STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 350.01	*STANDARD END SUPPORT WALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*12/12/86*
MD 351.01	*STANDARD END SUPPORT WALL METAL PIPE ARCH*	*10/01/01*	*12/12/86*
MD 352.01	*STANDARD HEADWALLS - B-48 B-54 B-60*	*10/01/01*	*08/01/84*
MD 352.02	*STANDARD HEADWALLS - B-66 B-72 B-78 B-84*	*10/01/01*	*06/18/75*
MD 354.01	*STANDARD TYPE C ENDWALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*12/12/86*
MD 355.01	*STANDARD TYPE C ENDWALL METAL PIPE ARCH*	*10/01/01*	*12/10/86*
MD 355.02	*STANDARD TYPE C ENDWALL HORIZONTAL ELLIPTICAL CONCRETE PIPE*	*08/12/02*	*09/27/01*
MD 355.03	*STANDARD END SUPPORT WALL HORIZONTAL ELLIPTICAL CONCRETE PIPE*	*08/12/02*	*09/27/01*
MD 356.01	*STANDARD TYPE E ENDWALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*12/12/86*
MD 357.01	*STANDARD TYPE E ENDWALL METAL PIPE ARCH*	*10/01/01*	*12/12/86*
MD 358.01	*STANDARD TYPE F ENDWALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*12/12/86*
MD 358.02	*SPECIAL TYPE F ENDWALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*12/12/86*
MD 358.03	*STANDARD TYPE F ENDWALL MODIFICATIONS*	*10/01/01*	*03/23/56*
MD 358.04	*PRECAST TYPE F ENDWALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*06/20/95*
MD 358.05	*PRECAST TYPE F ENDWALL DIMENSIONS METAL OR CONCRETE ROUND PIPE*	*08/12/02*	*06/20/95*
MD 359.01	*STANDARD TYPE F ENDWALL METAL PIPE ARCH*	*10/01/01*	*12/12/86*

STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 359.02	*PRECAST TYPE F ENDWALL METAL PIPE ARCH*	*10/01/01*	*12/16/93*
MD 359.03	*PRECAST TYPE F ENDWALL DIMENSIONS METAL PIPE ARCH*	*10/01/01*	*06/23/92*
MD 360.01	*STANDARD TYPE G ENDWALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*12/12/86*
MD 360.02	*STANDARD TYPE G ENDWALL MODIFICATIONS*	*10/01/01*	*03/23/56*
MD 362.01	*STANDARD TYPE H ENDWALL METAL OR CONCRETE ROUND PIPE*	*10/01/01*	*12/12/86*
MD 362.01-01	*STANDARD TYPE H ENDWALL DIMENSIONS AND QUANTITIES*	*10/01/01*	*12/12/86*
MD 368.01	*STANDARD CONCRETE END SECTION ROUND CONCRETE PIPE*	*07/01/09*	*07/27/09*
MD 368.02	*STANDARD CONCRETE END SECTION ROUND CONCRETE PIPE*	*07/01/09*	*07/27/09*
MD 369.00	*STANDARD CONCRETE END SECTION HORIZONTAL ELLIPTICAL PIPE*	*07/01/09*	*07/27/09*
MD 370.01	*STANDARD METAL END SECTION ROUND METAL PIPE*	*07/01/09*	*07/27/09*
MD 370.11	*STANDARD CONNECTIONS METAL END SECTIONS*	*07/01/09*	*07/27/09*
MD 371.01	*STANDARD METAL END SECTION METAL PIPE ARCH*	*07/01/09*	*07/27/09*
MD 372.00	*SAFETY END SECTION FOR METAL PIPE*	*10/07/14*	*09/29/14*
MD 372.01	*SAFETY END SECTION FOR METAL PIPE – PIPE CHART*	*10/07/14*	*09/29/14*
MD 373.00	*SAFETY END SECTION FOR CONCRETE AND PLASTIC PIPE*	*10/07/14*	*09/29/14*
MD 373.01	*SAFETY END SECTION FOR CONCRETE AND PLASTIC PIPE – CHART PIPE*	*10/07/14*	*09/29/14*

STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 374.02	*STANDARD WR & WRM INLET FRAME AND GRATE*	*10/07/14*	*09/29/14*
MD 374.03	*STANDARD WR & WRM INLET FRAME AND GRATE*	*10/01/01*	*09/21/87*
MD 374.04	*STANDARD WR INLET*	*10/07/14*	*09/29/14*
MD 374.05	*STANDARD WRM INLET*	*10/07/14*	*09/29/14*
MD 374.06	*SINGLE WR INLET*	*10/07/14*	*09/29/14*
MD 374.08	*TRIPLE WR INLET*	*10/07/14*	*09/29/14*
MD 374.09	*TRIPLE WR FRAME*	*10/07/14*	*09/29/14*
MD 374.10	*TRIPLE WRM INLET*	*10/07/14*	*09/29/14*
MD 374.12	*STANDARD NR & NRM INLET FRAME AND GRATE*	*10/07/14*	*09/29/14*
MD 374.13	*STANDARD NR & NRM INLET FRAME AND GRATE*	*10/01/01*	*09/21/87*
MD 374.14	*STANDARD NR INLET*	*10/07/14*	*09/29/14*
MD 374.15	*STANDARD NRM INLET*	*10/07/14*	*09/29/14*
MD 374.21	*PRECAST WR INLET*	*10/07/14*	*09/29/14*
MD 374.22	*PRECAST WRM INLET*	*10/07/14*	*09/29/14*
MD 374.23	*PRECAST SINGLE WR INLET*	*10/07/14*	*09/29/14*
MD 374.24	*PRECAST NR INLET*	*10/07/14*	*09/29/14*
MD 374.25	*PRECAST NRM INLET*	*10/07/14*	*09/29/14*
MD 374.26	*PRECAST TRIPLE WR INLET*	*10/07/14*	*09/29/14*
MD 374.27	*PRECAST TRIPLE WRM INLET*	*10/07/14*	*09/29/14*
MD 374.27-01	*PRECAST TRIPLE WRM INLET*	*10/07/14*	*09/29/14*
MD 374.31	*STANDARD C O G INLETS 5', 10' 15' & 20'*	*10/07/14*	*09/29/14*
MD 374.41	*STANDARD C O S INLETS 5' & 15'*	*10/07/14*	*09/29/14*

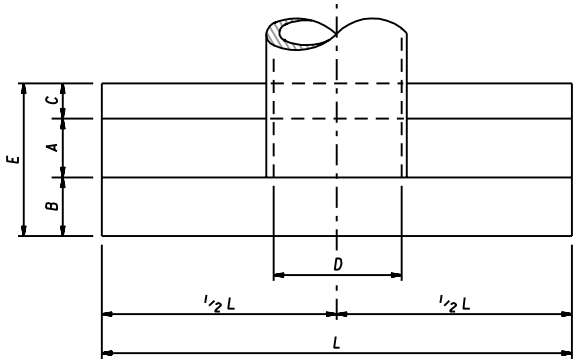
STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 374.51	*PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COG INLETS 5', 10', 15' & 20'*	*10/07/14*	*09/29/14*
MD 374.51-01	*PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COG INLETS 5', 10', 15' AND 20' – CHART*	*10/07/14*	*09/29/14*
MD 374.55	*PRECAST CONCRETE INLET SLABS AND ADJUSTMENT COLLARS FOR COG AND COS INLETS*	*10/01/01*	*01/02/91*
MD 374.55-01	*PRECAST CONCRETE INLET SLABS AND ADJUSTMENT COLLARS FOR COG/COS INLETS TO ACCOMMODATE 6 INCH CURB*	*03/25/03*	*05/05/03*
MD 374.61	*PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COS INLETS 5', 10', 15' & 20'*	*10/07/14*	*09/29/14*
MD 374.61-01	*PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COS INLETS 5', 10', 15' AND 20' – CHART*	*10/07/14*	*09/29/14*
MD 374.62	*PRECAST OR CAST IN PLACE CIRCULAR COG INLETS 5', 10', 15' & 20'*	*10/07/14*	*09/29/14*
MD374.62-01	*PRECAST OR CAST IN PLACE CIRCULAR COG INLETS 5', 10', 15' & 20' - CHART*	*10/07/14*	*09/29/14*
MD 374.63	*PRECAST OR CAST IN PLACE CIRCULAR COS INLETS 5', 10', 15' & 20'*	*10/07/14*	*09/29/14*
MD 374.64	*ALTERNATE PRECAST TROUGHS FOR COG AND COS INLETS*	*10/01/01*	*09/04/91*
MD 374.65	*DEPRESSED CONCRETE GUTTER PAN FOR COG AND COS INLETS*	*10/01/01*	*01/02/91*
MD 374.66	*PRECAST OR CAST IN PLACE SHALLOW COG INLET 5' OR 10' TROUGH OPENING*	*10/07/14*	*09/29/14*
MD 374.67	*PRECAST OR CAST IN PLACE SHALLOW COS INLET 5' OR 10' TROUGH OPENING*	*10/07/14*	*09/29/14*
MD 374.68	*PRECAST OR CAST-IN-PLACE COG / COS OPENING FOR 8' CURB 5' OR 10' ONLY*	*01/09/08*	*11/26/07*
MD 374.70	*PRECAST STANDARD TYPE S INLET DOUBLE GRATE TANDEM*	*10/07/14*	*09/29/14*

STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 374.71	*PRECAST STANDARD TYPE S COMBINATION INLET DOUBLE GRATE TANDEM*	*10/07/14*	*09/29/14*
MD 374.72	*PRECAST STANDARD TYPE HS COMBINATION INLET*	*10/07/14*	*09/29/14*
MD 374.73	*PRECAST STANDARD TYPE S INLET SINGLE GRATE*	*10/07/14*	*09/29/14*
MD 374.74	*PRECAST STANDARD TYPE E COMBINATION INLET*	*10/07/14*	*09/29/14*
MD 374.75	*PRECAST STANDARD TYPE H COMBINATION INLET*	*10/07/14*	*09/29/14*
MD 374.85	*STANDARD ADA COMPLIANT INLET SINGLE GRATE*	*10/07/14*	*09/29/14*
MD 374.85-01	*STANDARD ADA COMPLIANT INLET SINGLE FRAME AND GRATE*	*10/07/14*	*09/29/14*
MD 374.86	*STANDARD ADA COMPLIANT INLET DOUBLE GRATE TANDEM*	*10/07/14*	*09/29/14*
MD 374.86-01	*STANDARD ADA COMPLIANT INLET DOUBLE FRAME AND GRATE*	*10/07/14*	*09/29/14*
MD 376.11	*STANDARD TYPE E INLET*	*10/07/14*	*09/29/14*
MD 376.12-01	*CURVE VANE GRATE WITH FRAME FOR TYPE "E" INLET (E-CV)*	*10/07/14*	*09/29/14*
MD 376.21	*STANDARD TYPE E COMBINATION INLET*	*10/07/14*	*09/29/14*
MD 376.22	*STANDARD TYPE E COMBINATION INLET STANDARD CAST IRON FRAME*	*10/07/14*	*09/29/14*
MD 376.24	*STANDARD TYPE E COMBINATION INLET DETAIL OF SPECIAL CURB*	*11/18/04*	*02/04/69*
MD 378.03	*STANDARD SINGLE OR DOUBLE OPENING TYPE K INLET OPEN-END GRATE NON-TRAFFIC AREAS*	*10/01/01*	*06/23/87*
MD 378.04	*STANDARD TYPE K INLET REPLACEMENT GRATE*	*10/01/01*	*02/08/83*
MD 378.05	*STANDARD SINGLE OR DOUBLE OPENING TYPE K INLET OPEN-END GRATE*	*10/07/14*	*09/29/14*

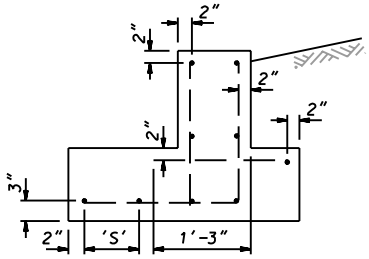
STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 378.06	*STANDARD TYPE K INLET SINGLE FRAME AND GRATE*	*10/07/14*	*09/29/14*
MD 378.07	*STANDARD TYPE K INLET DOUBLE FRAME AND GRATE*	*10/07/14*	*09/29/14*
MD 378.11	*PRECAST STANDARD SINGLE OR DOUBLE OPENING TYPE K INLET OPEN-END GRATE*	*10/07/14*	*09/29/14*
MD 379.01	*STANDARD TYPE S INLET SINGLE GRATE*	*10/07/14*	*09/29/14*
MD 379.02-01	*CURVE VANE GRATE WITH FRAME FOR SINGLE TYPE "S" INLET (S-CV)*	*10/07/14*	*09/29/14*
MD 379.03	*STANDARD TYPE S INLET DOUBLE GRATE TANDEM*	*10/07/14*	*09/29/14*
MD 379.04	*STANDARD TYPE S COMBINATION INLET DOUBLE GRATE TANDEM*	*10/07/14*	*09/29/14*
MD 379.05-01	*CURVE VANE GRATES WITH FRAME FOR DOUBLE TYPE "S" INLET (S2-CV)*	*10/07/14*	*09/29/14*
MD 379.06	*STANDARD TYPE S INLET & COMBINATION STEEL FRAME AND GRATE ALTERNATE*	*10/07/14*	*09/29/14*
MD 379.07	*STANDARD TYPE S INLET & COMBINATION STEEL FRAME AND GRATE ALTERNATE*	*10/07/14*	*09/29/14*
MD 379.08	*STANDARD TYPE S INLET & COMBINATION RETICULAR REPLACEMENT GRATE*	*10/07/14*	*09/29/14*
MD 380.01	*STANDARD TYPE HS COMBINATION INLET*	*10/07/14*	*09/29/14*
MD 381.01	*STANDARD YARD INLET*	*10/07/14*	*09/29/14*
MD 381.02	*PRECAST YARD INLET*	*10/01/01*	*06/23/87*
MD 383.00	*48" SQUARE STANDARD SHALLOW MANHOLE*	*10/07/14*	*09/29/14*
MD 383.01	*STANDARD MANHOLE*	*10/07/14*	*09/29/14*
MD 383.11	*STANDARD DROP MANHOLE*	*10/07/14*	*09/29/14*
MD 383.21	*STANDARD 4 FT. CIRCULAR MANHOLE MAX. DEPTH 36 FT.*	*10/07/14*	*09/29/14*

STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 383.31	*STANDARD MANHOLE TYPE A FRAME*	*10/07/14*	*09/29/14*
MD 383.32	*STANDARD MANHOLE TYPE A COVER*	*10/07/14*	*09/29/14*
MD 383.61	*STANDARD MANHOLE TYPE D FRAME & COVER*	*10/07/14*	*09/29/14*
MD 383.91	*STANDARD METAL LADDER RUNGS MISCELLANEOUS STRUCTURES*	*10/01/01*	*02/08/83*
MD 383.92	*COPOLYMER POLYPROPYLENE STEEL ENCAPSULATED LADDER RUNGS MISCELLANEOUS STRUCTURES*	*10/01/01*	*03/30/87*
MD 384.01	*48" DIAMETER PRECAST MANHOLE FOR 12" TO 24" PIPES*	*10/07/14*	*09/29/14*
MD 384.02	*FRAME ANCHORAGE FOR PRECAST MANHOLES*	*10/01/01*	*01/02/91*
MD 384.03	*60" DIAMETER PRECAST MANHOLE FOR 27" TO 36" PIPES*	*10/07/14*	*09/29/14*
MD 384.05	*72" DIAMETER PRECAST MANHOLE FOR 42" TO 48" PIPES*	*04/12/16*	*03/04/16*
MD 384.07	*84" DIAMETER PRECAST MANHOLE FOR 54" TO 60" PIPES*	*10/07/14*	*09/29/14*
MD 384.09	*96" DIAMETER PRECAST MANHOLE FOR 72" PIPES*	*10/07/14*	*09/29/14*
MD 384.11	*120" DIAMETER PRECAST MANHOLE FOR 78" TO 84" PIPES*	*10/07/14*	*09/29/14*
MD 384.12	*PRECAST FLAT SLAB TOP FOR 120" DIAMETER PRECAST MANHOLE*	*10/07/14*	*09/29/14*
MD 384.13	*PRECAST DRIP STONE LANDING DETAILS FOR 48" TO 120" DIAMETER MANHOLES*	*10/01/01*	*01/02/91*
MD 384.15	*PRECAST COMBINATION FLATTOP REDUCER AND DRIP STONE LANDING FOR 60" TO 120" DIAMETER MANHOLES*	*10/01/01*	*01/02/91*
MD 384.17	*PRECAST COMBINATION ECCENTRICAL CONE REDUCER AND DRIP STONE LANDING FOR 60" AND 72" DIAMETER MANHOLES*	*10/01/01*	*01/02/91*

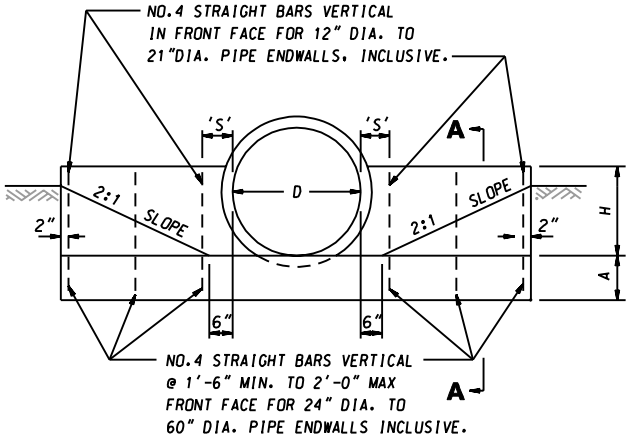
STANDARD NUMBERS	DESCRIPTION	Dates	
		MDSHA	FHWA
	CATEGORY "3" DRAINAGE		
MD 386.01	*STANDARD SPRING BOX SPRING OR WELL PROTECTION*	*10/01/01*	*03/23/56*
MD 386.02	*CAPPING EXISTING DUG WELLS*	*10/01/01*	*12/06/82*
MD 386.03	*SPRING CONTROL METHOD & DETAIL*	*03/15/06*	*04/05/06*
MD 386.11	*STANDARD JUNCTION BOX*	*10/01/01*	*03/23/56*
MD 386.21	*PRE-CAST REINFORCED CONCRETE SLAB*	*10/07/14*	*09/29/14*
MD 387.01	*STANDARD UNDERDRAINS*	*12/21/17*	*11/28/17*
MD 387.11	*LONGITUDINAL UNDERDRAIN LOCATED AT SHOULDER EDGE FOR FLEXIBLE PAVEMENT*	*06/30/16*	*06/28/16*
MD 387-11-01	*LONGITUDINAL UNDERDRAIN LOCATED AT CURB AND GUTTER EDGE FOR FLEXIBLE PAVEMENT*	*06/30/16*	*06/28/16*
MD 387.21	*LONGITUDINAL UNDERDRAIN LOCATED AT SHOULDER EDGE FOR RIGID PAVEMENT*	*06/30/16*	*06/28/16*
MD 387.21-01	*LONGITUDINAL UNDERDRAIN LOCATED AT CURB AND GUTTER EDGE FOR RIGID PAVEMENT*	*06/30/16*	*06/28/16*
MD 387.51	*STANDARD SUBGRADE DRAINS FLEXIBLE PAVING*	*06/30/16*	*06/28/16*
MD 387.61	*STANDARD SUBGRADE DRAINS RIGID PAVEMENT*	*06/30/16*	*06/28/16*
MD 389.01	*STANDARD CONCRETE VALLEY GUTTER, FLUMES, CONCRETE SHOULDER & REBUT*	*10/01/01*	
MD 389.02	*TOE WALL DETAIL-5" CONCRETE GUTTER*	*10/01/01*	*01/27/69*
MD 389.06	*SOIL STABILIZATION MATTING DRAINAGE DITCHES*	*10/01/01*	*06/27/85*
MD 389.07	*SOIL STABILIZATION MATTING DRAINAGE DITCHES*	*10/01/01*	*04/25/88*



PLAN



DISPOSITION OF BARS DETAIL



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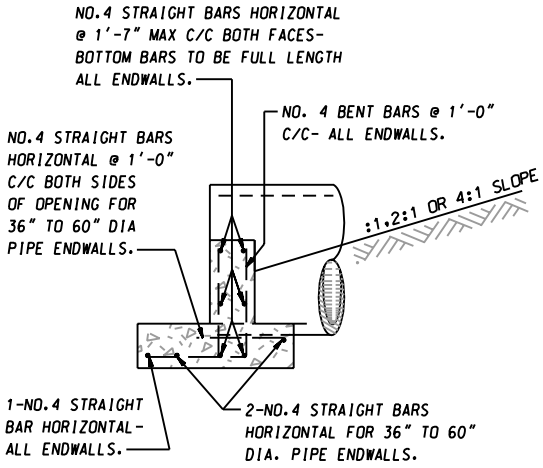


SECTION A – A

QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS						QUANTITIES	
D	AREA	A	B	C	E	H	L	CONC. C.Y.	STEEL LBS.
INCHES	SQ. FT								
12	0.79	9"	6"	6"	1'-9"	0'-10"	4'-0"	0.27	24
15	1.23	9"	6"	6"	1'-9"	1'-0½"	4'-9"	0.34	26
18	1.77	9"	6"	6"	1'-9"	1'-3"	5'-6"	0.41	29
21	2.40	9"	6"	6"	1'-9"	1'-5"	6'-3"	0.48	33
24	3.14	9"	14"	6"	2'-5"	1'-6"	7'-0"	0.67	38
27	3.98	9"	14"	6"	2'-5"	1'-8"	7'-9"	0.77	49
30	4.91	9"	14"	6"	2'-5"	1'-9"	8'-6"	0.85	53
33	5.94	9"	14"	6"	2'-5"	1'-11"	9'-3"	0.95	56
36	7.07	12"	16"	10"	3'-2"	2'-0"	10'-0"	1.65	85
42	9.62	12"	16"	10"	3'-2"	2'-3"	11'-6"	1.96	96
48	12.57	12"	16"	10"	3'-2"	2'-6"	13'-0"	2.27	106
54	15.90	12"	20"	12"	3'-8"	2'-9"	14'-6"	2.86	121
60	19.64	12"	20"	12"	3'-8"	3'-0"	16'-0"	3.22	143

'S' DISTANCE

4" FOR 12" DIA. TO 21" DIA. PIPES INCLUSIVE.
6" FOR 24" DIA. TO 36" DIA. PIPES INCLUSIVE.
8" FOR 42" DIA. TO 60" DIA. PIPES INCLUSIVE.

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS-NO.4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 8-28-86	APPROVAL 12-12-86
REVISED 10-1-01	REVISED
REVISED	REVISED
REVISED	REVISED

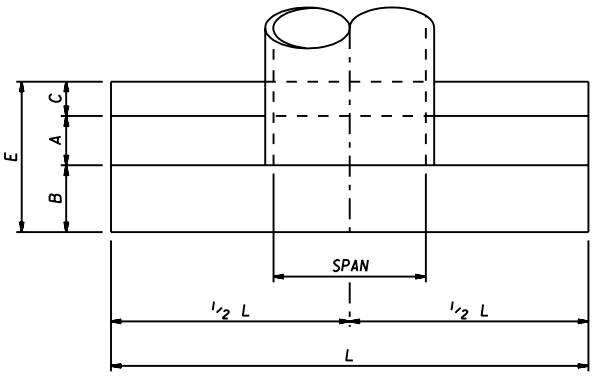
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

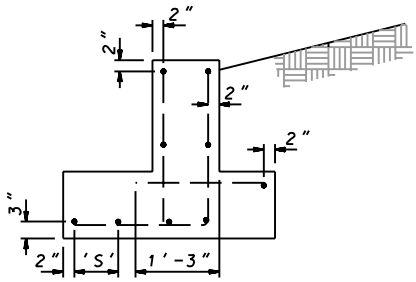
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD END SUPPORT WALL METAL OR CONCRETE ROUND PIPE

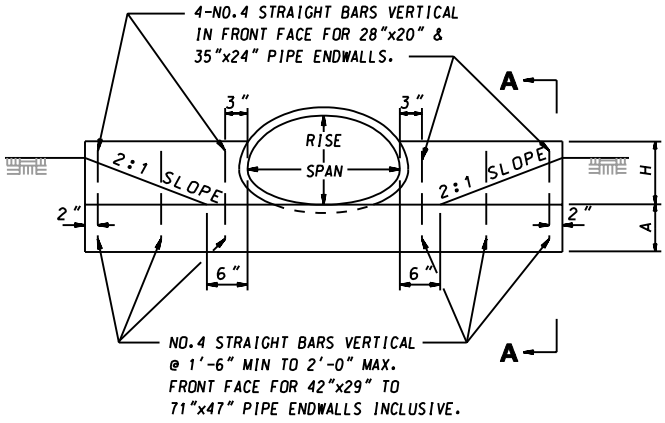
STANDARD NO. MD 350.01



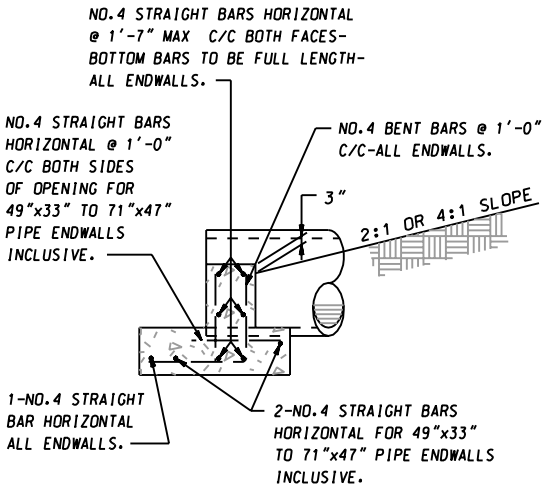
PLAN



DISPOSITION OF BARS DETAIL



ELEVATION



SECTION A-A

'S' DISTANCES

6" FOR 28"x20" TO 42"x29" INCLUSIVE.
8" FOR 49"x33" TO 71"x47" INCLUSIVE.

QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS						QUANTITIES	
SIZE INCHES SxR	AREA SQ. FT	A	B	C	E	H	L	CONC. C.Y.	STEEL LBS.
28x20	3.14	9"	14"	6"	2'-5"	1'-2"	5'-11"	.50	33
35x24	4.91	9"	14"	6"	2'-5"	1'-5"	7'-5"	.65	37
42x29	7.07	12"	16"	10"	3'-2"	1'-8"	8'-10"	1.32	54
49x33	9.62	12"	16"	10"	3'-2"	1'-11"	10'-4"	1.59	77
57x38	12.57	12"	16"	10"	3'-2"	2'-2"	12'-1"	1.92	90
64x43	15.90	12"	20"	12"	3'-8"	2'-6"	13'-7"	2.51	102
71x47	19.64	12"	20"	12"	3'-8"	2'-9"	15'-1"	2.86	112

GENERAL NOTES

SPECIFICATIONS LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS NO.4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

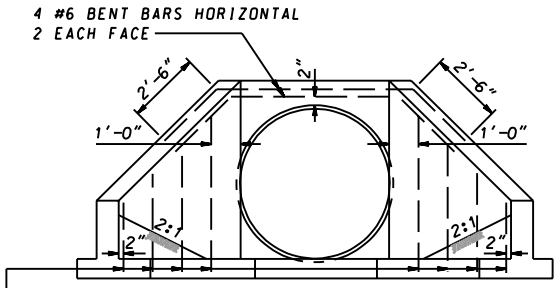
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

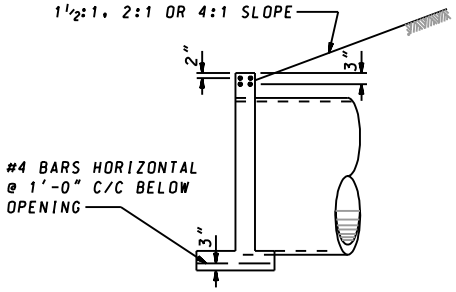
STANDARD END SUPPORT WALL METAL PIPE ARCH

STANDARD NO. MD 351.01

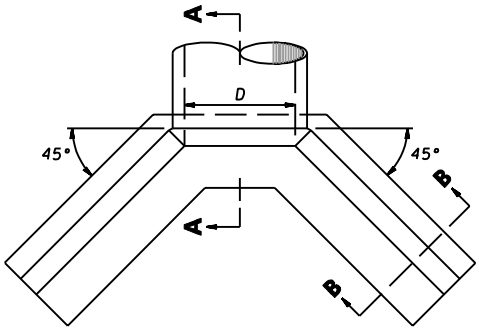


ELEVATION

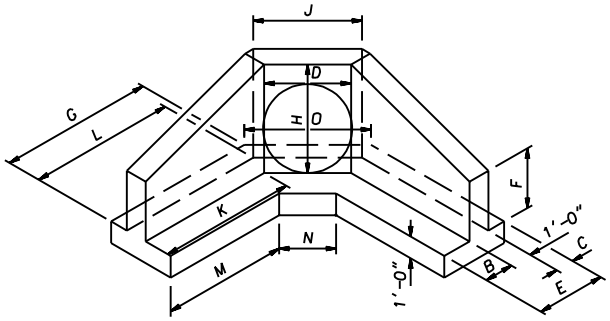
#4 STRAIGHT BARS VERTICAL
@ 1'-6"MIN. TO 2'-0"MAX.
FRONT FACE



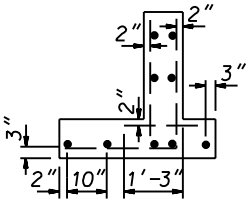
SECTION A-A



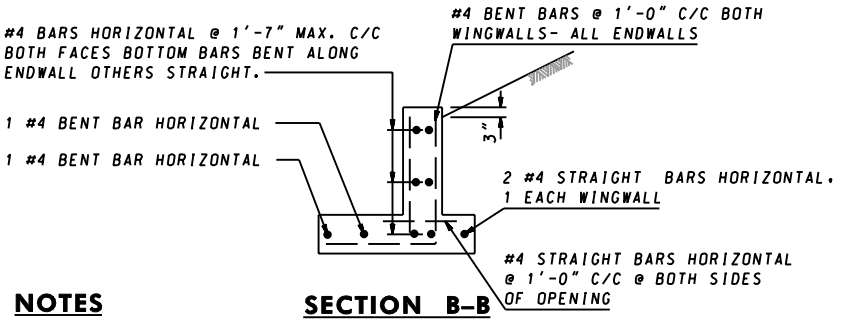
PLAN



ISOMETRIC VIEW



DISPOSITION OF BARS DETAIL



SECTION B-B

NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS #4 & #6
CHAMFER: ALL EXPOSED EDGES 1"X1" OR AS DIRECTED

OPENING		DIMENSIONS												VOL. CONC. C.Y.	STEEL LBS.
D INCHES	AREA SQ.FT.	B	C	E	F	G	H	J	K	L	M	N	O		
48	12.57	1'-4"	10"	3'-2"	2'-9"	7'-0¾"	5'-0"	4'-10"	6'-3½"	6'-8½"	5'-9"	2'-10¾"	5'-6"	4.3	262
54	15.9	1'-8"	1'-0"	3'-8"	3'-0"	7'-8½"	5'-6"	5'-4"	6'-10½"	7'-3½"	6'-2¼"	3'-1½"	6'-2"	5.3	301
60	19.64	1'-8"	1'-0"	3'-8"	3'-3"	8'-5"	6'-0"	5'-10"	7'-7¼"	8'-0¼"	6'-11"	3'-7½"	6'-8"	6.0	361

QUANTITIES IN TABLE TO BE USED FOR ESTIMATING ONLY

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-3-59	APPROVAL	2-15-60
REVISED	10-1-01	REVISED	8-1-84
REVISED		REVISED	
REVISED		REVISED	

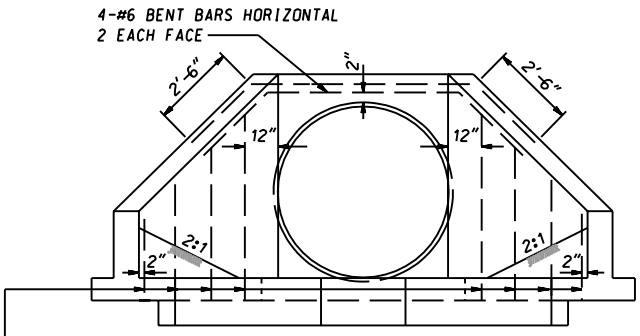
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

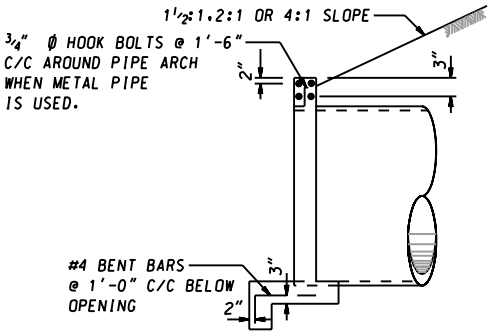
STANDARD HEADWALLS
B-48 B-54 B-60

STANDARD NO. MD 352.01

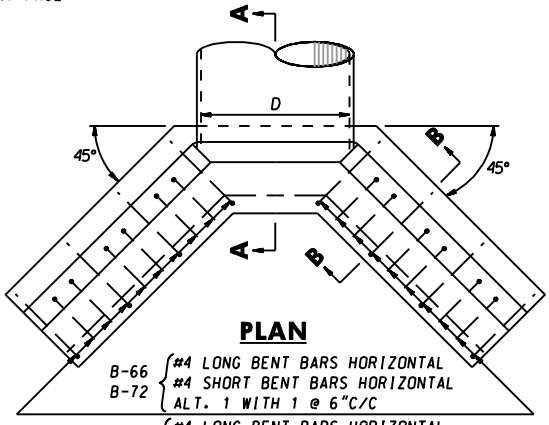


ELEVATION

#4 STRAIGHT BARS VERTICAL
@ 1'-6" MIN. TO 2'-0" MAX.
IN FRONT FACE



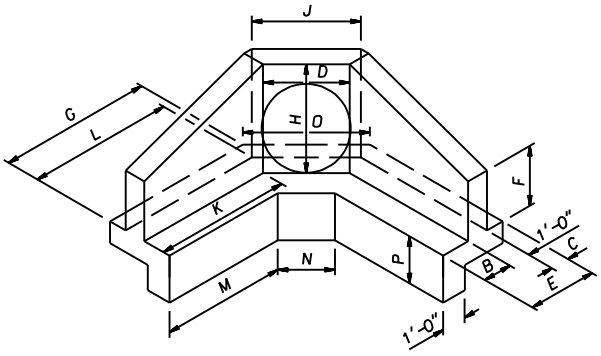
SECTION A-A



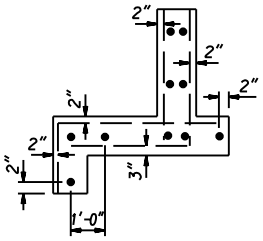
PLAN

B-66 / B-72: #4 LONG BENT BARS HORIZONTAL; #4 SHORT BENT BARS HORIZONTAL; ALT. 1 WITH 1 @ 6"C/C

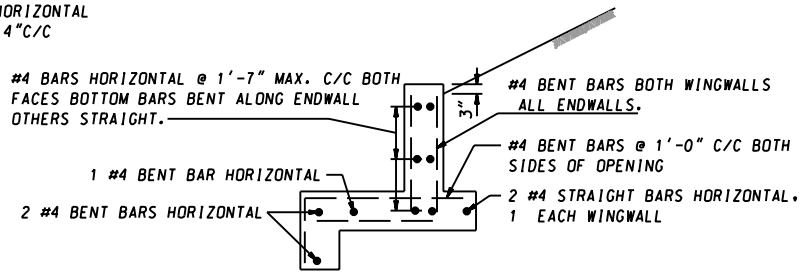
B-78 / B-84: #4 LONG BENT BARS HORIZONTAL; #4 SHORT BENT BARS HORIZONTAL; ALT. 1 WITH 2 RESP. 4"C/C



ISOMETRIC VIEW



DISPOSITION OF BARS DETAIL



SECTION B-B

NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS #4 & #6
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED

OPENING		DIMENSIONS													VOL. CONC. C.Y.	STEEL LBS.
D INCHES	AREA SQ.FT.	B	C	E	F	G	H	J	K	L	M	N	O	P		
66	23.80	2'-6"	1'-3"	4'-9"	3'-0"	11'-2½"	6'-8½"	6'-4"	10'-3¼"	10'-8½"	9'-3"	3'-5"	7'-4½"	2'-0"	9.7	585
72	28.27	2'-6"	1'-3"	4'-9"	3'-3"	12'-1"	7'-3"	6'-10"	11'-1¾"	11'-6¾"	10'-1¼"	3"-11"	7'-10½"	2'-0"	10.9	645
78	33.20	3'-0"	1'-6"	5'-6"	3'-6"	13'-0½"	7'-9½"	7'-4"	12'-0"	12'-5"	10'-9"	4'-0"	8'-6¾"	2'-6"	13.3	865
84	38.48	3'-0"	1'-6"	5'-6"	3'-9"	13'-10"	8'-4"	7'-10"	12'-9½"	13'-2½"	11'-6½"	4'-6"	9'-0¾"	2'-6"	14.7	984

QUANTITIES IN TABLE TO BE USED FOR ESTIMATING ONLY

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED: Kirk G. McClellan
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-3-59	APPROVAL	
REVISED	10-1-01	REVISED	6-18-75
REVISED		REVISED	
REVISED		REVISED	

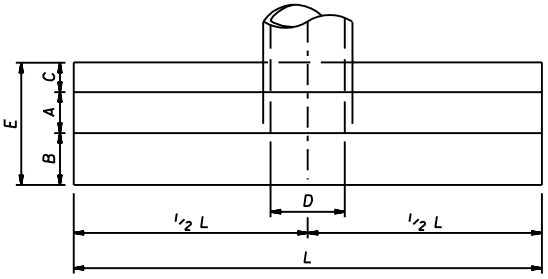
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

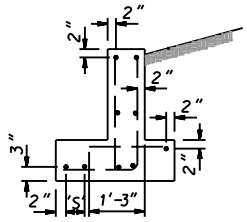
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD HEADWALLS
B-66 B-72 B-78 B-84

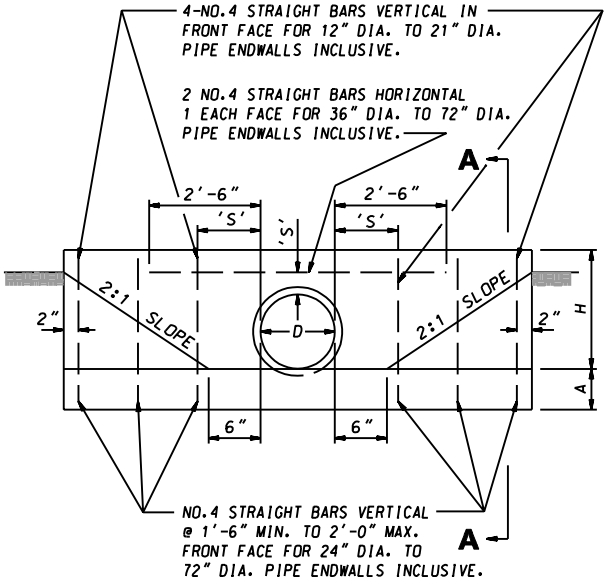
STANDARD NO. MD 352.02



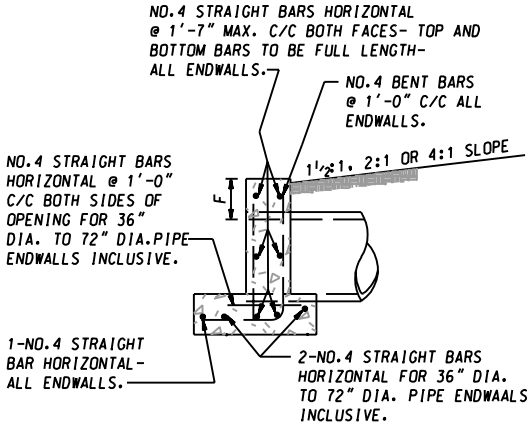
PLAN



DISPOSITION OF BARS DETAIL



ELEVATION



SECTION A-A

QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS							QUANTITIES	
D	AREA	A	B	C	E	F	H	L	CONC.	STEEL
INCHES	SQ.FT.								C.Y.	LBS.
12	0.79	9"	6"	6"	1'-9"	9"	1'-9"	6'-6"	0.61	41
15	1.23	9"	6"	6"	1'-9"	9"	2'-0"	7'-9"	0.77	47
18	1.77	9"	6"	6"	1'-9"	9"	2'-3"	9'-0"	0.95	54
21	2.40	9"	6"	6"	1'-9"	9"	2'-6"	10'-3"	1.14	70
24	3.14	9"	14"	6"	2'-5"	9"	2'-9"	11'-6"	1.56	80
27	3.98	9"	14"	6"	2'-5"	9"	3'-0"	12'-10"	1.82	88
30	4.91	9"	14"	6"	2'-5"	12"	3'-6"	14'-2"	2.22	98
33	5.94	9"	14"	6"	2'-5"	12"	3'-9"	15'-5"	2.48	105
36	7.07	12"	16"	10"	3'-2"	12"	4'-0"	16'-8"	4.16	182
42	9.62	12"	16"	10"	3'-2"	12"	4'-6"	19'-2"	5.07	206
48	12.57	12"	16"	10"	3'-2"	12"	5'-0"	21'-8"	6.09	244
54	15.90	12"	20"	12"	3'-8"	12"	5'-6"	24'-2"	7.62	275
60	19.64	12"	20"	12"	3'-8"	12"	6'-0"	26'-8"	8.82	304
72	28.27	12"	20"	12"	3'-8"	12"	7'-0"	31'-8"	11.46	377

'S' DISTANCES

4" FOR 12" DIA. TO 21" DIA. PIPES INCLUSIVE.
6" FOR 24" DIA. TO 36" DIA. PIPES INCUSIVE.
8" FOR 42" DIA. TO 72" DIA. PIPES INCLUSIVE.

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS-NO.4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

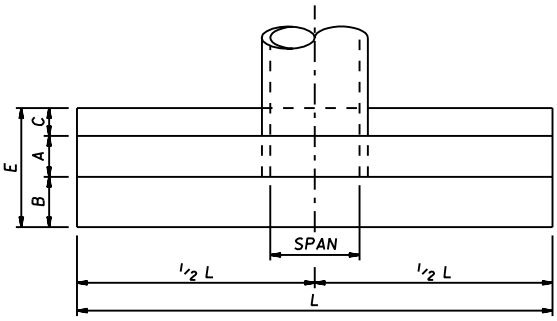
APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 8-28-86	APPROVAL 12-12-86
REVISED 10-1-01	REVISED
REVISED	REVISED
REVISED	REVISED

SHA State Highway Administration

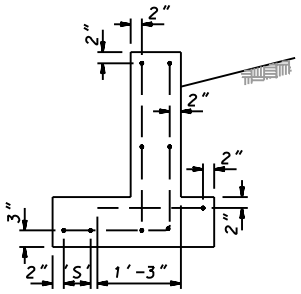
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE C ENDWALL METAL OR CONCRETE ROUND PIPE

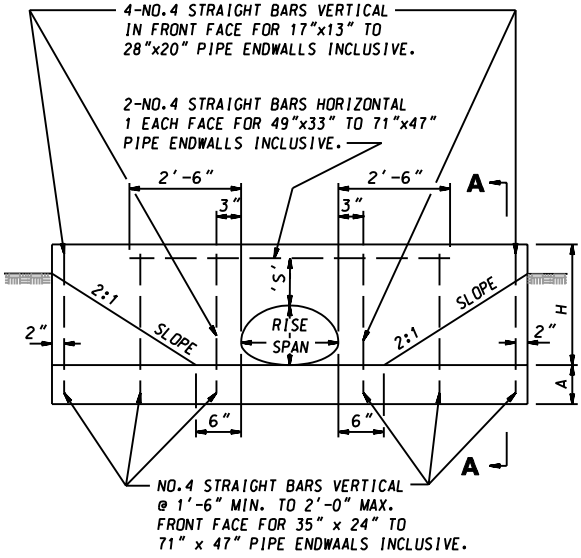
STANDARD NO. MD 354.01



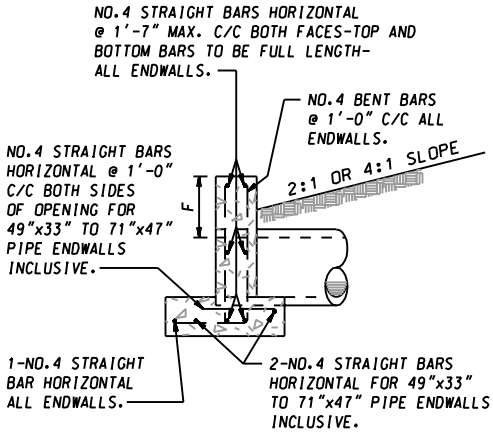
PLAN



DISPOSITION OF BARS DETAIL



ELEVATION



SECTION A-A

QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS							QUANTITIES	
D INCHES SXR	AREA SQ.FT.	A	B	C	E	F	H	L	CONC. C.Y.	STEEL LBS.
17X13	1.23	9"	6"	6"	1'-9"	9"	1'-10"	6'-3"	0.54	38
21X15	1.77	9"	6"	6"	1'-9"	9"	2'-0"	9'-6"	0.98	56
24X18	2.40	9"	6"	6"	1'-9"	9"	2'-3"	9'-6"	0.96	55
28X20	3.14	9"	6"	6"	1'-9"	9"	2'-5"	9'-6"	0.96	55
35X24	4.91	9"	14"	6"	2'-5"	12"	2'-9"	13'-8"	1.98	96
42X29	7.07	9"	14"	6"	2'-5"	12"	3'-2"	13'-8"	1.92	95
49X33	9.62	12"	16"	10"	3'-2"	12"	3'-9"	17'-11"	4.34	186
57X38	12.57	12"	16"	10"	3'-2"	12"	4'-2"	17'-11"	4.73	186
64X43	15.90	12"	20"	12"	3'-8"	12"	4'-7"	21'-9"	6.27	243
71X47	19.64	12"	20"	12"	3'-8"	12"	4'-11"	21'-9"	6.05	243

'S' DISTANCES

4" FOR 17" x 13" TO 24" x 18" INCLUSIVE.
6" FOR 28" x 20" TO 42" x 29" INCLUSIVE.
8" FOR 49" x 33" TO 71" x 47" INCLUSIVE.

GENERAL NOTES

SPECIFICATIOINS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS NO.4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 8-28-86	APPROVAL 12-10-86
REVISED 10-1-01	REVISED
REVISED	REVISED
REVISED	REVISED

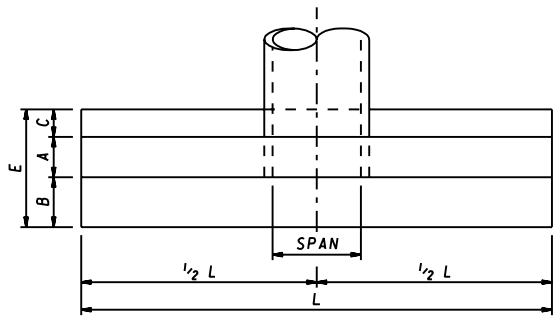
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

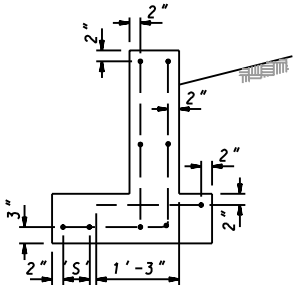
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE C ENDWALL METAL PIPE ARCH

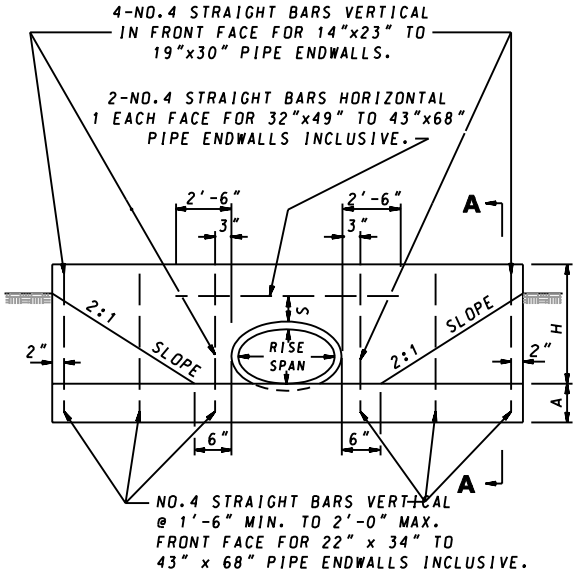
STANDARD NO. MD 355.01



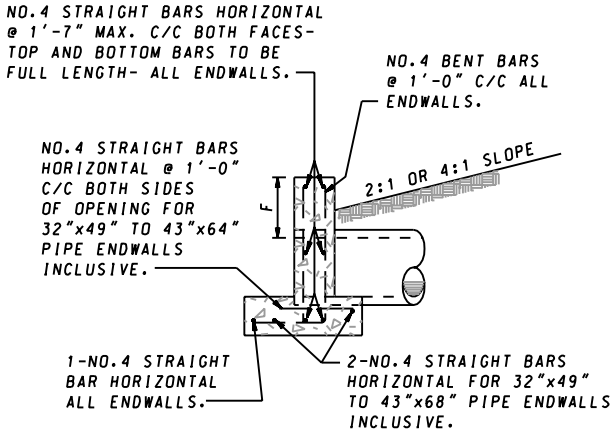
PLAN



DISPOSITION OF BARS DETAIL



ELEVATION



SECTION A-A

QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS							QUANTITIES	
D RISE x SPAN INCHES	AREA SQ.FT.	A	B	C	E	F	H	L	CONC. C.Y.	STEEL LBS.
14X23	1.8	9"	8"	6"	1'-11"	12"	2'-2"	8'-7"	0.88	56
19X30	3.3	9"	8"	6"	1'-11"	12"	2'-6"	10'-6"	1.15	63
22X34	4.1	9"	14"	6"	2'-5"	13"	2'-11"	12'-6"	1.74	100
24X38	5.1	9"	14"	6"	2'-5"	13"	3'-1"	13'-6"	1.92	116
27X42	6.3	9"	14"	6"	2'-5"	13"	3'-4"	14'-10"	2.19	124
29X45	7.4	9"	14"	10"	2'-9"	14"	3'-7"	16'-0"	2.61	141
32X49	8.8	12"	16"	10"	3'-2"	14"	3'-10"	17'-0"	4.08	202
34X53	10.2	12"	16"	10"	3'-2"	14"	4'-0"	18'-0"	4.40	210
38X60	12.9	12"	16"	10"	3'-2"	15"	4'-5"	20'-4"	5.23	266
43X68	16.6	12"	20"	12"	3'-8"	15"	4'-10"	22'-8"	6.52	307

'S' DISTANCES

6" FOR 14" x 23" TO 27" x 42" INCLUSIVE.
8" FOR 29" x 45" TO 43" x 68" INCLUSIVE.

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE: SEE S.H.A. SPECIFICATIONS
REINFORCEMENT: DEFORMED STEEL BARS NO.4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	10-1-01	APPROVAL	9-27-01
REVISED	8-12-02	REVISED	
REVISED		REVISED	
REVISED		REVISED	

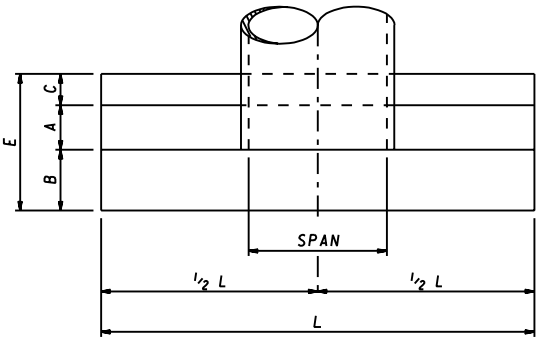
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

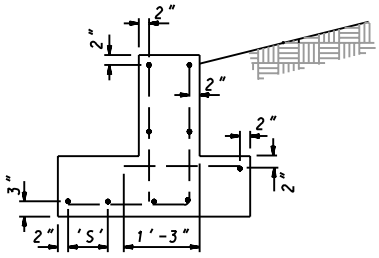
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE C ENDWALL HORIZONTAL ELLIPTICAL CONCRETE PIPE

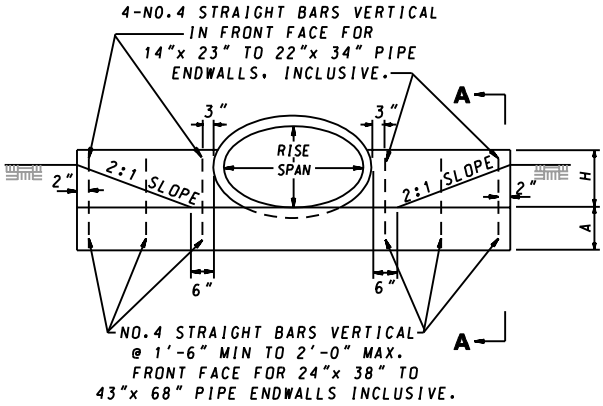
STANDARD NO. MD 355.02



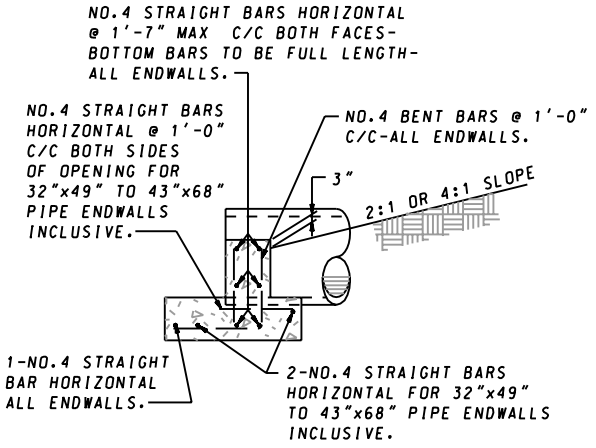
PLAN



DISPOSITION OF BARS DETAIL



ELEVATION



SECTION A-A

QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS						QUANTITIES	
RISExSPAN	AREA	A	B	C	E	H	L	CONC.	STEEL
INCHES	SQ. FT							C.Y.	LBS.
14X23	1.8	9"	8"	6"	1'-11"	1'-0"	4'-11"	.42	25
19X30	3.3	9"	8"	6"	1'-11"	1'-2"	6'-2"	.55	32
22X34	4.1	9"	14"	6"	2'-5"	1'-5"	7'-6"	.68	38
24X38	5.1	12"	16"	10"	3'-2"	1'-6"	8'-2"	1.22	51
27X42	6.3	12"	16"	10"	3'-2"	1'-8"	9'-2"	1.41	57
29X45	7.4	12"	16"	10"	3'-2"	1'-9"	9'-9"	1.50	65
32X49	8.8	12"	16"	10"	3'-2"	1'-11"	10'-9"	1.70	94
34X53	10.2	12"	16"	10"	3'-2"	2'-0"	11'-5"	1.81	98
38X60	12.9	12"	16"	12"	3'-4"	2'-1"	12'-4"	2.00	103
43X68	16.6	12"	20"	12"	3'-8"	2'-4"	13'-4"	2.35	111

'S' DISTANCES

6" FOR 14"x23" TO 27"x42" PIPES INCLUSIVE.
8" FOR 29"x45" TO 43"x68" PIPES INCLUSIVE.

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE: SEE S.H.A. SPECIFICATIONS.
REINFORCMENT: DEFORMED STEEL BARS NO.4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	10-1-01	APPROVAL	9-27-01
REVISED	8-12-02	REVISED	
REVISED		REVISED	
REVISED		REVISED	

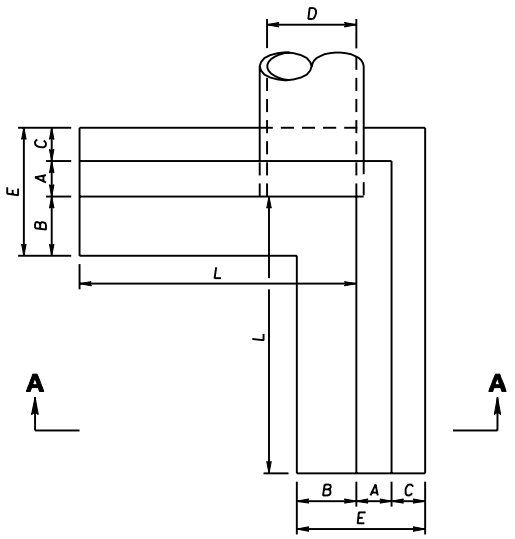
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD END SUPPORT WALL HORIZONTAL ELLIPTICAL CONCRETE PIPE

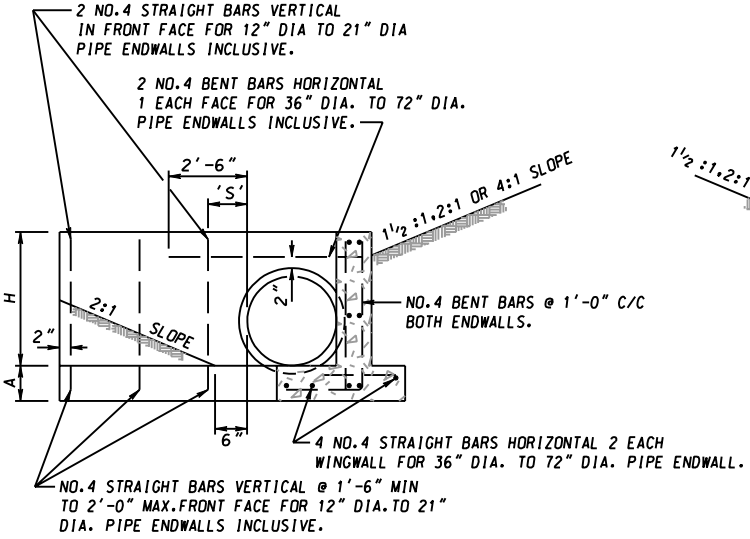
STANDARD NO. MD 355.03



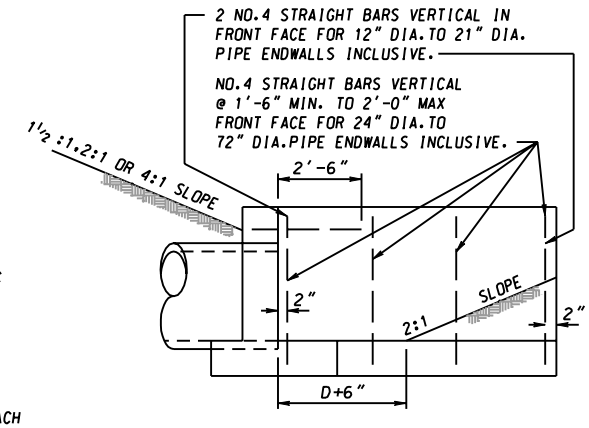
PLAN

QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS						QUANTITIES	
D INCHES	AREA SQ.FT	A	B	C	E	H	L	CONC. C.Y.	STEEL LBS.
12	0.79	9"	6"	6"	1'-9"	1'-9"	3'-6"	0.76	55
15	1.23	9"	6"	6"	1'-9"	2'-0"	4'-3"	0.99	61
18	1.77	9"	6"	6"	1'-9"	2'-3"	5'-0"	1.17	68
21	2.40	9"	6"	6"	1'-9"	2'-6"	5'-9"	1.38	77
24	3.14	9"	14"	6"	2'-5"	2'-9"	6'-6"	1.84	106
27	3.98	9"	14"	6"	2'-5"	3'-0"	7'-3"	2.11	115
30	4.91	9"	14"	6"	2'-5"	3'-6"	8'-0"	2.57	140
33	5.94	9"	14"	6"	2'-5"	3'-9"	8'-9"	2.92	148
36	7.07	12"	16"	10'	3'-2"	4'-0"	9'-6"	4.99	235
42	9.62	12"	16"	10"	3'-2"	4'-6"	11'-0"	6.12	303
48	12.57	12"	16"	10"	3'-2"	5'-0"	12'-6"	7.34	341
54	15.90	12"	20"	12"	3'-8"	5'-6"	14'-0"	9.17	438
60	19.64	12"	20"	12"	3'-8"	6'-0"	15'-6"	10.86	496
72	28.27	12"	20"	12"	3'-8"	7'-0"	17'-0"	12.69	597



SECTION A–A



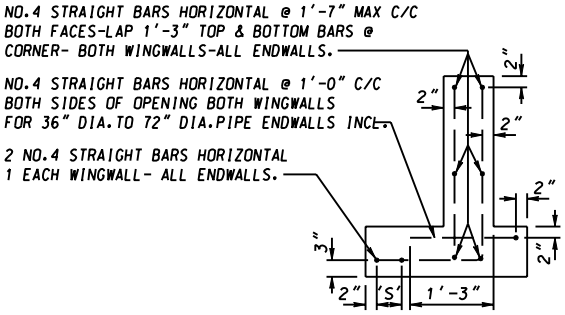
END VIEW

'S' DISTANCES

4" FOR 12" DIA. TO 21" DIA. PIPES INCLUSIVE.
6" FOR 24" DIA. TO 36" DIA. PIPES INCLUSIVE.
8" FOR 42" DIA. TO 72" DIA. PIPES INCLUSIVE.

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS - NO.4
CHAMFER: ALL EXPOSED EDGES 1"x 1" OR AS DIRECTED.



DISPOSITION OF BARS DETAIL

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan — DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

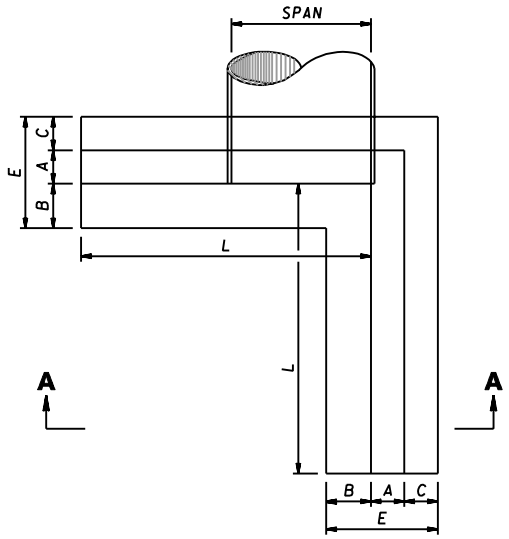
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE E ENDWALL METAL OR CONCRETE ROUND PIPE

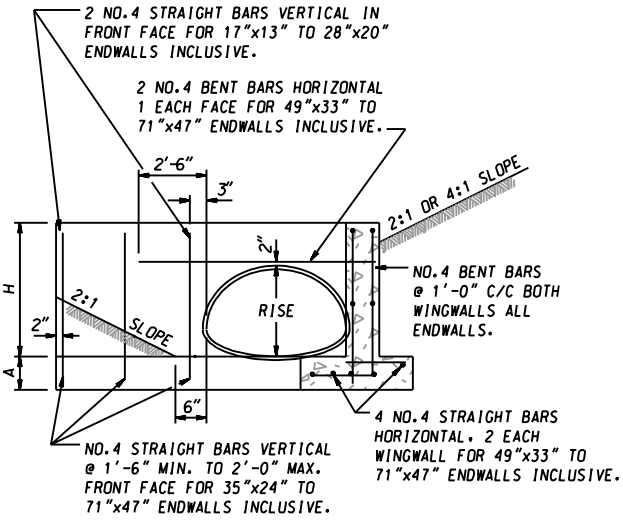
STANDARD NO. MD 356.01



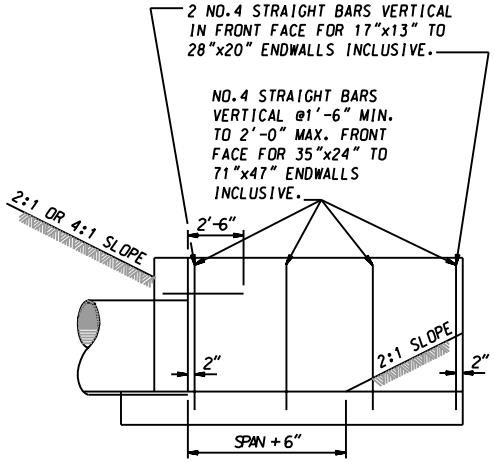
QUANTITIES FOR ESTIMATING PURPOSES ONLY

OPENING		DIMENSIONS						QUANTITIES	
SIZE INCHES SxR	AREA SQ. FT.	A	B	C	E	H	L	CONC. C.Y.	STEEL LBS.
17x13	1.23	9"	6"	6"	1'-9"	1'-7"	3'-9"	.73	53
21x15	1.77	9"	6"	6"	1'-9"	2'-2"	5'-10"	1.30	75
24x18	2.40	9"	6"	6"	1'-9"	2'-2"	5'-10"	1.28	75
28x20	3.14	9"	6"	6"	1'-9"	2'-2"	5'-10"	1.26	74
35x24	4.91	9"	14"	6"	2'-5"	3'-2"	8'-6"	2.57	118
42x29	7.07	9"	14"	6"	2'-5"	3'-2"	8'-6"	2.52	117
49x33	9.62	12"	16"	10"	3'-2"	3'-11"	11'-3"	5.80	271
57x38	12.57	12"	16"	10"	3'-2"	3'-11"	11'-3"	5.65	261
64x43	15.90	12"	20"	12"	3'-8"	4'-8"	13'-9"	8.12	366
71x47	19.64	12"	20"	12"	3'-8"	4'-8"	13'-9"	7.98	355

PLAN



SECTION A-A



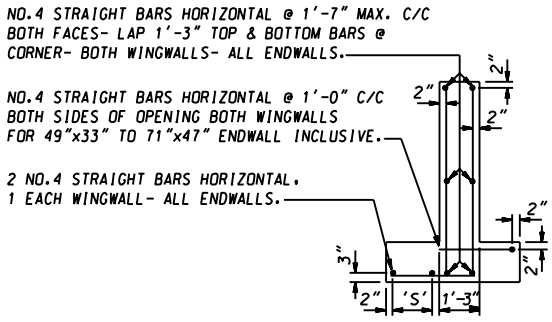
END VIEW

'S' DISTANCES

4" FOR 17"x13" TO 24"x18" INCLUSIVE.
6" FOR 28"x20" TO 42"x29" INCLUSIVE.
8" FOR 49"x33" TO 71"x47" INCLUSIVE.

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS- NO. 4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.



DISPOSITION OF BARS DETAIL

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall — DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

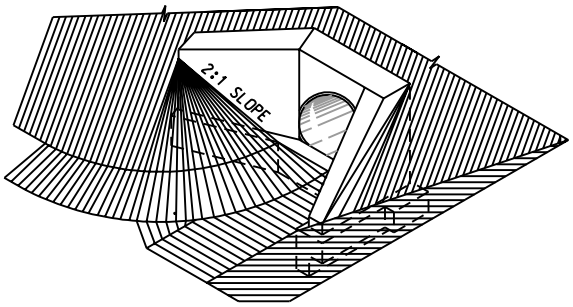
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

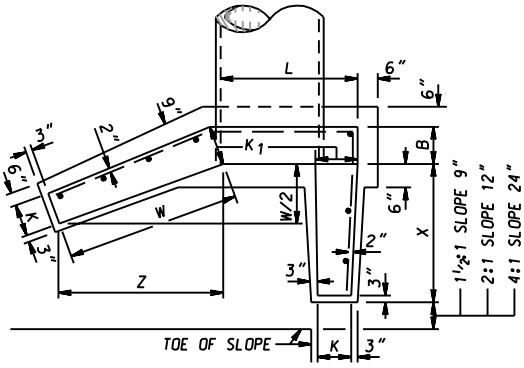
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE E ENDWALL METAL PIPE ARCH

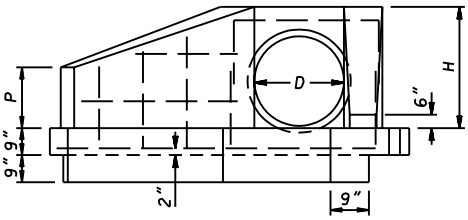
STANDARD NO. MD 357.01



ISOMETRIC VIEW



PLAN



ELEVATION

QUANTITIES FOR ESTIMATING PURPOSES ONLY

SLOPE 1½:1

OPENING		DIMENSIONS									QUANTITIES	
PIPE DIA.	AREA	ENDWALL			WINGS						1-ENDWALL 2-WINGS	
D	SQ.FT.	L	B	H	W	X	Z	K_1	K	P	CONC. C.Y.	STEEL LBS.
12"	0.79	1'-9"	9"	1'-8"	2'-0"	1'-3"	1'-9"	9"	7"	1'-4"	0.51	38
15"	1.23	2'-0"	9"	2'-0"	2'-4"	1'-9"	2'-0"	9"	7"	1'-5"	0.63	42
18"	1.77	2'-3"	9"	2'-3"	2'-8"	2'-1"	2'-4"	9"	8"	1'-6"	0.77	48
21"	2.40	2'-6"	9"	2'-7"	3'-1"	2'-6"	2'-8"	9"	8"	1'-9"	1.10	61
24"	3.14	3'-0"	12"	2'-11"	3'-6"	2'-11"	3'-0"	12"	11"	2'-1"	1.43	73
27"	3.98	3'-3"	12"	3'-3"	3'-11"	3'-4"	3'-4"	12"	11"	2'-3"	1.66	85
30"	4.91	3'-6"	12"	3'-6"	4'-4"	3'-9"	3'-9"	12"	11"	2'-4"	1.88	96
33"	5.94	3'-9"	12"	3'-9"	4'-8"	4'-1"	4'-0"	12"	11"	2'-6"	2.10	107
36"	7.07	4'-0"	12"	4'-0"	5'-0"	4'-6"	4'-4"	12"	11"	2'-7"	2.32	118
42"	9.62	4'-6"	12"	4'-7"	5'-9"	5'-4"	5'-0"	12"	11"	2'-11"	2.85	144
48"	12.57	5'-0"	12"	5'-1"	6'-4"	6'-2"	5'-6"	12"	11"	3'-3"	3.37	170

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS

VERTICAL NO.6 BARS 12" C/C

HORIZONTAL NO.4 BARS 12" C/C HOOKED ON ONE END
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SLOPE 2:1

OPENING		DIMENSIONS									QUANTITIES	
PIPE DIA.	AREA	ENDWALL			WINGS						1-ENDWALL 2-WINGS	
D	SQ.FT.	L	B	H	W	X	Z	K_1	K	P	CONC. C.Y.	STEEL LBS.
12"	0.79	1'-9"	9"	1'-7"	2'-3"	1'-10"	2'-0"	9"	7"	1'-3"	0.55	38
15"	1.23	2'-0"	9"	1'-11"	2'-6"	2'-6"	2'-2"	9"	8"	1'-5"	0.73	46
18"	1.77	2'-3"	9"	2'-2"	3'-0"	3'-0"	2'-7"	9"	8"	1'-7"	0.89	57
21"	2.40	2'-6"	9"	2'-5"	3'-6"	3'-6"	3'-0"	9"	8"	1'-10"	1.27	70
24"	3.14	3'-0"	12"	2'-9"	4'-0"	4'-0"	3'-5"	12"	11"	2'-1"	1.64	82
27"	3.98	3'-3"	12"	3'-0"	4'-4"	4'-6"	3'-9"	12"	11"	2'-3"	1.89	98
30"	4.91	3'-6"	12"	3'-4"	4'-8"	5'-2"	4'-1"	12"	11"	2'-6"	2.14	113
33"	5.94	3'-9"	12"	3'-7"	5'-0"	5'-8"	4'-4"	12"	11"	2'-8"	2.31	123
36"	7.07	4'-0"	12"	3'-10"	5'-4"	6'-2"	4'-7"	12"	11"	2'-10"	2.48	132
42"	9.62	4'-6"	12"	4'-5"	6'-4"	7'-4"	5'-6"	12"	11"	3'-2"	3.30	163
48"	12.57	5'-0"	12"	4'-11"	7'-0"	8'-4"	6'-1"	12"	11"	3'-6"	3.85	193

SLOPE 4:1

OPENING		DIMENSIONS									QUANTITIES	
PIPE DIA.	AREA	ENDWALL			WINGS						1-ENDWALL 2-WINGS	
D	SQ.FT.	L	B	H	W	X	Z	K_1	K	P	CONC. C.Y.	STEEL LBS.
12"	0.79	1'-9"	9"	1'-5"	2'-6"	3'-8"	2'-2"	9"	8"	1'-3"	0.81	45
15"	1.23	2'-0"	9"	1'-9"	3'-0"	5'-0"	2'-7"	9"	8"	1'-5"	1.04	68
18"	1.77	2'-3"	9"	2'-0"	3'-6"	6'-0"	3'-0"	9"	8"	1'-7"	1.26	74
21"	2.40	2'-6"	9"	2'-3"	4'-0"	7'-0"	3'-5"	9"	8"	1'-11"	1.75	89
24"	3.14	3'-0"	12"	2'-6"	4'-6"	8'-0"	3'-11"	12"	11"	2'-2"	2.23	104
27"	3.98	3'-3"	12"	2'-9"	5'-0"	9'-2"	4'-4"	12"	11"	2'-4"	2.64	126
30"	4.91	3'-6"	12"	3'-1"	5'-6"	10'-4"	4'-9"	12"	11"	2'-7"	3.04	147
33"	5.94	3'-9"	12"	3'-4"	6'-0"	11'-4"	5'-2"	12"	11"	2'-9"	3.40	164
36"	7.07	4'-0"	12"	3'-7"	6'-6"	12'-4"	5'-8"	12"	11"	3'-0"	3.75	180
42"	9.62	4'-6"	12"	4'-2"	7'-6"	14'-8"	6'-6"	12"	11"	3'-5"	4.67	218
48"	12.57	5'-0"	12"	4'-8"	8'-3"	16'-8"	7'-2"	12"	11"	3'-10"	5.57	277

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

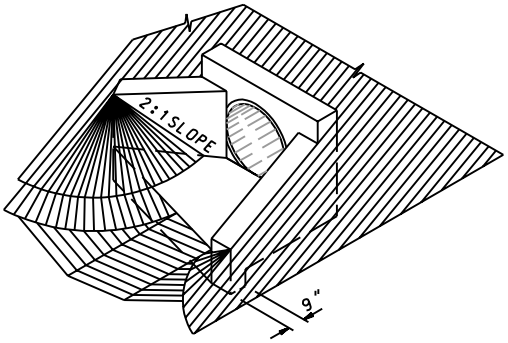
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

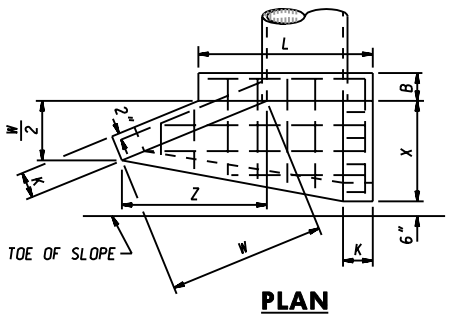
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE F ENDWALL
METAL OR CONCRETE ROUND PIPE

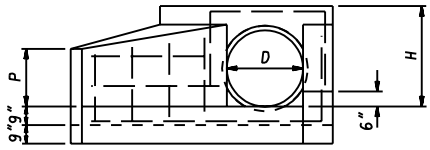
STANDARD NO. MD 358.01



ISOMETRIC VIEW



PLAN



ELEVATION

QUANTITIES FOR ESTIMATING PURPOSES ONLY

SLOPE: 1½:1

OPENING		DIMENSIONS								QUANTITIES	
		ENDWALL			WINGS					1-ENDWALL 2-WINGS	
PIPE DIA. D	AREA SQ. FT.	L	B	H	W	X	Z	K	P	CONC. CU. YDS.	STEEL LBS.
12"	0.79	3'-3"	9"	1'-8"	1'-11"	1'-3"	1'-8"	9"	1'-0"	0.47	33
15"	1.23	3'-6"	9"	2'-0"	2'-5"	1'-8"	2'-1"	9"	1'-2"	0.61	50
18"	1.78	3'-9"	9"	2'-3"	2'-8"	2'-1"	2'-4"	9"	1'-4"	0.75	53
21"	2.40	4'-0"	9"	2'-7"	3'-2"	2'-6"	2'-9"	9"	1'-6"	1.10	71
24"	3.14	5'-0"	12"	2'-11"	3'-5"	2'-11"	2'-11"	12"	1'-9"	1.44	89
27"	3.98	5'-3"	12"	3'-3"	3'-10"	3'-3"	3'-4"	12"	1'-11"	1.69	101
30"	4.91	5'-6"	12"	3'-6"	4'-2"	3'-8"	3'-7"	12"	2'-1"	1.93	112
33"	5.94	5'-9"	12"	3'-9"	4'-6"	4'-3"	3'-11"	12"	2'-3"	2.22	133
36"	7.07	6'-0"	12"	4"-0"	4'-10"	4'-6"	4'-2"	12"	2'-4"	2.51	154
42"	9.62	6'-6"	12"	4"-7"	5'-7"	5'-4"	4'-10"	12"	2'-8"	3.20	189
48"	12.57	7'-0"	12"	5'-1"	6'-3"	6'-2"	5'-5"	12"	2'-11"	3.92	216

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS
ENDWALLS: NO.6 BARS 12" C/C
WINGWALLS: VERTICAL NO.6 BARS 12" C/C.
18" BEND ON ONE END
HORIZONTAL NO.4 BARS 12" C/C
6" HOOK ON ONE END
FLOOR: NO.4 BARS 12" C/C. 2 WAYS
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SLOPE: 2:1

OPENING		DIMENSIONS								QUANTITIES	
		ENDWALL			WINGS					1-ENDWALL 2-WINGS	
PIPE DIA. D	AREA SQ. FT.	L	B	H	W	X	Z	K	P	CONC. CU. YDS.	STEEL LBS.
12"	0.79	3'-3"	9"	1'-7"	2'-1"	1'-10"	1'-10"	9"	1'-0"	0.53	37
15"	1.23	3'-6"	9"	1'-11"	2'-7"	2'-5"	2'-3"	9"	1'-3"	0.70	55
18"	1.78	3'-9"	9"	2'-2"	2'-11"	2'-11"	2'-6"	9"	1'-5"	0.82	68
21"	2.40	4'-0"	9"	2'-6"	3'-3"	3'-6"	2'-10"	9"	1'-7"	1.23	80
24"	3.14	5'-0"	12"	2'-9"	3'-7"	4'-0"	3'-1"	12"	1'-10"	1.63	92
27"	3.98	5'-3"	12"	3'-0"	4'-0"	4'-6"	3'-6"	12"	2'-0"	1.94	109
30"	4.91	5'-6"	12"	3'-4"	4'-5"	5'-1"	3'-10"	12"	2'-2"	2.24	125
33"	5.94	5'-9"	12"	3'-7"	4'-10"	5'-7"	4'-2"	12"	2'-4"	2.56	146
36"	7.07	6'-0"	12"	3'-10"	5'-2"	6'-2"	4'-6"	12"	2'-6"	2.88	166
42"	9.62	6'-6"	12"	4'-5"	6'-0"	7'-3"	5'-2"	12"	2'-10"	3.74	221
48"	12.57	7'-0"	12"	4'-11"	6'-9"	8'-4"	5'-10"	12"	3'-2"	4.61	262

SLOPE: 4:1

OPENING		DIMENSIONS								QUANTITIES	
		ENDWALL			WINGS					1-ENDWALL 2-WINGS	
PIPE DIA. D	AREA SQ. FT.	L	B	H	W	X	Z	K	P	CONC. CU. YDS.	STEEL LBS.
12"	0.79	3'-3"	9"	1'-5"	2'-4"	4'-2"	2'-0"	9"	1'-2"	0.76	61
15"	1.23	3'-6"	9"	1'-9"	2'-11"	5'-3"	2'-6"	9"	1'-5"	1.03	81
18"	1.78	3'-9"	9"	2'-0"	3'-1"	6'-4"	2'-11"	9"	1'-7"	1.33	98
21"	2.40	4'-0"	9"	2'-3"	3'-7"	7'-5"	3'-1"	9"	1'-9"	1.89	130
24"	3.14	5'-0"	12"	2'-6"	4'-0"	8'-6"	3'-6"	12"	2'-0"	2.45	161
27"	3.98	5'-3"	12"	2'-9"	4'-6"	9'-7"	3'-11"	12"	2'-2"	2.95	193
30"	4.91	5'-6"	12"	3'-1"	5'-0"	10'-8"	4'-4"	12"	2'-5"	3.44	225
33"	5.94	5'-9"	12"	3'-4"	5'-6"	11'-9"	4'-9"	12"	2'-7"	4.02	236
36"	7.07	6'-0"	12"	3'-7"	5'-11"	12'-10"	5'-2"	12"	2'-10"	4.59	246
42"	9.62	6'-6"	12"	4'-2"	7'-0"	15'-0"	6'-1"	12"	3'-4"	5.98	367
48"	12.57	7'-0"	12"	4'-8"	7'-11"	17'-2"	6'-10"	12"	3'-9"	7.46	499

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

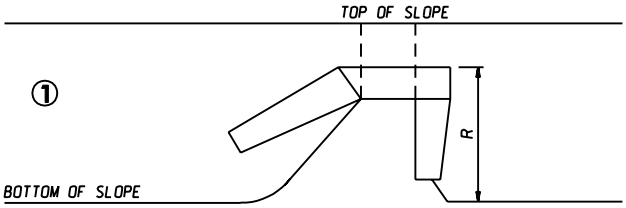
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

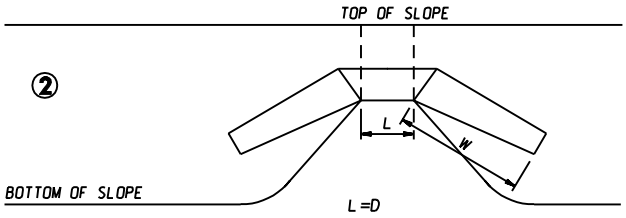
SPECIAL TYPE F ENDWALL
METAL OR CONCRETE ROUND PIPE

STANDARD NO. MD 358.02

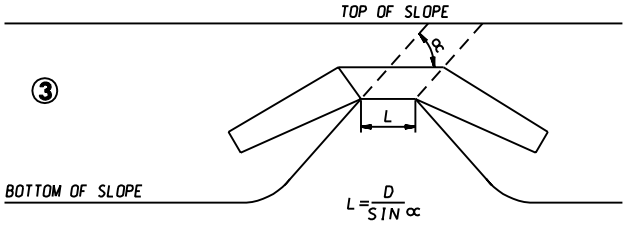
CASE ①. STANDARD TYPE "F" ENDWALL



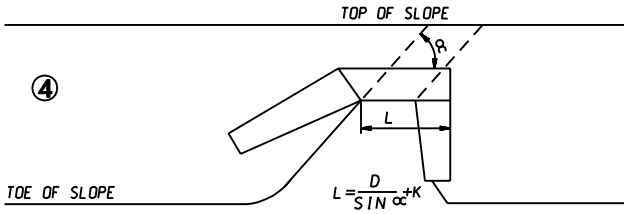
CASE ②. WHEN A WATER COURSE IS PERPENDICULAR OR ASKEW TO THE ℄, AND THE SIDE DITCH DRAINAGE IS IN BOTH DIRECTIONS AND IT IS MORE ECONOMICAL OR BETTER PRACTICE TO PLACE THE PIPE AT RIGHT ANGLES TO THE ℄, THE "F" ENDWALL CAN BE USED BY MAKING THE SHORTER WING EQUAL IN LENGTH AND ANGLE TO THE LONGER WING.



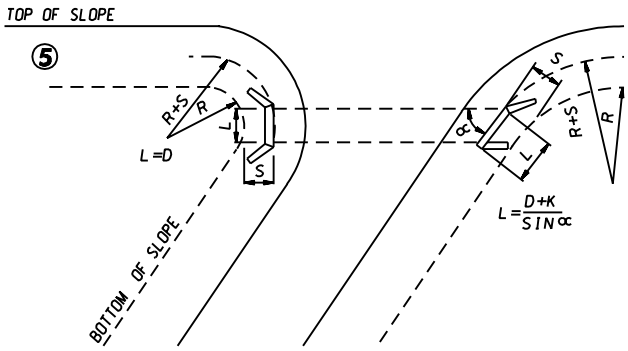
CASE ③. WHEN THE DRAINAGE CONDITIONS ARE SIMILIAR TO CASE 2 BUT IT IS DESIRED TO PLACE THE PIPE ASKEW, THE "F" ENDWALL CAN BE USED. THE WINGS WILL BE PLACED THE SAME AS IN CASE 2. BUT THE LENGTH OF THE HEADWALL WILL BE INCREASED DUE TO THE INCREASED AREA OF THE PIPE.



CASE ④. WHEN A PIPE IS PLACED ASKEW TO FOLLOW THE NATURAL WATER COURSE AND THE SIDE DITCH DRAINAGE IS IN ONE DIRECTION, THE "F" ENDWALL WILL BE USED WITH THE EXCEPTION THAT THE HEADWALL WILL BE LENGTHENED DUE TO THE INCREASED AREA OF THE PIPE.



CASE ⑤. WHEN AND ASKEWED ROAD OR ENTRANCE INTERSECTS THE MAIN LINE AND THE DRAINAGE IS PARALLEL TO THE MAIN LINE AND INTERSECTING ROAD OR ENTRANCE, THE "F" ENDWALL CAN BE USED AS FOLLOWS:
A. DETERMINE DIRECTION OF PIPE. B. COMPUTE "S", THEN A LINE WHICH IS PERPENDICULAR TO THE ℄ OF THE PIPE AND TANGENT TO THE ARC WHOSE RADIUS IS R + S DETERMINES THE LOCATION OF THE HEADWALL. THE LENGTH OF THE WINGWALLS IS STANDARD BUT THE ANGLE IS SUCH, THAT THE END OF THE WINGWALL IS 6" FROM THE TOE OF THE SLOPE, AS SHOWN. "S" IS COMPUTED IN LIKE MANNER, AND THE LOCATION OF THE HEADWALL IS THE INTERSECTION OF THE ARC R + S, AND THE ℄ OF THE PIPE. THE WINGS ARE LOCATED AS DESCRIBED ABOVE, OR AS SHOWN.



SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	1-26-72	APPROVAL	3-23-56
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

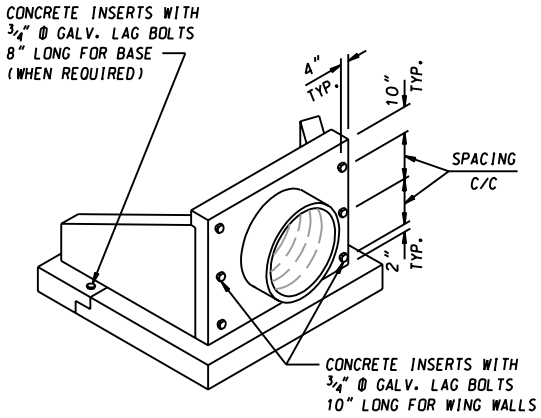
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

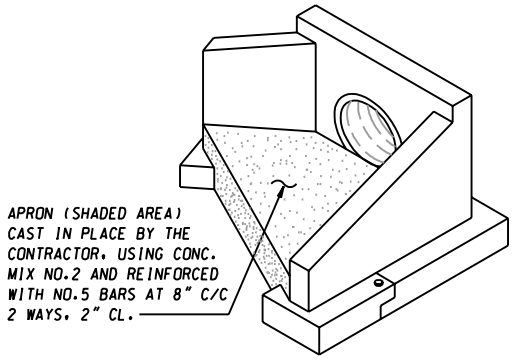
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE F ENDWALL MODIFICATIONS

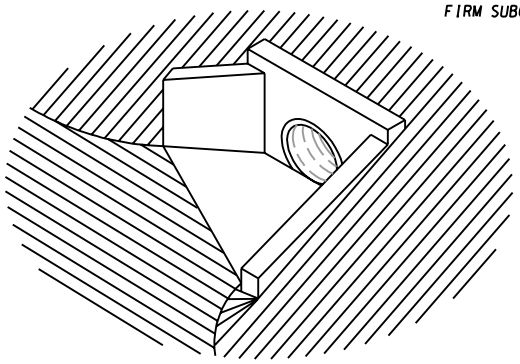
STANDARD NO. MD 358.03



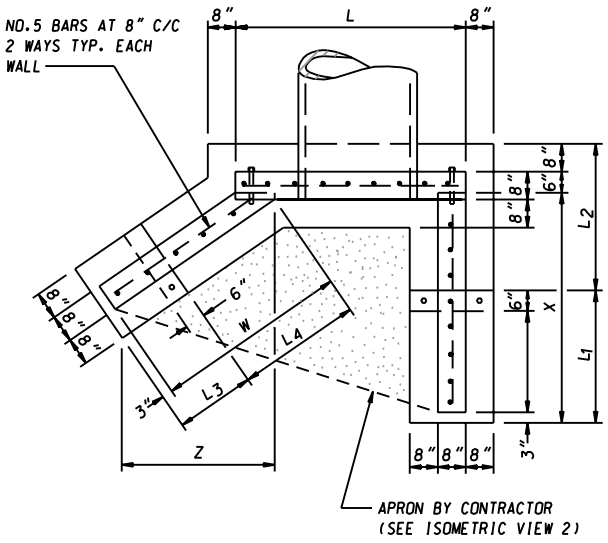
ISOMETRIC VIEW 1



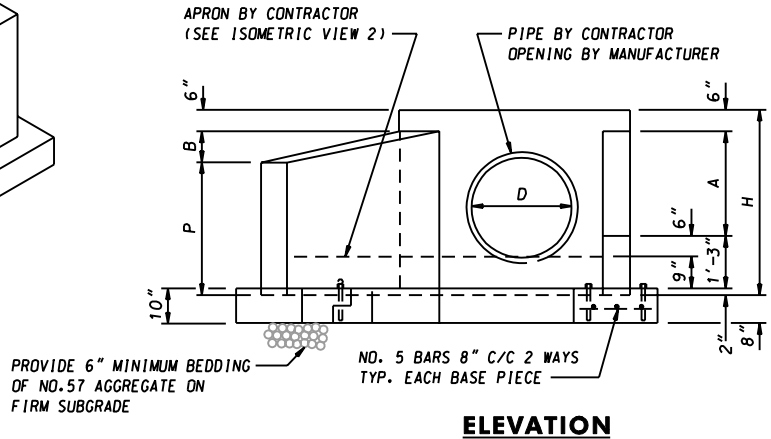
ISOMETRIC VIEW 2



ISOMETRIC VIEW 3



PLAN



ELEVATION

NOTES

1. THIS TYPE F ENDWALL SHALL NOT BE USED WITHIN THE CLEAR RECOVERY ZONE.
2. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
3. REINFORCEMENT SHALL BE DEFORMED BARS AS SHOWN OR WELDED WIRE FABRIC WITH AN EQUIVALENT AREA PER SQUARE FOOT. DEFORMED BARS SHALL CONFORM TO ASTM A 615, GRADE 60. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 82.
4. SEE CHARTS ON STANDARD MD 358.05 FOR DIMENSIONS NOT SHOWN.
5. LIFT HOLES OR LIFT EYES SHALL BE PROVIDED FOR HANDLING.
6. EXCAVATION, BACKFILL, CONCRETE, REINFORCEMENT FOR APRON, AND NO.57 AGGREGATE WILL BE INCIDENTAL TO THE CONTRACT PRICE PER EACH FOR THE ENDWALL.
7. CHAMFER ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McClellan
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-23-92	APPROVAL	6-23-92
REVISED	10-1-01	REVISED	6-20-95
REVISED		REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST TYPE F ENDWALL METAL OR CONCRETE ROUND PIPE

STANDARD NO. MD 358.04

PIPE SIZE D	DIMENSIONS - SLOPE 1½:1												LAG BOLTS FOR WING WALLS	
	L	X	L_1	L_2	W	L_3	L_4	Z	H	A	B	P	SPACING C/C	NO. REQ. EA. WALL
12"	4'-2"	1'-5"			1'-11"	-	-	1'-8"	2'-9"	10"	2"	2'-1"	1'-7"	2
15"	4'-9"	1'-10"	-	-	2'-5"	-	-	2'-1"	3'-0"	1'-1"	4"	2'-2"	1'-10"	2
18"	5'-0"	2'-3"	-	-	2'-8"	-	-	2'-4"	3'-4"	1'-5"	5"	2'-5"	2'-2"	2
21"	5'-3"	2'-8"	-	-	2'-10"	-	-	2'-7"	3'-7"	1'-8"	6"	2'-7"	2'-5"	2
24"	5'-7"	3'-1"	-	-	3'-5"	-	-	2'-11"	3'-10"	1'-11"	8"	2'-8"	1'-4"	3
27"	5'-10"	3'-5"	-	-	3'-11"	-	-	3'-5"	4'-1"	2'-2"	10"	2'-9"	1'-5½"	3
30"	6'-2"	3'-10"	1'-3"	4'-0"	4'-2"	1'-5"	3'-0"	3'-7"	4'-5"	2'-6"	11"	3'-0"	1'-7½"	3
33"	6'-5"	4'-4"	1'-9"	4'-0"	4'-7"	1'-10"	3'-0"	3'-11"	4'-8"	2'-9"	1'-0"	3'-2"	1'-9"	3
36"	6'-8"	4'-8"	2'-1"	4'-0"	4'-10"	2'-1"	3'-0"	4'-2"	4'-11"	3'-0"	1'-2"	3'-3"	1'-10½"	3
42"	7'-4"	5'-6"	2'-11"	4'-0"	5'-7"	2'-10"	3'-0"	4'-10"	5'-6"	3'-7"	1'-5"	3'-7"	2'-2"	3
48"	8'-0"	6'-4"	3'-9"	4'-0"	6'-3"	3'-6"	3'-0"	5'-5"	6'-0"	4'-1"	1'-8"	3'-10"	2'-5"	3

PIPE SIZE D	DIMENSIONS - SLOPE 2:1												LAG BOLTS FOR WING WALLS	
	L	X	L_1	L_2	W	L_3	L_4	Z	H	A	B	P	SPACING C/C	NO. REQ. EA. WALL
12"	3'-3"	2'-0"	-	-	2'-1"	-	-	1'-10"	2'-9"	10"	1"	2'-2"	1'-7"	2
15"	3'-6"	2'-7"	-	-	2'-7"	-	-	2'-3"	3'-0"	1'-1"	3"	2'-3"	1'-10"	2
18"	3'-9"	3'-1"	-	-	2'-11"	-	-	2'-6"	3'-4"	1'-5"	4"	2'-6"	2'-2"	2
21"	4'-0"	3'-7"	-	-	3'-3"	-	-	2'-10"	3'-7"	1'-8"	5"	2'-8"	2'-5"	2
24"	5'-0"	4'-2"	1'-7"	4'-0"	3'-7"	-	-	3'-1"	3'-10"	1'-11"	6"	2'-10"	1'-4"	3
27"	5'-3"	4'-8"	2'-1"	4'-0"	4'-1"	1'-4"	3'-0"	3'-6"	4'-1"	2'-2"	8"	2'-11"	1'-5½"	3
30"	5'-6"	5'-3"	2'-8"	4'-0"	4'-5"	1'-8"	3'-0"	3'-10"	4'-5"	2'-6"	9"	3'-2"	1'-7½"	3
33"	5'-9"	5'-9"	3'-2"	4'-0"	4'-10"	2'-1"	3'-0"	4'-2"	4'-8"	2'-9"	11"	3'-3"	1'-9"	3
36"	6'-0"	6'-4"	3'-9"	4'-0"	5'-2"	2'-5"	3'-0"	4'-6"	4'-11"	3'-0"	1'-0"	3'-5"	1'-10½"	3
42"	6'-6"	7'-5"	4'-10"	4'-0"	6'-0"	3'-3"	3'-0"	5'-2"	5'-6"	3'-7"	1'-3"	3'-9"	2'-2"	3
48"	7'-0"	8'-6"	5'-11"	4'-0"	6'-9"	4'-0"	3'-0"	5'-10"	6'-0"	4'-1"	1'-6"	4'-0"	2'-5"	3

PIPE SIZE D	DIMENSIONS - SLOPE 4:1												LAG BOLTS FOR WING WALLS	
	L	X	L_1	L_2	W	L_3	L_4	Z	H	A	B	P	SPACING C/C	NO. REQ. EA. WALL
12"	3'-3"	4'-4"	1'-9"	4'-0"	2'-4"	-	-	2'-0"	2'-9"	10"	1"	2'-2"	1'-7"	2
15"	3'-6"	5'-5"	2'-10"	4'-0"	2'-11"	-	-	2'-6"	3'-0"	1'-1"	2½"	2'-5½"	1'-10"	2
18"	3'-9"	6'-6"	3'-11"	4'-0"	3'-4"	-	-	2'-11"	3'-4"	1'-5"	3"	2'-7"	2'-2"	2
21"	4'-4"	7'-7"	5'-0"	4'-0"	3'-7"	-	-	3'-1"	3'-7"	1'-8"	4"	2'-9"	2'-5"	2
24"	5'-0"	8'-8"	6'-1"	4'-0"	4'-0"	1'-3"	3'-0"	3'-6"	3'-10"	1'-11"	4½"	2'-11½"	1'-4"	3
27"	5'-3"	9'-4"	6'-9"	4'-0"	4'-7"	1'-10"	3'-0"	3'-6"	4'-1"	2'-2"	6"	3'-1"	1'-5½"	3
30"	5'-6"	10'-0"	7'-5"	4'-0"	5'-0"	2'-3"	3'-0"	4'-4"	4'-5"	2'-6"	7"	3'-4"	1'-7½"	3
33"	5'-9"	11'-6"	8'-11"	4'-0"	5'-6"	2'-9"	3'-0"	4'-9"	4'-8"	2'-9"	8"	3'-6"	1'-9"	3
36"	6'-0"	13'-0"	10'-5"	4'-0"	5'-11"	3'-2"	3'-0"	5'-2"	4'-11"	3'-0"	9"	3'-8"	1'-10½"	3
42"	6'-6"	15'-2"	12'-7"	4'-0"	7'-0"	4'-3"	3'-0"	6'-1"	5'-6"	3'-7"	1'-0"	4'-0"	2'-2"	3
48"	7'-0"	17'-4"	14'-9"	4'-0"	7'-11"	5'-2"	3'-0"	6'-10"	6'-0"	4'-1"	1'-2"	4'-4"	2'-5"	3

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-23-92	APPROVAL	6-23-92
REVISED	8-12-02	REVISED	6-20-95
REVISED		REVISED	
REVISED		REVISED	

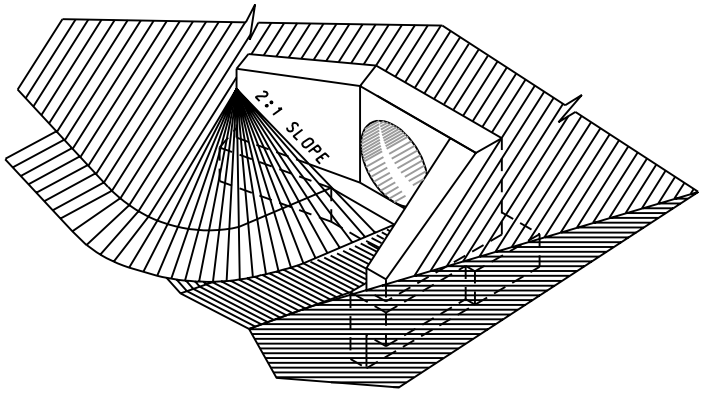
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

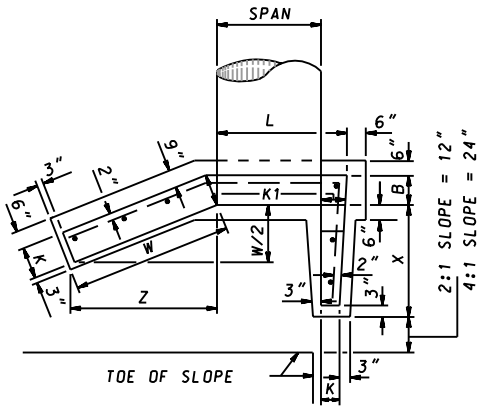
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST TYPE F ENDWALL DIMENSIONS METAL OR CONCRETE ROUND PIPE

STANDARD NO. MD 358.05



ISOMETRIC VIEW

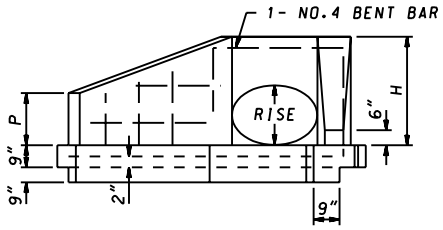


PLAN

QUANTITIES FOR ESTIMATING PURPOSES ONLY

SLOPE 2:1												
OPENING		DIMENSIONS									QUANTITIES	
SIZE INCHES S x R	AREA SQ.FT.	ENDWALL			WINGS						1-ENDWALL 2-WINGS	
		L	B	H	W	X	Z	K_1	K	P	CONC. CU. YDS.	STEEL LBS.
17"X13"	1.23	2'-2"	9"	1'-9"	2'-3"	1'-10"	2'-0"	9"	7"	1'-3"	0.60	39
21"X15"	1.77	2'-6"	9"	1'-9"	2'-3"	1'-10"	2'-0"	9"	7"	1'-3"	0.62	40
24"X18"	2.40	2'-9"	9"	2'-0"	2'-7"	2'-5"	2'-3"	9"	8"	1'-5"	0.80	45
28"X20"	3.14	3'-1"	9"	2'-4"	3'-0"	3'-0"	2'-7"	9"	8"	1'-7"	0.98	59
35"X24"	4.91	3'-11"	12"	2'-11"	4'-0"	4'-0"	3'-5"	12"	11"	2'-1"	1.77	85
42"X29"	7.07	4'-6"	12"	2'-11"	4'-0"	4'-0"	3'-5"	12"	11"	2'-1"	1.82	86
49"X33"	9.62	5'-1"	12"	3'-6"	4'-8"	5'-2"	4'-1"	12"	11"	2'-6"	2.35	117
57"X38"	12.57	5'-9"	12"	4'-0"	5'-4"	6'-2"	4'-7"	12"	11"	2'-10"	2.73	185

SLOPE 4:1												
OPENING		DIMENSIONS									QUANTITIES	
SIZE INCHES S x R	AREA SQ.FT.	ENDWALL			WINGS						1-ENDWALL 2-WINGS	
		L	B	H	W	X	Z	K_1	K	P	CONC. CU. YDS.	STEEL LBS.
17"X13"	1.23	2'-2"	9"	1'-7"	2'-6"	3'-8"	2'-2"	9"	8"	1'-3"	0.86	46
21"X15"	1.77	2'-6"	9"	1'-11"	3'-0"	5'-0"	2'-7"	9"	8"	1'-5"	1.10	69
24"X18"	2.40	2'-9"	9"	2'-1"	3'-3"	4'-0"	2'-10"	9"	8"	1'-6"	1.22	72
28"X20"	3.14	3'-1"	9"	2'-2"	3'-6"	6'-0"	3'-0"	9"	8"	1'-7"	1.34	76
35"X24"	4.91	3'-11"	12"	2'-8"	4'-6"	8'-0"	3'-11"	12"	11"	2'-2"	2.35	107
42"X29"	7.07	4'-6"	12"	3'-4"	5'-6"	10'-4"	4'-9"	12"	11"	2'-7"	3.20	150
49"X33"	9.62	5'-1"	12"	3'-3"	5'-6"	10'-4"	4'-9"	12"	11"	2'-7"	3.23	151
57"X38"	12.57	5'-9"	12"	3'-9"	6'-6"	12'-4"	5'-8"	12"	11"	3'-0"	3.98	185



ELEVATION

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.

CONCRETE SHALL BE MIX NO.2

REINFORCING: DEFORMED STEEL BARS
VERTICAL NO.6 BARS 12" C/C
HORIZONTAL NO.4 BARS 12" C/C HOOKED ON ONE END

CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

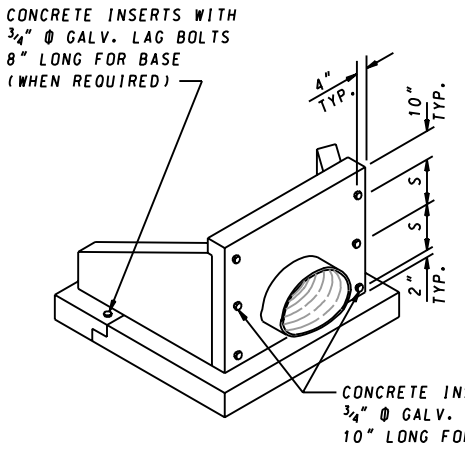
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

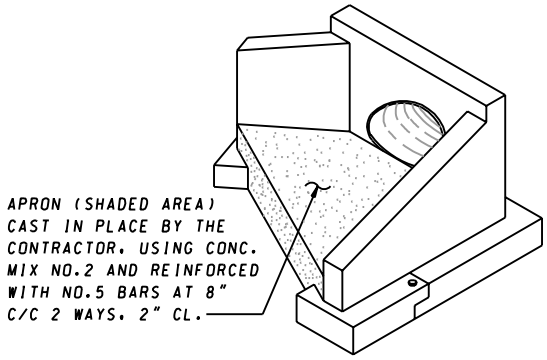
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE F ENDWALL METAL PIPE ARCH

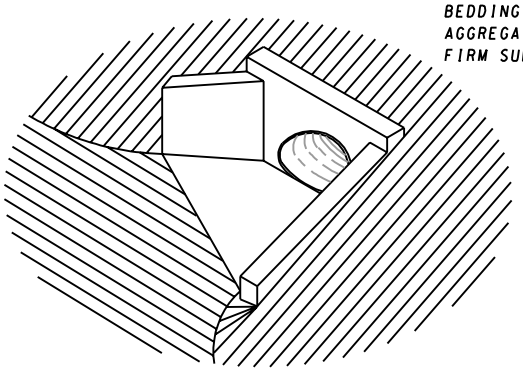
STANDARD NO. MD 359.01



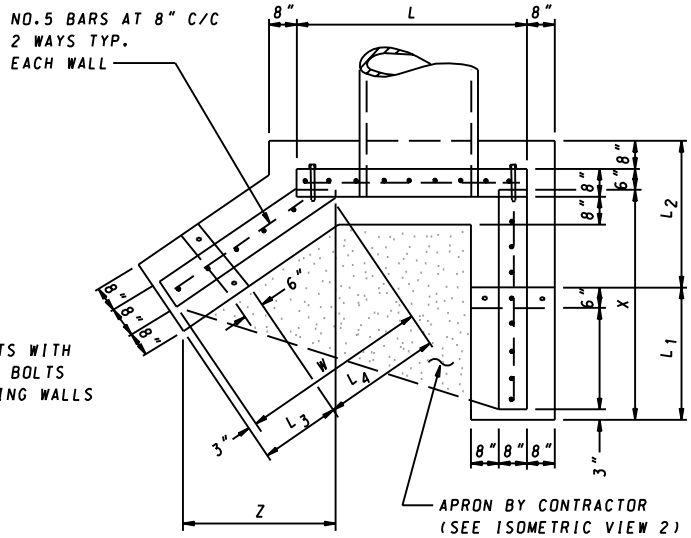
ISOMETRIC VIEW 1



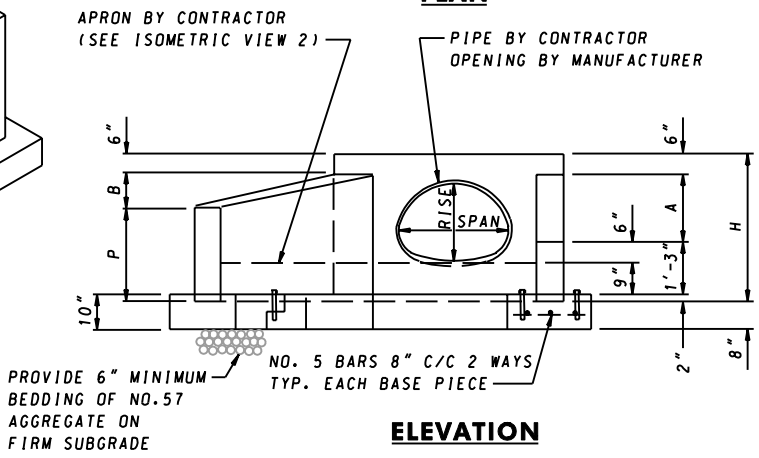
ISOMETRIC VIEW 2



ISOMETRIC VIEW 3



PLAN



ELEVATION

NOTES

1. THIS TYPE F ENDWALL SHALL NOT BE USED WITHIN THE CLEAR RECOVERY ZONE.
2. CONCRETE SHALL BE MIX NO. 6 (4500 PSI).
3. REINFORCEMENT SHALL BE DEFORMED BARS AS SHOWN OR WELDED WIRE FABRIC WITH AN EQUIVALENT AREA FOR SQUARE FOOT. DEFORMED BARS SHALL CONFORM TO ASTM A 615, GRADE 60. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 82.
4. SEE CHARTS ON STANDARD MD-359.03 FOR DIMENSIONS NOT SHOWN.
5. LIFT HOLES OR LIFT EYES SHALL BE PROVIDED FOR HANDLING.
6. EXCAVATION, BACKFILL, CONCRETE, REINFORCEMENT FOR APRON, AND NO.57 AGGREGATE WILL BE INCIDENTAL TO THE CONTRACT PRICE PER EACH FOR THE ENDWALL.
7. CHAMFER ALL EXPOSED EDGES 1" X 1" OR AS DIRECTED.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McClellan
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-23-92	APPROVAL	6-23-92
REVISED	10-1-01	REVISED	12-16-93
REVISED		REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST TYPE F ENDWALL METAL PIPE ARCH

STANDARD NO. MD 359.02

PIPE SIZE SxR	DIMENSIONS - SLOPE 2:1												LAG BOLTS FOR WING WALLS	
	L	X	L_1	L_2	W	L_3	L_4	Z	H	A	B	P	SPACING C/C	NO. REQ. EA. WALL
17" x 13"	3'-9"	2'-0"	-	-	2'-1"	-	-	1'-10"	2'-9"	10"	1"	2'-2"	1'-7"	2
21" x 15"	4'-2"	2'-0"	-	-	2'-1"	-	-	1'-10"	2'-9"	10"	1"	2'-2"	1'-7"	2
24" x 18"	4'-6"	3'-1"	-	-	2'-11"	-	-	2'-6"	3'-4"	10"	1"	2'-2"	2'-2"	2
28" x 20"	4'-9"	3'-1"	-	-	2'-11"	-	-	2'-6"	3'-4"	1'-5"	4"	2'-6"	2'-2"	2
35" x 24"	5'-7"	4'-2"	1'-7"	4'-0"	3'-7"	-	-	3'-1"	3'-10"	1'-11"	6"	2'-10"	1'-4"	3
42" x 29"	6'-2"	4'-2"	1'-7"	4'-0"	3'-7"	-	-	3'-1"	3'-10"	1'-11"	6"	2'-10"	1'-4"	3
49" x 33"	6'-8"	5'-3"	2'-8"	4'-0"	4'-5"	1'-8"	3'-0"	3'-10"	4'-5"	2'-6"	9"	3'-2"	1'-7 1/2"	3
57" x 38"	7'-4"	6'-4"	3'-9"	4'-0"	5'-2"	2'-5"	3'-0"	4'-6"	4'-11"	3'-0"	1'-0"	3'-5"	1'-10 1/2"	3

PIPE SIZE SxR	DIMENSIONS - SLOPE 2:1												LAG BOLTS FOR WING WALLS	
	L	X	L_1	L_2	W	L_3	L_4	Z	H	A	B	P	SPACING C/C	NO. REQ. EA. WALL
17" x 13"	3'-9"	4'-4"	1'-9"	4'-0"	2'-4"	-	-	2'-0"	2'-9"	10"	1"	2'-2"	1'-7"	2
21" x 15"	4'-2"	5'-5"	2'-10"	4'-0"	2'-11"	-	-	2'-6"	3'-0"	1'-1"	2 1/2"	2'-3 1/2"	1'-10"	2
24" x 18"	4'-6"	6'-6"	3'-11"	4'-0"	3'-1"	-	-	2'-11"	3'-4"	1'-5"	3"	2'-7"	2'-2"	2
28" x 20"	4'-9"	6'-6"	3'-11"	4'-0"	3'-1"	-	-	2'-11"	3'-4"	1'-5"	3"	2'-7"	2'-2"	2
35" x 24"	5'-7"	8'-8"	6'-1"	4'-0"	4'-0"	1'-3"	3'-0"	3'-6"	3'-10"	1'-11"	4 1/2"	2'-11 1/2"	1'-4"	3
42" x 29"	6'-2"	10'-10"	8'-8"	4'-0"	5'-0"	2'-3"	3'-0"	4'-4"	4'-5"	2'-6"	7"	3'-4"	1'-4"	3
49" x 33"	6'-8"	10'-10"	8'-8"	4'-0"	5'-0"	2'-3"	3'-0"	4'-4"	4'-5"	2'-6"	7"	3'-4"	1'-7 1/2"	3
57" x 38"	7'-4"	13'-0"	10'-5"	4'-0"	5'-11"	3'-2"	3'-0"	5'-2"	4'-11"	3'-0"	9"	3'-8"	1'-10 1/2"	3

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR - OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-23-92	APPROVAL	6-23-92
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

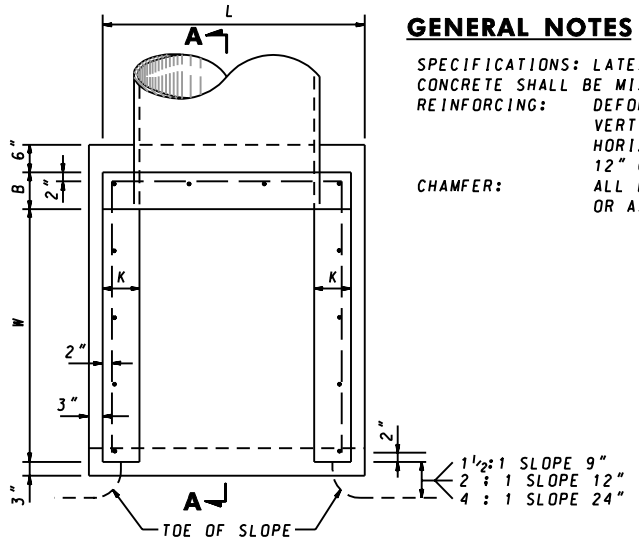
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST TYPE F ENDWALL DIMENSIONS METAL PIPE ARCH

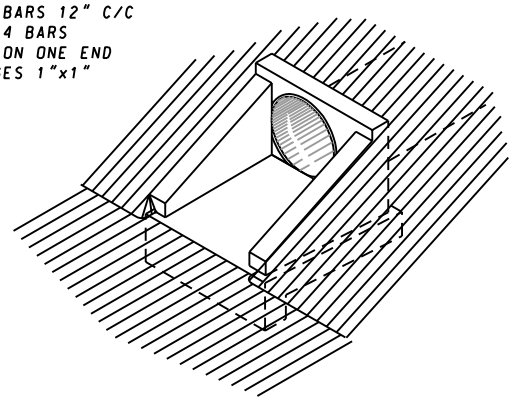
STANDARD NO. MD 359.03



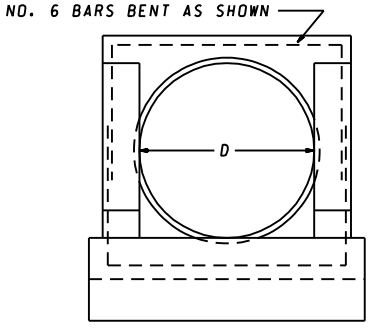
PLAN

GENERAL NOTES

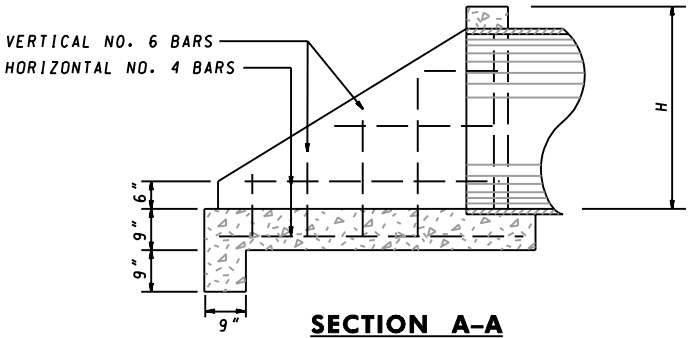
SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS
VERTICAL NO. 6 BARS 12" C/C
HORIZONTAL NO. 4 BARS
12" C/C HOOKED ON ONE END
CHAMFER: ALL EXPOSED EDGES 1"x1"
OR AS DIRECTED.



ISOMETRIC VIEW



ELEVATION



SECTION A–A

SLOPE 1½:1								
OPENING		DIMENSIONS					QUANTITIES	
PIPE DIA. D	AREA SQ.FT.	ENDWALL			WING		1- ENDWALL 2- WINGS	
		L	B	H	W	K	CONC. C.Y.	STEEL LBS.
12"	0.79	2'-0"	9"	1'-8"	1'-0"	6"	.31	29
15"	1.23	2'-3"	9"	2'-0"	1'-5"	6"	.41	31
18"	1.77	2'-6"	9"	2'-3"	1'-10"	6"	.50	41
21"	2.40	2'-9"	9"	2'-6"	2'-3"	6"	.65	49
24"	3.14	3'-6"	12"	2'-11"	2'-9"	9"	1.05	53
27"	3.98	3'-9"	12"	3'-3"	3'-2"	9"	1.18	70
30"	4.91	4'-0"	12"	3'-6"	3'-7"	9"	1.43	73
33"	5.94	4'-3"	12"	3'-9"	4'-0"	9"	1.65	93
36"	7.07	4'-6"	12"	4'-0"	4'-4"	9"	1.86	104
42"	9.62	5'-6"	12"	4'-7"	5'-2"	12"	2.70	126
48"	12.57	6'-0"	12"	5'-1"	6'-0"	12"	3.15	155
54"	15.90	6'-6"	12"	5'-7"	6'-9"	12"	3.74	187
60"	19.64	7'-0"	12"	6'-1"	7'-7"	12"	4.52	218

SLOPE 2:1								
OPENING		DIMENSIONS					QUANTITIES	
PIPE DIA. D	AREA SQ.FT.	ENDWALL			WING		1- ENDWALL 2- WINGS	
		L	B	H	W	K	CONC. C.Y.	STEEL LBS.
12"	0.79	2'-0"	9"	1'-7"	1'-4"	6"	.33	34
15"	1.23	2'-3"	9"	1'-11"	1'-11"	6"	.44	37
18"	1.77	2'-6"	9"	2'-2"	2'-5"	6"	.57	53
21"	2.40	2'-9"	9"	2'-5"	3'-0"	6"	.70	62
24"	3.14	3'-6"	12"	2'-9"	3'-8"	9"	1.16	71
27"	3.98	3'-9"	12"	3'-1"	4'-2"	9"	1.36	81
30"	4.91	4'-0"	12"	3'-4"	4'-9"	9"	1.54	91
33"	5.94	4'-3"	12"	3'-6"	5'-3"	9"	1.82	104
36"	7.07	4'-6"	12"	3'-10"	5'-10"	9"	2.03	116
42"	9.62	5'-6"	12"	4'-5"	6'-11"	12"	3.14	141
48"	12.57	6'-0"	12"	4'-11"	8'-0"	12"	3.90	174
54"	15.90	6'-6"	12"	5'-5"	9'-2"	12"	4.76	240
60"	19.64	7'-0"	12"	5'-11"	10'-2"	12"	5.64	306

QUANTITIES FOR ESTIMATING PURPOSES ONLY

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

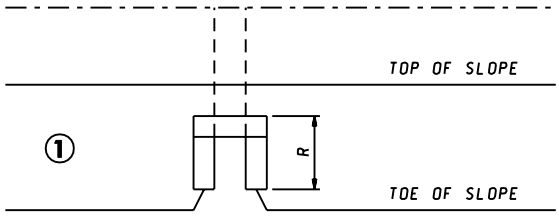
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE G ENDWALL METAL OR CONCRETE ROUND PIPE

STANDARD NO. MD 360.01

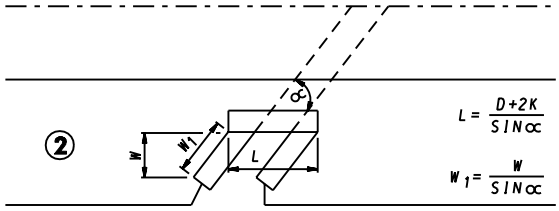
CASE ①

THIS CONDITION IS COVERED BY THE TYPE "G" ENDWALL.



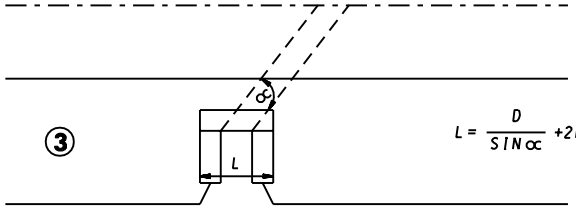
CASE ②

WHEN A PIPE IS TO BE PLACED ASKEW TO FOLLOW THE NATURAL WATER COURSE THE STANDARD "G" ENDWALL SHOULD BE MODIFIED BY LENGTHENING THE HEADWALL TO ALLOW FOR THE INCREASED AREA OF THE PIPE DUE TO THE ASKEW AND THE WINGS LENTHENED TO CARE FOR THE SLOPE.



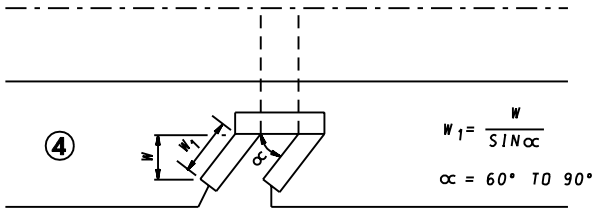
CASE ③

WHEN IT IS NOT PRACTICAL TO PLACE THE ENDWALL ON THE OUTLET END IN LINE WITH THE ENDWALL ON THE INLET END IT IS NECESSARY TO ASKEW THE PIPE. THIS REQUIRES THE LENGTHENING OF THE HEADWALL ONLY TO ALLOW FOR THE INCREASED AREA OF THE PIPE DUE TO THE ASKEW. THE LENGTH OF THE WINGS ARE STANDARD.



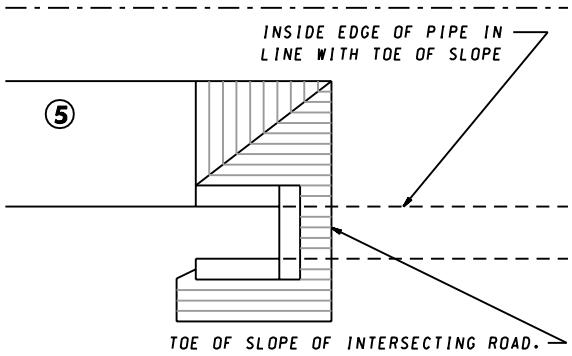
CASE ④

WHEN A WATER COURSE IS ASKEW AND IT IS MORE ECONOMICAL OR BETTER PRACTICE TO PLACE THE PIPE AT RIGHT ANGLES TO THE CENTERLINE AND RECUT THE OUTLET THE "G" ENDWALL CAN BE USED BY PLACING THE WINGS PARALLEL TO THE COURSE AND LENGTHENING THE WINGWALLS ONLY. THE HEADWALL REMAINS STANDARD.



CASE ⑤

THIS CONDITION APPLIES WHEN A ROAD OR ENTRANCE INTERSECTS AT RIGHT ANGLES AND THE WATER COURSE IS PERPENDICULAR TO THE INTERSECTING ROAD OR ENTRANCE THE STANDARD "G" ENDWALL CAN BE USED.



SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	1-26-72	APPROVAL	3-23-56
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

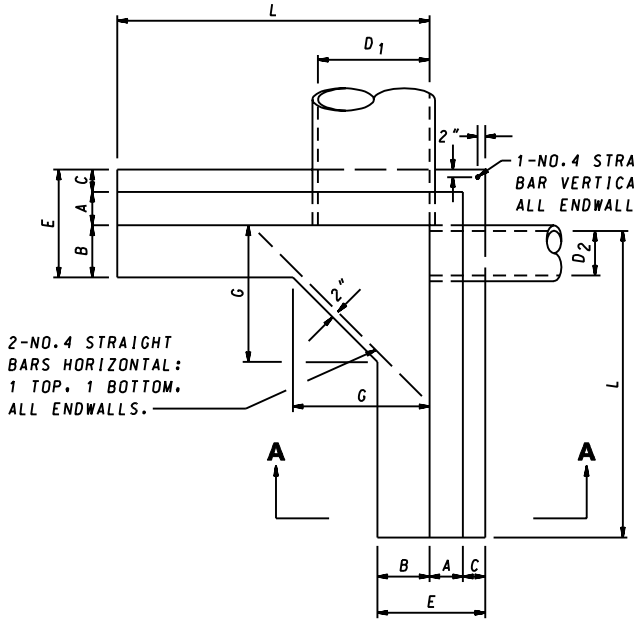
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

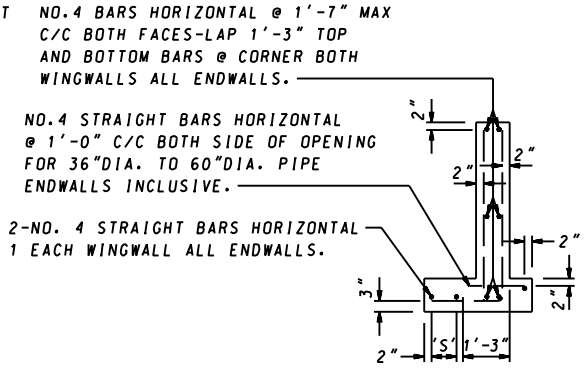
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE G ENDWALL MODIFICATIONS

STANDARD NO. MD 360.02



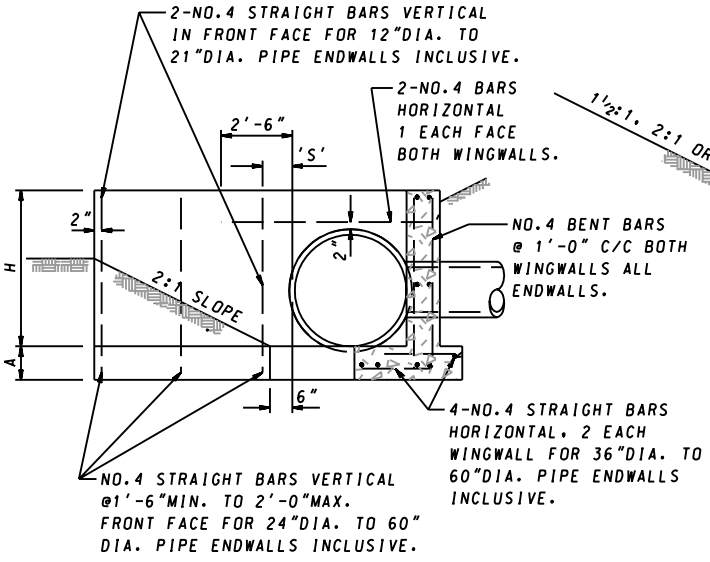
PLAN



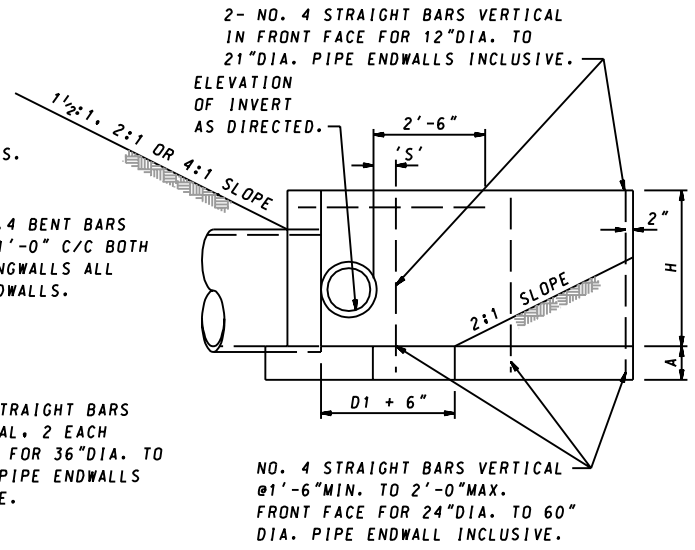
DISPOSITION OF BARS DETAIL

NOTE

FOR DIMENSIONS AND QUANTITIES SEE TABLES ON STANDARD MD 362.01-01



SECTION A-A



END VIEW

GENERAL NOTES

SPECIFICATIONS: LATEST S.H.A.
CONCRETE SHALL BE MIX NO.2
REINFORCING: DEFORMED STEEL BARS NO.4
CHAMFER: ALL EXPOSED EDGES 1"x1" OR AS DIRECTED
SOD: PLACE SOD, 3' WIDE, AROUND ENDWALL AS INDICATED ON THE PLANS.

'S' DISTANCE

4" FOR 12"DIA. TO 18"DIA. PIPES INCLUSIVE.
6" FOR 21"DIA. TO 36"DIA. PIPES INCLUSIVE.
8" FOR 42"DIA. TO 60"DIA. PIPES INCLUSIVE.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE H ENDWALL METAL OR CONCRETE ROUND PIPE

STANDARD NO. MD 362.01

QUANTITIES FOR ESTIMATING PURPOSES ONLY

D_1	D_2	A	B	C	E	H	L	G	QUANTITIES	
									CONC. C.Y.	STEEL LBS.
12"	12"	9"	6"	6"	1'-9"	1'-9"	3'-6"	1'-6"	0.72	62
15"	12"	9"	6"	6"	1'-9"	2'-0"	4'-3"	2'-0"	0.95	76
15"	15"	9"	6"	6"	1'-9"	2'-0"	4'-3"	2'-0"	0.94	76
18"	12"	9"	6"	6"	1'-9"	2'-3"	5'-0"	2'-3"	1.17	88
18"	15"	9"	6"	6"	1'-9"	2'-3"	5'-0"	2'-3"	1.15	85
18"	18"	9"	6"	6"	1'-9"	2'-3"	5'-0"	2'-3"	1.11	85
21"	12"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.88	124
21"	15"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.87	121
21"	18"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.86	121
21"	21"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.80	118
24"	12"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.86	118
24"	15"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.85	118
24"	18"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.84	113
24"	21"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0"	1.82	113
24"	24"	9"	14"	6"	2'-5"	2'-9"	6'-6"	3'-0'	1.80	113
27"	12"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.66	170
27"	15"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.65	170
27"	18"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.64	170
27"	21"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.62	170
27"	24"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.60	170
27"	27"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.57	170
30"	12"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.64	172
30"	15"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.63	171
30"	18"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.62	171
30"	21"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.60	170
30"	24"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.58	166
30"	27"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.55	169
30"	30"	9"	14"	6"	2'-5"	3'-6"	8'-0"	3'-9"	2.53	164
33"	12"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.20	271
33"	15"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.18	271
33"	18"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.16	271
33"	21"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.14	271
33"	24"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.11	271
33"	27"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.08	271
33"	30"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.04	270
33"	33"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.00	270
36"	12"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.15	271
36"	15"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.14	265
36"	18"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.12	267
36"	21"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.09	267
36"	24"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.07	266
36"	27"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.04	261
36"	30"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	5.00	261
36"	33"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	4.96	250
36"	36"	12"	16"	10"	3'-2"	4'-0"	9'-6"	4'-6"	4.92	249

D_1	D_2	A	B	C	E	H	L	G	QUANTITIES	
									CONC. C.Y.	STEEL LBS.
42"	12"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.37	328
42"	15"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.35	328
42"	18"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.33	327
42"	21"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.31	321
42"	24"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.28	317
42"	27"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.25	320
42"	30"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.21	315
42"	33"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.18	313
42"	36"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.13	308
42"	42"	12"	16"	10"	3'-2"	4'-6"	11'-0"	5'-3"	6.04	307
48"	12"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.71	387
48"	15"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.69	381
48"	18"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.67	382
48"	21"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.65	381
48"	24"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.62	376
48"	27"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.59	375
48"	30"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.55	374
48"	33"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.52	370
48"	36"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.47	362
48"	42"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.38	362
48"	48"	12"	16"	10"	3'-2"	5'-0"	12'-6"	6'-0"	7.27	352
54"	12"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.47	392
54"	15"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.45	392
54"	18"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.43	391
54"	21"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.41	392
54"	24"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.38	392
54"	27"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.35	405
54"	30"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.32	405
54"	33"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.28	405
54"	36"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.24	405
54"	42"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.14	404
54"	48"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	8.03	414
54"	54"	12"	16"	10"	3'-2"	5'-6"	13'-0"	6'-6"	7.91	412
60"	12"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.62	490
60"	15"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.61	489
60"	18"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.59	481
60"	21"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.56	474
60"	24"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.54	473
60"	27"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.50	472
60"	30"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.47	465
60"	33"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.43	463
60"	36"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.39	456
60"	42"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.30	449
60"	48"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.19	446
60"	54"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	9.06	438
60"	60"	12"	16"	10"	3'-2"	6'-0"	14'-0"	7'-0"	8.92	430

NOTE FOR STANDARD H ENDWALL DETAILS SEE STANDARD MD 362.01

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 8-28-86	APPROVAL 12-12-86
REVISED 10-1-01	REVISED
REVISED	REVISED
REVISED	REVISED

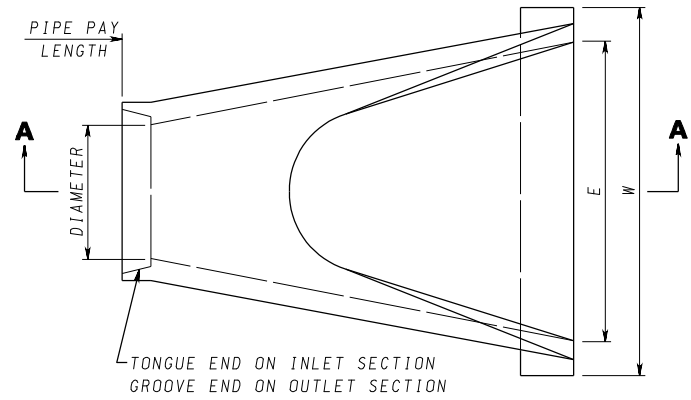
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE H ENDWALL DIMENSIONS & QUANTITIES

STANDARD NO. MD 362.01-01

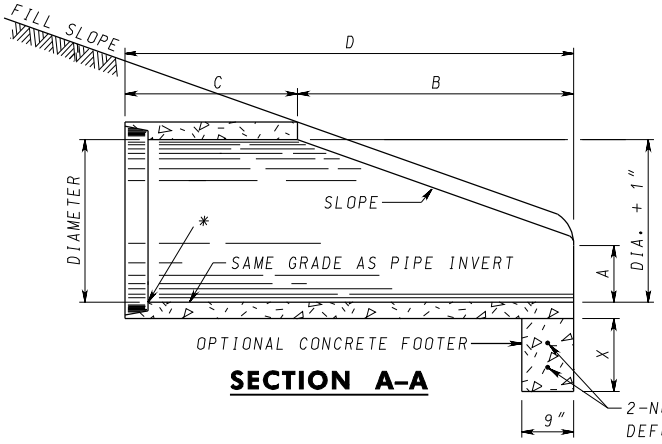


PLAN

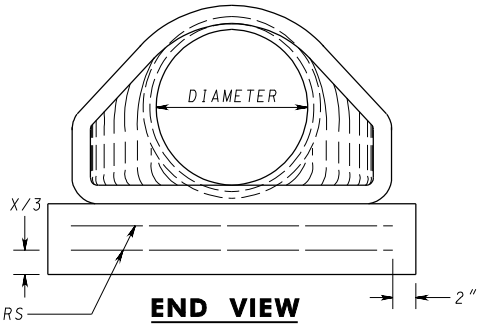
NOTES

1. CONTRACTOR HAS OPTION OF FURNISHING END SECTIONS CONFORMING TO DETAILS ON THIS SHEET OR END SECTIONS CONFORMING TO DETAILS ON STANDARD MD 368.02.
2. END SECTIONS MUST BE REINFORCED TO CONFORM TO ASTM - CLASS IV REINFORCED CONCRETE PIPE,
3. CONCRETE FOOTER SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF CONCRETE FOOTER TO BE INCLUDED IN PRICE OF END SECTION. CONCRETE TO BE MIX. NO.2. REINFORCEMENT TO BE NO.3 BARS.

* INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE CONSTRUCTION PLANS.



SECTION A–A

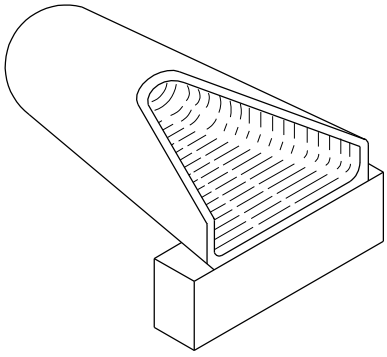


END VIEW

QUANTITIES FOR ESTIMATING PURPOSES ONLY

DIMENSIONS							QUANTITIES			
CONCRETE END SECTION							CONCRETE FOOTER			
DIA.	SLOPE	A	B	C	D	E	W	X	CONC. C.Y.	STEEL LBS.
12"	3:1	4"	2'-0"	4'-0 7/8"	6'-0 7/8"	2'-0"	3'-0"	12"	0.08	2.01
15"	3:1	6 1/2"	2'-4"	3'-10"	6'-2"	2'-6"	3'-6"	12"	0.10	2.38
18"	3:1	10 1/4"	2'-2"	4'-0"	6'-2"	3'-0"	4'-0"	12"	0.11	2.76
21"	3:1	9"	3'-0"	3'-1 1/2"	6'-1 1/2"	3'-6"	4'-6"	12"	0.13	3.13
24"	3:1	11"	3'-7"	2'-8"	6'-3"	4'-0"	5'-0"	15"	0.17	3.51
27"	3:1	10 1/2"	4'-1 1/2"	2'-0"	6'-1 1/2"	4'-6"	5'-6"	15"	0.19	3.89
30"	3:1	1'-1"	4'-5"	1'-10"	6'-3"	5'-0"	6'-0"	15"	0.21	4.26
33"	3:1	1'-2"	4'-7"	2'-2"	6'-9"	5'-6"	6'-6"	15"	0.23	4.64
36"	3:1	1'-3 1/2"	5'-3"	3'-1"	8'-4"	6'-0"	7'-3"	15"	0.25	5.20

SEE NOTE 3 ABOVE FOR CONCRETE FOOTER



ISOMETRIC VIEW

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

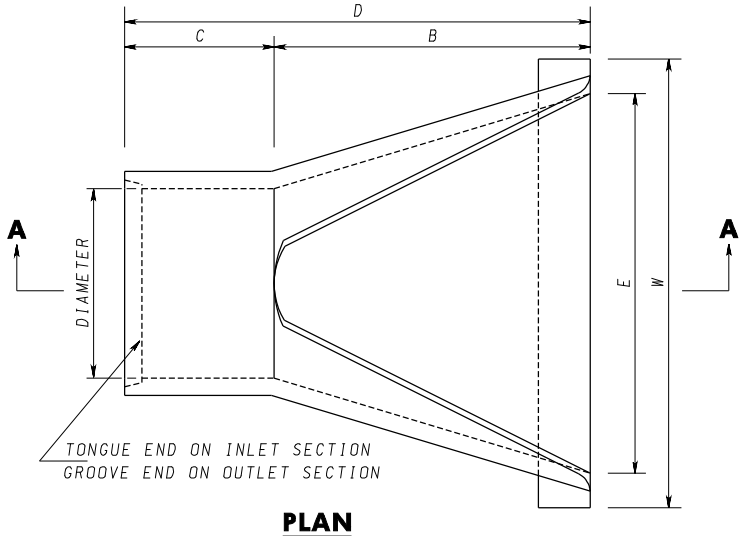
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	3-15-06	REVISED	4-05-06
REVISED	7-1-09	REVISED	7-27-09
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD CONCRETE END SECTION ROUND CONCRETE PIPE

STANDARD NO. MD 368.01

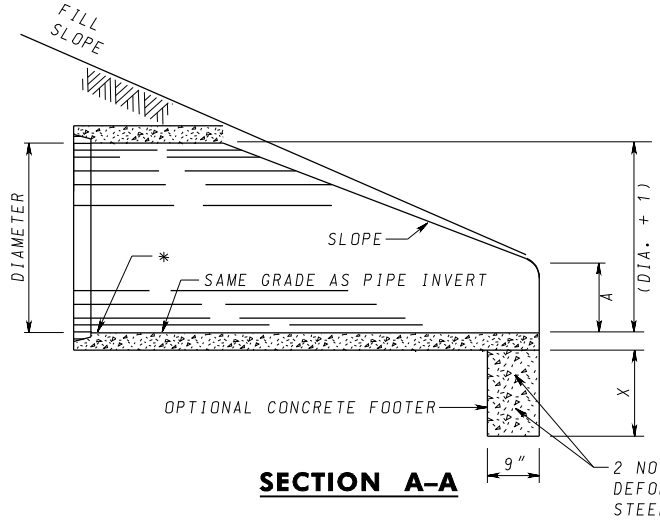


PLAN

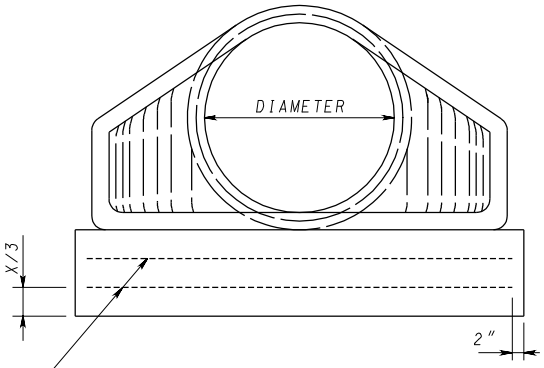
NOTES

1. CONTRACTOR HAS OPTION OF FURNISHING END SECTIONS CONFORMING TO DETAILS ON THIS SHEET OR END SECTIONS CONFORMING TO DETAILS ON STANDARD NO. MD 368.01.
2. END SECTIONS MUST BE REINFORCED TO CONFORM TO ASTM - CLASS IV REINFORCED CONCRETE PIPE.
3. CONCRETE FOOTER SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF CONCRETE FOOTER TO BE INCLUDED IN PRICE OF END SECTION. CONCRETE TO BE MIX. NO.2 REINFORCEMENT TO BE NO.3 BARS.

* INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION, ELEVATION TO BE NOTED ON THE CONSTRUCTION PLANS.



SECTION A-A

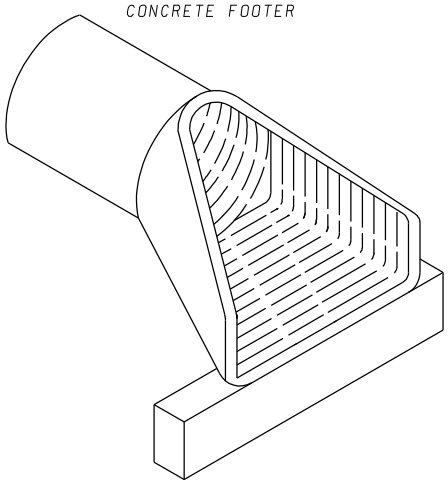


END VIEW

QUANTITIES FOR ESTIMATING PURPOSES ONLY

DIMENSIONS									QUANTITIES	
CONCRETE END SECTION							CONCRETE FOOTER			
DIA.	SLOPE	A	B	C	D	E	W	X	CONC. C.Y.	STEEL LBS.
12"	3:1	4"	2'-0"	4'-0 7/8"	6'-0 7/8"	2'-0"	3'-0"	12"	0.08	2.01
15"	3:1	6"	2'-3"	3'-10"	6'-1"	2'-6"	3'-6'	12"	0.10	2.38
18"	3:1	9"	2'-3"	3'-10"	6'-1"	3'-0'	4'-0"	12"	0.11	2.76
21"	3:1	9"	3'-0"	3'-1 1/2"	6'-1 1/2"	3'-6'	4'-6"	12"	0.13	3.13
24"	3:1	9 1/2"	3'-7 1/2"	2'-6"	6'-1 1/2"	4'-0"	5'-0"	15"	0.17	3.51
27"	3:1	10 1/2"	4'-1 1/2"	2'-0"	6'-1 1/2"	4'-6"	5'-6'	15"	0.19	3.89
30"	3:1	1'-0"	4'-6"	1'-7 3/4"	6'-1 3/4"	5'-0"	6'-0"	15"	0.21	4.26
33"	3:1	1'-2"	4'-7"	2'-2"	6'-9"	5'-6'	6'-6'	15"	0.23	4.64
36"	3:1	1'-3"	5'-3"	2'-10 3/4"	8'-1 3/4"	6'-0"	7'-3"	15"	0.25	5.20

SEE NOTE 3 ABOVE FOR CONCRETE FOOTER



ISOMETRIC VIEW

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

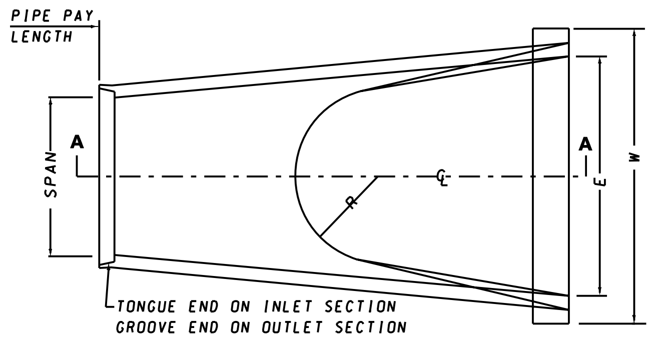
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	3-15-06	REVISED	4-5-06
REVISED	7-1-09	REVISED	7-27-09
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD CONCRETE END SECTION ROUND CONCRETE PIPE

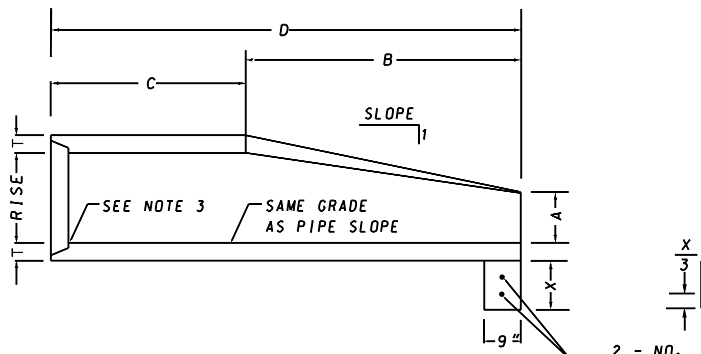
STANDARD NO. MD 368.02



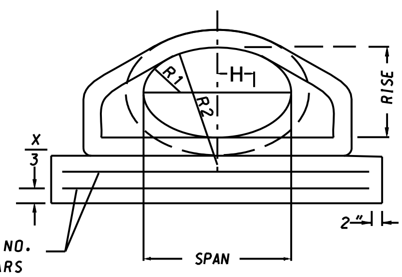
PLANS

NOTES:

1. END SECTIONS SHALL BE REINFORCED TO CONFORM TO ASTM - CLASS IV REINFORCED CONCRETE PIPE.
2. CONCRETE FOOTER SHALL BE USED WHEN SPECIFIED ON THE PLANS. COST OF THE FOOTER TO BE INCLUDED IN PRICE OF THE END SECTION. THE CONCRETE SHALL BE MIX #2 AND THE REINFORCEMENT IS TO BE #3 BARS.
3. INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE CONSTRUCTION PLANS.



SECTION A–A



END VIEW

QUANTITIES FOR ESTIMATING PURPOSES ONLY

HERCP			CONCRETE END SECTION											CONCRETE FOOTER			
RISE	SPAN	EQUIV. DIA.	APPR. SLOPE	WALL T	A	B	C	D	E	H	R	R1	R2	W	X	CONC. (CY)	REINF. (LBS.)
14"	23"	18"	3.1:1	2 3/4"	8"	2'-3"	3'-9"	6'-0"	3'-5"	5 3/8"	6"	6"	1'-8"	4'-5"	12"	0.12	3.07
19"	30"	24"	2.8:1	3 1/4"	8 1/2"	3'-3"	2'-9"	6'-0"	4'-6"	6 7/8"	7"	8 1/4"	2'-2 1/4"	5'-6"	15"	0.19	3.86
22"	34"	27"	2.9:1	3 1/2"	9"	4'-0"	2'-0"	6'-0"	5'-1"	7 3/4"	8"	9 1/4"	2'-5 1/4"	6'-1"	15"	0.21	4.32
24"	38"	30"	2.9:1	3 3/4"	9 1/2"	4'-6"	1'-6"	6'-0"	5'-8"	8 5/8"	9"	10 1/4"	2'-8 3/4"	6'-8"	15"	0.23	4.76
29"	45"	36"	2.7:1	4 1/2"	11 1/4"	5'-0"	3'-0"	8'-0"	6'-9"	10 1/2"	12"	12 1/4"	3'-3 1/4"	8'-0"	15"	0.28	5.76

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClelland — DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

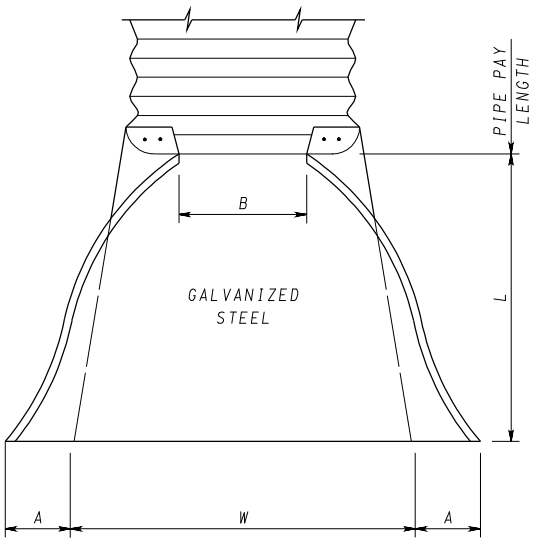
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	7-14-08	APPROVAL	01-09-08
REVISED	7-1-09	REVISED	7-27-09
REVISED		REVISED	
REVISED		REVISED	

SHA State Highway Administration — Driven to Excel

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

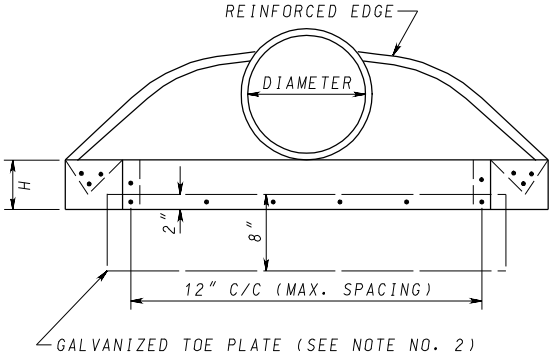
STANDARD CONCRETE END SECTION
HORIZONTAL ELLIPTICAL PIPE

STANDARD NO. ***MD 369.00***

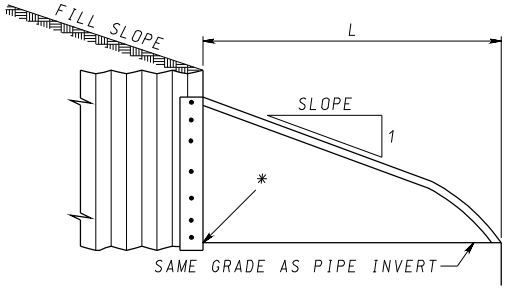


PLAN

DIMENSIONS								
PIPE DIA.	GA.	A 1″±	B MAX.	H 1″±	L 1½″±	W 2″±	APPROX. SLOPE	UNIT
12″	16	6″	6″	6″	21″	24″	2½	1 PC.
15″	16	7″	8″	6″	26″	30″	2½	1 PC.
18″	16	8″	10″	6″	31″	36″	2½	1 PC.
21″	16	9″	12″	6″	36″	42″	2½	1 PC.
24″	16	10″	13″	6″	41″	48″	2½	1 PC.
30″	14	12″	16″	8″	51″	60″	2½	1 PC.
36″	14	14″	19″	9″	60″	72″	2½	2 PC.



END VIEW



SIDE VIEW

* INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE CONSTRUCTION PLANS.

NOTES

1. METAL END SECTIONS SHALL BE GAGE 16 FOR PIPES RANGING FROM 15″ THRU 24″, AND GAGE 14 FOR PIPES RANGING FROM 30″ THRU 36″ . MULTIPLE PANEL UNITS TO HAVE LAP SEAMS WHICH ARE TO BE TIGHTLY JOINED BY $\frac{3}{8}$″ DIAMETER GALVANIZED RIVETS OR BOLTS.
2. TOE PLATES SHALL BE USED WHEN SPECIFIED ON THE PLANS. THICKNESS OF END PLATE TO BE SAME AS END SECTION. COST OF TOE PLATE TO BE INCIDENTAL TO THE BID PRICE PER EACH OF METAL END SECTION.

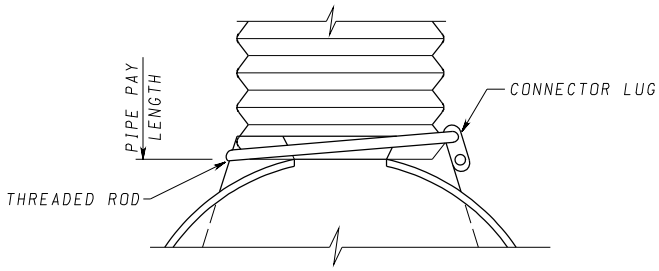
SPECIFICATION 303	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	7-27-09
REVISED	7-1-09	REVISED	
REVISED		REVISED	

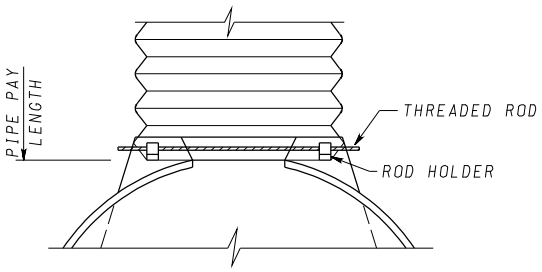
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD METAL END SECTION ROUND METAL PIPE

STANDARD NO. MD 370.01



TYPE 1
(FOR 12" THRU 24" ONLY)

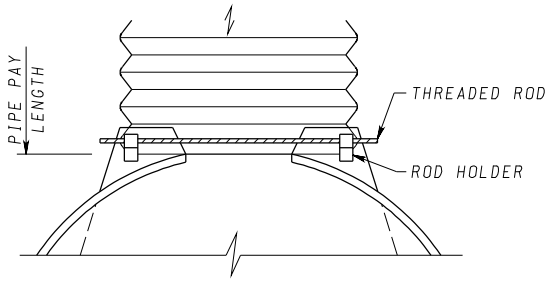


TYPE 2
(FOR 30" THRU 36" ONLY)

CONNECTIONS FOR ROUND PIPE

NOTE:

PIPES AND CONNECTION BANDS SHALL CONFORM TO APPLICABLE SECTION OF THE STANDARD SPECIFICATIONS AND TO AASHTO REQUIREMENTS.



TYPE 2
(FOR 17"x13" THRU 42"x29")

CONNECTIONS FOR PIPE ARCH

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

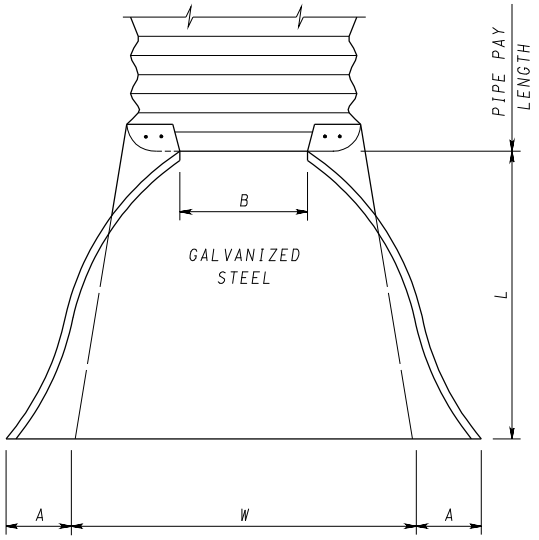
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	7-27-09
REVISED	7-1-09	REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

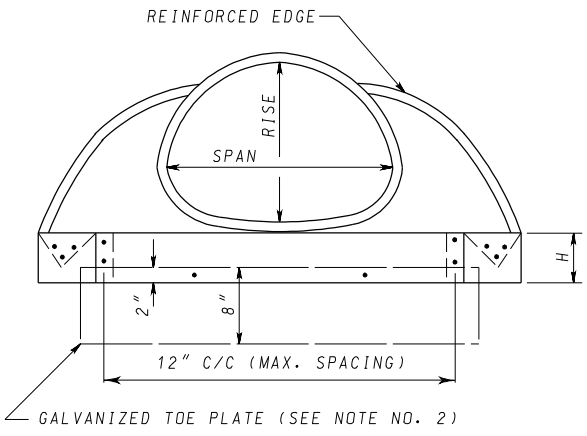
STANDARD CONNECTIONS
METAL END SECTIONS

STANDARD NO. MD 370.11

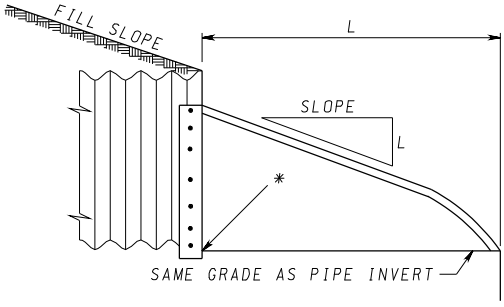


PLAN

DIMENSIONS									
PIPE ARCH DIMENSIONS		GA.	A	B	H	L	W	APPROX. SLOPE	UNIT
SPAN	RISE								
17"	13"	16	7"	9"	6"	19"	30"	2½	1 PC.
21"	15"	16	7"	10"	6"	23"	36"	2½	1 PC.
24"	18"	16	8"	12"	6"	28"	42"	2½	1 PC.
28"	20"	16	9"	14"	6"	32"	48"	2½	1 PC.
35"	24"	14	10"	16"	6"	39"	60"	2½	1 PC.
42"	29"	14	12"	18"	8"	46"	75"	2½	1 PC.



END VIEW



SIDE VIEW

* INVERT ELEVATION TO BE AT THE PIPE END OF THE STANDARD END SECTION. ELEVATIONS TO BE NOTED ON THE CONSTRUCTION PLANS.

NOTES

1. METAL END SECTIONS SHALL BE GAGE 16 FOR ARCH PIPES RANGING FROM 17"X13" THRU 28"X20", AND GAGE 14 FOR PIPES RANGING FROM 35"X24" THRU 42"X29".

2. TOE PLATE SHALL BE USED WHEN SPECIFIED ON THE PLANS. THICKNESS OF END PLATES TO BE SAME AS END SECTION. COST OF TOE PLATE TO BE INCIDENTAL TO THE BID PRICE PER EACH OF METAL END SECTION.

SPECIFICATION 303	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

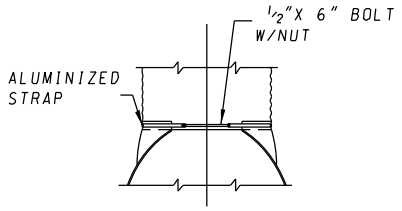
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-28-86	APPROVAL	12-12-86
REVISED	10-1-01	REVISED	7-27-09
REVISED	7-1-09	REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

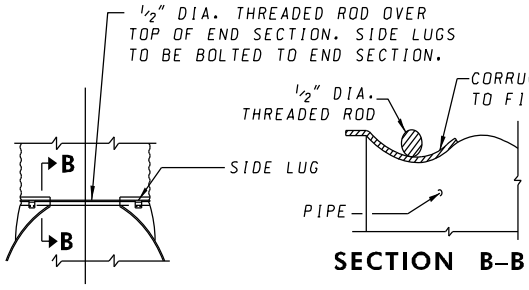
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD METAL END SECTION METAL PIPE ARCH

STANDARD NO. MD 371.01

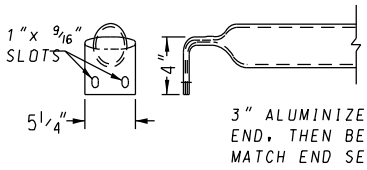


TYPE #1 CONNECTOR DETAIL

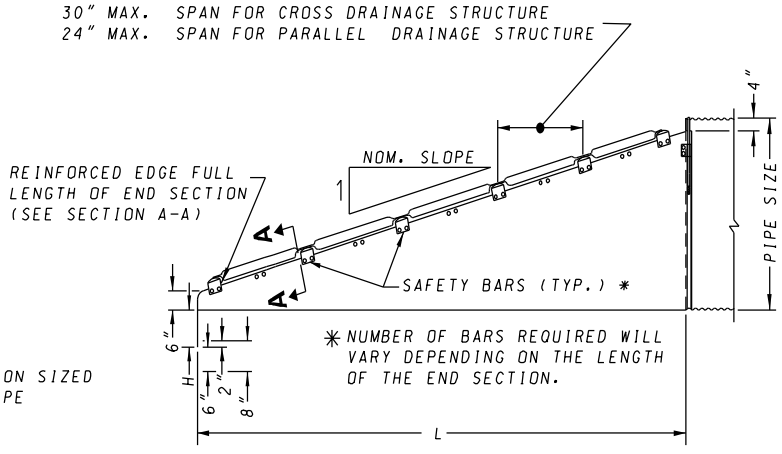


SECTION B–B

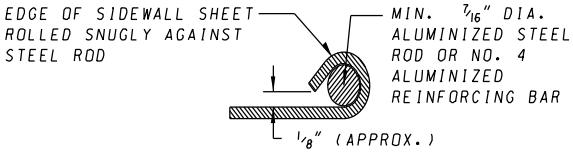
TYPE #2 CONNECTOR DETAILS



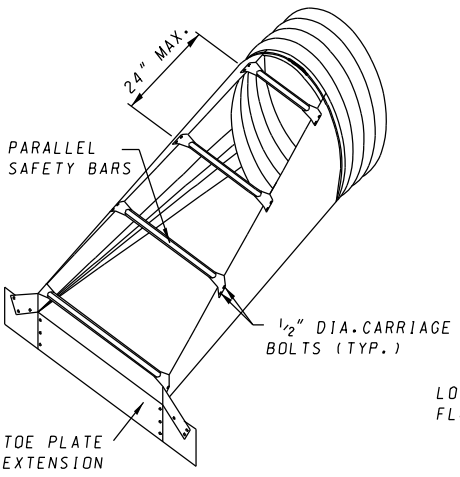
END TREATMENT OF SAFETY BARS DETAIL



SIDE VIEW

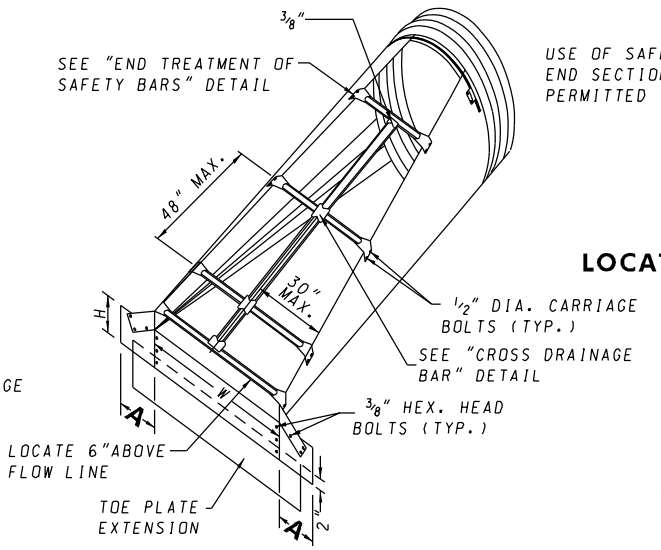


SECTION A–A



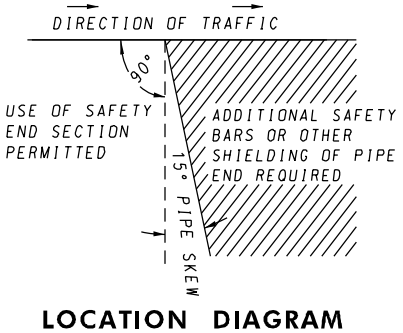
PARALLEL DRAINAGE STRUCTURE

USE WITH SINGLE PIPE INSTALLATIONS 30" DIA. OR LARGER. USE WITH MULTIPLE PIPE INSTALLATIONS 15" DIA. OR LARGER

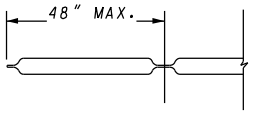


CROSS DRAINAGE STRUCTURE

USE WITH PIPE INSTALLATIONS 36" DIA. AND LARGER



LOCATION DIAGRAM



CROSS DRAINAGE BAR DETAIL

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____ DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
	APPROVAL 10-7-14	APPROVAL 9-29-14
	REVISED	REVISED
	REVISED	REVISED
	REVISED	REVISED

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SAFTEY END SECTION FOR METAL PIPE

STANDARD NO. ***MD–372.00***

STEEL END SECTIONS FOR ROUND PIPE CULVERT							
PIPE DIAMETER (In)	METAL THICK (MIN.) (In/Gage)	DIMENSIONS (Inches)					
		A	H	W	OVERALL WIDTH	L	
						Slope=4	Slope=6
18	0.064/16	8	6	24	40	32	47
24	0.064/16	8	6	30	46	55	83
30	0.109/12	12	9	36	60	79	118
36	0.109/12	12	9	42	66	102	154
42	0.109/12	16	12	48	80	126	189
48	0.109/12	16	12	54	86	150	224
54	0.109/12	16	12	60	92	173	260
60	0.109/12	16	12	66	98	197	295

STEEL END SECTIONS FOR ARCH PIPE CULVERT									
PIPE SIZE (Inches)			METAL THICK (MIN.) (In/Gage)	DIMENSIONS (Inches)					
EQUIVALENT ROUND DIAMETER	*** SPAN	*** RISE		A	H	W	OVERALL WIDTH	L	
								Slope=4	Slope=6
18	21	15	0.064/16	8	6	27	43	20	30
24	28	20	0.064/16	8	6	33	49	40	60
30	35	24	0.109/12	12	9	40	64	55	83
36	41	29	0.109/12	12	9	47	71	75	112
42	48	32	0.109/12	16	12	54	86	90	136
48	56	37	0.109/12	16	12	62	94	110	165
54 **	63	42	0.109/12	16	12	69	101	130	195
60 **	70	46	0.109/12	16	12	76	107	146	218
72 **	82	56	0.109/12	16	12	88	120	185	278

** REQUIRES 2 CROSS DRAINAGE BARS.
*** SEE GENERAL NOTE 5

GENERAL NOTES FOR ALL DETAILS:

1. FOR ROUND PIPES WITH DIAMETERS 24" OR LESS USE TYPE #1 CONNECTOR. ALL ARCH PIPES EQUIVALENT ROUND DIAMETER, AND ROUND PIPES OVER 24" DIAMETER USE TYPE #2 CONNECTOR.
2. TOE PLATE EXTENSIONS ARE TO BE THE SAME MIN. THICKNESS AS END SECTION. DIMENSIONS SHALL BE OVERALL WIDTH LESS 6" BY 8" HIGH.
3. CROSS DRAINAGE AND SAFETY BARS SHALL BE 3" DIA. SCHEDULE 40 ALUMINIZED STEEL PIPE.
4. SLOTTED HOLES FOR SAFETY BAR ATTACHMENT SHALL BE PROVIDED FOR ALL END SECTIONS.
5. CROSS-SECTIONAL DIMENSIONS OF ATTACHING PIPE MAY VARY WITH DIFFERENT MATERIALS.
6. OPEN ENDS OF PIPES NORMALLY REQUIRE A SITE SPECIFIC DESIGN, AND MAY REQUIRE SPECIAL TREAMENT (SLOPE ENDS, CULVERT EMBANKMENT PROTECTION, PAVED END SLOPES, SAFETY END SECTIONS, OR OTHER MEASURES). SEE SPECIAL DETAILS OR STANDARD DRAWINGS AS CALLED FOR ON PLANS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

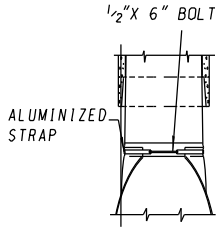
APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 10-7-14	APPROVAL 9-29-14
REVISED	REVISED
REVISED	REVISED
REVISED	REVISED

SHA State Highway Administration

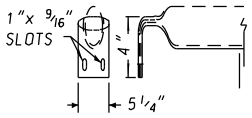
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SAFTEY END SECTION FOR METAL PIPE

STANDARD NO. ***MD-372.01***

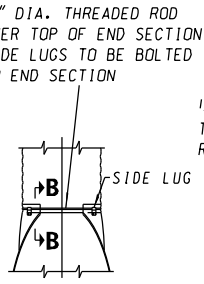


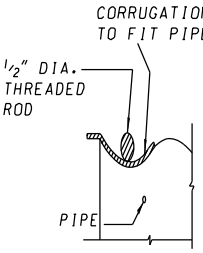
TYPE #1 CONNECTOR DETAIL



3" ALUMINIZED PIPE: FLATTEN END, THEN BEND OUTSIDE 4" TO MATCH END SECTION SIDES.

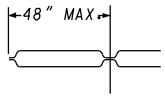
END TREATMENT OF SAFETY BARS DETAIL



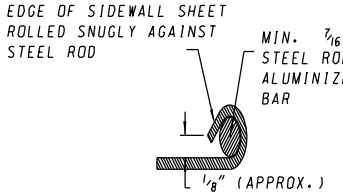


SECTION B–B

TYPE #2 CONNECTOR DETAILS

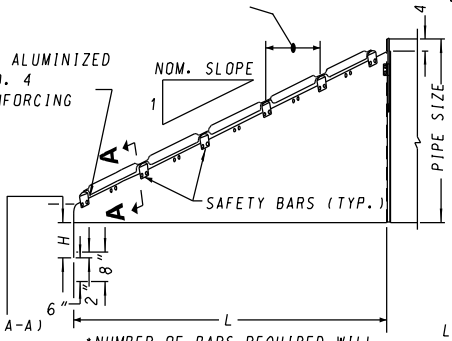


CROSS DRAINAGE BAR DETAIL



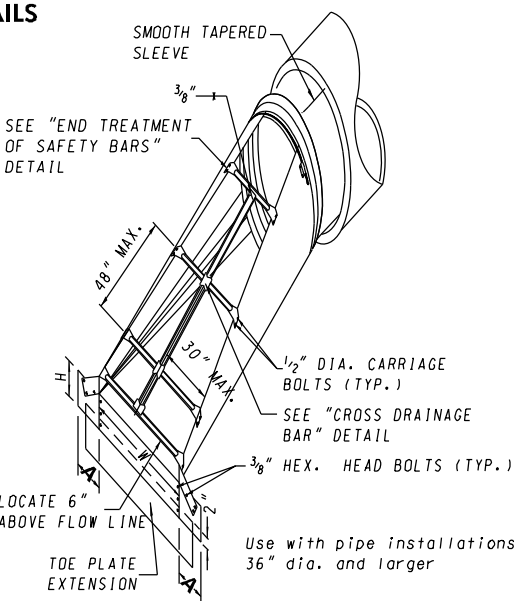
SECTION A–A

30" MAX. SPAN FOR CROSS DRAINAGE STRUCTURE
24" MAX. SPAN FOR PARALLEL DRAINAGE STRUCTURE



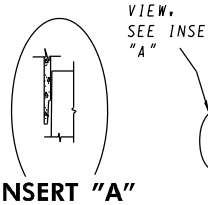
*NUMBER OF BARS REQUIRED WILL VARY DEPENDING ON THE LENGTH OF THE END SECTION.

SIDE VIEW



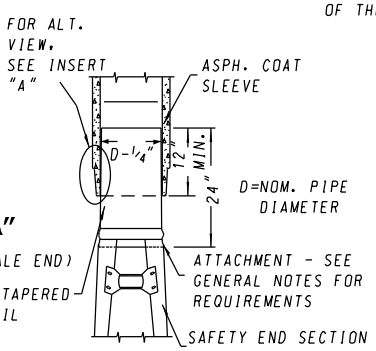
Use with pipe installations 36" dia. and larger

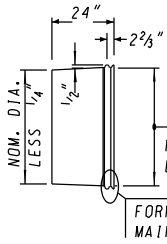
CROSS DRAINAGE STRUCTURE



INSERT "A"

(ALT. VIEW FOR FEMALE END)



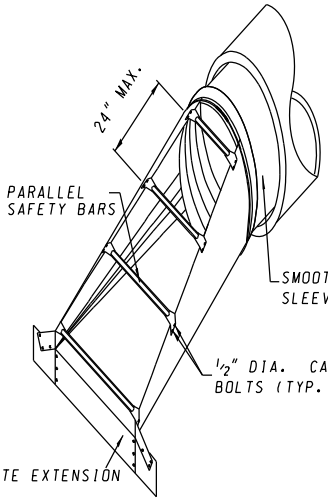


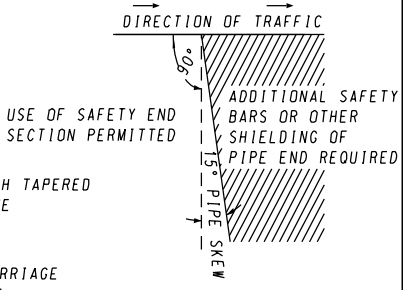
NOTE:
METAL TO BE SMOOTH ALUMINIZED STEEL IN ACCORDANCE WITH AASHTO M218
0.079 IN. (14 GA.) MIN. THKN. UP TO 18" DIA.
0.109 IN. (12 GA.) MIN. THKN. OVER 18" DIA.

NOM. DIA. + 1/8" BEFORE CORRUGATING

FORM 1/2" X 2" CORRUGATIONS. MAINTAIN INSIDE DIAMETER OF SLEEVE.

SMOOTH TAPERED SLEEVE FOR ATTACHING SAFETY END SECTIONS TO SMOOTH PIPE





LOCATION DIAGRAM

PARALLEL DRAINAGE STRUCTURE

USE WITH SINGLE PIPE INSTALLATIONS 30" DIA. OR LARGER
USE WITH MULTIPLE PIPE INSTALLATIONS 15" DIA. OR LARGER

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 10-7-14	APPROVAL 9-29-14
REVISED	REVISED
REVISED	REVISED
REVISED	REVISED

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SAFETY END SECTION FOR CONCRETE, PLASTIC PIPE

STANDARD NO. MD–373.00

STEEL END SECTIONS FOR ROUND PIPE CULVERT							
PIPE SIZE DIAMETER (Inches)	METAL THICK (MINIMUM) (In./ga.)	DIMENSIONS IN INCHES					
		A	H	W	OVERALL WIDTH	L	
						Slope=4	Slope=6
18	0.064/16	8	6	24	40	32	47
24	0.064/16	8	6	30	46	55	83
30	0.109/12	12	9	36	60	79	118
36	0.109/12	12	9	42	66	102	154
42	0.109/12	16	12	48	80	126	189
48	0.109/12	16	12	54	86	150	224
54	0.109/12	16	12	60	92	173	260
60	0.109/12	16	12	66	98	197	295

GENERAL NOTES FOR ALL DETAILS:

1. FOR ROUND PIPES WITH DIAMETERS 24" OR LESS USE TYPE # 1 CONNECTOR.
   ALL ARCH PIPES EQUIVALENT ROUND DIAMETER AND ROUND PIPES OVER 24" DIAMETER USE TYPE # 2 CONNECTOR.
2. TOE PLATE EXTENSIONS ARE TO BE THE SAME MIN. THICKNESS AS END SECTION.
   DIMENSIONS SHALL BE OVERALL WIDTH LESS 6" BY 8" HIGH.
3. CROSS DRAINAGE AND SAFETY BARS SHALL BE 3" DIA. SCHEDULE 40 ALUMINIZED STEEL PIPE.
4. SLOTTED HOLES FOR SAFETY BAR ATTACHMENT SHALL BE PROVIDED FOR ALL END SECTIONS.
5. OPEN ENDS OF PIPES NORMALLY REQUIRE A SITE SPECIFIC DESIGN, AND MAY REQUIRE SPECIAL TREAMENT (SLOPE ENDS, CULVERT EMBANKMENT PROTECTION, PAVED END SLOPES, SAFETY END SECTIONS, OR OTHER MEASURES).
   SEE SPECIAL DETAILS OR STANDARD DRAWINGS AS CALLED FOR ON PLANS.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

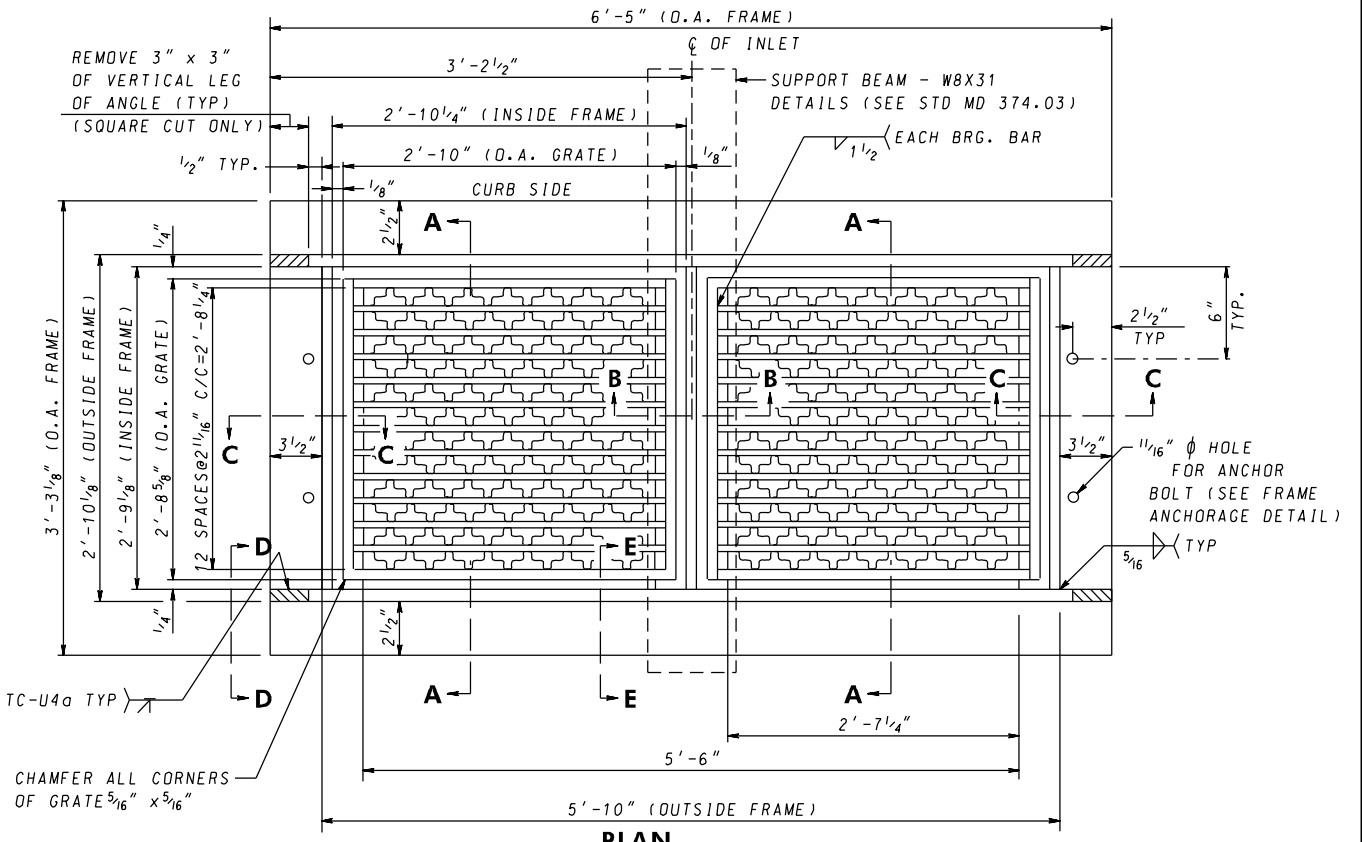
APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 10-7-14	APPROVAL 9-29-14
REVISED	REVISED
REVISED	REVISED
REVISED	REVISED

SHA State Highway Administration

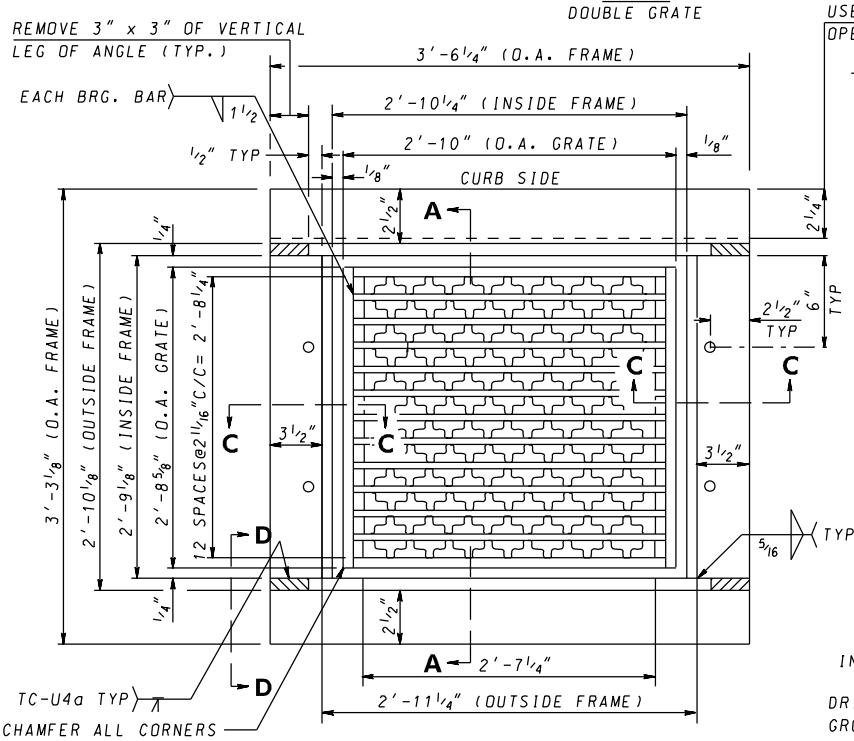
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SAFETY END SECTION FOR CONCRETE, PLASTIC PIPE

STANDARD NO. ***MD-373.01***



PLAN
DOUBLE GRATE



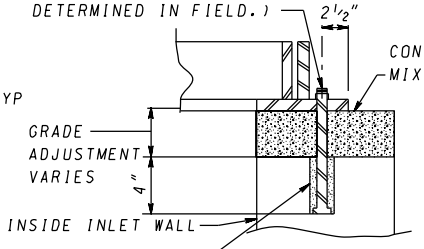
PLAN
SINGLE GRATE

USE 4"x1/2" FLAT BAR WHEN OPEN FACED CURB IS USED

GENERAL NOTES

1. FRAMES & GRATES TO BE SQUARE, FLAT AND TRUE.
2. STRUCTURAL STEEL SHALL BE A.S.T.M. A-36.
3. FRAMES AND GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH A.S.T.M. A-123.
4. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX # 6.
5. MANUFACTURER TO VERIFY THAT GRATE AND FRAME HAVE BEEN DESIGNED FOR HS-25 LOADING. ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

GALVANIZED 5/8 ϕ ANCHOR BOLT WITH DOUBLE NUT FOR ADJUSTING FRAME TO GRADE (FOUR BOLTS PER FRAME. LENGTH TO BE DETERMINED IN FIELD.)



FRAME ANCHORAGE DETAIL

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

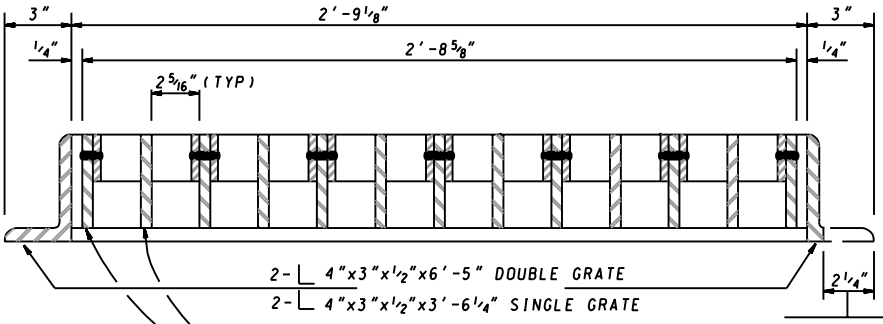
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-30-82	APPROVAL	9-29-82
REVISED	10-1-01	REVISED	9-21-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

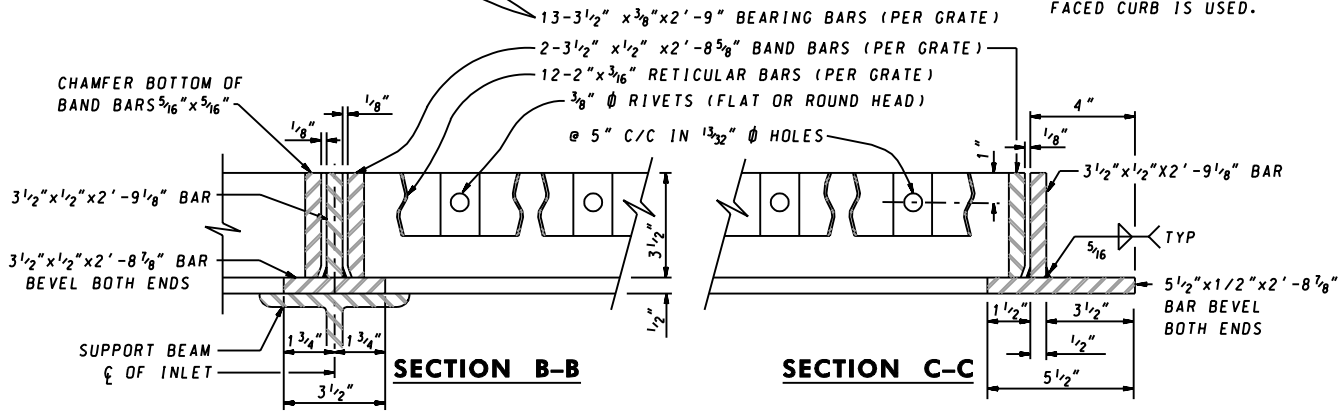
STANDARD WR & WRM INLET FRAME & GRATE

STANDARD NO. MD 374.02



SECTION A-A

USE 4"x1/2" FLAT BAR WHEN OPEN FACED CURB IS USED.

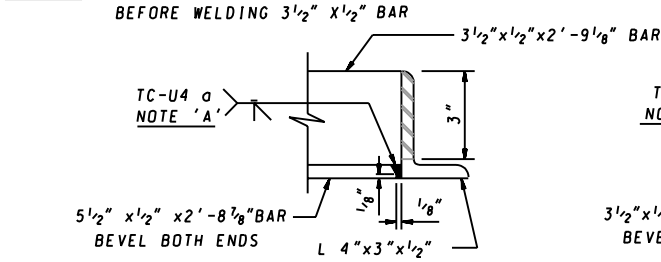


SECTION B-B

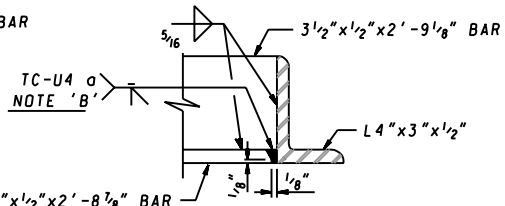
SECTION C-C

NOTE 'A'- WELD 5 1/2" x 1/2" BAR TO 4"x3"x1/2" L BEFORE WELDING 3 1/2" X 1/2" BAR

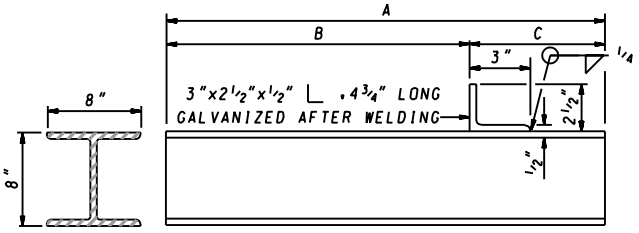
NOTE 'B'- WELD 3 1/2"x1/2"x2'-8 7/8" BAR TO 4"x3"x1/2" L BEFORE WELDING 3 1/2"x1/2"x2'-9 1/8" BAR



SECTION D-D

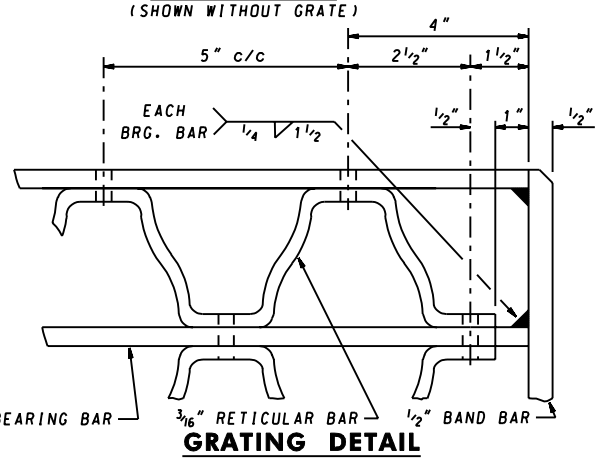


SECTION E-E
(SHOWN WITHOUT GRATE)



SUPPORT BEAM
W8 x 31 (GALVANIZED)

INLET TYPE	DIMENSIONS		
	A	B	C
WR	4'-6 1/8"	3'-4 3/8"	1'-1 3/4"
WRM	6'-4 5/8"	3'-4 3/8"	3'-0 1/4"



GRATING DETAIL

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	1-14-75
REVISED	10-1-01	REVISED	9-21-87
REVISED		REVISED	
REVISED		REVISED	

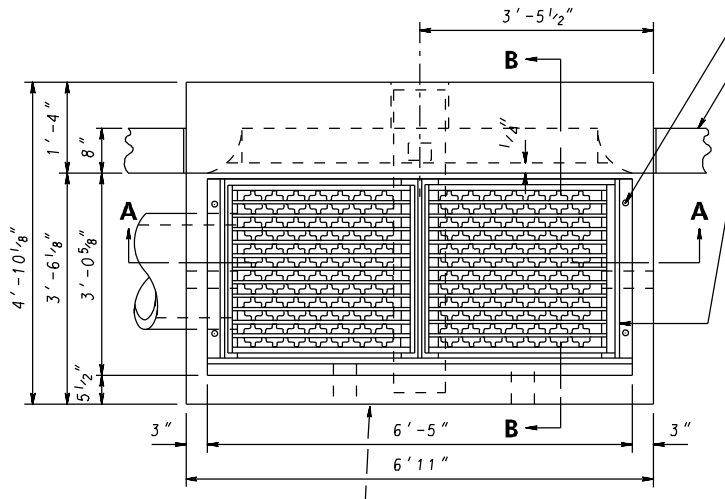
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

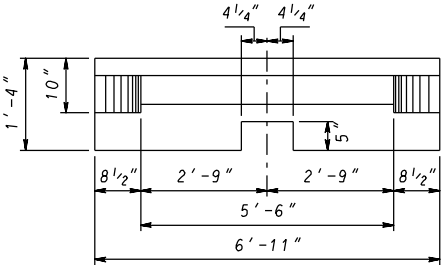
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD WR & WRM INLET FRAME & GRATE

STANDARD NO. MD 374.03

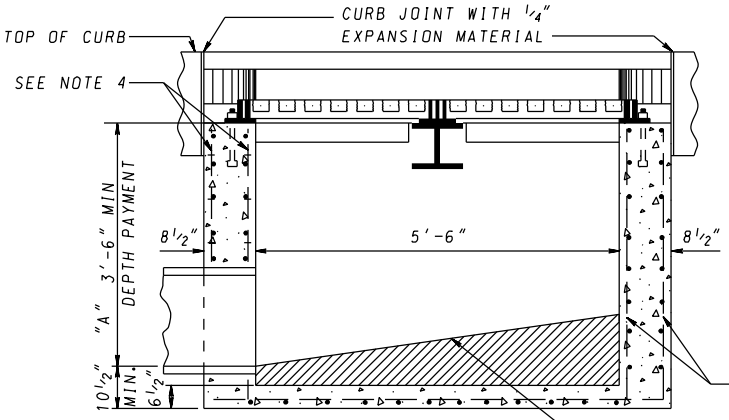


PLAN

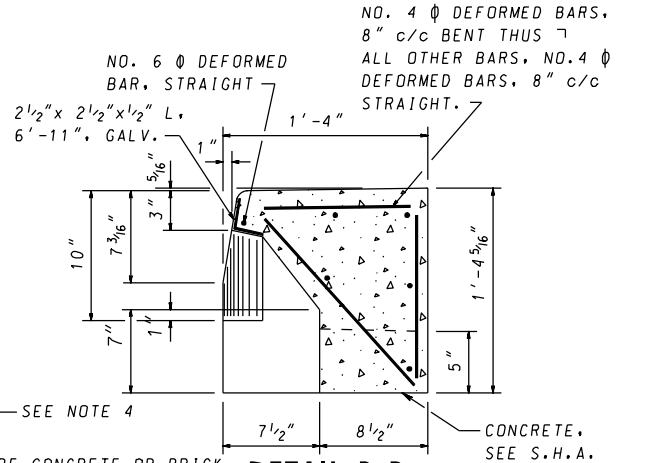


FRONT ELEVATION

PRECAST CURB

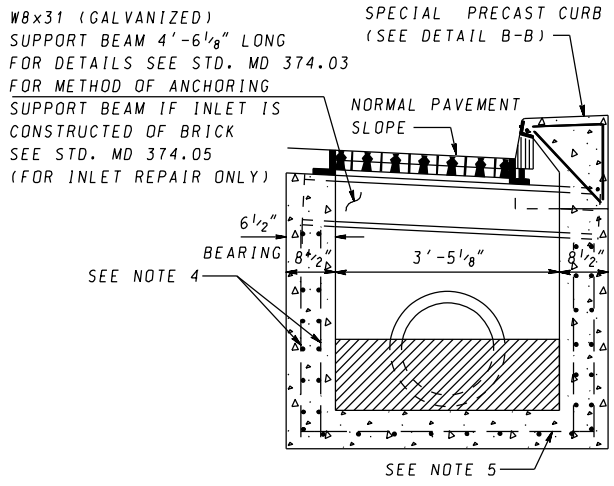


SECTION A–A



DETAIL B–B

PRECAST CURB



SECTION B–B

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3.5" COVER. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN THE 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE..
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND TO A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

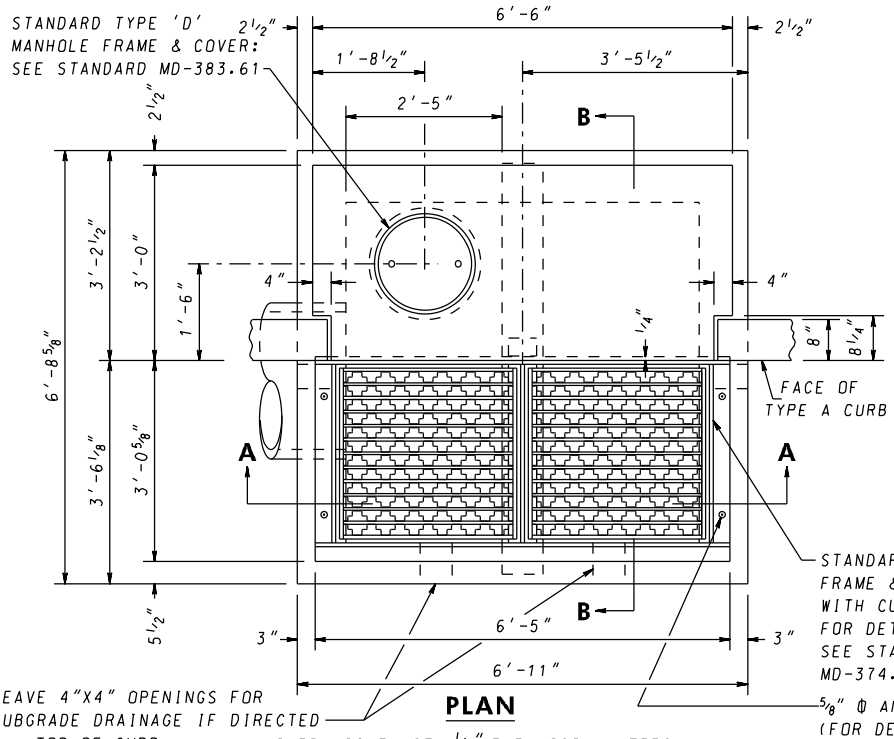
SHA State Highway Administration

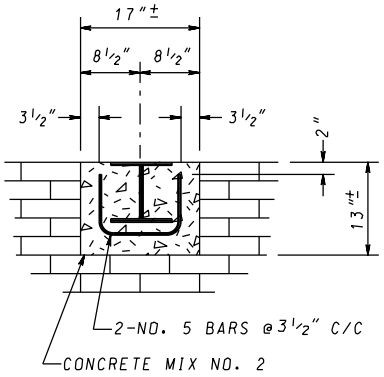
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD WR INLET

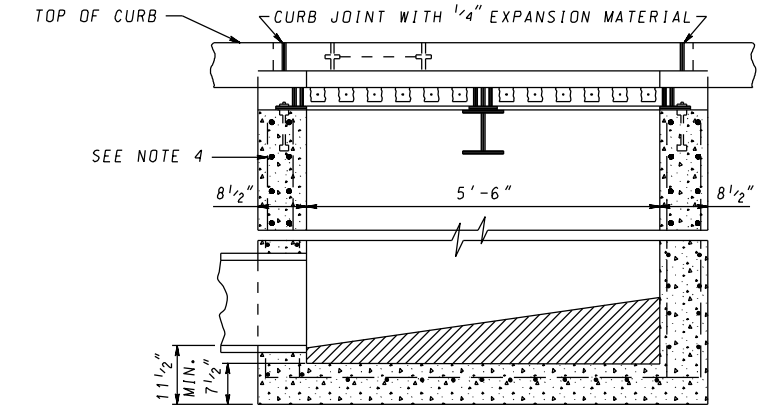
STANDARD NO. MD 374.04



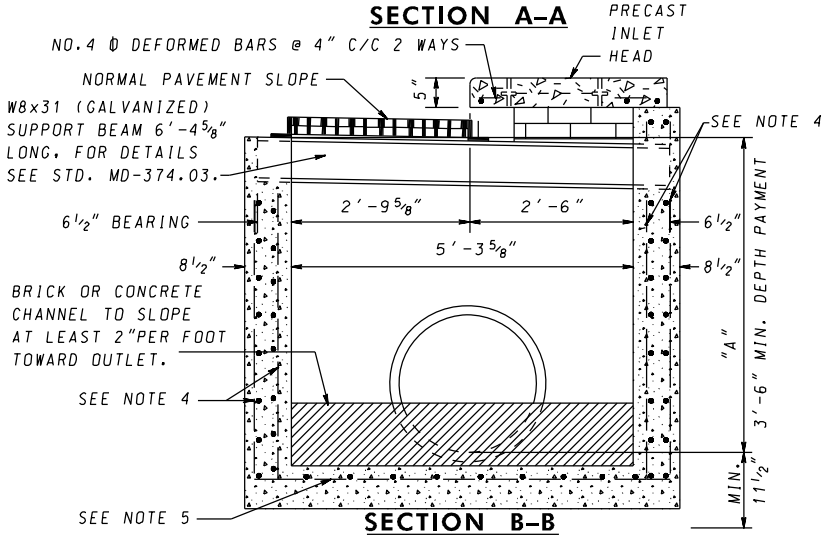


METHOD OF ANCHORING SUPPORT BEAM IF INLET IS CONSTRUCTED OF BRICK

(THIS DETAIL TO BE USED FOR INLET REPAIR ONLY)



SECTION A-A



SECTION B-B

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILLVARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 4" COVER. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN THE 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE.
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND TO A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

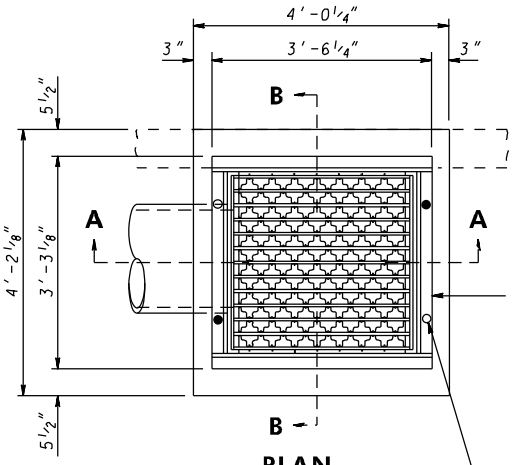
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

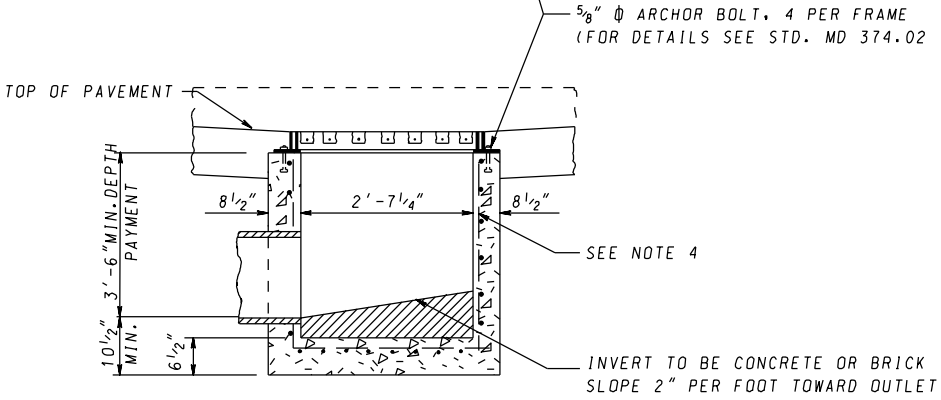
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD WRM INLET

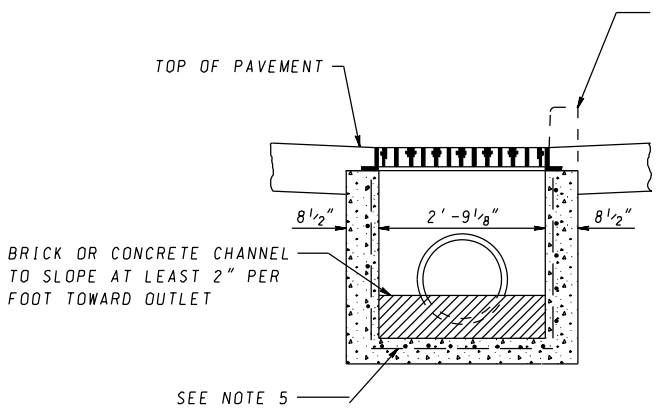
STANDARD NO. MD 374.05



PLAN



SECTION A–A



SECTION B–B

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WALL REINFORCEMENT SHALL BE ONE LAYER OF NO.4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3.5" COVER FROM INSIDE WALL.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO.4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE.
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND FOR A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-5-75	APPROVAL	5-22-75
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

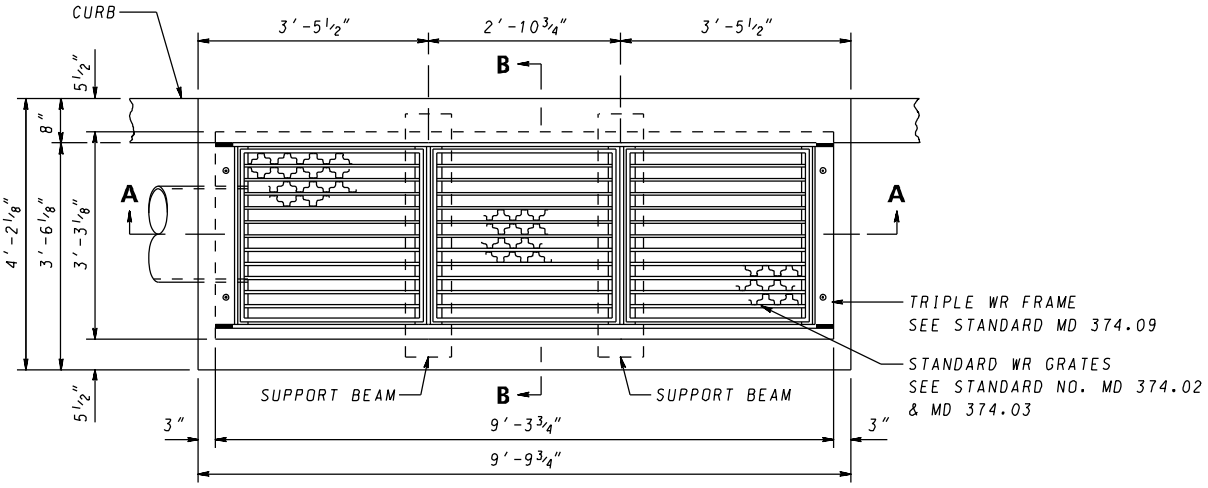
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

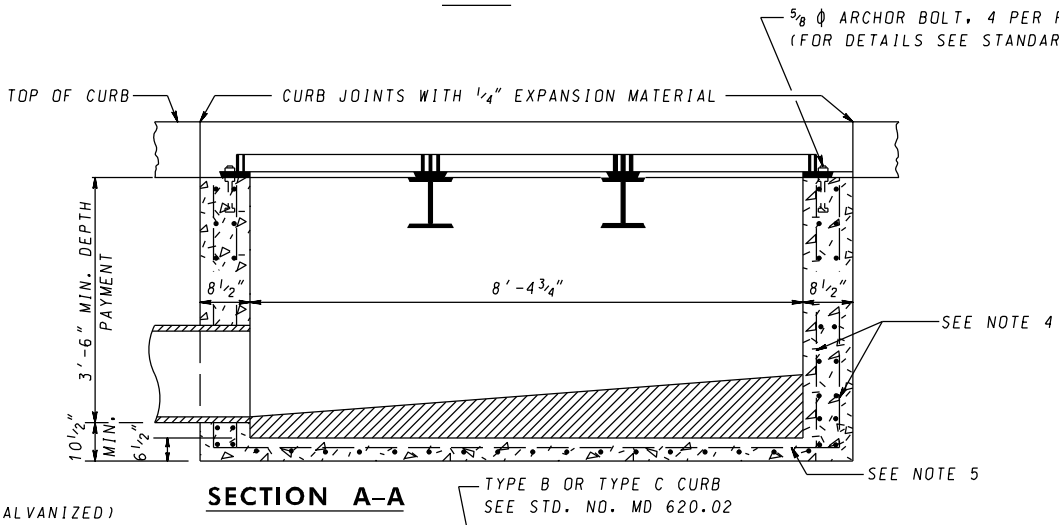
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SINGLE WR INLET

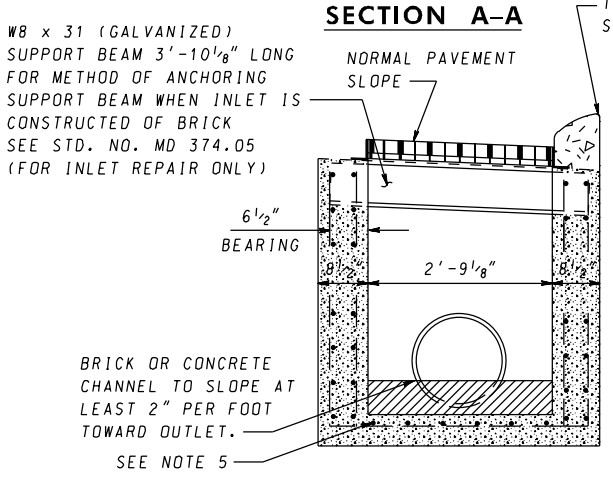
STANDARD NO. MD 374.06



PLAN



SECTION A–A



SECTION B–B

THIS INLET TO BE
USED WITH TYPE
B OR C CURB ONLY

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3 1/2" COVER. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, ON INSIDE AND OUTSIDE WALLS WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE.
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND TO A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-9-82	APPROVAL	9-13-82
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

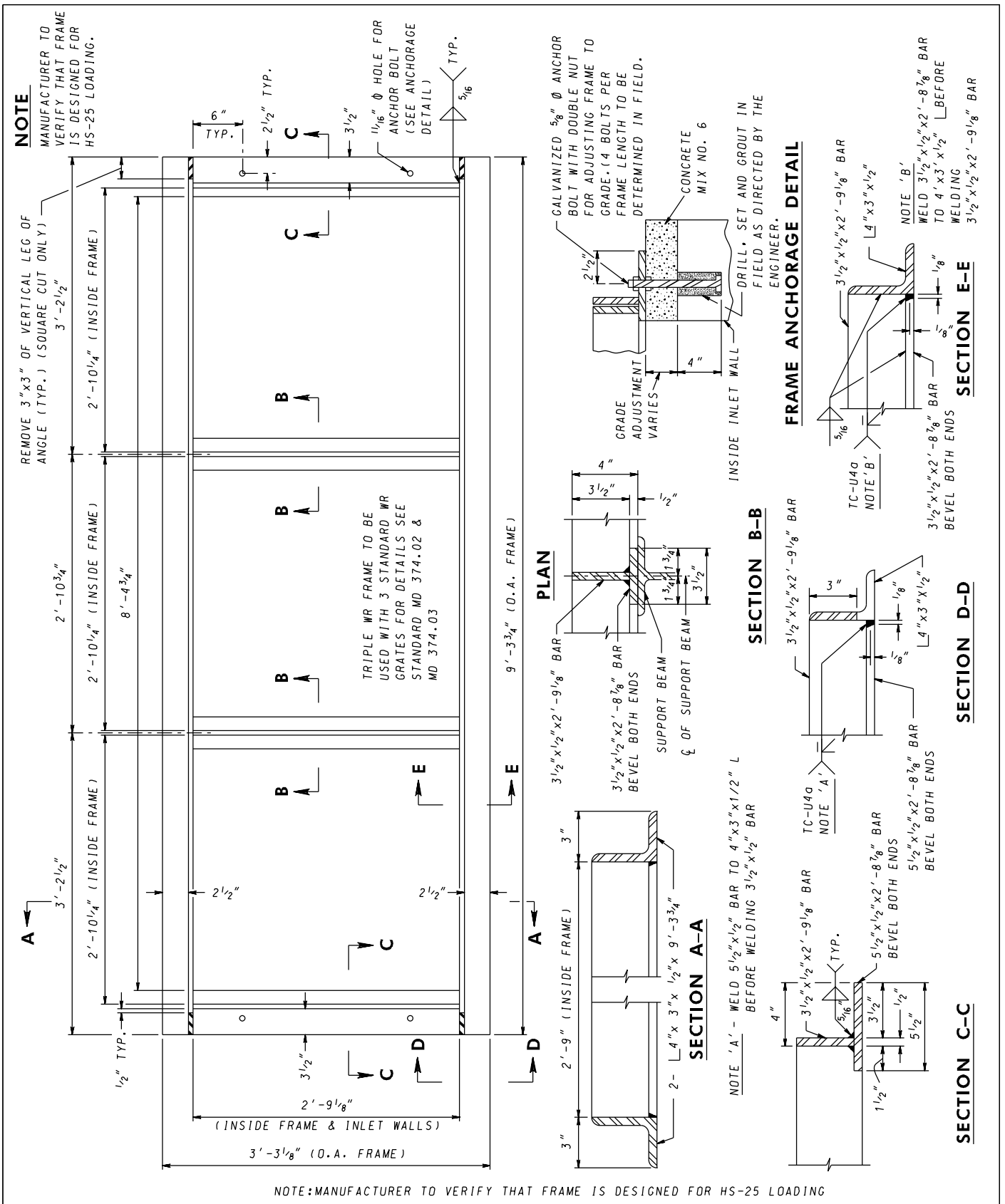
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

TRIPLE WR INLET

STANDARD NO. MD 374.08



NOTE: MANUFACTURER TO VERIFY THAT FRAME IS DESIGNED FOR HS-25 LOADING

SPECIFICATION	CATEGORY CODE ITEMS

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-9-82	APPROVAL	9-13-82
REVISED	10-1-01	REVISED	8-1-84
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

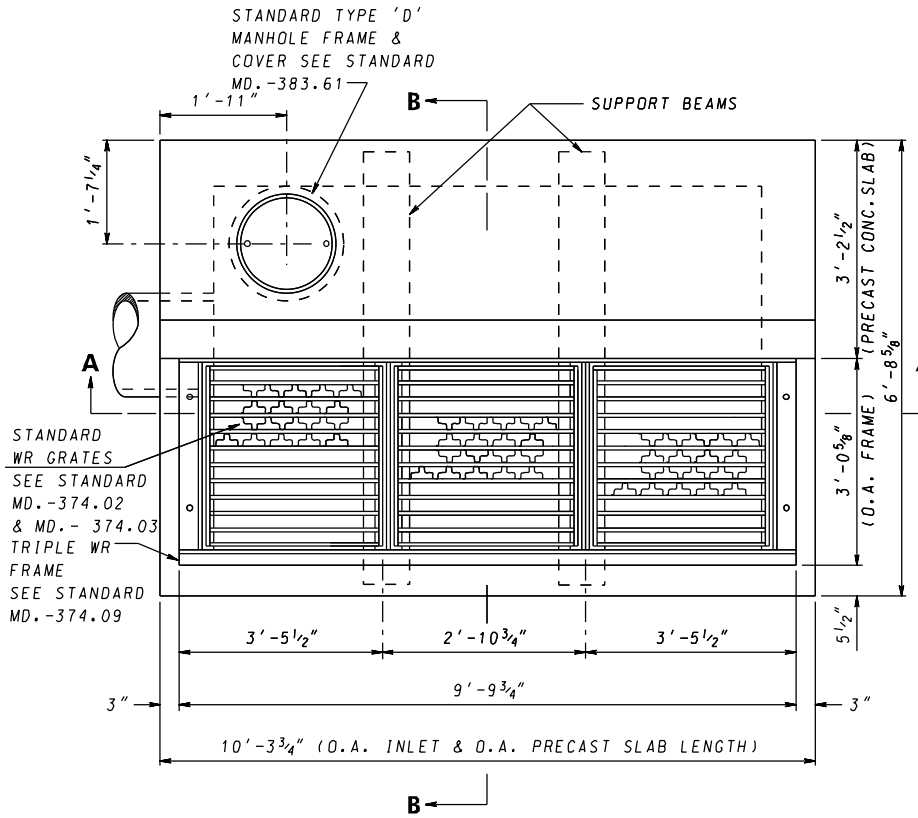
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

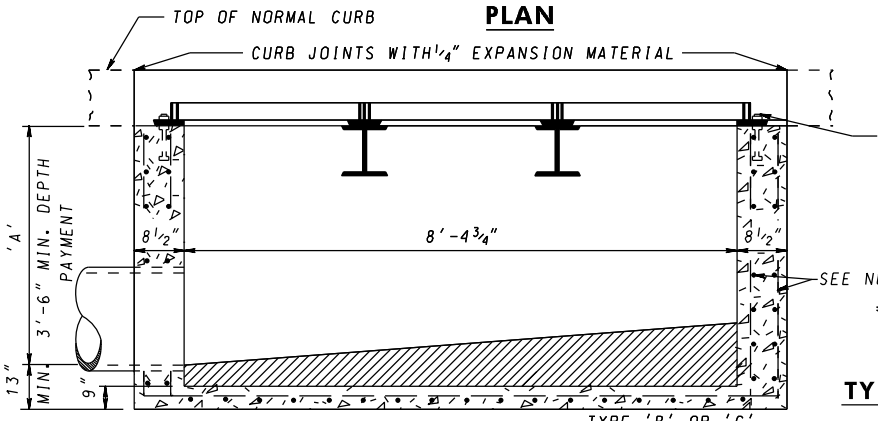
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

TRIPLE WR FRAME

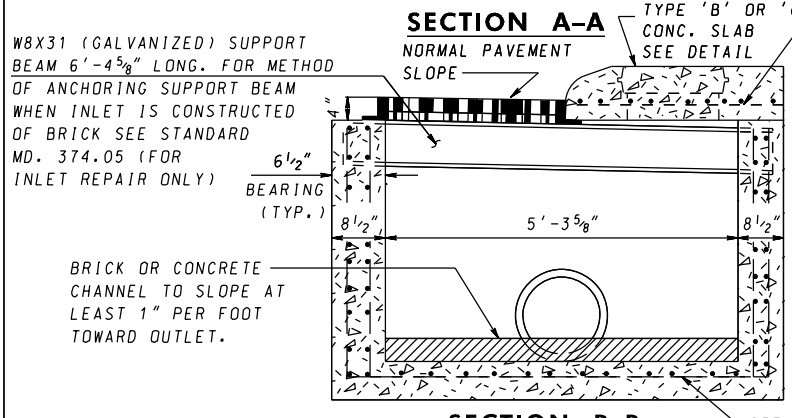
STANDARD NO. MD 374.09



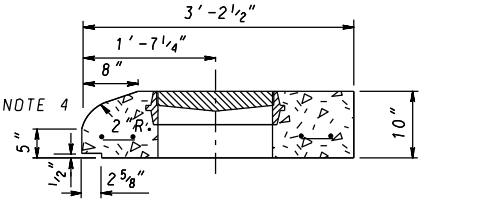
PLAN



SECTION A–A

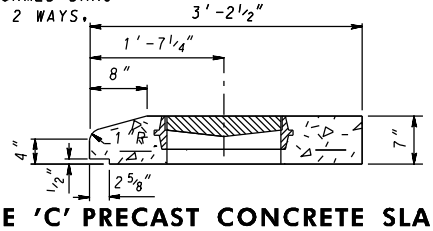


SECTION B–B



TYPE 'B' PRECAST CONCRETE SLAB

(CONC. MIX NO. 2)



TYPE 'C' PRECAST CONCRETE SLAB

(CONC. MIX NO. 2)

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 2" COVER. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN THE 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE¼" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE.
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND TO A MAXIMUM DEPTH OF 15'-0".

NOTE

TYPE 'B' SLAB-USED WITH STANDARD TYPE 'B' CONC. CURB
TYPE 'C' SLAB-USED WITH STANDARD TYPE 'C' CONC. CURB
FOR STANDARD CURB DETAILS REFER TO STANDARD MD= 620.02

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	1-24-83	APPROVAL	3-1-83
REVISED	12-7-09	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

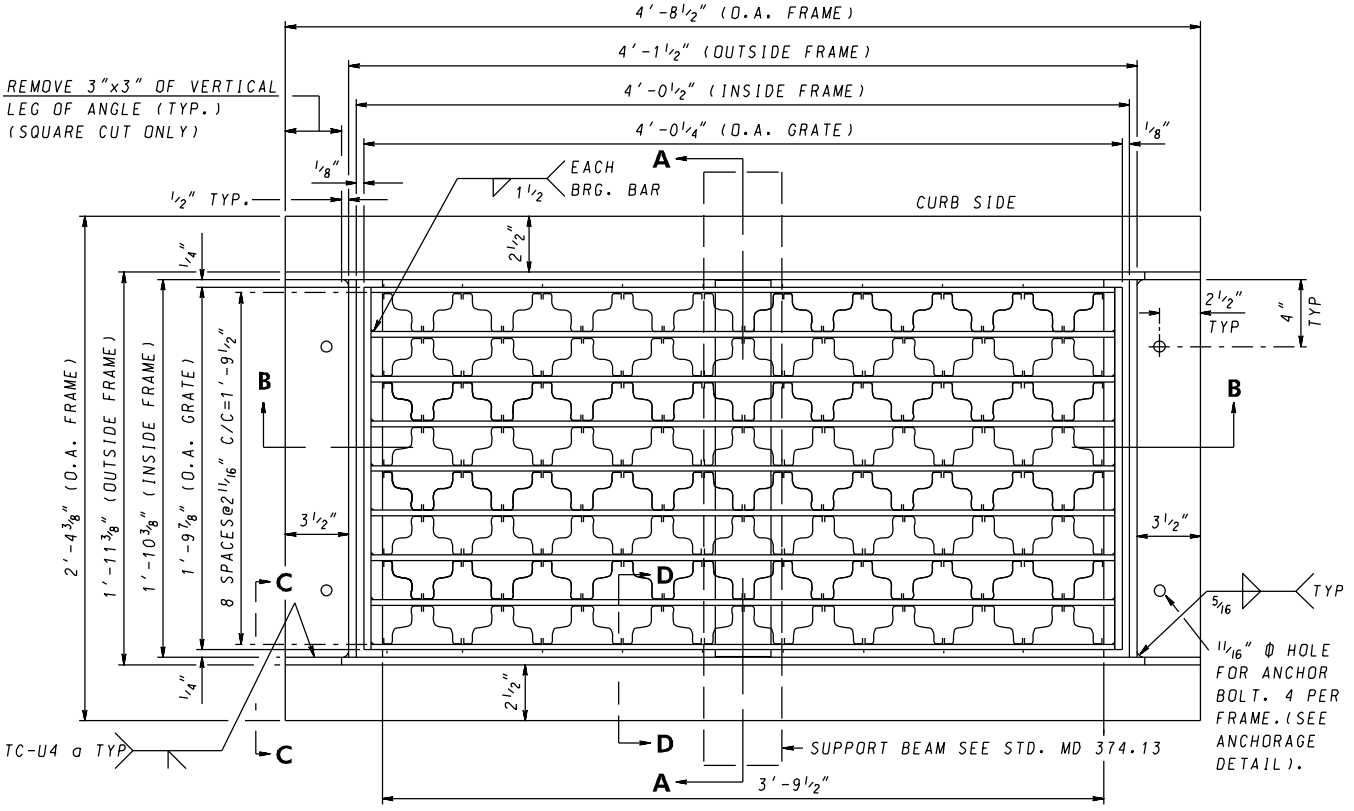
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

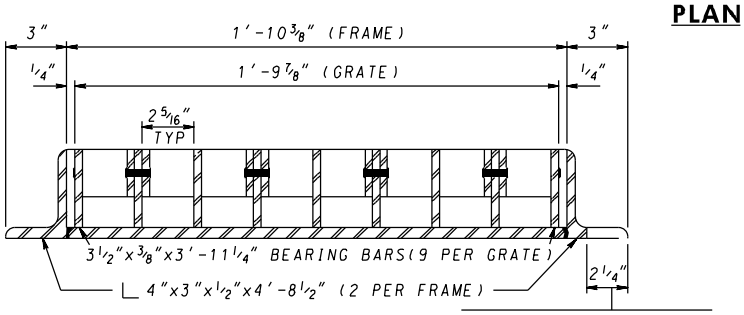
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

TRIPLE WRM INLET

STANDARD NO. MD 374.10



PLAN

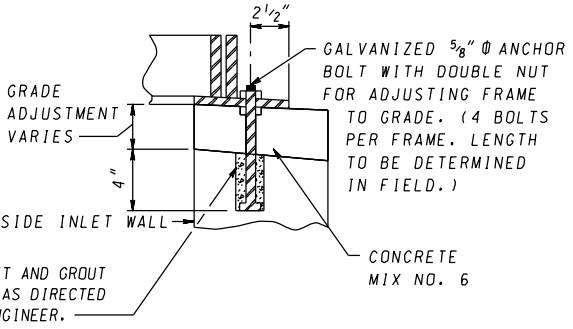


SECTION A–A

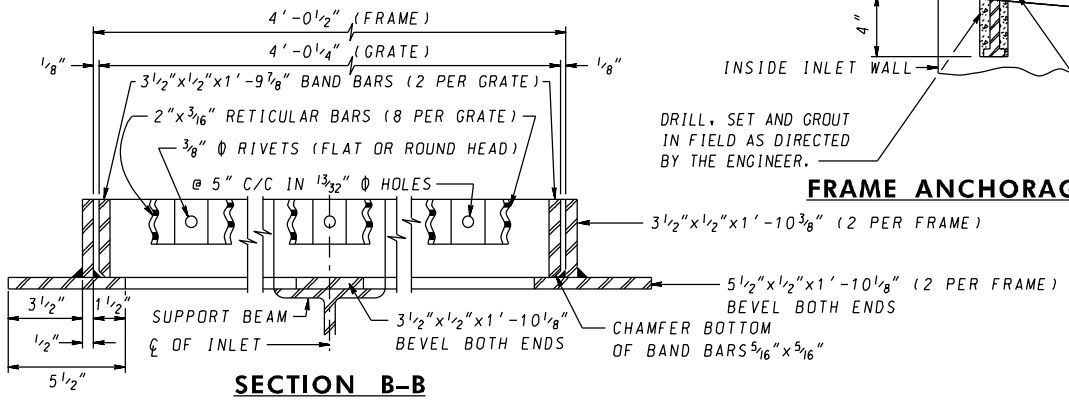
USE 4"x1/2" FLAT BAR WHEN OPEN FACED CURB IS USED.

GENERAL NOTES

1. FRAMES & GRATES TO BE SQUARE, FLAT & TRUE.
2. STRUCTURAL STEEL SHALL BE A.S.T.M. A-36.
3. FRAMES & GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH A.S.T.M. A-123.
4. SEE LATEST S.H.A. SPECIFICATIONS.
5. MANUFACTURER TO VERIFY THAT GRATE AND FRAME HAVE BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.



FRAME ANCHORAGE DETAIL



SECTION B–B

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED

DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	10-1-01	REVISED	8-1-84
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

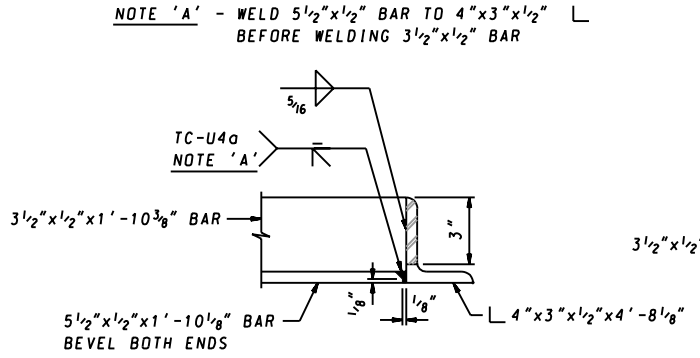
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

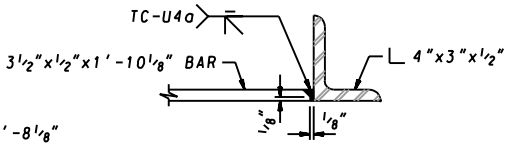
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD NR & NRM INLET FRAME & GRATE

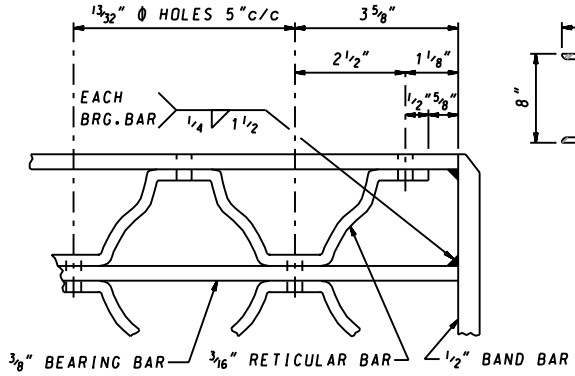
STANDARD NO. MD 374.12



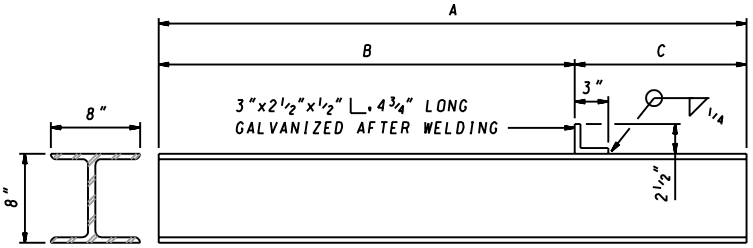
SECTION C-C



SECTION D-D
(GRATE NOT SHOWN)



GRATING DETAIL



SUPPORT BEAM
W8x31 (GALVANIZED)

INLET TYPE	DIMENSIONS		
	A	B	C
NR	3'-7 3/8"	2'-5 5/8"	1'-1 3/4"
NRM	5'-5 7/8"	2'-5 5/8"	3'-0 1/4"

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	10-1-01	REVISED	9-21-87
REVISED		REVISED	
REVISED		REVISED	

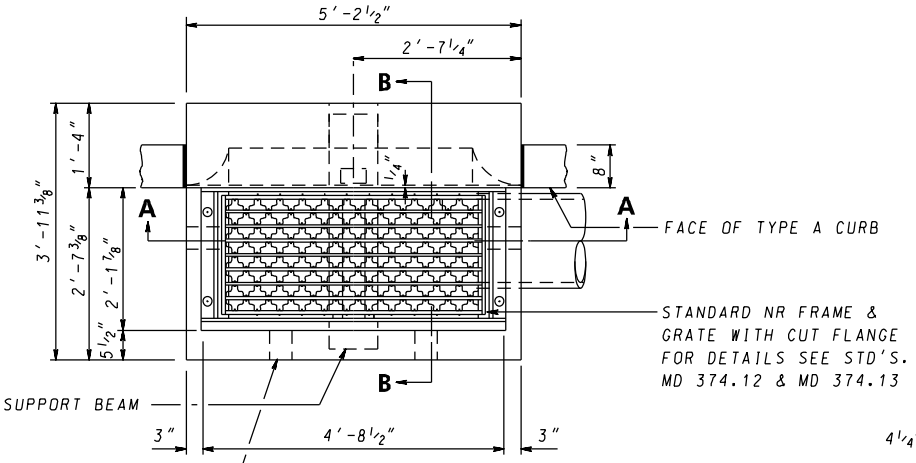
SHA State Highway Administration — Drive to Excel

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

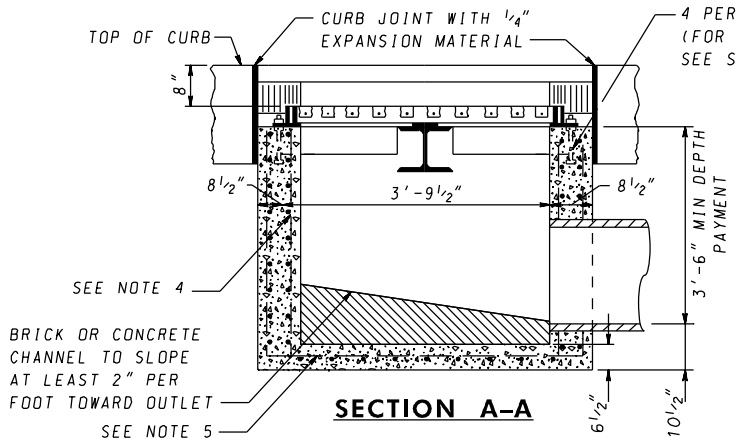
STANDARD NR & NRM INLET FRAME & GRATE

STANDARD NO. MD 374.13

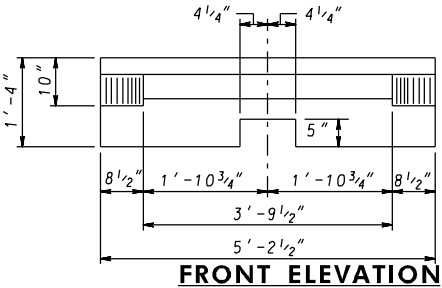


LEAVE 4"x4" OPENINGS FOR SUBGRADE DRAINAGE IF DIRECTED

PLAN

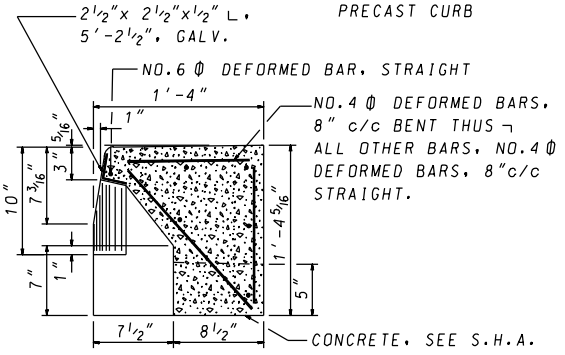


SECTION A–A



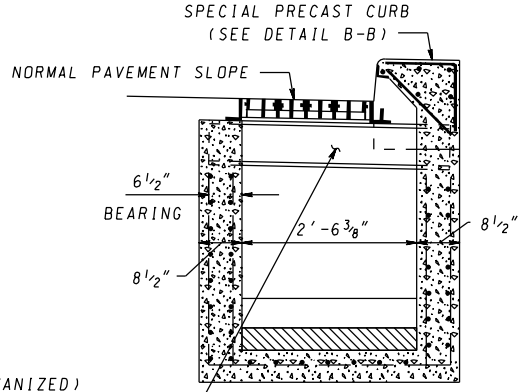
FRONT ELEVATION

PRECAST CURB



DETAIL B–B

PRECAST CURB



W8x31 (GALVANIZED) SUPPORT BEAM 3'-7 3/8" LONG FOR DETAILS SEE STD. MD 374.13 FOR METHOD OF ANCHORING SUPPORT BEAM INLET IF CONSTRUCTED OF BRICK SEE STD. MD 374.15 (FOR INLET REPAIR ONLY)

SECTION B–B

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. FOR INLETS 7'-0" OR LESS, WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3" COVER. FOR INLETS 7'-0" TO 15'-0", WALL REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, ON INSIDE AND OUTSIDE WALLS WITH 2" COVER.
5. FOR INLETS 15'-0" OR LESS, BASE SHALL BE 6 1/2" THICK. BASE REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE..
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND TO A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

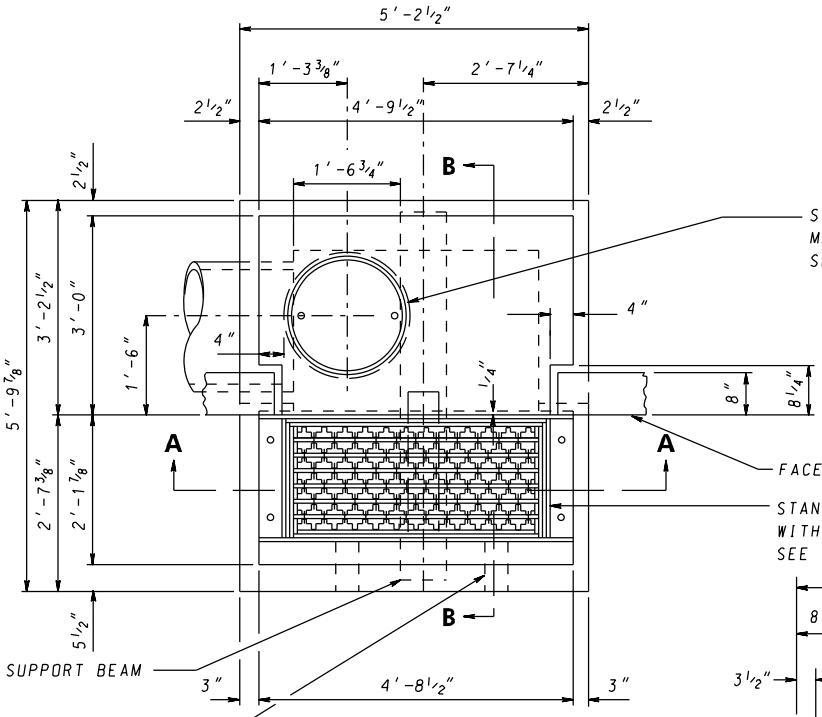
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

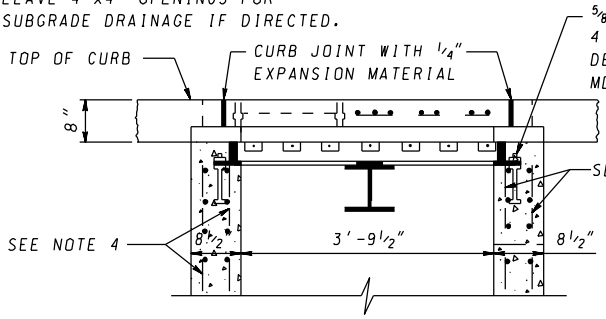
STANDARD NR INLET

STANDARD NO. MD 374.14

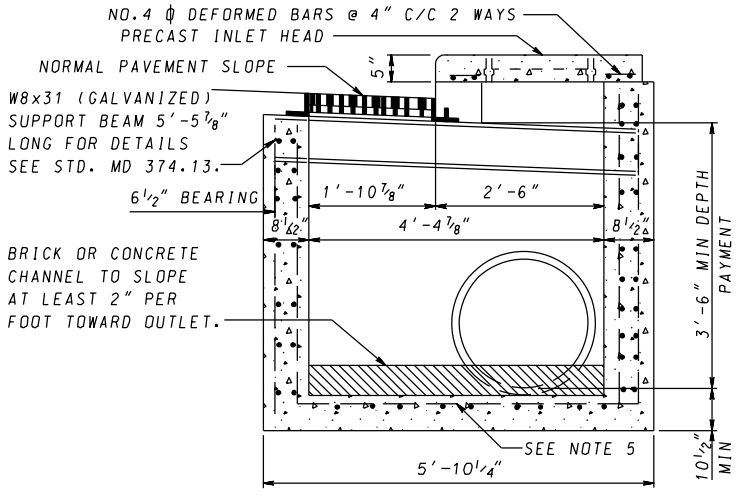


PLAN

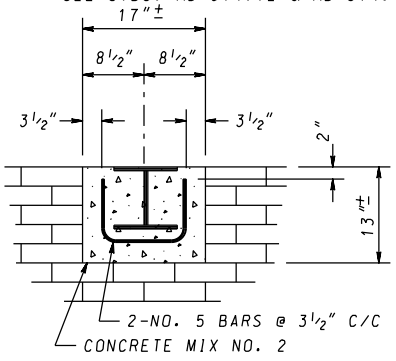
LEAVE 4"x4" OPENINGS FOR SUBGRADE DRAINAGE IF DIRECTED.



SECTION A-A



SECTION B-B



METHOD OF ANCHORING SUPPORT BEAM IF INLET IS CONSTRUCTED OF BRICK

(THIS DETAIL TO BE USED FOR INLET REPAIR ONLY)

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. FOR INLETS 7'-0" OR LESS, WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3 1/2" COVER. FOR INLETS 7'-0" TO 15'-0", WALL REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, ON INSIDE AND OUTSIDE WALLS WITH 2" COVER.
5. FOR INLETS 15'-0" OR LESS, BASE SHALL BE MINIMUM OF 6" THICK. BASE REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE.
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND TO A MAXIMUM DEPTH OF 15'.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

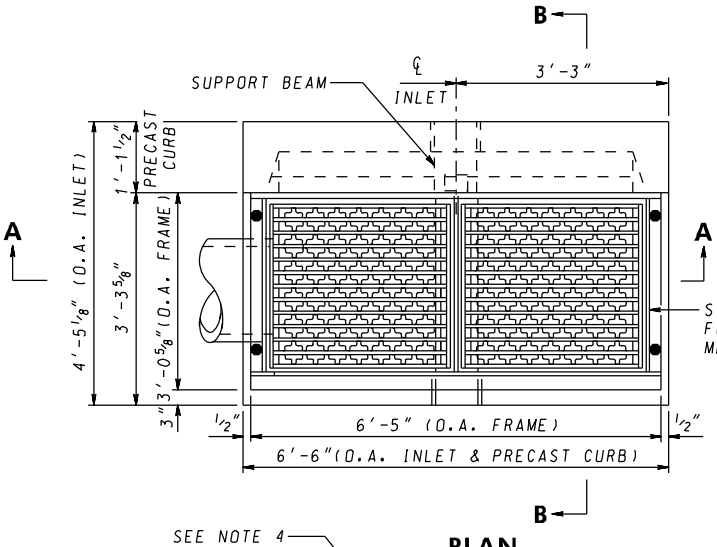
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

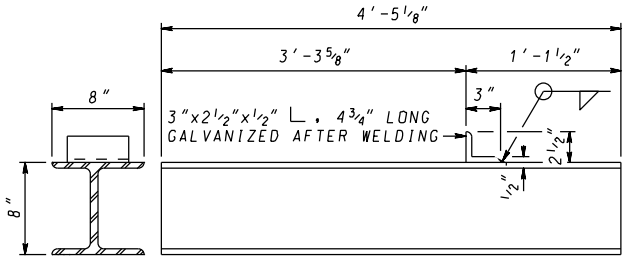
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD NRM INLET

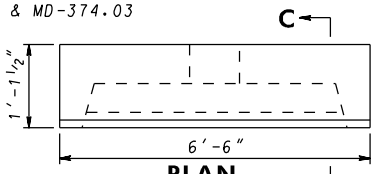
STANDARD NO. MD 374.15



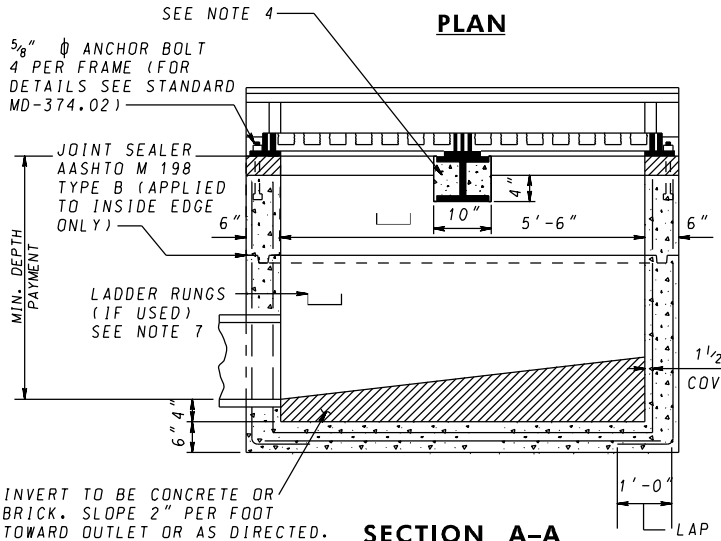
PLAN



SUPPORT BEAM
W8x31 (GALVANIZED)

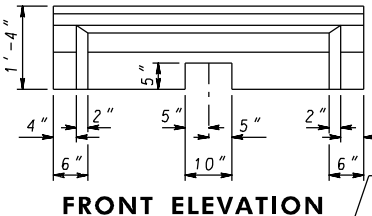


PLAN
PRECAST CURB

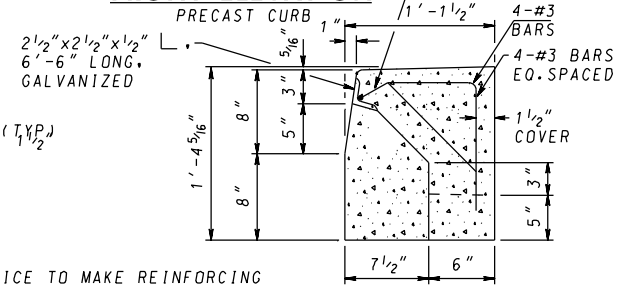


SECTION A-A

LAP SPLICE TO MAKE REINFORCING CONTINUOUS AROUND OUTSIDE CORNER.



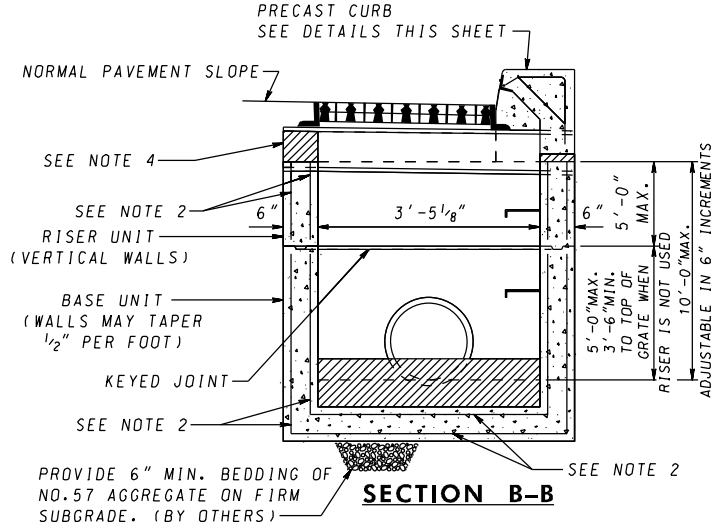
FRONT ELEVATION



SECTION C-C

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500PSI).
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W6.0 X W6.0 WELDED WIRE FABRIC WITH 1½" FROM EACH SIDE; BASE - 2 LAYERS OF 4X4 - W10.5 X W W10.5 WELDED WIRE FABRIC WITH 1½" COVER FROM EACH SIDE.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION, AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAVEMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.



SECTION B-B

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-4-84	APPROVAL	8-1-84
REVISED	10-1-01	REVISED	3-30-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

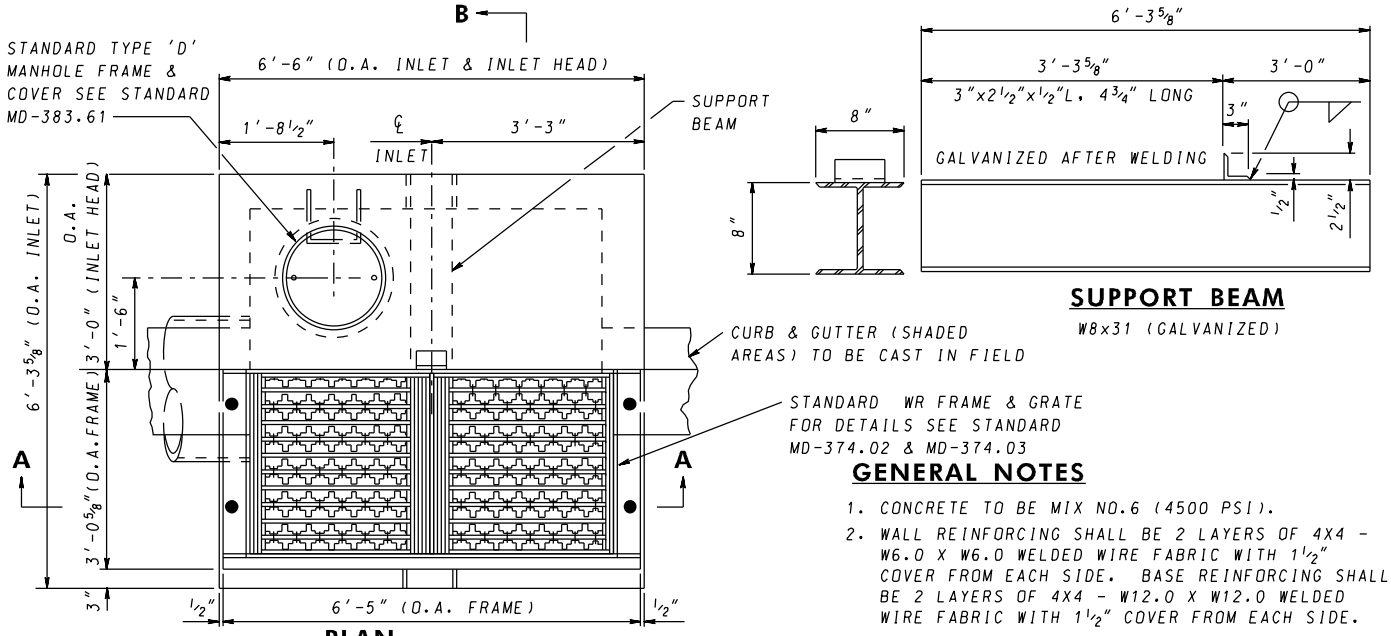
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

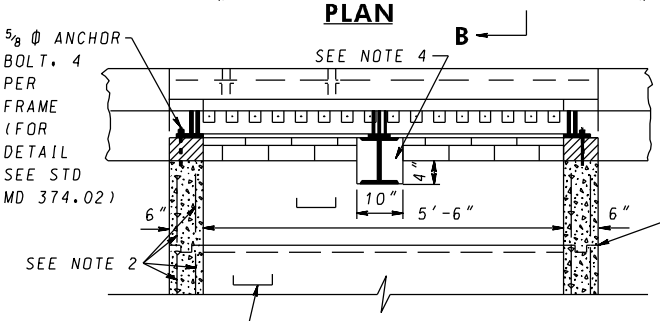
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST WR INLET

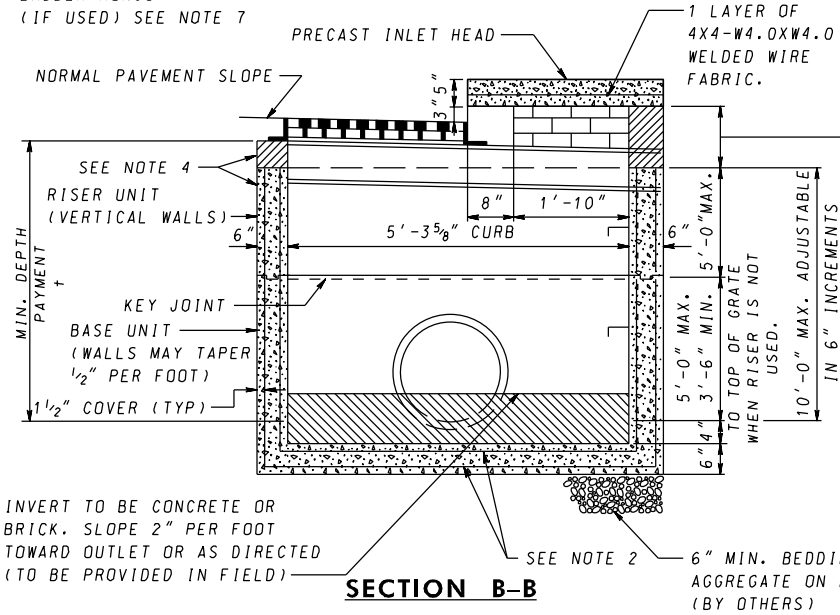
STANDARD NO. MD 374.21



PLAN



SECTION A–A



SECTION B–B

THIS PORTION OF INLET SHALL BE PROVIDED IN THE FIELD AND SHALL BE CONSTRUCTED OF BRICK MASONRY OR REINFORCED CONCRETE MIX NO.6. BRICK FOR MASONRY TO COMPLY WITH LATEST S.H.A. SPECIFICATIONS.

SUPPORT BEAM

W8x31 (GALVANIZED)

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. WALL REINFORCING SHALL BE 2 LAYERS OF 4X4 - W6.0 X W6.0 WELDED WIRE FABRIC WITH 1 1/2" COVER FROM EACH SIDE. BASE REINFORCING SHALL BE 2 LAYERS OF 4X4 - W12.0 X W12.0 WELDED WIRE FABRIC WITH 1 1/2" COVER FROM EACH SIDE.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTIONS PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-4-84	APPROVAL	8-1-84
REVISED	10-1-01	REVISED	3-30-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

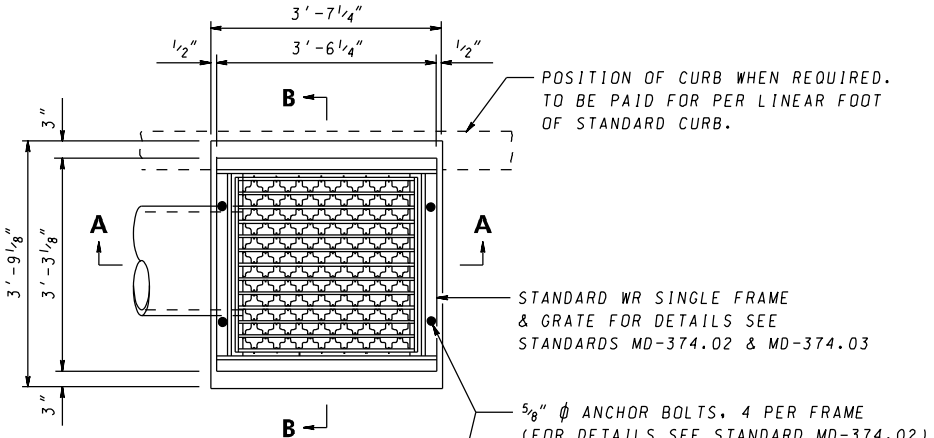
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

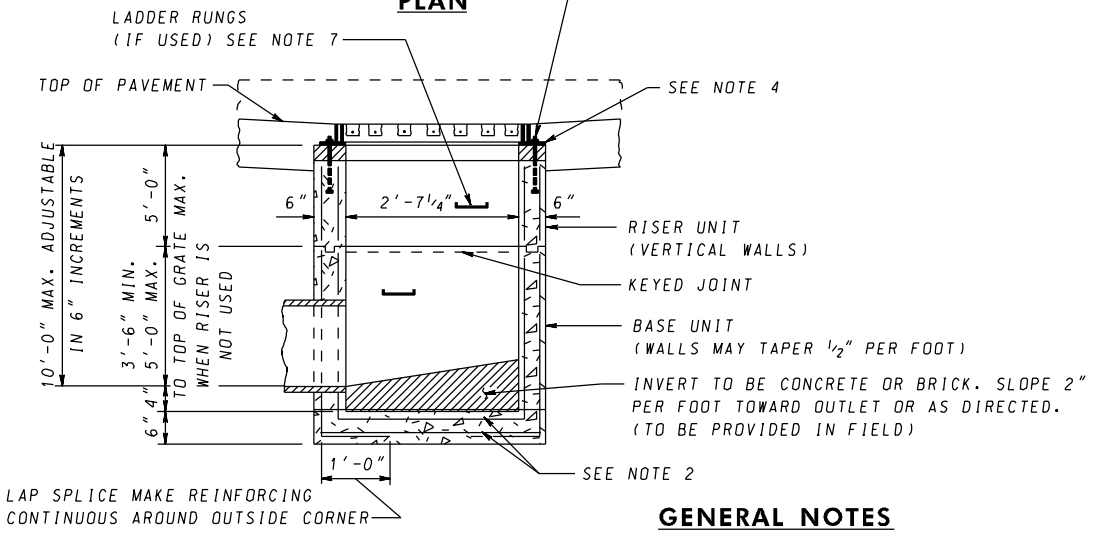
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST WRM INLET

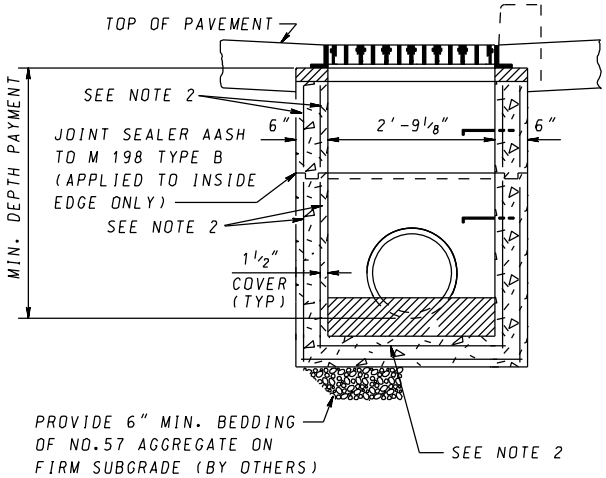
STANDARD NO. MD 374.22



PLAN



SECTION A-A



SECTION B-B

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 6 (4500 PSI).
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W4.0 X W4.0 WELDED WIRE FABRIC WITH 11#2" COVER FROM EACH SIDE; BASE - 2 LAYERS OF 4X4 - W5.0 X W5.0 WELDED WIRE FABRIC WITH 1 1/2" COVER FROM EACH SIDE.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED, FOR SIZE, LOCATION, AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-4-84	APPROVAL	8-1-84
REVISED	10-1-01	REVISED	3-30-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

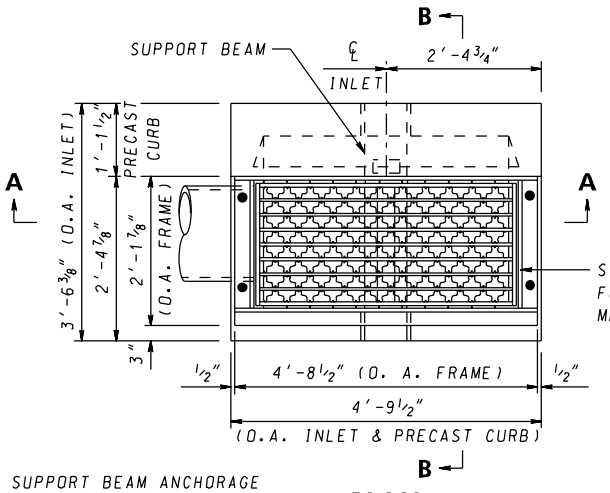
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

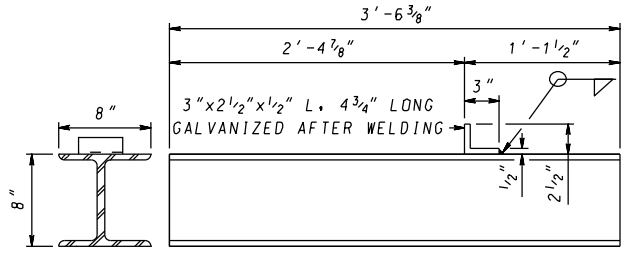
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST SINGLE WR INLET

STANDARD NO. MD 374.23

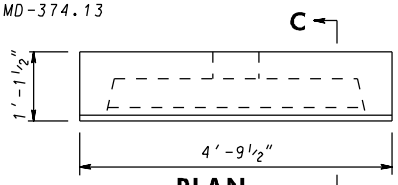


PLAN



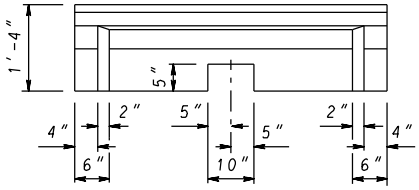
SUPPORT BEAM

W8x31 (GALVANIZED)



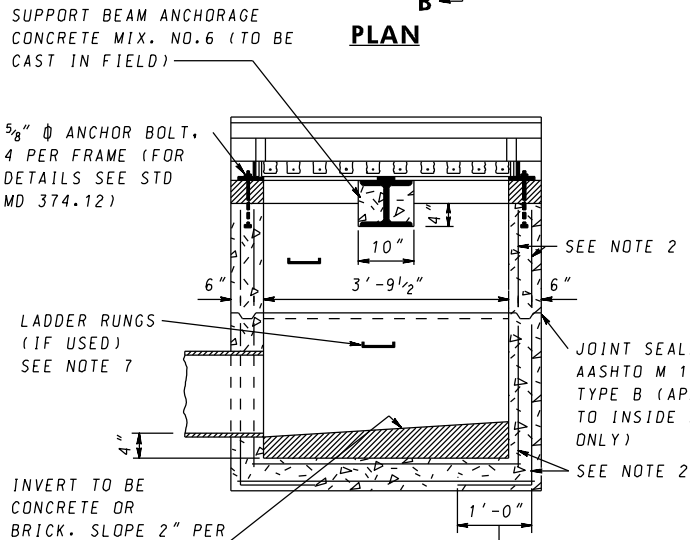
PLAN

PRECAST CURB

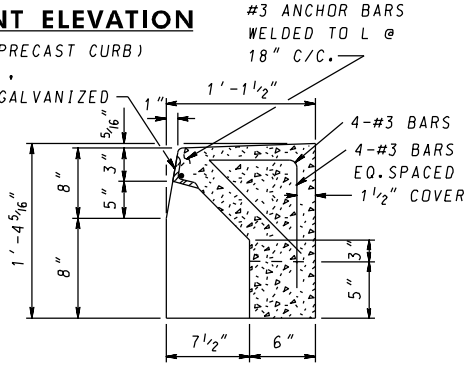


FRONT ELEVATION

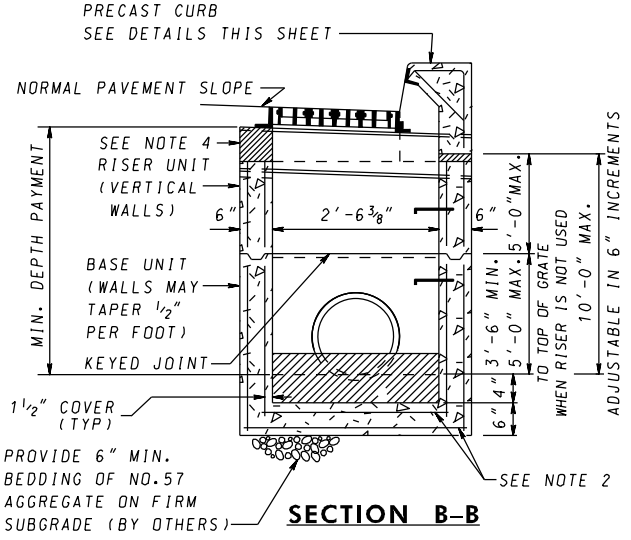
(PRECAST CURB)



SECTION A-A



SECTION C-C



SECTION B-B

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500PSI)
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W4.0 X W4.0 WELDED WIRE FABRIC WITH 1 1/2" COVER FROM EACH SIDE; BASE - 2 LAYERS OF 4X4 - W6.0 X W6.0 WELDED WIRE FABRIC WITH 1 1/2" COVER FROM EACH SIDE.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED, FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 AND 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT PER DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION 305	CATEGORY CODE ITEMS

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-4-84	APPROVAL	8-1-84
REVISED	10-1-01	REVISED	3-30-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

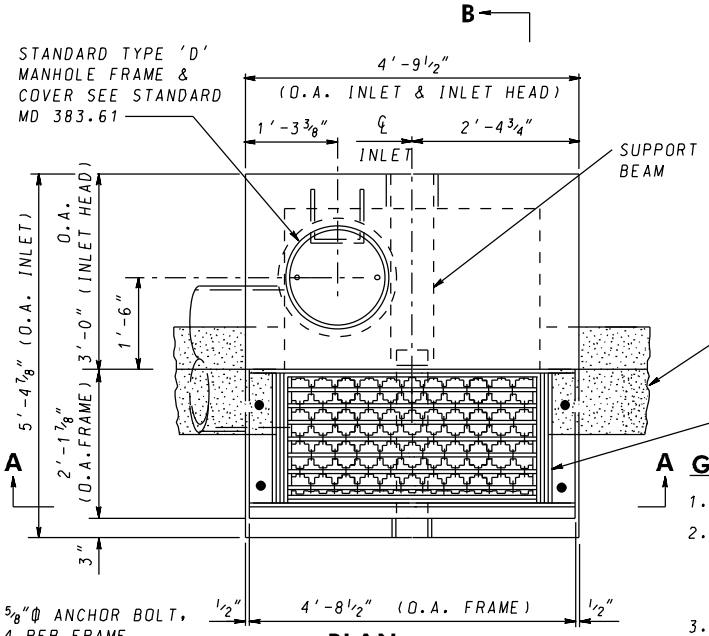
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

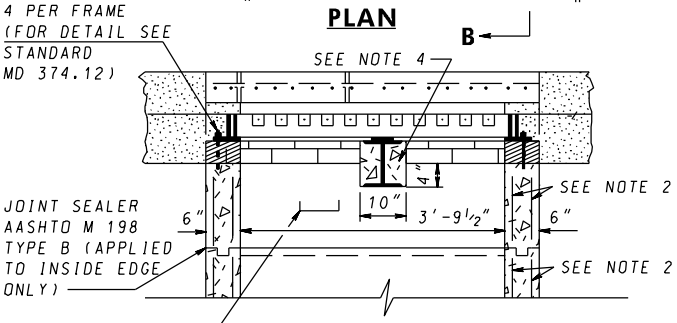
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST NR INLET

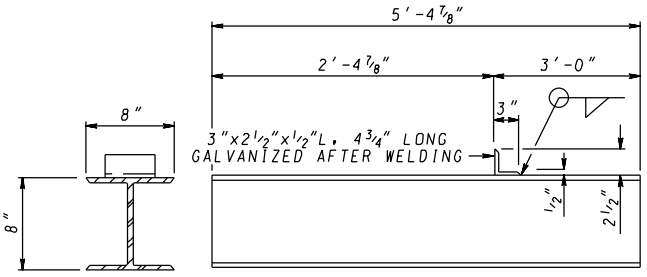
STANDARD NO. MD 374.24



PLAN



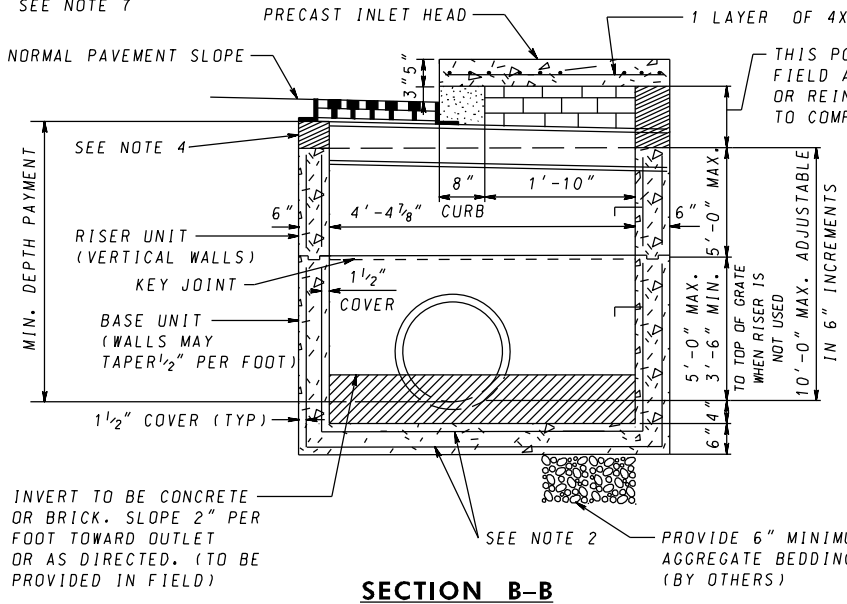
SECTION A–A



SUPPORT BEAM
W8x31 (GALVANIZED)

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W5.0 X W5.0 WELDED WIRE FABRIC WITH 1 1/2" COVER FROM EACH SIDE; BASE - 2 LAYERS LAYERS OF 4X4 - W7.0 X W7.0 WELDED WIRE FABRIC WITH 1 1/2" COVER FROM EACH SIDE.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE STANDARD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER .
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINER FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.



SECTION B–B

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-4-84	APPROVAL	8-1-84
REVISED	10-1-01	REVISED	3-30-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

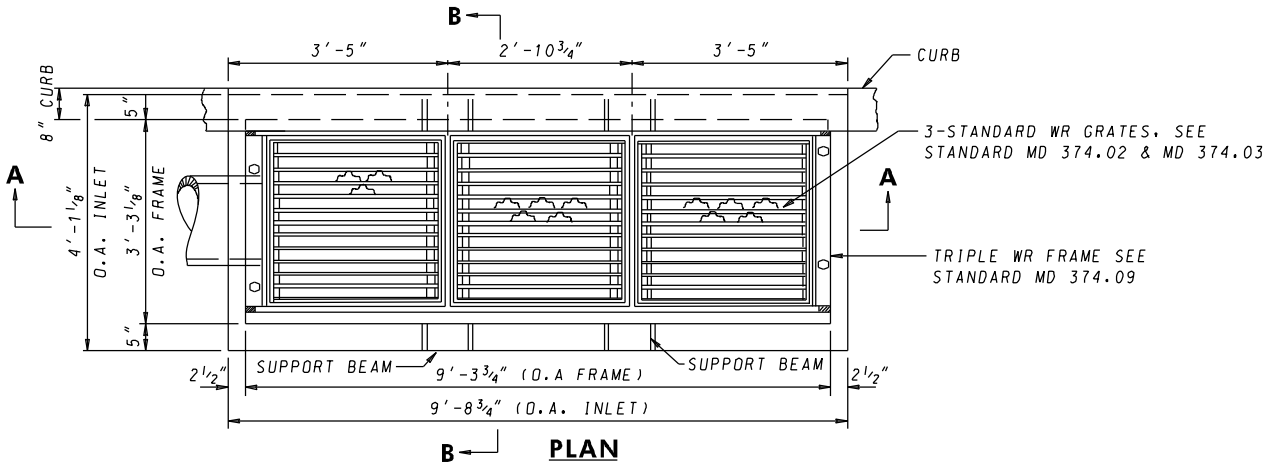
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

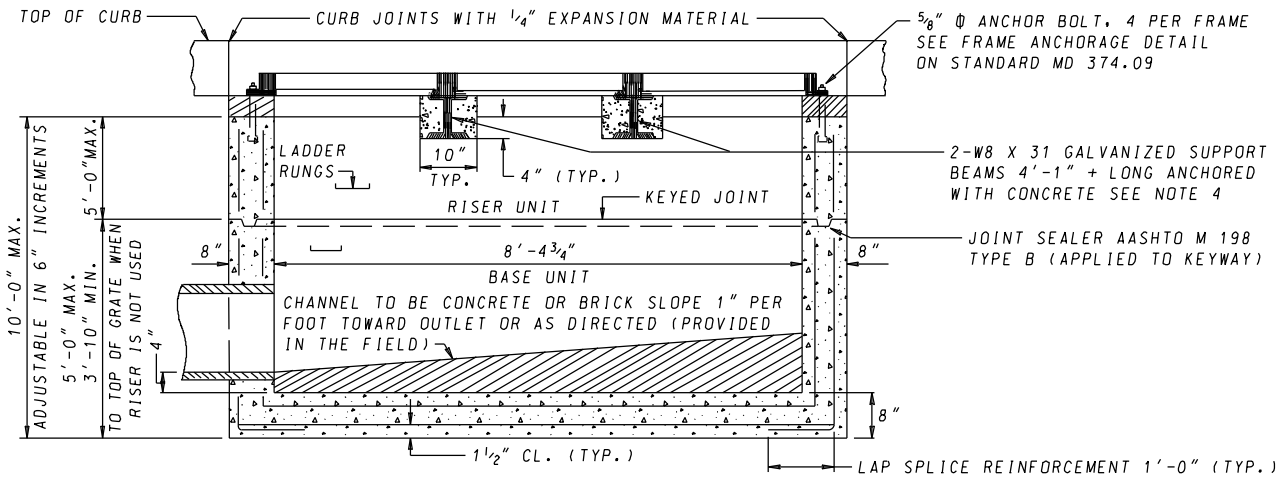
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST NRM INLET

STANDARD NO. MD 374.25

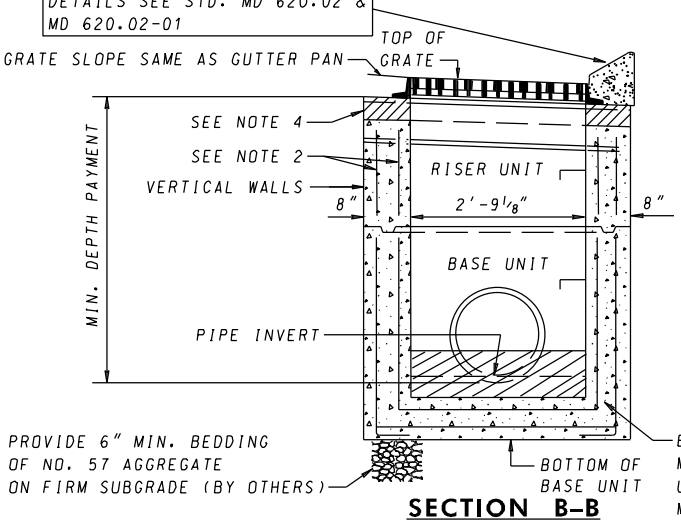


PLAN



SECTION A–A

THIS INLET TO BE USED WITH TYPE B OR C CURB. CURB PAID FOR SEPARATELY. FOR CURB DETAILS SEE STD. MD 620.02 & MD 620.02-01



SECTION B–B

NOTES

1. CONCRETE TO BE MIX NO. 6 (4500 PSI).
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W8.5 X W8.5 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W7.0 X W7.0 WELDED WIRE FABRIC.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS AND SUPPORT BEAM ANCHORAGE SHALL BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6 GRADE AND SLOPE ADJUSTMENTS SHALL BE MIN.2", MAX. 9".
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND ELEVATIONS REFER TOT HE CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 OR 383.92. RUNGS ARE INCIDENTAL TO THE COST OF THE INLET.
8. MINIMUM DEPTH PAYMENT PER EACH INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 3'-6" INCLUDING ALL APPURTENACNES.
9. BASE UNIT WALLS MAY TAPER PER MANUFACTURER'S DESIGN.
10. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

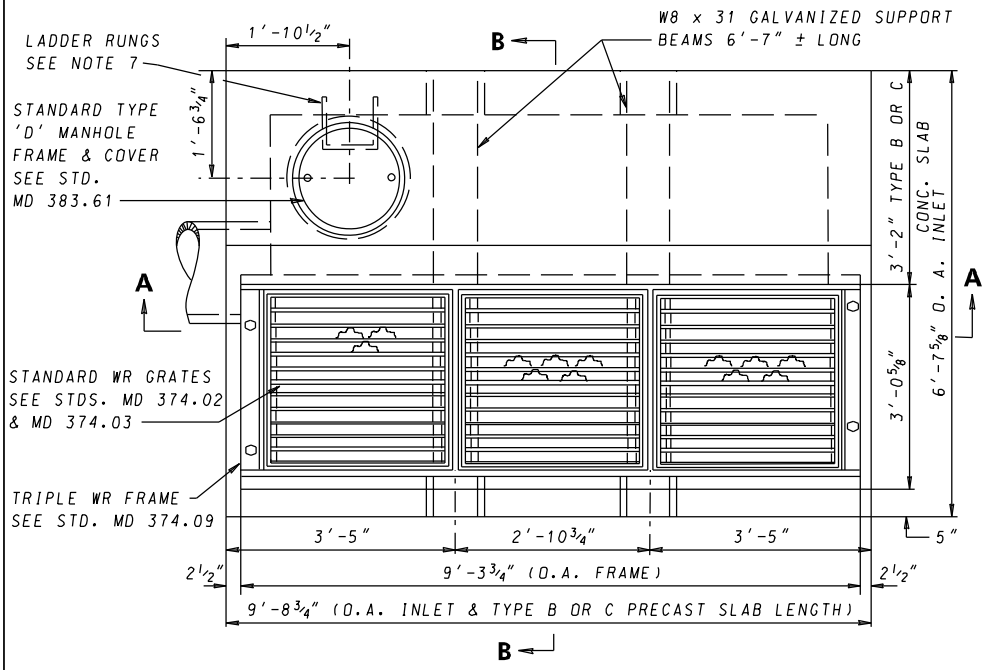
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST TRIPLE WR INLET

STANDARD NO. MD 374.26

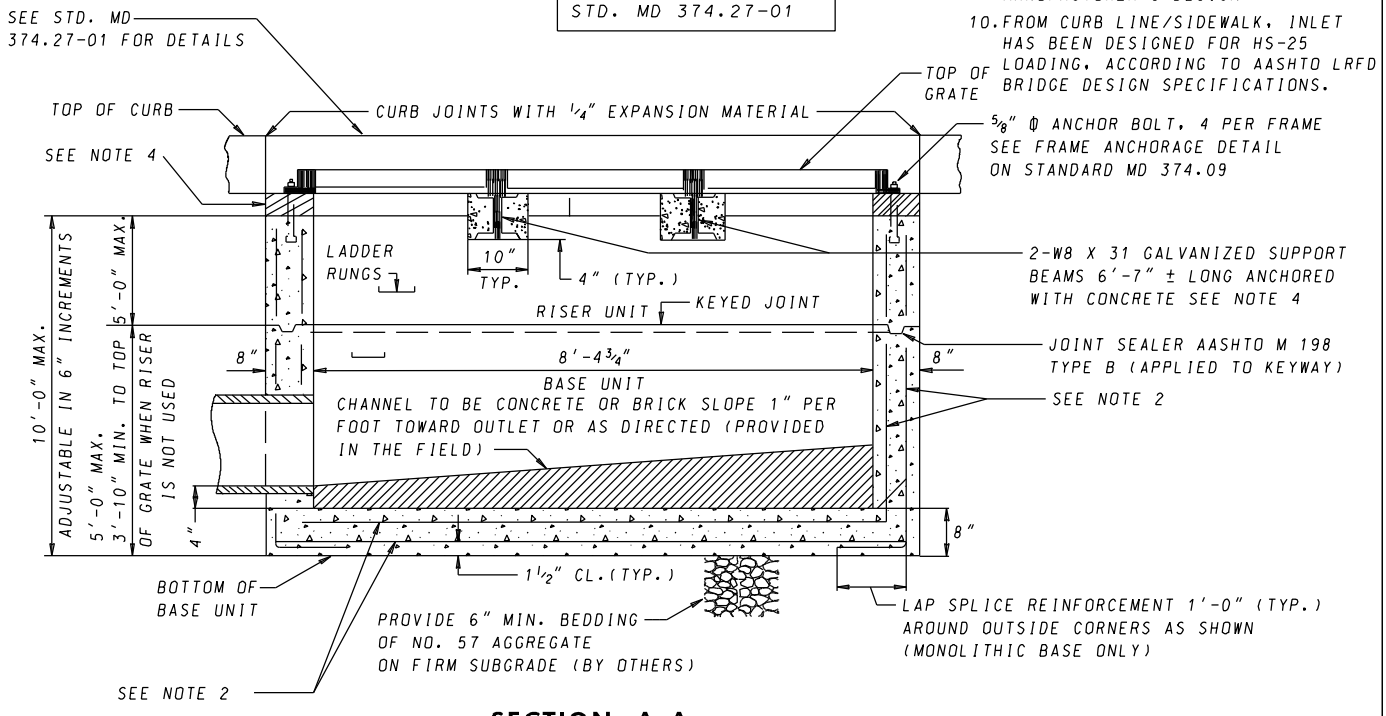
NOTES

1. CONCRETE TO BE MIX NO. 6 (4500 PSI).
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W8.5 X W8.5 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W11.0 X W11.0 WELDED WIRE FABRIC.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS AND SUPPORT BEAM ANCHORAGES SHALL BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6 GRADE AND SLOPE ADJUSTMENTS SHALL BE MIN. 2", MAX 9".
5. PIPE OPENINGS SHALL BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO THE CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STDS. MD 383.91 OR MD 383.92. RUNGS ARE INCIDENTAL TO THE COST OF THE INLET.
8. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 3'-10" MEASURED FROM THE PIPE INVERT TO THE TOP OF THE GRATE AT ITS HIGHEST POINT. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 3'-10" INCLUDING ALL APPURTENANCES.
9. BASE UNIT WALLS MAY TAPER PER MANUFACTURER'S DESIGN.
10. FROM CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.



PLAN

FOR SECTION B-B SEE STD. MD 374.27-01



SECTION A-A

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	
REVISED		REVISED	

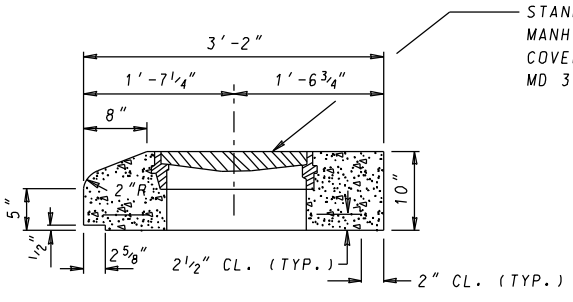
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

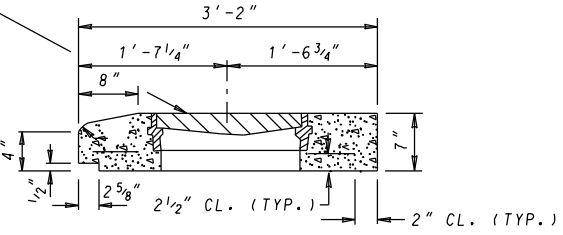
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST TRIPLE WRM INLET

STANDARD NO. MD 374.27



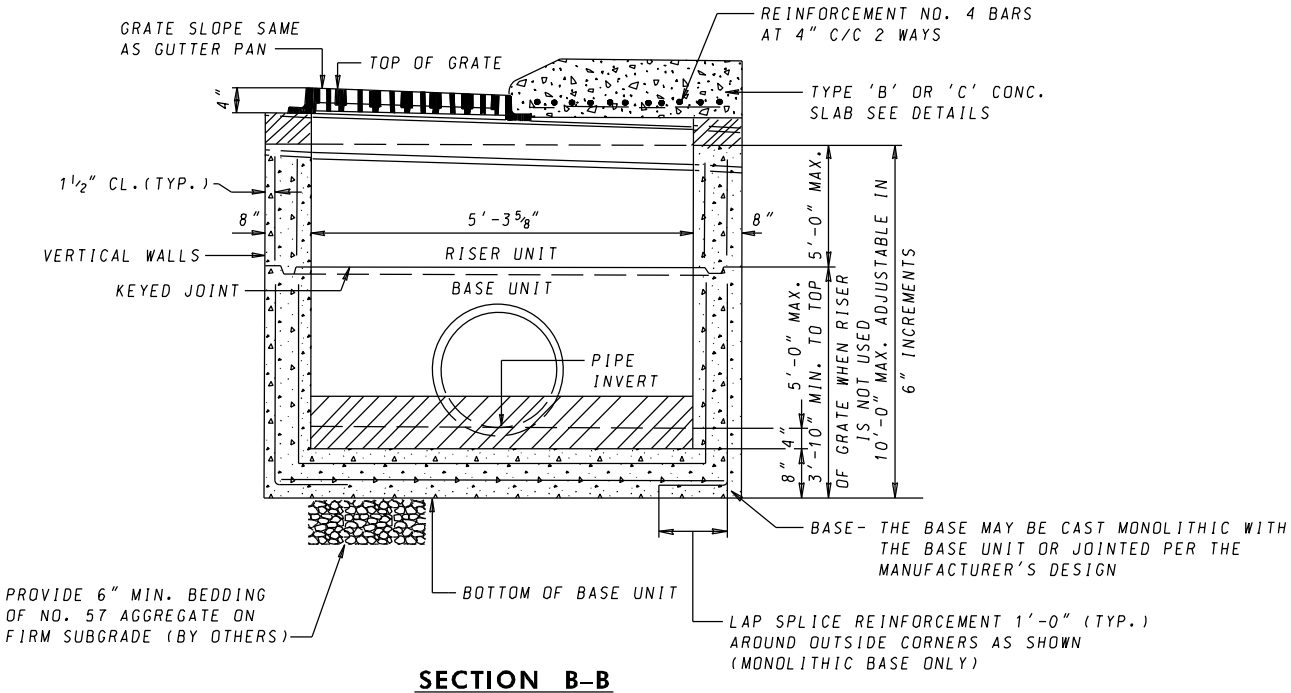
TYPE B PRECAST CONCRETE SLAB
(CONC. MIX NO. 2)



TYPE C PRECAST CONCRETE SLAB
(CONC. MIX NO. 2)

NOTE

TYPE 'B' SLAB SHALL BE USED WITH STD. TYPE 'B' CONC CURB
TYPE 'C' SLAB SHALL BE USED WITH STD. TYPE 'C' CONC CURB
FOR STANDARD CURB DETAILS SEE STD. MD 620.02.



SECTION B-B

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

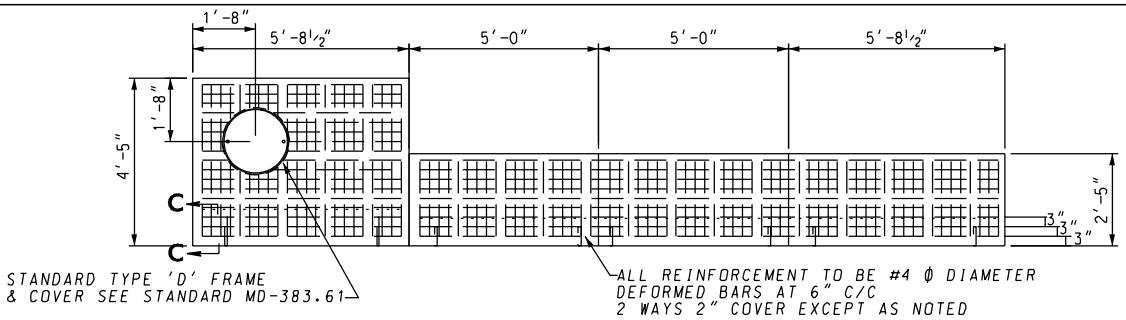
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

SHA State Highway Administration

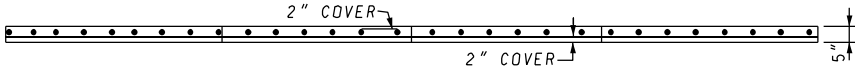
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST TRIPLE WRM INLET

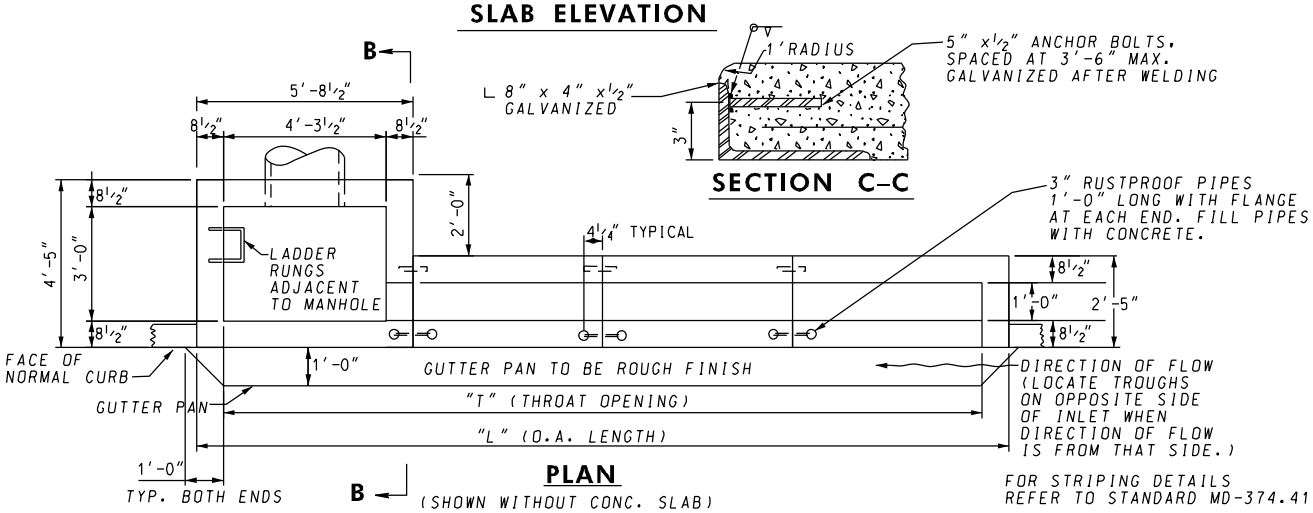
STANDARD NO. MD 374.27-01



CONCRETE SLAB



SLAB ELEVATION



SECTION C–C

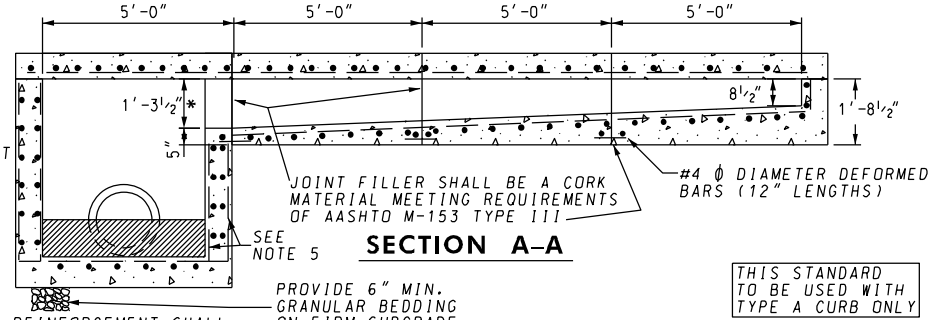
PLAN

(SHOWN WITHOUT CONC. SLAB)

FOR STRIPING DETAILS
REFER TO STANDARD MD-374.41

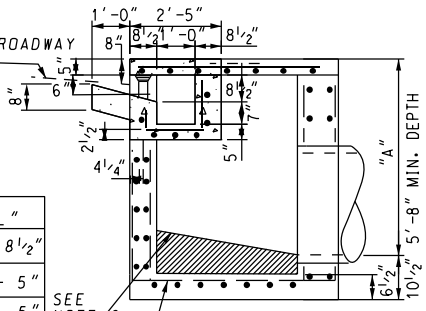
GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS
5. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3" COVER. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN THE 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
6. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
7. PLACE EXPANSION MATERIAL (SAME TYPE APPROVED FOR PAYMENT) AS INDICATED
8. ANGLES AND ANCHOR BOLTS TO BE GALVANIZED IN ACCORDANCE WITH ASTM A123 AFTER WELDING
9. INLET DEPTH MUST BE INCREASED WHEN PIPES LARGER THAN 18" AND USED UNDER THE TROUGH SECTION
10. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
11. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR A MAXIMUM DEPTH OF 15'-0"



SECTION A–A

THIS STANDARD
TO BE USED WITH
TYPE A CURB ONLY



SECTION B–B

INVERT TO SLOPE 2" PER FOOT
TOWARD OUTLET OR AS DIRECTED.

NOTE: INLET DEPTH MUST BE INCREASED WHEN PIPES LARGER THEN 18" ARE USED UNDER THE TROUGH SECTIONS.

INLET	"T"	"L"
C O G- 5	4'- 3½"	5'- 8½"
C O G- 10	10'- 0"	11'- 5"
C O G- 15	15'- 0"	16'- 5"
C O G- 20	20'- 0"	21'- 5"

* THIS DIMENSION TO BE MAINTAINED FOR ALL STANDARD COG INLETS

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-27-81	APPROVAL	6-24-81
REVISED	11-18-04	REVISED	3-30-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

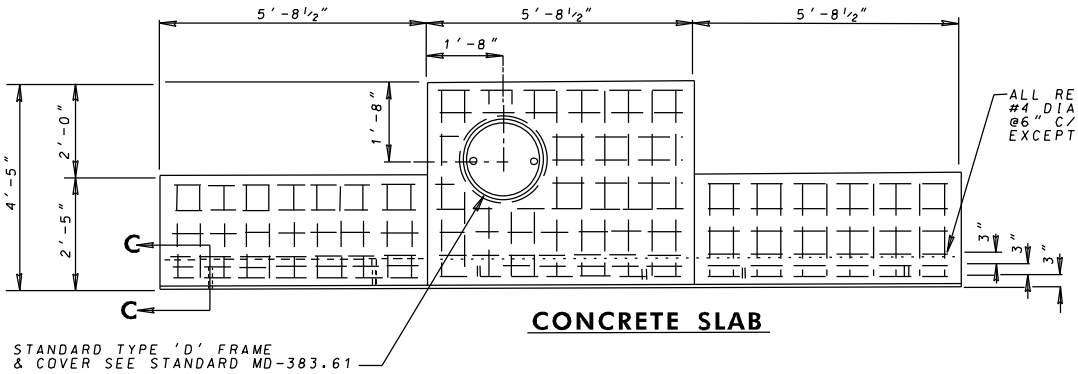
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

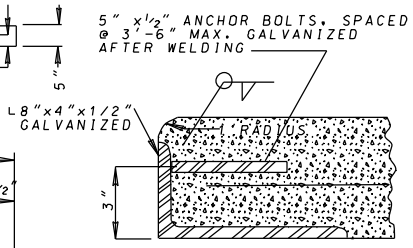
STANDARD C O G INLETS
5', 10', 15' & 20'

STANDARD NO. MD 374.31

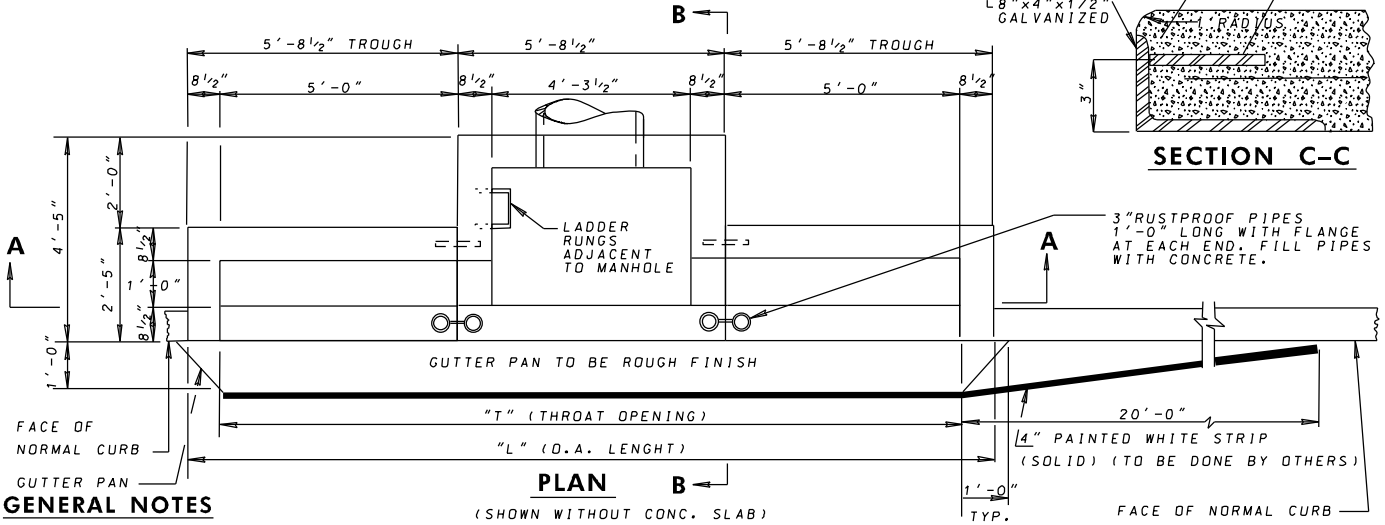


CONCRETE SLAB

SLAB ELEVATION



SECTION C–C

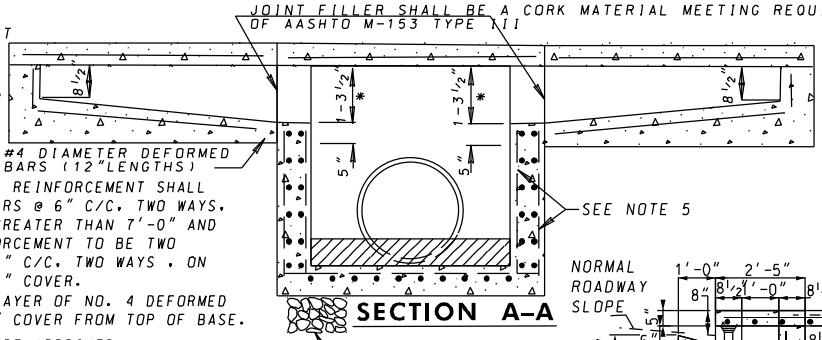


PLAN

(SHOWN WITHOUT CONC. SLAB)

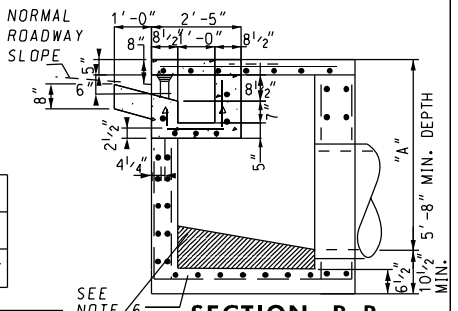
GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. CURB OPENING SHOULD NOT ENCROACH ON CROSSWALK AREAS
5. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3" COVER. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN THE 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
6. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
7. PLACE EXPANSION MATERIAL (SAME TYPE APPROVED FOR PAYMENT) AS INDICATED
8. ANGLES AND ANCHOR BOLTS TO BE GALVANIZED IN ACCORDANCE WITH ASTM A123 AFTER WELDING
9. INLET DEPTH MUST BE INCREASED WHEN PIPES LARGER THAN 18" AND USED UNDER THE TROUGH SECTION
10. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
11. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR A MAXIMUM DEPTH OF 15'-0"



SECTION A–A

INLET	"T"	"L"
COS - 5	4'-3½"	5'-8½"
COS - 15	15'-8½"	17'-1½"



SECTION B–B

INVERT TO SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED.

THIS STANDARD TO BE USED WITH TYPE A CURB ONLY

* THIS DIMENSION TO BE MAINTAINED FOR ALL STANDARD COS INLETS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-27-81	APPROVAL	6-4-81
REVISED	11-18-04	REVISED	3-30-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

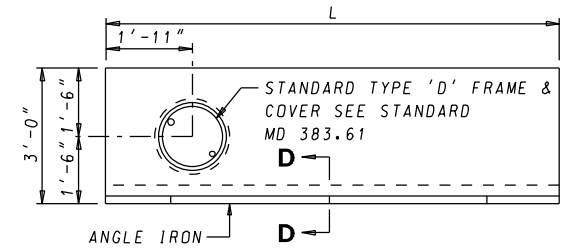
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

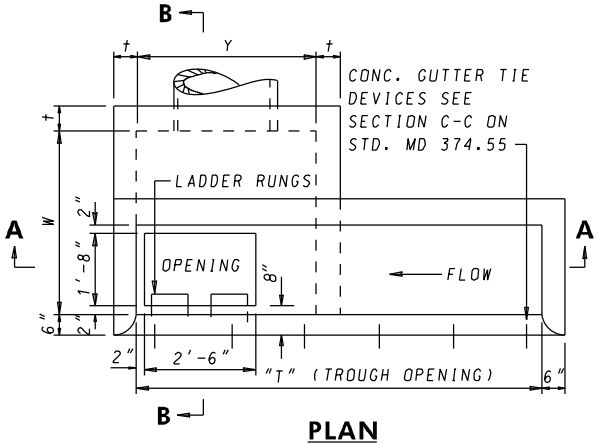
STANDARD C O S INLETS
5' & 15'

STANDARD NO. MD 374.41



PRECAST CONCRETE TROUGH SLAB

(6" THICK)

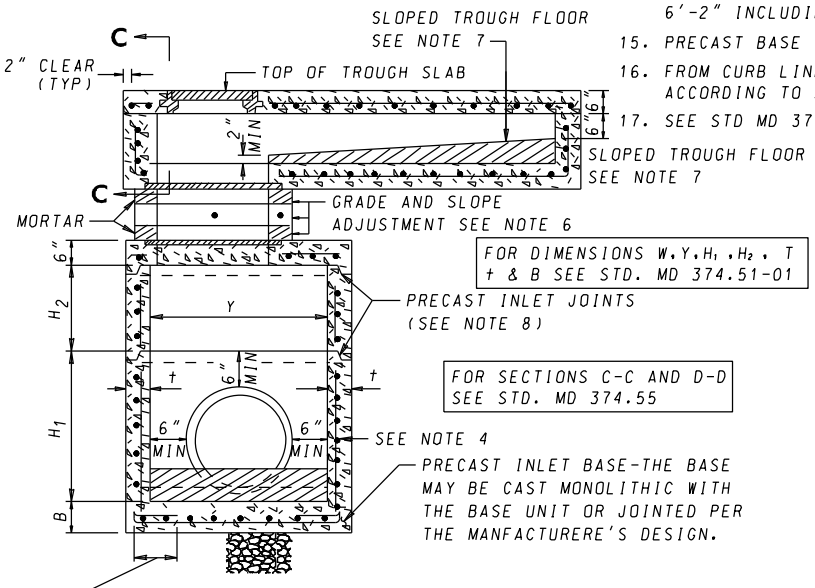


PLAN

(SHOWN WITHOUT TROUGH SLAB)

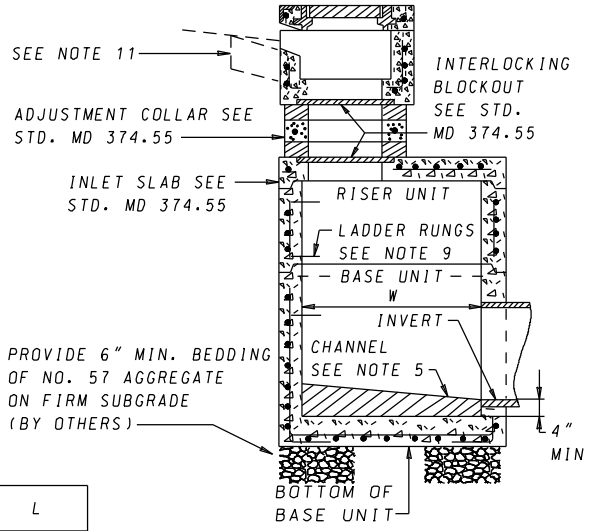
GENERAL NOTES

1. THIS STANDARD TO BE USED WITH TYPE A COMBINATION CURB AND GUTTER ONLY.
2. CURB OPENINGS SHALL NOT ENCROACH ON CROSSWALK AREAS.
3. CONCRETE SHALL BE MIX NO.6 (4500 PSI) FOR PRECAST UNITS AND MIX NO.3 (3500 PSI) FOR STRUCTURES CAST IN PLACE.
4. INLET MAY BE PRECAST OR CAST IN PLACE. ON WALLS, REINFORCEMENT SHALL BE AS SHOWN ON STD MD 351.52-01 TABLE WITH 1½" COVER FOR WELDED WIRE FABRIC (PRECAST) OR 2" COVER FOR DEFORMED BARS (CAST IN PLACE). ON BASE, REINFORCEMENT SHALL BE AS SHOWN ON MD STD. 374.51-01 TABLE WITH 1½" COVER (PRECAST) AND 2" COVER (CAST IN PLACE) FROM TOP OF BASE.
5. A CONCRETE OR BRICK CHANNEL WHICH SLOPES AT LEAST 2 IN./FT TOWARD THE OUTLET SHALL BE PROVIDED IN THE FIELD.
6. GRADE AND SLOPE ADJUSTMENTS SHALL BE COMPLETED IN THE FIELD USING PRECAST ADJUSTMENT COLLAR AND MORTAR.
7. SLOPED TROUGH FLOOR TO BE CAST IN THE FIELD AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED, ROUGHEN PRECAST TROUGH FLOOR.
8. PRECAST INLET JOINTS- THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO APPROVED SEALANT.
9. LADDER RUNGS SHALL BE PLACED IN VERTICAL ALIGNMENT AT 1'-3" C/C. RUNG TYPE SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR MD 383.92. RUNGS ARE INCIDENTAL TO THE COST OF THE INLET.
10. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVINIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123. SEE STD. MD 374.55 & MD 374.64.
11. SEE STANDARD MD 374.65 FOR DEPRESSED GUTTER PAN.
12. SEE STANDARD MD 374.64 FOR ALTERNATE PRECAST COG TROUGHS.
13. PAY MEASUREMENTS FOR CAST IN PLACE UNIT SHALL BE THE SAME AS THE PRECAST UNIT. REFER TO NOTE 14. ALL OTHER DIMENSIONS SHOWN FOR PRECAST SHALL APPLY TO CAST IN PLACE.
14. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 6'-2" MEASURED FROM THE PIPE INVERT TO THE TOP OF THE TROUGH SLAB. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 6'-2" INCLUDING ALL APPURTENANCES.
15. PRECAST BASE UNIT WALLS MAY TAPER PER MANUFACTURER'S DESIGN.
16. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LFRD BRIDGE DESIGN SPECIFICATIONS.
17. SEE STD MD 374.51-01 FOR PIPE / PRECAST DIMENSIONS TABLE.



SECTION A–A

(SHOWN AS PRECAST)



SECTION B–B

(SHOWN AS PRECAST)

INLET TYPE	T	L
COG - 5	5'- 0"	6'- 0"
COG - 10	10'- 0"	11'- 0"
COG - 15	15'- 0"	16'- 0"
COG - 20	20'- 0"	21'- 0"

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED

DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-21-91
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	-	REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COG INLETS 5', 10', 15' & 20'

STANDARD NO. MD 374.51

PIPE SIZE MIN. TO MAX.	W	Alt. W	Y	H_1 BASE	H_2 RISER	t MIN.	WALL REINFORCING		B	BASE REINFORCING		Min. Distance - (ft.) Top of Curb - Pipe Invert
							CAST IN PLACE DEFORMED BARS	PRECAST WWR		CAST IN PLACE DEFORMED BARS	PRECAST WWR	
12"	4'-0"		4'-0"	2' to 10'	1' to 5'	6"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W5.0xW5.0	7.5"	NO. 4@6"C/C. 1 LAYER	4X4.W7.0XW7.0	3.84
15" - 24"	4'-0"		4'-0"	3' to 10'	1' to 5'	6"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W5.0xW5.0	7.5"	NO. 4@6"C/C. 1 LAYER	4X4.W7.0XW7.0	4.11-4.92
27" - 33"	4'-0"		4'-0"	4' to 10'	1' to 5'	6"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W5.0xW5.0	7.5"	NO. 4@6"C/C. 1 LAYER	4X4.W7.0XW7.0	5.19-5.73
36"	4'-0"		4'-0"	5' to 10'	1' to 5'	6"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W5.0xW5.0	7.5"	NO. 4@6"C/C. 1 LAYER	4X4.W7.0XW7.0	6.00
42"	4'-0"	6'-0"	6'-0"	5' to 10'	1' to 5'	7"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W7.0xW7.0	8.5"	NO. 4@6"C/C. 1 LAYER	4X4.W10.5XW10.5	6.55
48" - 54"	4'-0"	6'-0"	6'-0"	6' to 10'	1' to 5'	7"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W7.0xW7.0	8.5"	NO. 4@6"C/C. 1 LAYER	4X4.W10.5XW10.5	7.09-7.63
60"	4'-0"		6'-0"	7' to 10'	1' to 5'	7"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W7.0xW7.0	8.5"	NO. 4@6"C/C. 1 LAYER	4X4.W10.5XW10.5	8.17
66" - 72"	6'-0"		8'-0"	8' to 10'	1' to 5'	8½"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W10.0xW10.0	9.5"	NO. 4@6"C/C. 1 LAYER	4X4.W12.0XW12.0	8.71-9.25
78" - 84"	6'-0"		8'-0"	9' to 10'	1' to 5'	8½"	NO. 4 @ 6" C/C. 2 LAYERS	4x4, W10.0xW10.0	9.5"	NO. 4@6"C/C. 1 LAYER	4X4.W12.0XW12.0	9.80-10.34

CAST IN PLACE/PRECAST DIMENSIONS

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

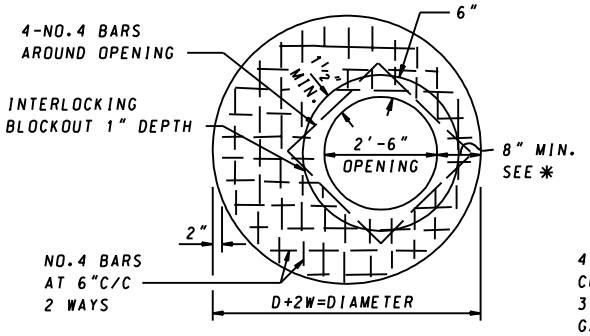
SHA State Highway Administration	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
	APPROVAL 10-7-14	APPROVAL 9-29-14
	REVISED	REVISED
	REVISED	REVISED
	REVISED	REVISED

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

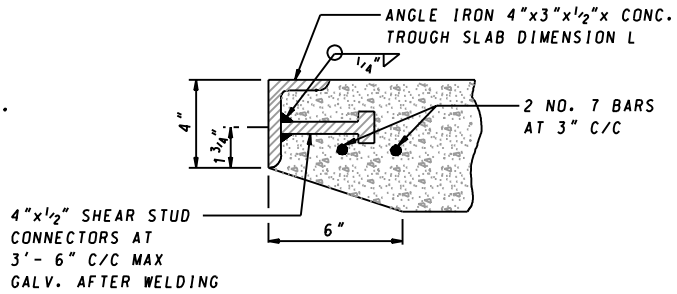
PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COG INLETS 5', 10', 15' & 20'

STANDARD NO. MD 374.51-01



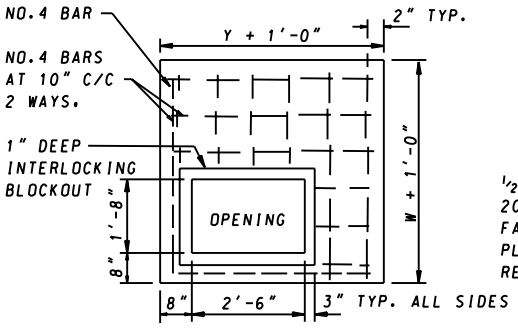
PRECAST CONCRETE INLET SLAB FOR CIRCULAR COG & COS INLETS

* THIS DIMENSION FOR THE 96" AND THE 108" DIAMETER INLETS SHALL BE THE SAME AS THE WALL THICKNESS SEE STD. MD 374.62 OR MD 374.63.



SECTION D-D

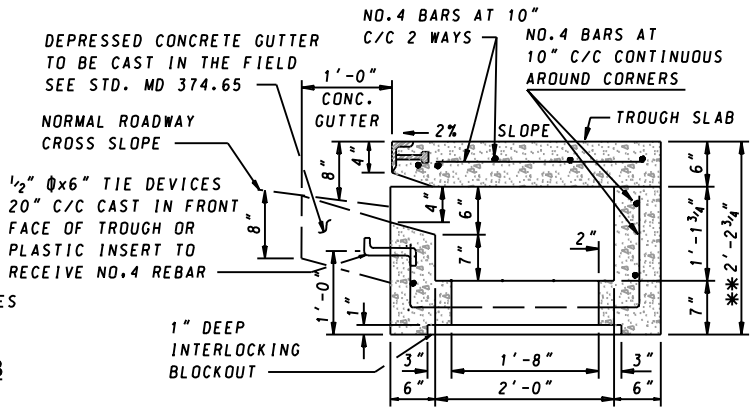
SEE STDS. MD 374.51, MD 374.61, MD 374.62 OR MD 374.63



PRECAST CONCRETE INLET SLAB FOR SQUARE & RECTANGULAR COG & COS INLETS

(6" THICK)

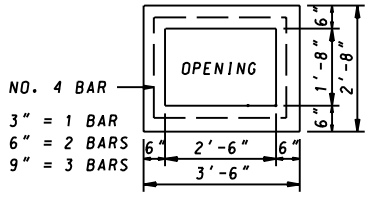
SEE STD. MD 374.51 OR 375.61



SECTION C-C

SEE STDS. MD 374.51, MD 374.61, MD 374.62 OR MD 374.63

** HEIGHT OF THE BACK WALL IS ¾" HIGHER THAN THE FRONT WALL DUE TO 2% SLOPE ON THE TOP TROUGH SLAB.



PRECAST CONCRETE ADJUSTMENT COLLAR FOR SQUARE, RECTANGULAR AND CIRCULAR INLETS

(CAST IN 3", 6", & 9" THICKNESS)

SEE STD. MD 374.51 OR MD 374.61

DETAILS FOR COG & COS INLETS ARE SHOWN ON THE FOLLOWING STANDARDS

MD 374.51 PRECAST OR CAST IN PLACE SQUARE & RECTANGULAR COG INLETS 5', 10', 15', & 20'
MD 374.61 PRECAST OR CAST IN PLACE SQUARE & RECTANGULAR COS INLETS 5', 10', 15', & 20'
MD 374.62 PRECAST CIRCULAR COG INLETS 5', 10', 15', & 20'
MD 374.63 PRECAST CIRCULAR COS INLETS 5', 10', 15', & 20'
MD 374.64 ALTERNATE PRECAST TROUGHS FOR COG AND COS INLETS
MD 374.65 DEPRESSED GUTTER PAN FOR COG & COS INLETS

NOTES

1. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
2. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

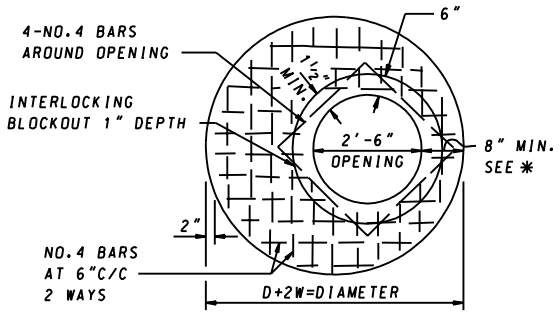
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

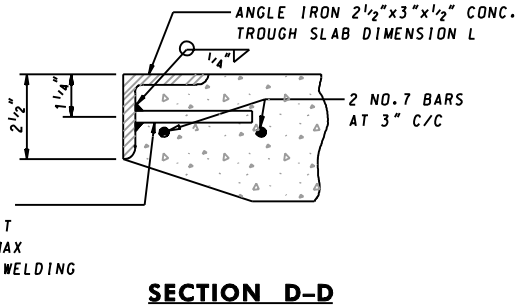
PRECAST CONCRETE INLET SLABS AND ADJUSTMENT COLLARS FOR COG AND COS INLETS

STANDARD NO. MD 374.55



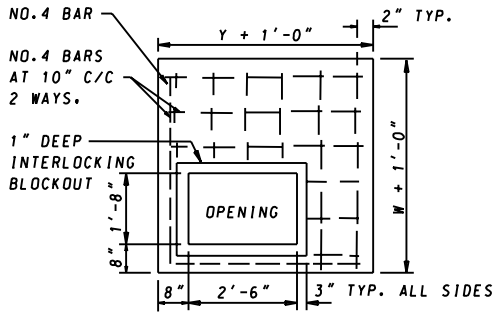
PRECAST CONCRETE INLET SLAB FOR CIRCULAR COG & COS INLETS

✱ THIS DIMENSION FOR THE 96" AND THE 108" DIAMETER INLETS SHALL BE THE SAME AS THE WALL THICKNESS SEE STD. MD 374.62 OR MD 374.63.



SECTION D-D

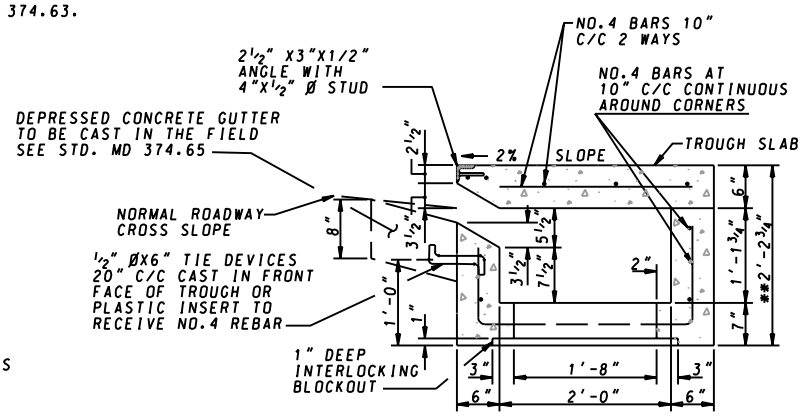
SEE STDS. MD 374.51. MD 374.61. MD 374.62 OR MD 374.63



PRECAST CONCRETE INLET SLAB FOR SQUARE & RECTANGULAR COG & COS INLETS

(6" THICK)

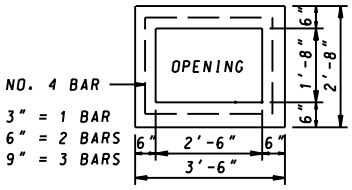
SEE STD. MD 374.51 OR 375.61



SECTION C-C

SEE STDS. MD 374.51. MD 374.61. MD 374.62 OR MD 374.63

✱✱ HEIGHT OF THE BACK WALL IS ¾" HIGHER THAN THE FRONT WALL DUE TO 2% SLOPE ON THE TOP TROUGH SLAB.



PRECAST CONCRETE ADJUSTMENT COLLAR FOR SQUARE, RECTANGULAR AND CIRCULAR INLETS

(CAST IN 3", 6", & 9" THICKNESS)

SEE STD. MD 374.51 OR MD 374.61

DETAILS FOR COG & COS INLETS ARE SHOWN ON THE FOLLOWING STANDARDS

MD 374.51 PRECAST OR CAST IN PLACE SQUARE & RECTANGULAR COG INLETS 5', 10', 15', & 20'
MD 374.61 PRECAST OR CAST IN PLACE SQUARE & RECTANGULAR COS INLETS 5', 10', 15', & 20'
MD 374.62 PRECAST OR CAST IN PLACE CIRCULAR COG INLETS 5', 10', 15', & 20'
MD 374.63 PRECAST OR CAST IN PLACE CIRCULAR COS INLETS 5', 10', 15', & 20'
MD 374.64 ALTERNATE PRECAST TROUGHS FOR COG AND COS INLETS
MD 374.65 DEPRESSED CONCRETE GUTTER PAN FOR COG & COS INLETS

NOTES

1. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
2. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

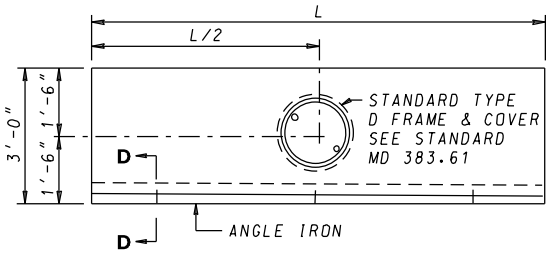
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-25-03	APPROVAL	5-5-03
REVISED		REVISED	
REVISED		REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

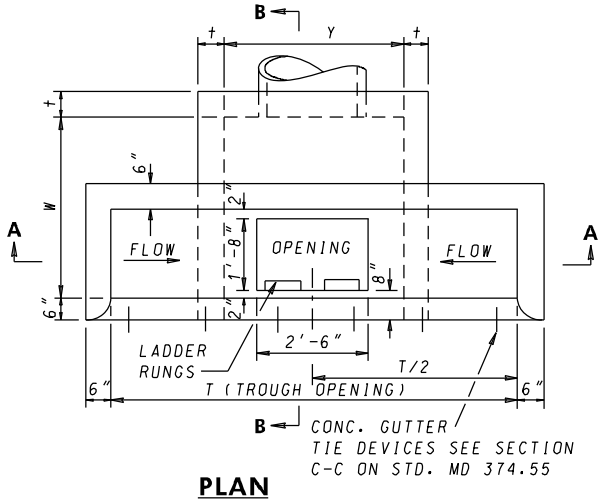
PRECAST CONCRETE INLET SLABS AND ADJUSTMENT COLLARS FOR COG/COS INLETS TO ACCOMODATE 6" CURB

STANDARD NO. MD 374.55-01



PRECAST CONCRETE TROUGH SLAB

(6"THICK)

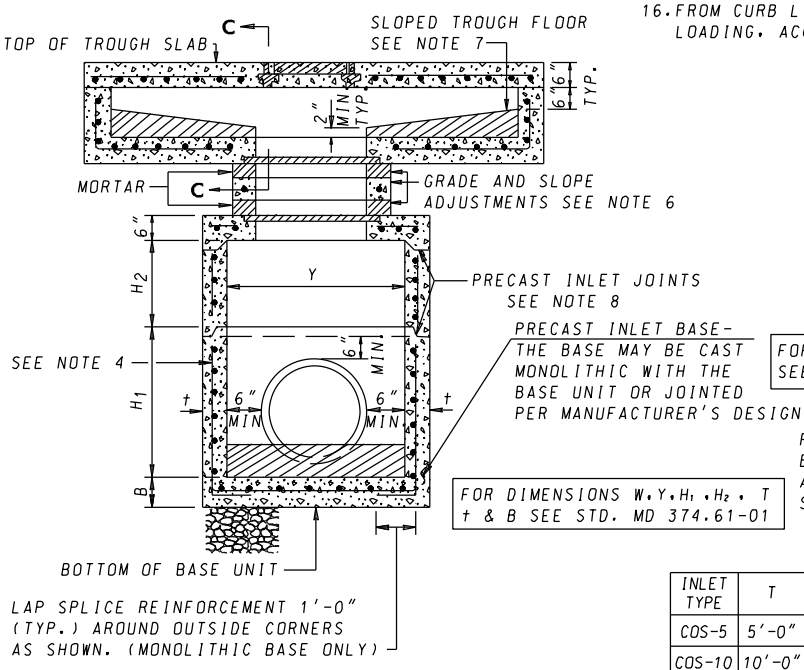


PLAN

(SHOWN WITHOUT TROUGH SLAB)

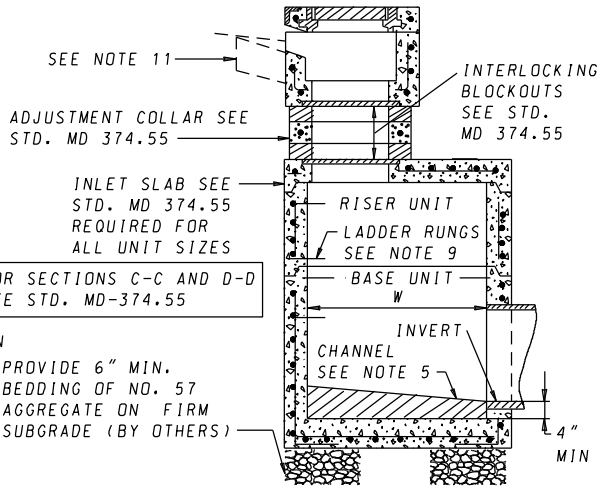
NOTES

1. THIS STANDARD TO BE USED WITH TYPE A COMBINATION CURB AND GUTTER ONLY.
2. CURB OPENINGS SHALL NOT ENCROACH ON CROSSWALK AREAS.
3. CONCRETE SHALL BE MIX NO.6 (4500 PSI) FOR PRECAST UNITS AND CONCRETE MIX NO.3 (3500 PSI) FOR CAST IN PLACE UNITS.
4. INLET MAY BE PRECAST OR CAST IN PLACE. ON WALLS, REINFORCEMENT SHALL BE AS SHOWN ON TABLE (STD MD 379.61.01) WITH 2"COVER FOR WELDED WIRE FABRIC (PRECAST) OR 2" COVER FOR DEFORMED BARS (CAST IN PLACE). ON BASE, REINFORCEMENT SHALL BE AS SHOWN ON STD MD 374.61-01 WITH 1½" COVER (PRECAST) AND 2" COVER (CAST IN PLACE)FROM TOP OF BASE.
5. A CONCRETE OR BRICK CHANNEL WHICH SLOPES AT LEAST 2 IN./FT TOWARD THE OUTLET SHALL BE PROVIDED IN THE FIELD.
6. GRADE AND SLOPE ADJUSTMENTS SHALL BE COMPLETED IN THE FIELD USING PRECAST ADJUSTMENT COLLAR AND MORTAR.
7. SLOPED TROUGH FLOOR TO BE CAST IN THE FIELD AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED, ROUGHEN PRECAST TROUGH FLOOR.
8. PRECAST INLET JOINTS-THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO APPROVED SEALANT.
9. LADDER RUNGS SHALL BE PLACED IN VERTICAL ALIGNMENT AT 1'-3" C/C. RUNGS ARE INCIDENTAL TO THE COST OF THE INLET.
10. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123. SEE STDS. MD 374.55 & MD 374.64.
11. SEE STANDARD MD 374.65 FOR DEPRESSED GUTTER PAN.
12. SEE STANDARD MD 374.64 FOR ALTERNATE PRECAST COS TROUGHS.
13. PAY MEASUREMENTS FOR CAST IN PLACE UNIT SHALL BE THE SAME AS THE PRECAST UNIT. REFER TO NOTE 14. ALL OTHER DIMENSIONS SHOWN FOR PRECAST UNIT SHALL APPLY TO CAST IN PLACE UNIT.
14. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 6'-2" MEASURED FROM THE PIPE INVERT TO THE TOP OF THE TROUGH SLAB. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 6'-2" INCLUDING ALL APPURTENANCES.
15. PRECAST BASE UNIT WALLS MAY TAPER PER MANUFACTURER'S DESIGN.
16. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LFRD BRIDGE DESIGN SPECIFICATIONS.



SECTION A-A

(SHOWN AS PRECAST)



SECTION B-B

(SHOWN AS PRECAST)

INLET TYPE	T	L
COS-5	5'-0"	6'-0"
COS-10	10'-0"	11'-0"
COS-15	15'-0"	16'-0"
COS-20	20'-0"	21'-0"

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED

DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	-	REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COS INLETS 5', 10', 15' & 20'

STANDARD NO. MD 374.61

PIPE SIZE MIN. TO MAX.	CAST IN PLACE/PRECAST DIMENSIONS													Min. Distance - (ft.) Top of Curb - Pipe Invert
	W	Alt. W	Y	H_1 BASE	H_2 RISER	t MIN.	WALL REINFORCEMENT				B	BASE REINFORCEMENT		
							CAST IN PLACE DEFORMED BARS		PRECAST WWR			CAST IN PLACE DEFORMED BARS	PRECAST WWR	
12"	4'-0"		4'-0"	2' to 10'	1 to 5'	6	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W5.0xW5.0		7.5"	NO.4@6"C/C,1 LAYER	4X4,W7.0XW7.0	3.84
15" - 24"	4'-0"		4'-0"	3' to 10'	1 to 5'	6	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W5.0xW5.0		7.5"	NO.4@6"C/C,1 LAYER	4X4,W7.0XW7.0	4.11-4.92
27" - 33"	4'-0"		4'-0"	4' to 10'	1 to 5'	6	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W5.0xW5.0		7.5"	NO.4@6"C/C,1 LAYER	4X4,W7.0XW7.0	5.19-5.73
36"	4'-0"		4'-0"	5' to 10'	1 to 5'	6	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W5.0xW5.0		7.5"	NO.4@6"C/C,1 LAYER	4X4,W7.0XW7.0	6.00
42"	4'-0"	6'-0"	6'-0"	5' to 10'	1 to 5'	7	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W7.0xW7.0		8.5"	NO.4@6"C/C,1 LAYER	4X4,W10.5XW10.5	6.55
48" - 54"	4'-0"	6'-0"	6'-0"	6' to 10'	1 to 5'	7	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W7.0xW7.0		8.5"	NO.4@6"C/C,1 LAYER	4X4,W10.5XW10.5	7.09-7.63
60"	4'-0"		6'-0"	7' to 10'	1 to 5'	7	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W7.0xW7.0		8.5"	NO.4@6"C/C,1 LAYER	4X4,W10.5XW10.5	8.17
66" - 72"	6'-0"		8'-0"	8' to 10'	1 to 5'	8.5	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W10.0xW10.0		9.5"	NO.4@6"C/C,1 LAYER	4X4,W12.0XW12.0	8.71-9.25
78" - 84"	6'-0"		8'-0"	9' to 10'	1 to 5'	8.5	NO. 4 @ 6" C/C, 2 LAYERS		4x4, W10.0xW10.0		9.5"	NO.4@6"C/C,1 LAYER	4X4,W12.0XW12.0	9.80-10.34

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED

DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 10-7-14	APPROVAL 9-29-14
REVISED	REVISED
REVISED	REVISED
REVISED	REVISED

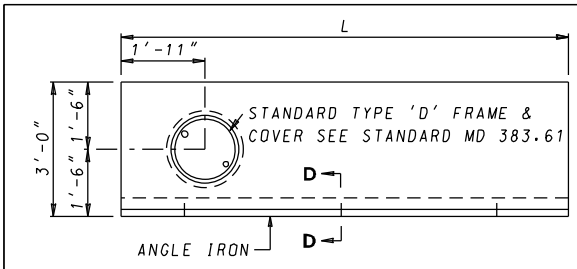
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

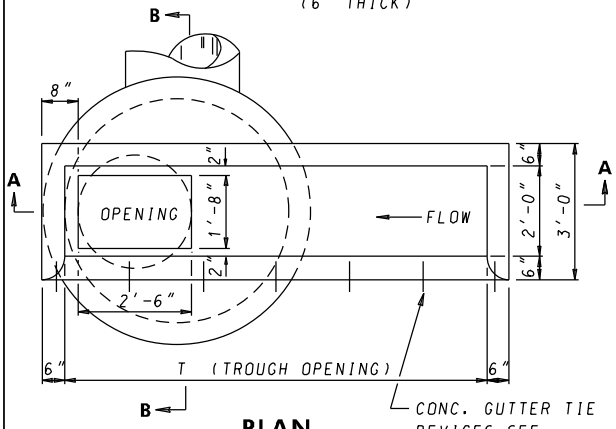
PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COS INLETS 5', 10', 15' & 20'

STANDARD NO. MD 374.61-01



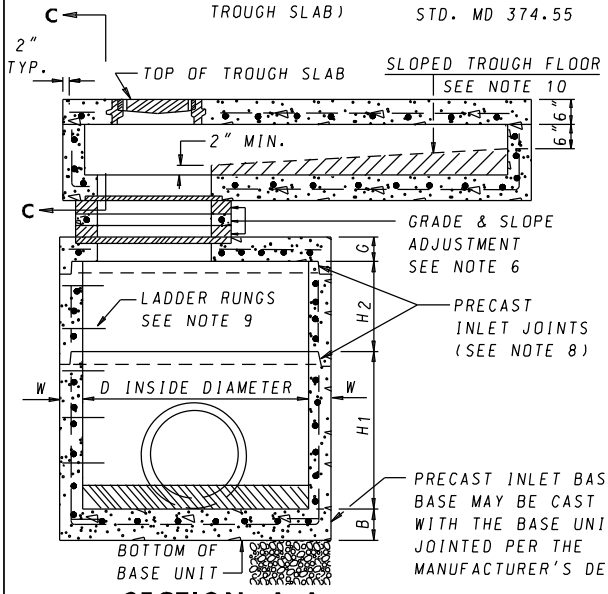
PRECAST CONCRETE TROUGH SLAB

(6" THICK)



PLAN

(SHOWN WITHOUT TROUGH SLAB)



SECTION A-A

(SHOWN PRECAST)

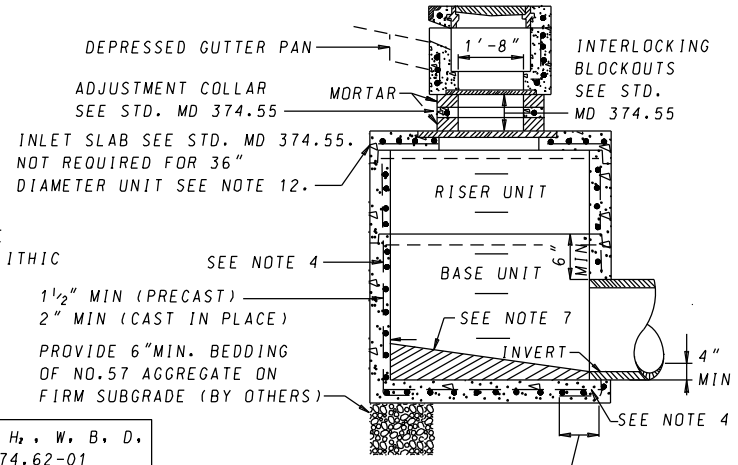
FOR SECTIONS C-C AND D-D SEE STD MD 374.55

INLET TYPE	T	L
COG-5	5'-0"	6'-0"
COG-10	10'-0"	11'-0"
COG-15	15'-0"	16'-0"
COG-20	20'-0"	21'-0"

FOR DIMENSIONS H_1, H_2, W, B, D, AND G SEE STD MD 374.62-01

NOTES

1. THIS STANDARD TO BE USED WITH TYPE A COMBINATION CURB AND GUTTER ONLY.
2. CURB OPENINGS SHALL NOT ENCROACH ON CROSSWALK AREAS.
3. CONCRETE SHALL BE MIX. NO.6(4500 PSI) FOR PRECAST UNITS AND CONCRETE MIX NO.3(3500 PSI) FOR CAST IN PLACE UNITS.
4. INLET MAY BE PRECAST OR CAST IN PLACE. REINFORCEMENT SHALL BE EITHER WELDED WIRE FABRIC (PRECAST) OR REINFORCING BARS (CAST IN PLACE)AND SHALL CONFORM TO THE AREAS GIVEN UNDER IN THE CHART ON STD MD 374.62-01. WALL REINFORCEMENT SHALL BE CENTERED AT THE MIDDLE OF THE WALL. BASE REINFORCEMENT SHALL HAVE 1½" COVER (PRECAST) AND 2" COVER (CAST IN PLACE) FROM THE TOP OF THE BASE.
5. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVANIZED AFTER AFTER WELDING IN ACCORDANCE WITH ASTM A 123. SEE STDS. MD 374.55 & 374.64.
6. GRADE AND SLOPE ADJUSTMENTS SHALL BE COMPLETED IN THE FIELD USING PRECAST ADJUSTMENT COLLAR AND MORTAR.
7. A CONCRETE OR BRICK CHANNEL WHICH SLOPES AT LEAST 2 IN./FT. TOWARD OUTLET SHALL BE PROVIDED IN THE FIELD.
8. PRECAST INLET JOINTS-THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING THE MANUFACTURERS RECOMMENDED ASTM OR AASHTO APPROVED SEALANT.
9. LADDER RUNGS SHALL BE PLACED IN VERTICAL ALIGNMENT AT 1'-3" C/C. RUNGS SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR MD 383.92. RUNGS ARE INCIDENTAL TO THE COST OF THE INLET.
10. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS.WHEN SLOPED TROUGH FLOOR IS USED, ROUGHEN PRECAST TROUGH FLOOR.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 6'-2" MEASURED FROM THE PIPE INVERT TO THE TOP OF THE TROUGH SLAB. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 6'-2" INCLUDING ALL APPURTENANCES.
12. INLET SLAB NOT REQUIRED FOR 36" DIAMETER INLET. TROUGH SITS DIRECTLY ON TOP OF THE CIRCULAR UNIT. MORTAR AREA BETWEEN THE OUTSIDE WALLS OF THE TROUGH AND THE UNIT WALL.
13. SEE STD. MD 374.64 FOR ALTERNATE PRECAST COG TROUGHS AND STD. MD 374.65 FOR DEPRESSED GUTTER PAN DETAILS.
14. BASE UNIT WALLS MAY TAPER PER MANUFACTURER'S DESIGN.
15. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.



SECTION B-B

(SHOWN PRECAST)

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____ DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST OR CAST IN PLACE CIRCULAR COG INLETS 5', 10', 15', & 20'

STANDARD NO. MD 374.62

CIRCULAR BASE AND RISER UNIT DIMENSIONS										INLET SLAB	
PIPE SIZE MIN. TO MAX.	H_1 BASE	H_2 RISER	W	WALL AREA STEEL IN^2/FT	MAX. SPACING IN.	B	BASE AREA STEEL IN^2/FT	MAX. SPACING IN.	D	G	Min. Distance, ft. Top of Curb - Pipe Invert
12"	2' TO 4'	1' TO 4'	4"	.09	12"	6.5"	.15	6"	36"	NOT REQ.	3.84
15" TO 24"	3' TO 5'	1' TO 5'	5"	.12	12"	6.5"	.18	6"	48"	8"	4.11-4.92
27" TO 33"	3' TO 6'	1' TO 6'	6"	.15	12"	6.5"	.27	6"	60"	8"	5.19-5.73
36"	5' TO 6'	1' TO 6'	6"	.15	12"	6.5"	.27	6"	60"	8"	6.00
42"	5' TO 7'	1' TO 7'	7"	.18	11"	7.5"	.30	6"	72"	8"	6.55
48"	6' TO 7'	1' TO 7'	7"	.18	11"	7.5"	.30	6"	72"	8"	7.09
54"	6' TO 8'	1' TO 8'	8"	.21	8"	9.5"	.36	6"	84"	8"	7.63
60"	7' TO 8'	1' TO 8'	8"	.21	8"	9.5"	.36	6"	84"	8"	8.17
66" TO 72"	8' TO 9'	1' TO 8'	9"	.24	7"	9.5"	.40	6"	96"	8"	8.71-9.25
78" TO 84"	9' TO 10'	1' TO 8'	10"	.27	4"	12.5"	.40	6"	120"	8"	9.80-10.34

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
REVISIONS		
	APPROVAL 10-7-14	APPROVAL 9-29-14
	REVISED	REVISED
	REVISED	REVISED
	REVISED	REVISED

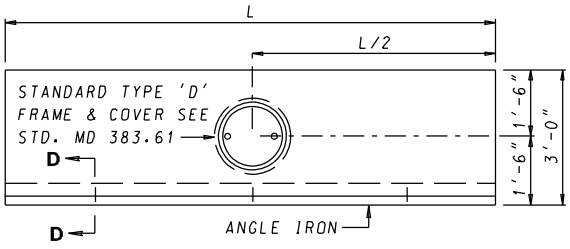
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

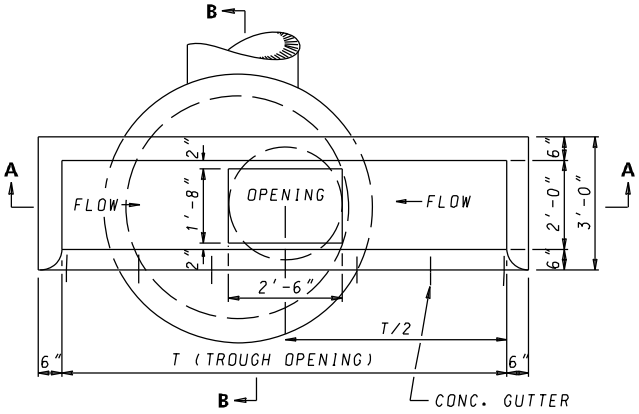
PRECAST OR CAST IN PLACE CIRCULAR COG/COS INLETS 5', 10', 15', & 20'

STANDARD NO. MD 374.62-01



PRECAST CONCRETE TROUGH SLAB

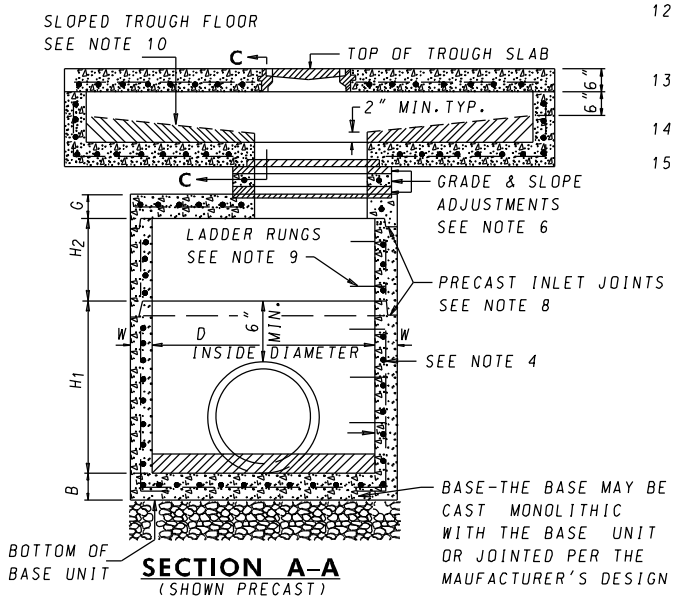
(6" THICK)



PLAN

NOTES

1. THIS STANDARD TO BE USED WITH TYPE A COMBINATION CURB AND GUTTER ONLY.
2. CURB OPENING SHALL NOT ENCROACH ON CROSSWALK AREAS.
3. CONCRETE TO BE MIX NO.6 (4500 PSI) FOR PRECAST UNITS AND CONCRETE MIX NO.3 (3500 PSI) FOR STRUCTURES CAST IN PLACE.
4. INLET MAY BE PRECAST OR CAST IN PLACE. REINFORCEMENT SHALL BE EITHER WELDED WIRE FABRIC (PRECAST) OR REINFORCING BARS (CAST IN PLACE) AND SHALL CONFORM TO THE AREAS AND SPACING GIVEN IN THE TABLE ON STD MD 374.62-01. WALL REINFORCEMENT SHALL BE CENTERED AT THE MIDDLE OF THE WALL. BASE REINFORCEMENT SHALL HAVE 1½" COVER (PRECAST) AND 2" COVER (CAST IN PLACE) FROM THE TOP OF THE BASE.
5. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123. SEE STDS. MD 374.55 & 374.64.
6. GRADE AND SLOPE ADJUSTMENTS SHALL BE COMPLETED IN THE FIELD USING PRECAST ADJUSTMENT COLLAR AND MORTAR.
7. A CONCRETE OR BRICK CHANNEL WHICH SLOPES AT LEAST 2 IN./FT. TOWARD OUTLET SHALL BE PROVIDED IN THE FIELD.
8. PRECAST INLET JOINTS- THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING THE MANUFACTURERS RECOMMENDED ASTM OR AASHTO APPROVED SEALANT.
9. LADDER RUNGS SHALL BE PLACED IN VERTICAL ALIGNMENT AT 1'-3" C/C RUNG TYPE SHALL BE IN ACCORDANCE WITH STDS. MD 383.91 OR MD 383.92. RUNGS ARE INCIDENTAL TO THE COST OF THE INLET.
10. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED, ROUGHEN PRECAST TROUGH FLOOR.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 6'-2" MEASURED FROM THE PIPE INVERT TO THE TOP OF THE TROUGH SLAB. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 6'-2" INCLUDING ALL APPURTENANCES.
12. INLET SLAB NOT REQUIRED FOR 36" DIAMETER INLET. TROUGH SITS DIRECTLY ON THE TOP OF THE CIRCULAR UNIT. MORTAR AREA BETWEEN THE OUTSIDE WALLS OF THE TROUGH AND THE UNIT WALL.
13. SEE STD. MD 374.64 FOR ALTERNATE PRECAST COS TROUGHS AND STD. MD 374.65 FOR DEPRESSED GUTTER PAN DETAILS.
14. BASE UNIT WALLS TAPER PER MANUFACTURER'S DESIGN.
15. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.



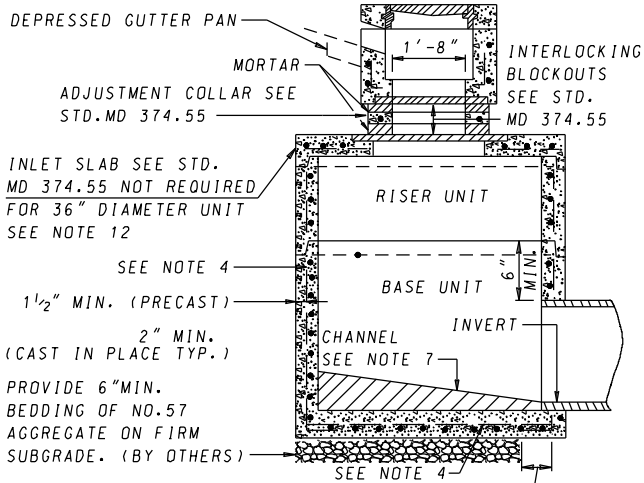
SECTION A-A

(SHOWN PRECAST)

FOR SECTION C-C AND D-D SEE STD MD 374.55

INLET TYPE	T	L
COS-5	5'-0"	6'-0"
COS-10	10'-0"	11'-0"
COS-15	15'-0"	16'-0"
COS-20	20'-0"	21'-0"

FOR DIMENSION H, , H₂ , W, B, AND G SEE STD MD 374.62-01



SECTION B-B

(SHOWN PRECAST)

SPECIFICATION	CATEGORY CODE ITEMS

APPROVED _____

DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

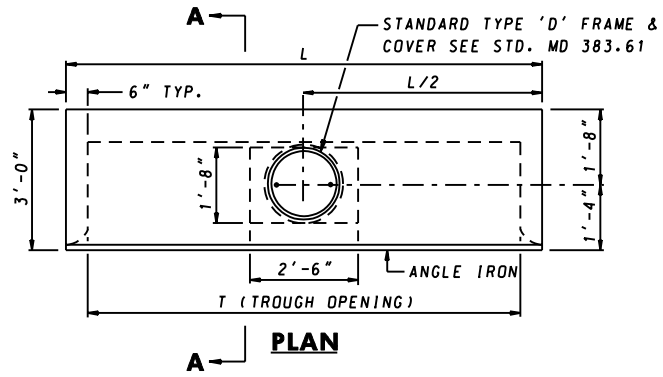
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

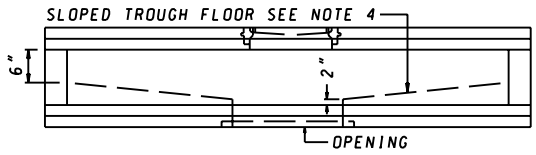
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST OR CAST IN PLACE CIRCULAR COS INLETS 5', 10', 15, & 20'

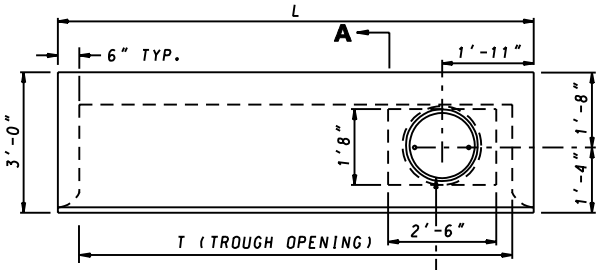
STANDARD NO. MD 374.63



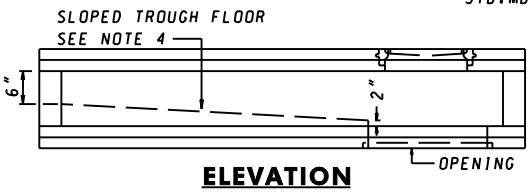
PLAN



ELEVATION
ALTERNATE COS TROUGH
(TROUGH FRONT NOT SHOWN)



PLAN

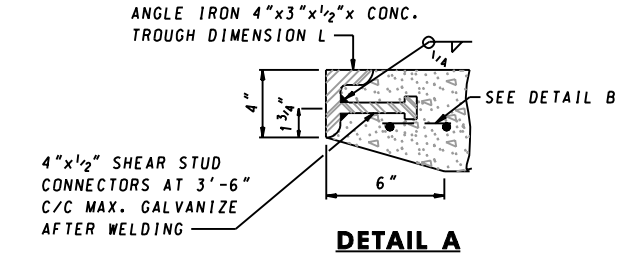


ELEVATION
ALTERNATE COG TROUGH
(TROUGH FRONT NOT SHOWN)

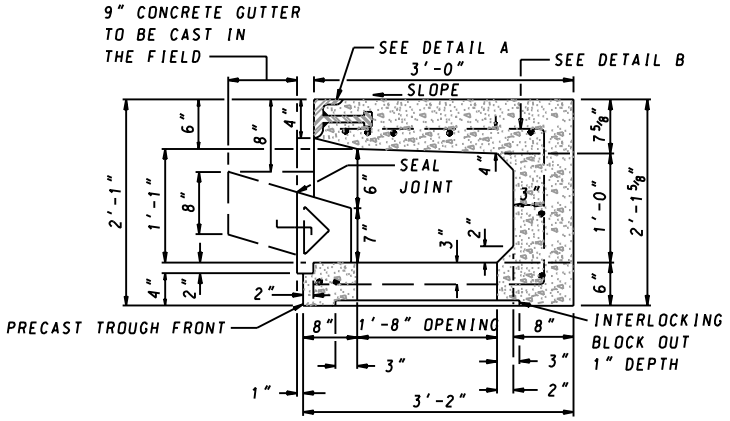
INLET TYPE	T	L
COG-5	5'-0"	6'-0"
COG-10	10'-0"	11'-0"
COG-15	15'-0"	16'-0"
COG-20	20'-0"	21'-0"
COS-5	5'-0"	6'-0"
COS-10	10'-0"	11'-0"
COS-15	15'-0"	16'-0"
COS-20	20'-0"	21'-0"

NOTES

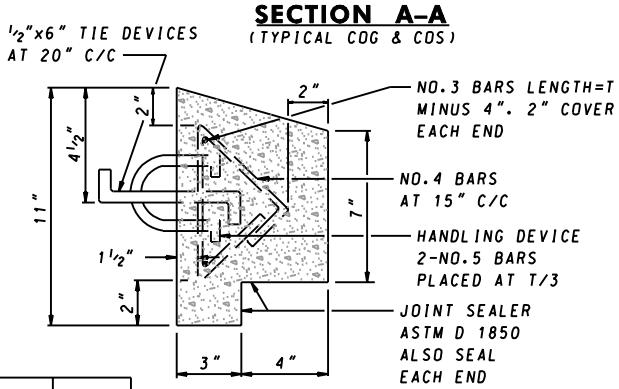
1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. ASTM A 185 GRADE 65 STEEL.
3. THESE TROUGHS MAY BE USED AS ALTERNATES FOR THOSE SHOWN ON STANDARDS MD 374.51, MD 374.61, MD 374.62, & MD 374.63.
4. SLOPED TROUGH FLOOR TO BE CONSTRUCTED IN THE FIELD USING BRICK OR CONCRETE AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED, ROUGHEN THE PRECAST TROUGH FLOOR.
5. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123.
6. WHEN USING THESE TROUGHS THE MINIMUM DEPTH PER EACH SHALL BE THE DEPTH SPECIFIED FOR THE RESPECTIVE INLET.



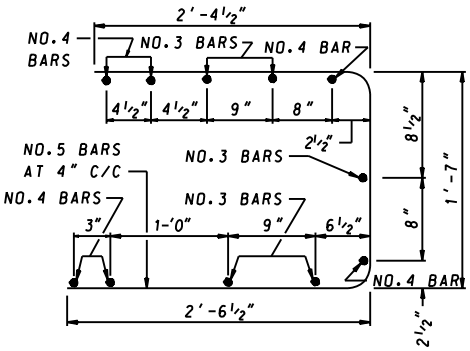
DETAIL A



SECTION A-A
(TYPICAL COG & COS)



PRECAST TROUGH FRONT
(TYPICAL COG & COS LENGTH=T)



DETAIL B

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-1-01	REVISED	9-4-91
REVISED		REVISED	
REVISED		REVISED	

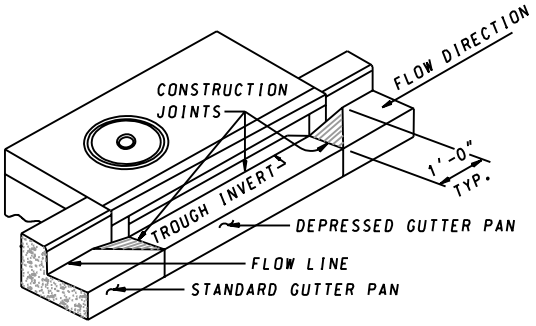
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

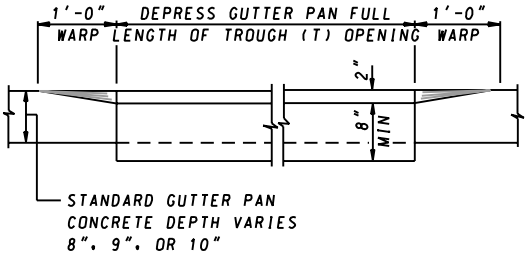
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

ALTERNATE PRECAST TROUGHS FOR COG & COS INLETS

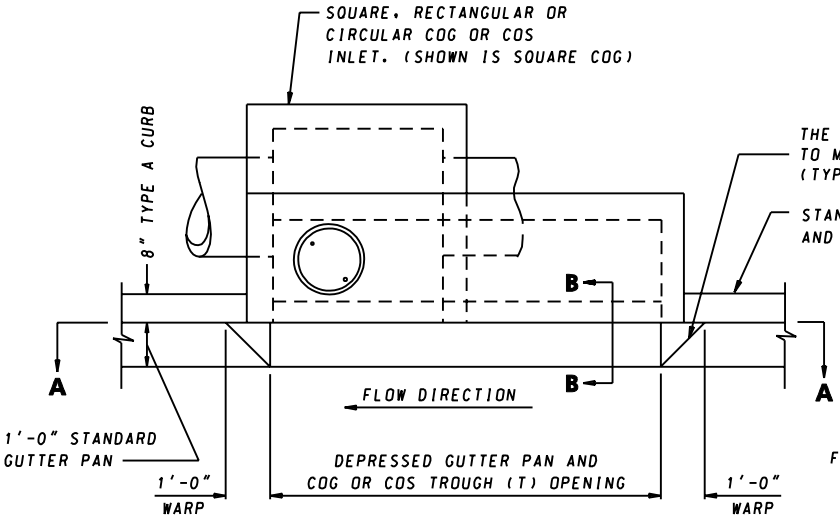
STANDARD NO. MD 374.64



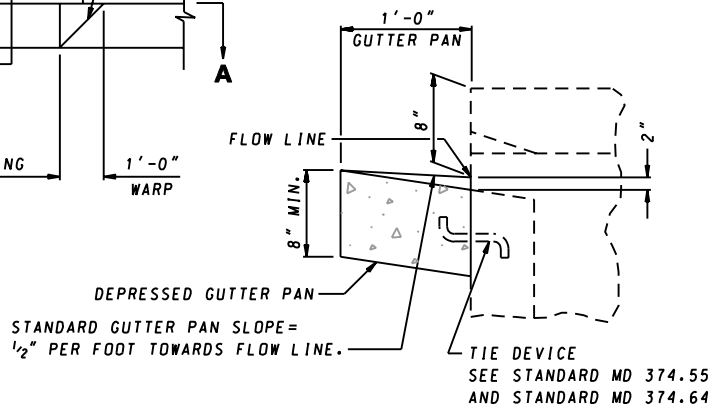
ISOMETRIC



SECTION A-A
(SHOWN LOOKING TOWARD ROADWAY)



PLAN



SECTION B-B

DETAILS FOR COG AND COS INLETS ARE SHOWN ON THE FOLLOWING STANDARDS

MD 374.51 PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COG INLETS 5', 10', 15', & 20'
MD 374.55 PRECAST CONCRETE TROUGH INLET SLABS AND ADJUSTMENT COLLAR FOR COG AND COS INLETS
MD 374.61 PRECAST OR CAST IN PLACE SQUARE AND RECTANGULAR COS INLETS 5', 10', 15', & 20'
MD 374.62 PRECAST CIRCULAR COG INLETS 5', 10', 15', & 20'
MD 374.63 PRECAST CIRCULAR COS INLETS 5', 10', 15', & 20'
MD 374.64 ALTERNATE PRECAST TROUGHS FOR COG AND COS INLETS

NOTES

1. COST OF DEPRESSED CONCRETE GUTTER PAN IS INCIDENTAL TO THE COST OF THE INLET.
2. STANDARD TYPE A COMBINATION CURB AND GUTTER PAID FOR SEPARATELY.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

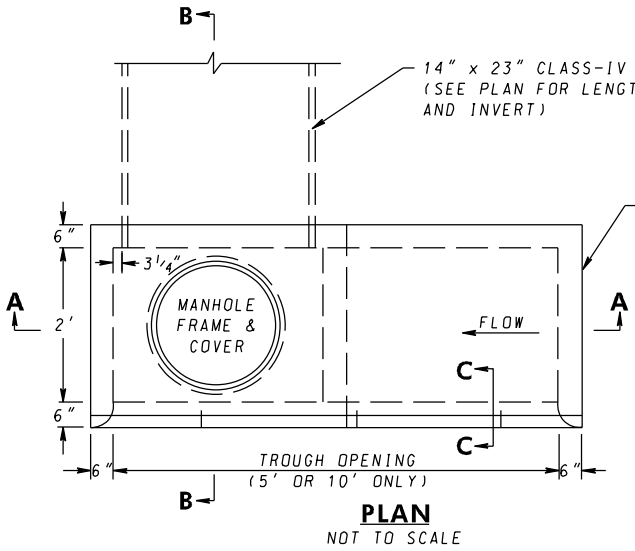
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

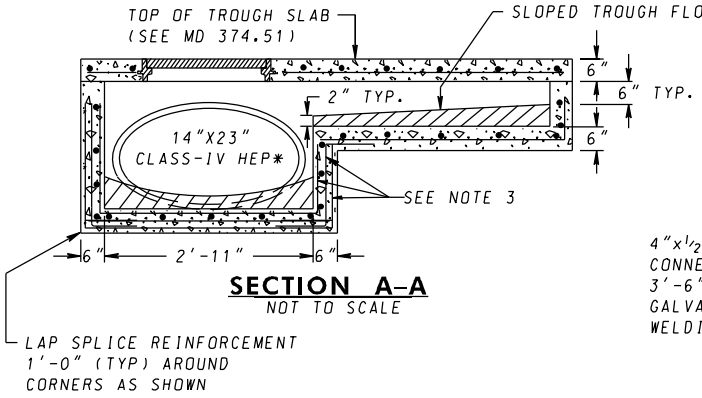
DEPRESSED CONCRETE GUTTER PAN FOR COG AND COS INLETS

STANDARD NO. MD 374.65

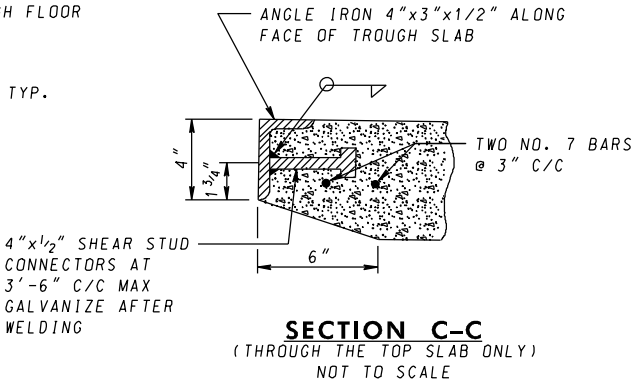


PLAN
NOT TO SCALE

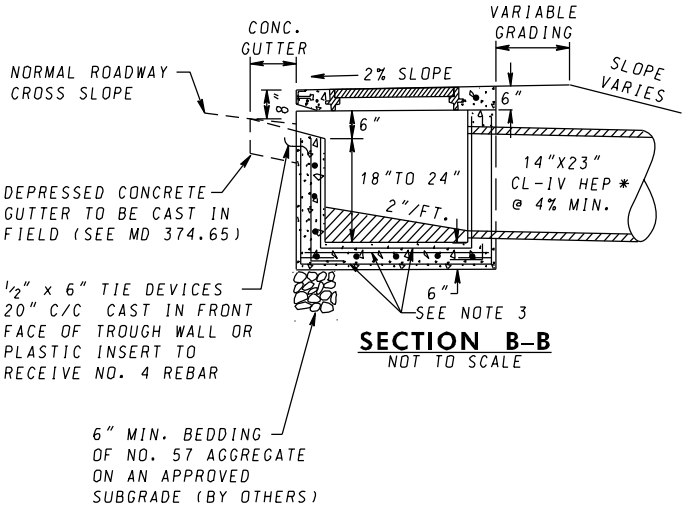
* EQUIVALENT PIPE(S) MAY BE SUBMITTED FOR APPROVAL. SUBMITTAL MUST INCLUDE HYDRAUALIC COMPUTATIONS.



SECTION A-A
NOT TO SCALE



SECTION C-C
(THROUGH THE TOP SLAB ONLY)
NOT TO SCALE



SECTION B-B
NOT TO SCALE

GENERAL NOTES

1. SLOPED TROUGH FLOOR TO BE CAST IN THE FIELD AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED, ROUGHEN PRECAST TROUGH FLOOR.
2. CONCRETE SHALL BE MIX NO. 6.
3. FOR CAST IN PLACE INLET, REINFORCEMENT SHALL BE NO. 4 BARS AT 6" C/C, TWO WAYS, PLACED AT THE CENTER OF BOTH WALLS AND BASE. FOR PRECAST INLET, REINFORCEMENT SHALL BE TWO LAYERS OF 4X4- W4.0 X W4.0 WELDED WIRE FABRIC WITH 1 1/2" COVER AT WALLS AND TWO LAYERS OF 4X4- W5.0 X W5.0 WELDED WIRE FABRIC WITH 1 1/2" COVER AT BASE.
4. FOR MANHOLE FRAME AND COVER SEE MD 383.61.
5. MINIMUM DEPTH PAYMENT SHALL BE 3'-6" MEASURED FROM THE BOTTOM OF THE BASE UNIT TO THE TOP OF THE TROUGH SLAB. VERTICAL DEPTH PAYMENT IN EXCESS OF 3'-6" IS NOT PERMITTED. USE OTHER STANDARDS IF ADDITIONAL VERTICAL DEPTH IS REQUIRED.
6. PIPE TO BE PAID FOR SEPARATELY
7. FROM CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	12-3-97	APPROVAL	2-23-98
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

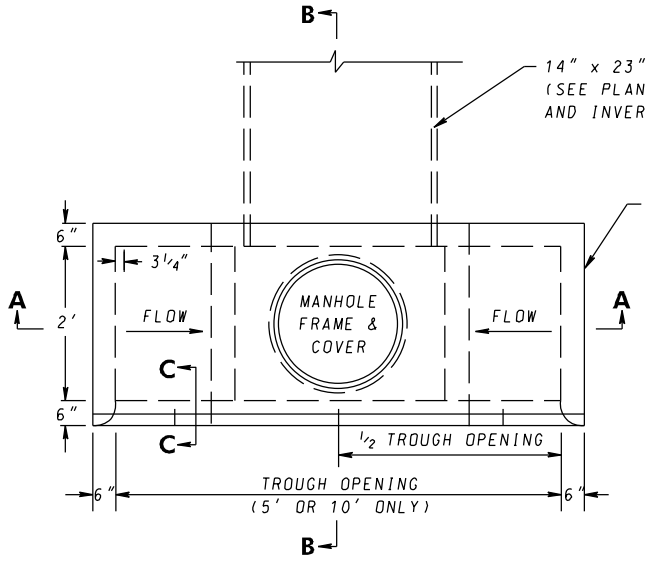
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

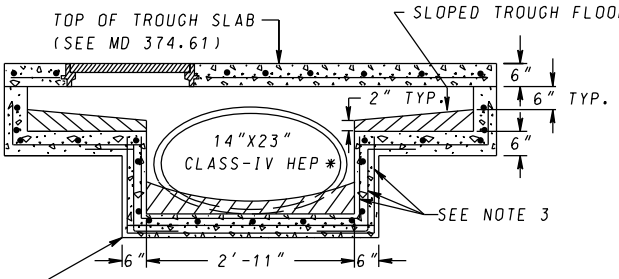
PRECAST OR CAST IN PLACE SHALLOW COG INLET 5' OR 10' TROUGH OPENING

STANDARD NO. MD 374.66



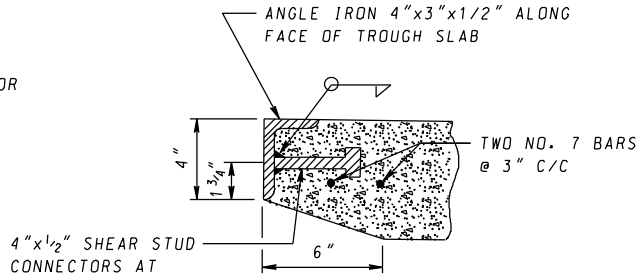
PLAN
NOT TO SCALE

* EQUIVALENT PIPE(S) MAY BE SUBMITTED FOR APPROVAL. SUBMITTAL MUST INCLUDE HYDRAULIC COMPUTATIONS.

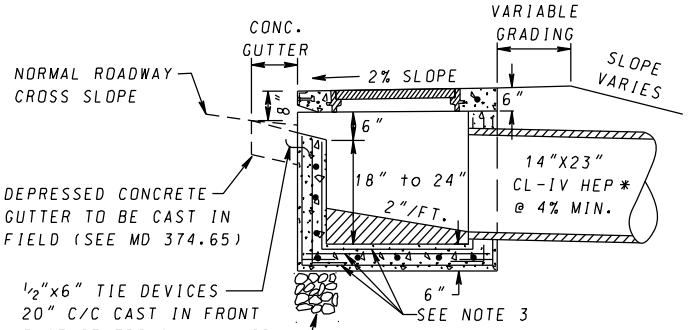


SECTION A-A
NOT TO SCALE

LAP SPLICE REINFORCEMENT 1'-0" (TYP) AROUND CORNERS AS SHOWN



SECTION C-C
(THROUGH THE TOP SLAB ONLY)
NOT TO SCALE



SECTION B-B
NOT TO SCALE

NOTES

1. SLOPED TROUGH FLOOR TO BE CAST IN THE FIELD AND USED ONLY WHEN ROAD GRADE IS 1.5% OR LESS. WHEN SLOPED TROUGH FLOOR IS USED, ROUGHEN PRECAST TROUGH FLOOR.
2. CONCRETE SHALL BE MIX NO. 6.
3. FOR CAST IN PLACE INLET, REINFORCEMENT SHALL BE NO. 4 BARS AT 6" C/C, TWO WAYS, PLACED IN THE CENTER OF THE INLET WALLS AND BASE. FOR PRECAST INLETS, REINFORCEMENT SHALL BE TWO LAYERS OF 4X4- W4.0 X W4.0 WELDED WIRE FABRIC WITH 1 1/2" COVER AT WALLS AND TWO LAYERS OF 4X4- W5.0 X W5.0 WELDED WIRE FABRIC WITH 1 1/2" COVER AT BASE.
4. FOR MANHOLE FRAME AND COVER SEE MD 383.61.
5. MINIMUM DEPTH PAYMENT SHALL BE 3'-6" MEASURED FROM THE BOTTOM OF THE BASE UNIT TO THE TOP OF THE TROUGH SLAB. VERTICAL DEPTH PAYMENT IN EXCESS OF 3'-6" IS NOT PERMITTED. USE OTHER STANDARDS IF ADDITIONAL VERTICAL DEPTH IS REQUIRED.
6. PIPE TO BE PAID FOR SEPARATELY
7. FROM CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	12-3-97	APPROVAL	2-23-98
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

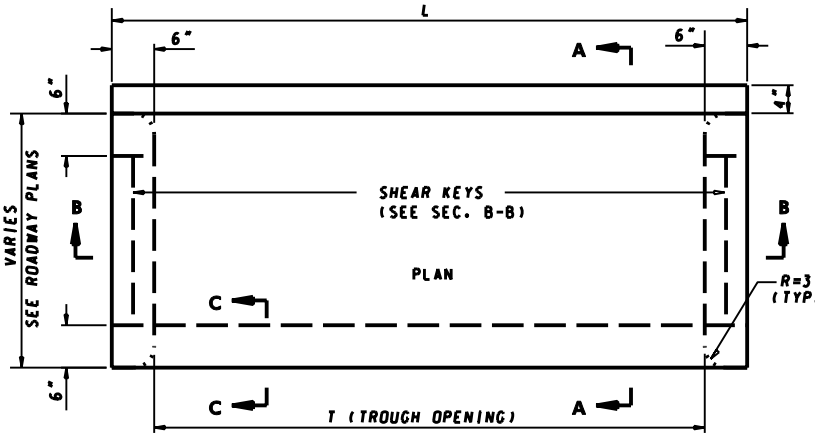
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

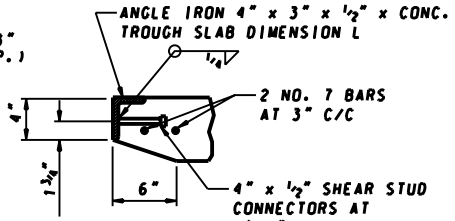
PRECAST OR CAST IN PLACE SHALLOW COS INLET 5' OR 10' TROUGH OPENING

STANDARD NO. MD 374.67



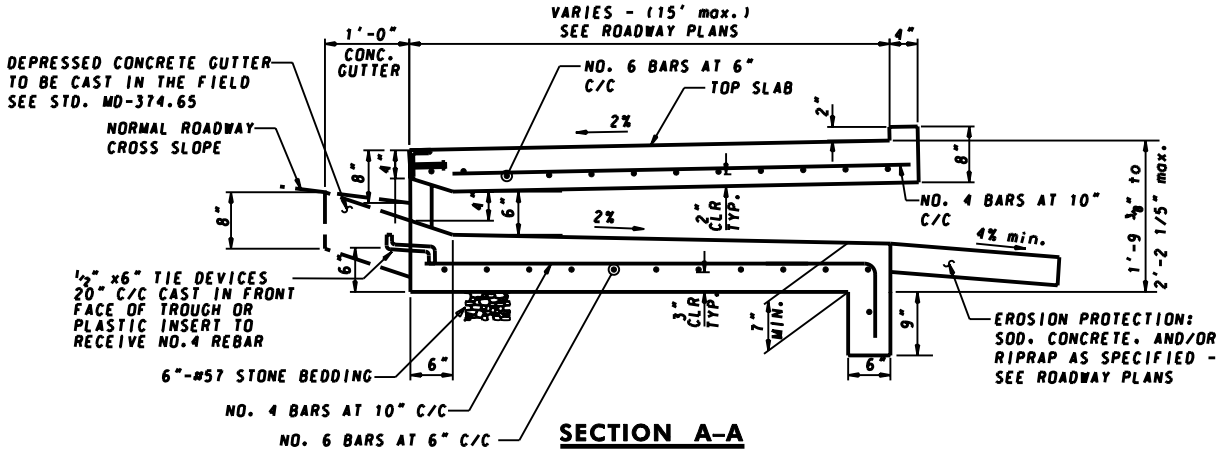
SLAB TYPE	L	T
I	6'-0"	5'-0"
II	11'-0"	10'-0"

PRECAST CONCRETE TOP SLAB

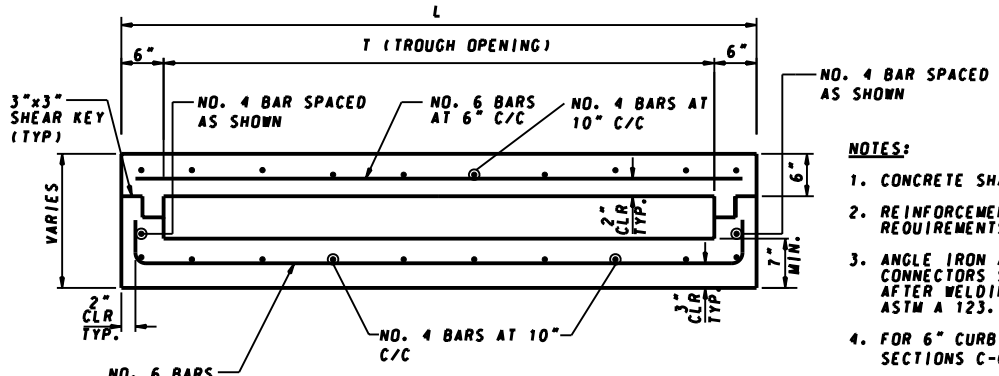


NOTE: FOR 6" CURB. SEE NOTE 4 BELOW.

SECTION C-C



SECTION A-A



SECTION B-B

NOTES:

1. CONCRETE SHALL BE MIX # 6 (4500 PSI).
2. REINFORCEMENT STEEL SHALL MEET THE REQUIREMENTS OF ASTM A615, GRADE 60.
3. ANGLE IRON AND SHEAR STUD CONNECTORS SHALL BE GALVANIZED AFTER WELDING IN ACCORDANCE WITH ASTM A 123.
4. FOR 6" CURB, REFER TO MD 374.55-01, SECTIONS C-C AND D-D.
5. EROSION PROTECTION TO BE PAID FOR SEPARATELY.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClelland DIRECTOR - OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	12-19-01	APPROVAL	7-15-02
REVISED	1-9-08	REVISED	11-26-07
REVISED		REVISED	
REVISED		REVISED	

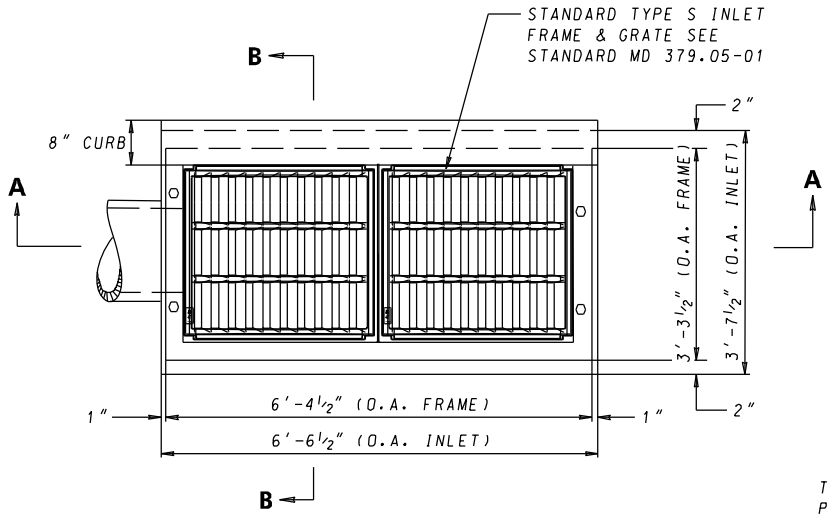
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

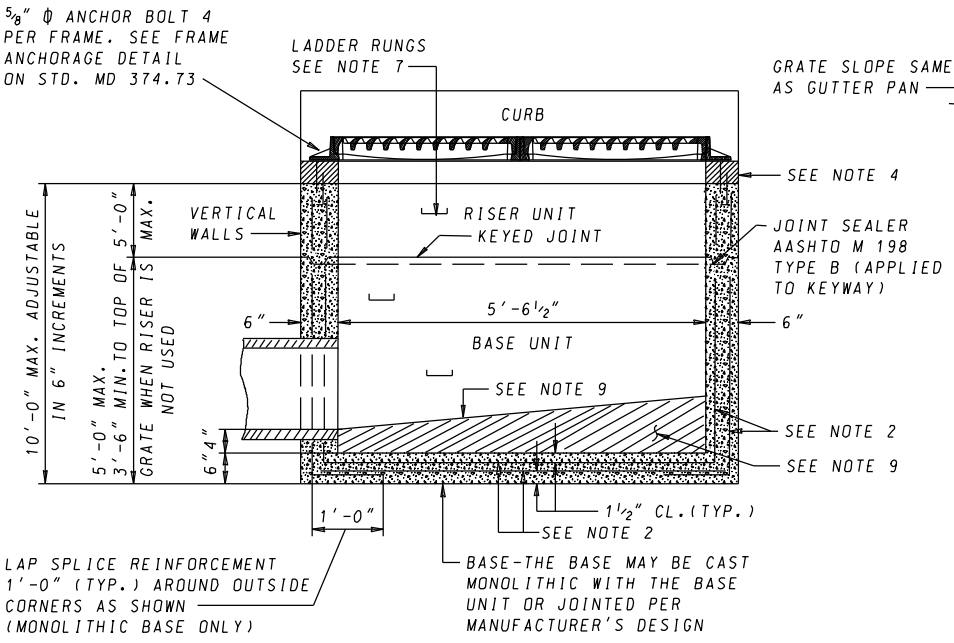
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST OR CAST-IN-PLACE COG /COS OPENING FOR 8" CURB 5' OR 10' ONLY

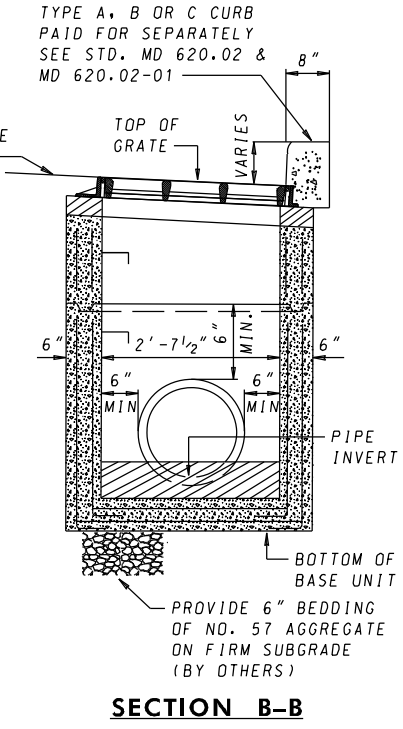
STANDARD NO. MD 374.68



PLAN



SECTION A-A



SECTION B-B

NOTES

1. CONCRETE TO BE MIX NO. 6 (4500 PSI).
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W6.0 X W6.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W7.0 X W7.0 WELDED WIRE FABRIC
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS MIN. 2", MAX. 9" SHALL BE COMPLETED IN THE FIELD USING CONCRETE MIX NO. 6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO THE CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 OR 383.92. RUNGS ARE INCIDENTAL TO THE COST OF THE INLET.
8. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 3'-6" MEASURED FROM THE PIPE INVERT TO THE TOP OF THE GRATE AT ITS HIGHEST POINT. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 3'-6" INCLUDING ALL APPURTENANCES.
9. CONCRETE OR BRICK INVERT TO BE PROVIDED IN THE FIELD AND SHALL SLOPE 2 IN./FT TOWARD OUTLET OR AS DIRECTED.
10. BASE WALLS UNIT MAY TAPER PER MANUFACTURER'S DESIGN.
11. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

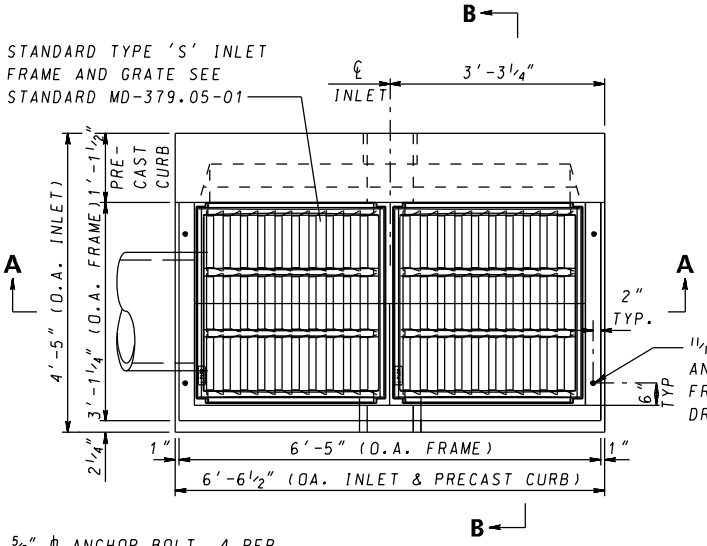
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

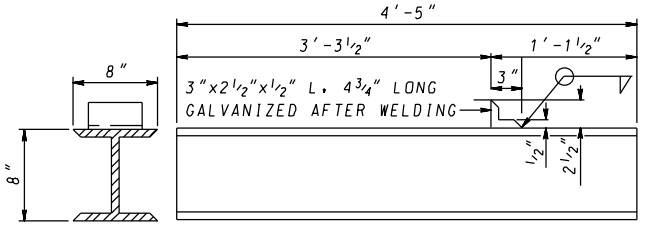
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST STANDARD TYPE S INLET DOUBLE GRATE TANDEM

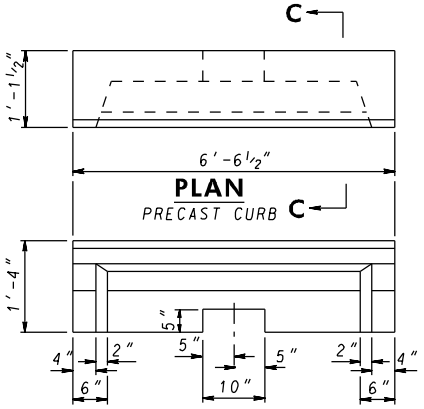
STANDARD NO. MD 374.70



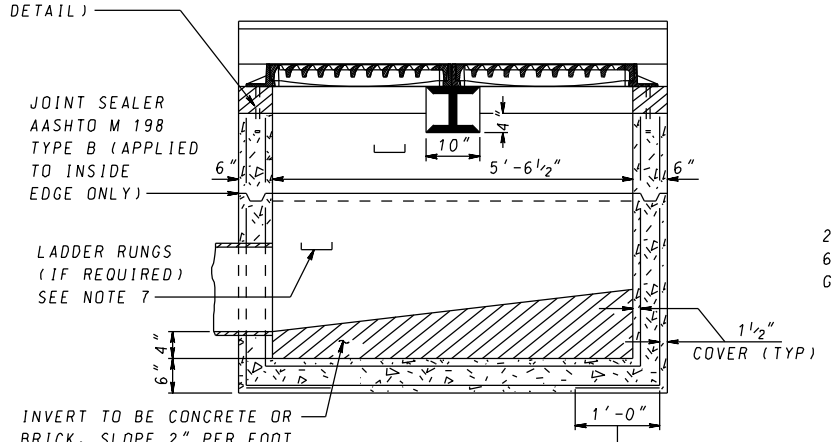
PLAN



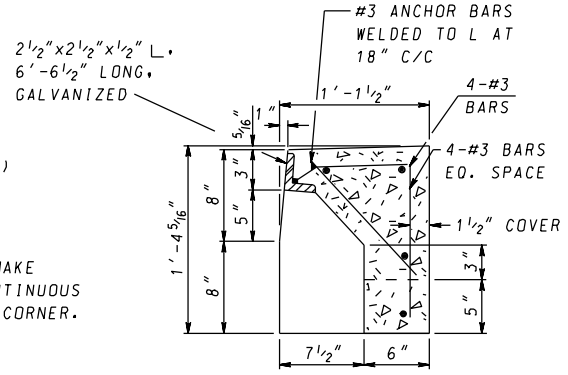
SUPPORT BEAM
W8 X 31 (GALVANIZED)



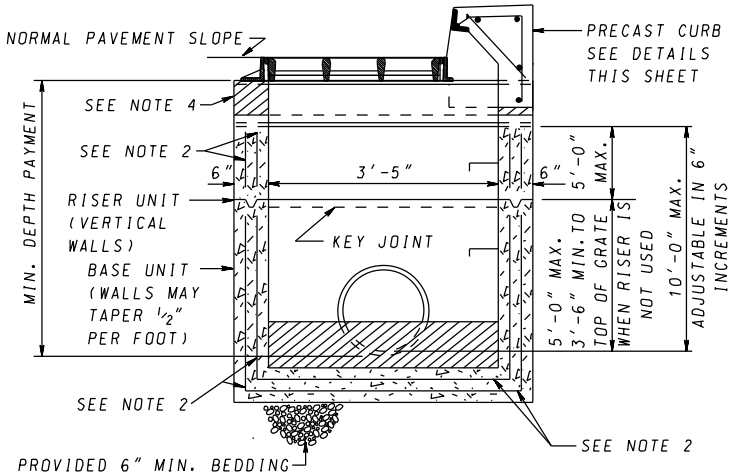
FRONT ELEVATION
PRECAST CURB



SECTION A-A



SECTION C-C



SECTION B-B

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. REINFORCING: WALLS - 2 LAYERS OF 4X4-W6.0 X W6.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W10.5 X W10.5 WELDED WIRE FABRIC.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENING TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 & MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-15-87	APPROVAL	6-23-87
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	-	REVISED	

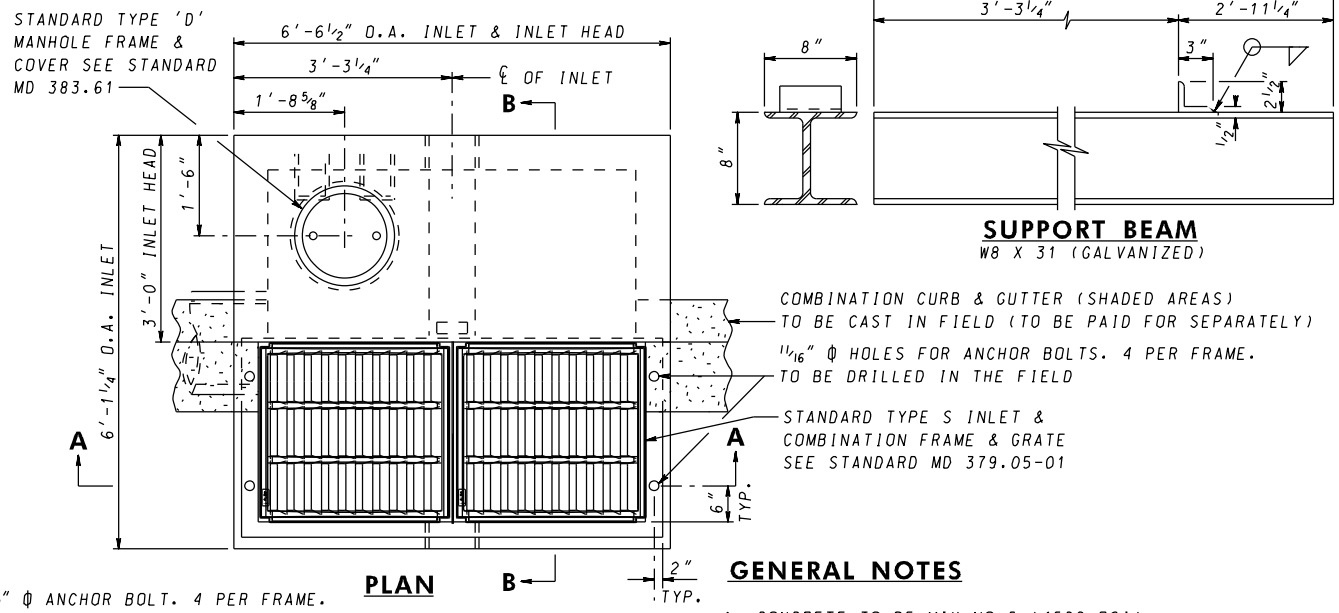
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST STANDARD
TYPE S COMBINATION INLET
DOUBLE GRATE TANDEM

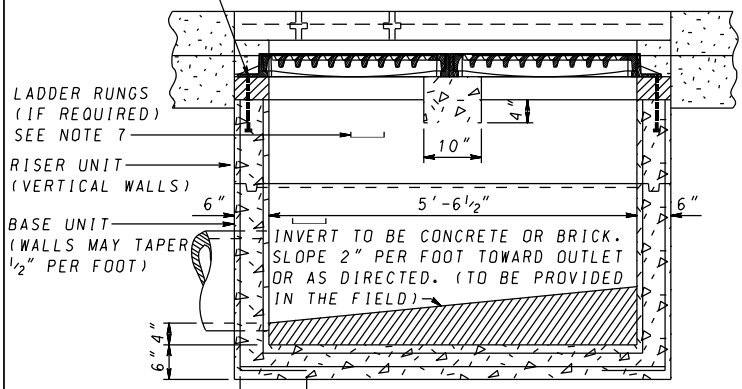
STANDARD NO. MD 374.71



PLAN

SUPPORT BEAM
W8 X 31 (GALVANIZED)

5/8" ϕ ANCHOR BOLT. 4 PER FRAME. SEE FRAME ANCHORAGE DETAIL ON STANDARD MD 374.73



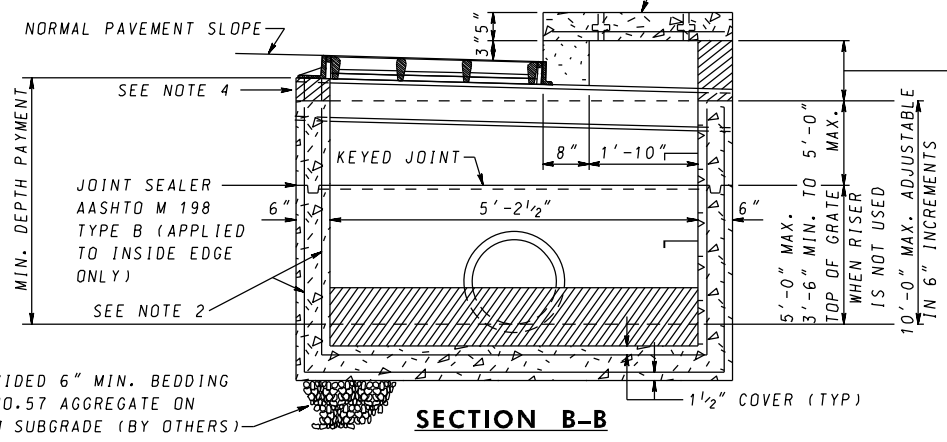
SECTION A-A

LAP SPLICE TO MAKE REINFORCEMENT CONTINUOUS AROUND OUTSIDE CORNER.

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. REINFORCING WALLS -2 LAYERS OF 4x4-W6.0x W6.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W12.0 X W12.0 WELDED WIRE FABRIC
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

5" THICK PRECAST INLET HEAD. CONCRETE TO BE MIX NO.6 (4500 PSI) 1 LAYER OF 4x4-W4.0x W4.0 WELDED WIRE FABRIC OR NO.4 DEFORMED BARS 6" C/C 2 WAYS



SECTION B-B

THIS PORTION OF INLET SHALL BE PROVIDED IN THE FIELD AND SHALL BE CONSTRUCTED OF BRICK MASONRY OR REINFORCED CONCRETE MIX NO. 6 REINFORCEMENT SHALL BE 2 LAYERS OF 4x4-W4.0x W4.0 WELDED WIRE FABRIC OR NO.4 DEFORMED BARS 6" C/C 2 WAYS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-15-87	APPROVAL	6-23-87
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

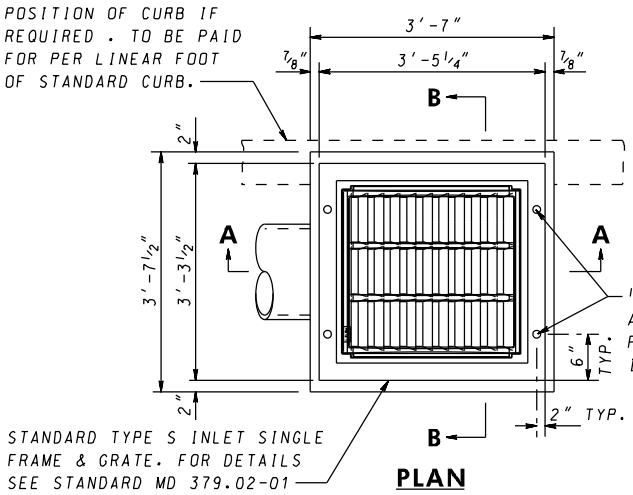
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

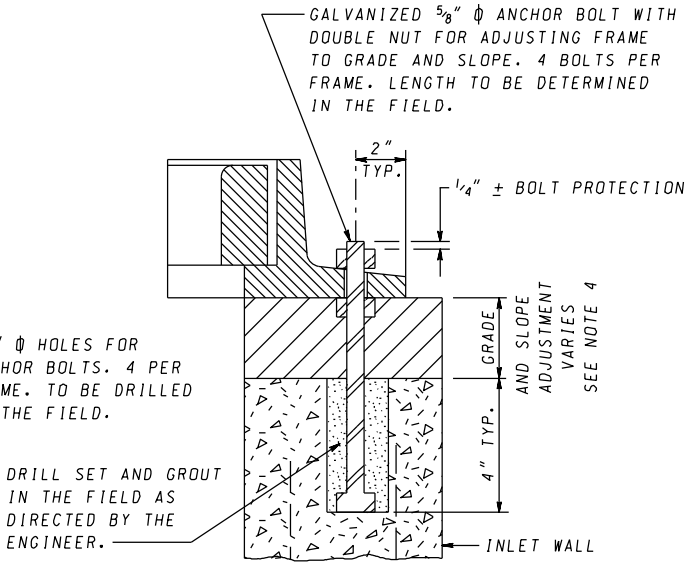
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST STANDARD TYPE HS COMBINATION INLET

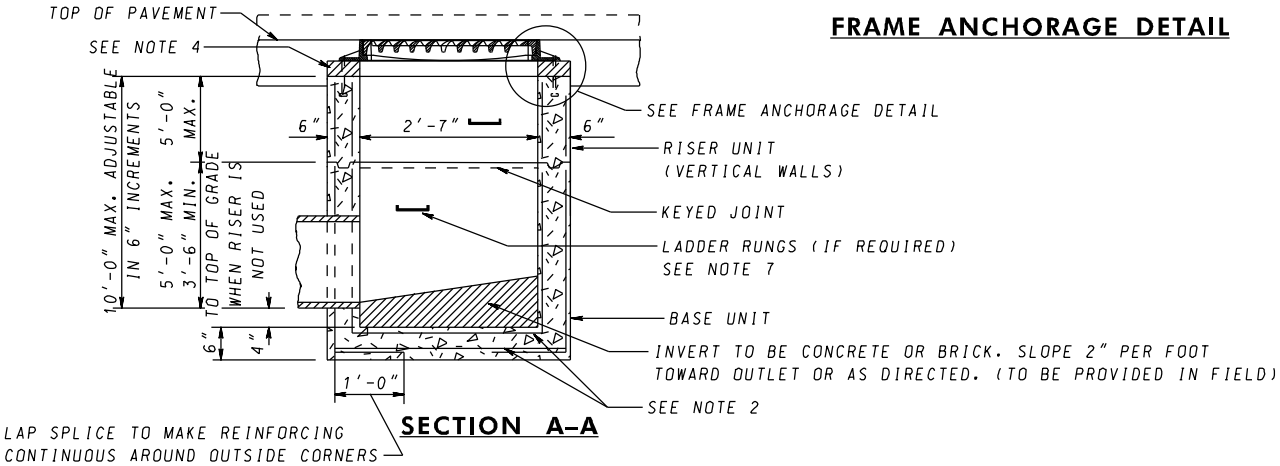
STANDARD NO. MD 374.72



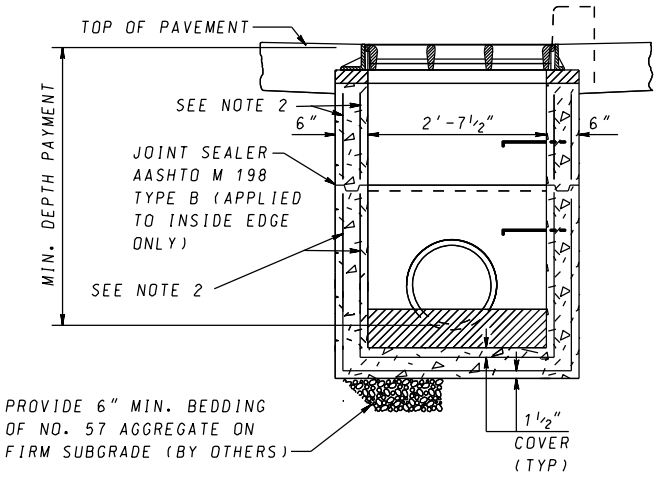
PLAN



FRAME ANCHORAGE DETAIL



SECTION A-A



SECTION B-B

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. REINFORCING WALLS -2 LAYERS OF 4x4-W4.0x W4.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W5.0 X W5.0 WELDED WIRE FABRIC
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-15-87	APPROVAL	6-23-87
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

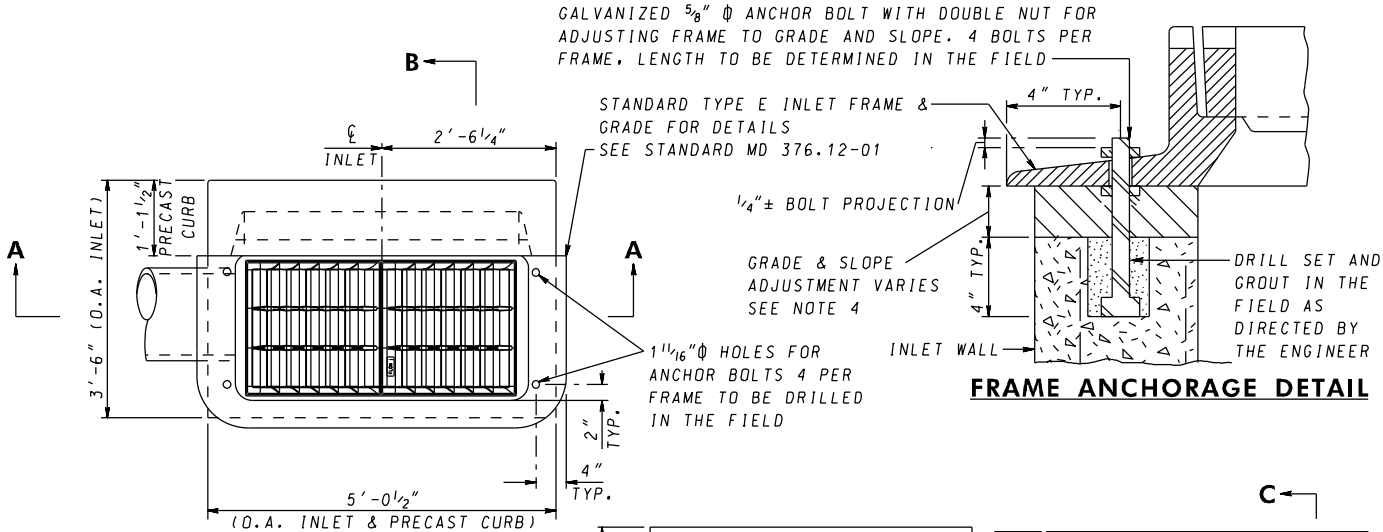
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST STANDARD
TYPE S INLET SINGLE GRATE

STANDARD NO. MD 374.73



GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. REINFORCING WALLS -2 LAYERS OF 4x4-W4.0x W4.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W6.0 X W6.0 WELDED WIRE FABRIC
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-15-87	APPROVAL	6-23-87
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

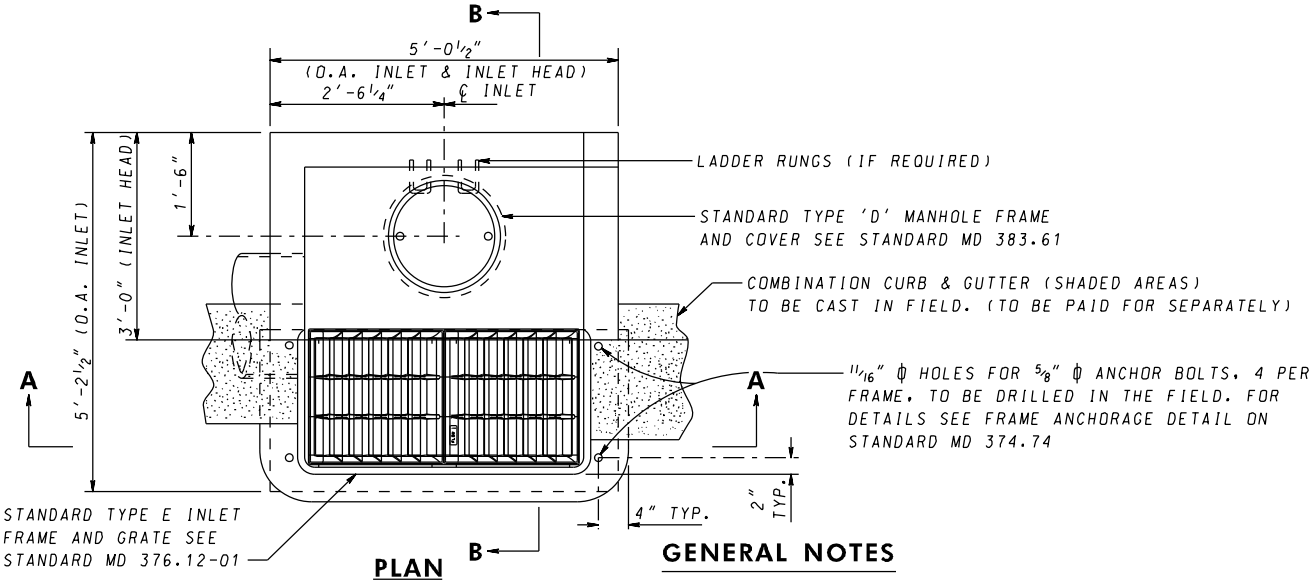
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

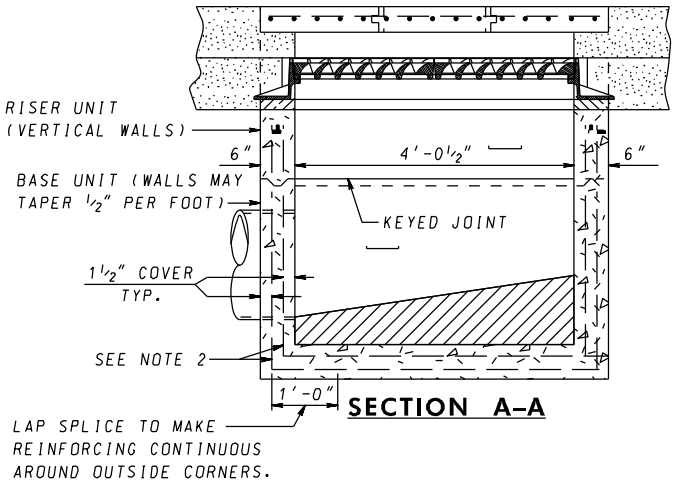
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST STANDARD
TYPE E COMBINATION INLET

STANDARD NO. MD 374.74



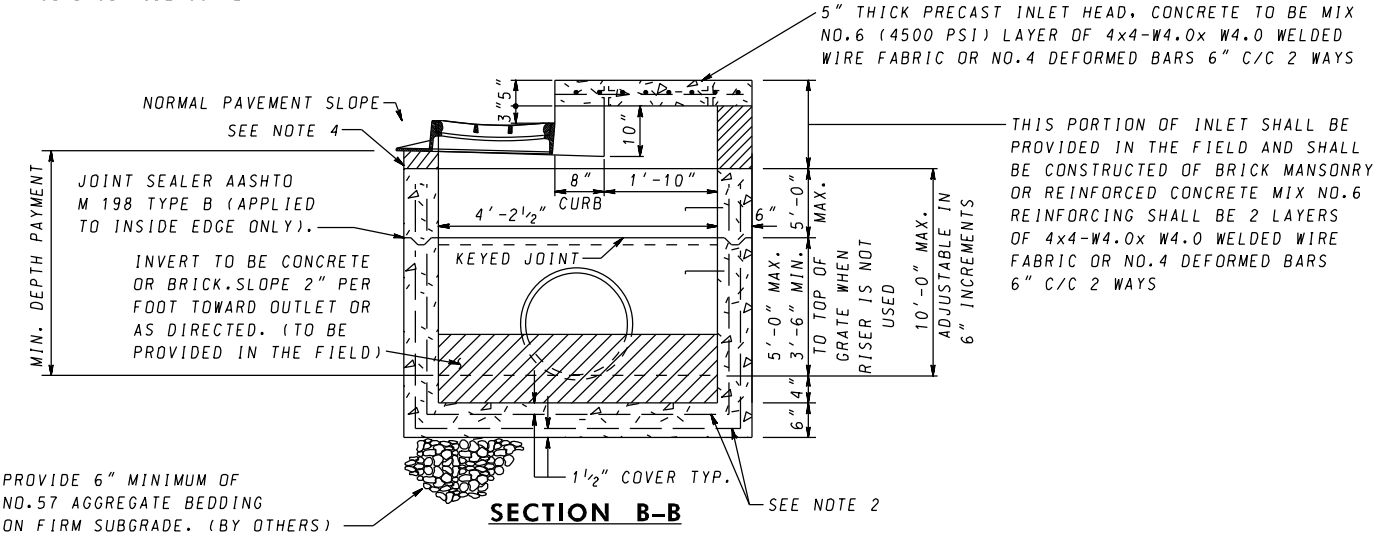
PLAN



SECTION A–A

GENERAL NOTES

1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. REINFORCING WALLS -2 LAYERS OF 4x4-W4.0x W4.0 WELDED WIRE FABRIC: BASE - 2 LAYERS OF 4X4 - W6.5 X W6.5 WELDED WIRE FABRIC
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONCRETE MIX NO.6.
5. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE CONSTRUCTION PLANS.
7. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STANDARD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6". VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. FROM CURB LINE/ SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS



SECTION B–B

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-15-87	APPROVAL	6-23-87
REVISED	7-1-09	REVISED	7-27-09
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

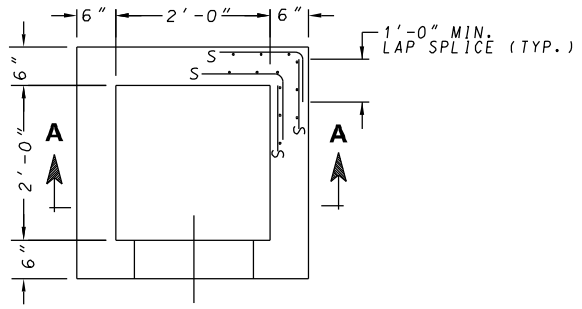
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

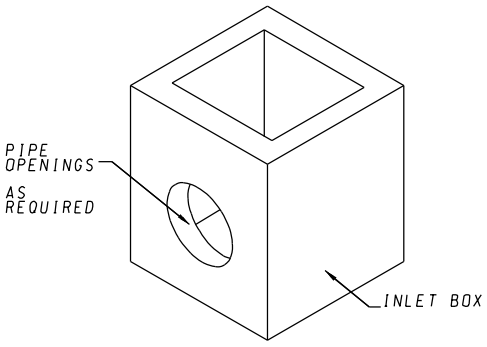
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST STANDARD
TYPE H COMBINATION INLET

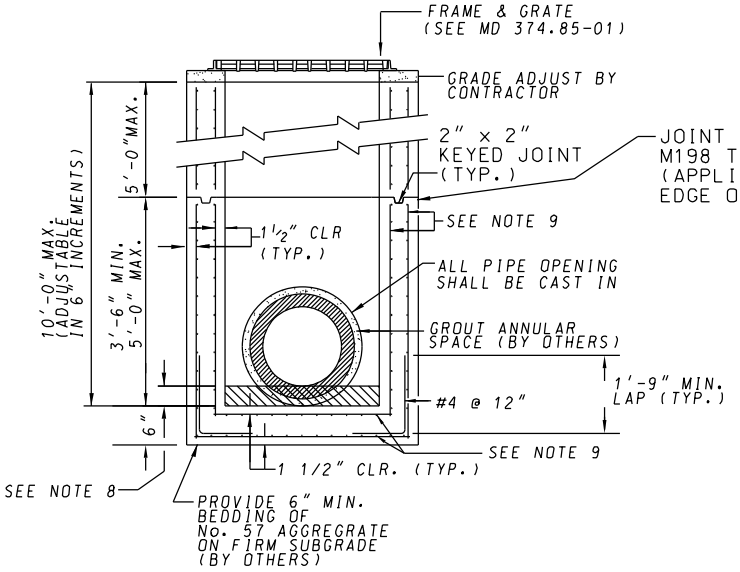
STANDARD NO. MD 374.75



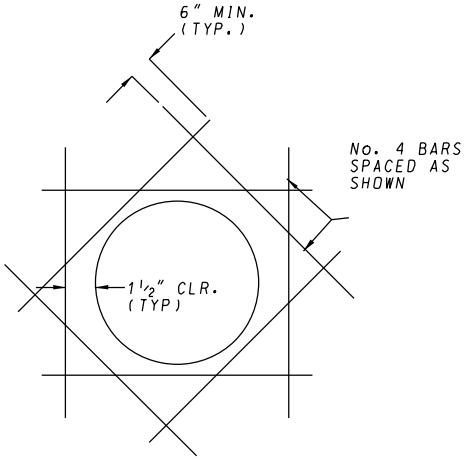
PLAN



ISOMETRIC VIEW



SECTION A–A



REINFORCING AROUND PIPE OPENING

GENERAL NOTES:

1. CONCRETE SHALL BE MIX No. 6.

2. WELDED WIRE FABRIC SHALL CONFORMS TO ASTM A185. DEFORMED STEEL CONFORMS TO ASTM A615 GRADE 60.

3. OVERALL HEIGHT OF PRECAST IS ADJUSTABLE IN 6" INCREMENTS. FINAL GRADE ADJUSTMENT SHALL BE MADE BY CONTRACTOR WITH CONCRETE MIX No. 6.

4. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.

5. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD. MD 383.91 AND STD. MD 383.92 OR AS DIRECTED BY THE ENGINEER.

6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NEEDED ON THE CONSTRUCTION PLANS.

7. MINIMUM DEPTH PAYMENT PER "EACH" INLETS INCLUDES DEPTH UP TO 3'-6'. VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6'.

8. CONCRETE OR BRICK INVERT TO BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARDS THE OUTLET OR AS DIRECTED.

9. REINFORCING: WALLS - 2 LAYERS OF 4X4 W4.0 X W4.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 W5.0 X W5.0 WELDED WIRE FABRIC WITH 1½" COVER (TYP).

10. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL	7-14-08	2-4-08
REVISED	10-7-14	9-29-14
REVISED		
REVISED		

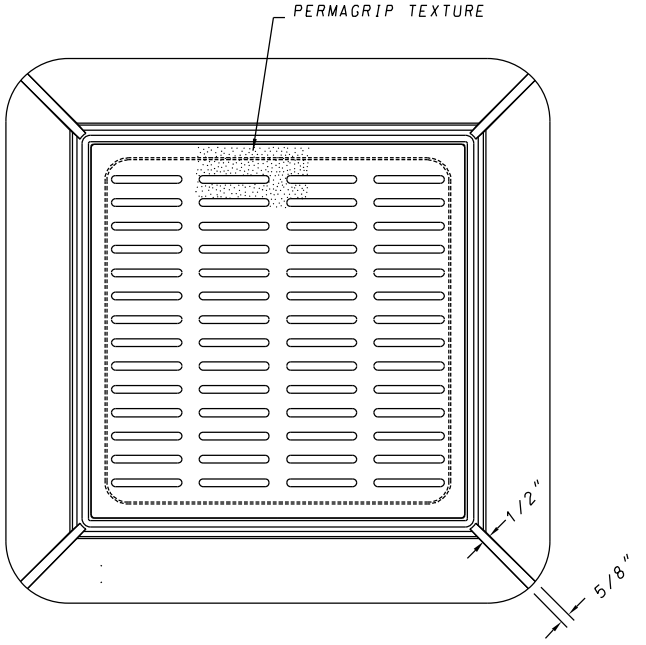
SHA State Highway Administration

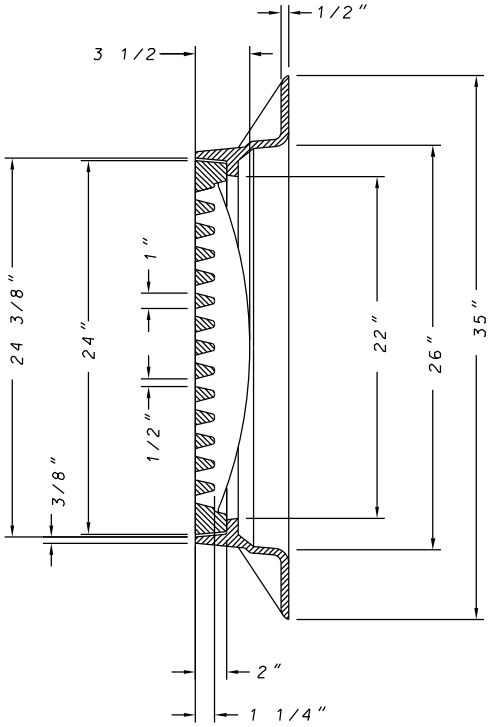
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

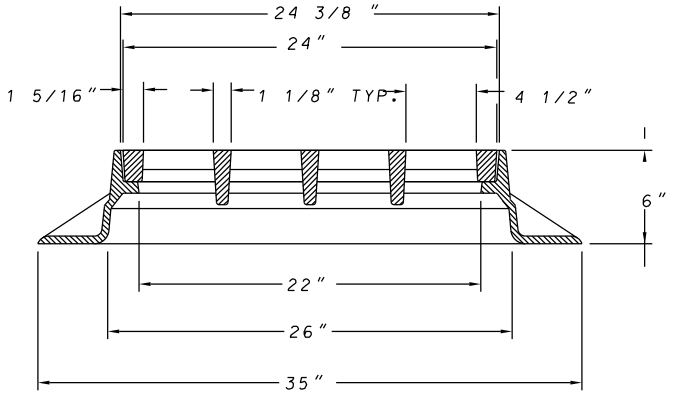
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD ADA COMPLIANT INLET SINGLE GRATE

STANDARD NO. MD 374.85







GENERAL NOTES

1. MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
2. FINISH: NO PAINT
3. WEIGHT: FRAME 165 LBS., GRATE 164 LBS.
4. MANUFACTURER TO VERIFY THAT FRAME AND GRATE ARE DESIGNED FOR HS-25 LOADING.
5. LONG DIMENSION MUST BE PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL	7-14-08	2-4-08
REVISED	10-7-14	9-29-14
REVISED		
REVISED		

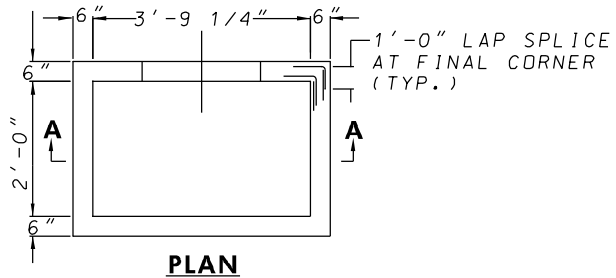
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

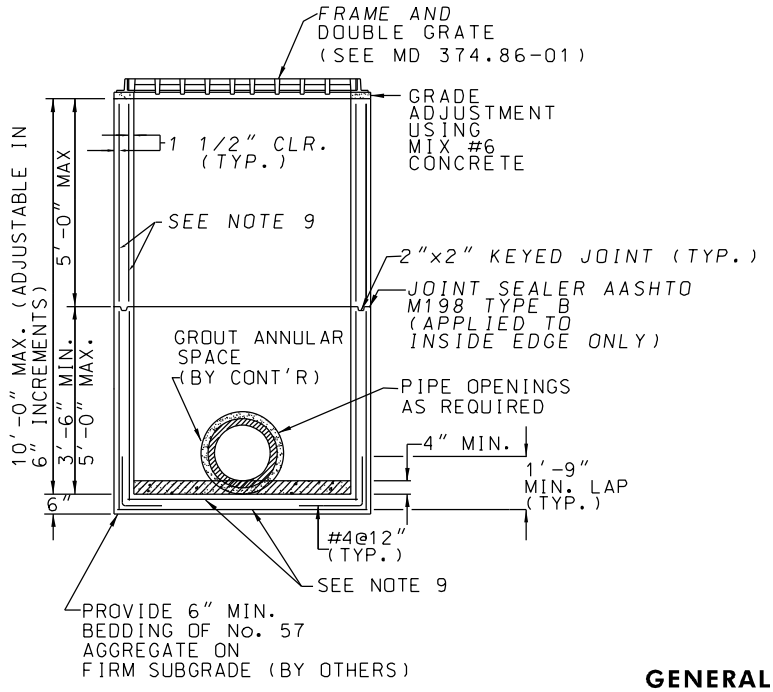
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD "ADA" COMPLIANT INLET SINGLE FRAME AND GRATE

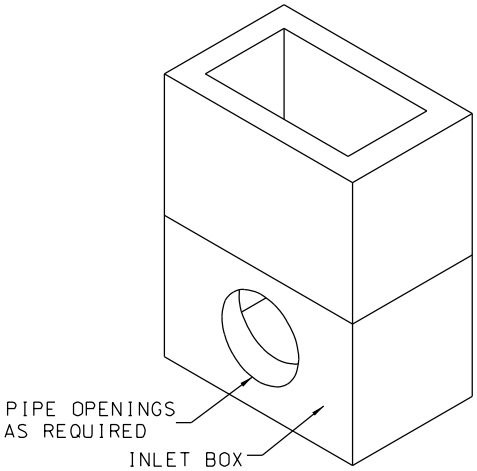
STANDARD NO. MD 374.85-01



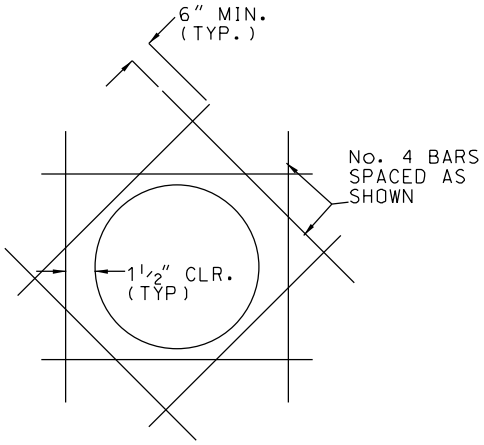
PLAN



SECTION A



ISOMETRIC VIEW



REINFORCING AROUND PIPE OPENING

GENERAL NOTES:

1. CONCRETE SHALL BE MIX No. 6.
2. WELDED WIRE FABRIC SHALL CONFORMS TO ASTM A185. DEFORMED STEEL CONFORMS TO ASTM A615 GRADE 60.
3. OVERALL HEIGHT OF PRECAST IS ADJUSTABLE IN 6" INCREMENTS. FINAL GRADE ADJUSTMENT SHALL BE MADE BY CONTRACTOR WITH CONCRETE MIX No. 6
4. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
5. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD. MD 383.91 AND STD. MD 383.92 OR AS DIRECTED BY THE ENGINEER.
6. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NEEDED ON THE CONSTRUCTION PLANS.
7. MINIMUM DEPTH PAYMENT PER "EACH" INLETS INCLUDES DEPTH UP TO 3'-6'. VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6'.
8. CONCRETE OR BRICK INVERT TO BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARDS THE OUTLET OR AS DIRECTED.
9. REINFORCING: WALLS - 2 LAYERS OF 4X4 W4.0 X W4.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 W5.0 X W5.0 WELDED WIRE FABRIC
10. FROM CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL	7-14-08	2-4-08
REVISED	10-7-14	9-29-14
REVISED		
REVISED		

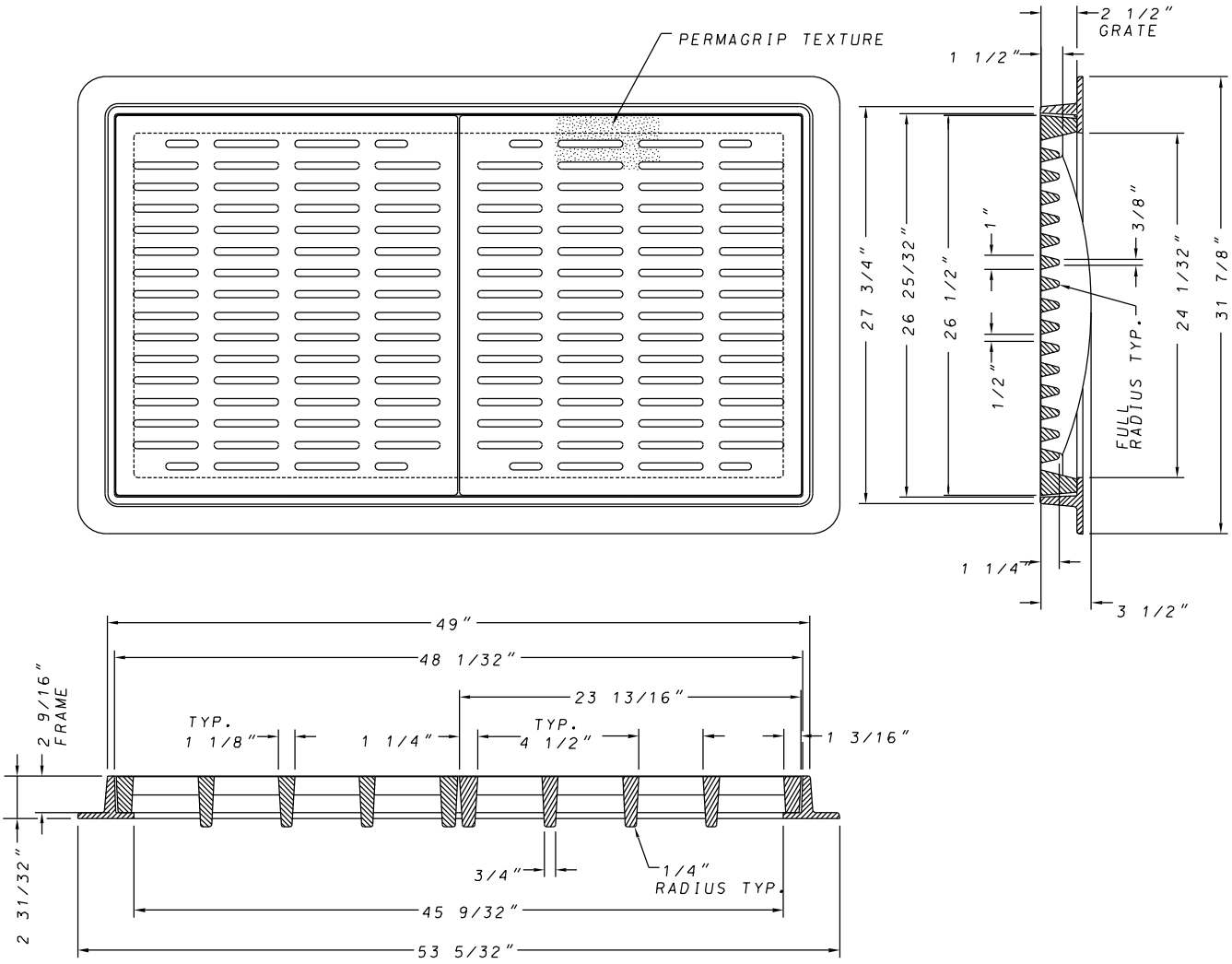
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD ADA COMPLIANT INLET DOUBLE GRATE TANDEM

STANDARD NO. MD 374.86



GENERAL NOTES

1. MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
2. FINISH: NO PAINT
3. WEIGHT: FRAME 120 LBS, GRATE 190 LBS EACH
4. MANUFACTURER TO VERIFY THAT FRAME AND GRATE ARE DESIGNED FOR HS-25 LOADING.
5. LONG DIMENSION MUST BE PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	7-14-08	APPROVAL	2-4-08
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	
REVISED		REVISED	

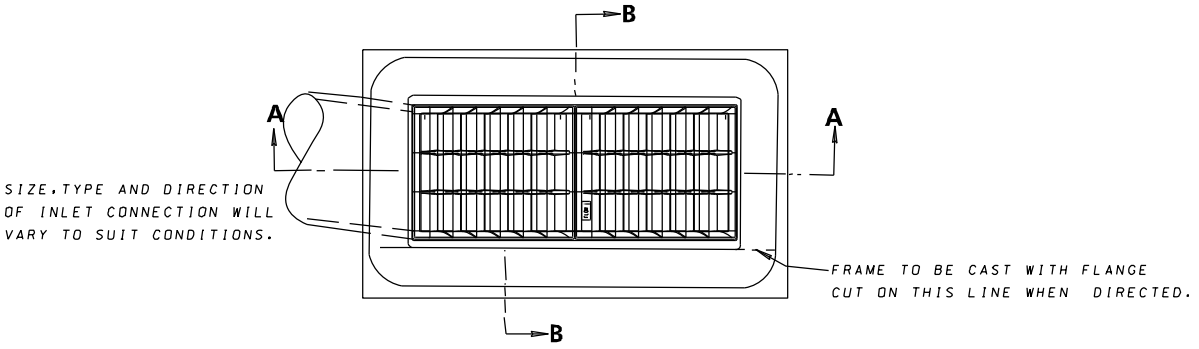
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

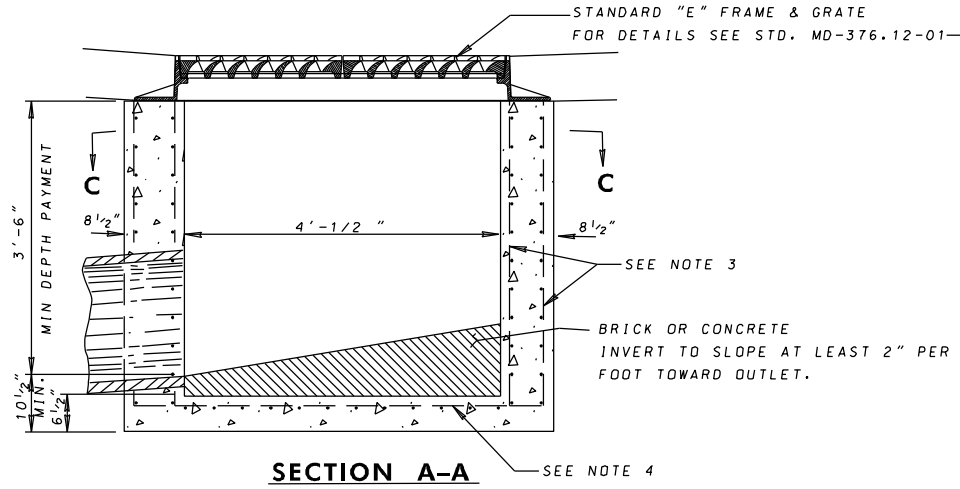
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD "ADA" COMPLIANT INLET DOUBLE FRAME & GRATE

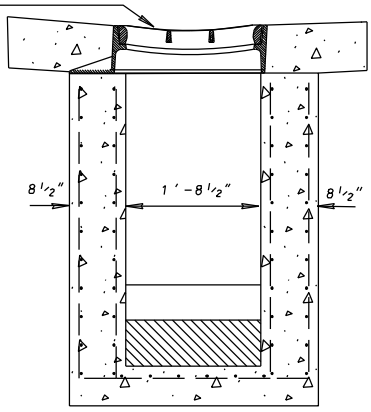
STANDARD NO. MD 374.86-01



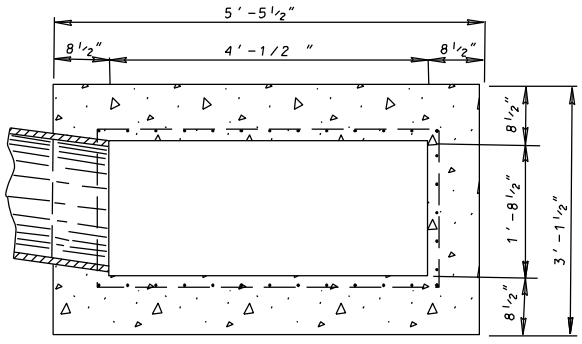
PLAN



SECTION A–A



SECTION B–B



SECTION C–C

GENERAL NOTES

1. BRICK FOR MASONARY TO COMPLY WITH THE LATEST SHA. SPECIFICATIONS.
2. INLET SHALL BE CONSTRUCTED OF REINFORCED CONCRETE MIX NO. 2 (3,000 PSI)
3. WHEN DEPTH IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C. TWO WAYS, AND HAVE 3 " COVER ON INSIDE. WHEN DEPTH IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C. TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
4. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
5. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND FOR A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	12-15-87	APPROVAL	2-24-88
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

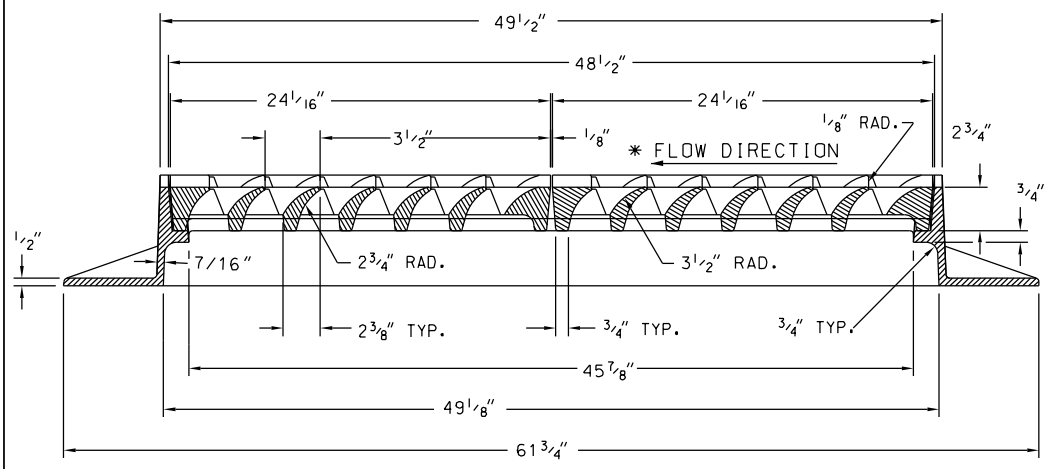
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE E INLET

STANDARD NO. MD 376.11



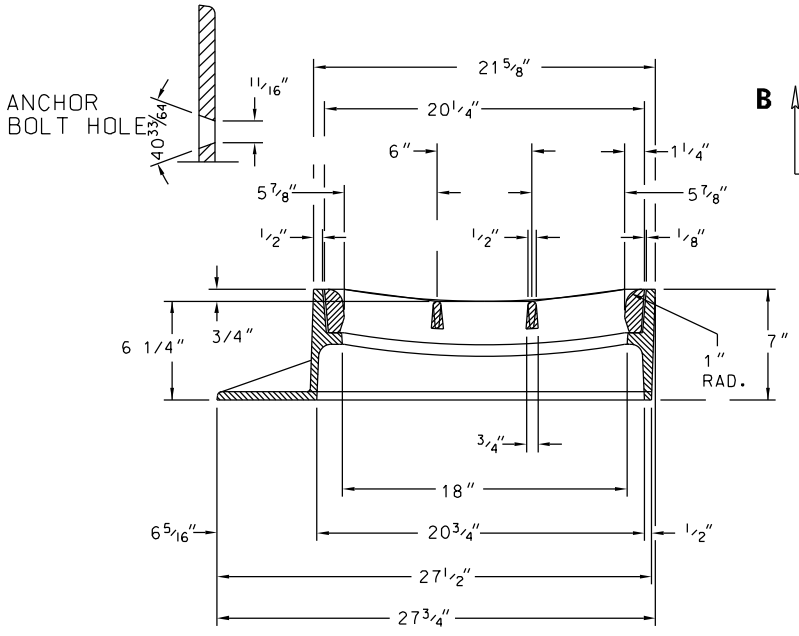
SECTION A–A

NOTES

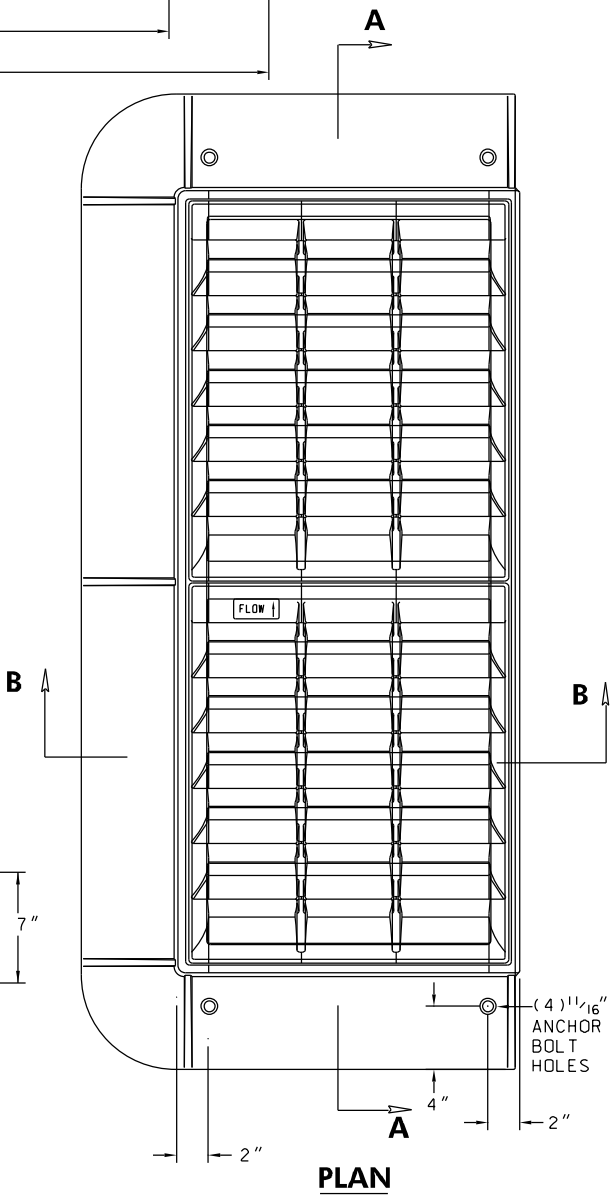
FRAME AND GRATE HAVE A RADIAL SEAT OF 52 7/8" RAD.
TOP OF FRAME ALSO HAS RADIUS OF 52 7/8" RAD.
TOP OF GRATE HAS FLAT SURFACES WHICH CLOSELY MATCH THE RADIUS OF THE FRAME.

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
FINISH: NOT PAINTED
FRAMES TO BE CASTING WITH FLANGE CUT, AS SHOWN, WHEN INLET TO BE PLACED ADAJCENT TO CURB OPENING.
FOR FULL FLANGE/DETAILS, REFER TO THE RESPECTIVE STANDARD PLATES FOR TYPE "E" INLET

* *CONTRACTOR IS RESPONSIBLE FOR CORRECT ORIENTATION OF THE CV-GRATE TOWARD THE DIRECTION OF FLOW.*



SECTION B–B



PLAN

MANUFACTURER TO VERIFY THAT FRAME AND GRATE ARE DESIGNED FOR HS-25 LOADING

SPECIFICATION 305	
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-10-04	APPROVAL	3-31-04
REVISED	7-1-09	REVISED	7-27-09
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

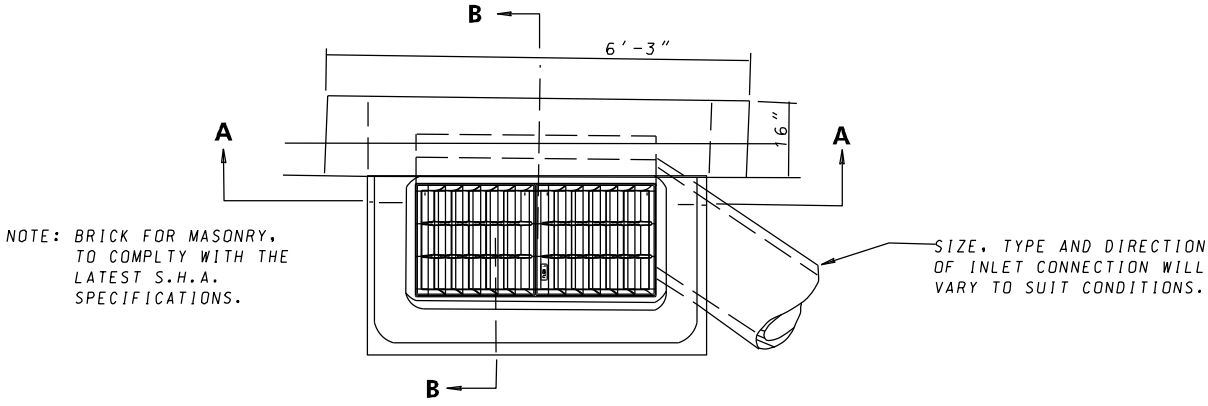
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

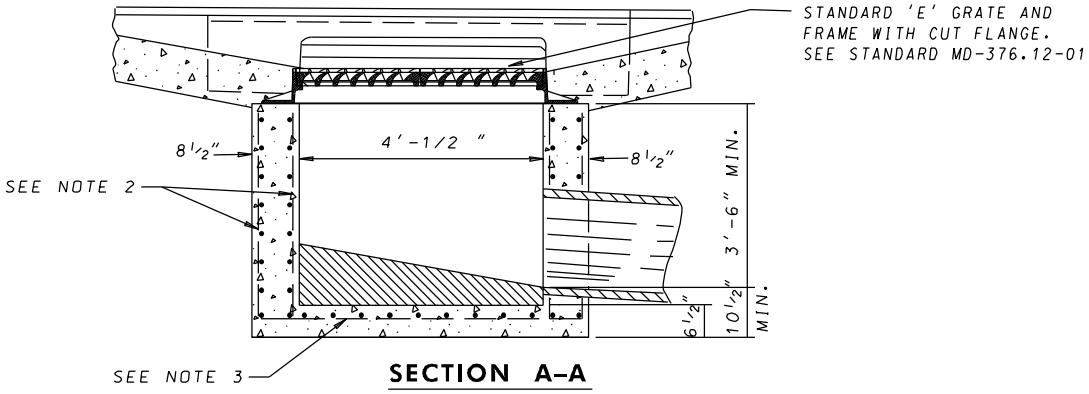
CURVED VANE GRATES WITH FRAME FOR TYPE "E" INLET (E-CV)

STANDARD NO. MD 376.12-01



PLAN

(SHOWN WITHOUT TROUGH SLAB)



SECTION A–A

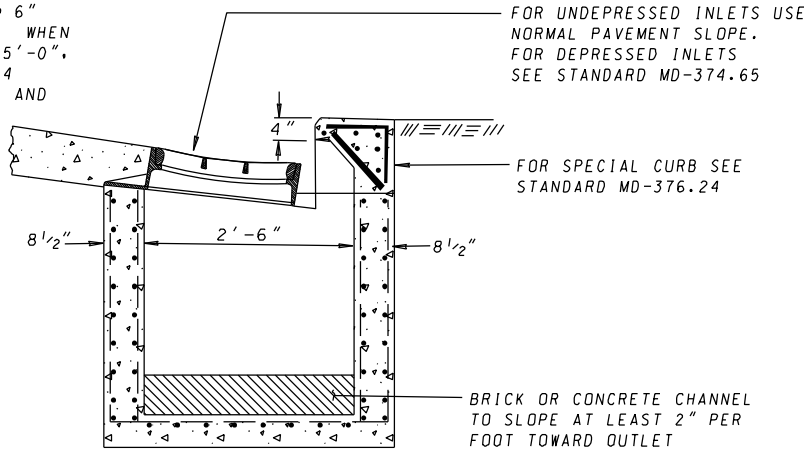
GENERAL NOTES

1. INLET SHALL BE CONSTRUCTED OF REINFORCED CONCRETE MIX NO. 2 (3,000 PSI).

2. WHEN DEPTH IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3" COVER ON INSIDE. WHEN DEPTH IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.

3. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, WITH 2" COVER FROM TOP OF BASE.

4. FROM CURBLINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND FOR A MAXIMUM DEPTH OF 15'-0".



SECTION B–B

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____ DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	12-15-87	APPROVAL	2-24-88
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

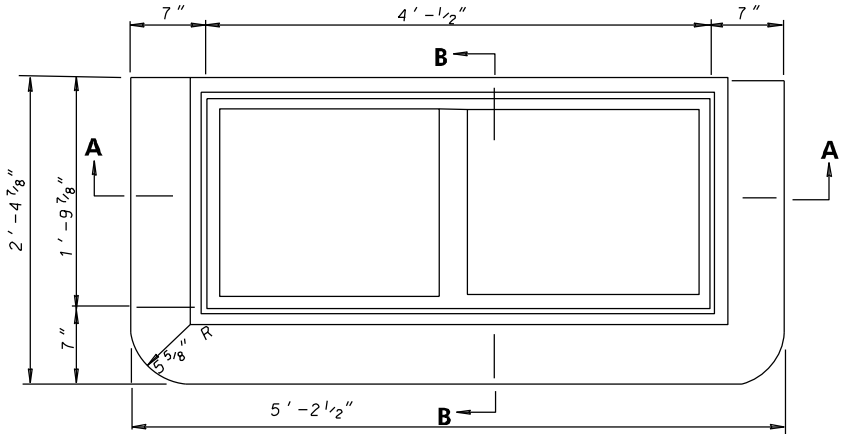
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

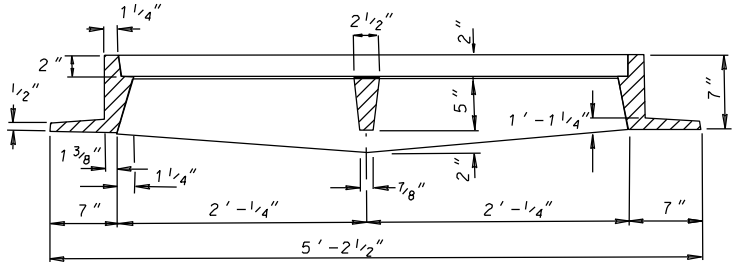
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE E COMBINATION INLET

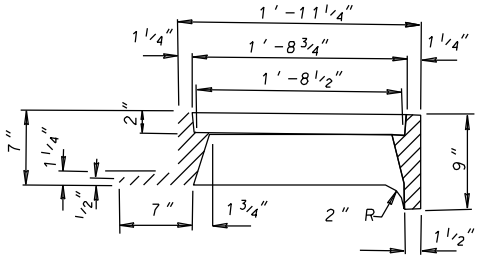
STANDARD NO. MD 376.21



PLAN



SECTION A–A



SECTION B–B

CAST IRON FRAME, APPROX. WEIGHT 653 LBS.

NOTE: MANUFACTURER TO VERIFY THAT FRAME IS DESIGNED FOR HS-25 LOADING

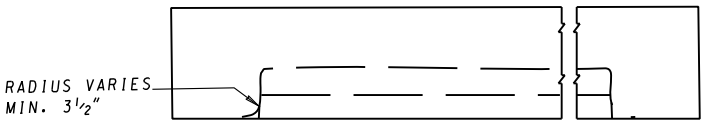
SPECIFICATION 305	CATEGORY CODE ITEMS	
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT	
	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
	APPROVAL 1-26-55	APPROVAL 3-23-56
	REVISED 11-18-04	REVISED –
	REVISED 10-7-14	REVISED 9-29-14
	REVISED	REVISED

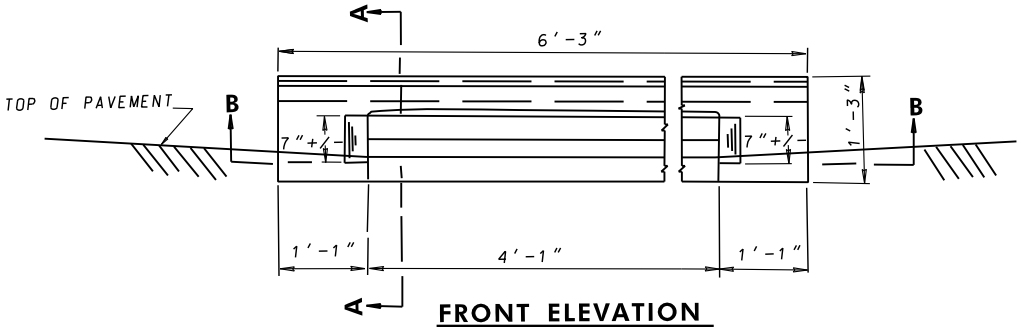
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

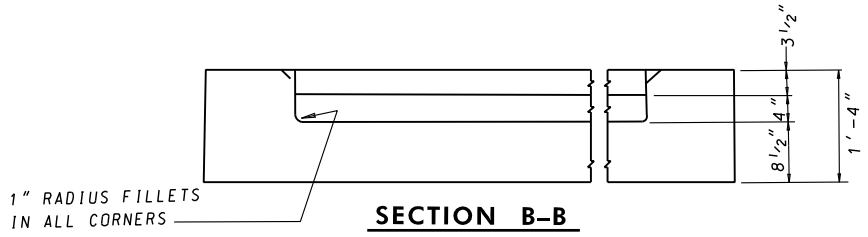
STANDARD TYPE E COMBINATION INLET
STANDARD CAST IRON FRAME

STANDARD NO. MD 376.22

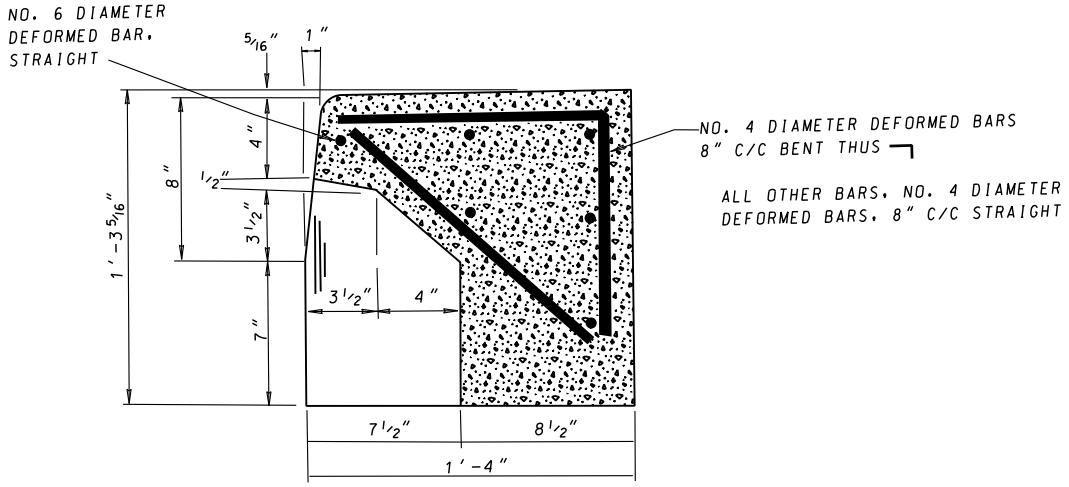




FRONT ELEVATION



SECTION B–B



SECTION A–A

NOTE: CONCRETE, S.H.A. FINISH, GRANOLITHIC APPROX. WEIGHT-1200 LBS.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 1-23-69	APPROVAL 2-24-69
REVISED 11-18-04	REVISED
REVISED	REVISED
REVISED	REVISED

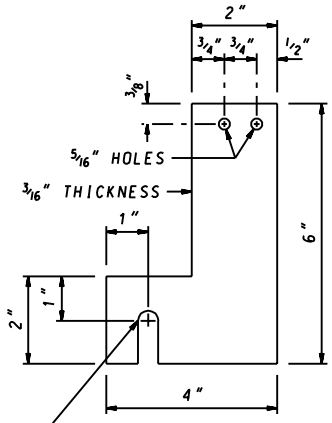
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

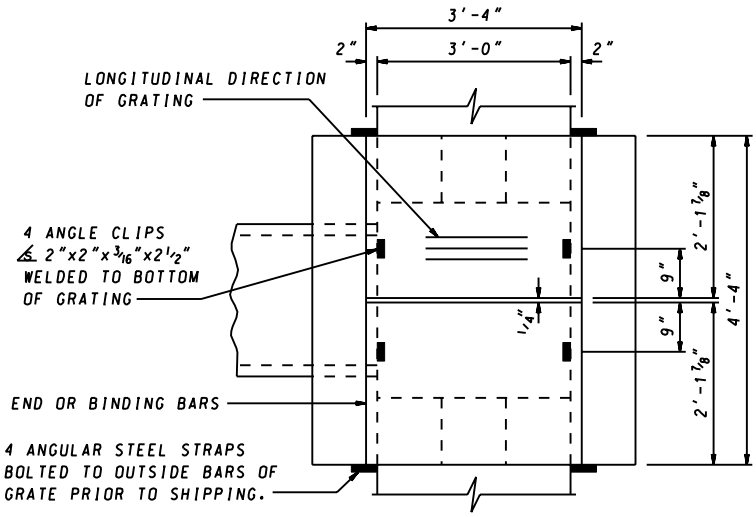
STANDARD TYPE E COMBINATION INLET DETAIL OF SPECIAL CURB

STANDARD NO. MD 376.24

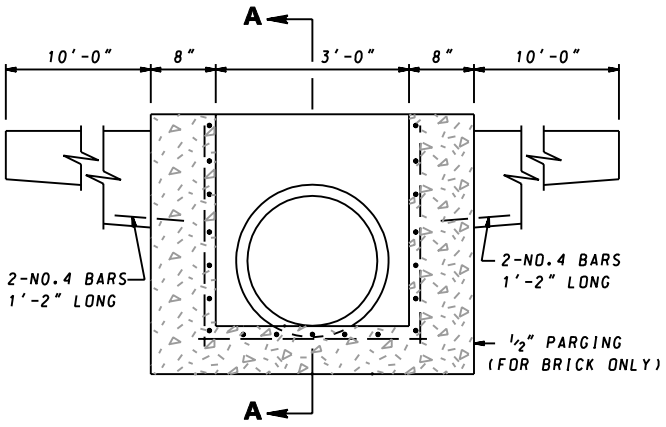


END STRAP DETAIL

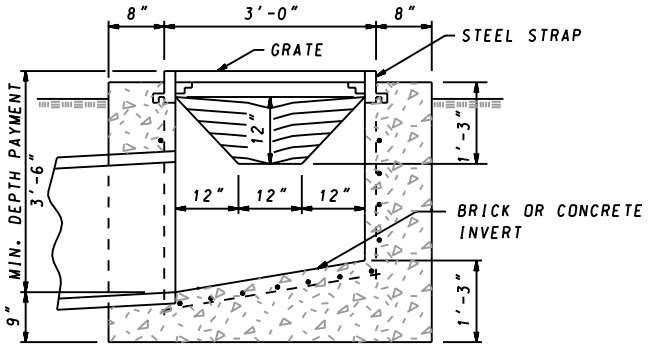
9/16" SLOTTED HOLE TO RECEIVE 1/2"x4" MACHINE BOLT (GALV.) IMBEDDED 3" IN CONC. WALL. NUT TO BE PLACED ON END OF BOLT AFTER GRATE IS INSTALLED.



PLAN



ELEVATION

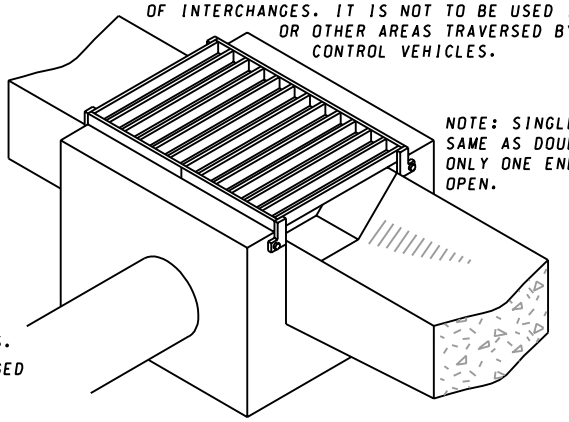


SECTION A-A

NOTES

1. THE CONCRETE VALLEY GUTTER TO BE USED IN CONNECTION WITH THIS INLET, WILL BE WARPED FROM THE STANDARD SECTION TO MEET THE SECTION AT THE END OF THE INLET. THIS TRANSITION WILL TAKE PLACE WITH A DISTANCE OF TEN (10) FEET FROM THE INLET. GUTTER TO BE PAID FOR SEPARATELY.
2. PIPE OUTLETS AND GUTTER APPROACHES CAN BE REVISED TO MEET EXISTING CONDITIONS.
3. INLET MAY BE CONSTRUCTED OF REINFORCED CONCRETE (MIX NO.2) OR BRICK. CHAMFER INSIDE CORNER 3/4"x3/4". REINFORCEMENT NO.4 BARS @ 6" C/C, 2" COVER.
4. GRATINGS ARE SUBJECT TO APPROVAL FOR EACH JOB. ANY TYPE OF SUBSTANTIAL TRANSVERSE BARS MAY BE USED WHICH WILL SUPPORT A MINIMUM UNIFORM LOAD OF 50 LBS./SQ.FT. THE TRANSVERSE BARS SHALL BE HELD RIGID BY SPACER BARS.
5. AREA TO BE MADE UP OF TWO EQUAL PANELED WIDTHS, ARRANGED FOR BOLTING TOGETHER IN THE FIELD.
6. ALL MATERIAL TO BE HOT DIPPED GALVANIZED.

NOTE THIS TYPE OF INLET MAY BE USED IN CONJUNCTION WITH BERM DITCHES, BENCHES, AND SUMP AREAS OF INNER LOOPS OF INTERCHANGES. IT IS NOT TO BE USED IN MEDIANS OR OTHER AREAS TRAVERSED BY OUT-OF-CONTROL VEHICLES.



NOTE: SINGLE OPENING SAME AS DOUBLE EXCEPT ONLY ONE END IS OPEN.

ISOMETRIC VIEW
(DOUBLE OPENING SHOWN)

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

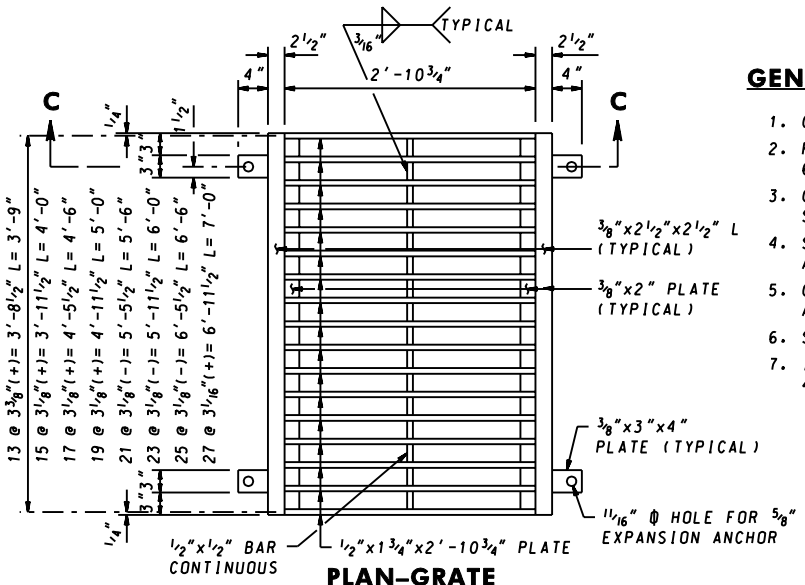
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	1-23-69	APPROVAL	2-6-69
REVISED	10-1-01	REVISED	6-23-87
REVISED		REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD SINGLE OR DOUBLE OPENING TYPE K INLET OPEN-END GRATE NON-TRAFFIC AREAS

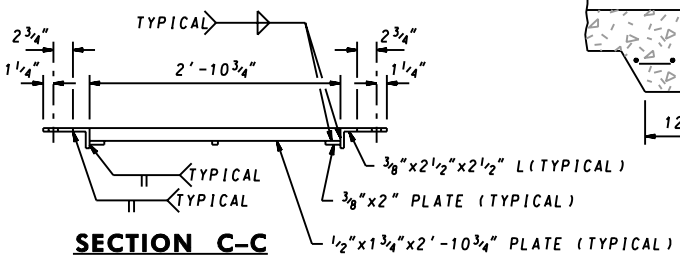
STANDARD NO. MD 378.03



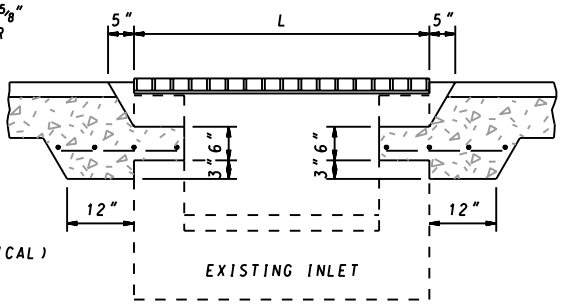
PLAN-GRATE

GENERAL NOTES

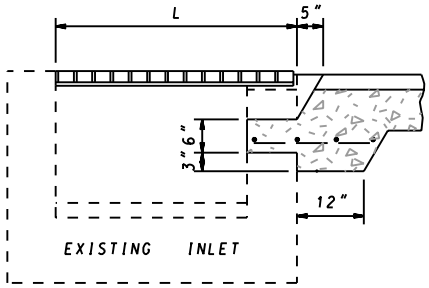
1. CONCRETE TO BE CONCRETE MIX NO.2.
2. REINFORCEMENT TO BE NO.4(1/2" Ø) DEFORMED BARS AT 6" C/C. 2" COVER.
3. GRATE TO BE OF STEEL CONSTRUCTION & SHALL BE SQUARE, FLAT & TRUE.
4. STRUCTURAL STEEL SHALL BE A.S.T.M. DESIGNATION A-36.
5. GRATE TO BE GALV. AFTER FABRICATION IN ACCORDANCE A.S.T.M. DESIGNATION A-123.
6. SEE LATEST S.H.A. SPECIFICATIONS.
7. INSTALL 4-5/8" Ø CONCRETE EXPANSION ANCHORS WITH 4-5/8" Ø HEX. HEAD BOLTS. (GALV.)



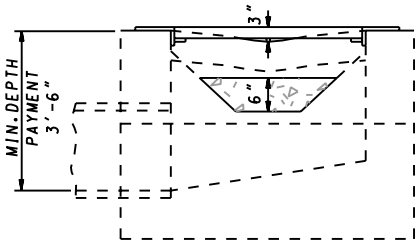
SECTION C-C



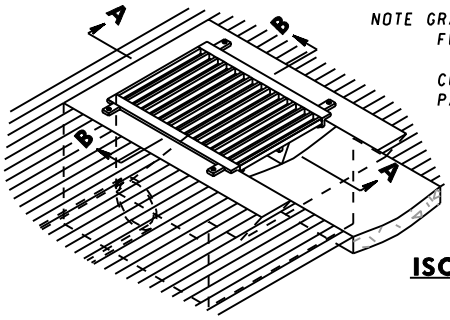
SECTION A-A
DOUBLE OPENING



SECTION A-A
SINGLE OPENING



SECTION B-B

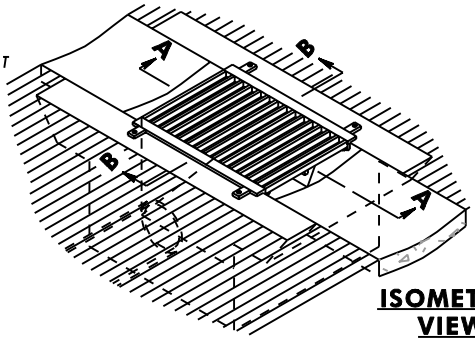


ISOMETRIC VIEW

SINGLE OPENING

NOTE GRATE TO BE AS SHOWN OR FURNISH APPROVED EQUIVALENT

CONCRETE GUTTER TO BE PAID FOR SEPARATELY.



ISOMETRIC VIEW

DOUBLE OPENING

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-8-73	APPROVAL	3-16-73
REVISED	10-1-01	REVISED	2-8-83
REVISED		REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

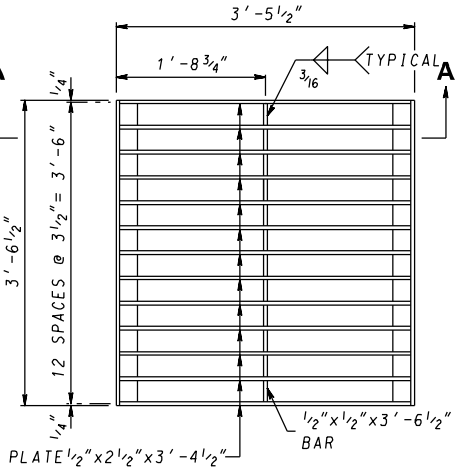
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE K INLET REPLACEMENT GRATE

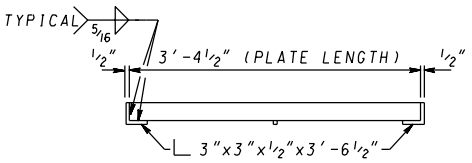
STANDARD NO. MD 378.04

GENERAL NOTES

1. CONCRETE TO BE MIX NO.2 (3,000 PSI)
2. GRATE IS TO BE OF STEEL CONSTRUCTION & SHALL BE SQUARE, FLAT & TRUE.
3. STRUCTURAL STEEL SHALL BE A.S.T.M. DESIGNATION A-36.
4. GRATE TO BE GALV. AFTER FABRICATION IN ACCORDANCE WITH ASTM. DESIGNATION A-123.
5. SEE LATEST S.H.A. SPECIFICATIONS.
6. THIS INLET IS TO BE USED IN MEDIAN DITCHES AND ANY DITCH BEYOND THE SHOULDER AREA. THIS INLET IS NOT TO BE USED IN ROADWAY OR SHOULDER PAVEMENT AREAS OR AREAS WHERE BICYCLE OR MOTORCYCLE TRAFFIC IS ANTICIPATED.
7. WHEN DEPTH IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3" COVER ON INSIDE. WHEN DEPTH IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
8. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
9. INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD FOR MAXIMUM DEPTH OF 15'-0"

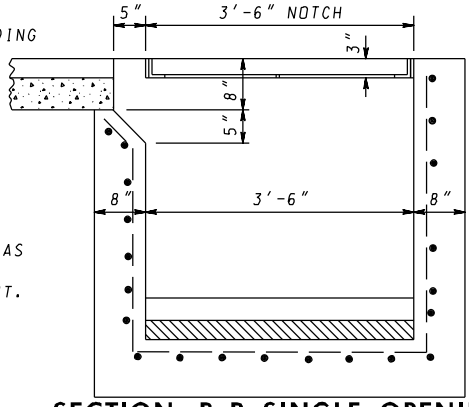


PLAN

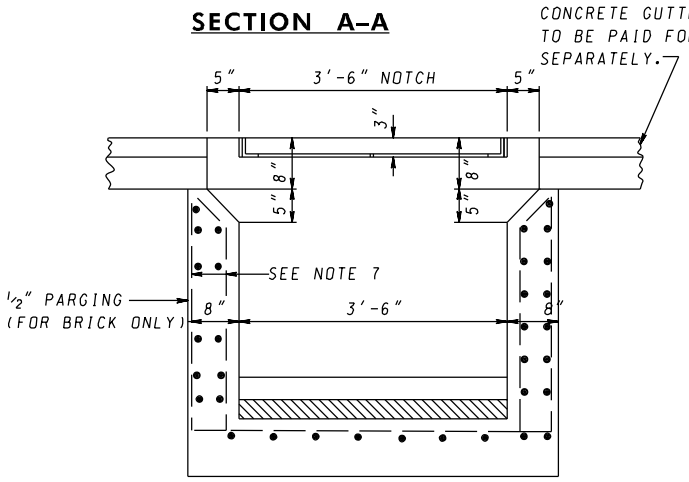


SECTION A-A

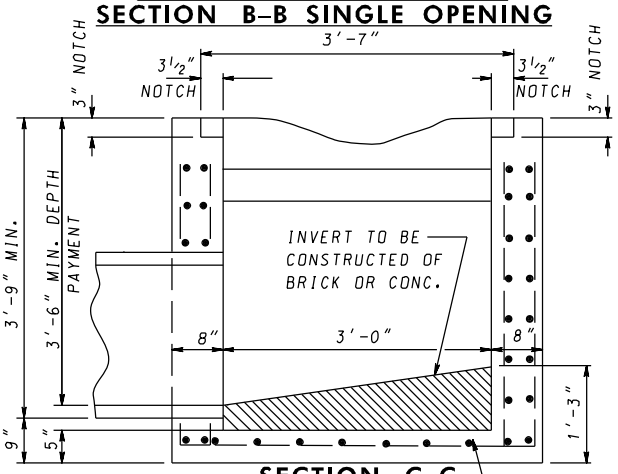
NOTE: GRATE TO BE AS SHOWN OR FURNISH APPROVED EQUIVALENT.



SECTION B-B SINGLE OPENING

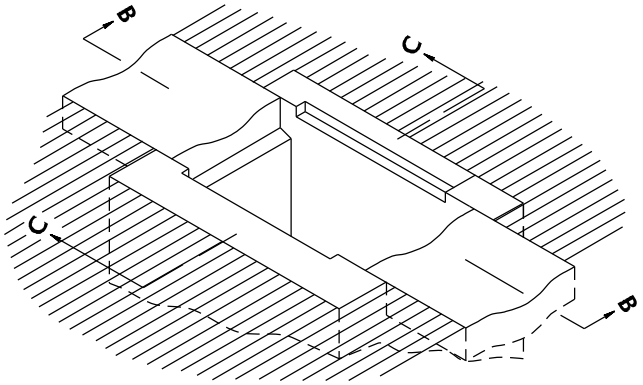


SECTION B-B DOUBLE OPENING



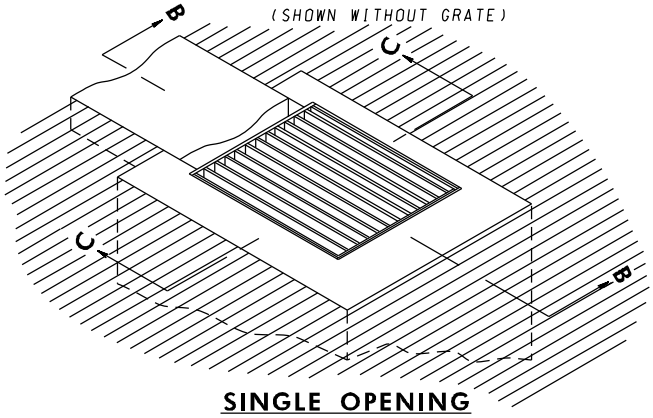
SECTION C-C

TYPICAL BOTH INLETS (SHOWN WITHOUT GRATE)



DOUBLE OPENING

(SHOWN WITHOUT GRATE)



SINGLE OPENING

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____ DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	5-28-82	APPROVAL	
REVISED	10-1-01	REVISED	6-23-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

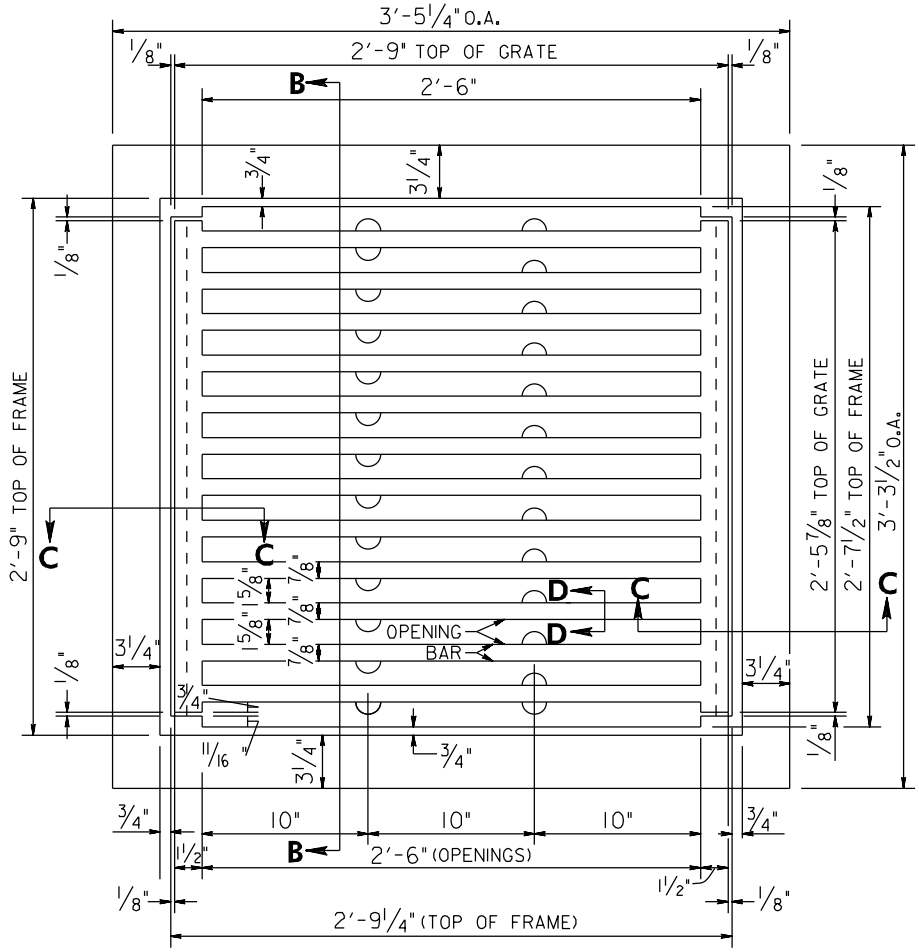
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

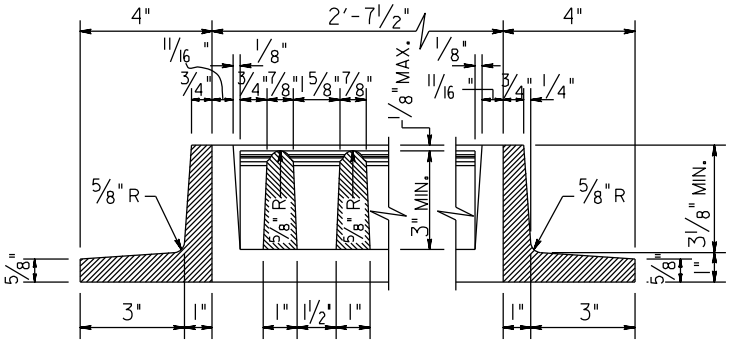
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD SINGLE OR DOUBLE OPENING TYPE K INLET OPEN – END GRATE

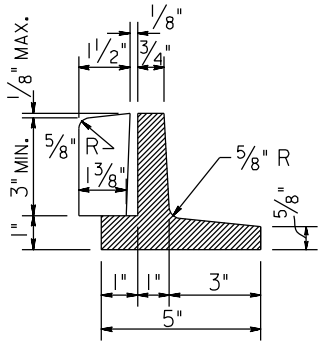
STANDARD NO. MD 378.05



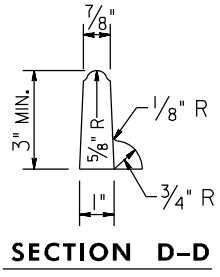
PLAN



SECTION B–B



SECTION C–C



SECTION D–D

MATERIAL: CAST IRON (SEE LATEST S.H.A. SPECIFICATIONS).

AVERAGE WEIGHTS:
FRAME–270 ± LBS.
GRATE–340 ± LBS.

NOTE: MANUFACTURER TO VERIFY THAT FRAME IS DESIGNED FOR HS-25 LOADING

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	3-15-06	REVISED	4-5-06
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

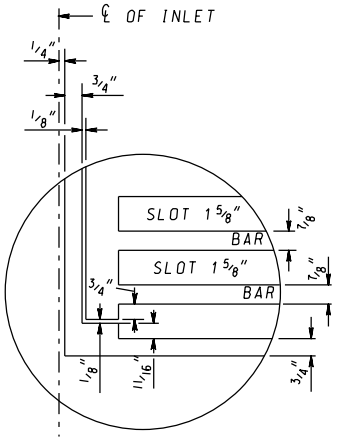
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE K INLET
SINGLE FRAME AND GRATE

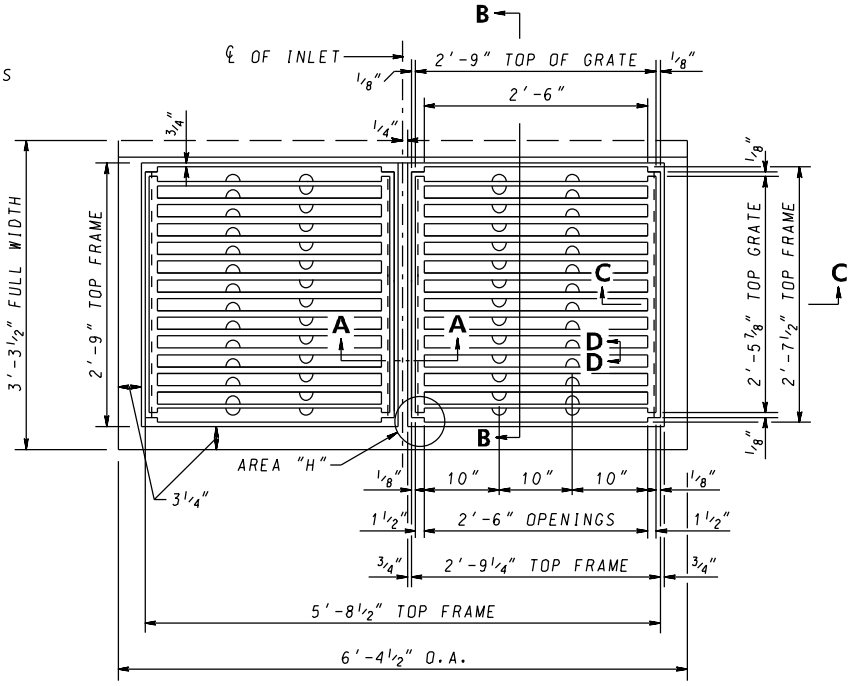
STANDARD NO. **MD–378.06**

CAST IRON FRAME & GRATES
SEE LATEST S.H.A. SPECIFICATIONS

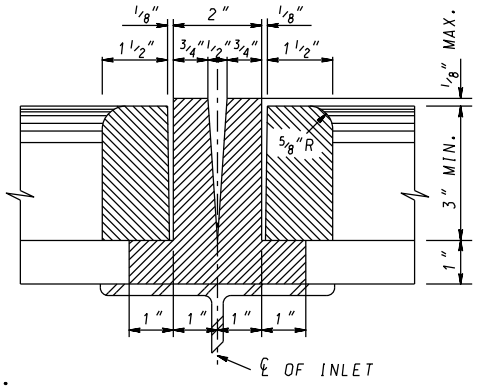
AVERAGE WEIGHTS
FRAME-CUT FLANGE=430 LBS. ±
FRAME-UNCUT=480 LBS. ±
GRATES-2=680 LBS. ±



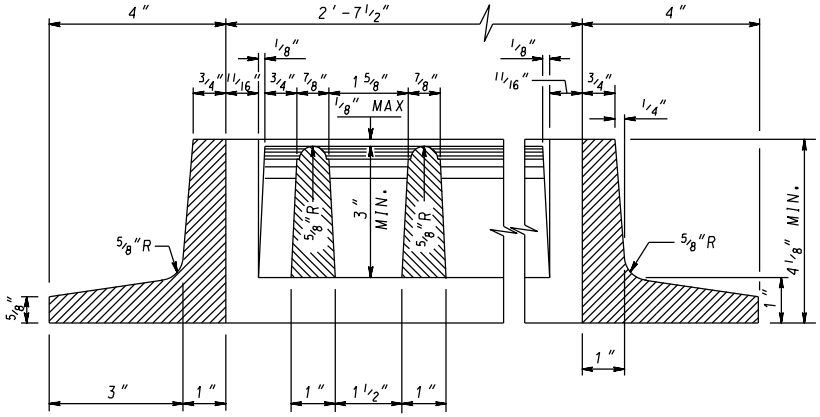
AREA "H" DETAIL



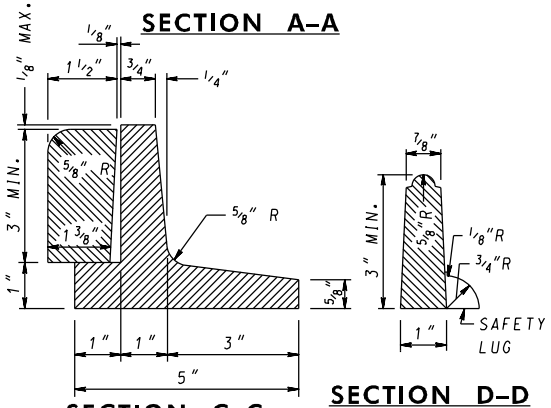
PLAN



SECTION A–A



SECTION B–B



SECTION C–C **SECTION D–D**

NOTE: MANUFACTURER TO VERIFY THAT FRAME IS DESIGNED FOR HS-25 LOADING

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-28-75	APPROVAL	5-12-75
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

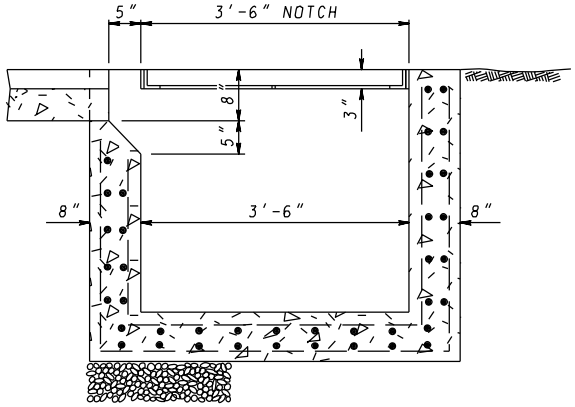
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE K INLET DOUBLE FRAME & GRATE

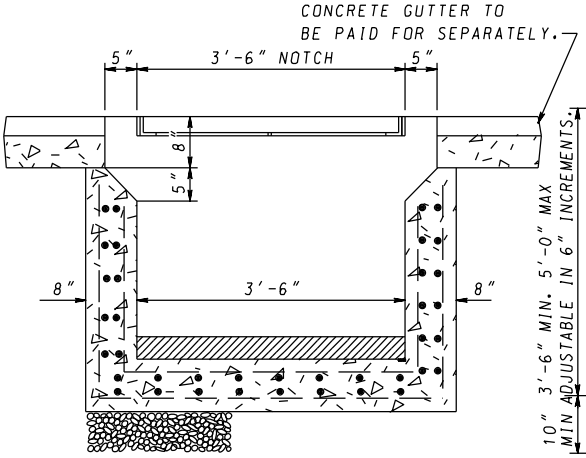
STANDARD NO. MD 378.07

GENERAL NOTES

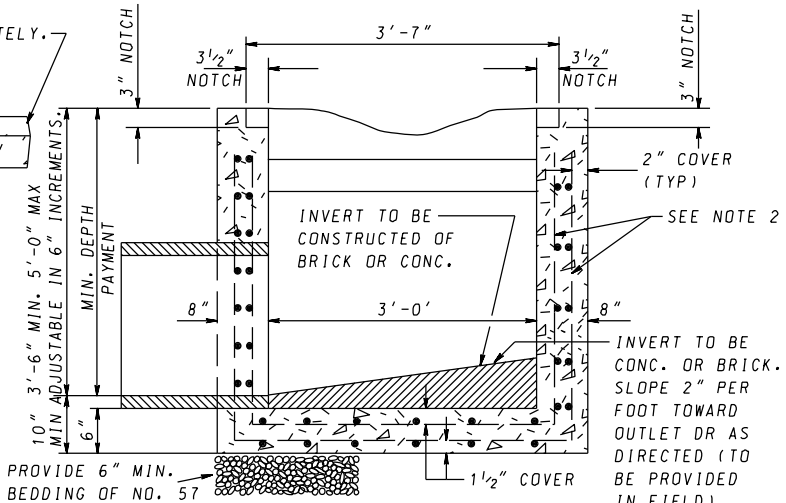
1. CONCRETE TO BE MIX. NO.6 (4500 P.S.I.)
2. REINFORCING WALLS - 2 LAYERS OF 4X4-W4.0xW4.0 WELDED WIRE FABRIC; BASE - 2 LAYERS OF 4X4 - W5.0 X W5.0 WELDED WIRE FABRIC
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. PIPE OPENINGS TO BE PROVIDED AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO CONSTRUCTION PLANS.
5. FOR GRATE DETAILS SEE STANDARD MD-378-05. GRATE TO BE AS SHOWN OR FURNISH APPROVED EQUIVALENT.
6. "MINIMUM DEPTH" PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6" . VERTICAL DEPTH PAYMENT PER "LINEAR FOOT" FOR DEPTHS IN EXCESS OF 3'-6".
7. THIS INLET IS TO BE USED IN MEDIAN DITCHES AND ANY DITCH BEYOND THE SHOULDER AREA. THIS INLET IS NOT TO BE USED IN ROADWAY OR SHOULDER PAVEMENT AREAS OR WHERE BICYCLE OR MOTORCYCLE TRAFFIC IS ANTICIPATED.
8. INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO ASHTOLRFD BRIDGE DESIGN SPECIFICATIONS



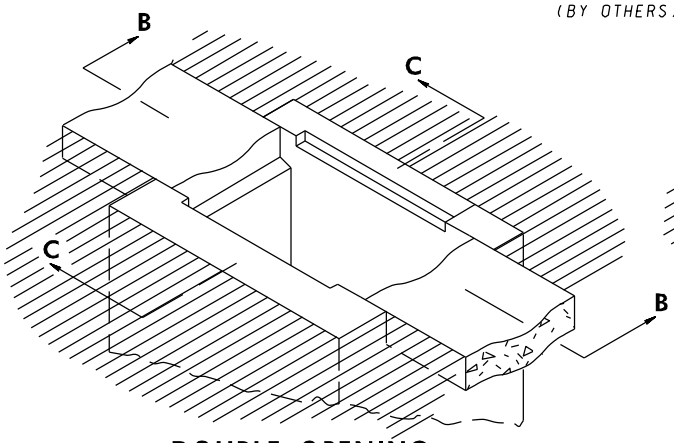
SECTION B–B SINGLE OPENING



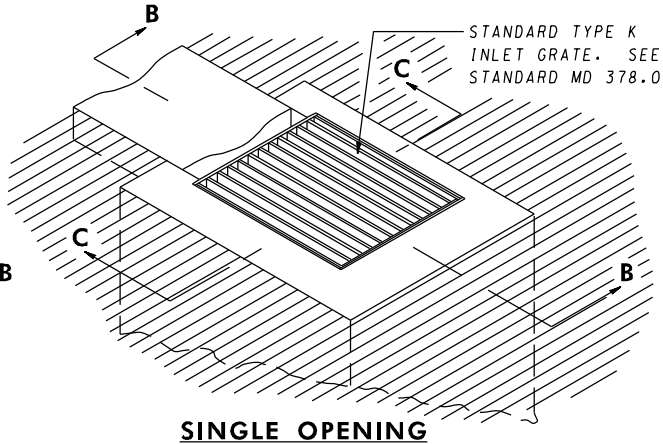
SECTION B–B DOUBLE OPENING



SECTION C–C
TYPICAL BOTH INLETS
(SHOWN WITHOUT GRATE)



DOUBLE OPENING
(SHOWN WITHOUT GRATE)



SINGLE OPENING

SPECIFICATION 305	CATEGORY CODE ITEMS

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-4-84	APPROVAL	8-1-84
REVISED	10-1-01	REVISED	6-23-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

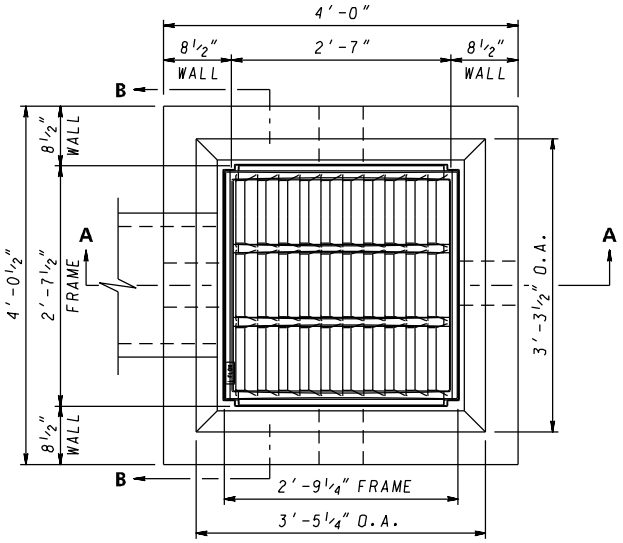
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

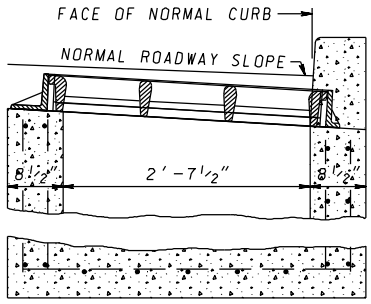
PRECAST STANDARD
SINGLE OR DOUBLE OPENING
TYPE K INLET OPEN-END GRATE

STANDARD NO. MD 378.11

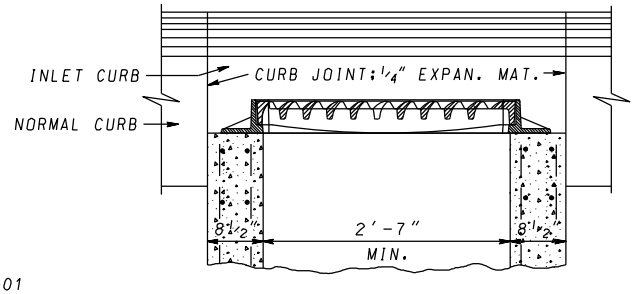


PLAN

NOTE FOR UNDEPRESSED INLETS, USE NORMAL PAVEMENT SLOPE.

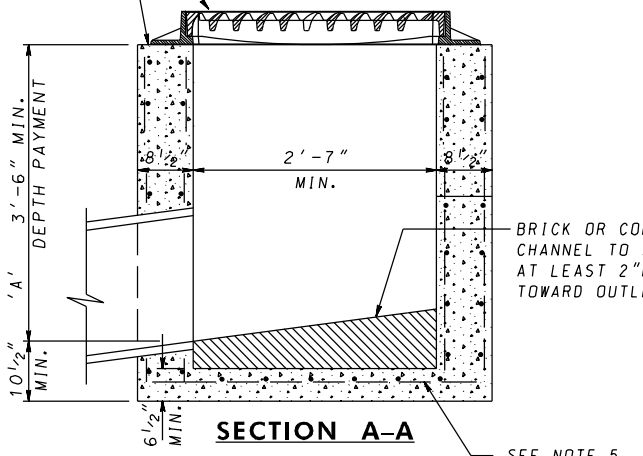


SECTION B–B ADJACENT TO CURB

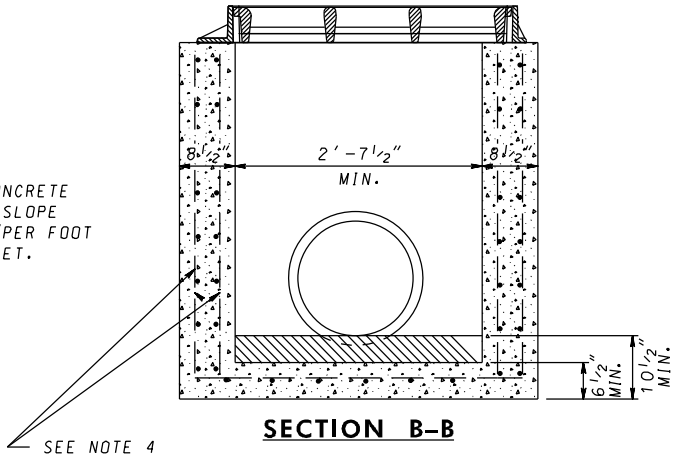


SECTION A–A ADJACENT TO CURB

LEAVE 4"x4" OPENINGS FOR SUBGRADE DRAINAGE, IF DIRECTED.



SECTION A–A



SECTION B–B

NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3 " COVER ON INSIDE. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE..
9. WHEN INLET IS USED ADJACENT TO CURB, SLOPE CURB FACE TO MEET INSIDE EDGE OF FRAME, AS SHOWN IN SECTION B-B, ADJACENT TO CURB.
10. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	7-9-62	APPROVAL	2-24-88
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	

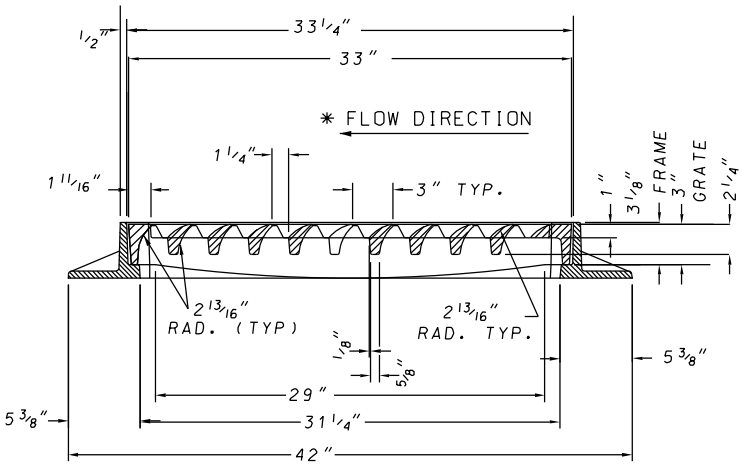
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

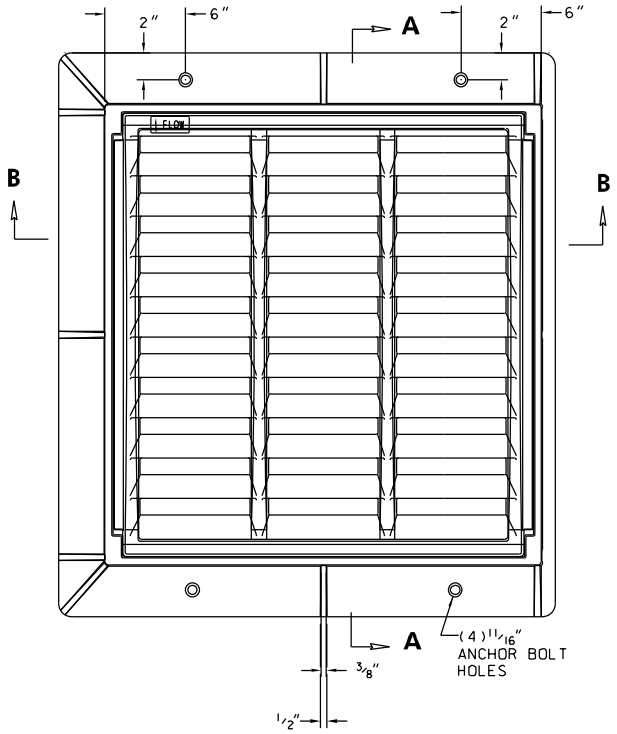
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE S INLET SINGLE GRATE

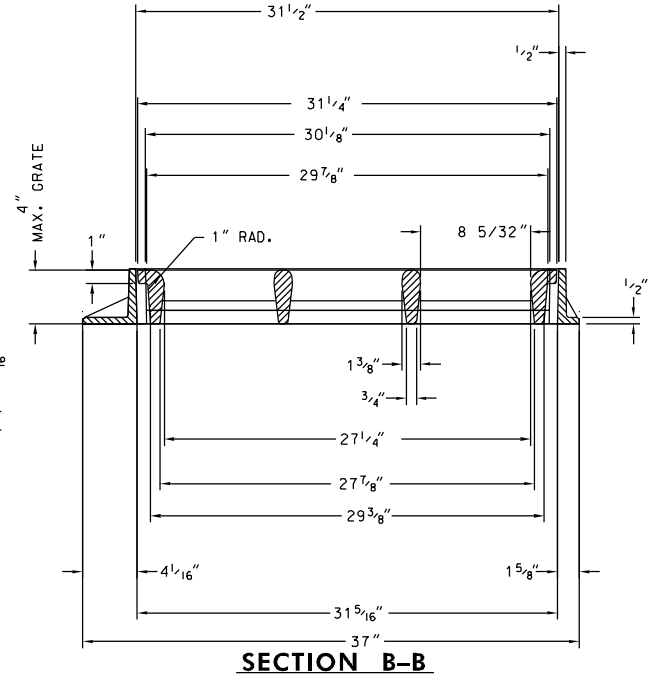
STANDARD NO. MD 379.01



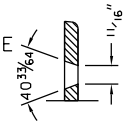
SECTION A–A



PLAN



SECTION B–B



NOTES:

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
FINISH: NO PAINT
WEIGHT (Min.): FRAME 163#, GRATE 295#

FRAMES TO BE CASTING WITH FLANGE CUT, AS SHOWN, WHEN INLET TO BE PLACED ADJACENT TO CURB OPENING FOR FULL FLANGE/DETAILS, REFER TO THE RESPECTIVE STANDARD PLATES FOR TYPE "S" INLET.

* CONTRACTOR IS RESPONSIBLE FOR CORRECT ORIENTATION OF THE CV-GRATE TOWARD THE DIRECTION OF FLOW.

NOTE: MANUFACTURER TO VERIFY THAT FRAME IS DESIGNED FOR HS-25 LOADING

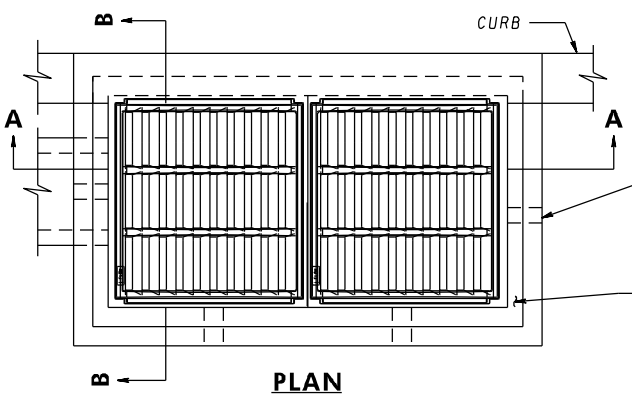
SPECIFICATION 305		
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT	
	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
	APPROVAL 2-10-04	APPROVAL 3-31-04
	REVISED 7-1-09	REVISED 7-27-09
	REVISED 10-7-14	REVISED 9-29-14
	REVISED	REVISED

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

CURVE VANE GRATE WITH FRAME FOR SINGLE TYPE S INLET (S–CV)

STANDARD NO. MD 379.02-01

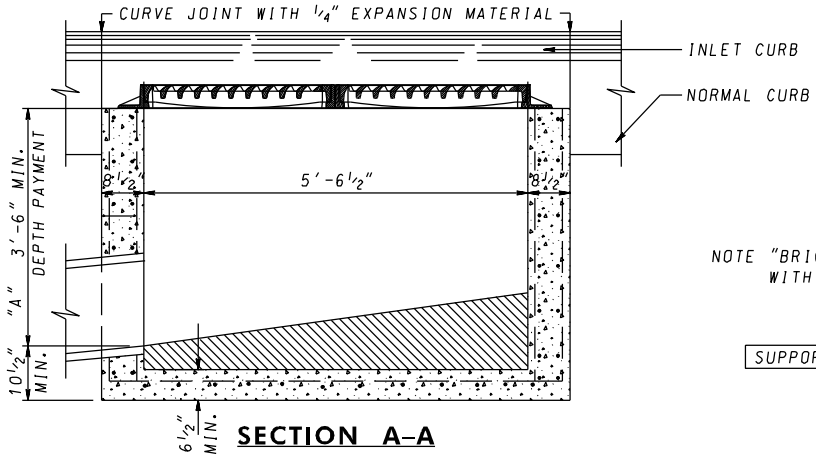


PLAN

INVERT MAY BE PLAIN CONCRETE OR 4" BRICK LAID ON EDGE. INVERT TO SLOPE DOWN TOWARD OUTLET AT THE RATE OF 2" PER FOOT, OR AS DIRECTED.

LEAVE 4"x4" OPENING FOR SUBGRADE DRAINAGE, IF DIRECTED.

STANDARD CLASS 'S' CAST IRON FRAME & GRATES. SEE STANDARD MD 379.05.

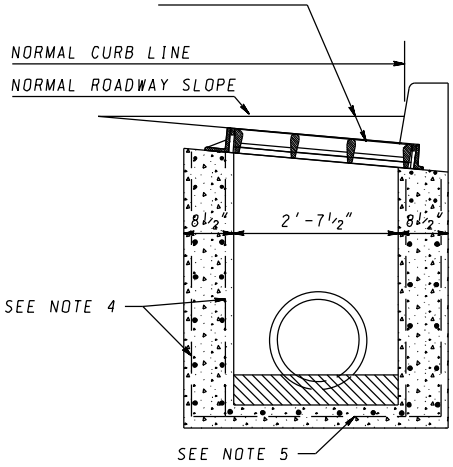


SECTION A–A

NOTE "BRICK FOR MASONRY", TO COMPLY WITH THE LATEST S.H.A. SPECIFICATIONS.

SUPPORT BEAM IS NOT TO BE USED

NOTE FOR UNDEPRESSED INLETS, USE NORMAL PAVEMENT SLOPE.



SECTION B–B

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3 1/2" COVER ON INSIDE. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. SLOPE FACE OF CURB TO MEET INSIDE EDGE OF FRAME AS SHOWN IN SECTION B-B.
8. STANDARD CLASS "S" INLET (DOUBLE GRATE TANDEM) MAY BE USED WITH ONE END ADJACENT TO CURB. FRAME WILL BE LAID ON NORMAL SLOPE OF ROADWAY UNLESS NOTED OTHERWISE.
9. ALL WALL, FRAME, AND GRATE DIMENSIONS SAME AS WHEN SIDE IS ADJACENT TO CURB AS SHOWN ON LEFT.
10. INLET MAY BE USED IN LOW SPOTS, WHICH ARE NOT ADJACENT TO CURB.
11. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND FOR A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	10-30-69	APPROVAL	11-10-69
REVISED	8-3-10	REVISED	7-27-09
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	–

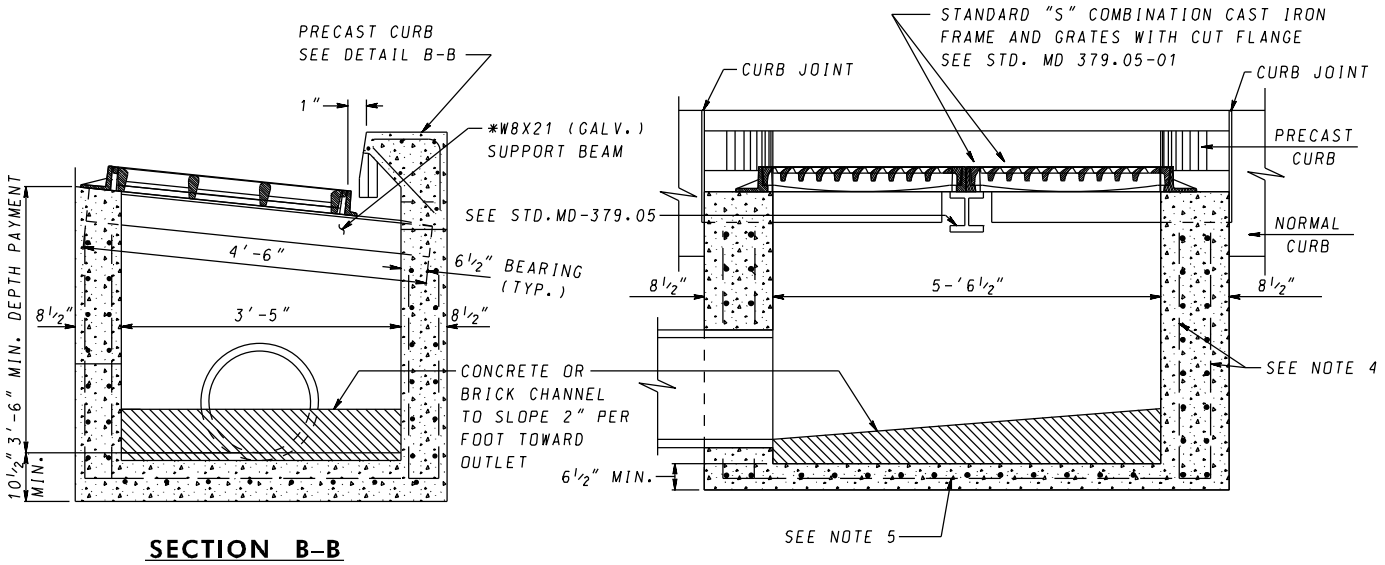
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE S INLET DOUBLE GRATE TANDEM

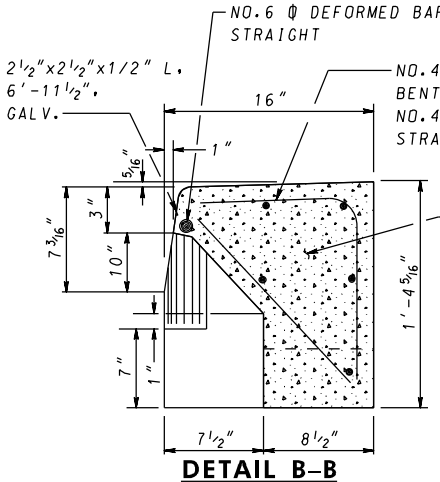
STANDARD NO. MD 379.03



SECTION B–B

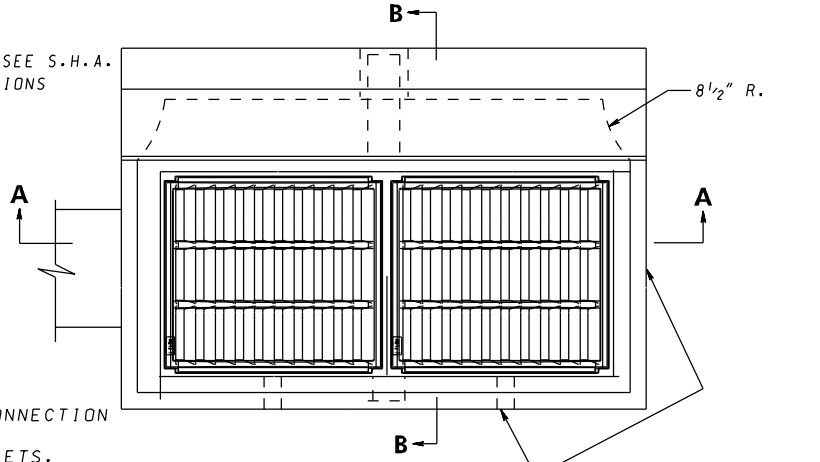
INVERT MAY BE PLAIN CONCRETE OR 4" BRICK LAID ON EDGE.

SECTION A–A

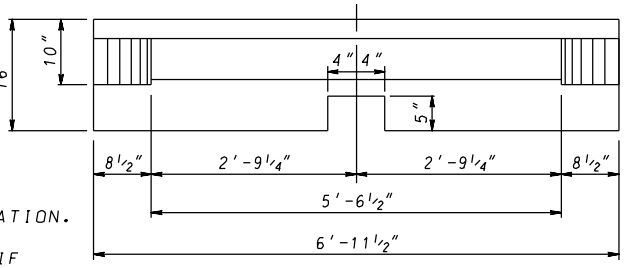


DETAIL B–B

PRECAST CURB



PLAN



ELEVATION

PRECAST CURB

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 3½" COVER ON INSIDE. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE.
9. FOR METHOD OF ANCHORING BEAM, SEE STD. MD 380.01 IF INLET IS CONSTRUCTED OF BRICK. (FOR INLET REPAIR ONLY).
10. FROM THE CURB LINE, INLET HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND FOR A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

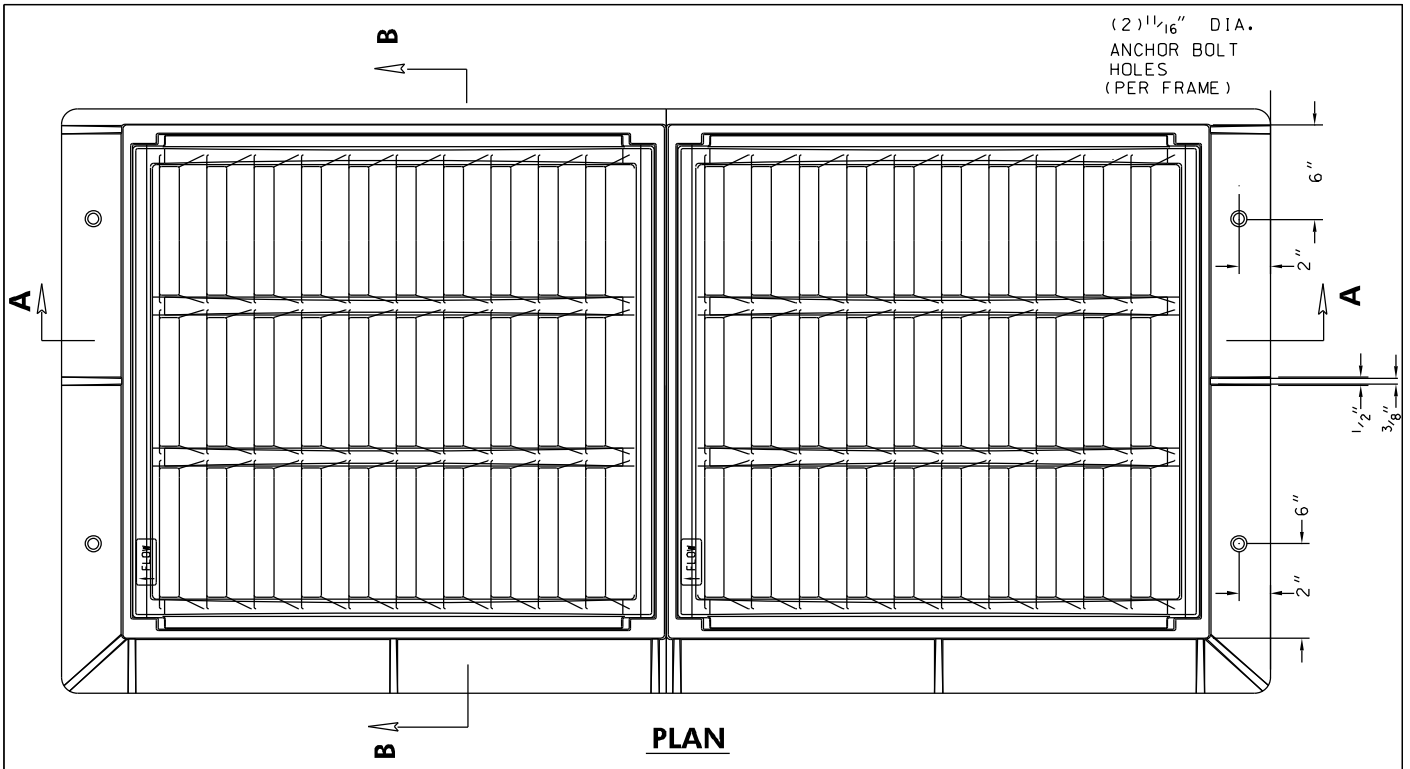
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	10-30-69	APPROVAL	11-10-69
REVISED	8-3-10	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	–

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

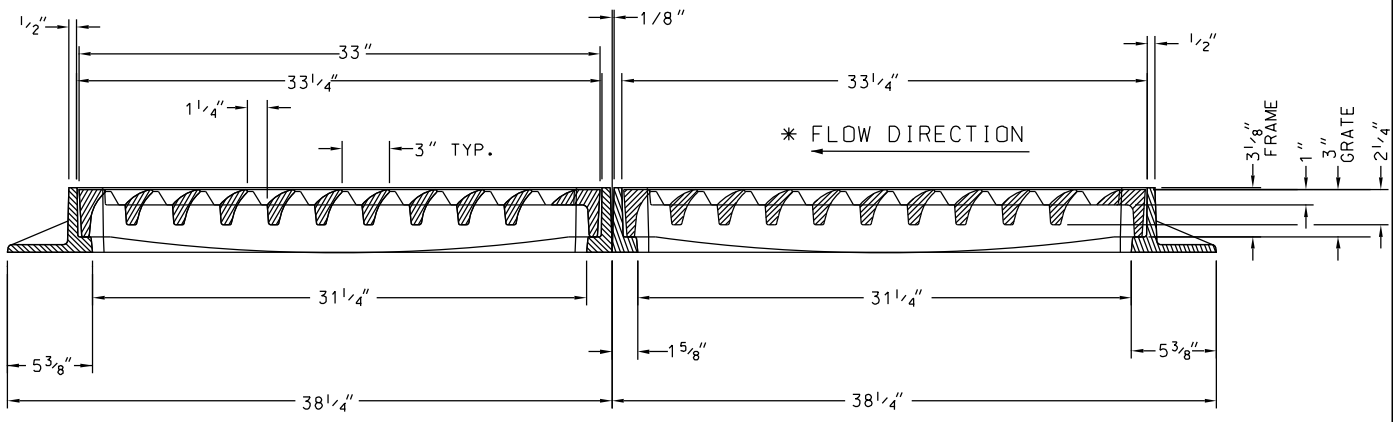
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE S COMBINATION INLET DOUBLE GRATE TANDEM

STANDARD NO. MD 379.04



PLAN



SECTION A–A

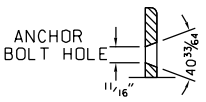
NOTES:

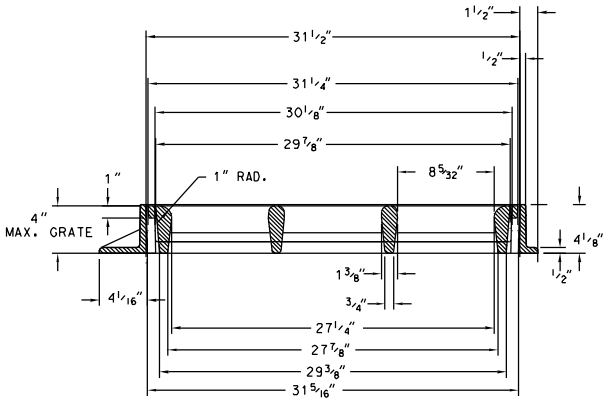
MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
FINISH: NO PAINT
WEIGHT (MIN.): FRAME 152#, FRAME 152#, GRATE 295# EA.

FRAMES TO BE CASTING WITH FLANGE CUT, AS SHOWN, WHEN INLET TO BE PLACED ADJACENT TO CURB OPENING. FOR FULL FLANGE/DETAILS, REFER TO THE RESPECTIVE STANDARD PLATES FOR TYPE "S" INLET.

* CONTRACTOR IS RESPONSIBLE FOR CORRECT ORIENTATION OF THE CV-GRATE TOWARD THE DIRECTION OF FLOW.

NOTE: MANUFACTURER TO VERIFY THAT FRAME AND GRATE IS DESIGNED FOR HS-25 LOADING.





SECTION B–B

SPECIFICATION 305	
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-10-04	APPROVAL	3-31-04
REVISED	7-1-09	REVISED	7-27-09
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

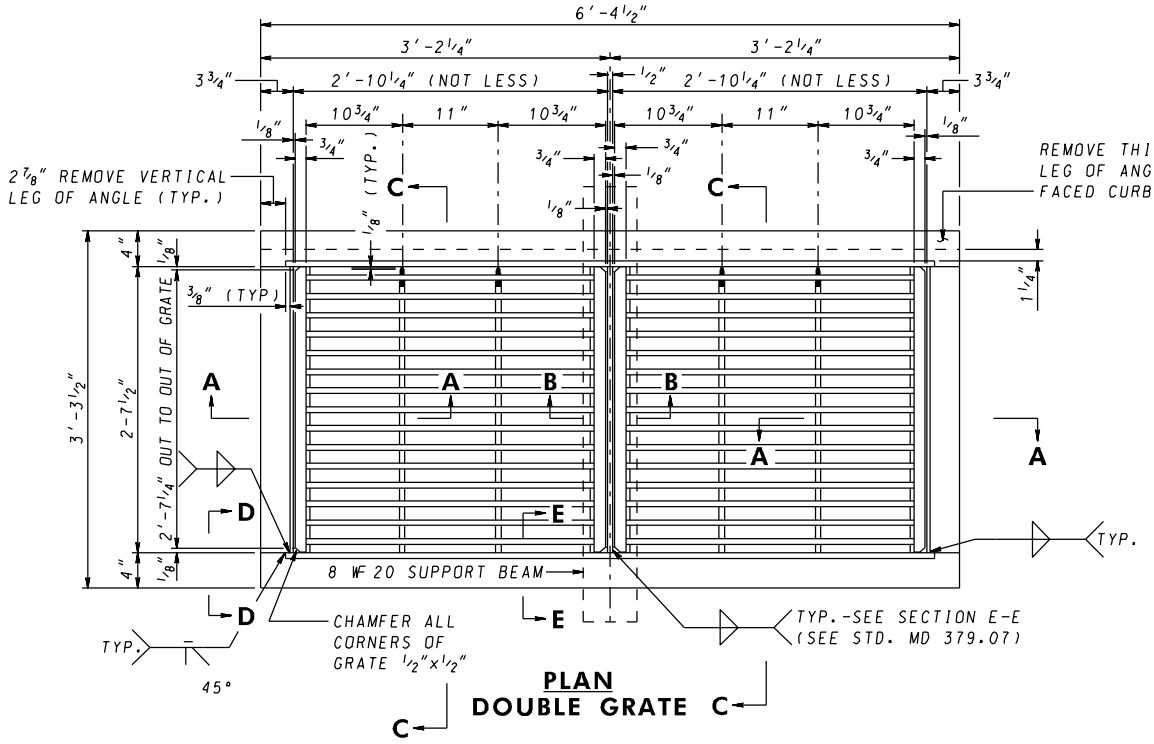
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

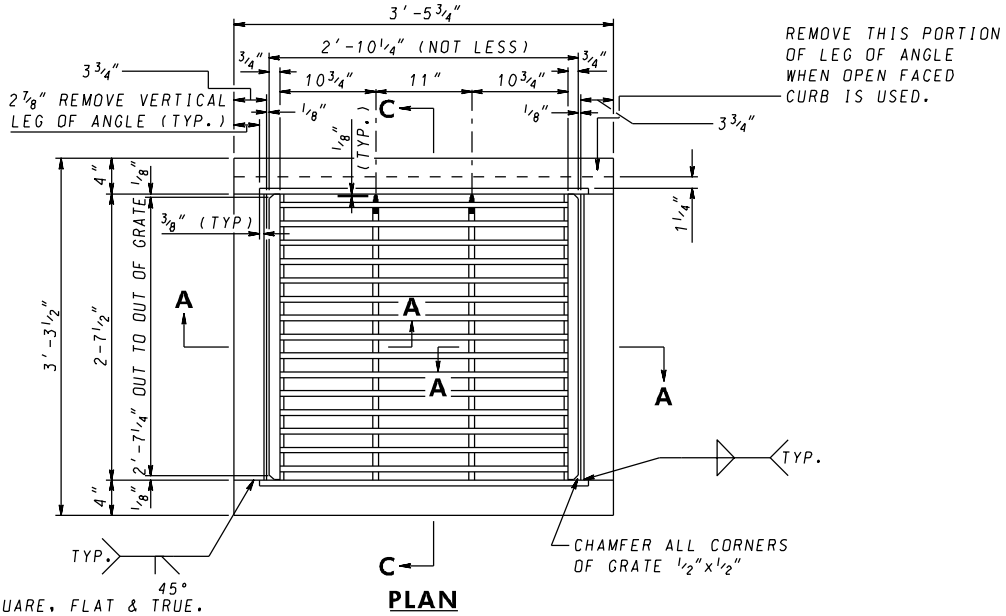
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

CURVE VANE GRATES WITH FRAME FOR DOUBLE TYPE "S" INLET (S2-CV)

STANDARD NO. MD 379.05-01



PLAN
DOUBLE GRATE



PLAN
SINGLE GRATE

GENERAL NOTES:

1. FRAMES & GRATES TO BE SQUARE, FLAT & TRUE.
2. STRUCTURAL STEEL SHALL BE A.S.T.M. DESIGNATION A-36.
3. FRAMES AND GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH A.S.T.M. DESIGNATION A-123
4. APPROX. WEIGHTS:
   DOUBLE FRAME=280# DOUBLE GRATE=520#
   SINGLE FRAME=175# SINGLE GRATE=260#
5. SEE LATEST S.H.A. SPECIFICATIONS
6. NOT COMPATIBLE WITH BICYCLE.
7. GRATE AND FRAME HAVE BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-23-70		APPROVAL	5-5-70
REVISED	7-1-09		REVISED	7-27-09
REVISED	10-7-14		REVISED	9-29-14
REVISED	–		REVISED	

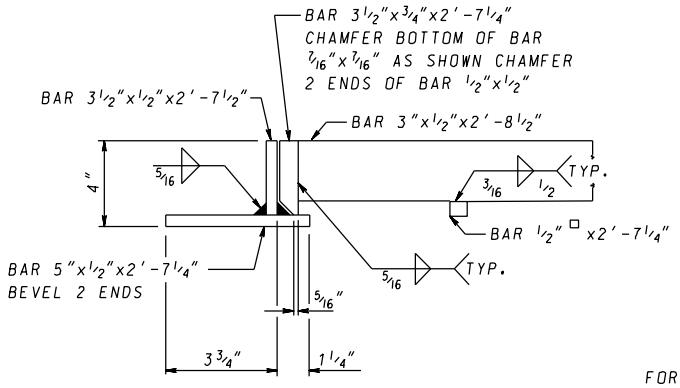
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

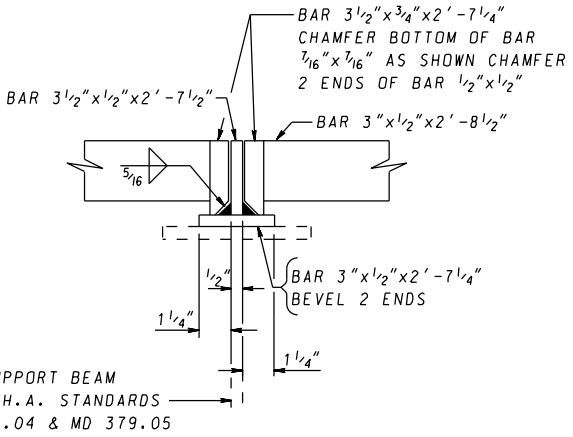
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE S INLET & COMBINATION STEEL FRAME & GRATE ALTERNATE

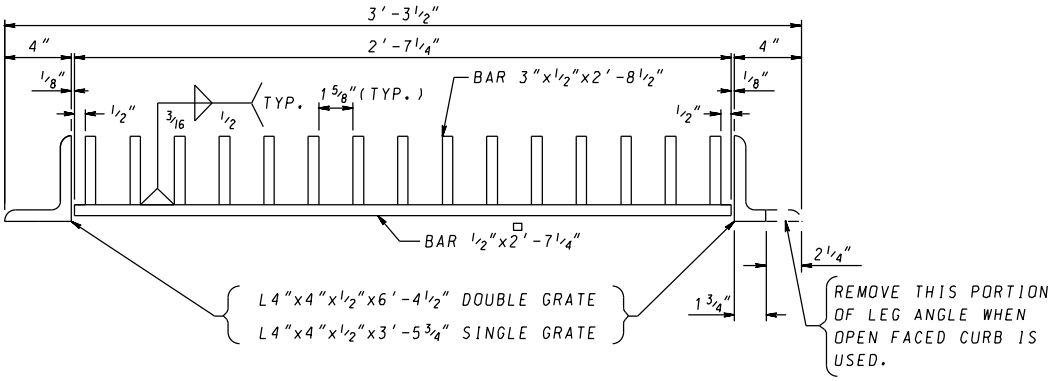
STANDARD NO. MD 379.06



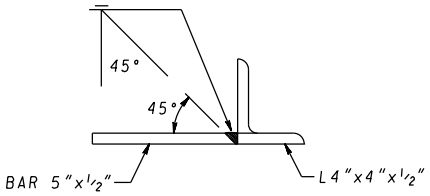
SECTION A–A



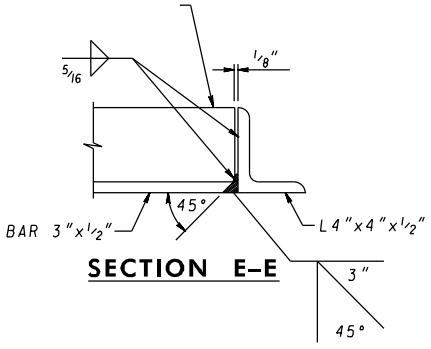
SECTION B–B



SECTION C–C



SECTION D–D



SECTION E–E

GENERAL NOTE:

GRATE AND FRAME HAVE BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE SPECIFICATIONS

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-23-70		APPROVAL	5-5-70
REVISED	7-1-09		REVISED	7-27-09
REVISED	10-7-14		REVISED	9-29-14
REVISED	–		REVISED	

SHA State Highway Administration

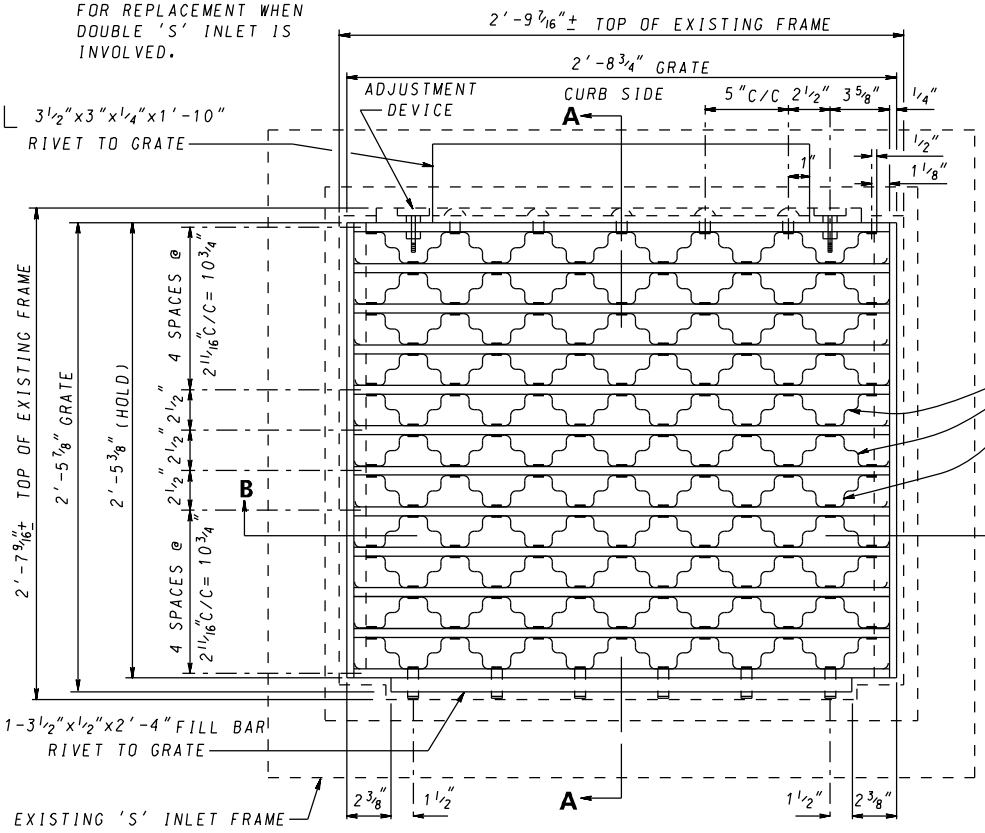
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE S INLET & COMBINATION STEEL FRAME & GRATE ALTERNATE

STANDARD NO. MD 379.07

NOTE 2 GRATES ARE REQUIRED FOR REPLACEMENT WHEN DOUBLE 'S' INLET IS INVOLVED.



PLAN

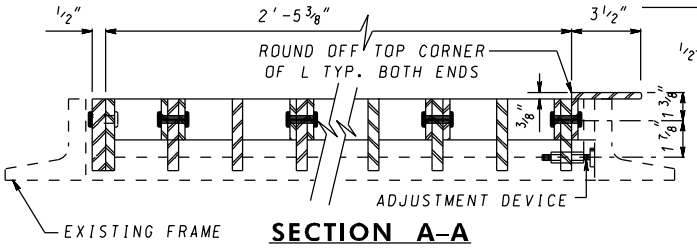
GENERAL NOTES

1. GRATES TO BE SQUARE FLAT & TRUE
2. STRUCTURAL STEEL SHALL BE ASTM DESIGNATION A-36.
3. GRATES TO BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM DESIGNATION A-123.
4. SEE LATEST S.H.A.SPECIFICATIONS.
5. GRATE AND FRAME HAVE BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

3-SPECIAL RETICULAR BARS

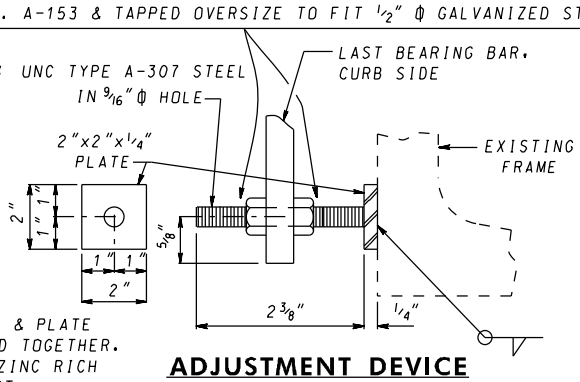
A "LOCKING DEVICE", TO BE DEVELOPED AND SUPPLIED BY THE CONTRACTOR, AND APPROVED BY THE S.H.A. ASSISTANT CHIEF ENGINEER-DESIGN FOR THE PURPOSE OF LOCKING THE GRATE IN-PLACE, IS REQUIRED PRIOR TO THE AWARD OF THE CONTRACT.

ANY DEVIATIONS FROM THE RETICULAR DESIGN AS SHOWN, MUST BE APPROVED BY THE S.H.A. ASSISTANT CHIEF ENGINEER-DESIGN.



SECTION A-A

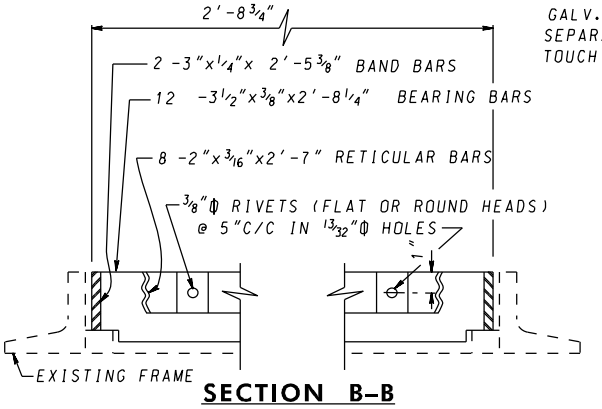
1/2-13 HEX THIN NUTS TYPE A-307 STEEL GALVANIZED AS PER A.S.T.M. A-153 & TAPPED OVERSIZE TO FIT 1/2" ⌀ GALVANIZED STUD



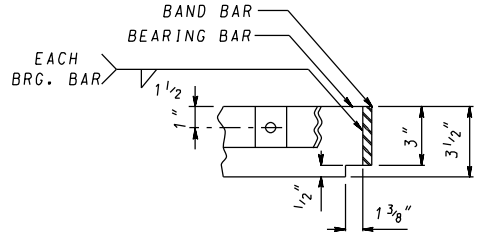
ADJUSTMENT DEVICE
(TWO PER GRATE)

NOTE

GALV. THE STUD & PLATE SEPARATELY. WELD TOGETHER. TOUCH UP WITH ZINC RICH ZRC PAINT.



SECTION B-B



GRATING DETAIL

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	12-20-74	APPROVAL	1-14-75
REVISED	10-1-01	REVISED	2-8-83
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

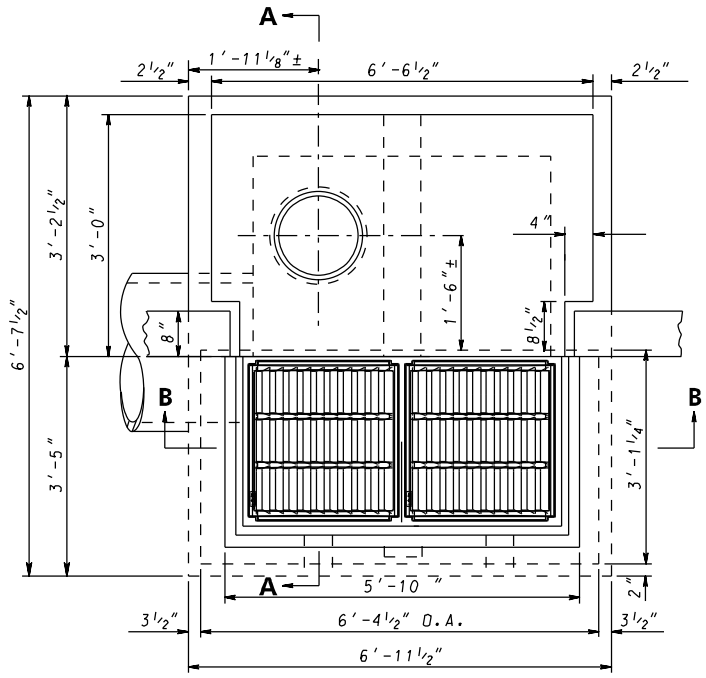
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

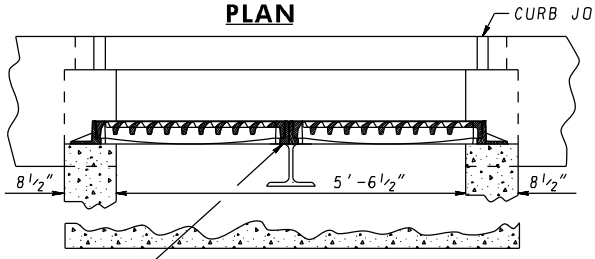
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE S INLET & COMBINATION RETICULAR REPLACEMENT GRATE

STANDARD NO. MD 379.08



PLAN

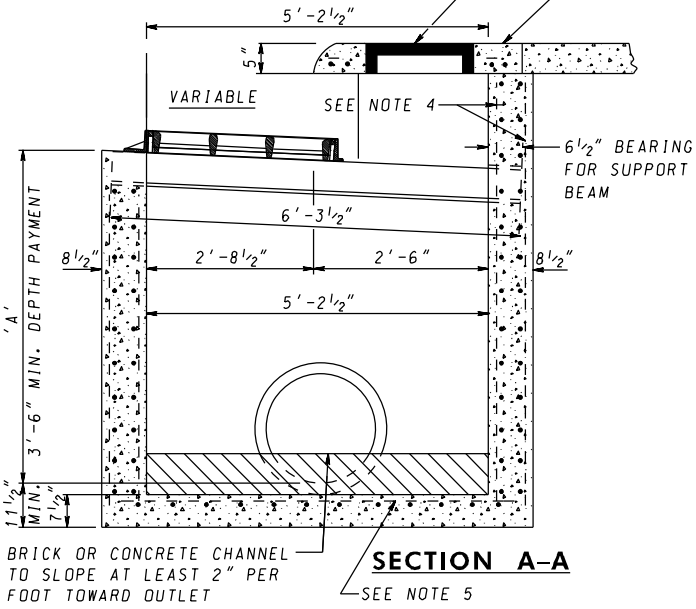


W8x31 (GALVANIZED) SUPPORT BEAM

SECTION B–B

STANDARD PRECAST CLASS "H" COMB. INLET HEAD (FOR DETAILS, SEE STANDARD MD-376.61)

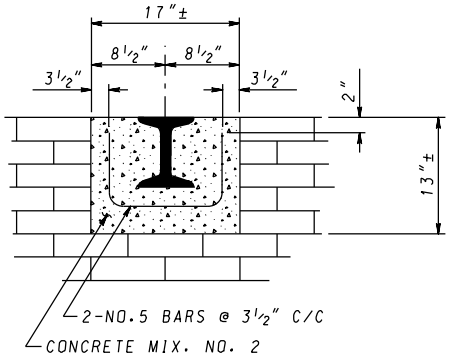
STANDARD TYPE "D" MANHOLE FRAME & COVER SEE STANDARD MD-383.61



BRICK OR CONCRETE CHANNEL TO SLOPE AT LEAST 2" PER FOOT TOWARD OUTLET

SECTION A–A

SEE NOTE 5



METHOD OF ANCHORING SUPPORT BEAM IF INLET IS CONSTRUCTED OF BRICK

(THIS DETAIL TO BE USED FOR INLET REPAIR ONLY)

LEAVE 4"x4" OPENING FOR SUBGRADE DRAINAGE IF DIRECTED

STANDARD "S" COMB CAST IRON FRAME & GRATES WITH CUT FLANGE SEE STANDARD MD 379.05-01

SEE STD MD 379.04 FOR THROUGH OPENING DIMENSIONS

GENERAL NOTES

1. CONCRETE TO BE MIX NO. 2 (3,000 PSI).
2. SIZE, TYPE, AND DIRECTION OF INLET CONNECTION WILL VARY TO SUIT CONDITIONS.
3. SEE SHA LATEST SPECIFICATIONS FOR INLETS.
4. WHEN "A" IS LESS THAN 7'-0", WALL REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS, AND HAVE 4" COVER ON INSIDE. WHEN "A" IS GREATER THAN 7'-0" AND LESS THAN 15'-0", WALL REINFORCEMENT TO BE TWO LAYERS OF NO. 4 DEFORMED BARS @ 6" C/C, TWO WAYS , ON INSIDE AND OUTSIDE OF WALL WITH 2" COVER.
5. BASE REINFORCEMENT SHALL BE ONE LAYER OF NO. 4 DEFORMED BARS @ 6" C/C , TWO WAYS, WITH 2" COVER FROM TOP OF BASE.
6. PLACE 1/4" EXPANSION MATERIAL OF THE SAME TYPE APPROVED FOR PAYMENT IN BETWEEN THE FRAME AND ABUTTING RIGID PAVEMENT AND BETWEEN ENDS OF INLET CURB AND NORMAL CURB.
7. BRICK FOR MASONRY TO COMPLY WITH THE SHA SPECIFICATION.
8. FOR UNDEPRESSED INLETS USE NORMAL PAVEMENT SLOPE.
9. LADDER RUNGS SHALL BE IN ACCORDANCE WITH STD MD 383.91 AND MD 383.92 OR AS DIRECTED BY THE ENGINEER.
10. FROM THE CURB LINE/SIDEWALK, INLET HAS BEEN DESIGNED FOR HS-25 LOADING ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS AND FOR A MAXIMUM DEPTH OF 15'-0".

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	10-30-69	APPROVAL	11-10-69
REVISED	7-1-09	REVISED	7-26-10
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	–

SHA State Highway Administration

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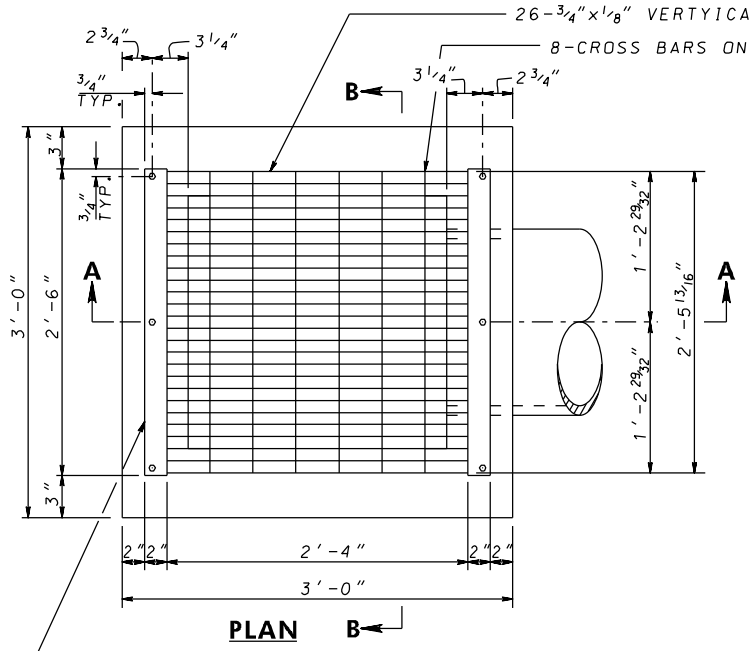
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD TYPE HS COMBINATION INLET

STANDARD NO. MD 380.01

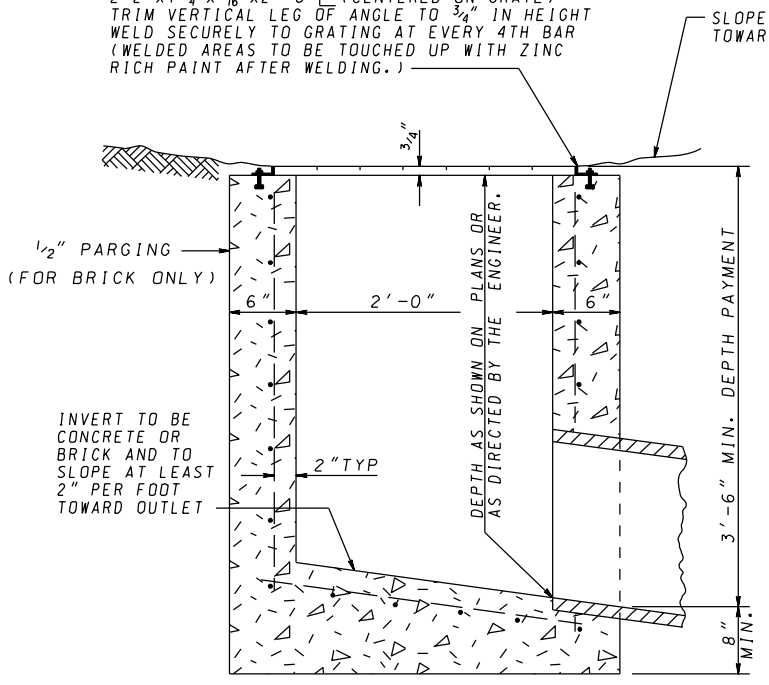


PLAN B

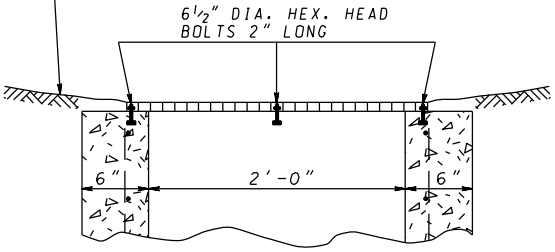
NOTES

1. GRATING TO BE GALVANIZED.
2. INLET TO BE CONSTRUCTED OF CONCRETE (MIX NO. 2) OR BRICK. WHEN INLET IS CONSRTUCTED OF CONCRETE ALL REINFORCING IS TO BE NO. 4 DEFORMED BARS 6 6" C/C.

NOTE EXPANSION ANCHORS MAY BE USED INSTEAD OF BOLTS.



SECTION A-A



SECTION B-B

PIPE TYPE, SIZE, SLOPE & INVERT ELEVATION AS SHOWN ON THE PLANS

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____ DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	8-7-72	APPROVAL	8-4-72
REVISED	10-1-01	REVISED	6-23-87
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

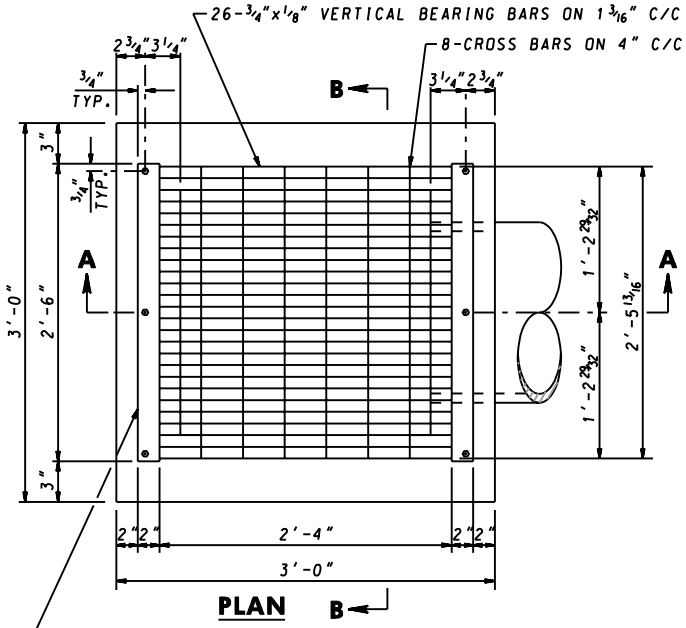
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD YARD INLET

STANDARD NO. MD 381.01

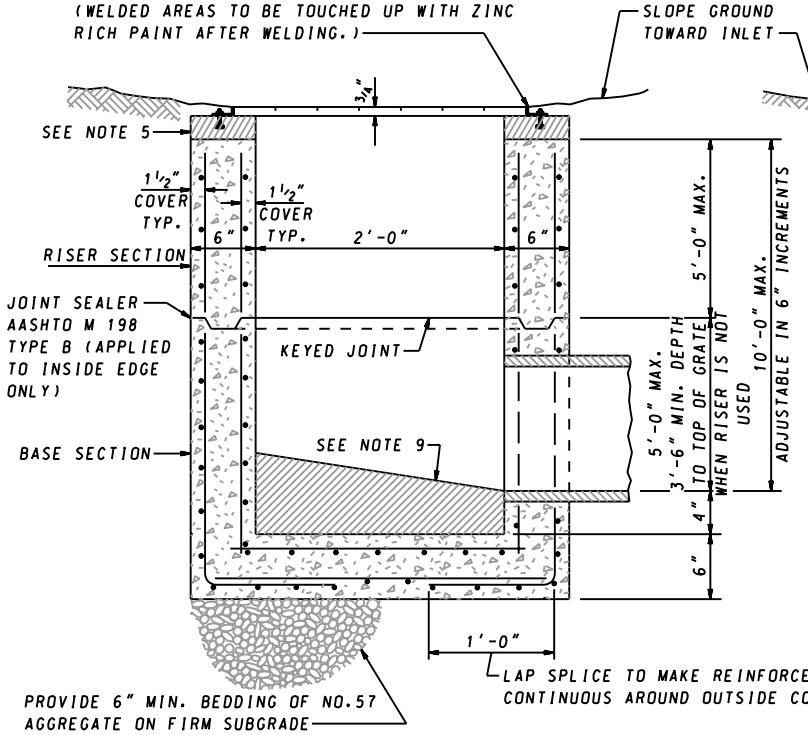


GENERAL NOTES

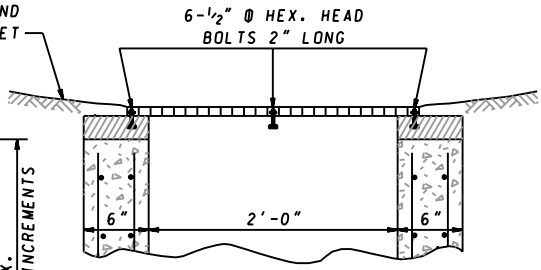
1. CONCRETE TO BE MIX NO.6 (4500 PSI).
2. REINFORCING-2 LAYERS OF 4x4-W4.0x W4.0 WELDED WIRE FABRIC.
3. THREADED PLASTIC INSERTS TO BE PROVIDED FOR HANDLING.
4. GRATING SHALL BE STEEL "IRVING X-BAR TYPE AA" OR APPROVED EQUIVALENT. ALL MATERIAL TO BE HOT DIPPED GALV.
5. GRADE AND SLOPE ADJUSTMENTS TO BE COMPLETED IN THE FIELD USING CONC. MIX NO.6 OR BRICK AND MORTAR. MIN. ONE LAYER OF BRICK OR 3" OF CONCRETE.
6. PIPE OPENINGS TO BE PROVIDE AS REQUIRED. FOR SIZE, LOCATION AND INVERT ELEVATIONS REFER TO PLANS.
7. PLACEMENT OF SUBGRADE DRAINAGE WILL BE AS DIRECTED BY THE ENGINEER OR AS NOTED ON THE PLANS.
8. MINIMUM DEPTH PAYMENT PER "EACH" INLET INCLUDES DEPTHS UP TO 3'-6" MEASURED FROM THE PIPE INVERT TO THE TOP OF THE GRATE. VERTICAL DEPTH PAYMENT PER LINEAR FOOT FOR DEPTHS IN EXCESS OF 3'-6".
9. INVERT TO BE CONCRETE OR BRICK AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER. (INVERT PROVIDED IN THE FIELD)

NOTE EXPANSION ANCHORS MAY BE USED INSTEAD OF BOLTS.

2- 2"x 1 1/4"x 3/16"x2'-6" ∟ (CENTERED ON GRATE) TRIM VERTICAL LEG OF ANGLE TO 3/4" IN HEIGHT WELD SECURELY TO GRATING AT EVERY 4TH BAR (WELDED AREAS TO BE TOUCHED UP WITH ZINC RICH PAINT AFTER WELDING.)



SECTION A–A



SECTION B–B

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

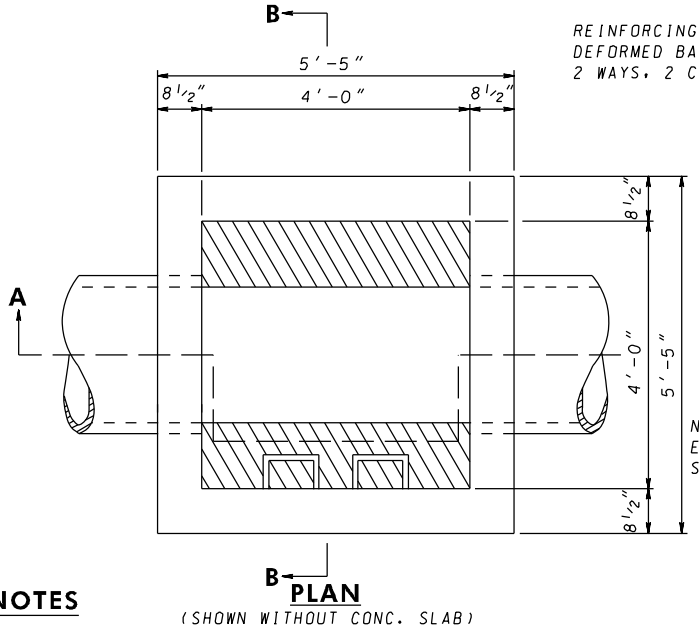
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	4-5-87	APPROVAL	6-23-87
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

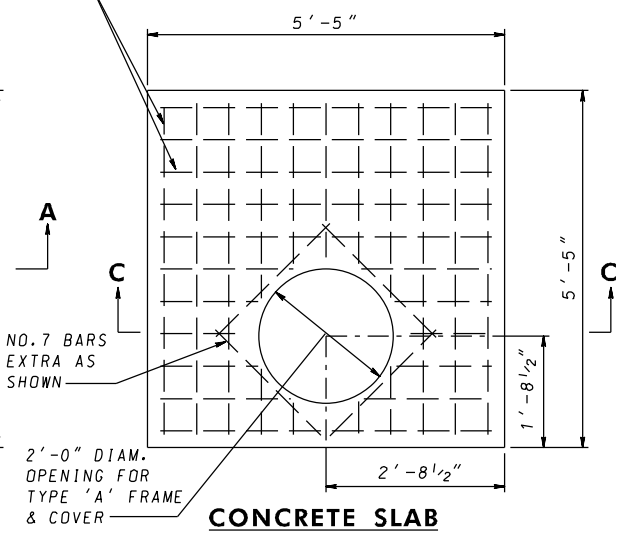
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST YARD INLET

STANDARD NO. MD 381.02



PLAN
(SHOWN WITHOUT CONC. SLAB)

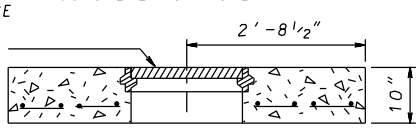


CONCRETE SLAB
(CONCRETE MIX NO.2)

NOTES

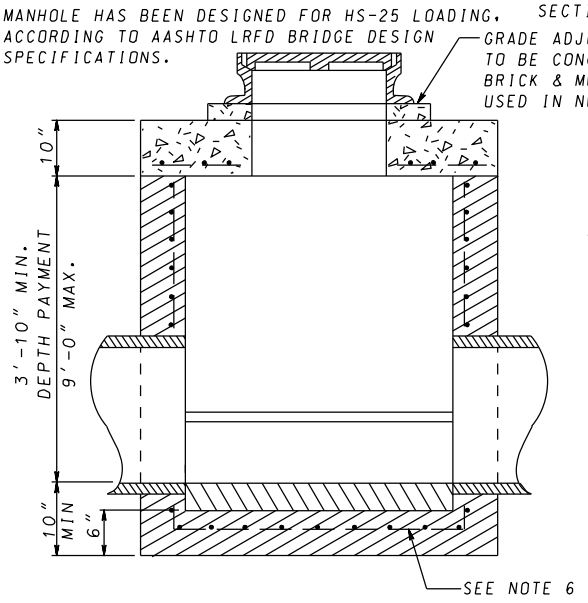
1. THIS MANHOLE IS FOR PIPES UP TO 36" DIAMETER.
2. MANHOLE SHALL BE CONSTRUCTED OF REINFORCED CONCRETE (MIX NO. 2). BRICK AND MORTER MAY BE USED IN NON-TRAFFIC AREAS ONLY
3. BENCH HEIGHT ABOVE OUTGOING PIPE INVERT SHALL BE HALF THE DIAMETER OF THE PIPE.
4. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF THE 3'-10".
5. WALL REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, 2 WAYS, AND HAVE 3-1/2" COVER.
6. BASE REINFORCEMENT SHALL BE NO. 4 BARS @ 6" C/C, 2 WAYS, AND HAVE 2" COVER FROM TOP OF BASE.
7. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

FOR DETAILS OF TYPE 'D' FRAME & COVER SEE STD. MD 383.61

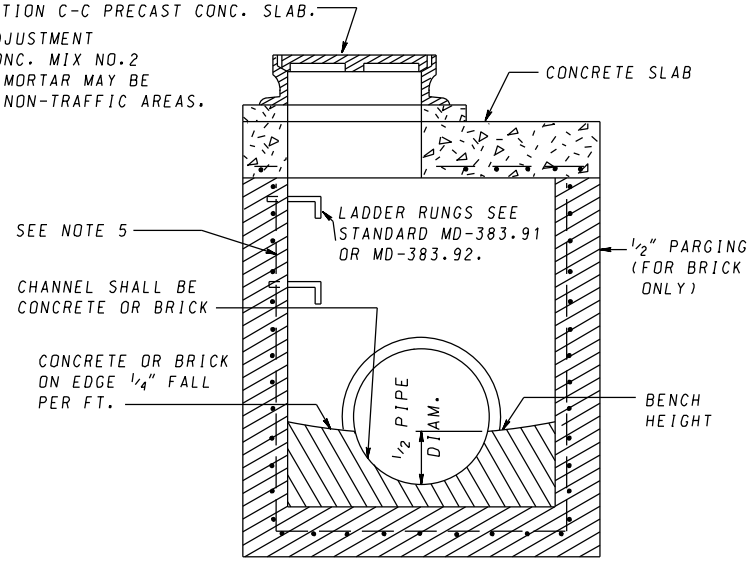


SECTION C-C
PRECAST CONC. SLAB WITH TYPE 'D' FRAME & COVER (NON-TRAFFIC AREAS)

STANDARD TYPE 'A' MANHOLE FRAME & COVER SEE STANDARDS MD-383.31 & 383.32 (WHEN IN NON-TRAFFIC AREAS USE STD. TYPE 'D' FRAME & COVER. SEE SECTION C-C PRECAST CONC. SLAB.



SECTION A-A



SECTION B-B

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	10-1-01	APPROVAL	3-1-83
REVISED	10-1-01	REVISED	4-26-89
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

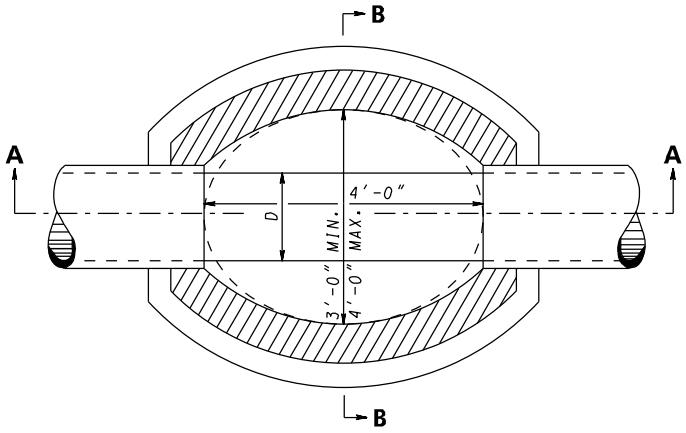
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

48" SQUARE
STANDARD SHALLOW MANHOLE

STANDARD NO. MD 383.00

GENERAL NOTES

1. WALL REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, 2 WAYS, AND HAVE 3" COVER BELOW DEPTH OF 12'-0" AND 4" COVER TO DEPTH OF 24'-0".
2. BASE REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, 2 WAYS, AND HAVE 2" COVER FROM TOP OF BASE.
3. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
4. BRICK AND MORTAR MAY BE USED IN NON-TRAFFIC AREAS ONLY.



PLAN

MANHOLE WALL THICKNESS

8" TO DEPTH OF 12'-0"

12" { BELOW DEPTH OF 12'-0" / TO DEPTH OF 24'-0"

MANHOLE BASE THICKNESS

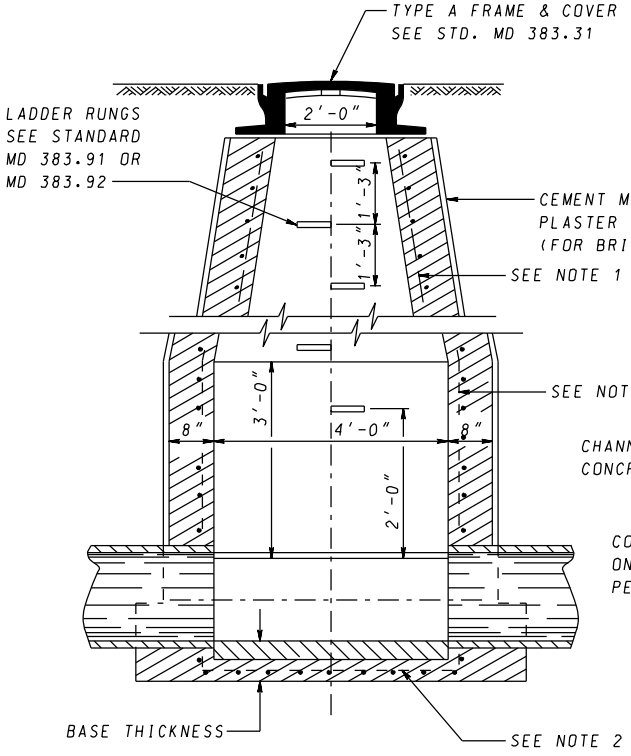
8" WALL-USE 12" BASE

12" WALL-USE 15" BASE

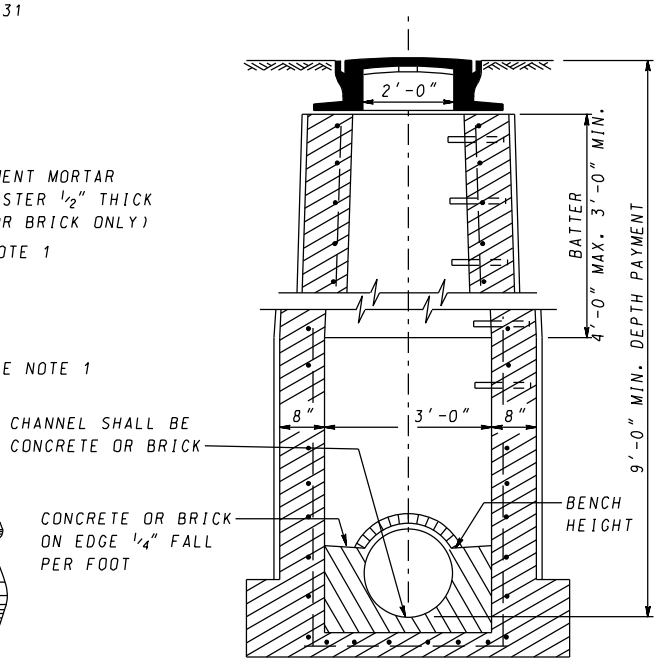
BENCH HEIGHT ABOVE OUTGOING PIPE INVERT

STORM WATER 0.5 D

SANITARY 0.9 D



SECTION A–A



SECTION B–B

SPECIFICATION 305	CATEGORY CODE ITEMS

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-7-51	APPROVAL	3-25-56
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD MANHOLE

STANDARD NO. MD 383.01

GRANITE DRIP STONES ARE PREFERABLE BUT IF NOT AVAILABLE SOME OTHER APPROVED TYPE MAY BE USED.
LOCATION OF DRIP STONES MAY BE ADJUSTED TO MEET THE REQUIREMENTS OF EACH CASE BUT NORMALLY SHALL BE 6' APART.

WALL THICKNESS

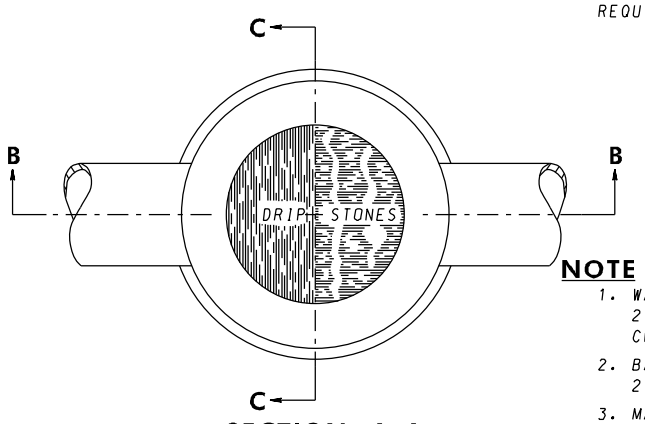
8" TO DEPTH OF 12'-0"

13" { BELOW DEPTH OF 12'-0"
13" { TO DEPTH OF 24'-0"

BASE THICKNESS

8" WALL-USE 12" BASE

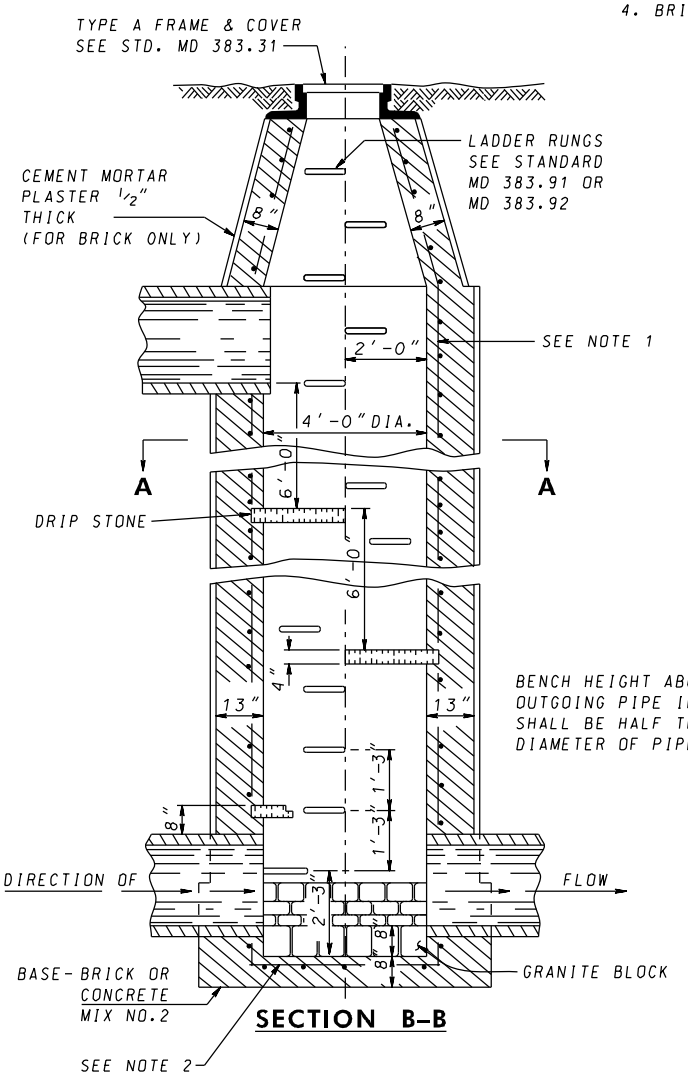
13" WALL-USE 16" BASE



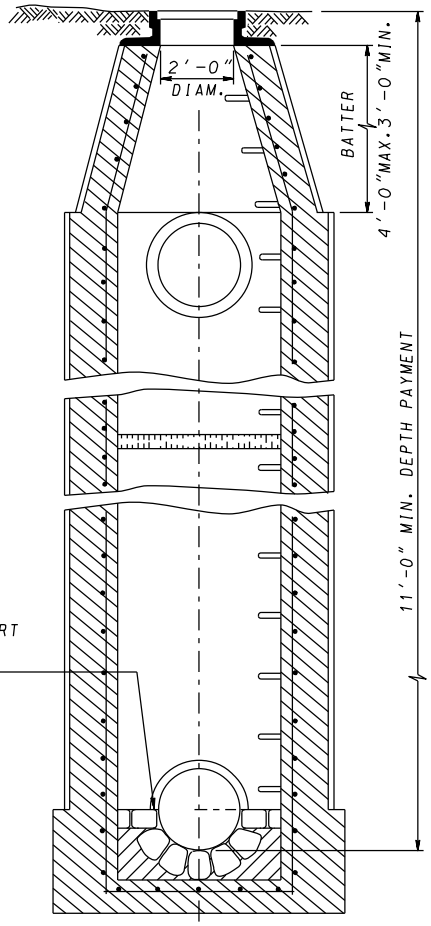
SECTION A-A

NOTE

1. WALL REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, 2 WAYS, AND HAVE 3" COVER BELOW DEPTH OF 12'-0" AND 4 1/2" COVER FROM TOP OF BASE.
2. BASE REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, 2 WAYS, AND HAVE 2" COVER FROM TOP OF BASE.
3. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
4. BRICK AND MORTAR MAY BE USED IN NON-TRAFFIC AREAS ONLY.



SECTION B-B



SECTION C-C

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	7-23-74	APPROVAL	9-11-74
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

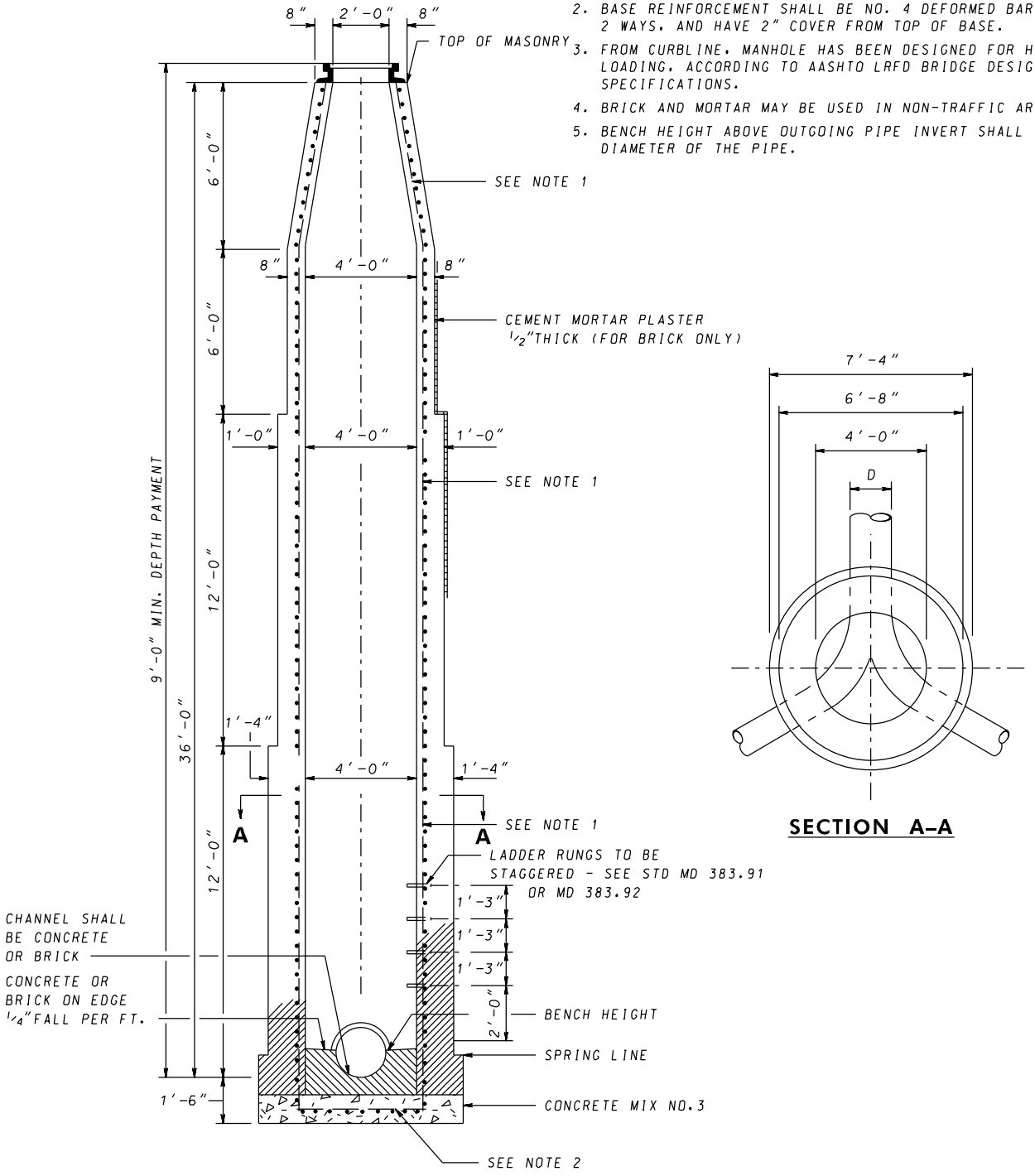
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD DROP MANHOLE

STANDARD NO. MD 383.11

NOTES

1. WALL REINFORCEMENT SHALL BE NO. 4 BARS @ 6" C/C, 2 WAYS, AND HAVE 3" COVER BELOW DEPTH OF 12'-0", 4" COVER TO DEPTH OF 24'-0", AND 6" COVER TO DEPTH OF 36'-0".
2. BASE REINFORCEMENT SHALL BE NO. 4 DEFORMED BARS @ 6" C/C, 2 WAYS, AND HAVE 2" COVER FROM TOP OF BASE.
3. FROM CURBLINE, MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.
4. BRICK AND MORTAR MAY BE USED IN NON-TRAFFIC AREAS ONLY.
5. BENCH HEIGHT ABOVE OUTGOING PIPE INVERT SHALL BE HALF THE DIAMETER OF THE PIPE.



ELEVATION – SECTIONAL VIEW

SECTION A–A

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	7-23-74	APPROVAL	9-11-74
REVISED	10-1-01	REVISED	2-24-88
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

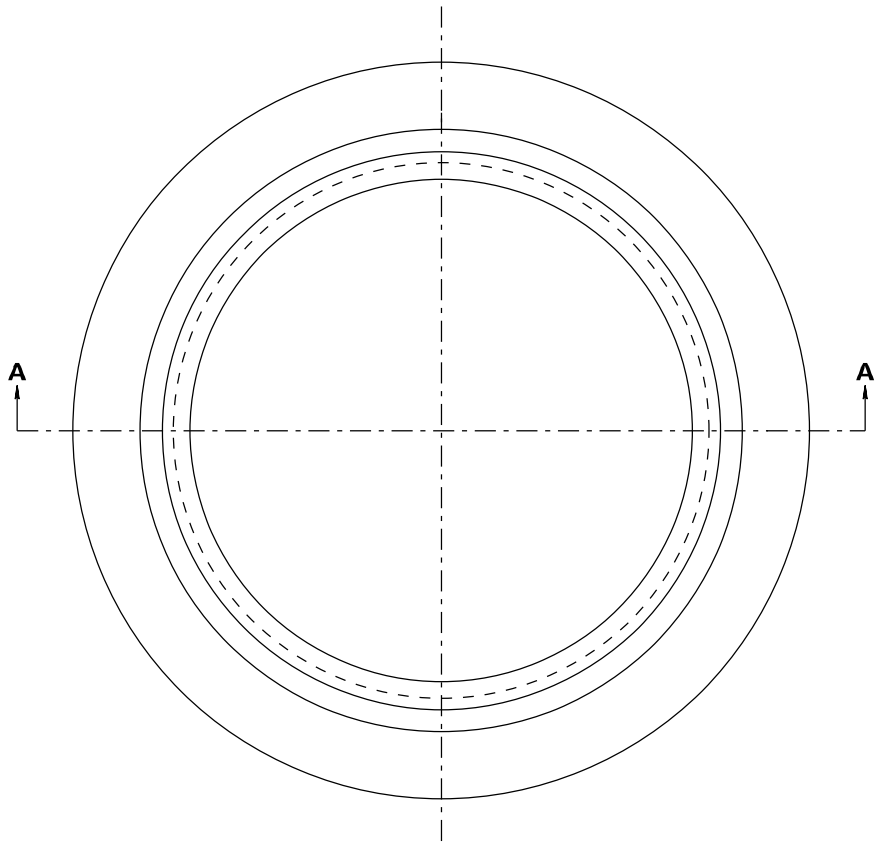
SHA State Highway Administration

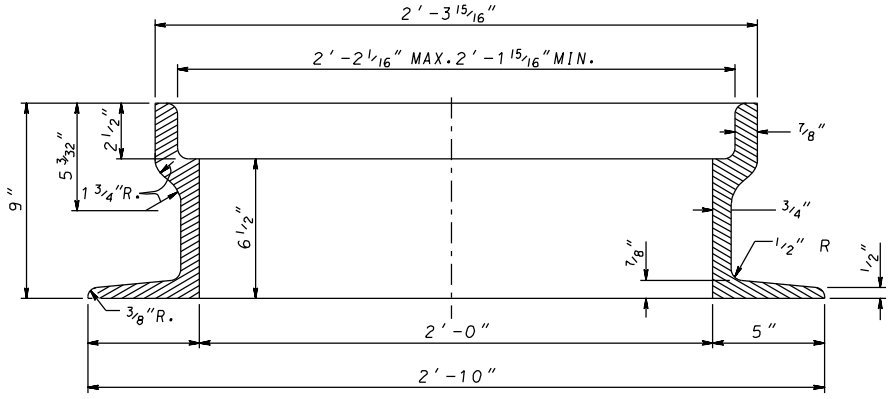
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD 4 FT. CIRCULAR MANHOLE MAX. DEPTH 36 FT.

STANDARD NO. MD 383.21





SECTION A–A

MATERIAL - CAST IRON
APPROX. WEIGHT 250 LBS.

NOTE:
MANUFACTURER TO VERIFY THAT MANHOLE FRAME IS DESIGNED FOR HS-25 LOADING.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	–	APPROVAL	3-23-56
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

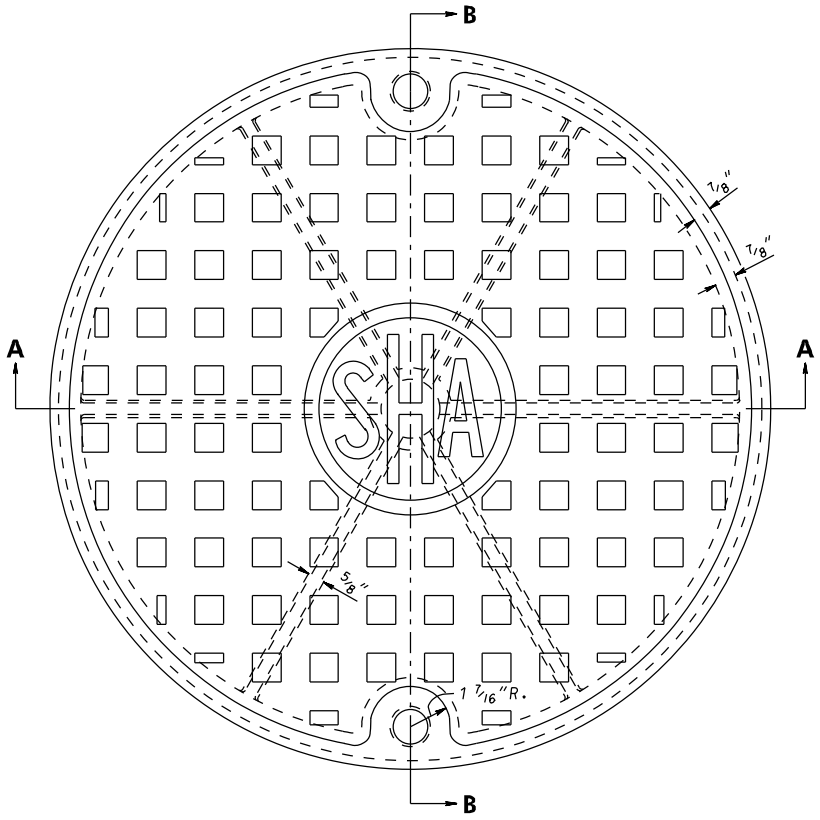
SHA State Highway Administration

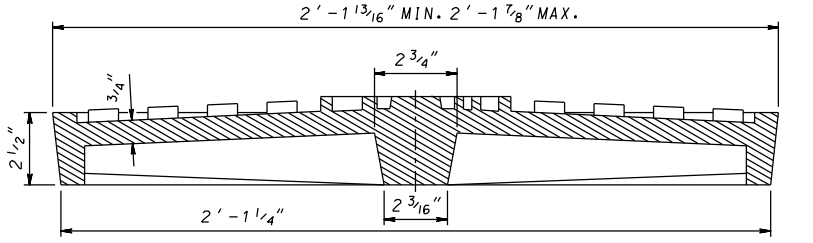
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

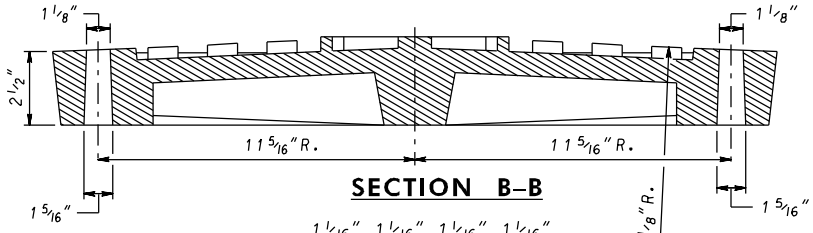
STANDARD MANHOLE
TYPE A FRAME

STANDARD NO. MD 383.31

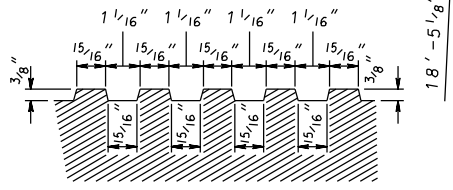




SECTION A–A



SECTION B–B



DETAIL OF CORRUGATIONS

MATERIAL – CAST IRON
APPROX. WEIGHT 170 LBS.

NOTE:
MANUFACTURER TO VERIFY THAT MANHOLE COVER IS DESIGNED FOR HS-25 LOADING.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-13-73	APPROVAL	3-16-73
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

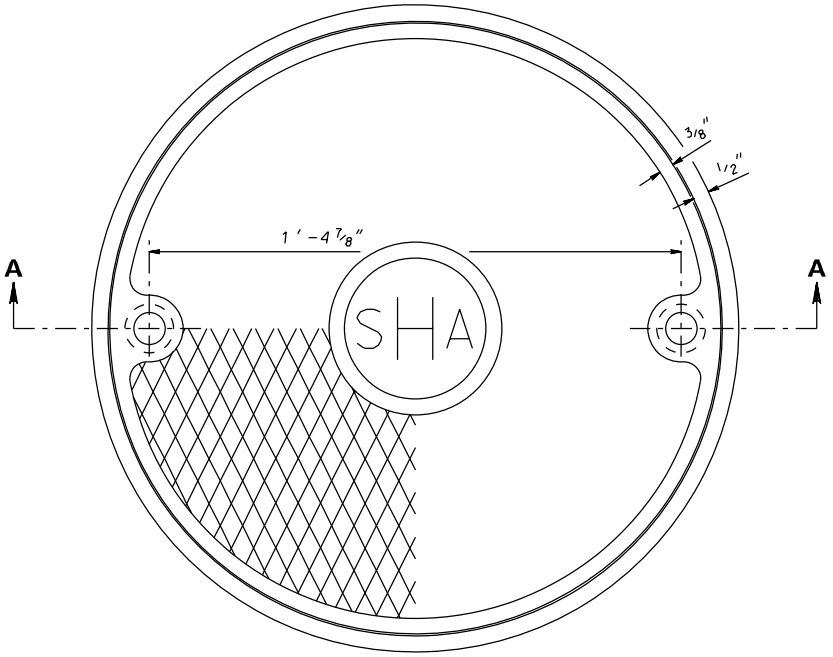
State Highway Administration

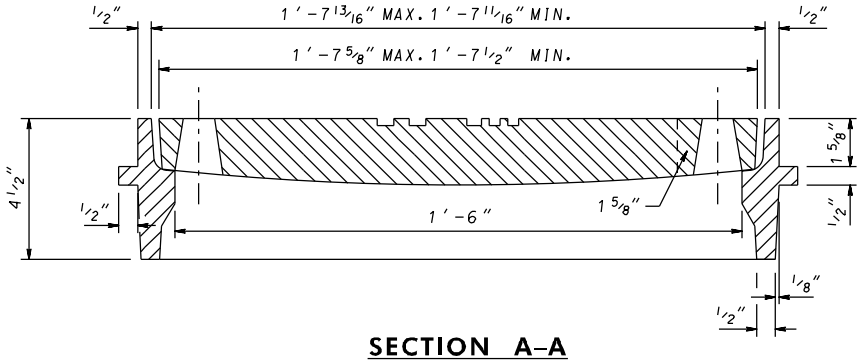
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD MANHOLE TYPE A COVER

STANDARD NO. MD 383.32





SECTION A–A

MATERIAL - CAST IRON
APPROX. WEIGHT OF FRAME 66 LBS.
APPROX. WEIGHT OF COVER 107 LBS.

NOTE:
MANUFACTURER TO VERIFY THAT FRAME AND COVER ARE DESIGNED FOR HS-25 LOADING

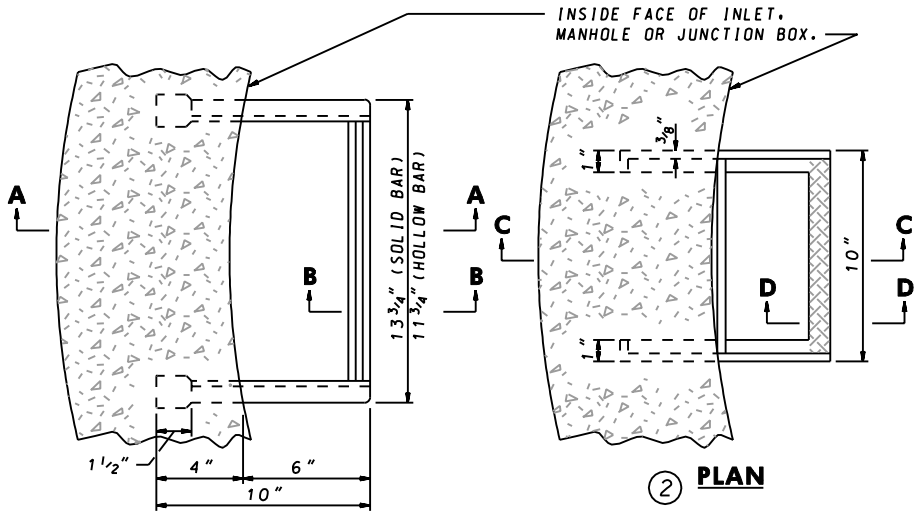
SPECIFICATION 305	CATEGORY CODE ITEMS	
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT	
SHA State Highway Administration	APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
	APPROVAL 2-13-73	APPROVAL 3-16-73
	REVISED 10-7-14	REVISED 9-29-14
	REVISED –	REVISED
	REVISED	REVISED

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

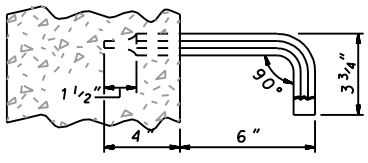
STANDARD MANHOLE
TYPE D FRAME & COVER

STANDARD NO. MD 383.61

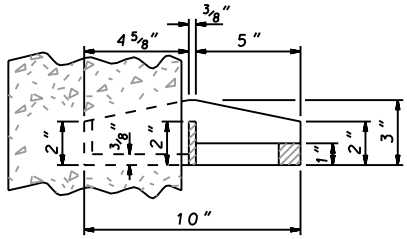


① PLAN

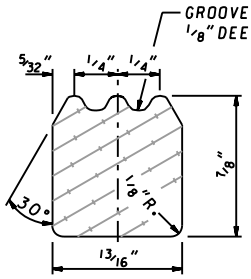
② PLAN



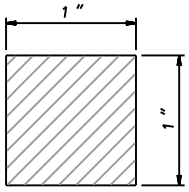
SECTION A–A



SECTION C–C

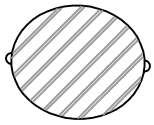


① SECTION B–B
ALUMINUM ALLOY
(SOLID BAR)



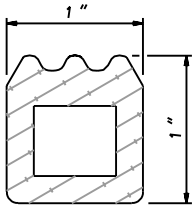
② SECTION D–D
CAST IRON

(ALTERNATE)

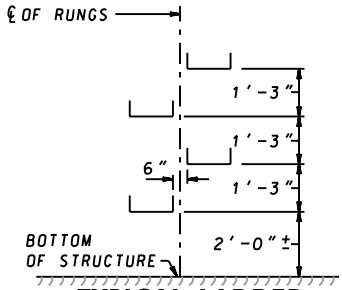


③ SECTION B–B
STEEL

(ALTERNATE)



④ SECTION B–B
ALUMINUM ALLOY
(HOLLOW BAR)



TYPICAL LADDER
RUNG LOCATION

NOTES

METAL LADDER RUNGS ARE TO BE USED IN INLETS, MANHOLES, AND JUNCTION BOXES OVER THREE FEET IN DEPTH OR AS DIRECTED BY THE ENGINEER. USED EITHER WITH BRICK OR CONCRETE CONSTRUCTION. (WHERE BRICK CONSTRUCTION IS EMPLOYED, THE MORTAR JOINTS SHALL BE ADJUSTED TO ACCOMODATE LADDER RUNGS.) METAL LADDER RUNGS MAY BE COMPRISED OF ONE OF THE FOLLOWING.

①&④ ALUMINUM ALLOY- SHALL CONFORM TO A.S.T.M. DESIGNATION B 221 ALLOY 6061-T6. THAT PORTION EMBEDDED IN THE STRUCTURE SHALL BE COATED WITH ZINC CHROMATE OR APPROVED EQUIVALENT COATING.

② CAST IRON- SHALL CONFORM TO A.S.T.M. A- 48 CLASS 30 B.

③ STEEL- SHALL CONFORM TO A.S.T.M. DESIGNATION A-615 GRADE 40, GALVANIZED AFTER FABRICATION AS PER A.S.T.M. DESIGNATION A-153.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	10-27-70	APPROVAL	11-19-70
REVISED	10-1-01	REVISED	2-8-83
REVISED		REVISED	
REVISED		REVISED	

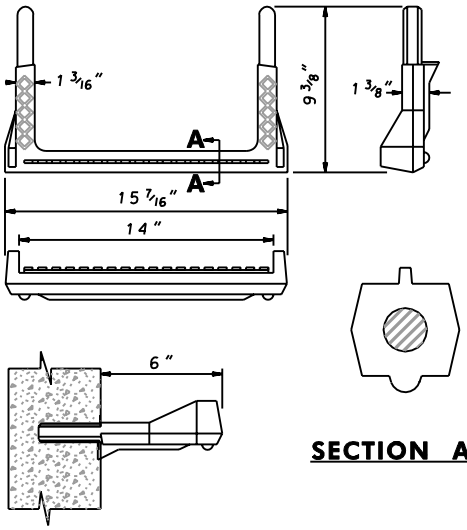
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

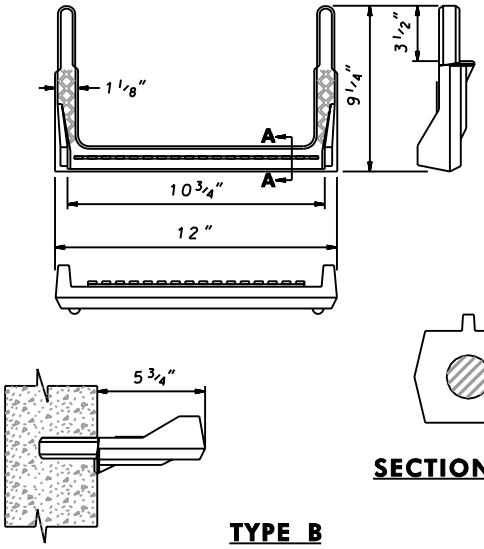
STANDARD METAL LADDER RUNGS
MISCELLANEOUS STRUCTURES

STANDARD NO. MD 383.91



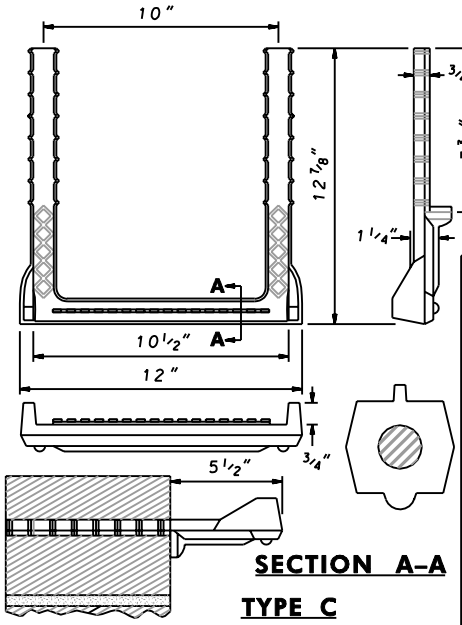
SECTION A–A

TYPE A



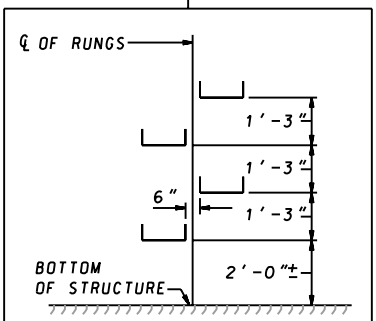
SECTION A–A

TYPE B

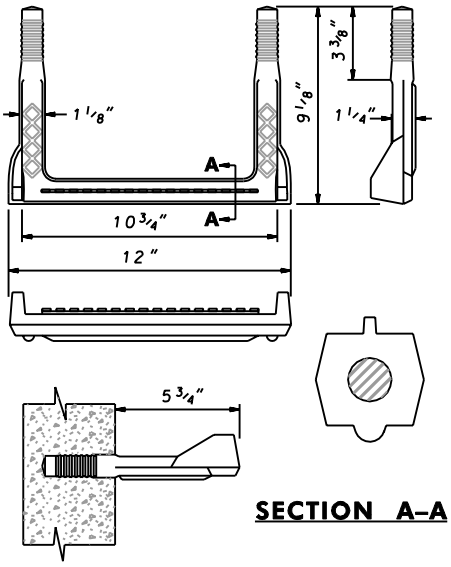


SECTION A–A

TYPE C



TYPICAL LADDER RUNG LOCATION



SECTION A–A

TYPE D

NOTES

1. TYPES A & B ARE TO BE DRIVEN INTO RECEPTACLES THAT ARE CAST INTO THE WALL.
2. TYPE C IS FOR BRICK AND BLOCK INSTALLATIONS.
3. TYPE D IS PRESS FITTED INTO PREFORMED CONCRETE HOLES.
4. LADDER RUNGS ARE TO BE USED IN INLETS, MANHOLES, AND JUNCTION BOXES OVER THREE FEET IN DEPTH OR AS DIRECTED BY THE ENGINEER. USED EITHER WITH BRICK OR CONCRETE CONSTRUCTION. (WHERE BRICK CONSTRUCTION IS EMPLOYED, THE MORTER JOINTS SHALL BE ADJUSTED TO ACCOMMODATE LADDER RUNGS.)
5. COPOLYMER POLYPROPYLENE ENCAPSULATED 1/2 IN. DIA. STEEL REINFORCEMENT BAR. STEEL SHALL CONFORM TO ASTM 615 GRADE 60. COPOLYMER POLYPROPYLENE SHALL BE CERTIFIED BY THE MANUFACTURER TO CONFORM TO ASTM D 4101 AND HAVE A MINIMUM EXPOSED SECTION THICKNESS OF 1/8 IN.
6. SECTION A-A SHOWS 1/2" DIA. STEEL REINFORCEMENT BAR.
7. INSTALLATION SHALL CONFORM TO MANUFACTURER'S RECOMMENDATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-3-87	APPROVAL	3-30-87
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

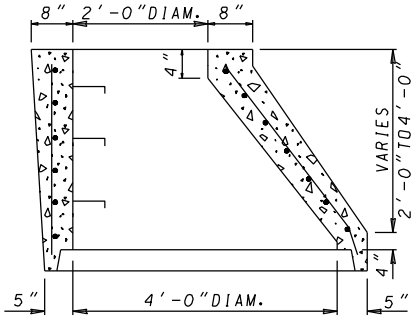
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

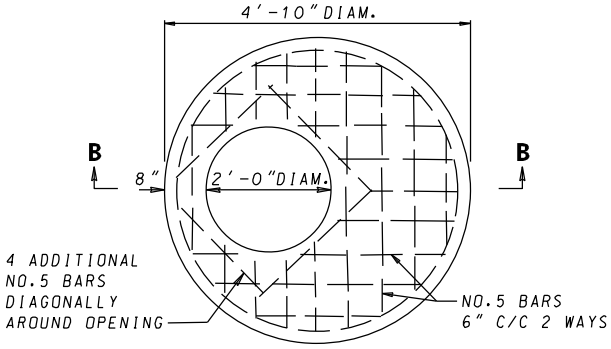
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

COPOLYMER POLYPROPYLENE STEEL ENCAPSULATED LADDER RUNGS MISCELLANEOUS STRUCTURES

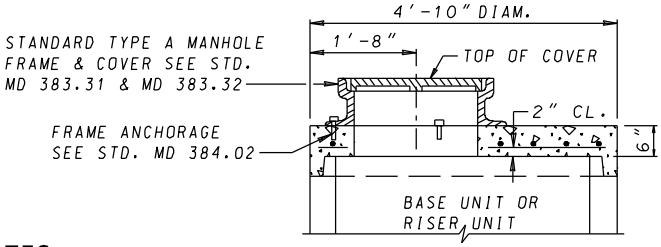
STANDARD NO. MD 383.92



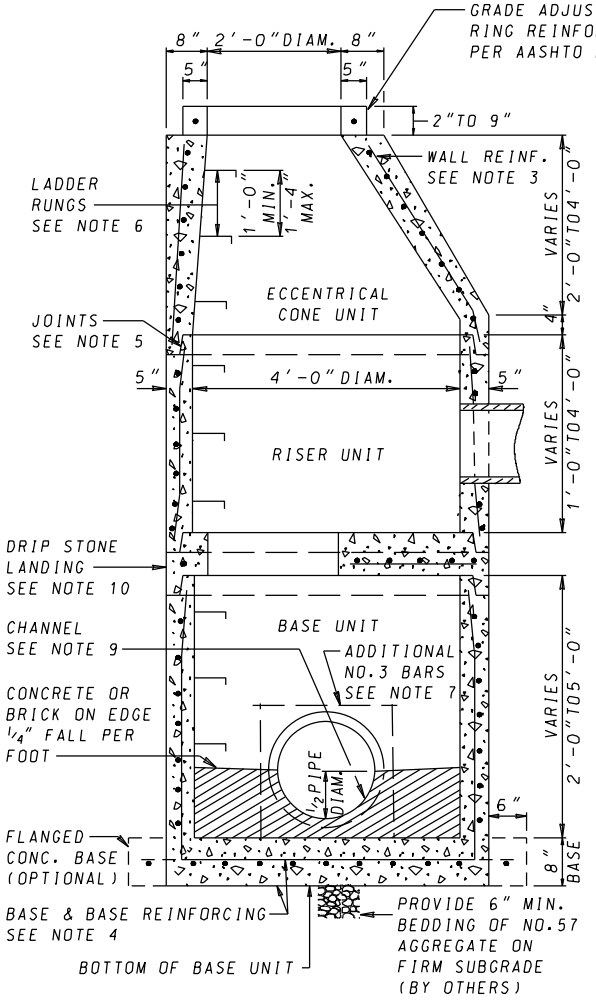
ALTERNATE ECCENTRICAL CONE UNIT



FLAT SLAB TOP
(SHOWN WITHOUT FRAME & COVER)



SECTION B–B



SECTION VIEW
(SHOWN WITHOUT FRAME & COVER)

NOTES

1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199.
2. CONCRETE SHALL BE MIX NO. 6 (4500 PSI).
3. WALL REINFORCEMENT FOR BASE UNITS, RISER UNITS AND ECCENTRICAL CONE UNITS SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.12 IN^2/FT AND MAXIMUM SPACING OF 12" FOR THE 48" DIAMETER MANHOLES. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 52. REINFORCEMENT SHALL MEET ASTM A 615, GRADE 60.
4. BASE REINFORCEMENT SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.20 IN^2/FT AND A MAXIMUM SPACING OF 10" WITH 2" COVER FROM THE TOP OF BASE. THE BASE SHALL BE CAST MONOLITHIC WITH THE UNIT OR JOINTED PER THE MANUFACTURER'S DESIGN.
5. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THIER DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING (WHERE APPLICABLE) MORTER, RUBBER O-RING GASKETS MEETING ASTM C 361 & C 443 OR FLEXIBLE PLASTIC GASKETS MEETING AASHTO M 198 TYPE B.
6. LADDER RUNGS SHALL BE INSTALLED IN VERTICAL ALIGNMENT AT 1'-4" MAXIMUM C/C. RUNG TYPES SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR MD 383.92 LADDER RUNGS SHALL BE INCIDENTAL TO THE COST OF THE MANHOLE.
7. WHEN THE DISTANCE BETWEEN MULTIPLE OPENINGS IN THE BASE UNIT OR ANY RISOR UNIT IS LESS THAN 6" ADDITIONAL NO. 3 BARS ARE REQUIRED AROUND OPENINGS.
8. LIFT HOLES OR LIFT EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.
9. MIX NO. 2 CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER.
10. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STD. MD 384.13 FOR DETAILS.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 9'-0" MEASURED FROM THE BOTOM OF THE BASE UNIT TO THE TOP OF THE MANHOLE COVER VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 9'-0". THE COST OF THE DRIP STONE LANDING. NO. 57 AGGREGATE GROUT, SEALANT, AND ALL NECESSARY APPURTENANCES SHALL BE INCIDENTAL TO THE PRICE BID.
12. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

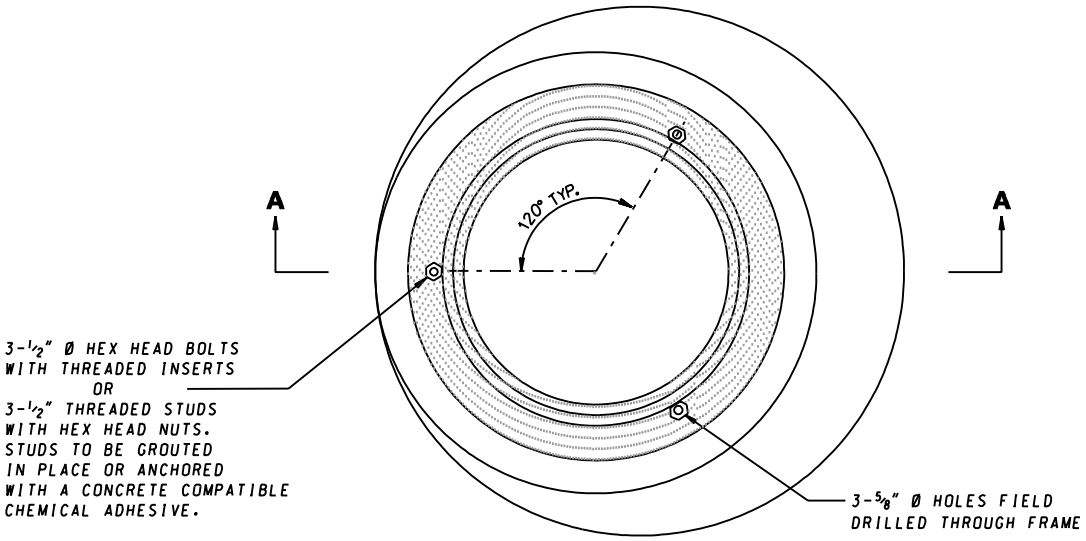
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

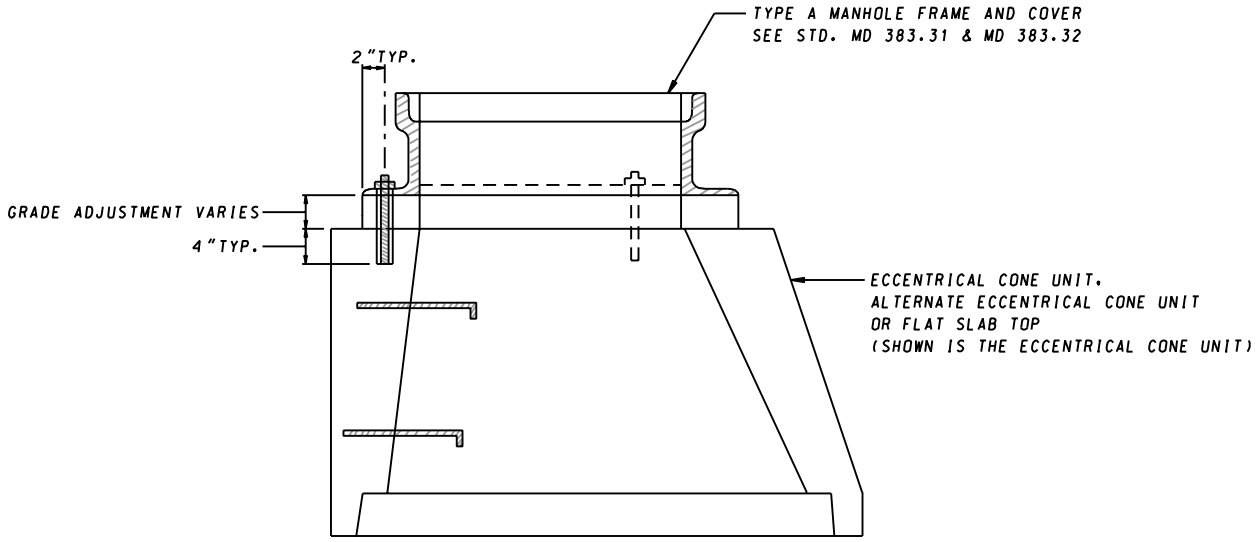
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

48" DIAMETER PRECAST MANHOLE FOR 12" TO 24" PIPES

STANDARD NO. MD 384.01



PLAN



SECTION A-A

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 2-22-91	APPROVAL 1-2-91
REVISED 10-1-01	REVISED
REVISED	REVISED
REVISED	REVISED

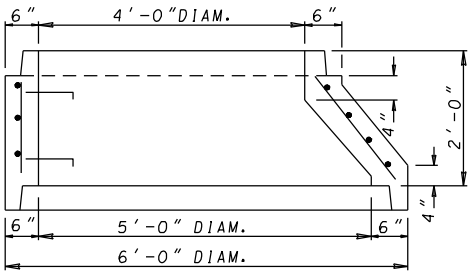
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

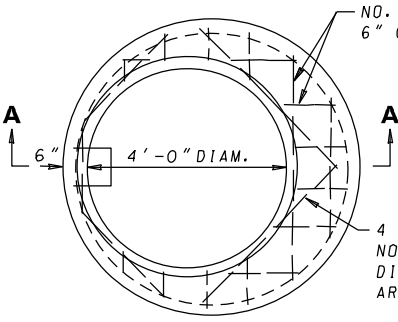
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

FRAME ANCHORAGE FOR PRECAST MANHOLES

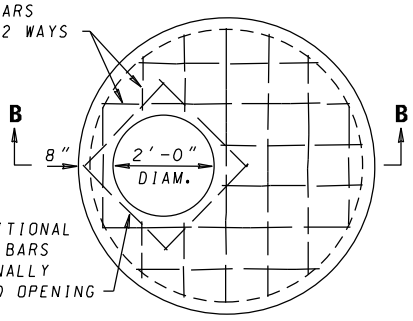
STANDARD NO. MD 384.02



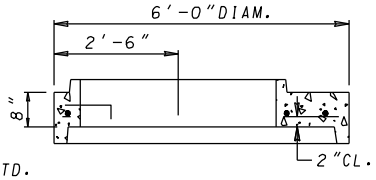
ECCENTRICAL CONE REDUCER
(ALTERNATE FOR FLATTOP REDUCER)



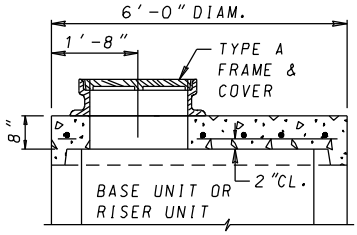
FLATTOP REDUCER



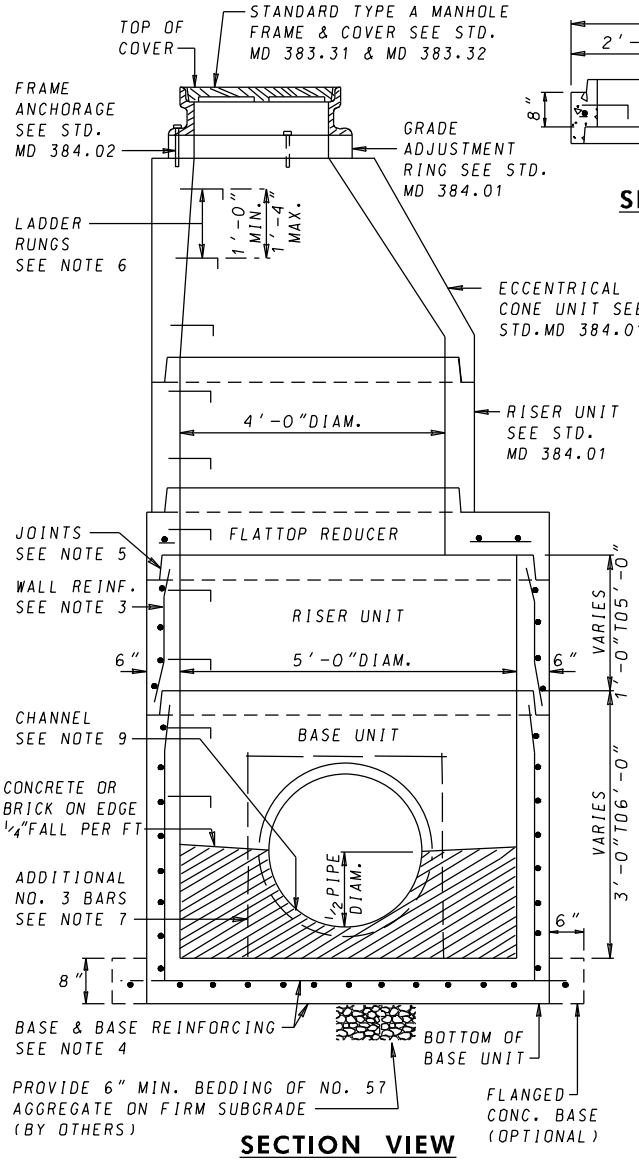
FLAT SLAB TOP
(SHOWN WITHOUT FRAME & COVER)



SECTION A–A



SECTION B–B



SECTION VIEW

NOTES

1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199.
2. CONCRETE SHALL BE MIX NO.6 (4500PSI).
3. WALL REINFORCEMENT FOR BASE UNITS, RISER UNITS AND ECCENTRICAL CONE UNITS SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.15 IN^2/FT AND MAXIMUM SPACING OF 9" FOR THE 60" DIAMETER MANHOLES. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 52. REINFORCEMENT SHALL MEET ASTM A 615, GRADE 60.
4. BASE REINFORCEMENT SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.27 IN^2/FT AND A MAXIMUM SPACING OF 8" WITH 2" COVER FROM THE TOP OF BASE. THE BASE SHALL BE CAST MONOLITHIC WITH THE UNIT OR JOINTED PER THE MANUFACTURER'S DESIGN.
5. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING (WHERE APPLICABLE) MORTAR, RUBBER O-RING GASKETS MEETING ASTM C 361 AND C 443 OR FLEXIBLE PLASTIC GASKETS MEETING AASHTO M 198 TYPE B.
6. LADDER RUNGS SHALL BE INSTALLED IN VERTICAL ALIGNMENT AT 1'-4" MAXIMUM C/C. RUNG TYPES SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR 383.92. LADDER RUNGS SHALL BE INCIDENTAL TO THE COST OF THE MANHOLE.
7. WHEN THE DISTANCE BETWEEN MUTIPLE OPENINGS IN THE BASE UNIT OR ANY RISER UNIT IS LESS THAN 6" ADDITIONAL NO.3 BARS ARE REQUIRED AROUND OPENINGS.
8. LIFT HOLES OR LIFT EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.
9. MIX NO.2 CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER.
10. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STD. MD 384.13 FOR DETAILS.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 9'-0" MEASURED FROM THE BOTTOM OF THE BASE UNIT TO THE TOP OF THE MANHOLE COVER. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 9'-0". THE COST OF THE DRIP STONE LANDING, NO.57 AGGREGATE, GROUT, SEALANT, AND ALL NECESSARY APPURTENANCES SHALL BE INCIDENTAL TO THE PRICE BID.
12. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

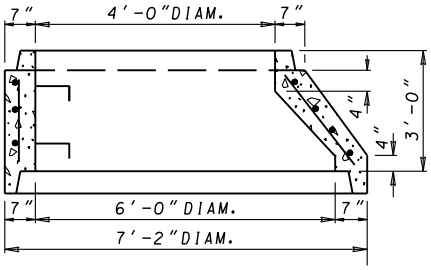
APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

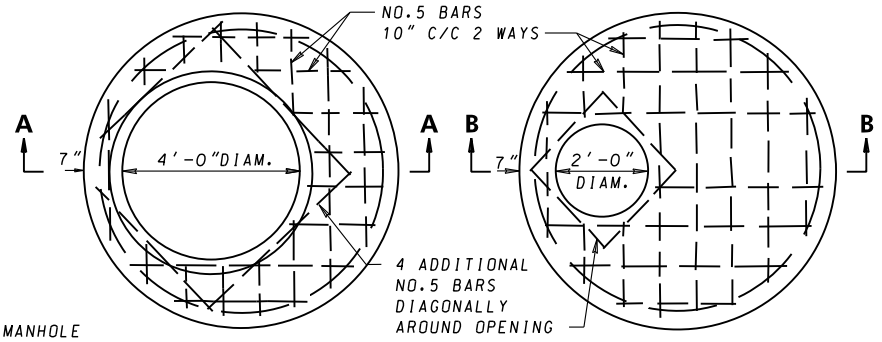
60" DIAMETER PRECAST MANHOLE FOR 27" TO 36" PIPES

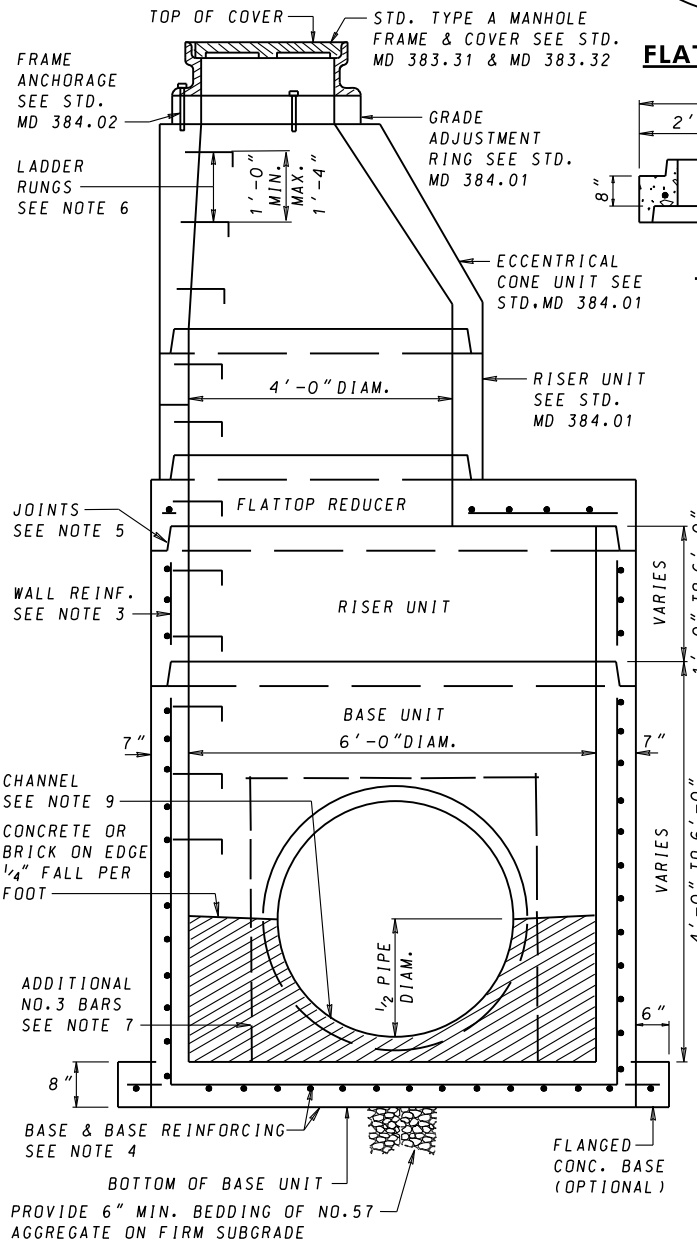
STANDARD NO. MD 384.03



ECCENTRICAL CONE REDUCER

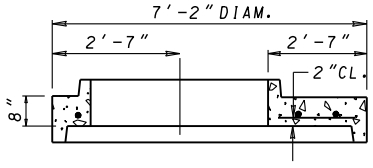
(ALTERNATE FOR FLATTOP REDUCER)





SECTION VIEW

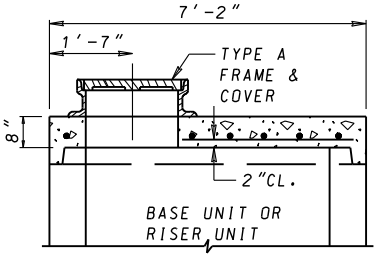
FLATTOP REDUCER



SECTION A–A

FLAT SLAB TOP

(SHOWN WITHOUT FRAME & COVER)



SECTION B–B

NOTES

1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199.
2. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4500PSI.
3. WALL REINFORCEMENT FOR BASE UNITS, RISER UNITS AND ECCENTRICAL CONE UNITS SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.18 IN.^{2}/FT AND MAXIMUM SPACING OF 6" FOR THE 72" DIAMETER MANHOLES. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 52. REINFORCEMENT SHALL MEET ASTM A 615 OR ASTM A 706, GRADE 60.
4. BASE REINFORCEMENT SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.27 IN. /FT. AND A MAXIMUM SPACING OF 4" WITH 2" COVERED FRO THE TOP OF BASE. THE BASE SHALL BE CAST MONOLITHIC WITH THE BASE UNIT OR JOINTED PER MANUFACTURER'S DESIGN.
5. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING (WHERE APPLICABLE) MORTAR, RUBBER O-RING GASKETS MEETING ASTM C 361 & C 443 OR FLEXIBLE PLASTIC GASKETS MEETING AASHTO M 198, TYPE B.
6. LADDER RUNGS SHALL BE INSTALLED IN VERTICAL ALIGNMENT AT 1'-4" MAXIMUM C/C. TYPES SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR 383.92. LADDER RUNGS SHALL BE INCIDENTAL TO THE COST OF THE MANHOLE.
7. WHEN THE DISTANCE BETWEEN THE MULTIPLE OPENINGS IN THE BASE UNIT OR IN ANY RISER UNIT IS LESS THAN 6" ADDITIONAL NO.3 BARS ARE REQUIRED AROUND OPENINGS.
8. LIFT HOLES OR LIFT EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.
9. MIX NO.2 CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER.
10. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STD. MD 384.13 FOR DETAILS.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 9'-0" MEASURED FROM THE BOTTOM OF THE BASE UNIT TO THE TOP OF THE MANHOLE COVER. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 9'-0". THE COST OF THE DRIP STONE LANDING, NO.57 AGGREGATE, GROUT, SEALANT, AND ALL NECESSARY APPURTENANCES SHALL BE INCIDENTAL TO THE PRICE BID.
12. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED

DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	4-12-16	REVISED	3-4-16
REVISED		REVISED	
REVISED		REVISED	

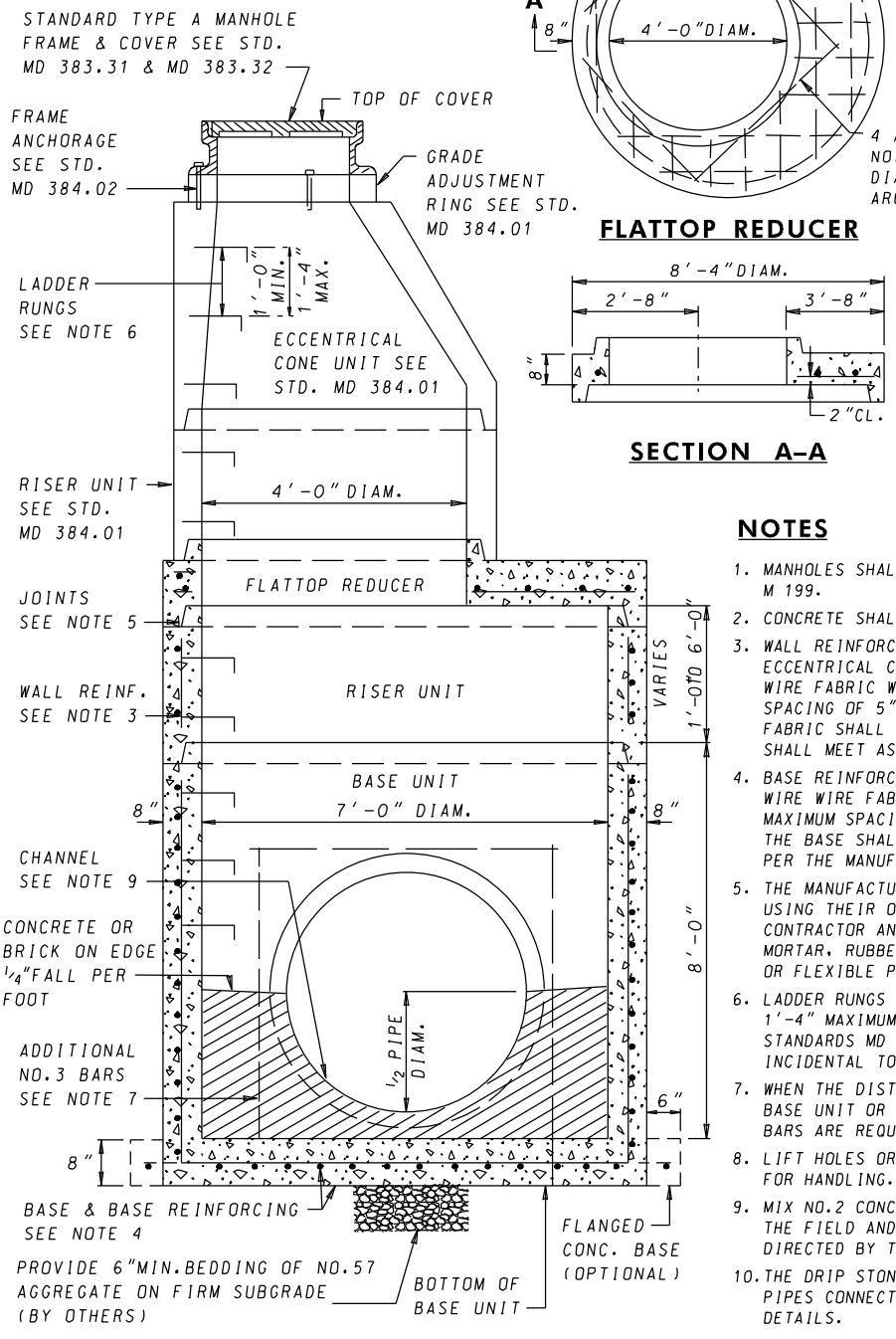
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

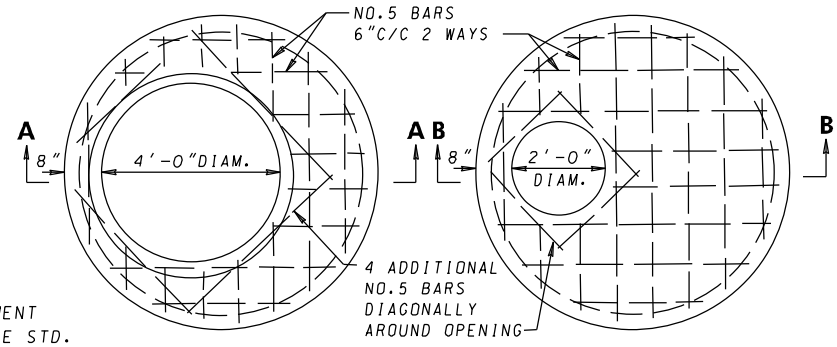
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

72" DIAMETER PRECAST MANHOLE FOR 42" & 48" PIPES

STANDARD NO. MD 384.05



SECTION VIEW

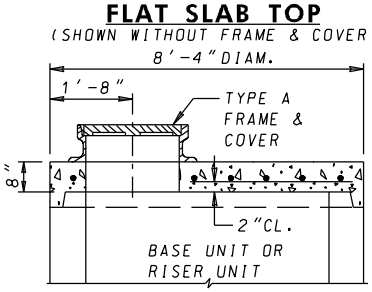


FLATTOP REDUCER

SECTION A-A

FLAT SLAB TOP

(SHOWN WITHOUT FRAME & COVER)



SECTION B-B

NOTES

1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199.
2. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
3. WALL REINFORCEMENT FOR BASE UNITS, RISER UNITS AND ECCENTRICAL CONE UNITS SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.21 IN^2/FT AND MAXIMUM SPACING OF 5" FOR THE 84" DIAMETER MANHOLES. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 52. REINFORCEMENT SHALL MEET ASTM A 615, GRADE 60.
4. BASE REINFORCEMENT SHALL BE REINFORCEMENT BARS OR WELDED WIRE WIRE FABRIC WITH A MINIMUM AREA OF 0.48 IN^2/FT AND A MAXIMUM SPACING OF 4" WITH 2" COVER FROM THE TOP OF BASE. THE BASE SHALL BE CAST MONOLITHIC WITH THE UNIT OR JOINTED PER THE MANUFACTURER'S DESIGN.
5. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING (WHERE APPLICABLE) MORTAR, RUBBER O-RING GASKETS MEETING ASTM C 361 AND C 443 OR FLEXIBLE PLASTIC GASKETS MEETING AASHTO M 198 TYPE B.
6. LADDER RUNGS SHALL BE INSTALLED IN VERTICAL ALIGNMENT AT 1'-4" MAXIMUM C/C. RUNG TYPES SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR 383.92. LADDER RUNGS SHALL BE INCIDENTAL TO THE COST OF THE MANHOLE.
7. WHEN THE DISTANCE BETWEEN MULTIPLE PIPE OPENING IN THE BASE UNIT OR ANY RISER UNIT IS LESS THAN 6" ADDITIONAL NO.3 BARS ARE REQUIRED AROUND OPENINGS.
8. LIFT HOLES OR LIFT EYES SHALL BE APPRIVED IN EACH SECTION FOR HANDLING.
9. MIX NO.2 CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER.
10. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STD. 384.13 FOR DETAILS.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 10'-1" MEASURED FROM THE BOTTOM OF THE BASE UNIT TO THE TOP OF THE MANHOLE COVER. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 10'-1". THE COST OF THE DRIP STONE LANDING, NO.57 AGGREGATE, GROUT, SEALANT, AND ALL NECESSARY APPURTENANCES SHALL BE INCIDENTAL TO THE PRICE BID.
12. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____ DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

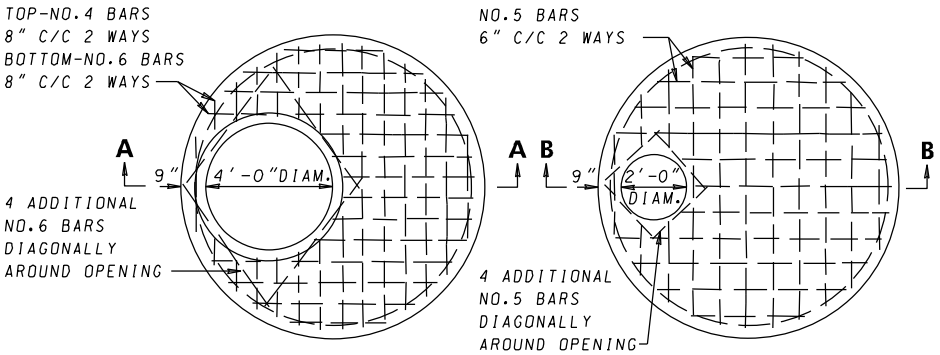
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

84" DIAMETER PRECAST MANHOLE FOR 54" &60" PIPES

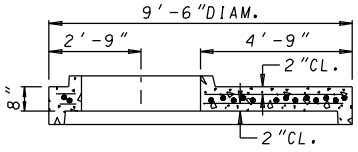
STANDARD NO. MD 384.07



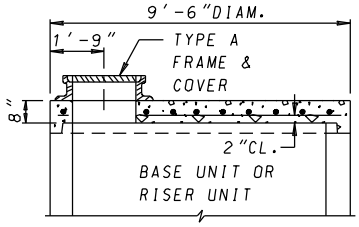
FLATTOP REDUCER

FLAT SLAB TOP

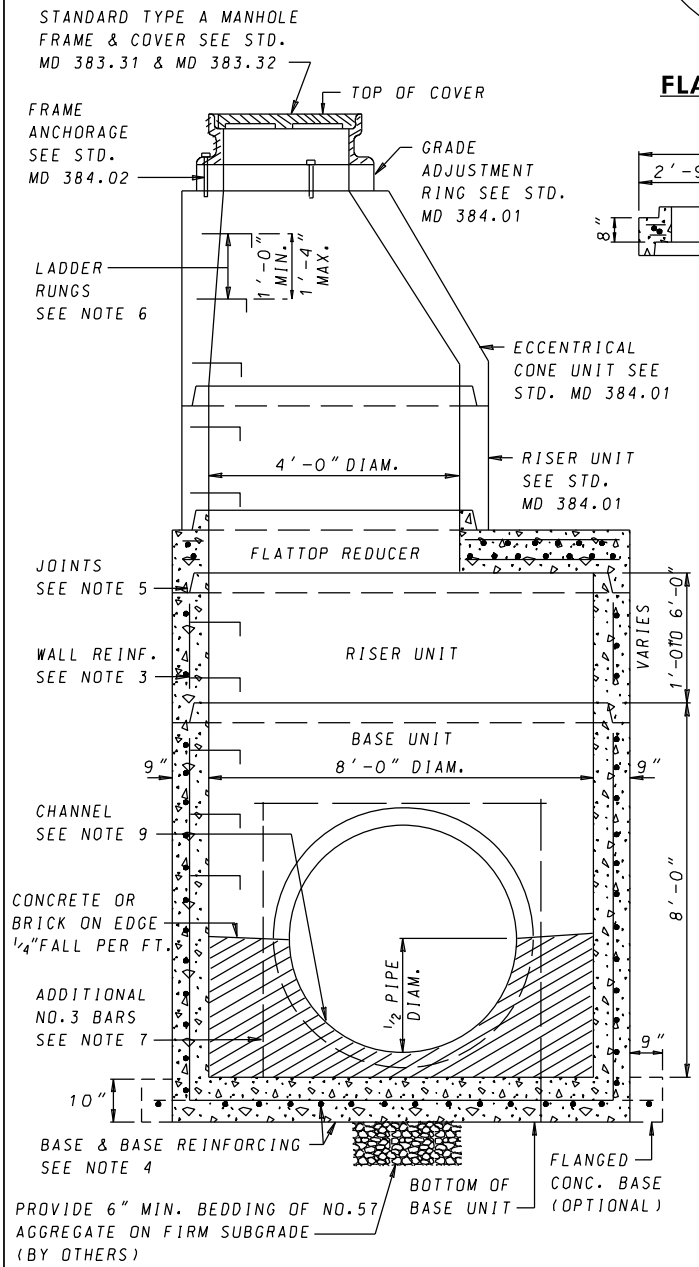
(SHOWN WITHOUT FRAME & COVER)



SECTION A-A



SECTION B-B



SECTION VIEW

NOTES

1. MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH AASHTO M 199.
2. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
3. WALL REINFORCEMENT FOR BASE UNITS, RISER UNITS AND ECCENTRICAL CONE UNITS SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.24 IN^2/FT AND MAXIMUM SPACING OF 6" FOR THE 96" DIAMETER MANHOLES. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 52. REINFORCEMENT SHALL MEET ASTM A 615, GRADE 60.
4. BASE REINFORCEMENT SHALL BE REINFORCEMENT BARS OR WELDED WIRE WIRE FABRIC WITH A MINIMUM AREA OF 0.42 IN^2/FT AND A MAXIMUM SPACING OF 5" WITH 2" COVER FROM THE TOP OF BASE. THE BASE SHALL BE CAST MONOLITHIC WITH THE UNIT OR JOINTED PER THE MANUFACTURER'S DESIGN.
5. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING (WHERE APPLICABLE) MORTAR, RUBBER O-RING GASKETS METTING ASTM A 361 & C 443 OR FLEXIBLE PLASTIC GASKETS METTING AASHTO M 198 TYPE B.
6. LADDER RUNGS SHALL BE INSTALLED IN VERTICAL ALIGNMENT AT 1'-4" MAXIMUM C/C. RUNG TYPES SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR 383.92. LADDER RUNGS SHALL BE INCIDENTAL TO THE COST OF THE MANHOLE.
7. WHEN THE DISTANCE BETWEEN MULTIPLE OPENINGS IN THE BASE UNIT OR ANY RISER UNIT IS LESS THAN 6" ADDITIONAL NO.3 BARS ARE REQUIRED AROUND OPENINGS.
8. LIFT HOLES OR LIFT EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.
9. MIX NO.2 CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER.
10. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STD.MD 384.13 FOR DETAILS.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 10'-3" MEASURED FROM THE BOTTOM OF THE BASE UNIT TO THE TOP OF THE MANHOLE COVER. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 10'-3". THE COST OF THE DRIP STONE LANDING, NO.57 AGGREGATE, GROUT, SEALANT, AND ALL NECESSARY APPURTENANCES SHALL BE INCIDENTAL TO THE PRICE BID.
12. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

SHA State Highway Administration

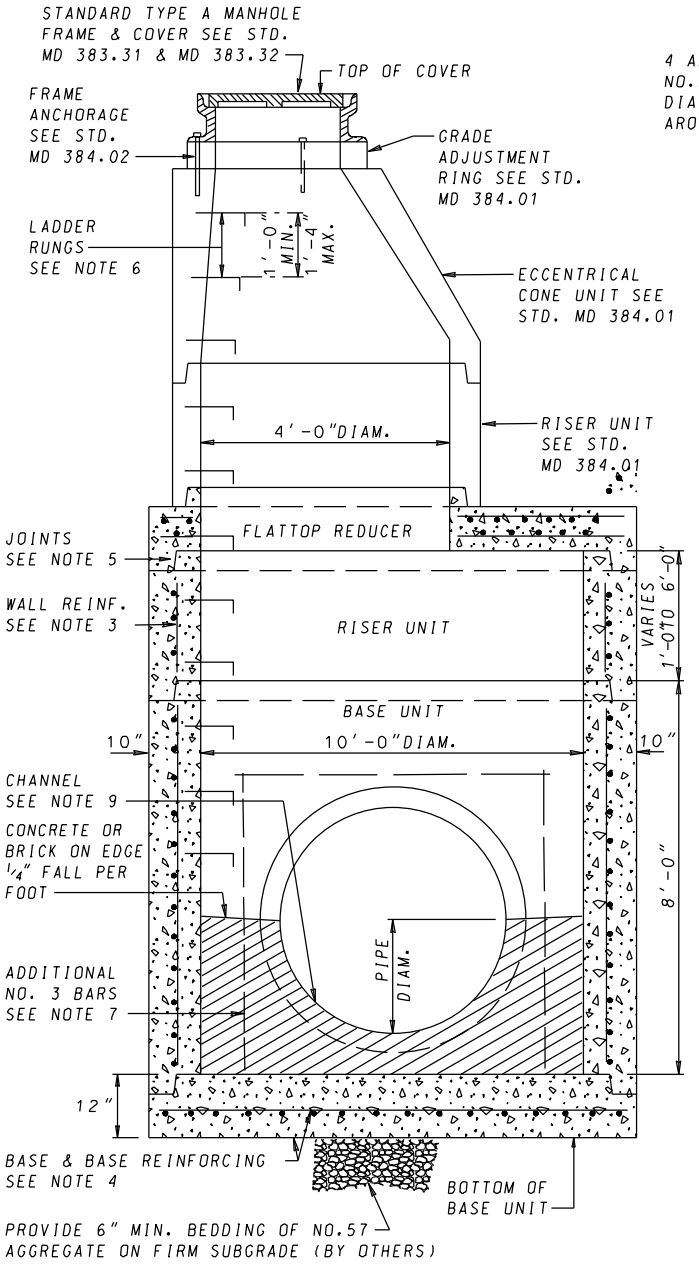
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

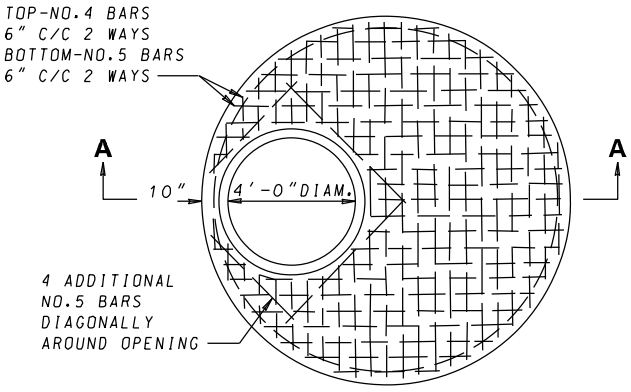
96" DIAMETER PRECAST MANHOLE FOR 72" PIPES

STANDARD NO. MD 384.09

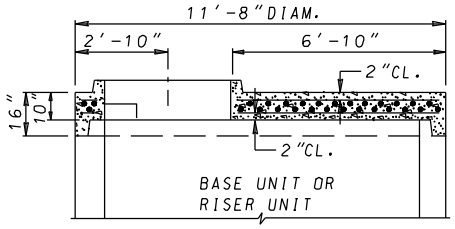
NOTE: SEE STD.MD 384.12
FOR PRECAST FLAT SLAB TOP



SECTION VIEW



FLATTOP REDUCER



SECTION A-A

NOTES

1. MANHOLES SHALL BE CONSRUCTED IN ACCORDANCE WITH AASHTO M 199.
2. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
3. WALL REINFORCEMENT FOR BASE UNITS, RISER UNITS AND ECCENTRICAL CONE UNITS SHALL BE REINFORCEMENT BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.33 IN^2/FT AND MAXIMUM SPACING OF 6" FOR THE 120" DIAMETER MANHOLES. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 AND A 52. REINFORCEMENT SHALL MEET ASTM A 615, GRADE 60.
4. BASE REINFORCEMENT SHALL BE REINFORCEMENT BARS OR WELDED WIRE WIRE FABRIC WITH A MINIMUM AREA OF 0.42 IN^2/FT AND A MAXIMUM SPACING OF 6" WITH 2" COVER FROM THE TOP OF BASE. THE BASE SHALL BE CAST MONOLITHIC WITH THE UNIT OR JOINTED PER THE MANUFACTURER'S DESIGN.
5. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATERTIGHT USING (WHERE APPLICABLE) MORTAR, RUBBER O-RING GASKETS MEETING ASTM C 361 & C 443 OR FLEXIBLE PLASTIC GASKETS MEETING AASHTO M 198 TYPE B.
6. LADDER RUNGS SHALL BE INSTALLED IN VERTICAL ALIGNMENT AT 1'-4" MAXIMUM C/C. RUNG TYPES SHALL BE IN ACCORDANCE WITH STANDARDS MD 383.91 OR MD 383.92. LADDER RUNGS SHALL BE INCIDENTAL TO THE COST OF THE MANHOLE.
7. WHEN THE DISTANCE BETWEEN MULTIPLE OPENINGS IN THE BASE UNIT OR ANY RISER UNIT IS LESS THAN 6" ADDITIONAL NO.3 BARS ARE REQUIRED AROUND OPENINGS.
8. LIFT HOLES OR LIFT EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.
9. MIX NO.2 CONCRETE OR BRICK CHANNEL SHALL BE PROVIDED IN THE FIELD AND SHALL SLOPE 2" PER FOOT TOWARD OUTLET OR AS DIRECTED BY THE ENGINEER.
10. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STD. MD 384.13 FOR DETAILS.
11. MINIMUM DEPTH PAYMENT PER EACH SHALL BE 10'-7" MEASURED FROM THE BOTTOM OF THE BASE UNIT TO THE TOP OF THE MANHOLE COVER. VERTICAL DEPTH PAYMENT PER LINEAR FOOT SHALL INCLUDE ALL DEPTHS IN EXCESS OF 10'-7". THE COST OF THE DRIP STONE LANDING, NO.57 AGGREGATE, GROUT, SEALANT, AND ALL APPURTENANCES SHALL BE INCIDENTAL TO THE PRICE BID.
12. MANHOLE HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

SPECIFICATION 305	CATEGORY CODE ITEMS

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

	APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91		APPROVAL	1-2-91
REVISED	10-7-14		REVISED	9-29-14
REVISED	–		REVISED	
REVISED			REVISED	

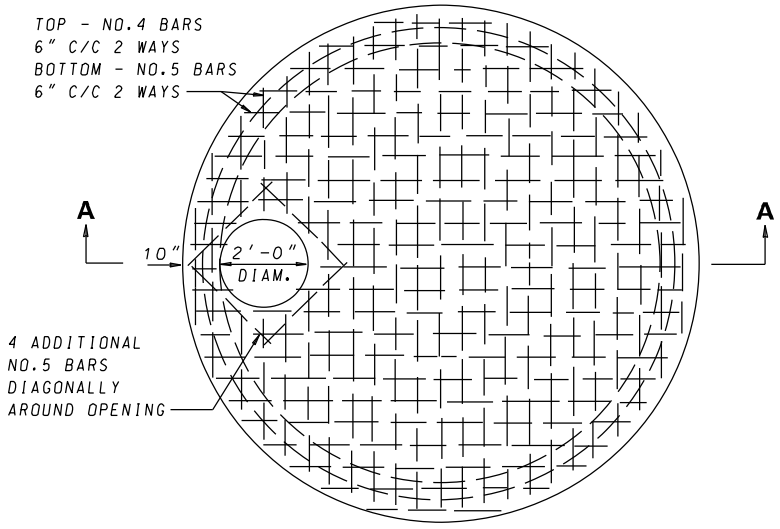
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

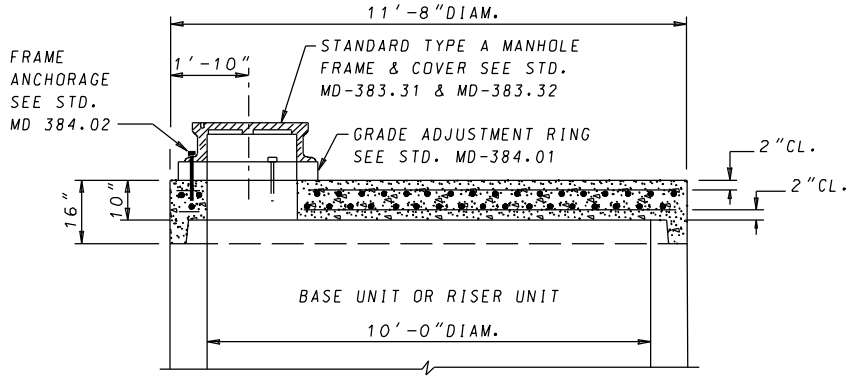
120" DIAMETER PRECAST MANHOLE FOR 78" TO 84" PIPES

STANDARD NO. MD 384.11



PLAN

(FRAME AND COVER NOT SHOWN)



SECTION A-A

GENERAL NOTES

1. CONCRETE SHALL BE MIX NO. 6 (4500 PSI).
2. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN.
3. LIFT EYES SHALL BE PROVIDED FOR HANDLING.
4. COST FOR THE PRECAST FLAT SLAB TOP IS INCIDENTAL TO THE COST OF THE 120" PRECAST MANHOLE.
5. FOR USE WITH THE 120" DIAMETER PRECAST MANHOLE, SEE STD. MD 384.11.
6. SLAB TOP HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-7-14	REVISED	9-29-14
REVISED	–	REVISED	
REVISED		REVISED	

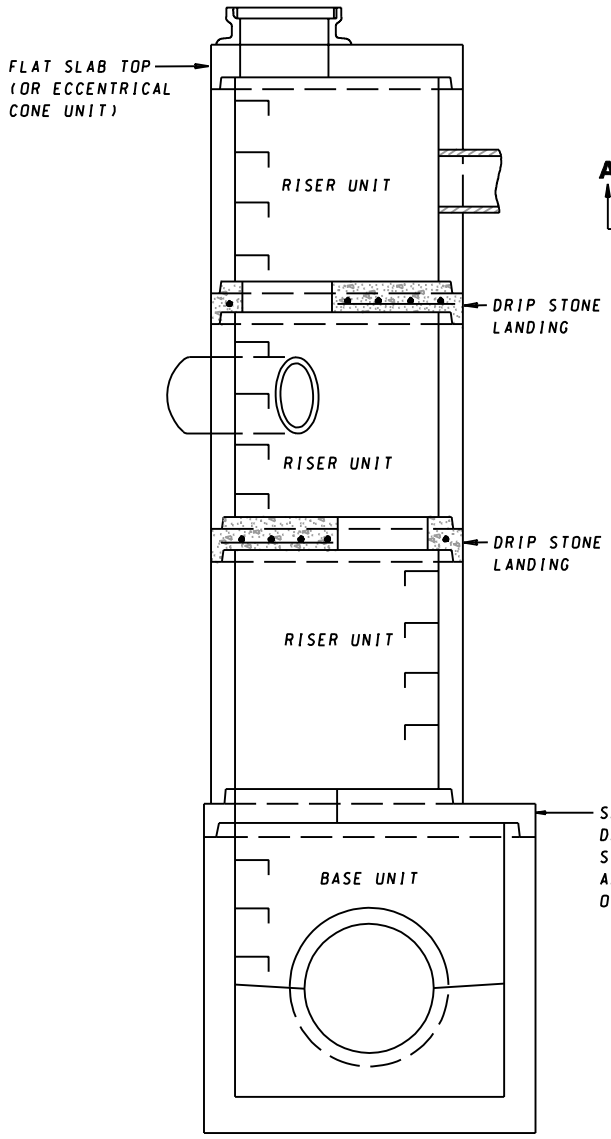
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

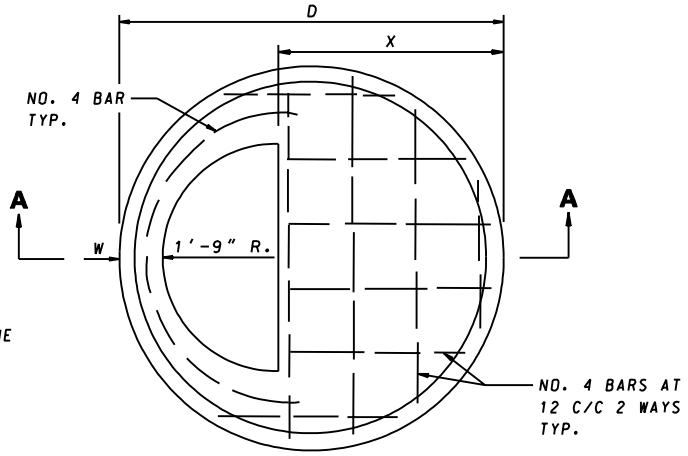
PRECAST FLAT SLAB TOP FOR 120" DIAMETER PRECAST MANHOLE

STANDARD NO. MD 384.12

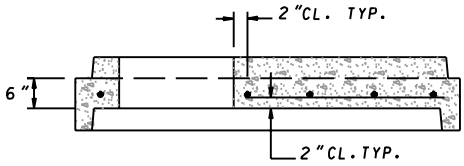


SEE STD. MD 384.15 FOR PRECAST COMBINATION FLATTOP REDUCER AND DRIP STONE LANDING FOR 60" TO 120" DIAMETER MANHOLES AND STD. MD 384.17 FOR PRECAST COMBINATION ECCENTRICAL CONE REDUCER AND DRIP STONE LANDING FOR 60" TO 72" DIAMETER MANHOLES. OTHERWISE USE 48" DIAMETER DRIP STONE LANDING ON THIS SHEET.

METHOD OF PLACING DRIP STONE LANDINGS



PLAN



SECTION A-A
DRIP STONE LANDING

PRECAST MANHOLE DIAMETER	DRIP STONE DIMENSIONS		
	D	W	X
48"	4'-10"	8"	2'-5"
60"	6'-0"	8"	3'-7"
72"	7'-2"	8"	4'-9"
84"	8'-4"	8"	5'-11"
96"	9'-6"	9"	7'-0"
120"	11'-8"	10"	9'-1"

NOTES

1. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS.
2. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
3. REINFORCEMENT SHALL MEET ASTM A 615 GRADE 60.
4. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN.
5. LIFT EYES SHALL BE PROVIDED FOR HANDLING.
6. COST FOR THE DRIP STONE LANDING IS INCIDENTAL TO THE COST OF THE MANHOLE.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

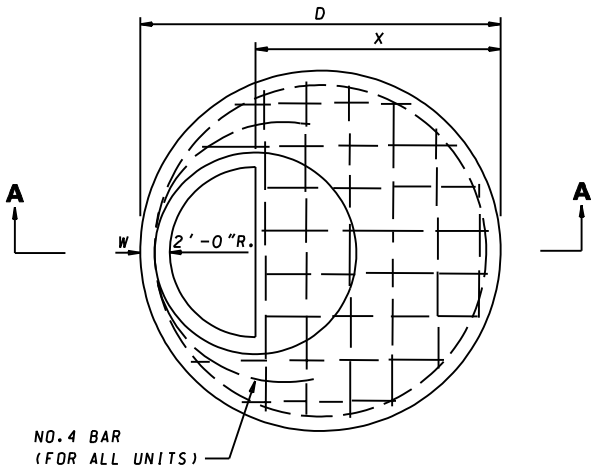
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

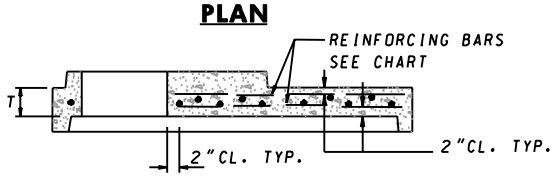
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST DRIP STONE LANDING DETAILS FOR 48" TO 120" DIAMETER MANHOLES

STANDARD NO. MD 384.13



PLAN



SECTION A-A

PRECAST MANHOLE DIAMETER	DIMENSIONS				REINFORCING BARS PLACED 2 WAYS	
	D	T	W	X	TOP LAYER	BOTTOM LAYER
60"	6'-0"	5"	6"	3'-6"	N/A	NO. 5 AT 10" C/C
72"	7'-2"	6"	7"	4'-7"	N/A	NO. 5 AT 10" C/C
84"	8'-4"	7"	8"	5'-8"	N/A	NO. 5 AT 10" C/C
96"	9'-6"	8"	9"	6'-9"	NO. 4 AT 8" C/C	NO. 6 AT 8" C/C
120"	11'-8"	9"	10"	8'-10"	NO. 4 AT 6" C/C	NO. 5 AT 6" C/C

NOTES

1. THE COMBINATION FLATTOP REDUCER DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STANDARD MD 384.13 FOR PLACEMENT.
2. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
3. REINFORCEMENT SHALL MEET ASTM A 615 GRADE 60.
4. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN.
5. LIFT EYES SHALL BE PROVIDED FOR HANDLING.
6. COST FOR THE CONBINATION FLATTOP REDUCER AND DRIP STONE LANDING IS INCIDENTAL TO THE COST OF THE MANHOLE.

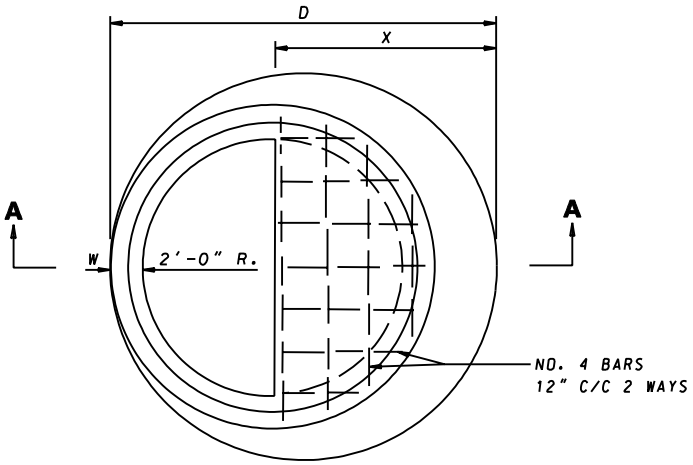
SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 2-22-91	APPROVAL 1-2-91
REVISED 10-1-01	REVISED
REVISED	REVISED
REVISED	REVISED

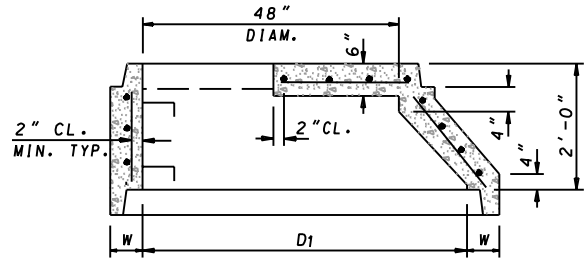
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES
PRECAST COMBINATION FLATTOP REDUCER AND DRIP STONE LANDING FOR 60" TO 120" DIAMETER MANHOLES

STANDARD NO. MD 384.15



PLAN



SECTION A-A

PRECAST MANHOLE DIAMETER	DIMENSIONS			
	D	D1	W	X
60"	6'-0"	5'-0"	6"	3'-6"
72"	7'-2"	6'-0"	7"	4'-7"

NOTES

1. THE COMBINATION ECCENTRICAL CONE REDUCER AND DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE STANDARD MD 384.13 FOR PLACEMENT.
2. CONCRETE SHALL BE MIX NO.6 (4500 PSI).
3. REINFORCEMENT SHALL BE REINFORCING BARS OR WELDED WIRE FABRIC WITH A MINIMUM AREA OF 0.15 IN. ^{2}/FT FOR THE 60" DIAMETER CONE UNIT AND 0.18 IN. ^{2}/FT FOR THE 72" DIAMETER CONE UNIT.
4. THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN.
5. LIFT EYES SHALL BE PROVIDED FOR HANDLING.
6. COST FOR THE COMBINATION ECCENTRICAL CONE REDUCER AND DRIP STONE LANDING IS INCIDENTAL TO THE COST OF THE MANHOLE.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-22-91	APPROVAL	1-2-91
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

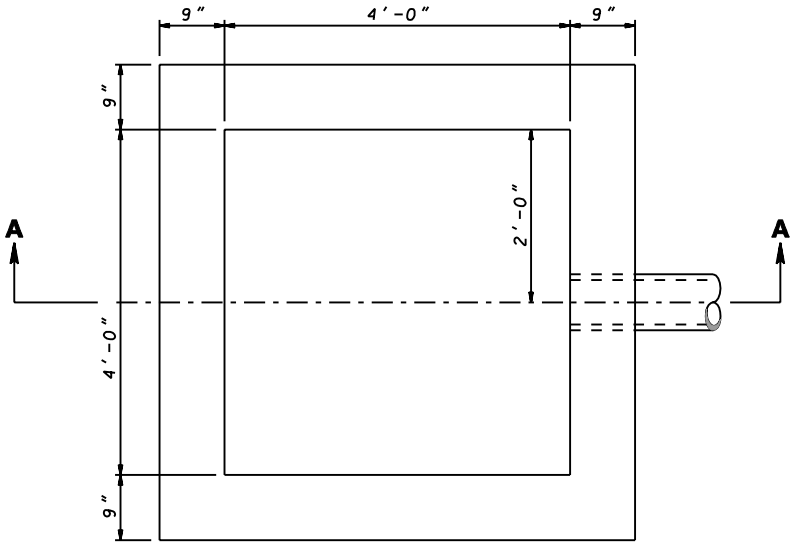
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

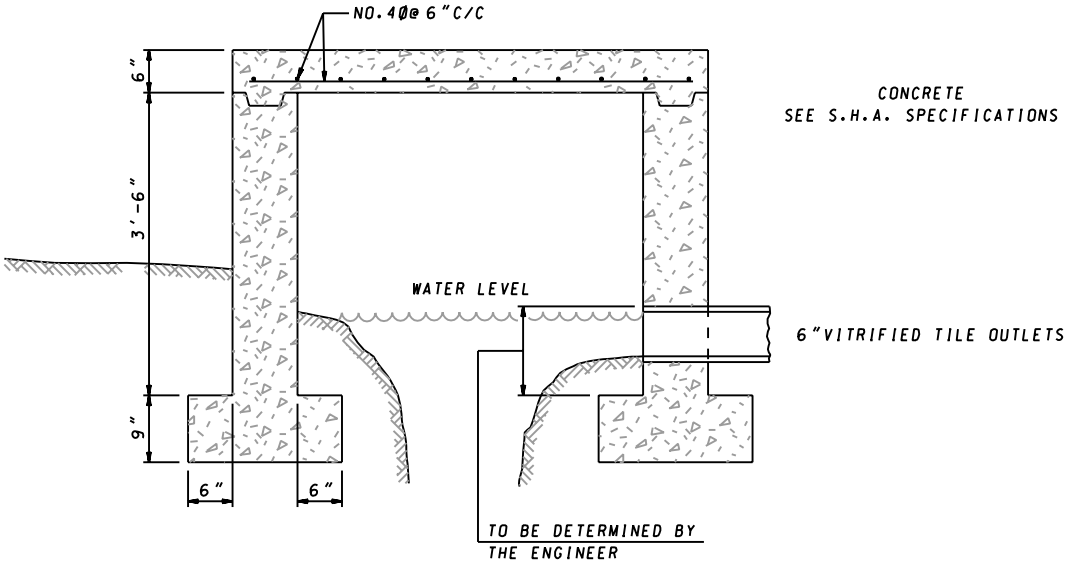
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRECAST COMBINATION ECCENTRICAL CONE REDUCER AND DRIP STONE LANDING FOR 60" AND 72" DIAMETER MANHOLES

STANDARD NO. MD 384.17



PLAN



SECTION A-A

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-7-51	APPROVAL	3-23-56
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

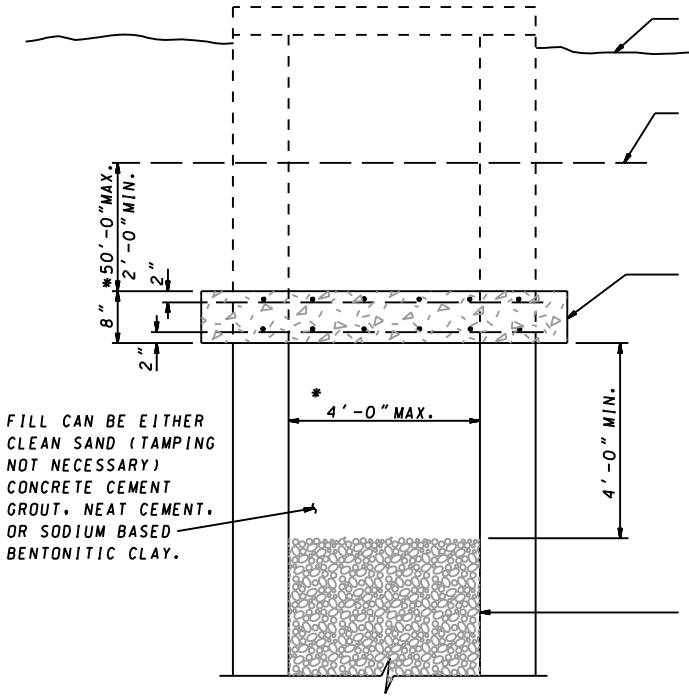
SHA State Highway Administration

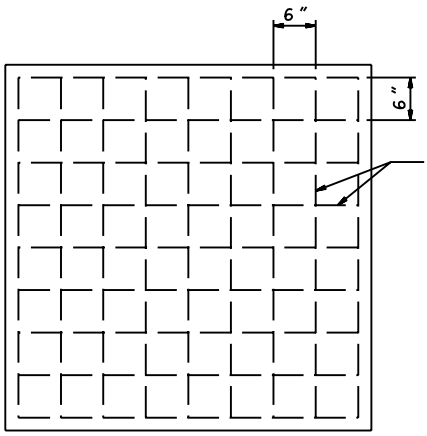
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD SPRING BOX SPRING OR WELL PROTECTION

STANDARD NO. MD 386.01





* CONSULT CHIEF. HIGHWAY DESIGN DIVISION OR DIRECTOR. OFFICE OF HIGHWAY DEVELOPMENT WHEN THESE DIMENSIONS ARE EXCEEDED.

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-11-77	APPROVAL	4-7-77
REVISED	10-1-01	REVISED	12-6-82
REVISED		REVISED	
REVISED		REVISED	

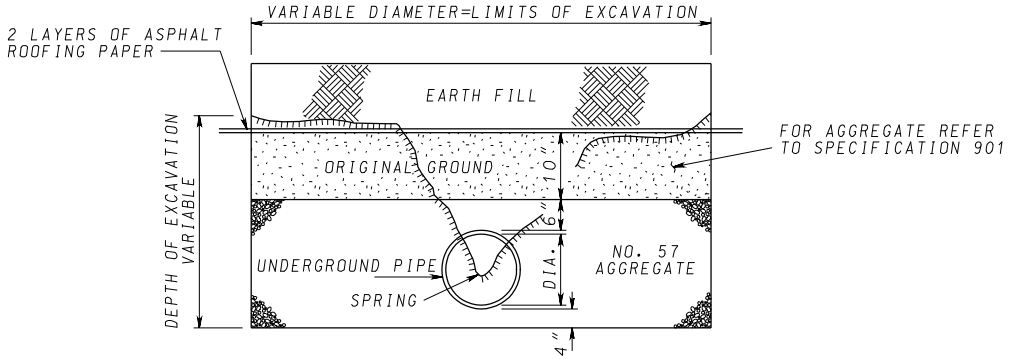
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

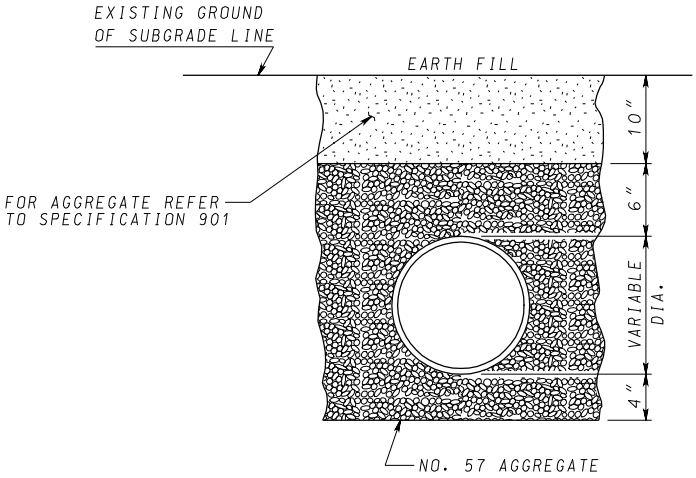
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

CAPPING EXISTING DUG WELLS

STANDARD NO. MD 386.02



CIRCULAR PLAN VIEW NOT SHOWN. TO BE USED WHERE NOTED ON THE PLANS OR WHERE DIRECTED BY THE ENGINEER.
TWO LAYERS OF THREE PLY ASPHALT ROOFING PAPER. COST OF PAPER AND INSTALLATION MUST BE INCLUDED IN THE CONTRACT PRICE FOR MEASUREMENT AND PAYMENT
REFER TO 306.04.01 WHEN PIPE IS USED AND TO 306.04.02 WHEN THE PIPE IS OMITTED.



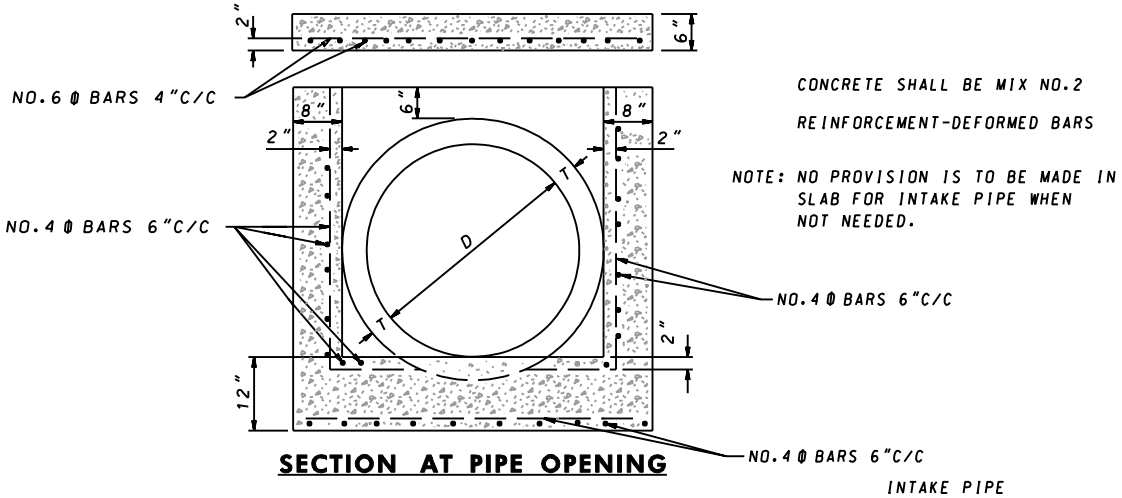
SPECIFICATION 306	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCallum DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	5-1-57	APPROVAL	8-6-57
REVISED	3-15-06	REVISED	4-5-06
REVISED		REVISED	
REVISED		REVISED	

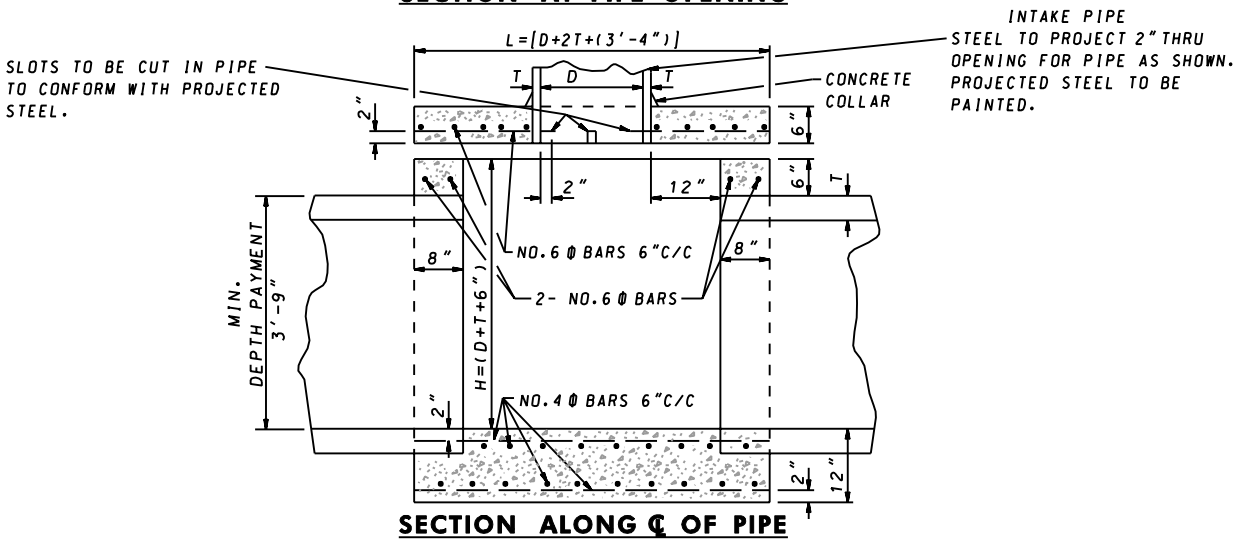
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SPRING CONTROL METHOD & DETAIL

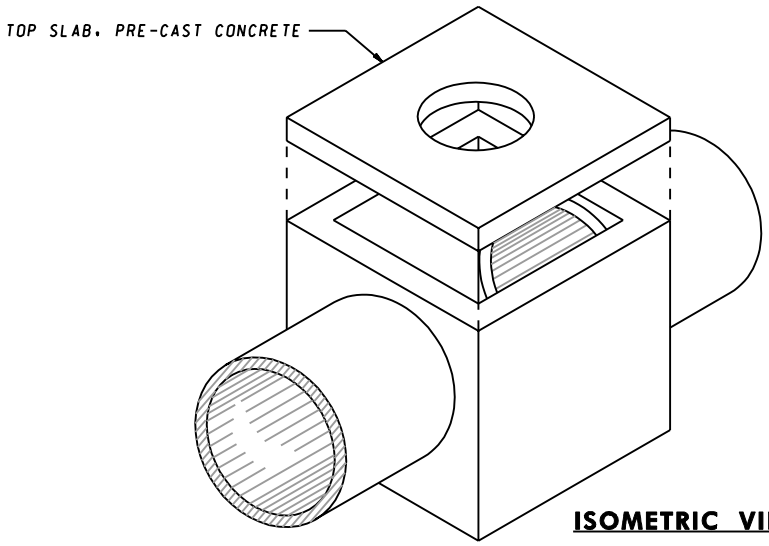
STANDARD NO. MD 386.03



SECTION AT PIPE OPENING



SECTION ALONG ℄ OF PIPE



ISOMETRIC VIEW

SPECIFICATION	CATEGORY CODE ITEMS
305	

APPROVED Kirk G. McCall
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

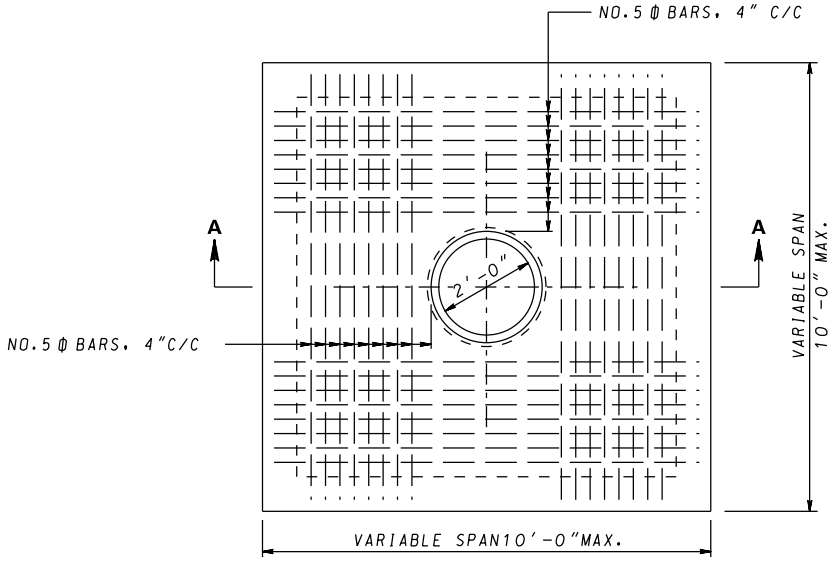
APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 2-7-51	APPROVAL 3-23-56
REVISED 10-1-01	REVISED
REVISED	REVISED
REVISED	REVISED

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

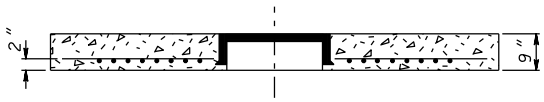
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD JUNCTION BOX

STANDARD NO. MD 386.11



PLAN



SECTION A-A

GENERAL NOTES

1. CONCRETE SHALL BE MIX NO.2
2. REINFOCEMENT- DEFORMED BARS
3. MANHOLE CASTINGS:- INSIDE DIA.- 2'-0"
4. MANHOLE CASTINGS:- MAXIMUM DEPTH- 0'-7"
5. ALL MATERIAL TO CONFORM TO S.H.A. SPECIFICATIONS
6. SLAB HAS BEEN DESIGNED FOR HS-25 LOADING, ACCORDING TO AASHTO LRFD BRIDGE SPECIFICATIONS.

SPECIFICATION 305	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	2-7-51	APPROVAL	3-23-56
REVISED	–	REVISED	9-30-75
REVISED	10-7-14	REVISED	9-29-14
REVISED		REVISED	

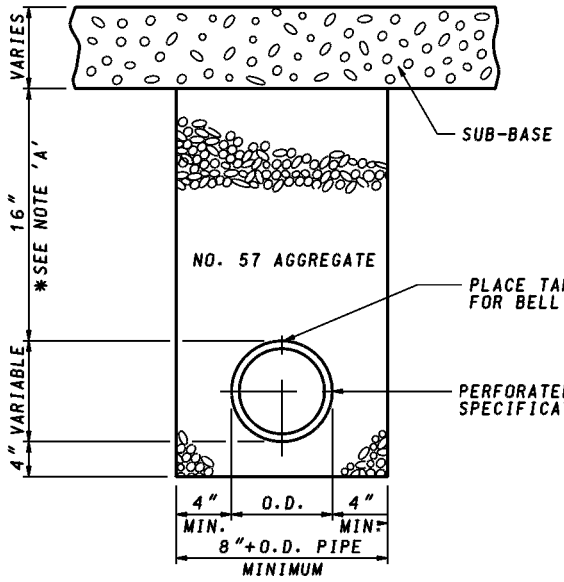
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

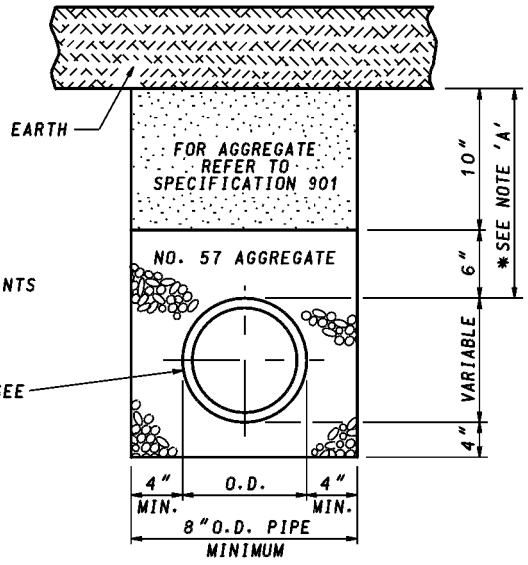
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

PRE-CAST REINFORCED CONCRETE SLAB

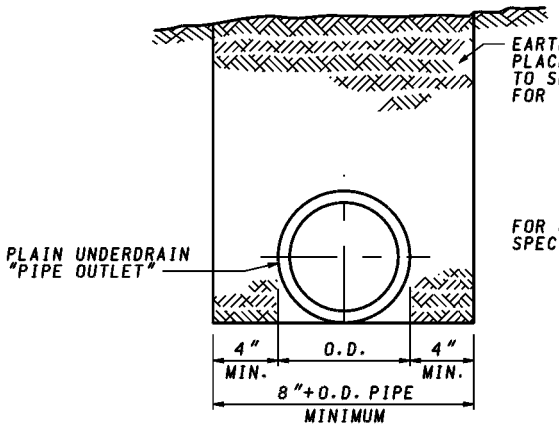
STANDARD NO. MD 386.21



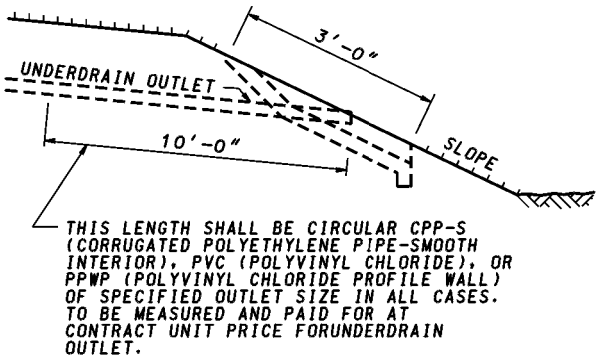
SUB-BASE DRAINAGE DITCH SECTION



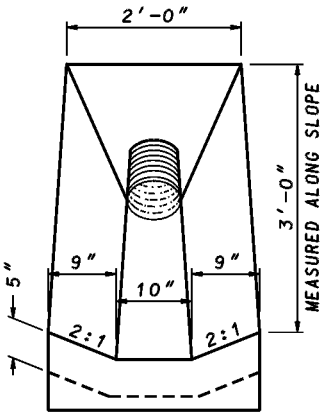
SUB-SURFACE DRAINAGE DITCH SECTION



OUTLET DITCH SECTION



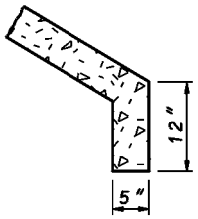
5" CONCRETE GUTTER FOR UNDERDRAIN OUTLET



ELEVATION-UNDERDRAIN OUTLET

NOTE: UNDERDRAIN TO BE LAID ON A MINIMUM OF 0.5% GRADE UNLESS OTHERWISE DIRECTED.

*NOTE 'A': WHERE UNDERDRAIN IS OUTLETTED INTO AN INLET, OR WHERE ANY OTHER UNUSUAL CONDITIONS PREVAIL, THESE DIMENSIONS MAY BE VARIED AS DIRECTED.



TOE WALL

SPECIFICATION	CATEGORY CODE ITEMS

APPROVED _____
DIRECTOR - OFFICE OF HIGHWAY DEVELOPMENT

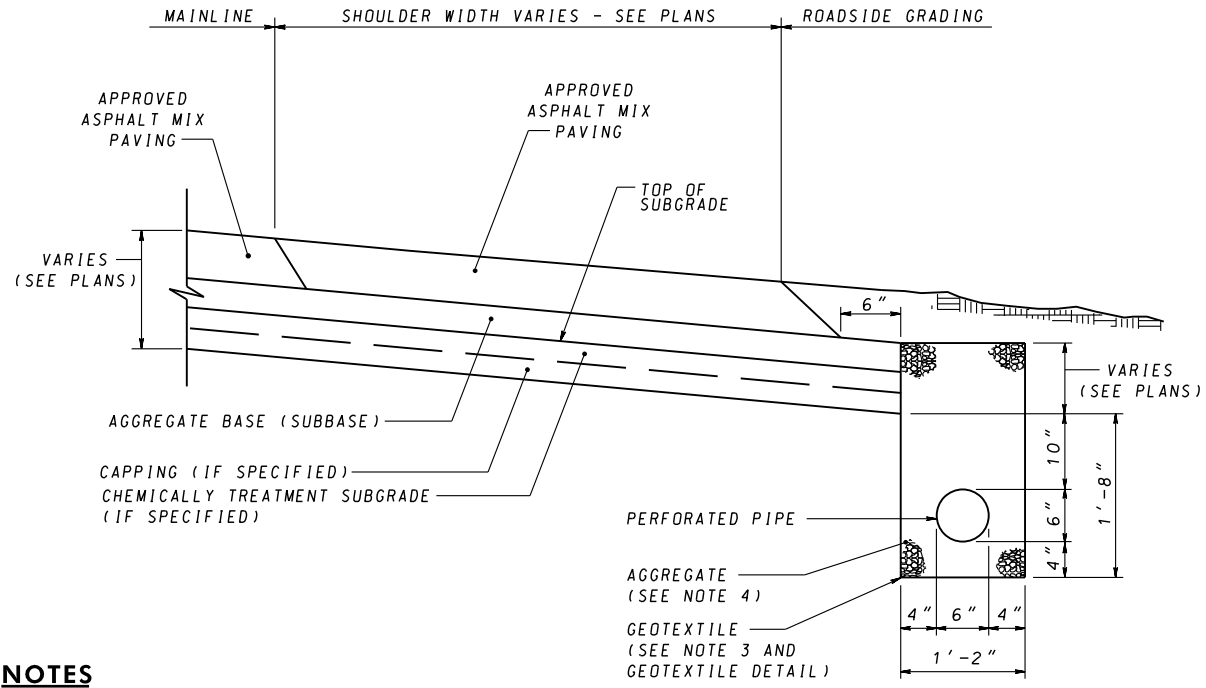
APPROVAL SHA REVISIONS		APPROVAL FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-6-86	APPROVAL	4-14-86
REVISED	12-21-17	REVISED	11-28-17
REVISED		REVISED	
REVISED		REVISED	

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

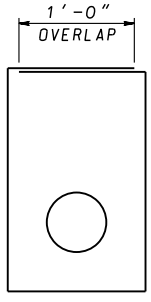
STANDARD UNDERDRAINS

STANDARD NO. MD 387.01



NOTES

1. LONGITUDINAL UNDERDRAIN SHALL BE PLACED ACCORDING TO THE PLANS OR AS DIRECTED BY THE ENGINEER.
2. THE UNDERDRAIN TRENCH SHALL NOT BE CONSTRUCTED BEFORE PLACEMENT OF THE BASE (SUBBASE) COURSE.
3. LONGITUDINAL UNDERDRAIN TRENCH SHALL BE WRAPPED IN CLASS SD TYPE II GEOTEXTILE.
4. AGGREGATE SHALL CONFORM TO No. 57 AGGREGATE, 901.01 OF THE STANDARD SPECIFICATION FOR CONSTRUCTION AND MATERIALS.
5. AGGREGATE SHALL BE TAMPED WITH A LIGHT VIBRATORY TAMPER PRIOR TO OVERLAPPING THE GEOTEXTILE FABRIC.
6. CONTRACT UNIT PRICE BID PER LINEAR FOOT FOR 6" PERFORATED CIRCULAR PIPE LONGITUDINAL UNDERDRAIN SHALL CONSTITUTE FULL COMPENSATION FOR ALL MATERIALS, LABOR, EQUIPMENT AND INCIDENTALS NECESSARY TO DO THE WORK.
7. IF ANY EXISTING LONGITUDINAL UNDERDRAIN IS ENCOUNTERED DURING WIDENING EXCAVATION, THE UNDERDRAIN PIPE SHOULD BE REMOVED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ANY VOID CREATED BY THE REMOVAL OF THE UNDERDRAIN PIPE SHOULD BE BACKFILLED BY MATERIAL SUITABLE FOR EMBANKMENT CONSTRUCTION. IF NO LONGITUDINAL UNDERDRAIN IS FOUND, BUT EXISTING UNDERDRAIN OUTLETS MAY BE IMPACTED BY NEW WIDENING, OUTLETS SHALL BE CONNECTED TO THE NEW UNDERDRAINS OR OTHER DRAINAGE FACILITIES.
8. OUTLET THE UNDERDRAINS INTO OTHER DRAINAGE STRUCTURES WHENEVER POSSIBLE AT INTERVALS NOT TO EXCEED 250'. REFER TO STD. NOS. 387.11, 387.11-01, 387.21 AND 387.21-01.



GEOTEXTILE FABRIC
DETAIL

SPECIFICATION 306	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-6-86	APPROVAL	4-14-86
REVISED	10-1-01	REVISED	3-21-88
REVISED	7-29-11	REVISED	8-11-11
REVISED	6-30-16	REVISED	6-28-16

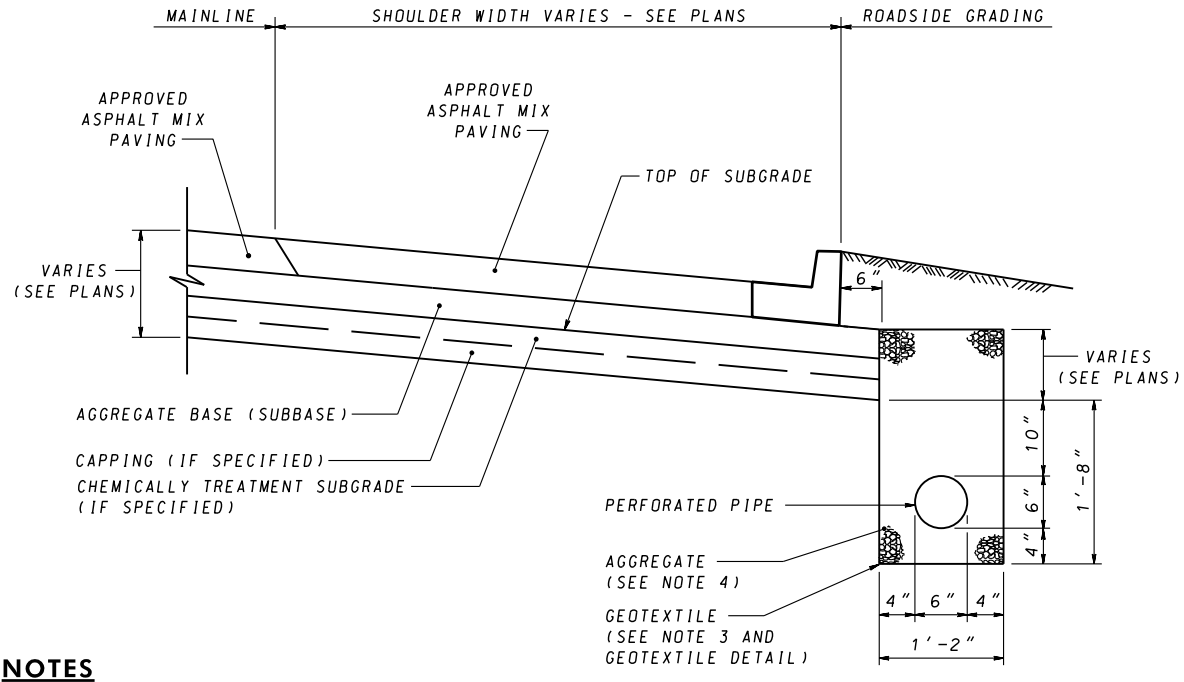
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

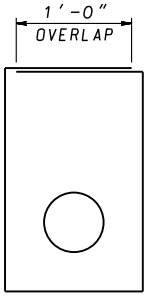
LONGITUDINAL UNDERDRAIN LOCATED AT SHOULDER EDGE FOR FLEXIBLE PAVEMENT

STANDARD NO. MD 387.11



NOTES

1. LONGITUDINAL UNDERDRAIN SHALL BE PLACED ACCORDING TO THE PLANS OR AS DIRECTED BY THE ENGINEER.
2. THE UNDERDRAIN TRENCH SHALL NOT BE CONSTRUCTED BEFORE PLACEMENT OF THE BASE (SUBBASE) COURSE.
3. LONGITUDINAL UNDERDRAIN TRENCH SHALL BE WRAPPED IN CLASS SD TYPE II GEOTEXTILE.
4. AGGREGATE SHALL CONFORM TO No. 57 AGGREGATE, 901.01 OF THE STANDARD SPECIFICATION FOR CONSTRUCTION AND MATERIALS.
5. AGGREGATE SHALL BE TAMPED WITH A LIGHT VIBRATORY TAMPER PRIOR TO OVERLAPPING THE GEOTEXTILE FABRIC.
6. CONTRACT UNIT PRICE BID PER LINEAR FOOT FOR 6" PERFORATED CIRCULAR PIPE LONGITUDINAL UNDERDRAIN SHALL CONSTITUTE FULL COMPENSATION FOR ALL MATERIALS, LABOR, EQUIPMENT AND INCIDENTALS NECESSARY TO DO THE WORK.
7. IF ANY EXISTING LONGITUDINAL UNDERDRAIN IS ENCOUNTERED DURING WIDENING EXCAVATION, THE UNDERDRAIN PIPE SHOULD BE REMOVED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ANY VOID CREATED BY THE REMOVAL OF THE UNDERDRAIN PIPE SHOULD BE BACKFILLED BY MATERIAL SUITABLE FOR EMBANKMENT CONSTRUCTION. IF NO LONGITUDINAL UNDERDRAIN IS FOUND, BUT EXISTING UNDERDRAIN OUTLETS MAY BE IMPACTED BY NEW WIDENING, OUTLETS SHALL BE CONNECTED TO THE NEW UNDERDRAINS OR OTHER DRAINAGE FACILITIES.
8. OUTLET THE UNDERDRAINS INTO OTHER DRAINAGE STRUCTURES WHENEVER POSSIBLE AT INTERVALS NOT TO EXCEED 250'. REFER TO STD. NOS. 387.11, 387.11-01, 387.21 AND 387.21-01.



GEOTEXTILE FABRIC
DETAIL

SPECIFICATION 306	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-6-86	APPROVAL	4-14-86
REVISED	10-1-01	REVISED	3-21-88
REVISED	7-29-11	REVISED	8-1-11
REVISED	6-30-16	REVISED	6-28-16

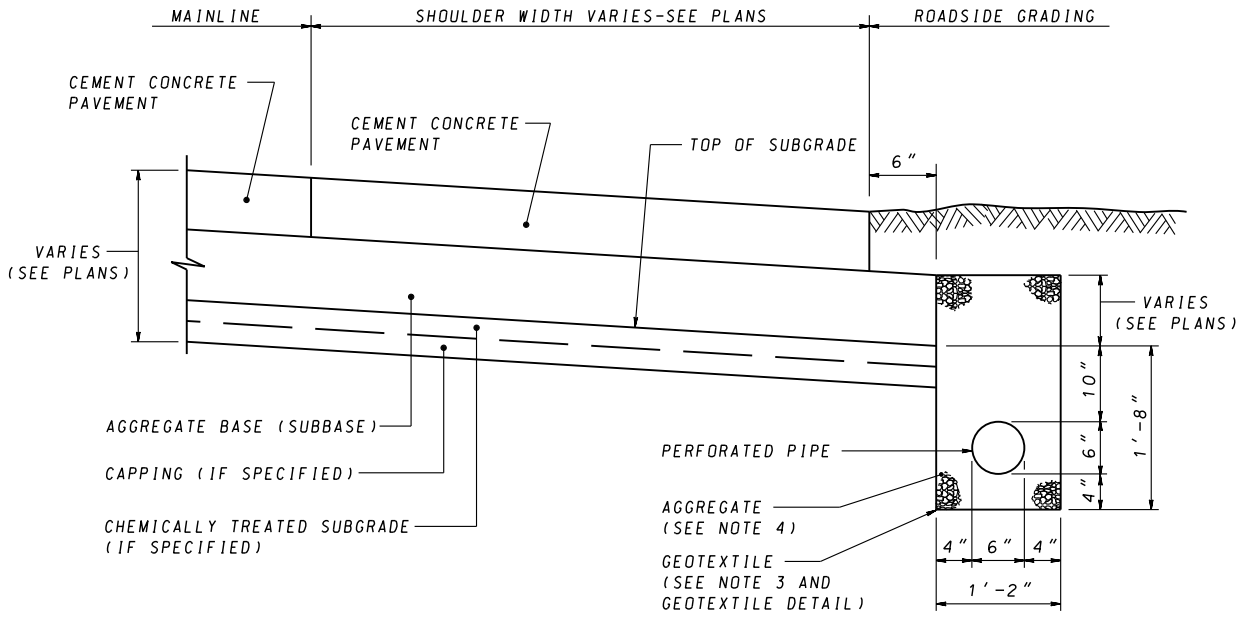
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

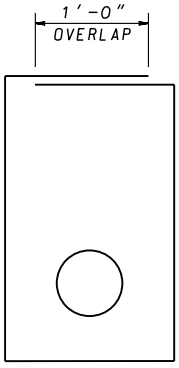
LONGITUDINAL UNDERDRAIN LOCATED AT CURB & GUTTER EDGE FOR FLEXIBLE PAVEMENT

STANDARD NO. MD 387.11-01



NOTES

1. LONGITUDINAL UNDERDRAIN SHALL BE PLACED ACCORDING TO THE PLANS OR DIRECTED BY THE ENGINEER.
2. THE UNDERDRAIN TRENCH SHALL NOT BE CONSTRUCTED BEFORE PLACEMENT OF THE BASE (SUBBASE) COURSE.
3. LONGITUDINAL UNDERDRAIN TRENCH SHALL BE WRAPPED IN CLASS SD TYPE II GEOTEXTILE.
4. AGGREGATE SHALL CONFORM TO No. 57 AGGREGATE, 901.01 OF THE STANDARD SPECIFICATION FOR CONSTRUCTION AND MATERIALS.
5. AGGREGATE SHALL BE TAMPED WITH A LIGHT VIBRATORY TAMPER PRIOR TO OVERLAPPING THE GEOTEXTILE FABRIC.
6. CONTRACT UNIT PRICE BID PER LINEAR FOOT FOR 6" PERFORATED CIRCULAR PIPE LONGITUDINAL UNDERDRAIN SHALL CONSTITUTE FULL COMPENSATION FOR ALL MATERIALS, LABOR, EQUIPMENT AND INCIDENTALS NECESSARY TO DO THE WORK.
7. IF ANY EXISTING LONGITUDINAL UNDERDRAIN IS ENCOUNTERED DURING WIDENING EXCAVATION, THE UNDERDRAIN PIPE SHOULD BE REMOVED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ANY VOID CREATED BY THE REMOVAL OF THE UNDERDRAIN PIPE SHOULD BE BACKFILLED BY MATERIAL SUITABLE FOR EMBANKMENT CONSTRUCTION. IF NO LONGITUDINAL UNDERDRAIN IS FOUND, BUT EXISTING UNDERDRAIN OUTLETS MAY BE IMPACTED BY NEW WIDENING, OUTLETS SHALL BE CONNECTED TO THE NEW UNDERDRAINS OR OTHER DRAINAGE FACILITIES.
8. OUTLET THE UNDERDRAINS INTO OTHER DRAINAGE STRUCTURES WHENEVER POSSIBLE AT INTERVALS NOT TO EXCEED 250'. REFER TO STD. NOS. 387.11, 387.11-01, 387.21 AND 387.21-01.



GEOTEXTILE FABRIC
DETAIL

SPECIFICATION 306	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	3-6-86	APPROVAL	4-14-86
REVISED	10-1-01	REVISED	3-21-88
REVISED	7-29-11	REVISED	8-1-11
REVISED	6-30-16	REVISED	6-28-16

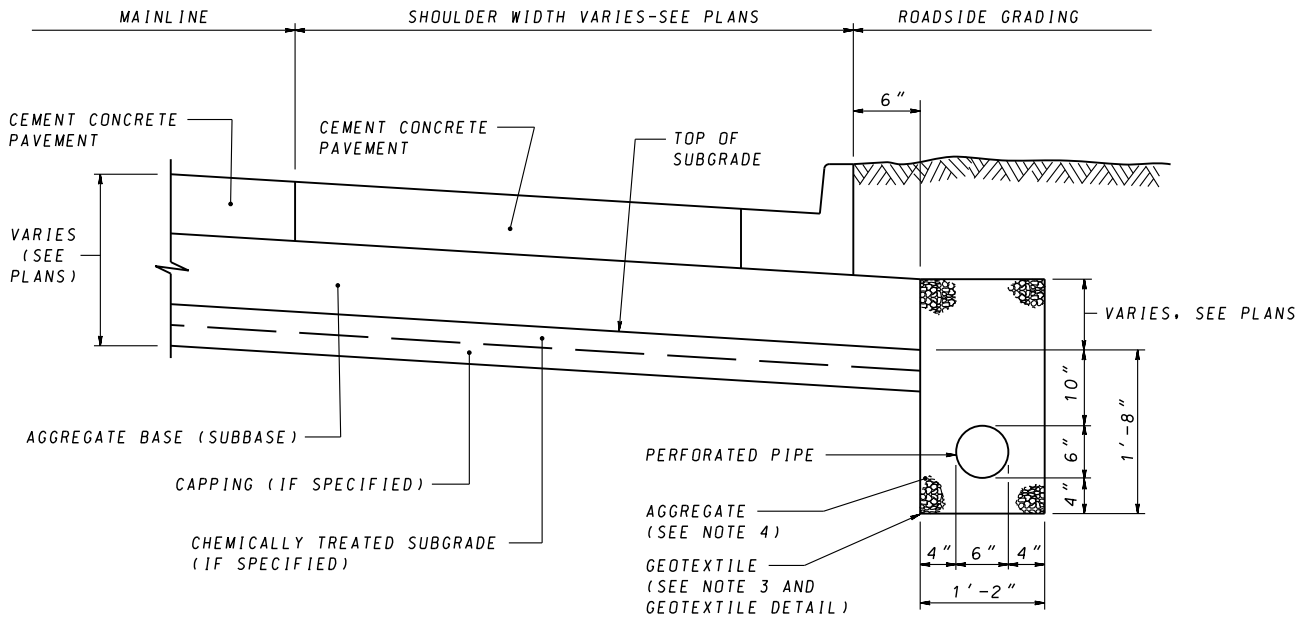
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

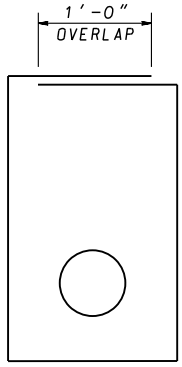
LONGITUDINAL UNDERDRAIN LOCATED AT SHOULDER EDGE FOR RIGID PAVEMENT

STANDARD NO. MD 387.21



NOTES

1. LONGITUDINAL UNDERDRAIN SHALL BE PLACED ACCORDING TO THE PLANS OR DIRECTED BY THE ENGINEER.
2. THE UNDERDRAIN TRENCH SHALL NOT BE CONSTRUCTED BEFORE PLACEMENT OF THE BASE (SUBBASE) COURSE.
3. LONGITUDINAL UNDERDRAIN TRENCH SHALL BE WRAPPED IN CLASS SD TYPE II GEOTEXTILE.
4. AGGREGATE SHALL CONFORM TO No. 57 AGGREGATE, 901.01 OF THE STANDARD SPECIFICATION FOR CONSTRUCTION AND MATERIALS.
5. AGGREGATE SHALL BE TAMPED WITH A LIGHT VIBRATORY TAMPER PRIOR TO OVERLAPPING THE GEOTEXTILE FABRIC.
6. CONTRACT UNIT PRICE BID PER LINEAR FOOT FOR 6" PERFORATED CIRCULAR PIPE LONGITUDINAL UNDERDRAIN SHALL CONSTITUTE FULL COMPENSATION FOR ALL MATERIALS, LABOR, EQUIPMENT AND INCIDENTALS NECESSARY TO DO THE WORK.
7. IF ANY EXISTING LONGITUDINAL UNDERDRAIN IS ENCOUNTERED DURING WIDENING EXCAVATION, THE UNDERDRAIN PIPE SHOULD BE REMOVED UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ANY VOID CREATED BY THE REMOVAL OF THE UNDERDRAIN PIPE SHOULD BE BACKFILLED BY MATERIAL SUITABLE FOR EMBANKMENT CONSTRUCTION. IF NO LONGITUDINAL UNDERDRAIN IS FOUND, BUT EXISTING UNDERDRAIN OUTLETS MAY BE IMPACTED BY NEW WIDENING, OUTLETS SHALL BE CONNECTED TO THE NEW UNDERDRAINS OR OTHER DRAINAGE FACILITIES.
8. OUTLET THE UNDERDRAINS INTO OTHER DRAINAGE STRUCTURES WHENEVER POSSIBLE AT INTERVALS NOT TO EXCEED 250'. REFER TO STD. NOS. 387.11, 387.11-01, 387.21 AND 387.21-01.



GEOTEXTILE FABRIC
DETAIL

SPECIFICATION 306	CATEGORY CODE ITEMS

APPROVED _____
DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS	APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL 6-30-16	APPROVAL 6-28-16
REVISED	REVISED
REVISED	REVISED
REVISED	REVISED

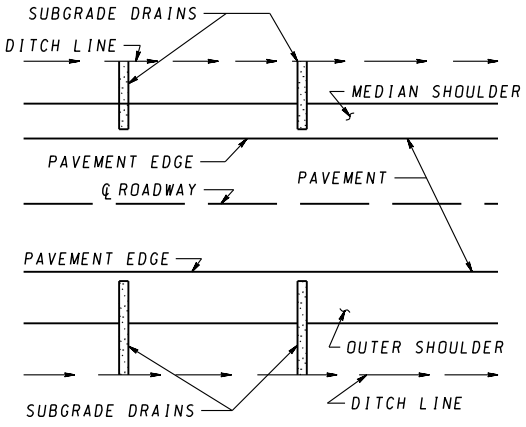
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

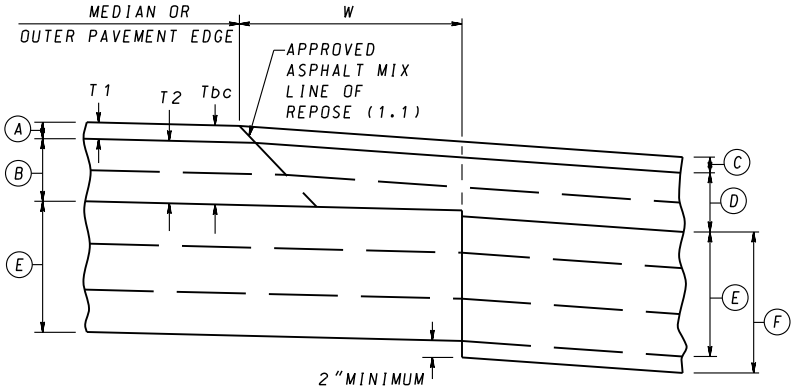
LONGITUDINAL UNDERDRAIN LOCATED AT CURB & GUTTER EDGE FOR RIGID PAVEMENT

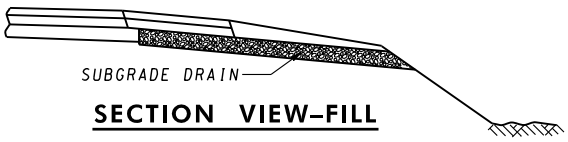
STANDARD NO. MD 387.21-01



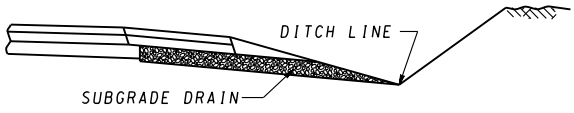
PLAN VIEW

SHOWN IS ONE ROADWAY OF A DUAL HIGHWAY. TWO LANE TWO WAY ROADWAY SAME AS THE OUTER SHOULDER



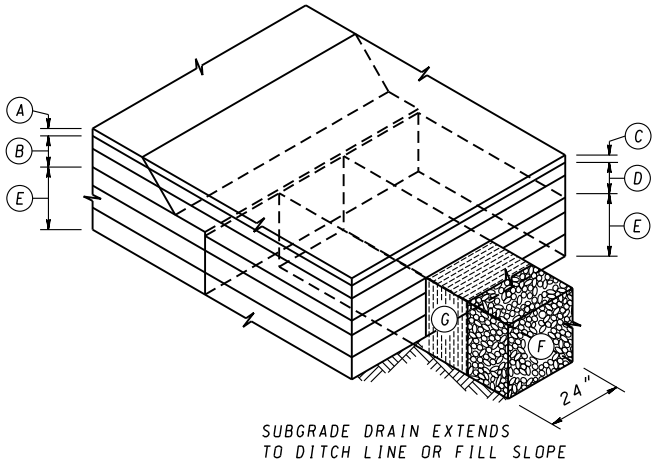


SECTION VIEW–FILL



SECTION VIEW–CUT

W	T1 +T2=Tbc
0'-6"	≤ 4½"
1'-0"	4½" TO 10½"
1'-6"	Tbc > 10½"



SUBGRADE DRAIN EXTENDS TO DITCH LINE OR FILL SLOPE

ISOMETRIC VIEW

(A) FLEXIBLE SURFACE PAVEMENT
(B) FLEXIBLE BASE PAVEMENT
(C) FLEXIBLE SURFACE PAVEMENT (SHOULDER)
(D) FLEXIBLE BASE PAVEMENT (SHOULDER)
(E) BASE MATERIAL
(F) SUBGRADE DRAIN MATERIAL
(G) GEOTEXTILE

NOTES

1. FOR LOCATION, MATERIAL, METHOD OF MEASUREMENT AND BASIS OF PAYMENT REFER TO SECTION 306.
2. WHEN THE BOTTOM OF THE SHOULDER FLEXIBLE BASE PAVEMENT (D) IS ABOVE THE MAINLINE BASE MATERIAL (E). THE MATERIAL REQUIRED TO FILL THE AREA WITHIN THE W DIMENSION WILL BE INCIDENTAL TO THE COST OF THE SHOULDER BASE MATERIAL (E). THIS CONDITION WILL BE INDICATED ON THE PLAN TYPICAL CROSS SECTIONS.
3. GEOTEXTILE CLASS SHALL BE AS SPECIFIED IN THE PLANS OR SPECIAL PROVISIONS. REFER TO SECTION 306 FOR METHOD OF MEASUREMENT AND BASIS OF PAYMENT.

SPECIFICATION 306	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	9-14-55	APPROVAL	7-7-67
REVISED	10-1-01	REVISED	3-21-88
REVISED	6-30-16	REVISED	6-28-16
REVISED		REVISED	

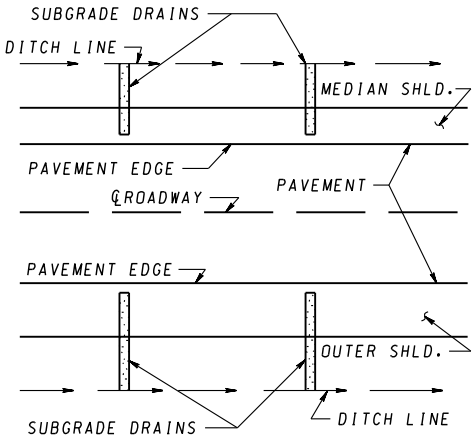
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

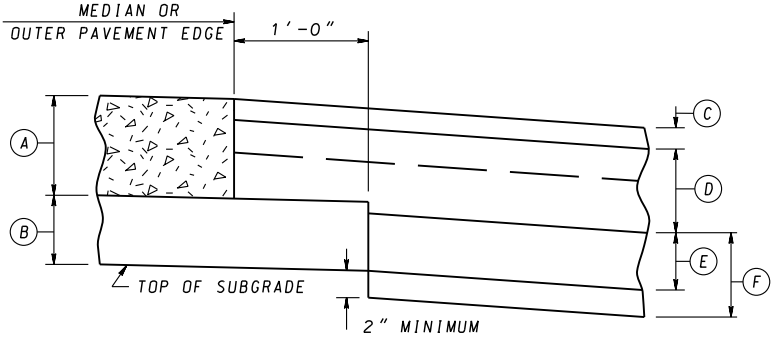
STANDARD SUBGRADE DRAINS FLEXIBLE PAVING

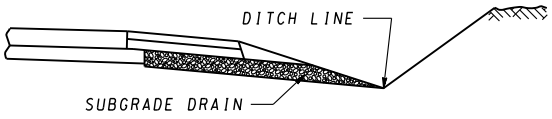
STANDARD NO. MD 387.51



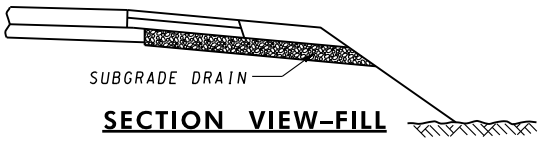
PLAN VIEW

SHOWN IS ONE ROADWAY OF A DUAL HIGHWAY. TWO LANE TWO WAY ROADWAY SAME AS THE OUTER SHOULDER

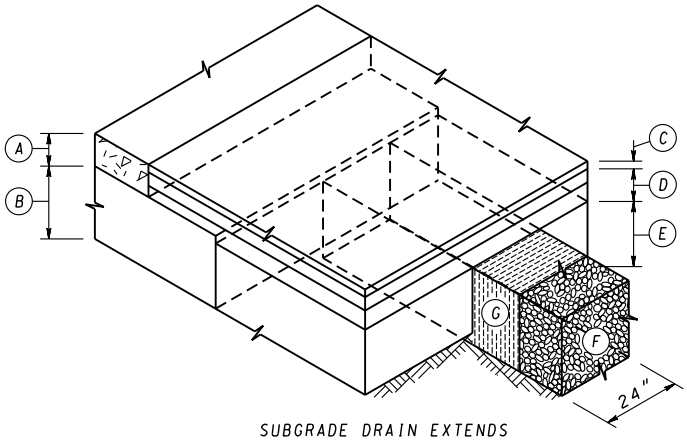




SECTION VIEW–CUT



SECTION VIEW–FILL



SUBGRADE DRAIN EXTENDS TO DITCH LINE OR FILL SLOPE

ISOMETRIC VIEW

(A) CONCRETE PAVEMENT
(B) SUBBASE MATERIAL
(C) FLEXIBLE SURFACE PAVEMENT (SHOULDER)
(D) FLEXIBLE BASE PAVEMENT (SHOULDER)
(E) BASE MATERIAL (SHOULDER)
(F) SUBGRADE DRAIN MATERIAL
(G) GEOTEXTILE

NOTES

1. FOR LOCATION, MATERIAL, METHOD OF MEASUREMENT AND BASIS OF PAYMENT REFER TO SECTION 306.
2. WHEN THE BOTTOM OF THE SHOULDER FLEXIBLE BASE PAVEMENT (D) IS ABOVE THE TOP OF THE MAINLINE SUBBASE MATERIAL (E). THE MATERIAL REQUIRED TO FILL THE AREA WITHIN THE 1'-0" DIMENSION WILL BE INCIDENTAL TO THE COST OF THE SHOULDER BASE MATERIAL (E). THIS CONDITION WILL BE INDICATED ON THE PLAN TYPICAL CROSS SECTIONS.
3. GEOTEXTILE CLASS SHALL BE AS SPECIFIED IN THE PLANS OR SPECIAL PROVISIONS. REFER TO SECTION 306 FOR METHOD OF MEASUREMENT AND BASIS OF PAYMENT.

SPECIFICATION 306	CATEGORY CODE ITEMS
APPROVED	DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

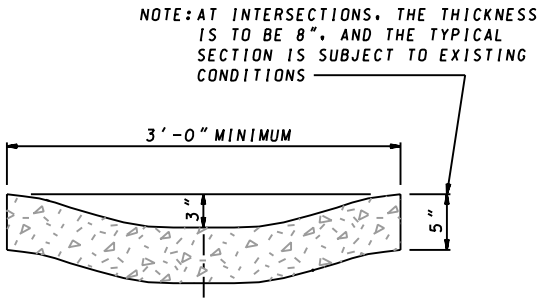
APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	1-11-63	APPROVAL	7-7-67
REVISED	10-1-01	REVISED	3-21-88
REVISED	6-30-16	REVISED	6-28-16
REVISED		REVISED	

SHA State Highway Administration

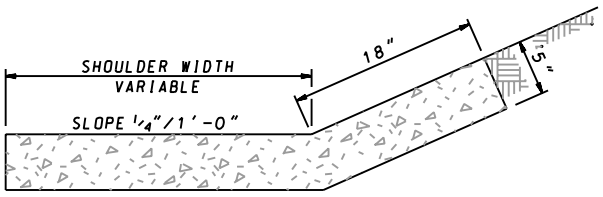
Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD SUBGRADE DRAINS RIGID PAVEMENT

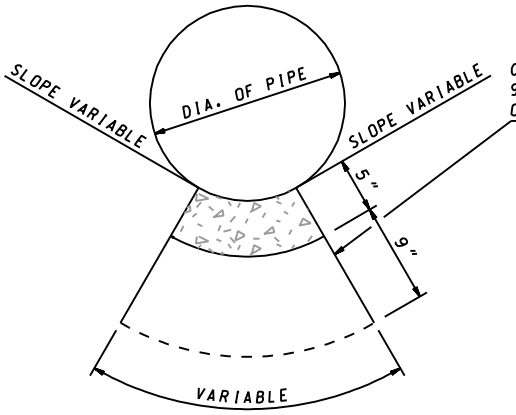
STANDARD NO. MD 387.61



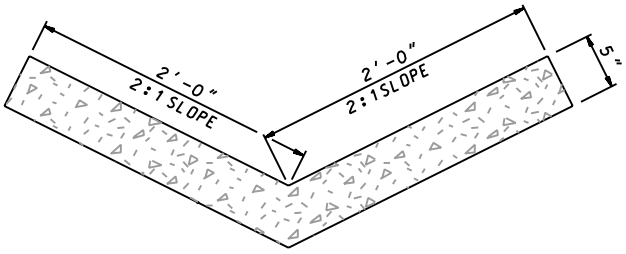
VALLEY GUTTER



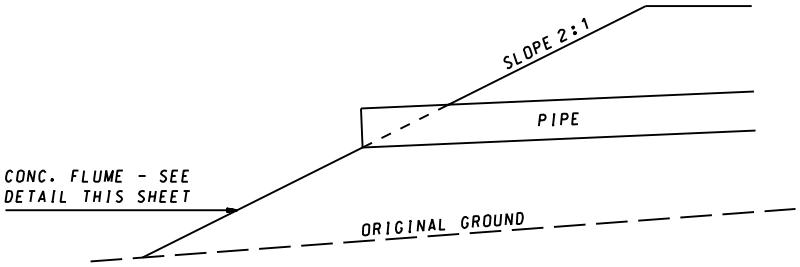
CONCRETE SHOULDER & REBUT



CONCRETE FLUME



FLUME



PIPE LOCATIONS UNDER DEEP FILL

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McCall DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION
APPROVAL	1-16-63	APPROVAL
REVISED	10-1-01	REVISED
REVISED		REVISED
REVISED		REVISED

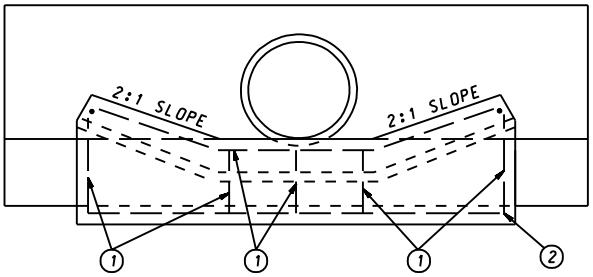
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

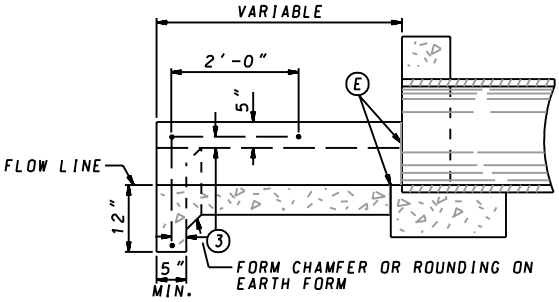
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

STANDARD CONCRETE VALLEY GUTTER, FLUMES CONCRETE SHOULDER & REBUT

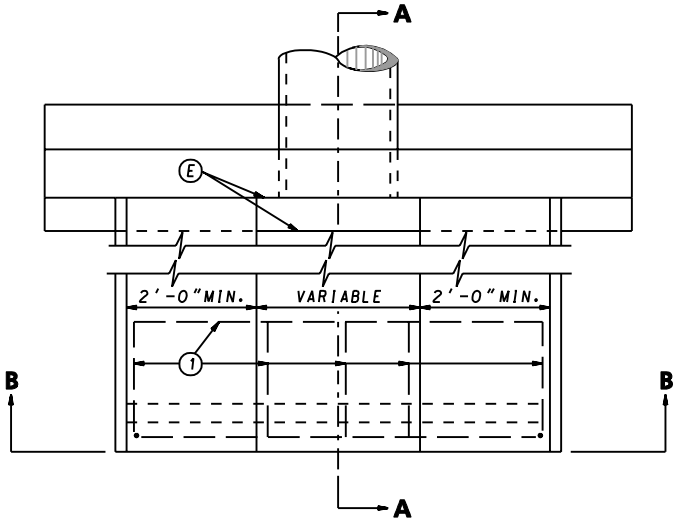
STANDARD NO. MD 389.01



ELEVATION "B–B"



SECTION A–A

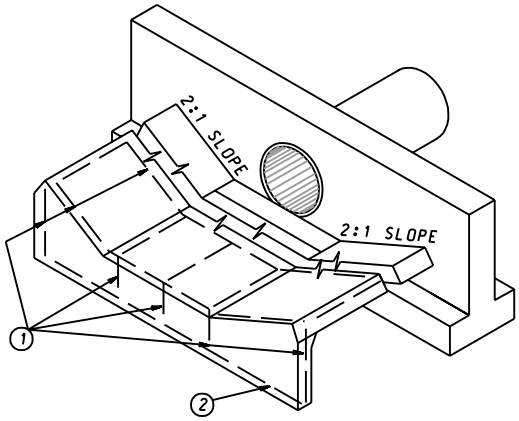


PLAN

REINFORCEMENT DATA
ALL BARS TO BE NO.3

(1) BENT BARS
(2) STRAIGHT BARS
(3) COVER TO BE 1/2" THICKNESS OF CONC. MIN. COVER ON ENDS
(E) EXPANSION MATERIAL

NOTE: COST OF TOE WALL TO BE INCIDENTAL TO SQUARE YARDS OF 5" CONCRETE GUTTER.



ISOMETRIC VIEW

SPECIFICATION	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	1-20-69	APPROVAL	1-27-69
REVISED	10-1-01	REVISED	
REVISED		REVISED	
REVISED		REVISED	

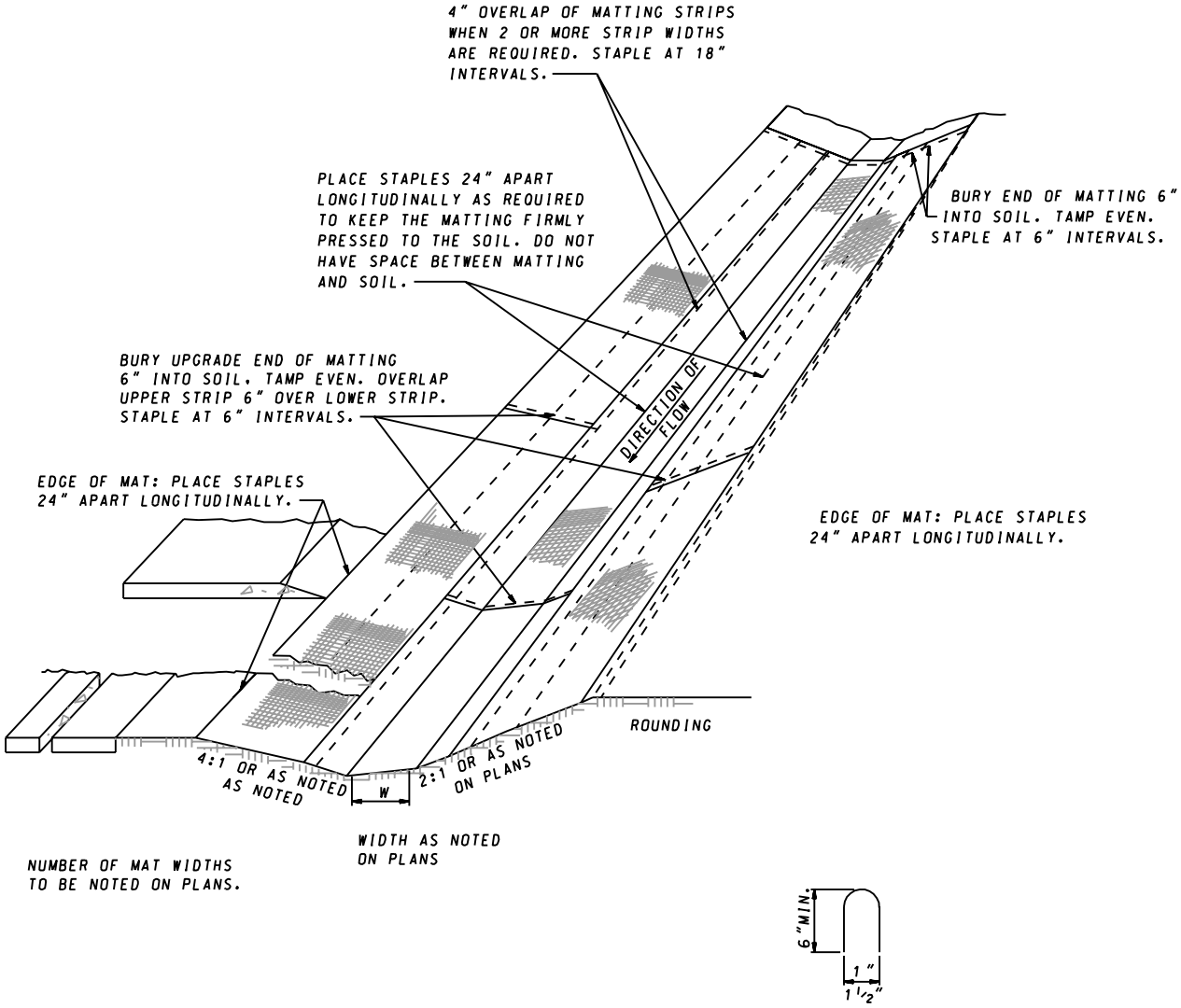
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

TOE WALL DETAIL – 5" CONCRETE GUTTER

STANDARD NO. MD 389.02



11 GAUGE WIRE OR HEAVIER LATERAL SPACING OF STAPLES TO BE AT EDGE OF MAT. AT OVERLAP OF MATS AND AT BREAK IN GROUND OR MIDPOINT OF MAT WHERE NO BREAKS OCCUR FOR THAT MAT.

NOTE: MAT WIDTH IS 48" ± 1"
SEE SPECIFICATIONS FOR "SOIL STABILIZATION MATTING" FOR DETAILS OF MAT.
USE SEED MIX SPECIFIED.
MULCH IS NOT REQUIRED.
WHEN TOPSOIL IS SPECIFIED IN THE AREA ADJACENT TO THAT WHERE SOIL STABILIZATION MATTING IS TO BE CONSTRUCTED. IT SHALL ALSO BE PLACED AT THE SAME DEPTH IN THE AREA WHERE SOIL STABILIZATION MATTING IS REQUIRED. PRIOR TO THE INSTALLATION OF THE MATTING.

SPECIFICATION 709	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-22-61	APPROVAL	9-28-61
REVISED	10-1-01	REVISED	6-27-85
REVISED		REVISED	
REVISED		REVISED	

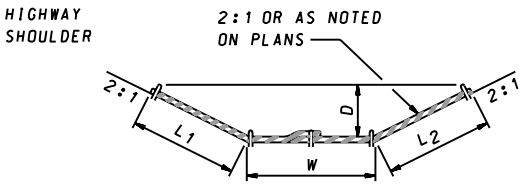
SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

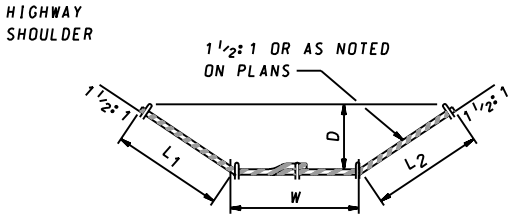
STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SOIL STABILIZATION MATTING DRAINAGE DITCHES

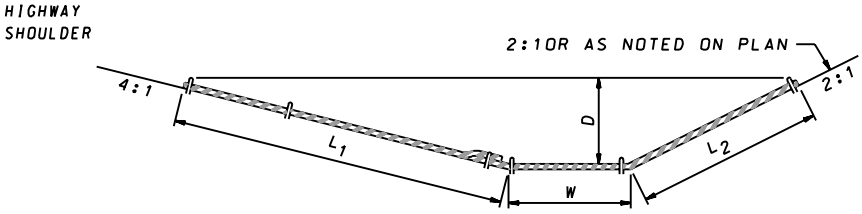
STANDARD NO. MD 389.06



W	MATS	D	L_1	L_2
12"	1	8.0"	18"	18"
18"	1	6.7"	15"	15"
24"	2	15.2"	34"	34"
36"	2	12.5"	28"	28"

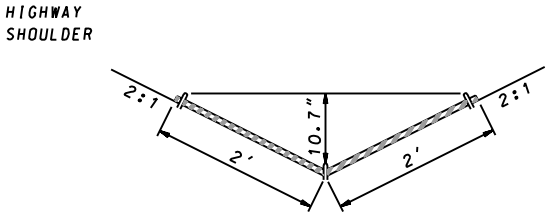


W	MATS	D	L_1	L_2
12"	1	10.0"	18"	18"
18"	1	8.3"	15"	15"
24"	1	6.7"	12"	12"
36"	2	15.5"	28"	28"

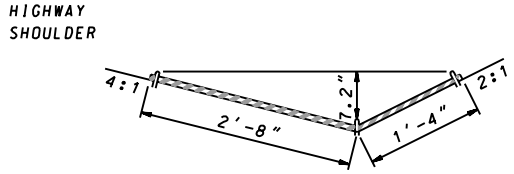


NOTE: ADDITIONAL MAT WIDTHS MAY BE USED AS NOTED ON THE PLANS. STAPLES TO BE PLACED AS NOTED BY SYMBOL (∩).

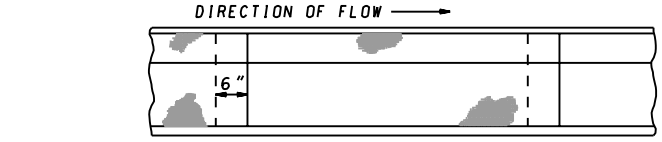
W	MATS	D	L_1	L_2
12"	2	12.5"	52"	28"
18"	2	11.6"	48"	26"
24"	2	10.6"	44"	24"
36"	2	8.7"	36"	20"



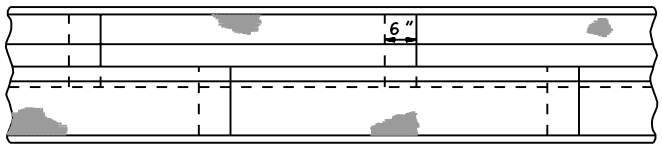
FLUME



FLUME



V-DITCH USING ONE MAT



SIDE DITCH USING TWO OR MORE MATS

SPECIFICATION 709	CATEGORY CODE ITEMS
APPROVED	Kirk G. McClellan DIRECTOR – OFFICE OF HIGHWAY DEVELOPMENT

APPROVAL • SHA REVISIONS		APPROVAL • FEDERAL HIGHWAY ADMINISTRATION	
APPROVAL	6-22-61	APPROVAL	9-28-61
REVISED	10-1-01	REVISED	4-25-88
REVISED		REVISED	
REVISED		REVISED	

SHA State Highway Administration

Maryland Department of Transportation
STATE HIGHWAY ADMINISTRATION

STANDARDS FOR HIGHWAYS AND INCIDENTAL STRUCTURES

SOIL STABILIZATION MATTING DRAINAGE DITCHES

STANDARD NO. MD 389.07