	STATE	PROJECT NO.	PCN	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	24567	1	1

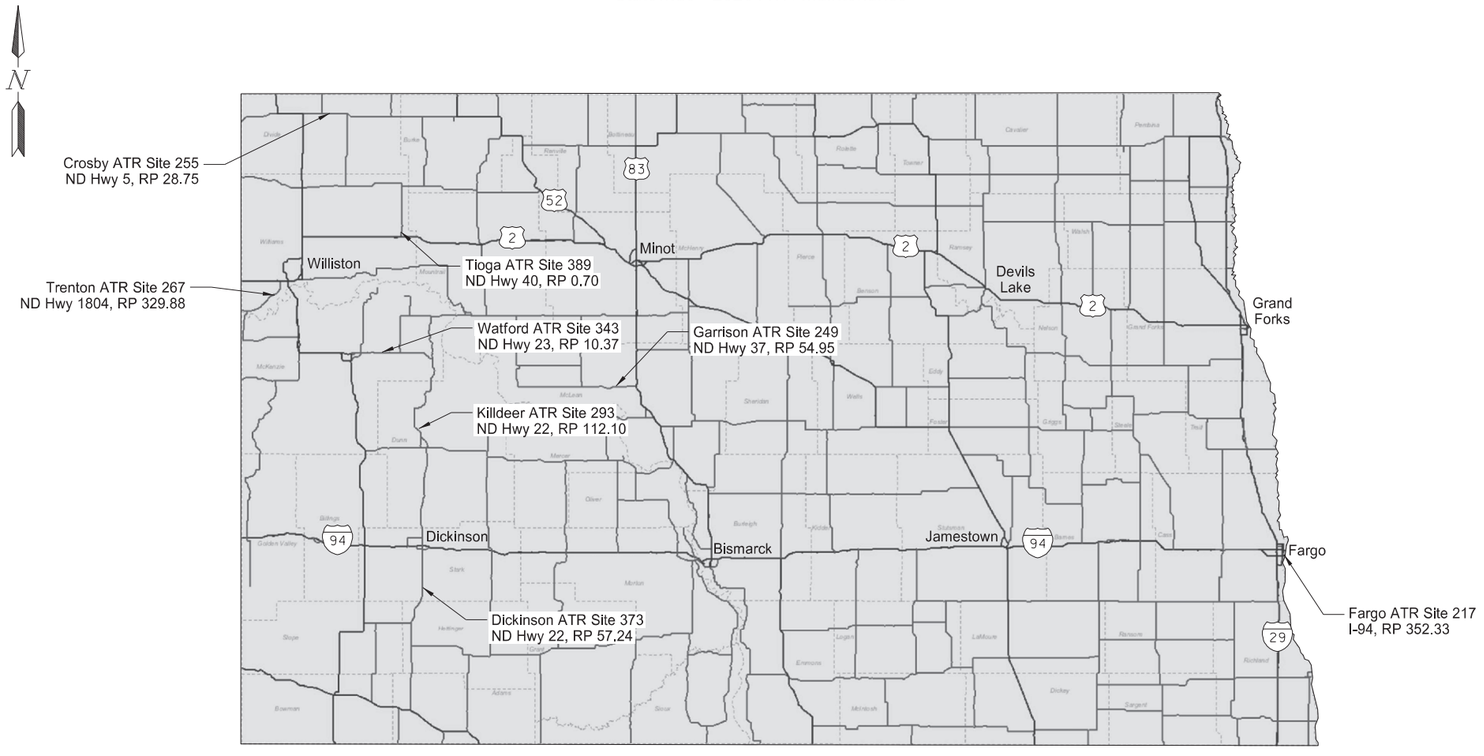
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

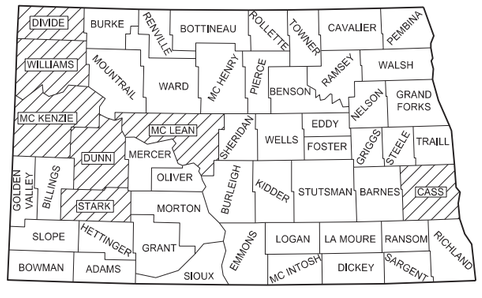
SS-9-999(546)

Cass, Divide, Dunn, McKenzie, McLean,
Stark, and Williams Counties
Various Districts
Statewide - 2025 ATR Maintenance

GOVERNING SPECIFICATIONS	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	7/1/2024
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION NET MILES GROSS MILES





STATE COUNTY MAP

DESIGNER	Erik Minge
DESIGNER	Ryan Schuehle
DESIGNER	Joe Bailey

ND DEPARTMENT OF TRANSPORTATION
OFFICE OF PROJECT DEVELOPMENT

Michael Johnson
03/12/25

SRF CONSULTING GROUP, INC.

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J
SEGALL
PE-41148
DATE:
03/12/25
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	2	1

TABLE OF CONTENTS

PLAN SECTIONS

LIST OF STANDARD DRAWINGS

SPECIAL PROVISIONS

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-9-999(546)	6	1

NOTES

100-P01 COORDINATION OF PROJECTS: The following projects are planned within the project limits.

- Project H-5-022(152)047, PCN 24266, is planned for 2025 Construction season. This is a chip seal coat project is along Hwy 22.

- Project IM-8-094(113)352, PCN 23520, is planned for 2025 Construction season. This is a structure repair project on I-94 Structures 94-352.453 R (MN Structure Number 9067) and 94-352.457 L (MN Structure Number 9066).

Coordinate all work and traffic control with these projects.

100-P02 COORDINATION: Contact the Engineer at least 1 week before disconnecting electrical conductors at ATR sites. Ensure the site is shut down properly by NDIT technicians before adding or removing components.

704-P01 TRAFFIC CONTROL DEVICES: The Traffic Control Devices List has been developed using the following Standard Drawing layouts:

D-704-24 Type R, Two lane highway shoulder closure.
D-704-24 Type HH, Shoulder closed on freeway. Delineator drums in place of portable barriers.

Traffic control device quantities are provided for each layout to have work done on both right and left shoulders at each site. If multiple sites are worked on simultaneously, the Department will pay for all necessary deployed devices to accommodate additional setups of the listed layouts.

772-P01 ATR TRUSS TOWER HEIGHT: Truss Tower heights required are indicated in the quantities for each site in section 160. A single, longer, truss tower length can be used, so long as the minimum height requirements are met for all sites. Ordering longer truss towers meeting minimum height requirements will be at no additional cost to the department.

772-P02 SEEDING: Include Seeding Class II in price bid for “Revise Automatic Traffic Recorder System.” See section 160 Quantity Estimates for estimated quantities at each site.

772-P03 EROSION CONTROL BLANKET: Include ECB Type 2 in price bid for “Revise Automatic Traffic Recorder System.” See section 160 Quantity Estimates for estimated quantities at each site.

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-9-999(546)	8	1

Estimated Quantities

SPEC	CODE	ITEM DESCRIPTION	UNIT	Mainline	TOTAL
103	0100	CONTRACT BOND	L SUM	1	1
702	0100	MOBILIZATION	L SUM	1	1
704	1000	TRAFFIC CONTROL SIGNS	UNIT	1454	1454
704	1060	DELINEATOR DRUMS	EA	62	62
704	1067	TUBULAR MARKERS	EA	22	22
772	9012	REVISE AUTOMATIC TRAFFIC RECORDER SYSTEM	EA	8	8

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-9-999(546)	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
E5-1-48	48"x48"	EXIT GORE		35	
G20-1-60	**60"x24"**	**ROAD WORK NEXT __ MILES**	**2**	**28**	**56**
G20-1b-60	60"x24"	NO WORK IN PROGRESS (Sign and installation only)		18	
G20-2-48	**48"x24"**	**END ROAD WORK**	**8**	**26**	**208**
G20-4-36	36"x18"	PILOT CAR FOLLOW ME (Mounted to back of pilot car)		18	
G20-4b-36	36"x30"	WAIT FOR PILOT CAR		18	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		43	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		36	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT		59	
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		11	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR (INSIDE ARROW) RIGHT or LEFT (Mounted on barricade)		7	
M5-1-21	21"x15"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		7	
M5-1-30	30"x21"	ADVANCE TURN ARROW RT or LT(Mounted on route marker post)		9	
M6-1-21	21"x15"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		7	
M6-1-30	30"x21"	DIRECTIONAL ARROW RT or LT (Mounted on route marker post)		9	
M6-3-21	21"x15"	DIRECTIONAL ARROW UP (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-2-60	60"x60"	YIELD		29	
R2-1-36	**36"x48"**	**SPEED LIMIT __ (Portable only)**	**12**	**30**	**360**
R2-1-48	48"x60"	SPEED LIMIT __		39	
R2-1aP-24	**24"x18"**	**MINIMUM FEE $80 (Mounted on Speed Limit post)**	**6**	**10**	**60**
R3-2-48	48"x48"	NO LEFT TURN		35	
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-54	54"x18"	ONE WAY RIGHT or LEFT (Mounted on STOP or DO NOT ENTER post)		14	
R7-1-12	12"x18"	NO PARKING ANY TIME		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	48"x30"	ROAD CLOSED (Mounted on barricade)		12	
R11-2a-48	48"x30"	STREET CLOSED (Mounted on barricade)		12	
R11-3a-60	60"x30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY (Mtd on barricade)		15	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC (Mounted on barricade)		15	
W1-3-48	48"x48"	REVERSE TURN RIGHT or LEFT		35	
W1-4-48	48"x48"	REVERSE CURVE RIGHT or LEFT		35	
W1-4b-48	48"x48"	TWO LANE REVERSE CURVE RIGHT or LEFT		35	
W1-6-48	48"x24"	ONE DIRECTION LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD		35	
W3-3-48	48"x48"	SIGNAL AHEAD		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	**48"x48"**	**SPEED REDUCTION AHEAD**	**6**	**35**	**210**
W4-2-48	48"x48"	LANE ENDS RIGHT or LEFT		35	
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER LINE		35	
W8-17-48	48"x48"	SHOULDER DROP-OFF SYMBOL		35	
W8-53-48	48"x48"	TRUCKS ENTERING HIGHWAY		35	
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT or _ MILE		35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT or _ MILE		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W13-1P-30	30"x30"	__ MPH ADVISORY SPEED PLAQUE (Mounted on warning sign post)		14	
W14-3-64	64"x48"	NO PASSING ZONE		28	
W16-2P-30	30"x24"	__ FEET PLAQUE (Mounted on warning sign post)		10	
W20-1-48	**48"x48"**	**ROAD WORK AHEAD or _FT or _ MILE**	**6**	**35**	**210**
W20-2-48	48"x48"	DETOUR AHEAD or __ FT or _ MILE		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT or _ MILE		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT or _ MILE		35	
W20-5-48	48"x48"	RIGHT or CENTER or LEFT LANE CLOSED AHEAD or __ FT or _ MILE		35	
W20-7-48	48"x48"	FLAGGER		35	
W20-8-18	18"x18"	STOP - SLOW PADDLE Back to Back		5	
W20-52P-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1-48	48"x48"	WORKERS		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT or _ MILE		35	
W21-5-48	**48"x48"**	**SHOULDER WORK**	**2**	**35**	**70**
W21-5a-48	**48"x48"**	**RIGHT or LEFT SHOULDER CLOSED**	**4**	**35**	**140**
W21-5b-48	**48"x48"**	**RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT or _ MILE**	**4**	**35**	**140**

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-6-48	48"x48"	SURVEY CREW		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W21-52-48	48"x48"	PAVEMENT BREAKS		35	
W21-53-48	48"x48"	RUMBLE STRIPS AHEAD		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
W24-1-48	48"x48"	DOUBLE REVERSE CURVE		35	

SPECIAL SIGNS

SPEC & CODE

704-1000	TRAFFIC CONTROL SIGNS	TOTAL UNITS	1454

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1048	PORTABLE RUMBLE STRIPS	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1052	TYPE III BARRICADES	EACH	
704-1060	**DELINEATOR DRUMS**	**EACH**	**62**
704-1065	TRAFFIC CONES	EACH	
704-1067	**TUBULAR MARKERS**	**EACH**	**22**
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1080	STACKABLE VERTICAL PANELS	EACH	
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	
704-1500	OBLITERATION OF PVMT MK	SF	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	

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

REGISTERED PROFESSIONAL ENGINEER
RYAN SCHUEHLE
PE-10772
DATE: 3/11/25
NORTH DAKOTA

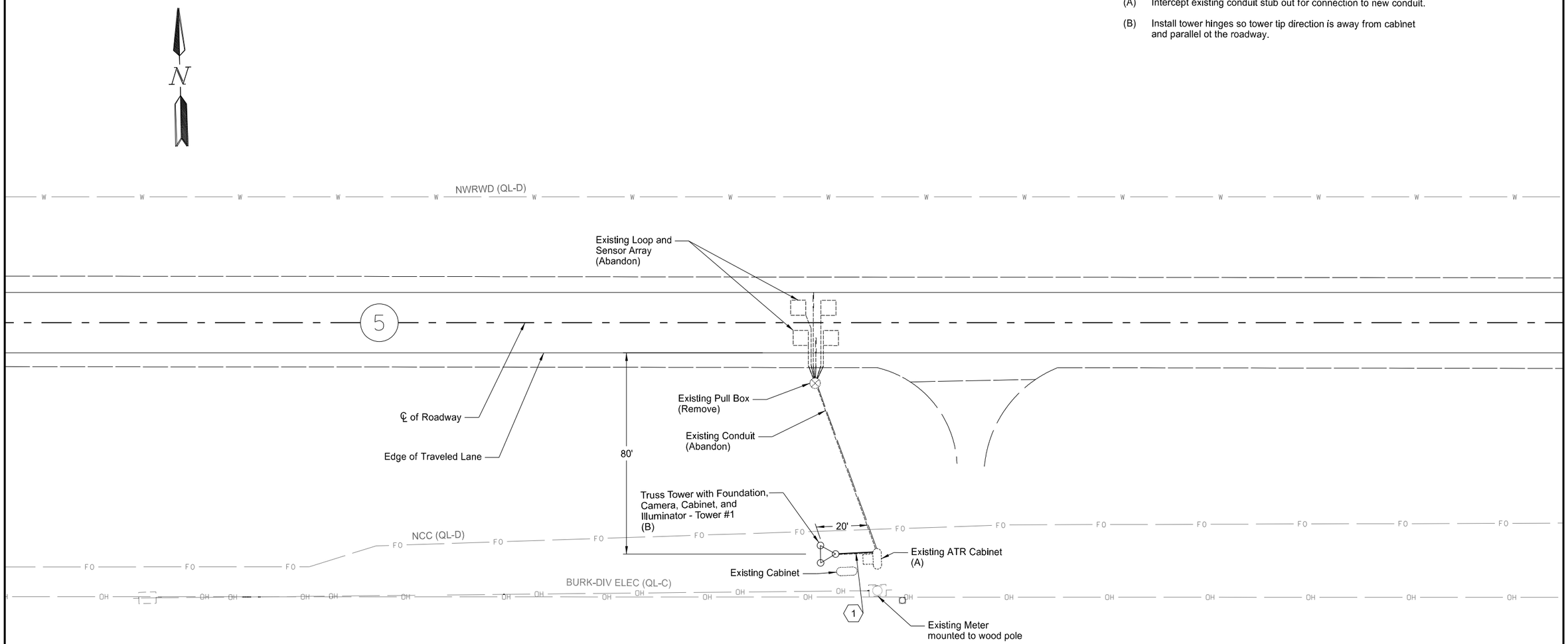
Traffic Control Devices List

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	1

NOTES:

(A) Intercept existing conduit stub out for connection to new conduit.

(B) Install tower hinges so tower tip direction is away from cabinet and parallel ot the roadway.



CONDUIT SCHEDULE									
RUN			CONDUIT			CABLE (INCLUDES SLACK)			
#	LOCATION		SIZE (IN)	LF	# of Conduit	No 12 AWG 3 Conductor	Multimode Fiber Optic	SJOOW 14/3	CAT 6 Ethernet
1	*Origin*	ATR Cabinet	2	21	1	36	36	-	-
	Destination	Tower Cabinet #1							
2	*Origin*	Tower Cabinet #1	-	-	-	-	-	44	-
	Destination	Illuminator #1							
3	*Origin*	Tower Cabinet #1	-	-	-	-	-	-	49
	Destination	Camera #1							

NOTE: Steel Conduit above ground on the truss tower is quantified in the quantities table on the next sheet.

ATR Layout
ND Hwy 5
RP 28.75

Site 255
Crosby

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J SEGALL
PE-41148
DATE: 3/12/25
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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	2

Quantities (A)		
2 Inch Diameter Rigid HDPE Conduit	LF	21
2 Inch Diameter Steel Conduit (B)	LF	40
40' Hinged Truss Tower	EA	1
Drilled Shaft Concrete Foundation for truss tower with grounding system and concrete mow strip	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor, weather/glare shield, and mounting bracket	EA	1
No 12 AWG 3 Conductor Cable	LF	36
Multimode Fiber Optic Cable	LF	36
SJOOW 14/3 Power Cable	LF	44
Quarterhill Infrared Illuminator with power supply and mounting bracket	EA	1
4G Cellular Modem including all necessary equipment and mounting hardware	EA	1
Remote Power Controlled Rack Mounted Outlet Strip	EA	1
CAT 6 Ethernet Cable	LF	49
Quarterhill iTHEIA Traffic Data System main panel electronics, power supply, and all necessary cables	EA	1
Quarterhill iTHEIA Traffic Data System tower panel electronics, power supply, and all necessary cables	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1
Remove Pull Box	EA	1
ECB Type 2 and Seeding Class II	SY	15

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

(B) Use steel conduit above ground on truss tower.

ATR Quantities
ND Hwy 5
RP 28.75

Site 255
Crosby

REGISTERED PROFESSIONAL ENGINEER
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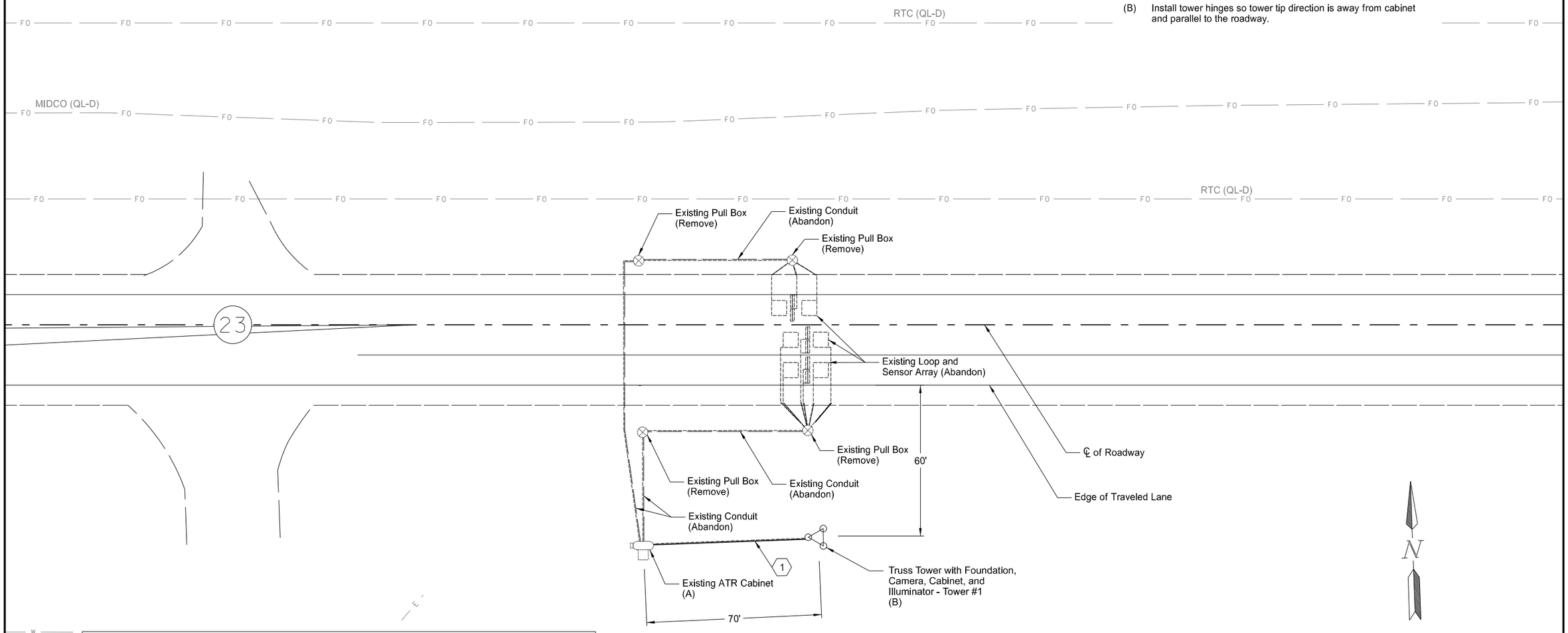
DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	3

NOTES:

(A) Intercept existing conduit stub out for connection to new conduit.

(B) Install tower hinges so tower tip direction is away from cabinet and parallel to the roadway.



CONDUIT SCHEDULE

RUN			CONDUIT			CABLE (INCLUDES SLACK)			
#	LOCATION		SIZE (IN)	LF	# of Conduit	No 12 AWG 3 Conductor	Multimode Fiber Optic	SJOOW 14/3	CAT 6 Ethernet
1	*Origin*	ATR Cabinet	2	70	1	85	85	-	-
	Destination	Tower Cabinet #1							
2	*Origin*	Tower Cabinet #1	-	-	-	-	-	39	-
	Destination	Illuminator #1							
3	*Origin*	Tower Cabinet #1	-	-	-	-	-	-	44
	Destination	Camera #1							

NOTE: Steel Conduit above ground on the truss tower is quantified in the quantities table on the next sheet.

ATR Layout
ND Hwy 23
RP 10.37

Site 343
Watford

REGISTERED PROFESSIONAL ENGINEER
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PE-41148
DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	4

Quantities (A)		
2 Inch Diameter Rigid HDPE Conduit	LF	70
2 Inch Diameter Steel Conduit (B)	LF	35
35' Hinged Truss Tower	EA	1
Drilled Shaft Concrete Foundation for truss tower with grounding system and concrete mow strip	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor, weather/glare shield, and mounting bracket	EA	1
No 12 AWG 3 Conductor Cable	LF	85
Multimode Fiber Optic Cable	LF	85
SJOOW 14/3 Power Cable	LF	39
Quarterhill Infrared Illuminator with power supply and mounting bracket	EA	1
4G Cellular Modem including all necessary equipment and mounting hardware	EA	1
Remote Power Controlled Rack Mounted Outlet Strip	EA	1
CAT 6 Ethernet Cable	LF	44
Quarterhill iTHEIA Traffic Data System main panel electronics, power supply, and all necessary cables	EA	1
Quarterhill iTHEIA Traffic Data System tower panel electronics, power supply, and all necessary cables	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1
Remove Pull Box	EA	4
ECB Type 2 and Seeding Class II	SY	34

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

(B) Use steel conduit above ground on truss tower.

ATR Quantities
ND Hwy 23
RP 10.37

Site 343
Watford

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	5

CONDUIT SCHEDULE

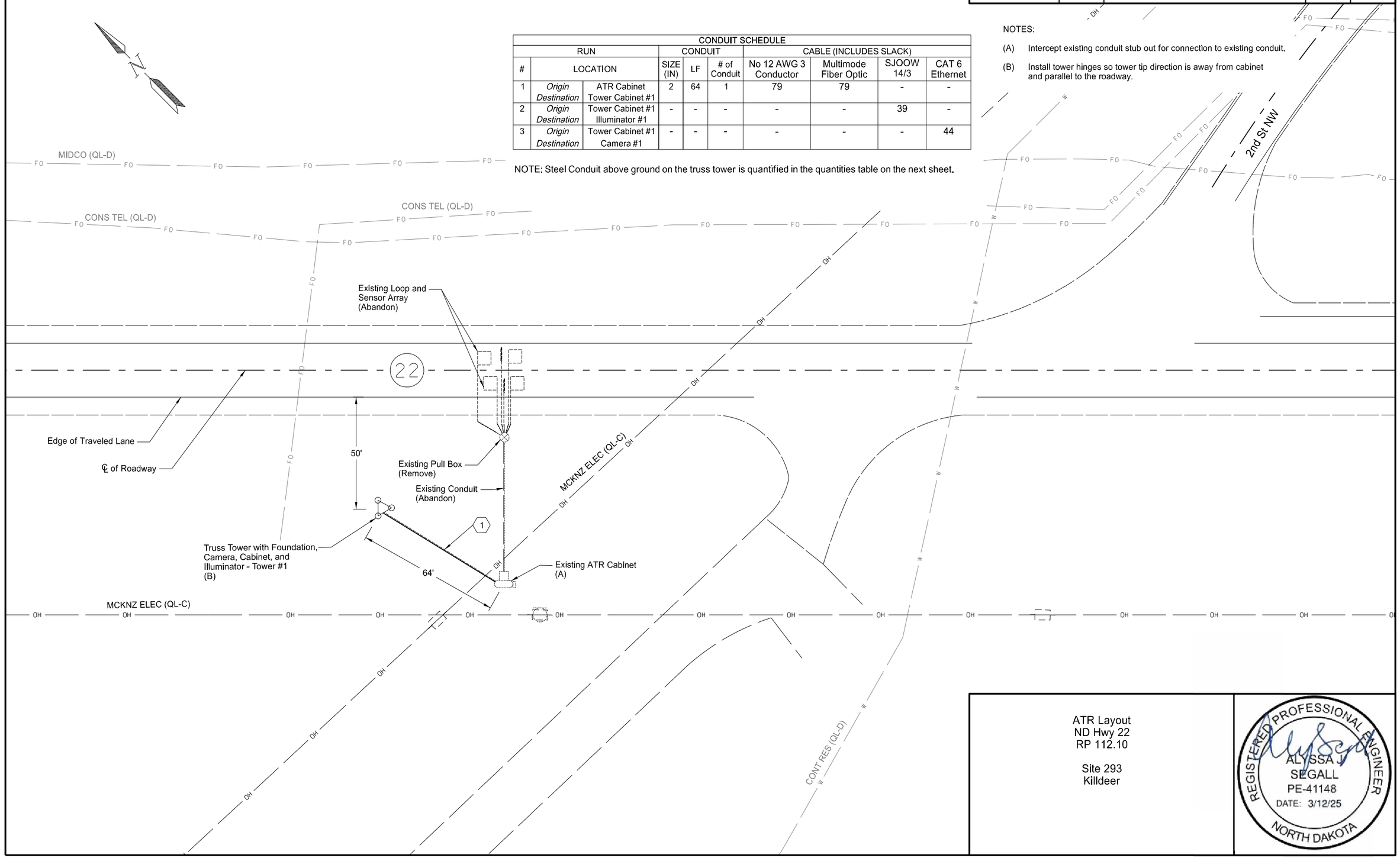
RUN			CONDUIT			CABLE (INCLUDES SLACK)			
#	LOCATION		SIZE (IN)	LF	# of Conduit	No 12 AWG 3 Conductor	Multimode Fiber Optic	SJOOW 14/3	CAT 6 Ethernet
1	*Origin*	ATR Cabinet	2	64	1	79	79	-	-
	Destination	Tower Cabinet #1							
2	*Origin*	Tower Cabinet #1	-	-	-	-	-	39	-
	Destination	Illuminator #1							
3	*Origin*	Tower Cabinet #1	-	-	-	-	-	-	44
	Destination	Camera #1							

NOTE: Steel Conduit above ground on the truss tower is quantified in the quantities table on the next sheet.

NOTES:

(A) Intercept existing conduit stub out for connection to existing conduit.

(B) Install tower hinges so tower tip direction is away from cabinet and parallel to the roadway.



ATR Layout
ND Hwy 22
RP 112.10

Site 293
Killdeer

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SS-9-999(546)	160	6

Quantities (A)		
2 Inch Diameter Rigid HDPE Conduit	LF	64
2 Inch Diameter Steel Conduit (B)	LF	35
35' Hinged Truss Tower	EA	1
Drilled Shaft Concrete Foundation for truss tower with grounding system and concrete mow strip	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor, weather/glare shield, and mounting bracket	EA	1
No 12 AWG 3 Conductor Cable	LF	79
Multimode Fiber Optic Cable	LF	79
SJOOW 14/3 Power Cable	LF	39
Quarterhill Infrared Illuminator with power supply and mounting bracket	EA	1
4G Cellular Modem including all necessary equipment and mounting hardware	EA	1
Remote Power Controlled Rack Mounted Outlet Strip	EA	1
CAT 6 Ethernet Cable	LF	44
Quarterhill iTHEIA Traffic Data System main panel electronics, power supply, and all necessary cables	EA	1
Quarterhill iTHEIA Traffic Data System tower panel electronics, power supply, and all necessary cables	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1
Remove Pull Box	EA	1
ECB Type 2 and Seeding Class II	SY	28

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

(B) Use steel conduit above ground on truss tower.

ATR Quantities
ND Hwy 22
RP 112.10

Site 293
Killdeer

REGISTERED PROFESSIONAL ENGINEER
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DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	7

NOTES:

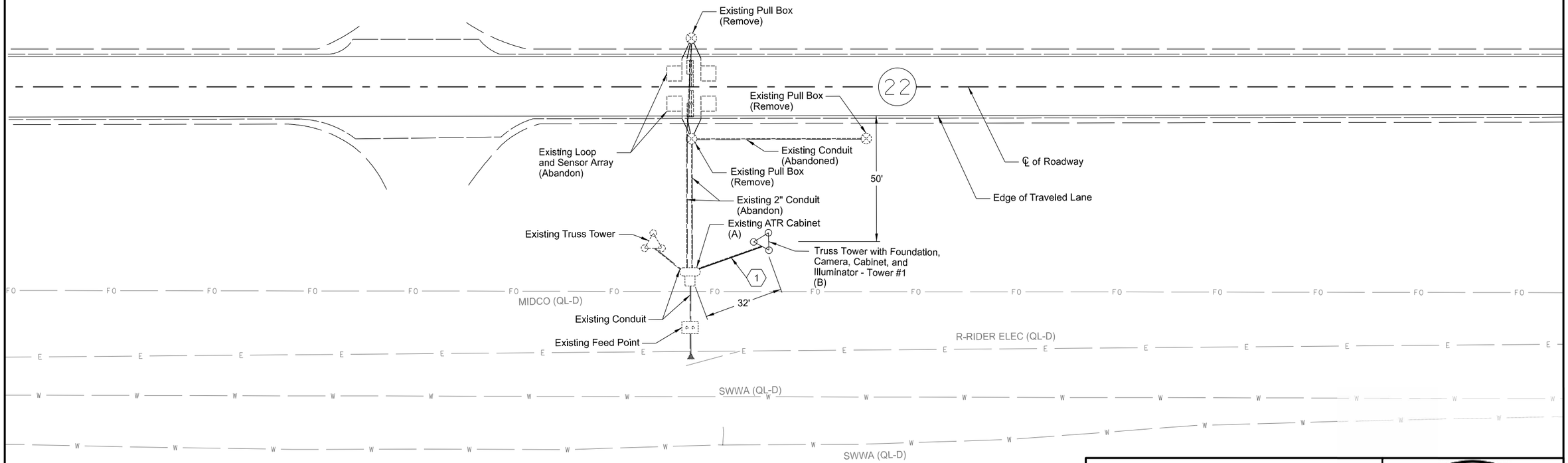
(A) Intercept existing conduit stub out for connection to new conduit.

(B) Install tower hinges so tower tip direction is away from cabinet and parallel to the roadway.

CONS TEL (QL-D)

CONDUIT SCHEDULE									
RUN			CONDUIT			CABLE (INCLUDES SLACK)			
#	LOCATION		SIZE (IN)	LF	# of Conduit	No 12 AWG 3 Conductor	Multimode Fiber Optic	SJOOW 14/3	CAT 6 Ethernet
1	*Origin*	ATR Cabinet	2	32	1	47	47	-	-
	Destination	Tower Cabinet #1							
2	*Origin*	Tower Cabinet #1	-	-	-	-	-	39	-
	Destination	Illuminator #1							
3	*Origin*	Tower Cabinet #1	-	-	-	-	-	-	44
	Destination	Camera #1							

NOTE: Steel Conduit above ground on the truss tower is quantified in the quantities table on the next sheet.



ATR Layout
ND Hwy 22
RP 57.24

Site 373
Dickinson

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J SEGALL
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DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	8

Quantities (A)		
2 Inch Diameter Rigid HDPE Conduit	LF	32
2 Inch Diameter Steel Conduit (B)	LF	35
35' Hinged Truss Tower	EA	1
Drilled Shaft Concrete Foundation for truss tower with grounding system and concrete mow strip	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor, weather/glare shield, and mounting bracket	EA	1
No 12 AWG 3 Conductor Cable	LF	47
Multimode Fiber Optic Cable	LF	47
SJOOW 14/3 Power Cable	LF	39
Quarterhill Infrared Illuminator with power supply and mounting bracket	EA	1
4G Cellular Modem including all necessary equipment and mounting hardware	EA	1
Remote Power Controlled Rack Mounted Outlet Strip	EA	1
CAT 6 Ethernet Cable	LF	44
Quarterhill iTHEIA Traffic Data System main panel electronics, power supply, and all necessary cables	EA	1
Quarterhill iTHEIA Traffic Data System tower panel electronics, power supply, and all necessary cables	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1
Remove Pull Box	EA	3
ECB Type 2 and Seeding Class II	SY	23

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

(B) Use steel conduit above ground on truss tower.

ATR Quantities
ND Hwy 22
RP 57.24

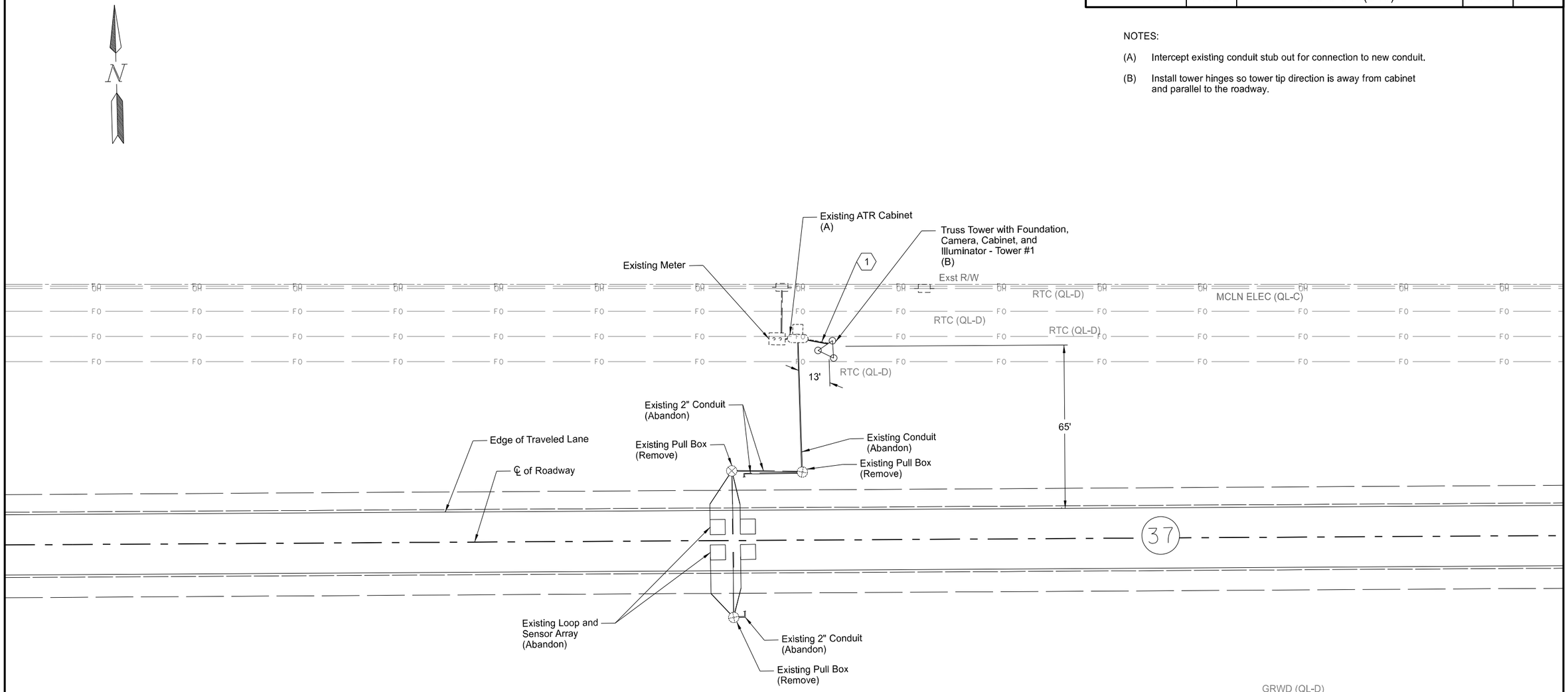
Site 373
Dickinson

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	9

NOTES:

(A) Intercept existing conduit stub out for connection to new conduit.

(B) Install tower hinges so tower tip direction is away from cabinet and parallel to the roadway.



CONDUIT SCHEDULE

#	RUN	LOCATION	CONDUIT SIZE (IN)	CONDUIT LF	CONDUIT # of Conduit	CABLE (INCLUDES SLACK) No 12 AWG 3 Conductor	Multimode Fiber Optic	SJOOW 14/3	CAT 6 Ethernet
1	*Origin*	ATR Cabinet	2	13	1	28	28	-	-
	Destination	Tower Cabinet #1							
2	*Origin*	Tower Cabinet #1	-	-	-	-	-	44	-
	Destination	Illuminator #1							
3	*Origin*	Tower Cabinet #1	-	-	-	-	-	-	49
	Destination	Camera #1							

NOTE: Steel Conduit above ground on the truss tower is quantified in the quantities table on the next sheet.

ATR Layout
ND Hwy 37
RP 54.95

Site 249
Garrison

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	10

Quantities (A)		
2 Inch Diameter Rigid HDPE Conduit	LF	13
2 Inch Diameter Steel Conduit (B)	LF	40
40' Hinged Truss Tower	EA	1
Drilled Shaft Concrete Foundation for truss tower with grounding system and concrete mow strip	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor, weather/glare shield, and mounting bracket	EA	1
No 12 AWG 3 Conductor Cable	LF	28
Multimode Fiber Optic Cable	LF	28
SJOOW 14/3 Power Cable	LF	44
Quarterhill Infrared Illuminator with power supply and mounting bracket	EA	1
4G Cellular Modem including all necessary equipment and mounting hardware	EA	1
Remote Power Controlled Rack Mounted Outlet Strip	EA	1
CAT 6 Ethernet Cable	LF	49
Quarterhill iTHEIA Traffic Data System main panel electronics, power supply, and all necessary cables	EA	1
Quarterhill iTHEIA Traffic Data System tower panel electronics, power supply, and all necessary cables	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1
Remove Pull Box	EA	3
ECB Type 2 and Seeding Class II	SY	18

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

(B) Use steel conduit above ground on truss tower.

ATR Quantities
ND Hwy 37
RP 54.95

Site 249
Garrison

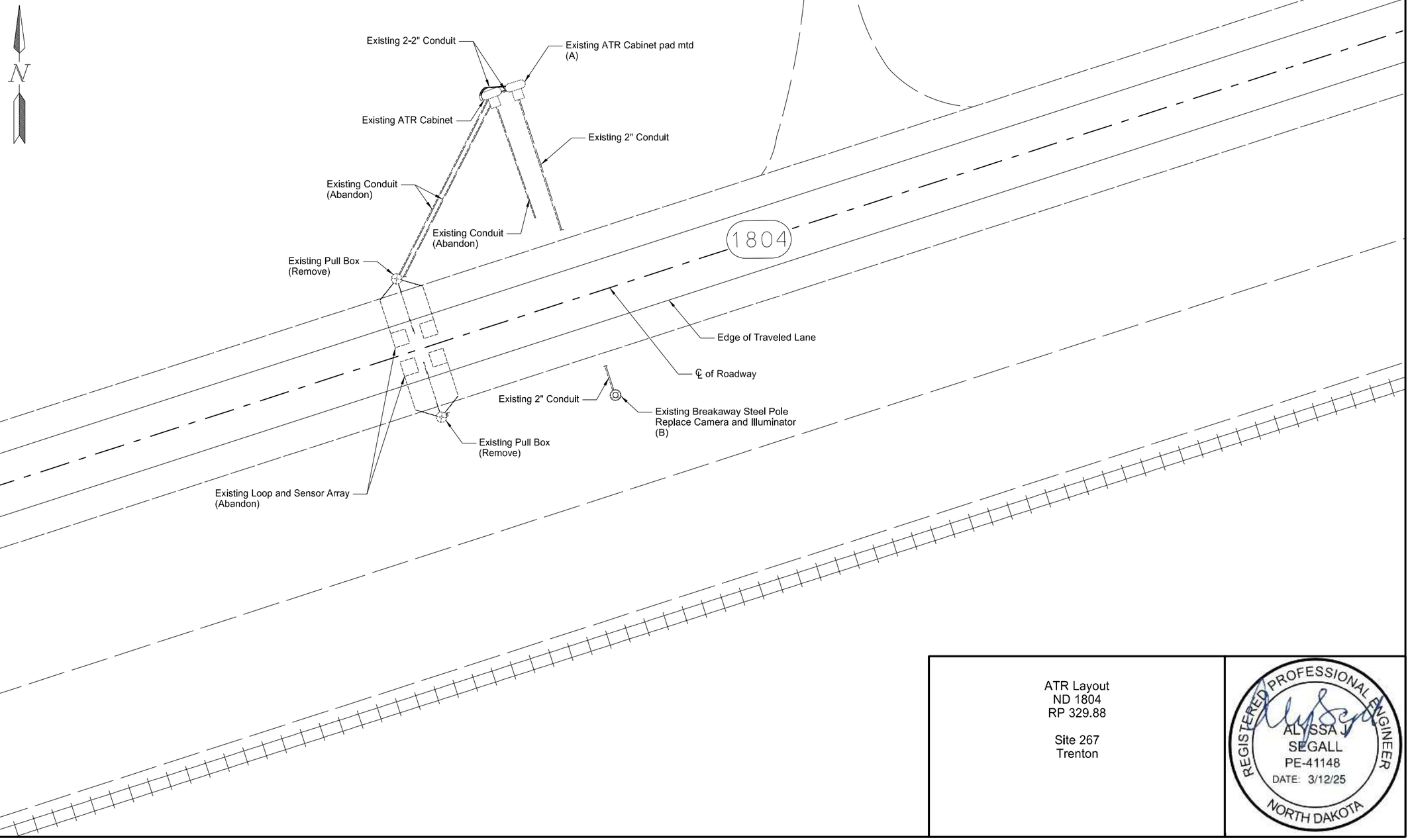
REGISTERED PROFESSIONAL ENGINEER
ALYSSA J
SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	11

NOTES:

(A) Remove existing shelf-mounted ICP and install new iTHEIA 2 panel on back of cabinet. Adjust cabling as required.

(B) Remove and salvage cameras and illuminators to NDDOT offices in Bismarck. Remove ICPs.



ATR Layout
ND 1804
RP 329.88

Site 267
Trenton

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

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	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	12

Quantities (A)		
Remove ICP	EA	1
Salvage Camera	EA	1
Salvage Infrared Illuminator	EA	1
Quarterhill iTHEIA 2 Panel	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor and weather/glare shield(C)	EA	1
Quarterhill Infrared Illuminator with power supply (C)	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1
Remove Pull Box	EA	2

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

(B) Salvage existing shelf-mounted ICP and install new iTHEIA 2 panel on back of cabinet. Adjust cabling as required.

(C) Quarterhill to provide mounting bracket for camera and illuminator.

ATR Quantities
ND 1804
RP 329.88

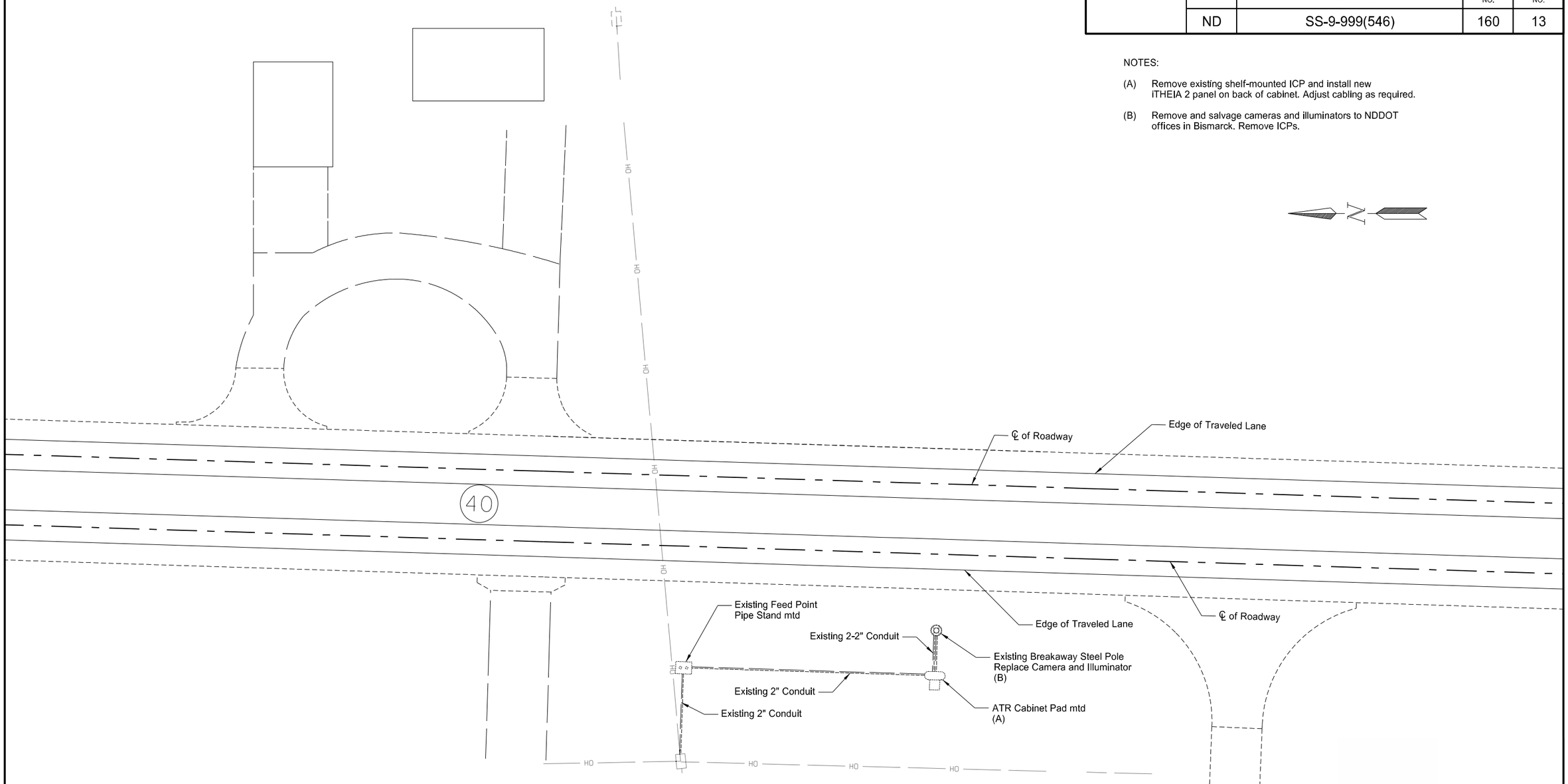
Site 267
Trenton

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	13

NOTES:

(A) Remove existing shelf-mounted ICP and install new iTHEIA 2 panel on back of cabinet. Adjust cabling as required.

(B) Remove and salvage cameras and illuminators to NDDOT offices in Bismarck. Remove ICPs.



ATR Layout
ND 40
RP 0.70

Site 389
Tioga

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J
SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	14

Quantities (A)		
Remove ICP	EA	1
Salvage Camera	EA	1
Salvage Infrared Illuminator	EA	1
Quarterhill iTHEIA 2 Panel	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor and weather/glare shield(C)	EA	1
Quarterhill Infrared Illuminator with power supply (C)	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

(B) Salvage existing shelf-mounted ICP and install new iTHEIA 2 panel on back of cabinet. Adjust cabling as required.

(C) Quarterhill to provide mounting bracket for camera and illuminator.

ATR Quantities
ND 40
RP 0.70

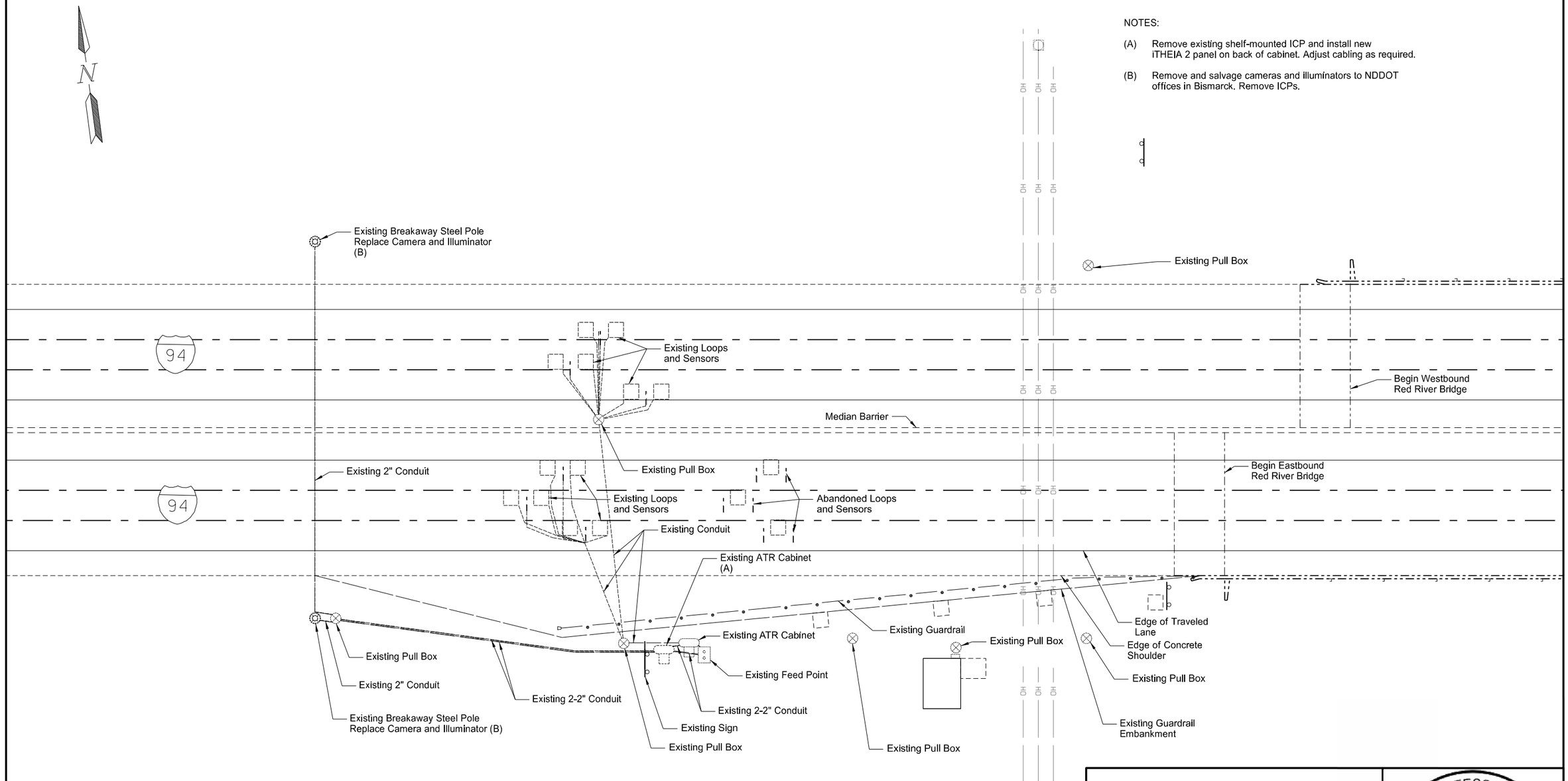
Site 389
Tioga

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	15

NOTES:

(A) Remove existing shelf-mounted ICP and install new iTHEIA 2 panel on back of cabinet. Adjust cabling as required.

(B) Remove and salvage cameras and illuminators to NDDOT offices in Bismarck. Remove ICPs.



ATR Layout
I-94
RP 352.33

Site 217
Fargo

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J
SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	16

Quantities (A)		
Remove ICP	EA	1
Salvage Camera	EA	1
Salvage Infrared Illuminator	EA	1
Quarterhill iTHEIA 2 Panel	EA	1
Quarterhill iTHEIA Traffic Data System Camera with surge arrestor and weather/glare shield(C)	EA	1
Quarterhill Infrared Illuminator with power supply (C)	EA	1
Quarterhill Representative Oversite	EA	1
Video Verification and Validation	EA	1
30 Day Monitoring Period	EA	1

Revise Automatic Traffic Recorder System	EA	1

(A) Include these quantities in the price bid for the item "Revise Automatic Traffic Recorder System".

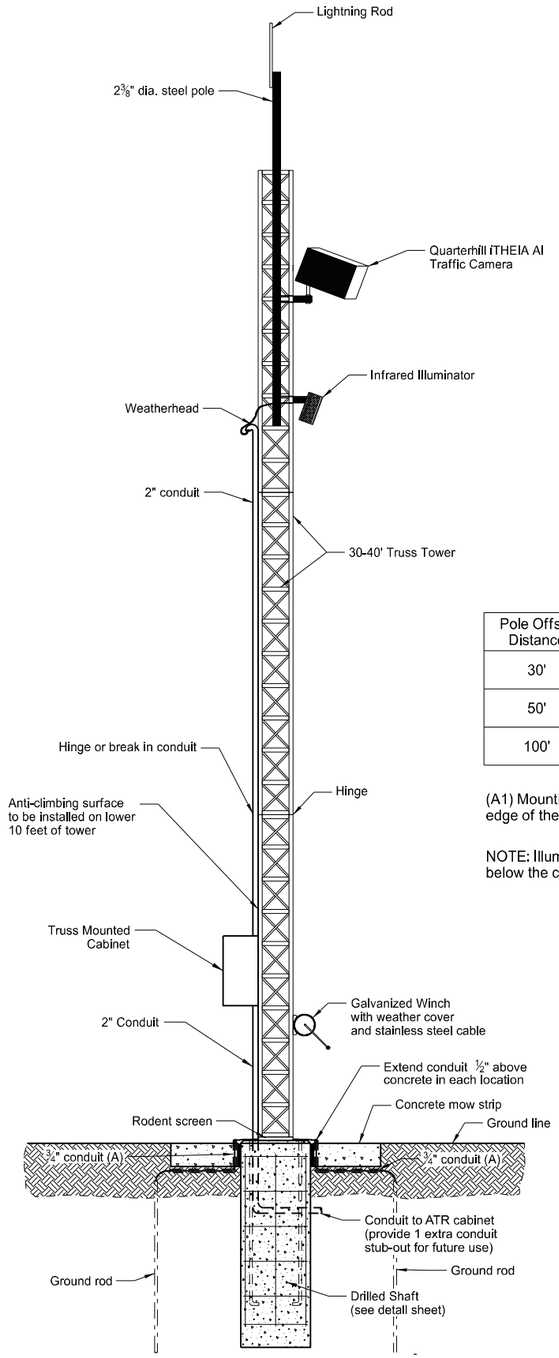
(B) Salvage existing shelf-mounted ICP and install new iTHEIA 2 panel on back of cabinet. Adjust cabling as required.

(C) Quarterhill to provide mounting bracket for camera and illuminator.

ATR Quantities
I-94
RP 352.33

Site 217
Fargo

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	17

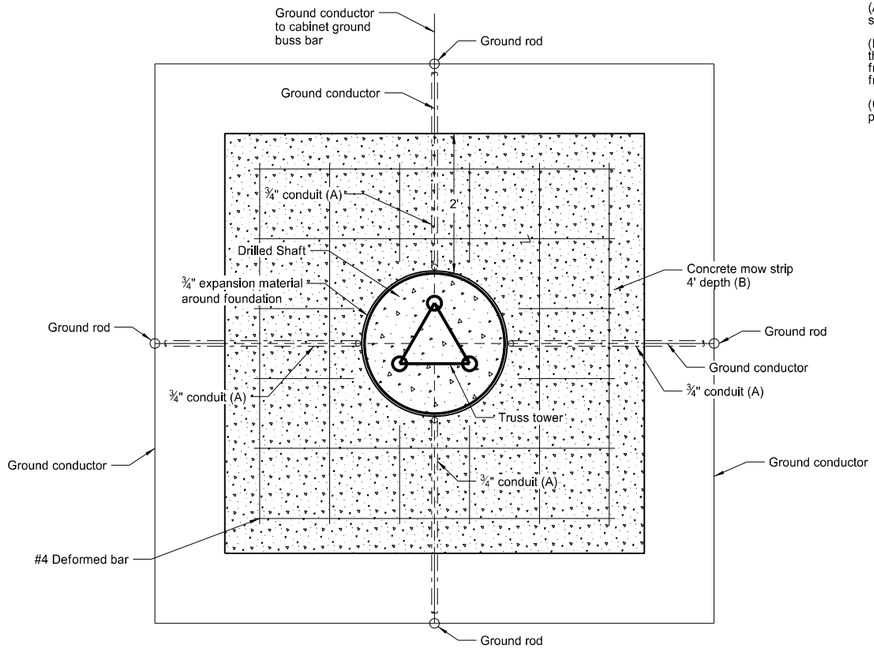


ATR Truss Tower with mow strip

Pole Offset Distance	Recommended Camera Mounting Height (A1)
30'	25'
50'	30'
100'	35'

(A1) Mounting height measured from the edge of the driving lane.

NOTE: Illuminator will be mounted 5' below the camera.



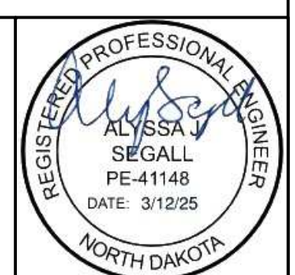
Truss Tower with grounding diagram and mow strip

(A) Install the ¾" conduit in the mow strip. Extend the conduit ½" above the surface of the mow strip.

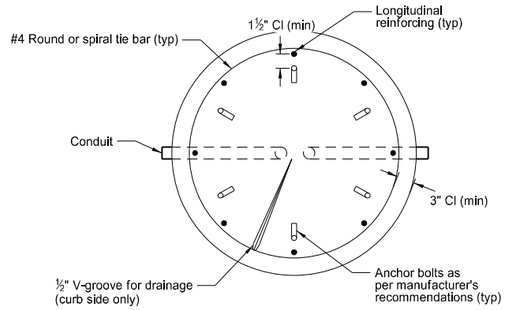
(B) Install a mow strip around the foundation. Place expansion material between the foundation and the mow strip. Ensure the mow strip is 4" depth and 2' width from the foundation. Use #4 deformed bars in the mow strip. Space the bars 6" from the outside edge. Place the bars in a grid pattern at 1' apart.

(C) Set the tower hinges away from the cabinet so that the tower folds down parallel to the highway and away from the cabinet.

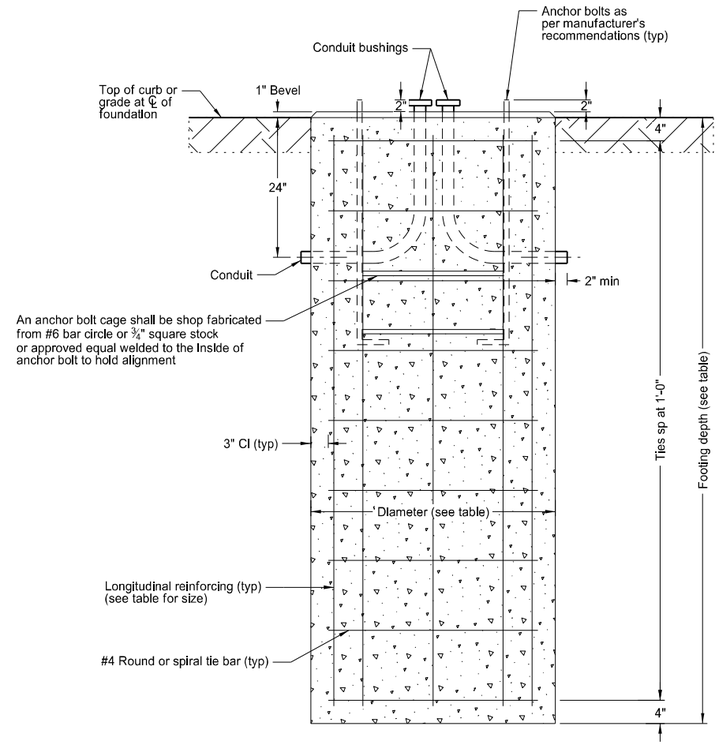
ATR Truss Tower Details



	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	18



Plan



Elevation

Foundation Details for
ATR Truss Tower

Notes: 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 location of foundations. The Engineer will establish the grade and exact location in the field. Use Grade 60 reinforcement. Lap tie bars a minimum of 12".

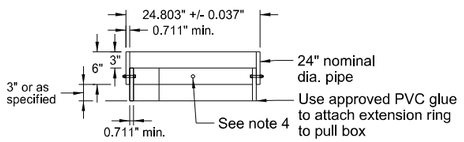
Foundation Table	
Footing Diameter	Longitudinal Reinforcing
24"	8 - #5
30"	8 - #6
36"	8 - #7
42"	8 - #8

Foundation Table			
Footing Dia FT	Truss Tower 30 FT	Truss Tower 35 FT	Truss Tower 40 FT
3	8.5 FT depth	9.5 FT depth	9.5 FT depth

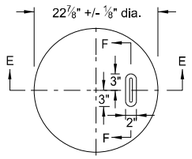
Foundation Details

REGISTERED PROFESSIONAL ENGINEER
ALYSSA J
SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

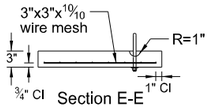
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	19



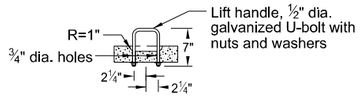
Extension Ring
(future adjustment)



Top View

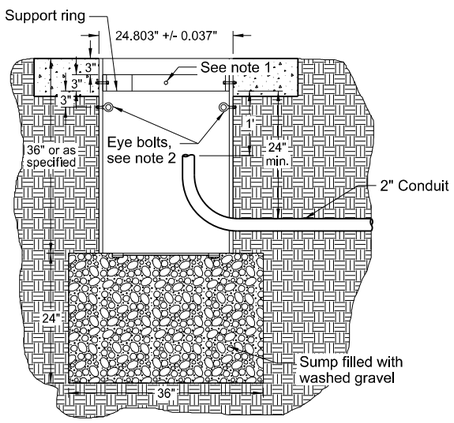


Section E-E

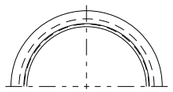


Section F-F

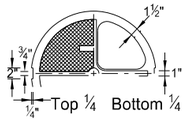
Concrete Cover



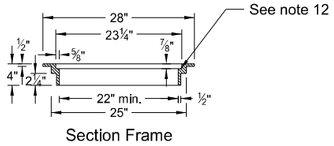
Elevation



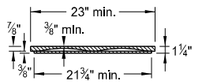
Half Top View



Top ¼ Bottom ¼

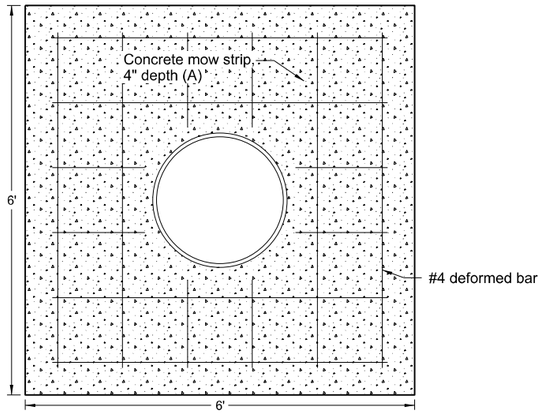


Section Frame

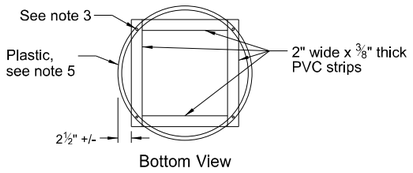


Section Cover

Cast Iron Frame and Cover



Top View
with mow strip



Bottom View

PVC Pull Box
with mow strip

(A) Install a mow strip around the pull box. Place expansion material between the foundation and the mow strip. Ensure the mow strip is 4" depth and 2' width from the foundation. Use #4 deformed bars in the mow strip. Space the bars 6" from the outside edge. Place the bars in a grid pattern at 1' apart.

PVC Pull Box Notes:

1. Attach split 24" nominal diameter PVC cover support ring with four ⅜" dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.

2. Two type 2 shoulder eye bolts, ⅜" dia. x 1¼" shank length with hex nuts 180 degrees apart (for lifting pull box and supporting electric cable).

3. Four ¼" x 1¼" long galvanized lag screws. Screw assembly together.

4. Attach split 24" nominal diameter PVC cover support extension ring with four ⅜" dia. x 2" long stainless steel hex head bolts with nuts at 90 degrees apart.

5. Bolt assembly together.

6. Size conduit holes located in barrel section no more than 1" larger than size of conduit being used.

7. After pull box and conduit installation, establish a waterproof seal where the conduit enters the pull box wall. Approach to waterproof this entry point shall be submitted to and approved by the engineer.

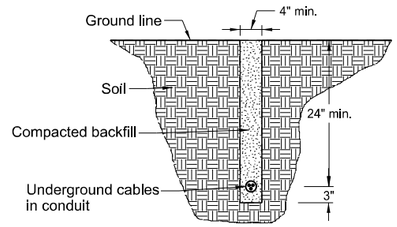
8. PVC pipe to meet requirements of ASTM F679 or equal.

9. Provide Austenitic Stainless Steel Hex Head bolts and nuts. Other fasteners to be galvanized as per ASTM A153.

10. Install an epoxy coating on the top and sides of the concrete cover. Provide an epoxy protective coating that is light gray, clear, or neutral in color and apply as recommended by the pull box manufacturer. Before application, clean with a wire brush and dry the surfaces of the concrete to which the epoxy protective coating is applied.

11. If a Cast Iron cover is provided, use grey iron as per AASHTO M 306.

12. Gasket made of non-absorbent material and must maintain its resiliency after long-term exposure to the outdoor environment.

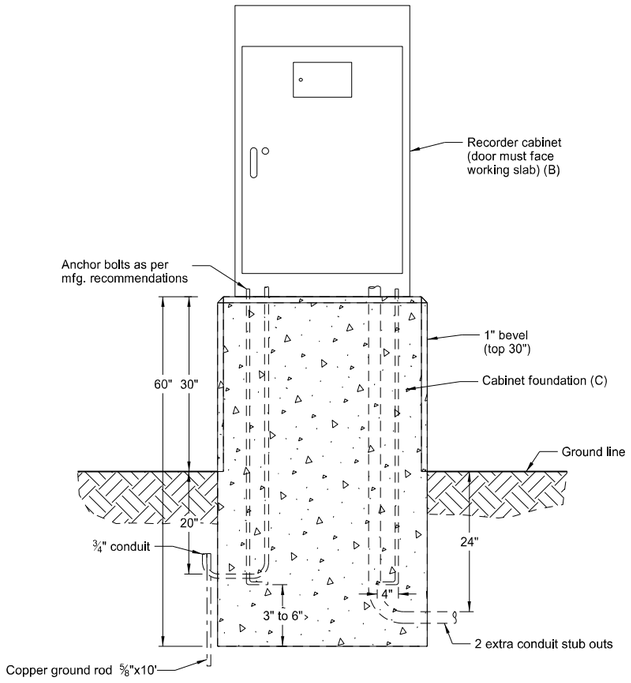


Cable Installation
(plow or trench)

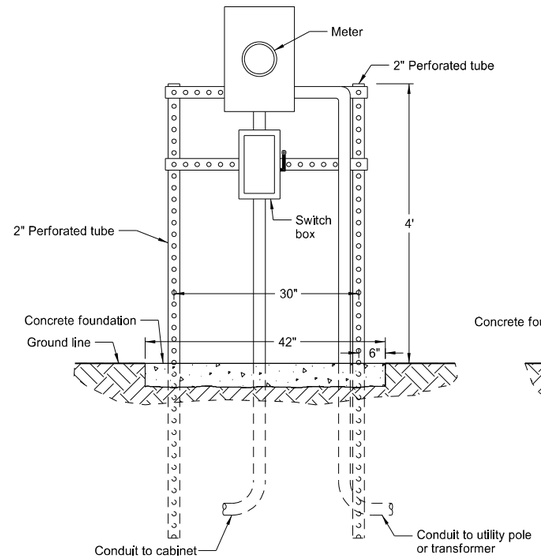
Pull Box and Trenching Details

REGISTERED PROFESSIONAL ENGINEER
ALYSSA SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

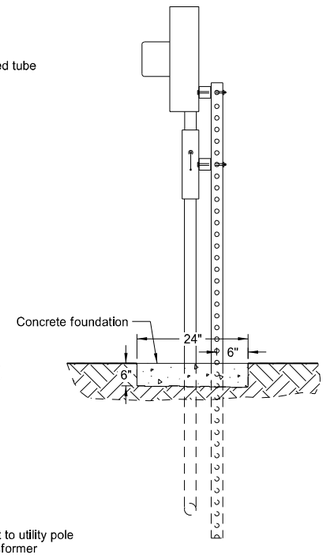
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SS-9-999(546)	160	20



ATR/WIM Recorder Cabinet
with concrete foundation



Front View



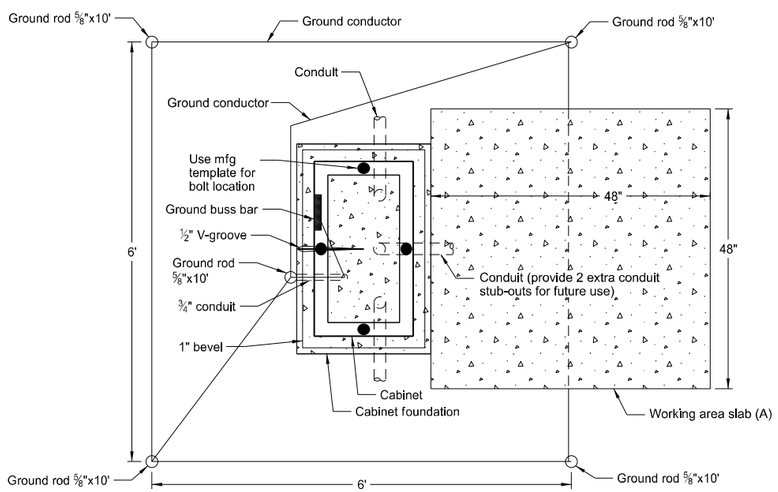
Side View

Feed Point Detail
with concrete foundation

(A) Ensure each working slab is 4" depth, 1" above the ground. Tie the cabinet foundation to the working slabs using #4 deformed bars, extending at least 12" beyond the foundation. Place a rebar grid in the working slab spaced 6" from the outside edge. Overlap the splice bars by at least 12". Place the rebar in a grid pattern at 1' apart in each slab.

(B) Cabinet dimensions are 30" width x 17" depth x 50" height.

(C) Construct the cabinet foundation so there is a minimum of 3 inches of clearance from the outside edge of the cabinet to the outside edge of the foundation on all sides.



ATR/WIM Cabinet Foundation
and working slab

Cabinet and Feed Point Details

REGISTERED PROFESSIONAL ENGINEER
ALYSSA SEGALL
PE-41148
DATE: 3/12/25
NORTH DAKOTA

NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
&	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
Bk	back
BF	back face
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
BI	beehive inlet
Beg	begin
BG	below grade
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
BH	bore hole
Bot	bottom
Blvd	Boulevard
Bndry	boundary
Brkwy	breakaway
Br	bridge
Bldg	building
Bus.	business
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
CL or ℄	centerline
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
CECB	concrete erosion control blanket
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSFES	corrugated steel flared end section
CSP	corrugated steel pipe
CSTES	corrugated steel traversable end section
Co	County
Crse	course
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	crossroad
Crn	crown
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
Dlnt	delineate
Dlntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia or ø	diameter
Dir	direction
Dist	distance
DM	disturbed material
DB	ditch block
DG	ditch grade
Dbl	double
Dn	down
Dwg	drawing
Dr	drive
Drwy	driveway
DI	drop inlet
D	dry density
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
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
Fed	Federal
FP	feed point
Fn	fence
Fn P	fence post
FO	fiber optic
FD	field drive
F	fill
FAA	fine aggregate angularity
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
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser
FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed

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NDDOT ABBREVIATIONS

D-101-2

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

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Salv	salvage(d)
San	sanitary sewer line
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw or Sdwk	sidewalk
SD	sight distance
SN	sign number
Sig	signal
Sgl	single
SRCP	slotted reinforced concrete pipe
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
Stk	stake
Std	standard
N	standard penetration test
Std Specs	standard specifications
Stm L	steam line
SEC	steel encased concrete
SMA	stone matrix asphalt
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical

Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	thinwall tube sample
Ts	topsoil
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
Trans	transition
TT	transmission tower
TES	traversable end section
Trans	transverse
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VCP	vitrified clay pipe
Vol	volume
VSFS	vehicle speed feedback sign
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
Wrng	wearing
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner

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NDDOT ABBREVIATIONS

MEASUREMENTS

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

SURVEY DESCRIPTIONS

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

SOIL TYPES

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

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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM	702 Communications
ACCENT	Accent Communications
AGASSIZ WU	Agassiz Water Users Incorporated
AGC	Assiociated General Contractors of America
ALL PL	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
CENTURYLINK	CenturyLink
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
EQUINOR	Equinor Pipeline
FALK MNG	Falkirk Mining Company
FHWA	Federal Highway Administration
G FKS-TRL WD	Grand Forks-traill Water District
GETTY TRD & TRAN	Getty Trading & Transportation
GLDN W ELEC	Golden West Electric Cooperative
GRGS CO TEL	Griggs County Telephone
GTR RAMSEY WD	Greater Ramsey Water District
GT PLNS NAT GAS	Great Plains Natural Gas Company
HALS TEL	Halstad Telephone Company
IDEA1	Idea1
INT-COMM TEL	Inter-Community Telephone Company
KANEB PL	Kaneb Pipeline Company
KEM ELEC	Kem Electric Cooperative Incorporated
KOCH GATH SYS	Koch Gathering Systems Incorporated
LKHD PL	Lakehead Pipeline Company
LNGDN RWU	Langdon Rural Water Users Incorporated
LWR YELL R ELEC	Lower Yellowstone Rural Electric
MCKNZ CON	McKenzie Consolidated Telcom
MCKNZ ELEC	McKenzie Electric Cooperative
MCKNZ WRD	McKenzie County Water Resource District
MCLEOD	McLeod USA
MCLN ELEC	McLean Electric Cooperative
MCLN-SHRDN R WAT	McLean-Sheridan Rural Water
MDU	Montana-dakota Utilities
MIDCO	MidContinent Communications
MIDSTATE TEL	Midstate Telephone Company
MINOT CABLE	Minot Cable Television
MINOT TEL	Minot Telephone Company
MISS VALL COMM	Missouri Valley Communications
MISS W W S	Missouri West Water System
MNKOTA PWR	Minnkota Power
MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative
MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative
MRE LBTY TEL	Moore & Liberty Telephone
MUNICIPAL	City Water And Sewer
MUNICIPAL	City Of '.....'
N CENT ELEC	North Central Electric Cooperative
N VALL W DIST	North Valley Water District
ND PKS & REC	North Dakota Parks And Recreation
ND TEL	North Dakota Telephone Company
NDDOT	North Dakota Department of Transportation
NDSU SOIL SCI DEPT	NDSU Soil Science Department
NEMONT TEL	Nemont Telephone
NODAK R ELEC	Nodak Rural Electric Cooperative
NOON FRMS TEL	Noonan Farmers Telephone Company
NPR	Northern Plains Railroad
NSP	Northern States Power
NTH PRAIR RW	Northern Prairie Rural Water Association
NTHN BRDR PL	Northern Border Pipeline
NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated
NTHWSTRN REF	Northwestern Refinery Company
NW COMM	Northwest Communication Cooperation
NWRWD	Northwest Rural Water District
ONEOK	Oneok gas
OSHA	Occupational Safety and Health Administration
OTTR TL PWR	Otter Tail Power Company
PAAP	Plains All American Pipeline
P L E M	Prairielands Energy Marketing
POLAR COM	Polar Communications
PVT ELEC	Private Electric
QWEST	Qwest Communications
R&T W SUPPLY	R & T Water Supply Association
RED RIV COMM	Red River Rural Communications
RESVTN TEL	Reservation Telephone
ROBRTS TEL	Roberts Company Telephone
R-RIDER ELEC	Roughrider Electric Cooperative
RRVW	Red River Valley & Western Railroad
S CENT REG WD	South Central Regional Water District
S E W U	South East Water Users Incorporated
SCOTT CABLE	Scott Cable Television Dickinson
SHERDN ELEC	Sheridan Electric Cooperative
SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
SKYTECH	Skyland Technologies Incorporated
SLOPE ELEC	Slope Electric Cooperative Incorporated
SOURIS RIV TELCOM	Souris River Telecommunications
ST WAT COMM	State Water Commission
STATE LN WATER	State Line Water Cooperative
STER ENG	Sterling Energy
STUT RWU	Stutsman Rural Water Users
SW PL PRJ	Southwest Pipeline Project
T M C	Turtle Mountain Communications
TCI	TCI of North Dakota
TESORO HGH PLNS PL	Tesoro High Plains Pipeline
TRI-CNTY WU	Tri-County Water Users Incorporated
TRL CO RWU	Traill County Rural Water Users
UNTD TEL	United Telephone
UPPR SOUR WUA	Upper Souris Water Users Association
US SPRINT	U.S. Sprint
USAF MSL CABLE	U.S.A.F. Missile Cable
USFWS	US Fish and Wildlife Service
USW COMM	U.S. West Communications
VRNDRY ELEC	Verendrye Electric Cooperative
W RIV TEL	West River Telephone Incorporated
WAPA	Western Area Power Administration
WAWSA	Western Area Water Supply Authority
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

D-101-20

Existing Topography

- Existing Ground Void
- Existing Cemetary Boundary
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Existing Gravel Surface
- Existing Riprap
- Existing Dirt Surface
- Existing Asphalt Surface
- Existing Tie Point Line
- Existing Railroad Centerline
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Existing Fence
- Existing Railroad
- Existing Field Line
- Exst Flow
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter

- Existing 3-Cable w Posts
- Site Boundary
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Existing Tree Boundary
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Existing W-Beam Guardrail with Posts
- Existing Railroad Switch
- Gravel Pit - Borrow Area
- Existing Wet Area-Vegetation Break
- Existing High Tension Cable Guardrail
- Existing High Tension Cable Guardrail with Posts

Proposed Topography

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

Existing Utilities

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

Proposed Utilities

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

Traffic Utilities

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

Sign Structures

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

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12 18 2020

LINE STYLES

D-101-21

Right Of Way

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

Boundary Control

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

Cross Sections and Typicals

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

Geotechnical

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

Countours

- Failure Line
- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

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

Pavement Joints

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

Bridge Details

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

Erosion Control

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

Environmental

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

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SYMBOLS

D-101-30

North Arrow (Half Scale)

Alignment Data Point

Alignment Monument

Spot Elevation

Existing Miscellaneous Spot

Existing Access Control Arrow

Existing Benchmark

Reset USGS Marker

Iron Monument Found

Iron Pin R/W Monument

Property Corner

Iron Pin Reference Monument

Right of Way Marker (Exst, Ppsd, Reset)

Existing Federal Reference Corner

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

Existing Witness Corner

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

Existing Traverse PI Aerial Panel

Existing Reference Marker Point NGS

Existing EFB Misc

Existing Bush or Shrub

Existing Large Evergreen Tree

Existing Small Evergreen Tree

Existing Large Tree

Existing Small Tree

Existing Tree Trunk

Cairn or Stone Circle

Existing Artifact

Existing Satellite Dish

Existing Weather Station

Existing Windmill or Tower

Reinforced Pavement

CSB Continuous Split Barrel Sample

FA Flight Auger Sample

SB Split Barrel Sample

T Thinwall Tube Sample

N Standard Penetration Test

Incl Inclinometer Tube

Excavation Unit

Existing Ground Water Well Bore Hole

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

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

Kirk J Hoff

12 18 2020

SYMBOLS

D-101-31

- Flexible Delineator
- Flexible Delineator Type A (Exst, Ppsd)
- Flexible Delineator Type B (Exst, Ppsd)
- Flexible Delineator Type C (Exst, Ppsd)
- Flexible Delineator Type D (Exst, Ppsd)
- Flexible Delineator Type E (Exst, Ppsd)
- Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)
- Delineator Type C (Exst, Ppsd, Diamond Grade)
- Delineator Type D (Exst, Ppsd, Diamond Grade)
- Delineator Type E (Exst, Ppsd, Diamond Grade)
- Barricade (Type I, Type II, Type III}
- Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)
- Attenuation Device
- Truck Mounted Attenuator
- Delineator Drums
- Flagger
- Tubular Marker
- Traffic Cone
- Back to Back Vertical Panel Sign

- Highway Sign (Exst, Ppsd)
- Mile Post Type A (Exst-Ppsd-Reset)
- Mile Post Type B (Exst, Ppsd)
- Mile Post Type C (Exst, Ppsd)
- Object Marker Type I (Exst, Ppsd)
- Object Marker Type II (Exst, Ppsd)
- Object Marker Type III (Exst, Ppsd)
- Existing Reference Marker
- Road Closure Gate 18 Ft (Exst, Ppsd)
- Road Closure Gate 28 Ft (Exst, Ppsd)
- Road Closure Gate 40 Ft (Exst, Ppsd)
- Existing Railroad Battery Box
- Existing RR Profile Spot
- Existing Railroad Crossbuck
- Existing Railroad Frog
- Existing Mailbox (Private, Federal)

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

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12 18 2020

SYMBOLS

D-101-32

- Existing Luminaire
- Luminaire LED
- Existing Light Standard Luminaire
- Relocate Light Standard
- Light Standard Light LED Luminaire
- Light Standard 35 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 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 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 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Emergency Vehicle Detector
- Video Detection Camera

- High Mast Light Standard 3 Luminaire (Exst, Ppsd)
- High Mast Light Standard 4 Luminaire (Exst, Ppsd)
- High Mast Light Standard 5 Luminaire (Exst, Ppsd)
- High Mast Light Standard 6 Luminaire (Exst, Ppsd)
- High Mast Light Standard 7 Luminaire (Exst, Ppsd)
- High Mast Light Standard 8 Luminaire (Exst, Ppsd)
- High Mast Light Standard 9 Luminaire (Exst, Ppsd)
- High Mast Light Standard 10 Luminaire (Exst, Ppsd)
- Overhead Sign Structure Load Center (Exst, Ppsd)
- Traffic Signal Controller (Exst, Ppsd)
- Pad Mounted Traffic Signal Controller (Exst, Ppsd)
- Flashing Beacon (Exst, Ppsd)
- Concrete Foundation (Exst, Ppsd)
- Pipe Mounted Flasher (Exst, Ppsd)
- Pad Mounted Feed Point (Exst, Ppsd)
- Pipe Mounted Feed Point with Pad (Exst, Ppsd)
- Pole Mounted Feed Point (Exst, Ppsd)
- Junction Box (Exst, Ppsd)
- Existing Pedestrian Head with Number
- Existing Signal Head
- Pole Mounted Head
- Existing Lighting Standard Pole

- Existing Traffic Signal Standard
- Pull Box (Exst-Ppsd-Undefined)
- Intelligent Transportation Pull Box (Exst, Ppsd)
- Transformer (Exst, Ppsd)
- Power Pole (Exst-Ppsd-with Transformer)
- Wood Pole (Exst, Ppsd)
- Pedestrian Push Button Post (Exst, Ppsd)
- Existing Pole
- Existing Telephone Pole
- Existing Post
- Connection Conductor (Ground, Neutral, Phase 1, Phase 2)

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

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12 18 2020

SYMBOLS

D-101-33

Existing Manhole (Electrical, Gas, Telephone)

Water Manhole (Exst, Exst with Valve)

Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)

Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)

Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)

Force Main Storm Drain Manhole (Exst, Exst with Valve)

Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)

Existing Water Appurtenance

Sprinkler Head (Exst, Ppsd)

Fire Hydrant (Exst, Ppsd)

Cleanout (Exst Sanitary, Underdrain)

Existing Catch Basin Inlet (Round, Square)

Existing Curb Inlet (Round, Square)

Existing Slotted Reinforced Concrete Pipe

Catch Basin (Riser 30 Inch, Beehive, Type A)

Inlet Mountable Curb (Type A, Type B)

Inlet Saddle Base (Type 1, Type 2)

Inlet Special (Catch Basin, Type 1, Type A)

Inlet (Tee, Type 1, Type 2, Type 2 Double)

Median Drain

Headwall (Exst, Ppsd, Ppsd Single with Vegitation Barrier,
Ppsd Double with Vegitation Barrier)

Cap or Stub
Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water

Existing Pedestal
Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined

Existing Pipe Vent
Gas, Fuel, Sanitary, Storm Drain, Water, Undefined

Valve
Exst Gas, Exst Water, Ppsd Water, Exst Undefined

Pump
Sanitary, Storm Drain, Exst Water

Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Existing Utility Marker

Existing Meter

Existing Fuel Dispensers

Existing Fuel Filler Pipes

Existing Fuel Leak Sensors

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

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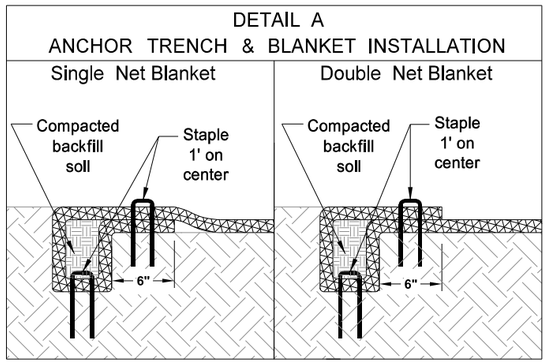
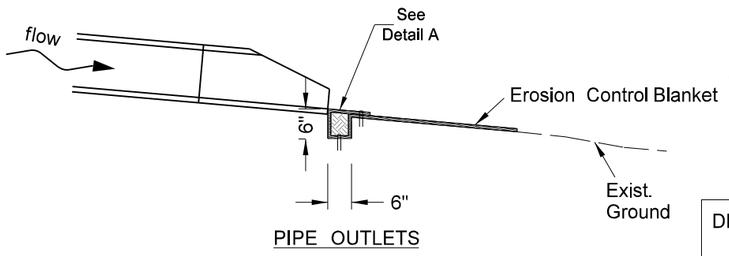
12 18 2020

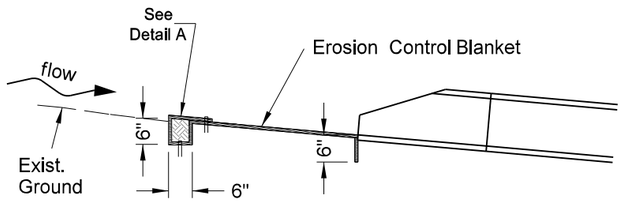
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



NOTE:
If a Single Net Blanket is used the side with the netting should be on the top once the blanket is installed.

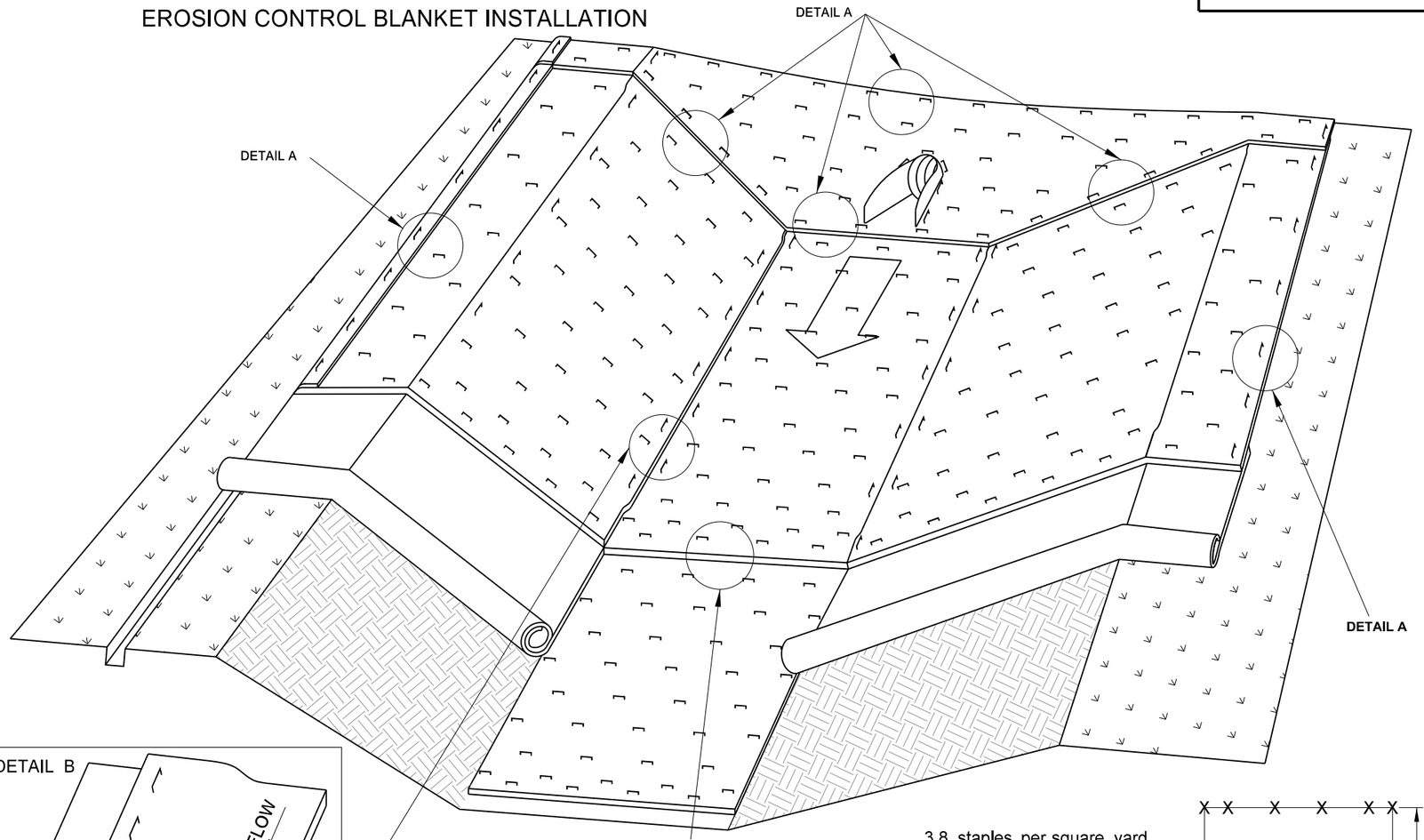


PIPE OUTLETS

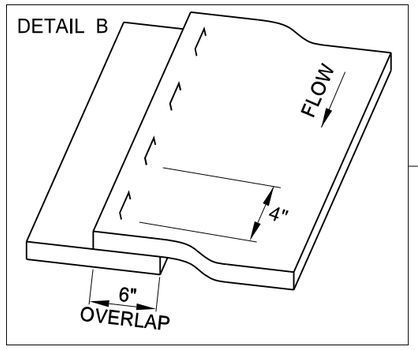


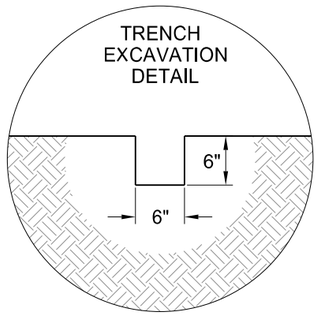
PIPE INLETS

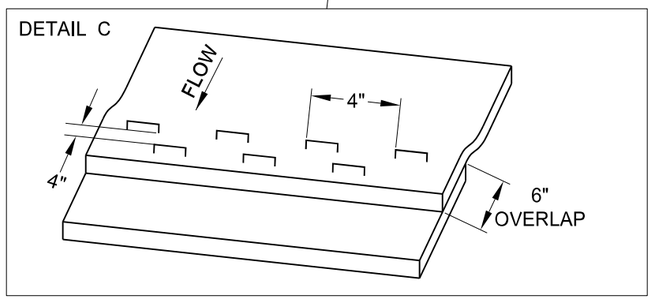
INSTALLATION AT PIPE ENDS



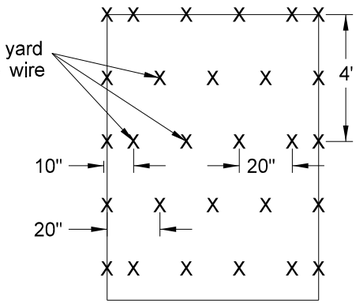
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION







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



STAPLE PATTERN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-5 to D-255-2.
07-27-15	Changed Installation details such as trench depth and overlap dimensions.
08-27-19	New Design Engineer PE Stamp.

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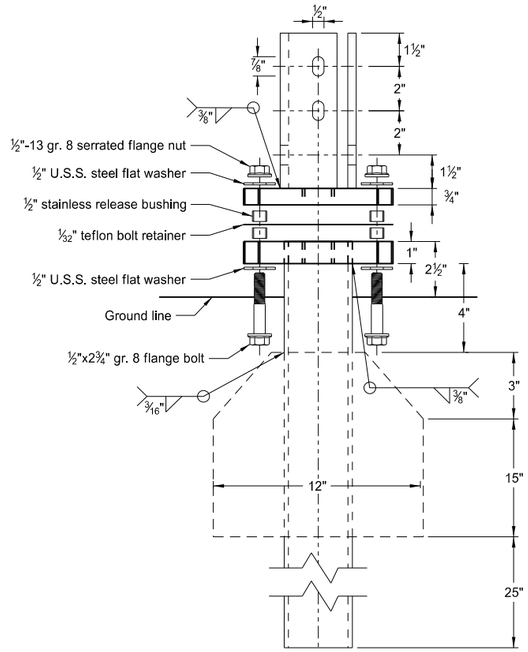
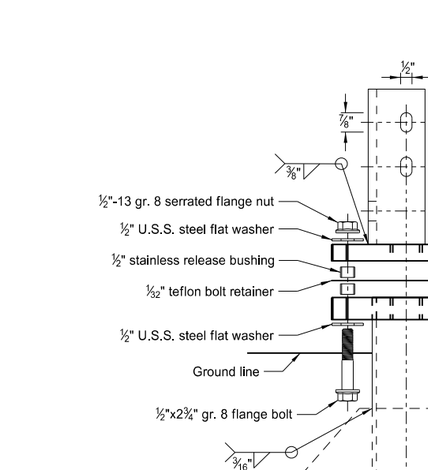
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

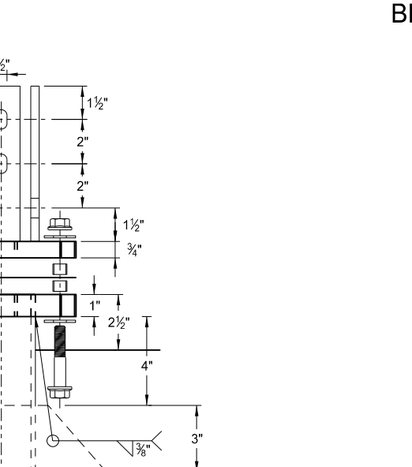
D-704-7



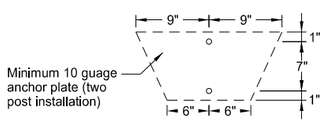
Multi-Directional
Slip Base Assembly



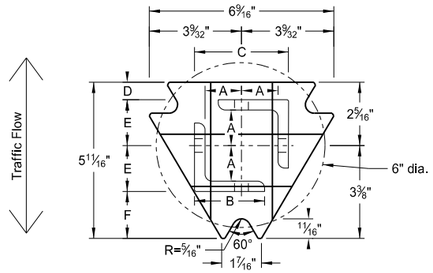
Anchor Unit and Post Assembly



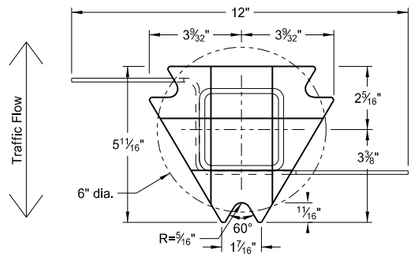
Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly



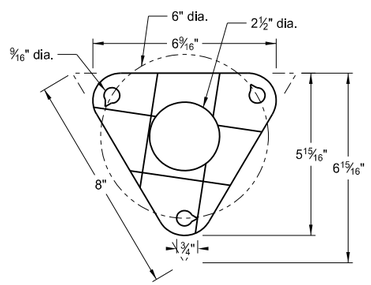
Perforated Tube



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



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



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

Notes:

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

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

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in.⁴	Cross Sec. Area in.²	Section Modulus in.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2³/16 x 2³/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

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

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

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

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

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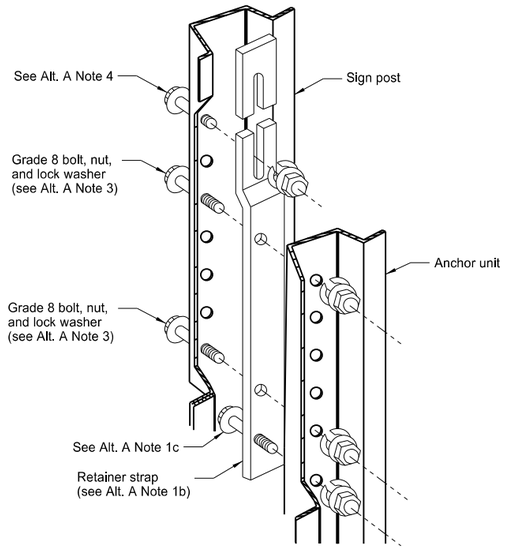
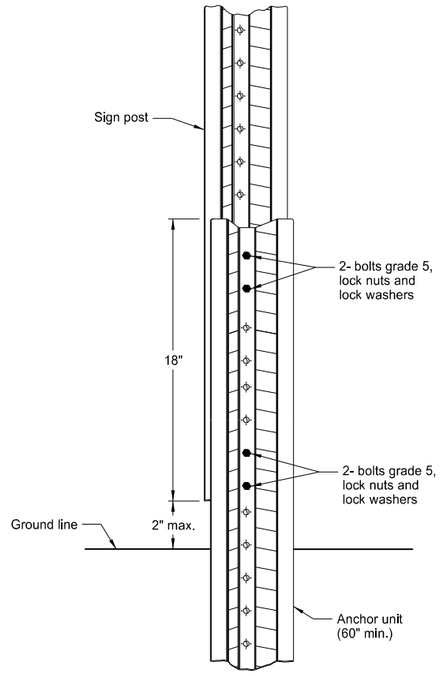
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

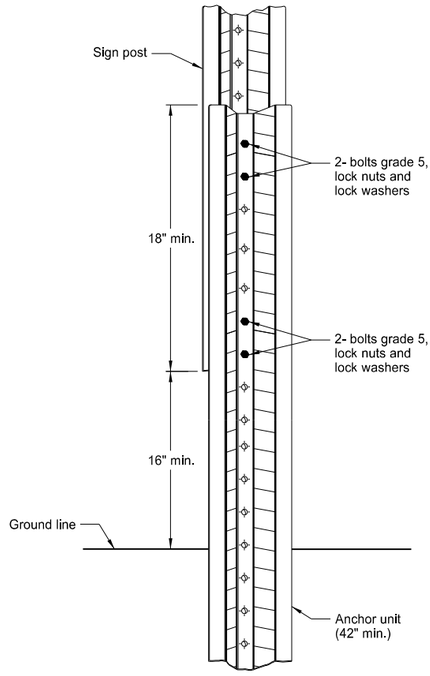


Detail A



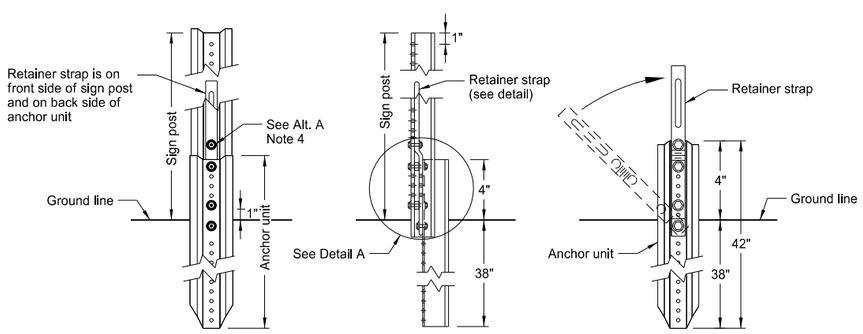
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



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

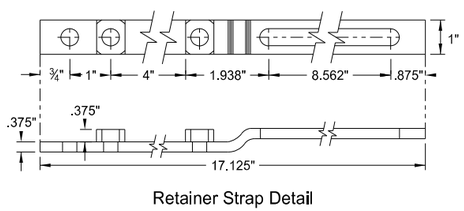
Install a maximum of 3 posts within 7'.



Front View Side View Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

Alternate A Steps of Installation:

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

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

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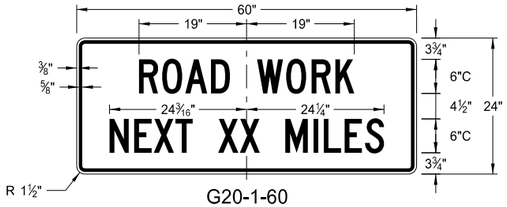
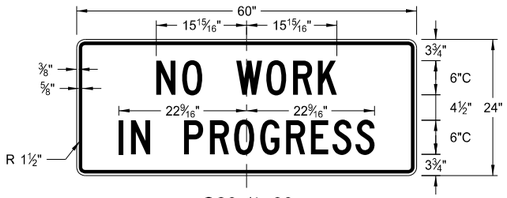
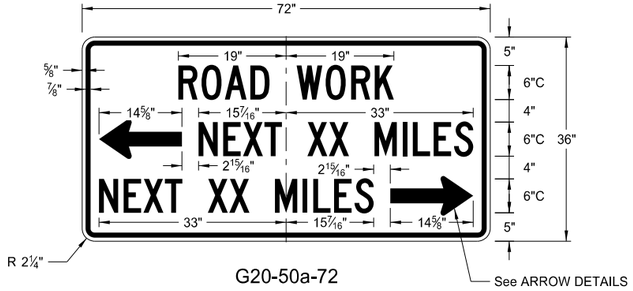
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



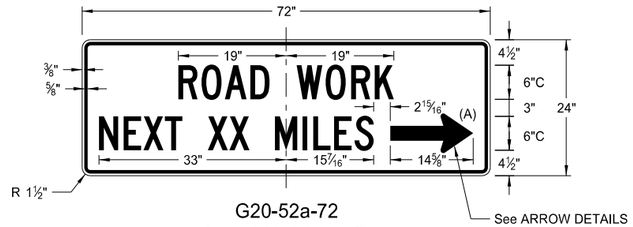
G20-1-60
Legend: black (non-refl)
Background: orange



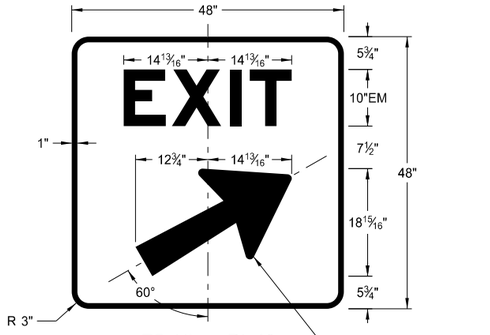
G20-1b-60
Legend: black (non-refl)
Background: orange



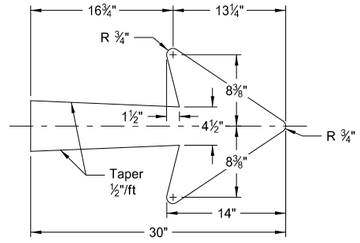
G20-50a-72
Legend: black (non-refl)
Background: orange



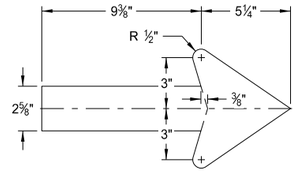
G20-52a-72
Legend: black (non-refl)
Background: orange



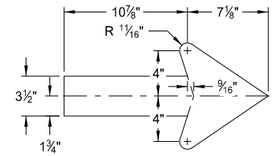
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



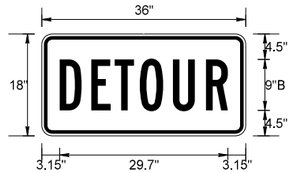
E5-1-48



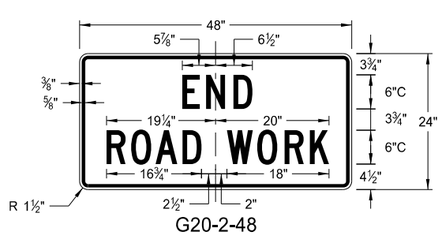
G20-50a-72
G20-52a-72



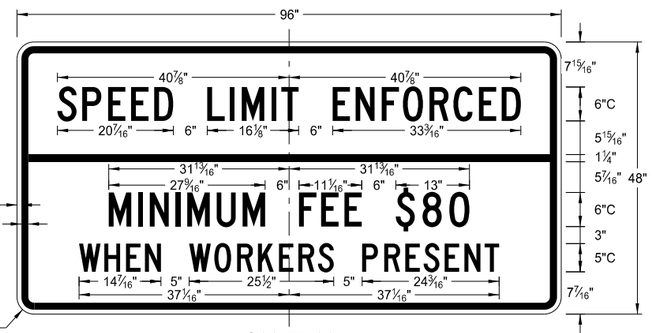
M4-9(L or R)-30
Right or Left



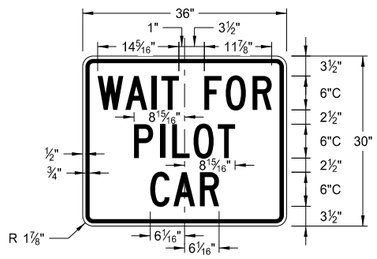
M4-8-36
Legend: black (non-refl)
Background: orange



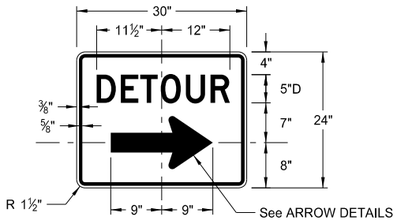
G20-2-48
Legend: black (non-refl)
Background: orange



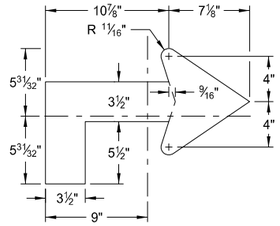
G20-55-96
Legend: black (non-refl)
Background: orange



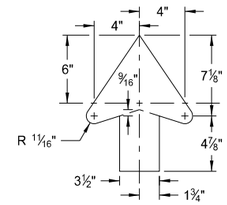
G20-4b-36
Legend: black (non-refl)
Background: orange



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



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



M4-9-30
Straight

ARROW DETAILS

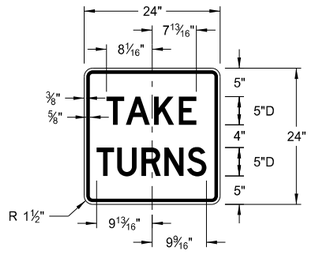
NOTES:

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

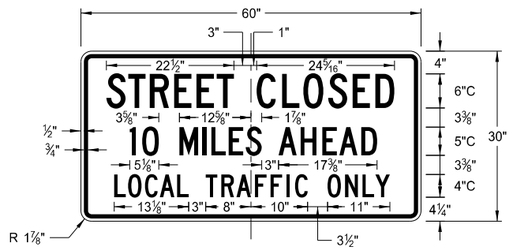
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17 10-03-19	Added sign & background color New Design Engineer PE Stamp

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

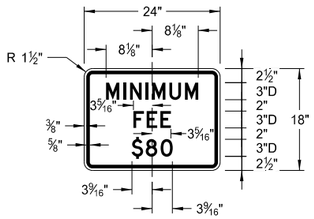
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



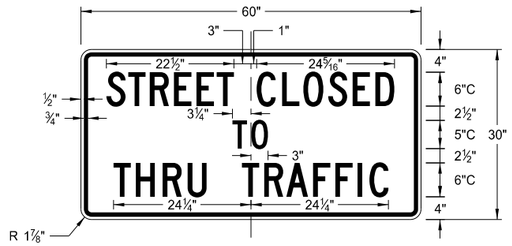
R1-50P-24
Legend: black (non-refl)
Background: white



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



R2-1aP-24
Legend: black (non-refl)
Background: white



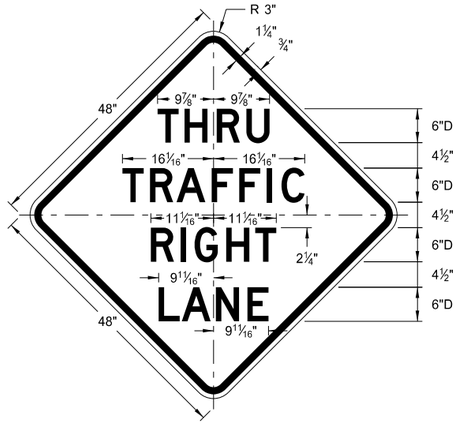
R11-4a-60
Legend: black (non-refl)
Background: white

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

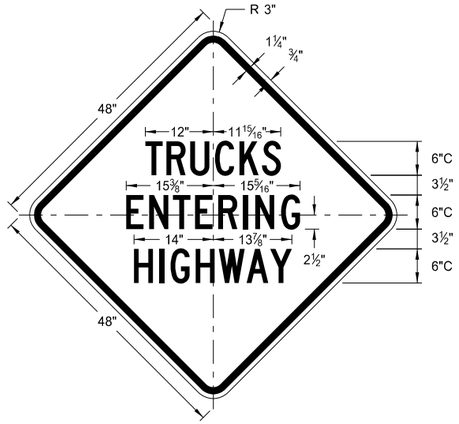
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp

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

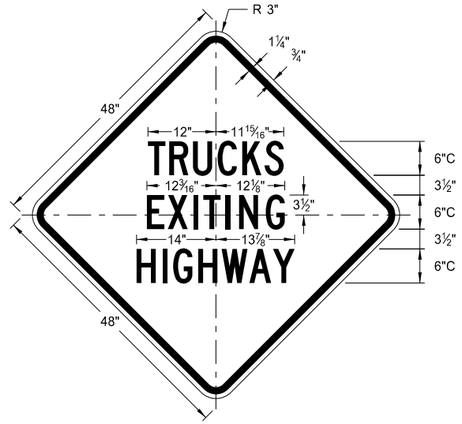
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



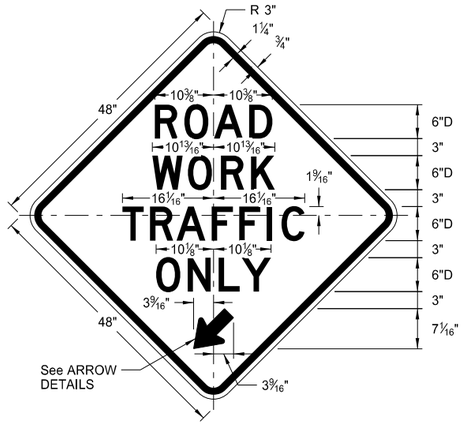
W5-8-48
Legend: black (non-refl)
Background: orange



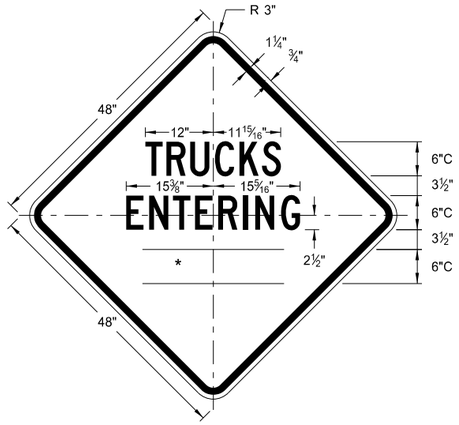
W8-53-48
Legend: black (non-refl)
Background: orange



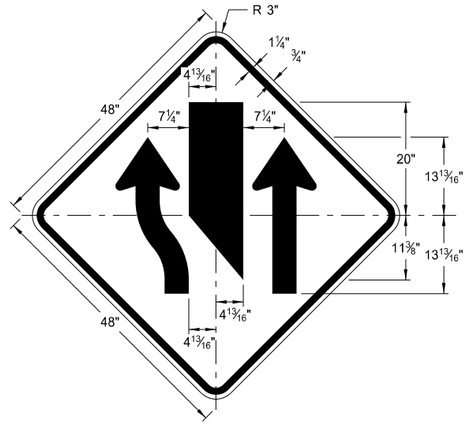
W8-56-48
Legend: black (non-refl)
Background: orange



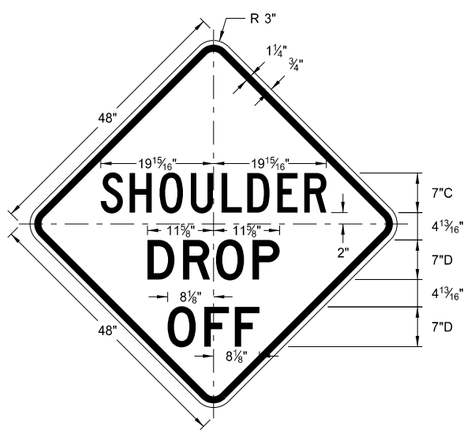
W5-9-48
Legend: black (non-refl)
Background: orange



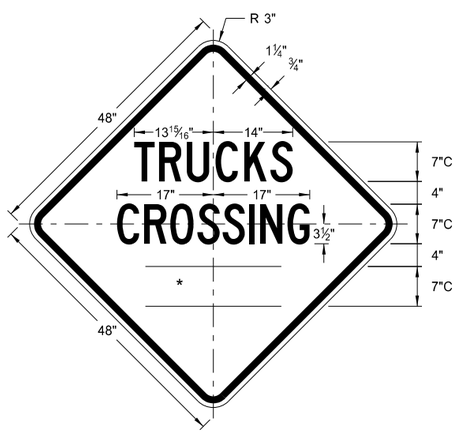
W8-54-48
Legend: black (non-refl)
Background: orange



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



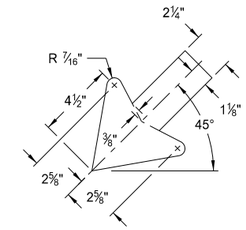
W8-9a-48
Legend: black (non-refl)
Background: orange



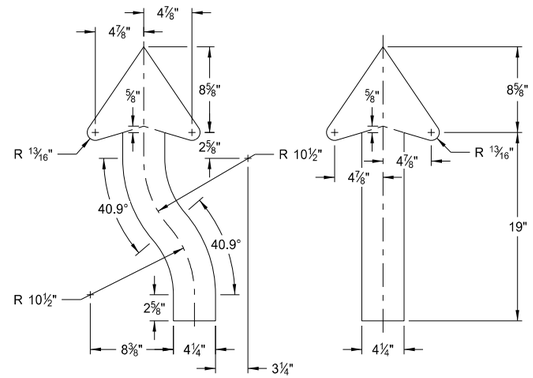
W8-55-48
Legend: black (non-refl)
Background: orange

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

* DISTANCE MESSAGES



W5-9-48



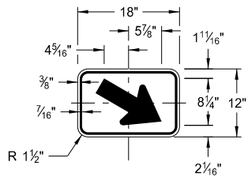
W9-3a-48

ARROW DETAILS

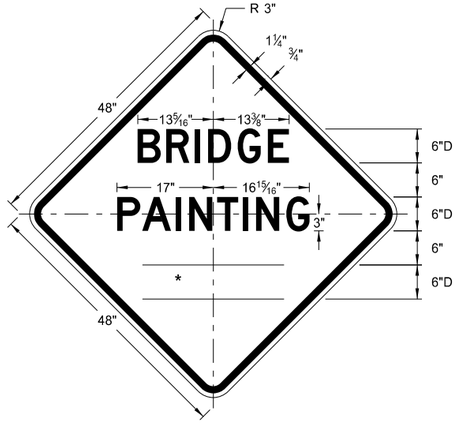
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

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

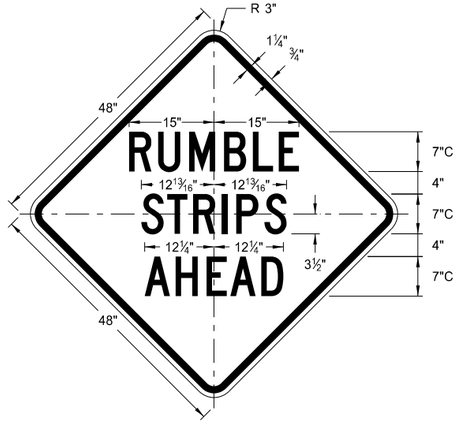
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



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



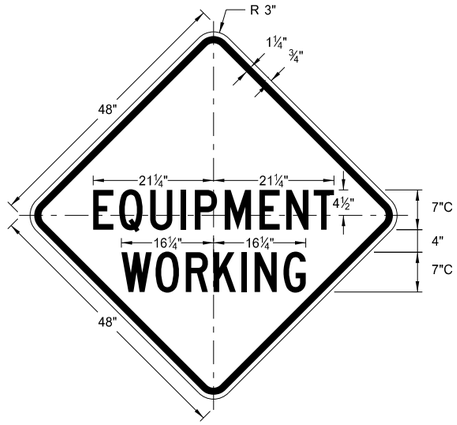
W21-50-48
Legend: black (non-refl)
Background: orange



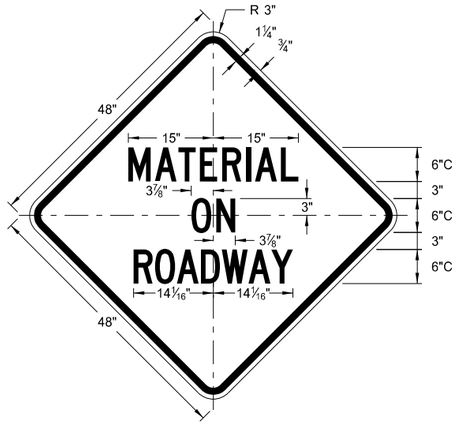
W21-53-48
Legend: black (non-refl)
Background: orange

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

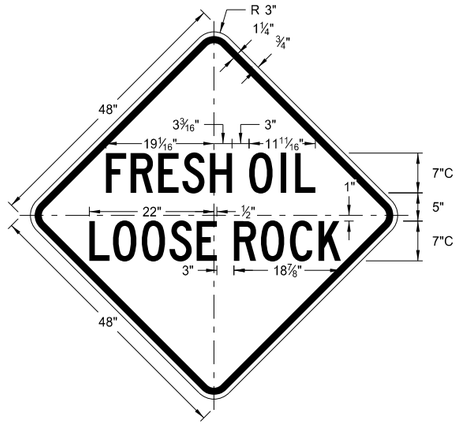
* DISTANCE MESSAGES



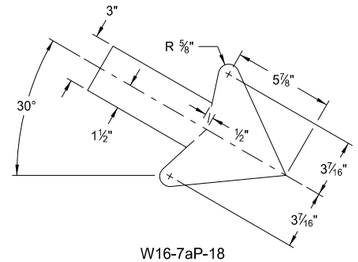
W20-51-48
Legend: black (non-refl)
Background: orange



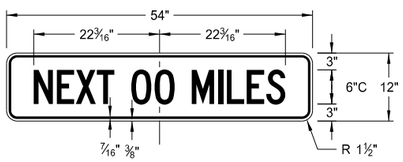
W21-51-48
Legend: black (non-refl)
Background: orange



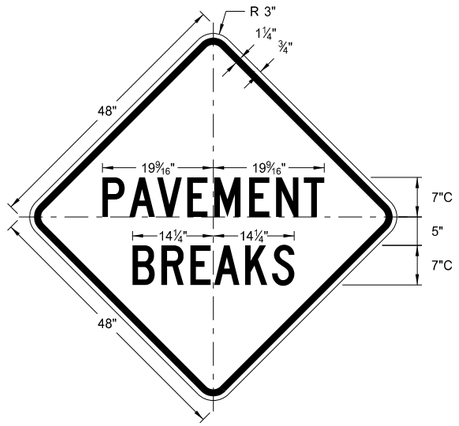
W22-8-48
Legend: black (non-refl)
Background: orange



W16-7aP-18



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



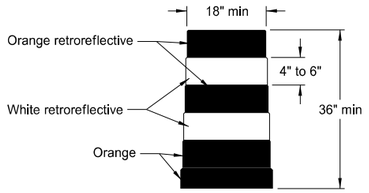
W21-52-48
Legend: black (non-refl)
Background: orange

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

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

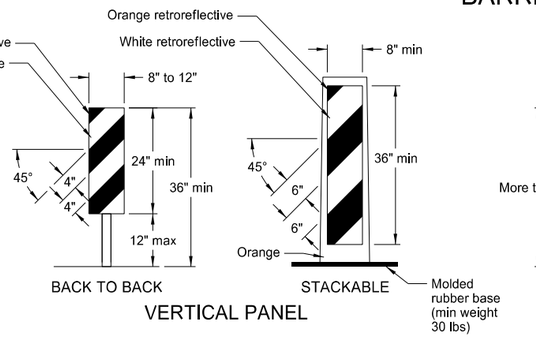
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



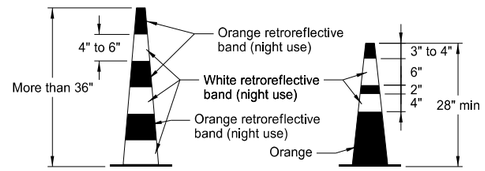
DELINEATOR DRUM

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



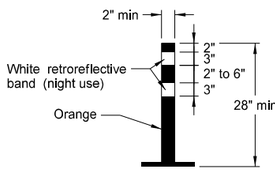
VERTICAL PANEL

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



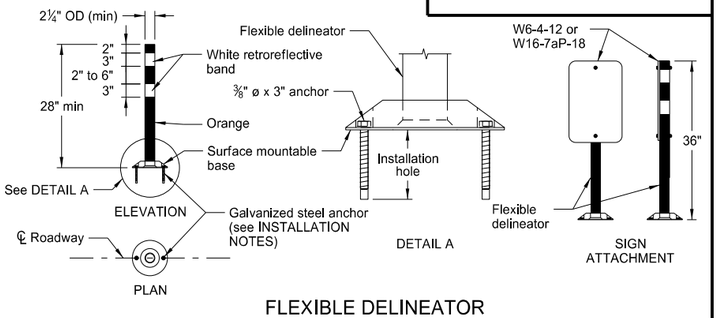
TRAFFIC CONE

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



TUBULAR MARKER

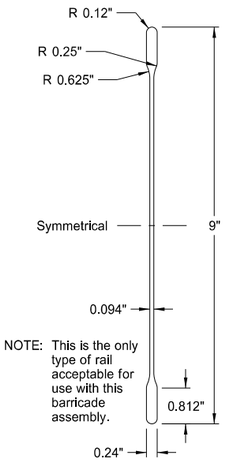
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



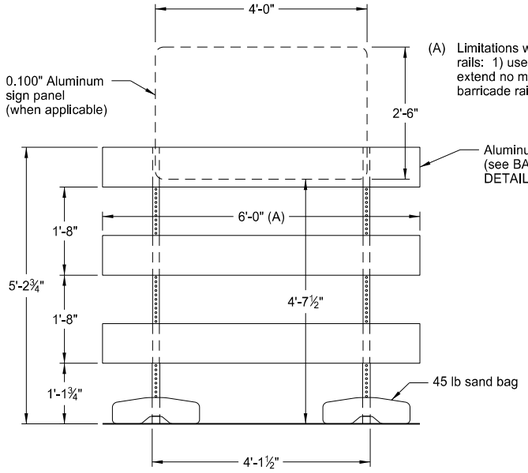
FLEXIBLE DELINEATOR

INSTALLATION NOTES:

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

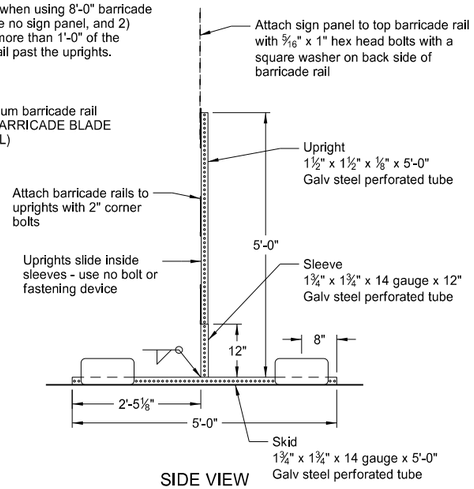


BARRICADE BLADE DETAIL



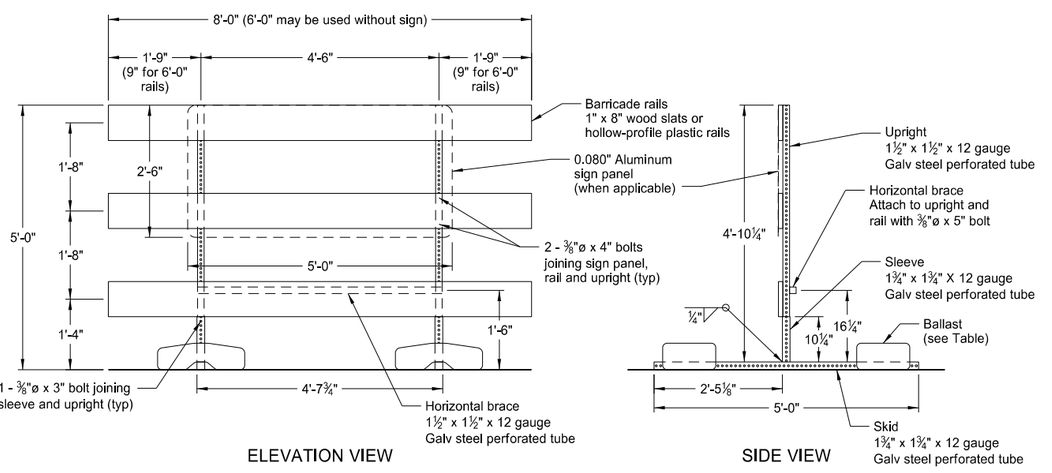
ELEVATION VIEW

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



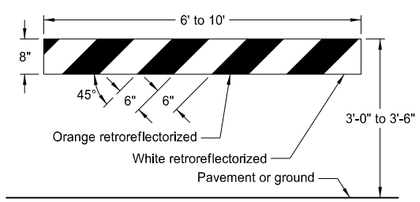
SIDE VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

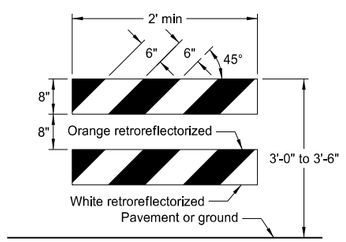


BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

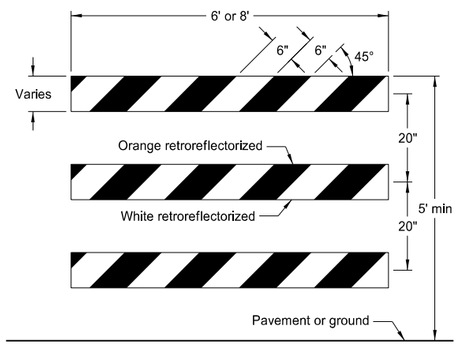
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the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



TYPE I BARRICADE

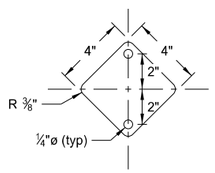


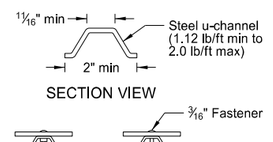
TYPE II BARRICADE

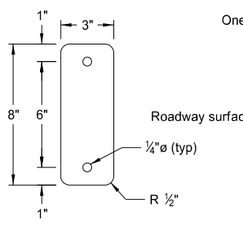


TYPE III BARRICADE

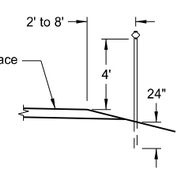
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

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

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

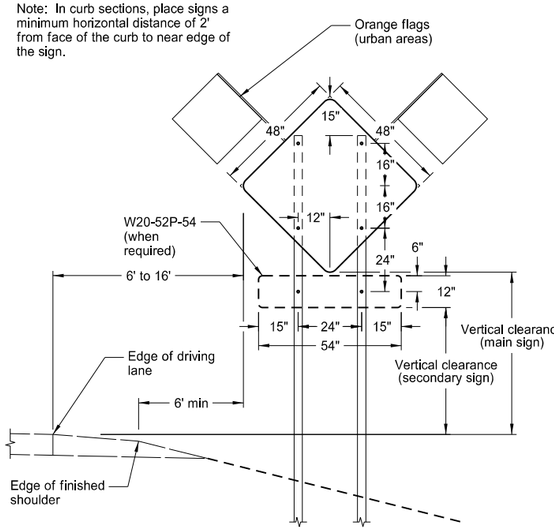
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17 11-01-19	Updated to active voice Revised details for Flexible Delineator

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

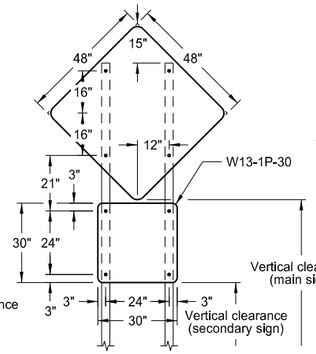
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

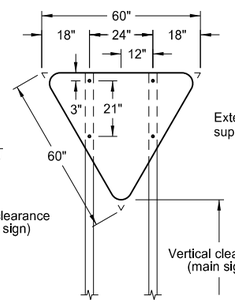
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



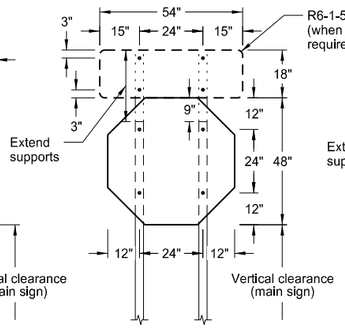
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



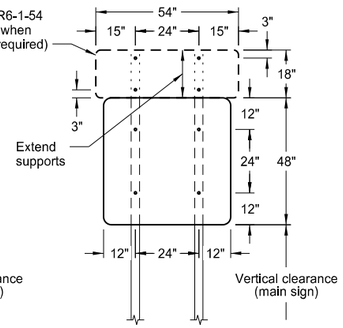
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



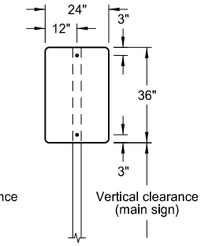
R1-2-60 - YIELD SIGN



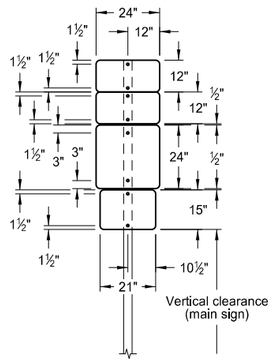
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



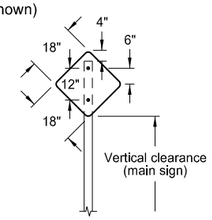
48" x 48" SIGN
(with R6-1-54 sign as required)



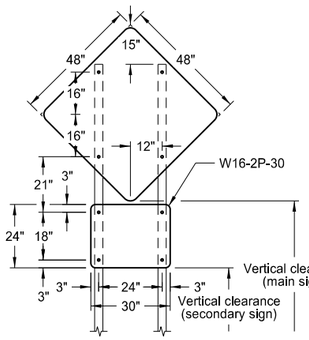
24" x 36" SIGN



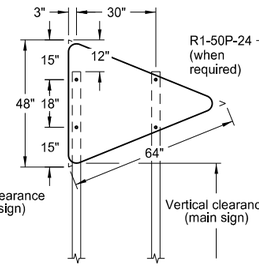
24" x 24"
ROUTE MARKER
ASSEMBLY



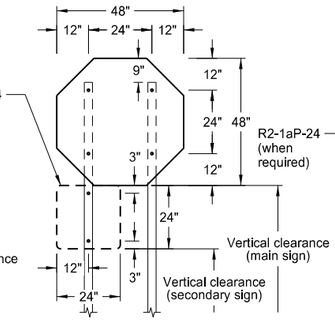
18" x 18"
DIAMOND SIGN



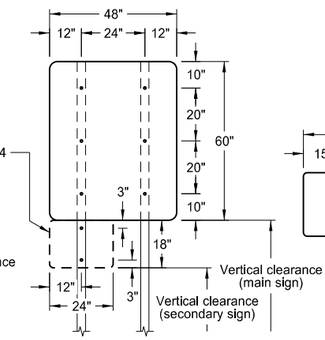
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



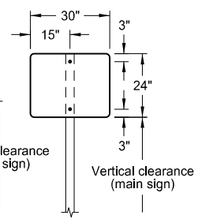
W14-3-64 - PENNANT SIGN



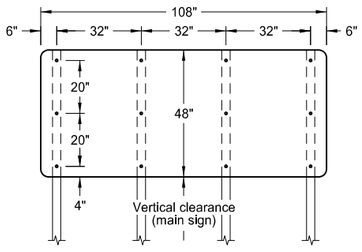
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



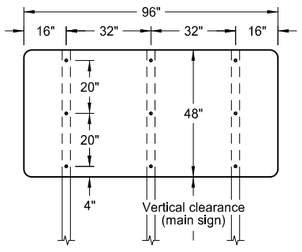
48" x 48" SIGN
(with R2-1aP-24 sign as required)



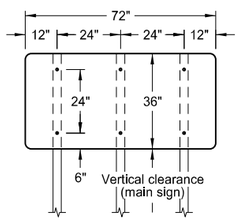
30" x 24" SIGN



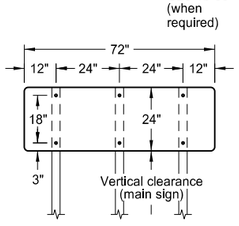
108" x 48" SIGN



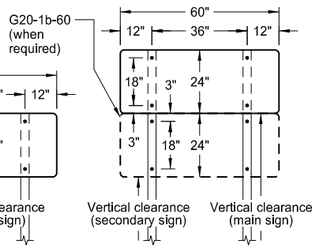
96" x 48" SIGN



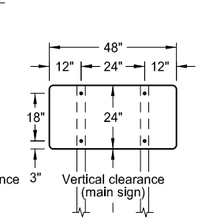
72" x 36" SIGN



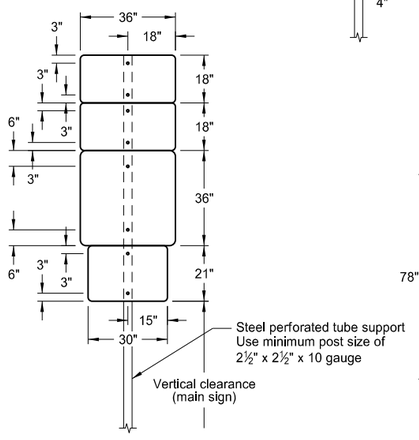
72" x 24" SIGN



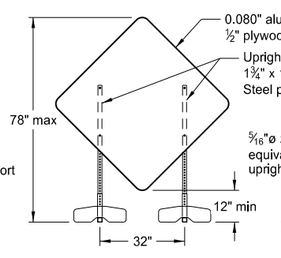
60" x 24" SIGN



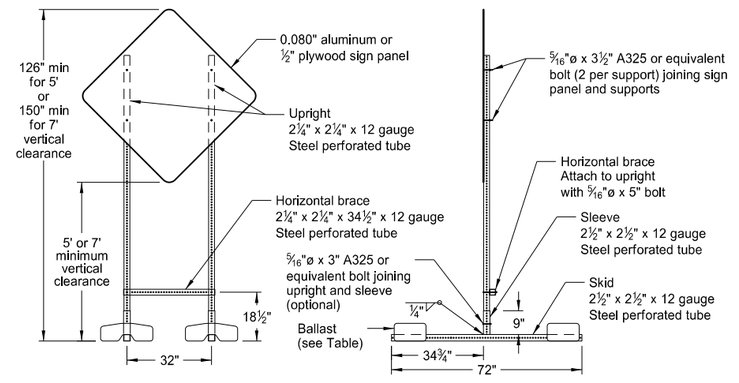
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

MINIMUM BALLAST
(For each side of sign support base)

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

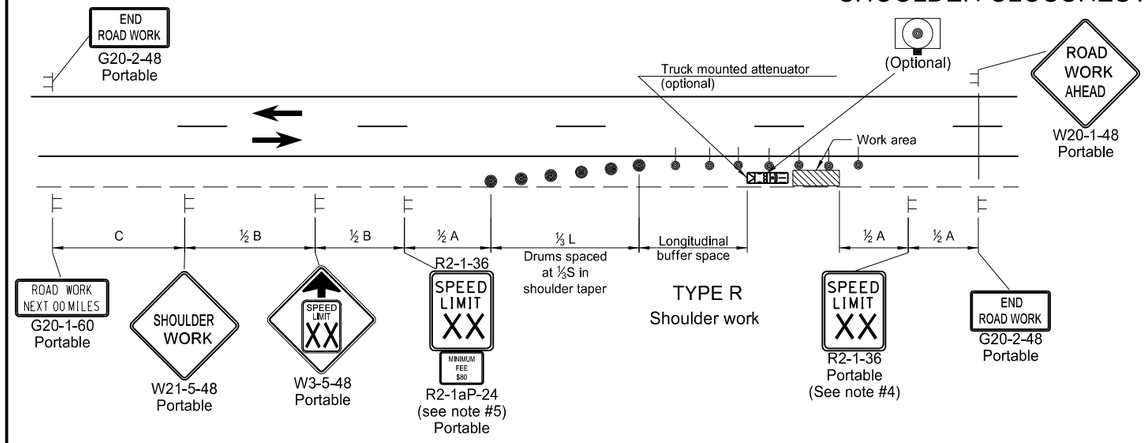
Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13	Revised Note 6
9-27-17	Updated to active voice
11-01-19	Revised 60"x24" sign detail

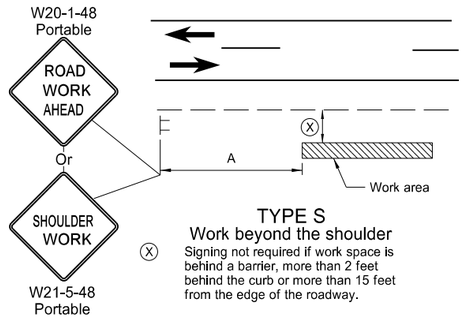
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE-4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

D-704-24

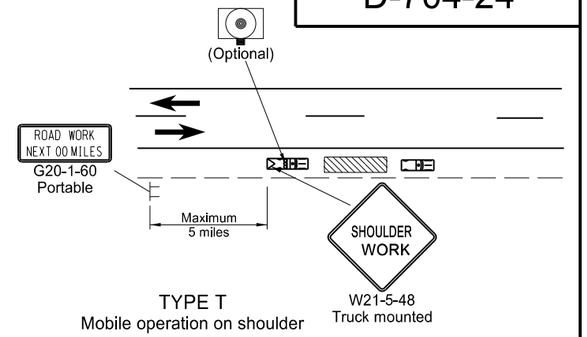


TYPE R
Shoulder work

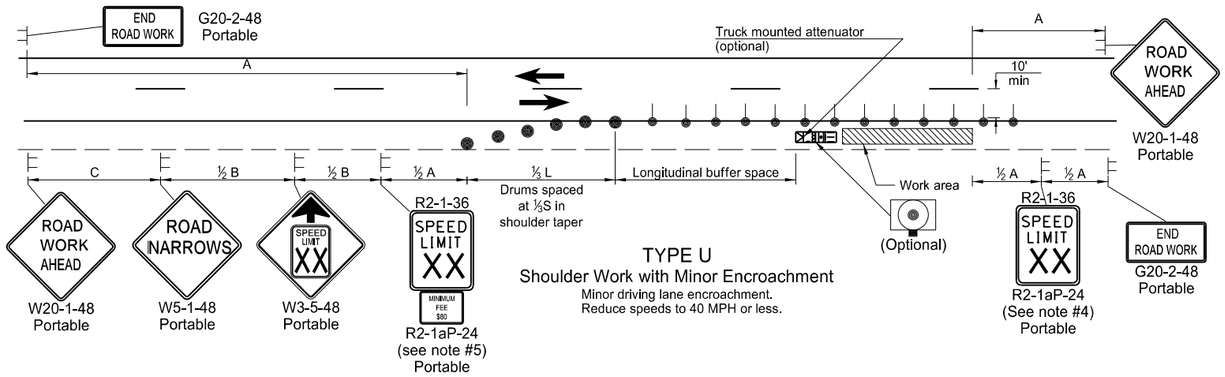


TYPE S
Work beyond the shoulder

Signing not required if work space is behind a barrier, more than 2 feet behind the curb or more than 15 feet from the edge of the roadway.

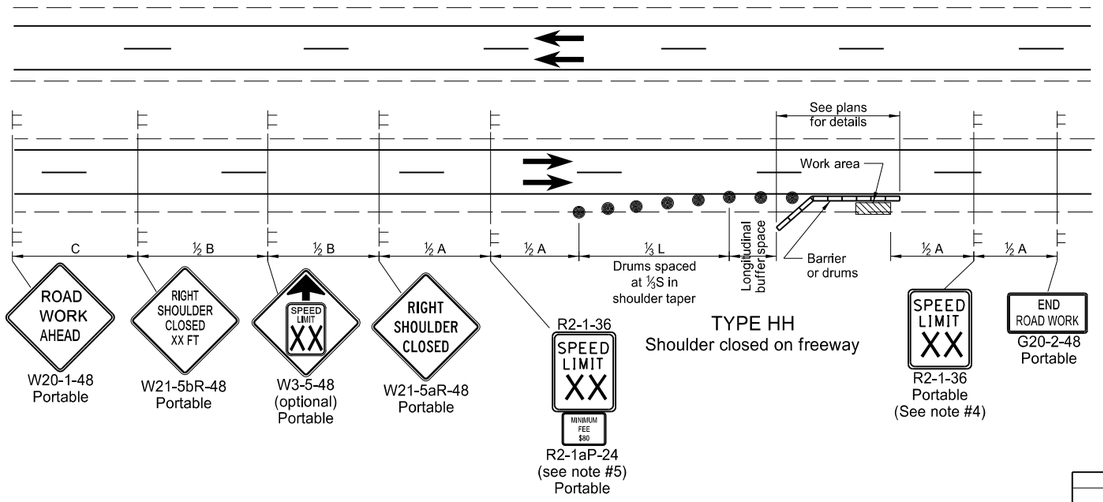


TYPE T
Mobile operation on shoulder

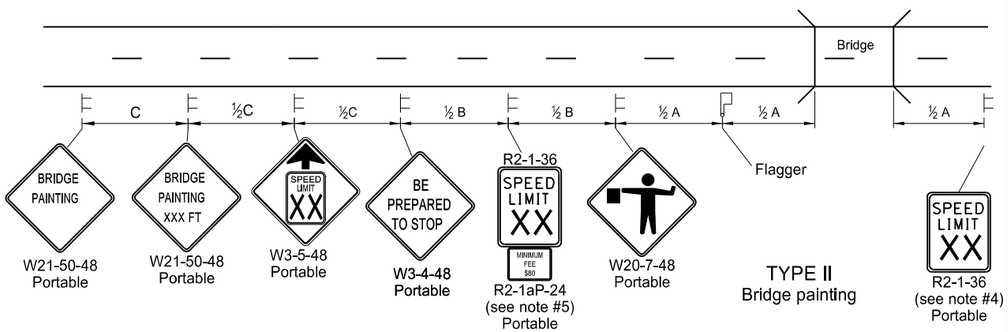


TYPE U
Shoulder Work with Minor Encroachment

Minor driving lane encroachment.
Reduce speeds to 40 MPH or less.



TYPE HH
Shoulder closed on freeway



TYPE II
Bridge painting

Notes
1. Variables
   S = Numerical value of speed limit or 85th percentile.
   W = The width of the taper in feet.
   L = Minimum length of taper, S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S^2 /60 for urban, residential, and other streets with speeds of 40 mph or less.
2. Space delineator drums for tapering traffic at dimension "S". Space delineator drums or tubular markers for tangents at 2 times "S".
3. Sequencing Arrow Panels
   Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
   UseType B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
   Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
4. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.
5. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½B.
6. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
7. Cover existing speed limit signs within a reduced speed zone.
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. Recommend 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

KEY

Sign	Work area
Delineator Drum	Tubular Marker
Sequencing Arrow Panel (Caution Mode)	

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

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

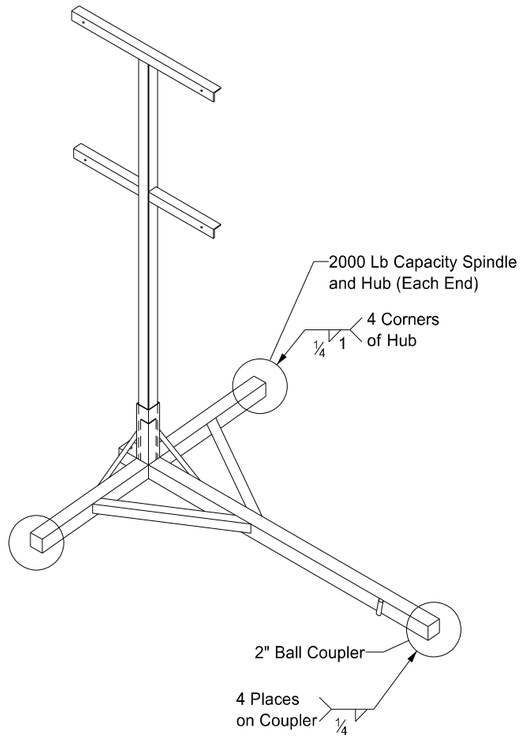
REVISIONS

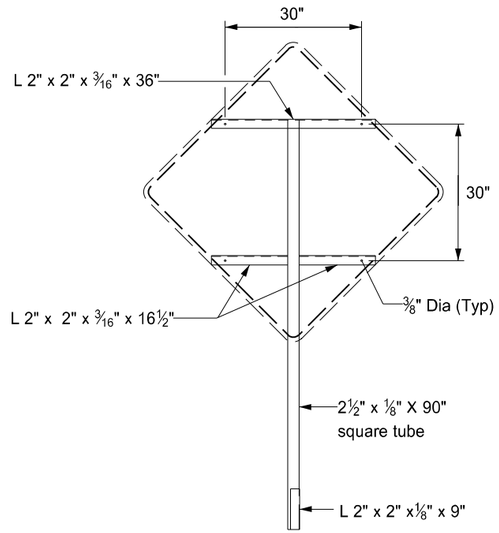
DATE	CHANGE
8-17-17	Updated notes & revised signs
11-01-19	Revised drum spacing & signs nos.

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

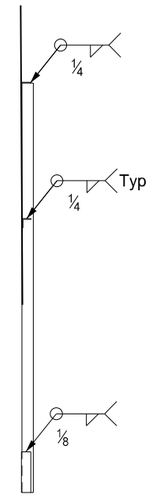
PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50





FRONT

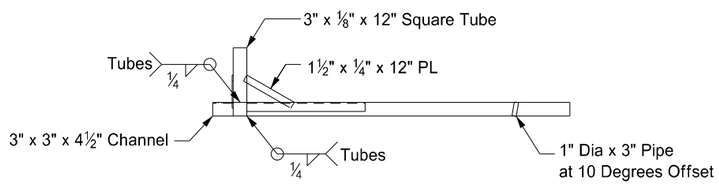


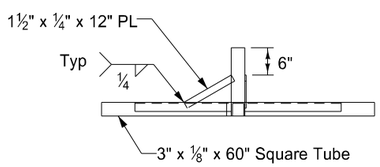
RIGHT

SIGN SUPPORT

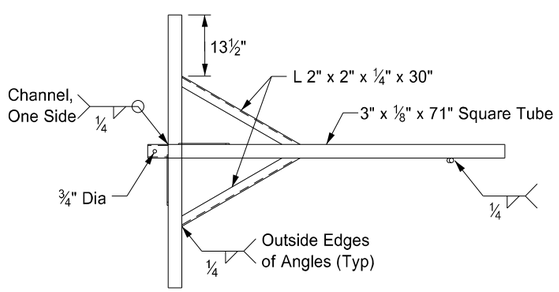
Notes:

1. Maximum 250 pound weight of assembly.
2. Use a 14" wheel and tire.
3. Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
4. Other NCHRP 350 or MASH crash tested assemblies are acceptable.





RIGHT



TOP

TRAILER

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

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ENGINEER
NORTH DAKOTA
Kirk J Hoff
12 02 2020