

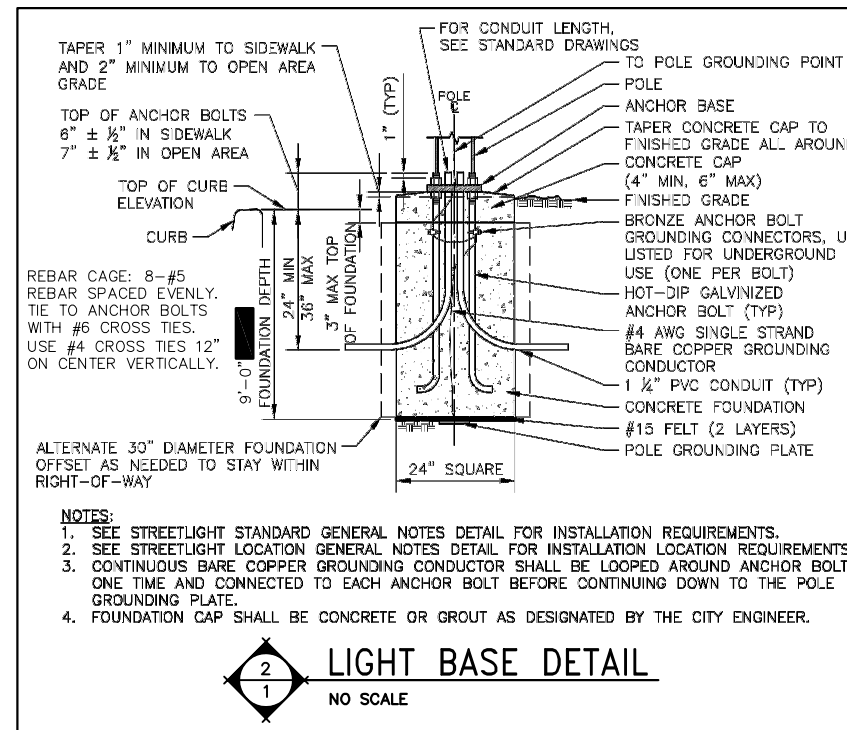
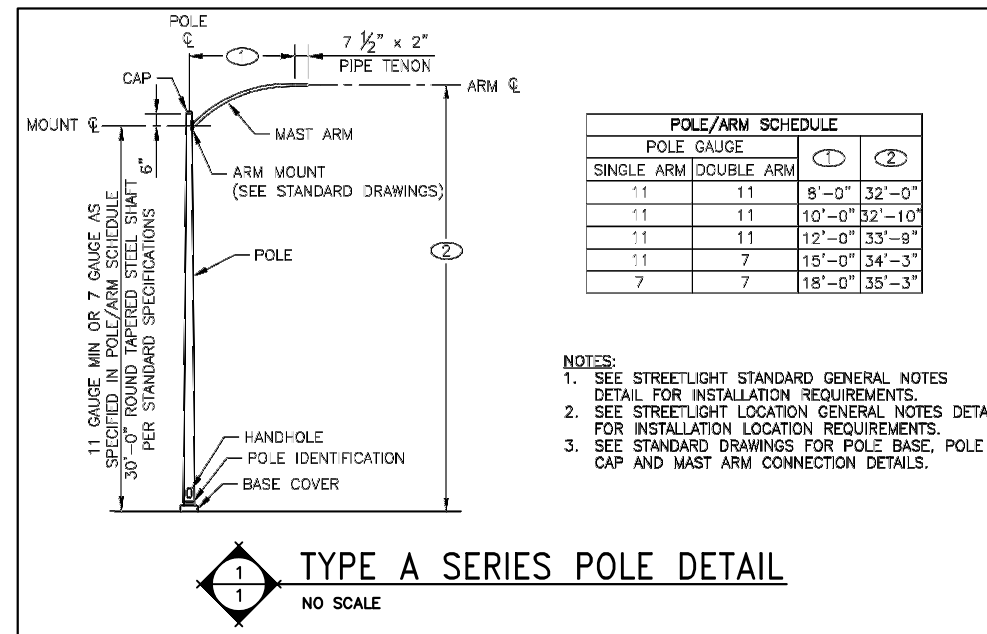
GENERAL NOTES

- COORDINATE ROUTING OF UNDERGROUND CIRCUITRY FEEDERS WITH TREE PLACEMENT TO AVOID CONFLICT WITH TREE ROOT SYSTEMS.
- LIGHT STANDARDS SHALL BE DESIGNED AND CONSTRUCTED AS SPECIFIED IN THE SPECIAL PROVISIONS. ALL THE NECESSARY CALCULATIONS AND DRAWINGS USED IN THE DESIGN OF THESE POLES SHALL BE FURNISHED WITH THE SHOP DRAWING SUBMITTAL. CALCULATIONS AND WORK DRAWINGS USED IN THE DESIGN OF THE LIGHT STANDARDS SHALL BE SIGNED, SEALED, AND DATED BY A PROFESSIONAL ENGINEER DULY REGISTERED IN THE STATE OF NORTH DAKOTA.

STREETLIGHT STANDARD AND LOCATION GENERAL NOTES

- ALL STREETLIGHT STANDARDS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIAL PROVISION AND AS INDICATED ON THESE DRAWINGS.
- ALL COMPONENTS OF THE STREETLIGHT STANDARD, INCLUDING THE POLE, ARM, HANDHOLE COVER, BASE COVER AND THE POLE CAP, SHALL BE FERROUS METAL AND HOT-DIP GALVANIZED AFTER CONSTRUCTION IN ACCORDANCE WITH ASTM A123. ALUMINUM OR ALUMINUM ALLOY IS NOT ACCEPTABLE. FLAWS IN THE APPEARANCE OF THESE GALVANIZED COMPONENTS (i.e. "TIGER STRIPED", "ZEBRA STRIPED"), SHALL BE CAUSE FOR REJECTION. NON-METALLIC TYPE BASE COVERS MAY BE ACCEPTABLE AND SHALL BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL. CONCRETE POLES SHALL BE SUBMITTED TO THE CITY ENGINEER FOR APPROVAL.
- ALL FASTENING HARDWARE SHALL BE NON-CORROSIVE, CADMIUM PLATED OR EQUAL, APPROVED BY THE CITY ENGINEER. FASTENERS SHALL BE OF THE SIZE AND CONFIGURATION NOTED ON THE DRAWINGS.
- CONCRETE POLE FOUNDATIONS SHOULD BE POURED AGAINST UNDISTURBED, NATURAL SOIL, OR IF FORMING MATERIAL IS USED, SHALL BE STRIPPED AWAY FROM THE FOUNDATION AT LEAST ONE (1) FOOT BELOW FINISHED GRADE.
- POLES SHALL BE INSTALLED ON THE CONCRETE FOUNDATIONS WITH ANCHOR BOLTS. EACH BOLT SHALL BE INSTALLED WITH TWO (2) HEX NUTS AND TWO (2) FLAT WASHERS. THE ANCHOR BOLTS SHALL BE 1-1/8" X 40" X 4". THE ANCHOR BOLTS, NUTS AND WASHERS SHALL BE HOT-DIP GALVANIZED. THE POLE SHALL BE PLUMBED PRIOR TO PLACING THE GROUT OR CONCRETE CAP. CONCRETE FOR CAP SHALL BE DESIGNATED BY CITY ENGINEER. SHIMS OR WEDGES OF ANY KIND ARE NOT ACCEPTABLE TO PLUMB THE POLE AFTER THE CAP HAS BEEN PLACED.
- ALL UNDERGROUND CONDUIT INSTALLED SHALL HAVE RED, CONTINUOUS MARKING TAPE INSTALLED IN THE TRENCH 12" BELOW FINISHED GRADE.
- WHERE SIGNALS AND STANDARDS ARE INSTALLED UNDER OVERHEAD POWER LINES, CLEARANCES SHALL BE PER NATIONAL ELECTRICAL SAFETY CODE SECTION 234 REQUIREMENTS. INSTALL STRAIGHT ARM STREETLIGHT ASSEMBLIES WHERE ADDITIONAL CLEARANCE IS REQUIRED AND APPROVED BY THE CITY ENGINEER.
- ALL STREETLIGHTS SHALL BE 240 VOLT SINGLE PHASE MULTIPLE CIRCUIT, EXCEPT STREETLIGHTS ON TRAFFIC SIGNALS WHICH SHALL BE 120 VOLT.

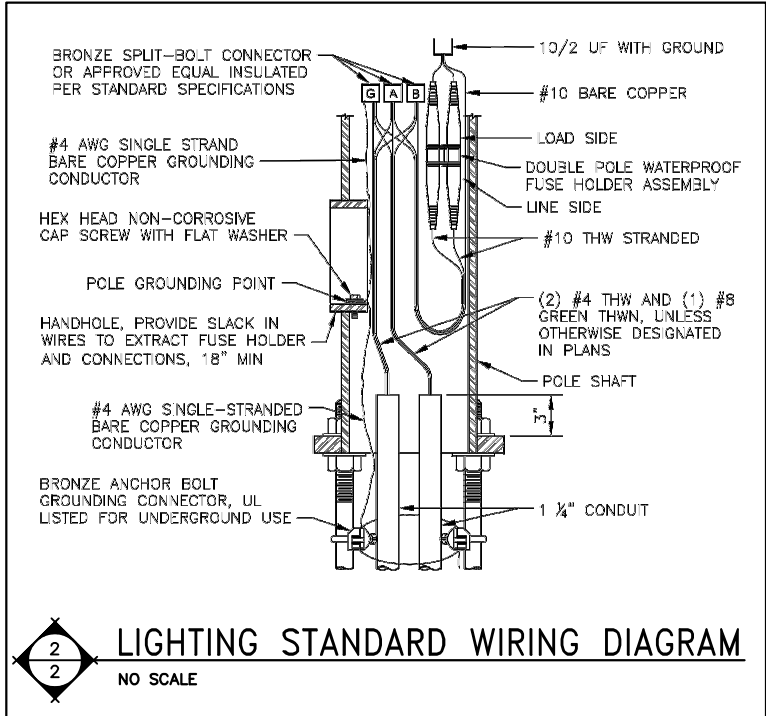
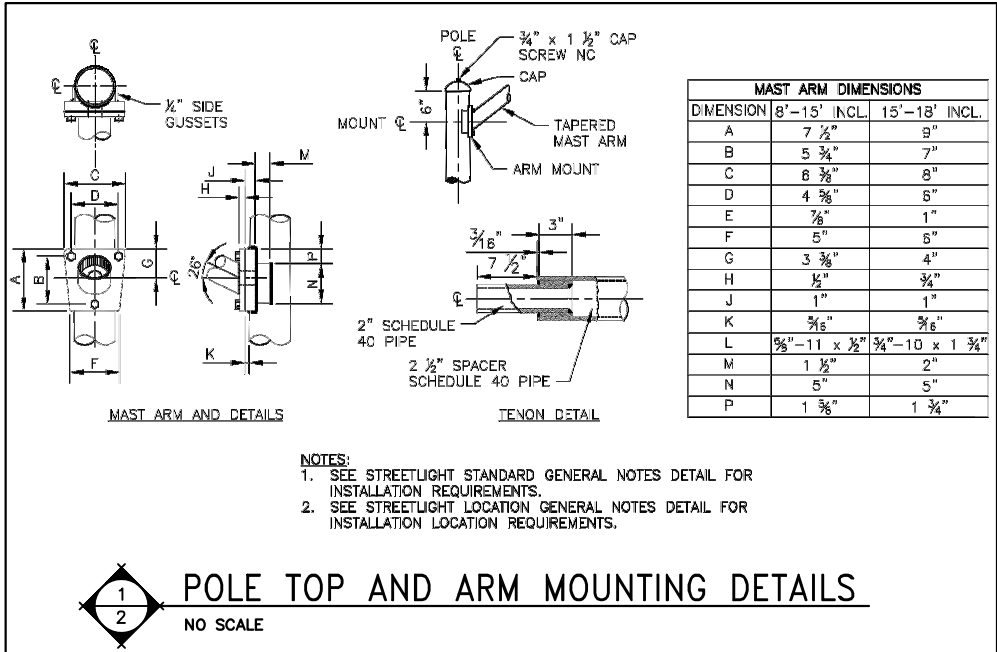
	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-5-983(059)059	140	1



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NOTES AND DETAILS

8TH STREET S RECONSTRUCTION

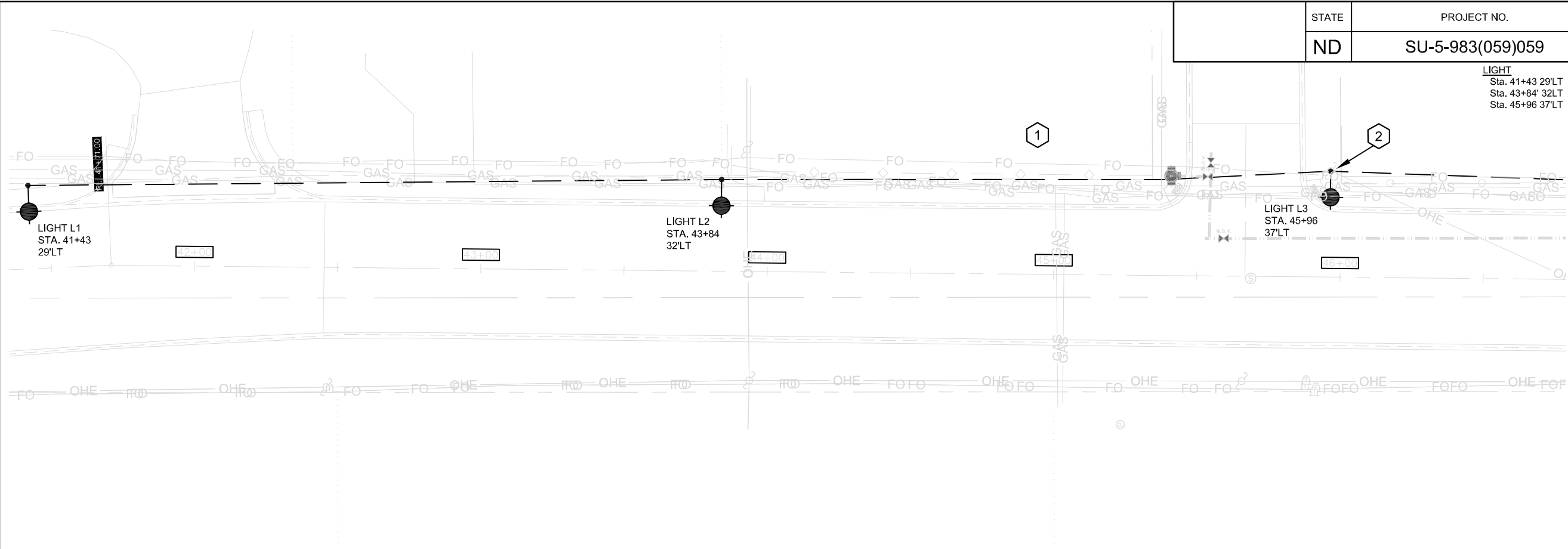


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ELECTRICAL SCHEMATIC

8TH STREET S RECONSTRUCTION

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	140	3



LIGHT	1 EA
Sta. 41+43 29'LT	1 EA
Sta. 43+84 32'LT	1 EA
Sta. 45+96 37'LT	3 EA

NOTES

- ALL HIGHWAY CIRCUITRY SHALL BE DIRECTIONAL BORED INTO PLACE.
- EXISTING UTILITY POLE, BASE AND LUMINAIRE TO BE REMOVED BY SERVING UTILITY.

FIXTURE NUMBER	STATION & OFFSET	LUMINAIRE WATTAGE	LUMINAIRE DISTRIBUTION	POLE HT.	MAST ARM
L1	41+56 32'LT	210 (LED)	M-S-II	32'	8'
L2	43+84 32'LT	210 (LED)	M-S-II	32'	8'
L3	45+96 37'LT	210 (LED)	M-S-II	32'	8'

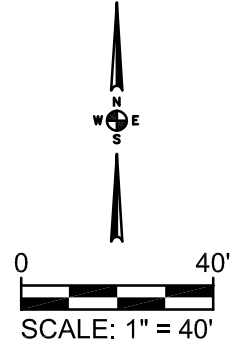
ITEM	STATION & OFFSET	2" DIAMETER RIGID CONDUIT	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	UNDERGROUND CONDUCTOR NO. 6 RHW
LIGHT L1 TO LIGHT L2	41+43 29'LT TO 43+84 32'LT	241 LF	498 LF	249 LF
LIGHT L2 TO LIGHT L3	43+84 32'LT TO 45+96 37'LT	213 LF	442 LF	221 LF

QUANTITIES-THIS SHEET			
770	0020	CONCRETE FOUNDATION-HIGHWAY LIGHTING	3 EA
770	0330	2" DIAMETER RIGID CONDUIT	454 LF
770	0504	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	940 LF
770	0505	UNDERGROUND CONDUCTOR NO. 6 RHW	470 LF
770	1718	LT STD 8FT MA 32FT POLE BREAKAWAY	3 EA
770	4210	LED LUMINAIRE	3 EA

LEGEND

LED LUMINAIRE, 250W EQUIVALENT 

ALL LUMINAIRES OPERATE AT 240-VOLTS.
ALL STREET LIGHT STATIONING BASED ON 8TH STREET CENTER LINE.



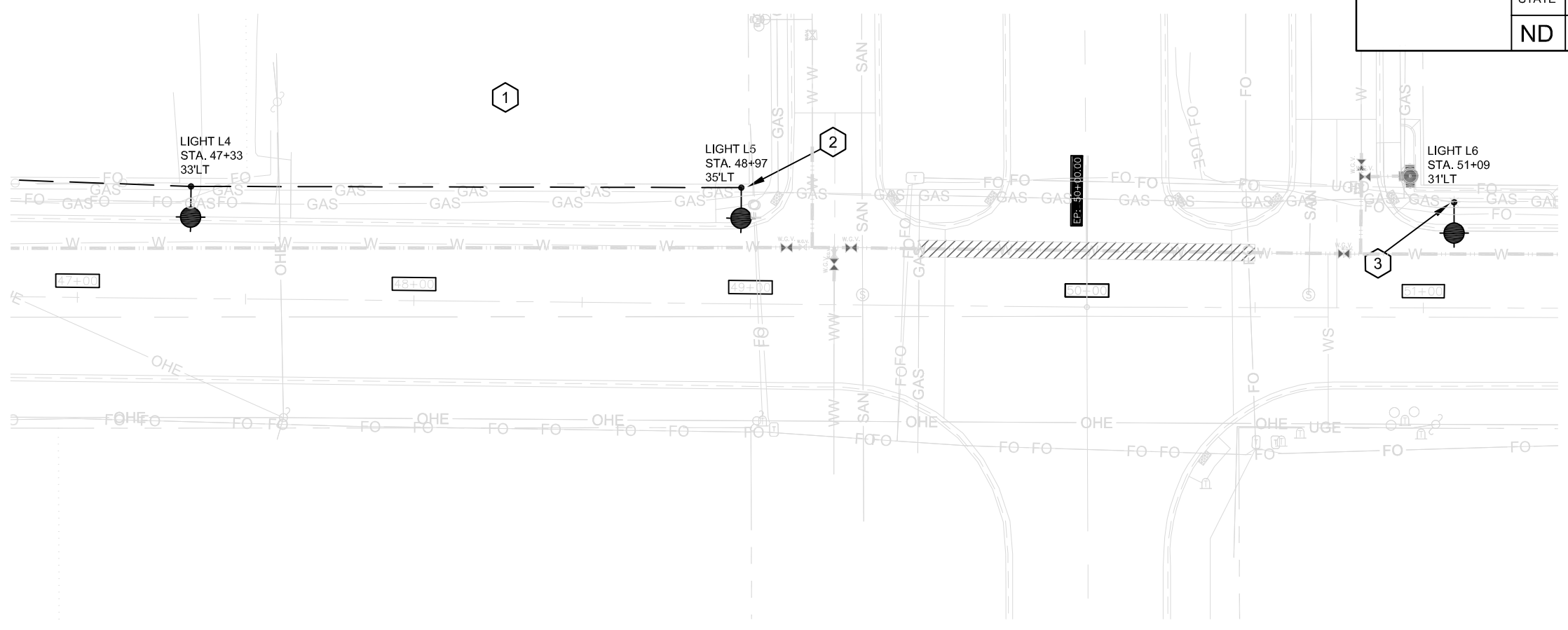
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LIGHTING PLAN
Sta 42+50 to Sta 45+50

8TH STREET S RECONSTRUCTION

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	140	4

LIGHT	
Sta. 47+33 33'LT	1 EA
Sta. 48+97 35'LT	1 EA
Sta. 51+09 31'LT	1 EA
	3 EA



- NOTES**
- ALL HIGHWAY CIRCUITRY SHALL BE DIRECTIONAL BORED INTO PLACE.
 - REMOVE EXISTING POLE AND ASSOCIATED BASE AT THIS LOCATION. PROVIDE NEW BASE AND NEW POLE INDICATED. REUSE EXISTING LIGHTING CIRCUITRY. EXTEND STREET LIGHTING CIRCUITRY FROM THIS POINT TO NEW LIGHT L3.
 - REMOVE EXISTING POLE AND ASSOCIATED BASE AT THIS LOCATION. PROVIDE NEW BASE AND NEW POLE INDICATED. REUSE EXISTING LIGHTING CIRCUITRY.

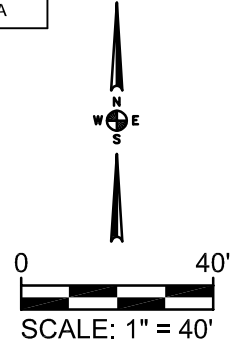
FIXTURE NUMBER	STATION & OFFSET	LUMINAIRE WATTAGE	LUMINAIRE DISTRIBUTION	POLE HT.	MAST ARM
L4	47+33 33'LT	210 (LED)	M-S-II	32'	8'
L5	48+97 35'LT	210 (LED)	M-S-II	32'	8'
L6	51+09 31'LT	210 (LED)	M-S-II	32'	8'

ITEM	STATION & OFFSET	2" DIAMETER RIGID CONDUIT	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	UNDERGROUND CONDUCTOR NO. 6 RHW
LIGHT L3 TO LIGHT L4	45+96 37'LT TO 47+33 33'LT	137 LF	290 LF	145 LF
LIGHT L4 TO LIGHT L5	47+33 33'LT TO 48+97 35'LT	164 LF	344 LF	172 LF

QUANTITIES-THIS SHEET			
770	0020	CONCRETE FOUNDATION-HIGHWAY LIGHTING	3 EA
770	0330	2" DIAMETER RIGID CONDUIT	301 LF
770	0504	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	634 LF
770	0505	UNDERGROUND CONDUCTOR NO. 6 RHW	317 LF
770	1718	LT STD 8FT MA 32FT POLE BREAKAWAY	3 EA
770	4210	LED LUMINAIRE	3 EA
770	4560	REMOVE LIGHT STANDARD	2 EA
770	4582	REMOVE CONCRETE FOUNDATION	2 EA



ALL LUMINAIRES OPERATE AT 240-VOLTS.
 ALL STREET LIGHT STATIONING BASED ON 8TH STREET CENTER LINE.

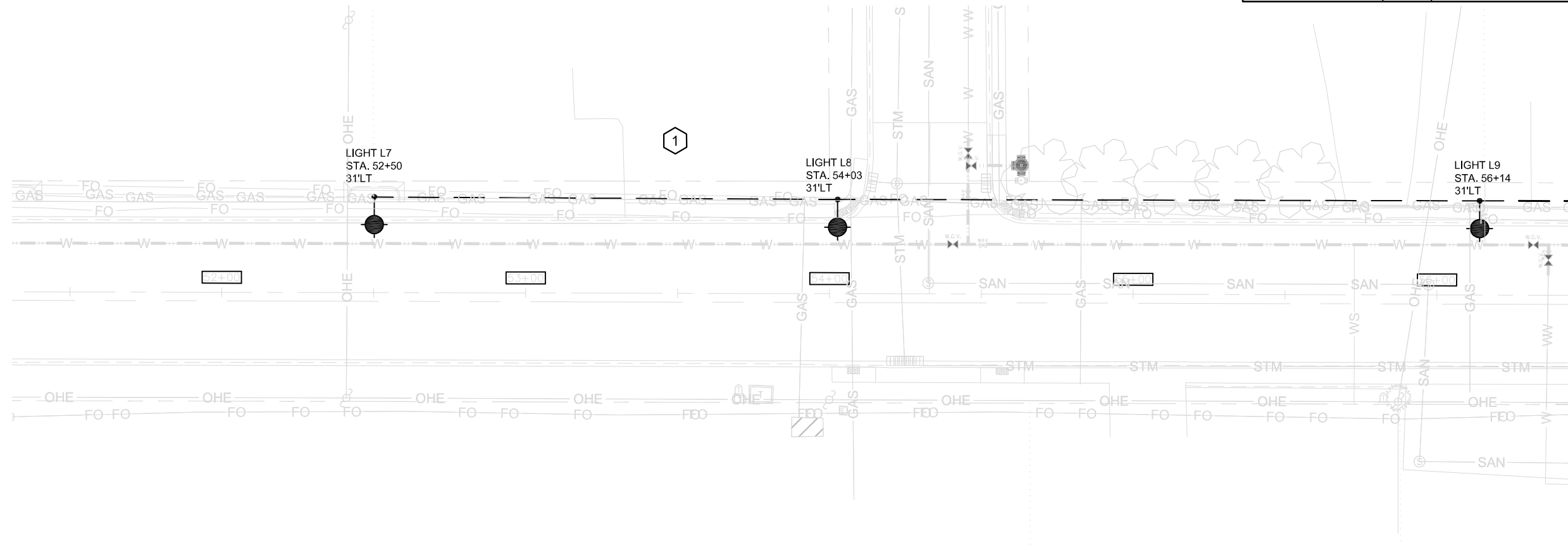


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LIGHTING PLAN
 Sta 47+00 to Sta 51+00

8TH STREET S RECONSTRUCTION

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	140	5



LIGHT	1 EA
Sta. 52+50 31'LT	1 EA
Sta. 54+03 31'LT	1 EA
Sta. 56+14 31'LT	3 EA

NOTES

1. ALL HIGHWAY CIRCUITRY SHALL BE DIRECTIONAL BORED INTO PLACE.

FIXTURE NUMBER	STATION & OFFSET	LUMINAIRE WATTAGE	LUMINAIRE DISTRIBUTION	POLE HT.	MAST ARM
L7	52+50 31'LT	210 (LED)	M-S-II	32'	8'
L8	54+03 31'LT	210 (LED)	M-S-II	32'	8'
L9	56+14 31'LT	210 (LED)	M-S-II	32'	8'

ITEM	STATION & OFFSET	2" DIAMETER RIGID CONDUIT	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	UNDERGROUND CONDUCTOR NO. 6 RHW
LIGHT L7 TO LIGHT L8	52+50 31'LT TO 54+03 31'LT	152 LF	320 LF	160 LF
LIGHT L8 TO LIGHT L9	54+03 31'LT TO 56+14 31'LT	213 LF	442 LF	221 LF

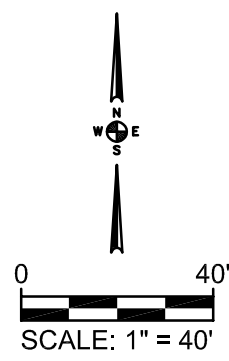
QUANTITIES-THIS SHEET			
770	0020	CONCRETE FOUNDATION-HIGHWAY LIGHTING	3 EA
770	0330	2" DIAMETER RIGID CONDUIT	373 LF
770	0504	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	762 LF
770	0505	UNDERGROUND CONDUCTOR NO. 6 RHW	381 LF
770	1718	LT STD 8FT MA 32FT POLE BREAKAWAY	3 EA
770	4210	LED LUMINAIRE	3 EA

LEGEND

LED LUMINAIRE, 250W EQUIVALENT

ALL LUMINAIRES OPERATE AT 240-VOLTS.

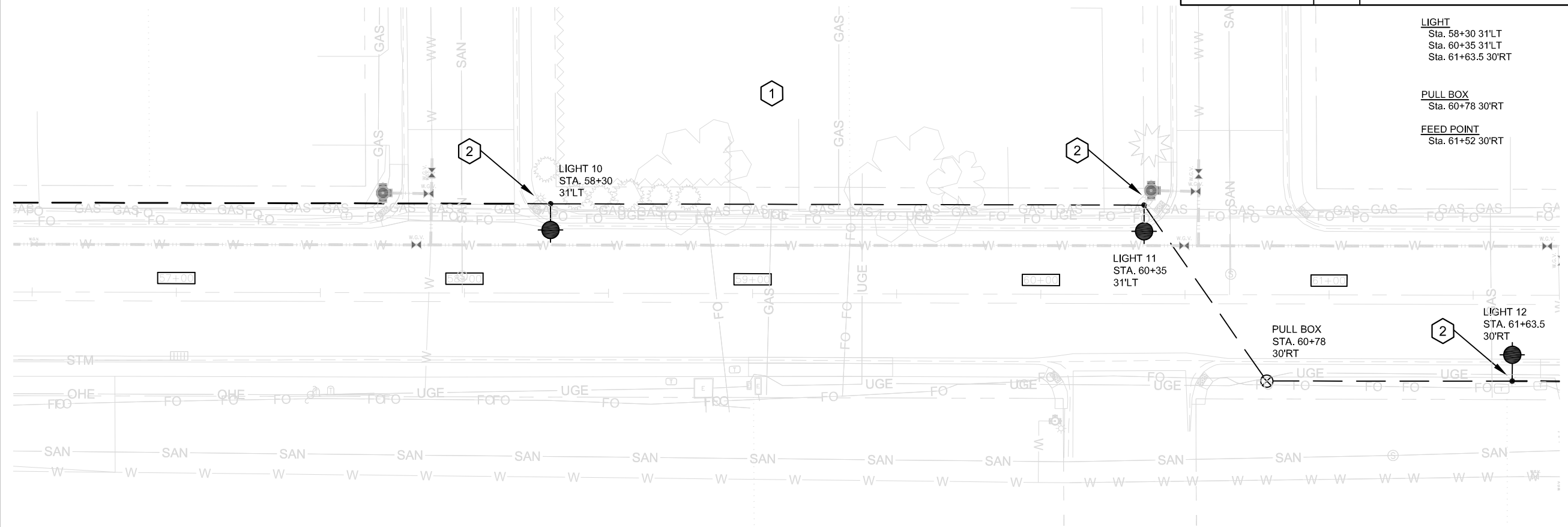
ALL STREET LIGHT STATIONING BASED ON 8TH STREET CENTER LINE.



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LIGHTING PLAN
 Sta 51+50 to Sta 56+00

8TH STREET S RECONSTRUCTION



LIGHT	
Sta. 58+30 31'LT	1 EA
Sta. 60+35 31'LT	1 EA
Sta. 61+63.5 30'RT	1 EA
	3 EA
PULL BOX	
Sta. 60+78 30'RT	1 EA
FEED POINT	
Sta. 61+52 30'RT	1 EA

NOTES

- ALL HIGHWAY CIRCUITRY SHALL BE DIRECTIONAL BORED INTO PLACE.
- EXISTING UTILITY STREET LIGHT POLE, BASE AND ASSOCIATED LUMINAIRE TO BE REMOVED BY SERVING UTILITY.

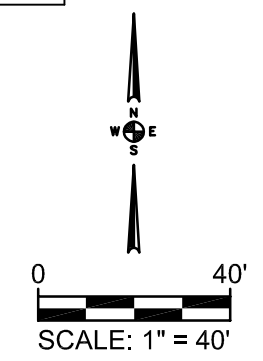
FIXTURE NUMBER	STATION & OFFSET	LUMINAIRE WATTAGE	LUMINAIRE DISTRIBUTION	POLE HT.	MAST ARM
L10	58+30 31'LT	210 (LED)	M-S-II	32'	8'
L11	60+35 31'LT	210 (LED)	M-S-II	32'	8'
L12	61+63.5 30'RT	210 (LED)	M-S-II	32'	8'

ALL LUMINAIRES OPERATE AT 240-VOLTS.
 ALL STREET LIGHT STATIONING BASED ON 8TH STREET CENTER LINE.

ITEM	STATION & OFFSET	2" DIAMETER RIGID CONDUIT	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	UNDERGROUND CONDUCTOR NO. 6 RHW
LIGHT L9 TO LIGHT L10	56+14 31'LT TO 58+30 31'LT	215 LF	446 LF	223 LF
LIGHT L10 TO LIGHT L11	58+30 31'LT TO 60+35 31'LT	206 LF	428 LF	214 LF
LIGHT L11 TO PULL BOX	60+35 31'LT TO 60+78 30'RT	75 LF	174 LF	87 LF
PULL BOX TO LIGHT L12	60+78 30'RT TO 61+63.5 30'RT	86 LF	196 LF	98 LF

QUANTITIES-THIS SHEET			
770	0020	CONCRETE FOUNDATION-HIGHWAY LIGHTING	3 EA
770	0100	PULL BOX	1 EA
770	0330	2" DIAMETER RIGID CONDUIT	582 LF
770	0504	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	1244 LF
770	0505	UNDERGROUND CONDUCTOR NO. 6 RHW	622 LF
770	1718	LT STD 8FT MA 32FT POLE BREAKAWAY	3 EA
770	4210	LED LUMINAIRE	3 EA

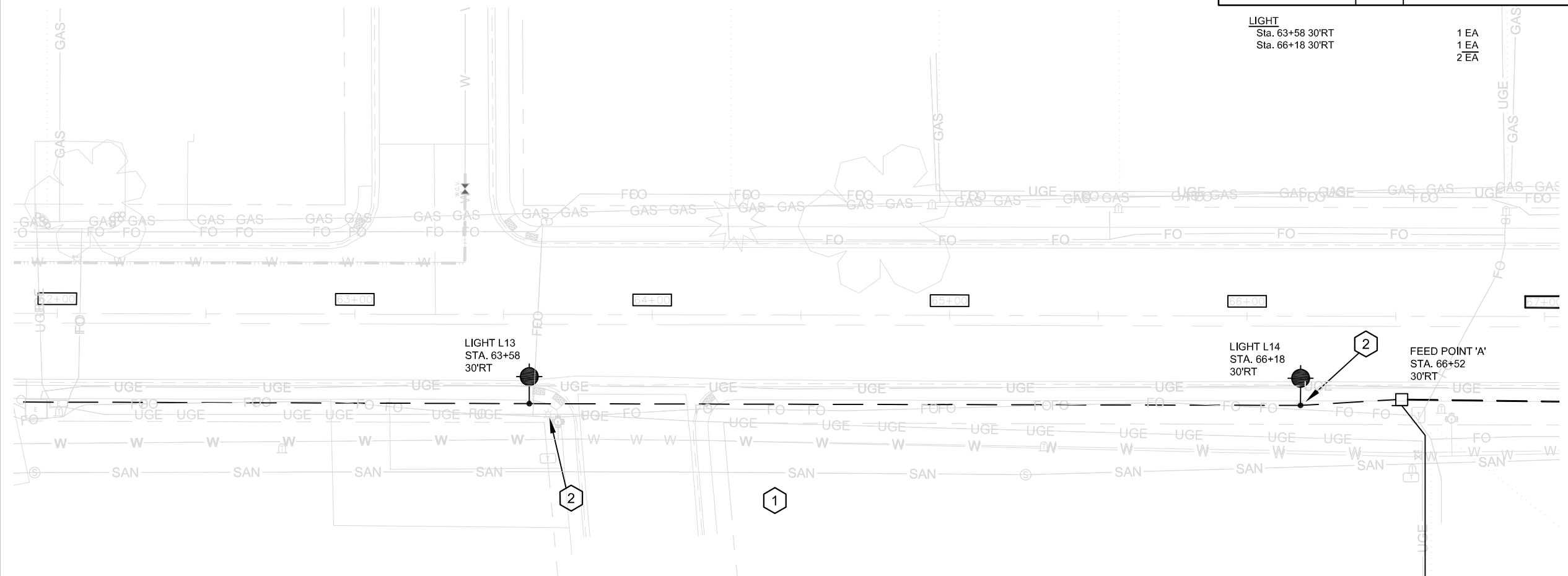
LEGEND
 LED LUMINAIRE, 250W EQUIVALENT



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LIGHTING PLAN
 Sta 56+50 to Sta 61+50

8TH STREET S RECONSTRUCTION



LIGHT
Sta. 63+58 30'RT
Sta. 66+18 30'RT

1 EA
1 EA
2 EA

LIGHT L13
STA. 63+58
30'RT

LIGHT L14
STA. 66+18
30'RT

FEED POINT 'A'
STA. 66+52
30'RT

QUANTITIES-THIS SHEET

770	0020	CONCRETE FOUNDATION-HIGHWAY LIGHTING	2 EA
770	0330	2" DIAMETER RIGID CONDUIT	454 LF
770	0504	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	940 LF
770	0505	UNDERGROUND CONDUCTOR NO. 6 RHW	470 LF
770	0735	FEED POINT-TYPE II-PAD MOUNTED	1 EA
770	1718	LT STD 8FT MA 32FT POLE BREAKAWAY	2 EA
770	4210	LED LUMINAIRE	2 EA

NOTES

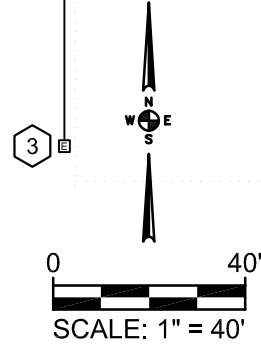
1. ALL HIGHWAY CIRCUITRY SHALL BE DIRECTIONAL BORED INTO PLACE.
2. EXISTING UTILITY STREET LIGHT POLE AND ASSOCIATED LUMINAIRE TO BE REMOVED BY SERVING UTILITY.
3. EXISTING UTILITY TRANSFORMER. PROVIDE CABLE TRENCH FROM FEED POINT TO TRANSFORMER FOR UTILITY CONDUCTORS. COORDINATE WITH SERVING UTILITY.

FIXTURE NUMBER	STATION & OFFSET	LUMINAIRE WATTAGE	LUMINAIRE DISTRIBUTION	POLE HT.	MAST ARM
L13	63+58 30'RT	210 (LED)	M-S-II	32'	8'
L14	66+18 30'RT	210 (LED)	M-S-II	32'	8'

ITEM	STATION & OFFSET	2" DIAMETER RIGID CONDUIT	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	UNDERGROUND CONDUCTOR NO. 6 RHW
LIGHT L12 TO LIGHT L13	61+52 30'RT TO 63+58 30'RT	195 LF	406 LF	203 LF
LIGHT L13 TO LIGHT L14	63+58 30'RT TO 66+18 30'RT	259 LF	534 LF	267 LF
LIGHT L14 TO FEED POINT	66+18 30'RT TO 66+52 30'RT	34 LF	96 LF	48 LF
FEED POINT TO UTILITY XFMR	66+52 30'RT TO 66+60 178'RT	150 LF		

LEGEND

LED LUMINAIRE, 250W EQUIVALENT



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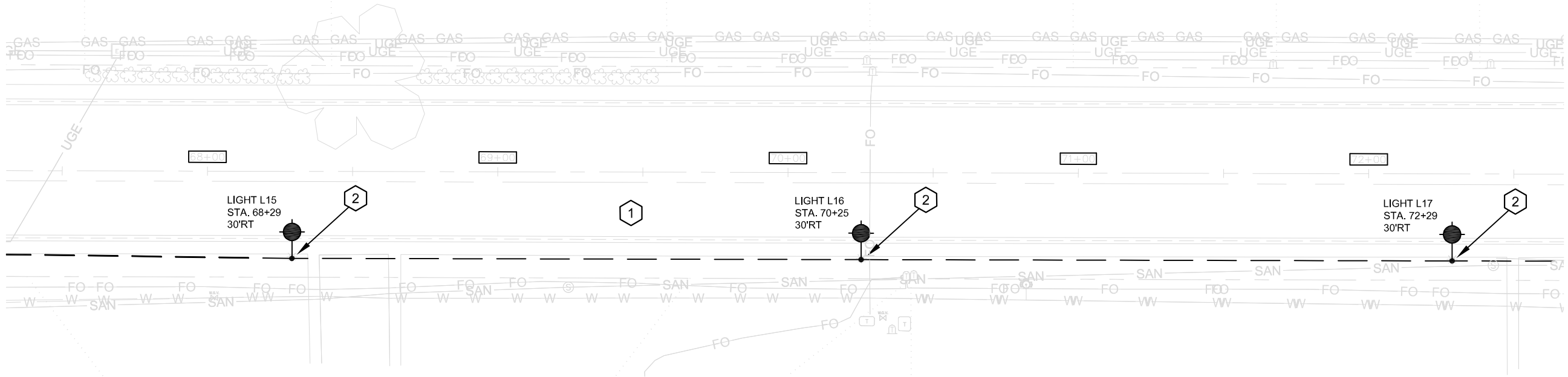
LIGHTING PLAN
Sta 62+00 to Sta 67+00

8TH STREET S RECONSTRUCTION

ALL LUMINAIRES OPERATE AT 240-VOLTS.
ALL STREET LIGHT STATIONING BASED ON 8TH STREET CENTER LINE.

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	140	8

LIGHT	1 EA
Sta. 68+29 30'RT	1 EA
Sta. 70+25 30'RT	1 EA
Sta. 72+29 30'RT	3 EA



NOTES

- ALL HIGHWAY CIRCUITRY SHALL BE DIRECTIONAL BORED INTO PLACE.
- EXISTING UTILITY STREET LIGHT POLE, BASE AND ASSOCIATED LUMINAIRE TO BE REMOVED BY SERVING UTILITY.

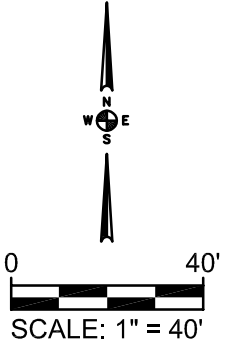
FIXTURE NUMBER	STATION & OFFSET	LUMINAIRE WATTAGE	LUMINAIRE DISTRIBUTION	POLE HT.	MAST ARM
L15	68+29 30'RT	210 (LED)	M-S-II	32'	8'
L16	70+25 30'RT	210 (LED)	M-S-II	32'	8'
L17	72+29 30'RT	210 (LED)	M-S-II	32'	8'

ALL LUMINAIRES OPERATE AT 240-VOLTS.
ALL STREET LIGHT STATIONING BASED ON 8TH STREET CENTER LINE.

ITEM	STATION & OFFSET	2" DIAMETER RIGID CONDUIT	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	UNDERGROUND CONDUCTOR NO. 6 RHW
FEED POINT TO LIGHT L15	66+52 30'RT TO 68+29 30'RT	175 LF	374 LF	187 LF
LIGHT L15 TO LIGHT L16	68+29 30'RT TO 70+25 30'RT	196 LF	408 LF	204 LF
LIGHT L16 TO LIGHT L17	70+25 30'RT TO 72+29 30'RT	204 LF	424 LF	212 LF

QUANTITIES-THIS SHEET			
770	0020	CONCRETE FOUNDATION-HIGHWAY LIGHTING	3 EA
770	0330	2" DIAMETER RIGID CONDUIT	575 LF
770	0504	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	1206 LF
770	0505	UNDERGROUND CONDUCTOR NO. 6 RHW	603 LF
770	1718	LT STD 8FT MA 32FT POLE BREAKAWAY	3 EA
770	4210	LED LUMINAIRE	3 EA

LEGEND
LED LUMINAIRE, 250W EQUIVALENT

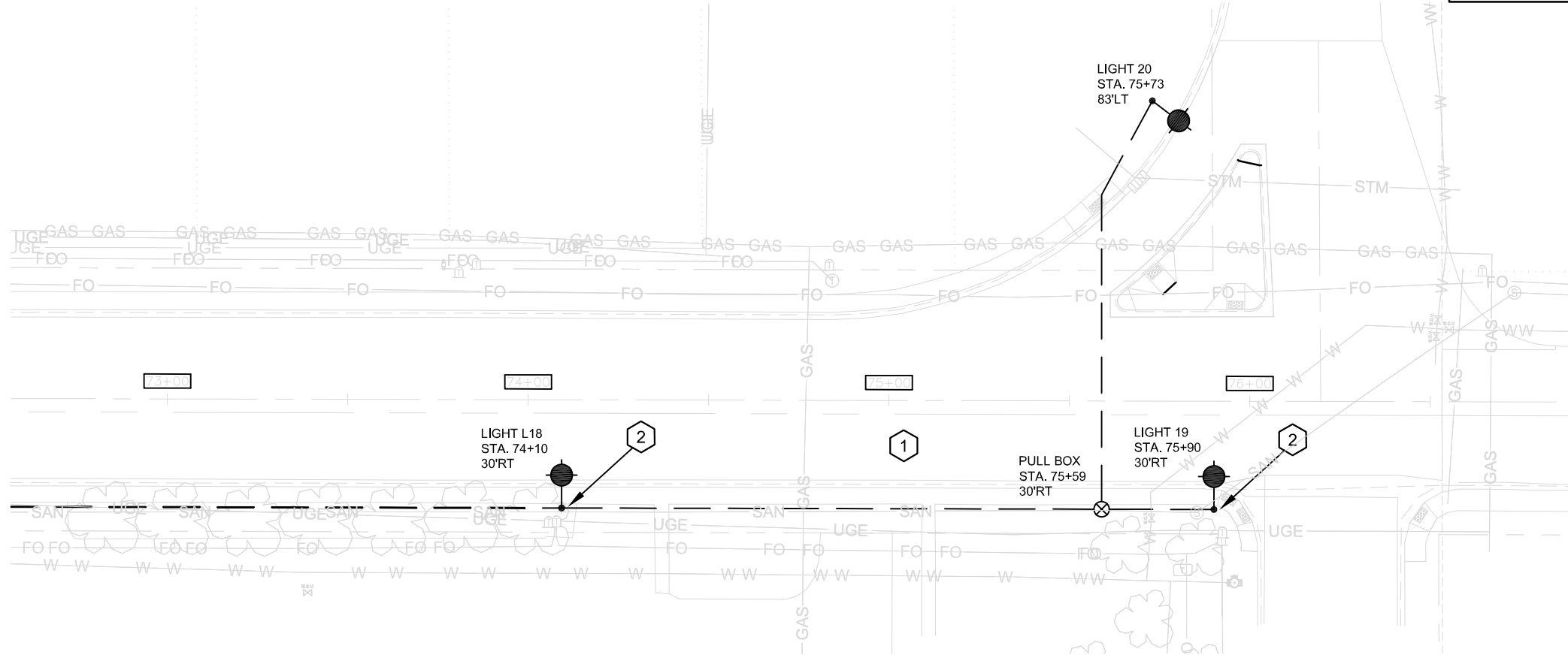


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LIGHTING PLAN
Sta 67+50 to Sta 72+50

8TH STREET S RECONSTRUCTION

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	140	9



LIGHT	1 EA
Sta. 74+10 30'RT	1 EA
Sta. 75+90 30'RT	1 EA
Sta. 75+73 83'LT	3 EA
PULL BOX	1 EA
Sta. 75+59 30'RT	

NOTES

- ALL HIGHWAY CIRCUITRY SHALL BE DIRECTIONAL BORED INTO PLACE.
- EXISTING UTILITY STREET LIGHT POLE, BASE AND ASSOCIATED LUMINAIRE TO BE REMOVED BY SERVING UTILITY.

FIXTURE NUMBER	STATION & OFFSET	LUMINAIRE WATTAGE	LUMINAIRE DISTRIBUTION	POLE HT.	MAST ARM
L18	74+10 30'RT	210 (LED)	M-S-II	32'	8'
L19	75+90 30'RT	210 (LED)	M-S-II	32'	8'
L20	75+73 83'RT	210 (LED)	M-S-II	32'	8'

ALL LUMINAIRES OPERATE AT 240-VOLTS.
ALL STREET LIGHT STATIONING BASED ON 8TH STREET CENTER LINE.

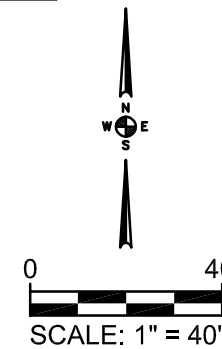
ITEM	STATION & OFFSET	2" DIAMETER RIGID CONDUIT	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	UNDERGROUND CONDUCTOR NO. 6 RHW
LIGHT L17 TO LIGHT L18	72+29 30'RT TO 74+10 30'RT	180 LF	376 LF	188 LF
LIGHT L18 TO PULL BOX	74+10 30'RT TO 75+59 30'RT	149 LF	322 LF	161 LF
PULL BOX TO LIGHT L19	75+59 30'RT TO 75+90 30'RT	31 LF	86 LF	43 LF
PULL BOX TO LIGHT L20	75+59 30'RT TO 75+77 80'LT	116 LF	256 LF	128 LF

QUANTITIES-TTHIS SHEET

ITEM	DESCRIPTION	QUANTITY
770 0020	CONCRETE FOUNDATION-HIGHWAY LIGHTING	3 EA
770 0100	PULL BOX	1 EA
770 0330	2" DIAMETER RIGID CONDUIT	476 LF
770 0504	(2) UNDERGROUND CONDUCTOR NO. 4 RHW	1040 LF
770 0505	UNDERGROUND CONDUCTOR NO. 6 RHW	520 LF
770 1718	LT STD 8FT MA 32FT POLE BREAKAWAY	3 EA
770 4210	LED LUMINAIRE	3 EA

LEGEND

LED LUMINAIRE, 250W EQUIVALENT

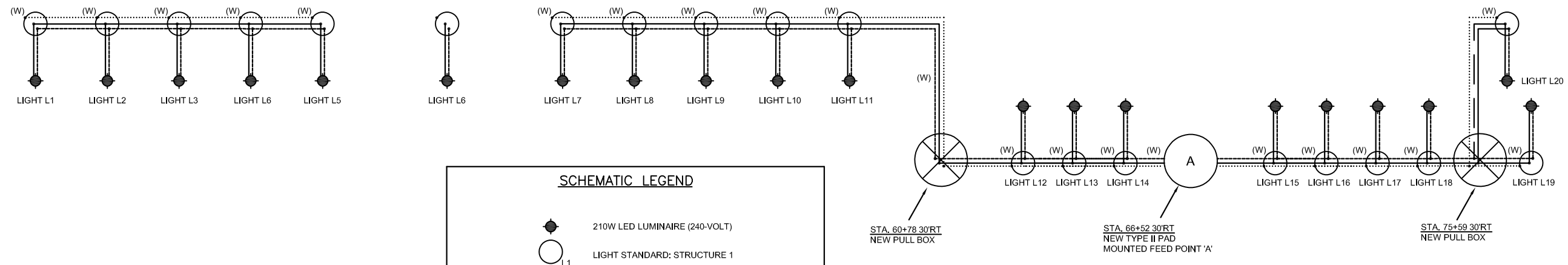


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LIGHTING PLAN
Sta 72+50 to Sta 76+50

8TH STREET S RECONSTRUCTION

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-5-983(059)059	140	10



SCHEMATIC LEGEND

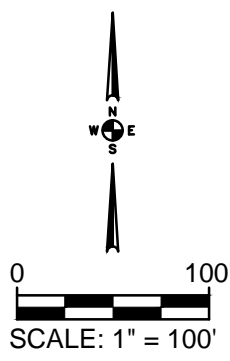
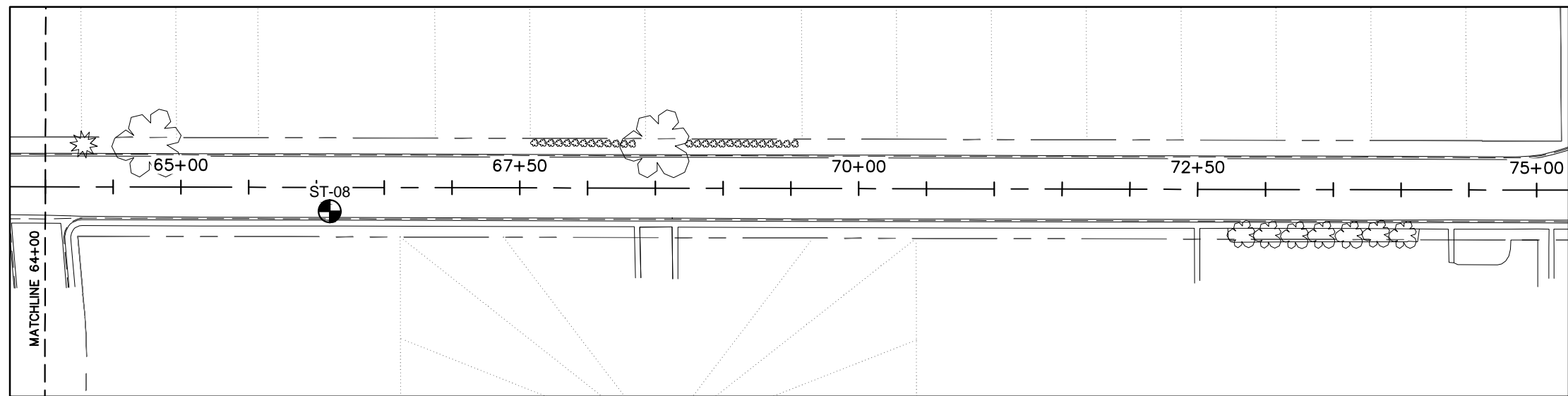
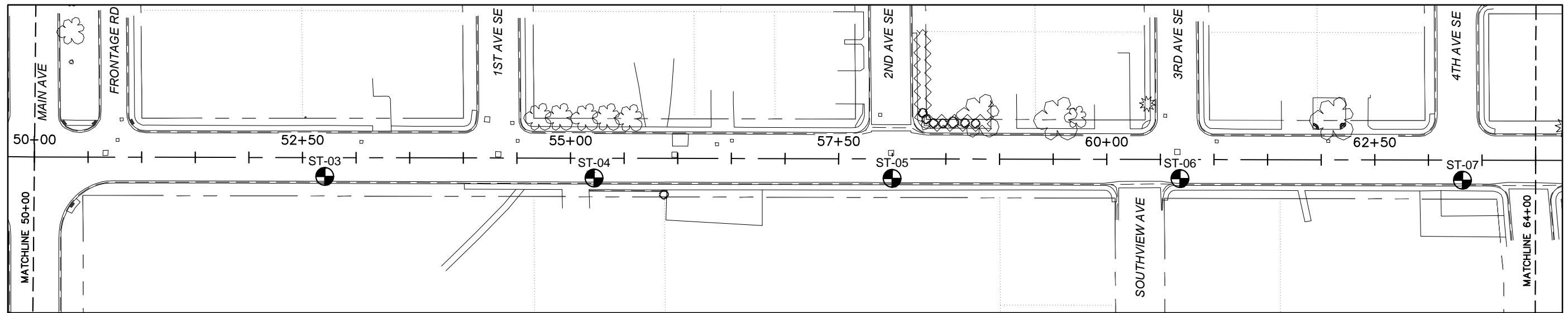
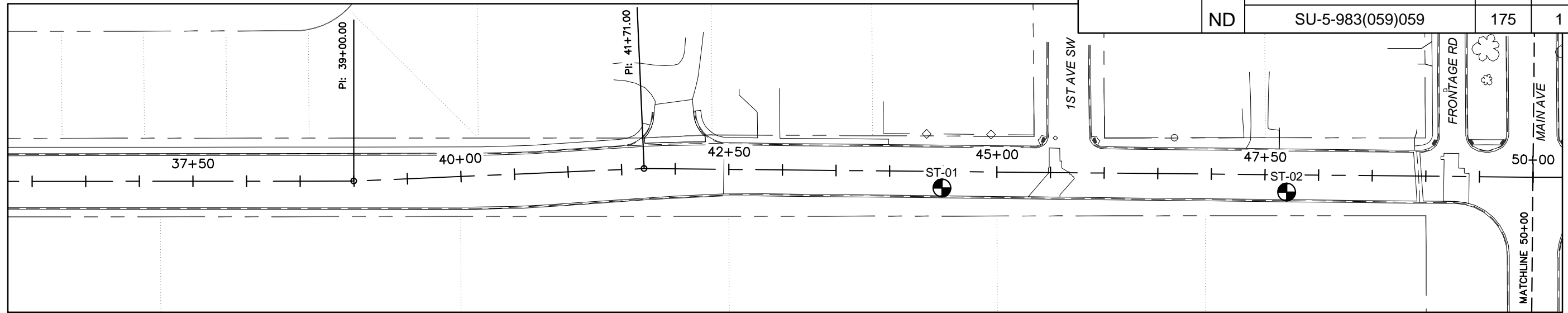
-  210W LED LUMINAIRE (240-VOLT)
-  LIGHT STANDARD: STRUCTURE 1
-  LIGHTING CIRCUIT PHASE "A" CONDUCTOR
-  LIGHTING CIRCUIT PHASE "B" CONDUCTOR
-  GROUND CONDUCTOR
- (W) (2) UNDERGROUND CONDUCTOR NO. 4 RHW
(1) UNDERGROUND CONDUCTOR NO. RHW
IN 2" CONDUIT

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 Jeremy J. Butman
 Registration Number PE-5943, on
 8/17/2017 and the original document is stored at
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LIGHTING SCHEMATIC

8TH STREET S RECONSTRUCTION

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	175	1



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SOIL BORES

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-01**
 LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: **9/21/16** SCALE: **1" = 3'**

Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	Tests or Notes
149.2	0.0						
148.7	0.5	BIT	FILL: 5 1/2 inches of Asphalt surfacing.				
		FILL	FILL: 18 inches of Poorly Graded Gravel.	23			
147.2	2.0	FILL	FILL: Silty Sand, fine-grained, dark brown, moist.		TW*	10	*4 inches of recovery. WD=126 pcf, DD=115 pcf
				5			
143.2	6.0		END OF BORING.				
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.				
			Boring then backfilled and Asphalt patched at the surface.				
							Elevations referenced to hydrant 725 located northeast of the intersection of 8th Street South and 1st Avenue SE with and assumed elevation of 150 feet.

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-02**
 LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: **9/21/16** SCALE: **1" = 3'**

Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
148.8	0.0					
148.4	0.4	BIT	FILL: 5 inches of Asphalt surfacing.			
		FILL	FILL: 14 inches of Poorly Graded Gravel.	11		
147.2	1.6	FILL	FILL: Silty Sand, fine-grained, trace Gravel, dark brown, moist.		18	Bag sample collected from 1 to 5 feet.
144.8	4.0	FILL	FILL: Silty Sand, fine-grained, brown, moist.		9	
142.8	6.0		END OF BORING.			
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.			
			Boring then backfilled and Asphalt patched at the surface.			

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SOIL BORES

8TH STREET S RECONSTRUCTION
 2ND AVE SW TO 6TH AVE SE

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-03**
 LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: 9/21/16 SCALE: 1" = 3'

Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
150.3	0.0					
149.9	0.4	BIT	FILL: 5 inches of Asphalt surfacing.			
149.3	1.0	FILL	FILL: 6 inches of Poorly Graded Gravel.	21		
		FILL	FILL: Silty Sand, fine-grained, dark brown, moist.			
147.8	2.5	FILL	FILL: Silty Sand with Gravel, fine- to coarse-grained, dark brown, damp.	20		
146.3	4.0	FILL	FILL: Silty Sand, fine-grained, dark brown, moist.			
				TW*		*6 inches of recovery.
143.8	6.5		END OF BORING.	15		
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.			
			Boring then backfilled and Asphalt patched at the surface.			

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-04**
 LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: 9/21/16 SCALE: 1" = 3'

Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
151.0	0.0					
150.5	0.5	BIT	FILL: 5 1/2 inches of Asphalt surfacing.			
		FILL	FILL: Silty Sand, fine-grained, brown and dark brown, moist.	9		
				7		Bag sample collected from 1 to 5 feet.
				4		
145.0	6.0		END OF BORING.			
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.			
			Boring then backfilled and Asphalt patched at the surface.			

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SOIL BORES

8TH STREET S RECONSTRUCTION
 2ND AVE SW TO 6TH AVE SE

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-05**

LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: 9/21/16 SCALE: 1" = 3'

Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	q _p tsf	Tests or Notes
151.4	0.0						
150.9	0.5	BIT	FILL: 6 inches of Asphalt surfacing.				
		FILL	FILL: Silty Sand, fine- to coarse-grained, trace Gravel, brown, damp.	9			
149.9	1.5						
		CLST	SENTINEL BUTTE FORMATION, CLAYSTONE, interbedded with Siltstone, gray, moist, decomposed, very soft, hand deformed sample classified as "Fat Clay (CH)".	16		4	
148.4	3.0						
		SIS	SENTINEL BUTTE FORMATION, SILTSTONE, trace iron staining, gray, moist, decomposed, very soft, sample retrieved as non-cemented "Silt (ML)".	TW*			*6 inches of recovery.
146.9	4.5						
		SS	SENTINEL BUTTE FORMATION, SANDSTONE, fine-grained, brown, moist, decomposed, very soft, sample retrieved as non-cemented "Silty Sand (SM)".	33			
145.4	6.0		END OF BORING.				
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.				
			Boring then backfilled and Asphalt patched at the surface.				

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-06**

LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: 9/21/16 SCALE: 1" = 3'

Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
152.1	0.0					
151.8	0.3	BIT	FILL: 4 inches of Asphalt surfacing.			
151.5	0.6	FILL	FILL: 3 inches of Poorly Graded Gravel.	16		
		FILL	FILL: Silty Sand, fine-grained, brown, moist.			
149.1	3.0			14		
		SS	SENTINEL BUTTE FORMATION, SANDSTONE, fine-grained, brown, moist, decomposed, very soft, sample retrieved as non-cemented "Silty Sand (SM)".			
146.1	6.0		END OF BORING.	5		
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.			
			Boring then backfilled and Asphalt patched at the surface.			

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SOIL BORES

8TH STREET S RECONSTRUCTION
 2ND AVE SW TO 6TH AVE SE

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-07**
 LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: **9/21/16** SCALE: **1" = 3'**

Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
151.6	0.0					
151.1	0.5	BIT	FILL: 6 inches of Asphalt surfacing.			
150.8	0.8	FILL	FILL: 3 inches of Poorly Graded Gravel.	22		
		FILL	FILL: Silty Sand, fine-grained, dark brown, moist.			
				18		Bag sample collected from 1 to 6 feet.
				7		
145.6	6.0		END OF BORING.			
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.			
			Boring then backfilled and Asphalt patched at the surface.			

Braun Project B1608780
Geotechnical Evaluation
8th Street South Street Reconstruction
8th Street South
Dickinson, North Dakota

BORING: **ST-08**
 LOCATION: See sketch

DRILLER: A.Horner METHOD: 3 1/4" HSA, Autohammer DATE: **9/21/16** SCALE: **1" = 3'**

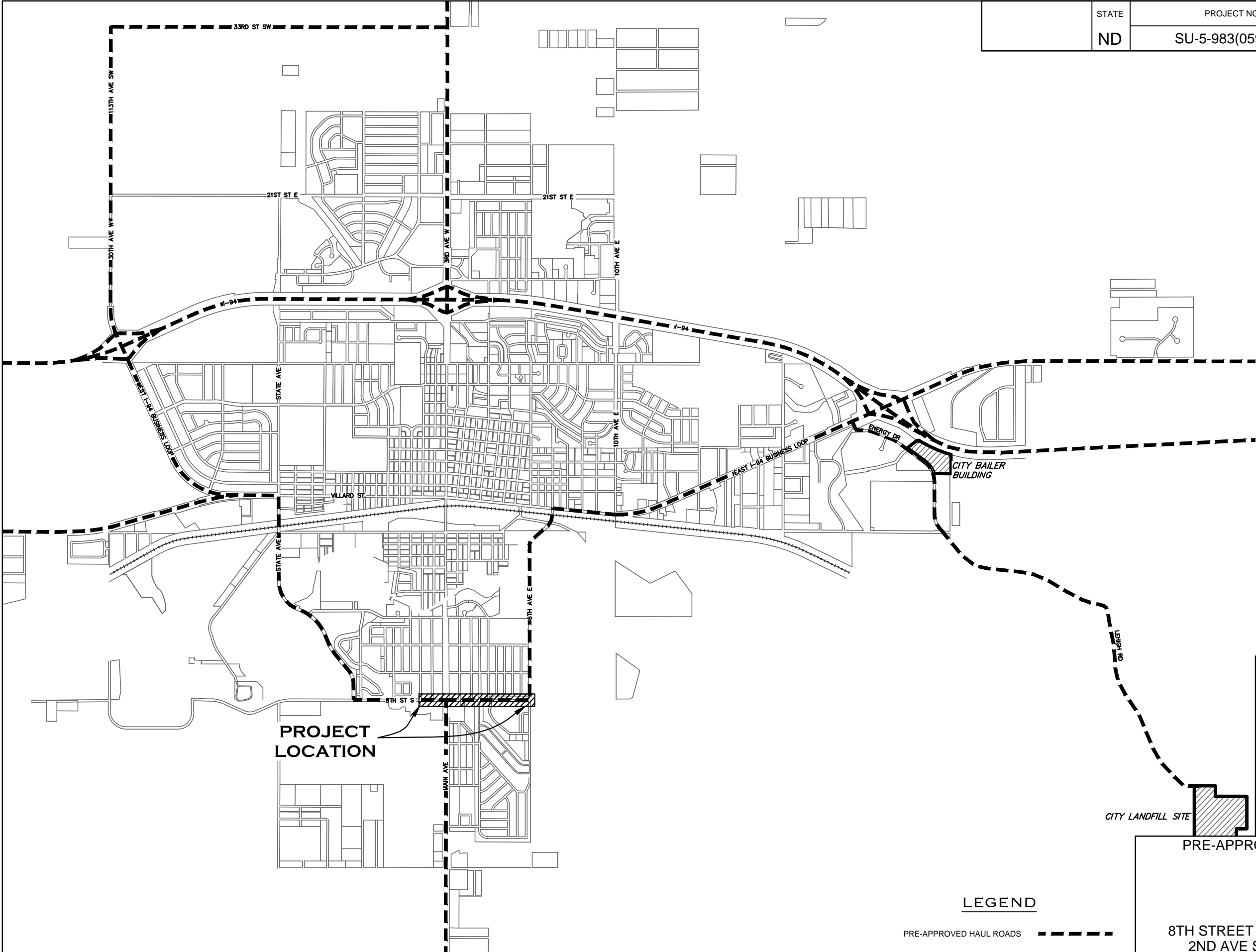
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	Tests or Notes
150.4	0.0					
150.1	0.3	BIT	FILL: 4 inches of Asphalt surfacing.			
149.9	0.5	FILL	FILL: 2 inches of Poorly Graded Gravel.	14		
		FILL	FILL: Silty Sand, fine-grained, dark brown, moist.			
				8		
				3		
144.4	6.0		END OF BORING.			
			Water not observed with 4 1/2 feet of hollow stem auger in the ground.			
			Boring then backfilled and Asphalt patched at the surface.			

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SOIL BORES

8TH STREET S RECONSTRUCTION
 2ND AVE SW TO 6TH AVE SE

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	190	1



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PRE-APPROVED HAUL ROADS

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE

LEGEND

PRE-APPROVED HAUL ROADS - - - - -

WATER PLAN NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	1

202-P01 REMOVAL OF PIPE ALL TYPES AND SIZES: Remove existing water pipe that is depicted for removal within the Plans. Disconnect at the corporation stop, protect, and leave in place all water service lines that are attached to pipes to be removed. If any piping cannot be removed as determined by the Engineer, note said piping on the Contractor's "as constructed" plans which are to be furnished to the Engineer at the completion of the project before final payment is made. Remove without damage and salvage cast iron pipe, caps, plugs, PVC pipe, and fittings. Allow City to inspect these removed items to determine which items are to be salvaged to the City. Deliver items the City determines to be salvageable to the Public Works maintenance shop located at 3411 Public Works Boulevard. Dispose of items the City does not wish to salvage per Specification Section 107.17. Provide all equipment, labor, excavating, loading, unloading, and hauling in the unit price bid for "Removal of Pipe All Types and Sizes".

Follow and comply with the ND Department of Health requirements for the handling of asbestos material (web site link <http://www.ndhealth.gov/AQ/IAQ/ASB/>) and the ND Department of Health Air Quality Division Asbestos Control Program (701.328.5188). Coordinate with ND Department of Health Environmental Scientist Jane Kangas (701.476.4122) or Justin Otto (701.328.5188). Coordinate with Aaron Praus, City of Dickinson Solid Waste Manager (701.456.7776) if AC pipe is to be disposed of at the City landfill. Copy the Engineer on all related communication including applications, forms, and certifications. Include costs associated with Health Department and City coordination, forms and applications, handling, transporting, and disposal of AC pipe in the unit price bid for "Removal of Pipe All Types and Sizes".

724-P01 REMOVED SECTIONS: Delete Sections 724.03, 724.04 B, 724.03 C.1, and 724.03 C.3 of the Standard Specifications.

724-P02 PLUG 6IN WATER LINE: Pump flowable fill into the existing water line from Sta. 49+49.79 to Sta. 50+49.79. Pump flowable fill into the existing pipe until it is full, and plug each end of the pipe with a ductile iron or PVC plug. Use flowable fill that is in accordance with ACI 229, and submit a mix design to the Engineer for approval prior to use. Include all equipment, labor, all fittings to connect to existing pipe and to concrete pumper materials, shoring, excavation, backfilling, compaction, and subgrade preparation for complete installation in the unit price bid for "Plug 6IN Water Line".

724-P03 TEMPORARY WATER SERVICE: Provide temporary water service as needed so that any interruption of service due to construction is minimized and limited to 6 hours at a time maximum for water users. Provide the City of Dickinson, Engineer, and all affected users 48 hours notice in advance of any interruption of service. Coordinate the timing of the connections with the affected businesses for the least impact to them. Connections may need to be made after business hours. Provide the Engineer and the City of Dickinson a comprehensive, realistic, written work plan explaining how the installation of the new system will be completed and how service to the existing system users will be accomplished. Base work plan on actual working conditions for this project. Clean, disinfect, and flush the temporary service lines before being put into service. Provide all piping and connections necessary for the temporary water service. Take a bacteriological test for each temporary water line before putting the temporary service online. Send a copy of the test results to the Engineer and the City of Dickinson water utility maintenance department. The temporary water service shall be disinfected per the requirements of plan note 724-P16. Include the necessary materials and labor to complete this work in the unit price bid for "Watermain 6IN PVC" and "Watermain 8IN PVC", as applicable.

724-P04 REMOVE GATE VALVE & BOX: Remove without damage and salvage gate valves and associated boxes that are depicted for removal within the Plans. Allow City to inspect these removed items to determine which items are to be salvaged to the City. Deliver items the City determines to be salvageable to the Public Works maintenance shop located at 3411 Public Works Boulevard. Dispose of items the City does not wish to salvage per Specification Section 107.17. Provide all equipment, labor, excavating, loading, unloading, and hauling in the unit price bid for "Remove Gate Valve & Box".

724-P05 REMOVE HYDRANT: Remove without damage and salvage fire hydrants that are depicted for removal within the Plans. Allow City to inspect these removed items to determine which items are to be salvaged to the City. Deliver items the City determines to be salvageable to the Public Works maintenance shop located at 3411 Public Works Boulevard. Dispose of items the City does not wish to salvage per Specification Section 107.17. Provide all equipment, labor, excavating, loading, unloading, and hauling in the unit price bid for "Remove Hydrant".

724-P06 UNDERGROUND PVC WATER DISTRIBUTION PIPE AND FITTINGS: Conform to the following requirements for the construction of water lines 6-inches and larger.

- MATERIALS: Use materials that meet the version current at the time of bidding of the specifications noted (i.e. AWWA, ANSI, etc.).
- A. Polyvinylchloride (PVC) Pipe: Use gasketed bell and spigot PVC pipe that meet the requirements of AWWA C900 *Standard for Polyvinyl Chloride Pressure Pipe* with of a quality equal to that manufactured by CertainTeed Polyvinyl Chloride Pipe, PW Eagle, or approved equal. Furnish pipe in cast iron pipe equivalent outside diameters with rubber gasketed joints. Use pipe with a DR 18 rating unless otherwise specified. Use pipe that complies with NSF/ANSI 61. Pipe must also be listed by Underwriters Laboratory Inc. (UL) and be Factory Mutual (FM) approved.
 - B. Fittings: Use ductile iron fittings with a pressure rating of no less than 350 psi when tested in accordance with AWWA standards. Use fittings specifically designed for the outside diameter (OD) of the pipe (cast iron pipe equivalent). Fittings with interchangeable gaskets are not allowed. Use fittings with a cement lined, ductile iron, class 350 interior as manufactured by Tyler Pipe, Trinity Valley, or approved equal that conforms to ANSI/AWWA C153/A21.53 and ANSI/AWWA C104/A21.4 at the time of bidding. Use fittings with an exterior that is coated with

- C. Koppers Bitumastic No. 300-M, Carbolinc Bitmastic 300-M, or approved equal. Wrap the exterior of all fittings with 8-mil polyethylene tubing in accordance with AWWA C105.
- C. Sleeves: Use sleeves that are specifically manufactured for the type, class, and diameter of pipe on which they will be used. Utilize PVC, stainless steel, or metal sleeves coated with a protective coating approved for use on potable water systems.
- D. Bolts, nuts, and washers: Use stainless steel bolts, nuts, and washers, approved grade.

- EXAMINATION:
- A. Verify that excavated base is ready to receive work.
 - B. Verify that all excavations, dimensions, and elevations are as indicated on the drawings or required to properly install pipe or fittings.

- PIPE INSTALLATION:
- A. After digging the required trench, hand trim excavations to required elevations. Provide proper pipe bedding for pipe and bell configuration as noted in the plans or as recommended by the manufacturer.
 - B. Remove clay lumps, large stones, or other hard matter that could damage pipe or impede consistent backfilling or compaction.
 - C. Place bedding material at trench bottom, cradling pipe and bell joint.
 - D. Level material in continuous compacted layers not exceeding 6-inches in compacted depth.
 - E. Install pipe, fittings, and accessories in accordance with the manufacturer's instructions and according to the line and grade shown on the drawings or as established by the Engineer in the field. Bury water piping with a full 7.5-feet of cover measured from the outside top of the pipe to the top of the proposed finish grade.
 - F. Clean and inspect each section of pipe and gasket before installation.
 - G. Hand compact backfill up both sides of pipe to 12-inches (compacted depth) above top of pipe.
 - H. If a section of pipe is cut, ream the cut to a smooth surface before use.
 - I. Prepare pipe connections according to manufacturer's recommendations and industry standards.
 - J. The following guidelines apply when working near or across a sewer main:
 - 1. Where water main crosses over an existing sewer:
 - a. No additional protection needed if water main is at least 1.5-feet above the sewer and the intervening dirt is left undisturbed.
 - b. If crossing is within 1.5-feet above the sewer or if the intervening dirt is disturbed, center a full length of water main over the sewer main.
 - 2. Where water main crosses under the sewer:
 - a. Provide 1.5-feet of separation, when possible.
 - b. In all cases, provide additional protection by centering a full length of water main under the sewer main. Sewer joints located within 10-feet of the crossing must withstand 25 psi internal pressure.

- TOLERANCES:
- A. Lay pipe to the following tolerances noted to the line and grade staked in the field:
 - Vertical Tolerance: ±0.1 feet
 - Horizontal Tolerance: ±0.5 feet
 - Separation Tolerance: Minimum of 10-feet measured to the outside of pipes between water and sewer mains
 - Deflection Tolerance: No more than 1° at any joint

- HYDROSTATIC TESTING:
- A. Hydrostatically test all pressure pipe in the presence of Engineer at a minimum pressure of 150 psi for a period of no less than three hours. Determine the allowable leakage per hour by the following equation:

$$Q = (L \cdot D \cdot \sqrt{P}) / 148,000$$
 where:
 - Q = allowable leakage (gal/hr.) during the test period
 - L = length of section tested (ft)
 - D = nominal diameter of the pipe (in)
 - P = average test pressure (psi)
 - B. Obtain Engineer's approval of testing equipment. Equipment, at a minimum must consist of a volumetrically calibrated water tank with cover, oil filled pressure gage graduated in feet of water or psi, flexible hoses, leak free valves, and gas driven pump with capability to develop 200 psi minimum of discharge pressure.
 - C. If leakage is greater than allowable, take immediate action to correct the problem(s) and retest the section until leakage limits are met.
 - D. If a new section of pipe is connected to an existing main or to a service connection, take appropriate action to prevent damage to the existing main. This may include temporary capping and blocking and/or leaving trench open for visual leakage inspection by Engineer.
 - E. Use a pressure gage graduated to 1 psi and/or 2-feet of water.

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WATER PLAN NOTES

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-5-983(059)059	199	2

FLUSHING:

- A. Flush newly constructed water lines in the presence of Engineer to the approval of Engineer immediately after completion of the pressure test.
- B. Flush away from existing mains or serviceas.
- C. Owner will furnish water for flushing.
- D. Provide temporary piping, if needed.

FIELD QUALITY CONTROL:

- A. Verify all pipe, fittings, and connections are clean, leak free, and correctly assembled prior to backfilling.

PROTECTION:

- A. Protect all pipe installed from contamination by maintaining a temporary manufactured plug on the end of each section until next section is installed.
- B. Protect pipe and bedding from damage or displacement during backfilling operation. Be especially diligent until initial backfilling operation has been completed.

PAYMENT:

- A. Include cost of materials and labor needed to complete the work herein described in the unit price bid for "Watermain 6IN PVC", "Watermain 8IN PVC", or "Fittings-Ductile Iron", as applicable.

724-P07 UNDERGROUND VALVES: Conform to the following requirements for the construction of valves and boxeds 6-inches and larger.

MANUFACTURERS:

- A. Gate Valve: American Flow Control Series 2500, Waterous, or approved equal.
- B. Underground Valve Boxes: Tyler Pipe, Trinity Valley, Sigma, Star, or approved equal.

MATERIALS:

- A. Gate Valves: Gray or ductile iron body, epoxy coated inside and out with resilient seat, stainless steel bolts and nuts on the body, bonnet and stuffing box and standard wrench nuts. Wrap the exterior of all gate valves with 8-mil polyethylene tubing in accordance with AWWA C105.
- B. Underground Valve Boxes:
 - 1. Standard Box: 3-piece, screw type with appropriate base, 4¼-inch diameter shaft and cover or drop lid marked "water" with stationary rod with centering ring which extends to within 3-feet of the finished grade.
 - 2. Boxes located on a fire/sprinkler system supply line: Marked "fire" on the lid and as per number 1 above.

EXAMINATION:

- A. Elevations and/or heights depicted on watermain plans for gate valves are for reference, and these dimensions are to be field verified prior to construction.
- B. Verify that excavated base is ready to receive gate valve and all piping is installed as shown on the drawings.

VALVE INSTALLATION:

- A. Place bedding material at trench bottom, cradling valve and adjoining pipe. Level materials in continuous layers not exceeding 6-inches compacted depth.
- B. Install valves, boxes and accessories in accordance with manufacturers' instructions according to the line and grade shown on the drawings.
- C. Install underground valve boxes plumb and vertical in accordance with the detail shown on the drawings and to the finished grade elevation.

TOLERANCES:

- A. Extend valve box to a point 0.04 feet below the finished grade surface.
- B. Install valve box plumb and vertical.

FIELD QUALITY CONTROL:

- A. Cover all scratches, nicks, and chips on the valve protective coating after proper preparation with an approved coating.

CLEANUP AND PROJECT CLOSEOUT:

- A. Prior to project final acceptance and under the observation of the Engineer, insert a wrench in each valve box installed and check proper wrench fit and operability.

PROTECTION:

- A. Protect valve and box from settlement by proper blocking.
- B. Protect all valves and underground boxes from damage during backfilling and grading.
- C. Protect all valve boxes from debris and clean all debris from valve boxes.

PAYMENT:

- A. Include cost of materials and labor needed to complete the work herein described in the unit price bid for "Gate Valve & Box 6IN", or "Gate Valve & Box 8IN", as applicable.

724-P08 FIRE HYDRANTS: Conform to the following requirements for the construction of fire hydrants:

MATERIALS:

- A. American Flow Control - Waterous WB 5¼ Pacer, American Darling - 5¼ B-62-B Pacer, or approved equal
- B. Furnish and install a breakaway feature with all stainless steel nuts and bolts on the bottom flange of all hydrants. Use threads compatible with the equipment of the Dickinson Fire Department.
- C. Use hydrants rated for 250 psi with two each, 2½-inch diameter hose connections, 4½-inch streamer, break away type traffic flange, and minimum 8-foot bury depth.
- D. Hydrant thread – hose nozzle #6038. 6 threads per inch, 3.25" O.D., pumper nozzle #80430, 8 threads per inch, 4 – 15/16" O. D. (Dickinson Fire Department Thread).
- E. Provide an auxiliary gate valve located a minimum of 1-foot from the tee flange. On the auxiliary valve box use a stationary rod and lettering marked as "FIRE" on the lid per plan note 724-P07.

EXAMINATION:

- A. Verify the exact location of the hydrant and direction of streamer outlet. Elevations and heights depicted on watermain plans for hydrants are for reference, and these dimensions are to be field verified prior to construction.
- B. Verify that pipe has been properly laid and is ready to receive the hydrant.
- C. Verify that all accessories and fittings are on site for proper installation of the hydrant.

CONSTRUCTION:

- A. Install hydrant in accordance with the detail shown on the drawings and to the finished grade elevation.
- B. Install appropriate base and blocking as shown on the plans.
- C. Follow all manufacturer's instructions.
- D. Adjust hydrant height in the field so break-a-way traffic flange is properly located. If needed, provide extensions or provide fill material and landscape around hydrant, as directed by the Engineer, to obatin proper elevation.
- E. If high groundwater is encountered, plug hydrant drain prior to installation.

TOLERANCES:

- A. Install traffic flange not more than 6-inches above the ground surface.
- B. Install hydrant plumb and vertical.
- C. Install hydrant nozzle height to be 18" minimum and 24" maximum above the finish grade.

FIELD QUALITY CONTROL:

- A. Cover all scratches, nicks, and chips on the protective coating with an approved coating after proper match preparations.

PROTECTION:

- A. Protect hydrant from damage during backfilling and grading.
- B. Protect aggregate base drain area from becoming contaminated with dust.

CLEANUP AND PROJECT CLOSEOUT:

- A. Prior to final acceptance, open and close each hydrant valve and observe the barrel drain down in presence of the Engineer.
- B. Verify proper threads by obtaining hose section from Owner and demonstrating the fit to the Engineer.
- C. If construction is in a previously seeded area, replace topsoil upon completion of backfilling and seed disturbed area per Standard Specification Section 251 using Seed Class I unless otherwise noted in the Plans.
- D. If construction is in an otherwise landscaped area, replace any disturbance to the existing landscaping to its existing condition upon completion of backfilling unless otherwise noted in the Plans.

PAYMENT:

- E. A. Include cost of materials and labor needed to complete the work herein described in the unit price bid for "6IN Hydrant".

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WATER PLAN NOTES

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	3

724-P09 WATER LINE CONNECTIONS: If a mechanical joint sleeve or coupling is not required where a new water line is to be connected to an existin water line, and the pipe can be connected to the existing water line using the bell and spigot joints as determined by the Engineer, no payment will be made for a water line connection. If the connection cannot be made in this manner as determined by the Engineer, make the connection with a mechanical joint sleeve with stainless steel nuts and bolts at every other bolt location, or use a Hymax (or approved equal) coupling. Include the cost of sleeves, fitting glands, bolts, transition fittings or gaskets, couplers, and labor for this type of connection in the unit price bid for "Water Line Connection _IN". Include a 6-inch by 8-inch ductile iron reducer meeting the requirements of plan note 724-P06 in the unit price bid for "Water Line Connection 6IN to 8IN". If payment for a water line connection is not warranted in these areas as defined herein, this reducer will be paid for as "Fittings-Ductile Iron".

724-P10 WATER SERVICE CONNECTION 1IN: Make connections to existing 1-inch polyethylene service lines using 8"x1" stainless steel double bolt saddles installed on the new water lines. Install all brass 1" corporation ball style stop at the tapping saddle, and connect the existing water service line at the corporation stop. Include the necessary materials and labor to complete this work in the unit price bid for "Water Service Connection 1IN".

724-P11 SITE EXCAVATING, TRENCHING, & GRADING: Conform to the following requirements for the excavation, trenching, and grading required to complete the installation of the water system and all associated components.

PREPARATION:

- A. Verify that surveyed benchmarks for the work are as shown on the Plans.
- B. Measure and document the locations of buried utilities by providing surface ties to existing, visible, permanent structures.
- C. Identify required lines, levels, contours, and datum.
- D. Locate, identify, and protect from damage all utilities that are to remain.
- E. Notify utility company(s) to remove and/or relocate utilities as needed.
- F. Protect plant life, lawns, and other features that are to remain as a portion of final landscaping.
- G. Protect benchmarks and existing structures and appurtenances from damage.
- H. Maintain and keep in good working order, all warning lights, barriers, signs, and other traffic control devices as required for the safety of the public and maintenance of traffic.
- I. In locations where existing aggregate base is to remain, remove and salvage existing aggregate base separate from other subgrade soils.

TRENCH EXCAVATION:

- A. Excavate to the required depth by trenching subsoil as required for utilities to be installed.
- B. Notify the Engineer if contaminated soils are encountered.
- C. Cut trenches sufficiently wide to enable installation, allow inspection, and to properly backfill.
- D. Do not interfere with 45° bearing splay of foundations.
- E. Hand trim where necessary. Remove all loose matter and lumped subsoil.
- F. Stockpile excavated material in Engineer approved area and remove excess material not being used from the site.
- G. Whenever unstable soils are encountered, protect trenches by sheeting or by trench jacks.
- H. Maintain and protect existing buried utilities or adjacent site features to remain by means of avoiding, shoring, supporting, or otherwise to complete the work.
- I. Provide berms or channels to prevent flooding of the subgrade and maintain ample means and devices to promptly dispose of all water from every source entering the excavated area.
- J. Machine slope bank to reduce sloughing.
- K. Safely protect all trench excavations at the end of the work day, and ensure requirements of Plan Note 704-P01 "Traffic Control Safety Wedge" in Section 6 are followed for trenches. No open trenches will be allowed during non-work periods. Provide necessary measures to safely separate work from the public and roadway user. This may include but is not limited to temporary guardrail, barriers, or other means.

ROCK EXCAVATION:

- A. Defined as material requiring additional heavy equipment such as jack hammers and rippers, or boulders and detached rock having a volume greater than ½ cubic yard.
- B. Notify Engineer prior to removal.
- C. Use suitable excess excavation already on the project site to replace the rock excavation.
- D. Engineer will measure Rock Excavation by the CY, and payment will be made per the PS-1 schedule.

GRADING:

- A. Grade all disturbed areas as required to obtain the final elevations shown on the drawings.
- B. Grade all areas to provide positive drainage.

TOLERANCES:

- A. Maintain all backfill layers within ±1-inch of the specified lift thickness.
- B. Finish grade to within 0.03 feet of the required elevations.

PAYMENT:

- A. Include cost of materials and labor needed to complete the work herein described in the unit price bid for the applicable item being installed.

724-P11 BACKFILLING AND COMPACTION: Conform to the following requirements for the backfilling of all utility trenches required to complete the installation of the water system and all associated components.

BACKFILLING:

- A. Notify engineer of intent to backfill.
- B. Backfill trenches with approved, compactable materials. Use material from on-site excavations for backfill.
- C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- D. Remove lumped subsoil, boulders, frozen lumps, rocks, or other material that, in the opinion of the Engineer, is unsuitable.
- E. Systematically backfill in continuous layers not exceeding 8-inches in compacted depth.
- F. Each layer shall be compacted before the next layer is placed.
- G. Compaction shall be 90% of the maximum dry density as determined by AASHTO T180. The moisture content of the soil at the time of compaction shall not be less than optimum moisture content and no more than 5 percentage points above optimum moisture.
- H. In areas where existing aggregate base is to remain, re-place existing salvaged aggregate base to existing depth, with a minimum depth is 5.5-inches in all areas. Compact aggregate base per Specification Section 302.04 B. Include final grading and shaping of this aggregate base in the "Reshape Aggregate Base Course" item.
- I. Employ a placement and compaction method that does not disturb or damage adjacent foundations, underground utilities, and perimeter drainage.
- J. Remove all surplus backfill materials from site and dispose of as directed by Engineer.

TOLERANCES:

- A. Top Surface of Backfilling under Paved Areas and Slabs on Grade: ±¼-inch from required elevations.
- B. Top Surface of General Backfilling: ±½-inch from required elevations.
- C. Maintain all backfill lift thickness: ±1-inch of specified thickness.

FIELD QUALITY CONTROL:

- A. Engineer will provide field quality control testing.
- B. In trench areas, one passing density test is required at mid-depth of trench and the second passing density test is required at 1-foot below finished grade elevation at 250-foot (horizontal) intervals.
- C. For a failing test, Engineer will define the limits of the failing area. Remove or scarify and recompact all backfill within the defined area.

CLEANUP AND PROJECT CLOSEOUT:

- A. Shape all backfilled and graded areas to provide positive drainage until permanent surfacing is installed.
- B. Clear the entire construction site of all surplus and salvaged material. Dispose of all dirt, rubbish, asphalt, concrete, rock, excess earth, and demolition items as directed by the Engineer.

PAYMENT:

- A. Include cost of materials and labor needed to complete the work herein described in the unit price bid for the applicable item being installed.

724-P13 BEDDING MATERIAL: Utilize existing, excavated sandy material that does not contain any rocks or chunks of earth larger than ½-inch. If material is not available on site, provide sand from an outside source, meeting the following gradation:

SIEVE SIZE	PERCENT PASSING
1/2"	100
No. 200	0-35

Include required bedding material in the unit price bid for the applicable item being installed.

724-P14 BACKFILLING DUCTILE IRON PIPE, FITTINGS, GATE VALVES, HYDRANTS: Once the ductile iron pipe, fittings, gate valves, and hydrants are completely wrapped in polyethylene tubing, use sand to backfill completely around the pipe, fitting, valve, or hydrant by approximately six-inches beyond the outside perimeter of the pipe, fitting, valve, or hydrant.

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WATER PLAN NOTES

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-5-983(059)059	199	4

724-P15 BORE AND PUSH 8IN PVC WATER: Provide personnel that are fully trained in their respective duties as part of the directional drilling crew and in safety. Provide a competent and experienced supervisor to represent the Drilling Contractor who is present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type work to be performed, must be in direct charge and control of the operation at all times.

Construct bore pits as needed to complete the directional drilling. Provide rock bedding associated with bore pits as needed. Provide dewatering and trench shoring as needed. Boring pit sizes will depend on the Contractor's means and methods and are not depicted herein. Enclose bore pit and drilling operations within temporary fencing as appropriate to separate the work from the public. Pits constructed at the entry or exit point area shall be so constructed to completely contain the drill fluid. The Horizontal Directional Drilling operation is to be operated in a manner to eliminate the discharge of water, drilling mud, and cuttings to areas outside of the established work area, storm drainage facilities, and surface or groundwater. Provide and maintain equipment (graders, shovels, etc.) and materials (such as groundsheets, hay bales, booms, and absorbent pads) for cleanup and contingencies in sufficient quantities for use in the event of inadvertent leaks, seeps, or spills. Comply with all environmental requirements. Bore pits must meet the requirements of Plan Note 704-P01 "Traffic Control Safety Wedge" in Section 6.

The Engineer must be notified 48 hours in advance of starting directional drilling work. Do not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. Engineer approval for beginning the installation in no way relieves the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract.

Carrier piping shall be restrained joint AWWA C900 PVC equal to CerainTeed Certa-Lok VIP Class 150, or approved equal. The required piping shall be assembled in a manner that does not obstruct adjacent roadways, driveways, or public activities unless otherwise allowed by the Plans. The contractor shall at all times handle the PVC pipe in a manner that does not over stress the pipe. Vertical and horizontal curves shall be limited to those allowed by the manufacturer. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced. Take appropriate steps during pullback to ensure that the PVC pipe will be installed without damage. During pull-back operations do not apply more than the maximum safe pipe pull force at any time. In the event that pipe becomes stuck, notify Engineer, and discuss how the work is to proceed.

After completion of the directional drilling work, the entry and exit pit locations shall be backfilled per plan note 724-P12.

Include bore pits, piping, dewatering, rock bedding, excavation, backfilling, compaction, trench shoring, carrier pipe, labor, materials, and equipment in the unit price bid for "Bore and Push 8IN PVC Water".

724-P16 DISINFECTATION OF WATER SYSTEM: Conform to the following requirements for the disinfection of all water lines prior to being placed in service.

MATERIALS:

- A. Certify all disinfectant products as meeting applicable AWWA Standards.
- B. Hypochlorite's, Liquid Chlorine, and Chlorine gas, are approved for use in disinfection.

EXAMINATION:

- A. Verify that water system has been cleaned, flushed, inspected, and pressure tested.
- B. Verify that all services are turned off.
- C. Perform scheduling and disinfecting activity with start-up, testing, adjusting and balancing, demonstration procedures, including coordination with related systems and services.

EXECUTION:

- A. Provide, in writing to the Engineer, the method for disinfection and testing of the newly installed watermain following the requirements of AWWA C651.

B. Option 1 – Tablet Method

- 1. During construction, place the following number of calcium hypochlorite tablets in each 20-foot long section of pipe, both mainline and branch lines.

Pipe Diameter	No. of 5-g tablets
4	1
6	1
8	2
10	3
12	4

- 2. Attach the tablets to the inside top of pipe by a food grade adhesive. Attach an equal number of tablets to each section of pipe.
- 3. When installation is complete, fill the main with water at a rate that maintains a velocity no greater than 1-foot/second.

- 4. Maintain water in pipe for at least 24 hours. Operate all valves and hydrants during the 24-hour period.
- 5. At the end of the 24-hour period, residual shall be greater than 2 mg/l of free chlorine.
- 6. If free residuals are acceptable, take one bacteriological test for each 400 LF of new water main installed.
- 7. If free residuals are less than the 2 mg/l, make the appropriate corrective actions.

C. Option 2 - Continuous Feed Method

- 1. Flush all components to remove particulate matter and air. Flush at a rate which maintains a velocity of 2.5 feet/second and continues until water is clear as determined by Engineer.
- 2. Connect chlorine feed equipment (gas or liquid) at a point not more than 10-feet downstream from beginning of new main.
- 3. Chlorine shall be fed by solution at a rate, which will provide a free chlorine residual within the main of not less than 25 mg/l. At the end of a 24-hour period, this residual shall not be less than 10 mg/l.
- 4. The following table can be used as a guide to determine amounts of chlorine needed for 50 mg/l chlorine solution.

Volume of Reservoir or Pipeline	Liquid Laundry Bleach (5.25% Chlorine)	Calcium Hypochlorite (70% Chlorine)
1,000	1 gallon	0.6 lbs
5,000	5 gallons	3.0 lbs
10,000	10 gallons	6.0 lbs
25,000	25 gallons	15.0 lbs
50,000	50 gallons	30.0 lbs
75,000	75 gallons	45.0 lbs
100,000	100 gallons	60.0 lbs
500,000	500 gallons	300.0 lbs

- 5. Flush main slowly while chlorine is being injected at the upstream end. Regular testing at the discharge point will determine when the entire main has been chlorinated.
- 6. Maintain chlorinated water in main for 24 hours during which time all valves shall be operated.
- 7. After the 24-hour period, take one random sample for each 400-feet of main being tested.
- 8. If the free chlorine residual is greater than 10 mg/l at all points tested, flush the main. Take a bacteriological test for each 400 LF of new water main installed.
- 9. If residuals are less than 10 mg/l, make the appropriate corrective actions.

D. Option 3 - Slug Method

- 1. Process is identical to option 2 except that the water is dosed with chlorine to a concentration of 100 mg/l for a period of 3-hours.
- 2. At the end of the 3-hour period, free chlorine residual shall not be less than 50 mg/l.
- 3. If the free residual is less than 50 mg/l at any random point tested, make the appropriate corrective actions.
- 4. If all samples have more than 50 mg/l of free residual, flush the main. Take a bacteriological test for each 400 LF of new water main installed.

TOLERANCES:

- A. A plate count of "zero" is required on the bacteriological test.
- B. The feed or application rates stated herein are for general guidance only. Refer to AWWA C651 for exact limits.

FIELD QUALITY CONTROL:

- A. After final flushing each 1,200-foot segment and branches greater than 50 L.F., and before the new water main is connected to the distribution system, three consecutive sets of acceptable samples, per 1,200-foot main or 50-foot branch, taken at least 24 hours apart, shall be collected from the new main. Record the locations the samples were taken. Perform sampling with due care to prevent contamination using sterile bottles provided by the testing laboratory. It is not recommended that samples be collected from hoses or fire hydrants. The testing of the samples shall be performed by a State of North Dakota certified testing laboratory selected by the Contractor. All samples shall be tested for bacteriological quality and shall show the absence of coliform organisms.
- B. Exact number of free residual tests will vary with the size of system but in no case take fewer than 3 random samples.
- C. Copies of all bacteriological tests shall be sent to the Engineer and the City of Dickinson Water Utility Maintenance Department.

CLEANUP AND PROJECT CLOSEOUT:

- A. Clean up and properly dispose of all chemicals and containers.
- B. Drain any standing water from flushing.

PAYMENT:

- A. Include cost of materials and labor needed to complete the work herein described in the unit price bid for "Watermain 6IN PVC" or "Watermain 8IN PVC", as applicable.

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WATER PLAN NOTES

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-5-983(059)059	199	5

724-P17 TRACER WIRE: Conform to the following requirements for the installation of tracer wire for new water lines. Install tracer wire on all new water lines.

724-P18 WATER DISTRIBUTION SYSTEM MATERIALS: All materials used for the water distribution system improvements are required to comply with NSF/ANSI 61.

MATERIALS:

- A. Open Trench/Boring Installation:
 - 1. Direct burial 12 AWG solid, CCS (Copper Clad Steel), 0.0808-inch diameter.
 - 2. Steel core soft drawn high strength 380 pound average tensile break load.
 - 3. 30-mil high molecular weight, high density polyethylene, complying with ASTM D1248.
 - 4. High flexibility, stretchable to accommodate ground movement.
 - 5. Impact resistant.
 - 6. 30 volt rating
 - 7. Jacket color: Blue
 - 8. Physical, permanent, surface legend on insulating jacket, repeated a minimum of every 2 linear feet.
- B. Connectors:
 - 1. Waterproof and corrosion-proof.
 - 2. Prefilled with non-hardening sealant.
 - 3. Lug:
 - a. Tin plated high conductivity aluminum with high impact polypropylene housing.
 - 4. Connectors:
 - a. CSA certified as both Pressure Type and Direct Bury.
- C. Magnesium Anode:
 - 1. Provide 5 pound anode at each
 - a. Hydrant
 - b. Every Other Manhole
 - c. Connection to existing facilities
- D. Tracer Wire Access Box:
 - 1. Valvco: Part SEWAB
 - 2. Copperhead Lite-Duty Box (LD14*TP) in grass areas
 - 3. Copperhead Driveway Box (CD14*TP) in sidewalks and driveways with light traffic
 - 4. Copperhead Roadway Box (RB14*TP) in streets and parking lots
 - 5. Approved Equal

INSTALLATION:

- A. Approved spliced connection locations: fire hydrants and manhole discharge connections to the main.
- B. Except for approved splice connections and repairs, install in continuous manner from discharge manhole to flushing connection, from hydrant to hydrant and manhole to manhole.
- C. Install tracer wire parallel with and above centerline axis of pipe.
 - 1. Do not spiral wrap wire to pipe.
 - 2. Do not install under service saddles.
 - 3. Tape tracer wire to pipe.
- D. Tracer wire termination.
 - 1. Terminate in tracer wire access box at each fire hydrant, air release manhole, sanitary manhole, flushing connection and discharge manhole.
 - 2. Provide minimum 3-foot-long pigtail at grade termination points within tracer box.
 - 3. Provide 5 pound magnesium anode a maximum of every 1000-feet and at buried pipe ends:
 - a. Attach to the main tracer wire by solder.
 - b. Remove anode protective cover.
 - c. Apply water as directed by manufacturer.

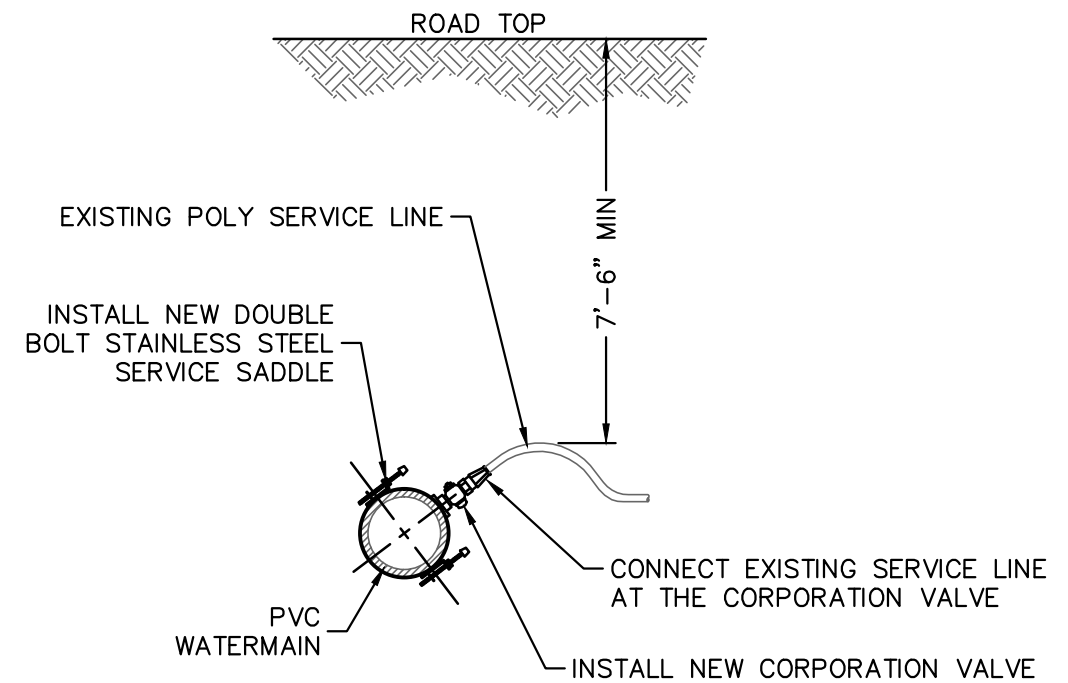
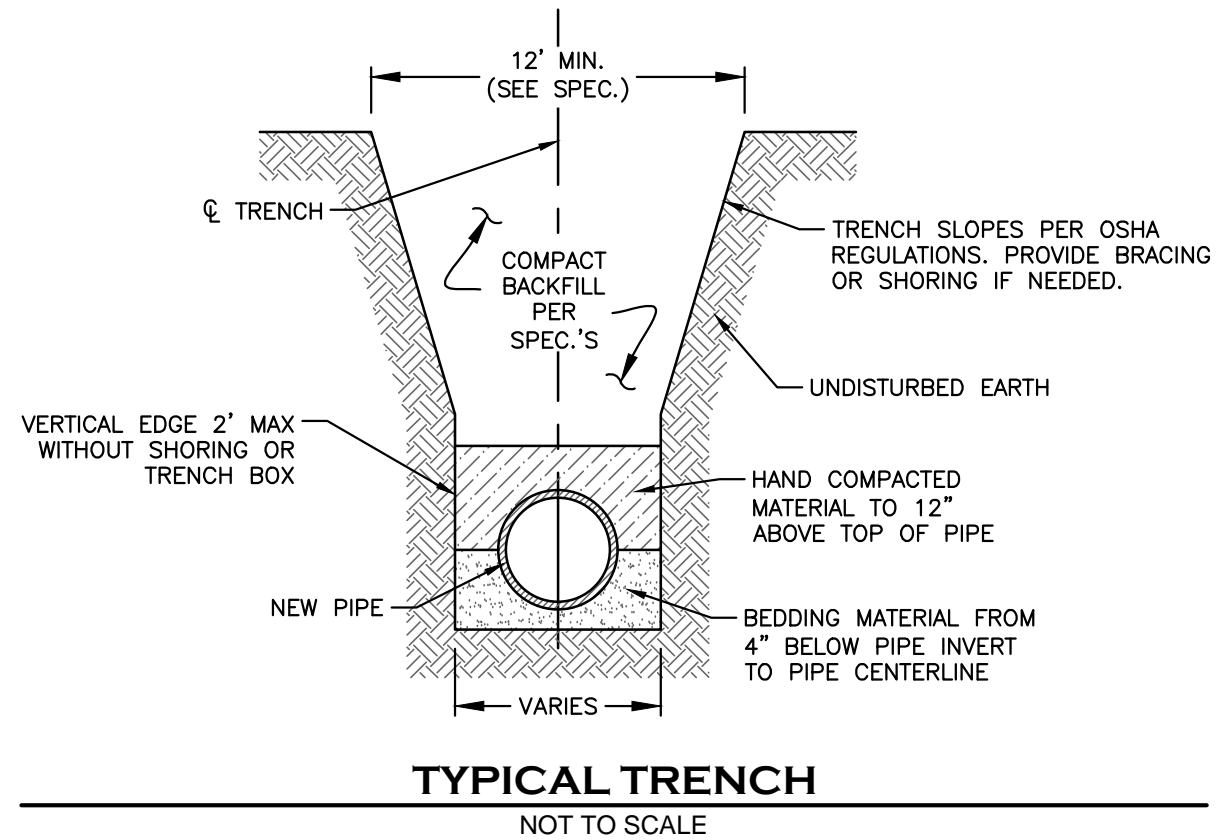
FIELD QUALITY CONTROL:

- A. System Testing:
 - 1. Test continuity of conduction in the presence of the Engineer.
 - 2. Connect signal generator at wire termini and trace signal throughout the installation.
 - 3. Locate and repair all breaks in conductivity.

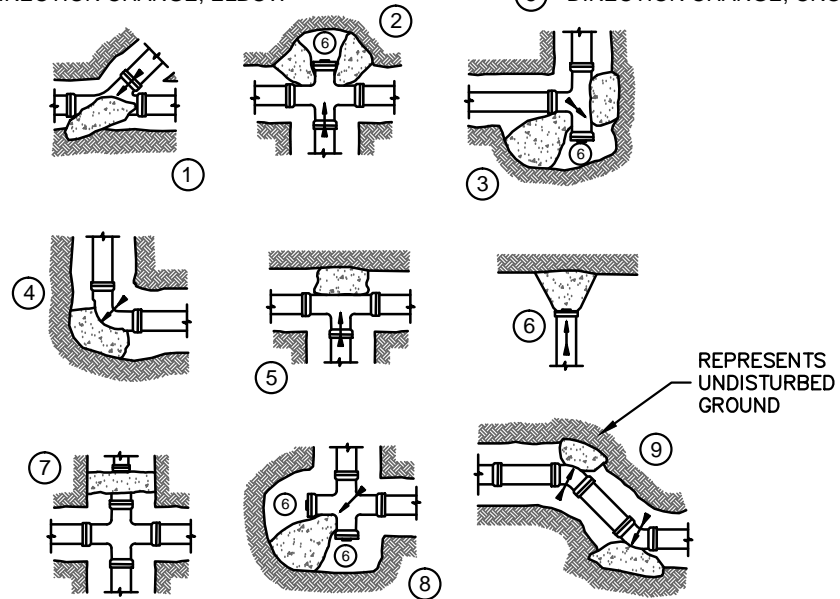
PAYMENT:

- A. Include cost of materials and labor needed to complete the work herein described in the unit price bid for "Watermain 6IN PVC", or "Watermain 8IN PVC" as applicable.

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- | | |
|---|---|
| ① THRU LINE CONNECTION, WYE | ⑤ THRU LINE CONNECTION, TEE |
| ② THRU LINE CONNECTION, CROSS USED AS TEE | ⑥ BLOCKING OF PLUG, TO INCLUDE BOND BREAKER |
| ③ DIRECTION CHANGE, TEE USED AS ELBOW | ⑦ CHANGE LINE SIZE, REDUCER |
| ④ DIRECTION CHANGE, ELBOW | ⑧ DIRECTION CHANGE, CROSS USED AS ELBOW |



THRUST BLOCKING

NOT TO SCALE

SIZE OF MAIN	MINIMUM BEARING SURFACE AREA (SQ. FT.)				TEE OR DEAD END PLUG
	11.25°	22.5°	45°	90°	
4"	0.00	1.00	1.00	2.50	1.50
6"	0.00	1.25	2.25	5.00	3.00
8"	0.00	2.00	4.00	8.00	5.25
12"	2.25	4.50	8.75	16.25	11.25
16"	3.75	7.50	14.50	24.00	19.00
20"	5.00	10.00	19.50	35.50	25.00
24"	7.00	14.00	27.75	51.00	36.00

NOTES

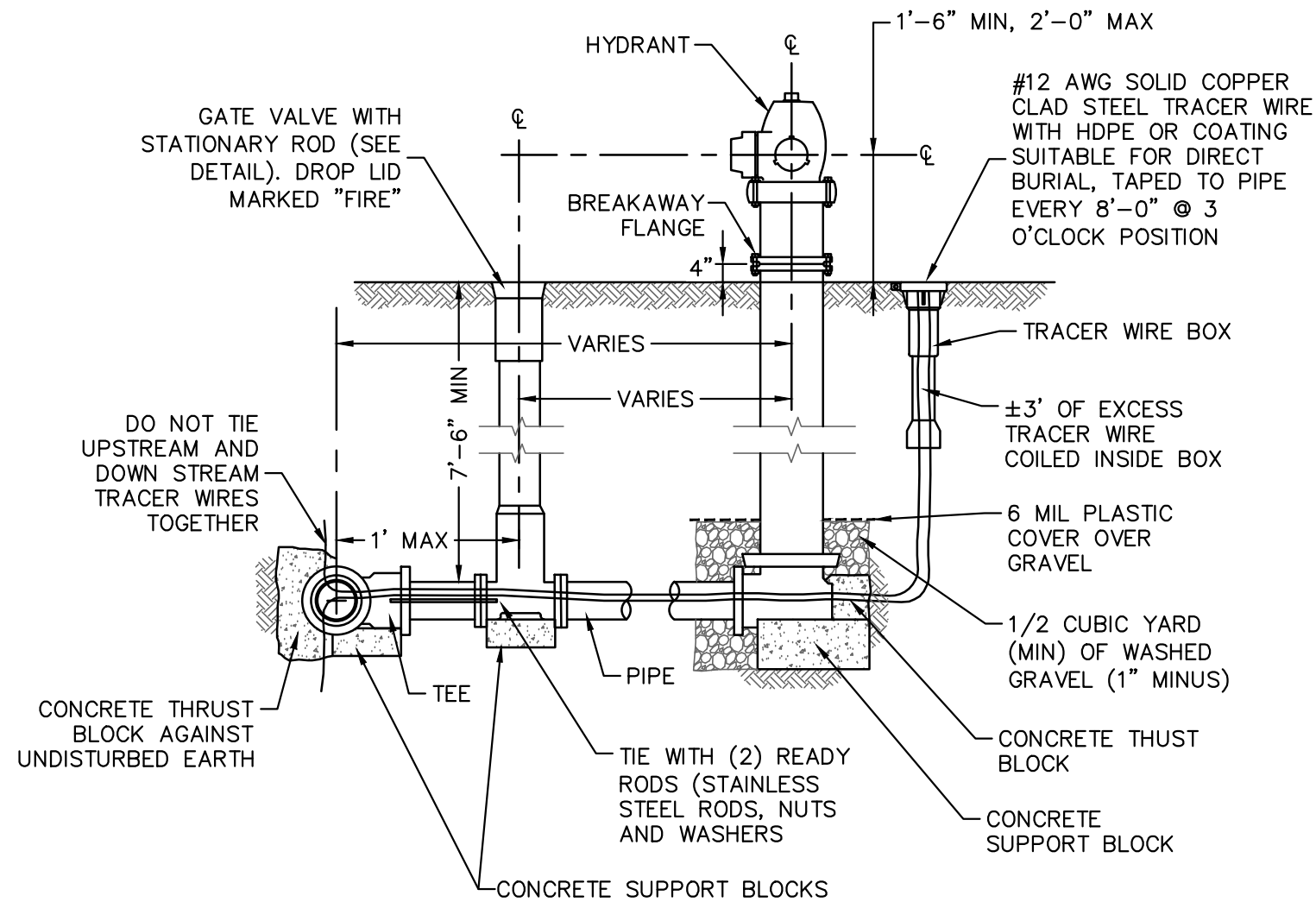
- BLOCKING NOT SHOWN MUST BE APPROVED BY ENGINEER.
- BEARING SURFACE AREAS SHOWN IN THE TABLE ARE MINIMUMS.
- BASED ON 150 PSI INTERNAL PIPE PRESSURE PLUS WATER HAMMER: 4", 6", 8" AND 12" WATER HAMMER = 110 PSI; 16", 20" & 24" WATER HAMMER = 70PSI.
- TABLE VALUES BASED ON 3,000 PSF SOIL BEARING CAPACITY

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WATER SYSTEM GENERAL DETAILS

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE

	STATE	PROJECT NO.	SECTION NO.	SHEET NO.
	ND	SU-5-983(059)059	199	7

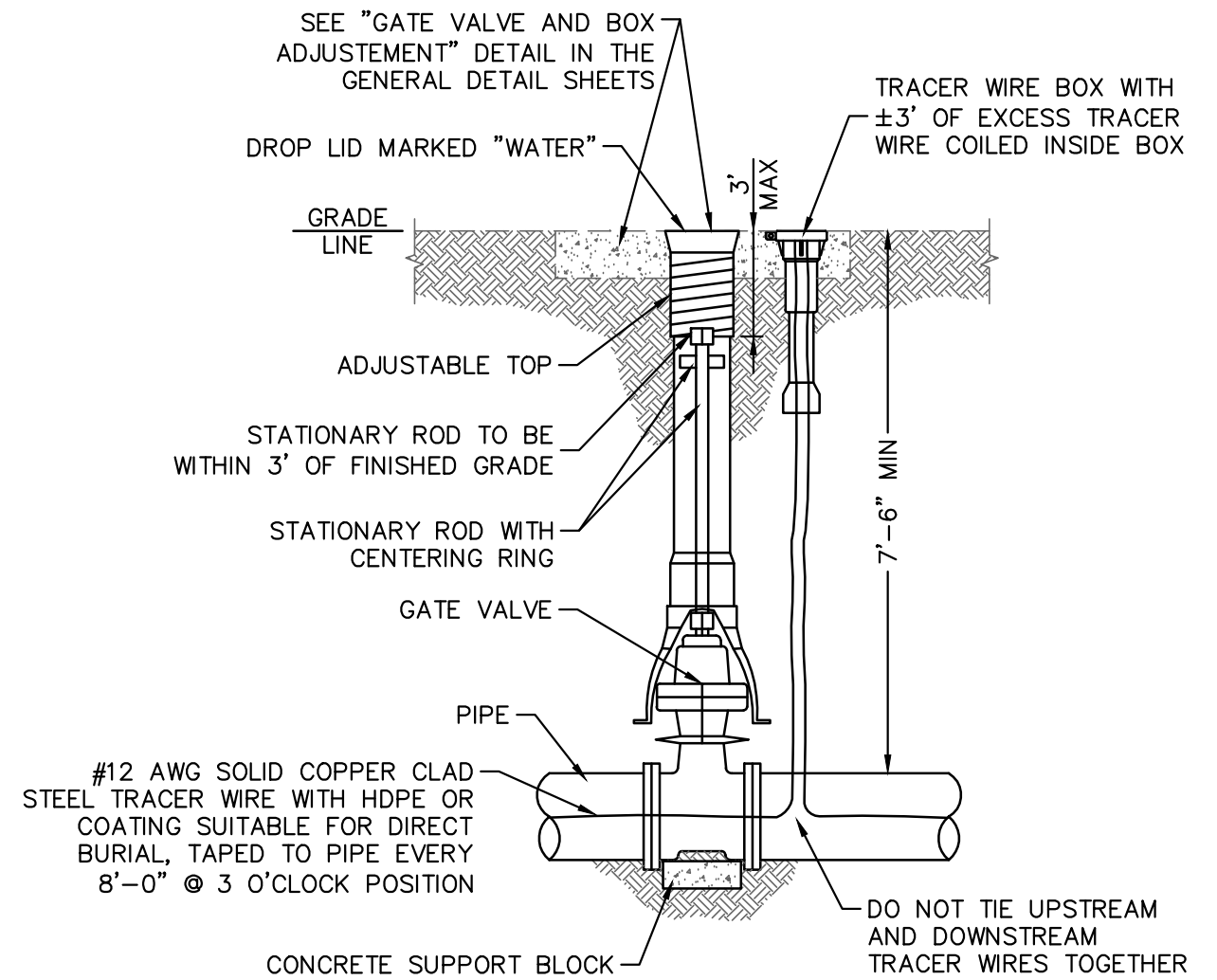


HYDRANT WITH GATE VALVE

NOT TO SCALE

NOTES:

1. IF FLANGE-TO-FLANGE INSTALLATION IS NOT TO BE USED, THEN USE STAINLESS STEEL READY RODS, NUTS, AND WASHERS.
2. VALVE BOXES ON HYDRANT LEADS SHALL HAVE DROP LIDS MARKED "FIRE".



GATE VALVE

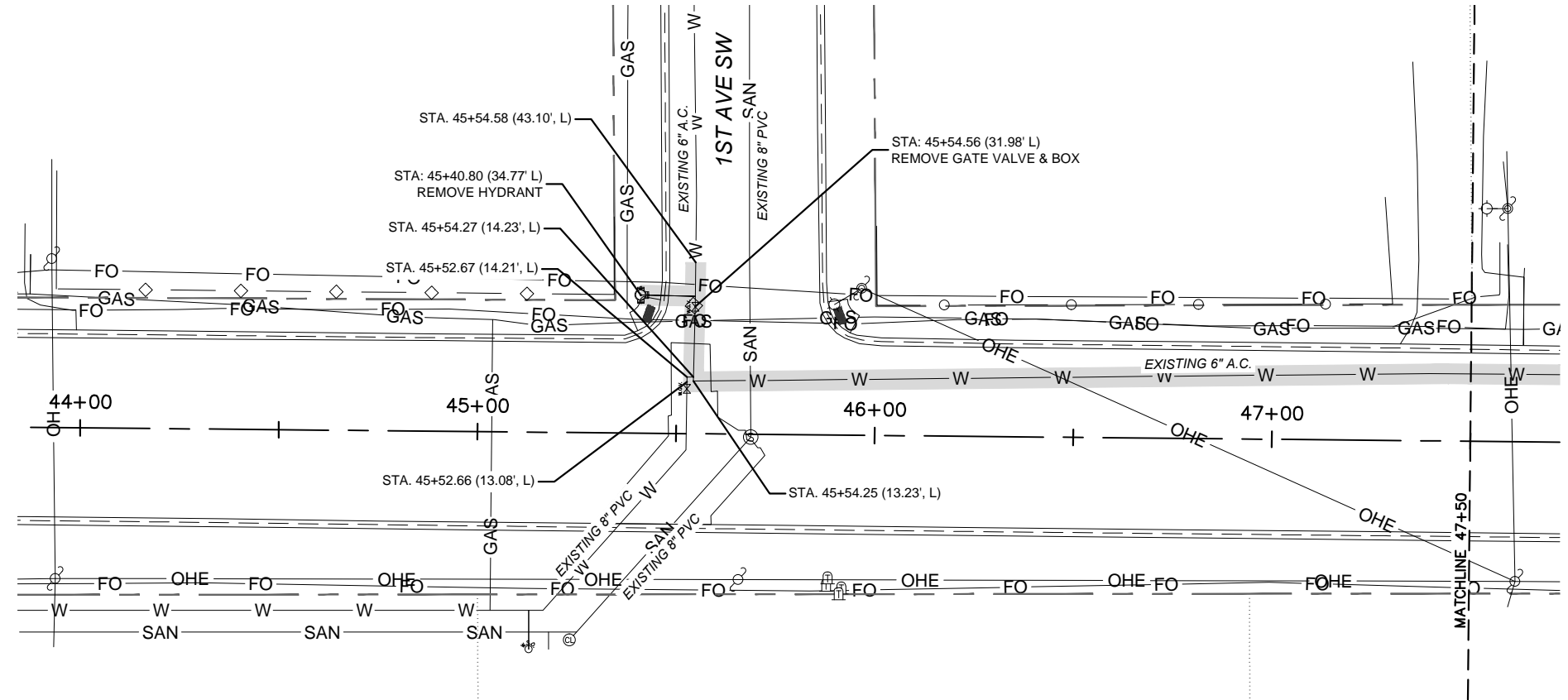
NOT TO SCALE

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WATER SYSTEM GENERAL DETAILS

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE

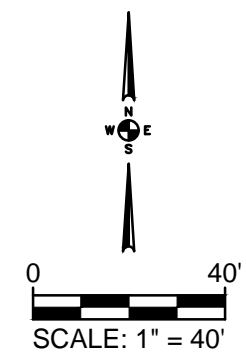
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	8



REMOVE GATE VALVE & BOX Sta 45+55 Lt	1 EA 1 EA
REMOVE HYDRANT Sta 45+41 Lt	1 EA 1 EA
REMOVAL OF PIPE ALL TYPES AND SIZES Sta 45+41 to Sta 47+50 Lt	241 LF 241 LF

LEGEND

EXISTING WATERMAIN	— W —
EXISTING WATER SERVICE LINE	— WS —
EXISTING FIRE HYDRANT	⊕
EXISTING GATE VALVE	⊞
REMOVE WATER LINE	— W —

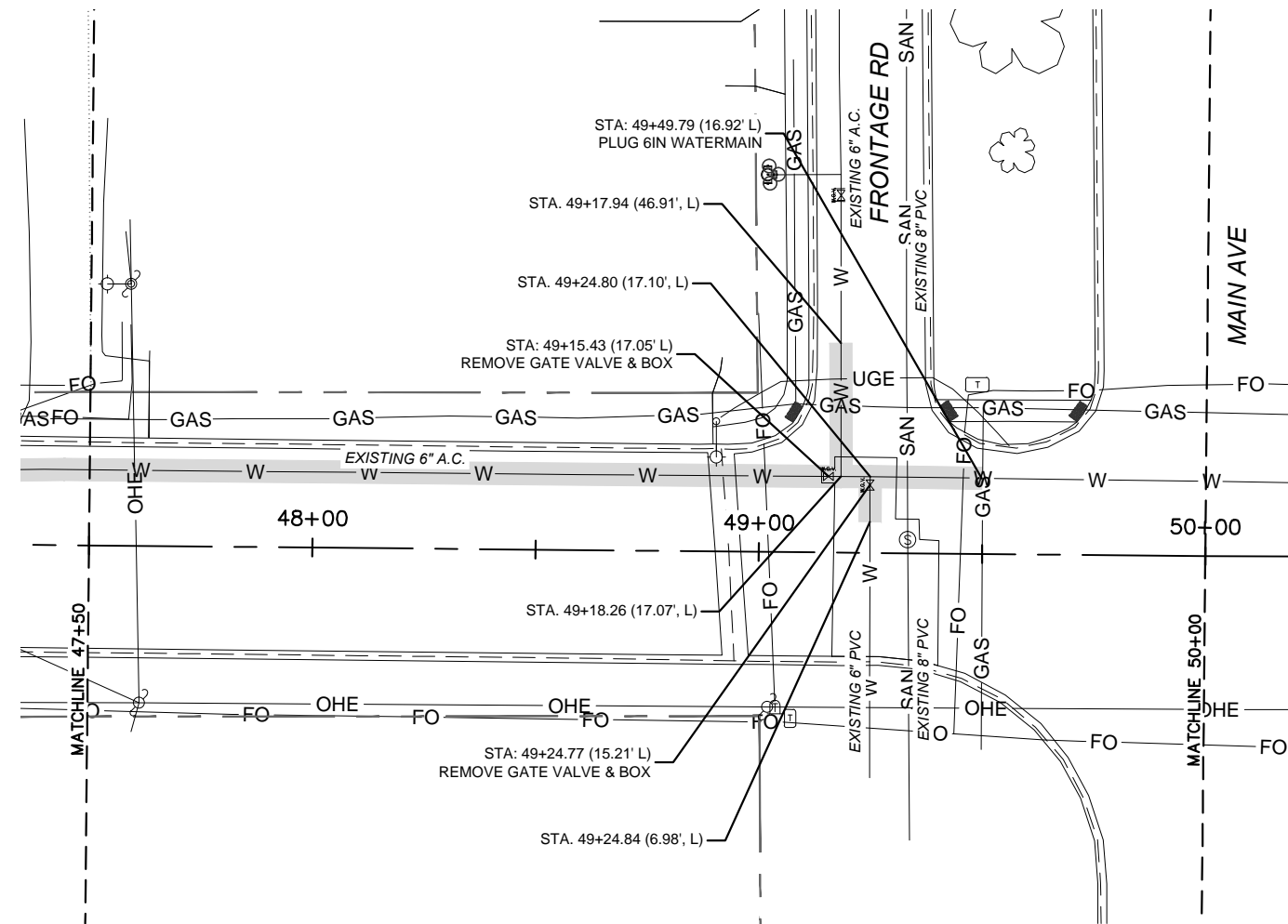


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WATER SYSTEM REMOVALS

**8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE**

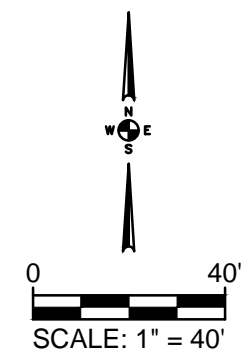
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	9



<u>REMOVE GATE VALVE & BOX</u>	
Sta 49+15 Lt	1 EA
Sta 49+25 Lt	1 EA
	2 EA
<u>PLUG 6IN WATERMAIN</u>	
Sta 49+50 Lt	1 EA
	1 EA
<u>REMOVAL OF PIPE ALL TYPES AND SIZES</u>	
Sta 47+50 to Sta 49+50 Lt	240 LF
	240 LF

LEGEND

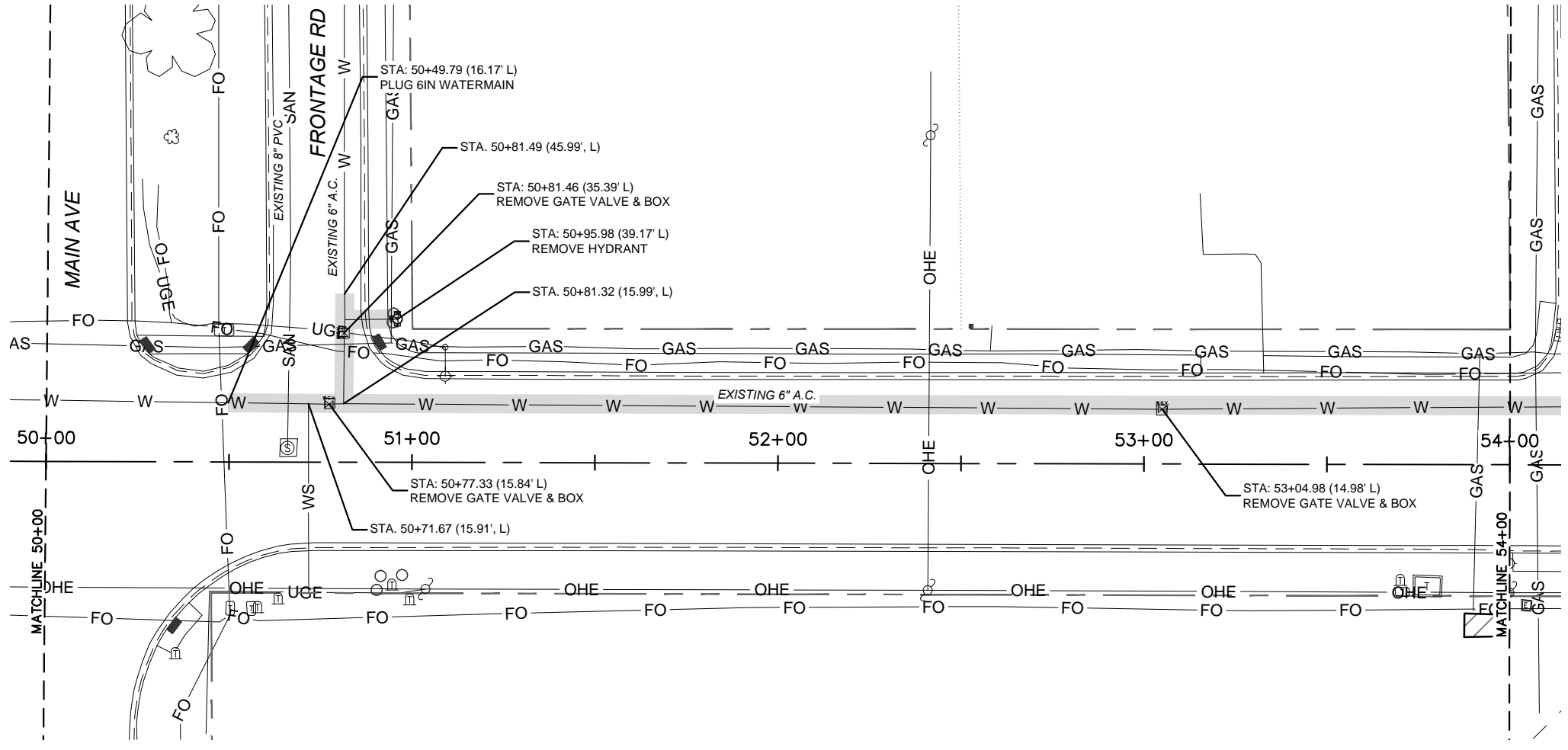
EXISTING WATER LINE	— W —
EXISTING FIRE HYDRANT	⊕
EXISTING GATE VALVE	⊗
REMOVE WATER LINE	— W —



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WATER SYSTEM REMOVALS

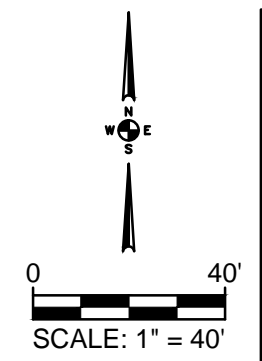
8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE



REMOVE GATE VALVE & BOX	
Sta 50+77 Lt	1 EA
Sta 50+81 Lt	1 EA
Sta 53+05 Lt	1 EA
	3 EA
REMOVE HYDRANT	
Sta 50+96 Lt	1 EA
	1 EA
PLUG 6IN WATERMAIN	
Sta 50+50 Lt	1 EA
	1 EA
REMOVAL OF PIPE ALL TYPES AND SIZES	
Sta 50+50 to Sta 54+00 Lt	394 LF
	394 LF

LEGEND

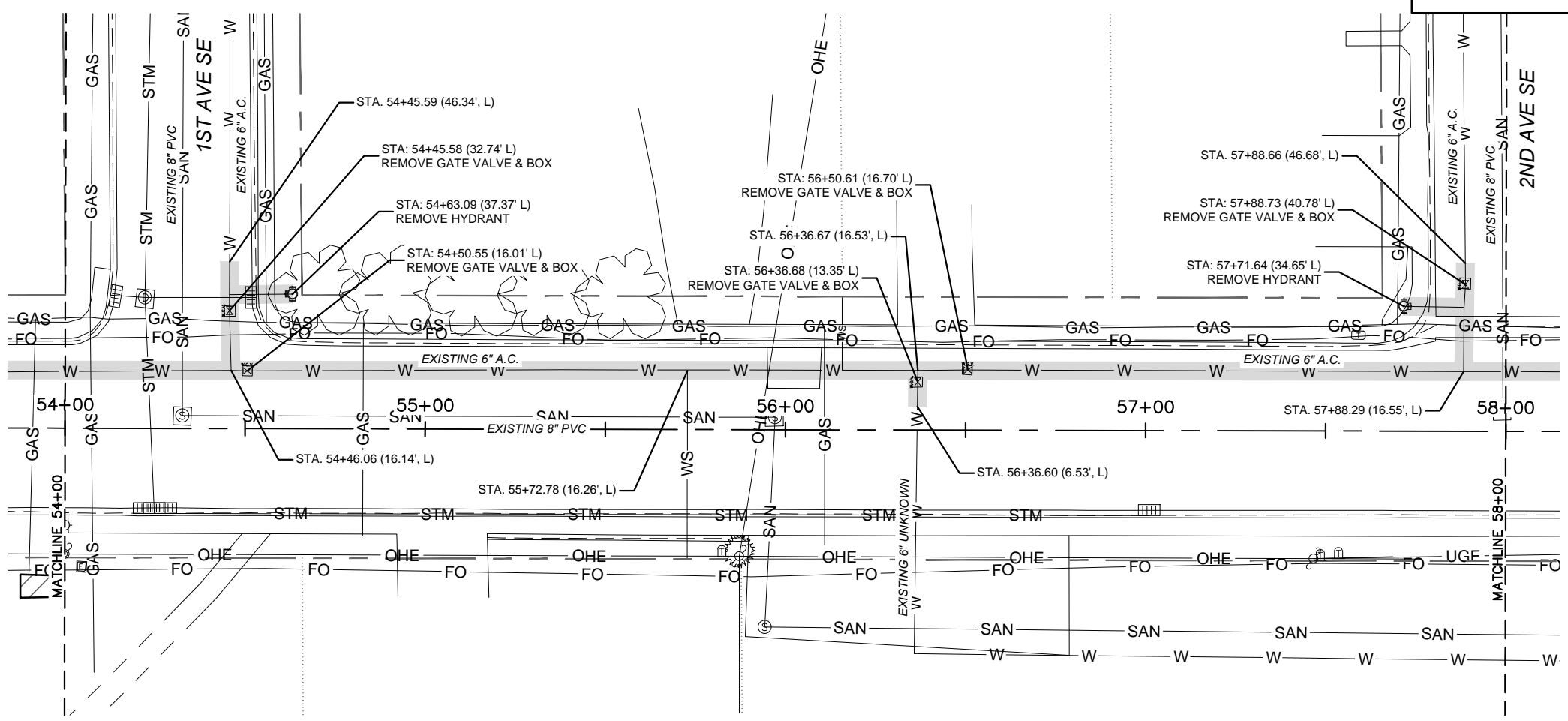
EXISTING WATER LINE	— W —
EXISTING FIRE HYDRANT	⊙
EXISTING GATE VALVE	⊠
REMOVE WATER LINE	— W —



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WATER SYSTEM REMOVALS

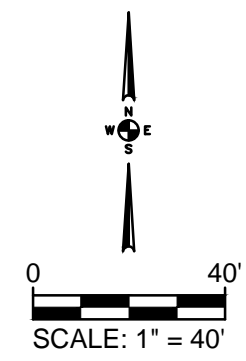
8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE



REMOVE GATE VALVE & BOX	
Sta 54+46 Lt	1 EA
Sta 54+51 Lt	1 EA
Sta 56+37 Lt	1 EA
Sta 56+51 Lt	1 EA
Sta 57+89 Lt	5 EA
REMOVE HYDRANT	
Sta 54+63 Lt	1 EA
Sta 57+72 Lt	2 EA
REMOVAL OF PIPE ALL TYPES AND SIZES	
Sta 54+00 to Sta 58+00 Lt	505 LF
	505 LF

LEGEND

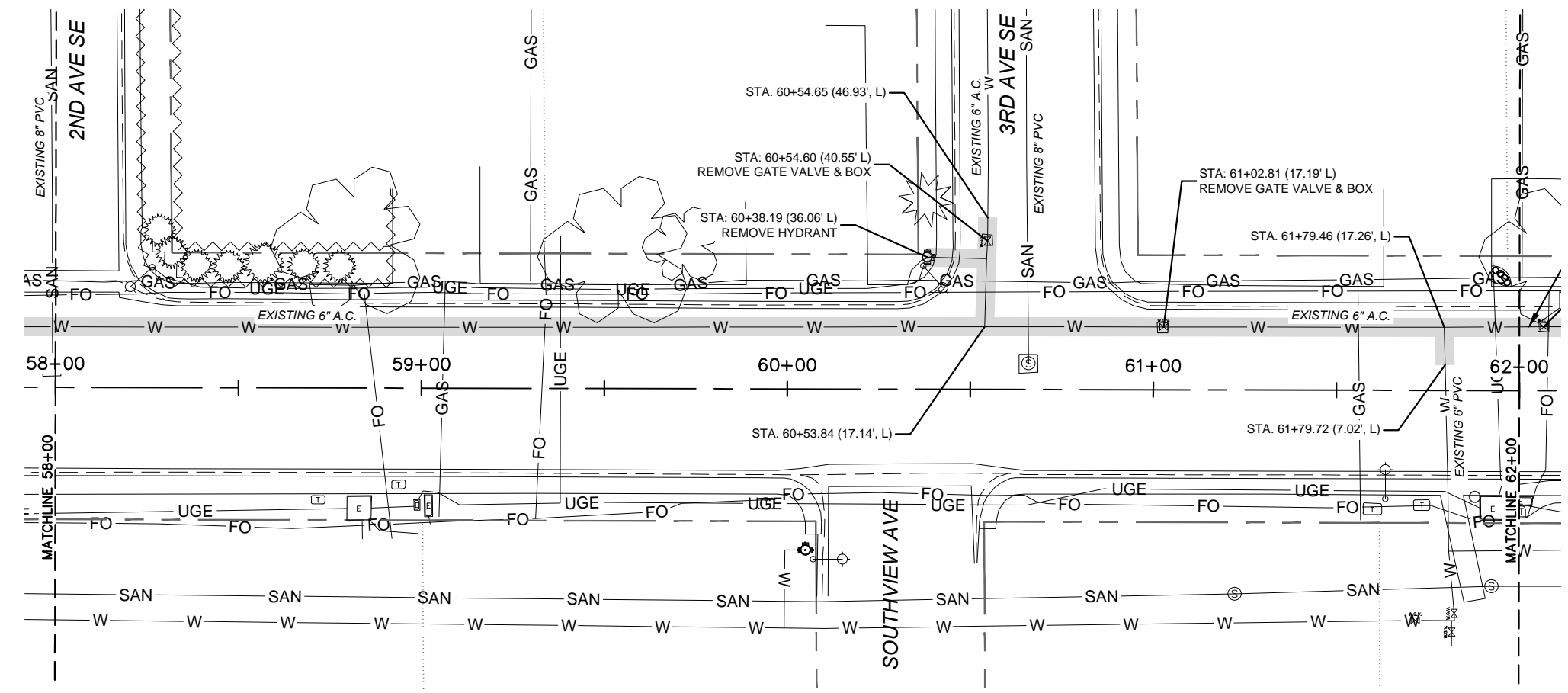
EXISTING WATER LINE	— W —
EXISTING FIRE HYDRANT	⊕
EXISTING GATE VALVE	⊗
REMOVE WATER LINE	— W —



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WATER SYSTEM REMOVALS

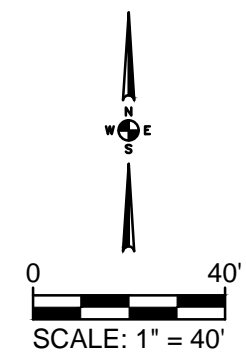
8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE



REMOVE GATE VALVE & BOX	
Sta 60+55 Lt	1 EA
Sta 61+03 Lt	1 EA
	2 EA
REMOVE HYDRANT	
Sta 60+38 Lt	1 EA
	1 EA
REMOVAL OF PIPE ALL TYPES AND SIZES	
Sta 58+00 to Sta 62+00 Lt	456 LF
	456 LF

LEGEND

EXISTING WATER LINE	— W —
EXISTING FIRE HYDRANT	⊕
EXISTING GATE VALVE	⊗
REMOVE WATER LINE	— W —

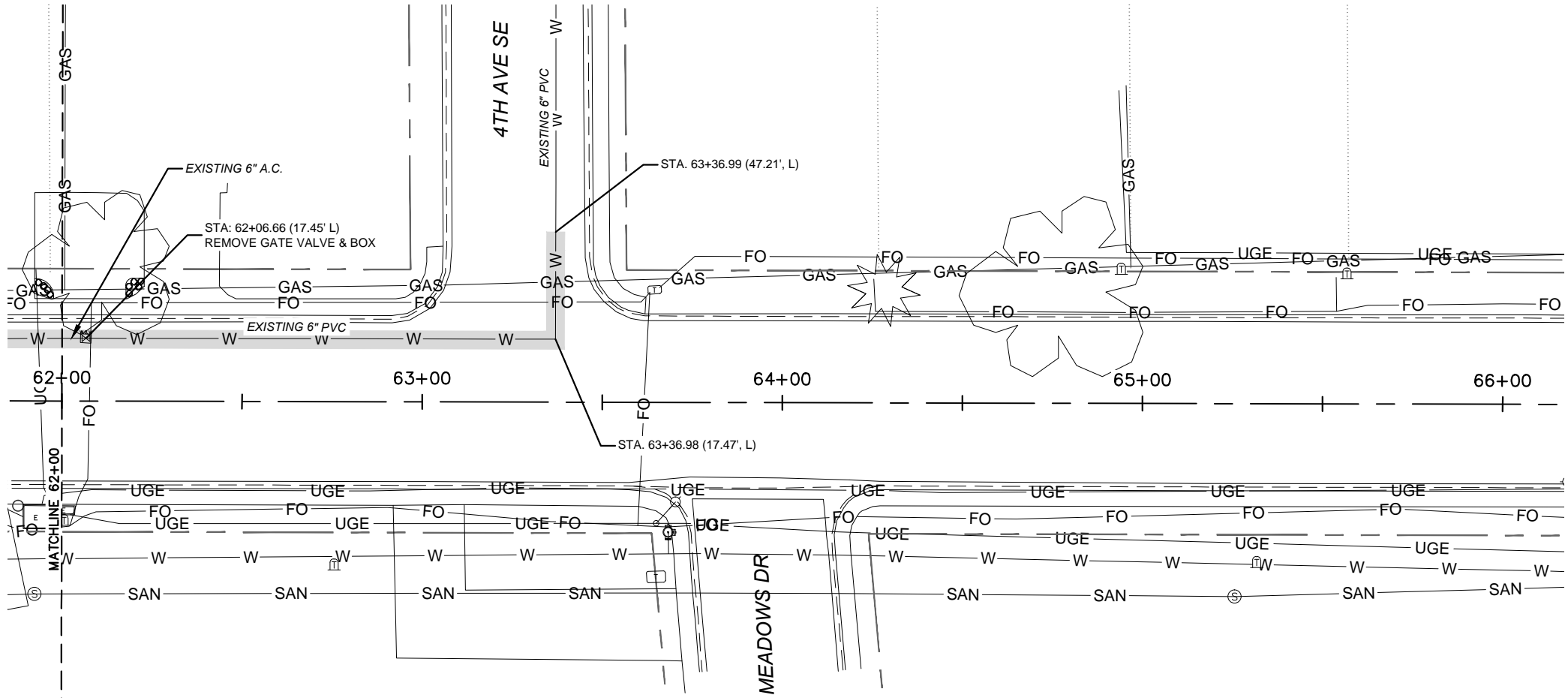


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WATER SYSTEM REMOVALS

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE

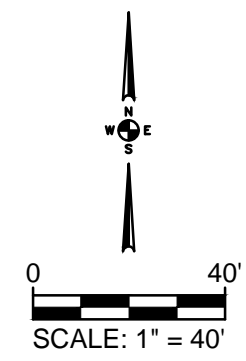
STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	13



REMOVE GATE VALVE & BOX Sta 62+07 Lt	1 EA 1 EA
REMOVAL OF PIPE ALL TYPES AND SIZES Sta 62+00 to Sta 63+37 Lt	167 LF 167 LF

LEGEND

EXISTING WATER LINE	— W —
EXISTING FIRE HYDRANT	⊕
EXISTING GATE VALVE	⊗
REMOVE WATER LINE	— W —

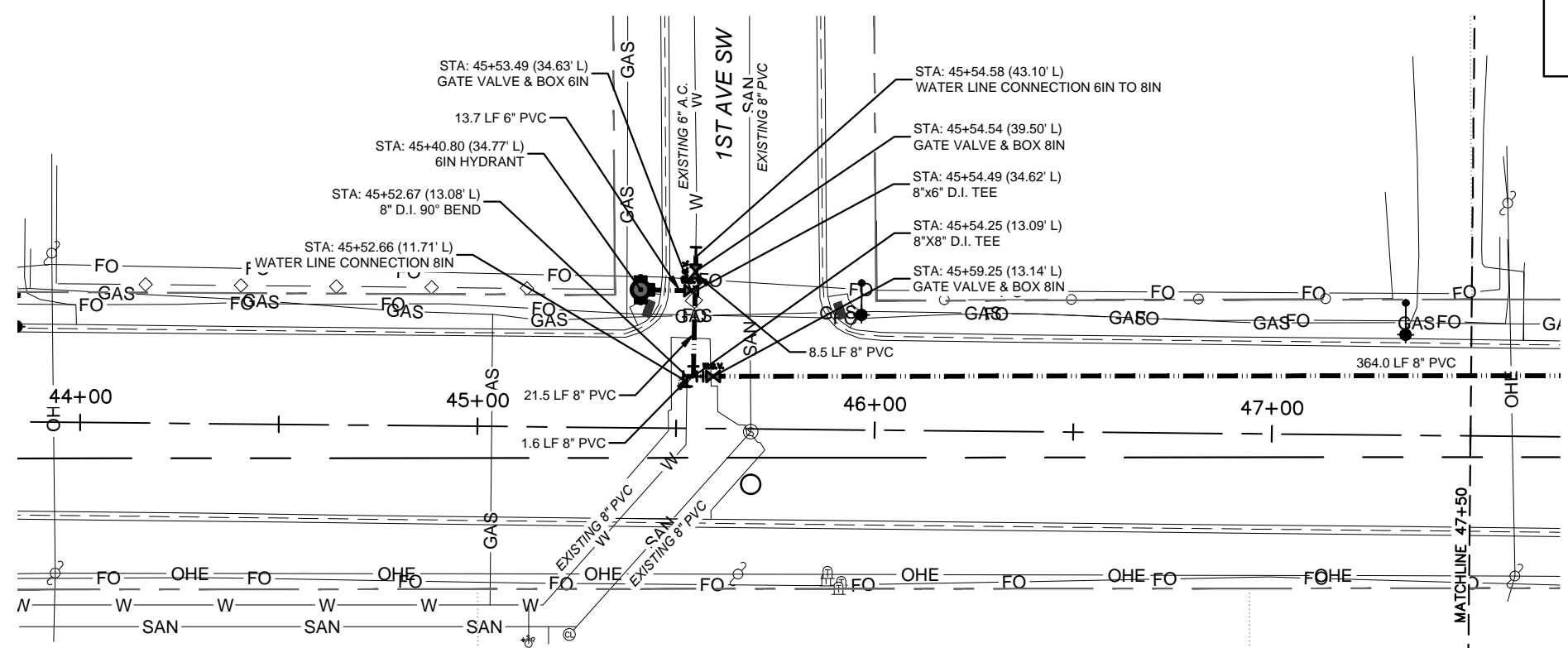


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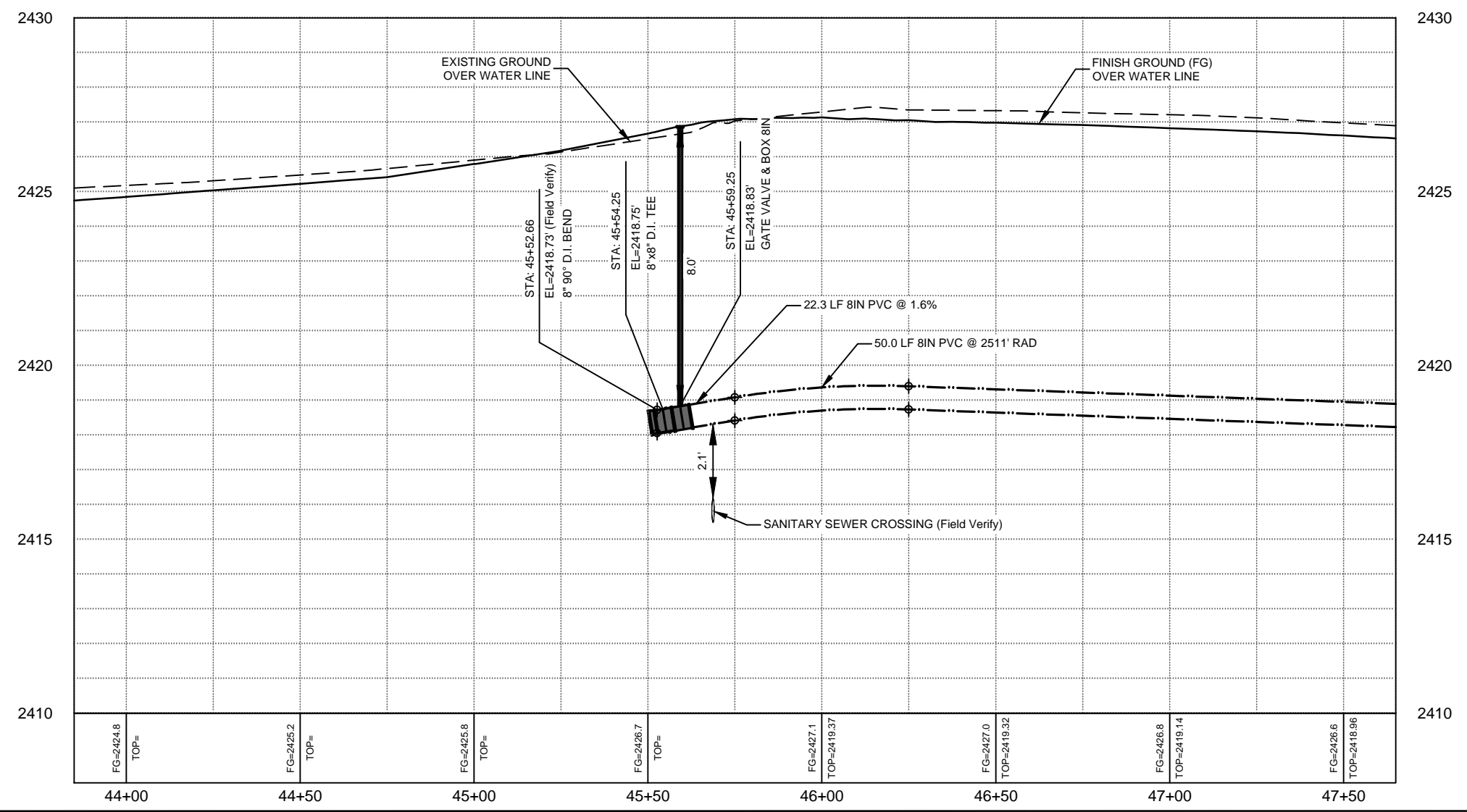
WATER SYSTEM REMOVALS

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	14

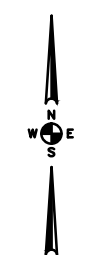


<u>WATERMAIN 6IN PVC</u> Sta 45+41 to 45+55 Lt	14 LF
<u>WATERMAIN 8IN PVC</u> Sta 45+53 to 47+50 Lt Sta 45+55	197 LF 30 LF 227 LF
<u>FITTINGS-DUCTILE IRON</u> 8" 90° Bend - Sta 45+53 Lt 8"x6" Tee - Sta 45+54 Lt 8"x8" Tee - Sta 45+54 Lt	71 LBS 88 LBS 99 LBS 258 LBS
<u>GATE VALVE & BOX 6IN</u> Sta 45+54 Lt	1 EA
<u>GATE VALVE & BOX 8IN</u> Sta 45+55 Lt Sta 45+59 Lt	1 EA 1 EA 2 EA
<u>6IN HYDRANT</u> Sta 45+41 Lt	1 EA
<u>WATER LINE CONNECTION 6IN TO 8IN</u> Sta 45+55 Lt	1 EA
<u>WATER LINE CONNECTION 8IN</u> Sta 45+53 Lt	1 EA



LEGEND

- PROPOSED WATER LINE
- PROPOSED FIRE HYDRANT
- PROPOSED GATE VALVE



SCALE

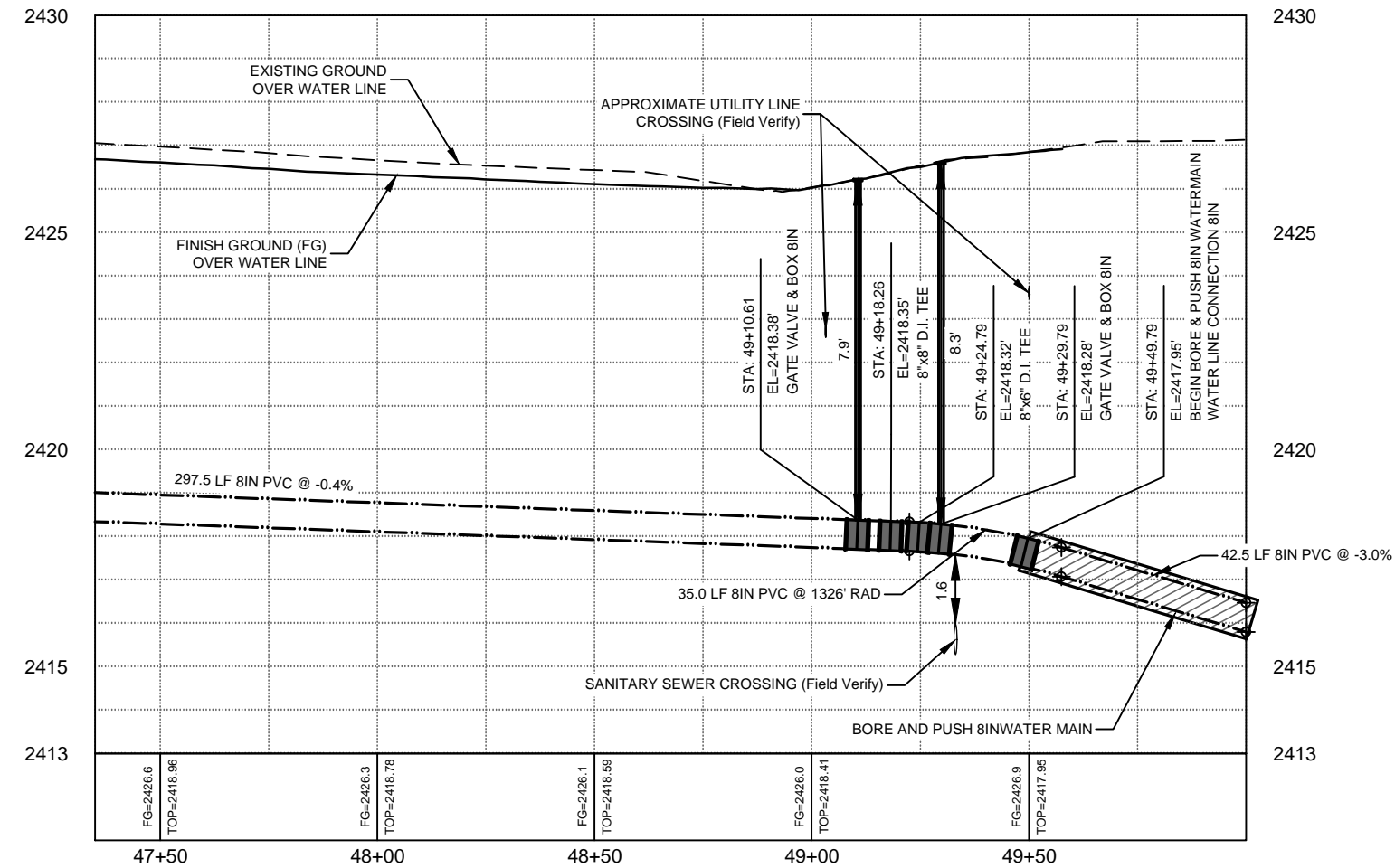
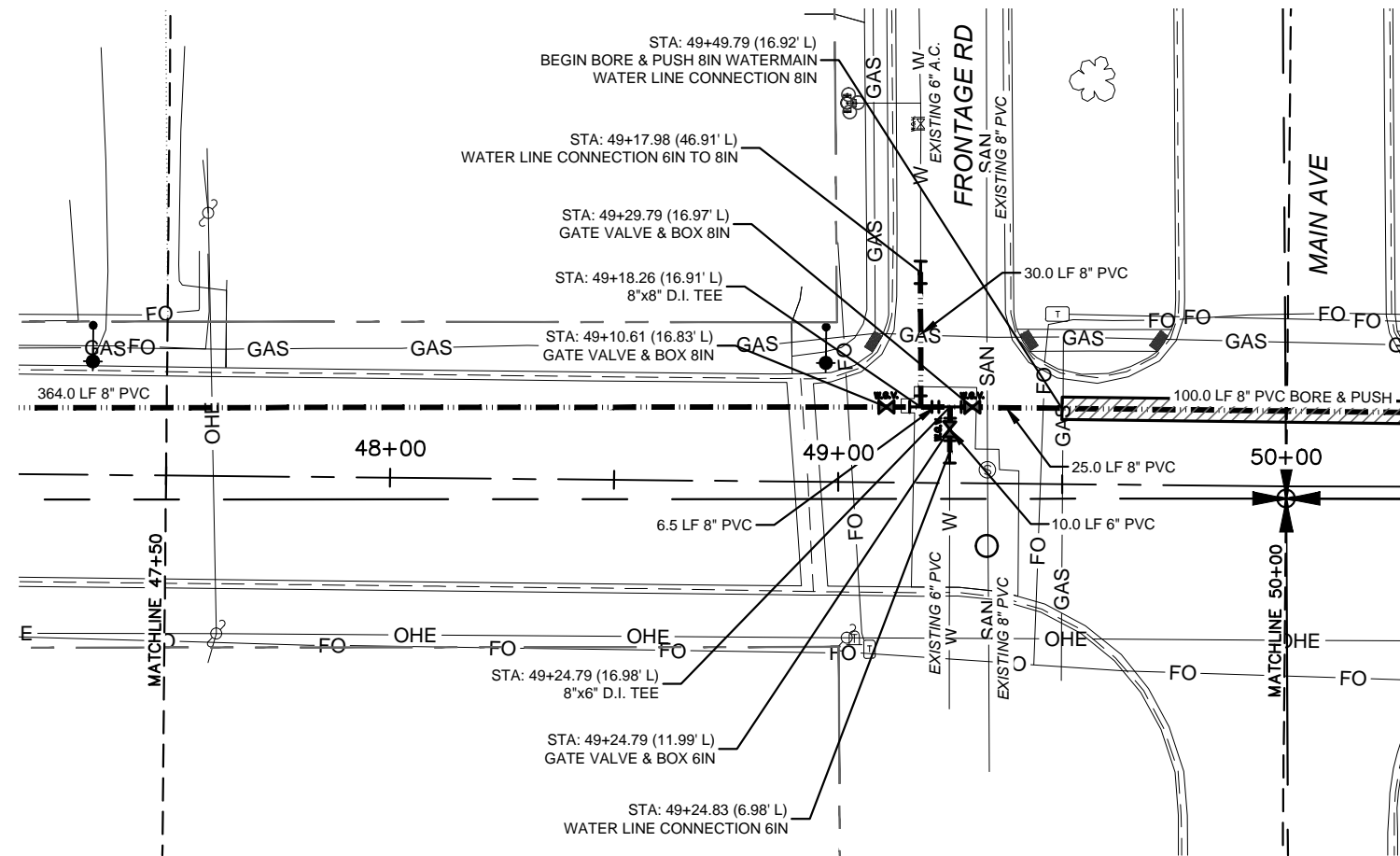
HORIZONTAL: 1"=40'
VERTICAL: 1"=4'

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WATER MAIN PLAN AND PROFILE

**8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE**

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	15



WATERMAIN 6IN PVC Sta 49+25 Lt	10 LF
WATERMAIN 8IN PVC Sta 47+50 to 49+50 Lt Sta 49+18 Lt	200 LF 30 LF 230 LF
BORE & PUSH 8IN WATERMAIN Sta 49+50 to 50+00 Lt	50 LF
FITTINGS-DUCTILE IRON 8"x6" Tee - Sta 49+25 Lt 8"x8" Tee - Sta 49+18 Lt	88 LBS 99 LBS 187 LBS
GATE VALVE & BOX 6IN Sta 49+25 Lt	1 EA
GATE VALVE & BOX 8IN Sta 49+11 Lt Sta 49+30 Lt	1 EA 1 EA 2 EA
WATER LINE CONNECTION 6IN Sta 49+25 Lt	1 EA
WATER LINE CONNECTION 6IN TO 8IN Sta 49+18 Lt	1 EA
WATER LINE CONNECTION 8IN Sta 49+50 Lt	1 EA



SCALE

HORIZONTAL: 1"=40'

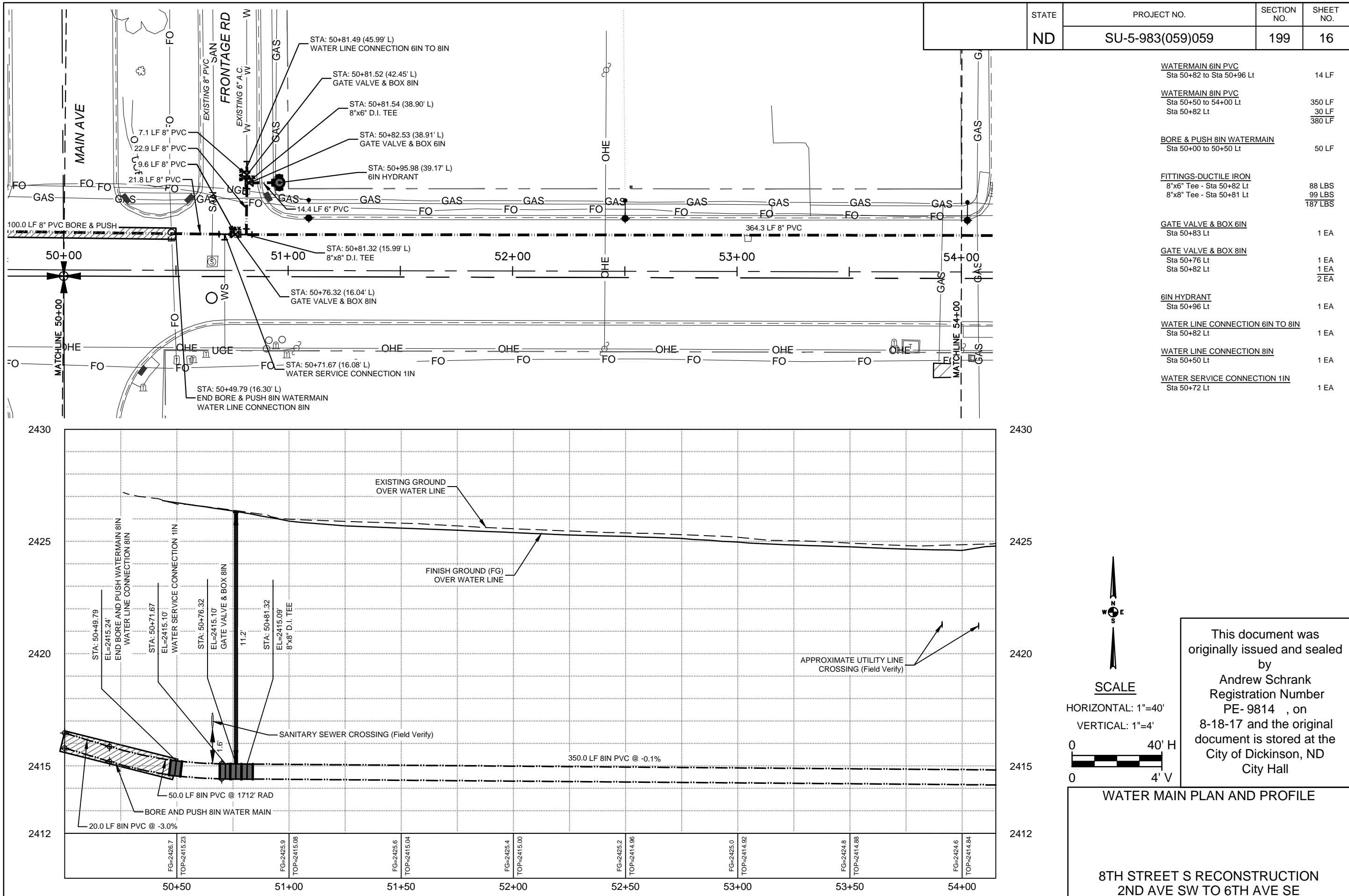
VERTICAL: 1"=4'



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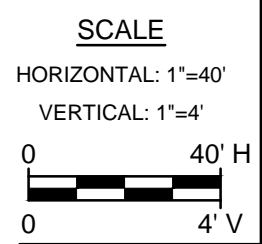
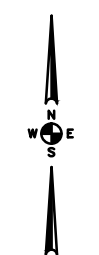
WATER MAIN PLAN AND PROFILE

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE



STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	16

<u>WATERMAIN 6IN PVC</u> Sta 50+82 to Sta 50+96 Lt	14 LF
<u>WATERMAIN 8IN PVC</u> Sta 50+50 to 54+00 Lt Sta 50+82 Lt	350 LF 30 LF 380 LF
<u>BORE & PUSH 8IN WATERMAIN</u> Sta 50+00 to 50+50 Lt	50 LF
<u>FITTINGS-DUCTILE IRON</u> 8"x6" Tee - Sta 50+82 Lt 8"x8" Tee - Sta 50+81 Lt	88 LBS 99 LBS 187 LBS
<u>GATE VALVE & BOX 6IN</u> Sta 50+83 Lt	1 EA
<u>GATE VALVE & BOX 8IN</u> Sta 50+76 Lt Sta 50+82 Lt	1 EA 1 EA 2 EA
<u>6IN HYDRANT</u> Sta 50+96 Lt	1 EA
<u>WATER LINE CONNECTION 6IN TO 8IN</u> Sta 50+82 Lt	1 EA
<u>WATER LINE CONNECTION 8IN</u> Sta 50+50 Lt	1 EA
<u>WATER SERVICE CONNECTION 1IN</u> Sta 50+72 Lt	1 EA



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WATER MAIN PLAN AND PROFILE

**8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE**

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	17

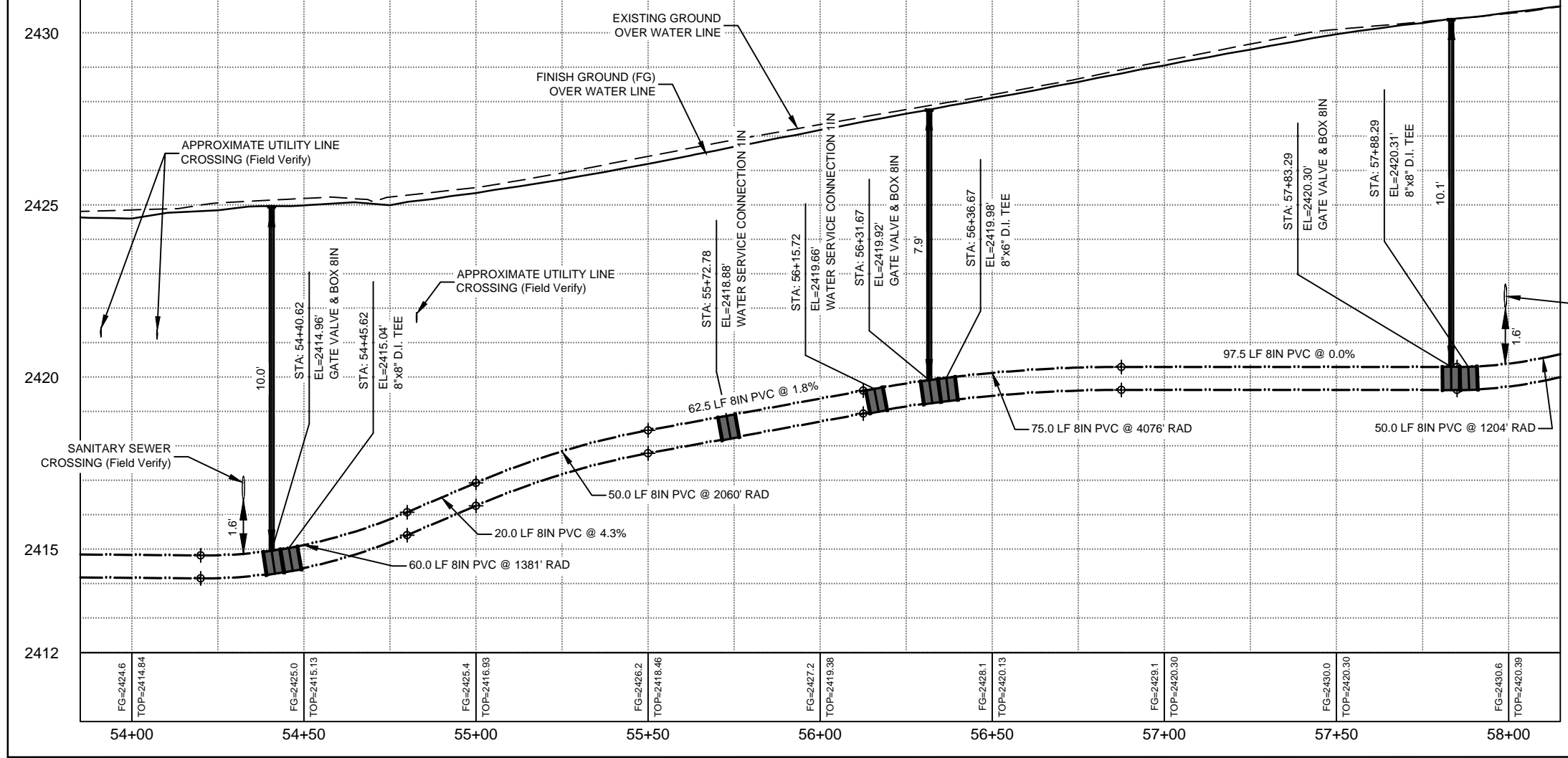
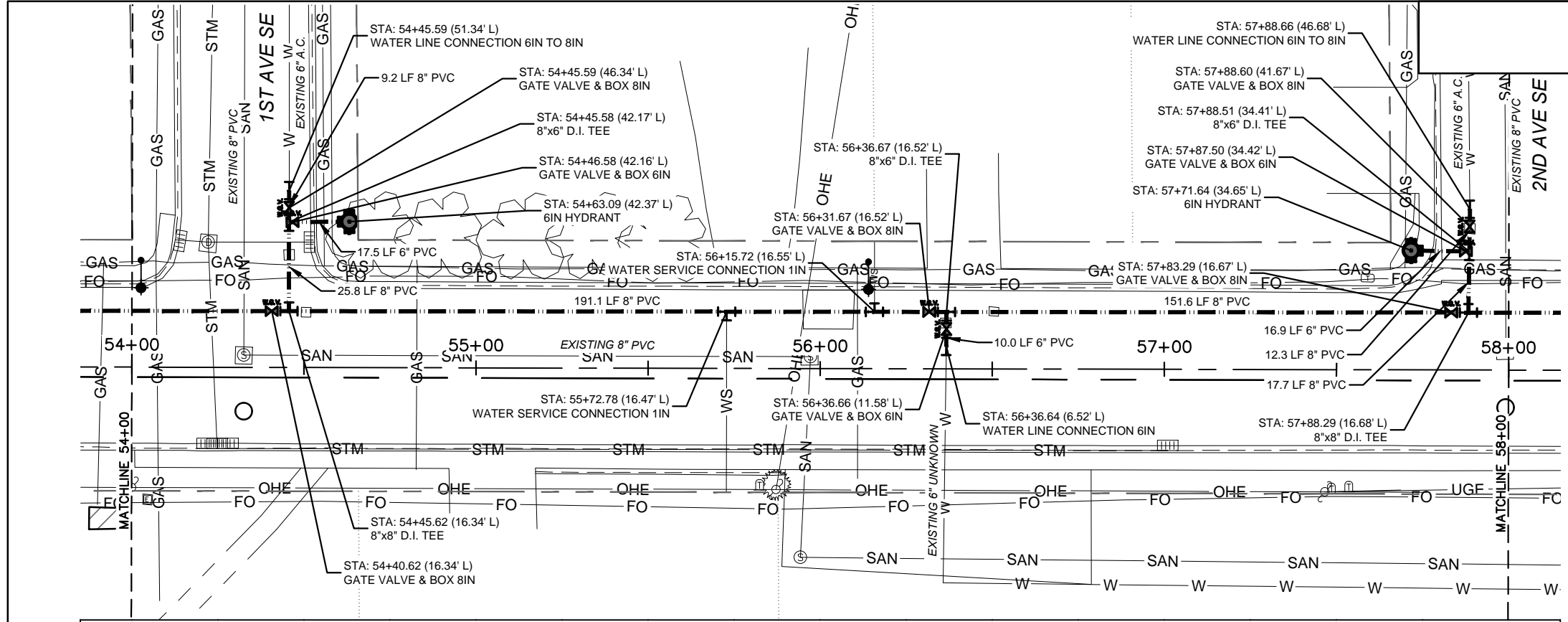
WATERMAIN 6IN PVC		
Sta 54+46 to 54+63 Lt	18 LF	
Sta 56+37 Lt	10 LF	
Sta 57+72 to Sta 57+89 Lt	17 LF	
	45 LF	
WATERMAIN 8IN PVC		
Sta 54+00 to 58+00 Lt	400 LF	
Sta 54+46 Lt	35 LF	
Sta 57+88 Lt	30 LF	
	465 LF	
FITTINGS-DUCTILE IRON		
8"x6" Tee - Sta 54+46 Lt	88 LBS	
8"x6" Tee - Sta 56+37 Lt	88 LBS	
8"x6" Tee - Sta 57+89 Lt	88 LBS	
8"x8" Tee - Sta 54+46 Lt	99 LBS	
8"x8" Tee - Sta 57+88 Lt	99 LBS	
	462 LBS	
GATE VALVE & BOX 6IN		
Sta 54+47 Lt	1 EA	
Sta 56+37 Lt	1 EA	
Sta 57+88 Lt	1 EA	
	3 EA	
GATE VALVE & BOX 8IN		
Sta 54+41 Lt	1 EA	
Sta 54+46 Lt	1 EA	
Sta 56+32 Lt	1 EA	
Sta 57+83 Lt	1 EA	
Sta 57+89 Lt	1 EA	
	5 EA	
6IN HYDRANT		
Sta 54+63 Lt	1 EA	
Sta 57+72 Lt	1 EA	
	2 EA	
WATER LINE CONNECTION 6IN		
Sta 56+37 Lt	1 EA	
WATER LINE CONNECTION 6IN TO 8IN		
Sta 54+46 Lt	1 EA	
Sta 57+89 Lt	1 EA	
	2 EA	
WATER SERVICE CONNECTION 1IN		
Sta 55+73 Lt	1 EA	
Sta 56+92 Lt	1 EA	
	2 EA	

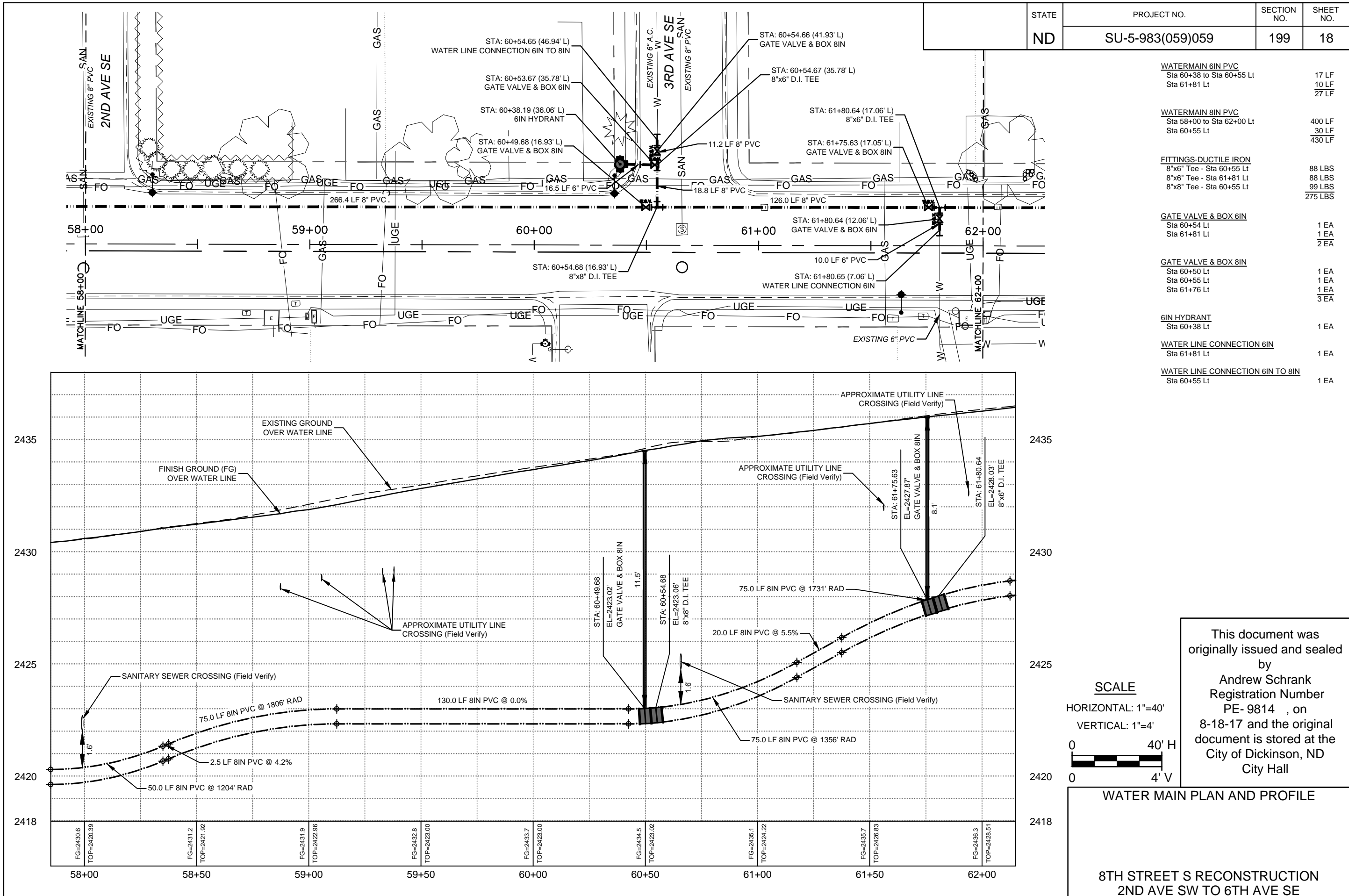
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SCALE
 HORIZONTAL: 1"=40'
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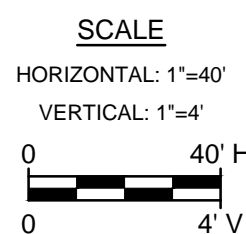
WATER MAIN PLAN AND PROFILE

8TH STREET S RECONSTRUCTION
 2ND AVE SW TO 6TH AVE SE



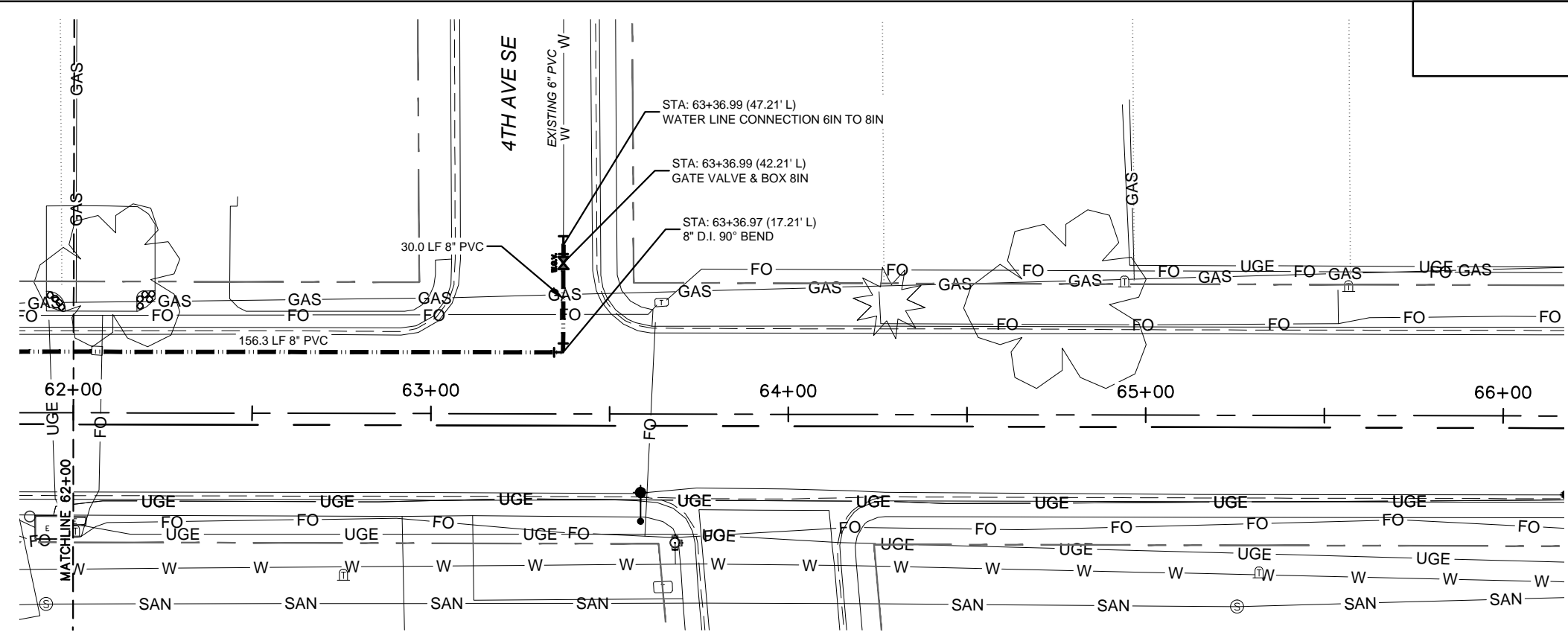


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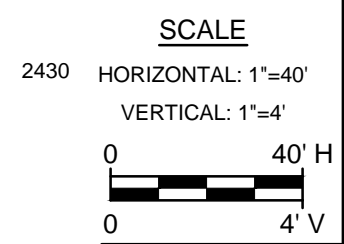
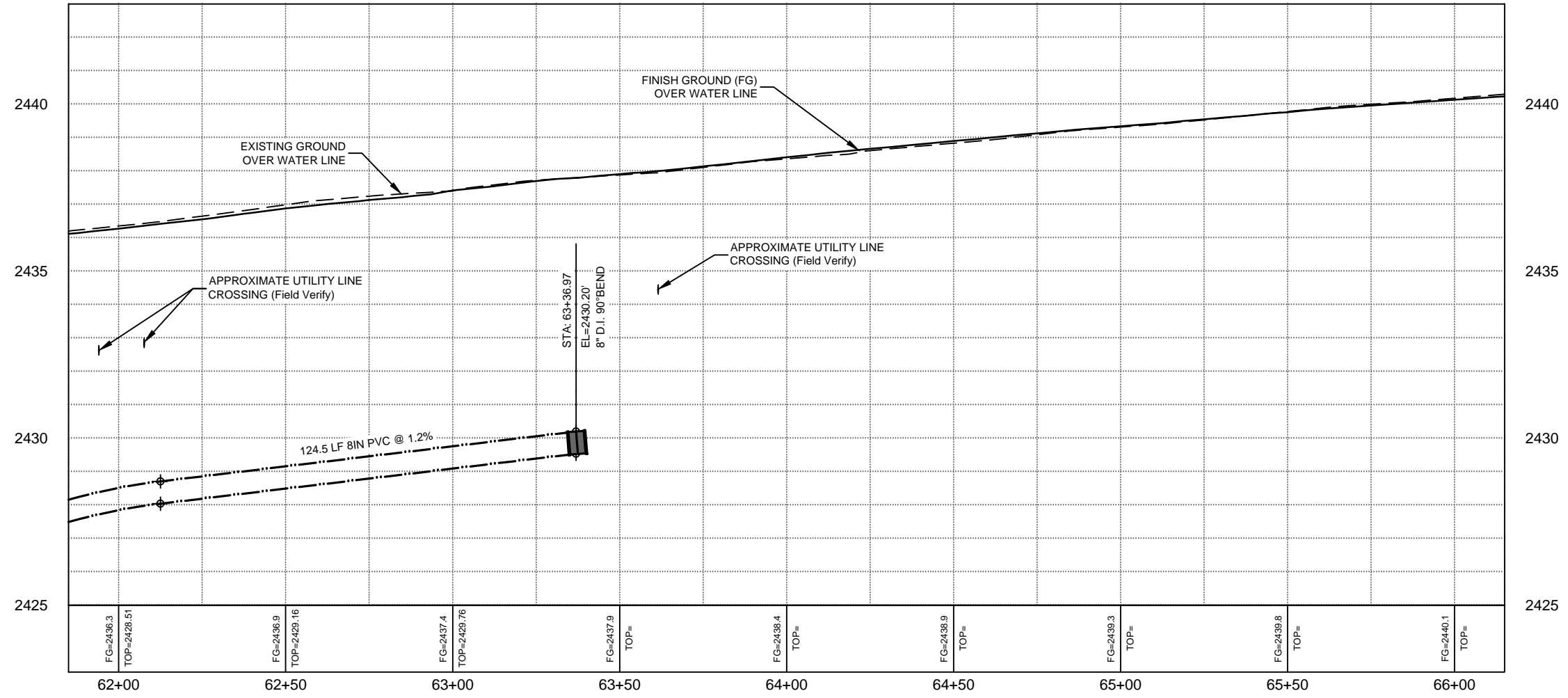


WATER MAIN PLAN AND PROFILE
 8TH STREET S RECONSTRUCTION
 2ND AVE SW TO 6TH AVE SE

STATE	PROJECT NO.	SECTION NO.	SHEET NO.
ND	SU-5-983(059)059	199	19



WATERMAIN 8IN PVC Sta 62+00 to 63+37 Lt	167 LF
FITTINGS-DUCTILE IRON 8" 90° Bend - Sta 63+37 Lt	71 LBS
GATE VALVE & BOX 8IN Sta 63+37 Lt	1 EA
WATER LINE CONNECTION 6IN TO 8IN Sta 63+37 Lt	1 EA



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WATER MAIN PLAN AND PROFILE

8TH STREET S RECONSTRUCTION
2ND AVE SW TO 6TH AVE SE

NDDOT ABBREVIATIONS

D-101-1

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

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

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

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

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

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

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NDDOT ABBREVIATIONS

D-101-2

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
08-03-15	General Revisions

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NDDOT ABBREVIATIONS

D-101-3

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
DATE	CHANGE
08-03-15	General Revisions

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 08/03/15 and the original document is stored at the North Dakota Department of Transportation

NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

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

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

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Line Styles

D-101-20

Existing Topography

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

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

Proposed Topography

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

Existing Utilities

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

Proposed Utilities

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

Traffic Utilities

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

Sign Structures

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

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

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Line Styles

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 Typical

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

Geotechnical

- D ----- D ----- Geotextile Fabric Type D
- **Geo** ----- **Geo** ----- Geogrid
- R ----- R ----- Geotextile Fabric Type R
- R ----- R ----- Geotextile Fabric Type R1
- RR ----- RR ----- Geotextile Fabric Type RR
- S ----- S ----- Geotextile Fabric Type S

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

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

Pavement Joints

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

Bridge Details

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

Erosion Control

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

Environmental

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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Symbols

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

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Symbols
































































































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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
REVISIONS	
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Symbols

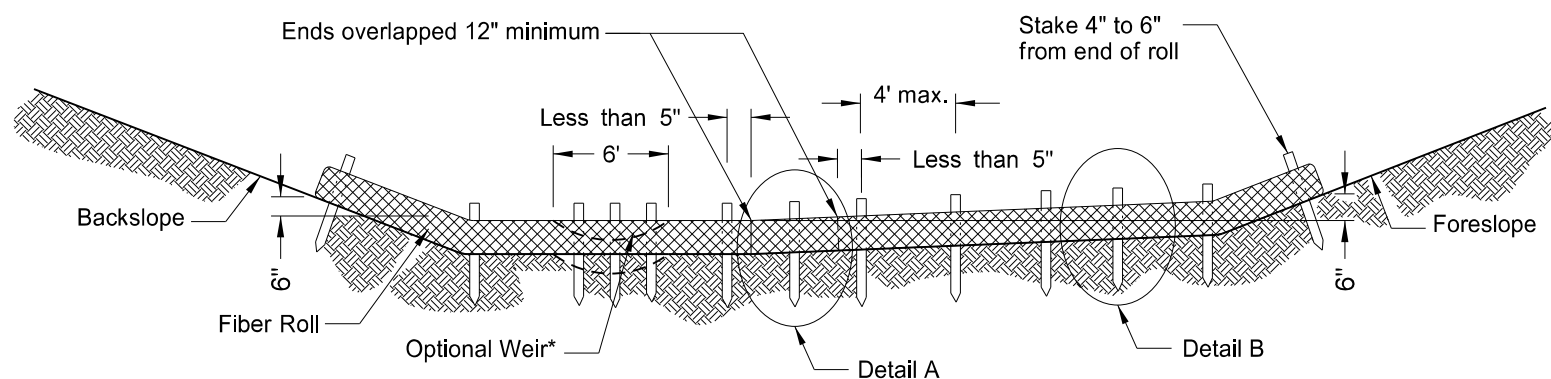
D-101-32

 Pad Mounted Feed Point  Pipe Mounted Feed Point with Pad  Pole Mounted Feed Point  Headwall  Double Headwall with Vegetation Barrier  Single Headwall with Vegetation Barrier  Pole Mounted Head  Sprinkler Head  Fire Hydrant  Inlet Type 1  Inlet Type 2  Double Inlet Type 2  Inlet Gate Type 2  Junction Box  High Mast Light Standard 10 Luminaire  High Mast Light Standard 3 Luminaire  High Mast Light Standard 4 Luminaire  High Mast Light Standard 5 Luminaire  High Mast Light Standard 6 Luminaire  High Mast Light Standard 7 Luminaire  High Mast Light Standard 8 Luminaire  High Mast Light Standard 9 Luminaire  Relocate Light Standard  Overhead Sign Structure Load Center  Light Standard 100 Watt High Pressure Sodium Vapor Luminaire	 Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire  Light Standard 150 Watt High Pressure Sodium Vapor Luminaire  Light Standard 175 Watt High Pressure Sodium Vapor Luminaire  Light Standard 200 Watt High Pressure Sodium Vapor Luminaire  Light Standard 250 Watt High Pressure Sodium Vapor Luminaire  Light Standard 310 Watt High Pressure Sodium Vapor Luminaire  Light Standard 35 Watt High Pressure Sodium Vapor Luminaire  Light Standard 400 Watt High Pressure Sodium Vapor Luminaire  Light Standard 50 Watt High Pressure Sodium Vapor Luminaire  Light Standard 70 Watt High Pressure Sodium Vapor Luminaire  Light Standard 700 Watt High Pressure Sodium Vapor Luminaire  Manhole  Manhole 48 Inch  Sanitary Force Main Manhole  Sanitary Sewer Manhole  Storm Drain Manhole  Storm Drain Manhole with Inlet  Reset Mile Post  Mile Post Type A  Mile Post Type B  Mile Post Type C  Right of Way Marker  Tubular Marker  Alignment Monument  Iron Pin Reference Monument	 Object Marker Type I  Object Marker Type II  Object Marker Type III  Caution Mode Arrow Panel  Back to Back Vertical Panel Sign  Double Direction Arrow Panel  Left Directional Arrow Panel  Right Directional Arrow Panel  Sequencing Arrow Panel  Truck Mounted Arrow Panel  Power Pole  Wood Pole  Pedestrian Push Button Post  Property Corner  Pull Box  Intelligent Transportation Pull Box  Sanitary Pump  Storm Drain Pump  Reinforced Pavement  Reinforced Concrete End Section 15 Inch  Reinforced Concrete End Section 18 Inch  Reinforced Concrete End Section 24 Inch  Reinforced Concrete End Section 30 Inch  Reinforced Concrete End Section 36 Inch  Reinforced Concrete End Section 42 Inch	 Reinforced Concrete End Section 48 Inch  Reinforced Concrete End Section 54 Inch  Reset Right of Way Marker  Reset USGS Marker  Right of Way Markers  Riser 30 Inch  Continuous Split Barrel Sample  Flight Auger Sample  Split Barrel Sample  Thinwall Tube Sample  Highway Sign  SNOW GATE 18 FT  SNOW GATE 28 FT  SNOW GATE 40 FT  Standard Penetration Test  Transformer  Inclinometer Tube  Underdrain Cleanout  Excavation Unit  Water Valve
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NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
07-01-14	
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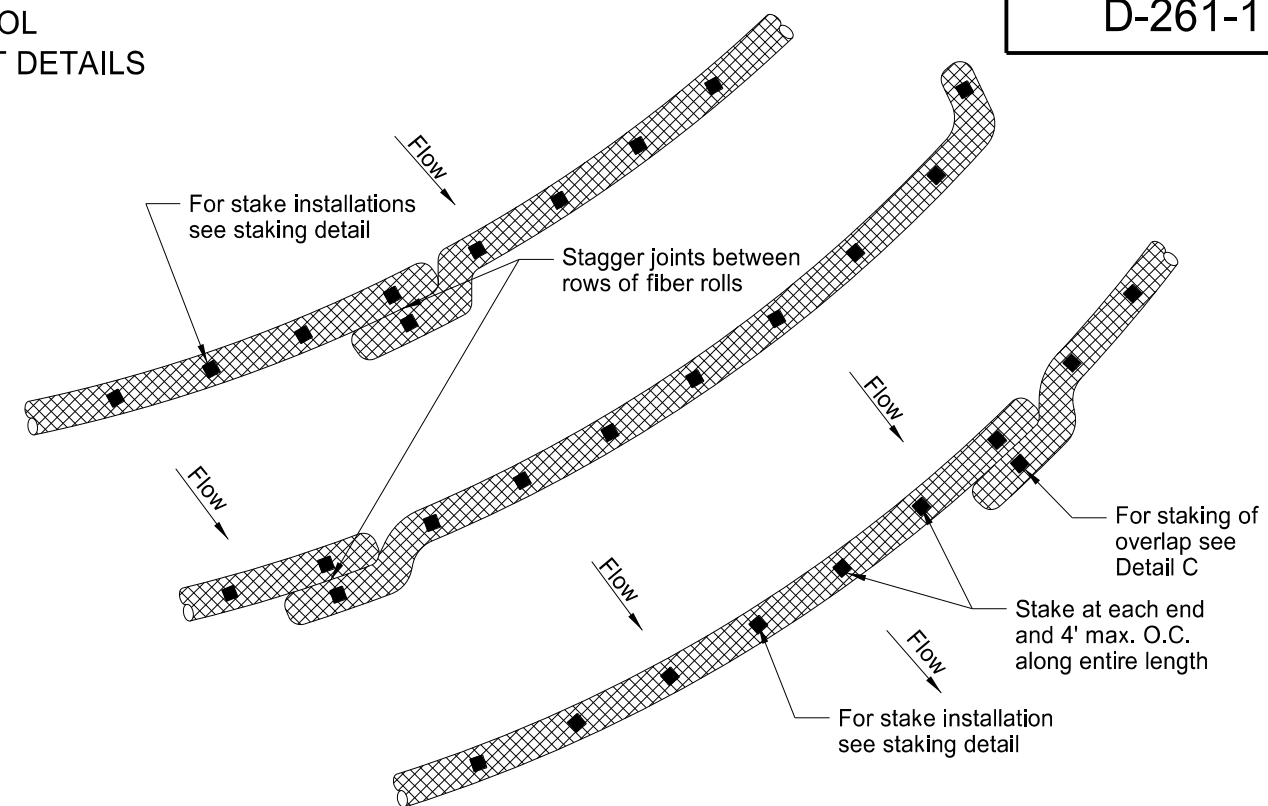
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EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

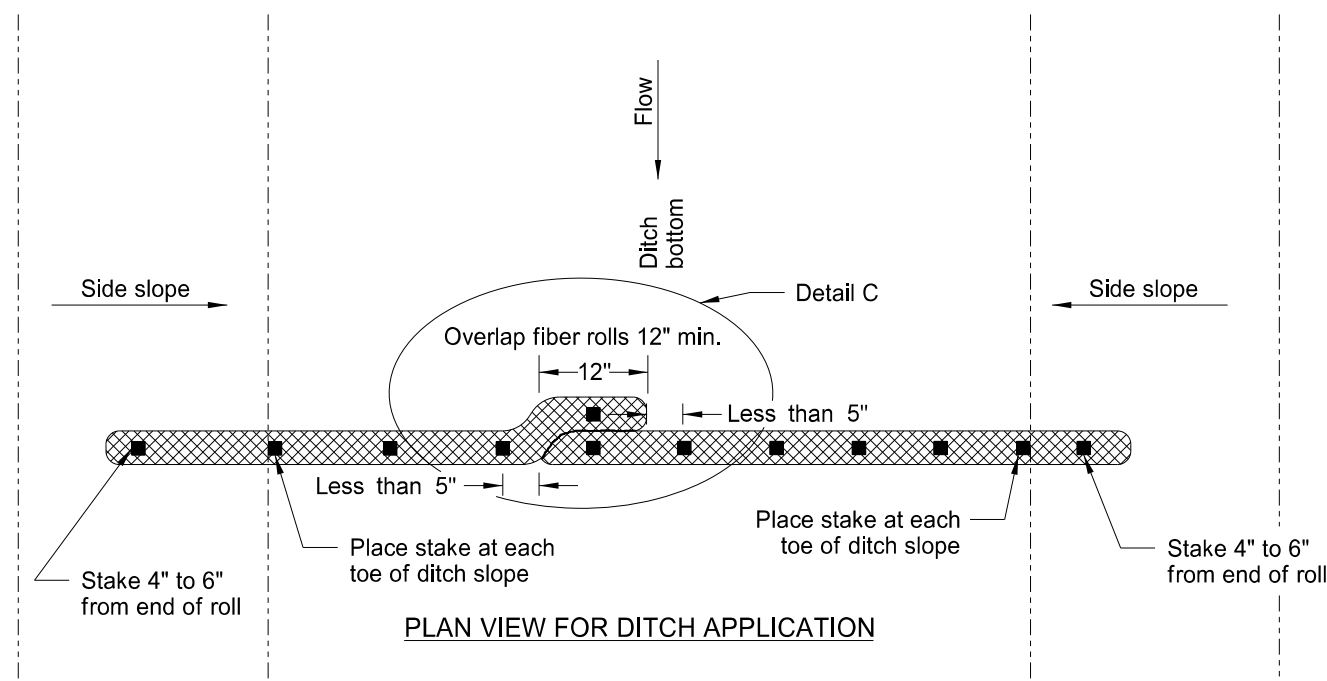


*Optional Weir. Use in flat areas, such as the Red River Valley, where there is potential for water to back up on adjacent property. Lower fiber roll enough to prevent water from backing up on adjacent property. Do not use 20-inch fiber rolls in flat areas where there is potential for water to back up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

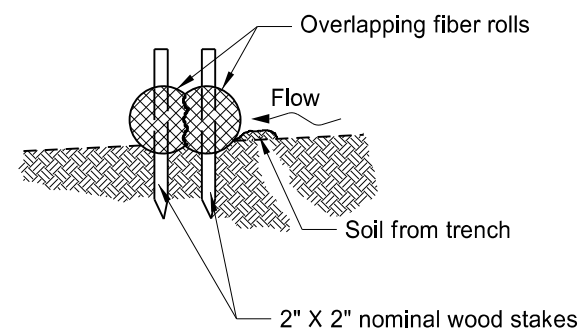
12 OR 20 INCH FIBER ROLL - DITCH BOTTOM



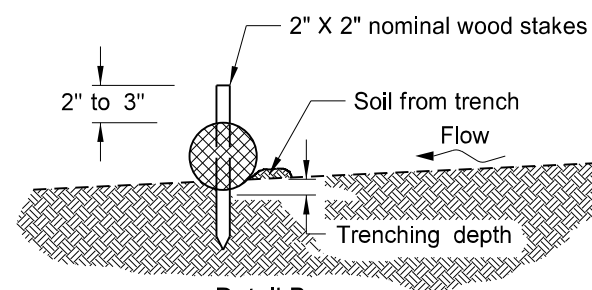
PLAN VIEW FOR SLOPE APPLICATION



PLAN VIEW FOR DITCH APPLICATION



Detail A
Fiber Roll Overlapping Staking Detail



Detail B
Fiber Roll Staking Detail

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

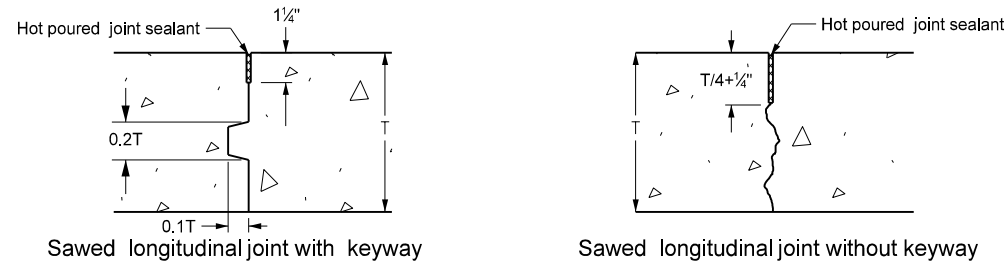
NOTE: Runoff must not be allowed to run under or around roll.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-18-10	
REVISIONS	
DATE	CHANGE
06-10-13	Added plan view for ditch and slope application, Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1

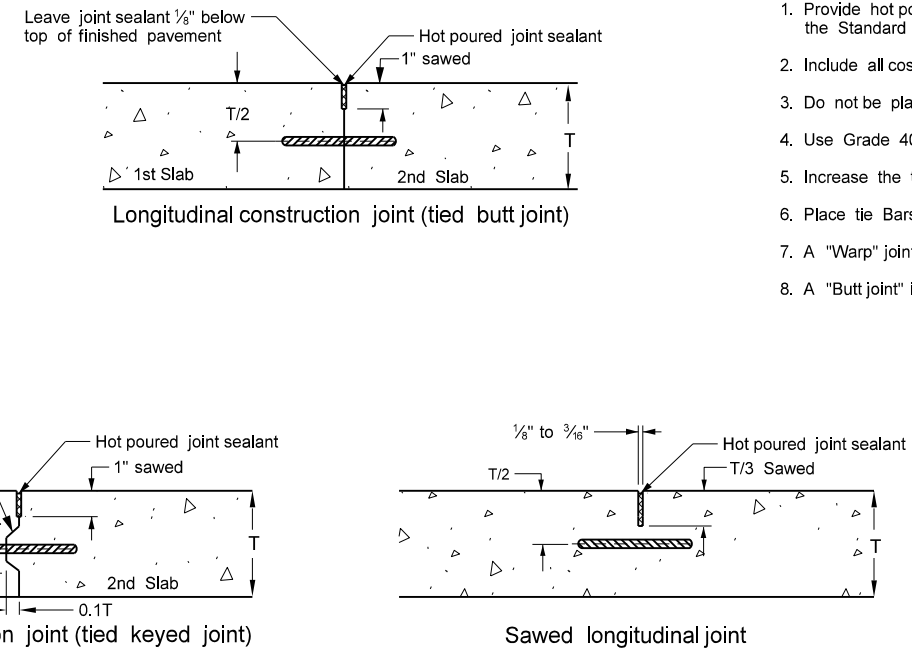
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LONGITUDINAL JOINT DETAILS

UNTIED JOINTS

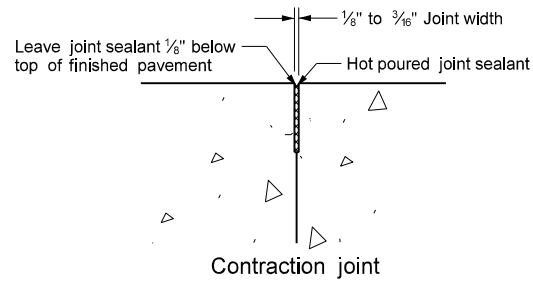


TIED JOINTS



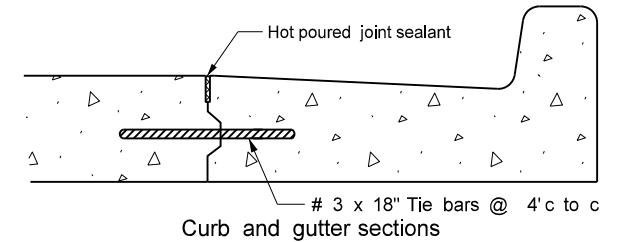
Notes:

1. Provide hot poured joint sealant meeting the requirements of Section 826.02A.2 of the Standard Specifications.
2. Include all costs of the longitudinal joint and seal in the price bid for the PCC pavement.
3. Do not place tie bars within 18 inches of a transverse skewed joint.
4. Use Grade 40 steel for tie bars installed bent and later straightened.
5. Increase the tie bar spacing up to 10%, when necessary to facilitate construction.
6. Place tie Bars at a 48 inch maximum spacing.
7. A "Warp" joint is a sawed joint or a construction joint with a keyway.
8. A "Butt joint" is a construction joint with no keyway.

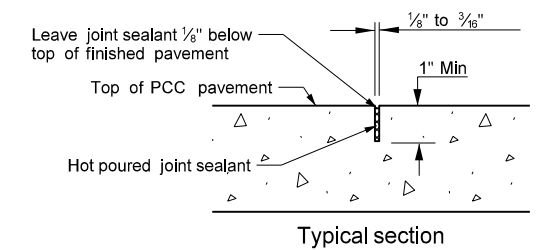


TIEBAR SPACINGS (In)

BAR SIZE GRADE STEEL DIST TO FREE EDGE JOINT TYPE PVTM THICKNESS		# 3 BAR		# 4 BAR				# 5 BAR				# 6 BAR					
		GRADE 40		GRADE 60		GRADE 40		GRADE 60		GRADE 40		GRADE 60		GRADE 40		GRADE 60	
		24"		30"		24"		36"		30"		42"		36"		48"	
6"	WARP	48	39	48	48	48	48	48	48	48	48	48	48	48	48	48	48
6"	BUTT	37	27	48	42	48	48	48	48	48	48	48	48	48	48	48	48
8"	WARP	48	39	48	48	48	48	48	48	48	48	48	48	48	48	48	48
8"	BUTT	42	27	48	42	48	48	48	48	48	48	48	48	48	48	48	48
8 1/2"	WARP	48	37	48	48	48	48	48	48	48	48	48	48	48	48	48	48
8 1/2"	BUTT	39	26	44	39	48	48	48	48	48	48	48	48	48	48	48	48
9"	WARP	48	35	48	48	48	48	48	48	48	48	48	48	48	48	48	48
9"	BUTT	37	24	48	37	48	48	48	48	48	48	48	48	48	48	48	48
9 1/2"	WARP	48	33	48	48	48	48	48	48	48	48	48	48	48	48	48	48
9 1/2"	BUTT	35	25	48	35	48	48	48	48	48	48	48	48	48	48	48	48
10"	WARP	47	31	48	47	48	48	48	48	48	48	48	48	48	48	48	48
10"	BUTT	33	24	48	33	48	48	48	48	48	48	48	48	48	48	48	48
10 1/2"	WARP	45	30	48	45	48	48	48	48	48	48	48	48	48	48	48	48
10 1/2"	BUTT	32	24	48	32	48	48	48	48	48	48	48	48	48	48	48	48
11"	WARP	43	28	48	43	48	48	48	48	48	48	48	48	48	48	48	48
11"	BUTT	30	24	46	30	48	48	48	48	48	48	48	48	48	48	48	48
11 1/2"	WARP	41	27	48	41	48	48	48	48	48	48	48	48	48	48	48	48
11 1/2"	BUTT	29	24	44	29	48	48	48	48	48	48	48	48	48	48	48	48
12"	WARP	39	26	48	39	48	48	48	48	48	48	48	48	48	48	48	48
12"	BUTT	27	24	42	27	48	48	48	48	48	48	48	48	48	48	48	48
12 1/2"	WARP	38	25	48	38	48	48	48	48	48	48	48	48	48	48	48	48
12 1/2"	BUTT	27	24	40	27	48	48	48	48	48	48	48	48	48	48	48	48
13"	WARP	36	24	48	36	48	48	48	48	48	48	48	48	48	48	48	48
13"	BUTT	25	24	38	25	48	48	48	48	48	48	48	48	48	48	48	48
13 1/2"	WARP	35	24	48	35	48	48	48	48	48	48	48	48	48	48	48	48
13 1/2"	BUTT	25	24	37	25	48	48	48	48	48	48	48	48	48	48	48	48
14"	WARP	34	24	48	34	48	48	48	48	48	48	48	48	48	48	48	48
14"	BUTT	24	24	35	24	48	48	48	48	48	48	48	48	48	48	48	48
14 1/2"	WARP	32	24	48	32	48	48	48	48	48	48	48	48	48	48	48	48
14 1/2"	BUTT	24	24	34	24	48	48	48	48	48	48	48	48	48	48	48	48
15"	WARP	31	24	47	31	48	48	48	48	48	48	48	48	48	48	48	48
15"	BUTT	24	24	33	24	48	48	48	48	48	48	48	48	48	48	48	48



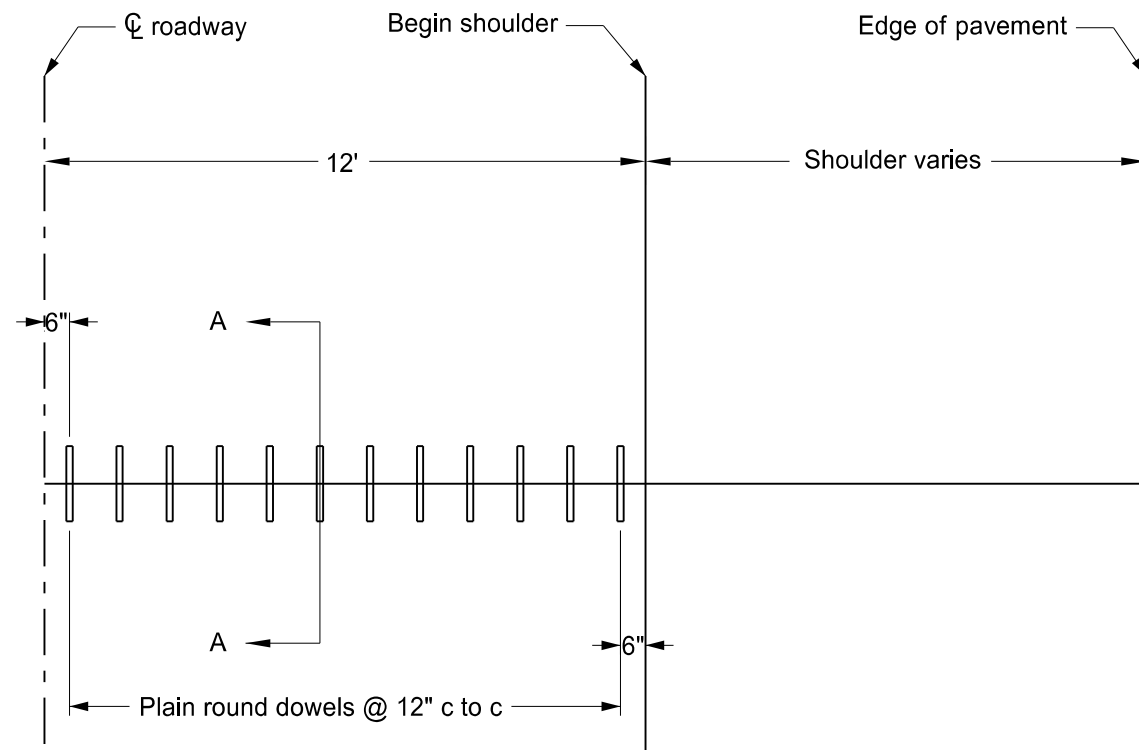
JOINT SEALER DETAILS



NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
10/23/2012	Expanded Tie Bar Table
03/16/2016	Updated Jt Details & notes

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TRANSVERSE CONTRACTION JOINT DETAILS

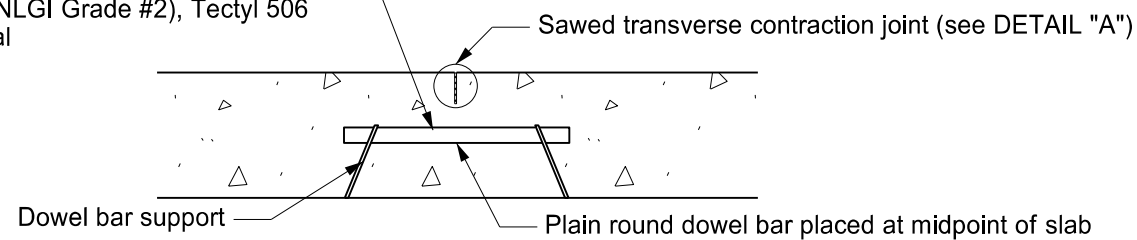


CONTRACTION JOINT DOWEL ASSEMBLY
(1/2 roadway shown)

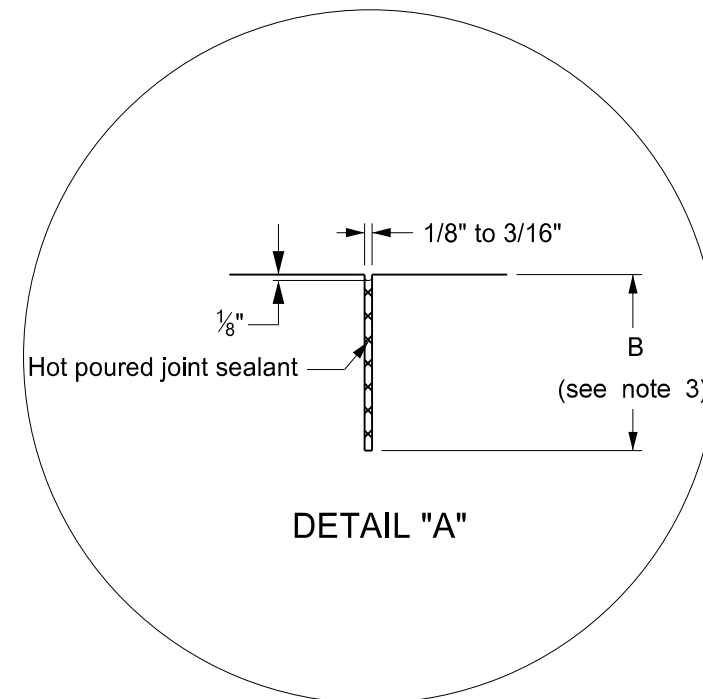
Notes

1. The joint seal details apply to both doweled and non-doweled (plain) transverse joints.
2. T = Thickness of pavement.
3. $B = T/4 + 1/4"$ for AE or YE for non-dowelled concrete pavement or $B = T/3$ for high early or dowelled concrete pavement

Coat entire dowel bar length with Multipurpose Lithium Grease (NLGI Grade #2), Tectyl 506 or approved equal



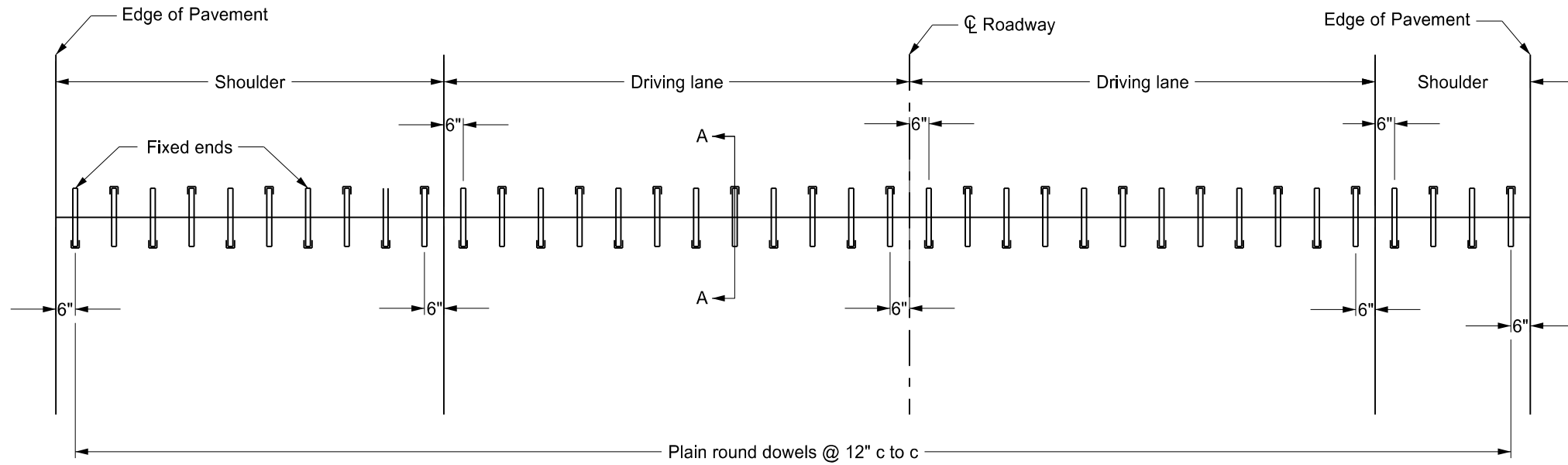
SECTION A-A



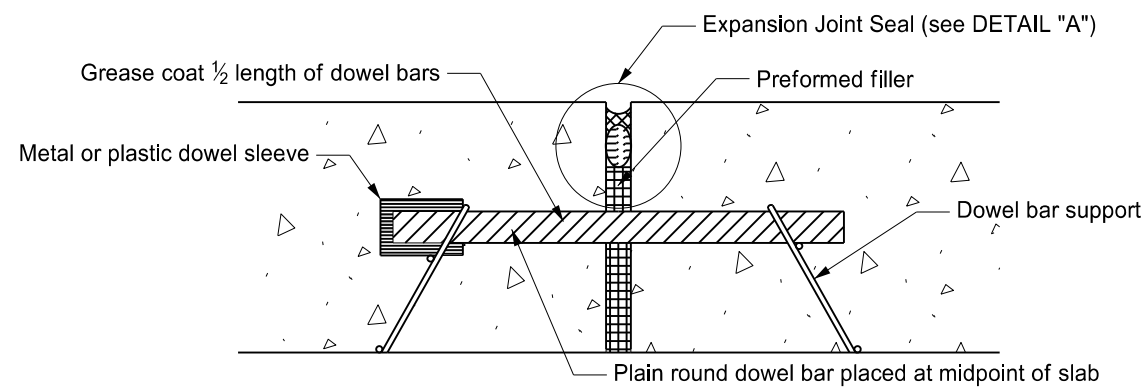
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel size reference
3/16/2016	Revised Joint Details and notes

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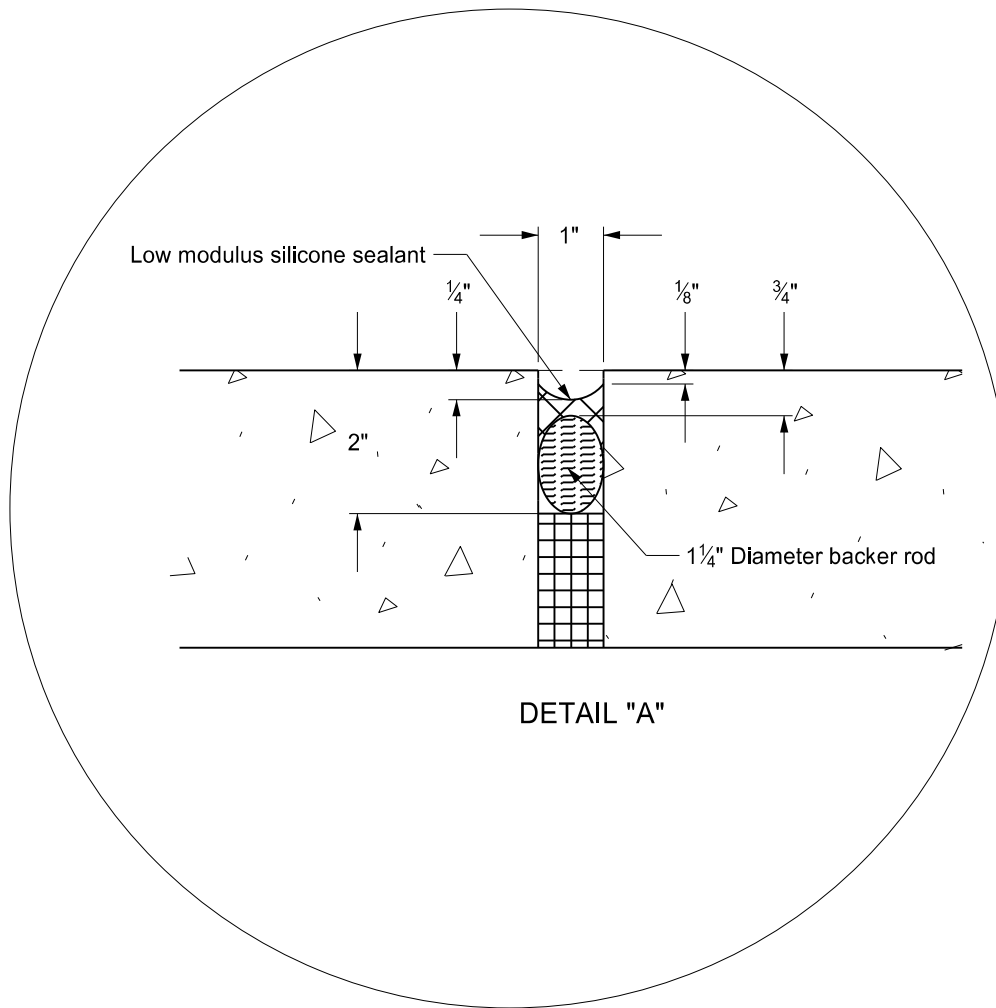
TRANSVERSE EXPANSION JOINT DETAIL



DOWELED EXPANSION JOINT ASSEMBLY



SECTION A-A

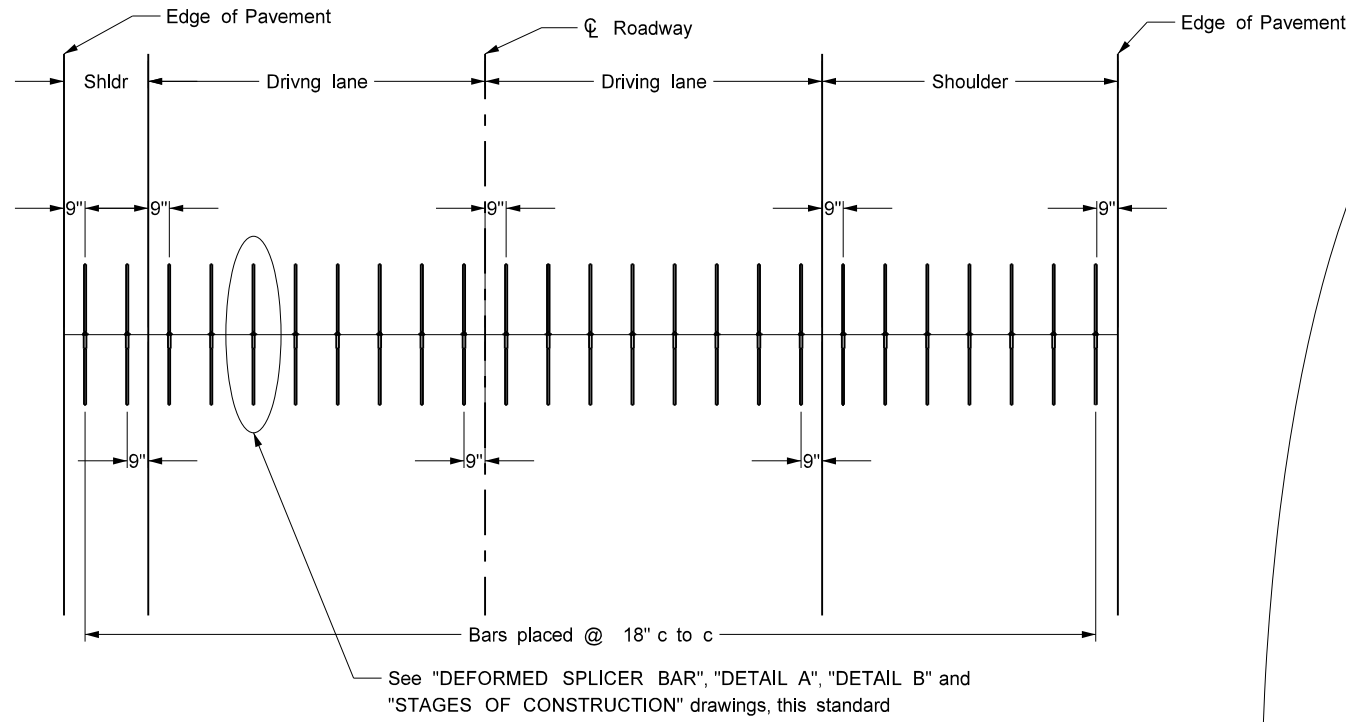


DETAIL "A"

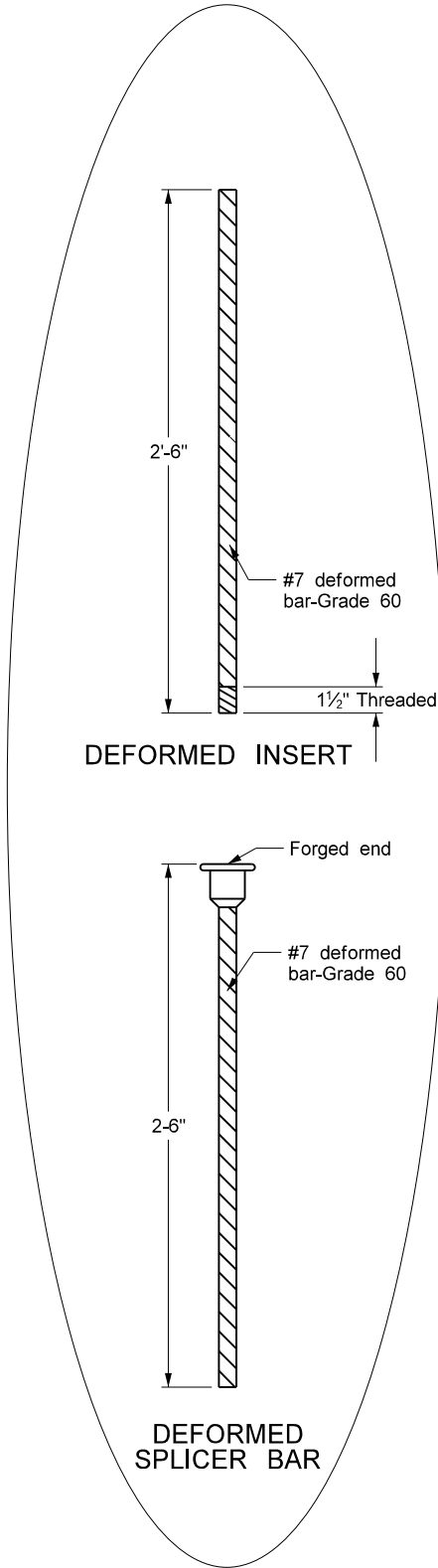
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-15-2010	
REVISIONS	
DATE	CHANGE
6/23/2014	Removed dowel bar sizes

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TRANSVERSE CONSTRUCTION JOINT



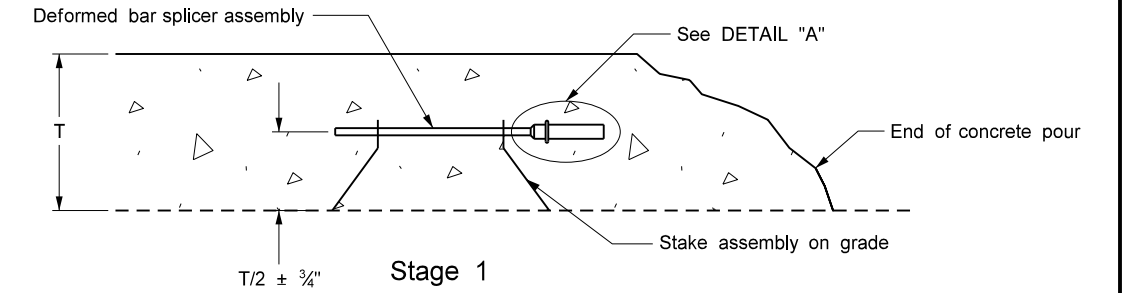
PLAN VIEW



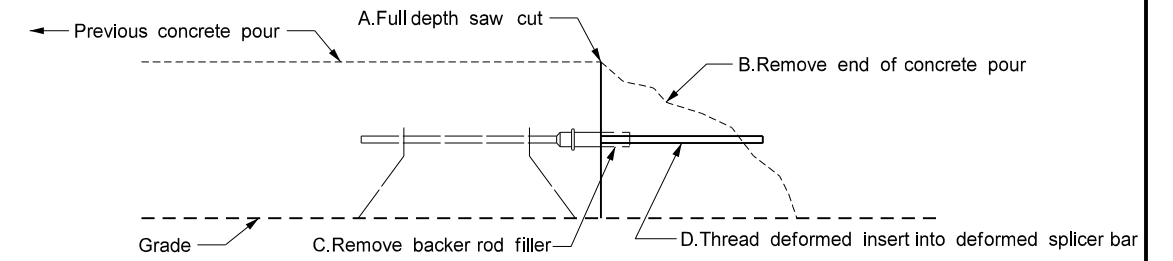
DEFORMED INSERT

DEFORMED SPLICER BAR

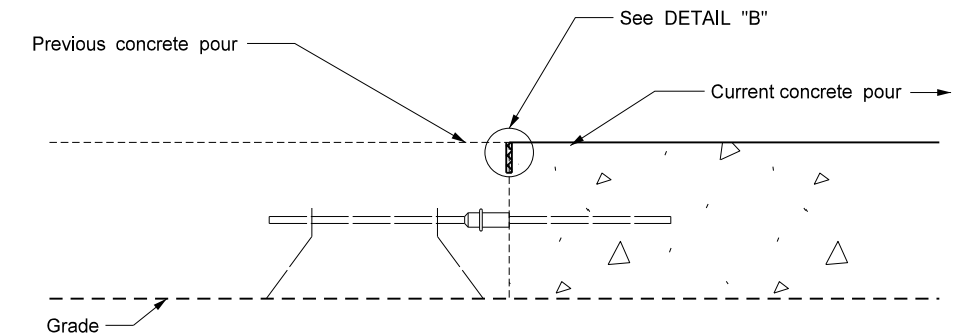
STAGES OF CONSTRUCTION



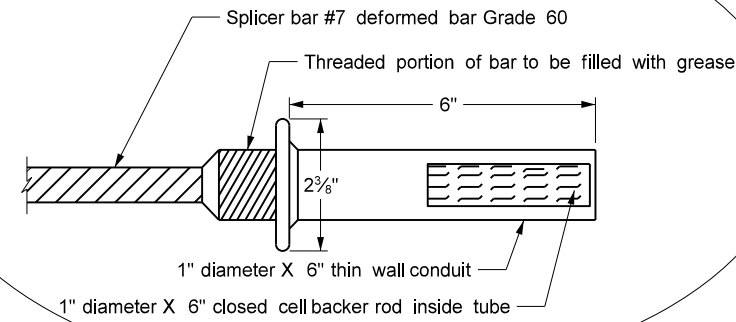
Stage 1



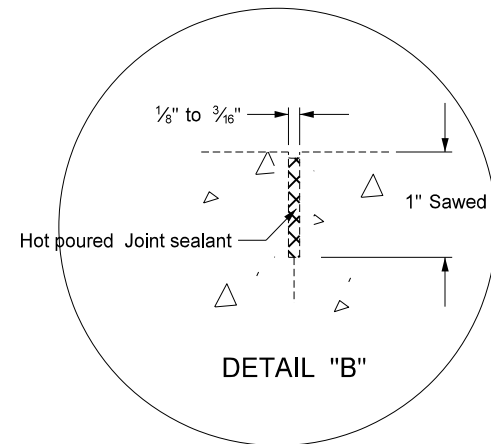
Stage 2



Stage 3



DETAIL "A"



DETAIL "B"

Notes

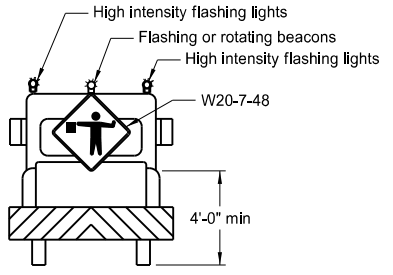
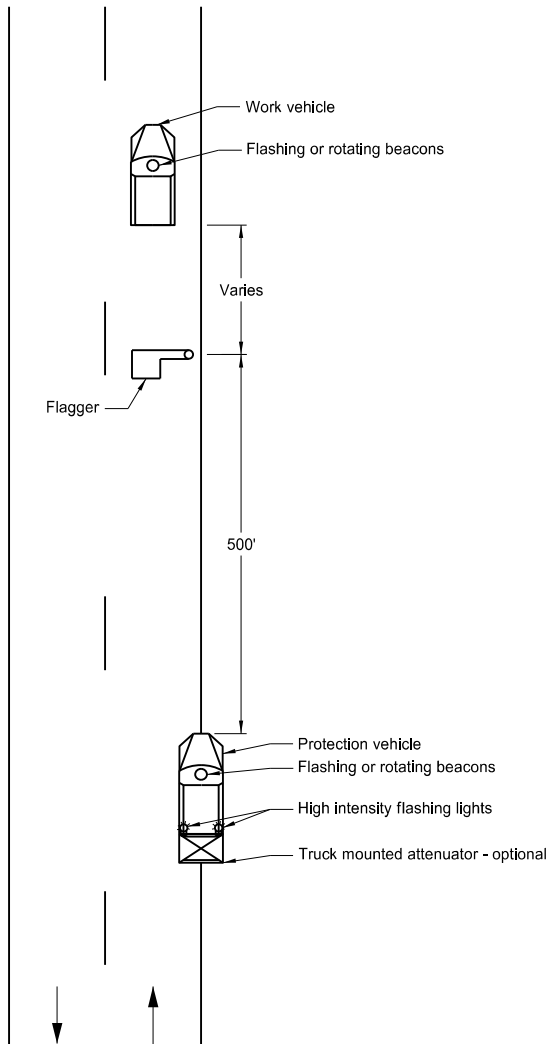
1. Saw and seal all construction joints.
2. Include all costs for transverse construction joints in the price bid for PCC pavement.
3. Do not saturate the subgrade during the sawing operation.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION 9-15-2010	
REVISIONS	
DATE	CHANGE
3-16-16	Revised Joint Details and notes

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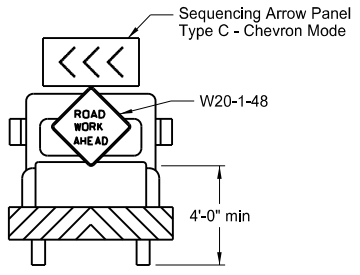
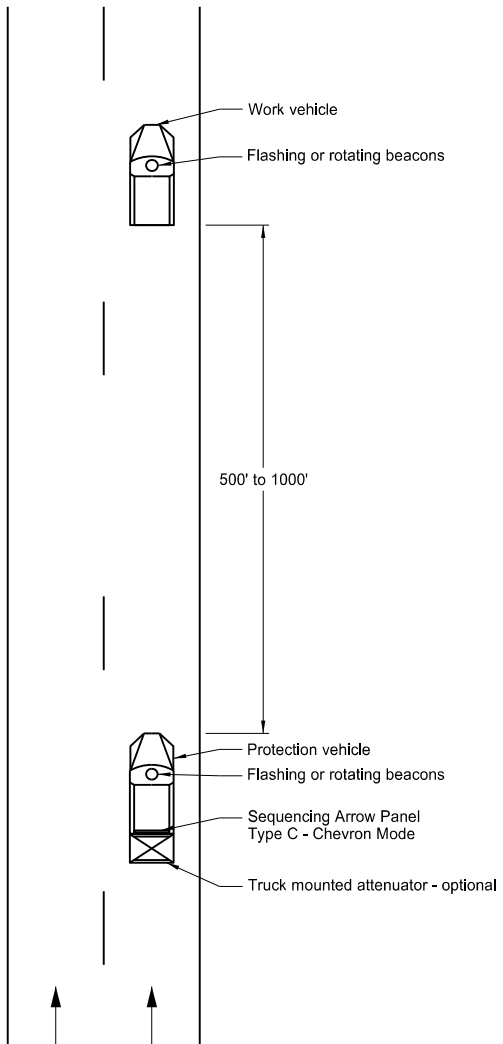
TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

Two Lane, Two Way Roadways



Typical Protection Vehicle

Multilane Roadways

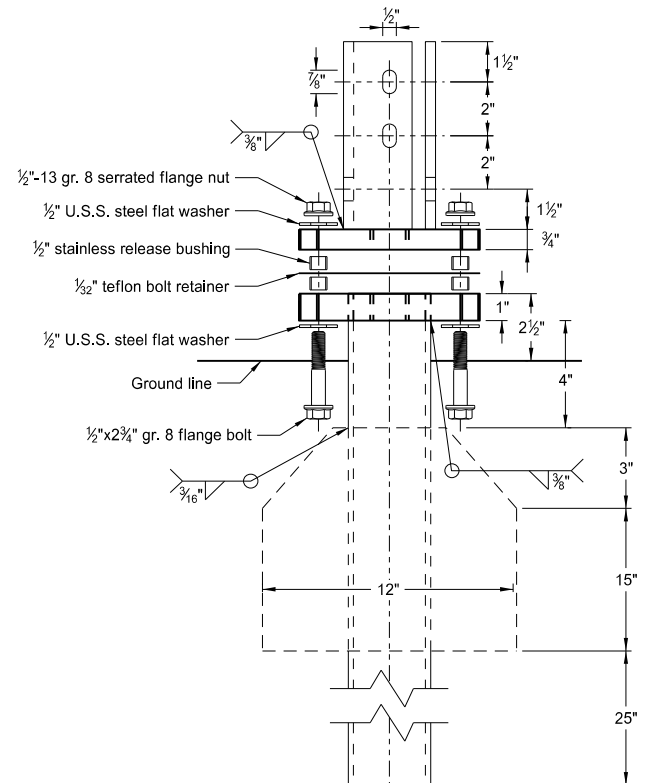


Typical Protection Vehicle

- Notes:
1. The working vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light.
 2. The shadow vehicle shall display a 360 degree rotating, flashing, oscillating or strobe light. The shadow vehicle for Multilane Roadway shall also have a sequencing arrow panel Type C operated in the chevron mode.
 3. This application is for use during daylight hours and in areas of good visibility only.
 4. Two lane, two way roadway, a flagger shall be used to protect the work area and warn oncoming traffic.

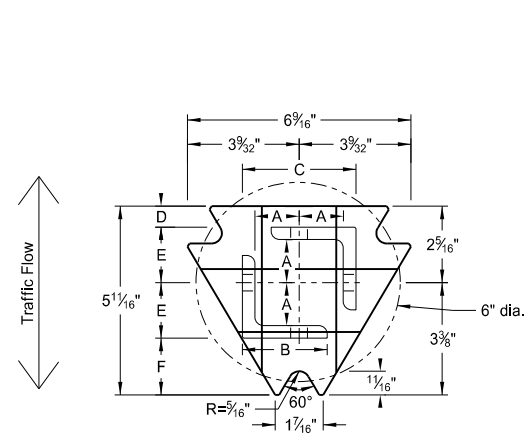
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE

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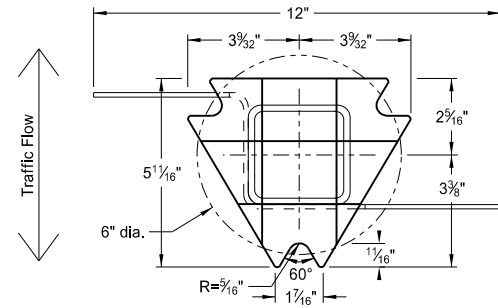


Multi-Directional Slip Base Assembly

Perforated Tube



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



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

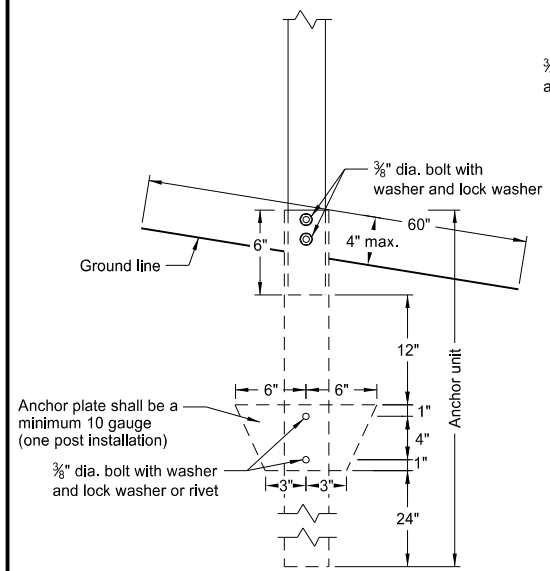
Notes:

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

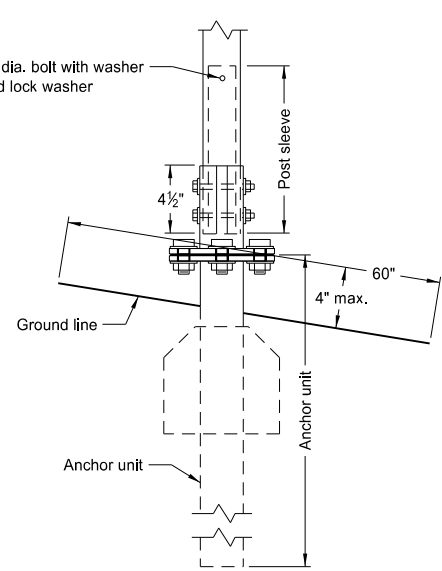
Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thickness Gauge	Sleeve Size in.	Wall Thickness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2 1/4
1	2 1/4	12			No	2 1/2
1	2 1/2	12			(A)	3
1	2 1/2	10			Yes	
1	2 1/4	12	2	12	Yes	
1	2 1/2	12	2 1/4	12	Yes	
2	2	12			No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

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in. ⁴	Cross Sec. Area in. ²	Section Modulus in. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.785

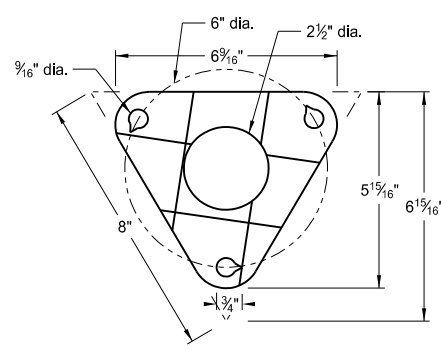
Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 9/64"	2 1/2"	3 1/32"	2 5/32"	1 33/64"	1 1/8"
2 1/2"x10 ga.	1 9/32"	2 1/2"	3 5/16"	5/8"	1 21/32"	1 3/4"



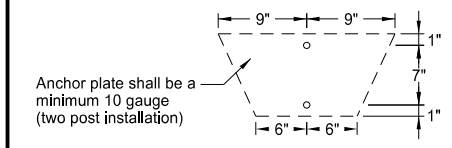
Anchor Unit and Post Assembly



Multi-Directional Slip Base Anchor Unit and Post Sleeve Assembly



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



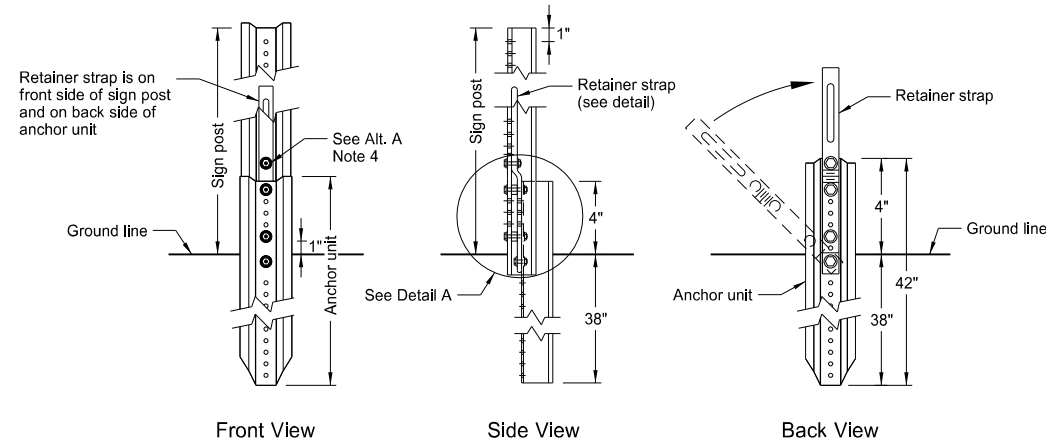
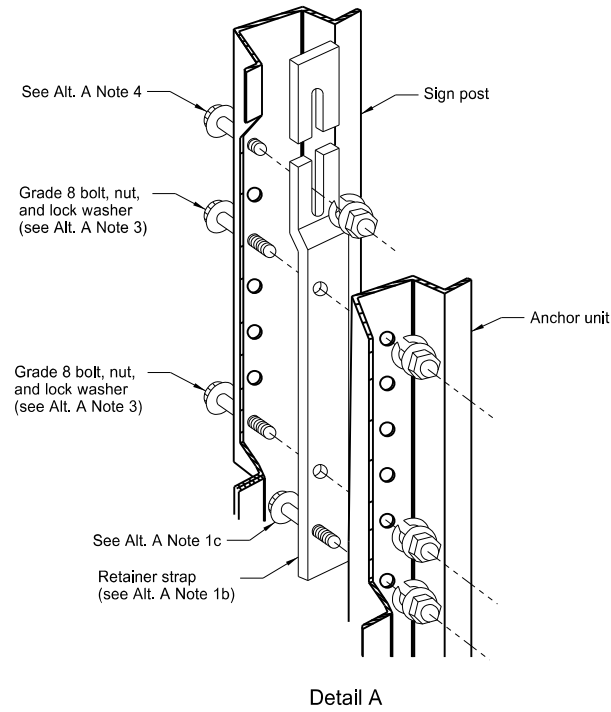
Anchor plate shall be a minimum 10 gauge (two post installation)

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE

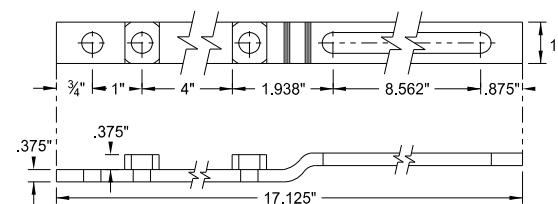
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U-Channel Post

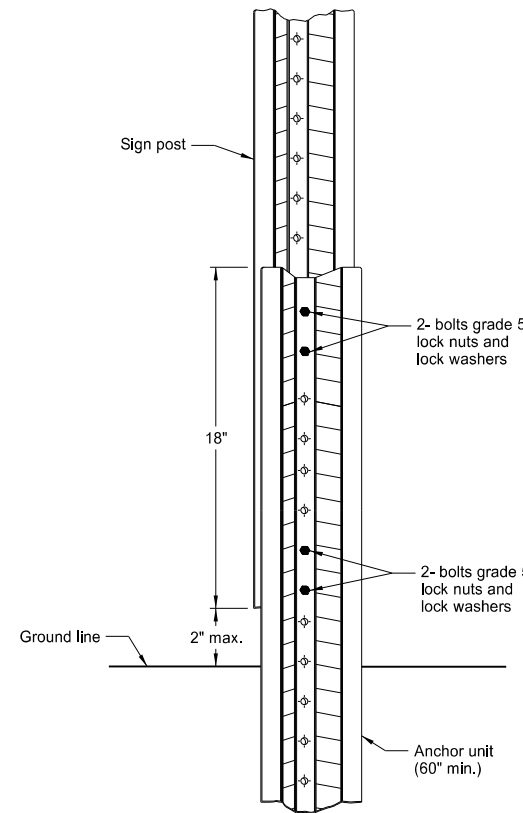


Breakaway U-Channel Detail Alternate A

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

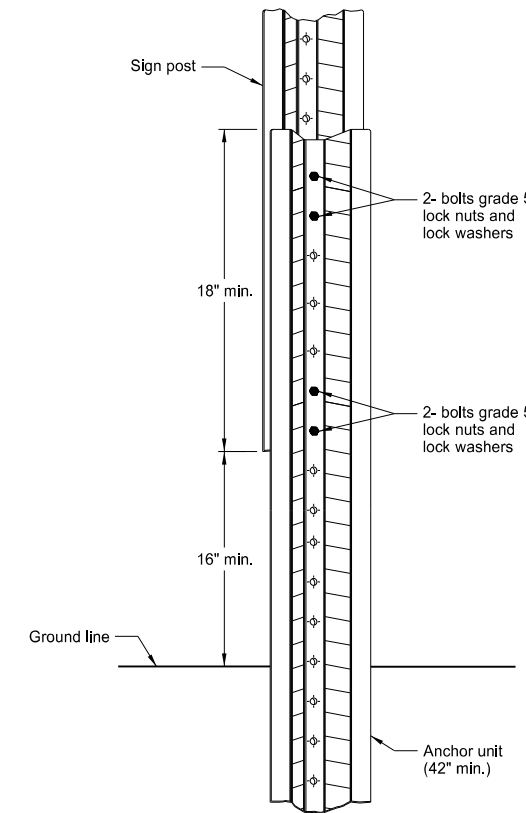


Retainer Strap Detail



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

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



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

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

Alternate A Steps of Installation:

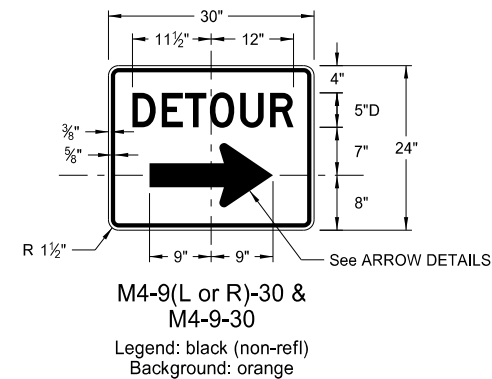
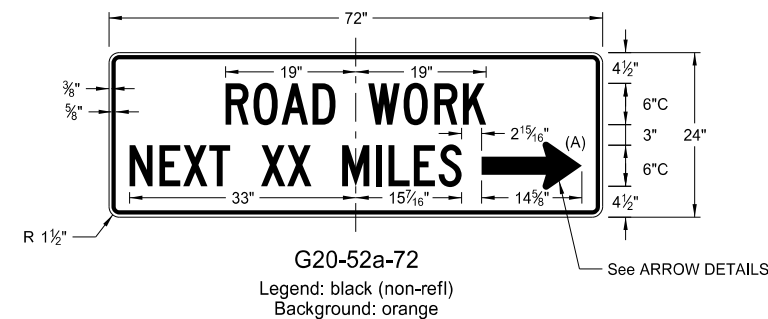
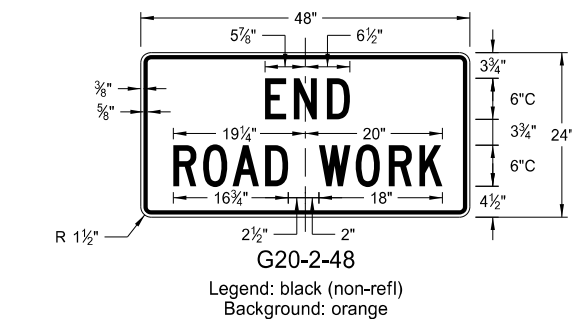
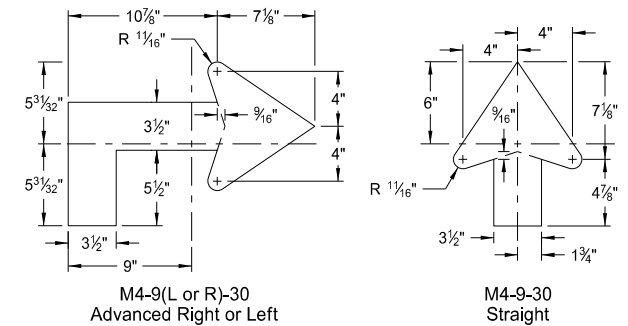
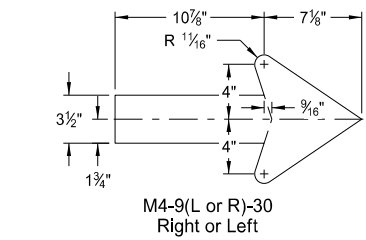
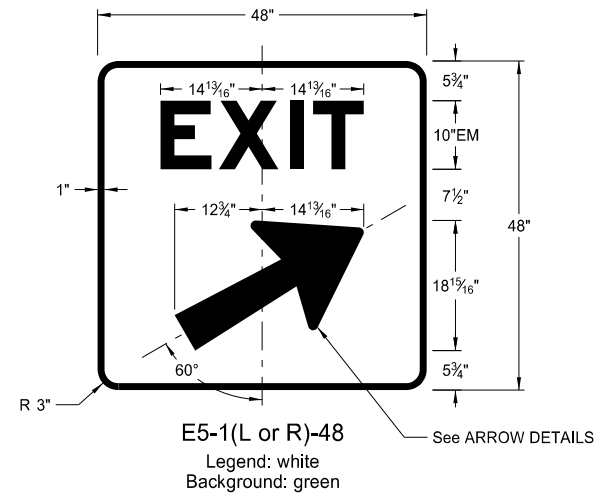
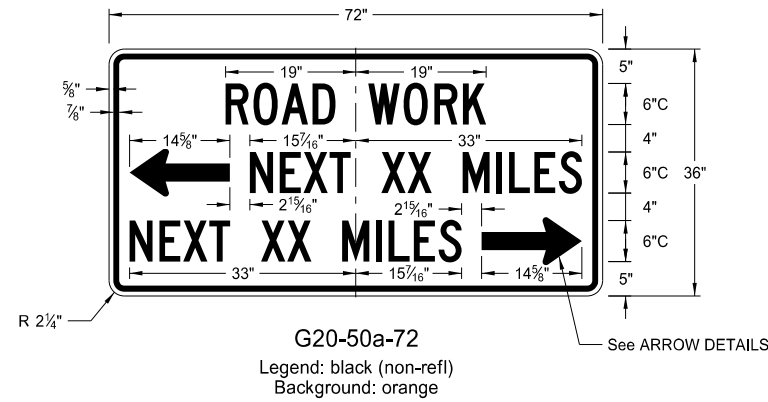
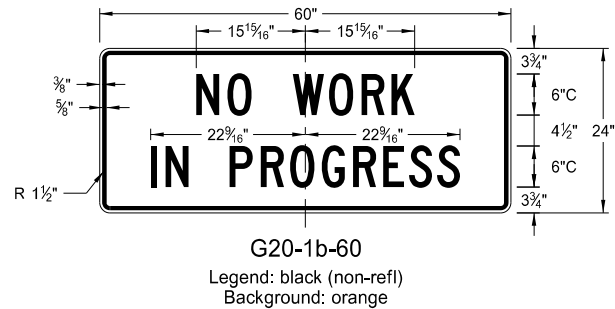
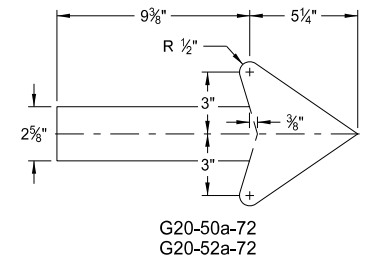
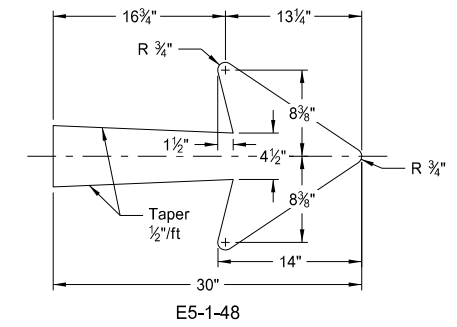
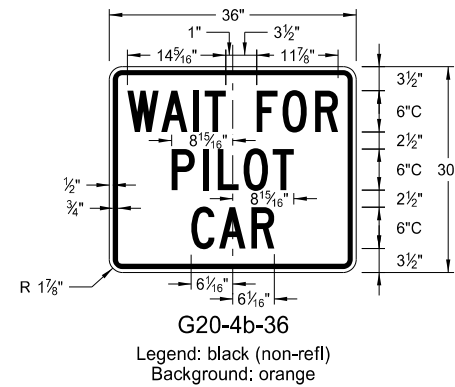
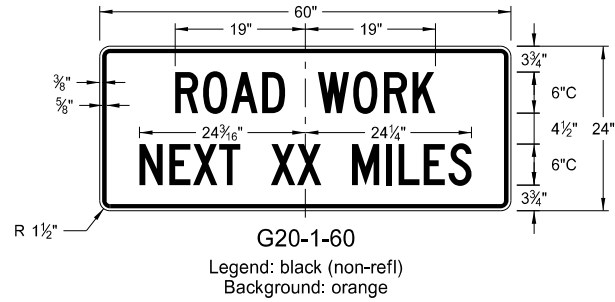
1. a) Drive anchor unit to within 12" of ground level.
b) Proper assembly established by lining up the bottom hole of retainer strap with the 6th hole from the top of the anchor unit.
c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
d) Rotate strap 90° to left.
2. a)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

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2-28-14	
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CONSTRUCTION SIGN DETAILS
 TERMINAL AND GUIDE SIGNS

D-704-9



ARROW DETAILS

NOTES:

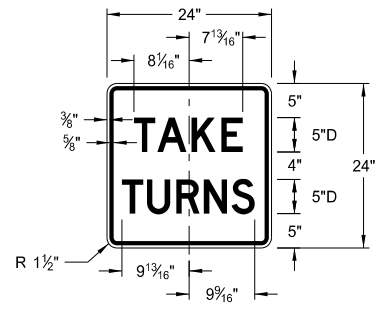
(A) Arrow may be right or left of the legend to indicate construction to the right or left.

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

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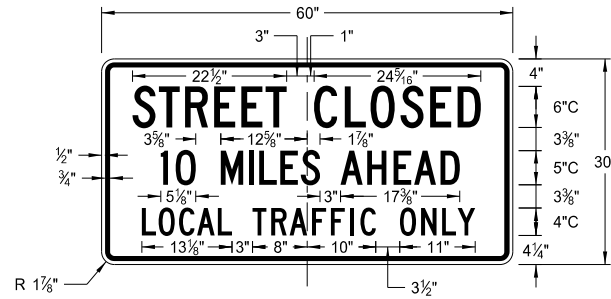
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS

D-704-10



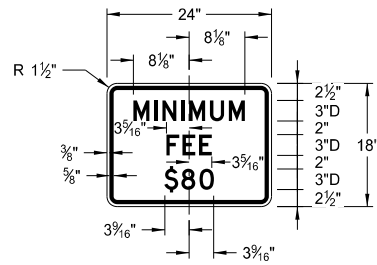
R1-50-24

Legend: black (non-refl)
Background: white



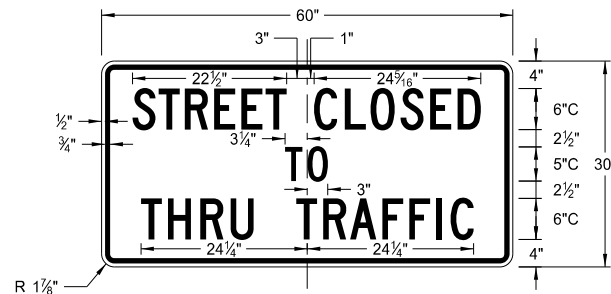
R11-3c-60

Legend: black (non-refl)
Background: white



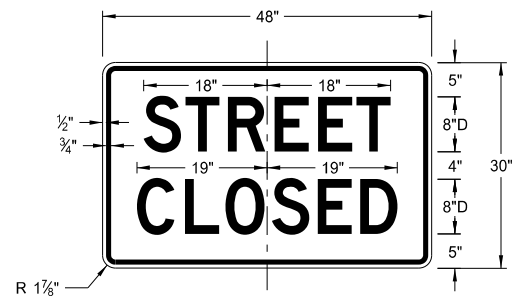
R2-1a-24

Legend: black (non-refl)
Background: white



R11-4a-60

Legend: black (non-refl)
Background: white



R11-2a-48

Legend: black (non-refl)
Background: white

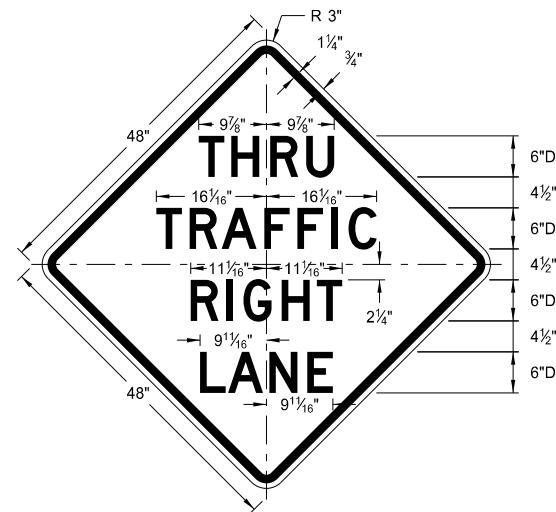
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
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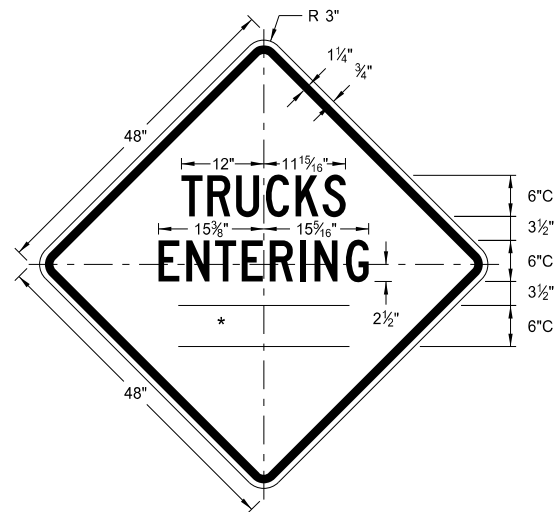
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

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

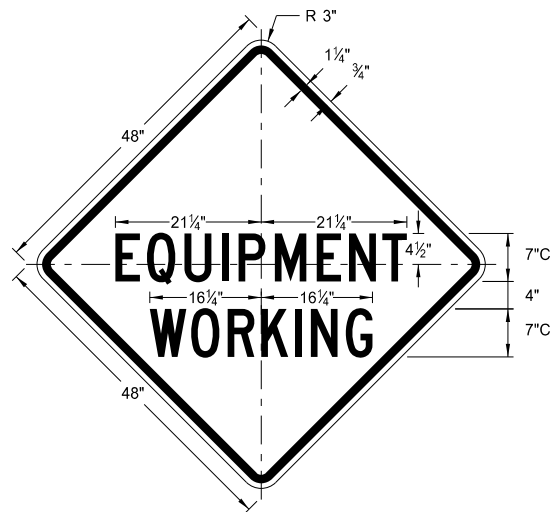
* DISTANCE MESSAGES



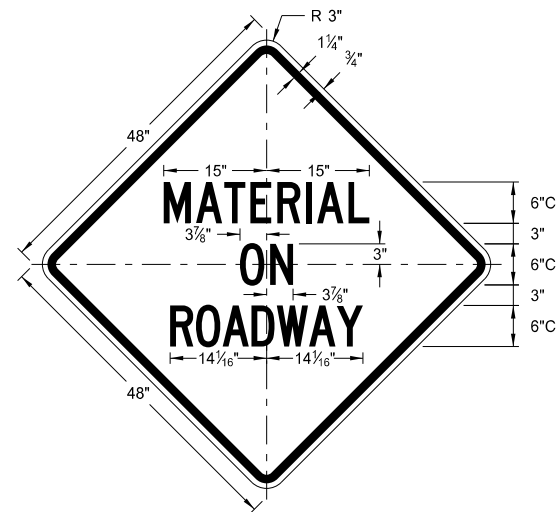
W5-8-48
Legend: black (non-refl)
Background: orange



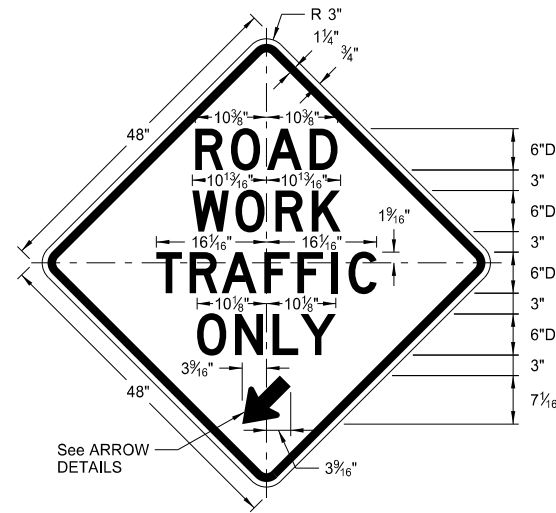
W8-54-48
Legend: black (non-refl)
Background: orange



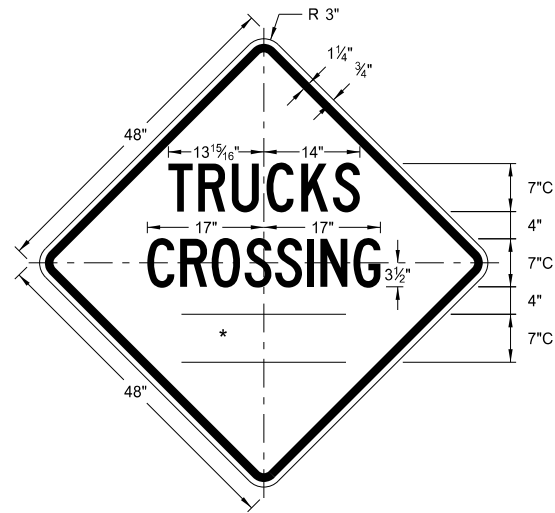
W20-51-48
Legend: black (non-refl)
Background: orange



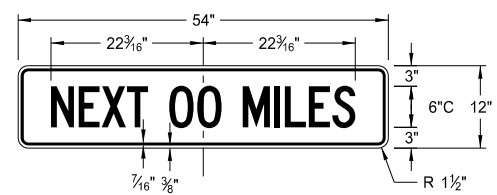
W21-51-48
Legend: black (non-refl)
Background: orange



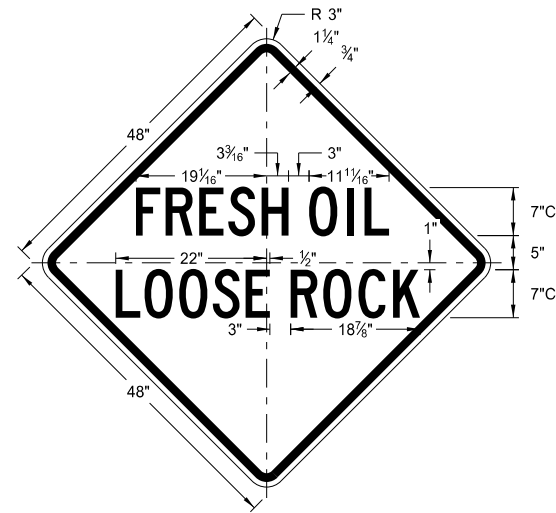
W5-9-48
Legend: black (non-refl)
Background: orange



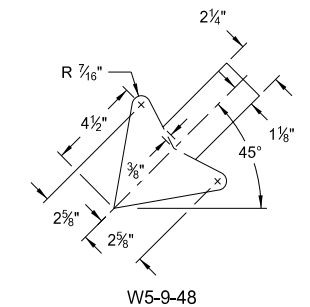
W8-55-48
Legend: black (non-refl)
Background: orange



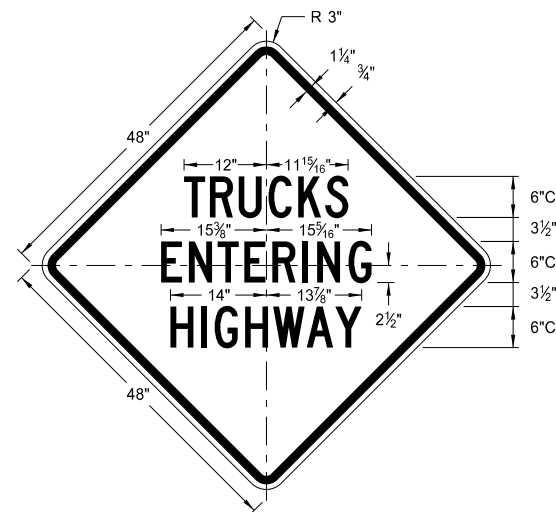
W20-52-54
Legend: black (non-refl)
Background: orange



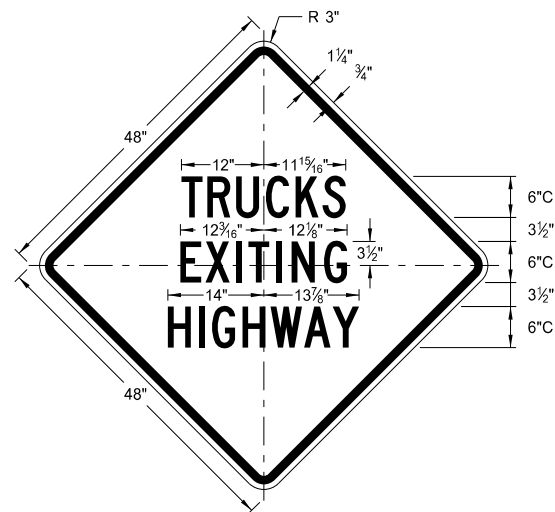
W22-8-48
Legend: black (non-refl)
Background: orange



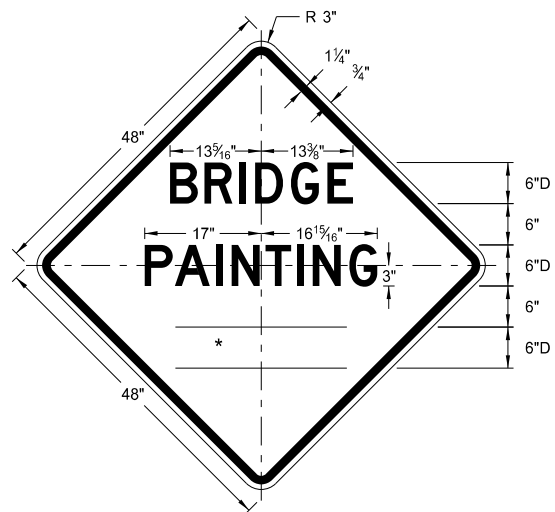
W5-9-48
ARROW DETAILS



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



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



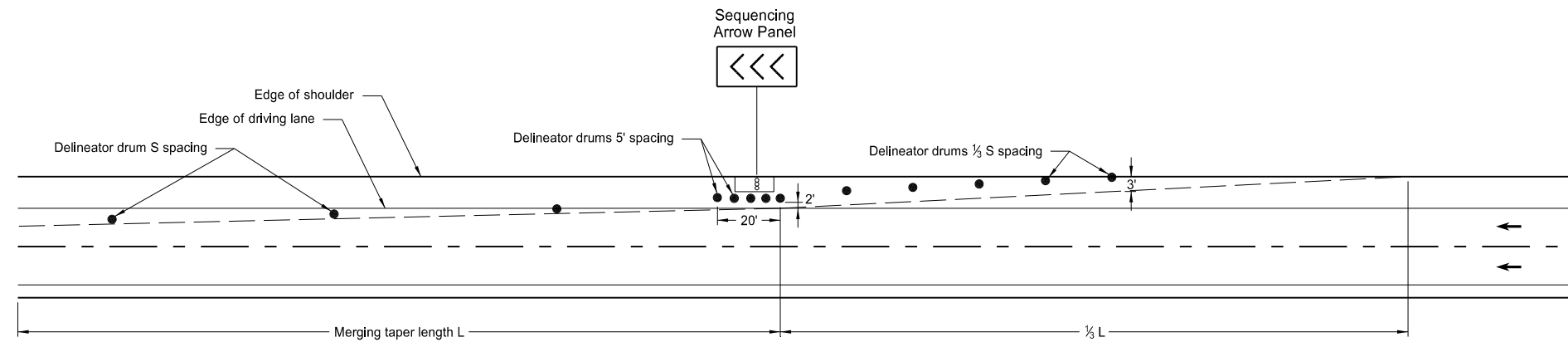
W21-50-48
Legend: black (non-refl)
Background: orange

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8-13-13	
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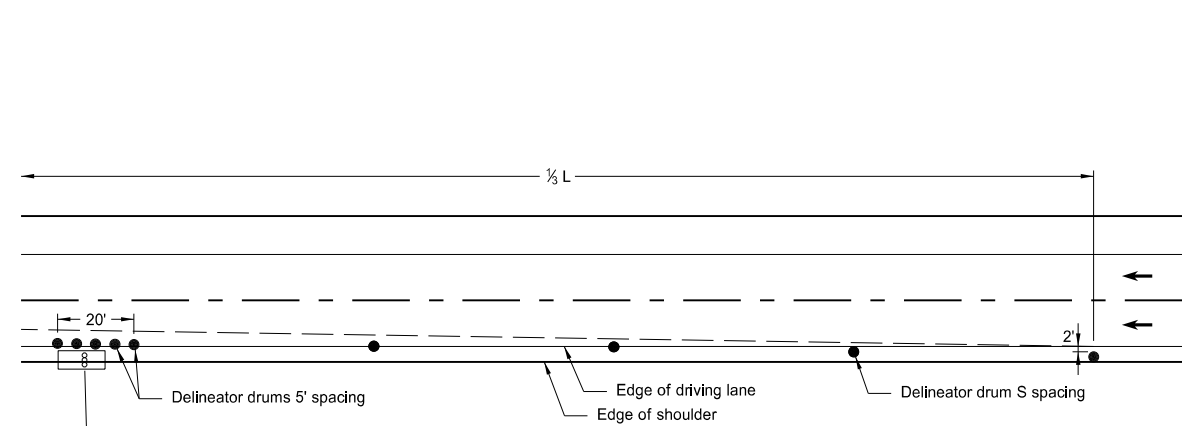
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SHOULDER CLOSURE TAPERS

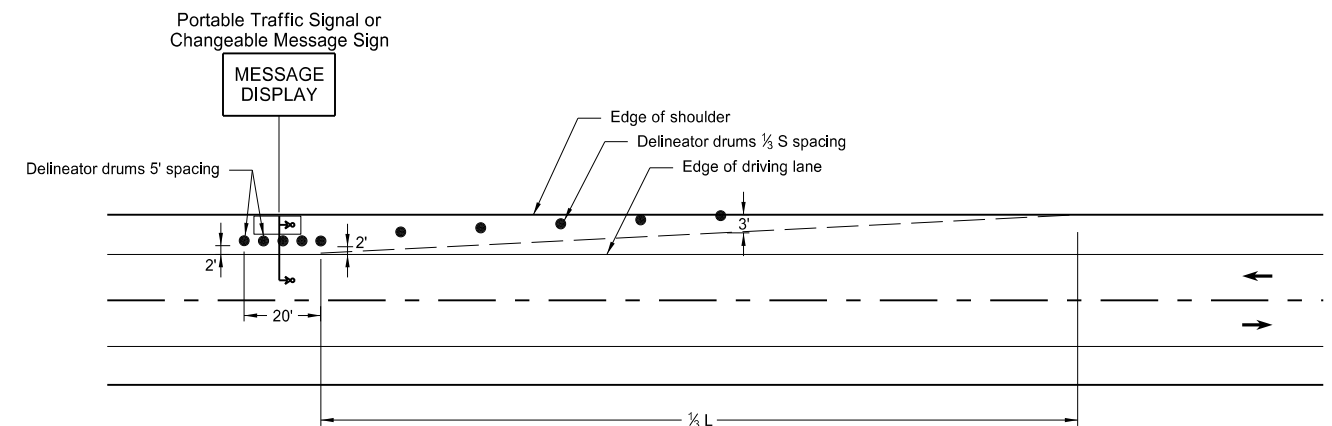
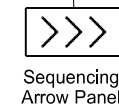
D-704-12



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



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



PORTABLE TRAFFIC SIGNAL OR CHANGEABLE MESSAGE SIGN ON SHOULDER

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

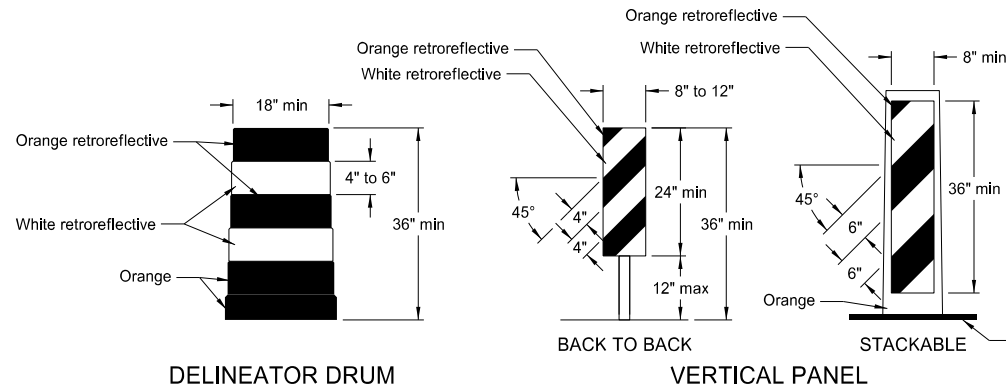
Notes:

- S = Posted Speed Limit in mph
W = Width of offset in feet
L = Taper length in feet
L = WS²/60 (40mph or less)
L = WS (45mph or more)
- If a shoulder taper is used, it should have a length of approximately 1/3L. If a shoulder is used as a travel lane, a normal merging or shifting taper should be used.
- When paved shoulders of 8 foot width or more are closed, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.

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10-3-13	
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BARRICADE AND CHANNELIZING DEVICE DETAILS

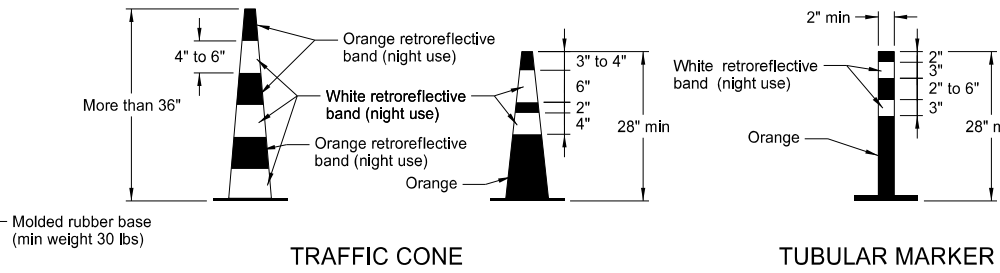


DELINEATOR DRUM

VERTICAL PANEL

The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectORIZED spaces between the horizontal orange and white stripes shall not exceed 3" wide. Stripes shall not be placed on ribs or indentations in the drum. Drums shall have closed tops that will not allow collection of construction debris or other debris. Ballast shall not be placed on the top of a drum.

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

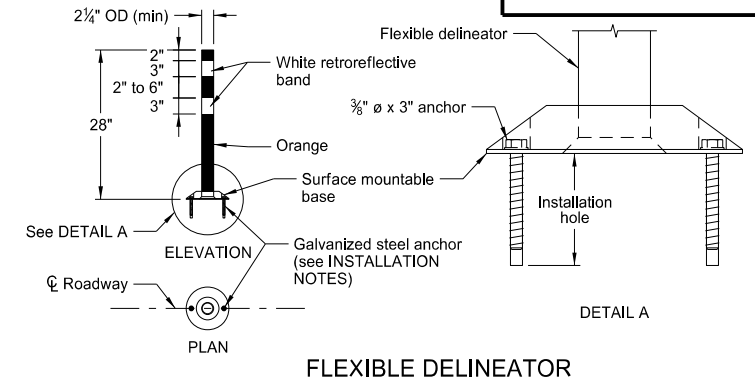


TRAFFIC CONE

TUBULAR MARKER

RetroreflectORIZATION of cones more than 36" in height shall be provided by alternating orange and white retroreflective stripes. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectORIZED space between the orange and white stripes shall not exceed 3" wide.

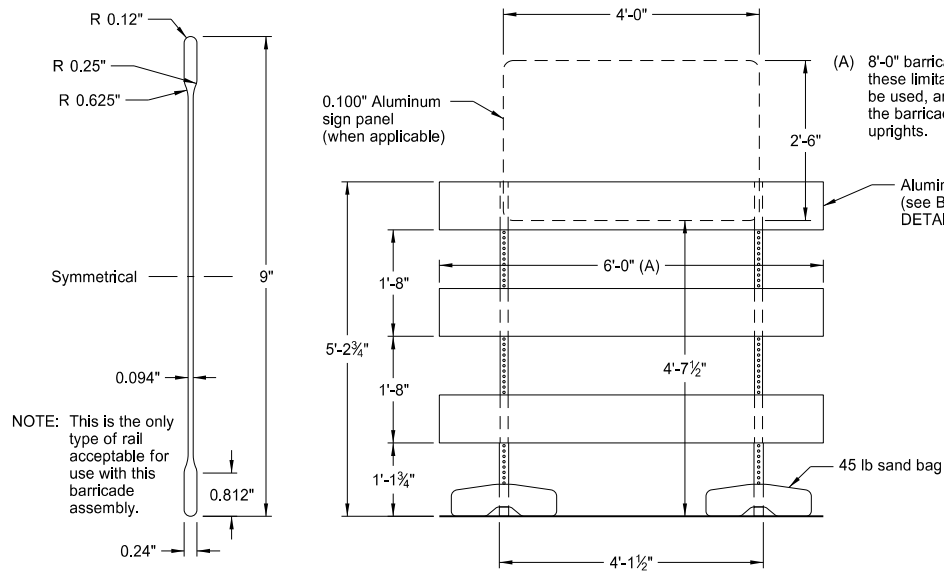
RetroreflectORIZATION of tubular markers more than 42" in height shall be provided by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

INSTALLATION NOTES:

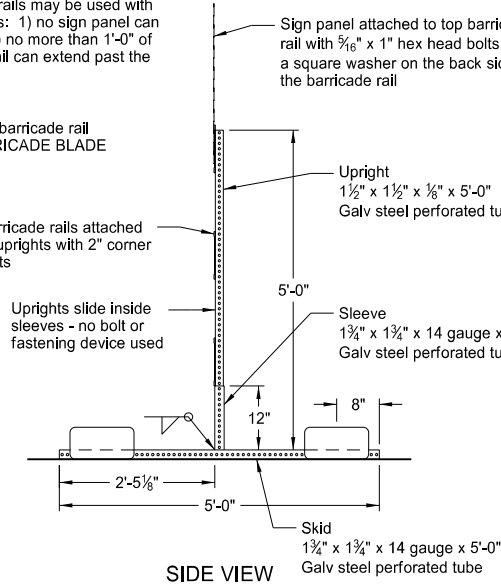
1. Drill installation holes to diameter and depth as required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, the contractor may use an 8" x 8" butyl pad or hot melt butyl.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



BARRICADE BLADE DETAIL

ELEVATION VIEW

BARRICADE ASSEMBLY DETAIL (Aluminum Barricade Rails)

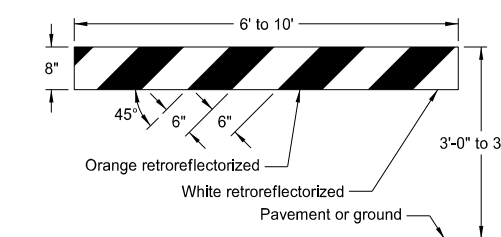


ELEVATION VIEW

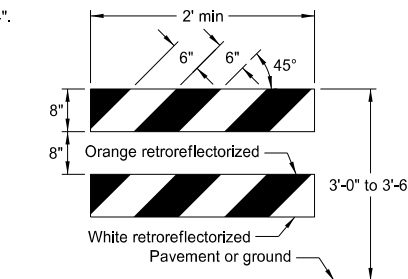
BARRICADE ASSEMBLY DETAIL (Wood or Plastic Rails)

SIDE VIEW

NOTE: Markings for barricades shall be alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Retroreflective sheeting shall be placed on both sides of the rails and shall have a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", the rail stripe width shall be 4".

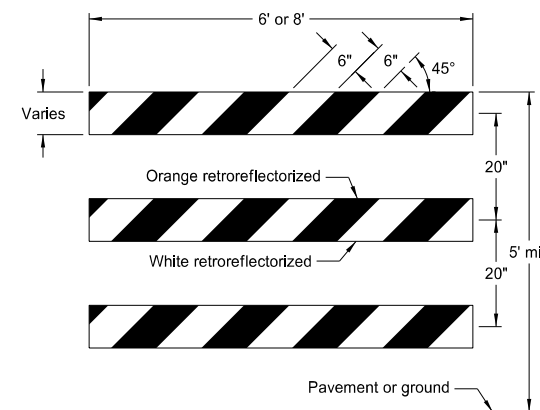


TYPE I BARRICADE

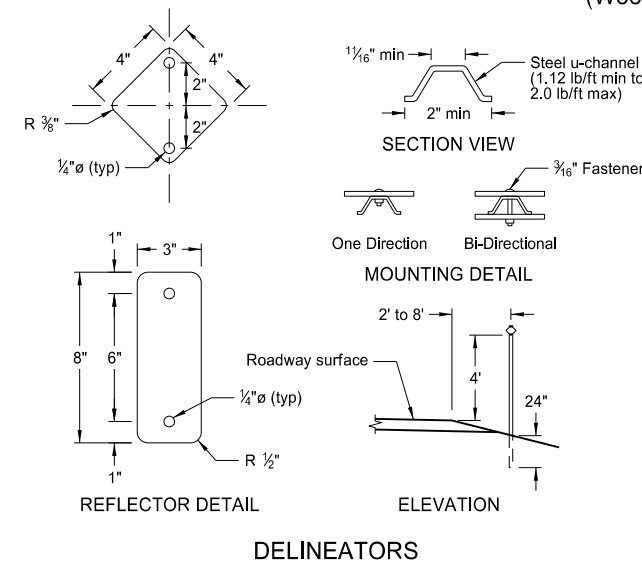


TYPE II BARRICADE

BARRICADE RAIL DETAILS



TYPE III BARRICADE



REFLECTOR DETAIL

ELEVATION

DELINEATORS

MINIMUM BALLAST (For each side of barricade support)

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

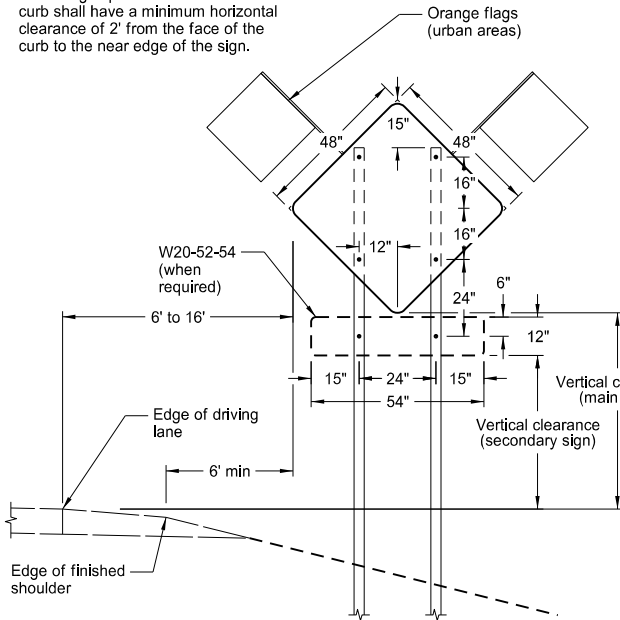
Note: The number of sandbags are based on a wind speed of 55 MPH. The sandbags are assumed to be placed at or near the ends of the skids.

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

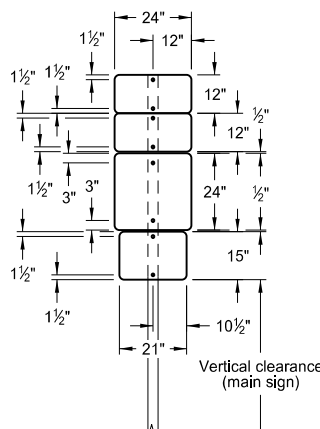
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CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

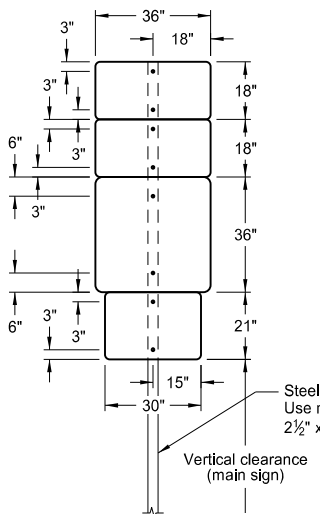
Note: Signs placed in sections with curb shall have a minimum horizontal clearance of 2' from the face of the curb to the near edge of the sign.



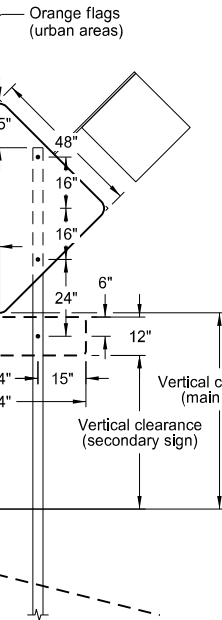
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



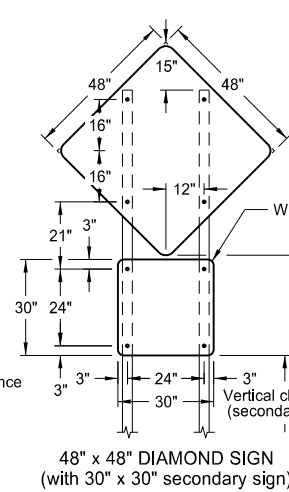
24" x 24" ROUTE MARKER ASSEMBLY



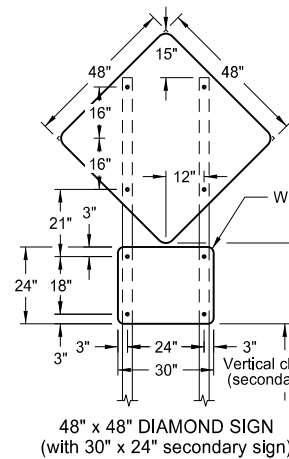
36" x 36" ROUTE MARKER ASSEMBLY



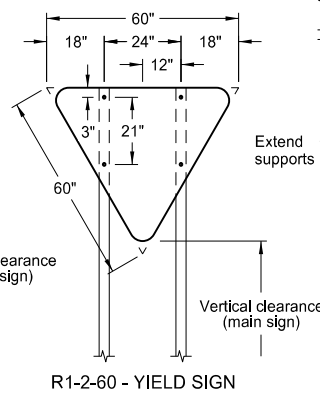
18" x 18" DIAMOND SIGN



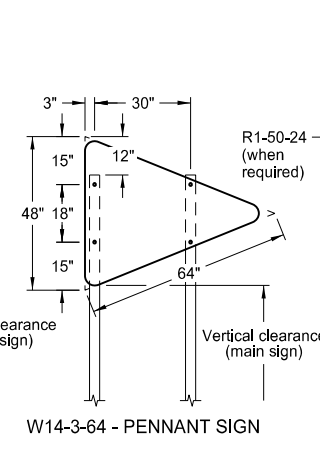
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



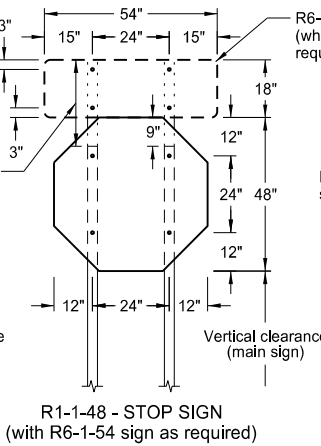
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



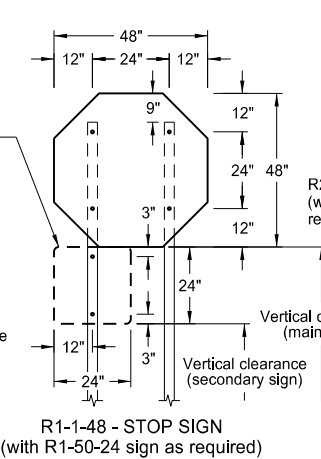
R1-2-60 - YIELD SIGN



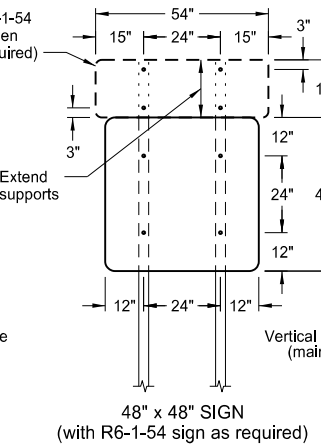
W14-3-64 - PENNANT SIGN



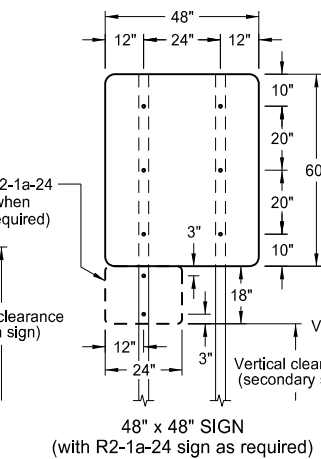
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



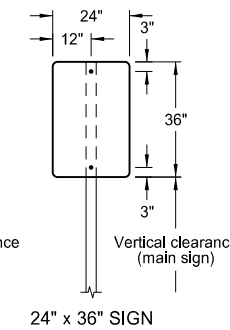
R1-1-48 - STOP SIGN
(with R1-50-24 sign as required)



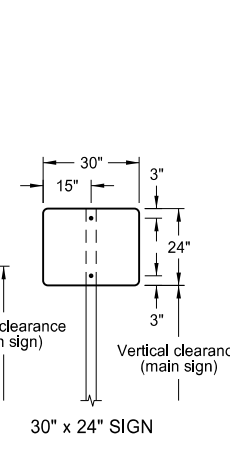
48" x 48" SIGN
(with R6-1-54 sign as required)



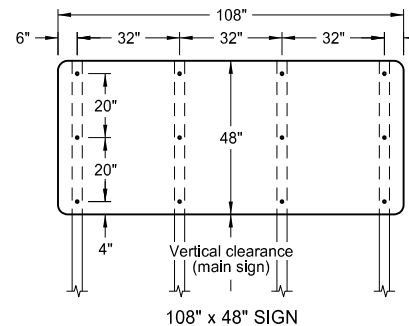
48" x 48" SIGN
(with R2-1a-24 sign as required)



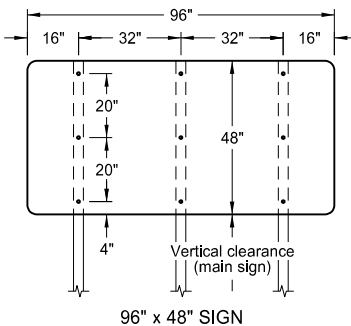
24" x 36" SIGN



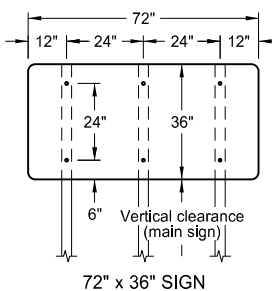
30" x 24" SIGN



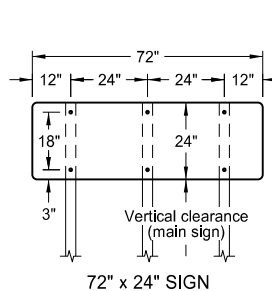
108" x 48" SIGN



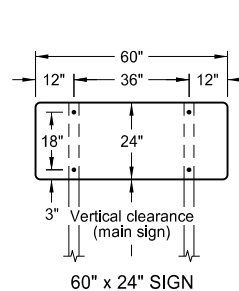
96" x 48" SIGN



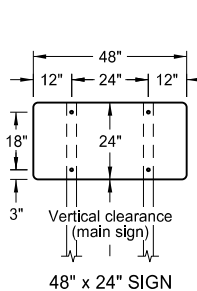
72" x 36" SIGN



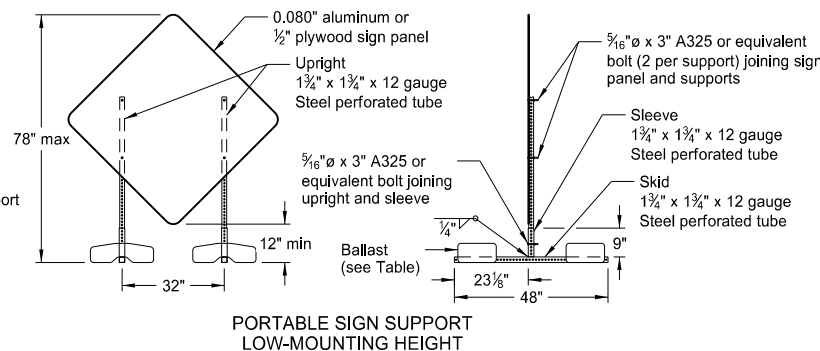
72" x 24" SIGN



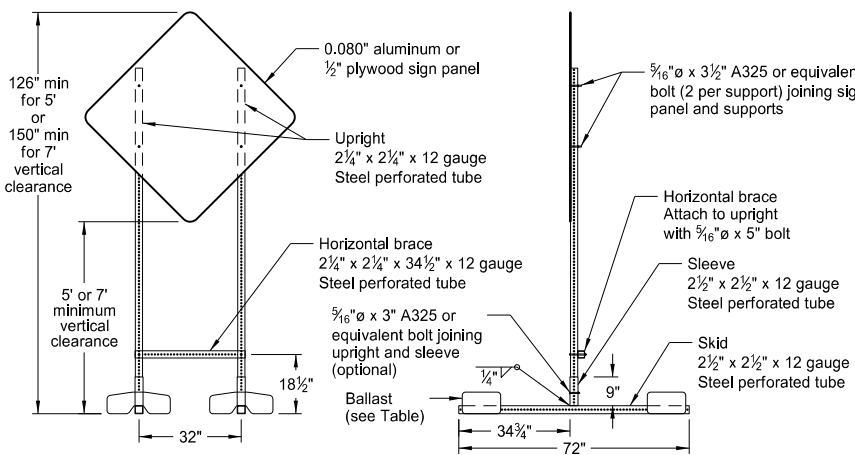
60" x 24" SIGN



48" x 24" SIGN



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

MINIMUM BALLAST
(For each side of sign support base)

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

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

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

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ROAD CLOSURE LAYOUTS

Notes

- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper.
 - L = Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.
- Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
- Delineator drums, barricades or cones used for tapering traffic shall be spaced at the dimension "S". Delineator drums or cones used for tangents shall be spaced at 2 times dimension "S".
- Sequencing Arrow Panels
 - Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room, the panel should be moved closer to the work area so that it can be placed on the roadway surface. See Shoulder Closure Standard Drawing.
 - Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
 - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}$ B.
- Use when work area is 1 mile or longer.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.

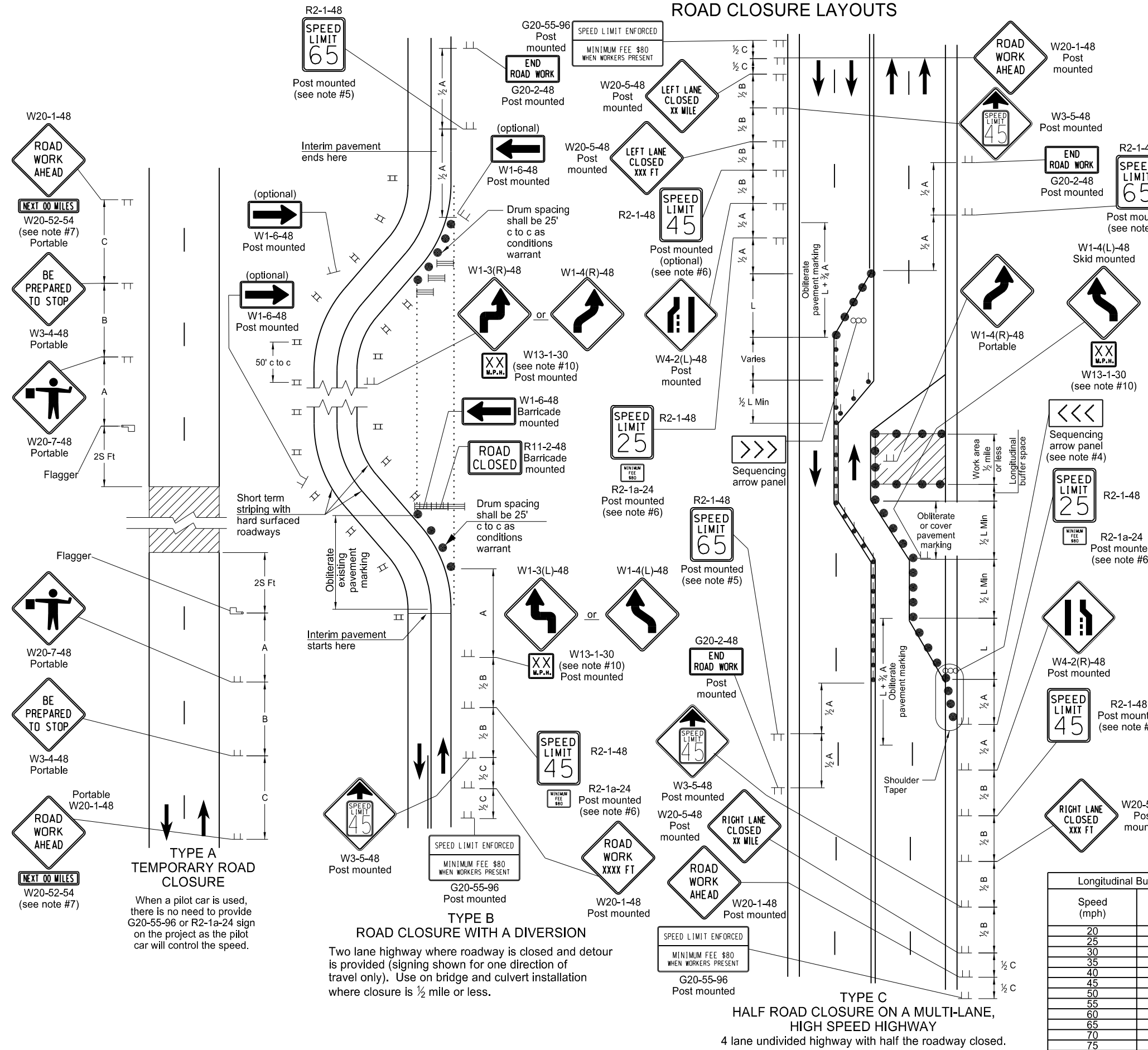
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60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

KEY	
	Type III barricade
	Sign
	Delineator drum
	Tubular markers
	Work area
	Flagger
	Sequencing arrow panel
	Vertical panels back to back

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	
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TYPE A TEMPORARY ROAD CLOSURE

When a pilot car is used, there is no need to provide G20-55-96 or R2-1a-24 sign on the project as the pilot car will control the speed.

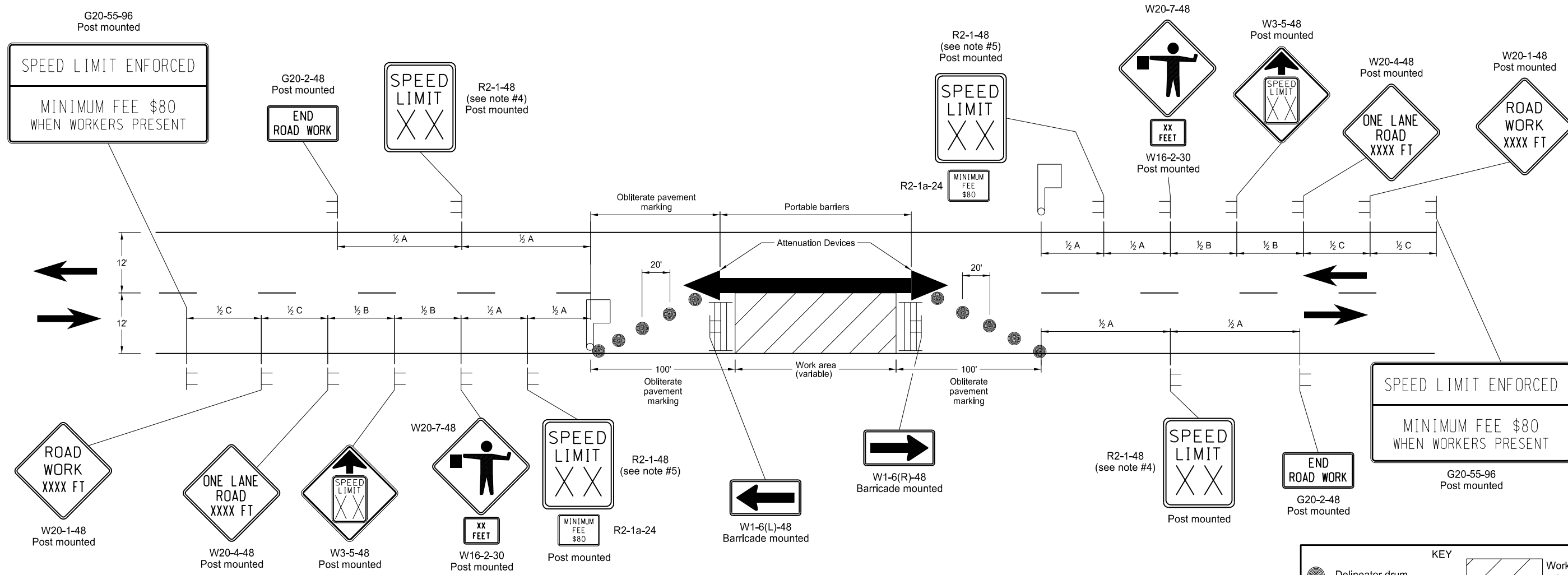
TYPE B ROAD CLOSURE WITH A DIVERSION

Two lane highway where roadway is closed and detour is provided (signing shown for one direction of travel only). Use on bridge and culvert installation where closure is $\frac{1}{2}$ mile or less.

TYPE C HALF ROAD CLOSURE ON A MULTI-LANE, HIGH SPEED HIGHWAY
4 lane undivided highway with half the roadway closed.

SIGN LAYOUT FOR ONE LANE CLOSURE TWO LANE ROADWAY

D-704-17



Notes

- Floodlights shall be provided to mark flagger stations at night. The lighting shall not create a disabling glare for drivers. Placement and elimination of potential glare can best be determined by driving through and observing the floodlighted area from each direction on the main roadway after lighting is set up.
- Barricades placed on roadway shall be on a movable assembly. Signs placed on the roadway shall be placed on skid mounted assembly.
- Existing striping shall be removed as required. Delineators will only be used when inslope is 4:1 or flatter and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadways have steep slopes and alignment is not visible to approaching vehicles. Delineators and vertical panels shall be installed back to back.
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- Existing speed limit signs within a reduced speed zone shall be covered. G20-55-96 sign is not required if this standard is part of other traffic control layouts, or the work is less than 15 days.
-

KEY

- Delineator drum
- Sign
- Type III barricade
- Work area
- Flagger

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

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9-27-13	
REVISIONS	
DATE	CHANGE

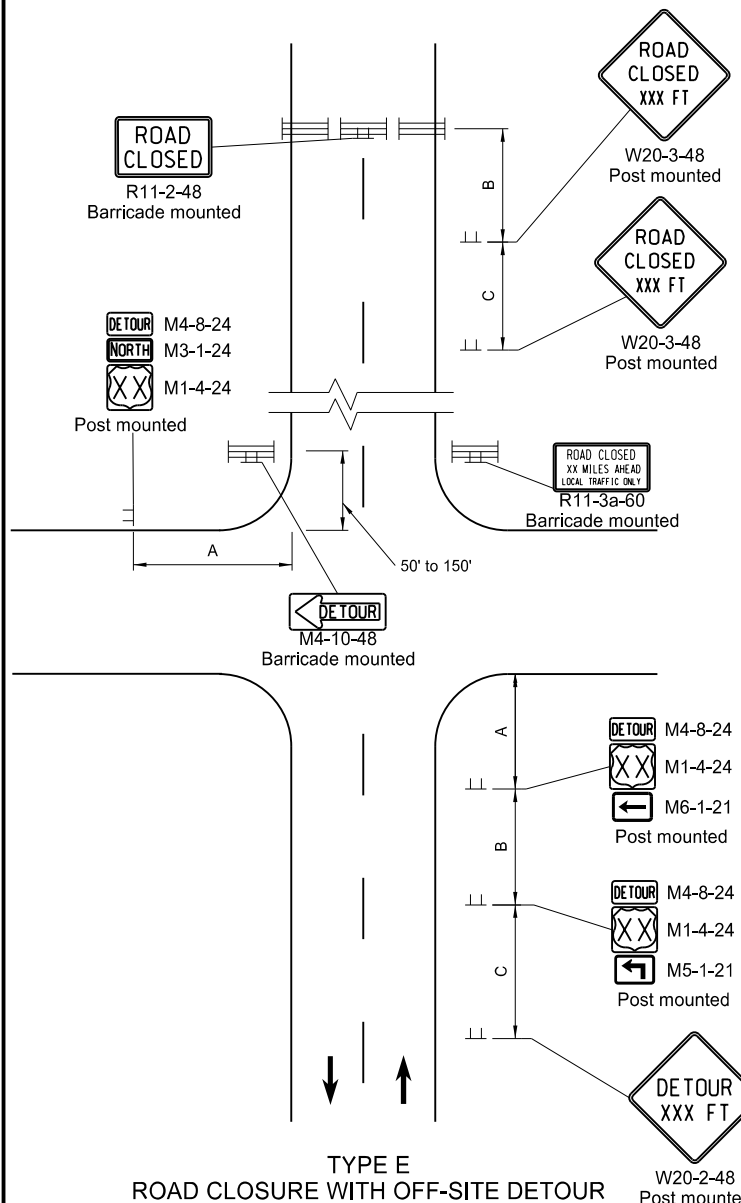
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ROAD CLOSURE AND LANE CLOSURE ON A TWO WAY ROAD LAYOUTS

D-704-19

Notes

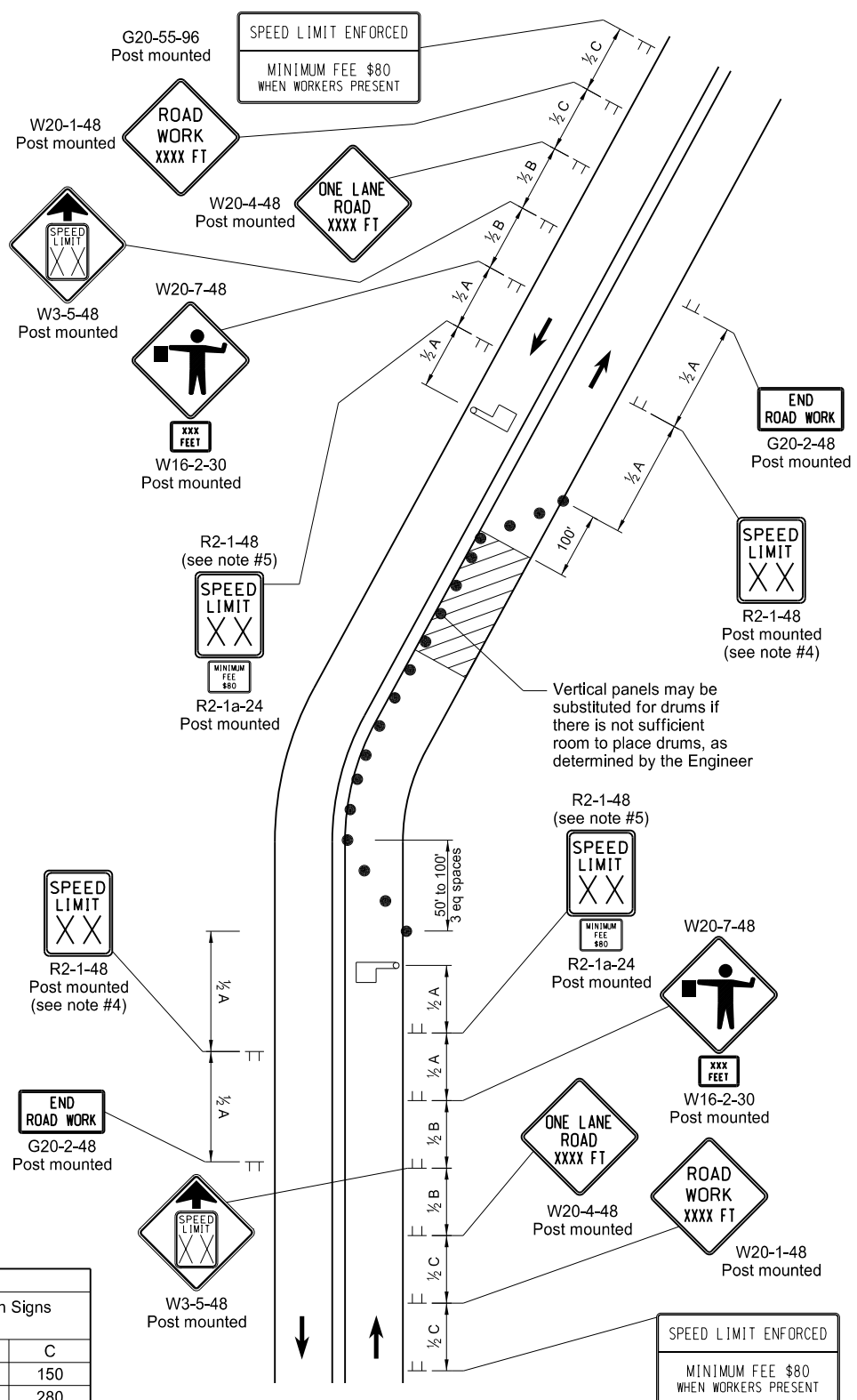
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper
 - L = Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or W x S²/60 for urban, residential, and other streets with speeds of 40 mph or less.
- Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
- Delineator drums used for tapering traffic shall be placed at 3 equal spaces. Delineator drums for tangents shall be spaced at 2 times dimension "S".
- The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
- The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
- When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Where necessary, safe speed to be determined by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
- G20-55-96 or R2-1a-24 sign are not required when a pilot car operation is used, if this standard is part of other traffic control layouts, or the work is less than 15 days.
- When highway-rail grade crossings exist either within or in the vicinity of the roadway work activities:
 - Extra care shall be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing (considered as being 15 feet on either side of the closest and farthest rail.)
 - A "Do Not Stop on Tracks" sign (R8-8-24) should be placed near the cross buck in each direction while the lane closure is in the vicinity of the tracks.
 - A buffer space between the work zone and the lane closure transition should be extended upstream of the highway-rail grade crossing so a queue created by the flagging operation will not extend across the highway-rail grade crossing.
 - If the queuing of vehicles across active rail tracks cannot be avoided, a flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing, even if automatic warning devices are in place.



**TYPE E
ROAD CLOSURE WITH OFF-SITE DETOUR**

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

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



**TYPE F
LANE CLOSURE ON A TWO WAY ROAD USING FLAGGERS**

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

KEY

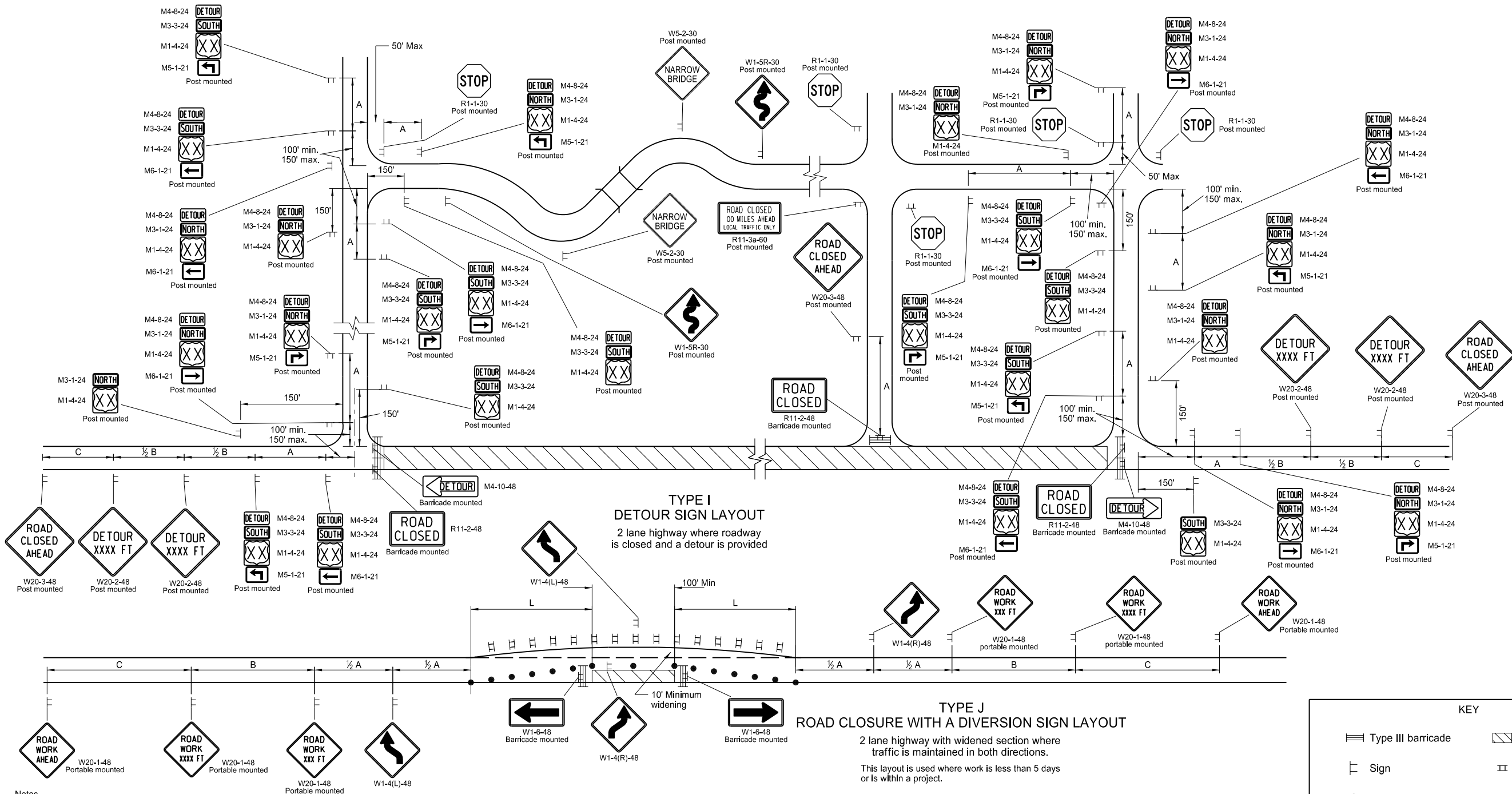
- Delineator Drum
- ▬ Sign
- ▬ Type III Barricade
- ▨ Work/Hazard Area
- 👤 Flagger

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
REVISIONS	
DATE	CHANGE
3-13-14	Revised Sign Cell "ROAD WORK XXX FT"

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DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

D-704-21



- Notes**
- Variables
S=Numerical value of speed limit or 85th percentile. W=The width of taper.
L=Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricades placed on roadway shall be on a moveable assembly. Signs placed on roadway shall be placed on skid mounted assemblies.
 - Delineator drums and vertical panels used for tapering traffic shall be spaced at dimension "S". Delineator drums, tubular markers and vertical panels used for tangents shall be spaced at 2 times "S". The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 MPH. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}$ B.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

- A W24-1-48 sign may be used in place of the double reverse curve signs if the tangent between tapers is less than 60'.

KEY

	Type III barricade		Work area
	Sign		Vertical panels back to back
	Delineator drum		

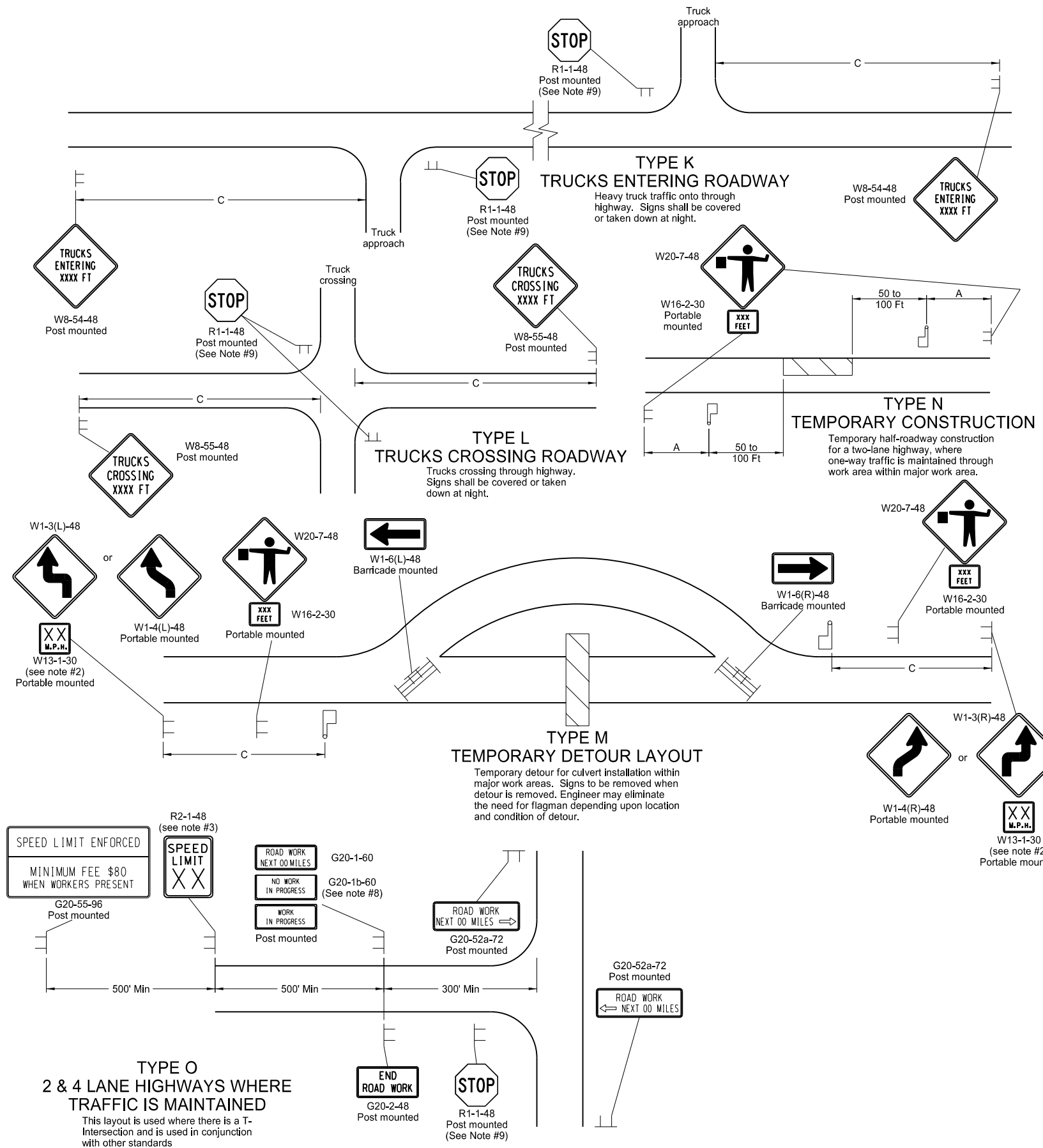
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

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9-27-13	
REVISIONS	
DATE	CHANGE

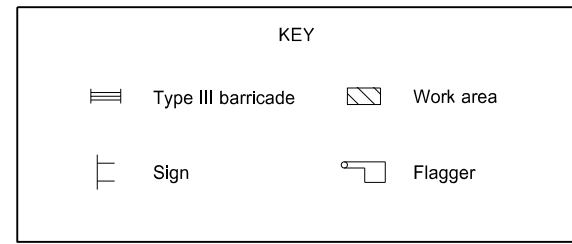
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CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

D-704-22



- Notes
1. Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies. Where necessary, safe speed to be determined by the Engineer.
 2. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
 3. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 4. Existing speed limit signs within a reduced speed zone shall be covered. Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 5. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
 6. The contractor shall install the G20-1b-60 sign when work is suspended for winter.
 7. If existing stop sign is in place, a 48" stop sign is not required.
 8. G20-55-96 sign is not required if this standard is part of other traffic control layouts with this sign or the work is less than 15 days.



ADVANCE WARNING SIGN SPACING

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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

9-27-13

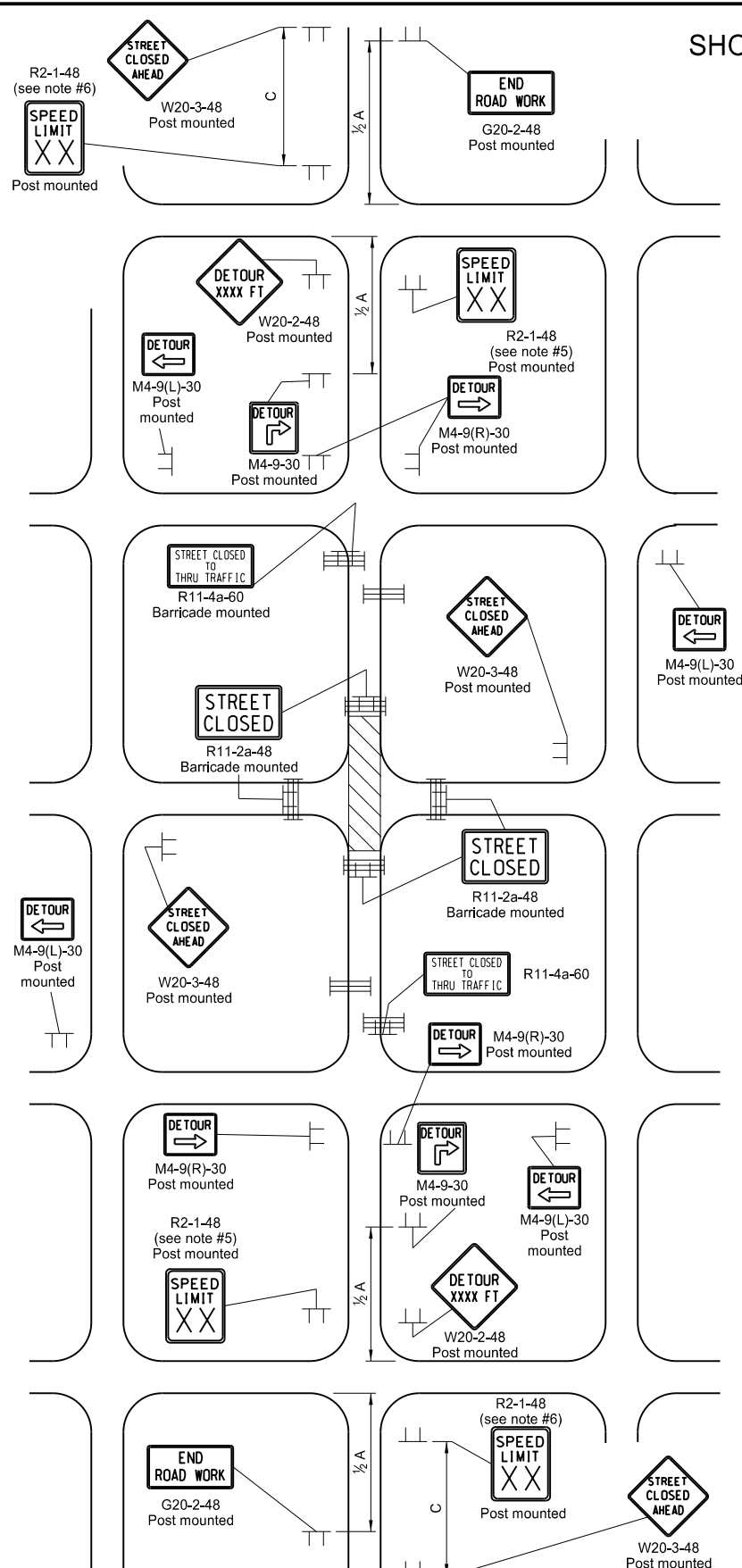
REVISIONS

DATE	CHANGE

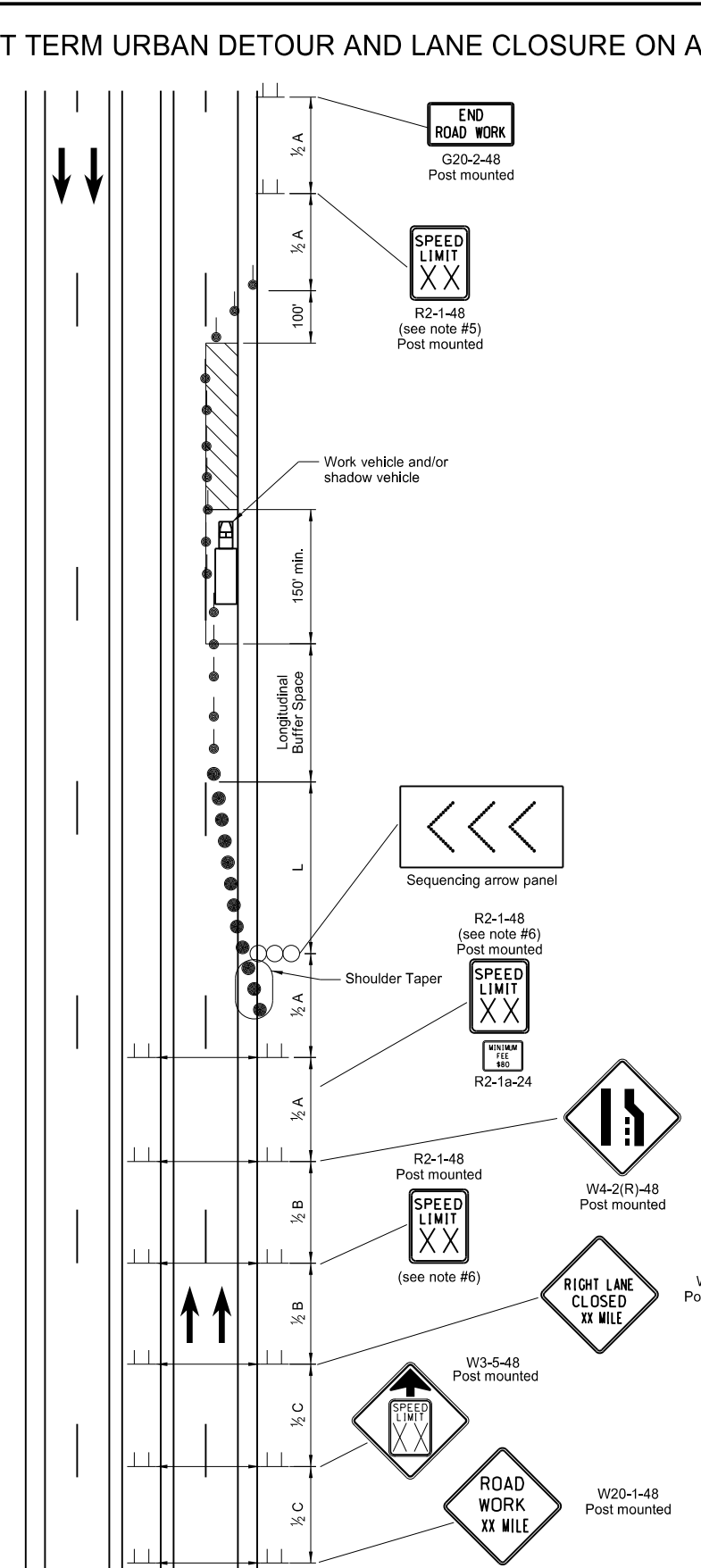
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SHORT TERM URBAN DETOUR AND LANE CLOSURE ON A DIVIDED HIGHWAY LAYOUTS

D-704-23



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



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

- Notes
- Variables
 - S = Numerical value of speed limit or 85th percentile.
 - W = The width of taper
 - L = Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Barricades placed on roadway shall be on a moveable assembly. Signs placed on the roadway shall be placed on skid mounted assemblies.
 - Delinicator drums used for tapering traffic shall be spaced at dimension "S". Delinicator drums or tubular markers used for tangents shall be spaced at 2 times "S".
 - Sequencing Arrow Panels
 - Panels should normally be placed at the beginning of the taper. Where shoulder width does not provide sufficient room the panel should be moved closer to the work area so that it can be placed on the roadway surface.
 - Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
 - Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
 - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the engineer.
 - Intersection control for Type Q may have to be changed on detour. The Engineer in the field shall determine what control is necessary.
 - Where necessary, safe speed to be determined by the Engineer. When parking is present, signs shall be placed so they are entirely visible above parked vehicles or placed at the edge of the parking area so they are visible to oncoming traffic. These signs may be skid mounted when placed on the roadway surface.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

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

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

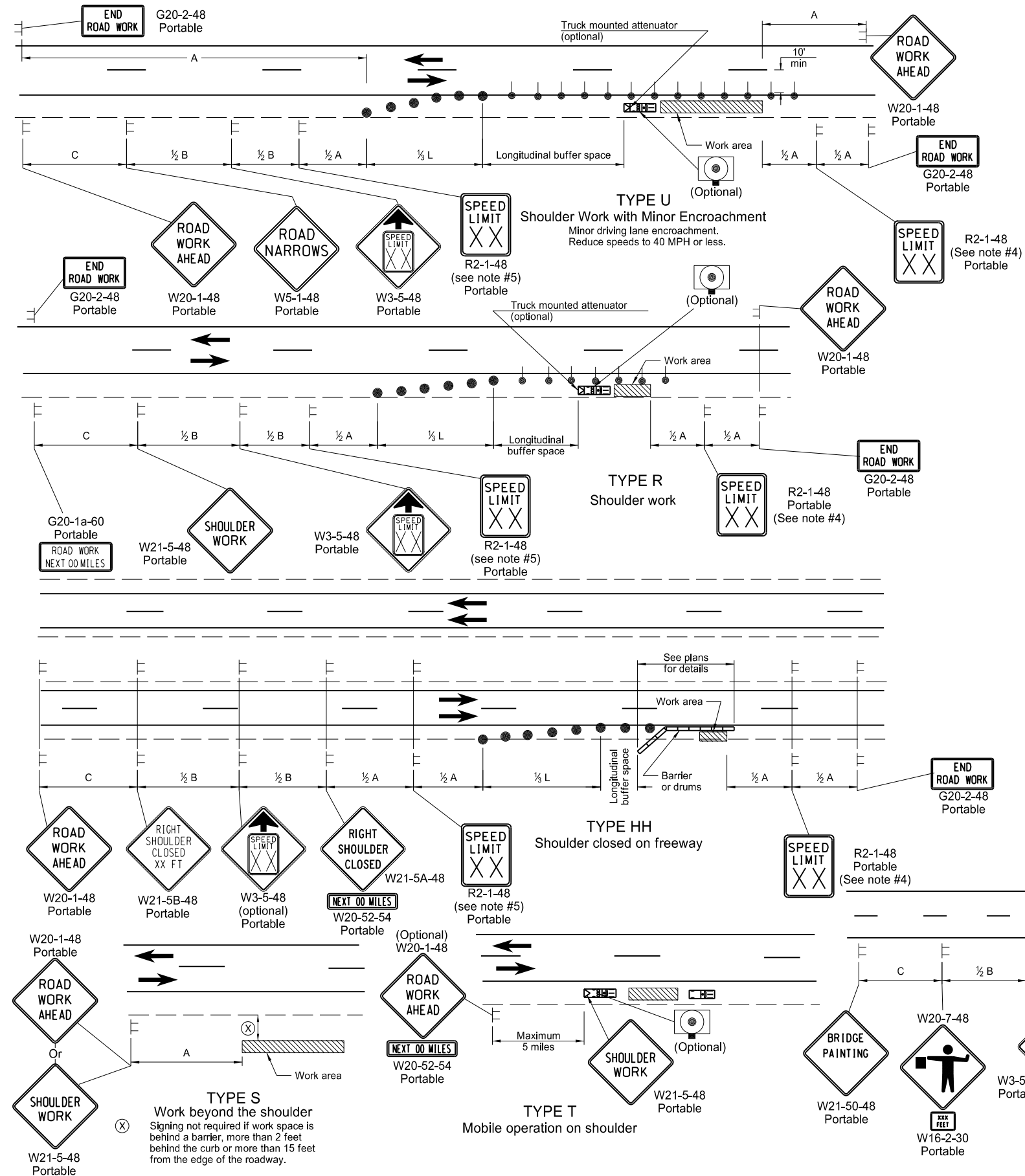
	Type III barricade		Work area
	Sign		Sequencing arrow panel
	Delineator Drum		Tubular Markers

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-27-13	
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SHOULDER CLOSURES AND BRIDGE PAINTING LAYOUTS

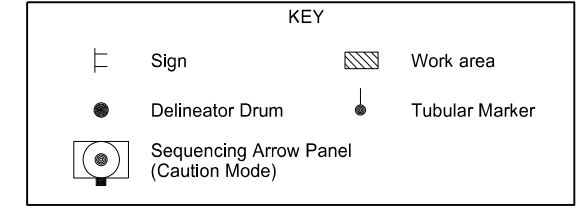
D-704-24



- Notes
- Variables
S = Numerical value of speed limit or 85th percentile.
W = The width of the taper.
L = Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
 - Delineator drums used for tapering traffic shall be spaced at dimension "S".
Delineator drums or tubular markers used for tangents shall be spaced at 2 times "S".
 - Sequencing Arrow Panels
Type A shall be used on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
Type B shall be used on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
Type C shall be used on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
 - The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 - The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at $\frac{1}{2}B$.
 - When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 - Existing speed limit signs within a reduced speed zone shall be covered.
 - The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.

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

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

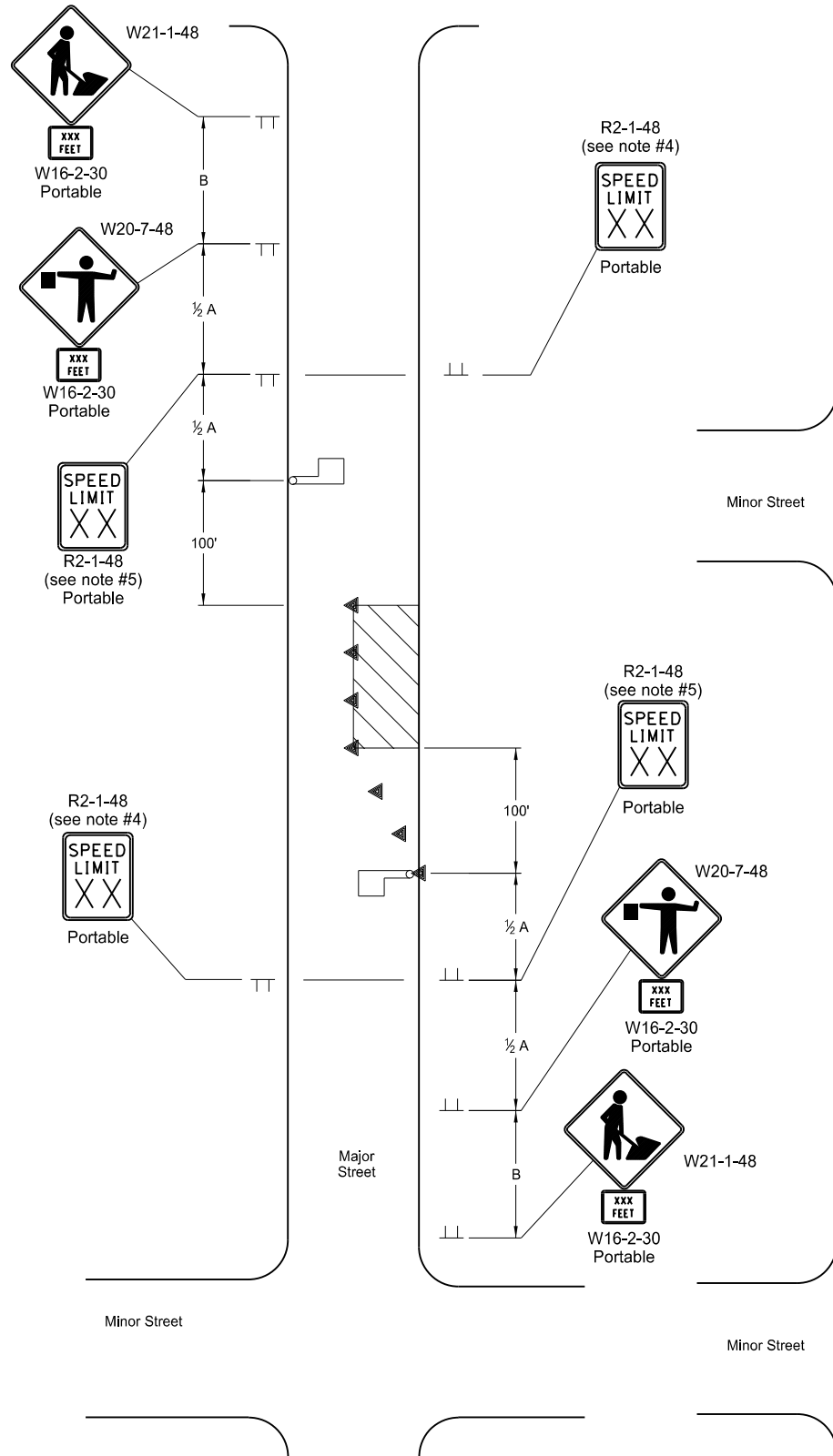


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9-27-13	
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DATE	CHANGE

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LANE CLOSURES ON URBAN STREETS LAYOUTS

D-704-25

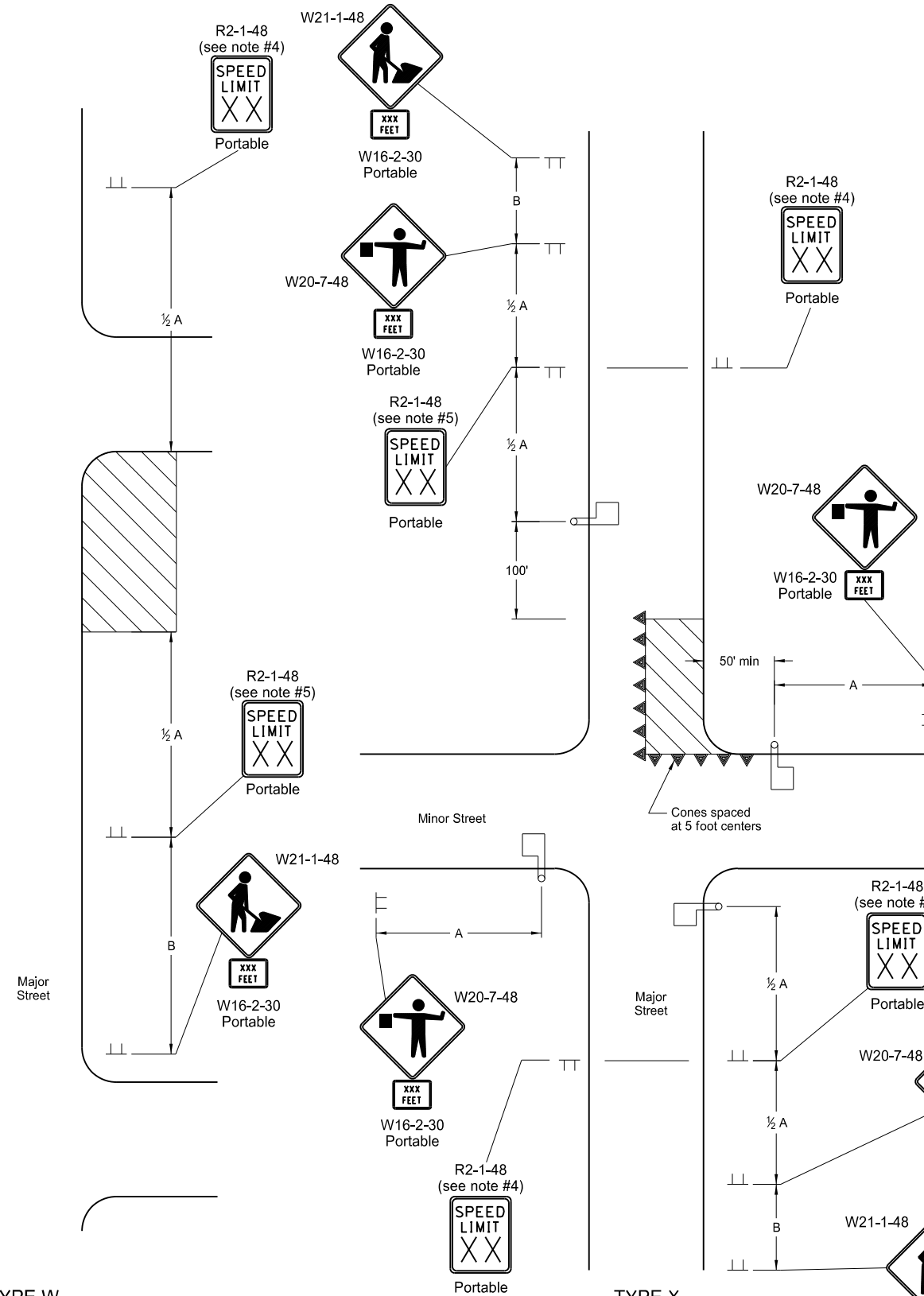


TYPE V
LANE CLOSURE ON URBAN STREET

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

TYPE W
WORK BEYOND CURB ON URBAN STREET

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

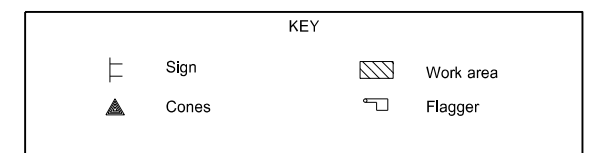


TYPE X
LANE CLOSURE NEAR INTERSECTION ON URBAN STREET

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

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

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

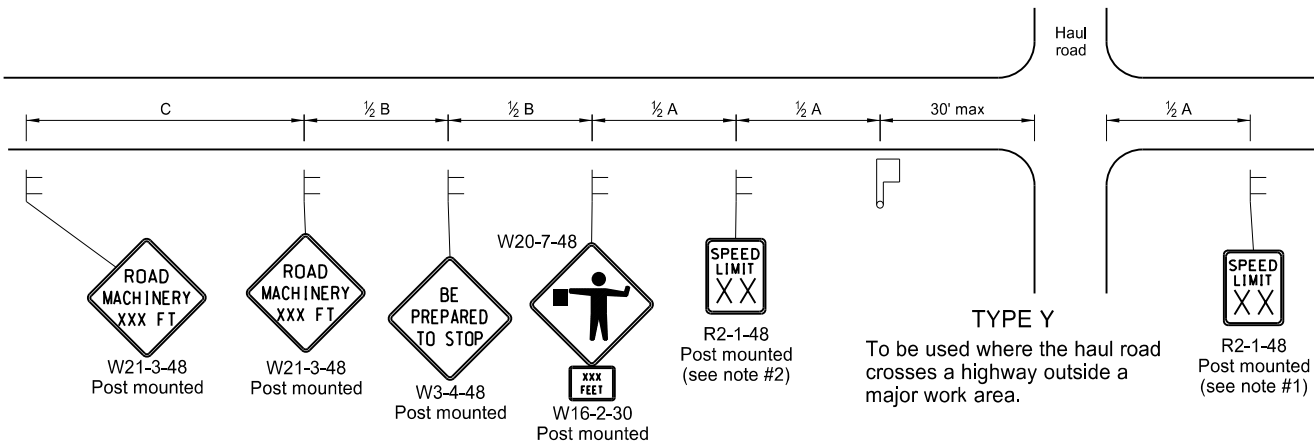


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9-27-13	
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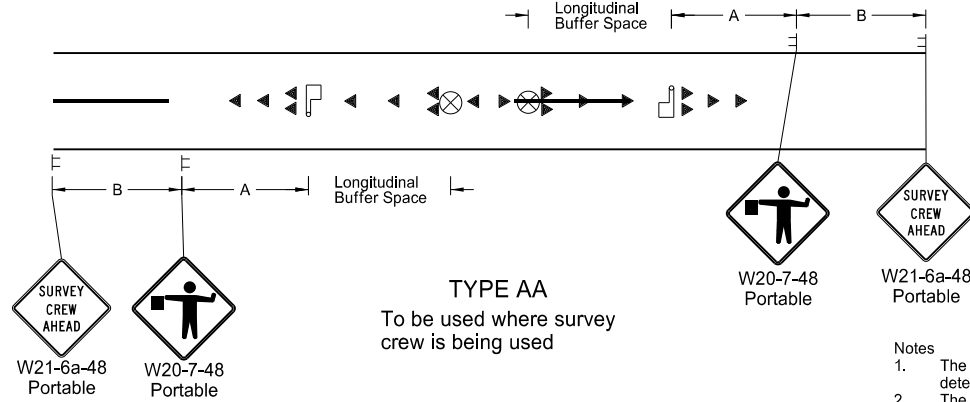
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MISCELLANEOUS SIGN LAYOUTS

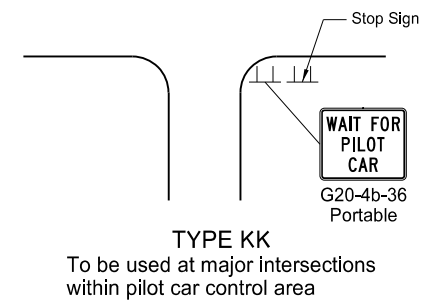
D-704-26



TYPE Y
To be used where the haul road crosses a highway outside a major work area.

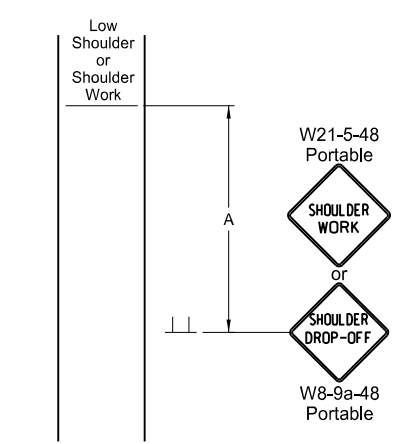


TYPE AA
To be used where survey crew is being used

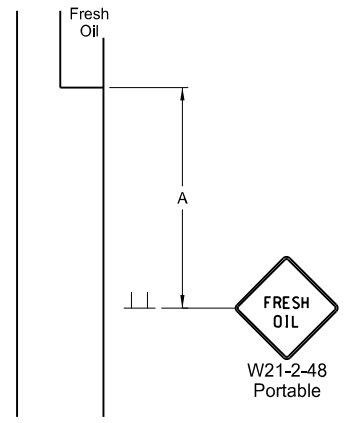


TYPE KK
To be used at major intersections within pilot car control area

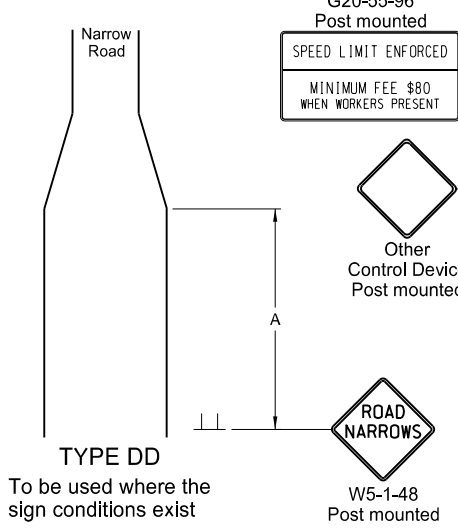
- Notes
1. The speed limit shall be re-established. The exact speed limit shall be determined in the field, dependent on location and conditions.
 2. The reduced speed limit shall be determined dependent on the in place speed limit before construction. The speed limit reduction should not exceed 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. In this case, the speed limit reduction shall not exceed 30 MPH. Where speed limits are to be reduced more than 30 MPH, a second speed limit sign shall be installed with the desired speed reduction but shall not exceed 30 MPH. The second speed limit sign shall be placed at 1/2 B.
 3. When warning signs are used in urban areas and the signs are not portable, flags shall be installed. The flags shall be 24 inches square, mounted perpendicular to the edges of the diamond sign, and at such a distance above the edge so that when the flag is limp it will not touch the sign. Rural areas will not require flags.
 4. Existing speed limit signs within a reduced speed zone shall be covered.
 5. The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with the NDDOT Standard Specifications.
 6. G20-55-96 signs are not required if this standard is part of other traffic control layouts, or the work is less than 15 days.
 7. When a pilot car operation is used, place a G20-4b-36 "Wait For Pilot Car" sign at major intersections within pilot car control area.



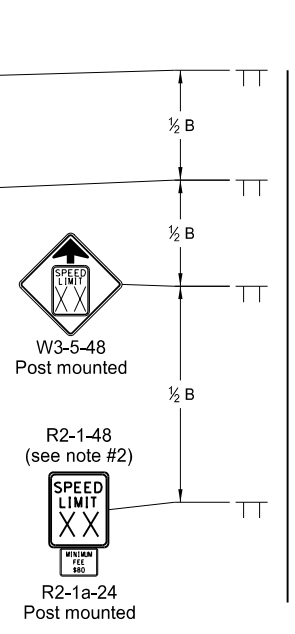
TYPE BB
To be used within a major work area where the sign conditions exist



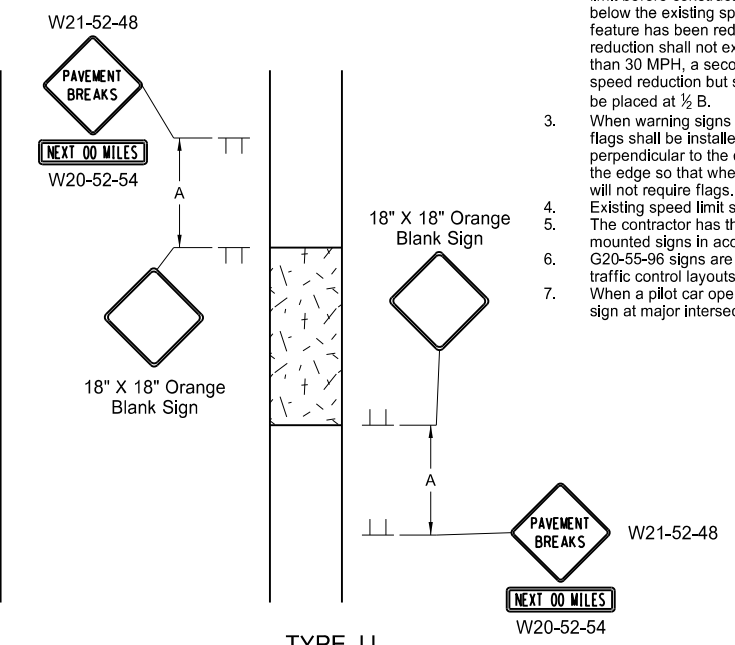
TYPE CC
To be used where the sign conditions exist



TYPE DD
To be used where the sign conditions exist



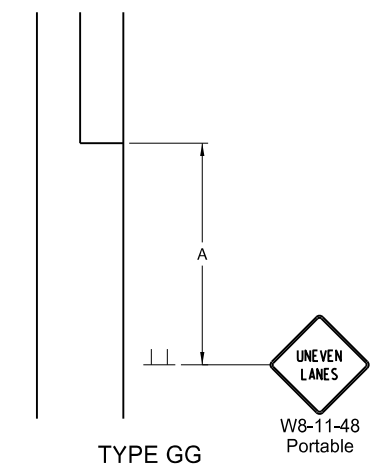
TYPE Z
To be used where speed zone is needed



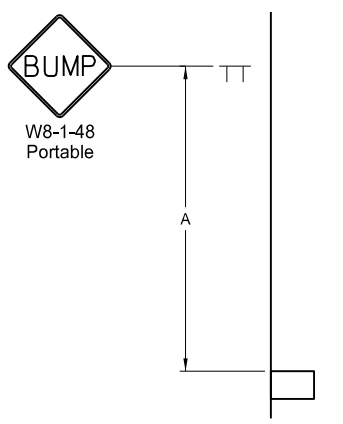
TYPE JJ
To be used where there is a break in the pavement. These signs may be skid mounted or post mounted and shall be installed when conditions exist and removed when not applicable.

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

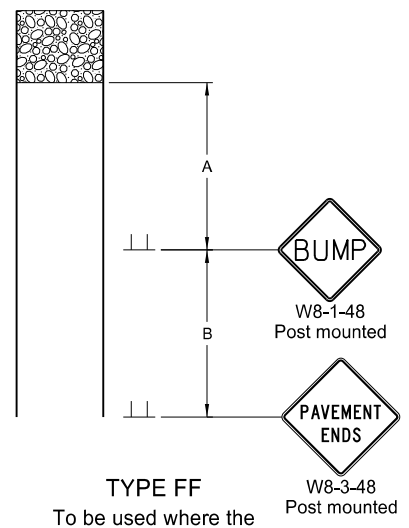
* Posted speed, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.



TYPE GG
To be used where a difference of elevation between lanes exist



TYPE EE
To be used where the sign conditions exist



TYPE FF
To be used where the sign conditions exist

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

KEY

Sign (represented by a vertical line with a horizontal bar)

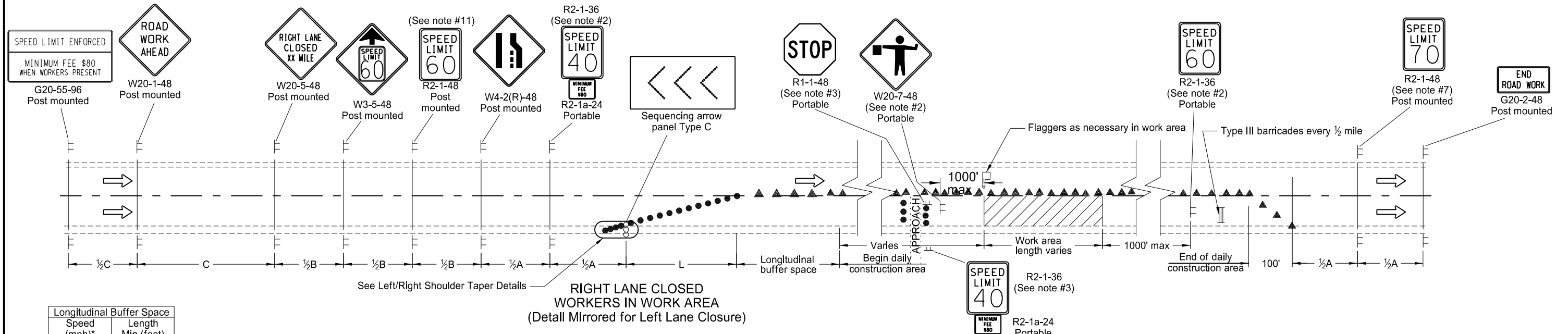
Flagger (represented by a square with a diagonal line)

Cones (represented by a triangle)

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9-27-13	
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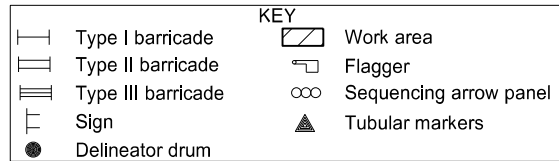
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SIGN LAYOUT FOR ONE LANE CLOSURE



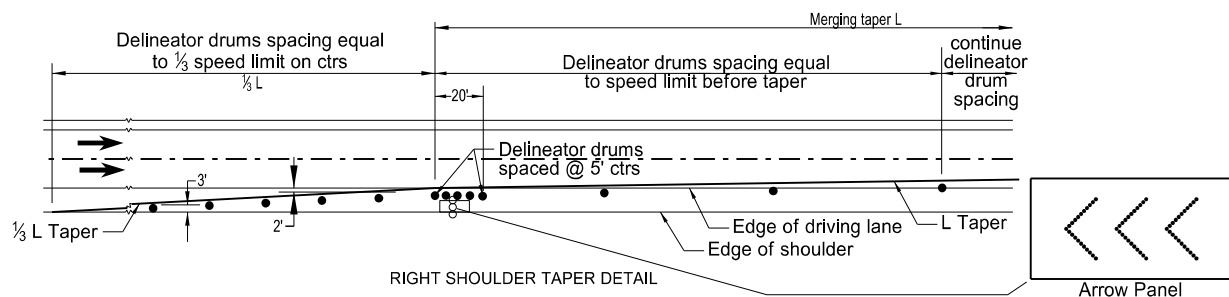
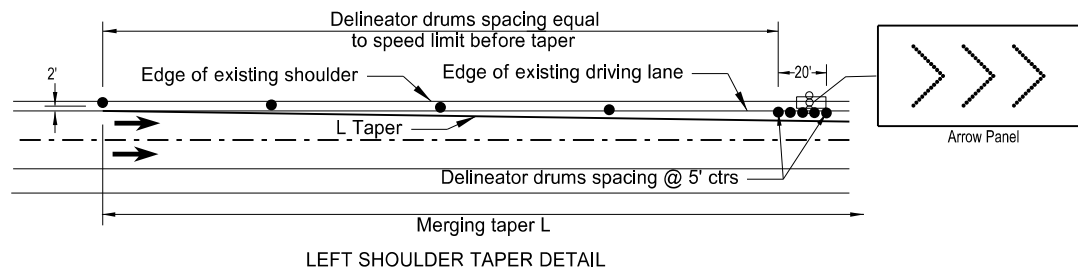
Speed (mph)*	Length Min (feet)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

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



Notes:

- Install advance signs for flagging when flaggers are flagging.
- Move the advanced flagger sign and speed limit signs as the work area moves through the construction zone. When the work area is not visible from the flagger, move the flagger station so the work area is visible. Place the 40 mph speed limit sign at 1/2 A in advance of the flagger sign and move the 60 mph speed limit sign. Cover or remove the 40 mph speed limit and the Minimum Fee \$80 signs upon completion of the work day or when workers are not present. Determine the exact speed limit in the field, dependent on location and conditions.
- Approaches: When the work area encompasses an approach, install a 40 mph speed limit sign to control the approach. Cover the existing stop sign and install a new portable stop sign when the approach is on the side of the lane closure. Remove the approach speed limit sign once the main line 40 mph speed zone is moved past the approach.
- Variables:
 - S=Numerical value of speed limit or 85th percentile
 - W=The width of taper.
 - L=Minimum length of taper, or $S \times W$ for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $(W \times S \times S) / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
- Space delineator drums for tapering traffic at the dimension "S". Space tubular markers used for tangents at 2 times dimension "S".
- Place sequencing arrow panels at the beginning of the taper when possible. Where shoulder width does not provide sufficient room, move the panel closer to the work area and place on the roadway surface.
 - Use Type A on roadways with slow moving traffic speeds and low volume (25 mph or less and 750 ADT or less).
 - Use Type B on roadways with moderate traffic speeds and volumes (40 mph or less and 5000 ADT or less).
 - Use Type C on roadways with high traffic speeds and volumes (over 40 mph or over 5000 ADT).
- Re-establish the speed limit. Determine the exact speed limit in the field, dependent on location and conditions.
- Cover existing speed limit signs within a reduced speed zone.
- Install flags when warning signs are used in urban areas and the signs are not portable. Mount 24 inch square flags perpendicular to the edges of the diamond sign, and at such a distance above the edge that the flag does not touch the sign when limp. Rural areas will not require flags.
- Determine the reduced speed limit dependent on the in place speed limit before construction. Do not exceed a speed limit reduction of 10 mph below the existing speed limit, unless the design speed of the work zone feature has been reduced below the 10 mph. Where speed limits are to be reduced more than 30 mph, install a second speed limit sign so no single speed reduction exceeds 30 mph. Place the second speed limit sign at 1/2 B.
- The contractor has the option of using portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Specifications.
- Sign G20-55-96 is not required if this standard is part of other traffic control layouts or the work is less than 15 days.



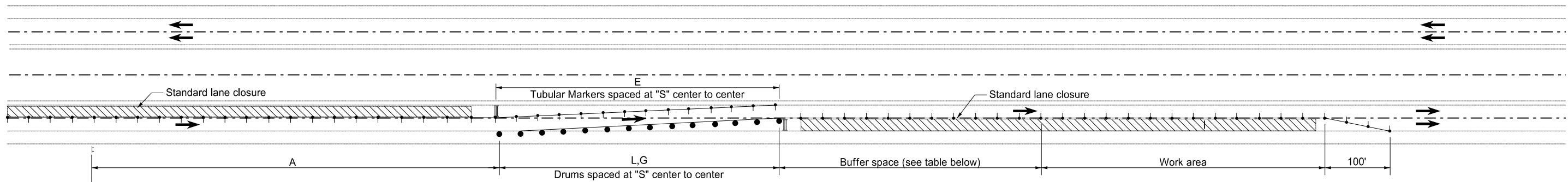
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-26-2012	
REVISIONS	
DATE	CHANGE
3-15-16	Removed Do Not Pass signs and updated notes

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TRAFFIC CONTROL SYSTEM
LANE SHIFT BETWEEN A LANE CLOSURE AND AN OPPOSITE LANE CLOSURE

D-704-34A



QUANTITIES	
TYPE III BARRICADES	2 Each
DELINEATOR DRUMS	14 Each
TUBULAR MARKERS	14 Each
RAISED PAVEMENT MARKERS (White)	Varies
OBLITERATION OF PAVEMENT MARKING	Varies

KEY			
	Work area		Delineator drum
	Type III barricade		Tubular markers
	Traffic Direction		Sign

LEGEND	
E	Obliteration of pavement marking (10' line, 30' skip centerline)
G	Raised pavement markers (white) 5' ctrs.

Notes

- Variables
 - S = Numerical value of posted speed limit, off-peak 85th percentile speed prior to work starting, or the anticipated operating speed in mph.
 - W = Width of offset in feet.
 - L = Taper length in feet. Speeds 40 mph or less $L = WS^2 / 60$. Speeds 45 mph or greater $L = WS$.
- Signs and barricade shown to be placed on roadway shall be placed on moveable assemblies.
- Existing speed limit signs within a reduced speed zone shall be covered.
- Obliterated or covered pavement marking shall be paid for as Obliteration of Pavement Marking. The covering shall be approved by the Engineer.
- The contractor has the option of using portable sign supports in lieu of post mounted sign as shown on the standard drawings in accordance with NDDOT Standard Specifications.
- When placing traffic control devices, speed reductions will be necessary. The "Minimum Fee \$80" sign shall be placed below these speed limit signs.
- Obliteration of pavement marking (10' line, 30' skip, centerline) and raised pavement markers are not necessary when the work is 14 days or less.

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

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

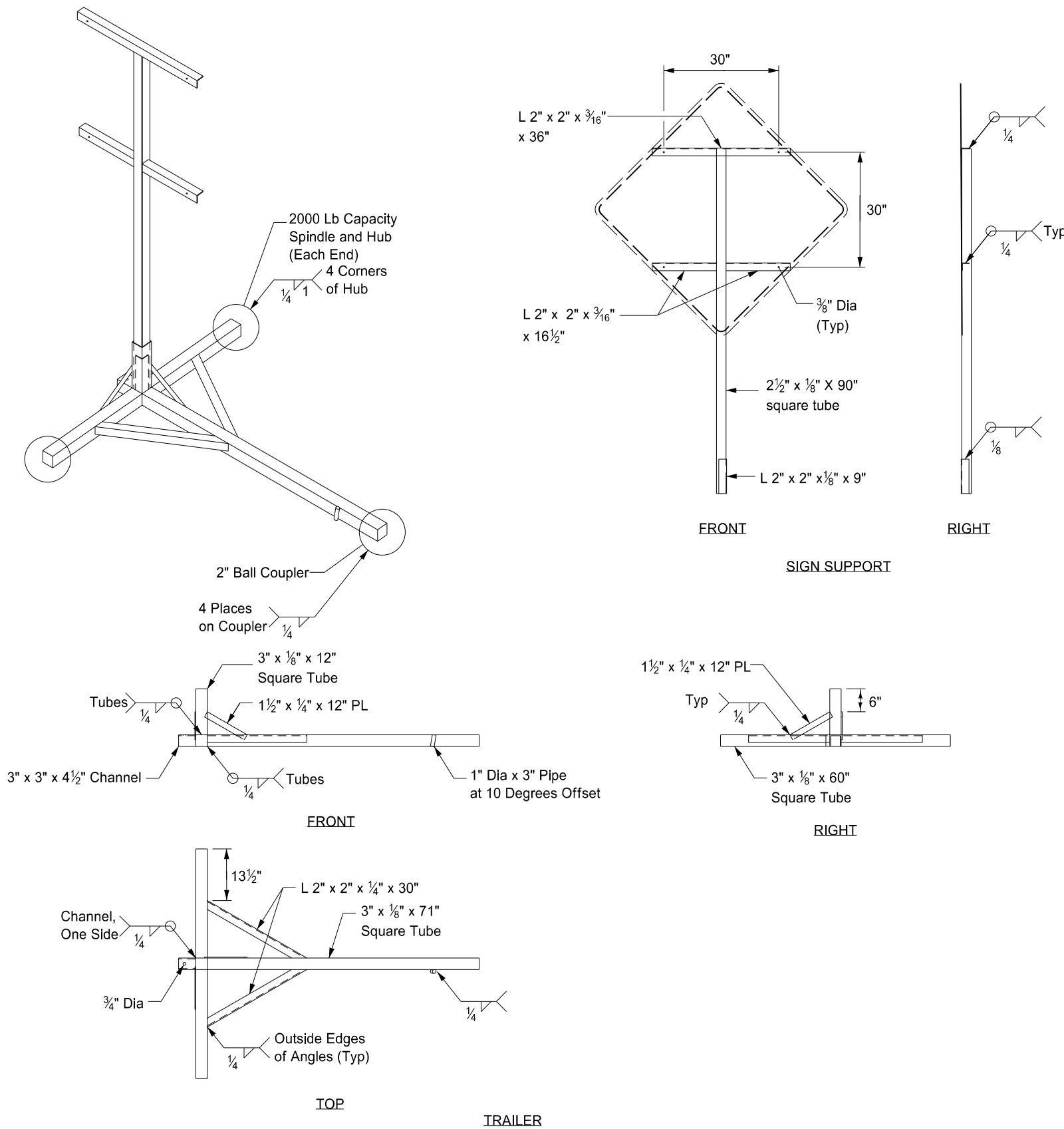
ADVANCE WARNING SIGN SPACING			
Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway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

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-26-2012	
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DATE	CHANGE

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PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50



Notes:

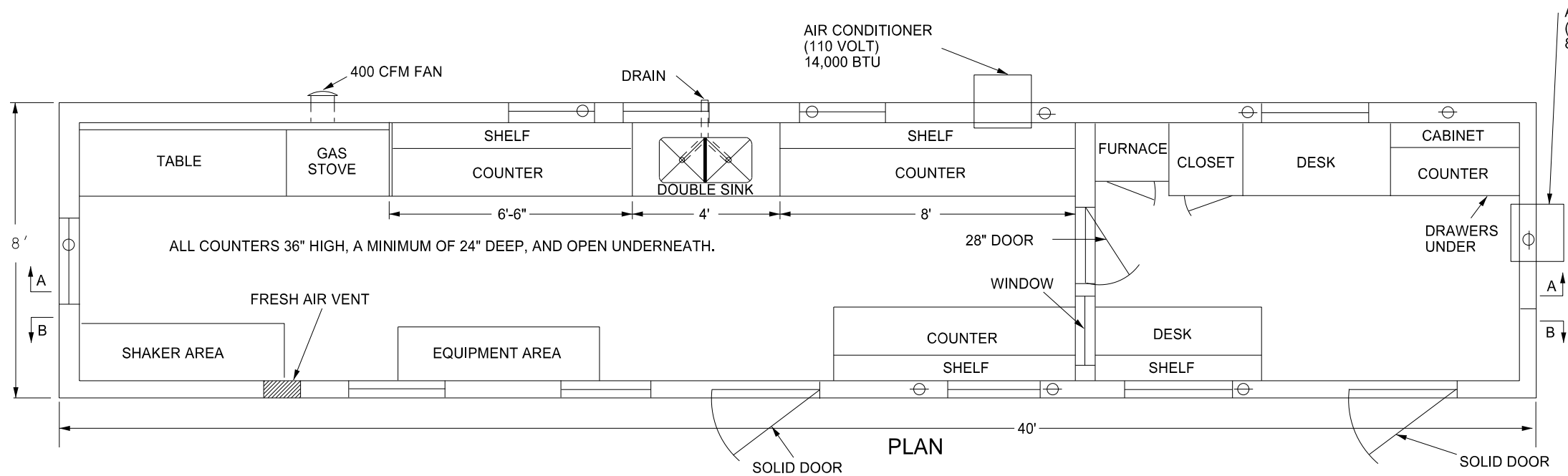
- ① The maximum weight of the assembly is 250 pounds.
- ② Use a 14" wheel and tire.
- ③ Automotive and equipment axle assemblies may not be used for trailer-mounted sign supports.
- ④ Other NCHRP 350 crash tested assemblies are acceptable.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
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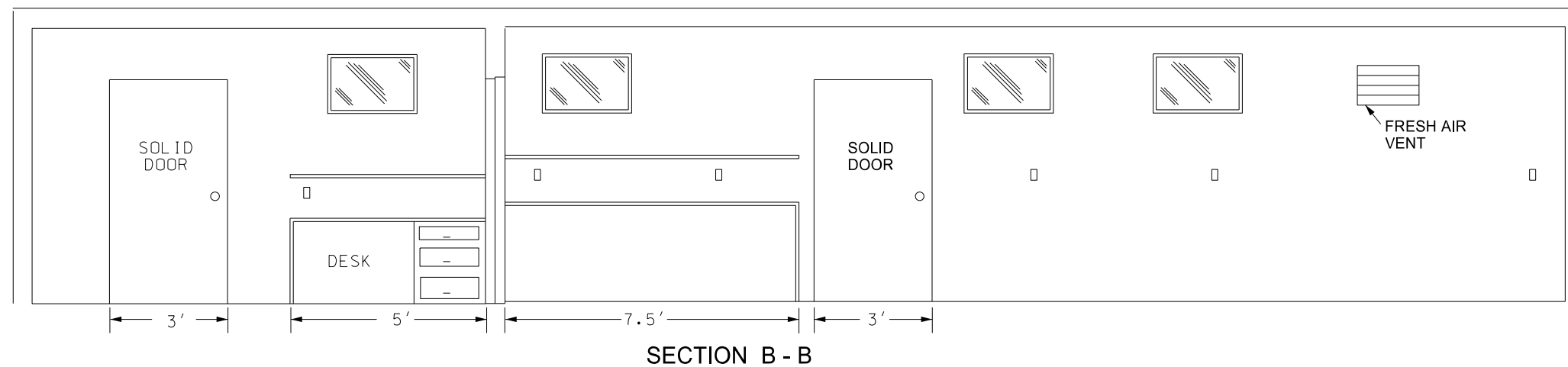
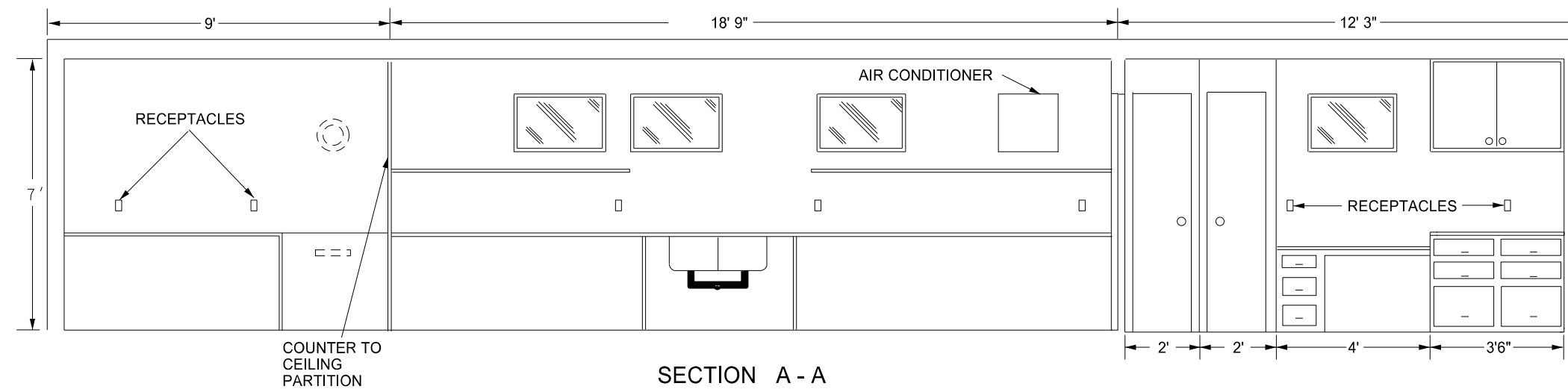
BITUMINOUS LABORATORY

D-706-1



Provide a laboratory with the following:

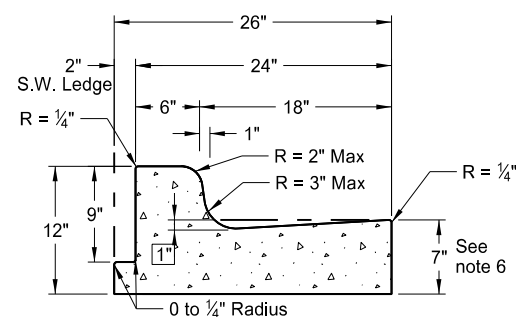
1. A 1'x1' shelf at 36" above the regular countertop.
2. Double compartment stainless steel sink, with each compartment a minimum of 16"x14"x10" deep. Provide water service lines made of copper or plastic and a diameter of 1/2 inch.
3. An exhaust fan capable of removing inside air at a rate of 400 CFM.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



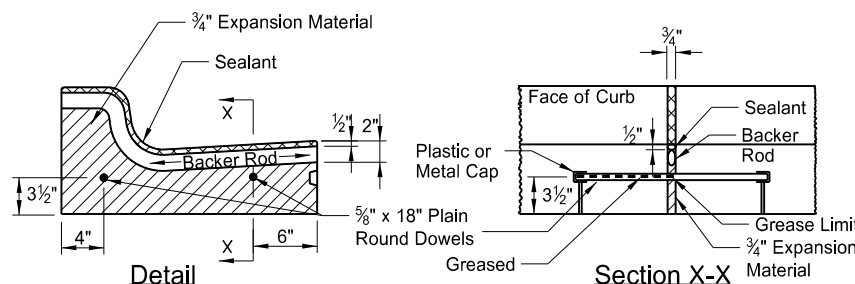
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
07-30-14	Changed standard's title and revised notes.
01-11-16	Revised notes.

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 on 01/11/16 and the original document is stored at the North Dakota Department of Transportation

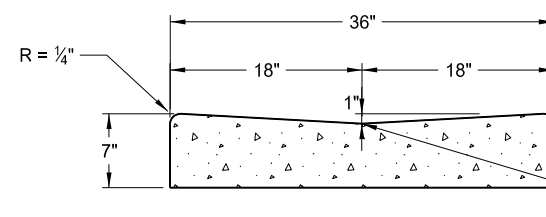
Curb & Gutter and Valley Gutter



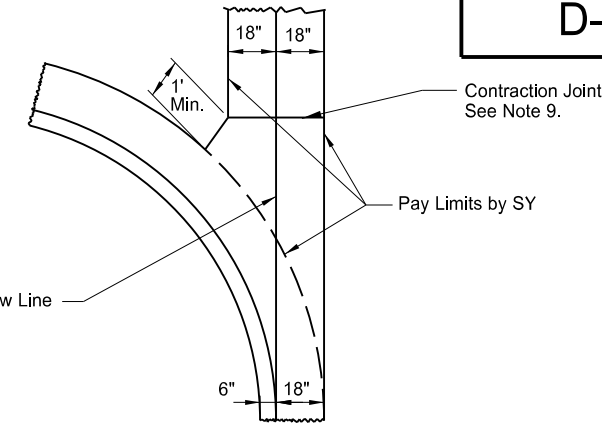
Curb & Gutter Type 1 (Sec. A & B)
Adjacent to Concrete Sidewalk,
Median, or Parking Lot.
(Sec. A shown. See Sec B for
additional details.)



Isolation Joint



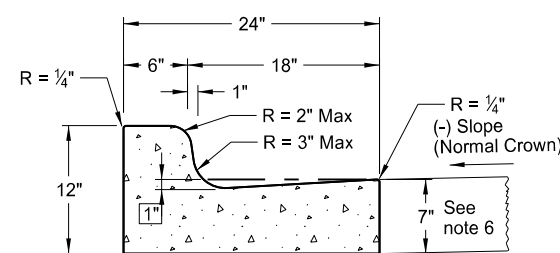
36" Concrete Valley Gutter Detail



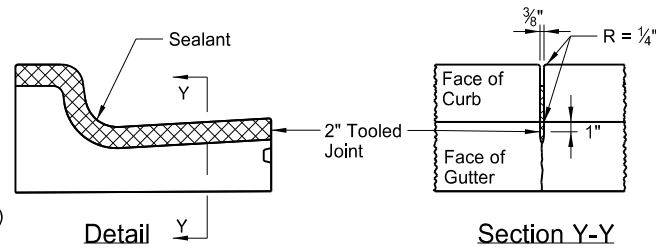
36" Concrete Valley Gutter Plan

NOTES:

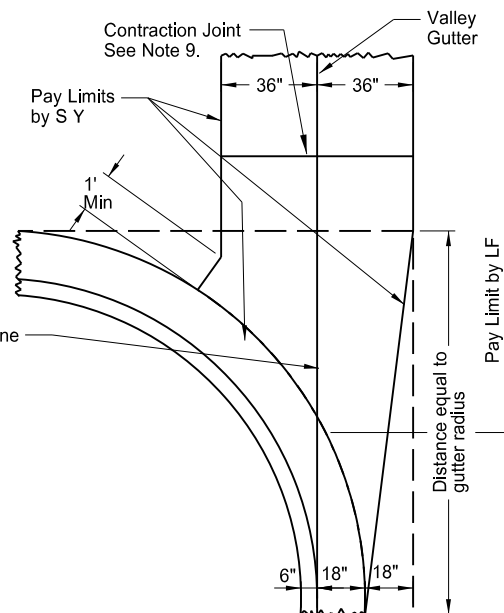
1. Curb and Gutter Type 1 (Sec. A & B) to be used. Section "A" to be used with (-) pavement slopes and section "B" to be used with (+) pavement slopes.
2. Contraction Joints: Tool the Curb & Gutter 2" as shown on the contraction joint details.
3. Isolation Joints: Isolation joint material shall be 3/4"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



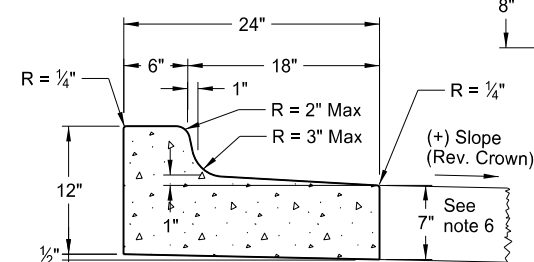
Curb & Gutter Type 1 (Sec. A)



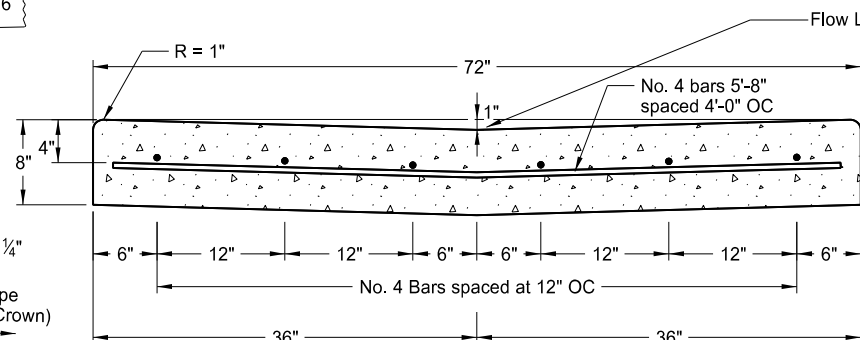
Contraction Joint
(10' Max Spacing)



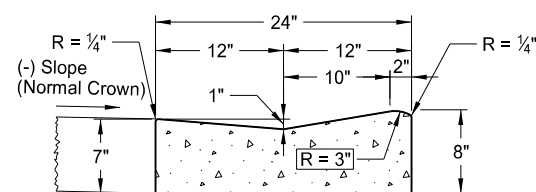
72" Concrete Valley Gutter Plan



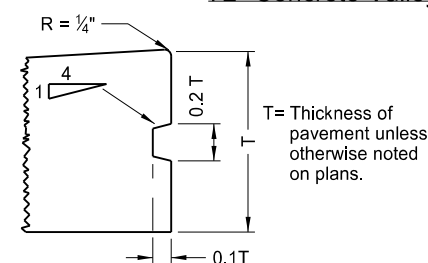
Curb & Gutter Type 1 (Sec. B)



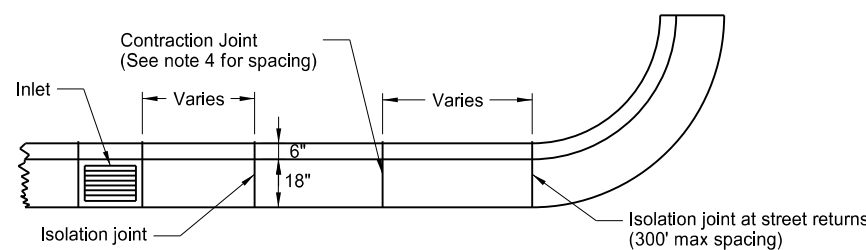
72" Concrete Valley Gutter Detail



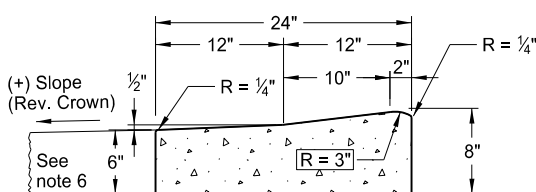
Mountable Curb & Gutter Type 1 (Sec. A)



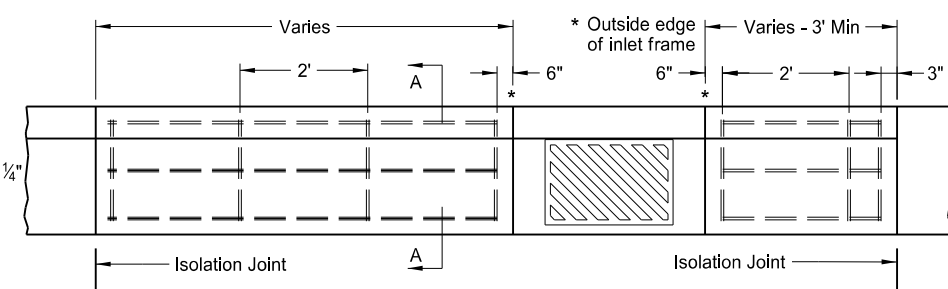
Keyway Detail for Curb & Gutter
(To be used with PCC Pavement and Drives)



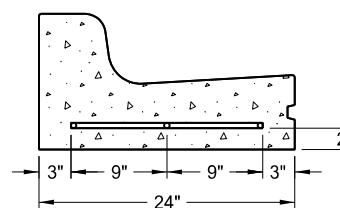
Joint Location Detail



Mountable Curb & Gutter Type 1 (Sec. B)



Curb & Gutter Reinforcing at Inlets



Section A-A

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

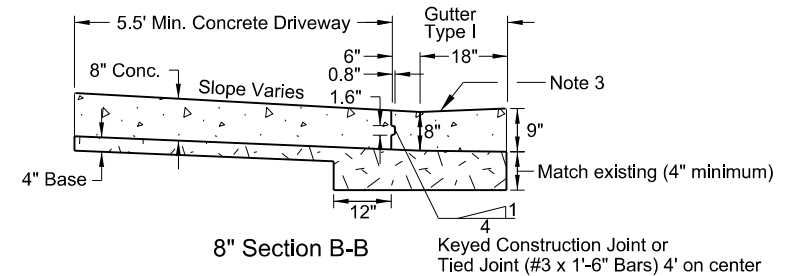
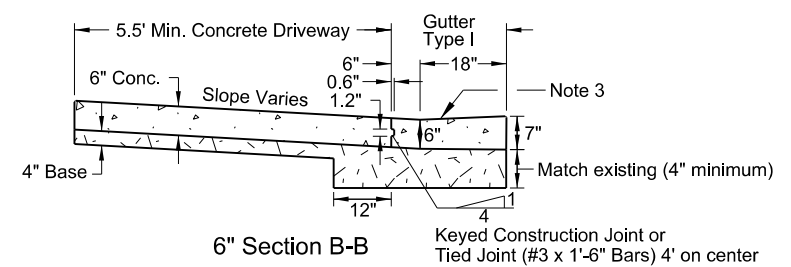
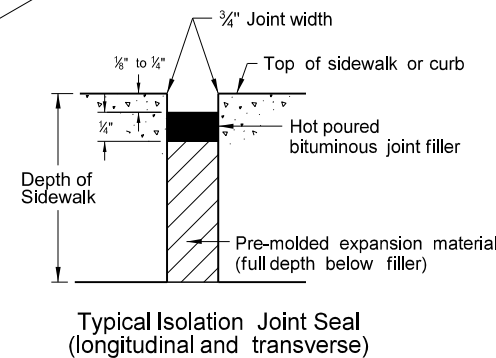
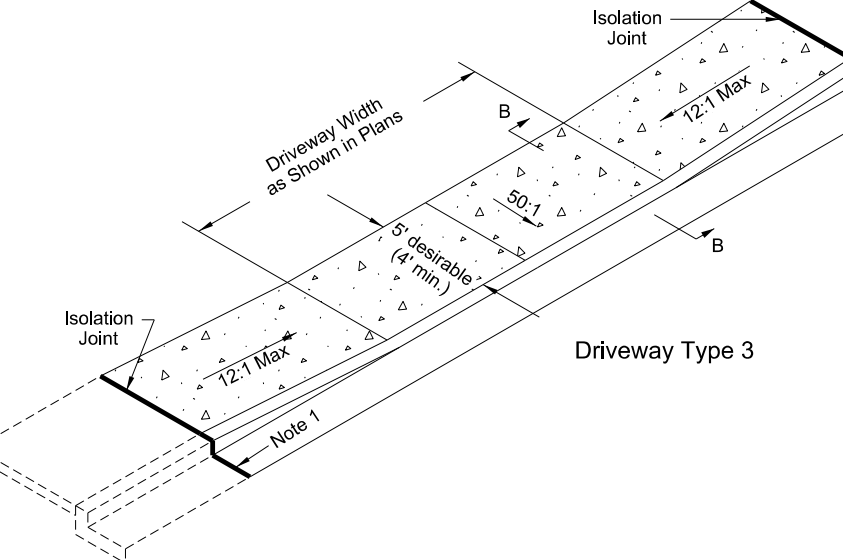
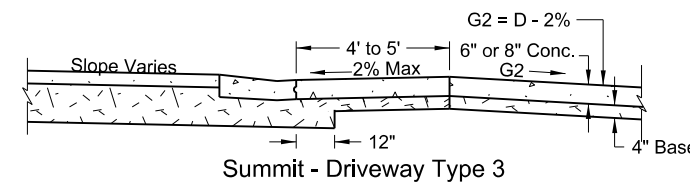
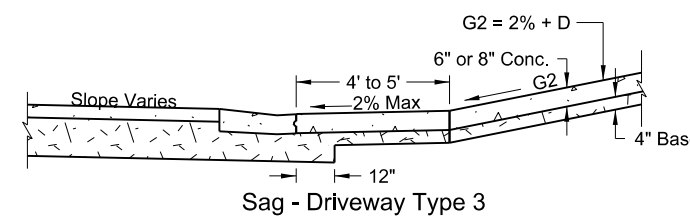
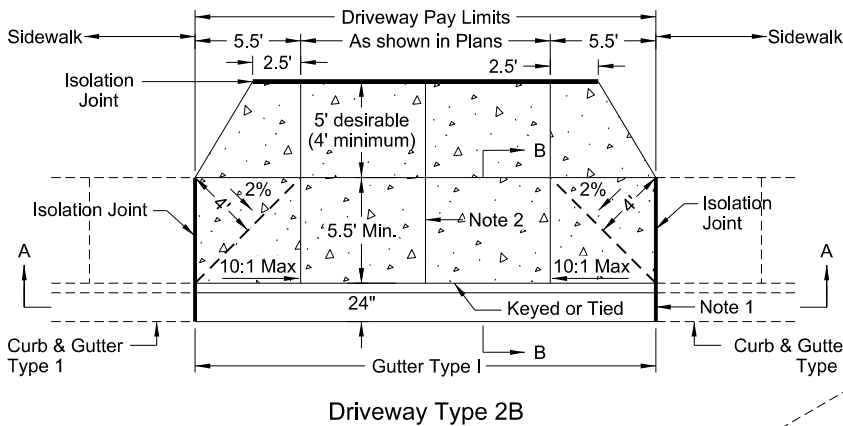
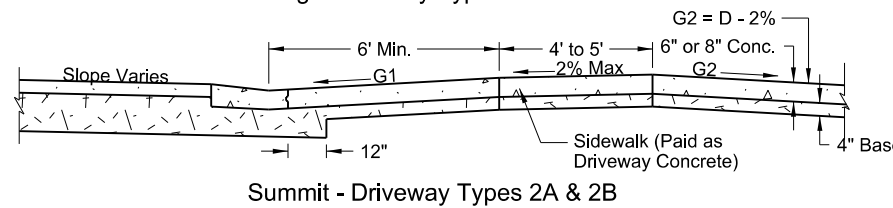
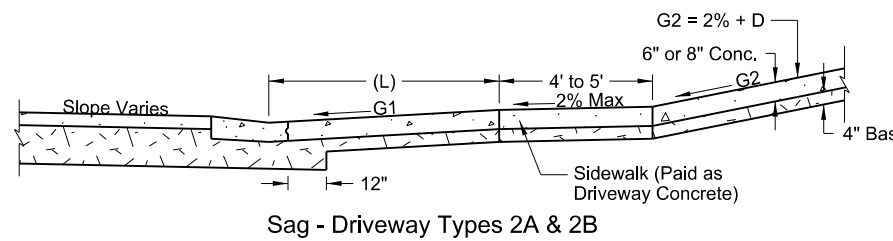
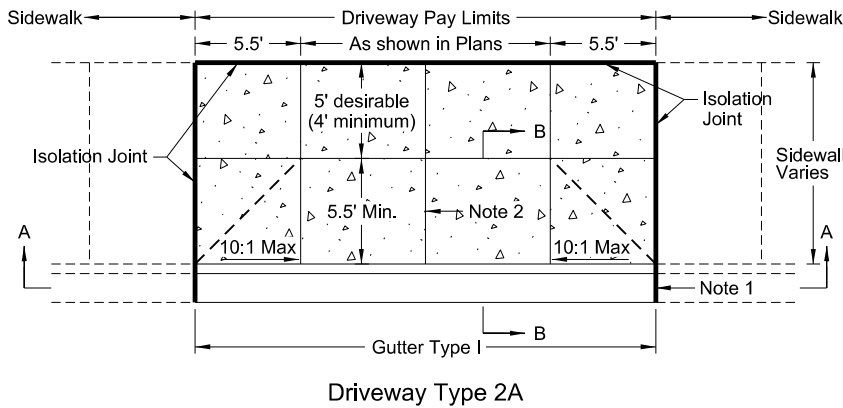
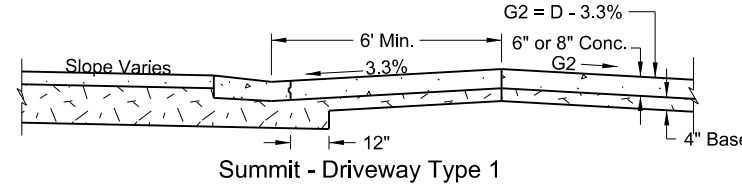
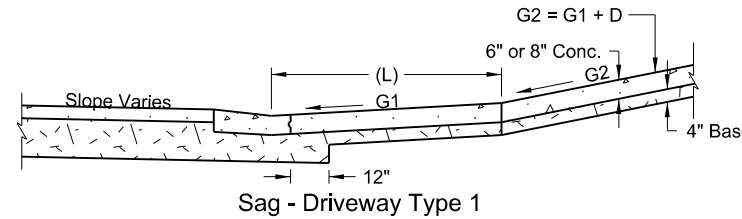
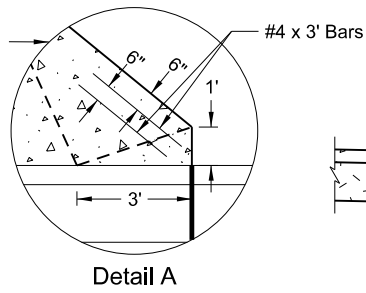
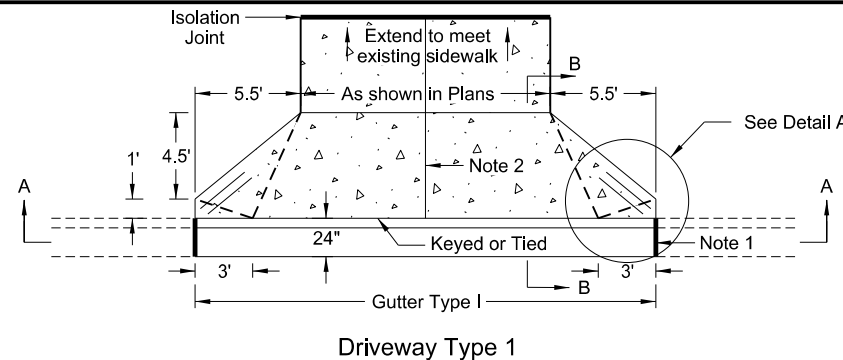
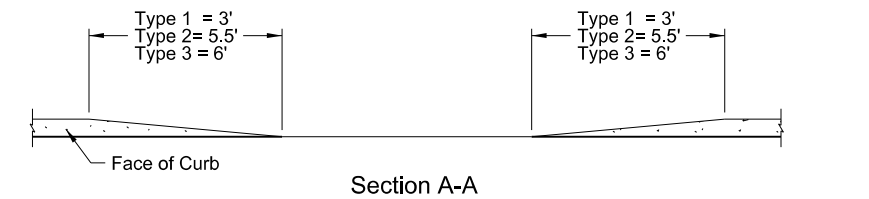
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CONCRETE DRIVEWAY - URBAN

NOTES:

- See Standard D-748-1 for curb and gutter isolation joint detail. On PCC roadways, the curb and gutter joints should match those of the pavement as much as practical.
- Joint Spacing: 1 Center contraction joint to be used on all driveways 20' width or less, 2 center contraction joints for driveways > 20' to 30' width, and 3 center contraction joints for driveways greater than 30' width.
The contraction joints may be sawed or a grooved joint, and shall be a minimum of 1/3 the depth of the concrete.
Isolation joints should also be used between separately poured concretes, or between old and new concrete.
All joints shall be sealed with hot pour bituminous filler or low modulus silicone. The sealant shall be installed and tooled in accordance with the manufacturer's recommendations.
All costs for labor, equipment, and material necessary to construct and seal joints shall be included in the price bid for the driveway.
- Gutter-Type 1 shall be paid for at the unit price bid for "Curb and Gutter-Type 1".
- 6" Driveway to be used unless otherwise specified.
- 4" base material shall be placed under the concrete driveway. All labor and materials necessary to place the base material shall be included in the price bid for Salvage Base Course or Aggregate Base Course CL 5.
- Sidewalk that falls behind a driveway shall be constructed to the same thickness as the driveway and shall be paid for as driveway concrete.



Driveway ADT	Grade G1		Dimension (L) ft.		Grade Changes (D)	
	Desirable	Maximum	Desirable	Maximum	Desirable	Maximum
(0-500)	5%	12% or controlled by vehicle clearance	12	6	6%	15% or controlled by vehicle clearance
(500-1500)	3%	8%	20	20	3%	6%
(> 1500)	2%	5%	40	40	0%	3%

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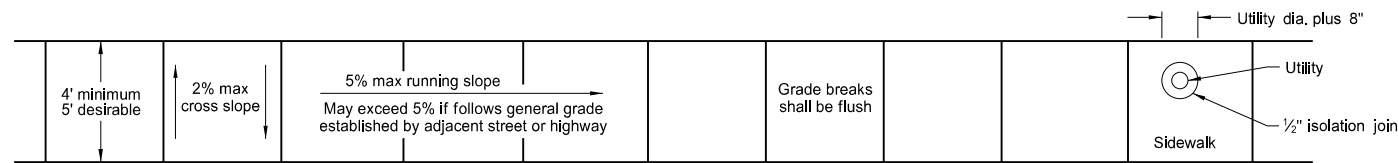
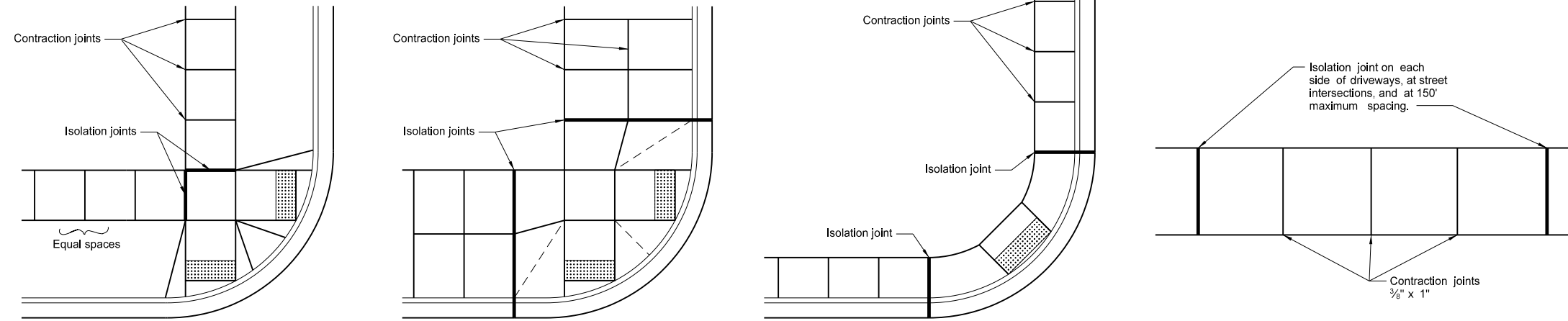
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SIDEWALK

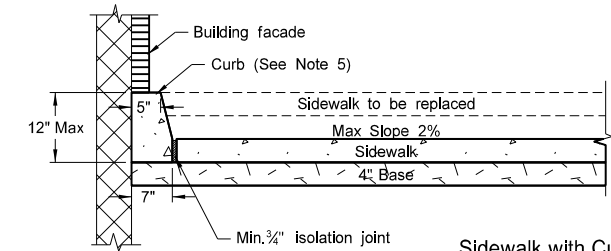
D-750-2

NOTES:

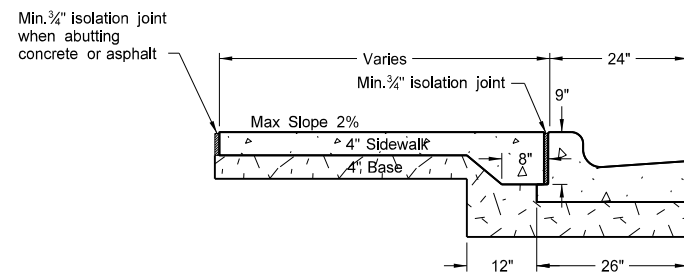
1. Curb ramp and detectable warning panel layouts are for informational purposes only. See Standard Drawing D-750-3 for curb ramp and detectable warning panel details.
2. Joint Spacing: Transverse contraction joint spacing shall vary from 4' to 6' to create approximate square panels. Longitudinal contraction joints shall be used where the sidewalk width is 8' or greater, and shall be spaced at half the sidewalk width. The contraction joints may be sawed or a grooved joint, and shall be a minimum of 1/3 the depth of the concrete. When the sidewalk is adjacent to the curb & gutter, the sidewalk joint spacing shall be varied to match up with the curb & gutter joints. Isolation joints should also be used between separately poured concretes, or between old and new concrete. The cost for all labor, equipment, and material necessary to construct contraction and isolation joints shall be included in the price bid for sidewalk concrete.
3. 4" sidewalk concrete thickness to be used unless otherwise specified in the plans.
4. 4" base material thickness to be used unless otherwise specified in the plans. All labor and materials necessary to place the base material shall be included in the price bid for "Salvage Base Course" or "Aggregate Base Course CL 5."
5. Landscaping is preferred to modify existing ground slope changes as needed. If not possible, such as adjacent buildings, a vertical curb may be used as shown in the detail below. The curb will be paid for at the unit price bid for the item "Curb - Type I" per lineal foot.



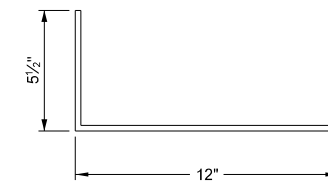
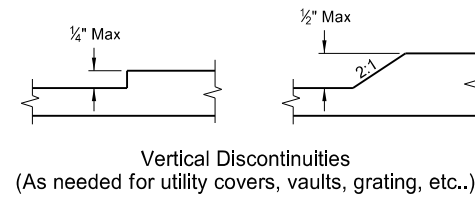
Utility Blockout



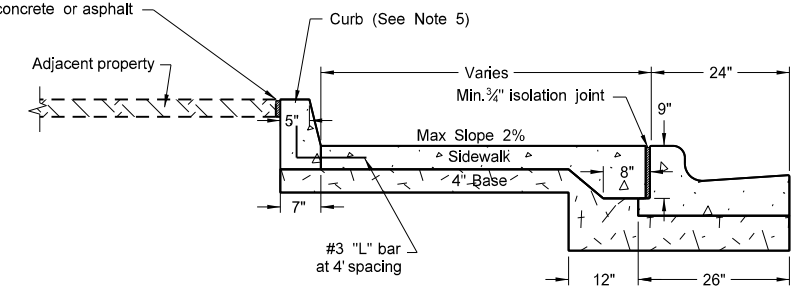
Sidewalk with Curb Detail (Building face application)



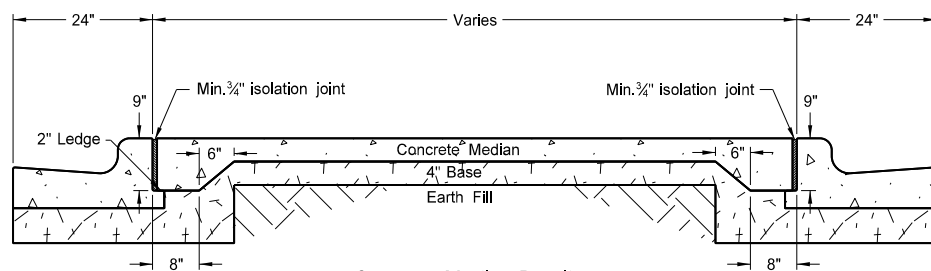
Sidewalk Detail (Installed adjacent to curb and gutter)



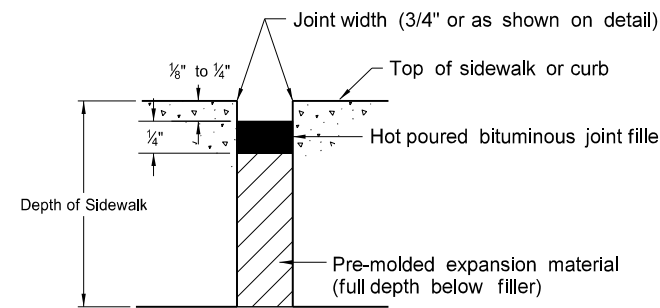
Min. 3/4" isolation joint when abutting concrete or asphalt



Sidewalk with Curb Detail (Adjacent property application)



Concrete Median Detail



Typical Isolation Joint Seal (longitudinal and transverse)

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CURB RAMP DETAILS

D-750-3






+More Right of Way

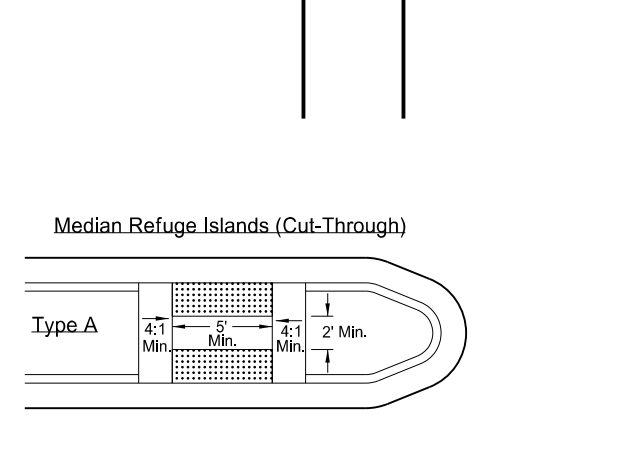
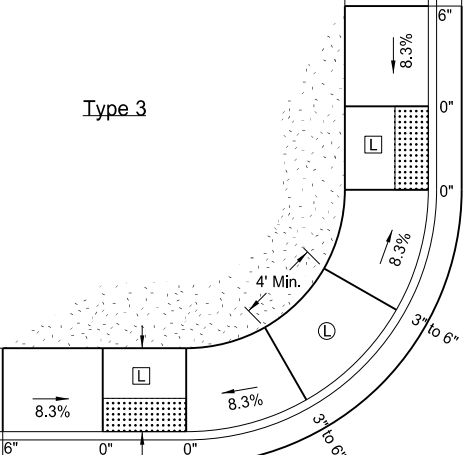
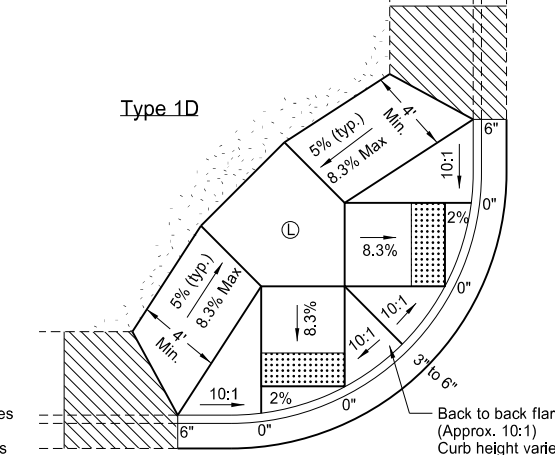
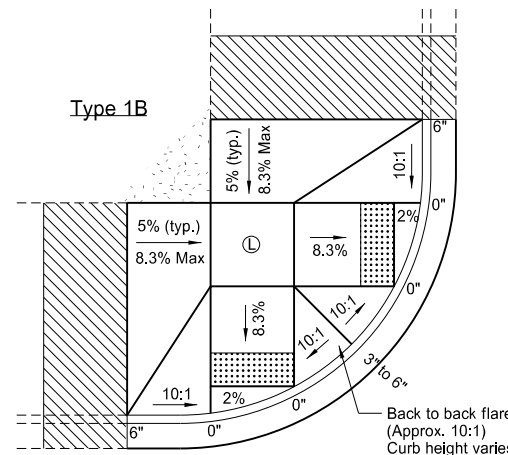
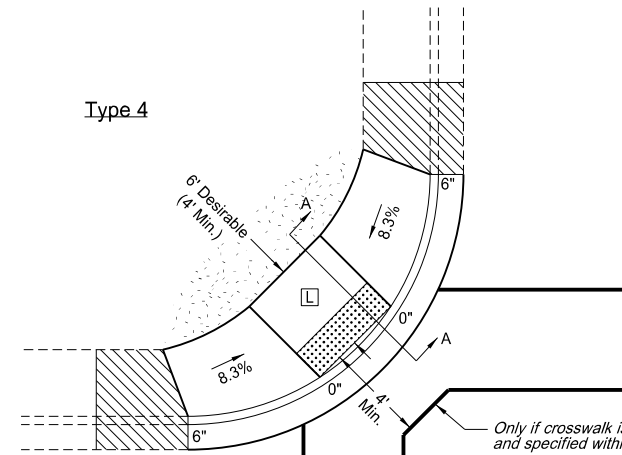
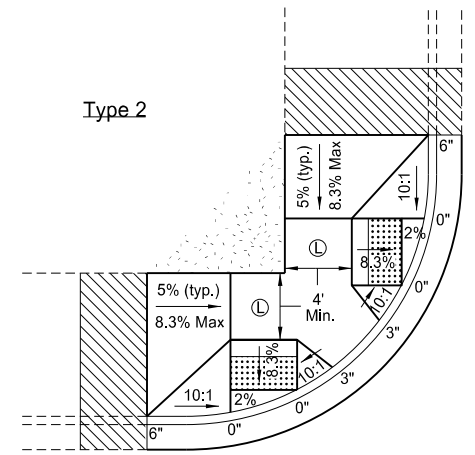
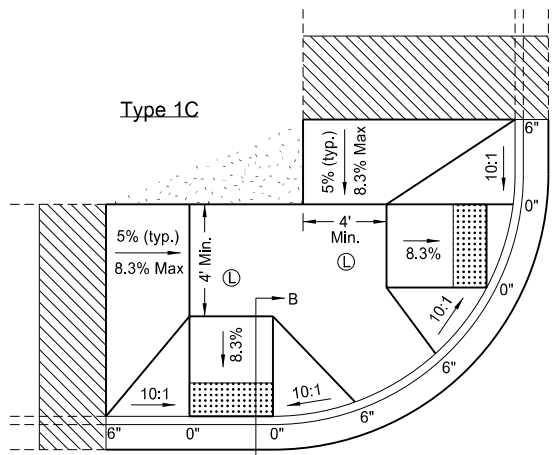
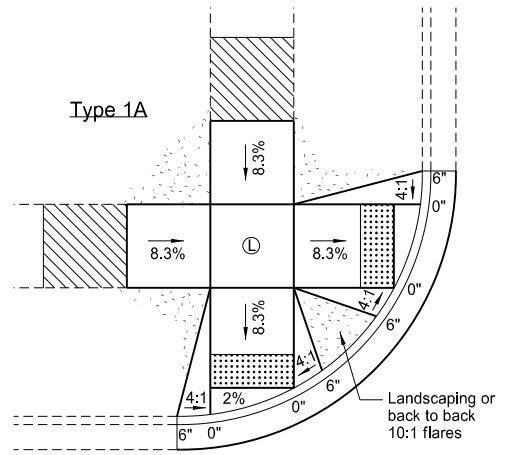
Less Right of Way

NOTES:

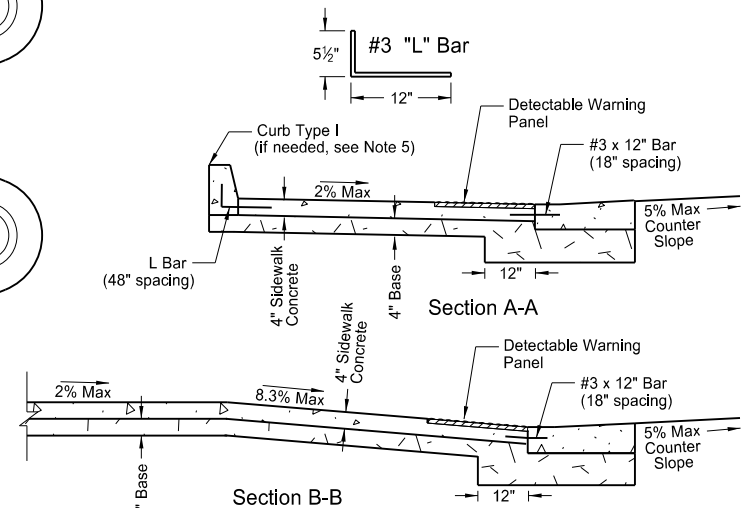
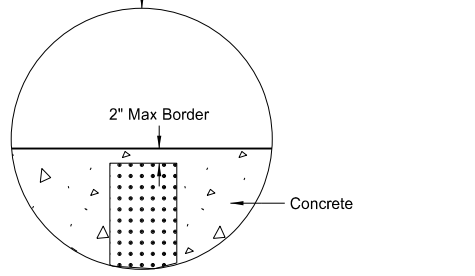
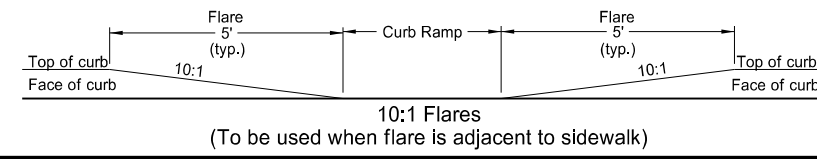
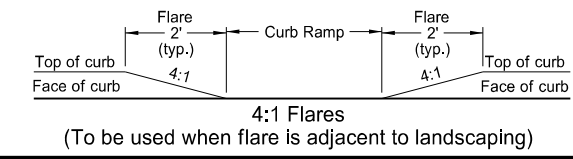
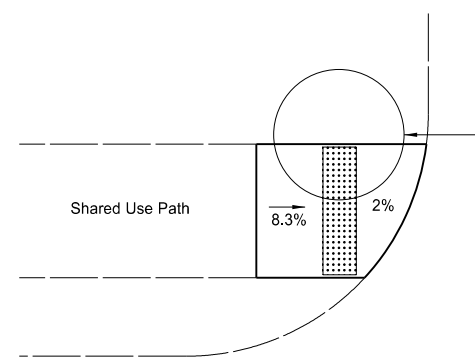
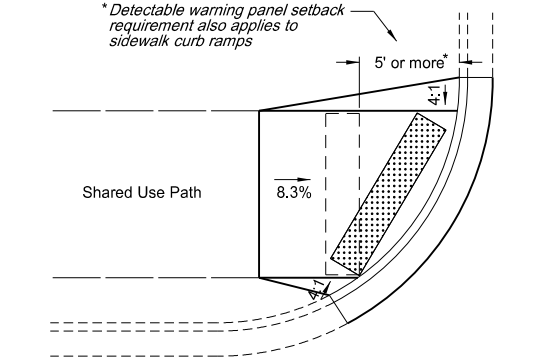
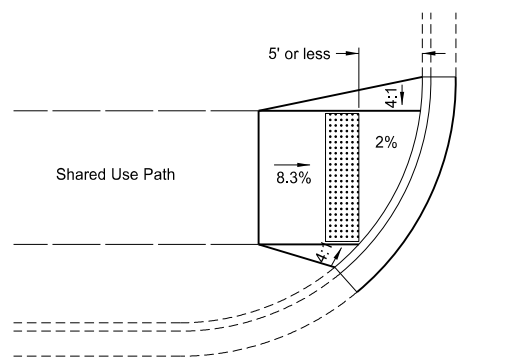
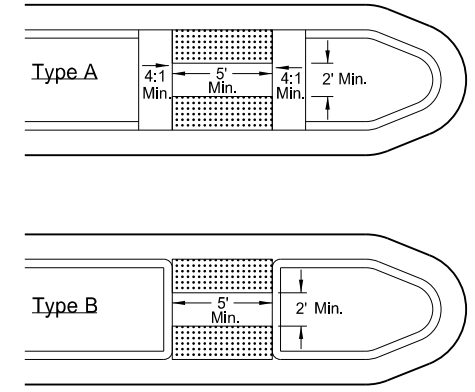
- Ramp width is defined as the useable portion of the ramp, excluding flares if used.
Curb ramp width should match the existing sidewalk width. 4' width minimum.
Ramp width for shared-use paths should match the existing shared use path width.
Ramp length shall be maximum of 15'.
- Landings shall be a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

LEGEND:

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



Median Refuge Islands (Cut-Through)



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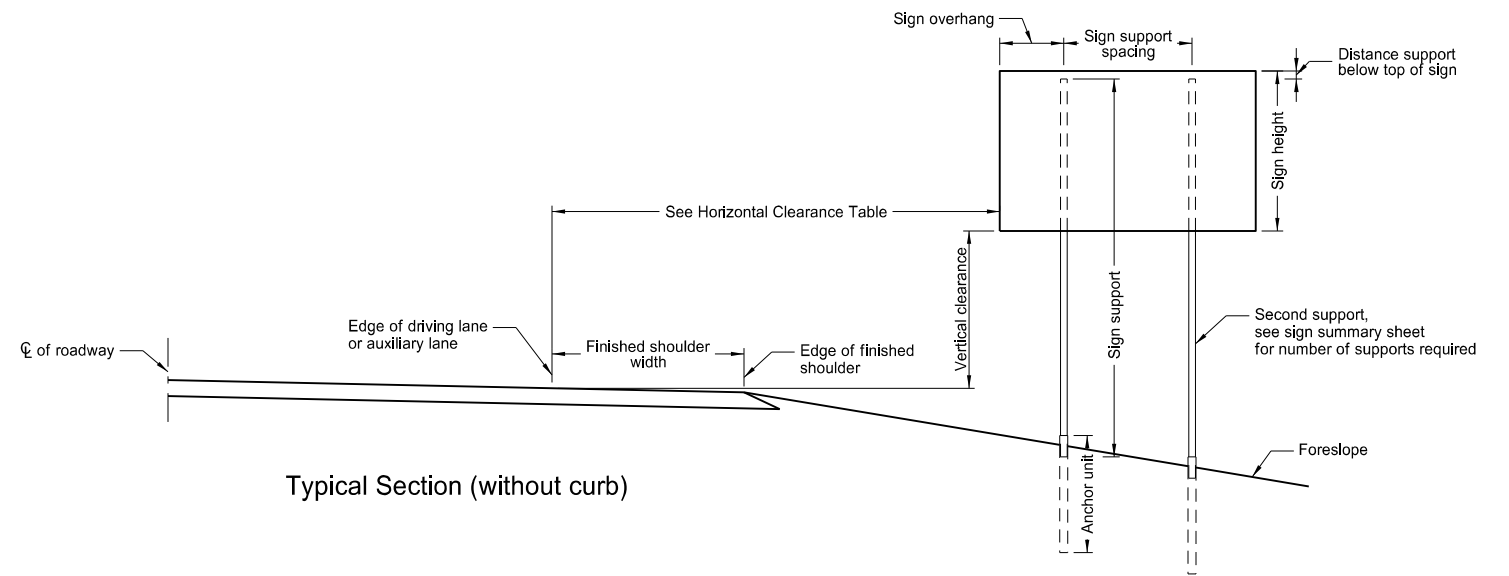
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PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

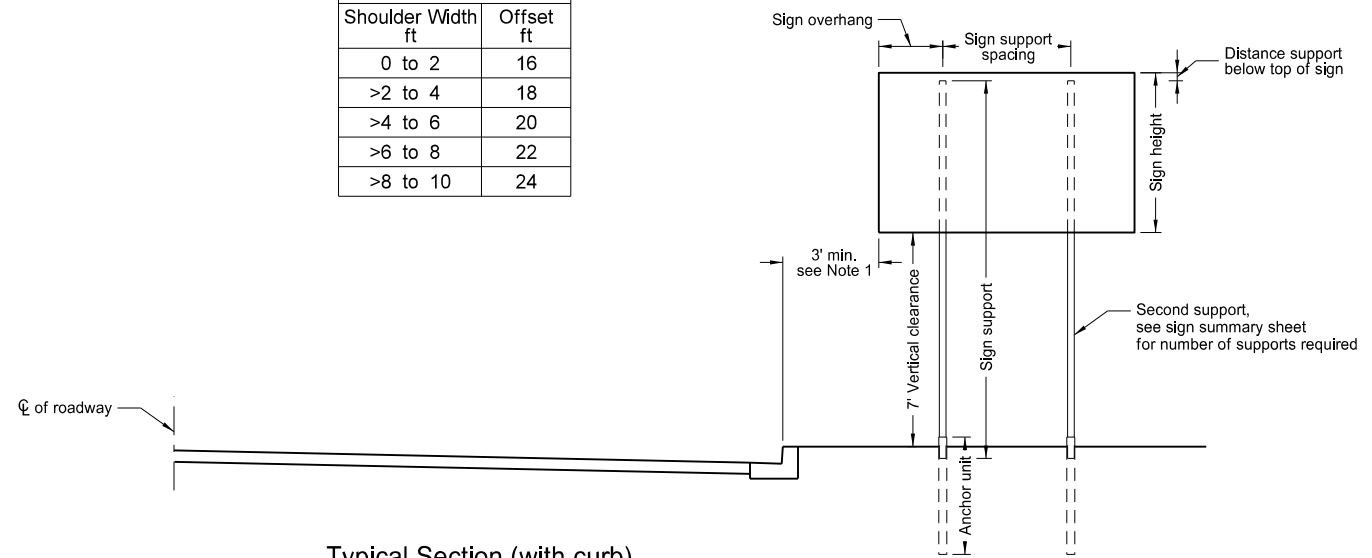
Notes:

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

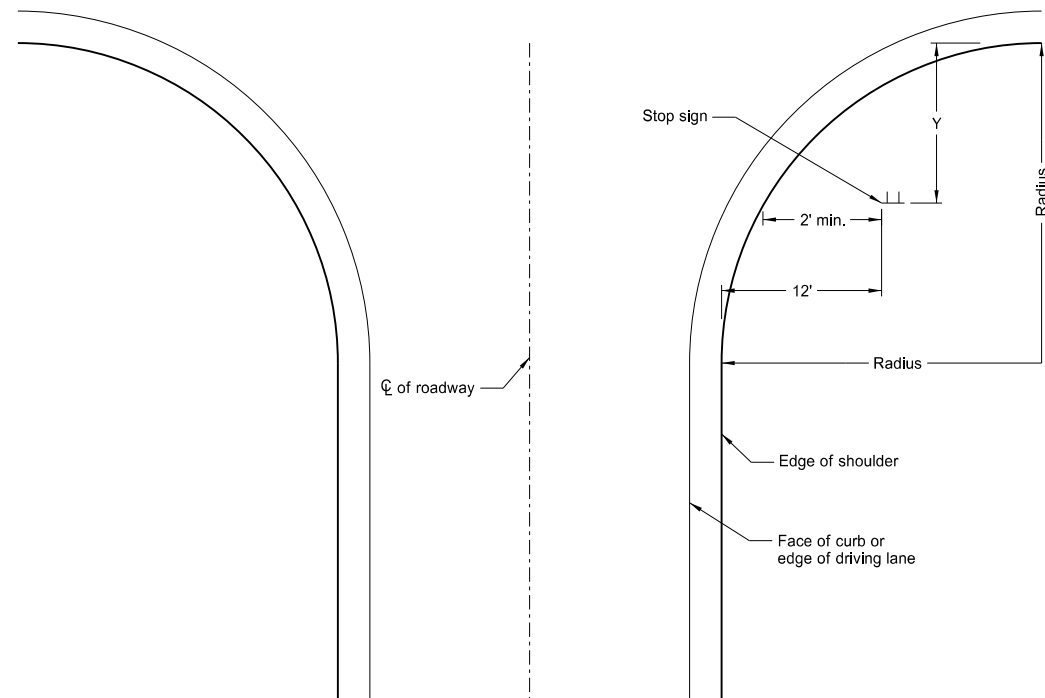


Typical Section (without curb)

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



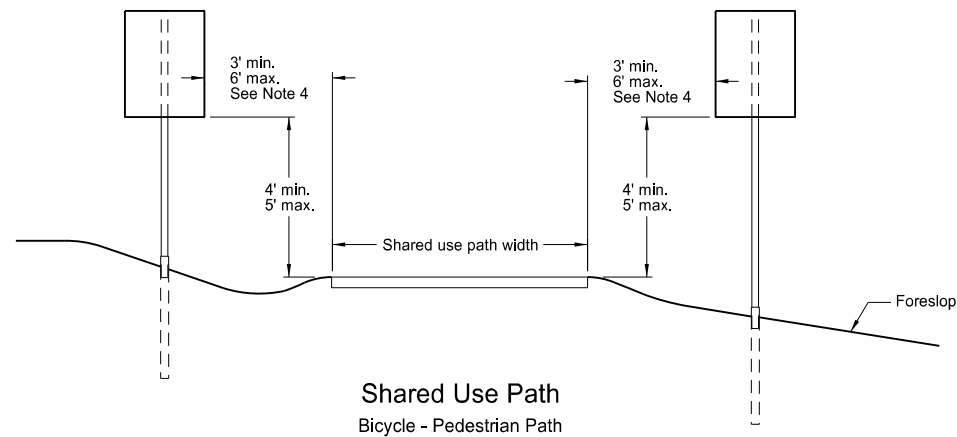
Typical Section (with curb)
Residential or Business District



Stop Sign Location
Wide Throat Intersection

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

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



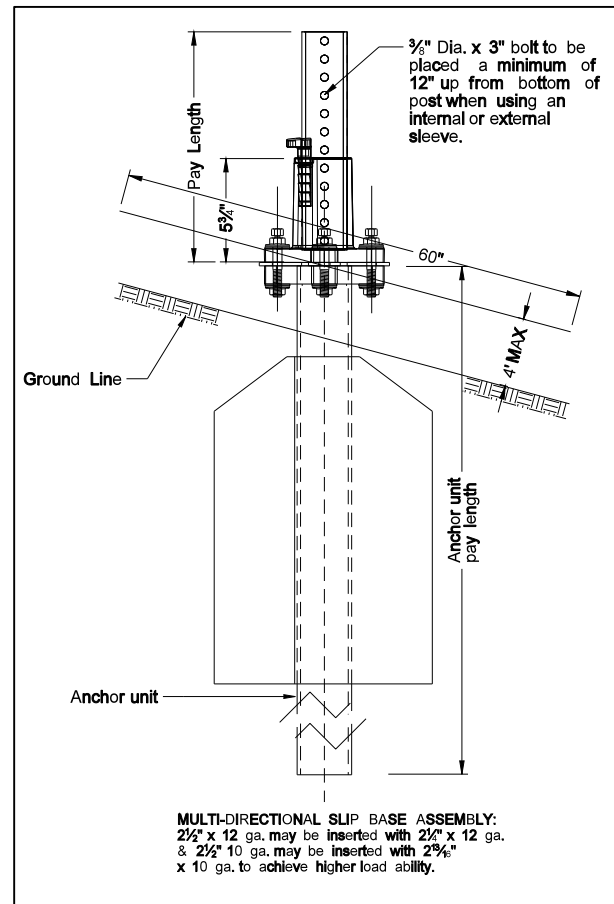
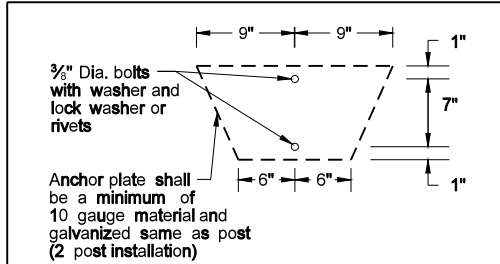
Shared Use Path
Bicycle - Pedestrian Path

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10-3-13	
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7-8-14	Revised note 2, added note 4.

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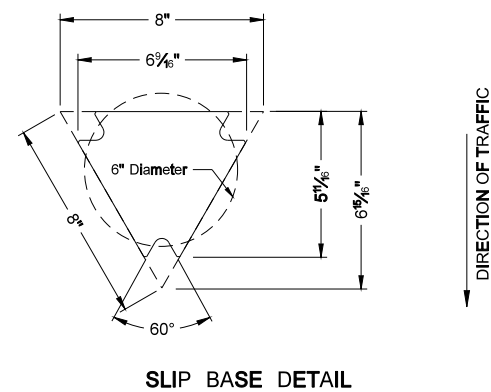
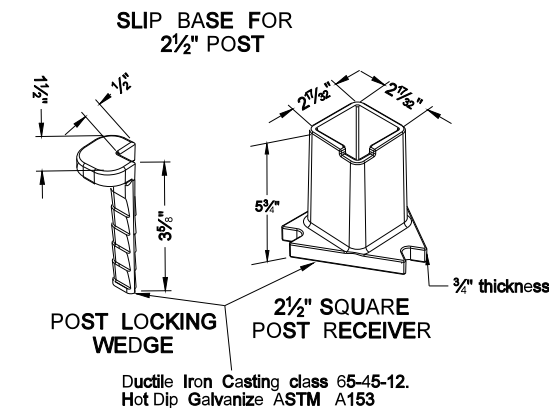
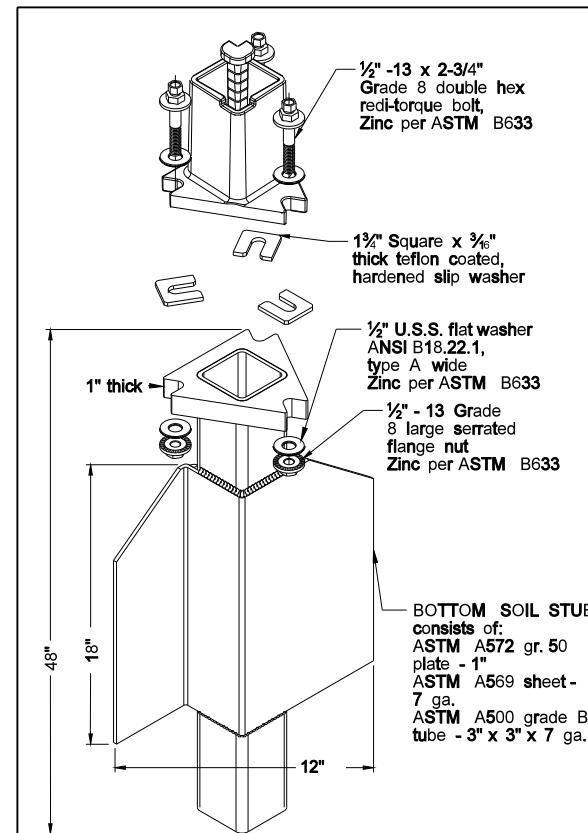
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/2	12
1	2 1/2	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/2	12	2 1/2(D)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

(B) - The 2 1/2", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
 (C) - 3" anchor unit
 (D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.



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

Mounting Details Perforated Tube

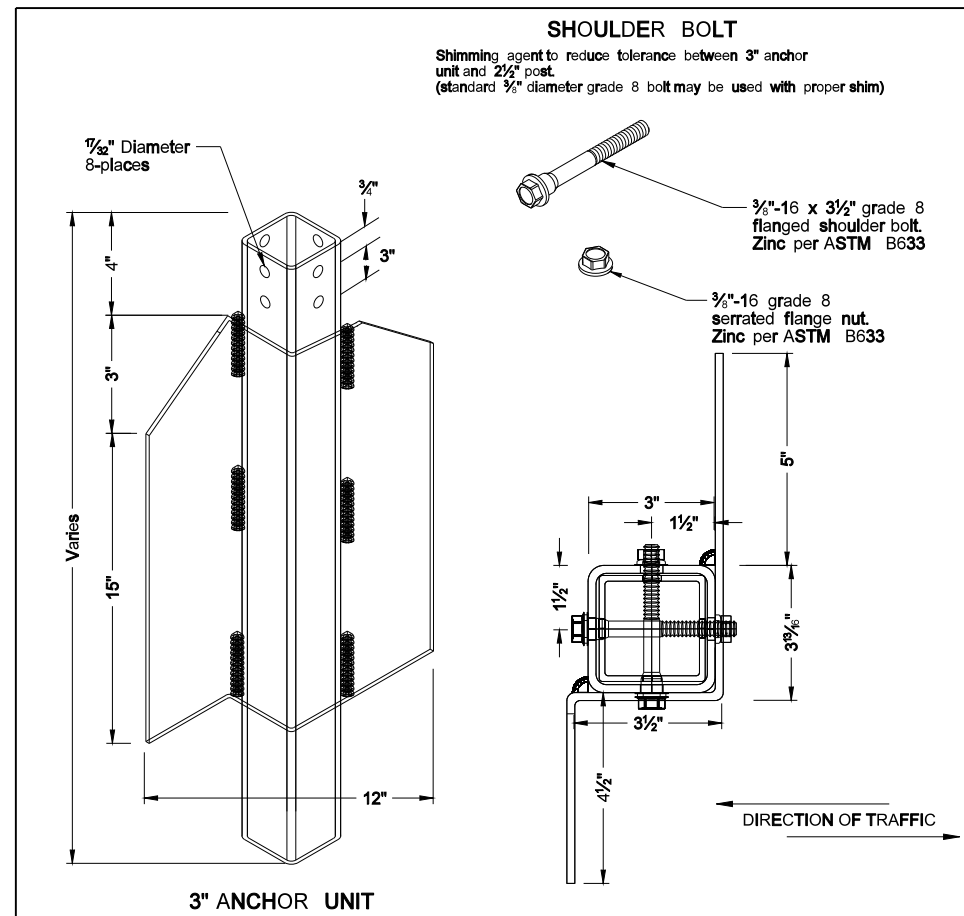
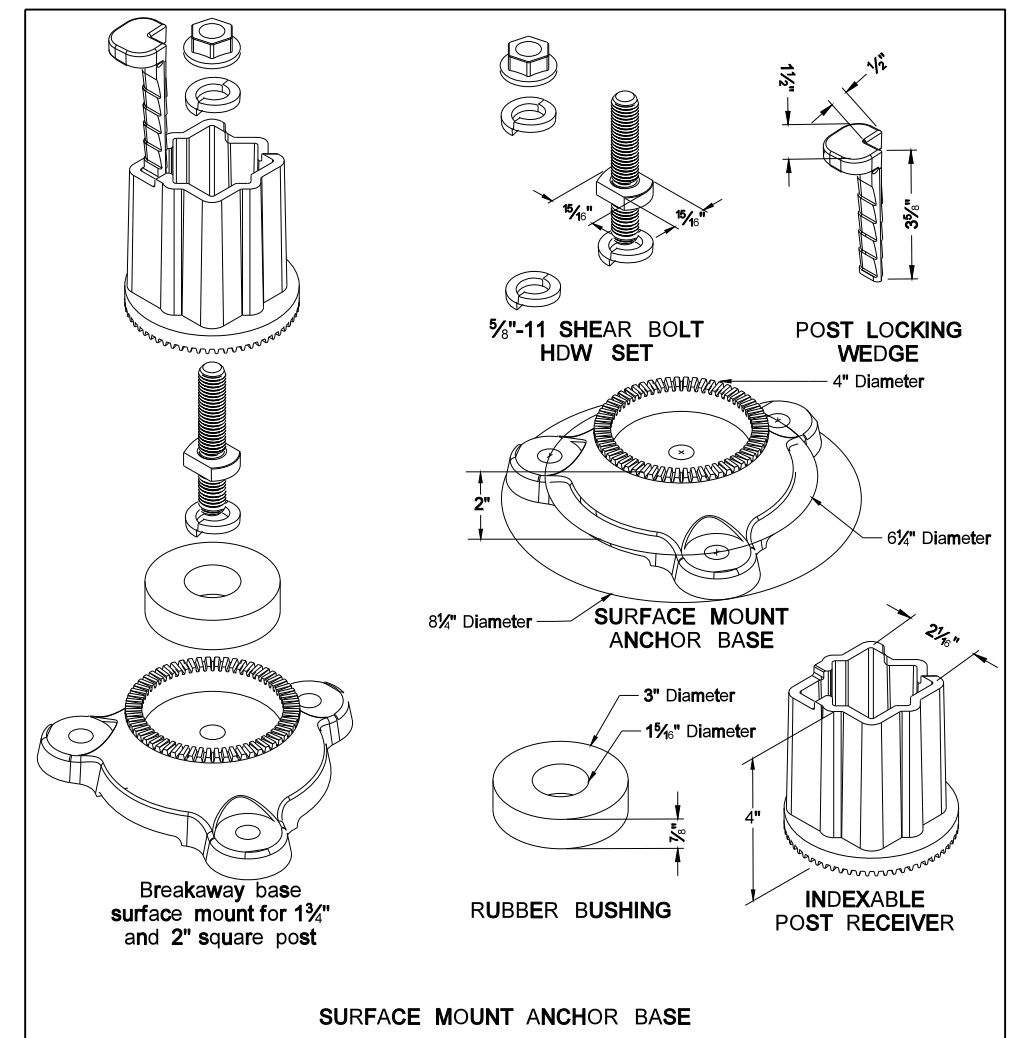


Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. Area In. ²	Section Modulus In. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/2 x 2 1/2	0.105	12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

The 2 3/4" size 10 gauge is shown as 2.19" size on the plans; The 2 1/2" size is shown as 2.51" size on the plans.

NOTE:

- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
- Anchor material shall be 7 gauge H.R.P.O. Commercial quality ASTM A569 and 3" x 3" x 7" gauge ASTM A500 grade B. Anchor shall have a yield strength 43.9 KSI and tensile strength of 59.3 KSI. Anchor shall be hot dipped galvanized per ASTM A123/153. All tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless otherwise noted.
- When used in concrete sidewalk, anchor shall be the same concept without the wings.
- Four post signs shall have over 8" between the first and fourth posts.
- Installation procedures as per manufacturers recommendation.
- Concrete fasteners for surface mount breakaway base shall be a minimum 1/2" diameter x 4" grade 8.



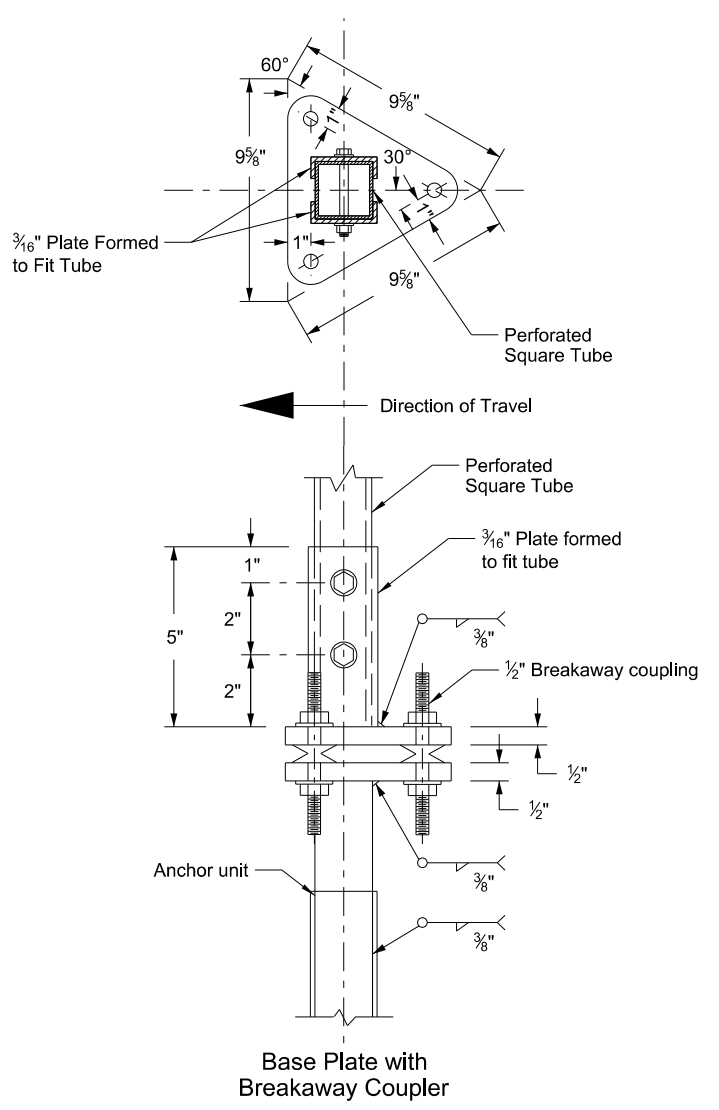
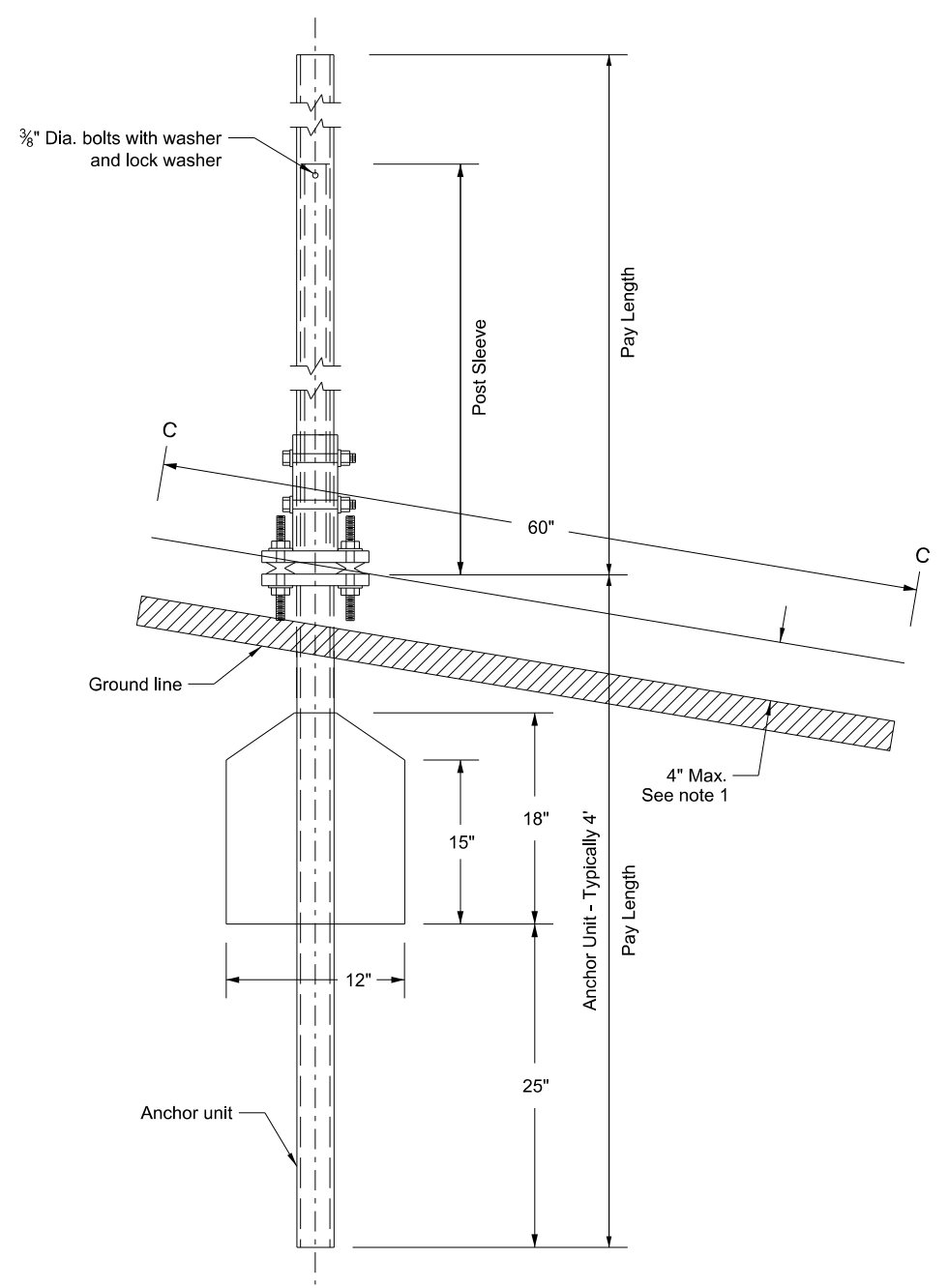
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
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DATE	CHANGE

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Breakaway Coupler System for Perforated Tubes

Notes:

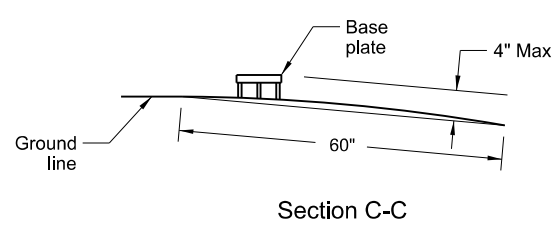
- 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.
- Anchor unit shall be the same size as the post and shall have the same specification as the post.
- Four post signs shall have over 8' between the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



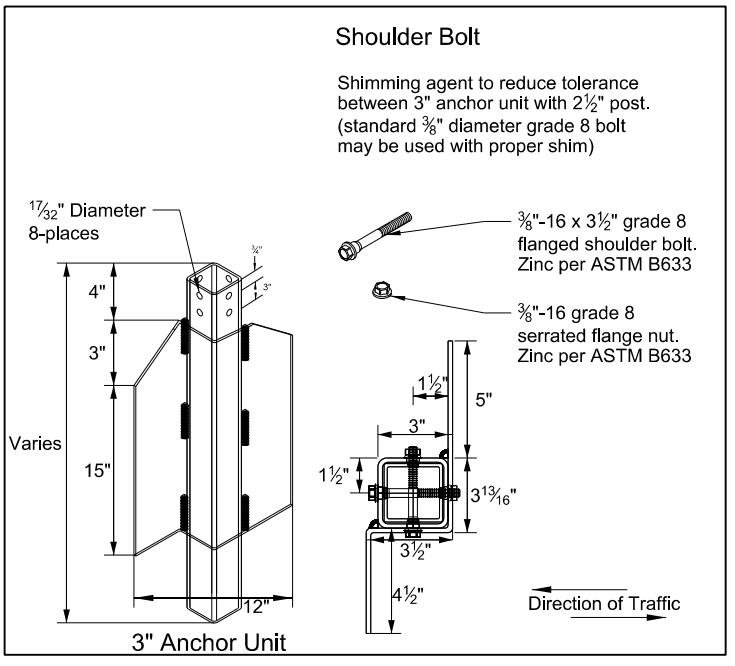
Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thickness Gauge	Sleeve Size In.	Wall Thickness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Gauge
1	2	12			No	2 1/4	12
1	2 1/4	12			No	2 1/2	12
1	2 1/2	12			(B)	3(C)	7
1	2 1/2	10			Yes		7
1	2 1/4	12	2	12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

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

(C) - 3" anchor unit



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



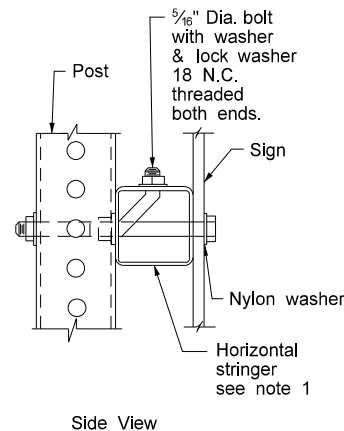
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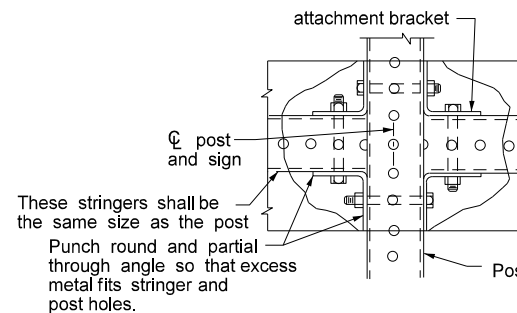
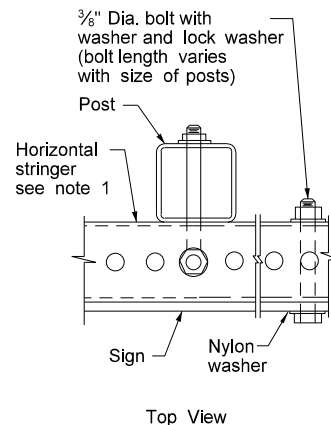
Mounting Details Perforated Tube

Note:

- Horizontal stringers - In lieu of perforated tubes, the contractor may substitute z bar stringers. The z bar stringers shall be 1 1/2" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel.
- Metal washers used on sign face shall have a minimum outside diameter of 5/16" ± 1/64" and 10 gauge thickness.
- No Parking Signs: All no parking signs with directional arrows shall be placed at a 30 to 45 degree angle with the line of traffic flow. No parking signs required at the above angles may have the support turned to the correct angle. If the no parking sign is placed with another sign that has to be placed at a 90 degree angle with the line of traffic flow, the detailed angle strap should be used to mount the no parking sign. Flat washers and lock washers shall be used with all nylon washers.
- In lieu of using the bent bolt to attach the post to the stringer, the contractor may choose to punch the sign backing and place the bolt through the sign, the stringer and the post.
- 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement shall be made above and below post location and also back and ahead of post.

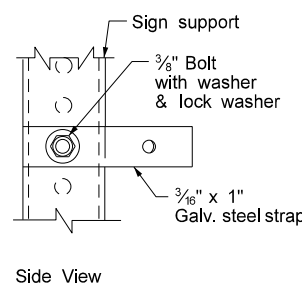


STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)

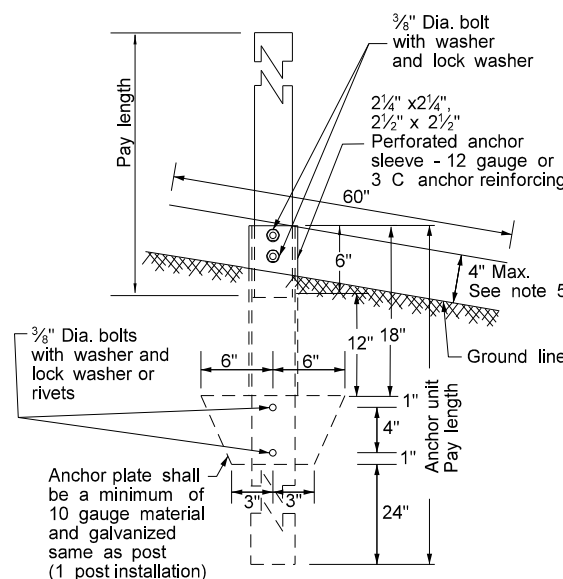
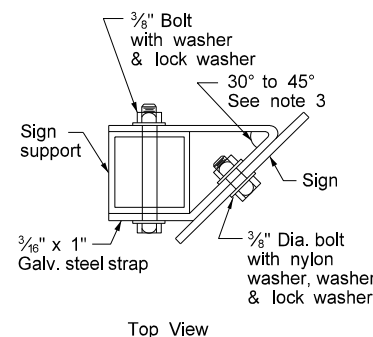


These stringers shall be the same size as the post. Punch round and partial through angle so that excess metal fits stringer and post holes.

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



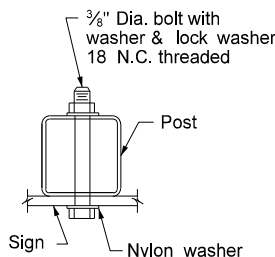
STRAP DETAIL



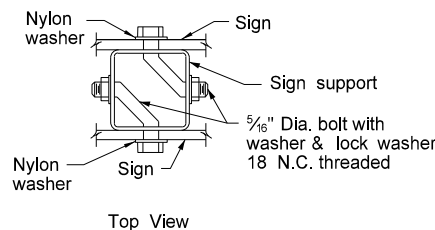
ANCHOR UNIT AND
POST ASSEMBLY

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

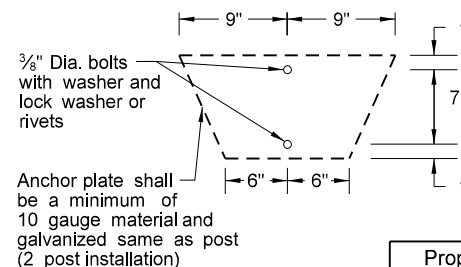
(B) - The 2 1/2", 12 gauge posts do not need breakaway bases when placed in standard soils, but require a shim as specified by the manufacturer. The breakaway base is required when the support is placed in weak soils. The Engineer shall determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2 1/2" x 12 ga. x 18" minimum length external sleeve required.



BOLT MOUNTING



BACK TO BACK
MOUNTING



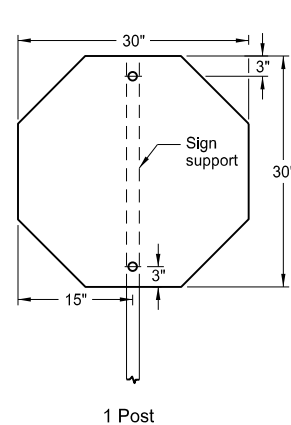
Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In. ⁴	Cross Sect. area In. ²	Section Modulus In. ³
1 1/2 x 1 1/2	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2 1/4 x 2 1/4	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2 1/2 x 2 1/2	0.105	12	3.141	0.804	0.803	0.643
2 1/2 x 2 1/2	0.135	10	4.006	0.979	1.010	0.783

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans.
The 2 1/2" size is shown as 2.51" size on the plans.

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

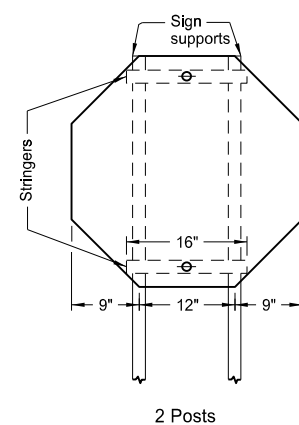
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

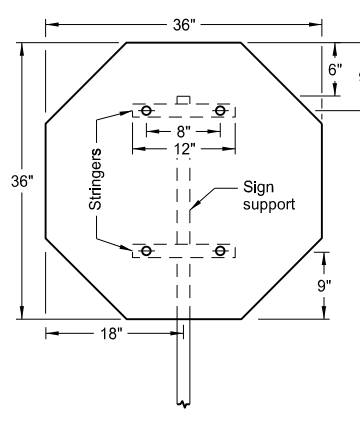


1 Post

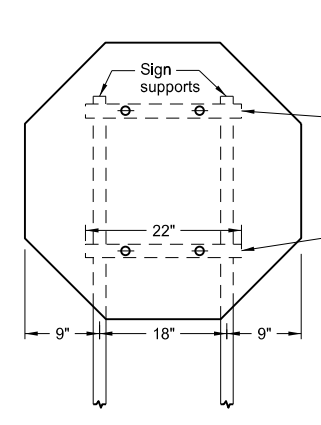
Assembly No. 1



2 Posts

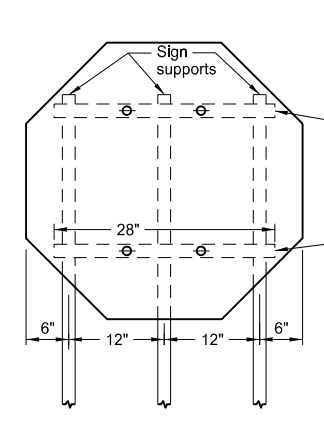


1 Post



2 Posts

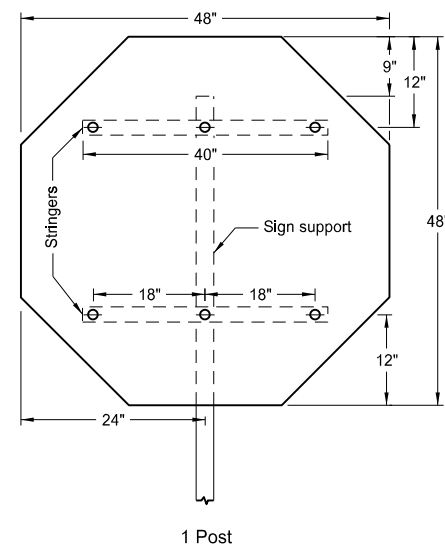
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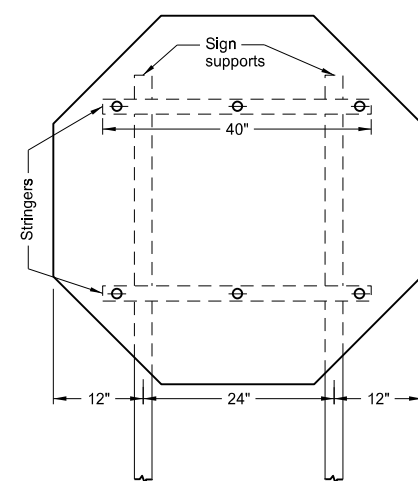
3 Posts

Notes:

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

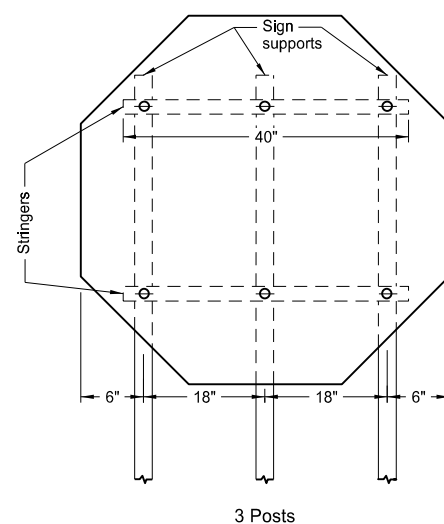


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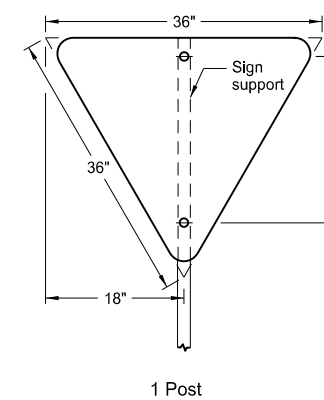


2 Posts

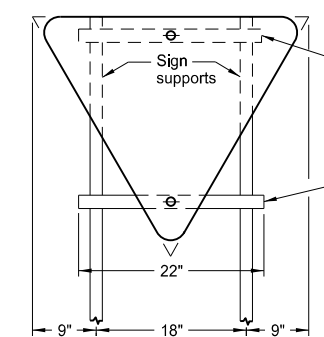
Assembly No. 3



3 Posts

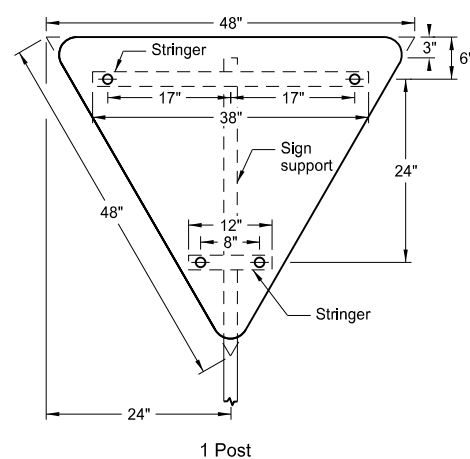


1 Post

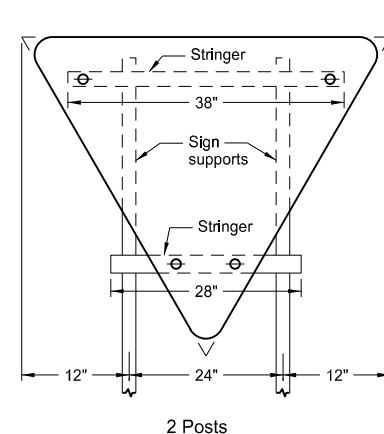


2 Posts

Assembly No. 4

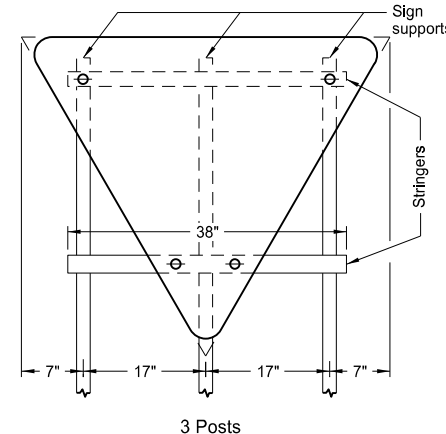


1 Post



2 Posts

Assembly No. 5

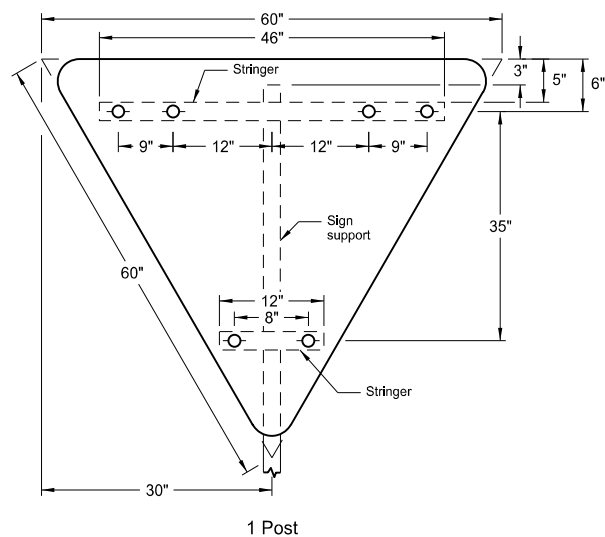


3 Posts

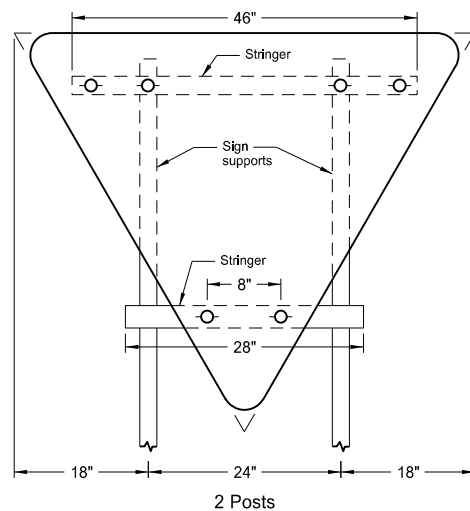
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12-1-10	
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DATE	CHANGE

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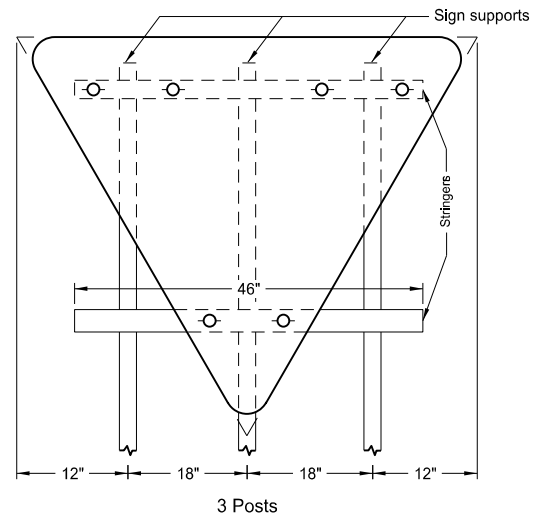
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS



1 Post



2 Posts

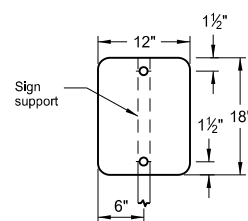


3 Posts

Assembly No. 6

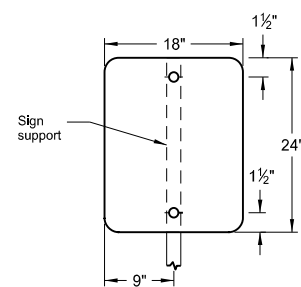
Notes:

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



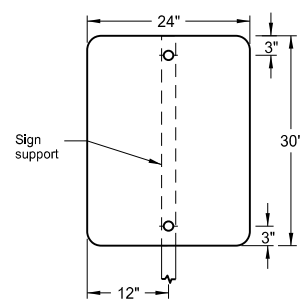
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Assembly No. 7



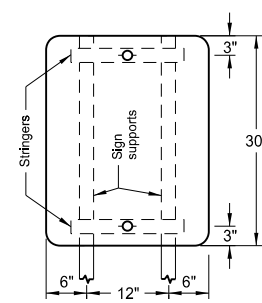
1 Post

Assembly No. 8

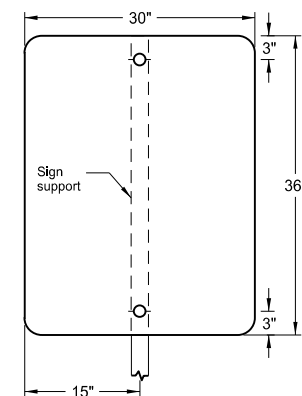


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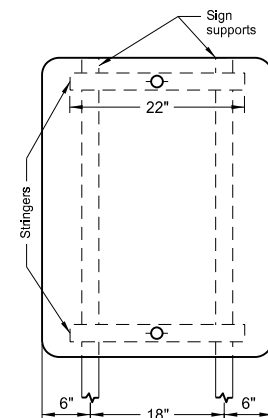
Assembly No. 9



2 Posts

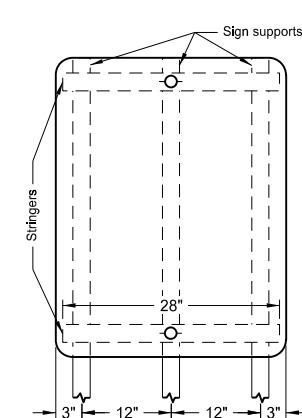


1 Post

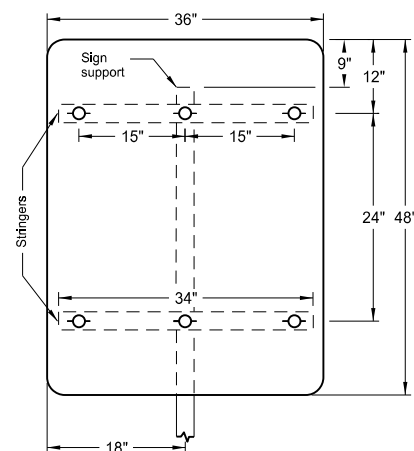


2 Posts

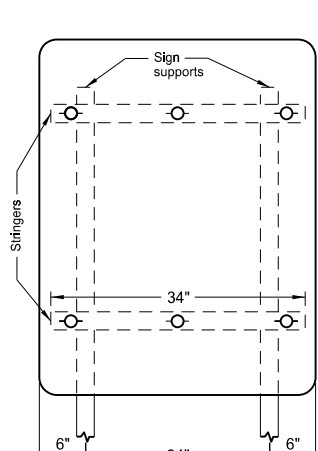
Assembly No. 10



3 Posts

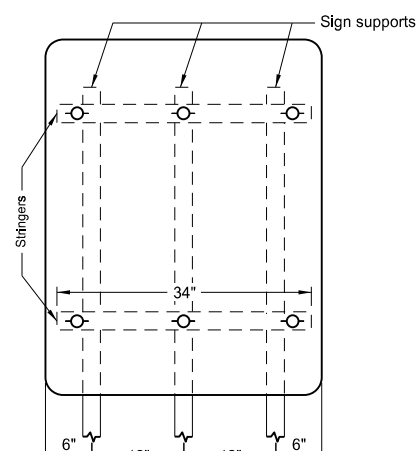


1 Post



2 Posts

Assembly No. 11

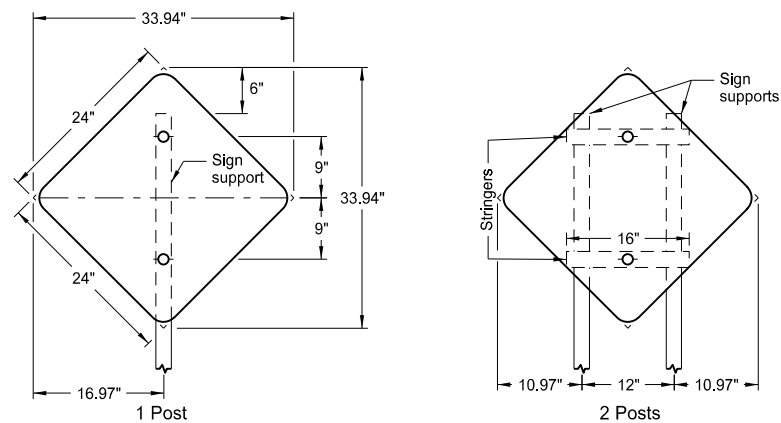


3 Posts

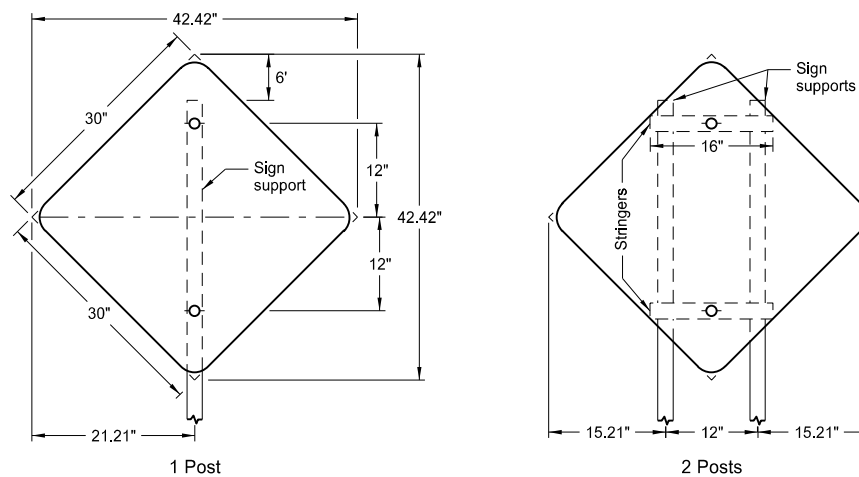
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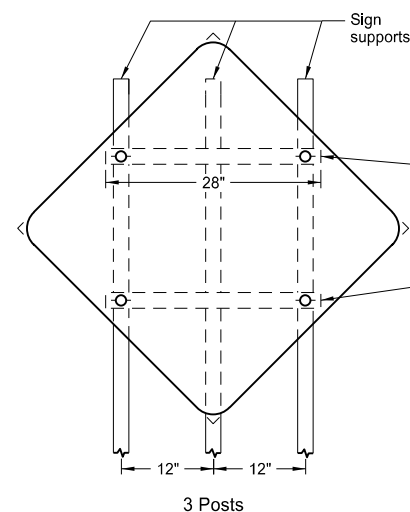
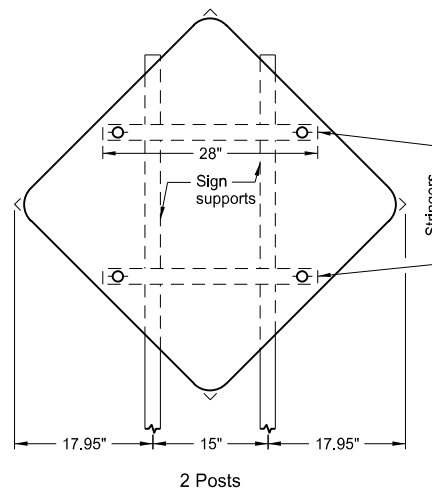
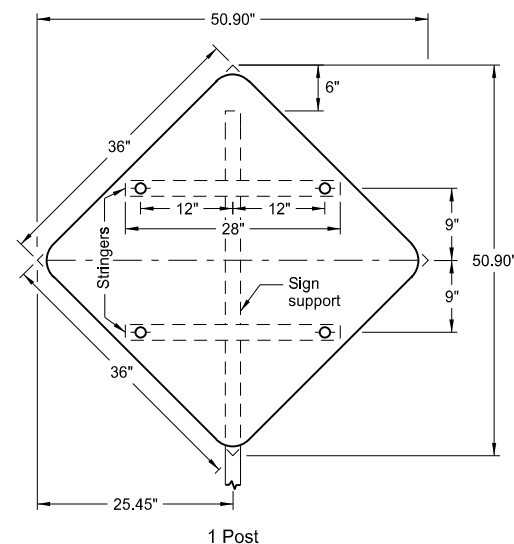
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS



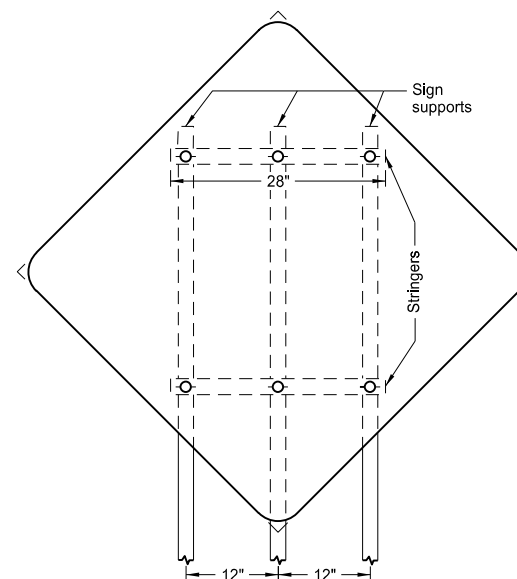
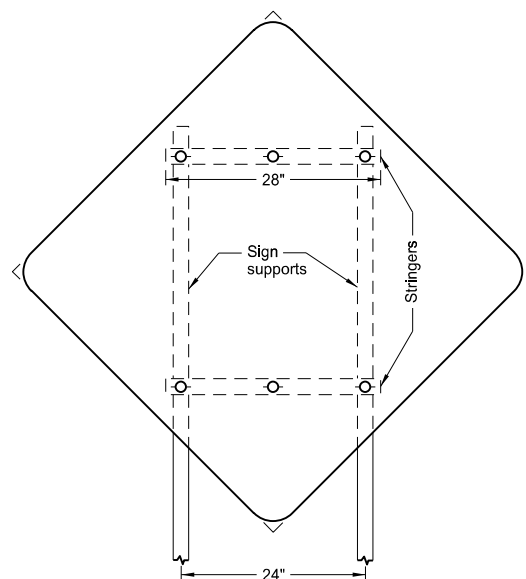
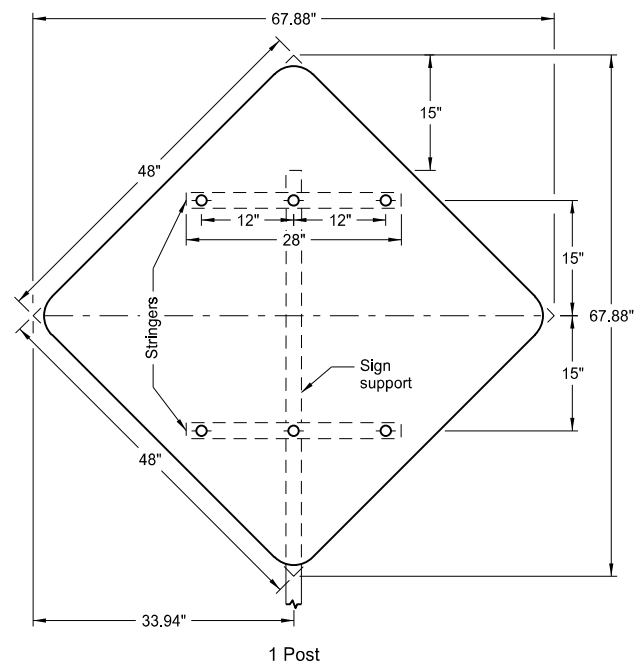
Assembly No. 18



Assembly No. 19



Assembly No. 20



Assembly No. 21

Notes:

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

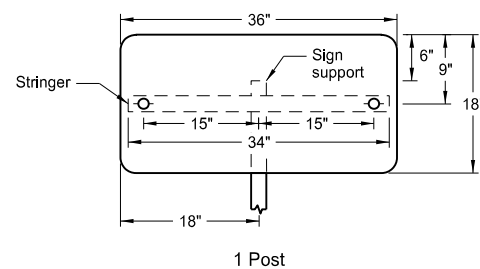
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12-1-10	
REVISIONS	
DATE	CHANGE

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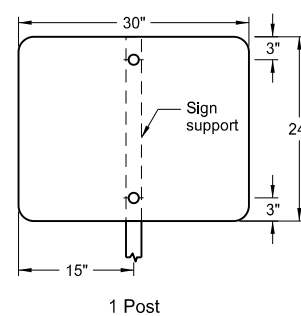
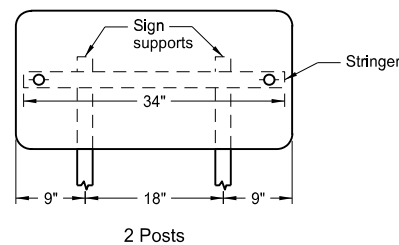
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION
DETAILS REGULATORY, WARNING AND GUIDE SIGNS

Notes:

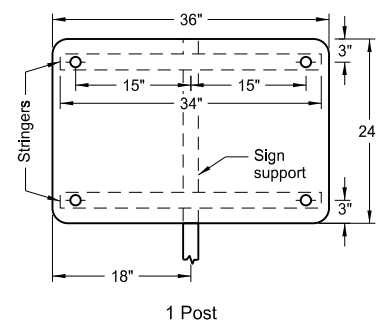
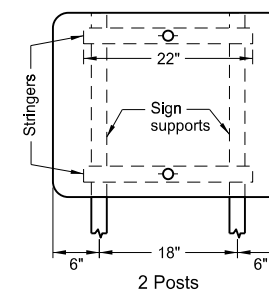
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.



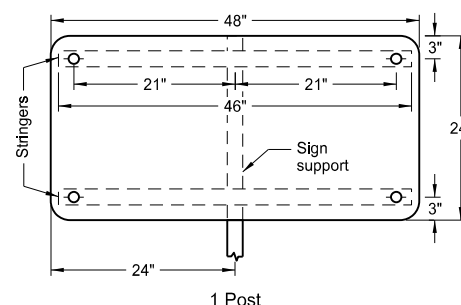
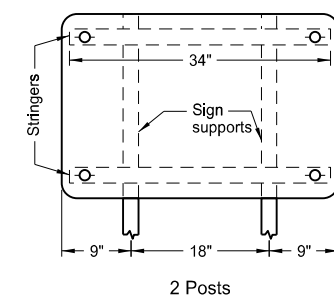
Assembly No. 31



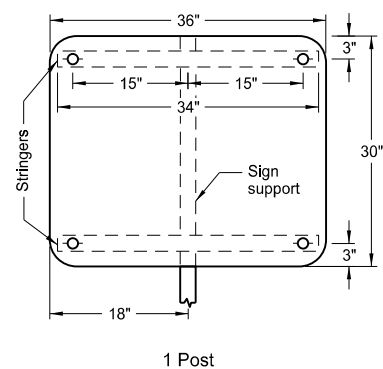
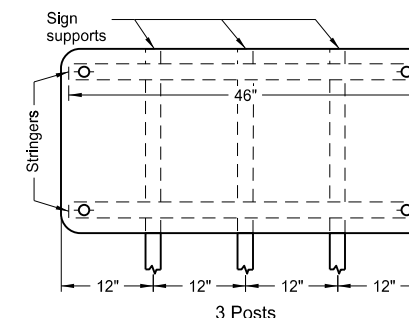
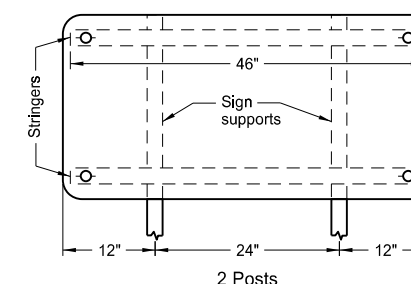
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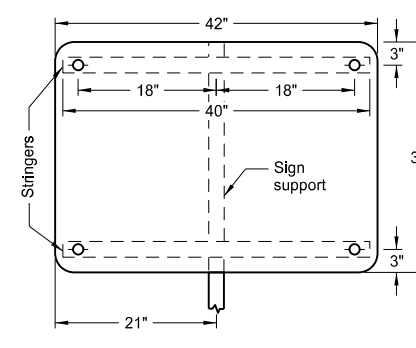
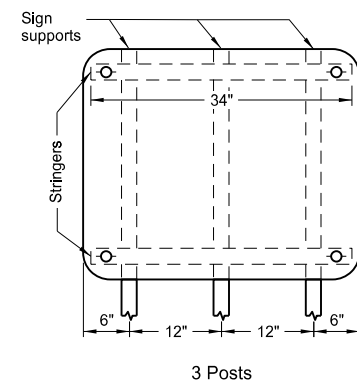
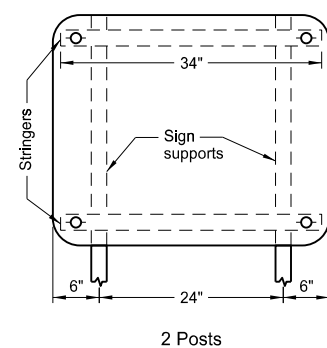
Assembly No. 33



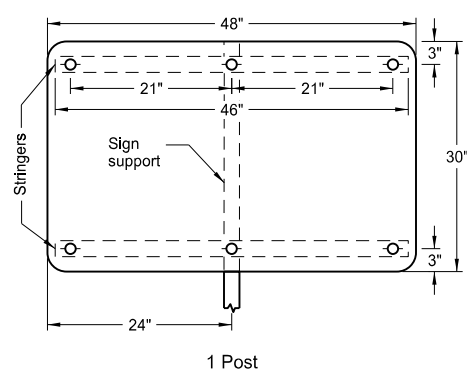
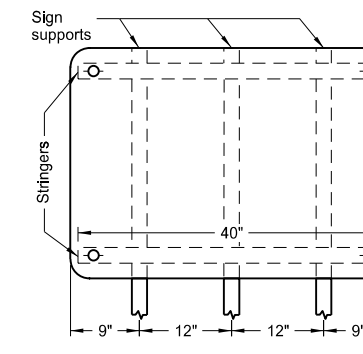
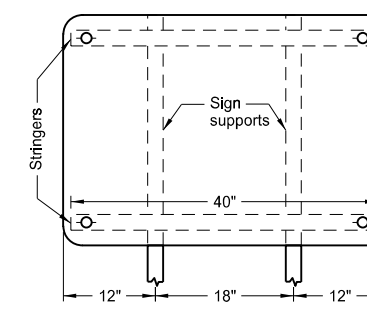
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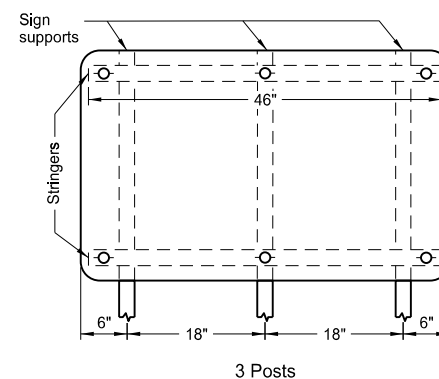
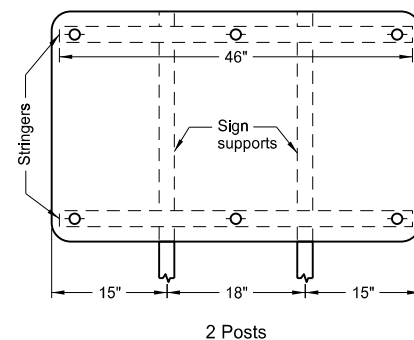
Assembly No. 35



Assembly No. 36



Assembly No. 37

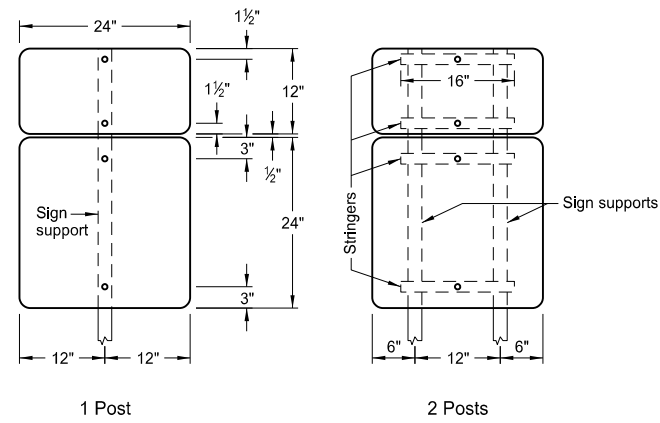


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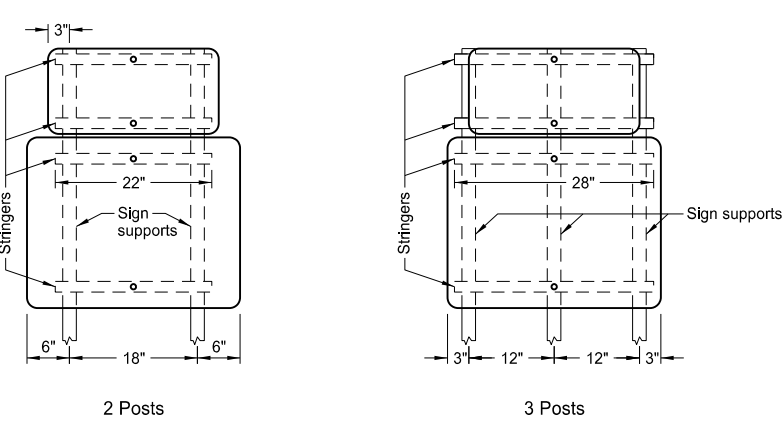
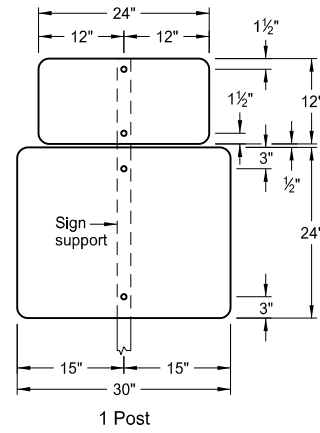
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SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-51

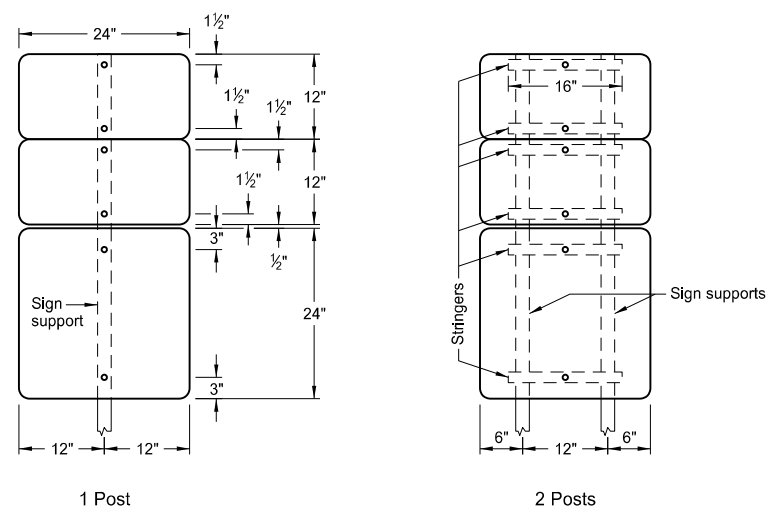


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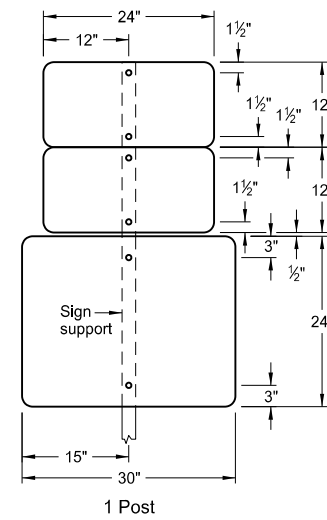
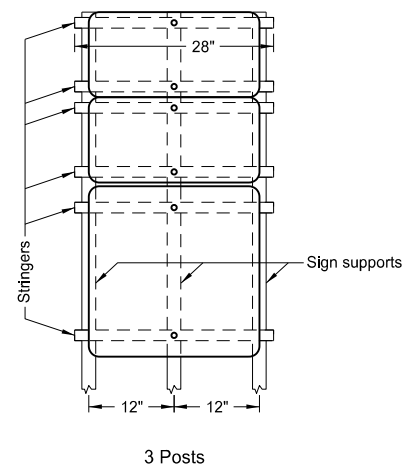


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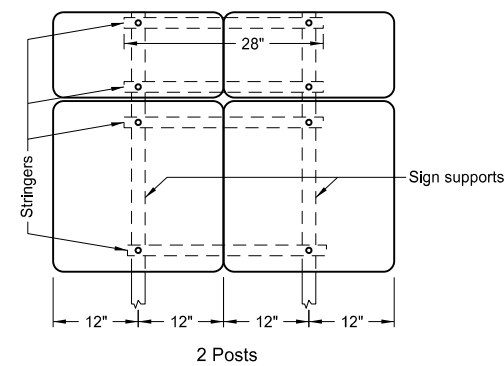
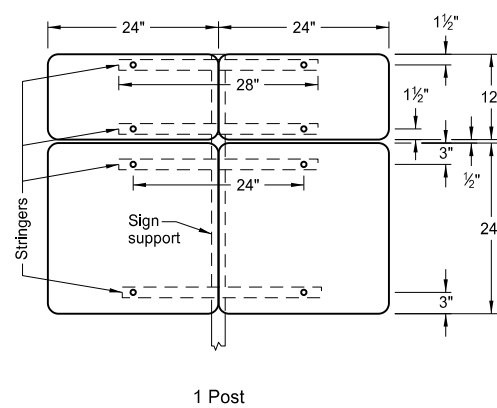
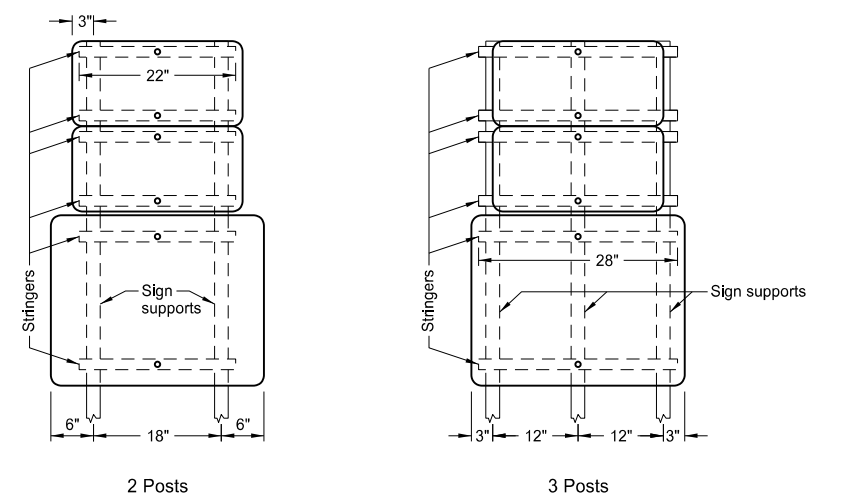
- Notes:
1. The minimum sign backing material thickness shall be 0.100 inch.
 2. Perforated square tube stringer shall be 1 1/2"x1 1/2".
 3. All holes shall be punched round for 3/8" bolt.



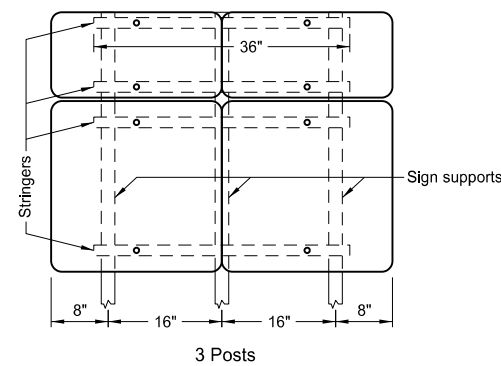
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ASSEMBLY NO. 374



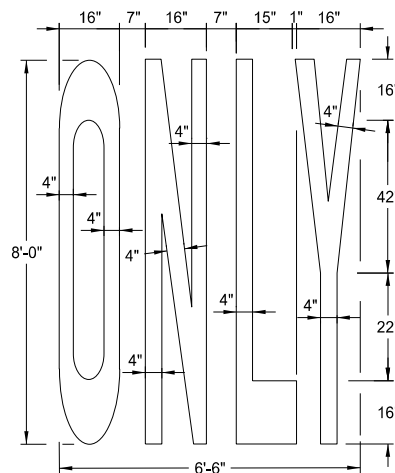
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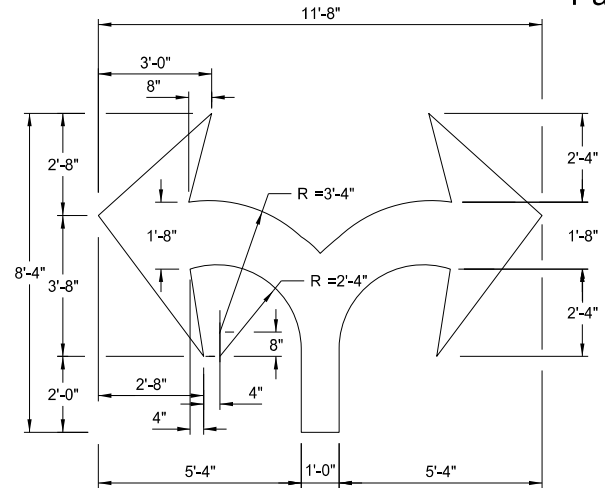
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DATE	CHANGE

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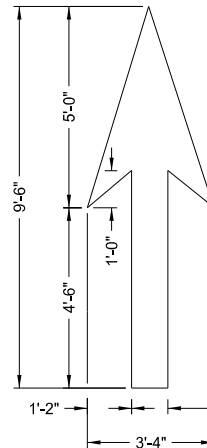
Pavement Marking Message Details



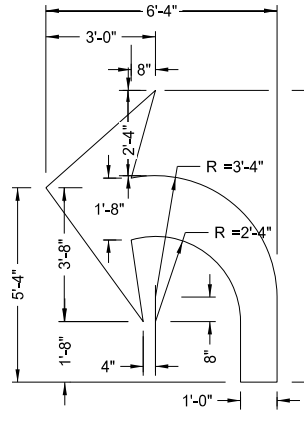
22 S. F.



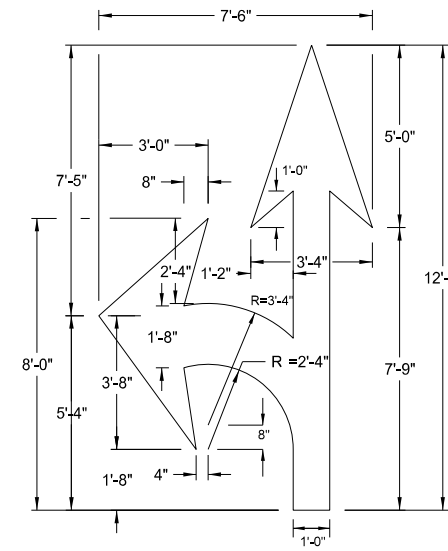
29 S. F.



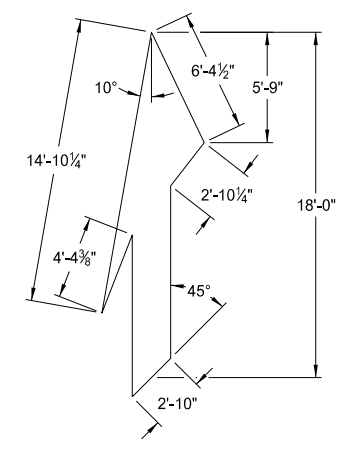
12 S. F.



16 S. F.



27 S. F.

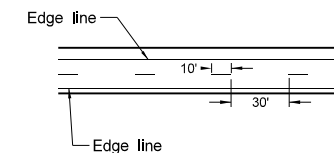


41 S. F.

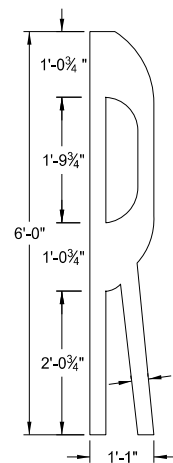
Note:
The merge arrow shall be rotated 20° from the edge of the roadway.

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

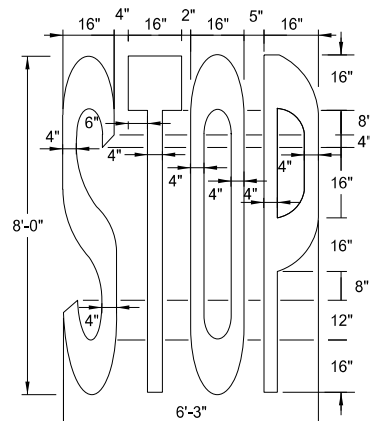
Chevron Crosshatching Table



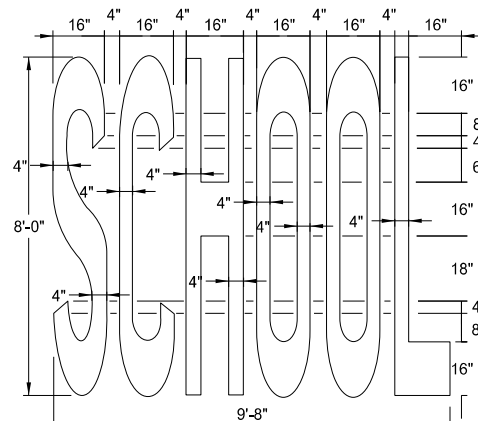
Centerline Pavement Marking Skip Spacing Detail



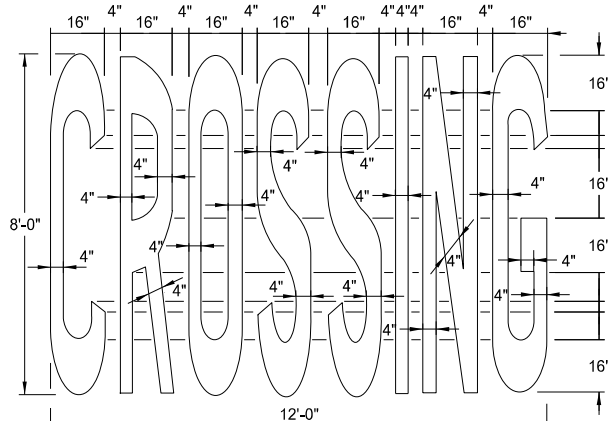
4 S. F.



22 S. F.



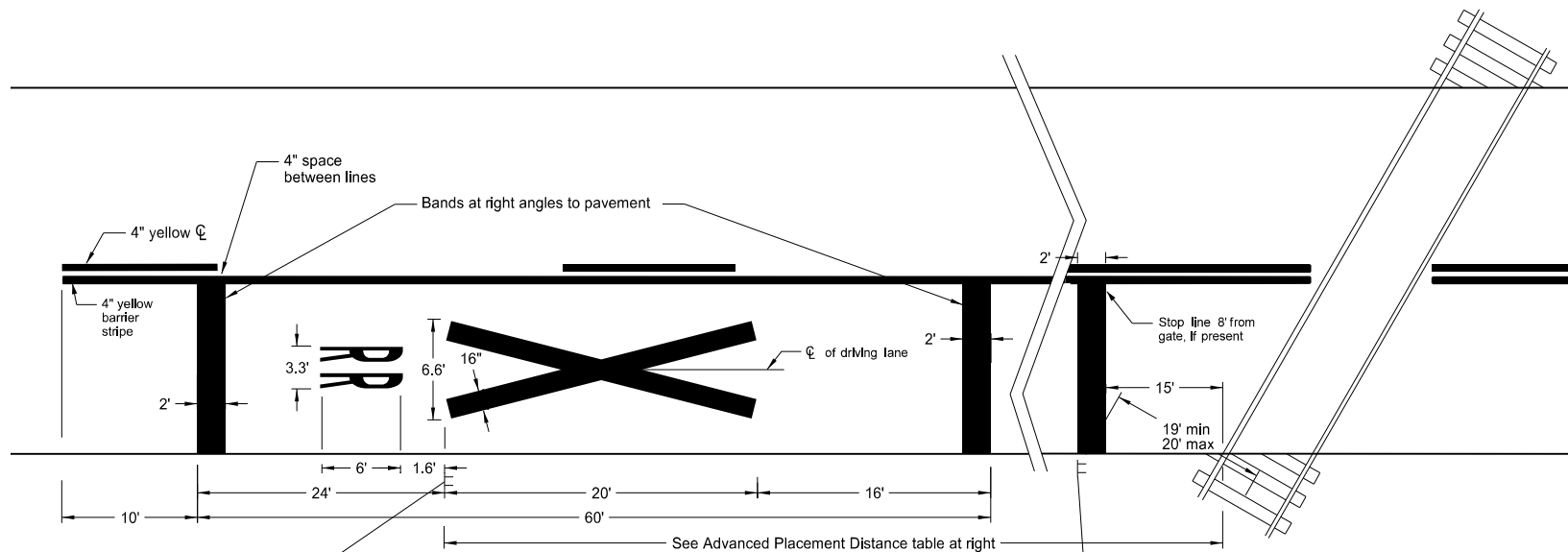
34.5 S. F.



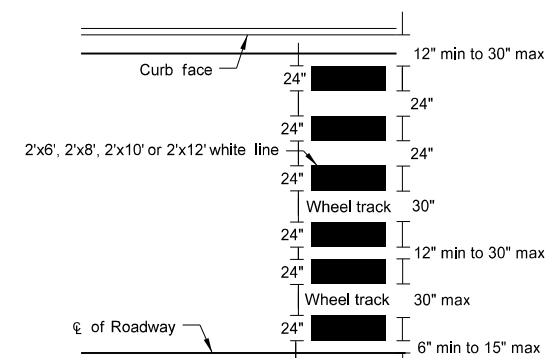
46 S. F.

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

Advance Placement Distance for Railroad Warning Signs



Railroad cross & 2 R's 60.5 S.F.
3 Bands (12' lane) 72 S.F.



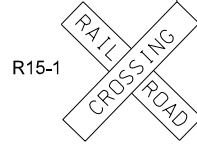
Continental Crosswalk Detail



See Standard Drawing D-754-81

Notes:
A three lane roadway should be marked with a centerline for two-lane approach operation on the approach to a crossing. On multi-lane roads, the transverse bands should extend across all approach lanes, and individual R X R symbols should be used in each approach lane.

See plans for correct message. All pavement markings shall be white unless noted otherwise.



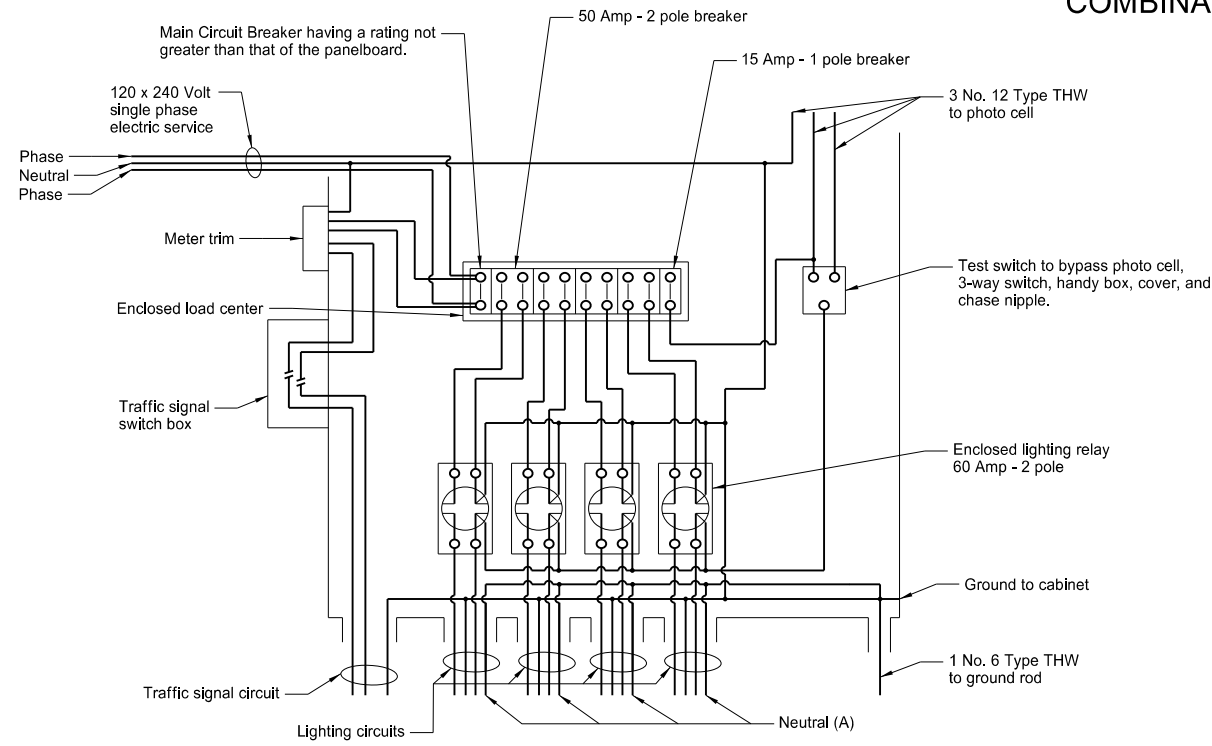
R15-1

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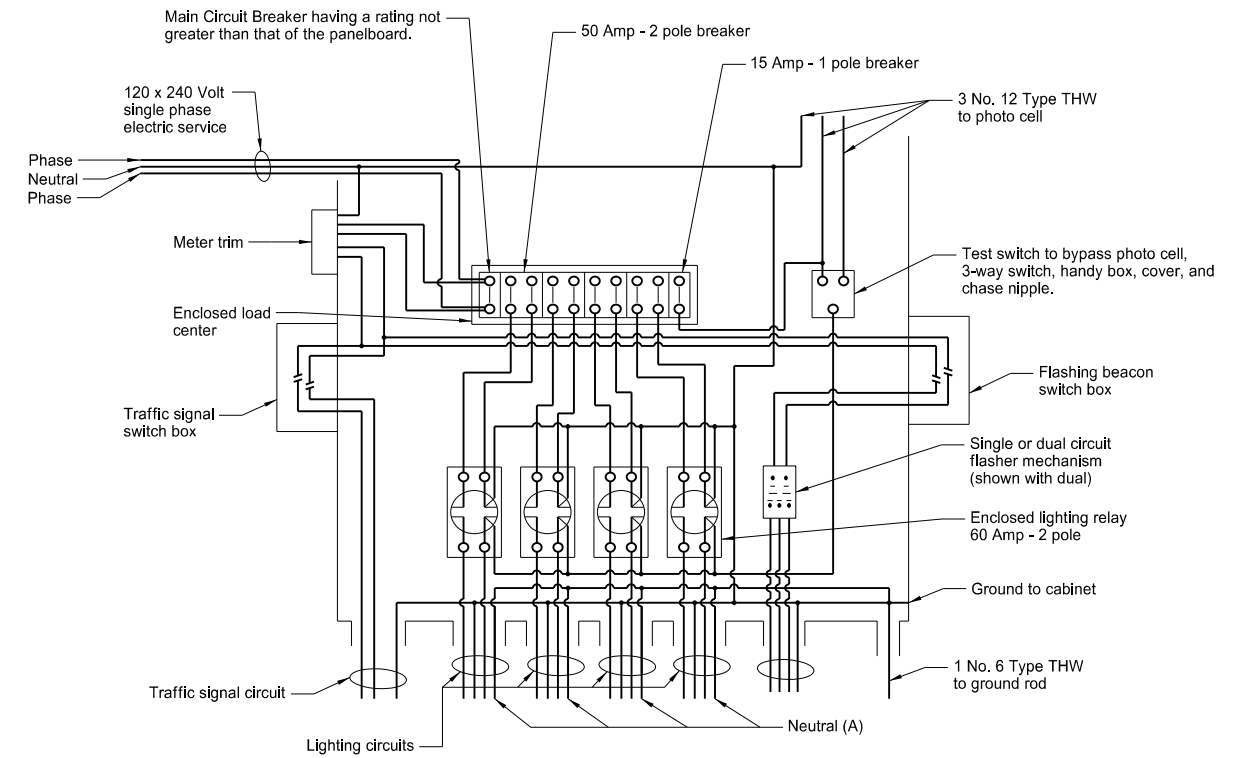
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COMBINATION FEED POINT DETAILS

D-770-2A



Combination Lighting and Signal Feed Point Type IV



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

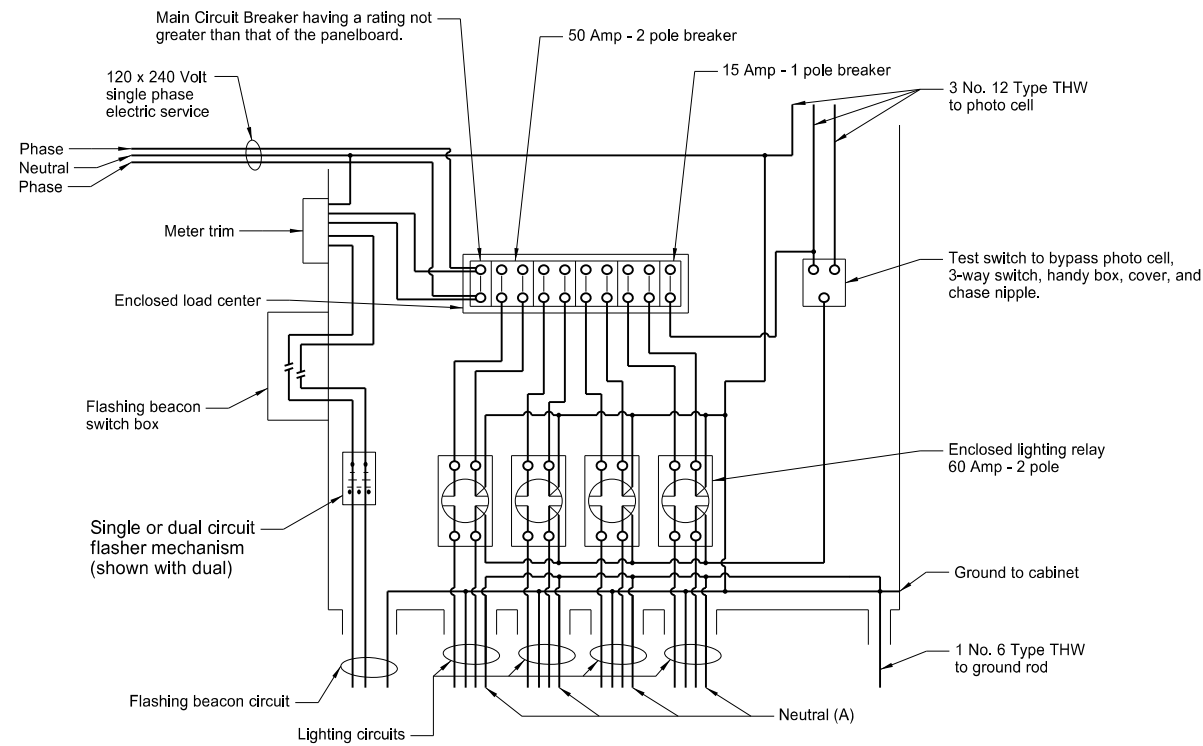
Notes:

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

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

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

(A) Install when festoon circuits are required

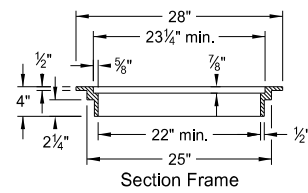
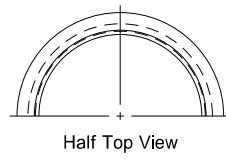
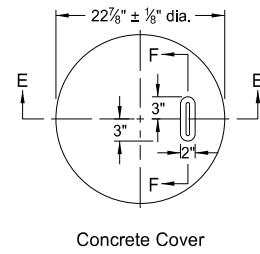
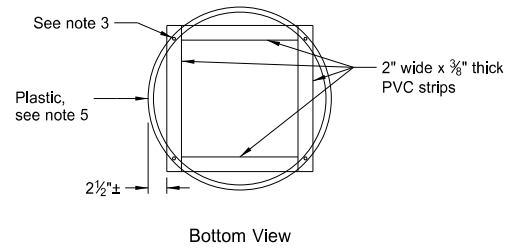
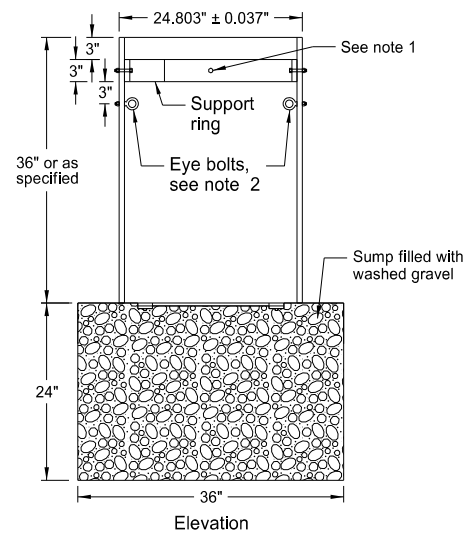
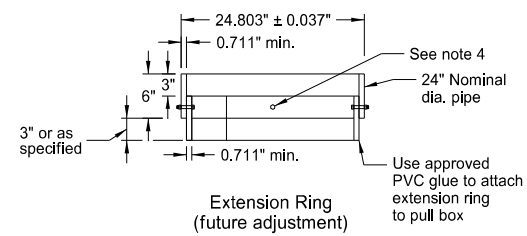


Combination Lighting and Flashing Beacon Feed Point Type IV

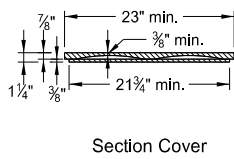
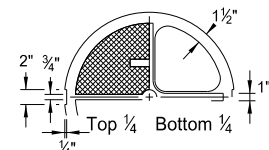
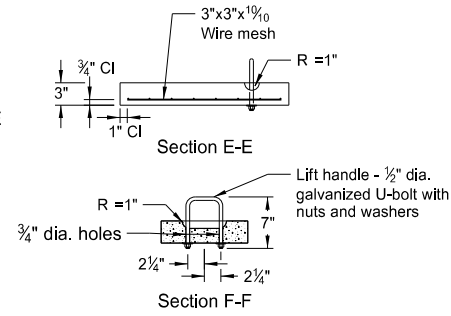
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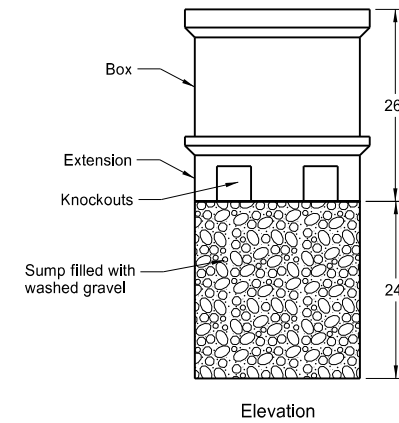
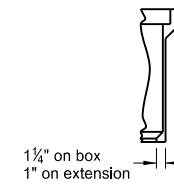
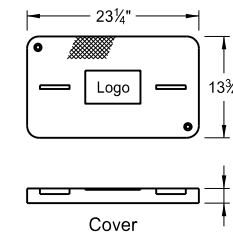
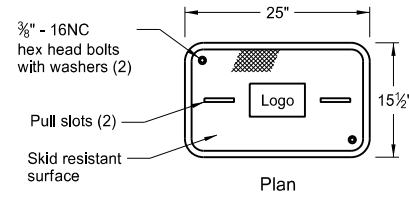
PULL BOX DETAILS



Cast Iron Frame and Cover



Section Cover



Elevation

Polymer Concrete Pull Box

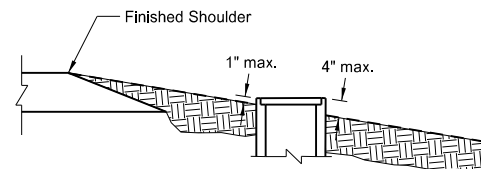
Note: Polymer concrete reinforced by a heavy weave fiberglass

Notes:

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

PVC Pull Box Notes:

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



Typical Pull Box in Rural Section

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7-8-14	Added Note 3

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