JOB# _____

FHWA REGION	STATE	PROJECT	SHEET NO.
8	N.D.	IR-194-4(053)000 F-1-094(007)920	1

DESIGN DATA

Traffic		Average Daily				Est. 30th Max. Hr.
Current (1990)	12,900 Pass.	700	Trucks	13,600	Total	1360
Forecast (2010)	15,950 Pass.	850	Trucks	16,800	Total	1680

Design Speed 35 MPH
Traffic Classification "M"
Minimum Sight Distance (Stopping) 250'
Minimum Sight Distance (Safe Passing)
Minimum Passing Sight Distance for Marking
Bridges HS 20

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

MORTON AND BURLEIGH COUNTIES

FEDERAL AID PROJECT NO. IR-194-4(053)000 & F-1-094(007)920

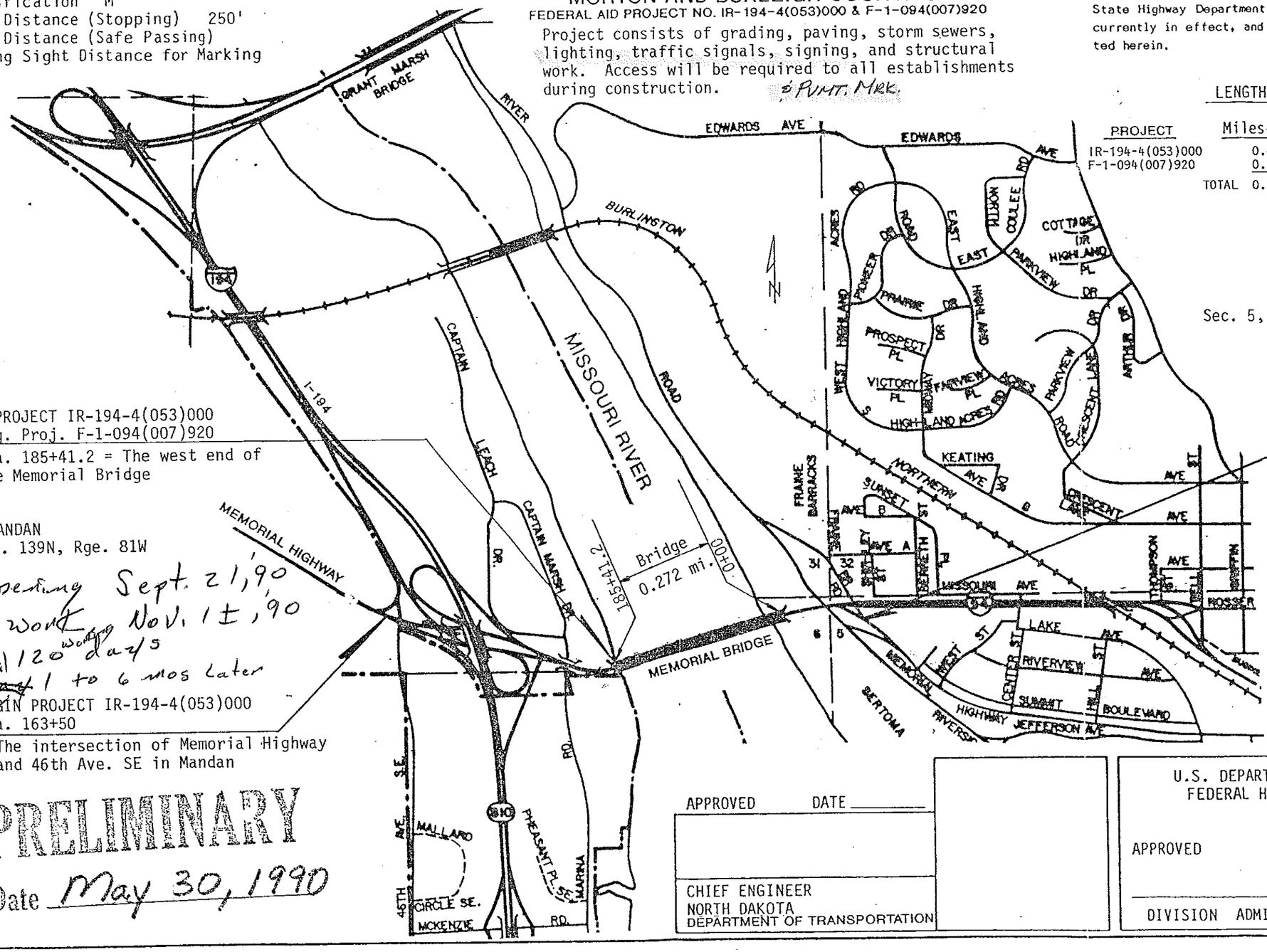
Project consists of grading, paving, storm sewers, lighting, traffic signals, signing, and structural work. Access will be required to all establishments during construction. & PVMT. MRK.

GOVERNING SPECIFICATIONS:

Standard Specifications adopted by the North Dakota State Highway Department November 1986, Standard Drawings currently in effect, and other Contract Provisions submitted herein.

LENGTH OF PROJECT

PROJECT	Miles-Gross	Miles-Net
IR-194-4(053)000	0.415	0.415
F-1-094(007)920	0.396	0.396
TOTAL	0.811	0.811



END PROJECT IR-194-4(053)000
= Beg. Proj. F-1-094(007)920
= Sta. 185+41.2 = The west end of the Memorial Bridge

BEGIN PROJECT IR-194-4(053)000
Sta. 163+50
= The intersection of Memorial Highway and 46th Ave. SE in Mandan

END PROJECT F-1-094(007)920
Sta. 6+50.16
= The intersection of Memorial Highway and Fraine Barracks Road in Bismarck

Bid opening Sept. 21, 90
Begin work Nov. 1 ±, 90
Allow 120 working days
+/- 1 to 6 mos later

Incentive $500/day
Disincentive $500/day after Oct 1

cap of 45 days

PRELIMINARY

Date May 30, 1990

APPROVED DATE _____

CHIEF ENGINEER
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED 21

DIVISION ADMINISTRATOR DATE

GENERAL NOTES

754 030 IN-PLACE SIGNS: The district shall inspect the in-place signs and supports for condition to determine if there are any additional signs or supports that can be reset or changed to new sign and supports. The district shall inform the contractor of any changes prior to the time the contractor orders materials.

754 050 SIGN SUPPORTS: The sign support "Steel Galvanized Posts - Square Tube Perforated" were designed using a minimum yield strength of 42,000 psi and the design requirements of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals." The wind speed of 75 mph was used. The contractor may choose other types of square telescoping steel post in lieu of the ones specified but the contractor must provide equivalent strength posts and meet the FHWA yielding support requirements.

770 001 OVERHEAD LINES CLEARANCE: Minimum horizontal and vertical clearance between light and/or signal standards and power lines shall be as shown for the following power line voltages:

Power Line Voltage	* Horizontal Clearance	Vertical Clearance
0-15,000	5'	6'
15,000-50,000	5'	7'
50,000 Plus	5'+0.033' per KV Over 50 KV	7'+0.033' per KV Over 50 KV

770 034 SODIUM VAPOR LUMINAIRE (MOUNTED ON EXISTING STANDARDS): The item sodium vapor luminaire shall consist of installing the new high-pressure sodium vapor luminaire on the existing light standard. The existing light standard shall remain in place. The contractor shall make the necessary connections between the new high-pressure sodium vapor luminaire and the existing light standard conductor.

The item sodium vapor luminaire will be measured by the number installed. The quantities measured will be paid for at the contract price and shall be full compensation for all labor, equipment, and materials necessary to complete the installation.

770 043 REMOVE STREET LIGHT LUMINAIRE: The item remove street light luminaire shall consist of removing the existing luminaires from their present locations. The contractor shall arrange with the local utility company to have the circuits disconnected from the source of live power. The conductor leading to the luminaire shall be disconnected. The luminaire shall be removed without damage to the luminaire or wiring. The existing light standards shall remain in place. The removed luminaires shall be loaded, hauled, and stored at a point not further than three (3) miles from the project as designated by the engineer. The contractor shall be responsible for any damage to the luminaire and shall replace, at the contractor's expense, any damaged luminaires. The removed luminaires shall be the property of the state. The item remove street light luminaire will be measured by the "Number of Luminaires Removed." The quantities measured will be paid for at the contract price and shall be full compensation for all labor, equipment, and material necessary to complete the removal and storage.

770 700 LUMINAIRES: The high-pressure sodium vapor luminaires shall be internal ballast-constant wattage, 120x240 voltage, operated on 120 volts.

770 750 LEGEND - LIGHTING:

250-watt sodium vapor luminaire

400-watt sodium vapor luminaire

770 P01 RELOCATE LIGHT STANDARD: After erection, the contractor shall touch up all marred or scratched areas with material conforming to Section 854.

770 P02 EXISTING PLANS: As-built plans of existing lighting system are available for inspection at the North Dakota Department of Transportation, Bismarck District Office.

FHWA REGION	STATE	FED. AID PROJ NO	SHEET NO
8	N.D.	F-1-094(007)920	

GENERAL NOTES

770 P03 RELOCATE CONCRETE LIGHT STANDARD: The item, "Relocate Concrete Light Standard" shall consist of removing light standard from existing location designated on the plans. The contractor shall arrange with the local utility company to have the light circuits disconnected from the source of live power at the feed point. Wires leading to the luminaire receptacle shall be disconnected at the fuses and light standard removed. All standards shall be plumbed. Mast arms shall be perpendicular to the centerline of the roadway to be lighted unless shown otherwise on the plans. The contractor shall be responsible for any damage to the poles, luminaires, mast arms, internal wiring and fuses, and shall replace at his own expense any damaged equipment. The item "Relocate Concrete Light Standard" will be measured by the number of light standards relocated. The quantities measured will be paid for at the contract price and shall be full compensation for all labor, equipment and materials necessary to complete the relocation of light standards.

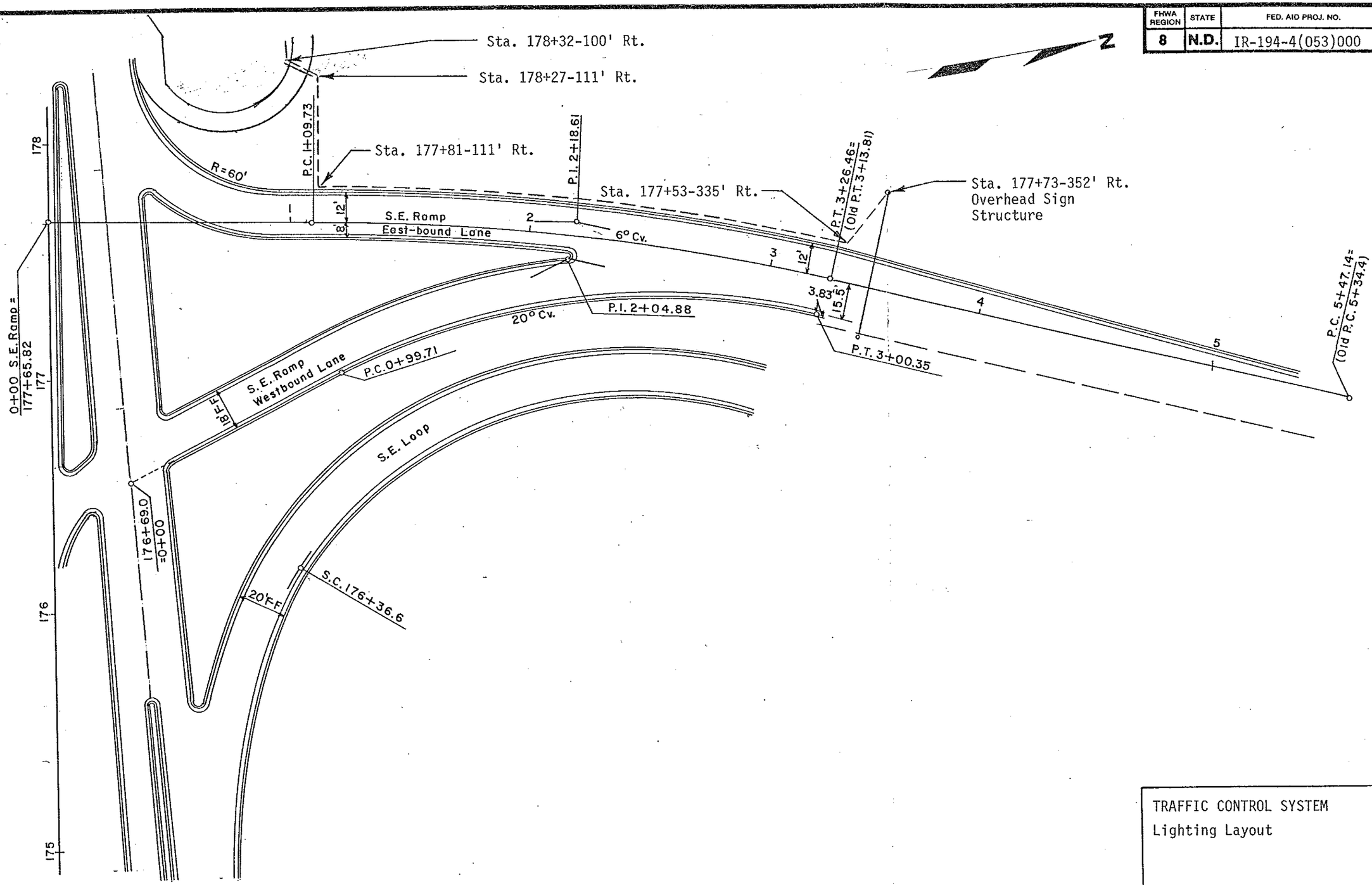
772 008 EXISTING PLANS: As-builts plans of existing traffic signal system are available for inspection at the North Dakota Department of Transporation, Bismarck district office.

772 100 PAINT: The traffic signal system components shall be painted in accordance with the following:

Transformer base - green
Mast arm - green
Signal head mounting hardware - green
Shaft - green
Signal housing - green
Pedestrian pushbutton post - green

772 P01 MICROLOOP DOUBLE PROBE SET: The microloop probe shall be a small cylindrical passive transducer of earth's vertical magnetic field intensity into inductance. It transforms changes in magnetic field intensity into inductance changes which can be sensed by loop detector units. Probes shall fit vertically in 1" holes and lead-in cable in 3/8" saw slot. Microloop probes can be connected in series with other microloop probes or conventional wire loops. The microloop probe shall operate under the following parameters: Earth's Vertical Magnetic Field (0.2 to 1.0 oersted), Inductance (20 mH to 25 m per probe plus 20 mH per 100' of wire), DC Resistance (0.5 ohms per probe plus 3.2 ohms per 100' of wire), Transducer Gain (typically 3.5 mH per oersted at 0.4 OE ambient vertical field intensity), and Sensitivity with 2 probes (7.0 mH per oersted at 0.4 OE ambient vertical field intensity). The microloop probes shall operate at a temperature range of -35°F to +165°F (-37°C to +74°C) and at humidity of 0 to 100%. The microloop probes shall detect all motorized vehicles registered in the state of North Dakota.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	1-1



TRAFFIC CONTROL SYSTEM
Lighting Layout

Memorial Highway
Mandan, ND

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	L-2

STATION	CONDUIT RUNS		CABLE TRENCH	CABLE RUNS	
	Length	Size	Length	Length	Type
177+73-352' Rt. to				(A)744'	(2) No.6 Type RHW
177+53-335' Rt. to			26'	(B)372'	(1) No.6 Type THW
177+81-111' Rt. to			230'		
178+27-111' Rt. to			46'		
178+32-100' Rt. to	12'	2"			
178+40-100' Rt.			8'		

QUANTITIES										
Cable Trench-Type I	2 Inch Dia. Rigid Conduit	Underground Conductor No. 6 Type RHW	Underground Conductor No. 6 Type THW							
LF	LF	LF	LF							
310	12	744	372							

(A) 100 ft. of conductor for providing wiring of overhead sign structure from foundation to load center.

(B) 50 ft. of conductor for providing wiring of overhead sign structure from foundation to load center.

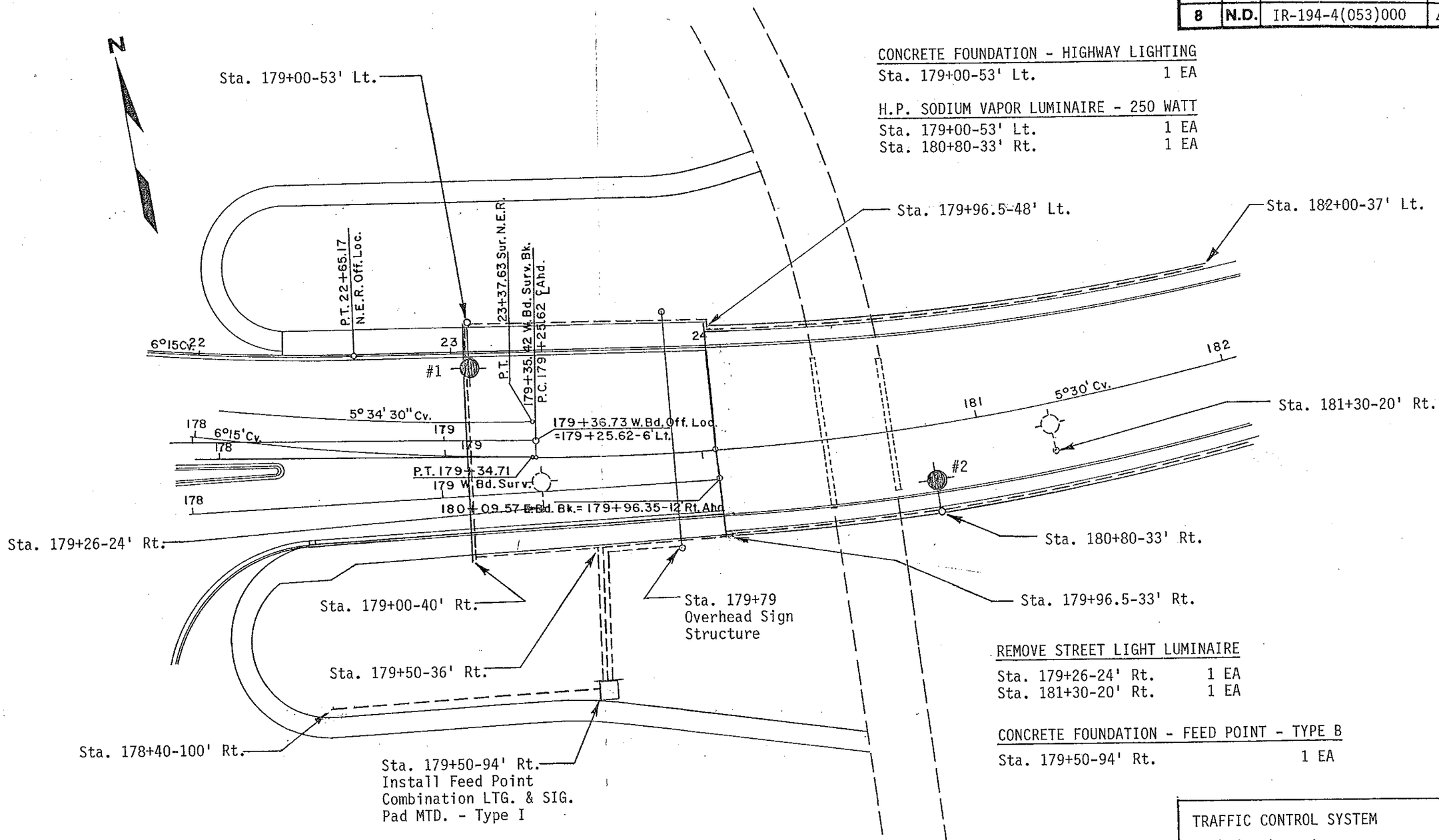
NO.	STATION	OFFSET	WATTAGE	CIRCUIT	IES-TYPE	POLE HT.	MAST ARM

TRAFFIC CONTROL SYSTEM

Lighting Quantities

Memorial Highway
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	L-3



CONCRETE FOUNDATION - HIGHWAY LIGHTING

Sta. 179+00-53' Lt.	1 EA

H.P. SODIUM VAPOR LUMINAIRE - 250 WATT

Sta. 179+00-53' Lt.	1 EA
Sta. 180+80-33' Rt.	1 EA

REMOVE STREET LIGHT LUMINAIRE

Sta. 179+26-24' Rt.	1 EA
Sta. 181+30-20' Rt.	1 EA

CONCRETE FOUNDATION - FEED POINT - TYPE B

Sta. 179+50-94' Rt.	1 EA

RELOCATE LIGHT STANDARD

Existing Location	New Location	
Sta. 179+26-24' Rt.	179+00-53' Lt.	1 EA
Sta. 181+30-20' Rt.	180+80-33' Rt.	1 EA

FEED POINT - COMBINATION LTG. & SIG. - PAD MTD.

Sta. 179+50-94' Rt.	1 EA

TRAFFIC CONTROL SYSTEM
Lighting Layout

Memorial Highway
Mandan, ND

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	L-4

STATION	CONDUIT RUNS Length	CONDUIT RUNS Size	CABLE TRENCH Length	CABLE RUNS Length	CABLE RUNS Type
178+40-100' Rt. to 179+50-94' Rt.			109'	240' 120'	(2) No.6 Type RHW (1) No.6 Type THW
179+50-94' Rt. to 179+50-36' Rt. to 179+79-36' Rt.				(E)394' (F)197'	(2) No.6 Type RHW (1) No.6 Type THW
179+50-94' Rt. to 179+50-36' Rt. to 179+96.5-33' Rt. to			57' 47'	666' 333' 333'	(2) No.2 Type RHW (1) No.4 Type RHW (1) No.6 Type THW
180+80-33' Rt. to	(G)85'	2"			
182+00-33' Rt.	(G)123'	2"			
179+50-94' Rt. to 179+50-36' Rt. to				1028' 514'	(2) No.4 Type RHW (1) No.6 Type THW
179+00-40' Rt. to			50'		
179+00-53' Lt. to	92'	2"			
179+96.5-48' Lt. to			96'		
182+00-37' Lt.	(G)196'	2"			

NO.	STATION	OFFSET	WATTAGE	CIRCUIT	IES-TYPE	POLE HT.	MAST ARM
1	179+00	53' Lt.	250	1	MSC IV	(H)	
2	180+80	33' Rt.	250	1	MSC IV	(H)	

QUANTITIES

Concrete Foundation Highway Lighting	Concrete Foundation Feed Point - Type B	Cable Trench - Type I	2 Inch Dia. Rigid Conduit	Underground Conductor No. 2 - Type RHW	Underground Conductor No. 4 - Type RHW	Underground Conductor No. 6 - Type RHW	Underground Conductor No. 6 - Type THW	H.P. Sodium Vapor Luminaire 250 Watt	Relocate Light Standard	Remove Street Light Luminaire	Feed Point - Combo LTG. & SIG. - Pad MTD. - Type I
EA	EA	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA
1	1	359	92	666	1361	634	1164	2	2	2	1

(E) 200 ft. of conductor for providing wiring of overhead sign structure from foundation to load center.

(F) 100 ft. of conductor for providing wiring of overhead sign structure from foundation to load center.

(G) 2" Dia. bridge mounted conduit shall be installed by structural contractor.

(H) Relocated light standard.

TRAFFIC CONTROL SYSTEM
Lighting Quantities

Memorial Highway
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	L-5

F-1-094(007)920

RELOCATE LIGHT STANDARD

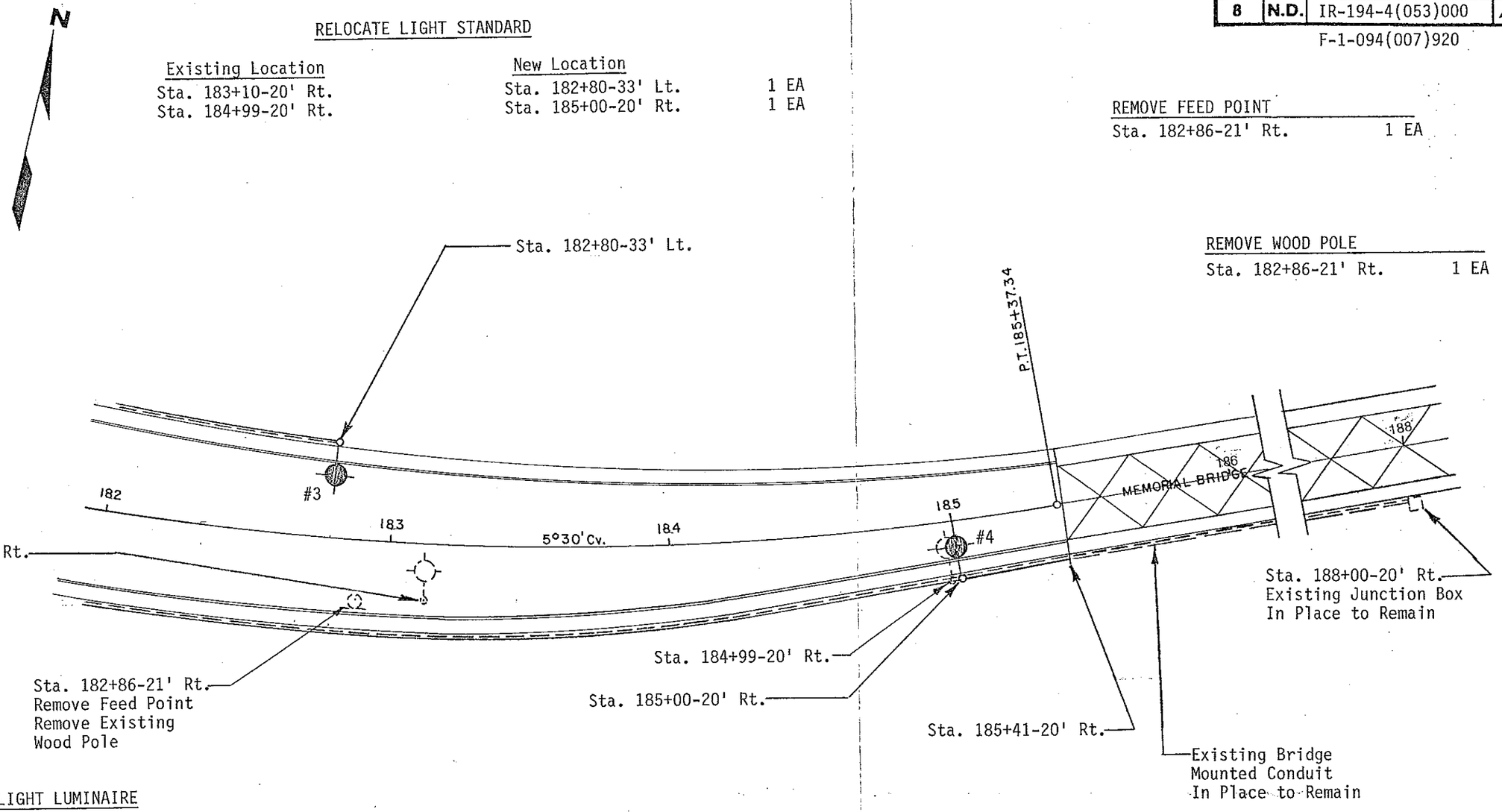
Existing Location	New Location	
Sta. 183+10-20' Rt.	Sta. 182+80-33' Lt.	1 EA
Sta. 184+99-20' Rt.	Sta. 185+00-20' Rt.	1 EA

REMOVE FEED POINT

Sta. 182+86-21' Rt. 1 EA

REMOVE WOOD POLE

Sta. 182+86-21' Rt. 1 EA



REMOVE STREET LIGHT LUMINAIRE

Sta. 183+10-20' Rt.	1 EA
Sta. 184+99-20' Rt.	1 EA

H.P. SODIUM VAPOR LUMINAIRE - 250 WATT

Sta. 182+80-33' Lt.	1 EA
Sta. 185+00-20' Rt.	1 EA

TRAFFIC CONTROL SYSTEM
Lighting Layout

Memorial Highway
Mandan, ND

512645

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	4-6

F-1-094(007)920

STATION	CONDUIT RUNS		CABLE TRENCH	CABLE RUNS	
	Length	Size	Length	Length	Type
182+00-33' Rt. to 185+00-20' Rt.	(C)309'	2"		628'	(2)No.2 Type RHW
				314'	(1)No.4 Type RHW
				314'	(1)No.6 Type THW
185+00-20' Rt. to 185+41-20' Rt.	(C)40'	2"		90'	(2)No.2 Type RHW
				45'	(1)No.4 Type RHW
				45'	(1)No.6 Type THW
185+41-20' Rt. to 188+00-20' Rt.				530'	(2)No.2 Type RHW
				265'	(1)No.4 Type RHW
				265'	(1)No.6 Type THW
182+00-37' Lt. to 182+80-33' Lt.	(C)76'	2"		162'	(2)No.4 Type RHW
				81'	(1)No.6 Type THW

QUANTITIES

	Underground Conductor No. 2 Type RHW	Underground Conductor No. 4 Type RHW	Underground Conductor No. 6 Type THW	H.P. Sodium Vapor Luminaire 250 Watt	Relocate Light Standard	Remove Feed Point	Remove Wood Pole	Remove Street Light Luminaire			
	LF	LF	LF	EA	EA	EA	EA	EA			
IR-194-4(053)000	718	521	440	2	2	1	1	2			
F-1-094(007)920	530	265	265								

(C) 2 inch dia. bridge mounted conduit shall be installed by structural contractor.

(D) Relocated light standard

NO.	STATION	OFFSET	WATTAGE	CIRCUIT	IES-TYPE	POLE HT.	MAST ARM
3	182+80	33' Lt.	250	1	MSC IV	(D)	
4	185+00	20' Rt.	250	1	MSC III	(D)	

TRAFFIC CONTROL SYSTEM

Lighting Quantities

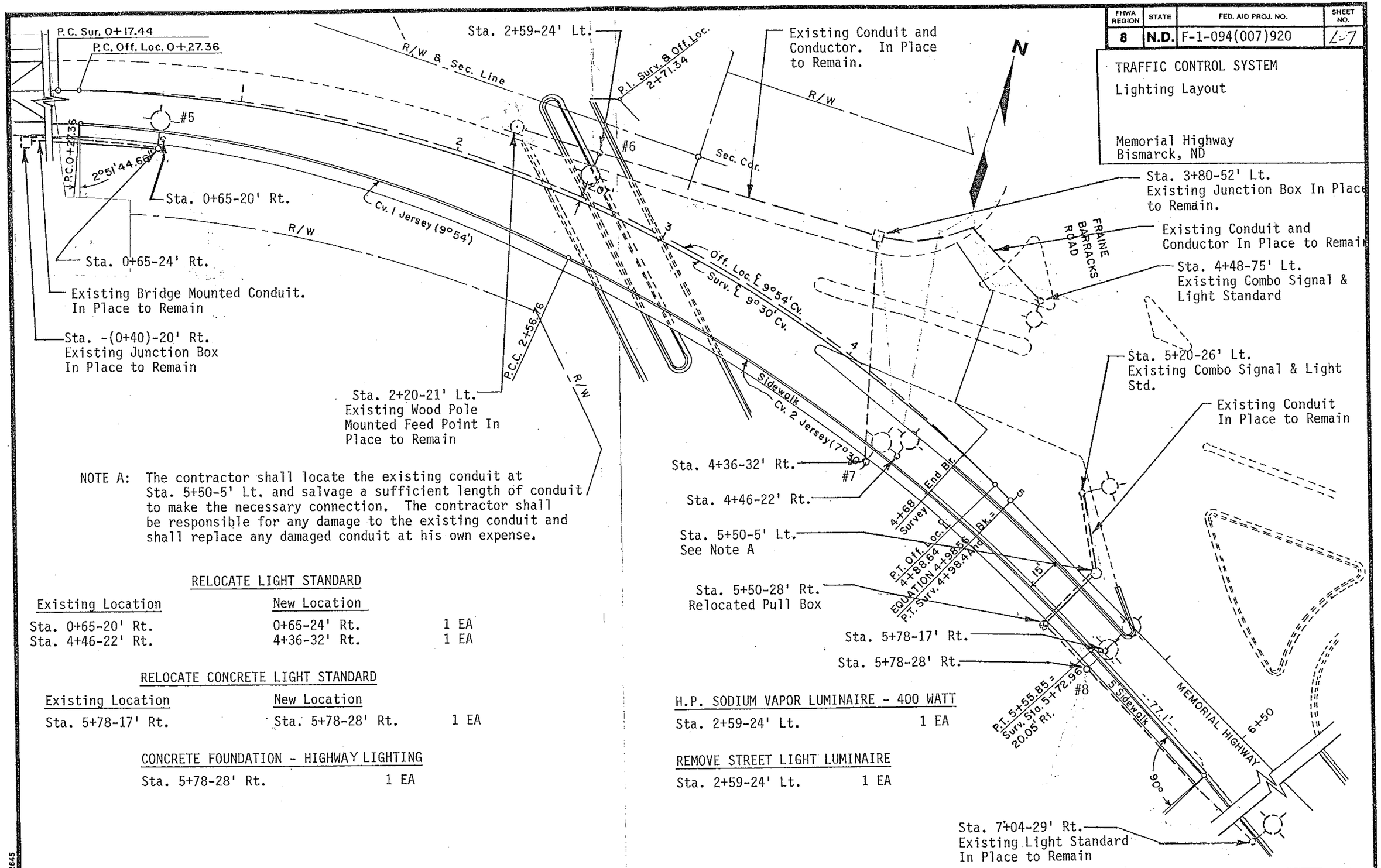
Memorial Highway
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	4-7

TRAFFIC CONTROL SYSTEM

Lighting Layout

Memorial Highway
Bismarck, ND



NOTE A: The contractor shall locate the existing conduit at Sta. 5+50-5' Lt. and salvage a sufficient length of conduit to make the necessary connection. The contractor shall be responsible for any damage to the existing conduit and shall replace any damaged conduit at his own expense.

RELOCATE LIGHT STANDARD

Existing Location	New Location	
Sta. 0+65-20' Rt.	0+65-24' Rt.	1 EA
Sta. 4+46-22' Rt.	4+36-32' Rt.	1 EA

RELOCATE CONCRETE LIGHT STANDARD

Existing Location	New Location	
Sta. 5+78-17' Rt.	Sta. 5+78-28' Rt.	1 EA

CONCRETE FOUNDATION - HIGHWAY LIGHTING

Sta. 5+78-28' Rt. 1 EA

H.P. SODIUM VAPOR LUMINAIRE - 400 WATT

Sta. 2+59-24' Lt. 1 EA

REMOVE STREET LIGHT LUMINAIRE

Sta. 2+59-24' Lt. 1 EA

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	2-8

STATION	CONDUIT RUNS Length	CONDUIT RUNS Size	CABLE TRENCH Length	CABLE RUNS Length	CABLE RUNS Type
-(0+40)-20' Rt. to 0+00-20' Rt.				230'	(2) No.4 Type RHW
				115'	(1) No.6 Type THW
0+00-20' Rt. to 0+65-24' Rt.	(I) 64'	2"			
3+80-52' Lt. to 4+36-32' Rt.	(J) 20'	2"	100'	270'	(2) No.4 Type RHW
				135'	(1) No.6 Type THW
5+20-26' Lt. to 5+50-05' Lt.				747'	(3) No.4 Type RHW
5+50-28' Rt. to 5+78-28' Rt.	33'	2"	27'		
7+04-29' Rt.			124'		

QUANTITIES										
Concrete Foundation Highway Lighting	Cable Trench-Type I	2 Inch Dia. Rigid Conduit-Bridge Mounted	Underground Conductor No. 4-Type RHW	Underground Conductor No. 6-Type THW	H.P. Sodium Vapor Luminaire 400 Watt	Relocate Light Standard	Relocate Concrete Light Standard	Remove Street Light Luminaire		
EA	LF	LF	LF	LF	EA	EA	EA	EA		
1	251	20	1247	250	1	2	1	1		

(I) 2" dia. bridge mounted conduit shall be installed on structural plans.

(J) 20 ft. of 2" dia. bridge mounted conduit from ground to light standard.

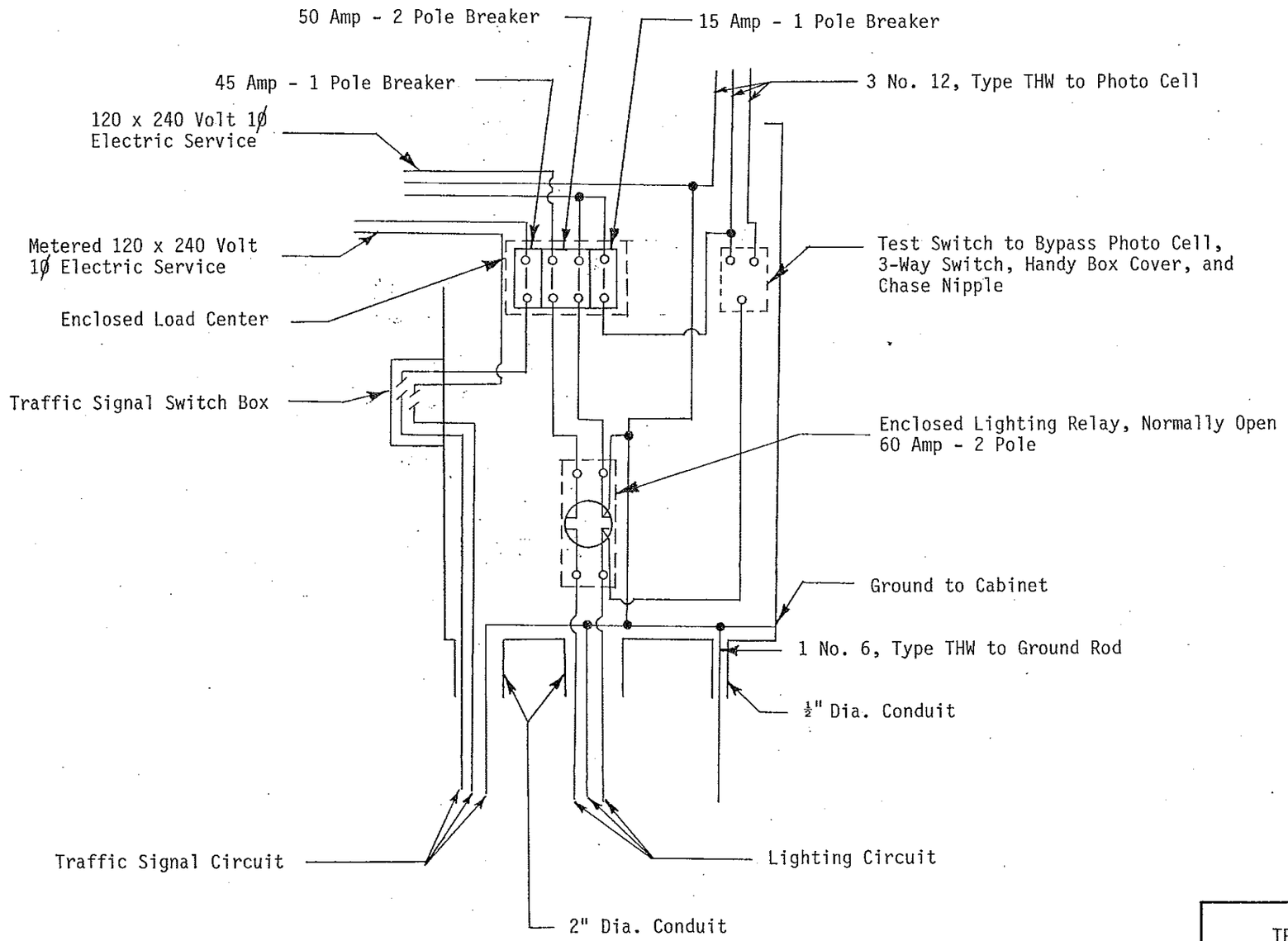
(K) Existing light standard.

NO.	STATION	OFFSET	WATTAGE	CIRCUIT	IES-TYPE	POLE HT.	MAST ARM
#6	2+59	24' Lt.	400	2	MSC III	(K)	

TRAFFIC CONTROL SYSTEM
Lighting Quantities

Memorial Highway
Bismarck, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	4-9

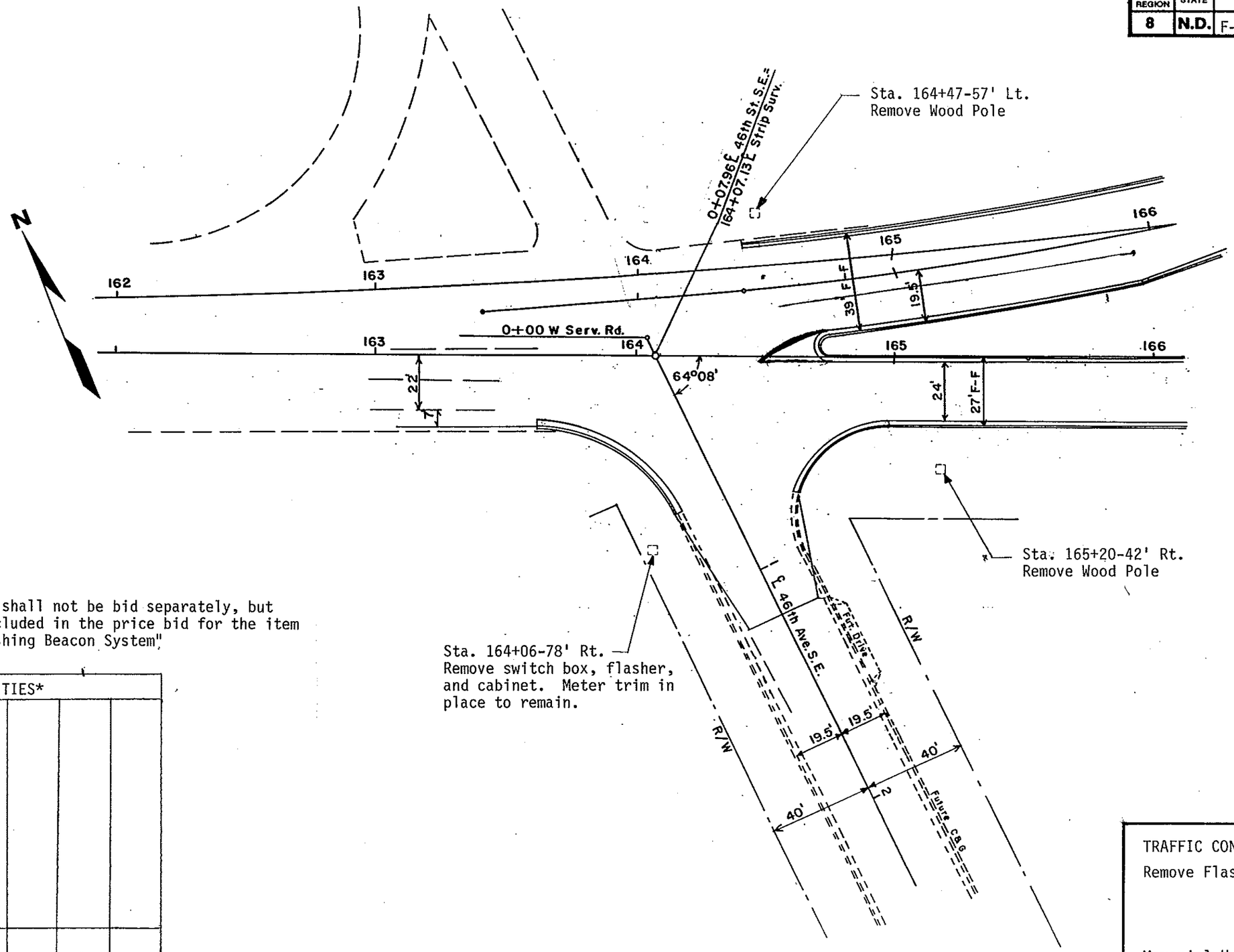


TRAFFIC CONTROL SYSTEM

Combination Lighting & Signal
Pad Mtd. Feed Point Detail

Memorial Highway
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	5-1



* These items shall not be bid separately, but shall be included in the price bid for the item "Remove Flashing Beacon System"

QUANTITIES*					
Remove Wood Poles	Remove Beacon Head	Remove Switch Box, Flasher and Cabinets			
EA	EA	EA			
2	1	1			

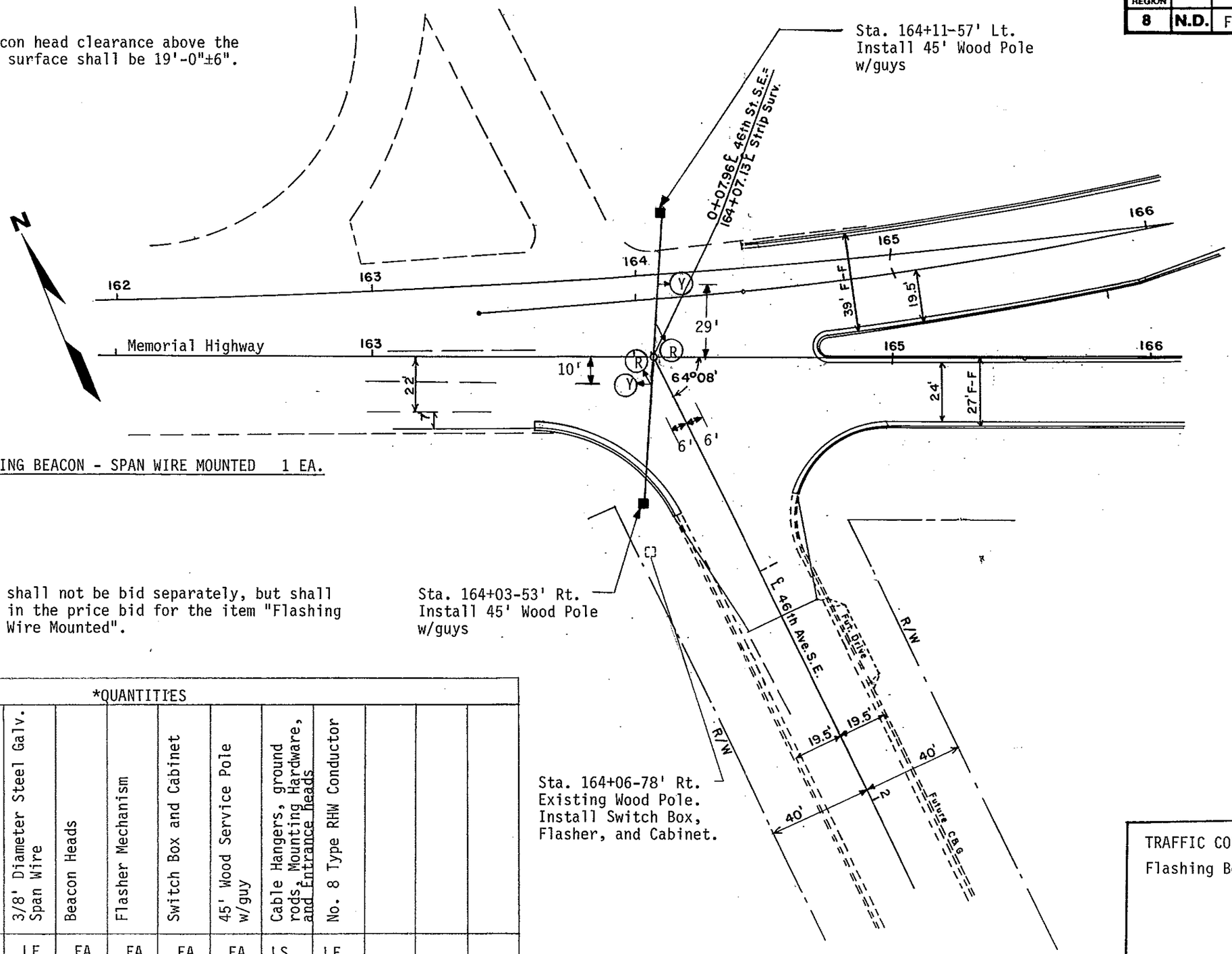
TRAFFIC CONTROL SYSTEM
Remove Flashing Beacon

Memorial Hwy. & 46th Av. S.E.
Mandan, ND

512645

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	5-2

NOTE: The beacon head clearance above the roadway surface shall be 19'-0"±6".



FLASHING BEACON - SPAN WIRE MOUNTED 1 EA.

* These items shall not be bid separately, but shall be included in the price bid for the item "Flashing Beacon Span Wire Mounted".

*QUANTITIES												
1" Dia. Rigid Conduit	No. 12 AWG 3 Conductor Cable	1/8" Diameter Steel Galv. Stability Wire	3/8' Diameter Steel Galv. Span Wire	Beacon Heads	Flasher Mechanism	Switch Box and Cabinet	45' Wood Service Pole w/guy	Cable Hangers, ground rods, Mounting Hardware, and Entrance heads	No. 8 Type RHW Conductor			
LF	LF	LF	LF	EA	EA	EA	EA	LS	LF			
77	158	114	114	4	1	1	2	1	90			

TRAFFIC CONTROL SYSTEM
Flashing Beacon Layout

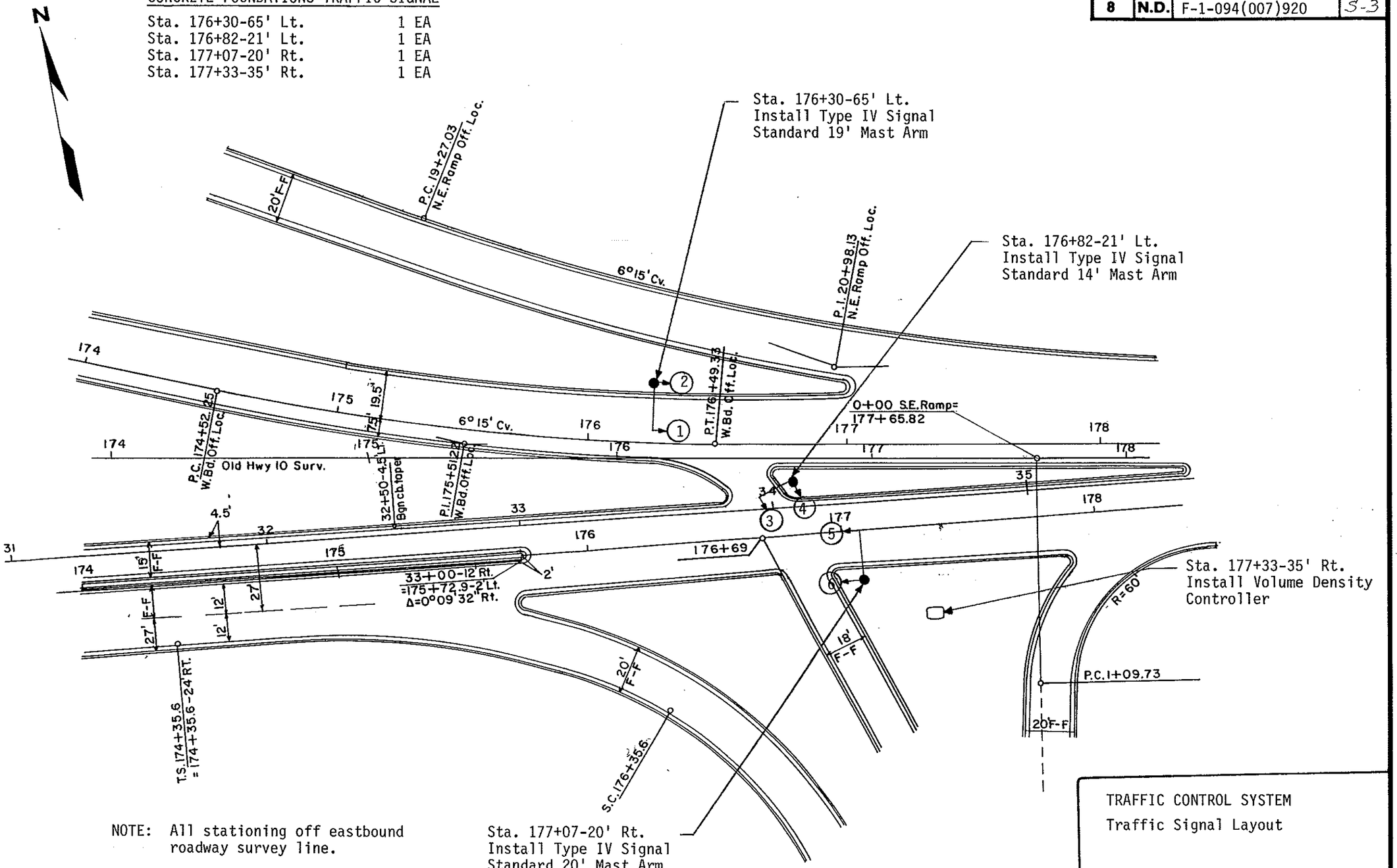
Memorial Hwy. & 46th Av. S.E.
Mandan, ND

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	5-3

CONCRETE FOUNDATIONS-TRAFFIC SIGNAL

Sta. 176+30-65' Lt.	1 EA
Sta. 176+82-21' Lt.	1 EA
Sta. 177+07-20' Rt.	1 EA
Sta. 177+33-35' Rt.	1 EA



NOTE: All stationing off eastbound roadway survey line.

TRAFFIC CONTROL SYSTEM

Traffic Signal Layout

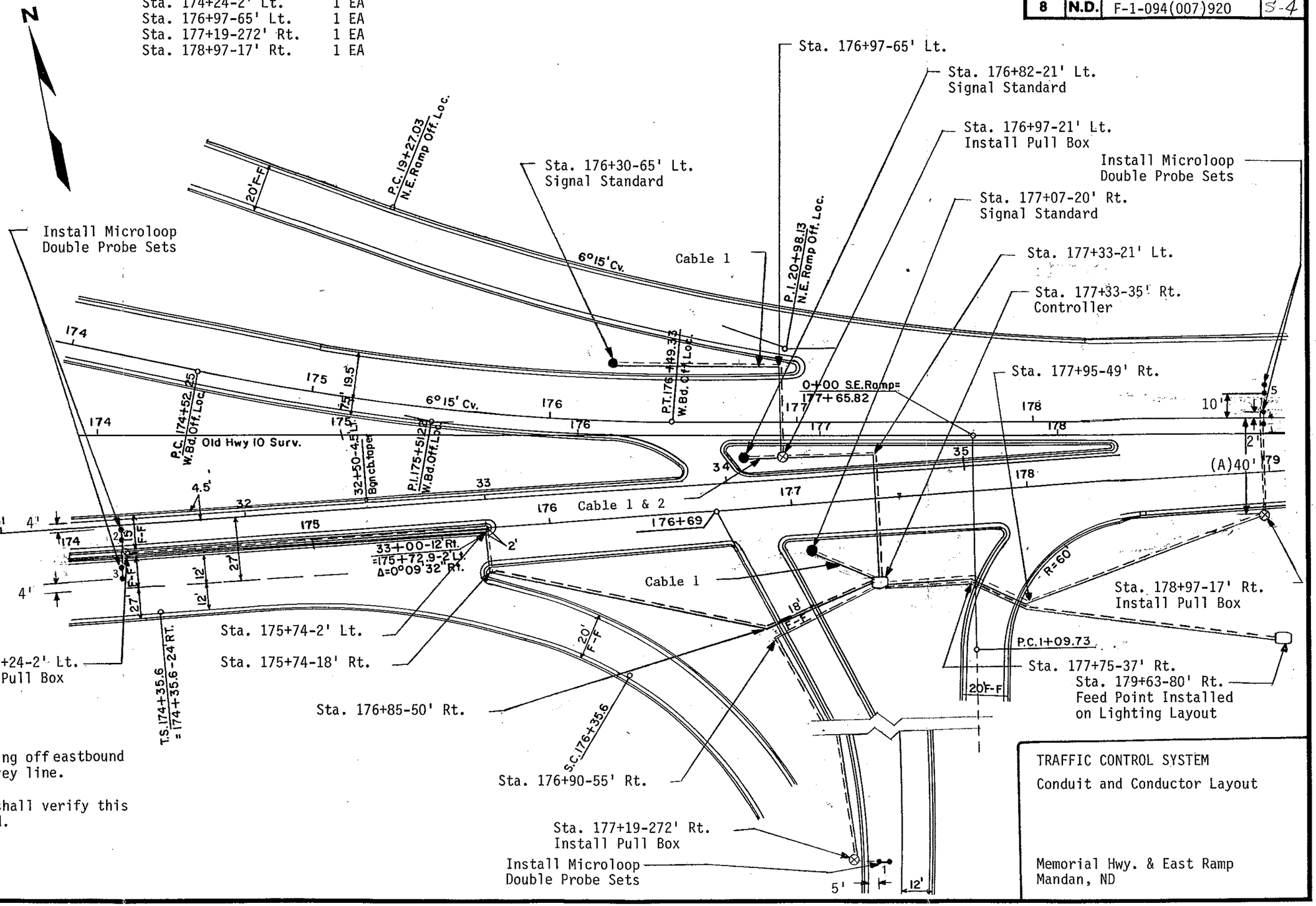
Memorial Hwy. & East Ramp
Mandan, ND

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	S-4

PULL BOX

Sta. 174+24-2' Lt.	1 EA
Sta. 176+97-65' Lt.	1 EA
Sta. 177+19-272' Rt.	1 EA
Sta. 178+97-17' Rt.	1 EA



NOTE: All stationing off eastbound roadway survey line.

(A): Contractor shall verify this in the field.

TRAFFIC CONTROL SYSTEM

Conduit and Conductor Layout

Memorial Hwy. & East Ramp
Mandan, ND

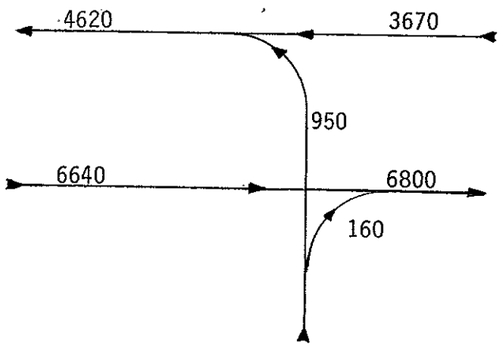
512845

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	F-1-094(007)920	5-5

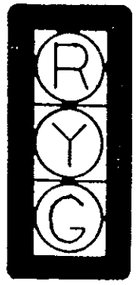
CONDUCTORS			CABLE 1 (12-12)		CABLE 2 (12-12)		CABLE 3		CABLE 4		CABLE 5	
	Base	Tracer	Head	Indication	Head	Indication	Head	Indication	Head	Indication	Head	Indication
1	Black			Spare		Spare						
2	White			Neutral		Neutral		Neutral		Neutral		Neutral
3	Red		1,2,5,6	Red	3,4	Red						
4	Green			Ground		Ground		Ground		Ground		Ground
5	Orange		1,2,5,6	Yellow	3,4	Yellow						
6	Blue		1,2,5,6	Green	3,4	Green						
7	White	Black		Spare		Spare						
8	Red	Black		Spare		Spare						
9	Green	Black		Spare		Spare						
10	Orange	Black		Spare		Spare						
11	Blue	Black		Spare		Spare						
12	Black	White		Spare		Spare						

MICROLOOPS

Loop No.	Type of Loop	Number of Probes	Saw Slot LF
1	Passage	2	--
2	Passage	2	8
3	Passage	2	8
4	Passage	2	--
5	Passage	2	--



ESTIMATED 19 ADT



Heads 1,2,3,4,
5, & 6
(12" Lenses)

TRAFFIC CONTROL SYSTEM

Heads, Conductors, Detector Loops, & Traffic Volumes

Memorial Hwy. & East Ramp
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	5-6

STATION	CONDUIT RUNS		CABLE RUNS	
	Length	Size	Length	Type
176+30-65' Lt. to 176+97-65' Lt. to 176+97-21' Lt.	110'	2"	116'	Cable 1
176+82-21' Lt. to 176+97-21' Lt.	14'	1.5"	20'	Cable 2
176+97-21' Lt. to 177+33-21' Lt. to 177+33-35' Rt.	91'	2.5"	101' 101'	Cable 1 Cable 2
177+07-20' Rt. to 177+33-35' Rt.	28'	1.5"	44'	Cable 1
174+24-02' Lt. to 175+74-2' Lt. to 175+74-18' Rt. to 176+85-50' Rt. to 177+33-35' Rt.	335'	2"	351'	Loop Lead In (2 & 3)
177+19-272' Rt. to 176+90-55' Rt. to 177+33-35' Rt.	265'	2"	281'	Loop Lead In (1)
178+97-17' Rt. to 177+95-49' Rt. to 177+75-37' Rt. to 177+33-35' Rt.	171'	2"	187'	Loop Lead In (4 & 5)
177+33-35' Rt. to 177+33-35' Rt. to 177+75-37' Rt. to 177+95-49' Rt. to 179+63-80' Rt.	234'	2"	510' 255'	(2) No. 6 RHW (1) No. 6 THW

TRAFFIC CONTROL SYSTEM
CONDUIT & CONDUCTOR QUANTITIES

MEMORIAL HWY & EAST RAMP
MANDAN, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	S-7

N

Head No.	NOT USED	→	NOT USED	↑	NOT USED	←	NOT USED	NOT USED
	Phase	Phase 2	Phase	Phase 4	Phase	Phase 6	Phase	Phase
	R/W	R/W Clear To ∅	R/W	R/W Clear To ∅	R/W	R/W Clear To ∅	R/W	R/W
	Clear To ∅	4 6	Clear To ∅	6 2	Clear To ∅	2 4	Clear To ∅	Clear To ∅
1						G * Y		
2						G * Y		
3				G Y Y				
4				G Y Y				
5		G Y *						
6		G Y *						

CHART "A"	
On Phase	Non-Conflicting Phase Allowed to Time Concurrently
1	Not Used
2	6
3	Not Used
4	None
5	Not Used
6	2
7	Not Used
8	Not Used

Blank Squares Denote a Red Indication.

*When one phase is on alone, any nonconflicting phase may start timing concurrently without a clearance interval. (See Chart "A")

TRAFFIC CONTROL SYSTEM
Controller Phasing

Memorial Hwy. & East Ramp
Mandan, ND

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	F-1-094(007)920	S-8

		Ø 1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	Ø8
BASIC INTERVALS (or FUNCTIONS)									
Initial			22.2		25.1		22.2		
Extension (Gap)			5.0		5.0		5.0		
Maximum (Maximum Green or Ext. Limit)			60		45		60		
Yellow Change			3.3		3.4		3.3		
Red Clearance			0.9		0.7		0.9		
Walk									
Pedestrian Clearance									
VOLUME DENSITY TIMING FUNCTIONS									
Variable Initial Timing Options									
Added Initial									
Minimum Initial			5.8		5.8		5.8		
Added Initial per Actuation			2.1		2.1		2.1		
Actuations Before Added Initial			2		2		2		
Computed Initial									
Minimum Initial			5.8		5.8		5.8		
Maximum Initial			22.2		25.1		22.2		
Actuations to Reach Maximum Initial			7.8		9.2		7.8		
Extensible Initial		NOT USED		NOT USED		NOT USED		NOT USED	NOT USED
Minimum Initial			5.8		5.8		5.8		
Maximum Initial			22.2		25.1		22.2		
Added Initial per Actuation			2.1		2.1		2.1		
TIME WAITING GAP REDUCTION OPTIONS									
Passage Time			5.0		5.0		5.0		
Minimum Gap			1.4		1.4		1.4		
Time to Reduce to Minimum Gap			25.8		10.9		25.8		
Reduce Gap Every			1.0		1.0		1.0		
Reduce Gap Every Second By			0.1		0.3		0.1		
Reduce Gap By			3.6		3.6		3.6		
Locking Memory			X		X		X		
Non-Locking Memory									
Flashing-Normal & Conflict Monitor			Y		R		Y		
Start Up Phasing			G		R		G		
Type of Detector Loop	Presence								
	Calling*								
	Passage		X		X		X		

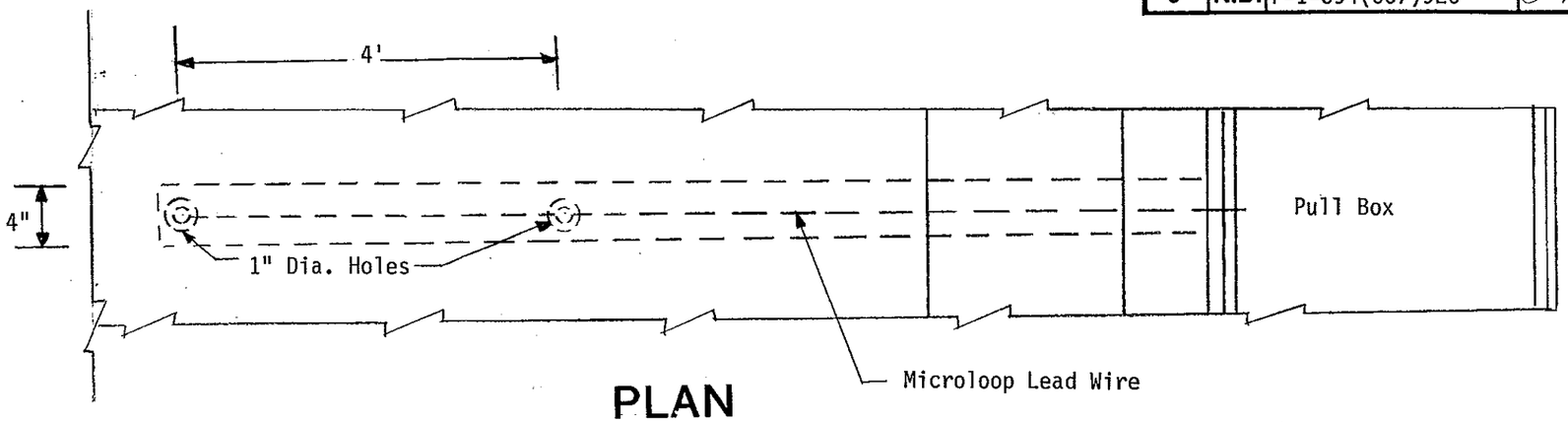
*Calling Loops shall place one call into the Controller on the Yellow or Red interval. Calling Loops shall be disconnected during the Green interval.

TRAFFIC CONTTOL SYSTEM
CONTROLLER SETTINGS

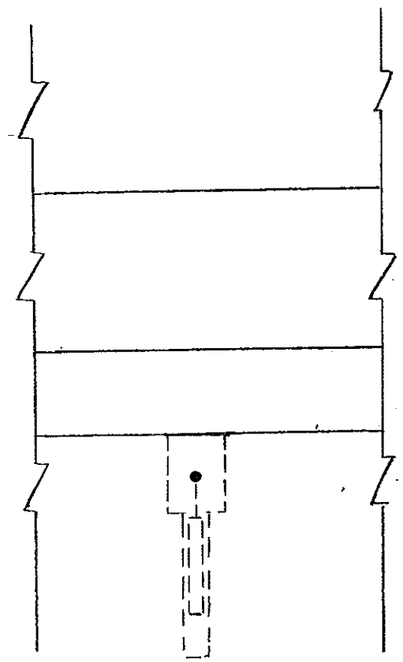
Memorial Hwy. & East Ramp
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	5-9

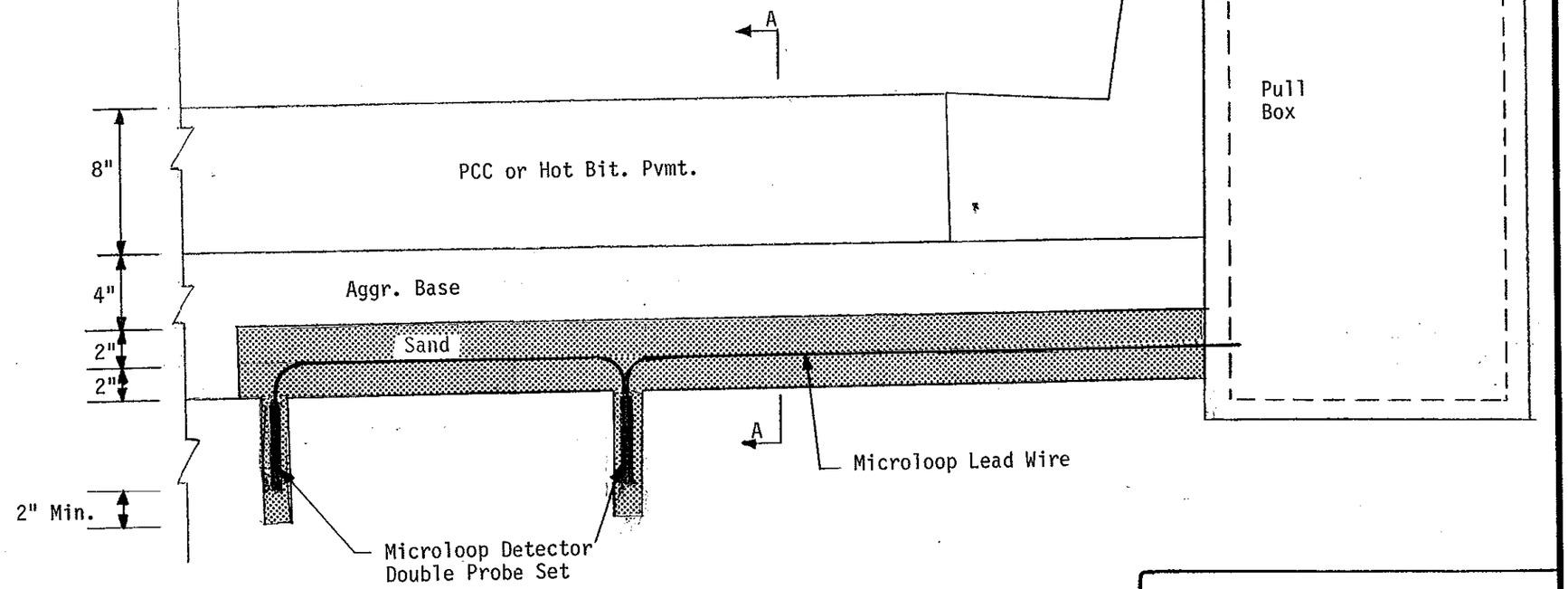
Note: After the installation and compaction of the aggregate base, the contractor shall trench a 4" trench and drill the 1" diameter holes. The microloop detectors shall be installed, embedded in the sand as shown. The aggregate base shall be recompacted to the density of the surrounding material and the microloops shall be tested for functional operational capacities prior to the PCC or Hot. Bit. Pavement placement.



PLAN



A - A



ELEVATION

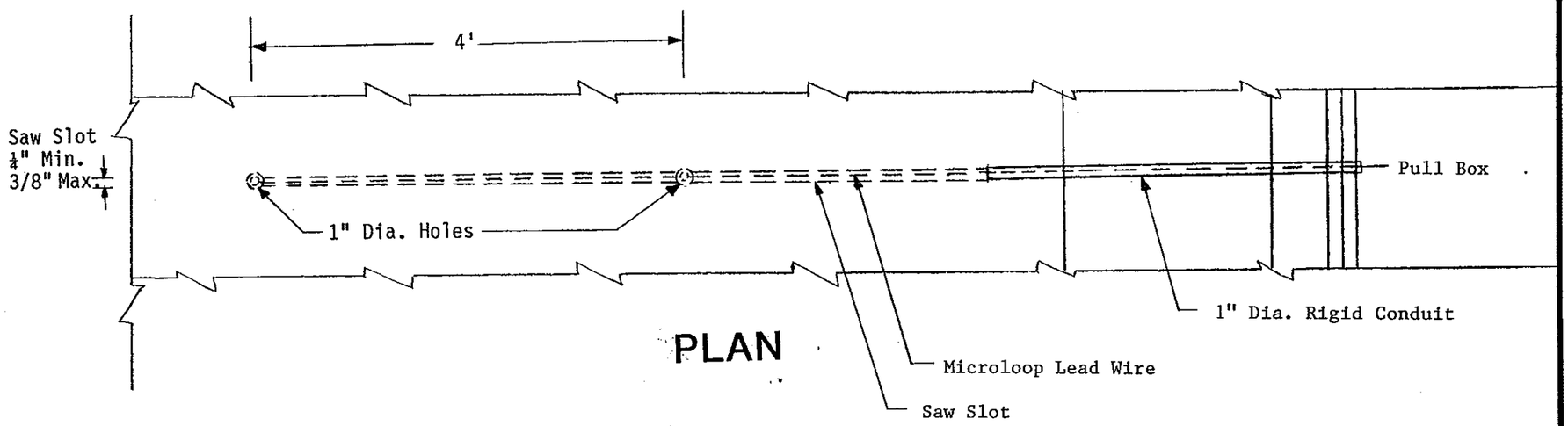
TRAFFIC CONTROL SYSTEM
Microloop Detector Details

Memorial Hwy. & East Ramp
Mandan, ND

524172

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO.
8	N.D.	F-1-094(007)920	5-10

NOTE: The contractor shall drill the 1 inch diameter holes, cut the saw slot in the existing hot bit. pavement and install the microloop detectors. The 1 inch diameter hole shall be filled with sand, seal the saw slot with sealant, and tested for functional operational capabilities prior to the placement of the 2 inch overlay.



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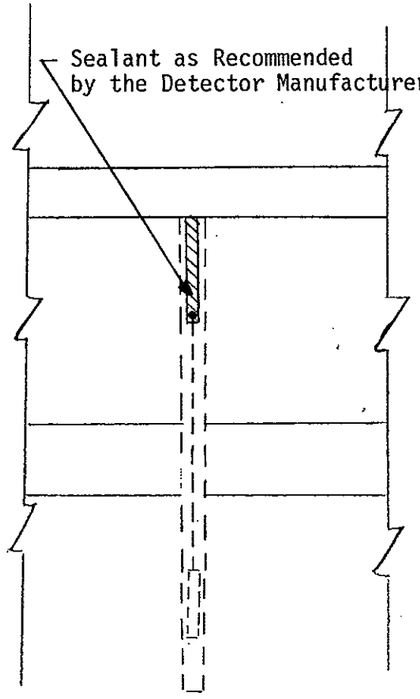
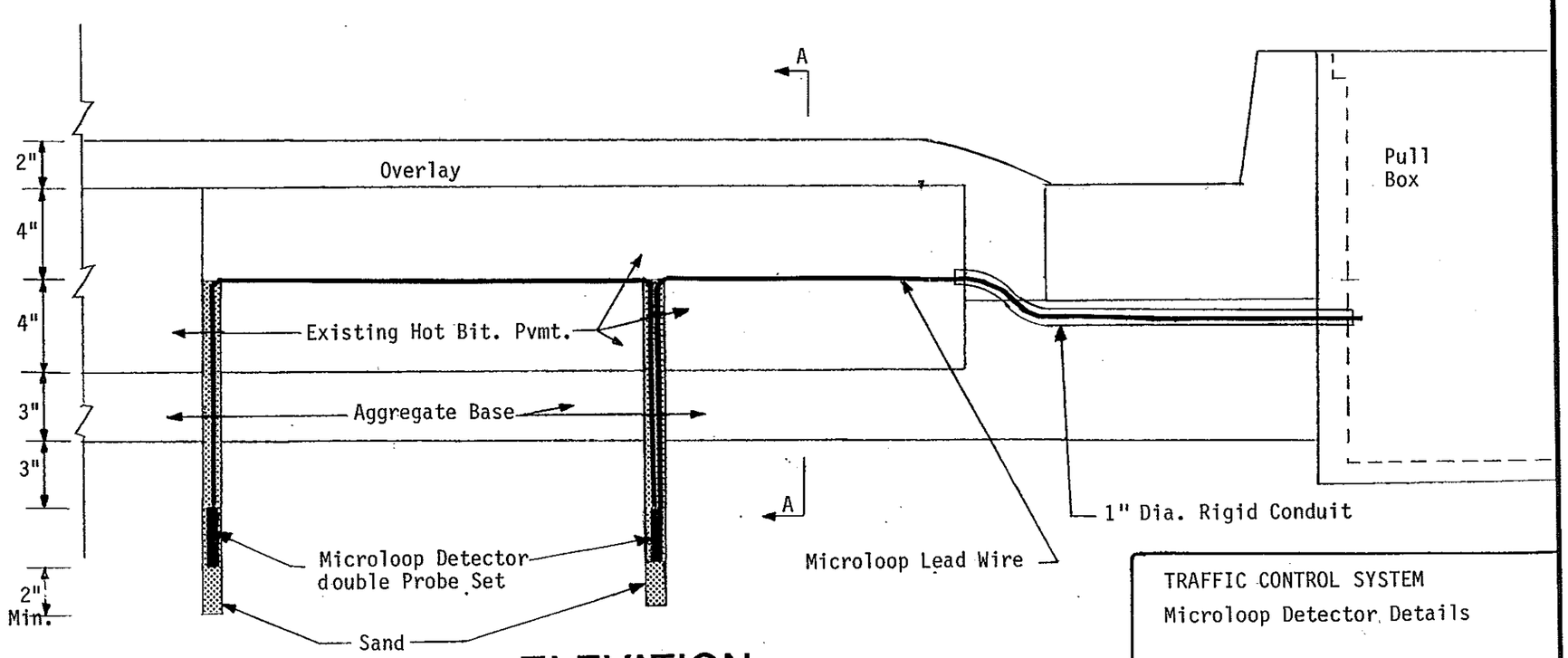


A – A



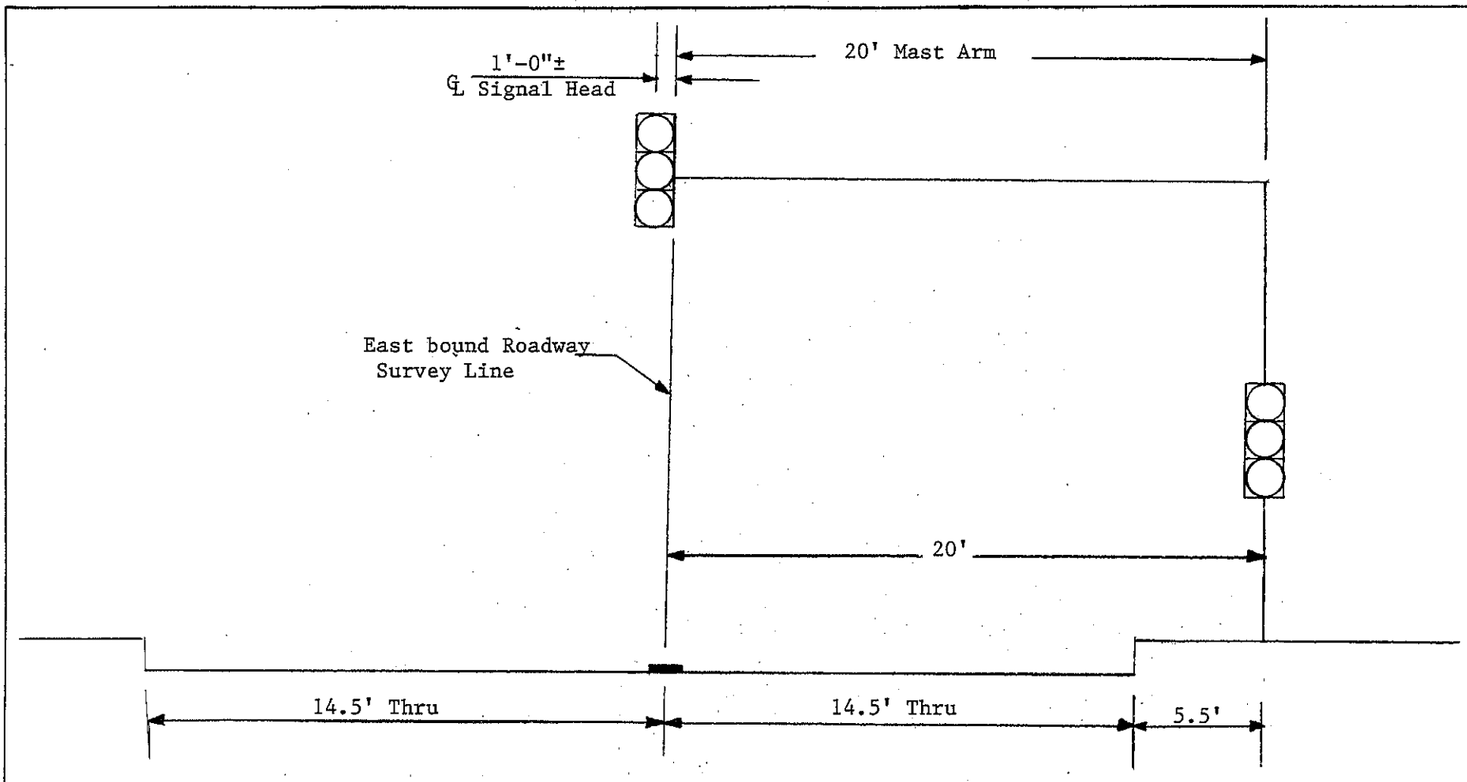
ELEVATION

TRAFFIC CONTROL SYSTEM

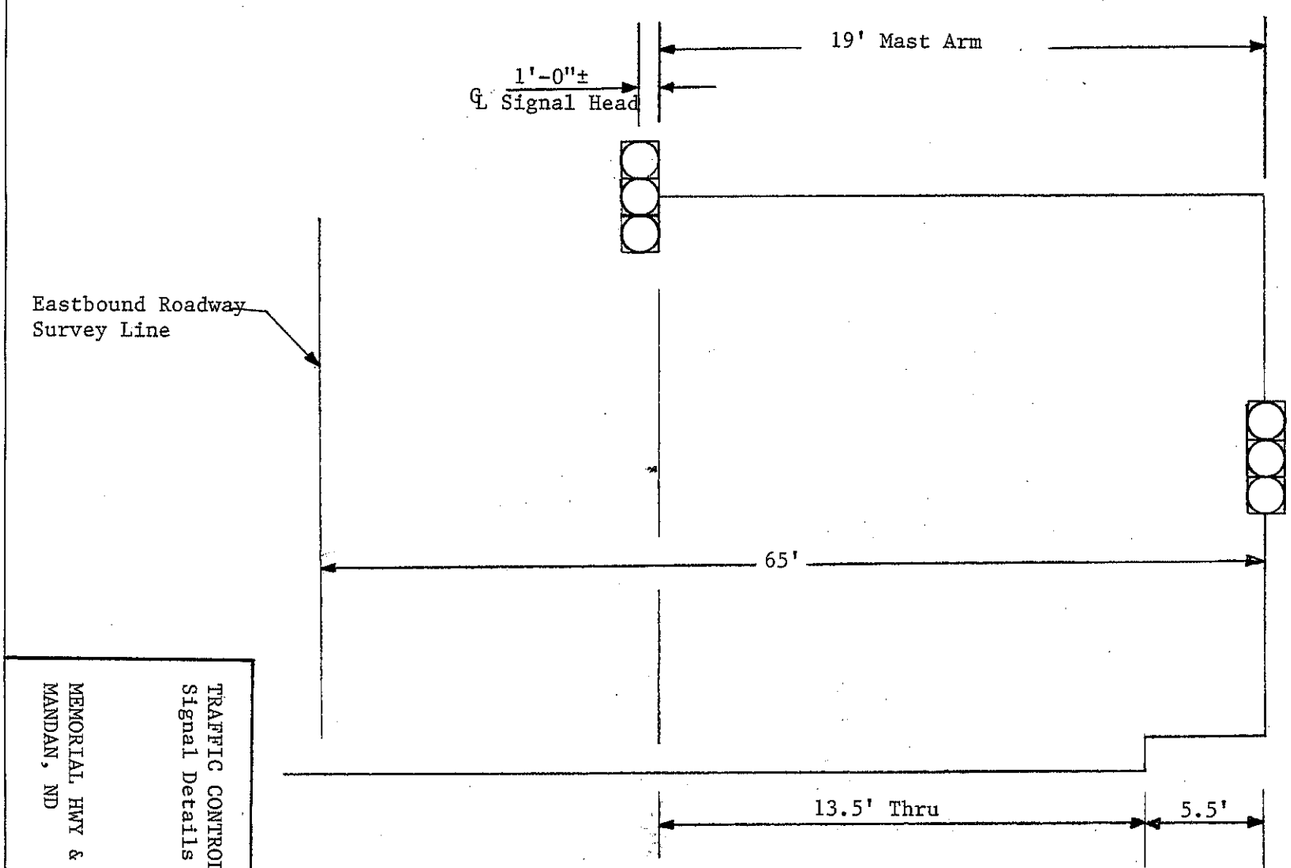
Microloop Detector Details

Memorial Hwy & East Ramp
Mandan, ND

524172



Sta. 177+07-20' Rt.
Eastbound Roadway
West Approach Cross
Section



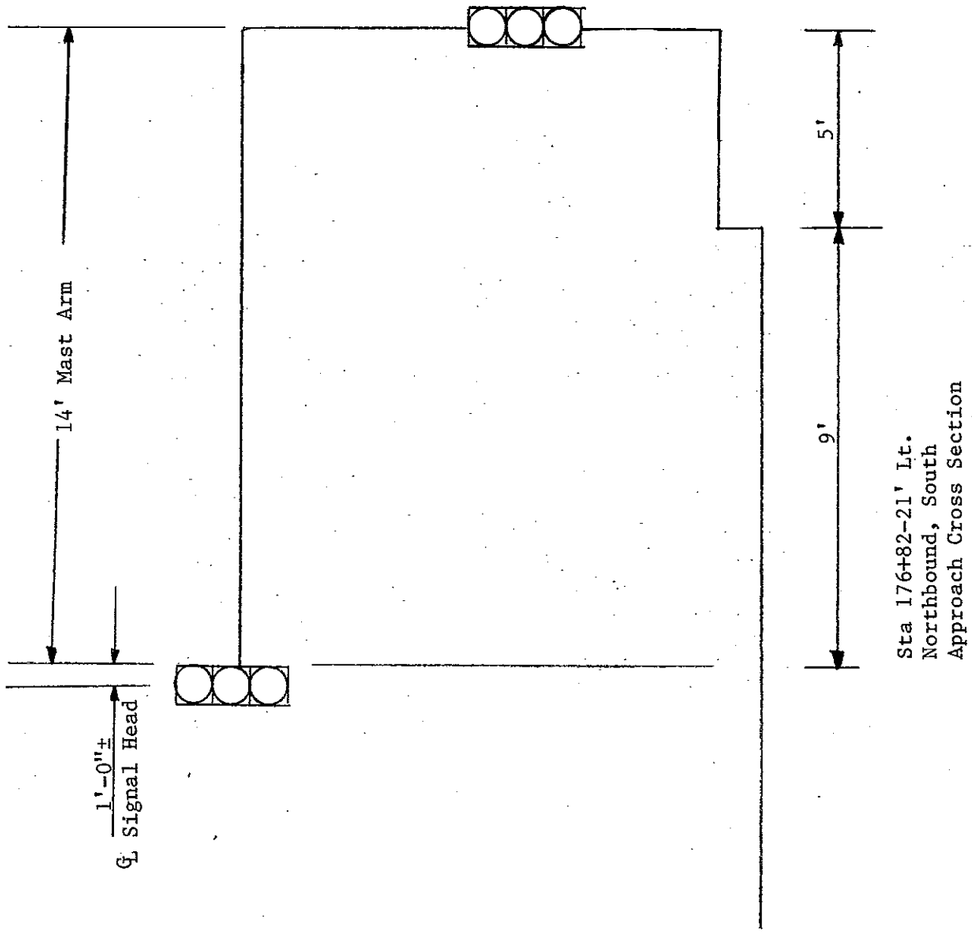
Sta. 176+30-65' Lt.
Westbound Roadway
East Approach
Cross Section

TRAFFIC CONTROL SYSTEM
Signal Details

MEMORIAL HWY & EAST RAMP
MANDAN, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	S-11

FHWA REGION	STATE	FED. AID PROJ NO.	SHEET NO.
8	N.D.	F-1-094(007)920	5-12



TRAFFIC CONTROL SYSTEM

Signal Standard Details

MEMORIAL HWY & EAST RAMP
MANDAN, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO
8	N.D.	F-1-094(007)920	5-13

QUANTITIES

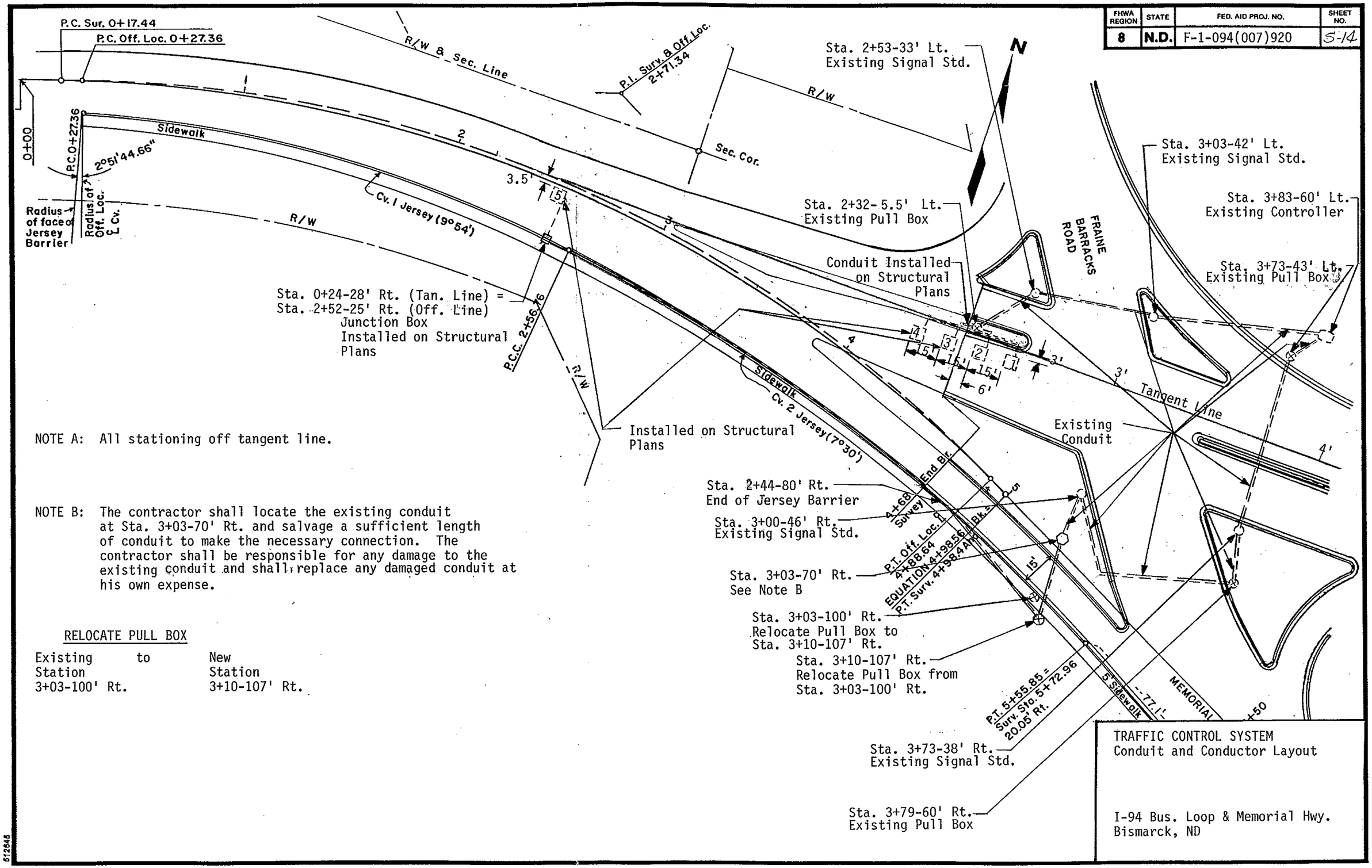
	Concrete Foundations - Traffic Signals	Pull Box	1.5" Dia. Rigid Conduit	2" Dia. Rigid Conduit	2.5" Dia. Rigid Conduit	Underground Conductor No. 6 Type RHW	Underground Conductor No. 6 Type THW	Microloop Double Probe Set	Loop Lead-In Conductor	No. 12 AWG 5 Conductor Cable (A)	No. 12 AWG 12 Conductor Cable	Saw Slot	Type IV Signal Standard 14' Mast Arm	Type IV Signal Standard 19' Mast Arm	Type IV Signal Standard 20' Mast Arm	1-Way, 3 Sec. Head W/12" Lenses- Mast Arm Mounted	1-Way, 3 Sec. Head W/12" Lenses Post Mounted	Volume Density Controller
	EA	EA	LF	LF	LF	LF	LF	EA	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA
176+30-65' Lt.	1									42				1		1	1	
176+82-21' Lt.	1									37			1			1	1	
177+07-20' Rt.	1									63					1	1	1	
177+33-35' Rt.	1																	1
174+24-2' Lt.		1						2										
176+97-65' Lt.		1																
177+19-272' Rt.		1						1										
178+97-17' Rt.		1						2										
Var. Locations			42	1115	91	510	255		819		382							
TOTAL	4	4	42	1115	91	510	255	5	819	142	382	16	1	1	1	3	3	1

(A) Used for internal wiring of signal standard.

TRAFFIC CONTROL SYSTEM
Summary of Quantities

Memorial Hwy & East Ramp
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	5-14



NOTE A: All stationing off tangent line.

NOTE B: The contractor shall locate the existing conduit at Sta. 3+03-70' Rt. and salvage a sufficient length of conduit to make the necessary connection. The contractor shall be responsible for any damage to the existing conduit and shall replace any damaged conduit at his own expense.

RELOCATE PULL BOX

Existing Station	to	New Station
3+03-100' Rt.		3+10-107' Rt.

TRAFFIC CONTROL SYSTEM
Conduit and Conductor Layout

I-94 Bus. Loop & Memorial Hwy.
Bismarck, ND

612848

FHWA REGION	STATE	FED AID PROJ. NO	SHEET NO.
8	N.D.	F-1-094(007)920	5-15

STATION	CONDUIT RUNS		CABLE RUNS	
	Length	Size	Length	Type
0+24-28' Rt. to	227'	1" (A)	618'	Loop Lead In
2+44-80' Rt. to	74	1"		
3+10-107' Rt. to	37'	2"		
3+03-70' Rt. to	23'	2" (B)		
3+00-46' Rt. to	92'	2" (B)		
3+79-60' Rt. to	26'	2½" (B)		
3+73-38' Rt. to	83'	3" (B)		
3+73-43' Lt. to	18'	3" (B)		
3+83-60' Lt.				
2+32-5.5' Lt	35'	2" (B)	213'	Loop Lead In
2+53-33' Lt.	58'	2½" (B)		
3+03-42' Lt.	93'	3" (B)		
3+83-60' Lt.				

QUANTITIES

Loop Lead-In Conductor	Detector Polyethylene Conduit Pre-wired	Saw Slot	Relocate Pull Box	1" Dia. Rigid Conduit	2" Dia. Rigid Conduit							
LF	LF	LF	EA	LF	LF							
831	242	52	1	74	37							

DETECTOR LOOPS

Loop No.	No. of Turns	Size	Type of Loop	Conductor LF	Saw Slot LF	Preformed Loop EA
1	3	6x6	Presence	136	26	
2	3	6x6	Presence	106	26	
3	4	6x6	Presence			(A)
4	4	6x6	Presence			(A)
5	4	6x6	Passage			(A)

(A) Installed on structural plans

(B) Existing conduit

TRAFFIC CONTROL SYSTEM

Conduit and Conductor Quantities

I-94 Bus. Loop & Memorial Hwy.
Bismarck, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	SS-1

SIGN SUMMARY - PERFORATED TUBE

STATION	ASSEMBLY NUMBER	SIGN AREA FLAT TYPE 2	SIGN AREA SHEET TYPE 3 OR 4	SIGN 1ST	SUPPORT 2ND	POST 3RD	LENGTHS 4TH	SIZE	SIGN 1ST	SUPPORT 2ND	SLEEVE 3RD	LENGTH 4TH	SIZE	ANCHOR LNG.	UNIT SIZE	NO	TOTAL SUPPORT WEIGHT	RESET SIGN PAN.	RESET SUP.	MAX. LNG. FOR SUP. SIZE
163+65RT	17RS			10.8	10.8			2.25	3.2	3.2			2.00	4.0	2.50	2	97.25	1		11.9
164+40LTWBDSurv.	ASSEMB		16.00	10.8	10.8			2.25	3.2	3.2			2.00	4.0	2.50	2	97.25	1		11.9
164+70RT	3RS			10.2	10.2			2.51						4.0	2.51	2	113.50	1		11.0
164+80LT	12RS																	1	2	
165+90RTWBDSurv.	33RS																	1	1	
165+90LTWBDSurv.	33RS																	1	1	
173+40RT	T094																	1	1	
173+80LTWBDOff.	9RS																	1	1	
19+10LTNER	12RS																	1	1	
32+60LTEBDRamp	36RS			9.2				2.51						4.0	2.51	1	52.75	1		9.3
176+65RT	17RS			10.8	10.8			2.25	3.2	3.2			2.00	4.0	2.50	2	97.25	1		11.9
1+50RTSERW.Bd.	36RS			9.2				2.51						4.0	2.51	1	52.75	1		9.3
1+60RTSERE.Bd.	36RS			9.2				2.51						4.0	2.51	1	52.75	1		9.3
1+60LTSERE.Bd.	17RS			10.8	10.8			2.25	3.2	3.2			2.00	4.0	2.50	2	97.25	1		11.9
178+10LT	ASSEMA		5.00	10.8				2.25						4.0	2.50	1	42.37	1		11.3
178+20RT	6RS																	1	1	
179+80RT	20WS		9.00	10.4				2.50	1.9				2.25	4.0	2.50	1	50.56	1		13.7
180+80RT	9RS			RESET	ON LIGHT	STANDARD														
182+80LT	20WS		9.00	LIGHT	STANDARD	MOUNTED														
TOTAL NO. 1		0.00	39.00														753.65	17	8	

BASIS OF ESTIMATE

Sign Support Lengths

The sign support lengths have been calculated using the following information:

VERTICAL CLEARANCE

Signs Viewed From Mainline	84"
Signs Viewed From Crossings	84"

TRAFFIC CONTROL SYSTEM
Sign Summary

Memorial Highway
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	55-2

SIGN SUMMARY - PERFORATED TUBE

STATION	ASSEMBLY NUMBER	SIGN AREA FLAT TYPE 2	SIGN AREA SHEET TYPE 3 OR 4	SIGN 1ST	SUPPORT 2ND	POST 3RD	LENGTHS 4TH	SIZE	SIGN 1ST	SUPPORT 2ND	SLEEVE 3RD	LENGTH 4TH	SIZE	ANCHOR LNG.	UNIT SIZE	UNIT NO	TOTAL SUPPORT WEIGHT	RESET SIGN PAN.	RESET SUP.	MAX. LNG. FOR SUP. SIZE
0+65RT	TRUCK			RESET ON LIGHT STANDARD														1		
3+18LT	9RS			9.8				2.25						4.0	2.50	1	39.60	1		10.8
5+53RT	15RS																	1	1	
5+76RT	YIELD			RESET ON LIGHT STANDARD														1		
TOTAL NO.	2	0.00	0.00														39.60	4	1	

BASIS OF ESTIMATE

Sign Support Lengths

The sign support lengths have been calculated using the following information:

VERTICAL CLEARANCE

Signs Veiwed From Mainline	84"
Signs Viewed From Crossings	84"

TRAFFIC CONTROL SYSTEM

Sign Summary

Memorial Highway
Mandan, ND

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	IR-194-4(053)000	55-3

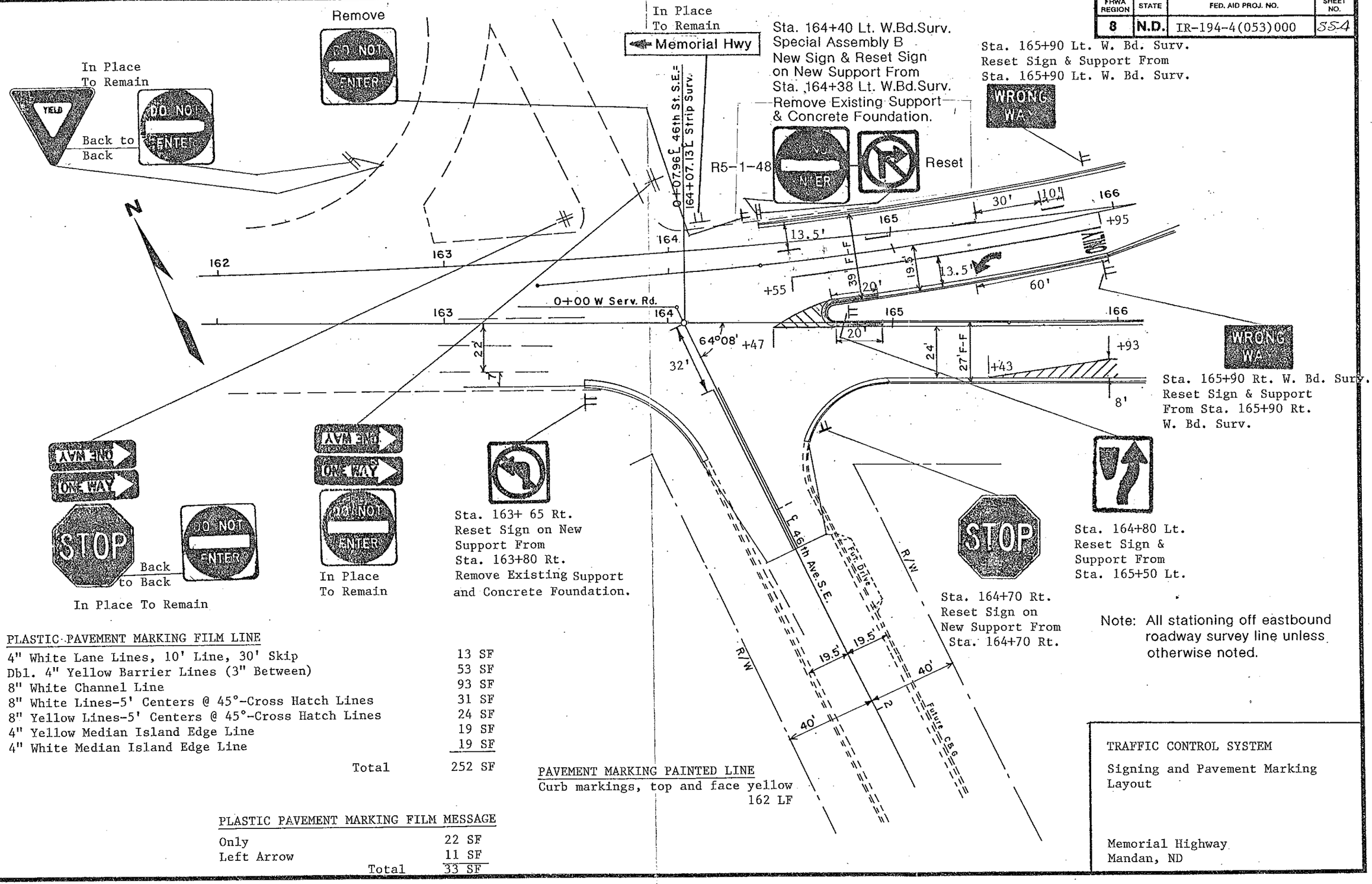
SIGN QUANTITIES FOR ROUND STEEL SUPPORTS

Station	Sign or Assembly Number	Steel Supports: Overlay Type 2 Panel	Steel Supports: Overlay Type 3 & 4 Panel	Steel Supports: Post 1st Post	Steel Supports: Length 2nd Post	Steel Supports: Length 3rd Post	Steel Supports: Nominal Post Dia.	Steel Supports: Wall Thickness	Steel Supports: Weight	Breakaway Bases: Directional 3.5"	Breakaway Bases: Stub Post 3.5"	Foundation: Dia.	Foundation: Depth	Foundation: C.Y	Foundation: Fuse Joints	Reset Sign Panel	Reset Sign Support	Revise Fuse Joints
169+95 Lt.	Sign No.1		30	12.0	12.0		3.5"	.226	218.64	2		1'4"	6'6"	.68	2	1		
169+98 Rt.											2	1'4"	6'6"	.68		1	2	2
12+55 Lt.											1	1'4"	7'6"	.39		1	1	
172+00 Rt.											1	1'4"	7'6"	.39		1	1	
175+90 Rt.											2	1'4"	6'6"	.68		1	2	2
176+82 Lt.											2	1'4"	6'6"	.68		1	2	2
0+20 Rt.											1	1'4"	6'6"	.34		1	1	
0+45 Lt.											1	1'4"	6'6"	.34		1	1	
TOTALS			30						218.64	2	10			4.18	2	8	10	6

TRAFFIC CONTROL SYSTEM
Round Steel Support
Sign Summary

Memorial Highway
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	554



PLASTIC PAVEMENT MARKING FILM LINE

4" White Lane Lines, 10' Line, 30' Skip	13 SF
Dbl. 4" Yellow Barrier Lines (3" Between)	53 SF
8" White Channel Line	93 SF
8" White Lines-5' Centers @ 45°-Cross Hatch Lines	31 SF
8" Yellow Lines-5' Centers @ 45°-Cross Hatch Lines	24 SF
4" Yellow Median Island Edge Line	19 SF
4" White Median Island Edge Line	19 SF
Total	252 SF

PLASTIC PAVEMENT MARKING FILM MESSAGE

Only	22 SF
Left Arrow	11 SF
Total	33 SF

PAVEMENT MARKING PAINTED LINE

Curb markings, top and face yellow
162 LF

Note: All stationing off eastbound roadway survey line unless otherwise noted.

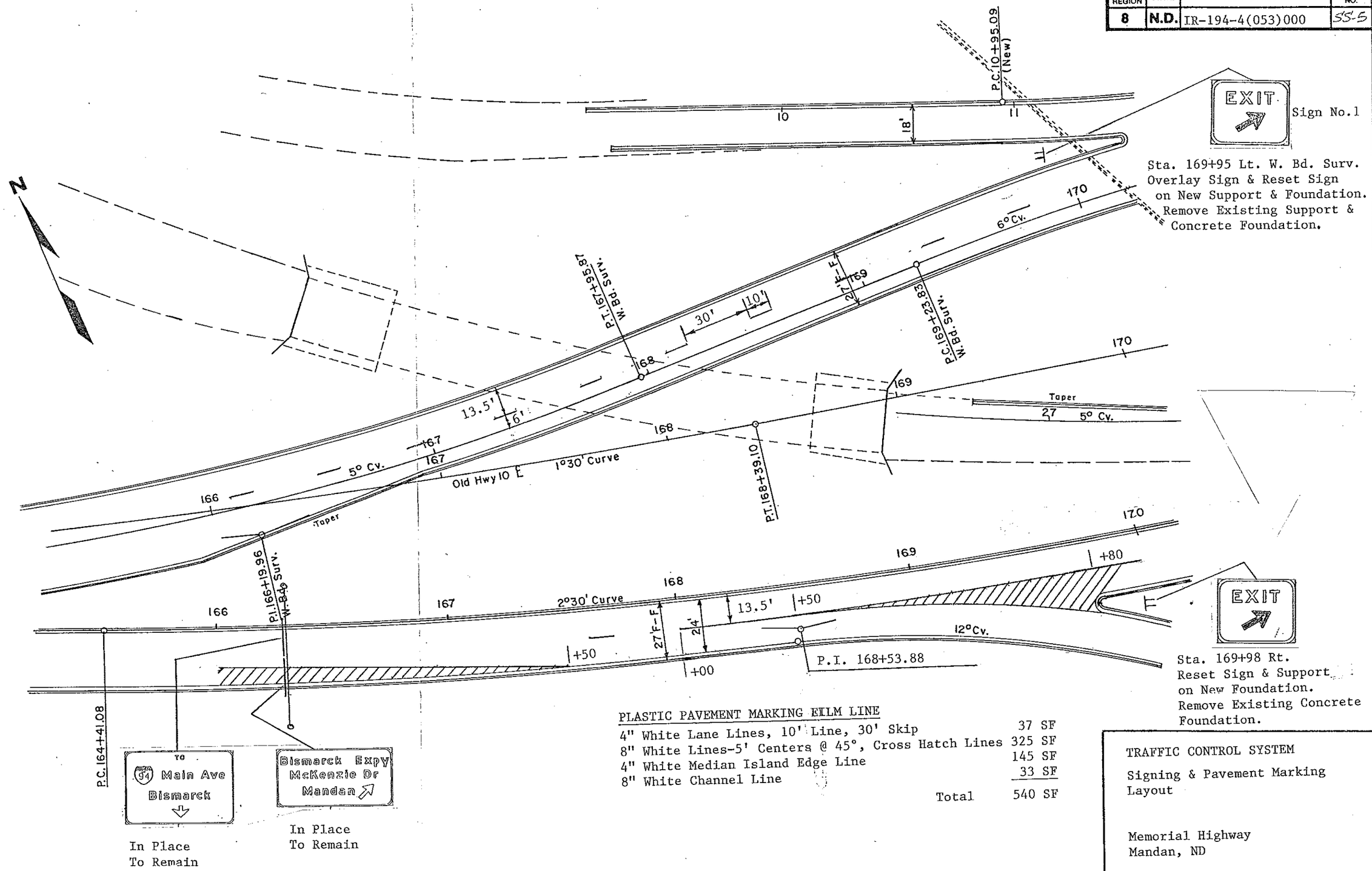
TRAFFIC CONTROL SYSTEM

Signing and Pavement Marking Layout

Memorial Highway
Mandan, ND

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	55-5



PLASTIC PAVEMENT MARKING FILM LINE

4" White Lane Lines, 10' Line, 30' Skip	37 SF
8" White Lines-5' Centers @ 45°, Cross Hatch Lines	325 SF
4" White Median Island Edge Line	145 SF
8" White Channel Line	33 SF
Total	540 SF

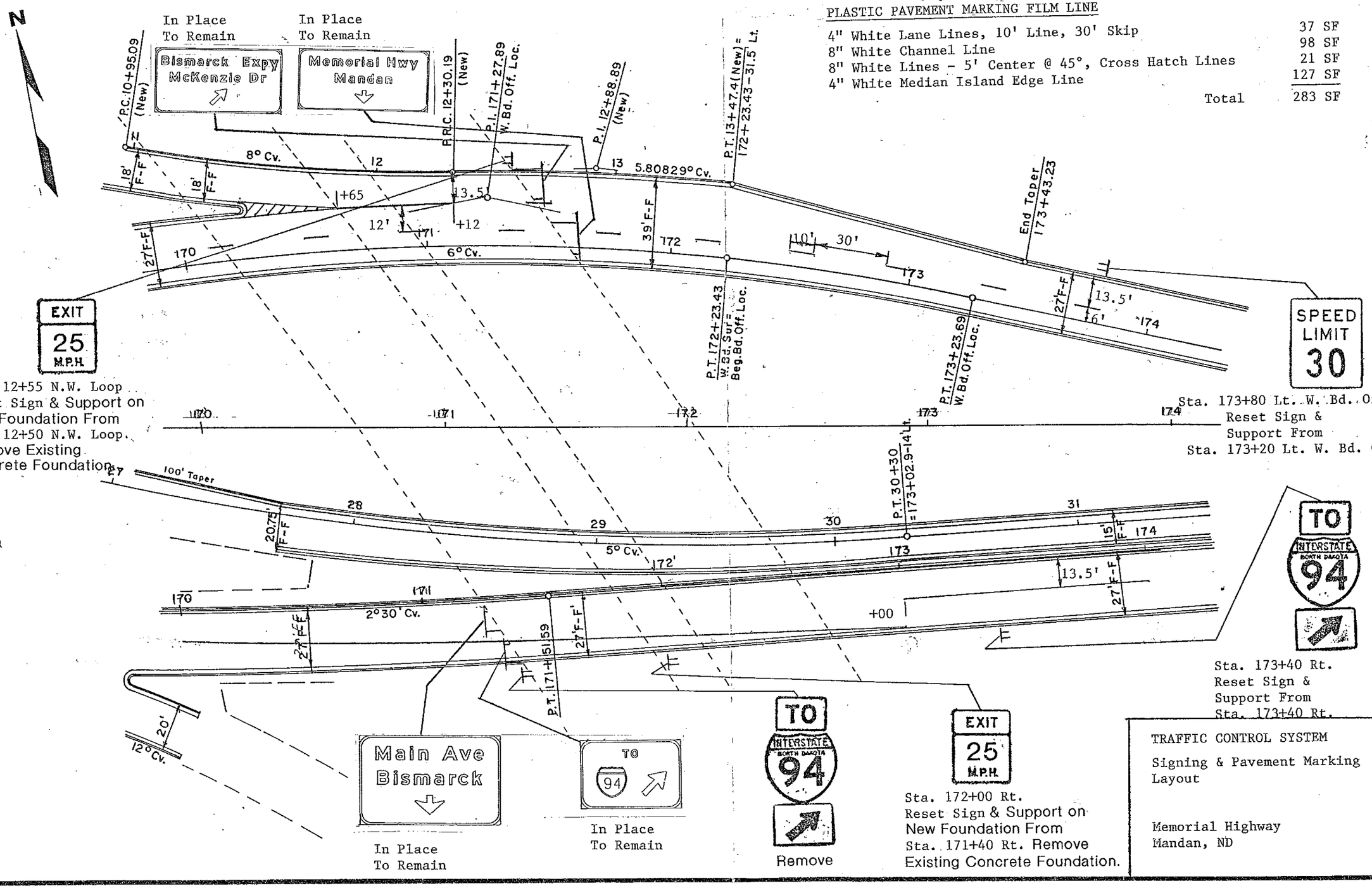
TRAFFIC CONTROL SYSTEM

Signing & Pavement Marking Layout

Memorial Highway
Mandan, ND

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	55-6



PLASTIC PAVEMENT MARKING FILM LINE

4" White Lane Lines, 10' Line, 30' Skip	37 SF
8" White Channel Line	98 SF
8" White Lines - 5' Center @ 45°, Cross Hatch Lines	21 SF
4" White Median Island Edge Line	127 SF
Total	283 SF

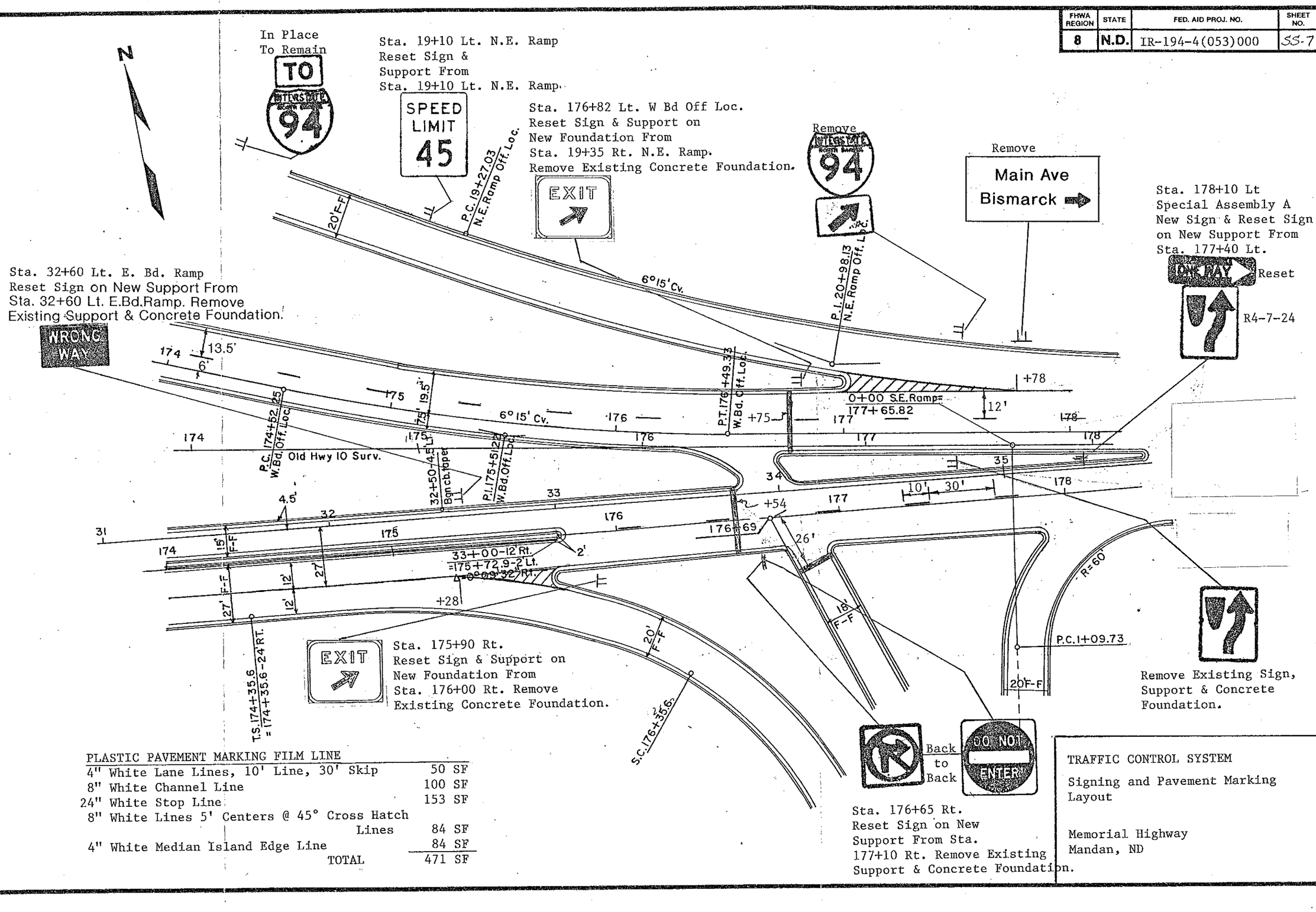
TRAFFIC CONTROL SYSTEM

Signing & Pavement Marking Layout

Memorial Highway
Mandan, ND

512645

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	55-7



PLASTIC PAVEMENT MARKING FILM LINE

4" White Lane Lines, 10' Line, 30' Skip	50 SF
8" White Channel Line	100 SF
24" White Stop Line	153 SF
8" White Lines 5' Centers @ 45° Cross Hatch Lines	84 SF
4" White Median Island Edge Line	84 SF
TOTAL	471 SF

TRAFFIC CONTROL SYSTEM

Signing and Pavement Marking Layout

Memorial Highway
Mandan, ND

512845

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	55-8

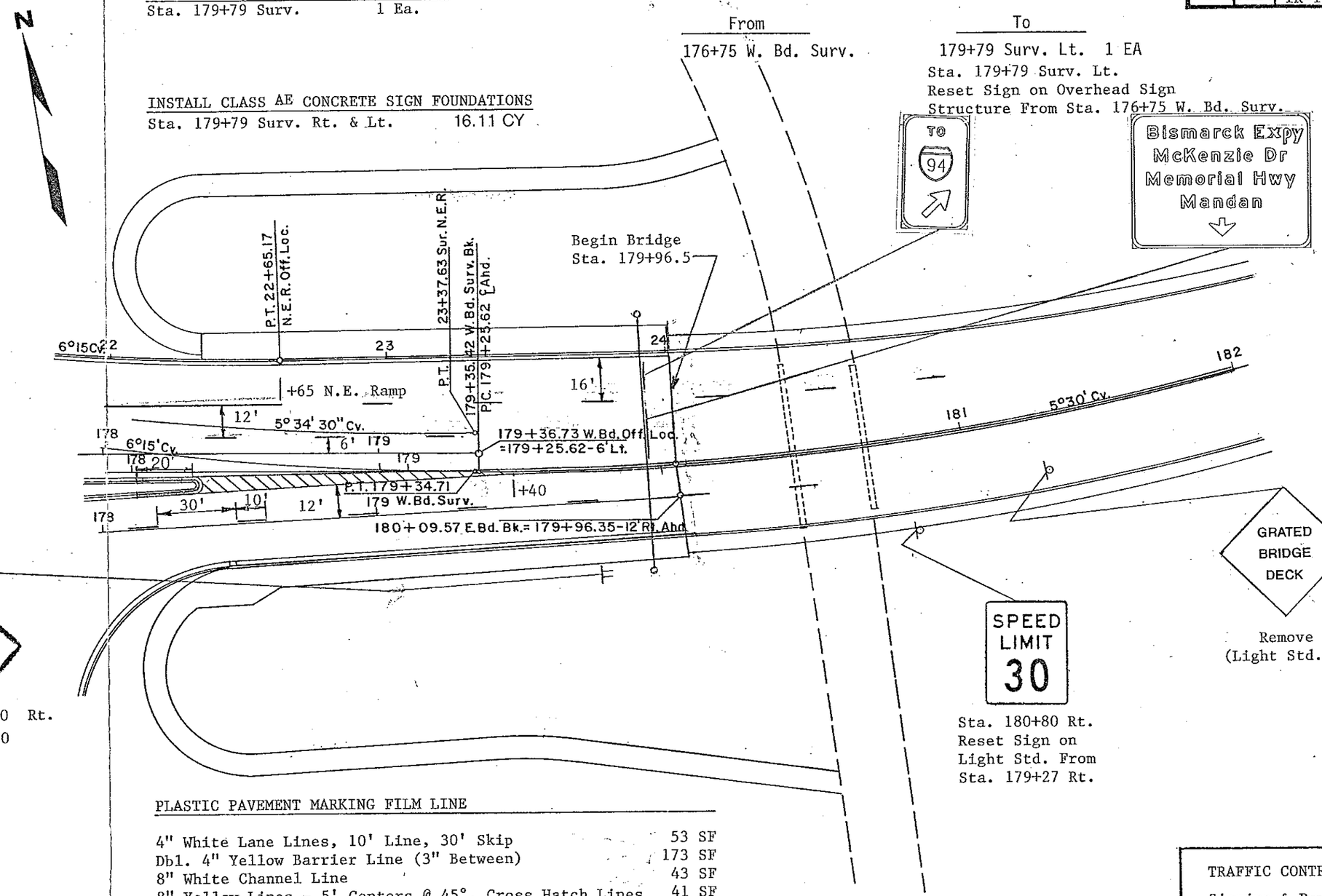
OVERHEAD SIGN STRUCTURE 94' TRUSS
Sta. 179+79 Surv. 1 Ea.

INSTALL CLASS AE CONCRETE SIGN FOUNDATIONS
Sta. 179+79 Surv. Rt. & Lt. 16.11 CY

RESET SIGN PANEL (Overhead Structure Mounted)

From	To
176+75 W. Bd. Surv.	179+79 Surv. Lt. 1 EA

Sta. 179+79 Surv. Lt.
Reset Sign on Overhead Sign
Structure From Sta. 176+75 W. Bd. Surv.



Sta. 179+80 Rt.
Assembly 20
WS

Remove
(Light Std. Mtd.)

Sta. 180+80 Rt.
Reset Sign on
Light Std. From
Sta. 179+27 Rt.

PLASTIC PAVEMENT MARKING FILM LINE

4" White Lane Lines, 10' Line, 30' Skip	53 SF
Dbl. 4" Yellow Barrier Line (3" Between)	173 SF
8" White Channel Line	43 SF
8" Yellow Lines - 5' Centers @ 45°, Cross Hatch Lines	41 SF
4" Yellow Median Island Edge Line	77 SF
Total	387 SF

PAVEMENT MARKING PAINTED LINE

Curb Markings, top and face yellow 131LF

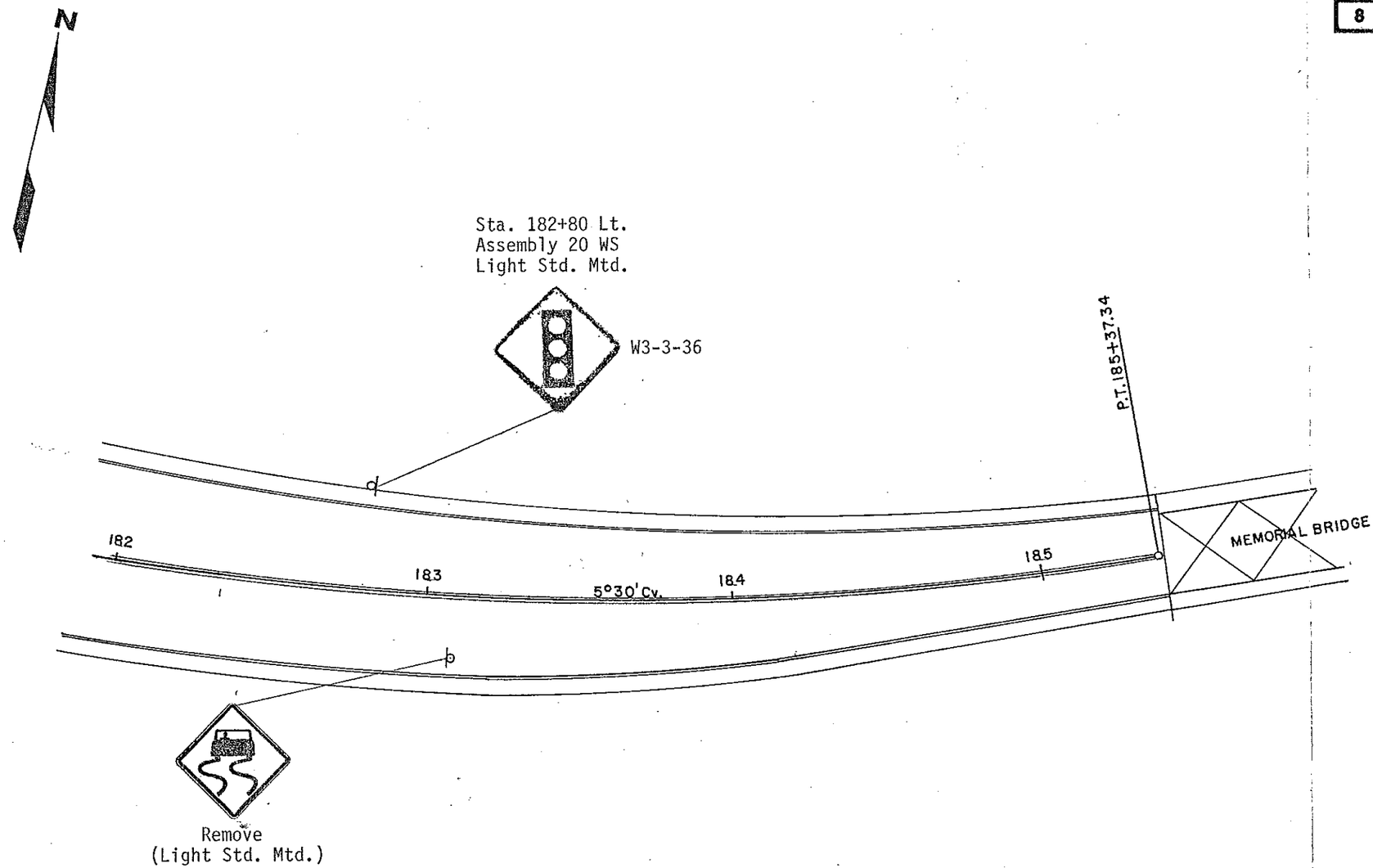
TRAFFIC CONTROL SYSTEM

Signing & Pavement Marking Layout

Memorial Highway
Mandan, ND

512645

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	55-9



PLASTIC PAVEMENT MARKING FILM-LINE

Dbl. 4" Yellow Barrier Lines (3" Between) 227 SF

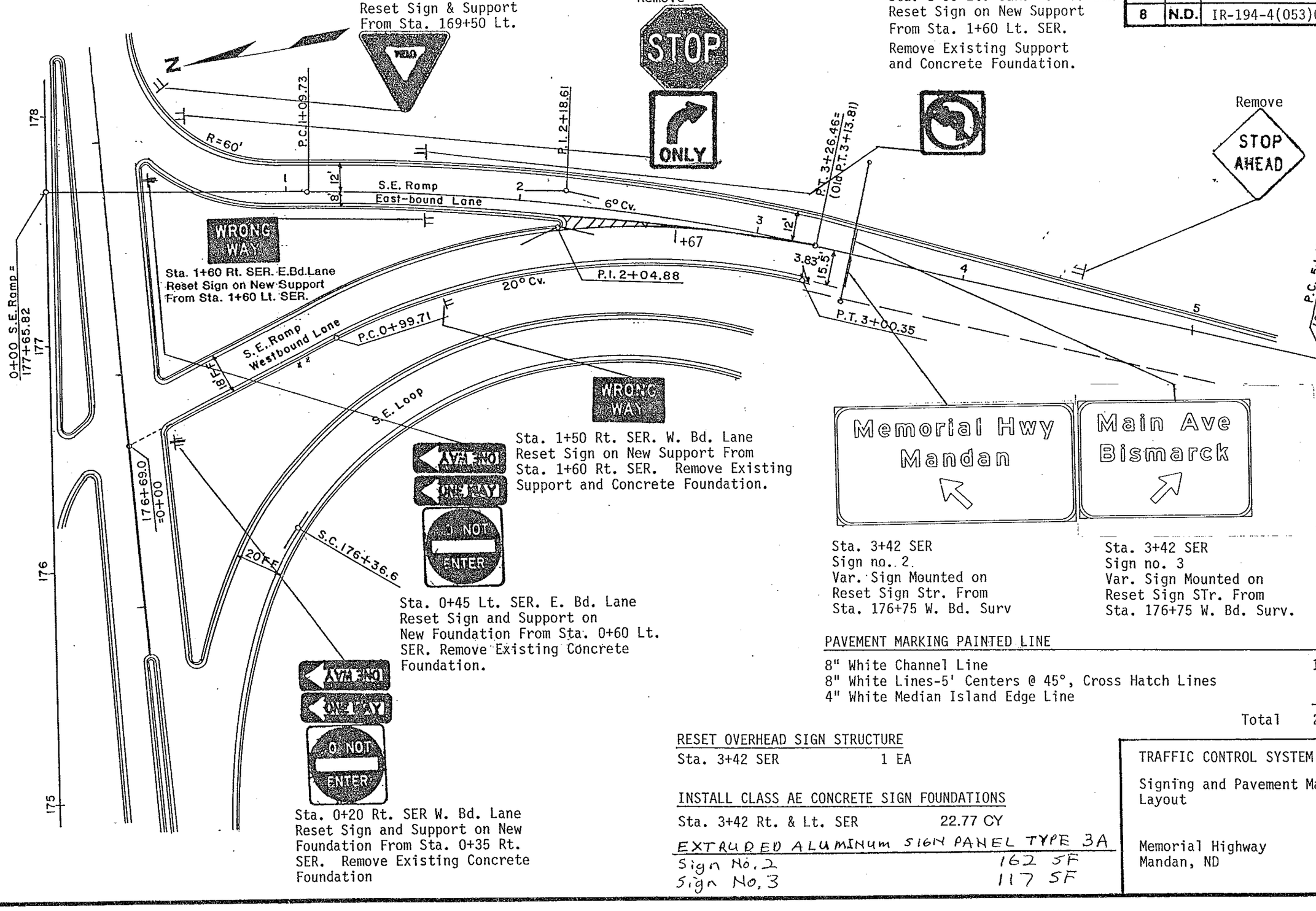
TRAFFIC CONTROL SYSTEM

Signing & Pavement Marking Layout

Memorial Highway
Mandan, ND

512645

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	55.10



PAVEMENT MARKING PAINTED LINE

8" White Channel Line	119 LF
8" White Lines-5' Centers @ 45°, Cross Hatch Lines	52 LF
4" White Median Island Edge Line	98 LF
Total	269 LF

RESET OVERHEAD SIGN STRUCTURE

Sta. 3+42 SER	1 EA

INSTALL CLASS AE CONCRETE SIGN FOUNDATIONS

Sta. 3+42 Rt. & Lt. SER	22.77 CY

EXTRUDED ALUMINUM SIGN PANEL TYPE 3A

Sign No. 2	162 SF
Sign No. 3	117 SF

TRAFFIC CONTROL SYSTEM

Signing and Pavement Marking Layout

Memorial Highway
Mandan, ND

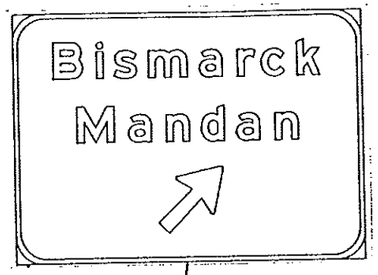
512845

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	IR-194-4(053)000	55-11

RESET SIGN PANEL

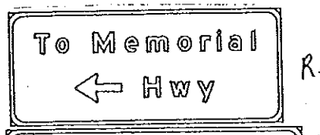
From Sta. 66+75 M.L. To Sta. 66+75 M.L. 1 EA

Sta. 44+66 M.L.
Overlay Sign



Sign No. 5

Sta. 40+10 E. Serv. Road
Cut Posts to
Required Length.



Remove

In Place
To Remain

Sta. 66+75 M.L.
Remove Top Sign &
Reset Bottom Sign 1'-3" Higher.

Remove

Reset

Sign No. 6

Sta. 66+75 M.L.
Overlay Sign

Sign No. 4

Sta. 44+66 M.L.
Overlay Sign

OVERLAY PANEL TYPE 3A REFLECTIVE SHEETING	
Sign No. 4	117.0 SF
Sign No. 5	117.0 SF
Sign No. 6	97.5 SF
Total	331.5 SF

TRAFFIC CONTROL SYSTEM
Signing Layout

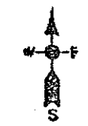
Bismarck Expressway
Mandan, N.D.

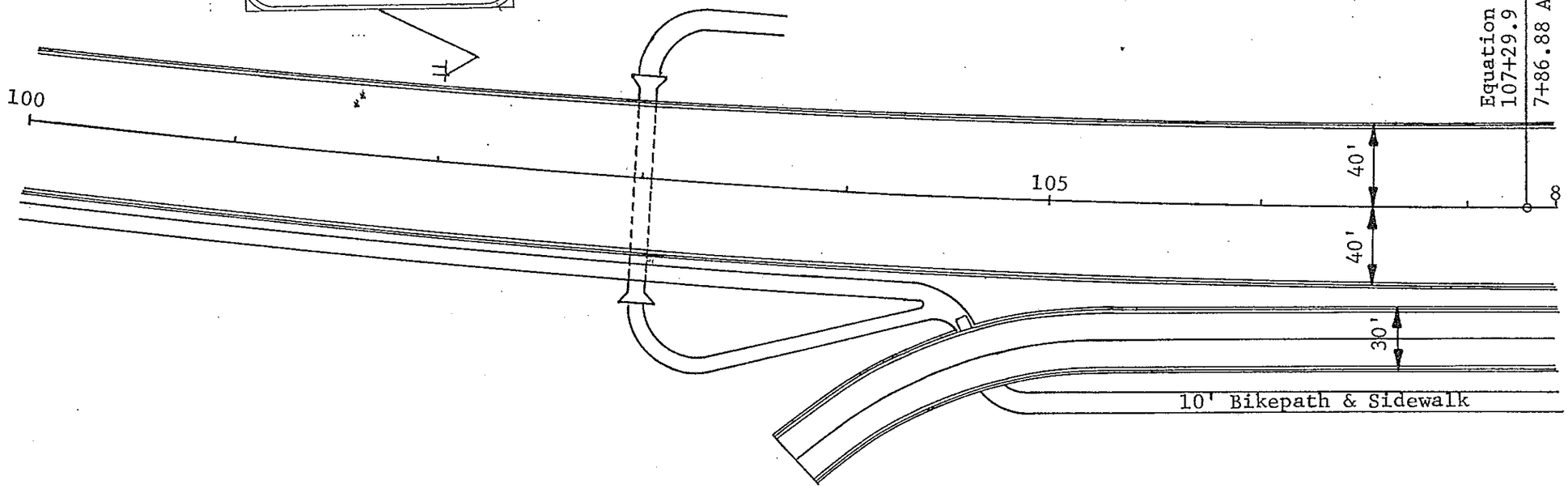
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)00055-12	

Sta. 102+00 Lt.
Cut Posts to
Required Length.

Remove

In Place
To Remain





TRAFFIC CONTROL SYSTEM
Signing Layout

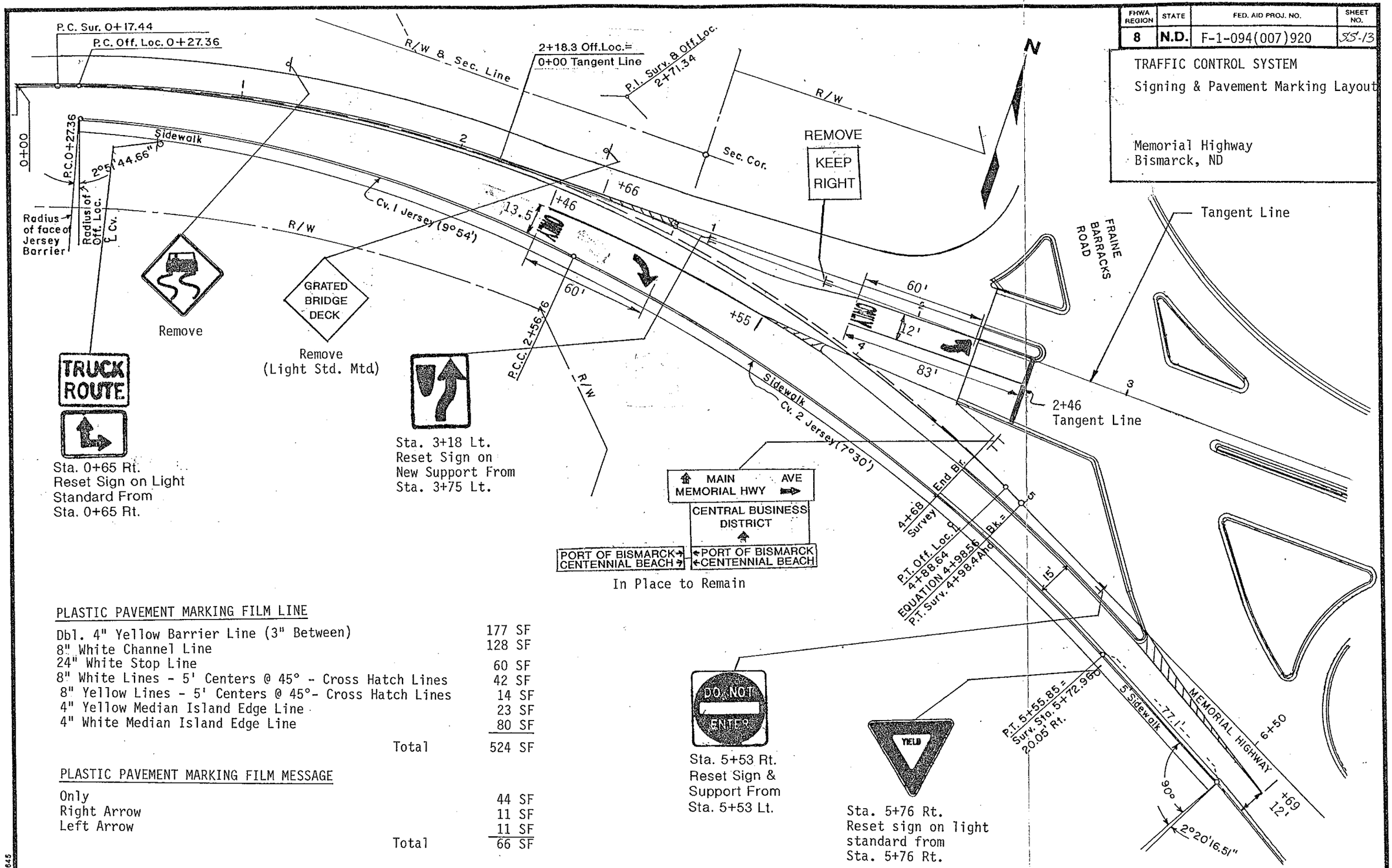
Bismarck Expressway
Bismarck, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-1-094(007)920	55-13

TRAFFIC CONTROL SYSTEM

Signing & Pavement Marking Layout

Memorial Highway
Bismarck, ND



PLASTIC PAVEMENT MARKING FILM LINE

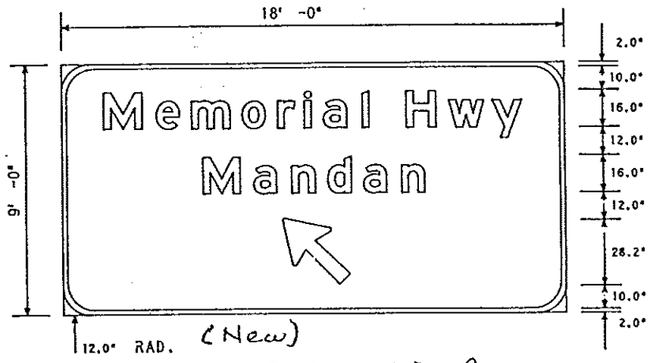
Dbl. 4" Yellow Barrier Line (3" Between)		177 SF
8" White Channel Line		128 SF
24" White Stop Line		60 SF
8" White Lines - 5' Centers @ 45° - Cross Hatch Lines		42 SF
8" Yellow Lines - 5' Centers @ 45°- Cross Hatch Lines		14 SF
4" Yellow Median Island Edge Line		23 SF
4" White Median Island Edge Line		80 SF
	Total	524 SF

PLASTIC PAVEMENT MARKING FILM MESSAGE

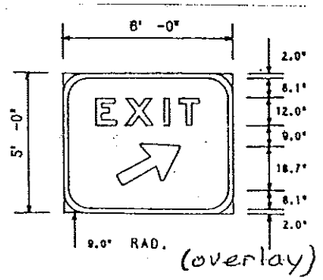
Only		44 SF
Right Arrow		11 SF
Left Arrow		11 SF
	Total	66 SF

512645

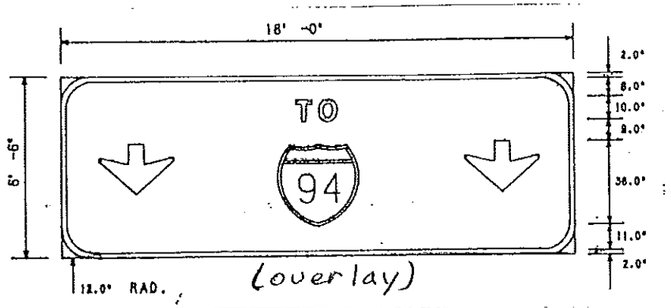
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	IR-194-4(053)000	55-14



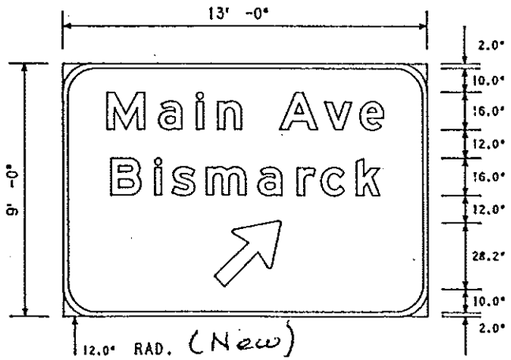
(New)
Sta. 3+42 S.E. Ramp
Sign No. 2
Area = 162.0 SF



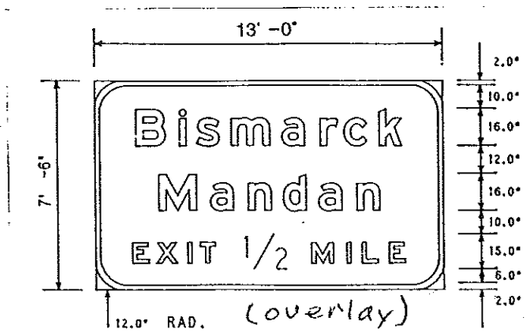
(overlay)
Sta. 169+95 Lt. W. Bd. Surv.
Sign No. 1
Area = 30.0 SF



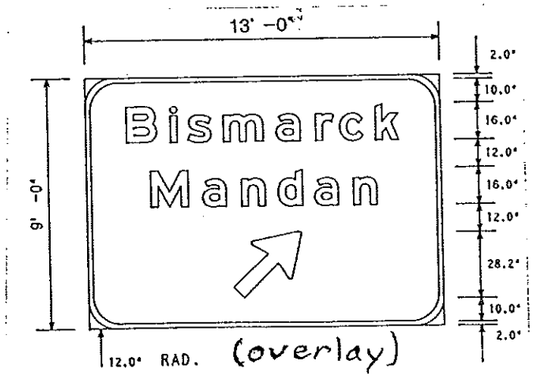
(overlay)
Sta. 44+66 M.L.
Sign No. 4
Area = 117.0 SF



(New)
Sta. 3+42 S.E. Ramp
Sign No. 3
Area = 117.0 SF



(overlay)
Sta. 66+75 M.L.
Sign No. 6
Area = 97.5 SF



(overlay)
Sta. 44+66 M.L.
Sign No. 5
Area = 117.0 SF

NOTE: All signs on this sheet have green background with white border and legend, Type 3A. ALL letters shall be Series E modified.

TRAFFIC CONTROL SYSTEM
Sign Detail Sheet
Bismarck Expressway
Memorial Highway
Mandan, ND