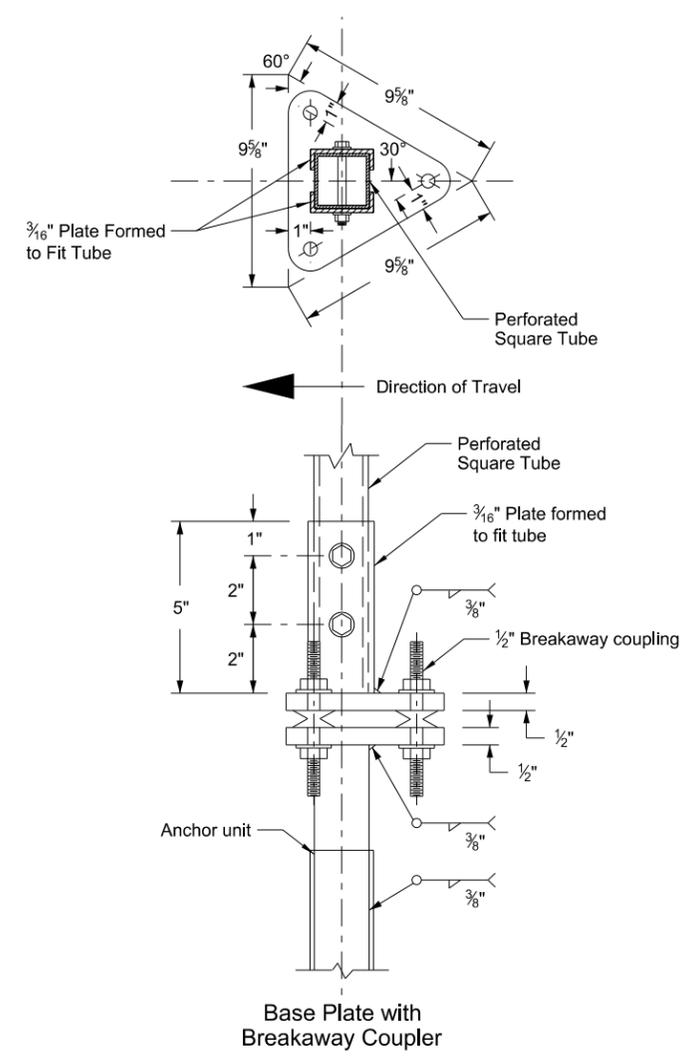
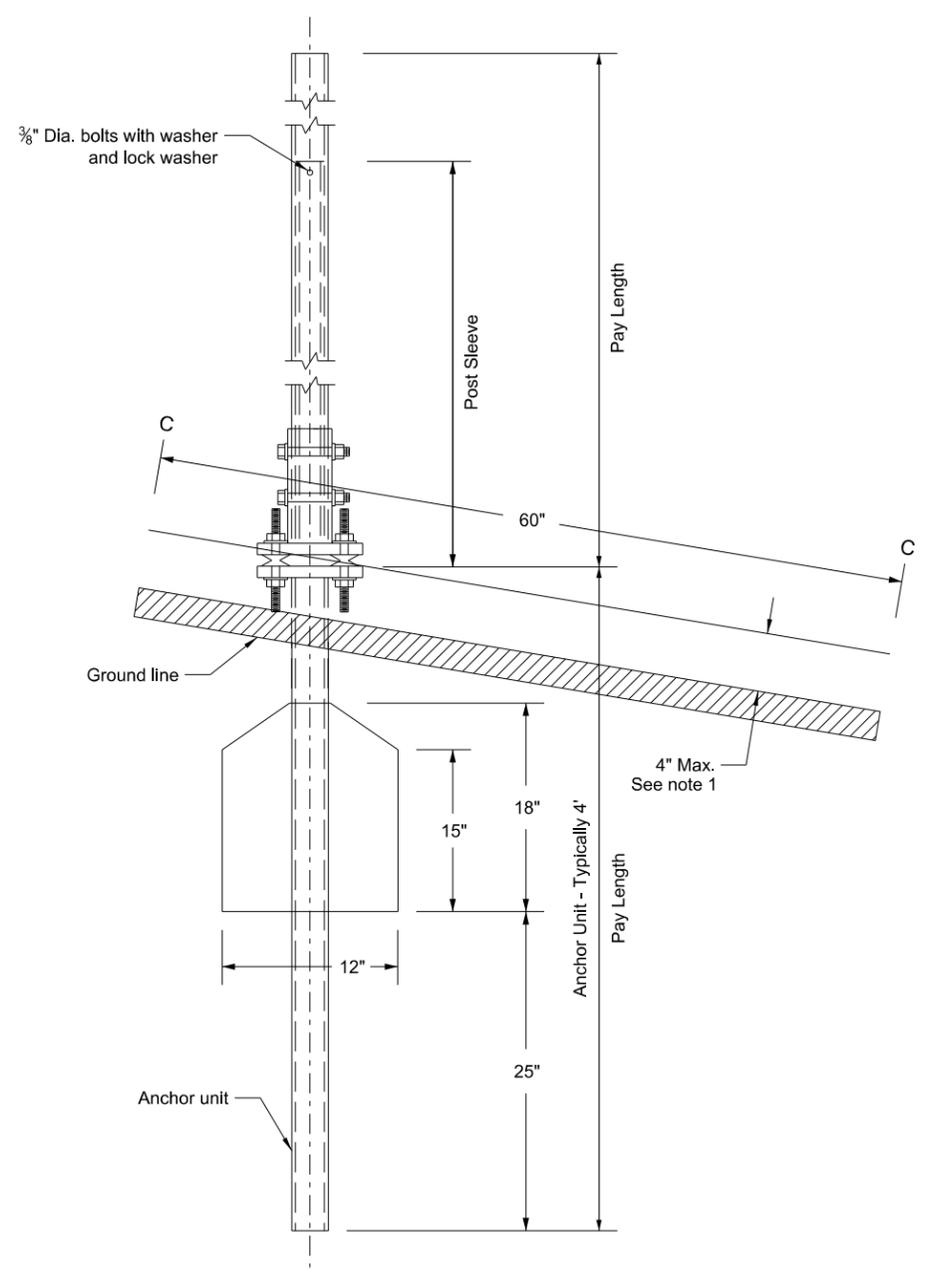
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Breakaway Coupler System for Perforated Tubes

Notes:

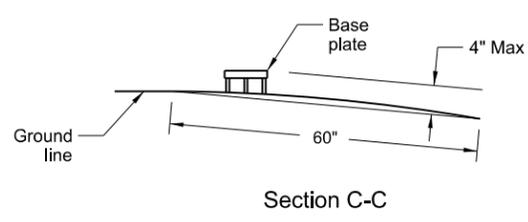
- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
- Anchor unit shall be the same size as the post and shall have the same specification as the post.
- Four post signs shall have over 8' between the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



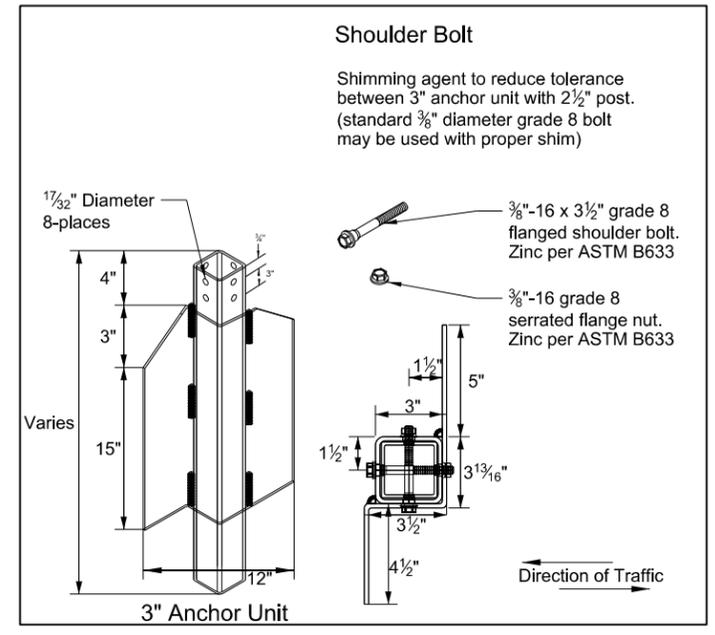
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2	12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

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

(C) - 3" anchor unit



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



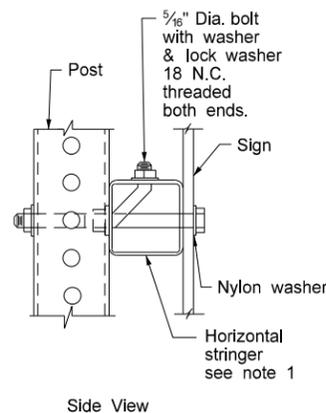
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-2013	
REVISIONS	
DATE	CHANGE

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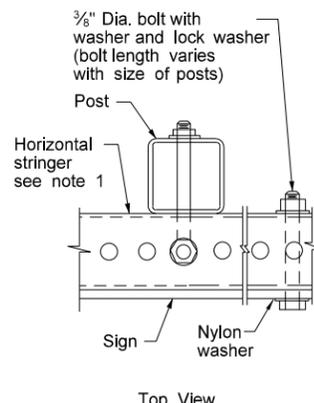
Mounting Details Perforated Tube

Note:

- Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1 1/2" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
- Metal washers used on sign face shall have a minimum outside diameter of 5/16" ± 1/64" and 10 gauge thickness.
- No Parking Signs: All no parking signs with directional arrows shall be placed at a 30 to 45 degree angle with the line of traffic flow. No parking signs required at the above angles may have the support turned to the correct angle. If the no parking sign is placed with another sign that has to be placed at a 90 degree angle with the line of traffic flow, the detailed angle strap should be used to mount the no parking sign. Flat washers and lock washers shall be used with all nylon washers.
- In lieu of using the bent bolt to attach the post to the stringer, the contractor may choose to punch the sign backing and place the bolt through the sign, the stringer and the post.
- 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.

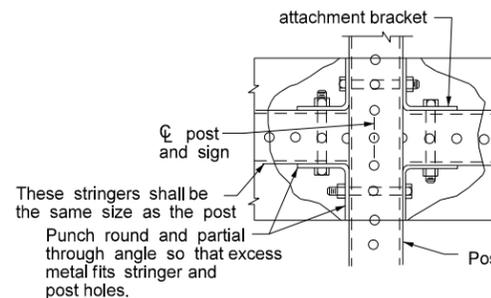


Side View



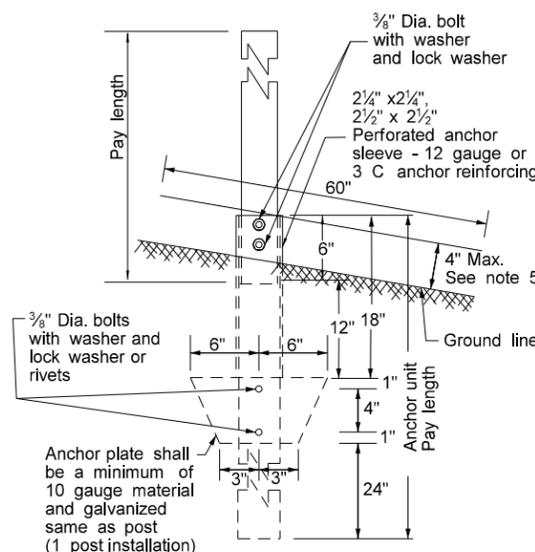
Top View

STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

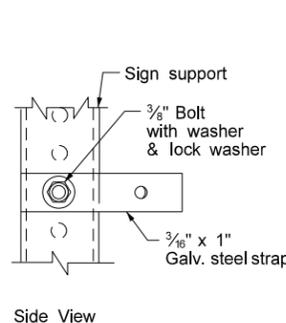


These stringers shall be the same size as the post. Punch round and partial through angle so that excess metal fits stringer and post holes.

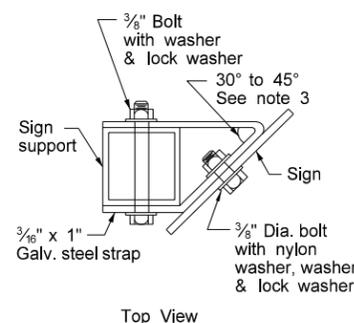
STREET NAME SIGNS
AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR
BACK TO BACK MOUNTING



ANCHOR UNIT AND
POST ASSEMBLY

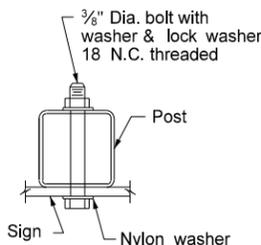


Side View

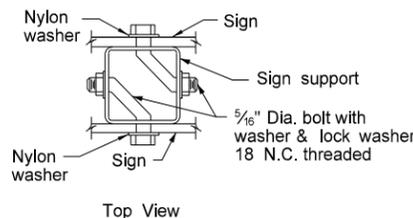


Top View

STRAP DETAIL

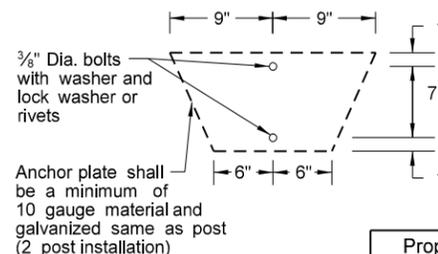


BOLT MOUNTING



Top View

BACK TO BACK
MOUNTING



Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. area In. ²	Section Modulus In. ³
1 1/2" x 1 1/2"	0.105	12	1.702	0.129	0.380	0.172
2" x 2"	0.105	12	2.416	0.372	0.590	0.372
2 1/4" x 2 1/4"	0.105	12	2.773	0.561	0.695	0.499
2 3/8" x 2 3/8"	0.135	10	3.432	0.605	0.841	0.590
2 1/2" x 2 1/2"	0.105	12	3.141	0.804	0.803	0.643
2 1/2" x 2 1/2"	0.135	10	4.006	0.979	1.010	0.783

The 2 3/8" size 10 gauge is shown as 2.19" size on the plans. The 2 1/2" size is shown as 2.51" size on the plans.

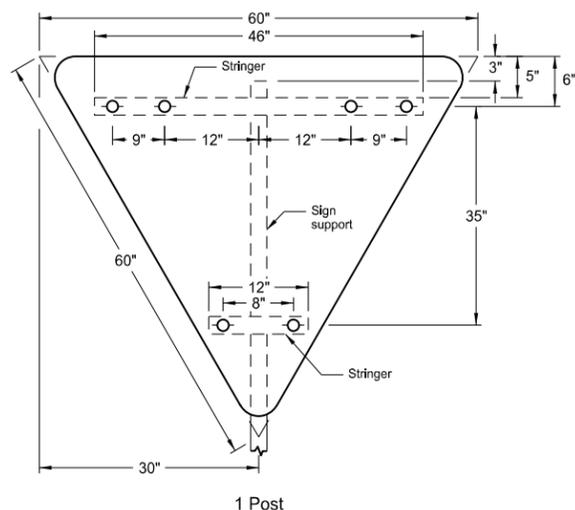
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2 1/2(D)	12	Yes		7
1	2 1/2	12	2 1/4	12	Yes		7
2	2 1/2	10			Yes		7
2	2 1/4	12	2 1/2(D)	12	Yes		7
2	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/2	12			Yes		7
3 & 4	2 1/2	10			Yes		7
3 & 4	2 1/2	12	2 1/4	12	Yes		7
3 & 4	2 1/4	12	2 1/2(D)	12	Yes		7
3 & 4	2 1/2	10	2 3/8	10	Yes		7

(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.
(C) - 3" anchor unit
(D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.

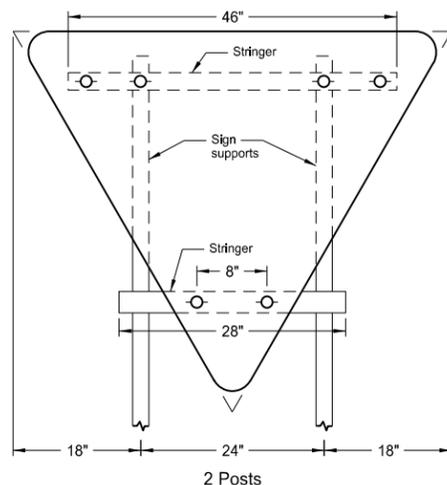
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
7-8-14	Revised Note 3

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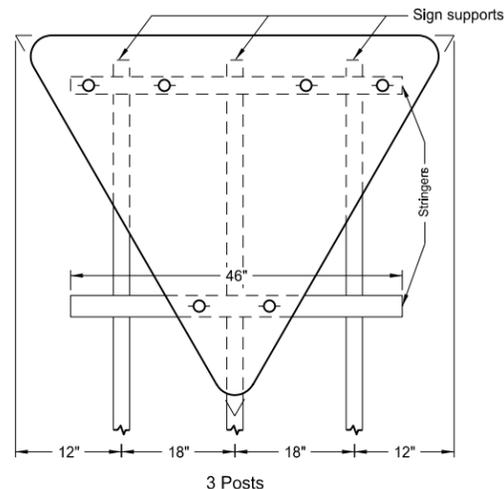
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

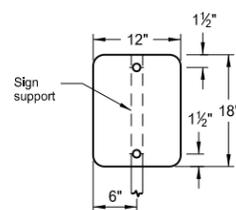


3 Posts

Assembly No. 6

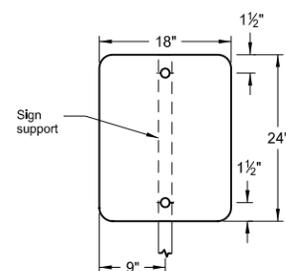
Notes:

1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1 1/2" x 1 1/2".
4. All holes shall be punched round for 3/8" bolt.



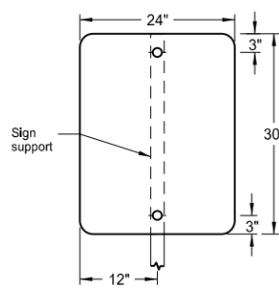
1 Post

Assembly No. 7



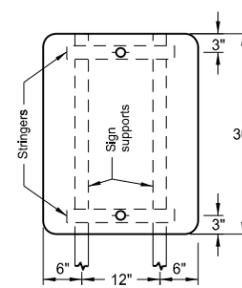
1 Post

Assembly No. 8

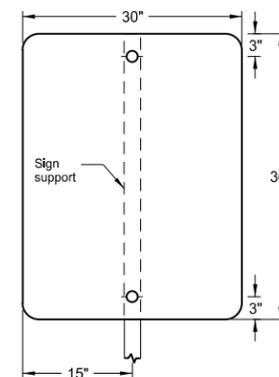


1 Post

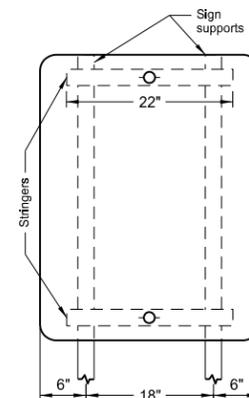
Assembly No. 9



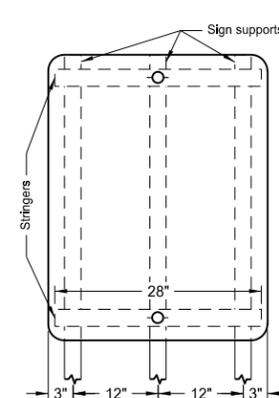
2 Posts



1 Post

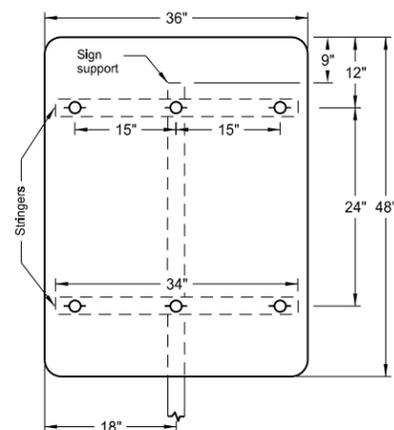


2 Posts

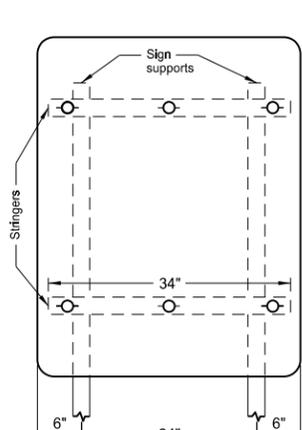


3 Posts

Assembly No. 10

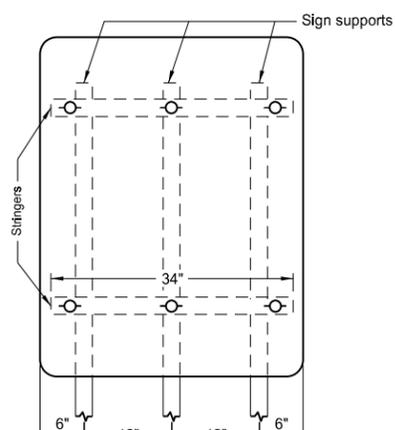


1 Post



2 Posts

Assembly No. 11

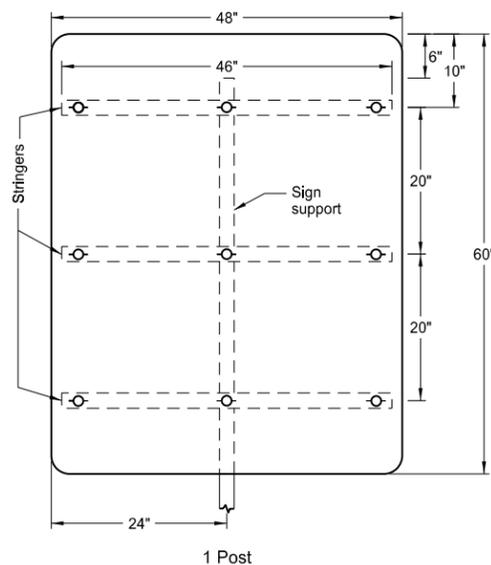


3 Posts

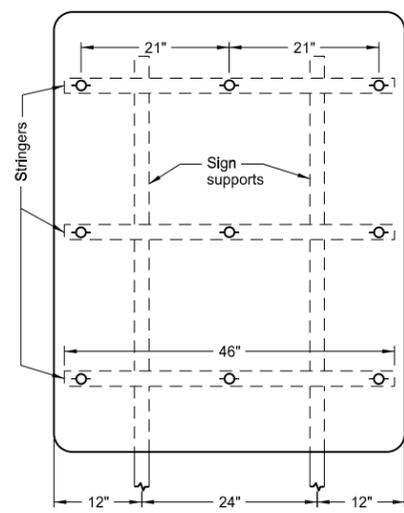
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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

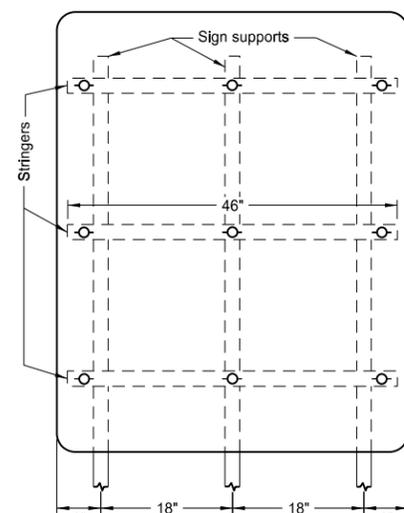


1 Post

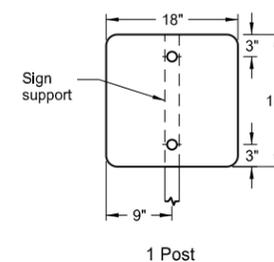


2 Posts

Assembly No. 12

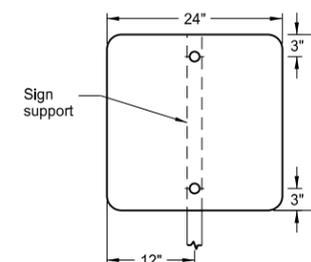


3 Posts



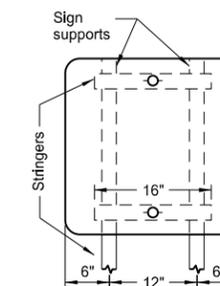
1 Post

Assembly No. 13

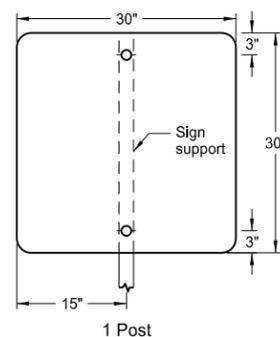


1 Post

Assembly No. 14

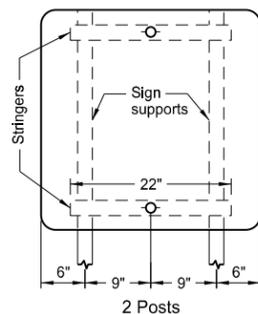


2 Posts

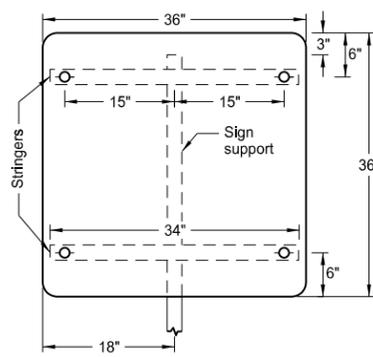


1 Post

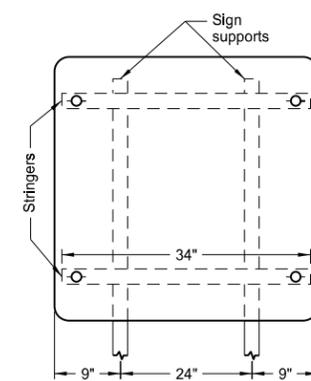
Assembly No. 15



2 Posts

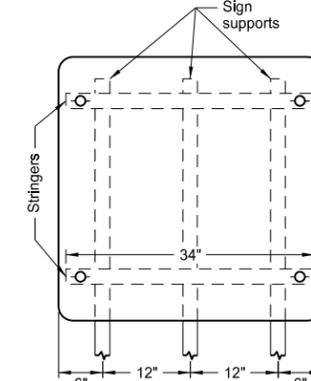


1 Post

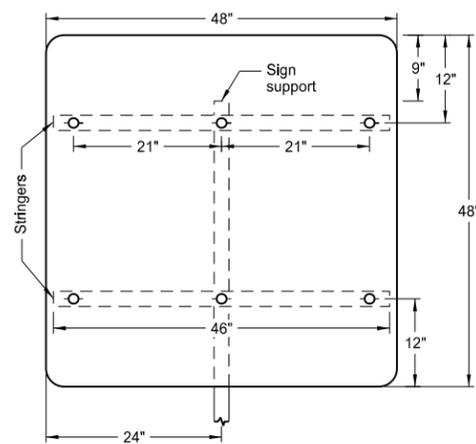


2 Posts

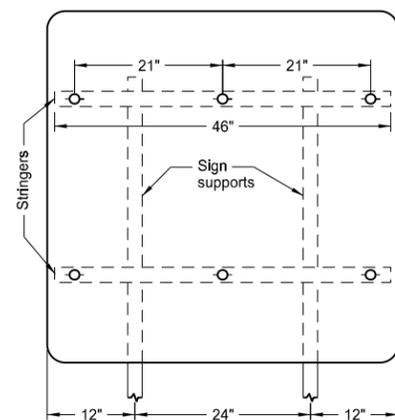
Assembly No. 16



3 Posts

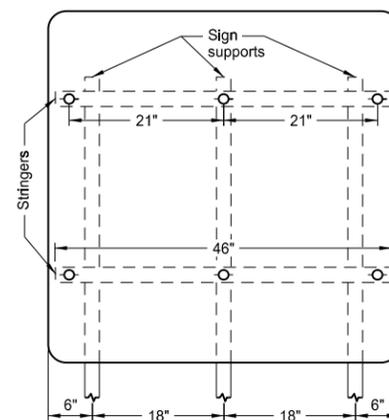


1 Post



2 Posts

Assembly No. 17



3 Posts

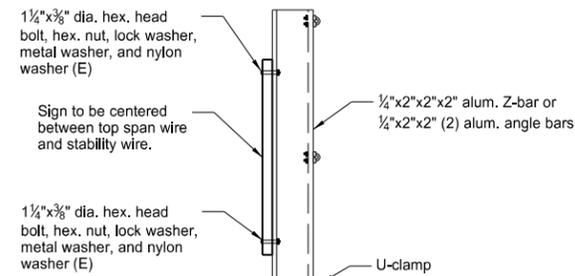
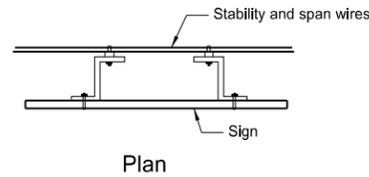
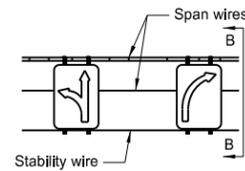
Notes:

1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.

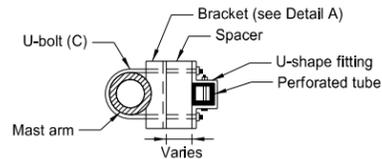
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

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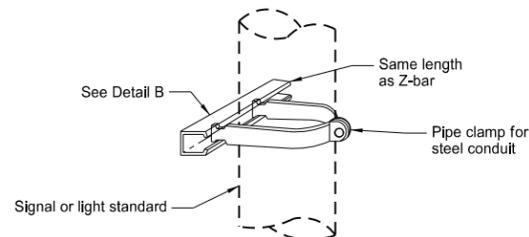
LIGHT STANDARD, SIGNAL STANDARD,
AND SPAN WIRE MOUNTED SIGN
ASSEMBLY DETAIL



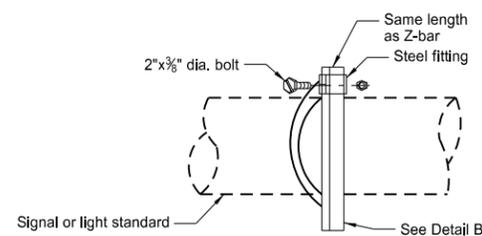
Section B-B
Span Wire Mounted Sign Detail



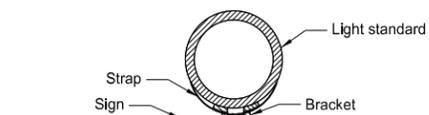
Section A-A



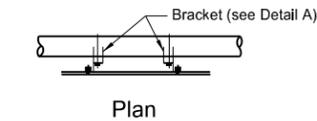
Vertical Mounting
(2 clamps required per sign)



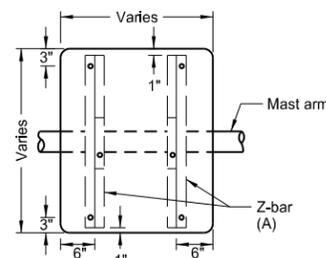
Horizontal Mounting
alternate clamp mounting
(2 clamps required per sign)



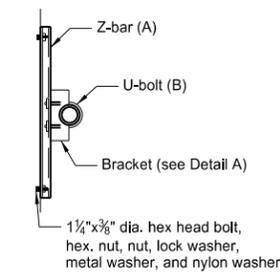
Light Standard Mounted Sign Bracket Detail
Max. 24"x30" signs (D)



Plan

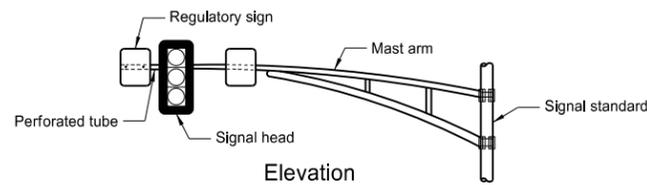


Elevation

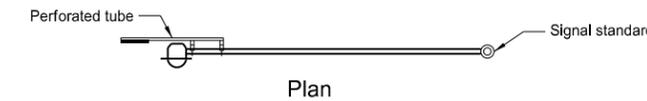


Side View

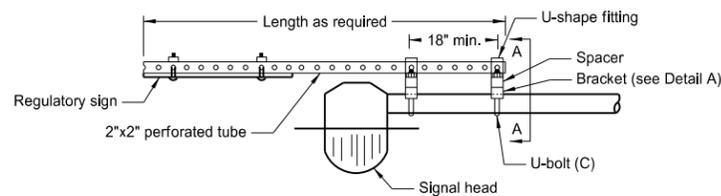
Mast Arm Mounted Regulatory Sign Detail



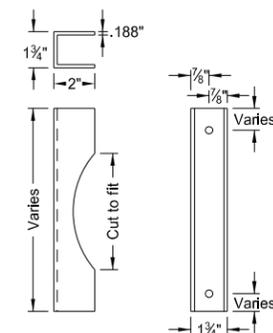
Elevation



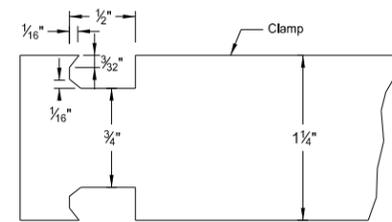
Plan



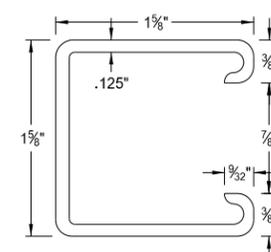
Sign Mounted Beyond End of Mast Arm Detail



Detail A



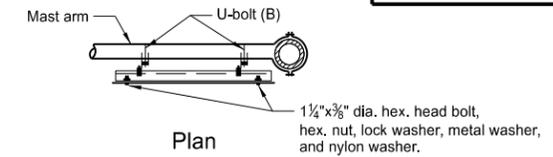
Clamp Detail



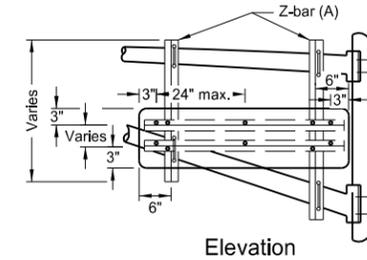
Detail B
Steel Channel

Post Size dia.	Clamp Gauge min.
3 1/2" to 5"	11
6" to 12"	10

Clamp	
Post Size dia. in.	D in.
3 1/2	3
4	3 3/16
5	5 1/8
6	7 7/16
8	13 1/16
10	20 3/4
12	29 5/8

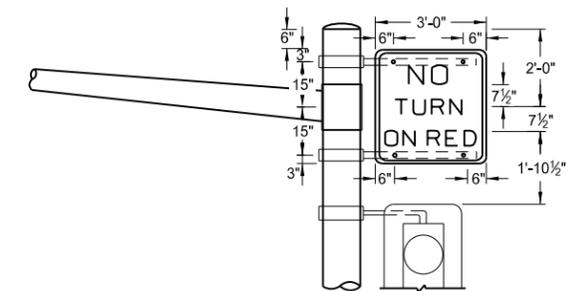


Plan



Elevation

Mast Arm Mounted Street Name Sign Detail



Signal Standard Mounted Sign Attachment Detail

Notes:

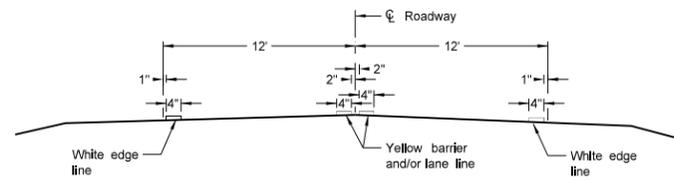
- (A) Z-bar - Use 1 1/4"x3/16" thick 1.08 lb/ft aluminum alloy. In place of Z-bar, two angles bolted together may be used or a channel. 1 1/4"x1 1/4"x3/16" angles or 1 1/4"x2"x.188" channels.
- (B) 3/8" U-bolt, hex. nut, lock washer, and length depends on dia. of mast arm.
- (C) 3/8" U-bolt, hex. nut, lock washer, and length depends on dia. of mast arm.
2"x2" maximum support length 9.9'
2 1/4"x2 1/4" maximum support length 12.6'
2 1/2"x2 1/2" maximum support length 15.7'
- (D) Bracket shall be of galv. steel consisting of strap and sign attachment bracket similar to the one shown in the detail. The cost of the bracket assembly is to be included in the price bid for flat sheet signs. Punching shall be as shown on the Standard Drawings. There shall be a 7" vertical clearance to the bottom of all signs mounted on light standards.
- (E) Metal washers and nylon washers used on sign face shall have a minimum outside dia. of 1 5/16" ± 1/16" and 10 gauge thickness.

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

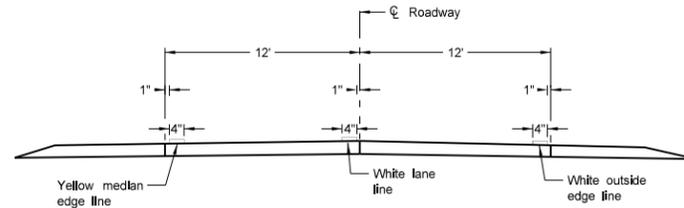
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Registration Number
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PAVEMENT MARKING

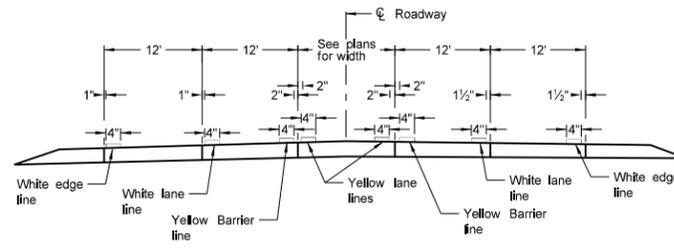
D-762-4



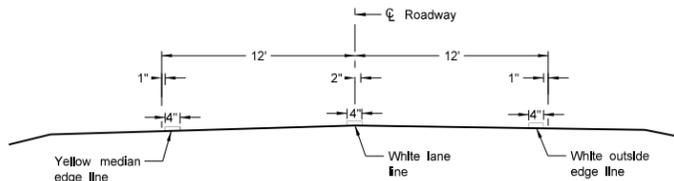
Two Lane Two Way
RURAL ROADWAY



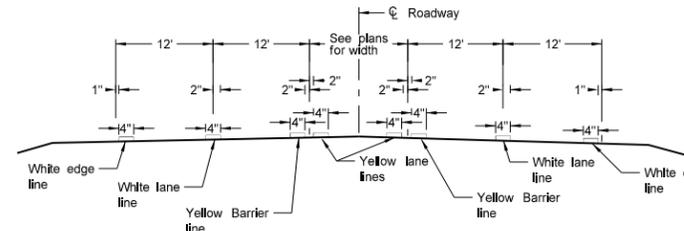
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



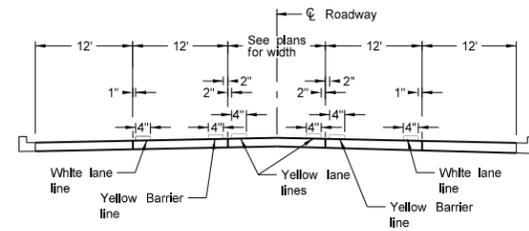
RURAL FIVE LANE ROADWAY
Concrete Section



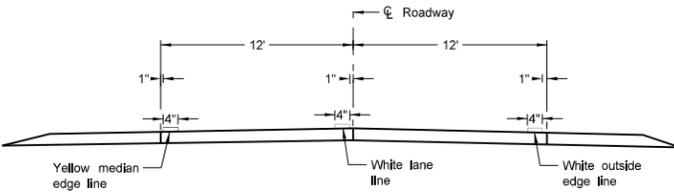
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



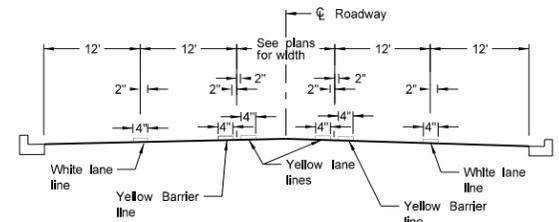
RURAL FIVE LANE ROADWAY
Asphalt Section



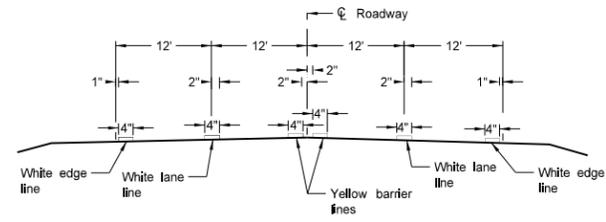
URBAN FIVE LANE SECTION
Concrete Section



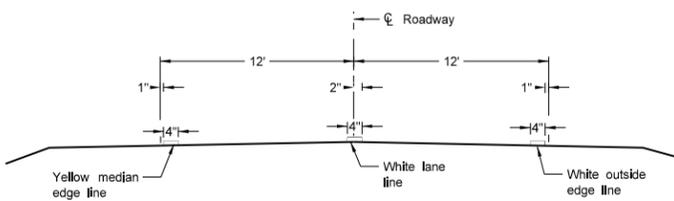
Two Lane Roadway
PRIMARY HIGHWAY
Concrete Section



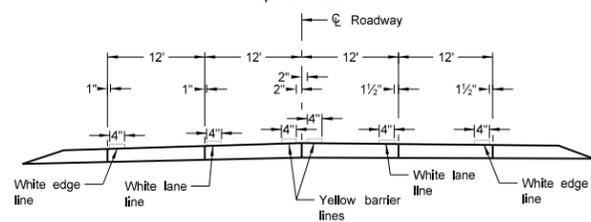
URBAN FIVE LANE SECTION
Asphalt Section



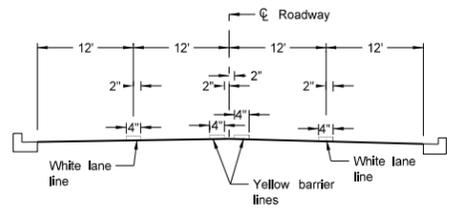
RURAL FOUR LANE ROADWAY
Asphalt Section



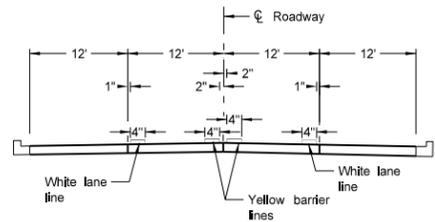
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



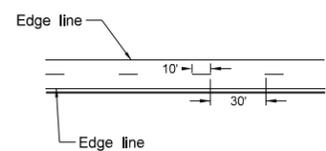
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



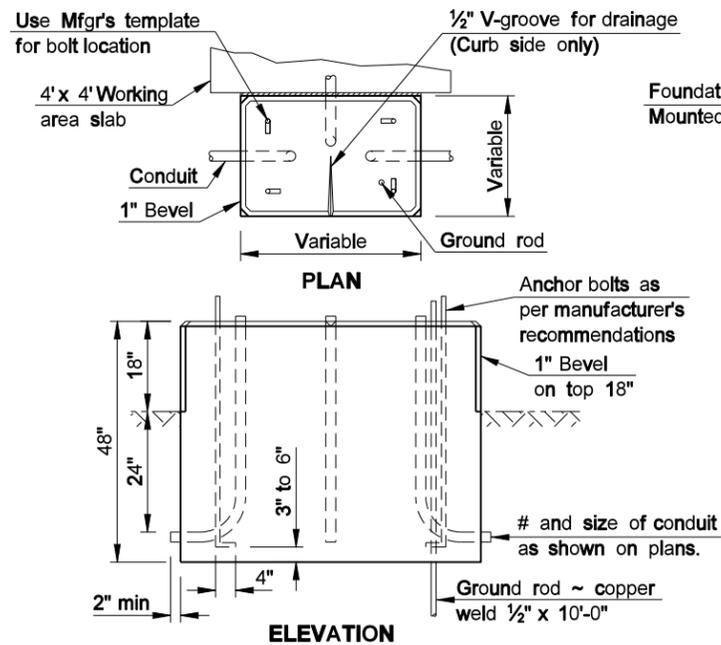
CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NOTES:
1. Edge lines shall be continued through private drives and field drives and broken for intersections.

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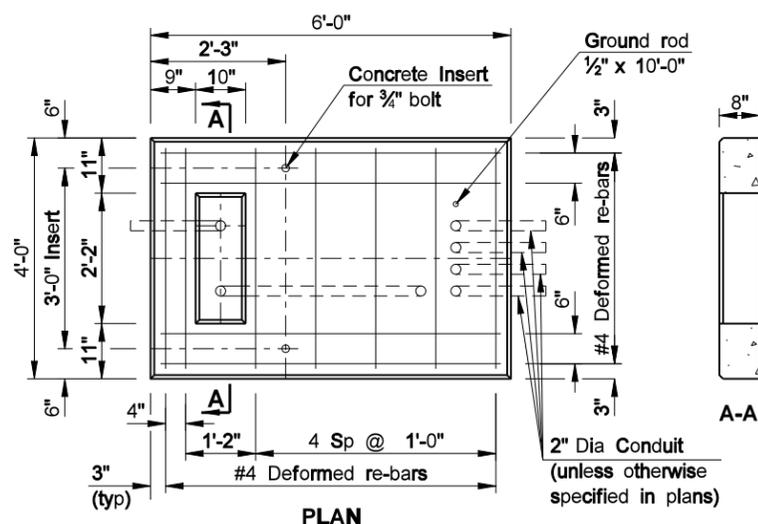
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**CONCRETE FOUNDATIONS
(TRAFFIC SIGNALS & HIGHWAY LIGHTING)**

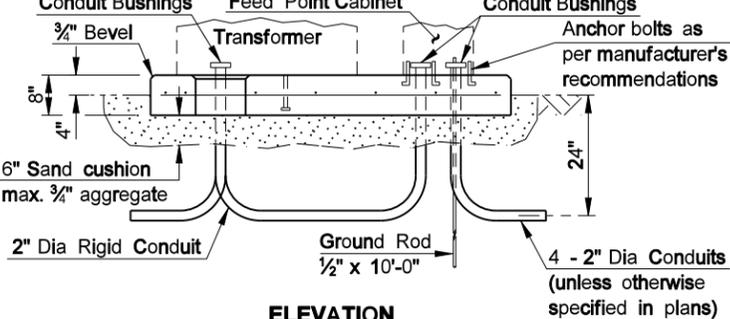


CONTROLLER CABINET FOUNDATION PAD MOUNT

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

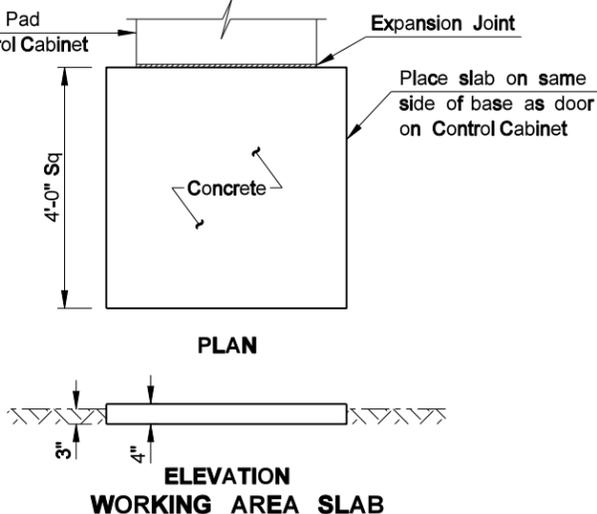


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

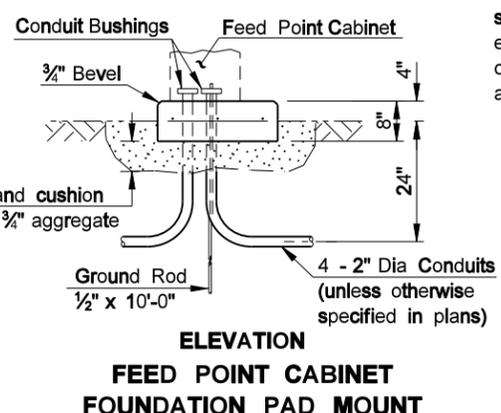
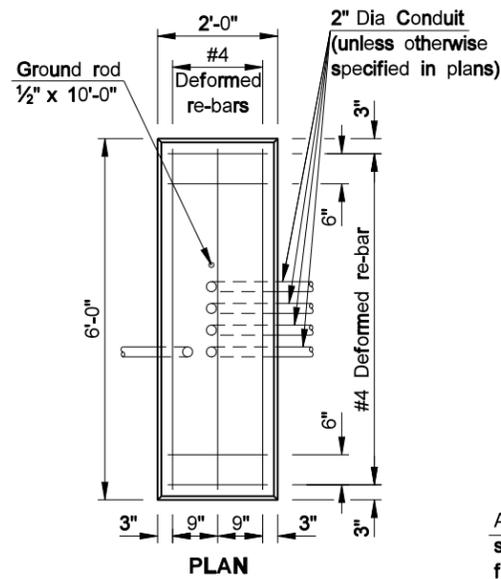


TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

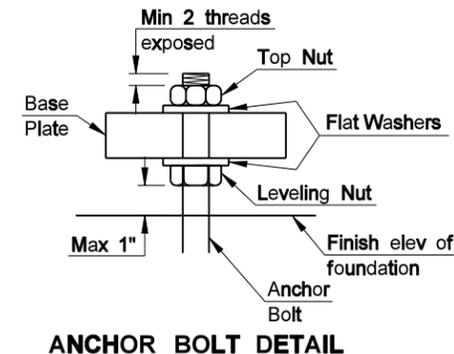
The Transformer & Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundation ~ Feed Point ~ Type A.



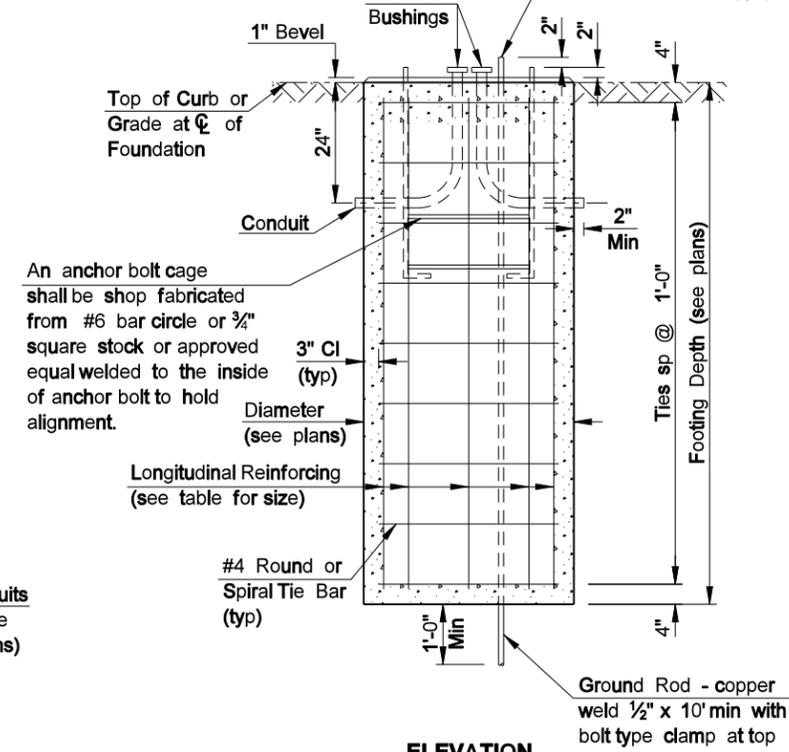
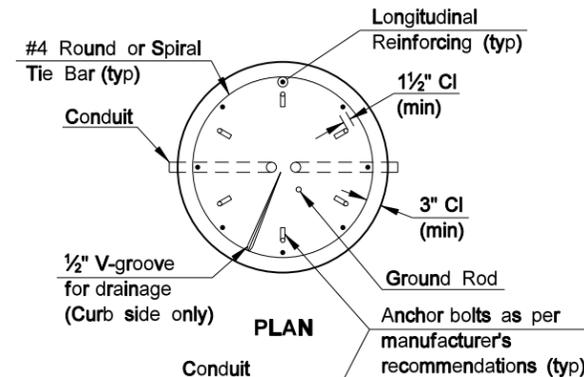
The Working Area Slab shall be installed where shown on the plans and shall not be bid separately but shall be included in the price bid for Concrete Foundation - Traffic Signals.



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.

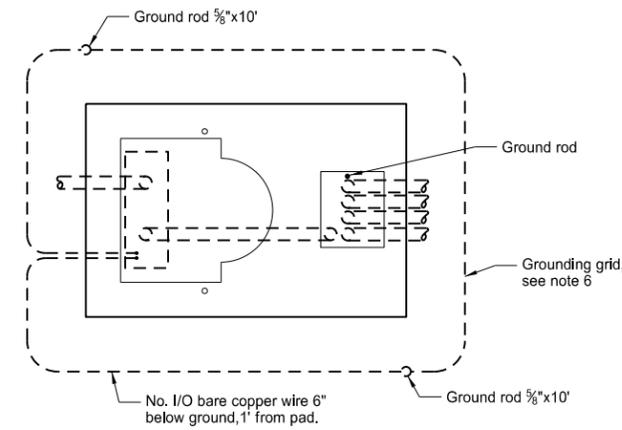
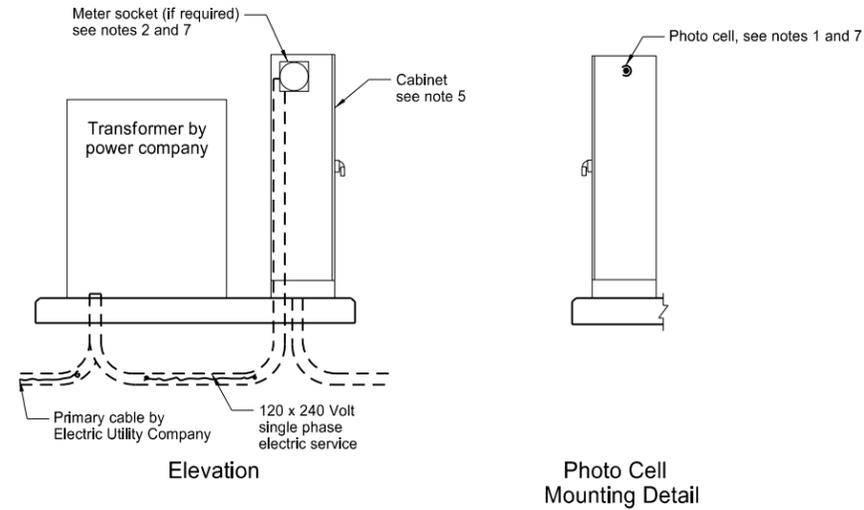
FEED POINT CABINET FOUNDATION PAD MOUNTED: The foundation shall have a wood float finish. All conduits shown shall be installed. Conduit that is not used at this time shall be plugged with an expandable plug.

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

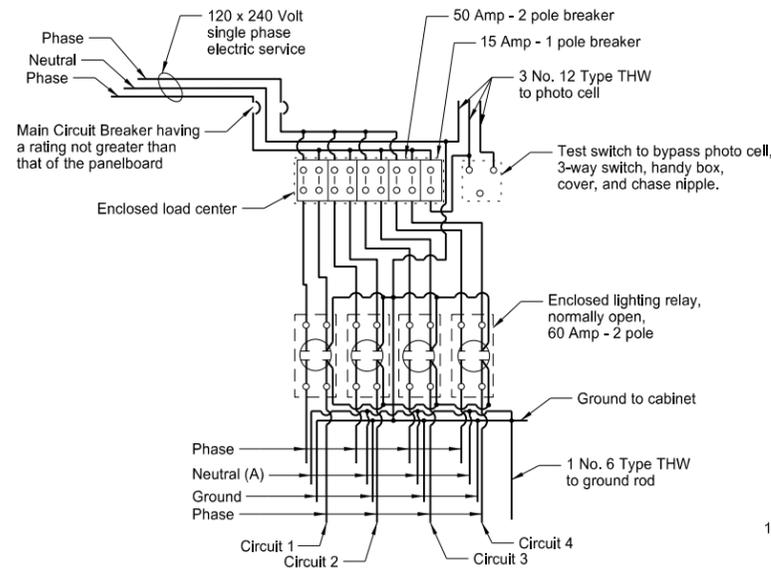
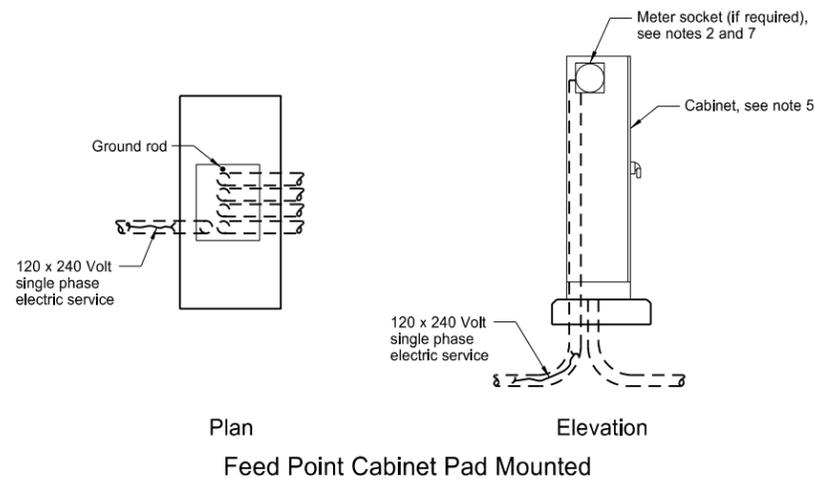
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FEED POINTS
(ROADWAY LIGHTING)



Plan
Transformer and Feed Point Cabinet Pad Mounted



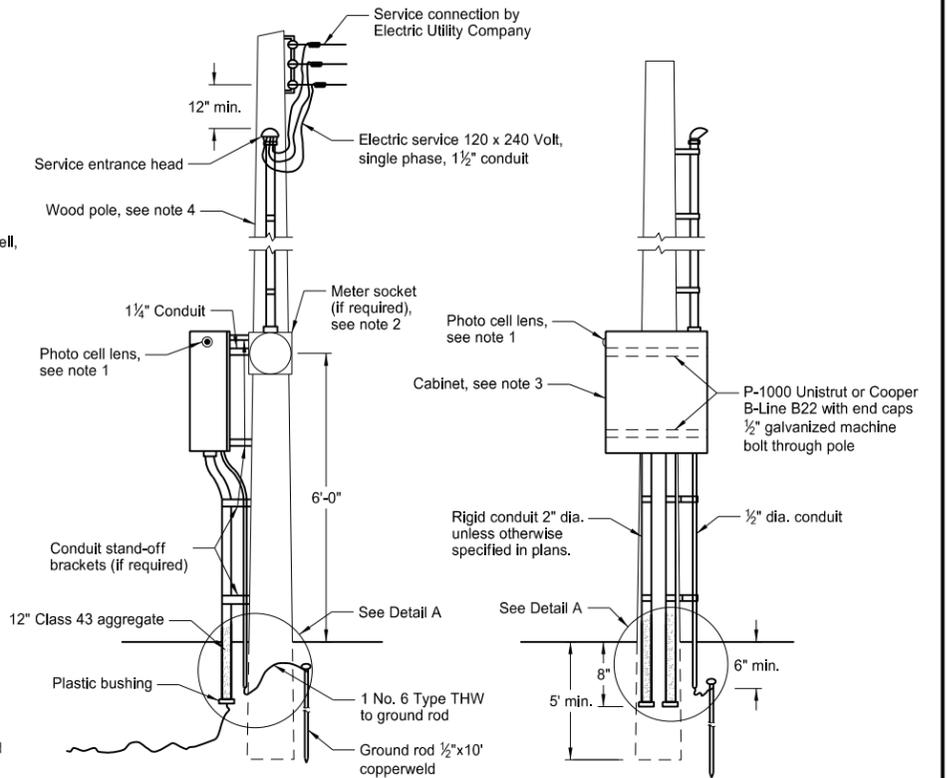
Feed Point Type IV

Type I feed point is similar to Type IV except only one electrical circuit, one 50 Amp - 2 pole breakers and one lighting relay, normally open, shall be installed.

Type II feed point is similar to Type IV except only two electrical circuit, two 50 Amp - 2 pole breakers and two lighting relays, normally open, shall be installed.

Type III feed point is similar to Type IV except only three electrical circuits, three 50 Amp - 2 pole breakers and three lighting relays, normally open, shall be installed.

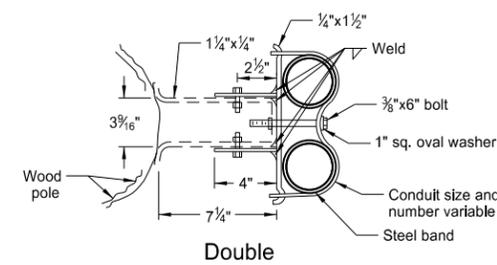
(A) Install when festoon circuit is required.



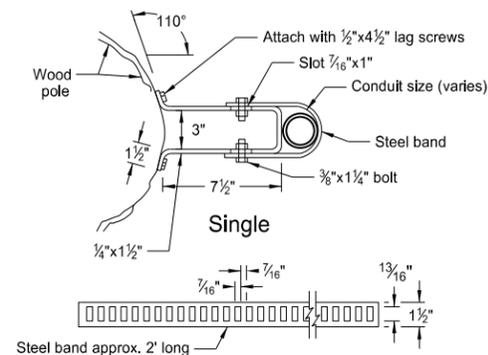
Feed Point Pole Mounted

Notes:

1. Photo Cell: The electrical contractor shall furnish and install the photoelectric cell. The photo lens shall face north.
2. Meter Socket: The contractor shall install the meter socket and trim if the meter is required by local Utility Company. Meter to be furnished and installed by Utility Company.
3. Pole Mounted Cabinet: Cabinet shall have lock drip shield, factory installed steel backing, stainless steel hardware, and side hinge door. Cabinet shall be shop coated with one coat of primer and have two coats of exterior gray enamel.
Type I and II feed point shall be 30" high x 24" wide x 8" deep, Type III and IV feed point shall be 30" high x 42" wide x 10" deep or 36" high x 36" wide x 10" deep.
4. Wood Pole: Minimum 20' Class VII full length penta pressure treated wood pole. (if required, see layout sheets)
5. Pad Mounted Cabinet: Cabinet shall be 56" high x 26" wide x 14" deep. Minimum 12 gauge steel or aluminum with provisions for padlock. Cabinet shall be weatherproof. A steel cabinet shall have one coat of primer and two coats of exterior dark green enamel.
6. Grounding Grid: The grounding grid shall have a ground resistance not to exceed 25 ohms. This shall be obtained by one or more 3/8"x10' copperweld ground rods in parallel or series at two corners. Minimum distance between ground unit assemblies shall be 6'0".
7. Meter Location: The meter (if required) shall not be mounted on the same side of the cabinet as the photo cell.



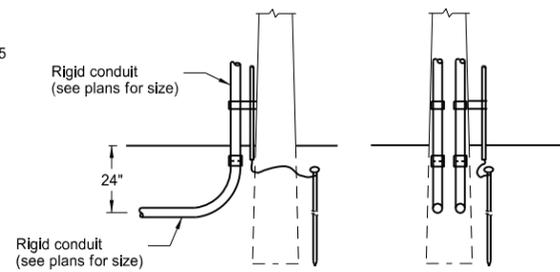
Double



Single

Conduit Standoff Bracket

The conduit standoff brackets may be omitted if not required by the local utility company.



Detail A

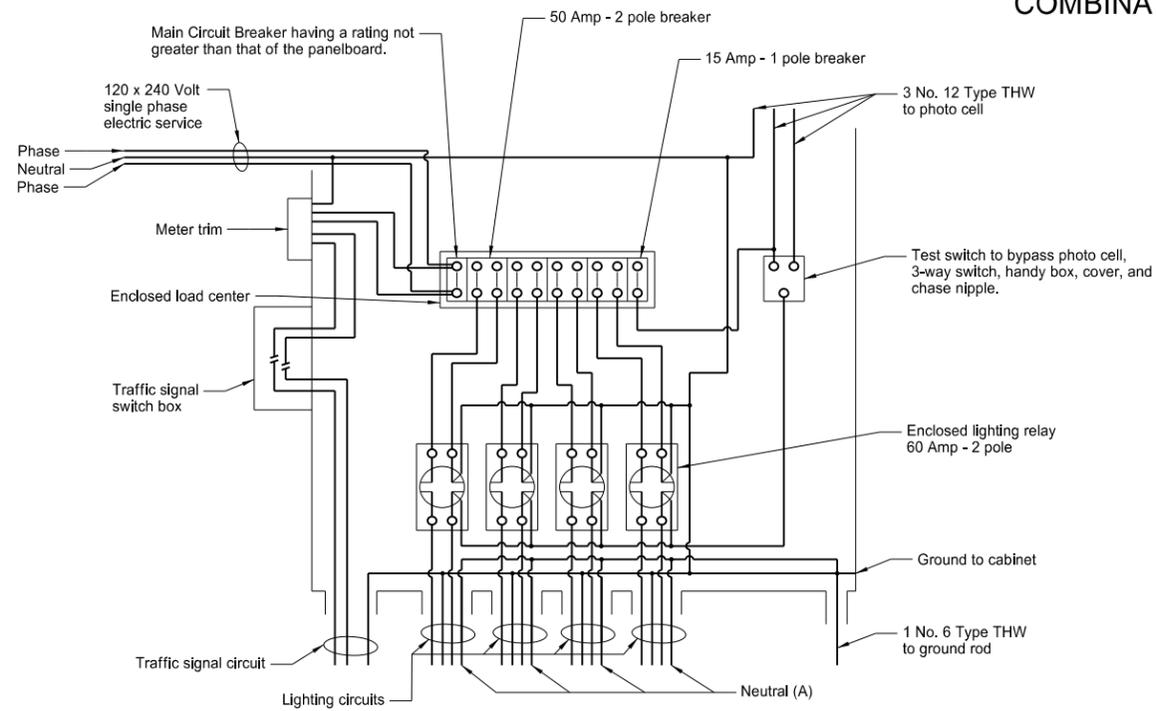
Use this detail if there is a continuous run of conduit from the feed point to the first light standard.

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7-8-14	Revised note 3

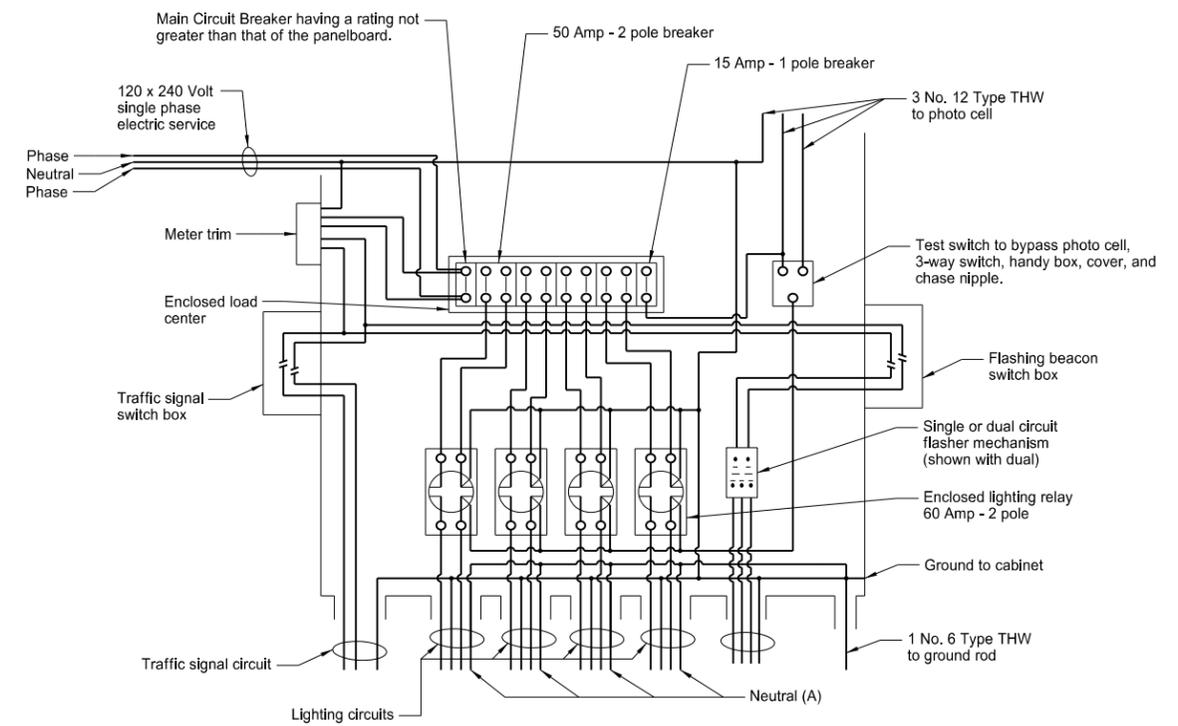
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COMBINATION FEED POINT DETAILS

D-770-2A



Combination Lighting and Signal Feed Point Type IV



Combination Lighting, Signal, and Flashing Beacon Feed Point Type IV

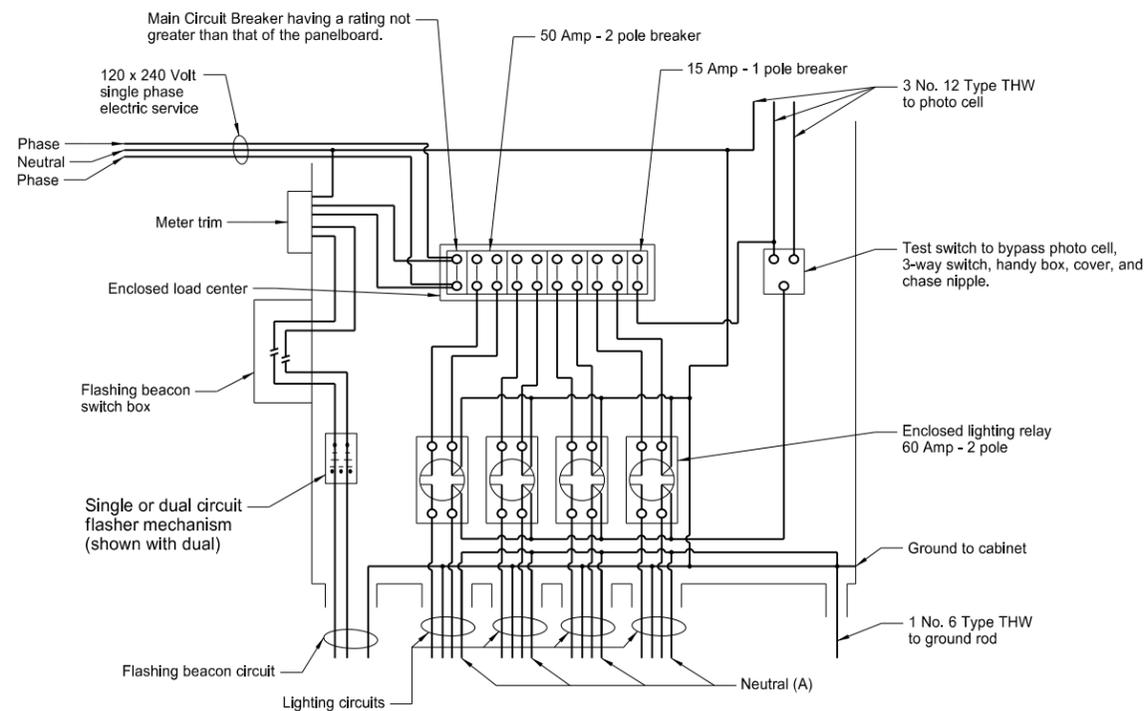
Notes:

Type I feed point is similar to Type IV except only one electrical circuit, one 50 Amp - 2 pole breaker and one lighting relay, normally open, shall be installed.

Type II feed point is similar to Type IV except only two electrical circuits, two 50 Amp - 2 pole breakers and two lighting relays, normally open, shall be installed.

Type III feed point is similar to Type IV except only three electrical circuits, three 50 Amp - 2 pole breakers and three lighting relays, normally open, shall be installed.

(A) Install when festoon circuits are required

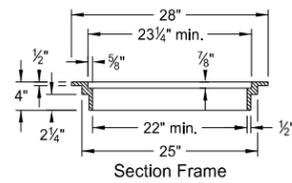
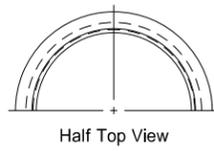
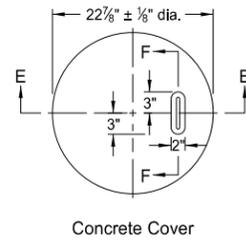
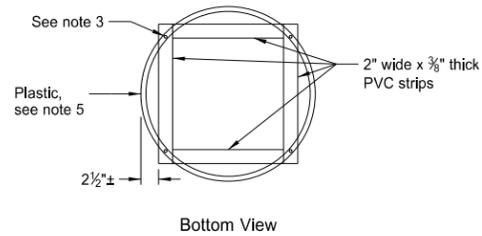
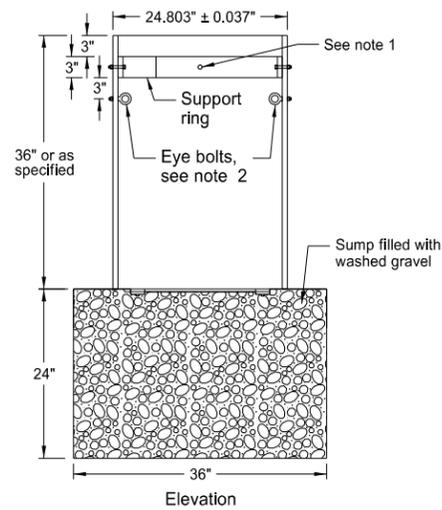
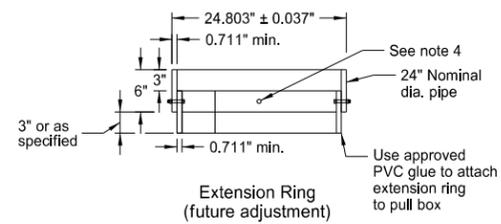


Combination Lighting and Flashing Beacon Feed Point Type IV

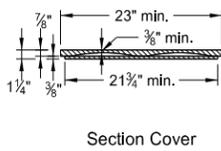
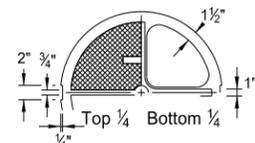
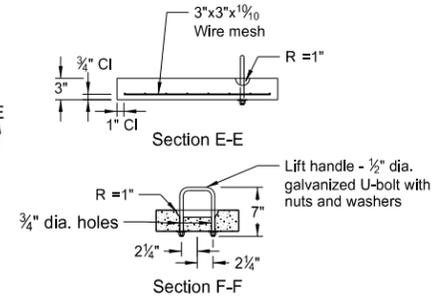
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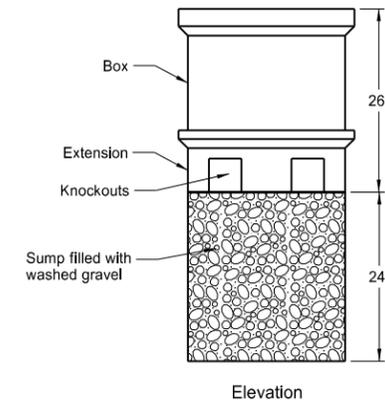
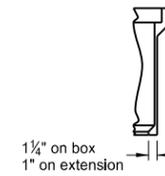
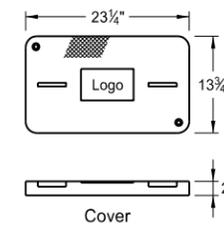
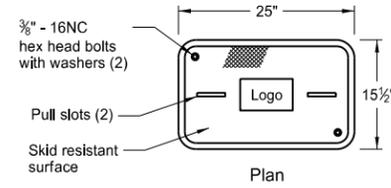
PULL BOX DETAILS



Cast Iron Frame and Cover



Section Cover



Elevation

Polymer Concrete Pull Box

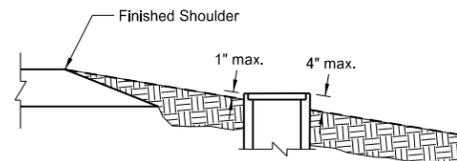
Note: Polymer concrete reinforced by a heavy weave fiberglass

Notes:

1. Place top of pull box flush with surfaced area and approximately one inch above earth or sodded areas on level surfaces.
2. Pull box shall have at least one knockout per side.
3. Polymer Concrete pull box shall be Tier 22 as per ANSI / SCTE 77.

PVC Pull Box Notes:

1. 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.
2. 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).
3. Four 1/4" x 1 1/4" long galvanized lag screws. Screw assembly together.
4. 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.
5. Bolt assembly together.
6. Conduit holes located in barrel section shall be sized no more than 1" larger than size of conduit being used.
7. After pull box and conduit installation all inside walls and cover shall be made water tight to the satisfaction of the Engineer.
8. PVC pipe to meet requirements of ASTM F679T-1 or equal.
9. Hex head bolts and nuts shall be austenitic stainless steel. Other fasteners to be galvanized as per AASHTO M-232.
10. Concrete cover shall be coated on top and sides with an 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.
11. Cast Iron Cover castings shall be gray iron as per AASHTO M 105, Class 35B.

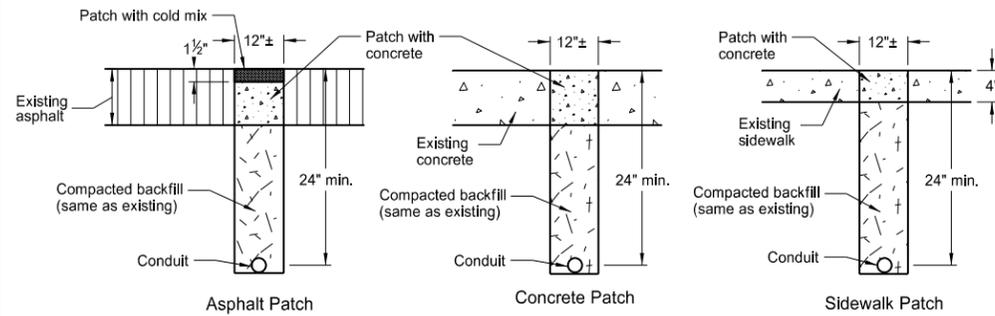


Typical Pull Box in Rural Section

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7-8-14	Added Note 3

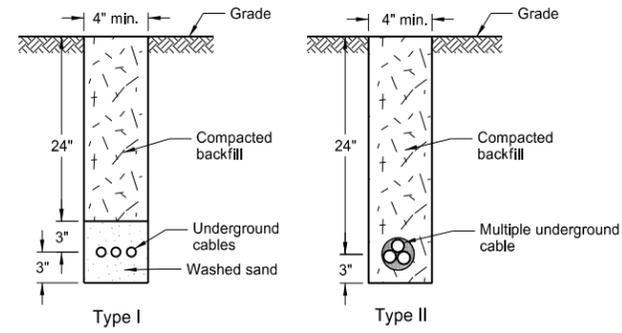
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LIGHTING AND SIGNAL DETAILS



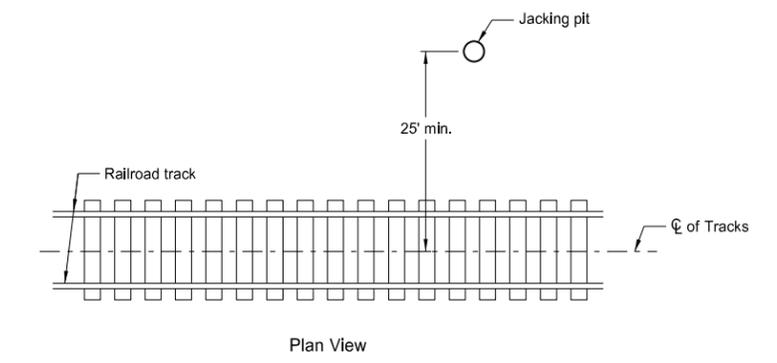
Surface Patch Details

Note: All trenches shall be saw cut. The replacement concrete shall be P.C.C. pavement and the coarse aggregate gradation, maximum size and method of curing shall be as approved by the Engineer. Immediately prior to pouring replacement concrete, all surfaces shall be painted with an approved epoxy compound.

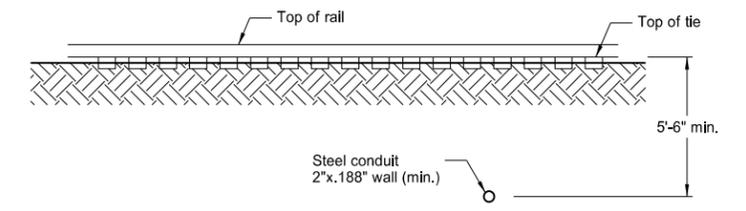


Cable Trench

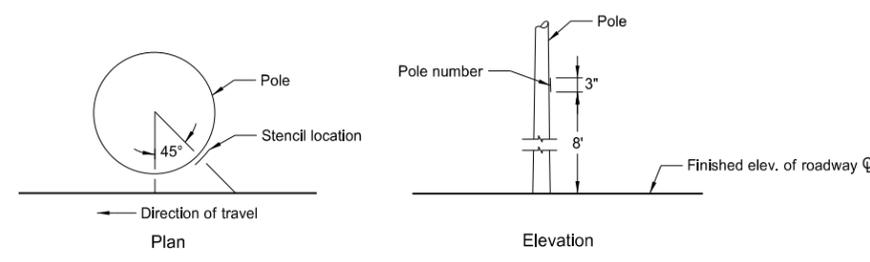
Note: The entire area which is disturbed by the trenching shall be sodded or as directed by the Engineer.



Plan View

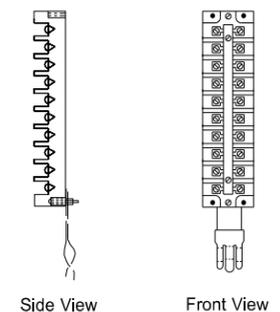


Elevation View
Conduit Placement under Railroad Tracks

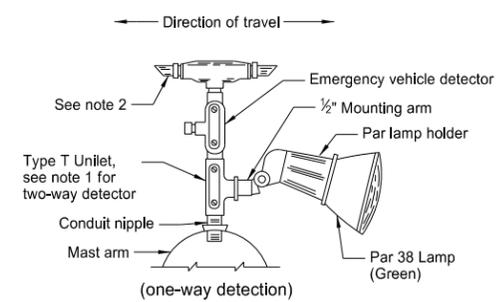


Light Standard Numbering

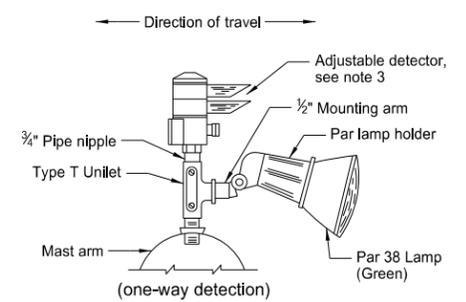
Note: On the roadway side of each light standard, the Contractor shall stencil on the pole number using black paint or an adhesive coated plastic such as Scotchcal by 3M or as approved by the Engineer. See layout sheets for pole numbers.



Terminal Block Detail

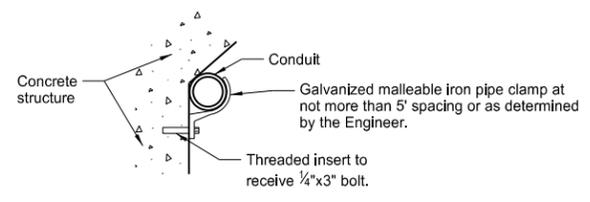


Emergency Vehicle Detector Detail

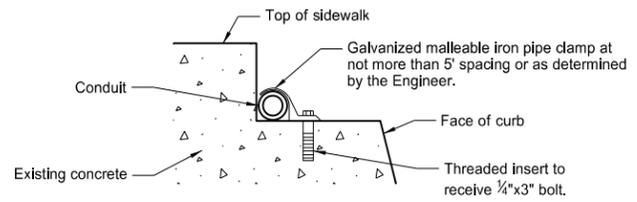


Alternate Emergency Vehicle Detector Detail (adjustable)

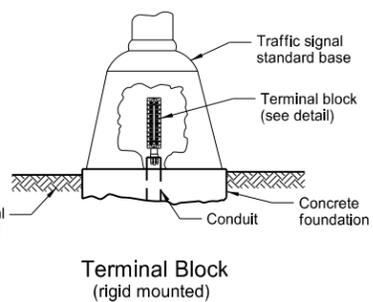
Notes:
1. Two-way Detector shall have Type X Unilet with two Par lamp holders and lamps. (one in each direction).
2. One-way Detector shall have the unused end plugged with metal pipe plug.
3. Two-way Detector shall have the detector lens rotated to face the direction of travel, and shall have Type X Unilet with two Par lamp holders and lamps (one in each direction).



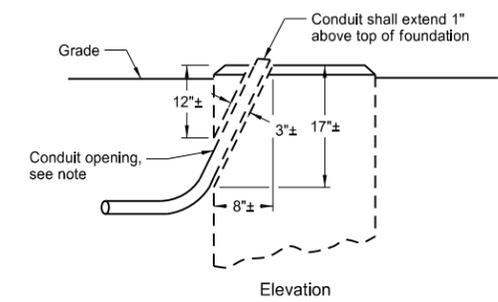
Bridge Mounted Conduit Hanger



Curb Mounted Conduit



Terminal Block (rigid mounted)



Revise Concrete Foundation

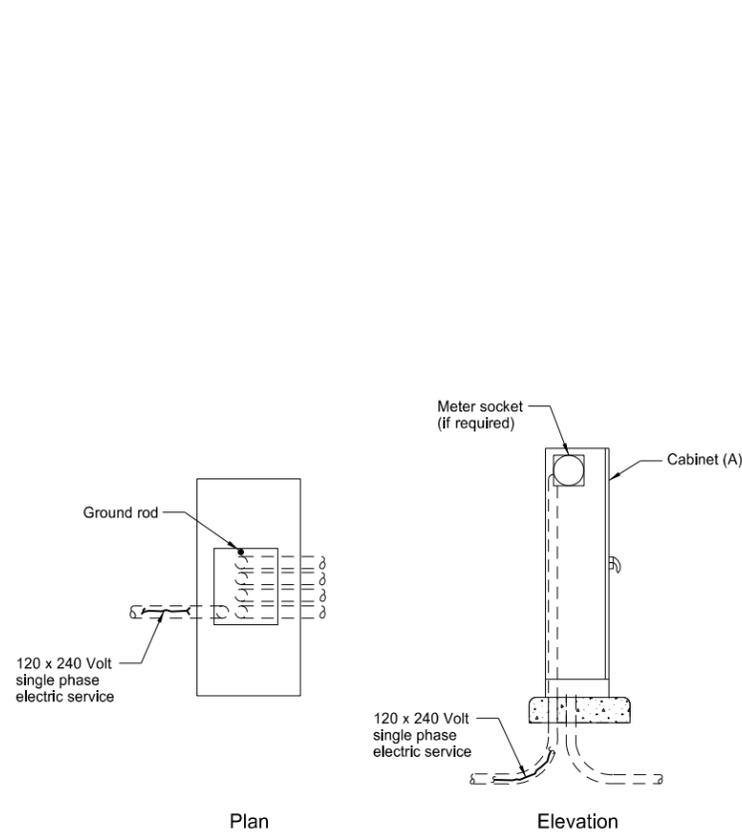
Note: Jackhammer or drill to remove material and provide a location for conduit. Make opening no larger than necessary. Place conduit, fill with concrete and finish foundation to original appearance.

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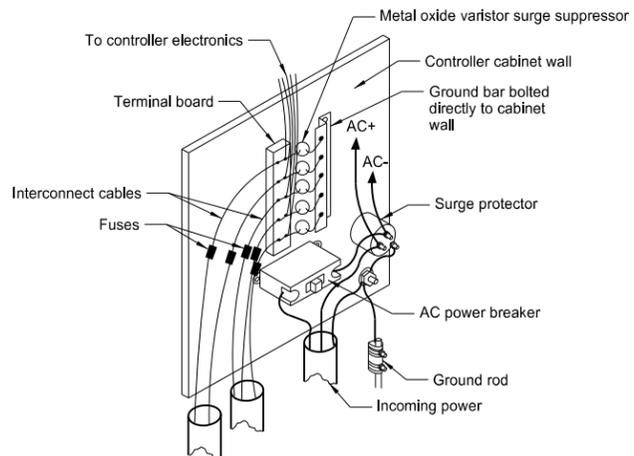
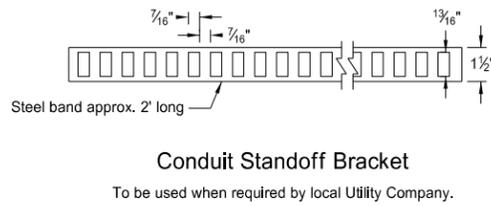
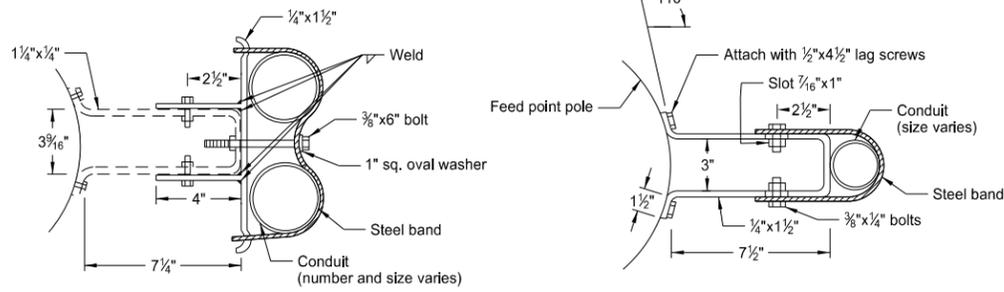
FEED POINT - TRAFFIC SIGNALS

D-772-1

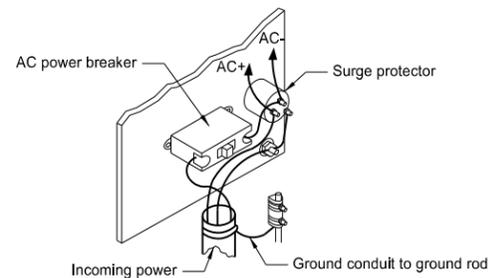


Circuit Breaker Cabinet Pad Mounted

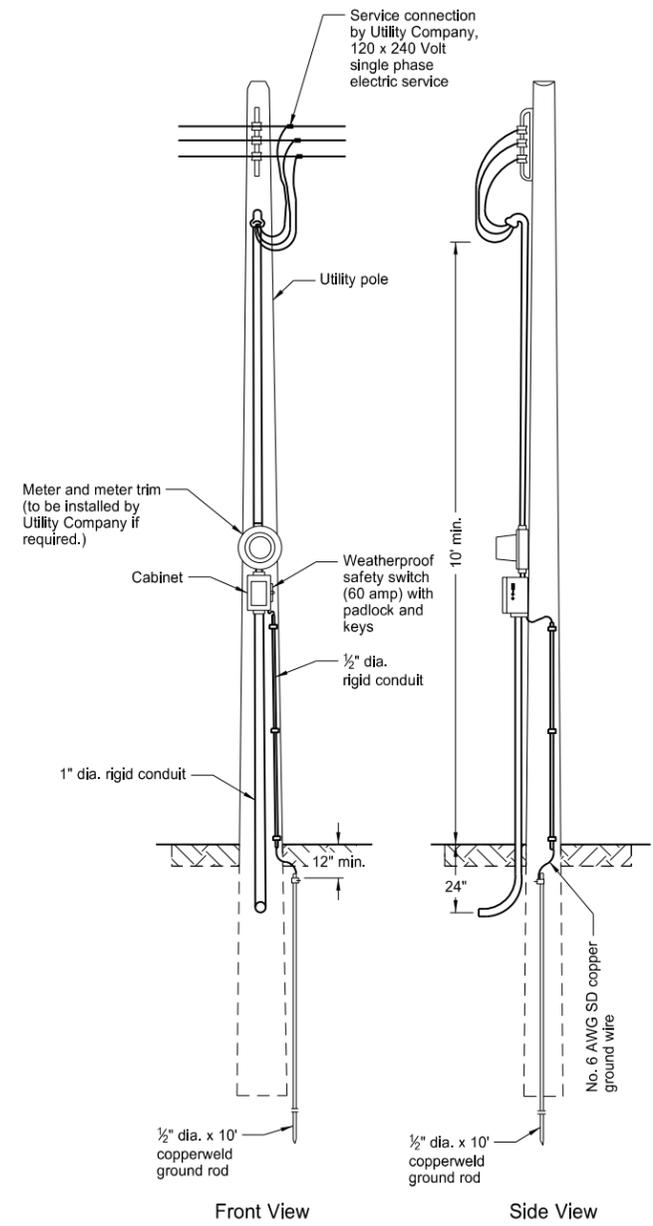
(A) Cabinet shall be 56 in. high x 26 in. wide x 14 in. deep, 12 gauge steel (min.) or aluminum with provisions for padlock. Cabinet shall be weatherproof. A steel cabinet shall have one coat of primer and two coats of exterior dark green enamel.



Controller Cabinet Interconnect and Power Cable Lightning Protection



Feed Point Cabinet Lightning Protection

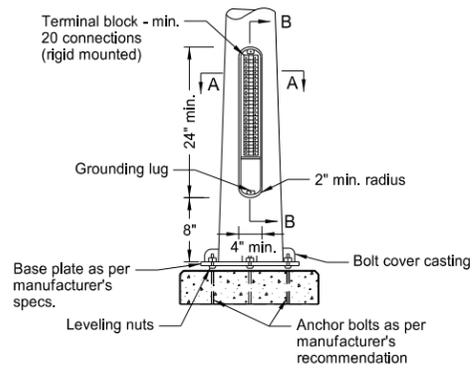
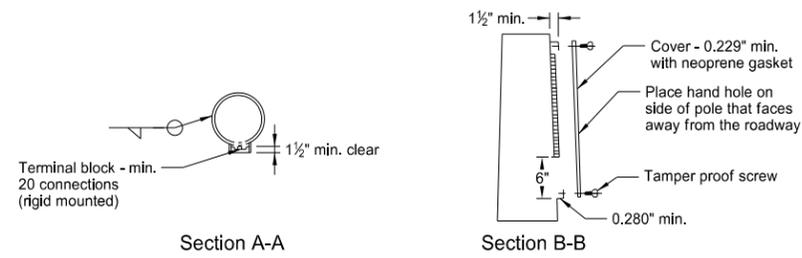


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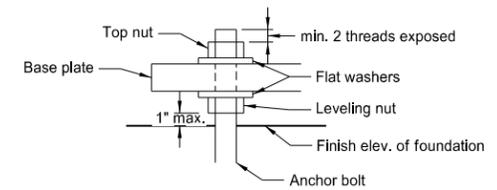
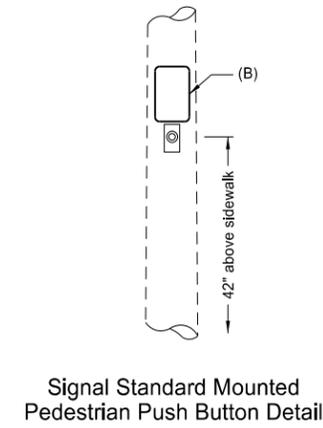
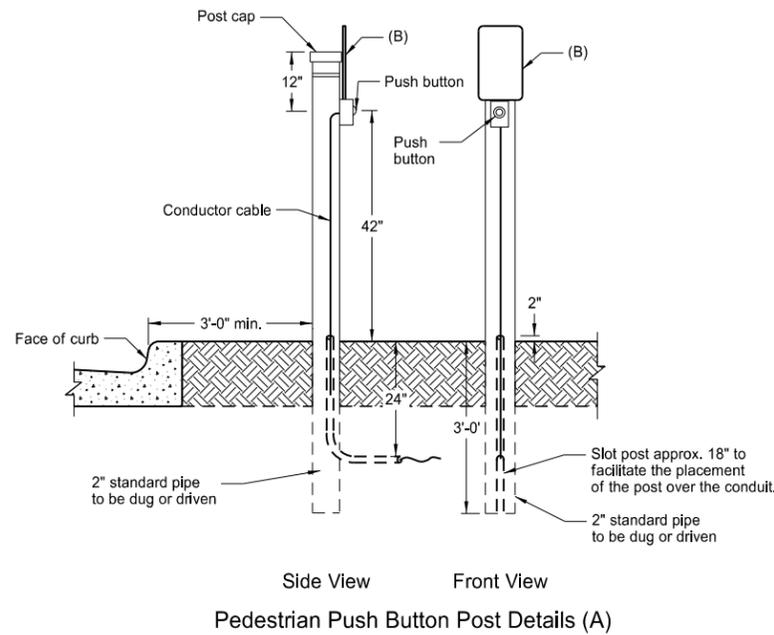
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TRAFFIC SIGNAL STANDARDS

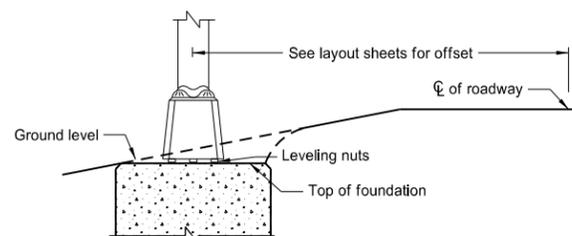
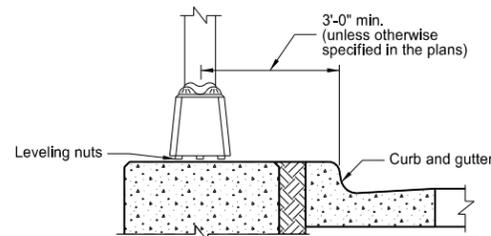
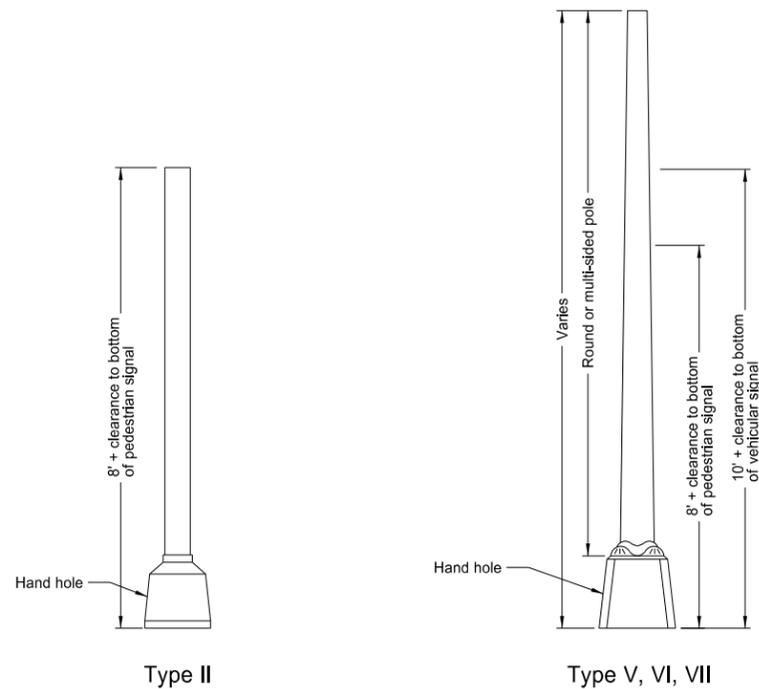
D-772-2



Alternate Signal Standard Base
For use only with Type V, VI, and VII signal standards.



Anchor Bolt Detail



Signal Standard Minimum Clearance Details

- (A) The positioning of the sign, pushbutton, and direction of arrow shall clearly indicate which crosswalk is actuated by the push button. The type of sign will depend on the jurisdiction they are to be placed in.
- (B) Sign shall be attached to post using rust resistant bracket and banding. The material shall be 0.081 aluminum. See Standard Signs book for dimensions and legend series. See plans for type of sign.

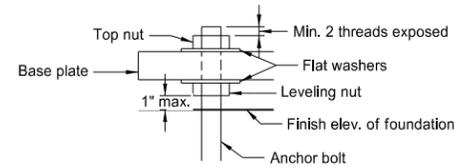
Notes:

- Signal Heads: See traffic signal layout for correct mounting position, number, size, and arrangement of lenses.
- Steel Standards: The center of the signal standard shall be a minimum of 3 ft. from the face of the curb unless shown otherwise on the layout sheets.
- Paint: See note sheet for required color of paint.
- Transformer Base: In lieu of the transformer base the contractor may use the alternate signal standard base.

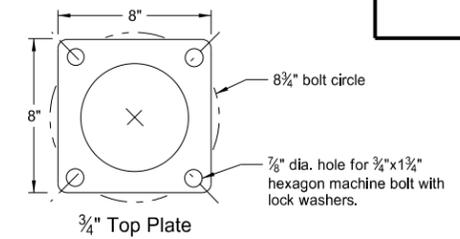
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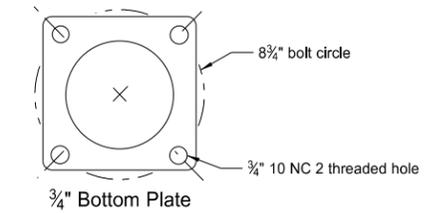
TRAFFIC SIGNAL STANDARDS (MAST ARM TYPE)



Anchor Bolt Detail



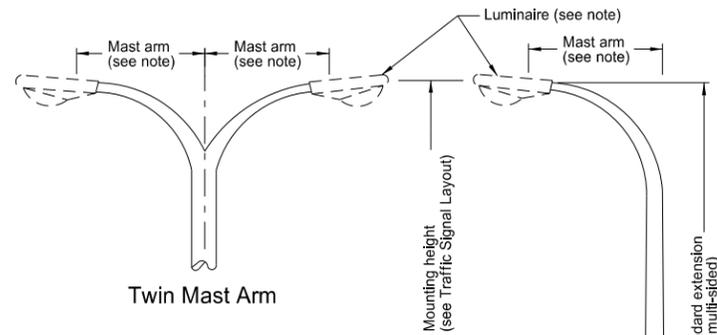
3/4" Top Plate



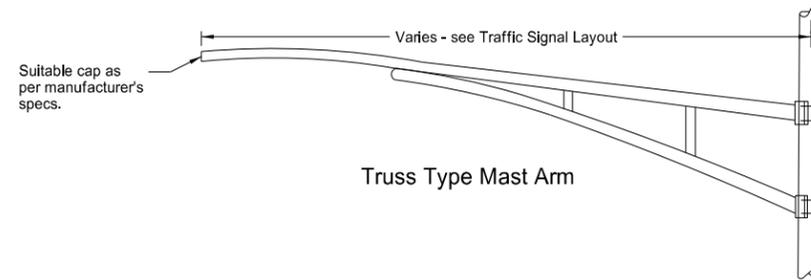
3/4" Bottom Plate

Detail A

Note: In lieu of the plate type connection a telescoping clamp type extension may be used.



Twin Mast Arm



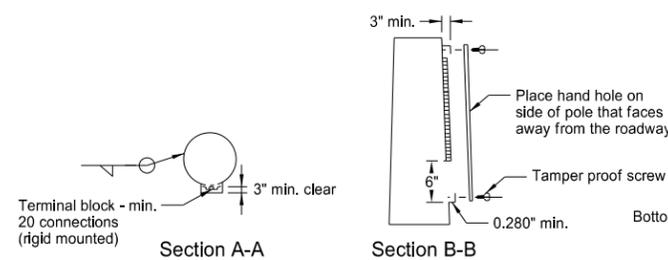
Truss Type Mast Arm

Combination Signal and Light Standard			
Signal Standard Type	Luminaire Mounting height (ft)	Install Light Standard Extension and Luminaire	Luminaire Mast Arm
A	30	yes	single
B	30	(A)	single
C	40	yes	single
D	40	(A)	single
E	30	yes	twin
F	30	(A)	twin
G	40	yes	twin
H	40	(A)	twin
I	50	yes	single
J	50	yes	twin

(A) The light standard extension for these signal standards shall be installed at a later date under a separate contract.

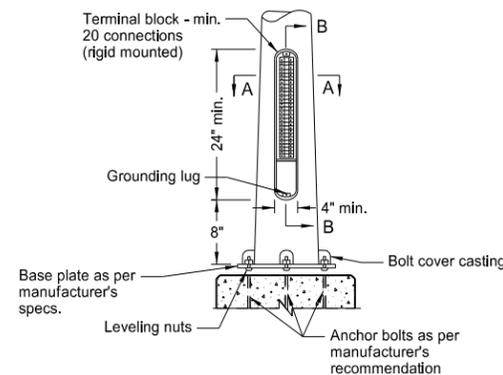
Notes:

- Light standard extension:** The mast arm shall be 6 ft. unless otherwise noted on the plans. The light standard extension shall be galvanized. Galvanizing shall be in accordance with ASTM A 123.
- Luminaire:** Luminaires shall be internal ballast - constant wattage 120 x 240 voltage. See layout sheets for type of luminaire, wattage, and I.E.S. distribution.
- Signal head:** See Traffic Signal Layout for correct mounting position, number, size, and arrangement of lenses. Clearance from the centerline of the roadway to the bottom of mast arm mounted signal heads shall be 17 ft. minimum and 19 ft. maximum.
- Multi-sided poles:** Shall have a means that will not allow the mast arm to be rotated by wind forces other than friction. The pole shall be so fabricated so that the mast arm is rotatable. This feature shall be approved by the Engineer.
- Transformer base:** In lieu of the transformer base the Contractor may use the alternate signal standard base.



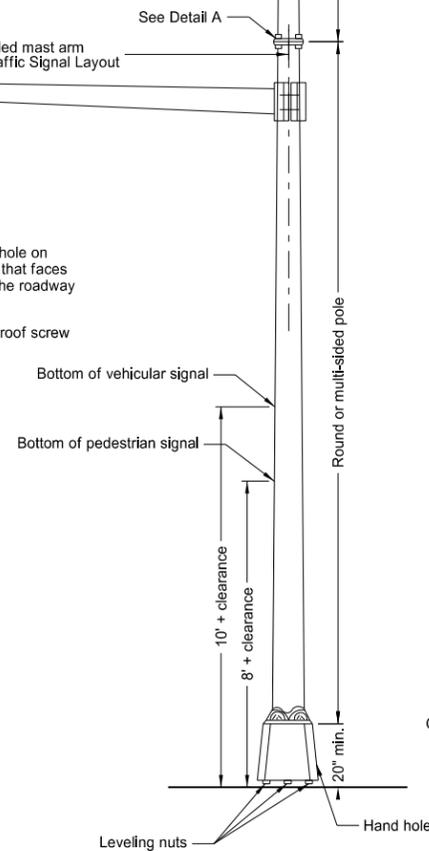
Section A-A

Section B-B

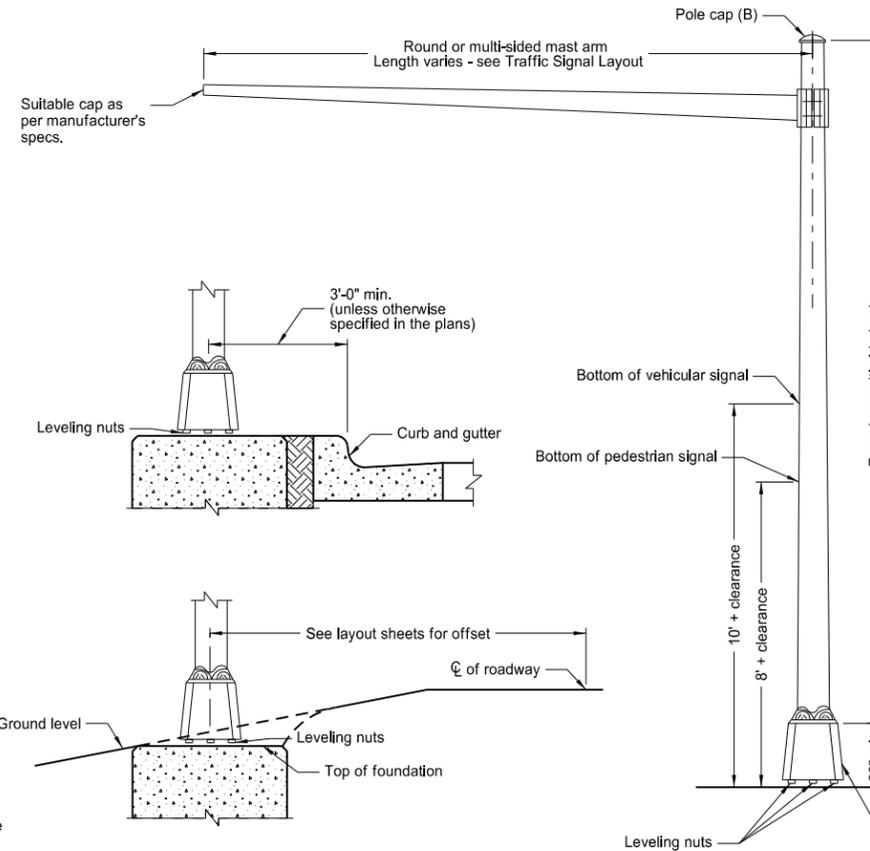


Alternate Signal Standard Base

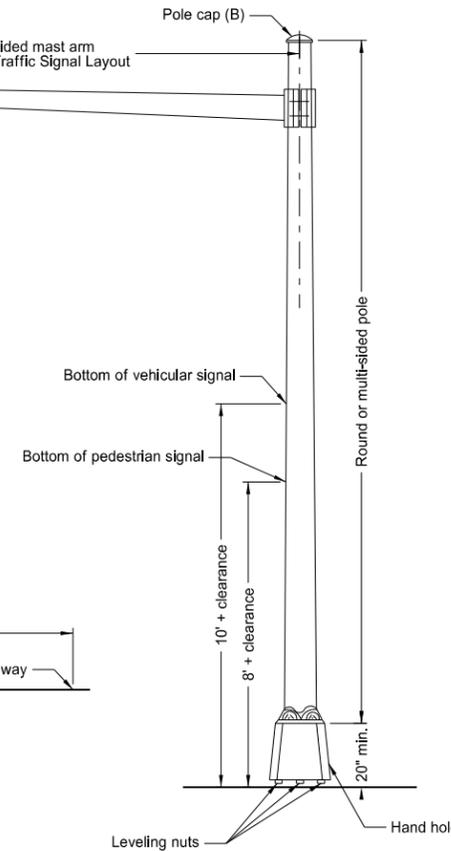
Note: For use only with Type IV and combination signal standards



Combination Signal and Light Standard



Signal Standard Minimum Clearance Detail



Type IV Signal Standard

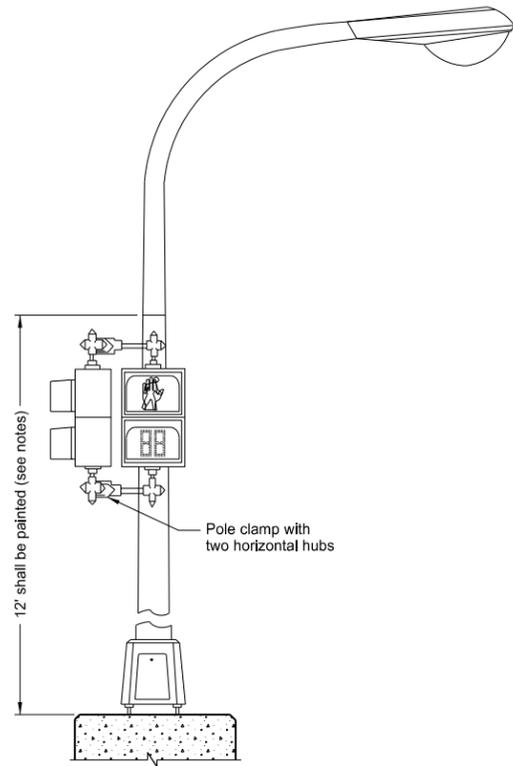
(B) On combination signal and light standards Type B, D, F, and H, and on all Type IV signal standards install a suitable pole cap as per manufacturer's specifications.

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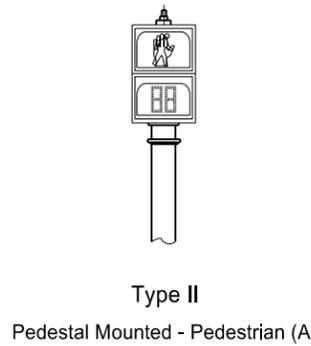
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TRAFFIC SIGNAL HEAD MOUNTING

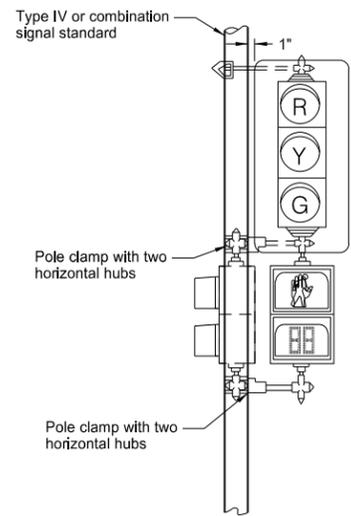
D-772-4



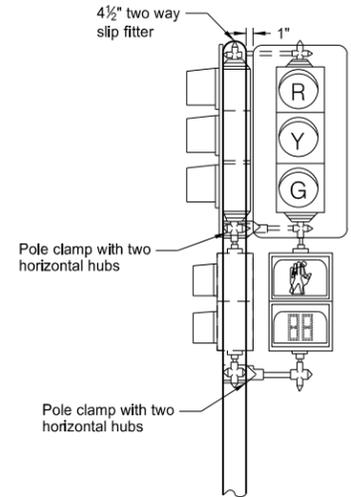
Light Standard Mounted Pedestrian Signal Head (A)



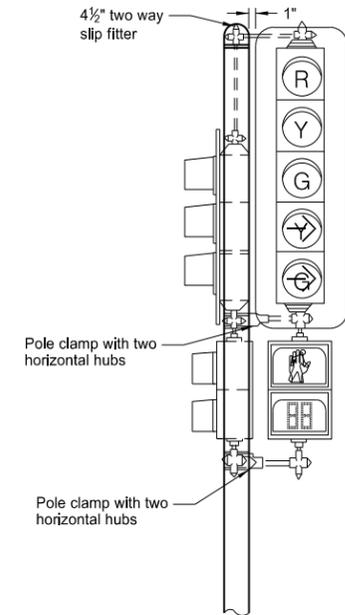
Type II
Pedestal Mounted - Pedestrian (A)



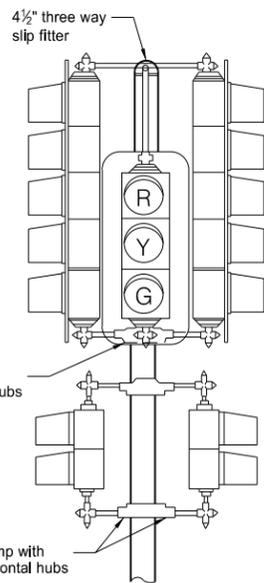
Type IV
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)



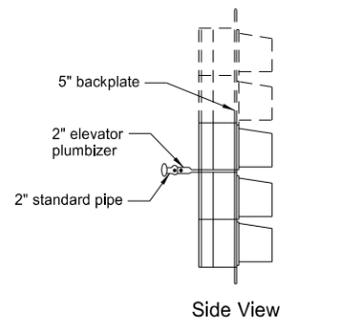
Type V
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)



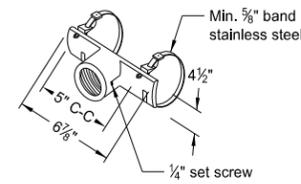
Type VI
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)



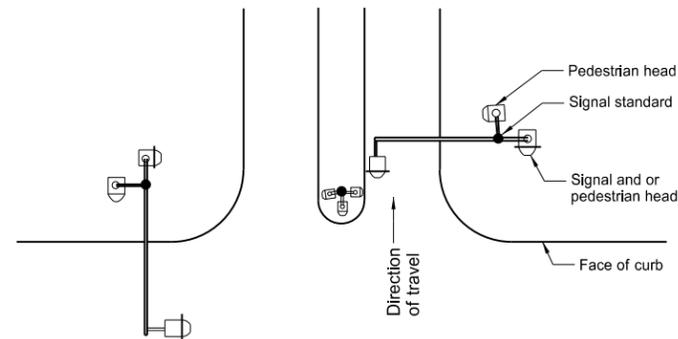
Type VII
Post Mounted - Vehicular
Post Mounted - Pedestrian (A)



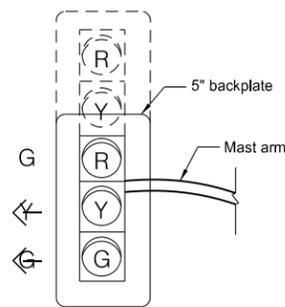
Side View
Mid-Span Mounted and
Mast Arm Rigid Mounted
Signal Heads



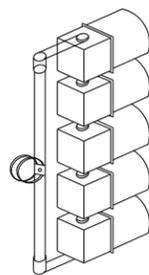
Mast Arm Signal
Head Bracket



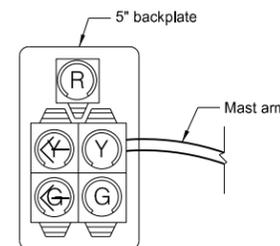
Plan Layout
(typical)



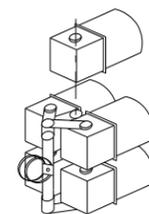
Front View



Isometric View
End Mounted and Mast Arm Rigid Mounted
Signal Heads



Front View



Isometric View

Notes:

- Reinforcing Plates:** Polycarbonate signal heads shall have reinforcing plates installed where the mounting hardware attaches to the signal head. Where a plumbizer is used reinforcing plates shall be placed on each side of the plumbizer.
- Clearance:** Clearance from the ground line or sidewalk to the bottom of post or pedestal mounted vehicular signal heads shall be 10 ft. minimum, from pedestrian signal heads shall be 8 ft. minimum.
- Signal Heads:** See traffic signal layout for correct mounting position, numbers, size, and arrangement of lenses.
- Pole Clamps:** A pole plate with suitable banding material, as approved by the Engineer, may be substituted for the pole clamps. Where traffic signal heads and pedestrian signal heads are mounted one above the other, one pole clamp assembly may be used.
- Paint:** Signal housing shall be painted yellow. Backplates shall be painted dull black. Pole clamps and signal head mounting hardware shall be painted the same color as the signal standard shaft.

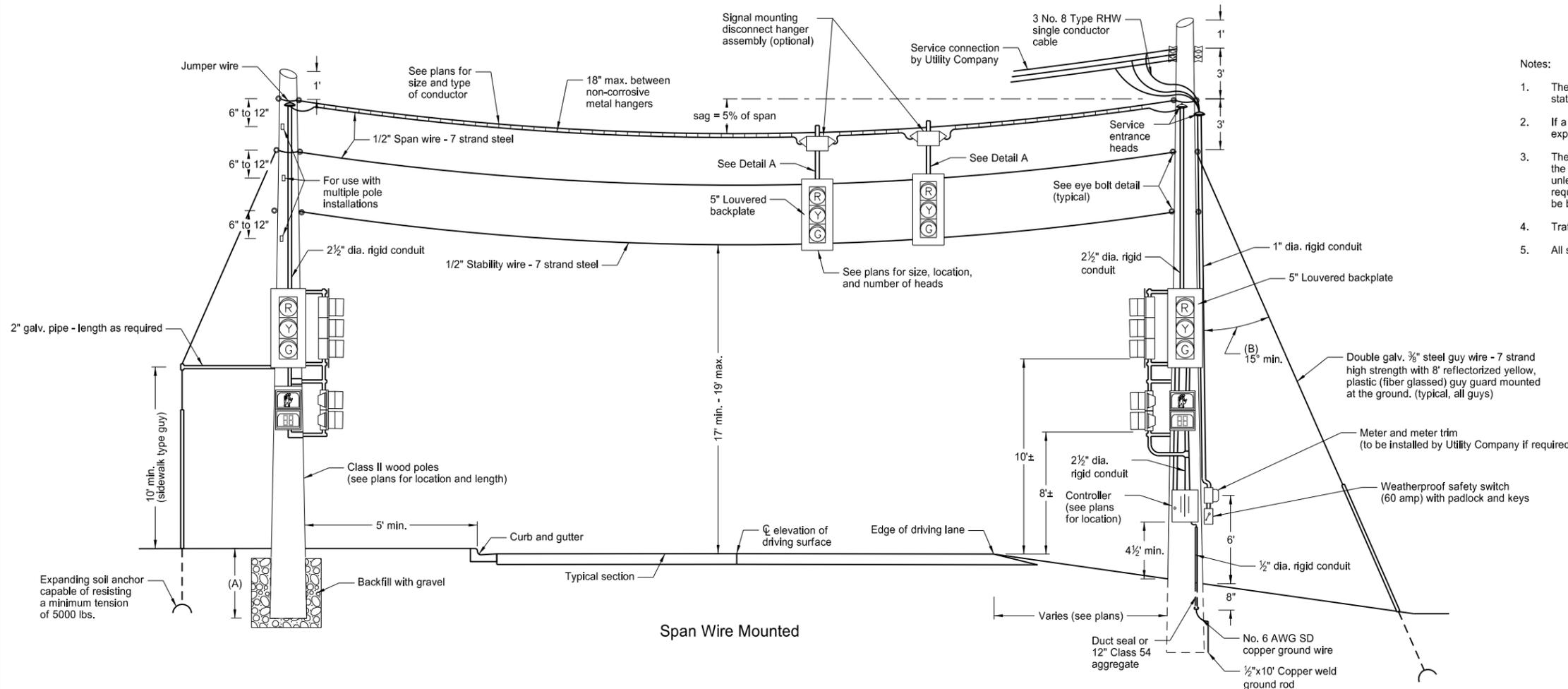
When pedestrian heads are light standard mounted, the lower 12 ft. shall be painted the same color as the other traffic signal standards.
- Mounting Details:** All signal heads shown are viewed from direction of travel.

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11-14-13	
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7-8-14	Added reinforcing plate note

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SPAN WIRE MOUNTED TRAFFIC SIGNALS

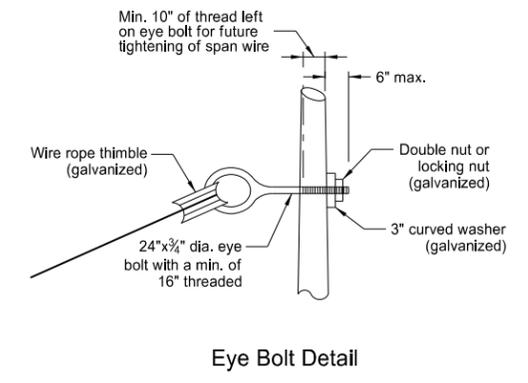
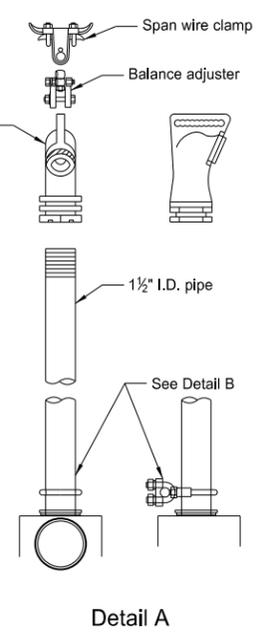
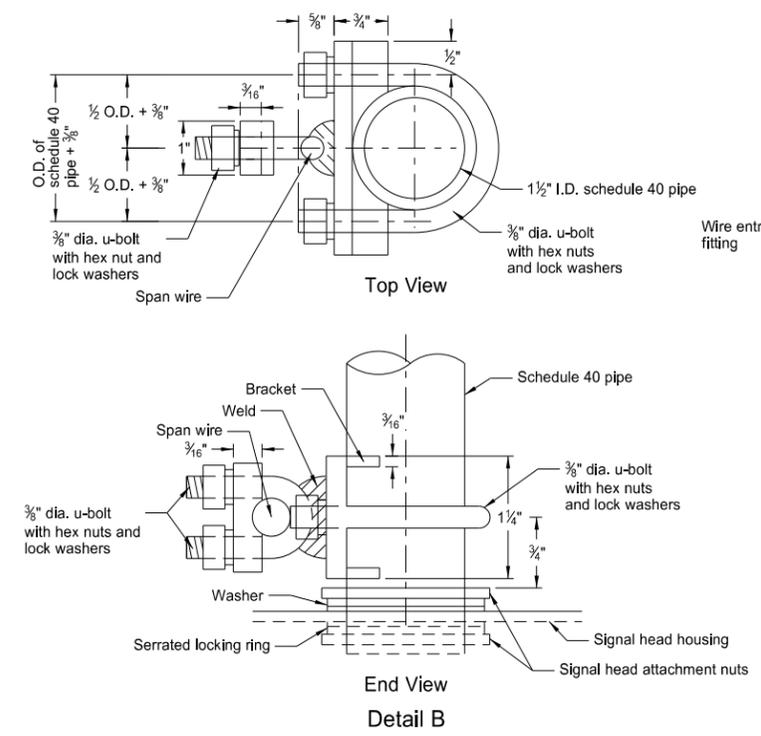
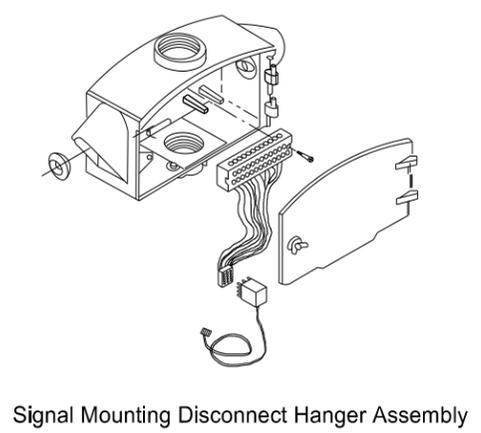
D-772-6



- Notes:
1. The span wire mounted traffic signals shall meet the requirements as stated in the Standard Specifications Section 772 and 896.
 2. If a guy wire angle of less than 45° is used, the capability of the expanding soil anchor to resist tensions on site must be increased.
 3. The contractor shall maintain the required 17 to 19 ft. signal height over the roadway for a minimum period of 90 calendar days after installation, unless written permission is granted 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 interim signals.
 4. Traffic signal controller shall be operated on 120 volts.
 5. All span wire and stability wire shall have thimble type connections.

Length of pole (ft)	Depth of pole min. (ft)
35	6
40	6
45	6.5
50	7
55	7.5

Angle	Anchor Resistance min.
30°	12,000 lbs.
15°	24,500 lbs.



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
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7-8-14	Title change, span wire size and sag

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