JOB # 20

FED. ROAD DIST. NO.	STATE	PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
8	ND	TEU-1-988(005)016	1	18

GOVERNING SPECIFICATIONS

Standard Specifications for Road and Bridge Construction, adopted by the North Dakota Department of Transportation, September 1992; Standard Drawings currently in effect; and other Contract Provisions submitted herein.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

PLANS

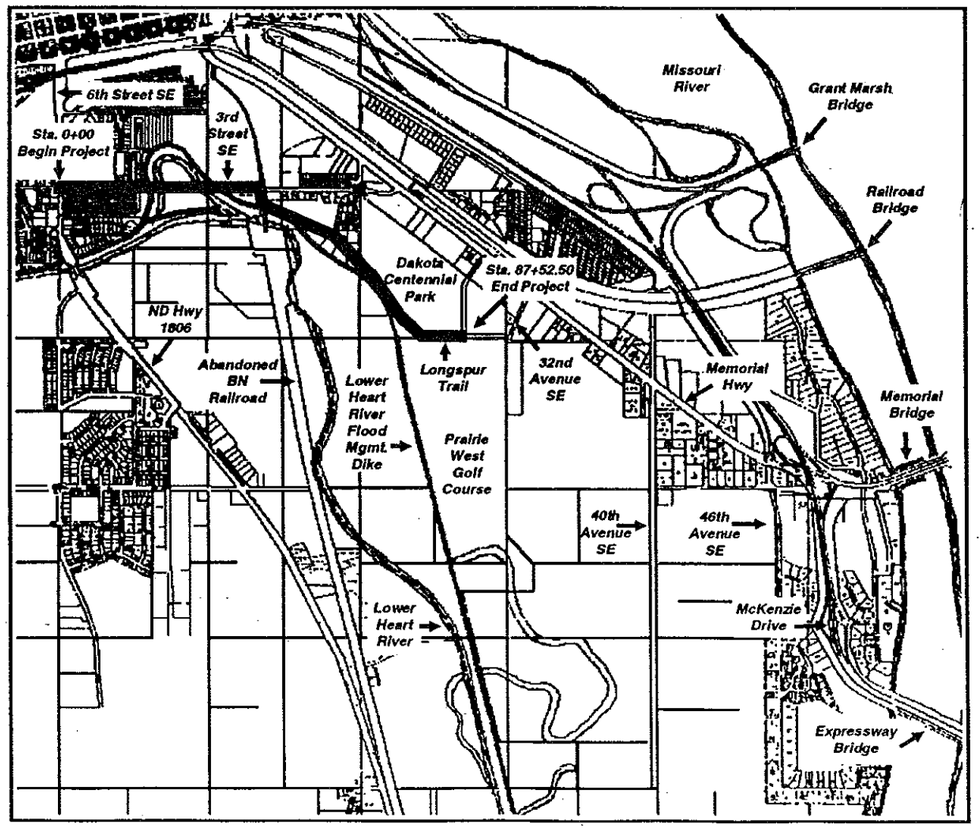
FOR THE PROPOSED IMPROVEMENT OF A

PEDESTRIAN / BIKE TRAIL
MANDAN, NORTH DAKOTA

FEDERAL AID
TRAFFIC ENHANCEMENT COUNTY / URBAN
PROJECT NO. TEU-1-988(005)016
PAVING, GRADING & INCIDENTAL ITEMS

PROJECT LENGTH

PROJECT	GROSS MILES	NET MILES
TEU	1.658	1.658
Total	1.658	1.658



INDEX OF PLAN SHEETS

STANDARD DRAWINGS

D-704-8,9,10,11	CONSTRUCTION SIGN DETAILS
D-704-13	BARRICADE DETAILS
D-704-14	CONSTRUCTION SIGN & BARRICADE ASSEMBLY DETAILS
D-714-1	REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS
D-714-4	CORRUGATED STEEL PIPE CULVERTS
D-722-1	INLET TYPE 1
D-714-22	CONCRETE PIPE TIES
D-748-1	VALLEY GUTTER AND CURB AND GUTTER
D-754-24	MOUNTING DETAILS
D-754-26, 27, 28, 29, 30, 31	SIGN PUNCHING, STRINGER & SUPPORT LOCATIONS DETAILS

P S & E Corrections Made August, 1994

Surveyed & Designed Date June, 1994

Kadrmas, Lee & Jackson, PC.
Consulting Engineers and Surveyors
Valley City, Bismarck & Dickinson, N.D.

NILES HUSHKA REGISTERED PROFESSIONAL ENGINEER NORTH DAKOTA PE-2653

23

TEU-1-988(005)016

23

23

FHWA REGION	STATE	FEDERAL AID PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
8	N.D.	TEU-1-988(005)016	2	18

MANDAN REC. TRAIL
SUMMARY OF QUANTITIES
STA. 00+00 TO STA. 87+53

SPEC.	CODE	ITEM	UNIT	SHEET 7 SHEET 8	SHEET 9 SHEET 10	SHEET 11 SHEET 12	TOTAL
103	0100	Contract Bond	L.S.				1
201	0295	Clearing and Grubbing	L.F.	1,250	3,100	2,653	7,003
201	0360	Removal of Trees 6"	EA.	12	42		54
201	0370	Removal of Trees 10"	EA.	4	10		14
201	0395	Stump Removal	EA.	16	44		60
202	0130	Removal of Curb and Gutter	L.F.	140			140
202	0145	Remove & Salvage Concrete	S.Y.	36			36
203	0109	Topsoil	C.Y.	440	1,524	528	2,492
203	0101	Common Excavation, Type A	C.Y.	360		280	640
203	0119	Topsoil - Imported	C.Y.	15	15	15	45
203	0140	Borrow	C.Y.	2,470	8,255	370	11,095
216	0100	Water	MGAL.	15	45	7	67
230	0183	Subgrade Preparation, Type B (6")	L.F.	2,645	3,100	2,653	8,398
302	0305	Salvaged Bituminous Base Course	TON	338	775	665	1,778
408	0170	Hot Bituminous Pavement Cl. 25	TON	234	530	455	1,219
408	0310	85-100 Asphalt Cement	TON	17	38	33	88
702	0100	Mobilization	L.S.				1
704	1000	Traffic Control Signs	UNIT				272
704	1065	Traffic Cones	EA.				10
708	1020	Riprap, Loose Rock	C.Y.	10	30		40
708	2331	Seeding Type B Special	ACRE	1.10	2.60	1.05	4.75
708	4000	Sodding	S.Y.	300			300
714	0200	Pipe Conc. Reinf. 15" Cl. II	L.F.	28	68		96
714	0505	Pipe Conc. Reinf. 24" Cl. II	L.F.	8	35		43
748	0100	Curb and Gutter	L.F.	884	1,085		1,969
750	0105	Sidewalk, Concrete-Bikeway	S.Y.	825			825
752	0922	Fence, Remove & Reset	L.F.		900	140	1,040
752	1000	Post, Treated 6" x 6"	L.F.		240		240
754	0601	Remove & Reset Signs	EA.	3	1		4
754	0650	18" x 18" Signs	EA.	1			1
754	0621	Yield Signs R1-2-24	EA.			2	2
722	3500	Inlet - Type 1	EA.	1	3		4
762	1124	Pavement Marking, Painted 24" Line	L.F.	322			322
920	0265	Outlet Structure	EA.	1	3		4
970	0004	Landscape Interlocking Block	S.F.	875	200		1,075
970	0005	Landscape Preparation	L.F.	1,303	3,100	2,653	7,056
970	0010	Trees	EA.			136	136
970	0110	Herbicide Weed Control	L.F.	1,320	3,100	2,653	7,073

Kadrmas, Lee & Jackson, P.C.
November 17, 1994

BASIS OF ESTIMATE

COMMON EXCAVATION, TYPE A:

25% ADDITIONAL VOLUME HAS BEEN ADDED TO THE EMBANKMENT QUANTITIES FOR SHRINKAGE.
AN ADDITIONAL 10 CY OF BORROW PER 100 LF OF TRAIL HAS BEEN ADDED TO THE BORROW QUANTITIES. THIS WILL BE USED ALONG THE FULL LENGTH OF THE TRAIL.

WATER:

6 GALLONS PER TON OF SALVAGED BITUMINOUS BASE COURSE
5 GALLONS PER CUBIC YARD EMBANKMENT

SALVAGED BITUMINOUS BASE COURSE:

1.85 TON PER CUBIC YARD OF SALVAGED BITUMINOUS BASE COURSE

HOT BITUMINOUS PAVEMENT, CL. 25:

2 TON PER CUBIC YARD OF HOT BITUMINOUS PAVEMENT, CL. 25

85-100 ASPHALT CEMENT:

7% 85-100 ASPHALT CEMENT PER TON OF HOT BITUMINOUS PAVEMENT, CL. 25

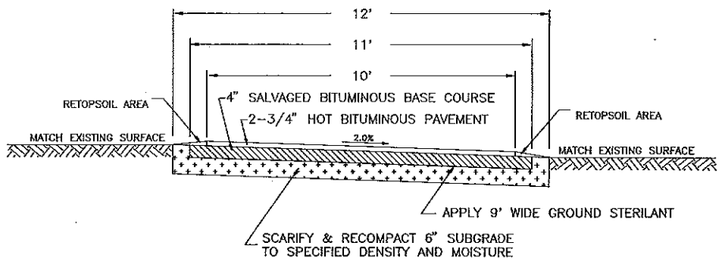
FHWA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	3

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

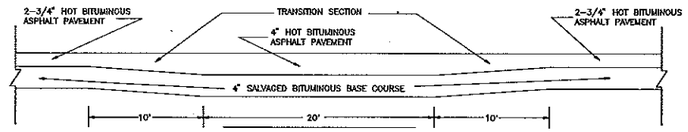
Kadrmas Lee & Jackson PC
Consulting Engineers & Surveyors

MANDAN REC. TRAILS DETAILS

CHK'R. NO.:	DATE
1451714	JULY 1994
DRWN. BY	CHK'D BY
T.R	R.S. & T.R.

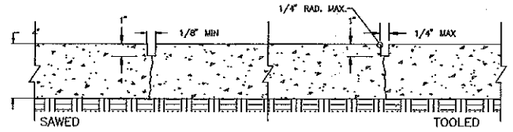


TYPICAL TRAIL SECTION



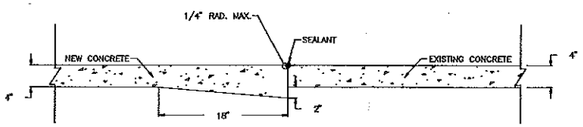
THICKENED HOT BITUMINOUS PAVEMENT SECTION

EXACT LOCATION DETERMINED BY ENGINEER IN THE FIELD
NOT TO SCALE



TRANSVERSE CONTRACTION JOINT

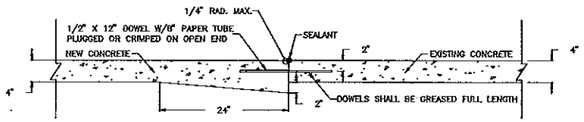
NOT TO SCALE



MATCH EXISTING TRANSVERSE JOINTS

CONCRETE SIDEWALK WIDENING

NOT TO SCALE

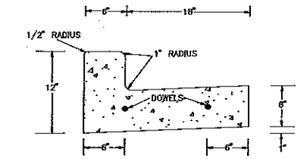


EXPANSION JOINT

NOT TO SCALE

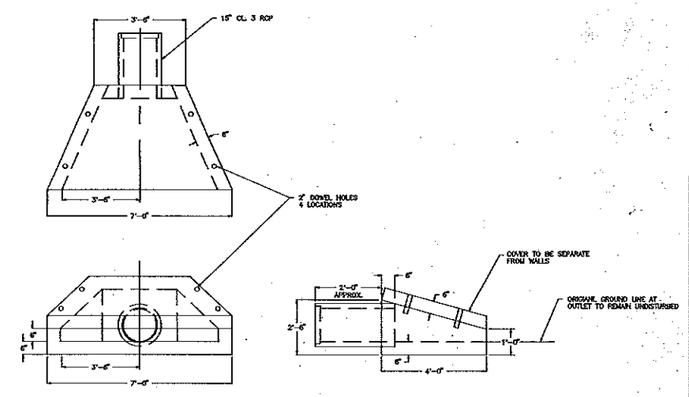
NOTE: PLACE EXPANSION JOINTS 96' APART
EXTEND CONTRACTION JOINTS FROM EXISTING SIDEWALK.

CONCRETE TRAIL DETAILS

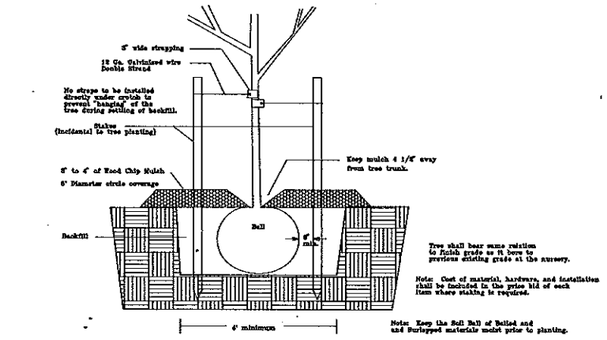


TYPICAL CURB & GUTTER DETAIL

NOT TO SCALE



OUTLET STRUCTURE DETAILS



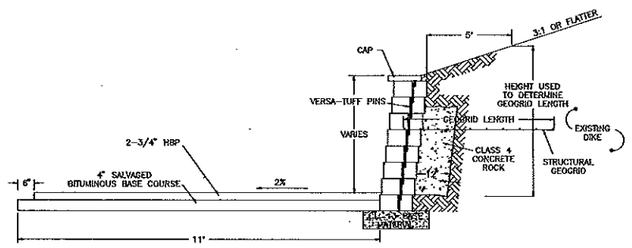
TYPICAL SIGN POSITION DETAIL EXISTING STREET

NOTE:

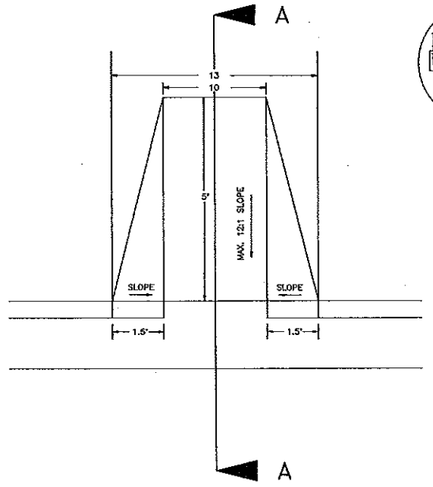
SEE PLAN SHEETS FOR SIGN LOCATIONS

TYPICAL SIGN POSITION DETAIL (TRAIL)

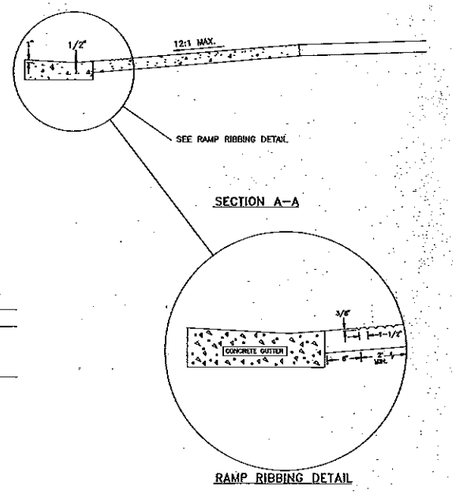
TYPICAL TREE PLANTING DETAIL



RETAINING WALL DETAIL



PLAN



RAMP RIBBING DETAIL

WHEEL CHAIR RAMP DETAILS

100. 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. UNDERGROUND UTILITIES: THE CONTRACTOR SHALL NOTIFY THE LOCAL UTILITY COMPANIES PRIOR TO THE BEGINNING OF CONSTRUCTION, SO THEY MAY DETERMINE THE LOCATION 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. 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 NOT DISTURBED. CONTRACTOR SHALL NOT BE PERMITTED ANY UNNECESSARY EQUIPMENT OPERATION UNDER OR AROUND TREES. THIS INCLUDES PARKING OF EQUIPMENT IN THE SHADE.

201. CLEARING AND GRUBBING: PRIOR TO PERFORMING LANDSCAPE PREPARATION, THE CONTRACTOR SHALL PERFORM CLEARING AND GRUBBING. THIS SHALL INCLUDE THE REMOVAL OF BRUSH, DEADFALL, ROCKS, GARBAGE, AND DEBRIS AND ALL OTHER SUCH ITEMS FROM THE TRAIL CONSTRUCTION CORRIDOR. THE WIDTH SHALL BE NO LESS THAN 10 FEET ON EITHER SIDE OF THE TRAIL CENTERLINE TO A MAXIMUM OF 5 FEET BEYOND THE TOE OF THE FILL SECTIONS AS SHOWN ON THE CROSS SECTIONS. THIS ITEM SHALL ALSO INCLUDE THE TRIMMING OF ANY TREE OR BRUSH LIMBS OR BRANCHES THAT WILL INTERFERE WITH TRAIL USE. BRANCHES AND LIMBS SHALL BE TRIMMED TO A DISTANCE OF 8 FEET FROM THE TRAIL CENTERLINE AND TO A HEIGHT OF 10 FEET ABOVE THE FINISHED TRAIL. ALL MATERIALS, LABOR AND INCIDENTALS TO COMPLETE THIS ITEM SHALL BE INCLUDED IN THE BID PRICE PER LINEAR FOOT OF CLEARING AND GRUBBING.

201. REMOVAL OF TREES AND BRUSH: CONTRACTOR SHALL DISPOSE OF ALL TREES AND BRUSH OFF SITE. DISPOSAL COSTS SHALL BE INCLUDED IN THE PRICE FOR REMOVAL OF TREES AND BRUSH. ANY TREES REMOVED BY THE CONTRACTOR WHICH ARE NOT MARKED FOR REMOVAL OR ANY TREES DAMAGED BEYOND THE REMOVAL LIMITS WILL BE REPLACED BY THE CONTRACTOR AT HIS OWN EXPENSE ON A TWO FOR ONE BASIS.

202. REMOVAL OF CURB AND GUTTER: CURB AND GUTTER SHALL BE REMOVED IN THOSE AREAS WHERE HANDICAP RAMPS ARE TO BE INSTALLED. REMOVAL OF CURB AND GUTTER SHALL BE DESIGNATED BY THE ENGINEER IN THE FIELD. ALL REMOVED CURB AND GUTTER SHALL BE DISPOSED OF BY CONTRACTOR AND SHALL BE INCLUDED IN THE PRICE FOR REMOVAL OF CURB AND GUTTER. SAWING, APPROXIMATELY 12 L.F., SHALL BE INCIDENTAL TO THE BID PRICE FOR REMOVAL OF CURB AND GUTTER.

203. COMMON EXCAVATION: PAYMENT FOR COMMON EXCAVATION SHALL BE IN ACCORDANCE WITH SECTION 203.03B OF THE STANDARD SPECIFICATIONS (CONTRACT QUANTITY).

203. BORROW: BORROW SHALL BE OBTAINED FROM ONE OF THE TWO DESIGNATED AREAS AS SHOWN IN THE PLANS. TOPSOIL REMOVAL, 6 INCHES, IN THE BORROW AREA SHALL BE PAID FOR AS BORROW. TOPSOIL REPLACEMENT SHALL BE CONSIDERED INCIDENTAL. BORROW MATERIAL SHALL BE PLACED IN ACCORDANCE TO SECTION 203.02G. PRIOR TO REPLACING TOPSOIL, THE BORROW AREA WILL BE RESHAPED AND THEN RESURVEYED SO AS TO DETERMINE FINAL QUANTITY OF BORROW MATERIAL. BORROW SHALL BE OBTAINED OVER A LARGE AREA SO AS TO MINIMIZE THE DEPTH OF THE SITE. MAXIMUM DEPTH SHALL NOT EXCEED 3 FEET WITH THE BOTTOM OF THE BORROW REMAINING LEVEL UPON PROJECT COMPLETION.

203. TOPSOIL: TOPSOIL SHALL BE REMOVED TO A DEPTH OF 2" AND A WIDTH OF 16 FEET, WITH HALF BEING BLADED TO EACH SIDE OF THE TRAIL, EXCEPT IN THOSE AREAS WHERE FILL MATERIAL IS BEING ADDED. IN FILL AREAS, TOPSOIL WILL BE REMOVED TO A WIDTH SUFFICIENT TO ACCOMMODATE THE FILL SECTION. ALL REMOVED TOPSOIL SHALL BE REPLACED. THE REPLACED TOPSOIL SHALL BE RAKED TO GRADE PRIOR TO SEEDING. ADDITIONAL RAKING MAY BE REQUIRED AFTER SEEDING. THE BID PRICE FOR TOPSOIL SHALL INCLUDE ALL COSTS ASSOCIATED WITH REMOVAL AND REPLACEMENT OF THE TOPSOIL.

230. SUBGRADE PREPARATION, TYPE B: THE SUBGRADE SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 6 INCHES AND COMPACTED AND SHAPED TO THE REQUIRED SECTION. THE COMPACTION SHALL BE AT ±2% OF OPTIMUM MOISTURE AND 92% OF MAXIMUM DENSITY BASED ON AASHTO T-99. TESTS SHALL BE TAKEN AT 2 PER 500 FEET WITH TEST LOCATIONS SELECTED AT RANDOM BY THE ENGINEER. TESTING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND ALL COSTS SHALL BE INCLUDED IN THE BID PRICE PER LINEAR FOOT OF SUBGRADE PREPARATION, TYPE B, MEASURED ON CENTERLINE.

302. SALVAGED BITUMINOUS BASE COURSE: THE SALVAGED BITUMINOUS BASE COURSE MATERIAL SHALL NOT EXCEED 1-1/2 INCHES IN SIZE. ANY OVERSIZED MATERIAL SHALL BE REMOVED PRIOR TO COMPACTION. THE MILLED ASPHALT SHALL MEET THE FOLLOWING GRADATION TABLE. THE CONTRACTOR SHALL PROVIDE THE FOLLOWING MATERIAL: (WHEREVER HE CAN GET IT)

SQUARE MESH SIEVE SIZE	PERCENT BY WEIGHT PASSING
1-1/2"	100
3/4"	70-100
No. 4	38-75
No. 30	12-37
No. 200	0-12
CLAY AND SOFT PARTICLES	8% MAXIMUM

THE SALVAGED BITUMINOUS BASE COURSE SHALL BE MECHANICALLY PLACED WITH EITHER AN ASPHALT PAVING MACHINE OR A JERSEY TYPE GRAVEL LAYDOWN MACHINE. THE MATERIAL SHALL BE COMPACTED WITH A STEEL DRUM ROLLER MEETING SECTIONS 151.02.C.2 OR 151.02.C.3, OR 151.02.D. PASSING AT LEAST TWICE OVER ALL AREAS.

THE SALVAGED BITUMINOUS BASE COURSE SHALL BE PLACED TO A DEPTH OF 4 INCHES. IF UNSTABLE AREAS ARE FOUND, ADDITIONAL RECYCLED MATERIAL MAY BE PLACED IN THESE AREAS AS DIRECTED BY THE ENGINEER AND WILL BE MEASURED AND PAID FOR AS SALVAGED BITUMINOUS BASE COURSE.

ALL COSTS ASSOCIATED WITH THE HAULING, PLACING AND COMPACTION, AS WELL AS THE MATERIAL COST, SHALL BE INCLUDED IN THE BID PRICE FOR SALVAGED BITUMINOUS BASE COURSE.

408. HOT BITUMINOUS PAVEMENT, CL. 25: THE CONTRACTOR SHALL HAVE AN INDEPENDENT TESTING LABORATORY PERFORM ALL MARSHALL MIX DESIGNS WITH THE AGGREGATE AND ASPHALT TO BE USED FOR THE PROJECT. THE COST SHALL BE INCLUDED IN THE PRICE BID FOR THE HOT BITUMINOUS PAVEMENT. THE MIX DESIGNS SHALL MEET THE FOLLOWING REQUIREMENTS:

STABILITY (MINIMUM) LB.	1800
FLOW (HUNDREDTH OF AN INCH)	10-20
PERCENT AIR VOIDS %	1 - 5

THE AGGREGATE SHALL MEET THE FOLLOWING GRADATION:

SQUARE MESH SIEVE SIZE	PERCENT BY WEIGHT PASSING
5/8"	100%
1/2"	80 - 100%
4	60 - 90%
8	35 - 70%
16	25 - 45%
30	15 - 35%
50	10 - 30%
100	6 - 20%
200	4 - 10%

THE CONTRACTOR SHALL FURNISH SAMPLES AND INFORM THE ENGINEER TWO WEEKS PRIOR TO PRODUCTION OF ANY STOCKPILES AS TO THE SOURCE OF AGGREGATE USED IN THE ASPHALT MIX DESIGN. ANY CHANGES IN AGGREGATE SOURCES, ASPHALT SOURCES OR OPERATIONS SHALL REQUIRE NEW OR ADDITIONAL MARSHALL MIX DESIGNS AT THE CONTRACTOR'S EXPENSE.

OTHER THAN THE MIX DESIGN AND AGGREGATE GRADATION PROVISIONS OUTLINED HEREIN, ALL OTHER PROVISIONS OF SECTION 408.04B SHALL REMAIN IN FORCE.

ORDINARY COMPACTION OF HOT BITUMINOUS PAVEMENT: COMPACTION SHALL BE IN ACCORDANCE TO SECTION 408.04.1.2

408. 85-100 ASPHALT CEMENT: THE HOT BITUMINOUS PAVING, CL. 25 SHALL HAVE MAXIMUM ASPHALT CONTENT OF 7.0%.

708. SEEDING TYPE B SPECIAL: CONTRACTOR SHALL USE A SEED MIXTURE CONSISTING OF 50% THICK SPIKE WHEAT GRASS AT 7 LBS./ACRE PURE LIVE SEED, 25% FAIRWAY CRESTED WHEATGRASS AT 4 LBS./ACRE PURE LIVE SEED AND 25% BEARDLESS WILD RYE AT 4 LBS./ACRE PURE LIVE SEED. THE APPLICATION TOTAL RATE SHALL BE 15 LBS./ACRE PURE LIVE SEED. THE CONTRACTOR SHALL USE A MECHANICAL TILLER ATTACHED TO THE DRILL TO AID IN PREPARING THE SEEDBED. RAKING MAY BE REQUIRED ALONG THE TRAIL UPON COMPLETION OF THE SEEDING. ALL COST OF MATERIALS AND PLACEMENT SHALL BE INCLUDED IN THE PRICE PER ACRE FOR SEEDING TYPE B SPECIAL.

714. PIPE: EXACT LOCATION OF PIPE SHALL BE DETERMINED BY FIELD ENGINEER SO AS TO PROVIDE POSITIVE DRAINAGE TO EXISTING DRAINAGE DITCH.

714. PIPE CONC. REINF. 24" CL. II: AT STATION 28 + 75, 55 FEET LEFT, CONTRACTOR SHALL REMOVE AN 8-FOOT SECTION OF 24" RCP AND INSTALL AN 8-FOOT SECTION OF 24" RCP WITH A TRASH GRATE CAST INTO THE PIPE. THE PIPE WILL BE TIED TO THE NEXT PIPE UPSTREAM ACCORDING TO NDDOT STANDARD DRAWING D-714-22. COST OF THE TRASH RACK, TIES, LABOR AND MATERIAL SHALL BE INCLUDED IN THE BID PRICE PER LINEAR FOOT OF PIPE CONC. REINF. 24" CL. II.

748. CURB AND GUTTER: NEW CURB AND GUTTER SHALL BE CONNECTED TO EXISTING CURB AND GUTTER WITH THE USE OF 3/4" EXPANSION MATERIAL BETWEEN THE NEW AND EXISTING AND THE USE OF 2 - 3/4"X24" SMOOTH DOWELS AND 16" PAPER TUBES PER END. DOWELS SHALL BE DRILLED 12" INTO THE EXISTING CURB AND GREASED THE FULL LENGTH. ALL PAPER TUBES SHALL BE PLUGGED OR CRIMPED ON OPEN ENDS AND ALL JOINTS SHALL BE SEALED WITH A SEALANT MEETING ASTM D-3405 STANDARDS.

COSTS OF DOWELS, PAPER TUBES, SEALANT AND LABOR SHALL BE INCLUDED IN BID PRICE FOR LINEAL FEET OF CURB AND GUTTER.

748. CURB AND GUTTER: NOTE #3 ON THE STANDARD DRAWINGS, SHEET D-748-1; DELETE BACKER ROD, THE JOINT SEALANT WILL BE PLACED OVER THE EXPANSION MATERIAL. NOTE #5 ON THE STANDARD DRAWINGS, SHEET D-748-1; SEALING OF CONTRACTION JOINTS ONLY, WILL NOT BE REQUIRED UNDER THIS PROJECT. THE SEALING OF EXPANSION JOINTS WILL BE AS STATED IN NOTE #5, SHEET D-748-1.

750. SIDEWALK, CONCRETE - BIKEWAY: CONTRACTOR SHALL PROVIDE TEMPORARY SIGNING AND/OR SUPERVISOR ALONG THE FRESH CONCRETE SIDEWALK IN ORDER TO PREVENT PEDESTRIAN USE UNTIL SUCH TIME THAT THE SIDEWALK HAS CURED TO SUPPORT SUCH TRAFFIC. COST OF SIGNING AND/OR SUPERVISOR SHALL BE INCIDENTAL TO THE BID PRICE FOR SIDEWALK, CONCRETE - BIKEWAY.

752. POSTS, TREATED 6" X 6": LOCATION OF POSTS WILL BE DETERMINED IN THE FIELD. THE CONTRACTOR WILL INSTALL 4-FOOT POSTS WITH 2 FEET PLACED BELOW THE GROUND. THE TOP FOOT OF THE POST WILL BE PAINTED WHITE. BID PRICE FOR POST, TREATED 6" X 6" LINEAR FOOT SHALL INCLUDE COST OF POST, DIGGING OF HOLE, BACKFILLING AROUND THE POST, PAINTING AND ALL OTHER EQUIPMENT, LABOR AND NECESSITIES TO COMPLETE THIS ITEM.

754. REMOVE AND RESET SIGNS: CONTRACTOR SHALL REMOVE AND RESET TRAILER COURT SIGN AT STATION 14+75, 7' RT. AND TROLLEY CAR SIGN AT STATION 38+45, CENTERLINE. TRAILER COURT SIGN WILL BE RELOCATED TO STATION 14+75, 12' RT. TROLLEY CAR SIGN RELOCATION WILL BE DETERMINED IN THE FIELD. ADDITIONAL TRAFFIC SIGNS WILL BE RESET AS INDICATED ON THE PLANS. THE BID PRICE FOR REMOVE AND RESET SIGNS, EACH SHALL INCLUDE ALL EQUIPMENT, LABOR, AND MATERIALS.

754. SIGNS: BID PRICE PER EACH FOR SIGNS SHALL INCLUDE POSTS AND ALL OTHER REQUIRED MATERIALS PLUS EQUIPMENT AND LABOR TO INSTALL THE SIGNS IN THE LOCATIONS SHOWN ON THE PLANS. POSTS SHALL BE 2" X 2" SQUARE TUBE PERFORATED WITH ANCHOR UNIT AND POST SLEEVE ASSEMBLY.

754. TRAFFIC SIGNING: PERMANENT TRAFFIC SIGNING WILL BE INSTALLED BY THE CONTRACTOR. THE FOLLOWING SIGN LIST SHALL BE FOLLOWED:

MANDAN BIKE TRAIL				
STA.	LOCATION EACH	SIGN NO.	DESCRIPTION	QUANTITY
0+10	7'LT	R1-1	Stop	1
76+95	8'RT	R1-2-24	Yield	1
77+43	8'RT	R1-2-24	Yield	1

762. PAVEMENT MARKING PAINTED LINE: PAVEMENT MARKINGS SHALL BE 24" X 10' AND PLACED AS SHOWN ON THE DETAIL SHEET. MARKINGS SHALL BE PLACED AT TRAIL CROSSINGS ON EIGHTH, NINTH, AND ELEVENTH AVENUES SE.

970. LANDSCAPE INTERLOCKING BLOCK: CONTRACTOR SHALL USE A VERSA-LOK BRAND RETAINING WALL OR AN APPROVED EQUAL. THE MANUFACTURER'S INSTALLATION SPECIFICATIONS SHALL BE FOLLOWED AS OUTLINED IN THE "DESIGN AND INSTALLATION GUIDE" SUPPLIED BY VERSA-LOK. WHEN DETERMINING GRID LENGTH, "H" WILL BE THE HEIGHT OF THE FILL FIVE FEET BEHIND THE WALL (DIFFERENCE BETWEEN FINISH TRAIL AND TOP OF DIKE). FOR WALL HEIGHT GREATER THAN THREE FEET, GEOGRID SHALL BE INSTALLED 1.5 FEET BELOW TOP OF FINISHED WALL. CONTRACTOR SHALL USE A MIRAFI 5T GEOGRID WITH A LONG TERM ALLOWABLE DESIGN STRENGTH OF 662 LBS./FT. BASE MATERIAL SHALL BE A CLASS 13 AND DRAINAGE FILL SHALL BE A CLASS 4 CONCRETE ROCK. CONTRACTOR SHALL REMOVE ONLY THAT MATERIAL REQUIRED TO COMPLETE THE RETAINING WALL AS SHOWN IN THE MANUFACTURER'S HANDBOOK. BASE MATERIAL, DRAINAGE FILL, GEOGRID, AND ALL OTHER MATERIALS, LABOR AND EQUIPMENT REQUIRED TO INSTALL THE RETAINING WALL SHALL BE INCLUDED IN THE BID PRICE PER SQUARE YARD OF LANDSCAPE INTERLOCKING BLOCK. EXCAVATION SHALL BE PAID FOR UNDER COMMON EXCAVATION TYPE A.

970. LANDSCAPE PREPARATION: CONTRACTOR SHALL APPLY ROUNDUP TO THE TRAIL CONSTRUCTION CORRIDOR 10 DAYS PRIOR TO MOWING/MULCHING OF THE CORRIDOR. ROUNDUP WILL NOT BE APPLIED NEXT TO RESIDENTIAL AREAS OR IN WOODED AREAS. GRASSES WILL BE MULCHED TO WITHIN 1 INCH OF THE EXISTING GROUND, USING A MULCHING MOWER CAPABLE OF PRODUCING STANDS OF 1 INCH OR LESS IN LENGTH. COST OF MATERIALS, EQUIPMENT, LABOR AND INCIDENTALS TO COMPLETE THIS ITEMS SHALL BE INCLUDED IN THE BID PRICE PER LINEAR FOOT OF LANDSCAPE PREPARATION.

970. HERBICIDE WEED CONTROL: CONTRACTOR SHALL PLACE A GRANULAR HERBICIDE IN THE AREAS WHERE THE HOT BITUMINOUS PAVEMENT TRAIL WILL BE PLACED. THE HERBICIDE SHALL BE PLACED TO A WIDTH OF 9 FEET. CONTRACTOR SHALL USE NOROSAC 106 AT AN APPLICATION RATE OF 100 - 120 LBS. PER ACRE OR 2.3 - 2.8 LBS. PER 1,000 S.F. OR DYCLOMEC 46 AT AN APPLICATION RATE OF 250-300 LBS. PER ACRE OR 5.75 - 7.0 LBS. PER 1,000 S.F. OR AN APPROVED EQUAL. THE HERBICIDE SHALL BE PLACED IMMEDIATELY AHEAD OF THE PLACEMENT OF THE RECYCLED ASPHALT.

970. TREES. CONTRACTOR SHALL USE CITY OF BISMARCK FORESTRY DEPARTMENT SPECIFICATIONS FOR TREE AND SHRUB PLANTING. REPLACEMENT SHALL BE ON A 2-FOR-1 BASIS. THE CONTRACTOR SHALL USE BALL AND BURLAPPED TREES, WITH A MINIMUM TRUNK DIAMETER OF 1-1/2 INCHES, SUCH AS GREEN ASH, BLACK ASH, AMUR MAPLE, FLOWERING CRAB, AMUR CHOKECHERRY, MEADOWLARK FORSYTHIA, FERNLEAS BUCKTHORN OR OTHER APPROVED TREES. THE TREES SHALL BE OF A VARIETY OF NOT LESS THAN SIX VARIOUS SPECIES APPROVED BY THE ENGINEER PRIOR TO PLANTING. TREES WILL BE PLANTED IN THE AREA ALONG EITHER SIDE OF LONGSPUR TRAIL SE, AS DIRECTED BY THE ENGINEER AND MANDAN PARKS AND RECREATION. BID PRICE PER TREE SHALL INCLUDE COST OF TREES, TRANSPORTING AND PLACING OF TREES, MULCH AROUND TREES, WATERING OF TREES AND PROPER MAINTENANCE DURING WARRANTY PERIOD OF ONE YEAR AS SPECIFIED IN THE ABOVE-MENTIONED SPECIFICATION.

ACCESS: THE CONTRACTOR SHALL MAINTAIN ACCESS TO THE TWO TROLLEY CAR PARKING AREAS AND THE PRAIRIE WEST GOLF COURSE.

PRAIRIE WEST GOLF COURSE: THE SECTION OF TRAIL ALONG THE PRAIRIE WEST GOLF COURSE PARALLELS GREENS, TEE BOXES AND FAIRWAYS. AT NO TIME SHALL THE CONTRACTOR HAVE EQUIPMENT, MATERIALS OR LABORERS ON THESE AREAS UNLESS WRITTEN PERMISSION IS RECEIVED FROM THE MANDAN PARKS AND RECREATION DEPARTMENT AND THE PRAIRIE WEST GOLF COURSE.

PROJECT NO. TEU-1-988(005) 016

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB-TOTAL
R1-1-30	30" X 30"	STOP		17	
R1-1-48	48" X 48"	STOP		34	
R1-2-48	48" X 48 & 36" X 30"	YIELD & TO ONCOMING TRAFFIC		45	
R2-1-48	48" X 60"	SPEED LIMIT		40	
R2-5C-48	48" X 60"	SPEED ZONE AHEAD		40	
R4-1-48	48" X 60"	DO NOT PASS		40	
R4-7-48	48" X 60"	KEEP RIGHT SYMBOL		40	
R4-8-48	48" X 60"	KEEP LEFT SYMBOL		40	
R10-6-48	48" X 72"	STOP HERE ON RED		44	
R11-2-48	48" X 30"	ROAD CLOSED		26	
R11-3a-60	60" X 30"	ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		30	
R11-3b-60	60" X 30"	BRIDGE OUT __ MILES AHEAD LOCAL TRAFFIC ONLY		30	
R11-2a-48	48" X 30"	STREET CLOSED		26	
R11-3C-48	60" X 30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		30	
R11-4a-60	60" X 30"	STREET CLOSED TO THRU TRAFFIC		30	
G20-1-60	60" X 36"	ROAD CONSTRUCTION NEXT __ MILES		34	
G20-2-60	60" X 24"	END CONSTRUCTION		28	
G20-2a-48	48" X 24"	END ROAD WORK		24	
G20-4-36	36" X 18"	PILOT CAR FOLLOW ME		10	
G20-50-72	72" X 36"	ROAD CONSTRUCTION NEXT __ MILES RT & LT ARROWS		38	
G20-52-72	72" X 24"	ROAD CONSTRUCTION NEXT __ MILES RT or LT ARROWS		30	
G20-54-48	48" X 36"	OVERHEAD BRIDGE PAINTING		30	
G20-8-48	48" X 36"	TEMPORARY SURFACE NEXT __ MILES		30	
M4-10-48	18" X 48"	DETOUR ARROW RIGHT OR LEFT		22	
W1-1-48	48" X 48"	RIGHT or LEFT SHARP CURVE ARROW		34	
W1-2-48	48" X 48"	RIGHT or LEFT CURVE ARROW		34	
W1-3-48	48" X 48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW		34	
W1-4-48	48" X 48"	RIGHT or LEFT REVERSE CURVE ARROW		34	
W1-6-48	48" X 24"	LARGE ARROW		26	
W3-1a-48	48" X 48"	STOP AHEAD SYMBOL		34	
W3-2a-48	48" X 48"	YIELD AHEAD SYMBOL		34	
W3-3-48	48" X 48"	SIGNAL AHEAD SYMBOL		34	
W4-2-48	48" X 48"	LANE TRANSITION SYMBOL		34	
W5-1-48	48" X 48"	ROAD NARROWS		34	
W6-3-48	48" X 48"	TWO WAY TRAFFIC SYMBOL		34	
W8-1-48	48" X 48"	BUMP		34	
W8-3a-48/W8-3a-24	48" X 48"/24" X 18"	PAVEMENT ENDS SYMBOL/PAVEMENT ENDS PLAQUE		40	
W8-9-48	48" X 48"	LOW SHOULDER		34	
W8-51-48	48" X 48"	UNEVEN PAVEMENT		34	
W8-53-48	48" X 48"	TRUCKS ENTERING HIGHWAY	4	34	136
W8-54-48	48" X 48"	TRUCKS ENTERING AHEAD OR __ FT.		34	
W8-55-48	48" X 48"	TRUCKS CROSSING AHEAD or __ FT.		34	
W13-1-24	24" X 24"	15 MPH ADVISORY SPEED PLATE		10	
W13-4-48	48" X 60"	RAMP ARROW		40	
W20-1-48	48" X 48"	ROAD CONSTRUCTION - AHEAD, 1/2 MILE, or FT.		34	
W20-1a-48	48" X 48"	MEN WORKING SYMBOL		34	
W20-2-48	48" X 48"	DETOUR __ FT.		34	
W20-3-48	48" X 48"	ROAD or STREET CLOSED AHEAD or __ FT.		34	
W20-4-48	48" X 48"	ONE LANE ROAD AHEAD or __ FT.		34	
W20-5-48	48" X 48"	RIGHT OR LEFT LANE CLOSED AHEAD or __ FT.		34	
W20-7a-48	48" X 48"	FLAGGING SYMBOL		34	
W20-7k-24	24" X 18"	FEET		8	
W20-8-48	48" X 48"	STREET CLOSED		34	
W20-50-48	48" X 48"	BE PREPARED TO STOP		34	
W20-51-48	48" X 48"	EQUIPMENT WORKING	2	34	68
W20-52-54	54" X 12"	NEXT __ MILES		10	
W21-2-48	48" X 48"	FRESH OIL		34	
W21-5-48	48" X 48"	SHOULDER WORK	2	34	68
W21-50-48	48" X 48"	BRIDGE PAINTING AHEAD or __ FT.		34	
W21-51-48	48" X 48"	MATERIAL ON ROADWAY		34	
W22-7-48	48" X 48"	SINGLE LANE AHEAD or __ FT.		34	
W22-8-48	48" X 48"	FRESH OIL LOOSE ROCK		34	
R1-1a-18/W22-14-18	18" X 18"	STOP and SLOW PADDLE Back to Back		8	
		TOTAL UNITS			272
TYPE III	8' LONG	BARRICADES	EACH		
TYPE II	2' MIN.	BARRICADES	EACH		
TYPE I	6' TO 10'	BARRICADES	EACH		
	18" X 36" MIN.	DELINEATOR DRUMS	EACH		
	28" MIN.	TRAFFIC CONES	EACH		10
	8" TO 12" X 24"	VERTICAL PANELS	EACH		
	3" X 8"	DELINEATOR	EACH		
		SEQUENCING ARROW PANEL TYPE C	EACH		

FHWA REGION	STATE	FEDERAL AID PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
8	N.D.	TEU-1-988(005)016	6	18

NOTES:

Removal of Curb and Gutter	140	L.F.
Remove and Salvage Concrete	38	S.Y.
Topsoil	130	C.Y.
Subgrade Preparation, Type B (6")	1,395	L.F.
Salvaged Bituminous Base Course	18	TON
Hot Bituminous Pavement, Cl. 25	12	TON
85-100 Asphalt Cement	1	TON
Seeding, Type B Special	.10	ACRE
Sodding	300	S.Y.
Curb and Gutter	84	L.F.
Sidewalk, Concrete - Bikeway	825	S.Y.
Pavement Marking, Painted 24" Line	322	L.F.
Landscape Preparation	53	L.F.
Herbicide Weed Control	70	L.F.

SIGNS - INSTALL 18"x18"

STA. 0+10 7'LT. R1-1

BENCH MARK LIST

NO.	DESCRIPTION	LOCATION	ELEVATION
1	CP #6A 2X2 W/ NAIL	N 4973.34 E 2851.11	1008.71

T 139N
R81W

N

50 0 50 100
scale 1"=50' feet

FHWA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	7

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

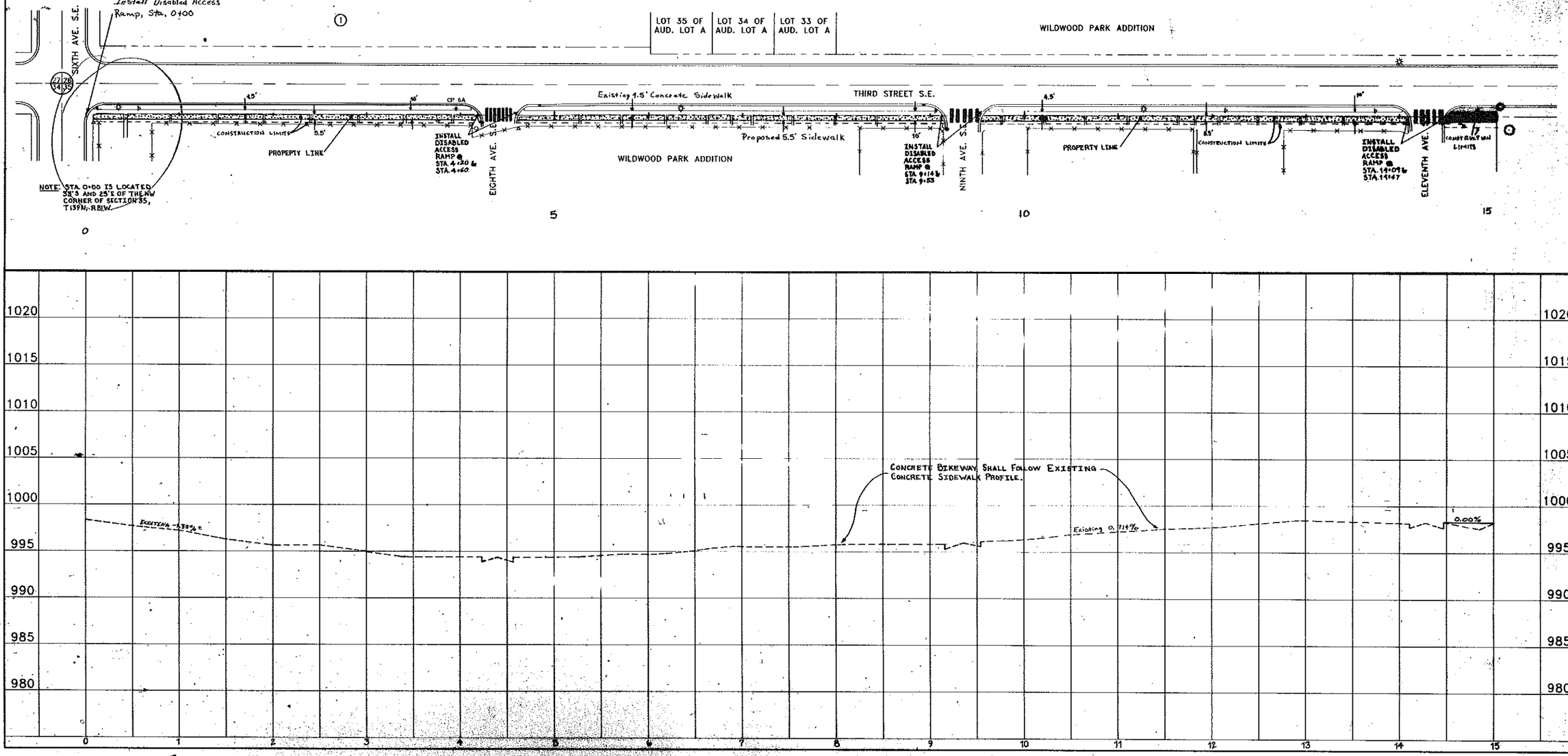
Kadrmas Lee & Jackson PC
Consulting Engineers & Surveyors

MANDAN REC. TRAILS
PLAN & PROFILE

CMPR. NO.:	DATE
14517	JULY 1994
DRWN. BY	CHK'D BY
AH	T.R.

Note:
Install Painted Crosswalks
14' In Length W/2' Wide Bars
At Eighth, Ninth & Eleventh Ave. S.E.

STA. 14+65 7' Rt.
Remove & Reset Trailer Court Sign to STA. 14+65, 12' Rt.



Trail Cross Slope Table

Sta. 15+00,	1%	Slope	Lt.
Sta. 16+00,	2%	Slope	Lt.
Sta. 25+00,	2%	Slope	Lt.
Sta. 30+00,	2%	Slope	Lt.

NOTES:

Clearing and Grubbing	1,250	L.F.
Topsoil	310	C.Y.
Excavation, Type A	360	C.Y.
Borrow	2,470	C.Y.
Subgrade Preparation, Type B (6")	1,250	L.F.
Salvaged Bituminous Base Course	320	TON
Hot Bituminous Pavement, Cl. 25	222	TON
85-100 Asphalt Cement	16	TON
Rip Rap	10	C.Y.
Seeding Type B Special	1.00	ACRE
Pipe Concrete Reinf. 15" Cl. II	28	L.F.
Inlet, Type 1	1	EACH
Curb and Gutter	800	L.F.
Outlet Structure - 15"	1	EACH
Landscape Interlocking Block	620	S.F.
Landscape Preparation	1,250	L.F.
Herbicide Weed Control	1,250	L.F.

BENCH MARK LIST

NO.	DESCRIPTION	LOCATION	ELEVATION
1	CP #5 2X2 W/ NAIL	N 4987.81 E 3527.16	1009.47
2	CP #6 2X2 W/ NAIL	N 5052.80 E 2908.35	1010.22

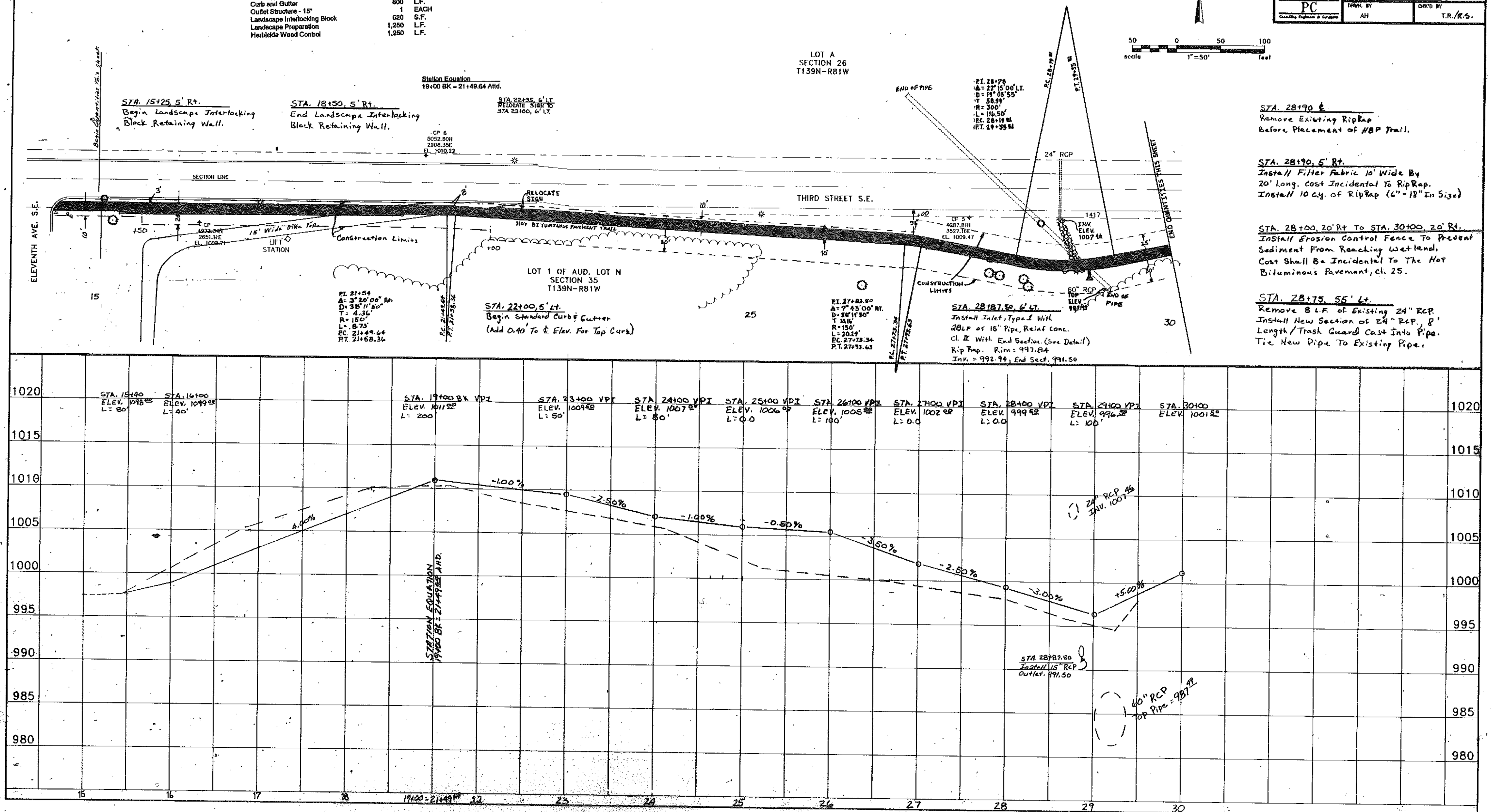
FHWA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	8

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

Kadrmas Lee & Jackson PC
Consulting Engineers & Surveyors

MANDAN REC. TRAILS PLAN & PROFILE

CLIP'R. NO.:	DATE
14517	JULY 1994
DRWN. BY	CHK'D BY
AH	T.R./R.S.



N
50 0 50 100
scale 1"=50' feet
Station Equation
19+00 BK = 21+49.64 Ahd.
STA. 15+25, 5' Rt.
Begin Landscape Interlocking Block Retaining Wall.
STA. 18+50, 5' Rt.
End Landscape Interlocking Block Retaining Wall.
STA. 22+35, 6' Lt.
RELOCATE SIGN TO STA 23+00, 6' LT.
CP 6 5052.80N 2908.35E EL. 1010.22
SECTION LINE
RELOCATE SIGN
LOT A
SECTION 26
T139N-R81W
THIRD STREET S.E.
ELEVENTH AVE. S.E.
15' Wide Bike Trail
HOT BITUMINOUS PAVEMENT TRAIL
Construction Limits
LIFT STATION
CP 4972.04N 2651.14E EL. 1008.71
CP 5 4987.81N 3527.16E EL. 1009.47
LOT 1 OF AUD. LOT N
SECTION 35
T139N-R81W
P.I. 21+54
Δ: 3°20'00" Rt.
D: 38°11'50"
T: 4.36'
R: 150'
L: 8.73'
P.C. 21+49.64
P.T. 21+58.36
STA. 22+00, 5' Lt.
Begin Standard Curb & Gutter
(Add 0.40' To ℄ Elev. For Top Curb)
P.I. 27+83.50
Δ: 7°45'00" Rt.
D: 38°11'50"
T: 10.16'
R: 150'
L: 20.29'
P.C. 27+73.34
P.T. 27+93.63
END OF PIPE
P.I. 28+78
Δ: 22°15'00" Lt.
D: 19°05'55"
T: 58.99'
R: 300'
L: 116.50'
P.C. 28+19.51
P.T. 29+35.51
24" RCP
INV. ELEV. 1007.46
60" RCP TOP ELEV. 987.97
END OF PIPE
CONSTRUCTION LIMITS
STA. 28+87.50, 6' Lt.
Install Inlet, Type 1 With 28LF of 15" Pipe, Reinf Conc. Cl. II With End Section (See Detail) Rip Rap. Rim: 997.84 Inv. = 992.94, End Sect. 991.50
END QUANTITIES THIS SHEET
STA. 28+90 ℄
Remove Existing RipRap Before Placement of HBP Trail.
STA. 28+90, 5' Rt.
Install Filter Fabric 10' Wide By 20' Long. Cost Incidental To RipRap. Install 10 c.y. of RipRap (6"-18" In Size)
STA. 28+00, 20' Rt To STA. 30+00, 20' Rt.
Install Erosion Control Fence To Prevent Sediment From Reaching Wetland. Cost Shall Be Incidental To The Hot Bituminous Pavement, Cl. 25.
STA. 28+75, 55' Lt.
Remove 8 L.F. of Existing 24" RCP. Install New Section of 24" RCP, 8' Length / Trash Guard Cast Into Pipe. Tie New Pipe To Existing Pipe.
STA. 15+40 ELEV. 1098.00 L= 80'
STA. 16+00 ELEV. 1099.00 L= 40'
STA. 19+00 BK VPI ELEV. 1011.00 L= 200'
STA. 23+00 VPI ELEV. 1009.00 L= 50'
STA. 24+00 VPI ELEV. 1007.00 L= 50'
STA. 25+00 VPI ELEV. 1006.00 L= 0.0
STA. 26+00 VPI ELEV. 1005.00 L= 100'
STA. 27+00 VPI ELEV. 1002.00 L= 0.0
STA. 28+00 VPI ELEV. 999.00 L= 0.0
STA. 29+00 VPI ELEV. 996.00 L= 100'
STA. 30+00 ELEV. 1001.50
4.00%
-1.00%
-2.50%
-1.00%
-0.50%
-3.50%
-2.50%
-3.00%
+5.00%
STATION EQUATION 19+00 BK = 21+49.64 AHD.
24" RCP INV. 1007.46
STA 28+87.50 Install 15" RCP Outlet. 991.50
60" RCP Top Pipe = 987.97
1020
1015
1010
1005
1000
995
990
985
980
15
16
17
18
19+00 = 21+49.64
22
23
24
25
26
27
28
29
30

Trail Cross Slope Table

Sta. 30+00,	2%	Slope	Lt.
Sta. 36+00,	2%	Slope	Lt.
Sta. 38+00,	2%	Slope	Lt.
Sta. 38+50,	0%	Slope	
Sta. 39+00,	2%	Slope	Rt.
Sta. 42+00,	2%	Slope	Rt.
Sta. 43+00,	2%	Slope	Lt.
Sta. 46+00,	2%	Slope	Lt.

NOTES:

#			
9	Clearing and Grubbing	1,600	L.F.
	Topsoil	1,170	C.Y.
	Borrow	6,860	C.Y.
	Subgrade Preparation, Type B (6")	1,600	L.F.
	Salvaged Bituminous Base Course	400	TON
	Hot Bituminous Pavement Cl. 26	275	TON
	85-100 Asphalt Cement	20	TON
	Rip Rap	30	C.Y.
	Seeding Type B Special	1.95	ACRE
	Pipe Concrete Reinf. 15" Cl. II	68	L.F.
	Pipe Concrete Reinf. 24" Cl. II	35	L.F.
	Inlet, Type I	3	EACH
	Curb and Gutter	1,085	L.F.
	Outlet Structure - 15"	3	EACH
	Landscape Interlocking Block	200	S.F.
	Landscape Preparation	1,600	L.F.
	Herbicide Weed Control	1,600	L.F.

BENCH MARK LIST

NO.	DESCRIPTION	LOCATION	ELEVATION
1	CP #3 2X2 W/ NAIL	N 4990.10 E 4587.13	1013.89
2	CP #4 2X2 W/ NAIL		
3	CP #7 2X2 W/ NAIL	N 4577.39 E 5111.38	1007.94

STA 38+50 - ℄
RELOCATE EXISTING RAIL CAR STOP TO STA 38+50, 10' RT. EXISTING TRACKS TO REMAIN. COST INCIDENTAL TO HBP CL. 2.5

STA 38+45 - ℄
RELOCATE TROLLEY CAR SIGN. NEW LOCATION WILL BE DETERMINED IN FIELD.

STA 38+01 TO STA 39+00
EXISTING GRAVEL SURFACE TO MATCH TRAIL ELEVATION. COST INCIDENTAL TO BID PRICE FOR HBP CL. 2.5

FINA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	9

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

Kadrmas Lee & Jackson PC

MANDAN REC. TRAILS PLAN & PROFILE

CNPR. NO.:	DATE
14517	JULY 1994
DRWN. BY: AH	CHK'D BY: T.R. /R.S.

SECTION 26 T139N-R81W

P.T. 31+24.52
Δ = 10° 30' 00" RT.
D = 26° 38' 52"
T = 18.35'
R = 200'
L = 36.65'
P.C. 31+05.74
P.T. 31+42.52

STA. 31+10, 5' Lt. End Standard Curb & Gutter

STA. 31+35, 5' Lt. Begin Standard Curb & Gutter

THIRD STREET S.E.

STA. 34+63 ℄, REGRADE EXISTING TROLLEY CAR ACCESS ROAD. COST INCIDENTAL TO PROJECT.

STA. 34+50, 5' Lt. End Standard Curb & Gutter

STA. 34+70, 5' Lt. Begin Standard Curb & Gutter (Add 0.40' To ℄ Elev. For Top Curb)

36" RCP PIPE END

P.T. 37+50
Δ = 10° 15' 06" LT.
D = 13° 55' 06"
T = 22.62'
R = 250'
L = 44.74'
P.C. 37+27.88
P.T. 37+72.62

STA. 34+00, 5' Rt. Begin Standard Curb & Gutter (Add 0.40' To ℄ Elev. For Top Curb)

STA. 34+10, 5' Rt. End Standard Curb & Gutter

AUD. LOT 4 OF LOT 4 SECTION 35 T139N-R81W

CP 1 5000N 5000E EL. 1000.00

LARK COMMERCIAL PARK II SECTION 35 T139N-R81W

APPROX. PROPERTY LINE

REMOVE ± 80 TREES 6"ø +

MAIN LINE

TROLLEY STATION

CP 3 4587.13E 1013.89

P.I. 39+13
Δ = 78° 00' 00" RT
D = 60° 00' 00"
T = 109.85'
R = 95.49'
L = 145.33'
P.C. 38+03.32
P.T. 39+48.65

P.I. 40+97
Δ = 75° 30' 00" LT.
D = 60° 00' 00"
T = 75.94'
R = 95.49'
L = 125.83'
P.C. 40+21.03
P.T. 41+46.86

P.C. 40+21.03

CONSTRUCTION LIMITS

STA. 42+50, 6' Rt. End Standard Curb & Gutter

10' H.B.P.

TOE OF DIKE

MINIMUM 10'

TOP OF DIKE

P.I. 44+87.86
Δ = 35° 40' 00" RT
D = 22° 50' 08"
T = 75.63'
R = 250'
L = 14.96'
P.C. 44+11.82
P.T. 45+58.72

STA. 45+67, 16' Rt. EXTEND EXISTING 24" RCP TO STA. 45 +60, 15 LT.

END SECTION

CP 7 4577.38N 5111.38E EL. 1007.94

Note:
Vertical Guy Wire Clearance Above Right Edge Of Trail Is Greater Than 8 Feet.

STA. 34+45, 6' Lt.
Install Inlet, Type I With 24LF of 15" Pipe, Reinf. Conc. Cl. II With End Sect. (See Detail)
Rim = 1003.90
Inv. = 1000.00
End Sect. = 999.80

STA. 34+75, 6' Lt.
Install Inlet, Type I With 24LF of 15" Pipe, Reinf. Conc. Cl. II With End Sect. (See Detail)
Rim = 1003.90
Inv. = 1000.00
End Sect. = 999.80

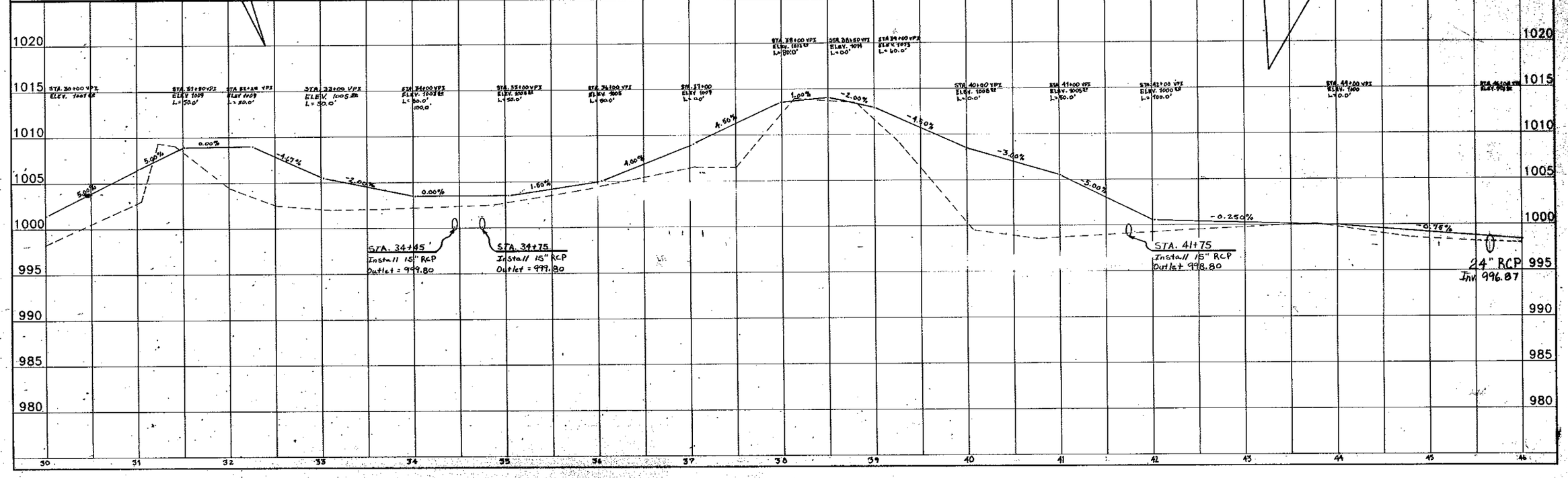
INTERLOCKING BLOCK DETAIL

NOTE:
FOUR OLD COTTONWOODS EXIST ALONG THE SOUTH SIDE OF THE PROPOSED TRAIL. THE ENGINEER WILL IDENTIFY THESE TREES AND THEY WILL REMAIN IN PLACE. THE CONTRACTOR SHALL PLACE INTERLOCKING BLOCKS AROUND THE BASE IN A HALF CIRCLE. THE BLOCKS WILL BE A MINIMUM OF FIVE FEET FROM THE BASE AND CONSTRUCTED TO A HEIGHT OF 2.5 FEET. MEASUREMENT SHALL BE ON THE VERTICAL FACE AND NOT ON THE INCLINE. CONTRACTOR SHALL USE VENEA LOCKSPLIT FACE BLOCKS OR AN APPROVED EQUAL. BLOCKS WILL BE 8" X 16" X 12" DEEP, STACKED WITH A 1/8" OFFSET. THE COST SHALL INCLUDE PINS, MATERIALS, AND LABOR.

CP 4 4728.80N 4614.55E EL. 1014.21

STA. 41+75, 6' Rt.
Install Inlet, Type I With 20 LF of 15" Pipe, Reinf. Conc. Cl. II With End Sect. (See Detail)
Rim = 1002.30
Inv. = 999.00
End Sect. 998.80

scale 1"=50' (50 0 50 100 feet)



FHWA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	10

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

Kadrmas Lee & Jackson PC
Consulting Engineers & Surveyors

MANDAN REC. TRAILS
PLAN & PROFILE

CHKR. NO.:	DATE
14517	JULY 1994
DRWN. BY	CHK'D BY
AH	T.R./R.S.

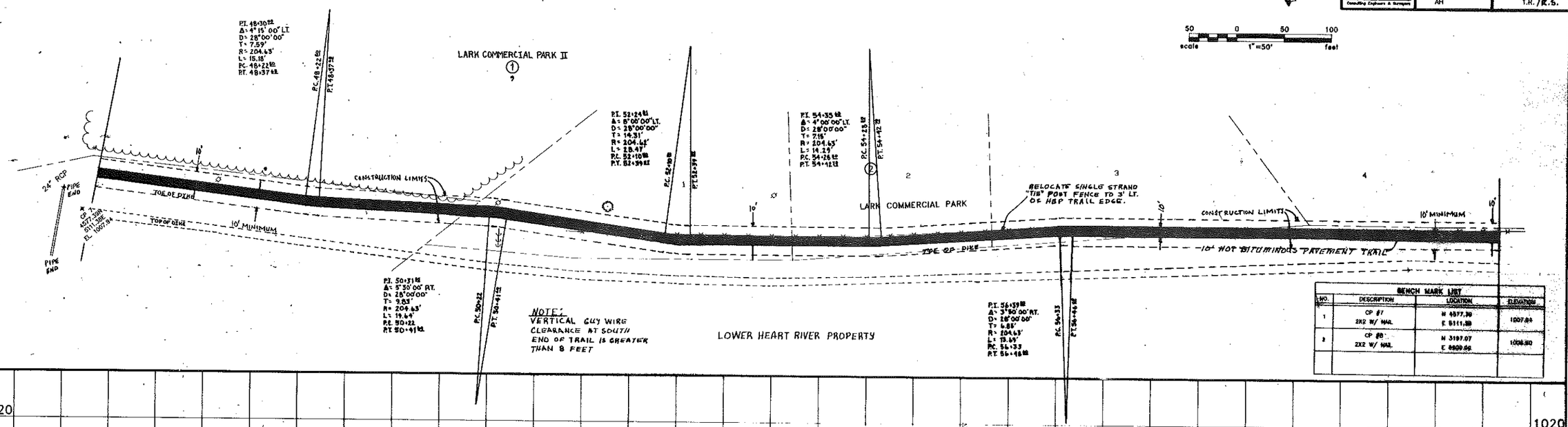
NOTES:

Clearing and Grubbing	1,500	L.F.
Topsoil	354	C.Y.
Borrow	1,395	C.Y.
Subgrade Preparation, Type B (6")	1,500	L.F.
Salvaged Bituminous Base Course	375	TON
Hot Bituminous Pavement, Cl. 25	255	TON
85-100 Asphalt Cement	18	TON
Seeding, Type B Special	.65	ACRE
Fence, Remove and Reset	900	L.F.
Landscape Preparation	1,500	L.F.
Herbicide Weed Control	1,500	L.F.

SEC. 35
T 139 N
R 81 W

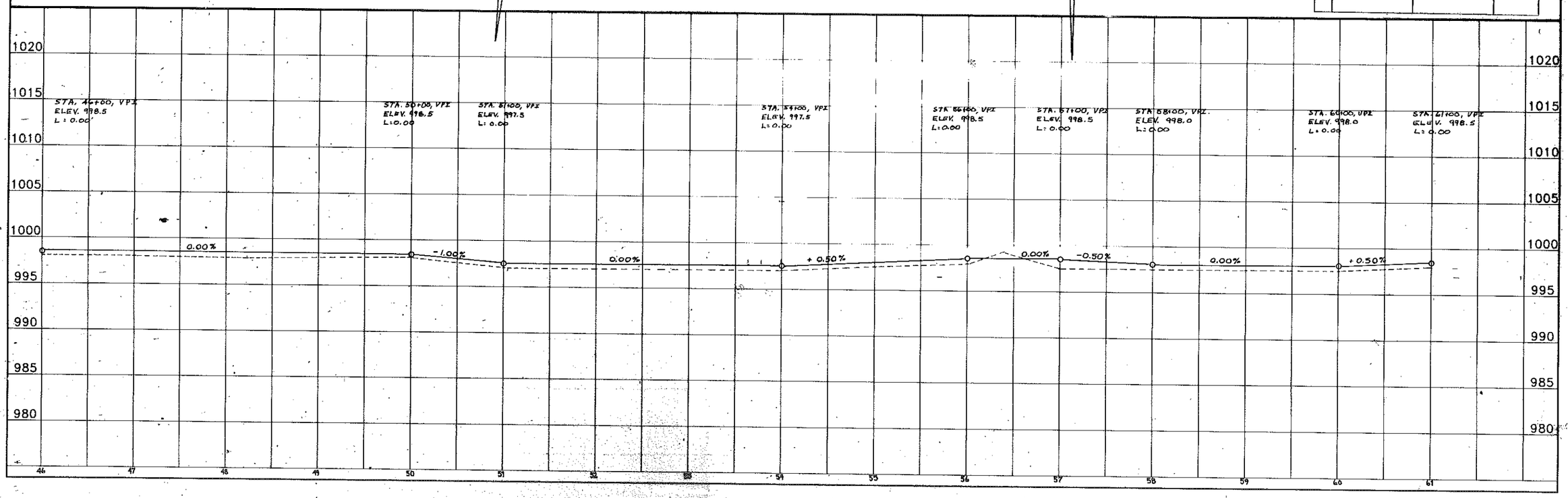
STA. 51+07 BEGIN FENCE RELOCATION TO 3 FEET LEFT OF HBP TRAIL EDGE.

scale 1"=50' feet (50 0 50 100)



BENCH MARK LIST

NO.	DESCRIPTION	LOCATION	ELEVATION
1	CP #7 2X2 W/ NAIL	N 4577.30 E 5111.88	1007.84
2	CP #8 2X2 W/ NAIL	N 3197.07 E 4909.66	1008.80



STA 77+00 TO STA 77+36
CONSTRUCT THICKENED TRAIL SECTION.
SEE DETAIL SHEET.

NOTES:

Clearing and Grubbing	1,053	L.F.
Borrow	110	C.Y.
Topsoil	208	C.Y.
Subgrade Preparation Type B (6")	1,053	L.F.
Salvaged Bituminous Base Course	265	TON
Hot Bituminous Pavement, Cl. 25	180	TON
85-100 Asphalt Cement	13	TON
Seeding, Type B Special	.45	ACRE
Yield Signs R1-2-24	2	EACH
Landscape Preparation	1,053	L.F.
Herbicide Weed Control	1,053	L.F.

INSTALL 24" SIGNS
STA. 76+95, 8'RT. R1-2-24 1 EA
STA. 77+43, 8'LT. R1-2-24 1 EA

SEC 36
T 139 N
R 81 W

FHWA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	12

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

Kadrmas Lee & Jackson PC
Consulting Engineers & Surveyors

MANDAN REC. TRAILS
PLAN & PROFILE

CHAPTR. NO.: 14517
DATE: JULY 1994
DRWN. BY: AH
CHK'D BY: T.R./R.S.

scale 1"=50' feet (50 0 50 100)

P.I. 76+77.22
Δ= 25°10'00" LT.
D= 14°00'00"
T= 91.35'
R= 409.26'
L= 179.74'
P.C. 77+86
P.T. 79+65.22

P.C. 77+86

P.T. 79+65.22

CONSTRUCTION LIMITS

R1-2-24

MIDWAY FIRST ADDITION

LONGSPUR TRAIL S.E.

LONGSPUR TRAIL S.E. R/W

REDWING DRIVE S.E.

STA. 87+52.86 END PROJECT.

P.I. 87+58.13
Δ= 1°45'08" LT.
D= 14°00'00"
T= 6.28'
R= 409.26'
L= 12.56'
P.C. 87+52.86
P.T. 87+65

P.C. 87+52.86

P.T. 87+65

CONSTRUCTION LIMITS

TREES TO REMAIN

10' HOT BITUMINOUS PAVEMENT/ TRAIL

SWALE EL. 994.00

P.I. 84+77.18
Δ= 1°45'08" RT.
D= 14°00'00"
T= 6.28'
R= 409.26'
L= 12.30'
P.C. 84+71.22
P.T. 84+83.51

P.C. 84+71.22

P.T. 84+83.51

BENCH MARK LIST

NO.	DESCRIPTION	LOCATION	ELEVATION
1	CP #8 2X2 W/ NAIL	N 3187.07 E 6809.99	1006.90
2	CP #8 2X2 W/ NAIL	N 2378.12 E 8184.76	994.51
3			

80 85 90

STA. 78+50 VPI
ELEV. 996.0
L=0.00

STA. 80+50 VPI
ELEV. 995.0
L= 0.00

STA. 85+50
ELEV. 994.9
L= 0.00

STA. 88+30 VPI
ELEV. 995.4
L=0.00

STA. 90+00, VPI
ELEV. 995.0
L=0.00

-0.05%

-0.50%

-0.02%

TRAIL TO FOLLOW EXISTING PROFILE UNLESS DIRECTED BY THE ENGINEER.

+0.18%

-0.24%

1020 1015 1010 1005 1000 995 990 985 980

77 78 79 80 81 82 83 84 85 86 87 88 89 90

NOTES:

Clearing and Grubbing	1,600	L.F.
Topsoil	320	C.Y.
Excavation	280	C.Y.
Borrow	260	C.Y.
Subgrade Preparation Type B (6")	1,600	L.F.
Salvaged Bituminous Base Course	400	TON
Hot Bituminous Pavement, Cl. 25	275	TON
85-100 Asphalt Cement	20	TON
Seeding, Type B Special	.60	ACRE
Fence, Remove and Reset	140	L.F.
Landscape Preparation	1,600	L.F.
Herbicide Weed Control	1,600	L.F.

STA 74+69.55 TO STA 74+96
CONSTRUCT THICKENED TRAIL SECTION.
SEE DETAIL SHEET.

FHWA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	11

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

Kadrmas Lee & Jackson PC
Consulting Engineers & Managers

MANDAN REC. TRAILS
PLAN & PROFILE

CHKR. NO.:	DATE
14517	JULY 1994
DRWN. BY	CHK'D BY
AH	T.R./K.S.

P.I. 61+55.53
Δ= 34° 30' 00" LT.
D= 38°00'00"
T= 49.72'
R= 150.78'
L= 96.05'
P.C. 61+05.81
P.T. 61+99.86

P.I. 62+84.53
Δ= 35° 30' 00" RT.
D= 34° 00' 00"
T= 83.74'
R= 159.15'
L= 154.32'
P.C. 62+00.79
P.T. 63+54.32

P.I. 69+16.68
Δ= 12° 20' 00" RT.
D= 38°00'00"
T= 14.29'
R= 150.78'
L= 32.46'
P.C. 69+00
P.T. 69+32.46

P.I. 70+17.53
Δ= 8° 00' 00" LT.
D= 38°00'00"
T= 10.54'
R= 150.78'
L= 21.05'
P.C. 70+07
P.T. 70+28.53

MIDWAY FIRST ADDITION

P.I. 73+74.48
Δ= 20° 10' 06" LT.
D= 2° 07' 00"
T= 50.94'
R= 2,86.4.8'
L= 100.85'
P.C. 73+23.54
P.T. 74+24.38

P.I. 75+09.38
Δ= 14° 19' 00" LT
D= 14° 00' 00"
T= 58.49'
R= 409.26'
L= 116.07'
P.C. 73+51.40
P.T. 76+67.47

LONGSPUR TRAIL

CONSTRUCTION LIMITS

10' HOT BITUMINOUS PAVEMENT TRAIL

EDGE OF HBP TRAIL TO MATCH CONCRETE DRIVE. (1)

BENCH MARK LIST			
NO.	DESCRIPTION	LOCATION	ELEVATION
1	CP #8 2X2 W/ NAIL	N 3197.07 E 6609.99	1006.90

scale 1"=50' (50 0 50 100 feet)

STA. 61+00, VPI ELEV. 998.5 L=0.00
STA. 61+70, VPI ELEV. 999.5 L=0.00
STA. 62+00, VPI ELEV. 999.5 L=0.00
STA. 63+00, VPI ELEV. 998.5 L=0.00
STA. 64+00, VPI ELEV. 996.8 L=0.00
STA. 65+30 VPI ELEV. 995.5 L=0.00
STA. 67+30 VPI ELEV. 996.6 L=0.00
STA. 70+40 VPI ELEV. 994.4 L=0.00
STA. 73+25 VPI ELEV. 995.5 L=0.00
STA. 74+70 VPI ELEV. 995.4 L=0.00
STA. 76+60 VPI ELEV. 996.1 L=0.00

+1.43% 0.00% -1.06% -1.70% -1.00% +0.55% -0.71% +0.39% -0.07% +0.27%

TRAIL TO FOLLOW EXISTING CONTOUR UNLESS DIRECTED BY THE ENGINEER.

1020 1015 1010 1005 1000 995 990 985 980

61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77

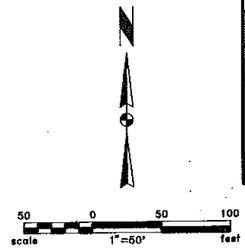
FHWA REGION	STATE	PROJECT No.	SHEET No.
8	ND	TEU 1-988(005)016	13

MANDAN PARKS & RECREATION
MANDAN, NORTH DAKOTA

Kadrmas Lee & Jackson PC
Consulting Engineers & Surveyors

MANDAN REC. TRAILS BORROW SITE MAP

CMPR. NO.:	DATE
14517	JULY 1994
DRWN. BY	CHK'D BY
AH	T.R.



TREES

TREES

TREES

APPROXIMATE LOCATION, BORROW AREA #2

TREES

CP 8
5052.80N
2908.35E
EL. 1010.22

THIRD STREET S.E.

24" RCP

CP 7
4973.34N
2651.11E
EL. 1008.71

UFT STATION

ELEVENTH AVE. S.E.

3rd STREET SE R/W

TREES

CP 5
4987.61N
3527.16E
EL. 1009.47

3rd STREET SE R/W

3rd STREET SE R/W

CMP

3rd STREET SE R/W

60" RCP

APPROXIMATE LOCATION, BORROW AREA #1

Kadrmas Lee & Jackson PC	FHWA REGION	STATE	PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
BISMARCK, GRAND FORKS, VALLEY CITY, N.D.	8	N.D.	STEU-1-966((005)016	14	16
	DRWN. BY	CK'D. BY	PROJ. NO.	DATE	

FINAL SURVEY	BY	DATE
NOTE BOOK		
NO.		

ORIGINAL SURVEY	BY	DATE
NOTE BOOK		
NO.		

Scale: Vert. 1" = 5' Horiz.

1650

1640

3:1

Verse Lock Retaining Wall

1.42%

0.93%

15+34

15+73

16+73

17+73

HIGHWAY FEDERAL AID SHEET
PLATE 3-FULL CROSS SECTION-FULL DOT

PRINTED IN U.S.A.

Kadrmas Lee & Jackson PC	FHWA REGION	STATE	PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
DICKINSON, BISMARCK, VALLEY CITY, N.D.	8	N.D.	TEU 1-068(008)016	15	19
	DRWN. BY	CK'D. BY	PROJ. NO.	DATE	

SCALE: 1" = 10' Horiz.
1" = 5' Vert.

FINAL SURVEY — NOTE BOOK NO. — PLOTTED — TEMPLATE — AREAS COMPUTED — BY — DATE

ORIGINAL SURVEY — NOTE BOOK NO. — PLOTTED — TEMPLATE — AREAS COMPUTED — BY — DATE

STA 18+73
STA 19+00 BK =
STA 21+75 AHD
STA 22+00
STA 23+00
STA 24+00
STA 25+00
STA 26+00

FLATE 3-FULL CROSS SECTION-FULL DOT

PRINTED IN U.S.A.

Kadrmas Lee & Jackson PC	FHWA REGION	STATE	PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
DICKINSON, BISMARCK, VALLEY CITY, N.D.	8	N.D.	TEU 1-[illegible]	16	16
	DRWN. BY	CK'D. BY	PROJ. NO.	DATE	

SCALE: 1" = 10' Horiz.
1" = 5' Vert.

FINAL SURVEY — SURVEYED, PLOTTED, NOTE BOOK, NO., BY, DATE, AREAS CHECKED

ORIGINAL SURVEY — SURVEYED, PLOTTED, NOTE BOOK, NO., BY, DATE, AREAS CHECKED

STA. 27+00 STA. 28+00 STA. 28+50 STA. 29+00 STA. 30+00 STA. 31+00

0+00

995 1000 1005 1010 1015

PLATE 3-FULL CROSS SECTION-FULL DOT

PRINTED IN U.S.A.

Kadrmas Lee & Jackson PC	FHWA REGION	STATE	PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
DICKINSON, N.DAKOTA, VALLEY CITY, W. D.	8	N.D.	TEU 1-[illegible](065)016	17	18
	DRWN. BY	CK'D. BY	PROJ. NO.	DATE	

SCALE: 1" = 10' HORIZ.
1" = 5' VERT.

FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
NO.	TEMPLATE		
	AREAS CHECKED		

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
NO.	TEMPLATE		
	AREAS CHECKED		

Proposed Ground Line

Sta 31+50 1025 1020 1015 1010

Sta 32+00 1025 1020 1015 1010

Sta 33+00 1025 1020 1015 1010

Sta 34+00 1025 1020 1015 1010

Sta 34+50 1025 1020 1015

Sta 35+00 1025 1020 1015

Sta 36+00 1025 1020 1015

Sta 37+00 1025 1020 1015

PLATE 3-FULL CROSS SECTION-FULL DOT

Kadrmas Lee & Jackson PC DICKINSON, BISMARCK, VALLEY CITY, N.D.	FHWA REGION	STATE	PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
	8	N.D.	TEU 1-999(999)999	15	15
	DRWN. BY	CK'D. BY	PROJ. NO.	DATE	

SCALE: 1"=10' Horiz.
1"=5' Vert.

FINAL SURVEY — SURVEYED, PLOTTED, TRACED, AREAS, AREAS CHECKED, NOTE BOOK, NO., BY, DATE

ORIGINAL SURVEY — SURVEYED, PLOTTED, TRACED, AREAS, AREAS CHECKED, NOTE BOOK, NO., BY, DATE

HERET River DIKE

TYPICAL SECTION

STA 38+00 1015 1010 1005 1000 0+00

STA 38+50 1015 1010 1005 1000 0+00

STA 39+00 1015 1010 1005 1000 0+00

STA 40+00 1015 1010 1005 1000 0+00

STA 41+00 1015 1010 1005 1000 0+00

STA 42+00 1015 1010 1005 1000 0+00

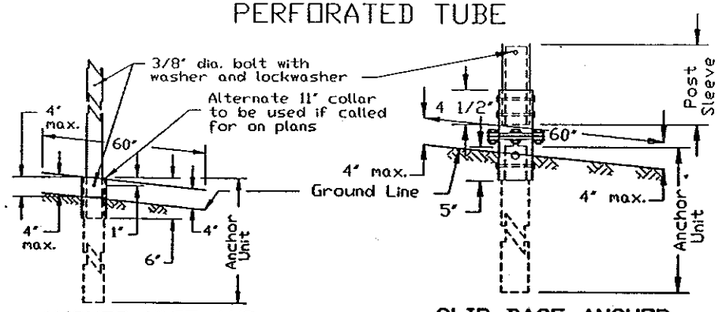
STA 43+00 1015 1010 1005 1000 0+00

HIGHWAY FEDERAL AID SHEET
PLATE 3-FULL CROSS SECTION-FULL DOT
PRINTED IN U.S.A.

BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

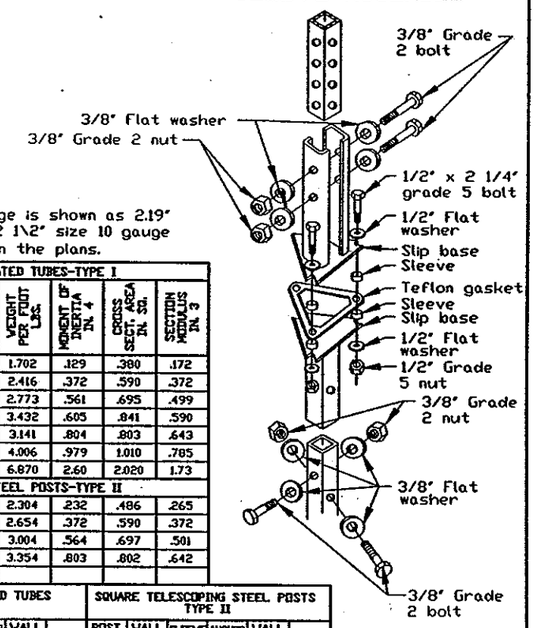
D-704-8

PERFORATED TUBE



ANCHOR UNIT AND POST SLEEVE ASSEMBLY

SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLE



SLIP BASE ASSEMBLY DETAILS

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans. The 2 1\2" size 10 gauge is shown as 2.51" size on the plans.

TELESCOPING PERFORATED TUBES-TYPE I

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	1.702	.129	.380	.172
2 x 2	.105	12	2.416	.372	.590	.372
2 1/4 x 2 1/4	.105	12	2.773	.561	.695	.499
2 3/16 x 2 3/16	.135	10	3.432	.605	.841	.590
2 1/2 x 2 1/2	.105	12	3.141	.804	.803	.643
2 1/2 x 2 1/2	.135	10	4.006	.979	1.010	.785
3 x 3	3/16	3/16	6.870	2.60	2.020	1.73

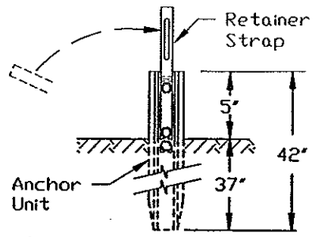
SQUARE TELESCOPING STEEL POSTS-TYPE II

1 3/4 x 1 3/4	.105	12	2.304	.232	.486	.265
2 x 2	.105	12	2.654	.372	.590	.372
2 1/4 x 2 1/4	.105	12	3.004	.564	.697	.501
2 1/2 x 2 1/2	.105	12	3.354	.803	.802	.642

NUMBER OF POSTS	TELESCOPING PERFORATED TUBES TYPE I						SQUARE TELESCOPING STEEL POSTS TYPE II					
	POST SIZE	WALL THICK-NESS GAUGE	SLEEVE SIZE	ANCHOR SIZE	WALL THICK-NESS GAUGE	SLIP BASE	POST SIZE	WALL THICK-NESS GAUGE	SLEEVE SIZE	ANCHOR SIZE	WALL THICK-NESS GAUGE	SLIP BASE
1	2	12		2 1/4	12	NO	1 3/4	12		2	12	NO
1	2 1/4	12		2 1/2	12	NO	2	12		2 1/4	12	NO
1	2 3/16	10		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
1	2 1/2	12		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
1	2 1/2	10		3	3/16	YES	2 1/2	12		2 1/2	12	YES
1	2 1/4	12	2	2 1/2	12	YES	2 1/2	12		2 1/2	12	YES
1	2 1/2	12	2 1/4	2 1/2	12	YES	2 1/4	12	2	2 1/4	12	YES
2	2	12		2 1/4	12	NO	1 3/4	12		2	12	NO
2	2 1/4	12		2 1/2	12	NO	2	12		2 1/4	12	NO
2	2 3/16	10		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
2	2 1/2	12		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
2	2 1/2	10		3	3/16	YES	2 1/2	12		2 1/2	12	YES
2	2 1/4	12	2	2 1/2	12	YES	2 1/2	12		2 1/2	12	YES
2	2 1/2	12	2 1/4	2 1/2	12	YES	2 1/4	12	2	2 1/4	12	YES
3 & 4	2 1/2	12		2 1/2	12	YES	2 1/4	12		2 1/4	12	YES
3 & 4	2 1/2	10		3	3/16	YES	2 1/2	12		2 1/2	12	YES
3 & 4	2 1/2	12	2 1/4	2 1/2	12	YES	2 1/4	12	2	2 1/4	12	YES
3 & 4	2 1/4	12	2	2 1/2	12	YES	2 1/2	12		2 1/2	12	YES
3 & 4	2 1/2	10	2 3/16	3	3/16	YES	2 1/2	12	2 1/4	2 1/2	12	YES

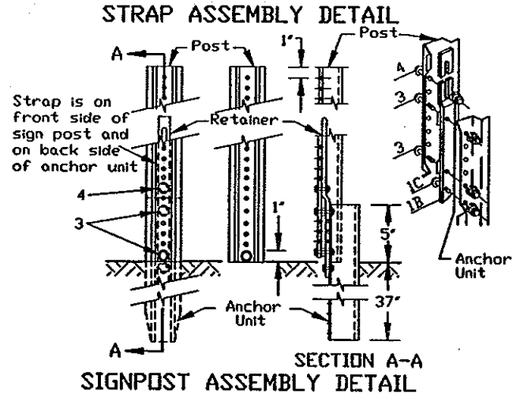
NOTE:
Slip base bolts shall be torqued as specified by the manufacturer.

FLANGED CHANNEL



1. A - Drive anchor unit to within 12" of ground level.
   B - Proper assembly established by lining up the top 3/4" slot of retainer spacer strap with top hole of anchor unit.
   C - Assemble strap to back of anchor unit using 3/8" -16 UNC x 2.0" long bolt & lock washer & nut.
   D - Rotate strap 90° to left.
2. A - Drive anchor unit to 5" dimension.
   B - Rotate strap to vertical position.

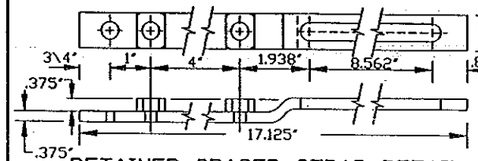
ANCHOR UNIT & STRAP ASSEMBLY DETAIL



SIGNPOST ASSEMBLY DETAIL

3. A - Place 3/8"-16 UNC x 2.0" bolt & lock washer & nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit. (This coincides with bottom 3/4" slot in strap)
   B - Alternately tighten two connector bolts.
4. A - Complete assembly by tightening 3/8"-16 UNC x 2.0" long retainer bolt. (This fastens sign post to retainer spacer strap.)

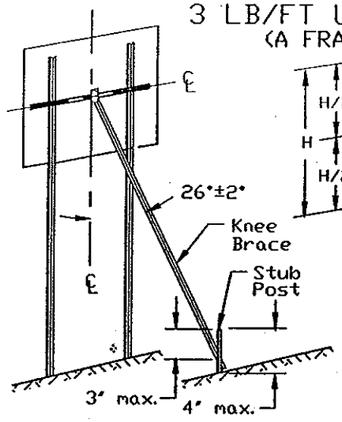
The base post, strap & sign post shall be properly nested. Proper nesting is achieved when all flat surfaces of the base post, strap & sign post at the bolts have full contact across there entire width.



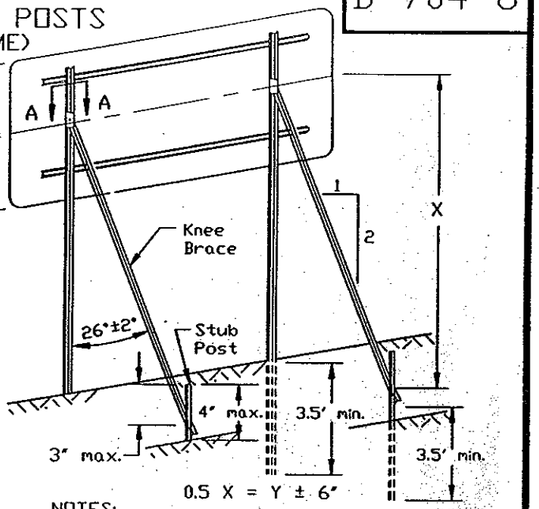
RETAINER-SPACER STRAP DETAIL

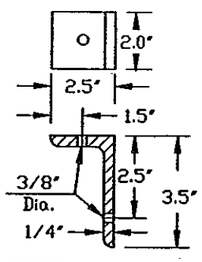
CHANNEL SIZE IN.	WALL THICKNESS IN.	WEIGHT PER FOOT LBS.	MOMENT OF INERTIA IN. 4	CROSS SECT. AREA IN. SQ.	SECTION MODULUS IN. 3
1.516 x 3.125"	.116	2.00	.179	.590	.225
1.532 x 3.125"	.124	2.25	.201	.648	.254
1.562 x 3.125"	.132	2.50	.233	.748	.289
1.578 x 3.125"	.140	2.75	.271	.819	.329
1.750 x 3.500"	.150	3.00	.372	.918	.403
1.750 x 3.500"	.175	4.00	.500	1.190	.560

3 LB/FT U POSTS (A FRAME)

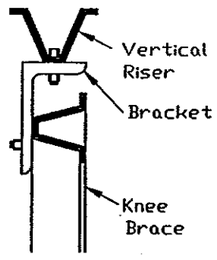


TYPICAL A-FRAME INSTALLATIONS





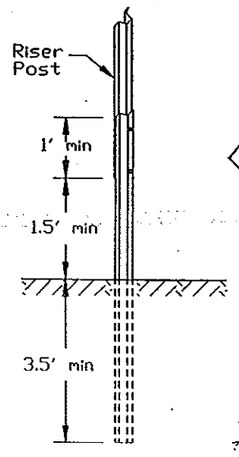
STEEL A-FRAME BRACKET



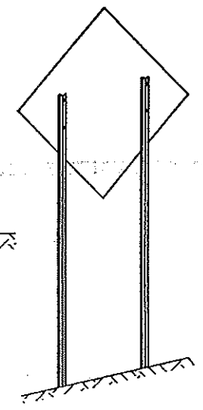
SECTION A-A

NOTES:
1. USE 3 LB/FT RISER STUB POSTS, RISERS, STRINGERS, KNEE BRACES, LATERAL BRACES AND KNEE BRACE STUB POSTS.
2. OFFSET KNEE BRACE STUB POST 1' TOWARD ROADWAY RELATIVE TO VERTICAL POST.
3. USE 5/16" BOLTS, WASHERS AND NUTS FOR ALL CONNECTIONS. A SPLICE SHALL OVERLAP 12" MIN. AND HAVE BOLTS IN THE TOP AND BOTTOM HOLES OF THE SPLICE.
4. DRIVEN RISER STUB POSTS SHALL BE AT LEAST 7' LONG AND EMBEDDED AT LEAST 3.5'. BRACING STUBS SHALL BE NO MORE THAN 4" ABOVE GROUND AND EMBEDDED AT LEAST 3.5'.

3# U POST



U-CHANNEL SPLICE



TYPICAL INSTALLATION

NOTES:
1. USE 3 LB/FT RISER STUB POSTS AND RISERS.
2. DRIVEN RISER STUB POSTS SHALL BE AT LEAST 7' LONG AND EMBEDDED AT LEAST 3.5'.
3. USE 5/16" BOLTS, WASHERS AND NUTS FOR ALL CONNECTIONS. A SPLICE SHALL OVERLAP 12" MIN. AND HAVE BOLTS IN THE TOP AND BOTTOM HOLES OF THE SPLICE.
4. ANCHOR POSTS FOR GUY WIRES SHALL BE NO MORE THAN 4" ABOVE GROUND AND EMBEDDED AT LEAST 3.5'.

REVISIONS	
DATE	CHANGE
7-28-93	

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
APPROVED David K. Zee
DESIGN ENGINEER

CONSTRUCTION SIGN DETAILS

STOP

STOP-SLOW PADDLE
RED & WHITE
FLAGPERSON PADDLE

STREET CLOSED
10 MILES AHEAD
LOCAL TRAFFIC ONLY

R11-3c-60
BLACK & WHITE

END
ROAD WORK

G20-2a-48
BLACK & ORANGE

TEMPORARY
SURFACE
NEXT 00 MILES

G20-6-48
BLACK & ORANGE

ROAD
CLOSED

R11-2-48
BLACK & WHITE

STREET CLOSED
TO
THRU TRAFFIC

R11-4a-60
BLACK & WHITE

PILOT CAR
FOLLOW ME

G20-4-36
BLACK & ORANGE

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

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

STREET
CLOSED

R11-2A-48
BLACK & WHITE

ROAD CLOSED
10 MILES AHEAD
LOCAL TRAFFIC ONLY

R11-3a-60
BLACK & WHITE

ROAD
CONSTRUCTION
NEXT 00 MILES

G20-1-60
BLACK & ORANGE

ROAD CONSTRUCTION
NEXT 00 MILES

G20-50-72
BLACK & ORANGE

ROAD CONSTRUCTION
NEXT 00 MILES

G20-52-72
BLACK & ORANGE

W8-3a-48

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

RAMP

W13-4-48 BLACK & ORANGE

BRIDGE OUT
10 MILES AHEAD
LOCAL TRAFFIC ONLY

R11-3b-60
BLACK & WHITE

7/8 Ø HOLE (TYP. LT & RT) FOR 3/8 Ø BOLT & WINGNUT

NO WORK
IN PROGRESS

G20-1A-60
DOUBLE FACE SIGN
LEGEND: BLACK (NON-REFL)
BACKGROUND: ORANGE

OVERHEAD
BRIDGE
PAINTING

G20-54-48
BLACK & ORANGE

END
CONSTRUCTION

G20-2-60
BLACK & ORANGE

DOUBLE FACE SIGN

WORK
IN PROGRESS

7/8 Ø HOLE (TYP. LT & RT) FOR 3/8 Ø BOLT & WINGNUT

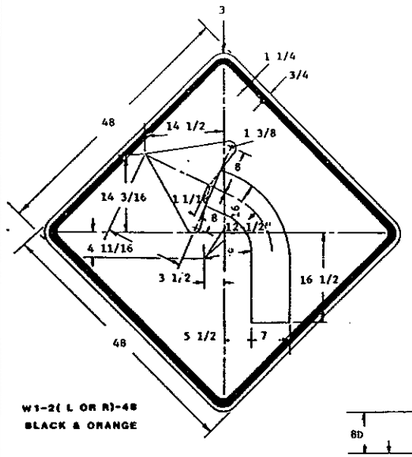
G20-1A-60
LEGEND: BLACK (NON-REFL)
BACKGROUND ORANGE

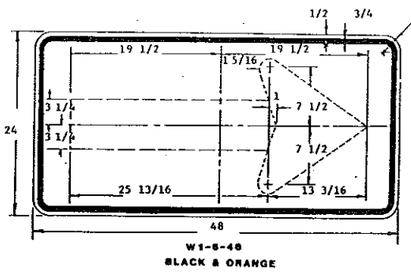
10-1-86	
REVISIONS	
DATE	CHANGE
5-1-92	GENERAL REVISIONS

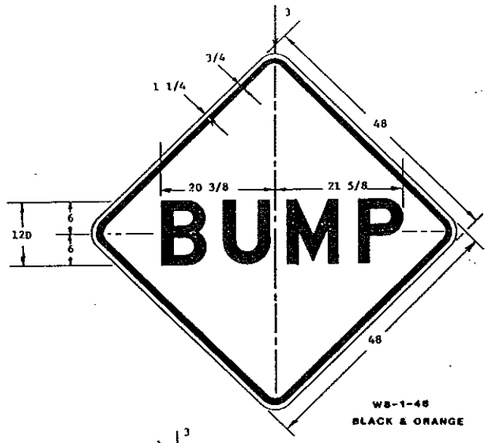
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: _____ DESIGN ENGINEER

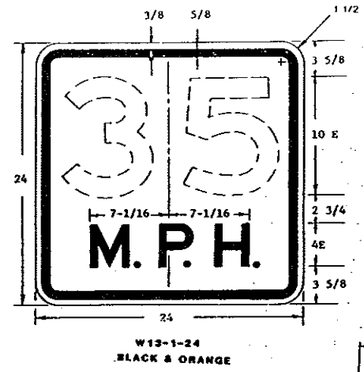
CONSTRUCTION SIGN DETAILS

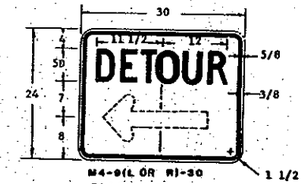
D-704-10

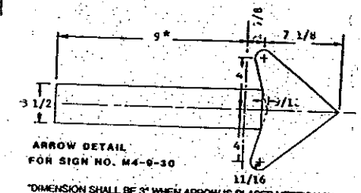


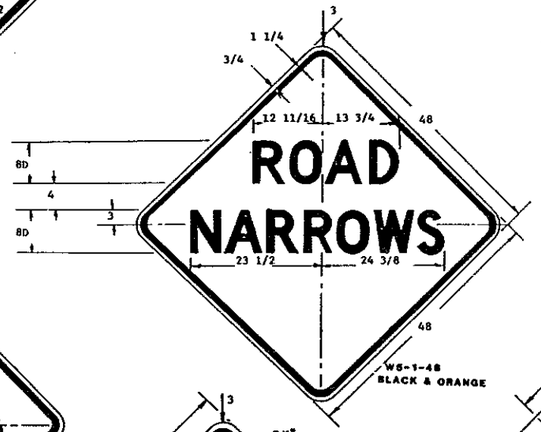


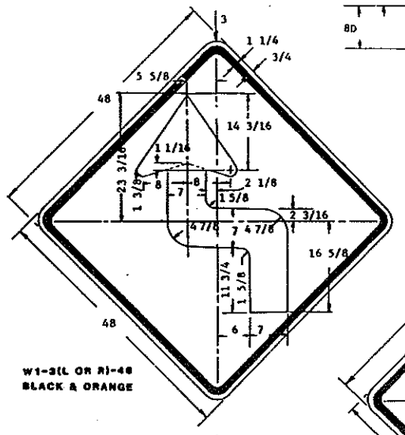


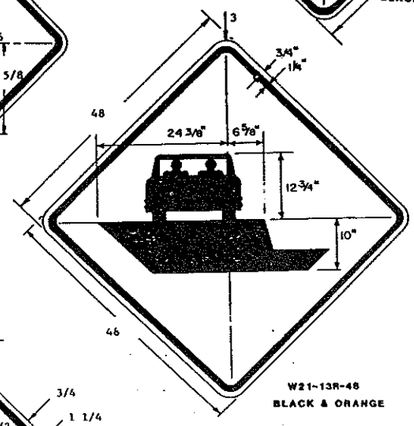


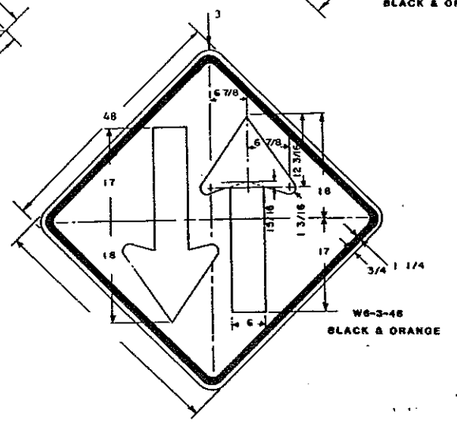


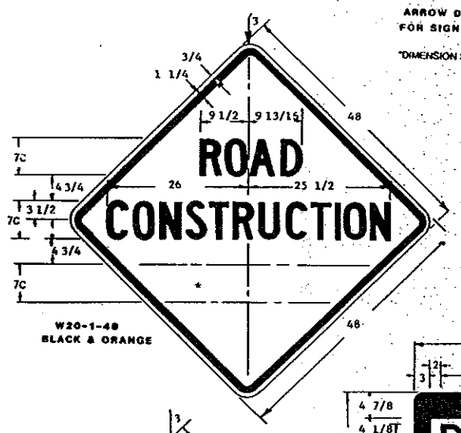


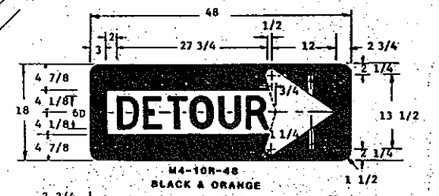


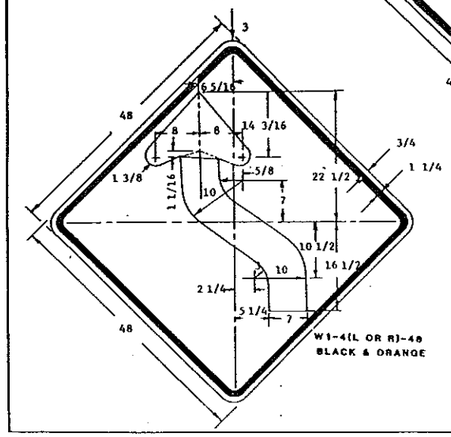


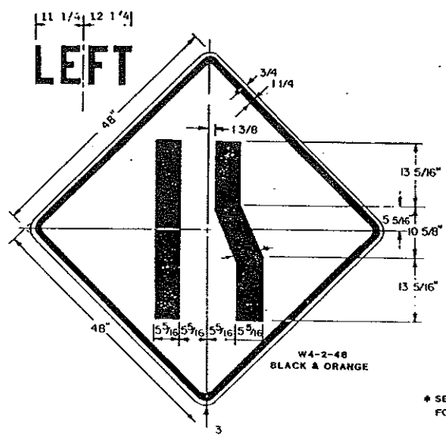


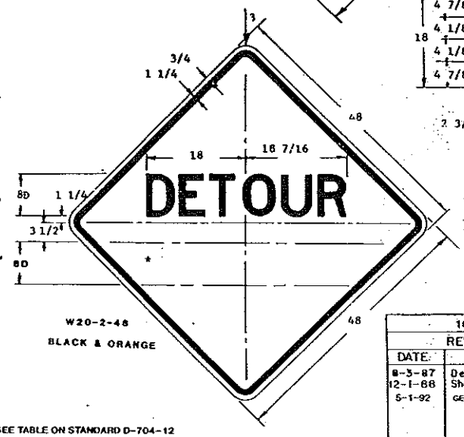


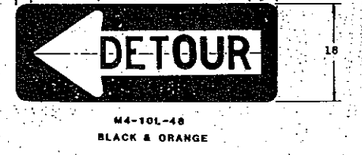












* SEE TABLE ON STANDARD D-704-12 FOR MESSAGES AND DIMENSIONS.

10-1-86

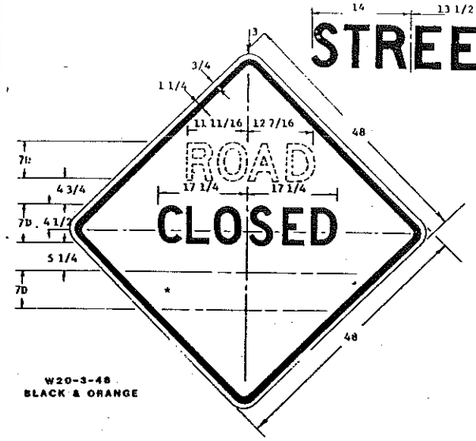
REVISIONS	
DATE	CHANGE
8-3-87	Detour No.
12-1-88	Shoulder Drop Off
5-1-92	GENERAL REVISIONS

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

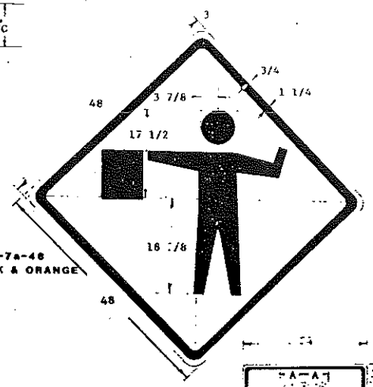
APPROVED: K. O. Lees
DESIGN ENGINEER

CONSTRUCTION SIGN DETAILS

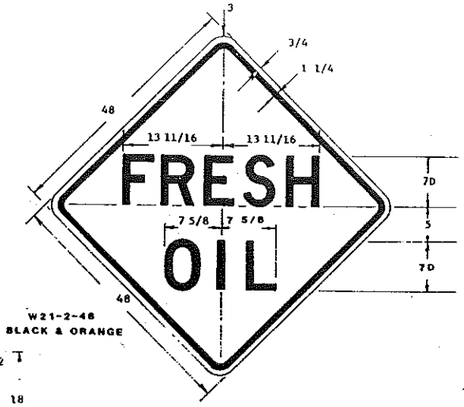
D-704-11



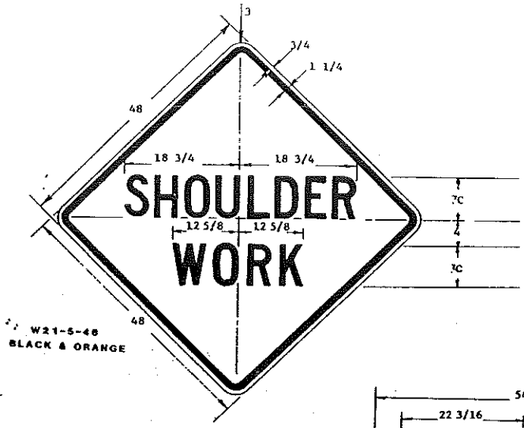
W20-3-48
BLACK & ORANGE



W20-7a-48
BLACK & ORANGE



W21-2-48
BLACK & ORANGE

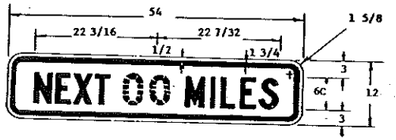


W21-5-48
BLACK & ORANGE

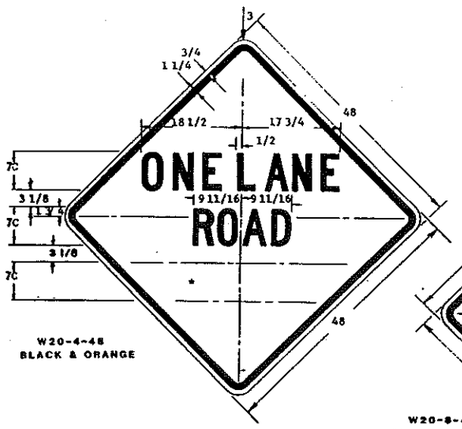
SIGN	A
500'	4 - 11/16
1000'	5 - 1/2
1500'	5 - 5/16

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

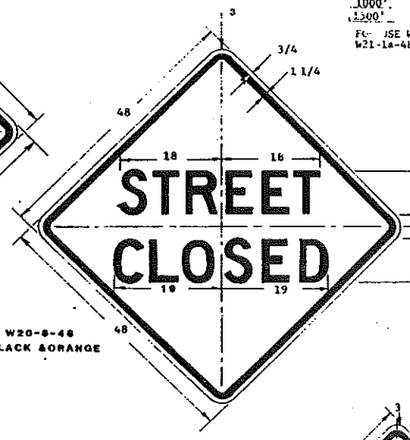
W20-7k-24
DIMENSION (INCHES)
BLACK & ORANGE



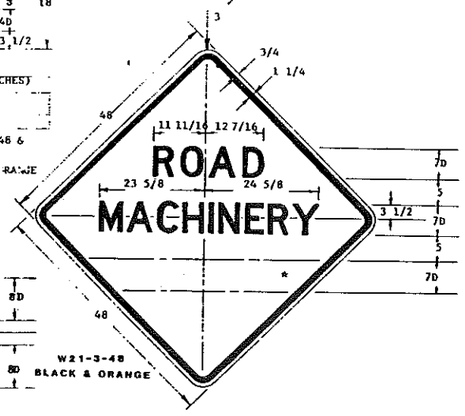
W20-52-54
BLACK & ORANGE



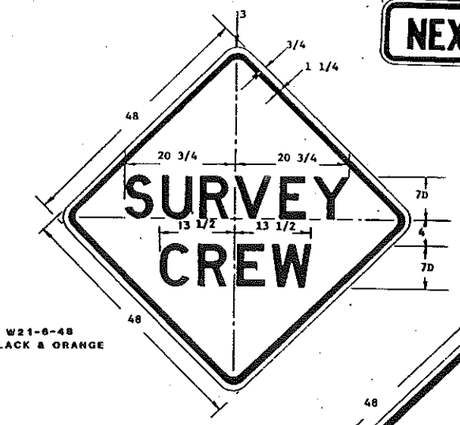
W20-4-48
BLACK & ORANGE



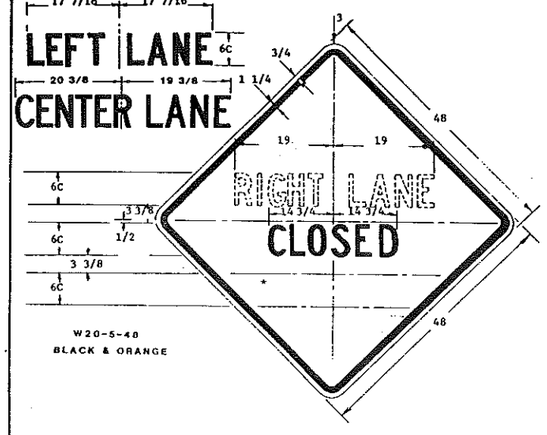
W20-8-48
BLACK &ORANGE



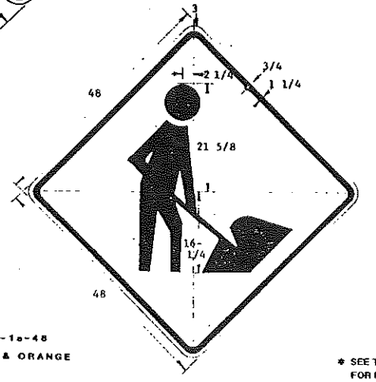
W21-3-48
BLACK & ORANGE



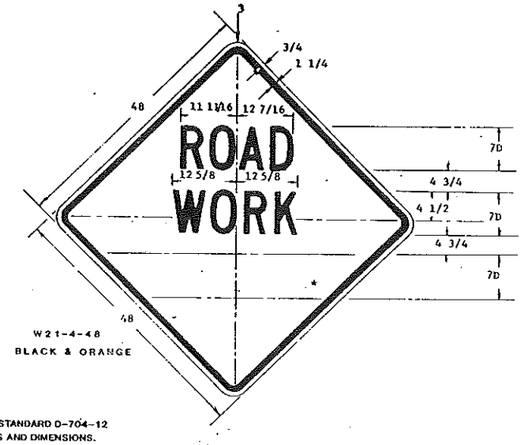
W21-6-48
BLACK & ORANGE



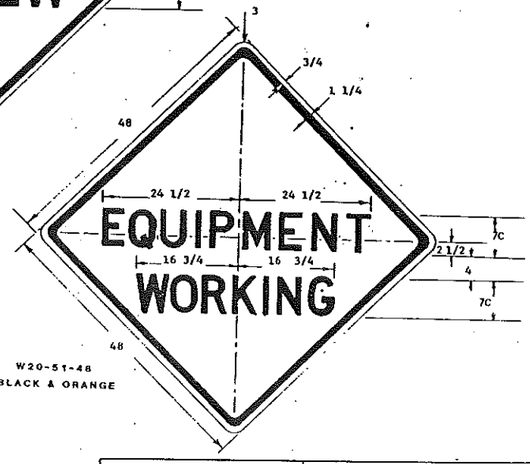
W20-5-48
BLACK & ORANGE



W21-1a-48
BLACK & ORANGE



W21-4-48
BLACK & ORANGE



W20-51-48
BLACK & ORANGE

* SEE TABLE ON STANDARD D-704-12 FOR MESSAGES AND DIMENSIONS.

10-1-86	
REVISIONS	
DATE	CHANGE
5-1-92	GENERAL REVISIONS

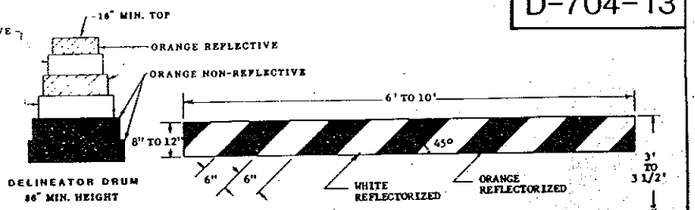
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K. D. Leer
DESIGN ENGINEER

BARRICADE DETAILS

D-704-13

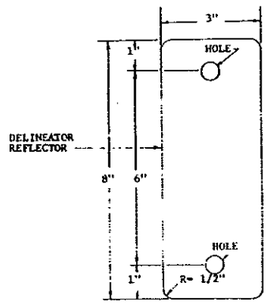
DELINEATOR DRUMS

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

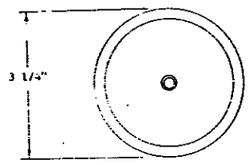


DELINEATOR DRUM
36" MIN. HEIGHT

TYPE I BARRICADE

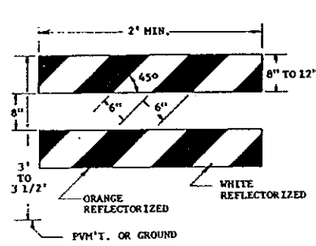


3" x 8" - 18 GUAGE GALVANIZED STEEL SHEETS, OR OR .080" ALUMINUM PLATE WITH WHITE REFLECTIVE SHEETING (TYPE 3A OR 3B) AS SPECIFIED IN SECTION 694 OF THE STANDARD SPECIFICATIONS.

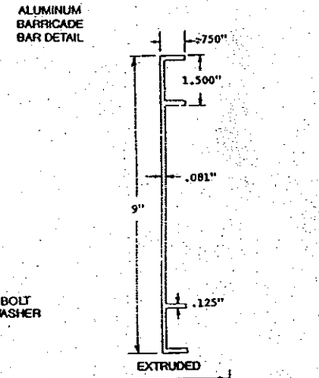


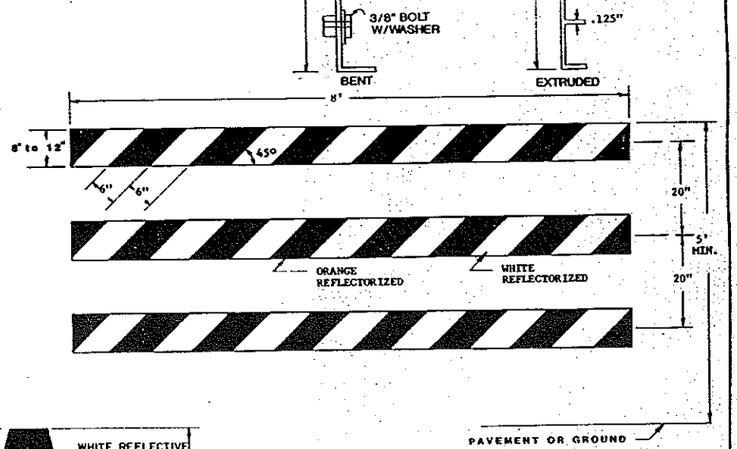
ACRYLIC PLASTIC REFLECTOR

DELINEATOR REFLECTOR SHALL MEET THE REQUIREMENTS OF SECTION 894.

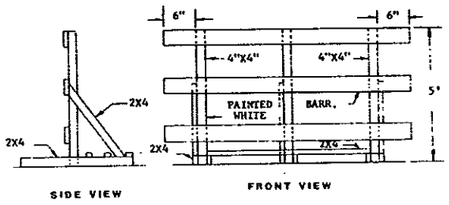


TYPE II BARRICADE





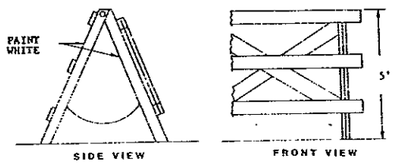
TYPE III BARRICADE



SIDE VIEW FRONT VIEW

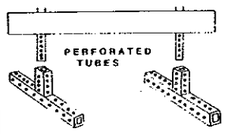
MOVABLE BARRICADE ASSEMBLY

NOTE: EACH MOVABLE BARRICADE SHALL BE WEIGHTED DOWN BY A SUFFICIENT NUMBER OF SAND BAGS 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.

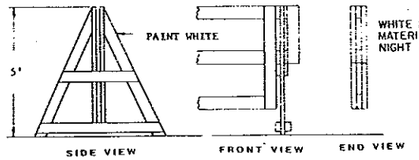


SIDE VIEW FRONT VIEW

HINGED BARRICADE ASSEMBLY

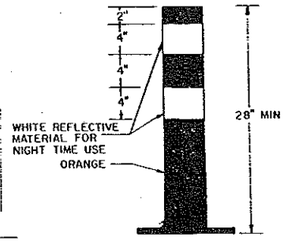


SECTIONAL BARRICADE

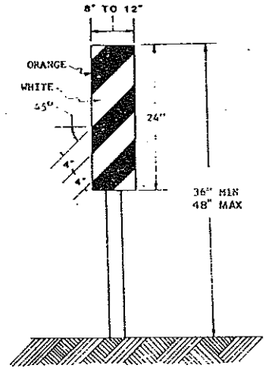


SIDE VIEW FRONT VIEW END VIEW

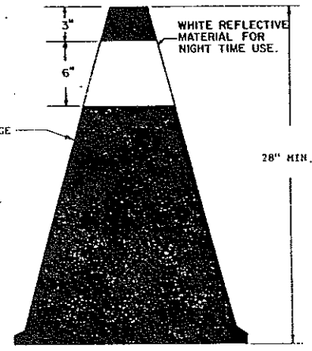
DEMOUNTABLE BARRICADE ASSEMBLY



TUBULAR MARKER



VERTICAL PANEL



CONE

BARRICADES: Number Of Reflectorized Rail Faces

TYPE I	TYPE II	TYPE III
2(One Each Direction)	4(Two Each Direction)	6(Facing in two Directions)

BARRICADE RAIL MATERIAL MAY BE 1" NOMINAL THICKNESS STANDARD LUMBER OR 3/4" PLYWOOD AND PREPARED AS RECOMMENDED BY THE SHEETING MANUFACTURER BEFORE REFLECTIVE SHEETING IS APPLIED.

10-1-86

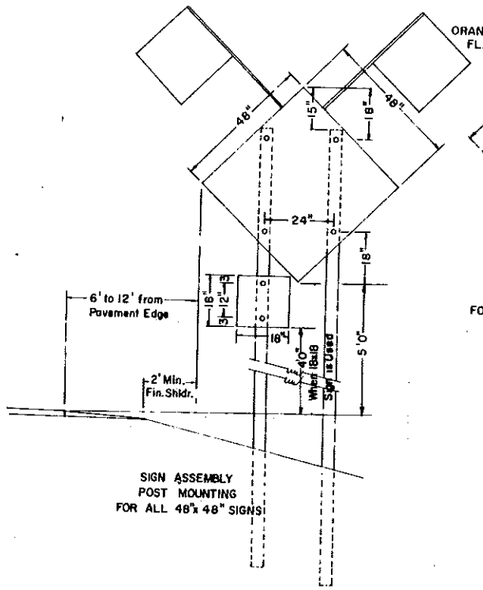
REVISIONS	
DATE	CHANGE
8-3-87	Type Sheeting
10-1-87	Delineator Drum Note
6-9-88	Barricades Type III
5-1-92	GENERAL REVISIONS
6-10-93	GENERAL REVISIONS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

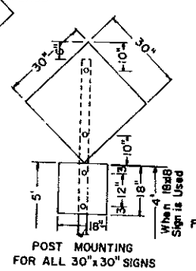
APPROVED: David K.O. Leer
DESIGN ENGINEER

CONSTRUCTION SIGN AND BARRICADE ASSEMBLY DETAILS

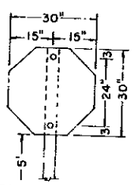
D-704-14



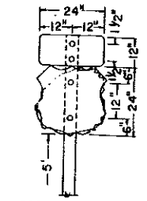
SIGN ASSEMBLY
POST MOUNTING
FOR ALL 48"x 48" SIGNS



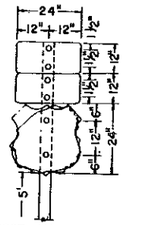
POST MOUNTING
FOR ALL 30"x30" SIGNS



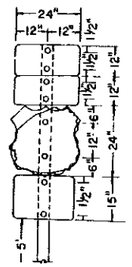
POST MOUNTING
FOR SIGN NO. R-1-30



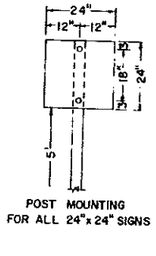
POST MOUNTING
FOR ASSEMBLIES WITH ONE CARDINAL DIRECTION SIGN & ONE ROUTE MARKER



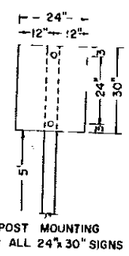
POST MOUNTING
FOR ASSEMBLIES WITH ONE CARDINAL DIRECTION SIGN, ONE DETOUR SIGN & ONE ROUTE MARKER



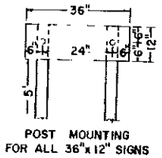
POST MOUNTING
FOR ASSEMBLIES WITH ONE CARDINAL DIRECTION SIGN, ONE DETOUR SIGN, ONE ROUTE MARKER & ONE DIRECTIONAL ARROW



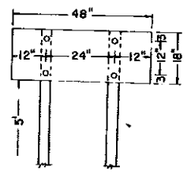
POST MOUNTING
FOR ALL 24"x24" SIGNS



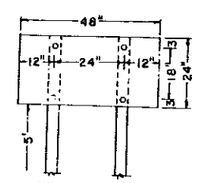
POST MOUNTING
FOR ALL 24"x30" SIGNS



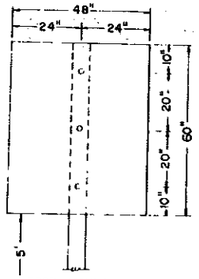
POST MOUNTING
FOR ALL 36"x12" SIGNS



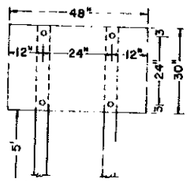
POST MOUNTING
FOR ALL 48"x18" SIGNS



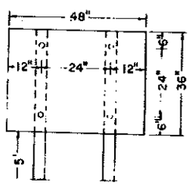
POST MOUNTING
FOR ALL 48"x24" SIGNS



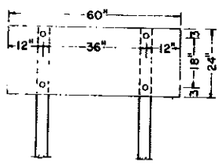
POST MOUNTING
FOR ALL 48"x60" SIGNS



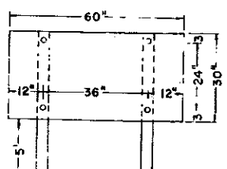
POST MOUNTING
FOR ALL 48"x30" SIGNS



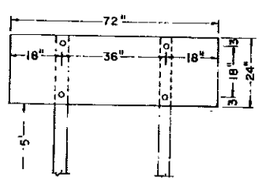
POST MOUNTING
FOR ALL 48"x36" SIGNS



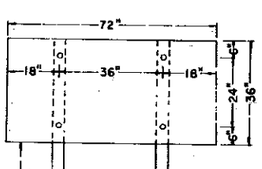
POST MOUNTING
FOR ALL 60"x24" SIGNS



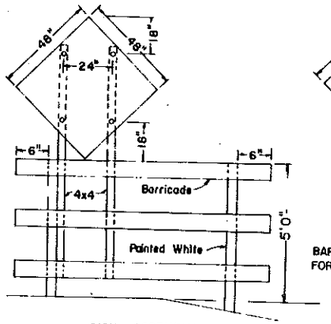
POST MOUNTING
FOR ALL 60"x30" SIGNS



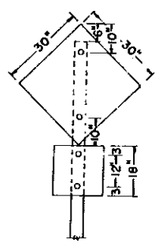
POST MOUNTING
FOR ALL 72"x24" SIGNS



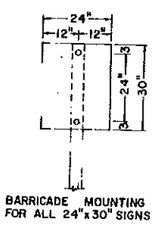
POST MOUNTING
FOR ALL 72"x36" SIGNS



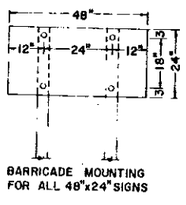
SIGN ASSEMBLY
BARRICADE MOUNTING
FOR ALL 48"x48" SIGNS



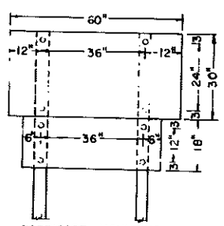
BARRICADE MOUNTING
FOR ALL 30"x30" SIGNS



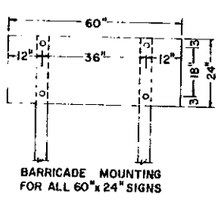
BARRICADE MOUNTING
FOR ALL 24"x30" SIGNS



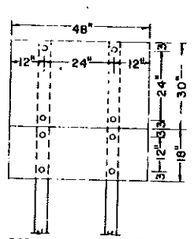
BARRICADE MOUNTING
FOR ALL 48"x24" SIGNS



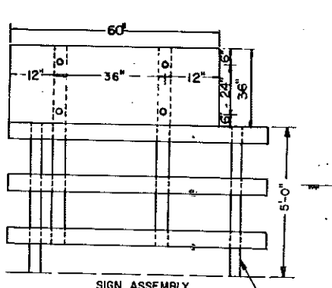
BARRICADE MOUNTING
FOR ALL 60"x30" SIGNS



BARRICADE MOUNTING
FOR ALL 60"x24" SIGNS

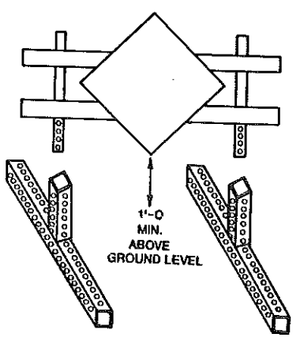


BARRICADE MOUNTING
FOR ALL 48"x30" & 48"x18" SIGNS



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

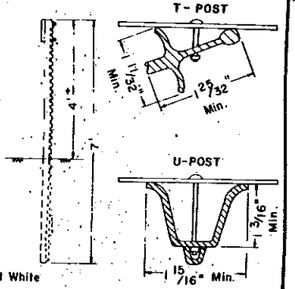
NOTE:
In Urban Areas the vertical clearance shall be increased to 7 feet on all signs, except when supplemental signs are placed below main signs.
The supplemental signs shall be placed at a 6'-0" minimum clearance.



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.

DELINEATOR ATTACHMENT AND POST MOUNTING DETAILS



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-704-13 thru D-704-21 for construction sign and barricade location details. All barricades and barricade mounted signs shall be assembled with 3/8" bolts.
SIGN SUPPORTS: Sign supports shall be 4"x 4" min. SFS or equivalent steel posts. The anchor for steel supports shall have a stub height of 4" or less. Wood posts more than 4"x 4" shall be breakaway. Sign supports shall be imbeded to a sufficient depth so that signs will remain plumb throughout duration of project. It is suggested that wood posts have a min. depth of embedment of 6'0" and steel posts be embeded a min. 3'6".
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.

10-1-86

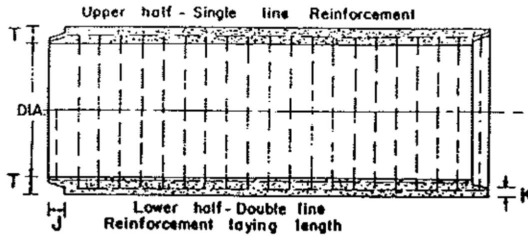
REVISIONS	
DATE	CHANGE
8-1-88	SIGN ASSEMBLY
5-1-92	SIGN ASSEMBLY
3-30-93	SIGN SUPPORTS NOTE

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED David K.D. Leer
DESIGN ENGINEER

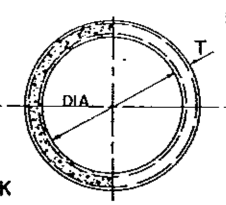
FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.		

D-714-1

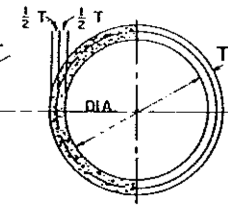
REINFORCED CONCRETE PIPE CULVERT AND END SECTIONS



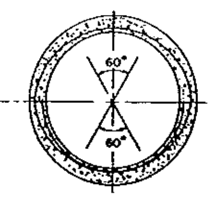
REINFORCED CONCRETE PIPE
TYPICAL LONGITUDINAL SECTION



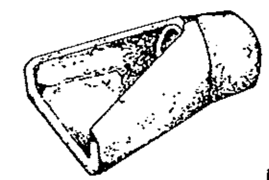
END VIEW
Double line Reinforcement



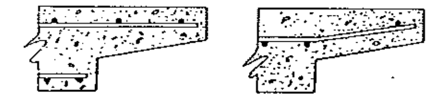
END VIEW
Single line Reinforcement



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

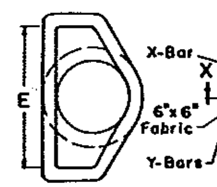


PERSPECTIVE

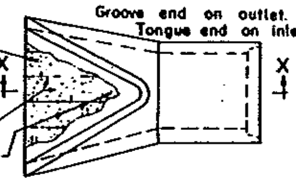


ARRANGEMENT FOR REINFORCEMENT
At end of 36" to 108" pipe. At end of 12" to 33" pipe.

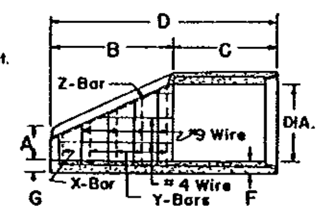
SEE STANDARD D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).



END VIEW



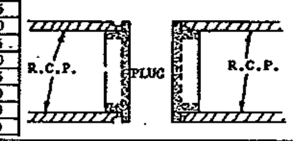
PLAN



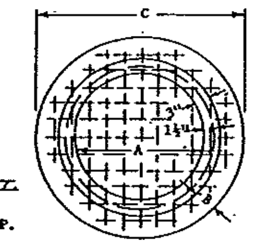
SECTION X-X

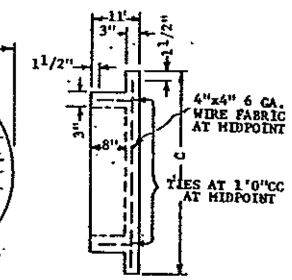
END SECTION
Equivalent to Class III Pipe

CONCRETE PIPE PLUG DIMENSIONS (In inches)			
PIPE DIAMETER	A	B	C
15	8	2.25	19.5
18	11	3.0	23.0
21	14	3.25	26.5
24	17	3.50	30.0
27	20	3.75	33.5
30	23	4.0	37.0
33	26	4.25	40.5
36	29	4.50	44.0
42	35	5.0	51.0
48	41	5.50	58.0



REINFORCED CONCRETE PIPE PLUG





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

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

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

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

REINFORCED CONCRETE PIPE

Class	D-Load to produce a 0.01 inch crack	D-Load to produce ultimate load
CLASS I	800	1200
CLASS II	1000	1500
CLASS III	1350	2000
CLASS IV / CLASS IV ALTERNATE	2000	3000
CLASS V / CLASS V ALTERNATE	3000	3750

Pipe data and CLASS I (4000 P.S.I.; 5000 P.S.I. for 102 and 108)

Internal Dia. of Pipe in Inches (Dia)	Cross-Sectional Water Area (Sq.ft.)	Weight per lin. foot of pipe Std. Wall (Lbs.)	Joint Groove End J Min./Max. (In.)	Joint Tongue End K Min. (In.)	Minimum Wall Thickness (In.)	Circular rein. in circular pipe Inner cage (Sq.in)	Circular rein. in circular pipe Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)	Height of Fill Trench Conditions (Ft.)
12	0.79	92	1⅝-2¾	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	2¾-3¾	1⅛					
27	3.98	322	2¾-4	1¼	☆ Special conditions only				
30	4.91	384	3¼-4¼	1¼					
33	5.94	452	3¼-4¼	1½					
36	7.07	524	3¼-4¼	1½					
42	9.62	685	3¾-4¾	1¾					
48	12.57	867	3⅝-4¾	1⅞					
54	15.90	1070	4½-5¼	2					☆
60	19.63	1296	4½-5½	2¼	6	.21	.13	.23	6-9
66	23.76	1542	5-6	2⅜	6½	.25	.15	28	6-9
72	28.27	1810	5⅝-6¾	2⅞	7	.29	.17	.32	6-9
78	33.18	2098	6¼-7¼	2⅞	7½	.32	.19	.36	6-9
84	38.48	2410	5⅝-7¾	3⅜	8	.37	.25	41	6-9
90	44.18	2793	6¾-8¼	3⅛	8½	.41	.25	.46	6-9
96	50.27	3092	7-8¼	3½	9	.46	.28	.51	6-9
					5000 P.S.I.				
102	56.75	3466	7-8¼	3½	9½	.54	.32	.13 .41	6-9
108	63.62	3864	7¼-8½	3¾	10	.61	.32	.15 .46	6-9

CLASS II (4000 P.S.I.; 5000 P.S.I. for 102 and 108)

Dia	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	Circular rein. Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12		.07				
15		.07				
18		.07		.07		
21		.07		.07		
24		.07		.07		
27	3¼	.13		.11	3-11	11-18
30	3½	.14		.12	3-11	11-18
33	3¾	.15		.13	3-11	11-18
36	4	.12	.07	.13	3-11	11-18
42	4½	.15	.09	.17	3-11	11-18
48	5	.18	.11	.20	3-11	11-18
54	5½	.22	.13	.24	3-11	11-18
60	6	.25	.15	.28	3-11	11-18
66	6½	.31	.19	.34	3-11	11-18
72	7	.35	.21	39	3-11	11-18
78	7½	.40	.24	44	3-11	11-18
84	8	.46	.28	51	3-11	11-18
90	8½	.51	.31	57	3-11	11-18
96	9	.57	.34	63	3-11	11-18
	5000 P.S.I.					
102	9½	.68	.41	.27 .41	3-11	11-18
108	10	.76	.46	.30 .46	3-11	11-18

CLASS III (4000 P.S.I.; 5000 P.S.I. from 90)

Dia	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in.)	Circular rein. Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12	2	.07				.07			1-16	16-31
15	2¼	.07				.07			1-16	16-31
18	2½	.07		.07		.07			1-16	16-31
21	2¾	.07		.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		.17	4½	.12			1-3 11-16	16-31
36	4	.17	.10	.19	4¾	.08	.07	.09	1-3 11-16	16-31
42	4½	.21	.13	.23	5¼	.12	.07	.13	1-3 11-16	16-31
48	5	.24	.14	27	5¾	.16	.10	.18	1-3 11-16	16-31
54	5½	.29	.17	32	6¼	.21	.13	.23	1-3 11-16	16-31
60	6	.34	.20	38	6¾	.25	.15	.28	1-3 11-16	16-31
66	6½	.41	.25	46	7¼	.31	.19	.34	1-3 11-16	16-31
72	7	.49	.29	54	7¾	.36	.22	.40	1-3 11-16	16-31
78	7½	.57	.34	63	8¼	.42	.25	47	1-3 11-16	16-31
84	8	.64	.38	71	8¾	.50	.30	56	1-3 11-16	16-31
	5000 PSI									
90	8½	.69	.41	77	9¼	.59	.35	66	1-3 11-16	16-31
96	9	.76	.46	84	9¾	.70	.42	.17 .53	1-3 11-16	16-31
102	9½	.90	.54	.36 .54	10¼	.83	.50	.33 .50	1-3 11-16	16-31
108	10	1.08	.65	.43 .65	10¾	.99	.59	.40 .59	1-3 11-16	16-31

CLASS IV (4000 P.S.I.; 5000 P.S.I. where noted)

Dia	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in.)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in.)
12	2	.07						
15	2¼	.10						
18	2½	.14		.11				
21	2¾	.20		.17				
24	3	.27		.23	3¾	.07	.07	.08
27	3¼	.31		.25	4	.08	.07	.09
30	3½	.35		.28	4¼	.09	.07	.10
33	3¾	.27	.16	.30	4½	.11	.07	.12
36	4	.30	.21	.33	4¾	.14	.08	.15
42	4½	.35	.21	.39	5¼	.20	.12	.22
48	5	.42	.25	.47	5¾	.26	.16	.29
54	5½	.50	.30	.55	6¼	.34	.25	.38
	5000 P.S.I.							
60	6	.59	.35	.66	6¾	.41	.25	46
66	6½	.69	.41	.77	7¼	.51	.31	57
					5000 PSI.			
72	7	.79	.47	88	7¾	.61	.37	.68
78					8¼	.71	.43	79
84					8¾	.85	.51	.94

CLASS IV ALTERNATE (5000 P.S.I.)

Dia	Minimum Wall Thickness (In.)	Inner cage Ai (Sq.in)	Ellip. cage Ae (Sq.in)	Outer cage Ao (Sq.in)	Shear Steel N (No.)	Shear Steel S (In.)	Shear Steel Ar (Sq.in)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12								16-24	24-43
15								16-24	24-43
18								16-24	24-43
21								16-24	24-43
24								16-24	24-43
27								16-24	24-43
30								16-24	24-43
33								16-24	24-43
36								16-24	24-43
42								16-24	24-43
48								16-24	24-43
54								16-24	24-43
60	6	.54	.27	.41	7	6	.22	16-24	24-43
66	6½	.60	.30	.45	8	6	.22	16-24	24-43
72	7	.64	.32	.48	8	6	.23	16-24	24-43
78	7½	.70	.35	.53	9	6	.25	16-24	24-43
84	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

CLASS V (6000 P.S.I.)

Dia	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)	Minimum Wall Thickness (In.)	Circular rein. Inner cage (Sq.in)	Circular rein. Outer cage (Sq.in)	Ellip. rein. in Cir. pipe & Cir. rein. in Ellip. pipe (Sq.in)
12	2	.10						
15	2¼	.14						
18	2½	.18		16				
21	2¾	24		.21				
24	3	30		24	3¾	.12	.07	.13
27	3¼	.38	.23	.42	4	.14	.08	16
30	3½	.41	.23	.46	4¼	.18	.11	.20
33	3¾	.46	.28	.51	4½	.23	.14	25
36	4	50	.30	56	4¾	.27	.16	30
42	4½	.60	.36	.67	5¼	.36	.28	.40
48	5	.73	.44	81	5¾	.47	.28	52
54					6¼	.58	.35	.64
60					6¾	.70	.42	78
66					7¼	.84	.60	93
72					7¾	.99	.57	.10

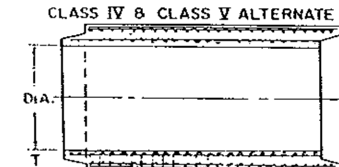
CLASS V ALTERNATE (5000 P.S.I.)

Dia	Minimum Wall Thickness (In.)	Inner cage Ai (Sq.in)	Ellip. cage Ae (Sq.in)	Outer cage Ao (Sq.in)	Shear Steel N (No.)	Shear Steel S (In.)	Shear Steel Ar (Sq.in)	Height of Fill Normal Backfill (Ft.)	Height of Fill Imperfect Trench (Ft.)
12								24-35	35-69
15								24-35	35-69
18								24-35	35-69
21								24-35	35-69
24								24-35	35-69
27								24-35	35-69
30								24-35	35-69
33								24-35	35-69
36								24-35	35-69
42								24-35	35-69
48	5	.66	.33	.50	8	4	.22	24-35	35-69
54	5½	.74	.37	.56	9	4	.22	24-35	35-69
60	6	.82	.41	.62	7	6	.22	24-35	35-69
66	6½	.88	.44	.66	8	6	.22	24-35	35-69
72	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									

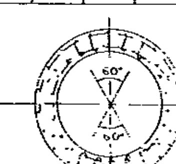
NOTES: All reinforcement shall be electrically welded cold drawn steel wire fabric.
Circular reinforcement shall lap in accordance to A.A.S.H.O. M170.
All circular, longitudinal and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact 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

Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drains or sanitary sewers.

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.

10-1-86 REVISIONS	
DATE	CHANGE
11-5-86	Note Added
7-17-87	ADDED PIPE PLUG DETAIL
8-1-88	Reinforcement Cage

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT
APPROVED: [signature]
DESIGN ENGINEER

CORRUGATED STEEL PIPE CULVERTS AND END SECTIONS
(ROUND PIPE)

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

D-714-4

NOTES:

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

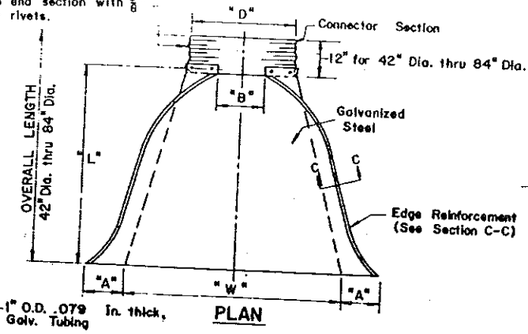
Top edge of all End Sections to have tubing reinforcement or rolled tubed reinforcement (See Section A-A). The tubing is to be supplemented with 2"x2"x ¼" Galv. Angle for 60" thru 72" Dia. and 2½"x2½"x ¼" Galv. Angle for 78" and 84" Dia. Angles to be attached by Gal. ⅜"ø bolts and nuts. Angles are to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

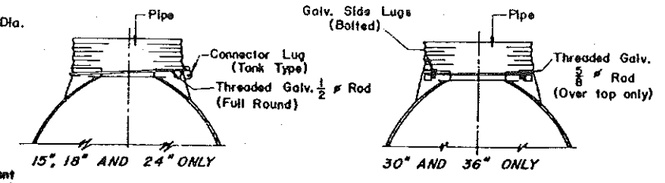
Fill Height Tables are based on the following criteria:

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

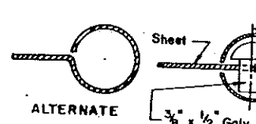
This connection for 42" thru 84" diameter pipe to be bolted or riveted to the end section with ⅜" Galv. bolts or rivets.



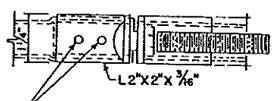
PLAN



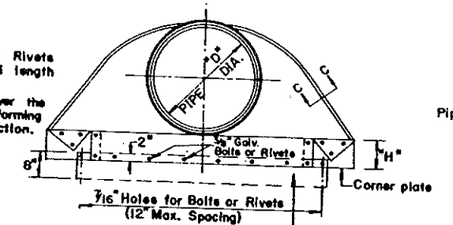
ROD CONNECTION DETAILS



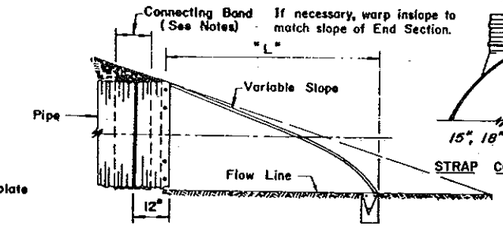
NOTE: Tubing is slipped over the sheet and rivets prior to forming operations of the End Section.



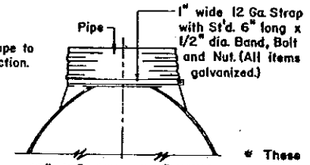
SECTION C-C



ELEVATION



TYPICAL CROSS-SECTION
(Showing Connector Section)

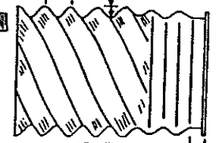


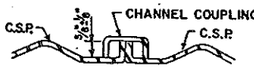
STRAP CONNECTION DETAILS

END SECTIONS

** PIPE DIA. (In.)	GALV. THICK.	DIMENSIONS A	B	H	L	W	Approx. Slope	Body Piece
		In.	In.	In.	In.	In.	Rate	
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 OR 2
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

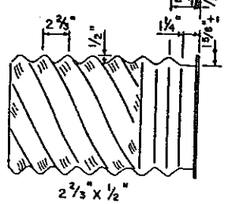
* These sizes have 0.138 in. center panels.
** Pipe diameter is equal to dimension "D" of end section.
Manufacturers tolerances of above dimensions will be allowed.
Splices to be the lap riveted type.
Multiple panel bodies shall have lap seams which are to be tightly joined with ⅜" ø galv. bolts or rivets.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





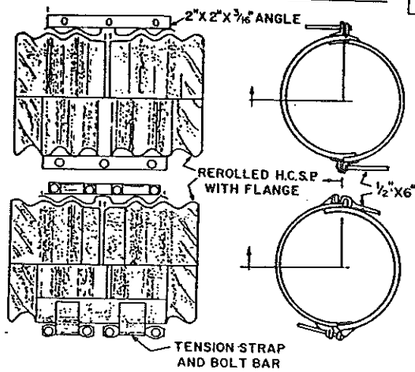
SECTION "B-B"

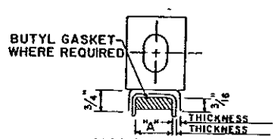
CHANNEL COUPLING BAND FOR USE ON FLANGED END C.S.P
(CHANNEL COUPLING BANDS SHALL BE TWO PIECE)



SPIRAL C.S.P

REFORMED TO ACCEPT FLANGE, ANNULAR, DIMPLE AND HUGGER COUPLERS



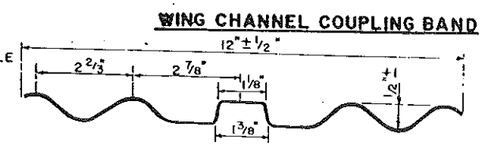


NOMINAL DIMENSIONS

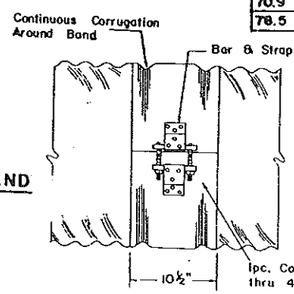
THICKNESS	"A"	FOR USE WITH C.S.P.
0.079"	¾	0.09" THICK OR LIGHTER
0.109"	1"	0.138" THICK OR HEAVIER

SECTION "A-A"

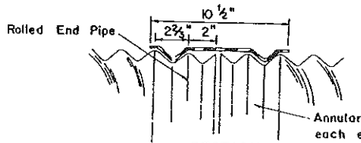
WING CHANNEL COUPLING BAND



CROSS SECTION OF WING CHANNEL COUPLING BAND



CONNECTING BAND DETAILS FOR HELICAL, WELDED - SEAM CULVERT



SECTION

FILL HEIGHT TABLES
RIVETED, WELDED OR HELICAL FABRICATION

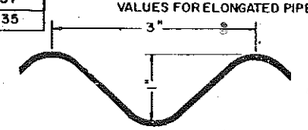
3" BY 1" CORRUGATIONS

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

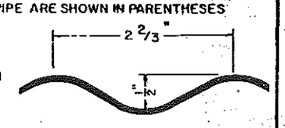
2⅔" BY ½" CORRUGATIONS

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

DATE	REVISIONS CHANGE
10-1-86	
4-28-89	Toe Plate Note

NORTH DAKOTA STATE HIGHWAY DEPARTMENT
APPROVED: David K. O. Leer
DESIGN ENGINEER

CORRUGATED STEEL PIPE FLANGE BAND DETAILS

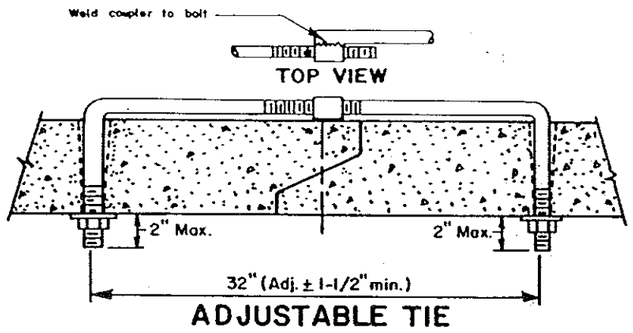
WING CHANNEL COUPLING BAND FOR ANNULAR C.S.P. OR REFORMED H.C.S.P.

30068

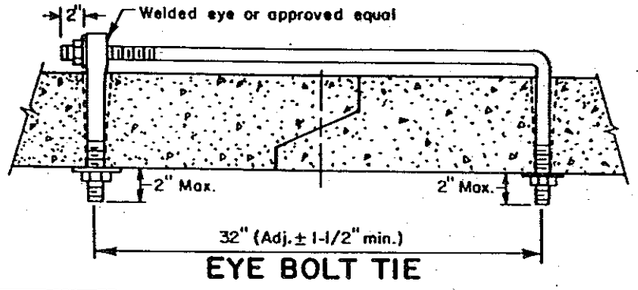
CONCRETE PIPE TIES

FHWA REGION	STATE	FED. AID PROJ. NO.	SHEET NO.
8	N.D.	CRS 3020(54)	

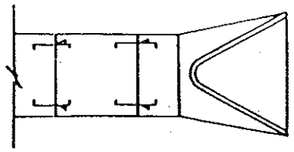
D-714-22

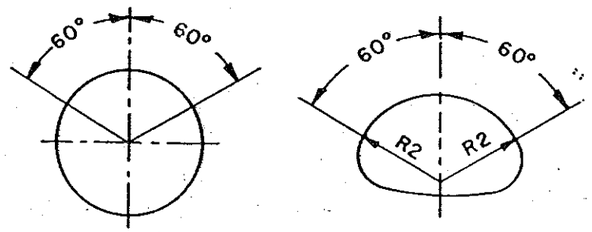


ADJUSTABLE TIE



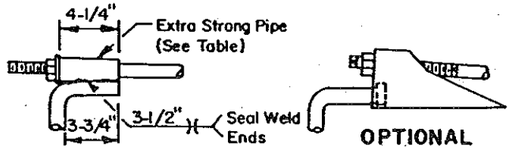
EYE BOLT TIE





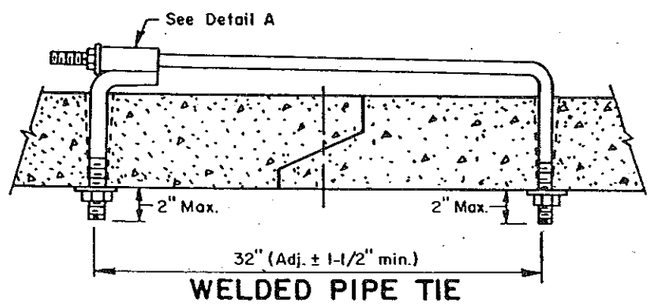
PLACEMENT OF HOLES

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

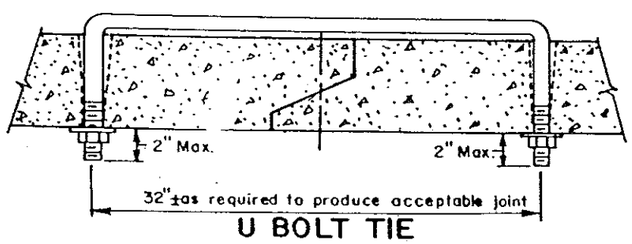


DETAIL A

OPTIONAL CANOPY TIE



WELDED PIPE TIE



U BOLT TIE

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.
9. TIE BOLTS ARE REQUIRED ON END SECTIONS (4 EA.) FOR ALL R.C.P. CULVERTS. ON CULVERTS WITHOUT FLARED END SECTIONS, THE 3 END SECTIONS OF THE CULVERT SHALL BE TIED TOGETHER IN THE SAME MANNER FOR EACH END.

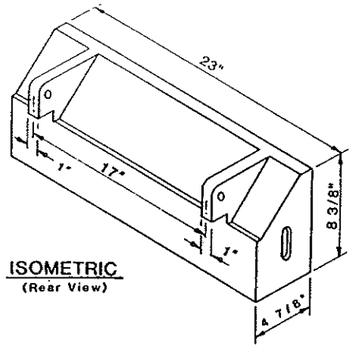
10-1-86	
REVISIONS	
DATE	CHANGE

NORTH DAKOTA
STATE HIGHWAY DEPARTMENT

APPROVED: David K.O. Leer
DESIGN ENGINEER

INLET - TYPE 1

D-722-1



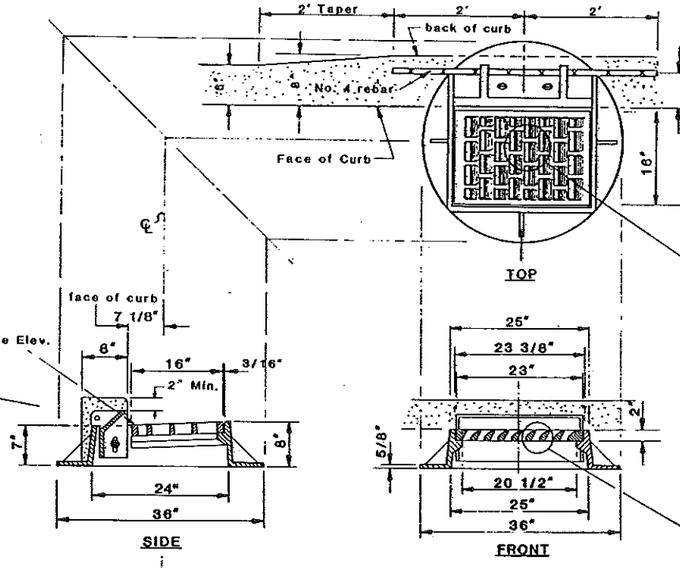
ISOMETRIC
(Rear View)

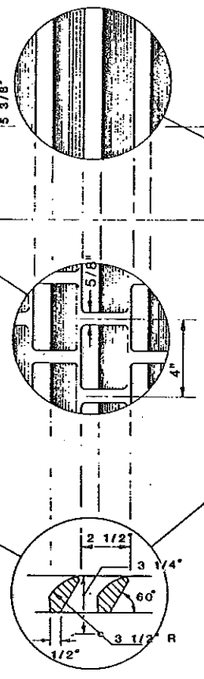
← GRATE STYLES →

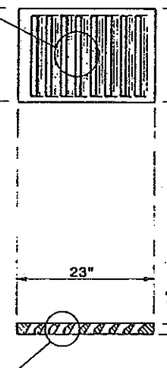
"L"

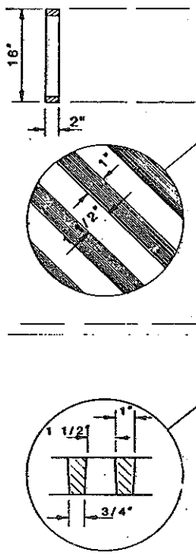
"V"

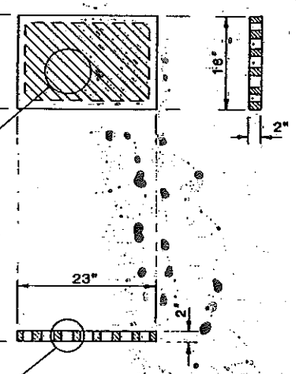
"D"
(Waterway Area = 1.3 Sq. Ft.)

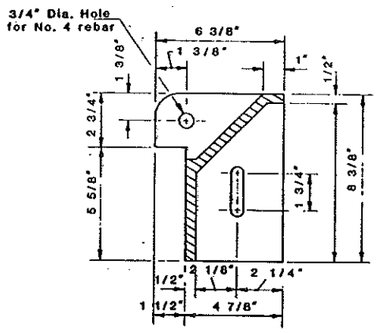












CURB BOX
Weight - 80 lbs

SIDE

FRONT

CASTING DETAILS

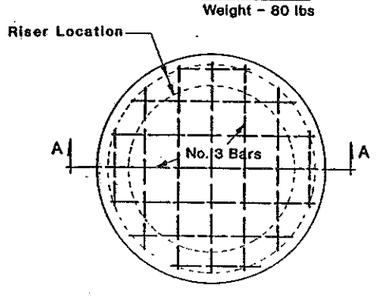
Weights - Frame - 209 lbs
Grate - 110 lbs

Notes:

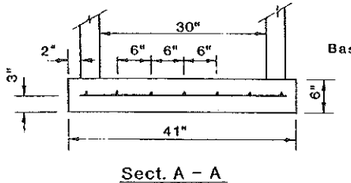
1. Other castings, similar in dimension and of equal or greater weight than that shown, may be used if accepted by the engineer in writing. The grate style shall be as specified on the plans.
2. Metal used in the manufacture of castings shall conform to AASHTO M-105, Class 35B.
3. The contractor shall have the option of using precast or poured in place bases. Class of concrete shall be AE. The aggregate size shall be approved by the engineer in the field. Construction shall be in accordance with section 722.03 of the Standard Specifications.
4. Precast risers shall be constructed in accordance with AASHTO M199.
5. On projects with P.C.C. pavement all inlet risers or barrels shall be constructed 4 to 5 inches below final elevation and adjusted to final grade after the paving. Adjustment may be done with adjusting rings, masonry, or cast-in-place. All costs for this adjustment shall be included in the price bid for the inlet.

Pay Item

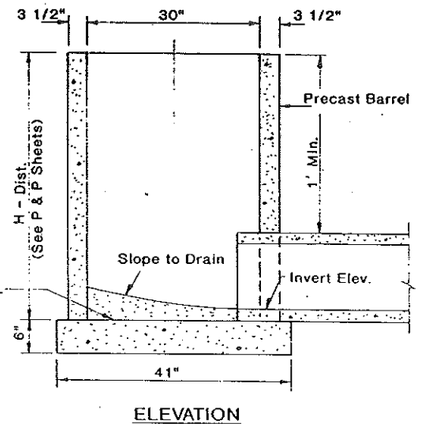
Inlet - Type 1 . . . . . Ea.



PLAN



Sect. A - A



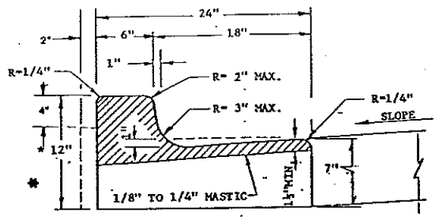
ELEVATION

RISER DETAILS

December 1, 1989	NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
Revisions	
Date / Change	
11/90 Note 5 added.	Approved: David K. O. Leer, Design Engineer

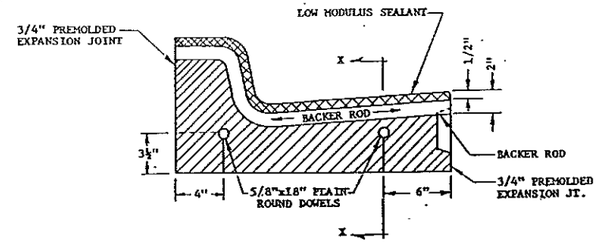
VALLEY GUTTER AND CURB & GUTTER

D-748-1

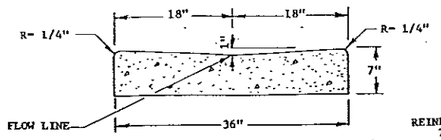


CURB & GUTTER TYPE I (SEC.A)

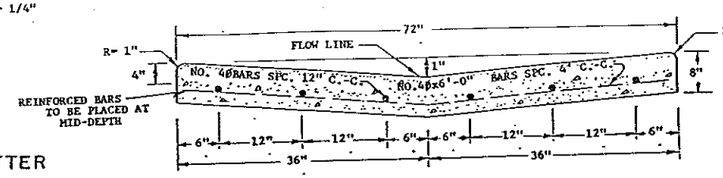
* 16" SEC. B
14" SEC. C



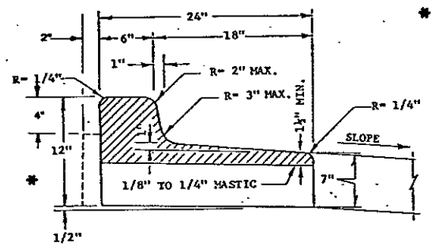
EXPANSION JOINT DETAIL



36" CONCRETE VALLEY GUTTER

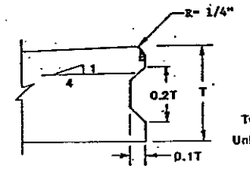


72" CONCRETE VALLEY GUTTER



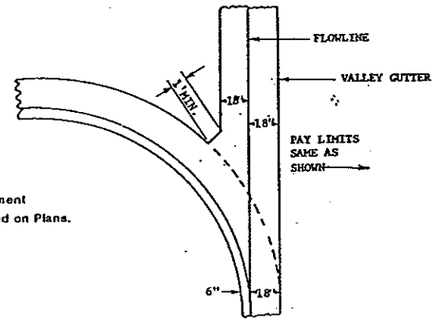
* PROVIDE 2" LEDGE AS SHOWN WHERE THE SIDEWALK IS ABUTTING THE CURB & GUTTER

CURB & GUTTER TYPE I (SEC. D)

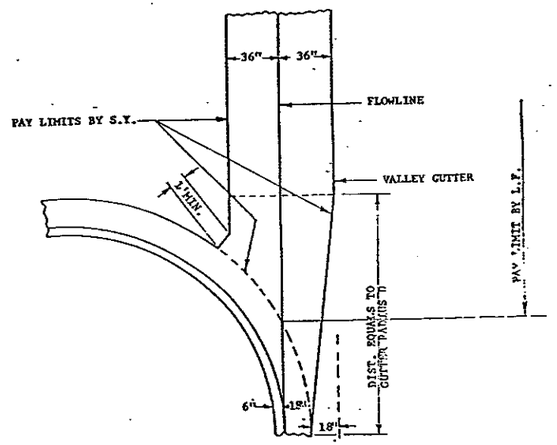


T=Thickness of Pavement Unless Otherwise Noted on Plans.

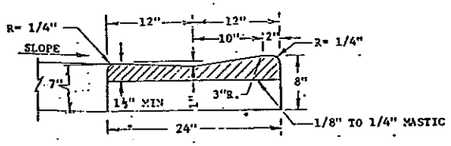
KEYWAY DETAIL FOR CURB & GUTTER
(TO BE USED WITH P.C.C. PAVEMENT AND DRIVES.)



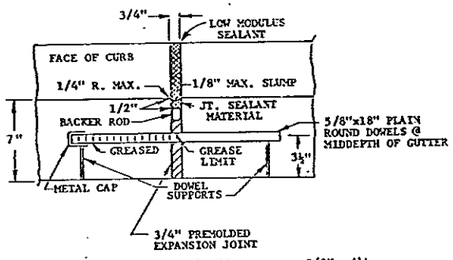
36" CONCRETE VALLEY GUTTER



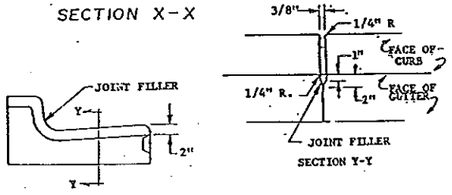
72" CONCRETE VALLEY GUTTER



MOUNTABLE CURB & GUTTER TYPE I (SEC. A)

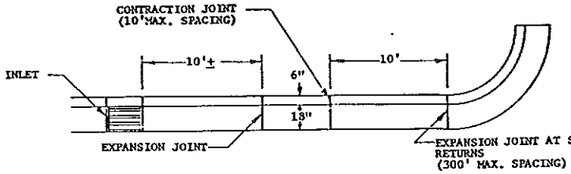


SECTION X-X

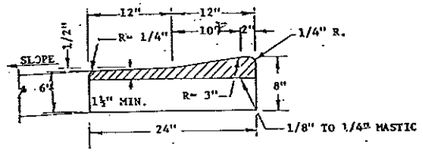


SECTION Y-Y

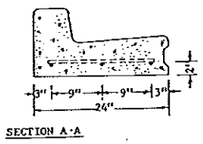
SCORED CONTRACTION JOINT DETAIL
(10' MAX. SPACING)



JOINT LOCATION DETAIL
HOT BITUMINOUS PAVEMENT

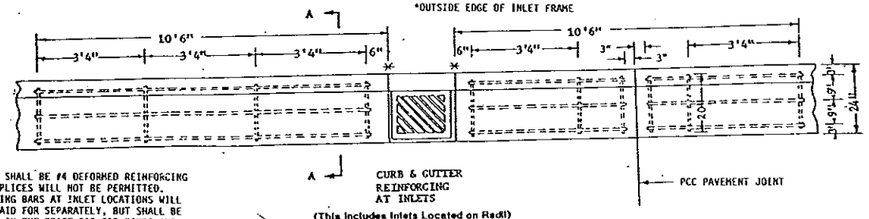


MOUNTABLE CURB & GUTTER TYPE I (SEC. B)



SECTION A-A

NOTE: ALL BARS SHALL BE #4 DEFORMED REINFORCING BARS. SPLICES WILL NOT BE PERMITTED. REINFORCING BARS AT INLET LOCATIONS WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE PRICE BID FOR "CURB AND GUTTER - TYPE I."



3. EXPANSION JOINTS - EXPANSION JOINT MATERIAL SHALL BE 3/4" PREMOLDED CONFORMING TO SECTION 826.02 B OF THE STANDARD SPECIFICATIONS. THE OPENING FOR THE BACKER ROD AND JOINT SEALANT SHALL BE FORMED BY A PRE-CUT PIECE OF WOOD OR OTHER MATERIAL APPROVED BY THE ENGINEER. DOWEL SUPPORTS ARE NOT REQUIRED ON THE SECOND POUR AT A COLD JOINT. THE METAL CAP AND GREASED DOWEL SHALL BE ON THE SECOND POUR.

4. JOINT SPACING - FOR HOT BITUMINOUS PAVEMENTS THE JOINT SPACING OF THE CURB AND GUTTER SHALL BE AS SHOWN IN THE DETAIL. THE CURB AND GUTTER JOINTS SHALL MATCH THE PAVEMENT JOINT ON PCC PAVEMENTS.

5. JOINT SEALING - ALL CONTRACTION AND EXPANSION JOINTS SHALL BE SEALED AS SHOWN IN THE DETAILS, OR AS APPROVED BY THE ENGINEER. THE JOINT SEALANT SHALL BE LOW MODULUS SILICONE OR POLYURETHANE WITH THE FOLLOWING MINIMUM PROPERTIES:
   TENSILE STRENGTH AT BREAK (ASTM D-412) 125 psi
   MOVEMENT CAPABILITY ±50% EXPANSION/CONTRACTION
   TT-S-00230C
   THE SEALANT SHALL BE TOOLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

6. THE COST FOR ALL LABOR, EQUIPMENT, AND MATERIAL NECESSARY TO CONSTRUCT CONTRACTION, & EXPANSION JOINTS SHALL BE INCLUDED IN THE PRICE BID FOR CURB AND GUTTER.

NOTES:

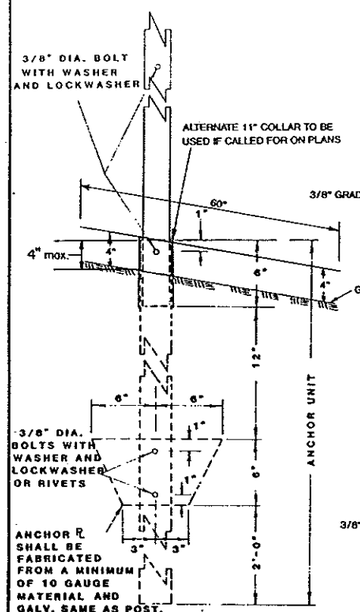
1. CURB AND GUTTER TYPE I (SEC. A) TO BE USED UNLESS OTHERWISE SPECIFIED.
2. CONTRACTION JOINTS: USE 1/8"-1/4" ASPHALTIC MASTIC BOARD EMBEDDED 1½" INTO THE GUTTER AND THROUGH THE CURB, OR SCORE THE CURB AND GUTTER 2" AS SHOWN IN THE DETAIL.

10-1-86	
REVISIONS	
DATE	CHANGE
10-1-87	NOTE REMOVED
3/1/88	Keyed Jt. Dimension
5/19/88	C & G Reinf. at Inlets
7/5/89	Reinf. Radii Inlets
3-27-92	Add 2" ledge

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K.D. Leer
DESIGN ENGINEER

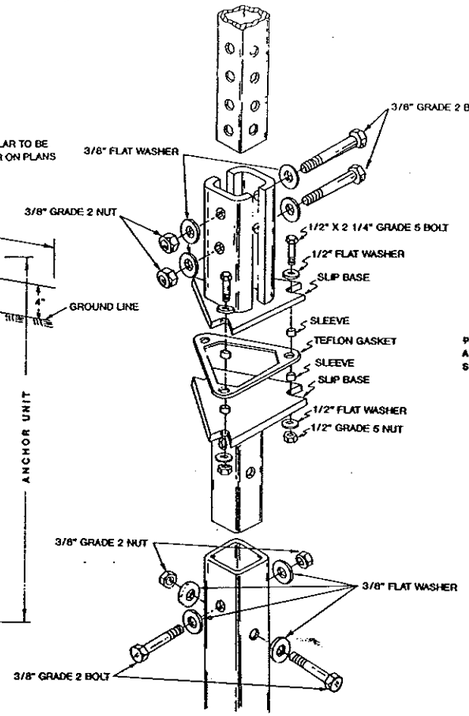
MOUNTING DETAILS
PERFORATED TUBE

D 754-24



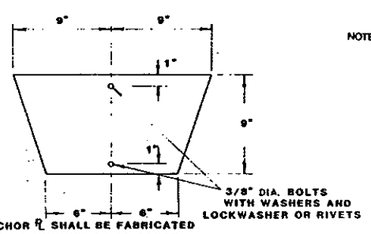
ANCHOR ℄ SHALL BE FABRICATED FROM A MINIMUM OF 10 GAUGE MATERIAL AND GALV. SAME AS POST. (1 POST INSTALLATIONS)

ANCHOR UNIT AND POST SLEEVE ASSEMBLY



SLIP BASE ASSEMBLY DETAILS

NOTE: SLIP BASE BOLTS SHALL BE TORQUE AS SPECIFIED BY THE MANUFACTURER.



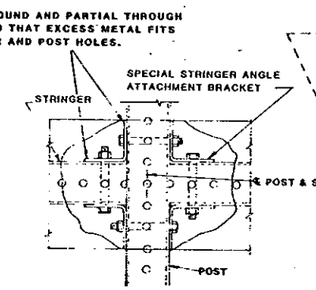
ANCHOR ℄ SHALL BE FABRICATED FROM A MINIMUM OF 10 GAUGE MATERIAL AND GALVINIZED SAME AS POST

ANCHOR PLATE DETAIL
(2 OR MORE POST INSTALLATIONS)

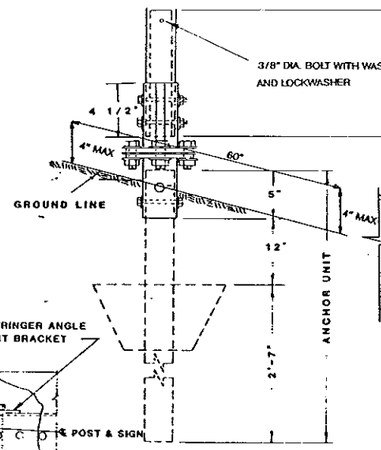
THE 2 3/16" SIZE 10 GAUGE IS SHOWN AS 2.19" SIZE ON THE PLANS. THE 2 1/2" SIZE 10 GAUGE IS SHOWN AS 2.51" SIZE ON THE PLANS.

TELESCOPING PERFORATED TUBES-TYPE I						
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	1.702	.129	.380	.172
2 x 2	.105	12	2.416	.372	.590	.372
2 1/4 x 2 1/4	.105	12	2.773	.561	.695	.499
2 3/16 x 2 3/16	.135	10	3.432	.605	.841	.590
2 1/2 x 2 1/2	.105	12	3.141	.804	.803	.643
2 1/2 x 2 1/2	.135	10	4.006	.979	1.010	.785
3 x 3	3/16	3/16	6.870	2.60	2.020	1.73
SQUARE TELESCOPING STEEL POSTS-TYPE II						
1 3/4x1 3/4	.105	12	2.304	.232	.486	.265
2 x 2	.105	12	2.654	.372	.590	.372
2 1/4x2 1/4	.105	12	3.004	.564	.697	.501
2 1/2x2 1/2	.105	12	3.354	.803	.602	.642

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

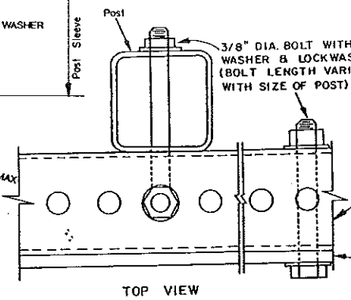


FOR SINGLE POST ASSEMBLIES HAVING ONLY ONE STRINGER OR WITH BACK TO BACK SIGNS.

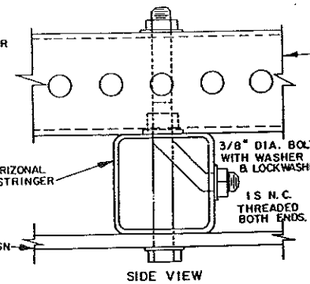


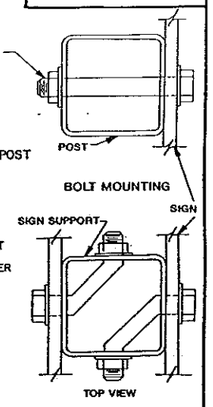
SLIP BASE ANCHOR UNIT AND POST SLEEVE ASSEMBLY

4" VERTICAL CLEARANCE OF ANCHOR OR BREAKAWAY BASE. THE 4" X 60° MEASUREMENT SHALL BE MADE ABOVE AND BELOW POST LOCATION, AND ALSO BACK AND AHEAD OF POST



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

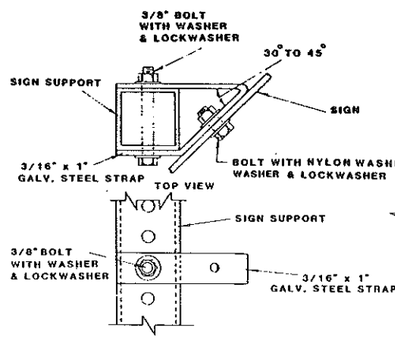




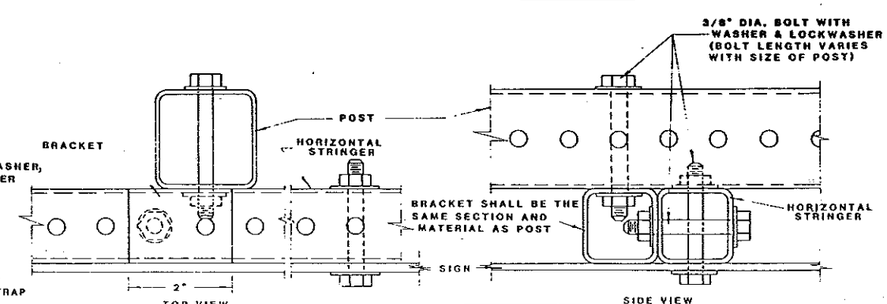
BACK TO BACK MOUNTING

HORIZONTAL STRINGERS – IN LIEU OF PERFORATED TUBES, THE CONTRACTOR MAY SUBSTITUTE Z BAR STRINGERS. THE Z BAR STRINGERS SHALL BE 1 3/4" X 3/16" THICK, 1.08LBS./FT. ALUMINUM ALLOY OR 3.16LBS./FT. STEEL.

NUMBER OF POSTS	TELESCOPING PERFORATED TUBES TYPE I						SQUARE TELESCOPING STEEL POSTS TYPE II					
	POST SIZE	WALL THICK-NESS GAUGE	SLEEVE SIZE	ANCHOR SIZE	WALL THICK-NESS GAUGE	SLIP BASE	POST SIZE	WALL THICK-NESS GAUGE	SLEEVE SIZE	ANCHOR SIZE	WALL THICK-NESS GAUGE	SLIP BASE
1	2	12		2 1/4	12	NO	1 3/4	12		2	12	NO
1	2 1/4	12		2 1/2	12	NO	2	12		2 1/4	12	NO
1	2 3/16	10		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
1	2 1/2	12		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
1	2 1/2	10		3	3/16	YES	2 1/2	12		2 1/2	12	YES
1	2 1/4	12	2	2 1/2	12	YES	2 1/2	12		2 1/2	12	YES
1	2 1/2	12	2 1/4	2 1/2	12	YES	2 1/4	12	2	2 1/4	12	YES
2	2	12		2 1/4	12	NO	1 3/4	12		2	12	NO
2	2 1/4	12		2 1/2	12	NO	2	12		2 1/4	12	NO
2	2 3/16	10		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
2	2 1/2	12		2 1/2	12	YES	2 1/4	12		2 1/2	12	NO
2	2 1/2	10		3	3/16	YES	2 1/2	12		2 1/2	12	YES
2	2 1/4	12	2	2 1/2	12	YES	2 1/2	12		2 1/2	12	YES
2	2 1/2	12	2 1/4	2 1/2	12	YES	2 1/4	12	2	2 1/4	12	YES
3&4	2 1/2	12		2 1/2	12	YES	2 1/4	12		2 1/4	12	YES
3&4	2 1/2	10		3	3/16	YES	2 1/2	12		2 1/2	12	YES
3&4	2 1/2	12	2 1/4	2 1/2	12	YES	2 1/4	12	2	2 1/4	12	YES
3&4	2 1/4	12	2	2 1/2	12	YES	2 1/2	12		2 1/2	12	YES
3&4	2 1/2	10	2 3/16	3	3/16	YES	2 1/2	12	2 1/4	2 1/2	12	YES



STRAP DETAIL



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

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.

NO PARKING SIGNS: ALL NO PARKING SIGNS THAT HAVE DIRECTIONAL ARROWS PLACED ON THEIR FACES SHALL BE PLACED AT 30 TO 45 DEGREE ANGLE WITH ONCOMING TRAFFIC. 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.

10-1-86

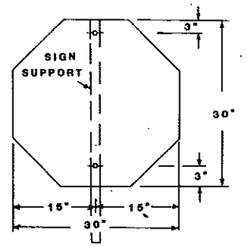
REVISIONS	
DATE	CHANGE
7-1-91	VERTICAL CLEARANCE & NOTE
7-9-91	REMOVE HINGE ASSEMBLIES
8-22-91	SLIP BASE ASSEMBLY
12-20-91	ALTERNATE 11" COLLAR
5-1-92	GENERAL REVISIONS
5-18-92	REVISED TABLES

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

APPROVED _____
DESIGN ENGINEER

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

D-754-26



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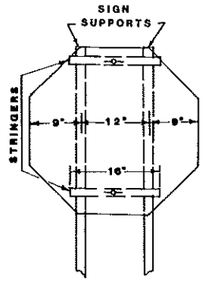
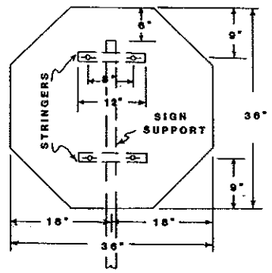
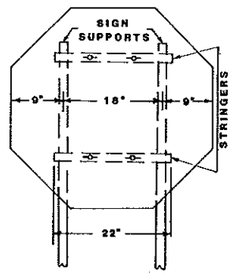


2 POSTS

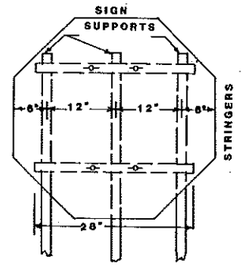


1 POST

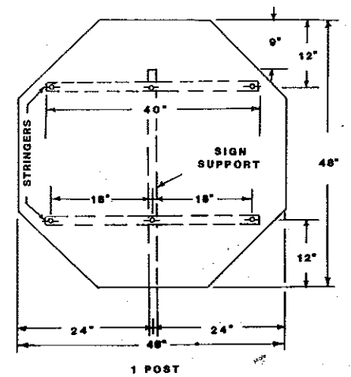
ASSEMBLY NO. 1



2 POSTS



3 POSTS



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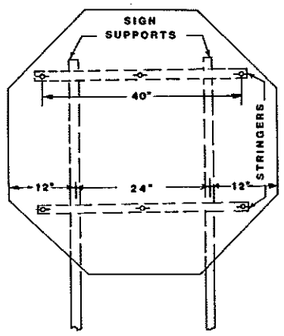
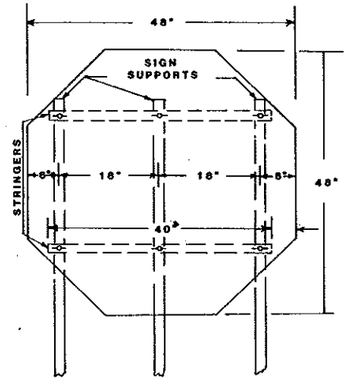
ASSEMBLY NO. 2

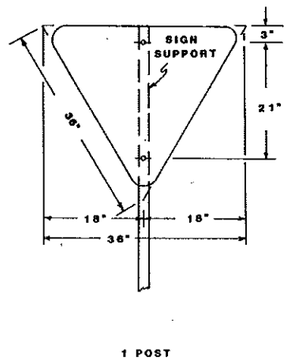


2 POSTS



3 POSTS

ASSEMBLY NO. 3



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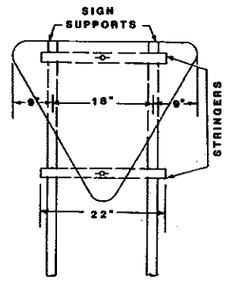
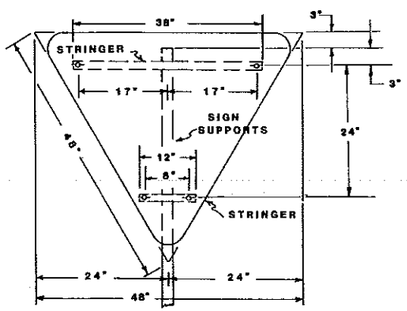
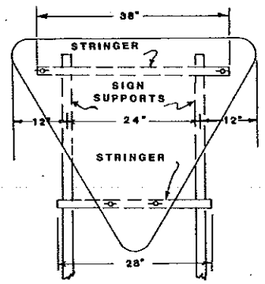


2 POSTS

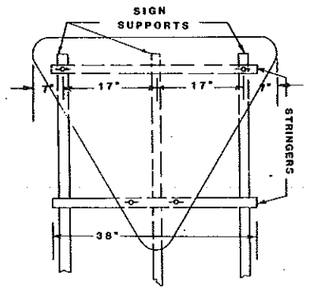
ASSEMBLY NO. 4



1 POST



2 POSTS



3 POSTS

ASSEMBLY NO. 5

NOTE:

Material:

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

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:

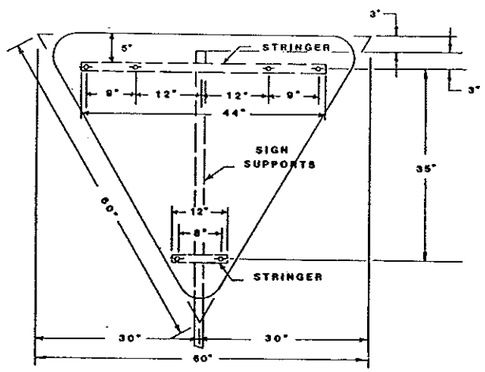
See plans for sign numbers to be used at each location.
See Std. D-754-24 square tube, perforated mounting details.
See Std. D-754-25 for flange channel mounting details.

10-1-86	
REVISIONS	
DATE	CHANGE
6-1-92	GENERAL REVISIONS

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K. D. Boen
DESIGN ENGINEER

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

D-754-27



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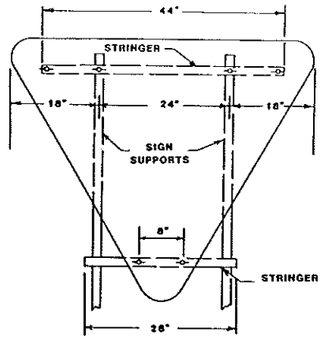
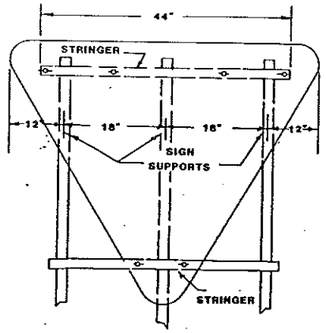
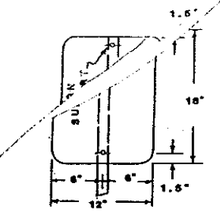


2 POSTS



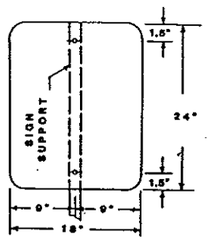
3 POSTS

ASSEMBLY NO. 6



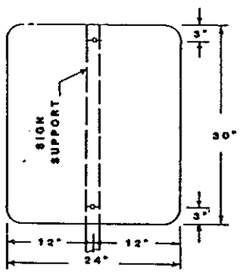
1 POST

ASSEMBLY NO. 7



1 POST

ASSEMBLY NO. 8



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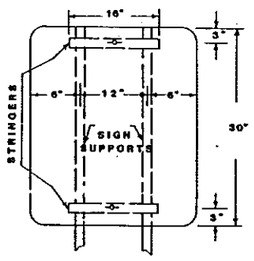
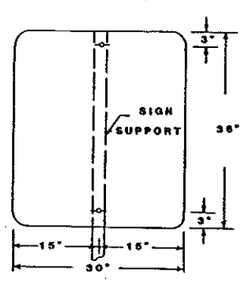


2 POSTS

ASSEMBLY NO. 9



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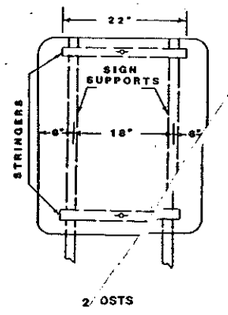
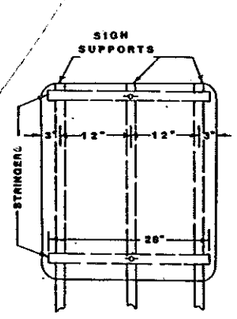
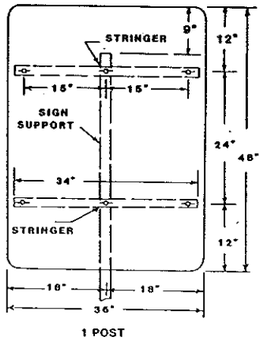


2 POSTS

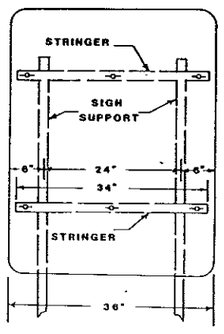


3 POSTS

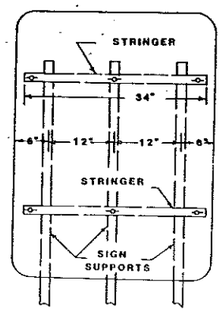
ASSEMBLY NO. 10



1 POST



2 POSTS



3 POSTS

ASSEMBLY NO. 11

NOTE:

Material:

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

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.

10-1-86

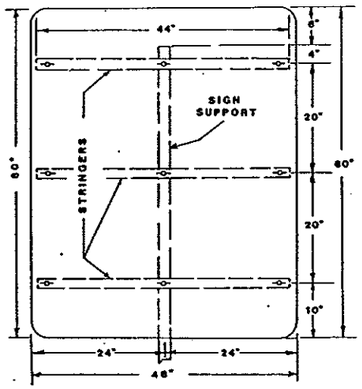
REVISIONS	
DATE	CHANGE
5-1-92	GENERAL REVISIONS

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

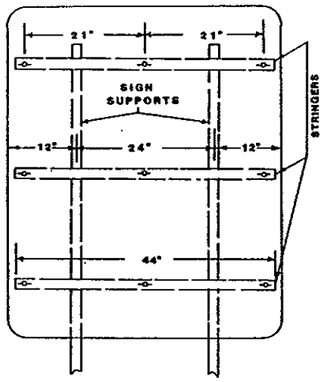
APPROVED: David K.O. Leer
DESIGN ENGINEER

D-754-28

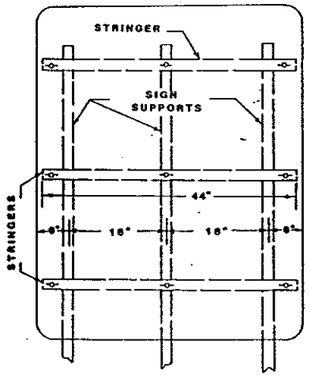
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING, AND GUIDE SIGNS



1 POST

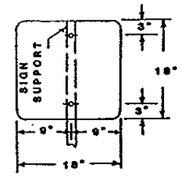


2 POSTS



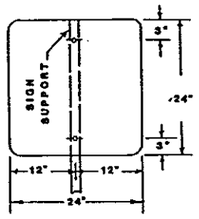
3 POSTS

ASSEMBLY NO. 12

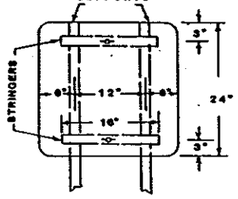


1 POST

ASSEMBLY NO. 13

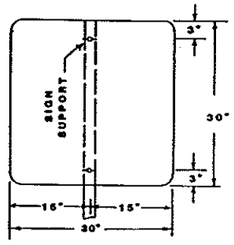


1 POST

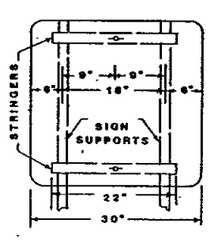


2 POSTS

ASSEMBLY NO. 14

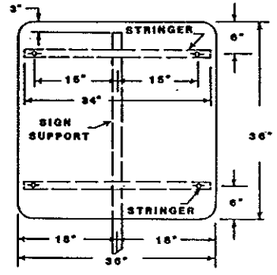


1 POST



2 POSTS

ASSEMBLY NO. 15



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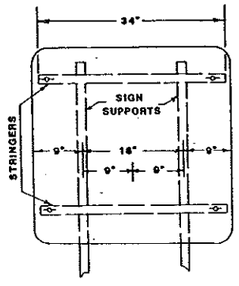
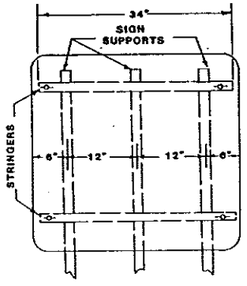
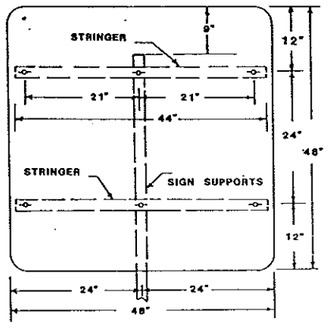


2 POSTS



3 POSTS

ASSEMBLY NO. 16



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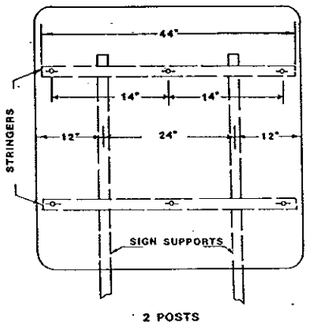

2 POSTS

ASSEMBLY NO. 17

NOTE:

Material

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

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 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.

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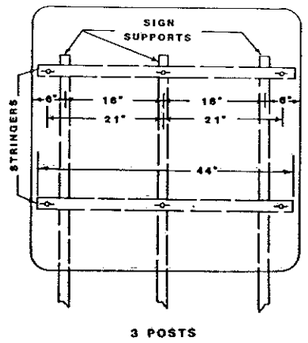
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K.O. Boe
DESIGN ENGINEER

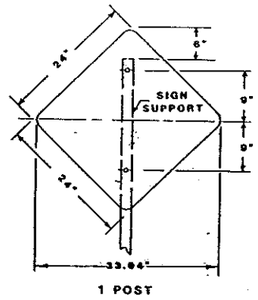
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING, AND GUIDE SIGNS

D-754-29

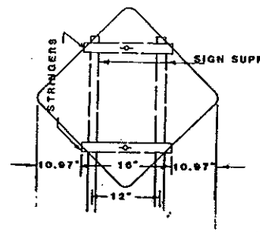


3 POSTS

ASSEMBLY NO. 17

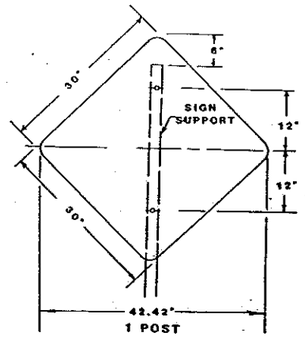


1 POST



2 POSTS

ASSEMBLY NO. 18



1 POST

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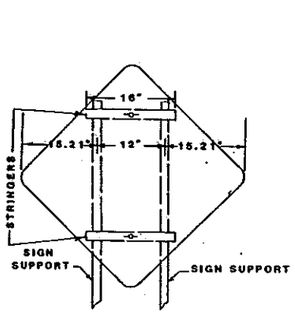
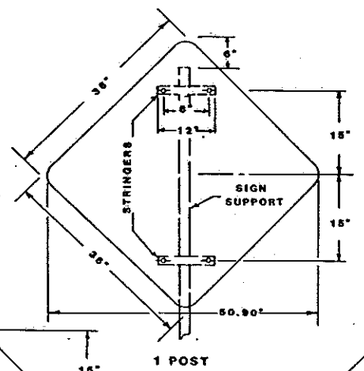
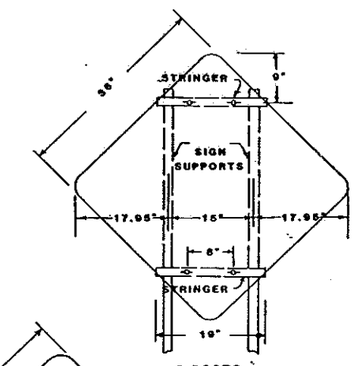


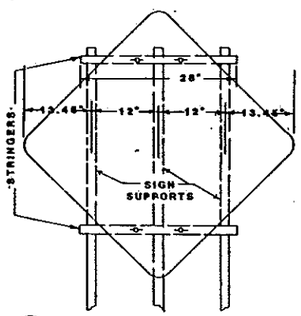
2 POSTS



1 POST

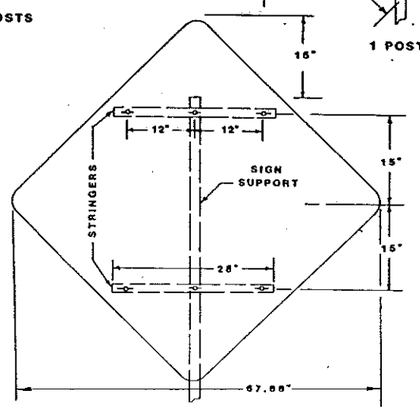


2 POSTS

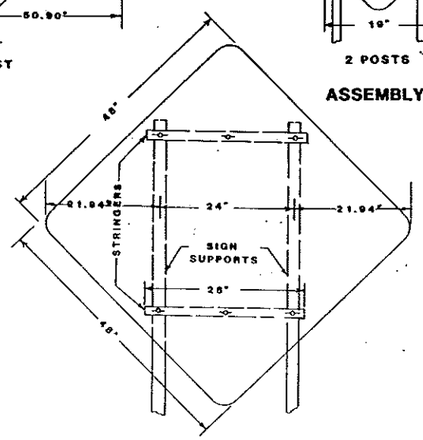


3 POSTS

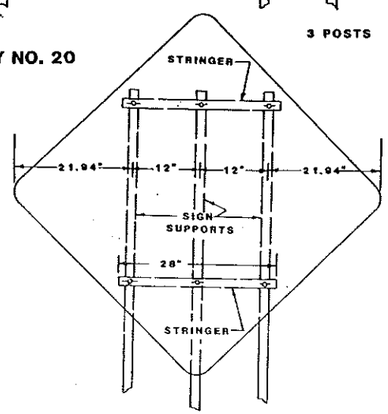
ASSEMBLY NO. 20



1 POST



2 POSTS



3 POSTS

ASSEMBLY NO. 21

NOTE:

Material:

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

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.

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-754-24 for square tube, perforated mounting details.

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

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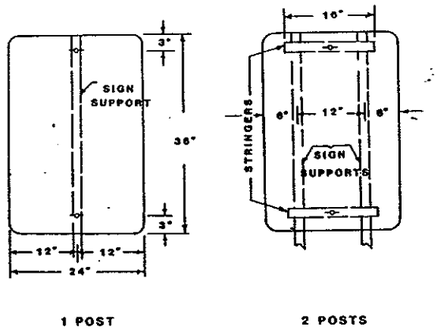
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K. Olson
DESIGN ENGINEER

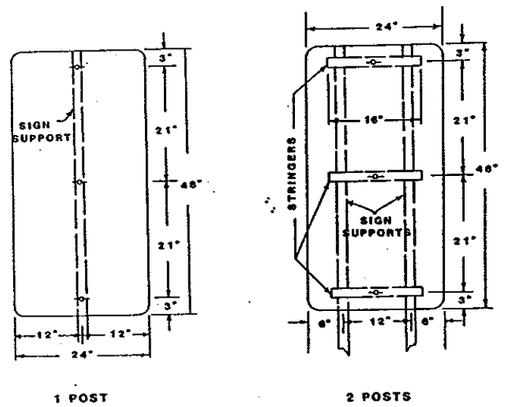
D-754-30

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



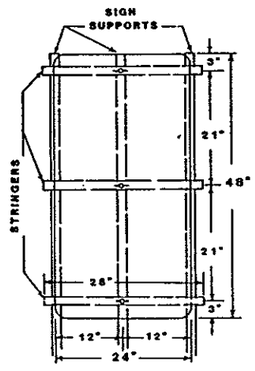
1 POST 2 POSTS

ASSEMBLY NO. 22



1 POST 2 POSTS

ASSEMBLY NO. 23



3 POSTS

ASSEMBLY NO. 23

NOTE:

Material:

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

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 Sta. D-754-25 for flange channel mounting details.

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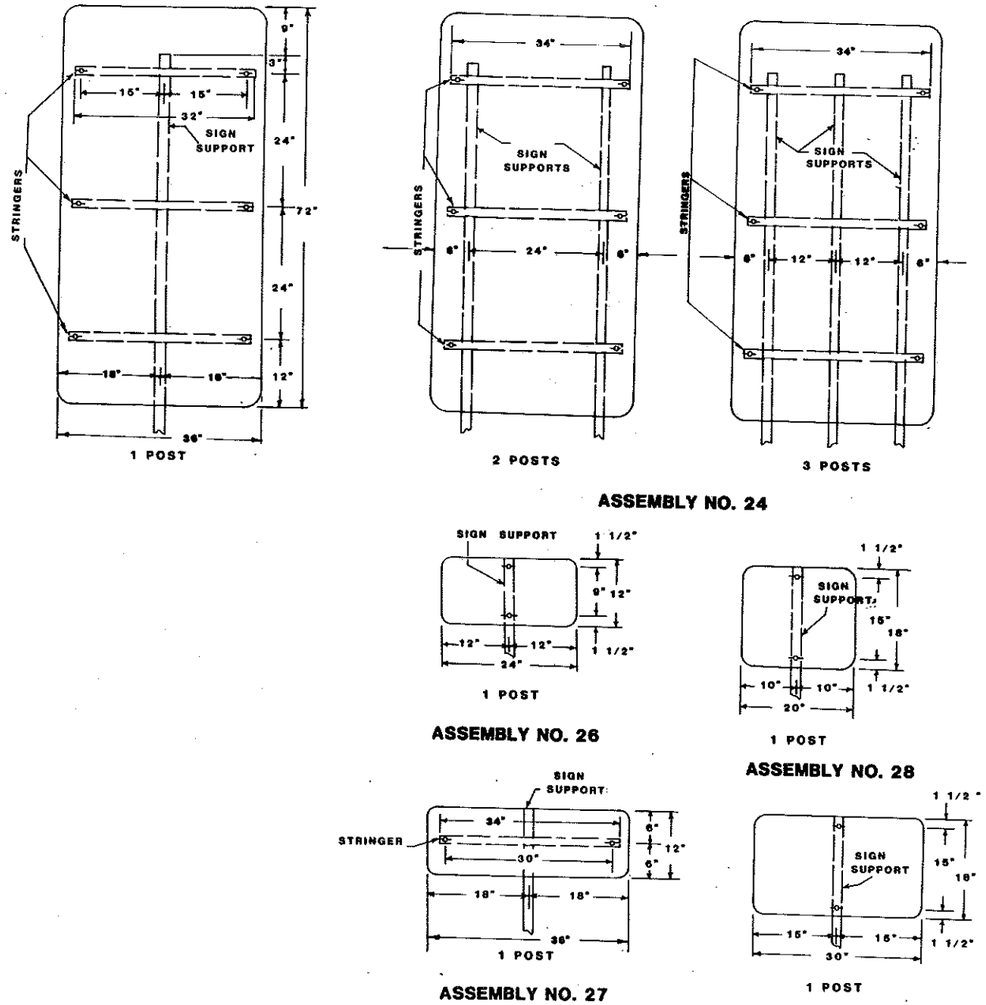
NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K. Olson
DESIGN ENGINEER

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

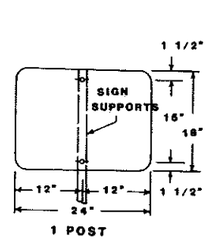
D-754-31



ASSEMBLY NO. 24

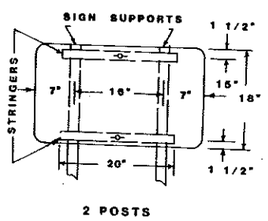
ASSEMBLY NO. 26

ASSEMBLY NO. 28

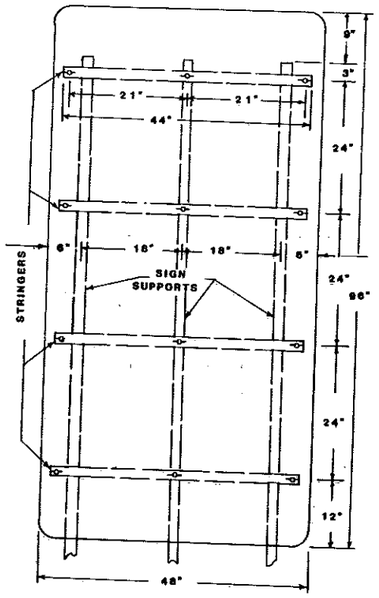


ASSEMBLY NO. 29

ASSEMBLY NO. 27



ASSEMBLY NO. 30



NOTE:

Material:

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

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 shwn.

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.

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NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION
APPROVED: David K. D. Kan
DESIGN ENGINEER