north dakota
state highway department, capitol grounds, bismarck, nd 58505

ALLEN I. OLSON, GOVERNOR
DUANE R. LIFFRIG, COMMISSIONER
RAY ZINK, CHIEF ENGINEER

May 13, 1982

A D D E N D U M

To: All prospective bidders and plan holders on Project M-1-988(03)010, Job No. 5 on the letting of May 21, 1982.

Remove and discard plan sheet number 65 and replace with the enclosed revised sheet dated May 13, 1982. The enclosed sheet provides the details for the breakaway base and indicates where this base is to be used.

This addendum is hereby incorporated into the bidder's proposal for this project.

A. L. Haykel
Construction Engineer

dkb

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DESIGN DATA

Traffic	Average Daily			Est. 30th Max. Hr.
Current Traffic (1982)	4550 Pass.	250 Trucks	4800 Total	480
Traffic Forecast (2000)	4950 Pass.	250 Trucks	5200 Total	520
Design Speed	35 MPH			
Traffic Classification "M"				
Minimum Sight Distance (Stopping)	250'			

Job#

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NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

GRADING, SURFACING, STORM SEWER & INCIDENTALS
IN
MORTON COUNTY
FEDERAL AID PROJECT M-1-988(03)010

GOVERNING SPECIFICATIONS:

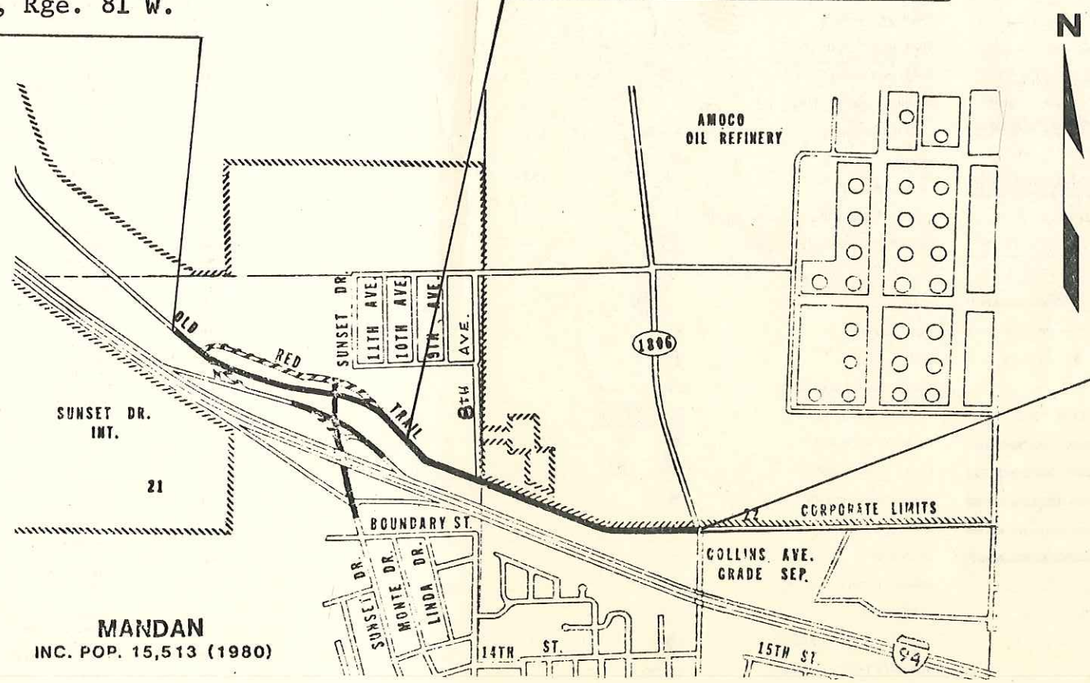
Standard Specifications adopted by the North Dakota State Highway Department, Oct. 1976, and approved by the Federal Highway Administration on December 17, 1976, and other Contract Provisions submitted herewith.

LENGTH OF PROJECT

Project	Miles-Gross	Miles-Net
M-1-988(03)010	1.096	1.096

BEG. PROJ. M-1-988(03)010
Sta. 171+00 Surv. A point 2347.81' E. & 572.70' S. of the N.W. Cor., Sec. 21, Twp. 139 N., Rge. 81 W.

EQUATION STA. 202+31.2 O.L.
=201+43.8 SURV.



MANDAN
INC. POP. 15,513 (1980)

END PROJ. M-1-988(03)010
Sta. 228+00 Surv. A point 2262.88' S. & 1551.92' E. of the N.W. Cor., Sec. 22, Twp. 139 N., Rge. 81 W.

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APPROVED DATE 3-12-82

Ray Zink

CHIEF ENGINEER
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

RAY ZINK REGISTERED PROFESSIONAL P.E. 972 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 BRIDGE
SERVICE ROAD
TERMINATED CROSS-ROAD

BUILDINGS
TELEGRAPH LINES
TELEPHONE LINES
POWER LINES
CULVERTS (In Place)
CULVERTS (Install)
CONCRETE BOX CULVERTS (Install)
BRIDGES (Install)
CONCRETE CURB
CONCRETE CURB AND GUTTER
CONCRETE WALK
CATCH BASIN (Existing)
CATCH BASIN (New)
MANHOLE (Existing)
MANHOLE (New)
CURB INLET (Existing)
CURB INLET (New)
GROUND MOUNTED SIGNS
OVERHEAD SIGNS
HYDRANT
LIGHT STANDARDS
TRAFFIC SIGNALS (Plan & Profile Sheets)
HIGH MAST LIGHTING ASSEMBLY
GROUND ELEVATION / GRADE — 6430 / 6410 / 245
CENTERLINE
SECTION LINE
DEFLECTION ANGLE (Delta)
SOD OR JUTE MESH
POLES TO BE MOVED
POLES TO BE LOWERED
CONCRETE FOUNDATION
CONDUIT
CONDUCTOR
CONCRETE PULL BOX
FEED POINT
250 WATT LIGHT STANDARDS
400 WATT LIGHT STANDARDS
700 WATT LIGHT STANDARDS
1000 WATT LIGHT STANDARDS
FLASHING BEACON
TRAFFIC SIGNAL - MAST ARM MOUNTED
TRAFFIC SIGNAL - POST MOUNTED
SIGNAL HEAD — 3
PEDESTRIAN PUSH BUTTON POST
TRAFFIC SIGNAL CONTROLLER
FEED POINT - PAD MOUNTED

ABBREVIATIONS

Aggr.	Aggregate
Ahd.	Ahead
Alt.	Alternate
Approx.	Approximate or Approximately
Appr.	Approach
Asph. Cem. or A.C.	Asphalt Cement
Asph. Conc.	Asphaltic Concrete
Bit.	Bituminous or Bitumen
Bk.	Back
B.M.	Bench Mark
Bldg.	Building
Br.	Bridge
C.A.E.S.	Corrugated Aluminum End Section
C.A.P.	Corrugated Aluminum Pipe
C.B.	Catch Basin
C. & G.	Curb and Gutter
Ch. Blk.	Channel Block
Ch. Ch.	Channel Change
C. I.	Curb Inlet
C.I.P.	Cast Iron Pipe
Cl.	Class
C.S.E.S.	Corrugated Steel End Section
C.S.P.	Corrugated Steel Pipe
CMS	Cationic Medium Setting
Comp.	Compression
Const.	Construction
Conc.	Concrete
Cont. Reinf. Conc. Pvm't	Continuously Reinforced Concrete Pavement
Contn.	Contraction
Crn.	Crown
CRS	Cationic Rapid Setting
Crse.	Course
C. S.	Curve to Spiral
C. to C.	Center to Center
C.Y.	Cubic Yard
D	Degree of Curvature
D-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. Pvm't	Portland Cement Concrete Pavement
P. D	Private Drive
Pen.	Penetration
Perf.	Perforated
P I	Point of Intersection
P O C	Point on Curve
P O T	Point on Tangent
P. P	Power Pole
P.R C	Point of Reverse Curvature
Pref	Preformed
P.S.D	Passing Sight Distance
P.T.	Point of Tangency
P.V.C.	Polyvinyl Chloride Sewer Pipe
Quant.	Quantity or Quantities
R	Radius
R or Rge.	Range
RC	Rapid Curing
R.C.E.S.	Reinforced Concrete End Section
R.C.P.	Reinforced Concrete Pipe
R.C.P.S	Reinforced Concrete Pipe Sewer
Rd.	Road
Rdbd.	Roadbed
Rdwy.	Roadway
Refl	Reflectorized
R R	Railroad
Rt.	Right
R/W	Right of Way
Salv.	Salvage
San.	Sanitary
S.C.	Spiral to Curve
SC	Slow Curing
Sc	Spiral Deflection Angle
S.D.	Sight Distance
S. E.	Superelevation
Sec	Section
Sec. Line Appr.	Section Line Approach
Sep.	Separation
Serv.	Service
Sgr. Prep.	Subgrade Preparation
Shldr.	Shoulder
SP	Special Provision
S.P.P.	Structural Plate Pipe
S.P.P.A.	Structural Plate Pipe Arch
S. R.	South Roadway
SS	Slow Setting or Supplement Specification
S.S.D	Stopping Sight Distance
S. T.	Spiral to Tangent
Sta.	Station
Std.	Standard
Std. Specs.	Standard Specifications
Struct.	Structure
Surf.	Surface or Surfacing
Surv.	Survey
S.W.	Sidewalk
S.Y.	Square Yard
T	Tangent Length (circular curve)
T or Twp.	Township
Tel.	Telephone
Temp.	Temporary
T. P.	Telephone Pole
Tr.	Traffic
Trans.	Transverse or Transition
Trtd.	Treated
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

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NOTE SHEET

GENERAL: The Engineer will attend to the removal of privately owned fences to the highway right of way line and to the relocation or adjustment of utility facilities as shown on the plans. All privately owned light poles, guard posts, signs, etc.,within the right of way limits will be removed by the owners.

UTILITIES: Separate plans, if any, showing the utility relocation or adjustment work to be performed by the utility companies to accommodate highway construction will be made available to the Contractor upon request to the Engineer.

SHRINKAGE: 10% additional volume in yardage computed by the end area method is allowed for shrinkage in earth embankment.

BEDDING & BACKFILL: All trenches shall have granular material installed as shown on trench details. The quality of the granular material shall be approved by the Engineer. The "Granular Material" shall be considered incidental to water and sewer line bid items.

COMPACTION & DENSITY CONTROL: Compaction and Density Control shall be in accordance with Paragraph 203-2.3.3 except that if the embankment is unstable (as evidenced by sponginess or rutting) when compacted to the required density, it may be necessary to dry the soils to obtain adequate stability. In some cases, 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.)

ADJUST WATER & SEWER LINES: The Contractor shall maintain sanitary sewer service during construction. All costs involved including pumping shall be included in price bid for applicable items.

Additional water & sewer adjustments may be necessary, other than those shown on the plans. If applicable bid items are not on the contract such work shall be done in accordance with Sec.109-5 of the Std. Specifications "Extra or Force Account work." The extent of all adjustments will be determined and work approved by the Engineer and Mandan City Engineer. The city engineer will be notified prior to any work on those items.

DRAINAGE: If the existing facilities become inoperable before the new drainage system is functioning, the Contractor shall provide sufficient temporary pumping and drainage facilities to keep the roadway drained to the satisfaction of the Engineer. Cost to be considered incidental to price bid for applicable items.

WORK SCHEDULE: In order to minimize interference with traffic operations, a detailed schedule will be agreed to prior to beginning work, between the engineer, utility companies and the contractor and sub-contractors, if any. The Contractor shall contact the local utility companies prior to the beginning of construction for the location of utilities.

MAINTAINING ACCESS: The Contractor shall be responsible for providing temporary access to all residential dwellings and commercial properties adjacent to this project. Final details on location of temporary access points and construction procedures will be worked out with the Engineer in the field prior to the start of the project.

POLE LINES: Pole lines (Power, Telephone, etc.) interfering with construction of this project shall be removed or relocated by the utility companies.

JOINTS FOR STORM SEWER PIPE: Joints shall be sealed with rubber gaskets or with a sealer approved by the Engineer.

WATER: The cost of applying water for compaction and for use as a dust palliative, as required, shall be included in the price bid for "Water."

UNDERGROUND CABLES: The Contractor shall notify the Engineer sufficiently in advance of beginning excavation in areas of underground utilities so that arrangements may be made to have the utility determine location and depths. Subcutting or scarifying over the cables may be eliminated if in the opinion of the Engineer, a hazardous situation exists.

DETOURS: The Contractor shall maintain the streets used as detours (Streets to be designated by the Engineer) and repair areas damaged by detour traffic. Upon completion of the project, the Contractor shall restore the streets to a condition at least equal to that which existed at the time traffic was routed over them. Work shall be as deemed necessary by the Engineer. The repair of the detours will be paid for in accordance with SP-273.

Quantity totals have been rounded off to the nearest whole unit for bidding purposes.

The Contractor shall have the option of supplying and installing precast inlet risers in lieu of poured in place risers as indicated on the plans for double and triple inlets. Precast inlet to be of a type approved by the Engineer.

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N O T E _ _ S H E E T _ _ C O N T I N U E D _

GENERAL CONSTRUCTION REQUIREMENTS: It is the intent of the Plans, the Standard Specifications of the North Dakota State Highway Department, and the Special Provisions to comply in every respect to the requirements set forth by the National Plumbing Code, the North Dakota State Health Department and the ordinances established by the City of Mandan, North Dakota. It shall be the responsibility of the Contractor to insure that the above requirements are met in every respect. Approval is required by the Mandan City Engineer.

PROJECT ENGINEER RESPONSIBLITY:

(a) USC & 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 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.

If future activities should result in the discovery of any cultural resources that are eligible for inclusion in the National Register of Historic Places this will require compliance with Section 106 of the National Historic Preservation "Procedures for the Protection of Historic and Cultural Properties" (36, CFR, Part 800)

MANHOLE & WATER GATE VALVES ADJUSTMENT: The exact number, if any, of these adjustments will be determined by the Engineer. The Contractor shall not disturb any hydrants.

ANCHOR REINFORCING SLEEVE: The Anchor Reinforcing Sleeve will not be required and is not included on the sign summary for perforated tube supports.

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

CONCRETE PROTECTION: Adjacent concrete shall be protected during the application of all bituminous and asphalt materials to prevent any discoloration of the concrete. Failure to comply will result in the Contractor having to clean the concrete to the satisfaction of the Engineer at his own expense.

EMULSIFIED ASPHALT: When directed by the Engineer, emulsified asphalt for tack coat and prime coat shall be diluted prior to application with water in a 50:50 ration or other approved proportion. Cost of water shall be included in the price bid for "Emulsified Asphalt." Quantities shown do not include water.

HOT BITUMINOUS PAVEMENT: The temperature of the mix at laydown shall not be less than 210° F., if the air temperature is above 60° and shall not be less than 225° F., if the air temperature is less than 60° F. The actual mixing temperature shall be adjusted as directed by the Engineer within the allowable limitations to best suit construction conditions.

COMPACTION OF HOT BITUMINOUS PAVEMENT: The compaction equipment shall include not less than one approved steel roller or approved vibratory roller and one approved pneumatic tired roller. The initial compaction shall be completed before the mat drops below 170° F., and the specified density shall be obtained before the mat temperature drops below 140° F. The maximum speed of vibratory roller in the vibratory mode shall be 3 MPH. The maximum speed of non-vibratory and vibratory roller in the static mode shall be 4 MPH.

SUBGRADE PREPARATION: The subgrade shall be completed for a sufficient distance ahead of the placement of subsequent courses to allow adequate opportunity for inspection. At the time the first lift of hot mix is placed, the subgrade shall have adequate stability to support the hauling, laydown and compaction equipment, Without significant rutting or displacement. The sequence of paving operations shall be such that the possibility of damage to the initial lift from the Contractor's vehicles or public traffic is minimized. No payment will be made for hot mix or bitumen used to repair the subgrade or subsequent lifts of hot mix.

SUBCUT: 1.0' below grade line, scarify an additional 1.0'.

FENCE REMOVAL: (Station 173+27 to 205+00) The existing 5-strand barbed wire fence and posts shall be removed and placed within the right of way limits for salvage by the North Dakota State Highway Department District Forces. The fence wire and posts shall be removed in a careful manner to minimize damage.

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2,000 Ton of Aggregate Base Course, Class 5 has been provided to improve traffic conditions prior to placement of the Hot Bituminous Pavement and for subgrade reinforcement if required. This material shall be used only if required and as directed by the Engineer in the field.

The 7" Hot Bituminous Pavement shall be laid in a minimum of three lifts and the 6" Hot Bituminous Pavement in a minimum of two lifts. The top lift shall not exceed two inches.

IN PLACE PIPE SIGN SUPPORTS: The following locations have Standard Pipe Posts set on Concrete Foundation.

Sta.	Sta.	Sta.
170+00 Rt.	6+70 Rt.	14+75 Rt.
174+20 Rt.	8+30 Lt.	15+75 Rt.
174+74 Rt.	8+95 Lt.	9+40 Rt.
175+10 Rt.	13+20 Rt.	12+00 Lt.
176+30 Rt.	14+20 Rt.	14+20 Lt.
179+30 Lt.	16+00 Lt.	

Where removal is indicated on the Plans, the Signs, Supports and Foundation shall be removed. The Signs and Support shall be stockpiled within the right of way at the location designated by the Engineer. Concrete Foundations are deemed not salvageable and shall be removed and disposed of as directed by the Engineer. If in the opinion of the Engineer the Foundation will not interfere with other construction, they shall be cut off and restored to match the existing ground line.

CONSTRUCTION SEQUENCE: Unless otherwise instructed by the Engineer the Construction Sequence shall be as follows:

1. Mainline (Beg. to 204+50±)
   X-Rd. (1+53± to 9+00±)
   Temp. Conn. (176+00± Rt.)
   (Including initial lift of Hot Bit. Pavement.
2. NW Ramp (Route Traffic onto Mainline & Temp. Conn.)

NOTE CONT'D. FROM 1ST. COLUMN:

3. NERAMP (Maintain Traffic on existing NER).
4. Mainline (204+50 to End of Project).
5. X-Rd. widening (9+00 Ahd.) may be done during any phase of construction.

The existing Bituminous Pavement that is to be removed may be salvaged for the Contractor's own use.

Approximately 32,400 CY of excavation shall be used to construct the extension of the cross road to the north as shown on the Plans.

The 55,000 CY of excavation to be wasted, if placed in the temporary waste area easement, shall be placed to grades approved by the owner and shall be left in a reasonably smooth manner which allows drainage. Type C Compaction in accordance with Sec. 203-2.5 of the Standard Specifications shall be required. The Contractor shall not be required to remove or replace topsoil or seed the waste area. Other disposal sites, if any, selected by the Contractor shall be approved by the Engineer. Disposal of waste material at any site shall comply with all environmental regulations. The cost of disposal, and obtaining of any other disposal area, shall be included in the price bid for common excavation.

The Contractor shall coordinate his work activities with the Electrical Contractor.

Trees and shrubs that are within the right of way and outside of construction limits are not to be disturbed.

TOPSOIL: Removal of topsoil from excavation areas will be paid for as Common Excavation. Removal of topsoil from embankment areas will be included in the price bid for Clearing and Grubbing.

Total topsoil from Clearing and Grubbing areas is approximately 5365 C.Y.

The Contractor shall make his own arrangement for topsoil storage areas if sufficient room is not available on the existing right of way. The Contractor will not be reimbursed for additional handling of topsoil that must be moved to provide additional excavation area between the plan backslope and the right-of-way line.

SCARIFYING & RECOMPACTION OF EMBANKMENT AREAS: After removing 6" of topsoil from original ground under all roadway embankment areas, an additional one foot shall be scarified and recompacted. All scarifying and recompaction shall be included in the price bid for "Common Excavation".

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UNDERDRAINS: All perforated PVC pipe used for underdrains shall be encased in Coarse Aggregate which is wrapped with filter fabric. The Coarse Aggregate shall meet the Screen Analysis of Size 1,2,3 or 4 Aggregate in Section 806-2 of the Standard Specifications. The Filter Fabric shall be one of the following:

Dupont Typar Style	3401
Mirafi	1405
Stabilanka	T-80

or an equivalent material approved by the Engineer. The cost of Coarse Aggregate Filter Material and Filter Fabric shall be incidental to the price bid for 6" Perforated PVC Underdrain Pipe.

The price bid for the installation of PVC Underdrain Pipe shall include the cost of trenching, pumping the ground water encountered in the trenches and shoring, if any, required to maintain roadway stability. The cost of the placement of the clay embankment over the underdrain granular fill shall be included in the price bid for underdrain granular fill. The Contractor shall dispose of the excess excavation in a manner approved by the Engineer.

The cost of all fittings required for PVC Underdrain Pipe installation including frame and lids for clean-out tubes shall be included in the price bid for PVC Underdrains.

If necessary, the Engineer will adjust the Underdrain System to insure the capture of the ground water.

The City of Mandan will remove trees (Sta. 175 to 179 & Sta. 186 to 193) prior to June 1, 1982. The Contractor shall not commence work in the areas prior to that time or until the trees have been removed whichever is earlier.

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BASIS OF ESTIMATE - SURFACING

DESCRIPTION	UNIT	48' CURB & GUTTER QUANTITY PER STA.	48' CURB & GUTTER DEPTH	RAMPS QUANTITY PER STA.	RAMPS DEPTH	RAMPS WIDTH	CROSS ROAD QUANTITY PER S.Y.	CROSS ROAD DEPTH	WIDEN SECTION QUANTITY PER. S.Y.	WIDEN SECTION DEPTH
Hot Bituminous Pavement - Class 25 @ 2.0 Ton/C.Y.	Ton	111.11	4"	86.37	5"	26'	.2778	5"	.3333	6"
Hot Bituminous Pavement - Class 25@ 2.0 Ton/C.Y.	Ton	55.56	2"	30.81	2"	24'	.1111	2"	.1111	2"
85-100 Asphalt Cement @ 6.9% of Hot Bituminous Pavement	Ton	7.67	4"	5.96	5"		.0192	5"	.0230	6"
85-100 Asphalt Cement @ 6.9% of Hot Bituminous Pavement	Ton	3.83	2"	2.13	2"		.0077	2"	.0077	2"
SS-1h or CSS-1h Emuls. Asph. for Tack Coat @ 0.05 Gal./S.Y.	Gal.	25.00		14.44		26'	.05		.05	
AE-150S Amuls. Asph. for Seal Coat @ 0.35 Gal./S.Y.	Gal.	175.00		124.44		32'	.35		.035	
Cover Coat Material Class 43 @ 25 Lbs./S.Y.	Ton	6.25		3.33		24"	.0125		.0125	

Aggregate Base Course-Cl. 5 @ 1.5 Ton/C.Y. + 25%

BASIS OF ESTIMATE - GRADING

WATER: 10 Gal./C.Y. of Estimated Embankment Quantities and 20 Gal./Ton of Aggregate Base Course. An estimated amount has been included in the quantities for use as a dust palliative.

TOPSOIL: Topsoil (where presently existing) shall be removed and replaced to a minimum depth of 6" Removal of topsoil has been included in the quantities and shall be paid for at the unit price bid for "Common Excavation, Type A."

SEEDING: The entire right of way and easements, except the roadway and other surfaced or sodded areas shall be seeded (Hydro-Mulch).

MAXIMUM SIZE OF AGGREGATE

Description	Type of Aggregate	Max. Size
Hot Bit. Pvm't. Class 25	Crushed	3/4"
Cover Coat Material - Cl. 43		1/2"
Aggregate Base Course - Cl. 5	Crushed	3/4"

SPECIAL PROVISIONS

Name	No.
Award and Execution of Contract	SP-103-3
Legal Relations and Responsibility to Public	SP-107-6
Legal Relations and Responsibility to Public	SP-107-7
Prosecution and Progress	SP-108-9
Prosecution and Progress	SP-108-19
Measurement and Payment	SP-109-4
Riprap	SP-702-2
Fuel Cost Adjustment	SP-272
Haul Road Maintenance	SP-273
Minority Business Enterprises	SP-357
Hot Bituminous Pavement	SP-406-7,8,10
Seeding (Hydro-Mulch)	SP-726-30
Portland Cement Concrete	SP-610-3
Pavement Marking	SP-743-10
Flagging	SP-746-1
Highway Signs	SP-754-6
Maintenance and Protection of Traffic	SP-762-6
Temporary Striping	SP-776-2
Portland Cement Concrete	SP-806-3
Bituminous Materials	SP-814-2,1
Paints, Oils and Thinners	SP-870-4
Pavement Marking Material	SP-871-4
Highway Signs	SP-894-3
Trainee	SP-
Watermains	SP-421

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SUMMARY OF QUANTITIES

CITY FUND ONLY
STA. 3+66 TO 9+00
X-RD.

SPEC.	CODE	DESCRIPTION	UNIT	FEDERAL AND CITY PARTICIPATION QUANTITY	QUANTITY	TOTAL
103	0100	Contract Bond	L. Sum	1		1
201	0330	Clearing and Grubbing	L. Sum	1		1
202	0312	Remove Existing Fence	L.F.	2802		2802
203	0101	Common Excavation - Type A	C.Y.	101266	38370	139636
216	0100	Water	M. Gal.	876		876
302	0120	Aggregate Base Course, Cl. 5	Ton	2000		2000
401	0152	SS-1h or CSS-1h Emulsified Asphalt	Gal.	1721	270	1991
406	0190	Hot Bituminous Pavement, Cl. 25	Ton	11568	2104	13672
406	0310	85-100 Asphalt Cement	Ton	798	145	943
420	0112	AE-150 S Emulsified Asphalt	Gal.	12934	1893	14827
420	0145	Cover Coat Material, Cl. 43	Ton	447	68	515
630	2216	12" Reinf. Conc. Pipe Sewer - Cl. III	L.F.	63	16	79
630	2256	15" Reinf. Conc. Pipe Sewer - Cl. III	L.F.	1332		1332
630	2341	21" Rienf. Conc. Pipe Sewer - Cl. III	L.F.	100		100
630	2381	24" Reinf. Conc. Pipe Sewer - Cl. III	L.F.	1690		1690
630	2426	27" Reinf. Conc. Pipe Sewer - Cl. III	L.F.	160		160
630	2466	30" Reinf. Conc. Pipe Sewer - Cl. III	L.F.	86	16	102
630	3260	15" Reinf. Conc. End Section	Ea.	7		7
630	3270	21" Reinf. Conc. End Section	Ea.	1		1
630	3275	24" Reinf. Conc. End Section	Ea.	2		2
630	3285	30" Reinf. Conc. End Section	Ea.	2	2	4
705	0100	Mobilization	L. Sum	1		1
708	0300	Curb and Gutter - Type I	L.F.	12880	1095	13975
712	0100	Concrete Sidewalk	S.Y.	555	428	983
712	0118	8" Concrete Driveway	S.Y.	87		87
714	0110	Manhole Riser - 48"	L.F.	86		86
714	0120	Manhole Riser - 60"	L.F.	3		3
714	0122	Manhole Riser - 72"	L.F.		6	6
714	0130	Inlets	Ea.	8	1	9
714	0134	Double Inlets	Ea.	13		13
714	0135	Triple Inlets	Ea.	1		1
714	0208	Manhole - 48"	Ea.	11		11
714	0212	Manhole - 60"	Ea.	1		1
714	0216	Manhole - 72"	Ea.		1	1
716	0110	Adjust Manhole	Ea.	1		1
716	0140	Adjust Utility Appurtenances	Ea.	1		1
726	0320	Hydro Mulch Seeding	Acre	17		17
728	0100	Sodding	S.Y.	100		100
738	0110	Chain Link Fence	L.F.	2616		2616
738	0142	Corner Assembly - Chain Link	Ea.	3		3

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SUMMARY OF QUANTITIES (CONT'D.)

SPEC.	CODE	DESCRIPTION	UNIT	FEDERAL AND CITY PARTICIPATION QUANTITY	CITY FUND ONLY STA. 3+66 TO 9+00 X-RD. QUANTITY	TOTAL
738	0152	Double Brace Assembly - Chain Link	Ea.	5		5
743	0102	Pvm't. Marking - Drop on Beads - Type II (Line)	L.F.	3764	7478	11242
743	0103	Pvm't. Marking-Drop on Beads-Type II (Message)	S.F.	13	272	285
746	0100	Flagging	M. Hr.	500		500
754	0116	Flat Sheet for Signs - Type II - Refl. Sheet	S.F.	91	39	130
754	0117	Flat Sheet for Signs - Type III & IV Refl. Sheet	S.F.	81	44	125
754	0150	Delineators - Type A	Ea.		20	20
754	0209	Steel Galv. Posts - Square Tube Perforated	Lbs.	903	394	1297
776	0100	Temporary Striping	Mile	2		2
630	5206	6" PVC Pressure Sewer Pipe	L.F.	267		267
900	2000	Median Drains - Type A	Ea.	2		2
900	5006	12" Watermain	L.F.	2074	6	2080
900	5038	Cast Iron Fittings	Lbs.	1085		1085
630	5214	12" PVC Sewer Pipe	L.F.	1114		1114
900	5077	12" x 12" Tee (Mech. Joint)	Ea.		1	1
900	5152	12" Gate Valve and Box	Ea.	1		1
900	8505	Trainee	M. Hr.	2000		2000
203	0110	Rock Excavation	C.Y.	400		400
630	2465	30" Reinf. Conc. Pipe - Cl. III	L.F.		126	126
630	3414	Relay End Section	Ea.	1	1	2
714	0150	Relocate Air Rel[illegible]. Valve and Manhole	Ea.	1		1
706	0110	Underdrain Granular Fill Material	C.Y.	541		541
706	0392	6 In. Non-Perforated PVC Pipe	L.F.	130		130
706	0395	6 In. Perforated PVC Pipe for Underdrains	L.F.	1010		1010
702	0130	Loose Rock Riprap	C.Y.	10		10

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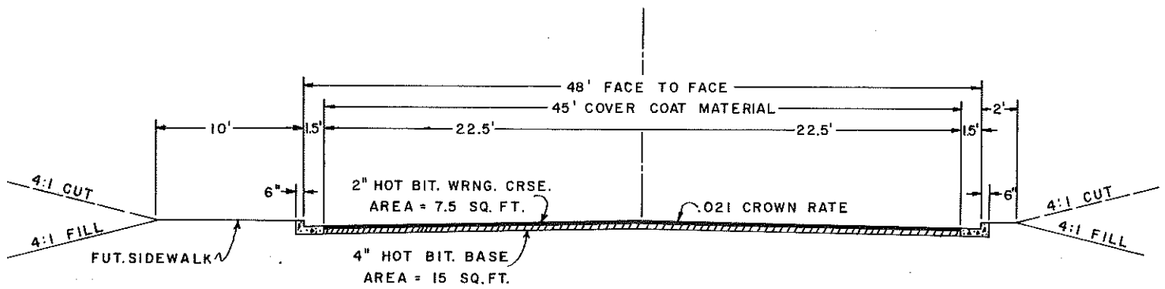
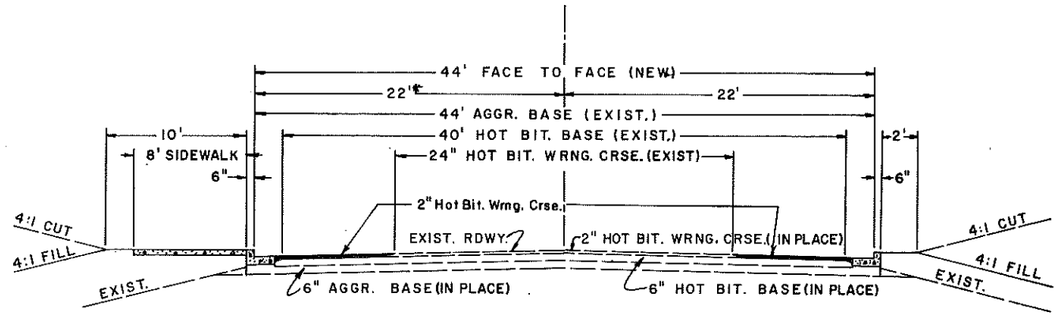
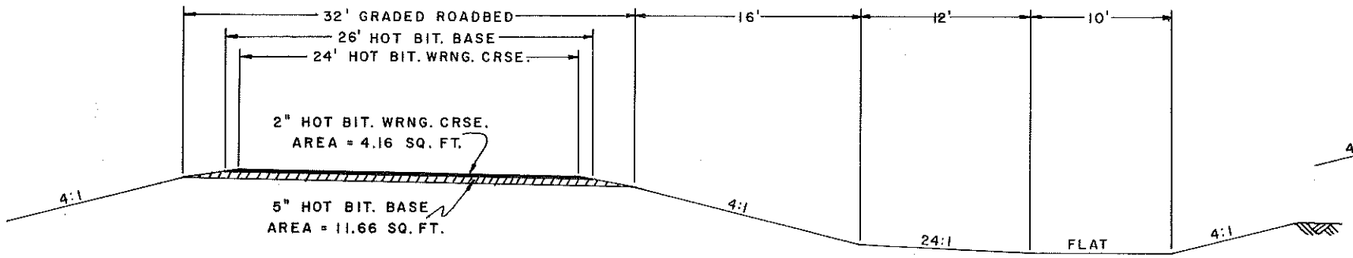
TYPICAL SECTIONS



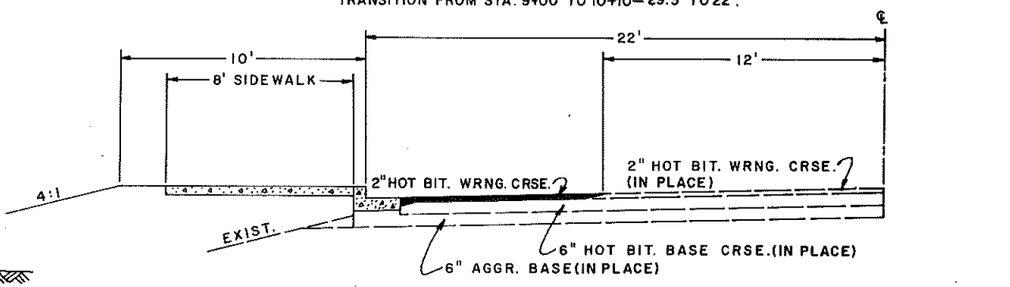
URBAN SECTION
OLD RED TRAIL



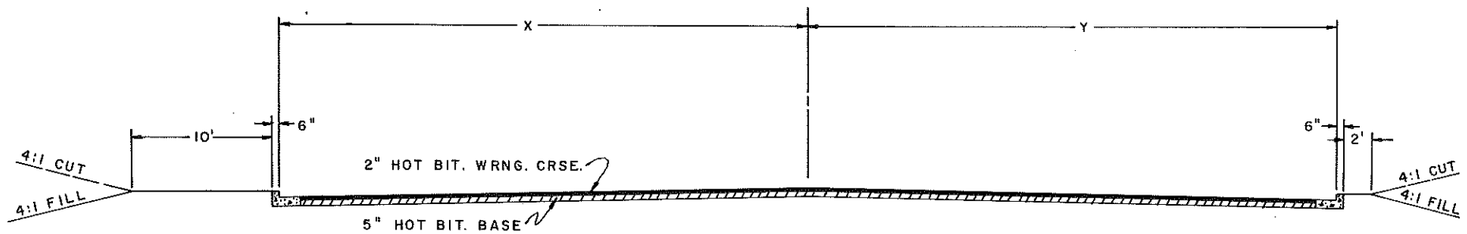
CROSSROAD (SUNSET DRIVE)
WIDENED SECTION
STA. 9+00 TO 15+00 (END)
* TRANSITION FROM STA. 9+00 TO 10+10 — 29.3' TO 22'.



TYPICAL RAMP SECTION
SUNSET INTERCH.

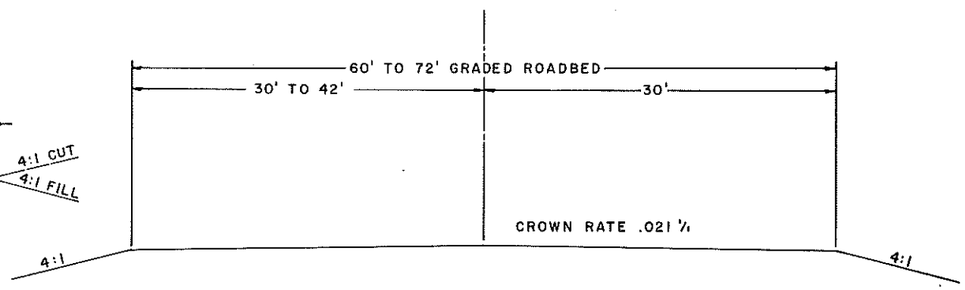


CROSSROAD (SUNSET DRIVE)
WIDENED SECTION



CROSSROAD (SUNSET DRIVE)
REGRADED SECTION

DISTANCE ALONG X-RD.	X	Y
STA. 3+00	37.5	26'
TRANSITION FROM STA. 3+00 TO STA. 4+08	37.5	37.5
FROM STA. 4+08 TO STA. 6+00	37.5	37.5
FROM STA. 6+00 TO STA. 8+00	36'	22'
TRANSITION FROM STA. 8+00 TO STA. 9+00	29.3'	22'



CROSSROAD (SUNSET DRIVE)
REGRADED SECTION N. OF OLD RED TRAIL

	LT.	RT.
FROM STA. -(8+13.6) TO STA. -(0+70)	30'	30'
TRANSITION FROM STA. -(0+70) TO STA. 0+50	42'	30'
FROM STA. 0+50 TO STA. 2+00	42'	30'

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO
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N

SEC. LINE

377.29'

1012.8'

TEMPORARY WASTE EASEMENT

80'

7'

SUNSET DRIVE

T.S. 171+17.4 O.L.

S.C. 173+17.4 O.L.

1/4 LINE

O. L.
Δ = 37.204° Lt.
D = 4° (2-200' Sp.)
R = 1432.69'
Sc = 4°, q = 99.96'
Xc = 4.65', Yc = 199.9'
Ts = 582.6'
L = 730.1', S.E. = 0.021 1/2

C.S. 180+47.5 O.L.

S.T. 182+47.5 O.L.

R/W

185+31.4 O.L. = 2 + 56 X-Rd.

C. 187+07.4 O.L.

P.T. 189+08.0

O. L.
Δ = 44.5° Rt.
D = 12° (1-200' Sp) Sc = 12°
R = 478.34'
P = 3.47'
Xc = 13.92', q = 99.68'
Ts = 291.84', Yc = 199.13
L = 270.83', T = 200.64'
S.E. = 0.021 1/2

C.S. 189+78.2

S.T. 191+78.2 O.L.

O. L.
Δ = 26.5571° Lt.
D = 5° (2-200' Sp.)
R = 1146.28', Sc = 5°
P = 1.45', q = 99.94'
Xc = 5.81'
Yc = 199.85'
Ts = 370.8', L = 331.1'
S.E. = 0.021 1/2

T.S. 195+00.1 O.L.

S.C. 197+00.1 O.L.

C.S. 200+31.2 O.L.

S.T. 202+31.2 O.L. Bk. = 201+43.8 Surv. Ahd.

Curb
Δ = 7°
D = 28°
R = 205.08'
T = 12.64'
L = 25.25' (Arc)

P.I. 4+08.0

See Detail A

P.I. 179+73.35
Δ = 9° 15' 40"

181+00 N.W.R. = 181+00 Surv.

188+43.5 N.W.R.

189+35.96 Surv. = 7+00 X-Rd.

P.C. 190+18.2 O.L.

P.I. 191+49.5 O.L.

P.I. 192+54.4 O.L.

P.C. 193+61.9 O.L.

P.I. 194+75.4 O.L.

P.C.C. 196+01.5 O.L. = 195+23.1 - 164.5 Rt.

P.T. 198+70.9 O.L. = 197+73.0 Surv.

Oblit.

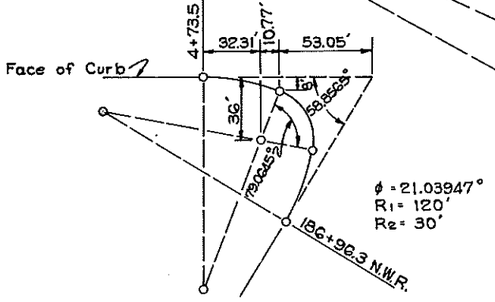
Exist. I-94 West Bound Lane

Exist. I-94 East Bound Lane

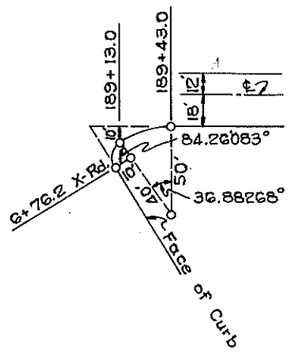
N.E.R. O.L.
R = 300'
T = 125.3'
L = 236.2'
S.E. = 0.060 1/2

See Detail C

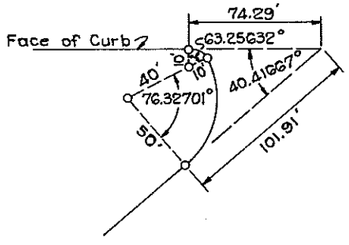
N.E.R. O.L.
Δ = 19°09'51" Lt.
D = 8°00'
T = 121.0'
L = 239.0'
S.E. = 0.060 1/2



DETAIL A



DETAIL B



DETAIL C

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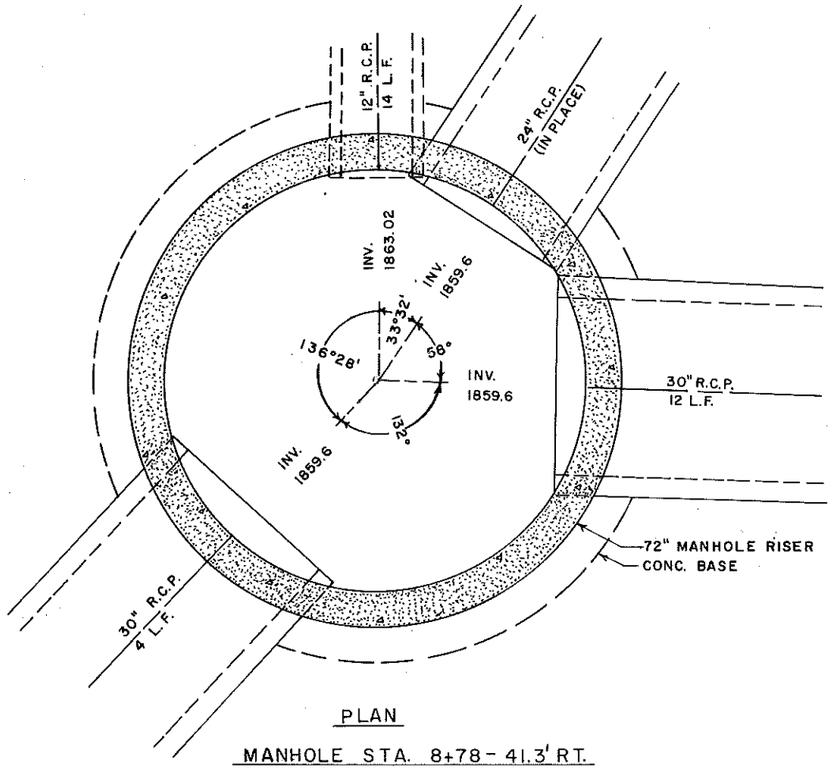
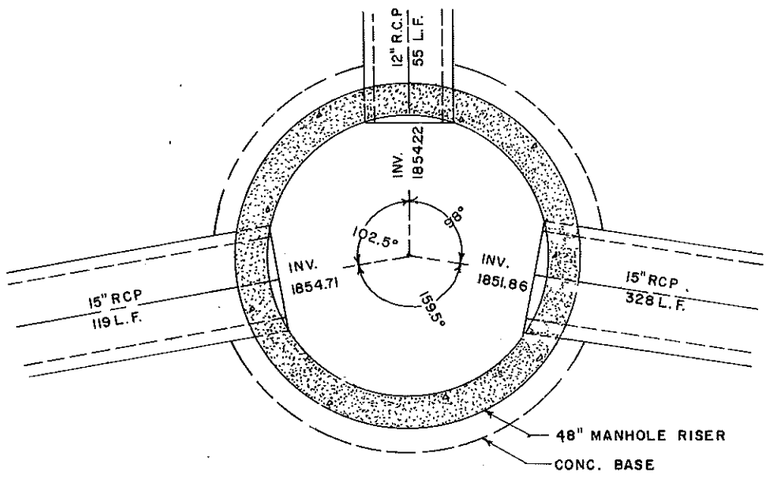
DETAILS



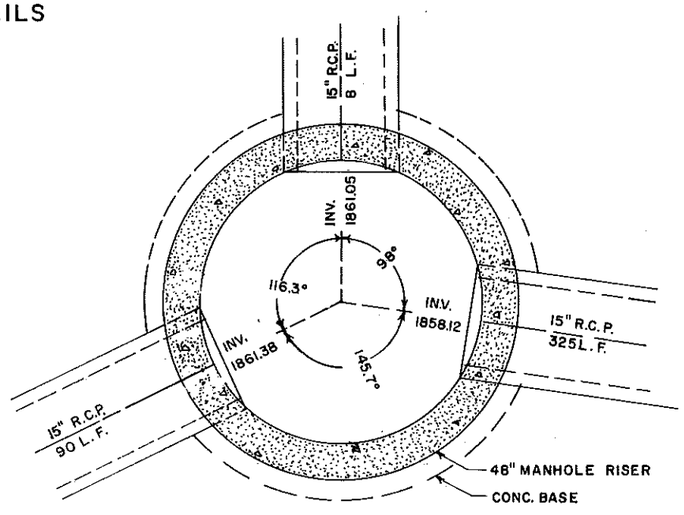
PLAN

MANHOLE STA. 8+78 - 41.3' RT.



PLAN

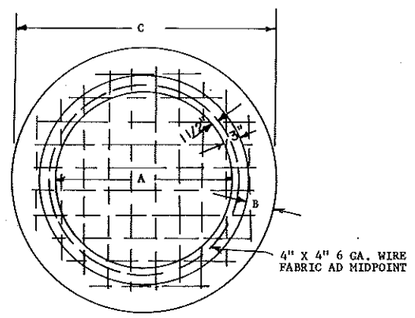
MANHOLE STA. 190+00 - 33' RT.

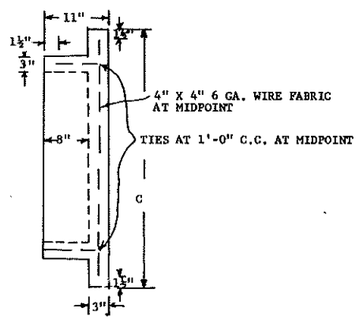


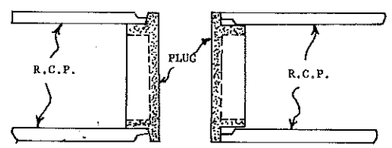
PLAN

MANHOLE STA. 187+85 - 33' RT.

DIMENSIONS (IN INCHES)			
PIPE DIAMETER	A	B	C
15	8	2-3/4	19-1/2
18	11	3	23
21	14	3-1/4	26-1/2
24	17	3-1/2	30
27	20	3-3/4	33-1/2
30	23	4	37
33	26	4-1/4	40-1/2
36	29	4-1/2	44
42	35	5	51
48	41	5-1/2	58







REINFORCED CONCRETE PIPE PLUG

NOTES:

ALL REINFORCEMENT SHALL BE ELECTRICALLY WELDED COLD DRAWN STEEL WIRE FABRIC AND SHALL BE ASSEMBLED AND SECURELY FASTENED IN CAGE FASHION SO AS TO MAINTAIN REINFORCEMENT IN EXACT SHAPE AND CORRECT POSITION WITHIN THE FORMS.

CONCRETE SHALL CONFORM TO STRENGTH REQUIREMENTS FOR REINFORCED CONCRETE PIPE CULVERTS, CL. II.

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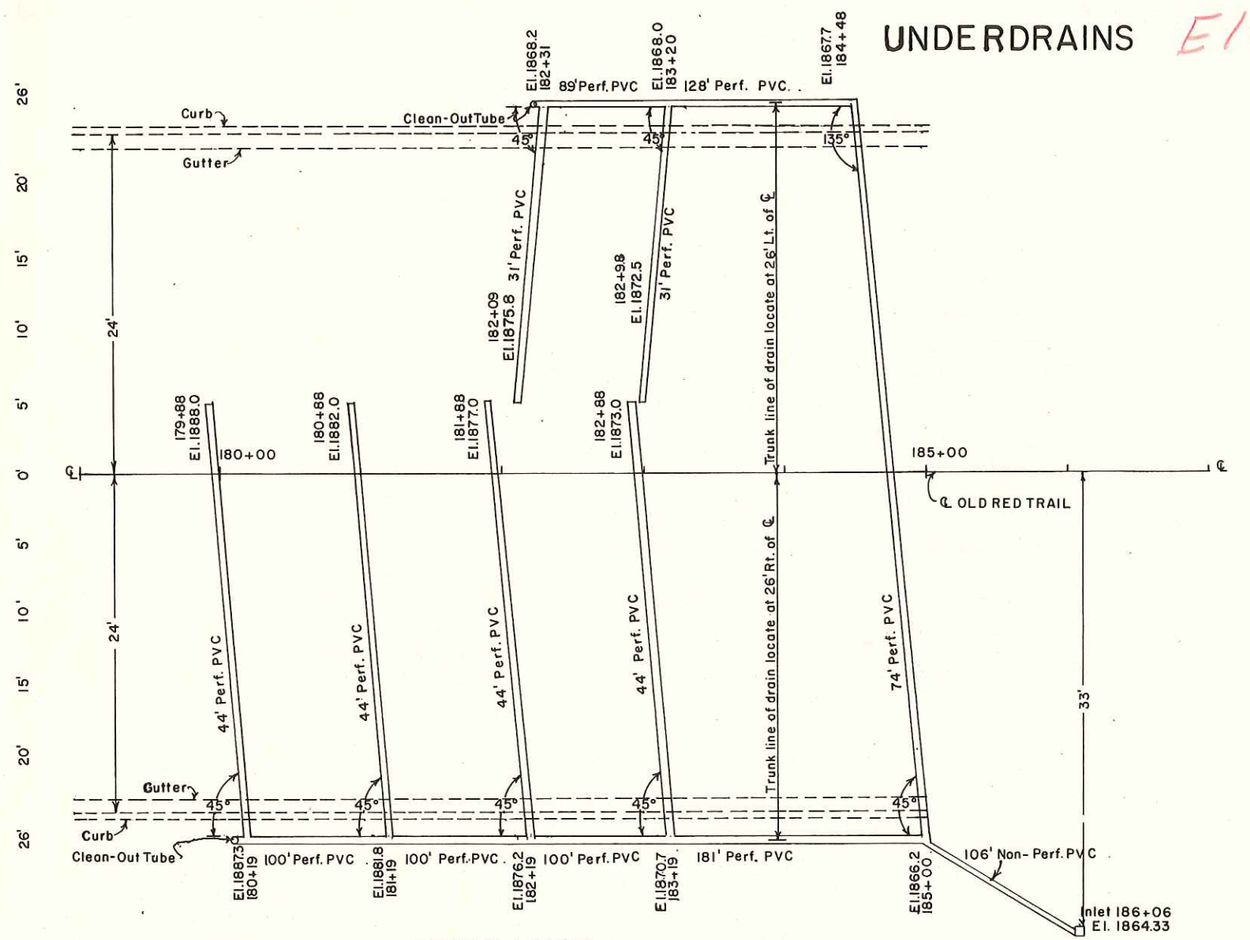
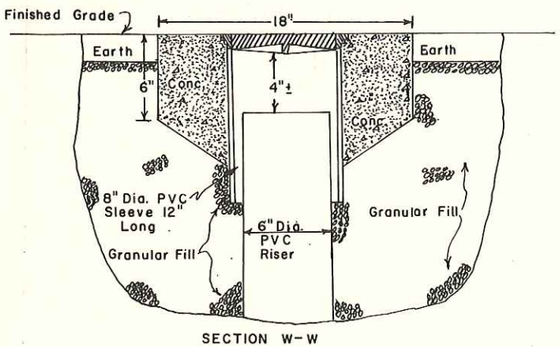
UNDERDRAINS Elim.

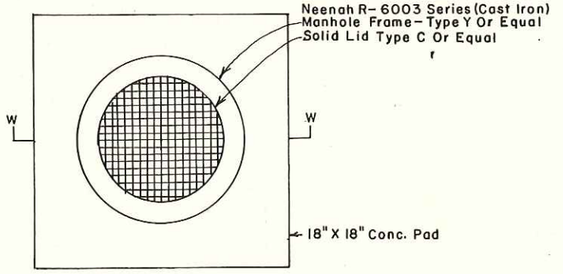


SUBDRAIN LAYOUT

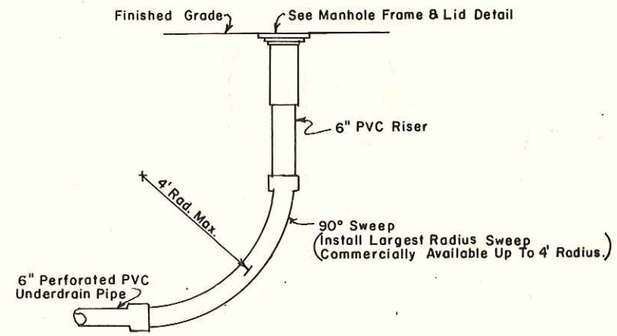


SECTION W-W

MANHOLE FRAME AND LID ELEVATION

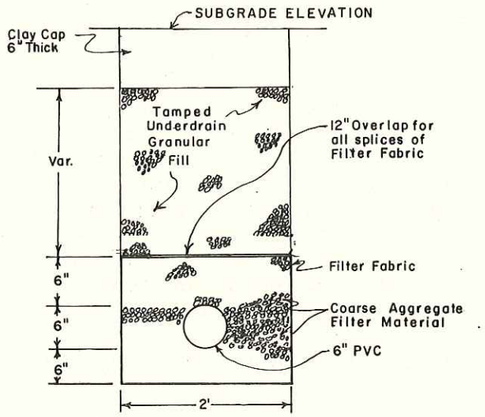


MANHOLE FRAME AND LID DETAIL

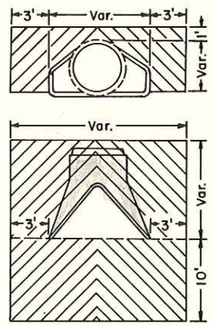


TYPICAL UNDERDRAIN CLEAN-OUT RISER DETAIL

NOTE: 6" PVC RADIUS SWEEPS & 6" PVC RISER TO BE PAID FOR AS 6" NONPERFORATED PVC UNDERDRAIN PIPE.



BACKFILL DETAIL
6" PERFORATED PVC



TYPICAL SODDING DETAILS FOR CULVERT ENDS

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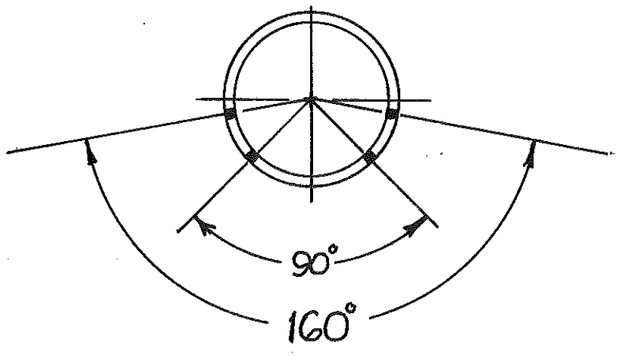
DETAILS

6" Perforated PVC



ANGULAR POSITION OF ROWS

PIPE SIZE	ROWS OF PERFORATIONS	NO. OF PERFORATIONS PER ROW*
6	4	48

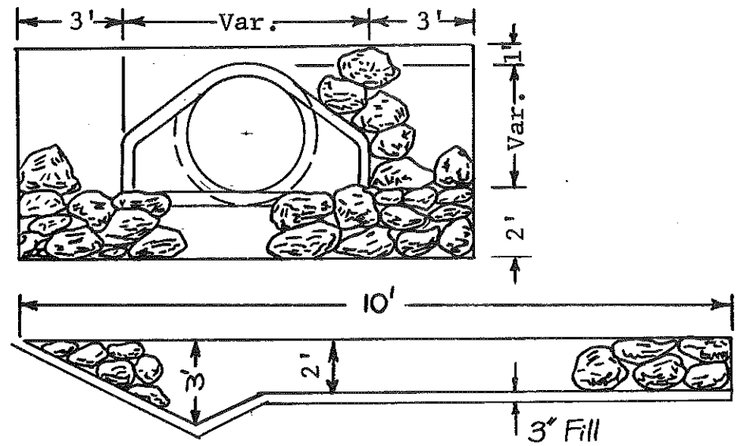
*For 12.5 Foot Pipe Laying Lengths

PERFORATED PVC SEWER PIPE

1. TYPE OF PIPE
   The pipe shall be Polyvinyl Chloride Sewer Pipe with Solvent Cemented Joints as specified in ASTM Spec. No. 3034.

2. Perforations shall be circular and ¼" + 1/16" in diameter. They should be arranged in ROWS parallel to the axis of the pipe and shall be spaced approximately 3" center to center along the ROWS. The spigot end of the pipe shall be unperforated for a length equal to the depth of the socket. The placement and total number of the ROWS shall be as shown below with an allowable tolerance of +10°. The spigot and bell end shall be unperforated for a length equal to the depth of the spigot.

3. The nominal laying length of the pipe shall be 12.5 Feet. Shorter or longer laying lengths shall be provided if required.

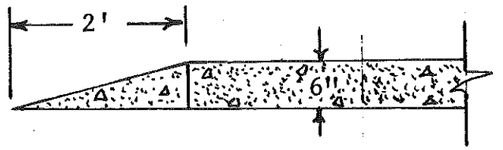


Filter Fabric

LOOSE ROCK RIPRAP

At Pipe Ends

NOTE: The Filter Fabric Material shall be Dupont Typar Style 3401, Mirafi 1405, Stabilanka T-80 or an equivalent material approved by the Engineer. A two foot overlap shall be used where required. Equipment shall not be allowed directly on the filter fabric. A minimum of 3" Excavation shall be placed over the Filter Fabric to protect the material during riprap installation. Riprap shall be installed according to Plan and Standard Specification 702. The Filter Fabric Material and Excavation costs shall be included in the price bid for "Loose Rock Riprap".



CURB TAPER
AT ENDS OF APPROACH RADIUS

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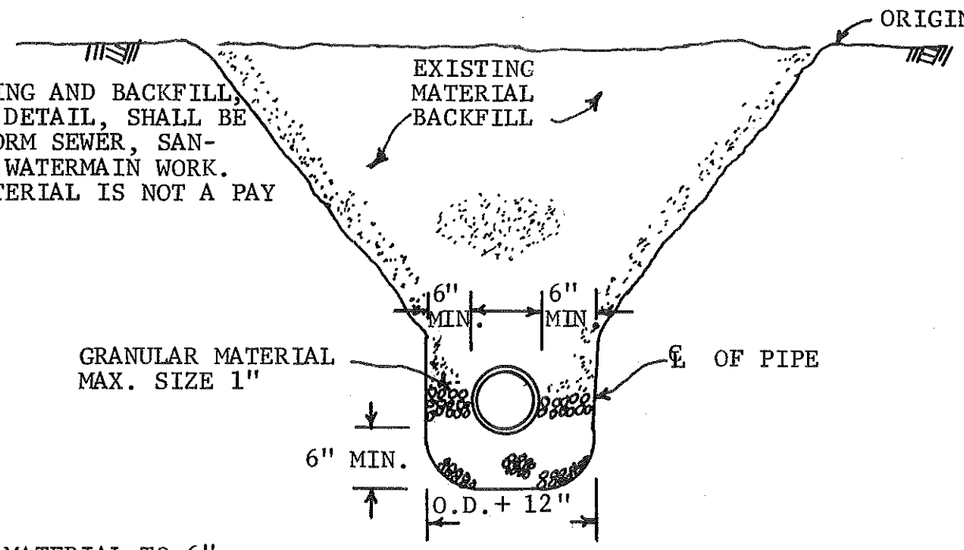
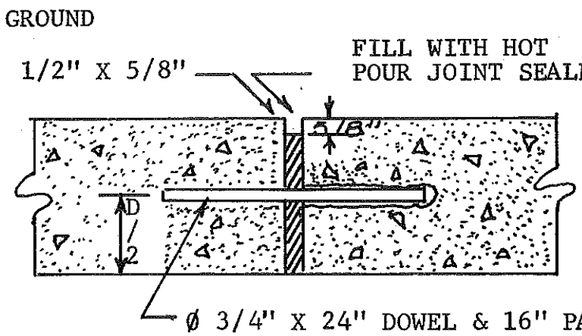
NOTE: THE BEDDING AND BACKFILL, AS SHOWN IN THE DETAIL, SHALL BE USED FOR ALL STORM SEWER, SANITARY SEWER AND WATERMAIN WORK. THE GRANULAR MATERIAL IS NOT A PAY ITEM.



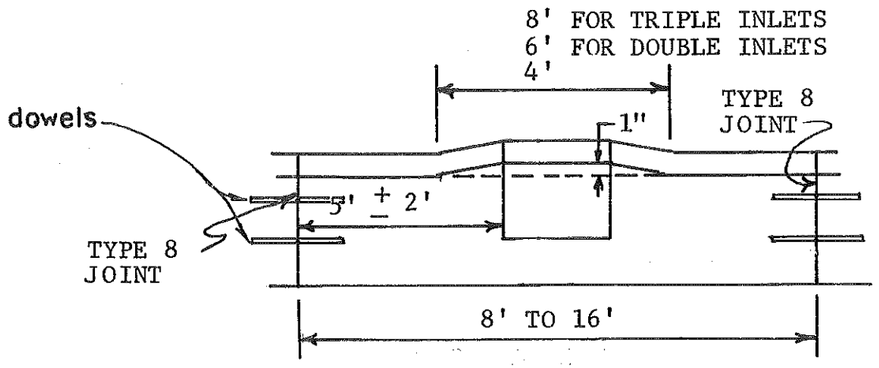
(PLACE GRANULAR MATERIAL TO 6" ABOVE TOP OF WATERMAIN.)

BEDDING AND BACKFILL SECTION

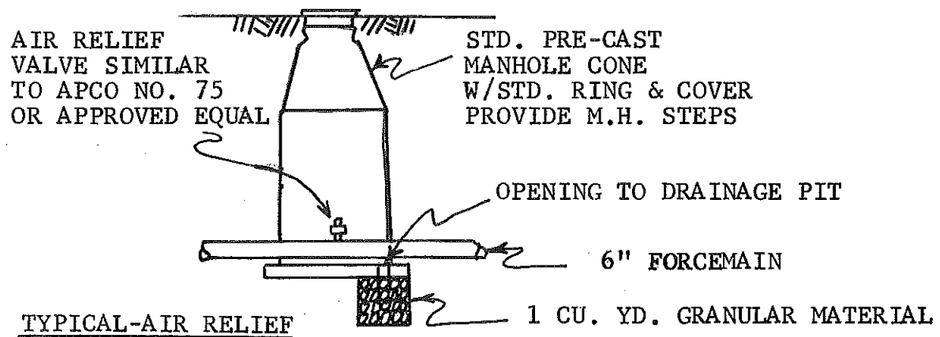


NOTE: FOR TYPE 8 JOINT USE 3/4" X 24" SMOOTH DOWELS AND 16" PAPER TUBES. DOWELS SHALL BE GREASED THE FULL LENGTH. ALL PAPER TUBES SHALL BE PLUGGED OR CRIMPTED ON OPEN END. ALL JOINTS SHALL BE SEALED. DOWELS SHALL BE SUPPORTED BY AN APPROVED SUPPORT MADE OF NO. 7 AWG WIRE, SPACED 12" O.C. UNLESS OTHERWISE SHOWN ON THE PLANS.

TYPE 8 JOINT



INLET



TYPICAL-AIR RELIEF STRUCTURE

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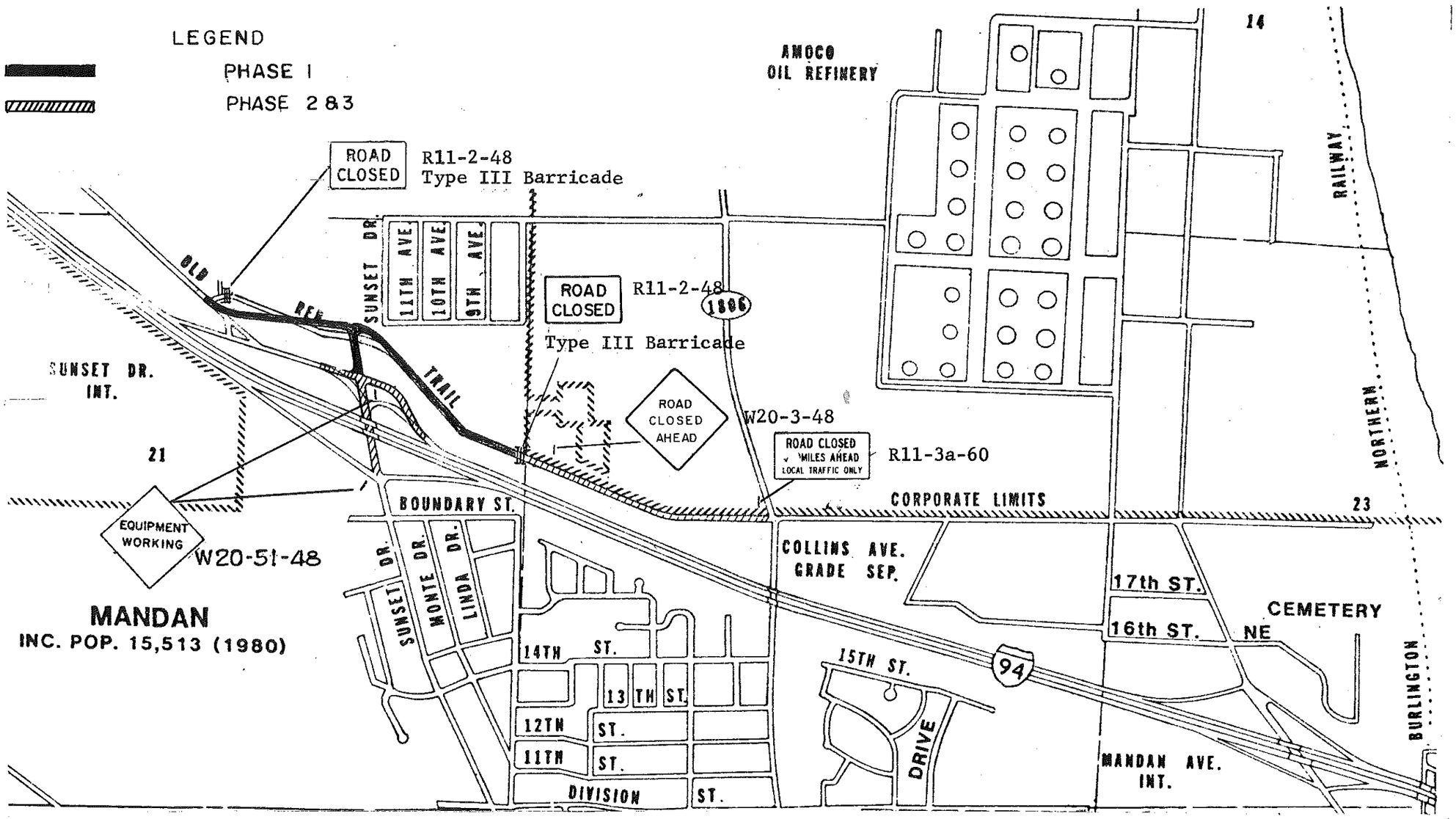
CONSTRUCTION SIGNING

PHASE 1



FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)	17

CONSTRUCTION SIGNING

PHASE 2

LEGEND

PHASE 2

PHASE 1 & 3

DETOUR M4-8-24
WEST M3-4-24
INTERSTATE NORTH DAKOTA 94 M1-1(I)-24
M6-1-21

DETOUR M4-8-24
WEST M3-4-24
INTERSTATE NORTH DAKOTA 94 M1-1(I)-24
M6-1-21

DETOUR M4-8-24
WEST M3-4-24
INTERSTATE NORTH DAKOTA 94 M1-1(I)-24

WEST M3-4-24
INTERSTATE NORTH DAKOTA 94 M1-1(I)-24
SUNSET DR. INT.

ROAD CLOSED R11-2-48
Type III Barricade

ROAD CLOSED R11-2-48
DETOUR M4-10-48
Type III Barricade

MANDAN
INC. POP. 15,513 (1980)

Type II Barricades
5 @ 50' Spacing

EQUIPMENT WORKING W20-51-48

AMOCO
OIL REFINERY

OLD RED TRAIL

SUNSET DR.
11TH AVE.
10TH AVE.
9TH AVE.
SUNSET DR.
MONTE DR.
LINDA DR.

BOUNDARY ST.
14TH ST.
13TH ST.
12TH ST.
11TH ST.
DIVISION ST.

CORPORATE LIMITS

COLLINS AVE.
GRADE SEP.

15TH ST.
DRIVE

17th ST.
16th ST. NE
CEMETERY

MANDAN AVE.
INT.

1806

94

RAILWAY
NORTHERN
BURLINGTON

14
21
22
23

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
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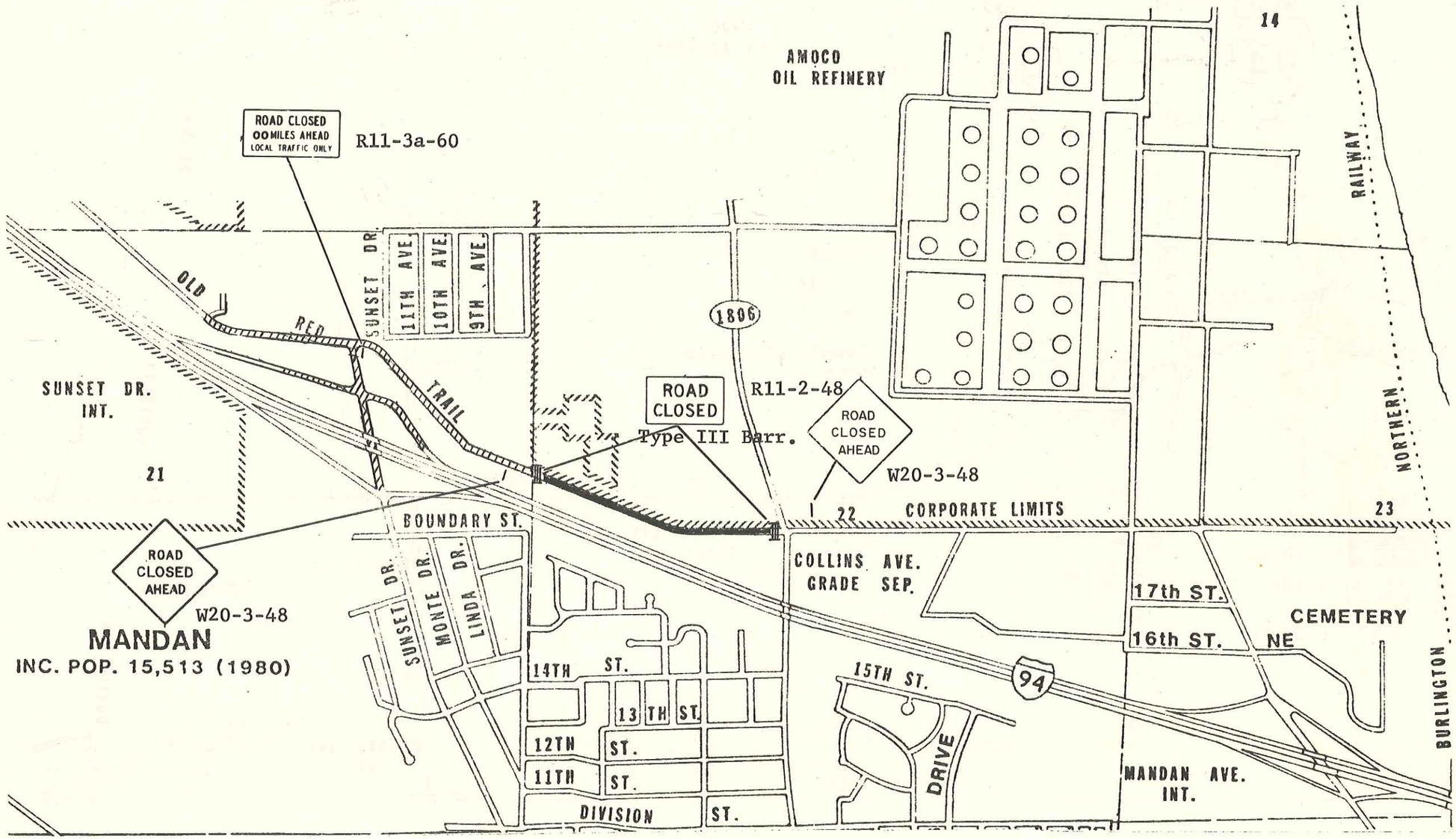
CONSTRUCTION SIGNING

PHASE 3

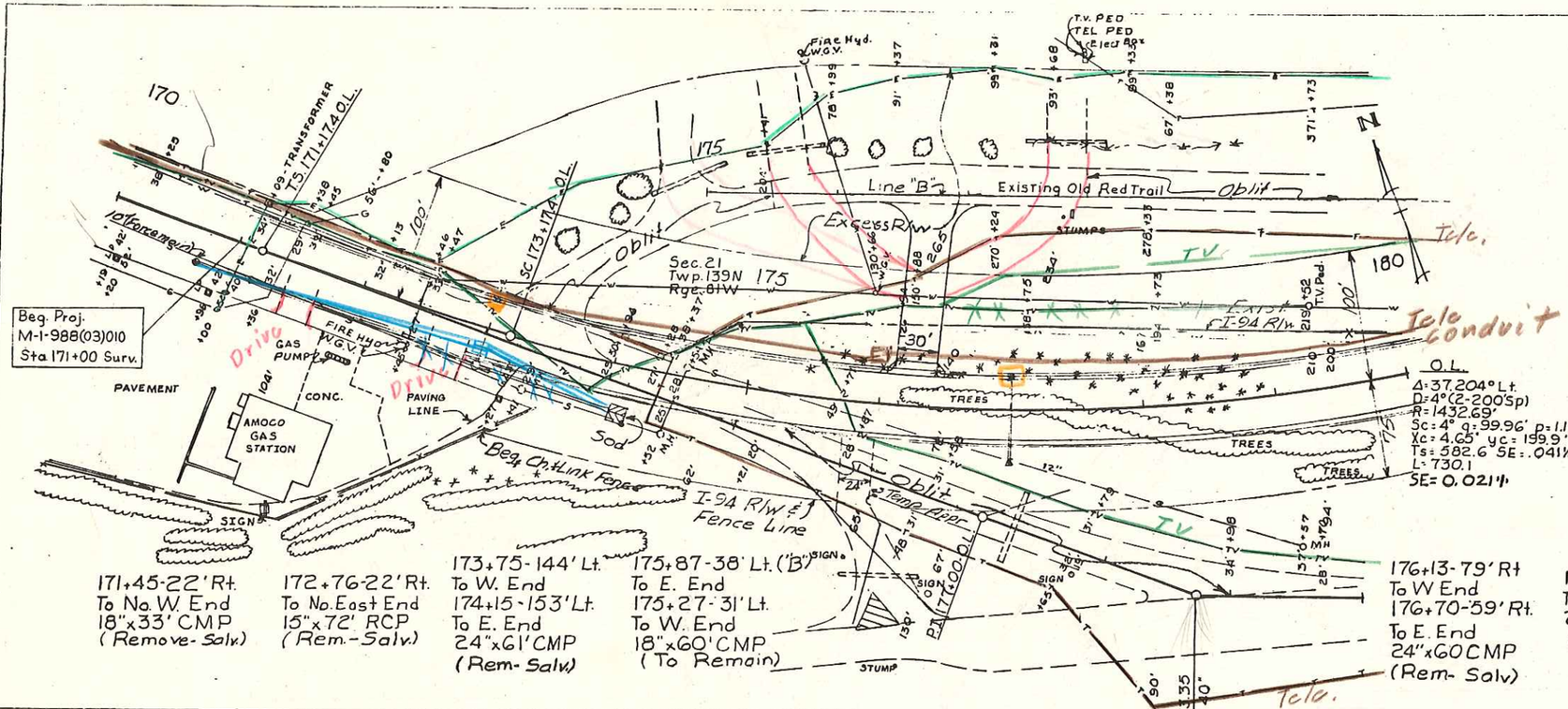
LEGEND

PHASE 3

PHASE 1 & 2



FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)	19



BENCH MARKS

NO.	DESCRIPTION	LOCATION	ELEV.
P	TOP OF HYDRANT @ AMOCO STATION	172+46-29' RT.	1933.17

INSTALL CURB & GUTTER TYPE I

171+00-23.5' LT. TO 180+00-23.5' LT. 890 L.F.
171+00-23.5' RT. TO 180+00-23.5' RT. 900 L.F.

INSTALL REINFORCED CONCRETE PIPE - SEWER CLASS III

170+75-26' RT. TO 173+00-29.5' RT.	24" X 226' R.C.P.-S. (INCL. 1 "T" SEC. 1-PLUG)	
173+00-23.5' LT. TO 173+00-29.5' RT.	15" X 52' R.C.P.-S.	
173+00-29.5' RT. TO 174+00-32' RT.	21" X 100' R.C.P.-S.	
177+00-23.5' LT. TO 177+00-36.5' RT.	15" X 60' R.C.P.-S.	

INSTALL REINFORCED CONCRETE END SECTIONS

174+00-32' RT.	21" R.C.E.S.	1 EA.
177+00-36.5' RT.	15" R.C.E.S.	1 EA.

INSTALL MANHOLE

173+00-29.5' RT. 1-60"

INSTALL MANHOLE RISER

173+00-29.5' RT. 60" X 3.16'

INSTALL DOUBLE INLETS

173+00-23.5' LT. 1 EA.
177+00-23.5' LT. 1 EA.

INSTALL 8" CONCRETE DRIVEWAY

176+25-23.5' LT. 30' 21.7 S.Y.

ADJUST MANHOLE

174+37-38' LT. SURV.

ADJUST UTILITY APPURTENANCES

WGV 175+66-130' LT. SURV.

REMOVE EXISTING FENCE

174+45.5-21' LT. O.L. TO 180+00-31' LT. O.L. 549 L.F.

INSTALL CHAIN LINK FENCE

173+17.4-75' RT. O.L. TO 180+00-75' RT. O.L. 683 L.F.

INSTALL CONCRETE MEDIAN DRAIN - TYPE A

170+75-26' RT. 1 EA.

INSTALL DOUBLE BRACE ASSEMBLY - CHAIN LINK

173+17.4-75' RT. O.L. 1 EA.
179+39.7-75' RT. O.L. 1 EA.

INSTALL SODDING

174+00-32' RT. & AHD. 100 S.Y.

NOTE: Water From Sta. 171+00 Should Drain Back to Median Drain At Sta. 170+75-26' Rt. Drainage Ditch Will have to be Graded Between Sta. 170+50 & Sta. 171+00 In Order to get Water to Drain at 26' Rt..

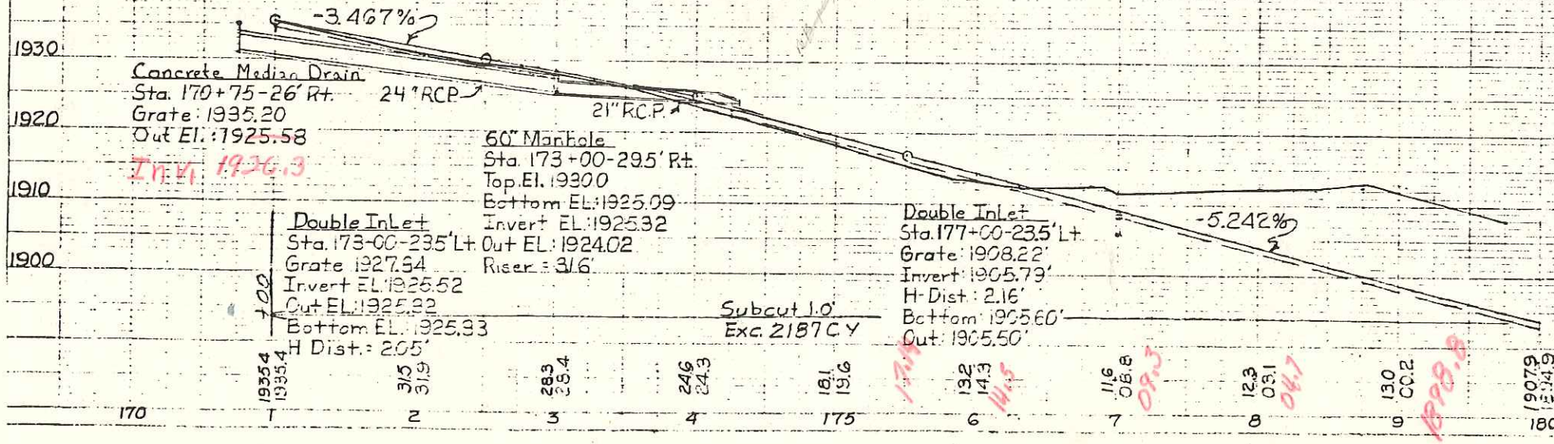
Note: Transition from Sta. 170+00 to Sta. 171+00 (existing section to new curb & gutter section.)

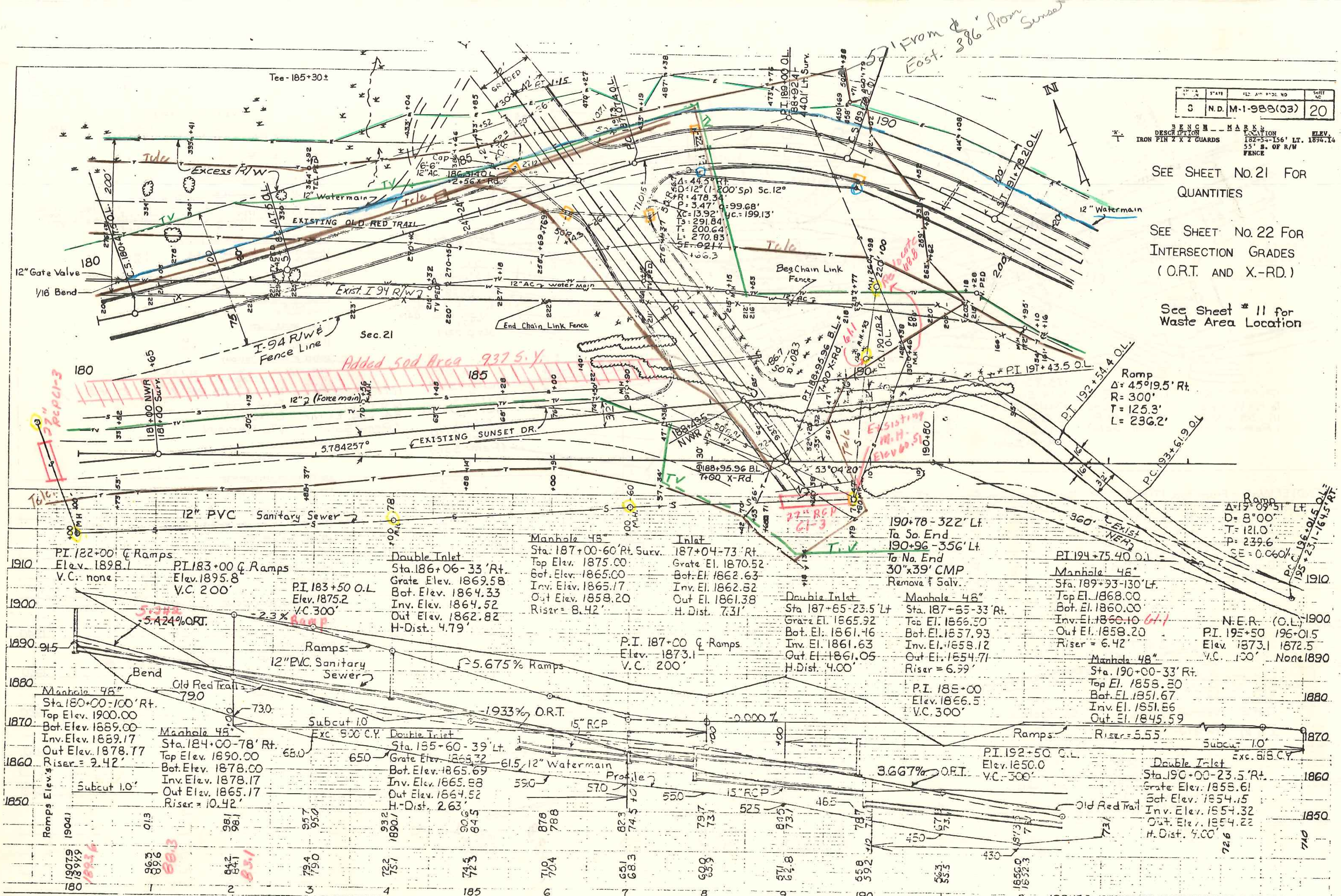
176+25 Construct P.D. Appr. Lt.

175+80 Rt Constr. Temp Appr.

P.I. 174+00 O.L. Elev. 1925.0 V.C. 300'

P.I. 171+00 O.L. Elev. 1935.4




521' From ℄
East. 386' from Sunset
| | STATE | FED. AID PROJ. NO | SHEET NO |
| 3 | N.D. | M-1-989(03) | 20 |
BENCH MARKS
DESCRIPTION: IRON PIN 2 X 2 GUARDS — LOCATION: 182+54-156' LT. 55' S. OF R/W FENCE — ELEV. 1894.14
SEE SHEET NO. 21 FOR QUANTITIES
SEE SHEET NO. 22 FOR INTERSECTION GRADES (O.R.T. AND X.-RD.)
See Sheet # 11 for Waste Area Location
Tee - 185+30±
Excess R/W
12" Watermain
EXISTING OLD RED TRAIL
12" Gate Valve
1/16 Bend
Exist. I 94 R/W
12" AC water Main
End Chain Link Fence
Beg. Chain Link Fence
I-94 R/W & Fence Line
Sec. 21
Added Sod Area 937 S.Y.
12" (Force main)
EXISTING SUNSET DR.
5.784257°
12" PVC Sanitary Sewer
Δ: 44.5° Rt. D: 12° (1-200' Sp) Sc. 12° R: 478.34' P: 3.47' q: 99.68' Xc: 13.92' yc: 199.13' Ts: 291.84' T: 200.64' L: 270.83' SE: .021%
P.I. 189+00 O.L. 188+92.4 - 40.1' Lt. Surv.
P.I. 188+95.96 B.L. 7+00 X-Rd.
188+95.96 B.L. 7+00 X-Rd.
53°04'20"
Relocate 68.8
Existing M.H. Elev 60.51
27" RCP CI-3
Ramp Δ: 45°19.5' Rt. R: 300' T: 125.3' L: 236.2'
P.I. 191+43.5 O.L.
P.T. 192+54.4 O.L.
P.C. 193+61.9 O.L.
Ramp Δ: 17°09'51" Lt. D: 8°00' T: 121.0' P: 239.6' SE: 0.060%
P.C. 196+01.5 O.L. 195+23.1 - 164.5' RT.
360' ℄ Exist NER
190+78 - 322' Lt. To So. End
190+96 - 356' Lt. To No. End
30"x39' CMP Remove & Salv.
P.I. 182+00 ℄ Ramps Elev. 1898.1 V.C. none
P.I. 183+00 ℄ Ramps Elev. 1895.8 V.C. 200'
P.I. 183+50 O.L. Elev. 1875.2 V.C. 300'
5.424% O.R.T.
-2.3% Ramp
Double Inlet Sta. 186+06-33' Rt. Grate Elev. 1869.58 Bot. Elev. 1864.33 Inv. Elev. 1864.52 Out Elev. 1862.82 H-Dist. 4.79'
Manhole 48" Sta. 187+00-60' Rt. Surv. Top Elev. 1875.00 Bot. Elev. 1865.00 Inv. Elev. 1865.17 Out Elev. 1858.20 Riser = 8.42'
Inlet 187+04-73' Rt. Grate El. 1870.52 Bot. El. 1862.63 Inv. El. 1862.82 Out El. 1861.38 H. Dist. 7.31'
Double Inlet Sta 187+65-23.5' Lt Grate El. 1865.92 Bot. El. 1861.46 Inv. El. 1861.63 Out El. 1861.05 H. Dist. 4.00'
Manhole 48" Sta. 187+85-33' Rt. Top El. 1866.50 Bot. El. 1857.93 Inv. El. 1858.12 Out El. 1854.71 Riser = 6.99'
P.I. 194+75.40 O.L.
Manhole 48" Sta. 189+93-130' Lt. Top El. 1868.00 Bot. El. 1860.00 Inv. El. 1860.10 61.1 Out El. 1858.20 Riser = 6.42'
N.E.R. (O.L.) P.I. 195+50 196+01.5 Elev. 1873.1 1872.5 V.C. 100' None
Ramps
12" PVC Sanitary Sewer
-5.675% Ramps
P.I. 187+00 ℄ Ramps Elev. 1873.1 V.C. 200'
P.I. 188+00 Elev. 1866.5 V.C. 300'
Manhole 48" Sta. 190+00-33' Rt. Top El. 1858.80 Bot. El. 1851.67 Inv. El. 1851.86 Out. El. 1845.59 Riser = 5.55'
Bend
Old Red Trail
Manhole 48" Sta 180+00-100' Rt. Top Elev. 1900.00 Bot. Elev. 1889.00 Inv. Elev. 1889.17 Out Elev. 1878.77 Riser = 2.42'
Manhole 48" Sta. 184+00-78' Rt. Top Elev. 1890.00 Bot. Elev. 1878.00 Inv. Elev. 1878.17 Out Elev. 1865.17 Riser = 10.42'
Subcut 1.0' Exc. 900 C.Y.
Double Inlet Sta. 185+60-39' Lt. Grate Elev. 1868.32 Bot. Elev. 1865.69 Inv. Elev. 1865.88 Out Elev. 1864.52 H.-Dist. 2.63'
-1.933% O.R.T.
15" RCP
-0.000%
12" Watermain Profile
3.667% O.R.T.
P.I. 192+50 O.L. Elev. 1850.0 V.C. 300'
Subcut 1.0' Exc. 818 C.Y.
Double Inlet Sta. 190+00-23.5' Rt. Grate Elev. 1858.61 Bot. Elev. 1854.15 Inv. Elev. 1854.32 Out. Elev. 1854.22 H. Dist. 4.00'
Subcut 1.0'
Ramps Elev.'s
180 1 2 3 4 185 6 7 8 9 190 1 2 192+50

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INSTALLATIONS

INSTALL CURB & GUTTER TYPE 1

180+00-23.5' LT. TO 1+53.2-23.5' RT. X-RD.	618 L.F.
1+53.2-35.5' LT. TO 192+50-23.5' LT.	692 L.F.
180+00-23.5' RT. TO 3+66.3-33' RT. X-RD.	654 L.F.
3+66.3-37' LT. X-RD. TO 192+50-23.5' RT.	459 L.F.

INSTALL REINFORCED CONCRETE PIPE - SEWER CLASS III

185+60-39 ' LT. TO 186+06-33 ' RT.	15" X 85' R.C.P.-S.
186+06-33 ' RT. TO 187+04-73' Rt.	15" X 106' R.C.P.-S.
187+04-73' RT. TO 187+85-33' RT.	15" X 90' R.C.P.-S.
187+85-23.5' LT. TO 187+85-33' RT.	12" X 55' R.C.P.-S.
187+85-33' RT. TO 190+00-33' RT.	15" X ~~119~~ 198' R.C.P.-S. Plan Error
190+00-23.5' RT. TO 190+00-33' RT.	12" X 8' R.C.P.-S.
190+00-33' RT. TO 192+50-33' RT.	15" X 248' R.C.P.-S.
179+61-25' LT. SURV. TO 179+82.5-42' RT. SURV.	27" X 70' R.C.P.-S.
188+90-56' RT. SURV. TO 189+80-47' RT. SURV.	27" X 90' R.C.P.-S.

INSTALL MANHOLE

180+00-100' RT. SURV.	1-48"
184+00-78' RT. SURV.	1-48"
187+00-60' RT. SURV.	1-48"
187+85-33' RT.	1-48"
189+93-130' RT. SURV.	1-48"
190+00-33' RT.	1-48"

INSTALL MANHOLE RISER

180+00-100' RT.	48" X 9.42'
184+00-78' RT.	48" X 10.42'
187+00-60' RT.	48" X 8.42'
187+85-33' RT.	48" X 6.99'
189+93-130' RT.	48" X 6.42'
190+00-33' RT.	48" X 5.55'

RELOCATE AIR RELIEF VALVE & MANHOLE

190+46-130' LT. SURV. TO 190+00-220' LT. SURV. 1 EA.

INSTALL DOUBLE INLETS

185+60-39 ' LT.	1 EA.
186+06-33 ' RT.	1 EA.
187+85-23.5' LT.	1 EA.
190+00-23.5' RT.	1 EA.

INSTALL SINGLE INLET

187+04-73' RT. 1 EA.

REMOVE EXISTING FENCE

180+00-31' LT. TO 192+50-129' RT. 1154 L.F.

INSTALL CHAIN LINK FENCE

180+00-75' RT. TO 183+70-75' RT.	370 L.F.
183+70-75' RT. TO 185+52-135' RT.	192 L.F.
189+20.5-196' RT. TO 191+63-129' RT.	185 L.F.
191+63-129' RT. TO 192+50-129' RT.	87 L.F.

CAST IRON FITTINGS

180+50-46' LT. (1-12" SIXTEENTH BEND)	300 LBS.
185+30-49' LT. (1-12" CAP)	115 LBS.

INSTALL 12" WATERMAIN

180+50-46' LT. TO 192+50-46' LT.	1250 L.F.
*185+30 Lt.	6 L.F.

12" X 12" TEE (MECH. JOINT)

*185+30-49' LT. 1 EA.

12" GATE VALVE AND BOX

180+50-46' LT. 1 EA.

INSTALL 6" PVC SEWER PIPE (SDR 26)

189+80-47' RT. SURV. TO 189+93-130' LT.	177 L.F.
189+93-130' LT. TO 190+00-220' LT.	90 L.F.

INSTALL 12" PVC SEWER PIPE (DR 35)

179+57-37' LT. SURV. TO 180+00-100' RT.	140 L.F.
180+00-100' RT. TO 184+00-78' RT.	398 L.F.
184+00-78' RT. TO 187+00-60' RT.	298 L.F.
187+00-60' RT. TO 189+80-47' RT.	278 L.F.

INSTALL CORNER ASSEMBLY - CHAIN LINK

183+70-75' RT.	1 EA.
191+63-129' RT.	1 EA.

INSTALL DOUBLE BRACE ASSEMBLY - CHAIN LINK

185+52-135' RT.	1 EA.
189+20.5-196' RT.	1 EA.

INSTALL 6" NON-PERF. PVC (SEE UNDERDRAIN LAYOUT)

185+00-26' RT. TO 186+06-33' RT. 106 L.F.

INSTALL 6" PERF. PVC (SEE UNDERDRAIN LAYOUT)

179+88 TO 185+00 1010 L.F.

UNDERDRAIN GRANULAR FILL MATERIAL

179+88 TO 185+00 541 C.Y.

ALL STATIONING IS OFF. LOC. UNLESS OTHERWISE NOTED.

*CITY FUNDS ONLY

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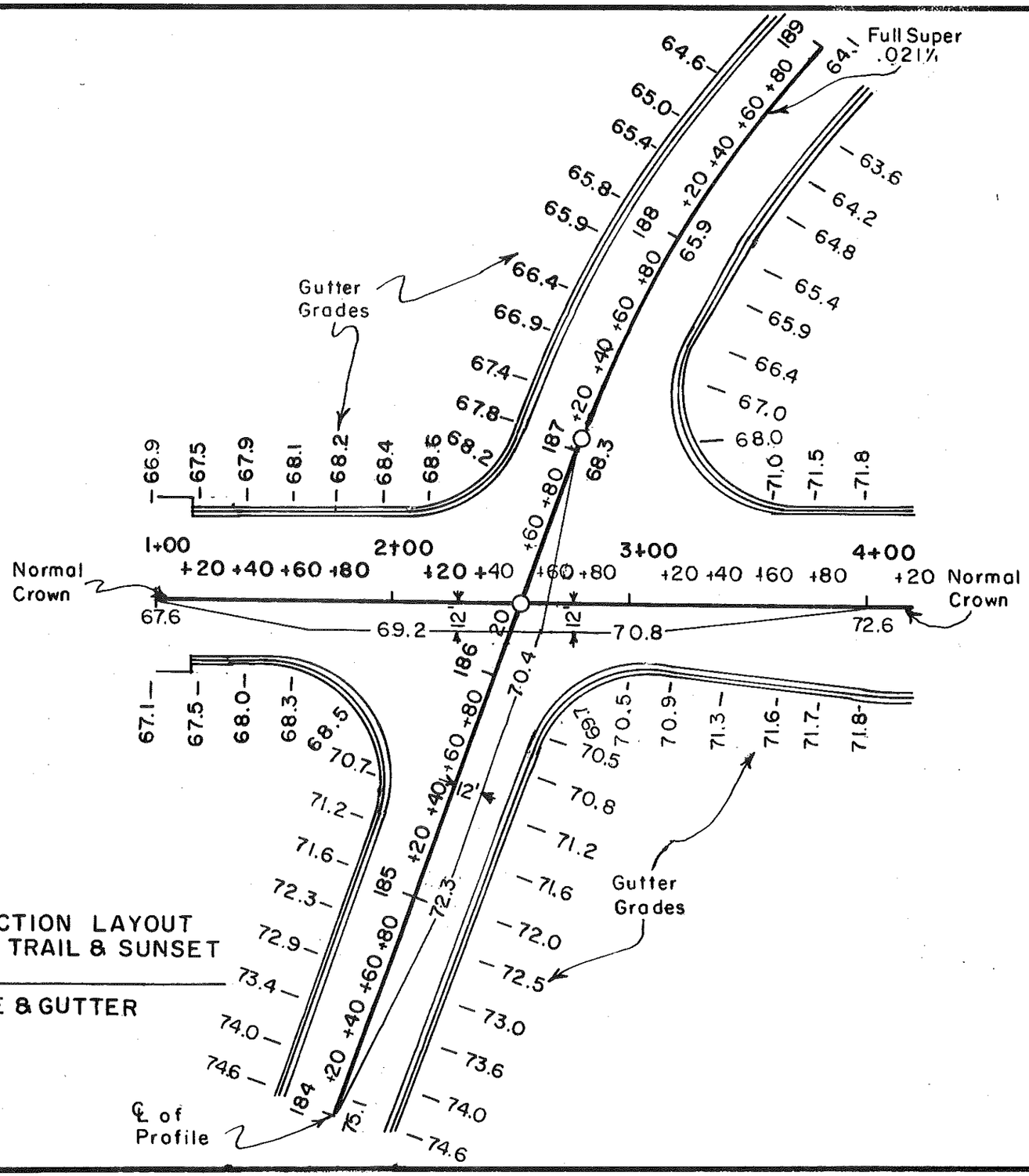
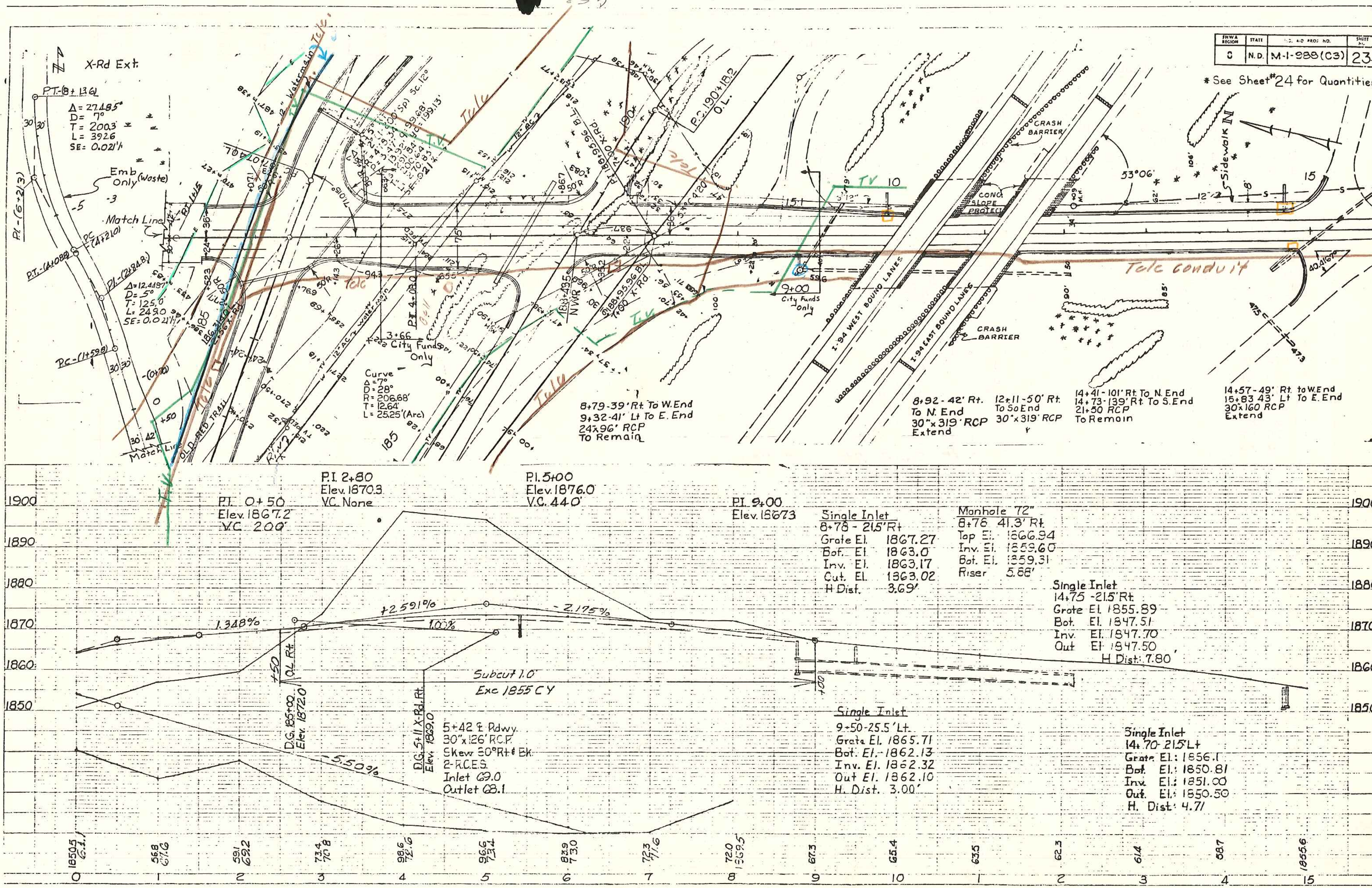


INTERSECTION LAYOUT
OLD RED TRAIL & SUNSET DRIVE

℄ PROFILE & GUTTER GRADES



FHWA REGION 8 | STATE N.D. | FED. AID PROJ. NO. M-1-988(C3) | SHEET NO. 23
* See Sheet #24 for Quantities
X-Rd Ext.
PT-(8+13.61)
Δ= 27.485°
D= 7°
T= 200.3
L= 392.6
SE= 0.021'/'
Emb Only (Waste)
Match Line
PI-(6+2/3)
PT-(4+10.89)
PC (4+21.0)
PI-(2+84.8)
Δ=12.4497°
D= 5°
T= 125.0
L= 249.0
SE= 0.021'/'
PC-(1+59.9)
Match Line
OLD RED TRAIL
12" Watermain
12" AC 2 Watermain
Tele
T.V.
Tele conduit
P.I. 4+03.0
3+66 City Funds Only
9+00 City Funds Only
Curve
Δ=7°
D=28°
R= 206.68'
T= 12.64'
L= 25.25'(Arc)
P.C. 190+15.2 O.L.
I-94 WEST BOUND LANES
I-94 EAST BOUND LANES
CRASH BARRIER
CONC. SLOPE PROTECT.
53°06'
Sidewalk
8+79-39' Rt. To W. End
9+32-41' Lt To E. End
24"x96' RCP
To Remain
8+92-42' Rt. To N. End
30"x319' RCP
Extend
12+11-50' Rt. To S. End
30"x319' RCP
14+41-101' Rt. To N. End
14+73-139' Rt. To S. End
21+50 RCP
To Remain
14+57-49' Rt. to W. End
15+83 43' Lt To E. End
30"x160 RCP
Extend
P.I. 0+50
Elev. 1867.2
V.C. 200'
P.I. 2+80
Elev. 1870.3
V.C. None
P.I. 5+00
Elev. 1876.0
V.C. 440'
P.I. 9+00
Elev. 1867.3
Single Inlet
8+78 - 21.5' Rt
Grate El. 1867.27
Bot. El. 1863.0
Inv. El. 1863.17
Out. El. 1863.02
H Dist. 3.69'
Manhole 72"
8+76 41.3' Rt
Top El. 1866.94
Inv. El. 1859.60
Bot. El. 1859.31
Riser 5.88'
Single Inlet
14+75 - 21.5' Rt
Grate El. 1855.89
Bot. El. 1847.51
Inv. El. 1847.70
Out El. 1847.50
H Dist. 7.80'
+2.591%
-2.175%
1.348%
1.00%
-5.50%
Subcut 1.0'
Exc 1855 CY
D.G. 185+00 Elev. 1872.0
D.G. 5+11 X-Rd Rt. Elev. 1869.0
5+42 ℄ Rdwy.
30"x126' RCP
Skew 30° Rt ℄ Bk.
2-RCES
Inlet 69.0
Outlet 68.1
Single Inlet
9+50-25.5' Lt.
Grate El. 1865.71
Bot. El. 1862.13
Inv. El. 1862.32
Out El. 1862.10
H. Dist. 3.00'
Single Inlet
14+70-21.5' Lt
Grate El.: 1856.1
Bot. El.: 1850.81
Inv. El.: 1851.00
Out. El.: 1850.50
H. Dist: 4.71
1900
1890
1880
1870
1860
1850
0
1
2
3
4
5
6
7
8
9
10
1
2
3
4
15

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
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INSTALLATIONS

INSTALL CURB & GUTTER - TYPE I

*3+66.3-33' RT. TO 186+96.3-16' LT. NWR	237 L.F.
*187+96.9-16' RT. NWR TO 9+00-23' RT.	316 L.F.
9+00-23' RT. TO 14+78+ 90' RT.	657 L.F.
*3+66.3-37' LT. TO 189+08.3-20' LT. NER	272 L.F.
*189+43.0-20' RT. NER TO 9+00-32' LT.	270 L.F.
9+00-32' LT. TO 15+12+ 60' LT.	630 L.F.

INSTALL CONCRETE SIDEWALK (8')

3+37 LT. TO 3+66 LT.	25.8 S.Y.
*6+64 LT. TO 9+00 LT.	209.8 S.Y.
9+00 LT. TO 14+95 LT.	528.9 S.Y.
*3+66 LT. TO 6+11 LT.	217.8 S.Y.

INSTALL REINFORCED CONCRETE PIPE - SEWER CLASS III

*8+78-21.5' RT. TO 8+78-38.5' RT.	12" X 16' R.C.P.-S.
*8+78 RT.	30" X 4' R.C.P.-S.
*8+80-41.3' RT. TO 8+92-41.3' RT.	30" X 12' R.C.P.-S.
9+50 LT.	15" X 26' R.C.P.-S.
14+70 LT.	15" X 26' R.C.P.-S.
14+56 RT. & BK.	30" X 10' R.C.P.-S.
14+75 RT. & BK.	15" X 46' R.C.P.-S.
8+78 RT 41.3' RT	24" X 10' R.C.P. Added C.O. No.1

INSTALL R.C. END SECTIONS

*5+11-53' RT.	1-30" R.C.E.S.
*5+79-64' LT.	1-30" R.C.E.S.
9+50 LT.	1-15" R.C.E.S.
14+75 RT.	1-15" R.C.E.S.
14+70 LT.	1-15" R.C.E.S.

RELAY R.C. END SECTION

*8+78 RT.	1-30" R.C.E.S.
14+56 RT. & BK.	1-30" R.C.E.S.

INSTALL MANHOLE

*8+78-41.3' RT.	1-72"

INSTALL REINFORCED CONCRETE PIPE - CLASS III

*5+11-53' RT. TO 5+79-64' LT.	30" X 126 L.F.

INSTALL MANHOLE RISER

*8+78-41.3' RT.	72" X 5.88'

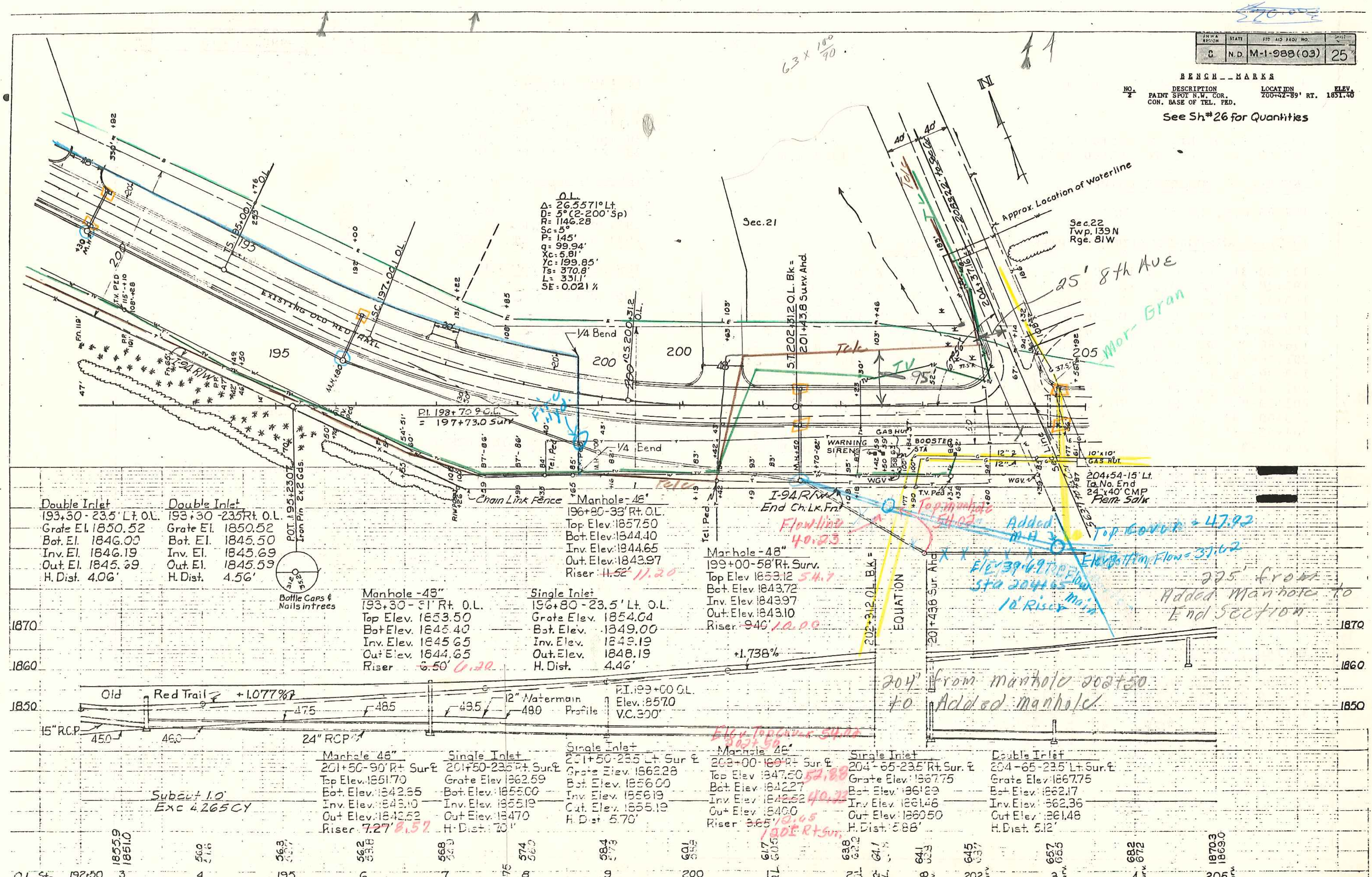
INSTALL INLETS

*8+78-21.5' RT.	1 EA.
9+50-25.5' LT.	1 EA.
14+75-21.5' RT.	1 EA.
14+70-21.5' LT.	1 EA.

*City Funds Only.
(3+66 TO 9+00)

EARTHWORK QUANITITIES

	SUB CUT EXC.	EXC.	EMB.	TOPSOIL	CL. & GRUB.
Old Red Trail	7633 CY	37955 CY	35267 CY	3009 CY	3015 CY
Ramps	1618	48295	2913	2397	183
X-Rd.	1855	35429	7119	1445	209
X-Rd. (Ext.)	0	0	32400	0	1958
TOTALS	11106	121679	77699	6851	5365



M-1-988(03)
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BENCH MARKS
No. 2 DESCRIPTION PAINT SPOT N.W. COR. CON. BASE OF TEL. PED. LOCATION 200+42-89' RT. ELEV. 1851.40
See Sh# 26 for Quantities
N
O.L.
Δ= 26.5571° Lt.
D= 5° (2-200' Sp)
R= 1146.28
Sc= 5°
P= 145'
q= 99.94'
Xc= 5.81'
Yc= 199.85'
Ts= 370.8'
L= 331.1'
SE= 0.021 ‰
Sec.21
Sec.22
Twp. 139 N
Rge. 81 W
Approx. Location of Waterline
25' 8th Ave
Mor-Gran
EXISTING OLD RED TRAIL
I-94 R/W
1/4 Bend
Fire Hyd
P.I. 198+70.9 O.L. = 197+73.0 Surv.
S.T. 202+31.2 O.L. Bk = 201+43.8 Surv. Ahd.
Tele
TV
WARNING SIRENS
GAS HUT
BOOSTER STA
WGV
T.V. Ped
Tel. Ped
10'x10' GAS HUT
204+54-15' Lt. Ta No. End 24"x40" CMP Plem. Salk
Chain Link Fence
I-94 R/W End Ch. Lk. Fn.
POT. 195+23.07 Iron Pin 2x2 Gds.
Bottle Caps & Nails in trees
Double Inlet
193+30 - 23.5' Lt. O.L.
Grate El. 1850.52
Bot. El. 1846.00
Inv. El. 1846.19
Out. El. 1845.59
H. Dist. 4.06'
Double Inlet
193+30 - 23.5' Rt. O.L.
Grate El. 1850.52
Bot. El. 1845.50
Inv. El. 1845.69
Out. El. 1845.59
H. Dist. 4.56'
Manhole - 48"
193+30 - 31' Rt. O.L.
Top Elev. 1853.50
Bot. Elev. 1845.40
Inv. Elev. 1845.65
Out. Elev. 1844.65
Riser 6.50' 6.20
Manhole - 48"
196+80 - 33' Rt. O.L.
Top Elev. 1857.50
Bot. Elev. 1844.40
Inv. Elev. 1844.65
Out. Elev. 1843.97
Riser 11.52' 11.20
Single Inlet
196+80 - 23.5' Lt. O.L.
Grate Elev. 1854.04
Bot. Elev. 1849.00
Inv. Elev. 1849.19
Out. Elev. 1848.19
H. Dist. 4.46'
Manhole - 48"
199+00 - 58' Rt. Surv.
Top Elev 1853.12 54.1
Bot. Elev 1843.72
Inv. Elev 1843.97
Out. Elev. 1843.10
Riser 9.40' 10.00
Flowline 40.23
Top manhole 54.02
Added MH
Top Cover = 47.92
Elev Bottom Flow = 37.62
Elev 39.69 Pipe Flow Main
Sta 204+65
10' Riser
225' from Added Manhole to End Section
EQUATION
202+31.2 O.L. Bk =
201+43.8 Sur. Ahd.
204' from manhole 202+50 to Added manhole
+1.738%
Old Red Trail +1.077%
12" Watermain Profile
P.I. 199+00 O.L. Elev. 1857.0 V.C. 300'
15" R.C.P.
24" RCP
Elev Top Cover 54.02 202+50
Manhole 48"
201+50 - 90' Rt. Surv.
Top Elev. 1851.70
Bot. Elev. 1842.65
Inv. Elev. 1843.10
Out Elev. 1842.52
Riser 7.27' 8.57
Single Inlet
201+50 - 23.5' Rt. Surv.
Grate Elev 1862.59
Bot. Elev. 1855.00
Inv. Elev. 1855.19
Out Elev. 1847.0
H. Dist. 7.01'
Single Inlet
201+50 - 23.5 Lt. Surv.
Grate Elev. 1862.28
Bot. Elev. 1856.00
Inv. Elev. 1856.19
Out. Elev. 1855.19
H. Dist. 5.70'
Manhole 48"
203+00 - 180' Rt. Surv.
Top Elev 1847.50 52.88
Bot. Elev 1842.27
Inv. Elev 1842.52 40.23
Out Elev 1840.0
Riser 3.65' 12.65
180' Rt Surv.
Single Inlet
204-65 - 23.5' Rt. Surv.
Grate Elev. 1867.75
Bot. Elev. 1861.29
Inv. Elev. 1861.46
Out Elev. 1860.50
H. Dist. 5.88'
Double Inlet
204-65 - 23.5' Lt. Surv.
Grate Elev. 1867.75
Bot. Elev. 1862.17
Inv. Elev. 1862.36
Out Elev. 1861.48
H. Dist. 5.12'
Subcut 1.0'
Exc 4265 CY
1870
1860
1850
O.L. Sta. 192+50 3 4 195 6 7 8 9 200 1 2 3 202 3 4 205

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
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INSTALLATIONS

INSTALL CURB & GUTTER TYPE 1

192+50-23.5' LT. TO 205+00-23.5' LT. O.L. 1357 L.F.
192+50-23.5' RT. TO 205+00-23.5' RT. O.L. 1357 L.F.

INSTALL 8" CONCRETE DRIVEWAY

197+83 O.L. LT. 30' 21.7 S.Y.

INSTALL REINFORCED CONCRETE PIPE - SEWER - CLASS III

192+50-31' RT. O.L. TO 193+30-31' RT. O.L. - 15" X 80' R.C.P.-S.
193+30-23' LT. O.L. TO 193+30-23' RT. O.L. - 15" X 46' R.C.P.-S.
193+30-25' RT. O.L. TO 193+30-30' RT. O.L. - 15" X 5' R.C.P.-S.
193+30-31' RT. O.L. TO 196+80-33' RT. O.L. - 24" X 350' R.C.P.-S.
196+80-23' LT. O.L. TO 196+80-31' RT. O.L. - 15" X 54' R.C.P.-S.
196+80-33' RT. O.L. TO 199+00-58' RT. SURV.- 24" X 330' R.C.P.-S.
201+50-23' LT. SURV. TO 201+50-23' RT. SURV.- 15" X 46' R.C.P.-S.
199+00-58' RT. SURV. TO 201+50-90' RT. SURV.- 24" X 250' R.C.P.-S.
201+50-25' RT. SURV. TO 201+50-90' RT. SURV.- 15" X 65' R.C.P.-S.
201+50-90' RT. SURV. TO 203+00-180' RT. SURV.-24" X 175' R.C.P.-S.
203+00-180' RT. SURV. TO 205+00-180' RT. 24" X 200' R.C.P.-S.
204+65-23' LT. SURV. TO 204+65-23' RT. SURV.- 15" X 46' R.C.P.-S.
204+65-25' RT. SURV. TO 204+65-61' RT. 15" X 36' R.C.P.-S.

INSTALL R.C. END SECTIONS

204+65 RT. SURV. 1-15" R.C.E.S.

INSTALL MANHOLES

193+30-31' RT. O.L. 1-48"
196+80-33' RT. O.L. 1-48"
199+00-58' RT. SURV. 1-48"
201+50-90' RT. SURV. 1-48"
203+00-180' RT. SURV. 1-48"

INSTALL MANHOLE RISER

193+30-31' RT. O.L. 48" X 6.52'
196+80-33' RT. O.L. 48" X 11.52'
199+00-58' RT. SURV. 48" X 9.40'
201+50-90' RT. SURV. 48" X 7.27'
203+00-180' RT. SURV. 48" X 3.65'

INSTALL INLETS

196+80-23.5' LT. O.L. 1 EA.
201+50-23.5' LT. SURV. 1 EA.
201+50-23.5' RT. SURV. 1 EA.
204+65-23.5' RT. SURV. 1 EA.

INSTALL DOUBLE INLETS

193+30-23.5' LT. O.L. 1 EA.
193+30-23.5' RT. O.L. 1 EA.
204+65-23.5' LT. SURV. 1 EA.

INSTALL 12" WATERMAIN

192+50 LT. O.L. TO 199+70 RT. O.L. 824 L.F.

INSTALL CAST IRON FITTINGS

2-12" QUARTER BENDS 670 LBS.

REMOVE EXISTING FENCE

192+50-127' RT. O.L. TO 201+93-100' RT. SURV. 1099 L.F.

INSTALL CHAIN LINK FENCE

192+50-127' RT. O.L. TO 201+93-100' RT. SURV. 1099 L.F.

INSTALL CORNER ASSEMBLY - CHAIN LINK

198+62-141' RT. O.L. 1 EA.

INSTALL DOUBLE BRACE ASSEMBLY - CHAIN LINK

201+93-100' RT. SURV. 1 EA.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
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BENCH MARKS

NO.	DESCRIPTION	LOCATION	ELEV.
3	PAINT SPOT LARGE ROCK LT.	213+72-200' LT. S. OF HILL	1849.68

INSTALL CURB & GUTTER TYPE 1

205+00-23.5' LT. TO 217+50-23.5' LT.	1250 L.F.
205+00-23.5' LT. TO 217+50-23.5' RT.	1250 L.F.

INSTALL REINFORCED CONCRETE PIPE - SEWER - CLASS III

205+00-180' RT. TO 205+80-180' RT. 24"X80' R.C.P.-S.
216+00-44.5' LT. TO 216+00-24.5' LT. 15"X20' R.C.P.-S.
216+00-23.0' LT. TO 216+00-23.0' RT. 15"X46' R.C.P.-S.
216+00-24.5' RT. TO 216+00-54.5' RT. 15"X30' R.C.P.-S.

INSTALL R.C. END SECTION

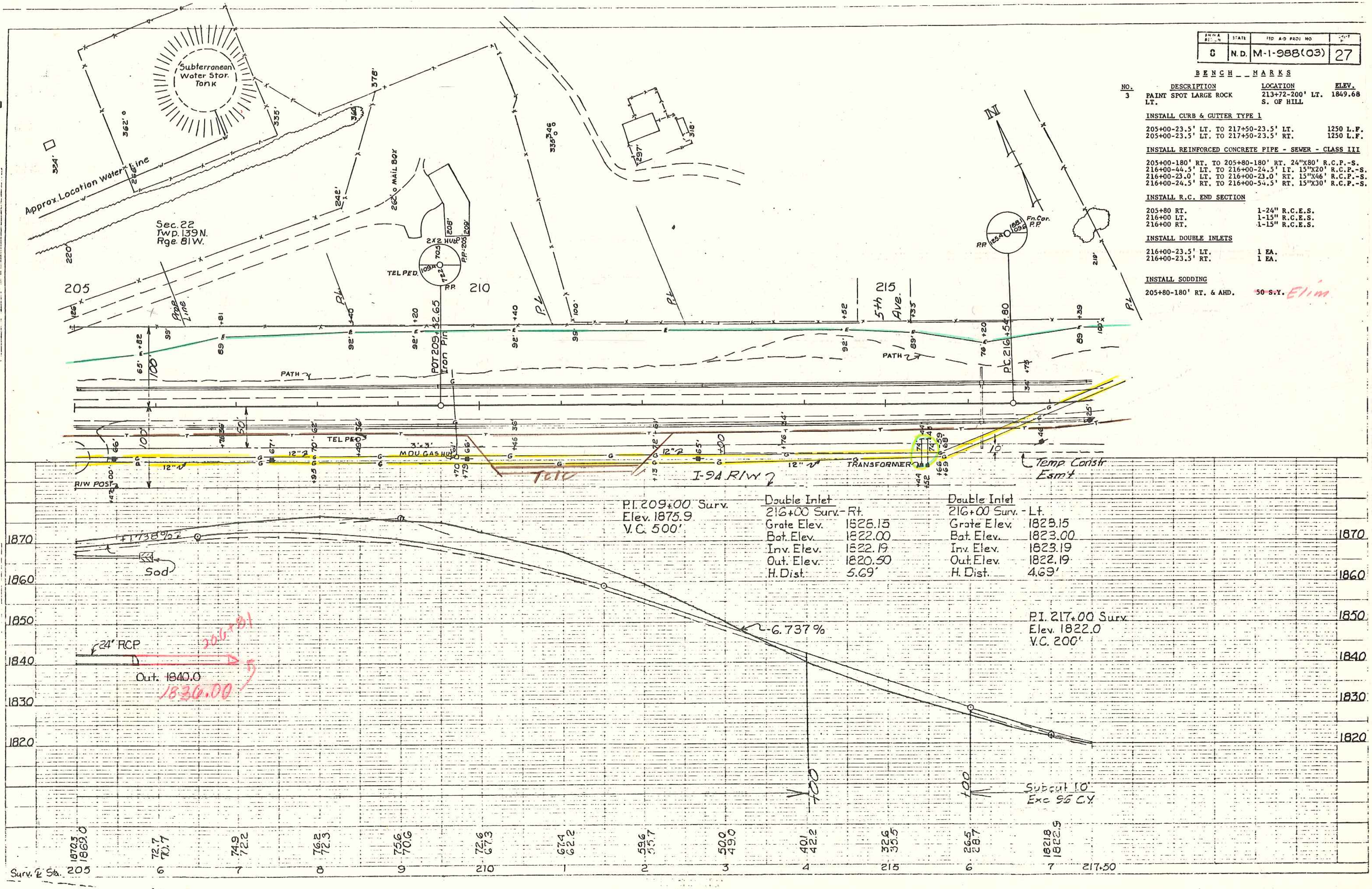
205+80 RT.	1-24" R.C.E.S.
216+00 LT.	1-15" R.C.E.S.
216+00 RT.	1-15" R.C.E.S.

INSTALL DOUBLE INLETS

216+00-23.5' LT.	1 EA.
216+00-23.5' RT.	1 EA.

INSTALL SODDING

205+80-180' RT. & AHD.	~~50 S.Y.~~ Elim



FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)	28

BENCH MARKS

NO.	DESCRIPTION	LOCATION	ELEV.
4	PAINT SPOT N.W. COR. CON. BASE OF TEL. PED.	230+00-135' RT.	1794.33

INSTALL CURB & GUTTER TYPE 1

217+50-23.5' LT. TO 228+00 LT. 1083 L.F.
217+50-23.5' RT. TO 228+00 RT. 1083 L.F.

INSTALL 8" CONCRETE DRIVEWAY

222+48 RT. 30' 21.7 S.Y.
226+64 RT. 30' 21.7 S.Y.

INSTALL REINFORCED CONCRETE PIPE - SEWER - CLASS III

221+00 45.5' LT. TO 221+00-24.5' LT. 24"X21' R.C.P-S. (INCL. 1-24" "T" SEC., 1-PLUG LT.)
221+00-22.5' LT. TO 221+00-35.5' RT. 24"X58' R.C.P.-S.
227+56-45' LT. TO 227+58-29' LT. 30"X16' R.C.P.-S.
227+58-27' LT. TO 227+66-29' RT. 30"X56' R.C.P.-S.
227+66-31' RT. TO 227+67-35' RT. 30"X44' R.C.P.-S.

INSTALL CONCRETE MEDIAN DRAIN TYPE A

221+00 LT. 1 EA.

INSTALL DOUBLE INLET

221+00-23.5' LT. 1 EA.
227+66-30' RT. 1 EA.

INSTALL TRIPLE INLET

227+58-28' LT. 1 EA.

INSTALL R.C. END SECTION

221+00 RT. 1-24" R.C.E.S.
227+56 LT. 1-30" R.C.E.S.
227+67 RT. 1-30" R.C.E.S.

ROCK EXCAVATION

224+00 TO 226+00 400 C.Y.

End Proj M-1-988(03)010 Sta. 228+00 Surv.

220+48-22' Lt. To E. End 24"x37' CMP Rem-Salv

227+62-21' Rt. To So. End 30"x58' RCP Rem-Salv

229+30-36' Lt. To W. End 18"x54' CMP To-Remain

229+95-36' Rt. To W. End 18"x46' CMP To Remain

THIEL MARINE

Δ = 22°54' Lt.
D = 5°00'
R = 1146.28'
T = 232.17'
L = 458.00'
SE = 0.021'

Added 300 Rd 156 S.Y.

Double Inlet
221+00 Lt.
Grade Elev. 1812.85 12.00
Bot. Elev. 1806.70 5.85
Inv. Elev. 1806.95 6.15
Out. Elev. 1805.00
H. Dist. 5.69'

Triple Inlet
227+58-28' Lt.
Grade Elev. 1792.58
Bot. Elev. 1787.34
Inv. Elev. 1787.63
Out. Elev. 1787.50
H. Dist 4.70'

Double Inlet
227+66-30' Rt.
Grade Elev. 1792.52
Bot. Elev. 1787.21
Inv. Elev. 1787.50
Out. Elev. 1787.40
H. Dist. 4.72'

P.I. 220+00 Surv.
Elev. 1813.0
V.C. 200'

P.I. 224+00 Surv.
Elev. 1811.0
V.C. 400'

P.I. 227+00 Surv.
Elev. 1793.0
V.C. 200'

P.I. 230+00 Surv.
Elev. 1792.6

-3.000%
-0.50%
-6.00%

Rock Excavation

Subcut 1.0'
Exc. 1085 C.Y.

1820
1810
1800
1790

Surv. & Sta. 217+50 8 9 220 1 2 3 4 225 6 7 8 9 230

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
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In Place - Remove

Sta. 175+50 Rt.
Assembly 9
Route Marker

M4-5-24

M1-1-24

M5-1(R)-21

In Place
Remove

In Place
Remove

In Place
Remove

In Place
Remove

4" White Edge Line

4" Yellow Edge Line

Old Red Trail
Install Pavement Marking, Drop on Beads, Type II - Lines

4" Yellow Lane Line 260 L.F.

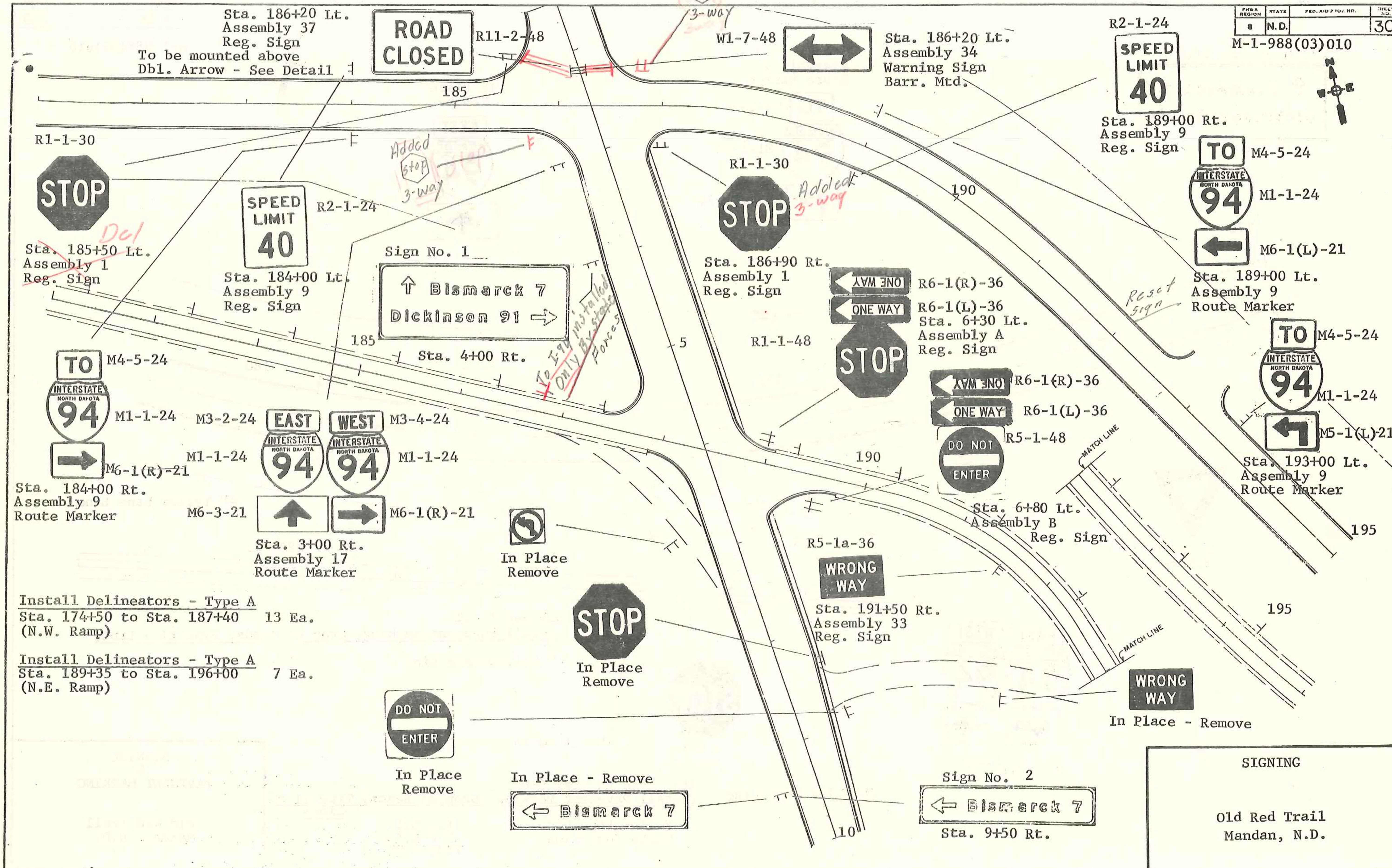
Sta. 2+80 to Sta. 9+00
Install Pavement Marking, Drop on Beads, Type II - Lines

4" Yellow Edge Line	750 L.F.
4" White Edge Line	750 L.F.
	1500 L.F.

SIGNING
&
PAVEMENT MARKING

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)010	30



Sta. 186+20 Lt.
Assembly 37
Reg. Sign
To be mounted above
Dbl. Arrow - See Detail
ROAD CLOSED
R11-2-48
Added
STOP
3-way
W1-7-48
Sta. 186+20 Lt.
Assembly 34
Warning Sign
Barr. Mtd.
R2-1-24
SPEED LIMIT 40
Sta. 189+00 Rt.
Assembly 9
Reg. Sign
185
R1-1-30
STOP
Del
Sta. 185+50 Lt.
Assembly 1
Reg. Sign
SPEED LIMIT 40
R2-1-24
Sta. 184+00 Lt.
Assembly 9
Reg. Sign
Added
STOP
3-way
Sign No. 1
Bismarck 7
Dickinson 91
Sta. 4+00 Rt.
To I-94 installed Only By state forces
R1-1-30
STOP
Added 3-way
Sta. 186+90 Rt.
Assembly 1
Reg. Sign
190
TO
M4-5-24
INTERSTATE NORTH DAKOTA 94
M1-1-24
M6-1(L)-21
Sta. 189+00 Lt.
Assembly 9
Route Marker
Reset Sign
ONE WAY
R6-1(R)-36
ONE WAY
R6-1(L)-36
Sta. 6+30 Lt.
Assembly A
Reg. Sign
R1-1-48
STOP
185
5
TO
M4-5-24
INTERSTATE NORTH DAKOTA 94
M1-1-24
M6-1(R)-21
Sta. 184+00 Rt.
Assembly 9
Route Marker
M3-2-24
EAST
INTERSTATE NORTH DAKOTA 94
WEST
INTERSTATE NORTH DAKOTA 94
M3-4-24
M1-1-24
M1-1-24
M6-3-21
M6-1(R)-21
Sta. 3+00 Rt.
Assembly 17
Route Marker
ONE WAY
R6-1(R)-36
ONE WAY
R6-1(L)-36
DO NOT ENTER
R5-1-48
Sta. 6+80 Lt.
Assembly B
Reg. Sign
TO
M4-5-24
INTERSTATE NORTH DAKOTA 94
M1-1-24
M5-1(L)-21
Sta. 193+00 Lt.
Assembly 9
Route Marker
MATCH LINE
190
195
In Place
Remove
R5-1a-36
WRONG WAY
Sta. 191+50 Rt.
Assembly 33
Reg. Sign
195
STOP
In Place
Remove
MATCH LINE
WRONG WAY
In Place - Remove
DO NOT ENTER
In Place
Remove
In Place - Remove
Bismarck 7
10
Sign No. 2
Bismarck 7
Sta. 9+50 Rt.

Install Delineators - Type A
Sta. 174+50 to Sta. 187+40 13 Ea.
(N.W. Ramp)

Install Delineators - Type A
Sta. 189+35 to Sta. 196+00 7 Ea.
(N.E. Ramp)

SIGNING

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		33

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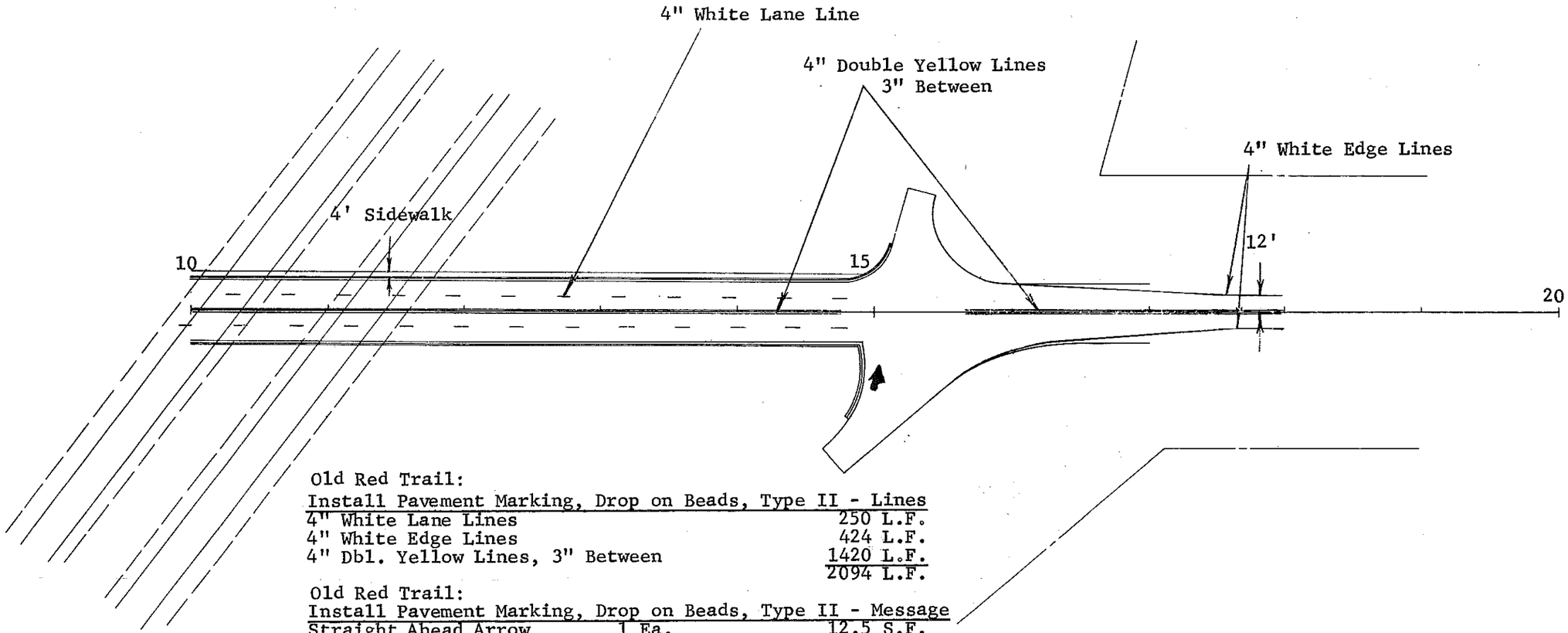

Old Red Trail:

Install Pavement Marking, Drop on Beads, Type II - Lines	
4" White Lane Lines	250 L.F.
4" White Edge Lines	424 L.F.
4" Dbl. Yellow Lines, 3" Between	1420 L.F.
	2094 L.F.

Old Red Trail:

Install Pavement Marking, Drop on Beads, Type II - Message		
Straight Ahead Arrow	1 Ea.	12.5 S.F.
		12.5 S.F.

PAVEMENT MARKING

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		34

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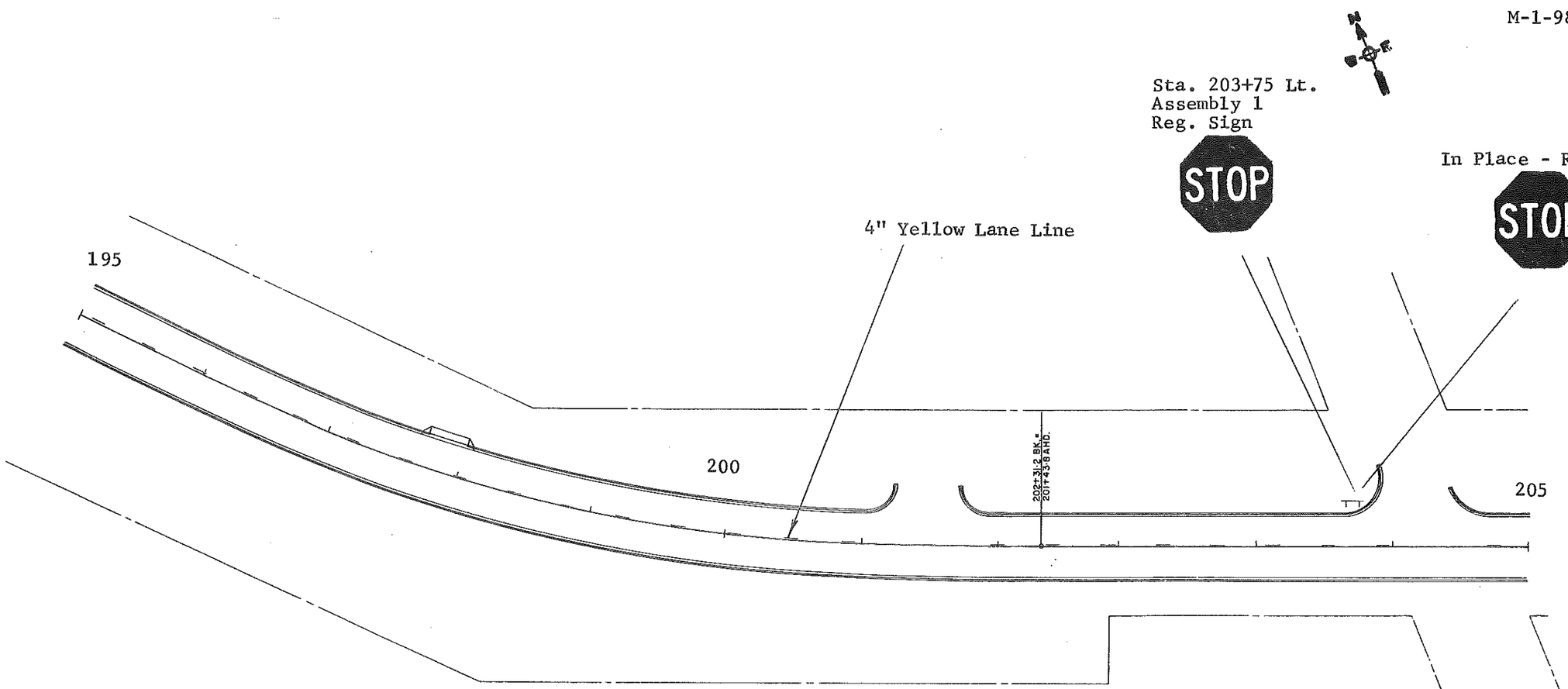


Old Red Trail:
Install Pavement Marking, Drop on Beads, Type II - Lines

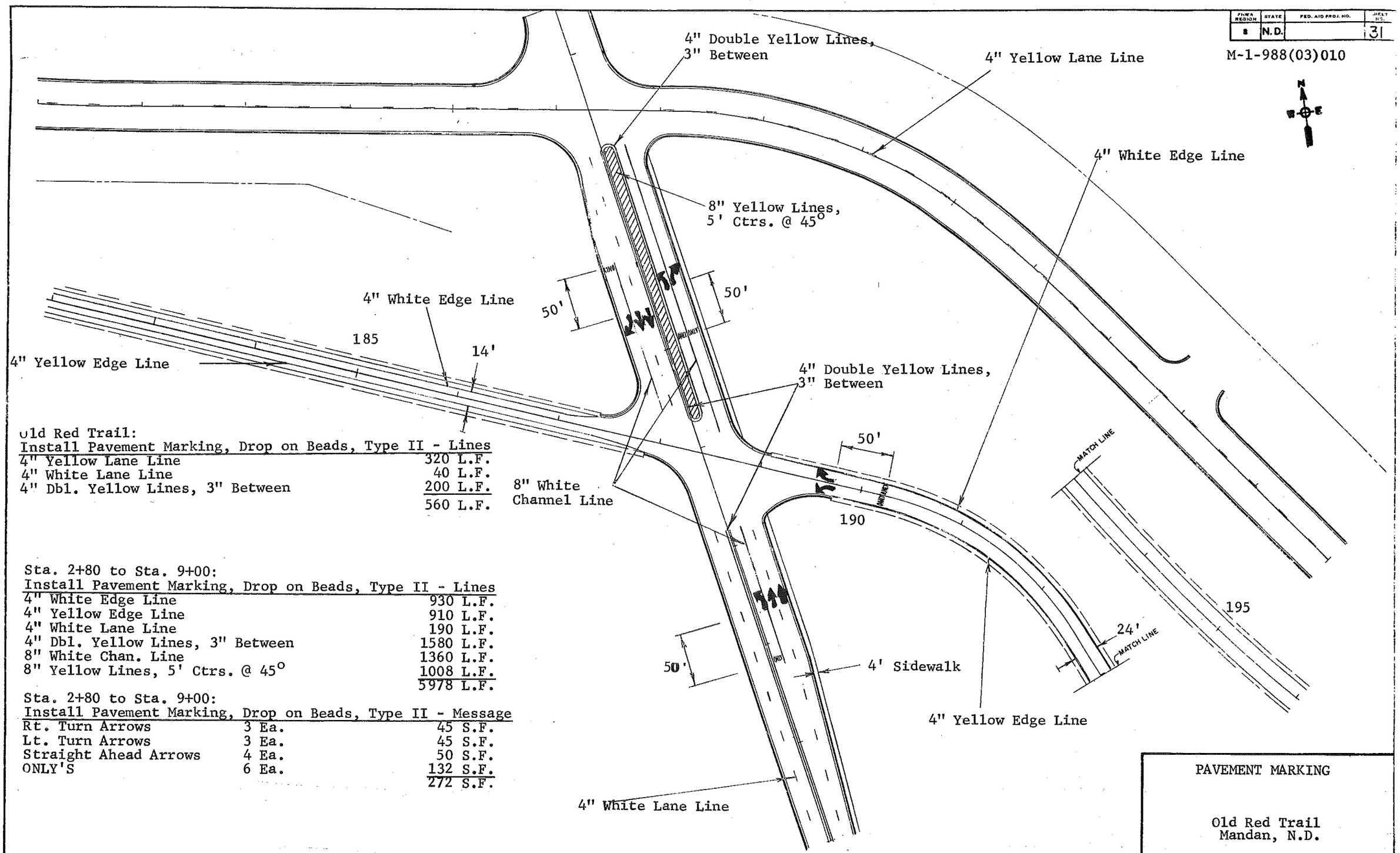
4" Yellow Lane Lines	240 L.F.

SIGNING
&
PAVEMENT MARKING

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		31

M-1-988(03)010



Old Red Trail:

Install Pavement Marking, Drop on Beads, Type II - Lines	
4" Yellow Lane Line	320 L.F.
4" White Lane Line	40 L.F.
4" Dbl. Yellow Lines, 3" Between	200 L.F.
	560 L.F.

Sta. 2+80 to Sta. 9+00:

Install Pavement Marking, Drop on Beads, Type II - Lines	
4" White Edge Line	930 L.F.
4" Yellow Edge Line	910 L.F.
4" White Lane Line	190 L.F.
4" Dbl. Yellow Lines, 3" Between	1580 L.F.
8" White Chan. Line	1360 L.F.
8" Yellow Lines, 5' Ctrs. @ 45°	1008 L.F.
	5978 L.F.

Sta. 2+80 to Sta. 9+00:

Install Pavement Marking, Drop on Beads, Type II - Message		
Rt. Turn Arrows	3 Ea.	45 S.F.
Lt. Turn Arrows	3 Ea.	45 S.F.
Straight Ahead Arrows	4 Ea.	50 S.F.
ONLY'S	6 Ea.	132 S.F.
		272 S.F.

PAVEMENT MARKING

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		32

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Sign No. 3

Dickinson 91

Sta. 12+00 Lt.

In Place - Remove

Dickinson 91

R6-1(R)-36

R6-1(L)-36

R5-1-48

Sta. 14+75 Rt.
Assembly B
Reg. Sign

In Place - Remove

WEST INTERSTATE NORTH DAKOTA 94

Sta. 14+25 Lt.
Assembly 9
Route Marker

WEST M3-4-24

INTERSTATE NORTH DAKOTA 94 M1-1-24

M5-1(L)-21

In Place - Remove

In Place Remain

EAST INTERSTATE NORTH DAKOTA 94

In Place Remain

DICKINSON 91
BISMARCK 7

10 15 20

EAST INTERSTATE NORTH DAKOTA 94

In Place -Remove

W4-2-36

Sta. 11+50 Rt.
Assembly 20
Warning Sign

EAST M3-2-24

INTERSTATE NORTH DAKOTA 94 M1-1-24

M6-1(L)-21

Sta. 13+20 Rt.
Assembly 9
Route Marker

In Place
Remove

DO NOT ENTER

In Place
Remove

R6-1(R)-36

R6-1(L)-36

STOP R1-1-48

Sta. 15+75 Rt.
Assembly A
Reg. Sign

STOP

In Place
Remove

WEST INTERSTATE NORTH DAKOTA 94 EAST INTERSTATE NORTH DAKOTA 94

In Place - Remain

SIGNING

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		35

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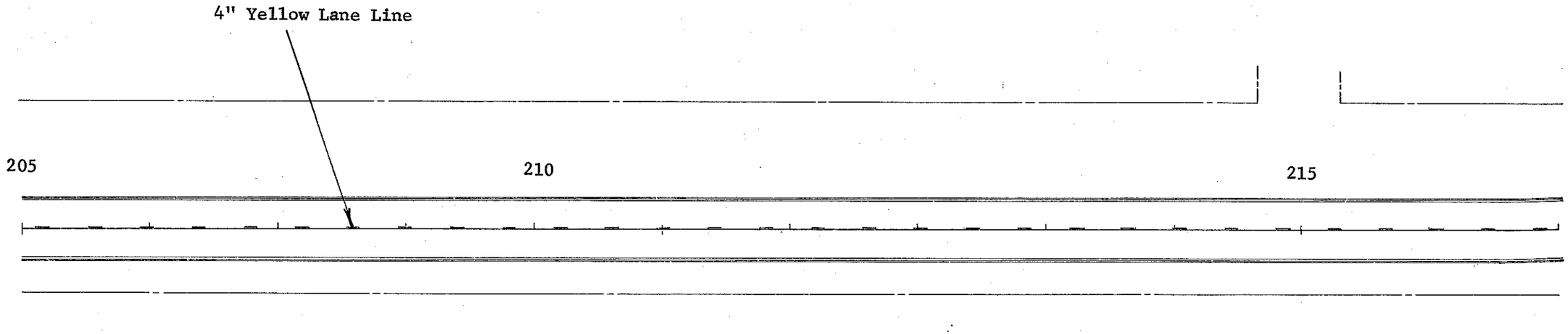


Install Pavement Marking, Drop on Beads, Type II - Lines

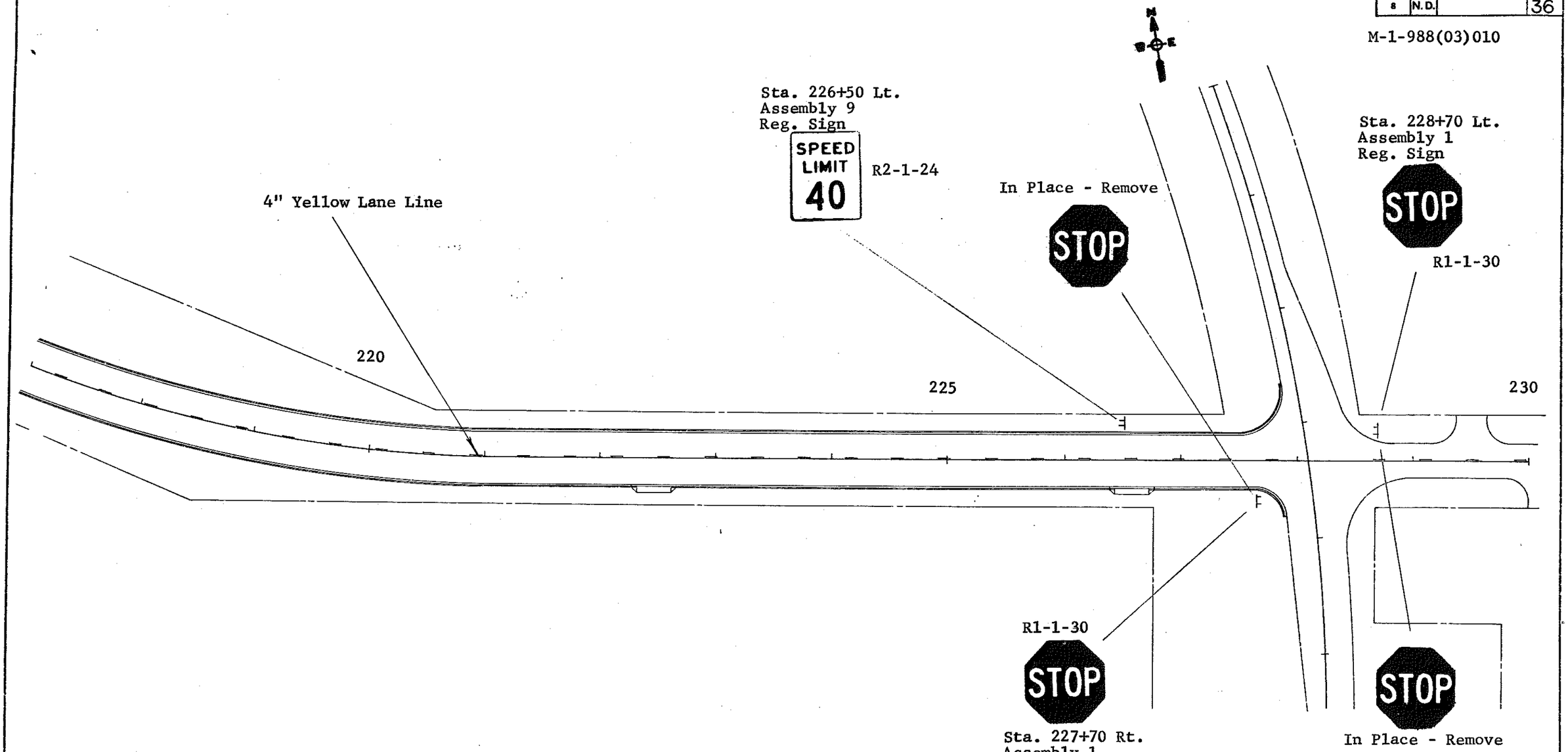
4" Yellow Lane Line	300 L.F.

SIGNING

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		36

M-1-988(03)010



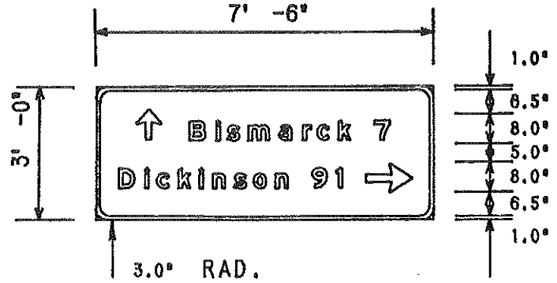
Install Pavement Marking, Drop on Beads, Type II - Lines

4" Yellow Lane Line	310 L.F.

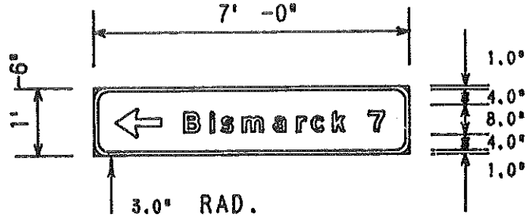
SIGNING

Old Red Trail
Mandan, N.D.

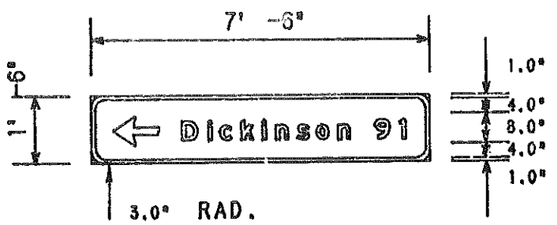
FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO
8	N.D.	M-1-988(03)010	37



Sign No. 1
Sta. 4+00 Rt.
Green Background
White Message & Border



Sign No. 2
Sta. 9+50 Rt.
Green Background
White Message & Border



Sign No. 3
Sta. 12+00 Lt.
Green Background
White Message & Border

NOTE: All signs on this sheet shall have a green, Type II Background with a white, Type III or IV border and legend. All letters shall be Series E modified.

DISTANCE & DESTINATION LAYOUTS

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	M-1-988(03)010	38

SIGN SUMMARY - PERFORATED TUBE

STATION	ASSEMBLY NUMBER	SIGN AREA FLAT TYPE 2	SIGN AREA SHEET TYPE 3 OR 4	LENGTHS SIGN 1ST	LENGTHS SUPPORT 2ND	LENGTHS POST 3RD	LENGTHS 4TH	LENGTHS SIZE	SLEEVE LENGTH SIGN 1ST	SLEEVE LENGTH SUPPORT 2ND	SLEEVE LENGTH 3RD	SLEEVE LENGTH 4TH	SLEEVE LENGTH SIZE	ANCHOR LNG.	ANCHOR SIZE	ANCHOR NO	TOTAL SUPPORT WEIGHT	RESET SIGN PAN.	RESET SIGN SUP.	MAX. LNG. FOR SUP. SIZE
175+50 RT	9 RM	8.19		10.6				2.19						4.0	2.19	1	50.05			11.7
184+00 RT	9 RM	8.19		10.6				2.19						4.0	2.19	1	50.05			11.7
184+00 LT	9 RS	5.00		8.8				2.00						4.0	2.25	1	32.23			11.0
185+50 LT	1 RS		5.18	8.8				2.00						4.0	2.25	1	32.23			10.7
186+20 LT	34 WS	8.00		BARRICADE MOUNTED																
186+20 LT	37 RS	10.00		BARRICADE MOUNTED																
189+00 RT	9 RS	5.00		8.8				2.00						4.0	2.25	1	32.23			11.0
189+00 LT	9 RM	8.19		10.6				2.19						4.0	2.19	1	50.05			11.7
193+00 LT	9 RM	8.19		10.6				2.19						4.0	2.19	1	50.05			11.7
203+75 LT	1 RS		5.18	8.8				2.00						4.0	2.25	1	32.23			10.7
226+50 LT	9 RS	5.00		8.8				2.00						4.0	2.25	1	32.23			11.0
227+70 RT	1 RS		5.18	8.8				2.00						4.0	2.25	1	32.23			10.7
228+70 LT	1 RS		5.18	8.8				2.00						4.0	2.25	1	32.23			10.7
SUBTOTAL NO.	1	65.76	20.72														425.82	0	0	
4+00 RT	10 VAR	~~17.00~~ 22.50		8.3				2.50	1.5				2.25	4.0	2.50	1	42.76			9.1
6+30 LT	A RS		19.25	11.3	11.3			2.19						4.0	2.19	2	104.68			11.8
6+80 LT	B RS		19.25	11.3	11.3			2.19						4.0	2.19	2	104.68			11.8
186+90 RT	1 RS 3-way		5.18	8.8				2.00						4.0	2.25	1	32.23			10.7
191+50 RT	33 RS	6.00		11.0				2.19						4.0	2.19	1	51.48			13.1
3+00 RT	17 RM	16.38		10.6				2.51						4.0	2.51	1	58.42			8.5
*SUBTOTAL NO.	2	39.38	43.68														394.24	0	0	
9+50 RT	2		10.50	7.8	7.8			2.00						4.0	2.25	2	59.63			9.9
11+50 RT	20 WS	9.00		10.0				2.19						4.0	2.19	1	48.02			10.3
12+00LT	3		11.25	7.8	7.8			2.00						4.0	2.25	2	59.63			9.1
13+20 RT	9 RM	8.19		10.6				2.19						4.0	2.19	1	50.05			11.7
14+25 LT	9 RM	8.19		10.6				2.19						4.0	2.19	1	50.05			11.7
14+75RT	B RS		19.25	11.3	11.3			2.19						4.0	2.19	2	104.68			11.8
15+75RT	A RS		19.25	11.3	11.3			2.19						4.0	2.19	2	104.68			11.8
SUBTOTAL NO.	3	25.38	60.25														476.73	0	0	
SUBTOTAL NO.	1	65.76	20.72														425.82	0	0	
SUBTOTAL NO.	2	39.38	43.68														394.24	0	0	
SUBTOTAL NO.	3	25.38	60.25														476.73	0	0	
TOTAL		~~130.52~~ 136.02	~~124.65~~ 131.33														~~1296.80~~ 1452.13	0	0	

11-8-82 186+00 1 RS 5.18 9.2 2.0 Added signs as requested by city of Mandan 4.0 2.25 3-way sign

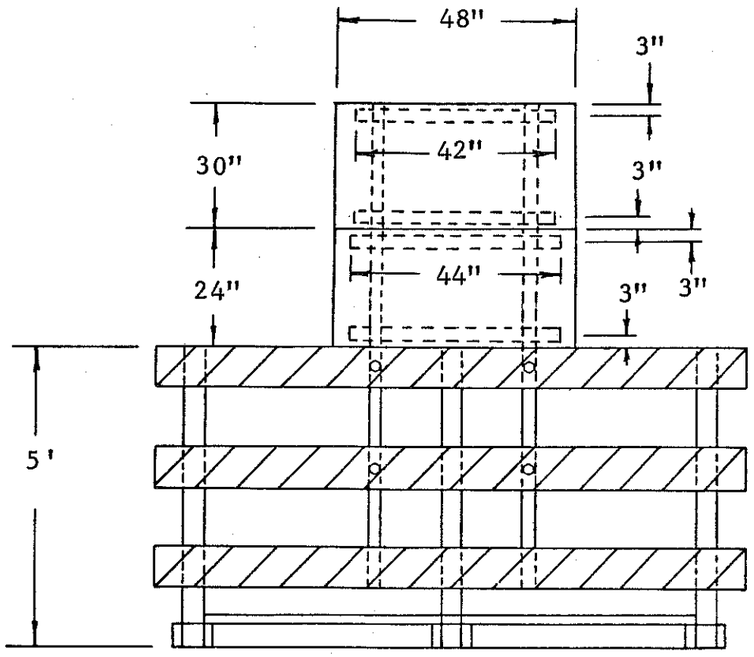
11-8-82 187+00 1 RS 5.18 9.0 2.0 " 4.0 2.25 3-way sign

11-8-82 192+00 Ramp Reset 13.0 14.6 2.0 " 4.0 4.0 2.19 Reset Sign

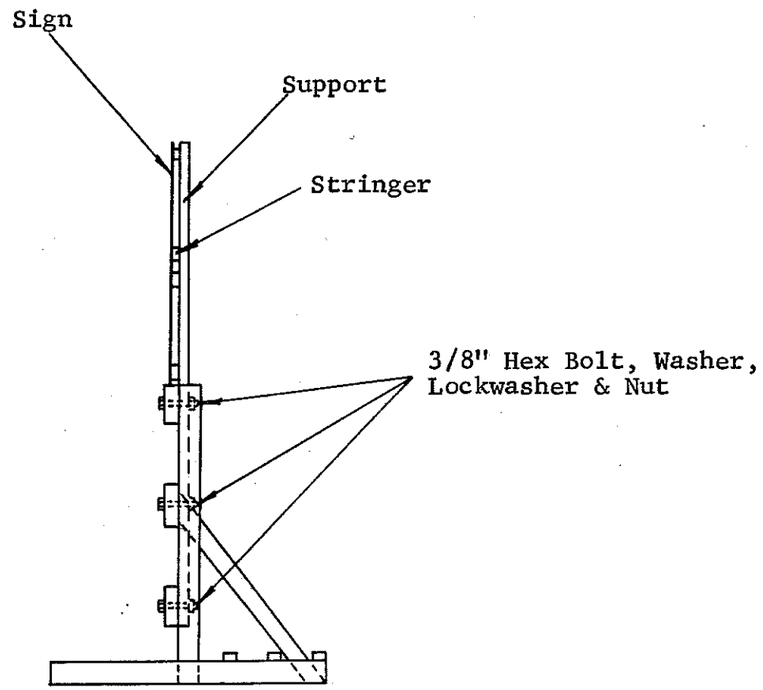
*Paid for With City Funds.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)010	39

SIGN & BARRICADE ASSEMBLY



FRONT VIEW

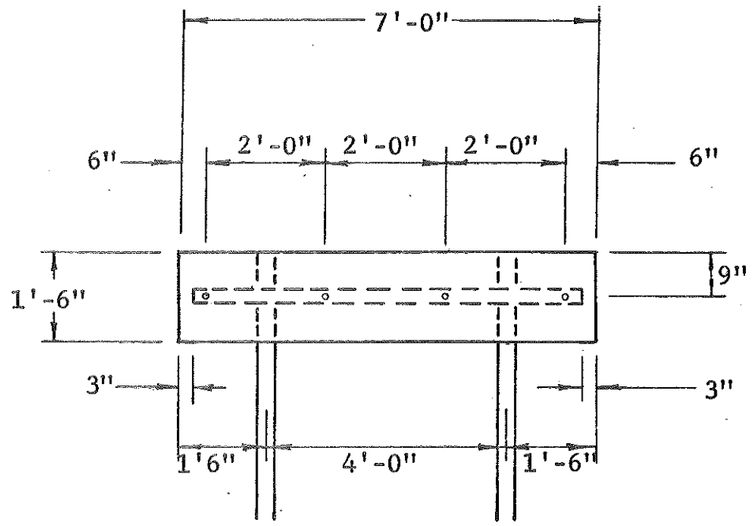


SIDE VIEW

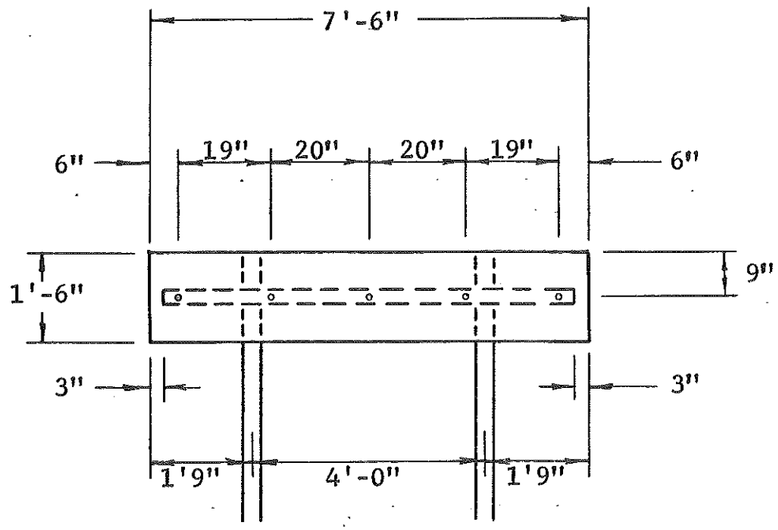
See Assemblies 34
and 37 for punching.

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO.
8	N.D.	M-1-988(03)010	40



Sign No. 2
Sta. 9+50 Rt.

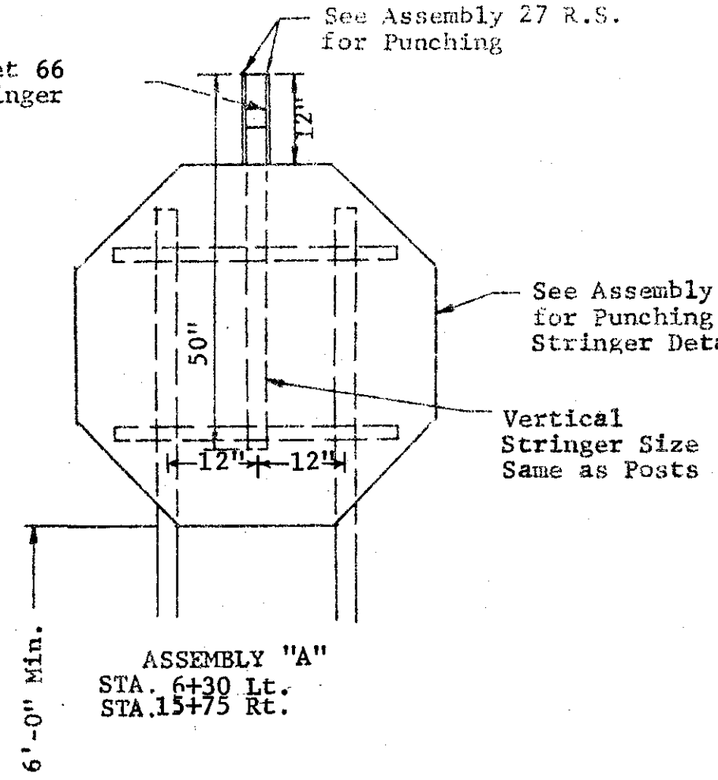


Sign No. 3
Sta. 12+00 Lt.

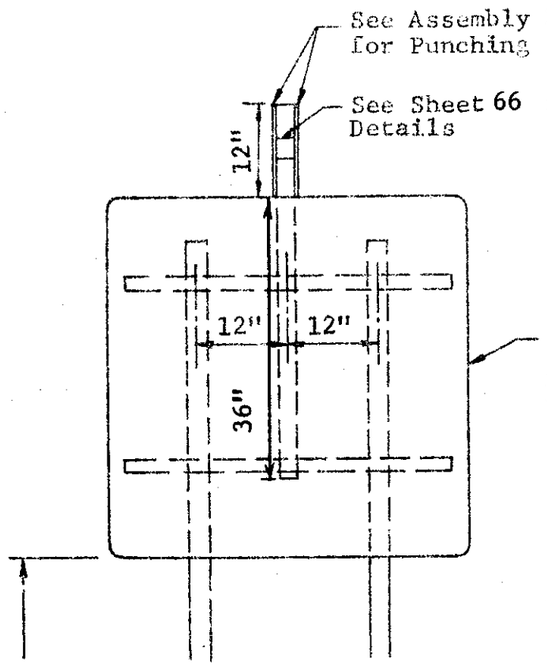
SPECIAL ASSEMBLY DETAILS

Old Red Trail
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)010	41



ASSEMBLY "A"
STA. 6+30 Lt.
STA. 15+75 Rt.

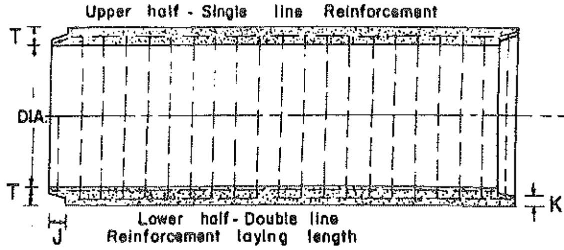


ASSEMBLY "B"
STA. 6+80 Lt.
STA. 14+75 Rt.

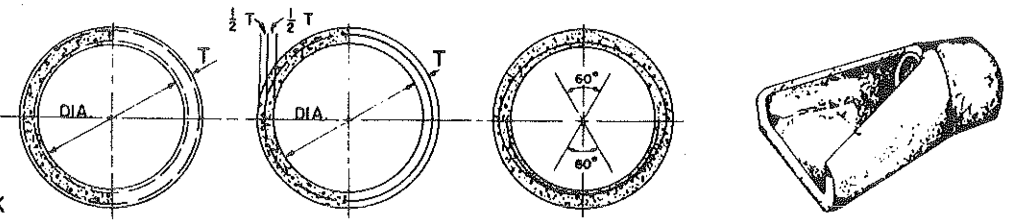
SIGN ASSEMBLY DETAILS

OLD RED TRAIL
MANDAN, N.D.

REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS



REINFORCED CONCRETE PIPE
TYPICAL LONGITUDINAL SECTION



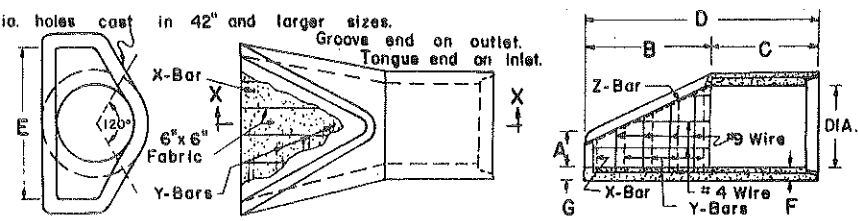
END VIEW — Double line Reinforcement

END VIEW — Single line Reinforcement

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

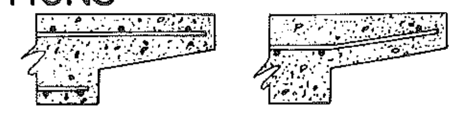
PERSPECTIVE

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

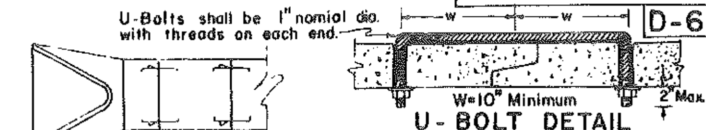


END VIEW — PLAN — SECTION X-X

END SECTION
Equivalent to Class III Pipe

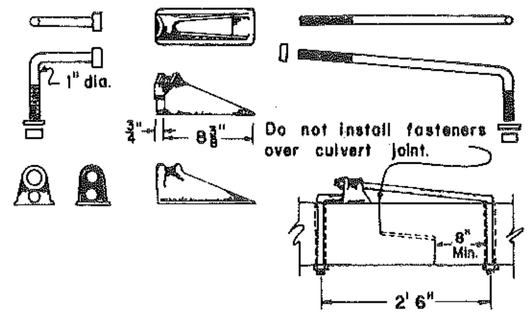


ARRANGEMENT FOR REINFORCEMENT
At end of 36" to 108" pipe. At end of 12" to 33" pipe.



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.



FASTENERS AND TIE BOLTS

END SECTION

DIA.	A	B	C	D	E	F	G	X	Y	Z
	TERMINAL DIMENSIONS							**REINFORCING STEEL**		
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'-10⅜"	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"x10' @ 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"x10' @ 6"c.c.	2-½"x10'
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	8"	6½"	4½"x 10'	28-½"x10' @ 6"c.c.	4-½"x10'
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	8½"	6½"	4½"x 11'	28-½"x11' @ 6"c.c.	4-½"x10'

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

PIPE SIZE	Class II FT.	Class III FT.	Class IV FT.	Class V 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

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	1¾-2⅜	⅞
18	1.77	166	1⅞-2⅞	1
21	2.40	214	1⅞-3⅛	1⅛
24	3.14	265	2¾-3¾	1⅛
27	3.98	322	2¾-4	1¼
30	4.91	384	3¼-4¼	1¼
33	5.94	452	3¼-4½	1½
36	7.07	524	3¼-4¼	1½
42	9.62	665	3⅜-4⅜	1¾
48	12.57	867	3⅝-4¾	1⅞
54	15.90	1070	4⅛-5¼	2
60	19.63	1296	4½-5½	2¼
66	23.76	1542	5-6	2⅝
72	28.27	1810	5⅜-6⅜	2⅞
78	33.18	2098	6¼-7¼	2⅞
84	38.48	2410	5⅝-7⅞	3⅛
90	44.18	2565	6¾-8¾	3⅛
96	50.27	2910	7-8¼	3½
102	56.75	3075	7-8¼	3½
108	63.62	3690	7⅛-8½	3¾

CLASS I — D-Load to produce a 0.01 inch crack: 800; D-Load to produce ultimate load: 1200; 4000 P.S.I.

Dia.	Minimum Wall Thickness (In.)	Circular rein. in circular pipe Inner cage (Sq.in.)	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			
30–54					☆
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
	5000 P.S.I.				
102	9½	.64 / .20	.41	.41	6-9
108	10	.81 / .22	.46	.46	6-9

CLASS II — D-Load to produce a 0.01 inch crack: 1000; D-Load to produce ultimate load: 1500; 4000 P.S.I.

Dia.	Minimum Wall Thickness (In.)	Circular rein. in circular pipe Inner cage (Sq.in.)	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
	5000 P.S.I.					
102	9½	.86 / .24	.61	.51	3-11	11-18
108	10	.78 / .27	.57	.57	3-11	11-18

CLASS III — D-Load to produce a 0.01 inch crack: 1350; D-Load to produce ultimate load: 2000

Dia.	4000 P.S.I. Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	4000 P.S.I. Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	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 / 11-16	16-31
15	2¼	.07							1-3 / 11-16	16-31
18	2½	.07		.07					1-3 / 11-16	16-31
21	2¾	.07		.07					1-3 / 11-16	16-31
24	3	.07		.07					1-3 / 11-16	16-31
27	3¼	.16		.14					1-3 / 11-16	16-31
30	3½	.18		.15					1-3 / 11-16	16-31
33	3¾	.15	.11	.17					1-3 / 11-16	16-31
36	4	.17	.13	.19					1-3 / 11-16	16-31
42	4½	.21	.16	.23					1-3 / 11-16	16-31
48	5	.24	.18	.27					1-3 / 11-16	16-31
54	5½	.29	.22	.32					1-3 / 11-16	16-31
60	6	.34	.26	.38					1-3 / 11-16	16-31
66	6½	.41	.31	.46					1-3 / 11-16	16-31
72	7	.49	.37	.54	7¾	.36	.27	.40	1-3 / 11-16	16-31
78	7½	.57	.43	.63	8¼	.42	.32	.47	1-3 / 11-16	16-31
84	8	.64	.48	.71	8¾	.50	.38	.56	1-3 / 11-16	16-31
	5000 P.S.I.									
90	8½	.69	.52	.77	9¼	.59	.45	.66	1-3 / 11-16	16-31
96	9	.76	.57	.84					1-3 / 11-16	16-31
102	9½	.90 / .32	.68	.68					1-3 / 11-16	16-31
108	10	1.08 / .39	.81	.81					1-3 / 11-16	16-31

CLASS IV — D-Load to produce a 0.01 inch crack: 2000; D-Load to produce ultimate load: 3000

Dia.	4000 P.S.I. Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	4000 P.S.I. Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	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	.38
	5000 P.S.I.							
60	6	.59	.45	.66	6¾	.41	.31	.46
66	6½	.69	.52	.77	7¼	.51	.39	.57
					5000 P.S.I.			
72	7	.79	.60	.88	7¾	.61	.46	.68
78					8¼	.71	.53	.79
84					8¾	.85	.63	.94

CLASS IV ALTERNATE — D-Load to produce a 0.01 inch crack: 2000; D-Load to produce ultimate load: 3000; 5000 P.S.I.

Dia.	Minimum 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 to produce a 0.01 inch crack: 3000; D-Load to produce ultimate load: 3750

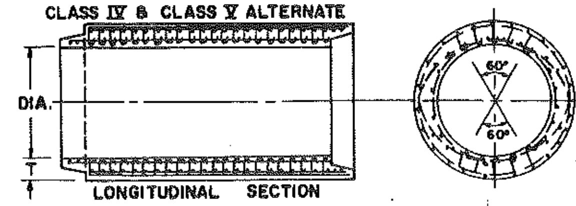
Dia.	6000 P.S.I. Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	6000 P.S.I. Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in 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 — D-Load to produce a 0.01 inch crack: 3000; D-Load to produce ultimate load: 3750; 5000 P.S.I.

Dia.	Minimum 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

A_i, A_e, A_o = Minimum circumferential reinforcement required in square inches per lineal foot of pipe.
A_r = 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

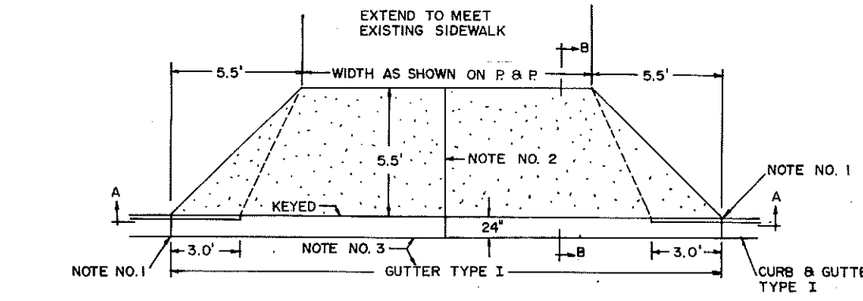
4.11

CONCRETE DRIVEWAY (URBAN)

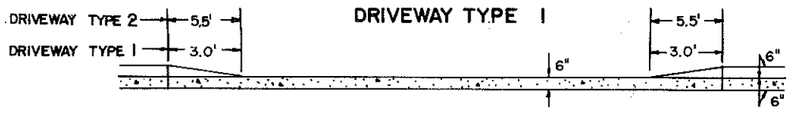
M-1-988(03)010

FHWA REGION	STATE	PROJECT	SHEET NO.
8	N.D		43

D-712-1



DRIVEWAY TYPE 1



6" SECTION A-A

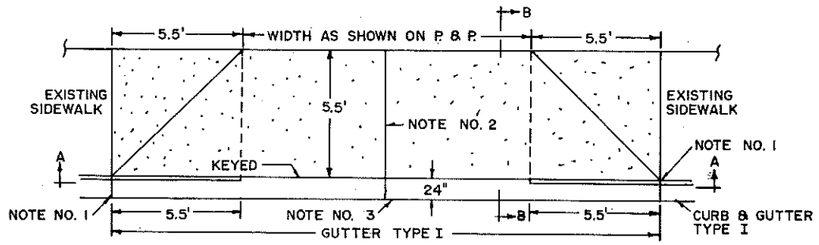
NOTE NO. 1 3/4" PREMOLDED EXPANSION JOINT FULL DEPTH AND SAME SHAPE AS CURB AND GUTTER.

NOTE NO. 2 CENTER JOINT SHALL BE USED ON ALL DRIVEWAYS 16' IN WIDTH OR GREATER. JOINTS SHALL BE A KEYED CONSTRUCTION JOINT OR A CONTRACTION JOINT SCORED 1/3 THE DEPTH OF THE CONCRETE. JOINT SHALL BE SEALED IN A MANNER AND WITH A MATERAL APPROVED BY THE ENGINEER.

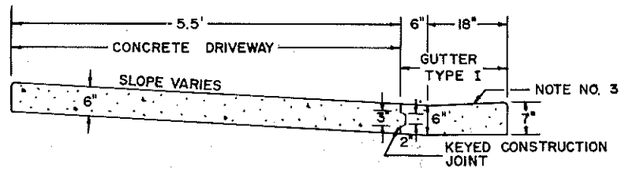
NOTE NO. 3 GUTTER-TYPE I SHALL BE PAID FOR AT THE UNIT PRICE BID FOR "CURB AND GUTTER-TYPE I."

NOTE NO. 4 6" DRIVEWAY TO BE USED UNLESS OTHERWISE SPECIFIED.

DRIVEWAY QUANTITIES (S.Y.)		
WIDTH	TYPE 1	TYPE 2
10'	9.5	12.8
12'	10.7	14.1
14'	11.9	15.3
16	13.1	16.5
18'	14.4	17.7
20'	15.6	18.9
22'	16.8	20.2
24'	18.0	21.4
26'	19.3'	22.6
28'	20.5	23.8
30'	21.7	25.1

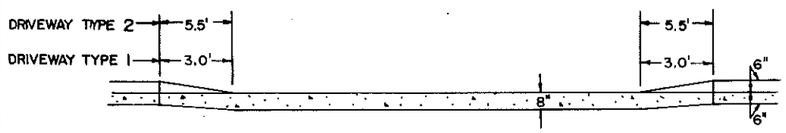


DRIVEWAY TYPE 2

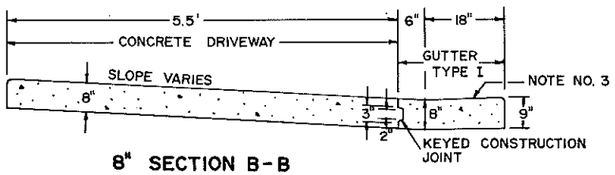


6" SECTION B-B

CONCRETE DRIVEWAY DETAILS

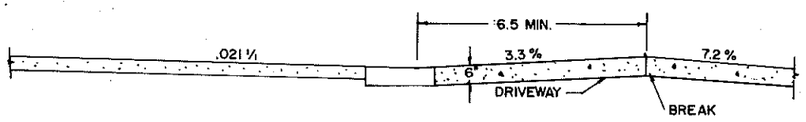


8" SECTION A-A



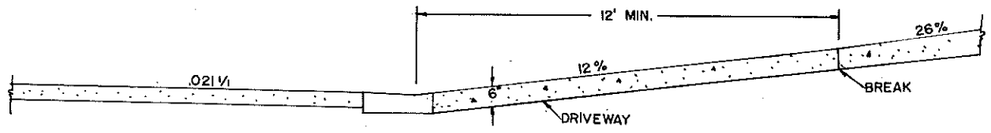
8" SECTION B-B

CONCRETE DRIVEWAY DETAILS



SUMMIT

(MAX. SUMMIT CHANGE 10.5 %)



SAG

(MAX. SAG CHANGE 14 %)

NOTE: ABOVE GRADIENTS ARE MAXIMUM VALUES ONLY. LESSER GRADIENTS ARE DESIRABLE WHERE EXISTING CONDITIONS PERMIT.

7-26-77	
REVISIONS	
DATE	CHANGE

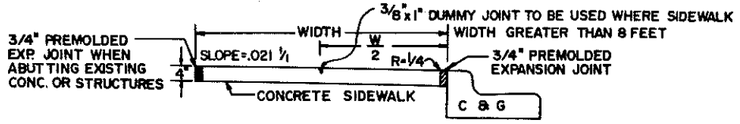
NORTH DAKOTA STATE HIGHWAY DEPARTMENT

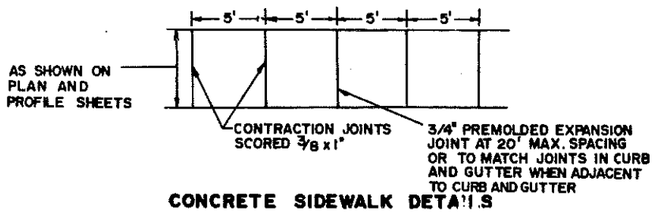
Submitted _____ Design Engineer

Recommended _____ Asst. Chief Engineer Pre-Construction

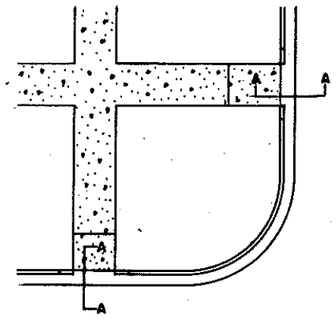
Approved R.C. Bradley Chief Engineer

SIDEWALKS AND CURB RAMPS

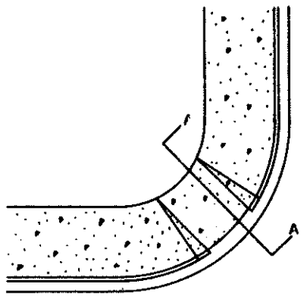




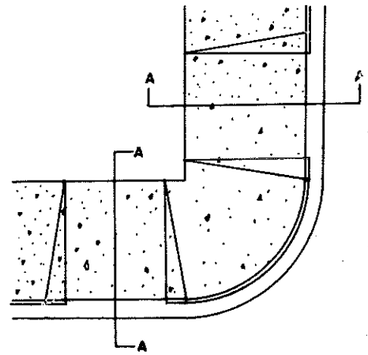
CONCRETE SIDEWALK DETAILS



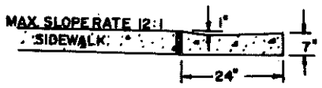
TYPE B



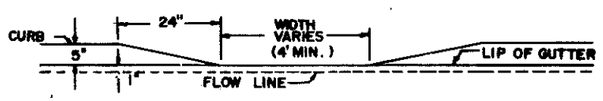
TYPE A



TYPE C



SEC. A-A



DEPRESSED CURB FOR PEDESTRIAN CROSSING

NOTES:

1. METHOD OF PAYMENT. THE CURB RAMP WILL NOT BE PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE QUANTITIES AND PAID FOR AT THE UNIT PRICE BID FOR CONCRETE SIDEWALK AND CURB AND GUTTER.
2. THE TYPE OF CURB RAMP TO BE USED AT EACH INTERSECTION WILL BE INDICATED ON THE PLANS.
3. THE LOCATION AND TYPE OF RAMPS MAY BE CHANGED BY THE ENGINEER IN THE FIELD TO CONFORM TO EXISTING CONDITIONS.

8-8 77 REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer Pre-Construction

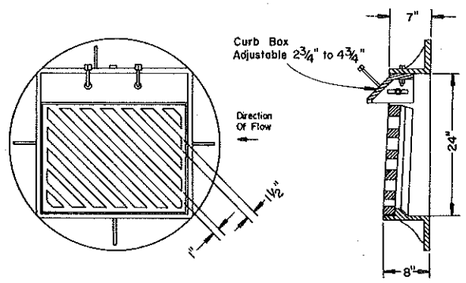
Approved: _____ Chief Engineer

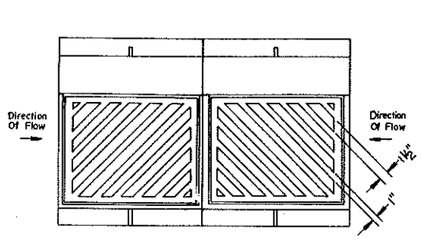
INLET DETAILS

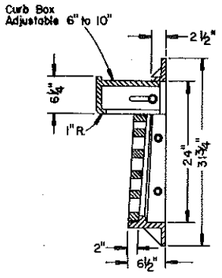
M-1-988(03)010

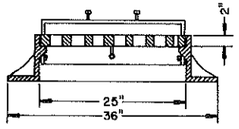
	STATE		
d	N. D.		45

D-714-1



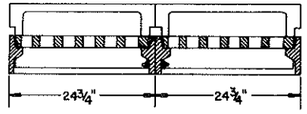






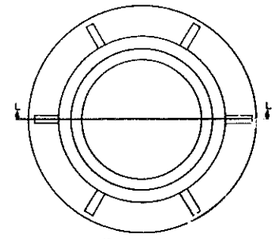
NOTE: Reversible grates to be furnished

INLET CASTING DETAILS

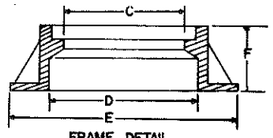


DOUBLE INLET CASTING DETAILS
NOTE: FOR TRIPLE INLETS ADD ONE ADDITIONAL INLET CASTING

CATCH BASIN
FRAME AND GRATE

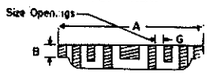


TOP VIEW



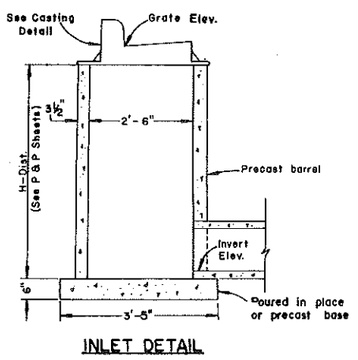
FRAME DETAIL
SECTION L-L

TOP VIEW

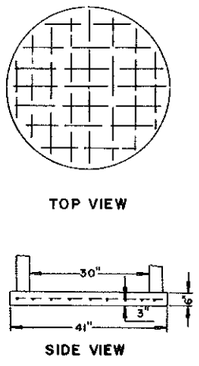


GRATE DETAIL
SECTION M-M

CATCH BASINS								
	DIMENSIONS IN INCHES							WT.
	A	B	C	D	E	F	G	Lbs.
TYPE A (24")	22	1½	20	24	33	8	¼	275
TYPE B (30")	23	1¾	20¾	26	36	9	1	420



INLET DETAIL

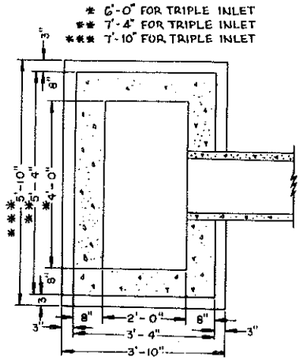


TOP VIEW

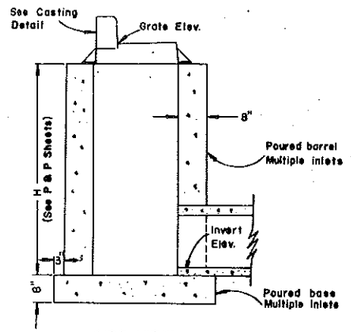
SIDE VIEW

PRECAST INLET BASE

* 6'-0" FOR TRIPLE INLET
** 7'-4" FOR TRIPLE INLET
*** 7'-10" FOR TRIPLE INLET



TOP VIEW



SIDE VIEW

MULTIPLE INLET DETAIL

* Dimensions shown for double inlet. Add 2 feet for each additional inlet on multiple installations.

Notes:

Bottoms of curb inlets shall be cut or precast square to fit the base. Grout joint between base and wall with cement mortar.

The Contractor may, if he so desires, construct the curb inlets lower than plan grade and bring the casting to grade using precast adjusting rings in a manner satisfactory to the Engineer in the field.

Bolts shall be Temper Finish–Double Heat Treated 1038 S.A.E. Grade 5, with Cad–Dichromate plating.

The Contractor may, if he so elects, construct multiple inlet boxes of ~~solid~~ concrete, block, or brick. The materials used shall be approved by the Engineer in writing. The type of construction shall be as specified in Section 714-3. of the Standard Specifications.

The Contractor shall have the option of using precast or poured in place bases. Precast bases shall be reinforced with #3 deformed bars at 6" centers in each direction. The class of concrete used in poured bases shall be Class AE. The aggregate size shall be approved by the engineer.

Precast barrels shall be constructed in accordance with ASTM 478.

Other castings, similar in dimension, may be used if accepted by the engineer in writing.

12-22-75	
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer Pre-Construction

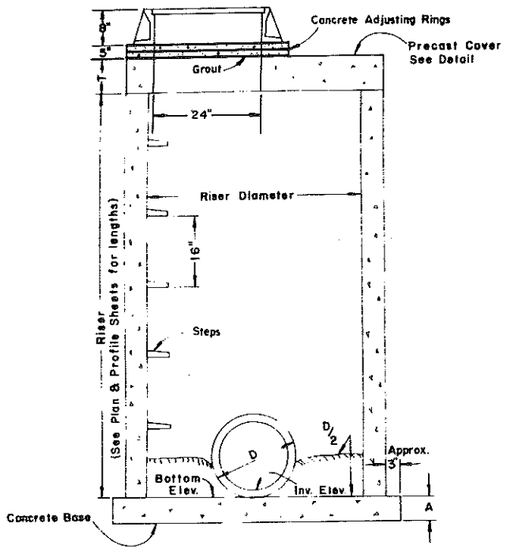
Approved _____ Chief Engineer

MANHOLE DETAILS

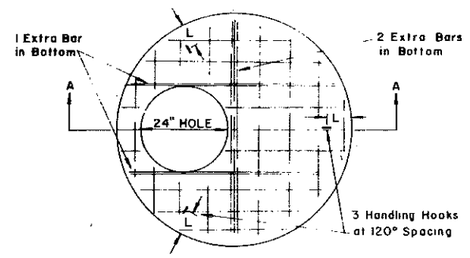
M-1-988(03)010

Region	State	Fed. Aid Proj. No.	Sheet No.
8	N.D.		46

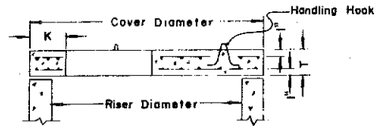
D-714-2



MANHOLE



TOP VIEW



SECTION A-A

PRECAST COVER

PRECAST MANHOLE COVERS

PIPE DIAMETER	COVER DIAMETER	WEIGHT OF SECTION	T	K	L	BOTTOM BARS	TOP BARS
42"	51"	800#	6"	6"	7"	#4 AT 6"	——
48"	58"	1110#	6"	6"	8"	#4 AT 6"	——
54"	65"	1950#	8"	6"	8"	#4 AT 6"	——
60"	72"	2470#	8"	7"	9"	#4 AT 6"	#3 AT 6"
66"	79"	3050#	8"	7"	9"	#4 AT 6"	#3 AT 6"
72"	86"	3680#	8"	8"	10"	#4 AT 6"	#3 AT 6"
78"	93"	4360#	8"	8"	10"	#4 AT 4"	#3 AT 4"
84"	100"	5100#	8"	9"	11"	#4 AT 4"	#3 AT 4"
90"	107"	5890#	8"	9"	11"	#4 AT 4"	#3 AT 4"
96"	114"	6730#	8"	9"	11"	#4 AT 4"	#3 AT 4"
102"	121"	7630#	8"	9"	12"	#4 AT 4"	#3 AT 4"
108"	128"	12460#	12"	10"	12"	#4 AT 4"	#3 AT 4"
120"	140"	15500#	12"	11"	13"	#4 AT 4"	#3 AT 4"

Top and Bottom Bars run in both directions.

PRECAST MANHOLE BASES

PIPE DIAMETER	BASE DIAMETER	WEIGHT OF SECTION	A BARS
42"	58"	1380#	6" #3 AT 6"
48"	66"	1780#	6" #3 AT 6"
54"	72"	2120#	6" #3 AT 6"
60"	79"	3410#	8" #3 AT 8"
66"	87"	4130#	8" #3 AT 8"
72"	94"	4820#	8" #3 AT 8"
78"	101"	5570#	8" #3 AT 8"
84"	108"	6370#	8" #3 AT 8"
90"	115"	7220#	8" #3 AT 8"
96"	122"	8130#	8" #3 AT 8"
102"	129"	9080#	8" #3 AT 8"
108"	136"	15130#	12" #3 AT 8"
120"	149"	18170#	12" #3 AT 8"

NOTES: BOTTOMS OF MANHOLES SHALL BE CUT OR PRECAST SQUARE TO FIT THE BASE GROUT JOINT BETWEEN BASE AND WALL WITH CEMENT MORTAR. THE CONTRACTOR MAY, IF HE SO DESIRES, CONSTRUCT THE MANHOLES LOWER THAN PLAN GRADE AND BRING THE CASTING TO GRADE USING PRECAST ADJUSTING RINGS IN A MANNER SATISFACTORY TO THE ENGINEER IN THE FIELD.

THE CONTRACTOR SHALL HAVE THE OPTION OF USING PRE-CAST OR POURED IN PLACE BASES.

PRECAST BASES SHALL BE REINFORCED AS SHOWN IN LISTING FOR EACH SIZE BASE.

THE CLASS OF CONCRETE USED IN POURED BASES SHALL BE CLASS AE.

THE AGGREGATE SIZE SHALL BE APPROVED BY THE ENGINEER.

PRECAST BARRELS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM 478.

OTHER CASTINGS, SIMILAR IN DIMENSION MAY BE USED IF ACCEPTED BY THE ENGINEER IN WRITING.

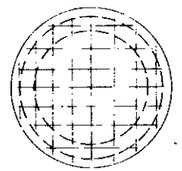
MANHOLE RISER SHALL BE PRODUCED IN ACCORDANCE WITH ASTM 478.

MANHOLE STEP SHALL BE CORROSION RESISTANT AND SHALL HAVE A MINIMUM VERTICAL LOAD RESISTANCE OF 400 POUNDS AND A PULL-OUT RESISTANCE OF UP TO 1000 POUNDS. CONFIGURATION OF THE STEPS SHALL BE APPROVED BY THE ENGINEER.

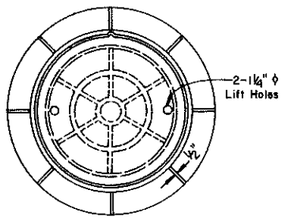
NOTE: METHOD OF MEASUREMENT FOR MANHOLES SHALL BE AS FOLLOWS: THE CONTRACT UNIT PRICE BID FOR MANHOLES SHALL INCLUDE THE FURNISHING AND INSTALLING THE FOLLOWING:

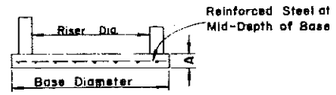
1. CAST IRON RING AND COVER
2. PRECAST COVER
3. CONCRETE BASE
4. CONCRETE ADJUSTING RINGS

THE ITEM "MANHOLE RISER" SHALL INCLUDE THE FURNISHING & INSTALLING OF THE REQUIRED LENGTH OF RISER & CAST IRON STEPS.

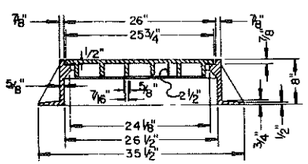


TOP VIEW

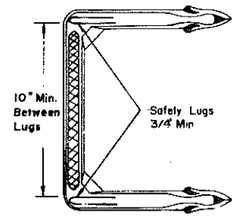




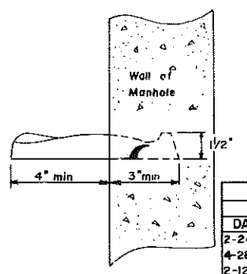
PRECAST MANHOLE BASE



MANHOLE CAST IRON RING & COVER



STEP DETAIL



12-22-75 REVISIONS	
DATE	CHANGE
2-24-76	Step Dimensions
4-28-77	Step Note
2-12-80	M.H Adjusting Rings

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: Design Engineer

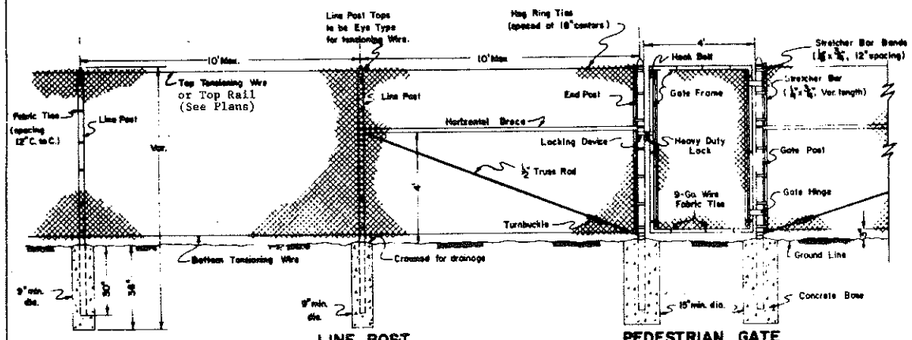
Recommended: Asst. Chief Engineer Pre-Construction

Approved: Chief Engineer

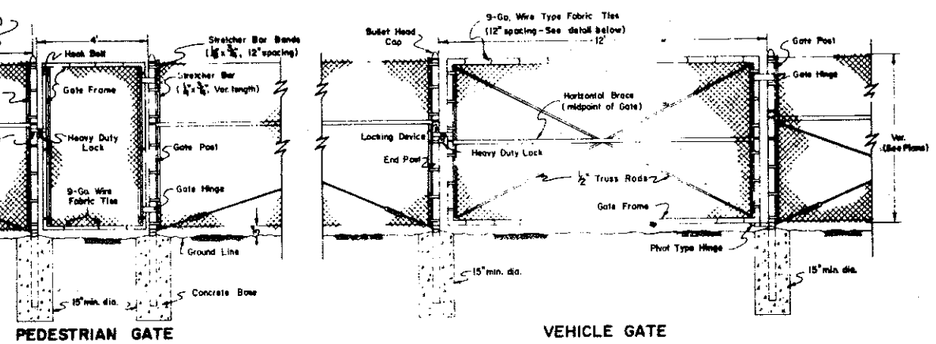
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)010	47

D-738-2

CHAIN LINK FENCE

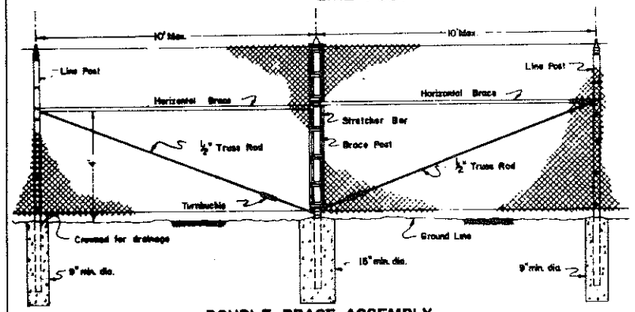


LINE POST

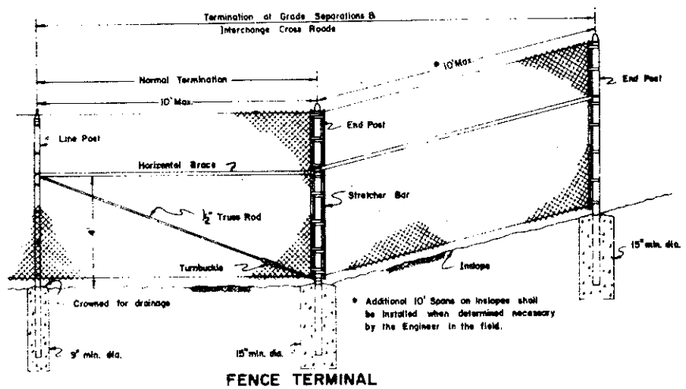


PEDESTRIAN GATE

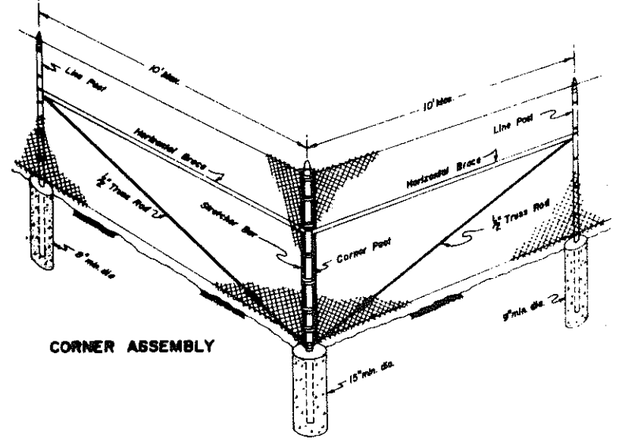
VEHICLE GATE



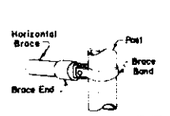
DOUBLE BRACE ASSEMBLY



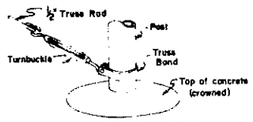
FENCE TERMINAL



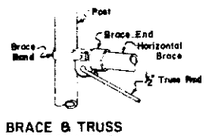
CORNER ASSEMBLY



BRACE ATTACHMENT

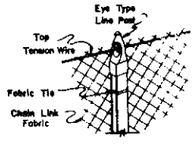


TRUSS ATTACHMENT AT TERMINAL POSTS

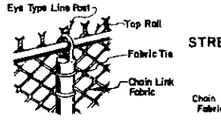


BRACE & TRUSS ATTACHMENT

"H" COLUMN POST

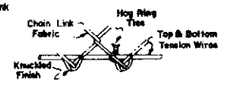


LINE POST TOP DETAIL

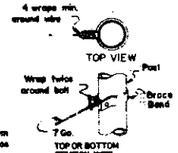


LINE POST TOP DETAIL (PIPE ALTERNATE SHOWN)

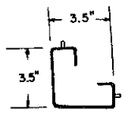
STRETCHER BAR BAND



HOG RING FASTENER DETAIL



TENSION WIRE ANCHORAGE

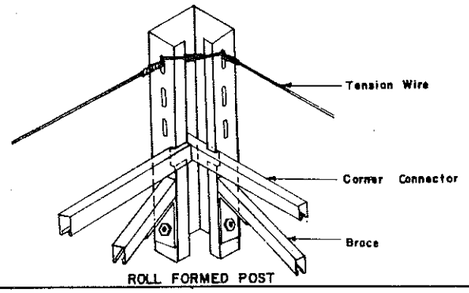


TEMINAL POST

LINE POST

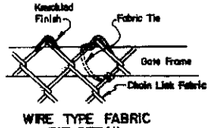
TOP & BRACE RAIL

"C" SECTION POST & RAIL



ROLL FORMED POST

"C" SECTION POST



WIRE TYPE FABRIC TIE DETAIL

PRIVATE FENCES SHALL NOT BE CONNECTED TO THE HIGHWAY RIGHT-OF-WAY 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 1000 FEET.

ALL MISCELLANEOUS FITTINGS SHALL BE OF THE TYPE AND SIZE RECOMMENDED BY THE MANUFACTURER OF THE FENCE AND APPROVED BY THE ENGINEER.

SEE PLANS FOR LENGTH OF ALL POSTS, HEIGHT OF FABRIC, AND LOCATION AND NUMBER OF GATES.

CONCRETE FOR POST BASES SHALL BE CLASS AE IN ACCORDANCE WITH SEC. 610 OF THE STANDARD SPECIFICATIONS. COURSE AGGREGATE FOR CONCRETE MIX SHALL BE SIZE NO. 1,3, OR 4 AT THE OPTION OF THE CONTRACTOR BUT SHALL NOT BE CHANGED DURING THE WORK EXCEPT BY WRITTEN PERMISSION OF THE ENGINEER.

CHAIN LINK FABRIC SHALL BE 9-GAGE WIRE 2" MESH. KNUCKLED FINISHED TOP AND BOTTOM. WIRE SHALL HAVE A MINIMUM TENSILE STRENGTH OF 80,000 P.S.I.

ALL MATERIALS SHALL BE IN ACCORDANCE WITH AASHTO DESIGNATION M-181-77 TYPE II.

EACH FENCE TERMINAL WILL BE COUNTED AND PAID FOR AS A DOUBLE BRACE ASSEMBLY.

THE CONTRACTOR SHALL HAVE THE OPTION OF USING ANY OF THE TYPES OF POSTS SHOWN IN THE TABLE OF EQUIVALENT POST SIZES AND WEIGHTS FOR THE SPECIFIED USE.

NO DEDUCTION IN MEASURED PAY LENGTH OF CHAIN LINK FENCE WILL BE MADE FOR GATES, CORNER ASSEMBLIES, DOUBLE BRACE ASSEMBLIES OR FENCE TERMINALS.

TOP AND BOTTOM TENSIONING WIRES SHALL BE 7-GAGE STEEL WIRE WITH A MINIMUM TENSILE STRENGTH OF 80,000 POUNDS PER SQUARE INCH.

TOP RAIL SHALL BE 1-5/8" X 1-1/4" 14 GA. ROLL FORMED SECTIONS OR 1-5/8" O.D. PIPE (SCH 40). TOPRAIL SHALL PASS THROUGH INTERMEDIATE POST TOPS AND FORM A CONTINUOUS BRACE WITHIN EACH STRETCH OF FENCE AND BE SECURELY FASTENED TO TERMINAL POSTS.

TOP TENSIONING WIRE ALTERNATE WILL BE USED UNLESS TOP RAIL IS SPECIFIED ON THE PLANS.

THE FABRIC SHALL BE TIED TO THE TOP RAIL OR TENSION WIRE AS RECOMMENDED BY THE MANUFACTURER.

EQUIVALENT POST SIZES AND WEIGHTS

USE OF POST	SECTION	"C" SEC. STEEL		"H" COLUMN STEEL			ROUND STEEL		ROUND ALUM.	
		Size	Weight	Size		Weight	Size	Weight	Size	Weight
		Inch	Lbs./Ft.	A	B	Lbs./Ft.	Out. Dia.	Lbs./Ft.	Out. Dia.	Lbs./Ft.
LINE POST	Fabric 6' or less	1.875x 1.625	1.60	1 5/8"	1 5/8"	2.72	1.900"	2.72	1.900"	1.28
	Fabric over 6'	1.875x 1.625	2.34	2 1/4"	2"	4.10	2.375"	3.65	2.375"	1.74
END, CORNER,	Fabric 6' or less	3.5x 3.5	5.10	"H" COLUMN STEEL POSTS NOT PERMITTED			2.375"	3.65	2.375"	1.74
	Fabric over 6'	3.5x 3.5	5.10				2.875"	5.79	2.875"	2.66
GATE POST	All	3.5x 3.5	5.10				4.000"	9.11	4.000"	4.33
EXTERIOR FRAME FOR GATE	Gate width 6' or less	—	—				1.315"	1.68	1.315"	.75
	Gate width over 6'	—	—				1.900"	2.72	1.900"	1.25
HORIZONTAL BRACE		1.625x 1.25	1.35				1.660"	2.27	1.660"	1.04
BRACE POST	Fabric 6' or less	1.875x 1.624	2.34				2.375"	3.65	2.375"	1.74
	Fabric 6' or less	1.875 1.624	2.34				2.875"	5.79	2.875"	2.65

REVISIONS	
DATE	CHANGE
2-23-77	Added "C" Section Posts
4-6-77	Line Post Weight
9-26-79	Added Toprail Detail
8-21-80	Materials Note

1-1-75

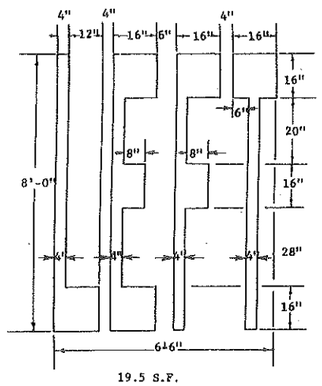
NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer.

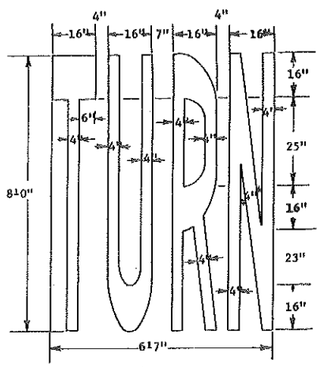
Recommended: _____ Asst. Chief Engineer Pre-Construction.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED AID PROJ. NO	SHEET NO
8	N.D.	M-1-988(03)010	48
		D-743-I	



19.5 S.F.



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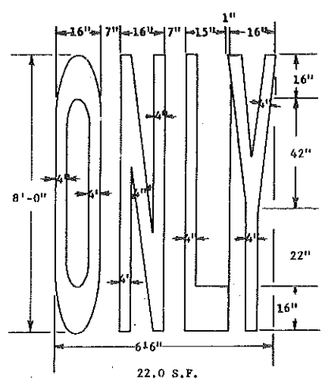

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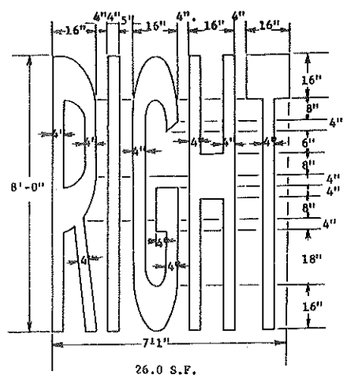

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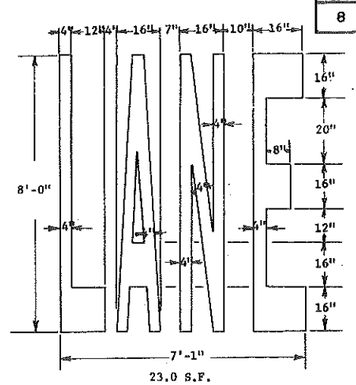

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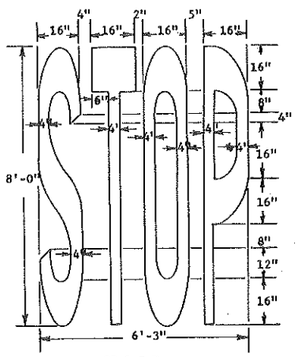

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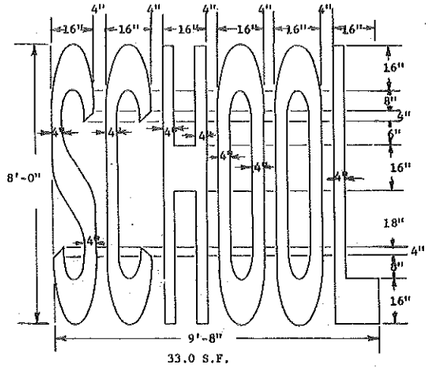

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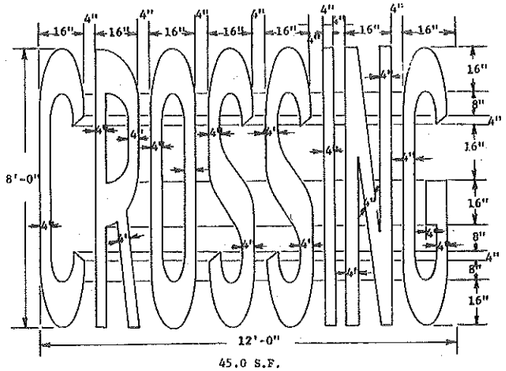

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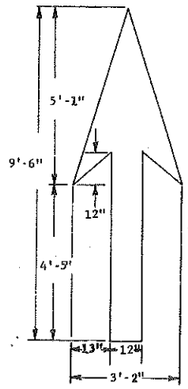

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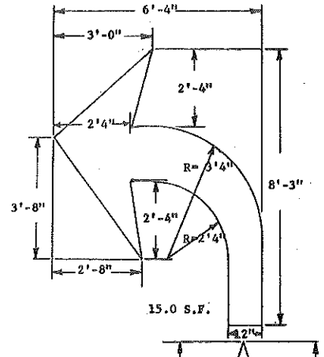

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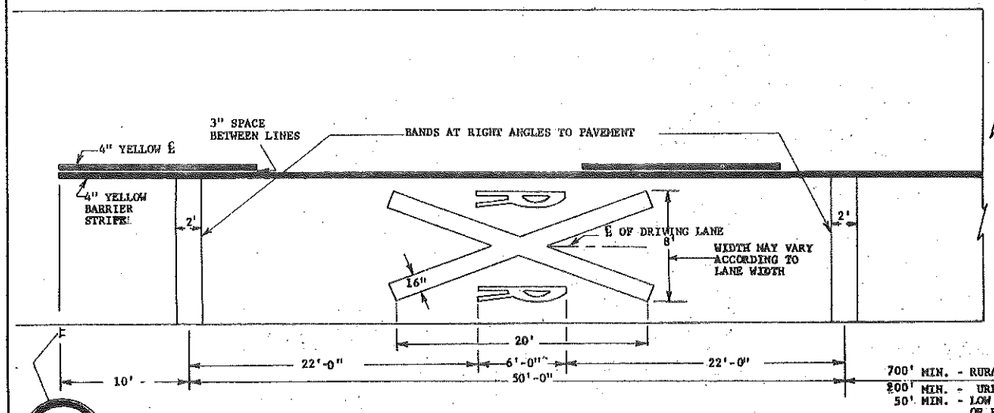
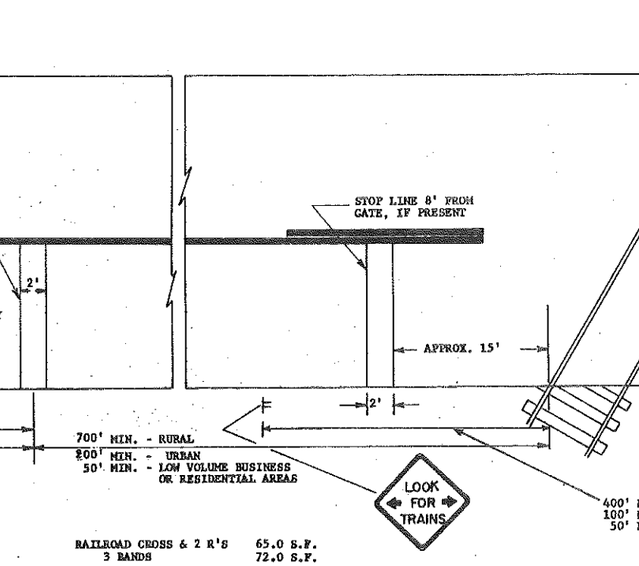


M10-1-36 SHALL BE PLACED WITHIN 10'± OF LOCATION SHOWN

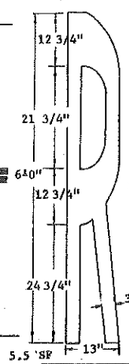
A THREE LANE ROADWAY SHOULD BE MARKED WITH A CENTERLINE FOR TWO-LANE APPROACH OPERATION ON THE APPROACH TO A CROSSING. ON MULTI-LANE ROADS THE TRANSVERSE BANDS SHOULD EXTEND ACROSS ALL APPROACH LANES, AND INDIVIDUAL R X R SYMBOLS SHOULD BE USED IN EACH APPROACH LANE.



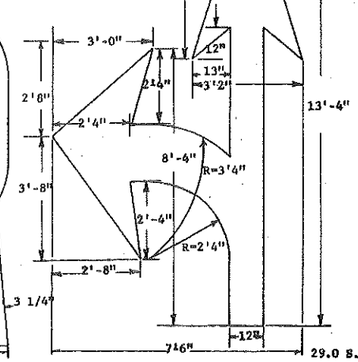
700' MIN. - RURAL
200' MIN. - URBAN
50' MIN. - LOW VOLUME BUSINESS OR RESIDENTIAL AREAS

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

400' MIN. - RURAL
100' MIN. - URBAN
50' MIN. - LOW VOLUME BUSINESS OR RESIDENTIAL AREAS.



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



29.0 S.F.

REVISIONS	
DATE	CHANGE
12-11-78	NOTE CHANGE
5-23-79	SIZES & AREA
6-20-79	NOTE ADDED
6-29-79	DIMENSIONS
11-20-79	DIMENSION & NOTE CHANGE
2-21-80	DIMENSIONS & NOTES ADDED.
1-21-81	DIMENSIONS ADDED

6-23-78

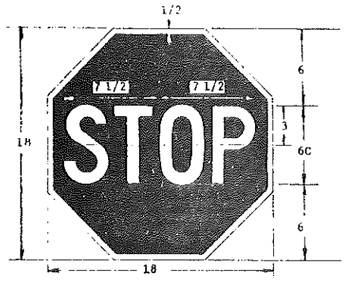
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted:

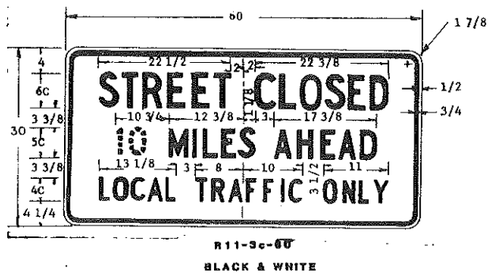
Recommended:
Asst. Chief Engineer, Pre-Constr.

Approved:
Chief Engineer

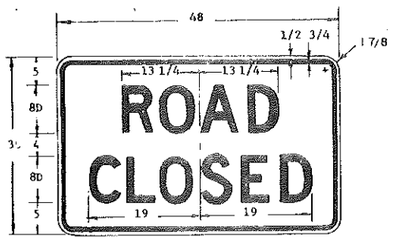
CONSTRUCTION SIGN DETAILS



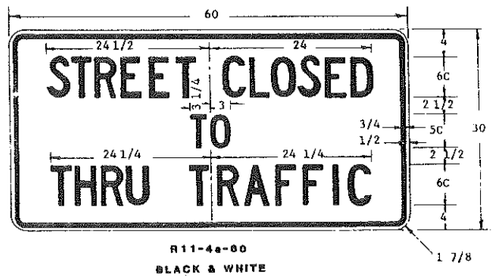
STOP-SLOW PADDLE
RED & WHITE
FLAGPERSON PADDLE



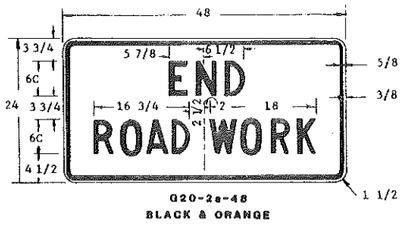
R11-3c-60
BLACK & WHITE



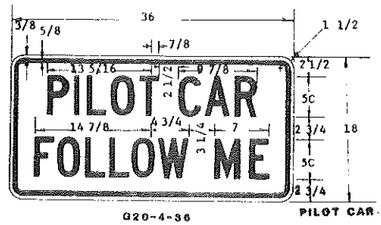
R11-2-48
BLACK & WHITE



R11-4a-60
BLACK & WHITE

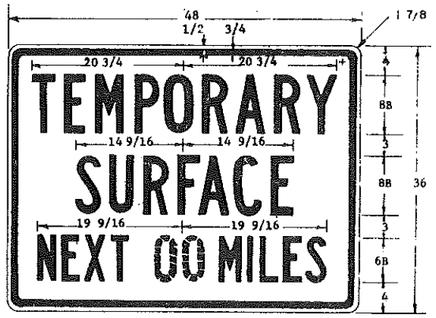


G20-2a-48
BLACK & ORANGE

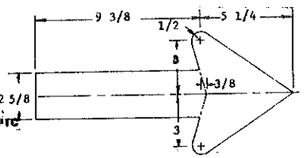


G20-4-36
BLACK & ORANGE

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



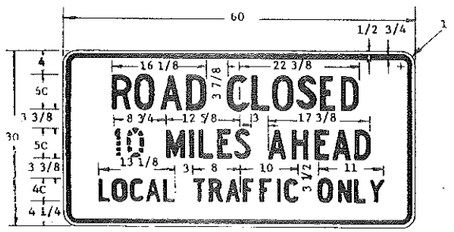
G20-8-48
BLACK & ORANGE



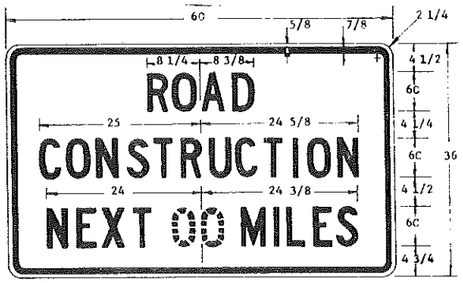
ARROW DETAIL FOR SIGN NO'S.
G20-50-72 & G20-52-72

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.

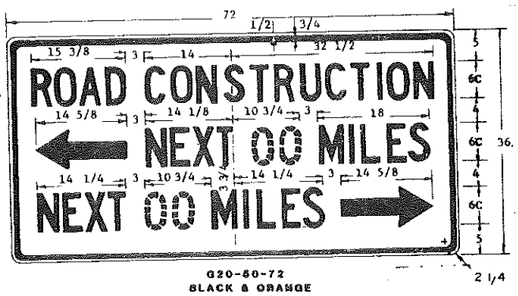
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.



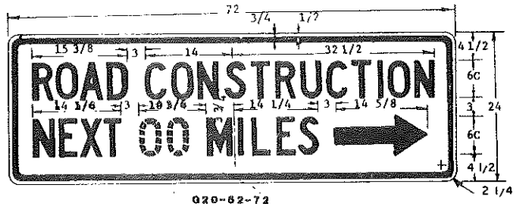
R11-3a-60
BLACK & WHITE



G20-1-60
BLACK & ORANGE

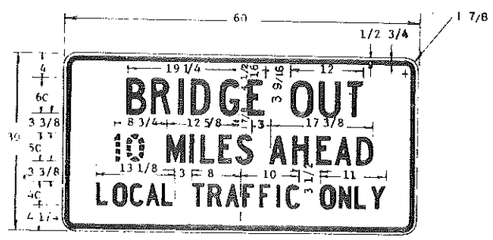


G20-50-72
BLACK & ORANGE

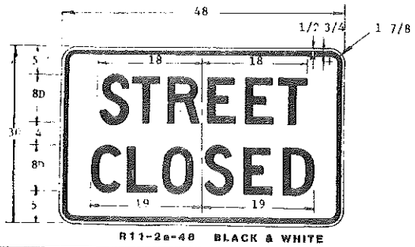


G20-52-72
BLACK & ORANGE

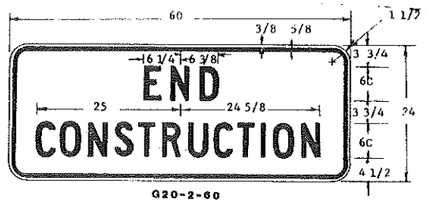
ARROW MAY BE TO RIGHT OR LEFT OF LEGEND TO INDICATE CONSTRUCTION TO THE RIGHT OR LEFT.



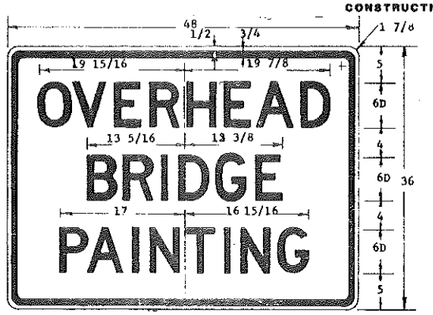
R11-3b-60
BLACK & WHITE



R11-2a-48 BLACK & WHITE



G20-2-60
BLACK & ORANGE



G20-54-48
BLACK & ORANGE

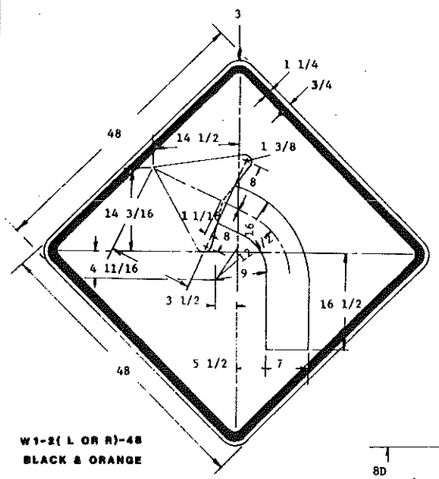
2-17-78 REVISIONS	
DATE	CHANGE
12-18-78	TITLE ADDED
2-21-80	SIGN COLOR
6-23-80	SIGN NUMBERS
8-4-80	SIGN COLOR
9 19 80	SIGN NUMBERS
8 19-81	REMOVE SIGN & NUMBER

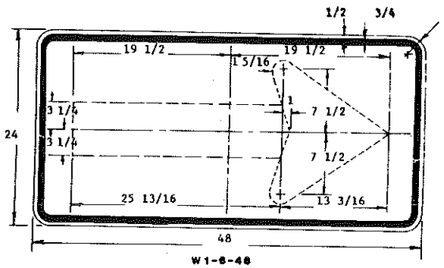
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT
Submitted: _____ Design Engineer
Recommended: _____ Asst. Chief Engineer, Pre-Constr
Approved: _____ Chief Engineer

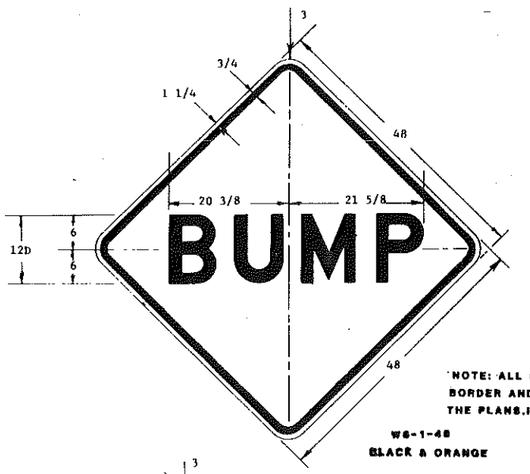
CONSTRUCTION SIGN DETAILS

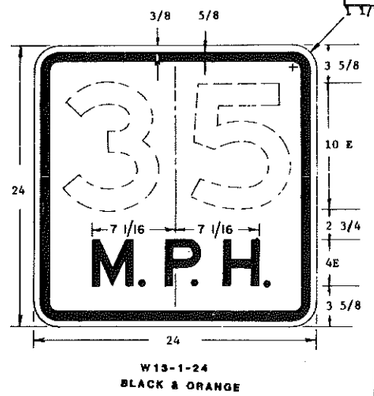
FHWA REGION	STATE	FED AID PROJECT NO	SHEET NO
8	N.D.	M-1-988(03)010	50

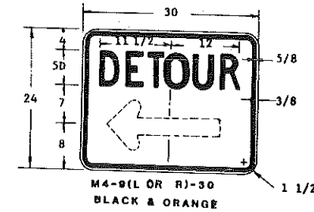
D-754-2

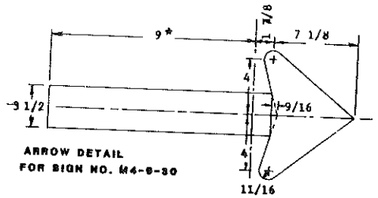




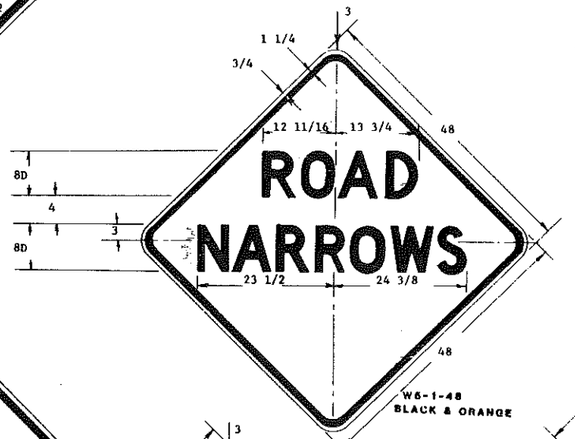


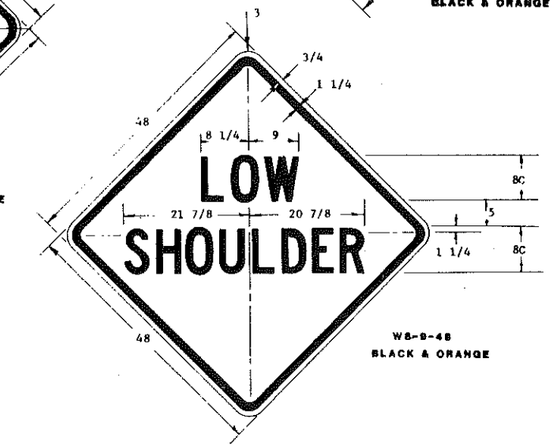


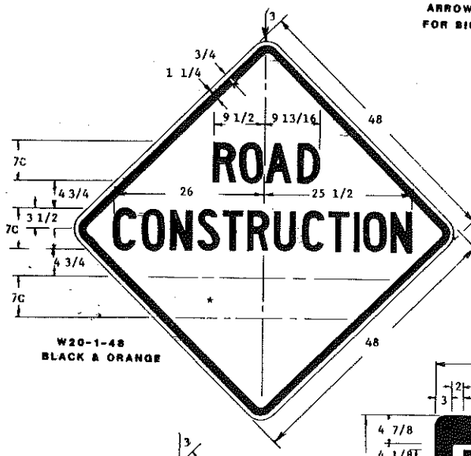




NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.

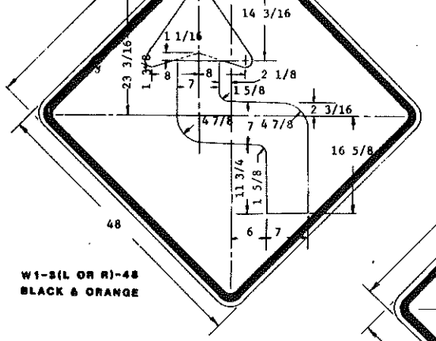


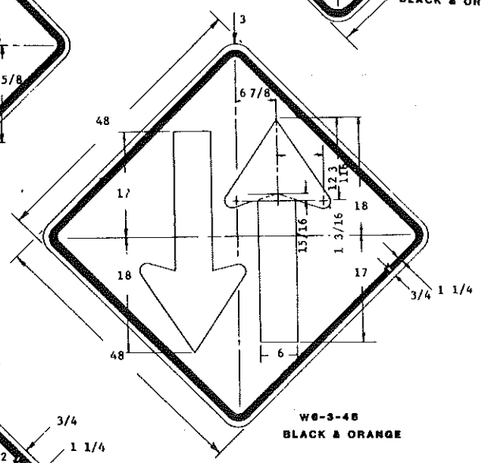


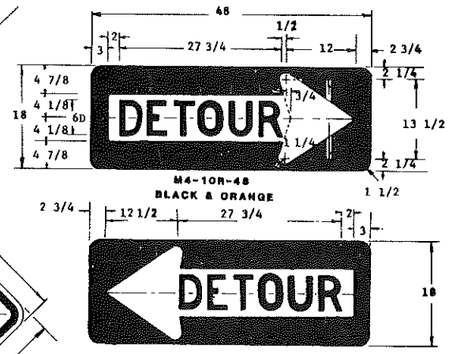


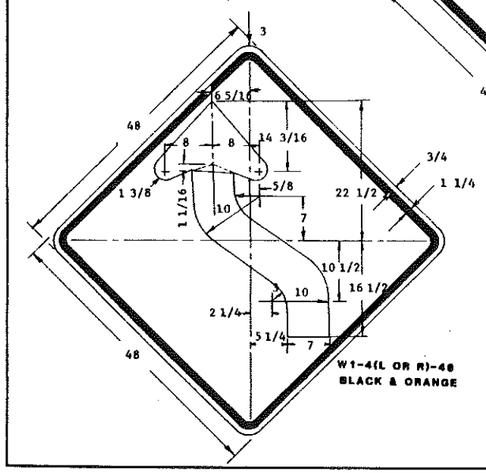
MESSAGE AND BORDER: THE MESSAGES AND BORDERS SHALL BE SCREENED ON REFLECTIVE SHEETING OR INSTALLED USING PIGMENTED PLASTIC FILM CONFORMING TO THE REQUIREMENT OF SEC. 804-3.6 OF THE STD. SPECIFICATIONS. THE PIGMENTED PLASTIC FILM SHALL BE INSTALLED IN ACCORDANCE WITH THE REFLECTIVE SHEETING MANUFACTURERS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

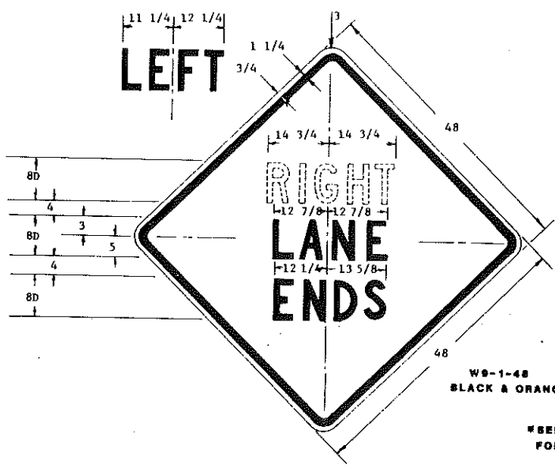
*DIMENSION SHALL BE 3" WHEN ARROW IS PLACED VERTICALLY.

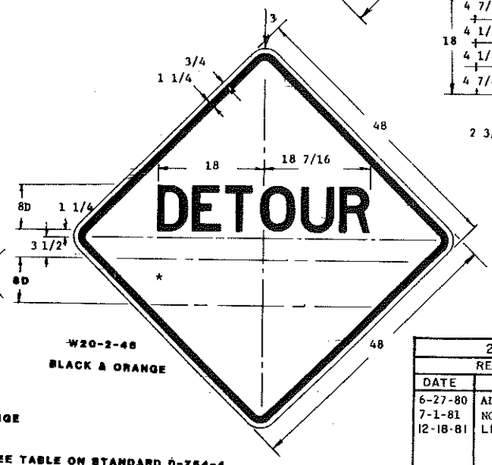












*SEE TABLE ON STANDARD D-754-4 FOR MESSAGE AND DIMENSIONS.

2-17-78 REVISIONS	
DATE	CHANGE
6-27-80	ADDED NOTE
7-1-81	NOTE ADDITION
12-18-81	LETTERING

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

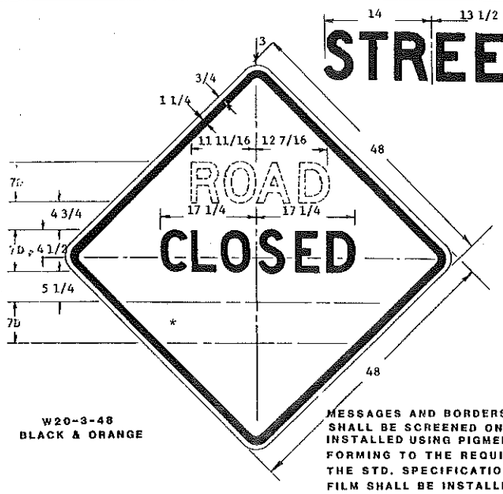
Submitted: _____ Design Engineer

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

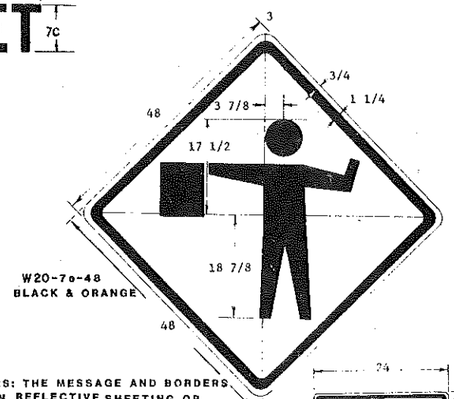
Approved: _____ Chief Engineer

CONSTRUCTION SIGN DETAILS

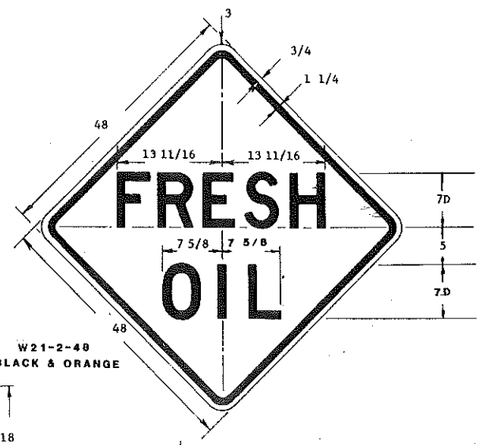
FHWA REGION	STATE	FED AID PROJ NO.	SHEET NO.
8	N.D.	M-1-988(03)010	51
		D 754-3	



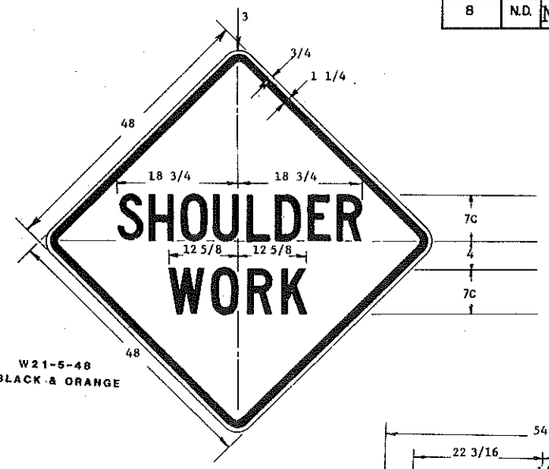
W20-3-48
BLACK & ORANGE



W20-7a-48
BLACK & ORANGE



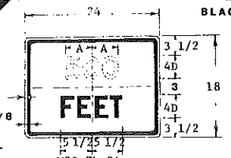
W21-2-48
BLACK & ORANGE



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.

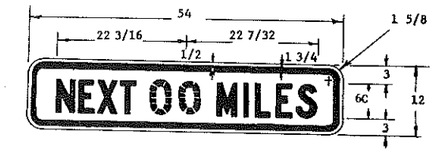


W20-7k-24

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

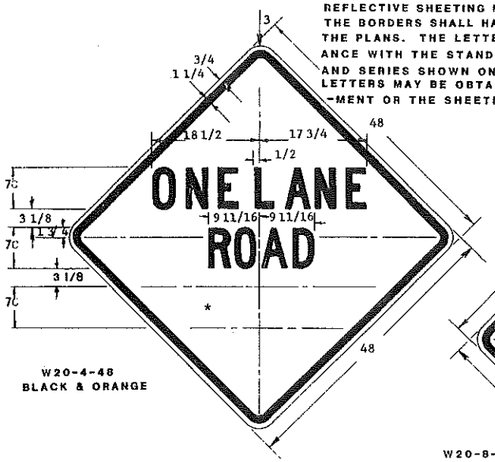
FOR USE WITH W20-7a-48 & W21-1a-48

BLACK & ORANGE

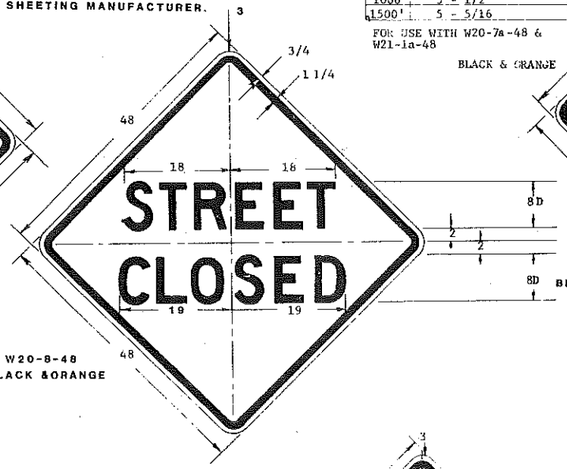


W20-52-54
BLACK & ORANGE

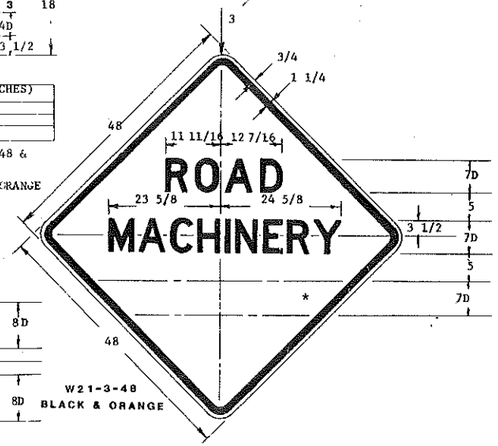
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGES, BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORHZED.



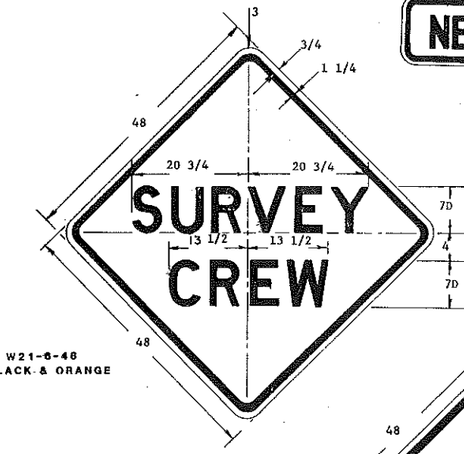
W20-4-48
BLACK & ORANGE



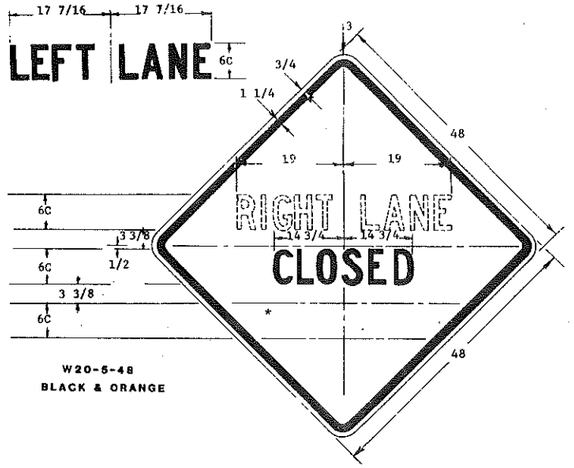
W20-8-48
BLACK &ORANGE



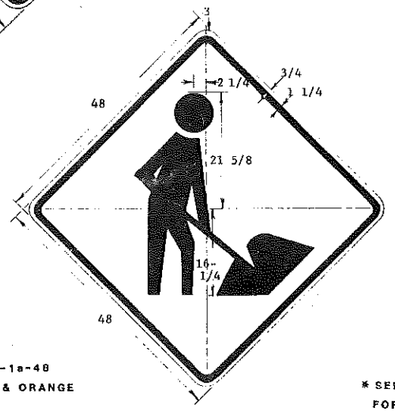
W21-3-48
BLACK & ORANGE



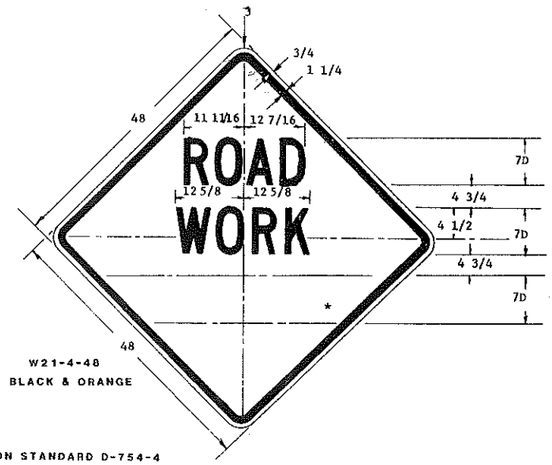
W21-6-48
BLACK & ORANGE



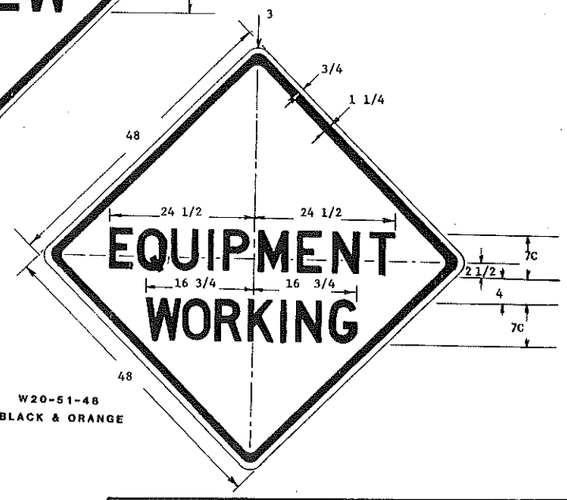
W20-5-48
BLACK & ORANGE



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.

2-17-78 REVISIONS	
DATE	CHANGE
5-14-79	Symbols Added
1-16-80	ADD DIMENSION
6-27-80	REVISED SIGN NO.'S
9-1-81	LETTERING

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

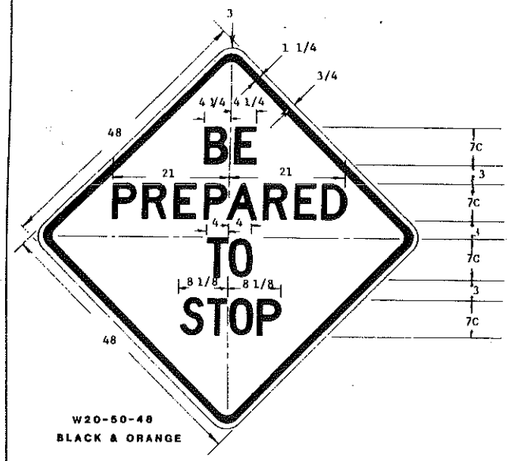
Submitted: _____ Design Engineer

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

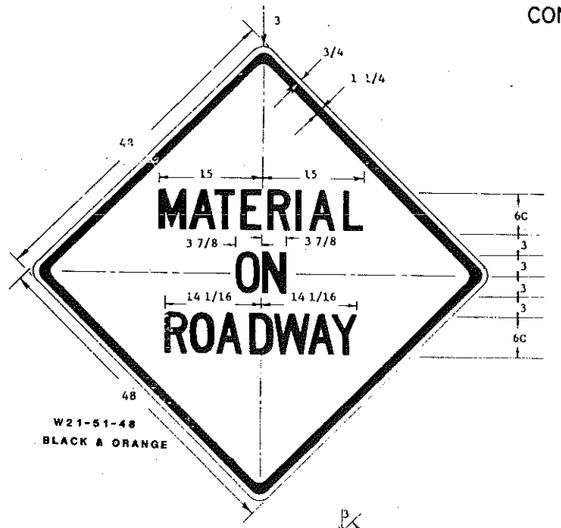
Approved: _____ Chief Engineer

CONSTRUCTION SIGN DETAILS

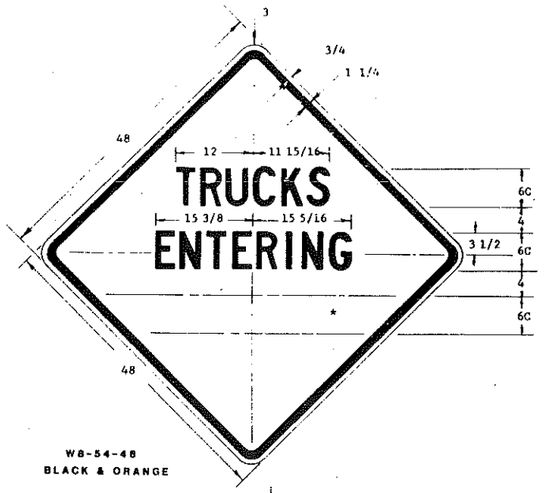
FHWA REGION		FED AID PROJECT NO.	SHEET NO.
8	N.D.	M-1-988(03)010	52
		D 754-4	



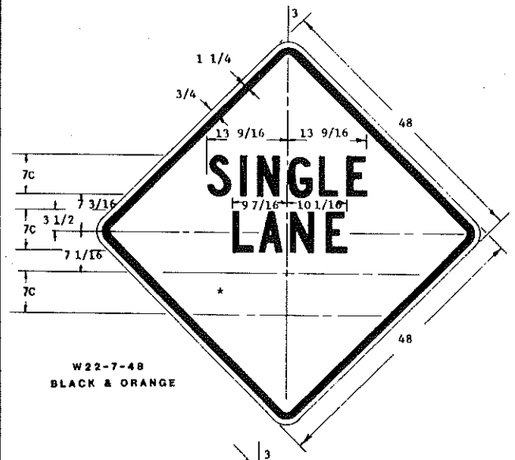
W20-50-48
BLACK & ORANGE



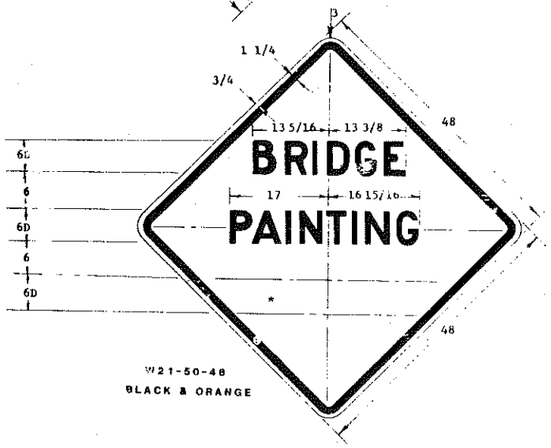
W21-51-48
BLACK & ORANGE



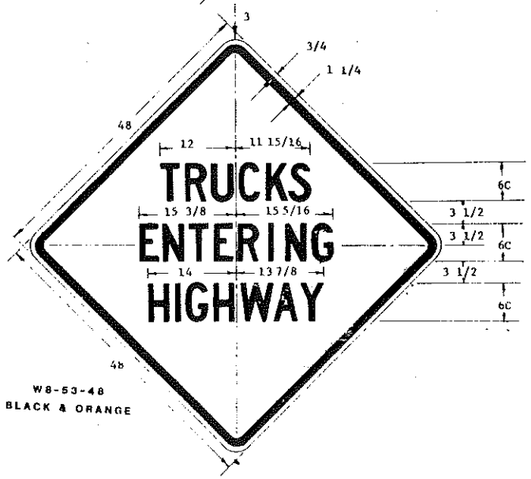
W8-54-48
BLACK & ORANGE



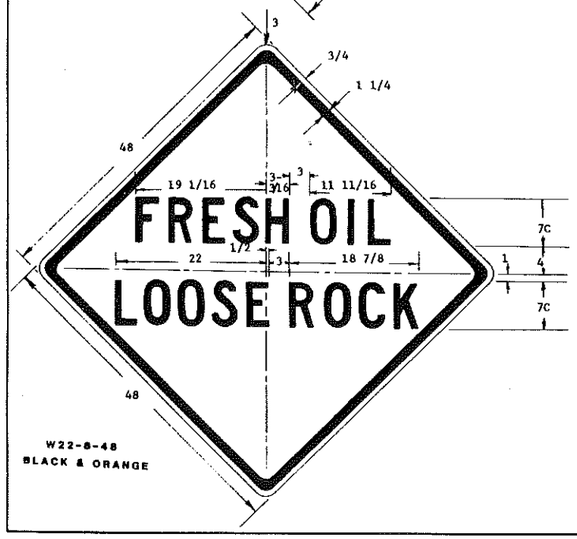
W22-7-48
BLACK & ORANGE



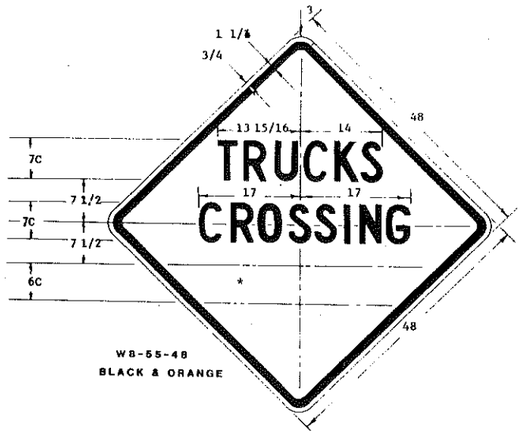
W21-50-48
BLACK & ORANGE



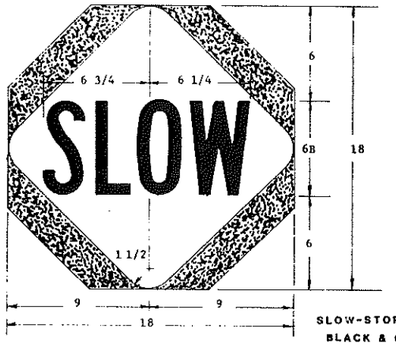
W8-53-48
BLACK & ORANGE



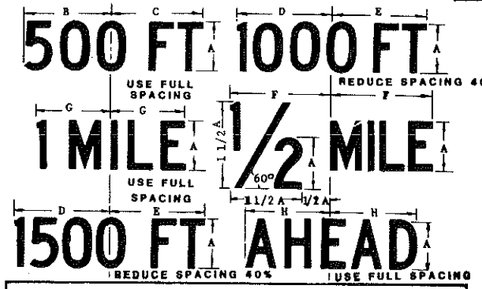
W22-8-48
BLACK & ORANGE



W8-55-48
BLACK & ORANGE



SLOW-STOP PADDLE
BLACK & ORANGE
FLAGPERSON PADDLE



DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
4C	6-7/8	7	7-1/2	8	8-5/16	6-1/16	7
5C	8-3/4	8-13/16	9-3/8	10	10-7/16	7-5/8	8-3/4
6C	10-3/8	10-1/2	11-1/4	12	12-1/2	9-1/8	10-1/2
7C	12	12-3/16	13-1/8	14	14-9/16	10-5/8	12-1/4
8C	13-3/4	14	15	16	16-5/8	12-1/8	14
4D	8-1/8	8-5/8	8-1/2	9	9	7-3/16	8-11/16
5D	10-3/16	10-13/16	11-5/8	11-1/4	11-1/4	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 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 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
6-27-80	REVISED SIGN NO.'S
12-17-81	Notes

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____
Design Engineer

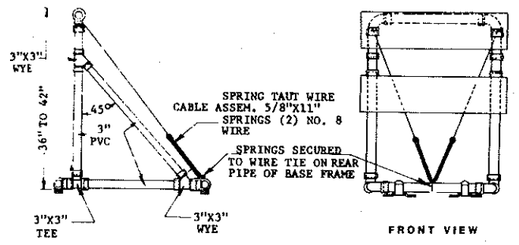
Recommended: _____
Asst. Chief Engineer, Pre-Constr.

Approved: _____
Chief Engineer

BARRICADE DETAILS

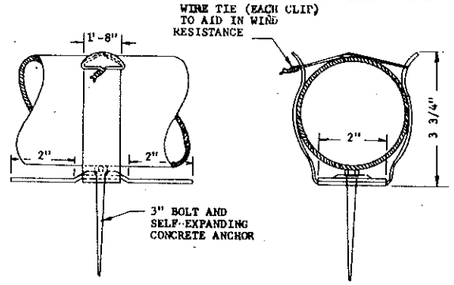
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)010	53

D 754-5



SIDE VIEW

FRONT VIEW

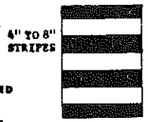


TYPICAL CLAMP DETAIL

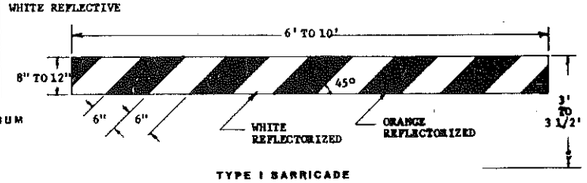
(SINGLE FIRE EXTINGUISHER CLIPS, 3 1/2" DIA.)

DELINEATOR DRUMS

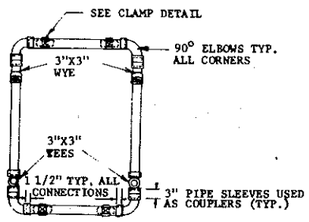
THE MARKINGS ON DRUMS SHALL BE ORANGE AND WHITE STRIPES 4 TO 8 INCHES WIDE. THERE SHALL BE AT LEAST THREE ORANGE AND TWO WHITE STRIPES. WHERE DRUMS HAVE RIBS OR INDENTATION THERE SHALL BE NO REFLECTORIZED SHEETING IN THIS AREA. THIS SPACE SHALL BE PAINTED ORANGE AND SHALL BE NO MORE THAN 2 INCHES WIDE. 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

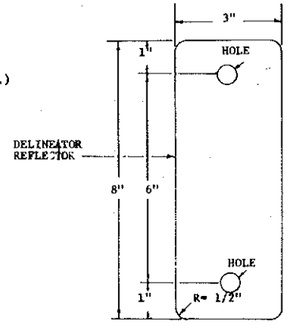
NOTE: THE PIPE, WYES, TEES ANDD ELBOWS USED TO CONSTRUCT TYPE II BARRICADES (SPECIAL) SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION: D2241 FOR PVC 1120 OR 1220, SDR 21, PRESSURE RATING 200 P.S.I. THE WYES, TEES, AND ELBOWS SHALL SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION: D-2466, TYPE 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.

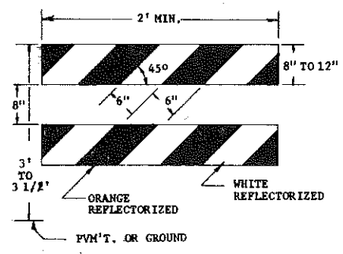
THE 9" X 48" BARRICADE RAIL SHALL BE FABRICATED FROM 0.025" ANODIZED ALUMINUM AND SHALL BE ATTACHED WITH 1 INCH NO. 14 PAN BEAD METAL SCREWS. COLORS: REFLECTIVE ORANGE AND REFLECTIVE WHITE.

BREAKAWAY BARRICADE ASSEMBLY

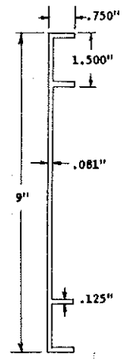
NOTE: EACH MOVABLE BARRICCADE SHALL BE WEIGHTED DOWN BY A SUFFICIENT NUMBER OF SAND BAGS OR OTHER SUITABLE WEIGHT SO THAT IT WILL NOT BE BLOWN OVER BY THE WIND UNLESS THE MOVABLE SUPPORTING STRUCTURE IS CONSTRUCTED IN SUCH A MANNER THAT THE WIND CANNOT BLOW IT OVER. WEIGHT USED SHALL BE APPROVED BY THE 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.



3" x 8" - 16 GUAGE GALVANIZED STEEL SHEETS, OR OR .080" ALUMINUM PLATE WITH WHITE REFLECTIVE SHEETING (TYPE III OR IV) AS SPECIFIED IN SECTION 894 OF THE STANDARD SPECIFICATIONS.

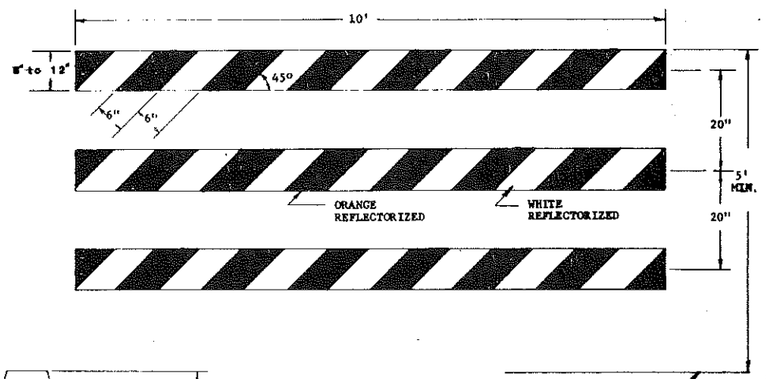


TYPE II BARRICADE

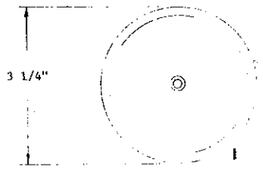


EXTRUDED ALUMINUM BARRICADE

BAR DETAIL

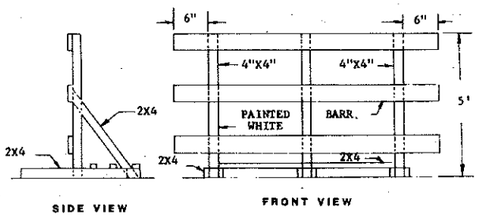


TYPE III BARRICADE



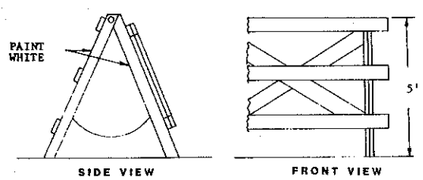
ACRYLIC PLASTIC REFLECTOR

DELINEATOR REFLECTOR SHALL MEET THE REQUIREMENTS OF SECTION 894.



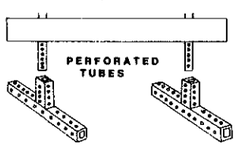
SIDE VIEW FRONT VIEW

MOVABLE BARRICADE ASSEMBLY

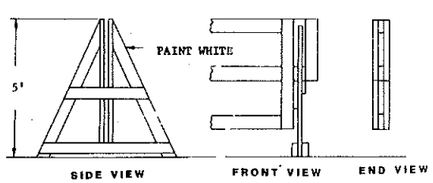


SIDE VIEW FRONT VIEW

HINGED BARRICADE ASSEMBLY

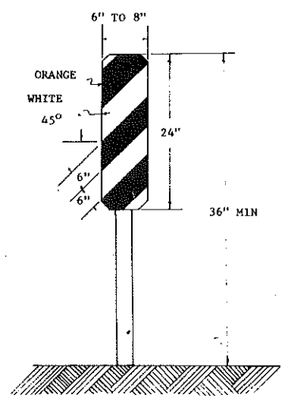


SECTIONAL BARRICADE

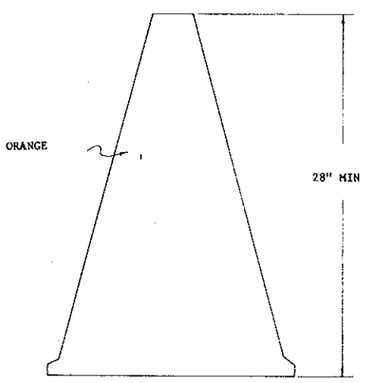


SIDE VIEW FRONT VIEW END VIEW

DEMOUNTABLE BARRICADE ASSEMBLY



VERTICAL PANEL



CONE

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

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

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

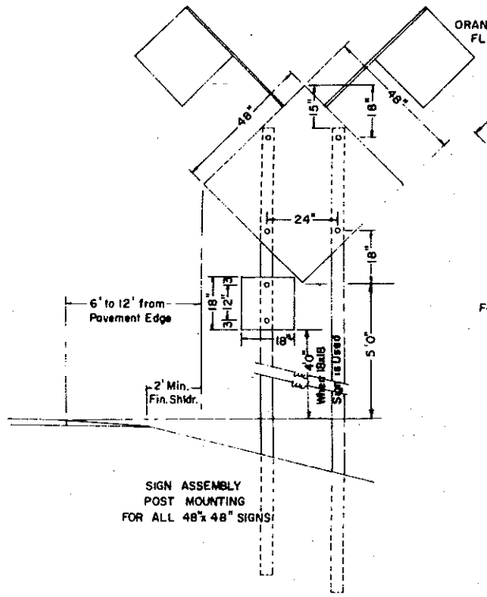
Approved: _____ Chief Engineer

CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

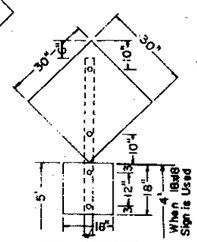
M-1-988(03)010

FHWA REGION	STATE	FED AID PROJ NO	SHEET
8	N.D.		54

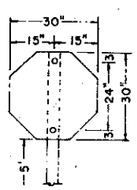
D-754-5-A



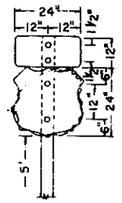
SIGN ASSEMBLY
POST MOUNTING
FOR ALL 48"x48" SIGNS



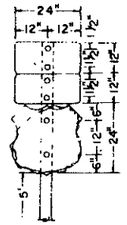
POST MOUNTING
FOR ALL 30"x30" SIGNS



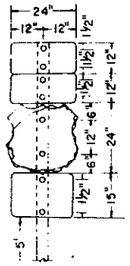
POST MOUNTING
FOR SIGN NO. R-1-30



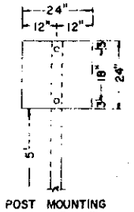
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN & ONE ROUTE MARKER



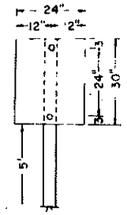
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN, ONE DETOUR SIGN
& ONE ROUTE MARKER



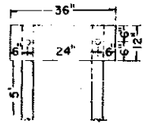
POST MOUNTING
FOR ASSEMBLIES WITH ONE
CARDINAL DIRECTION SIGN, ONE
DETOUR SIGN, ONE ROUTE MARKER
& ONE DIRECTIONAL ARROW



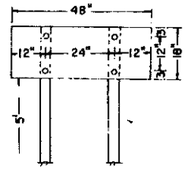
POST MOUNTING
FOR ALL 24"x24" SIGNS



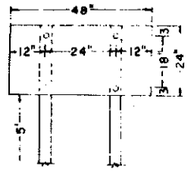
POST MOUNTING
FOR ALL 24"x30" SIGNS



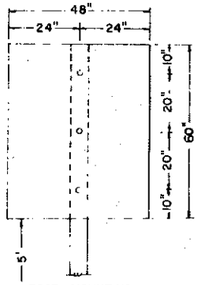
POST MOUNTING
FOR ALL 36"x12" SIGNS



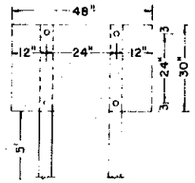
POST MOUNTING
FOR ALL 48"x18" SIGNS



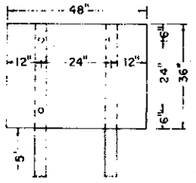
POST MOUNTING
FOR ALL 48"x24" SIGNS



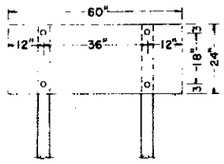
POST MOUNTING
FOR ALL 48"x60" SIGNS



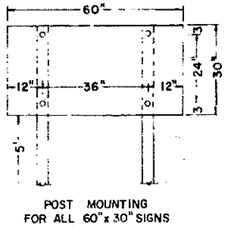
POST MOUNTING
FOR ALL 48"x30" SIGNS



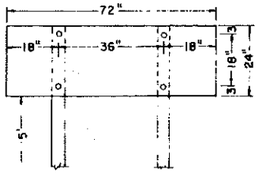
POST MOUNTING
FOR ALL 48"x36" SIGNS



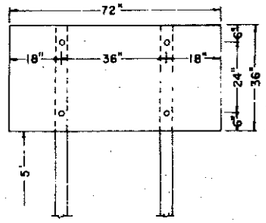
POST MOUNTING
FOR ALL 60"x24" SIGNS



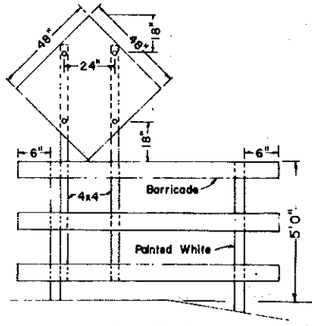
POST MOUNTING
FOR ALL 60"x30" SIGNS



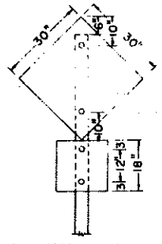
POST MOUNTING
FOR ALL 72"x24" SIGNS



POST MOUNTING
FOR ALL 72"x36" SIGNS

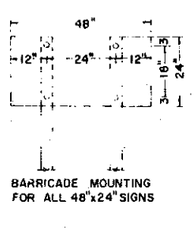


SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL 48"x48" SIGNS

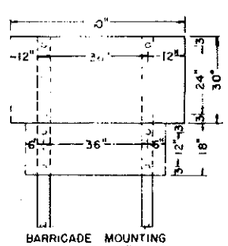


BARRICADE MOUNTING
FOR ALL 30"x30" SIGNS

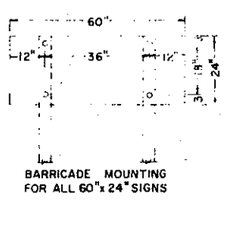
BARRICADE MOUNTING
FOR ALL 24"x30" SIGNS



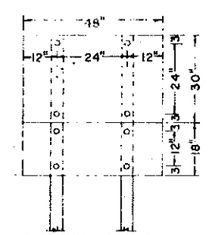
BARRICADE MOUNTING
FOR ALL 48"x24" SIGNS



BARRICADE MOUNTING
FOR ALL 60"x30" SIGNS

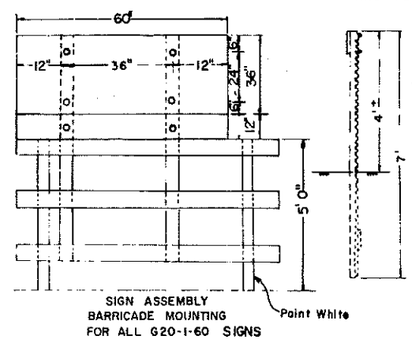


BARRICADE MOUNTING
FOR ALL 60"x24" SIGNS

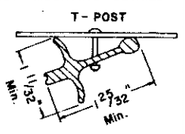


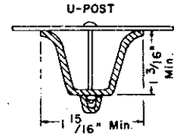
BARRICADE MOUNTING
FOR ALL 48"x30" & 48"x18" SIGNS

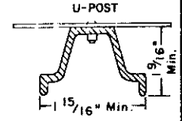
DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS

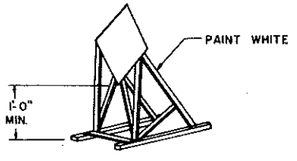


SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL G20-1-60 SIGNS

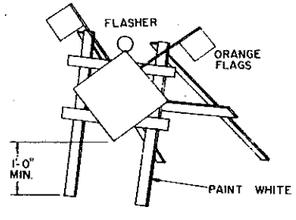








PORTABLE SIGN MOUNTING



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 imbeded to a sufficient depth so that the signs will remain plumb throughout duration of the project it is suggested that the min. depth of imbedment be 5'-0".

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

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

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
8-21-78	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.	M-1-988(03)010	55
		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.

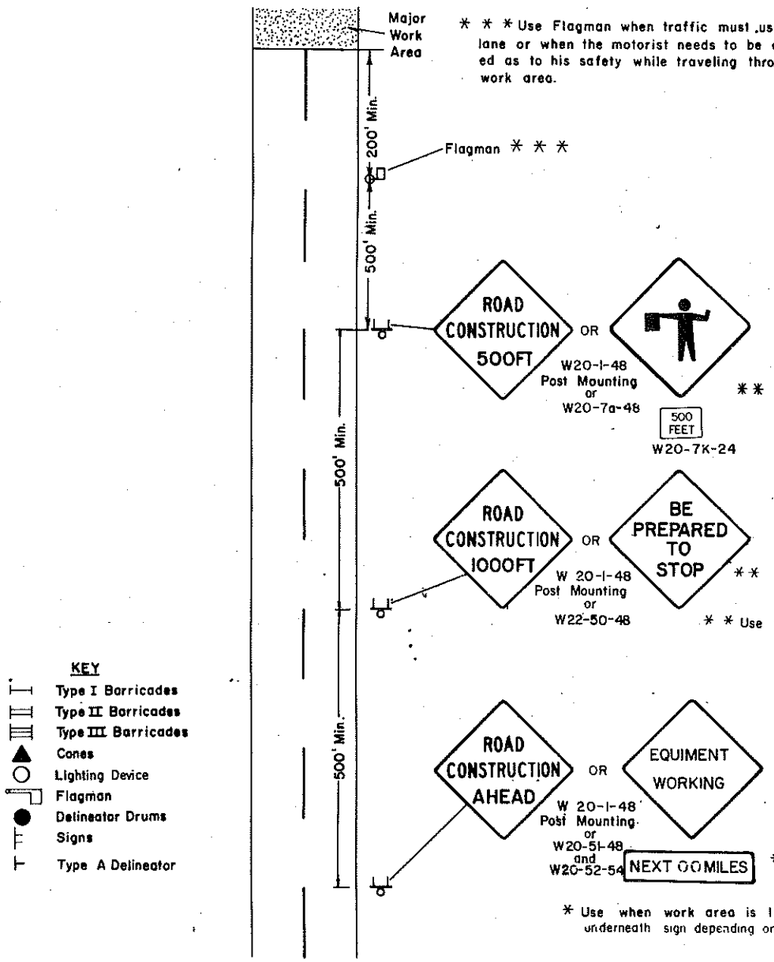
Delineator Drums, Barricades or cones used for tapering traffic shall be spaced at the demention "S".

"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.

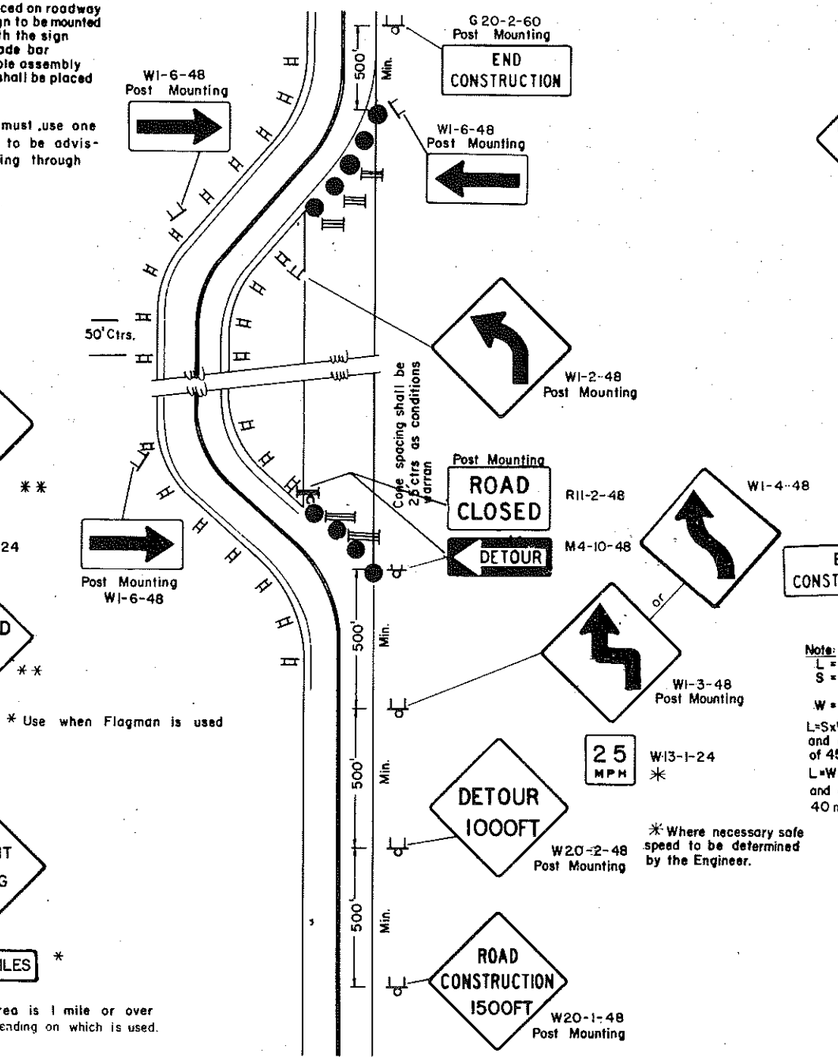
Mounting - Barricade shown to be placed on roadway shall be on a movable Assembly. Sign to be mounted on barricades shall be mounted with the sign bottom on the top of the top barricade bar intermediate Sign shall be on a movable assembly Sign show to be placed on roadway shall be placed on movable assemblies.

* * * 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.



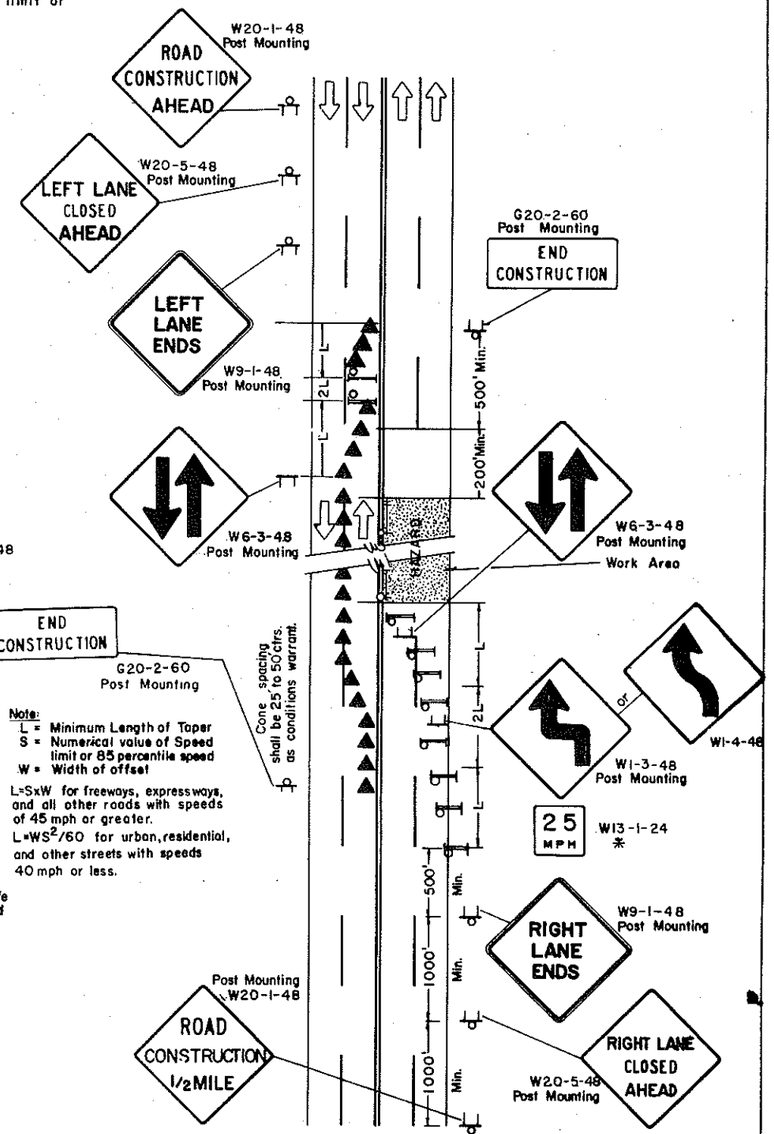
TYPE A
CONSTRUCTION SIGN LAYOUT
2 & 4 Lane Highway when traffic is maintained.
(Sign shown for one end only)
MAJOR WORK AREA
(shall be limited to 3 miles)

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



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

NOTE, (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.

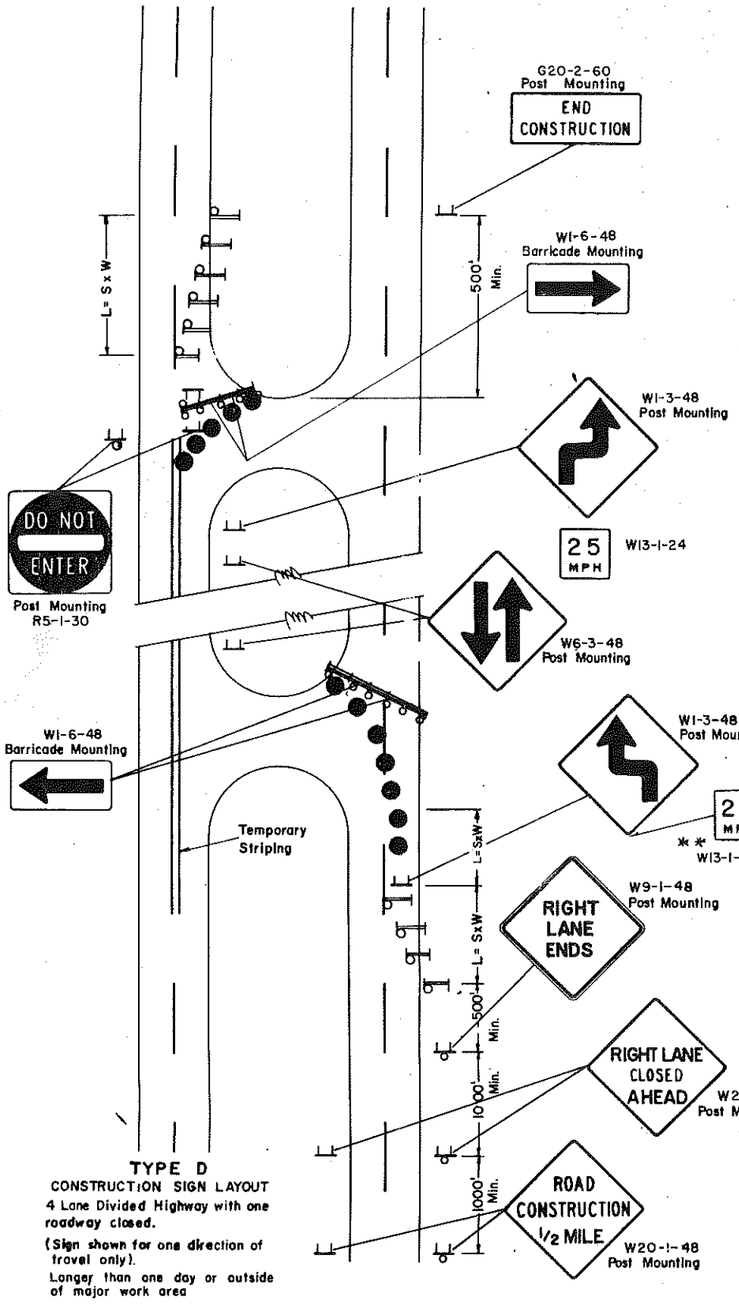
Approved: _____ Chief Engineer

FHWA REGION	STATE	FED AID PROJ NO	SHEET NO
8	N.D.	M-1-988(03)010	56
		D-754-7	

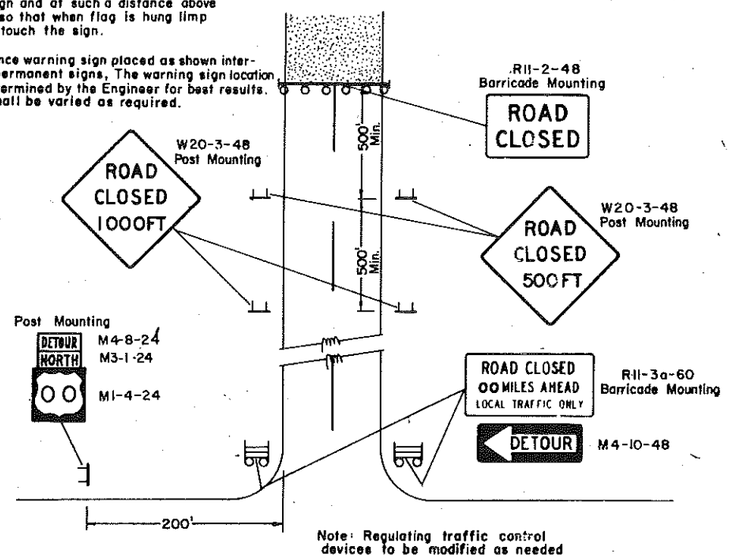
CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

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

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



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



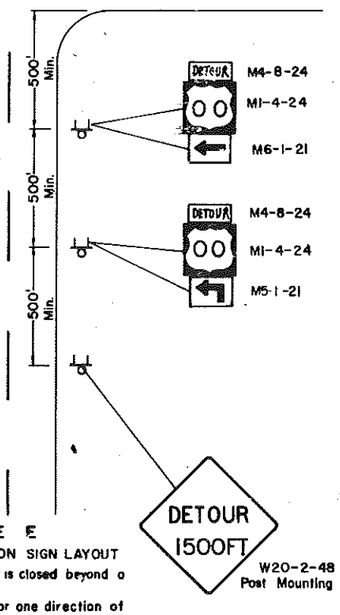
Note: Regulating traffic control devices to be modified as needed for the duration of the detour.

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

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

L = S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater.
L = WS²/60 for urban, residential, and other streets with speeds of 40 mph or less.

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



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

Longer than one day or outside of major work area

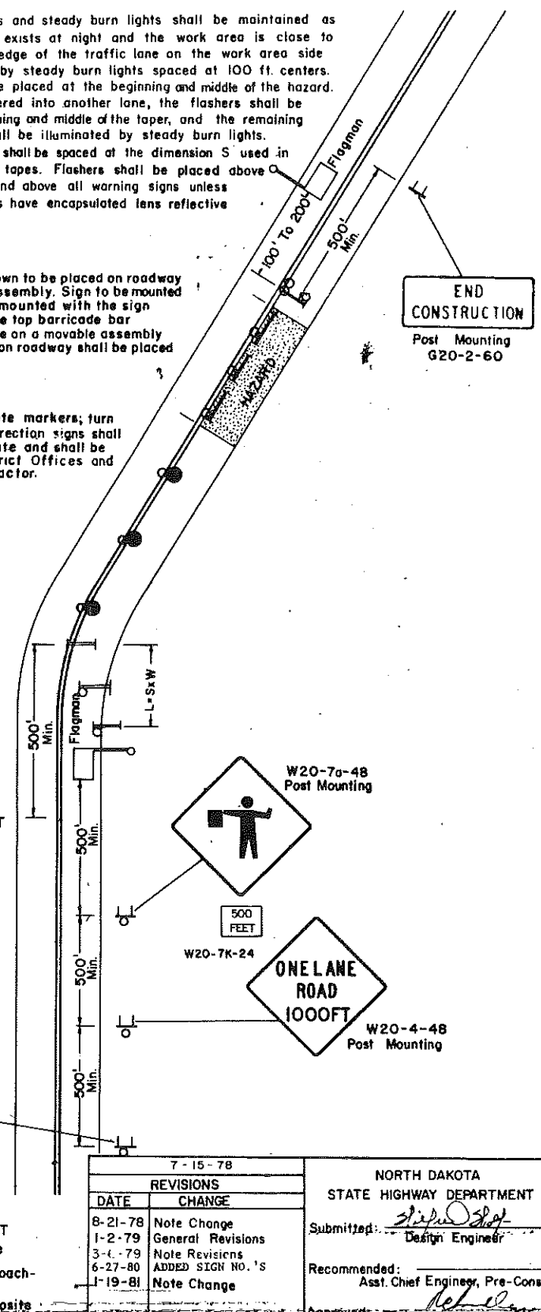
Delineator drums, Barricades or Cones used for tapering traffic shall be spaced at the demention "S".

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

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

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

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



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

REVISIONS	
DATE	CHANGE
8-21-78	Note Change
1-2-79	General Revisions
3-6-79	Note Revisions
6-27-80	ADDED SIGN NO.'S
1-19-81	Note Change

7-15-78

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

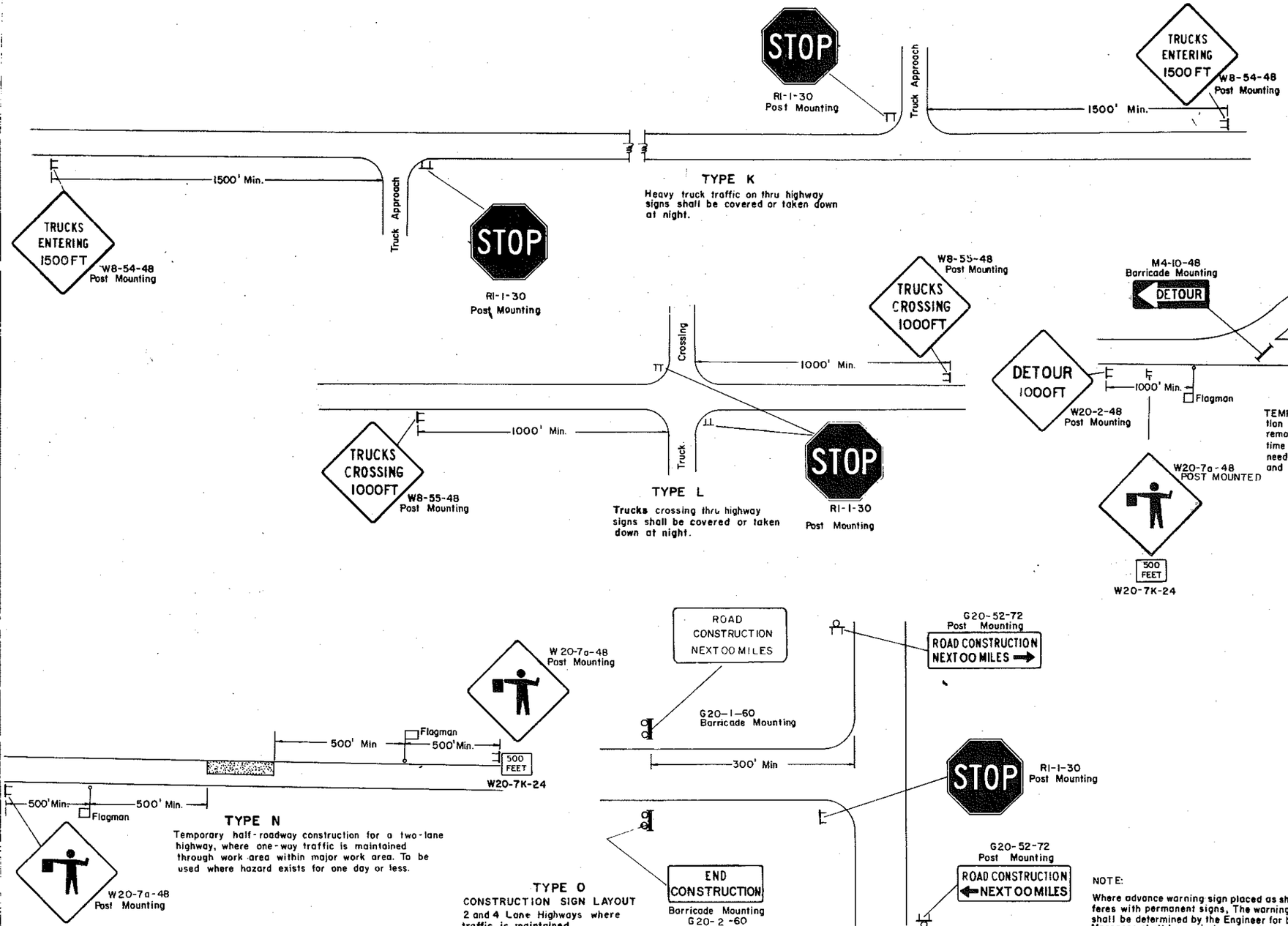
Submitted: _____ Design Engineer

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.	M-1-988(03)010	57
		D-754-10	



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

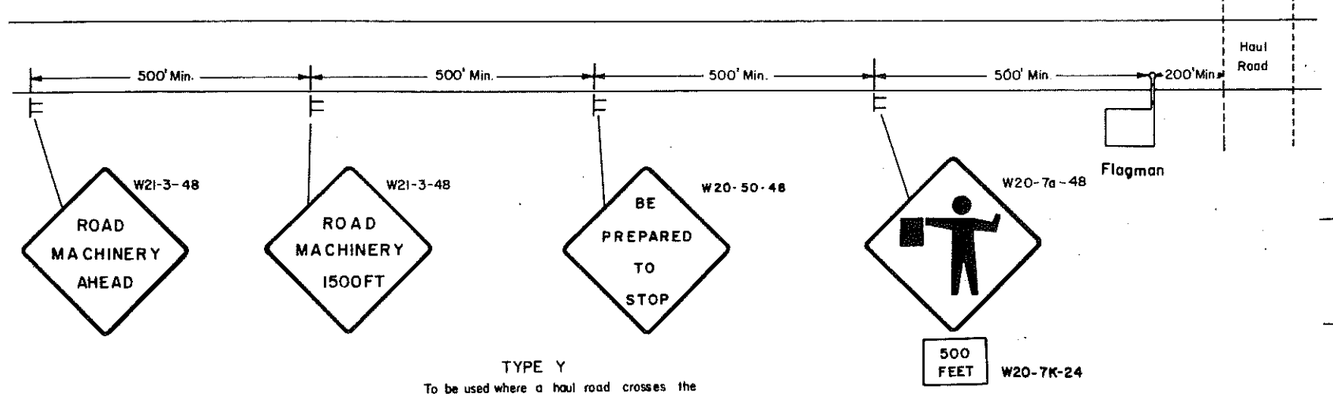
Submitted: _____
Design Engineer

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

Approved: _____
Chief Engineer

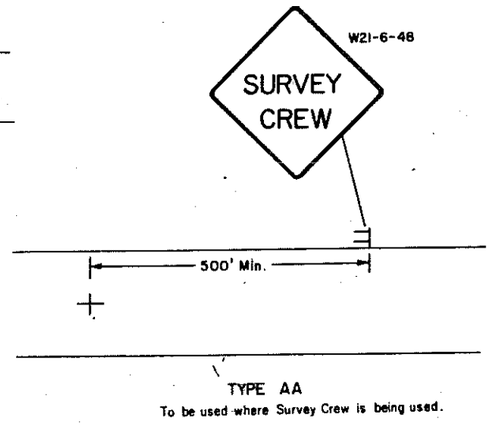
FHWA REGION	STATE	FED. AID. PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)010	58
		D-754-13-A	

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS



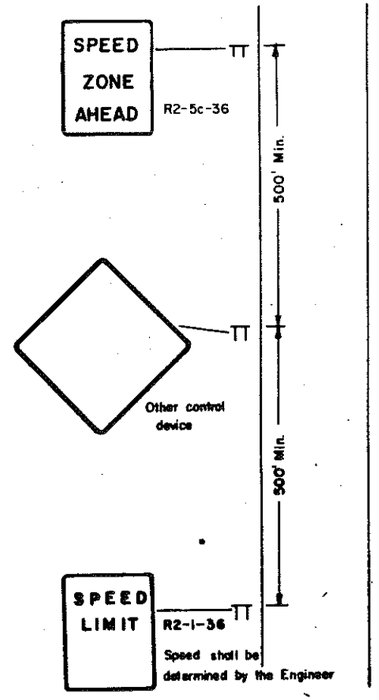
TYPE Y

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



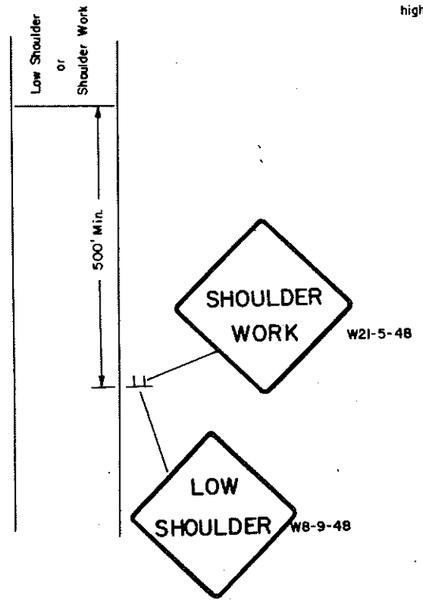
TYPE AA

To be used where Survey Crew is being used.



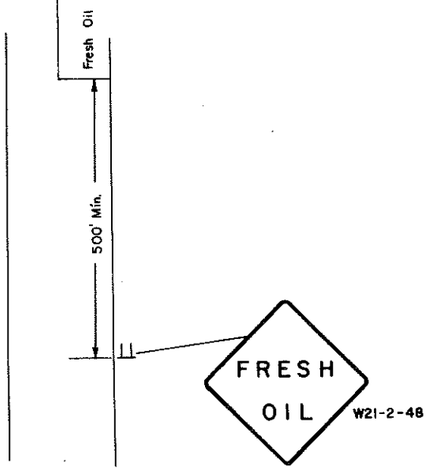
TYPE Z

To be used where speed zone is needed.



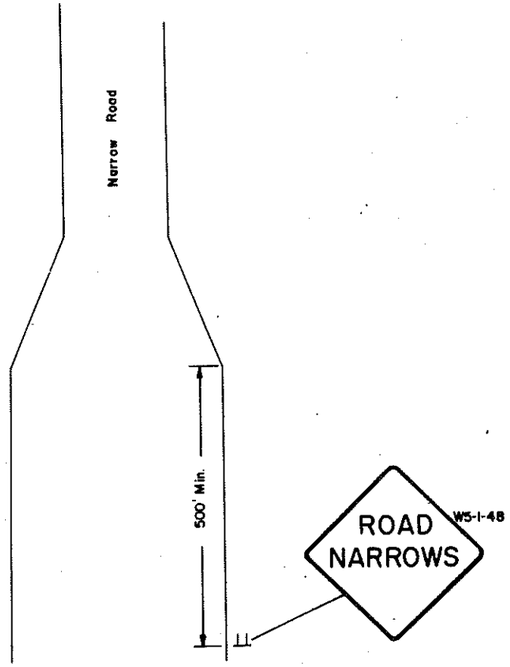
TYPE BB

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



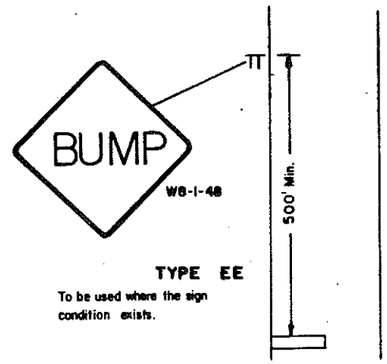
TYPE CC

To be used where the signed conditions exists.



TYPE DD

To be used where the signed condition exists.



TYPE EE

To be used where the sign condition exists.

3-9-79	
REVISIONS	
DATE	CHANGE
6-23-80	Add Sign Std. Number
4-8-81	Sign Change

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

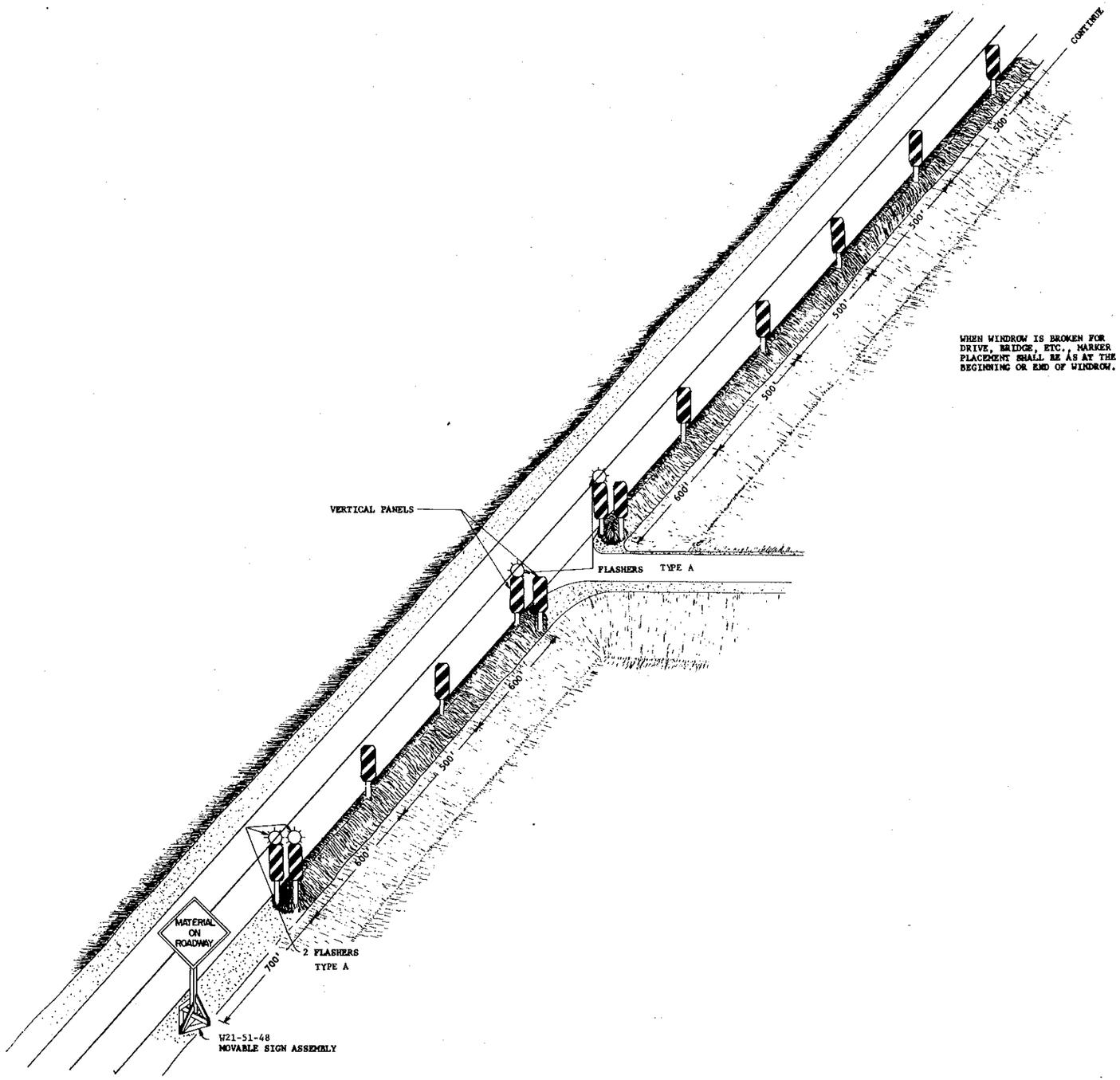
Submitted: _____ Design Engineer

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

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED AID PROJ NO.	SHEET NO.
8	N.D.	M-1-988(03)010	59
		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.

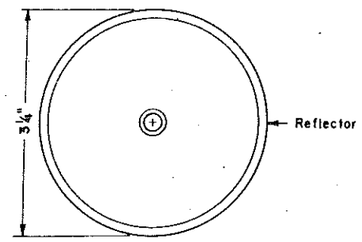
APPROVED: _____ CHIEF ENGINEER

REFLECTORIZED DELINEATORS
ACRYLIC PLASTIC REFLECTORS

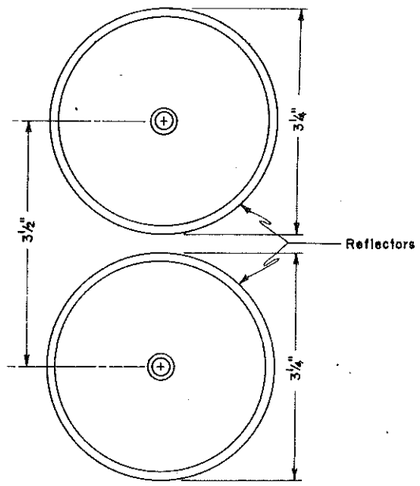
M-1-988(03)010

FHWA REGION	STATE	FED. AID PROJ. NO.	
8	N.D.		60

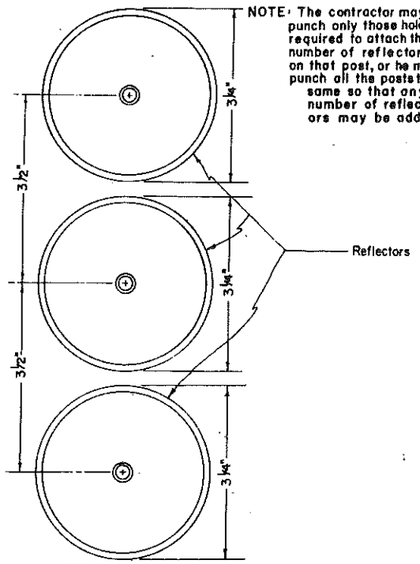
D-754 2



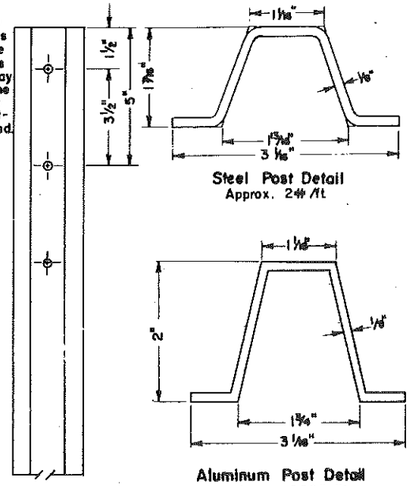
MAIN LINE
ONE REFLECTOR
(TYPE A DELINEATOR)



RAMPS
TWO REFLECTORS
(TYPE B DELINEATOR)

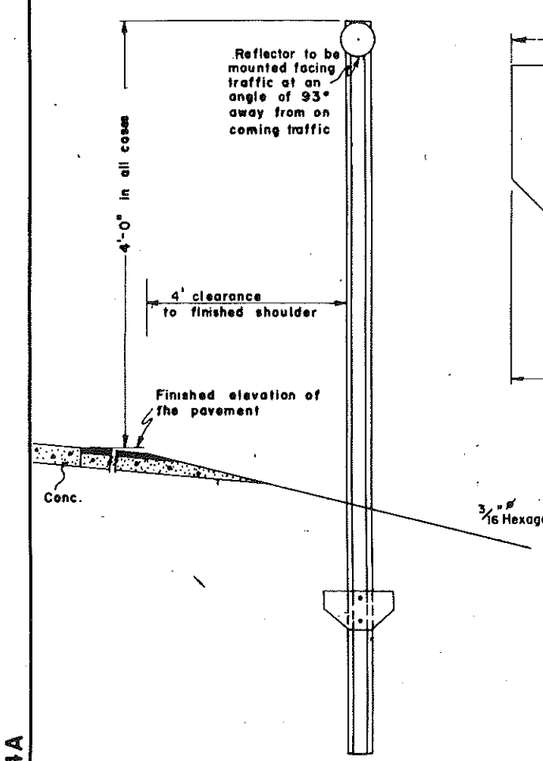


NARROW BRIDGES
THREE REFLECTORS
(TYPE C DELINEATOR)

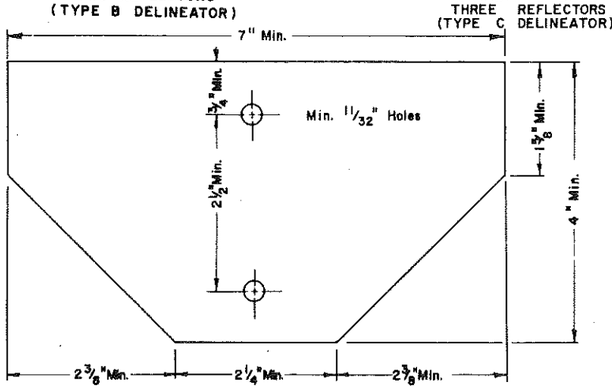


Steel Post Detail
Approx. 2# /ft.

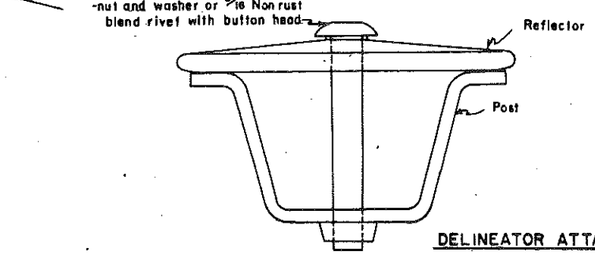
Aluminum Post Detail
Approx. 0.88# /ft.



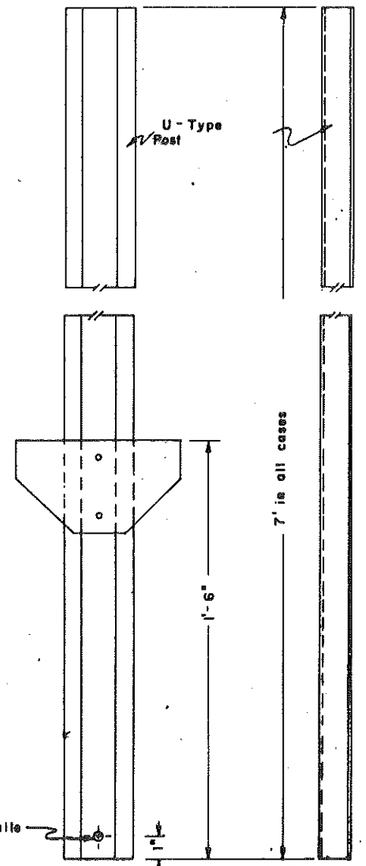
INSTALLATION



SPADE TYPE ANCHOR PLATE
Minimum Wt. 0.75#
Min. ⅛" Thick
Min. 22.36 Sq.in.
Attached to Post with Min. 5/16" Rivets

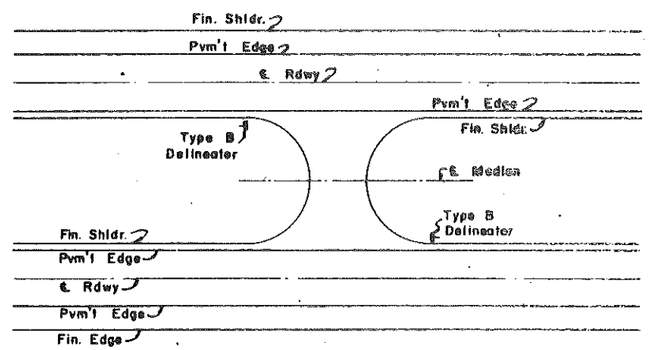


DELINEATOR ATTACHMENT DETAIL



POST

SPACING FOR HIGHWAY DELINEATORS ON HORIZONTAL CURVES (RAMPS)				
Radius in Feet	Spacing on Curve ft.	Spacing in Advance and Beyond Curve in ft.		
		1st Space	2nd Space	3rd Space
1.000	90	185	275	300
900	85	175	260	300
800	80	165	245	300
700	75	150	230	300
600	70	140	210	300
500	65	125	190	300
400	55	110	170	300
300	50	95	145	290
250	40	85	125	250
200	35	70	110	215
150	30	60	90	180
50	20	40	65	125



PLACEMENT OF DELINEATOR
on median crossovers

NOTES:
- Reflectors: The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
- Installation: Posts are to be installed along right shoulder line unless shown otherwise on the plans.
- Spacing: Delineator spacing along main line shall be at 528' ctrs. on tangent and curves less than 0° 30' and 264' ctrs. on curves of 0° 30' and over. Spacing along ramps shall be at 100' ctrs. unless shown otherwise on the plans.
- Posts: Posts shall conform to Sec. 694-7.1 of the Standard Specification. Steel posts shall be galvanized in accordance with ASTM A-123.
- Fasteners: The reflector shall be attached to the post by a non rust tension pin type fastener, or a round unslotted head aluminum machine screw fabricated of aluminum alloy 2024-T4 and vandal resistant nut fabricated of aluminum alloy 2011-T3.

7-18-68

REVISIONS	
DATE	CHANGE
2-3-71	Table Change
4-28-71	Specification Change
1-27-11	Delineator Spacing
10-9-78	Clearance Change
9-15-77	Added Reflectors
12-14-79	Note Change
2-10-81	Change Detail

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

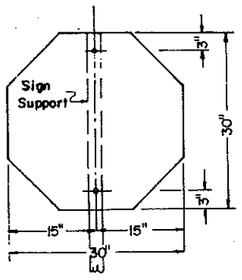
Submitted: _____ Design Engineer

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

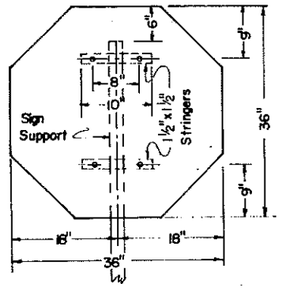
Approved: _____ Chief Engineer

10.4A

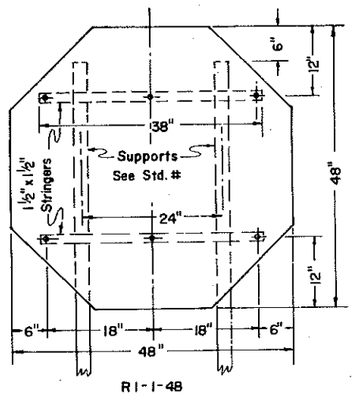
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY AND WARNING SIGNS



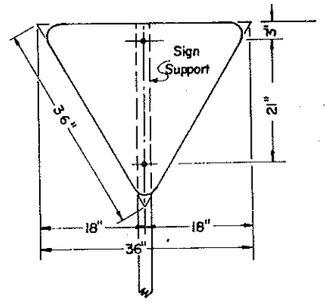
R1-1-30
Assembly 1



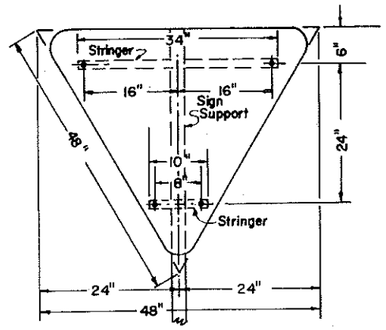
R1-1-36
Assembly 2



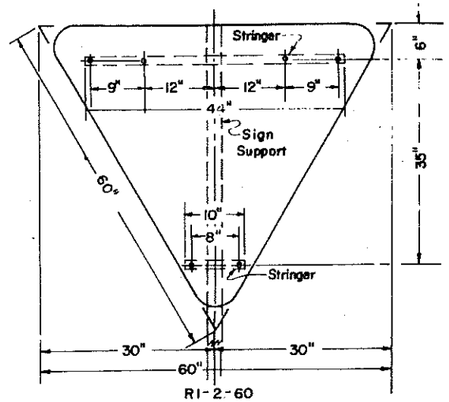
R1-1-48
Assembly 3



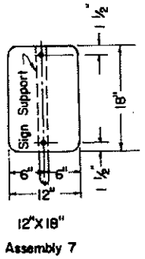
R1-2-36
Assembly 4



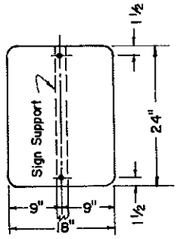
R1-2-48
Assembly 5



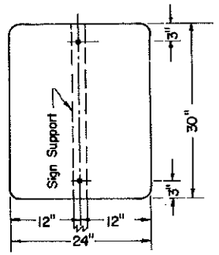
R1-2-60
Assembly 6



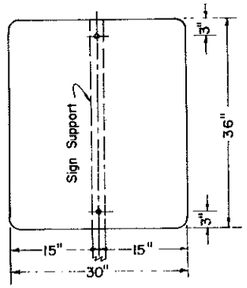
12"X18"
Assembly 7



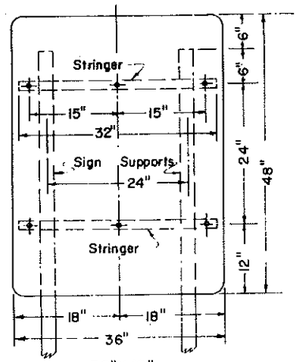
18"X 24"
Assembly 8



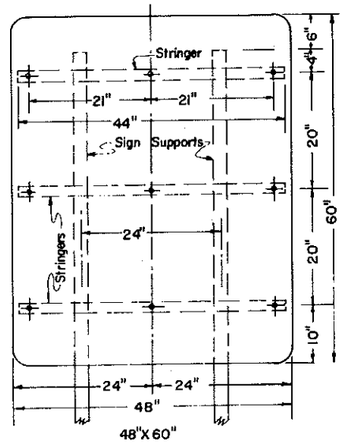
24"X30"
Assembly 9



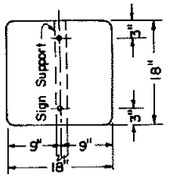
30"X 36"
Assembly 10



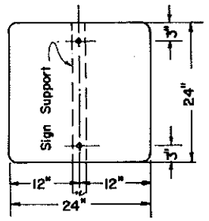
36"X48"
Assembly 11



48"X60"
Assembly 12



18"X18"
Assembly 13



24"X24"
Assembly 14

NOTE:

MATERIAL:

SIGN BACKING: THE SIGN BACKING MATERIAL SHALL BE AS FOLLOWS.

STEEL: SIGNS HAVING A WIDTH OF LESS THAN 36" SHALL USE 14 GAUGE MATERIAL. SIGNS 30" OR MORE SHALL USE 12 GAUGE MATERIAL.

ALUMINUM: ALUMINUM ALLOY 6061-T6 AND 5052-H38 SHALL HAVE THE FOLLOWING MINIMUM THICKNESS: SIGNS 24" OR LESS IN WIDTH SHALL BE 0.100 INCH. SIGNS OVER 24" IN WIDTH SHALL BE 0.125 INCH.

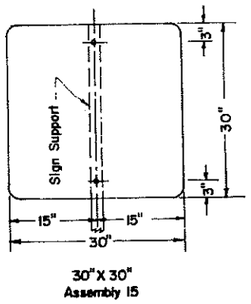
THE YIELD SIGN R1-2-36 ASSEMBLY 4, SHALL HAVE A MINIMUM THICKNESS OF .100 INCH FOR BOTH 6061-T6 AND 5052-H38 ALLOYS.

STRINGERS: ALL STRINGERS SHALL BE SQUARE TUBE, PERFORATED 1½ X 1½ AND OF THE LENGTH SHOWN.

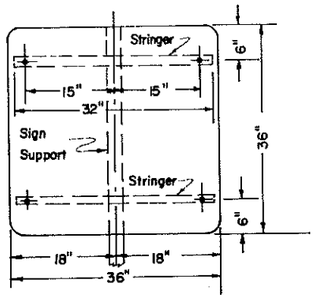
HOLES: ALL HOLES SHALL BE PUNCHED ROUND FOR 3/8" DIAMETER BOLTS.

GENERAL: SEE PLANS FOR SIGN NUMBERS TO BE USED AT EACH LOCATION.
SEE STD. D-754-44 FOR MOUNTING DETAILS.
SEE STD. D-754-23 & 24 FOR POST LENGTH AND SIZES.

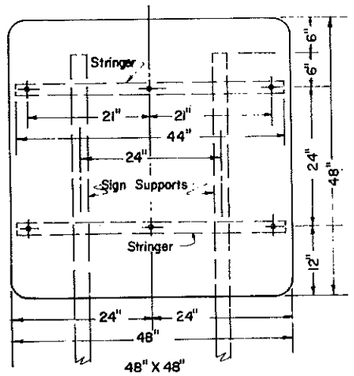
WHEN PARKING SIGNS WITH ARROWS ARE USED TO INDICATE THE RESTRICTED ZONES, THE SIGNS SHOULD BE SET AT AN ANGLE OF NOT LESS THAN 30 NOR MORE THAN 45 DEGREES WITH THE LINE OF TRAFFIC FLOW TO BE VISIBLE TO APPROACHING TRAFFIC.



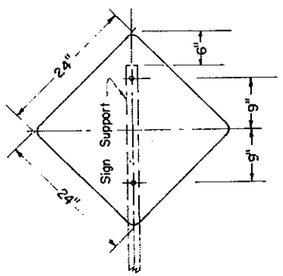
30"X 30"
Assembly 15



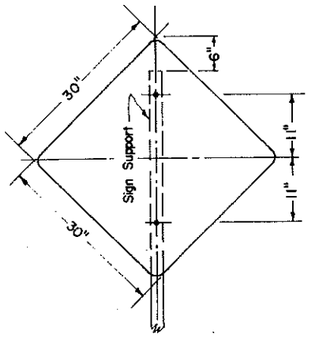
36"X36"
Assembly 16



48"X48"
Assembly 17



24"X24"
Assembly 18



30" X 30"
Assembly 19

11-10-75	
REVISIONS	
DATE	CHANGES
5-4-77	MESSAGE
8-11-78	MATERIAL NOTE
12 28-79	MESSAGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer, Pre-Constr

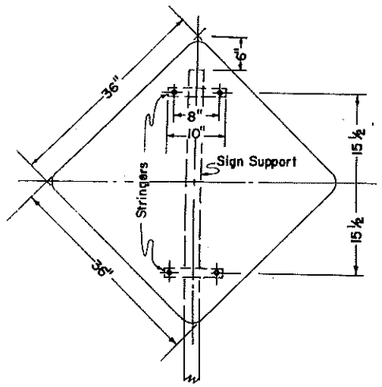
Approved: _____ Chief Engineer

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

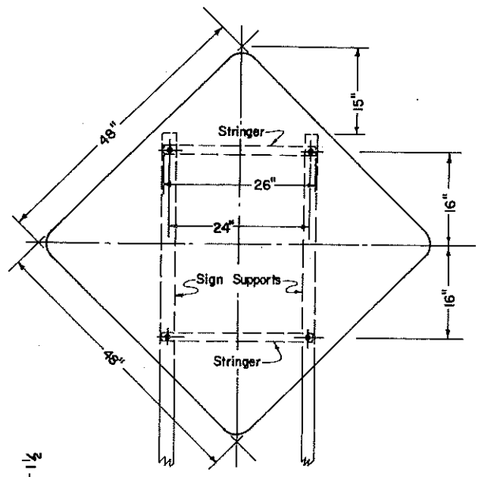
M-1-988(03)010

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.
8	N. D.		62

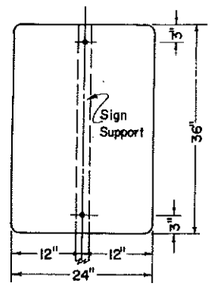
D-754-26



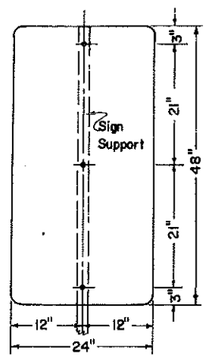
36"X 36"
Assembly 20



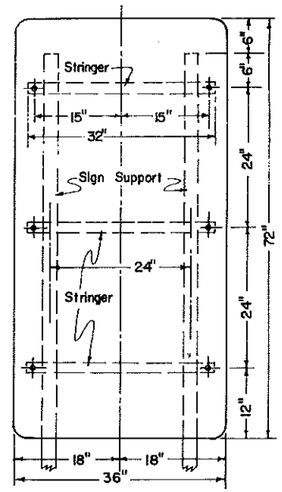
48"X 48"
Assembly 21



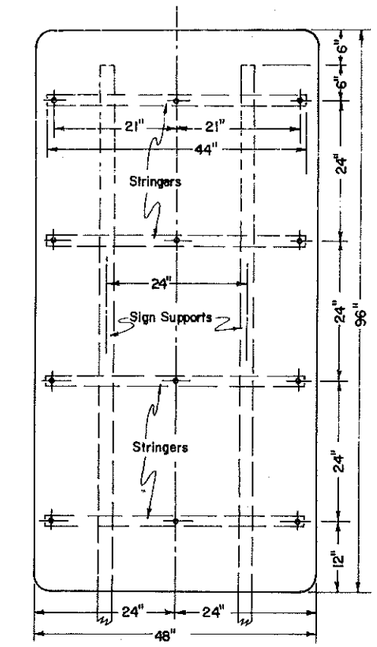
24"X36"
Assembly 22



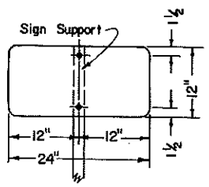
24"X48"
Assembly 23



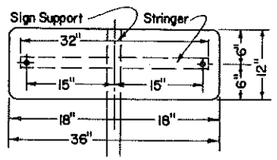
36"X72"
Assembly 24



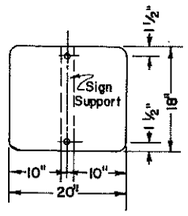
48"X96"
Assembly 25



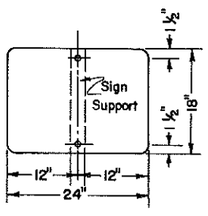
24"X12"
Assembly 26



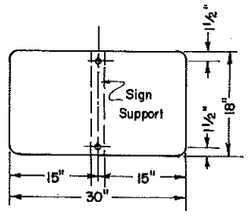
36"X12"
Assembly 27



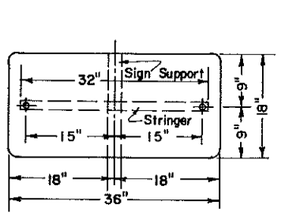
20"X18"
Assembly 28



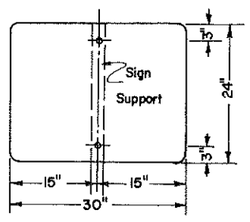
24"X18"
Assembly 29



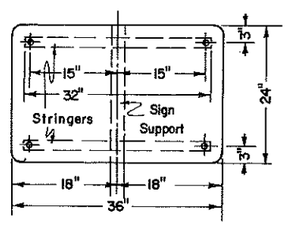
30"X18"
Assembly 30



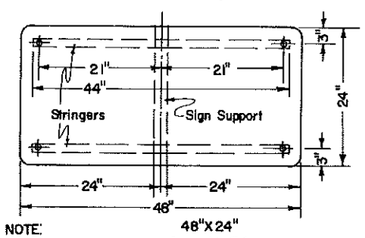
36"X18"
Assembly 31



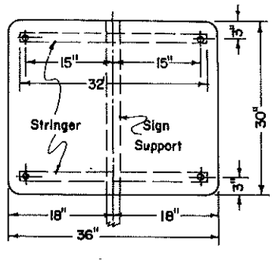
30"X24"
Assembly 32



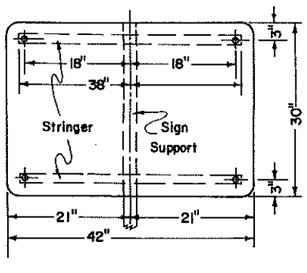
36"X24"
Assembly 33



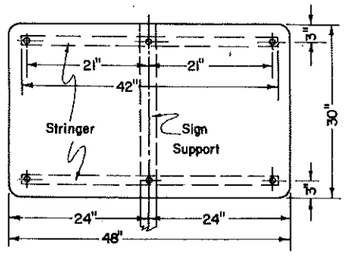
48"X24"
Assembly 34



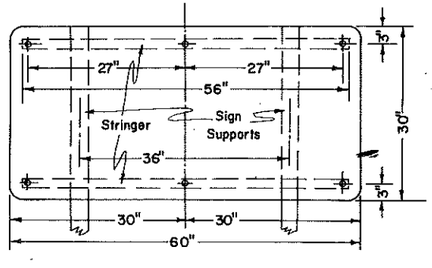
36"X30
Assembly 35



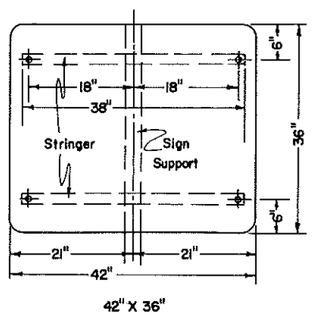
42"X30"
Assembly 36



48"X30"
Assembly 37



60"X30"
Assembly 38



42"X36"
Assembly 39

NOTE:

Material:

Sign Backing: The sign backing material thickness shall be as follows:
Steel: Signs having a width of less than 30" shall use 14 gauge material. Signs 30" or more shall use 12 gauge material.

ALUMINUM: ALUMINUM ALLOY 6061-T6 AND 5052-H38 SHALL HAVE THE FOLLOWING MINIMUM THICKNESS: SIGNS 24" OR LESS IN WIDTH SHALL BE 0.100 INCH. SIGNS OVER 24" IN WIDTH SHALL BE 0.125 INCH.

Stringers: All stringers shall be square tube, perforated 1½ x 1½ and of the length shown.

Holes: All holes shall be punched round for ⅜" diameter bolts.

General: See plans for sign numbers to be used at each location.
See Std. D-754-44 for mounting details.
See Std. D-754-23 & 24 for post length and sizes.

11-10-75 REVISIONS	
DATE	CHANGES
8-11-78	MATERIAL [illegible]

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: [signature]
Design Engineer

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

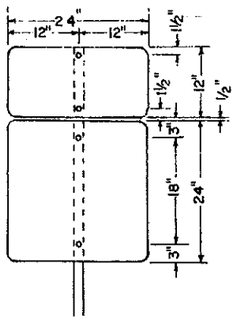
Approved: [signature]
Chief Engineer

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS ROUTE MARKERS

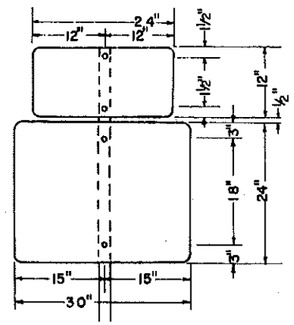
M-1-988(03)010

FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.
8	N. D.		63

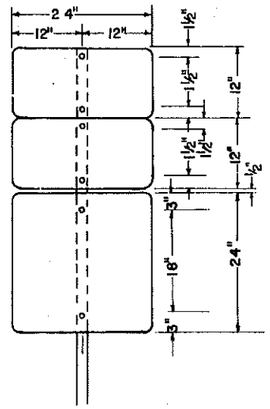
D-754-40



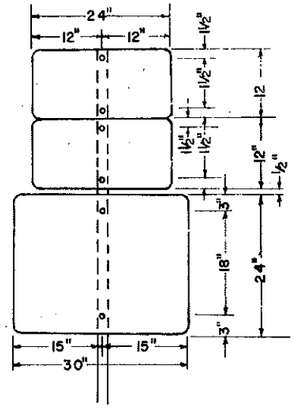
Assembly No.1



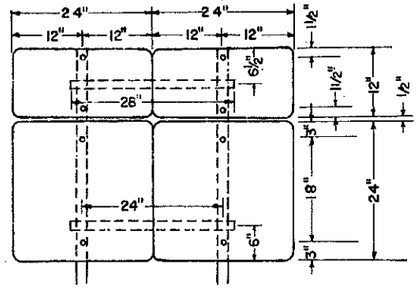
Assembly No. 2



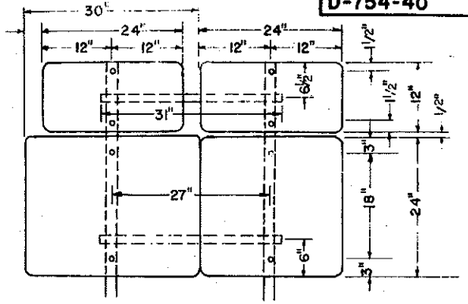
Assembly No.3



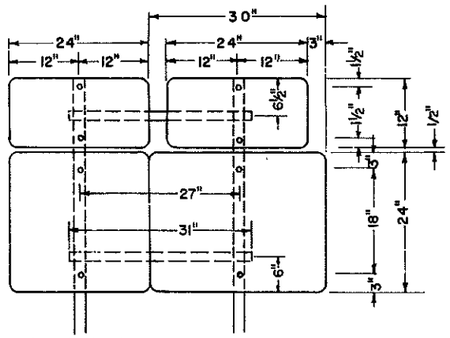
Assembly No.4



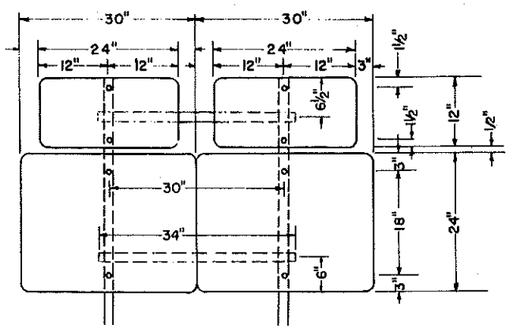
Assembly No. 5



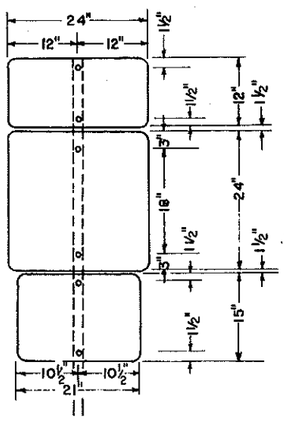
Assembly No. 6



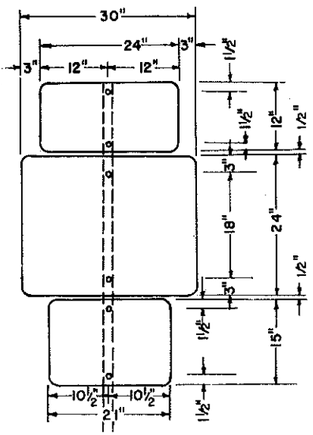
Assembly No. 7



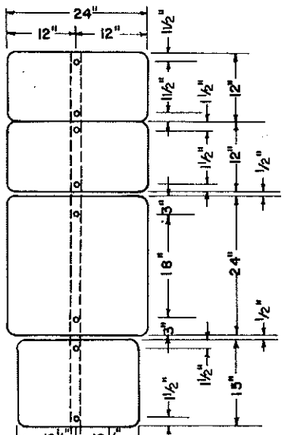
Assembly No. 8



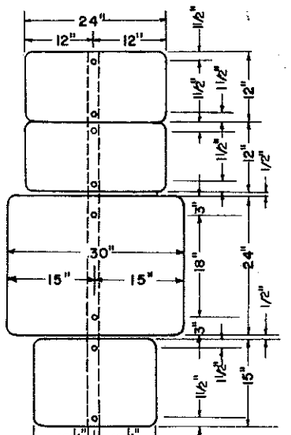
Assembly No. 9



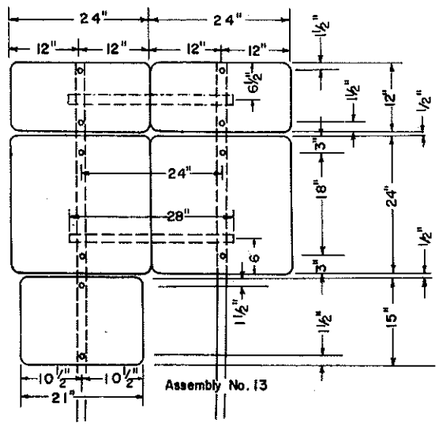
Assembly No.10



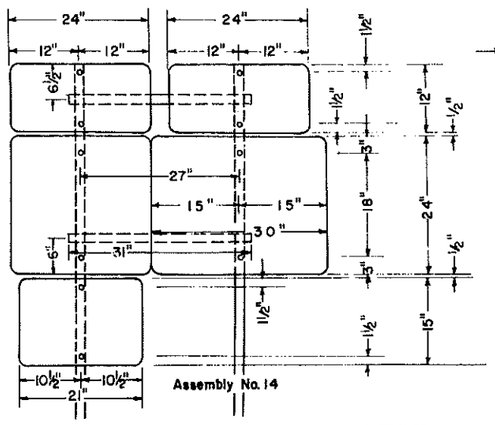
Assembly No.11
NOTE.



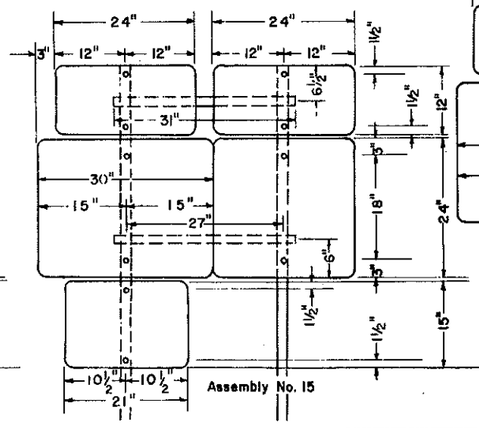
Assembly No. 12



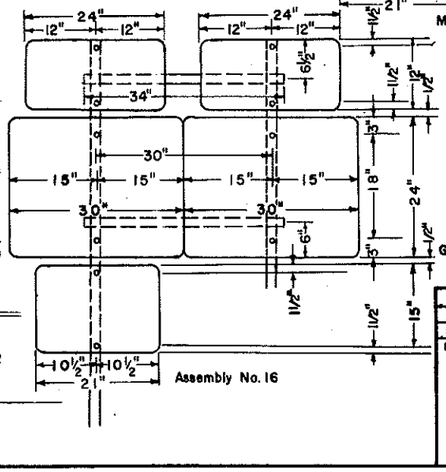
Assembly No. 13



Assembly No. 14



Assembly No. 15



Assembly No. 16

Material:

Sign Backing: The sign backing material thickness shall be as follows.
Steel: Signs having a width of less than 30" shall use 14 gauge material. Signs 30" or more shall use 12 gauge material.

ALUMINUM: ALUMINUM ALLOY 6061-T6 AND 5052-H38 SHALL HAVE THE FOLLOWING MINIMUM THICKNESS: SIGNS 24" OR LESS IN WIDTH SHALL BE 0.100 INCH. SIGNS OVER 24" IN WIDTH SHALL BE 0.125 INCH.

Stringers: All stringers shall be square tube, perforated 1½"x1½" and of the length shown.

Holes: All holes shall be punched round for ⅜" diameter bolts.

General: See plans for sign numbers to be used at each location
See Std. D-754-44 for mounting details
See Std. D-754-39 for post length and sizes.

11-13-75

REVISIONS	
DATE	CHANGE
8-11-76	MATERIAL NOTE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____
Design Engineer

Recommended: _____
Asst. Chief Engineer
Pre-Construction

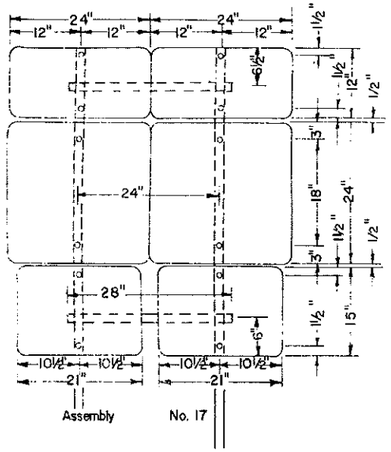
Approved: _____
Chief Engineer

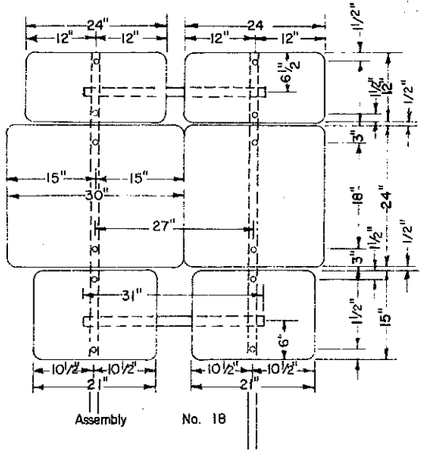
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS ROUTE MARKERS

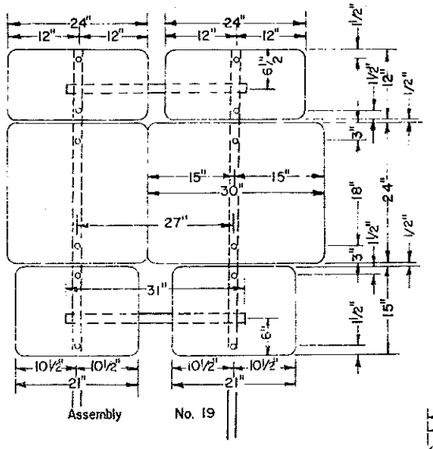
M-1-988(03)010

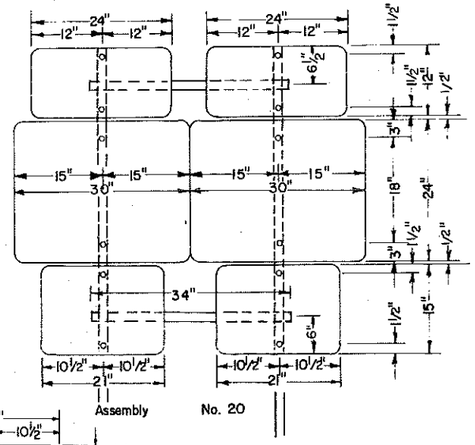
FED. ROAD DIST. NO.	STATE	PROJ. NO.	SHEET NO.
8	N. D.		64

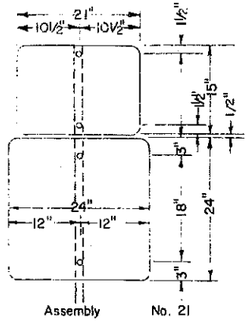
D-754-41

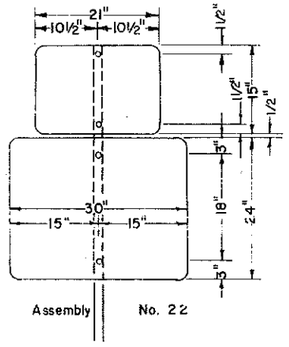


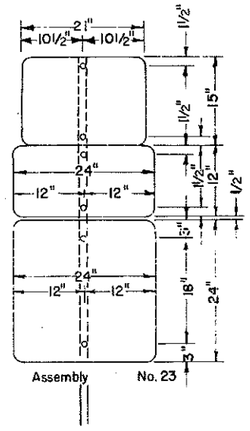


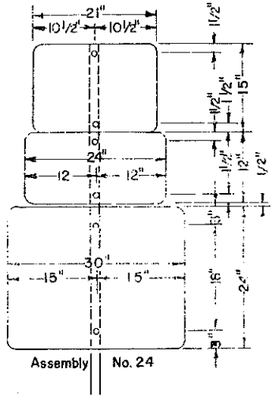


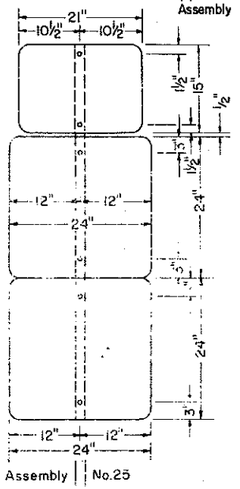


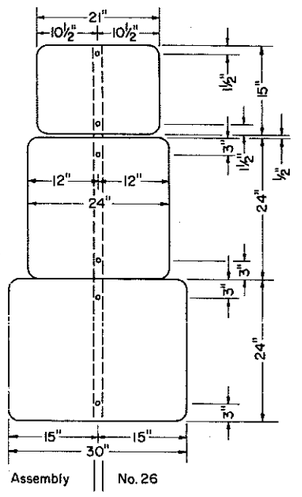


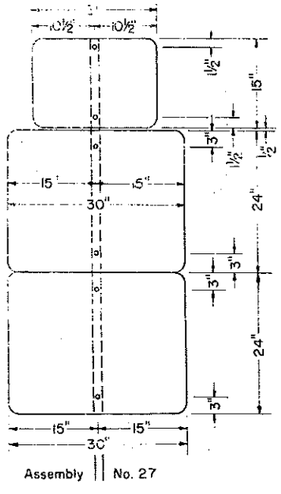


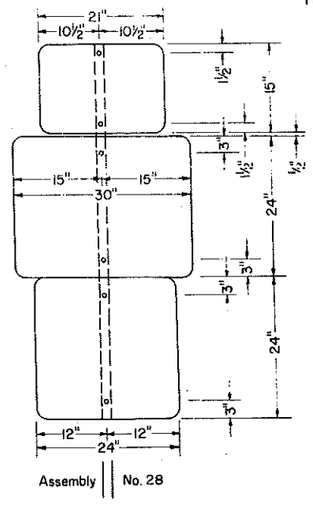


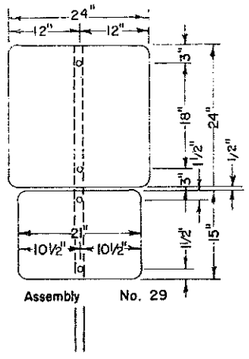


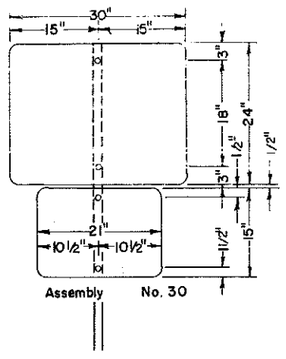












NOTE:

Material:

Sign Backing: The sign backing material thickness shall be as follows.

Steel: Signs having a width of less than 30" shall use 14 gauge material: Signs 30" or more shall use 12 gauge material:

ALUMINUM: ALUMINUM ALLOY 5061-T6 AND 5052-H38 SHALL HAVE THE FOLLOWING MINIMUM THICKNESS: SIGNS 24" OR LESS IN WIDTH SHALL BE 0.100 INCH. SIGNS OVER 24" IN WIDTH SHALL BE 0.125 INCH.

Stringers: All stringers shall be square tube, perforated 1 1/2" X 1 1/2" and of the length shown.

Holes: All holes shall be punched round for 3/8" diameter bolts.

General; See plans for sign numbers to be used at each location.
See Std. D-754-44 for mounting details.
See Std. D-754-39 for post lengths and sizes.

11-13-75	
REVISIONS	
DATE	CHANGE
8-11-78	MATERIAL NOTE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

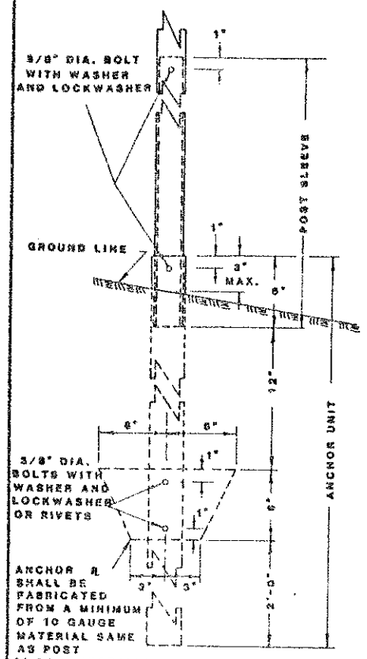
Submitted _____ Design Engineer

Recommended: _____ Asst. Chief Engineer Pre-Construction

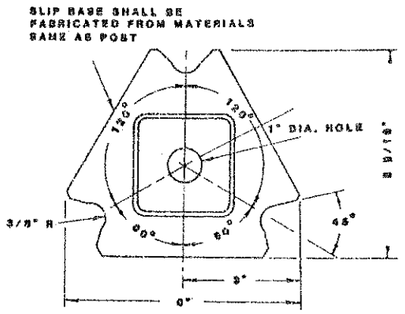
Approved: _____ Chief Engineer

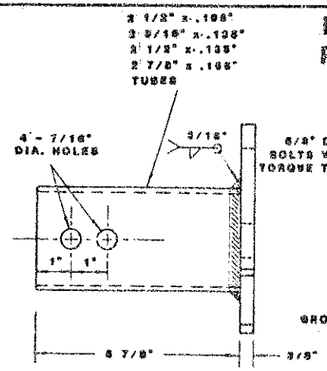
MOUNTING DETAILS
PERFORATED TUBE

STATE	FED. AID PROJ. NO.	SHEET NO.
N.D.	M-1-988(03)010	65

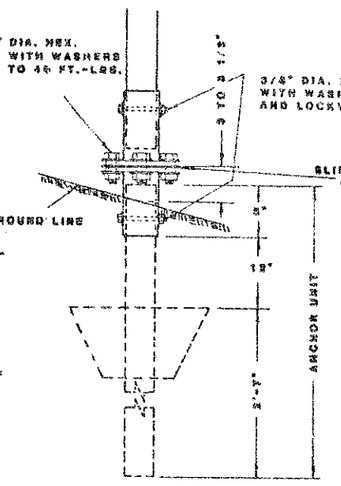


ANCHOR UNIT AND POST SLEEVE ASSEMBLY

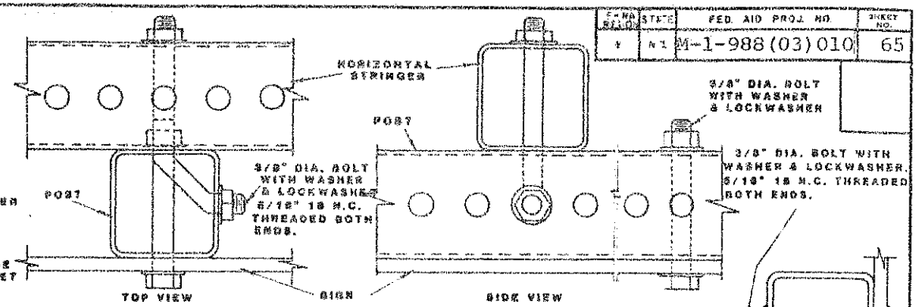




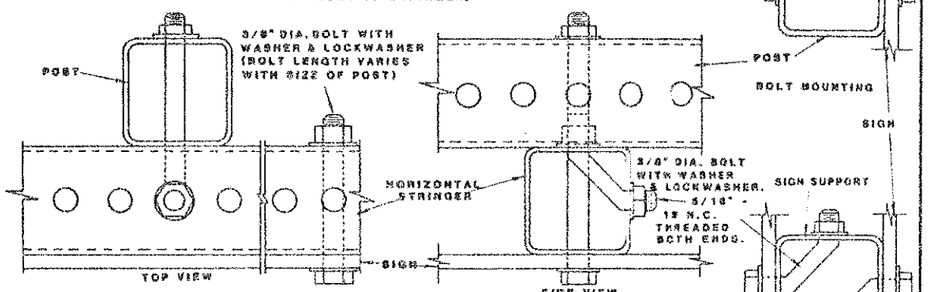
SLIP BASE DETAIL
REQUIRED ON ALL 2 1/2" (12 GA.), 2 3/16" (10 GA.), 2 1/2" (10 GA.) POSTS & ALL THREE OR MORE POST ASSEMBLIES



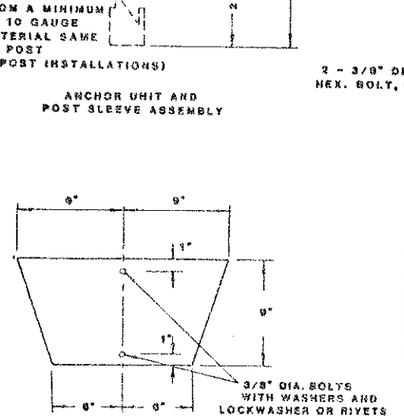
SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY



STRINGER MOUNTING
(WITH POST IN FRONT OF STRINGER)



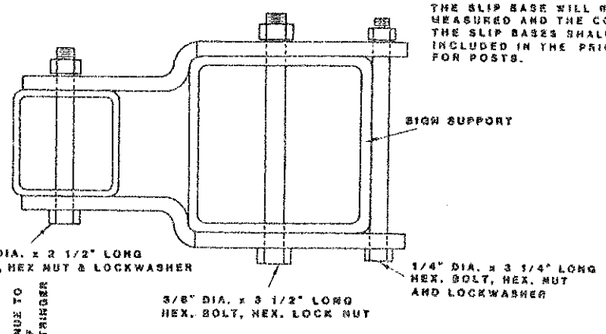
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)
ALTERNATE A



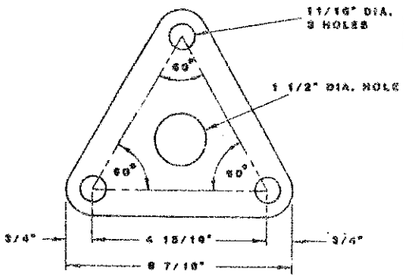
ANCHOR R SHALL BE FABRICATED FROM A MINIMUM OF 10 GAUGE MATERIAL SAME AS POST

ANCHOR PLATE DETAIL
(2 OR MORE POST INSTALLATIONS)

THE 2 3/16" SIZE 10 GAUGE IS SHOWN AS 2.19" SIZE ON THE PLANS. THE 2 1/2" SIZE 10 GAUGE IS SHOWN AS 2.51" SIZE ON THE PLANS.

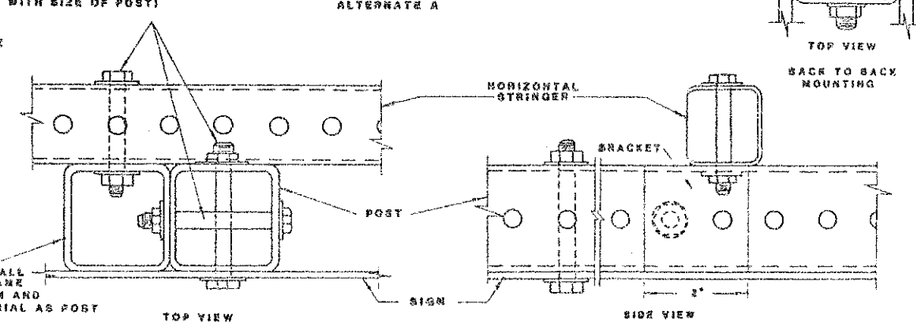


THE SLIP BASE WILL NOT BE MEASURED AND THE COST OF THE SLIP BASES SHALL BE INCLUDED IN THE PRICE BID FOR POSTS.

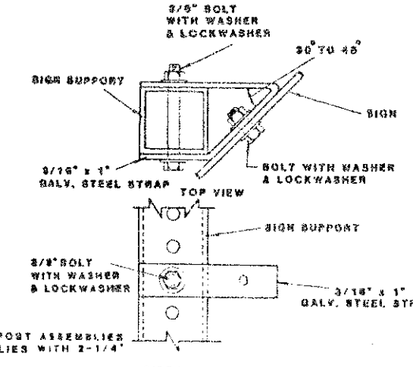


SLIP BASE GASKET

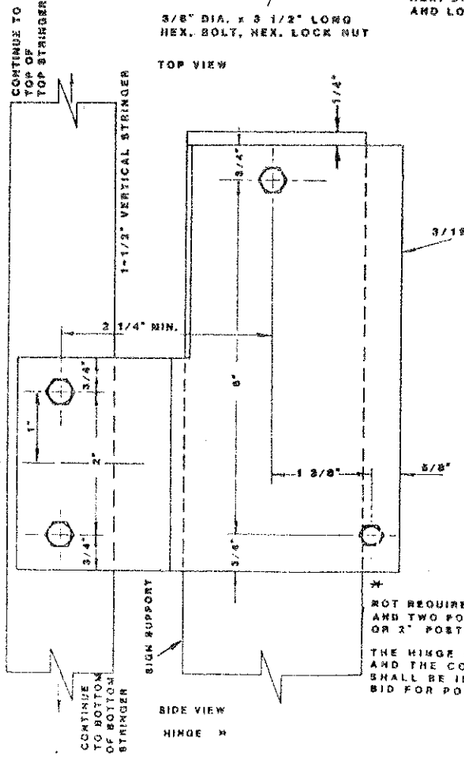
NOTE: THE SLIP BASE GASKET SHALL BE FABRICATED FROM POLYPROPYLENE (BLACK) COPOLYMER. THICKNESS: 0.060" ±.010"



STRINGER MOUNTING
(WITH POST IN FRONT OF STRINGER)



STRAP DETAIL



* NOT REQUIRED ON ONE POST ASSEMBLIES AND TWO POST ASSEMBLIES WITH 2-1/4" OR 2" POSTS.

THE HINGE WILL NOT BE MEASURED AND THE COST OF THE HINGES SHALL BE INCLUDED IN THE PRICE BID FOR POSTS.

NO PARKING SIGNS: ALL NO PARKING SIGNS THAT HAVE DIRECTIONAL ARROWS PLACED ON THEIR FACES SHALL BE PLACED AT 30 TO 45 DEGREE ANGLE WITH ONCOMING TRAFFIC. MATERIAL USED FOR THE ATTACHMENT STRAPS SHALL BE INCLUDED IN THE PRICE BID FOR FLAT SHEET SIGNS

TELESCOPING PERFORATED TUBES

TUBE SIZE IN.	WALL THICKNESS IN.	U.S. STANDARD GAUGE	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN.⁴	CROSS SECT. AREA IN. SQ.	SECTION MODULUS IN.³
1 1/2 x 1 1/2	.105	12	1.705	.129	.380	.172
2 x 2	.105	12	2.416	.372	.590	.372
2 1/4 x 2 1/4	.105	12	2.773	.561	.695	.499
2 3/16 x 2 3/16	.135	10	3.432	.605	.841	.590
2 1/2 x 2 1/2	.105	12	3.141	.804	.803	.643
2 1/2 x 2 1/2	.135	10	4.006	.979	1.016	.785

REVISIONS	
DATE	CHANGE
MAY 13 1982	

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

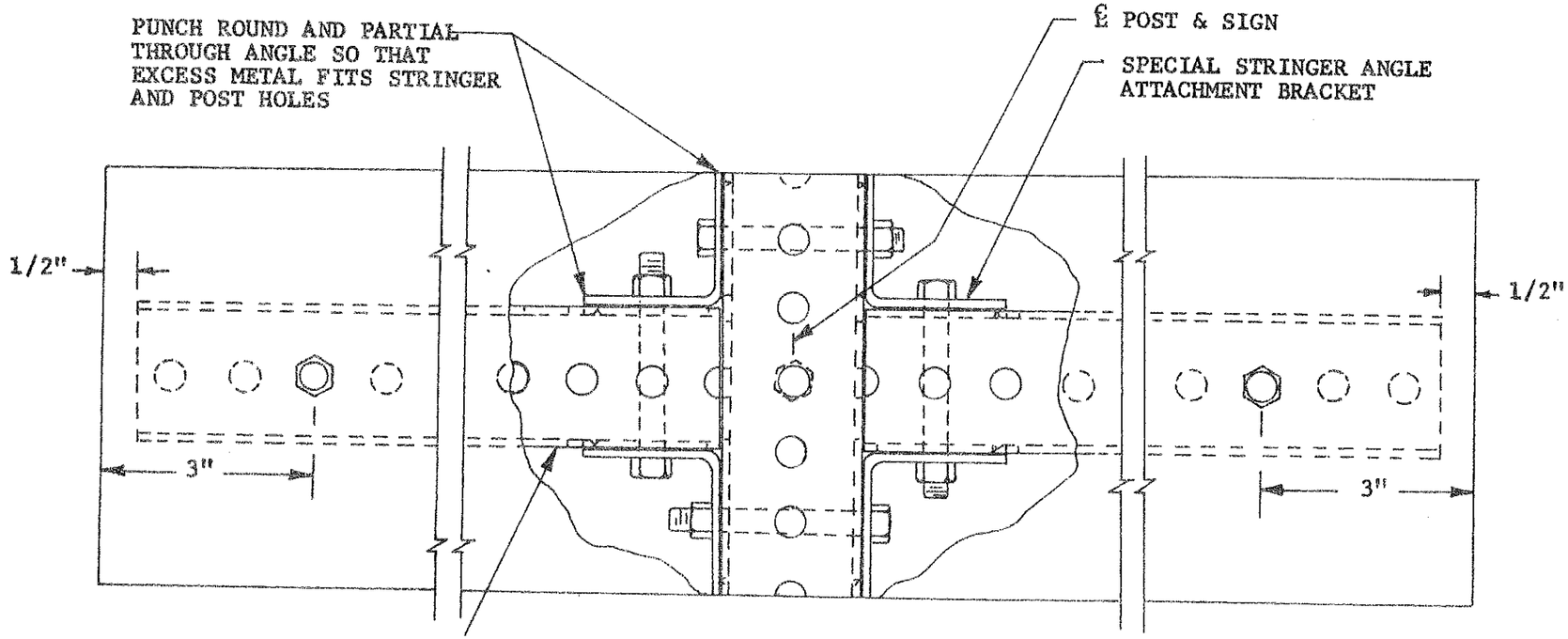
SUBMITTED _____ DESIGN ENGINEER

RECOMMENDED _____ ASST. CHIEF ENGINEER, PRE-CONSTR.

APPROVED _____ CHIEF ENGINEER

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-988(03)010	66

STRINGER LAYOUT FOR ASSEMBLY A & B

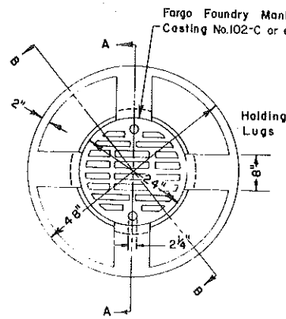


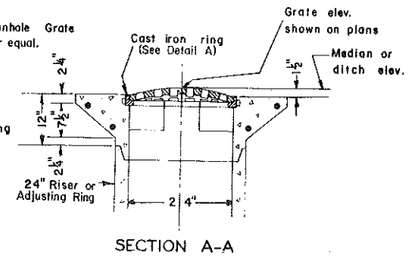
M-1-988(03)010

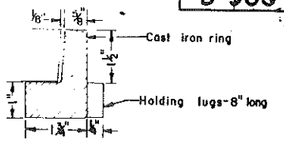
FED. AID PROJ. NO.	SHEET NO.
S N.D.	68

D-900-9

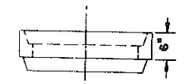
PRECAST CONCRETE MEDIAN DRAIN



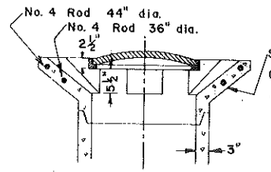


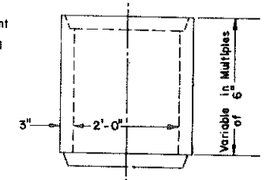


DETAIL A

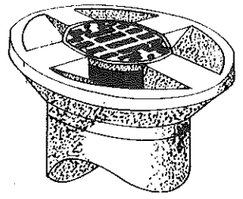


ADJUSTING RING

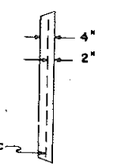




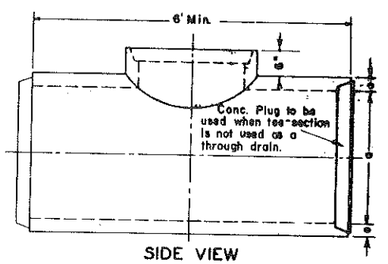
RISER SECTION



TYPE A

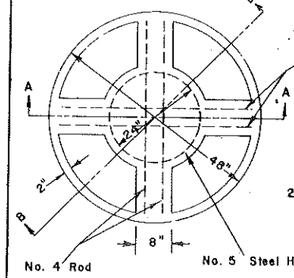


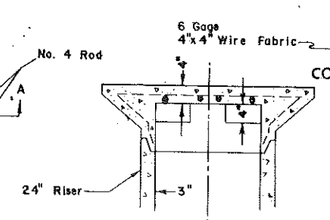
CONC. PLUG

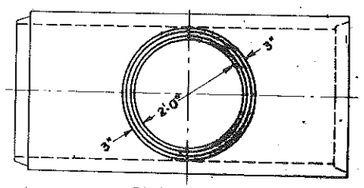


SIDE VIEW

a=Diameter of drainage pipe
e=Wall thickness of drainage pipe





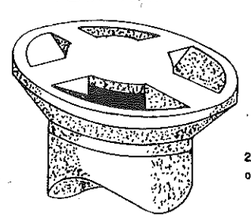


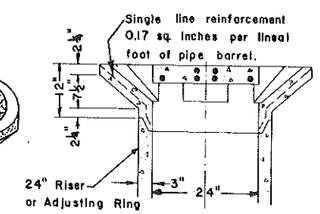
PLAN VIEW

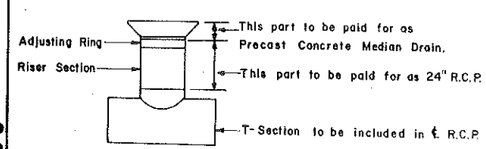
Reinforcement in above sections shall be in accordance with Standard Specifications.

T-SECTION

PLAN VIEW







TYPE B

4.10C

1-1-75 REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

SUBMITTED: Design Engineer

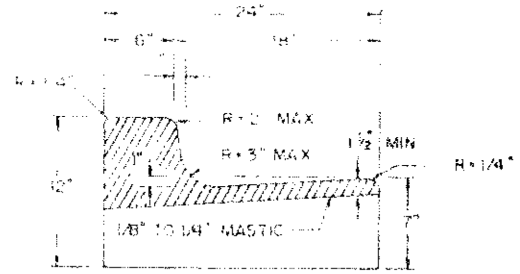
RECOMMENDED: Asst. Chief Engineer Pre-Construction

APPROVED: Chief Engineer

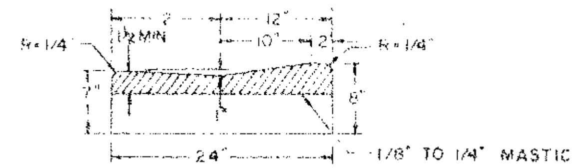
FHWA REGION	STATE	PROJECT	SHEET NO.
8	N.D.	M-1-988(03)014	69A

D-708-1

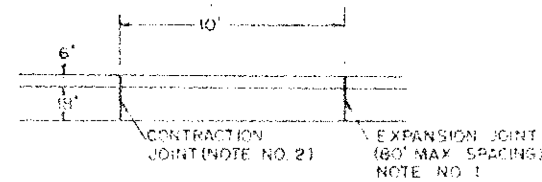
VALLEY GUTTER AND CURB & GUTTER



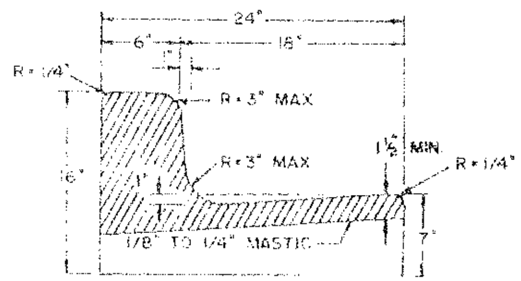
CURB & GUTTER TYPE I (SEC. A)



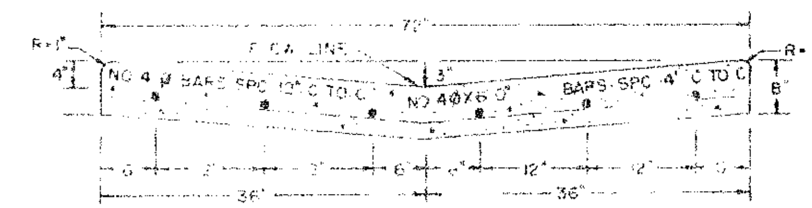
MOUNTABLE CURB & GUTTER
TYPE I (SEC. A)



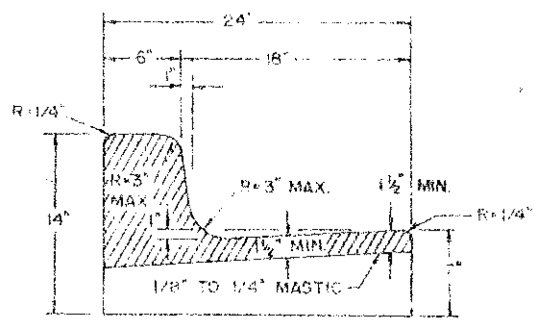
EXPANSION JOINT DETAIL



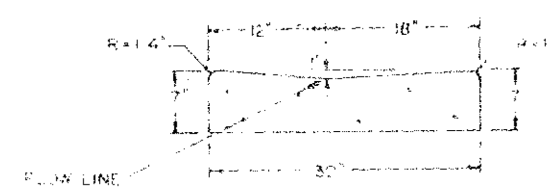
CURB & GUTTER TYPE I (SEC. B)



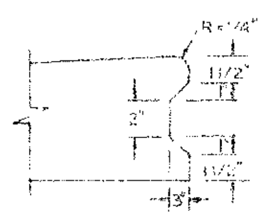
72" CONCRETE VALLEY GUTTER



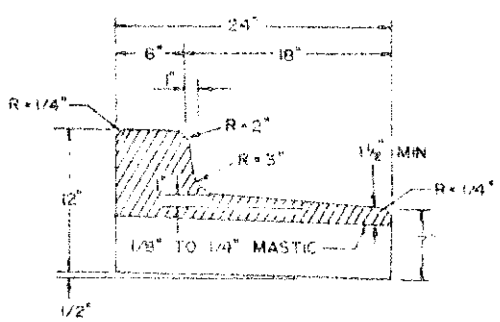
CURB & GUTTER TYPE I (SEC. C)



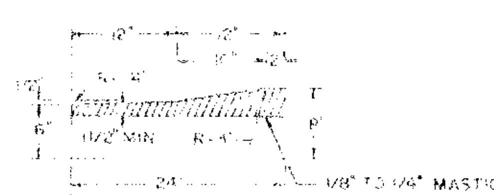
30" CONCRETE VALLEY GUTTER



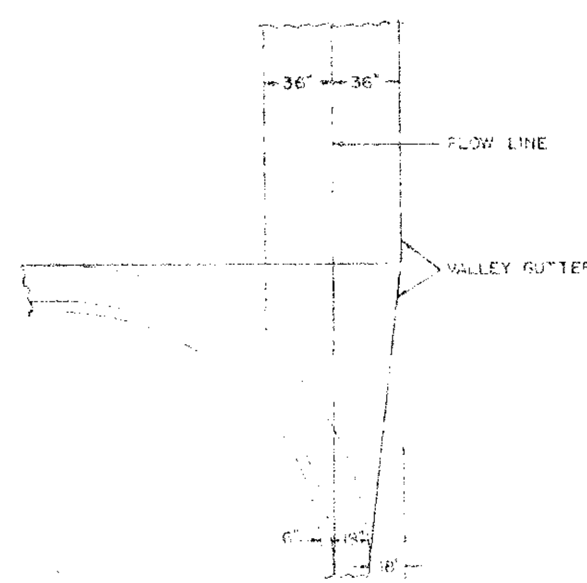
KEYWAY DETAIL FOR
CURB & GUTTER
(TO BE USED WITH P.C.C. PAVEMENT)



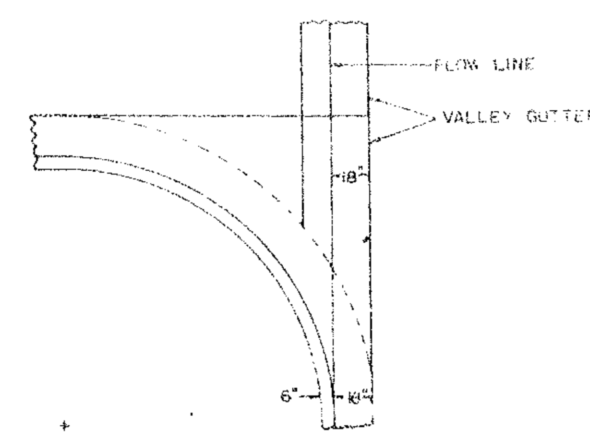
CURB & GUTTER TYPE I (SEC. D)



MOUNTABLE CURB & GUTTER
TYPE I (SEC. B)



72" CONCRETE VALLEY GUTTER



30" CONCRETE VALLEY GUTTER

NOTES:

1. 3/4" PREMOLDED [illegible] FULL DEPTH [illegible] SAME SHAPE AS [illegible] GUTTER. ALL [illegible] BE SEALED [illegible] WITH A MATERIAL APPROVED BY THE ENGINEER.

2. CONTRACTION JOINTS [illegible] USE 1/8"-1/4" ASPHALTIC MASTIC BOARD EMBEDDED 1-1/2" INTO THE GUTTER AND THROUGH THE CURB. THE CONTRACTOR MAY SCORE THE CURB AND GUTTER TO A DEPTH OF 2" AS AN ALTERNATE TO USING ASPHALTIC MASTIC BOARD UPON APPROVAL OF THE ENGINEER. CONTRACTION JOINTS SPACING SHALL BE AS SHOWN IN ABOVE DETAIL OR MATCH JOINTS IN PCC PAV'T.

3. THE CONTRACTOR MAY USE A [illegible] TOP OF CURB IN PLACE OF A 6" TOP. THE FACE OF THE CURB WILL BE MEASURED 6" FROM THE BACK OF THE CURB IN ALL CASES.

4. CURB & GUTTER TYPE I (SEC. A) TO BE USED UNLESS OTHERWISE SPECIFIED.

7-26-77

REVISIONS

DATE	CHANGE
8-21-80	ADDED NOTE NO. 4.

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: Design Engineer

Recommended: Ass't Chief Engineer Pre-Construction

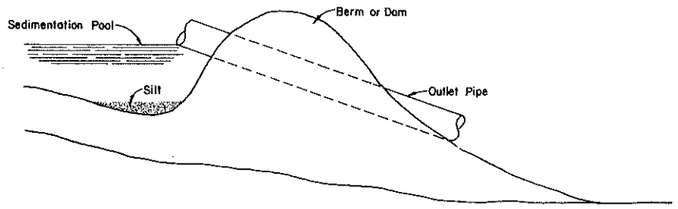
Approved: Chief Engineer

TEMPORARY EROSION AND SILTATION CONTROLS

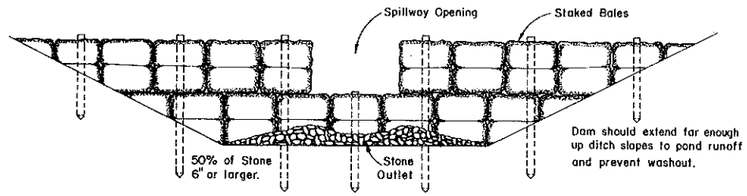
M-1-988(03)010

FHWA REGION	STATE	NO.	SHEET NO.
8	N.D.		69

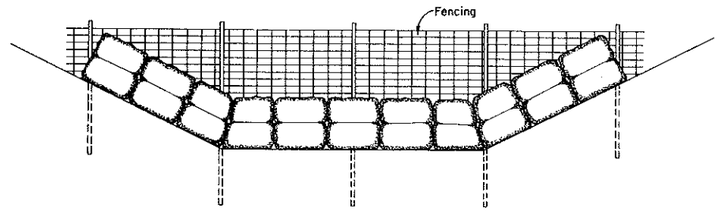
D-900-20



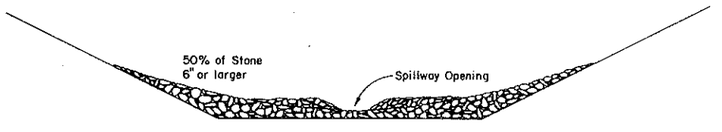
SMALL SEDIMENT DAM OR BERM



STAKED BALES

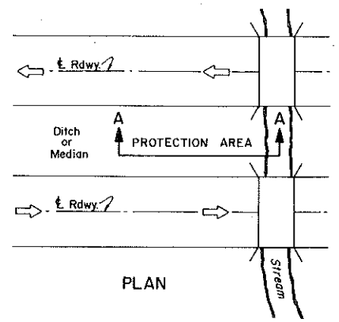


FENCE-BACKED BALES

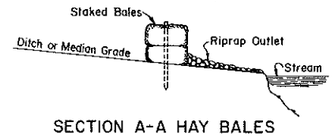


GRADED STONE

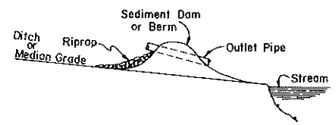
DITCH EROSION DAMS



PLAN

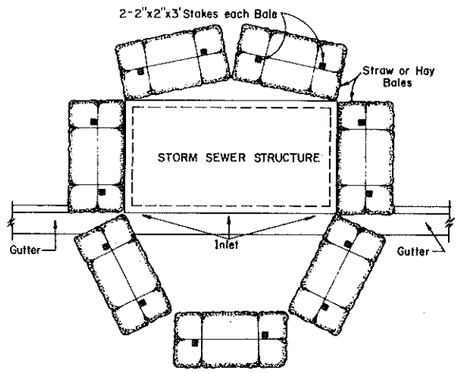


SECTION A-A HAY BALES

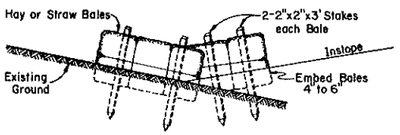


SECTION A-A SEDIMENT DAM OR BERM

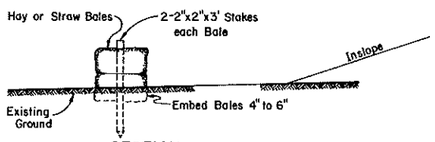
MEDIAN OR DITCH PROTECTION AT STREAM CROSSINGS



STORM SEWER INLET EROSION & SILTATION BARRIER



SECTION



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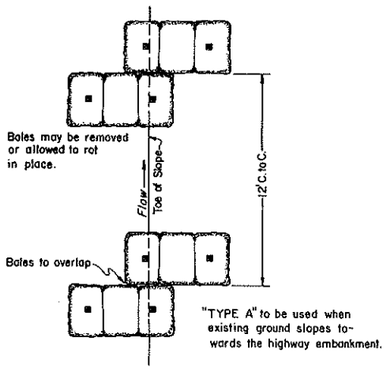
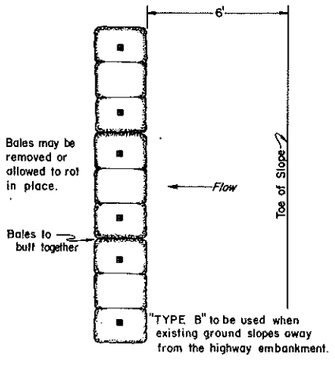
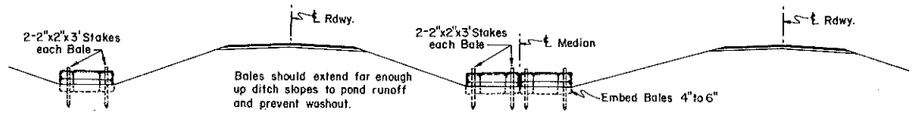


PLAN
"TYPE A"

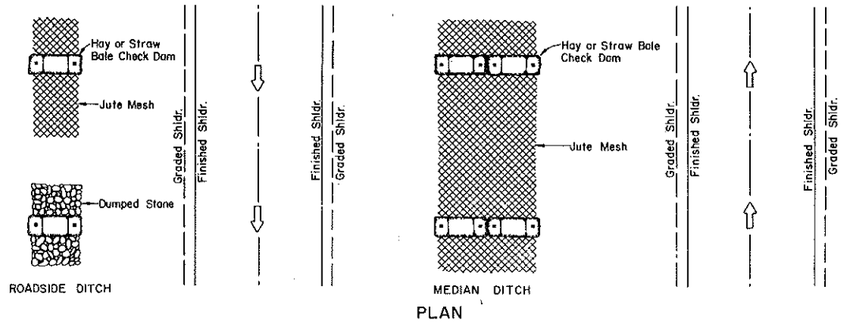


PLAN
"TYPE B"

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: R. P. Thomas
Design Engineer

Recommended: _____
Asst. Chief Engineer
Pre-Construction

Approved: _____
Chief Engineer

12 Ft. Lt. of ℄ Survey

12 Ft. Rt. of ℄ Survey

Rt.-50 Ft. of ℄ Sur.

Ledge Rock (Sandstone)

PI 208+00 El 1875.9 VC 300'

PI 220+00 El 1815.0 VC 200'

PI 227+00 El 1799.0 VC 200'

PI 237+00 El 1792.6

PI 217+00 El 1825.0 VC 200'

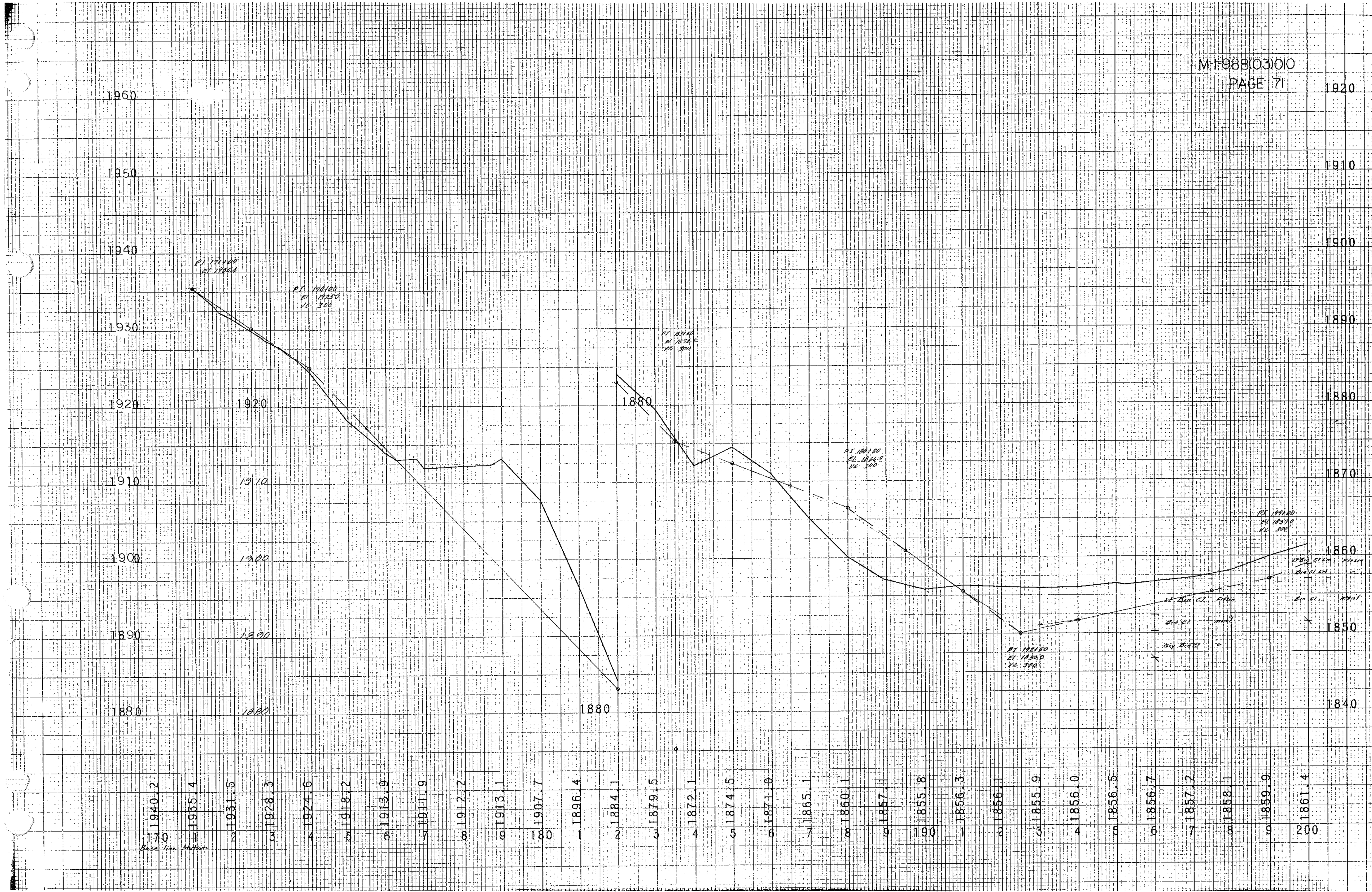
PI 224+00 El 1811.0 VC 300'

1900 1890 1880 1870 1860 1850 1840 1830 1820

1820 1810 1800 1790 1820 1810 1800 1790 1780

1861.4 1863.8 1864.5 1865.7 1868.2 1870.3 1872.7 1874.9 1876.2 1875.6 1872.6 1867.4 1859.6 1850.0 1840.1 1832.5 1826.4 1821.8 1817.6 1813.5 1811.0 1810.4 1810.8 1811.8 1813.5 1811.0 1803.7 1796.0 1792.8 1792.9 1792.7

200 1 2 3 4 5 6 7 8 9 210 1 2 3 4 5 6 7 8 9 220 1 2 3 4 5 6 7 8 9 230


1960
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1940.2
1935.4
1931.5
1928.3
1924.6
1918.2
1913.9
1911.9
1912.2
1913.1
1907.7
1896.4
1884.1
1879.5
1872.1
1874.5
1871.0
1865.1
1860.1
1857.1
1855.8
1856.3
1856.1
1855.9
1856.0
1856.5
1856.7
1857.2
1858.1
1859.9
1861.4
170 1 2 3 4 5 6 7 8 9 180 1 2 3 4 5 6 7 8 9 190 1 2 3 4 5 6 7 8 9 200
Base line Stations

M--988(03)010

PAGE 72

35 Ft. Lt. of Proposed ℄

Old Red Trail

105' Lt. of Proposed ℄

No H2O

H2O Level 14.6'

76' Lt. of Proposed ℄

70' Lt. of Proposed ℄

H2O Level 8.4'

45' Lt. of Proposed ℄

H2O Level 5.0'

H2O Level 6.0'

18' Lt. of Proposed ℄

Old Red Trail

H2O Level 6.7'

35 Ft. Rt. of Proposed ℄

No H2O

H2O Level 15.1'

H2O Level 9.6'

H2O Level 3.2'

H2O Level 6.4'

H2O Level 5.0'

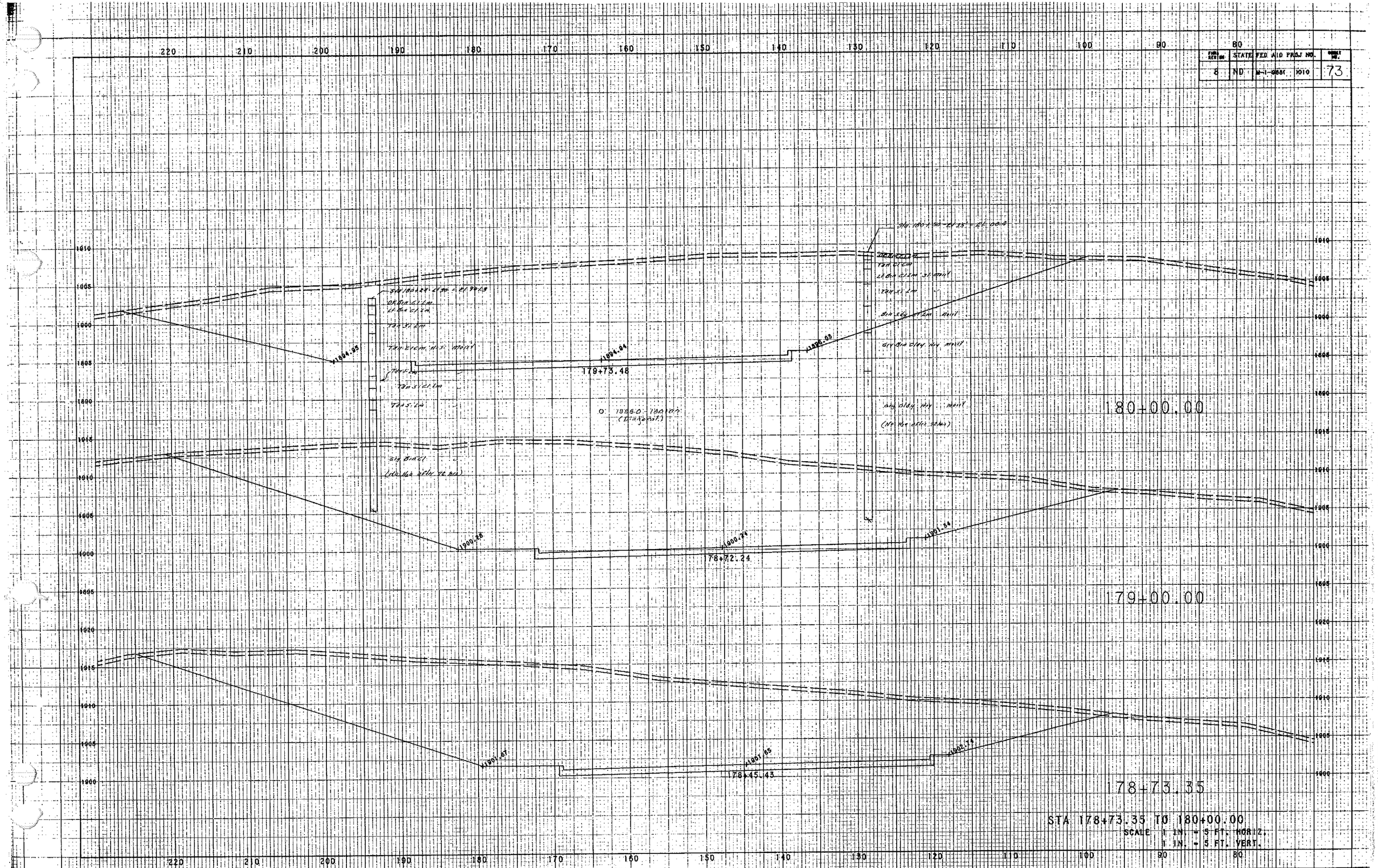
H2O Level 13.1'

1900 1890 1880 1870 1860 1910

180 181 182 183 184 185 186

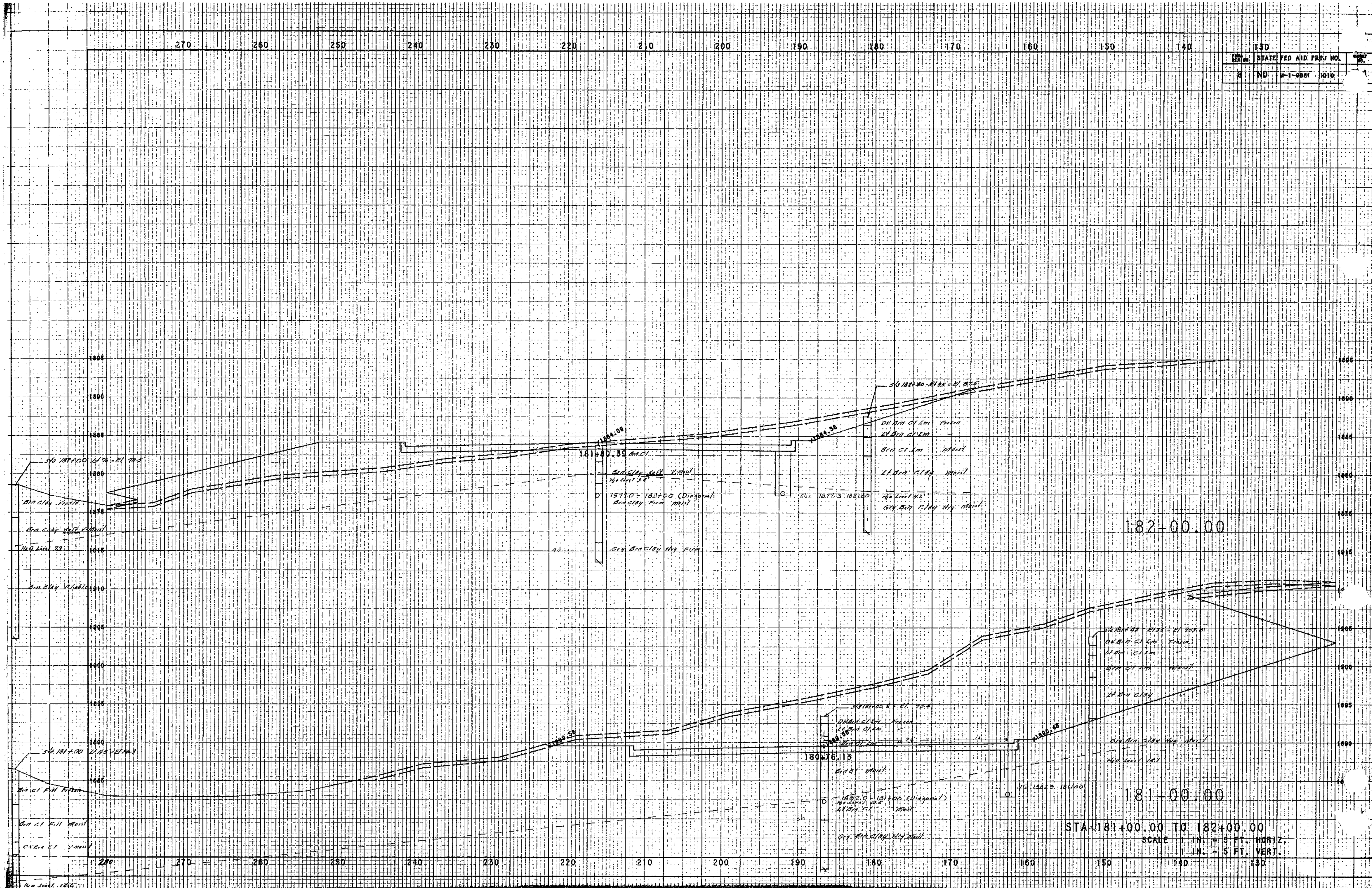
K&E 183 3. CROSS SECTION
KEUFFEL & ESSER CO

FED. ROAD SECTION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	ND	M-1-0881 (010	73



STA 178+73.35 TO 180+00.00

SCALE 1 IN. = 5 FT. HORIZ.
1 IN. = 5 FT. VERT.


STATE | FED AID PROJ NO.
8 | ND
181+80.39
182+00.00
180+76.13
181+00.00
STA 181+00.00 TO 182+00.00
SCALE 1 IN. = 5 FT. HORIZ.
1 IN. = 5 FT. VERT.

DIST.	SECTION	STATE	FED. AID PROJ. NO.		SHEET NO.
	B	ND	M-1-9881	0010	75

187+05.89

187+00.00

186+00.79

186+00.00

184+95.67

185+00.00

STA 185+00.00 TO 187+00.00

SCALE 1 IN. = 5 FT. HORIZ.
1 IN. = 5 FT. VERT.

FHWA REGION	STATE	FED AID PROJ NO.	SHEET NO.
8	ND	M-1-9881 (010)	76