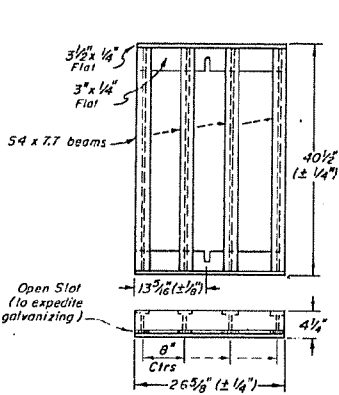
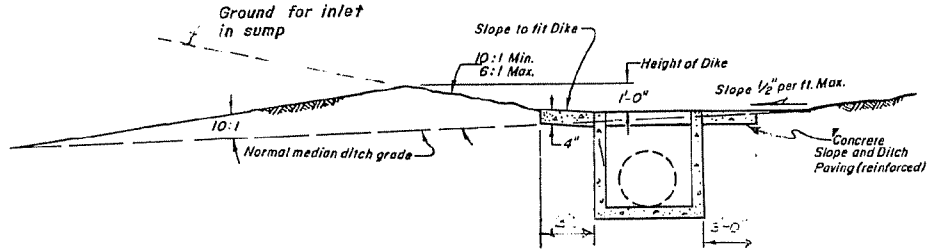




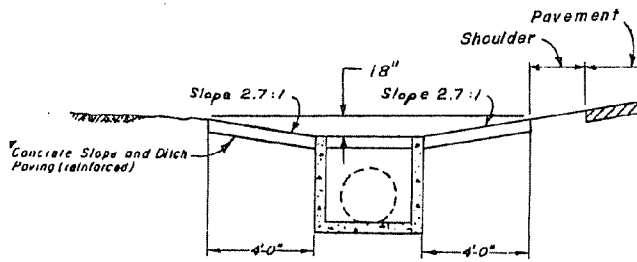
**GRATED INLET TYPE C**



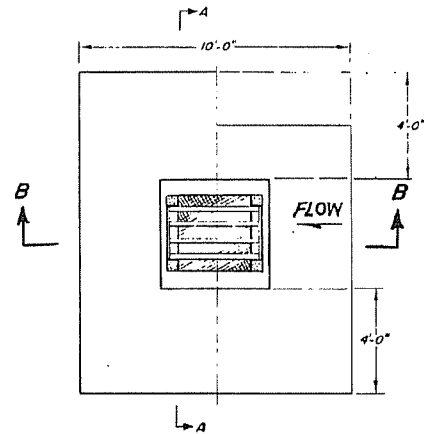
**DETAIL OF GRATING**



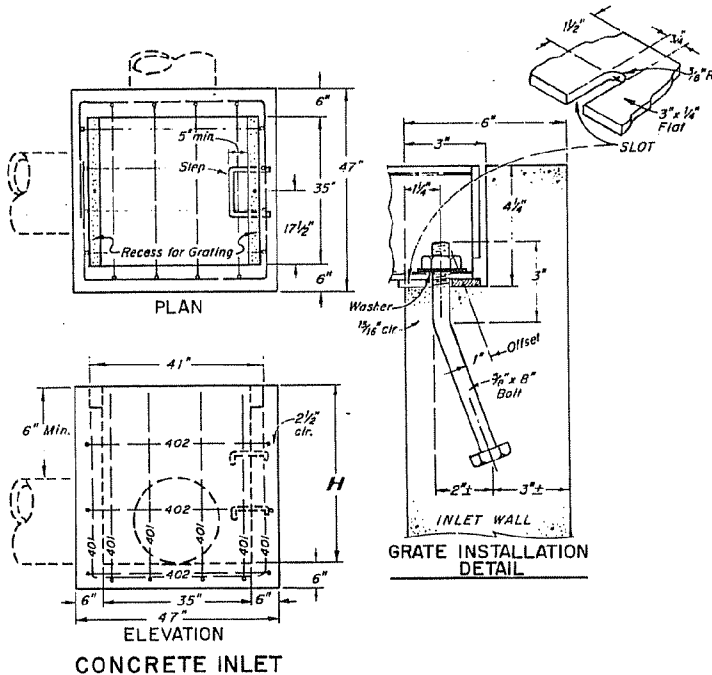
**SECTION B-B  
INLET FOR USE IN DITCH ON GRADE  
(FLOW FROM ONE DIRECTION)**



**SECTION A-A**



**LAYOUT OF INLET IN ROADSIDE DITCH**



**CONCRETE INLET**

**QUANTITIES FOR ONE INLET**

H	CONCRETE *(CU. YDS.)	REINF. STEEL (LBS.)	NO. STEPS REQ'D.
2'-6"	0.9	75	0
3'-0"	1.0	80	0
3'-6"	1.2	96	0
4'-0"	1.3	101	1
4'-6"	1.4	116	2
5'-0"	1.5	122	2
5'-6"	1.7	137	2
6'-0"	1.8	142	3
6'-6"	1.9	158	3
7'-0"	2.0	163	3
7'-6"	2.2	179	4
8'-0"	2.3	184	4
8'-6"	2.4	199	4
9'-0"	2.5	205	5
9'-6"	2.7	220	5
10'-6"	3.0	235	6
11'-6"	3.4	251	6

\* Note: Includes Volume occupied by pipes.

**BAR LIST FOR H-2'-6" AND BENDING DIAGRAM**

MARK	NO. REQ'D	HGT. "U"	LENGTH
401	2	2'-3"	7'-11"
401	6	2'-7"	8'-7"
402	3		15'-0"

No. 401 U

Increase dimension "U" 6" for each 6" increase of H above 2'-6".

No. 402

Add one bar for each foot increase of H above 2'-6".

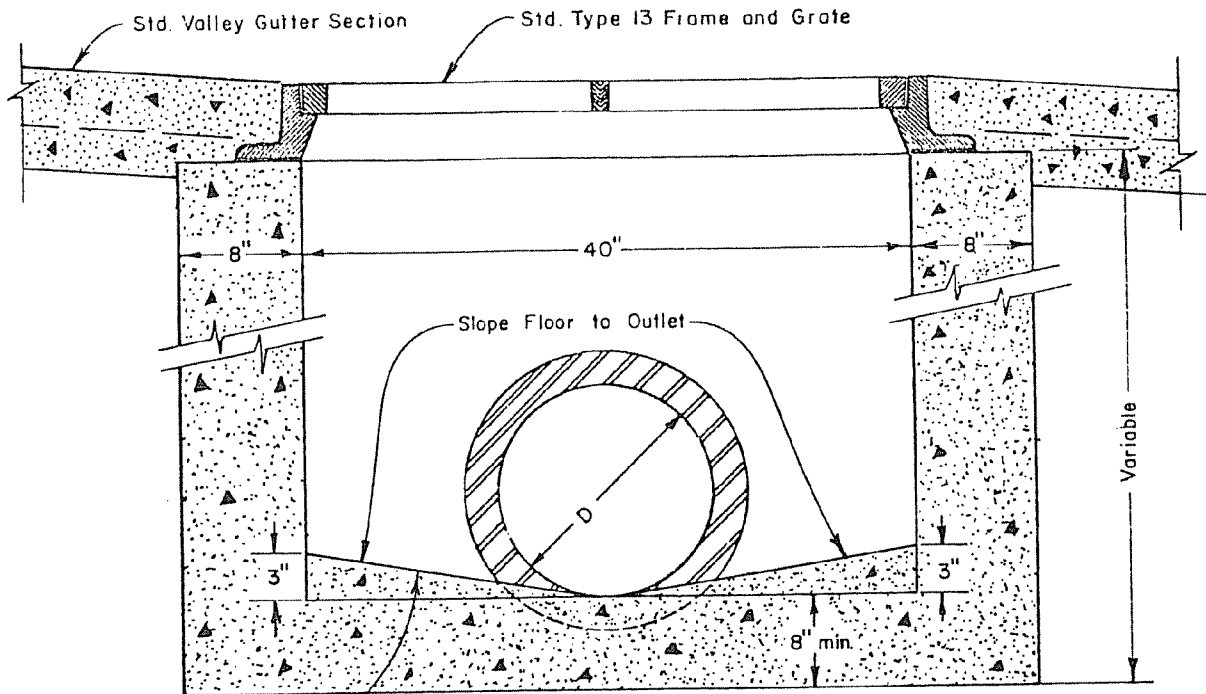
All bars to be 1/2" Dia. - Cut or bend around pipes as required.

**WRC ENG.**

**REFERENCE:**

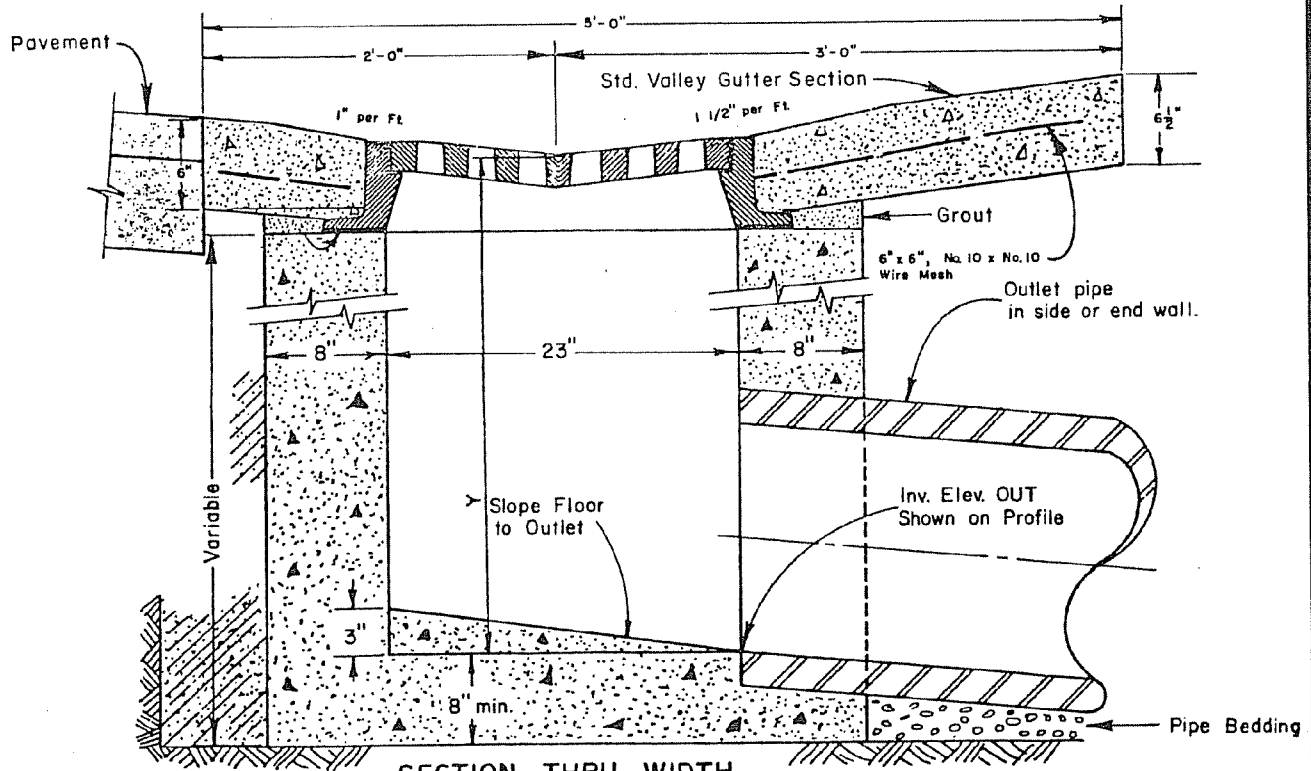
Colorado Department of Highways  
Standard M-604-BA (with modifications)

**GRATED INLET TYPE 13**



Floor slope may be poured monolithic with base.

**SECTION THRU LENGTH**

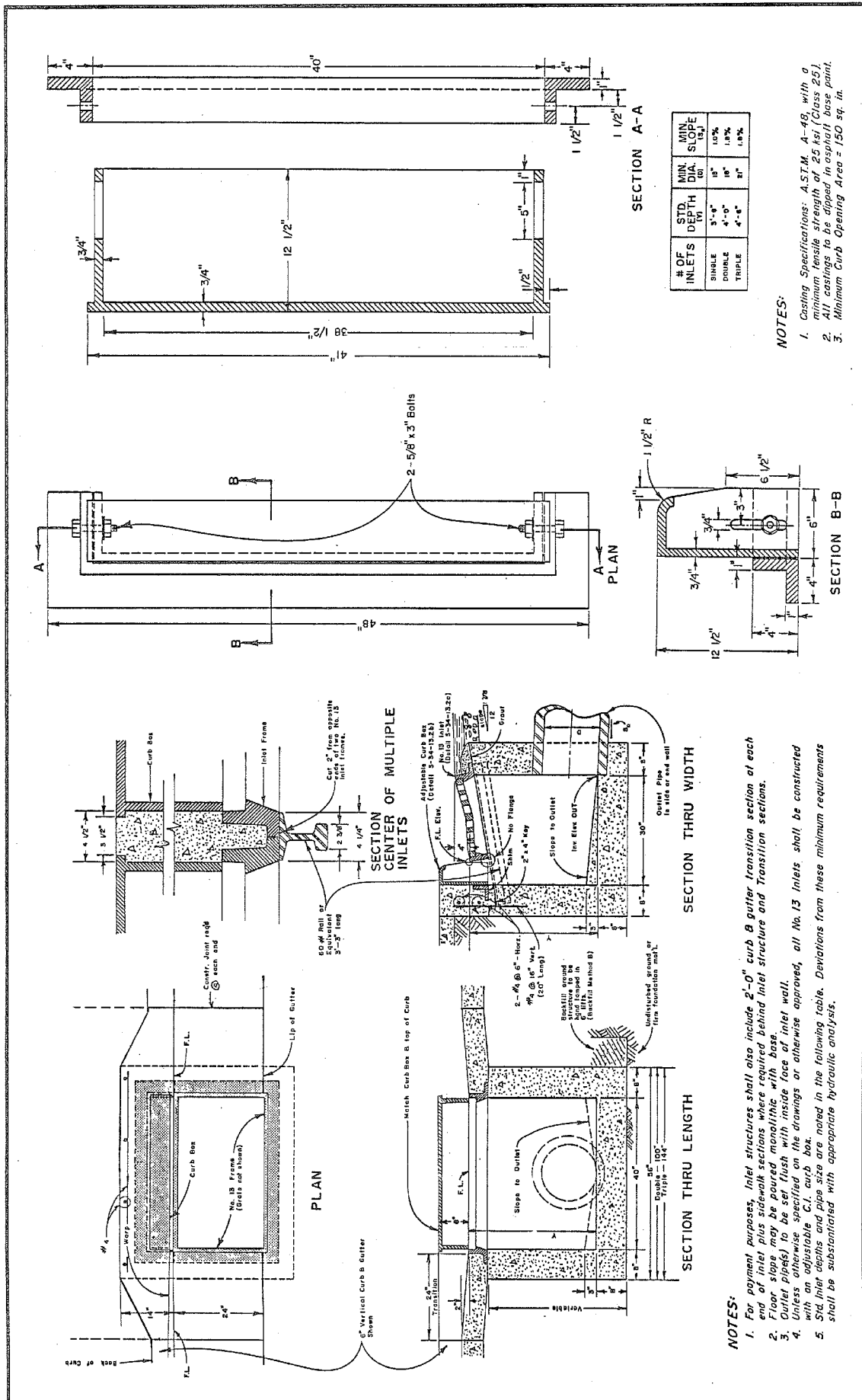


**SECTION THRU WIDTH**

**WRC ENG.**

**REFERENCE:**

City and County of Denver  
Standard S-34-31.b (with modifications)



# OF INLETS	STD. DEPTH (ft)	MIN. DEPTH (ft)	MIN. SLOPE (%)	MIN. SLOPE (ft/ft)
SINGLE	3'-6"	3'-0"	1.0%	1/100
DOUBLE	4'-0"	3'-6"	1.0%	1/100
TRIPLE	4'-6"	4'-0"	1.0%	1/100

**NOTES:**

1. Casting Specifications: A.S.T.M. A-49, with a minimum tensile strength of 25 ksi (Class 25).
2. All castings to be dipped in asphalt base paint.
3. Minimum Curb Opening Area = 150 sq. in.

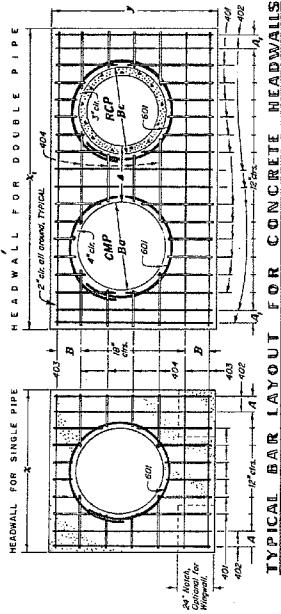
**NOTES:**

1. For payment purposes, inlet structures shall also include 2'-0" curb & gutter transition sections at each end of inlet plus sidewalk sections where required behind inlet structure and transition sections.
2. Floor slope may be poured monolithic with base.
3. Outlet pipes to be set flush with inside face of inlet wall.
4. Unless otherwise specified on the drawings or otherwise approved, all No. 13 inlets shall be constructed with an adjustable C.I. curb box.
5. Std. inlet depths and pipe size are noted in the following table. Deviations from these minimum requirements shall be substantiated with appropriate hydraulic analysis.

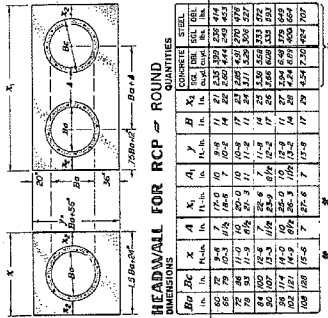
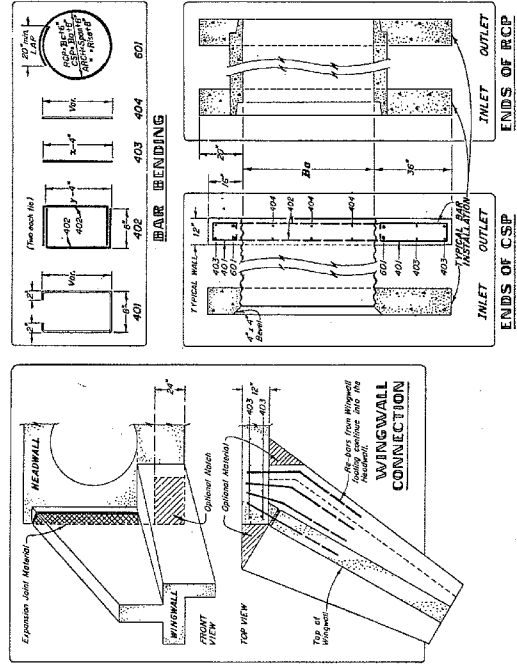
REFERENCE: City and County of Denver Standard Details S-34-13.1a and S-34-13.2b (with modifications)





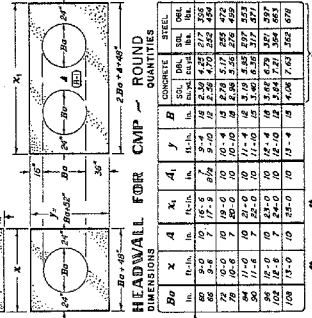


TYPICAL BAR LAYOUT FOR CONCRETE HEADWALLS



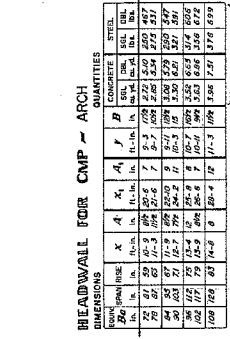
HEADWALL FOR RCP - ROUND

DIMENSIONS	CONCRETE		STEEL	
	cu. yd.	sq. ft.	lb.	sq. ft.
100	100	100	100	100
120	120	120	120	120
140	140	140	140	140
160	160	160	160	160
180	180	180	180	180
200	200	200	200	200
220	220	220	220	220
240	240	240	240	240
260	260	260	260	260
280	280	280	280	280
300	300	300	300	300
320	320	320	320	320
340	340	340	340	340
360	360	360	360	360
380	380	380	380	380
400	400	400	400	400
420	420	420	420	420
440	440	440	440	440
460	460	460	460	460
480	480	480	480	480
500	500	500	500	500
520	520	520	520	520
540	540	540	540	540
560	560	560	560	560
580	580	580	580	580
600	600	600	600	600



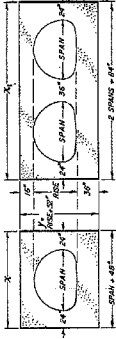
HEADWALL FOR CMP - ROUND

DIMENSIONS	CONCRETE		STEEL	
	cu. yd.	sq. ft.	lb.	sq. ft.
100	100	100	100	100
120	120	120	120	120
140	140	140	140	140
160	160	160	160	160
180	180	180	180	180
200	200	200	200	200
220	220	220	220	220
240	240	240	240	240
260	260	260	260	260
280	280	280	280	280
300	300	300	300	300
320	320	320	320	320
340	340	340	340	340
360	360	360	360	360
380	380	380	380	380
400	400	400	400	400
420	420	420	420	420
440	440	440	440	440
460	460	460	460	460
480	480	480	480	480
500	500	500	500	500
520	520	520	520	520
540	540	540	540	540
560	560	560	560	560
580	580	580	580	580
600	600	600	600	600



HEADWALL FOR CMP - ARCH

DIMENSIONS	CONCRETE		STEEL	
	cu. yd.	sq. ft.	lb.	sq. ft.
100	100	100	100	100
120	120	120	120	120
140	140	140	140	140
160	160	160	160	160
180	180	180	180	180
200	200	200	200	200
220	220	220	220	220
240	240	240	240	240
260	260	260	260	260
280	280	280	280	280
300	300	300	300	300
320	320	320	320	320
340	340	340	340	340
360	360	360	360	360
380	380	380	380	380
400	400	400	400	400
420	420	420	420	420
440	440	440	440	440
460	460	460	460	460
480	480	480	480	480
500	500	500	500	500
520	520	520	520	520
540	540	540	540	540
560	560	560	560	560
580	580	580	580	580
600	600	600	600	600



HEADWALL FOR STRUCTURAL PLATE - ARCH

DIMENSIONS	CONCRETE		STEEL	
	cu. yd.	sq. ft.	lb.	sq. ft.
100	100	100	100	100
120	120	120	120	120
140	140	140	140	140
160	160	160	160	160
180	180	180	180	180
200	200	200	200	200
220	220	220	220	220
240	240	240	240	240
260	260	260	260	260
280	280	280	280	280
300	300	300	300	300
320	320	320	320	320
340	340	340	340	340
360	360	360	360	360
380	380	380	380	380
400	400	400	400	400
420	420	420	420	420
440	440	440	440	440
460	460	460	460	460
480	480	480	480	480
500	500	500	500	500
520	520	520	520	520
540	540	540	540	540
560	560	560	560	560
580	580	580	580	580
600	600	600	600	600

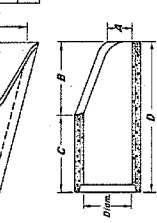
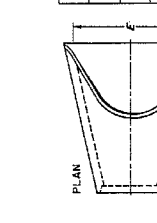
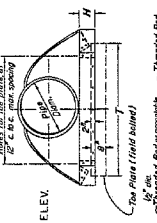
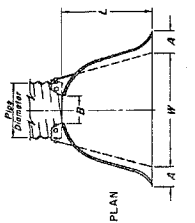
\*SKIRM FACTOR TABLE

SKIRM FACTOR	WIND VELOCITY (mi/hr)
1.00	100
1.05	105
1.10	110
1.15	115
1.20	120
1.25	125
1.30	130
1.35	135
1.40	140
1.45	145
1.50	150
1.55	155
1.60	160
1.65	165
1.70	170
1.75	175
1.80	180
1.85	185
1.90	190
1.95	195
2.00	200

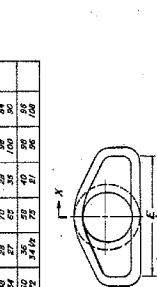
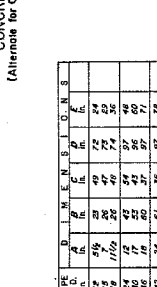
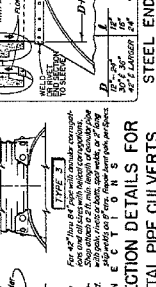
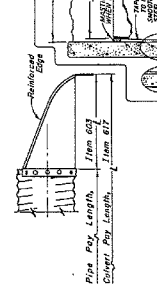
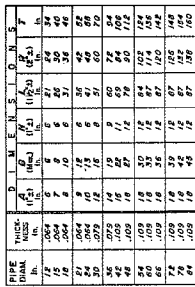
GENERAL NOTES  
 All work shall be done in accordance with the Standard Specifications applicable to the project.  
 Concrete shall be Class C or B.  
 The quantity of steel shall be determined by the architect & unless otherwise shown on the plans shall be provided in the amount of 1% of the concrete volume.  
 For Wingwall details, see Standard M-601-CH.  
 When 2 or more culverts are located by side they shall be placed so that the wingwalls are on the same side of the culverts.  
 Use Class C concrete for the wingwalls and 1% steel reinforcement.



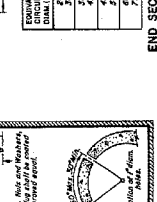
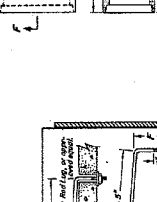
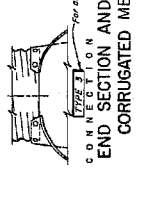
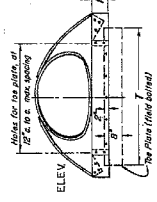
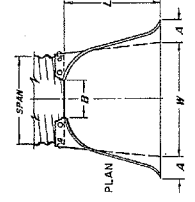
PIPE DIAM.	THICK. IN.	D I M E N S I O N S				
		A	B	C	D	F
12	.064	6	6	6	6	6
15	.084	7	7	7	7	7
18	.104	8	8	8	8	8
21	.124	9	9	9	9	9
24	.144	10	10	10	10	10
27	.164	11	11	11	11	11
30	.184	12	12	12	12	12
33	.204	13	13	13	13	13
36	.224	14	14	14	14	14
39	.244	15	15	15	15	15
42	.264	16	16	16	16	16
45	.284	17	17	17	17	17
48	.304	18	18	18	18	18
51	.324	19	19	19	19	19
54	.344	20	20	20	20	20
57	.364	21	21	21	21	21
60	.384	22	22	22	22	22
63	.404	23	23	23	23	23
66	.424	24	24	24	24	24
69	.444	25	25	25	25	25
72	.464	26	26	26	26	26
75	.484	27	27	27	27	27
78	.504	28	28	28	28	28
81	.524	29	29	29	29	29
84	.544	30	30	30	30	30
87	.564	31	31	31	31	31
90	.584	32	32	32	32	32
93	.604	33	33	33	33	33
96	.624	34	34	34	34	34
99	.644	35	35	35	35	35
102	.664	36	36	36	36	36
105	.684	37	37	37	37	37
108	.704	38	38	38	38	38
111	.724	39	39	39	39	39
114	.744	40	40	40	40	40
117	.764	41	41	41	41	41
120	.784	42	42	42	42	42
123	.804	43	43	43	43	43
126	.824	44	44	44	44	44
129	.844	45	45	45	45	45
132	.864	46	46	46	46	46
135	.884	47	47	47	47	47
138	.904	48	48	48	48	48
141	.924	49	49	49	49	49
144	.944	50	50	50	50	50
147	.964	51	51	51	51	51
150	.984	52	52	52	52	52



PIPE DIAM.	THICK. IN.	D I M E N S I O N S				
		A	B	C	D	F
12	.064	6	6	6	6	6
15	.084	7	7	7	7	7
18	.104	8	8	8	8	8
21	.124	9	9	9	9	9
24	.144	10	10	10	10	10
27	.164	11	11	11	11	11
30	.184	12	12	12	12	12
33	.204	13	13	13	13	13
36	.224	14	14	14	14	14
39	.244	15	15	15	15	15
42	.264	16	16	16	16	16
45	.284	17	17	17	17	17
48	.304	18	18	18	18	18
51	.324	19	19	19	19	19
54	.344	20	20	20	20	20
57	.364	21	21	21	21	21
60	.384	22	22	22	22	22
63	.404	23	23	23	23	23
66	.424	24	24	24	24	24
69	.444	25	25	25	25	25
72	.464	26	26	26	26	26
75	.484	27	27	27	27	27
78	.504	28	28	28	28	28
81	.524	29	29	29	29	29
84	.544	30	30	30	30	30
87	.564	31	31	31	31	31
90	.584	32	32	32	32	32
93	.604	33	33	33	33	33
96	.624	34	34	34	34	34
99	.644	35	35	35	35	35
102	.664	36	36	36	36	36
105	.684	37	37	37	37	37
108	.704	38	38	38	38	38
111	.724	39	39	39	39	39
114	.744	40	40	40	40	40
117	.764	41	41	41	41	41
120	.784	42	42	42	42	42
123	.804	43	43	43	43	43
126	.824	44	44	44	44	44
129	.844	45	45	45	45	45
132	.864	46	46	46	46	46
135	.884	47	47	47	47	47
138	.904	48	48	48	48	48
141	.924	49	49	49	49	49
144	.944	50	50	50	50	50
147	.964	51	51	51	51	51
150	.984	52	52	52	52	52



PIPE DIAM.	THICK. IN.	D I M E N S I O N S				
		A	B	C	D	F
12	.064	6	6	6	6	6
15	.084	7	7	7	7	7
18	.104	8	8	8	8	8
21	.124	9	9	9	9	9
24	.144	10	10	10	10	10
27	.164	11	11	11	11	11
30	.184	12	12	12	12	12
33	.204	13	13	13	13	13
36	.224	14	14	14	14	14
39	.244	15	15	15	15	15
42	.264	16	16	16	16	16
45	.284	17	17	17	17	17
48	.304	18	18	18	18	18
51	.324	19	19	19	19	19
54	.344	20	20	20	20	20
57	.364	21	21	21	21	21
60	.384	22	22	22	22	22
63	.404	23	23	23	23	23
66	.424	24	24	24	24	24
69	.444	25	25	25	25	25
72	.464	26	26	26	26	26
75	.484	27	27	27	27	27
78	.504	28	28	28	28	28
81	.524	29	29	29	29	29
84	.544	30	30	30	30	30
87	.564	31	31	31	31	31
90	.584	32	32	32	32	32
93	.604	33	33	33	33	33
96	.624	34	34	34	34	34
99	.644	35	35	35	35	35
102	.664	36	36	36	36	36
105	.684	37	37	37	37	37
108	.704	38	38	38	38	38
111	.724	39	39	39	39	39
114	.744	40	40	40	40	40
117	.764	41	41	41	41	41
120	.784	42	42	42	42	42
123	.804	43	43	43	43	43
126	.824	44	44	44	44	44
129	.844	45	45	45	45	45
132	.864	46	46	46	46	46
135	.884	47	47	47	47	47
138	.904	48	48	48	48	48
141	.924	49	49	49	49	49
144	.944	50	50	50	50	50
147	.964	51	51	51	51	51
150	.984	52	52	52	52	52



**GENERAL NOTES**

All work shall be done in accordance with the Standard Specifications for Highway Construction, 1967 Edition, as amended.

Alternative end sections for concrete end sections may be submitted to the District Engineer for approval. Design length of culvert is based on length of pipe section. Length of culvert shall be furnished by end of the span of the structure.

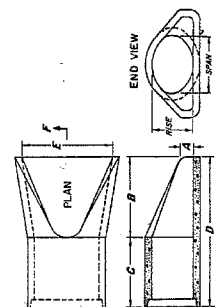
Other uses of concrete pipe and end sections may be available upon request. See Standard Specifications for Highway Construction, 1967 Edition, for details.

Reinforced concrete end sections shall match the dimensions of the culvert shown on plans.

End sections shall be reinforced with rebar as shown on end section drawings. Reinforcement shall be placed in accordance with the Standard Specifications for Highway Construction, 1967 Edition, as amended.

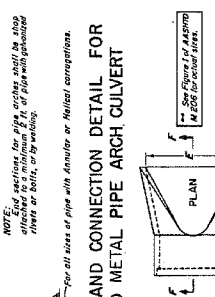
Designs for Alternative End Sections for use on ultimate culverts shall be submitted to the District Engineer for approval prior to use.

Concrete Pipe Joint Fasteners, when shown on plans, shall be installed mechanically fastened together. End Section Heights, when used, will be indicated in the S.I.C. requirements.



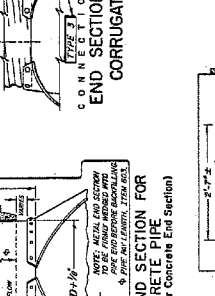
EQUIVALENT DIAM. (IN.)	D I M E N S I O N S (INCHES)				
	A	B	C	D	E
36	30	14	14	14	14
42	36	17	17	17	17
48	42	20	20	20	20
54	48	23	23	23	23
60	54	26	26	26	26
66	60	29	29	29	29
72	66	32	32	32	32
78	72	35	35	35	35
84	78	38	38	38	38
90	84	41	41	41	41
96	90	44	44	44	44
102	96	47	47	47	47
108	102	50	50	50	50
114	108	53	53	53	53
120	114	56	56	56	56
126	120	59	59	59	59
132	126	62	62	62	62

END SECTION FOR REINFORCED CONCRETE ELLIPTICAL PIPE

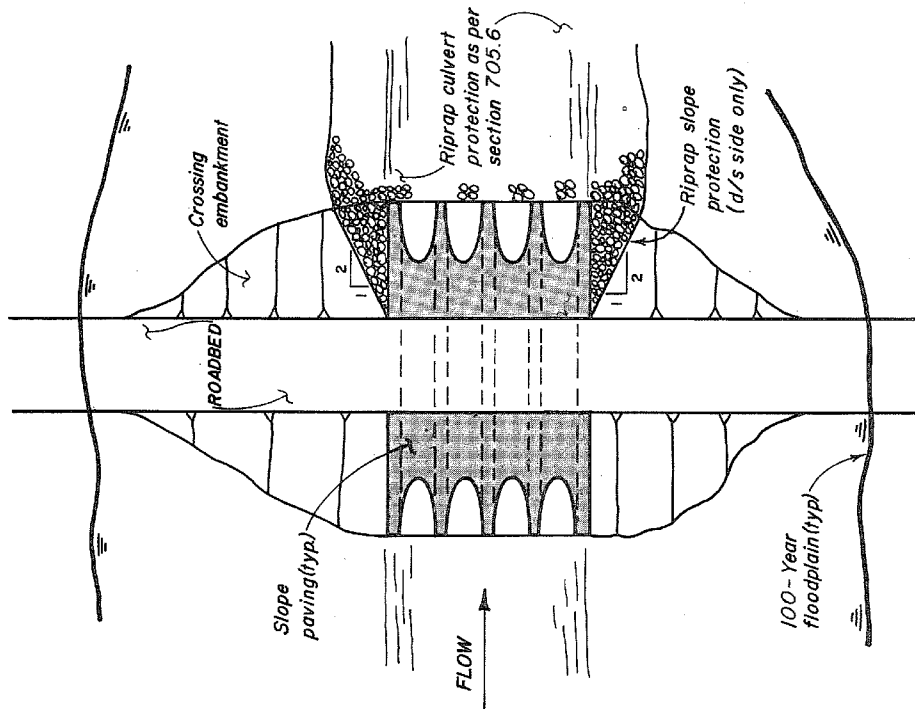


EQUIVALENT DIAM. (IN.)	D I M E N S I O N S (INCHES)				
	A	B	C	D	E
36	30	14	14	14	14
42	36	17	17	17	17
48	42	20	20	20	20
54	48	23	23	23	23
60	54	26	26	26	26
66	60	29	29	29	29
72	66	32	32	32	32
78	72	35	35	35	35
84	78	38	38	38	38
90	84	41	41	41	41
96	90	44	44	44	44
102	96	47	47	47	47
108	102	50	50	50	50
114	108	53	53	53	53
120	114	56	56	56	56
126	120	59	59	59	59
132	126	62	62	62	62

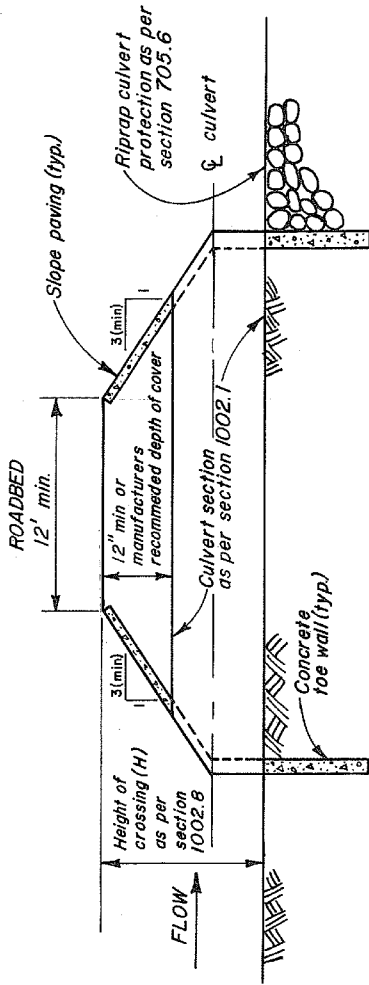
END SECTION FOR REINFORCED CONCRETE ARCH PIPE



EQUIVALENT DIAM. (IN.)	D I M E N S I O N S (INCHES)				
	A	B	C	D	E
36	30	14	14	14	14
42	36	17	17	17	17
48	42	20	20	20	20
54	48	23	23	23	23
60	54	26	26	26	26
66	60	29	29	29	29
72	66	32	32	32	32
78	72	35	35	35	35
84	78	38	38	38	38
90	84	41	41	41	41
96	90	44	44	44	44
102	96				

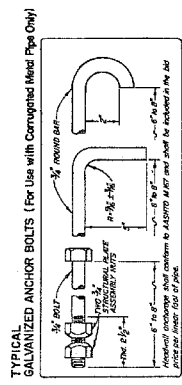
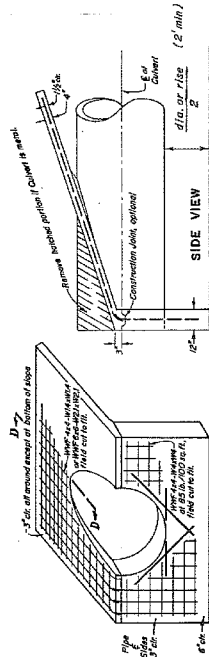


TYPICAL PLAN VIEW



TYPICAL SECTION

HEADWALL WITH SLOPE PAVING



GENERAL NOTES

All work shall be done in accordance with the Standard Specifications applicable to the project.  
Concrete shall be Class A or B.  
Headwall shall be parallel to roadway centerline - unless otherwise specified.  
Exposed corners on concrete shall be chamfered 1/4\"/>

TYPE "S" HEADWALL AND SLOPE PAVING FOR ROUND PIPE OR ARCH PIPE

WRC ENGINEERING, INC.  
REFERENCE: Colorado Department of Highways  
Standard M-601-KA (with modifications)

BOULDER COUNTY  
STORM DRAINAGE CRITERIA MANUAL

LOW WATER  
CROSSING

STANDARD DETAIL SD-10