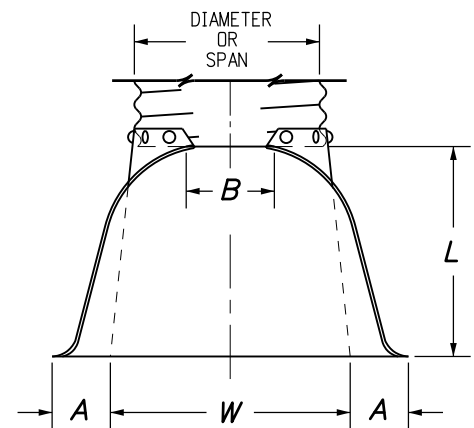


PIPE DIA.	THICKNESS	DIMENSIONS					
		A	B	H	L	W	T
IN.							
12	0.064	6	6	6	21	24	34
18	0.064	8	10	6	31	36	46
21	0.064	9	12	6	36	42	52
24	0.064	10	13	6	41	48	58
30	0.079	12	16	8	51	60	70
36	0.079	14	19	9	60	72	94
42	0.109	16	22	11	69	84	106
48	0.109	18	27	12	78	90	112
54	0.109	18	30	12	84	102	124
60	0.109	18	33	12	87	114	136
66	0.109	18	36	12	87	120	142
72	0.109	18	39	12	87	126	148
78	0.109	18	42	12	87	132	154
84	0.109	18	45	12	87	138	160



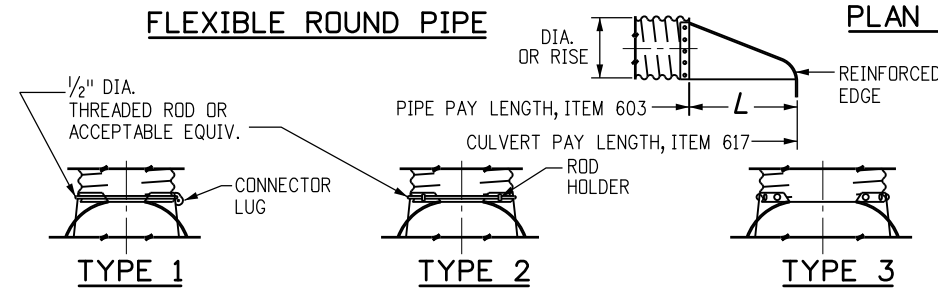
PIPE ARCH	THICKNESS	DIMENSIONS					
		A	B	H	L	W	T
IN.							
SPAN x RISE		(±1")	(MAX.)	(±1")	(±1.5")	(±2")	
21 x 15	0.064	7	10	6	23	36	46
24 x 18	0.064	8	12	6	28	42	52
28 x 20	0.064	9	14	6	32	48	58
35 x 24	0.079	10	16	6	39	60	70
42 x 29	0.079	12	18	8	46	75	85
49 x 33	0.109	13	21	9	53	85	103
57 x 38	0.109	18	26	12	63	90	108
64 x 43	0.109	18	30	12	70	102	120
71 x 47	0.109	18	33	12	77	114	132

FLEXIBLE PIPE ARCH

GENERAL NOTES

- DIMENSIONS OF END SECTIONS MAY VARY SLIGHTLY FROM THOSE SHOWN ON THE TABLES DUE TO DIFFERENT MANUFACTURERS' CONFIGURATIONS.
- CONCRETE END SECTIONS SHALL BE FURNISHED WITH TONGUE OR GROOVE AS REQUIRED.
- DESIGN LENGTH OF PIPE OR SIDE DRAIN IS BASED ON LENGTH OF END SECTION SHOWN IN TABLE. ANY ADDITIONAL PIPE REQUIRED TO PROVIDE THE DESIGN LENGTH SHALL BE FURNISHED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE PROJECT.
- THE INSIDE CONFIGURATION AND THE JOINT OF CONCRETE END SECTION AND PIPE SHALL MATCH.
- END SECTIONS FOR CMP ARCH PIPE SHALL MATCH THE DIMENSIONS OF THE PIPE SHOWN ON THE PLANS.
- GALVANIZED TOE PLATE AS SHOWN IS REQUIRED ON END SECTIONS FOR CORRUGATED STEEL PIPE AND SHALL BE THE SAME THICKNESS AS END SECTIONS. TOE PLATE SHALL BE FIELD-BOLTED TO END SECTION WITH 3/8" IN. GALVANIZED BOLTS, NUTS AND WASHERS.
- GALVANIZED STEEL SHALL CONFORM TO AASHTO M 111, M 218 OR M 232.
- FOR TYPE SD END SECTIONS, BARS SHALL BE FABRICATED FROM NPS-3 GALVANIZED STEEL SCHEDULE 40 PIPE WHICH SHALL CONFORM TO ASTM A 53.
- FOR A TYPE SD END SECTION, THE INSTALLATION OF ALTERNATIVE 1 OR ALTERNATIVE 2 END SECTION SHALL BE THE CONTRACTOR'S OPTION.
- CONCRETE PIPE JOINT FASTENERS, WHERE SHOWN ON PLANS, SHALL BE INSTALLED SO THAT A MINIMUM OF 15 LINEAR FEET OF THE OUTLET END OF THE PIPE ARE MECHANICALLY LOCKED TOGETHER. END SECTION LENGTHS WHEN USED, SHALL BE INCLUDED IN THE 15 LF REQUIREMENT.
- CONNECTIONS OF METAL END SECTIONS TO PLASTIC PIPE SHALL BE APPROVED BY THE ENGINEER. PLASTIC END SECTIONS SHALL NOT BE USED.
- THE END SECTION STYLE, EITHER REGULAR OR SAFETY, SHALL BE AS SHOWN ON THE PLANS.
- AT THE OPTION OF THE CONTRACTOR AND APPROVAL OF THE CDOT PROJECT ENGINEER, REINFORCED CONCRETE END SECTIONS MAY BE MADE WITH SYNTHETIC FIBERS INSTEAD OF STEEL FOR PIPES 36 INCHES IN DIAMETER AND SMALLER, AND CONFORM TO AASHTO M 86 AND SUBSECTION 601.03.

FLEXIBLE ROUND PIPE

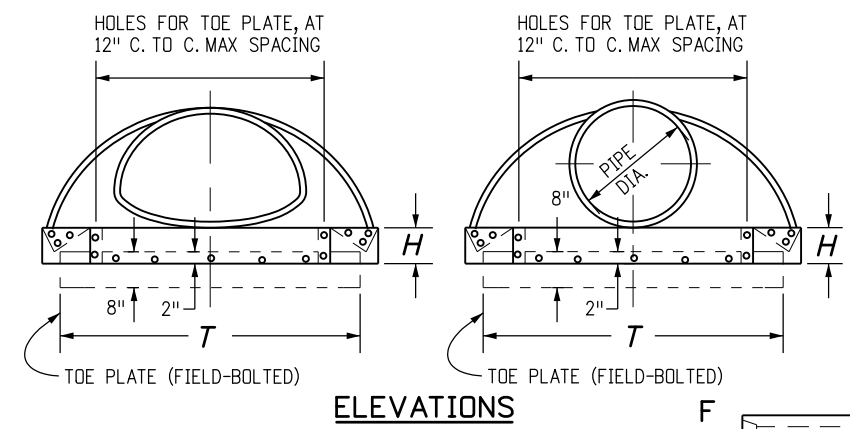


**TYPE 1**  
FOR 18 IN. THRU 24 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS. NOT TO BE USED ON HELICALLY-FORMED PIPE UNLESS RECORRUGATED.

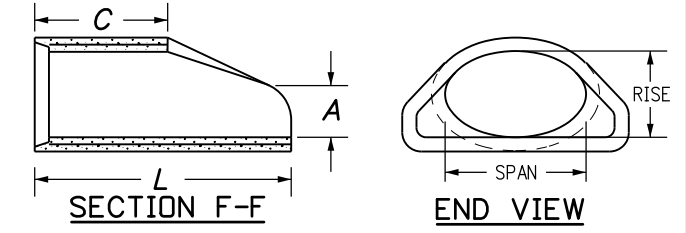
**TYPE 2**  
FOR 30 IN. THRU 36 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS. NOT TO BE USED ON HELICALLY-FORMED PIPE UNLESS RECORRUGATED.

**TYPE 3**  
FOR 42 IN. THRU 84 IN. ROUND PIPE WITH ANNULAR CORRUGATIONS AND ALL SIZES WITH HELICAL CORRUGATIONS AND FOR ALL METAL PIPE ARCH CULVERTS. SHOP ATTACH A 24 IN. MIN. LENGTH OF ANNULAR PIPE WITH GALV. RIVETS OR BOLTS, SPOT WELDS, OR 2 IN. LONG SKIP WELDS ON 8 IN. CTRS. REPAIR BURNT GALVANIZING IN ACCORDANCE WITH SUBSECTION 707.09.

TYPICAL CONNECTIONS



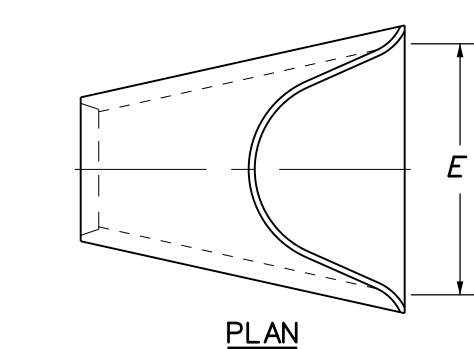
ELEVATIONS



EQUIVALENT CIRCULAR DIA.	DIMENSIONS					
	NOMINAL SPAN x RISE	A	C	L	E	
		IN.				
24	30	19	9	33	72	48
30	38	24	10	18	72	60
36	45	29	12	24	84	72
42	53	34	16	36	96	78
48	60	38	21	36	96	84
54	68	43	26	36	96	90
60	76	48	30	36	96	96

END SECTION FOR REINFORCED CONCRETE ELLIPTICAL PIPE

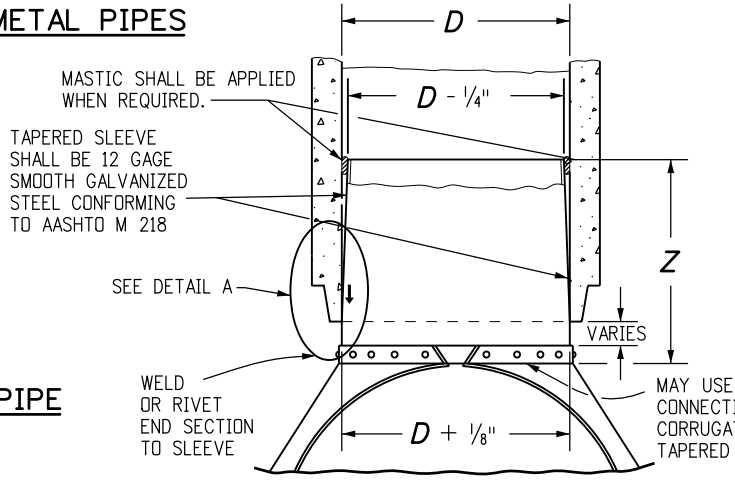
END SECTION AND CONNECTION DETAILS FOR ROUND AND ARCH METAL PIPES



PLAN

PIPE I.D.	DIMENSIONS			
	A	C	L	E
IN.				
18	10	48	78	36
24	10	48	78	48
30	14	36	96	60
36	18	36	96	72
42	24	36	96	78
48	28	24	96	84
54	30	36	96	90
60	36	36	96	96
72	34	20	96	108

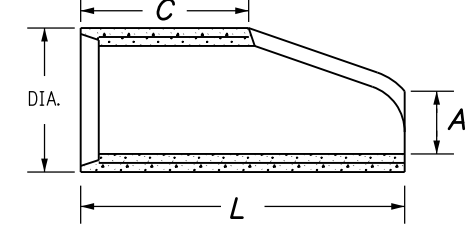
REINFORCED CONCRETE CIRCULAR PIPE



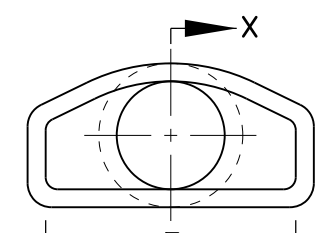
D	Z (MIN.)
IN.	
18 - 24	12
30 AND 36	16
42 AND LARGER	24

STEEL END SECTION FOR CONCRETE CIRCULAR PIPE

(ALTERNATIVE FOR CONCRETE END SECTION)

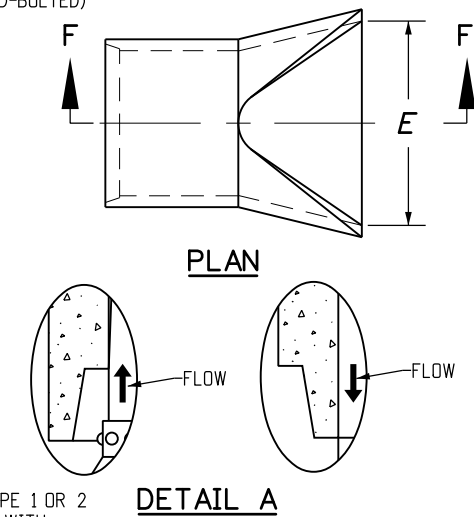


SECTION X-X



END VIEW

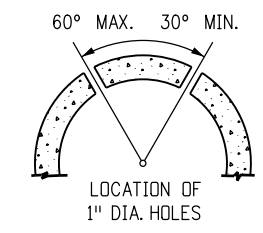
END SECTION FOR REINFORCED CONCRETE CIRCULAR PIPE



PLAN

DETAIL A

3/4" GALVANIZED ANCHOR BOLTS, NUTS AND WASHERS, MILD STEEL, ASTM A 307. ROD LUG SHALL BE GALVANIZED OR COATED WITH EPOXY PAINT OR APPROVED EQUAL.



CONCRETE JOINT FASTENER (TWO PER JOINT)

Computer File Information

Creation Date: 07/04/12	Initials: JBK
Last Modification Date: 05/01/18	Initials: LTA
Full Path: www.codot.gov/business/designsupport	
Drawing File Name: 6010100102.dgn	
CAD Ver.: MicroStation V8	Scale: Not to Scale Units: English

Sheet Revisions

Date:	Comments
5/01/18	Added General Note 13.
(R-X)	
(R-X)	
(R-X)	
(R-X)	

Colorado Department of Transportation

2829 West Howard Place  
CDOT HQ, 3rd Floor  
Denver, CO 80204  
Phone: 303-757-9021 FAX: 303-757-9868

Division of Project Support      JBK/LTA

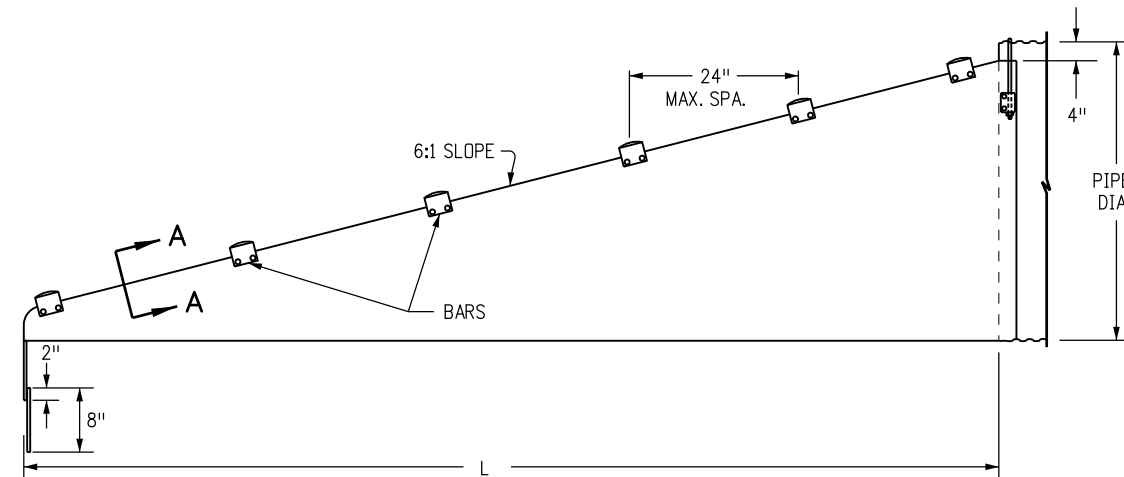
CONCRETE AND METAL END SECTIONS

Issued By: Project Development Branch July 4, 2012

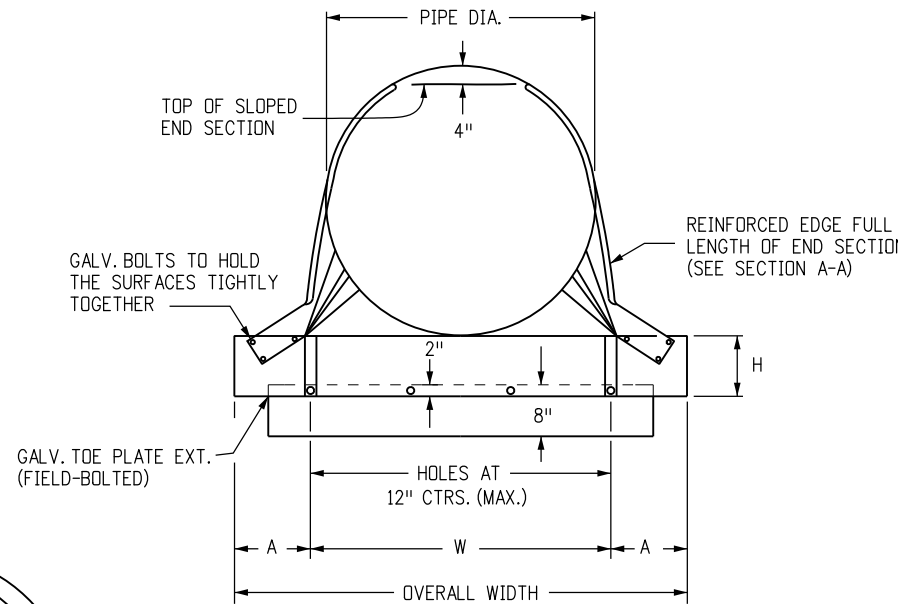
STANDARD PLAN NO.

M-603-10

Sheet No. 1 of 2



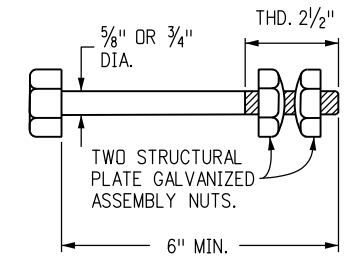
**SIDE VIEW OF END SECTION - ALTERNATIVE 1**



**FRONT VIEW - ALTERNATIVE 1**

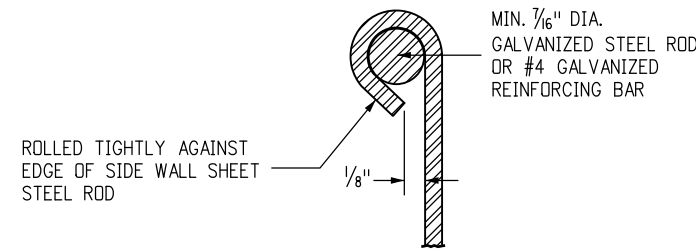
(BARS NOT SHOWN)

NOTE: ALL CUT OR WELDED SURFACES SHALL BE PROTECTED WITH ONE FULL BRUSH COAT OF ZINC RICH PAINT IN ACCORDANCE WITH SUBSECTION 707.09.

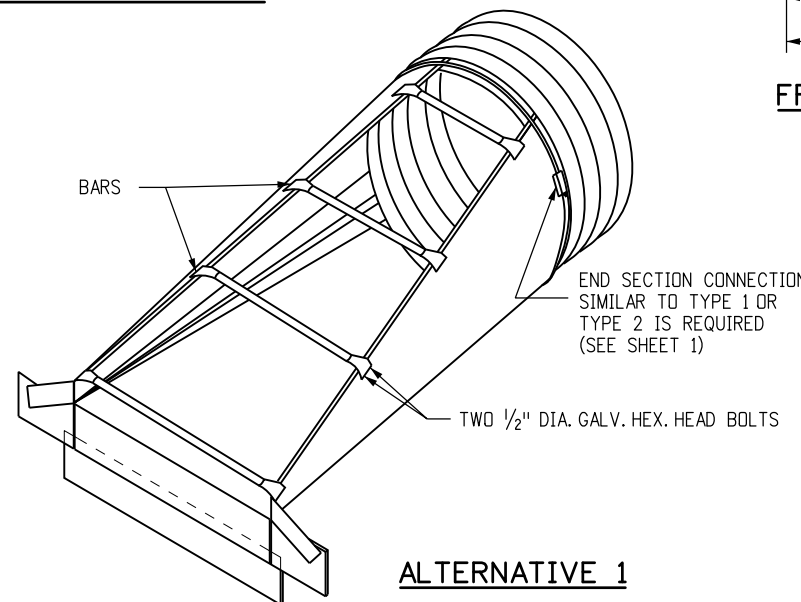


**TYPICAL ANCHOR BOLT**

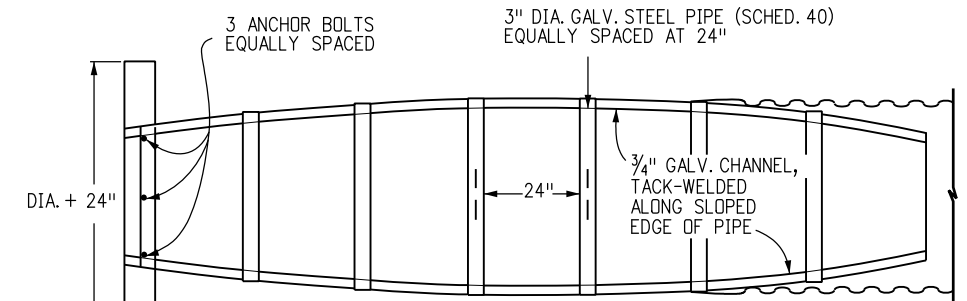
(GALVANIZED)



**SECTION A-A**



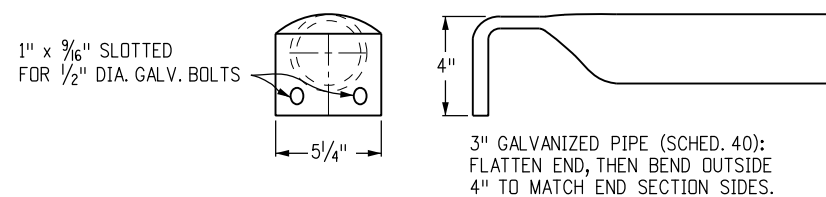
**ALTERNATIVE 1**



**TOP VIEW - ALTERNATIVE 2**

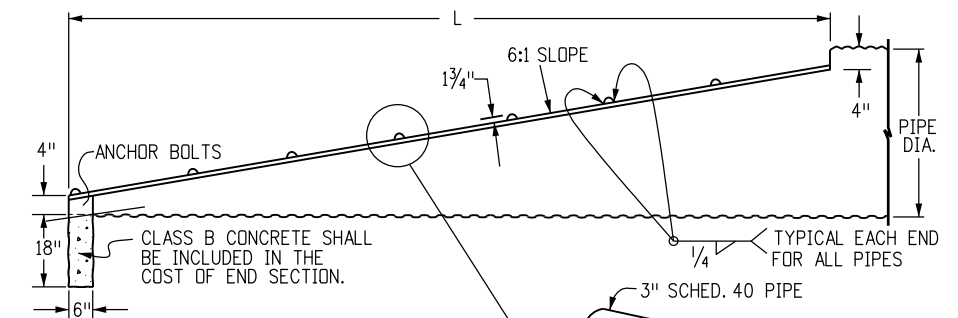
**END SECTIONS FOR CIRCULAR PIPES**

PIPE DIA. (IN.)	MIN. THICK (IN.)	DIMENSION (IN.)					SLOPE	LENGTH (L)
		A	H	W	OVERALL WIDTH			
15	.064	8	6	21	37	6:1	30	
18	.064	8	6	24	40	6:1	48	
21	.064	8	6	27	43	6:1	66	
24	.079	8	6	30	46	6:1	84	
30	.079	12	9	36	60	6:1	120	
36	.109	12	9	42	66	6:1	156	



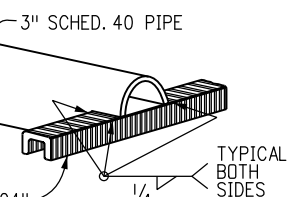
**BAR END DETAILS**

(FOR ALTERNATIVE 1)



**SIDE VIEW OF END SECTION - ALTERNATIVE 2**

3/4 inch GALV. CHANNEL, TACK-WELDED EVERY 24 inch OR LESS ALONG SLOPED EDGE OF PIPE



**BAR END DETAIL**

(FOR ALTERNATIVE 2)

**TYPE SD END SECTIONS FOR SIDE DRAIN**

**Computer File Information**

Creation Date: 07/04/12 Initials: JBK  
 Last Modification Date: 05/01/18 Initials: LTA  
 Full Path: www.codot.gov/business/designsupport  
 Drawing File Name: 6030100202.dgn  
 CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English

**Sheet Revisions**

Date:	Comments
(R-X)	
(R-X)	
(R-X)	
(R-X)	

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**CONCRETE AND METAL END SECTIONS**

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**STANDARD PLAN NO.**

M-603-10

Sheet No. 2 of 2