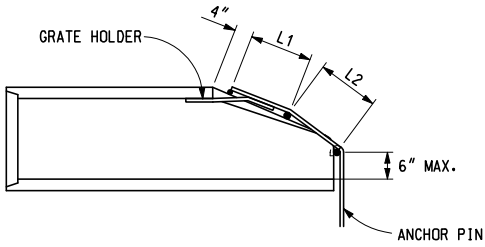


PLAN VIEW

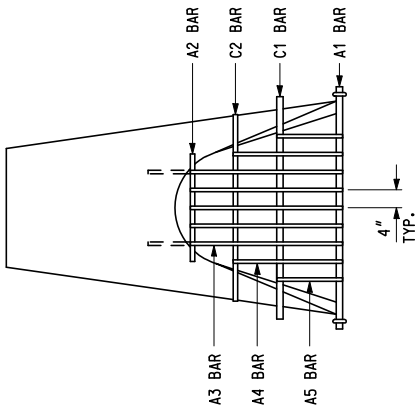


LONGITUDINAL SECTION

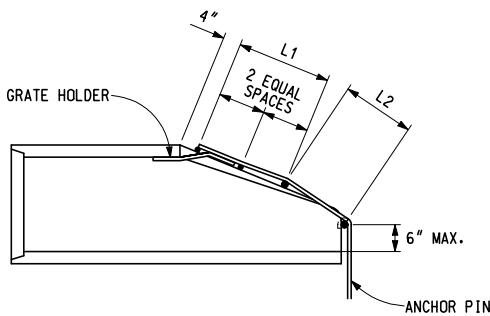
STEEL REINFORCEMENT QUANTITIES											
DIAMETER		12"			15"			18"			
BAR	BAR SIZE	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	
A1	#10	1	34"	12	1	40"	14	1	48"	17	
A2	#6	5	24"	15	5	28"	17	7	28"	24	
A3	#6				2	14"	3	2	14"	3	
C1	#10	1	36"	13	1	40"	14	1	44"	16	
C2	#8	1	30"	6	1	34"	7	1	36"	8	
ANCHOR PIN	#6	2	36"	9	2	36"	9	2	36"	9	
GRATE HOLDER	#6	2	20"	5	2	20"	5	2	20"	5	
TOTAL STEEL WEIGHT (LBS)				60				69			

DIMENSIONS		
DIAMETER	L1	L2
12"	12"	12"
15"	14"	14"
18"	14"	14"

GRATE FOR 12" THROUGH 18" DIAMETER PIPE WITH CONCRETE END SECTION



PLAN VIEW



LONGITUDINAL SECTION

STEEL REINFORCEMENT QUANTITIES					
DIAMETER		21"			
BAR	BAR SIZE	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	
A1	#10	1	54"	19	
A2	#8	1	24"	5	
A3	#6	5	37"	23	
A4	#6	2	26 1/2"	7	
A5	#6	2	16"	4	
C1	#10	1	52"	18	
C2	#8	1	44"	9	
ANCHOR PIN	#6	2	36"	9	
GRATE HOLDER	#6	2	20"	5	
TOTAL STEEL WEIGHT (LBS)				99	

DIMENSIONS		
DIAMETER	L1	L2
21"	21"	16"

GRATE FOR 21" DIAMETER PIPE WITH CONCRETE END SECTION



ENGINEER OF CONSTRUCTION & TECHNOLOGY
 ENGINEER OF MAINTENANCE
 ENGINEER OF TRAFFIC AND SAFETY

ENGINEER - ROAD DESIGN
 ENGINEER OF DESIGN
 DEPARTMENT DIRECTOR
 Gregory J. Rosine
 BY: CHIEF ENGINEER/DEPUTY DIRECTOR
 BUREAU OF HIGHWAY TECHNICAL SERVICES

MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

STEEL GRATES
 FOR END SECTIONS

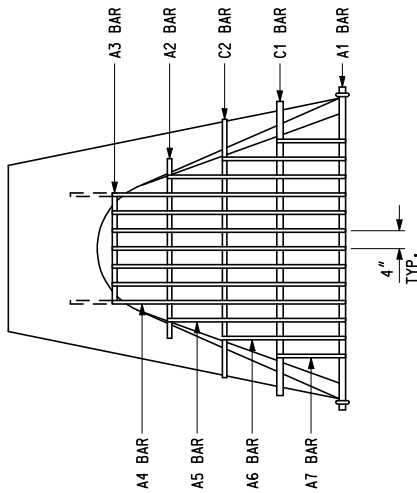
PREPARED BY DESIGN DIVISION
 DRAWN BY: B.L.T.
 CHECKED BY: W.K.P.

9-14-2001
 F.H.W.A. APPROVAL

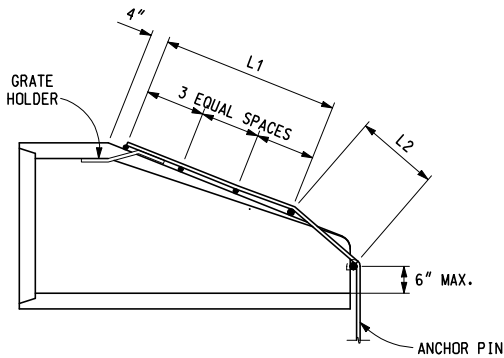
2-26-2001
 PLAN DATE

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PLAN VIEW



LONGITUDINAL SECTION

GRATE FOR 24" THROUGH 30" DIAMETER PIPE WITH CONCRETE END SECTION

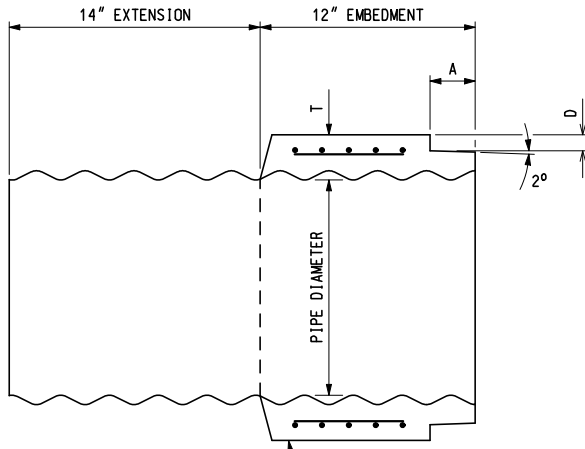
STEEL REINFORCEMENT QUANTITIES											
DIAMETER		24"			27"			30"			
BAR	BAR SIZE	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	NUMBER REQUIRED	LENGTH	WEIGHT (LBS)	
A1	#10	1	60"	21	1	66"	23	1	72"	25	
A2	#8	1	32"	7	1	34"	7	1	40"	9	
A3	#8	1	24"	5	1	24"	5	1	24"	5	
A4	#6	7	45 ¹ / ₄ "	39	7	52 ¹ / ₄ "	46	7	58 ¹ / ₄ "	51	
A5	#6	2	34 ³ / ₄ "	9	2	40 ¹ / ₄ "	10	2	45	11	
A6	#6	2	24 ¹ / ₂ "	6	2	28 ¹ / ₄ "	7	2	31 ³ / ₄ "	8	
A7	#6				2	18 ¹ / ₄ "	4	2	18 ¹ / ₂ "	5	
C1	#10	1	60"	21	1	62"	22	1	68"	24	
C2	#8	1	52"	11	1	54"	12	1	60"	13	
ANCHOR PIN	#6	2	36"	9	2	36"	9	2	36"	9	
GRATE HOLDER	#6	2	20"	5	2	20"	5	2	20"	5	
TOTAL STEEL WEIGHT (LBS)				133				150			

DIMENSIONS		
DIAMETER	L1	L2
24"	31 ¹ / ₄ "	14"
27"	36"	16 ¹ / ₄ "
30"	39 ¹ / ₂ "	18 ¹ / ₂ "

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

**STEEL GRATES
FOR END SECTIONS**

9-14-2001 F.H.W.A. APPROVAL	2-26-2001 PLAN DATE	R-92-C	SHEET 2 OF 6
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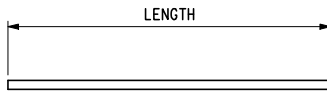


PIPE DIAMETER	DIMENSIONS		
	T	A	D
12"	2"	2 1/2"	7/8"
15"	2 1/4"	2 1/2"	7/8"
18"	2 1/2"	2 3/4"	7/8"
21"	2 3/4"	2 3/4"	7/8"
24"	3"	3"	7/8"
27"	3 1/4"	4"	3/4"
30"	3 1/2"	4 1/8"	1 1/8"
36"	4"	4 1/8"	1 1/2"
42"	4 1/2"	5"	2 1/2"
48"	5"	5"	2 3/4"

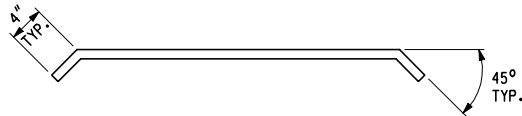
CONCRETE STRENGTH AND REINFORCEMENT SHALL BE AS SPECIFIED IN THE CURRENT A.S.T.M. C76 - 85a

CONNECTING ADAPTOR

(CORRUGATED STEEL PIPE TO CONCRETE PIPE OR CONCRETE END SECTION)



A BAR



C BAR

(FOR 12" DIAMETER THROUGH 30" DIAMETER PIPE)



C BAR

(FOR 36" DIAMETER THROUGH 48" DIAMETER PIPE)

BAR DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

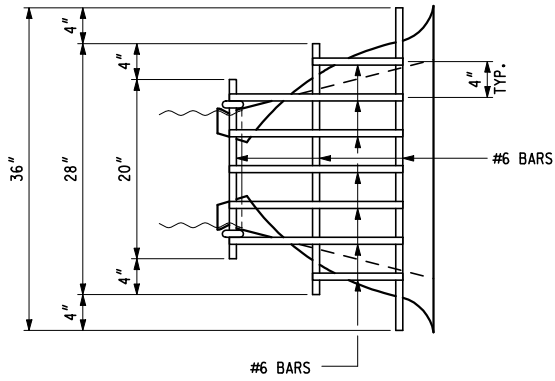
STEEL GRATES FOR END SECTIONS

9-14-2001
F.H.W.A. APPROVAL

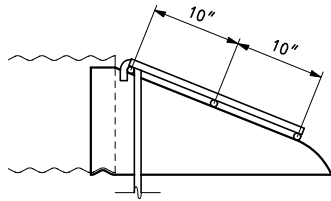
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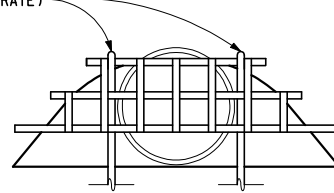


PLAN VIEW



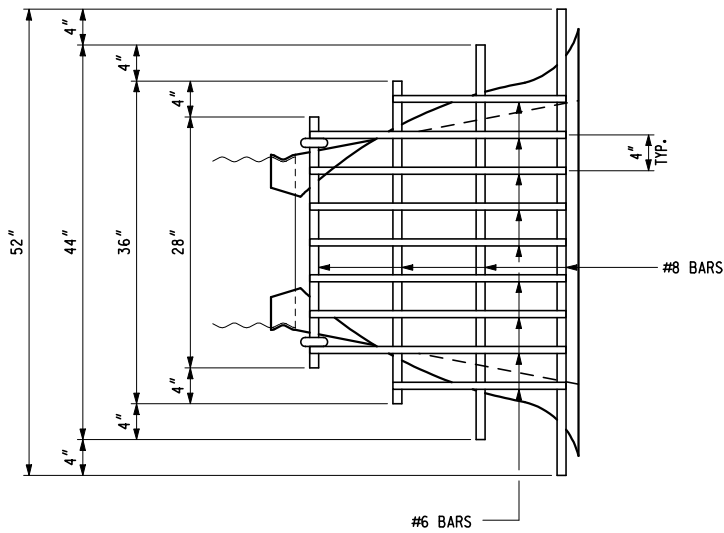
LONGITUDINAL VIEW

36" LONG ANCHOR PIN
MADE FROM #6 BAR
(2 PER GRATE)

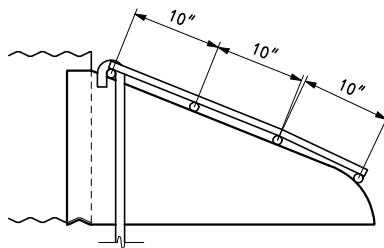


END VIEW

GRATE FOR 12" DIAMETER PIPE WITH STEEL END SECTION
34 LBS STEEL REQUIRED PER GRATE

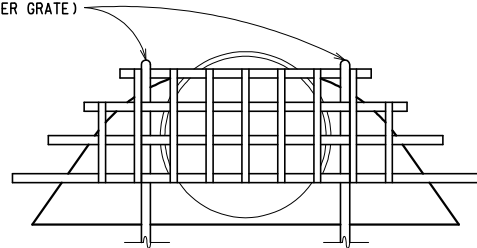


PLAN VIEW



LONGITUDINAL VIEW

42" LONG ANCHOR PIN
MADE FROM #6 BAR
(2 PER GRATE)



END VIEW

GRATE FOR 18" DIAMETER PIPE WITH STEEL END SECTION
76 LBS STEEL REQUIRED PER GRATE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

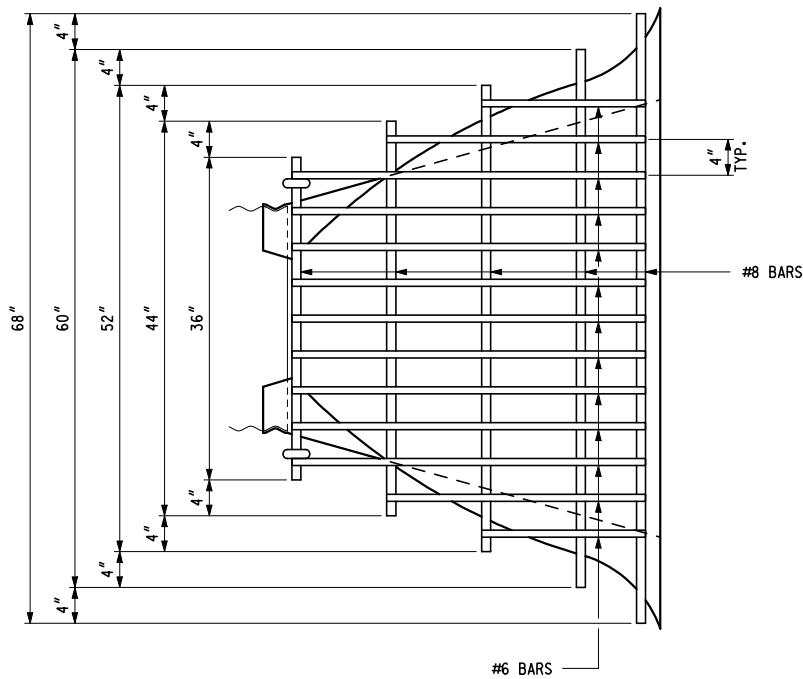
**STEEL GRATES
FOR END SECTIONS**

9-14-2001
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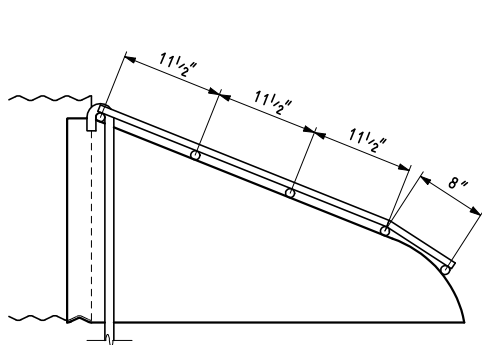
2-26-2001
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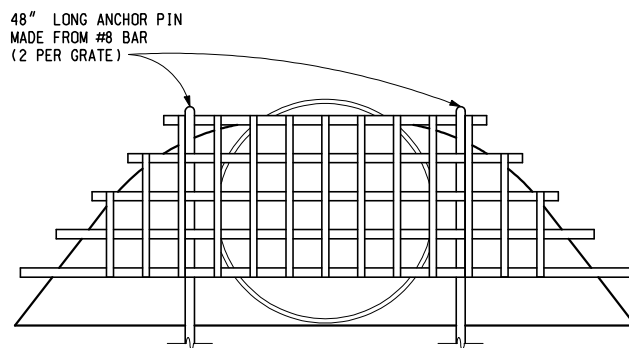
SHEET
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PLAN VIEW



LONGITUDINAL VIEW



END VIEW

GRATE FOR 24" DIAMETER PIPE WITH STEEL END SECTION

137 LBS STEEL REQUIRED PER GRATE

NOTES:

ALL MATERIALS AND WORKMANSHIP SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

FABRICATION OF GRATE SHALL BE BY WELDING EACH BAR INTERSECTION.

SEE STANDARD PLAN R-86-SERIES FOR PRECAST CONCRETE END SECTIONS.

PRECAST CONCRETE END SECTIONS FROM DIFFERENT MANUFACTURERS VARY IN EXACT WIDTH AND SHAPE OF THE OPENING. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT THE GRATE WILL ADEQUATELY COVER THE OPENING.

SEE STANDARD PLAN R-88-SERIES FOR STEEL END SECTIONS.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

**STEEL GRATES
FOR END SECTIONS**

9-14-2001
F.H.W.A. APPROVAL

2-26-2001
PLAN DATE

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