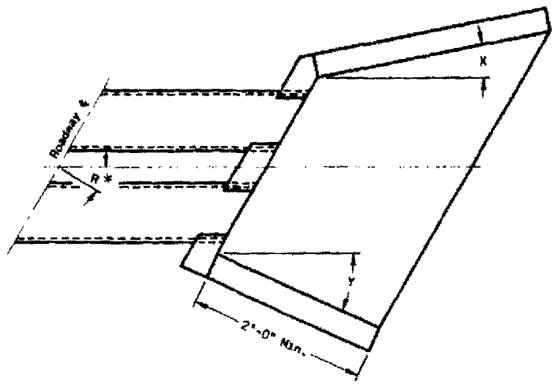
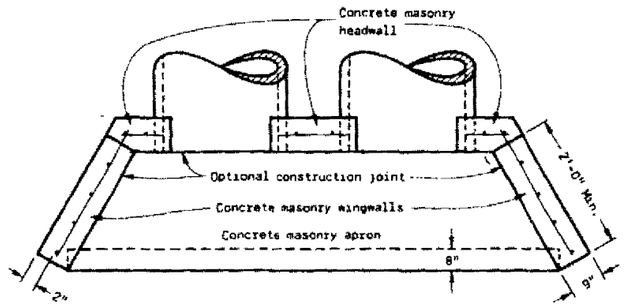


WINGWALL ANGLE DETAILS

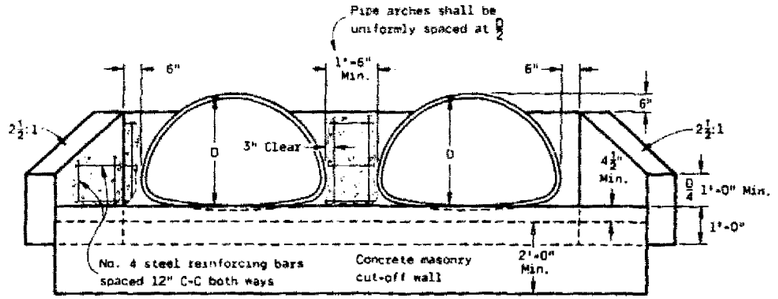
INLET			OUTLET		
R*	X	Y	R*	X	Y
0 - 7°	30°	30°	0 - 15°	15°	15°
8 - 22°	25°	"	16 - 45°	10°	"
23 - 37°	20°	"	46 - 75°	5°	"
38 - 52°	15°	"	over 75°	0°	"
53 - 67°	10°	"			
68 - 82°	5°	"			
over 82°	0°	"			

*R = Number of degrees right or left hand forward.



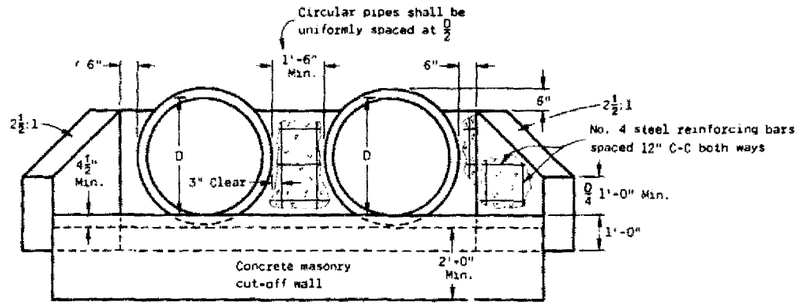
PLAN VIEW

CIRCULAR PIPE AND PIPE ARCH



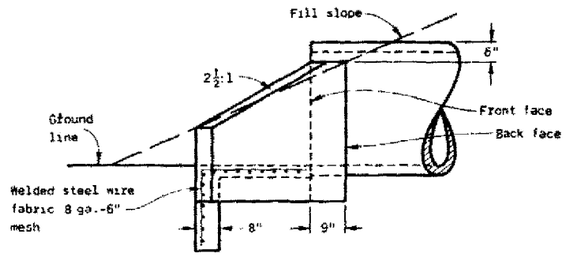
END ELEVATION

PIPE ARCH



END ELEVATION

CIRCULAR PIPE



SIDE ELEVATION

CIRCULAR PIPE AND PIPE ARCH

GENERAL NOTES

Details of construction, materials and workmanship not shown on this drawing shall conform to the pertinent requirements of the Standard Specifications and the applicable Special Provisions.

Fill slopes flatter than $2\frac{1}{2}$:1 shall be warped to meet the top of the wingwall.

All headwalls, aprons and cut-off walls shall be constructed of concrete masonry reinforced as shown on this drawing. Construction methods, materials, measurement and payment for concrete masonry endwalls shall conform to the pertinent requirements of section 504 of the Standard Specifications and with any applicable Supplemental Specifications and Special Provisions.

Steel reinforcing bars and welded steel wire fabric shall be of the size and spacing shown on this drawing. Construction methods and materials for steel reinforcing bars (high strength bars not required) and welded steel wire fabric shall conform to the requirements of section 505 of the Standard Specifications and with any applicable Supplemental Specifications and Special Provisions.

All steel reinforcement and welded steel wire fabric shall be embedded 2 inches clear unless otherwise noted.

CONCRETE MASONARY ENDWALLS
(CIRCULAR PIPE & PIPE ARCHES)

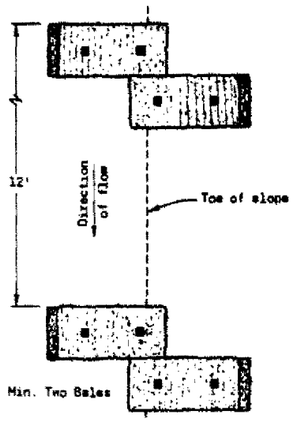
State of Wisconsin
Department of Transportation
Division of Highways

RECOMMENDED FOR APPROVAL:
6-6-75 DATE — CHIEF of FACILITIES DEVELOPMENT

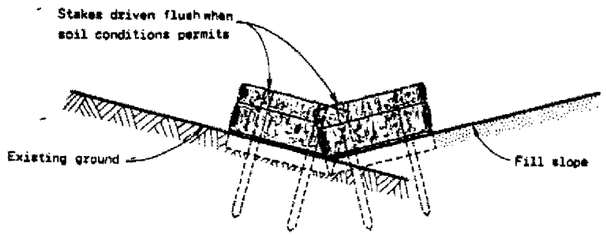
APPROVED
6-6-75 DATE — STATE HIGHWAY ENGINEER

S.D.D. 8E6-3

S.D.D. 8E6-3

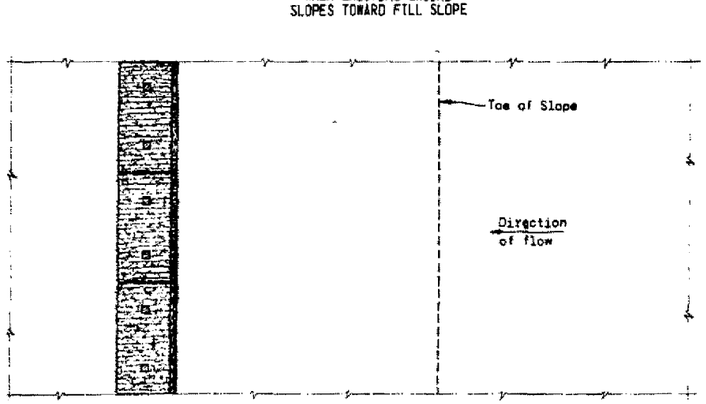


PLAN VIEW

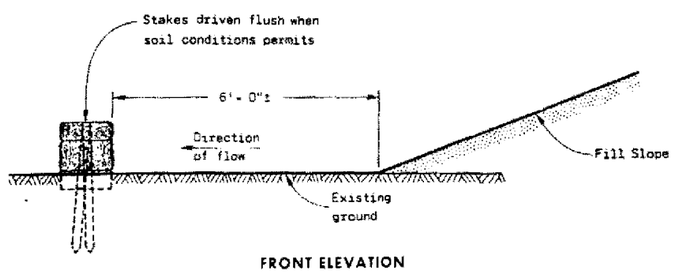


FRONT ELEVATION

WHEN EXISTING GROUND SLOPES TOWARD FILL SLOPE



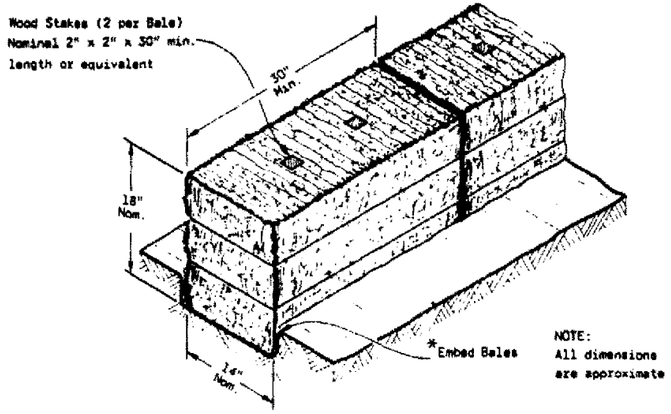
PLAN VIEW



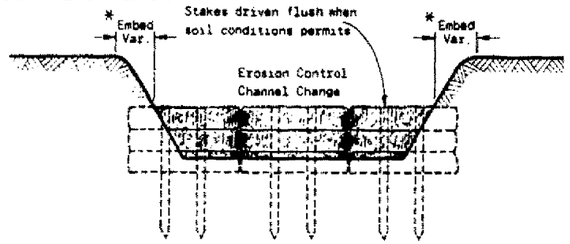
FRONT ELEVATION

EROSION BALES AT TOE OF SLOPE

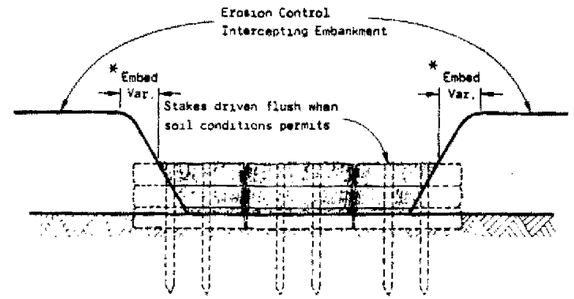
WHEN EXISTING GROUND SLOPES AWAY FROM FILL SLOPE



DETAIL OF EROSION BALE INSTALLATION

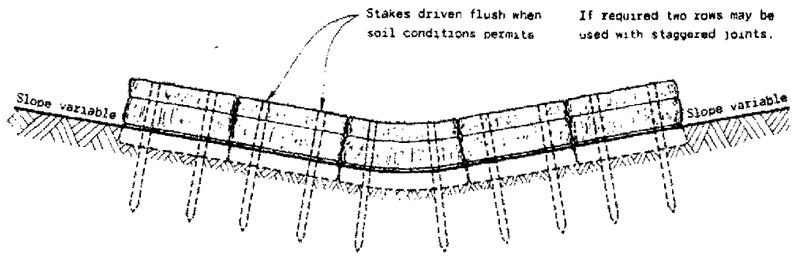


EROSION CONTROL CHANNEL CHANGE



EROSION CONTROL INTERCEPTING EMBANKMENT

PLAN VIEW



FRONT ELEVATION

EROSION BALES ACROSS DITCH BOTTOM

GENERAL NOTES

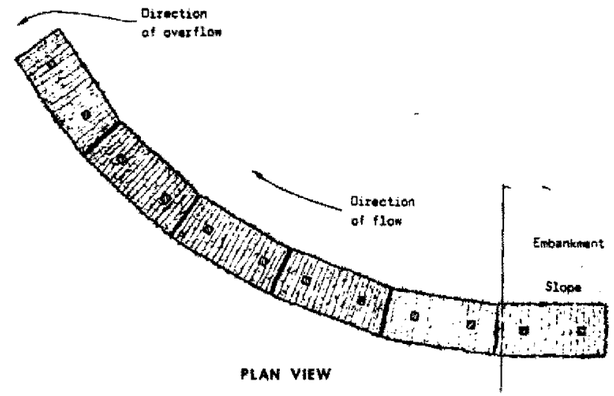
Details of construction, materials and workmanship not shown on this drawing shall conform to the pertinent requirements of the Standard Specifications and the applicable Special Provisions.

Bales shall be placed end to end or overlapping at right angles to the direction of flow and far enough up the sides of the ditch to prevent eroding around ends.

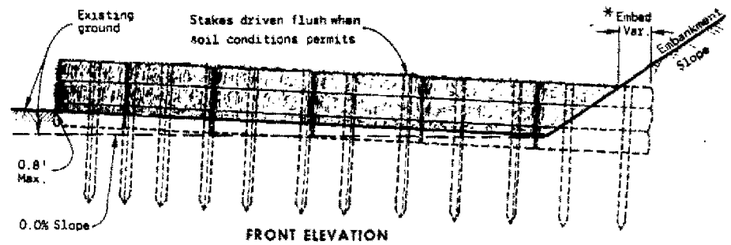
Bales shall be placed with twine or tie wires parallel to the ground.

Stakes to be battered in opposite directions.

* As determined by the Engineer.



PLAN VIEW



FRONT ELEVATION

EROSION BALES AT TOE OF SLOPE

TYPICAL INSTALLATIONS OF EROSION BALES

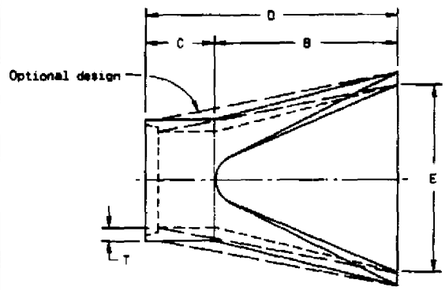
State of Wisconsin
Department of Transportation
Division of Highways

RECOMMENDED FOR APPROVAL
10/14/75 DATE
CHIEF of FACILITIES DEVELOPMENT

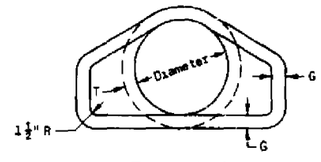
APPROVED
10/16/75 DATE
STATE HIGHWAY ENGINEER

S.D.D. 8E8-1

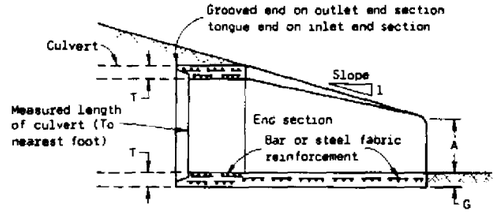
S.D.D. 8E8-1



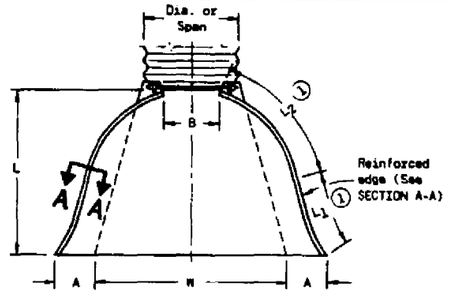
PLAN



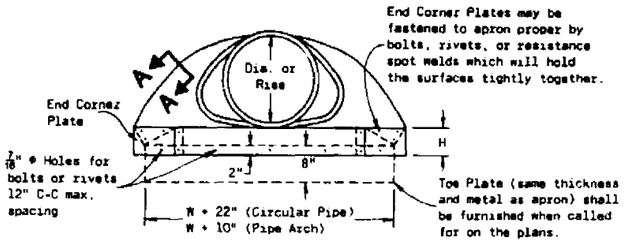
END VIEW



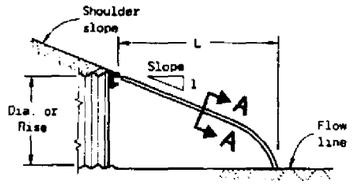
LONGITUDINAL SECTION



PLAN

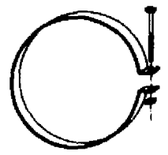


END VIEW

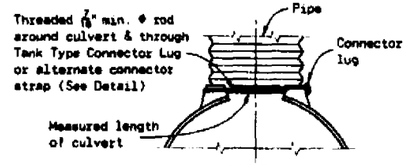


SIDE ELEVATION

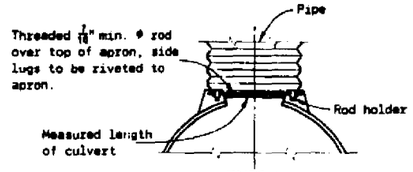
1" Wide, 12 Ga. (0.109" thick) galvanized strap with standard 6" x ½" band bolt and nut.



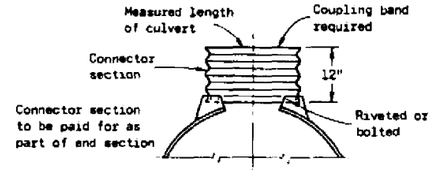
Alternate for Type 1 Connection
END SECTION CONNECTOR STRAP



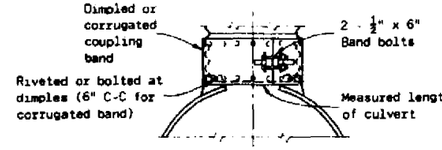
TYPE 1
For 12" thru 24" only (Circular pipe)



TYPE 2
For 30" & 36" only (Circular pipe)
For 17"x13" thru 57"x38" only (Pipe arch)

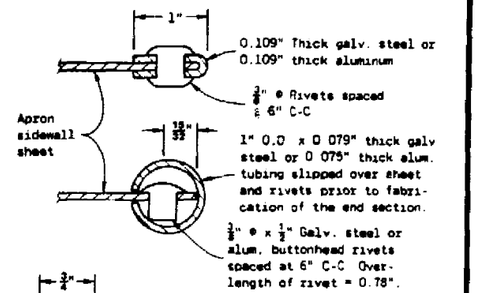


TYPE 3
For 42" thru 84" only (Circular pipe)
For 64"x43" & 71"x47" (Pipe arch)



TYPE 5
Alternate for:
All sizes corrugated circular pipe & pipe arches

NOTE: Dimpled band fits over outside of endwall, and corrugated band fits inside endwall. Dimpled band may be used with helically corrugated pipe.



SECTION A-A

GENERAL NOTES

Details of construction, materials and workmanship not shown on this drawing shall conform to the pertinent requirements of the Standard Specifications and the applicable Special Provisions.

Variations of the dimensions and designs shown hereon will be permitted providing equivalent capacity and structural integrity are attained, and prior approval of the Engineer is obtained.

Concrete culvert endwalls may not be used with galvanized steel or aluminum culvert pipe or vice versa.

Galvanized steel or aluminum endwalls shall normally be installed on culvert pipe of the same metal. The use of galvanized steel endwalls on aluminum pipes is permitted, provided the two metals at the joint interface are kept separated by a suitable insulating material approximately 1/16" thick or greater. Such material would be an asphalt impregnated fabric, a sheet plastic, a rubber gasket or other non-degradable material of substantial strength.

When two or more pipe arches with apron endwalls are to be laid adjacent to each other, they shall be separated by the following amount:

PIPES: Total width of apron endwall less the diameter of pipe plus 6 inches.

PIPE ARCHES: Total width of apron endwall less the span dimension of the pipe arch plus 6 inches.

CONNECTION DETAILS

CIRCULAR PIPE

For circumferentially corrugated pipe use Endwall Connection Details 1, 2, 3 or 5 as applicable.

For helically corrugated pipe use Endwall Connection Details 1, 2 or 5.

For helically corrugated pipes with two circumferential corrugations at each end use Endwall Connection Details 1, 2 or 3.

PIPE ARCH

Use Endwall Connection Details 2, 3 or 5 as applicable.

(1) A combination of steel rod rolled into edge sidewall (L_1), and 180° roll on edge of sidewall (L_2), is permitted for metal apron endwalls up to 60" diameter for circular pipe, and 77" x 52" for pipe arches.

PIPE DIA. (In.)	APPROX. WEIGHT PER SECTION	DIMENSIONS (Inches)							APPROX. SLOPE
		T	A	B	C	D	E	G	
12	530	2	4	24	48 7/8	72 7/8	24	2	3 to 1
15	740	2¼	6	27	46	73	30	2¼	↑
18	990	2½	9	27	46	73	36	2½	↑
21	1,280	2¾	9	36	37½	73½	42	2¾	↑
24	1,520	3	9½	43½	30	73½	48	3	↑
27	1,930	3¼	10½	49½	24	73½	54	3¼	↑
30	2,190	3½	12	54	19¾	73¾	60	3½	↑
36	4,100	4	15	63	34¾	97¾	72	4	↑
42	5,380	4½	21	63	35	98	78	4½	↑
48	6,550	5	24	72	26	98	84	5	3 to 1
54	8,040	5½	27	65	* 33¼ - 35 **	* 98¼ - 100 **	90	5	2⅔ to 1
60	8,730	6	* ** 30 - 35	60	39	99	96	5	2 to 1
66	10,630	6½	* ** 24 - 30	* ** 72 - 78	* ** 21 - 27	↑	102	5½	↑
72	12,520	7	* ** 24 - 36	78	21	↑	108	6	↑
78	14,430	7½	* ** 24 - 36	78	21	99	114	6½	2 to 1
84	18,160	8	36	90½	21	111½	120	6½	1½ to 1

* Minimum ** Maximum

REINFORCED CONCRETE APRON ENDWALLS

PIPE DIA. (In.)	MIN. THICKNESS (Inches)		DIMENSIONS (Inches)							APPROX. SLOPE
	STEEL	ALUM.	A ±1"	B MAX.	H ±1"	L ±1½"	L1 (1)	L2 (1)	W ±2"	
12	0.064	0.060	6	6	6	21	12	17½	24	2½ to 1
15	↑	↑	7	8	↑	26	14	21¾	30	↑
18	↓	↓	8	10	↑	31	15	28¼	36	↑
21	↓	0.060	9	12	↑	36	18	29⅜	42	↑
24	0.064	0.075	10	13	6	41	18	37½	48	↑
30	0.079	0.075	12	16	8	51	18	52¼	60	↑
36	0.079	0.105	14	19	9	60	24	59¾	72	↓
42	0.109	0.105	16	22	11	69	24	76⅜	84	2½ to 1
48	↑	0.135	18	27	12	78	24	81	90	2¼ to 1
54	↓	0.135	↑	30	↑	84	30	85½	102	2 to 1
60	↓	0.164	↑	33	↑	87	–	–	114	1¾ to 1
66	↓	↓	↑	36	↑	87	–	–	120	1½ to 1
72	↓	↓	↑	39	↑	87	–	–	126	1⅓ to 1
78	↓	↓	↑	42	↑	87	–	–	132	1¼ to 1
84	0.109	0.164	18	45	12	87	–	–	138	1¼ to 1

NOTE: All splices to be lap riveted or bolted.

METAL APRON ENDWALLS
FOR CIRCULAR PIPE

PIPE-ARCH DIMENSIONS (Inches)		MIN. THICK. (Inches)		DIMENSIONS (Inches)							APPROX. SLOPE
SPAN	RISE	STEEL	ALUM.	A ±1"	B MAX.	H ±1"	L ±1½"	L1 (1)	L2 (1)	W ±2"	
17	13	0.064	0.060	7	9	6	19	14	16	30	2½ to 1
21	15	↑	0.060	7	10	↑	23	14	19⅜	36	↑
24	18	↓	0.060	8	12	↓	28	18	21¾	42	↑
28	20	0.064	0.075	9	14	↓	32	18	27½	48	↑
35	24	0.079	0.075	10	16	6	39	18	37⅝	60	↑
42	29	0.079	0.105	12	18	8	46	24	45⅜	75	↑
49	33	0.109	0.105	13	21	9	53	↑	54¾	85	↓
57	38	↑	0.135	18	26	12	63	↑	68	90	2½ to 1
64	43	↑	0.135	↑	30	↑	70	24	72¾	102	2¼ to 1
71	47	↑	0.164	↓	33	↑	77	30	82¼	114	2¼ to 1
77	52	↑	0.164	↓	36	↓	77	–	–	126	2 to 1
83	57	0.109	0.164	18	39	12	77	–	–	138	2 to 1

NOTE: All splices to be lap riveted or bolted.

METAL APRON ENDWALLS
FOR PIPE ARCHES

APRON ENDWALLS FOR
CULVERT PIPE AND PIPE ARCHES

State of Wisconsin
Department of Transportation

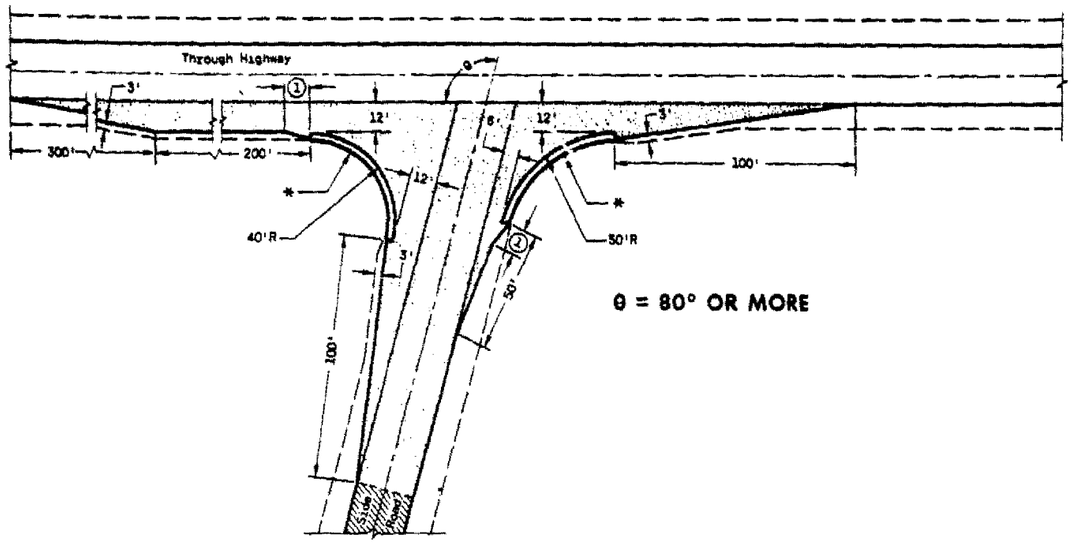
APPROVED 2-15-82
DATE

CHIEF DESIGN ENGINEER

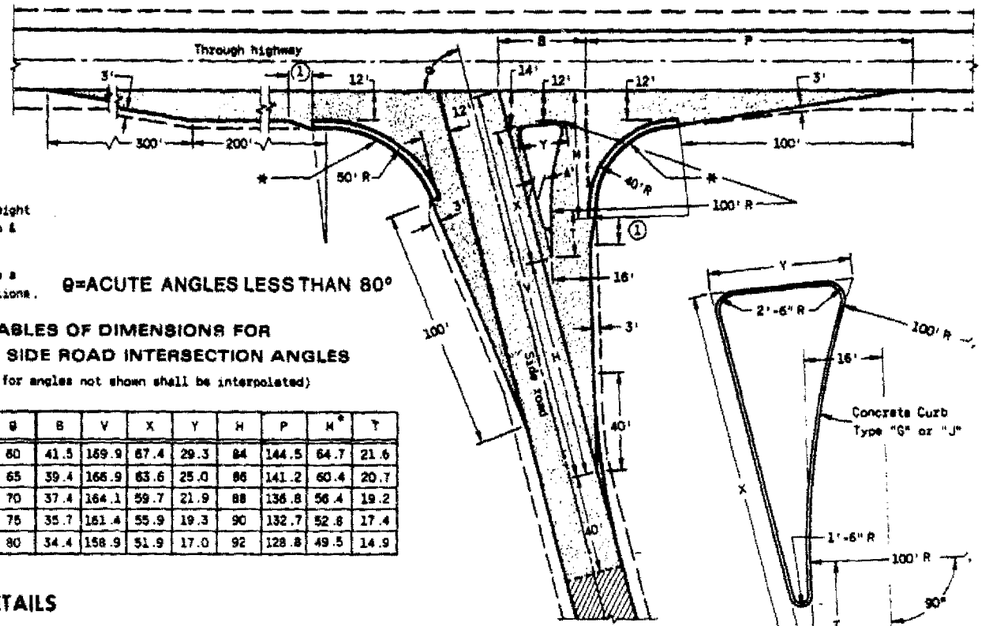
FHWA

S.D.D. 8 F 1-9

S.D.D. 8 F 1-9



θ = 80° OR MORE



* Concrete Curb & Gutter 36". Taper curb height 0" to 6" in 10'-0" length at ends of curb & gutter sections.

Provide sod or salvaged topsoil & seed to a 3'-0" width in back of curb & gutter sections.

① 10' Typical

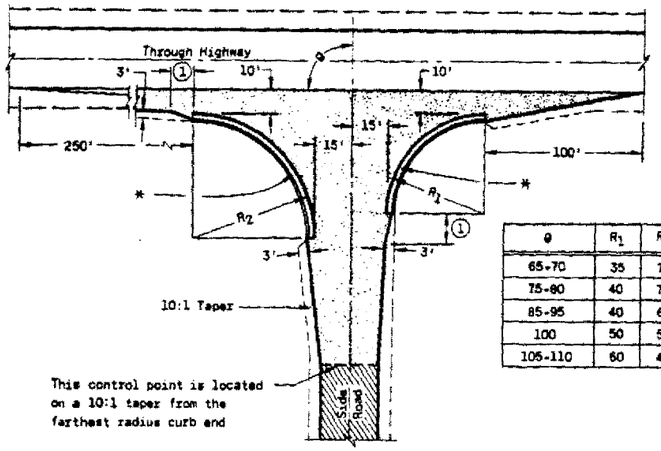
θ=ACUTE ANGLES LESS THAN 80°

TABLES OF DIMENSIONS FOR VARIABLE SIDE ROAD INTERSECTION ANGLES

(Values for angles not shown shall be interpolated)

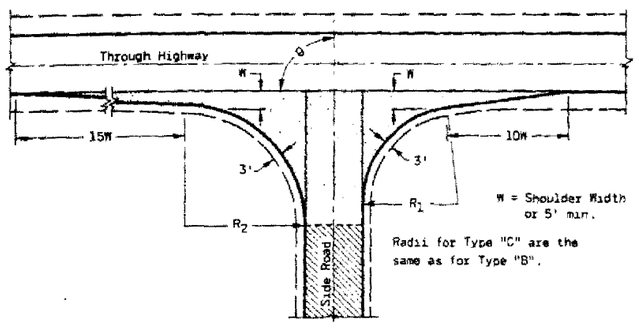
θ	B	V	X	Y	H	P	M*	T
60	41.5	169.9	67.4	29.3	84	144.5	64.7	21.6
65	39.4	166.9	63.6	25.0	86	141.2	60.4	20.7
70	37.4	164.1	59.7	21.9	88	136.8	56.4	19.2
75	35.7	161.4	55.9	19.3	90	132.7	52.8	17.4
80	34.4	158.9	51.9	17.0	92	128.8	49.5	14.9

TYPE "A" SIDE ROAD INTERSECTION DETAILS



θ	R_1	R_2
65-70	35	70
75-80	40	70
85-95	40	60
100	50	55
105-110	60	45

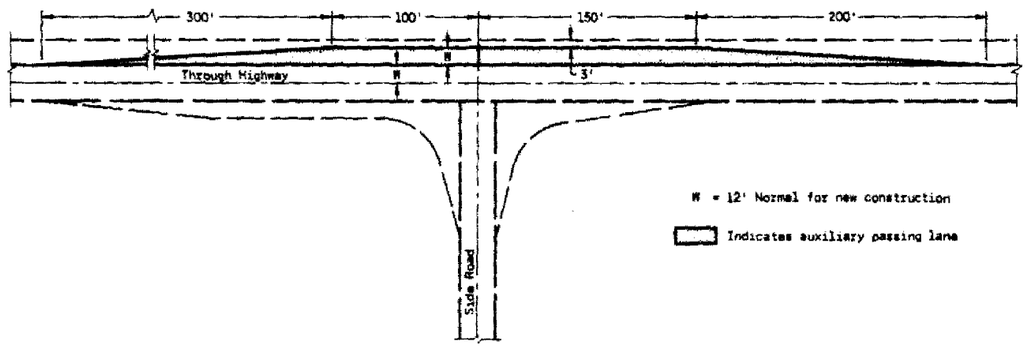
TYPE "B" SIDE ROAD INTERSECTION DETAILS



W = Shoulder Width or 5' min.

Radii for Type "C" are the same as for Type "B".

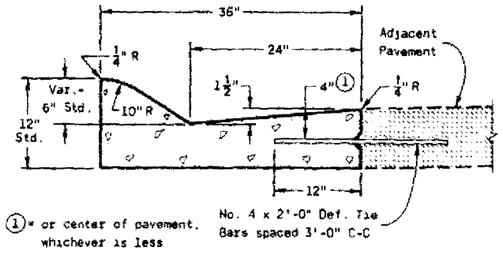
TYPE "C" SIDE ROAD INTERSECTION DETAILS



W = 12' Normal for new construction

Indicates auxiliary passing lane

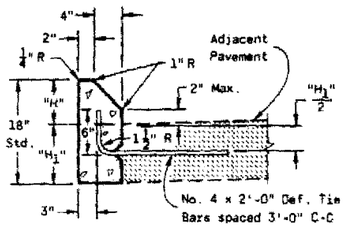
PASSING LANE DETAIL



① = or center of pavement, whichever is less

TYPE "A" (INCLUDING TIE BARS) TYPE "D" (EXCLUDING TIE BARS)

CONCRETE CURB & GUTTER 36"



"H" = 6" Max. and 4" Min. and shall be 6" unless otherwise shown on the plans.

"H_1" = Same as adjacent pavement thickness for rigid pavement and 12" for non-rigid pavement (Tie Bars omitted).

TYPE "G" (INCLUDING TIE BARS) TYPE "J" (EXCLUDING TIE BARS)

CONCRETE CURB

GENERAL NOTES

Designs may be used interchangeably in combination or separately for any one complete intersection depending upon intersection angle and surfacing of each approach roadway.

SIDE ROAD SURFACING NOTE

If the side road is not presently paved, pavement shall be placed to the limits shown. In the case where the construction limits are beyond the paving limits, crushed aggregate surfacing shall be placed between the paving limits and construction limits

If the side road is presently paved, new pavement shall be placed to the limits of design as shown and beyond, if necessary, to meet existing pavement.

If the side road is the construction project, the intersection surfacing shall be the same as for the project.

New Pavement

Existing Surface

LAYOUT DETAILS FOR AT-GRADE SIDE ROAD INTERSECTIONS

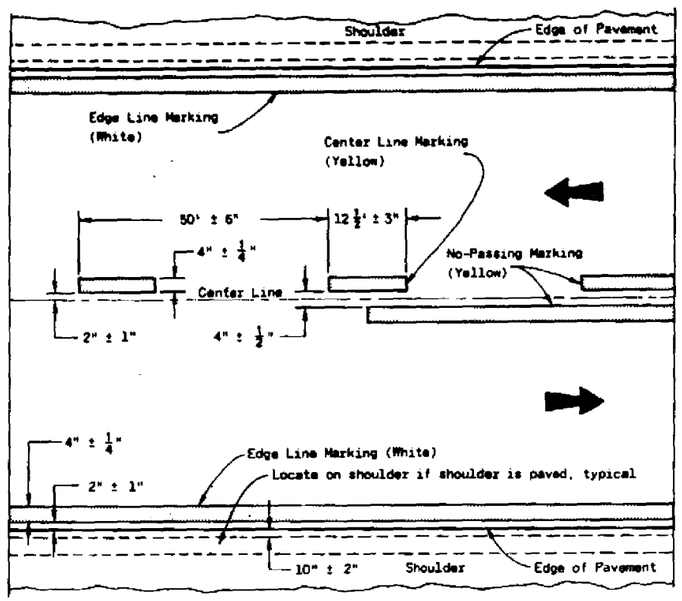
State of Wisconsin
Department of Transportation

APPROVED 12-15-80 DATE

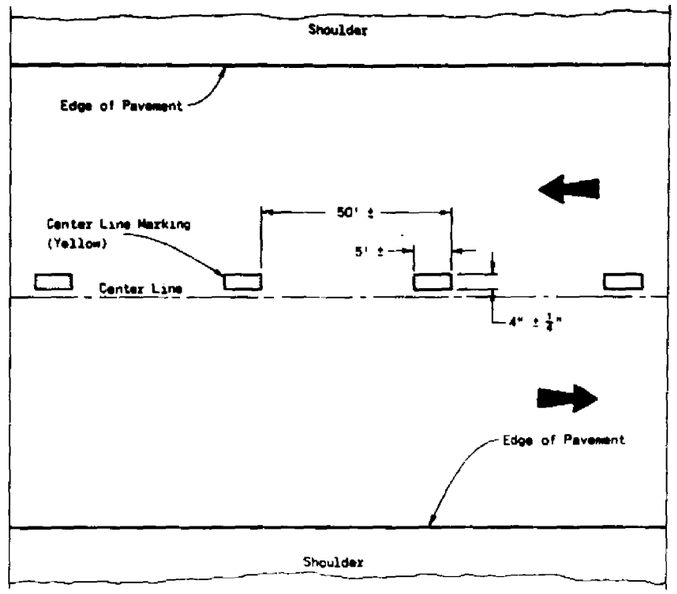
FHWA

S.D.D. 9 A 1-5

S.D.D. 9 A 1-5

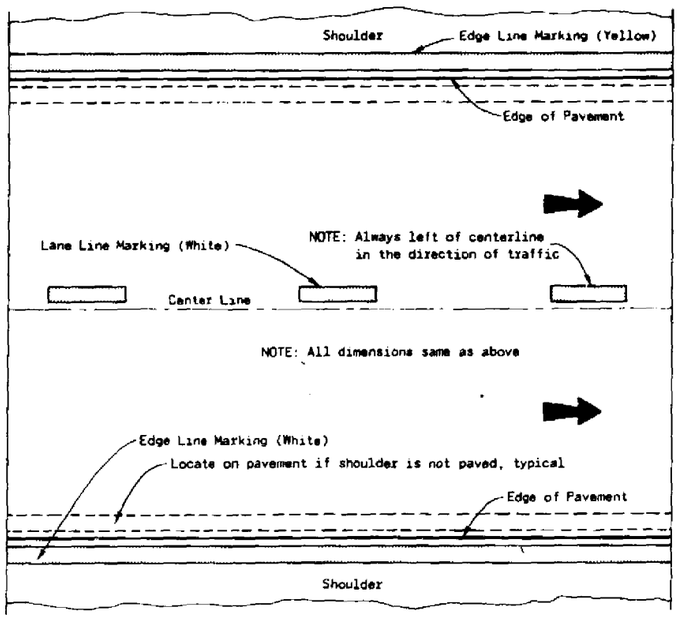


PERMANENT MARKING

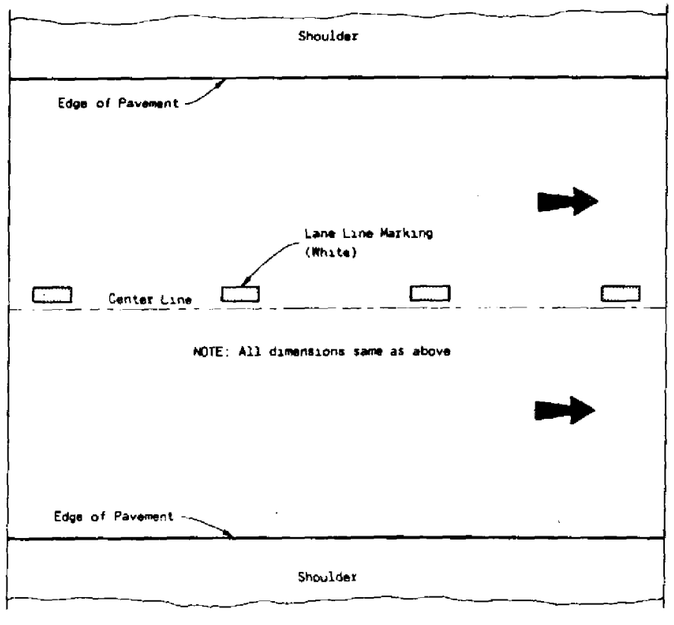


TEMPORARY MARKING

PAVEMENT MARKING - TWO WAY TRAFFIC

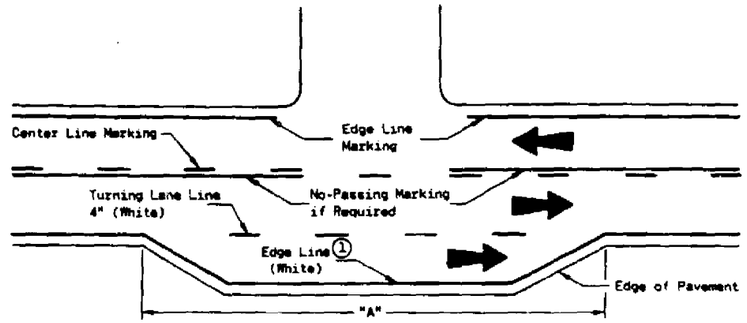


PERMANENT MARKING



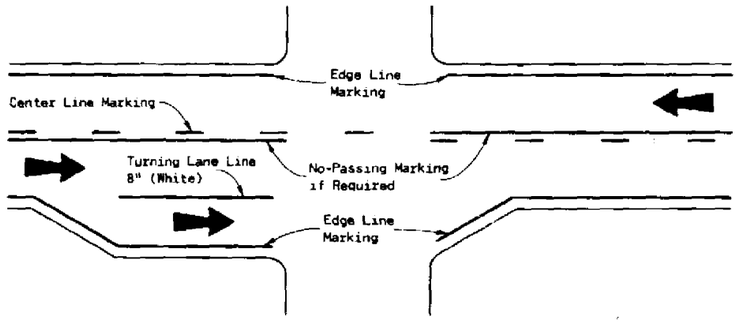
TEMPORARY MARKING

PAVEMENT MARKING - ONE WAY TRAFFIC



PASSING LANE MARKING

(1) When distance "A" is less than 750 feet, omit edge line and turning lane marking.



RIGHT TURN LANE MARKING

GENERAL NOTES

Details of construction not shown on this drawing shall conform to Standard Specifications and Special Provisions.

Where pavement marking tape is used, which would underlie the permanent markings, it shall be removed immediately prior to permanent painting. Other temporary markings shall be removed when required by the plans or Special Provisions.

PAVEMENT MARKING

State of Wisconsin
Department of Transportation

APPROVED 2/13/81 DATE

CHIEF DESIGN ENGINEER

FHWA

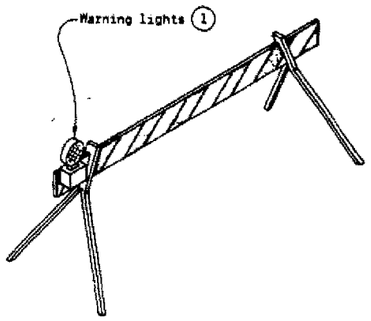
S.D.D. 13 B 5-2

S.D.D. 13 B 5-2

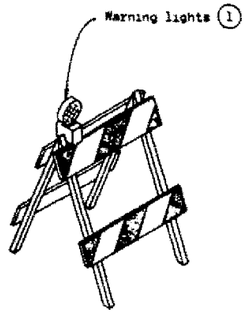
TABLE OF BARRICADE CHARACTERISTICS

BARRICADE TYPE	I	II	III
Height	3' Minimum		5' Minimum
*Rail Width	8" Minimum to 12" Maximum		
Rail Length	2' Minimum		4' Minimum
**Stripe Width	6" at 45° Angle		
Stripe Colors	Reflectorized Orange & White		

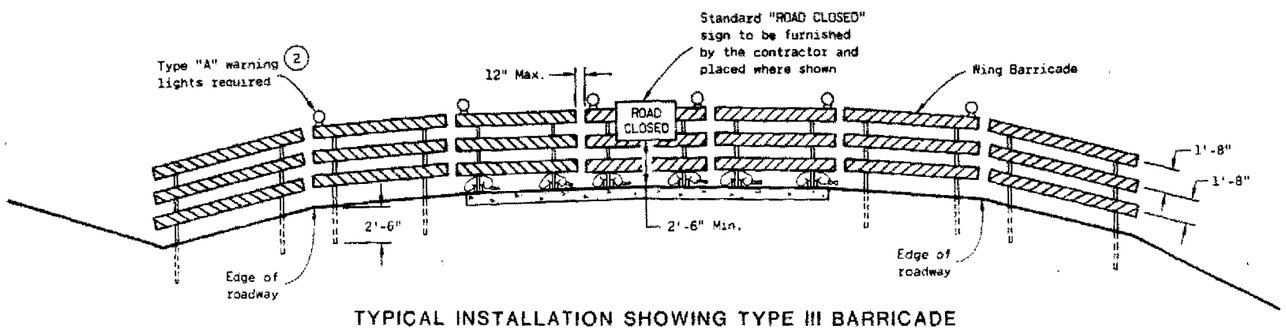
*Nominal dimensions when barricade is constructed of lumber.
**Shall be 4" for rail lengths less than 3'.



TYPICAL TYPE I BARRICADE



TYPICAL TYPE II BARRICADE



TYPICAL INSTALLATION SHOWING TYPE III BARRICADE

CONSTRUCTION BARRICADES

R11-2
48" x 30"
Black Lettering on Reflective White Background
Letter Series "D"
Letter height 8"

W20-3
48" x 48"
Black Lettering on Reflective Orange Background
Letter Series "D"
Letter height 7"

STANDARD SIGNS - TYPE II

GENERAL NOTES

The contractor shall furnish, erect and maintain barricades and signs. Details regarding location, spacing, dimensions, fabrication, material, sign lettering, lighting devices and color of barricades and signs shall conform to this drawing, the Manual On Uniform Traffic Control Devices, the Standard Specifications, Special Provisions and/or plans.

Type III Barricades and Signs shall be erected at the termini of projects and at other road or street locations where it is necessary to control or eliminate public access to the construction area.

Type I and II Barricades shall be used on projects when traffic is to be maintained through the construction area.

The actual field location of barricade installations and advance signs shall be as directed by the Engineer.

Each barricade shall have the name and telephone number of a person responsible for 24 hour emergency service printed in letters at least $\frac{3}{4}$ inch in height on the barricade rails. Prior to May 1, 1983, such information may be shown on either front or back faces of the barricade rails. After May 1, 1983, all printed information or identification markings shall be shown only on the back side of barricade rails.

Type I Barricades may include other unstriped horizontal panels necessary to provide stability.

On high speed expressways or in other situations where barricades may be susceptible to overturning in the wind, sandbags should be used for ballasting. Sandbags may be placed on lower parts of the frame or stays to provide the required ballast but shall not be placed on top of any striped rail.

(1) Unless otherwise provided elsewhere in the contract, warning lights are required on all barricades which will be located near traffic operations during periods of inclement weather or hours of darkness. Barricades used to shield isolated hazards shall be equipped with Type "A" (low intensity - flashing) lights unless Type "B" (high intensity) flashing) lights are specified elsewhere in the contract documents. Barricades used for channelization or delineation of the travel path shall be equipped with Type "C" (steady burn) lights except for the initial barricade(s) in sequence, which shall be equipped with Type "A" or "B" lights as previously noted.

(2) Two warning lights shall be provided on the center barricade and at least one warning light shall be provided on each of the other barricades within the roadway limits. Spacing of the warning lights shall be uniform to the edge of roadway as shown.

CONSTRUCTION BARRICADES & STANDARD SIGNS

State of Wisconsin
Department of Transportation

APPROVED 9-14-81 DATE
FHWA

S.D.D. 15 C 1-7

S.D.D. 15 C 1-7