north dakota
state highway department

August 19, 1983

A D D E N D U M

To: All Prospective Bidders on Project No. BRF-1-006(02)066, Job No. 4 to be let on August 26, 1983

The following plan and proposal revisions shall be made:

Proposal Revision:

Bid item No. 16 on green bid sheet 4 of 6, Spec. 726, Code 0120 "Seeding Type A Class IV", shall be changed to Spec. 726 Code 0170 "Seeding Type B, Class IV."

Plan Revision:

The following notes shall be added:

1. Clearing and grubbing (approximately 4272 c.y.) shall be considered incidental to the price bid for "Common Excavation - Type A".

2. Topsoil excavation will be measured and paid for at the price bid for "Common Excavation - Type A."

The bid item "Seeding Type A, Class IV" on page 4, shall be changed to "Seeding Type B, Class IV" under section 726 of the standard specifications.

This addendum is hereby incorporated into the bidders proposal for this project.

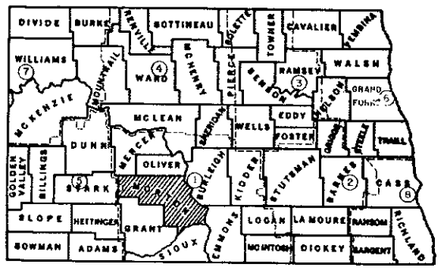
Sincerely,

Francis G. Ziegler

Francis G. Ziegler
Construction Engineer
jjb

JOB # 4

FED. ROAD DIV. NO.	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	BRF-I-006 (02) 066	1



SKETCH-MAP OF NORTH DAKOTA
SHOWING COUNTIES

SCALES
- LAYOUT SHEET: 1 IN. = 2000 FT.
- PLAN AND PROFILE DRAWINGS: HOR. 1 IN. = 30 FT. / VERT. 1 IN. = 5 FT.
- STRUCTURAL DRAWINGS: AS SHOWN
- CROSS SECTION SHEETS: 1 IN. = 5 FT.

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

PLANS

FOR THE PROPOSED IMPROVEMENT OF A

STATE HIGHWAY

IN MORTON COUNTY

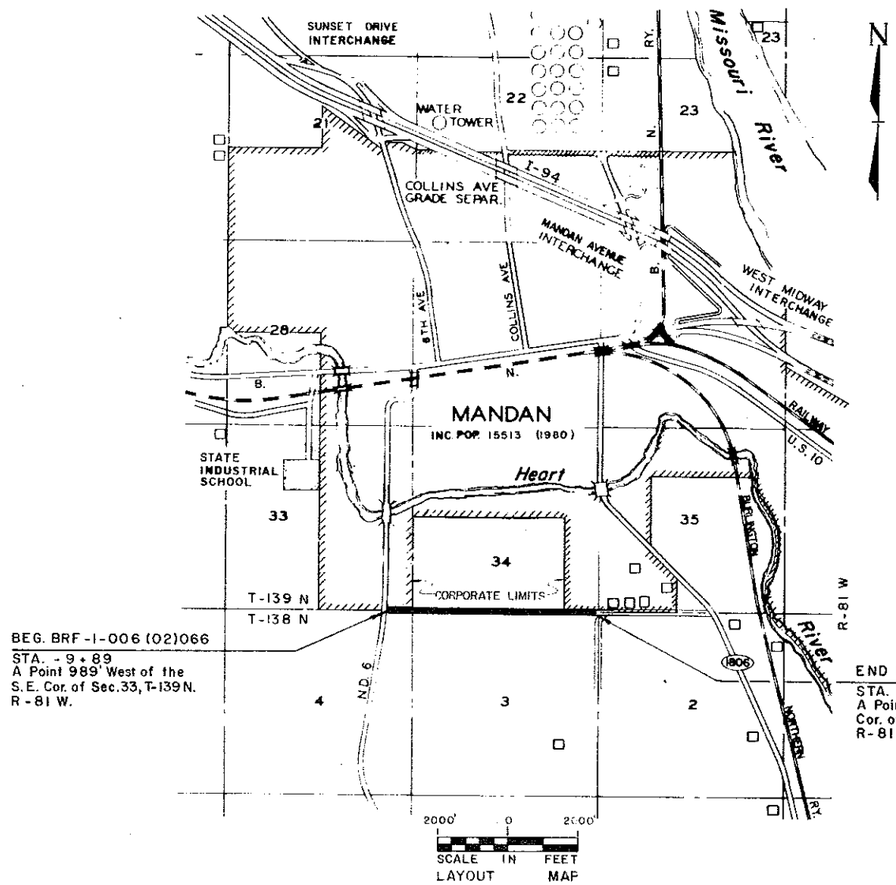
FEDERAL AID PROJECT NO. BRF-I-006(02)066

GRADING & AGGREGATE SURFACING (DETOUR)

LENGTH OF PROJECT		
PROJECT	MILES-GROSS	MILES-NET
BRS-I-006(02)	1.181	1.181
TOTALS	1.181	1.181

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 Supplemental Specifications thereto adopted July 1, 1983, and approved by the Federal Highway Administration and other Contract Provisions submitted herewith.



BEG. BRF-I-006 (02)066
STA. - 9+89
A Point 989' West of the S.E. Cor. of Sec. 33, T-139 N. R-81 W.

END BRF-I-006(02)066
STA. 52+48
A Point 38.4' West of the S.E. Cor. of Sec. 34, T-139 N., R-81 W.

APPROVED DATE 7-1-83

Ray Eink

CHIEF ENGINEER
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

REGISTERED PROFESSIONAL ENGINEER NORTH DAKOTA

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED

DIVISION ENGINEER DATE

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 SPIDGE

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 643.0
GRADE 641.0
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 — 3

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 Bituman
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.	Cdtch Basin
C.B.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. Pvmt.	Continuously Reinforced Concrete Pavement
Contn.	Contraction
Cr.	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-Load	Dead Load
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 Foot
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. Pvmt.	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
Ts	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
Yc	Spiral Coordinate

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO
8	N.D.	BRF-1-006(02)066	2

TABLE OF CONTENTS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	BRF-1-006(02)066	3

GENERAL NOTES

100 GENERAL: The engineer will attend to the removal of existing
011 fences to the highway right of way line and to the relocation or adjustment of utility facilities as shown on the plans. Equipment shall work around utility poles, within the area, that are not to be disturbed.

100 UNDERGROUND UTILITIES: The contractor shall notify the local
030 utility companies prior to the beginning of construction, so they may stake location and depth of all utilities in the project area. Subcutting or scarifying over utility lines may be eliminated if, in the opinion of the engineer, a hazardous situation exists. Separate plans, if any, showing relocation or adjustment work to be performed by utility companies to accommodate highway construction will be made available to the contractor, upon request to the engineer.

100 PROJECT ENGINEER RESPONSIBILITY:
050 (a) USC & G Bench Mark
As soon as it has been determined that a bench mark must be moved, consult your Construction Survey Manual (Sec. 150-4.9), for the proper steps needed to preserve the bench mark.

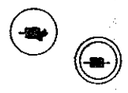
(b) All section corners must be monumented and a corner recordation form must be filed with the County Register of Deeds. See Appendix G of the Preliminary Survey Manual for instructions on how to fill out the form.

100 TREES, SHRUBS, AND NATIVE GRASSES: The contractor shall exercise
130 care in his construction operations to ensure that trees, shrubs, and native grasses within the right of way and outside the construction area are disturbed as little as possible.

100 The contractor will be required to conduct the construction
133 activities in such a manner as to comply with the Air Pollution Control Regulations of the state of North Dakota. Water will be used to control dust on the construction site.

100 The contractor will be required to comply with the North Dakota
134 State Highway Department's Standard Specifications and any Special Provisions that are considered necessary to control erosion.

100 HISTORICAL INFORMATION: If any scientific or historical
140 information is encountered after construction is in progress, the Highway Department will immediately notify the Historical Society, and efforts will be made to protect the material until it has been examined by an archaeologist from the Historical Society. If future activities should result in the discovery of any cultural resources that are eligible for inclusion in the National Register of Historical Places, this will require compliance with Section 106 of the National Historic Preservation Act of 1966 and the Advisory Council on Historic Preservation "Procedures for the Protection of Historic and Cultural Properties" (36, CRF, Part 800).

100 POLE LINES:  Designation of poles to be moved.
170 Designation of poles to be lowered.

200 SHRINKAGE: 25 percent additional volume in yardage computed by
010 the end area method is allowed for shrinkage in earth embankment.

200 COMPACTION AND DENSITY CONTROL: Compaction and density controls
021 shall be in accordance with Section 203-2.3.3 of the Standard Specifications, except that, if the subgrade is unstable (as evidenced by sponginess or rutting) when compacted to the required density, it will be necessary to dry the soils to obtain adequate stability. This may require drying below optimum moisture. The cost of such drying will be incidental to the price bid for "Roadway Excavation" (and/or "Borrow," if used).

200 INTERCEPTING DITCH: Intercepting ditches shall be constructed
290 wherever considered necessary by the engineer.

300 AGGREGATE BASE COURSE: The Class 11 material (clay binder) shall
020 be weighed and paid for by the ton prior to blending this material with the aggregate base material at the plant site. No deduction in weight will be made for the Class 11 material at the time of weighing the aggregate base (Class 8) material for payment. The Class 11 material can be omitted if not required.

762 MAINTAINING ACCESS: The contractor will be responsible for
010 providing access to all residential dwelling and business establishments adjacent to this project. Final details on location of access points and construction procedures shall be worked out with the engineer in the field prior to start of the project.

WIRE FENCE: Standard D-738-1 shall be used exceptthat 3 strands will be used. Engineer shall determine wire spacing. Wood post will be used.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	BRF-1-006(02)066	4

SUMMARY OF QUANTITIES

SPEC	CODE	ITEM DESCRIPTION	UNIT	TOTAL
103	0100	Contract Bond	L. Sum	1
203	0101	Common Excavation - Type A	Cu. Yd.	54698
204	0100	Average Haul (Not a Pay Item)	Cu. Yd. Sta.	49316 4.52
216	0100	Water	M. Gal.	637
302	0135	Aggregate Base Course Cl. 8	Ton	4519
302	0150	Aggregate Base Course Cl. 11	Ton	45
630	0455	18 In. Corr. Steel End Section .064 in.	Ea.	2
630	2380	24 In. Reinf. Conc. Pipe Cl. III	L. Ft.	134
630	2460	30 In. Reinf. Conc. Pipe Cl. II	L. Ft.	60
630	2465	30 In. Reinf. Conc. Pipe Cl. III	L. Ft.	48
630	2900	84 In. Reinf. Conc. Pipe Cl. III	L. Ft.	112
630	3275	24 In. Reinf. Conc. End Section	Ea.	6
630	3285	30 In. Reinf. Conc. End Section	Ea.	4
630	3325	84 In. Reinf. Conc. End Section	Ea.	2
630	3410	Relaying Pipe - All Types & Sizes	L. Ft.	54
705	0100	Mobilization	L. Sum	1
726	0120	Seeding Type A Class IV	Acre	12
738	0106	Barbed Wire Fence - 3 Strand	L. Ft.	6166
738	0120	Install Vehicle Gate	Ea.	1
738	0144	Install Corner Assembly - Barbed Wire (Wd. Post)	Ea.	40
738	0151	Inst. Double Brace Assem.-Barbed Wire	Ea.	1
740	0110	Remove & Reset Fence	L. Ft.	4135
762	3298	Traffic Control	L. Sum	1
772	0100	Wood Excelsior Fibermat	Sq. Yd.	4365

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO.
8	N.D.	BRF-1-006(02)066	5

SPECIAL PROVISIONS

Seq. No.	Name	SP No.
272	Fuel Cost Adjustment	SP 272
492	Legal Relations and Responsibility to Public	SP 107-8
532	Haul Road Maintenance	
531	Utilization of Minority Business Enterprises	

BASIS OF ESTIMATE

WATER FOR COMPACTION: 10 Gal. per C.Y. of Embankment.
20 Gal. per Ton of Aggregate Base Coarse

SEEDING: Entire right of way except roadbed.

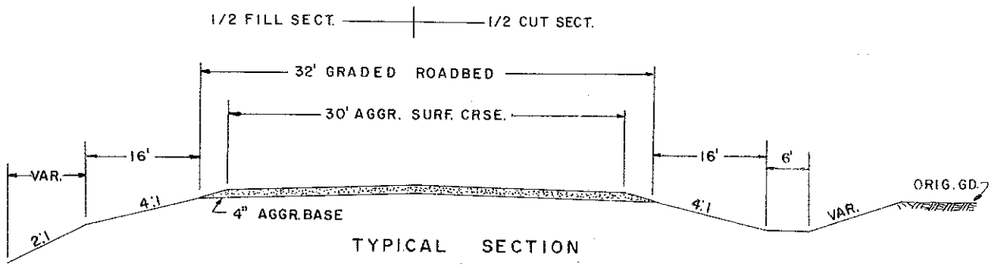
AGGREGATE BASE COARSE: Class 8 = 1.5 Ton/C.Y. + 25%
Class 11 = 10% of Class 8

MAXIMUM SIZE OF AGGRETATE

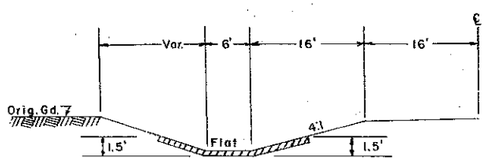
Description	Type of Aggregate	Maximum Size
Aggregate Base Coarse Class 8	Crushed	3/4"

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	BRF-I-006(02)	6

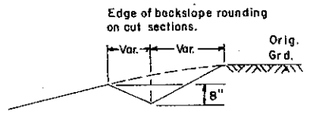
TYPICAL SECTIONS, DETAILS & SIGNING



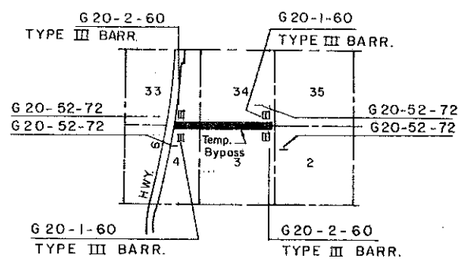
TYPICAL SECTION



TYPICAL DITCH SECTION
WOOD EXCELSIOR FIBERMAT



INTERCEPTING DITCH
Not a pay item. To be considered as incidental to Common Excavation.



CONSTRUCTION SIGNING

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO
8	N.D.	BRF-1-006(02)066	7

CULVERT LIST

STATION	LOCATION	SIZE	LENGTH	TYPE	END SECTION
-9+40	CL	24"	42'	RCP CL. III	2
-4+00	CL	30"	48'	RCP CL. III	2
0+00	Lt.	18"		CSES (.064)	2
8+00	CL	24"	44'	RCP CL. III	2
21+00	CL	24"	48'	RCP CL. III	2
34+18	CL	84"	112'	RCP CL. III	2
50+00	CL	30"	60'	RCP CL. II	2

SUMMARY

18" CSES 2 .064

24"X134' RCP CL. III 6 RCES

30"X60" RCP CL. II 2 RCES

30"X48' RCP CL. III 2 RCES

84"X112' RCP CL. III 2 RCES

BRF-1-006 (22) 6

BENCH MARKS			
NO.	DESCRIPTION	LOCATION	ELEV.
1	Point Spot on Culvert	-9+53 - 73.04	1745.45
2	Top Cadastral Cor	0+00 - ℄	1736.08

N

INSTALL PIPE CULVERTS

-4+00 ℄ 30"x 48' R.C.P. Cl. III 2-[illegible] C.E.S.
0+00 Lt. 2-18" C.S.E.S. (.064)
8+00 ℄ 24"x 44' R.C.P. Cl. III 2-24 [illegible] C.E.S.
-9+40 ℄ 24"x 42' R.C.P. Cl. III 2-24 [illegible] C.E.S.

RELAY PIPE CULVERT

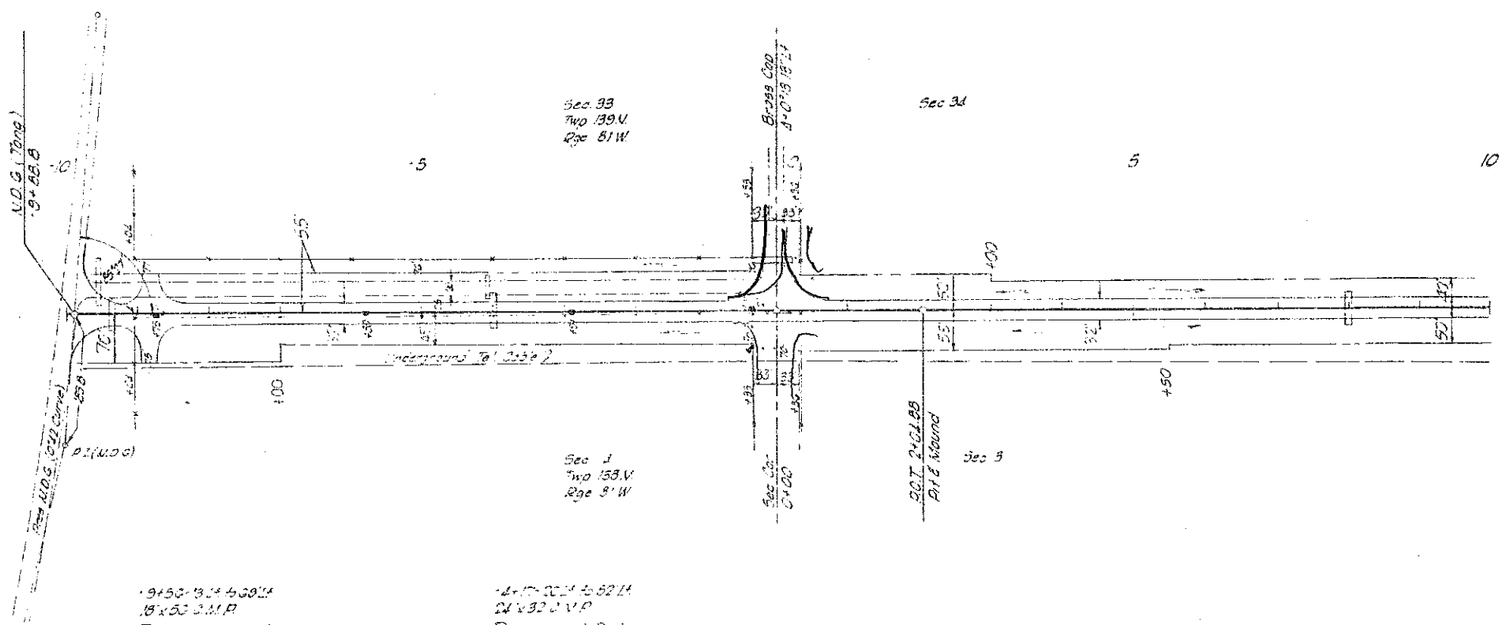
0+00 Lt. 18"x 54' C.S.P. (from Salv.)

INSTALL BARBED WIRE FENCE - 3 STRAND

0+36 to 10+00 Lt. & Rt. 1928 L.F.

REMOVE AND RESET FENCE

-9+04 to -0+33 Rt. 871 L.F.



INSTALL BARBED WIRE FENCE - 3 STRAND

10+00 to 19+88 Lt. 988 L.F
10+00 to 40+00 Rt. 3000 L.F

INSTALL WOOD EXCELSIOR FIBERMAT

25+00 to 32+65 Rt. 1530 S.Y.
35+00 to 38+00 Rt. 600 S.Y.
35+00 to 40+00 Lt. 1000 S.Y.
39+00 to 40+00 Rt. 200 S.Y.

INSTALL PIPE CULVERT

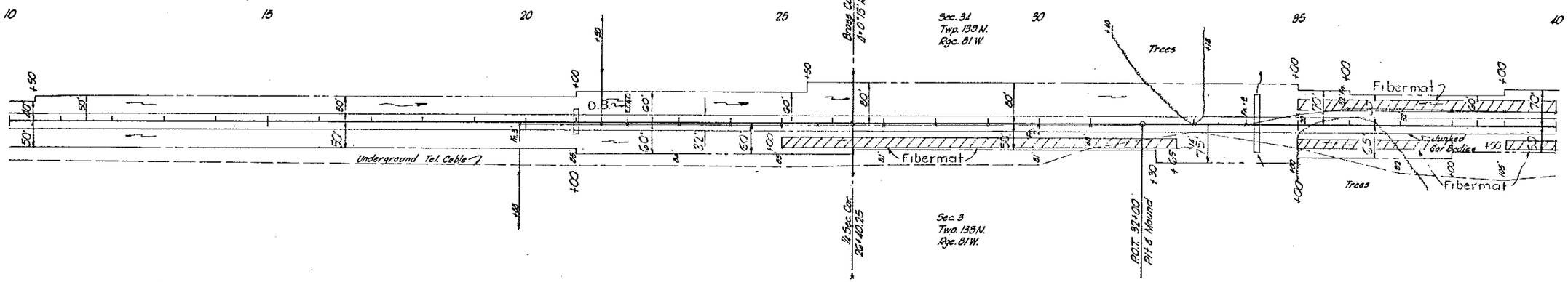
21+00 ℄ 24"x 48' R.C.P. Cl. III 2-24" R.C.E.S.
34+18 ℄ 84"x 112' R.C.P. Cl. III 2-84" R.C.E.S.
(Imperfect Trench)

REMOVE AND RESET FENCE

19+88 to 40+00 Lt. 2012 L.F.

N

BENCH MARKS			
NO.	DESCRIPTION	LOCATION	ELEV.
3	Iron Pin on Fn. Line	19+88-100' Rt.	1782.60
4	1/2" Grdx. on Fn. Line	21+50-150' Lt.	1758.04
5	Iron Pin on Fn. Line	26+42-130' Lt.	1750.02
6	Iron Pin	30+81-52' Rt.	1702.27
7	Iron Pin	32+45-166' Rt.	1687.39
8	Iron Pin	35+15-170' Rt.	1687.68



Detour

Exc. 7931 C.Y.
Emb. 7931 C.Y.
Ave. Haul 8242 C.Y. 5.90 Sta.

22+00 Lt.
Constr. Ditch Block

P.I. 15+00
El. 1756.0
V.C. 300'

+0.09 7%

-0.43 %

In 48.5 Lt.
Out 48.0 Rt.

21+00 ℄
24"x 48' R.C.P.
2-24" R.C.E.S.

D.G. 21+00 Lt.
El. 1748.5

D.G. 22+00 Lt.
El. 1749.0

23+40

Exc. 20971 C.Y.
Emb. 20971 C.Y.
Ave. Haul 20378 C.Y. 3.91 Sta.

P.I. 24+20
El. 1752.2
V.C. 800'

-7.00 %

34+13-℄
84"x 112' R.C.P.
2-84" R.C.E.S.

In. 1685.6 Rt.
Out 1684.5 Lt.

34+67

Exc. 12083 C.Y.
Emb. 12085 C.Y.
Ave. Haul 11213 C.Y. 5.67 Sta.

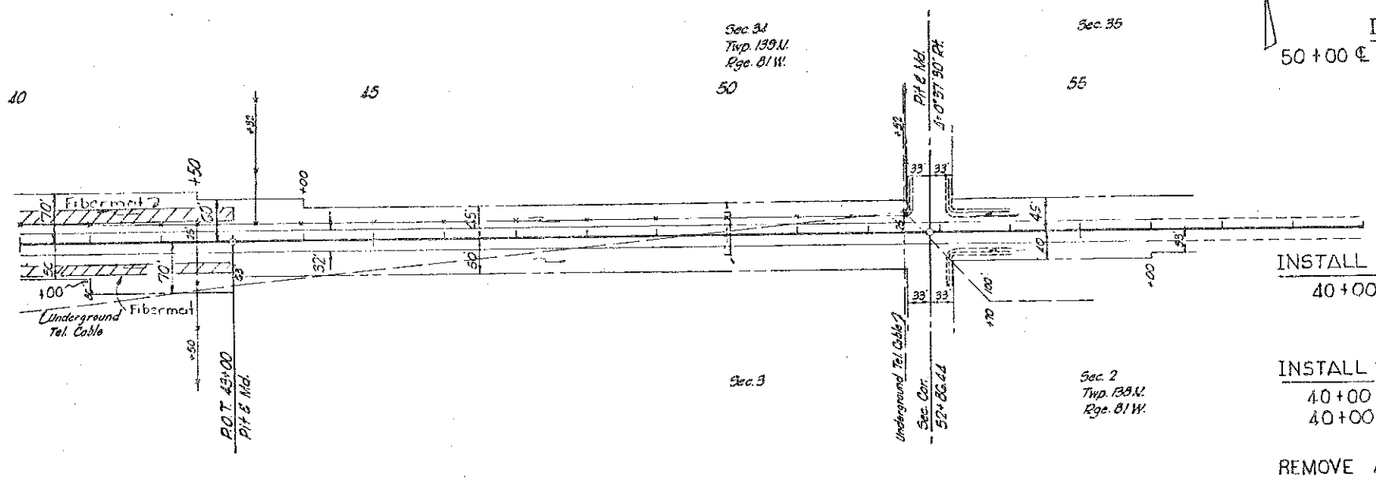
P.I. 32+80
El. 1675.0
V.C. 650'

+6.35%

1760
1750
1740
1730
1720
1710
1700
1690
1680
1670

BRF-1-006(02) 10

BENCH MARKS			
NO.	DESCRIPTION	LOCATION	ELEV.
9	Iron Pin	42+77.12 Lt.	1738.26
10	Iron Pin	52+52.10 Lt.	1738.23



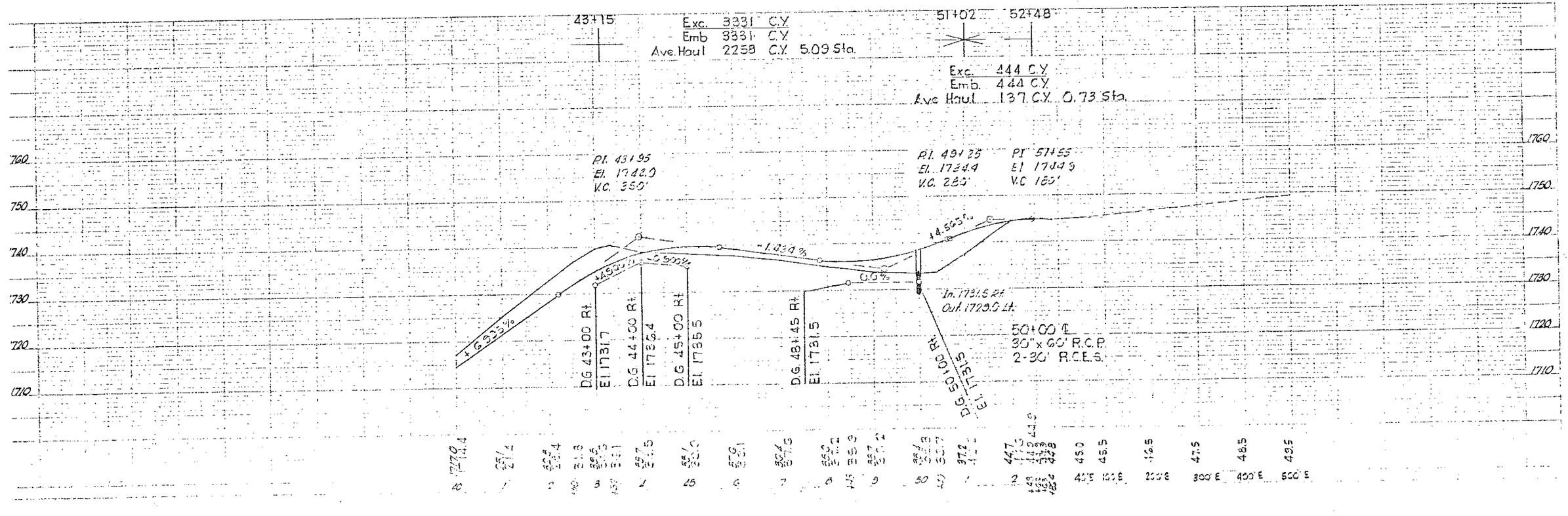
INSTALL PIPE CULVERT
50+00 ℄ 30"x60' R.C.P. Cl. III 2-30"R.C.E.S.

INSTALL BARBED WIRE FENCE - 3 STRAND
40+00 to 42+50 250 L.F.

INSTALL WOOD EXCELSIOR FIBERMAT
40+00 to 43+00 Lt. 500 S.Y.
40+00 to 43+00 Rt. 535 S.Y.

REMOVE AND RESET FENCE
40+00 to 42+50 Lt. 250 LF

Detour

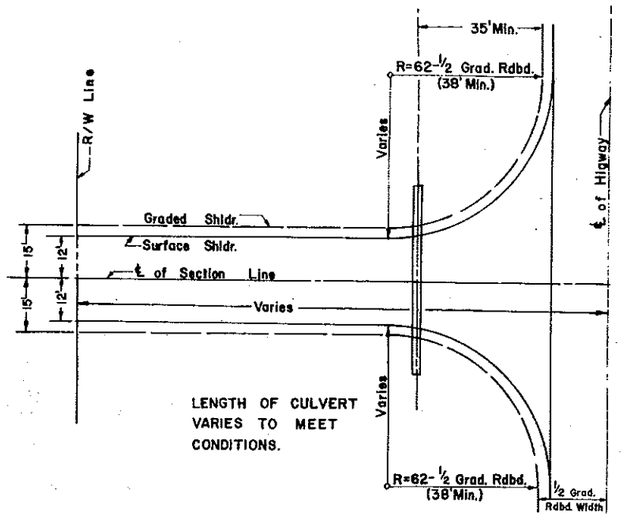


BRF-1-006(02)066

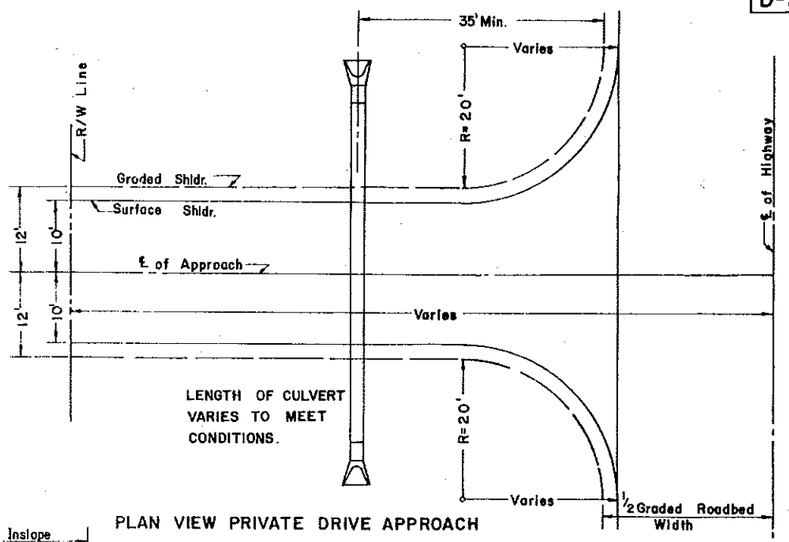
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		11

D-203-8

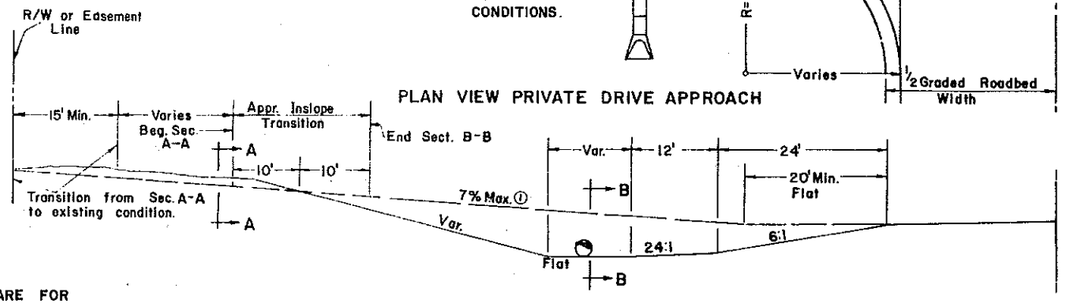
SECTION LINE & PRIVATE DRIVE APPROACHES
(RURAL)



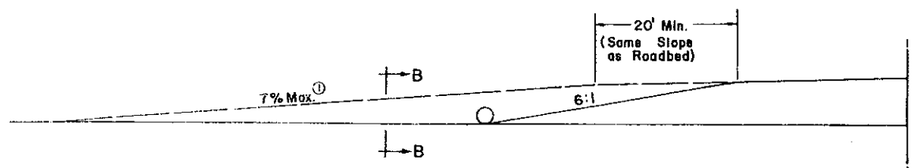
PLAN VIEW SECTION LINE APPROACH (WITHOUT SKEW)



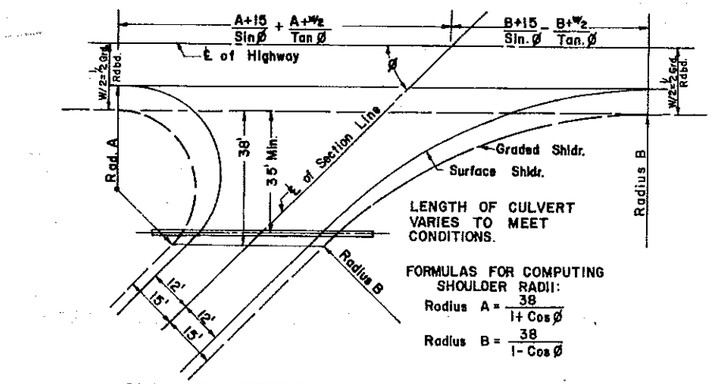
PLAN VIEW PRIVATE DRIVE APPROACH



APPROACH GRADE ON CUT SECTION



APPROACH GRADE ON FILL SECTION 12 FEET OR LESS



PLAN VIEW SECTION LINE APPROACH (SKEWED)

NOTE:

DIMENSIONS SHOWN FOR SURFACING ARE FOR AGGREGATE SURFACE COURSE OR BITUMINOUS SURFACE CONSTRUCTED WITH GRADING CONTRACT.

APPR. GRADES AND TYPICAL SECTIONS APPLY TO BOTH PRIVATE DRIVES AND SECTION LINE APPROACHES.

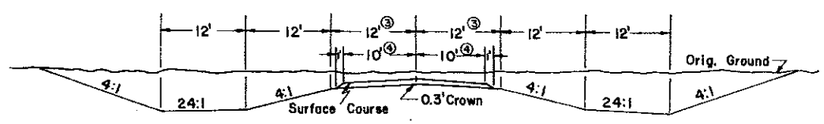
FOOT NOTES

① 10% Max. on Field Drives

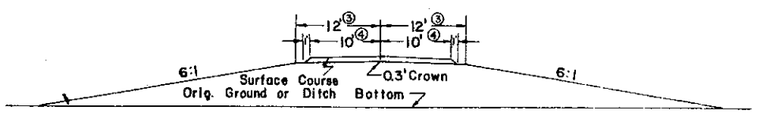
② 3:1 Slope - 20' to 30' Fill
2:1 Slope on Fills over 30'

③ 15' on Sec. Line Appr's.

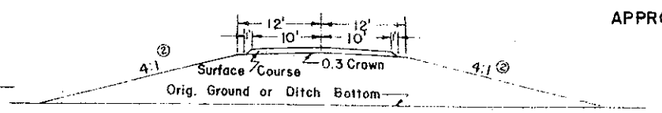
④ 12' on Sec. Line Appr's



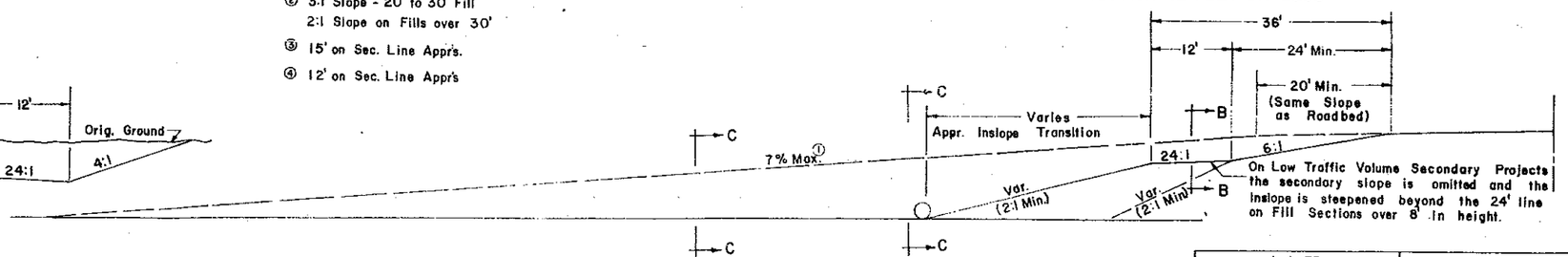
SECTION A-A



SECTION B-B



SECTION C-C



APPROACH GRADE ON FILL SECTION OVER 12 FEET

1-1-75	
REVISIONS	
DATE	CHANGE

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: [illegible] Design Engineer

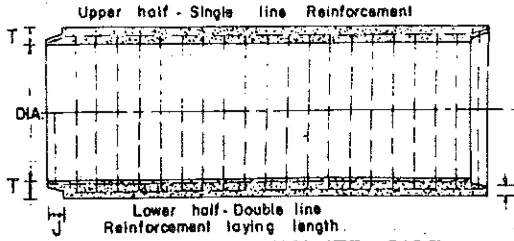
Recommended: Asst. Chief Engineer Pre-Construction

Approved: [illegible] Chief Engineer

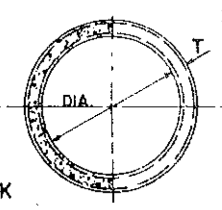
BRF-1-006(02)066 | 12

D-630-1

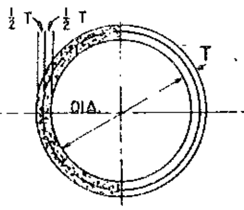
REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS



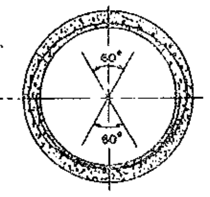
REINFORCED CONCRETE PIPE
TYPICAL LONGITUDINAL SECTION



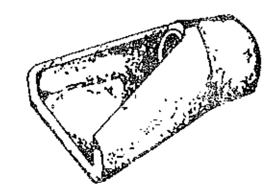
END VIEW
Double line Reinforcement



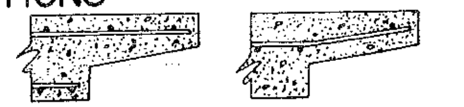
END VIEW
Single line Reinforcement



END VIEW
Top half showing Elliptical Reinforcement.
Bottom half showing Elliptical & Inner Cage Reinforcement.

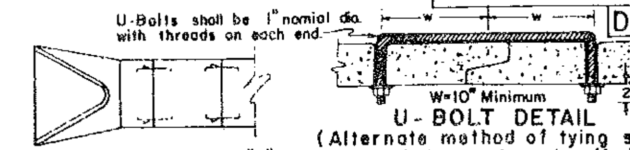


PERSPECTIVE



ARRANGEMENT FOR REINFORCEMENT
At end of 36" to 108" pipe.
At end of 12" to 33" pipe.

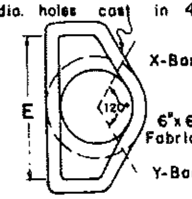
U-Bolts shall be 1" nomial dia. with threads on each end.



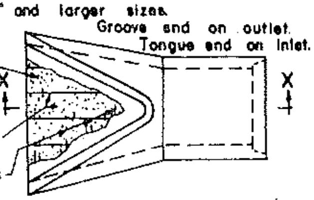
U-BOLT DETAIL
(Alternate method of tying sections)

Fasteners and tie bolts or "U" Bolts are required on end sections (4ea) for 42" thru 108" R.C.P. Culverts. On culverts without flared-end sections the 3-end sections of the above culvert sizes shall be tied together in the same manner for each end. Galvanizing of fasteners, tie bolts or "U" Bolts is not req'd.

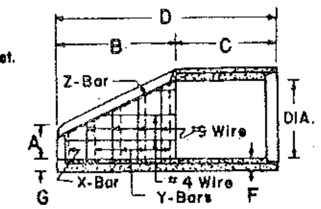
1¼" dia. holes cast in 42" and larger sizes.



END VIEW

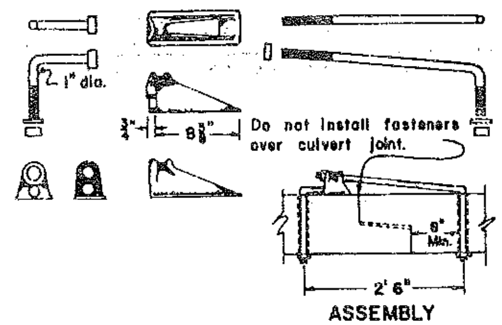


PLAN



SECTION X-X

END SECTION
Equivalent to Class III Pipe



FASTENERS AND TIE BOLTS

END SECTION

	TERMINAL DIMENSIONS							REINFORCING STEEL		
DIA.	A	B	C	D	E	F	G	X	Y	Z
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"	2"	2¼" x 2'	6-¼" x 2' @ 6" c.c.	2-¼" x 4'
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"	2¼"	2¼" x 2½'	6-¼" x 2½' @ 6" c.c.	2-⅜" x 4'
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"	2½"	2⅜" x 3'	6-¼" x 3' @ 6" c.c.	2-⅜" x 4'
21	0'-9"	3'-0"	3'-1½"	6'-1½"	3'-6"	2¾"	2¾"	2⅜" x 3½'	8-¼" x 3½' @ 6" c.c.	2-⅜" x 5'
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"	3"	2½" x 4'	8-⅜" x 4' @ 8" c.c.	2-⅜" x 6'
27	0'-10½"	4'-1½"	2'-0"	6'-1½"	4'-6"	3¼"	3¼"	2½" x 5'	8-⅜" x 5' @ 9" c.c.	2-⅜" x 6'
30	1'-0"	4'-6"	3'-7¾"	8'-1¾"	5'-0"	3½"	3½"	2½" x 5'	12-⅜" x 5' @ 8" c.c.	2-½" x 6'
36	1'-3"	5'-3"	2'-10¾"	8'-1¾"	6'-0"	4"	4"	2½" x 6'	18-⅜" x 6' @ 6" c.c.	2-½" x 8'
42	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4½"	4½"	2½" x 7'	12-½" x 7' @ 9" c.c.	2-½" x 8'
48	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"	5"	2½" x 8'	16-½" x 8' @ 8" c.c.	2-½" x 8'
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"	5½"	2½" x 8'	16-½" x 8' @ 7" c.c.	2-½" x 8'
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	6"	5"	2½" x 9'	16-½" x 9' @ 6" c.c.	2-½" x 9'
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	6½"	5½"	2½" x 9'	22-½" x 9' @ 6" c.c.	2-½" x 9'
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	7"	6"	2½" x 10'	24-½" x 10' @ 6" c.c.	2-½" x 9'
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	7½"	6½"	2½" x 10'	28-½" x 10' @ 6" c.c.	2-½" x 10'
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	8"	6½"	4½" x 10'	28-½" x 10' @ 6" c.c.	4-½" x 10'
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	8½"	6½"	4½" x 11'	28-½" x 11' @ 6" c.c.	4-½" x 10'

Permissable Fill Heights
RCP-Sewer-Trench Conditions
Other than Class I

PIPE SIZE	Class II	Class III	Class IV	Class V
	FT.	FT.	FT.	FT.
2" thru 54"	3-9	1-3 9-13	13-23	23+
60" thru 108"	1-9	9-13	13-23	23+

REINFORCED CONCRETE PIPE

D-LOAD TO PRODUCE A 0.01 INCH CRACK: Class I 800; Class II 1000; Class III 1350; Class IV and Class IV Alternate 2000; Class V and Class V Alternate 3000.

D-LOAD TO PRODUCE ULTIMATE LOAD: Class I 1200; Class II 1500; Class III 2000; Class IV and Class IV Alternate 3000; Class V and Class V Alternate 3750.

Pipe data

Internal Dia. of Pipe in Inches (Dia)	Cross-Sectional Water Area (Sq.ft.)	Weight per lin. foot of pipe Std. Wall (Lbs.)	Joint J Groove End Min./Max. (In.)	Joint K Tongue End Min. (In.)
12	0.79	92	1⅝-2⅜	¾
15	1.23	127	1¾-2½	⅞
18	1.77	166	1⅞-2⅞	1
21	2.40	214	1⅞-3⅛	1⅛
24	3.14	265	2¼-3½	1¼
27	3.98	322	2¾-4	1¼
30	4.91	384	3¼-4½	1¼
33	5.94	452	3¼-4½	1½
36	7.07	524	3¼-4½	1½
42	9.62	686	3⅜-4⅝	1⅝
48	12.57	867	3⅜-4⅝	1⅞
54	15.90	1070	4⅛-5½	2
60	19.63	1296	4½-5½	2¼
66	23.76	1542	5-6	2⅜
72	28.27	1810	5⅜-6⅝	2⅝
78	33.18	2098	6¼-7¼	2⅞
84	38.48	2410	5⅞-7⅜	3⅛
90	44.18	2565	6¾-8¼	3⅛
96	50.27	2910	7-8¼	3½
102	56.75	3075	7-8¼	3½
108	63.62	3690	7¼-8½	3¾

CLASS I (D-load 0.01 inch crack 800; ultimate 1200) — 4000 P.S.I. (102 and 108: 5000 P.S.I.)

Dia	Minimum Wall Thickness (In.)	Circular rein. in circular pipe Inner cage (Sq.in)	Circular rein. in circular pipe Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)	Height of Fill Trench Conditions (Ft.)
12					
15	TO BE USED FOR				
18	R.C.P. SEWER ONLY				
21					
24					
27	☆ Special conditions only				
30					
33					
36					
42					
48					
54					☆
60	6	.21	.16	.23	6-9
66	6½	.25	.19	.28	6-9
72	7	.29	.22	.32	6-9
78	7½	.32	.24	.36	6-9
84	8	.37	.28	.41	6-9
90	8½	.41	.31	.46	6-9
96	9	.46	.35	.51	6-9
102	9½	.54 .20	.41	.41	6-9
108	10	.61 .22	.46	.46	6-9

CLASS II (D-load 0.01 inch crack 1000; ultimate 1500) — 4000 P.S.I. (102 and 108: 5000 P.S.I.)

Dia	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	Circular rein. Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12	2	.07			3-11	11-18
15	2¼	.07			3-11	11-18
18	2½	.07		.07	3-11	11-18
21	2¾	.07		.07	3-11	11-18
24	3	.07		.07	3-11	11-18
27	3¼	.13		.11	3-11	11-18
30	3½	.14		.12	3-11	11-18
33	3¾	.15		.13	3-11	11-18
36	4	.12	.09	.13	3-11	11-18
42	4½	.15	.12	.17	3-11	11-18
48	5	.18	.14	.20	3-11	11-18
54	5½	.22	.16	.24	3-11	11-18
60	6	.25	.19	.28	3-11	11-18
66	6½	.31	.23	.34	3-11	11-18
72	7	.35	.26	.39	3-11	11-18
78	7½	.40	.30	.44	3-11	11-18
84	8	.46	.34	.51	3-11	11-18
90	8½	.51	.38	.57	3-11	11-18
96	9	.57	.43	.63	3-11	11-18
102	9½	.48 .24	.51	.51	3-11	11-18
108	10	.74 .27	.57	.57	3-11	11-18

CLASS III (D-load 0.01 inch crack 1350; ultimate 2000) — 4000 P.S.I. (90 to 108, first group: 5000 P.S.I.)

Dia	Min. Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)	Min. Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12	2	.07							1-3 11-18	16-31
15	2¼	.07							1-3 11-18	16-31
18	2½	.07		.07					1-3 11-18	16-31
21	2¾	.07		.07					1-3 11-18	16-31
24	3	.07		.07					1-3 11-18	16-31
27	3¼	.16		.14					1-3 11-18	16-31
30	3½	.18		.15					1-3 11-18	16-31
33	3¾	.15	.11	.17					1-3 11-18	16-31
36	4	.17	.13	.19					1-3 11-18	16-31
42	4½	.21	.16	.23					1-3 11-18	16-31
48	5	.24	.18	.27					1-3 11-18	16-31
54	5½	.29	.22	.32					1-3 11-18	16-31
60	6	.34	.26	.38					1-3 11-18	16-31
66	6½	.41	.31	.46					1-3 11-18	16-31
72	7	.49	.37	.54	7¾	.36	.27	.40	1-3 11-18	16-31
78	7½	.57	.43	.63	8¼	.42	.32	.47	1-3 11-18	16-31
84	8	.64	.48	.71	8¾	.50	.38	.56	1-3 11-18	16-31
90	8½	.69	.52	.77	9¼	.59	.45	.66	1-3 11-18	16-31
96	9	.76	.57	.84					1-3 11-18	16-31
102	9½	.90 .32	.68	.68					1-3 11-18	16-31
108	10	1.08 .39	.81	.81					1-3 11-18	16-31

CLASS IV (D-load 0.01 inch crack 2000; ultimate 3000) — 4000 P.S.I. (first group 60 to 72 and second group 72 to 84: 5000 P.S.I.)

Dia	Min. Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)	Min. Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)
12	2	.07						
15	2¼	.10						
18	2½	.14		.11				
21	2¾	.20		.17				
24	3	.27		.23	3¾	.07	.07	.08
27	3¼	.31		.25	4	.08	.07	.09
30	3½	.35		.28	4¼	.09	.07	.10
33	3¾	.27	.20	.30	4½	.11	.08	.12
36	4	.30	.22	.33	4¾	.14	.10	.15
42	4½	.35	.26	.39	5¼	.20	.15	.22
48	5	.42	.32	.47	5¾	.26	.20	.29
54	5½	.50	.37	.55	6¼	.34	.26	.36
60	6	.59	.45	.68	6¾	.41	.31	.46
66	6½	.69	.52	.77	7¼	.51	.39	.57
72	7	.79	.60	.88	7¾	.61	.46	.68
78					8¼	.71	.53	.79
84					8¾	.85	.63	.94

CLASS IV ALTERNATE — 5000 P.S.I. (Height of Fill columns apply to Class IV and Class IV Alternate)

Dia	Min. Wall Thickness (In.)	Inner cage Ai (Sq.in)	Ellip. cage Ae (Sq.in)	Outer cage Ao (Sq.in)	Shear Steel N (No.)	Shear Steel S (In.)	Shear Steel Ar (Sq.in)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12								16-24	24-43
15								16-24	24-43
18								16-24	24-43
21								16-24	24-43
24								16-24	24-43
27								16-24	24-43
30								16-24	24-43
33								16-24	24-43
36								16-24	24-43
42								16-24	24-43
48								16-24	24-43
54								16-24	24-43
60	6	.27	.27	.22	7	6	.22	16-24	24-43
66	6½	.30	.30	.24	8	6	.22	16-24	24-43
72	7	.32	.32	.26	8	6	.23	16-24	24-43
78	7½	.35	.35	.28	9	6	.25	16-24	24-43
84	8	.38	.38	.30	10	6	.28	16-24	24-43
90	8	.43	.43	.34	11	6	.31	16-24	24-43
96	8½	.46	.46	.36	11	6	.34	16-24	24-43
102	9	.52	.52	.41	12	6	.37	16-24	24-43
108	9	.57	.57	.46	12	6	.40	16-24	24-43

CLASS V (D-load 0.01 inch crack 3000; ultimate 3750) — 6000 P.S.I.

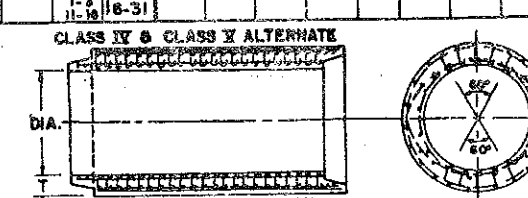
Dia	Min. Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)	Min. Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)
12	2	.10						
15	2¼	.14						
18	2½	.19		.16				
21	2¾	.24		.21				
24	3	.30		.24	3¾	.12	.09	.13
27	3¼	.38	.28	.42	4	.14	.11	.16
30	3½	.41	.31	.46	4¼	.18	.14	.20
33	3¾	.46	.35	.51	4½	.23	.17	.25
36	4	.50	.38	.56	4¾	.27	.20	.30
42	4½	.60	.45	.67	5¼	.36	.27	.40
48	5	.73	.55	.81	5¾	.47	.35	.52
54					6¼	.58	.43	.64
60					6¾	.70	.53	.78
66					7¼	.84	.63	.93
72					7¾	.99	.74	1.10

CLASS V ALTERNATE — 5000 P.S.I. (Height of Fill columns apply to Class V and Class V Alternate)

Dia	Min. Wall Thickness (In.)	Inner cage Ai (Sq.in)	Ellip. cage Ae (Sq.in)	Outer cage Ao (Sq.in)	Shear Steel N (No.)	Shear Steel S (In.)	Shear Steel Ar (Sq.in)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12								24-35	35-69
15								24-35	35-69
18								24-35	35-69
21								24-35	35-69
24								24-35	35-69
27								24-35	35-69
30								24-35	35-69
33								24-35	35-69
36								24-35	35-69
42								24-35	35-69
48	5	.33	.33	.26	8	4	.22	24-35	35-69
54	5½	.37	.37	.29	9	4	.22	24-35	35-69
60	6	.41	.41	.32	7	6	.22	24-35	35-69
66	6½	.44	.44	.36	8	6	.22	24-35	35-69
72	7	.48	.48	.38	8	6	.23	24-35	35-69
78	7½	.52	.52	.42	9	6	.25	24-35	35-69
84	8	.56	.56	.45	10	6	.28	24-35	35-69
90	8	.65	.65	.52	11	6	.31	24-35	35-69

NOTES: All reinforcement shall be electrically welded cold drawn steel wire fabric.
Circular reinforcement shall lap in accordance to A.A.S.H.O. M170.
All circular, longitudinal and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
Laying length of pipe: 12" to 66" (incl.) = Not less than 4 feet.
66" to 108" (incl.) = Not less than 6 feet.
Furnishing and installing fasteners and tie bolts shall be included in price bid for R.C.P. Culverts.

CLASS IV & CLASS V ALTERNATE



LONGITUDINAL SECTION

Ai, Ae, Ao = Minimum circumferential reinforcement required in square inches per lineal foot of pipe.
Ar = Minimum radial reinforcement required in square inches per square foot of pipe.
N = Minimum number of rows of radial reinforcing at top and bottom of pipe.
S = Maximum circumferential spacing of rows of radial reinforcing.

1-1-75

REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT
Submitted: [signature] Design Engineer
Recommended: ______ Asst. Chief Engineer Pre-Construction
Approved: [signature] Chief Engineer

BRF-1-006(02)066

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		13

D-630-4

CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS

(ROUND PIPE)

NOTES:

Pipe and Connecting Bands shall conform to applicable sections of 1'DSHD Standard Specifications and to AASHO M-36.

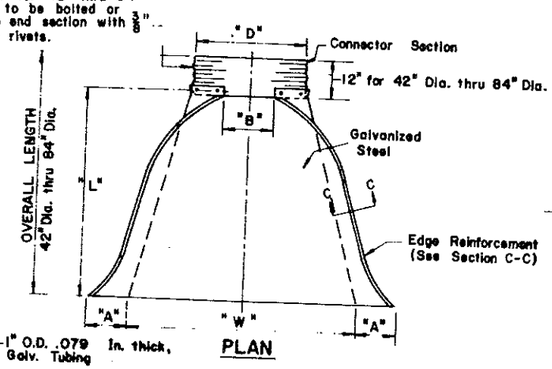
Top edge of all End Sections to have tubing reinforcement or rolled tubed reinforcement (See Section A-A). The tubing is to be supplemented with 2"x2"x¼" Galv. Angle for 60" thru 72" Dia. and 2½"x2½"x¼" Galv. Angle for 78" and 84" Dia. Angles to be attached by Gal. ⅜ ø bolts and nuts. Angles are to extend 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.

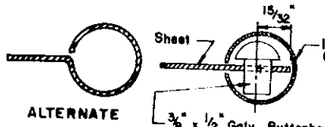
Fill Height Tables are based on the following criteria:

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

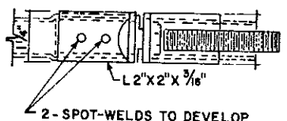
This connection for 42" thru 84" diameter pipe to be bolted or riveted to the end section with ⅜" Galv. bolts or rivets.



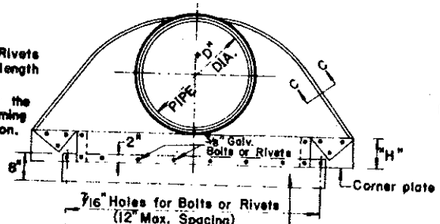
PLAN



NOTE: Tubing is slipped over the sheet and rivets prior to forming operations of the End Section.



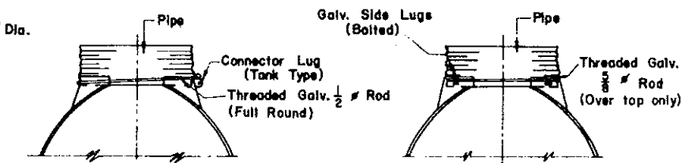
SECTION C-C



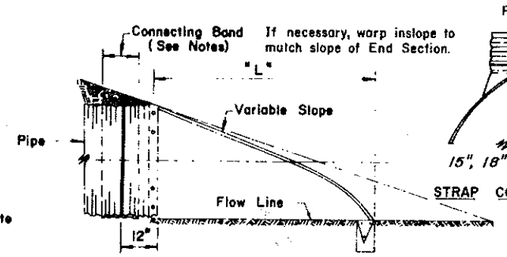
ELEVATION

Galv. Toe Plate required on End Sections for pipe of 30" dia. or larger. Plate to be fastened to End Section in field. Thickness of Toe Plate to be same as End Section.

Where Toe Plate is needed the Toe Plate, Bolts and Nuts are to be included in price bid for End Sections.

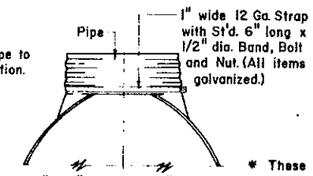


ROD CONNECTION DETAILS



TYPICAL CROSS-SECTION

(Showing Connector Section)



STRAP CONNECTION DETAILS

END SECTIONS

** PIPE DIA. (In.)	GALV. THICK.	DIMENSIONS A	B	H	L	W	Approx. Slope	Body
		In.	In.	In.	In.	In.	Rate	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 ⅜" ø galv. bolts or rivets. Nuts to be torqued to 25 lbs. ±.

FILL HEIGHT TABLES

RIVETED, WELDED OR HELICAL FABRICATION

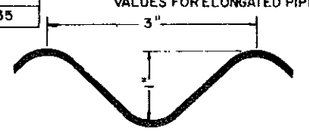
3" BY 1" CORRUGATIONS

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 (116)
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

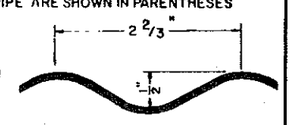
2⅔" BY ½" CORRUGATIONS

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

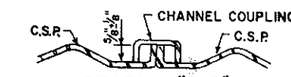
VALUES FOR ELONGATED PIPE ARE SHOWN IN PARENTHESES



3" BY 1" CORRUGATIONS

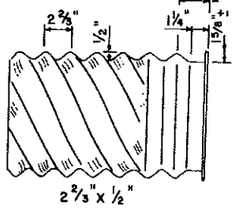


2⅔" BY ½" CORRUGATIONS



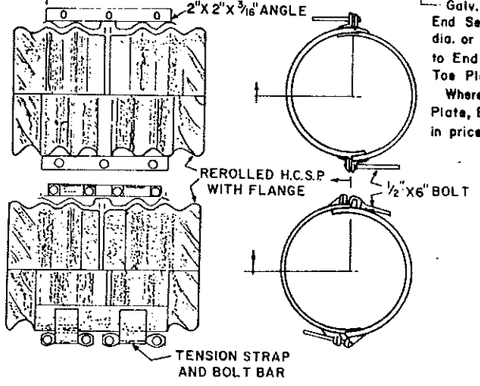
SECTION "B-B"

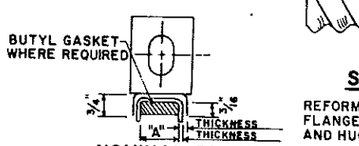
CHANNEL COUPLING BAND FOR USE ON FLANGED END C.S.P.
(CHANNEL COUPLING BANDS SHALL BE TWO PIECE)



SPIRAL C.S.P

REFORMED TO ACCEPT FLANGE, ANNULAR, DIMPLE AND HUGGER COUPLERS



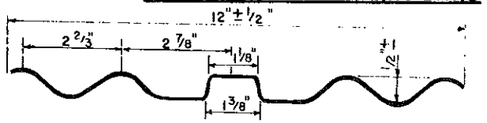


NOMINAL DIMENSIONS

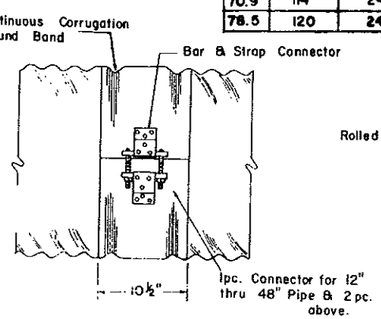
THICKNESS	"A"	FOR USE WITH C.S.P.
0.079"	¾	0.09" THICK OR LIGHTER
0.109"	1"	0.138" THICK OR HEAVIER

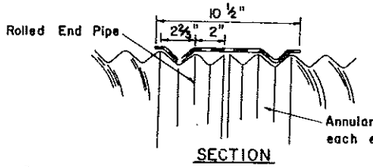
SECTION "AA"

WING CHANNEL COUPLING BAND



CROSS SECTION OF WING CHANNEL COUPLING BAND





SECTION

CONNECTING BAND DETAILS FOR HELICAL, WELDED - SEAM CULVERT

CORRUGATED STEEL PIPE FLANGE BAND DETAILS

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

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

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: C.P. Romas
Design Engineer

Recommended:
Asst. Chief Engineer Pre-Construction

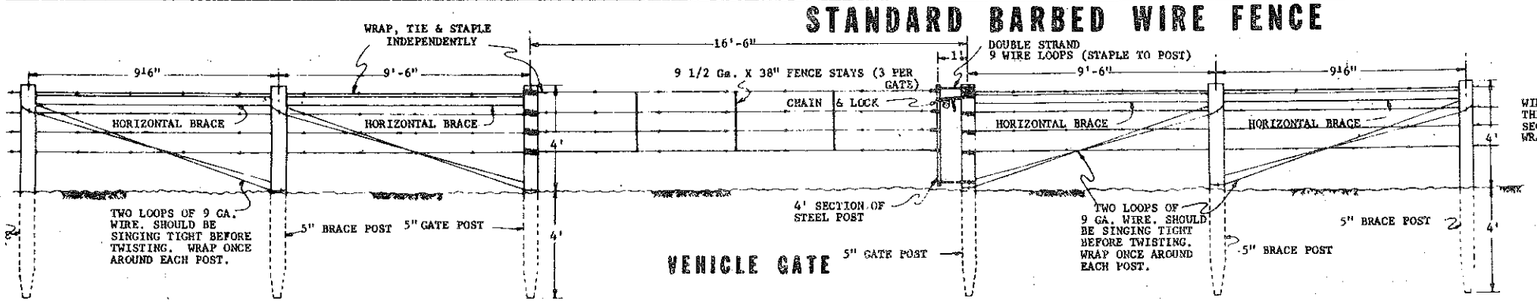
Approved: K. Hundley
Chief Engineer

BRF-1-006(02)066

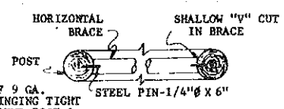
FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.		14

D-738-1

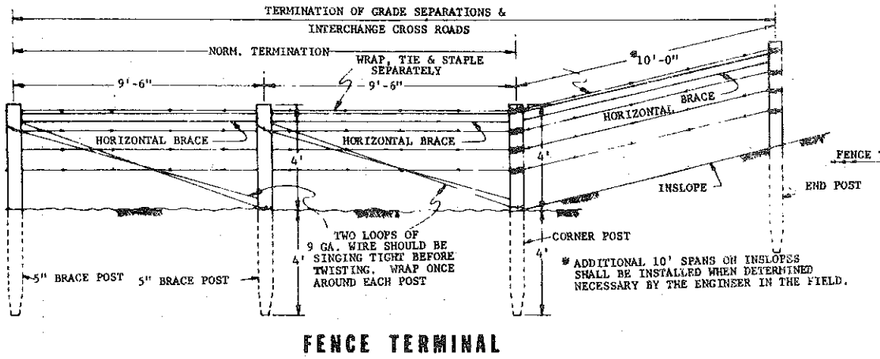
STANDARD BARBED WIRE FENCE



VEHICLE GATE



HORIZONTAL BRACE DETAIL



* ADDITIONAL 10' SPANS ON INSLOPES SHALL BE INSTALLED WHEN DETERMINED NECESSARY BY THE ENGINEER IN THE FIELD.

FENCE TERMINAL

STEEL OR WOOD LINE POSTS

16'-6" SPACING

NOTES:

CORNER ASSEMBLY POSTS SHALL BE ROUND-BACK ANGLE STEEL OR TREATED WOOD. THE TYPE OF POST USED UNDER THE ABOVE OPTIONS SHALL BE DETERMINED BY THE CONTRACTOR. TREATED WOOD POSTS SHALL BE USED FOR GATES, DOUBLE BRACE ASSEMBLIES AND FENCE TERMINAL. TYPE OF LINE POST TO BE INDICATED ON PLANS.

NO DEDUCTION IN MEASURED PAY LENGTH OF WIRE FENCE WILL BE MADE FOR GATES, CORNER ASSEMBLIES, DOUBLE BRACE ASSEMBLIES, FENCE TERMINALS OR DEPRESSION FENCING. DEPRESSION FENCING AND ABUTMENT FENCING SHALL BE INCLUDED IN THE PRICE BID FOR FENCING.

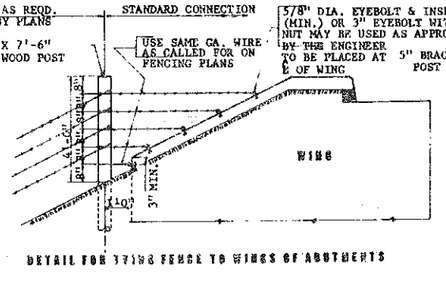
ALL MATERIALS SHALL BE IN ACCORDANCE WITH SEC. 884 OF THE STANDARD SPECIFICATIONS. POSTS AND BRACES SHALL BE GALVANIZED IN ACCORDANCE WITH REQUIREMENTS OF AASHTO M-111 OR PAINTED WITH PAINT CONFORMING TO SECTION 870-1.18 OF THE STANDARD SPECIFICATIONS.

PRIVATE FENCES SHALL NOT BE CONNECTED TO THE HIGHWAY FENCE.

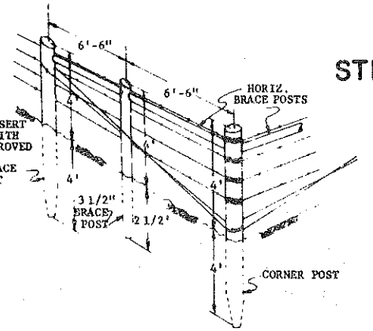
DOUBLE BRACE ASSEMBLIES SHALL BE INSTALLED AT LOCATIONS SHOWN ON THE PLANS OR ESTABLISHED BY THE ENGINEER. THE DISTANCE BETWEEN ADJACENT FENCE TERMINALS, CORNER ASSEMBLIES, OR DOUBLE BRACE ASSEMBLIES SHALL NOT EXCEED 1320 FEET.

ADDITIONAL MATERIALS AND LABOR FOR EACH FENCE TERMINAL WILL BE PAID FOR AT THE PRICE BID FOR DOUBLE BRACE ASSEMBLY.

COST OF FURNISHING AND INSTALLING INSERTS AND EYEBOLTS SHALL BE INCLUDED IN THE UNIT PRICE BID FOR FENCING. EYEBOLTS SHALL BE GALVANIZED ACCORDING TO AASHTO DESIGNATION: M-30, INSERTS OF CORROSION RESISTANT MATERIAL NEED NOT BE GALVANIZED. CONCRETE INSERTS SHALL BE OF SUCH DESIGN THAT, WHEN INSTALLED IN THE CONCRETE, WILL BE CAPABLE OF DEVELOPING THE FULL STRENGTH OF THE 5/8" DIA. THREADED EYE BOLT.



DETAIL FOR TYING FENCE TO WINGS OF ABUTMENTS

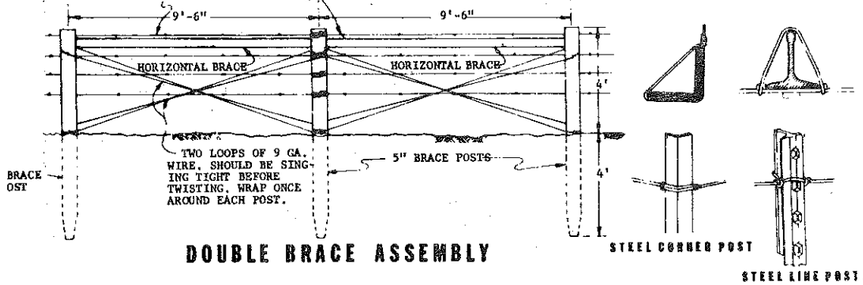


SHORT SPAN DETAIL

(FENCE LINE 100' OR LESS)

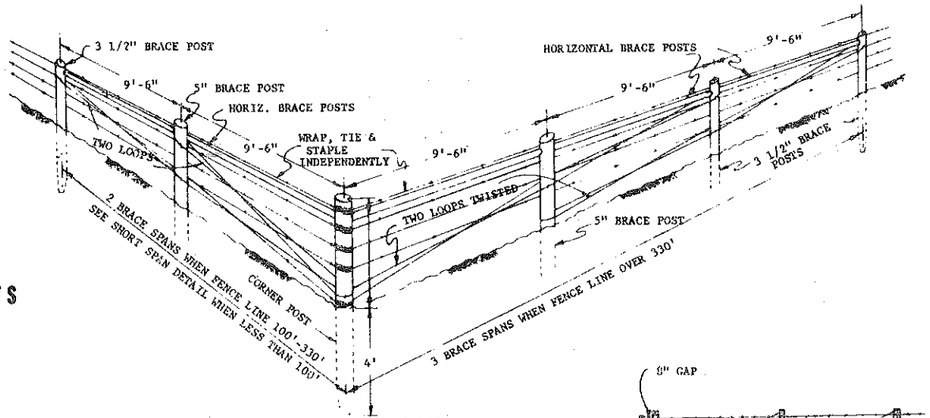
POST SIZES

USE OF POST	TREATED WOOD		STEEL		
	Post Dia.	Post Length	Post Length	Post Weight Lbs./Ft.	Anchor Wt. Lbs.
Line Post	3 1/2"	6'-6"	6'-6"	1.33	0.67
Corner Post	8"	8'	7'	4.10	(CONC.)
End Post	5"	8'			
Brace Post	5" / 3 1/2"	8'	7'	3.19	(CONC.)
Gate Post	5"	8'			
Horizontal Brace	3 1/2"	VAR.			

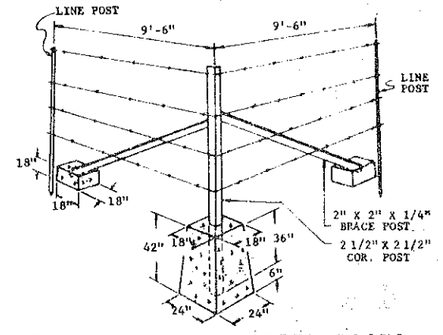


DOUBLE BRACE ASSEMBLY

WIRE FASTENING TO POSTS

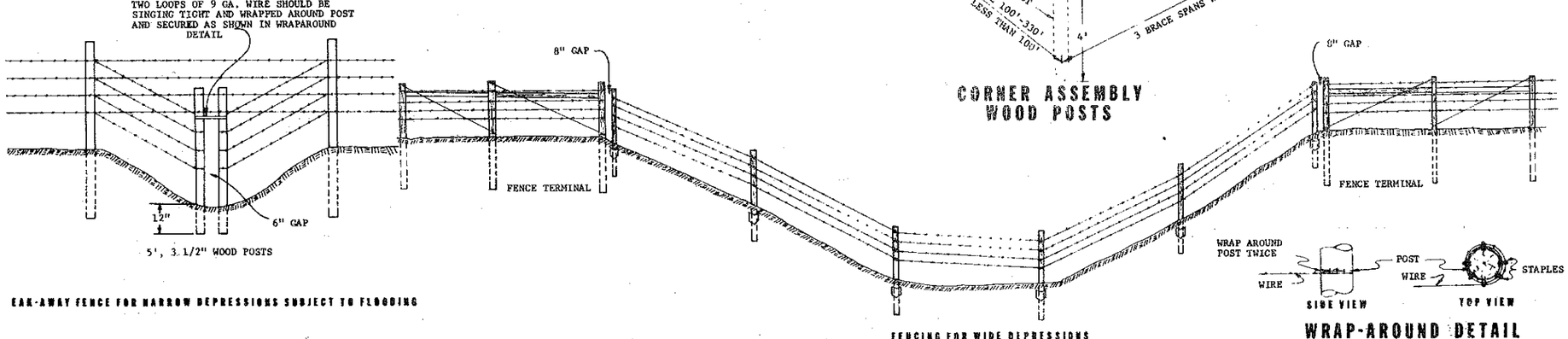


CORNER ASSEMBLY WOOD POSTS



CORNER ASSEMBLY - STEEL POSTS

TWO LOOPS OF 9 GA. WIRE SHOULD BE SINGING TIGHT AND WRAPPED AROUND POST AND SECURED AS SHOWN IN WRAPAROUND DETAIL



EAR-AWAY FENCE FOR NARROW DEPRESSIONS SUBJECT TO FLOODING

FENCING FOR WIDE DEPRESSIONS

WRAP-AROUND DETAIL

REVISIONS	
DATE	CHANGE
8-8-78	FENCING FOR WIDE DEPRESSIONS
2-16-82	LINE WOOD POST DIMENSIONS ADDED AND NOTE
11-1-82	NOTES CHANGED
1-25-83	POST SPACING DETAIL

JUNE 12, 1978

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: Design Engineer.

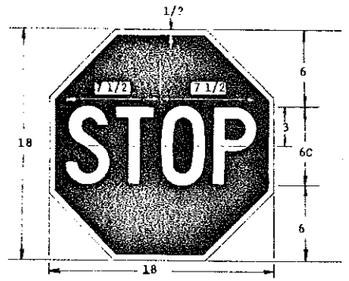
Recommended: Asst. Chief Engineer Pre-Construction.

Approved: Chief Engineer

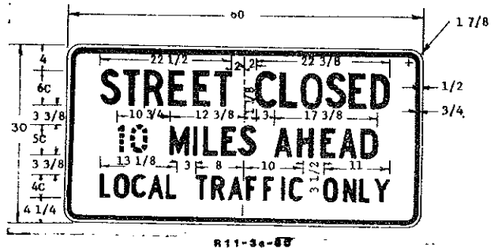
CONSTRUCTION SIGN DETAILS

FHWA REGION	STATE	PROJECT NO.	SHT.
8	N.D.	BRF-1-006(02)066	15

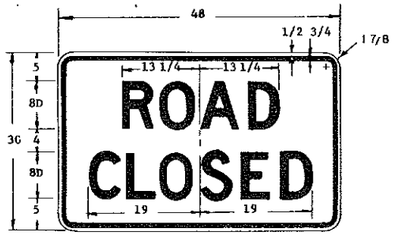
D754-1



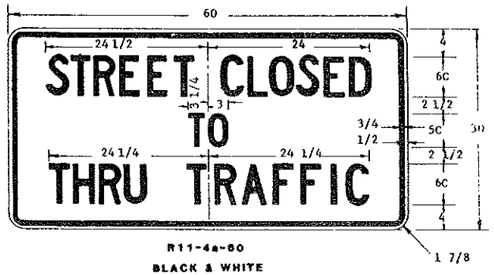
STOP-SLOW PADDLE
RED & WHITE
FLAGPERSON PADDLE



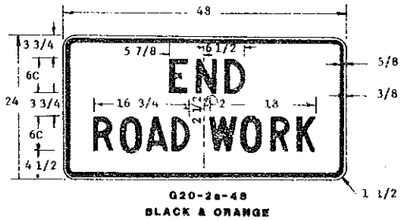
R11-3a-60
BLACK & WHITE



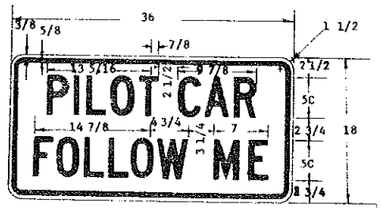
R11-2-48
BLACK & WHITE



R11-4a-60
BLACK & WHITE



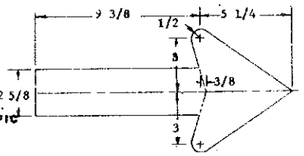
G20-2a-48
BLACK & ORANGE



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.

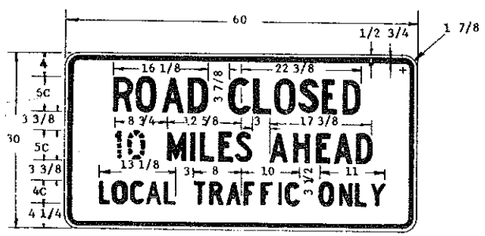
G20-8-48
BLACK & ORANGE



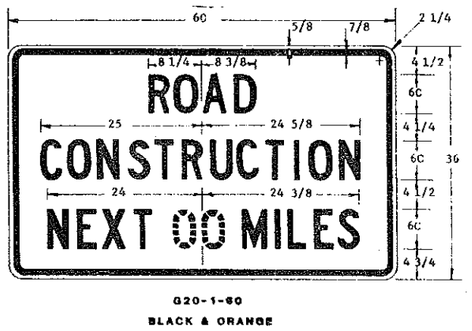
ARROW DETAIL FOR SIGN NO'S.
G20-50-72 & G20-52-72

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 DETAILS OF THESE LETTERS MAY BE OBTAINED FROM THE STATE HIGHWAY DEPARTMENT OR THE SHEETING MANUFACTURER.

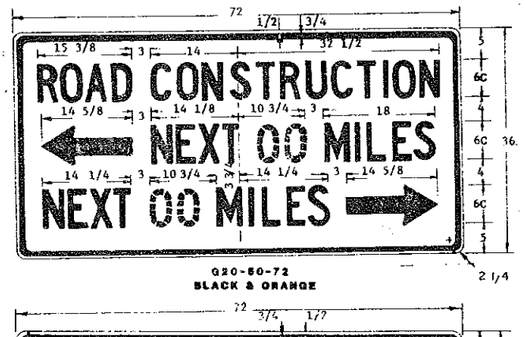
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.



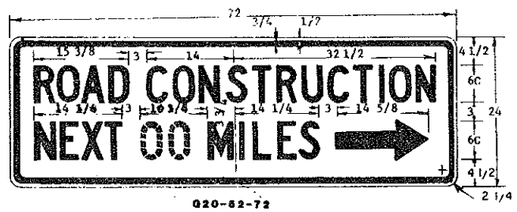
R11-3a-60
BLACK & WHITE



G20-1-60
BLACK & ORANGE

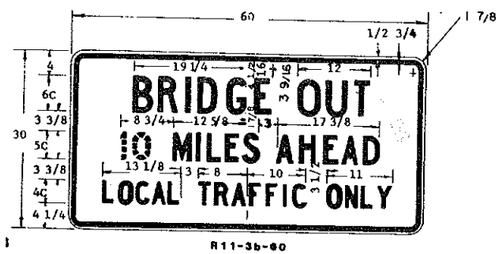


G20-50-72
BLACK & ORANGE

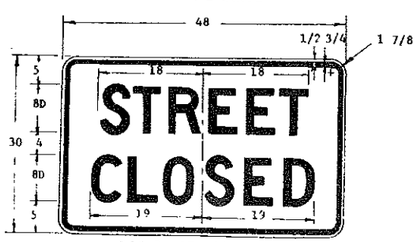


G20-52-72
BLACK & ORANGE

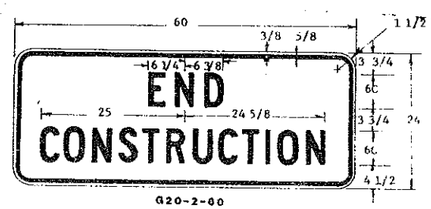
ARROW MAY BE TO RIGHT OR LEFT OF LEGEND TO INDICATE CONSTRUCTION TO THE RIGHT OR LEFT.



R11-3b-60
BLACK & WHITE



R11-2a-48 BLACK & WHITE



G20-2-60
BLACK & ORANGE

G20-54-48
BLACK & ORANGE

2-17-78	
REVISIONS	
DATE	CHANGE
12-18-78	TITLE ADDED
2-22-80	SIGN COLOR
2-23-80	SIGN SIZES
5-19-80	SIGN COLOR
6-11-80	SIGN SIZES

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted _____
Design Engineer

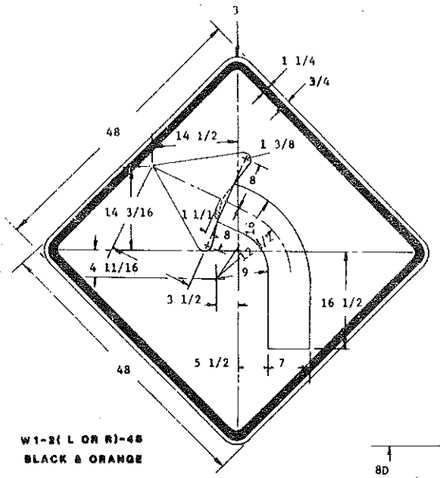
Recommended _____
Asst. Chief Engineer, Eng. Comm.

Approved: _____
Chief Engineer

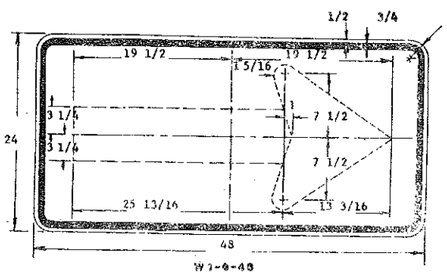
CONSTRUCTION SIGN DETAILS

FHWA REGION	STATE	ROAD PROJECT NO.	SHT.
8	ND	BRF-1-006(02)066	16

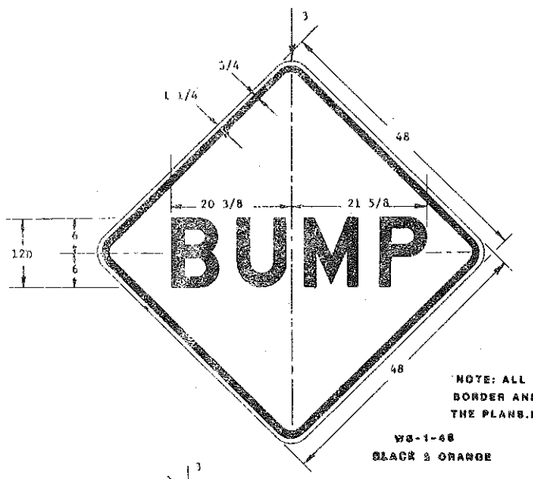
D-754-2



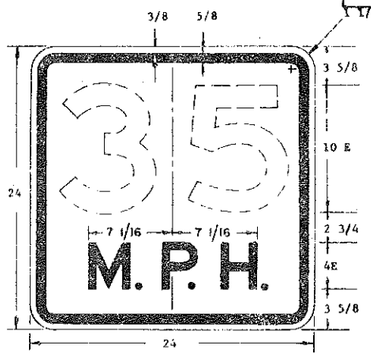
W1-2(L OR R)-48
BLACK & ORANGE



W1-6-48
BLACK & ORANGE

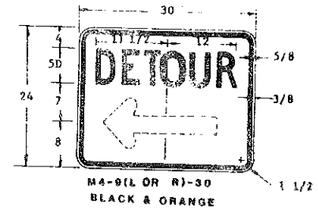


W8-1-48
BLACK & ORANGE

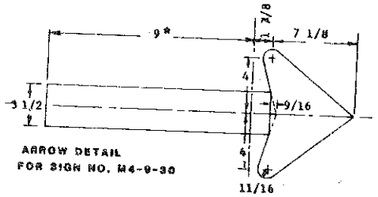


W13-1-24
BLACK & ORANGE

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



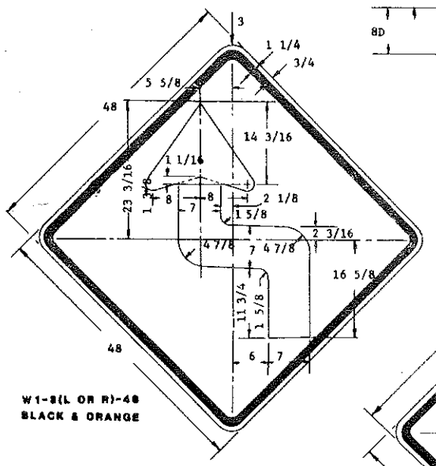
M4-9(L OR R)-30
BLACK & ORANGE



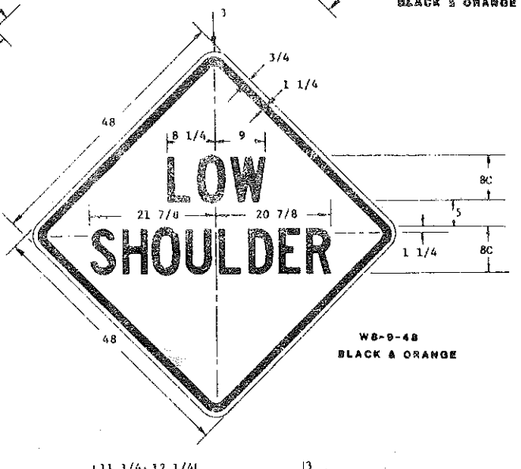
ARROW DETAIL
FOR SIGN NO. M4-9-30

MESSAGE AND BORDER: THE MESSAGES AND BORDERS SHALL BE SCREENED ON REFLECTIVE SHEETING OR INSTALLED USING PIGMENTED PLASTIC FILM CONFORMING TO THE REQUIREMENT OF SEC. 804-3.6 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.

*DIMENSION SHALL BE 3" WHEN ARROW IS PLACED VERTICALLY.

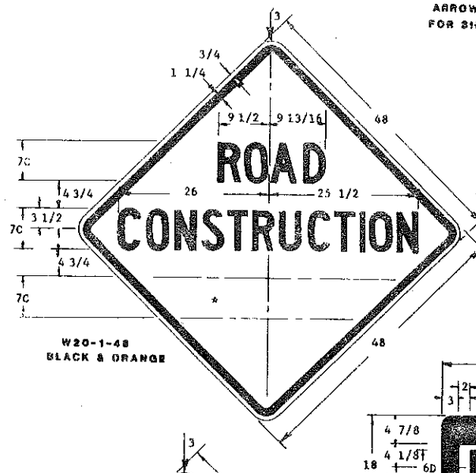


W1-3(L OR R)-48
BLACK & ORANGE

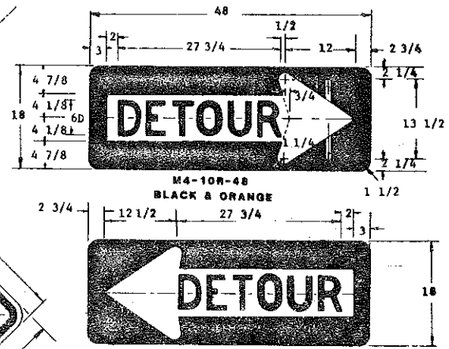


W8-4-48
BLACK & ORANGE

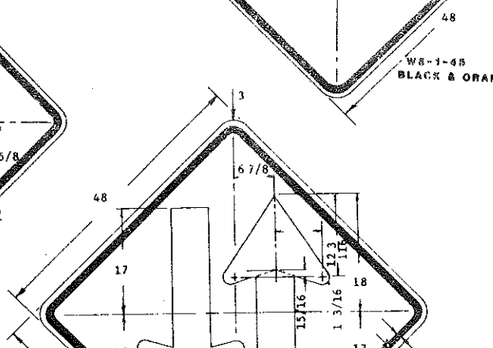
W8-9-48
BLACK & ORANGE



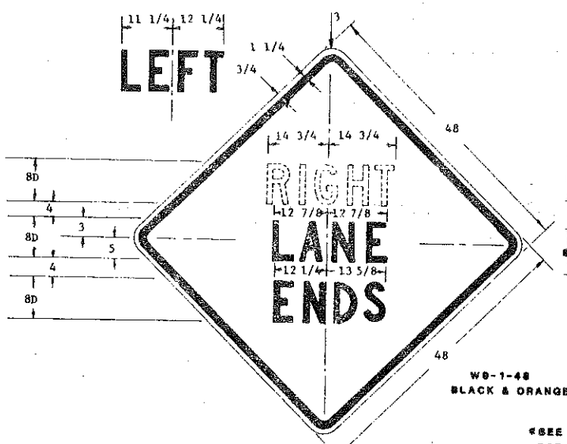
W20-1-48
BLACK & ORANGE



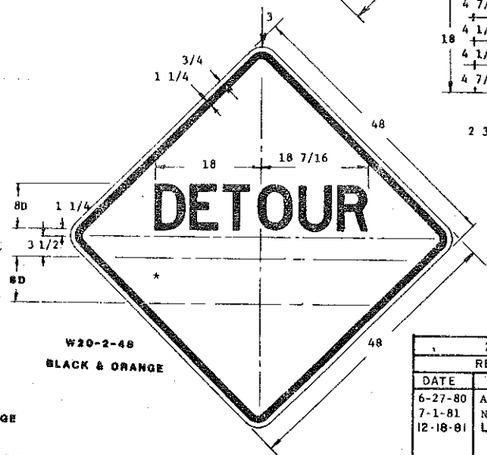
M4-10R-48
BLACK & ORANGE



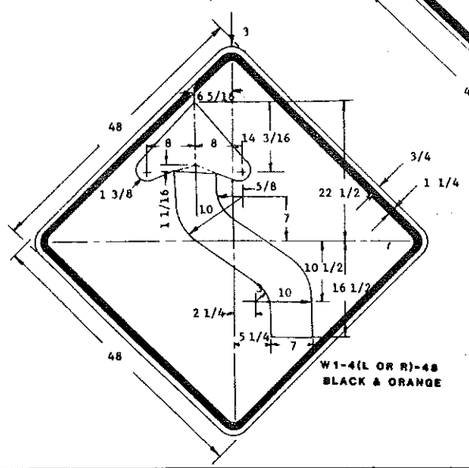
W6-3-48
BLACK & ORANGE



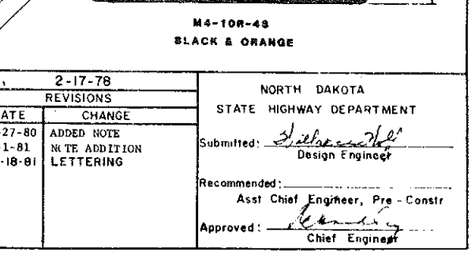
W6-1-48
BLACK & ORANGE



W20-2-48
BLACK & ORANGE



W1-4(L OR R)-48
BLACK & ORANGE



M4-10R-48
BLACK & ORANGE

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

REVISIONS	
DATE	CHANGE
6-27-80	ADDED NOTE
7-1-81	NOTE ADDITION
12-18-81	LETTERING

2-17-78

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

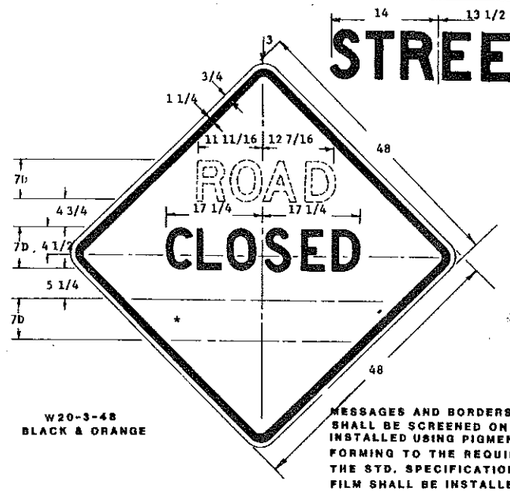
Submitted: _____ Design Engineer

Recommended: _____ Asst Chief Engineer, Pre-Constr

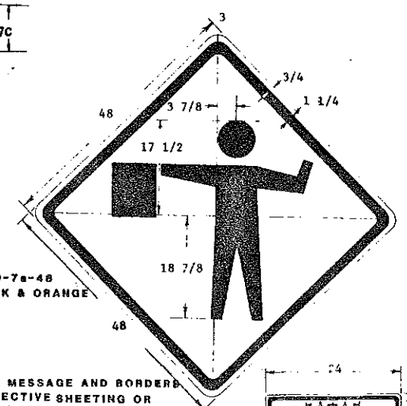
Approved: _____ Chief Engineer

CONSTRUCTION SIGN DETAILS

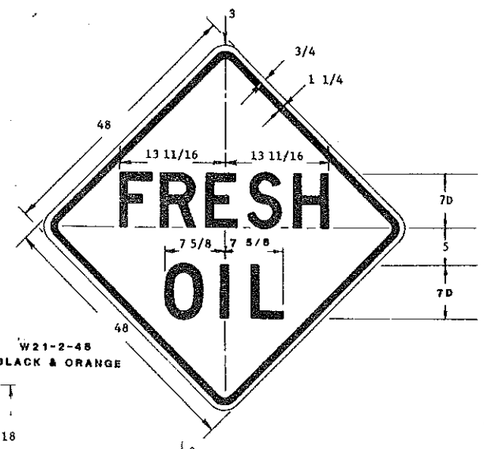
FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	BRF-1-006(02)066	17
		D 754-3	



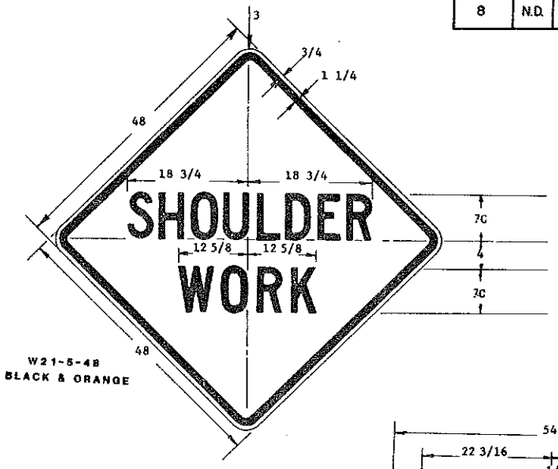
W20-3-48
BLACK & ORANGE



W20-7a-48
BLACK & ORANGE



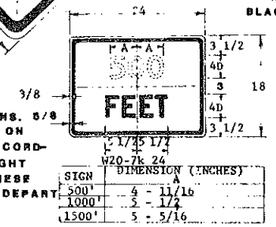
W21-2-48
BLACK & ORANGE



W21-5-48
BLACK & ORANGE

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

MESSAGES AND BORDERS: THE MESSAGE 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 LETTERS 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.

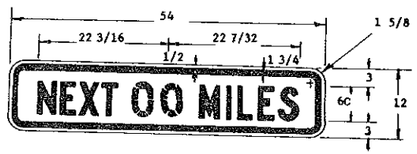


W20-7k-24

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

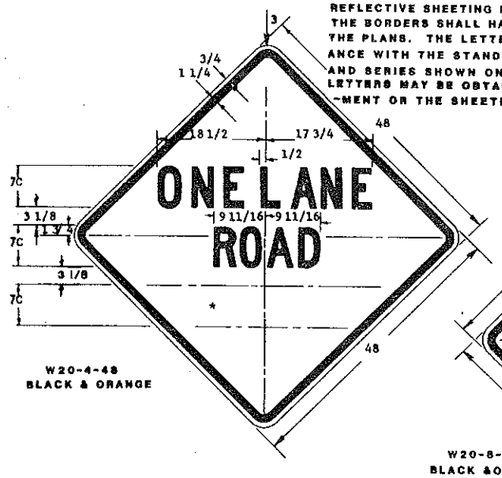
FOR USE WITH W20-7a-48 & W21-1a-48

BLACK & ORANGE

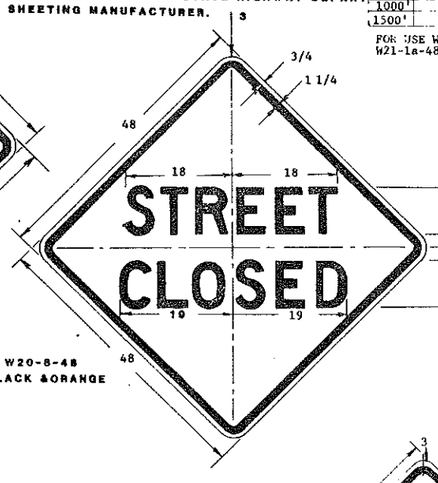


W20-52-54
BLACK & ORANGE

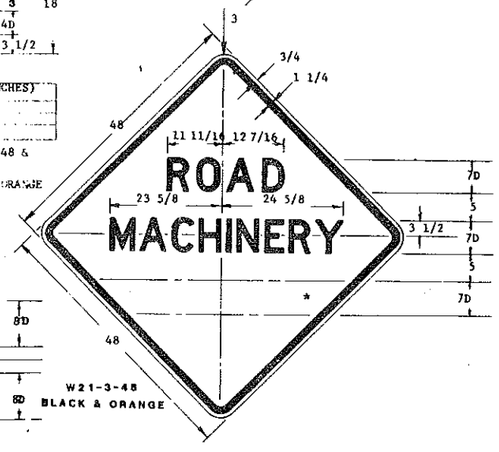
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGES, BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.



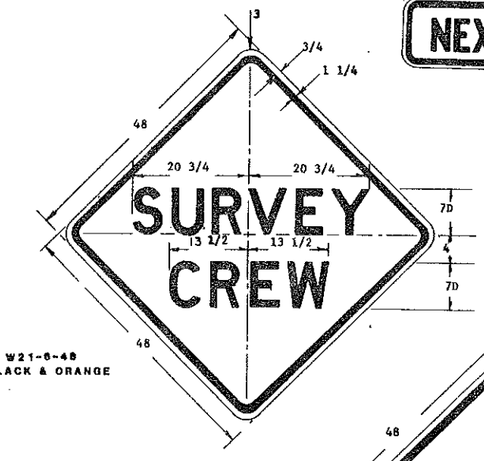
W20-4-48
BLACK & ORANGE



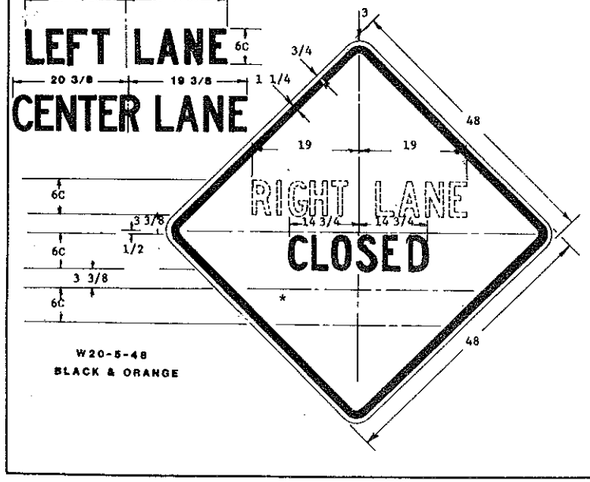
W20-8-48
BLACK &ORANGE



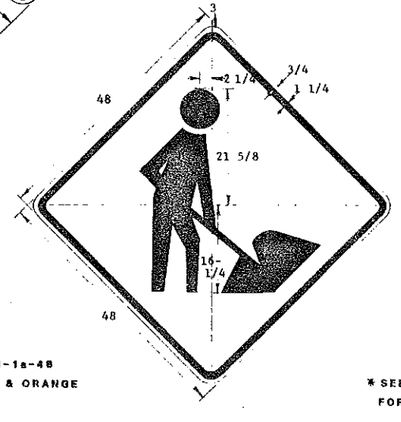
W21-3-48
BLACK & ORANGE



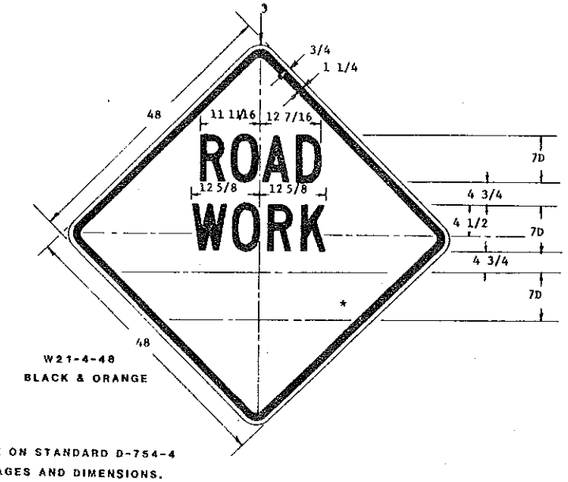
W21-6-48
BLACK & ORANGE



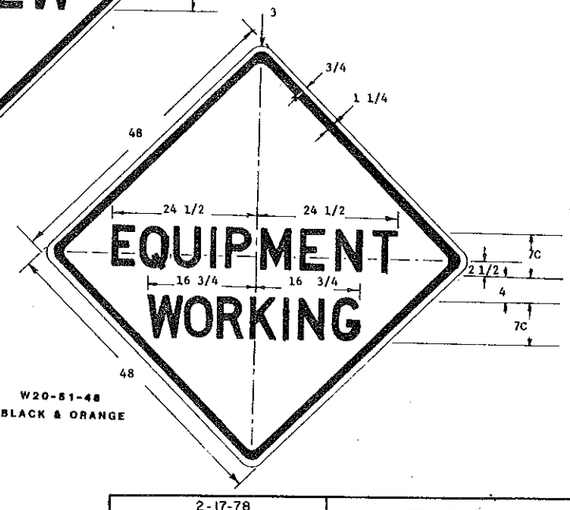
W20-5-48
BLACK & ORANGE



W21-1a-48
BLACK & ORANGE



W21-4-48
BLACK & ORANGE



W20-51-48
BLACK & ORANGE

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

REVISIONS	
DATE	CHANGE
5-14-79	Symbols Added
1-16-80	ADD DIMENSION
6-27-80	REVISED SIGN NO.'S
9-1-81	LETTERING
4-12-82	ADD LEGEND

2-17-78

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

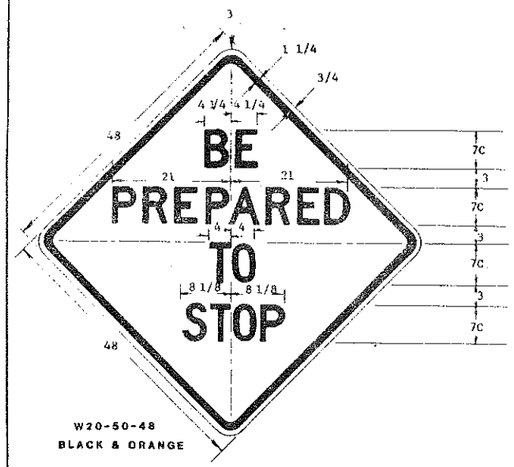
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

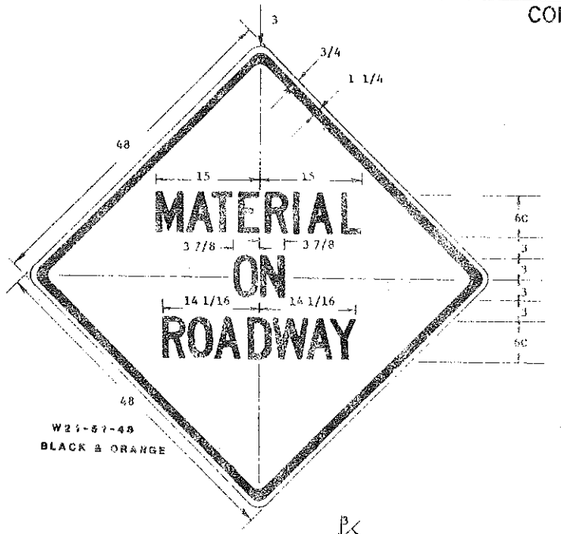
CONSTRUCTION SIGN DETAILS

FHWA REGION		FED. PROJECT NO.	
8	N.D.	BRF-1-006(02)066	18

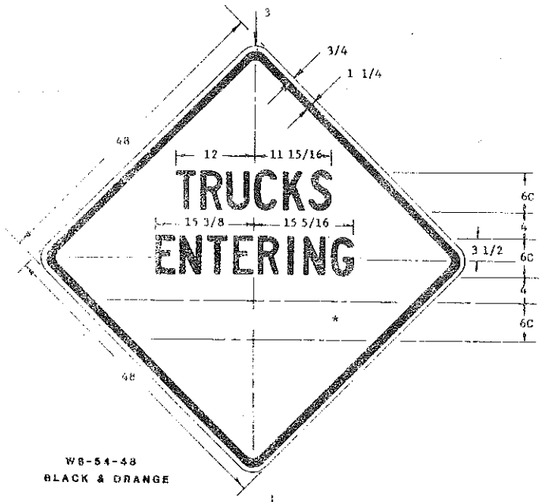
D 754-4



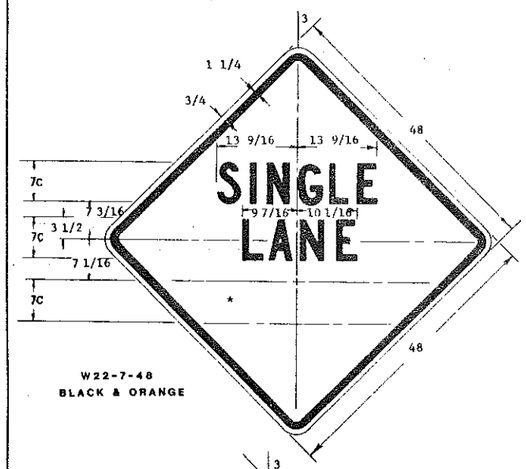
W20-50-48
BLACK & ORANGE



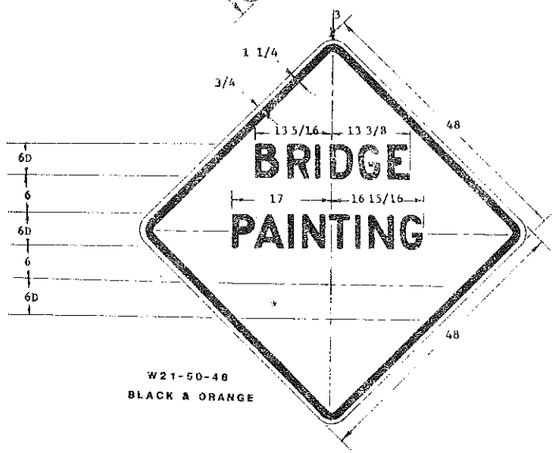
W21-51-48
BLACK & ORANGE



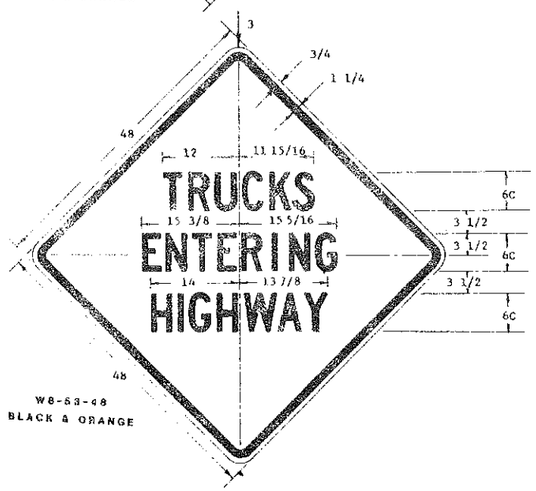
W8-54-48
BLACK & ORANGE



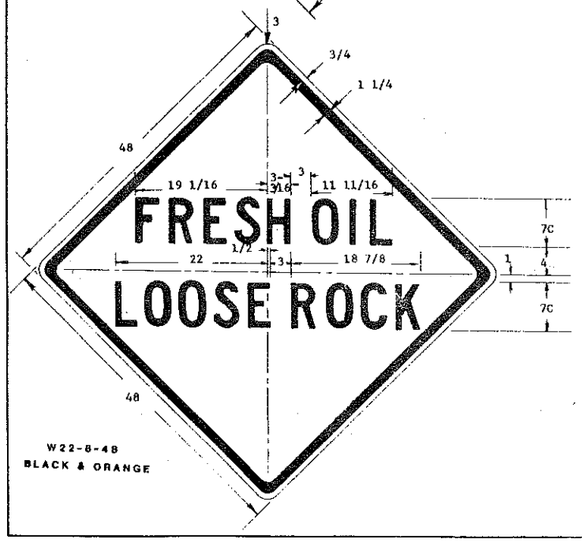
W22-7-48
BLACK & ORANGE



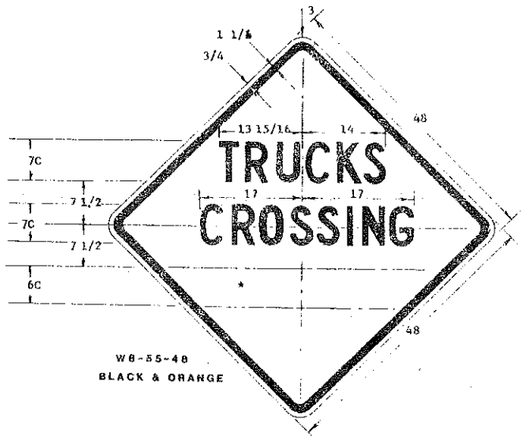
W21-50-48
BLACK & ORANGE



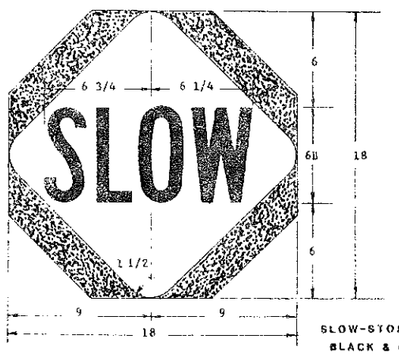
W8-53-48
BLACK & ORANGE



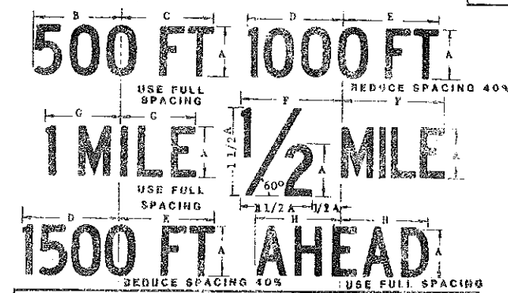
W22-8-48
BLACK & ORANGE



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	8-1/16
5D	10-3/16	10-13/16	11-5/8	11-1/4	11-1/4	9-1/2	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 OR REFLECTIVE SHEETING OR INSTALLED USING PIGMENTED PLASTIC FILM CONFORMING TO THE REQUIREMENT OF SEC. 804-3.5 OF THE STD. SPECIFICATIONS. THE PIGMENTED PLASTIC FILM SHALL BE INSTALLED IN ACCORDANCE WITH THE REFLECTIVE SHEETING MANUFACTURERS RECOMMENETION.
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.

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
9-27-8[illegible]	REVISED STD. [illegible]
12-17-81	Notes

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted _____ Design Engineer

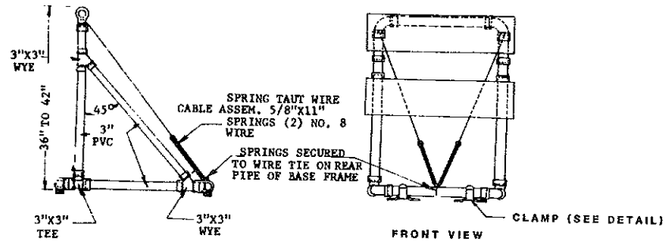
Recommended _____ Asst Chief Engineer, Pre-Constr

Approved _____ Chief Engineer

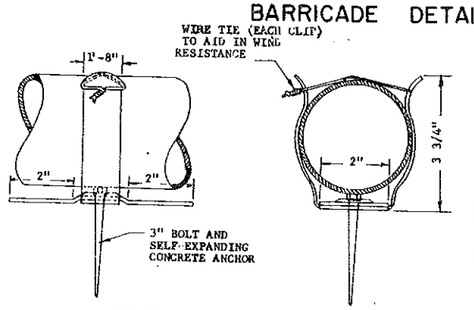
BARRICADE DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	BRF-1-006(02)066	19

D 754-5



SIDE VIEW FRONT VIEW



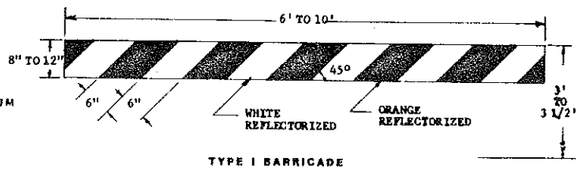
TYPICAL CLAMP DETAIL

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

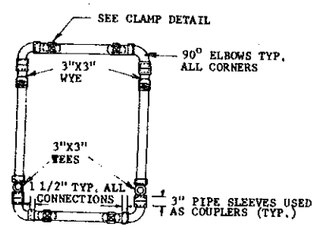
DELINEATOR DRUMS

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 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



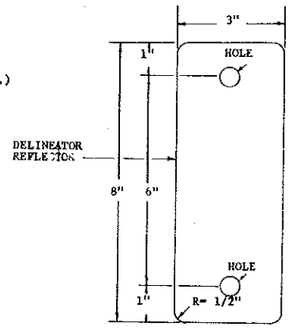
BASE

BREAKAWAY BARRICADE ASSEMBLY

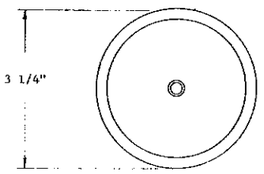
NOTE: THE PIPE, WYES, TEES ANDD ELBOWS USED TO CONSTRUCT TYPE II BARRICADES (SPECIAL) SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION: D2241 FOR PVC 1120 OR 1220, SDR 21, PRESSURE RATING 200 P.S.I. THE WYES, TEES, AND ELBOWS SHALL SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION: D-2466, TYPE II, GRADE 1. ALL JOINTS SHALL BE SLIP-FIT AND SHALL NOT BE THEADED OR CEMENTED.

3" PVC PIPE CONFORMING TO ASTM D2665-DWV OR ASTM D2729 MAY BE USED AS AN ALTERNATE TO ASTM D2241-SDR 21.

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

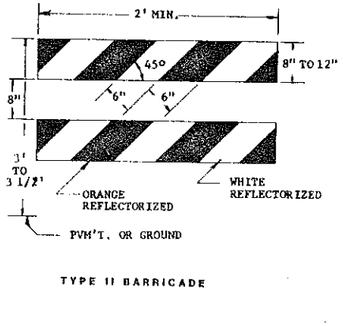


3" x 8" - 18 GUAGE GALVANIZED STEL SHEETS, OR OR .060" ALUMINUM PLATE WITH WHITE REFLECTIVE SHEETING (TYPE III OR IV) AS SPECIFIED IN SECTION 804 OF THE STANDARD SPECIFICATIONS.

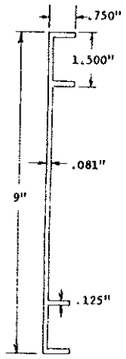


ACRYLIC PLASTIC REFLECTOR

DELINEATOR REFLECTOR SHALL MEET THE REQUIREMENTS OF SECTION 804.

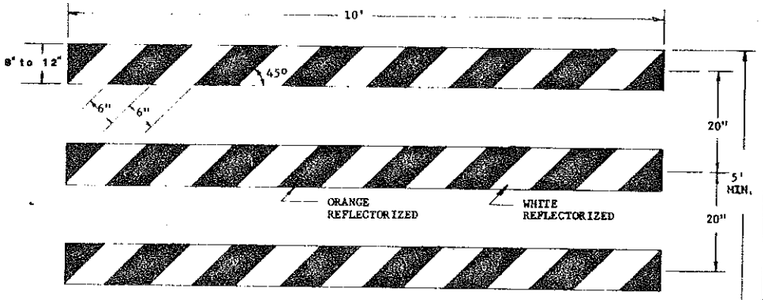


TYPE II BARRICADE

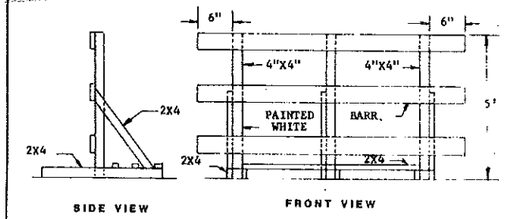


EXTRUDED ALUMINUM BARRICADE

BAR DETAIL



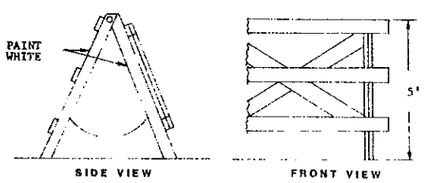
TYPE III BARRICADE



SIDE VIEW FRONT VIEW

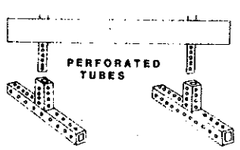
MOVABLE BARRICADE ASSEMBLY

NOTE: EACH MOVABLE BARRICCADE 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.

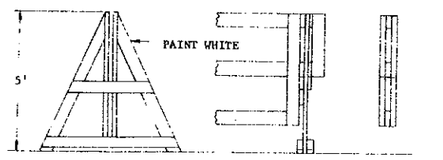


SIDE VIEW FRONT VIEW

HINGED BARRICADE ASSEMBLY

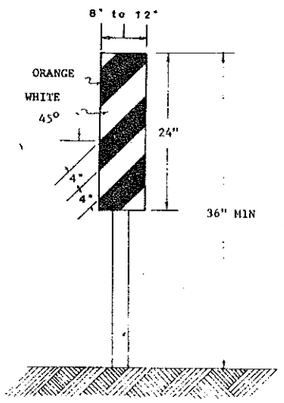


SECTIONAL BARRICADE

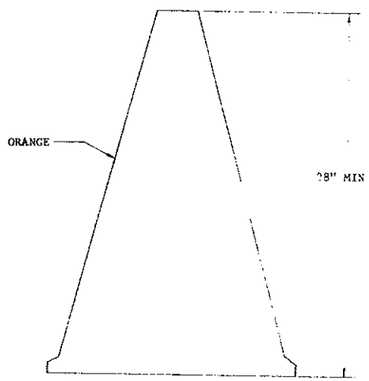


SIDE VIEW FRONT VIEW END VIEW

DEMOUNTABLE BARRICADE ASSEMBLY



VERTICAL PANEL



CONE

DATE	REVISIONS CHANGE
2-17-78	
5-14-79	Delineator Drum Removed
5-12-81	NOTE CHANGE
9-1-81	NOTES
1-18-82	Dimensions
4-6-82	HEADING & PANEL

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted _____ Design Engineer

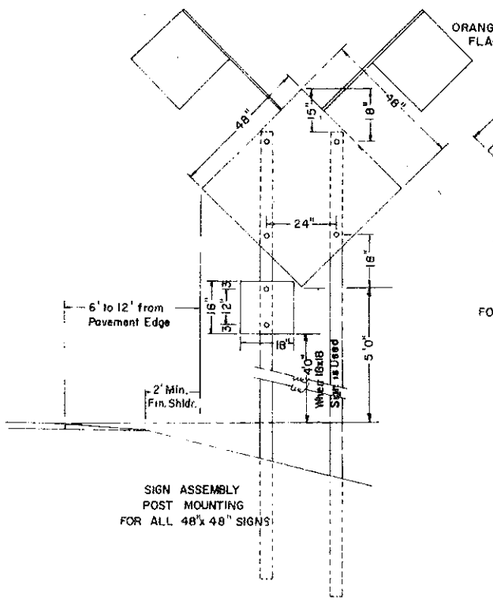
Recommended _____ Asst. Chief Engineer, Pre-Constr

Approved _____ Chief Engineer

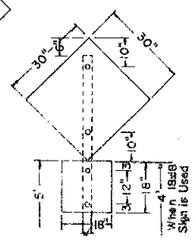
CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

FHWA REGION	STATE	FED AID PROJ NO	SHEET
8	N.D.	BRF-1-006(02)066	20

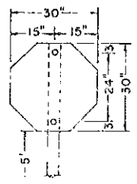
D-754-5-A



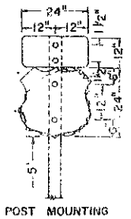
SIGN ASSEMBLY
POST MOUNTING
FOR ALL 48"x 48" SIGNS



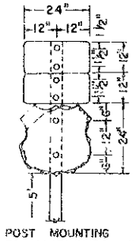
POST MOUNTING
FOR ALL 30"x30" SIGNS



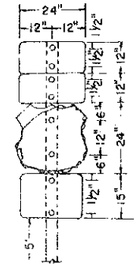
POST MOUNTING
FOR SIGN NO R-1-30



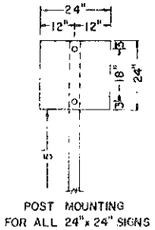
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN & ONE ROUTE MARKER



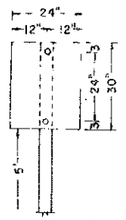
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN, ONE DETOUR SIGN
& ONE ROUTE MARKER



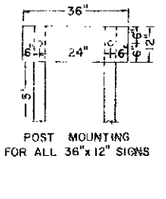
POST MOUNTING
FOR ASSEMBLIES WITH ONE
CARDINAL DIRECTION SIGN, ONE
DETOUR SIGN, ONE ROUTE MARKER
& ONE DIRECTIONAL ARROW



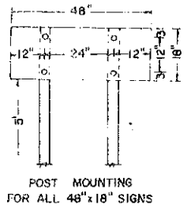
POST MOUNTING
FOR ALL 24"x 24" SIGNS



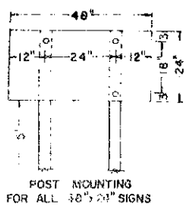
POST MOUNTING
FOR ALL 24"x 30" SIGNS



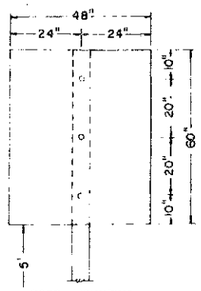
POST MOUNTING
FOR ALL 36"x 12" SIGNS



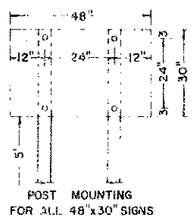
POST MOUNTING
FOR ALL 48"x 18" SIGNS



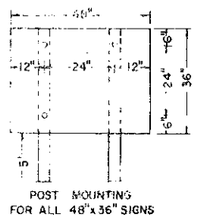
POST MOUNTING
FOR ALL 48"x 24" SIGNS



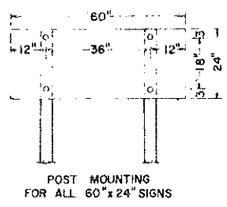
POST MOUNTING
FOR ALL 48"x 60" SIGNS



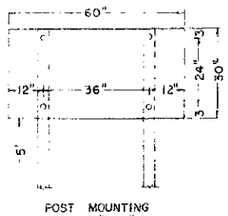
POST MOUNTING
FOR ALL 48"x 30" SIGNS



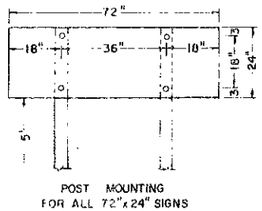
POST MOUNTING
FOR ALL 48"x 36" SIGNS



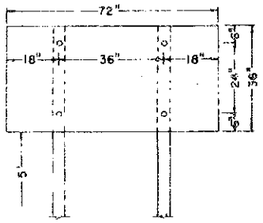
POST MOUNTING
FOR ALL 60"x 24" SIGNS



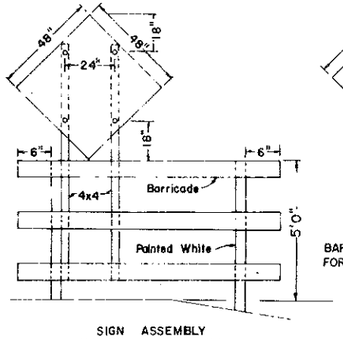
POST MOUNTING
FOR ALL 60"x 30" SIGNS



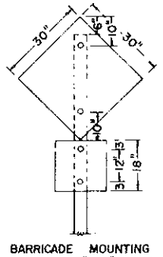
POST MOUNTING
FOR ALL 72"x 24" SIGNS



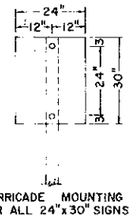
POST MOUNTING
FOR ALL 72"x 36" SIGNS



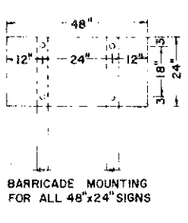
SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL 48"x 48" SIGNS



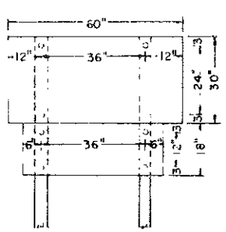
BARRICADE MOUNTING
FOR ALL 30"x 30" SIGNS



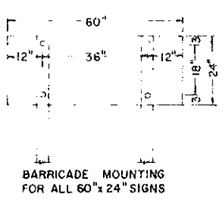
BARRICADE MOUNTING
FOR ALL 24"x 30" SIGNS



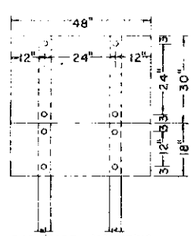
BARRICADE MOUNTING
FOR ALL 48"x 24" SIGNS



BARRICADE MOUNTING
FOR ALL 60"x 30" SIGNS

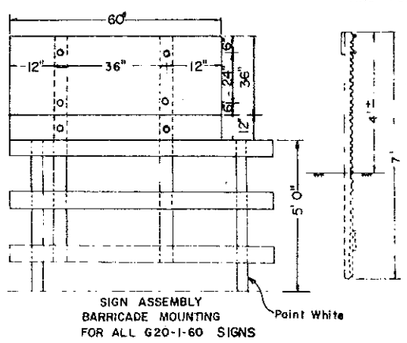


BARRICADE MOUNTING
FOR ALL 60"x 24" SIGNS

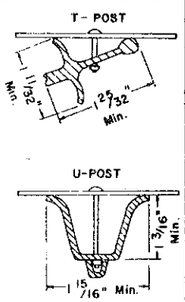


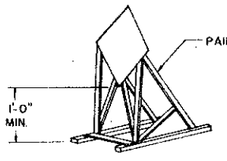
BARRICADE MOUNTING
FOR ALL 48"x 30" & 48"x 18" SIGNS

DELINEATOR ATTACHMENT
AND POST MOUNTING DETAILS

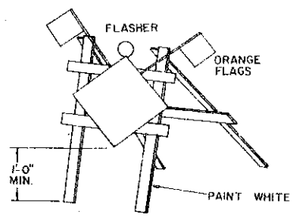


SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL G20-1-60 SIGNS





PORTABLE SIGN MOUNTING



PORTABLE SIGN MOUNTING

NOTES:
Barricade and Sign Supports: Wooden supports shall be painted white. Steel supports shall be galvanized or painted.

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 imbedded 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.

ALTERNATE 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
6-21-78	DETAIL ADDED
4-16-79	SIGN NO CORRECTION
2-6-81	NOTE ADDED

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.	BRF-1-006(02)066	21

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 sheeted faces.

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.

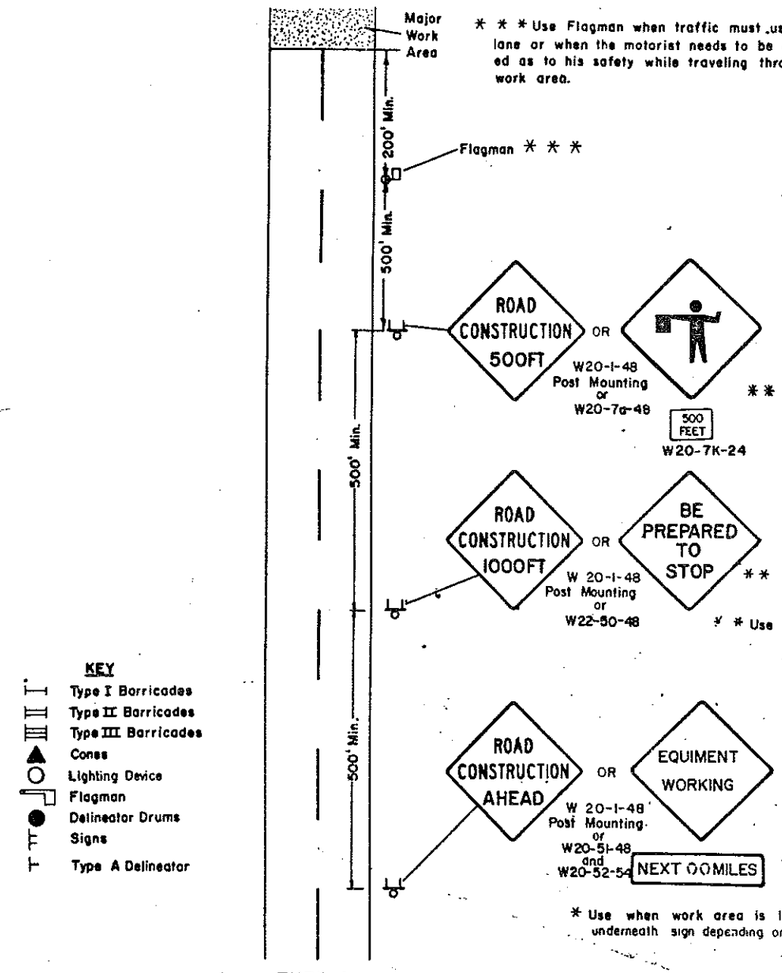
Delineator Drums, Barricades or cones used for tapering traffic shall be spaced at the demention "S".

"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.

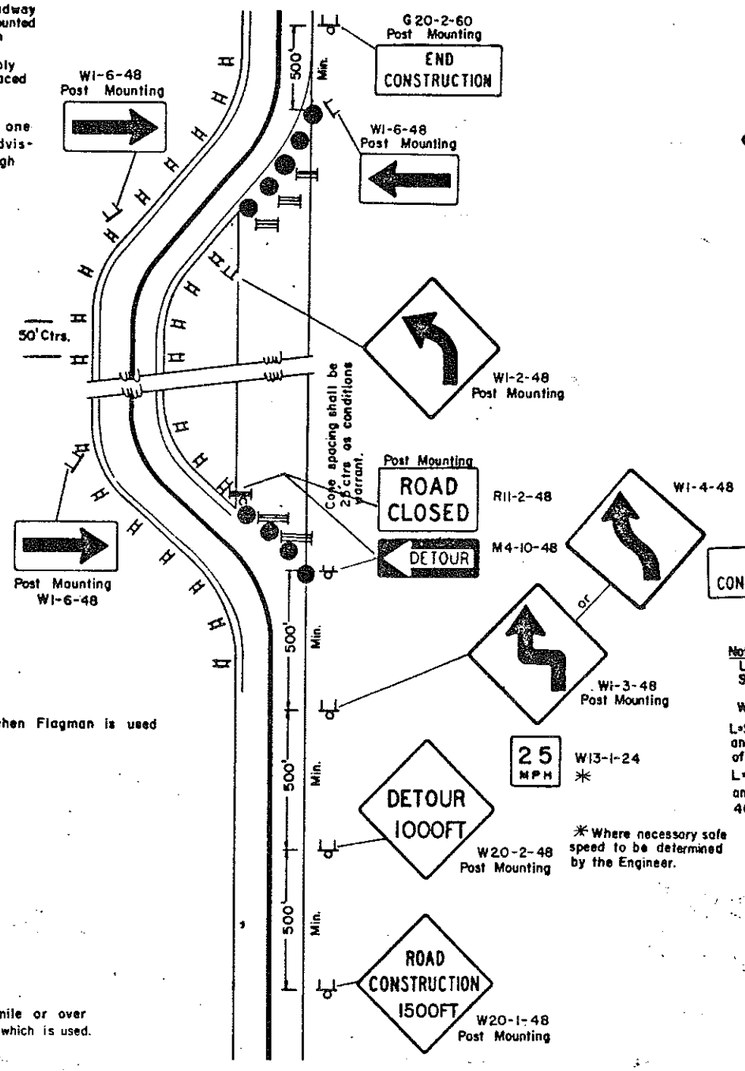


* * Use when Flagman is used

* Use when work area is 1 mile or over underneath sign depending on which is used.

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)

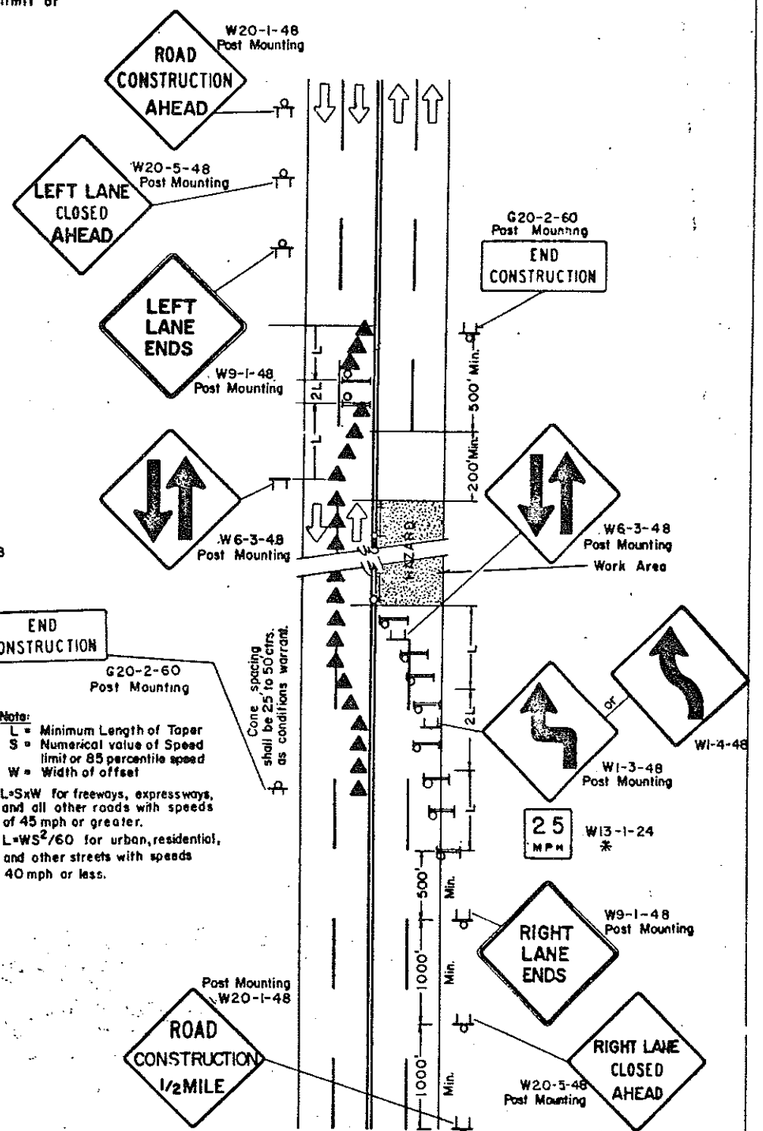
When the work area is left overnight the necessary warning signs shall remain and others added reflecting the conditions in the work area. Speed limit signs and advisory speed plates shall be added as needed



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

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, (Type B) If detour is hardsurfaced State Maintenance forces shall pavement mark. Existing striping shall be removed as required. Delineator will only be used when inslope are 4:1 or better and roadway alignment is visible to approaching vehicles. Vertical panels shall be used where roadway has steep slopes and alignment is not visible to approaching vehicles. Delineator and vertical panels shall be installed back to back.



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.

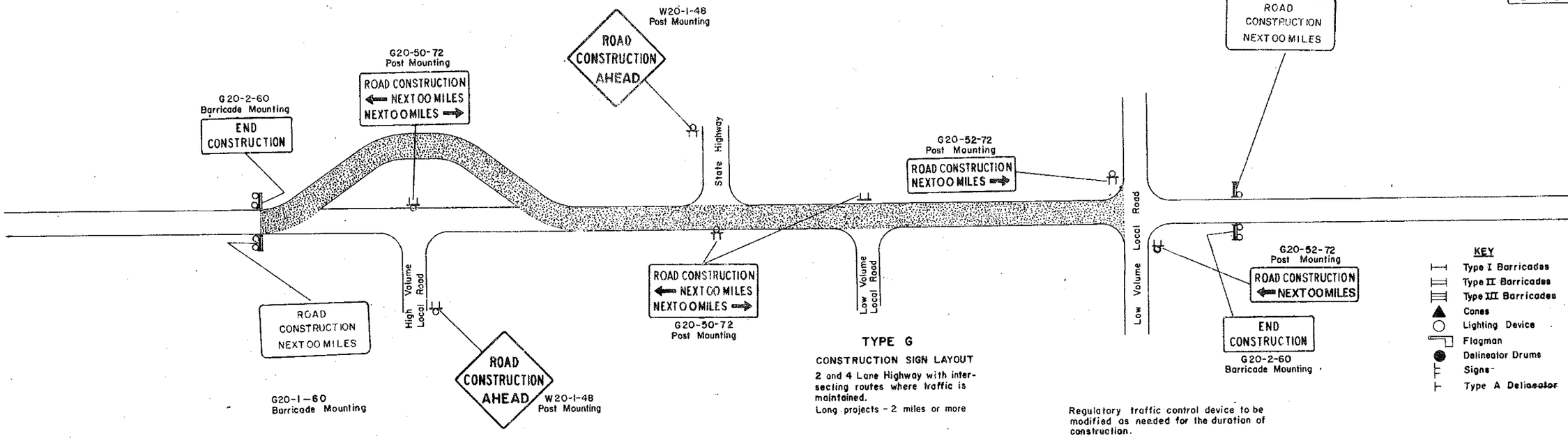
TYPE C
CONSTRUCTION SIGN LAYOUT
4 Lane Undivided Highway with half the roadway closed.
Longer than one day or outside of Major Work Area

7-15-78 REVISIONS	
DATE	CHANGE
8-21-78	Note Change
12-29-78	General Revisions
1-6-79	Notes Added and Changed.
7-15-80	Change Sign Std. Number.
7-1-81	Detail Changes
7-9-81	Detail Changes

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.	BRF-1-006(02)066	22
		D-754-8	

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



KEY

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

TYPE G

CONSTRUCTION SIGN LAYOUT

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

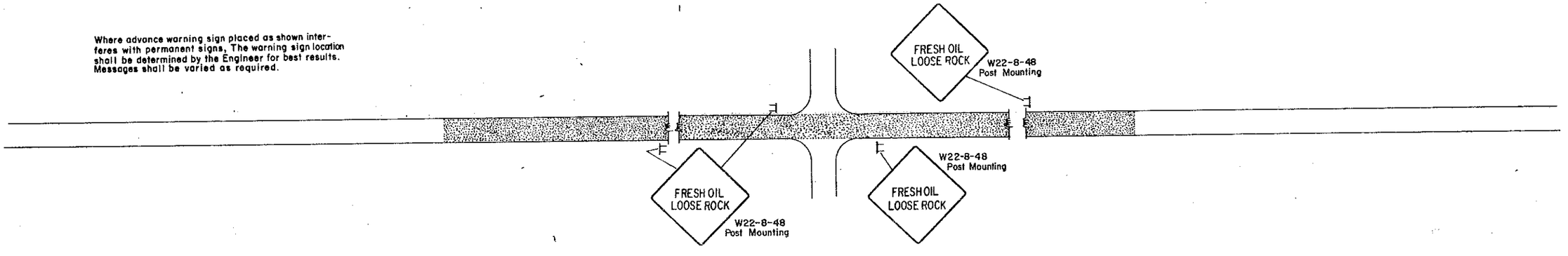
Regulatory traffic control device to be modified as needed for the duration of construction.

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.

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
8-19-81	Remove Sign & Number

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

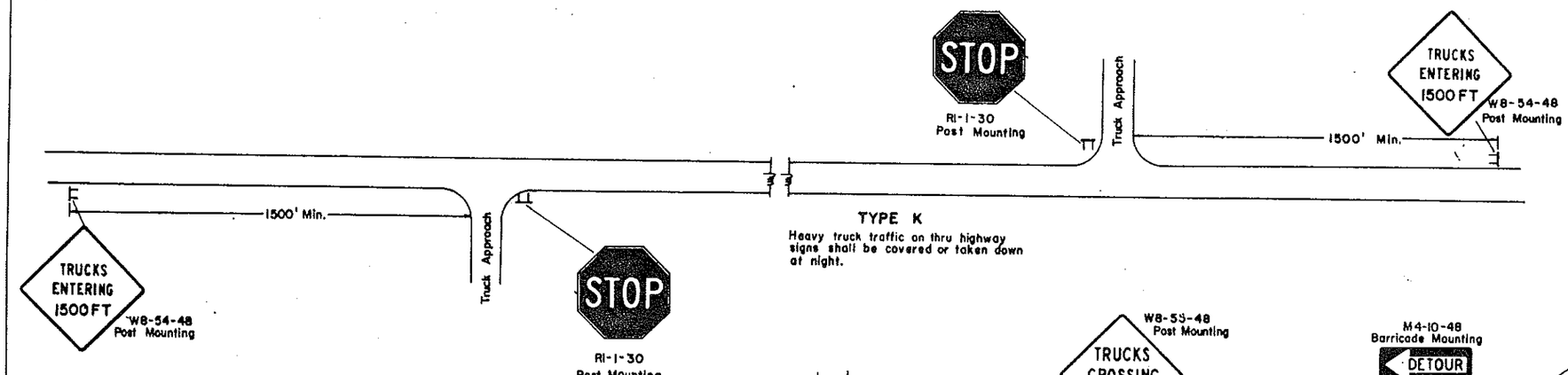
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

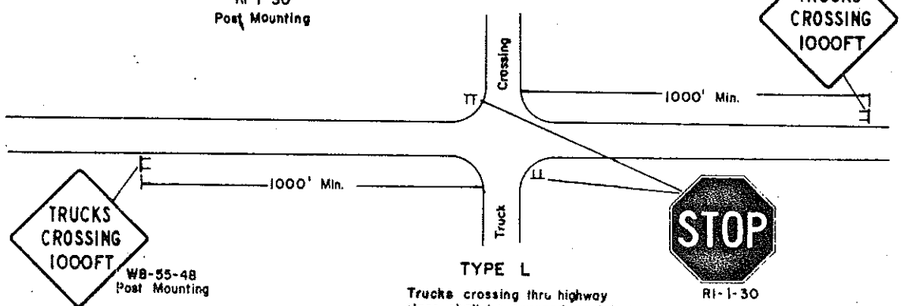
Approved: _____ Chief Engineer

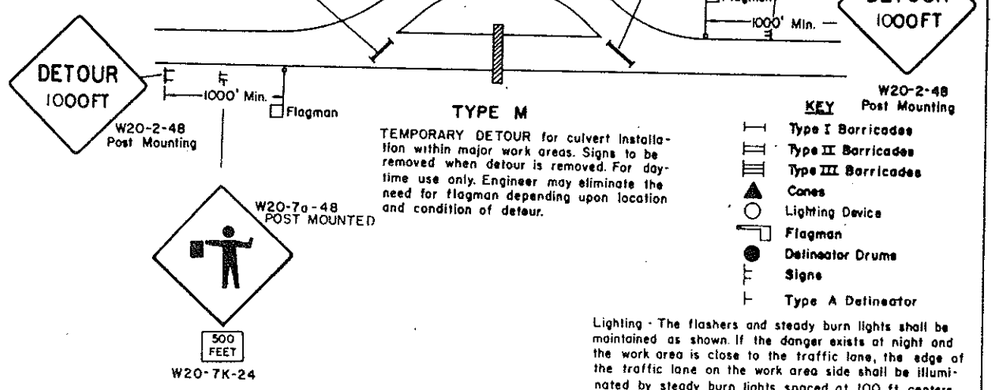
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

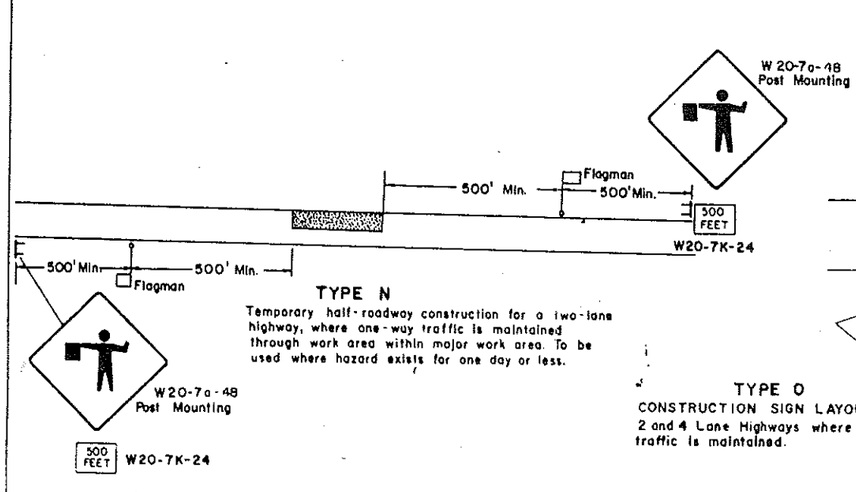
FHWA REGION	STATE	FED. AID PROJ NO	SHEET NO
8	N.D.	BRF-1-006(02)066	23

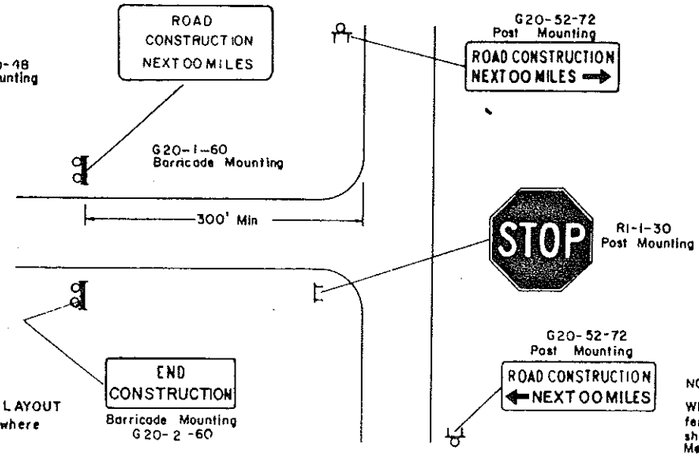
D-754-10











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

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
8-19-81	Remove Sign & Number

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted _____ Design Engineer

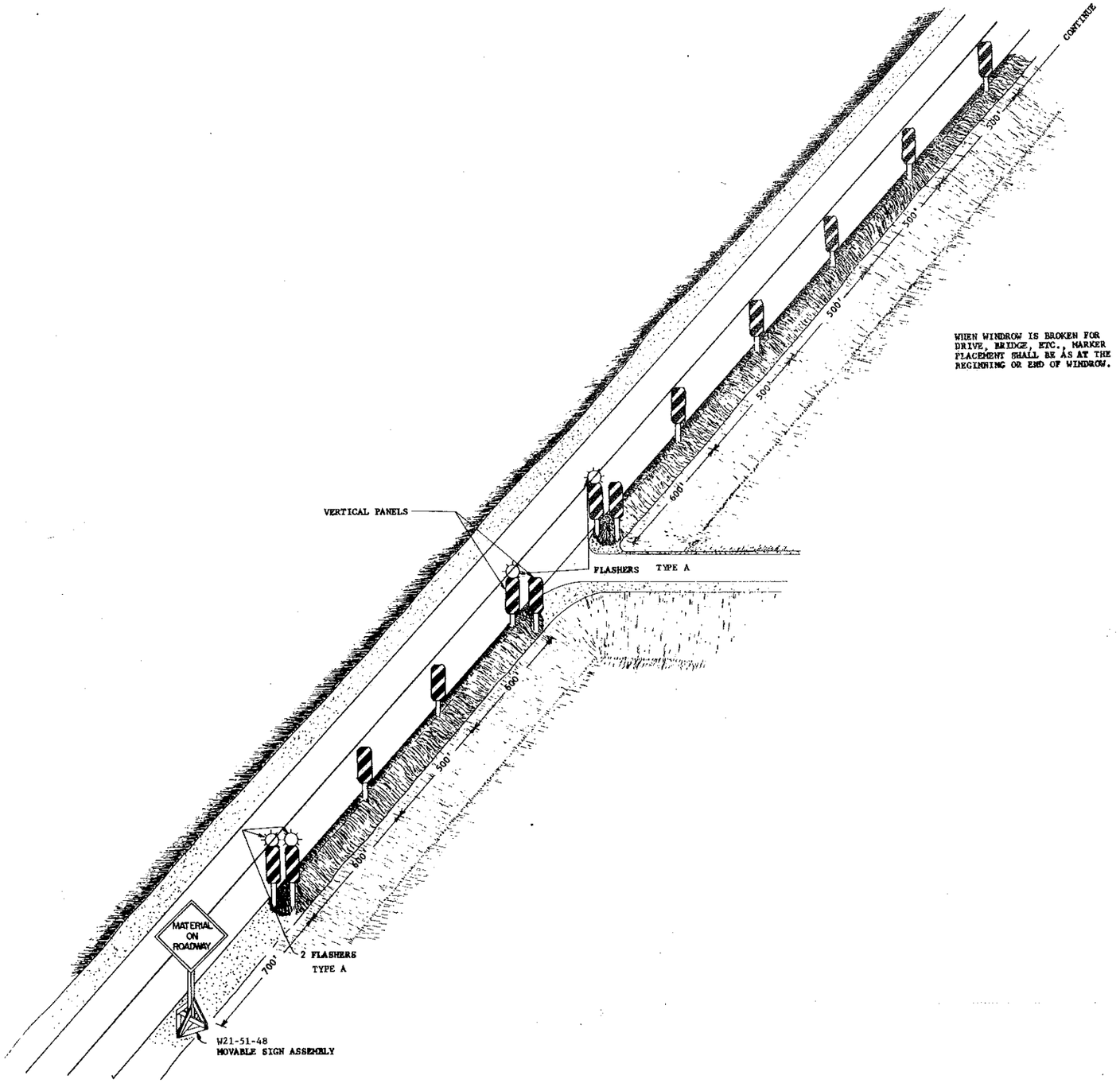
Recommended: _____ Asst Chief Engineer, Pre-Constr

Approved _____ Chief Engineer

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	BRF-1-006(02)066	24

D-754-14

WINDROW MARKING



WHEN WINDROW IS BROKEN FOR DRIVE, BRIDGE, ETC., MARKER PLACEMENT SHALL BE AS AT THE BEGINNING OR END OF WINDROW.

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

NORTH DAKOTA STATE HIGHWAY DEPT.

SUBMITTED: _____ DESIGN ENGINEER

RECOMMENDED: ASS'T CHIEF ENGINEER PRE-CONSTR.

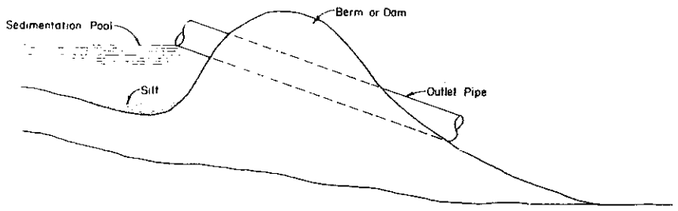
APPROVED: _____ CHIEF ENGINEER

BRF-1-006(02)066

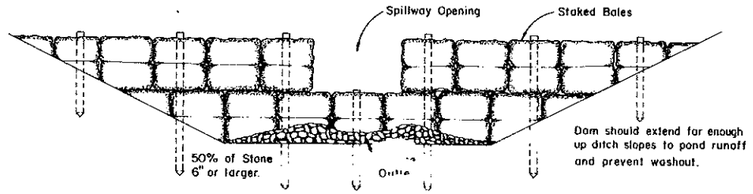
8	N.D.		25

D-900-20

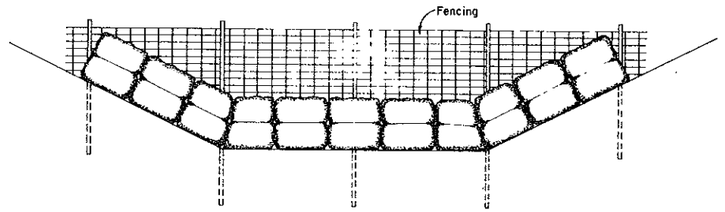
TEMPORARY EROSION AND SILTATION CONTROLS



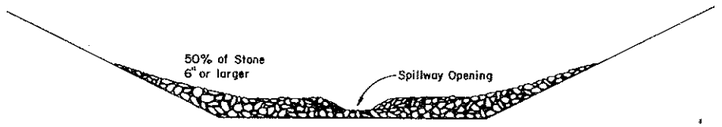
SMALL SEDIMENT DAM OR BERM



STAKED BALES

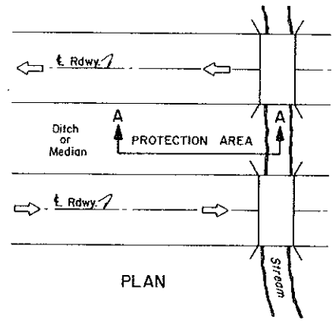


FENCE-BACKED BALES

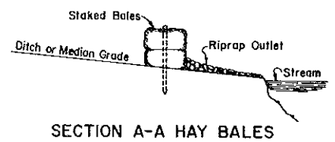


GRADED STONE

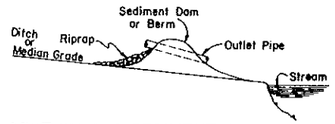
DITCH EROSION DAMS



PLAN

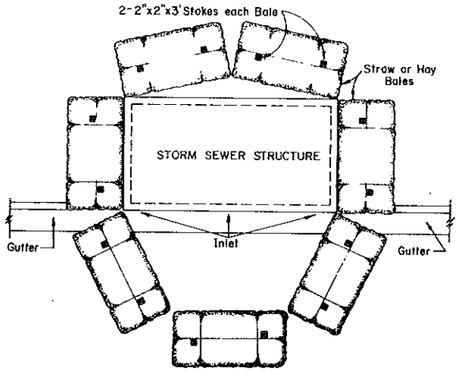


SECTION A-A HAY BALES

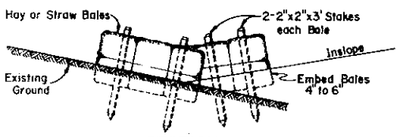


SECTION A-A SEDIMENT DAM OR BERM

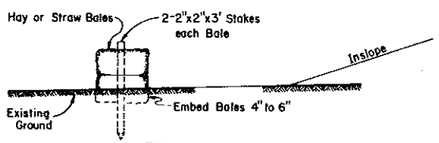
MEDIAN OR DITCH PROTECTION AT STREAM CROSSINGS



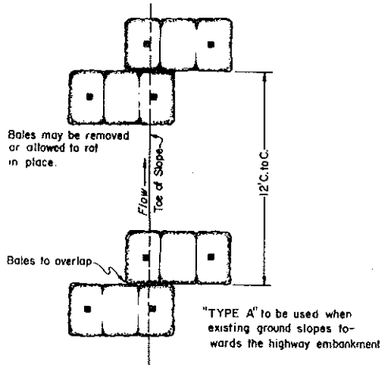
STORM SEWER INLET EROSION & SILTATION BARRIER



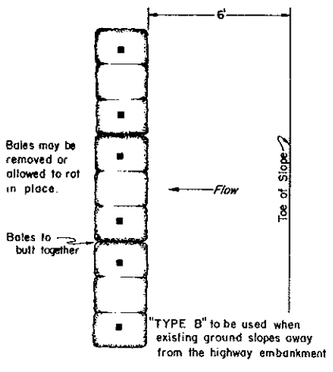
SECTION



SECTION

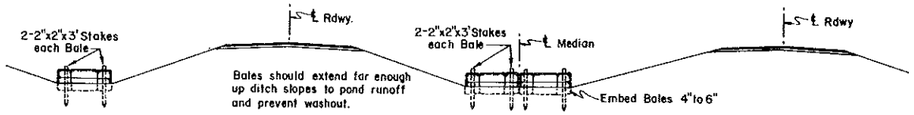


PLAN
"TYPE A"

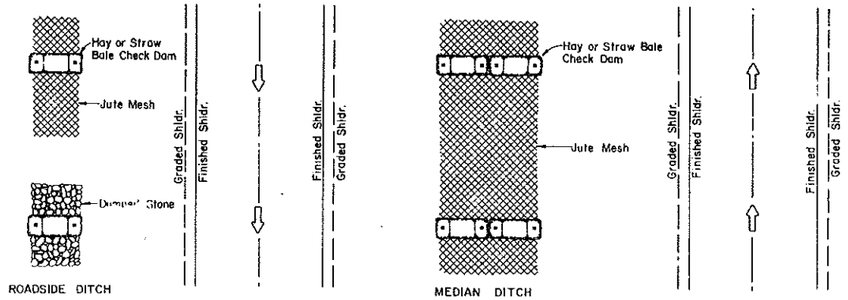


PLAN
"TYPE B"

BALED HAY OR STRAW EROSION CHECKS



SECTION



PLAN

STONE, JUTE MESH, OR SOD DITCH & MEDIAN EROSION CONTROL

NOTES

These Temporary Erosion and Siltation Controls or modifications thereof may be used by the Contractor or directed by the Engineer to prevent erosion or siltation during the construction stage.

Payment for these items will be in accordance with Special Provisions for "Erosion and Water Pollution Control."

3-25-74	
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: P.B. Thomas
Design Engineer

Recommended:
Asst. Chief Engineer
Prec Construction

Approved:
Chief Engineer