Doug Fercho St. Hwy Dept
Gordon Schmidt - Northern Imp

24

JOB #7

DESIGN DATA

Traffic	Average Daily			Est. 30th Max. Hr.
Current Traffic (1984)	2700 Pass.	300 Trucks	3000 Total	300
Traffic Forecast (2004)	5450 Pass.	450 Trucks	5900 Total	590
Design Speed	30 MPH	Sta. 263 to 266	20 MPH	
Traffic Classification "M"				
Minimum Sight Distance (Stopping)	250'			

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NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

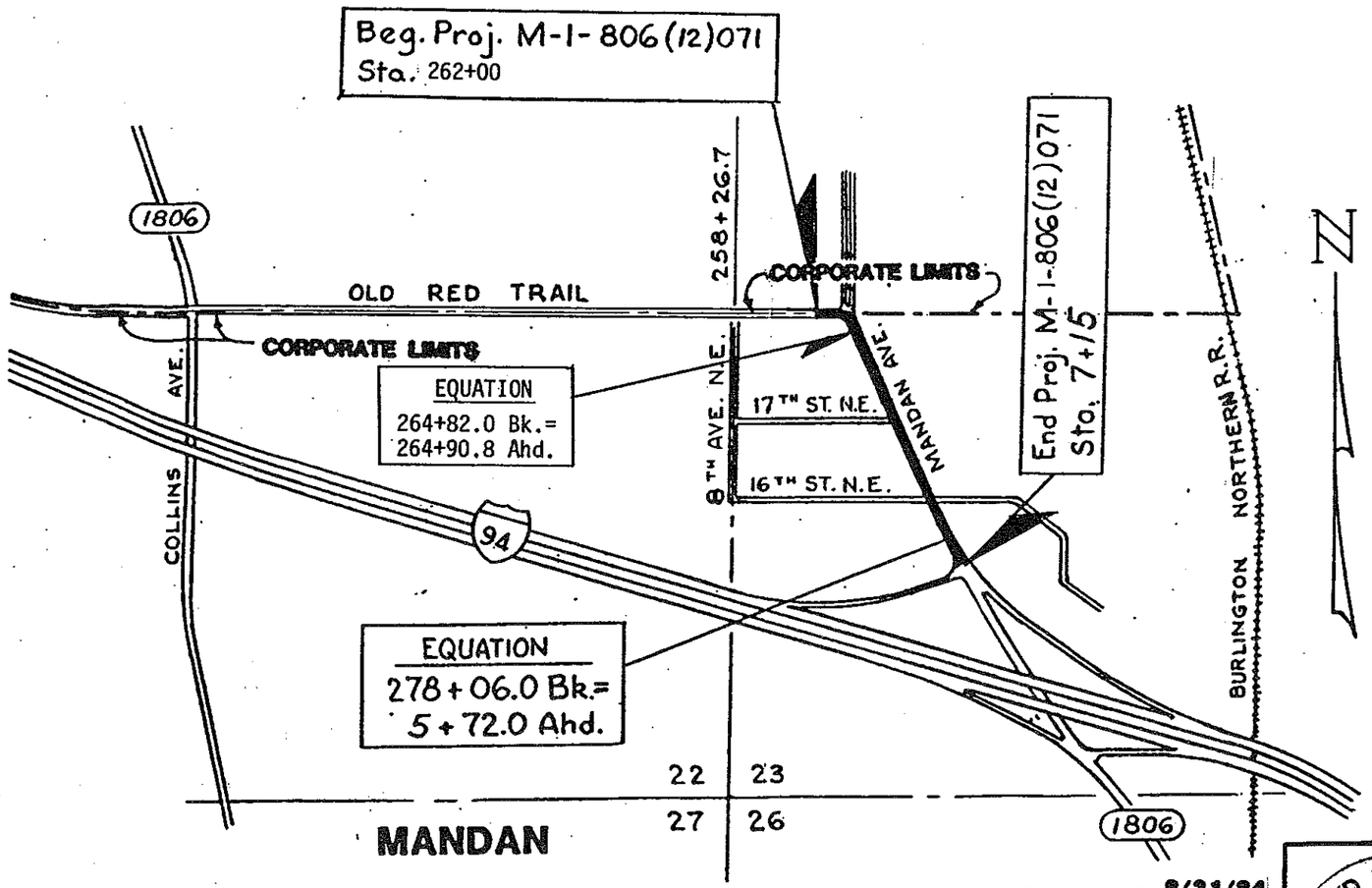
MORTON COUNTY
M-1-806(12)071
GRADE, SURFCING, STORM SEWER & INCIDENTALS

GOVERNING SPECIFICATIONS:

Standard Specifications adoped by the North Dakota State Highway Department, October, 1976 and approved by the Federal Highway Administration on December 17, 1976 and Supplemental Specifications thereto adopted July 1, 1983 and approved by the Federal Highway Administration and other Contract Provisions submitted herewith.

LENGTH OF PROJECT

Project	Miles-Gross	Miles-Net
M-1-806(12)071	0.329	0.329



Twp. 138 N.
Rge. 81 W.

Asst.

APPROVED DATE 8/31/84

CHIEF ENGINEER
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

LLOYD L. LAMMER
REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR
975
NORTH DAKOTA

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED [redacted] 14

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 SPLICE
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 — 645.9 / 641.0 / 245
CENTERLINE
SECTION LINE
DEFLECTION ANGLE (Delta)
SOD OR JUTE MESH
POLES TO BE MOVED
POLES TO BE LOWERED
CONCRETE FOUNDATION
CONDUIT
CONDUCTOR
CONCRETE PULL BOX
FEED POINT
250 WATT LIGHT STANDARDS
400 WATT LIGHT STANDARDS
700 WATT LIGHT STANDARDS
1000 WATT LIGHT STANDARDS
FLASHING BEACON
TRAFFIC SIGNAL - MAST ARM MOUNTED
TRAFFIC SIGNAL - POST MOUNTED
SIGNAL HEAD
PEDESTRIAN PUSHBUTTON POST
TRAFFIC SIGNAL CONTROLLER
FEED POINT - PAD MOUNTED

E1

ABBREVIATIONS

Aggr.	Aggregate
Ahd	Ahead
Alt.	Alternate
Approx	Approximate or Approximately
Appr.	Approach
Asph. Cem. or A.C.	Asphalt Cement
Asph. Conc.	Asphaltic Concrete
Bit	Bituminous or Bitumen
Bk.	Back
B.M.	Bench Mark
Bldg.	Building
Br.	Bridge
C.A.E.S.	Corrugated Aluminum End Section
C.A.P.	Corrugated Aluminum Pipe
C.B.	Catch Basin
C. & G.	Curb and Gutter
Ch. Blk.	Channel Block
Ch. Ch.	Channel Change
C.I.	Curb Inlet
C.I.P.	Cast Iron Pipe
Cl.	Class
C.S.E.S.	Corrugated Steel End Section
C.S.P.	Corrugated Steel Pipe
CMS	Cationic Medium Setting
Comp	Compression
Const	Construction
Conc.	Concrete
Cont. Reinf Conc Pvm't	Continuously Reinforced Concrete Pavement
Contr	Contraction
Crn	Crown
CRS	Cationic Rapid Setting
Crse	Course
C.S.	Curve to Spiral
C. to C.	Center to Center
C.Y.	Cubic Yard
D	Degree of Curvature
D-Load	Dead Load
D.B.	Ditch Block
Def.	Deformed
Del	Deliver
D.G.	Ditch Grade
El or Elev	Elevation
Elliptl.	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 Linear 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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GENERAL NOTES

100 020 WORK SCHEDULE: In order to minimize interference with traffic operations, a detailed schedule shall be agreed to prior to beginning work, between the engineer, utility companies, and the contractor and subcontractors, if any.

100 022 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 will be the responsibility of the contractor to insure that the above requirements are met in every respect.

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

100 050 PROJECT ENGINEER RESPONSIBILITY:

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

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

100 060 DETOURS: The contractor shall maintain the streets used as detours and repair areas damaged by the detoured 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 and maintenance of the detours will be paid for in accordance with provisions for Haul Road Maintenance as set forth in this contract. Necessary route markers will be furnished by the State Highway Department and erected and maintained by the contractor as an incidental item.

(See note on traffic control sheet)

100 068 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 at his own expense.

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

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

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

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

100 150 SOILS SURVEY: The soil survey information has been carefully prepared and, while not guaranteed, is believed to be correct. The contractor is presumed to have verified the soil survey information before submitting a bid.

100 190 At the pre-job conference or prior to hauling over the project, the contractor and engineer shall agree on the designated haul roads so as to minimize hauling over the project.

GENERAL NOTES

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200 010 SHRINKAGE: 20 percent additional volume in yardage computed by the end area method is allowed for shrinkage in earth embankment.

200 021 COMPACTION AND DENSITY CONTROL: Compaction and density controls shall be in accordance with Section 203-2.3.3 T-180 of the Standard Specifications, except that, if the subgrade is unstable (as evidenced by sponginess or rutting) when compacted to the required density, it will be necessary to dry the soils to obtain adequate stability. This may require drying below optimum moisture. The cost of such drying will be incidental to the price bid for "Common Excavation" (and/or "Borrow," if used).

200 030 SUBCUT, SCARIFY, AND RECOMPACT: Through all cut sections, the entire cut section to a point 1 foot behind the back of the new curb where possible, shall be scarified 1 foot below the proposed subgrade elevations. In sections where the subgrade to 1 foot behind back of new curb cannot be scarified due to footings or other reasons, the engineer shall determine the extent of subgrade to be scarified in the field. Any soft spots or areas containing an inferior quality of soil (as determined by the engineer) shall be subcut and replaced with acceptable backfill. The subcut and scarified areas shall be compacted as specified under compaction and density note. Subcutting will be measured and paid for as common excavation. Cost of scarifying and recompacting to be included in the price bid for "Common Excavation."

200 070 DISPOSAL OF UNSUITABLE MATERIAL: The contractor shall be responsible for the proper disposal of all removed concrete, pavements, foundations, and other unsuitable material. The disposal site shall not be a wetland and shall be a site approved by the engineer.

200 090 SCARIFYING AND RECOMPACTION OF EMBANKMENT AREAS: After removing topsoil, if any, from original ground under all roadway embankment areas, an additional one foot shall be scarified and recompacted. All scarifying and recompacting shall be included in price bid for "Common Excavation."

200 250 WASTE EXCAVATION DISPOSAL: Excavation to be wasted shall be salvaged and stockpiled on temporary construction easements as directed by the engineer.

200 301 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." If city water is used, the contractor shall make arrangements with the city engineer.

200 450 BENCHING ON WIDENING SECTIONS: All inslopes, regardless of rate of slope, shall be benched unless otherwise directed by the engineer. Benches shall be deep enough to provide sufficient width to permit placing, spreading, and compacting equipment to operate and each bench shall be thoroughly compacted before additional embankment is placed. Cost of benching shall be included in the price bid for "Common Excavation, Type A."

300 010 AGGREGATE BASE COURSE, CLASS 5: 1600 tons of aggregate base course have been provided for maintaining traffic. It shall be used as directed by the engineer in the field.

400 010 PRIME, FOG, OR TACK COAT: When directed by the engineer, emulsified asphalt for prime, fog, or tack coat shall be diluted with water prior to application in a 50-50 ratio or other approved proportions. Cost of water shall be included in the price bid for "Emulsified Asphalt for Prime, Fog, or Tack Coat."

400 040 HOT BITUMINOUS PAVEMENT: The temperature of the mix at laydown shall not be less than 225°F, if the air temperature is above 60°F, and shall not be less than 240°F if the air temperature is below 60°F. The actual mixing temperature shall be adjusted as directed by the engineer within the allowable limitations to best suit construction conditions.

400 050 AUTOMATIC BATCHING EQUIPMENT: The automatic batching equipment as specified in Section 406-3.13.5 of the Standard Specifications will not be required on this project.

400 070 DIMENSIONS: Thicknesses shown on the typical sections for surfacing are approximate. It is intended that the plan tonnages provided for by the basis of estimate will be used uniformly throughout the project unless otherwise authorized by the engineer.

400 080 HOT BITUMINOUS PAVEMENT: The hot bituminous pavement shall be laid in two (2) lifts with the top lift having a depth of approximately 2 inches.

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400 120 COMPACTION OF HOT BITUMINOUS PAVEMENT: The compaction equipment for mainline paving 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 speed of nonvibratory rollers and vibratory rollers in the static mode shall not exceed 4 mph during initial and intermediate rolling prior to obtaining the required density.

400 145 When the contractor must encroach onto the driving lanes, flagpersons and flagperson signs must be provided by the contractor for directing the traffic through the construction area.

400 310 HOT BITUMINOUS PAVEMENT: Unless otherwise authorized by the engineer, placement of hot bituminous pavement (top lift only) for mainline surfacing will not be permitted when the temperature of the existing surface is below 40°F and air temperature is below 32°F.

406 010 HOT BITUMINOUS PAVEMENT: With the approval of the engineer, the class of hot bituminous pavement may be changed to allow the use of available hot bituminous.

550 010 PORTLAND CEMENT CONCRETE PAVEMENT, CLASS AE: Use 6.0 sacks of Portland Cement per cubic yard of concrete. Cost of cement, longitudinal joint sealer, and all steel used for tie bars shall be included in the unit price bid for "P.C.C. Pavement." The coarse aggregate for concrete may be Size No. 1 or Size No. 3. Size No. 3 will not have to be separated into two fractions. Whichever size is chosen, it must be used for the entire project unless othrwise approved by the engineer.

550 020 CURING: Curing materials shall meet the requirements of subsection 880-1 of the Standard Specifications.

550 030 DOWELLED JOINTS: The pay length of a dowelled expansion or contraction joint assembly shall be equal to the width of pavement in which the assembly is installed. Location of the dowelled expansion and contraction joints are shown on the plans.

550 040 TRANSVERSE JOINT SPACING (P.C.C. PAVEMENT): Mainline - 14'. See Joint Detail Sheet.

550 060 PAVEMENT REINFORCING OVER PIPE CROSSING: The P.C.C. Pavement over center line pipe crossings shall be reinforced with No. 4 reinforcing bar as shown on the detail sheet. The cost of the reinforcing steel shall be included in the price bid for "8-inch Nonreinforced Concrete Pavement.

550 090 PORTLAND CEMENT CONCRETE PAVEMENT: Section 550.3.1 of the Standard Specifications is modified as follows: The batching and weighing equipment shall conform to the general requirements of subsection 610.3.1.1. Automatic batching equipment as specified in 610.3.1.3 will not be required.

550 101 P.C.C. REINFORCEMENT: All reinforcement shall be positioned on approved supported in advance of concrete placement.

630 010 STORM SEWER: Where the new sewer is to be installed into an existing manhole or inlet barrel, the cost of cutting into the manholes or inlet barrels and grouting of sewer leads shall be included in the price bid for other items.

630 020 ADJUST WATER AND SEWER LINES: The exact depth of the existing water and sewer lines under the roadway is unknown. If it is determined in the field that adjustment or relocation of these lines is necessary to facilitate the installation of the new storm sewer, such work shall be done in accordance with Sec. 109-5 of the Standard Specifications, "Extra and Force Account Work."

630 031 JOINTS FOR SEWER PIPE: Joints shall be sealed with rubber gaskets or with a sealer approved by the engineer.

630 040 DRAINAGE: If the existing drainage 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. Not a pay item, cost to be incidental to the price bid for other items.

630 070 RELAYING PIPE: Only that pipe in good condition shall be relaid and determination of its fitness for relaying shall rest with the engineer.

630 182 CONCRETE PIPE TIES (TIE BOLTS): Unless otherwise shown on the plans, the flared end section and the end sections of pipe on all concrete pipe installations, including concrete cattle pass, shall be tied as shown on Standard D-630-30. On culverts without flared end sections, the end three sections shall be tied together.

706 010 UNDERDRAINS: All materials, (perforated and nonperforated P.V.C. pipe, bends, underdrain granular fill, filter fabric, frames, and lids, etc.) labor, and equipment necessary for construction of cleanouts shall be considered incidental to the price bid for "6-inch Perforated P.V.C. Pipe for Underdrains."

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708 010 CURB AND GUTTER: The curb and gutter shall be curb and gutter Type I (Section A) in the areas where the water drains toward and along the gutter as detailed on the Standard Drawing D-708-1. All curb and gutter shall be paid for under "Curb and Gutter, Type I."

708 020 CURB ENDS: On street returns and other locations where the new curb and gutter ends and does not abut existing curb and gutter, the end two (2) feet of the curb shall be tapered from 6" in height to 0". A 1/2" premolded expansion joint which is full depth and the same shape as the curb and gutter shall be installed just ahead of the taper. An 18" tie bar shall be installed across the joint.

708 030 CLASS OF CONCRETE: The class of concrete used in the curb and gutter, sidewalks, and driveways shall be Class AE. The contractor shall have the option of using aggregate, Size No. 1, 3, 4, or 5 as defined in Section 806-2 of the Standard Specifications.

708 040 Dowel bars installed at expansion joints in the curb and gutter will not be paid for separately, but shall be included in the price bid for "Curb and Gutter - Type I."

714 010 ADJUST MANHOLES: The existing manhole castings that are required to be raised may be brought to their respective elevations by the use of adapter rings of a grade and type approved by the engineer. Cost of all materials and labor required to perform the work as noted above, shall be incidental to the price bid for "Adjust Manholes."

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

762 030 MAINTAIN TRAFFIC: The Contractor shall maintain local traffic through all construction areas. He shall arrange his work so that there will be the least amount of hindrance to traffic.

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 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 fame 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.

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BASIS OF ESTIMATE - SURFACING

DESCRIPTION	UNIT
Hot Bituminous Pavement - Class 25 @ 2.0 Ton/C.Y.	Ton
120-150 Asphalt Cement @ 7% of Hot Bit. Pvmt.	Ton
MC 70, 250, or SP-6 Liq. Asph. @ 0.20 Gal./S.Y. for Prime Coat	Gal.
SS-1h or CSS-1h Emuls. Asph. for Tack Coat @ 0.05 Gal./S.Y.	Gal.
Aggregate Base Course - Cl. 5 @ 1.5 Ton/C.Y. + 25%	Ton
Aggregate Base Course - Cl. 11 @ 10% of Cl. 5	C.Y.

BASIS OF ESTIMATE - GRADING

WATER: 10 Gal./S.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.

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

SODDING: The engineer shall determine locations.

MAXIMUM SIZE OF AGGREGATE

Description	Type of Aggregate	Max. Size
Hot Bit. Pvmt. Class 25	Crushed	3/4"
Aggregate Base Course, Cl. 5	Crushed	3/4"

SPECIAL PROVISIONS

SEQ. NO.	NAME	SP NO.
155	Relocate Hydrant	
344	Hot Bituminous Pavement	SP 406-9
476	Bituminous Materials	SP 406-9
532	Haul Road Maintenance	
563	Measurement and Payment	SP 109-7
573	BIdding Requirements and Conditions	SP 102-20
583	Flagging	SP 746-2
588	Concrete, Clay, and Fiber Pipe	SP 828-1

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QUANTITIES

SPEC	CODE	ITEM DESCRIPTION	UNIT	FEDERAL & CITY	CITY	FEDERAL & STATE	TOTAL
103	0100	Contract Bond	L. Sum	1			1
201	0330	Clearing & Grubbing	L. Sum	1			1
202	0130	Removal of Curb & Gutter	L. Ft.	12			12
203	0101	Common Excavation - Type A	Cu. Yd.	13,136		1,020	14,156
216	0100	Water	M. Gal.	193			193
302	0120	Aggregate Base Course Cl. 5	Ton	2,895			2,895
302	0150	Aggregate Base Course Cl. 11	C.Y.	193			193
401	0103	MC-70, 250 or SP-6 Liquid Asphalt	Gal.	486			486
401	0152	SS-1h or CSS-1h Emulsified Asphalt	Gal.	66			66
406	0190	Hot Bituminous Pavement Class 25	Ton	448			448
406	0320	120-150 Asphalt Cement	Ton	34			34
550	0112	8 In. Nonreinf. Conc. Pvmt. Cl. AE 3	Sq. Yd.	8,472			8,472
550	0230	Doweled Expansion Joint Assembly	L. Ft.	240			240
550	0240	Doweled Contraction Joint Assembly	L. Ft.	480			480
550	0809	Preformed Compression Joint Seal 9/16 In.	L. Ft.	5,099			5,099
550	0830	Preformed Compression Joint Seal 1 5/8 In.	L. Ft.	240			240
630	2256	15 In. Reinf. Conc. Pipe - Sewer - Cl. III	L. Ft.	115			115
630	2296	18 In. Reinf. Conc. Pipe - Sewer - Cl. III	L. Ft.	181	300		481
630	2381	24 In. Reinf. Conc. Pipe - Sewer - Cl. III	L. Ft.	414			414
*630	2426	27 In. Reinf. Conc. Pipe - Sewer - Cl. III	L. Ft.	967			967
630	2735	60 In. Reinf. Conc. Pipe Cl. III	L. Ft.			12	12
630	3310	60 In. Reinf. Conc. End Section	Ea.			4	4
630	3410	Relay (60") RCP	L. Ft.			216	216
630	3415	Relay Conc. Cattle Pass Intermediate Secs.	L. Ft.			86	86

* City Funds only for the cost difference of 27" vs. 24" RCP (oversizing due to additional drainage from property to the east)

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	9

QUANTITIES

SPEC	CODE	ITEM DESCRIPTION	UNIT	FEDERAL & CITY	CITY	FEDERAL & STATE	TOTAL
630	3425	Relay Concrete Cattle Pass End Sections	Ea.			2	2
630	3435	Intermediate Section Concrete Cattle Pass	L. Ft.			20	20
630	3465	18 In. Conduit Pipe	L. Ft.	47			47
702	0130	Loose Rock Riprap	Cu. Yd.			250	250
705	0100	Mobilization	L. Sum	1			1
706	0110	Underdrain Granular Fill Material	Cu. Yd.	3,278			3,278
706	0395	6 In. Perforated PVC Pipe for Underdrains	L. Ft.	1,343			1,343
708	0296	36 In. Valley Gutter	L. Ft.	60			60
708	0300	Curb & Gutter Type I	L. Ft.	3,474			3,474
712	0118	8" Concrete Driveway	S.Y.	440			440
714	0110	Manhole Riser - 48 In.	L. Ft.	19			19
714	0120	Manhole Riser - 60 In.	L. Ft.	25			25
714	0137	Inlets Vane Grate	Ea.	9			9
714	0138	Inlets Type II Vane Grate	Ea.	1			1
714	0139	Inlets Type II - Double V.G.	Ea.	1			1
714	0143	Catch Basins	Ea.	1	3		4
714	0208	Manhole - 48 in.	Ea.	3			3
714	0212	Manhole - 60 In.	Ea.	3			3
716	0110	Adjust Manhole	Ea.	8			8
716	0140	Adjust Utility Appurtenance	Ea.	8			8
726	0320	Hydro Mulch Seeding	Acre	1			1
728	0100	Sodding	Sq. Yd.	100			100
743	0102	Pavement Marking Drop on Beads Type II (Line)	L. Ft.	2,540			2,540
746	0100	Flagging	M. Hrs.	100			100
754	0116	Flat Sheet for Signs - Type II Refl. Sheeting	S.F.	92.0			92.0

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
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QUANTITIES

SPEC	CODE	ITEM DESCRIPTION	UNIT	FEDERAL & CITY	CITY	FEDERAL & STATE	TOTAL
754	0117	Flat Sheet fot Signs - Type III or IV Refl. Shtg.	S.F.	77			77
754	0209	Steel Galv. Posts - Sq. Tube Perforated	Lbs.	981			981
762	3298	Traffic Control	L. Sum	1			1
900	5030	Relocate Hydrant	Ea.	2			2

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
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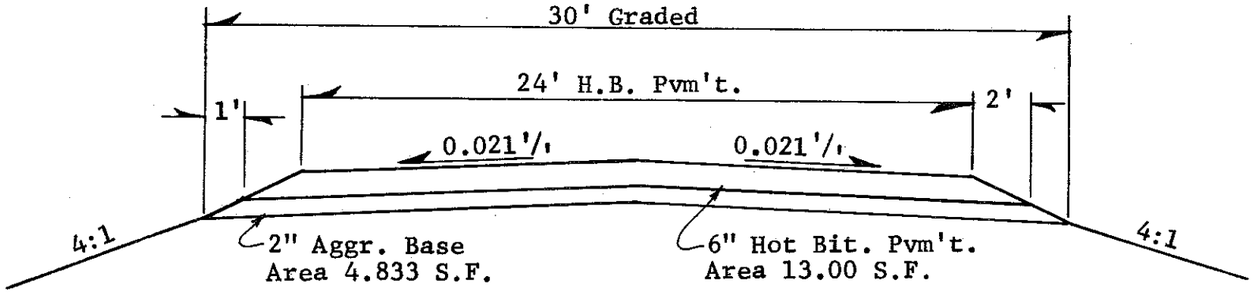
SUMMARY OF QUANTITIES - ELECTRICAL

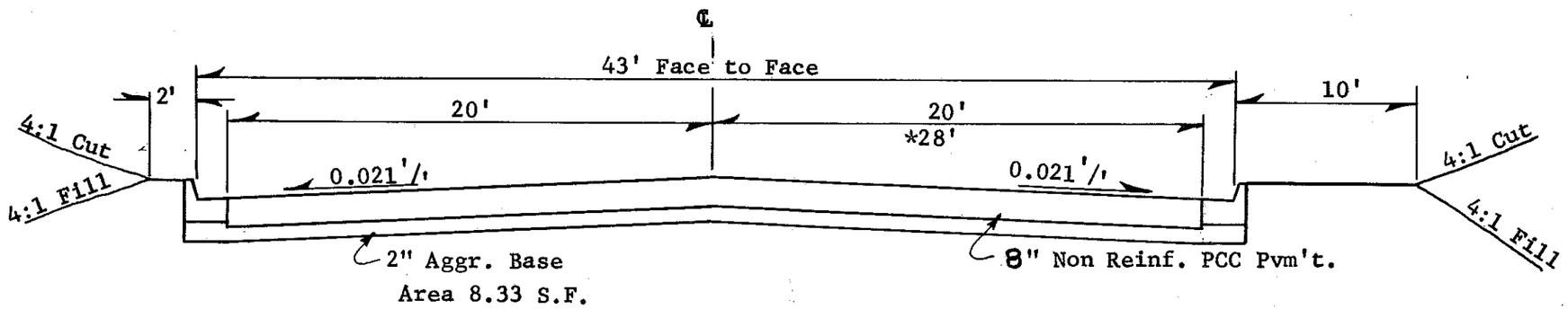
CITY FUNDS ONLY

SPEC	CODE	ITEM DESCRIPTION	UNIT	LIGHTING	TOTAL
777	0101	Cable Trench - Type I	L. Ft.	1059	1059
777	0103	Concrete Foundation - Highway Lighting	Ea.	7	7
777	0106	Concrete Foundation - Feed Point - Type B	Ea.	1	1
777	0141	2 Inch Diameter Rigid Conduit	L. Ft.	417	417
777	0260	Underground Conductor No. 4 - Type RHW	L. Ft.	3352	3352
777	0275	Underground Conductor No. 6 - Type THW	L. Ft.	1676	1676
777	0470	Feed Point - Type I - Pad Mounted	Ea.	1	1
777	0606	Lt. Std. 6 Ft. M.A. 40 Ft. Mt. Ht.	Ea.	6	6
777	1041	Sodium Vapor Luminaire - 250 Watt	Ea.	6	6
777	2300	Relocate Light Standards	Ea.	1	1

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	12



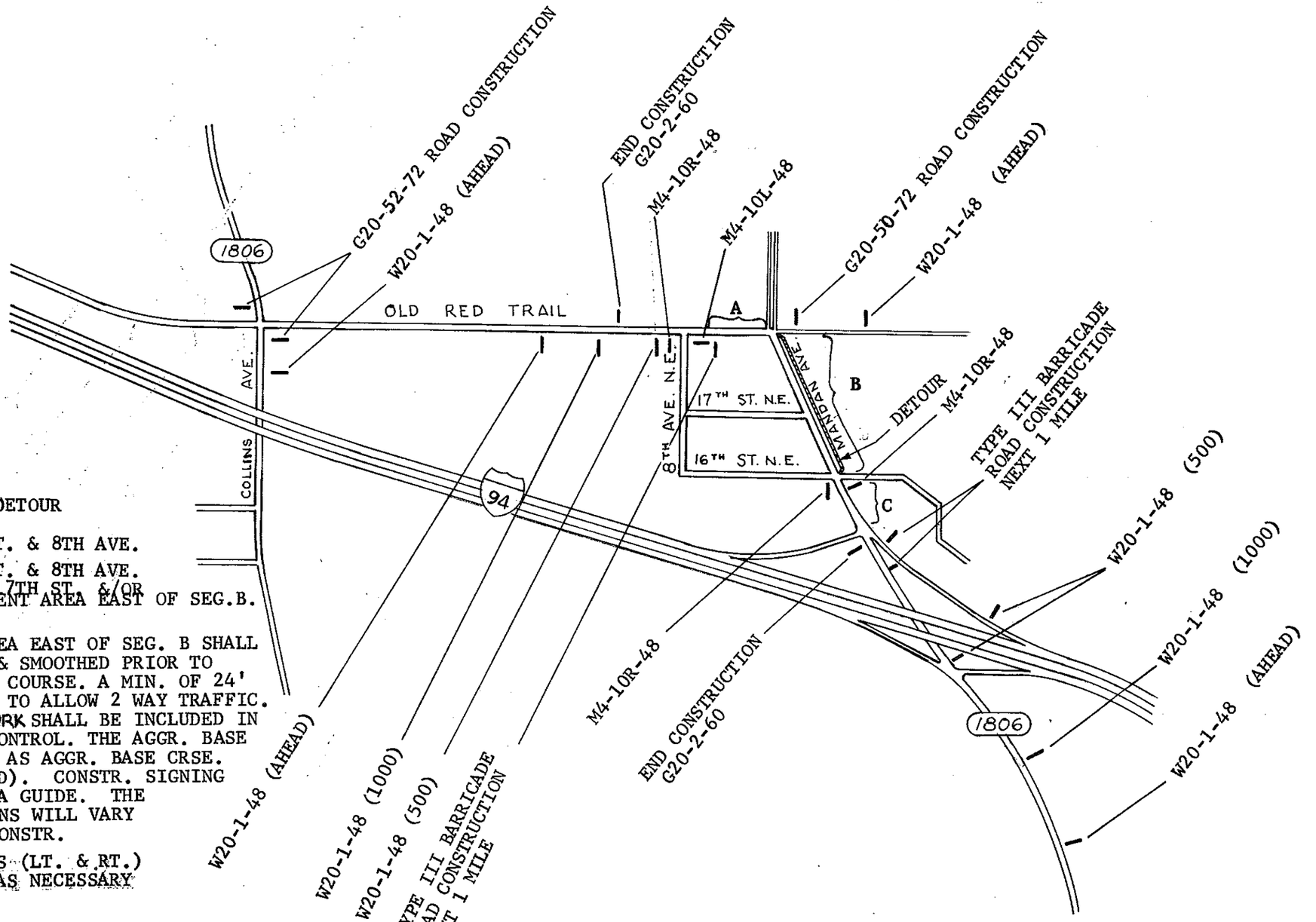
AMOCO REFINERY
APPROACH ROAD



Sta. 262+00 to 6+00
* Sta. 7+00

TYPICAL SECTIONS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806 (12)	13



SEGMENT	DETOUR
A	17TH ST. & 8TH AVE.
B	16TH ST. & 8TH AVE. & OR 17TH ST. &/OR ADJACENT AREA EAST OF SEG.B.
C	* NONE

THE 8TH AVE & ADJ. AREA EAST OF SEG. B SHALL BE LEVELED & COMPACTED & SMOOTHED PRIOR TO PLACEMENT OF AGGR. BASE COURSE. A MIN. OF 24' WIDTH SHALL BE OBTAINED TO ALLOW 2 WAY TRAFFIC. THE COST OF THE EARTHWORK SHALL BE INCLUDED IN PRICE BID FOR TRAFFIC CONTROL. THE AGGR. BASE CRSE. SHALL BE PAID FOR AS AGGR. BASE CRSE. CL. 5 (& CL. 11, IF USED). CONSTR. SIGNING SHOWN IS TO BE USED AS A GUIDE. THE ACTUAL PLACEMENT OF SIGNS WILL VARY DEPENDING ON PHASE OF CONSTR.

*CONSTRUCT IN TWO PHASES (LT. & RT.) USE AGGR. BASE COURSE AS NECESSARY TO MAINTAIN TRAFFIC.

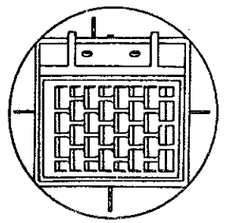
COST OF DETOUR REMOVAL EAST OF SEG. B SHALL BE INCLUDED IN PRICE BID FOR TRAFFIC CONTROL.

TRAFFIC CONTROL

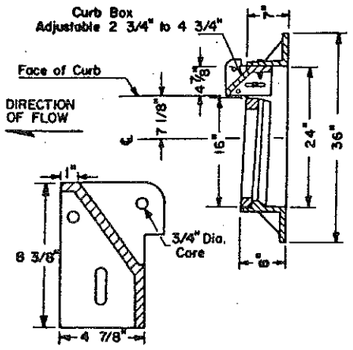
CONSTRUCTION SIGNING

INLET DETAILS

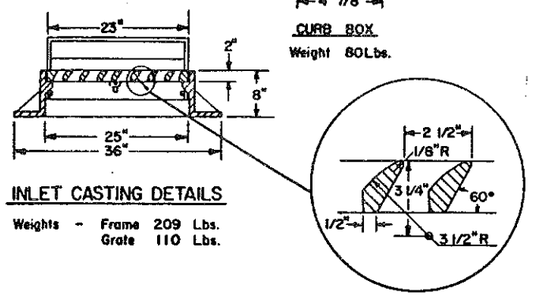
FED. ROAD PROJ. NO.	STATE	PROJECT	SHEET NO.
8	N.D.	M-1-806(12)	14



NOTE: Reversible grates to be furnished.



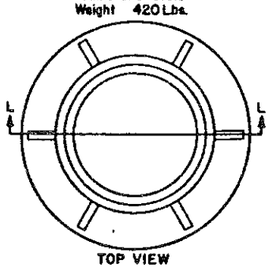
CURB BOX
Weight 80 Lbs.



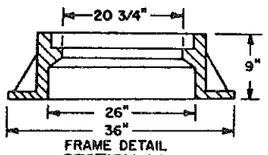
INLET CASTING DETAILS

Weights - Frame 209 Lbs.
Grate 110 Lbs.

CATCH BASIN
Frame and Grate
Weight 420 Lbs.

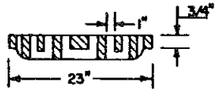


TOP VIEW

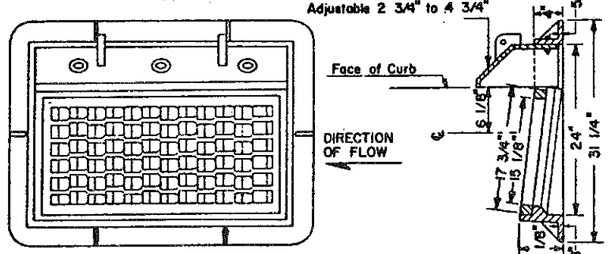


FRAME DETAIL
SECTION LL

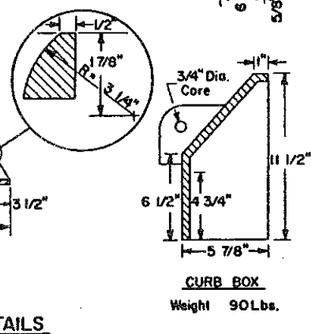
TOP VIEW



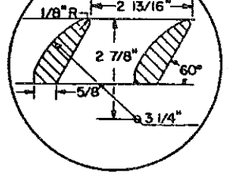
GRATE DETAIL
SECTION MM



NOTE: Reversible grates to be furnished.

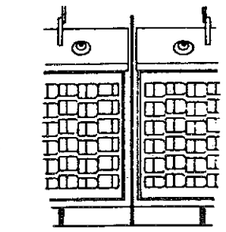


CURB BOX
Weight 90 Lbs.



INLET TYPE 2 CASTING DETAILS

Weights - Frome 197 Lbs.
Grate 165 Lbs.



ABUTTING FRAME ENDS FOR TYPE 2 DOUBLE

NOTES:

The contractor may, if he so desires, construct the curb inlets lower than plan grade and bring the casting to grade using pre-cast adjusting rings or in a manner satisfactory to the engineer in the field.

The contractor may, if he so desires, construct inlet boxes of solid concrete block or brick. The materials used shall be approved by the engineer in writing. Construction of the boxes shall be in accordance with section 714-3 of the standard specifications.

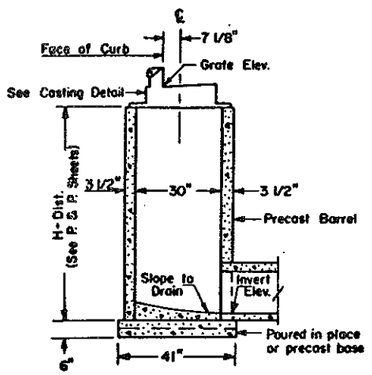
The contractor shall have the option of using precast or poured in place boxes for inlets and precast or poured in place bases for inlets.

The class of concrete used in the poured inlets or bases shall be A.E. The aggregate size shall be approved by the engineer in the field.

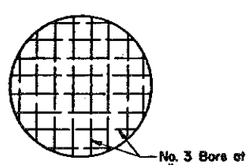
Precast 30" barrels for inlets shall be constructed in accordance with ASTM 478.

Other castings, similar in dimenion and of equal or greater weight than that shown, may be used if accepted by the engineer in writing.

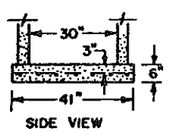
Metal used in the manufacture of castings shall conform to AASHTO M-105, Class 35B.



INLET DETAIL

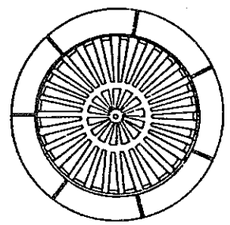


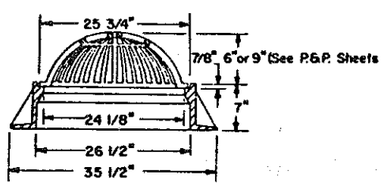
TOP VIEW



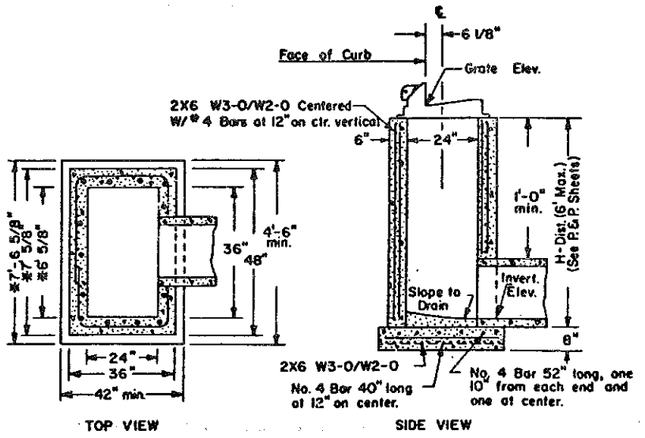
SIDE VIEW

INLET BASE





BEEHIVE CASTING & COVER
6" Beehive Weight 285 Lbs.
9" Beehive Weight 300 Lbs.



TOP VIEW SIDE VIEW

TYPE-2 INLET

* TYPE 2 - DOUBLE INLET

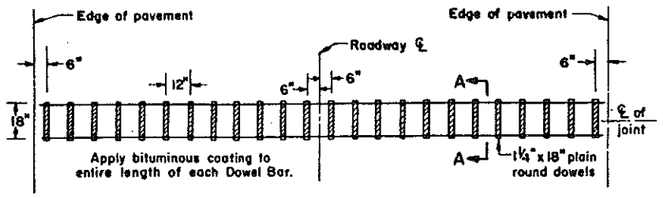
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Approved: _____
Design Engineer

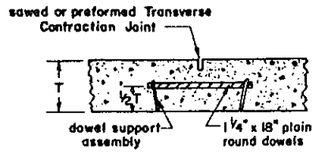
FHWA REGION	STATE	FED. AID PROJ. NO.	SHT. NO.
8	N.D.	M-1-806(12)	15

JOINT DETAILS

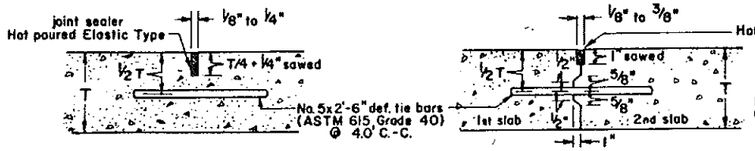


PLAN

CONTRACTION JOINT DOWEL BAR ASSEMBLY

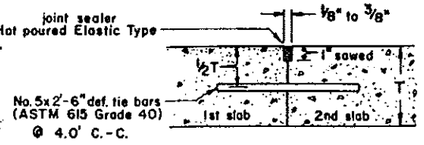


SECTION A-A

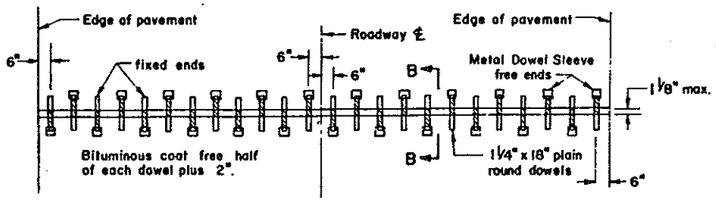


SAWED LONGITUDINAL JOINT

LONGITUDINAL CONSTRUCTION JOINT
(KEYED TIED JOINT)

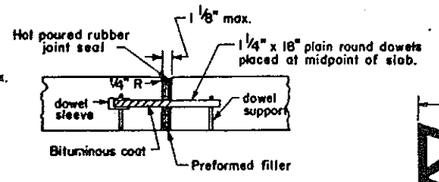


LONGITUDINAL CONSTRUCTION JOINT
(TIED BUTT JOINT)

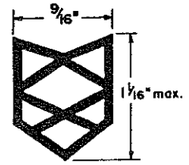


PLAN

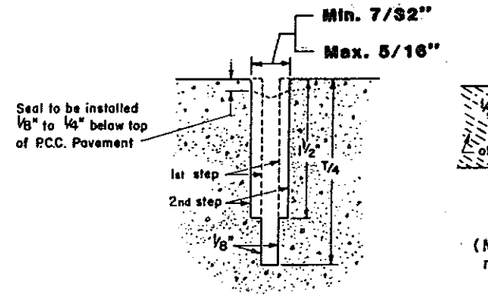
EXPANSION JOINT DOWEL BAR ASSEMBLY



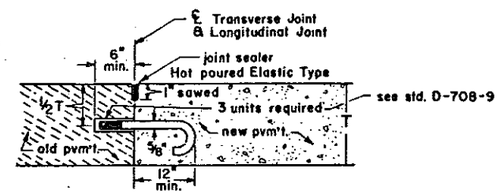
SECTION B-B



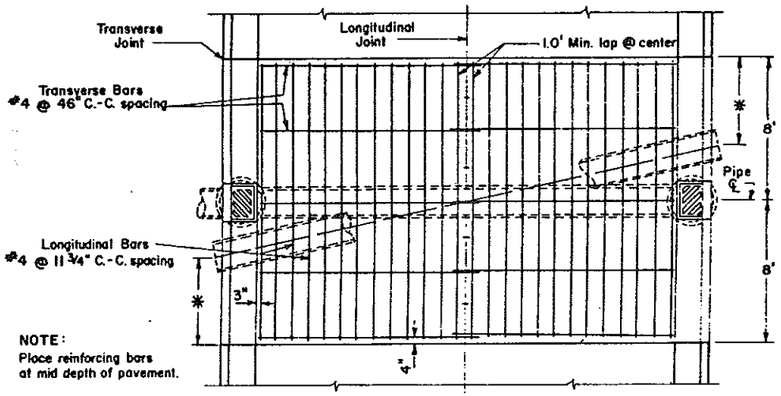
PREFORMED COMPRESSION JOINT SEAL FOR PREFORMED TRANSVERSE CONTRACTION JOINTS.



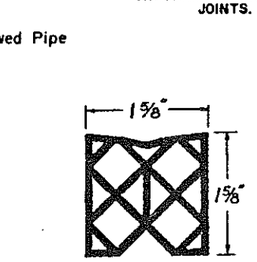
SAWED TRANSVERSE JOINT



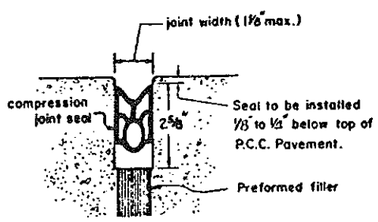
J-BOLT INSTALLATION
(Max. spacing of 4.0' C.-C. where new concrete abuts existing conc.)



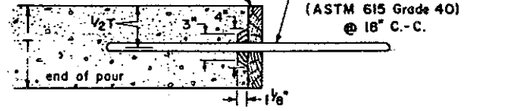
PAVEMENT REINFORCING OVER ℄ PIPE CROSSING



PREFORMED COMPRESSION JOINT SEAL FOR PREFORMED EXPANSION JOINT

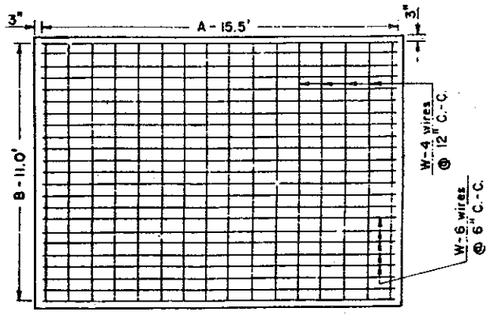


INSTALLATION
(Expansion joint seal)



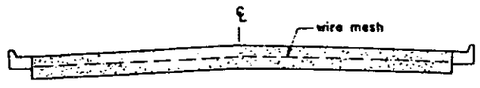
TRANSVERSE CONSTRUCTION JOINT
(KEYED & TIED JOINT)

NOTE:
Construction Joints to be sawed to a depth of 1" and a width of ¼" to ⅜" and sealed

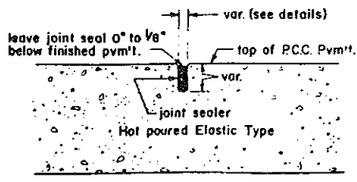


TYPICAL REINF. CONC. ROADWAY PANEL WITH WELDED WIRE FABRIC

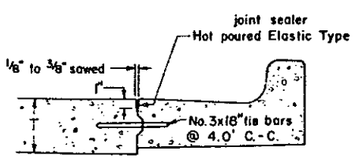
NOTES:
1. A = Panel Length
2. B = Panel Width
3. Where lapping is desired for odd length panels, the total lap shall be a min. of 12".
4. All laps in fabric shall be tied at not more than 4' intervals.
5. Place mesh at mid-depth of slab.



TYPICAL PVM'T. SEC. WITH WIRE MESH PLACEMENT



JOINT SEALER DETAIL
(applies to all sawed joints except transverse joints)



JOINT SEALER AT ALL CURB & GUTTER SECTIONS

NOTE:
Preformed inserts used to form grooves for transverse joints shall be of a type approved by the Engineer. The preformed insert shall have a maximum top width of ¼" and a minimum depth of 2". The preformed insert shall form a groove so shaped that the top edge of the installed sealer will be ⅛" to ¼" below the top edge of the P.C.C. Pvm't. Transverse Joint may be sawed to dimensions shown in lieu of forming.
Preformed compression joint seals of other shapes may be used. The shape and dimensions must be approved by the Engineer.

DATE	REVISIONS CHANGE
9-30-83	

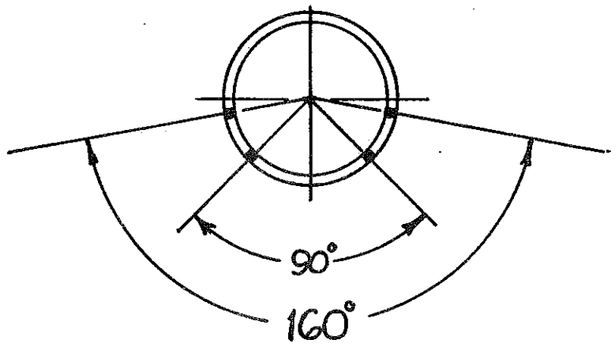
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Approved: _____
Design Engineer

FHWA REGION	STATE	FED. AID PROJ NO.	SHEET NO.
8	N.D.	M-1-805(12)	16

DETAILS

6" Perforated PVC



ANGULAR POSITION OF ROWS

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

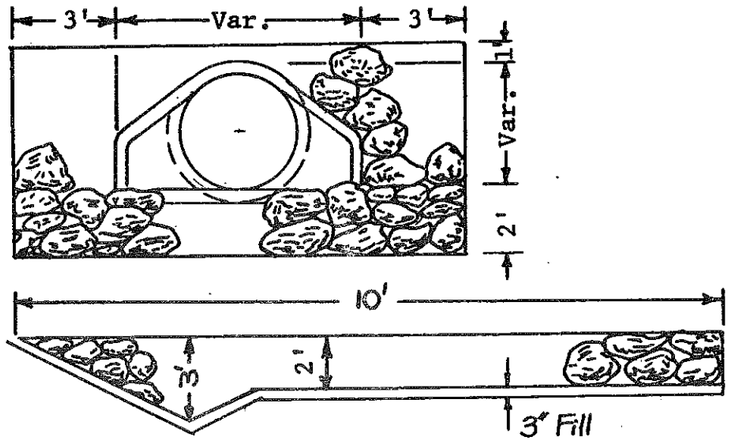
*For 12.5 Foot Pipe Laying Lengths

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.

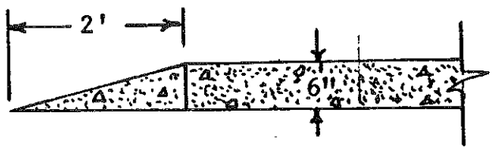


Filter Fabric

LOOSE ROCK RIPRAP

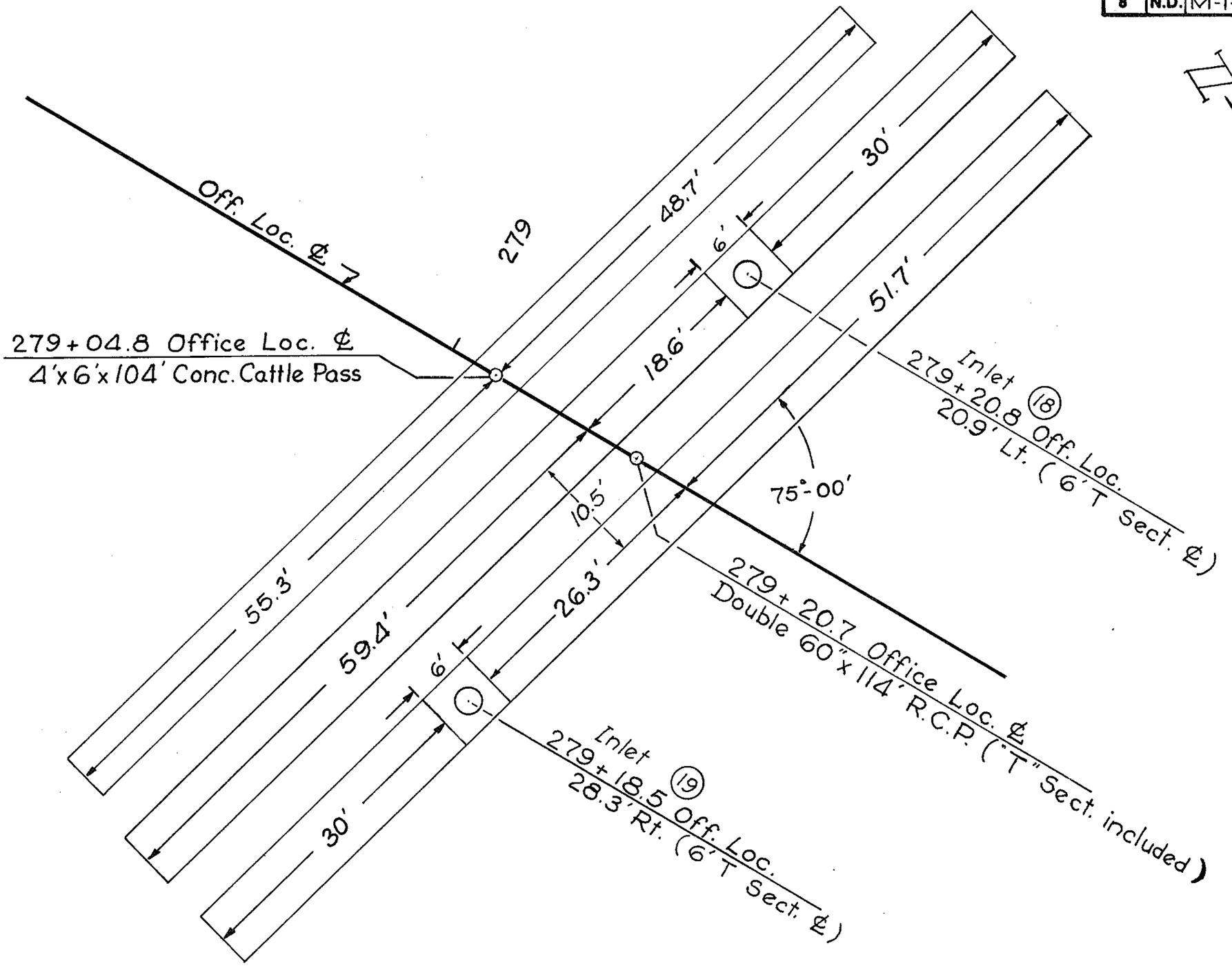
At Pipe Ends

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".

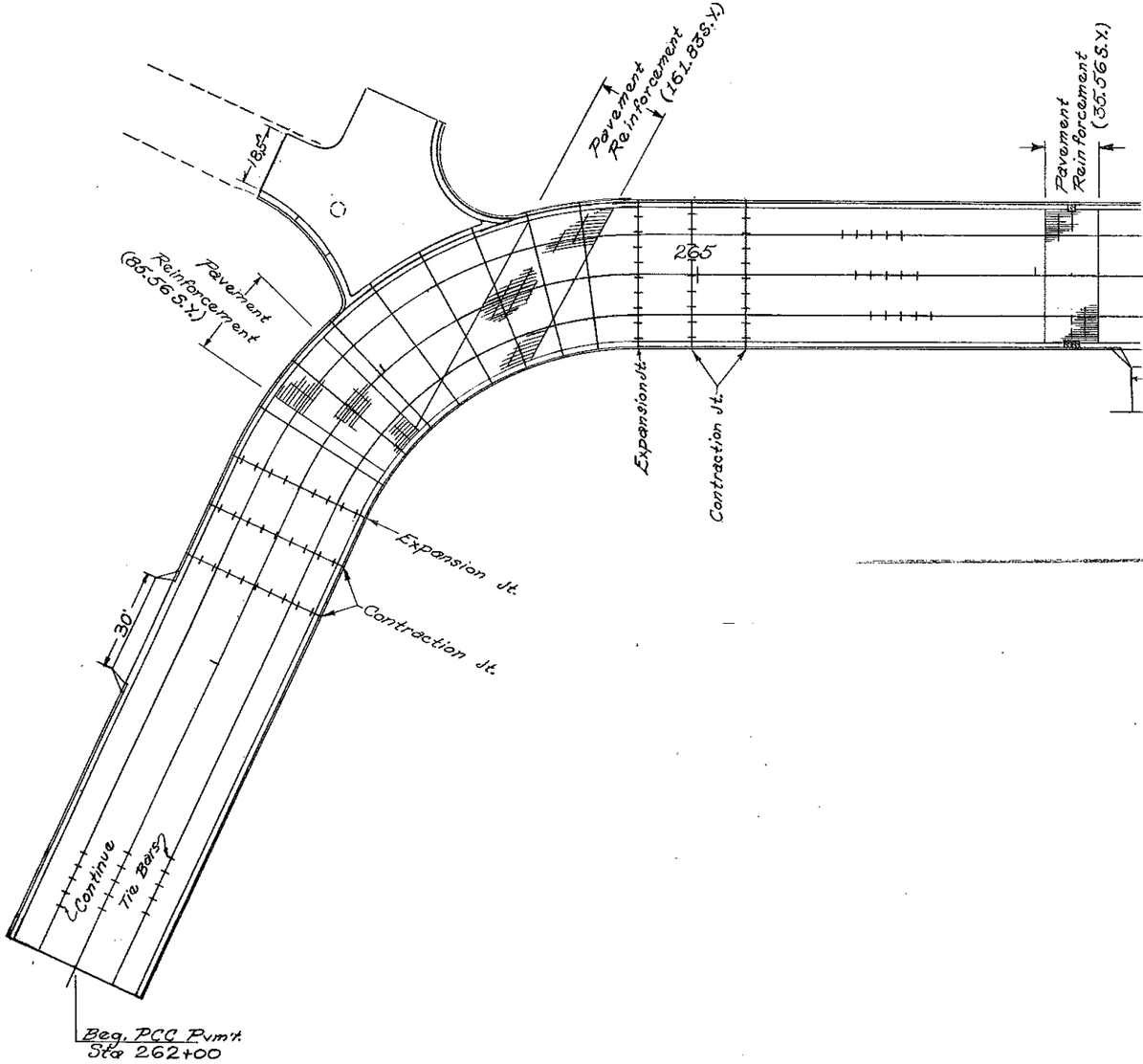


CURB TAPER
AT ENDS OF APPROACH RADIUS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	17



FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	18



CURB & GUTTER - TYPE 1

262+00 to 268+00 Lt. 652 L.F.
262+00 to 268+00 Rt. 576 L.F.

DOWELLED EXPANSION JOINT

262+00 to 268+00 80 L.F.

DOWELLED CONTRACTION JOINT

262+00 to 268+00 160 L.F.

8" NON-REINF. CONC. PVM'T.

262+00 to 268+00 2666.7 S.Y.

CONC. DRIVEWAY - TYPE 1

263+00 Lt. 30' 63.4 S.Y.
266+49.1 Rt. 40' 83.4 S.Y.
267+39.1 Lt. 40' 83.4 S.Y.

VALLEY GUTTER - 36"

264+28 Lt. 60 L.F.

PREFORMED EXPANSION JOINT SEAL-1 5/8"

262+00 to 268+00 80 L.F.

PREFORMED CONTRACTION JOINT SEAL - 9/16"

262+00 to 268+00 1520 L.F.

PCC PAVING DETAIL

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	19

CURB & GUTTER - TYPE 1

268+00 to 279+45.3 Lt. 1134 L.F.
268+00 to 279+31.5 Rt. 1111 L.F.

DOWELLED EXPANSION JOINT

268+00 to 279+40.1 160 L.F.

DOWELLED CONTRACTION JOINT

268+00 to 279+40.1 320 L.F.

8" NON-REINF. CONC. PVM'T.

268+00 to 279+40.1 5805 S.Y.

8" CONC. DRIVEWAY - TYPE 1

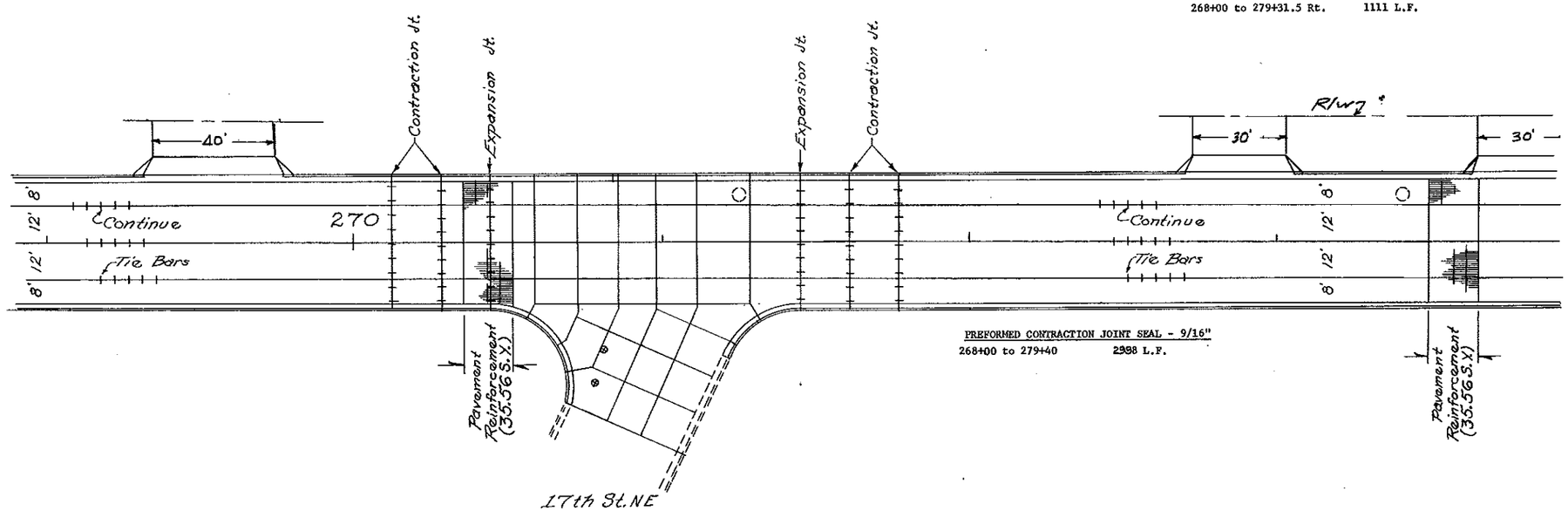
269+54.1 Lt. 40' 83.4 S.Y.
272+88.1 Lt. 30' 63.4 S.Y.
273+80.1 Lt. 30' 63.4 S.Y.

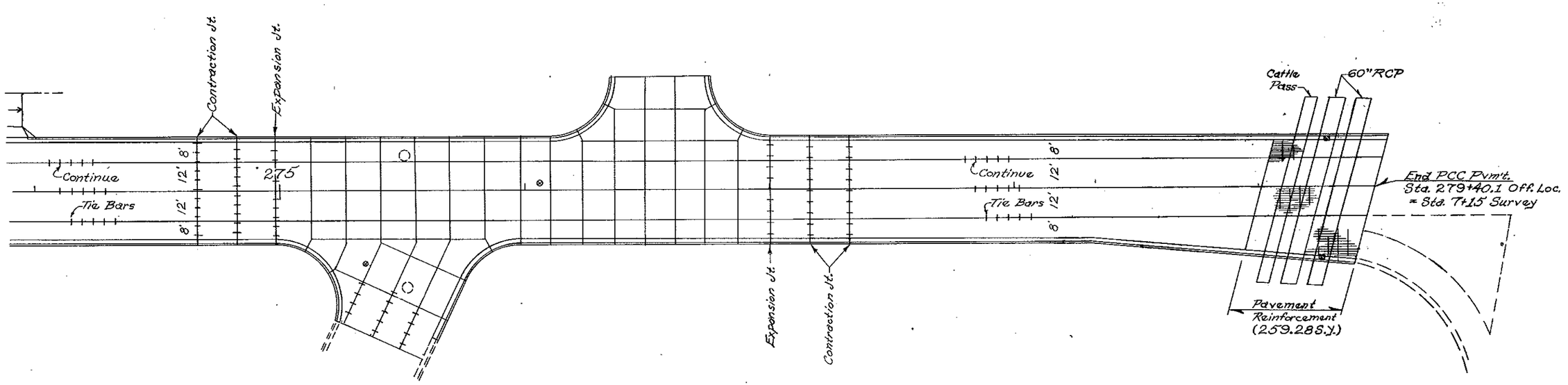
PREFORMED EXPANSION JOINT SEAL - 1 5/8"

268+00 to 279+40.1 160 L.F.

PREFORMED CONTRACTION JOINT SEAL - 9/16"

268+00 to 279+40 2988 L.F.





PCC PAVEMENT DETAIL

ERWA REGION	STATE	FED. AID PROJ. NO.	
8	N.D.	M-1-806(12)	2

264+75-25' Lt
1696.0
Clean-Out Tube

266+25-25' Lt
1697.5

6" Perf. PVC

268+25-25' Lt
1697.0

270+40-25' Lt
1696.5
6" PVC to MH
Paint Pair as Perf. PVC Pipe.
Clean-Out Tube

266+00 ℄ Ol
1698.1

268+00 ℄ Ol
1697.6

Off Loc. ℄

Survey ℄

270+15 ℄ Ol
1697.0

Clean-Out Tube

264+82-25' Rt
1699.0
Clean-Out Tube

263+75-25' Rt
1698.7
Clean-Out Tube

6" Perf. PVC

267+75-25' Rt
1698.1
Clean-Out Tube

269+90-25' Rt
1697.5

25'
25'
10'

264 265 266 267 268 269 270 271 272

1700 1690

Bit. Mat.
Gravel Base
Mixed Bit. Cl. Fill v-moist - soft
Brn. Cl. firm
Brn. Cl. firm moist

Gravel Base
Crse. Gravel
Brn. Cl. Hvy. Firm
Brn. Cl. firm moist

Gravel Base
Dk. Brn. Cl. soft v-m
Brn. Cl. soft v-m
Brn. Sdy. Cl. (Lm soft) loosening
Brn. Cl. firm

Gravel Base
Blk. Cl. organic v-m soft
Brn. Cl. soft v-m
Dk. Brn. Cl. Hvy. soft water bearing
Brn. Cl. firm moist

Gravel Base
Brn. Cl. soft v-m

Gravel Base
Blk. Cl. soft v-m w/ Org.
Brn. Cl. soft v-m
Brn. Cl. firm (Sdy.) moist

Gravel Base
Brn. Cl. soft v-m

Gravel Base
Blk. Cl. soft
Tan Cl. soft
Brn. Cl. soft
Brn. Cl. firm
Brn. Cl. Gravelly firm water bearing

v-moist
moist

Gravel Base
Crse. Gravel
Brn. Cl. soft v-moist
Dk. Brn. Cl. firm
Brn. Cl. firm (Sdy.)

Gravel Base
Gravel
Brn. Cl. soft v-moist
Brn. Cl. Hvy. Firm moist

264+75-25' Rt
1699.0
264+75-25' Lt
1699.0

269+75-25' Rt
1697.5
269+75-25' Lt
1697.5

272+35-25' Rt
1696.5
272+35-25' Lt
1696.5

Neenah R-6003 Series (cast iron) Manhole Frame + Type Y or equal

Solid Lid - Type C or equal

18"x18" Conc. Pad

W

MANHOLE FRAME & LID DETAIL

18"

finished grade

earth

6" conc.

4"± conc.

6" Diam. P.V.C. riser

8" Dia. P.V.C. sleeve 12" long

gran. fill

SECTION W-W

MANHOLE FRAME & LID ELEVATION

See Manhole Frame & Lid Detail

6" P.V.C. Riser

90° Sweep

R=6'

6" Perforated P.V.C. Underdrain Pipe

TYPICAL UNDERDRAIN CLEAN-OUT RISER DETAIL

NOTE: 6" P.V.C. Radius Sweep & 6" P.V.C. Riser to be paid for as 6" Perf. P.V.C. Underdrain Pipe.

3' Underdrain Granular Fill

6" Perf. Pipe

6" Perf. Pipe

Underdrain Granular Fill

12"

6"

6"

6"

6" PVC

2"

Filter Fabric (12" Overlap for all splices)

Coarse Aggr. Filter Material

BACKFILL DETAIL
6" PERF. PIPE

066.6 061.1 058.8 056.6 053.3 049.9 046.6

+16.36 +38 1706.5

K&E 46 7042 MADE IN U.S.A.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	21

REINF. CONC. PIPE-SEWER CL. III
262+00 Rt. to ② 24"x176 L.F.
① to ② 15"x63 L.F.
② to ③ 24"x100 L.F.

CONDUIT PIPE
263+00 Lt. 18"x47 L.F.

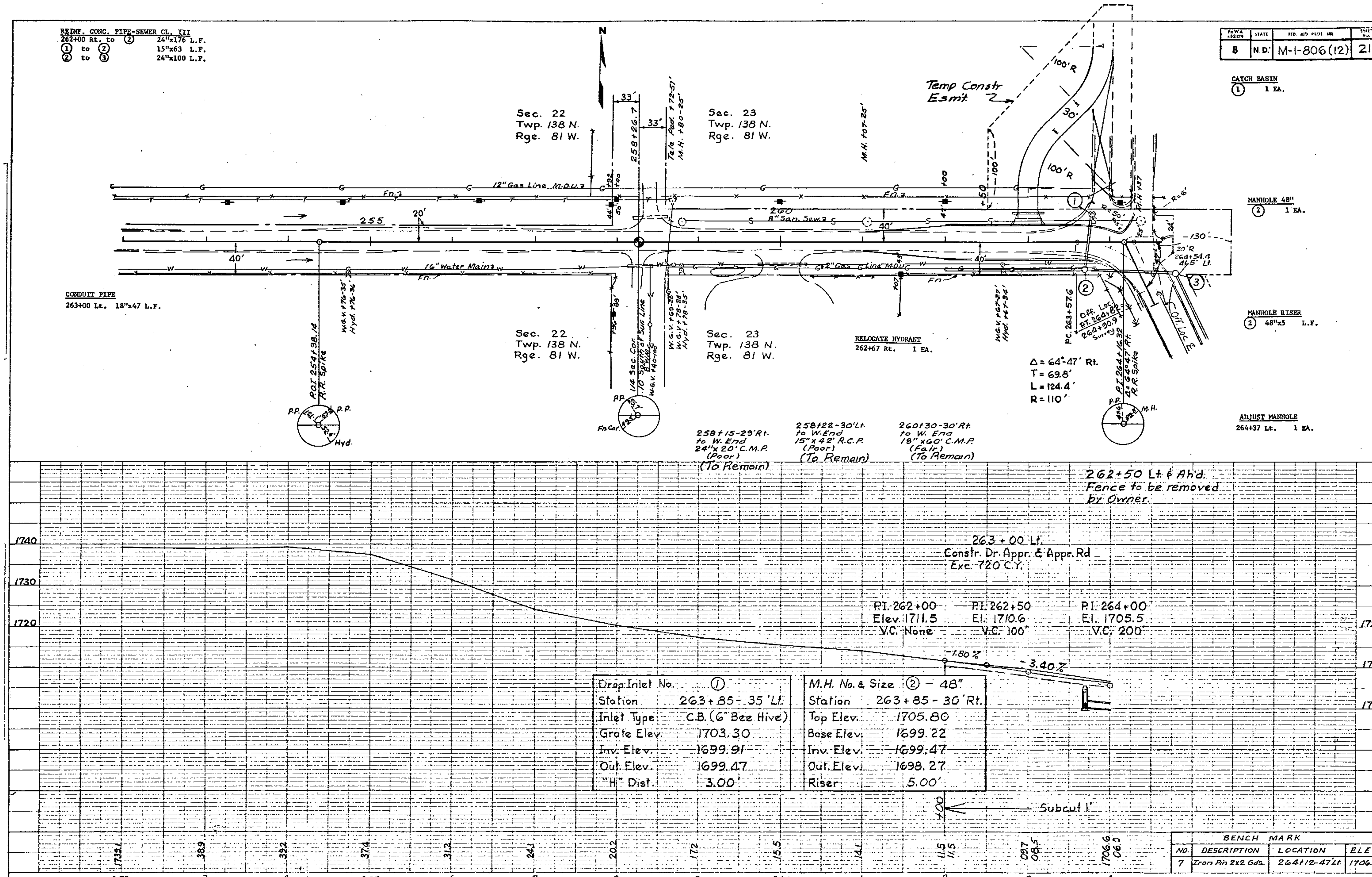
CATCH BASIN
① 1 EA.

MANHOLE 48"
② 1 EA.

MANHOLE RISER
② 48"x5 L.F.

RELOCATE HYDRANT
262+67 Rt. 1 EA.

ADJUST MANHOLE
264+37 Lt. 1 EA.



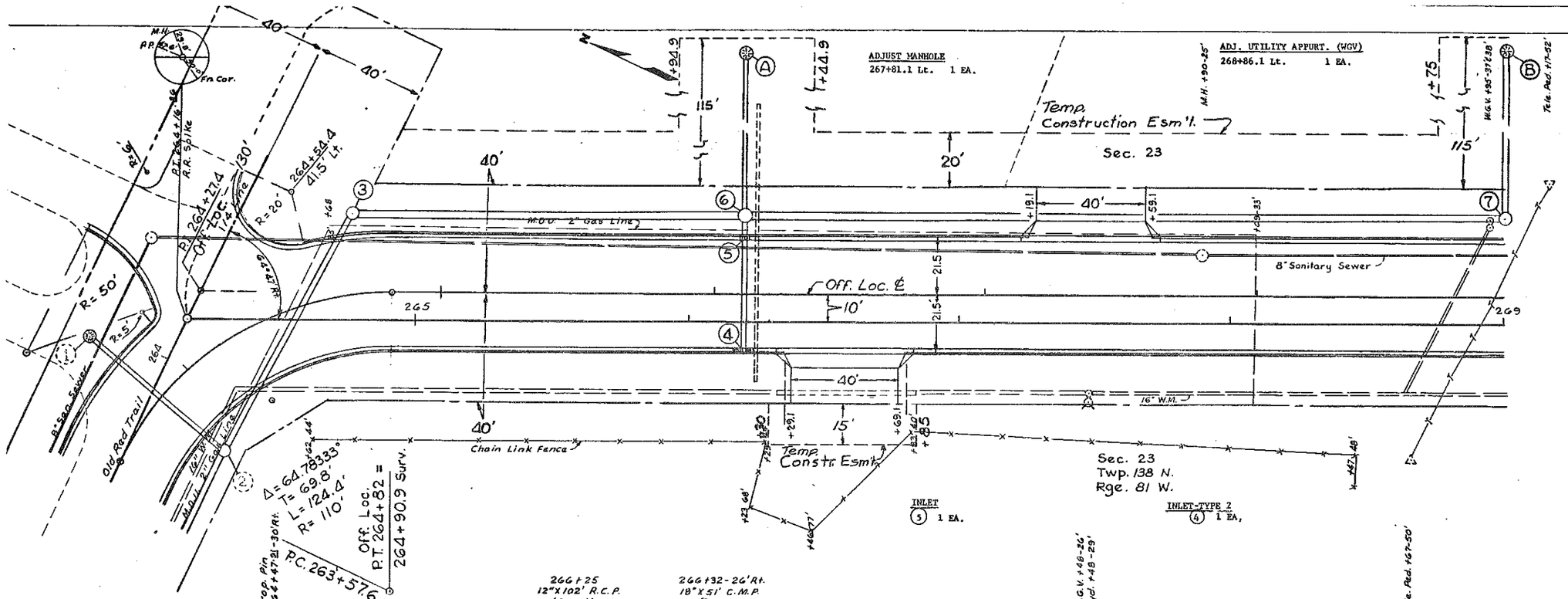
Drop Inlet No.	①
Station	263+85-35' Lt.
Inlet Type	C.B. (6" Bee Hive)
Grate Elev.	1703.30
Inv. Elev.	1699.91
Out. Elev.	1699.47
"H" Dist.	3.00'

M.H. No. & Size	② - 48"
Station	263+85-30' Rt.
Top Elev.	1705.80
Base Elev.	1699.22
Inv. Elev.	1699.47
Out. Elev.	1698.27
Riser	5.00'

BENCH MARK

NO.	DESCRIPTION	LOCATION	ELEV.
7	Iron Pin 2x2 Gds.	264+12-47' Lt.	1706.31

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	22

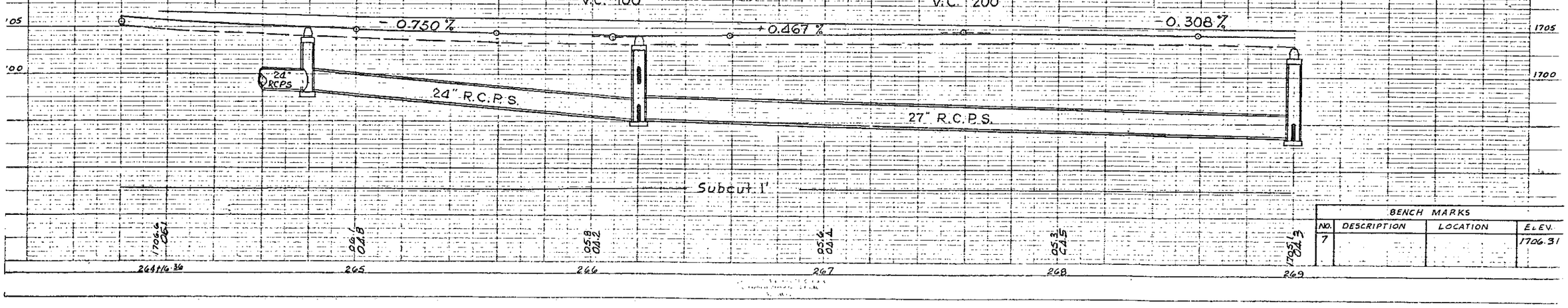


266+25 12"X102' R.C.P. (Good) (Remove-Salv.)

266+32-26' Rt. 18"X51' C.M.P. (Poor) (Remove)

M.H. No. & Size	3 - 48"	6 - 60"	7 - 60"
Station	264+706-29.8' Lt.	266+11.6-29' Lt.	268+91.1-29' Lt.
Top El.	1704.80	1704.20	1703.10
Base El.	1698.02	1694.73	1693.33
Inv. El.	1698.27	1695.00	1693.60
Out. El.	1695.00	1693.60	1692.80
Riser	5.20'	7.89'	8.19'

Drop Inlet No.	4	5
Station	266+11.6 Rt	266+11.6 Lt.
Inlet Type	Type 2 - Dbl.	Single
Grate El.	1704.06	1703.64
Inv. El.	1700.42	1699.26
Out. El.	1699.26	1699.10
"H" Dist.	3.00'	4.00'



See Sh. # 20 for Underdrain Details

BENCH MARKS			
NO.	DESCRIPTION	LOCATION	ELEV.
7			1706.31

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	23

ADJ. UTILITY APPURTENANCE (WGV.)

270+63.1 Rt.	1 EA.
270+78.1 Rt.	1 EA.
270+81.1 Rt.	1 EA.

ADJUST MANHOLE

271+25.1 Lt.	1 EA.
273+41.1 Lt.	1 EA.

CATCH BASIN (6" BEE HIVE)

Ⓒ 1 EA.

INLET

⑨ ⑩ ⑫ ⑬ ⑭ 5 EA.

MANHOLE 60"

⑧ 1 EA.

MANHOLE 48"

⑮ 1 EA.

MANHOLE RISER

⑧ 60"x8.99 L.F.

⑮ 48"x9.22 L.F.

INLET - TYPE 2

⑪ 1 EA.

RELOCATE HYDRANT

270+58.1 Rt. 1 EA.

REINF. CONC. PIPE-SEWER CL. III

⑦	to	⑧	27"x149	L.F.
⑧	to	Ⓒ	18"x100	L.F.
⑧	to	⑨	18"x5	L.F.
⑨	to	⑩	18"x41	L.F.
⑩	to	⑪	18"x42	L.F.
⑪	to	⑫	15"x36	L.F.
⑧	to	⑮	27"x311	L.F.
⑬	to	⑭	18"x41	L.F.
⑭	to	⑮	18"x6	L.F.
⑮	to	Ⓓ	27"x32	L.F.

M.H. No. & Size	⑧ - 60"	⑮ - 48"
Station	270+44.1 - 29' Lt.	273+58.1 - 29' Lt.
Top El.	1703.10	1701.10
Base El.	1692.53	1690.30
Inv. El.	1692.80	1690.57
Out. El.	1690.57	1688.60
Riser	8.99'	9.22'

Drop Inlet No.	⑨	⑩	⑪	⑫	⑬	⑭
Station	270+44.1 Lt.	270+44.1 Rt.	270+67.1-57.5' Rt.	271+03.7-75' Rt.	273+58.1 Rt.	273+58.1 Lt.
Inlet Type	Single	Single	Type 2	Single	Single	Single
Grate El.	1703.29	1703.29	1705.47	1705.47	1702.22	1702.22
Inv. El.	1698.91	1699.91	1701.25	1702.07	1698.84	1697.84
Out. El.	1698.66	1698.91	1699.91	1701.25	1697.84	1697.59
"H" Dist.	4.00'	3.00'	4.00'	3.00'	3.00'	4.00'

Temp Construction Esm't.

Sec. 23

Sec. 23
Twp. 138 N.
Rge. 81 W.

8" Sanitary Sewer

16" W.M.

Off. Loc. ℄

271+15.03

-0.308 %

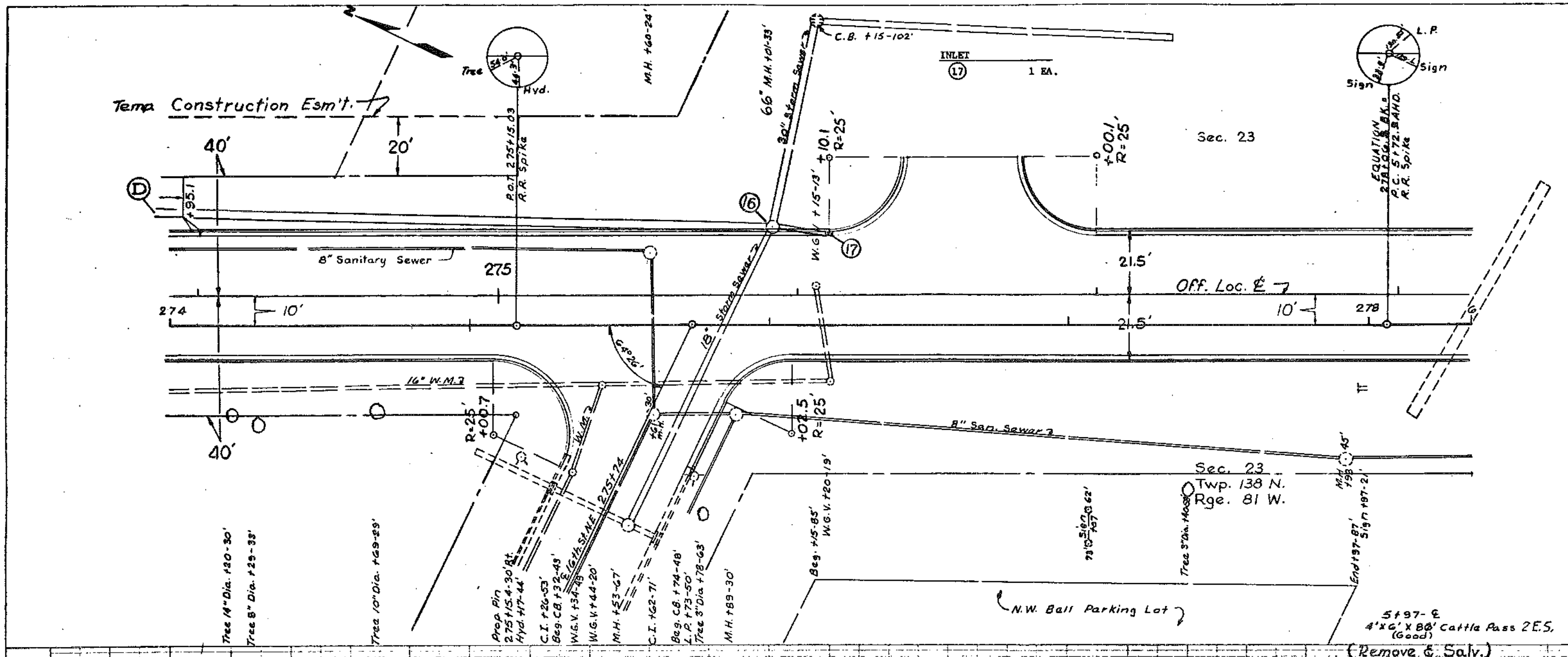
27" R.C.P.S.

27" R.C.P.S.

27" R.C.P.S.

Subcut 1'
Exc. 1873 C.Y.

FHWA Region	State	Fed. Aid Proj. No.	Sheet No.
8	N D	M-1-806 (12)	24



ADJ. UTILITY APPURTENANCE (WGV)

275+25.1 Rt.	1 EA.
275+35.1 Rt.	1 EA.
276+06.1 Lt.	1 EA.
276+11.1 Lt.	1 EA.

ADJUST MANHOLE

275+51.1 Lt.	1 EA.
275+52.1 Rt.	1 EA.
275+92.1 Lt.	1 EA.
277+85 Rt.	1 EA.

REINF. CONC. PIPE - SEWER CL. III

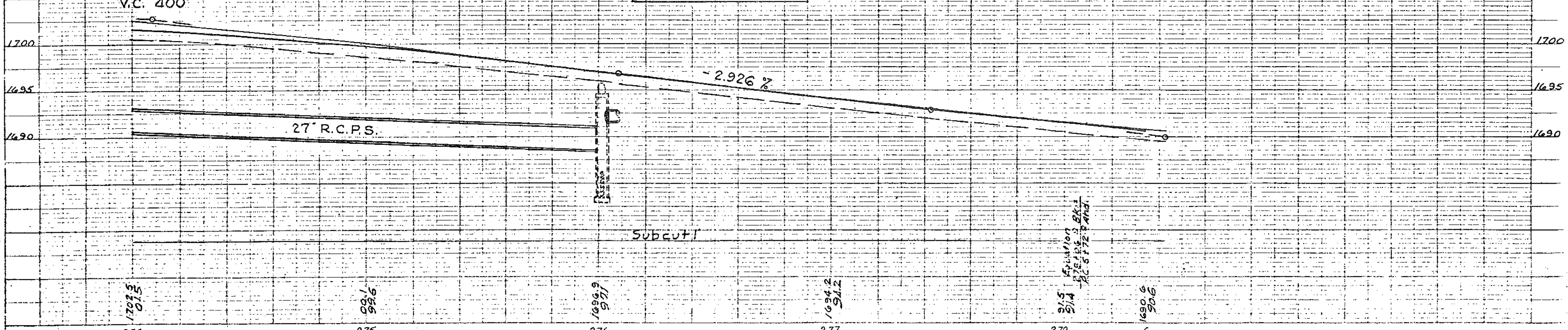
(D)	to	(16)	27"x199	L.F.
(16)	to	(17)	15"x16	L.F.

M.H. No. (16) (Existing)
Station 275+92.1 - 23' Lt.

Drop Inlet No. (17)	
Station	276+10.1 Lt.
Inlet Type	Single
Grate El.	1696.05
Inv. El.	1691.65
Out. El.	1691.40
"H" Dist.	4.00'

	S.C Exc.	Exc.	Emb.	Waste	
Underdrains	6060		3166	4009	C.Y.
Subcut 1'	1873		2248		C.Y.
Mainline		4479	3733		C.Y.
Dr. Ditch (7+00 Rt.)		1020			C.Y.
Appr. Rd. (263+00 Lt.)		724	1000		C.Y.
	7933	6223	10,147	4009	C.Y.

P.I. 274+00 (Off. Loc.)
Elev. 1702.7
V.C. 400'



FHWA Region	State	Fed. Aid Proj. No.	Sheet No.
8	N.D.	M-1-806(12)	25

RELAY CONC. CATTLE PASS E.S.
279+04.8 ℄ 2 EA.

REINF. CONC. PIPE CL. III
279+20.7 ℄ 60"x12' (2-Tees)

RELAY 60" REINF. CONC. PIPE
279+20.7 ℄ 216 L.F.

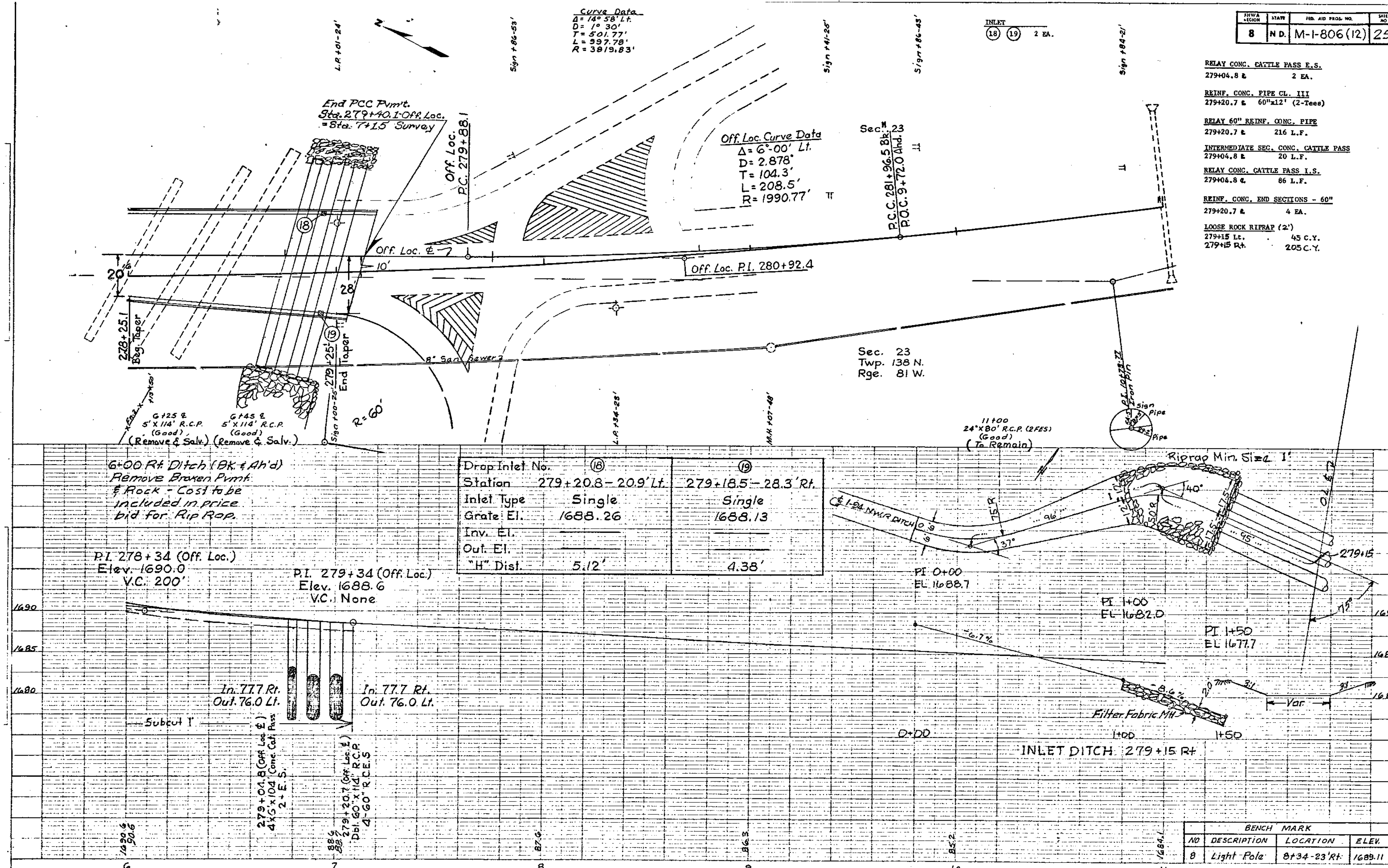
INTERMEDIATE SEC. CONC. CATTLE PASS
279+04.8 ℄ 20 L.F.

RELAY CONC. CATTLE PASS I.S.
279+04.8 ℄ 86 L.F.

REINF. CONC. END SECTIONS - 60"
279+20.7 ℄ 4 EA.

LOOSE ROCK RIPRAP (2')
279+15 Lt. 45 C.Y.
279+15 Rt. 205 C.Y.

INLET
(18) (19) 2 EA.



Curve Data
Δ = 14° 58' Lt.
D = 1° 30'
T = 501.77'
L = 997.78'
R = 3819.83'
End PCC Pvm't.
Sta. 279+40.1-Off. Loc.
= Sta. 7+15 Survey
Off. Loc. P.C. 279+88.1
Off. Loc. Curve Data
Δ = 6°-00' Lt.
D = 2.878°
T = 104.3'
L = 208.5'
R = 1990.77'
Sec. 23
P.C.C. 281+96.5 Bk.
P.O.C. 9+72.0 Ahd.
Off. Loc. ℄
10'
Off. Loc. P.I. 280+92.4
20'
28'
278+25.1 Beg. Taper
279+25.1 End Taper
8" San. Sewer
Sec. 23
Twp. 138 N.
Rge. 81 W.
R=60'
6+25 ℄ 5' X 114' R.C.P. (Good) (Remove & Salv.)
6+45 ℄ 5' X 114' R.C.P. (Good) (Remove & Salv.)
11+00 24"X80' R.C.P. (2FES) (Good) (To Remain)
Sign Pipe
Riprap Min. Size 1'
℄ I-94 NWR Ditch
75' R
50' R
40°
37°
45°
279+15
75°
6+00 Rt. Ditch (Bk. & Ah'd) Remove Broken Pvmt. & Rock - Cost to be included in price bid for Rip Rap.
P.I. 278+34 (Off. Loc.) Elev. 1690.0 V.C. 200'
P.I. 279+34 (Off. Loc.) Elev. 1688.6 V.C. None
PI 0+00 EL 1688.7
PI 1+00 EL 1682.0
PI 1+50 EL 1677.7
-6.7%
-8.6%
Var.
Filter Fabric MH
0+00
1+00
1+50
INLET DITCH 279+15 Rt.
In. 77.7 Rt. Out. 76.0 Lt.
In. 77.7 Rt. Out. 76.0 Lt.
Subcut 1'
279+04.8 (Off. Loc. ℄) 4'x5'x104' Conc. Cat. Pass 2 - E.S.
279+20.7 (Off. Loc. ℄) Dbl. 60"x114' R.C.P. 4-60" R.C.E.S.
1690
1685
1680
6
7
8
9
10
11

Drop Inlet No.	18	19
Station	279+20.8 - 20.9' Lt.	279+18.5 - 28.3' Rt.
Inlet Type	Single	Single
Grate El.	1688.26	1688.13
Inv. El.	—	—
Out. El.	—	—
"H" Dist.	5.12'	4.38'

BENCH MARK

No	Description	Location	Elev.
8	Light Pole	8+34-23' Rt.	1689.11

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	26

SIGN SUMMARY - PERFORATED TUBE

STATION	ASSEMBLY NUMBER	SIGN AREA FLAT TYPE 2	SIGN AREA SHEET TYPE 3 OR 4	SIGN 1ST	SUPPORT 2ND	POST LENGTHS 3RD	4TH	SIGN SIZE	SLEEVE LENGTH 1ST	2ND	3RD	4TH	SIZE	ANCHOR LNG.	UNIT SIZE	NO	TOTAL SUPPORT WEIGHT	RESET SIGN PAN.	RESET SIGN SUP.	MAX. LNG. FOR SUP. SIZE
262+50 RT	53WS		8.50	10.8				2.51						4.0	2.51	1	59.22			10.8
262+80 LT	1RS		5.18	8.8				2.25						4.0	2.50	1	36.83			10.5
263+50 LT	54WS		11.25	10.7				2.50	3.0				2.25	4.0	2.50	1	54.60			11.3
264+00 LT	1RS		5.18	8.8				2.25						4.0	2.50	1	36.83			10.5
264+30 LT	1RS		5.18	8.8				2.25						4.0	2.50	1	36.83			10.5
264+40 LT	SNS																	1	1	
266+00 LT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
266+00 RT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
267+25 LT	1RS		5.18	8.8				2.25						4.0	2.50	1	36.83			10.5
267+50 RT	SL25																	1	1	
268+00 LT	53WS		8.50	10.8				2.51						4.0	2.51	1	59.22			10.8
269+00 LT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
269+00 RT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
269+30 LT	1RS		5.18	8.8				2.25						4.0	2.50	1	36.83			10.5
270+45 RT	391RM		16.00	10.7	10.7			2.25	3.0	3.0			2.00	4.0	2.50	2	95.91			12.0
270+65 RT	SNS																	1	1	
270+65 RT	SNS	3.00		MOUNTED ON EXISTING SUPPORTS																
271+15 LT	SNS																	1	1	
272+00 LT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
273+38 RT	387RM			9.3				2.19						4.0	2.19	1	45.59	1		10.3
274+00 RT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
275+00 LT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
275+18 RT	SNS		3.00	MOUNTED ON EXISTING SUPPORTS																
275+75 LT	SNS																	1	1	
276+30 LT	STOP																	1	1	
276+30 RT	DS																	1	1	
277+00 RT	SIGN NO1	49.00		9.8	9.8			2.50						4.0	2.50	2	87.48			10.1
278+00 LT	9RS	5.00		8.8				2.25						4.0	2.50	1	36.83			10.8
6+00 RT	379RM			8.8				2.25						4.0	2.50	1	36.83	1		10.8
7+00 RT	14RS			8.3				2.00						4.0	2.25	1	31.02	1		9.9
7+86 LT	4RS		3.90	8.8				2.00						4.0	2.25	1	32.47			10.4
SUBTOTAL NO. 1		92.00	77.05														981.10	10	7	
SUBTOTAL NO. 1		92.00	77.05														981.10	10	7	
TOTAL		92.00	77.05														981.10	10	7	

BASIS OF ESTIMATE

Sign Support Lengths

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

Vertical Clearance - 72 inches
Signs viewed from mainline
Signs viewed from crossings

TRAFFIC CONTROL SYSTEM

SIGN SUMMARY

Mandan Ave. NE (Refinery Road)
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	27

Sta. 264+40 Lt.
Reset Sign & Support
from Sta. 264+65 Lt.

MANDAN AVE NE 1-D3-36
OLD RED TRAIL 1-D3-36

STOP R1-1-30

Sta. 264+00 Lt.
Assembly 1
RS

ROAD NARROWS W5-1-36

Sta. 263+50 Lt.
Assembly 54
WS

STOP R1-1-30

Sta. 262+80 Lt.
Assembly 1
RS

Sta. 264+30 Lt.
Assembly 1
RS

STOP R1-1-30

Sta. 266+00 Lt.
Assembly 9 RS

NO PARKING R8-3-24

Remove

STOP

Sta. 267+25 Lt.
Assembly 1 RS

STOP R1-1-30

Remove

REDUCED SPEED 20

265

Off Loc. ℄

30'

10'

21.5'

21.5'

40'

268

Mandan AV. N.E.

40'

+70

Sta. 268+00
Lt.
Assembly 53
RS

W1-1(L)30

15 M.P.H.

W13-1-18

W1-1(R)30

15 M.P.H.

W13-1-18

Sta. 262+50 Rt.
Assembly 53
RS

262

Old Red Trail

15 M.P.H.

Remove

NO PARKING R8-3-24

Sta. 266+00 Rt.
Assembly 9
RS

SPEED LIMIT 25

Sta. 267+50 Rt.
Reset Sign & Support
From Sta. 267+50 Rt.

INSTALL PVMT. MARKING DROP ON BEADS TYPE II (LINE)

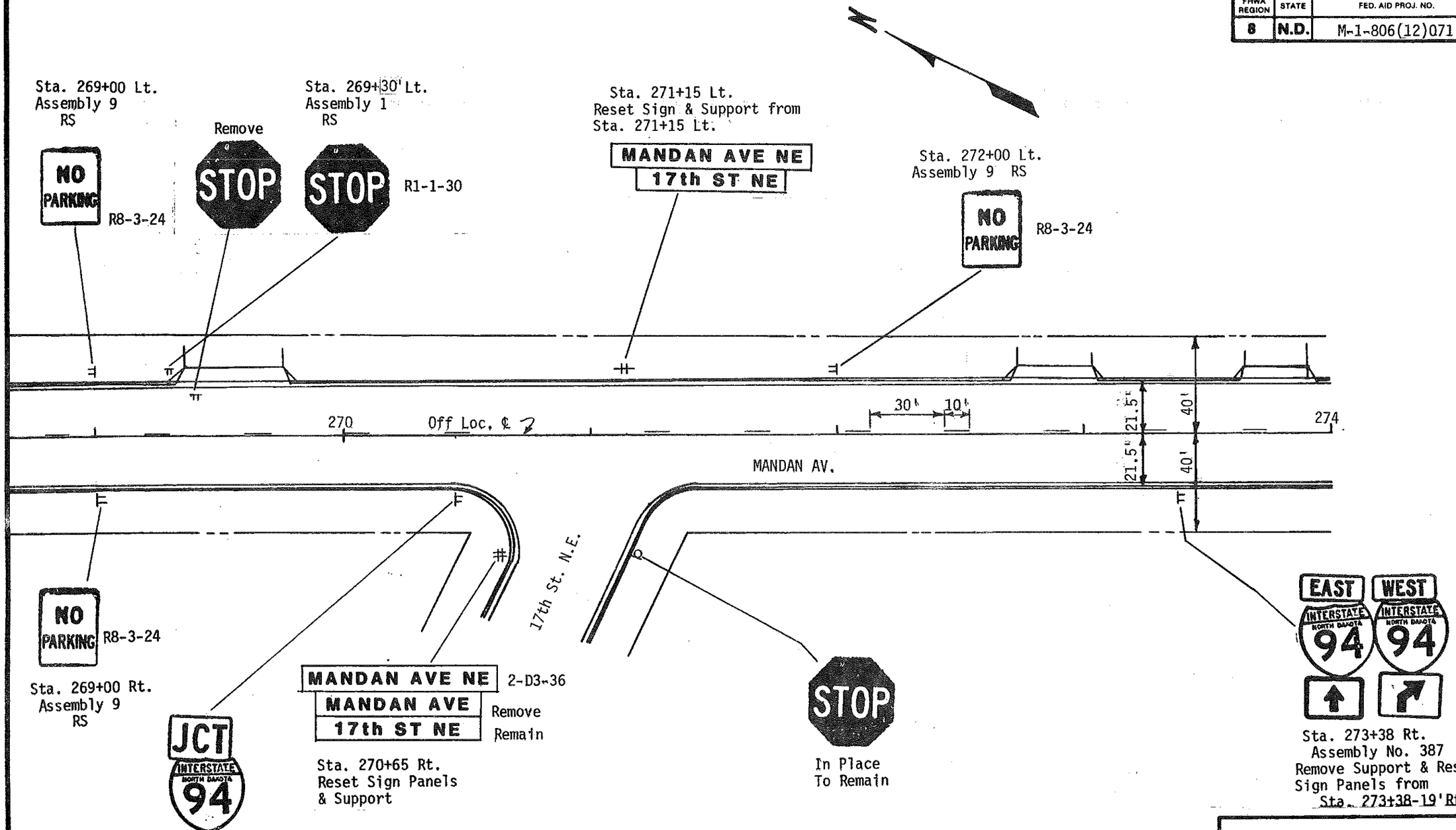
4" Yellow Centerline, 10' Line, 30 ft. skip 170 L.F.

TRAFFIC CONTROL SYSTEM

SIGNING & MARKING
LAYOUT

Mandan Av. N.E. (Refinery Rd.)
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	28



INSTALL PVMT MARKING DROP ON BEADS TYPE II (Line)
4" Yellow Center Line, 10' Line, 30 ft. skip 120 L.F.

TRAFFIC CONTROL SYSTEM

SIGNING & MARKING
LAYOUT

MANDAN AV. N.E. (Refinery Rd.)
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	29

Sta. 275+75 Lt.
Reset Sign & Support from Sta. 275+75 Lt.

MANDAN AVE NE
16th ST NE

Sta. 276+30 Lt.
Reset Sign & Support from Sta. 276+30 Lt.

STOP

Sta. 277+00 Lt.
Assembly No. 212

MANDAN UNION ⇦ CEMETERY

MANDAN UNION CEMETERY ⇨

REMOVE

MANDAN UNION CEMETERY ←

MANDAN UNION CEMETERY →

SIGN NO. 1

Sta. 278+00 Lt.
Assembly No. 9
RS

R2-1-24

SPEED LIMIT 25

Sta. 275+00 Lt.
Assembly No. 9
RS

NO PARKING R8-3-24

Remove

STATE MTCE ENDS

21.5' 40' 21.5'

275

Off Loc. ℄

30' 10'

278

MANDAN AV. N.E.

10'

278

Survey ℄

NO PARKING R8-3-24

Sta. 274+00 Rt.
Assembly No. 9
RS

STOP

In Place
To Remain

BISMARCK 5
DICKINSON 92

Sta. 276+30 Rt.
Reset Sign & Support
From Sta. 276+30 Rt.

Sta. 278+06.9 Bk =
5+72.0 AHD.

WEST INTERSTATE NORTH DAKOTA 94

Sta. 6+00 Rt.
Assembly No. 379
Remove Support & Reset
Sign Panels from
Sta. 277+97-21' Rt.

MANDAN AVE NE
MANDAN AVE
16th ST NE

2-D3-36
Remove
Remain

Sta. 275+18

INSTALL PVMT MARKING DROP ON BEADS TYPE II (Line)

4" Yellow Center Line, 10' Line, 30' Skip 120 L.F.

TRAFFIC CONTROL SYSTEM

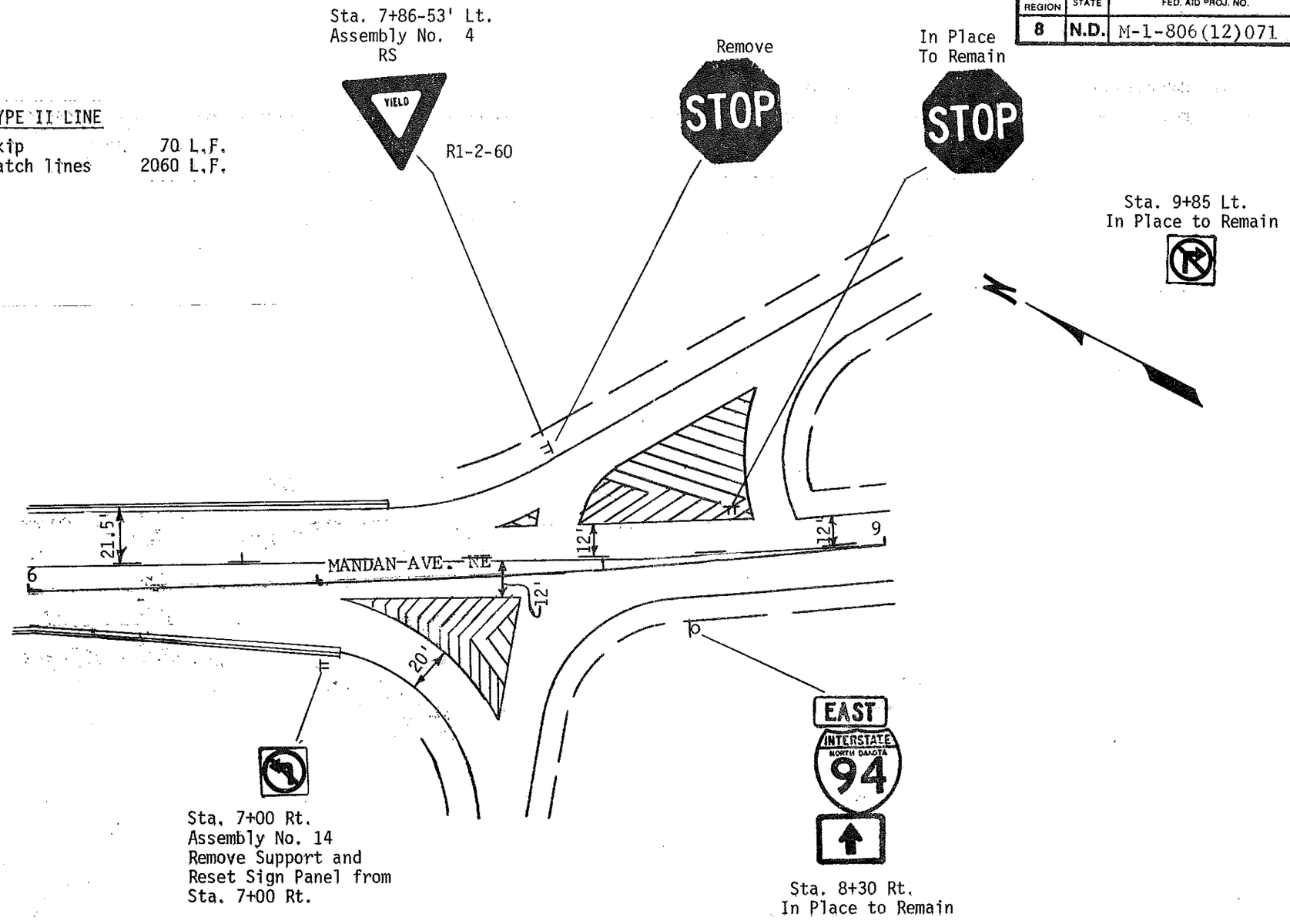
SIGNING & MARKING
LAYOUT

MANDAN AV. N.E. (Refinery Rd.)
MANDAN, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	30

INSTALL PVM'T. MARKING DROP ON BEADS TYPE II LINE

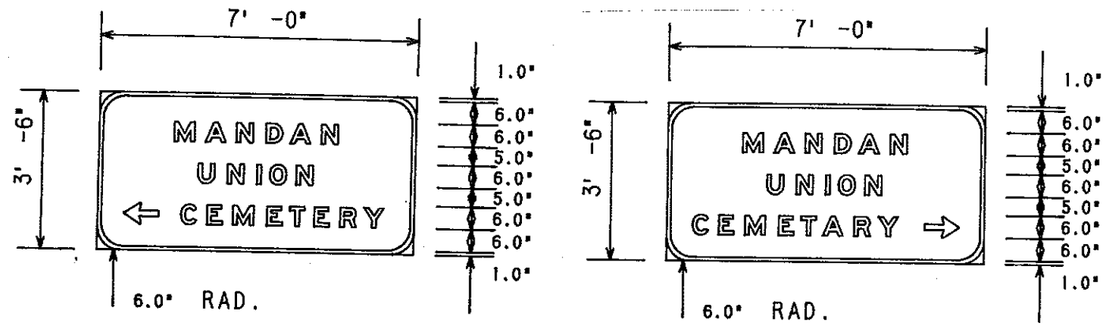
4" Yellow Center Line, 10' Line, 30' Skip	70 L.F.
8" White Lines-5' Ctrs. @ 45°, cross hatch lines	2060 L.F.



TRAFFIC CONTROL SYSTEM
SIGNING,
PAVEMENT MARKING LAYOUT

Mandan Ave. NE (Refinery Rd.)
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	31



SIGN NO. 1

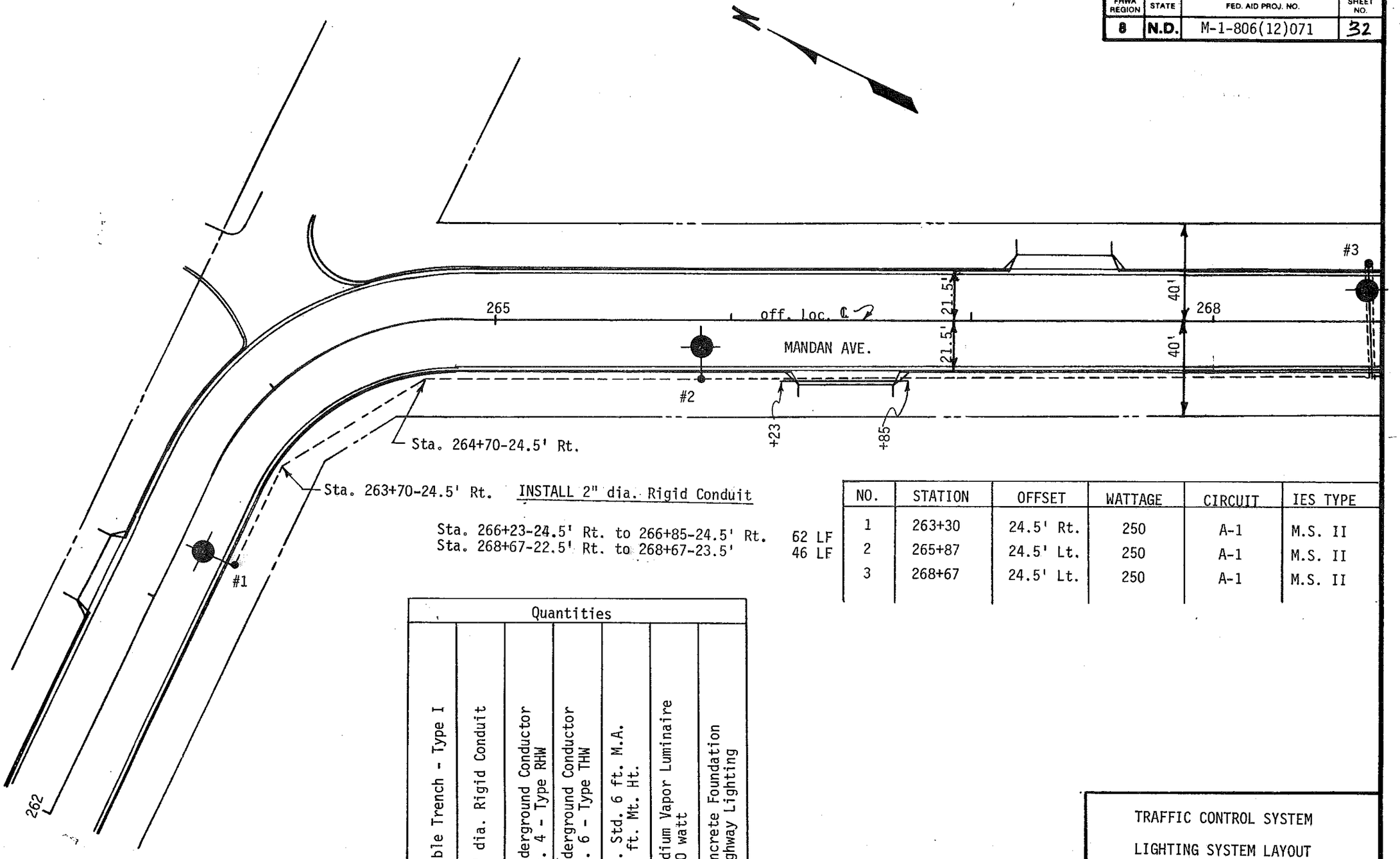
Sta. 277+00 Lt.
Area: 49.00 Sq. Ft.

TRAFFIC CONTROL SYSTEM

SIGN LAYOUT SHEET

Mandan Ave. N.E. (Refinery Road)
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	32



INSTALL 2" dia. Rigid Conduit

Sta. 266+23-24.5' Rt. to 266+85-24.5' Rt. 62 LF
Sta. 268+67-22.5' Rt. to 268+67-23.5' 46 LF

NO.	STATION	OFFSET	WATTAGE	CIRCUIT	IES TYPE
1	263+30	24.5' Rt.	250	A-1	M.S. II
2	265+87	24.5' Lt.	250	A-1	M.S. II
3	268+67	24.5' Lt.	250	A-1	M.S. II

Quantities

Cable Trench - Type I	2" dia. Rigid Conduit	Underground Conductor No. 4 - Type RHW	Underground Conductor No. 6 - Type THW	Lt. Std. 6 ft. M.A. 40 ft. Mt. Ht.	Sodium Vapor Luminaire 250 watt	Concrete Foundation Highway Lighting
LF.	LF	LF	LF	EA	EA	EA
475	108	1336	668	3	3	3

TRAFFIC CONTROL SYSTEM

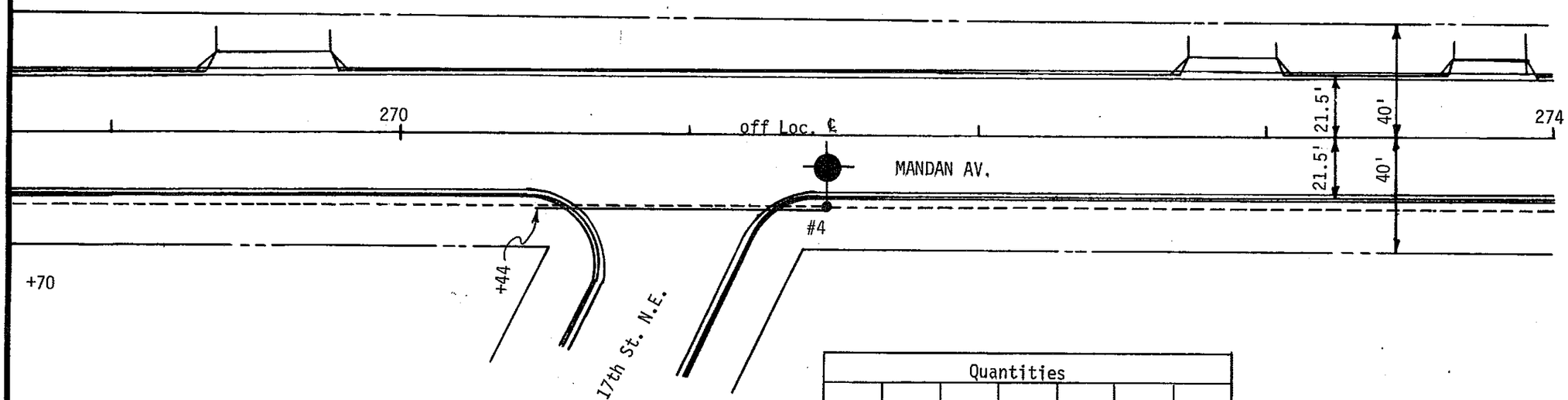
LIGHTING SYSTEM LAYOUT

MANDAN AV. N.E. (Refinery Rd.)
Mandan N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-906(12)071	33

INSTALL 2" dia. Rigid Conduit

Sta. 270+AA-24.5' Rt. to 271+66-24.5' Rt. 122 L.F.



NO.	STATION	OFFSET	WATTAGE	CIRCUIT	IES TYPE
4	271+47	4.5' Rt.	250	A-1	M.S. II

Quantities						
Cable Trench - Type I	Concrete Foundation-Highway Lighting	2" dia. Rigid Conduit	Underground Conductor No. 4 - Type RHW	Underground Conductor No. 6 - Type THW	Lt. Std. 6 ft. Mast Arm 40 ft. Mt. Ht.	Sodium Vapor Luminaire - 250 watt
LF	EA	LF	LF	LF	EA	EA
306	1	122	884	442	1	1

TRAFFIC CONTROL SYSTEM

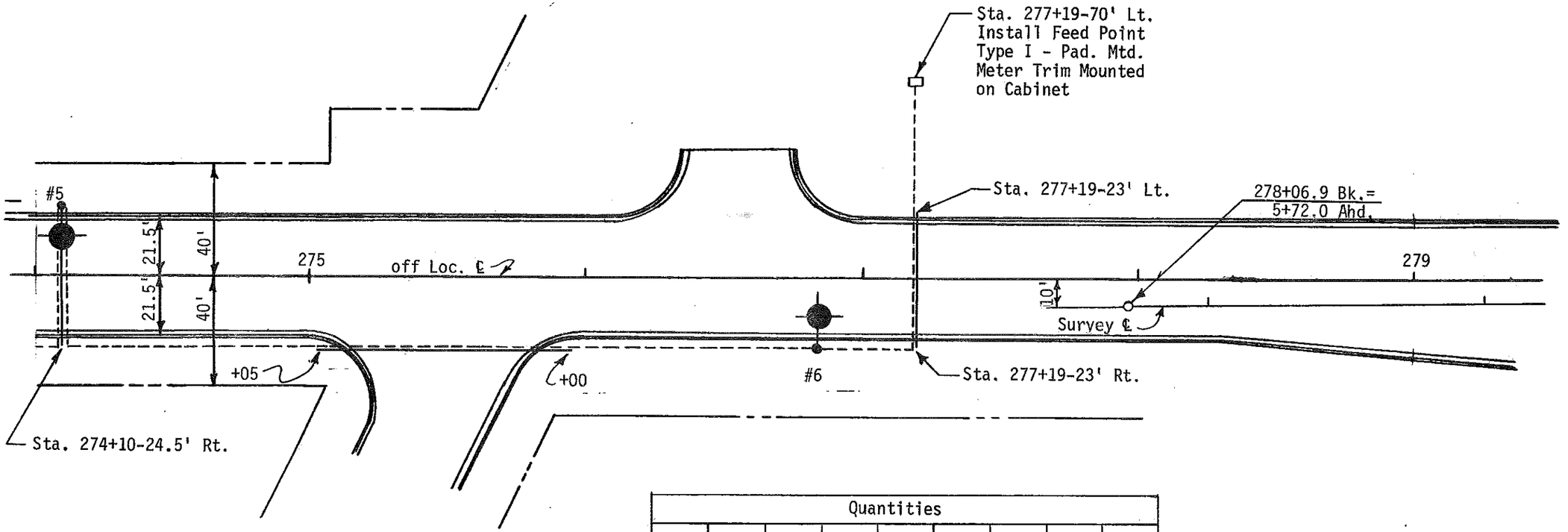
LIGHTING SYSTEM LAYOUT

Mandan Av. N.E. (Refinery Rd.)
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	34

INSTALL 2" dia. Rigid Conduit

Sta. 275+05-24.5' Rt. to 276+00-24.5' Rt. 95 LF
Sta. 277+23' Lt. to 277+19-23' Rt. 46 LF
Sta. 274+10-23.5' Lt. to 274+10-22.5' Rt. 46 LF



NO.	STATION	OFFSET	WATTAGE	CIRCUIT	IES TYPE
5	-274+10	24.5' Lt.	250	A-1	M.S. II
6	276+85	24.5' Rt.	250	A-1	M.S. II

Quantities								
Cable Trench - Type I	2" dia. Rigid Conduit	Concrete Foundations - Highway Lighting	Underground Conductor No. 4 - Type RHW	Underground Conductor No. 6 - Type THW	Concrete Foundation - Feed Point - Type B	Feed Point Type I Pad Mtd.	Lt. Std. 6 ft. Mast Arm 40 ft. Mt. Ht.	Sodium Vapor Luminaire- 250 watt
LF	LF	EA	LF	LF	EA	EA	EA	EA
269	187	2	1092	546	1	1	2	2

TRAFFIC CONTROL SYSTEM

Lighting System Layout

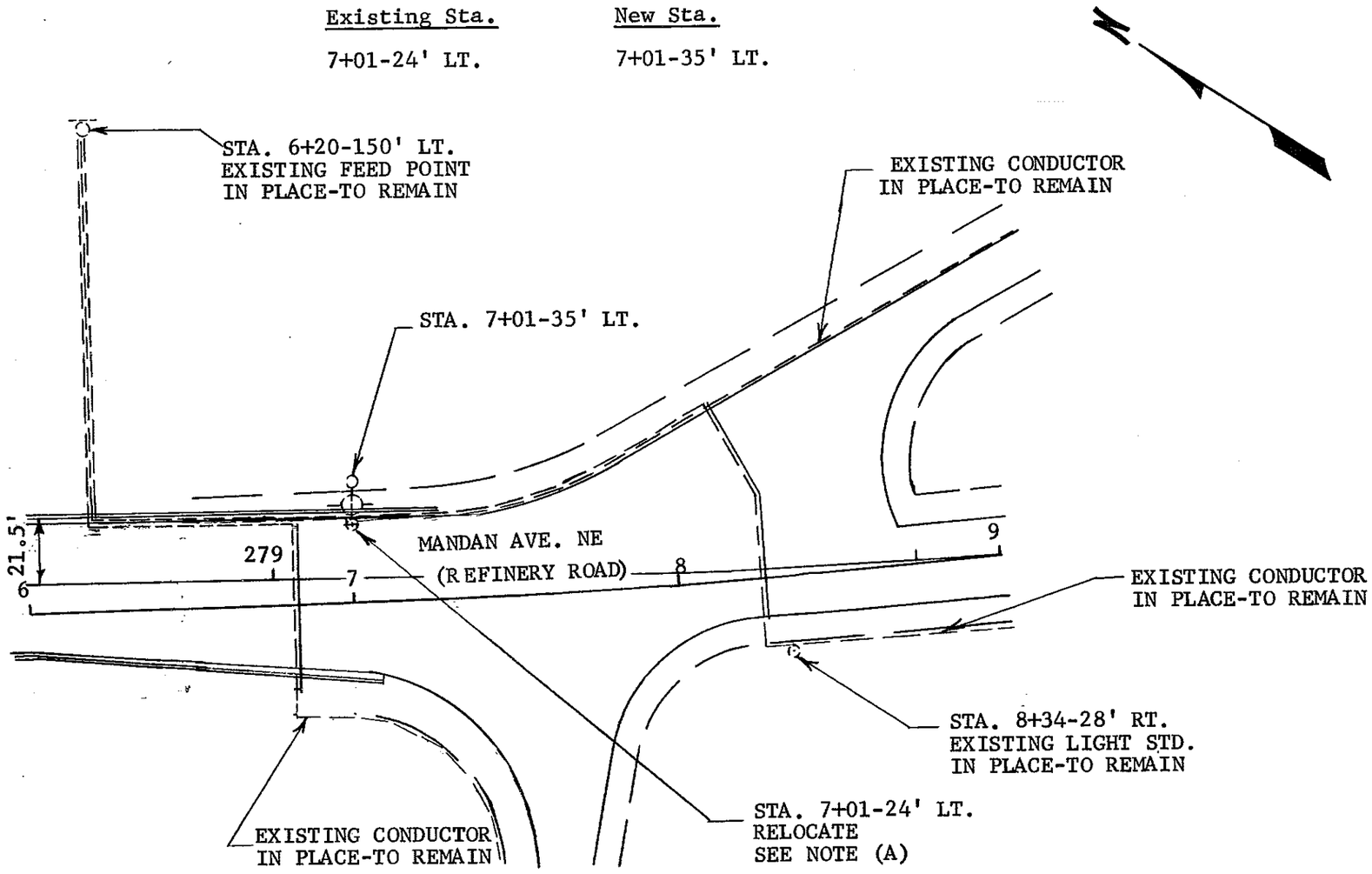
MANDAN AVE. N.E. (Refinery Rd.)
Mandan, N.D.

FHWA REGION	STATE	FED. AID PROJ NO	SHEET NO.
8	N.D.	M-1-806(12)071	35

QUANTITIES				
CABLE TRENCH TYPE I	UNDERGROUND CONDUCTOR NO. 4 - TYPE RHW	UNDERGROUND CONDUCTOR NO. 6 - TYPE THW	CONCRETE FOUNDATIONS - HIGHWAY LIGHTING	RELOCATE LIGHT STANDARD
LF	LF	LF	EA	EA
9	40	20	1	1

RELOCATE LIGHT STANDARD

Existing Sta.	New Sta.
7+01-24' LT.	7+01-35' LT.



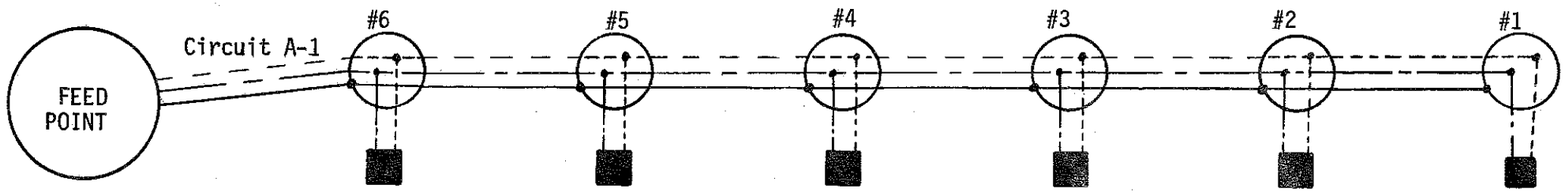
NOTE (A): THE CONTRACTOR SHALL SPLICE THE EXISTING CONDUCTORS AT STA. 7+01-24' LT. TO PROVIDE CONTINUITY. THE SPLICE SHALL BE WATERPROOF AND APPROVED BY THE ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE EXISTING UNDERGROUND CONDUCTOR AND SHALL REPLACE ANY DAMAGED CONDUCTOR AT HIS OWN EXPENSE.

TRAFFIC CONTROL SYSTEM

LIGHTING SYSTEM LAYOUT

Mandan Ave. NE (Refinery Rd.)
Mandan, ND

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	36



Phase Conductor

Phase Conductor

Ground Conductor

3 Light Standard Number

250 Watt High Pressure Sodium Vapor Luminaire

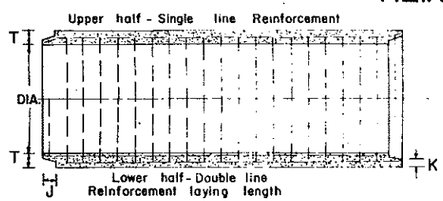
LUMINAIRES: The high-pressure sodium vapor luminaires shall be internal ballast-constant wattage, 120x240 voltage, operated on 240 volts.

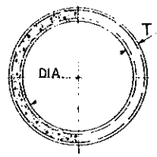
LIGHTING SYSTEM

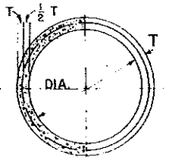
Schematics

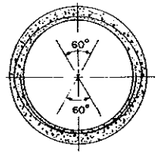
Feed Point-Sta. 277+19-70' Lt.
Mandan Ave. NE (Refinery Rd.)

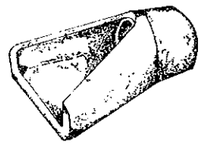
Mandan, ND

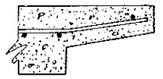


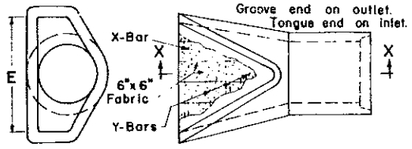


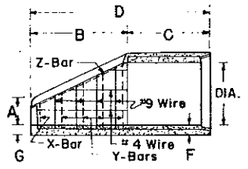












FHWA REGION	STATE	FED AID PROJ. NO.	SHEET NO.
8	N.D	M-1-806	37

D-630-1

REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS

REINFORCED CONCRETE PIPE
TYPICAL LONGITUDINAL SECTION

END VIEW
Double line Reinforcement

END VIEW
Single line Reinforcement

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

PERSPECTIVE

ARRANGEMENT FOR REINFORCEMENT

At end of 36" to 108" pipe.

At end of 12" to 33" pipe.

SEE STANDARD D-630-30 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

END SECTION									
TERMINAL DIMENSIONS								REINFORCING STEEL		
DIA.	A	B	C	D	E	F	G	X	Y	Z
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅜"	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'-5"	6'-1½"	4'-0"	3"	3"	2½"x 4'	8-⅜"x 4' @ 8"c.c.	2-⅜"x 6'
27	0'-10½	4'-1½"	2'-0"	6'-1½"	4'-6"	3¼"	3¼"	2½"x 5'	8-⅜"x 5' @ 9"c.c.	2-⅜"x 6'
30	1'-0"	4'-6"	3'-7¾"	8'-1¾"	5'-0"	3½"	3½"	2½"x 5'	12-⅜"x 5' @ 8"c.c.	2-½"x 6'
36	1'-3"	5'-3"	2'-10¾"	8'-1¾"	6'-0"	4"	4"	2½"x 6'	18-⅜"x 6' @ 6"c.c.	2-½"x 8'
42	1'-9"	5'-3"	2'-11"	8'-2"	6'-6"	4½"	4½"	2½"x 7'	12-½"x 7' @ 9"c.c.	2-½"x 8'
48	2'-0"	6'-0"	2'-2"	8'-2"	7'-0"	5"	5"	2½"x 8'	16-½"x 8' @ 8"c.c.	2-½"x 8'
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"	5½"	2½"x 8'	16-½"x 8' @ 7"c.c.	2-½"x 8'
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	6"	5"	2½"x 9'	16-½"x 9' @ 6"c.c.	2-½"x 9'
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	6½"	5½"	2½"x 9'	22-½"x 9' @ 6"c.c.	2-½"x 9'
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	7"	6"	2½"x 10'	24-½"x 10' @ 6"c.c.	2-½"x 9'
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	7½"	6½"	2½"x 10'	28-½"x 10' @ 6"c.c.	2-½"x 10'
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	8"	6½"	4½"x 10'	28-½"x 10' @ 6"c.c.	4-½"x 10'
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	8½"	6½"	4½"x 11'	28-½"x 11' @ 6"c.c.	4-½"x 10'

END VIEW

PLAN

SECTION X-X

END SECTION
Equivalent to Class III Pipe

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

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

REINFORCED CONCRETE PIPE

Internal Dia. of Pipe in inches	Cross-Sectional Water Area	Weight per lin. foot of pipe Std. Wall	Joint J Groove End Min./Max.	Joint K Tongue End Min.	CLASS I					CLASS II					
D-LOAD TO PRODUCE A 0.01 INCH CRACK					800					1000					
D-LOAD TO PRODUCE ULTIMATE LOAD					1200					1500					
						4000 P.S.I.					4000 P.S.I.				
					Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Height of Fill Trench Conditions	Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Height of Fill Normal Backfill	Height of Fill Imperfect Trench
Dia.	Sq.ft.	Lbs.	In.	In.	In.	Sq.in	Sq.in.	Sq.in.	Ft.	In.	Sq.in.	Sq.in.	Sq.in.	Ft.	Ft.
12	0.79	92	1⅝-2⅜	¾											
15	1.23	127	1¾-2¾	⅞	TO BE USED FOR										
18	1.77	166	1⅞-2⅞	1	R.C.P. SEWER ONLY										
21	2.40	214	1⅞-3⅛	1⅛											
24	3.14	265	2¼-3¾	1⅛											
27	3.98	322	2¾-4	1¼	☆ Special conditions only					3¼	.13		.11	3-11	11-18
30	4.91	384	3¼-4¼	1¼						3½	.14		.12	3-11	11-18
33	5.94	452	3¼-4¼	1½						3¾	.15		.13	3-11	11-18
36	7.07	524	3¼-4¼	1½						4	.12	.09	.13	3-11	11-18
42	9.62	685	3¾-4¾	1¾						4½	.15	.12	.17	3-11	11-18
48	12.57	867	3⅝-4¾	1⅞						5	.18	.14	.20	3-11	11-18
54	15.90	1070	4⅛-5¼	2					☆	5½	.22	.16	.24	3-11	11-18
60	19.63	1296	4½-5½	2¼	6	.21	.16	.23	6-9	6	.25	.19	.28	3-11	11-18
66	23.76	1542	5-6	2⅜	6½	.25	.19	.28	6-9	6½	.31	.23	.34	3-11	11-18
72	28.27	1810	5⅝-6¾	2⅝	7	.29	.22	.32	6-9	7	.35	.26	.39	3-11	11-18
78	33.18	2098	6¼-7¼	2⅞	7½	32	.24	.36	6-9	7½	.40	.30	.44	3-11	11-18
84	38.48	2410	5⅝-7¾	3⅜	8	37	.28	.41	6-9	8	.46	.34	.51	3-11	11-18
90	44.18	2793	6¾-8¼	3⅛	8½	.41	.31	.46	6-9	8½	.51	.38	.57	3-11	11-18
96	50.27	3092	7-8¼	3½	9	.46	.35	.51	6-9	9	.57	.43	.63	3-11	11-18
						5000 P.S.I.					5000 P.S.I.				
102	56.75	3466	7-8¼	3½	9½	54	41	.13 .41	6-9	9½	.68	.51	.17 .51	3-11	11-18
108	63.62	3864	7¼-8½	3¾	10	61	46	.15 46	6-9	10	76	57	.19 .57	3-11	11-18

Dia.	CLASS III									
D-LOAD TO PRODUCE A 0.01 INCH CRACK	1350									
D-LOAD TO PRODUCE ULTIMATE LOAD	2000									
		4000 P.S.I.				4000 P.S.I.				
	Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Height of Fill Normal Backfill	Height of Fill Imperfect Trench
Dia.	In.	Sq.in.	Sq.in.	Sq.in.	In.	Sq.in.	Sq.in.	Sq.in.	Ft.	Ft.
12	2	.07							1-16	16-31
15	2¼	.07							1-16	16-31
18	2½	.07		.07					1-16	16-31
21	2¾	.07		.07					1-16	16-31
24	3	.07		.07	3¾	.07			1-16	16-31
27	3¼	.16		.14	4	.08			1-3 11-16	16-31
30	3½	.18		.15	4¼	.10			1-3 11-16	16-31
33	3¾	.20	.11	.17	4½	.12			1-3 11-16	16-31
36	4	.17	.13	.19	4¾	.08	.07	.09	1-3 11-16	16-31
42	4½	.21	.16	.23	5¼	.12	.09	.13	1-3 11-16	16-31
48	5	.24	.18	.27	5¾	.16	.12	.18	1-3 11-16	16-31
54	5½	.29	.22	.32	6¼	.21	.16	.23	1-3 11-16	16-31
60	6	.34	.26	.38	6¾	.25	.19	.28	1-3 11-16	16-31
66	6½	.41	.31	.46	7¼	.31	.23	.34	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	9¾	.70	.53	.17 .53	1-3 11-16	16-31
102	9½	.90	.68	.22 .68	10¼	.83	.62	.21 .62	1-3 11-16	16-31
108	10	1.08	.81	.27 .81	10¾	.99	.74	.25 .74	1-3 11-16	16-31

Dia.	CLASS IV								CLASS IV ALTERNATE								
D-LOAD TO PRODUCE A 0.01 INCH CRACK	2000																
D-LOAD TO PRODUCE ULTIMATE LOAD	3000																
		4000 P.S.I.				4000 P.S.I.				5000 P.S.I.							
	Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Minimum Wall Thickness	Inner cage Ai	Ellip. cage Ae	Outer cage Ao	Shear Steel N	Shear Steel S	Shear Steel Ar	Height of Fill Normal Backfill	Height of Fill Imperfect Trench
Dia.	In.	Sq.in.	Sq.in.	Sq.in.	In.	Sq.in.	Sq.in.	Sq.in.	In.	Sq.in	Sq.in	Sq.in	No.	In.	Sq.in	Ft.	Ft.
12	2	.07														16-24	24-43
15	2¼	.10														16-24	24-43
18	2½	.14		.11												16-24	24-43
21	2¾	.20		.17												16-24	24-43
24	3	.27		.23	3¾	.07	.07	.08								16-24	24-43
27	3¼	.31		.25	4	.08	.07	.09								16-24	24-43
30	3½	.35		.28	4¼	.09	.07	.10								16-24	24-43
33	3¾	.27	.20	.30	4½	.11	.08	.12								16-24	24-43
36	4	.30	.22	.33	4¾	.14	.10	.15								16-24	24-43
42	4½	.35	.26	.39	5¼	.20	.15	.22								16-24	24-43
48	5	.42	.32	.47	5¾	.26	.20	.29								16-24	24-43
54	5½	.50	.37	.55	6¼	.34	.26	.38								16-24	24-43
		5000 P.S.I.															
60	6	.59	.45	.66	6¾	.41	.31	.46	6	.54	.27	.41	7	6	.22	16-24	24-43
66	6½	.69	.52	.77	7¼	.51	.39	.57	6½	.60	.30	.45	8	6	.22	16-24	24-43
						5000 P.S.I.											
72	7	.79	.60	.88	7¾	.61	.46	.68	7	.64	.32	.48	8	6	.23	16-24	24-43
78					8¼	.71	.53	.79	7½	.70	.35	.53	9	6	.25	16-24	24-43
84					8¾	.85	.63	.94	8	.76	.38	.57	10	6	.28	16-24	24-43
90									8½	.82	.43	.62	11	6	.31	16-24	24-43
96									9	.88	.46	.66	11	6	.34	16-24	24-43
102									9½	.94	.52	.71	12	6	.37	16-24	24-43
108									10	1.02	.57	.76	12	6	.40	16-24	24-43

Dia.	CLASS V								CLASS V ALTERNATE								
D-LOAD TO PRODUCE A 0.01 INCH CRACK	3000																
D-LOAD TO PRODUCE ULTIMATE LOAD	3750																
		6000 P.S.I.				6000 P.S.I.				5000 P.S.I.							
	Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Minimum Wall Thickness	Circular rein. in circular pipe Inner cage	Circular rein. in circular pipe Outer cage	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe	Minimum Wall Thickness	Inner cage Ai	Ellip. cage Ae	Outer cage Ao	Shear Steel N	Shear Steel S	Shear Steel Ar	Height of Fill Normal Backfill	Height of Fill Imperfect Trench
Dia.	In.	Sq.in.	Sq.in.	Sq.in.	In.	Sq.in	Sq.in	Sq.in.	In.	Sq.in	Sq.in	Sq.in.	No.	In.	Sq.in.	Ft.	Ft.
12	2	.10														24-35	35-69
15	2¼	.14														24-35	35-69
18	2½	.19		.16												24-35	35-69
21	2¾	.24		.21												24-35	35-69
24	3	.30		.24	3¾	.12	.09	.13								24-35	35-69
27	3¼	.38	.28	.42	4	.14	.11	.16								24-35	35-69
30	3½	.41	.31	.46	4¼	.18	.14	.20								24-35	35-69
33	3¾	.46	.35	.51	4½	.23	.17	.25								24-35	35-69
36	4	.50	.38	.56	4¾	.27	.20	.30								24-35	35-69
42	4½	.60	.45	.67	5¼	.36	.27	.40								24-35	35-69
48	5	.73	.55	.81	5¾	.47	.35	.52	5	.66	.33	.50	8	4	.22	24-35	35-69
54					6¼	.58	.43	.64	5½	.74	.37	.56	9	4	.22	24-35	35-69
60					6¾	.70	.53	.78	6	.82	.41	.62	7	6	.22	24-35	35-69
66					7¼	.84	.63	.93	6½	.88	.44	.66	8	6	.22	24-35	35-69
72					7¾	.99	.74	110	7	.96	.48	.72	8	6	.23	24-35	35-69
78									7½	1.04	.52	.78	9	6	.25	24-35	35-69
84									8	1.12	.56	.84	10	6	.28	24-35	35-69
90									8½	1.20	.65	.90	11	6	.31	24-35	35-69
96									9	1.32		.99	11	8	.34	24-35	35-69
102									9½	1.42		1.07	12	8	.37	24-35	35-69
108																	

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.

CLASS IV & CLASS V ALTERNATE

LONGITUDINAL SECTION

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

1-1-75

REVISIONS	
DATE	CHANGE
3-1-84	REMOVED TIE BOLTS CHANGED REINF. DIMEN.

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT
Submitted: ____ Design Engineer
Recommended: ____ Asst. Chief Engineer Pre-Construction
Approved: ____ Chief Engineer

4.11

CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS
(ROUND PIPE)

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	38

D-630-4

NOTES:

Pipe and Connecting Bands shall conform to applicable sections of N.D.S.H.D. Standard Specifications and to AASHO M-36.

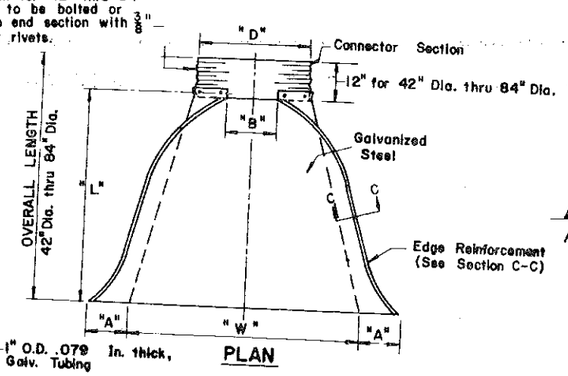
Top edge of all End Sections to have tubing reinforcement or rolled tubed reinforcement (See Section A-A). The tubing is to be supplemented with 2"x2"x ¼" Galv. Angle for 60" thru 72" Dia. and 2½"x2½"x¼" Galv. Angle for 78" and 84" Dia. Angles to be attached by Gal. ⅜ ø bolts and nuts. Angles are to extend from Pipe to the corner wing bend.

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

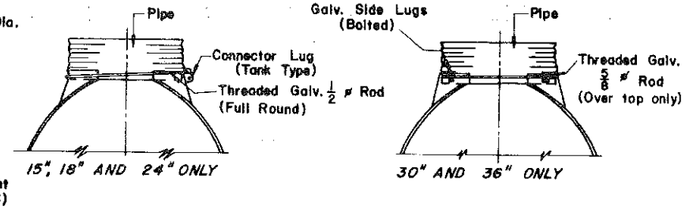
Fill Height Tables are based on the following criteria:

1. Embankment weight = 120 lb/ft³
2. Max. pipe deflection = 5%
3. Bedding - Class C
4. Compaction = 95% Proctor Density
5. Modulus of passive soil resistance (E') = 1400 psi
6. H-20 Live Load

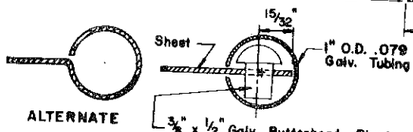
This connection for 42" thru 84" diameter pipe to be bolted or riveted to the end section with ⅜" Galv. bolts or rivets.



PLAN



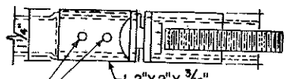
ROD CONNECTION DETAILS



ALTERNATE

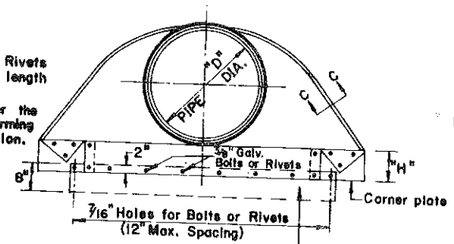
⅜" x ½" Galv. Buttonhead Rivets spaced 6" C. to C. Overall length of rivets = 0.78".

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



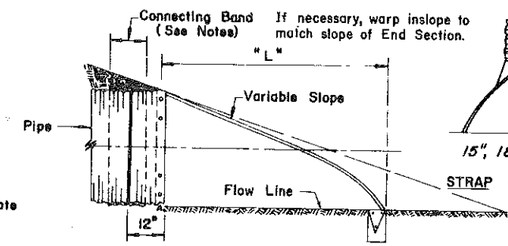
2 - SPOT-WELDS TO DEVELOP STRENGTH OF BOLT

SECTION C-C

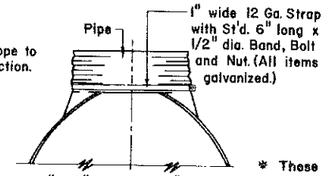


ELEVATION

Galv. Toe Plate required on End Sections for pipe of 30" dia. or larger. Plate to be fastened to End Section in field. Thickness of Toe Plate to be same as End Section. Where Toe Plate is needed the Toe Plate, Bolts and Nuts are to be included in price bid for End Sections.



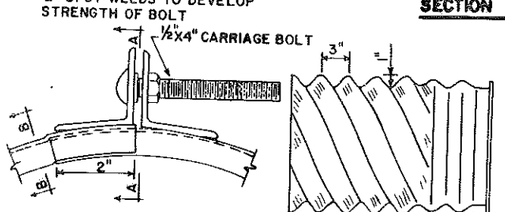
TYPICAL CROSS-SECTION
(Showing Connector Section)

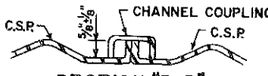


STRAP CONNECTION DETAILS

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

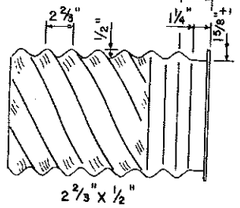
* These sizes have 0.138 in. center panels.
** Pipe diameter is equal to dimension "D" of end section.
Manufacturers tolerances of above dimensions will be allowed.
Splices to be the lap riveted type.
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" ø galv. bolts or rivets. Nuts to be torqued to 25 lbs. ±.





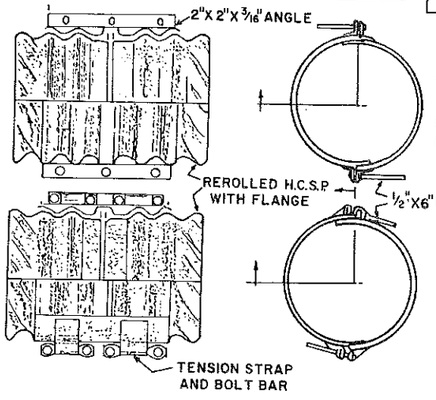
SECTION "B-B"

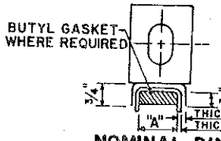
CHANNEL COUPLING BAND FOR USE ON FLANGED END C.S.P.
(CHANNEL COUPLING BANDS SHALL BE TWO PIECE)



SPIRAL C.S.P

REFORMED TO ACCEPT FLANGE, ANNULAR, DIMPLE AND HUGGER COUPLERS



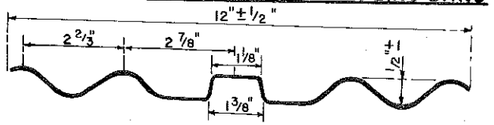


NOMINAL DIMENSIONS

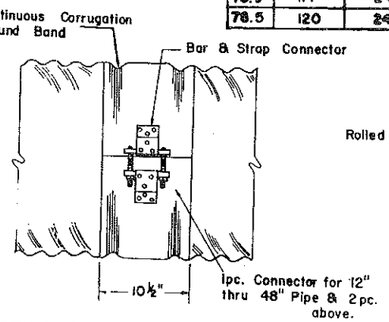
THICKNESS	"A"	FOR USE WITH C.S.P.
0.079"	¾"	0.09" THICK OR LIGHTER
0.109"	1"	0.138" THICK OR HEAVIER

SECTION "A A"

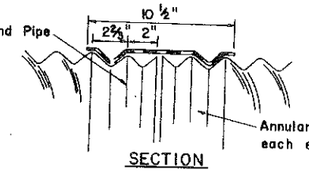
WING CHANNEL COUPLING BAND



CROSS SECTION OF WING CHANNEL COUPLING BAND



CONNECTING BAND DETAILS FOR HELICAL, WELDED - SEAM CULVERT



SECTION

FILL HEIGHT TABLES
RIVETED, WELDED OR HELICAL FABRICATION

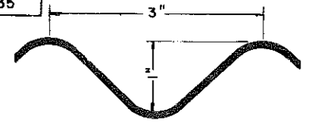
3" BY 1" CORRUGATIONS

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

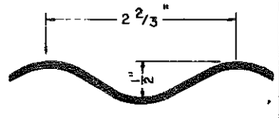
2⅔" BY ½" CORRUGATIONS

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

VALUES FOR ELONGATED PIPE ARE SHOWN IN PARENTHESES



3" BY 1" CORRUGATIONS



2⅔" BY ½" CORRUGATIONS

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

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer Pre-Construction

Approved: _____ Chief Engineer

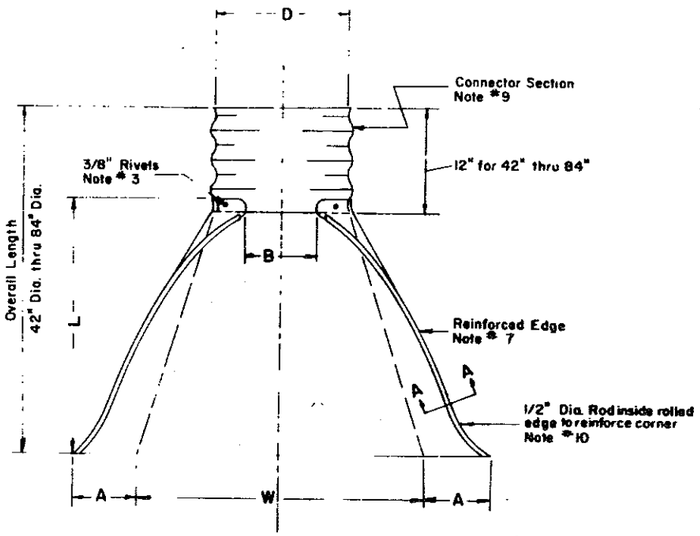
CORRUGATED STEEL PIPE FLANGE BAND DETAILS

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

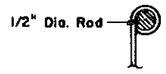
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	39

D-630-7

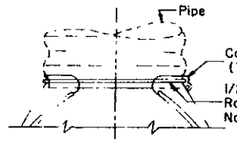
CORRUGATED ALUMINUM PIPE CULVERT AND END SECTIONS
(ROUND PIPE)



PLAN



SECTION A-A



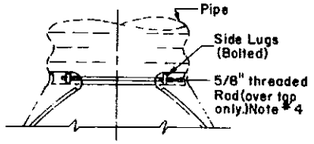
SIZES 18" & 24" ONLY

TABLE

1/2" Dia. threaded Rod

Pipe Size	Length In.
18"	65"
24"	83"

2 1/2" thread length both ends. 1/2"-13 UNC thread.



SIZES 30" & 36" ONLY

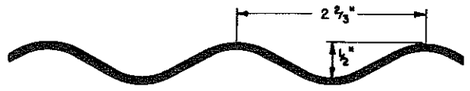
TABLE

5/8" Dia. threaded Rod

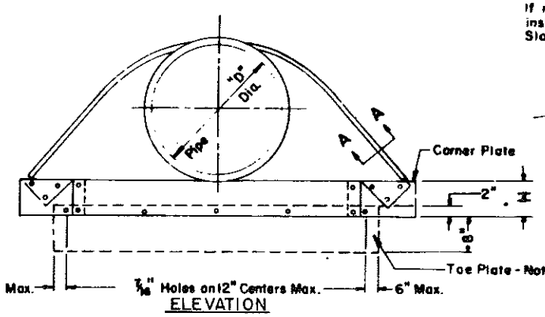
Pipe Size	Length In.
30"	22 1/8"
36"	25 3/8"

1 3/4" thread length both ends. 5/8"-11 UNC thread.

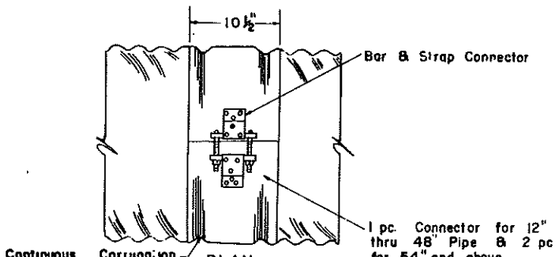
ROD CONNECTION DETAILS



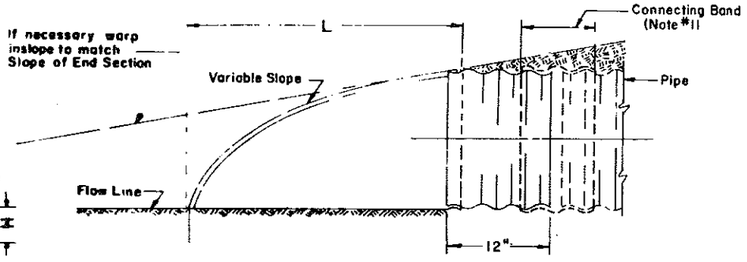
2 2/3" x 1/2" CORRUGATIONS



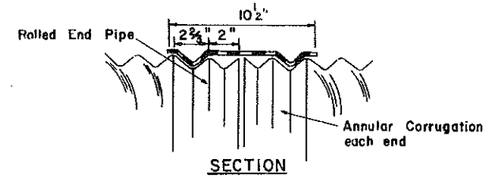
ELEVATION



PLAN



TYPICAL CROSS SECTION
(Showing Connector Section)



SECTION

CONNECTING BAND DETAILS FOR HELICAL, WELDED-SEAM CULVERT

END SECTIONS

WATERWAY AREA SQ. FT.	** PIPE DIA. (IN.)	THICK.	DIMENSIONS A	B	H	L	W	APPROX. SLOPE	BODY
			In.	In.	In.	In.	In.	Rate	Piece
1.8	18	.060	8	10	6	31	36	2 1/2 :1	1
3.1	24	.060	10	13	6	41	48	2 1/2 :1	1
4.9	30	.075	12	16	8	51	60	2 1/2 :1	1
7.1	36	.075	14	19	9	60	72	2 1/2 :1	2
9.6	42	.105	16	22	11	69	84	2 1/2 :1	2
12.6	48	.105	18	27	12	78	90	2 1/4 :1	2
16.0	54	.105	18	30	12	84	102	2 :1	2
19.6	*60	.105	18	33	12	87	114	1 3/4 :1	3
23.8	*66	.105	18	36	12	87	120	1 1/2 :1	3
28.3	*72	.105	18	39	12	87	126	1 1/3 :1	3
33.2	*78	.105	18	42	12	87	132	1 1/4 :1	3
38.5	*84	.105	18	45	12	87	138	1 1/6 :1	3

* These sizes shall have 0.135 In. thick center panels.

** Pipe diameter is equal to dimension "D" of End Section.

Manufactures tolerances of above dimensions will be allowed.

78" and 84" diameter Pipe shall be 5 % vertically elongated.

RIVETED OR HELICAL FABRICATION 2 2/3 x 1/2 INCH CORRUGATIONS

PIPE DIA. (IN.)	MIN. COVER (IN.)	MAX. FILL HEIGHT OVER TOP OF PIPE FOR METAL THICKNESS (IN.) .060	.075	.105	.135	.164
18	12	30	30	52	54	56
24	12	22	22	39	41	42
30	12	18	18	31	32	34
36	12	15	15	26	27	28
42	12		26	43	43	44
48	12			40	41	43
54	12			35	37	38
60	12				33	34
66	12				30	31
72	12					29
78	12					26
84	12					24

Fill Height Table is based on the following criteria:

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

NOTES:

1. End Sections shall be made from Aluminum Alloy 3004-0, clad 5% each side with Alloy 7072.
2. Corner Plate shall be the same material and thickness as End Section.
3. Rivets shall be Aluminum Alloy 6053-T4.
4. Threaded Rods shall be Aluminum Alloy 6061-T6.
5. Connector & Side Lugs, Bolts, and Nuts shall be Hot-Dipped Galvanized Steel.
6. Multiple panel bodies shall have 2" Lap Seams which are to be tightly joined with 3/8" diameter rivets spaced 6" C to C.
7. Top edge of all End Sections to have rolled edge reinforcement (See Section A-A). The rolled edge is to be supplemented with 2"X2"X1/4" Aluminum Alloy Angle for 60" thru 72" diameter and 2 1/2"X 2 1/2"X1/4" Angle for 78" and 84" diameter. Angles to be attached by 3/8" diameter bolts and nuts. Angles are to extend from pipe to the corner of the wing bend.
8. Aluminum Alloy Toe Plate required on End Sections for Pipe of 30" diameter or larger. Plate to be fastened to End Section in field. Thickness of Toe Plate to be same as End Section. Where Toe Plate is needed, the Toe Plate, Nuts, and Bolts are to be included in price bid for End Sections.
9. Connector Section, when specified, shall be Corrugated Aluminum Alloy Pipe Culvert.
10. Reinforcement for edge of End Section shall be Alloy 6063-F.
11. Pipe and Connecting Bands shall Conform to Applicable Sections of N.D.S.H.D. Standard Specifications and to A.A.S.H.O. M-196 and M-211.

REVISIONS	
DATE	CHANGE
1-15-75	Connecting Band

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer Pre-Construction

Approved: _____ Chief Engineer

8-1-74

4.19A

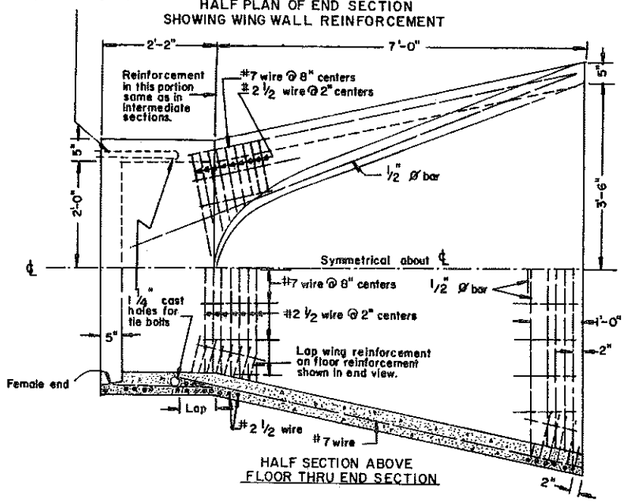
4'X6' STANDARD SECTIONAL CONCRETE CATTLE PASS
(WITH STEEL FABRIC REINFORCEMENT)

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	40

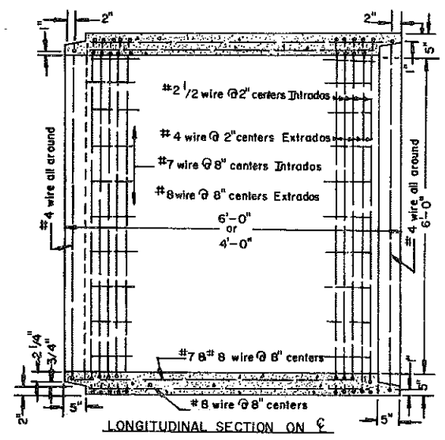
D-630-9

2-1" tie bolts, each @ 75° to the vertical used to tie flared end section to adjacent straight section.

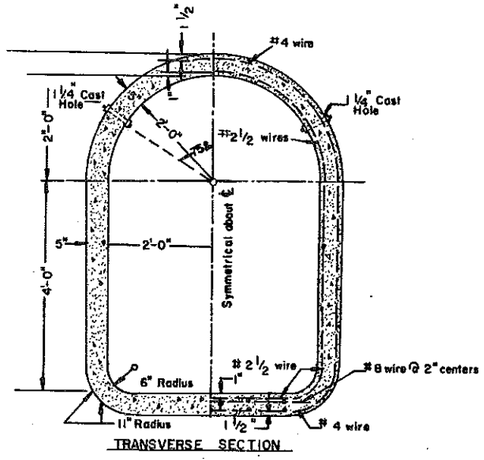
HALF PLAN OF END SECTION
SHOWING WING WALL REINFORCEMENT



HALF SECTION ABOVE
FLOOR THRU END SECTION

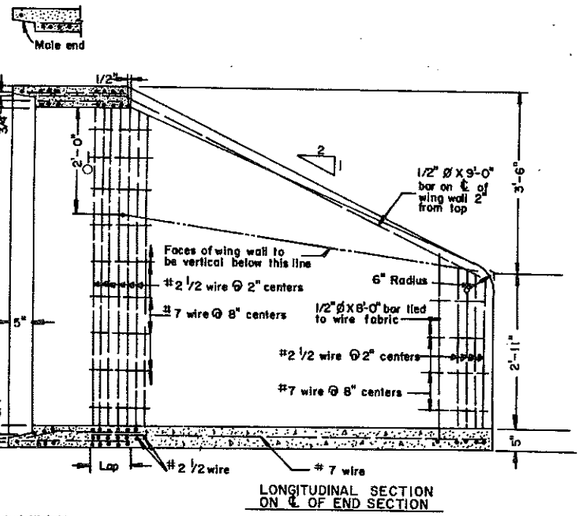


LONGITUDINAL SECTION ON ℄



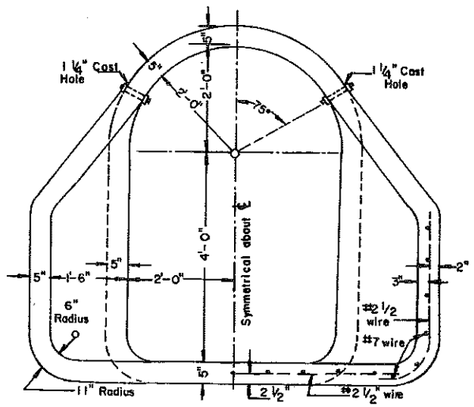
TRANSVERSE SECTION

INTERMEDIATE SECTIONS

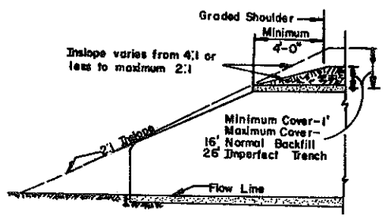


LONGITUDINAL SECTION
ON ℄ OF END SECTION

Estimated Weight:
1237 lbs. Intermediate Section per foot
9415 lbs. Flared End Section
Area of Waterway, 22.2 Sq. Feet
Minimum Cover: 1 foot
Maximum Cover: 16' Normal Backfill
26' Imperfect Trench



END VIEW OF END SECTION



CONSTRUCTION NOTES
If splices are not electrically welded the reinforcement shall be lapped 40 diameters. If splices are electrically welded the members at either a welded splice or intersection shall develop a tensile strength across the weld not less than the minimum required strength of the fabric.

1-1-75 REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

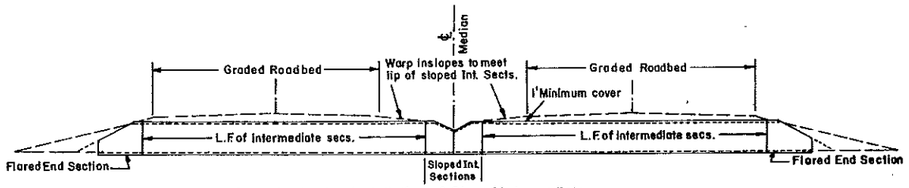
Recommended: _____ Asst. Chief Engineer Pre-Construction

Approved: _____ Chief Engineer

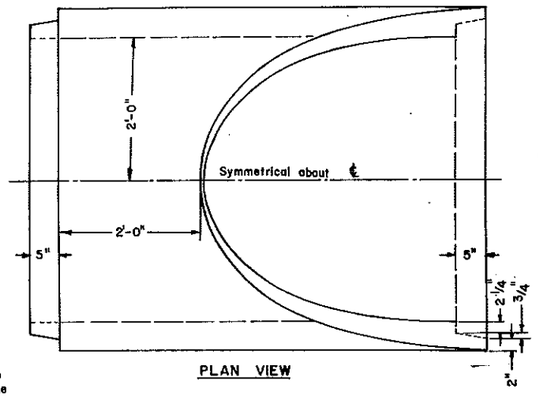
SLOPED INTERMEDIATE SECTIONS FOR STANDARD SECTIONAL CONCRETE CATTLE PASS

SHEET NO. M-1-809 4

D-630-10

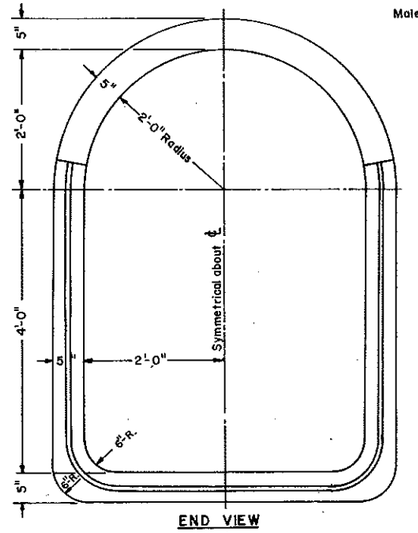


Sketch showing installation of Sloped Intermediate Sections in the median of a 4 Lane Divided Highway

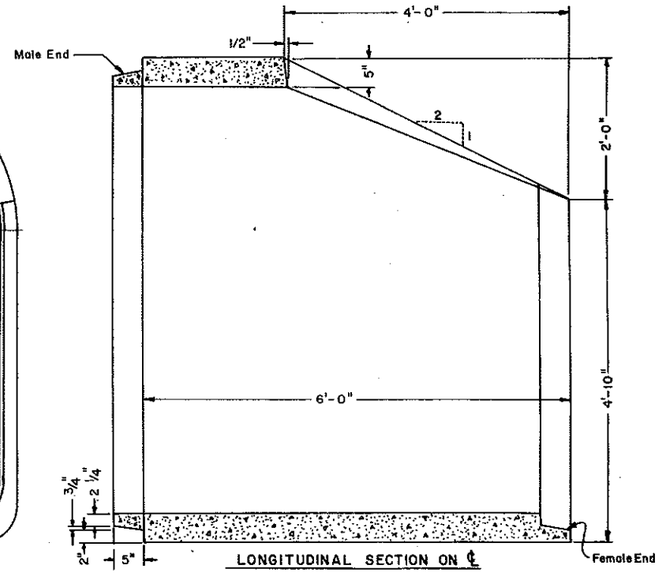


PLAN VIEW

NOTE:
Each installation, as shown in sketch above, requires one intermediate section sloped from the female end and one section sloped from the male end.



END VIEW



LONGITUDINAL SECTION ON ℄

Steel Reinforcing in Sloped Intermediate Sections to be in accordance with requirements set forth in the Standard Specifications for Standard Sectional Concrete Cattle Pass and as shown in Standard No. D-630-9.

REVISIONS	
DATE	CHANGE
1-1-75	

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

Recommended: _____ Asst. Chief Engineer Pre-Construction

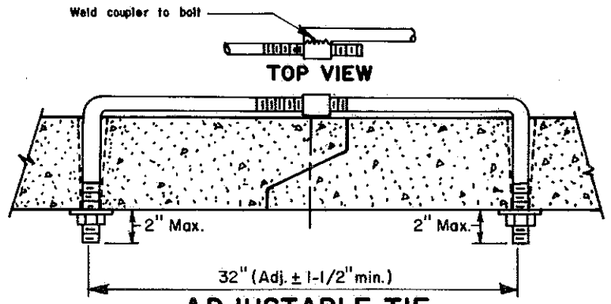
Approved: _____ Chief Engineer

4.14A

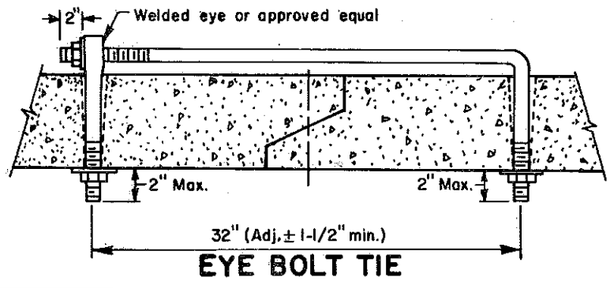
CONCRETE PIPE TIES

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	42

D-630-30

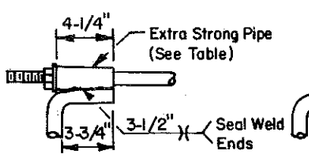


ADJUSTABLE TIE

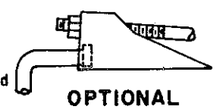


EYE BOLT TIE

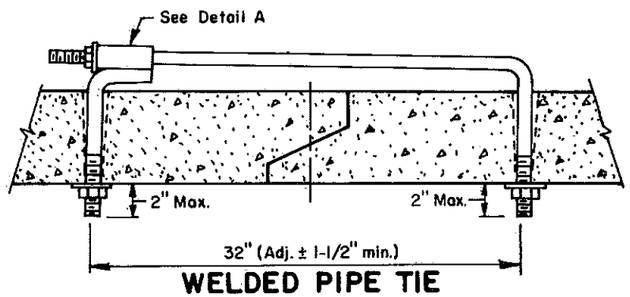
Thread Dia.	E.S. Pipe I.D.
5/8"	3/4"
3/4"	1"
1"	1-1/4"



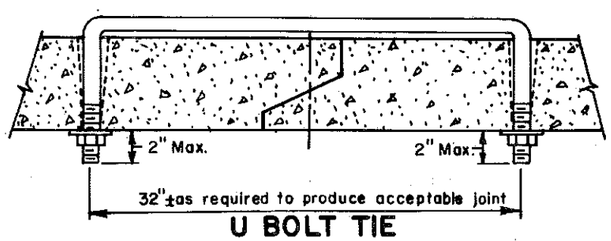
DETAIL A



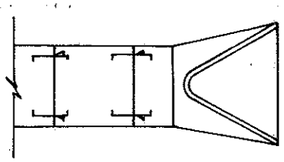
OPTIONAL CANOPY TIE

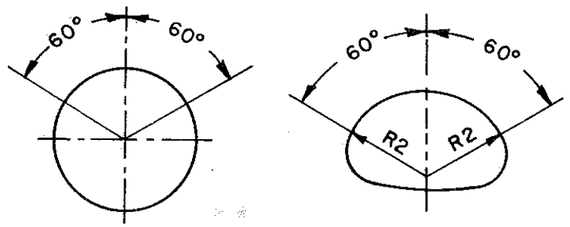


WELDED PIPE TIE



U BOLT TIE





PLACEMENT OF HOLES

REQUIRED SIZE OF TIE BOLTS					
Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.	Pipe Size (Inches)	Thread Dia.
12	5/8" (See Note 2)	30	3/4"	72	1"
15		33		78	
18		36		84	
21		42		90	
24		48		96	
27		54		102	
		60		108	
		66		120	
				132	

NOTES:

1. PIPE SIZE LISTED IS INSIDE DIAMETER OF ROUND PIPE OR EQUIVALENT DIAMETER OF PIPE ARCH.
2. NUTS AND WASHERS ARE NOT REQUIRED ON INSIDE OF 21" DIAMETER PIPE OR LESS.
3. TIES TO BE USED ONLY TO HOLD PIPE SECTIONS TOGETHER, NOT FOR PULLING SECTIONS TIGHT.
4. TIE BOLTS SHALL BE PAINTED AFTER FABRICATION WITH ONE COAT OF ZINC CHROMATE IRON OXIDE PAINT. THREADED PORTION OF RODS DO NOT HAVE TO BE PAINTED.
5. HOLES IN PIPE TO ACCOMMODATE THE TIE BOLTS CAN BE PRECAST OR DRILLED. TAPERED HOLES WILL BE PERMITTED WHEN PRECAST. WHEN EXISTING PIPE ARE EXTENDED OR SALVAGED AND RELAYED, THE CONTRACTOR WILL BE REQUIRED TO DRILL THE NECESSARY HOLES.
6. THE CONTRACTOR HAS THE OPTION OF SELECTING THE TYPE OF TIE BOLT TO BE USED. THE TYPE SELECTED SHALL BE APPROVED BY THE ENGINEER.
7. THE COST OF PRECASTING OR DRILLING THE REQUIRED HOLES AND FURNISHING AND INSTALLING THE TIE BOLTS SHALL BE INCLUDED IN THE PRICE BID FOR REINFORCED CONCRETE PIPE CULVERTS.
8. TIE BOLTS ARE NOT REQUIRED ON STORM SEWER PIPE UNLESS SPECIFICALLY NOTED IN THE PLANS.

3-9-84 REVISIONS	
DATE	CHANGE

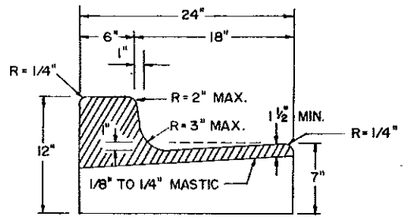
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

SUBMITTED: David K.O. Leer
DESIGN ENGINEER

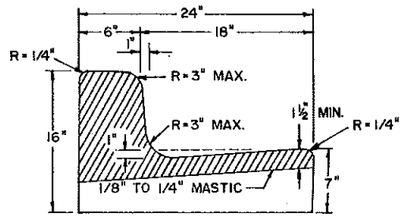
VALLEY GUTTER AND CURB & GUTTER

FHWA REGION	STATE	PROJECT	SHEET NO.
8	N.D.	M-1-806	43

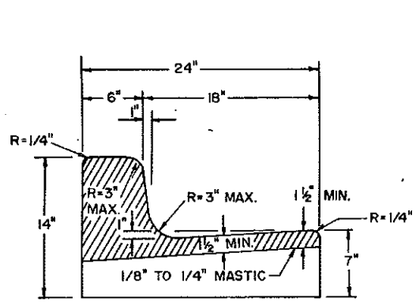
D-708-1



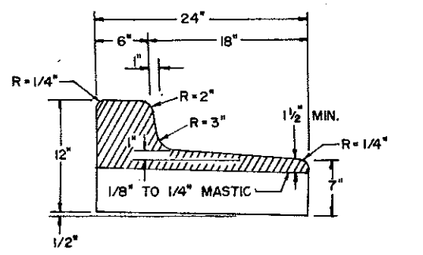
CURB & GUTTER TYPE I (SEC. A)



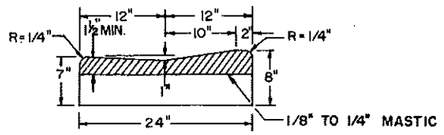
CURB & GUTTER TYPE I (SEC. B)



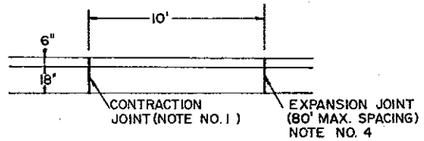
CURB & GUTTER TYPE I (SEC. C)



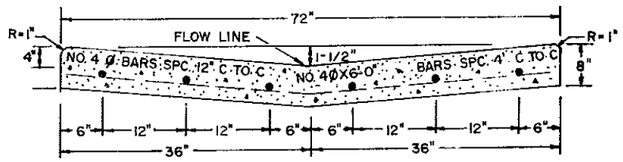
CURB & GUTTER TYPE I (SEC. D)



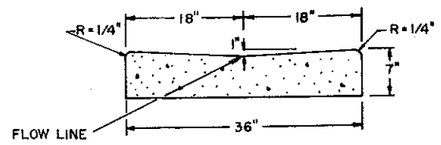
MOUNTABLE CURB & GUTTER TYPE I (SEC. A)



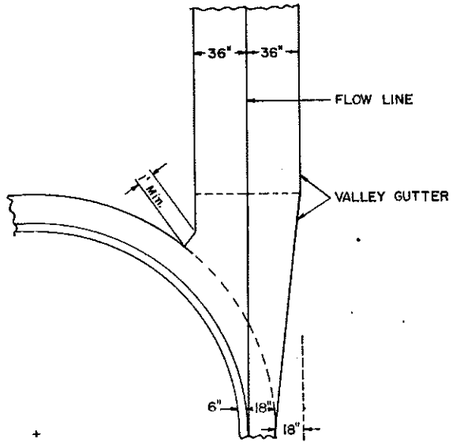
EXPANSION JOINT DETAIL



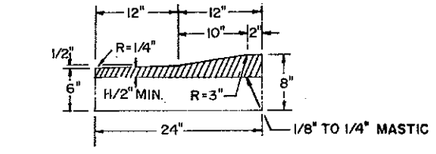
72" CONCRETE VALLEY GUTTER



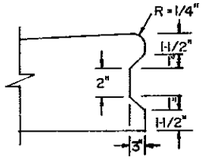
36" CONCRETE VALLEY GUTTER



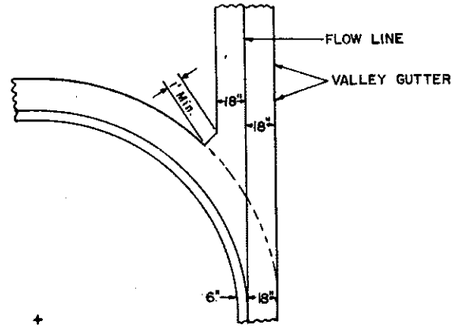
72" CONCRETE VALLEY GUTTER



MOUNTABLE CURB & GUTTER TYPE I (SEC. B)



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



36" CONCRETE VALLEY GUTTER

NOTES:

1. CONTRACTION JOINTS: 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 ON PCC PVMT.

2. THE CONTRACTOR MAY USE A 5" 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.

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

4. CURB AND GUTTER EXPANSION JOINT MATERIAL SHALL BE OF 3/4" PREMOLDED EXPANSION JOINT FULL DEPTH AND THE SAME SHAPE AS THE CURB AND GUTTER CONFORMING TO SECTION 824-5 OF THE STANDARD SPECIFICATIONS. ALL JOINTS SHALL BE SEALED WITH A PARA PLASTIC HOT POURED JOINT FILLER MEETING THE REQUIREMENTS OF AASHTO M-173 CONCRETE JOINT SEALER, HOT POURED ELASTIC TYPE. THE COST OF ALL LABOR AND MATERIAL NECESSARY TO CONSTRUCT EXPANSION JOINTS SHALL BE INCLUDED IN THE PRICE BID FOR CURB AND GUTTER.

7-26-77 REVISIONS	
DATE	CHANGE
8-21-80	ADDED NOTE NO. 4.
9-26-82	W.T.P. REVISION
9-30-82	REVISED VALLEY GUTTER

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: Design Engineer

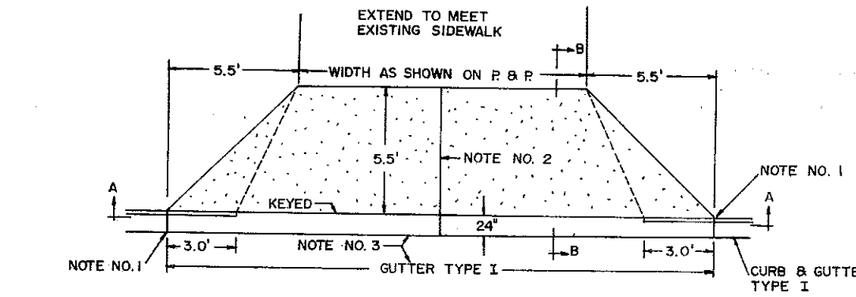
Recommended: Asst. Chief Engineer Pre-Construction

Approved: Chief Engineer

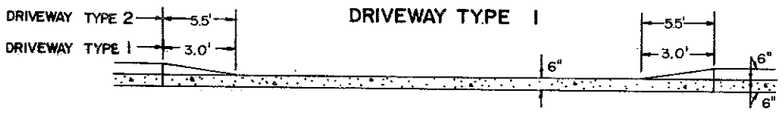
FHWA REGION	STATE	PROJECT	SHEET NO.
8	N.D	M-1-806	44

D-712-1

CONCRETE DRIVEWAY (URBAN)



DRIVEWAY TYPE 1



6" SECTION A-A

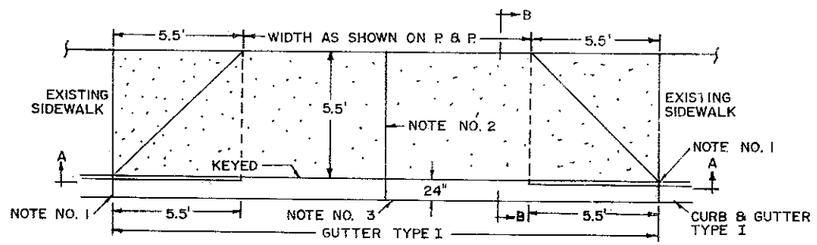
NOTE NO. 1 — 3/4" PREMOLDED EXPANSION JOINT FULL DEPTH AND SAME SHAPE AS CURB AND GUTTER.

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.

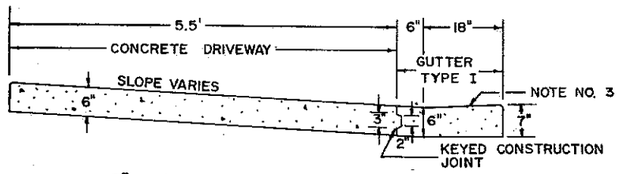
NOTE NO. 3 — GUTTER-TYPE I SHALL BE PAID FOR AT THE UNIT PRICE BID FOR "CURB AND GUTTER-TYPE I."

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

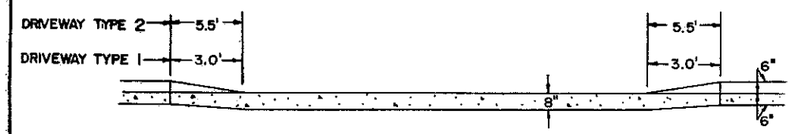


DRIVEWAY TYPE 2

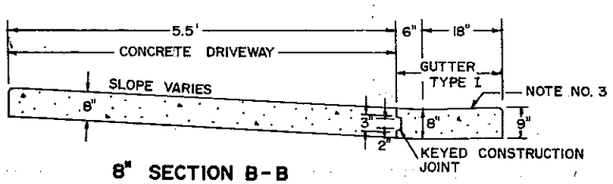


6" SECTION B-B

CONCRETE DRIVEWAY DETAILS

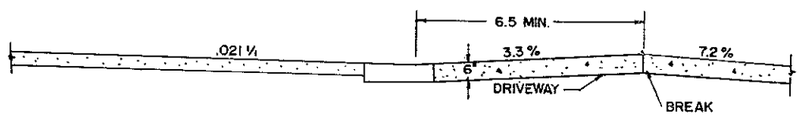


8" SECTION A-A



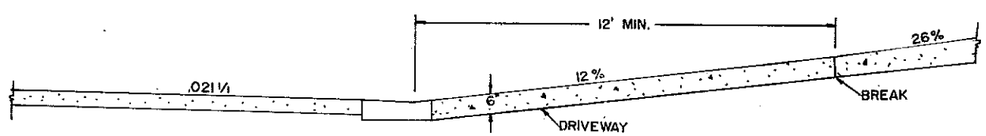
8" SECTION B-B

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

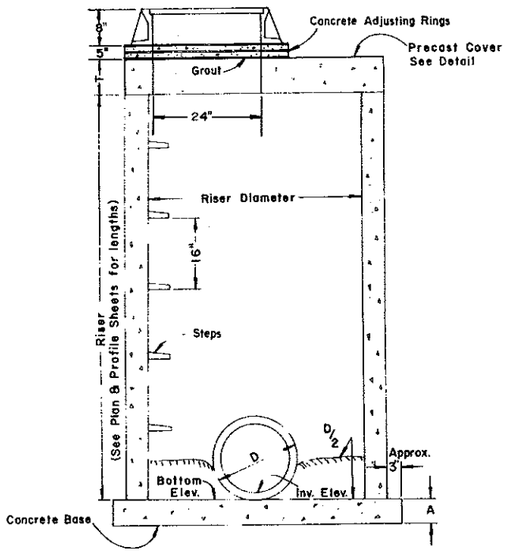
Recommended _____ Asst. Chief Engineer Pre-Construction

Approved _____ Chief Engineer

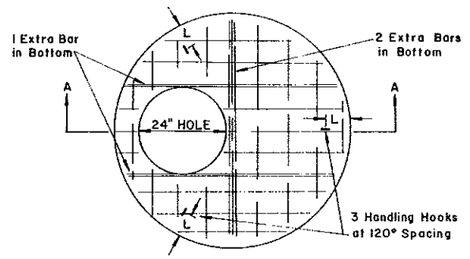
8	N.D.	M-1-806	45

D-714-2

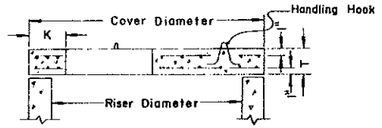
MANHOLE DETAILS



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"	#3AT 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"	#3AT 4"
102"	121"	7630#	8"	9"	12"	#4 AT 4"	#3AT 4"
108"	128"	12460#	12"	10"	12"	#4 AT 4"	#3AT 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"	1785 #	6"	#3 AT 6"
54"	72"	2125 #	6"	#3 AT 6"
60"	78"	3320 #	8"	#3 AT 6"
66"	86"	4030 #	8"	#3 AT 6"
72"	92"	4610 #	8"	#3 AT 6"
78"	100"	5460 #	8"	#3 AT 6"
84"	107	6230 #	8"	#3 AT 6"
90"	114	7070 #	8"	#3 AT 6"
96"	120	7850 #	8"	#3 AT 6"
102"	127	13200 #	12"	#3 AT 6"
108"	132	14270 #	12"	#3 AT 6"
120"	148	17925 #	12"	#3 AT 6"

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.

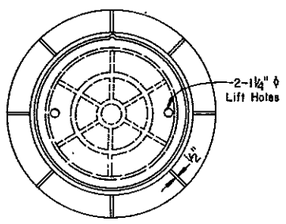
THE AGGREGATE SIZE SHALL BE APPROVED BY THE ENGINEER.

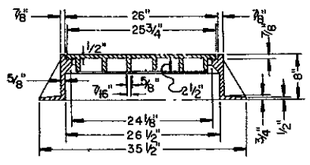
PRECAST BARRELS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM 478.

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 OR BEEHIVE CASTING & COVER
2. PRECAST COVER
3. CONCRETE BASE
4. CONCRETE ADJUSTING RINGS

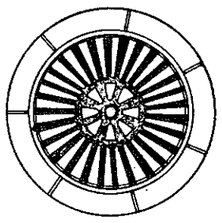
THE ITEM "MANHOLE RISER" SHALL INCLUDE THE FURNISHING & INSTALLING OF THE REQUIRED LENGTH OF RISER & CAST IRON STEPS.

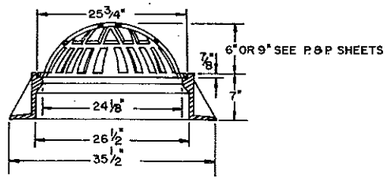




MANHOLE CAST IRON RING & COVER

Weight 460 Lbs.



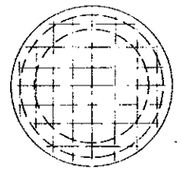


BEEHIVE CASTING & COVER

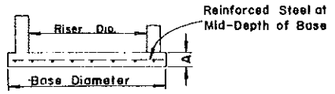
(To be used when noted on plans)

6" Beehive Weight 285 Lbs.

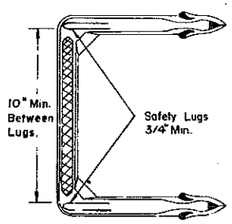
9" Beehive Weight 300 Lbs.



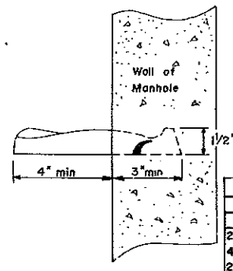
TOP VIEW



PRECAST MANHOLE BASE



STEP DETAIL



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.

THE CONTRACTOR MAY, IF HE SO ELECTS, CONSTRUCT MANHOLES OF SOLID CONCRETE BLOCK OR BRICK. THE MATERIALS SHALL BE APPROVED BY THE ENGINEER IN WRITING. THE TYPE OF CONSTRUCTION SHALL BE AS SPECIFIED IN SECTION 714-3 OF THE STANDARD SPECIFICATIONS.

OTHER CASTINGS, SIMILAR IN DIMENSION AND OF EQUAL OR GREATER WEIGHT THAN THAT SHOWN MAY BE USED IF ACCEPTED BY THE ENGINEER IN WRITING.

METAL USED IN THE MANUFACTURE OF CASTINGS SHALL CONFORM TO AASHTO M-105, CLASS 35 B.

12-22-75

REVISIONS	
DATE	CHANGE
2-24-76	Step Dimensions
4-28-77	Step Note
2-12-80	MH Adjusting Rings
5-13-82	Beehive Cover
7-23-82	Note Added
7-12-82	Note
2-1-83	Weights Changed Note Added

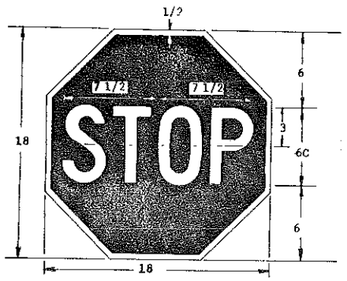
NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Approved: Design Engineer

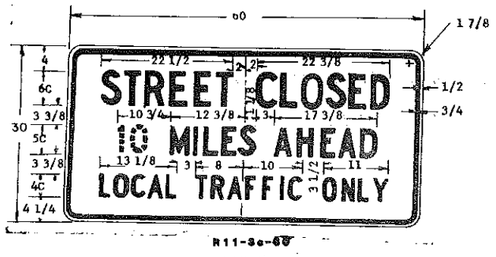
CONSTRUCTION SIGN DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	46

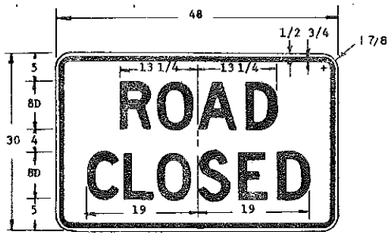
D754-1



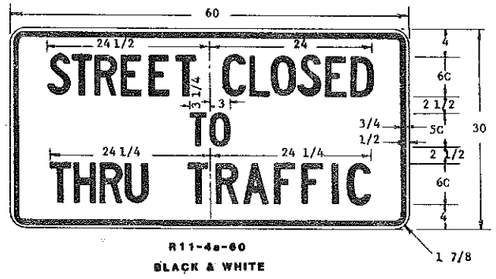
STOP-SLOW PADDLE
RED & WHITE
FLAGPERSON PADDLE



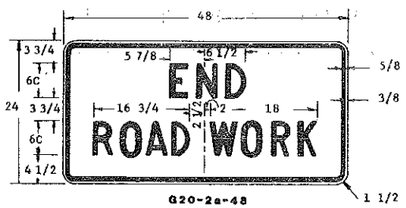
R11-3c-60
BLACK & WHITE



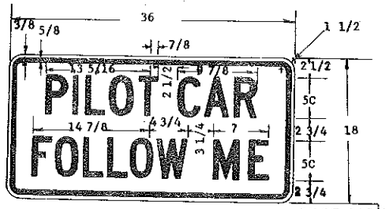
R11-2-48
BLACK & WHITE



R11-4a-60
BLACK & WHITE

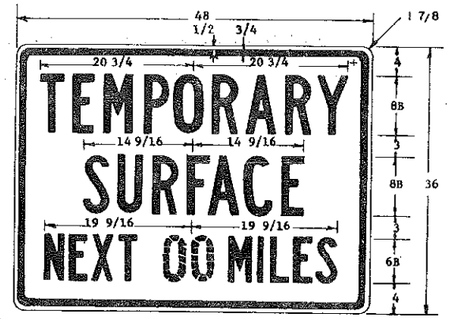


G20-2a-48
BLACK & ORANGE

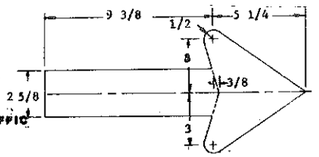


G20-4-36
BLACK & ORANGE

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



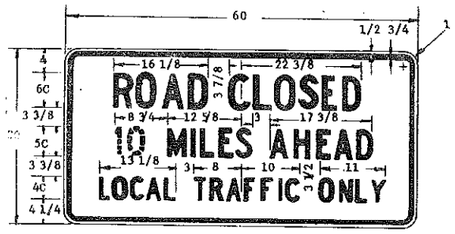
G20-6-48
BLACK & ORANGE



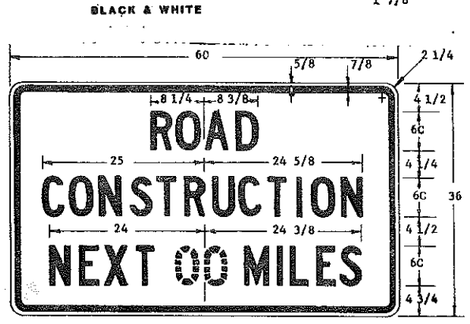
ARROW DETAIL FOR SIGN NO'S.
G20-50-72 & G20-52-72

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.

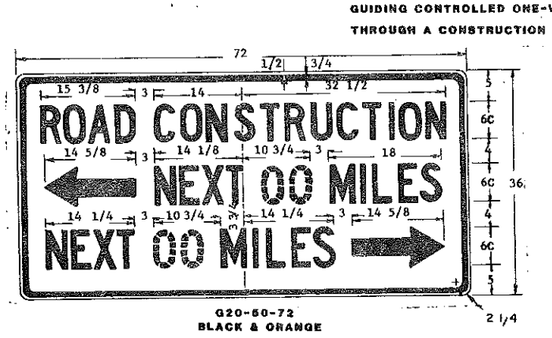
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGE BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.



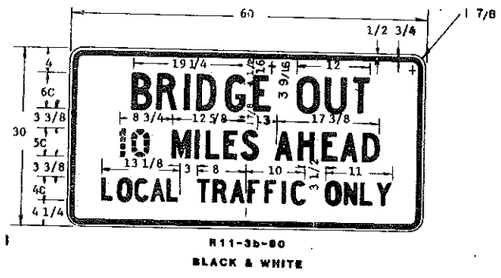
R11-3a-60
BLACK & WHITE



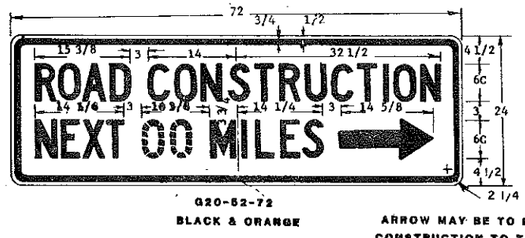
G20-1-60
BLACK & ORANGE



G20-50-72
BLACK & ORANGE



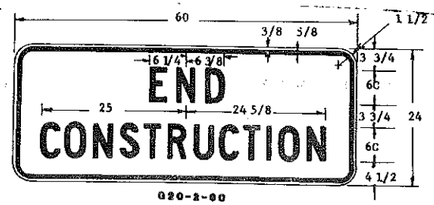
R11-3b-60
BLACK & WHITE



G20-52-72
BLACK & ORANGE

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

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
7-7-80	SIGN COLOR
9-19-80	SIGN NUMBERS
8-1-81	REMOVE SIGN NUMBER

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

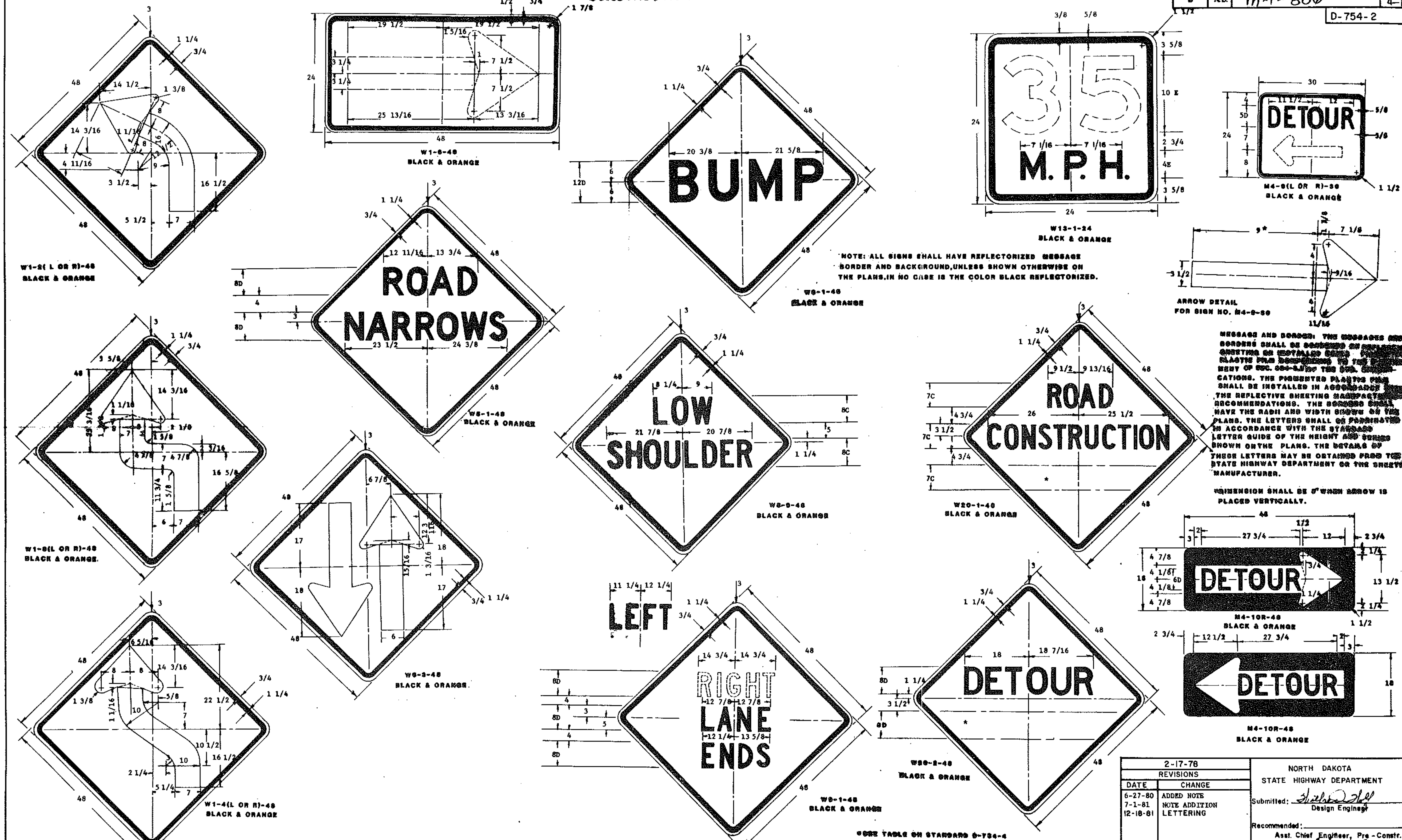
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

FHWA REGION	STATE	FED AID PROJECT NO.	SHEET NO.
8	N.D.	M-1-806	47

D-754-2

CONSTRUCTION SIGN DETAILS



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 [illegible] OF REFLECTIVE SHEETING OR [illegible] [illegible] PLASTIC FILM [illegible] TO THE [illegible] MENT OF SEC. [illegible] THE STD. SPECIFI-CATIONS. 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 5" 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

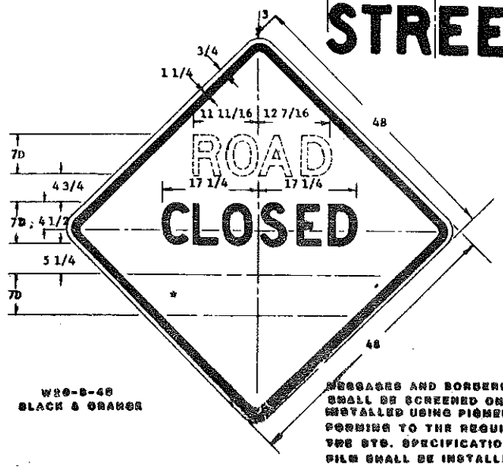
Submitted: [signature] Design Engineer

Recommended: Asst. Chief Engineer, Pre-Constr.

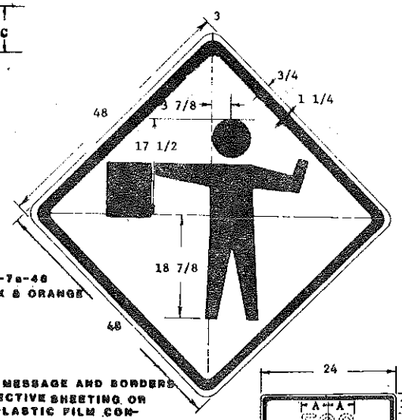
Approved: [signature] Chief Engineer

CONSTRUCTION SIGN DETAILS

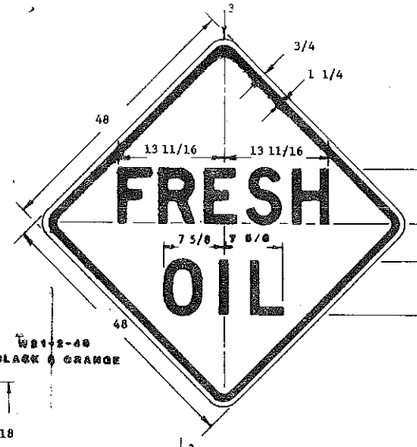
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	48
		D 754-3	



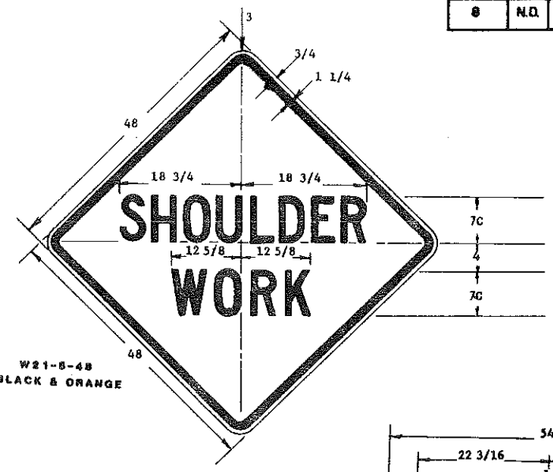
W20-8-48
BLACK & ORANGE



W20-7a-48
BLACK & ORANGE



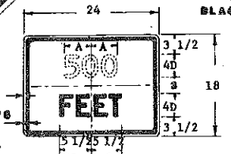
W21-2-48
BLACK & ORANGE



W21-5-48
BLACK & ORANGE

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

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. 804-3.5 OF THE STD. SPECIFICATIONS. THE PIGMENTED PLASTIC FILM SHALL BE INSTALLED IN ACCORDANCE WITH THE REFLECTIVE SHEETING MANUFACTURERS RECOMMENDATIONS. B/G 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.

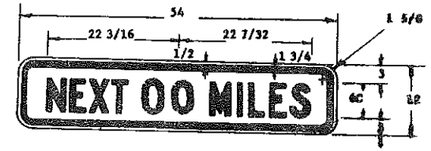


W20-7a-24

SIGN	DIMENSION A (INCHES)
500'	6 - 11/16
1000'	5 - 1/2
1500'	5 - 5/16

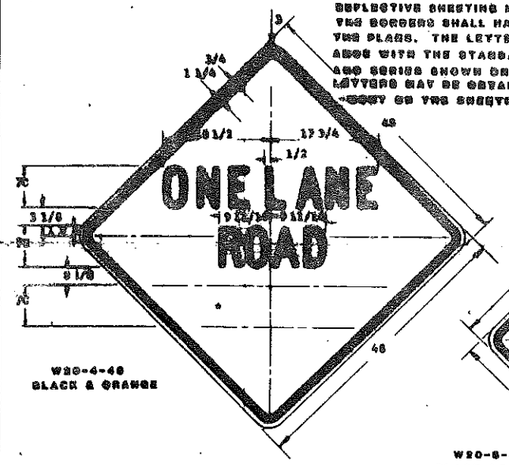
FOR USE WITH W20-7a-48 & W21-1a-48

BLACK & ORANGE

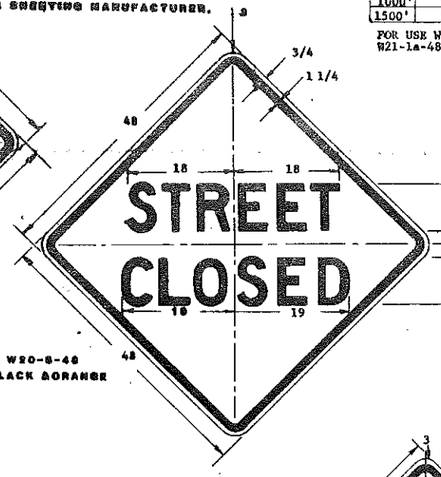


W20-82-84
BLACK & ORANGE

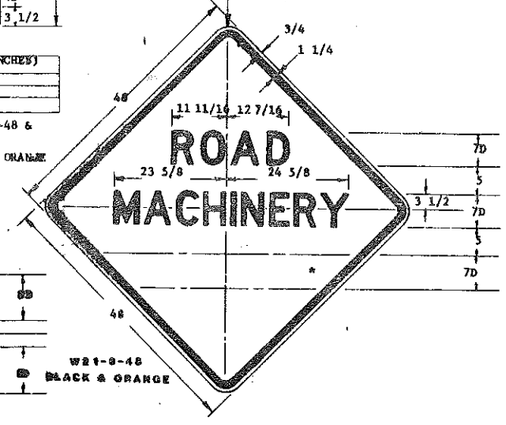
NOTE: ALL SIGNS SHALL HAVE REFLECTORIZED MESSAGES, BORDER AND BACKGROUND, UNLESS SHOWN OTHERWISE ON THE PLANS. IN NO CASE IS THE COLOR BLACK REFLECTORIZED.



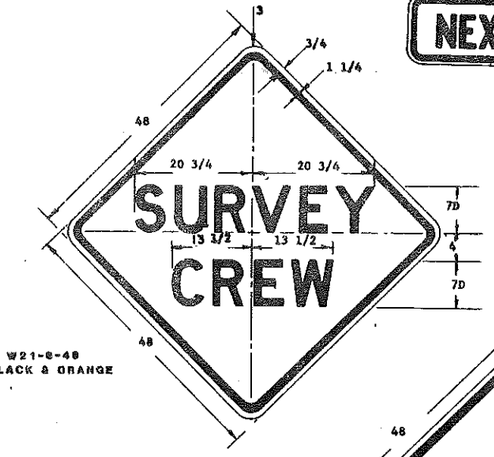
W20-4-48
BLACK & ORANGE



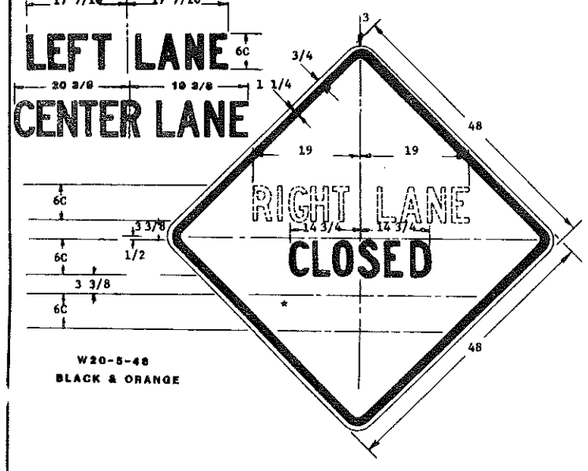
W20-6-48
BLACK &ORANGE



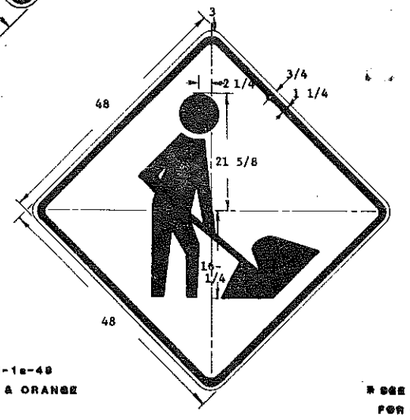
W21-9-48
BLACK & ORANGE



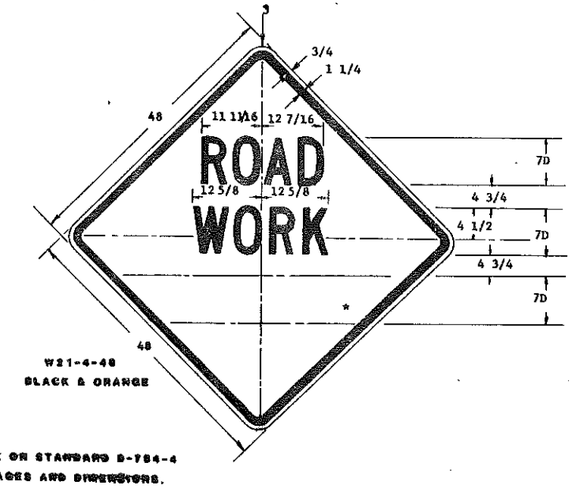
W21-6-48
BLACK & ORANGE



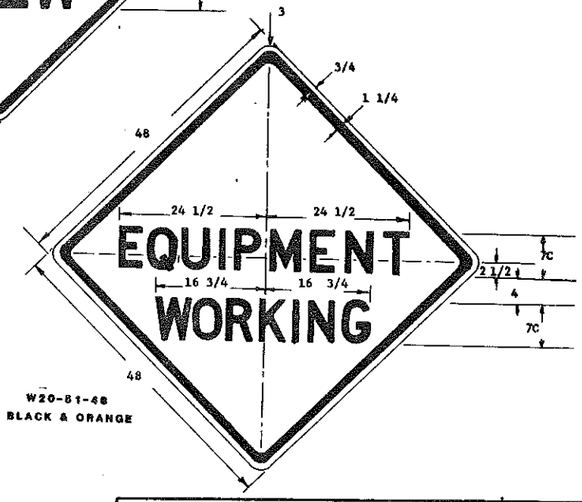
W20-5-48
BLACK & ORANGE



W21-1a-48
BLACK & ORANGE



W21-4-48
BLACK & ORANGE



W20-81-48
BLACK & ORANGE

* SEE TABLE OR STANDARD B-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
4-12-82	ADD LEGEND

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

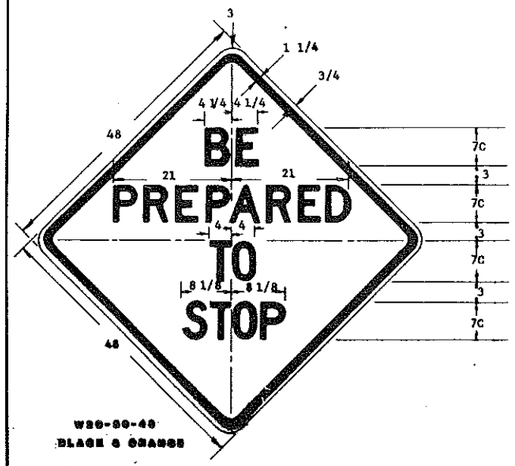
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

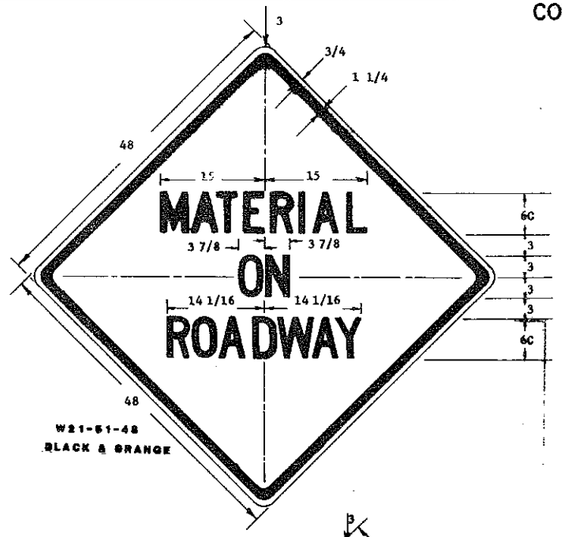
CONSTRUCTION SIGN DETAILS

FHWA REGION		FED. AID PROJECT NO.	SHEET NO.
8	N.D.	M-1-806	49

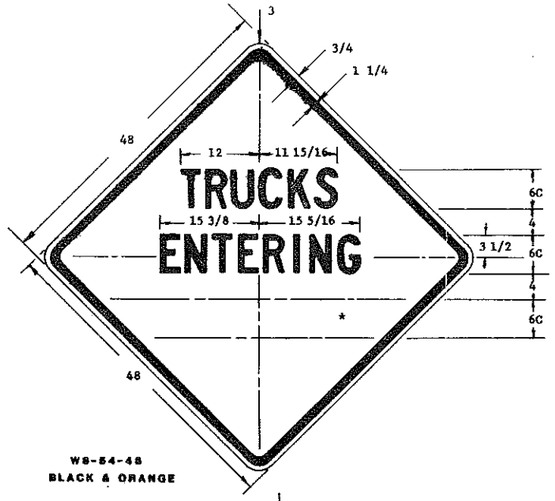
D 754-4



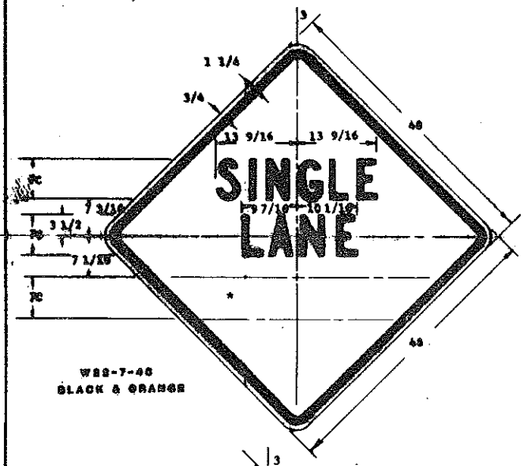
W20-30-48
BLACK & ORANGE



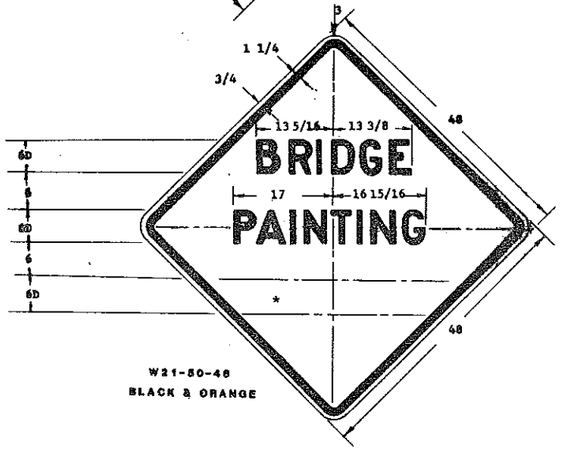
W21-51-48
BLACK & ORANGE



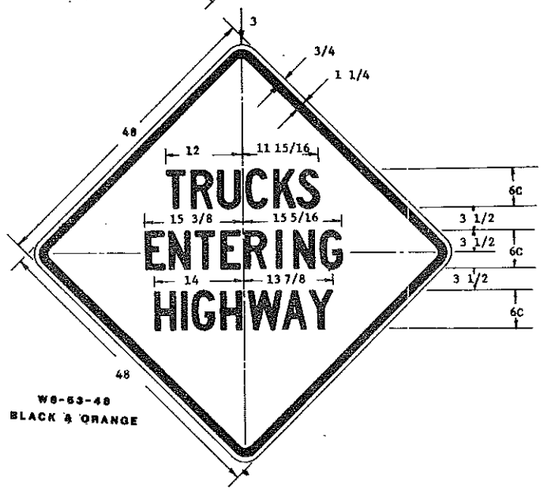
W8-54-48
BLACK & ORANGE



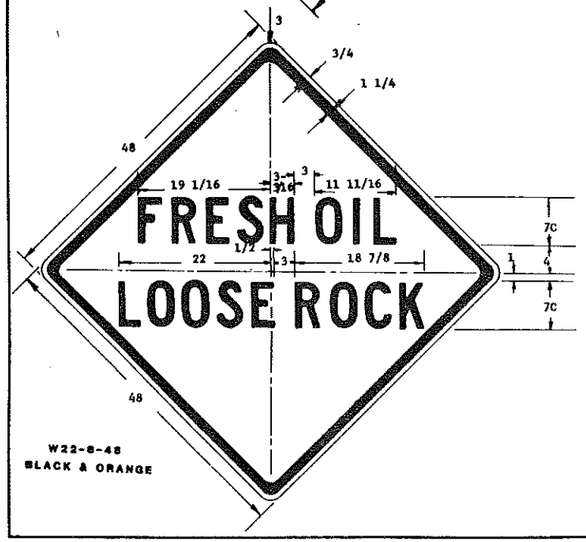
W22-7-48
BLACK & ORANGE



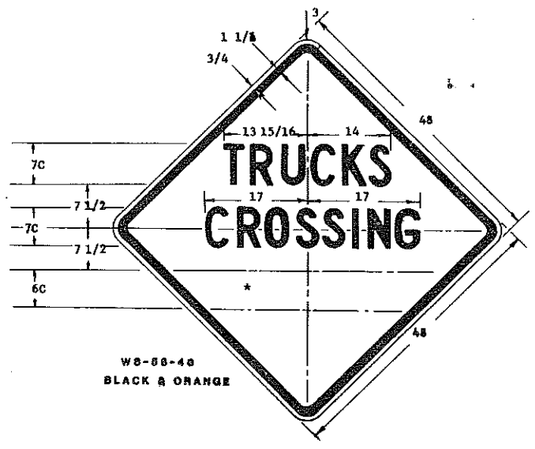
W21-50-48
BLACK & ORANGE



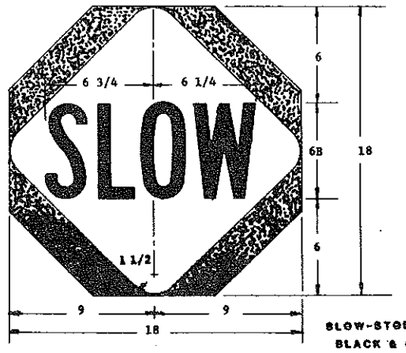
W8-53-48
BLACK & ORANGE



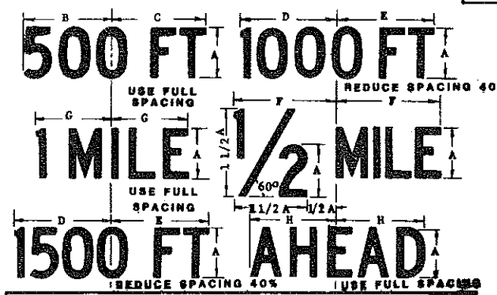
W22-8-48
BLACK & ORANGE



W8-55-48
BLACK & ORANGE



SLOW-STOP PADDLE
BLACK & ORANGE
FLAGPERSON PADDLE



DIMENSIONS (INCHES)							
A	B	C	D	E	F	G	H
4C	6-7/8	7	7-1/2	8	8-5/16	6-1/16	7
5C	8-3/4	8-13/16	9-3/8	10	10-7/16	7-5/8	8-3/4
6C	10-3/8	10-1/2	11-1/4	12	12-1/2	9-1/8	10-1/2
7C	12	12-3/16	13-1/8	14	14-9/16	10-5/8	12-1/4
8C	13-3/4	14	15	16	16-5/8	12-1/8	14
4D	8-1/8	8-5/8	8-1/2	9	9	7-3/16	8-1/4
5D	10-3/16	10-13/16	11-5/8	11-1/4	11-1/4	9-1/8	10-7/8
6D	12-3/16	12-15/16	12-3/4	13-1/2	13-1/2	11-13/16	13-1/8
7D	14-1/4	15-1/8	14-7/8	15-3/4	15-3/4	13-1/16	15-1/8
8D	16-1/4	17-1/4	17	18	18	14-8/8	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. 894-3.8 OF THE STD. SPECIFICATIONS. THE PIGMENTED PLASTIC FILM SHALL BE INSTALLED IN ACCORDANCE WITH THE REFLECTIVE SHEETING MANUFACTURERS RECOMMENDATION.

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

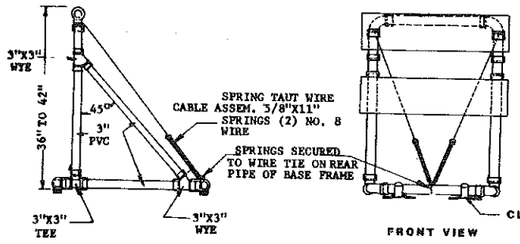
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

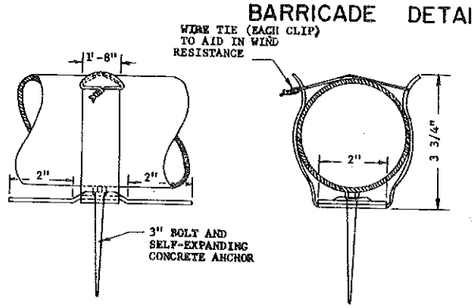
BARRICADE DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	50

D 754-5



SIDE VIEW FRONT VIEW



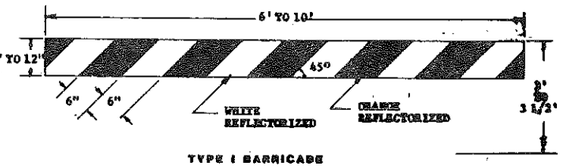
TYPICAL CLAMP DETAIL

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

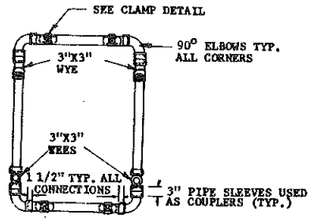
DELINEATOR DRUMS

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

DELINEATOR DRUM



TYPE I BARRICADE



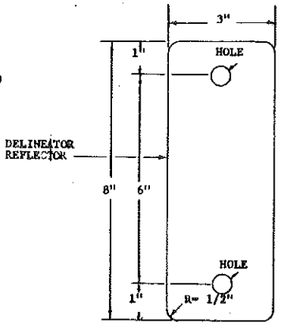
BASE

BREAKAWAY BARRICADE ASSEMBLY

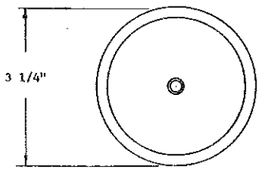
NOTE: THE PIPE, WYES, TEES ANDD ELBOWS USED TO CONSTRUCT TYPE II BARRICADES (SPECIAL) SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION: D2241 FOR PVC 1120 OR 1220, SDR 21, PRESSURE RATING 200 P.S.I. THE WYES, TEES, AND ELBOWS SHALL SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION : D-2466,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

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

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

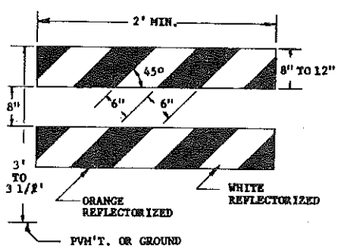


3" x 8" - 18 GUAGE GALVANIZED STEEL SHEETS, OR OR .080" ALUMINUM PLATE WITH WHITE REFLECTIVE SHEETING (TYPE III OR IV) AS SPECIFIED IN SECTION 894 OF THE STANDARD SPECIFICATIONS.

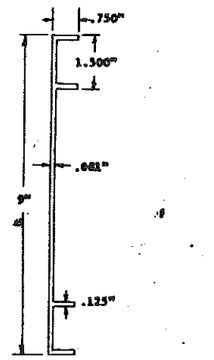


ACRYLIC PLASTIC REFLECTOR

DELINEATOR REFLECTOR SHALL MEET THE REQUIREMENTS OF SECTION 894.

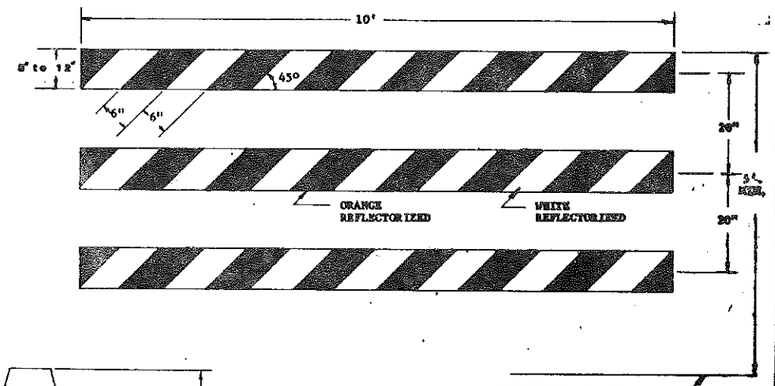


TYPE II BARRICADE

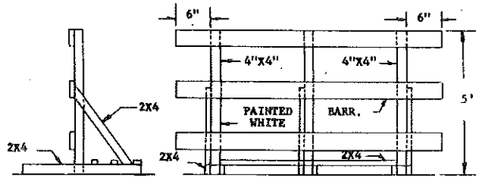


EXTRUDED ALUMINUM BARRICADE

BAR DETAIL



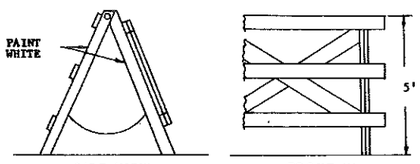
TYPE III BARRICADE



SIDE VIEW FRONT VIEW

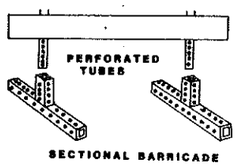
MOVABLE BARRICADE ASSEMBLY

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

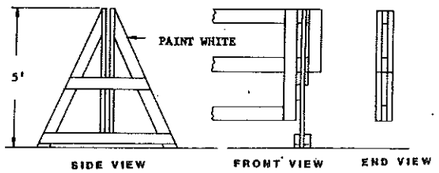


SIDE VIEW FRONT VIEW

HINGED BARRICADE ASSEMBLY

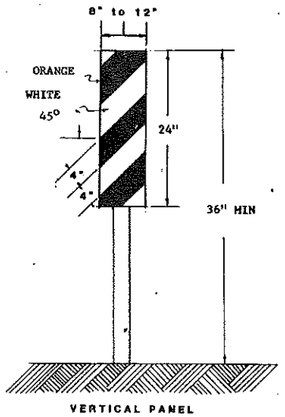


SECTIONAL BARRICADE

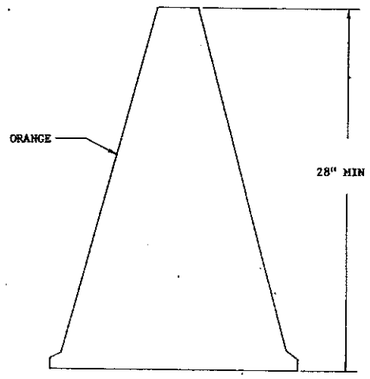


SIDE VIEW FRONT VIEW END VIEW

DEMOUNTABLE BARRICADE ASSEMBLY



VERTICAL PANEL



CONE

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

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

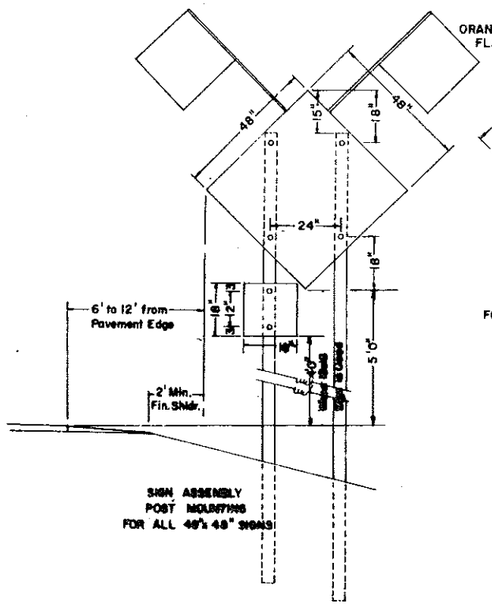
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

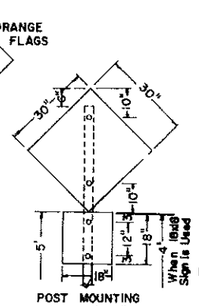
CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	51

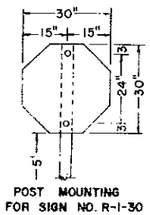
D-754-5-A



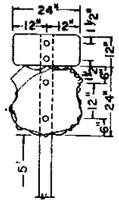
SIGN ASSEMBLY
POST MOUNTING
FOR ALL 48"x48" SIGNS



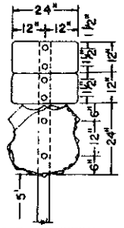
POST MOUNTING
FOR ALL 30"x30" SIGNS



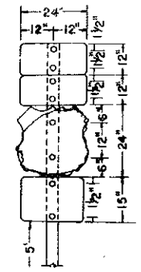
POST MOUNTING
FOR SIGN NO. R-1-30



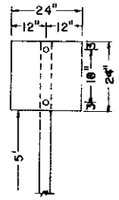
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN & ONE ROUTE MARKER



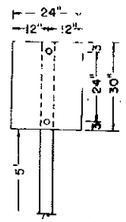
POST MOUNTING
FOR ASSEMBLIES WITH
ONE CARDINAL DIRECTION
SIGN, ONE DETOUR SIGN
& ONE ROUTE MARKER



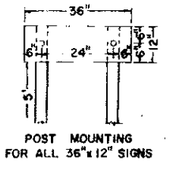
POST MOUNTING
FOR ASSEMBLIES WITH ONE
CARDINAL DIRECTION SIGN, ONE
DETOUR SIGN, ONE ROUTE MARKER
& ONE DIRECTIONAL ARROW



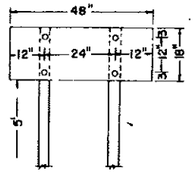
POST MOUNTING
FOR ALL 24"x24" SIGNS



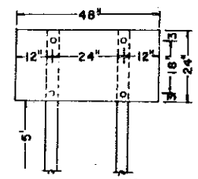
POST MOUNTING
FOR ALL 24"x30" SIGNS



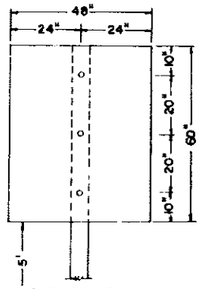
POST MOUNTING
FOR ALL 36"x12" SIGNS



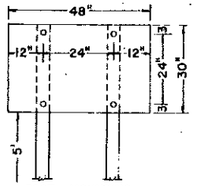
POST MOUNTING
FOR ALL 48"x18" SIGNS



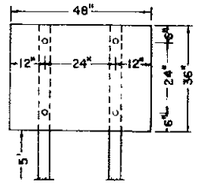
POST MOUNTING
FOR ALL 48"x24" SIGNS



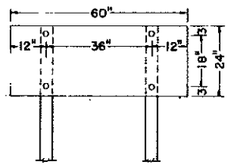
POST MOUNTING
FOR ALL 48"x60" SIGNS



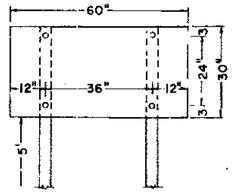
POST MOUNTING
FOR ALL 48"x30" SIGNS



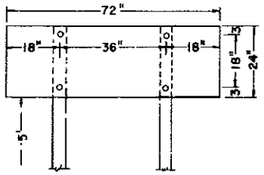
POST MOUNTING
FOR ALL 48"x36" SIGNS



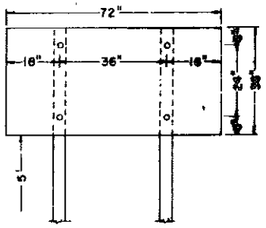
POST MOUNTING
FOR ALL 60"x24" SIGNS



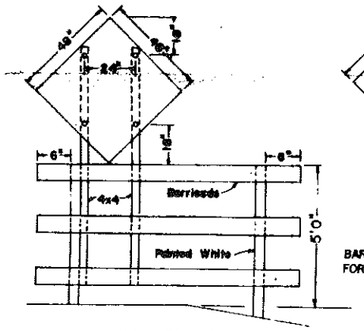
POST MOUNTING
FOR ALL 60"x30" SIGNS



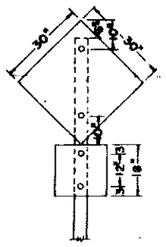
POST MOUNTING
FOR ALL 72"x24" SIGNS



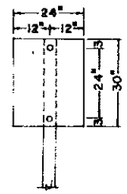
POST MOUNTING
FOR ALL 72"x36" SIGNS



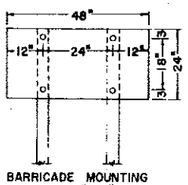
SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL 48"x48" SIGNS



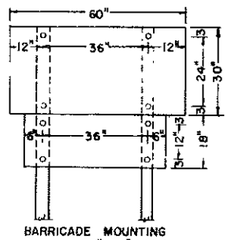
BARRICADE MOUNTING
FOR ALL 30"x30" SIGNS



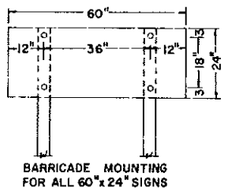
BARRICADE MOUNTING
FOR ALL 24"x30" SIGNS



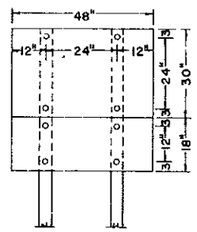
BARRICADE MOUNTING
FOR ALL 48"x24" SIGNS



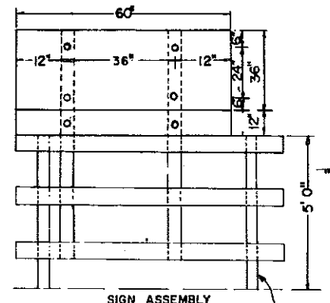
BARRICADE MOUNTING
FOR ALL 60"x30" SIGNS



BARRICADE MOUNTING
FOR ALL 60"x24" SIGNS

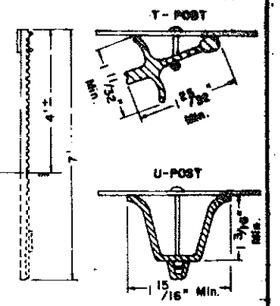


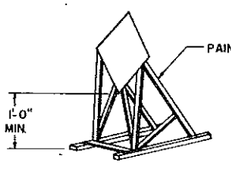
BARRICADE MOUNTING
FOR ALL 48"x30" & 48"x18" SIGNS



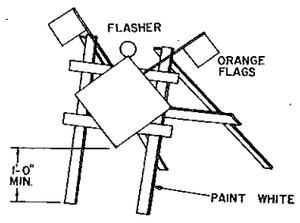
SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL G20-1-60 SIGNS

DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS





PORTABLE SIGN MOUNTING



PORTABLE SIGN MOUNTING

NOTES:

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

ADVANCE WARNING FLASHING OR SEQUENCING ARROW PANELS: The minimum mounting height shall be 7 feet above the roadway to the bottom of the panel, except on vehicle mounted panels which shall be as high as practicable.

NOTES:

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

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

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

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

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

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

2-17-78

REVISIONS	
DATE	CHANGE
8-21-78	DETAIL ADDED
4-16-79	SIGN NO. CORRECTION
2-6-81	NOTE ADDED
4-23-84	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-1-806	52

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 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 all warning signs unless barricades and signs have encapsulated lens reflective sheeted face.

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.

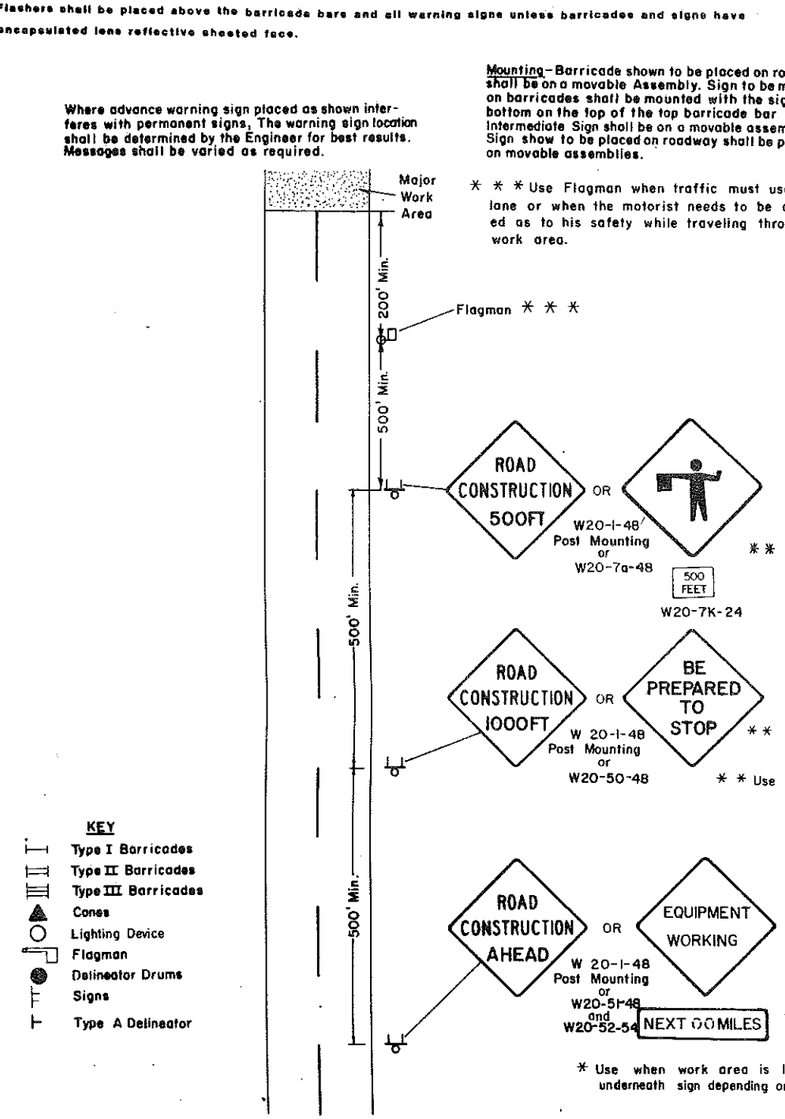
Delineator Drums, Barricades or cones used for tapering traffic shall be spaced at the demention "S".

"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.

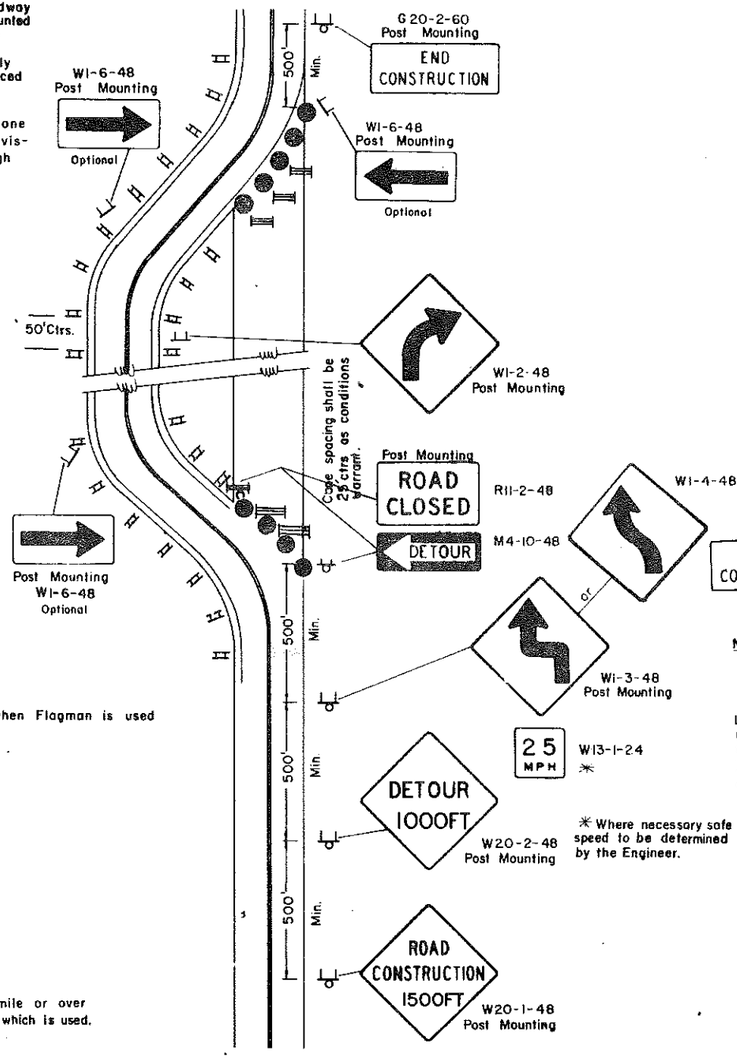


KEY

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

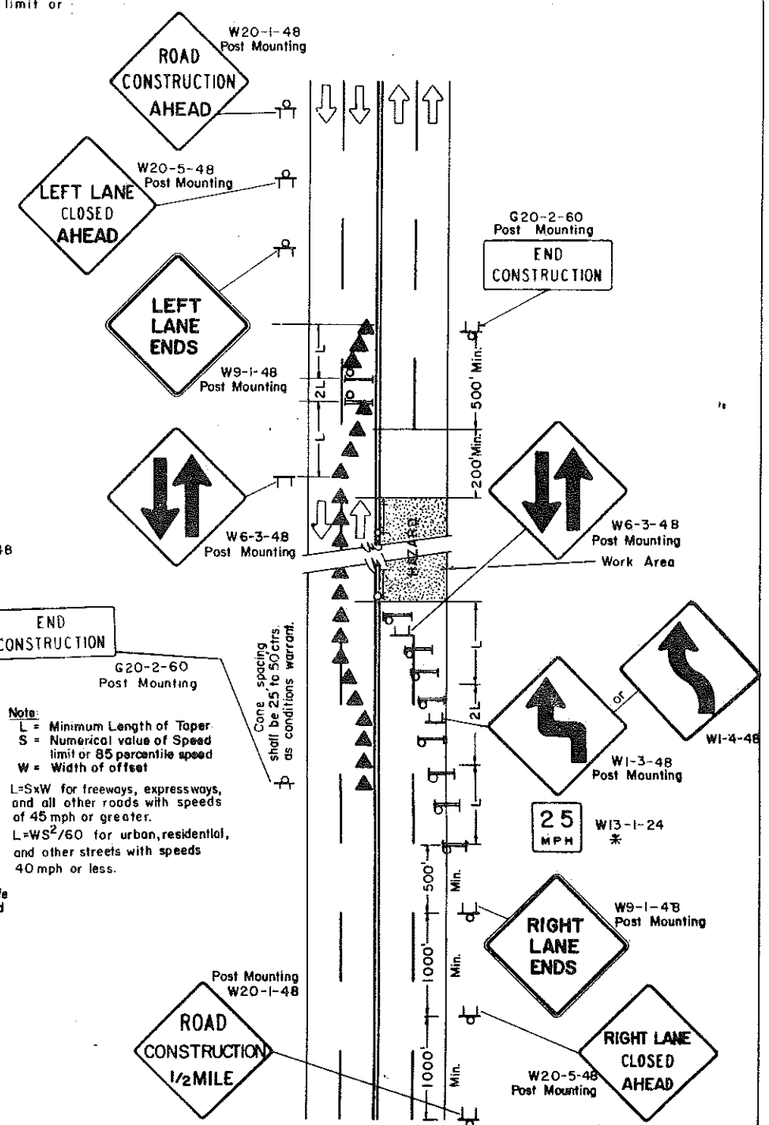
TYPE A
CONSTRUCTION SIGN LAYOUT
2 & 4 Lane Highway when traffic is maintained.
(Sign shown for one end only)
MAJOR WORK AREA
(shall be limited to 3 miles)

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

REVISIONS	
DATE	CHANGE
8-14-84	Detail Changes

7-15-76

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

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

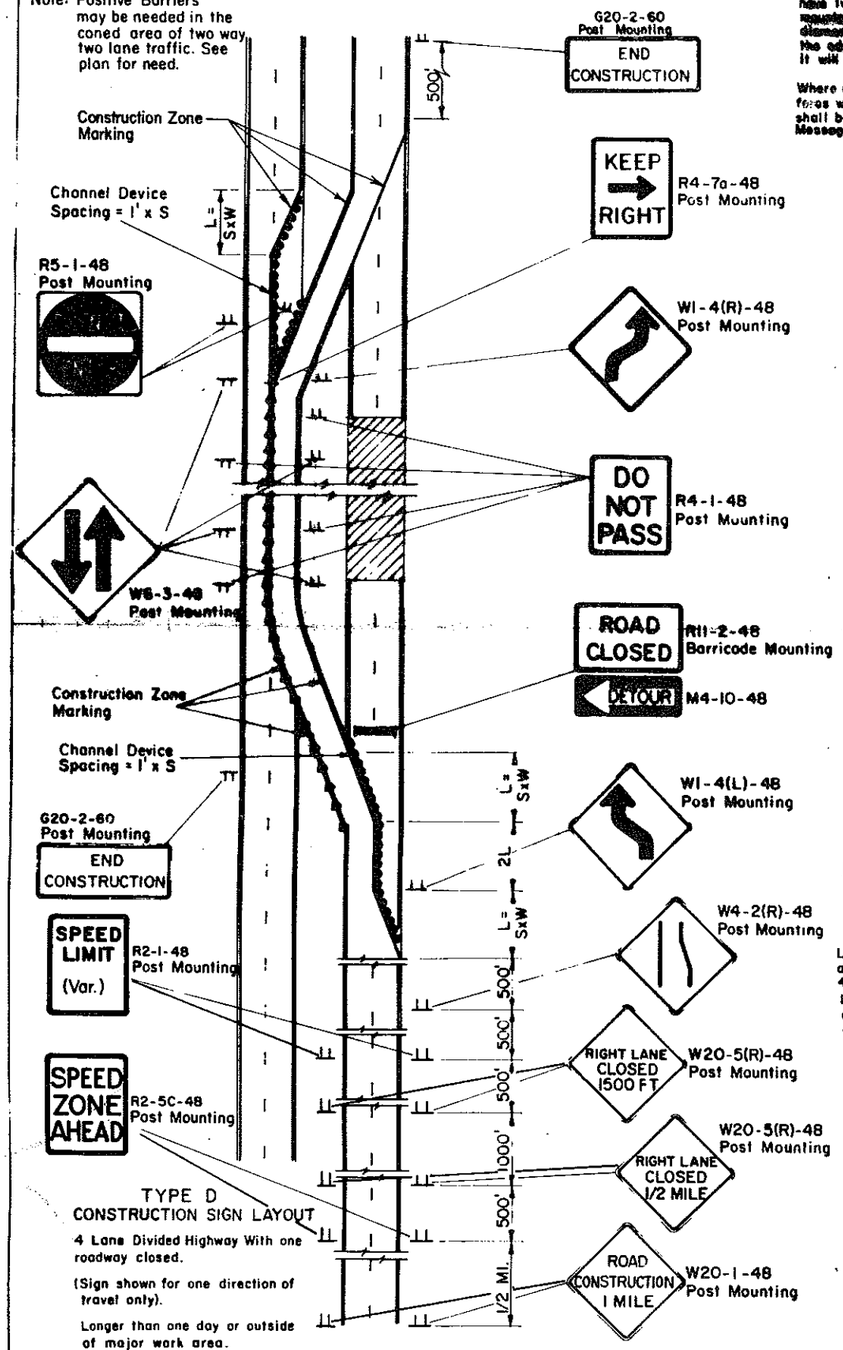
Approved: _____ Chief Engineer

FHWA REGION	STATE	FED AID PROJ NO.	SHEET NO.
8	N.D.	M-1-806	53

D-754-7

CONSTRUCTION SIGN AND [illegible] LOCATION DETAILS

Note: Positive Barriers may be needed in the coned area of two way, two lane traffic. See plan for need.



TYPE D
CONSTRUCTION SIGN LAYOUT

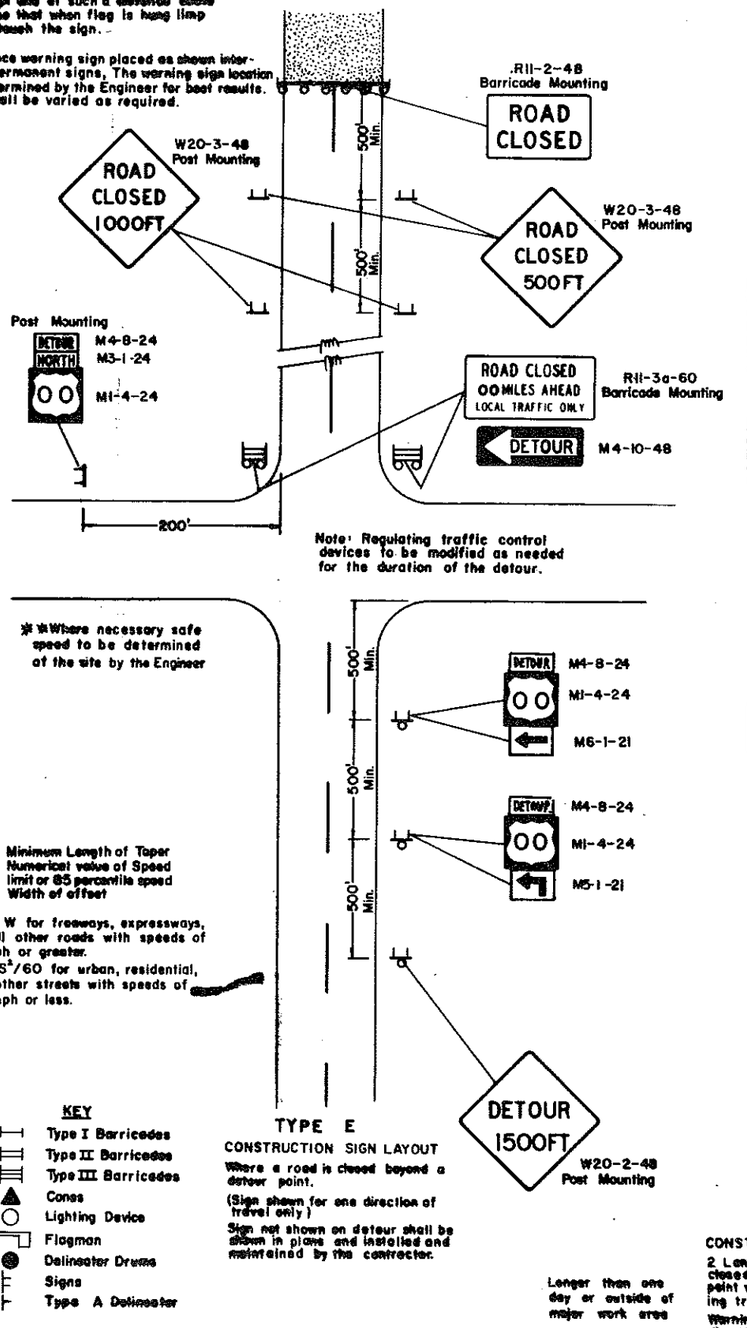
4 Lane Divided Highway With one roadway closed.

(Sign shown for one direction of travel only).

Longer than one day or outside of major work area.

NOTE:
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.



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

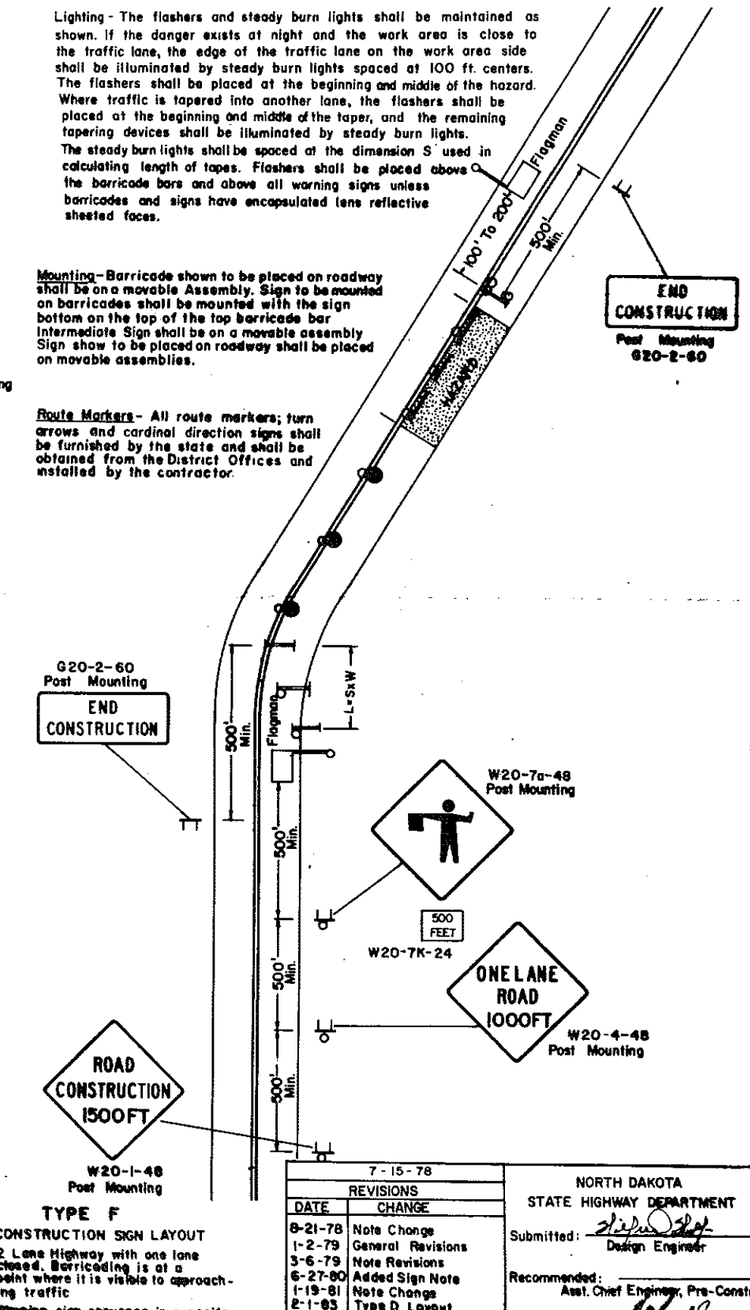
Delineator drums, Barricades or Cones used for tapering traffic shall be spaced at the dimention "S".

"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 Note
1-19-81	Note Change
2-1-83	Type D Layout
6-29-83	Marking Notation
7-6-83	Add Median Signs

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-1-806	54

D-754-9

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

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

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

Route Markers

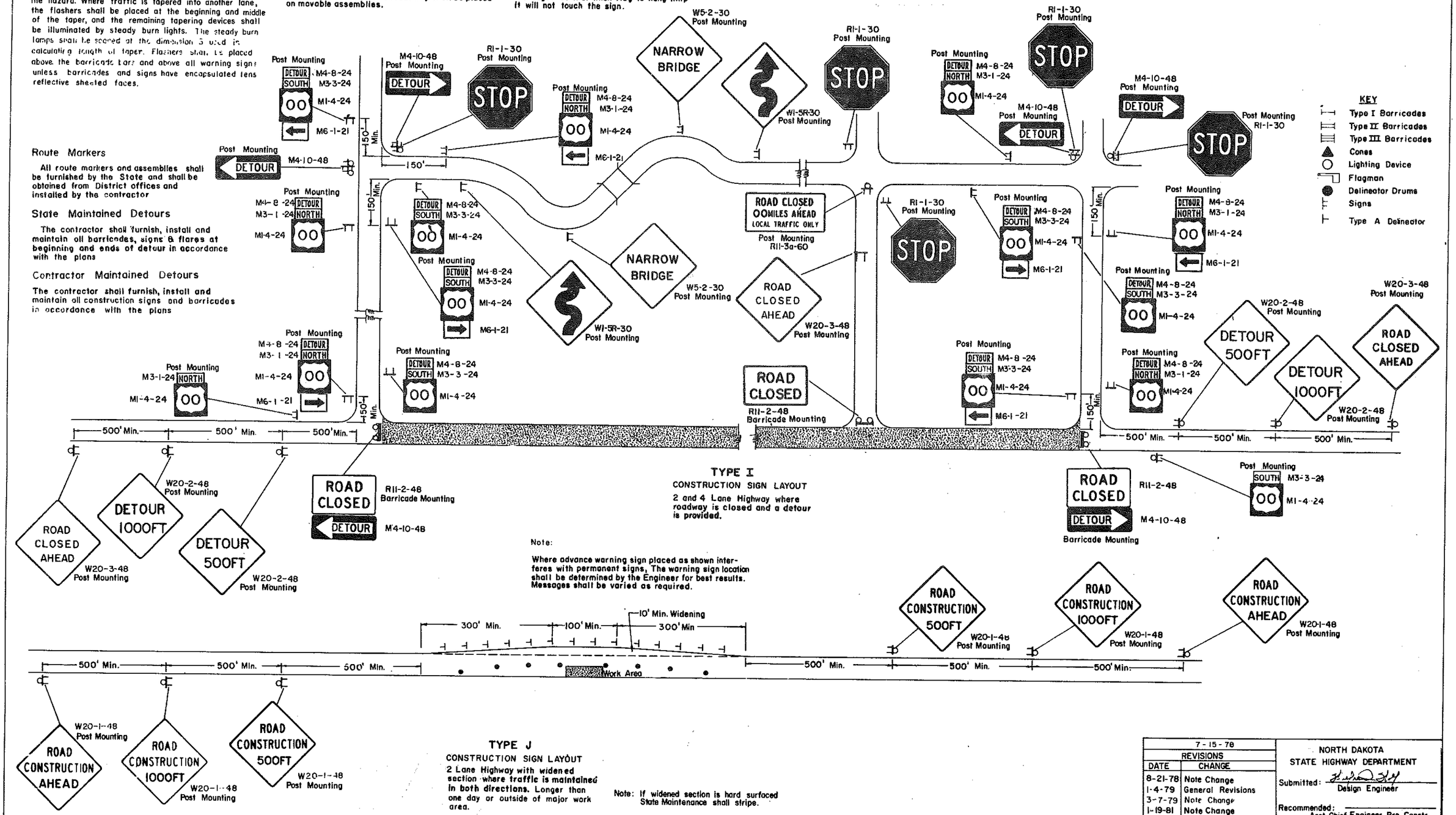
All route markers and assemblies shall be furnished by the State and shall be obtained from District offices and installed by the contractor

State Maintained Detours

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

Contractor Maintained Detours

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



TYPE I

CONSTRUCTION SIGN LAYOUT

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

Note:

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

TYPE J

CONSTRUCTION SIGN LAYOUT

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

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

7-15-78	
REVISIONS	
DATE	CHANGE
8-21-78	Note Change
1-4-79	General Revisions
3-7-79	Note Change
1-19-81	Note Change

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

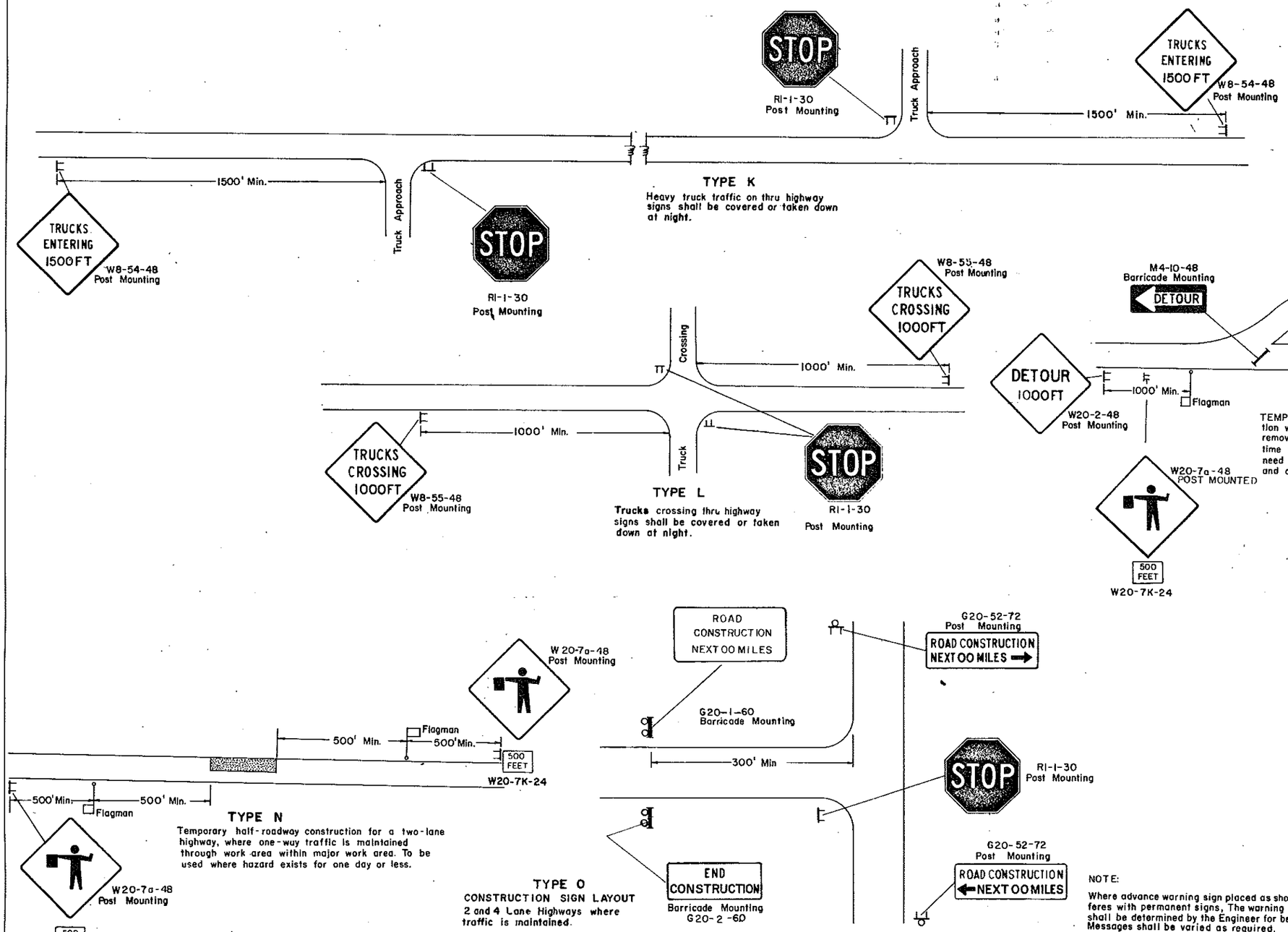
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

FHWA REGION	STATE	F.A.I. PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	55

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.

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.

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

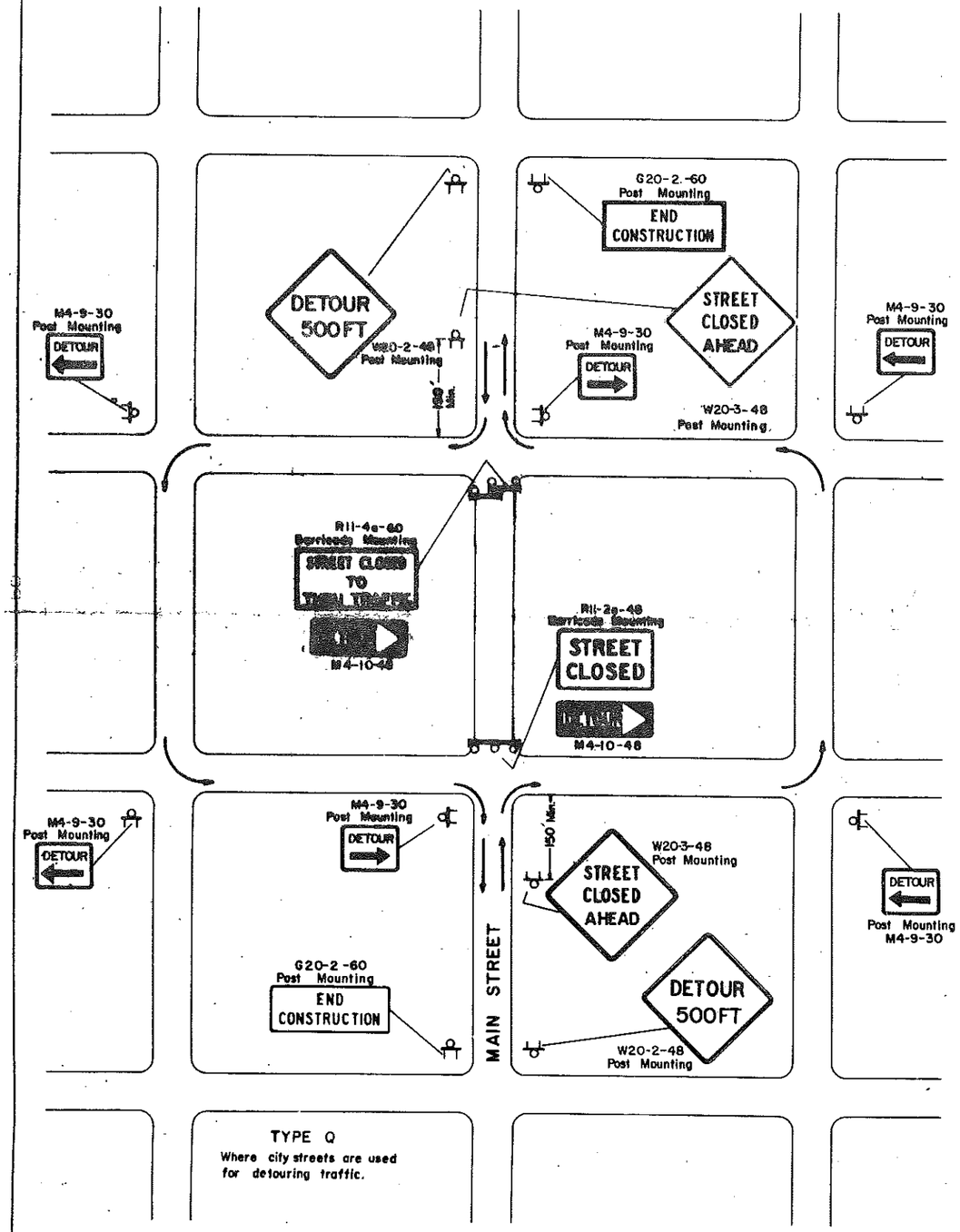
Recommended: _____
Asst. Chief Engineer, Pre-Constr.

Approved: _____
Chief Engineer

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-804	56

D-754-11

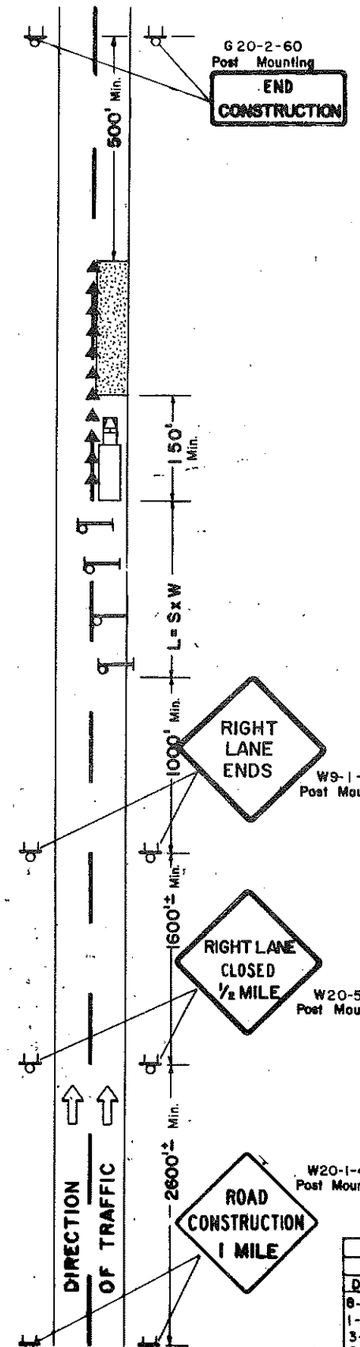


TYPE Q

Where city streets are used for detouring traffic.

KEY

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



NOTES:

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

Lighting - The flashers and steady burn lights shall be maintained as shown. If the danger exists at night and 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 beam 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.

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 shown to be placed on roadway shall be placed on movable assemblies.

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

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

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

TYPE P

4 Lane Divided Roadway where half of roadway is closed. Longer than one day or outside of major work area.

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

7-15-78

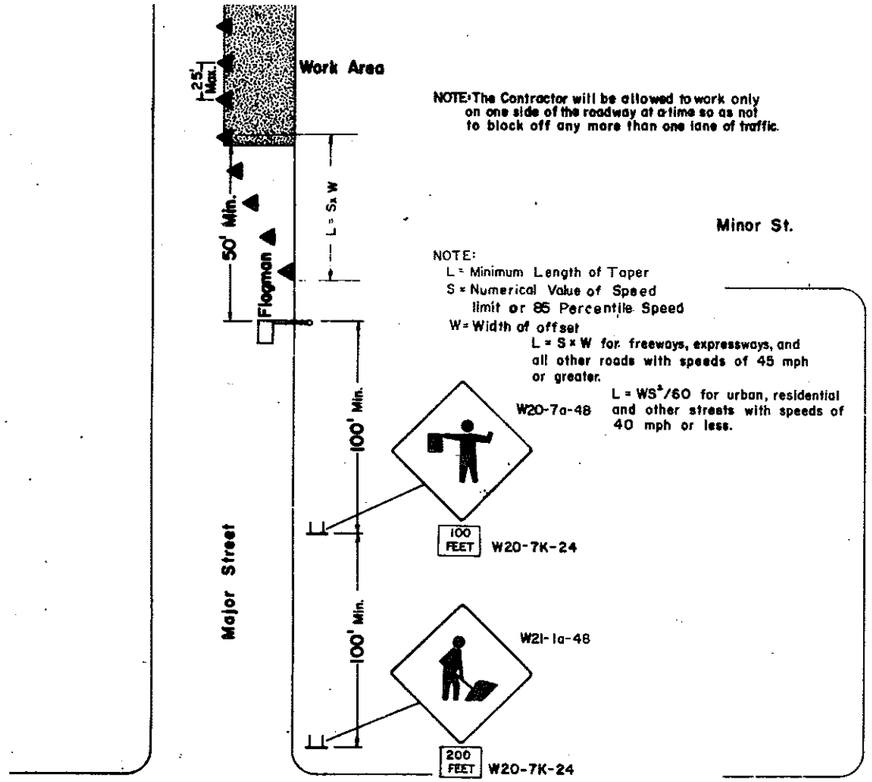
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Approved: _____
Design Engineer

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO.
8	N.D.	m-1-806	57

D-754-13

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

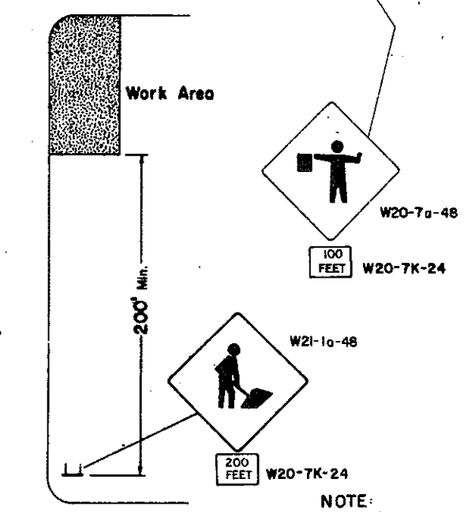


NOTE: The Contractor will be allowed to work only on one side of the roadway at a time so as not to block off any more than one lane of traffic.

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.

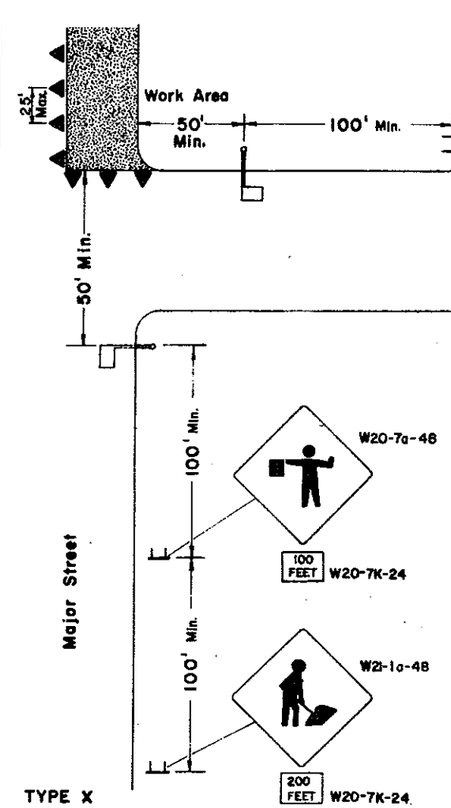
TYPE V

WHEN PORTION OF ROADWAY IS CLOSED TO TRAFFIC ONLY DURING DAYLIGHT HOURS (MID BLOCK LOCATION)



TYPE W

WHEN WORK AREA IS OUTSIDE OF DRIVING LANE AND NO CLOSURE IS NECESSARY



TYPE X

WHEN PORTION OF ROADWAY IS CLOSED TO TRAFFIC ONLY DURING DAYLIGHT HOURS (END BLOCK LOCATION)

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

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.

Where parking is present the signs shall be placed so they are entirely visible above the parked vehicles or placed at the edge of the parking area so they are visible to oncoming traffic. The number of locations will determine the number of signs needed and the length of the work area will determine the number of cones. The contractor shall furnish the number of appurtenances needed for each situation. If more than one location is being worked on, the Contractor shall furnish the necessary appurtenances for those additional locations. No additional compensation will be given for additional appurtenances but shall be included in the price bid for maintenance and protection of traffic.

Mounting- Sign shown to be placed on roadway shall be placed on movable assemblies.
(All devices shall be removed when hazard ceases to exist).

KEY
- Cones
- Flagman
- Signs

7-15-78 REVISIONS	
DATE	CHANGE
8-21-78	Sign List Change
1-8-79	General Revisions
3-8-79	General Revisions
5-19-80	General Revisions
6-23-80	Sign Std. Numbers

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: _____ Design Engineer

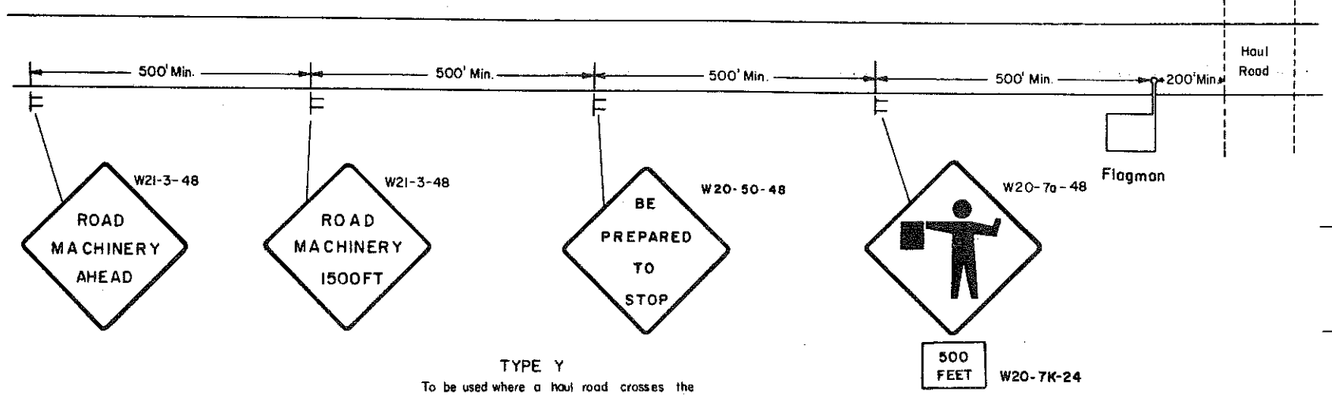
Recommended: _____ Asst. Chief Engineer, Pre-Constr.

Approved: _____ Chief Engineer

CONSTRUCTION SIGN AND BARRICADE LOCATION DETAILS

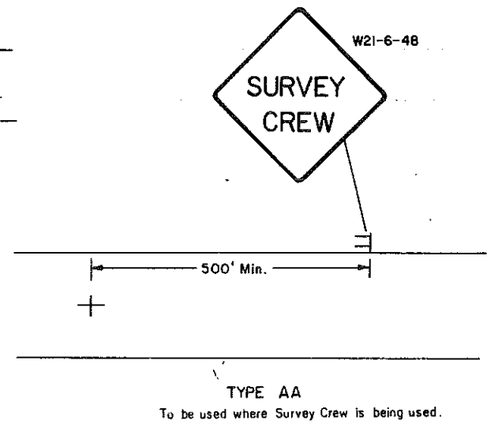
FHWA REGION	STATE	FED. AID. PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	58

D-754-13-A



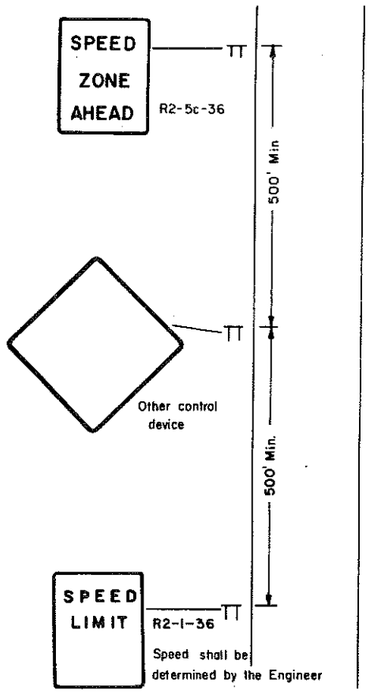
TYPE Y

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



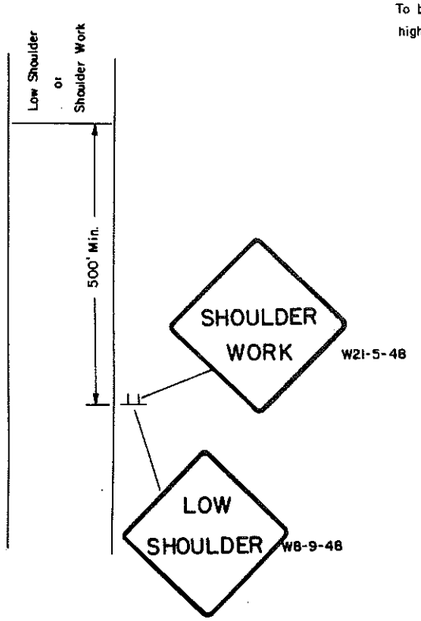
TYPE AA

To be used where Survey Crew is being used.



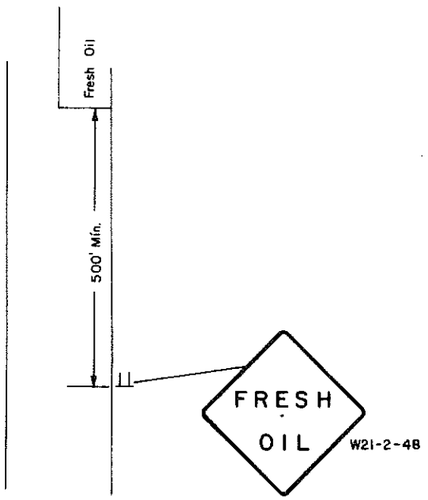
TYPE Z

To be used where speed zone is needed.



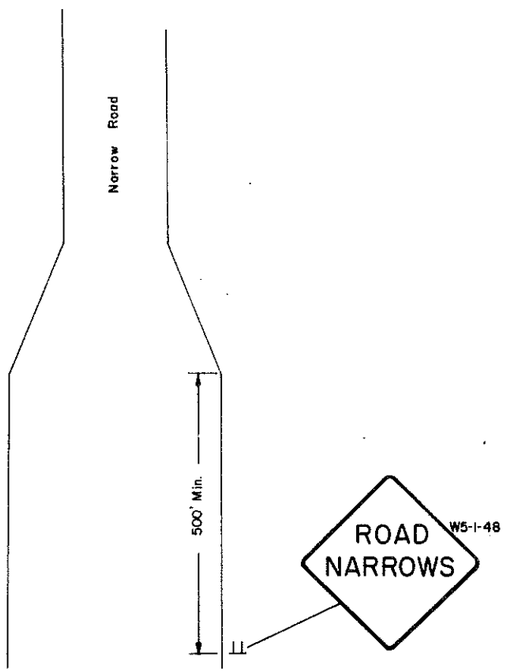
TYPE BB

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



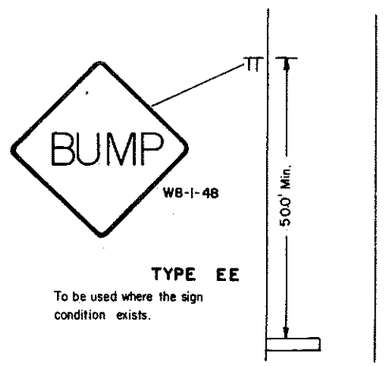
TYPE CC

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

ASSEMBLY DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	59

D-754-23

MINIMUM
HORIZONTAL CLEARANCE

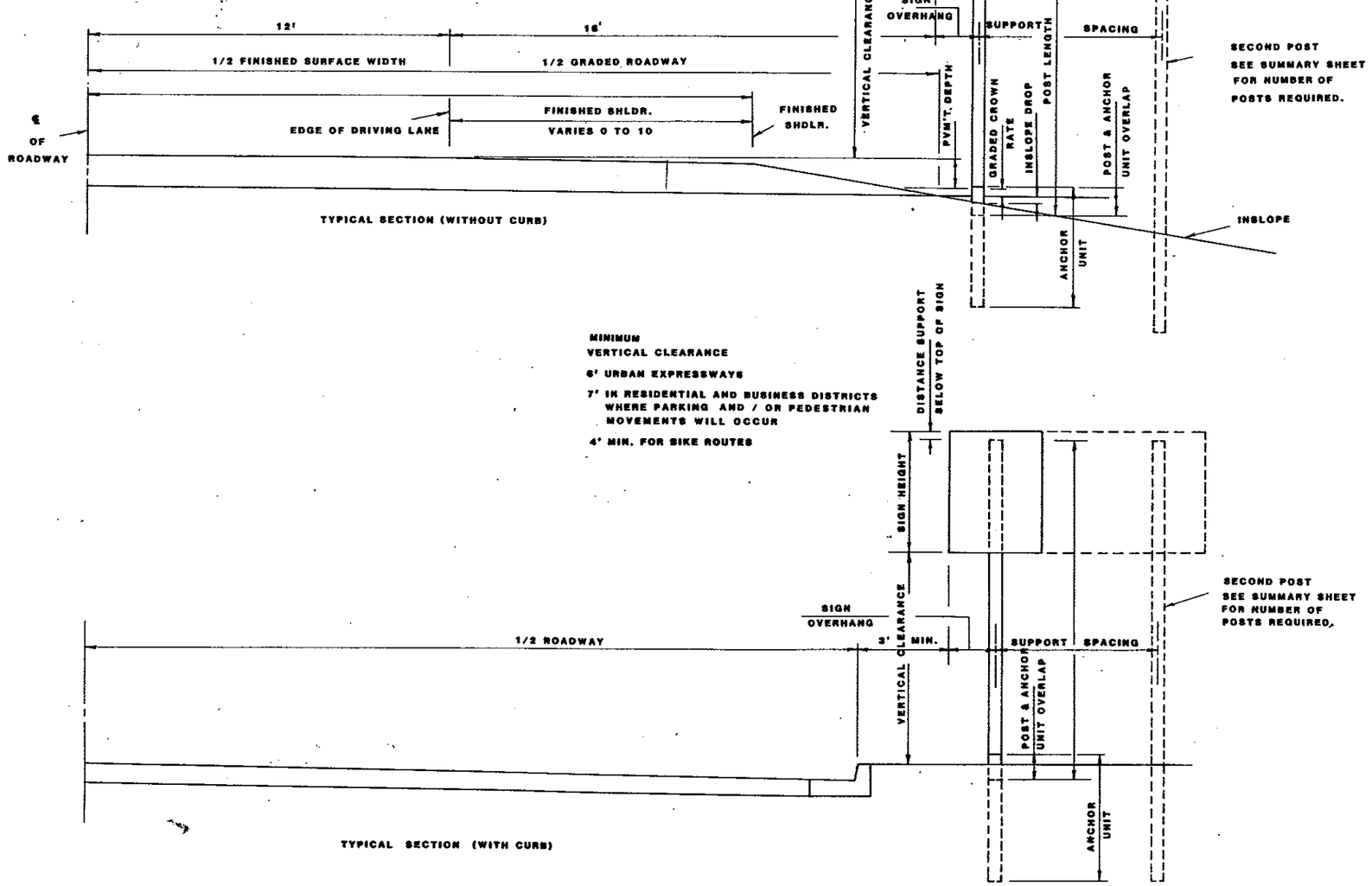
THE 16' CLEARANCE FROM THE EDGE OF THE DRIVING LANE TO THE EDGE OF THE SIGN SHALL BE FOR ALL ROADWAYS WITHOUT CURBS. ALL CURBED ROADWAYS SHALL HAVE 3' HORIZONTAL CLEARANCE FROM THE FACE OF THE CURB TO THE EDGE OF THE SIGN UNLESS NOTED OTHERWISE ON THE PLANS.

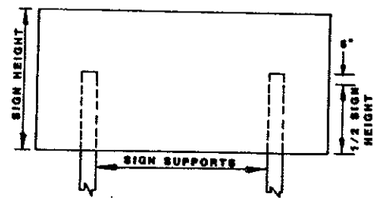
ALL BIKE ROUTE SHALL HAVE A 3' MINIMUM HORIZONTAL CLEARANCE FROM THE EDGE OF THE BIKE ROUTE TO THE EDGE OF THE SIGN.

MINIMUM
VERTICAL CLEARANCE

5' RURAL ROADWAYS

6' ON RURAL OR URBAN EXPRESSWAYS





HINGE LOCATION DETAIL
FOR 2 OR MORE POSTS ASSEMBLIES - WITH SLIP BASES.

MINIMUM
VERTICAL CLEARANCE

6' URBAN EXPRESSWAYS

7' IN RESIDENTIAL AND BUSINESS DISTRICTS WHERE PARKING AND / OR PEDESTRIAN MOVEMENTS WILL OCCUR

4' MIN. FOR BIKE ROUTES

TYPICAL SECTION (WITH CURB)

NOTE

PAVEMENT DEPTH-THE PAVEMENT DEPTH USED TO DEVELOP SUMMARY SHEETS SHOULD BE THE ULTIMATE PAVEMENT DEPTH.

SEE PLANS FOR SIGN NUMBERS AND ASSEMBLY NUMBERS.

SIGN PUNCHING AND , STRINGERS SHALL BE AS SHOWN ON STANDARDS.

HORIZONTAL CLEARANCE:

THE POST LENGTHS HAVE BEEN COMPUTED USING A HORIZONTAL CLEARANCE OF 16 FEET BETWEEN THE EDGE OF THE DRIVING LANE AND THE EDGE OF THE SIGN.

FOR AN ULTIMATE SHOULDER WIDTH OF 10 FEET, THE DISTRICTS HAVE THE OPTION OF SETTING THE SIGNS OUT TO 18 FEET CLEARANCE.

IF THE CLEARANCE IS TO BE INCREASED TO 18 FEET, THE NECESSARY ADJUSTMENT IN SUPPORT LENGTH SHALL BE MADE IN THE FIELD.

REVISIONS	
DATE	CHANGE

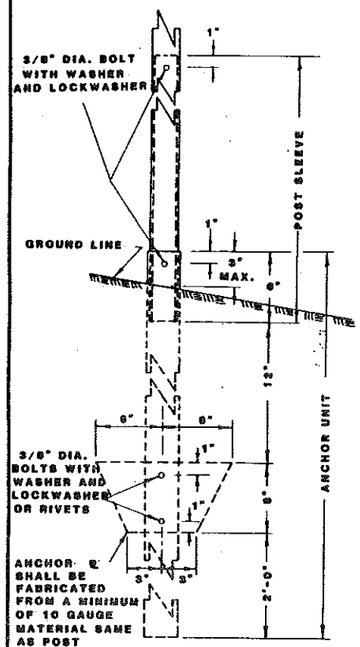
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED: _____
Design Engineer

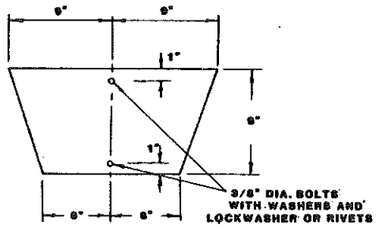
MOUNTING DETAILS
PERFORATED TUBE

FHWA REGION	STATE	FED AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	60

D-754-24



ANCHOR UNIT AND POST SLEEVE ASSEMBLY



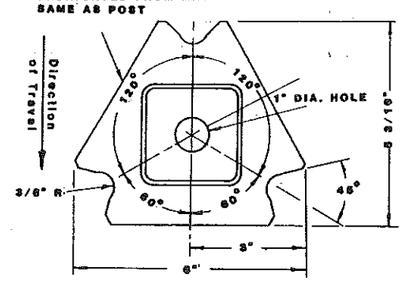
ANCHOR SHALL BE FABRICATED FROM A MINIMUM OF 10 GAUGE MATERIAL SAME AS POST

ANCHOR PLATE DETAIL
(2 OR MORE POST INSTALLATIONS)

THE 2 3/16" SIZE 10 GAUGE IS SHOWN AS 2.10" 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.

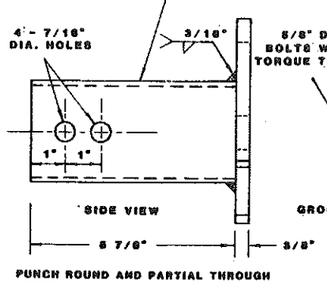
SLIP BASE SHALL BE FABRICATED FROM MATERIALS SAME AS POST



TOP VIEW

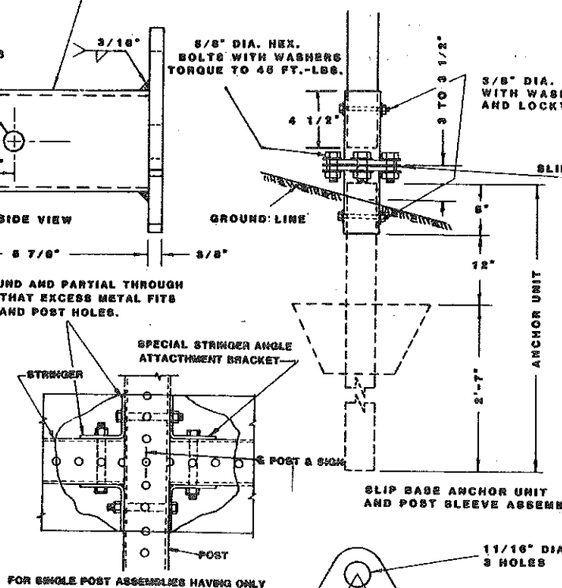
SLIP BASE DETAIL
REQUIRED ON ALL 2 1/2" (12 GA.), 2 3/16" (10 GA.), 2 1/2" (10 GA.) POSTS & ALL THREE OR MORE POST ASSEMBLIES

2 1/2" x .105"
2 3/16" x .135"
2 1/2" x .135"
2 7/8" x .156"
TUBES



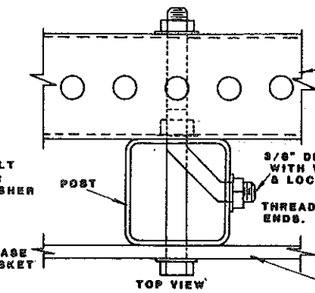
SIDE VIEW

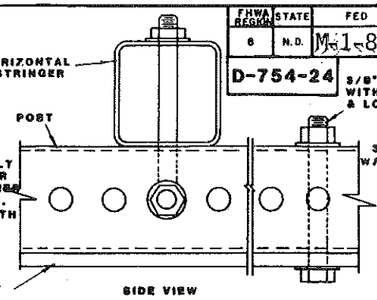
PUNCH ROUND AND PARTIAL THROUGH ANGLE SO THAT EXCESS METAL FITS STRINGER AND POST HOLES.



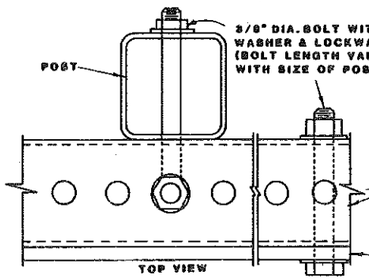
FOR SINGLE POST ASSEMBLIES HAVING ONLY ONE STRINGER, OR WITH BACK TO BACK SIGNS.

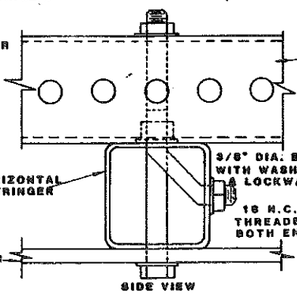
SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY



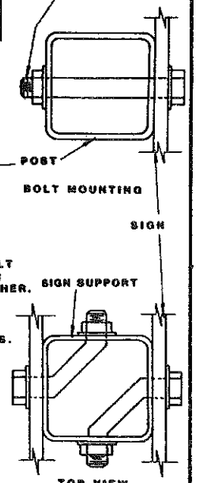


STRINGER MOUNTING
(WITH POST IN FRONT OF STRINGER)

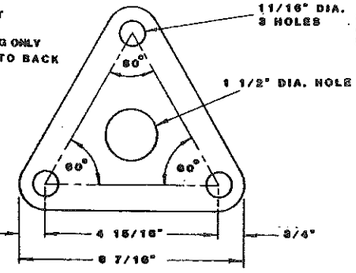




STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)
ALTERNATE A

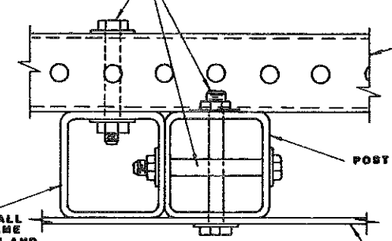


BACK TO BACK MOUNTING

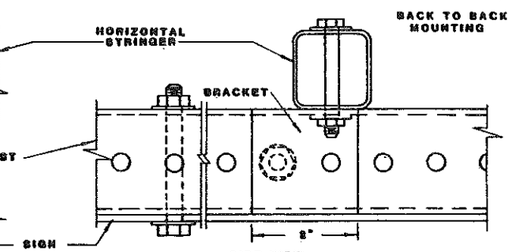


SLIP BASE GASKET

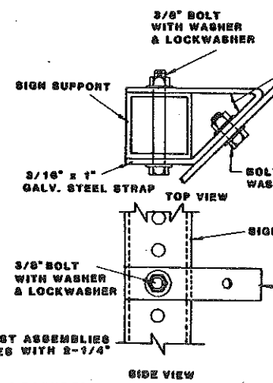
NOTE: THE SLIP BASE GASKET SHALL BE FABRICATED FROM POLYPROPYLENE (BLACK) COPOLYMER. THICKNESS: 0.060"±.010"



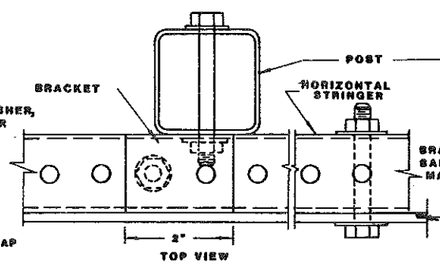
BRACKET SHALL BE THE SAME SECTION AND MATERIAL AS POST

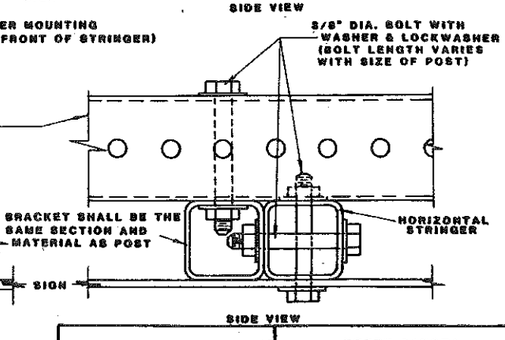


STRINGER MOUNTING
(WITH POST IN FRONT OF STRINGER)

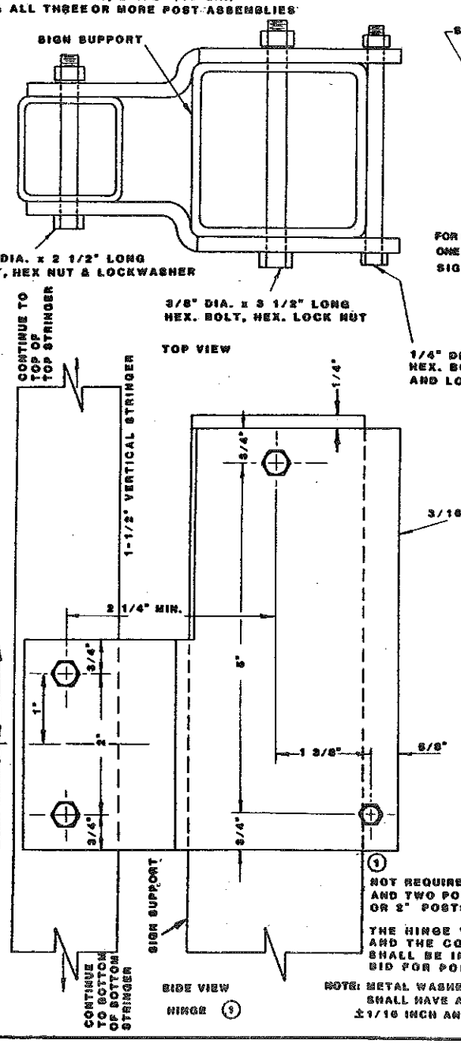


STRAP DETAIL





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



TOP VIEW

① NOT REQUIRED ON ONE POST ASSEMBLIES AND TWO POST ASSEMBLIES WITH 2-3/4" OR 2" POSTS.

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

NOTE: METAL WASHER AND NYLON WASHERS USED ON SIGN FACE SHALL HAVE A MINIMUM OUTSIDE DIAMETER OF 15/16 INCH ±1/16 INCH AND 10 GAUGE THICKNESS.

2 - 3/8" DIA. x 2 1/2" LONG HEX. BOLT, HEX NUT & LOCKWASHER

3/8" DIA. x 3 1/2" LONG HEX. BOLT, HEX. LOCK NUT

1/4" DIA. x 3 1/4" LONG HEX. BOLT, HEX. NUT AND LOCKWASHER

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	.690	.372
2 1/4 x 2 1/4	.105	12	2.773	.561	.995	.499
2 3/16 x 2 3/16	.135	10	3.432	.606	.641	.590
2 1/2 x 2 1/2	.105	12	3.141	.604	.803	.643
2 1/2 x 2 1/2	.135	10	4.006	.979	1.010	.786

NO PARKING SIGNS: ALL NO PARKING SIGNS THAT HAVE DIRECTIONL ARROWS PLACED ON THEIR FACES SHALL BE PLACED AT 30 TO 45 DEGREE ANGLE AT ONCOMING TRAFFIC. NO PARKING SIGNS PLACED AT THE ABOVE ANGLES MAY HAVE THE SUPPORT TURNED AT THE CORRECT ANGLE UNLESS THE NO PARKING SIGN IS PLACED WITH ANOTHER SIGN THAT HAS TO BE PLACED AT 90 DEGREE ANGLE WITH ONCOMING TRAFFIC. IN WHICH CASE THE DETAILED ANGLE STRAP SHOULD BE USED TO MOUNT THE NO PARKING SIGN. MATERIAL USED FOR THE ATTACHMENT STRAPS SHALL BE INCLUDED IN THE PRICE BID FOR FLAT SHEET SIGNS. FLAT WASHERS & LOCKWASHERS SHALL BE USED WITH ALL NYLON WASHERS

REVISIONS	
DATE	CHANGE

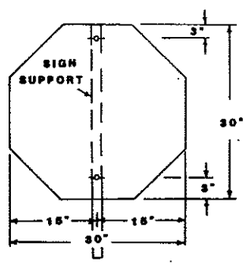
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED _____
DESIGN ENGINEER

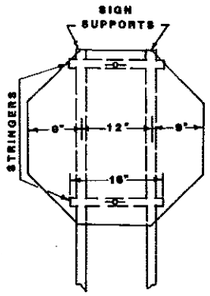
FHWA REGION	STATE	FED. AID PROJECT NO.	SHEET NO.
8	N.D.	M-1-806(12)071	64

D-754-26

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

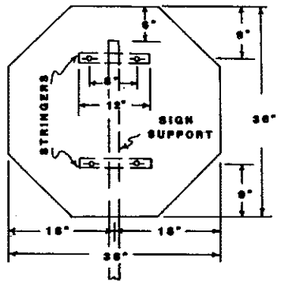


1 POST



2 POSTS

ASSEMBLY NO. 1



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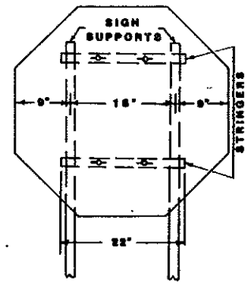

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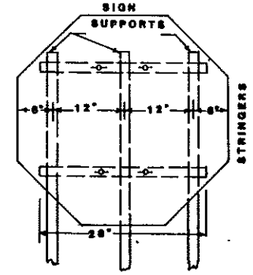

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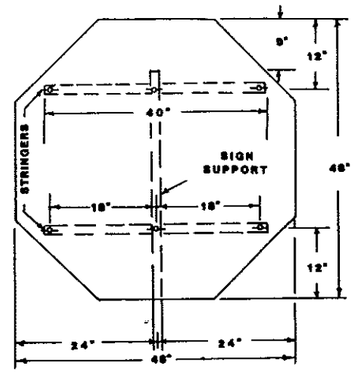

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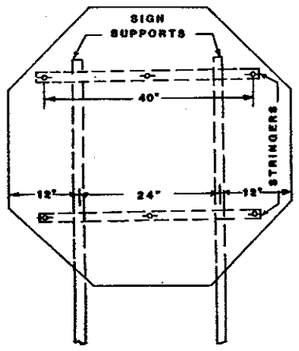
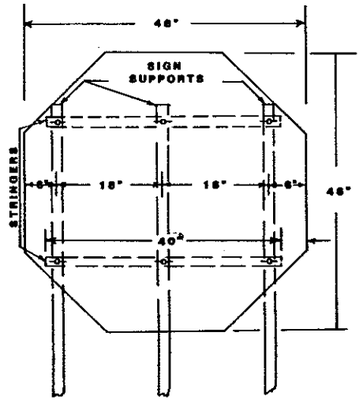
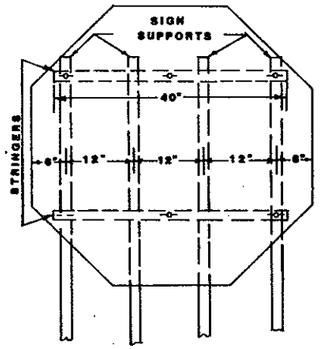


2 POSTS



3 POSTS



4 POSTS

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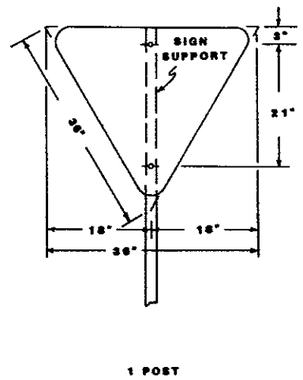

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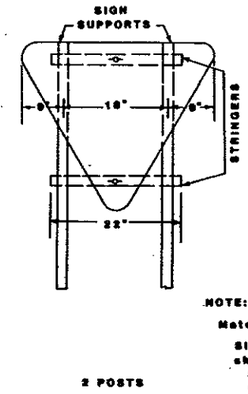

2 POSTS

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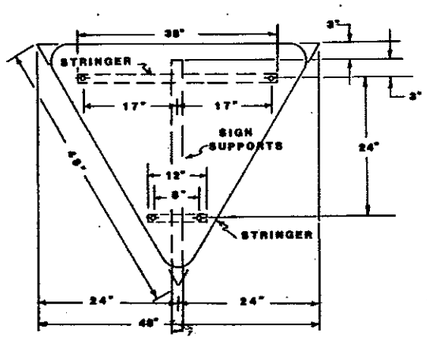

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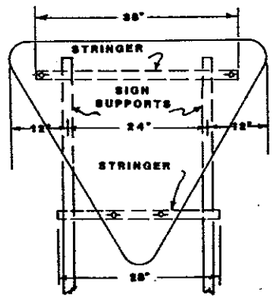
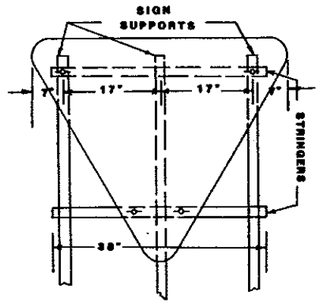


2 POSTS



3 POSTS

ASSEMBLY NO. 5

NOTE:

Material:

Signing 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: All signs shall be 0.100 inch.

Stringers:

Flange Channel : All stringers shall be flange channel 1.12# per foot and of the length shown.

Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2"X1 1/2" and of the length shown.

Holes:

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

Square Tube, Perforated: 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-754-24 square tube , perforated mounting details.
See Std. D-754-25 for flange channel mounting details.

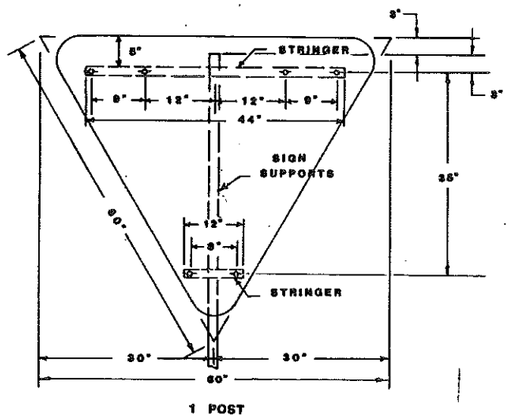
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

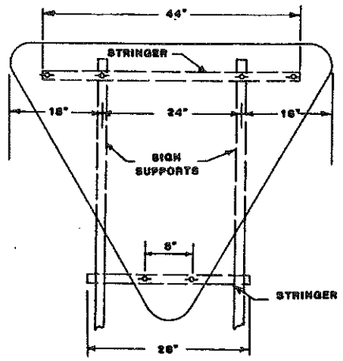
APPROVED: _____
DESIGN ENGINEER

FHWA REGION	STATE	FED. AID PROJECT NO.	SHEET NO.
8	N.D.	M-1-806(12)071	62
			D-754-27

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



1 POST



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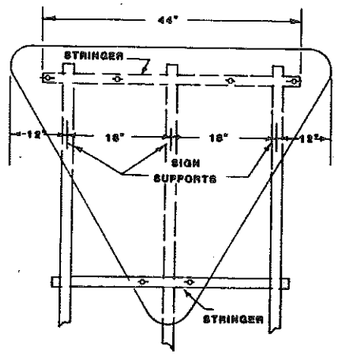
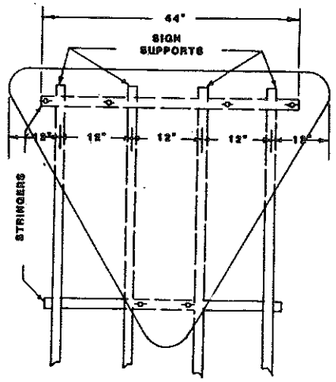
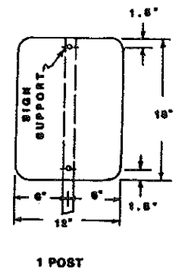


3 POSTS



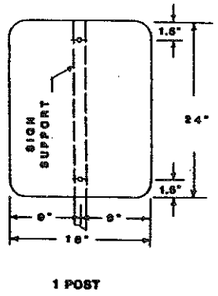
4 POSTS



1 POST

ASSEMBLY NO. 7

ASSEMBLY NO. 6



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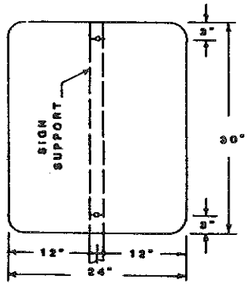

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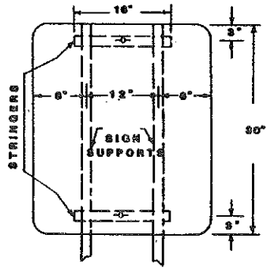
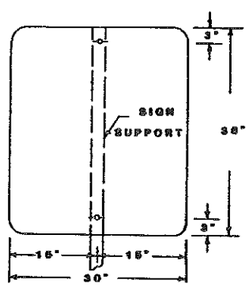


2 POSTS

ASSEMBLY NO. 8

ASSEMBLY NO. 9



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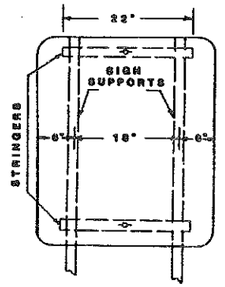
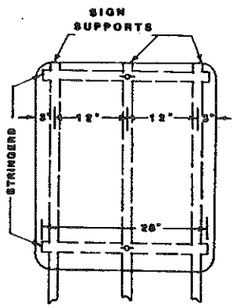


2 POSTS



3 POSTS

ASSEMBLY NO. 10

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: All signs shall be 0.100 inch.

Stringers:

Flange Channel: All stringers shall be flange channel 1.12# per foot and of the length shown.

Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2"X1 1/2" and of the length shown.

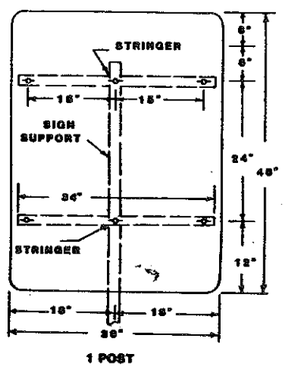
Holes:

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

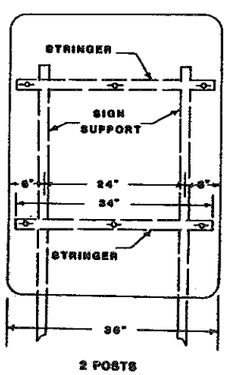
Square Tube, Perforated: All holes shall be punched round for 3/8" diameter bolts.

General:

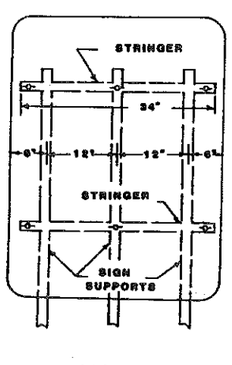
See plans for sign numbers to be used at each location.
See Std. D-754-24 for square tube, perforated mounting details.
See Std. D-754-25 for flange channel mounting details.



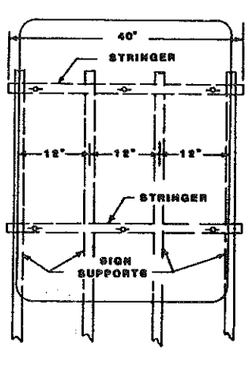
1 POST



2 POSTS



3 POSTS



4 POSTS

ASSEMBLY NO. 11

REVISIONS	
DATE	CHANGE

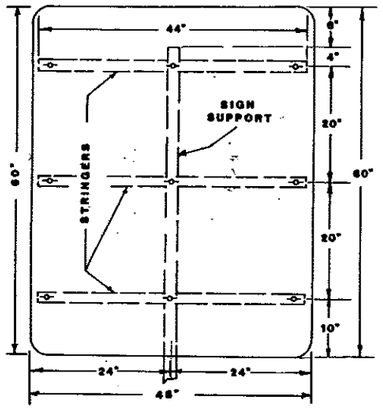
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED: _____
DESIGN ENGINEER

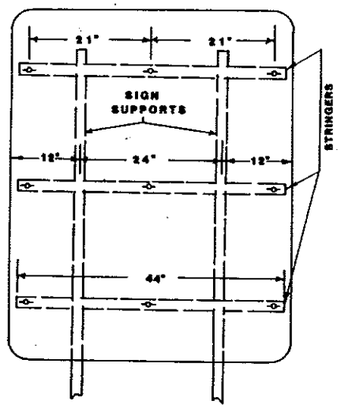
FHWA REGION	STATE	FED. AID PROJECT NO.	SHEET NO.
8	N.D.	M-1-806(12)071	63

D-754-28

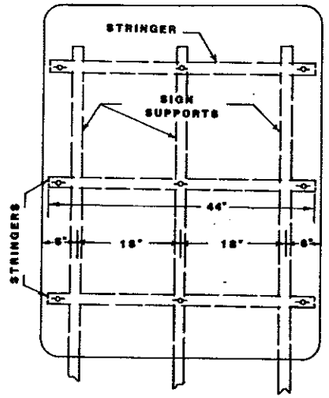
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING, AND GUIDE SIGNS



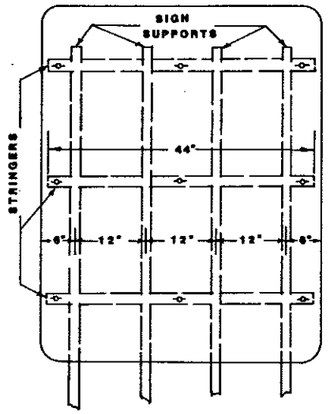
1 POST



2 POSTS

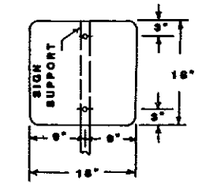


3 POSTS



4 POSTS

ASSEMBLY NO. 12



1 POST

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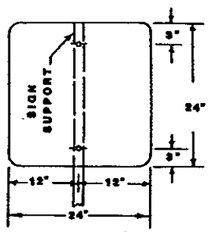

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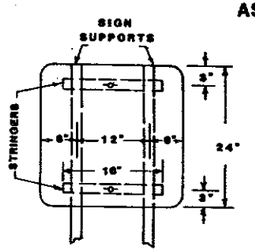

2 POSTS

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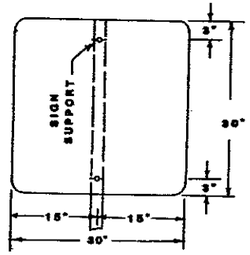

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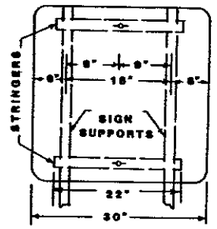
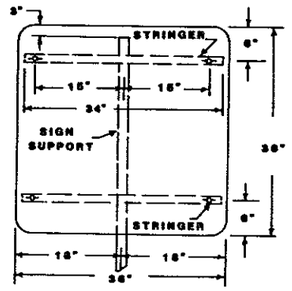
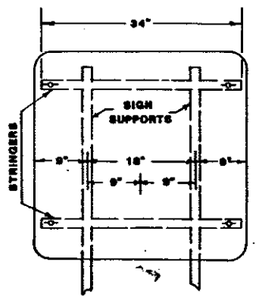


2 POSTS

ASSEMBLY NO. 15

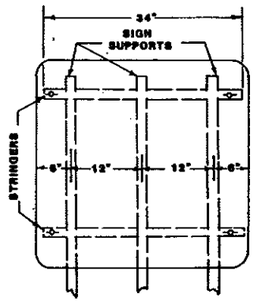


1 POST

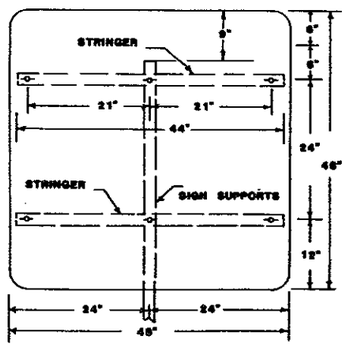


2 POSTS

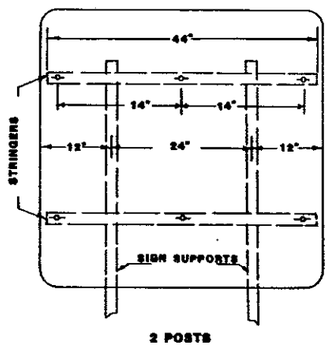
ASSEMBLY NO. 16



3 POSTS



1 POST



2 POSTS

ASSEMBLY NO. 17

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 minimum thickness: All signs shall be 0.100 inch.

Stringers:

Flange Channel : All stringers shall be flange channel 1.12# per foot and of the length shown.

Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2"X1 1/2" and of the length shown.

Holes:

Flange Channel: All holes shall be punched round for 5/8" diameter bolts.
Square Tube, Perforated: 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-754-24 for square tube, perforated mounting details.
See Std. D-754-28 for flange channel mounting details.

REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

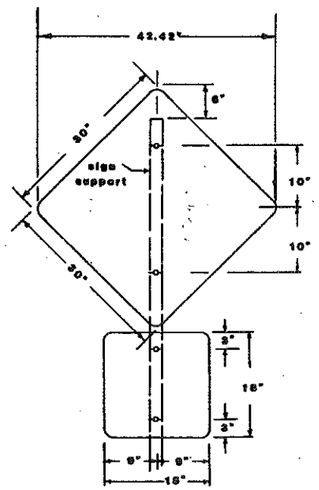
APPROVED: _____
DESIGN ENGINEER

FHWA REGION	STATE	FED. AID PROJECT NO.	SHEET NO.
8	N.D.	M-1-806(12)071	64

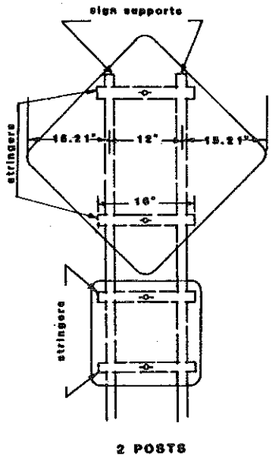
D-754-37

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS

REGULATORY, WARNING, AND GUIDE SIGNS

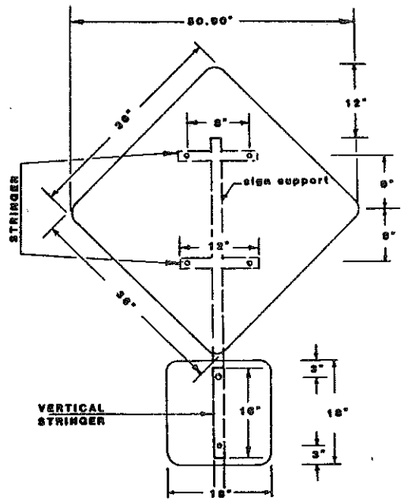


1 POST

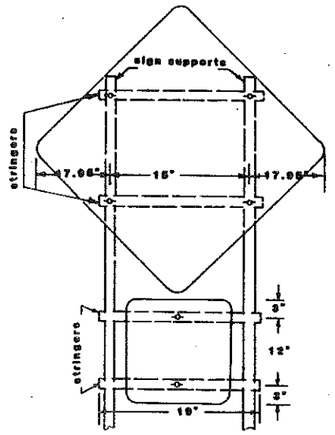


2 POSTS

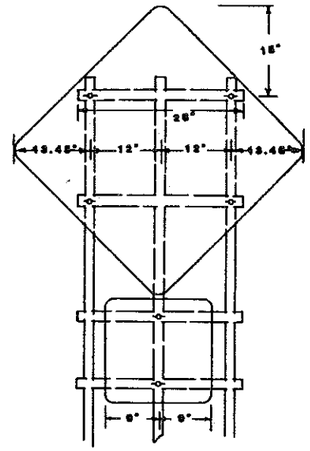
ASSEMBLY NO. 53



1 POST

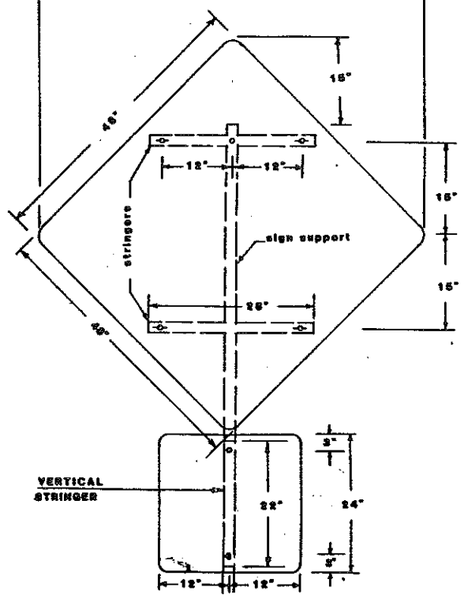


2 POSTS

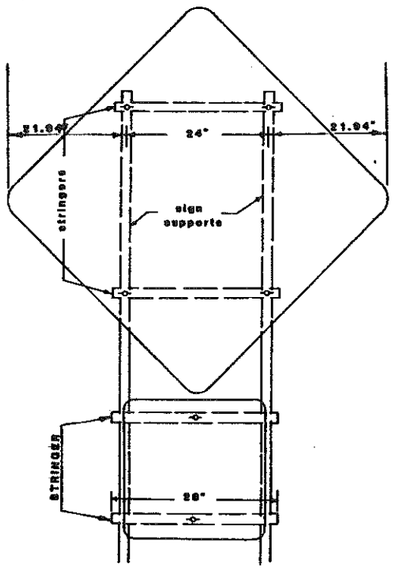


3 POSTS

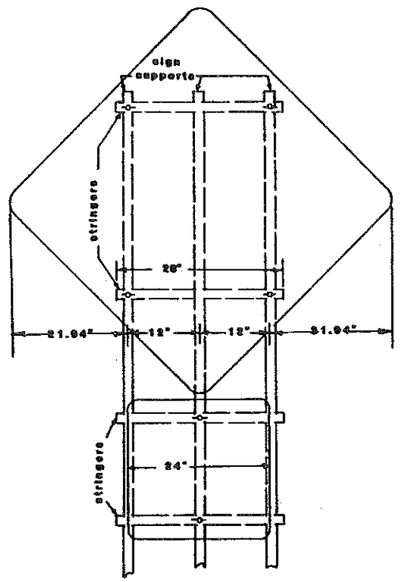
ASSEMBLY NO. 54



1 POST



2 POSTS



3 POSTS

ASSEMBLY NO. 55

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: All signs shall be 0.100 inch.

Stringers:

Flange Channel: All stringers shall be flange channel 1.12# per foot and of the length shown.

Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2"X1 1/2" and of the length shown.

Holes:

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

Square Tube, Perforated: All holes shall be punched round for 3/8" diameter bolts.

General:

See plans for signs numbers to be used at each location.
See Std. D-754-24 for square tube, perforated mounting details.
See Std. D-754-25 for flange channel mounting details.

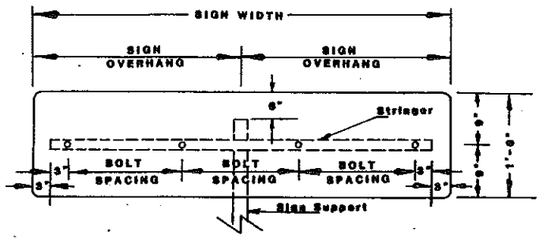
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

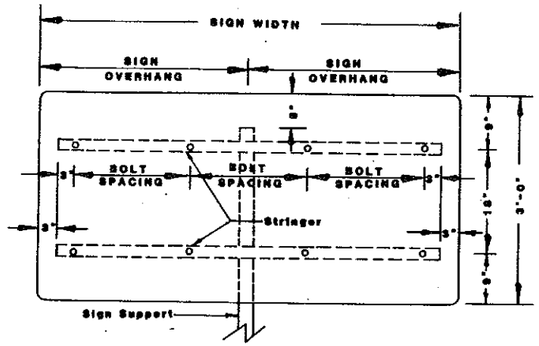
APPROVED: _____
DESIGN ENGINEER

SIGN PUNCHING, STRINGER, AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

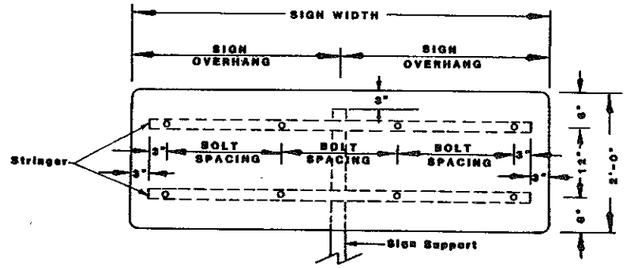
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	65
			D-754-47



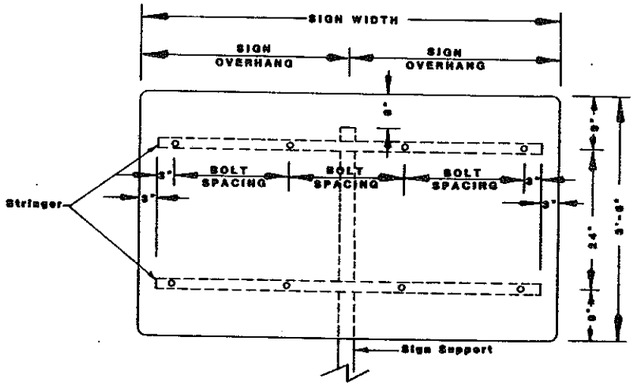
VARIES X 1'-6"



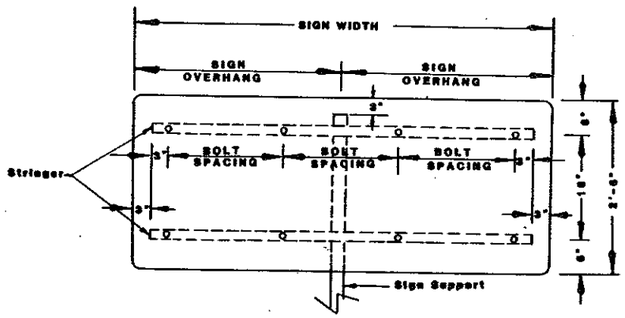
VARIES X 3'-0"



VARIES X 2'-0"



VARIES X 3'-6"



VARIES X 2'-6"

1 POST, 2 POSTS, 3 POSTS, 4 POSTS, & INFORMATION ASSEMBLY NUMBERS											1 POST
Sign Length	1'-6" High	2'-0" High	2'-6" High	3'-0" High	3'-6" High	4'-0" High	4'-6" High	5'-0" High	5'-6" High	Bolt Spacing	Sign Overhang
4'-0"	81	107	140	173	206	239	272	305	338	18"	2'-0"
4'-6"	82	108	141	174	207	240	273	306	339	21"	2'-3"
5'-0"	83	109	142	175	208	241	274	307	340	24"	2'-6"
5'-6"	84	110	143	176	209	242	275	308	341	18"	2'-9"
6'-0"	85	111	144	177	210	243	276	309	342	20"	3'-0"
6'-6"	86	112	145	178	211	244	277	310	343	22"	3'-3"
7'-0"	87	113	146	179	212	245	278	311	344	24"	3'-6"
7'-6"	88	114	147	180	213	246	279	312	345	2-22"A 2-26"	3'-9"
8'-0"	89	115	148	181	214	247	280	313	346	21"	4'-0"
8'-6"	90	116	149	182	215	248	281	314	347	2-19"A 2-26"	4'-3"
9'-0"	91	117	150	183	216	249	282	315	348	24"	4'-6"
9'-6"	92	118	151	184	217	250	283	316	349	2-20"A 2-21"	4'-9"
10'-0"	93	119	152	185	218	251	284	317	350	2-21"A 2-22"	5'-0"
10'-6"	94	120	153	186	219	252	285	318	351	4-22"A 1-22"	5'-3"
11'-0"	95	121	154	187	220	253	286	319	352	24"	5'-6"
11'-6"	96	122	155	188	221	254	287	320	353	21"	5'-9"
12'-0"	97	123	156	189	222	255	288	321	354	22"	6'-0"
12'-6"	98	124	157	190	223	256	289	322	355	23"	
13'-0"	99	125	158	191	224	257	290	323	356	24"	
13'-6"	100	126	159	192	225	258	291	324	357	3-22"A 4-21"	
14'-0"	101	127	160	193	226	259	292	325	358	2-20"A 6-22"	
14'-6"	102	128	161	194	227	260	293	326	359	6-22"A 1-24"	
15'-0"	103	129	162	195	228	261	294	327	360	24"	
15'-6"	104	130	163	196	229	262	295	328	361	6-22"A 2-21"	
16'-0"	105	131	164	197	230	263	296	329	362	4-20"A 6-22"	
16'-6"	106	132	165	198	231	264	297	330	363	6-22"A 2-24"	
17'-0"		133	166	199	232	265	298	331	364	24"	
17'-6"		134	167	200	233	266	299	332	365	23"	
18'-0"		135	168	201	234	267	300	333	366	6-20"A 3-22"	
18'-6"		136	169	202	235	268	301	334	367	6-22"A 6-24"	
19'-0"		137	170	203	236	269	302	335	368	24"	
19'-6"		138	171	204	237	270	303	336	369	6-22"A 2-23"	
20'-0"		139	172	205	238	271	304	337	370	6-20"A 3-22"	

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: All signs shall be 0.100 inch.

Stringers:
Flange Channel: All stringers shall be flange channel 1.12# per foot and of length shown.
Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2"X1 1/2" and of the length shown.

Holes:

Flange Channel: All holes shall be punched round for 3/8" diameter bolts.
Square Tube, Perforated: 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-754-24 for square tube, perforated mounting details.

See Std. D-754-25 for flange channel mounting details.

NOTE:

The single stringer and single post sign shall have stringers attached to the post using the special stringer angle shown std. D-754-24 for Perforated Tube post & stringers or using the stringer attachment plate shown on std. D-754-25 for Flange Channel post and stringers.

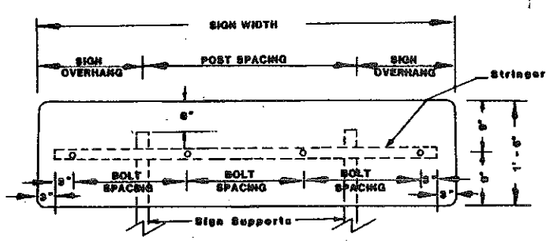
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

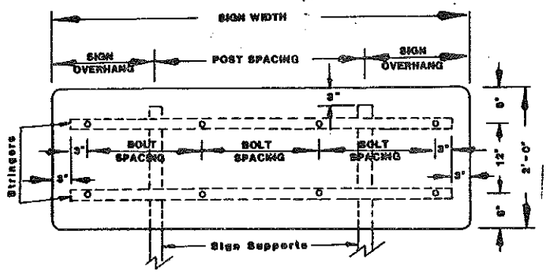
APPROVED: _____
DESIGN ENGINEER

SIGN PUNCHING, STRINGER, AND SUPPORT LOCATION DETAILS FOR VARIABLE LENGTH SIGNS

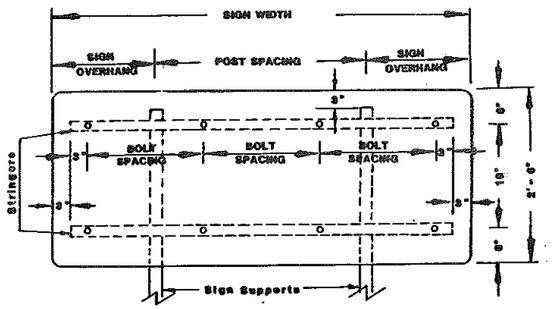
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)	66
		071 D-754-48	



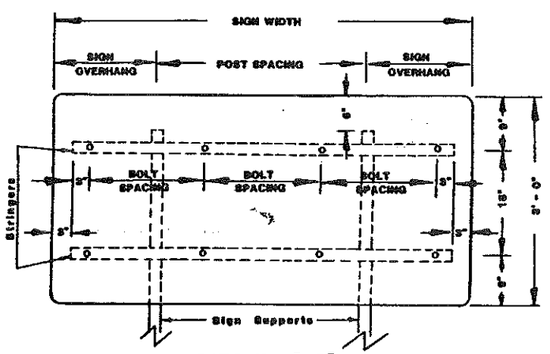
VARIES X 1"-6"



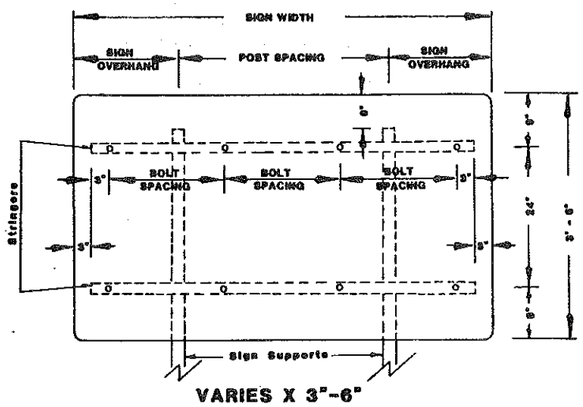
VARIES X 2"-0"



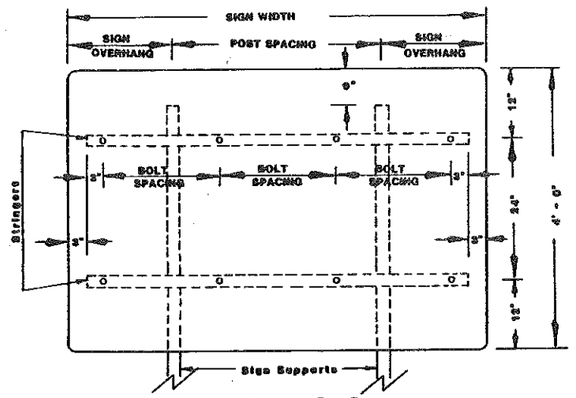
VARIES X 2"-6"



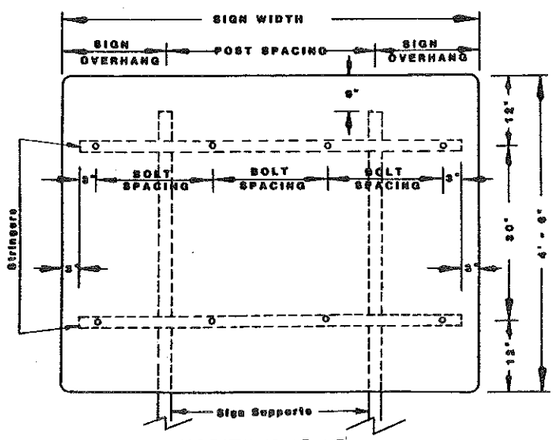
VARIES X 3"-0"



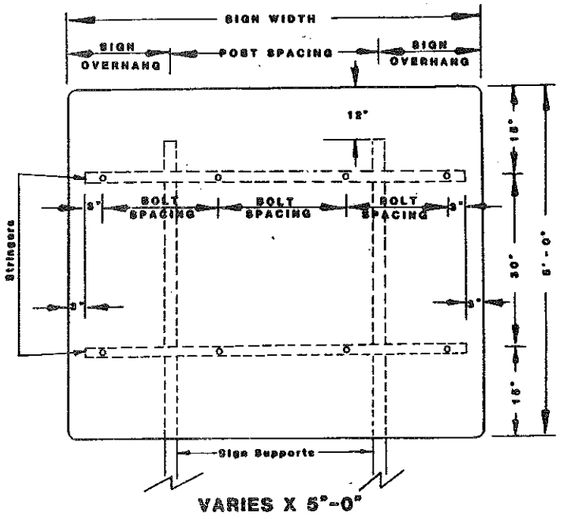
VARIES X 3"-6"



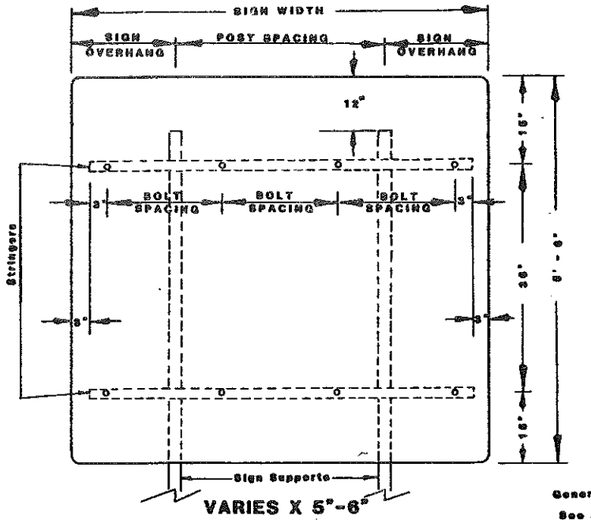
VARIES X 4"-0"



VARIES X 4"-6"



VARIES X 5"-0"



VARIES X 5"-6"

* See Standard Number D-754-47 for Assembly Numbers & Bolts spacing.

2 POSTS *		
Sign Length	Sign Overhang	Post Spacing
4'-0"	1'-0"	2'-0"
4'-6"	1'-3"	2'-0"
5'-0"	1'-0"	3'-0"
5'-6"	1'-3"	3'-0"
6'-0"	1'-6"	3'-0"
6'-6"	1'-3"	4'-0"
7'-0"	1'-6"	4'-0"
7'-6"	1'-6"	4'-0"
8'-0"	2'-0"	4'-0"
8'-6"	1'-9"	5'-0"
9'-0"	2'-0"	5'-0"
9'-6"	1'-9"	6'-0"
10'-0"	2'-0"	6'-0"
10'-6"	2'-3"	6'-0"
11'-0"	2'-6"	6'-0"
11'-6"	2'-9"	6'-0"
12'-0"	2'-0"	8'-0"
12'-6"	2'-3"	8'-0"
13'-0"	2'-6"	8'-0"
13'-6"	2'-9"	8'-0"
14'-0"	3'-0"	8'-0"
14'-6"	2'-3"	8'-0"
15'-0"	3'-0"	8'-0"
15'-6"	2'-9"	10'-0"
16'-0"	3'-0"	10'-0"
16'-6"	3'-3"	10'-0"
17'-0"	2'-6"	10'-0"
17'-6"	3'-0"	10'-0"
18'-0"	3'-0"	12'-0"
18'-6"	3'-3"	12'-0"
19'-0"	3'-6"	12'-0"
19'-6"	3'-9"	12'-0"
20'-0"	4'-0"	12'-0"

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: All signs shall be 0.100 inch.

Stringer:

Flange Channel: All stringers shall be flange channel 1.12# per foot and of the length shown.
Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2" X 1 1/2", and of the length shown.

Holes:

Flange Channel: All holes shall be punched round for 3/8" diameter bolts.
Square Tube, Perforated: 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-754-24 for square tube, perforated mounting details.
See Std. D-754-26 for flange channel mounting details.

REVISIONS	
DATE	CHANGE

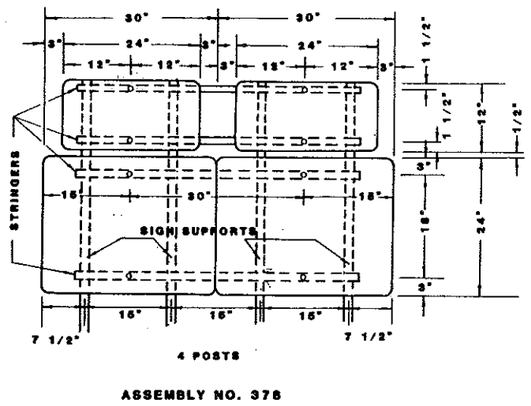
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED: _____
DESIGN ENGINEER

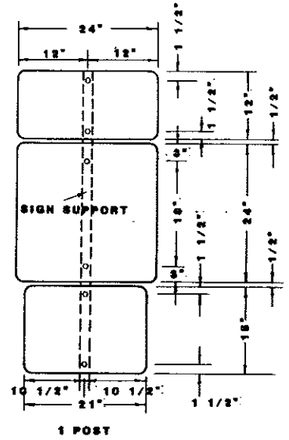
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

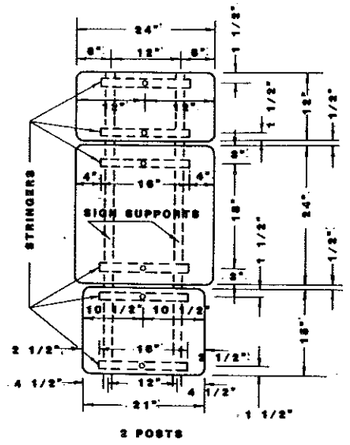
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	67

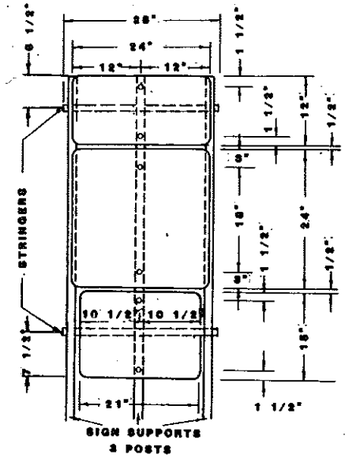
D-754-53



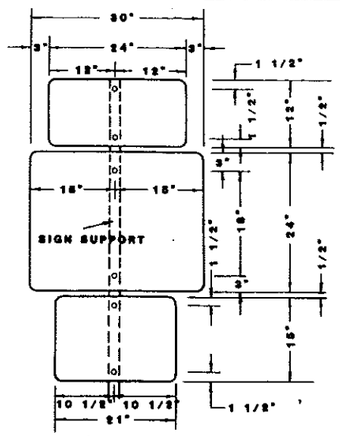
ASSEMBLY NO. 378



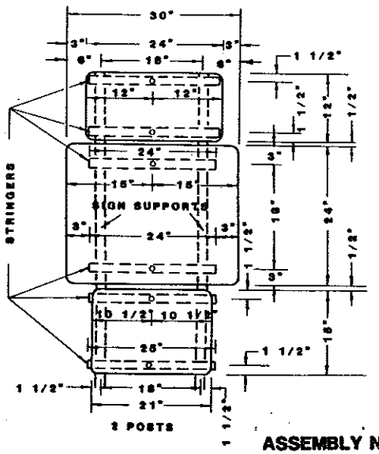


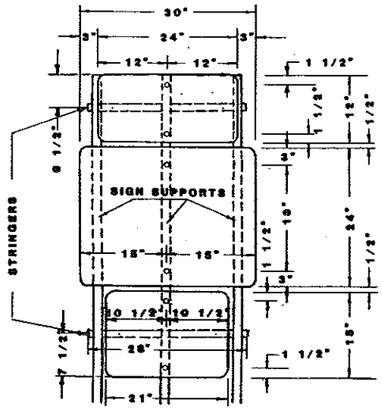


ASSEMBLY NO. 379



ASSEMBLY NO. 380





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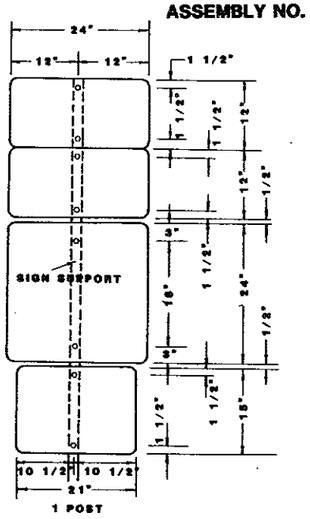
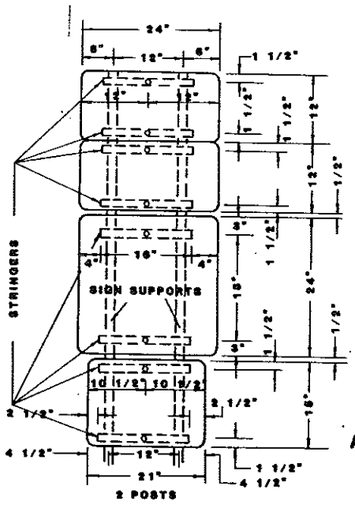
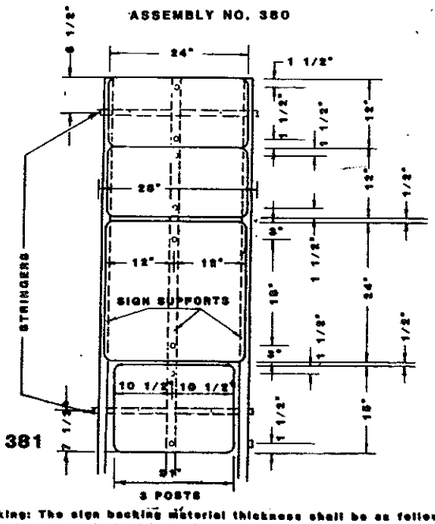
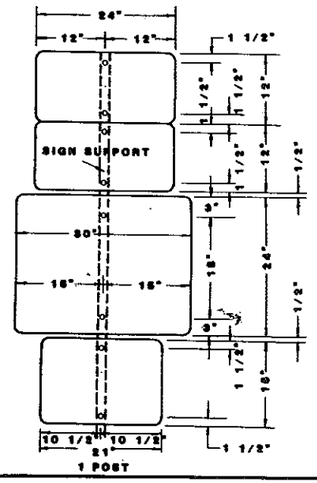
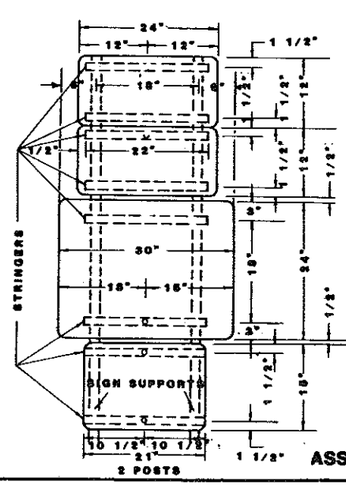




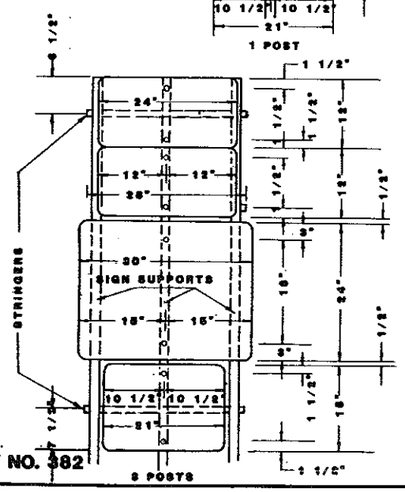
ASSEMBLY NO. 381

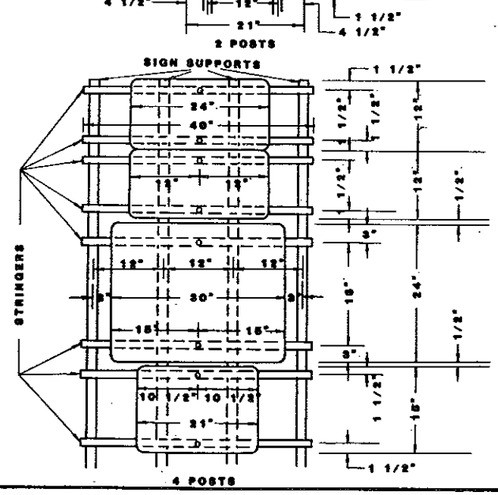






ASSEMBLY NO. 382





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: All signs shall be 0.100 inch.

Stringers: Flange Channel: All stringers shall be flange channel 1.12# per foot and of the length shown. Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2" X 1 1/2" and of the length shown.

Holes: Flange Channel: All holes shall be punched round for 5/8" diameter bolts.

Square Tube, Perforated: All holes shall be punched round for 5/8" diameter bolts.

General: See plans for sign numbers to be used at each location.

See Std. D-754-24 for square tube, perforated mounting details.
See Std. D-754-25 for flange channel mounting details.

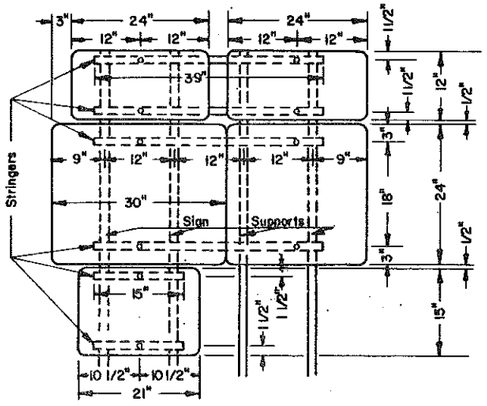
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

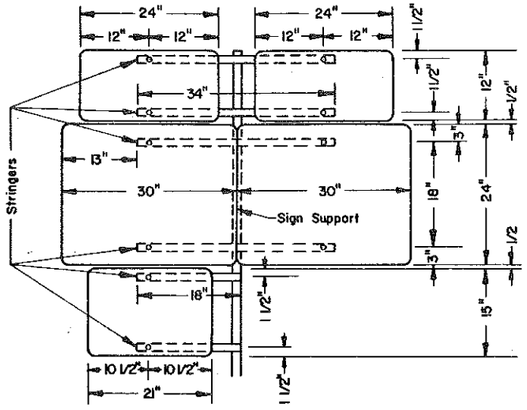
APPROVED:
DESIGN ENGINEER

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

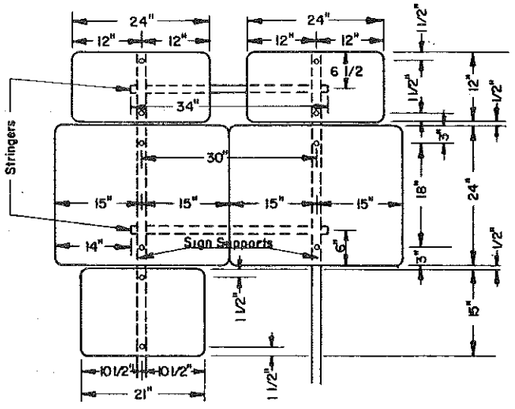
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	68
		D-754-55	



4 POSTS

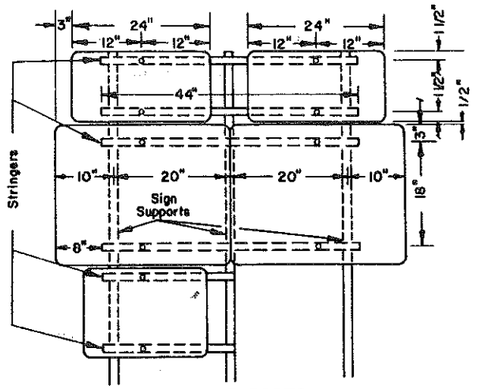


1 POST



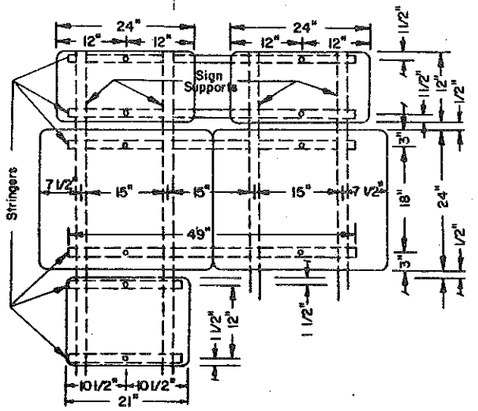
2 POSTS

ASSEMBLY 385

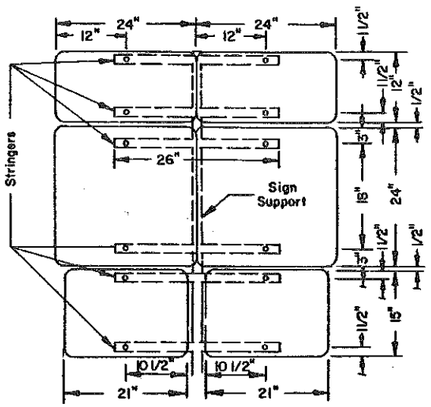


3 POSTS

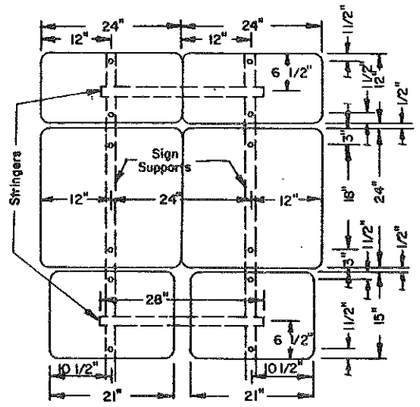
ASSEMBLY 386



4 POSTS

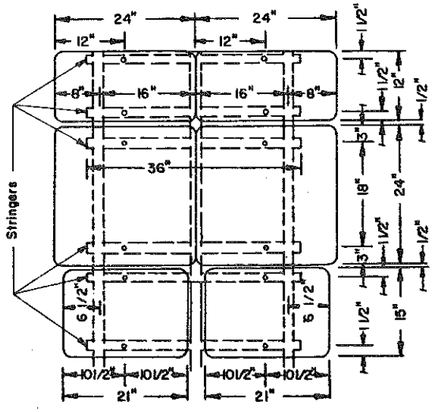


1 POST

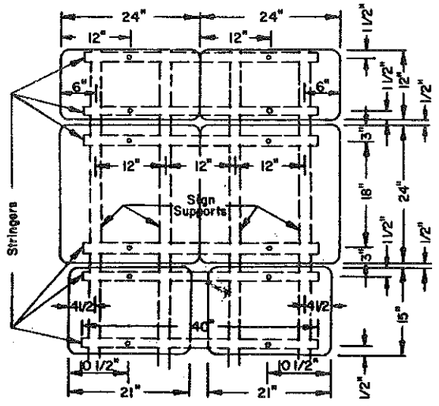


2 POSTS

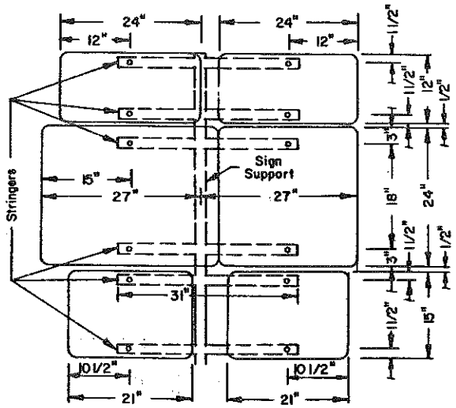
ASSEMBLY 387



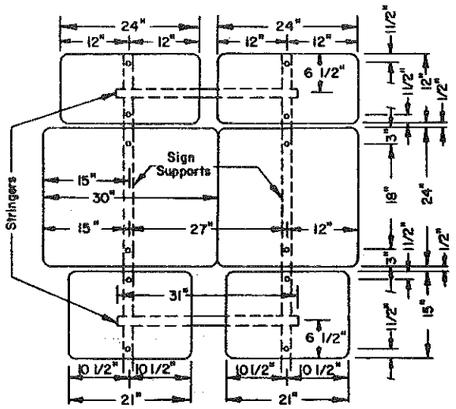
3 POSTS



4 POSTS



1 POST



2 POSTS

ASSEMBLY 388

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: All signs shall be 0.100 inch.

Stringers: Flange Channel: All stringers shall be flange channel 1.12# per foot and of the length shown.

Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2" x 1 1/2" and of the length shown.

Hole: Flange Channel: All holes shall be punched round for 3/8" diameter bolts.

Square Tube, Perforated: 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-754-25 for flange channel mounting details.
See Std. D-754-24 for square tube, perforated mounting details.

REVISIONS	
DATE	CHANGE

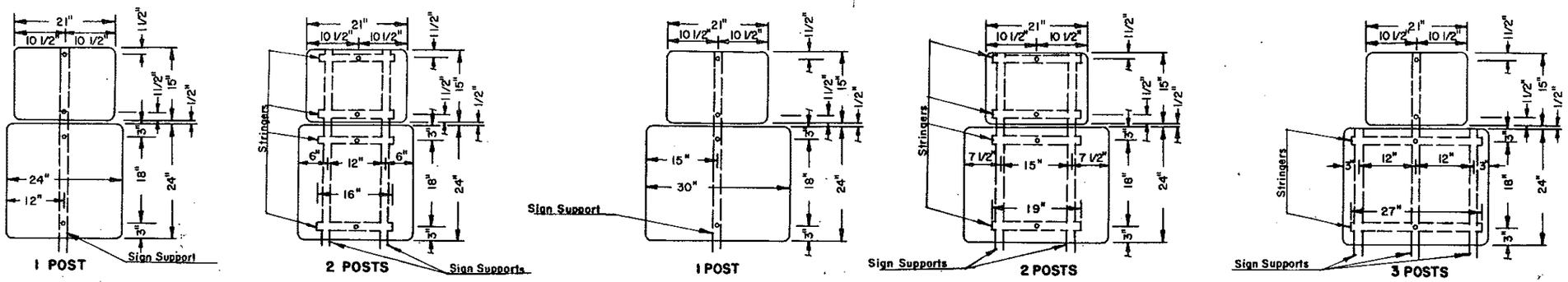
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED: _____
DESIGN ENGINEER

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

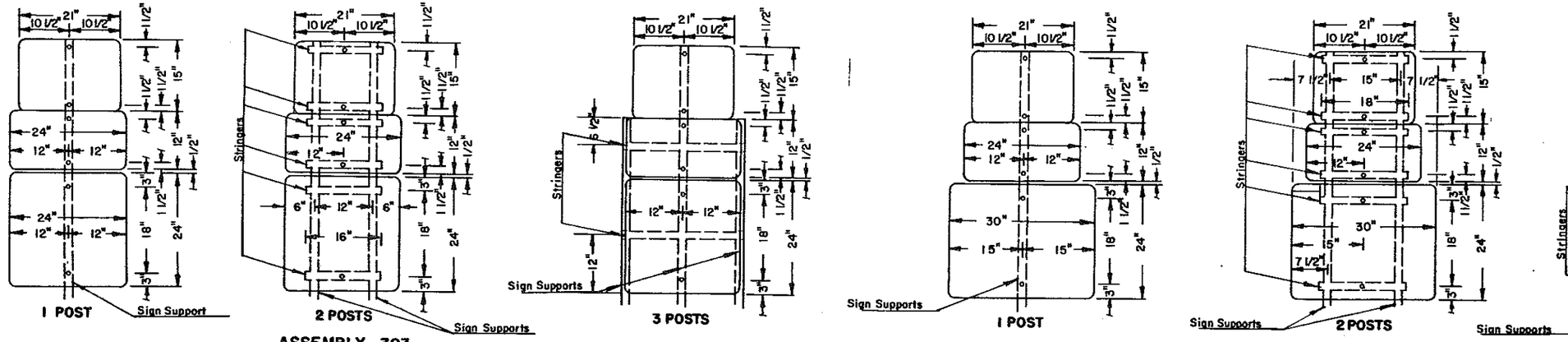
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	69

D-754-57



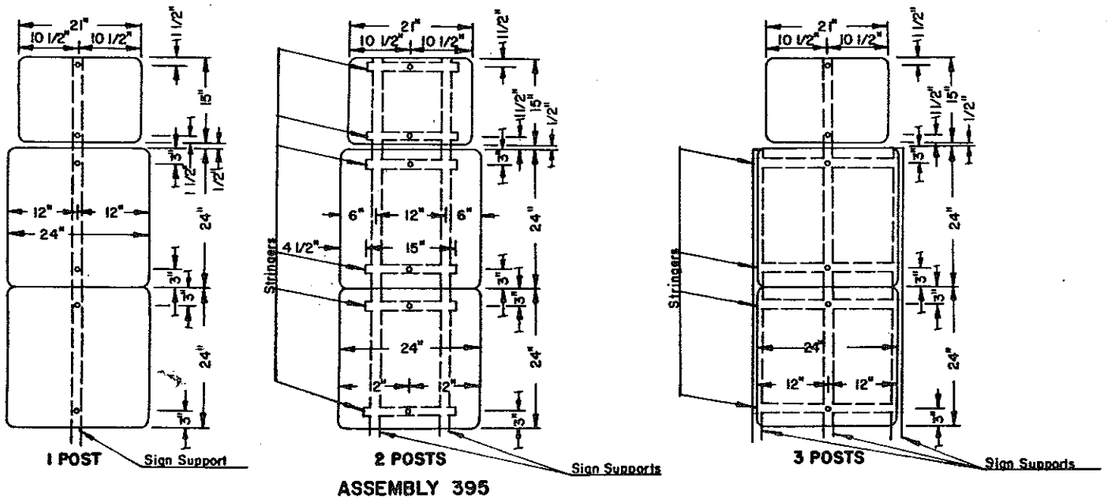
ASSEMBLY 391

ASSEMBLY 392



ASSEMBLY 393

ASSEMBLY 394



ASSEMBLY 395

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 5052H38 shall have the following minimum thickness: All signs shall be 0.100 inch.

Stringers: Flange Channel: All stringers shall be flange channel 1.12 # per foot and of the length shown.

Square Tube, Perforated: All stringers shall be square tube, perforated 1 1/2"X1 1/2" and of the length shown.

Hole: Flange Channel: All holes shall be punched round for 3/8" diameter bolts.

Square Tube, Perforated: All holes shall be punched round for 3/8" diameter bolts.

General: See plans for sign numbers to be used of each location.
See Std. D-754-25 for flange channel mounting details.
See Std. D-754-24 for square tube, perforated mounting details.

REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED _____

DESIGN ENGINEER

FHWA REGION	STATE	FED. AID PROJ. NO	SHEET NO.
8	N.D.	M-1-806(12)071	70

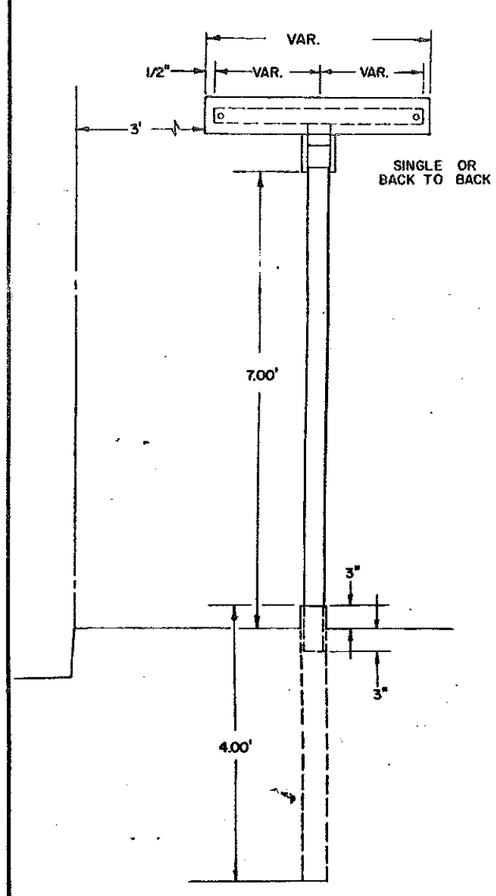
D-754-76

MAXIMUM SUPPORT LENGTH POSSIBLY - PERFORATED TUBE

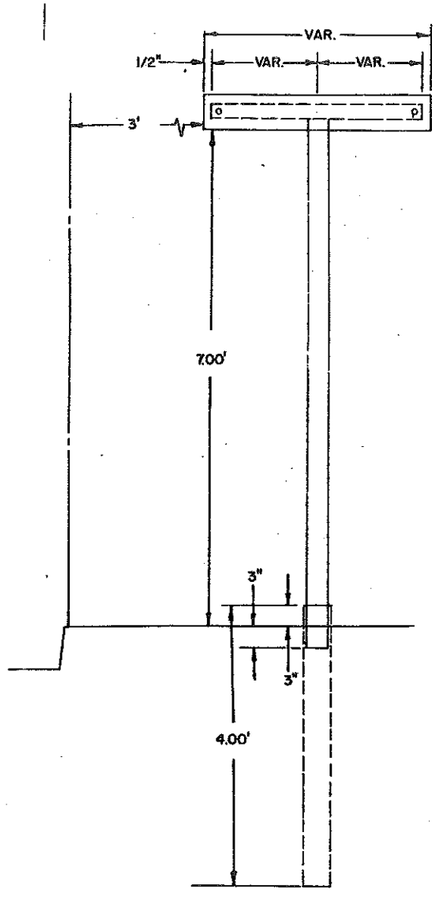
SIGN SIZE	2"	2½"	2 3/16"*	2½"	2½"*2"S	2½"*2½"S	2½"*2½"S
Assemblies 438, 439, 440, 441 and 442							
36x6	284	379	-	-	-	-	-
42x6	244	326	-	-	-	-	-
48x6	213	286	337	-	-	-	-
54x6	191	255	300	327	-	-	-
60x6	173	230	271	294	357	-	-
66x6	157	209	246	268	325	-	-
72x6	180	192	226	246	299	332	-
78x6	166	186	209	228	276	306	400
84x6	154	186	195	211	257	285	372
90x6	144	186	186	198	240	266	347
96x6	135	180	186	186	225	250	326
Assemblies 443, 444							
36x6	193	206	241	262	315	349	-
42x6	162	195	209	226	272	301	390
48x6	148	194	195	200	240	265	343
54x6	134	174	195	195	215	237	307
60x6	119	155	180	195	195	210	271
66x6	109	147	165	178	195	195	248
72x6	-	131	152	165	195	195	228
78x6	-	122	142	153	183	195	222
84x6	-	114	132	143	171	189	197
90x6	-	107	124	134	161	177	195
96x6	-	-	117	126	151	167	195

MAXIMUM SUPPORT LENGTH POSSIBLE - FLANGE CHANNEL

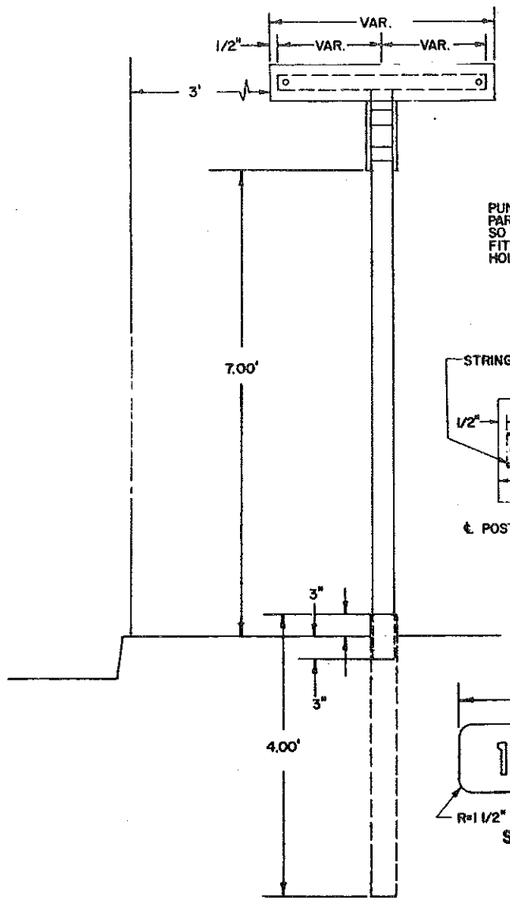
SIGN SIZE	2#	2.5#	2½#	2 3/4#	3#	4#
Assemblies 438, 439, 440, 441 and 442						
36x6	256	288	327	-	-	-
42x6	218	246	280	319	-	-
48x6	190	215	245	279	342	-
54x6	184	191	218	248	304	422
60x6	184	184	195	222	273	379
66x6	171	184	184	202	247	345
72x6	155	176	184	184	226	316
78x6	141	161	184	184	208	291
84x6	128	148	171	184	192	269
90x6	117	135	158	181	184	251
96x6	106	124	146	168	184	234
Assemblies 443, 444						
36x6	173	193	193	201	243	343
42x6	149	167	179	193	210	288
48x6	130	146	166	169	193	253
54x6	115	130	148	167	193	225
60x6	-	113	129	147	179	199
66x6	-	-	107	133	162	193
72x6	-	-	106	121	148	193
78x6	-	-	-	110	136	189
84x6	-	-	-	-	124	175
90x6	-	-	-	-	114	163
96x6	-	-	-	-	105	151



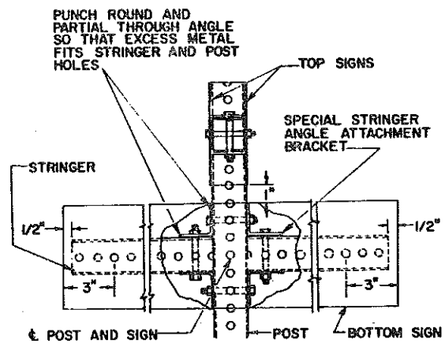
ASSEMBLIES 440,441,442



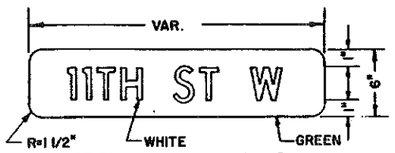
ASSEMBLIES 438,439



ASSEMBLIES 443,444



ATTACHMENT BRACKET DETAIL
(Square Tube, Perforated)



STREET NAME SIGN D3

NOTE: The ground mounted street name sign areas have been calculated using a 6"x36" sign panel. The city shall determine the size needed and inform the contractor of the exact length required to accomodate the message in accordance with following legend.

Size and Series: Street name signs 24", 30", or 36" standard length shall be fabricated using the following size and series capital letters:

LENGTH	STREET NAME OR NUMBER
24" Length	4" B,C,D Series
30" Length	4" B,C,D Series
36" Length	4" A,B,C,D Series

To provide maximum legibility, the widest letter shall be used whenever possible for each of the standard lengths specified. A minimum distance of 1/2" shall be allowed between legend and ends of the sign. The actual area shall be paid for at the contract unit price.

Material:

Sign Backing: The sign backing material thickness shall be as follows:
Steel: 14 Guage
Aluminum: Aluminum Alloy 6061-T6 shall have a minimum thickness of 0.080 inch.

Stringers:
Perforated Tube: All stringers shall be square tube perforated, the same size as support post.
Flange Channel: All stringers shall be flange channel, 1.12# per foot.
Holes: All holes shall be punched round for 3/8" diameter bolts.

General: See Std. D-754-24 for square tube, perforated mounting details.
See Std. D-754-25 for flange channel mounting details.

* 10 guage material has been used in the manufacturing of these support.

Assembly: 438 Single sign
439 Back to Back
440 Single sign each direction
441 Single sign one direction back to back other direction
442 Back to Back both directions
Assembly: 443 Back to Back single other direction
444 Back to Back all directions

REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Approved: _____
Design Engineer

CONCRETE FOUNDATIONS (TRAFFIC SIGNALS & HIGHWAY LIGHTING)

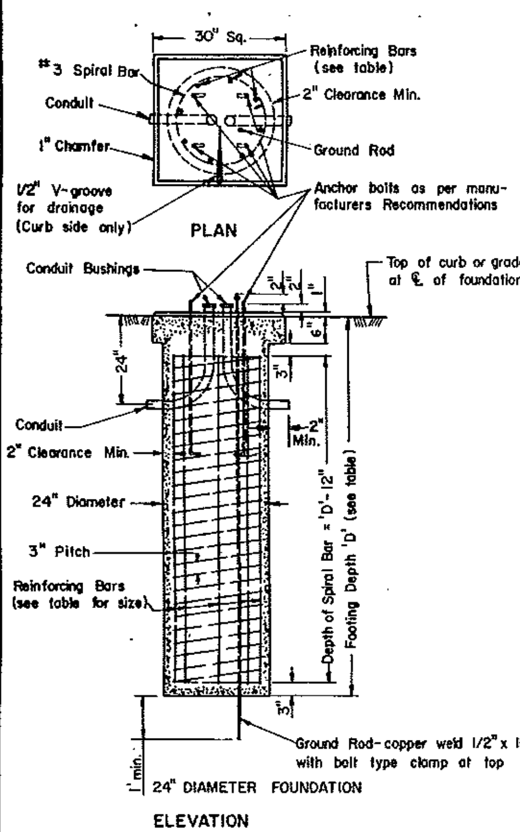
LIGHT & SIGNAL STANDARD FOUNDATION SELECTION TABLE

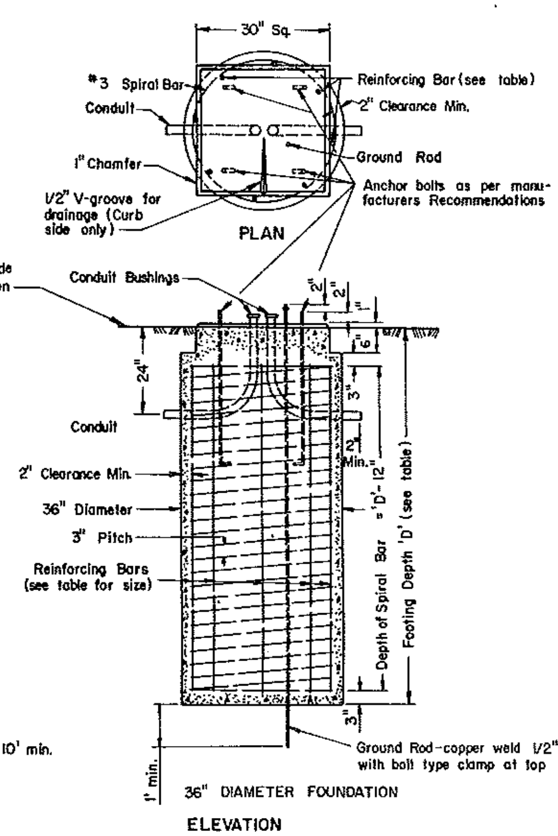
Description	Reinforcing Bars Required	Footing Depth "D" 24" Diameter	Reinforcing Bars Required	Footing Depth "D" 36" Diameter
Light Standard				
30' Mounting Height	8-#5	6'	8-#4	5'
40' Mounting Height	8-#5	6'	8-#4	5'
50' Mounting Height	8-#5	8'	8-#4	7'
Combination 30' Mounting Height				
0-25' Signal Mast Arm	8-#6	10'	8-#5	8'
26'-44' Signal Mast Arm	8-#6	10'	8-#5	8'
45'-50' Signal Mast Arm	8-#8	11'	8-#7	9'
Combination 40' Mounting Height				
0-25' Signal Mast Arm	8-#6	10'	8-#5	8'
26'-44' Signal Mast Arm	8-#7	11'	8-#6	9'
45'-50 Signal Mast Arm	8-#8	12'	8-#7	10'
Combination 50' Mounting Height				
0-25' Signal Mast Arm	8-#6	10'	8-#5	9'
26'-44' Signal Mast Arm	8-#8	12'	8-#7	10'
45'-50' Signal Mast Arm	8-#8	13'	8-#7	11'
Type IV Signal Standard	8-#7	10'	8-#6	9'
Type I, II, & III, V, VI, & VII Signal Std.	4-#5 (1)	4'	4-#5 (1)	3'

(1) No reinforcement is required if the anchor bolts extend to within 3" to 6" above the bottom of the foundation.

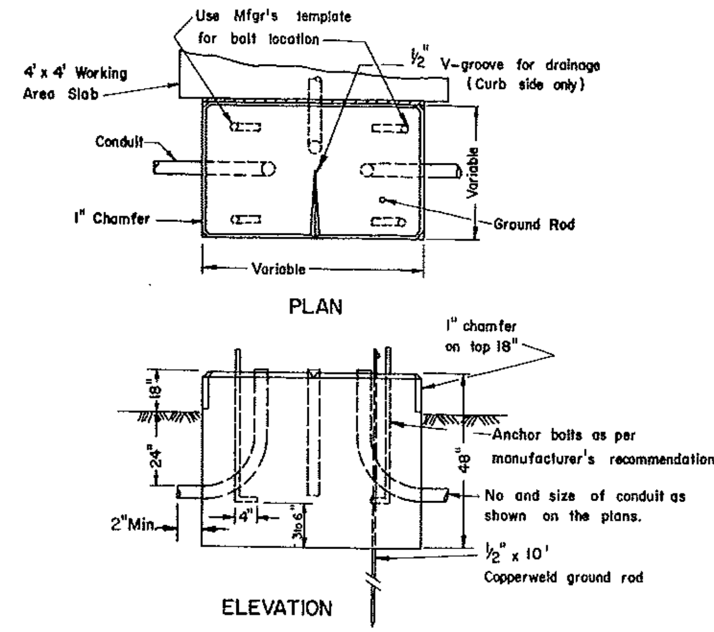
All reinforcing steel to be Grade 40 or 60.

If the Contractor elects to use a 24" square foundation, the next size smaller reinforcement bars may be substituted for those shown in the table. No substitutions may be made for a 36" square foundation. #4 tie bars on 12" c-c may be substituted for the spiral when a 24" square foundation is used. #4 round tie bars on 12" c-c may be substituted for the spiral when a 24" or 36" round foundation is used. Round tie bars shall have a min. of 12" lap.



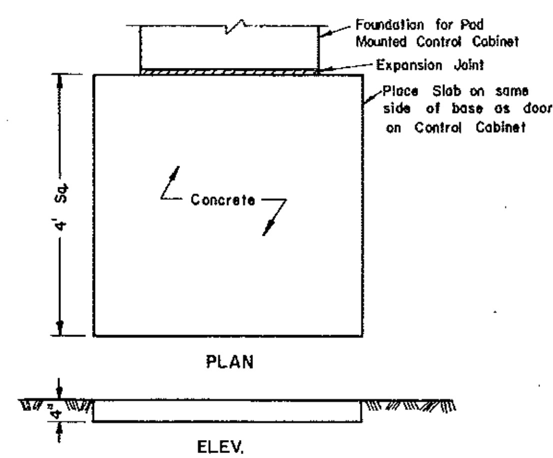


LIGHT & SIGNAL STANDARD FOUNDATION



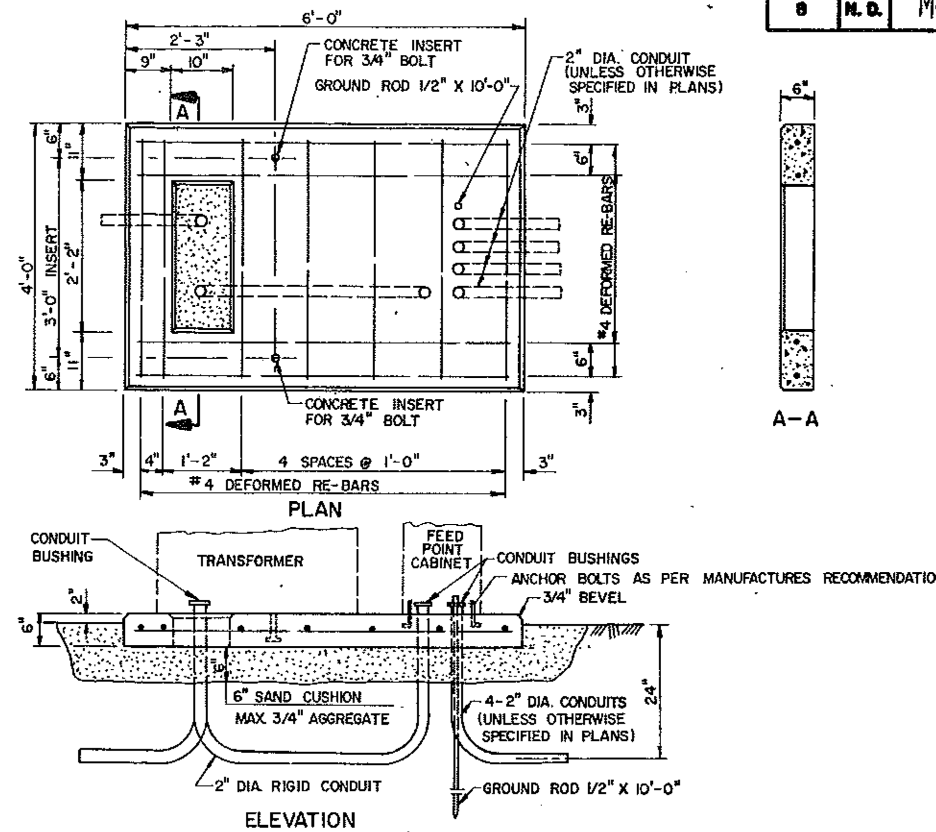
CONTROLLER CABINET FOUNDATION PAD MOUNT

The Controller Cabinet Foundation shall be bid as Concrete Foundations-Traffic Signals.



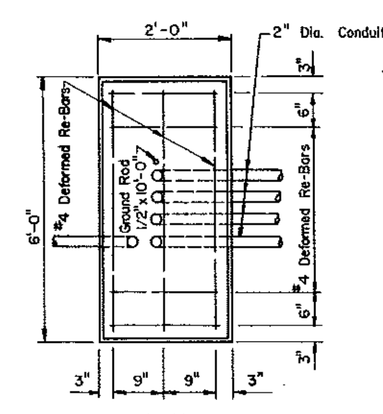
WORKING AREA SLAB

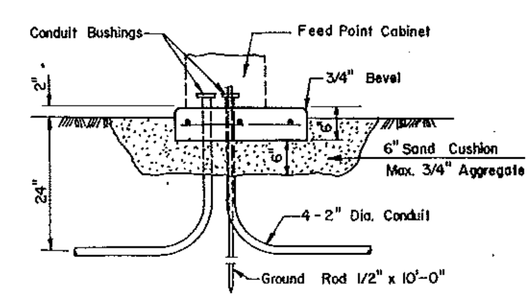
The Working Area Slab shall be installed where shown on the plans, and shall not be bid separarately but shall be included in the price bid for Concrete Foundations-Traffic Signals.



TRANSFORMER & FEED POINT CABINET FOUNDATION PAD MOUNT

The Transformer & Feed Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundations-Feed Point Pad-Type A





FEED POINT CABINET FOUNDATION PAD MOUNT

The Feed-Point Cabinet Foundation Pad Mount shall be bid as Concrete Foundations-Feed Point Pad-Type B

NOTES:

Light & Signal Standard Foundations:

See plans for conduit size, number of bends and correct positioning for each foundation.

When conduit does not continue beyond the foundation, conduit with a 105° bend and bushings on both ends may be substituted for the 90° bends shown.

See plans for correct location of foundations. The grade and exact location shall be established by the Engineer in the field.

Maximum anchor bolt circle for the 24" foundation shall not exceed 18". Maximum anchor bolt circle for the 36" foundation shall not exceed 30".

Pad Mounted Signal Control Cabinet Foundation:

See plans for the number of 90° bends per foundation and correct positioning.

Foundation for Pad Mounted Signal Control Cabinets shall be of sufficient size so that there is a minimum of 3" of clearance from the outside edge of cabinet to the outside edge of the foundation on any side. The Contractor shall insure a watertight seal between the control cabinet and the foundation by caulking, except for V grove.

Working Area Slab:

The materials and preparation of this slab shall be as approved by the Engineer in the field.

Transformer & Feed Point Cabinet Foundation Pad Mounted:

Foundation shall have a wood float finish.

All conduits shown shall be installed. Conduit that is not used at this time shall be plugged.

Feed Point Cabinet Foundation Pad Mounted:

Foundation shall have wood float finish.

All conduits shown shall be installed. Conduit that is not used at this time shall be plugged.

November 16, 1976

REVISIONS	
DATE	CHANGES
3-18-77	Added type to pad foundation
9-28-77	Controller foundation depth
2-28-78	Tie bar note
8-15-79	Foundation Table
12-11-79	Foundation Table
6-6-80	Foundation Table
12-31-81	Foundation Table
11-19-82	Deleted note
6-9-83	Note Changes

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Submitted: [signature] Design Engineer

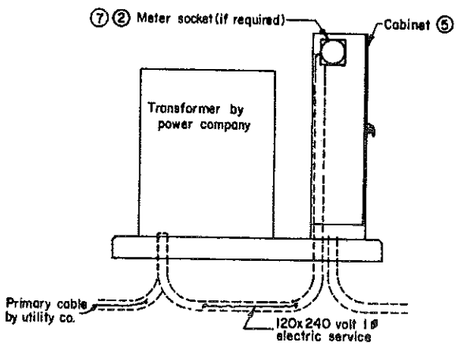
Recommended: Ass't. Chief Engineer Pre-Constr.

Approved: [signature] Chief Engineer

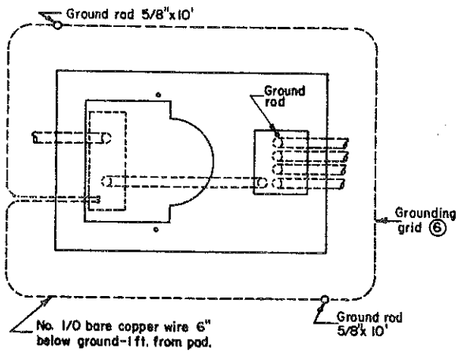
FEED POINTS
(ROADWAY LIGHTING)

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N. D.	M-1-806(12)071	72

D-777-2



ELEVATION



PLAN

TRANSFORMER AND CIRCUIT BREAKER
CABINET PAD MOUNTED

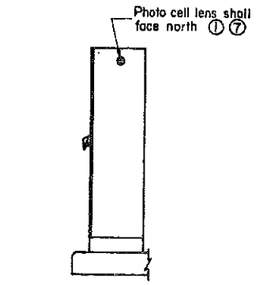
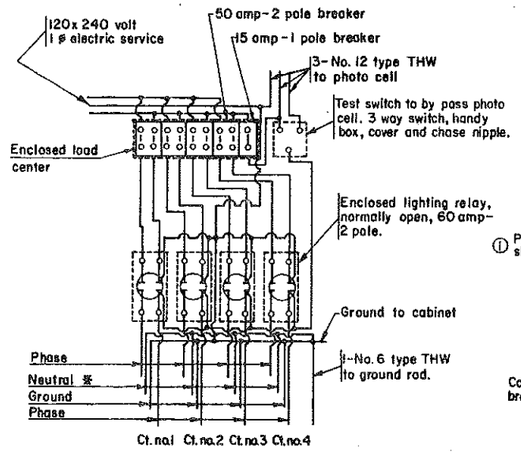


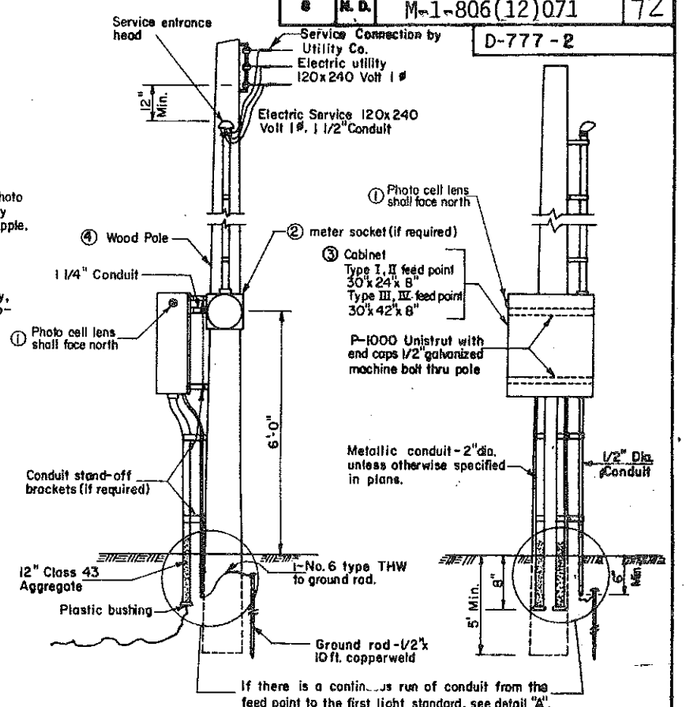
PHOTO CELL
MOUNTING DETAIL



※ Install when festoon circuit is required.

FEED POINT
TYPE IV

Type I feed point is similar to type IV except only one electrical circuit, one 50 amp-2 pole breaker and one lighting relay, normally open, shall be installed. Type II feed point is similar to type IV except only two electrical circuit, two 50 amp-2 pole breaker and two lighting relays, normally open, shall be installed. Type III feed point is similar to type IV except only three eletrical circuits, three 50 amp-2 pole breakers and three lighting relays, normally open, shall be installed.



POLE MOUNTED

NOTES:

① PHOTO CELL: The Electrical Contractor shall furnish and install the photoelectric cell.

② METER SOCKET: The contractor shall install the meter socket and trim if meter is required by local utility company. Meter to be furnished and installed by utility company.

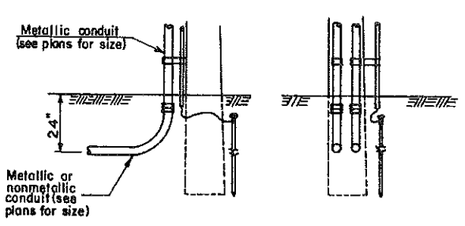
③ CABINET: Cabinet shall be N. E. M. A. 12 rating with lock drip shield and 1/2" plywood backing, stainless steel hardware. Paint plywood with 2 coats of oil base gray. Cabinet shall be shop coated with one coat of red lead and have two coats of exterior gray enamel.

④ WOOD POLE: Minimum 20 ft. Class VII full length penta pressure treated wood pole. (if required, see layout sheets)

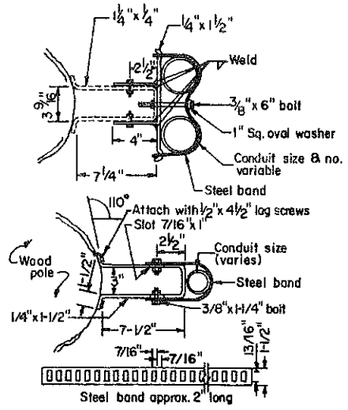
⑤ CABINET: Cabinet shall be 56" high x 26" wide x 14" deep. Minimum 12 ga. steel with provisions for padlock. Cabinet shall be weatherproof. Cabinet shall have one shop coat of red lead and two field coat of exterior dark green enamel.

⑥ GROUNDING GRID: The grounding grid shall have a ground resistance not to exceed 25 ohms. This shall be obtained by one or more 5/8"x10' copperweld ground rods in parallel or series at two corners. Minimum distance between ground unit assemblies shall be 6'-0".

⑦ METER LOCATION: The Meter (if required) shall not be mounted on the same side of the cabinet as the photo-cell is mounted.

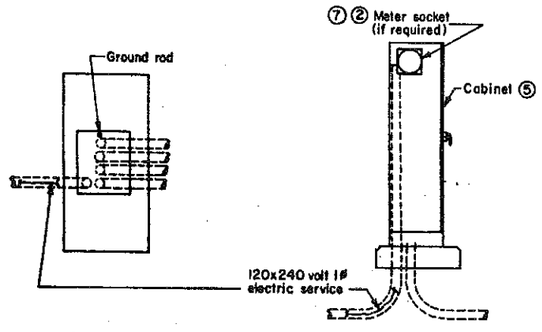


DETAIL "A"



CONDUIT STANDOFF BRACKET

The conduit standoff brackets may be omitted if not required by the local utility company.



PLAN ELEVATION

CIRCUIT BREAKER CABINET PAD MOUNTED

November 16, 1976 REVISIONS	
DATE	CHANGES
11-13-78	Cabinet & Photo cell
8-15-79	Revise Circuit Breaker
5-1-83	Revise Elect. Serv. Lines
1-4-84	Meter Location

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

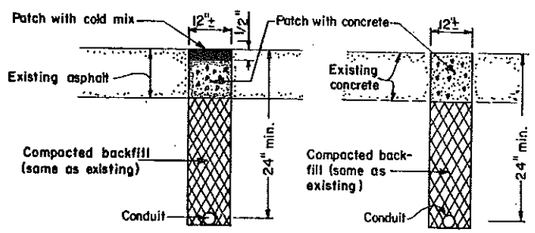
Submitted: Richard Holt
Design Engineer

Recommended:
Asst. Chief Engineer, Pre-Constr.

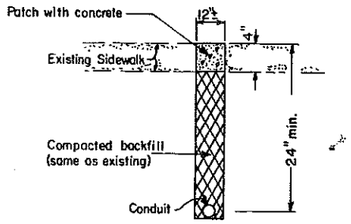
Approved:
Chief Engineer

LIGHTING & SIGNAL DETAILS

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	73
		D-777-10	



ASPHALT PATCH CONCRETE PATCH



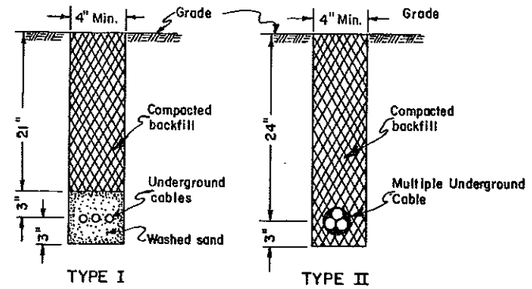
SIDEWALK PATCH

SURFACE PATCH DETAILS

NOTE:

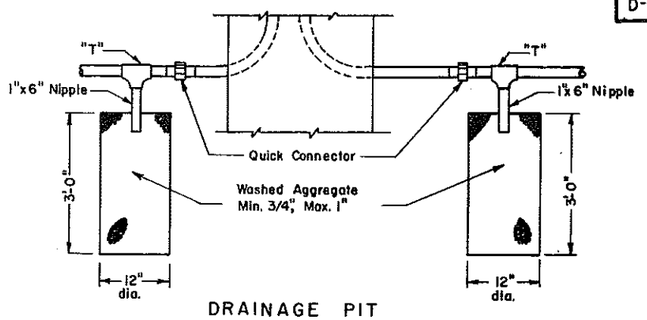
PATCHES: All trenches shall be saw-cut. The replacement concrete shall be P.C.C. pavement and the coarse aggregate gradation, maximum size and method of curing shall be as approved by the Engineer. The cost shall be included in the price bid for Conduit.

Immediately prior to pouring replacement concrete, all surfaces shall be painted with an approved epoxy compound.



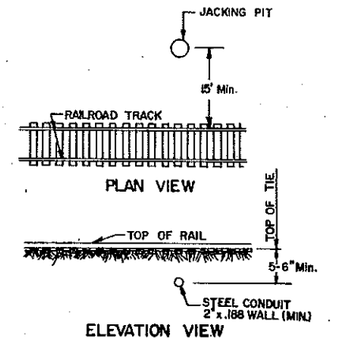
CABLE TRENCH

The entire area which is disturbed by the trenching shall be sodded, or as directed by the Engineer. The cost shall be included in the price bid for "Cable Trench".

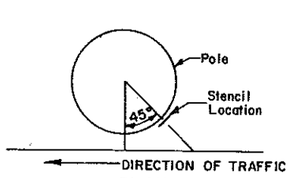


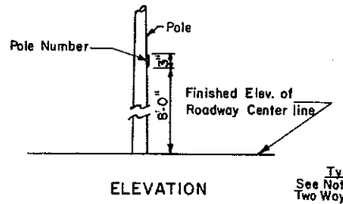
DRAINAGE PIT

Drainage pits shall be installed in both ends of the conduit runs. Except where conduit slopes enough for drainage to one end. (To be used for Traffic Signal Conduit Runs Only)



RAILROAD TRACK CONDUIT PLACEMENT

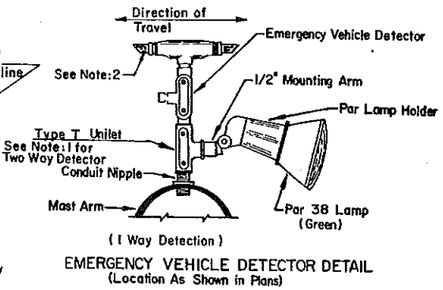




LIGHT STANDARD NUMBERING

NOTE:

POLE NUMBERING: The contractor shall stencil on each light standard the pole number in black paint on the roadway side of the pole, or adhesive coated plastic such as Scotch cal, Manufactured by 3M as approved by the Engineer. See layout sheets for pole numbers.



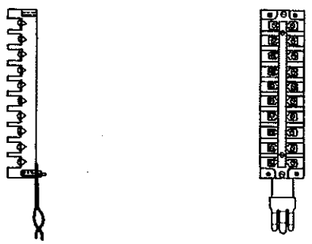
(1 Way Detection)

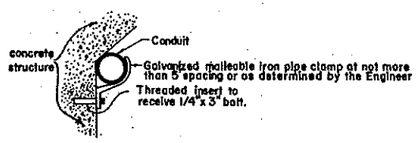
EMERGENCY VEHICLE DETECTOR DETAIL

(Location As Shown in Plans)

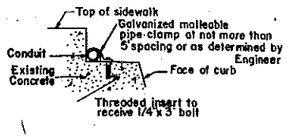
Notes:

1. Two way Detector shall have type X Unilet with two Par lamp holders and lamps. (one in each direction)
2. One Way Detector shall have the unused end plugged with metal pipe plug.

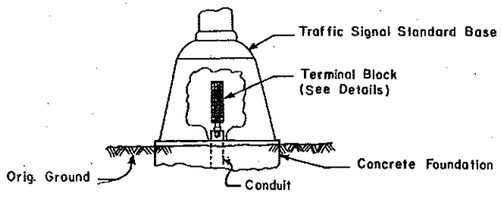




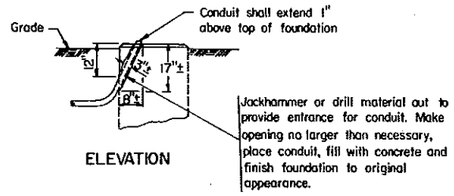
BRIDGE MOUNTED CONDUIT HANGER



CURB MOUNTED CONDUIT



TERMINAL BLOCK
(Rigid Mounted)



REVISE CONCRETE FOUNDATION

January 19, 1977 REVISIONS	
DATE	CHANGES
8-26-82	Emer. Veh. Detector Detail
1-11-84	Conduit Clamp Spacing

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

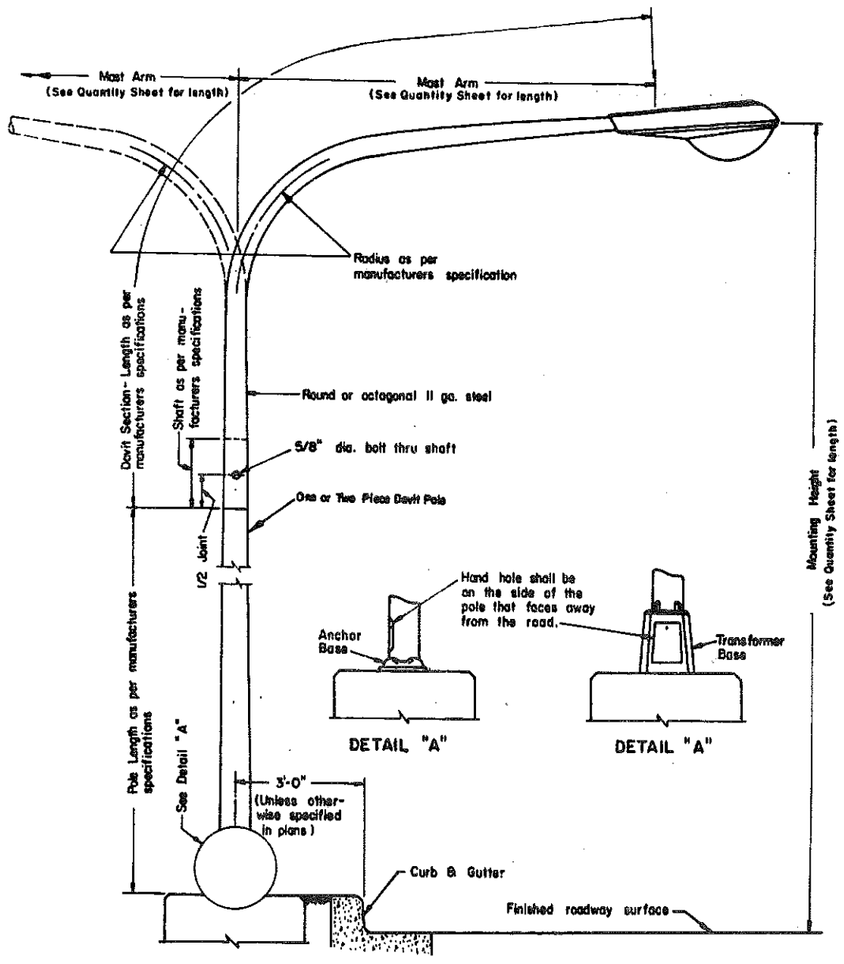
Submitted: _____
Design Engineer

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

Approved: _____
Chief Engineer

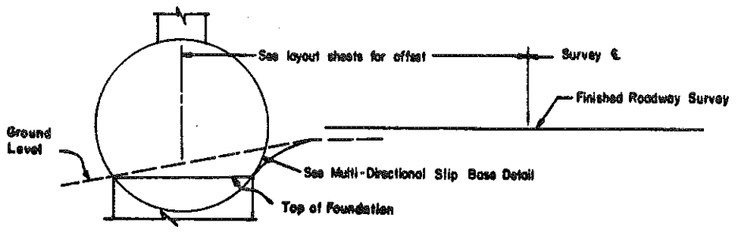
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806(12)071	74
		D-777-11	

LIGHT STANDARD DETAILS

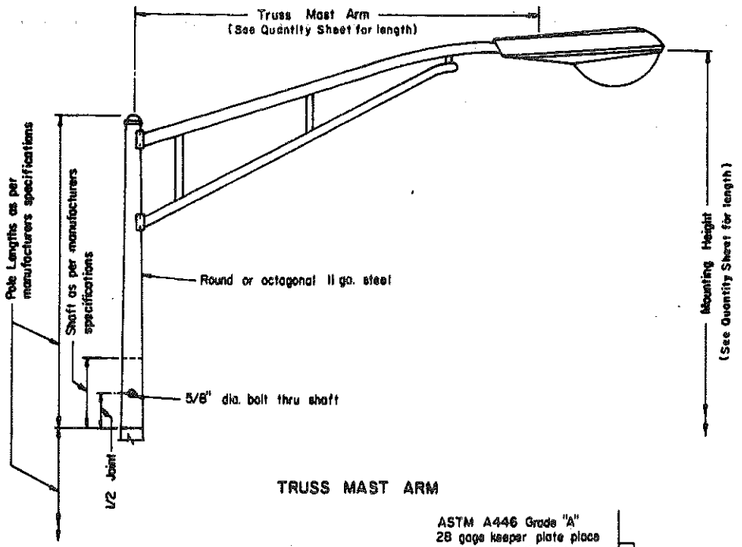


DETAIL "A"

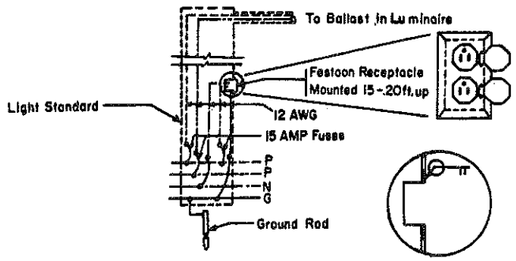
DETAIL "A"



CONCRETE FOUNDATION LOCATION



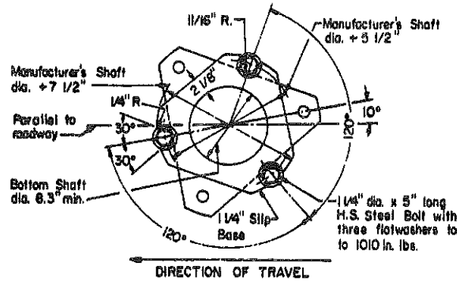
TRUSS MAST ARM



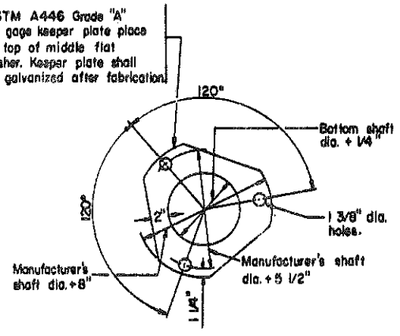
POLE WIRING DIAGRAM

RECEPTACLE MOUNTING DETAIL

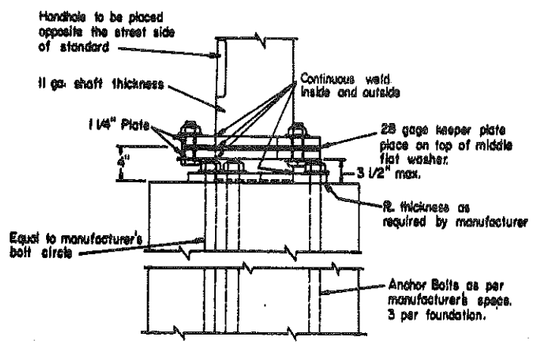
Receptacle shall be mounted on the side of the pole that faces the street side.



TOP VIEW

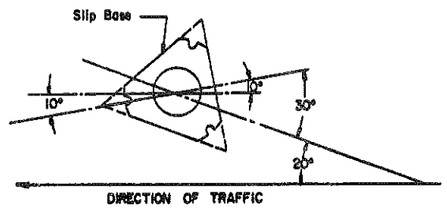


PLAN VIEW
KEEPER PLATE



SIDE VIEW

STEEL BASE DETAIL
MULTI-DIRECTIONAL SLIP BASE



SLIP BASE PLACEMENT DETAIL

NOTES:

STEEL STANDARDS: Steel light standard shall be galvanized in accordance with ASTM A123. Marred or scratch areas shall be touchedup after erection.

Mast Arm: See Quantity Sheet for length.

LUMINAIRE: Shall be internal ballast-constant wattage 120 x 240 voltage. See layout sheets for type of luminaire, wattage, I.E.S. distribution, operating voltage.

FUSING: Fusing in base, see specifications.

SLIP BASE BOLT TORQUE PROCEDURE:

1. Tighten all bolts the maximum possible with 12" to 15" wrench to bed washers and to clean bolt threads, then loosen.
2. Retighten bolts in a systematic order to prescribed torque.
3. Loosen each bolt and retighten to prescribed torque in same order as initial retightening.
4. Burr threads at junction with nut using center punch to prevent nut loosening.

JUNE 1, 1977

REVISIONS

DATE	CHANGE
6-6-80	Revised Pole Wiring Dia.
8-29-80	Added Receptacle Mounting Detail
6-30-81	Added note to Receptacle Mounting Detail
10-9-81	Revised Titles
12-31-81	Added Note

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

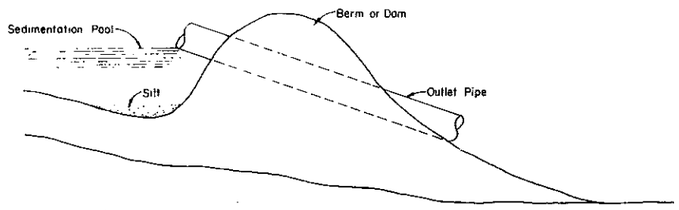
Submitted: _____ Design Engineer

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

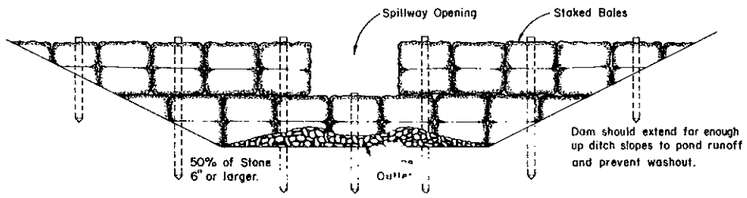
Approved: _____ Chief Engineer

PROJECT	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	75
		D-900-20	

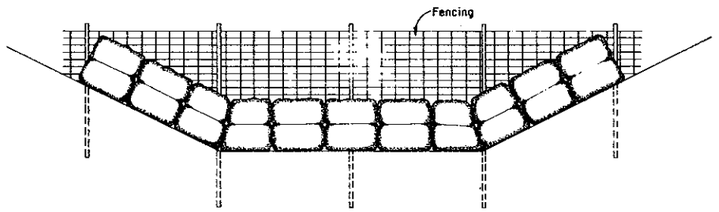
TEMPORARY EROSION AND SILTATION CONTROLS



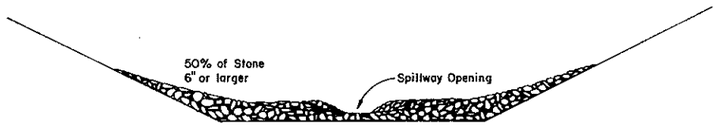
SMALL SEDIMENT DAM OR BERM



STAKED BALES

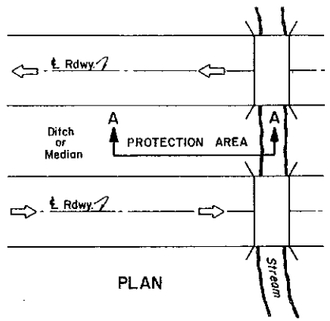


FENCE-BACKED BALES

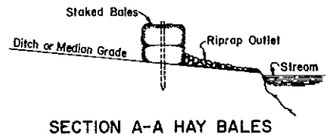


GRADED STONE

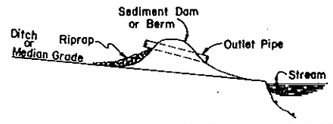
DITCH EROSION DAMS



PLAN

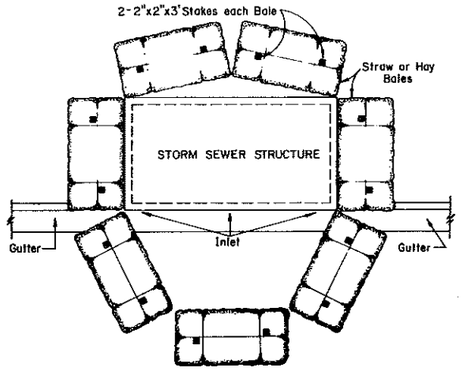


SECTION A-A HAY BALES

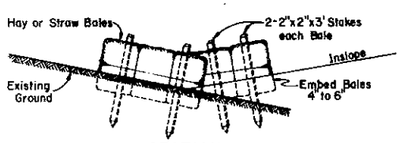


SECTION A-A SEDIMENT DAM OR BERM

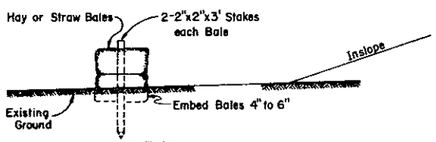
MEDIAN OR DITCH PROTECTION AT STREAM CROSSINGS



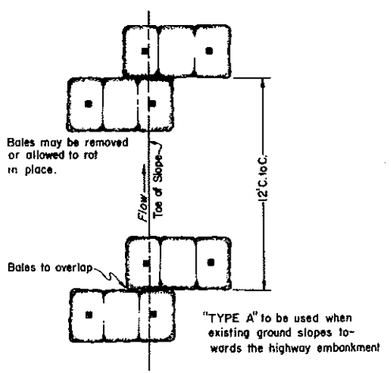
STORM SEWER INLET EROSION & SILTATION BARRIER



SECTION

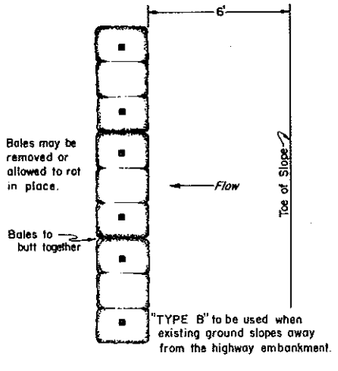


SECTION



PLAN

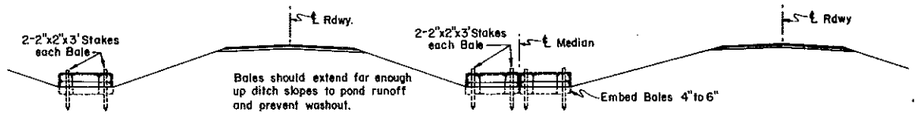
"TYPE A"



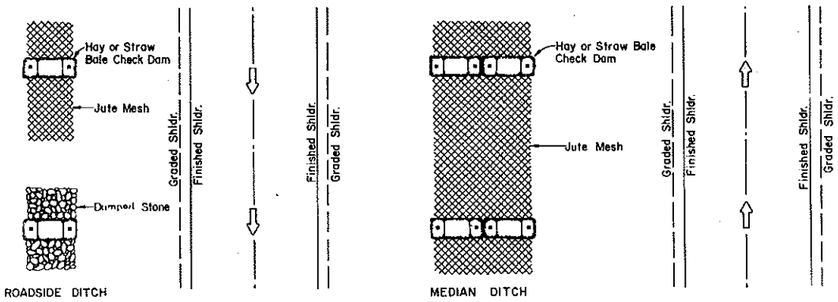
PLAN

"TYPE B"

BALED HAY OR STRAW EROSION CHECKS



SECTION



PLAN

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

NOTES

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

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

3-25-74	
REVISIONS	
DATE	CHANGE

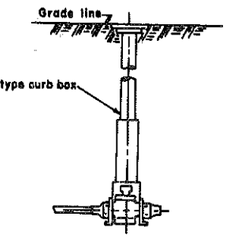
NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

Submitted: R. Thomas
Design Engineer

Recommended: _____
Asst. Chief Engineer
Pre-Construction

Approved: R. Bradley
Chief Engineer

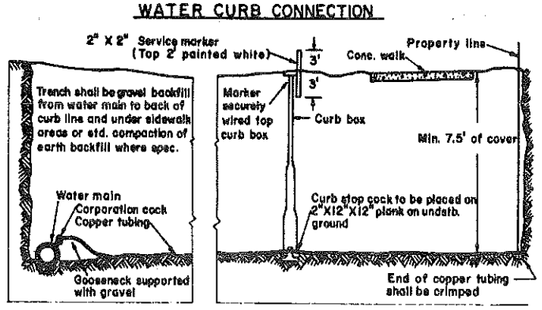
SECTION	STATE	FED. AID PROJ. NO	SHEET
8	N.D.	M-1-806	76
		D-900-22	



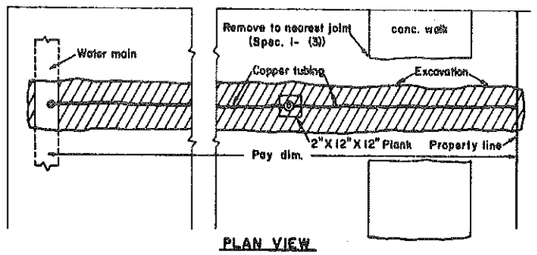
NOTE: Service clamp not required where small size service lines connect to large C.I.P. and three threads of the corp. stop make contact with the wall.

CURB STOP

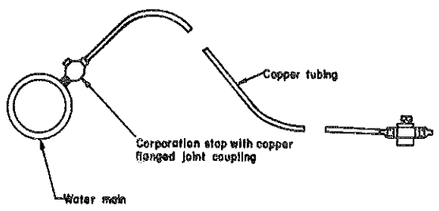
WATER CURB CONNECTION



SECTIONAL ELEVATION

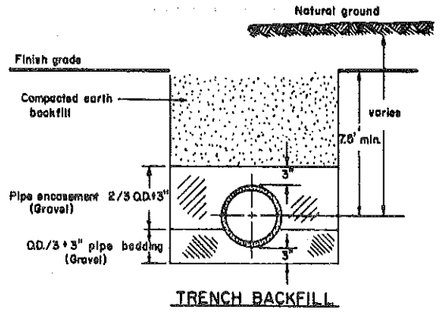


PLAN VIEW



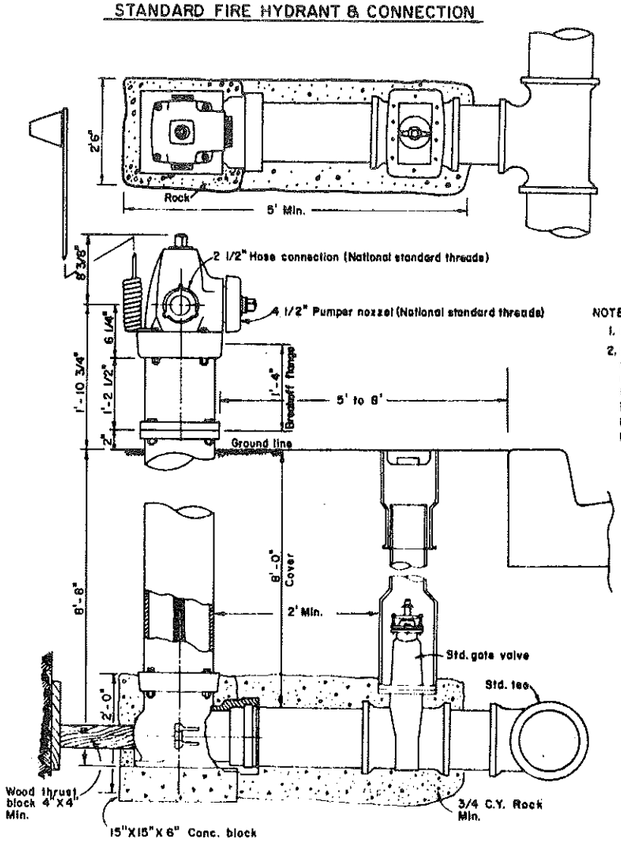
TYPICAL CORPORATION STOP AND CURB STOP

No Scale



TRENCH BACKFILL

STANDARD FIRE HYDRANT & CONNECTION

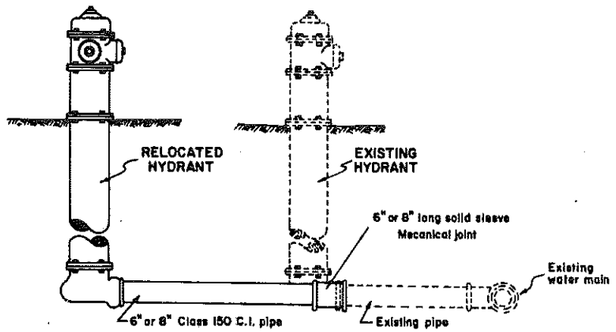


NOTES:

1. Operating & Cap nuts: city standards
2. Supplier will furnish and install hydrant marker. Cost will be included with the unit bid price for the hydrant. The hydrant marker shall be the Nordic Flexi-Flag as manufactured by Nordic Fiberglass, Inc. or approved equal. marker will be rust resistant.

Concrete thrust blocking to be placed as directed.

Hydrant to be set on a precast concrete pad 6" thick by 18" sq. The hydrant shall be surrounded by 1/2 C.Y. course conc. aggr.



LAYOUT FOR RELOCATION OF HYDRANTS

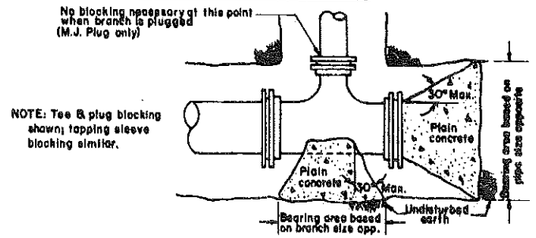
TYPICAL SEQUENCE OF INSTALLATION

1. Remove existing hydrant.
2. Install long solid sleeve mech. joint, CL150 C.I.P.
3. Install 6"or 8" CI. 150 C.I. Pipe (length as needed).
4. Install salvaged hydrant at new location.

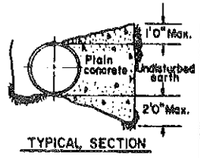
All materials necessary for the Relocation of the Hydrant to be included in price bid for "Relocate Hydrant."

Existing water main valve to be adjusted as necessary and paid for as "Adjusted Utility Appurtenances."

WATERMAIN THRUST BLOCK DETAILS



TEE, PLUG & TAPPING SLEEVE

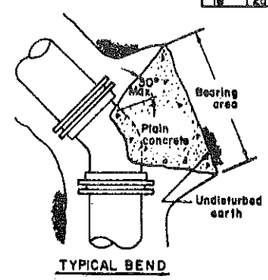


TYPICAL SECTION

TABLE OF REQUIRED BEARING AREAS

SIZE OF PIPE	90° BEND	45° BEND	22.5° BEND	11.25° BEND	TEES, PLUGS & TAPPING SLEEVE
4"	5' SQ.	2' SQ.	2' SQ.	2' SQ.	2' SQ.
6"	5' SQ.	2' SQ.	2' SQ.	2' SQ.	3' SQ.
8"	5' SQ.	3' SQ.	2' SQ.	2' SQ.	4' SQ.
10"	8' SQ.	4' SQ.	3' SQ.	2' SQ.	6' SQ.
12"	11' SQ.	6' SQ.	3' SQ.	2' SQ.	8' SQ.
16"	20' SQ.	11' SQ.	6' SQ.	4' SQ.	15' SQ.
18"	25' SQ.	14' SQ.	7' SQ.	4' SQ.	18' SQ.

NOTE: Concrete blocking to be poured against undisturbed earth. Keep bolts and bolts free of concrete. Concrete in place to be included in price bid for water main.



TYPICAL BEND

THRUST BLOCK DETAIL

No Scale

05-11-82	
REVISIONS	
DATE	CHANGE

NORTH DAKOTA STATE HIGHWAY DEPARTMENT

Approved: _____ DESIGN ENGINEER

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	M-1-806	77

BASELINE STA	MATERIAL NAME	END AREAS	-- UNADJUSTED VOLUMES -- INCR	FROM BAL	ACCUM	MULT FACTOR	-- ADJUSTED VOLUMES -- INCR	FROM BAL	ACCUM	MASS ORDINATE
262+ 0.0	FILL	78.27	0	0	0	1.200	0	0	0	0.
	EARTH	27.15	0	0	0	1.000	0	0	0	
263+ 0.0	FILL	51.48	240	240	240	1.200	288	288	288	-129.
	EARTH	58.95	159	159	159	1.000	159	159	159	
263+76.00	FILL	28.09	112	352	352	1.200	135	423	423	-124.
	EARTH	40.13	140	299	299	1.000	140	299	299	
263+84.00	FILL	25.32	8	360	360	1.200	10	433	433	-122.
	EARTH	33.96	11	310	310	1.000	11	310	310	
264+16.40	FILL	0.0	7	368	368	1.200	9	442	442	-94.
	EARTH	93.13	38	348	348	1.000	38	348	348	
264+38.00	FILL	3.84	2	370	370	1.200	2	444	444	-11.
	EARTH	79.66	85	433	433	1.000	85	433	433	
264+41.20	NATURAL BALANCE									0.
	FILL		0	370	370	1.200	0	444	444	
	EARTH		11	444	444	1.000	11	444	444	
265+ 0.0	FILL	0.05	4	4	374	1.200	5	5	449	197.
	EARTH	99.85	203	203	647	1.000	203	203	647	
266+ 0.0	FILL	0.33	1	5	375	1.200	1	6	450	582.
	EARTH	108.43	386	588	1032	1.000	386	588	1032	
267+ 0.0	FILL	5.87	11	17	387	1.200	14	20	464	940.
	EARTH	92.27	372	960	1404	1.000	372	960	1404	
268+ 0.0	FILL	13.93	37	53	423	1.200	44	64	508	1179.
	EARTH	60.32	283	1243	1687	1.000	283	1243	1687	
269+ 0.0	FILL	10.90	46	99	469	1.200	55	119	563	1369.
	EARTH	72.23	245	1488	1932	1.000	245	1488	1932	
270+ 0.0	FILL	9.26	37	137	507	1.200	45	164	608	1612.
	EARTH	83.41	288	1776	2220	1.000	288	1776	2220	
271+ 0.0	FILL	1.83	21	157	527	1.200	25	189	633	1940.
	EARTH	106.93	352	2129	2573	1.000	352	2129	2573	
272+ 0.0	FILL	0.74	5	162	532	1.200	6	194	638	2325.
	EARTH	104.14	391	2520	2964	1.000	391	2520	2964	
273+ 0.0	FILL	0.04	1	163	533	1.200	2	196	640	2715.
	EARTH	107.06	391	2911	3355	1.000	391	2911	3355	

BASELINE STA	MATERIAL NAME	END AREAS	-- UNADJUSTED VOLUMES -- INCR	FROM BAL	ACCUM	MULT FACTOR	-- ADJUSTED VOLUMES -- INCR	FROM BAL	ACCUM	MASS ORDINATE
274+ 0.0	FILL	2.63	5	168	538	1.200	6	202	646	3050.
	EARTH	77.37	342	3252	3696	1.000	342	3252	3696	
275+ 0.0	FILL	7.03	18	186	556	1.200	21	223	667	3265.
	EARTH	50.10	236	3488	3932	1.000	236	3488	3932	
276+ 0.0	FILL	13.92	39	225	595	1.200	47	270	714	3368.
	EARTH	30.88	150	3638	4082	1.000	150	3638	4082	
277+ 0.0	FILL	18.02	59	284	654	1.200	71	341	785	3417.
	EARTH	33.83	120	3758	4202	1.000	120	3758	4202	
277+36.00	FILL	162.49	120	404	774	1.200	144	485	929	3319.
	EARTH	35.12	46	3804	4248	1.000	46	3804	4248	
278+ 0.0	FILL	411.10	680	1084	1454	1.200	816	1301	1745	2585.
	EARTH	33.69	82	3886	4330	1.000	82	3886	4330	
A 6+ 0.0	FILL	449.89	542	1626	1996	1.200	651	1952	2396	1974.
	EARTH	30.23	40	3926	4370	1.000	40	3926	4370	
A 7+ 0.0	BACKFILL	0.0	0	0	0	1.200	0	0	0	746.
	FILL	152.00	1115	2741	3111	1.200	1338	3289	3733	
	EARTH	28.85	109	4035	4479	1.000	109	4035	4479	

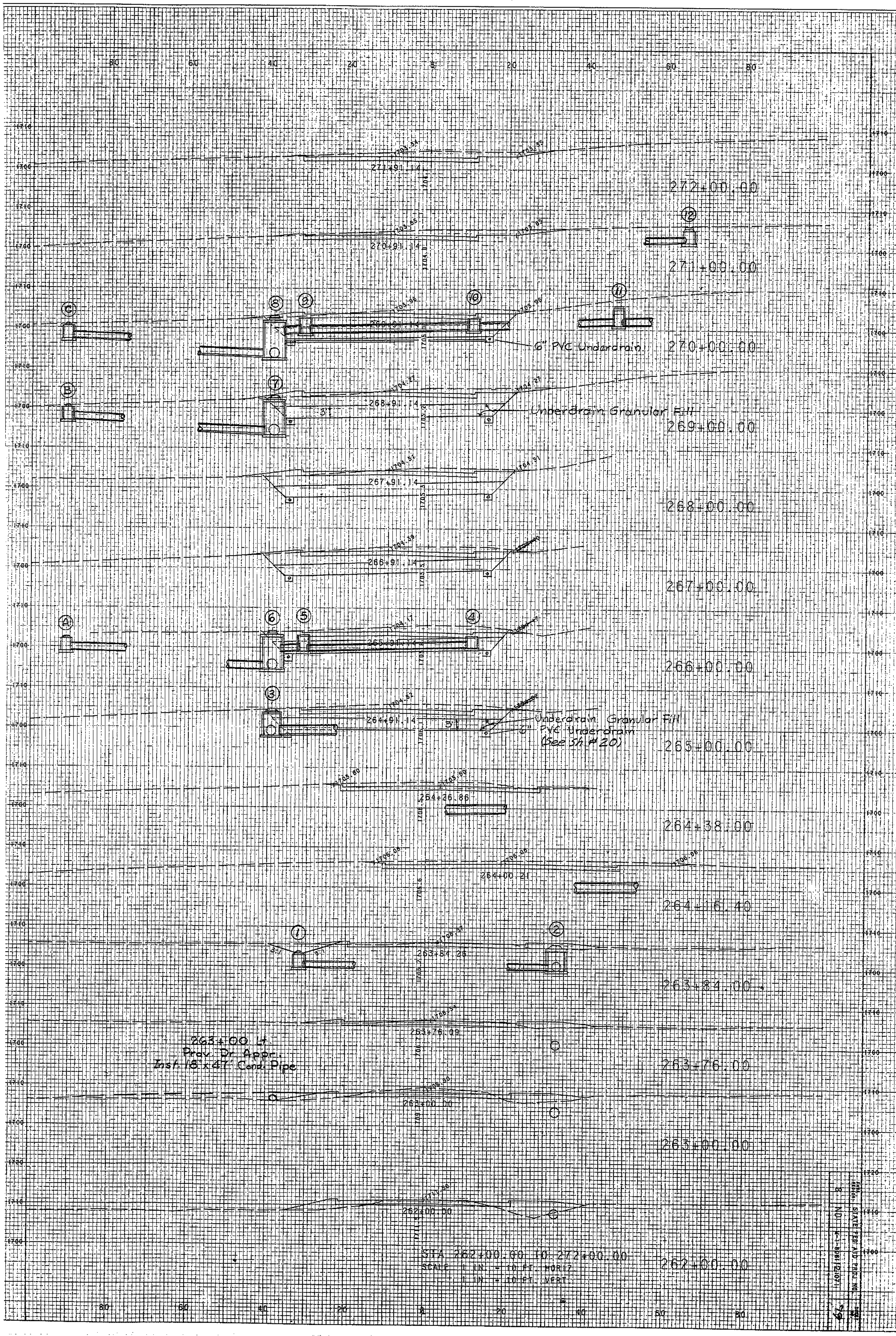
$$$$ FILE 'MASSPLT ' HAS BEEN SAVED

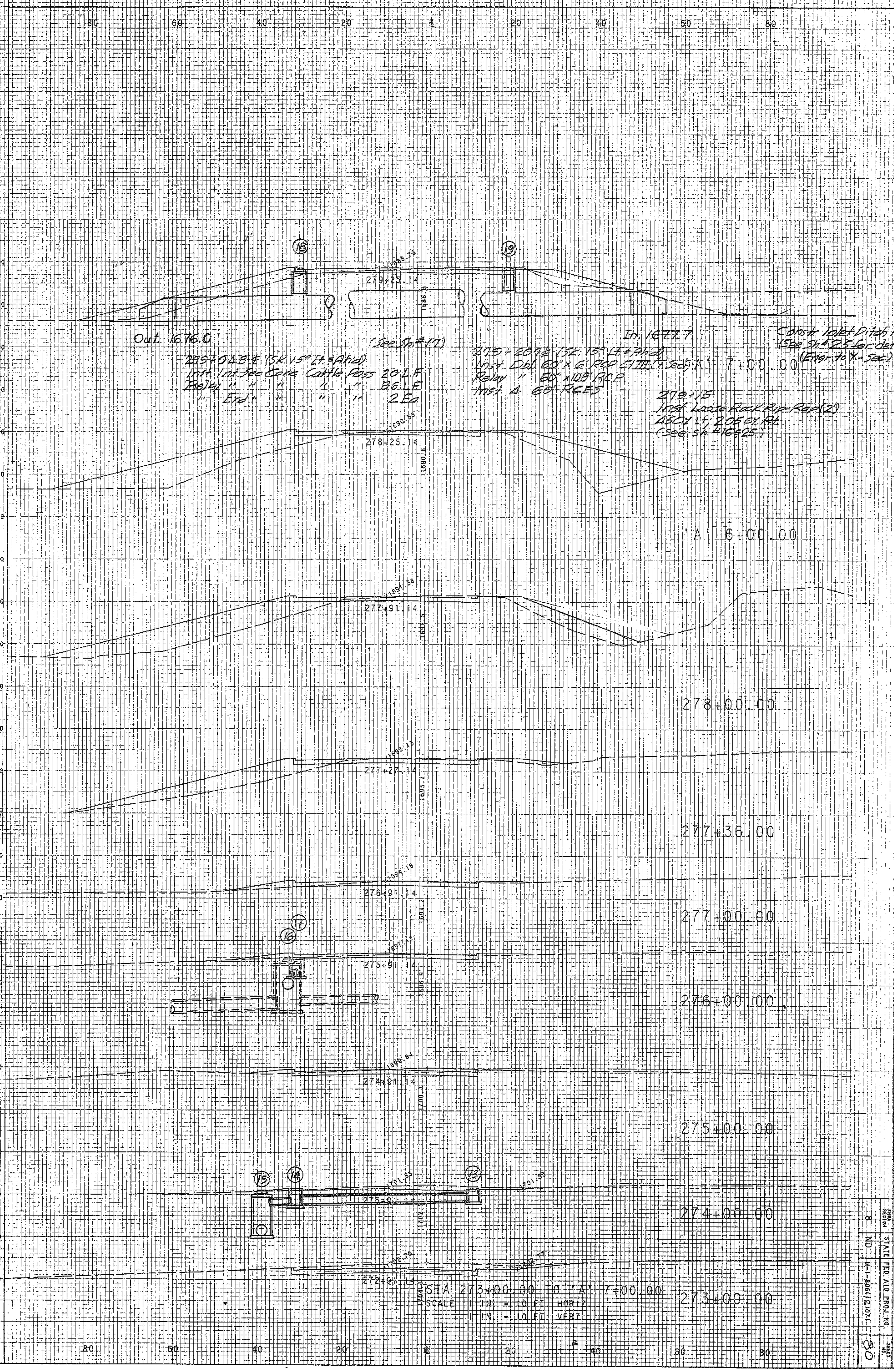
M.H. No. & Size	② - 48"	③ - 48"	⑥ - 60"	⑦ - 60"	⑧ - 60"	⑮ - 48"	⑯ (Existing 66")
Station	263+85 - 30' Rt.	264+70.6 - 29.8' Lt.	266+11.6 - 29' Lt.	268+91.1 29' Lt.	270+44.1 - 29' Lt.	273+58.1 29' Lt.	275+92.1 - 23' Lt.
Top El.	1705.80	1704.80	1704.20	1703.10	1703.10	1701.10	1695.65
Base El.	1699.22	1698.02	1694.73	1693.33	1692.53	1690.30	1683.35
Invert El.	1699.47	1698.27	1695.00	1693.60	1692.80	1690.57	
Outlet El.	1698.27	1695.00	1692.60	1692.80	1690.57	1688.60	1683.35
Riser	5.00'	5.20'	7.89'	8.19'	8.99'	9.22'	

Inlet No.	①	④	⑤	Ⓐ	Ⓑ	Ⓒ
Station	263+85 - 35' Lt.	266+11.6 Rt.	266+11.6 Lt.	266+11.6 - 131'± Lt.	268+91.1 - 131'± Lt.	270+44.1 - 131'± Lt.
Inlet Type	C.B. (6" Bee Hive)	Type 2 - Dbl.	Single	C.B. (6" Bee Hive)	C.B. (6" Bee Hive)	C.B. (6" Bee Hive)
Grate El.	1703.30	1703.64	1703.64			
Bottom El.	1699.72	1700.21	1699.05			
Invert El.	1699.91	1700.42	1699.26			
Outlet El.	1699.47	1699.26	1699.10			
"H" Dist.	3.00'	3.00'	4.00'			

Inlet No.	⑨	⑩	⑪	⑫
Station	270+44.1 Lt.	270+44.1 Rt.	270+67±-57.5' Rt.	271+03.7 - 75' Rt.
Inlet Type	Single	Single	Type 2	Single
Grate El.	1703.29	1703.29	1705.47	1705.47
Bottom El.	1698.70	1699.70	1701.04	1701.83
Invert El.	1698.91	1699.91	1701.25	1702.07
Outlet El.	1698.66	1698.91	1699.91	1701.25
"H" Dist.	4.00'	3.00'	4.00'	3.00'

Inlet No.	⑬	⑭	⑰	⑱	⑲
Station	273+58.1 Rt.	273+58.1 Lt.	276+10.1 Lt.	279+20.8 - 20.9' Lt.	279+18.5 - 28.3' Rt.
Inlet Type	Single	Single	Single	Single	Single
Grate El.	1702.22	1702.22	1696.05	1688.26	1688.13
Bottom El.	1698.63	1697.63	1691.46		
Invert El.	1698.84	1697.84	1691.65		
Outlet El.	1697.84	1697.59	1691.40		
"H" Dist.	3.00'	4.00'	4.00'	5.12'	4.38'


272+00.00
271+00.00
270+00.00
269+00.00
268+00.00
267+00.00
266+00.00
265+00.00
264+38.00
264+16.40
263+84.00
263+76.00
263+00.00
262+00.00
271+91.14
270+91.14
269+91.14
268+91.14
267+91.14
266+91.14
265+91.14
264+91.14
264+26.86
264+00.21
263+84.26
263+76.09
263+00.00
262+00.00
6" PVC Underdrain
Underdrain Granular Fill
Underdrain Granular Fill
6" PVC Underdrain
(See Sh #20)
263+00 Lt.
Prov. Dr. Appr.
Inst. 18"x47' Cond. Pipe
STA. 262+00.00 TO 272+00.00
SCALE 1 IN. = 10 FT. HORIZ.
1 IN. = 10 FT. VERT.
STATE
N.D.
FED. AID PROJ. NO.


FHWA REGION 8
STATE ND
FED. AID PROJ. NO. I-1-806(12)071
SHEET NO. 80
279+25.14
Out. 1676.0
In. 1677.7
(See Sh # 17)
279+04 & (Sk. 15° Lt. = Ahd)
Inst. Int. Sec. Conc. Cattle Pass 20 L.F.
Relay " " " " " 86 L.F.
" End " " " " 2 Ea.
279+20 & (Sk. 15° Lt. = Ahd)
Inst. Dbl. 60" x 6' RCP Cl. III (7 Sec.)
Relay " 60" x 108' RCP
Inst. 4 60" RCES
Constr. Inlet Ditch Rt.
(See Sh # 25 for details)
(Engr. to X-Sec.)
'A' 7+00.00
279+15
Inst. Loose Rock Rip-Rap (2)
45 CY Lt., 205 CY Rt.
(See Sh # 16 & 25)
278+25.14
'A' 6+00.00
277+91.14
278+00.00
277+27.14
277+36.00
276+91.14
277+00.00
275+91.14
276+00.00
274+91.14
275+00.00
273+91.14
274+00.00
272+91.14
273+00.00
STA 273+00.00 TO 'A' 7+00.00
SCALE 1 IN. = 10 FT. HORIZ.
1 IN. = 10 FT. VERT.