Pre Construction Meeting 5/15/81.

Denny Best - Earth Builders 258-3234

Marlon Wilson - Earth Builders

IKe 21 Grantham St. Hwy Dept

Adian Fessen St. Hy Dept

Terry Dennis

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	1

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

PLANS
FOR THE PROPOSED IMPROVEMENT OF A
STATE HIGHWAY
IN MORTON COUNTY
FEDERAL AID PROJECT NO. FI-194-4(45)000
BASE, HOT BITUMINOUS PAVEMENT & INCIDENTALS

LENGTH OF PROJECT		
PROJECT	MILES-GROSS	MILES-NET
FI-194-4(45)	1.060	0.968
TOTALS	1.060	0.968

.092 Mi. deducted for Mdinline Structure

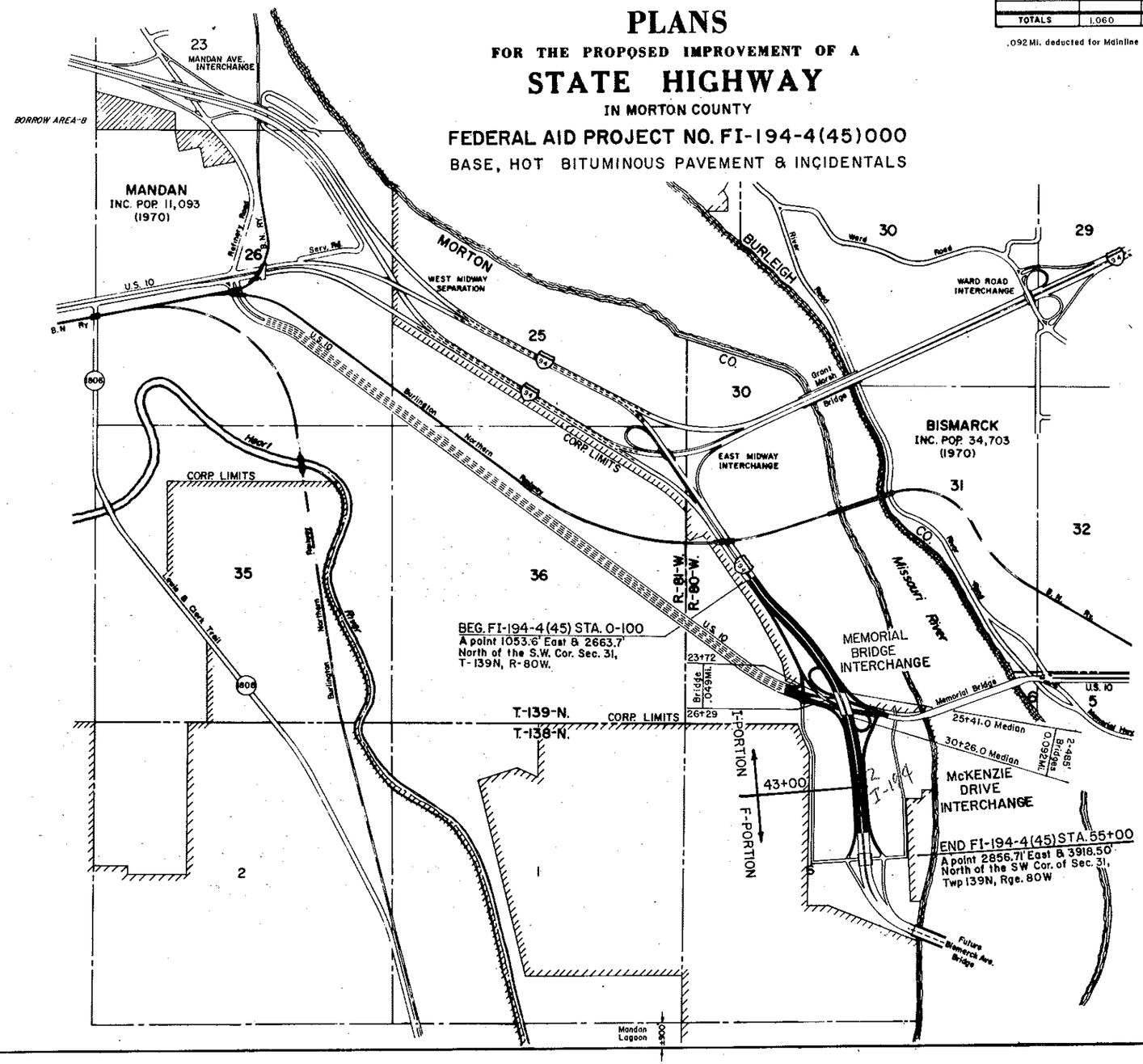
GOVERNING SPECIFICATIONS:
Standard Specifications adopted by the North Dakota State Highway Department, Oct. 1976, and approved by the Federal Highway Administration on December 17, 1976, and other Contract Provisions submitted herewith.

DESIGN DATA

TRAFFIC	AVERAGE DAILY			EST. 30TH MAX. HR.
CURRENT TRAFFIC (1981)	16200 PASS.	800 TRUCKS	17000 TOTAL	1760
TRAFFIC FORECAST (2001)	20900 PASS.	1100 TRUCKS	22000 TOTAL	2260

DESIGN SPEED 50 MPH
TRAFFIC CLASSIFICATION "M"
MINIMUM SIGHT DISTANCE (STOPPING) 300'

Earth Builders
Start



Editing Elect. (Elec

APPROVED DATE 12-12-80
CHIEF ENGINEER
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

E. N. BRADLEY
REGISTERED PROFESSIONAL ENGINEER
NORTH DAKOTA

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
APPROVED
DIVISION ADMINISTRATOR DATE

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FI-194-4(45)000

SYMBOLS

STATE & NATIONAL LINES
COUNTY LINE
TOWNSHIP & RANGE LINES
SECTION LINE
QUARTER SECTION LINE
SECTION CORNER
QUARTER SECTION CORNER
OLD RIGHT OF WAY LINE
NEW RIGHT OF WAY LINE
GRADE LINE
CENTERLINE OF CONSTRUCTION — 500
RAILROAD RIGHT OF WAY LINE
CITY OR VILLAGE CORPORATE LIMITS
PROPERTY LINE
EASEMENT LINE
FENCES
SNOW FENCE
DRAINAGE
WATERS EDGE
MARSH OR SWAMP
RIPRAP
DRAINAGE DITCH
APPROACH — 502 + 00
TRAVELED WAY
RAILROADS — NAME
GUARD RAIL
GUIDE POSTS
DELINEATORS
HEDGES AND TREES
INTERCHANGE
HIGHWAY GRADE SEPARATION - NO CONNECTION
OTHER BRIDGE
SERVICE ROAD
TERMINATED CROSS-ROAD

BUILDINGS
TELEGRAPH LINES
TELEPHONE LINES
POWER LINES
CULVERTS (In Place)
CULVERTS (Install)
CONCRETE BOX CULVERTS (Install)
BRIDGES (Install)
CONCRETE CURB
CONCRETE CURB AND GUTTER
CONCRETE WALK
CATCH BASIN (Existing)
CATCH BASIN (New)
MANHOLE (Existing)
MANHOLE (New)
CURB INLET (Existing)
CURB INLET (New)
GROUND MOUNTED SIGNS
OVERHEAD SIGNS
HYDRANT
LIGHT STANDARDS
TRAFFIC SIGNALS (Plan & Profile Sheets)
HIGH MAST LIGHTING ASSEMBLY
GROUND ELEVATION / GRADE — 6430 / 6410 / 245
CENTERLINE
SECTION LINE
DEFLECTION ANGLE (Delta)
SOD OR JUTE MESH
POLES TO BE MOVED
POLES TO BE LOWERED
CONCRETE FOUNDATION
CONDUIT
CONDUCTOR
CONCRETE PULL BOX
FEED POINT
250 WATT LIGHT STANDARDS
400 WATT LIGHT STANDARDS
700 WATT LIGHT STANDARDS
1000 WATT LIGHT STANDARDS
FLASHING BEACON
TRAFFIC SIGNAL - MAST ARM MOUNTED
TRAFFIC SIGNAL - POST MOUNTED
SIGNAL HEAD
PEDESTRIAN PUSHBUTTON POST
TRAFFIC SIGNAL CONTROLLER
FEED POINT - PAD MOUNTED

ABBREVIATIONS

Aggr	Aggregate
Ahd	Ahead
Alt	Alternate
Approx	Approximate or Approximately
Appr	Approach
Asph Cem or A C	Asphalt Cement
Asph Conc	Asphaltic Concrete
Bit	Bituminous or Bitumen
Bk	Back
B M	Bench Mark
Bldg.	Building
Br	Bridge
C.A.E.S	Corrugated Aluminum End Section
C A P	Corrugated Aluminum Pipe
C B	Catch Basin
C & G	Curb and Gutter
Ch Blk	Channel Block
Ch. Ch	Channel Change
C. I	Curb Inlet
C.I P	Cast Iron Pipe
Cl	Class
C.S.E.S	Corrugated Steel End Section
C.S.P.	Corrugated Steel Pipe
CMS	Cationic Medium Setting
Comp.	Compression
Const	Construction
Conc	Concrete
Cont. Reinf. Conc Pvm't	Continuously Reinforced Concrete Pavement
Contr	Contraction
Crn	Crown
CRS	Cationic Rapid Setting
Crse	Course
C S.	Curve to Spiral
C. to C.	Center to Center
C Y	Cubic Yard
D	Degree of Curvature
D-Lead	Dead Lead
D.B.	Ditch Block
Def.	Deformed
Del.	Deliver
D.G.	Ditch Grade
El. or Elev	Elevation
Ellipt	Elliptical
Emb	Embankment
Emul.	Emulsified
Engr	Engineer
Eq.	Equation
E R	East Roadway
E S	End Section
Esmt	Easement
Exc.	Excavation
Exp.	Expansion
F D	Field Drive
Found	Foundation
F P	Fence Post
Furn	Furnish
Ga	Gage or Gauge
Gr	Gravel
Grd	Graded
G V	Gate Valve
Hel	Helical
Hyd	Hydrant
Ident	Identification
Inchg	Interchange
I M	Iron Monument
Inst	Install
Inter	Intersection
Inv	Invert
Jt	Joint
L	Length of Curve
Lc	Length of Spiral
Levg	Leveling
L. F	Linear or Lineal Feet
Liq.	Liquid
Long	Longitudinal
L P	Light Pole
Lt	Left
"M"	One Thousand
Matl	Material
Max	Maximum
MC	Medium Curing
M H	Manhole
Min.	Minimum
M L	Main Line
N R	North Roadway
Off Loc	Office Location
O to O	Out to Out
P & P	Plan and Profile
P C	Point of Curvature
P C C	Point of Compound Curve
P C C Pvm't	Portland Cement Concrete Pavement
P D	Private Drive
Pen	Penetration
Perf	Perforated
P I	Point of Intersection
P O C	Point on Curve
P O T	Point on Tangent
P P	Power Pole
P R C	Point of Reverse Curvature
Pref	Preformed
P S D	Passing Sight Distance
P T	Point of Tangency
P V C	Polyvinyl Chloride Sewer Pipe
Quant	Quantity or Quantities
R	Radius
R or Rge	Range
RC	Rapid Curing
R C E S	Reinforced Concrete End Section
R C P	Reinforced Concrete Pipe
R C P S	Reinforced Concrete Pipe Sewer
Rd	Road
Rdbd	Roadbed
Rdwy	Roadway
Refl	Reflectorized
R R	Railroad
Rt	Right
R/W	Right of Way
Salv	Salvage
San	Sanitary
S C	Spiral to Curve
SC	Slow Curing
Sc	Spiral Deflection Angle
S D	Sight Distance
S E	Superelevation
Sec	Section
Sec Line Appr	Section Line Approach
Sep	Separation
Serv	Service
Sgr Prep	Subgrade Preparation
Shldr	Shoulder
SP	Special Provision
S P P	Structural Plate Pipe
S P P A	Structural Plate Pipe Arch
S R	South Roadway
SS	Slow Setting or Supplement Specification
S S D	Stopping Sight Distance
S T	Spiral to Tangent
Sta	Station
Std	Standard
Std. Specs	Standard Specifications
Struct	Structure
Surf	Surface or Surfacing
Surv	Survey
S W	Sidewalk
S Y	Square Yard
T	Tangent Length (circular curve)
T or Twp.	Township
Tel	Telephone
Temp.	Temporary
T P	Telephone Pole
Tr	Traffic
Trans	Transverse or Transition
Trtd	Treated
Te	Tangent Length (curve with spirals)
T S	Tangent to Spiral
U.S.C & G.S	United States Coast and Geodetic Survey
V C	Vertical Curve
V C P	Vitrified Clay Pipe
W.M.	Water Main
W M V	Water Main Valve
W R	West Roadway
Wrng.	Wearing
W.S.V	Water Service Valve
X-Sec	Cross Section
Xc	Spiral Coordinate
Ye	Spiral Coordinate

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NOTE SHEET

1. PLAN DIMENSIONS: Thickness shown on the typical sections for surfacing are approximate. It is intended that the plan tonnages provided for by the Basis of Estimate will be used uniformly throughout the project unless otherwise authorized by the Engineer.

2. SHOULDERS: The width of the shoulder shown on the typical sections may be reduced and/or the shoulder edge bevel extended in order to maintain a shoulder edge slope consistent with the roadway inslope,

3. PATCHING: Patching operations shall be performed as follows:

   (1) Remove existing surfacing, base and subgrade material to a depth as required to establish a satisfactory subgrade.

   (2) Aggregate will be placed and compacted to bottom of existing bituminous pavement, but not less than 3" below the existing surface. Compaction shall be with rubber-tired equipment. Class 5 Aggregate will be used for patching purposes.

   (3) Hot bituminous material will be placed with a motor patrol. Maximum lift 3". Compaction of each lift with rubber-tired equipment.

   (4) The patches shall be allowed 48 hours of curing time prior to being overlaid, except in such instances where the break-up occurs during the actual paving operation.

4. EXCAVATION: Excavate, if necessary, at all points where existing pavement is met & at bridge ends to allow placement of the full depth of surfacing course. Excavation not a pay item, to be considered incidental to other items.

5. MILLING BITUMINOUS SURFACE (MEMORIAL BRIDGE APPROACHES): See Special Provision and Milling & Surfacing layout sheet. The Contractor shall not permit two-way public traffic past the bituminous milling or machine laydown operations. The Contractor shall furnish a pilot car to control one-way traffic. Measurement & Payment for the item "Pilot Car" will be based on hours that the vehicle is actually in use.

6. GRADE OF BITUMEN: Grade of liquid asphalt for surface treatment to be specified by the Engineer. 120-150

7. COMPACTION OF HOT BITUMINOUS PAVEMENT: A minimum of 2 approved rollers shall be used for the compaction of each main line paving course. The Engineer may require the use of a pneumatic-tired roller to assist in obtaining a dense surface texture. The initial breakdown rolling shall be completed before the mat temperature drops below 170° F. The maximum speed of rollers when used in the vibratory mode shall be 3 MPH.

8. HOT BITUMINOUS PAVEMENT: The 4" Hot Bit. Pavement shall be laid in approximately two (2) equal lifts and the 8" depth in three (3) lifts with the top lift having a depth of approximately 2".

9. FIELD LABORATORY: If deemed unnecessary by the Engineer in the field, the item "Field Laboratory" shall be deleted.

10. SPECIFIED DENSITY: Compaction of the Hot Bit. Pavement shall be in accordance with Sec. 406-4.8.2 of the Standard Specifications. The Hot Bit. Pavement shall be compacted to 97% of the Marshall Density determined in the field. The average of the sub-lot densities shall equal 97% or more, and no one sub-lot density shall be less than 95%.

11. CLASS 25 AGGREGATE: Class 25 Aggregate shall have a maximum clay content of 3% and a maximum shale and soft rock content of 4%. Not less than 50% by weight of the particles retained on No. 4 Sieve shall have at least one fractured face.

12. CURB & GUTTER-TYPE I: Class AE Concrete shall be used. Curb and Gutter (reinforced) at bridge ends shall be installed in accordance with the details shown in the plans. Backfill for curbing shall be in accordance with Sec. 708-3,1,7, of the Standard Specifications. Cost for backfill to be included in the price bid for Curb and Gutter.

13. SEEDED AREAS: The Contractor may operate his vehicles and equipment on grassed areas within the right-of-way; however, the Contractor shall, at his own expense repair any damaged areas with topsoil and Class IV Seed.

SS-1H

14. TACK COAT: When directed by the Engineer, Emulsified Asphalt for Tack Coat shall be diluted with water prior to application in a 50:50 ratio or other approved proportions. Quantity shown does not include water. Cost of water shall be included in the price bid for Emulsified Asphalt for Tack Coat.

15. SURFACE TREATMENT: Surface treatment shall not be applied in those areas where plastic pavement marking film lines and messages are to be installed.

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NOTE SHEET CONT'D.

16. MEDIAN CROSSOVER (APPROX. 210' NORTH OF BEGINNING OF PROJECT): The Engineer shall determine when the median crossover (approx. 500 c.y.) shall be removed. Scheduling should be done so as to have the minimum amount of interference with traffic. All available topsoil in the areas to be disturbed shall be salvaged and stockpiled so it may be spread over the disturbed areas and seeded with a type specified by the Engineer. The embankment material shall be disposed of within the right-of-way as designated by the Engineer and the surfacing material shall be disposed of by the Contractor at a location obtained by him (and approved by the Engineer) off the highway right-of-way. The present drainage pattern shall not be disrupted by the removal and disposal of any material. Cost for removal and disposal of the material, stockpiling and spreading of topsoil and seeding shall be included in the price bid for "Removal of Bypass", Item 724.

17. EXISTING SIGNS & BARRICADE ASSEMBLIES: The Engineer shall determine when the construction signing at the median crossover for diverting traffic to the northwest ramp and the barricade assemblies in place at the ramps and loops shall be removed. The signs and barricades shall be stockpiled at a location within the right-o-fway as directed by the Engineer. Cost of removal and stockpiling to be incidental to the price bid for "Traffic Control". Ownership to remain with the State.

18. PLASTIC PAVEMENT MARKING FILM (RETRO-REFL.) LINE AND MESSAGE: This pavement marking shall be applied to the top lift of Hot Bit. Pavement while the material is still warm and rolled into the surface with the steel wheel roller. Cost of installing, rolling, labor and necessary equipment shall be included in the price bid for "Plastic Pavement Marking Film (Retro-Refl.) Line and Message".

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ESTIMATED QUANTITIES

SPEC.	CODE	ITEM	UNIT	MAINLINE (LT. & RT. RDWY.)	CROSSRAOD	RAMPS	BIKEWAY & SIDEWALK	TOTAL "I" PORTION
103	0100	Contract Bond	L. Sum	1				1
216	0100	Water	M. Gal.	314	74	466		854
302	0301	Subgrade Preparation	Mile	1.038		1.065		2.103
302	0120	Aggregate Base Course, Class 5	Ton	6332		4380		10712
401	0100	MC-70,250 Liq. Asphalt	Gal.	1698	597	1224	39	3558
401	0152	SS-1h or CSS-1h Emulsified Asphalt	Gal.	3904	1381	3113		8398
401	0160	Blotter Material, Cl. 44	Ton	97	34	70	2	203
406	0190	Hot Bit. Pavement, Cl. 25	Ton	15043	2978	11004	125	29150
406	0320	120-150 Asphalt Cement	Ton	962.5	190.6	704.5	8.0	1866
406	1185	Pilot Car	Hrs.					
630	0040	15" Corr. Steel Pipe .064"	L.F.	198		40		238
630	0440	15" C.S.E.S. .064"	Ea.	2		1		3
705	0100	Mobilization	L. Sum	1				1
708	0420	Curb & Gutter (Reinforced) Type I	L.F.	160		40		200
722	0115	Three Cable Guardrail	L.F.	5034				5034
722	0118	Box Beam Guardrail	L.F.	1479.8				1480
722	0119	Box Beam Guardrail-End Section	Ea.	2				2
722	0147	End Treatment	Ea.	4				4
724	0160	Removal of Bypass	L. Sum	1				1
743	0102	Pvm't. Marking-Drop on Beads, Type II (Line)	L.F.	59141				59141
743	0128	Plastic Pvm't. Marking Film Message (Retro-Refl.)	S.F.	153.5				154
743	0129	Plastic Pvm't. Marking Film Line (Retro.-Refl.)	S.F.	250				250
746	0100	Flagging	M. Hrs.	275				275
752	0100	Bridge Approach Drains	Ea.	2				2
752	0101	Bridge Approach Drain (Single)	Ea.			1		1
756	0100	Field Laboratory, Type A	Ea.	1				1
762	3298	Traffic Control	L. Sum	1				1
776	0100	Temporary Striping	Mile		.7	.4		1.1
900	8593	Milling Bituminous Surface	Ton					
777	0307	Underground Cond. #14, Type XHHW	L.F.					
777	0430	Saw Slot	L.F.					

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ESTIMATED QUANTITIES

SPEC.	CODE	ITEM	UNIT	MAINLINE LT. & RT. RDWY.	RAMPS	MEMORIAL BRIDGE APPROACHES	TOTAL "F" PORTION	GRAND TOTAL
103	0100	Contract Bond	L. Sum					1
216	0100	Water	M. Gal.	60	44		104	958
302	0301	Subgrade Preparation	Mile	.284	.211		.495	2.598
302	0120	Aggregate Base Course, Class 5	Ton	2048	814		2862	13574
401	0100	MC-70,250 Liq. Asphalt	Gal.	443	139	260	842	4400
401	0152	SS-1h or CSS-1h Emulsified Asphalt	Gal.	900	353	186	1439	9837
401	0160	Blotter Material, Cl. 44	Ton	26	8	15	49	252
406	0190	Hot Bit. Pavement, Cl. 25	Ton	4037	1570	310	5917	35067
406	0320	120-150 Asphalt Cement	Ton	258.3	100.5	19.8	379	2245
406	1185	Pilot Car	Hrs.				50	50
630	0040	15" Corr. Steel Pipe .064"	L.F.					238
630	0440	15" C.S.E.S. .064"	Ea.					3
705	0100	Mobilization	L. Sum					1
708	0420	Curb & Gutter (Reinforced) Type I	L.F.					200
722	0115	Three Cable Guardrail	L.F.	503.5			504	5538
722	0118	Box Beam Guardrail	L.F.					1480
722	0119	Box Beam Guardrail-End Section	Ea.					2
722	0147	End Treatment	Ea.					4
724	0160	Removal of Bypass	L. Sum					1
743	0102	Pvm't. Marking-Drop on Beads, Type II (Line)	L.F.	13342		1240	14582	73723
743	0128	Plastic Pvm't. Marking Film Message (Retro-Refl.)	S.F.	70.5		34.5	105	259
743	0129	Plastic Pvm't. Marking Film Line (Retro.-Refl.)	S.F.			450	450	700
746	0100	Flagging	M. Hrs.	125			125	400
752	0100	Bridge Approach Drains	Ea.					2
752	0101	Bridge Approach Drain (Single)	Ea.					1
756	0100	Field Laboratory, Type A	Ea.					1
762	3293	Traffic Control	L. Sum					1
776	0100	Temporary Striping	Mile			.2	.2	1.3
900	8593	Milling Bituminous Surface	Ton			530	530	530
777	0307	Underground Cond. #14, Type XHHW	L.F.			412	412	412
777	0430	Saw Slot	L.F.			83	83	83

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LIST OF PROVISIONS

No.	Description
SP-109-3	Measurement & Payment
SP-762-6	Maintenance & Protection of Traffic
SP-273	Repair & Restoration of Haul Roads
SP-107-6 & 7	Legal Relations & Responsibility to Public
SP-610-3	Portland Cement Concrete
SP-406-7 & 8	Hot Bit. Pavement
SP-272	Fuel Cost Adjustment
SP-103-3	Award & Execution of Contract
SP-108- 9 & 19	Prosecution & Progress
SP-814-2	Bituminous Materials
SP-302-1	Aggregate Base
SP-746-1	Flagging
SP-302-3	Aggregate Base
SP-806-3	Coarse Aggregate
SP-743-10	Pavement Marking
SP-776-2	Temporary Striping
SP-870-4	Paints, Oils & Thinner
SP-871-4	Pavement Marking
SP-333	Milling Bituminous Surface
SP-334	Pavement Surface Treatment
SP-722-2	Guardrail, Guard Posts & Guide Posts
SP-850-1	Guardrail & Guard Posts
SP-302-7	Aggregate Base

Description	Type of Aggregate	Size
Aggregate Base, Cl. 5	Crushed	3/4"
Hot Bit. Pavement, Cl. 25	Crushed	3/4"
Blotter Material, Cl. 44	Screened	5/8"

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BASIS OF ESTIMATE (ONE ROADWAY)

MAINLINE 48' GRADED QUANTITY PER STA.	WIDTH	60' GRADED QUANTITY PER STA.	WIDTH	DEPTH	UNIT	DESCRIPTION
4.0		4.0			M. Gal.	Water for Dust Palliative, Subgrade Preparation plus 20 Gal./Ton of Aggregate Base
108.80	46'	136.58	58'	2"	Ton	Aggregate Base Course Cl. 5 @ 1.5 Ton/C.Y. + 25%
22.78	41'	29.44	53'		Gal.	SS-1h or CSS-1h Emuls. Asphalt for Tack Coat @ .05 Gal./S.Y.
23.89	43'	30.56	55'		Gal.	SS-1h or CSS-1h Emuls. Asphalt for Tack Coat @ .05 Gal./S.Y.
100.62	39'			4"	Ton	Hot Bit. Pavement Cl. 25 @ 2.0 Ton/C.Y.
209.88	39'	269.14	51'	8"		
6.44				4"	Ton	120-150 Asph. Cement for Hot Bit. Pavement @ 6.4 of Hot Bit. Pvm't.
13.43		17.22		8"		
20.22	26'	29.56	38'		Gal.	*MC-70,250 Liq. Asph. @ .07 Gal./S.Y. or Petroleum Resin-Oil Base Emulsion @ .04 Gal./S.Y. for Surface Treatment
1.16	26'	1.69	38'		Ton	Blotter Material, Class 44 @ 8 Lbs./S.Y. (Surf. Trtm't. Mtce.)

*Quantity based on MC-70,250 Liquid Asphalt.

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BASIS OF ESTIMATE

EAST BOUND CROSS ROAD QUANTITY PER STA.	WIDTH	RAMPS, LOOPS & W. BOUND CROSSROAD QUANTITY PER STA.	WIDTH	DEPTH	UNIT	DESCRIPTION
		4.0			M. Gal.	Water for Dust Palliative, Subgrade Preparation plus 20 Gal./Ton of Aggregate Base
		72.92	31'	2"	Ton	Aggregate Base Course Cl. 5 @ 1.5 Ton/C.Y. + 25%
21.67	39'	15.56	28'		Gal.	SS-1h or CSS-1h Emuls. Asphalt for Tack Coat @ .05 Gal./S.Y.
22.22	40'	16.11	29'		Gal.	SS-1h or CSS-1h Emuls. Asphalt for Tack Coat @ .05 Gal./S.Y.
96.30	38'	66.67	26'	4"	Ton	Hot Bit. Pavement Cl. 25 @ 2.0 Ton/C.Y.
		140.74	26'	8"		
6.16		4.27		4"	Ton	120-150 Asph. Cement for Hot Bit. Pavement @ 6.4 of Hot Bit. Pvm't.
		9.01		8"		
20.22	26'	12.44	16'		Gal.	*MC-70,250 Liq. Asph. @ .07 Gal./S.Y. or Petroleum Resin-Oil Base Emulsion @ .04 Gal./S.Y. for Surface Treatment
1.16	26'	.71	16'		Ton	Blotter Material, Class 44 @ 8 Lbs./S.Y. (Surf. Trtm't. Mtce.)

*Quantity based on MC-70,250 Liquid Asphalt.

NOTE: Curve Sections same as Tangent except for Superelevation

TYPICAL SECTIONS
MAINLINE

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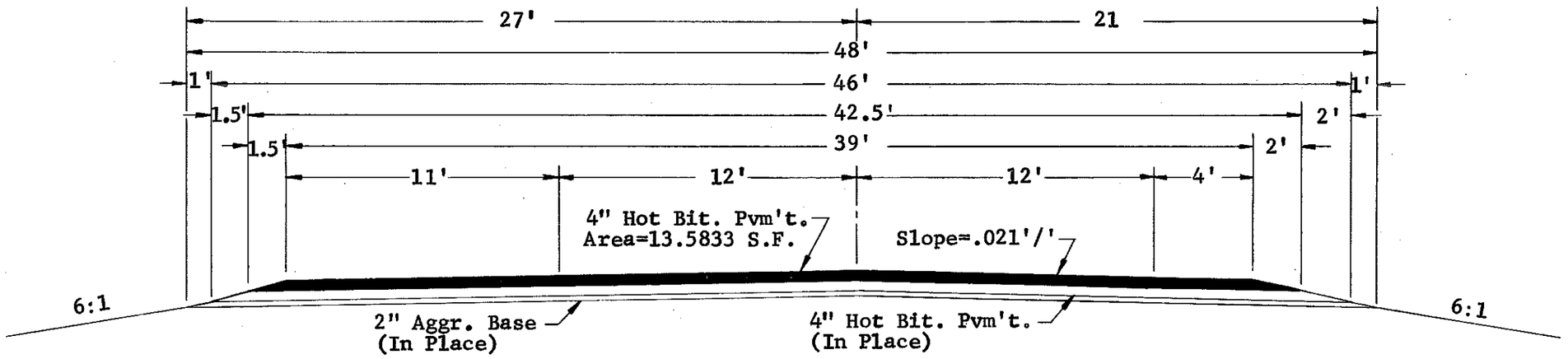
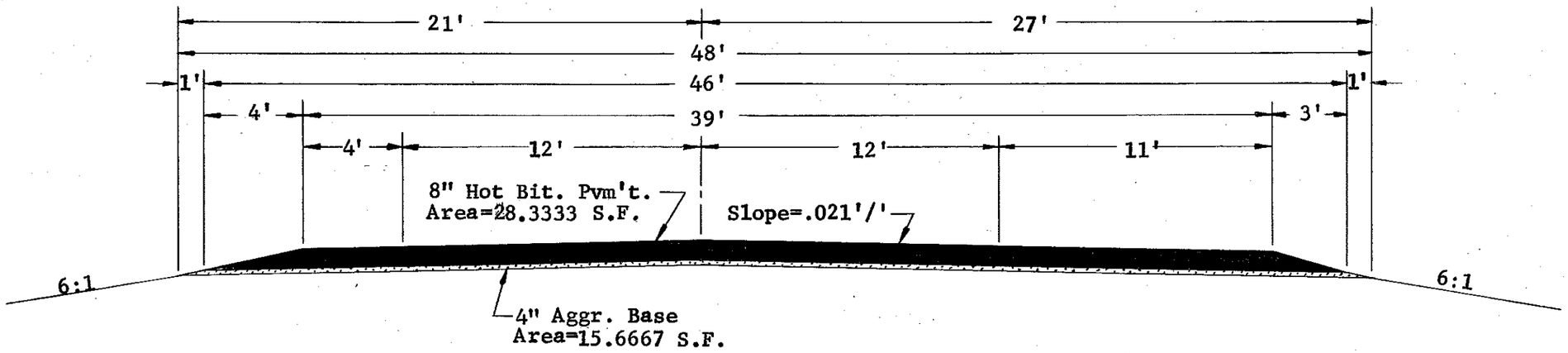


Lt. Roadway
Sta. 0-00 to 17+25+
Sta. 17+25+ to 21+25+ Variable Widths

Rt. Roadway (Section Reversed)
Sta. 0-00 to 0+00
Sta. 0+00 to 4+50+ Var. Widths



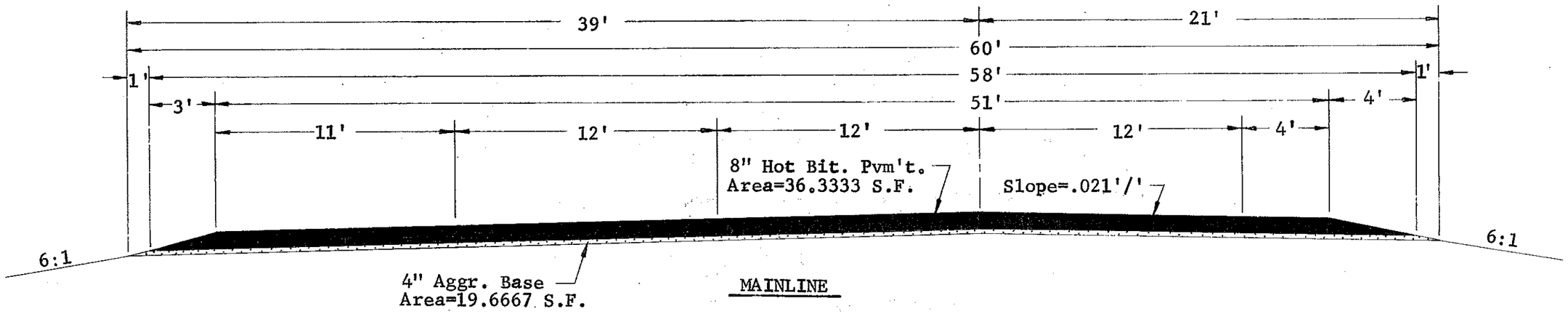
Lt. Rdwy. (Section Reversed)
Sta. 17+25+ to 21+25+ Var. Widths
Sta. 21+25+ to 25+56.5
Sta. 30+41.5 to 40+20.6

Rt. Rdwy.
Sta. 0+00 to 4+50+ Var. Widths
Sta. 4+50+ to 25+25.5
Sta. 30+10.5 to 33+57.0

NOTE: Curve Sections same as Tangent except for Superelevation.

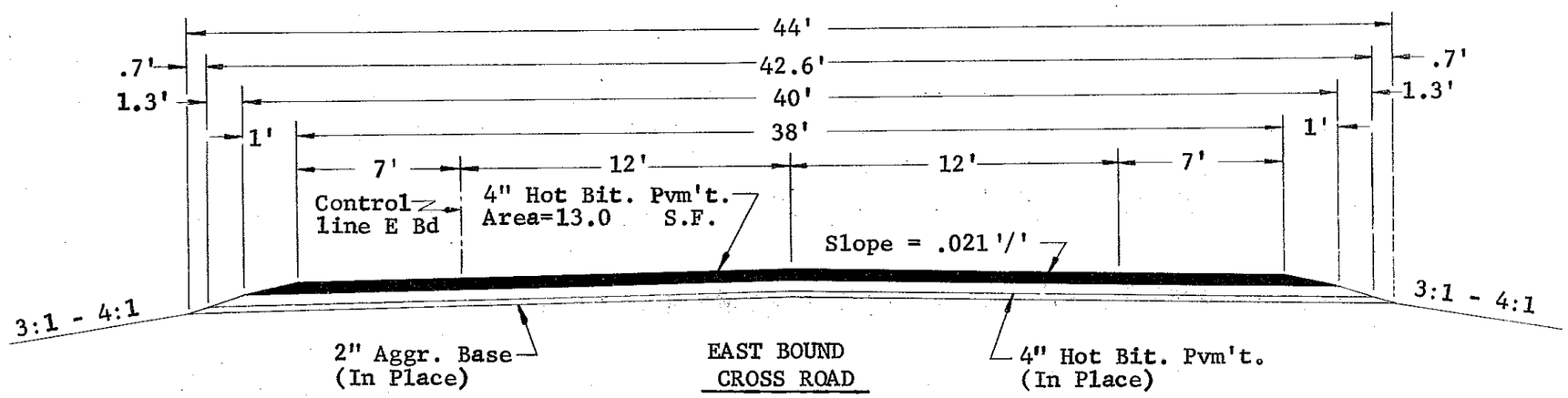
TYPICAL SECTIONS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	11



Lt. Rdwy.
Sta. 40+20.6 to 50+50

Rt. Rdwy. (Section Reversed)
Sta. 33+57.0 to 50+50

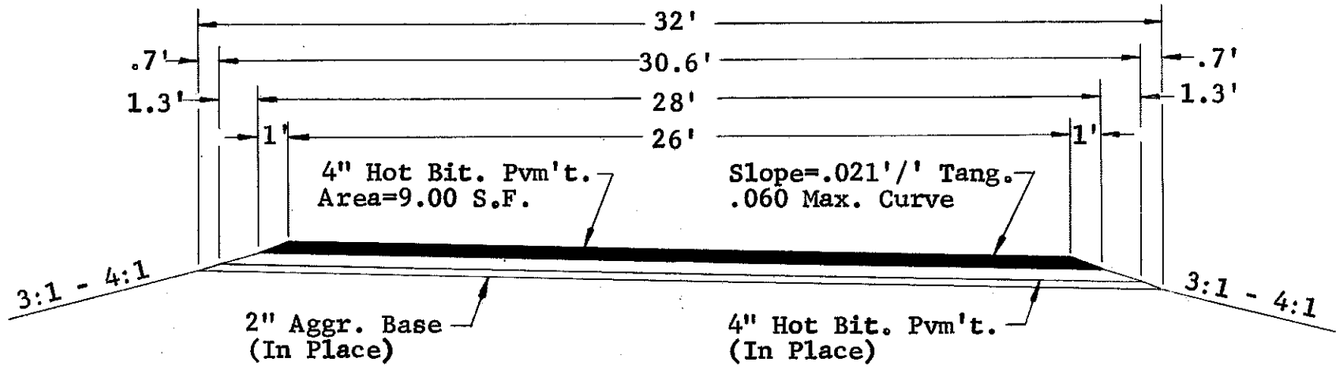


FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	12

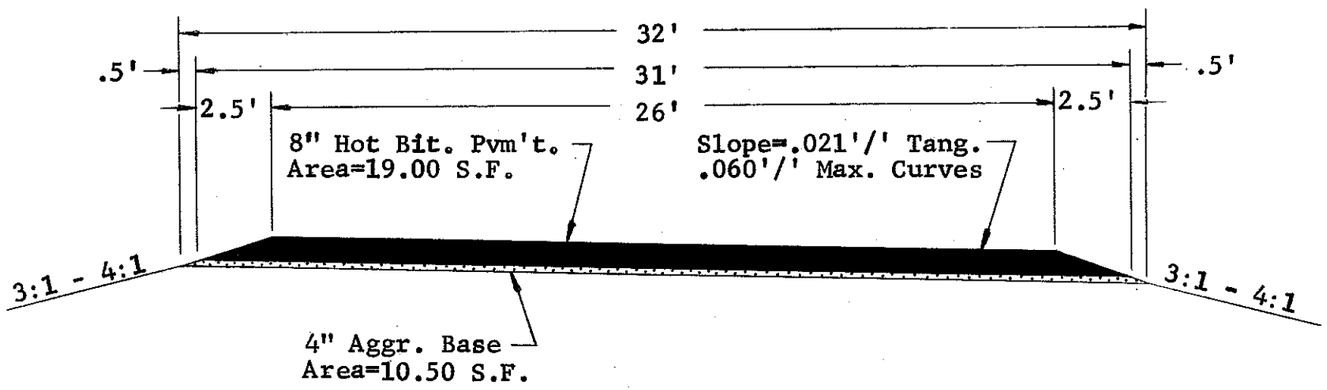
NOTE: Curve Sections same as Tangent except for Superelevation.

TYPICAL SECTIONS

RAMPS, LOOPS & WEST BOUND CROSSROAD



MEMORIAL BRIDGE INTERCHANGE
E. Bd., N.W. & N.E. Ramps
West Bound Crossroad



MEMORIAL BRIDGE INTERCHANGE

S.E. RAMP & LOOP
N.W. LOOP
EAST BOUND RAMP
S.W. RAMP

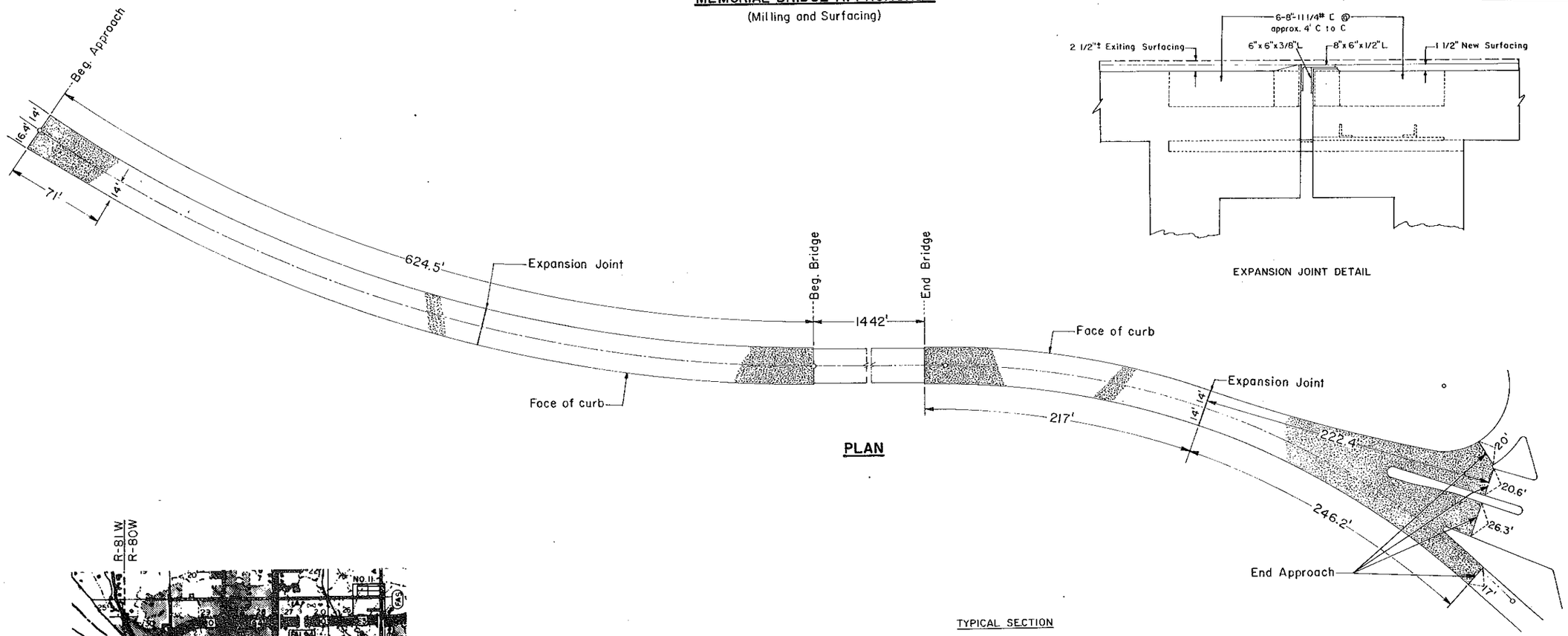
McKENZIE DRIVE INTERCHANGE

N.W. & N.E. RAMPS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	13

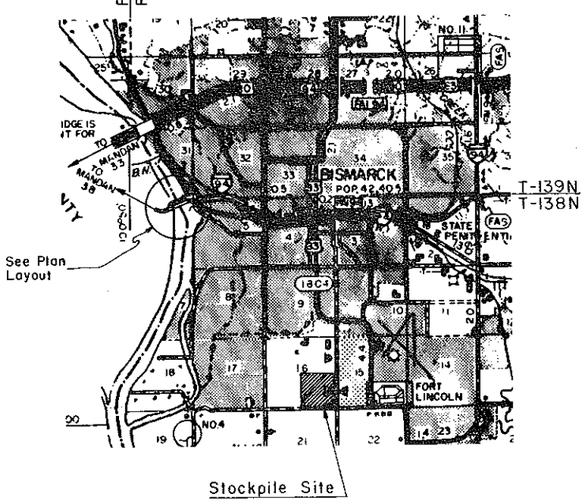
MEMORIAL BRIDGE APPROACHES

(Milling and Surfacing)



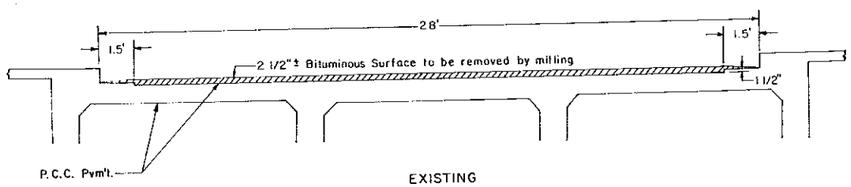
PLAN

EXPANSION JOINT DETAIL

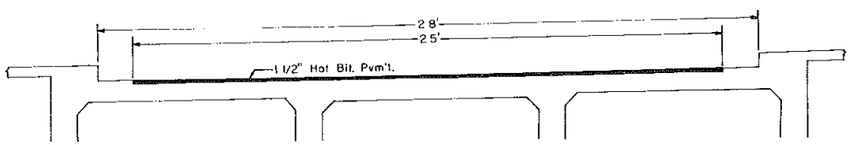


SE 1/4 Sec. 16, Twp. 138 N, Rge. 80 W.

TYPICAL SECTION



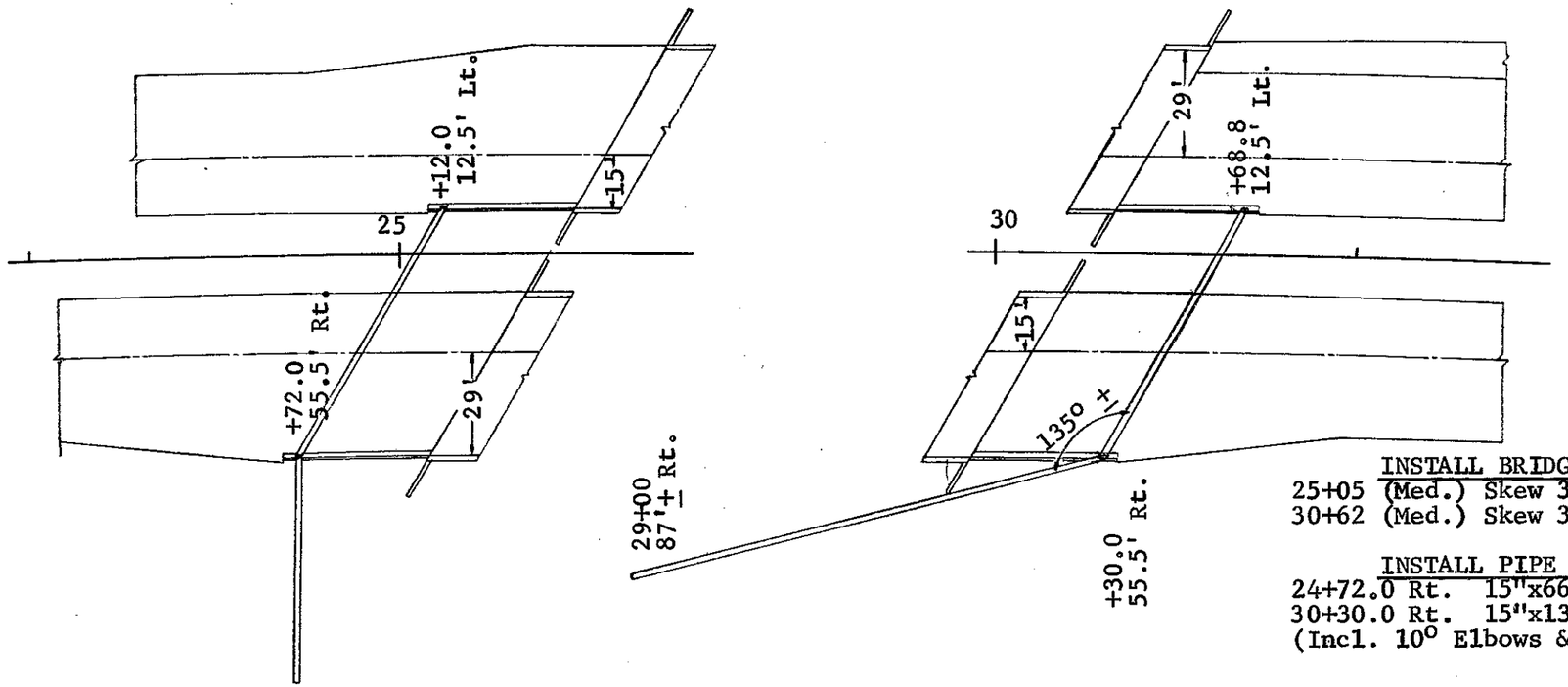
EXISTING



SURFACING

FHWA REGION	STATE	FED. A.D. PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	14

MAINLINE

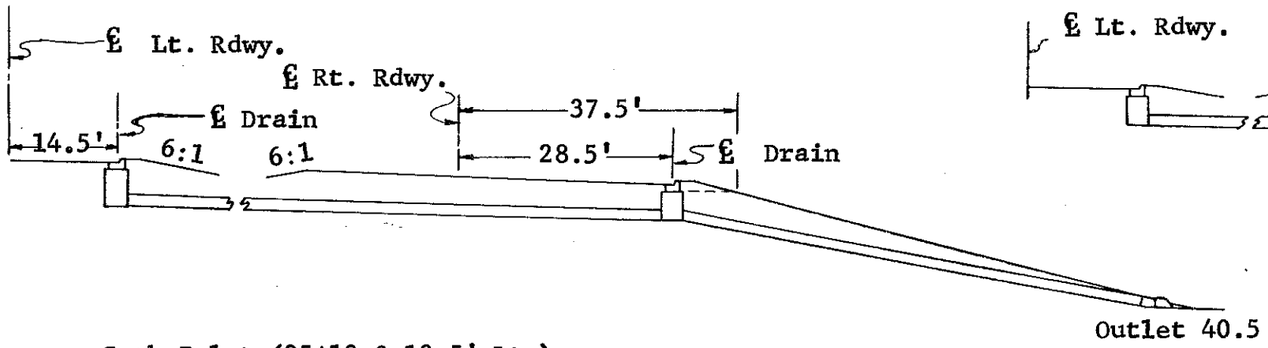


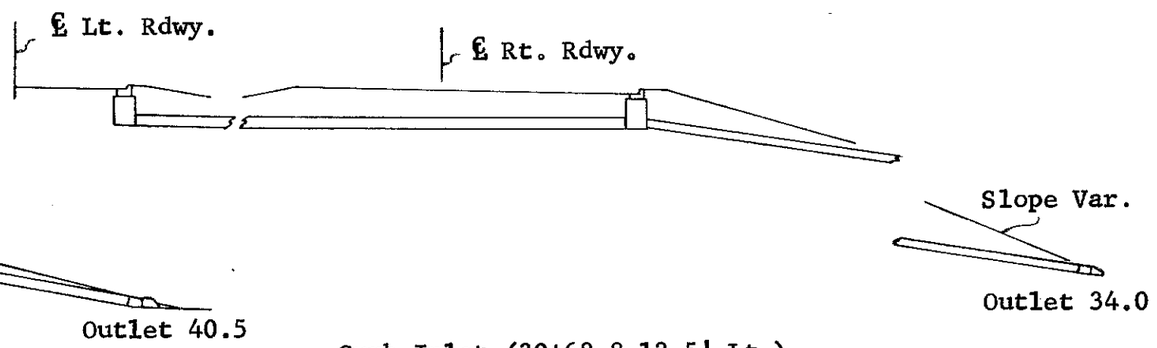
INSTALL BRIDGE APPROACH DRAINS

25+05 (Med.) Skew 30° Lt. & Ahd. (15"x76'CSP)
30+62 (Med.) Skew 30° Lt. & Ahd. (15"x76'CSP)

INSTALL PIPE CULVERTS

24+72.0 Rt. 15"x66' CSP 1-CSES
30+30.0 Rt. 15"x132' CSP 1-CSES
(Incl. 10° Elbows & Connecting Bands)





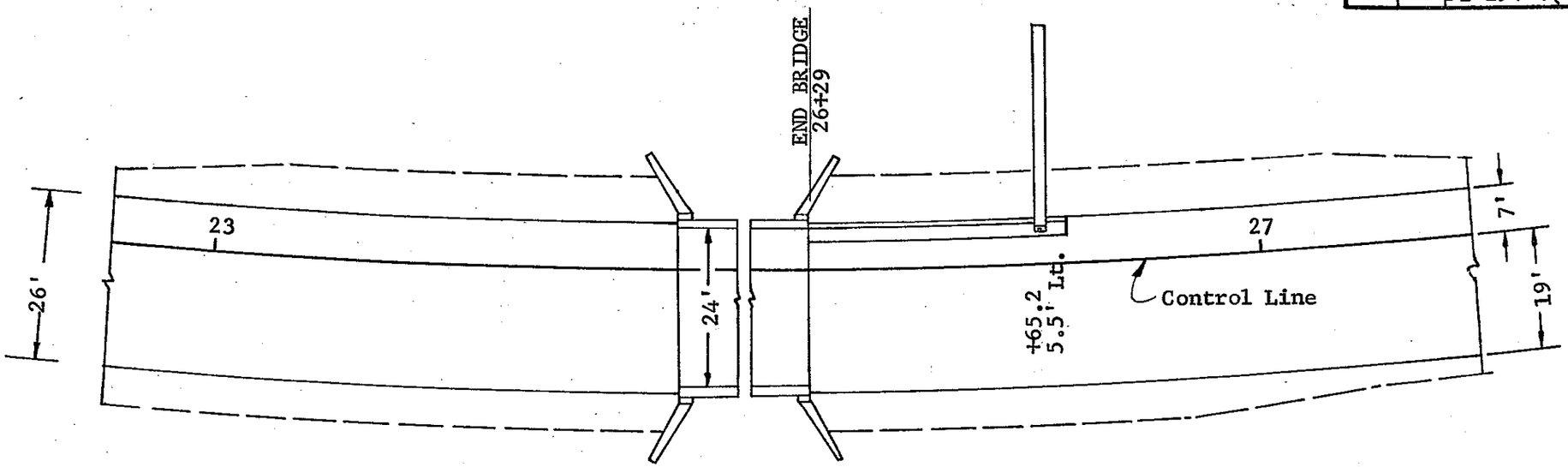
Curb Inlet (25+12.0-12.5' Lt.)
Top Elev. 1659.75 (13.5' Lt.)
Inv. Elev. 1654.09

Curb Inlet (24+72.0-55.5' Rt.)
Top Elev. 1657.02 (54.5' Rt.)
Inv. Elev. 1652.36

Curb Inlet (30+68.8-12.5' Lt.)
Top Elev. 1660.06 (13.5' Lt.)
Inv. Elev. 1655.40

Curb Inlet (30+30.0-55.5' Rt.)
Top Elev. 1658.66 (54.5' Rt.)
Inv. Elev. 1654.00

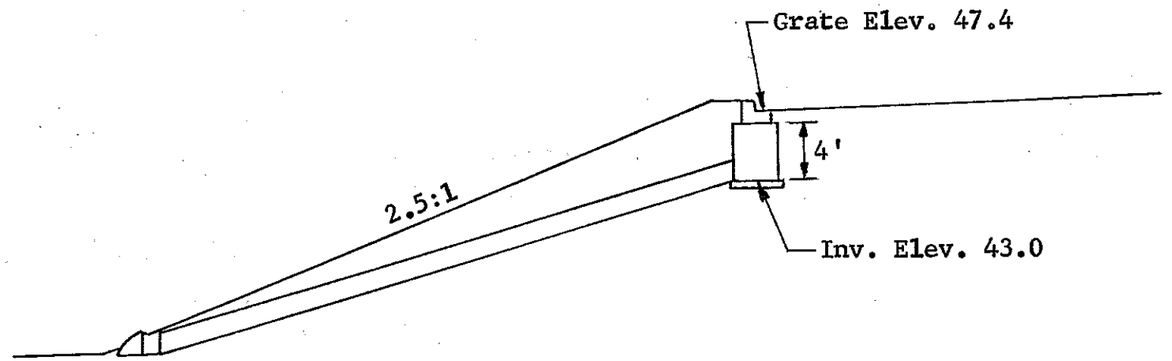
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	15



EAST BOUND RAMP

INSTALL BRIDGE APPROACH DRAIN (SINGLE)
26+65.2 - 5.5' Lt.

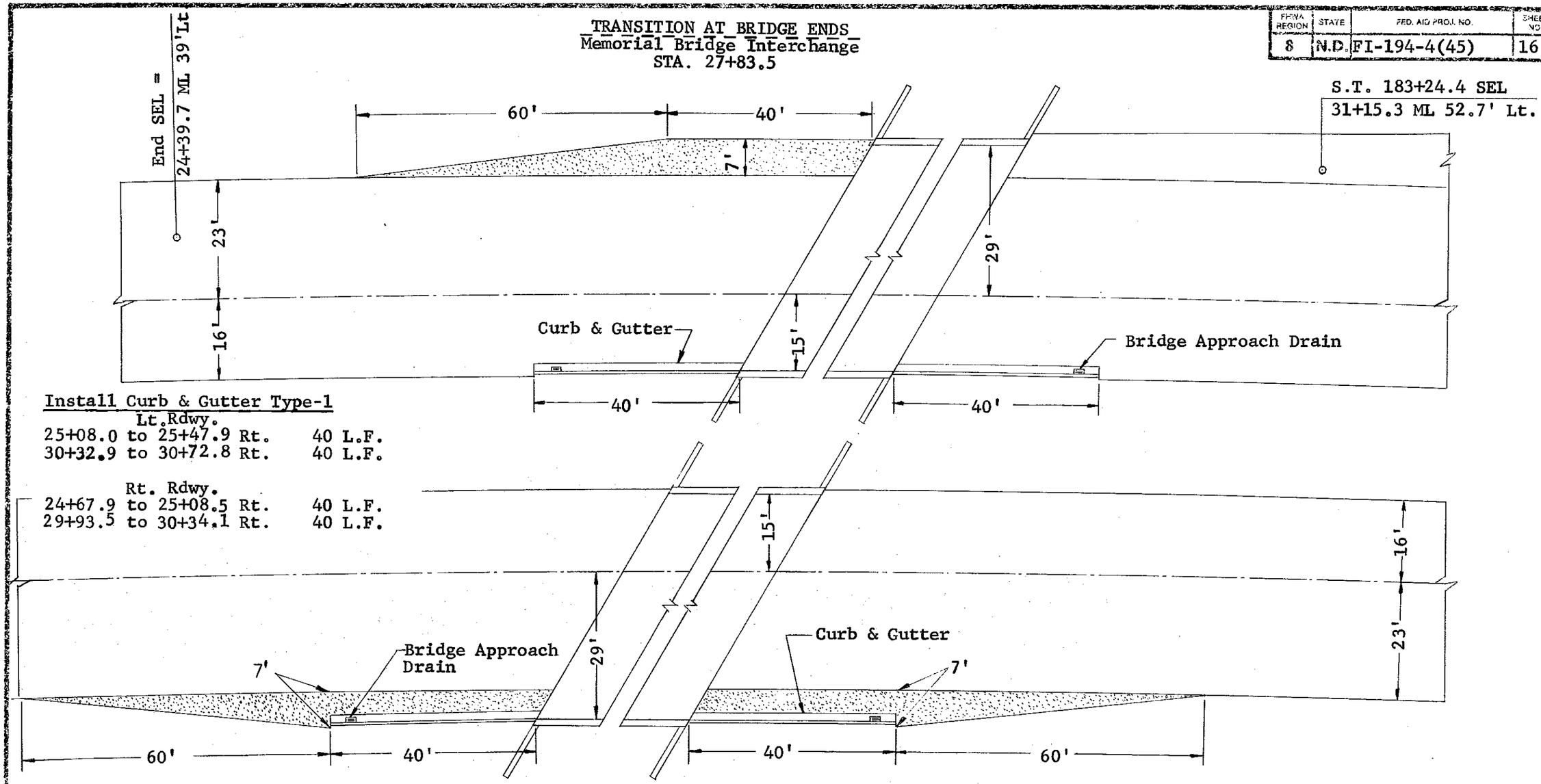
INSTALL PIPE CULVERT
26+65.2 Lt. 15"x40' CSP - 1 CSES
(Incl. 1-17° Elbow & Connecting Band)



Outlet 31.5

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	16

TRANSITION AT BRIDGE ENDS
Memorial Bridge Interchange
STA. 27+83.5

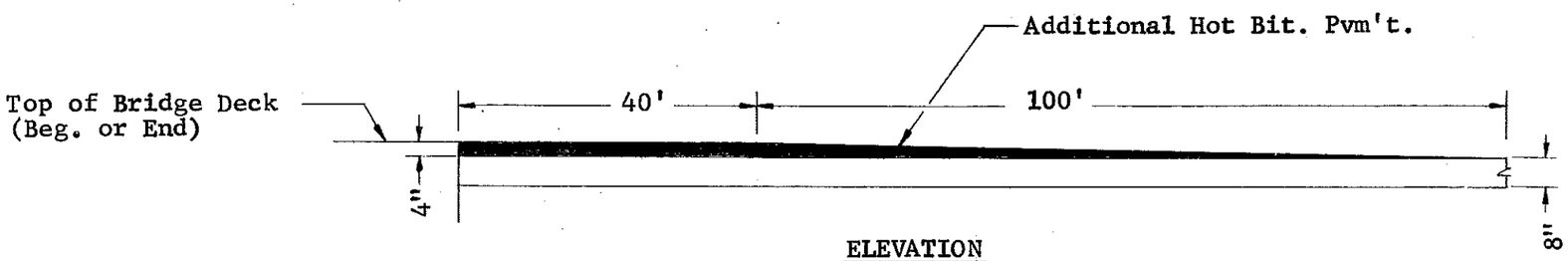


PLAN

Install Curb & Gutter Type-1

	Lt. Rdwy.	
25+08.0 to 25+47.9	Rt.	40 L.F.
30+32.9 to 30+72.8	Rt.	40 L.F.

	Rt. Rdwy.	
24+67.9 to 25+08.5	Rt.	40 L.F.
29+93.5 to 30+34.1	Rt.	40 L.F.

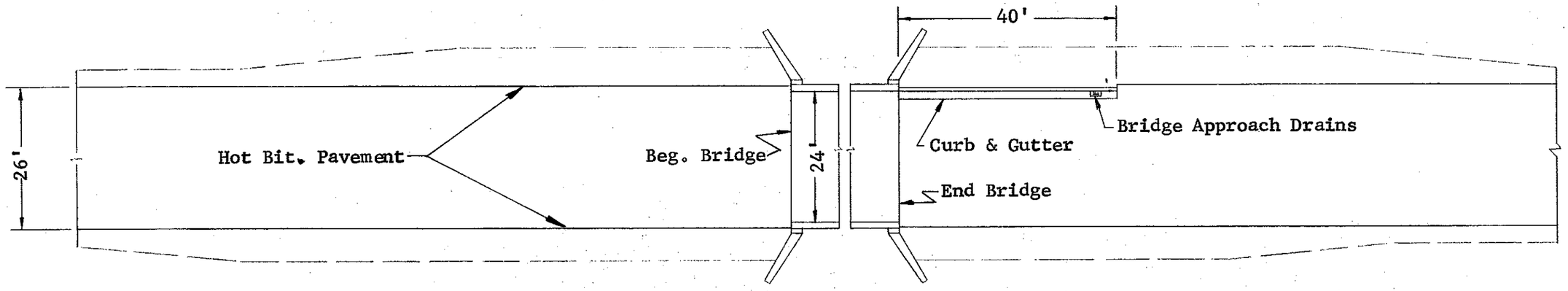


ELEVATION

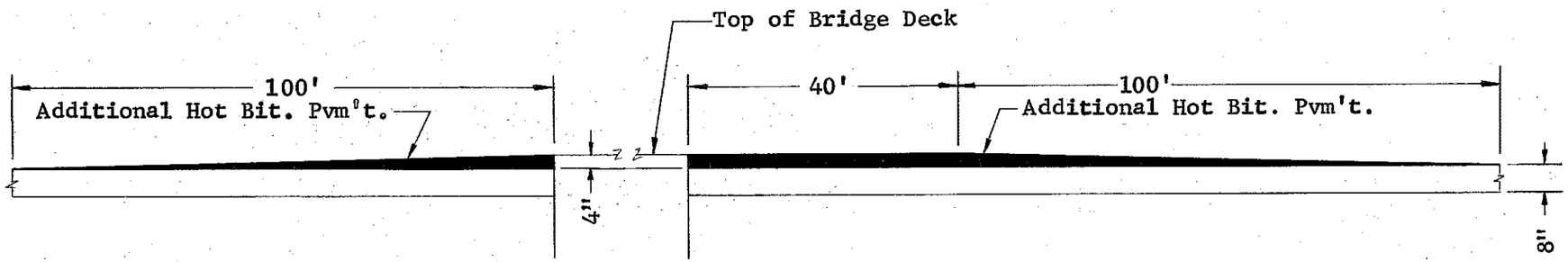
FHWA Region	State	Fed. Aid Proj. No.	Sheet No.
8	N.D.	FI-194-4(45)	17

TRANSITION AT BRIDGE ENDS

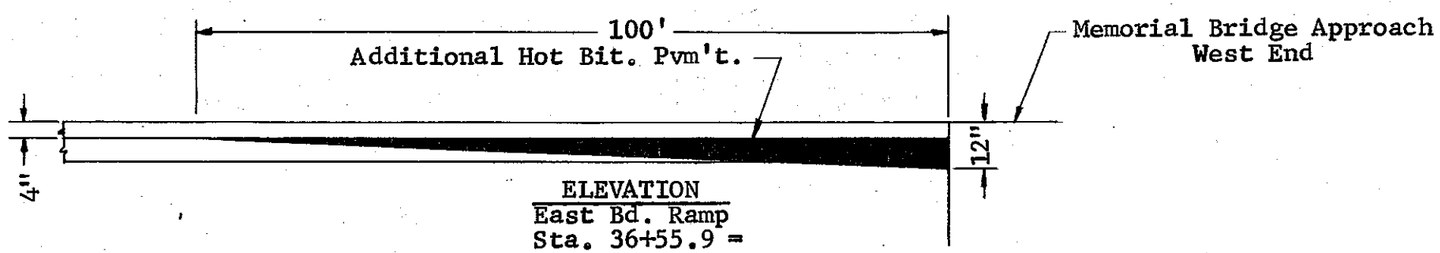
INSTALL CURB AND GUTTER - TYPE 1
26+29 to 26+69.2 Lt. 40 L.F.



PLAN
East Bd. Ramp
Sta. 24+95.5



ELEVATION

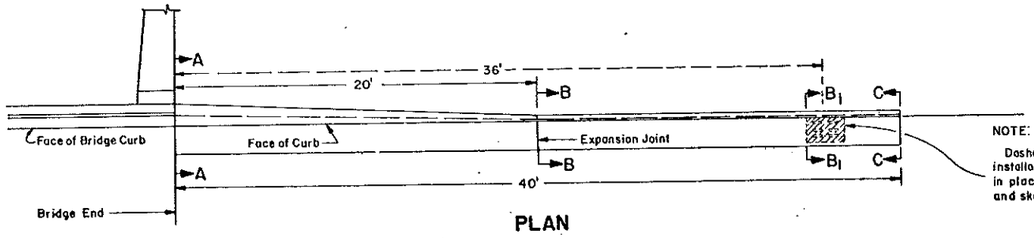


ELEVATION
East Bd. Ramp
Sta. 36+55.9 =
Sta. 179+15.5
Memorial Bridge Approach

COMBINED CONCRETE CURB & GUTTER FOR BRIDGE APPROACHES

FED. AID PROJ. NO.	STATE	SHEET NO.	TOTAL SHEETS
	N.D.		

FI-194-4(45) 18



PLAN

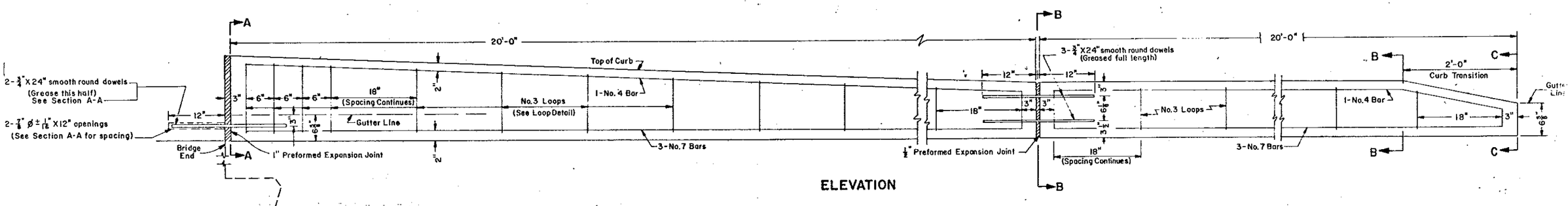
NOTE:
Dashed dimensions and curb inlet apply to installation where required. Where inlets are in place the engineer will verify all dimensions and skew angles before installations.

NOTES:

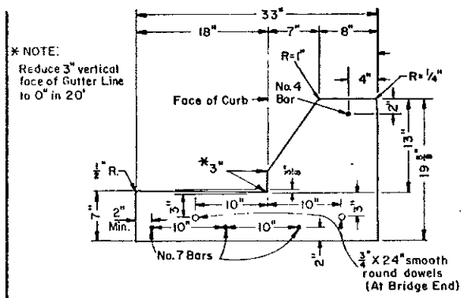
All reinforcing Steel & Dowels shall be included in price bid for Combined Concrete Curb & Gutter.

At locations where bridge and bridge curb are constructed on a skew the end section of Combined Curb & Gutter abutting bridge curb shall be constructed on the skew.

See Standard D-752-3 for detail of curb inlet.

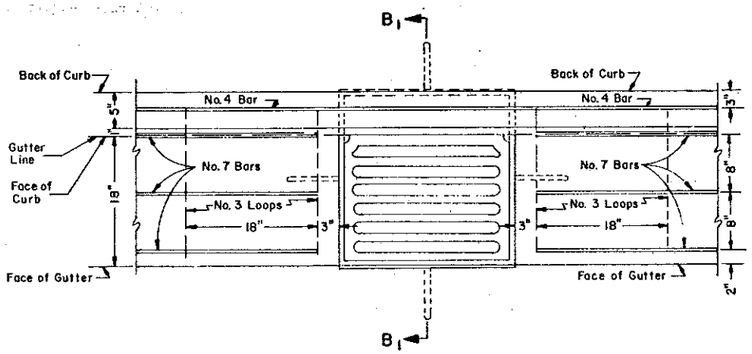


ELEVATION

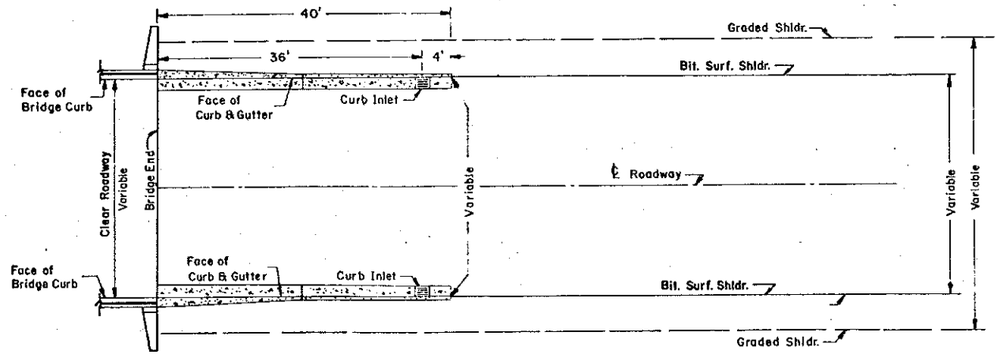


* NOTE:
Reduce 3" vertical face of Gutter Line to 0" in 20'

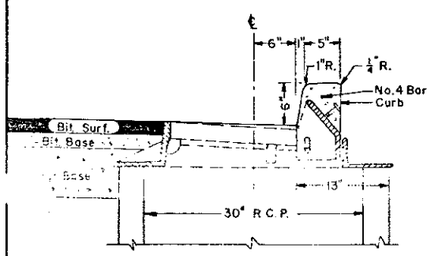
SECTION A-A



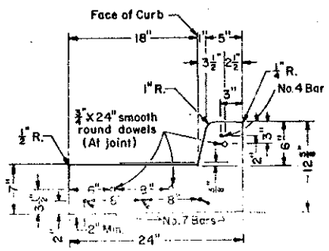
PLAN
Curb and Gutter with Inlet



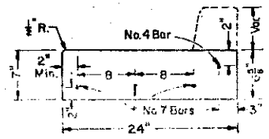
PLAN VIEW



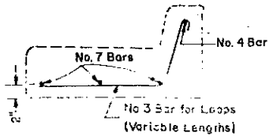
SECTION B_1-B_1



SECTION B-B



SECTION C-C



LOOP DETAIL

TYPICAL CURB & GUTTER SECTIONS
(Showing placement of reinforcing Steel & Dowels)

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO.
8	N.D.	FI-194-4(45)	19

R=21'

8'

Sidewalk & Bikeway

4" Hot Bit. Pavement

P.C.C. 23+30.5 NE Ramp=
179+15.5 Bridge Appro. 14' Lt.

P.T. 179+25.3 W. Bd. X-Rd=
179+15.5 Bridge Appro. ℄

7'

15'

14'

35

7'

25'

0+00 SE Ramp =
35+04.4 E. Bd. Ramp

23.3'

21'

14'

40:1

40:1

P.O.T. 36+55.9 E. Bd. Ramp=
179+15.5 Bridge Appro. 2.4' Rt.

37+29.1 E. Bd. Ramp=
P.O.C. 179+88.7 Bridge Appro.

Δ=84.5443°
T=39.1'
R=43'

R=21'

Sidewalk & Bikeway

4" Hot Bit. Pavement

8'

7'

19'

Pavement Edge
of East
Service Road

MEMORIAL BRIDGE INTERCHANGE

AREAS SURFACED ON GRADING CONTRACT

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
0	N.D.	FI-194-1(45)	20

MED-X-OVER
Δ = 18.572° LT. & RT.
R = 300'
T = 49.1'

Mainline
Δ = 11 65278°
D = 2°00'(2-200'Sp)
R = 2864.93
Te = 392 39
L = 382 64
Sc = 2°
Xc = 2 33
Yc = 199 98
SE = .043%

E. Bd. Ramp
Δ = 4.99139°
D = 1°30'
R = 3819.83
T = 166.49
L = 332.76
SE = .030%

Mainline
Δ = 41.99444°
D = 1°30'(2-200'Sp.)
R = 3819 83
Te = 1566.24
L = 2599.63
Sc = 1°30'
Xc = 1 75
Yc = 199.99
SE = .035%

NE Ramp
Δ = 19.9419°
D = 4°00'
R = 1432'69
T = 251.87
L = 498.55
SE = .041%

NE Ramp
Δ = 19.87055°
D = 5°34'30"
R = 1028.14
T = 180 09
L = 356.42
SE = .034%

W Bd. X-Rd.
Δ = 6.25944°
D = 5°30'
R = 1042.14
T = 56.98
L = 113.81
SE = .021%

E. Service Rd
Δ = 25.00°
D = 16°00'
R = 359.26
T = 79.65
L = 156.25

E. Service Rd.
Δ = 22.23333°
D = 6°00'
R = 955.37
T = 187.72
L = 370.52

NW Loop
Δ = 198.02562°
D = 43°00'(2-200'Sp)
R = 136.42
Lc = 200'
L = 266 73 (Arc)
Xc = 48.08
Yc = 189.08
p = 11.44
q = 96.07
SE = .060%

NWL oop
Δ = 21 15814°
D = 8°00'
R = 716 78
T = 133 87
L = 264 48
SE = .045%

NW Ramp
Δ = 26.27806°
D = 6°00'
R = 955 37
T = 223 01
L = 437 97
SE = .038%

Exist. Rd.
Δ = 22.51667°
D = 1°30'
R = 3819.83
T = 760.38
L = 1501.11

W Bd. X-Rd.
Δ = 17 80472°
D = 5°00'
R = 1146 28
T = 179 55
L = 356 09
SE = 034%

E. Bd. Ramp
Δ = 51.41221°
D = 5°00'
R = 1146.28
T = 551.82
L = 1028.24
SE = .034%

W. Service Rd.
Δ = 16.31111°
D = 6°00'
R = 955.37
T = 136.91
L = 271 85

W Bd. X-Rd.
Δ = 18.06416°
D = 6°00'
R = 955.37
T = 151.86
L = 301.07
SE = .038%

SW Ramp

Curve ①	Curve ②	Curve ③
Δ = 31.67236°	Δ = 24.79490°	Δ = 6.17553°
D = 12°00'	D = 6°00'	D = 3°00'
R = 478.34	R = 955.37	R = 1910.08
T = 135.68	T = 210.01	T = 103.04
L = 263.94	L = 413.25	L = 205 85
SE = .060%	SE = 060%	SE = .060%

E. Bd X-Rd
Δ = 14.97242°
D = 2°30'
R = 2292.01
T = 301.19
L = 598 90
SE = .031%

SE Ramp
Δ = 13.00000°
D = 6°00'
R = 955.37
T = 108.85
L = 216.67
SE = .021%

SE Loop
Δ = 246.13479°
D = 36°(2-200'Sp.)
R = 161.80
Lc = 200'
L = 488.77(Arc)
Xc = 40.74
Yc = 192 29
p = 9.84
q = 97.20
SE = .060%

SE Ramp
Δ = 31.69306°
D = 5°00'
R = 1146.28
T = 325.37
L = 633.86
SE = .056%

SERV. RD. SECT. CON'T. THRU. McKENZIE DRIVE INTER.

MEMORIAL BRIDGE INTERCHANGE

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-1(45)	21

Scale 1" = 217.40 feet

Mainline
Δ = 11.65278°
D = 2°00'(2-200'Sp.)
R = 2864.93
Te = 392.39
L = 382.64
Sc = 2°
Xc = 2.33
Yc = 199.98
SE = .043⅄

E.Bd. Ramp
Δ = 4.99139°
D = 1°30'
R = 3819.83
T = 166.49
L = 332.76
SE = .030⅄

Mainline
Δ = 41.99444°
D = 1°30'(2-200'Sp.)
R = 3819.83
Te = 1566.24
L = 2599.63
Sc = 1°30'
Xc = 1.75
Yc = 199.99
SE = .035⅄

NE Ramp
Δ = 19.9419°
D = 4°00'
R = 1432.69
T = 251.67
L = 498.55
SE = .041⅄

NE Ramp
Δ = 19.87055°
D = 5°34'30"
R = 1028.14
T = 180.09
L = 356.42
SE = .034⅄

W Bd. X-Rd.
Δ = 6.25944°
D = 5°30'
R = 1042.14
T = 56.98
L = 113.81
SE = .021⅄

E. Service Rd.
Δ = 25.00°
D = 16°00'
R = 359.26
T = 79.65
L = 156.25

NW Loop
Δ = 198.02562°
D = 43°00'(2-200'Sp.)
R = 136.42
Lc = 200'
L = 266.73 (Arc)
Xc = 48.08
Yc = 189.08
p = 11.44
q = 96.07
SE = .060⅄

NW Loop
Δ = 21.15814°
D = 8°00'
R = 716.76
T = 133.87
L = 264.48
SE = .043⅄

NW Ramp
Δ = 26.27606°
D = 6°00'
R = 955.37
T = 223.01
L = 437.97
SE = .038⅄

Δ = 104.8°
R = 97.7'
T = 126.9'

Exist. Rd.
Δ = 22.51667°
D = 1°30'
R = 3819.83
T = 760.38
L = 1501.11

W Bd. X-Rd.
Δ = 17.60472°
D = 5°00'
R = 1146.28
T = 179.55
L = 356.09
SE = .034⅄

E. Bd. Ramp
Δ = 51.41221°
D = 5°00'
R = 1146.28
T = 551.62
L = 1028.24
SE = .034⅄

W Bd. X-Rd.
Δ = 18.06416°
D = 6°00'
R = 955.37
T = 151.86
L = 301.07
SE = .038⅄

SW Ramp

Curve ①	Curve ②	Curve ③
Δ = 31.67236°	Δ = 24.79490°	Δ = 6.17853°
D = 12°00'	D = 6°00'	D = 3°00'
R = 478.34	R = 955.37	R = 1910.08
T = 135.68	T = 210.01	T = 103.04
L = 263.94	L = 413.25	L = 205.85
SE = .060⅄	SE = .060⅄	SE = .060⅄

E. Bd. X-Rd.
Δ = 14.97242°
D = 3°30'
R = 1592.01
T = 301.19
L = 598.90
SE = .051⅄

W. Service Rd.
Δ = 16.31111°
D = 6°00'
R = 955.37
T = 136.91
L = 271.85

E. Service Rd.
Δ = 22.23333°
D = 6°00'
R = 955.37
T = 187.72
L = 370.92

SE Ramp
Δ = 13.00000°
D = 6°00'
R = 955.37
T = 108.85
L = 216.67
SE = .021⅄

SE Loop
Δ = 246.13479°
D = 36°(2-200'Sp.)
R = 161.80
Lc = 200'
L = 488.77 (Arc)
Xc = 40.74
Yc = 192.29
p = 9.84
q = 97.20
SE = .060⅄

SE Ramp
Δ = 31.69306°
D = 8°00'
R = 1146.28
T = 325.37
L = 633.96
SE = .056⅄

C	N.D.	FED. AID PROJ. NO. FI-194-1(45)	SHEET NO. 22

Mc KENZIE DRIVE INTERCHANGE

E Service Rd.
Δ=15.00556°
D=5°00'
R=1146.28
T=150.97
L=300.11

P.I. 23+99.83 E. Serv. Rd.

P.C. 23+48.86 E. Serv. Rd.

P.T. 23+48.97 E. Serv. Rd.

P.I. 34+94.04 E. Serv. Rd.
Δ=94.40833°

NE Ramp
Δ=25.00°
D=5°00'
R=1146.28
T=254.12
L=500.0
SE=.060'/ft

7+16.8 NE Ramp = 40+08.7 E. Serv. Rd.

0+00 SE Ramp = 40+08.7 E. Serv. Rd.

SE Ramp
Δ=46.13100'
D=7°00'
R=819.02
T=348.76
L=659.01
SE=.060'/ft

P.C. 4+35.6 S.E. Ramp

P.I. 7+84.4 N.E. Ramp

P.I. 10+94.6 N.E. Ramp = 66+52.8 Lt. Rdwy. 28' Lt.

S.T. 72+98 Lt. Rdwy. = 73+09.1 Med. ℄ 18' Rt.

C.S. 71+90 Beg. Prop. Struct.

C.S. 70+92.0 Lt. Rdwy.

End S.E. Ramp = 70+72.9 Lt. Rdwy. 12'

S.T. 73+02.8 Rt. Rdwy. = 72+6.3 Med. ℄ Rt.

P.T. 72+40.2 Med. ℄

C.S. 71+02.6 Rt. Rdwy.

End S.W. Ramp Taper

I-PORTION F-PORTION

P.T. 11+68.36 SE Ramp = 41+46.0 M.L.-51' Lt.

END ML SURF
50+50

P.C. 0+00 NE Ramp = 48+19.1 M.L.-51' Lt.

P.I. 2+54.1 NE R = 50+73.2 M.L.-51' Lt.

P.C. 0+00 NW Ramp = 48+19.1 M.L.-51' Rt.

P.I. 2+54.1 NW R = 50+73.2 M.L.-51' Rt.

T.S. 54+92.2 Lt. Rdwy. = 54+92.2 Med. ℄ - 27' Rt.

T.S. 55+46.6 Lt. Rdwy. = 55+48.6 Med. ℄ 27' Rt.

P.C. 56+00.4 Med. ℄

S.C. 57+48.6 Lt. Rdwy.

55+00 M.L. & Med. ℄ = 38+26.2 End W. Serv. Rd. = 42+58.7 End E. Serv. Rd.

T.S. 55+69.3 Rt. Rdwy. = 55+07.2 Med. ℄ - 27' Lt.

S.C. 57+59.3 Rt. Rdwy.

P.I. 2+00 NW R.

P.I. 5+00 NW R.

7+16.8 NW Ramp = 35+76.2 W. Serv. Rd.

0+00 SW Ramps = 33+76.2 W. Serv. Rd.

P.C. 65+00

P.I. 7+39.8

P.I. 7+39.8

6°40'02.8" M.L. R=1432.69

P.I. 65+18.3 Lt. Rdwy.

P.I. 65+23.6 Med. ℄

P.I. 65+28.9 Rt. Rdwy.

W. Service Rd.
Δ=16.66333°
D=6°00'
R=955.37
T=140.08
L=278.05

P.I. 10+16.12 W. Serv. Rd.

P.C. 8+76.04 W. Serv. Rd.

P.T. 11+54.09 W. Serv. Rd.

NW Ramp
Δ=25.00°
D=5°00'
R=1146.28
T=254.12
L=500.0
SE=.060'/ft

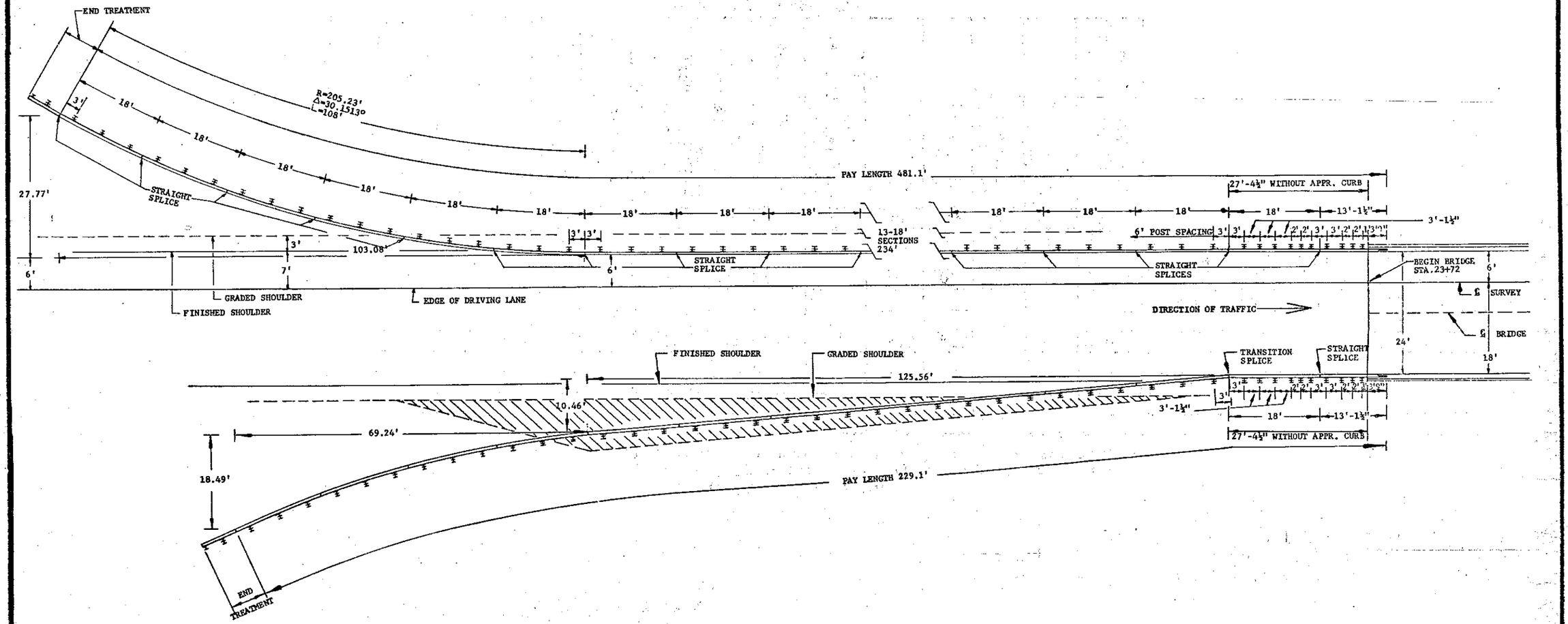
P.I. 29+26.34 W. Serv. Rd.
Δ=85.85833°

SW Ramp
Δ=10.78032°
D=4°00'
R=1432.69'
T=135.18'
L=269.51
SE=0.050'/ft

Lt. & Rt. Roadways
Δ=65.59305°
D=4°00'(2-200' Sp.)
R=1432.69
Ts=1023.89
L=1439.83
Sc=4°00'
Xc=4.65
Yc=199.90
SE=.050'/ft

Mainline Med. ℄
Δ=65.59305°
D=4°00'
R=1432.69
T=923.18
L=1659.83
SE=.050'/ft

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	23



BOX BEAM GUARDRAIL
Layout

Sta. 25+21.5 E. Bd. Ramp
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	24

ESTIMATED GUARDRAIL QUANTITIES

	BOX BEAM GUARDRAIL*														
	Box Beam Guard-rail (Pay Length)	W6 x 8.5# Posts	Blockouts (W6 x 8.5#)	S3 x 5.7# Posts	Adjustment Block (S 3 x 5.7#)	5/8" Dia. Carriage Attach-ment Bolts	5" x 3½" x 7.0# Angle	5/8" Dia. x 8" Beam Attachment Bolts	3/8" Dia. Post Attachment Bolts	Transition Splice Plates	Straight Splice Plates		Box Beam End Treatment	Reflectorized Plates	
	LF	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.		Ea.	Ea.	
21+46.65 to 23+75.75 Rt. E. Bd. Ramp	229.1	5	5	38	38	5	38	38	76	1	12			9	
21+40.05 to 21+46.65 Rt. E. Bd. Ramp													1		
18+94.65 to 23+75.75 Lt. E. Bd. Ramp	481.1	5	5	80	80	5	80	80	160		27			10	
18+87.55 to 18+94.65 Lt. E. Bd. Ramp													1		
TOTALS	710.2	10	10	118	118	10	118	118	236	1	39		2	19	

*These items are not to be bid separate, but shall be included in the price bid for items: "Box Beam Guardrail" and "End Treatment".

Install Box Beam Guardrail

21+46.65 to 23+75.75 Rt. E. Bd. Ramp	229.1 L.F.
18+94.65 to 23+75.75 Lt. E. Bd. Ramp	481.1 L.F.

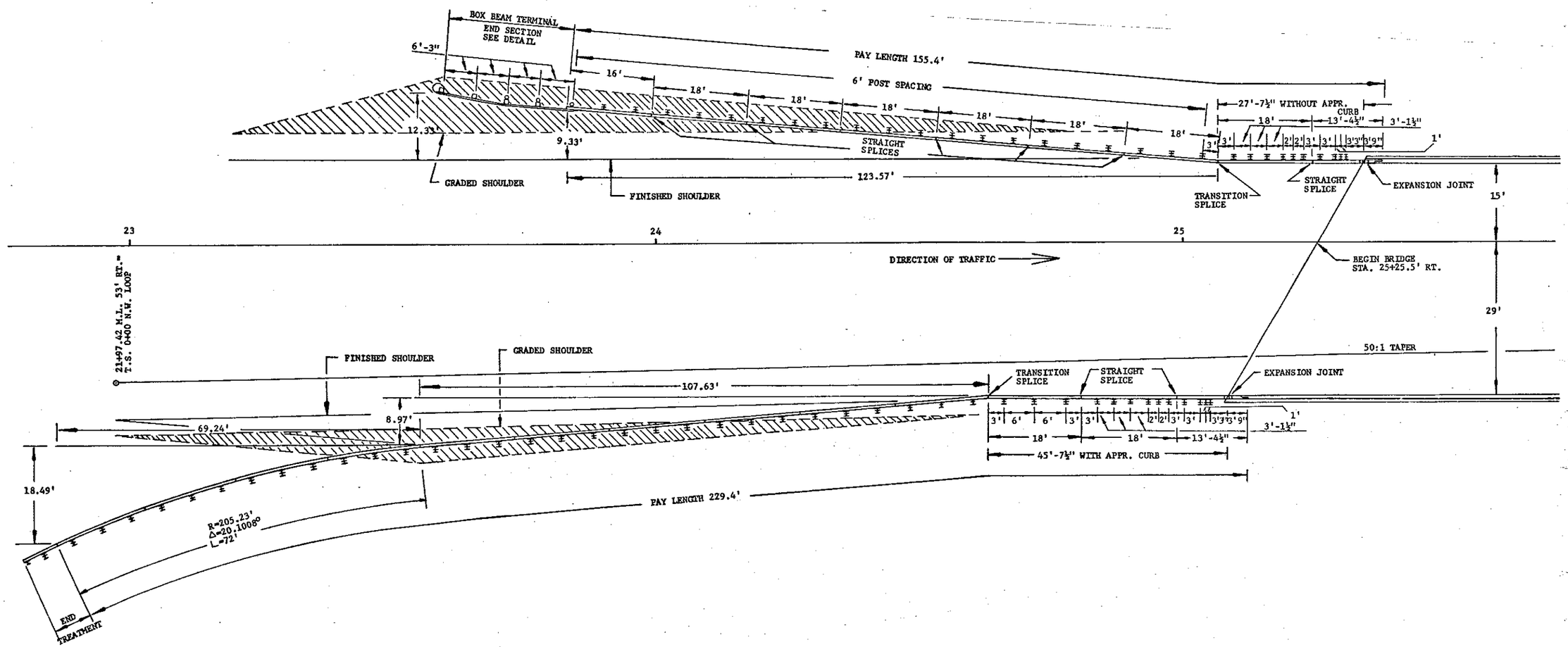
Install End Treatment

21+40.05 to 21+46.65 Rt. E. Bd. Ramp	1 Ea.
18+87.55 to 18+94.65 Lt. E. Bd. Ramp	1 Ea.

BOX BEAM GUARDRAIL
Quantities

Sta. 25+21.5 E. Bd. Ramp
Memorial Bridge Interchange

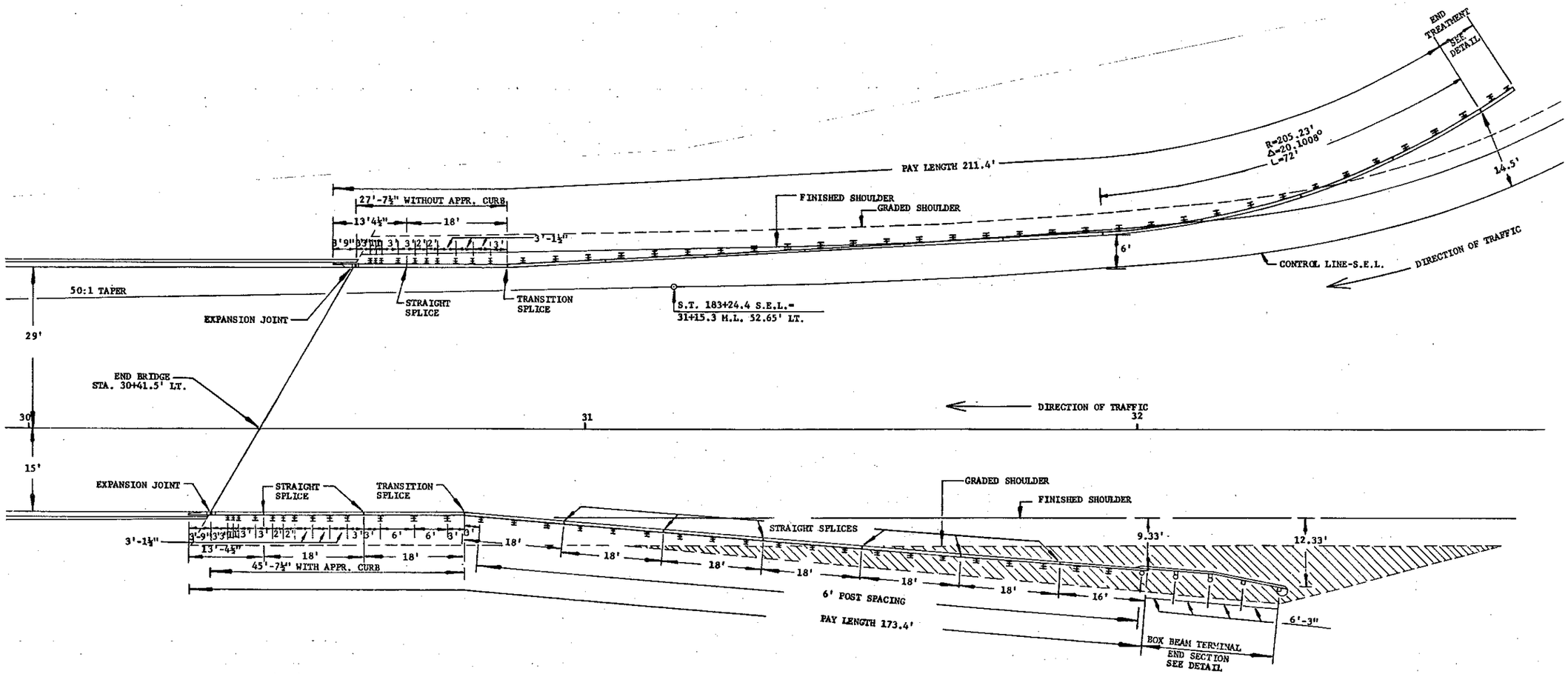
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	25



BOX BEAM GUARDRAIL
Layout

Sta. 27+83.5 Main Line
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	26



BOX BEAM GUARDRAIL
Layout

Sta. 27+83.5 Main Line
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	27

ESTIMATED GUARDRAIL QUANTITIES

Location	Box Beam Guardrail*														
	Box Beam Guardrail (Pay Length)	W6 x 8.5# Posts	Blockouts (W6 x 8.5#)	S3 x 5.7# Posts	Adjustment Block (S3 x 5.7#)	5/8" Dia. Carriage Attachment Bolts	5"x3½"x7.0# Angle	5/8" Dia.x8" Beam Attachment Bolts	3/8" Dia. Post Attachment Bolts	Transition Splice Plates	Straight Splice Plates	Box Beam Terminal End Section	Box Beam End Treatment	Reflectorized Plates	Expansion Joint
	LF	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.	EA.
22+83.1 to 25+12.5 Rt. M.L.W. Rdwy.	229.4	5	5	38	38	5	38	38	76	1	12			9	1
22+76 to 22+83.1 Rt.M.L.W. Rdwy.													1		
23+82.6 to 25+38 Lt. M.L.W. Rdwy.	155.4	5	5	25	25	5	25	25	50	1	7			6	1
23+57.6 to 23+82.6 Lt. M.L.W. Rdwy.												1			
30+28.5 to 32+01.9 Rt. M.L.E. Rdwy.	173.4	5	5	28	28	5	28	28	56	1	8			6	1
32+01.9 to 32+26.9 Rt. M.L.E. Rdwy.												1			
30+54.5 to 32+65.9 Lt. M.L.E. Rdwy.	211.4	5	5	35	35	5	35	35	70	1	11			9	1
32+65.9 to 32+73 Lt. M.L.E. Rdwy.													1		
TOTAL	769.6	20	20	126	126	20	126	126	252	4	38	2	2	30	4

*These items are not to be bid separately, but shall be included in the price bid for items: "Box Beam Guardrail", "Box Beam Guardrail-End Section" and "End Treatment".

Install Box Beam Guardrail

22+83.1 to 25+12.5 Rt. M.L.W. Rdwy.	229.4 L.F.
23+82.6 to 25+38 Lt. M.L.W. Rdwy.	155.4 L.F.
30+28.5 to 32+01.9 Rt. M.L.E. Rdwy.	173.4 L.F.
30+54.5 to 32+65.9 Lt. M.L.E. Rdwy.	211.4 L.F.

Install Box Beam Guardrail-End Section

23+57.6 to 23+82.6 Lt. M.L.W. Rdwy.	1 Ea.
32+01.9 to 32+26.9 Rt. M.L.E. Rdwy.	1 Ea.

Install End Treatment

22+76 to 22+83.1 Rt. M.L.W. Rdwy.	1 Ea.
32+65.9 to 32+73 Lt. M.L.E. Rdwy.	1 Ea.

BOX BEAM GUARDRAIL
Quantities

Sta. 27+83.5 Main Line
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	28

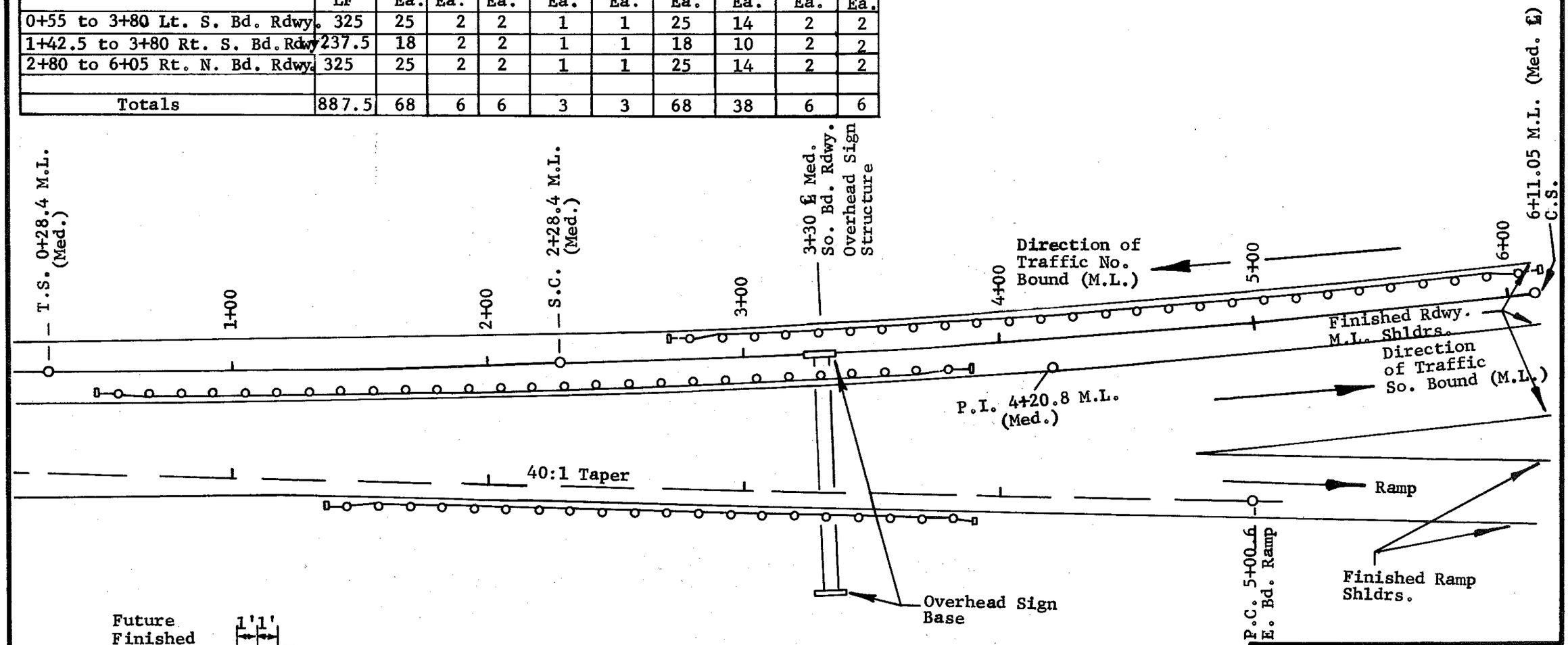
ESTIMATED GUARDRAIL QUANTITIES*

Location	3- CABLE GUARDRAIL									
	3-Cable Guardrail (Pay Length)	Posts		Concrete Bearing Block	Tension Spring Assembly	End Turn-Buckle Tie Rods	Hook Bolt Brackets	Reflectorized Plates	End Post Assembly	Anchor Block
		Line	End							
	LF	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.
0+55 to 3+80 Lt. S. Bd. Rdwy.	325	25	2	2	1	1	25	14	2	2
1+42.5 to 3+80 Rt. S. Bd. Rdwy.	237.5	18	2	2	1	1	18	10	2	2
2+80 to 6+05 Rt. N. Bd. Rdwy.	325	25	2	2	1	1	25	14	2	2
Totals	887.5	68	6	6	3	3	68	38	6	6

*Not to be bid separately, but to be included in the price bid for the item: "Three Cable Guardrail".

Install 3-Cable Guardrail

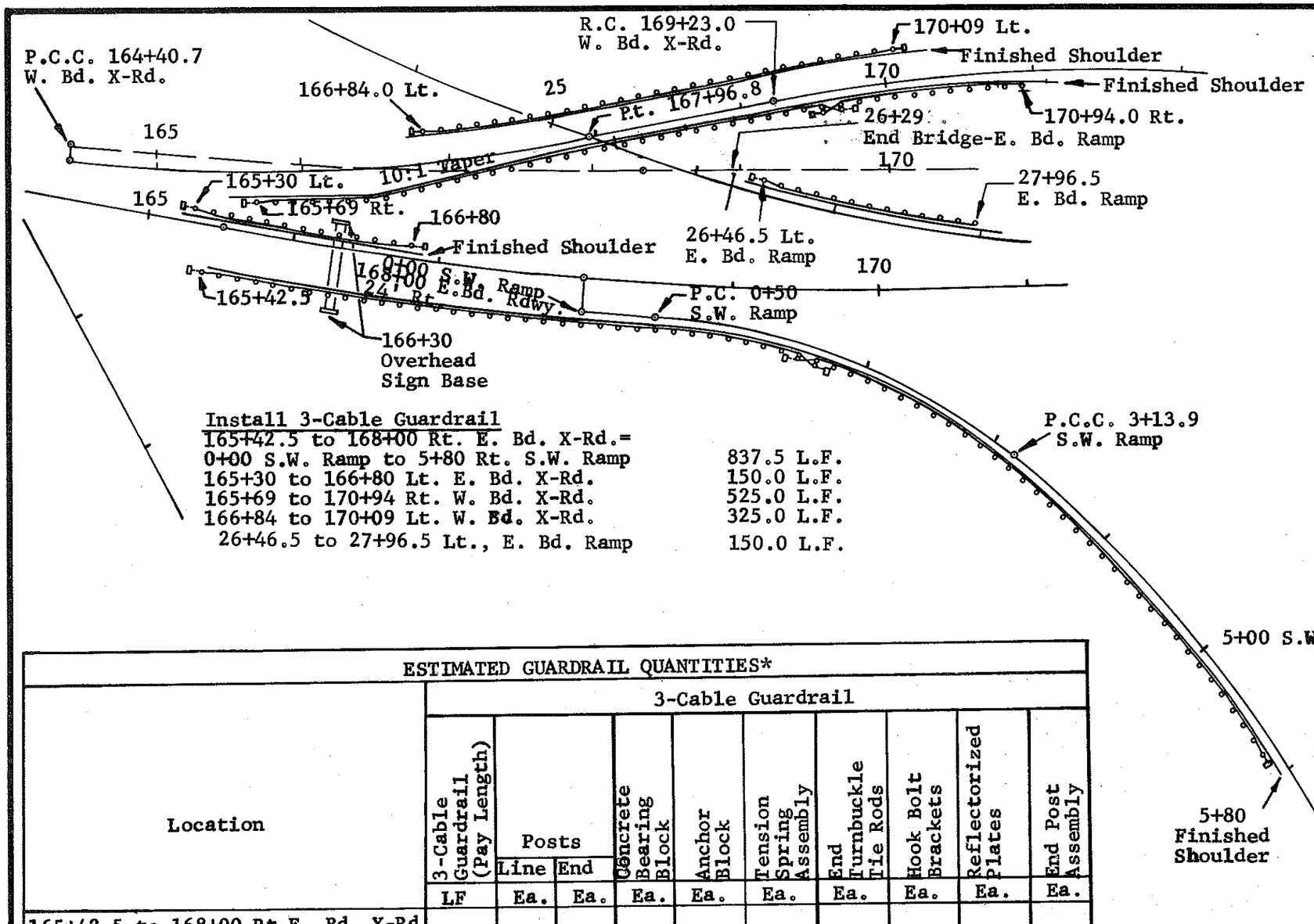
0+55 to 3+80 Lt. So. Bound Rdwy.	325 L.F.
1+42.5 to 3+80 Rt. So. Bound Rdwy.	237.5 L.F.
2+80 to 6+05 Rt. No. Bound Rdwy.	325 L.F.

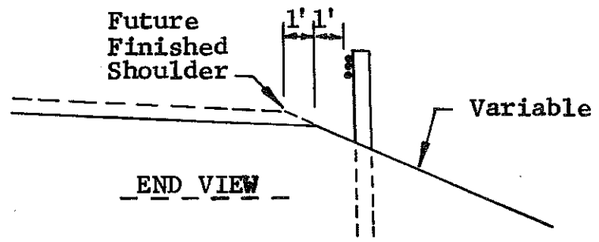


3-CABLE GUARDRAIL QUANTITIES

Sta. 3+30 ℄ Median
South Bound Rdwy.
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	29





Install 3-Cable Guardrail

165+42.5 to 168+00 Rt. E. Bd. X-Rd.= 0+00 S.W. Ramp to 5+80 Rt. S.W. Ramp	837.5 L.F.
165+30 to 166+80 Lt. E. Bd. X-Rd.	150.0 L.F.
165+69 to 170+94 Rt. W. Bd. X-Rd.	525.0 L.F.
166+84 to 170+09 Lt. W. Bd. X-Rd.	325.0 L.F.
26+46.5 to 27+96.5 Lt., E. Bd. Ramp	150.0 L.F.

ESTIMATED GUARDRAIL QUANTITIES*

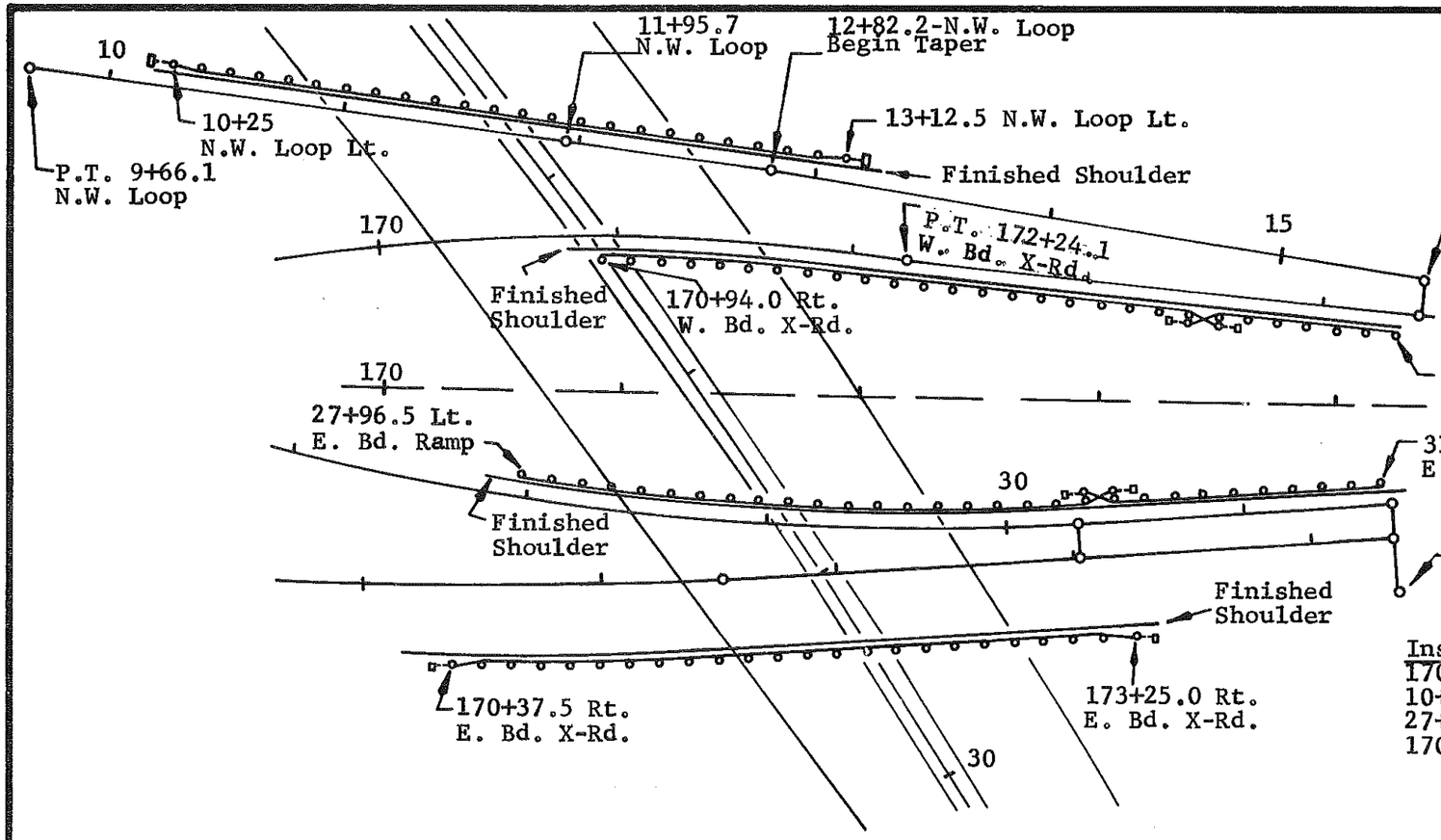
Location	3-Cable Guardrail (Pay Length)	Posts		Concrete Bearing Block	Anchor Block	Tension Spring Assembly	End Turnbuckle Tie Rods	Hook Bolt Brackets	Reflectorized Plates	End Post Assembly
		Line	End							
	LF	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.
165+42.5 to 168+00 Rt.E. Bd. X-Rd. =0+00 S.W. Ramp to 5+80 Rt. S.W.R	837.5	66	4	4	4	2	2	66	34	4
165+30 to 166+80 Lt. E.Bd. X-Rd.	150.0	11	2	2	2	1	1	11	7	2
165+69 to 170+94 Rt. W.Bd. X-Rd.	525.0	42	3	3	3	2	1	42	22	3
166+84 to 170+09 Lt. W. Bd. X-Rd.	325.0	25	2	2	2	1	1	25	14	2
26+46.5 to 27+96.5 Lt. E.Bd. Ramp	150.0	11	1	1	1	1	0	11	7	1
Total	1987.5	155	12	12	12	7	5	155	84	12

*Not to be bid separately, but to be included in the price bid for the item: "Three Cable Guardrail".

3-Cable Guardrail
QUANTITIES

Sta. 166+30 E. Bd. X-Rd.
Sta. 167+96.7 W. Bd. X-Rd.
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	30



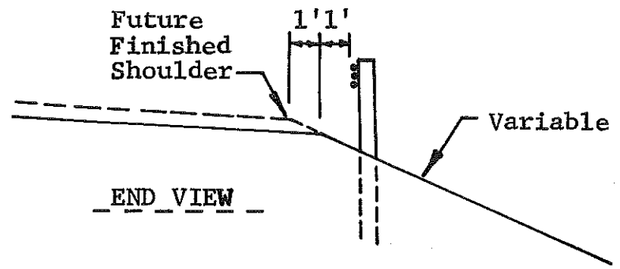
Install 3-Cable Guardrail

170+94 to 174+31.5 Rt. W. Bd. Rdwy.	337.5 L.F.
10+25 to 13+12.5 Lt. N.W. Loop	287.5 L.F.
27+96.5 to 31+59 Lt. E. Bd. Ramp	362.5 L.F.
170+37.5 to 173+25 Rt. E. Bd. X-Rd.	287.5 L.F.

ESTIMATED GUARDRAIL QUANTITIES*

Location	3-Cable Guardrail									
	3-Cable Guardrail (Pay Length)	Posts		Concrete Bearing Block	Anchor Block	Tension Spring Assembly	End Turnbuckle Tie Rods	Hook Bolt Brackets	Reflectorized Plates	End Post Assembly
		Line	End							
	LF	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.
170+94 to 174+31.5 Rt. W. Bd. Rdwy.	337.5	27	2	2	2	1	1	27	13	2
10+25 to 13+12.5 Lt. N.W. Loop	287.5	22	2	2	2	1	1	22	12	2
27+96.5 to 31+59 Lt. E. Bd. Ramp	362.5	29	2	2	2	1	1	29	14	2
170+37.5 to 173+25 Rt. E. Bd. X-Rd.	287.5	22	2	2	2	1	1	22	12	2
TOTAL	1275.0	100	8	8	8	4	4	100	51	8

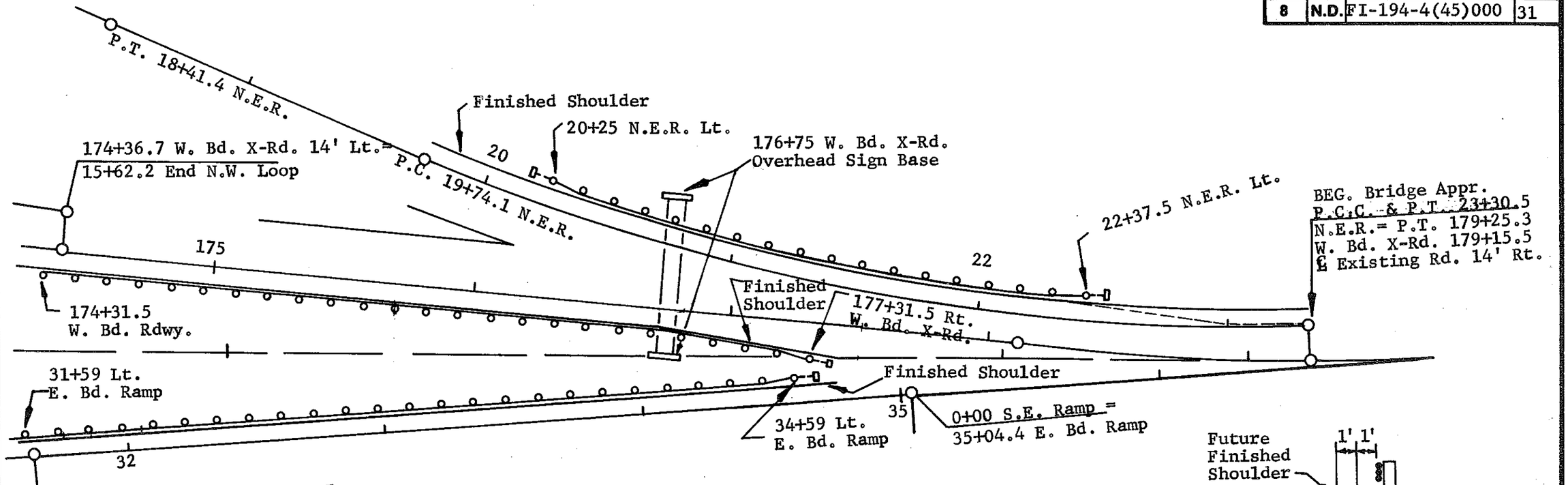
*Not to be bid separately, but to be included in the price bid for the item: "Three Cable Guardrail".



3-CABLE GUARDRAIL
QUANTITIES

Sta. 170+00 to 174+40
M.L. Bridges Underpass
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	31



ESTIMATED GUARDRAIL QUANTITIES *

Location	3-Cable Guardrail									
	3-Cable Guardrail (Pay Length)	Posts		Concrete Bearing Block	Anchor Block	Tension Spring Assembly	End Turnbuckle Tie Rods	Hook Bolt Brackets	Reflectorized Plates	End Post Assembly
		Line	End							
	L.F.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.
31+59 to 34+59 Lt. E. Bd. Ramp	300.0	24	1	1	1	0	1	24	12	1
174+31.5 to 177+31.5 Rt. W. Bd. X-Rd.	300.0	23	1	1	1	0	1	23	12	1
20+25 to 22+37.5 Lt. N.E. Ramp	212.5	16	2	2	2	1	1	16	9	2
TOTAL	812.5	63	4	4	4	1	3	63	33	4

*Not to be bid separately, but to be included in the price bid for item; "Three Cable Guardrail".

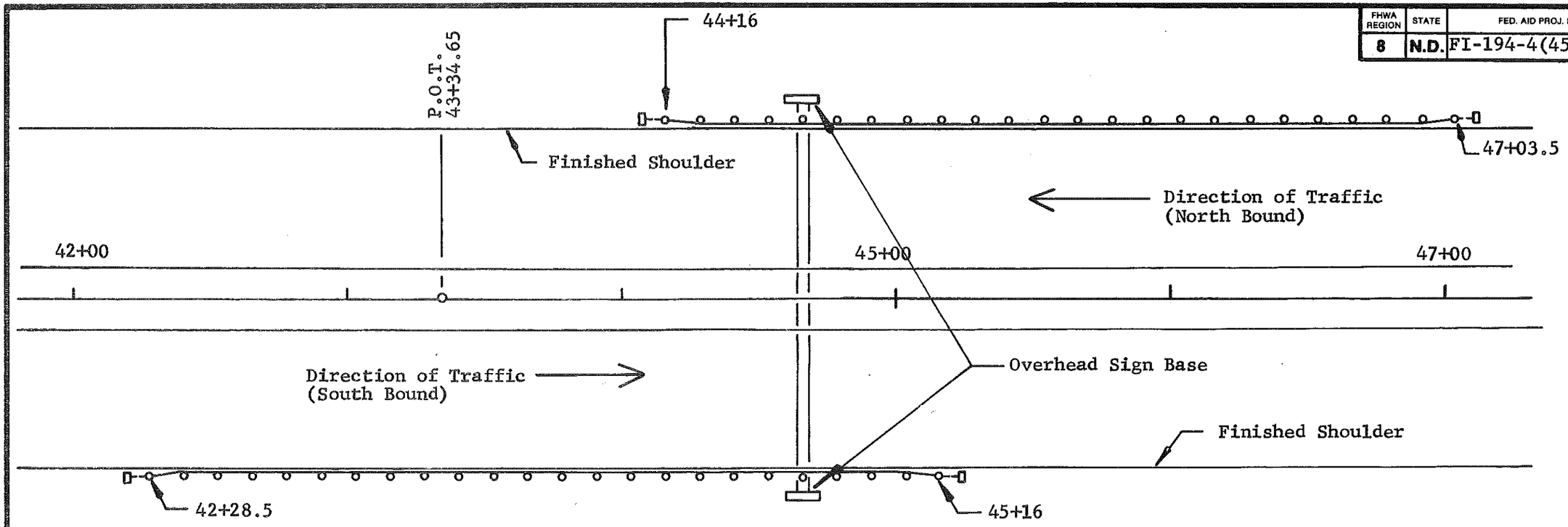
Install 3-Cable Guardrail

31+59 to 34+59 Lt. E. Bd. Ramp	300.0 L.F.
174+31.5 to 177+31.5 Rt. W. Bd. X-Rd.	300.0 L.F.
20+25 to 22+37.5 Lt. N.E. Ramp	212.5 L.F.

3-CABLE GUARDRAIL QUANTITIES

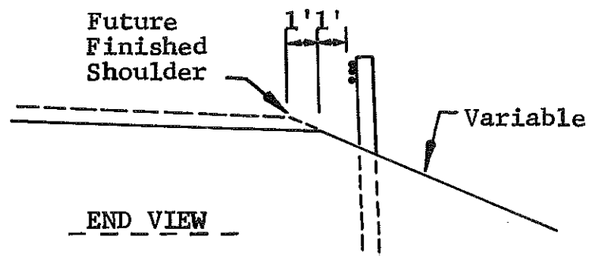
Sta. 176+75 W. Bd. X-Rd.
Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	32



Install 3-Cable Guardrail

42+28.5 to 45+16 Rt. So. Bd. Rdwy.	287.5 L.F.
44+16 to 47+03.5 Lt. No. Bd. Rdwy.	287.5 L.F.



ESTIMATED GUARDRAIL QUANTITIES *

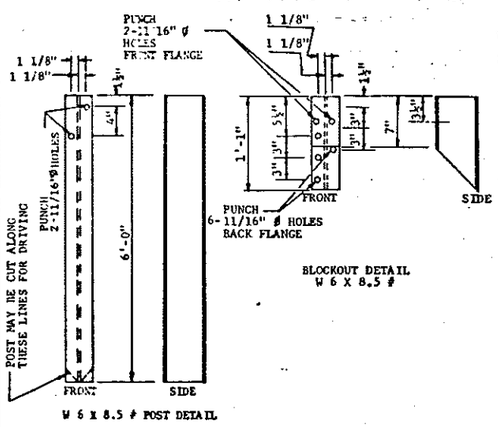
Location	3-CABLE GUARDRAIL									
	3- Cable Guardrail (Pay Length)	Posts		Concrete Bearing Block	Anchor Block	Tension Spring Assembly	End Turnbuckle Tie Rods	Hook Bolt Brackets	Reflectorized Plates	End Post Assembly
		Line	End							
	L.F.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.	Ea.
42+28.5 to 45+16 Rt. S. Bd. Rdwy.	287.5	22	2	2	2	1	1	22	12	2
44+16 to 47+03.5 Lt. N. Bd. Rdwy.	287.5	22	2	2	2	1	1	22	12	2
TOTALS	575	44	4	4	4	2	2	44	24	4

*Not to be bid separately, but to be included in the price bid for the item: "Three Cable Guardrail".

3-CABLE GUARDRAIL QUANTITIES

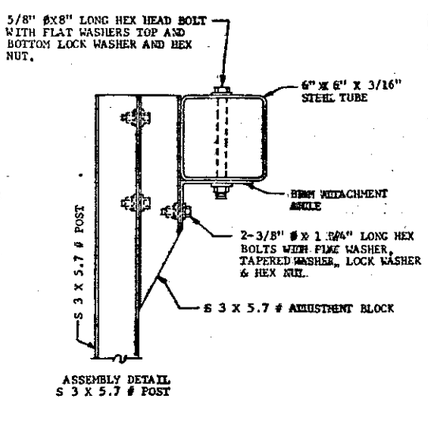
Sta. 44+66 M.L.
North & South Bound Rdwys.
Memorial Bridge Interhcange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	33

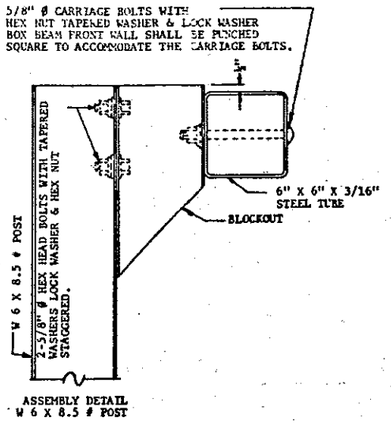


W 6 X 8.5 # POST DETAIL

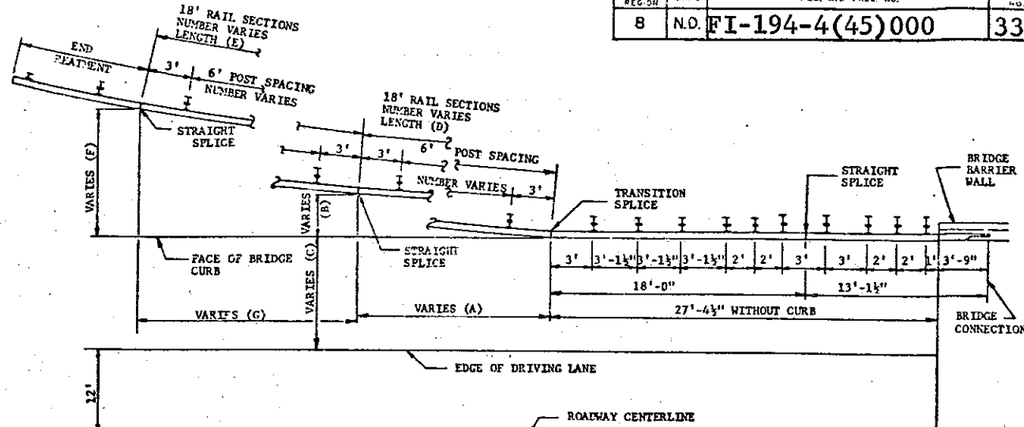
BLOCKOUT DETAIL W 6 X 8.5 #

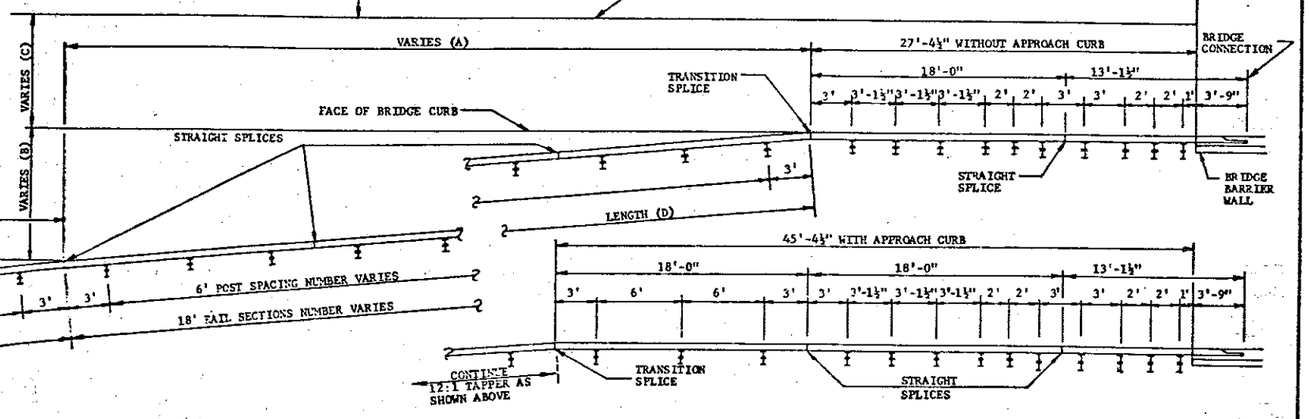


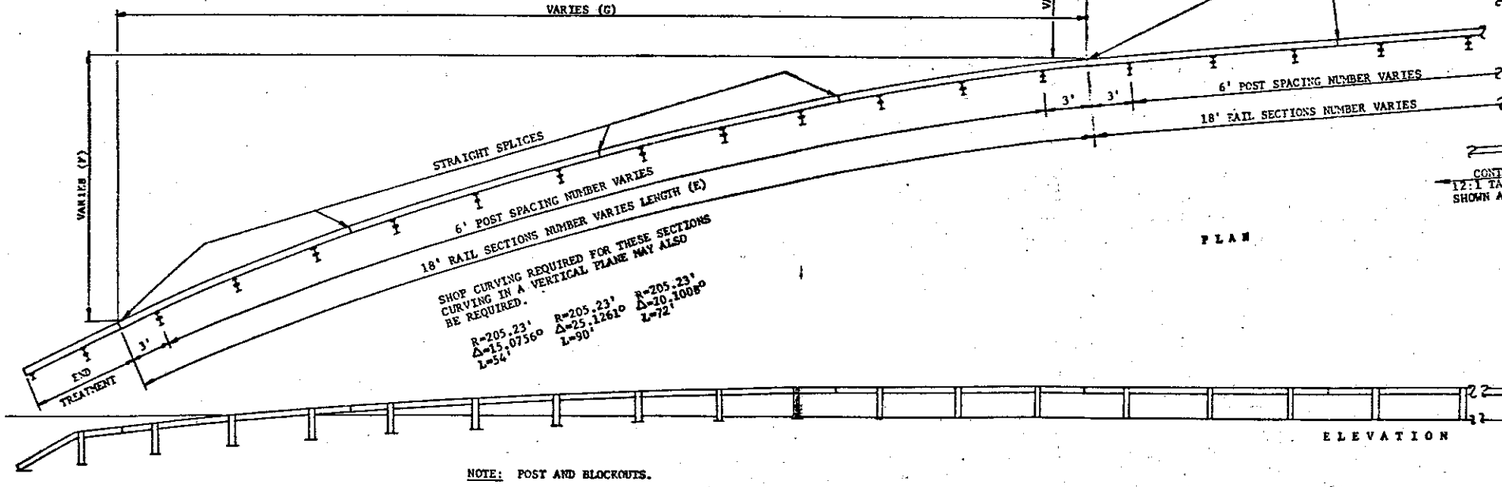
ASSEMBLY DETAIL S 3 X 5.7 # POST



ASSEMBLY DETAIL W 6 X 8.5 # POST







PLAN

ELEVATION

NOTE: POST AND BLOCKOUTS.

THE POST AND BLOCKOUTS SHALL CONFORM TO THE REQUIREMENTS SECTION 850-6 OF THE STANDARD SPECIFICATION.

BOX BEAM GUARDRAIL.

BOX BEAM SHALL CONFORM TO THE REQUIREMENT OF SECTION 722 OF THE STANDARD SPECIFICATION.

BOX BEAM GUARDRAIL Layout & Details

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	34

BOX BEAM DIMENSION TABLE

DESIGN TRAFFIC VOLUME (ADT)	CLEAR RDWY. WIDTH OF BRIDGE	APPROACH SIDE														OPPOSITE SIDE													
		WITHOUT APPROACH CURB								WITH APPROACH CURB								WITHOUT APPROACH CURB								WITH APPROACH CURB			
		A	B	C	D	E	F	G	GUARD RAIL L.F.	A	B	C	D	E	F	C	GUARD RAIL L.F.	A	B	C	D	E	F	G	GUARD RAIL L.F.	A	B	C	D	E	F	G	GUARD RAIL L.F.
		FT.	FT.	FT.	FT.	FT.	FT.	FT.		FT.	FT.	FT.	FT.	FT.	FT.	FT.		FT.	FT.	FT.	FT.	FT.	FT.	FT.		FT.	FT.	FT.	FT.	FT.	FT.	FT.	
UNDER 250	44	71.75	5.98	10	72	72	18.49	69.24	175.1	53.81	4.48	10	54	72	18.49	69.24	175.1	17.94	1.49	10	18	54	11.49	52.61	103.1	17.94	1.49	10	18	54	11.49	52.61	121.1
	42	71.75	5.98	9	72	72	18.49	69.24	175.1	71.75	5.98	9	72	72	18.49	69.24	193.1	17.94	1.49	9	18	54	11.49	52.61	103.1	17.94	1.49	9	18	54	11.49	52.61	121.1
	40	71.75	5.98	8	72	72	18.49	69.24	175.1	71.75	5.98	8	72	72	18.49	69.24	193.1	17.94	1.49	8	18	54	11.49	52.61	103.1	17.94	1.49	8	18	54	11.49	52.61	121.1
	38	89.69	7.47	7	90	72	18.49	69.24	193.1	71.75	5.98	7	72	72	18.49	69.24	193.1	17.94	1.49	7	18	54	11.49	52.61	103.1	17.94	1.49	7	18	54	11.49	52.61	121.1
	36	89.69	7.47	6	90	72	18.49	69.24	193.1	71.75	5.98	6	72	72	18.49	69.24	193.1	17.94	1.49	6	18	54	11.49	52.61	103.1	17.94	1.49	6	18	54	11.49	52.61	121.1
	34	89.69	7.47	5	90	72	18.49	69.24	193.1	89.69	7.47	5	90	72	18.49	69.24	211.1	35.88	2.99	5	36	54	11.49	52.61	121.1	17.94	1.49	5	18	72	18.49	69.24	139.1
	32	89.69	7.47	4	90	90	26.59	85.22	229.1	89.69	7.47	4	90	90	26.59	85.22	229.1	35.88	2.99	4	36	54	11.49	52.61	121.1	17.94	1.49	4	18	72	18.49	69.24	139.1
	30	107.63	8.97	3	108	72	18.49	69.24	211.1	89.69	7.47	3	90	90	26.59	85.22	229.1	35.88	2.99	3	36	72	18.49	69.24	139.1	35.88	2.99	3	36	72	18.49	69.24	157.1
	28	107.63	8.97	2	108	90	26.59	85.22	229.1	107.63	8.97	2	108	90	26.59	85.22	247.1	35.88	2.99	2	36	72	18.49	69.24	139.1	35.88	2.99	2	36	72	18.49	69.24	157.1
	26	107.63	8.97	1	108	90	26.59	85.22	229.1	107.63	8.97	1	108	90	26.59	85.22	247.1	53.81	4.48	1	54	72	18.49	69.24	157.1	35.88	2.99	1	36	72	18.49	69.24	157.1
	24	125.56	10.46	0	126	90	26.59	85.22	247.1	107.63	8.97	0	108	90	26.59	85.22	247.1	53.81	4.48	0	54	72	18.49	69.24	157.1	53.81	4.48	0	54	72	18.49	69.24	175.1
800-250	44	71.75	5.98	10	72	72	18.49	69.24	175.1	71.75	5.98	10	72	72	18.49	69.24	193.1	17.94	1.49	10	18	54	11.49	52.61	103.1	17.94	1.49	10	18	54	11.49	52.61	121.1
	42	71.75	5.98	9	72	72	18.49	69.24	175.1	71.75	5.98	9	72	72	18.49	69.24	193.1	17.94	1.49	9	18	54	11.49	52.61	103.1	17.94	1.49	9	18	54	11.49	52.61	121.1
	40	89.69	7.47	8	90	72	18.49	69.24	193.1	71.75	5.98	8	72	72	18.49	69.24	193.1	17.94	1.49	8	18	54	11.49	52.61	103.1	17.94	1.49	8	18	54	11.49	52.61	121.1
	38	89.69	7.47	7	90	72	18.49	69.24	193.1	89.69	7.47	7	90	72	18.49	69.24	211.1	17.94	1.49	7	18	54	11.49	52.61	103.1	17.94	1.49	7	18	54	11.49	52.61	121.1
	36	89.69	7.47	6	90	72	18.49	69.24	193.1	89.69	7.47	6	90	72	18.49	69.24	211.1	35.88	2.99	6	36	54	11.49	52.61	121.1	17.94	1.49	6	18	54	11.49	52.61	121.1
	34	107.63	8.97	5	108	72	18.49	69.24	211.1	89.69	7.47	5	90	72	18.49	69.24	211.1	35.88	2.99	5	36	54	11.49	52.61	121.1	17.94	1.49	5	18	72	18.49	69.24	139.1
	32	107.63	8.97	4	108	72	18.49	69.24	211.1	89.69	7.47	4	90	90	26.59	85.22	229.1	35.88	2.99	4	36	54	11.49	52.61	121.1	35.88	2.99	4	36	54	11.49	52.61	139.1
	30	107.63	8.97	3	108	72	18.49	69.24	211.1	107.63	8.97	3	108	72	18.49	69.24	229.1	35.88	2.99	3	36	72	18.49	69.24	139.1	35.88	2.99	3	36	72	18.49	69.24	157.1
	28	107.63	8.97	2	108	90	26.59	85.22	229.1	107.63	8.97	2	108	90	26.59	85.22	247.1	53.81	4.48	2	54	72	18.49	69.24	157.1	35.88	2.99	2	36	72	18.49	69.24	157.1
	26	125.56	10.46	1	126	90	26.59	85.22	247.1	107.63	8.97	1	108	90	26.59	85.22	247.1	53.81	4.48	1	54	72	18.49	69.24	157.1	53.81	4.48	1	54	72	18.49	69.24	157.1
	24	125.56	10.46	0	126	90	26.59	85.22	247.1	125.56	10.46	0	126	90	26.59	85.22	265.1	53.81	4.48	0	54	72	18.49	69.24	157.1	53.81	4.48	0	54	72	18.49	69.24	175.1
2000-800	44	71.75	5.98	10	72	72	18.49	69.24	175.1	71.75	5.98	10	72	72	18.49	69.24	193.1	17.94	1.49	10	18	54	11.49	52.61	103.1	17.94	1.49	10	18	54	11.49	52.61	121.1
	42	89.69	7.47	9	90	72	18.49	69.24	193.1	71.75	5.98	9	72	72	18.49	69.24	193.1	17.94	1.49	9	18	54	11.49	52.61	103.1	17.94	1.49	9	18	54	11.49	52.61	121.1
	40	89.69	7.47	8	90	72	18.49	69.24	193.1	89.69	7.47	8	90	72	18.49	69.24	211.1	17.94	1.49	8	18	54	11.49	52.61	103.1	17.94	1.49	8	18	54	11.49	52.61	121.1
	38	89.69	7.47	7	90	72	18.49	69.24	193.1	89.69	7.47	7	90	72	18.49	69.24	211.1	17.94	1.49	7	18	54	11.49	52.61	103.1	17.94	1.49	7	18	54	11.49	52.61	121.1
	36	107.63	8.97	6	108	72	18.49	69.24	211.1	89.69	7.47	6	90	72	18.49	69.24	211.1	35.88	2.99	6	36	54	11.49	52.61	121.1	17.94	1.49	6	18	54	11.49	52.61	121.1
	34	107.63	8.97	5	108	72	18.49	69.24	211.1	107.63	8.97	5	108	72	18.49	69.24	229.1	35.88	2.99	5	36	54	11.49	52.61	121.1	35.88	2.99	5	36	54	11.49	52.61	139.1
	32	107.63	8.97	4	108	72	18.49	69.24	211.1	107.63	8.97	4	108	72	18.49	69.24	229.1	35.88	2.99	4	36	54	11.49	52.61	121.1	35.88	2.99	4	36	54	11.49	52.61	139.1
	30	125.56	10.46	3	126	72	18.49	69.24	229.1	107.63	8.97	3	108	72	18.49	69.24	229.1	53.81	4.48	3	54	54	11.49	52.61	139.1	53.81	4.48	3	54	72	18.49	69.24	157.1
	28	125.56	10.46	2	126	72	18.49	69.24	229.1	107.63	8.97	2	108	90	26.59	85.22	247.1	53.81	4.48	2	54	72	18.49	69.24	157.1	53.81	4.48	2	54	54	11.49	52.61	157.1
	26	125.56	10.46	1	126	90	26.59	85.22	247.1	125.56	10.46	1	126	90	26.59	85.22	265.1	71.75	5.98	1	72	54	11.49	52.61	157.1	53.81	4.48	1	54	54	11.49	52.61	157.1
	24	143.50	11.96	0	144	72	18.49	69.24	247.1	125.56	10.46	0	126	90	26.59	85.22	265.1	71.75	5.98	0	72	72	18.49	69.24	175.1	53.81	4.48	0	54	72	18.49	69.24	175.1
6000-2000	44	89.69	7.47	10	90	72	18.49	69.24	193.1	71.75	5.98	10	72	72	18.49	69.24	193.1	17.94	1.49	10	18	54	11.49	52.61	103.1	17.94	1.49	10	18	54	11.49	52.61	121.1
	42	89.69	7.47	9	90	72	18.49	69.24	193.1	71.75	5.98	9	72	72	18.49	69.24	193.1	17.94	1.49	9	18	54	11.49	52.61	103.1	17.94	1.49	9	18	54	11.49	52.61	121.1
	40	89.69	7.47	8	90	72	18.49	69.24	193.1	89.69	7.47	8	90	72	18.49	69.24	211.1	17.94	1.49	8	18	54	11.49	52.61	103.1	17.94	1.49	8	18	54	11.49	52.61	121.1
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	34	107.63	8.97	5	108	72	18.49	69.24	211.1	107.63	8.97	5	108	72	18.49	69.24	229.1	35.88	2.99	5	36	54	11.49	52.61	121.1	35.88	2.99	5	36	54	11.49	52.61	139.1
	32	125.56	10.46	4	126	72	18.49	69.24	229.1	107.63	8.97	4	108	72	18.49	69.24	229.1	35.88	2.99	4	36	54	11.49	52.61	121.1	35.88	2.99	4	36	54	11.49	52.61	139.1
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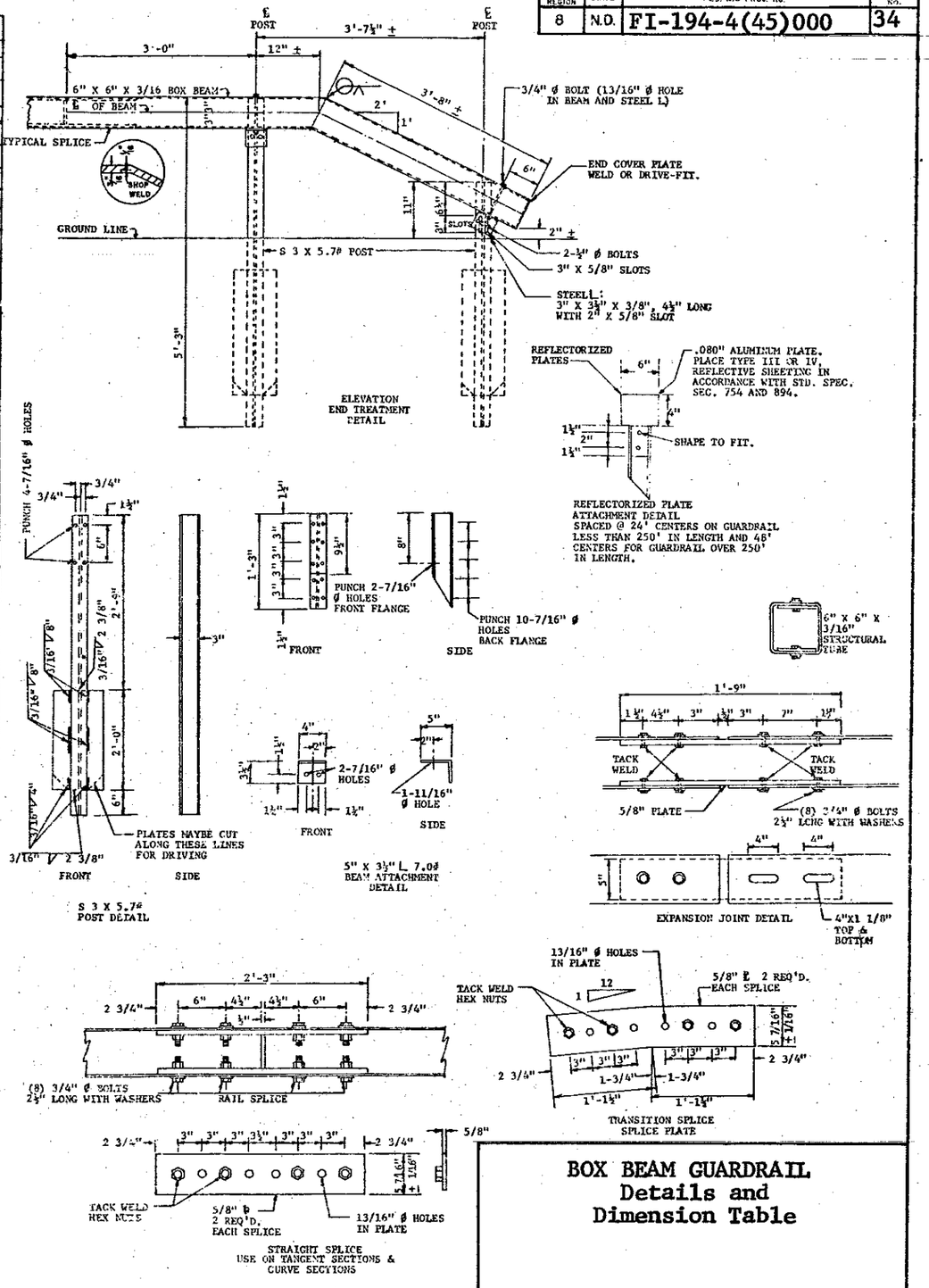
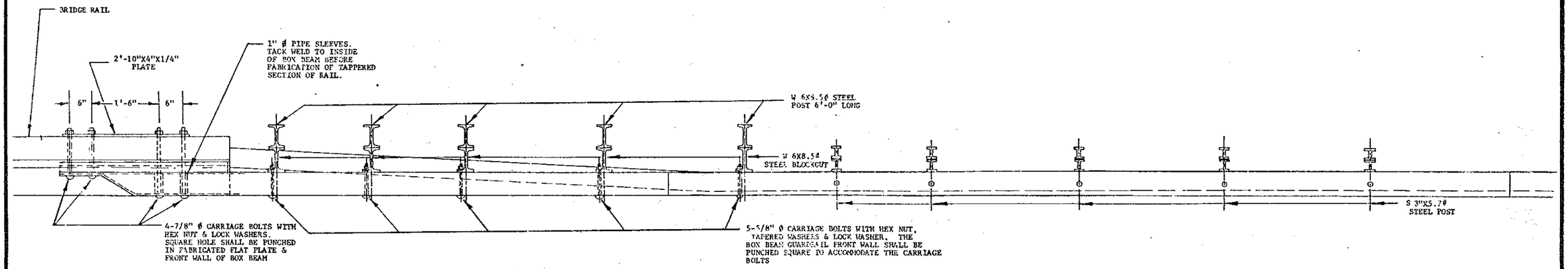
	28	125.56	10.46	2	126	72	18.49	69.24	229.1	125.56	10.46	2	126	72	18.49	69.24	247.1	53.81	4.48	2	54	72	18.49	69.24	157.1	53.81	4.48	2	54	72	18.49	69.24	175.1
	26	143.50	11.96	1	144	72	18.49	69.24	247.1	125.56	10.46	1	126	90	26.59	85.22	265.1	71.75	5.98	1	72	54	11.49	52.61	157.1	53.81	4.48	1	54	72	18.49	69.24	175.1
	24	143.50	11.96	0	144	72	18.49	69.24	247.1	143.50	11.96	0	144	72	18.49	69.24	265.1	71.75	5.98	0	72	72	18.49	69.24	175.1	53.81	4.48	0	54	72	18.49	69.24	175.1
OVER 6000	44	89.69	7.47	10	90	72	18.49	69.24	193.1	71.75	5.98	10	72	72	18.49	69.24	193.1	17.94	1.49	10	18	54	11.49	52.61	103.1	17.94	1.49	10	18	54	11.49	52.61	121.1
	42	89.69	7.47	9	90	72	18.49	69.24	193.1	89.69	7.47	9	90	72	18.49	69.24	211.1	17.94	1.49	9	18	54	11.49	52.61	103.1	17.94	1.49	9	18	54	11.49	52.61	121.1
	40	107.63	8.97	8	108	72	18.49	69.24	211.1	89.69	7.47	8	90	72	18.49	69.24	211.1	17.94	1.49	8	18	54	11.49	52.61	103.1	17.94	1.49	8	18	54	11.49	52.61	121.1
	38	107.63	8.97	7	108	72	18.49	69.24	211.1	107.63	8.97	7	108	72	18.49	69.24	229.1	35.88	2.99	7	36	54	11.49	52.61	121.1	17.94	1.49	7	18	54	11.49	52.61	121.1
	36	107.63	8.97	6	108	72	18.49	69.24	211.1	107.63	8.97	6	108	72	18.49	69.24	229.1	35.88	2.99	6	36	54	11.49	52.61	121.1	35.88	2.99	6	36	54	11.49	52.61	139.1
	34	125.56	10.46	5	126	72	18.49	69.24	229.1	107.63	8.97	5	108	72	18.49	69.24	229.1	35.88	2.99	5	36	54	11.49	52.61	121.1	35.88	2.99	5	36	54	11.49	52.61	139.1
	32	125.56	10.46	4	126	72	18.49	69.24	229.1	125.56	10.46	4	126	72	18.49	69.24	247.1	53.81	4.48	4	54	54	11.49	52.61	139.1	35.88	2.99	4	36	54	11.49	52.61	139.1
	30	125.56	10.46	3	126	72	18.49	69.24	229.1	125.56	10.46	3	126	72	18.49	69.24	247.1	53.81	4.48	3	54	54	11.49	52.61	139.1	35.88	2.99	3	36	54	11.49	52.61	157.1
	28	143.50	11.96	2	144	72	18.49	69.24	247.1	125.56	10.46	2	126	72	18.49	69.24	247.1	53.81	4.48	2	54	72	18.49	69.24	157.1	53.81	4.48	2	54	72	18.49	69.24	175.1
	26	143.50	11.96	1	144	72	18.49	69.24	247.1	143.50	11.96	1	144	72	18.49	69.24	265.1	71.75	5.98	1	72	54	11.49	52.61	157.1	53.81	4.48	1	54	72	18.49	69.24	175.1
	24	143.50	11.96	0	144	72	18.49	69.24	247.1	143.50	11.96	0	144	72	18.49	69.24	265.1	71.75	5.98	0	72	72	18.49	69.24	175.1	71.75	5.98	0	72	72	18.49	69.24	193.1

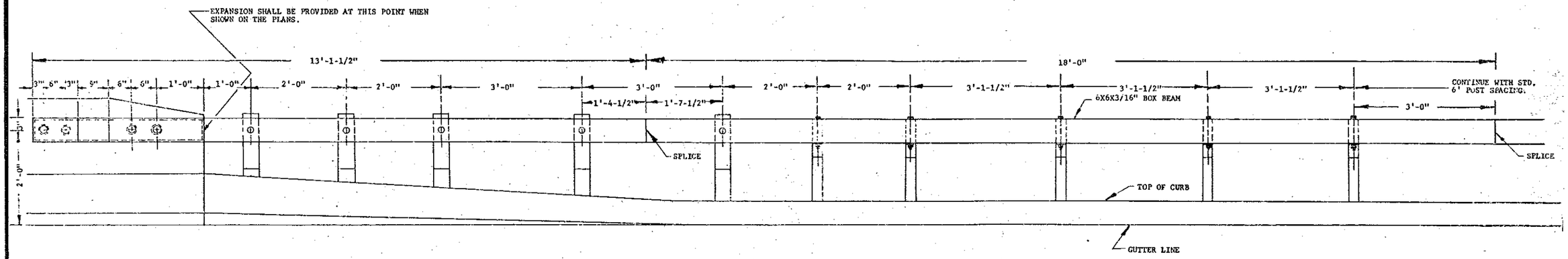


BOX BEAM GUARDRAIL Details and Dimension Table

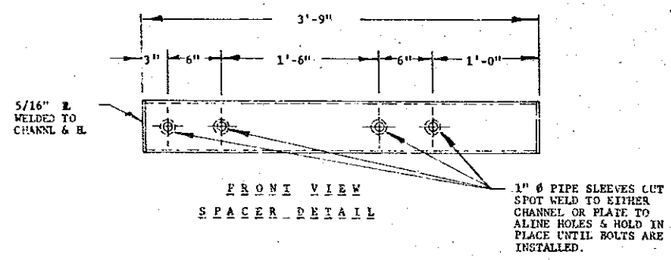
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	35



PLAN

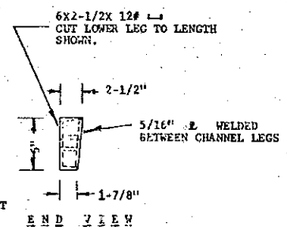


ELEVATION

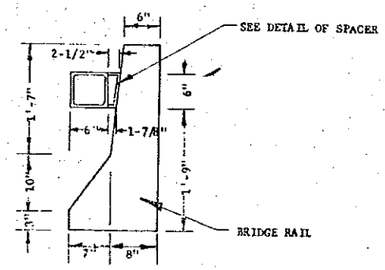


FRONT VIEW

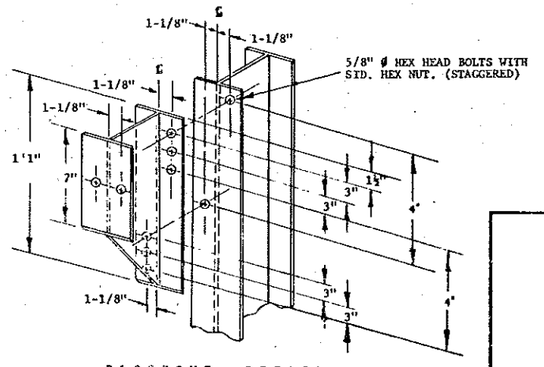
SPACER DETAIL



END VIEW



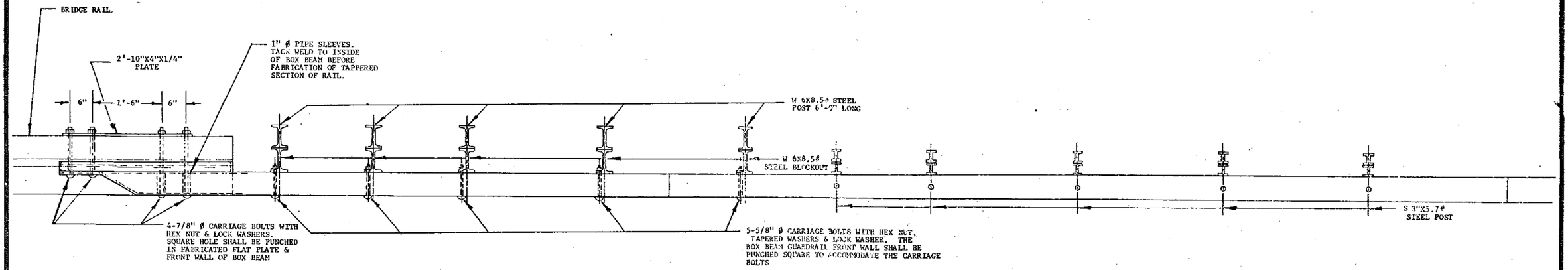
END VIEW



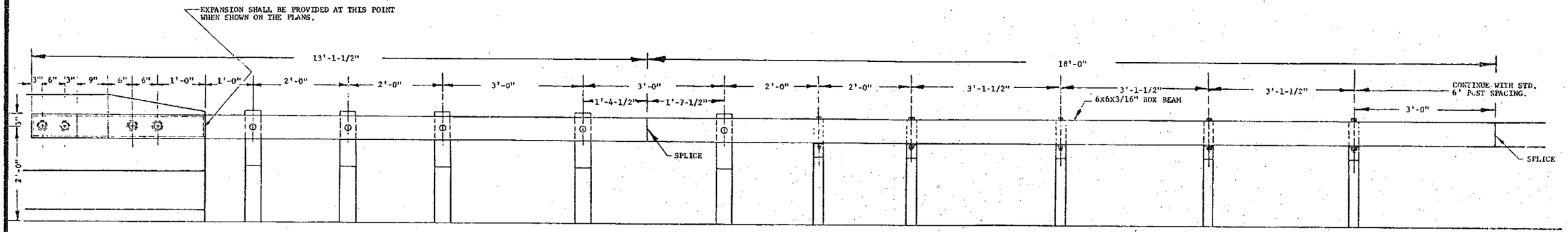
BLOCKOUT DETAIL

BOX BEAM GUARDRAIL
BARRIER WALL
ATTACHMENT DETAIL

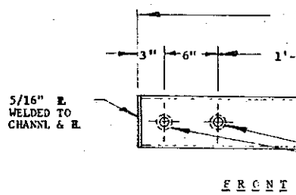
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	36



PLAN

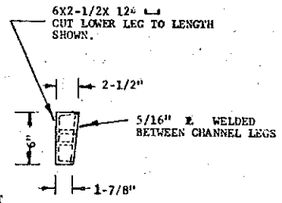


ELEVATION

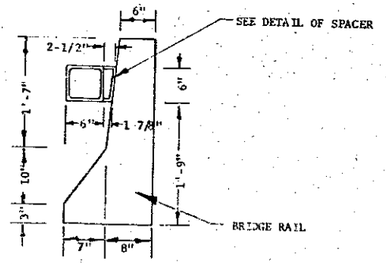


FRONT VIEW

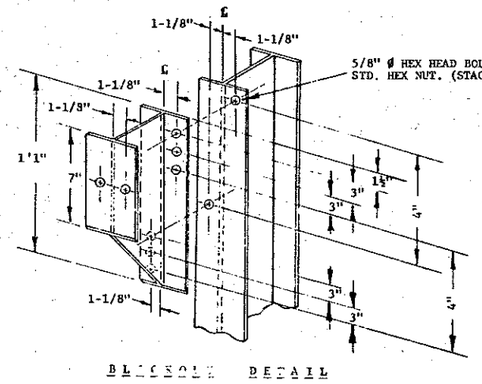
SPACER DETAIL



END VIEW



END VIEW



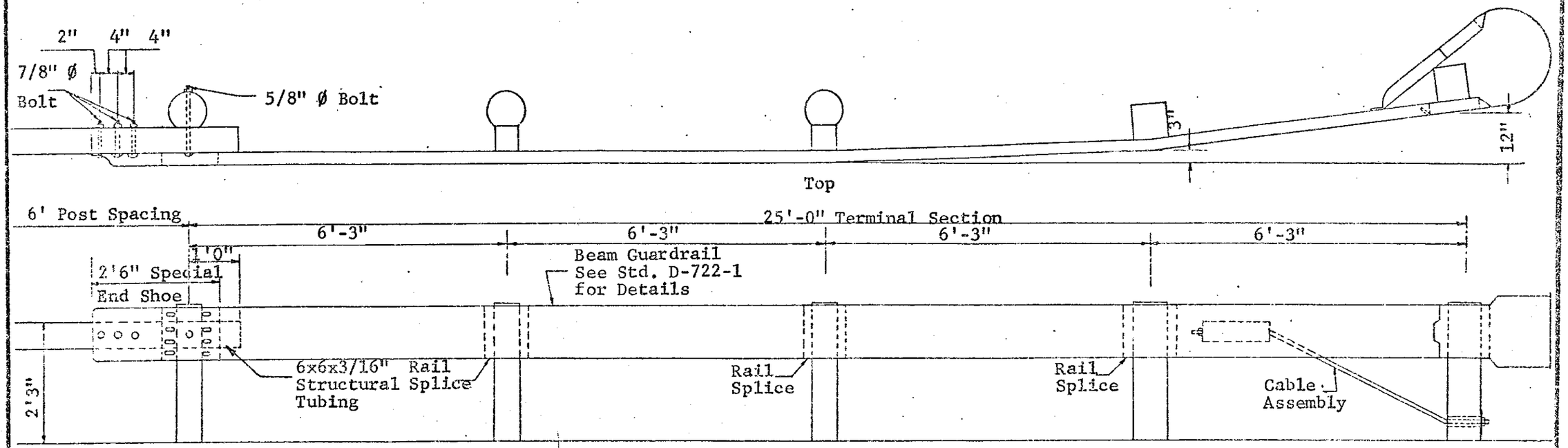
BLOCKOUT DETAIL

BOX BEAM GUARDRAIL

BARRIER WALL

ATTACHMENT DETAIL

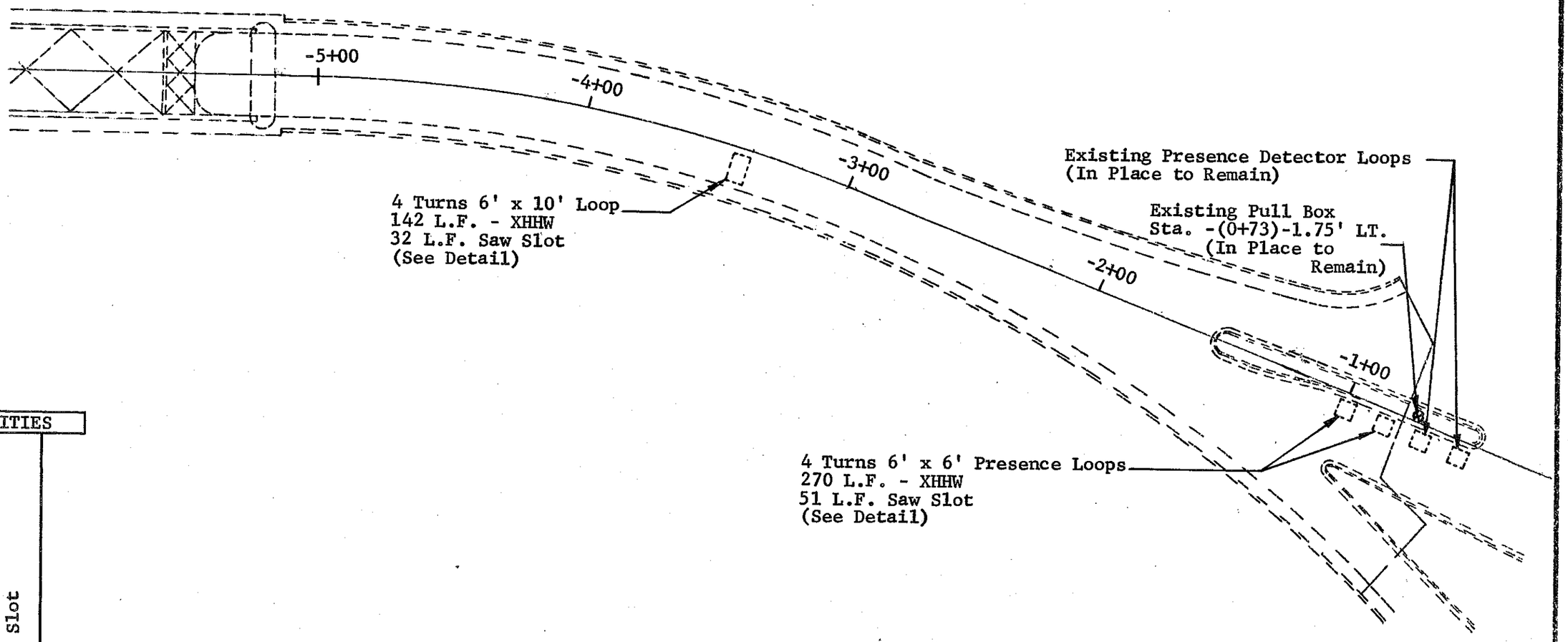
LOCAL REGION	STATE	FED. AND PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	37



BOX BEAM GUARDRAIL

Terminal End Section
Detail

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	38

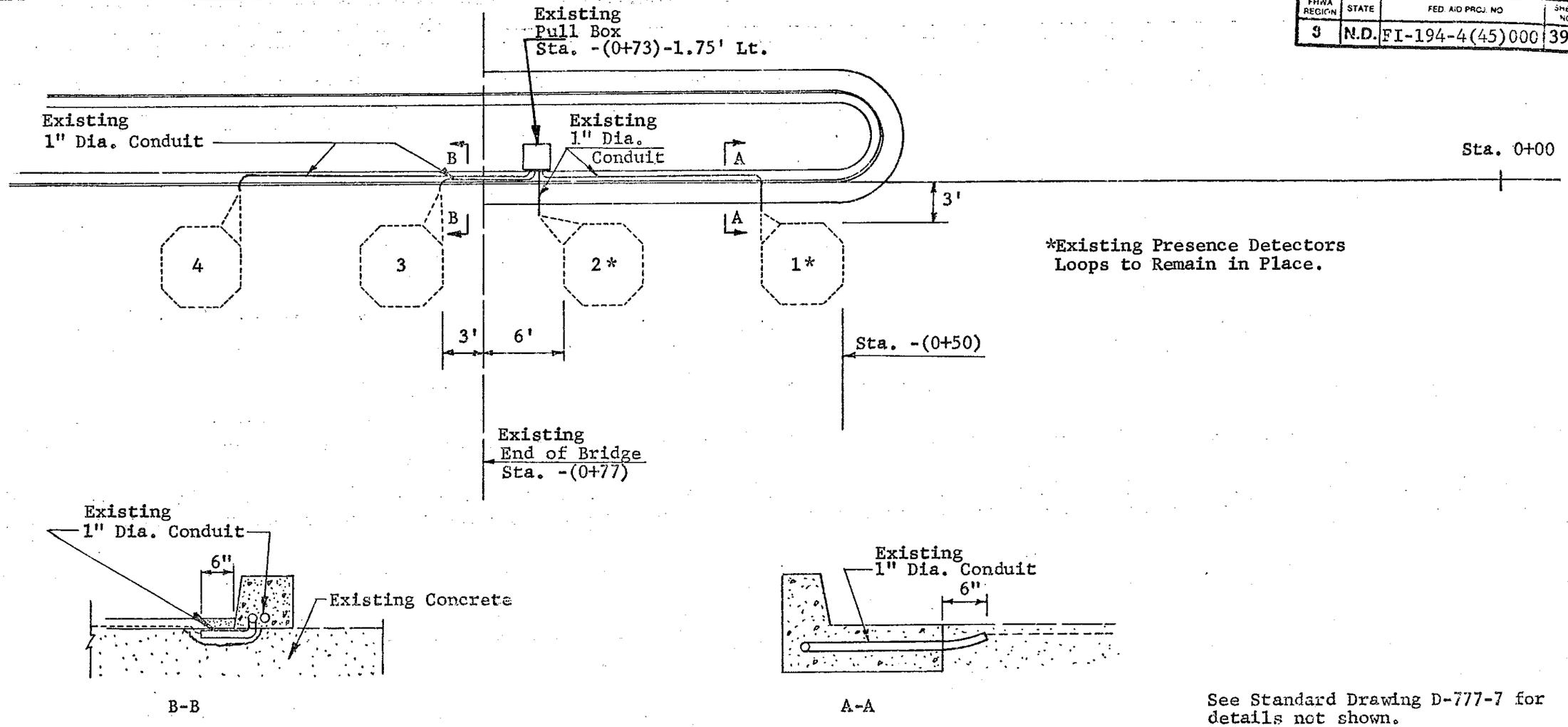


QUANTITIES	
Underground Conductor No. 14, Type XHHW	Saw Slot
LF	LF
412	83

TRAFFIC CONTROL SYSTEM
Loop Detectors

I-94 Bus. Loop
& Memorial Highway
Bismarck, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
9	N.D.	FI-194-4(45)000	39



*Existing Presence Detectors Loops to Remain in Place.

B-B

A-A

See Standard Drawing D-777-7 for details not shown.

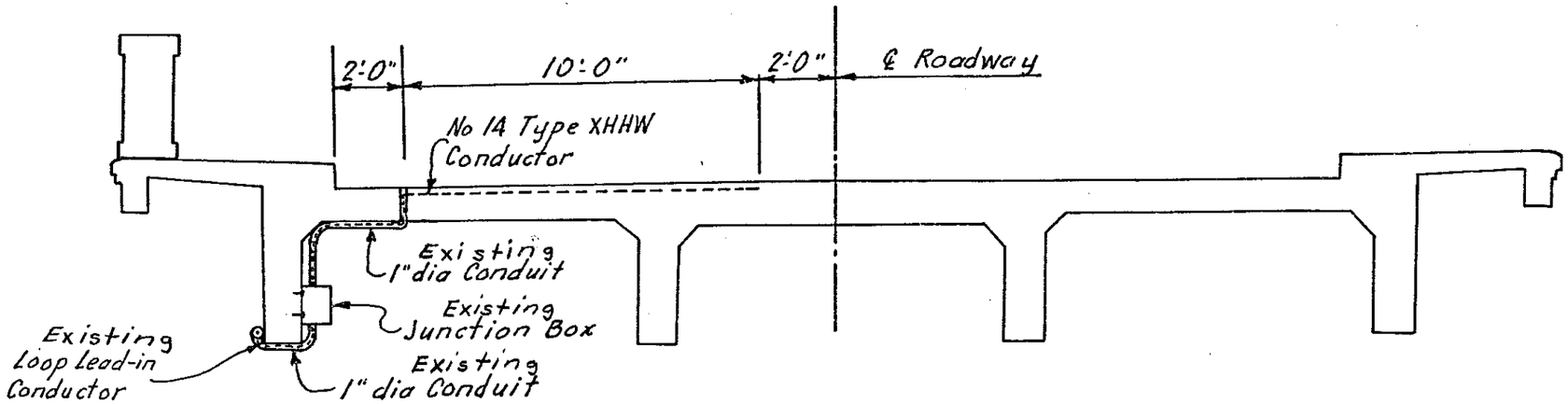
TRAFFIC CONTROL SYSTEM
CONDUIT & LOOP LAYOUT

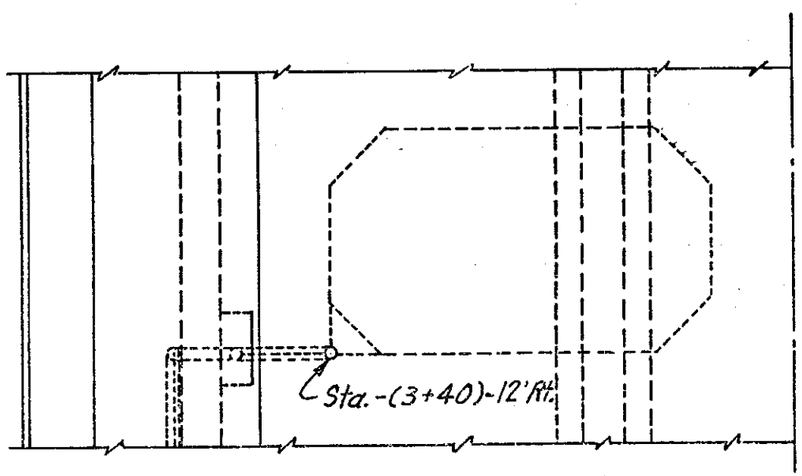
Sta. -(0+50) - 3' Rt.

I-94 Bus. Loop & Memorial Hwy
Bismarck, N.D.

Existing

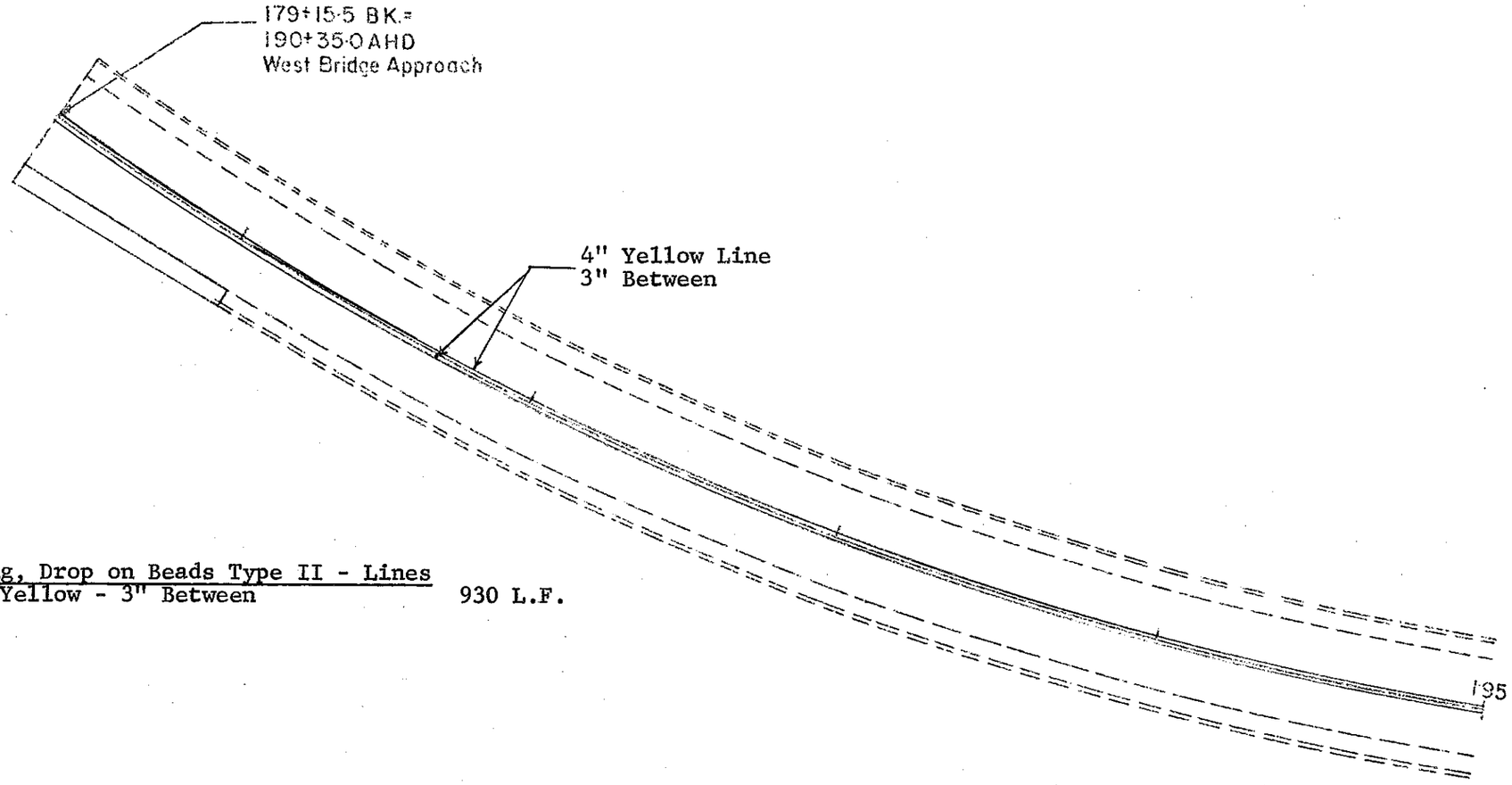
FHWA REGION	STATE	FED. A.D. PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	40





TRAFFIC CONTROL SYSTEM
Existing
Sta. -(3+40) Loop Layout
Details
I-94 Bus Loop & Memorial Hwy.
Bismarck, N.D.

STATE	FED. AID PROJ. NO.	SHEET NO.
MD.	FI-194-4(45)000	41

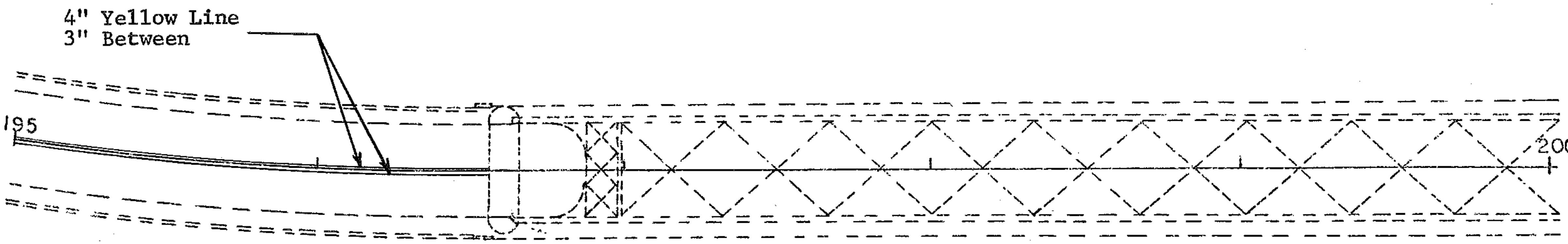


Install Pavement Marking, Drop on Beads Type II - Lines
Barrier Lines, Dbl. 4" Yellow - 3" Between 930 L.F.

MEMORIAL BRIDGE INTERCHANGE

Pavement Marking
&
Signing Layout

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
[illegible]	[illegible]	FI-194-4(45)000	42



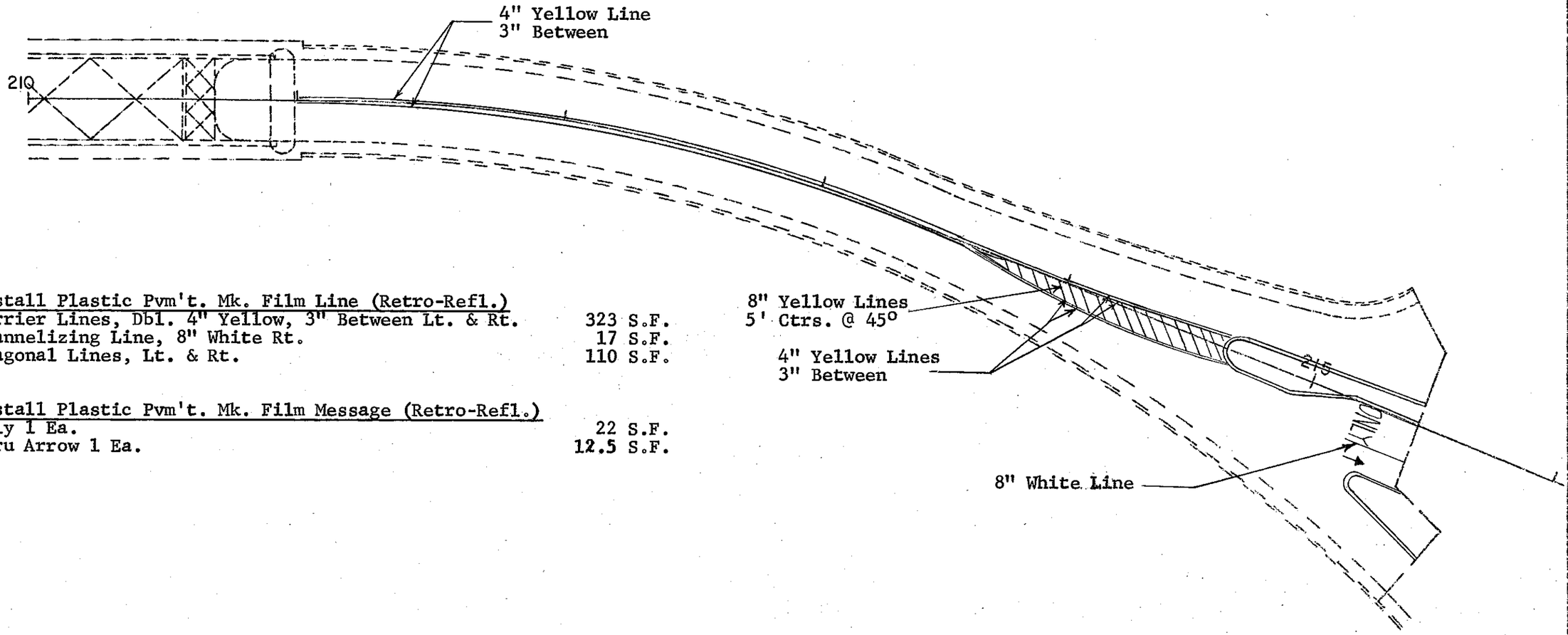
Install Pavement Marking, Drop on Beads Type II - Lines
Barrier Lines, Double 4" Yellow, 3" Between 310 L.F.

MEMORIAL BRDIGE INTERCHANGE

Pavement Marking
&
Signing Layout

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	43

000



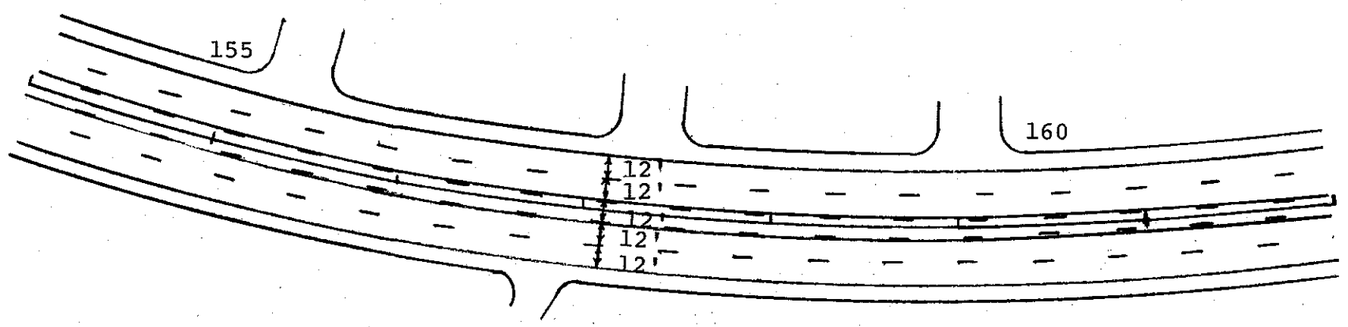
Install Plastic Pvm't. Mk. Film Line (Retro-Refl.)	
Barrier Lines, Dbl. 4" Yellow, 3" Between Lt. & Rt.	323 S.F.
Channelizing Line, 8" White Rt.	17 S.F.
Diagonal Lines, Lt. & Rt.	110 S.F.
Install Plastic Pvm't. Mk. Film Message (Retro-Refl.)	
Only 1 Ea.	22 S.F.
Thru Arrow 1 Ea.	12.5 S.F.

MEMORIAL BRIDGE INTERCHANGE
PAVEMENT MARKING
&
SIGNING LAYOUT

FHWA REGION	STATE	FED. AID PROJ NO.	SHEET NO
8	N.D.	F-I-194-4(45)000	44

INSTALL PAVEMENT MARKING DROP ON BEADS-TYPE-II-LINES

Sta. 154+00 to 160+00-Rt. Edge Lines-4" White	600 L.F.
Sta. 154+00 to 160+00-Lt. Edge Lines-4" Yellow	600 L.F.
Sta. 154+00 to 161+00-Lane Lines-4" White (10' Line,30' Skip)	340 L.F.
Sta. 154+00 to 160+00-Lane Lines-4" Yellow (10' Line,30' Skip)	260 L.F.
	1800 L.F.



Pavement Marking Layout

Memorial Bridge Inchg.
Cross Road

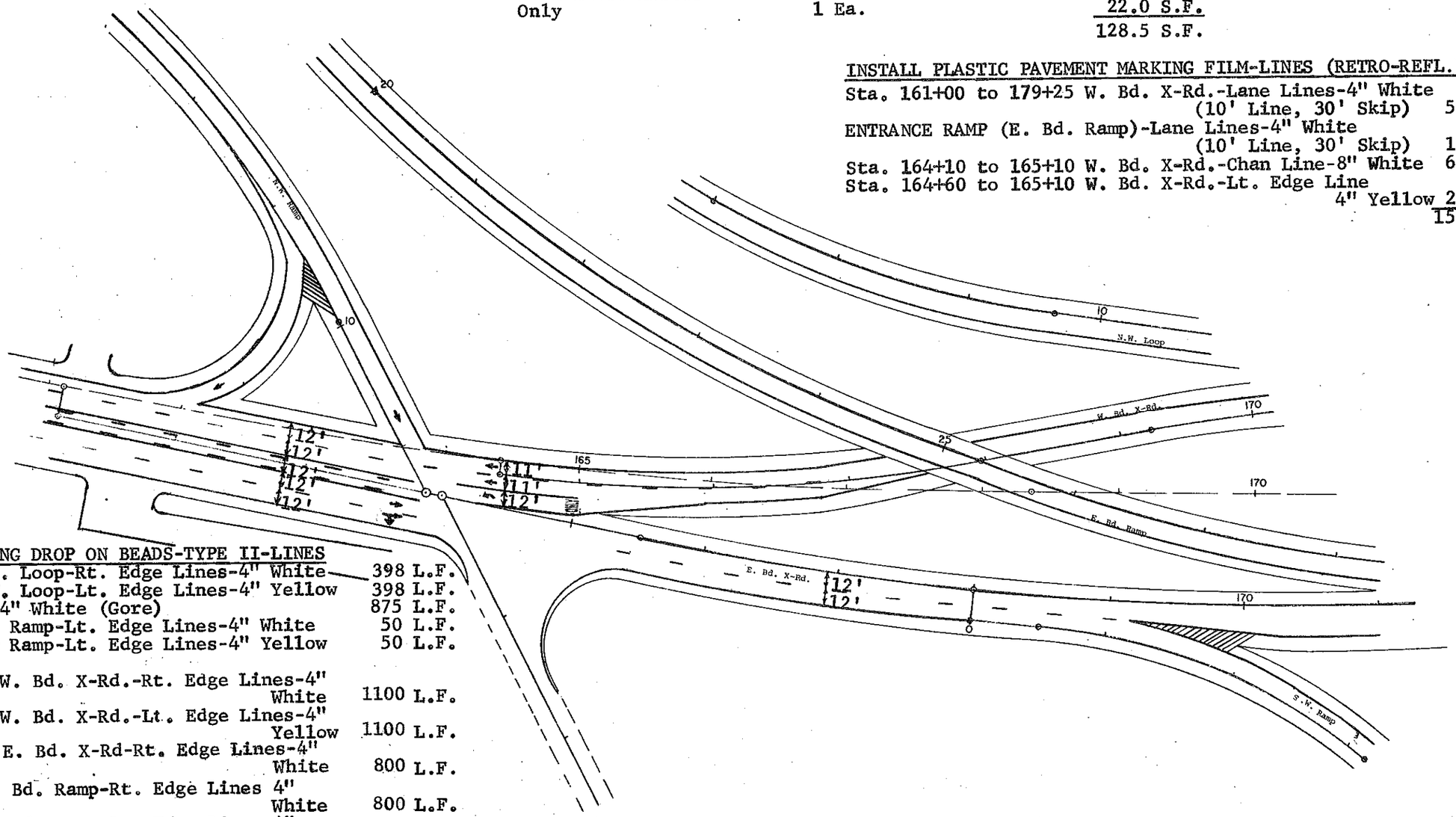
FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	I-194-4(45)000	45

INSTALL PLASTIC PAVEMENT MARKING FILM-MESSAGES (RETRO-REFL.)

St. Arrows	5 Ea.	62.5 S.F.
Lt. Arrows	1 Ea.	15.0 S.F.
Thru & Rt. Arrows	1 Ea.	29.0 S.F.
Only	1 Ea.	22.0 S.F.
		128.5 S.F.

INSTALL PLASTIC PAVEMENT MARKING FILM-LINES (RETRO-REFL.)

Sta. 161+00 to 179+25 W. Bd. X-Rd.-Lane Lines-4" White (10' Line, 30' Skip)	50.0 S.F.
ENTRANCE RAMP (E. Bd. Ramp)-Lane Lines-4" White (10' Line, 30' Skip)	13.3 S.F.
Sta. 164+10 to 165+10 W. Bd. X-Rd.-Chan Line-8" White	66.7 S.F.
Sta. 164+60 to 165+10 W. Bd. X-Rd.-Lt. Edge Line 4" Yellow	20.0 S.F.
	150.0 S.F.



INSTALL PAVEMENT MARKING DROP ON BEADS-TYPE II-LINES

Sta. 7+02 to 11+00 N.W. Loop-Rt. Edge Lines-4" White	398 L.F.
Sta. 7+02 to 11+00 N.W. Loop-Lt. Edge Lines-4" Yellow	398 L.F.
EXIT RAMP (S.W. Ramp)-4" White (Gore)	875 L.F.
Sta. 0+00 to 3+13 S.W. Ramp-Lt. Edge Lines-4" White	50 L.F.
Sta. 0+00 to 3+13 S.E. Ramp-Lt. Edge Lines-4" Yellow	50 L.F.
Sta. 171+00 to 160+00 W. Bd. X-Rd.-Rt. Edge Lines-4" White	1100 L.F.
Sta. 171+00 to 160+00 W. Bd. X-Rd.-Lt. Edge Lines-4" Yellow	1100 L.F.
Sta. 171+00 to 160+00 E. Bd. X-Rd-Rt. Edge Lines-4" White	800 L.F.
Sta. 20+00 to 28+00 E. Bd. Ramp-Rt. Edge Lines 4" White	800 L.F.
Sta. 20+00 to 28+00 E. Bd. Ramp-Lt. Edge Lines-4" Yellow	800 L.F.
EXIT RAMP (N.W. Ramp)-4" White (Gore)	875 L.F.
Sta. 8+00 to 11+40 N.W. Ramp-Rt. Edge Lines-4" White	310 L.F.
Sta. 8+00 to 11+40 N.W. Ramp-Lt. Edge Lines-4" Yellow	330 L.F.
Sta. 171+00 to 160+00 E. Bd. X-Rd.-Lt. Edge Lines-4" Yellow	900 L.F.
	8786 L.F.

PAVEMENT MARKING
Layout

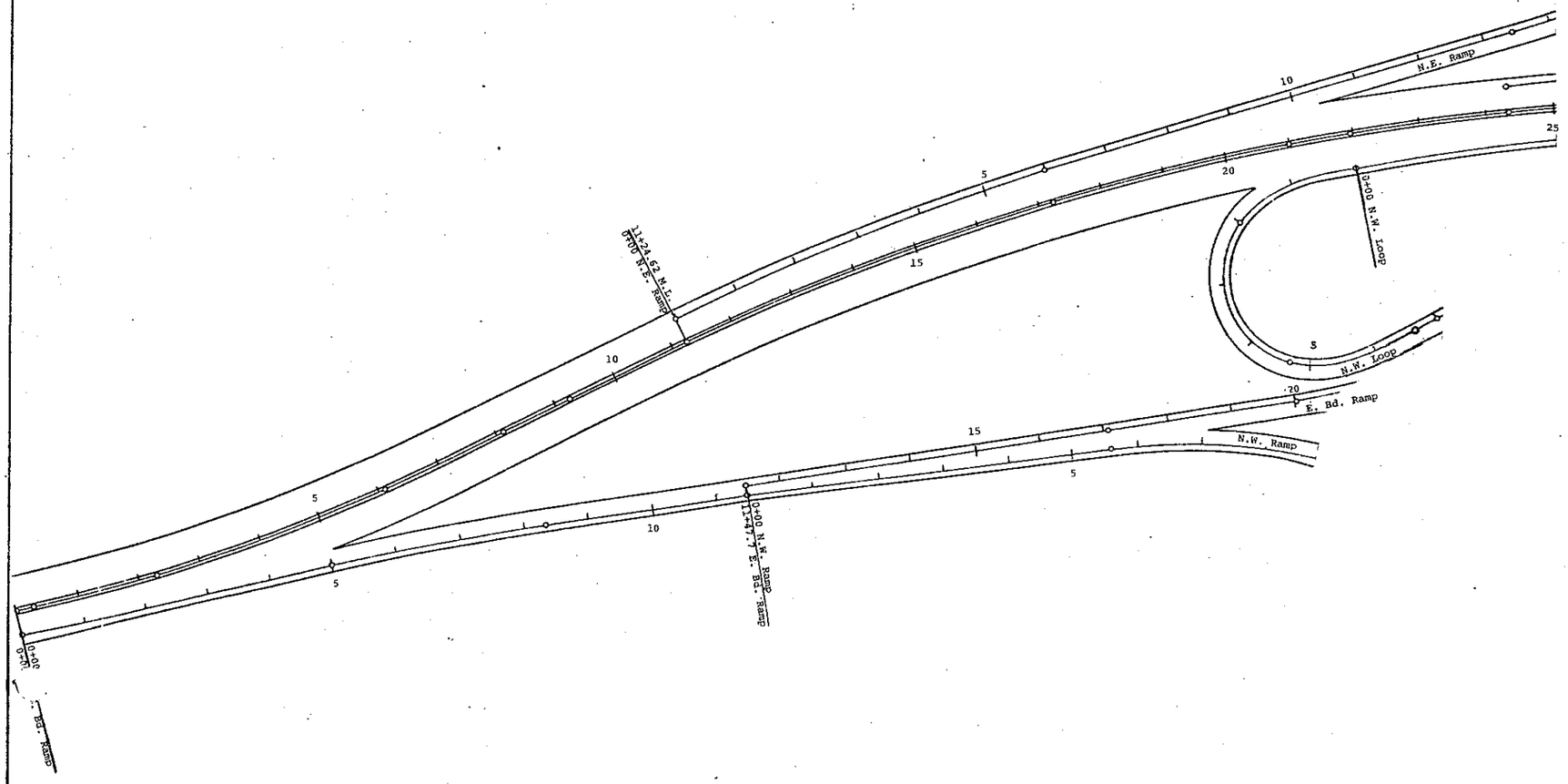
MEMORIAL BRIDGE INCHG.

CROSS-ROADS

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	I-194-4(45)000	46

INSTALL PAVEMENT MARKING DROP ON BEADS, TYPE II-(LINES)

Sta. 0+00 to 25+00 M.L.-Lane Lines-4" White	1250 L.F.
Sta. 0+00 to 25+00 M.L.-Outside Edge Lines-6" White	7500 L.F.
Sta. 0+00 to 25+00 M.L.-Median Edge Lines-6" Yellow	7500 L.F.
Sta. 0+00 to 7+02 N.W. Loop-Lt. Edge Lines-4" Yellow	550 L.F.
EXIT RAMP (E. Bd. Ramp)-8" White (Gore)	1750 L.F.
Sta. 0+00 to 8+00 N.W. Ramp-Rt. Edge Lines-4" White	800 L.F.
ENTRANCE RAMP (N.W. Loop)-Rt. Edge Lines-6" White	60 L.F.
ENTRANCE RAMP (N.W. Loop)-Lt. Edge Lines-8" White	390 L.F.
ENTRANCE RAMP (N.W. Loop)-Lane Lines-4" White (10' Line, 30' Skip)	100 L.F.
Sta. 0+00 to 7+02 N.W. Loop-Rt. Edge Lines-4" White	550 L.F.
ENTRANCE RAMP (N.E.R.)-Rt. Edge Lines-6" White	60 L.F.
ENTRANCE RAMP (N.E.R.)-Lt. Edge Lines-8" White	390 L.F.
ENTRANCE RAMP (N.E.R.)-Lane Lines-4" White (10' Line, 30' Skip)	100 L.F.
Sta. 0+00 to 14+00 N.E.R.-Rt. Edge Lines-4" White	350 L.F.
Sta. 0+00 to 14+00 N.E.R.-Lt. Edge Lines-4" Yellow	350 L.F.
Sta. 0+00 to 20+00 E.Bd. Ramp-Rt. Edge Lines-4" White	700 L.F.
Sta. 0+00 to 20+00 E.Bd. Ramp-Lt. Edge Lines-4" Yellow	1400 L.F.
EXIT RAMP (N.W. Ramp)-4" White (Gore)	875 L.F.
	24675 L.F.



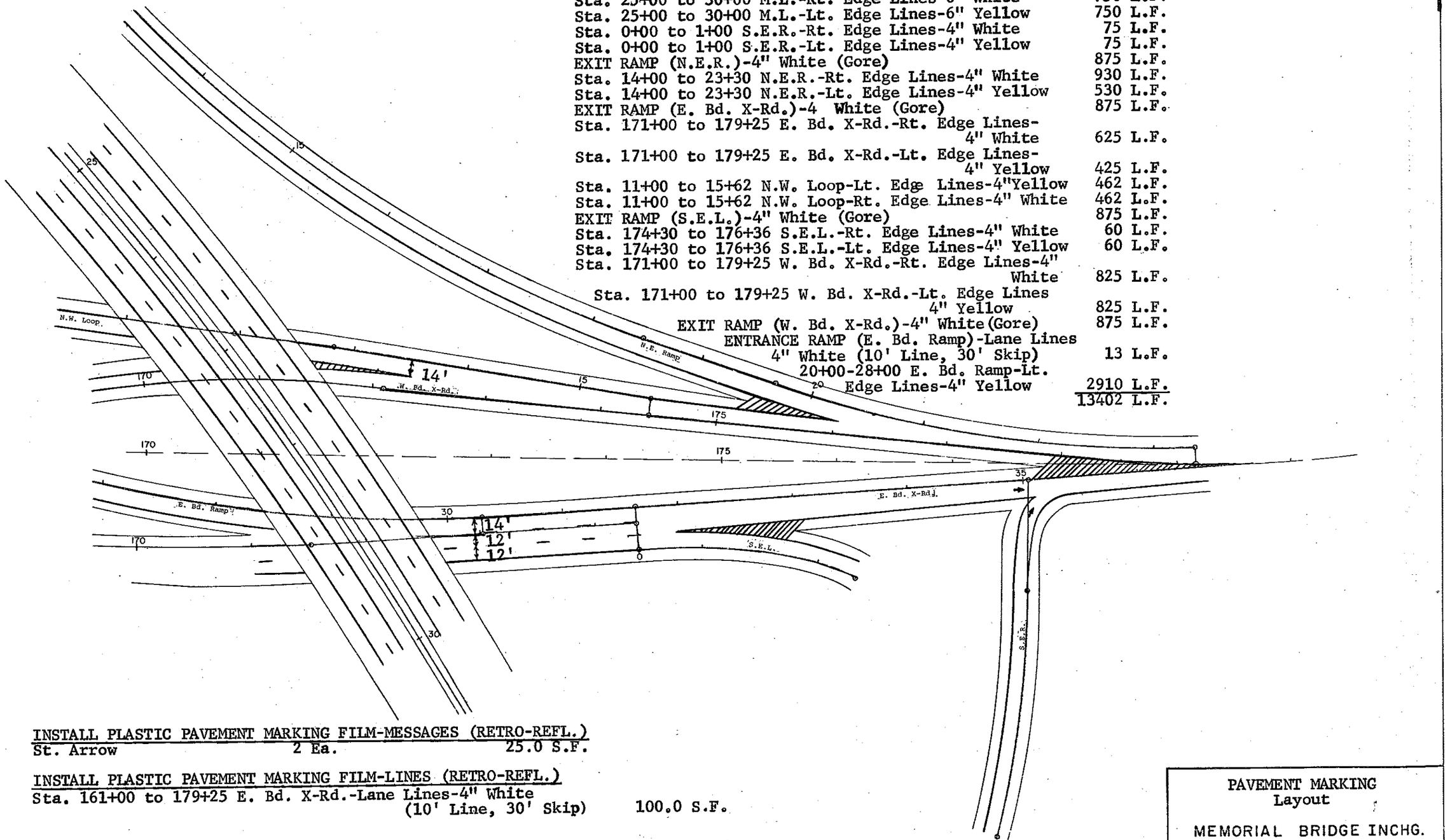
PAVEMENT MARKING
Layout

Memorial Bridge Interchange

FHWA REGION	STATE	FED AID PROJ NO.	SHEET NO.
8	N.D.	I-194-4(45)000	47

INSTALL PAVEMENT MARKING DROP ON BEADS-TYPE II-LINES

Sta. 25+00 to 30+00 M.L.-Lane Lines-4" White (10' Line 30' Skip)	125 L.F.
Sta. 25+00 to 30+00 M.L.-Rt. Edge Lines-6" White	750 L.F.
Sta. 25+00 to 30+00 M.L.-Lt. Edge Lines-6" Yellow	750 L.F.
Sta. 0+00 to 1+00 S.E.R.-Rt. Edge Lines-4" White	75 L.F.
Sta. 0+00 to 1+00 S.E.R.-Lt. Edge Lines-4" Yellow	75 L.F.
EXIT RAMP (N.E.R.)-4" White (Gore)	875 L.F.
Sta. 14+00 to 23+30 N.E.R.-Rt. Edge Lines-4" White	930 L.F.
Sta. 14+00 to 23+30 N.E.R.-Lt. Edge Lines-4" Yellow	530 L.F.
EXIT RAMP (E. Bd. X-Rd.)-4 White (Gore)	875 L.F.
Sta. 171+00 to 179+25 E. Bd. X-Rd.-Rt. Edge Lines-4" White	625 L.F.
Sta. 171+00 to 179+25 E. Bd. X-Rd.-Lt. Edge Lines-4" Yellow	425 L.F.
Sta. 11+00 to 15+62 N.W. Loop-Lt. Edge Lines-4"Yellow	462 L.F.
Sta. 11+00 to 15+62 N.W. Loop-Rt. Edge Lines-4" White	462 L.F.
EXIT RAMP (S.E.L.)-4" White (Gore)	875 L.F.
Sta. 174+30 to 176+36 S.E.L.-Rt. Edge Lines-4" White	60 L.F.
Sta. 174+30 to 176+36 S.E.L.-Lt. Edge Lines-4" Yellow	60 L.F.
Sta. 171+00 to 179+25 W. Bd. X-Rd.-Rt. Edge Lines-4" White	825 L.F.
Sta. 171+00 to 179+25 W. Bd. X-Rd.-Lt. Edge Lines 4" Yellow	825 L.F.
EXIT RAMP (W. Bd. X-Rd.)-4" White(Gore)	875 L.F.
ENTRANCE RAMP (E. Bd. Ramp)-Lane Lines 4" White (10' Line, 30' Skip)	13 L.F.
20+00-28+00 E. Bd. Ramp-Lt. Edge Lines-4" Yellow	2910 L.F.
	13402 L.F.



INSTALL PLASTIC PAVEMENT MARKING FILM-MESSAGES (RETRO-REFL.)

St. Arrow	2 Ea.	25.0 S.F.

INSTALL PLASTIC PAVEMENT MARKING FILM-LINES (RETRO-REFL.)

Sta. 161+00 to 179+25 E. Bd. X-Rd.-Lane Lines-4" White (10' Line, 30' Skip)	100.0 S.F.

PAVEMENT MARKING
Layout

MEMORIAL BRIDGE INCHG.

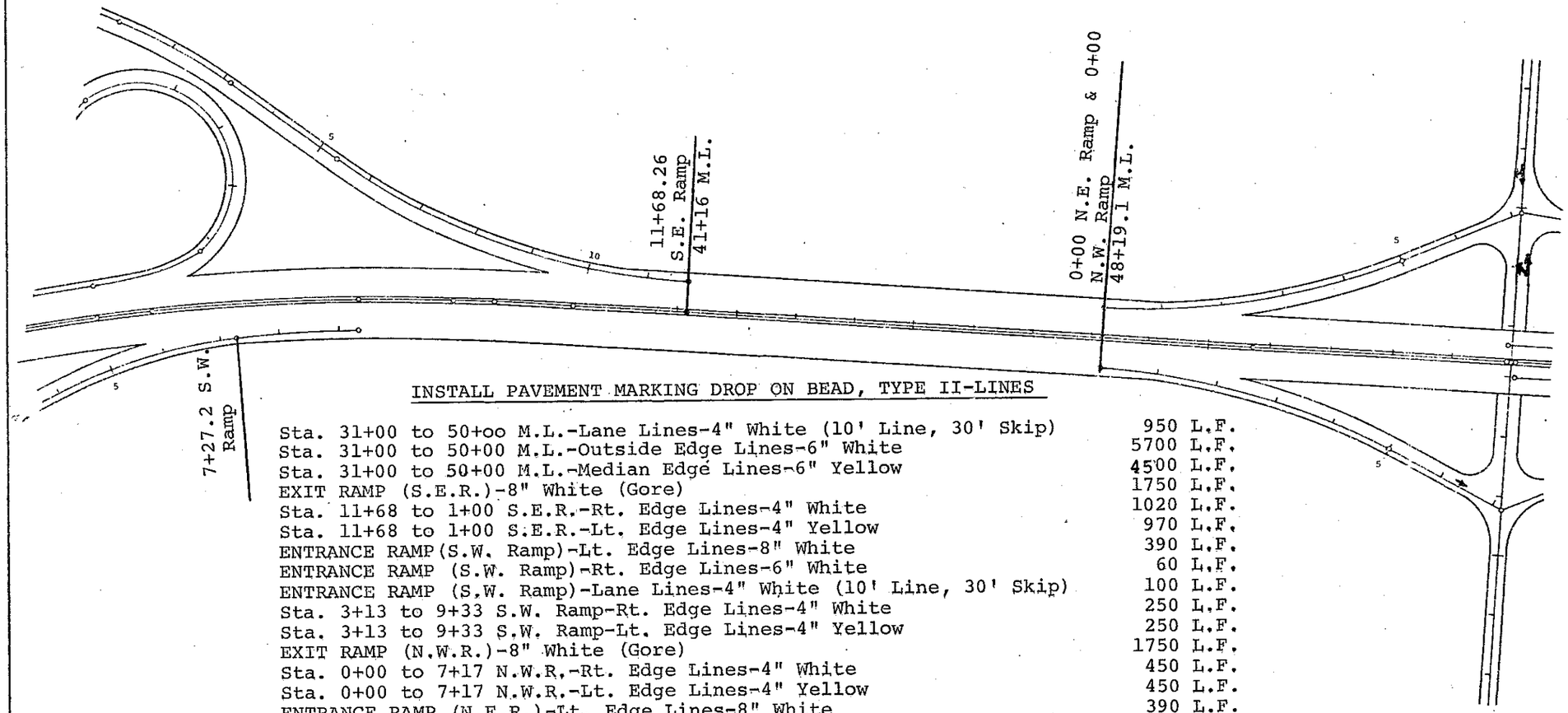
CROSS-ROADS

FHWA REGION	STATE	FED AID PROJ NO.	SHEET NO.
8	N.D.	F-I-194(45)000	48

N

INSTALL PLASTIC PAVEMENT MARKING FILM-MESSAGES (RETRO-REFL.)

St. Arrow	1 Ea.	12.5 S.F.
Thru & Rt. Arrow	1 Ea.	29.0 S.F.
Thru & Lt. Arrow	1 Ea.	29.0 S.F.
		70.5 S.F.



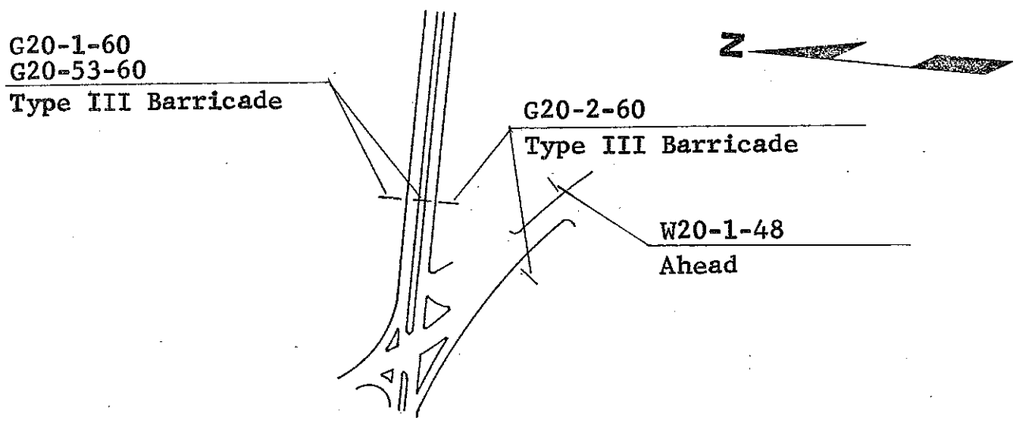
INSTALL PAVEMENT MARKING DROP ON BEAD, TYPE II-LINES

Sta. 31+00 to 50+oo M.L.-Lane Lines-4" White (10' Line, 30' Skip)	950 L.F.
Sta. 31+00 to 50+00 M.L.-Outside Edge Lines-6" White	5700 L.F.
Sta. 31+00 to 50+00 M.L.-Median Edge Lines-6" Yellow	4500 L.F.
EXIT RAMP (S.E.R.)-8" White (Gore)	1750 L.F.
Sta. 11+68 to 1+00 S.E.R.-Rt. Edge Lines-4" White	1020 L.F.
Sta. 11+68 to 1+00 S.E.R.-Lt. Edge Lines-4" Yellow	970 L.F.
ENTRANCE RAMP(S.W. Ramp)-Lt. Edge Lines-8" White	390 L.F.
ENTRANCE RAMP (S.W. Ramp)-Rt. Edge Lines-6" White	60 L.F.
ENTRANCE RAMP (S.W. Ramp)-Lane Lines-4" White (10' Line, 30' Skip)	100 L.F.
Sta. 3+13 to 9+33 S.W. Ramp-Rt. Edge Lines-4" White	250 L.F.
Sta. 3+13 to 9+33 S.W. Ramp-Lt. Edge Lines-4" Yellow	250 L.F.
EXIT RAMP (N.W.R.)-8" White (Gore)	1750 L.F.
Sta. 0+00 to 7+17 N.W.R.-Rt. Edge Lines-4" White	450 L.F.
Sta. 0+00 to 7+17 N.W.R.-Lt. Edge Lines-4" Yellow	450 L.F.
ENTRANCE RAMP (N.E.R.)-Lt. Edge Lines-8" White	390 L.F.
ENTRANCE RAMP (N.E.R.)-Rt. Edge Lines-6" White	60 L.F.
ENTRANCE RAMP (N.E.R.)-Lane Lines-4" White (10'Line, 30' Skip)	100 L.F.
Sta. 0+00 to 7+17 N.E.R.-Rt. Edge Lines-4" White	450 L.F.
Sta. 0+00 to 7+17 N.E.R.-Lt. Edge Lines-4" Yellow	450 L.F.
ENTRANCE RAMP (S.E.L.)-Lt Edge Lines-8" White	390 L.F.
ENTRANCE RAMP (S.E.L.)-Rt. Edge Lines-6" White	60 L.F.
ENTRANCE RAMP (S.E.L.)-Lane Lines-4" White (10' Line, 30' Skip)	100 L.F.
Sta. 176+36 to 183+00 S.E.L.-Rt. Edge Lines-4" White	515 L.F.
Sta. 176+36 to 183+00 S.E.L.-Lt. Edge Lines-4" Yellow	515 L.F.
Sta. 35+76 W. SERV. Rd. to 40+09 E. SERV. Rd.-Barrier Lines-4" Dbl. Yellow, 3" Between.	1000 L.F.
Sta. 42+00 to 50+00 M.L. Rt. - Left Side Lane Transfer line - 6" Yellow	1200 L.F.
	23820 L.F.

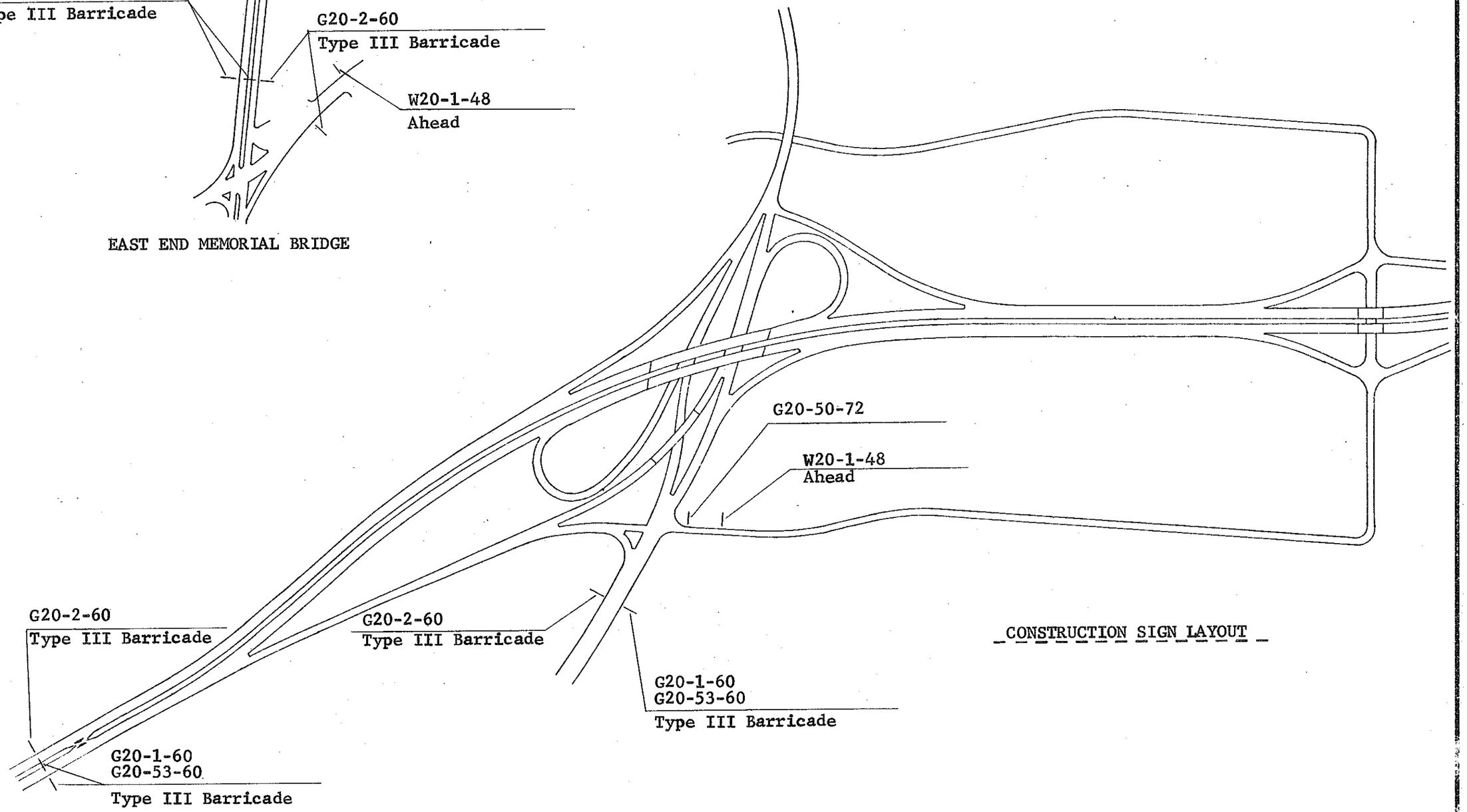
Pavement Marking Layout

Memorial Bridge Interchange

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	49



EAST END MEMORIAL BRIDGE



CONSTRUCTION SIGN LAYOUT

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		50

FI-194-4(45) D-630-4

CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

(ROUND PIPE)

NOTES:

Pipe and Connecting Bands shall conform to applicable sections of the NDSHD Standard Specifications and to AASHO M-36.

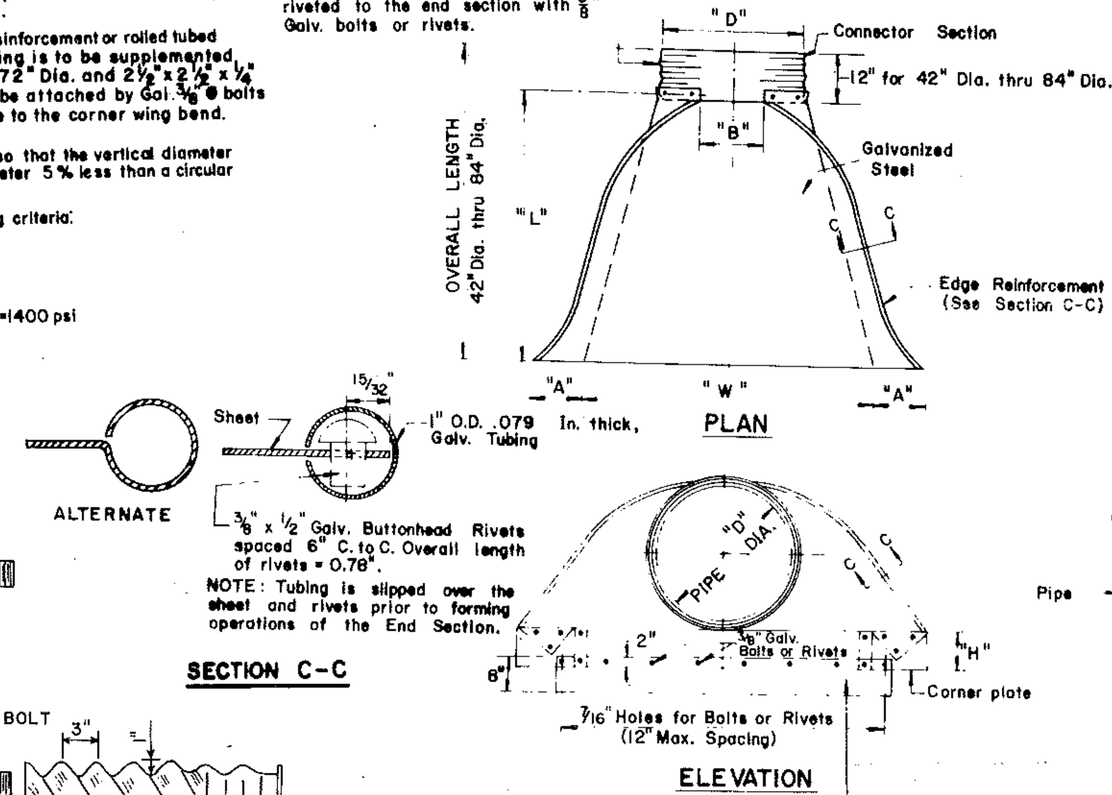
Top edge of all End Sections to have tubing reinforcement or rolled tubed reinforcement (See Section A-A). The tubing is to be supplemented with 2"x2"x 1/4" Galv. Angle for 60" thru 72" Dia. and 2½"x2½"x¼" Galv. Angle for 78" and 84" Dia. Angles to be attached by Gal. 3/8" Ø bolts and nuts. Angles are to extend from Pipe to the corner wing bend.

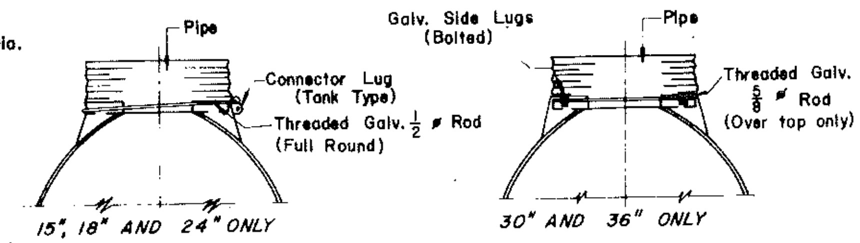
Elongated pipe shall be factory preformed so that the vertical diameter shall be 5% greater and the horizontal diameter 5% less than a circular pipe.

Fill Height Tables are based on the following criteria:

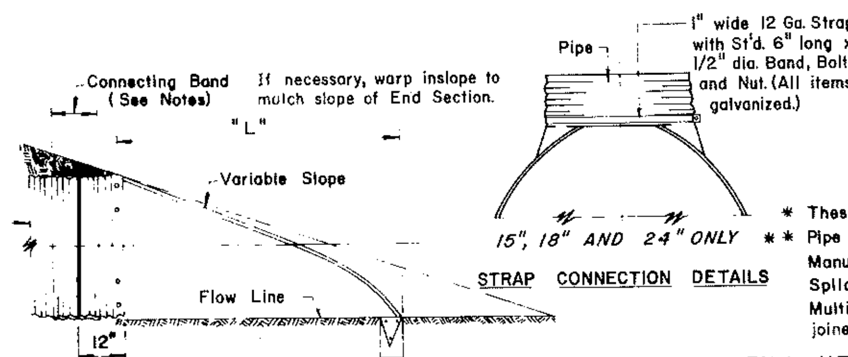
1. Embankment weight = 120 lb/ft^3
2. Max. pipe deflection = 5%
3. Bedding - Class C
4. Compaction = 95% Proctor Density
5. Modulus of passive soil resistance (E') = 1400 psi
6. H-20 Live Load

This connection for 42" thru 84" diameter pipe to be bolted or riveted to the end section with 3/8" Galv. bolts or rivets.





ROD CONNECTION DETAILS



TYPICAL CROSS-SECTION

(Showing Connector Section)

STRAP CONNECTION DETAILS

END SECTIONS

** PIPE DIA. (In.)	GALV. THICK.	DIMENSIONS A In.	B In.	H In.	L In.	W In.	Approx. Slope Rate	Body Piece
15	.064	7	8	6	26	30	2-1/2:1	1
18	.064	8	10	6	31	36	2-1/2:1	1
24	.064	10	13	6	41	48	2-1/2:1	1
30	.079	12	16	8	51	60	2-1/2:1	1
36	.079	14	19	9	60	72	2-1/2:1	2
42	.109	16	22	11	69	84	2-1/2:1	2
48	.109	18	27	12	78	90	2-1/4:1	2
54	.109	18	30	12	84	102	2:1	2
*60	.109	18	33	12	87	114	1-3/4:1	3
*66	.109	18	36	12	87	120	1-1/2:1	3
*72	.109	18	39	12	87	126	1-1/3:1	3
*78	.109	18	42	12	87	132	1-1/4:1	3
*84	.109	18	45	12	87	138	1-1/6:1	3

* These sizes have 0.138 in. center panels.
** Pipe diameter is equal to dimension "D" of end section.
Manufacturers tolerances of above dimensions will be allowed.
Splices to be the lap riveted type.
Multiple panel bodies shall have lap seams which are to be tightly joined with 3/8" Ø galv. bolts or rivets. Nuts to be torqued to 25 lbs. ±.

FILL HEIGHT TABLES

RIVETED, WELDED OR HELICAL FABRICATION

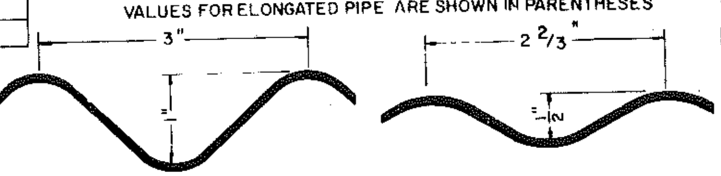
3" BY 1" CORRUGATIONS

WATERWAY AREA SQ. FT.	PIPE DIA. (IN.)	MIN. COVER (IN.)	MAX. FILL HEIGHTS OVER TOP OF PIPE — GALV. METAL THICKNESS (IN.) .064	.079	.109	.138	.168
7.1	36	12	48	60	78 (88)	89 (106)	101 (118)
9.6	42	12	41	51	64 (76)	71 (91)	79 (101)
12.6	48	12	36	45	57 (66)	61 (80)	66 (88)
15.9	54	12	32	40	52 (59)	55 (71)	59 (79)
19.6	60	12	29	36	49 (53)	51 (64)	54 (71)
23.8	66	12	26	33	47	49 (58)	51 (64)
28.3	72	12	24	30	44	47 (53)	49 (59)
33.2	78	12	22	28	41	46 (49)	47 (54)
38.5	84	12	21	26	38	45	46 (51)
44.2	90	12	19	24	35	43	45
50.3	96	12	18	22	33	40	44
56.7	102	24	17	21	31	38	42
63.6	108	24		20	30	35	39
70.9	114	24		19	28	34	37
78.5	120	24			27	32	35

2⅔" BY ½" CORRUGATIONS

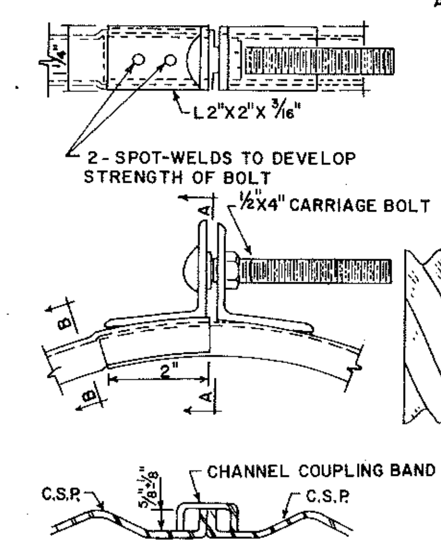
WATERWAY AREA SQ. FT.	PIPE DIA. (IN.)	MIN. COVER (IN.)	MAX. FILL HEIGHTS OVER TOP OF PIPE — GALV. METAL THICKNESS (IN.) .064	.079	.109	.138	.168
1.2	15	12	67	73			
1.8	18	12	56	61			
3.1	24	12	42	46	59		
4.9	30	12	34	36	47		
7.1	36	12	28	30	39	41	
9.6	42	12	31	43	46 (67)	48 (70)	50 (73)
12.6	48	12	27	37	45 (58)	46 (61)	47 (64)
15.9	54	12		33	43 (52)	44 (54)	45 (57)
19.6	60	12			43 (47)	43 (49)	44 (51)
23.8	66	12			42	43	43 (47)
28.3	72	12				41	43
33.2	78	12					39
38.5	84	12					35

VALUES FOR ELONGATED PIPE ARE SHOWN IN PARENTHESES



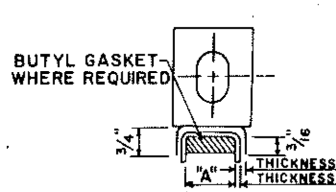
3" BY 1" CORRUGATIONS

2⅔" BY ½" CORRUGATIONS



SECTION "B-B"

CHANNEL COUPLING BAND FOR USE ON FLANGED END C.S.P. (CHANNEL COUPLING BANDS SHALL BE TWO PIECE)

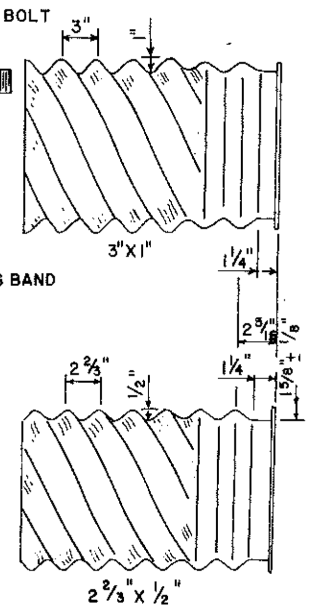


NOMINAL DIMENSIONS

THICKNESS	"A"	FOR USE WITH C.S.P.
0.079"	3/4	0.09" THICK OR LIGHTER
0.109"	1"	0.138" THICK OR HEAVIER

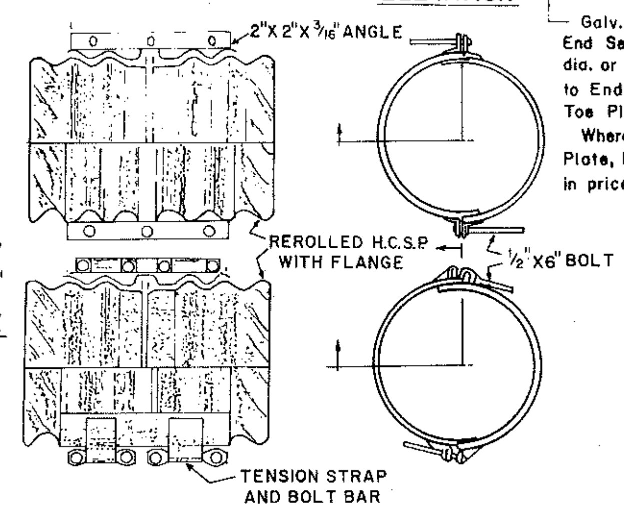
SECTION "A A"

CORRUGATED STEEL PIPE FLANGE BAND DETAILS

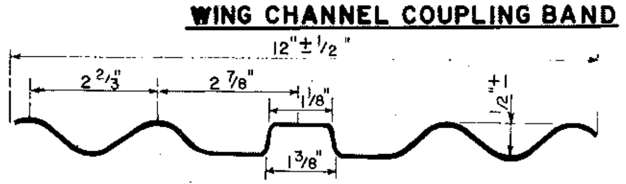


SPIRAL C.S.P.

REFORMED TO ACCEPT FLANGE, ANNULAR, DIMPLE AND HUGGER COUPLERS

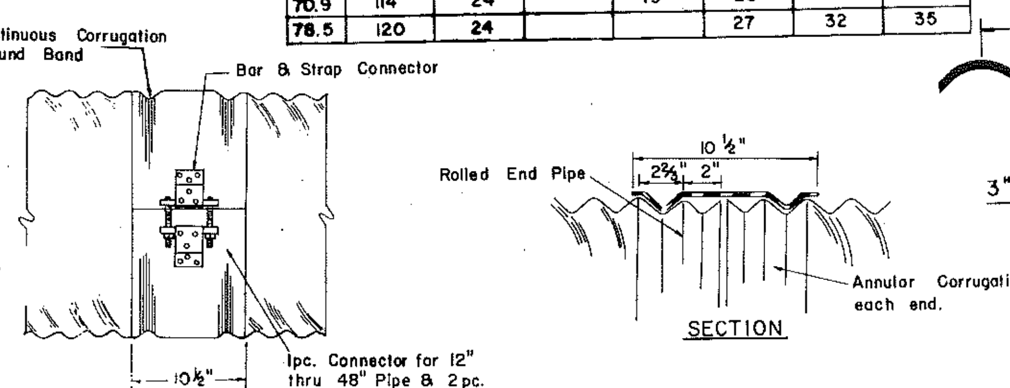


WING CHANNEL COUPLING BAND



CROSS SECTION OF WING CHANNEL COUPLING BAND

WING CHANNEL COUPLING BAND FOR ANNULAR C.S.P. OR REFORMED H.C.S.P.



CONNECTING BAND DETAILS FOR HELICAL, WELDED - SEAM CULVERT

6-1-74	
REVISIONS	
DATE	CHANGE
1-1-75	Connecting Band
3-16-77	Connecting Strap
5-1-78	Flange Band Details

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

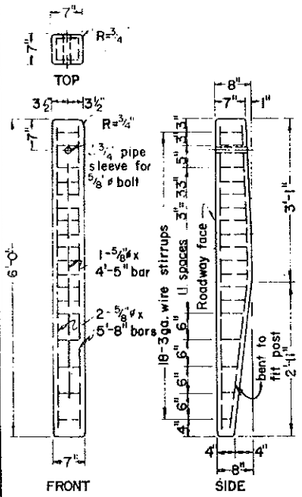
Submitted: [signature] Design Engineer

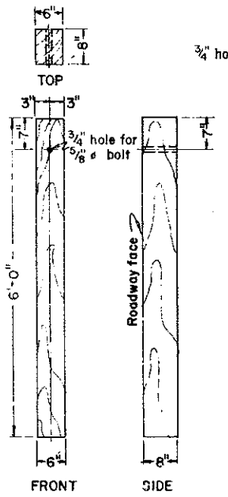
Recommended: Asst. Chief Engineer Pre-Construction

Approved: [signature] Chief Engineer

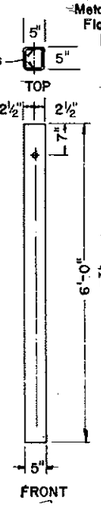
BEAM GUARD RAIL GENERAL DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	51
		D-722-1	

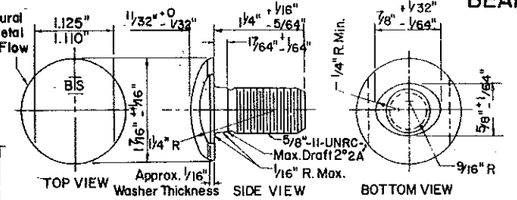


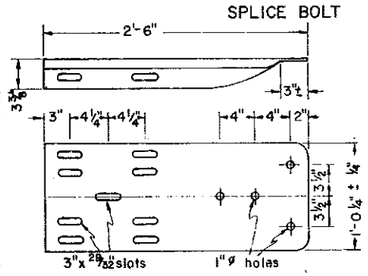


WOOD POST

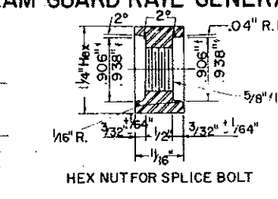


STEEL POST
11.86 lbs/ft.

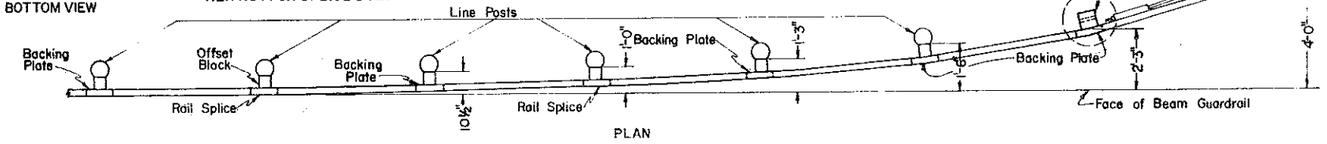


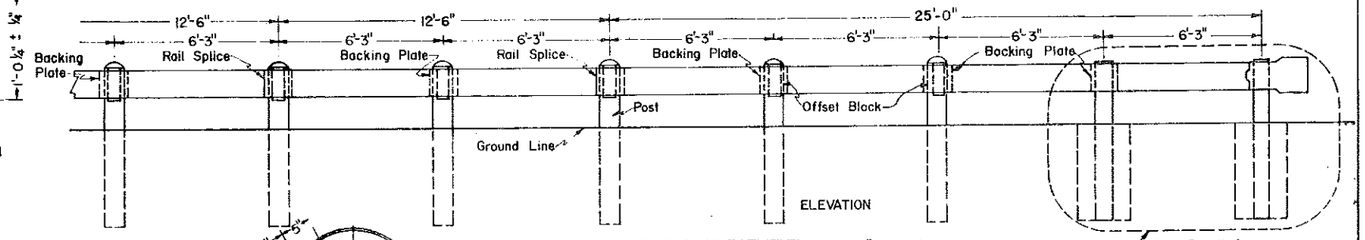


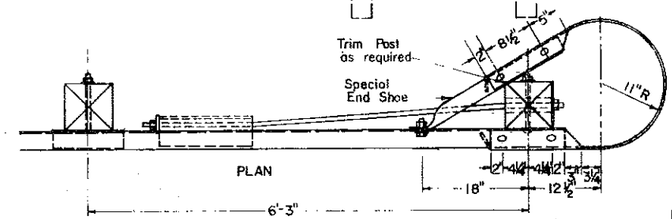
SPECIAL END SHOE
End to be shaped to fit the Standard Rail Section and fabricated from the same material except it shall be 10 Gauge.



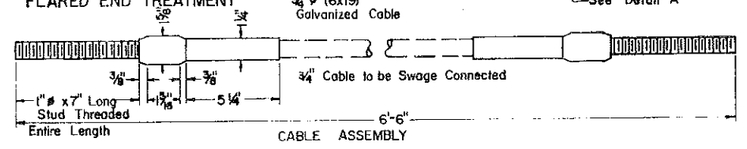
NOTES: 8 Bolts in regular joint bolt pattern, tested in shear with two 10 ga. plates shall withstand a load of 100,000 lbs. without failing. Bolts will have Tensile Strength of 70,000 lbs./sq.in. Bolts roll threaded Class 2A Fit before Galvanizing. Nuts tapped oversize after Galvanizing. Galvanize per A.S.T.M. A-153

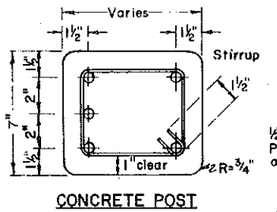




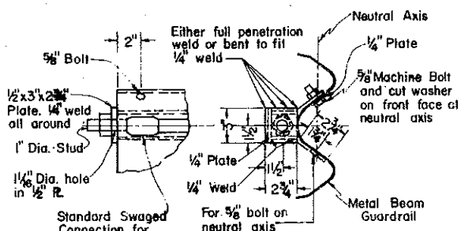


FLARED END TREATMENT

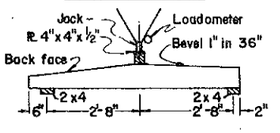




CONCRETE POST

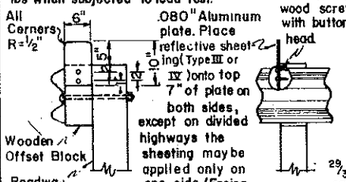


ANCHOR PLATE DETAIL



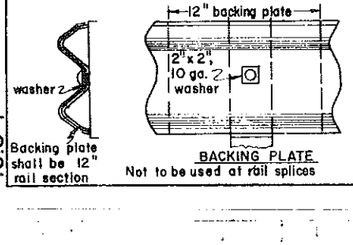
TRANSVERSE LOAD TEST
(Concrete Posts)

Note.
All posts shall sustain a load of 5,800 lbs or more without visible cracking and an ultimate load of not less than 13,000 lbs when subjected to load test.

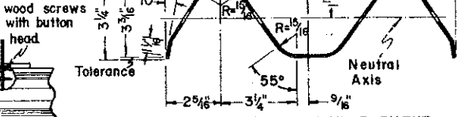


REFLECTORIZED PLATE DETAIL

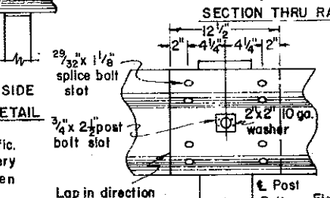
Note:
Always face reflective plate toward traffic. Reflectorized plate shall be placed every 12'-6" unless length exceeds 200', then the spacing shall be 25'-0".

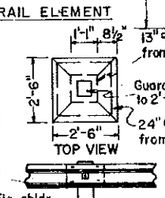


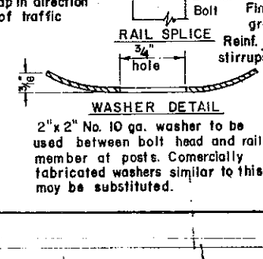
BACKING PLATE
Not to be used at rail splices



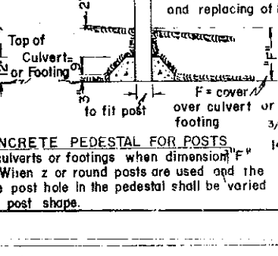
SECTION THRU RAIL ELEMENT



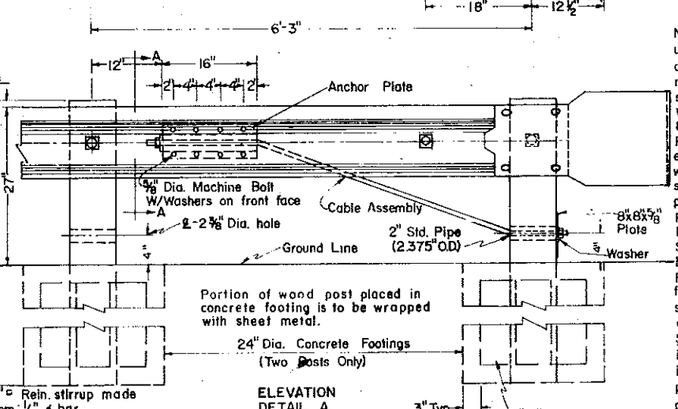




WASHER DETAIL
2"x 2" No. 10 ga. washer to be used between bolt head and rail member at posts. Comercially fabricated washers similar to this may be substituted.

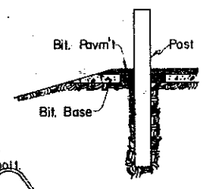


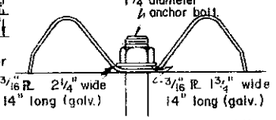
DETAIL OF CONCRETE PEDESTAL FOR POSTS
To be used over culverts or footings when dimension "F" is less than 3'-8" When z or round posts are used and the pedestal is required the post hole in the pedestal shall be varied as required by the post shape.



MANNER OF REPLACING BIT. MATERIAL AT GUARD RAIL POST

Note. All excess earth from excavations for guard posts shall be disposed of as directed by the Engineer. Replace Bit. material where ever guard rail is installed after mat has been laid. Cost of excavation and replacing of Bit. material to be included in the price bid for other items.





RAIL ANCHOR BOLT DETAIL
for bolting directly to rail

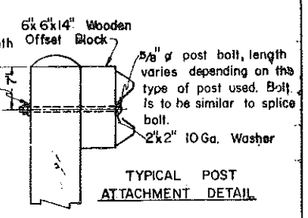
NOTE: WOOD POST: 8"-9 1/2" diam. (± 1/4") round post may be used as an alternate to 6"x8" rectangular post shown on the drawings. Oversized posts may be approved by the engineer. The max. difference in diameter between the smallest and the largest shall be 2 inches. Wood Posts shall conform to Section 850-4 with the following exceptions. Treatment shall conform to Section 866. Timber preservative shall conform to Section 866. Post treated with creasote or pentachlorophenol shall not be painted. Posts treated with water borne preservative shall be painted with three coats of paint. The first coat shall be a prime. The second and third coats shall be white or aluminum. All posts on the project shall have the same treatment. Treated Wood Guard Rail Posts shall have an allowable unit working fibre stress in bending of 1400 psi or more as determined from Section 1.10.1 of the AASHO Standard Specifications for Highway Bridges. Round Posts shall be notched to receive wooden offset block prior to treatment. Flat surface shall be 5"-6" wide and 14"-15" long or extending the full length of the post. Minimum width of post after notching shall be 6 3/4 inches. Round posts may have domed top in lieu of flat top as shown for 6x8 rectangular post.

STEEL POSTS: The steel posts shall conform to ASTM designation A-36 and shall be galvanized after fabrication according to the requirements of AASHO designation M-111, hot dip process, (ASTM designation A-123). In lieu of square steel post a steel Z post may be used weighing 8.64 #/L F. Moment of Inertia 17.06 in.^{4}, Section Modulus 5.10 in.^{3}, 3/16" thick open hearth, low carbon, Hot Rolled Steel. Coating shall be the same as squaresteel posts.

CONCRETE POSTS: Stirrups shall be tack welded or wrapped around each bar. Wire for stirrups shall conform to the requirements for "Cold Drawn Steel Wire for Concrete Reinforcement" AASHO designation M-32 or the latest revisions. Pipe sleeves may be aluminum or steel standard galvanized pipe. If standard pipe is used galvanizing shall be done after cutting to proper length.

CONTRACTORS OPTION: Wood, Concrete or Steel Posts and Aluminum or Steel Beam Guard Rail. Aluminum Guard Rail shall conform to the following ASTM Specs; Rail-B209 alloy clad 2024-T3; Bolts-B211 alloy 2024-T4 with at least 0.0002 inches of anodic coating and chrome seal; Nuts-B211 alloy 6061-T6.

NOTE: The contractor may substitute a rod type assembly with a minimum breaking strength as specified below and galvanized.



CONCRETE: Class AE Concrete shall be used. Course Aggregate for Class AE Concrete shall be Class 1, 3, 4 or 5 at the option of the Contractor.

WOOD OFFSET BLOCKS: The material requirements, Paint & Treatment for Wood Offset Blocks shall be the same as for Wooden Posts.

STEEL BEAM GUARD RAIL: Steel Beam Guard Rail shall conform to the requirements of AASHO M-180 Class A, Type 1.

ALUMINUM BEAM GUARD RAIL: Aluminum Beam Guard Rail shall be 0.156" nominal thickness.

END TREATMENT: The contractor shall have no option for the type of posts to be used in the construction of the end unit. The End Plates shall be galvanized steel fabricated of the same material as the Steel Rail. The Anchor Plate and Washer Plate shall be fabricated from Steel conforming to ASTM A 36 and galvanized after fabrication. The Cable Assembly shall be fabricated with a minimum breaking strength of 40,000 lbs. and shall be galvanized. Cost of End Plates, End Shoes, Anchor Plates, Cable Assembly and other hardware required to fabricate and assemble the End Treatment Unit shall be included in the price bid for Beam Guard Rail including concrete and Reinforcing Bars.

12-8-69 REVISIONS	
DATE	CHANGE
8-21-78	Note Added Dim. Change
6-22-79	Post Size Correction
6-23-80	Note on Refl. Plate Detail

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer, Pre-Constr.

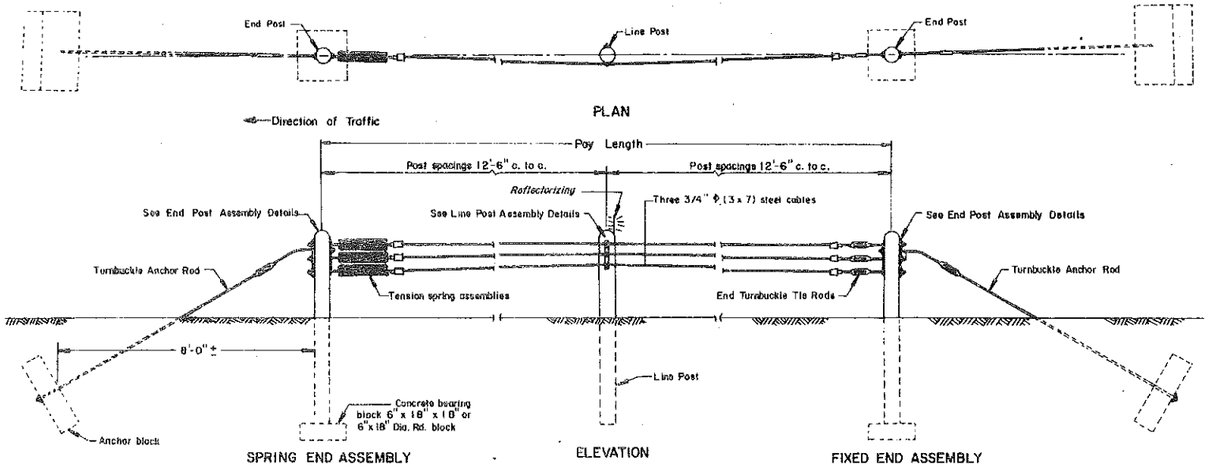
Approved: _____ Chief Engineer

108-1

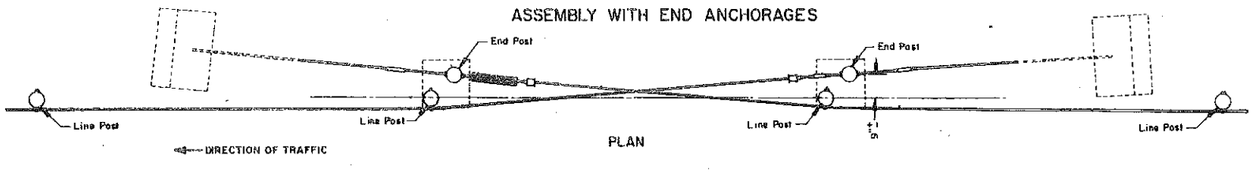
THREE CABLE GUARD RAIL (WOOD POSTS)

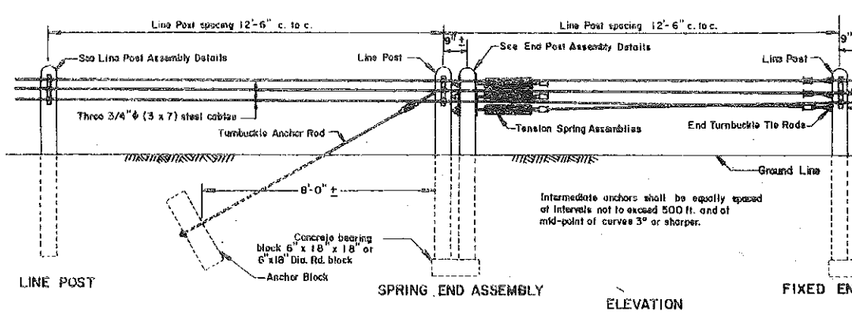
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)000	52

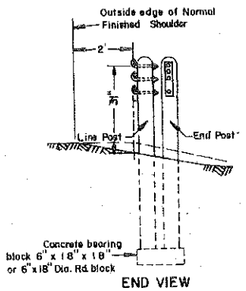
D-722-11



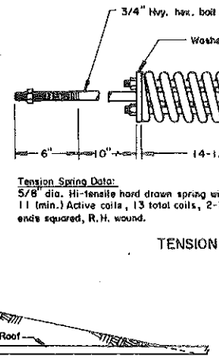
ASSEMBLY WITH END ANCHORAGES

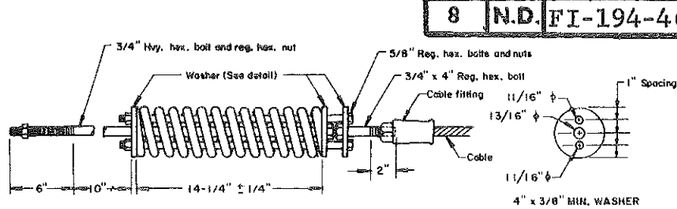


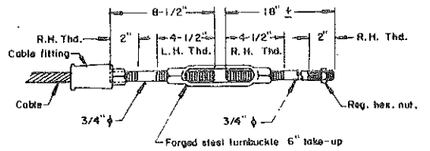


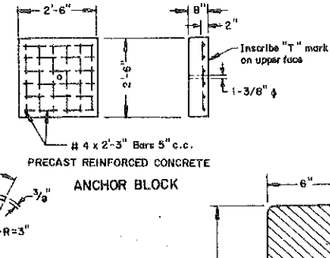


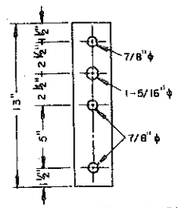
ASSEMBLY WITH INTERMEDIATE ANCHORAGES

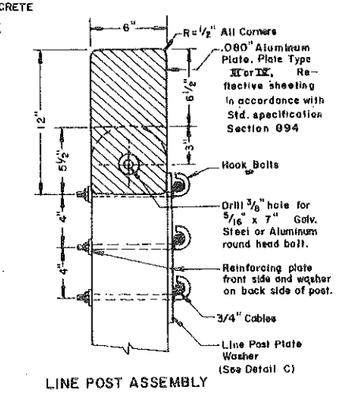


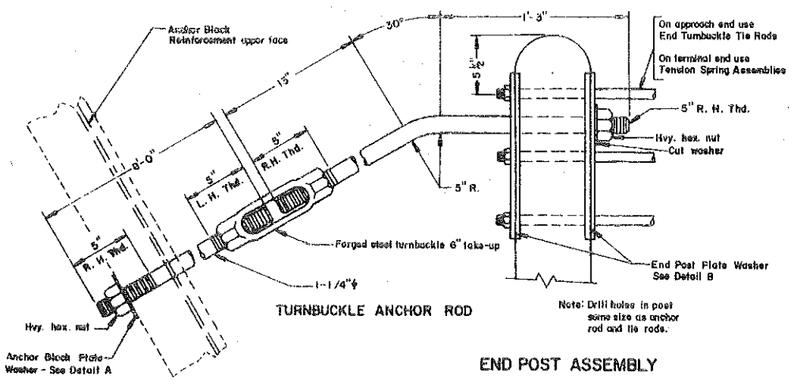


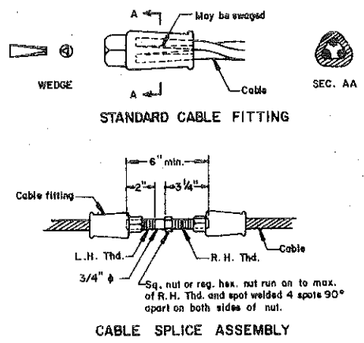


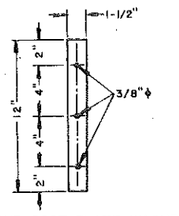


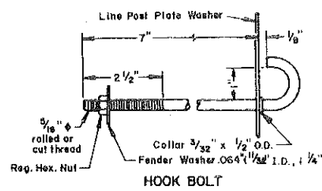












NOTES:
WOOD POSTS: All posts shall be 5½" nominal (4¾" to 6¼") round by 6'-0" treated timber and shall conform to Section 850-4 with the following exceptions. Treatment shall conform to Section 866. Timber preservative shall conform to section 866. Posts treated with creosote or pentachlorophenal shall not be painted. Posts treated with water borne preservative shall be painted with three coats of paint. The first coat shall be primer, the second and third coats shall be aluminum or white. All posts shall have the same treatment.

Treated wood guard rail posts shall have an allowable unit working fibre stress in bending of 1400 PSI or more as determined from Section 1.10.1 of the AASHO Standard Specifications for Highway Bridges.

BEARING BLOCKS: Bearing blocks may be precast or cast in place. Class A concrete shall be used. Coarse aggregate for the Class A concrete shall be Class 1,3,4 or 5 at the option of the Engineer.

REFLECTOR PLATES: Reflector plates shall be installed on all posts except end posts.

Reflectorplates to be included in price bid for Three Cable Guard Rail.

THE INTERMEDIATE ANCHORAGE ASSEMBLIES SHALL NOT BE INCLUDED IN PAY LENGTH, BUT SHALL BE INCLUDED IN THE PRICE BID FOR THREE CABLE GUARD RAIL. THE INTERMEDIATE ANCHORAGE ASSEMBLY SHALL INCLUDE END POSTS, TENSION SPRING ASSEMBLIES, END POST ASSEMBLIES, ANCHOR BLOCK AND OTHER EQUIPMENT NEEDED FOR ASSEMBLY.

1-1-75 REVISIONS	
DATE	CHANGE
4-18-75	Spec. onWood Posts.
10-13-75	Post Height
4-20-76	Add Pay Length
2-10-78	Refl. Detail
10-3-78	NOTE ADDED
6-23-80	Add Note on Refl. Detail

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

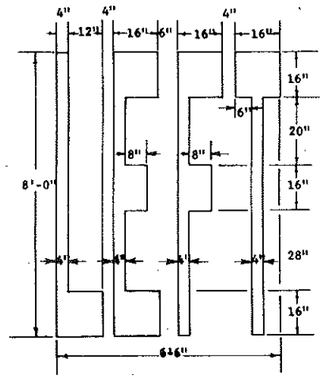
Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer Pre-Construction

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO.
8	N.D.	F-I-194-4(45)000	53

D-743-I



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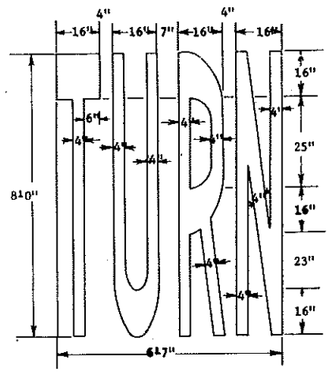

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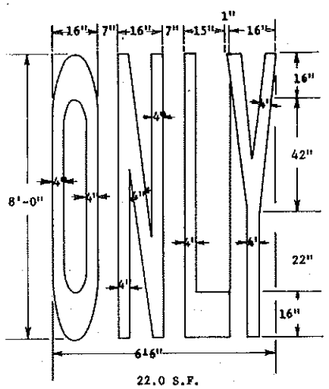

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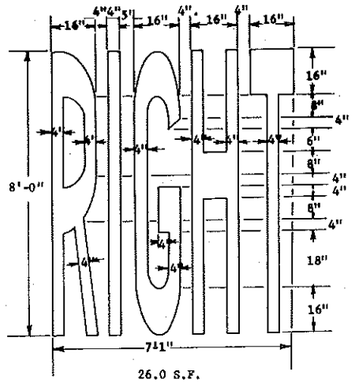

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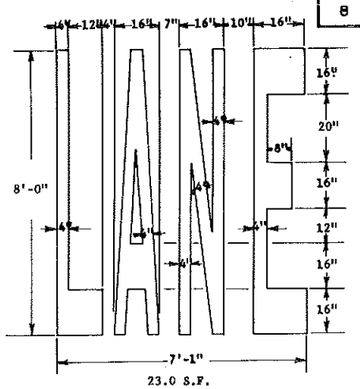

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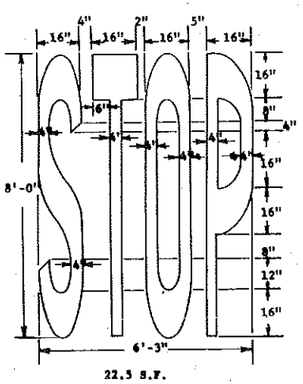

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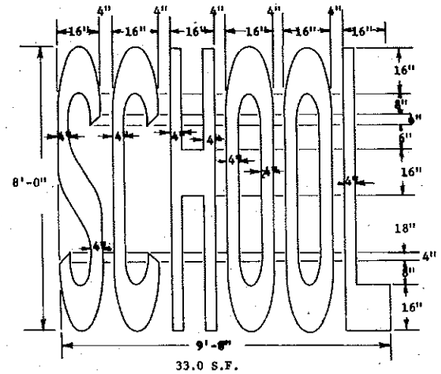

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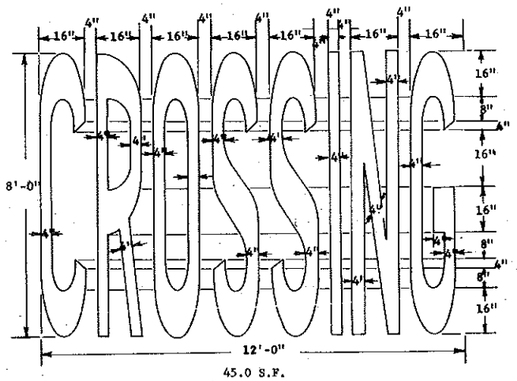

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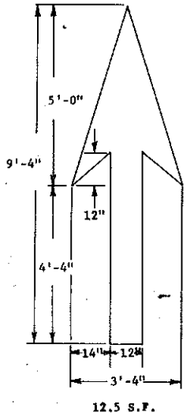

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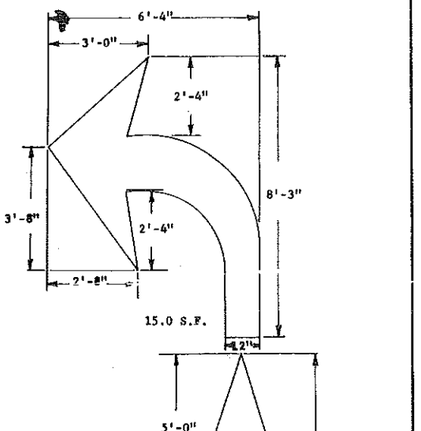

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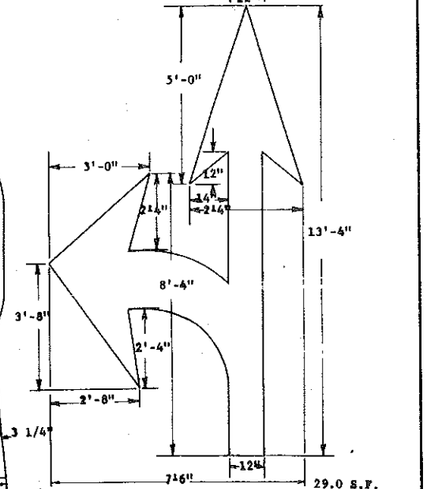

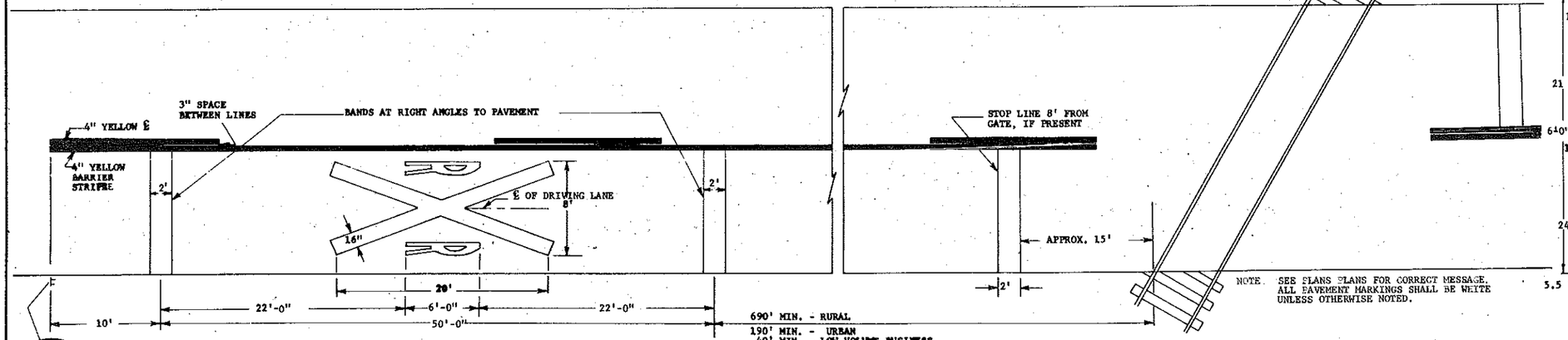

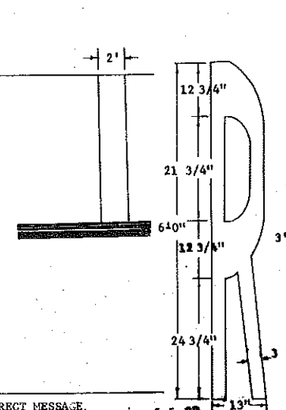

W10-1-36 SHALL BE PLACED WITHIN 10'± OF LOCATION SHOWN

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.

RAILROAD CROSS & 2 R'S 65.0 S.F.
3 BANDS 72.0 S.F.

NOTE. SEE PLANS PLANS FOR CORRECT MESSAGE. ALL PAVEMENT MARKINGS SHALL BE WHITE UNLESS OTHERWISE NOTED.

6-23-78 REVISIONS	
DATE	CHANGE
12-11-78	NOTE CHANGE
5-23-79	SIZES & AREA
6-20-79	Note Added
6-29-79	DIMENSIONS
12-20-79	DIMENSION & NOTES CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: Wilbert Stoll

Recommended: _____
Asst. Chief Engineer, Pre-Constr.

Approved: _____
Chief Engineer

INTERSTATE PAVEMENT MARKING
4 LANE DIVIDED HIGHWAY

F-I-194-4(45)000

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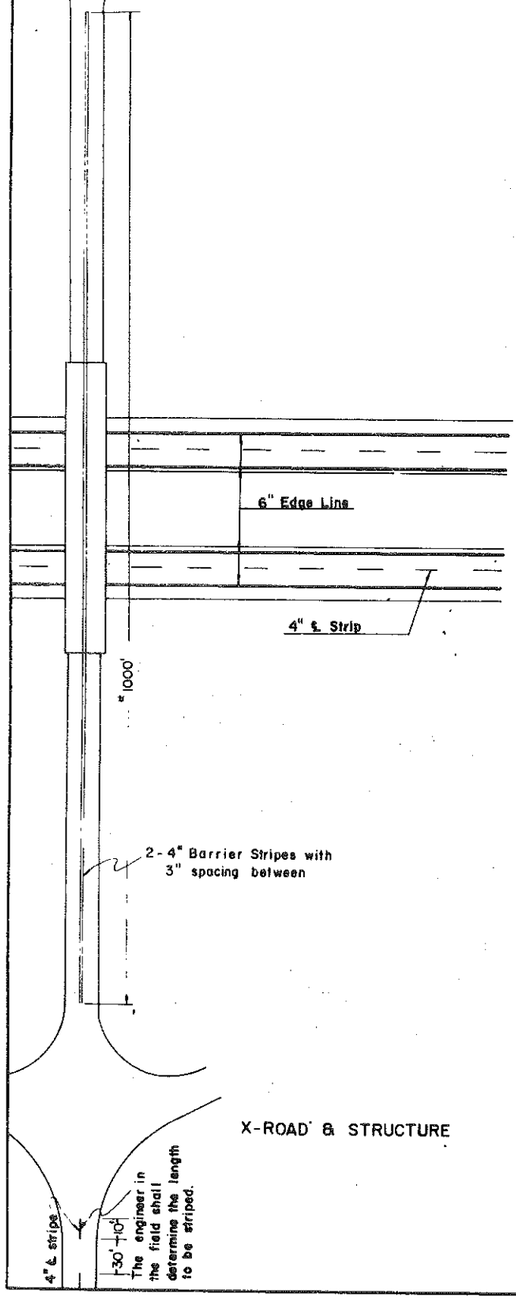
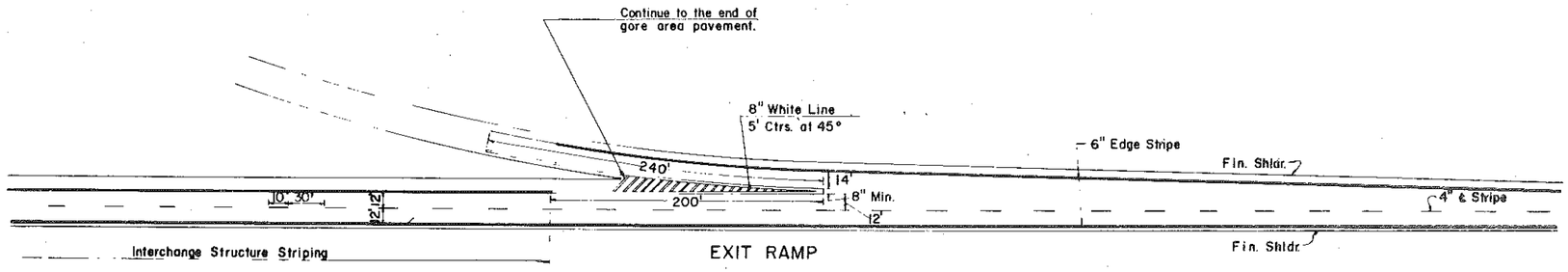
8	N.D.		54

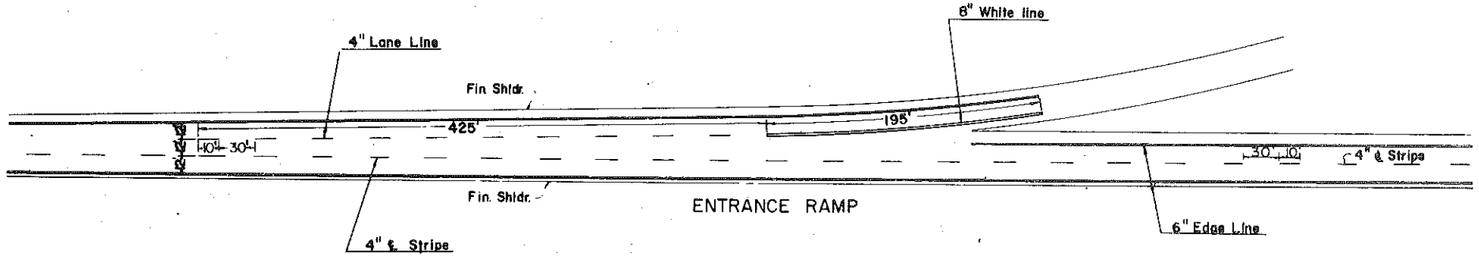
D-743-2



X-ROAD & STRUCTURE



EXIT RAMP



ENTRANCE RAMP

LEGEND
- Designates 8" stripe
- Designates 4" or 6" stripe as shown.
- # Basis of estimate only

NOTES:

LANE LINE STRIPE: The right edge of this stripe shall be located a minimum of 1" left of the centerline joint.

PAVEMENT EDGE STRIPE: All stripes located on this pavement edge shall be placed so that the edge of the stripe is 1" outside the edge of the driving lane.

RAMP STRIPE: Stripe as shown.

All stripes to be reflectorized.

All striping shall be white except barrier stripes, centerline of 2-Lane roads, and median edge markings shall be yellow.

Pavement edge stripe is not required where major road goes over minor road.

All lines will be measured by the linear foot of four inch line. The line greater than four inches in width will be divided by four inches and multiplied by its length to obtain the pay length.

BASIS OF ESTIMATE	
ITEM	L. F.
Lane Line Stripe (Two Roadways)	2640/mile
Interchange Structures (Two Roadways)	2160 *
Standard Exit Ramp (One Ramp)	1750
Standard Entrance Ramp (One Ramp)	550
Crossroad ℄	2000
Grade Separation (Two Roadways)	1040 *
Edge line (Two Roadway)	31,680/Mile

* Not Required When Edge Lined

8-1-69

REVISIONS	
DATE	CHANGE
1-10-71	Add Edge Line.
10-27-72	Added to Note.
4-24-74	Change ℄ Marking
7-15-75	Change in Notes
7-17-75	Table Change
8-13-76	Add Note
6-21-77	Center Line Stripe Length & Note

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: R. Thomas
Design Engineer

Recommended:
Asst. Chief Engineer, Pre-Const.

Approved: R. E. Bradley
Chief Engineer

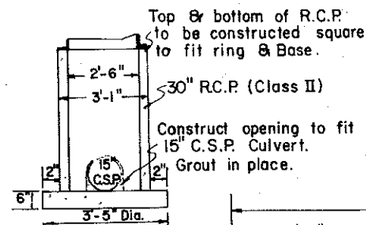
FI-194-4(45)

8	N.D. 55

D-752-3

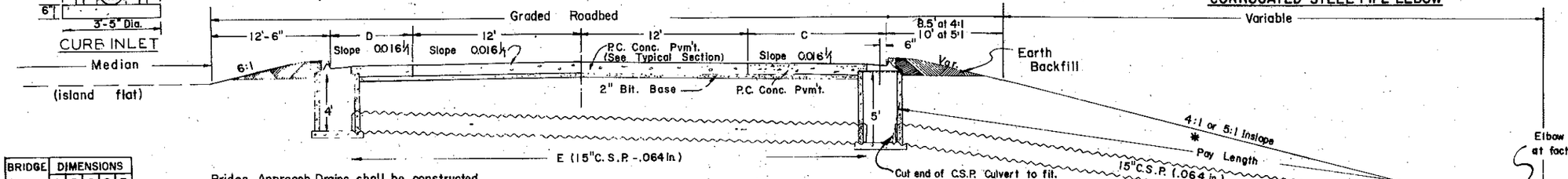
BRIDGE APPROACH SLAB DRAINS

(4-LANE OVER MINOR ROAD)



CURB INLET

GRADED ROADBED		BRIDGE WIDTH
4:1	5:1	
57'	58.5'	36'
58'	59.5'	37'
61'	62.5'	40'

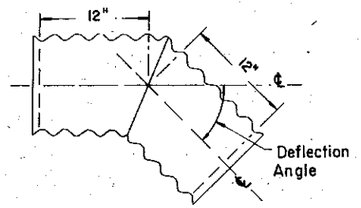


CROSS-SECTION
36' From Bridge End

BRIDGE WIDTH	DIMENSIONS				
	A	B	C	D	E
36'	18'	3'	9'	3'	33'
37'	18.5	3.5	10'	3'	34'
40'	20'	2'-10"	10'	3'-2"	37'

Bridge Approach Drains shall be constructed in accordance with section 752 of the Standard Specifications.

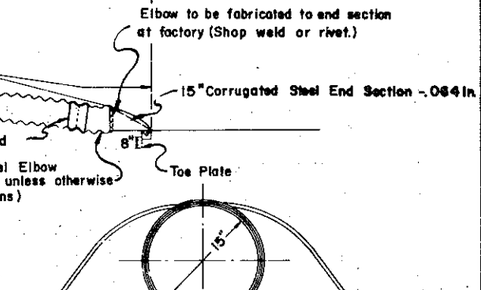
Payment for Bridge Approach Drains shall include inlets and 15" C.S.P. connecting Culvert between inlets.

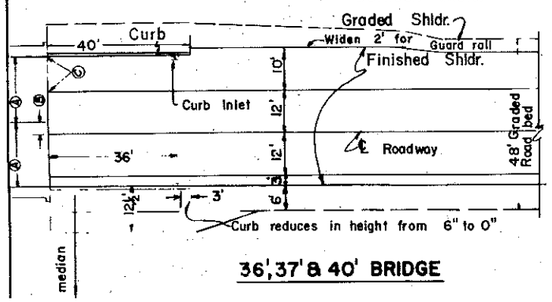


CORRUGATED STEEL PIPE ELBOW

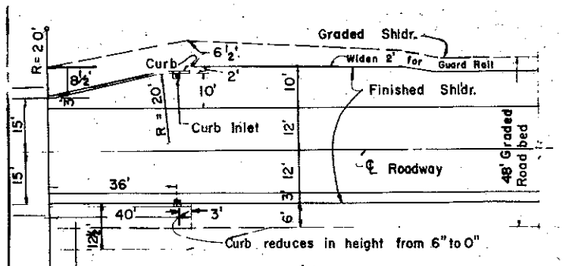
NOTES:
See Std. D-630-4 for corrugated steel Pipe Culverts and End Sections.

* Pay length for 15" C.S.P. Culvert will include the Corrugated Steel Elbow and connecting Band. 15" Corrugated Steel End Section will be a separate pay item.



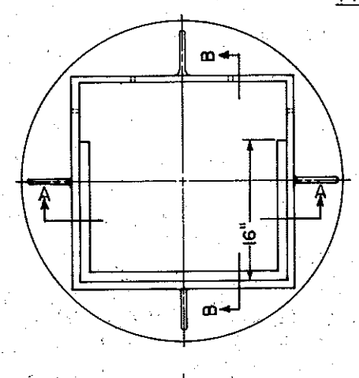


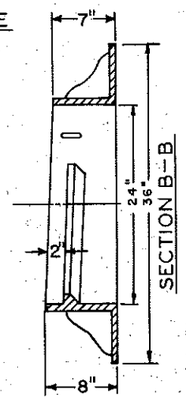
36', 37' & 40' BRIDGE

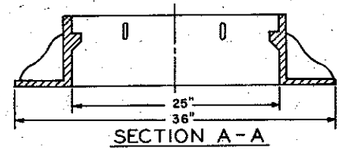


30' BRIDGE

FRAME

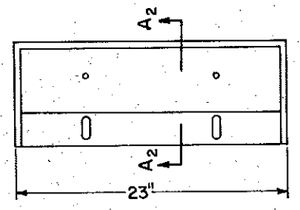






SECTION A-A

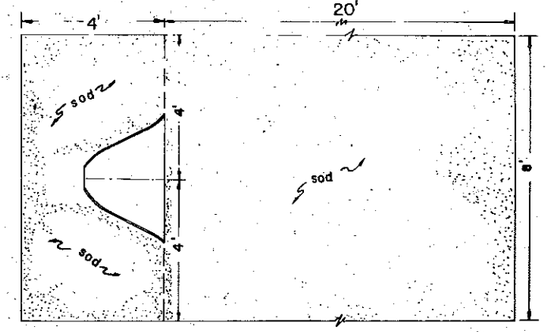
BOX



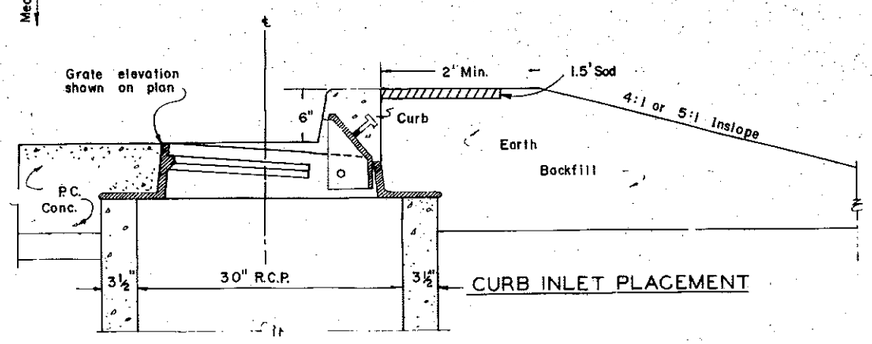
SECTION A2-A2

ELEVATION
(TOE PLATE)

Galvanized Toe Plate to be fastened to End Section in the field. Thick. of Toe Plate to be same as End Section. Toe Plate, Bolts and Nuts are to be included in price bid for End Sections.

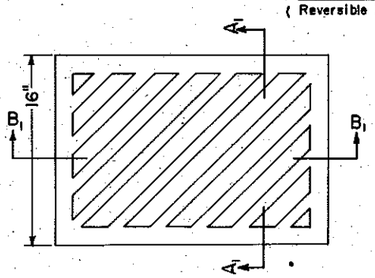


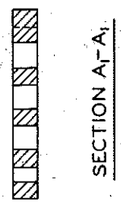
PLAN VIEW-SODDING DETAIL



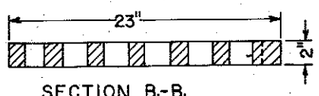
CURB INLET PLACEMENT

GRATE
(Reversible)





SECTION A1-A1



SECTION B1-B1
(1" diagonal bars with 1½" openings)

1-1-75	
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer.

Recommended: Asst. Chief Engineer Pre Construction

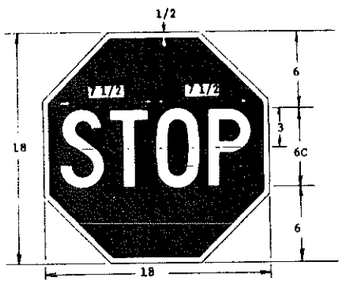
Approved: _____ Chief Engineer

4.10 H

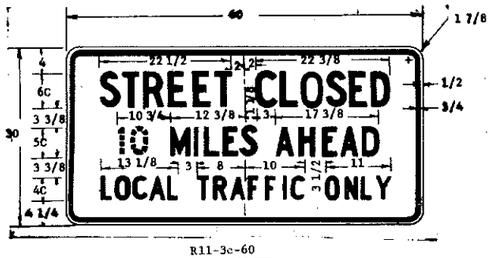
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	56

D754-I

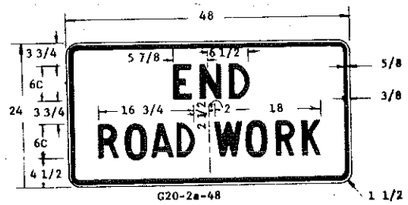
CONSTRUCTION SIGN DETAILS



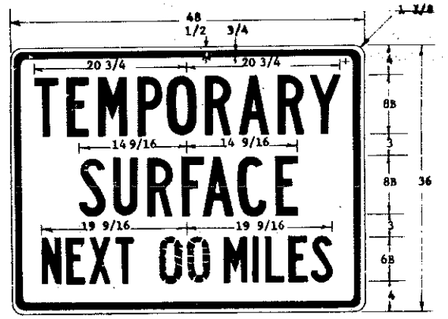
STOP-SLOW PADDLE
RED & WHITE
FLAGPERSON PADDLE



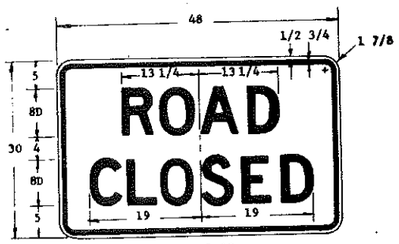
R11-3c-60
BLACK & WHITE



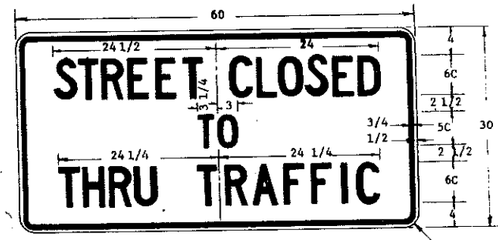
G20-2a-48
BLACK & ORANGE



G20-6-48
BLACK & ORANGE



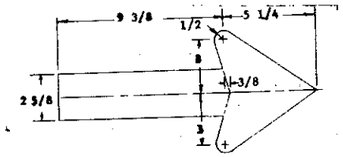
R11-2-48
BLACK & WHITE



R11-4a-60
BLACK & WHITE

G20-4-36
BLACK & ORANGE

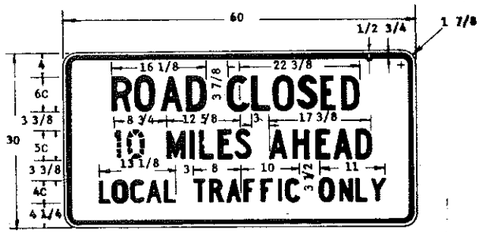
PILOT CAR SIGN SHALL BE MOUNTED ON REAR OF A VEHICLE USED FOR GUIDING CONTROLLED ONE-WAY TRAFFIC THROUGH A CONSTRUCTION AREA.



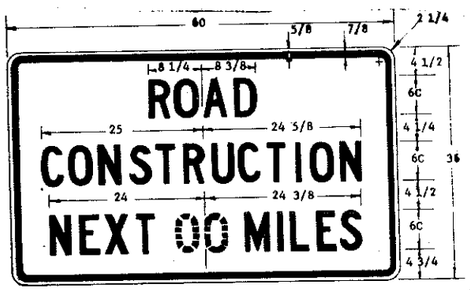
ARROW DETAIL FOR SIGN NO'S.
G20-50-72 AND G20-52-72

MESSAGES AND BORDERS: THE MESSAGES AND BORDERS SHALL BE SCREENED ON REFLECTIVE SHEETING OR INSTALLED USING PIGMENTED PLASTIC FILM CONFORMING TO THE REQUIREMENT OF SEC. 894-3.5 OF THE STD. SPECIFICATIONS. THE PIGMENTED PLASTIC FILM SHALL BE INSTALLED IN ACCORDANCE WITH THE REFLECTIVE SHEETING MANUFACTURERS RECOMMENDATIONS. THE BORDERS SHALL HAVE THE RADII AND WIDTH SHOWN ON THE PLANS. THE LETTERS SHALL BE FABRICATED IN ACCORDANCE WITH THE STANDARD LETTER GUIDE OF THE HEIGHT AND SERIES SHOWN ON THE PLANS. THE DESIGN OF THESE LETTERS MAY BE OBTAINED FROM THE STATE HIGHWAY DEPARTMENT OR THE SHEETING MANUFACTURER.

NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.



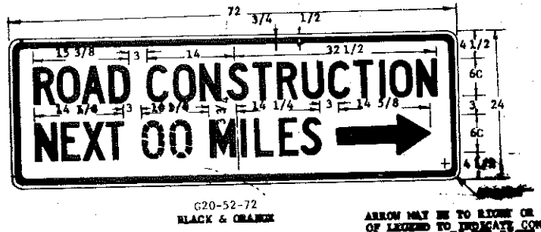
R11-3b-60
BLACK & WHITE



G20-1-60
BLACK & ORANGE

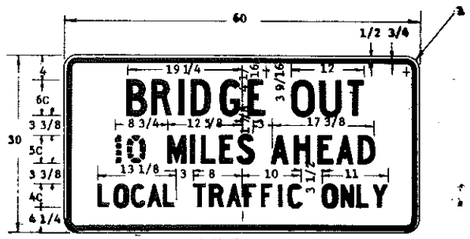
THIS SIGN SHALL INCLUDE THE PANEL NUMBERED G20-53-60.

G20-50-72
BLACK & ORANGE

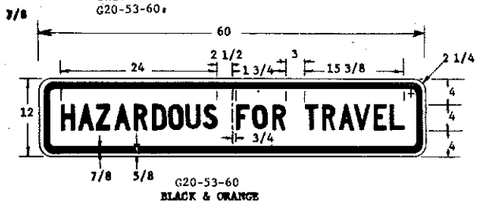


G20-52-72
BLACK & ORANGE

ARROW MAY BE TO RIGHT OR LEFT OF LEGEND TO INDICATE CONSTRUCTION TO THE RIGHT OR LEFT.



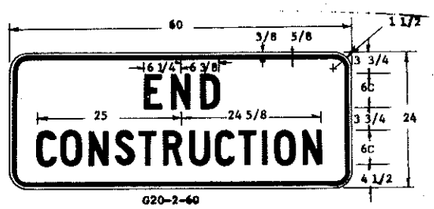
R11-3b-60
BLACK & WHITE



G20-53-60
BLACK & ORANGE

G20-54-48
BLACK & ORANGE

R11-2a-48, BLACK & WHITE



G20-2-60
BLACK & ORANGE

2-17-78	
REVISIONS	
DATE	CHANGE
12-18-78	TITLE ADDED
2-21-80	SIGN COLOR
6-23-80	SIGN NUMBERS
9-9-80	SIGN COLOR
9-19-80	SIGN NUMBERS

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____
Design Engineer

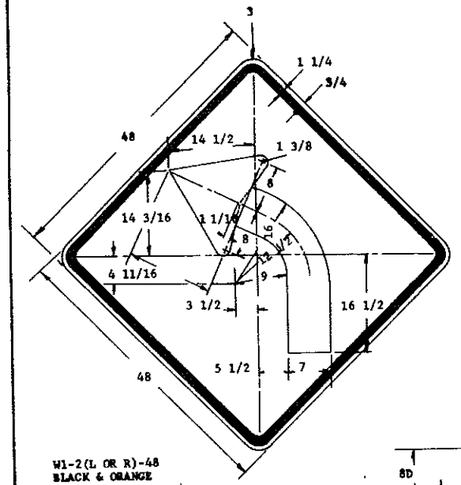
Recommended: _____
Asst Chief Engineer, Pre-Constr.

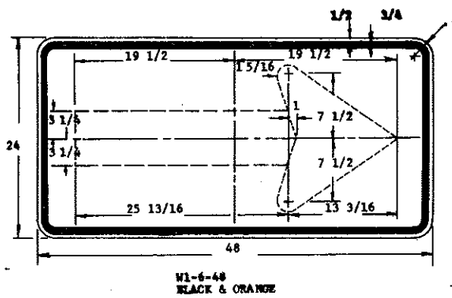
Approved: _____
Chief Engineer

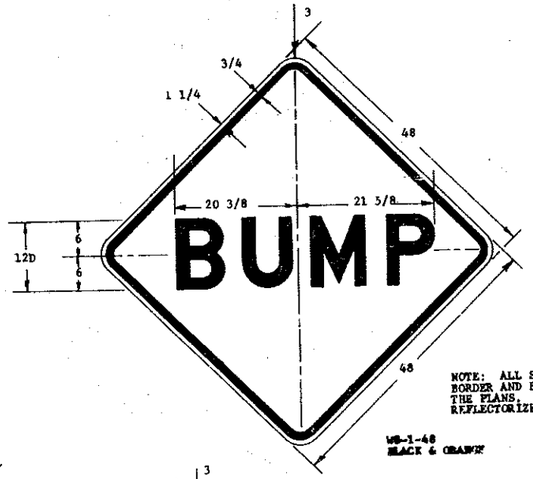
CONSTRUCTION SIGN DETAILS

FHWA REGION	STATE	FED. AID PROJECT NO	SHEET NO
8	N.D.	FI-194-4(45)	57

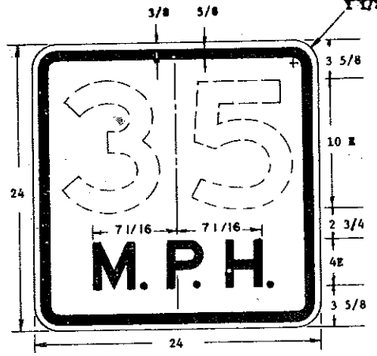
D-754-2

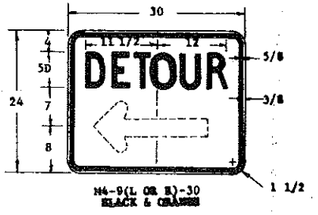


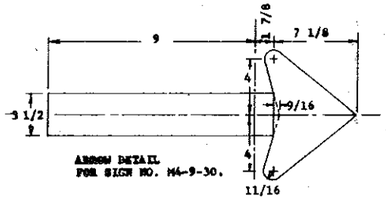


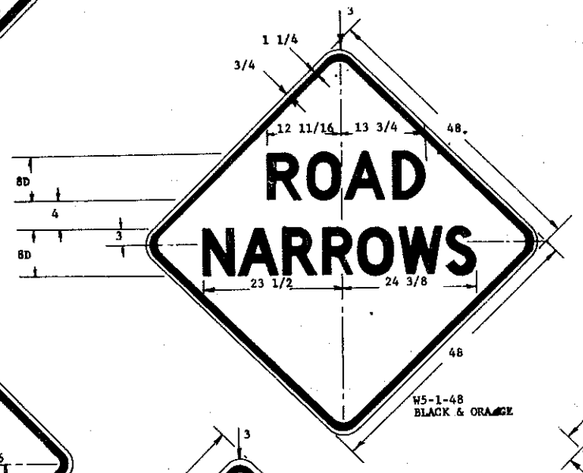


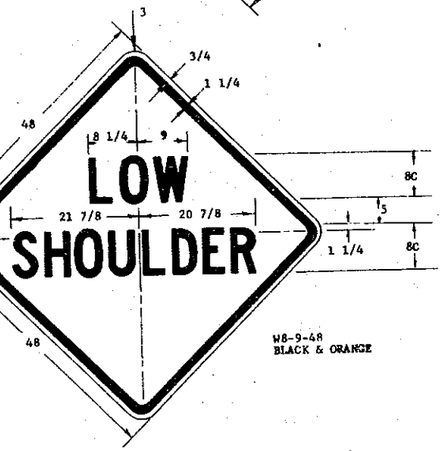
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.

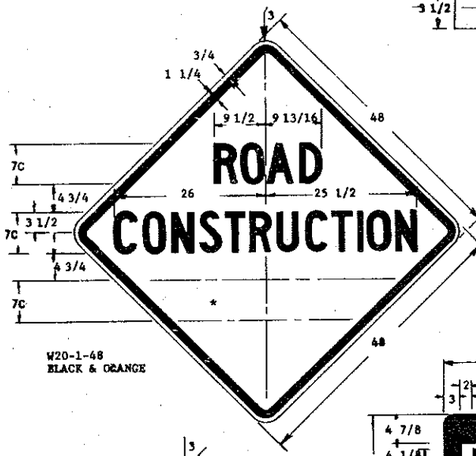




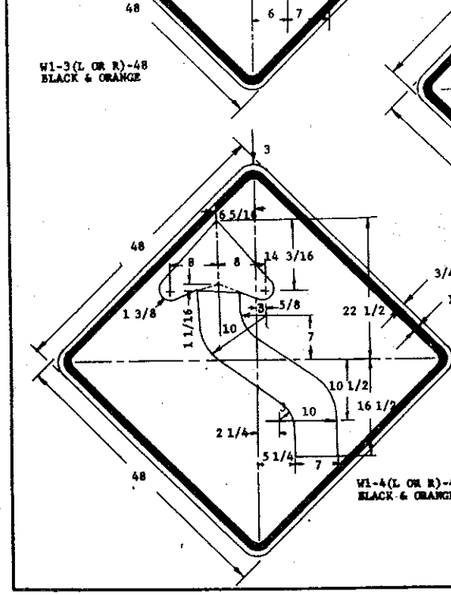


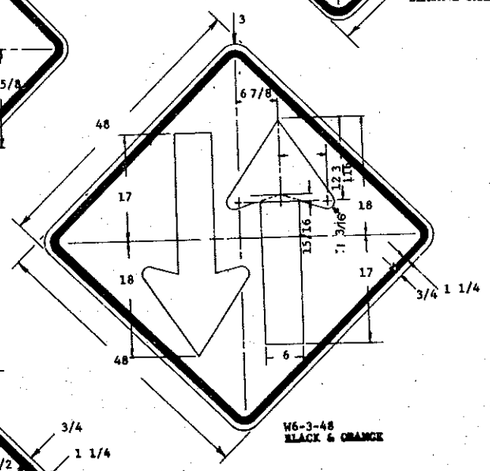


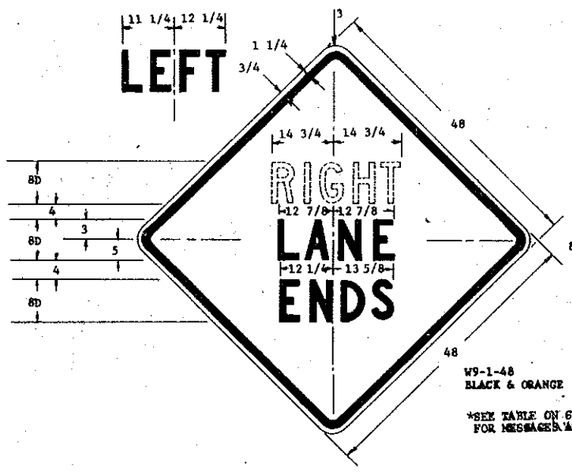




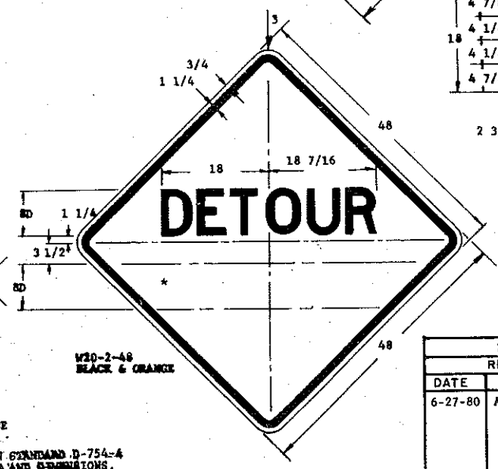
MESSAGES AND BORDERS: THE MESSAGES AND BORDERS SHALL BE SCREENED ON REFLECTIVE SHEETING OR INSTALLED USING PIGMENTED PLASTIC FILM CONFORMING TO THE REQUIREMENT OF SEC. 894-3.5 OF THE STD. SPECIFICATIONS. THE PIGMENTED PLASTIC FILM SHALL BE INSTALLED IN ACCORDANCE WITH THE REFLECTIVE SHEETING MANUFACTURERS RECOMMENDATIONS. THE BORDERS SHALL HAVE THE RADII AND WIDTH SHOWN ON THE PLANS. THE LETTERS SHALL BE FABRICATED IN ACCORDANCE WITH THE STANDARD LETTER GUIDE OF THE HEIGHT AND SERIES SHOWN ON THE PLANS. THE DETAILS OF THESE LETTERS MAY BE OBTAINED FROM THE STATE HIGHWAY DEPARTMENT OR THE SHEETING MANUFACTURER.

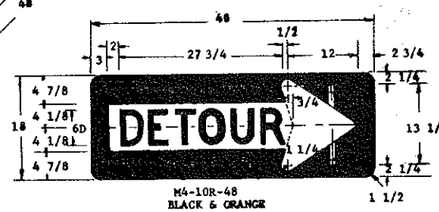


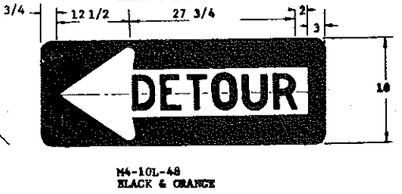




*SEE TABLE ON STANDARD D-754-4 FOR MESSAGES AND DIMENSIONS.







2-17-78	
REVISIONS	
DATE	CHANGE
6-27-80	ADDED NOTE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

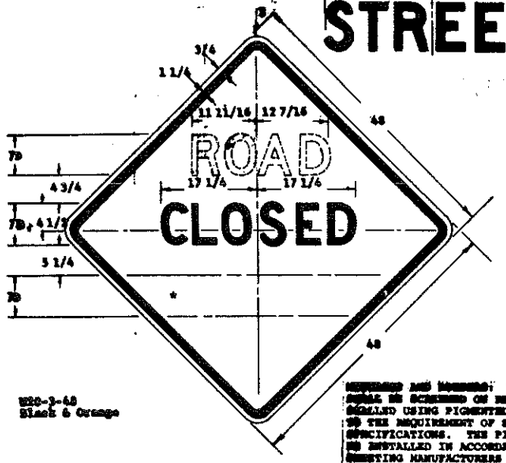
Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer, Pre-Constr.

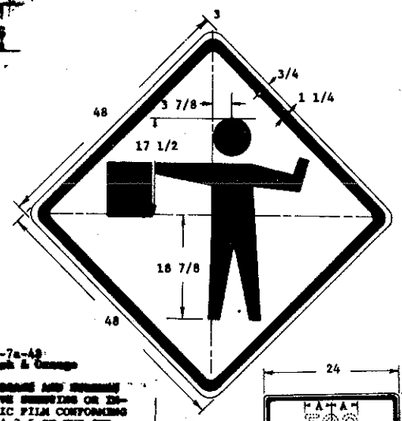
Approved: _____ Chief Engineer

CONSTRUCTION SIGN DETAILS

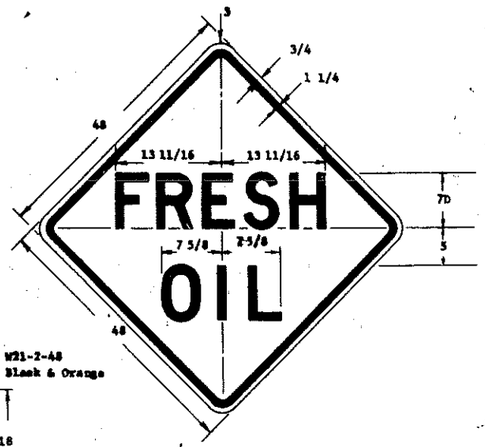
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	58
		D 754 - 3	



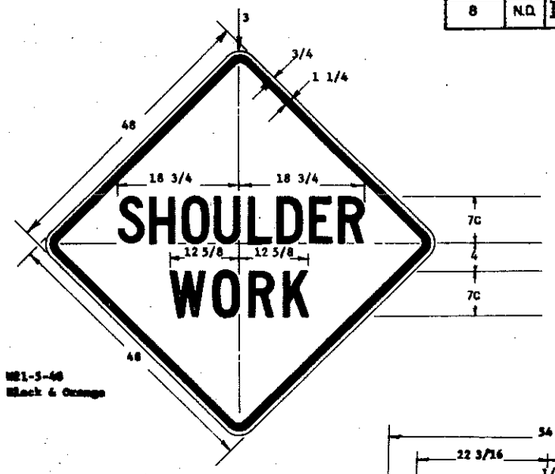
W20-3-48
Black & Orange



W20-7a-48
Black & Orange

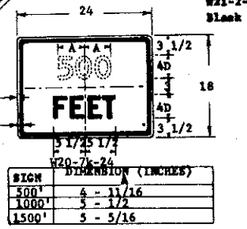


W21-2-48
Black & Orange



W21-5-48
Black & Orange

NOTE: EXISTING INVENTORY OF FLAGMAN & MEN WORKING SIGNS WITH WORD MESSAGES MAY BE USED UNTIL THEY NEED REPLACEMENT.

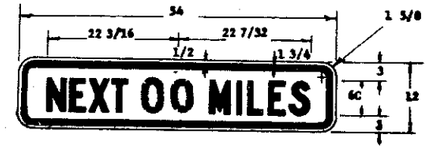


W20-7a-24

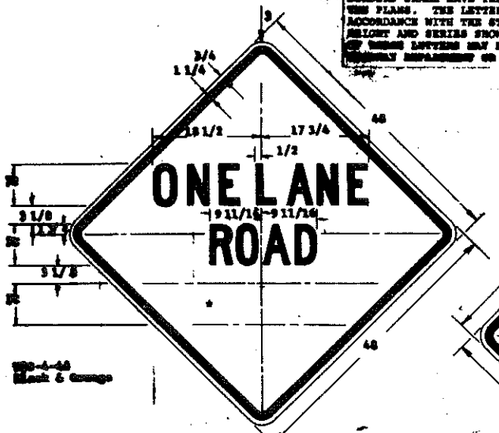
SIGN	DIMENSION (INCHES)
500'	4 - 11/16
1000'	5 - 1/2
1500'	5 - 5/16

FOR USE WITH W20-7a-48 & W21-1a-48

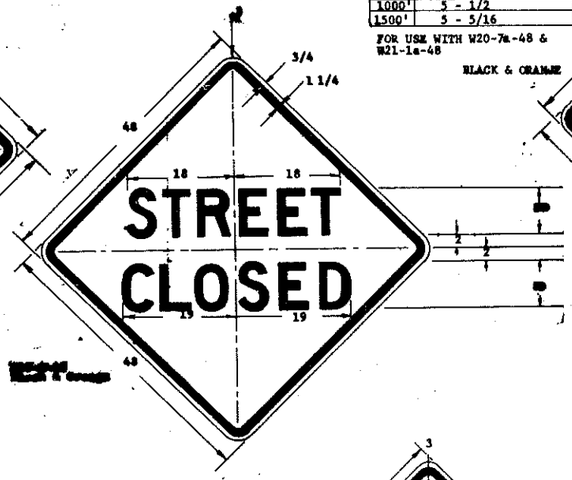
BLACK & ORANGE



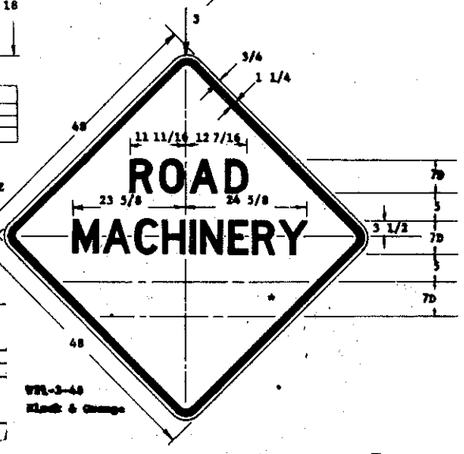
W20-52-54
Black & Orange



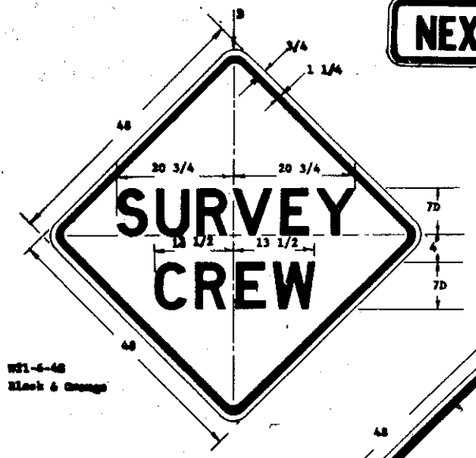
W20-4-48
Black & Orange



W21-1a-48
Black & Orange

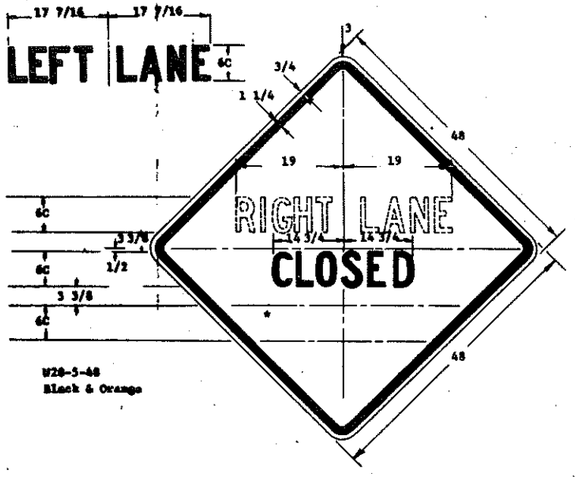


W21-3-48
Black & Orange

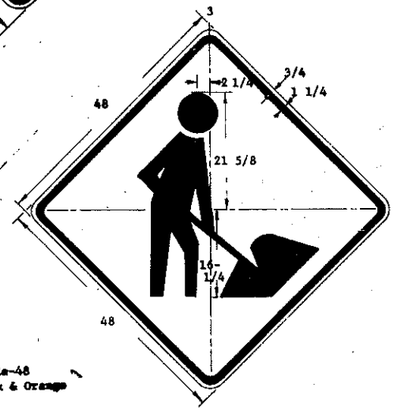


W21-6-48
Black & Orange

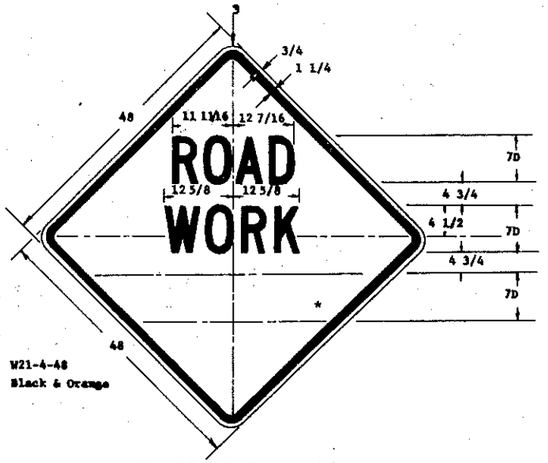
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE, BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.



W20-5-48
Black & Orange

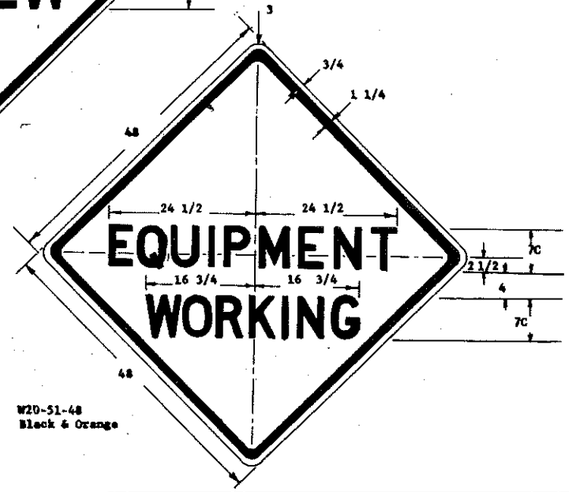


W21-1a-48
Black & Orange



W21-4-48
Black & Orange

*SEE TABLE ON STANDARD D-754-4 FOR MESSAGES AND DIMENSIONS.



W20-51-48
Black & Orange

REVISIONS	
DATE	CHANGE
5-14-79	Symbols Added
1-16-80	ADD DIMENSION
6-27-80	REVISED SIGN NO.'S

2-17-78

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: Design Engineer

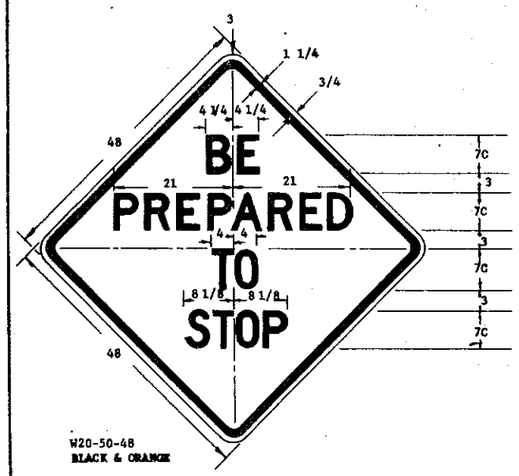
Recommended: Asst. Chief Engineer, Pre-Constr.

Approved: Chief Engineer

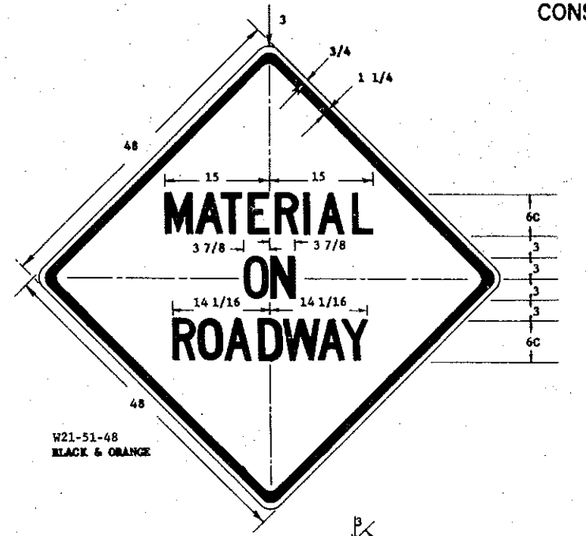
CONSTRUCTION SIGN DETAILS

FHWA REGION		FED. AID PROJECT NO	SHEET NO.
8	N.D.	FI-194-4(45)	59

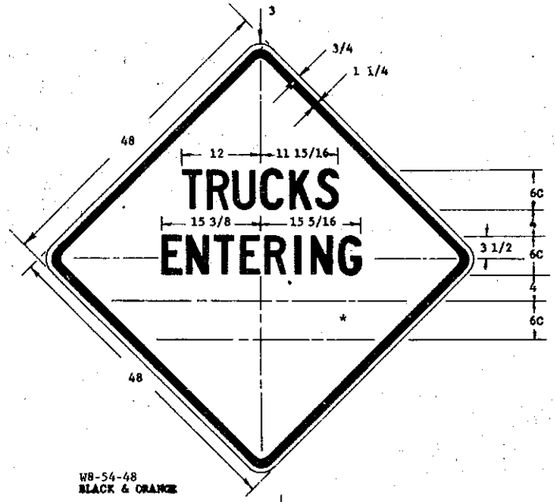
D 754-4



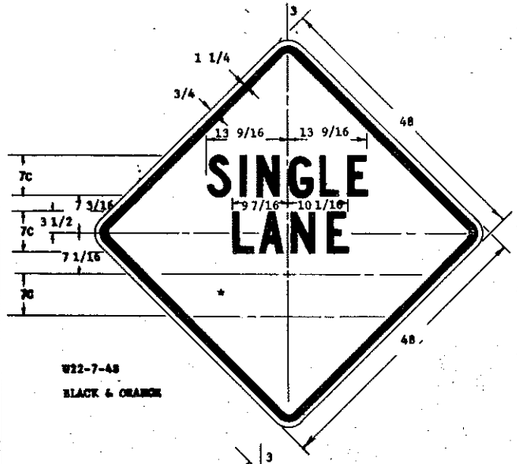
W20-50-48
BLACK & ORANGE



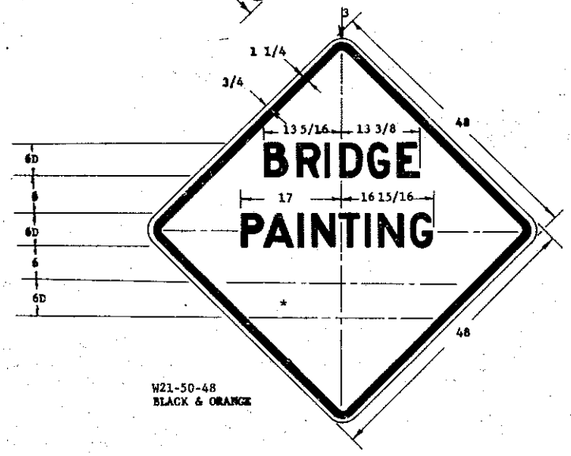
W21-51-48
BLACK & ORANGE



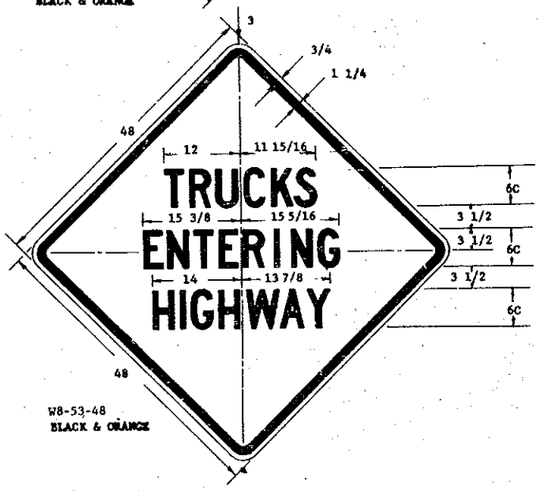
W8-54-48
BLACK & ORANGE



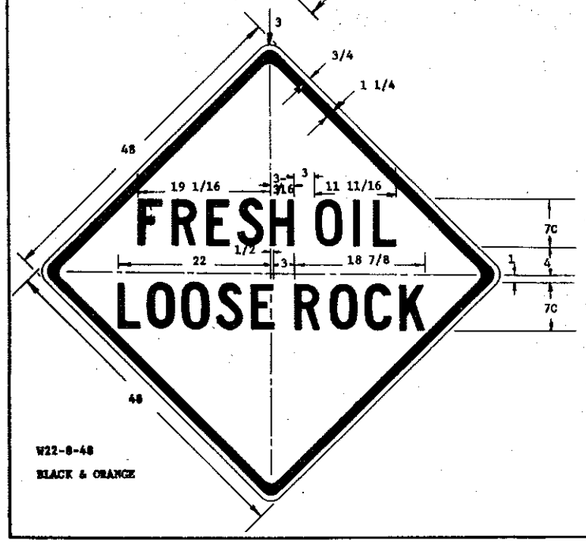
W22-7-48
BLACK & ORANGE



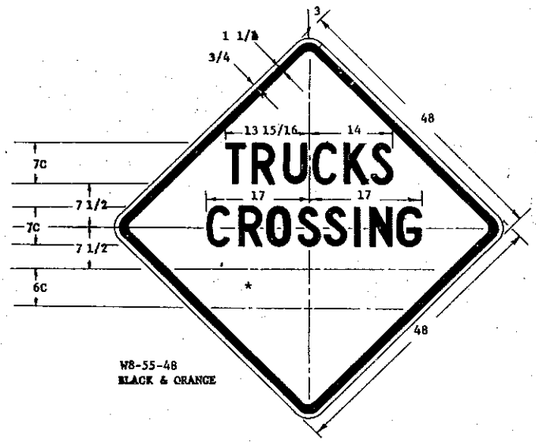
W21-50-48
BLACK & ORANGE



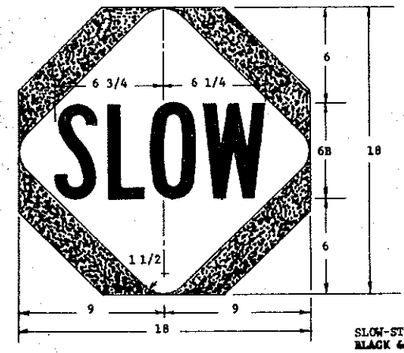
W8-53-48
BLACK & ORANGE



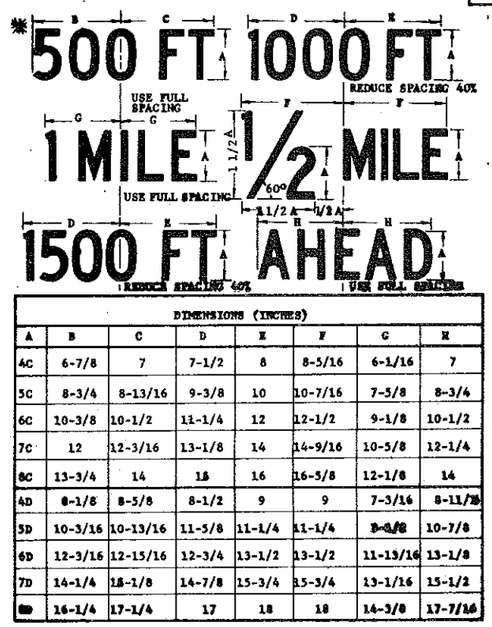
W22-8-48
BLACK & ORANGE



W8-55-48
BLACK & ORANGE



SLOW-STOP PADDLE
BLACK & ORANGE
FLAGPERSON PADDLE



DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
4C	6-7/8	7	7-1/2	8	8-5/16	6-1/16	7
5C	8-3/4	8-13/16	9-3/8	10	10-7/16	7-5/8	8-3/4
6C	10-3/8	10-1/2	11-1/4	12	12-1/2	9-1/8	10-1/2
7C	12	12-3/16	13-1/8	14	14-9/16	10-5/8	12-1/4
8C	13-3/4	14	15	16	16-5/8	12-1/8	14
4D	8-1/8	8-5/8	8-1/2	9	9	7-3/16	8-11/16
5D	10-3/16	10-13/16	11-5/8	11-1/4	11-1/4	8-1/8	10-7/8
6D	12-3/16	12-15/16	12-3/4	13-1/2	13-1/2	11-13/16	13-1/8
7D	14-1/4	15-1/8	14-7/8	15-3/4	15-3/4	13-1/16	15-1/2
8D	16-1/4	17-1/4	17	18	18	14-3/8	17-7/16

MESSAGES AND BORDERS: THE MESSAGES AND BORDERS SHALL BE SCREENED ON REFLECTIVE SHEETING OR INSTALLED USING PIGMENTED PLASTIC FILM CONFORMING TO THE REQUIREMENT OF SEC. 894-3.5 OF THE STD. SPECIFICATIONS. THE PIGMENTED PLASTIC FILM SHALL BE INSTALLED IN ACCORDANCE WITH THE REFLECTIVE SHEETING MANUFACTURERS RECOMMENDATIONS. THE BORDERS SHALL HAVE THE RADII AND WIDTH SHOWN ON THE PLANS. THE LETTERS SHALL BE FABRICATED IN ACCORDANCE WITH THE STANDARD LETTER GUIDE OF THE REGENT AND SERIES SHOWN ON THE PLANS. THE DETAILS OF THESE LETTERS MAY BE OBTAINED FROM THE STATE HIGHWAY DEPARTMENT OR THE SHEETING MANUFACTURER.

NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.

STANDARD SIGNS THAT ARE SHOWN IN THE CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS SHALL BE FABRICATED IN THE SHAPE, COLOR AND DIMENSIONS AS SHOWN IN THE STANDARD SIGNS LAYOUT BOOKLET.

2-17-78	
REVISIONS	
DATE	CHANGE
6-27-80	REVISED SIGN NO.'S

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

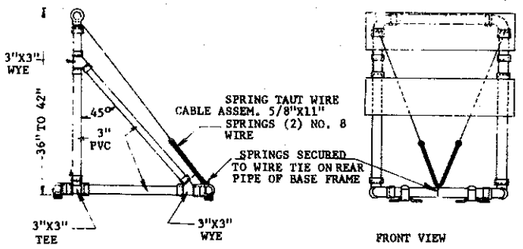
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	60

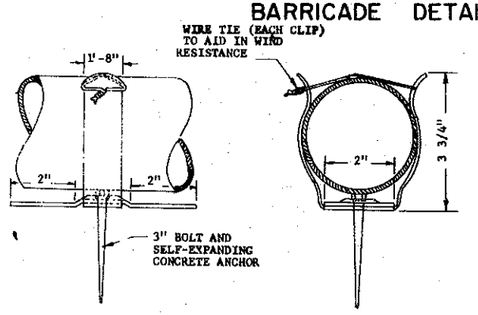
D 754-5

BARRICADE DETAILS



SIDE VIEW

FRONT VIEW

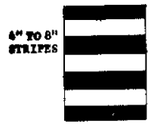


TYPICAL CLAMP DETAIL

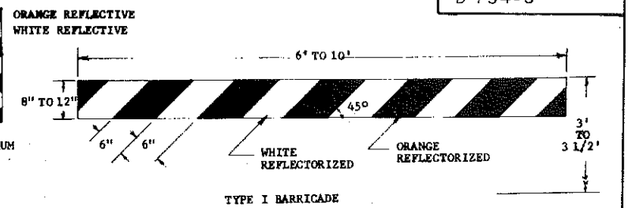
(SINGLE FIRE EXTINGUISHER CLIPS, 3 1/2" DIA.)

DELINEATOR DRUMS

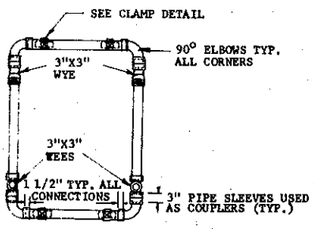
THE MARKINGS ON DRUMS SHALL BE ORANGE AND WHITE STRIPES 4 TO 8 INCHES WIDE. THERE SHALL BE AT LEAST THREE ORANGE AND TWO WHITE STRIPES. WHERE DRUMS HAVE RIBS OR OR INDENTATION THERE SHALL BE NO REFLECTORIZED SHEETING IN THIS AREA. THIS SPACE SHALL BE PAINTED ORANGE AND SHALL BE NO MORE THAN 2 INCHES WIDE. THE STRIPE COLOR SHALL BE CHANGED AT THESE POINTS (ORANGE ABOVE WHITE BELOW OR WHITE ABOVE AND ORANGE BELOW). THE DRUM SURFACE SHALL BE PREPARED AS RECOMMENDED BY THE SHEETING MANUFACTURER BEFORE REFLECTIVE SHEETING IS APPLIED.



DELINEATOR DRUM



TYPE I BARRICADE



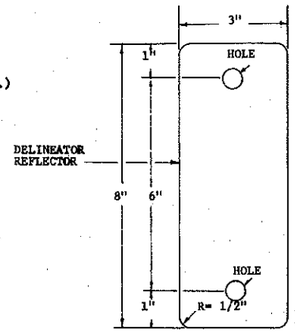
BASE

NOTE:

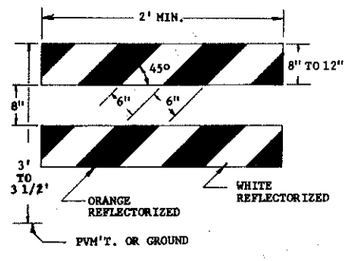
THE PIPE, WYES, TEES AND ELBOWS USED TO CONSTRUCT TYPE II BARRICADES (SPECIAL) SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION: D 2241 FOR PVC 1120 OR 1220, SDR 21, PRESSURE RATING 200 P.S.I. THE WYES, TEES AND ELBOWS SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION: D 2466, TYPE II, GRADE 1. ALL JOINTS SHALL BE SLIP-FIT AND SHALL NOT BE THREADED OR CEMENTED.

THE 9" X 48" BARRICADE RAILS SHALL BE FABRICATED FROM 0.025" ANODIZED ALUMINUM AND SHALL BE ATTACHED WITH 1 INCH NO. 14 PAN HEAD METAL SCREWS. COLORS: REFLECTIVE ORANGE AND REFLECTIVE WHITE.

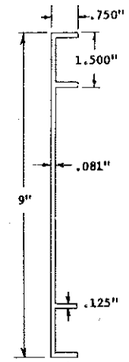
BREAKAWAY BARRICADE ASSEMBLY



3" X 8" - 18 GUAGE GALVANIZED STEEL SHEETS, OR .080" ALUMINUM PLATE WITH WHITE REFLECTIVE SHEETING (ENCAPSULATED LENS) AS SPECIFIED IN SECTION 894 OF THE STANDARD SPECIFICATIONS.

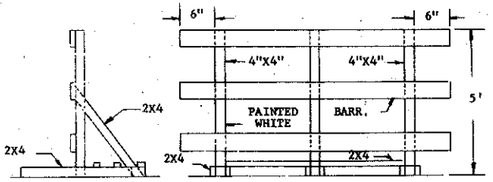


TYPE II BARRICADE



EXTRUDED ALUMINUM BARRICADE

BAR DETAIL

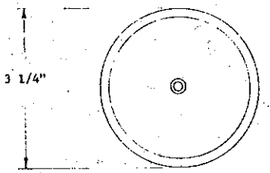


SIDEVIEW FRONT VIEW

MOVABLE BARRICADE ASSEMBLY

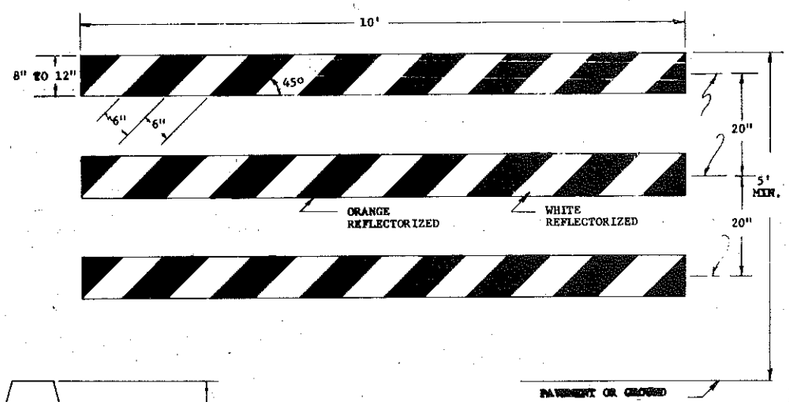
NOTE:

EACH MOVABLE BARRICADE SHALL BE WEIGHTED DOWN BY A SUFFICIENT NUMBER OF SAND BAGS OR OTHER SUITABLE WEIGHT SO THAT IT WILL NOT BE BLOWN OVER BY THE WIND UNLESS THE MOVABLE SUPPORTING STRUCTURE IS CONSTRUCTED IN SUCH A MANNER THAT THE WIND CANNOT BLOW IT OVER.
WEIGHT USED SHALL BE APPROVED BY THE ENGINEER IN THE FIELD.
THE STRIPES SHALL SLANT DOWNWARD TOWARD THE SIDE WHICH TRAFFIC IS TO PASS.
BARRICADES USED AT THE BEGINNING OF A PROJECT SHALL FACE TRAFFIC ENTERING THAT PROJECT.

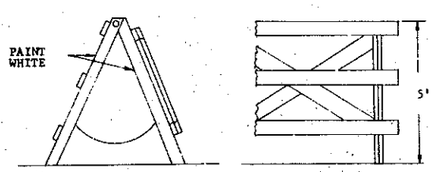


ACRYLIC PLASTIC REFLECTOR

DELINEATOR REFLECTOR SHALL MEET THE REQUIREMENTS OF SECTION 894.

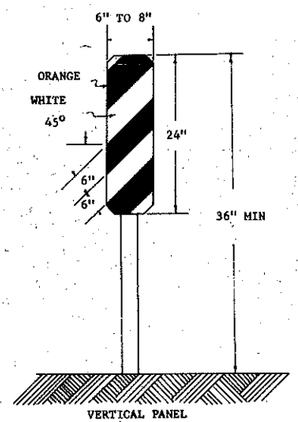


TYPE III BARRICADE

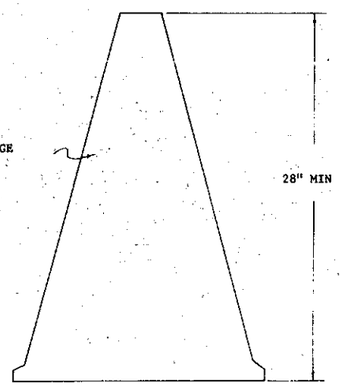


SIDE VIEW FRONT VIEW

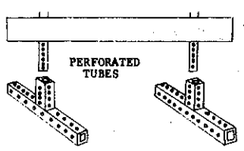
HINGED BARRICADE ASSEMBLY



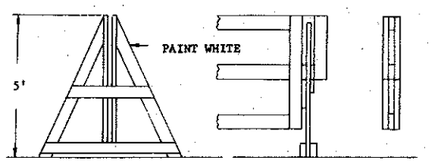
VERTICAL PANEL



CONE



SECTIONAL BARRICADE



SIDE VIEW FRONT VIEW END VIEW

DEMOUNTABLE BARRICADE ASSEMBLY

2-17-78	
REVISIONS	
DATE	CHANGE
5-14-79	Delineator Drum Removed

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted _____ Design Engineer

Recommended _____ Asst. Chief Engineer, Pre-Constr.

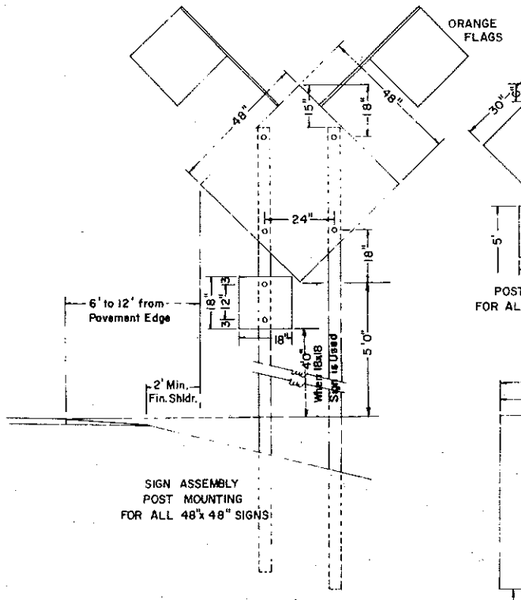
Approved _____ Chief Engineer

CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

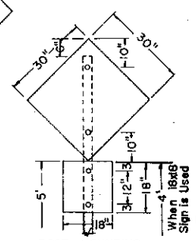
FI-194-4(45)

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		61

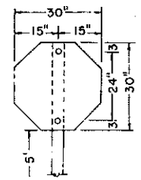
D-754-5-A



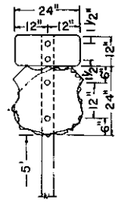
SIGN ASSEMBLY
POST MOUNTING
FOR ALL 48"x48" SIGNS



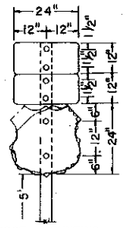
POST MOUNTING
FOR ALL 30"x30" SIGNS



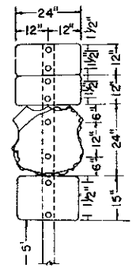
POST MOUNTING
FOR SIGN NO. R-1-30



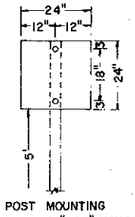
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN & ONE ROUTE MARKER



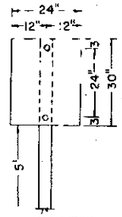
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN, ONE DETOUR SIGN
& ONE ROUTE MARKER



POST MOUNTING
FOR ASSEMBLIES WITH ONE
CARDINAL DIRECTION SIGN, ONE
DETOUR SIGN, ONE ROUTE MARKER
& ONE DIRECTIONAL ARROW



POST MOUNTING
FOR ALL 24"x24" SIGNS



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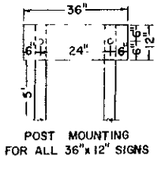
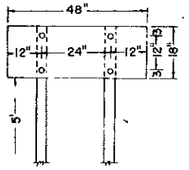
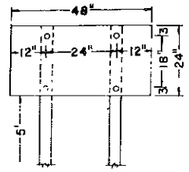
FOR ALL 24"x30" SIGNS



POST MOUNTING
FOR ALL 36"x12" SIGNS



POST MOUNTING
FOR ALL 48"x18" SIGNS



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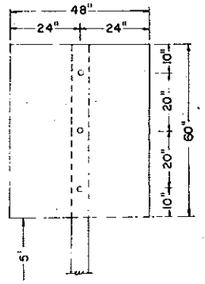
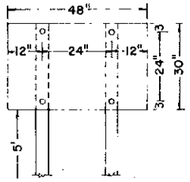
FOR ALL 48"x24" SIGNS



POST MOUNTING
FOR ALL 48"x60" SIGNS



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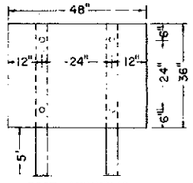
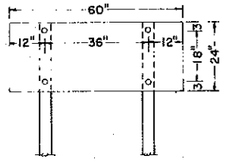
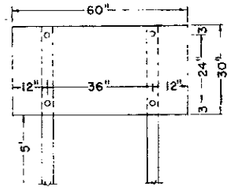
FOR ALL 48"x30" SIGNS



POST MOUNTING
FOR ALL 48"x36" SIGNS



POST MOUNTING
FOR ALL 60"x24" SIGNS



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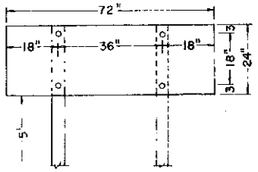
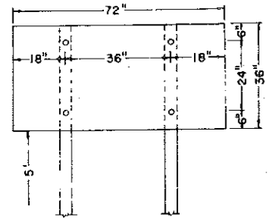
FOR ALL 60"x30" SIGNS



POST MOUNTING
FOR ALL 72"x24" SIGNS



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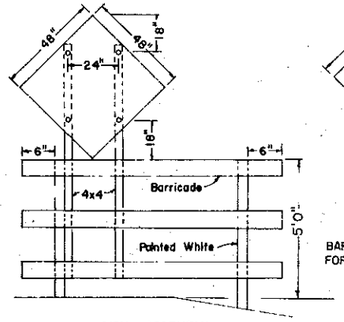
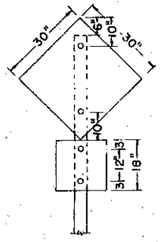
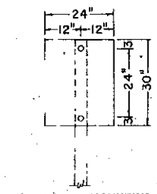
FOR ALL 72"x36" SIGNS



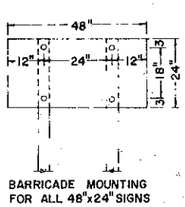
SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL 48"x48" SIGNS



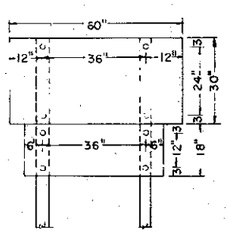
BARRICADE MOUNTING
FOR ALL 30"x30" SIGNS



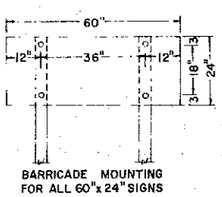
BARRICADE MOUNTING
FOR ALL 24"x30" SIGNS



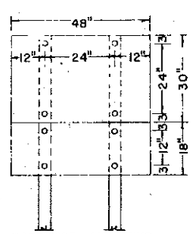
BARRICADE MOUNTING
FOR ALL 48"x24" SIGNS



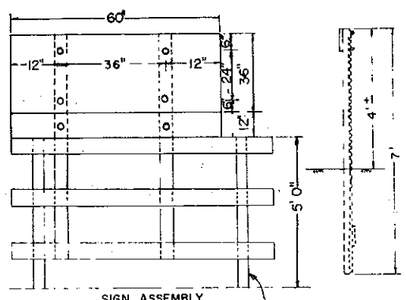
BARRICADE MOUNTING
FOR ALL 60"x30" SIGNS



BARRICADE MOUNTING
FOR ALL 60"x24" SIGNS

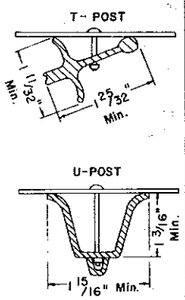


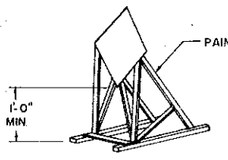
BARRICADE MOUNTING
FOR ALL 48"x30" & 48"x18" SIGNS



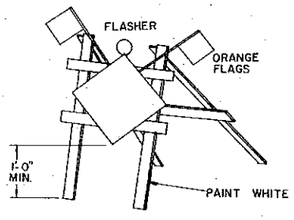
SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL G20-1-60 SIGNS

DELINEATOR ATTACHMENT
AND POST MOUNTING DETAILS





PORTABLE SIGN MOUNTING



PORTABLE SIGN MOUNTING

NOTES:

DELINEATOR POSTS: Typical fence post sections are shown in Attachment Details. Other types of metal fence posts may be substituted upon approval of the engineer. These substituted posts shall have reflectors attached similar to the ones shown.

BARRICADE MOUNTING SIGNS: The bottom of the sign shall be flush with the top of the top rail. Wood sign posts shall be 4x4 min. SFS or equivalent steel posts. See Stds. D-754-5 thru D-754-9 for construction sign and barricade location details. All barricades and barricade mounted signs shall be assembled with 3/8" bolts.

SIGN SUPPORTS: The sign supports shall be imbeded to a sufficient depth so that the signs will remain plumb throughout duration of the project. It is suggested that the min. depth of imbedment be 5'-0".

MATERIAL: All signs shall be .100" aluminum, 12 gage galv. steel, 1/2" plywood or other approved mat'l.

HOLES: All holes to be punched round for 3/8" bolts.

ALTERNAL MESSAGES: The signs that have alternate messages may have these alternate messages placed on a reflectorized plate without a border and this plate installed and removed as required.

2-17-78

REVISIONS	
DATE	CHANGE
8-21-78	DETAIL ADDED
4-16-79	SIGN NO. CORRECTION

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	62
		D-754-6	

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Lighting - The flashers and steady burn lights shall be maintained as shown. If the danger exists at night and the work area is close to the traffic lane, the edge of the traffic lane on the work area side shall be illuminated by steady burn lights spaced at 100 ft. centers. The flashers shall be placed at the beginning and middle of the hazard. Where traffic is tapered into another lane, the flashers shall be placed at the beginning and middle of the taper, and the remaining tapering devices shall be illuminated by steady burn lights. The steady burn light shall be spaced at the dimension S used in calculating length of tapes. Flashers shall be placed above the barricade bars and above all warning signs unless barricades and signs have encapsulated lens reflective faced.

FLAGS: All advance warning signs shall have two orange warning flags 24" square mounted perpendicular to the edges of the diamond sign and at such a distance above the edges so that when flag is hung limp it will not touch the sign.

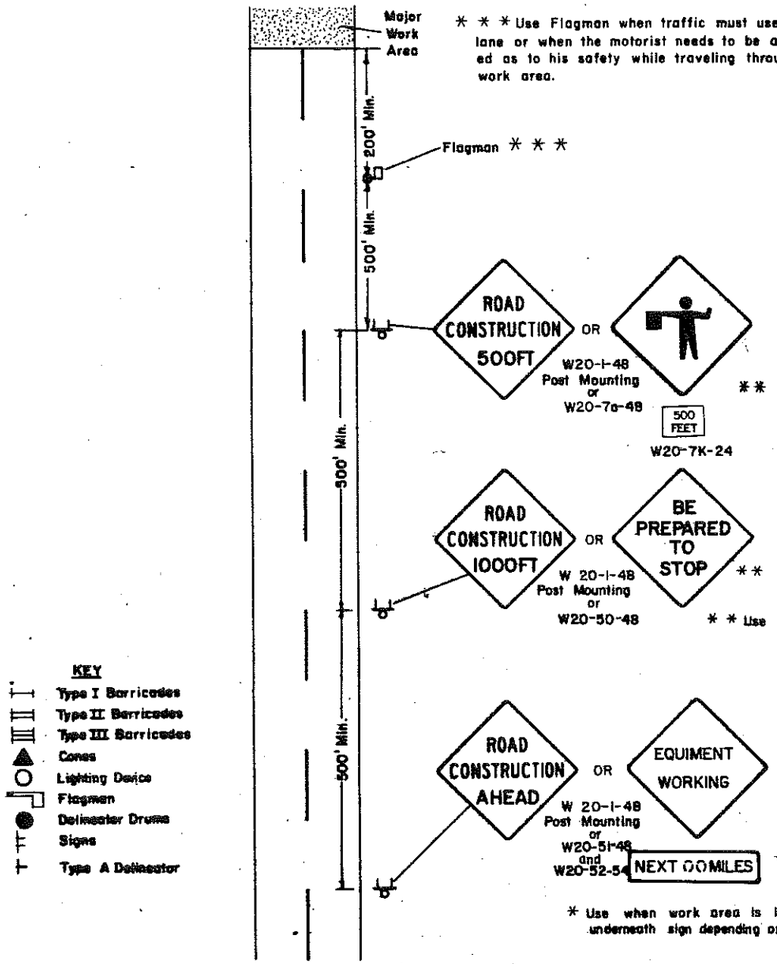
Delineator Drums, Barricades or cones used for tapering traffic shall be spaced at the demention "S".

"S" = Numerical value of speed limit or 85 percentile speed

Where advance warning sign placed as shown interferes with permanent signs, The warning sign location shall be determined by the Engineer for best results. Messages shall be varied as required.

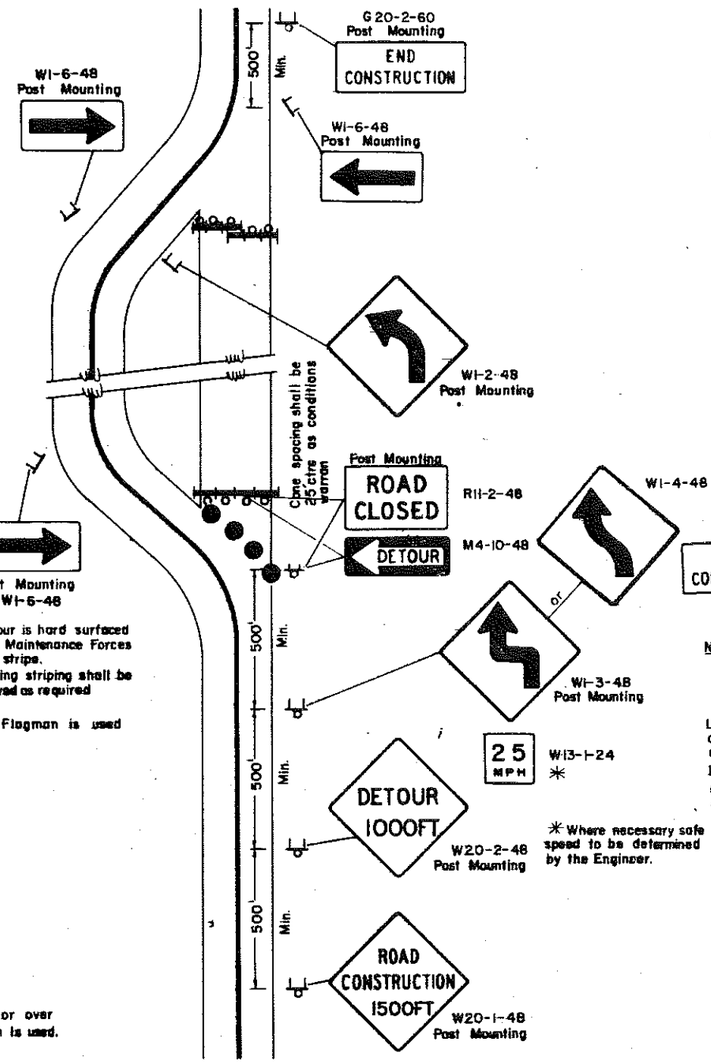
Mounting - Barricade shown to be placed on roadway shall be on a movable Assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar intermediate Sign shall be on a movable assembly Sign show to be placed on roadway shall be placed on movable assemblies.

* * * Use Flagman when traffic must use one lane or when the motorist needs to be advised as to his safety while traveling through work area.

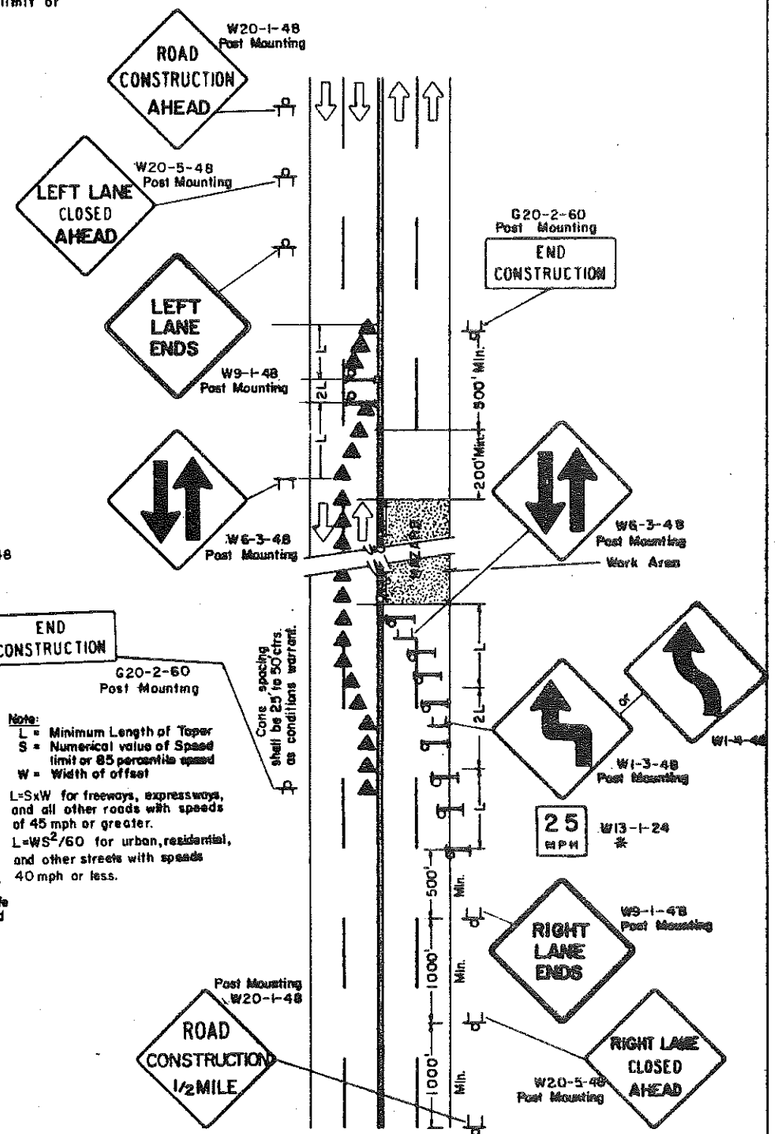


TYPE A
CONSTRUCTION SIGN LAYOUT
2 & 4 Lane Highway when traffic is maintained.
(Sign shown for one end only)
MAJOR WORK AREA
(shall be limited to 3 miles)

When the work area is left overnight the necessary warning signs shall remain and others added reflecting the conditions in the work area. Speed limit signs and advisory speed plates shall be added as needed.



TYPE B
CONSTRUCTION SIGN LAYOUT
2 Lane Highway where roadway is closed and detour is provided.
(Sign shown for one direction of travel only).
Longer than one day or outside of Major Work Area



Note:
L = Minimum Length of Taper
S = Numerical value of Speed limit or 85 percentile speed
W = Width of offset

L=SxW for freeways, expressways, and all other roads with speeds of 45 mph or greater.
$L=WS^2/60$ for urban, residential, and other streets with speeds 40 mph or less.

* Where necessary safe speed to be determined by the Engineer.

TYPE C
CONSTRUCTION SIGN LAYOUT
4 Lane Undivided Highway with half the roadway closed.
Longer than one day or outside of Major Work Area

REVISIONS	
DATE	CHANGE
7-15-78	
8-21-78	Note Change
12-29-78	General Revisions
1-6-79	Notes Added and Changed.
7-15-80	Change Sign Std. Number.

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer, Pre-Constr.

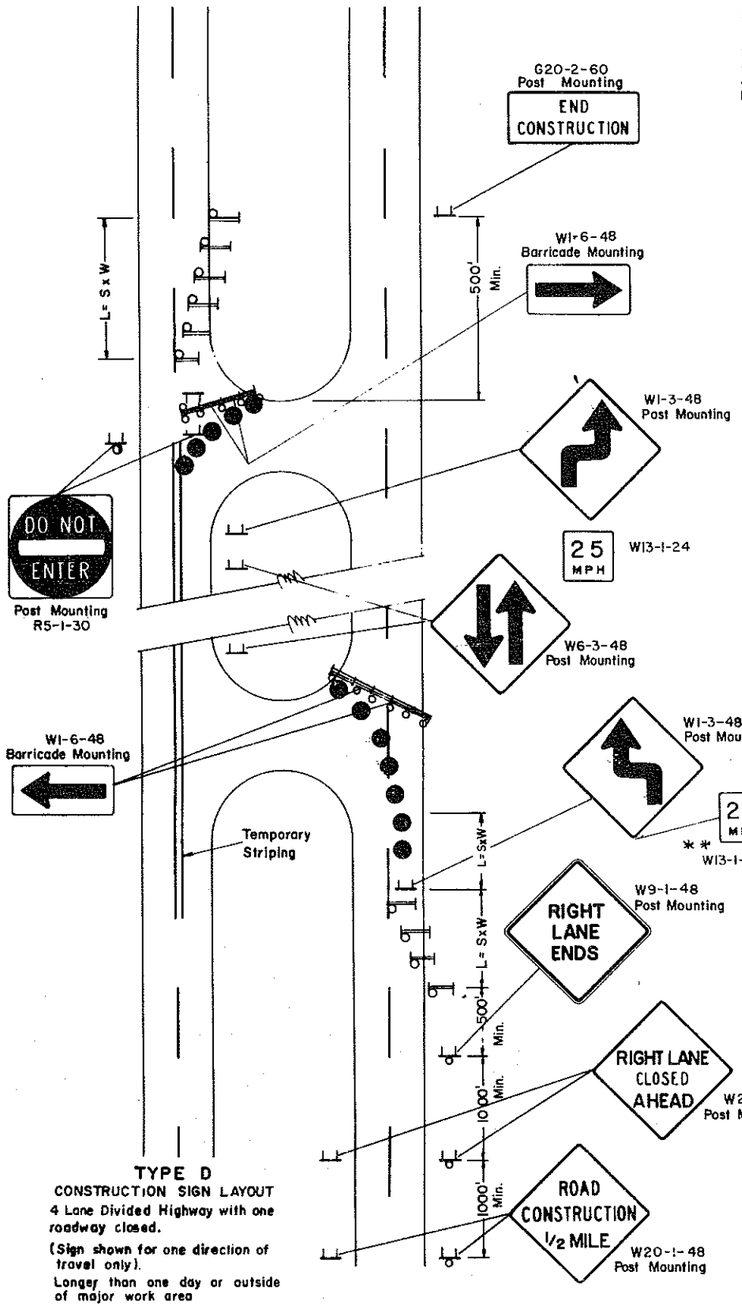
Approved: _____ Chief Engineer

FHWA REGION	STATE	FED AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	63
		D-754-7	

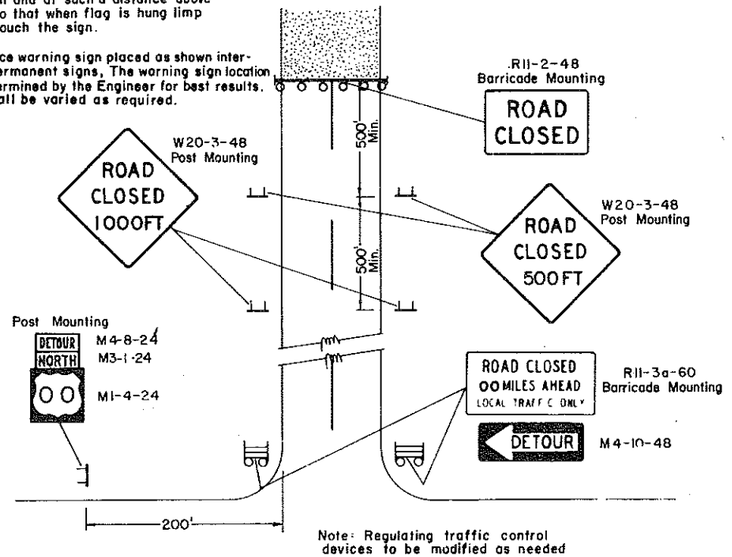
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

NOTE:
FLAGS: All warning signs shall have two orange warning flags 24" square mounted perpendicular to the edges of the diamond sign and at such a distance above the edges so that when flag is hung limp it will not touch the sign.

Where advance warning sign placed as shown interferes with permanent signs, The warning sign location shall be determined by the Engineer for best results. Messages shall be varied as required.



TYPE D
CONSTRUCTION SIGN LAYOUT
4 Lane Divided Highway with one roadway closed.
(Sign shown for one direction of travel only).
Longer than one day or outside of major work area



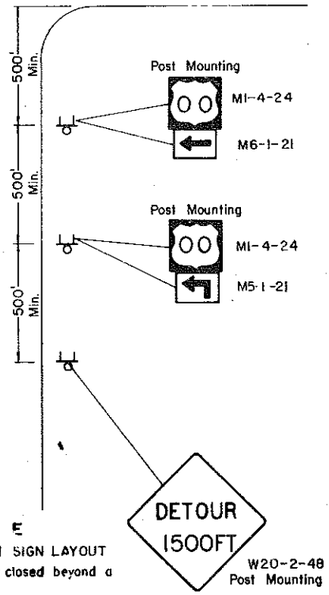
Note: Regulating traffic control devices to be modified as needed for the duration of the detour

**Where necessary safe speed to be determined at the site by the Engineer

Note:
L = Minimum Length of Taper
S = Numerical value of Speed limit or 85 percentile speed
W = Width of offset

L = S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater.
L = $WS^2/60$ for urban, residential, and other streets with speeds of 40 mph or less.

KEY
- Type I Barricades
- Type II Barricades
- Type III Barricades
- Cones
- Lighting Device
- Flagman
- Delineator Drums
- Signs
- Type A Delineator



TYPE E
CONSTRUCTION SIGN LAYOUT
Where a road is closed beyond a detour point.
(Sign shown for one direction of travel only)
Sign not shown on detour shall be shown in plans and installed and maintained by the contractor.

Longer than one day or outside of major work area

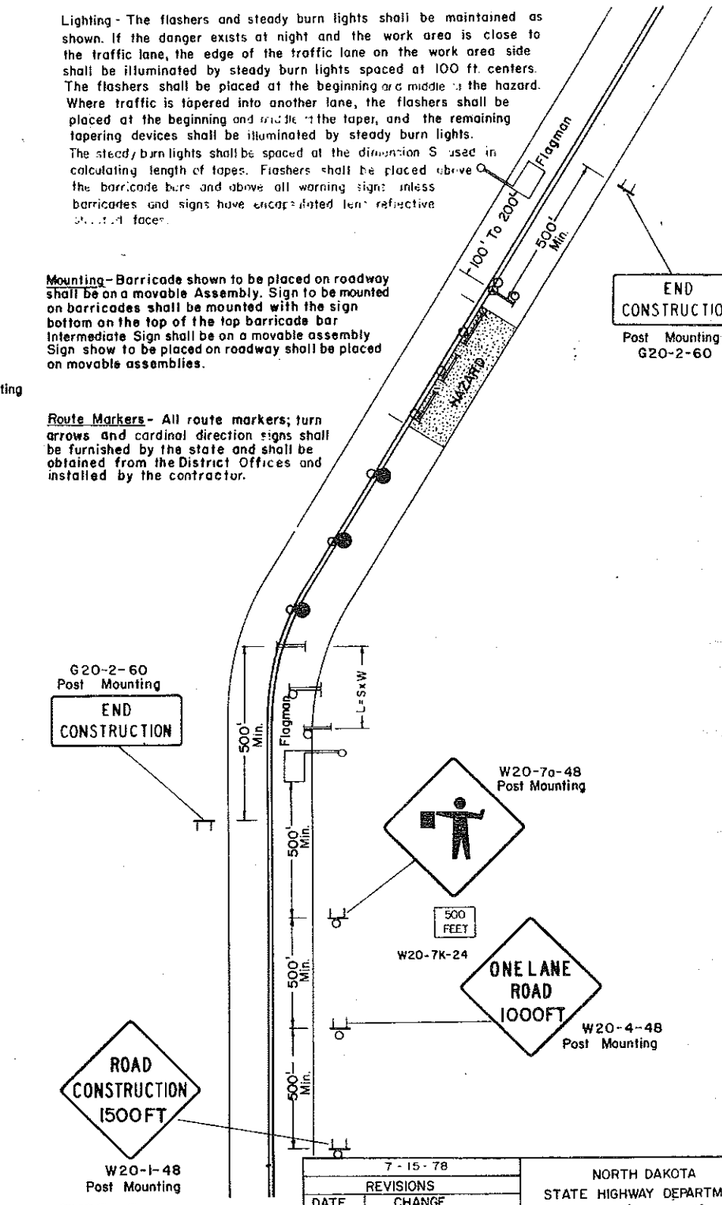
Delineator drums, Barricades or Cones used for tapering traffic shall be spaced at the demention "S".

"S" = Numerical value of speed limit or 85 percentile speed

Lighting - The flashers and steady burn lights shall be maintained as shown. If the danger exists at night and the work area is close to the traffic lane, the edge of the traffic lane on the work area side shall be illuminated by steady burn lights spaced at 100 ft. centers. The flashers shall be placed at the beginning and middle of the hazard. Where traffic is tapered into another lane, the flashers shall be placed at the beginning and middle of the taper, and the remaining tapering devices shall be illuminated by steady burn lights.
The steady burn lights shall be spaced at the dimension S used in calculating length of tapes. Flashers shall be placed above the barricade bars and above all warning signs unless barricades and signs have encapsulated lens reflective sheeted faces.

Mounting - Barricade shown to be placed on roadway shall be on a movable Assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar Intermediate Sign shall be on a movable assembly Sign show to be placed on roadway shall be placed on movable assemblies.

Route Markers - All route markers; turn arrows and cardinal direction signs shall be furnished by the state and shall be obtained from the District Offices and installed by the contractor.



TYPE F
CONSTRUCTION SIGN LAYOUT
2 Lane Highway with one lane closed. Barricading is at a point where it is visible to approaching traffic
Warning sign sequence in opposite direction — same as one shown.

7-15-78

REVISIONS	
DATE	CHANGE
8-21-78	Note Change
1-2-79	General Revisions
5-1-79	Note Revisions
6-27-80	ADDED SIGN NO.'S

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

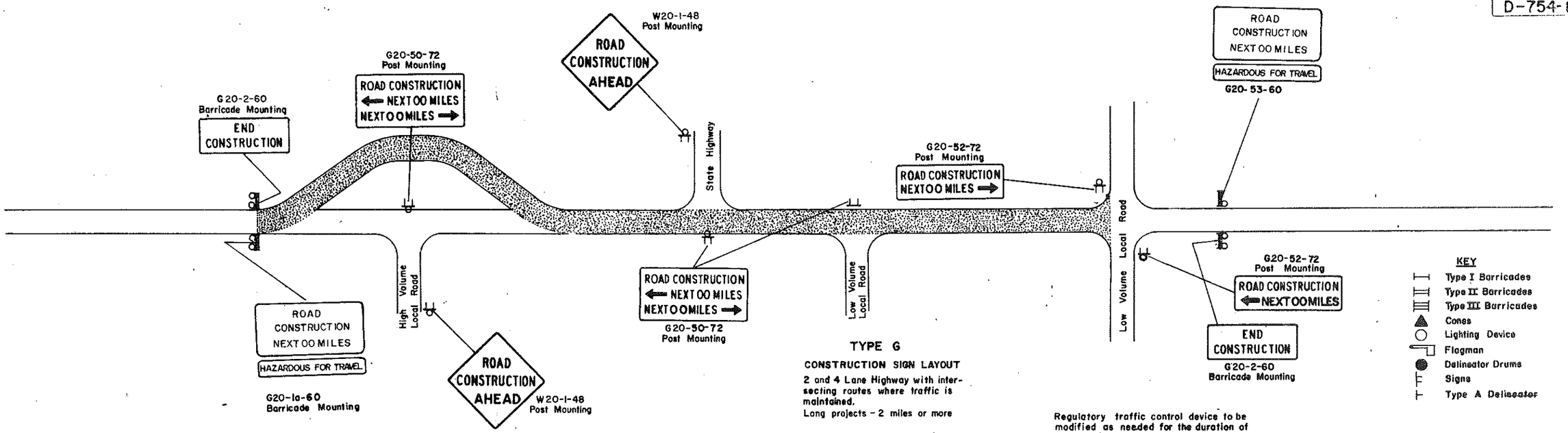
Recommended: _____ Asst. Chief Engineer, Pre-Constr

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	64

D-754-8

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



TYPE G

CONSTRUCTION SIGN LAYOUT

2 and 4 Lane Highway with intersecting routes where traffic is maintained.
Long projects – 2 miles or more

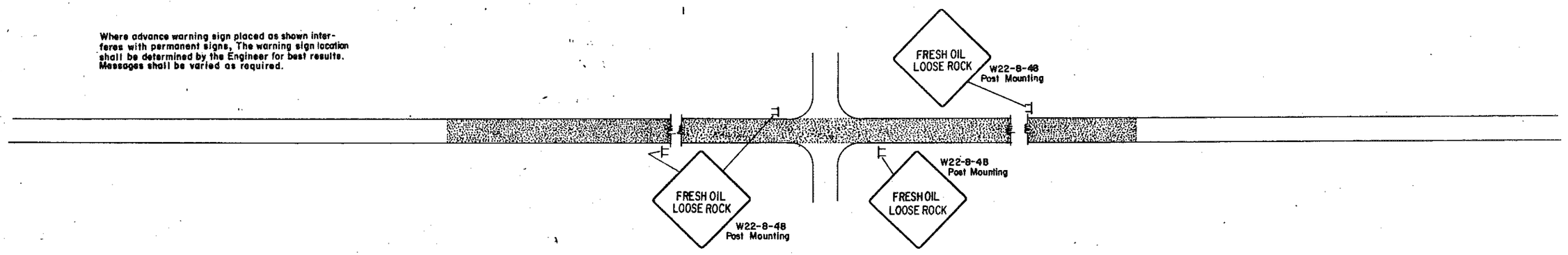
Regulatory traffic control device to be modified as needed for the duration of construction.

FLAGS: All advance warning signs shall have two orange warning flags 24" square mounted perpendicular to the edges of the diamond sign and at such a distance above the edges so that when flag is hung limp it will not touch the sign.

Lighting – The flashers and steady burn lights shall be maintained as shown. If the danger exists at night and the work area is close to the traffic lane, the edge of the traffic lane on the work area side shall be illuminated by steady burn lights spaced at 100 ft. centers. The flashers shall be placed at the beginning and middle of the hazard. Where traffic is tapered into another lane, the flashers shall be placed at the beginning and middle of the taper, and the remaining tapering devices shall be illuminated by steady burn lights. The steady burn lamps shall be spaced at the dimension S used in calculating length of taper. Flashers shall be placed above the barricade bars and above all warning signs unless barricades and signs have encapsulated lens reflective sheeted faces.

Mounting – Barricade shown to be placed on roadway shall be on a movable Assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar Intermediate Sign shall be on a movable assembly Sign show to be placed on roadway shall be placed on movable assemblies.

Where advance warning sign placed as shown interferes with permanent signs, The warning sign location shall be determined by the Engineer for best results. Messages shall be varied as required.



TYPE H

CONSTRUCTION SIGN LAYOUT

2 and 4 Lane Highway with intersecting routes where traffic is maintained over seal project.

Sign No. W22-8-48 This sign shall be placed 500' past the barricade just after all important intersections and every 5 miles in either direction.

7 - 15 - 78	
REVISIONS	
DATE	CHANGE
8-21-78	Note Change
1-3-79	General Revisions
3-7-79	Note Revisions
6-23-80	Standard numbers

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	65
		D-754-9	

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

Lighting - The flashers and steady burn lights shall be maintained as shown. If the danger exists at night and the work area is close to the traffic lane, the edge of the traffic lane on the work area side shall be illuminated by steady burn lights spaced at 100 ft. centers. The flashers shall be placed at the beginning and middle of the hazard. Where traffic is tapered into another lane, the flashers shall be placed at the beginning and middle of the taper, and the remaining tapering devices shall be illuminated by steady burn lights. The steady burn lamps shall be spaced at the dimension S used in calculating length of taper. Flashers shall be placed above the barricade bars and above all warning signs unless barricades and signs have encapsulated lens reflective sheeted faces.

Mounting - Barricade shown to be placed on roadway shall be on a movable Assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar Intermediate Sign shall be on a movable assembly Sign show to be placed on roadway shall be placed on movable assemblies.

FLAGS: All advance warning signs shall have two orange warning flags 24" square mounted perpendicular to the edges of the diamond sign and at such a distance above the edges so that when flag is hung limp it will not touch the sign.

Route Markers

All route markers and assemblies shall be furnished by the State and shall be obtained from District offices and installed by the contractor

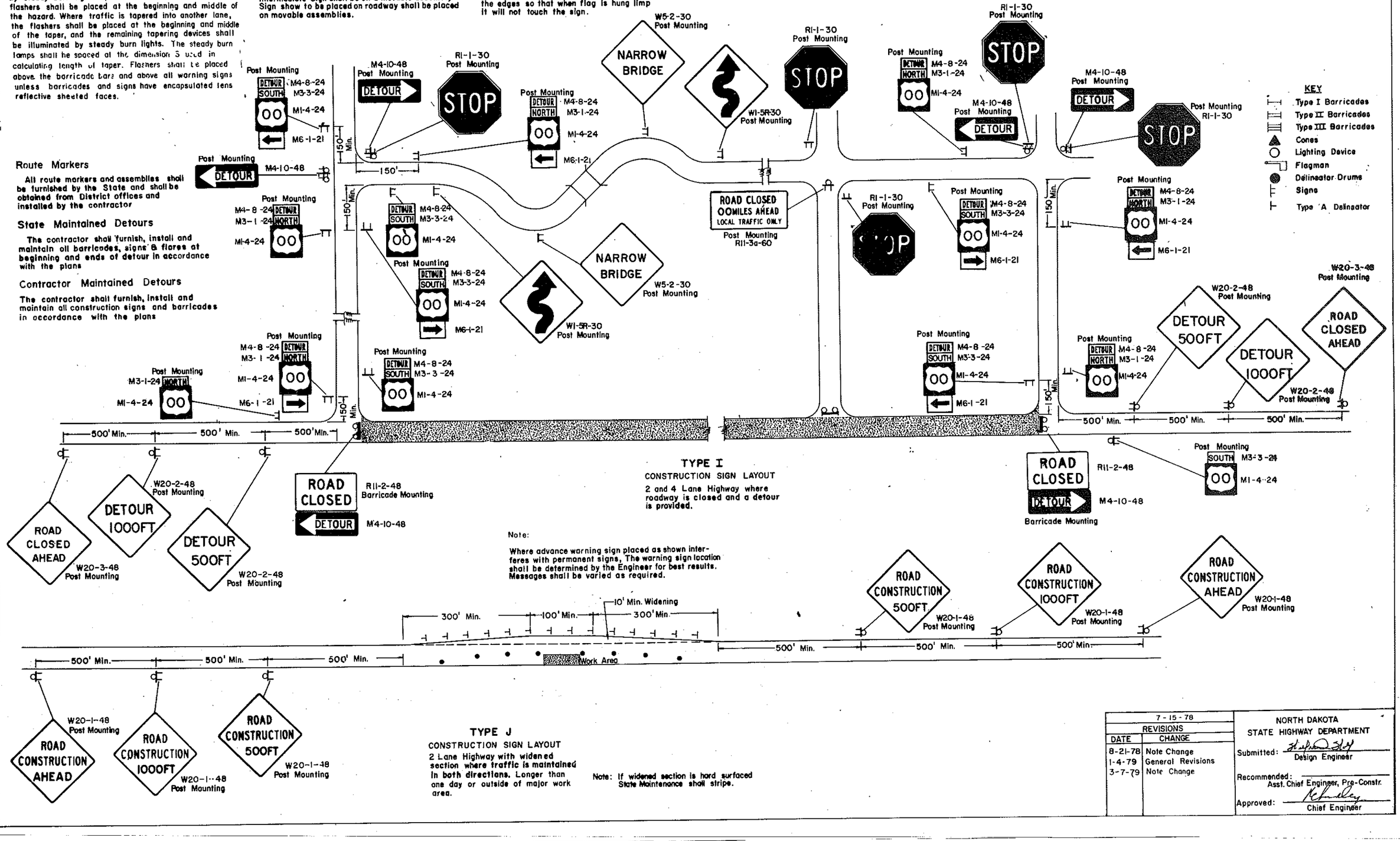
State Maintained Detours

The contractor shall furnish, install and maintain all barricades, signs & flares at beginning and ends of detour in accordance with the plans

Contractor Maintained Detours

The contractor shall furnish, install and maintain all construction signs and barricades in accordance with the plans

KEY
- Type I Barricades
- Type II Barricades
- Type III Barricades
- Cones
- Lighting Device
- Flagman
- Delineator Drums
- Signs
- Type 'A' Delineator



TYPE I
CONSTRUCTION SIGN LAYOUT

2 and 4 Lane Highway where roadway is closed and a detour is provided.

Note:

Where advance warning sign placed as shown interferes with permanent signs, The warning sign location shall be determined by the Engineer for best results. Messages shall be varied as required.

TYPE J
CONSTRUCTION SIGN LAYOUT

2 Lane Highway with widened section where traffic is maintained in both directions. Longer than one day or outside of major work area.

Note: If widened section is hard surfaced State Maintenance shall stripe.

7-15-78	
REVISIONS	
DATE	CHANGE
8-21-78	Note Change
1-4-79	General Revisions
3-7-79	Note Change

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

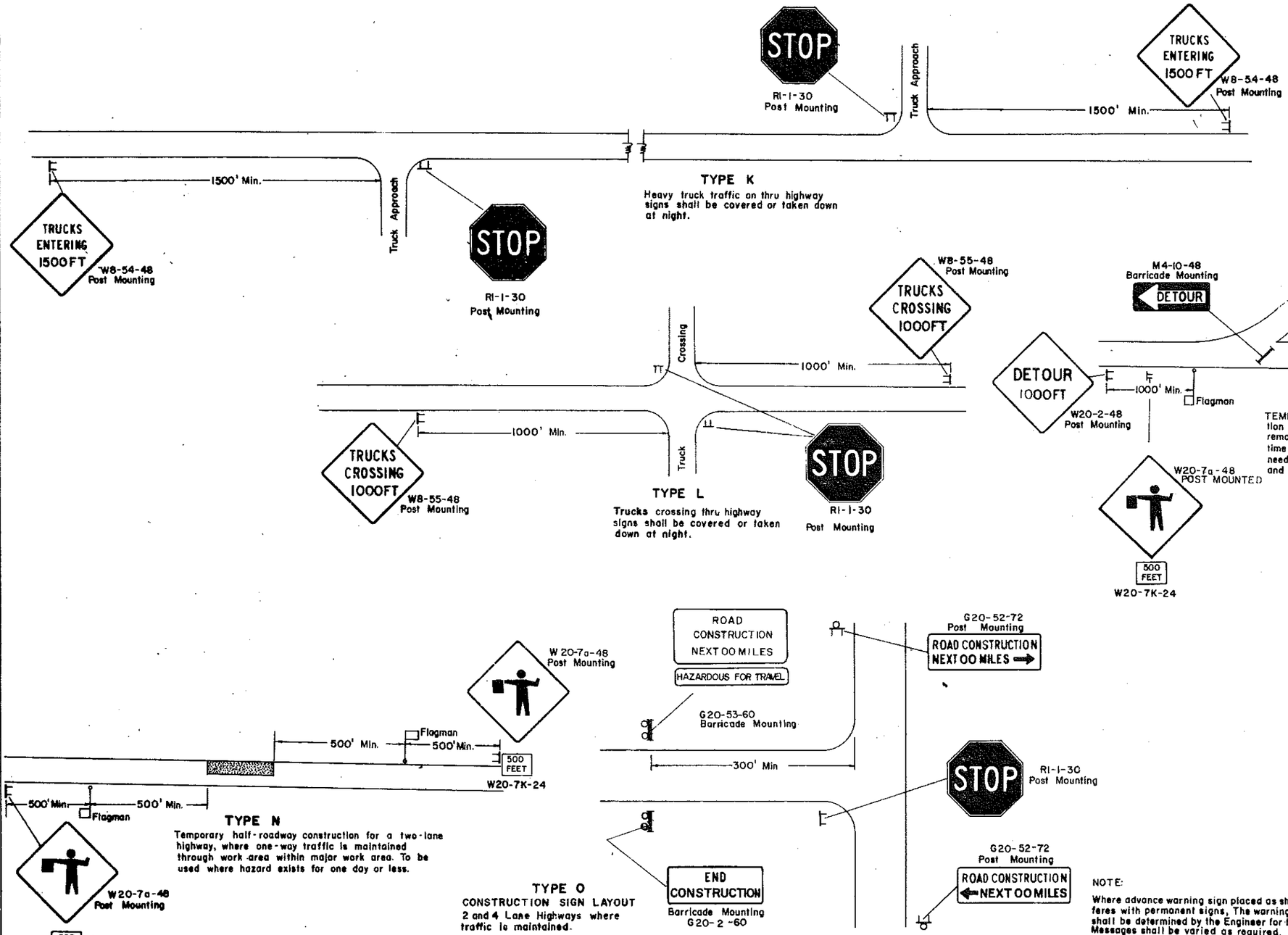
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO.
8	N.D.	FI-194-4(45)	66

D-754-10



Lighting - The flashers and steady burn lights shall be maintained as shown. If the danger exists at night and the work area is close to the traffic lane, the edge of the traffic lane on the work area side shall be illuminated by steady burn lights spaced at 100 ft. centers. The flashers shall be placed at the beginning and middle of the hazard. Where traffic is tapered into another lane, the flashers shall be placed at the beginning and middle of the taper, and the remaining tapering devices shall be illuminated by steady burn lights. The steady burn lamps shall be spaced at the dimension S used in calculating length of taper. Flashers shall be placed above the barricade bars and above all warning signs unless barricades and signs have encapsulated lens reflective sheeted faces.

Mounting - Barricade shown to be placed on roadway shall be on a movable Assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar Intermediate Sign shall be on a movable assembly Sign show to be placed on roadway shall be placed on movable assemblies.

NOTE:

Where advance warning sign placed as shown interferes with permanent signs, The warning sign location shall be determined by the Engineer for best results. Messages shall be varied as required.

FLAGS: All advance warning signs shall have two orange warning flags 24" square mounted perpendicular to the edges of the diamond sign and at such a distance above the edges so that when flag is hung limp it will not touch the sign.

7 - 15 - 78

REVISIONS	
DATE	CHANGE
8-21-78	Note Change
1-4-79	General Revisions
3-7-79	Note Change and Sign Added
6-23-80	Sign Std. Numbers

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____
Design Engineer

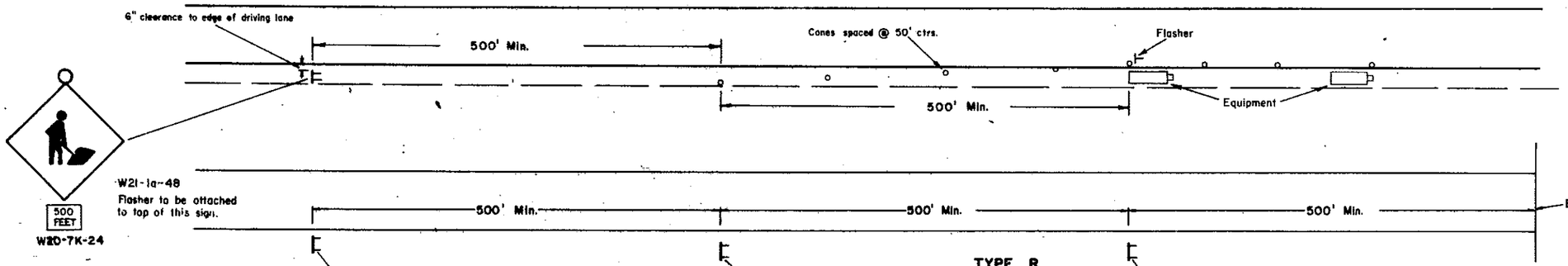
Recommended: _____
Asst. Chief Engineer, Pre-Constr.

Approved: _____
Chief Engineer

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

FHWA REGION	STATE	FED. AID. PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	67

D-754-12



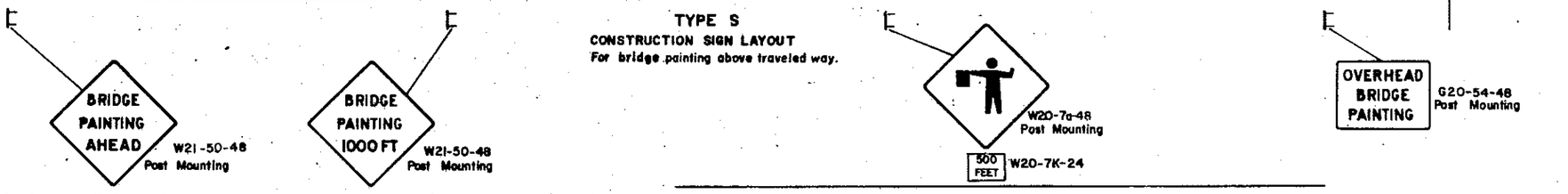
TYPE U

TRAFFIC PROTECTION DEVICES PLACEMENT FOR SITUATION WHEN EQUIPMENT WILL BE PARKED ON THE RIGHT SHOULDER

TYPE R

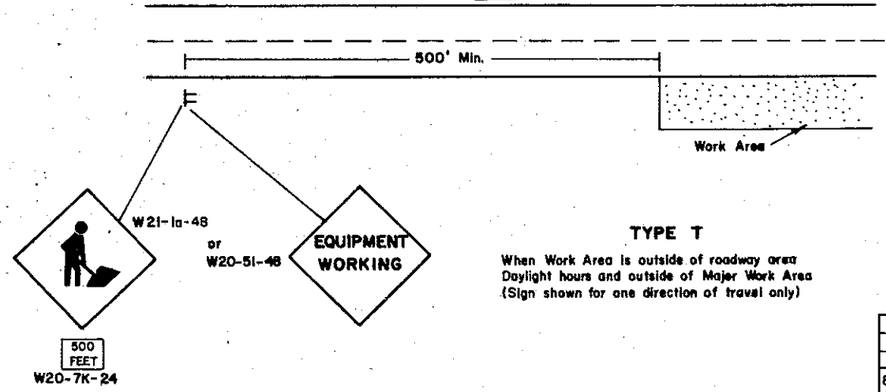
CONSTRUCTION SIGN LAYOUT
For bridge painting below traveled way,

KEY
- Type I Barricades
- Type II Barricades
- Type III Barricades
- Cones
- Lighting Device
- Flagman
- Delineator Drums
- Signs
- Type A Delineator



TYPE S

CONSTRUCTION SIGN LAYOUT
For bridge painting above traveled way.



TYPE T

When Work Area is outside of roadway area Daylight hours and outside of Major Work Area (Sign shown for one direction of travel only)

NOTE:

FLAGS: All advance warning signs shall have two orange warning flags 24" square mounted perpendicular to the edges of the diamond sign and at such a distance above the edges so that when flag is hung limp it will not touch the sign.

Where advance warning sign placed as shown interferes with permanent signs, The warning sign location shall be determined by the Engineer for best results. Messages shall be varied as required.

Lighting - The flashers and steady burn lights shall be maintained as shown. If the danger exists at night and the work area is close to traffic lane, the edge of the traffic lane on the work area side shall be illuminated by steady burn lights spaced at 100 ft. centers. The flashers shall be placed at the beginning and middle of the hazard. Where traffic is tapered into another lane, the flashers shall be placed at the beginning and middle of the taper, and the remaining tapering devices shall be illuminated by steady burn lights. The steady beam light shall be spaced at the dimension S used in calculating length of taper. Flashers shall be placed above the barricade bars and above all warning signs unless barricades and signs have encapsulated lens reflective sheeted faces.

7-15-78	
REVISIONS	
DATE	CHANGE
8-21-78	Note Change
1-5-79	General Revisions
3-7-79	Note Change
6-23-80	Sign Std. Numbers

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

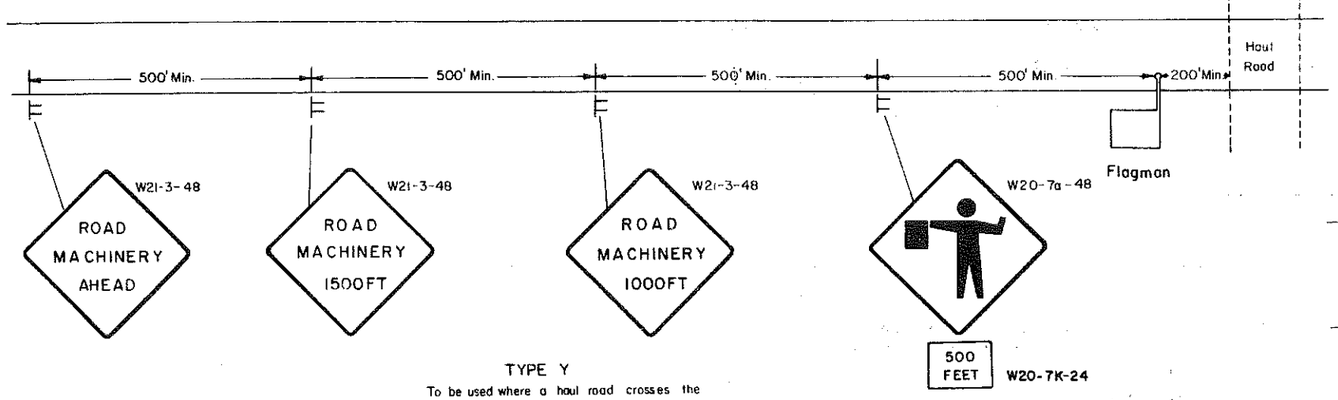
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. AID. PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	68

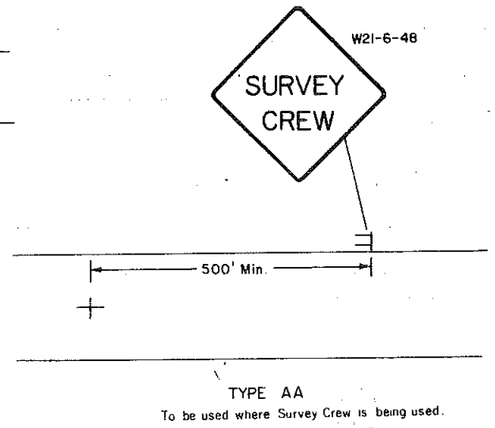
D-754-13-A

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



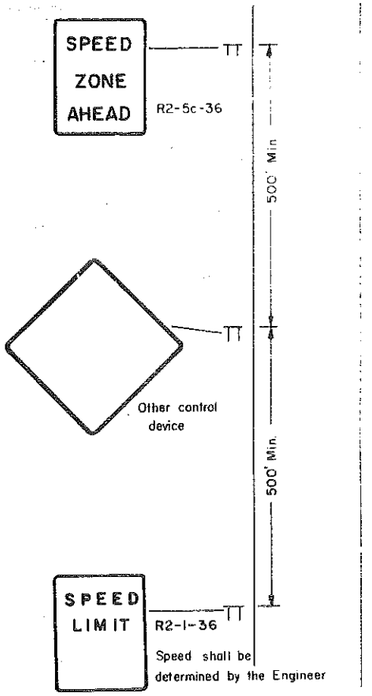
TYPE Y

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



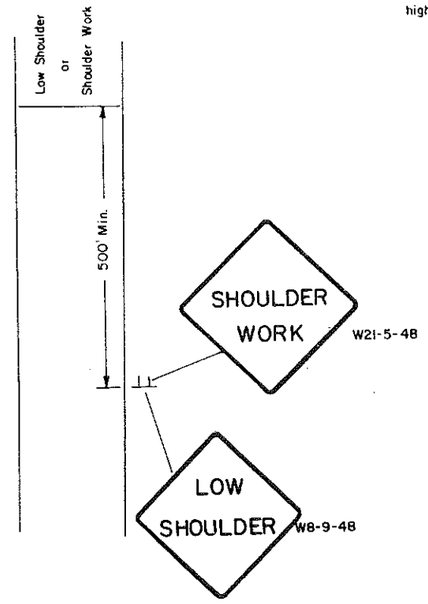
TYPE AA

To be used where Survey Crew is being used.



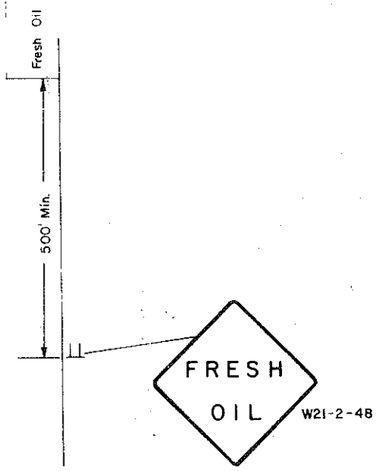
TYPE Z

To be used where speed zone is needed.



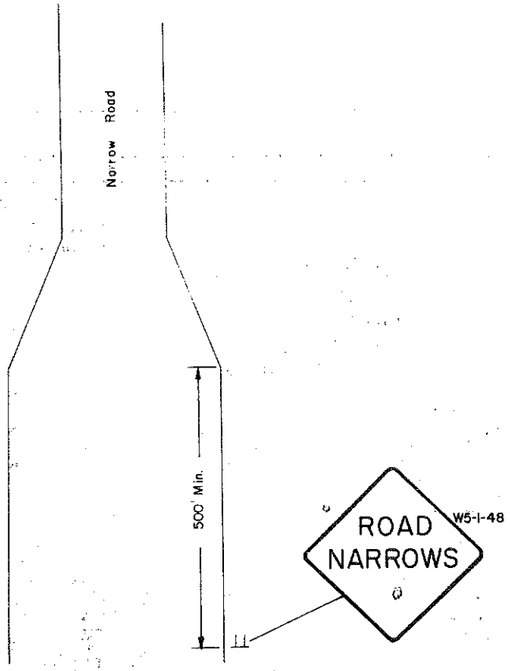
TYPE BB

To be used with in a major work area, where the sign conditions exist.



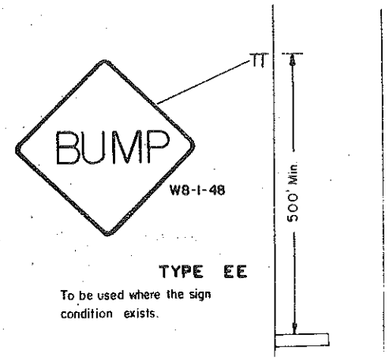
TYPE CC

To be used where the signed conditions exists



TYPE DD

To be used where the signed condition exists.



TYPE EE

To be used where the sign condition exists.

3-9-79	
REVISIONS	
DATE	CHANGE
6-23-80	Add Sign Std. Number

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

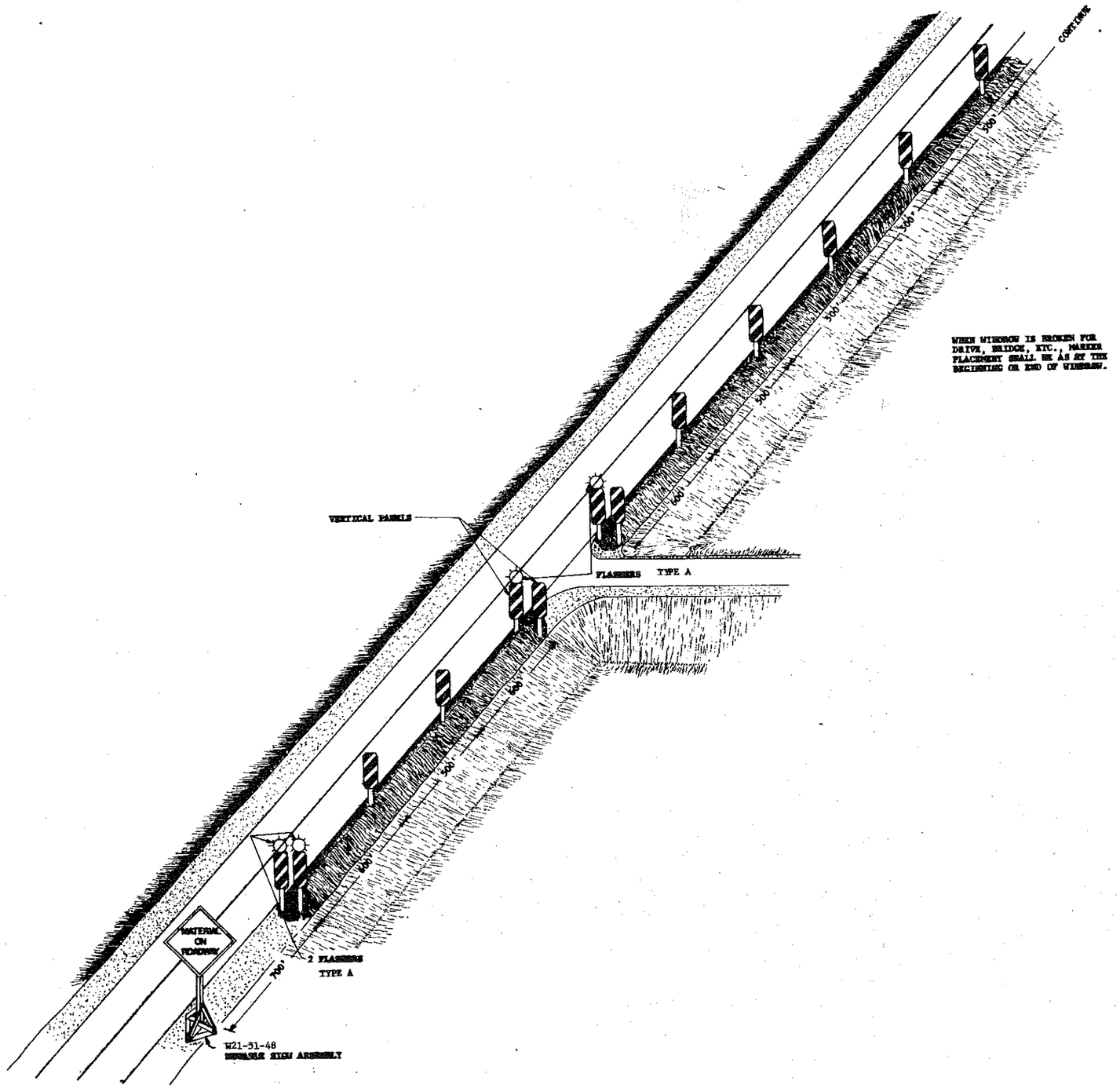
Recommended: _____ Asst Chief Engineer, Pre-Const.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. RID PROJ. NO	SHT. NO
8	N.D.	FI-194-4(45)	69

D-754-14

WINDROW MARKING



4-5-78	
REVISIONS	
DATE	CHANGE
7-31-80	CHANGED SIGN NO.'S

NORTH DAKOTA STATE HIGHWAY DEPT.

SUBMITTED: _____
DESIGN SECTION

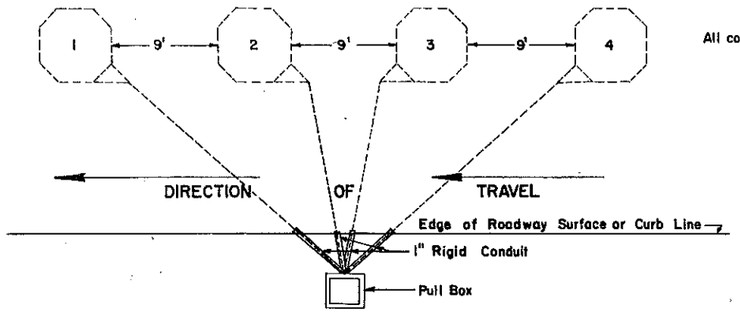
RECOMMENDED:
ASS'T CHIEF ENGINEER FOR OPERATIONS

APPROVED: _____
CHIEF ENGINEER

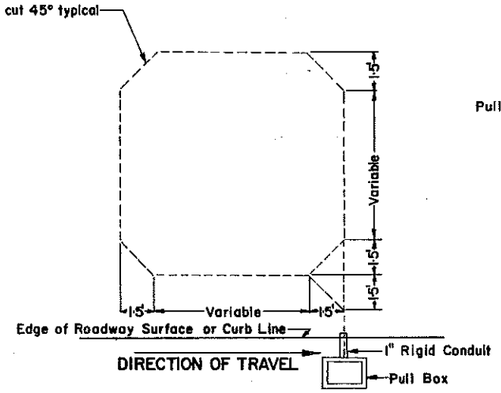
LOOP DETECTORS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	FI-194-4(45)	70

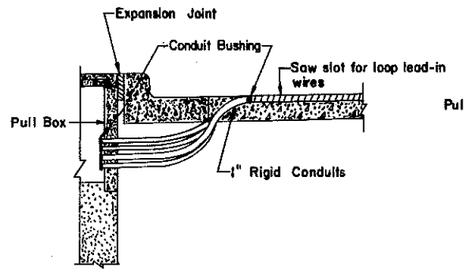
D-777-7



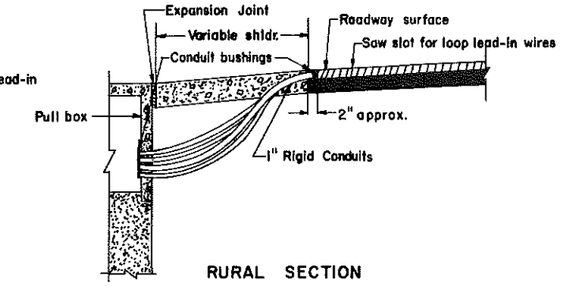
MULTIPLE LOOP DETECTOR DETAIL



LOOP DETECTOR DETAIL

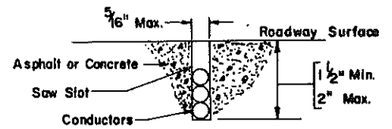


CURB SECTION

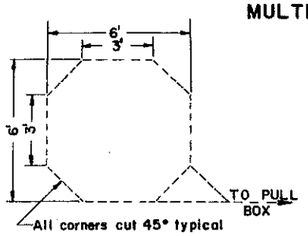


RURAL SECTION

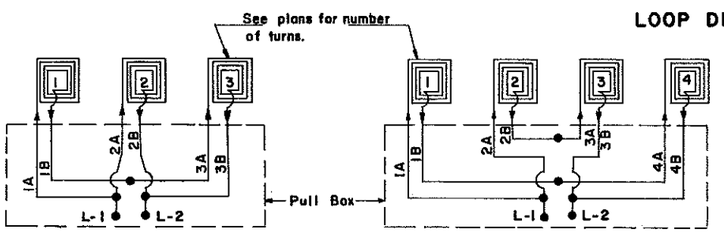
SAW SLOT TO PULL BOX DE TAILS



SAW SLOT DETAIL



TYPICAL MULTIPLE LOOP DIMENSIONS



MULTIPLE LOOP CONNECTION

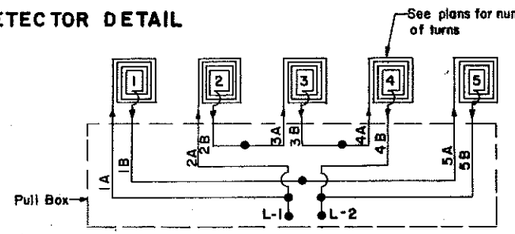
All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)

The loop connections shall be spliced in the pull box: 1B to 3A, 1A and 2A to L-1, 2B and 3B to L-2.

MULTIPLE LOOP CONNECTION

All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)

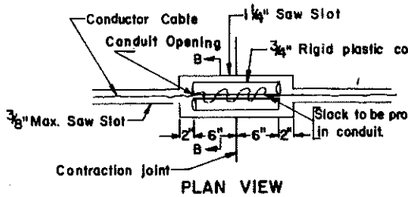
The loop connections shall be spliced in the pull box: 1B to 4A, 2B to 3A, 1A and 2A to L-1, 3B and 4B to L-2.



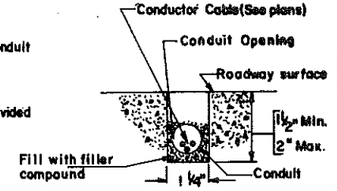
MULTIPLE LOOP CONNECTION

All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)

The loop connections shall be spliced in the pull box: 1B to 5A, 2B to 3A, 3B to 4A, 1A and 2A to L-1, 4B and 5B to L-2.



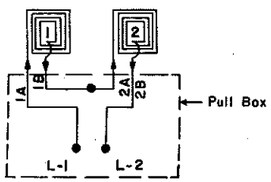
PLAN VIEW



SECTION BB

CONTRACTION JOINT DETAIL

(This detail shall also be used whenever a crack in the roadway is encountered.)



MULTIPLE LOOP CONNECTION

All conductors shall be labeled in the pull box as shown. (1A, 1B, 2A, etc.)

The loop connections shall be spliced in the pull box: 1A to L1, 1B to 2A, and 2B to L2.

NOTES:

1. Each loop shall be saw cut in the roadway.
2. The number of turns, size of loop and size of conductor shall be as shown on the plans. The first loop dimension figure is the length in the direction of travel and the second dimension is the width across the traffic lane.
3. The loop conductor shall be pushed into the saw slot with a blunt stick to avoid damaging the conductor insulation.
4. The loop conductor shall be one continuous length of conductor from the nearest pull box around the loop and back.
5. The loop lead-in conductor shall be continuous from the detector sensor unit to the nearest pull box by the sensing loop.
6. The resistance of the loop conductor to ground shall be checked before the roadway loop is sealed in place. A resistance of less than 10 megohms will indicate a fault requiring correction.
7. Saw cuts in concrete shall be filled with an asphaltic joint sealer or microcement as approved by the engineer.
8. Saw cuts in bituminous shall be filled with an approved filler compound, asphaltic joint sealer or preformed contraction joint seal as approved by the engineer.
9. A thin layer of filler material shall be placed on the bottom of the saw cut before the conductor is installed.
10. All exposed filler compound shall be covered with a layer of fine sand.
11. The loop wire from the loop to the pull box must be twisted two to five times per foot. The loop shall be wound in the same direction as adjacent loops of a multiple loop installation. The lead routing shall be in seperate slots to conduit leading to pull box to minimize interaction. The loop lead-in to loop splice shall be soldered (rasine core only) and wrapped with a high grade PVC or equivalent plastic tape and coated with sealant such as scotchkote. Consult detector manufactures recommendations for other installation details.

(11. Contd.)

January 19, 1977 REVISIONS	
DATE	CHANGES
12-6-77	Added Conduits
8-15-79	Revise Notes
9-9-79	Revise Loop Connection Detail

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO
8	N.D.	FI-194-4(45)	2

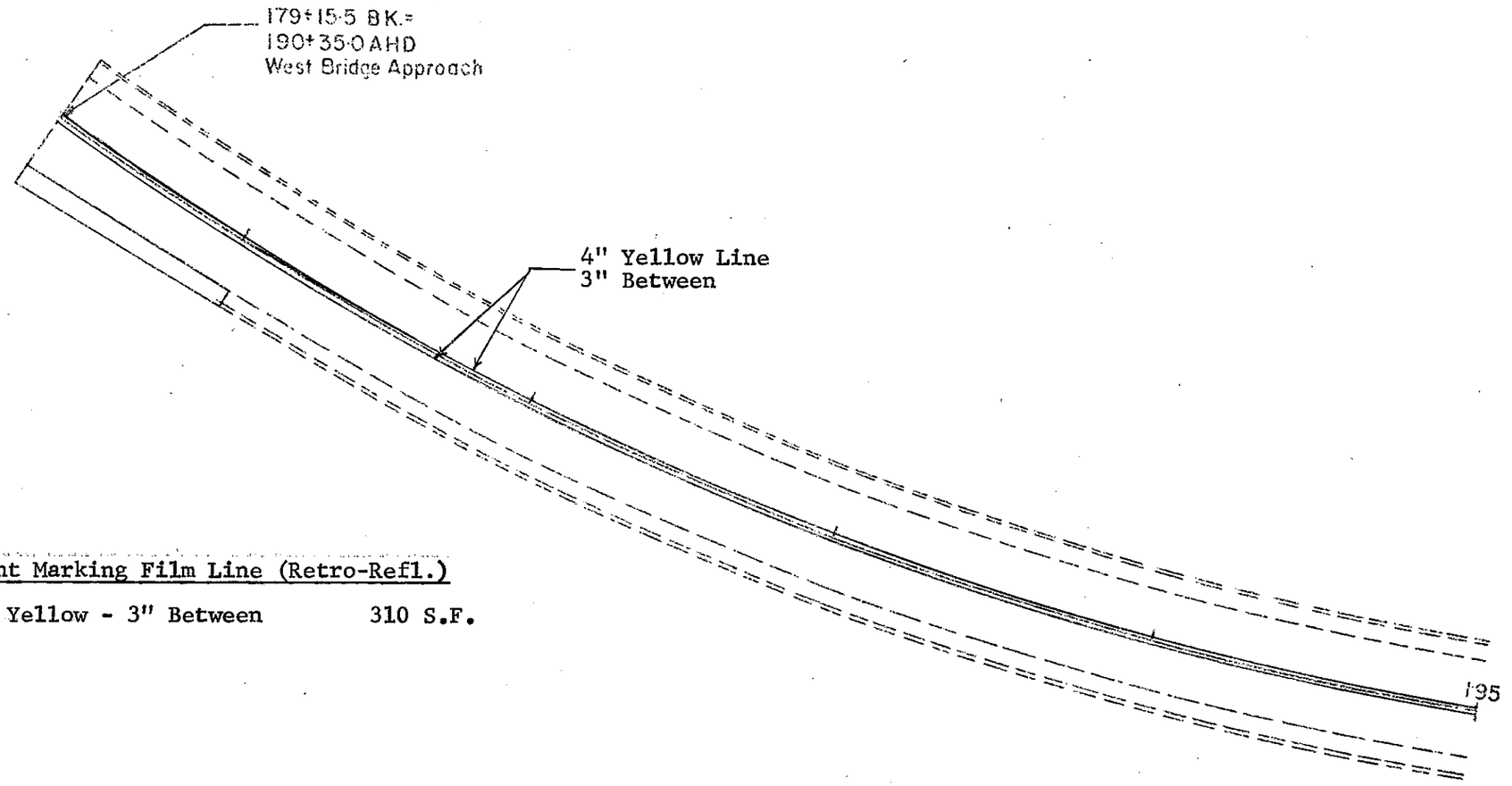
TABLE OF CONTENTS

Revised: 3-26-81

Sheets revised: 41, 42, 44,45 46, 47 & 48.

STATE	FED. AID PROJ. NO.	SHEET NO.
R.I.	FI-194-4(45)000	41

① Revised 3-26-81



Install Plastic Pavement Marking Film Line (Retro-Refl.)

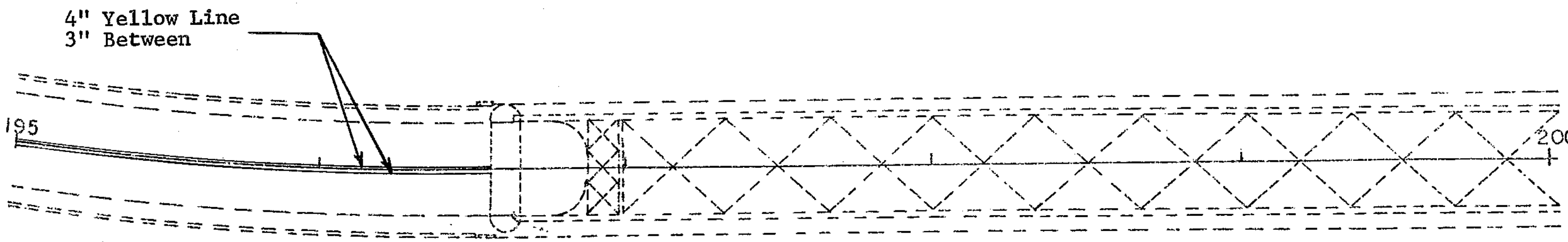
Barrier Lines, Dbl. 4" Yellow - 3" Between 310 S.F.

MEMORIAL BRIDGE INTERCHANGE

Pavement Marking
&
Signing Layout

FI-194-4(45)000 | 42

(1) Revised 3-26-81



Install Plastic Pavement Marking Film Line (Retro-Refl.)

Barrier Lines, Dbl. 4" Yellow - 3" Between 104 S.F.

MEMORIAL BRDIGE INTERCHANGE

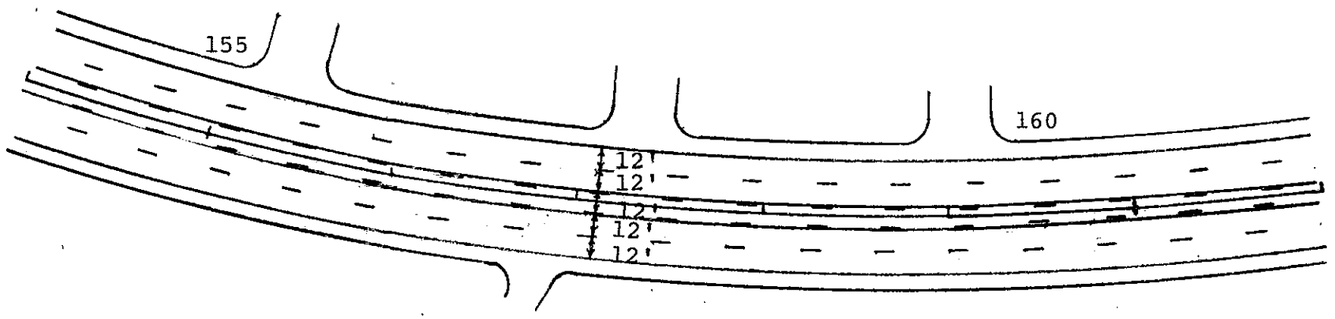
Pavement Marking
&
Signing Layout

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-I-194-4(45)000	44

(1) Revised 3-26-81

INSTALL PAVEMENT MARKING DROP ON BEADS-TYPE-II-LINES

Sta. 154+00 to 161+00-Rt. Edge Lines-4" White	700 L.F.
Sta. 154+00 to 161+00-Lt. Edge Lines-4" Yellow	700 L.F.
Sta. 154+00 to 161+00-Lane Lines-4" White (10' Line,30' Skip)	340 L.F.
Sta. 154+00 to 161+00-Lane Lines-4" Yellow (10' Line,30' Skip)	340 L.F.
	2080 L.F.

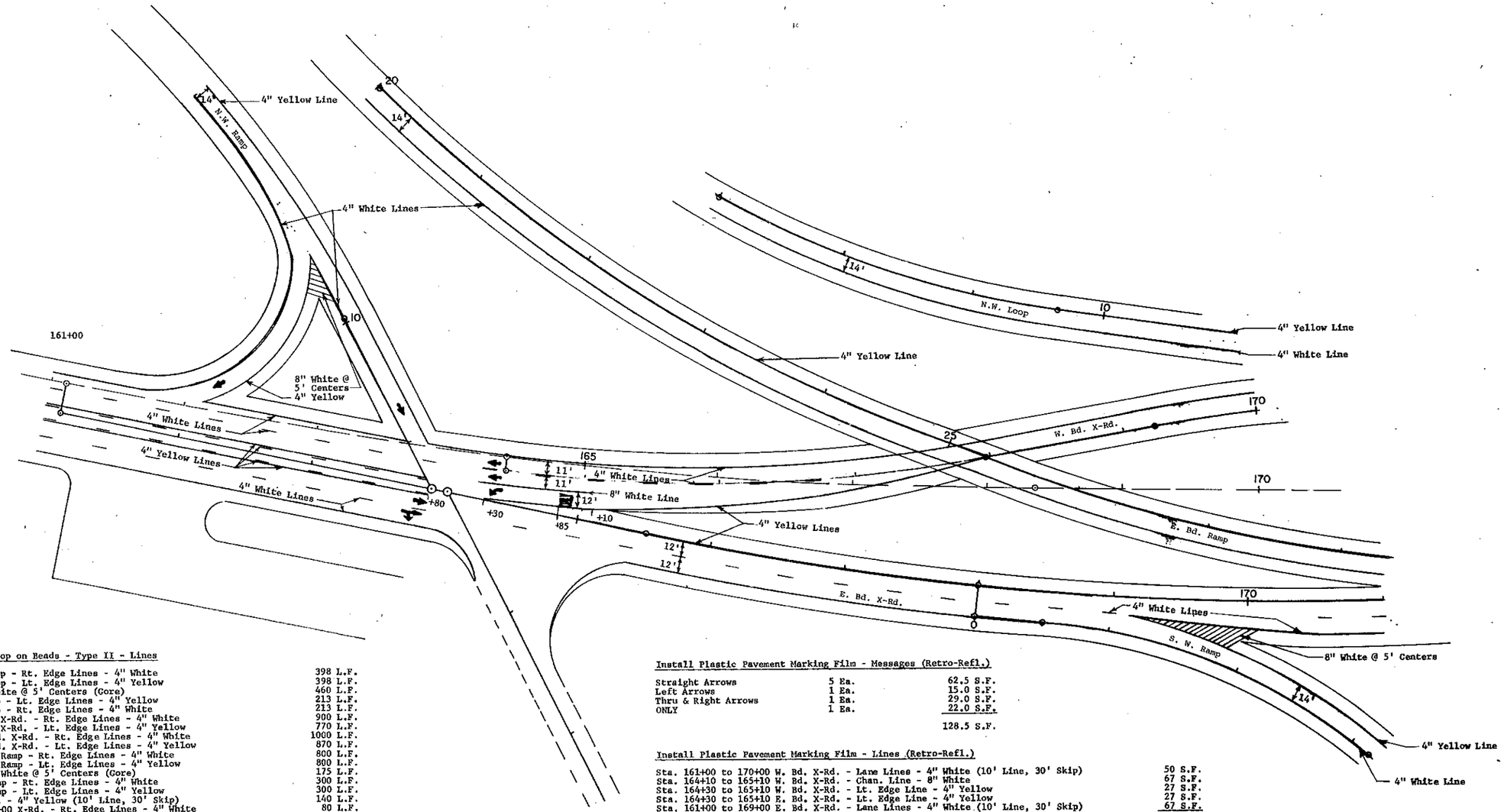


Pavement Marking Layout

Memorial Bridge Inchg.
Cross Road

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	I-194-4(45)000	45

(1) Revised 3-26-81



Install Pavement Marking Drop on Beads - Type II - Lines

Sta. 7+02 to 11+00 N.W. Loop - Rt. Edge Lines - 4" White	398 L.F.
Sta. 7+02 to 11+00 N.W. Loop - Lt. Edge Lines - 4" Yellow	398 L.F.
EXIT RAMP (S.W. RAMP) 8" White @ 5' Centers (Gore)	460 L.F.
Sta. 1+00 to 3+13 S.W. Ramp - Lt. Edge Lines - 4" Yellow	213 L.F.
Sta. 1+00 to 3+13 S.W. Ramp - Rt. Edge Lines - 4" White	213 L.F.
Sta. 161+00 to 170+00 W.B. X-Rd. - Rt. Edge Lines - 4" White	900 L.F.
Sta. 161+00 to 170+00 W.B. X-Rd. - Lt. Edge Lines - 4" Yellow	770 L.F.
Sta. 161+00 to 171+00 E. Bd. X-Rd. - Rt. Edge Lines - 4" White	1000 L.F.
Sta. 161+00 to 171+00 E. Bd. X-Rd. - Lt. Edge Lines - 4" Yellow	870 L.F.
Sta. 20+00 to 28+00 E. Bd. Ramp - Rt. Edge Lines - 4" White	800 L.F.
Sta. 20+00 to 28+00 E. Bd. Ramp - Lt. Edge Lines - 4" Yellow	800 L.F.
EXIT RAMP (N.W. RAMP) - 8" White @ 5' Centers (Gore)	175 L.F.
Sta. 8+00 to 11+40 N.W. Ramp - Rt. Edge Lines - 4" White	300 L.F.
Sta. 8+00 to 11+40 N.W. Ramp - Lt. Edge Lines - 4" Yellow	300 L.F.
Sta. 161+00 to 163+80 X-Rd. - 4" Yellow (10' Line, 30' Skip)	140 L.F.
Sta. 9+50 N.W. Ramp to 162+00 X-Rd. - Rt. Edge Lines - 4" White	80 L.F.
Sta. 9+50 N.W. Ramp to 162+00 X-Rd. - Lt. Edge Lines - 4" Yellow	65 L.F.
	7882 L.F.

Install Plastic Pavement Marking Film - Messages (Retro-Refl.)

Straight Arrows	5 Ea.	62.5 S.F.
Left Arrows	1 Ea.	15.0 S.F.
Thru & Right Arrows	1 Ea.	29.0 S.F.
ONLY	1 Ea.	22.0 S.F.
		128.5 S.F.

Install Plastic Pavement Marking Film - Lines (Retro-Refl.)

Sta. 161+00 to 170+00 W. Bd. X-Rd. - Lane Lines - 4" White (10' Line, 30' Skip)	50 S.F.
Sta. 164+10 to 165+10 W. Bd. X-Rd. - Chan. Line - 8" White	67 S.F.
Sta. 164+30 to 165+10 W. Bd. X-Rd. - Lt. Edge Line - 4" Yellow	27 S.F.
Sta. 164+30 to 165+10 E. Bd. X-Rd. - Lt. Edge Line - 4" Yellow	27 S.F.
Sta. 161+00 to 169+00 E. Bd. X-Rd. - Lane Lines - 4" White (10' Line, 30' Skip)	67 S.F.
	238 S.F.

PAVEMENT MARKING LAYOUT

MEMORIAL BRIDGE INCHG.

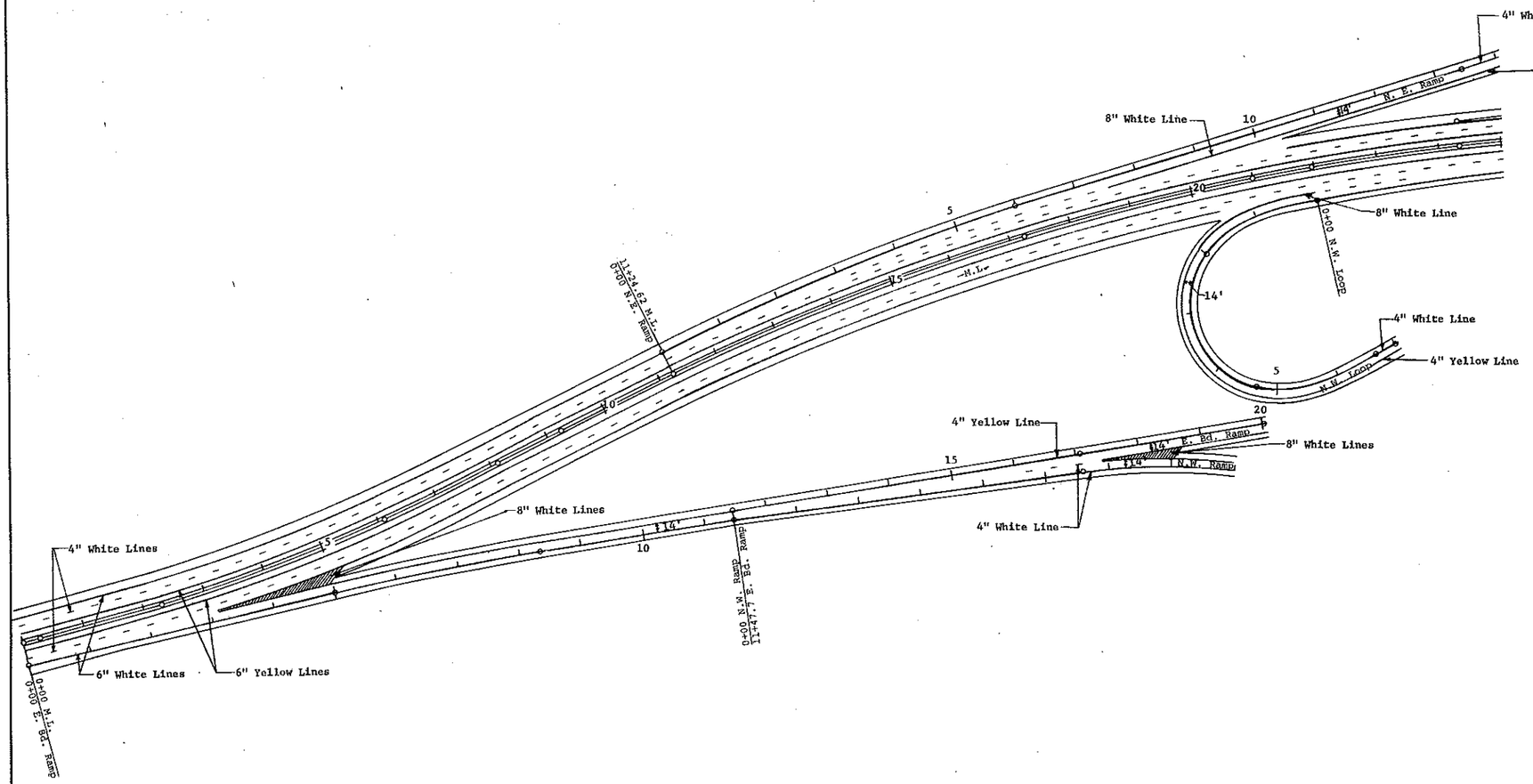
CROSS-ROADS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	I-194-4(45)000	46

(1) Revised 3-26-81

Install Pavement Marking, Drop on Beads, Type II - (Lines)

Sta. 0+00 to 25+00 M.L. - Lane Lines - 4" White (10' Line, 30' Skip)	1250 L.F.
Sta. 0+00 to 25+00 M.L. - Outside Edge Lines - 6" White	7500 L.F.
Sta. 0+00 to 25+00 M.L. - Median Edge Lines - 6" Yellow	7500 L.F.
Sta. 0+00 to 7+02 N.W. Loop - Lt. Edge Line - 4" Yellow	507 L.F.
Sta. 0+00 to 7+02 N.W. Loop - Rt. Edge Line - 4" White	567 L.F.
ENTRANCE RAMP (N.W. LOOP) - Lane Lines - 4" White (10' Line 30' Skip)	40 L.F.
ENTRANCE RAMP (N.W. LOOP) - Rt. Edge Line - 6" White	90 L.F.
ENTRANCE RAMP (N.W. LOOP) - Lt. Edge Line - 8" White	390 L.F.
Sta. 0+00 to 8+00 N.W. Ramp - Rt. Edge Line - 4" White	800 L.F.
Sta. 6+00 to 8+00 N.W. Ramp - Lt. Edge Line - 4" Yellow	200 L.F.
EXIT RAMP (N.W. RAMP) - 8" White Lines @ 5' Centers (Gore)	648 L.F.
EXIT RAMP (E. BD. RAMP) - 8" White Dia. W/8" White & Yellow Edge Lines	1750 L.F.
Sta. 5+40 to 11+50 E. Bd. Ramp - Rt. Edge Line - 4" White	610 L.F.
Sta. 5+40 to 20+00 E. Bd. Ramp - Lt. Edge Line - 4" Yellow	1460 L.F.
Sta. 17+40 to 20+00 E. Bd. Ramp - Rt. Edge Line - 4" White	260 L.F.
ENTRANCE RAMP (N.E. RAMP) - Lane Lines - 4" White (10' Line, 30' Skip)	110 L.F.
ENTRANCE RAMP (N.E. RAMP) - Rt. Edge Line - 6" White	90 L.F.
ENTRANCE RAMP (N.E. RAMP) - Lt. Edge Line - 8" White	390 L.F.
Sta. 11+00 to 14+00 N.E. Ramp - Lt. Edge Line - 4" Yellow	300 L.F.
Sta. 11+00 to 14+00 N.E. Ramp - Rt. Edge Line - 4" White	300 L.F.
	24762 L.F.

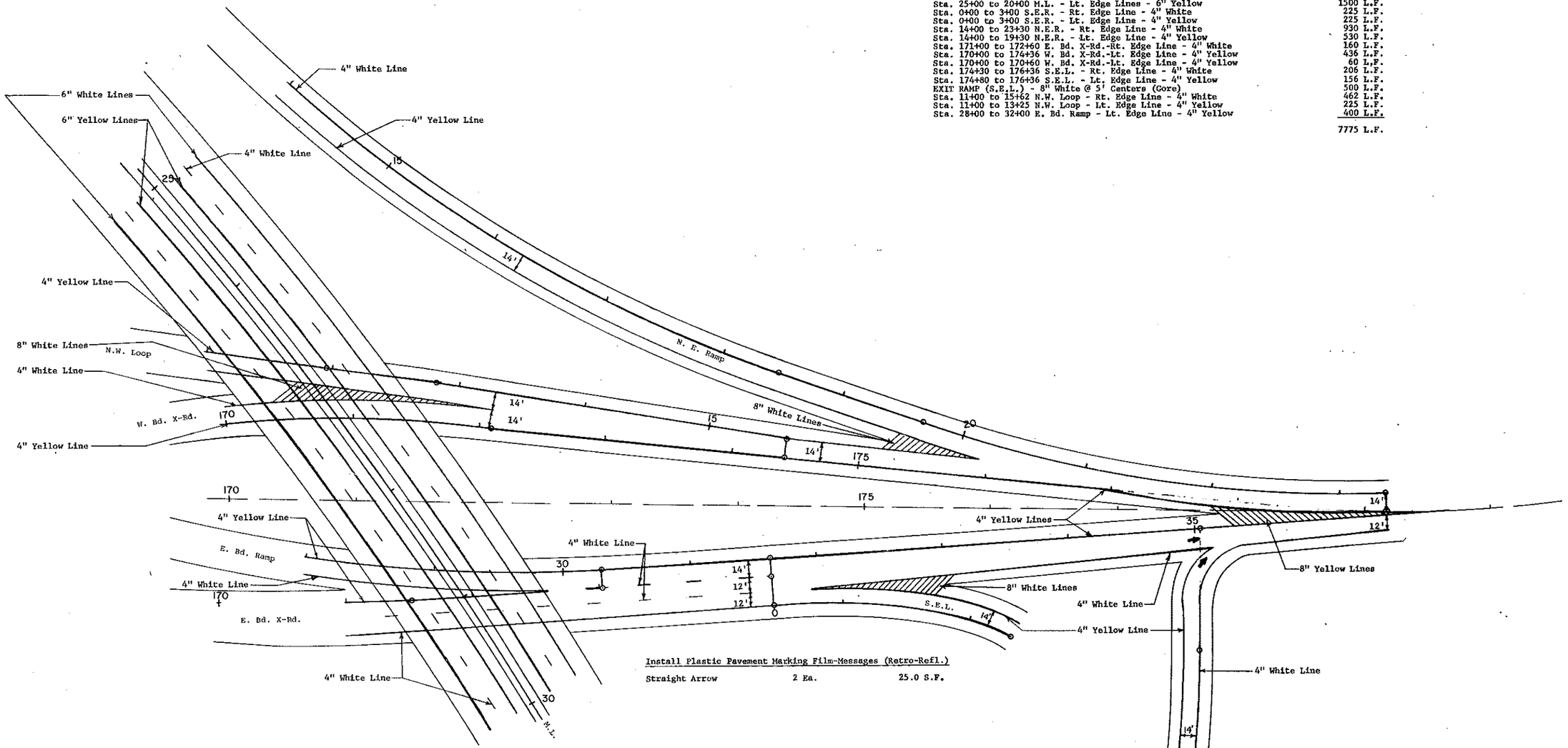


PAVEMENT MARKING LAYOUT

MEMORIAL BRIDGE INTERCHANGE

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	I-194-4(45)000	47

(1) Revised 3-26-81



Install Pavement Marking, Drop on Beads, Type II - Lines

Sta. 25+00 to 30+00 M.L. - Lane Lines - 4" White (10' Line, 30' Skip)	260 L.F.
Sta. 25+00 to 30+00 M.L. - Rt. Edge Lines - 6" White	1500 L.F.
Sta. 25+00 to 20+00 M.L. - Lt. Edge Lines - 6" Yellow	1500 L.F.
Sta. 0+00 to 3+00 S.E.R. - Rt. Edge Line - 4" White	225 L.F.
Sta. 0+00 to 3+00 S.E.R. - Lt. Edge Line - 4" Yellow	225 L.F.
Sta. 14+00 to 23+30 N.E.R. - Rt. Edge Line - 4" White	930 L.F.
Sta. 14+00 to 19+30 N.E.R. - Lt. Edge Line - 4" Yellow	530 L.F.
Sta. 171+00 to 172+60 E. Bd. X-Rd.-Rt. Edge Line - 4" White	160 L.F.
Sta. 170+00 to 174+36 W. Bd. X-Rd.-Lt. Edge Line - 4" Yellow	436 L.F.
Sta. 170+00 to 170+60 W. Bd. X-Rd.-Lt. Edge Line - 4" Yellow	60 L.F.
Sta. 174+30 to 176+36 S.E.L. - Rt. Edge Line - 4" White	206 L.F.
Sta. 174+80 to 176+36 S.E.L. - Lt. Edge Line - 4" Yellow	156 L.F.
EXIT RAMP (S.E.L.) - 8" White @ 5' Centers (Core)	500 L.F.
Sta. 11+00 to 15+62 N.W. Loop - Rt. Edge Line - 4" White	462 L.F.
Sta. 11+00 to 13+25 N.W. Loop - Lt. Edge Line - 4" Yellow	225 L.F.
Sta. 28+00 to 32+00 E. Bd. Ramp - Lt. Edge Line - 4" Yellow	400 L.F.
	7775 L.F.

Install Plastic Pavement Marking Film-Messages (Retro-Refl.)

Straight Arrow	2 Ea.	25.0 S.F.

Install Plastic Pavement Marking Film-Line (Retro-Refl.)

Sta. 171+00 to 174+30 E. Bd. X-Rd - Lane Lines - 4" White (10' Line, 30' Skip)	27 S.F.
Sta. 171+00 to 174+30 E. Bd. X-Rd - Rt. Edge Lines - 4" White	110 S.F.
EXIT RAMP (N.E.R.) - 8" White Dia. W/4" White Edge Lines	185 S.F.
Sta. 30+00 to 32+00 E. Bd. Ramp - Lane Lines - 4" White (10' Line, 30' Skip)	14 S.F.
Sta. 28+00 to 30+00 E. Bd. Ramp - Rt. Edge Line - 4" White	117 S.F.
Sta. 35+00 to 36+55 E. Bd. Ramp - Diagonal Marking - 8" Yellow	243 S.F.
Sta. 174+36 to 179+25 W. Bd. X-Rd. - Lt. Edge Line - 4" Yellow	163 S.F.
Sta. 32+00 to 36+55 E. Bd. Ramp - Lt. Edge Line - 4" Yellow	152 S.F.
Sta. 32+00 to 36+55 E. Bd. Ramp - Rt. Edge Line - 4" White	152 S.F.
	1163 S.F.

PAVEMENT MARKING LAYOUT

MEMORIAL BRIDGE INCHG.

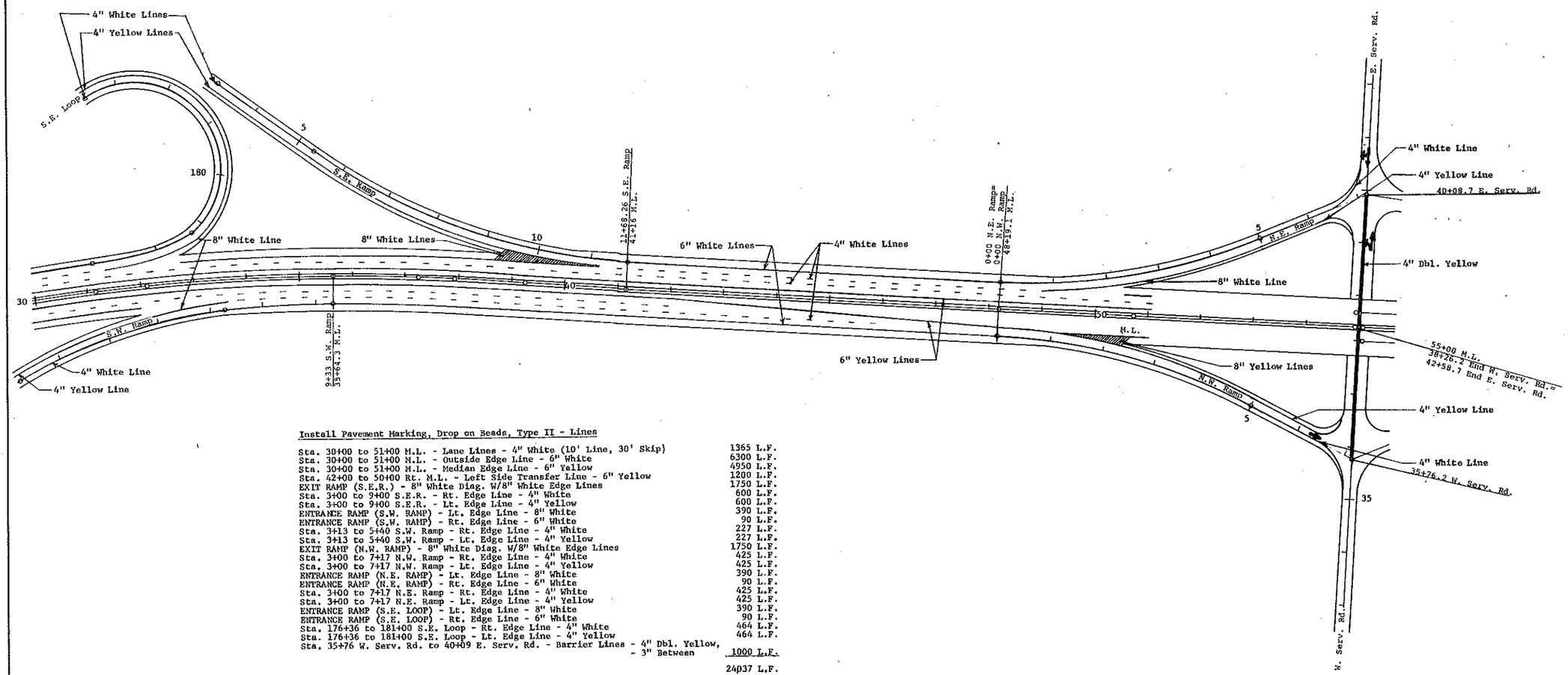
CROSS-ROADS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	F-I-194-4(45)000	48

(1) Revised 3-26-81

INSTALL PLASTIC PAVEMENT MARKING FILM - MESSAGES (RETRO-REFL.)

Straight Arrow	1 Ea.	12.5 S.F.
Thru & Rt. Arrow	1 Ea.	29.0 S.F.
Thru & Lt. Arrow	1 Ea.	29.0 S.F.
		70.5 S.F.



Install Pavement Marking, Drop on Beads, Type II - Lines

Sta. 30+00 to 51+00 M.L. - Lane Lines - 4" White (10' Line, 30' Skip)	1365 L.F.
Sta. 30+00 to 51+00 M.L. - Outside Edge Line - 6" White	6300 L.F.
Sta. 30+00 to 51+00 M.L. - Median Edge Line - 6" Yellow	4950 L.F.
Sta. 42+00 to 50+00 Rt. M.L. - Left Side Transfer Line - 6" Yellow	1200 L.F.
EXIT RAMP (S.E.R.) - 8" White Diag. W/8" White Edge Lines	1750 L.F.
Sta. 3+00 to 9+00 S.E.R. - Rt. Edge Line - 4" White	600 L.F.
Sta. 3+00 to 9+00 S.E.R. - Lt. Edge Line - 4" Yellow	600 L.F.
ENTRANCE RAMP (S.W. RAMP) - Lt. Edge Line - 8" White	390 L.F.
ENTRANCE RAMP (S.W. RAMP) - Rt. Edge Line - 6" White	90 L.F.
Sta. 3+13 to 5+40 S.W. Ramp - Rt. Edge Line - 4" White	227 L.F.
Sta. 3+13 to 5+40 S.W. Ramp - Lt. Edge Line - 4" Yellow	227 L.F.
EXIT RAMP (N.W. RAMP) - 8" White Diag. W/8" White Edge Lines	1750 L.F.
Sta. 3+00 to 7+17 N.W. Ramp - Rt. Edge Line - 4" White	425 L.F.
Sta. 3+00 to 7+17 N.W. Ramp - Lt. Edge Line - 4" Yellow	425 L.F.
ENTRANCE RAMP (N.E. RAMP) - Lt. Edge Line - 8" White	390 L.F.
ENTRANCE RAMP (N.E. RAMP) - Rt. Edge Line - 6" White	90 L.F.
Sta. 3+00 to 7+17 N.E. Ramp - Rt. Edge Line - 4" White	425 L.F.
Sta. 3+00 to 7+17 N.E. Ramp - Lt. Edge Line - 4" Yellow	425 L.F.
ENTRANCE RAMP (S.E. LOOP) - Lt. Edge Line - 8" White	390 L.F.
ENTRANCE RAMP (S.E. LOOP) - Rt. Edge Line - 6" White	90 L.F.
Sta. 176+36 to 181+00 S.E. Loop - Rt. Edge Line - 4" White	464 L.F.
Sta. 176+36 to 181+00 S.E. Loop - Lt. Edge Line - 4" Yellow	464 L.F.
Sta. 35+76 W. Serv. Rd. to 40+09 E. Serv. Rd. - Barrier Lines - 4" Dbl. Yellow, - 3" Between	1000 L.F.
	24037 L.F.

PAVEMENT MARKING LAYOUT

MEMORIAL BRIDGE INTERCHANGE