Supplemental Figures for Chapter 6 of DelDOT Road Design Manual

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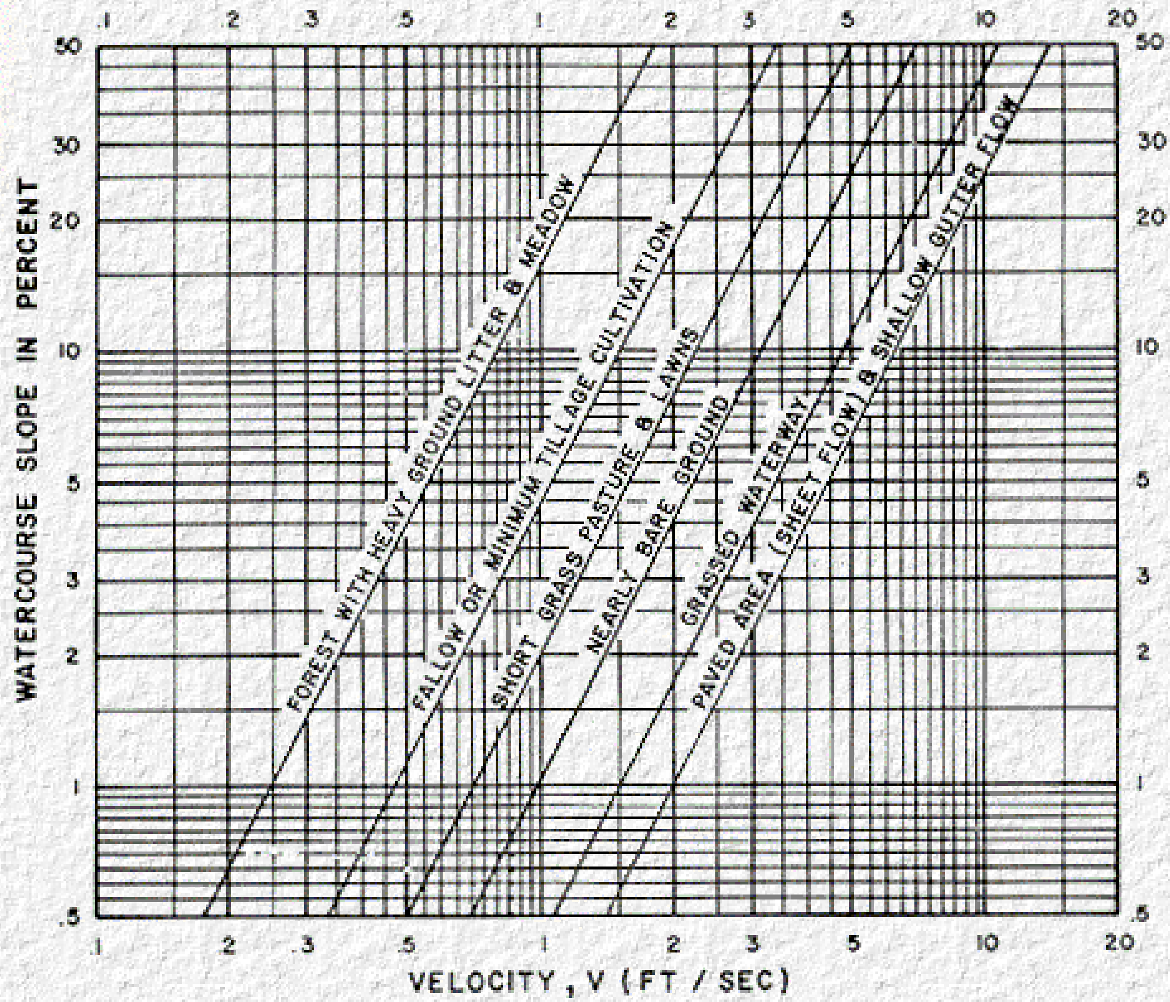
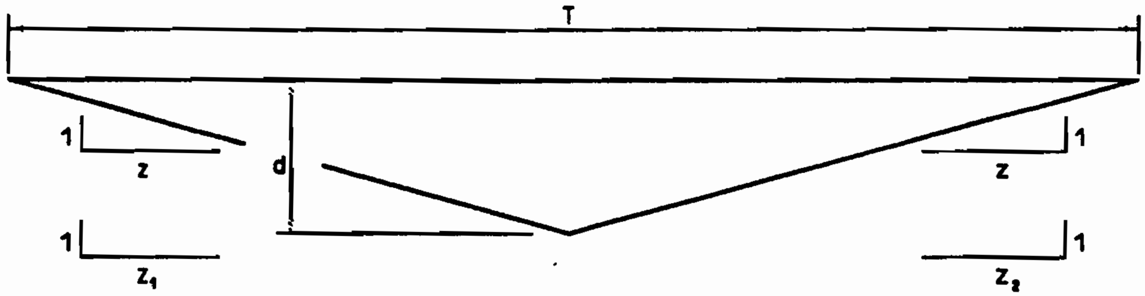


Figure 37. Velocities for Upland Method of Estimating Time of Concentration

Figure 6-20
Formulas for Various Channel Geometries



SYMMETRICAL SECTION

$A = zd^2$

$P = 2d\sqrt{z^2+1}$

$T = 2dz$

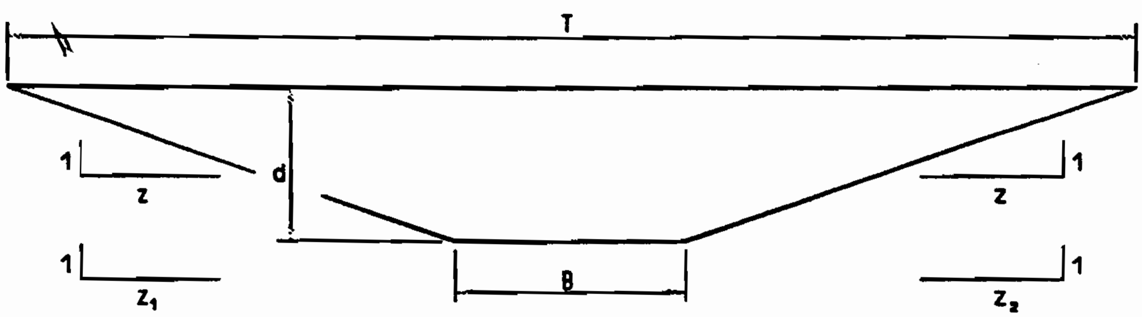
UNSYMMETRICAL SECTION

$A = (z_1+z_2)d^2/2$

$P = (\sqrt{z_1^2+1}+\sqrt{z_2^2+1})d$

$T = (z_1+z_2)d$

V - SHAPE



SYMMETRICAL SECTION

$A = Bd+zd^2$

$P = B+2d\sqrt{z^2+1}$

$T = B+2dz$

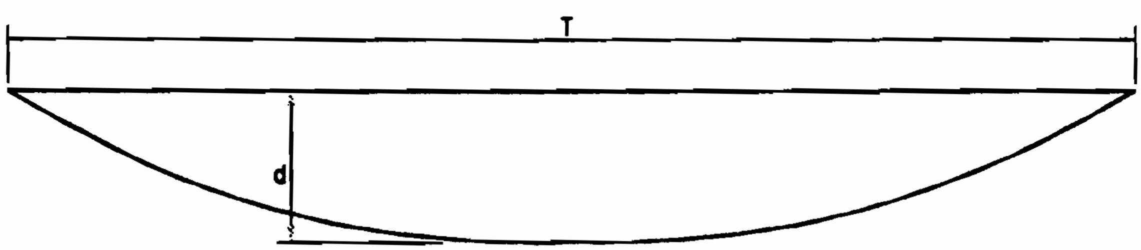
UNSYMMETRICAL SECTION

$A = Bd+(z_1+z_2)d^2/2$

$P = B+d(\sqrt{z_1^2+1}+\sqrt{z_2^2+1})$

$T = B+d(z_1+z_2)$

TRAPEZOIDAL



$A = \frac{2}{3}Td$

$P = T+\frac{8d^2}{3T}$

$T = \frac{3}{2}\frac{A}{d}$

PARABOLIC

Appendix 7C-1 Nomograph for Solution of Manning's Equation

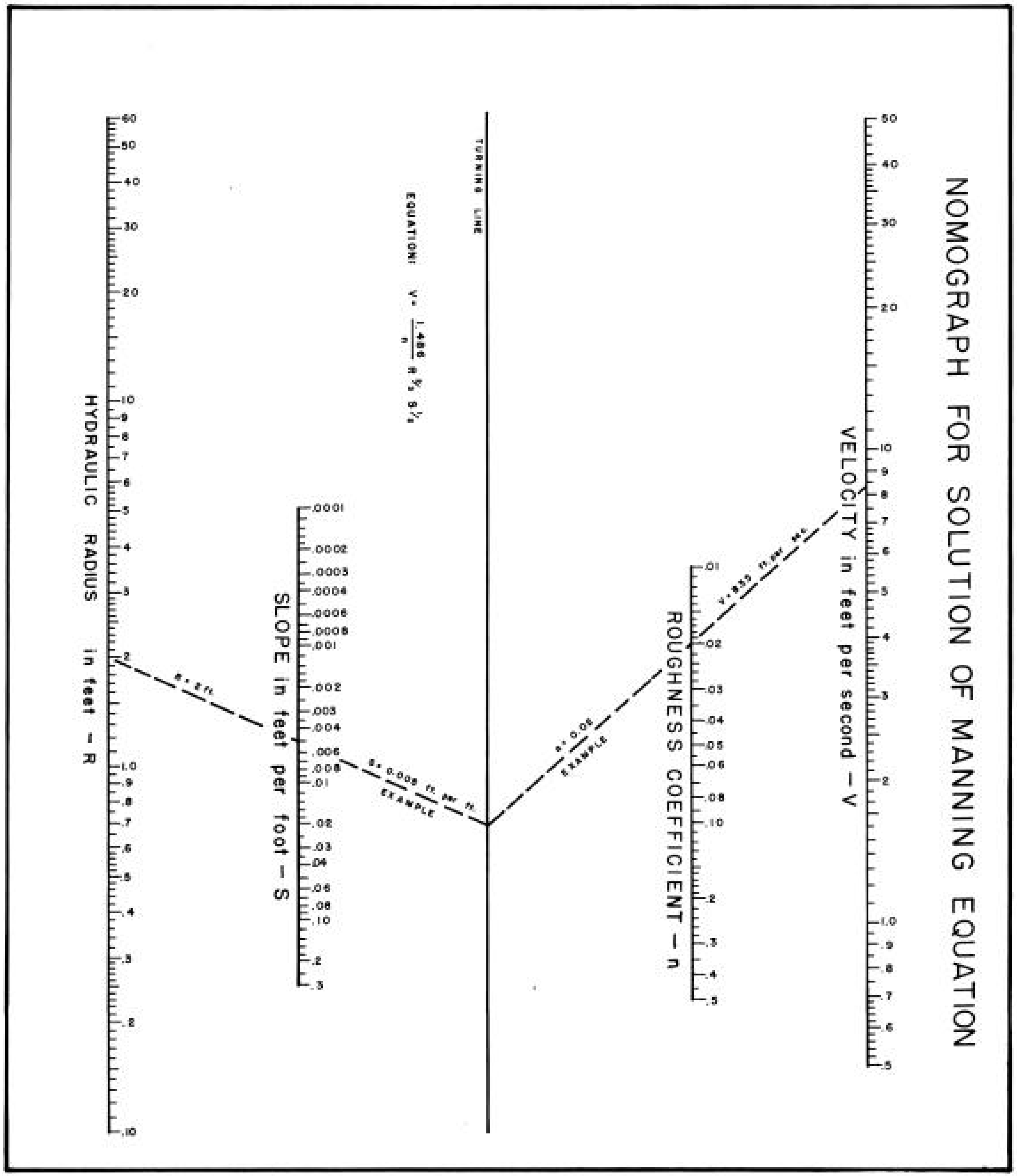
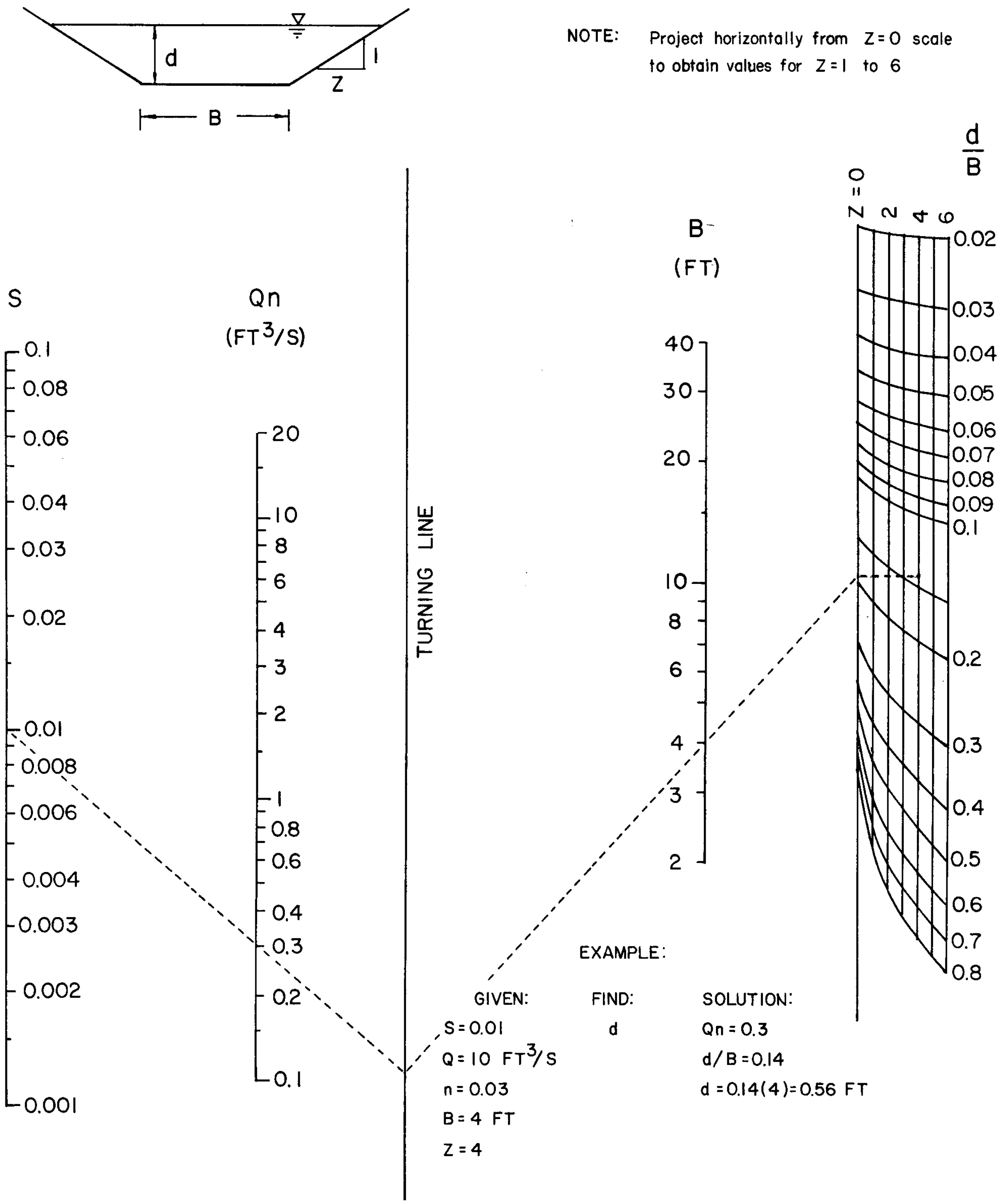


CHART 14B



Solution to Manning's Equation for Channels of Various Side Slopes - English Units

Figure 6-23
Capacity of Trapezoidal Section

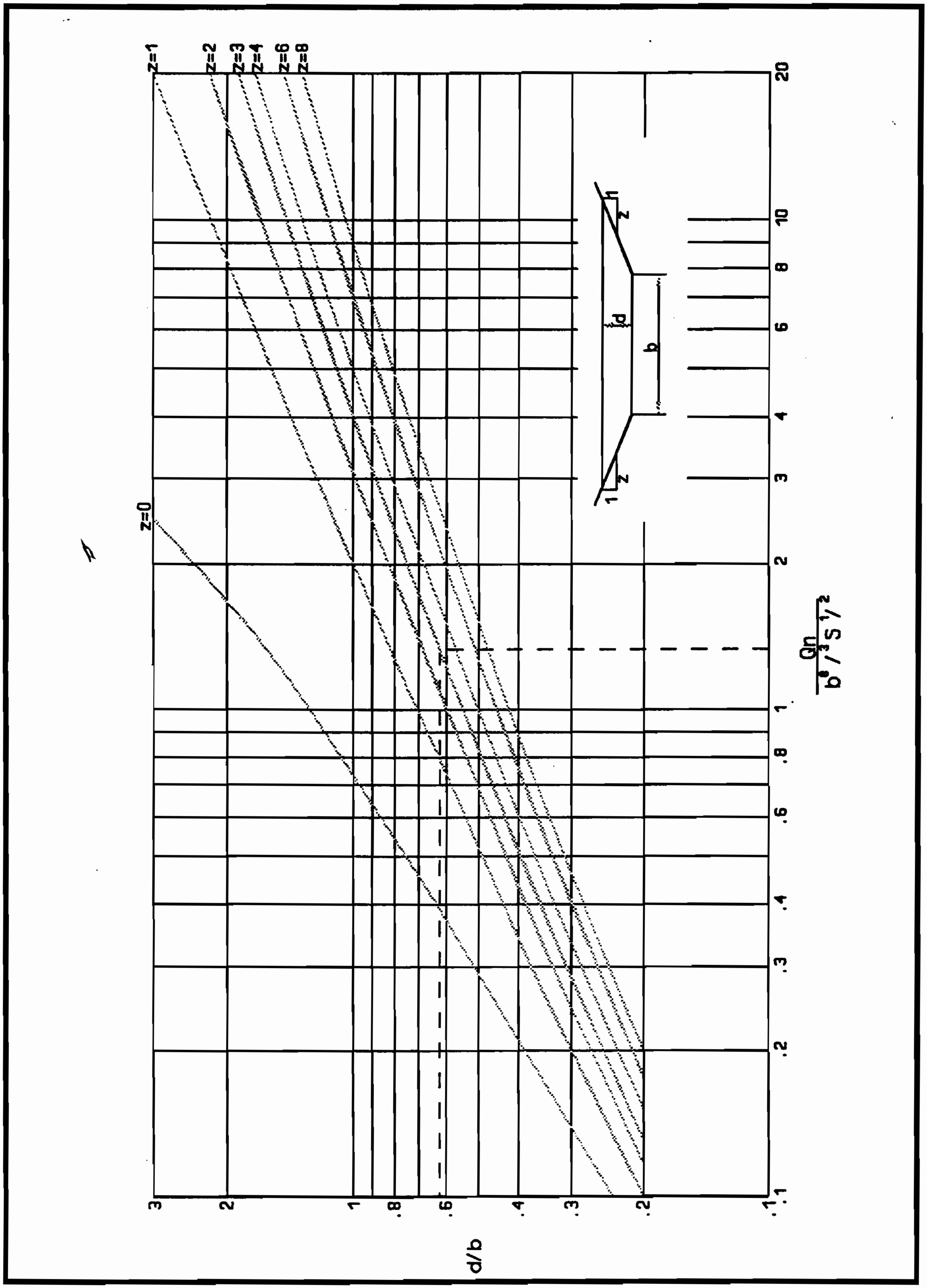
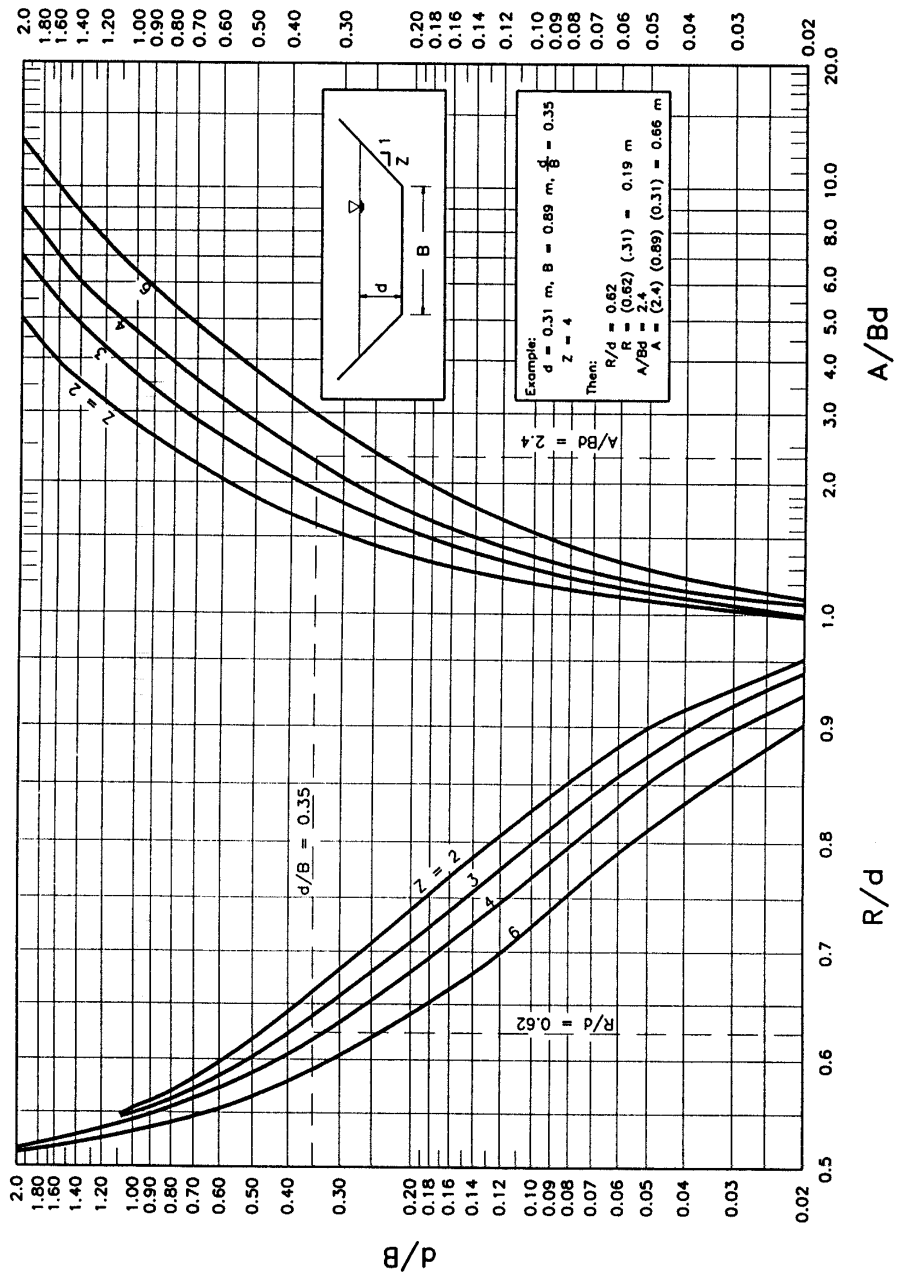


CHART 22



Geometric Design Chart For Trapezoidal Channels.

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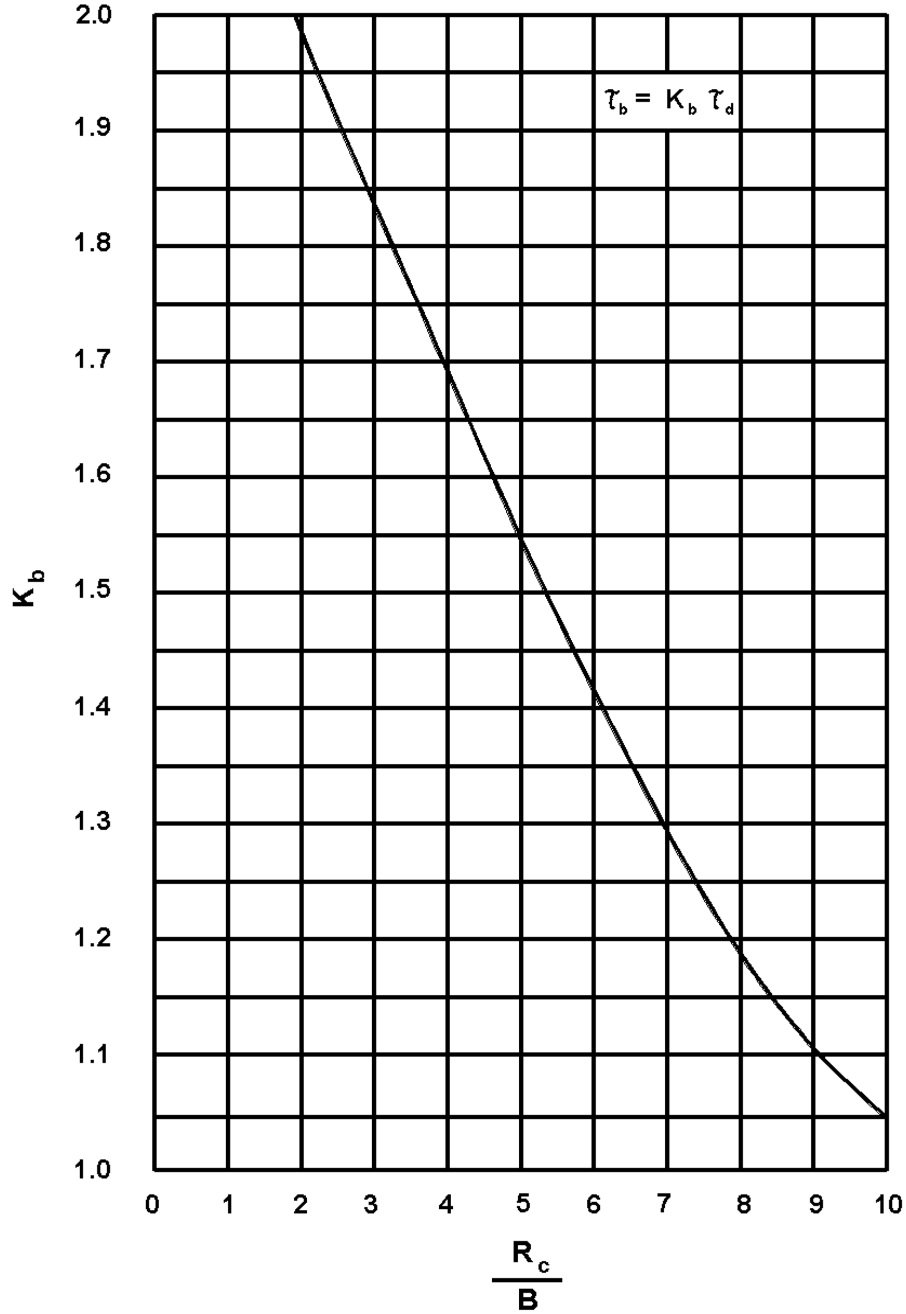
CHART 21



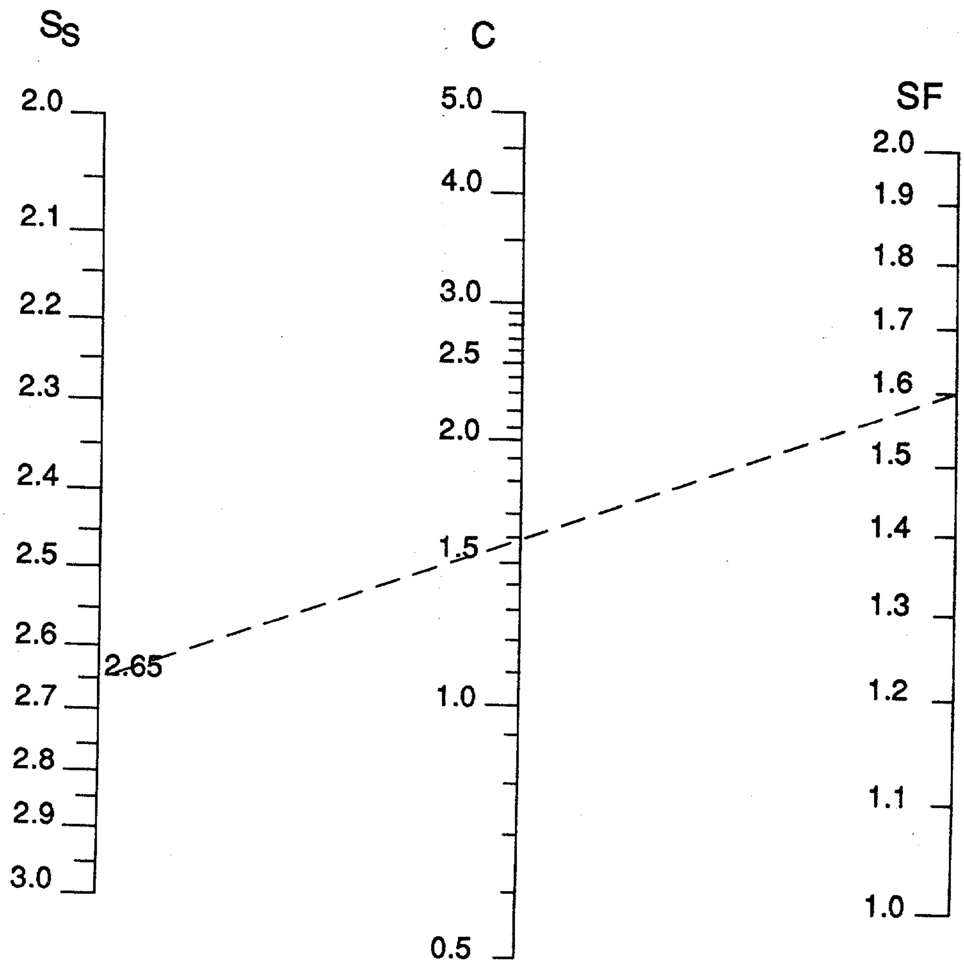
K_b Factor For Maximum Shear Stress On Channel Bends. (12)

Figure 6-30
Criteria for Selection of Stability Factors

Condition	Stability Factor Range
Uniform flow; Straight or mildly curving reach (curve radius/channel width > 30); Impact from wave action and floating debris is minimal; Little or no uncertainty in design parameters.	1.0 - 1.2
Gradually varying flow; Moderate bend curvature (30 > curve radius/channel width > 10); Impact from waves or floating debris moderate.	1.3 - 1.6
Approaching rapidly varying flow; Sharp bend curvature (10 > curve radius/channel width); Significant impact potential from floating debris and/or ice; Significant wind and/or boat generated waves (1 to 2 feet or 0.31 to 0.60 meters); High flow turbulence; Significant uncertainty in design parameters.	1.6 - 2.0

$$C = 1.61 SF^{1.5}/(S_S - 1)^{1.5}$$

CORR= D_{50} CORRECTION FACTOR
SF = STABILITY FACTOR
S_S= SPECIFIC GRAVITY OF ROCK



Example:

Given:	Find:	Solution:
S_S=2.75	C	C=1.59
SF= 1.60		

Chart 2. Correction factor for riprap size

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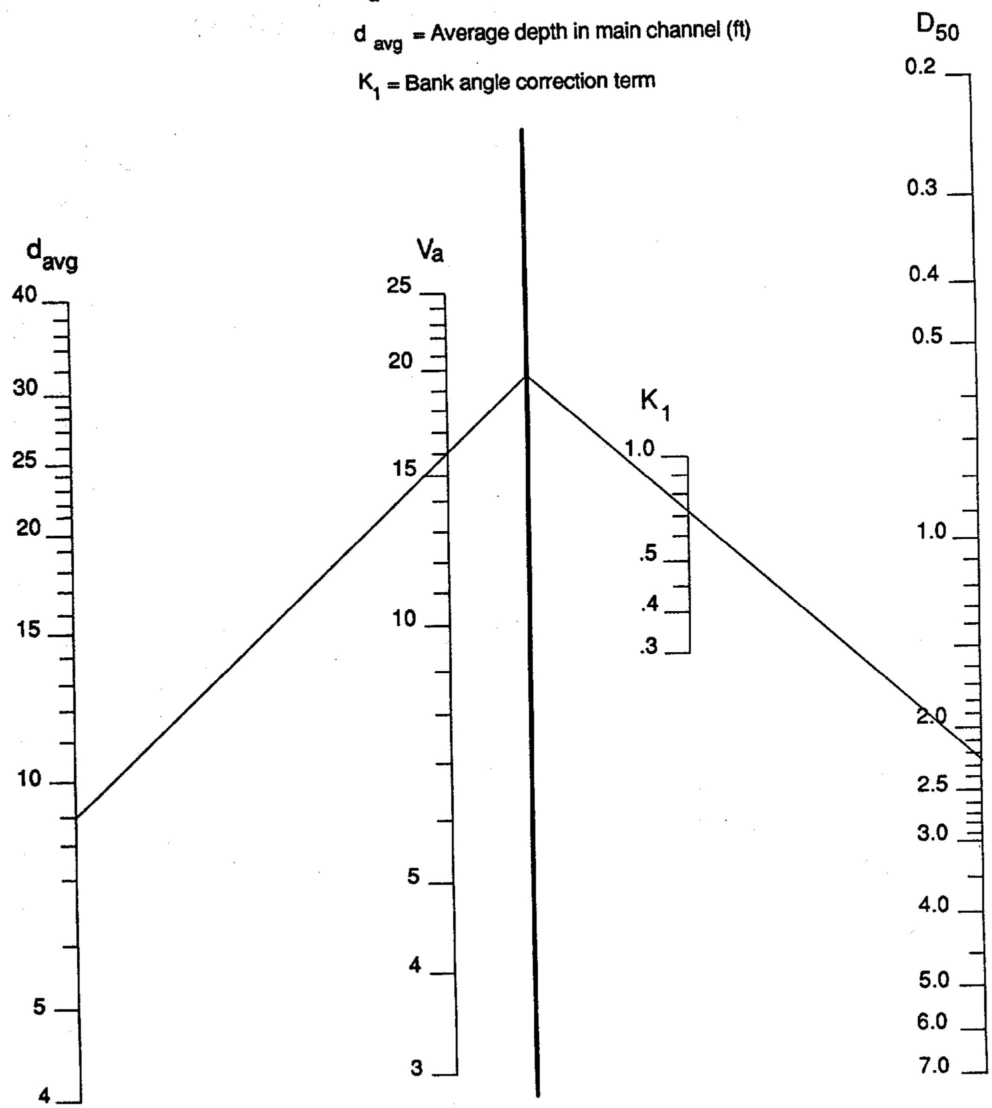
$$D_{50} = 0.001\, V_a^3 / (d_{avg}^{1/2} K_1^{3/2})$$

D_{50} = Median Riprap Size (ft.)

V_a = Average velocity in main channel (ft/sec)

d_{avg} = Average depth in main channel (ft)

K_1 = Bank angle correction term



Example

Given:

V_a = 16 ft/sec

d_{avg} = 9 ft

K_1 = 0.72

Find:

D_{50}

Solution:

D_{50} = 2.25

Chart 1. Riprap size relationship

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CHART 26- (ROTATED)

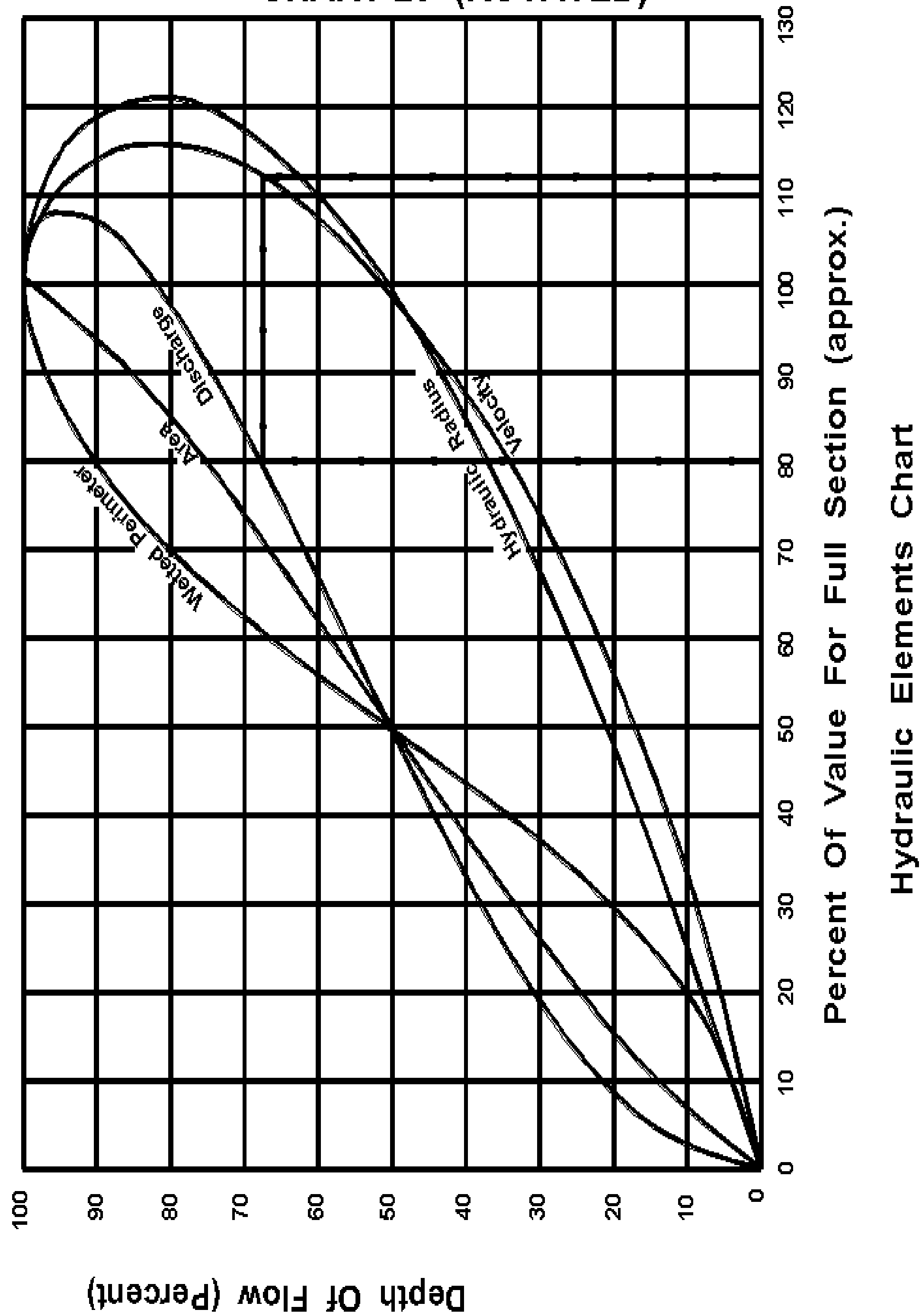

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Figure 6-51
Flow Coefficients for Circular Pipe

	Values of K_1									
$\frac{d}{D}$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0		0.00007	0.00031	0.00074	0.00138	0.00222	0.00328	0.00455	0.00604	0.0077
0.1	0.00967	0.0118	0.0142	0.0167	0.0195	0.0225	0.0257	0.0291	0.0327	0.0366
0.2	0.0406	0.0448	0.0492	0.0537	0.0585	0.0634	0.0686	0.0738	0.0793	0.0849
0.3	0.0907	0.0966	0.1027	0.1089	0.1153	0.1218	0.1284	0.1352	0.1420	0.1490
0.4	0.1561	0.1633	0.1705	0.1779	0.1854	0.1929	0.2005	0.2082	0.2160	0.2238
0.5	0.232	0.239	0.247	0.255	0.263	0.271	0.279	0.287	0.295	0.303
0.6	0.311	0.319	0.327	0.335	0.343	0.350	0.358	0.366	0.373	0.380
0.7	0.388	0.395	0.402	0.409	0.416	0.422	0.429	0.435	0.441	0.447
0.8	0.453	0.459	0.463	0.468	0.473	0.477	0.481	0.485	0.488	0.491
0.9	0.494	0.496	0.497	0.498	0.498	0.498	0.496	0.494	0.489	0.483
1.0	0.463									

$$K_1 = \frac{Q\,n}{D^{8/3}\,S^{1/2}}$$

Where,

D = Diameter of pipe
d = Depth of flow
Q = Flow (cfs)
n = Manning's coefficient
S = Slope (feet/foot)

To determine Q:

1. Obtain K_1 from the Figure for the given d/D ratio.
2. Solve the equation for Q.

Figure 6-52
Uniform Flow for Pipe Culverts

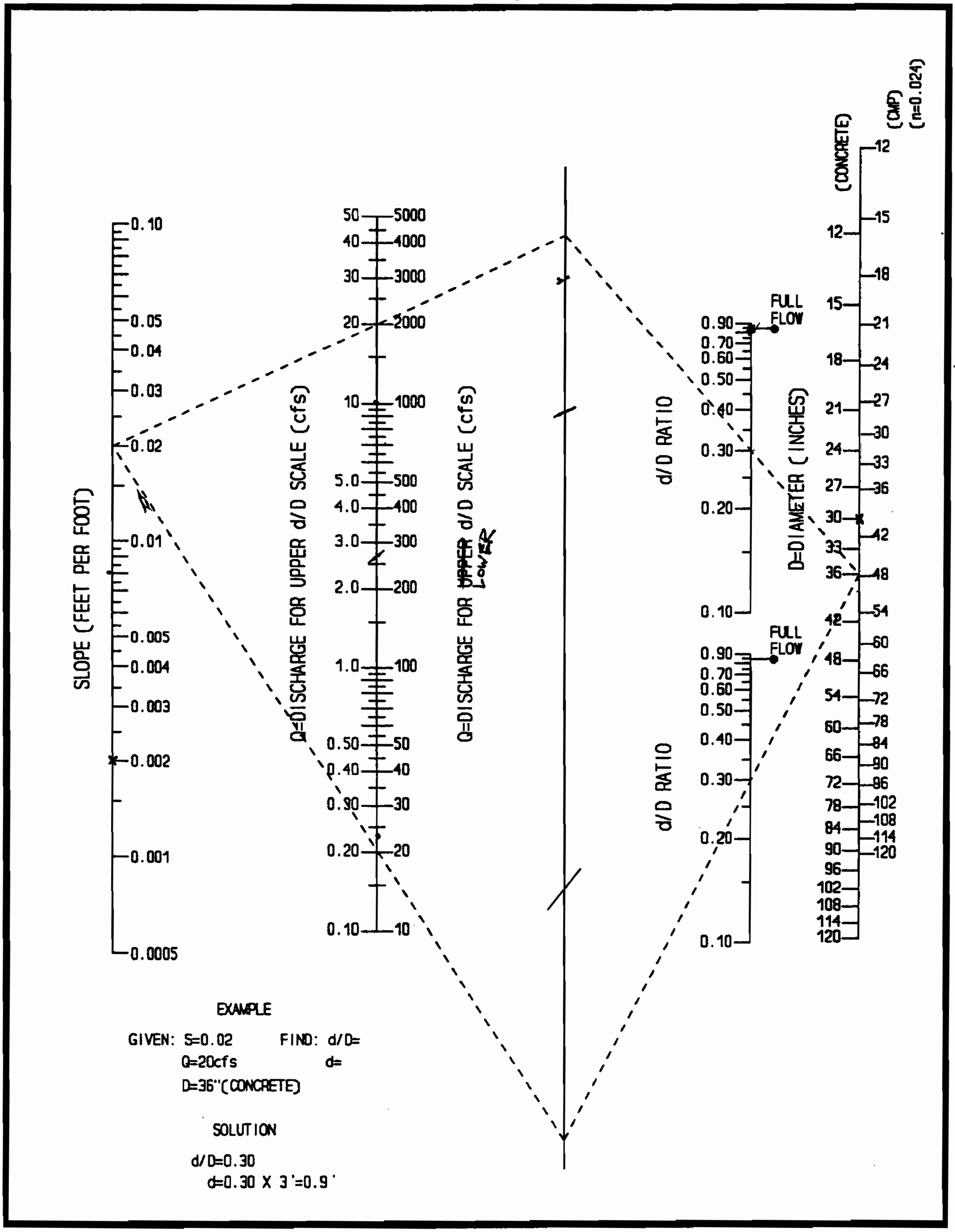


Figure 6-53
Uniform Flow for Concrete Elliptical Pipes

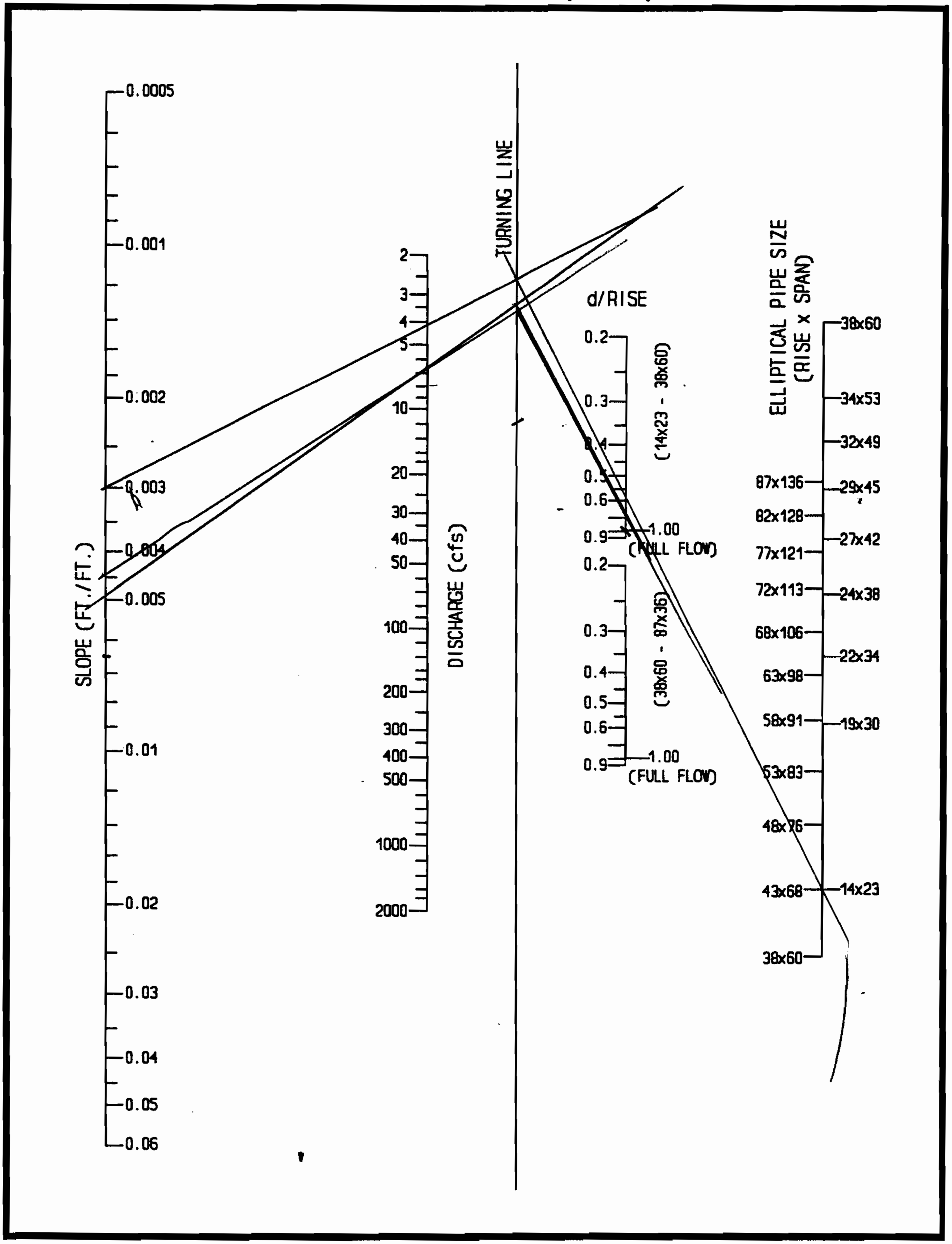


Figure 6-54
Uniform Flow for Pipe Arches

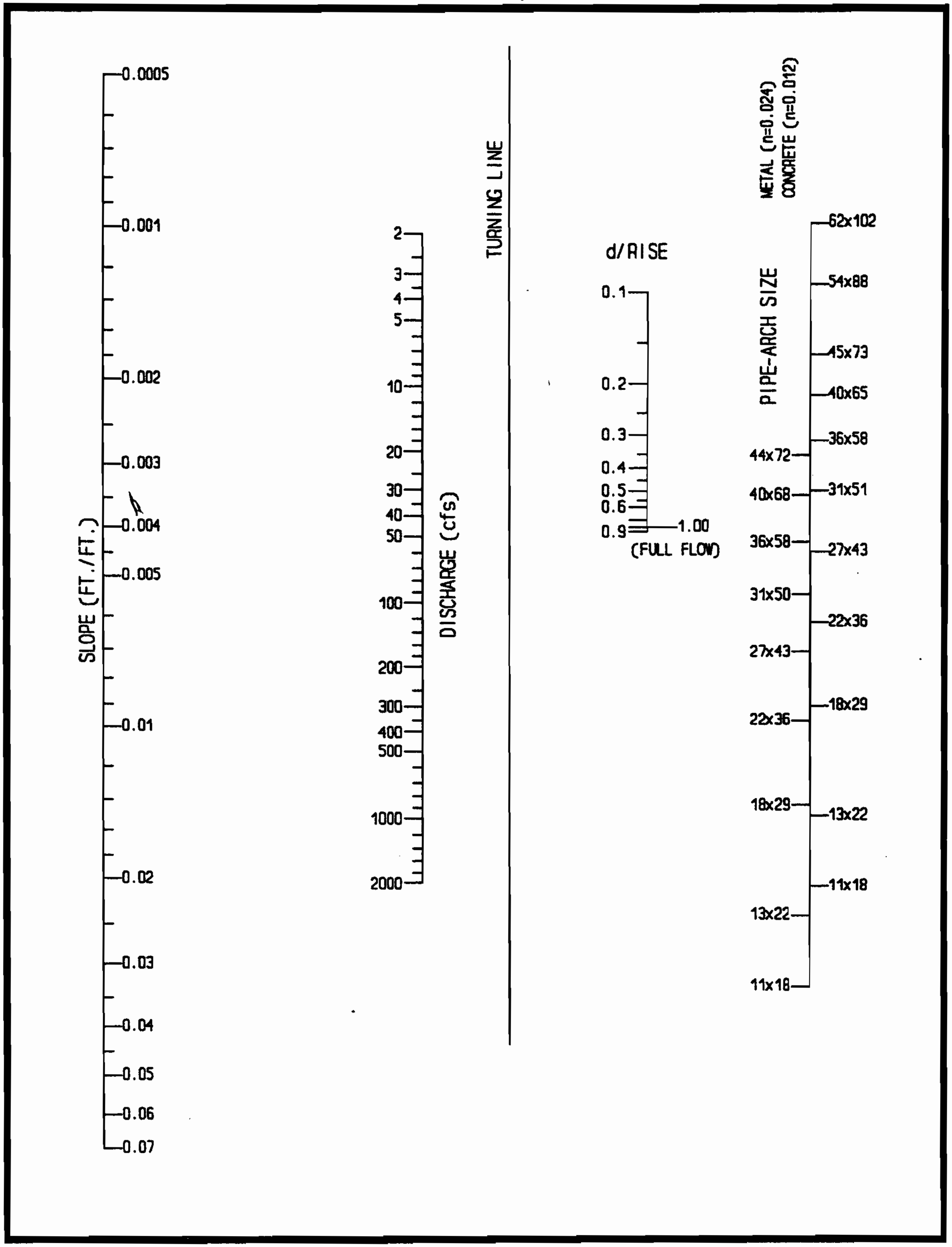


Figure 6-55
Velocity in Pipe Conduits

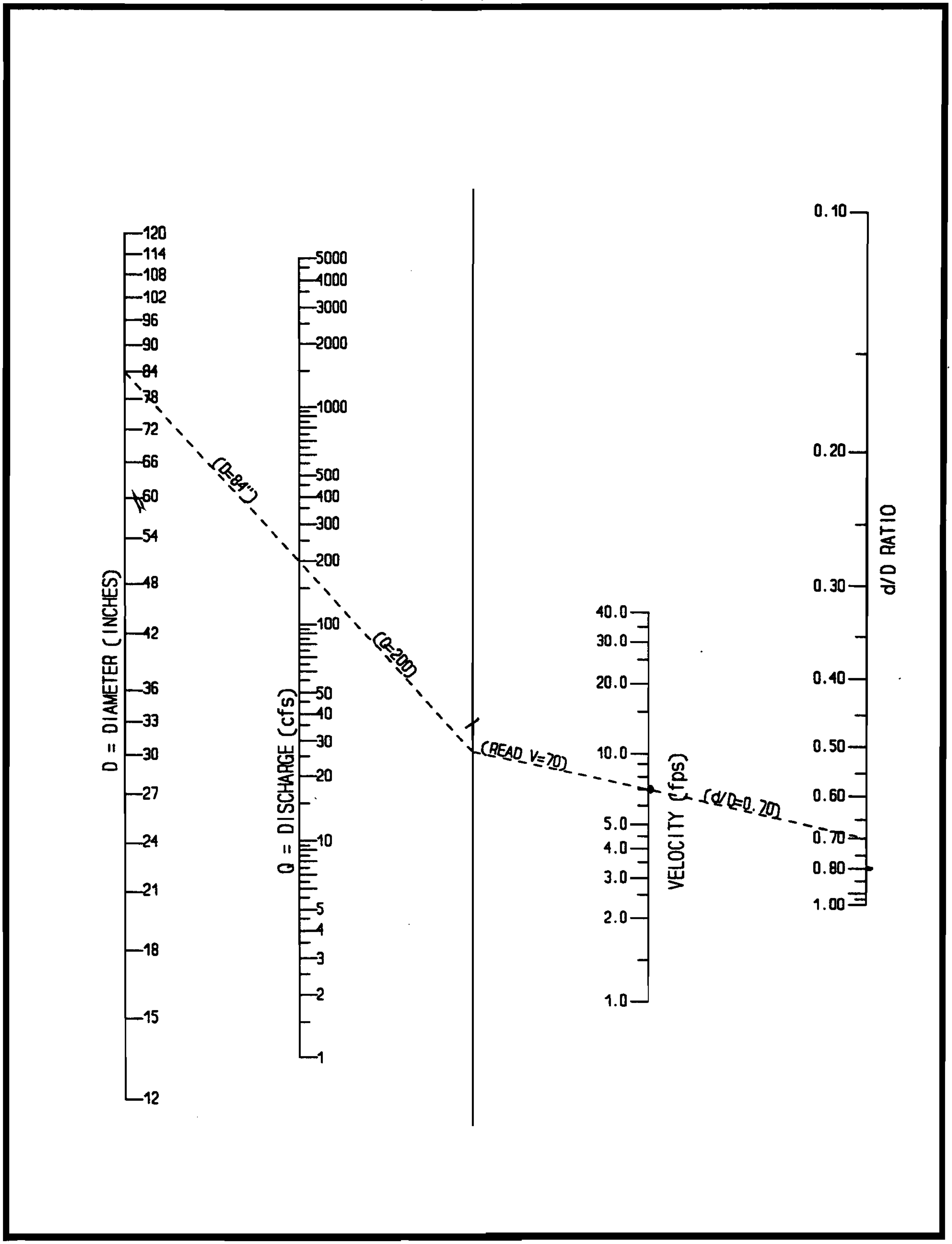


Figure 6-56
Velocity in Elliptical Pipes

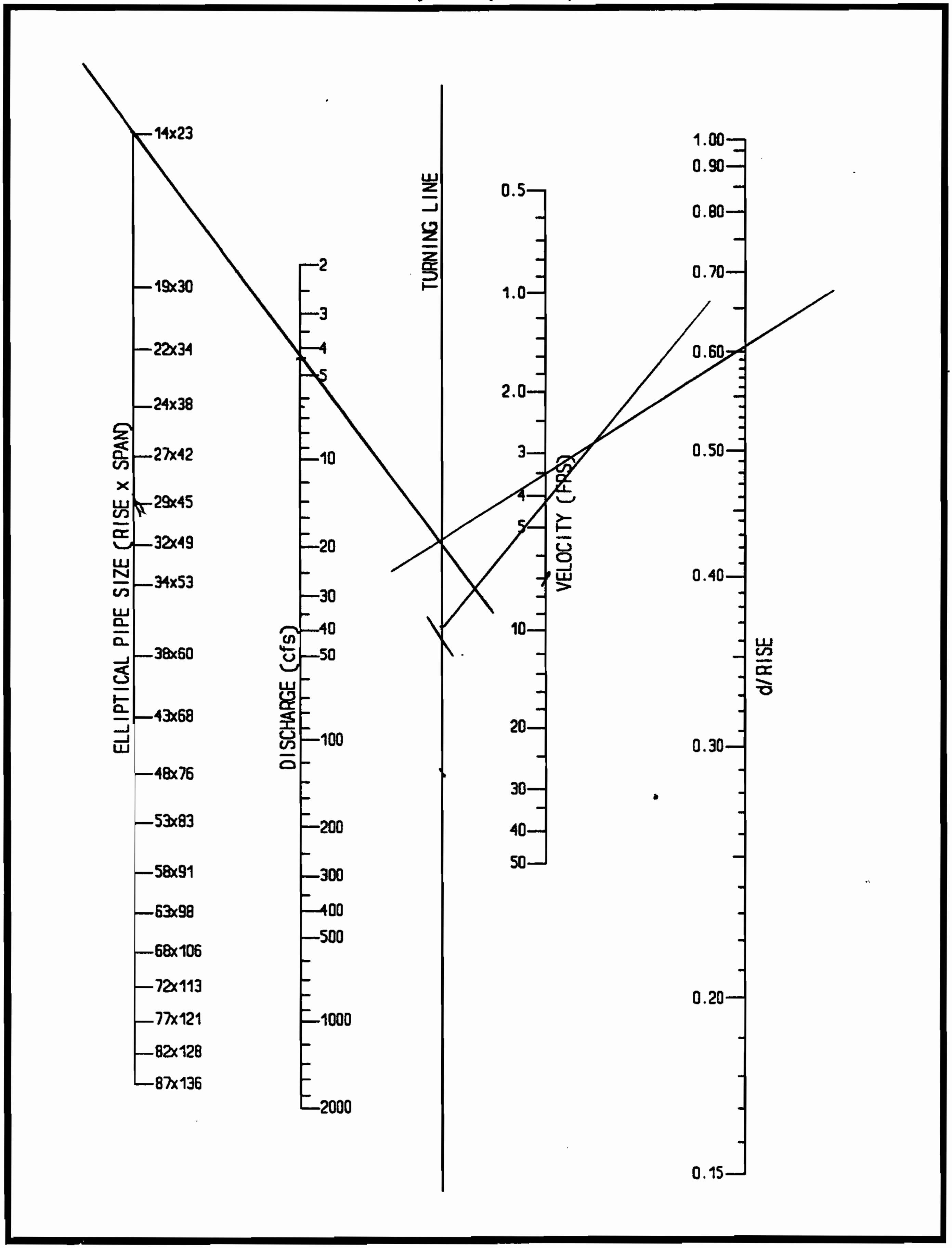


Figure 57
Velocity in Pipe Arches

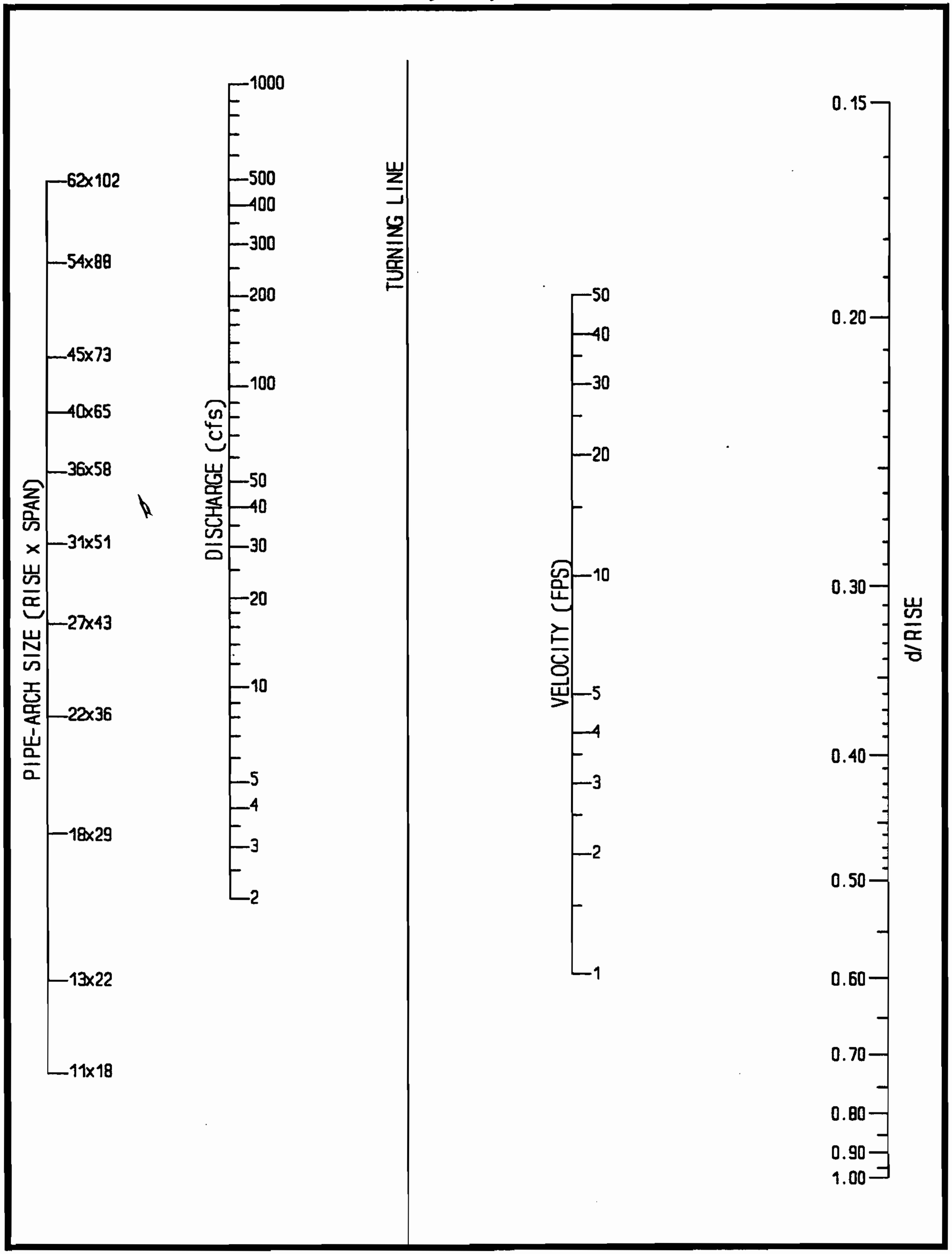


Figure 6-58
Critical Depth of Flow for Circular Conduits

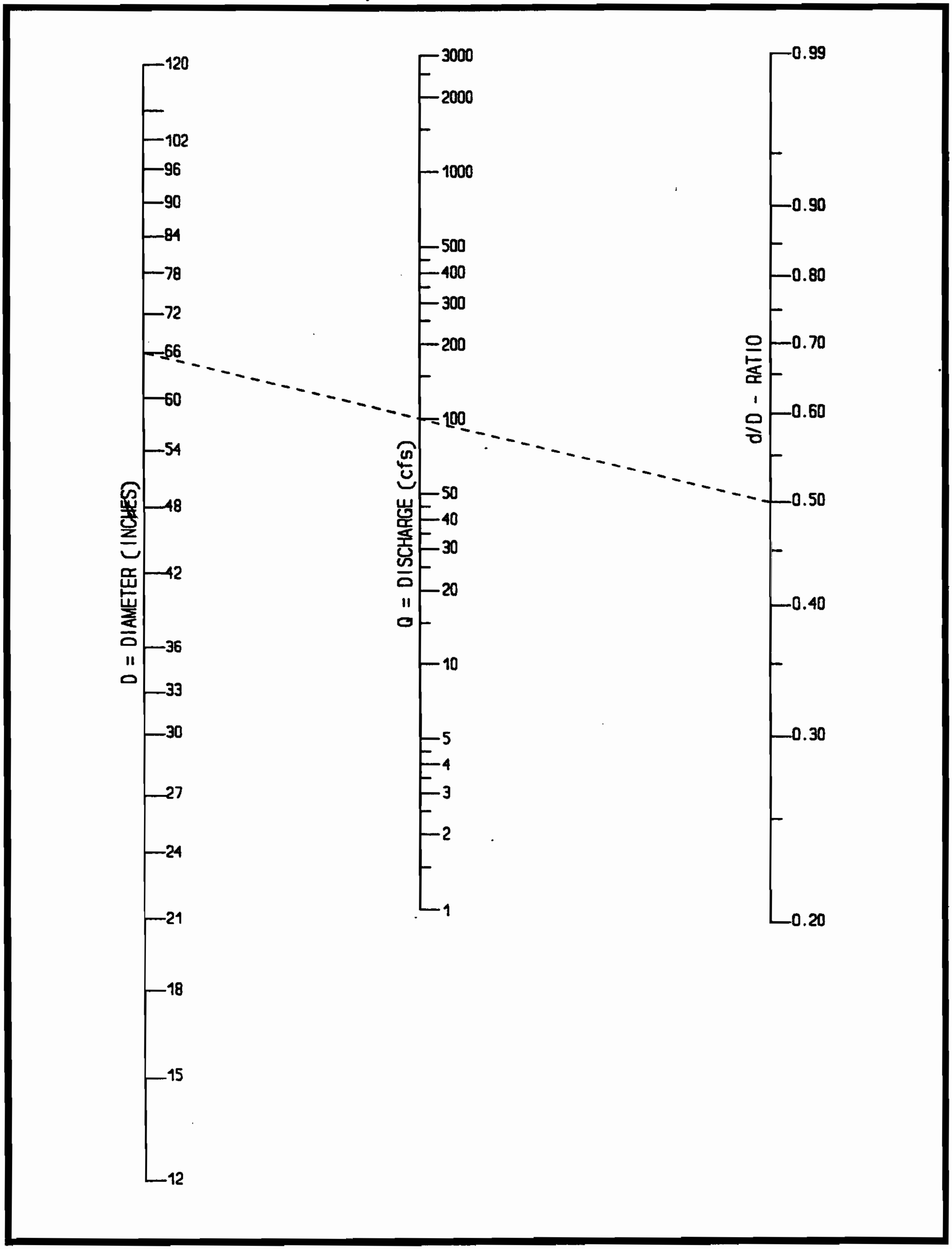


Figure 6-59
Critical Depth of Flow for Elliptical Pipes

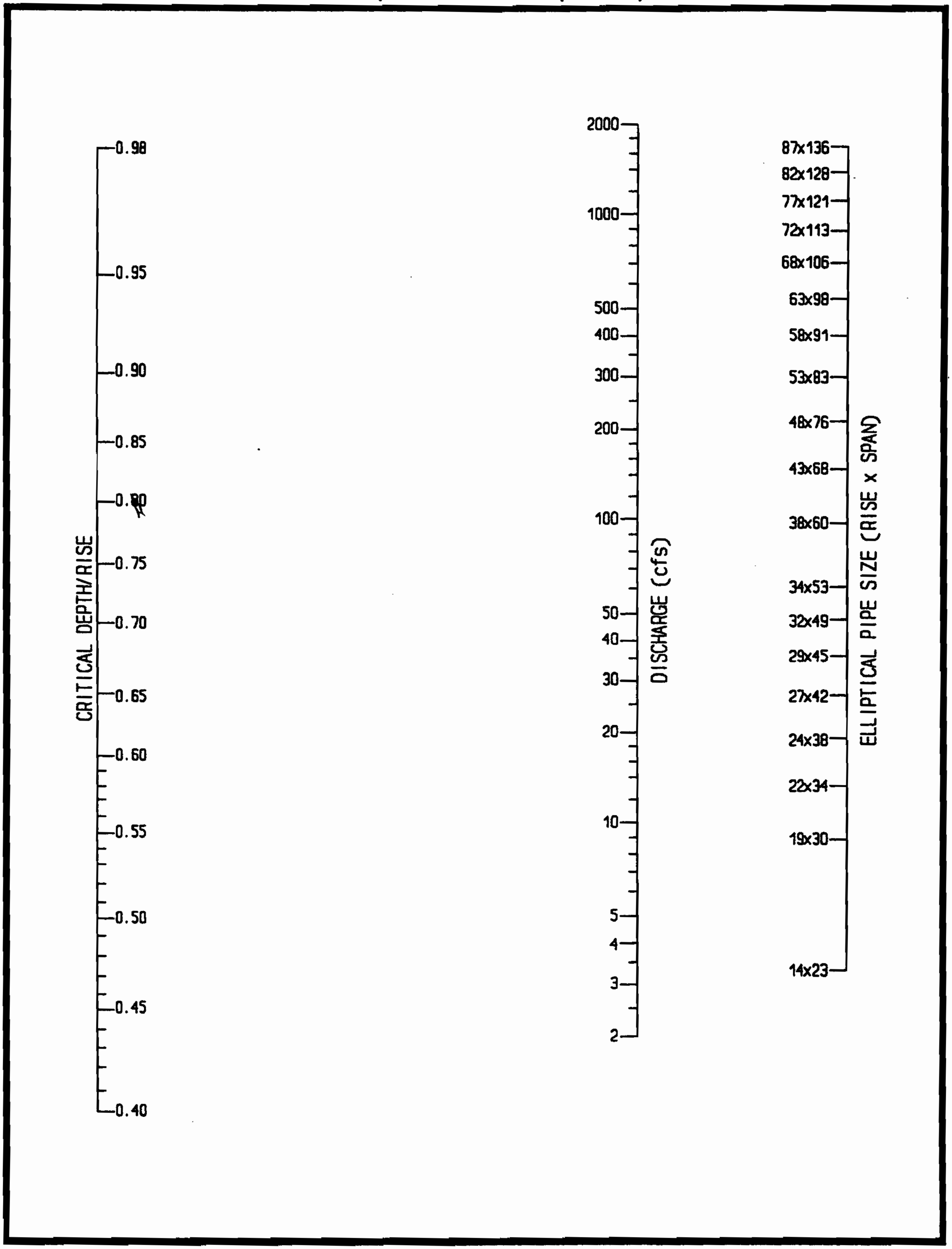


Figure 6-60
Critical Depth of Flow for Pipe Arches

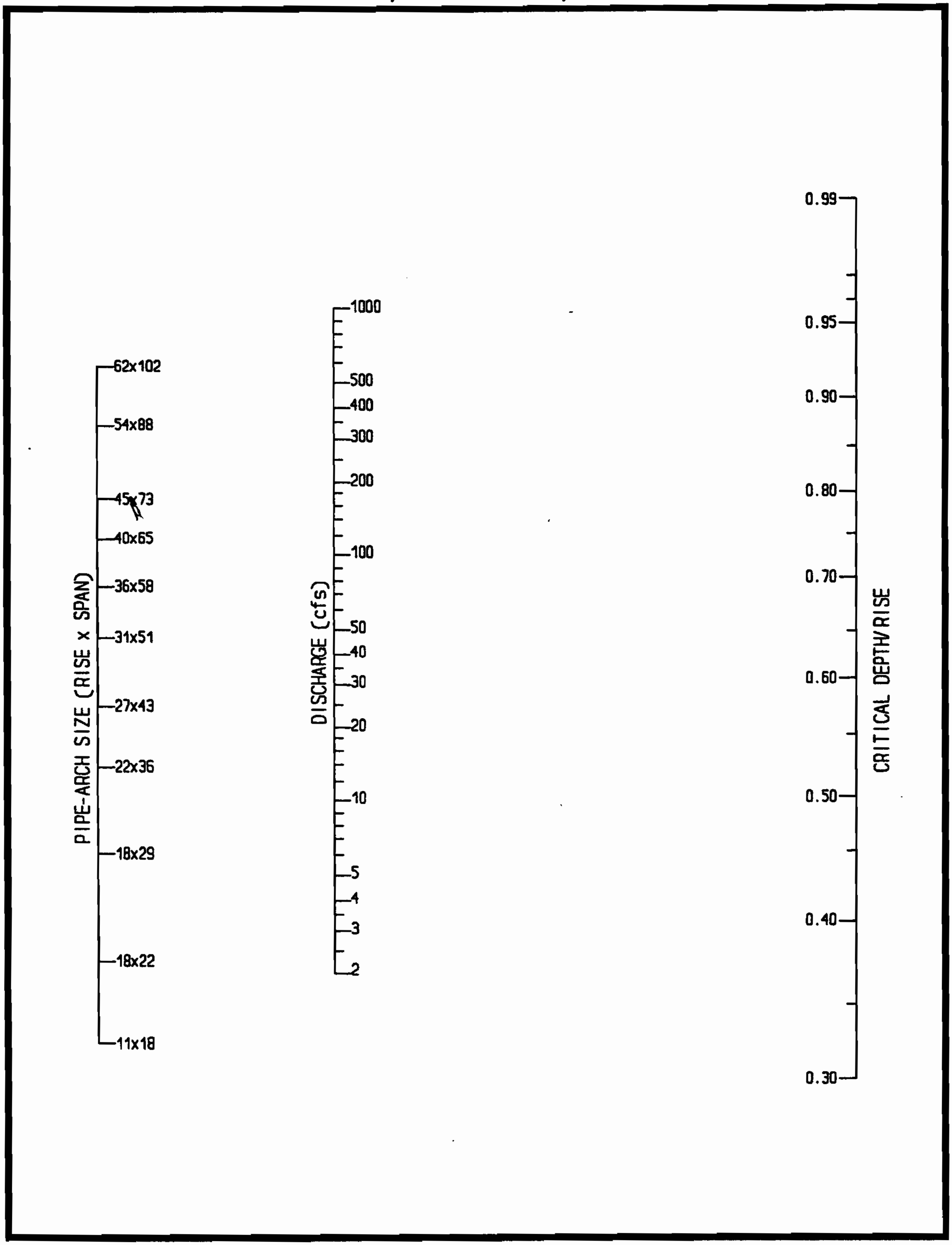
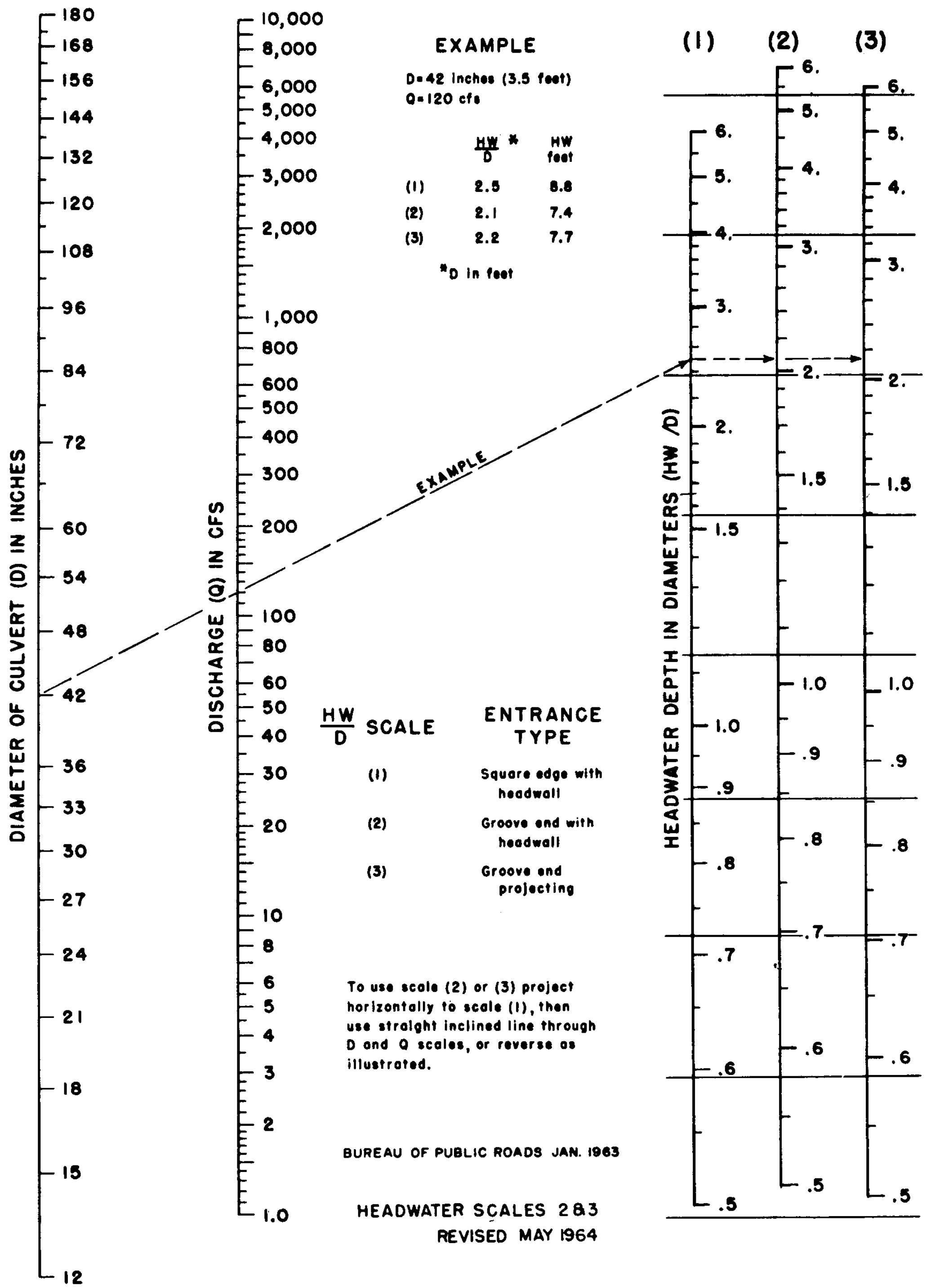


CHART 28B



Headwater Water Depth for Concrete Pipe Culverts with Inlet Control - English Units

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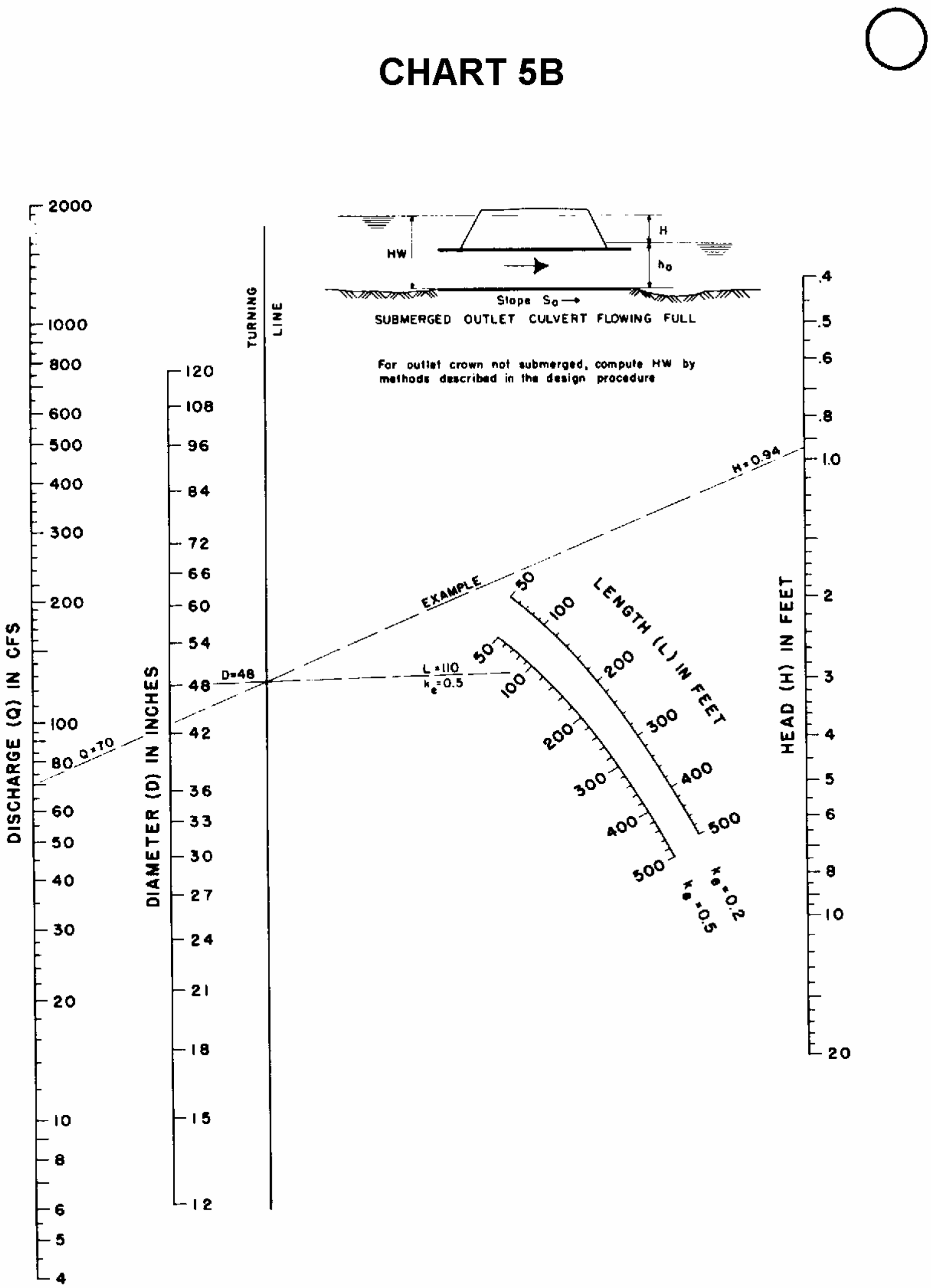
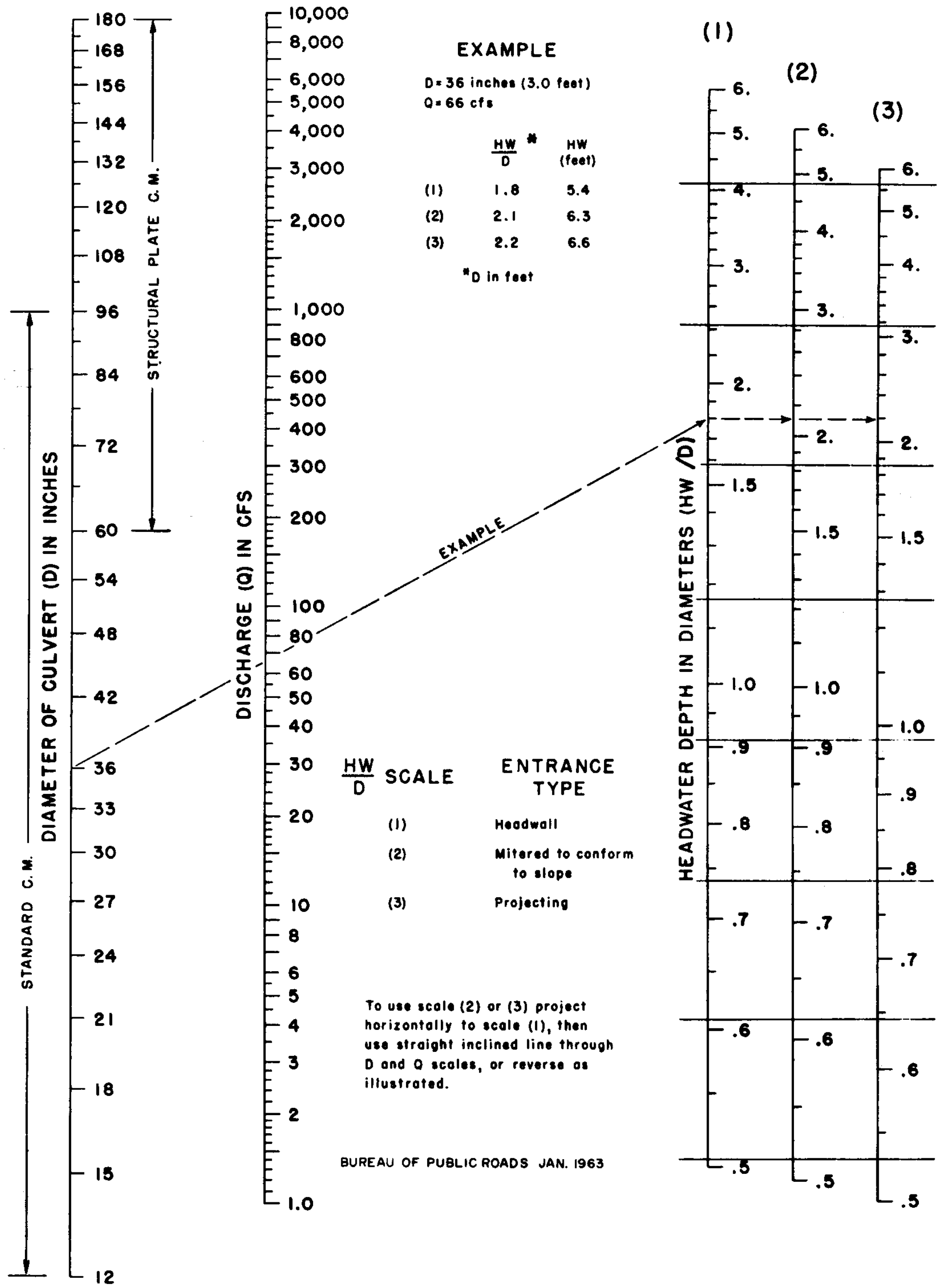
CHART 5B



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

CHART 29B



Headwater Depth for C. M. Pipe Culverts with Inlet Control - English Units

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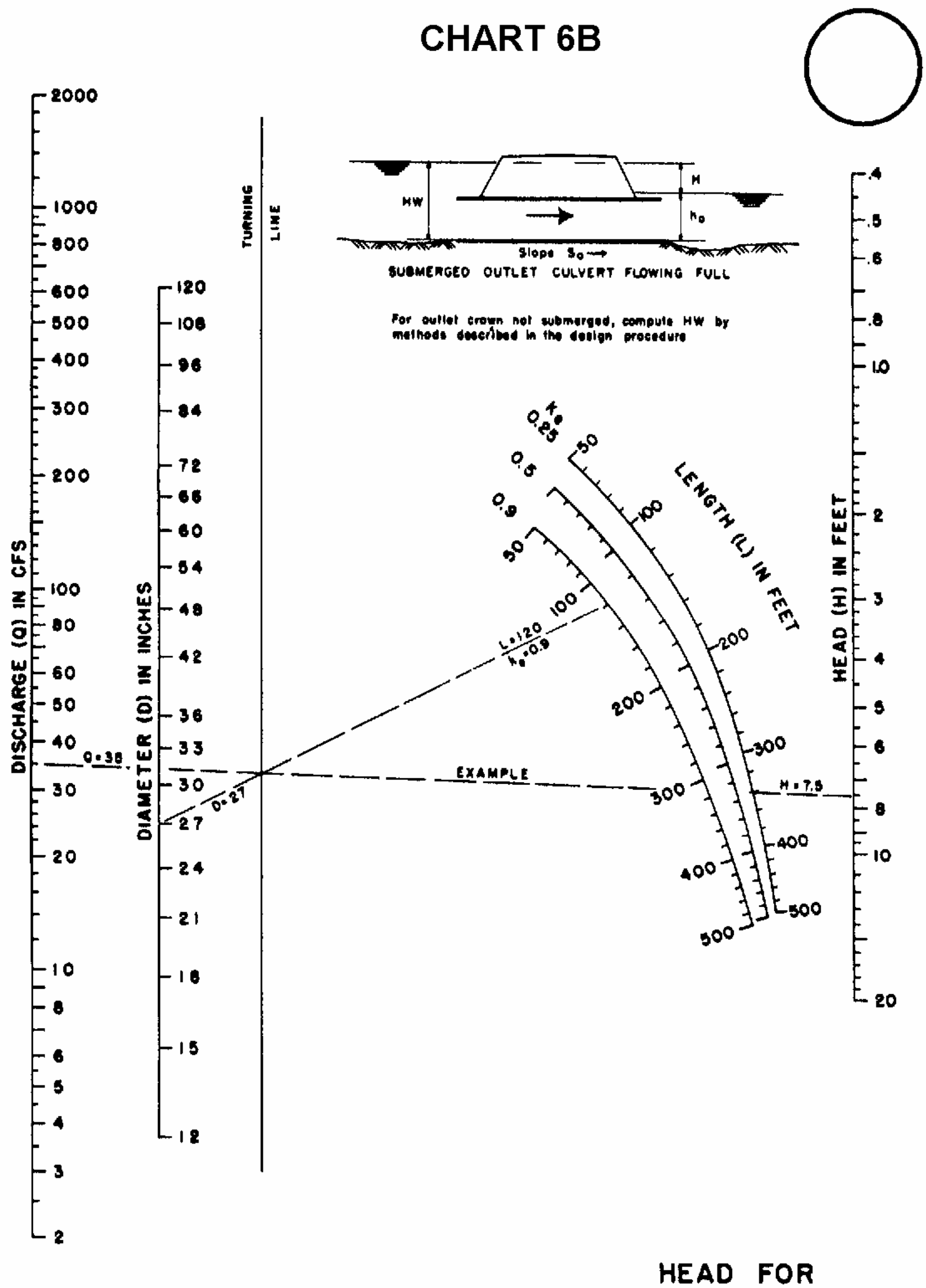
CHART 6B



HEAD FOR STANDARD C. M. PIPE CULVERTS FLOWING FULL
n = 0.024

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Figure 6-67
Headwater Depth for Concrete Arch Culverts with Inlet Control

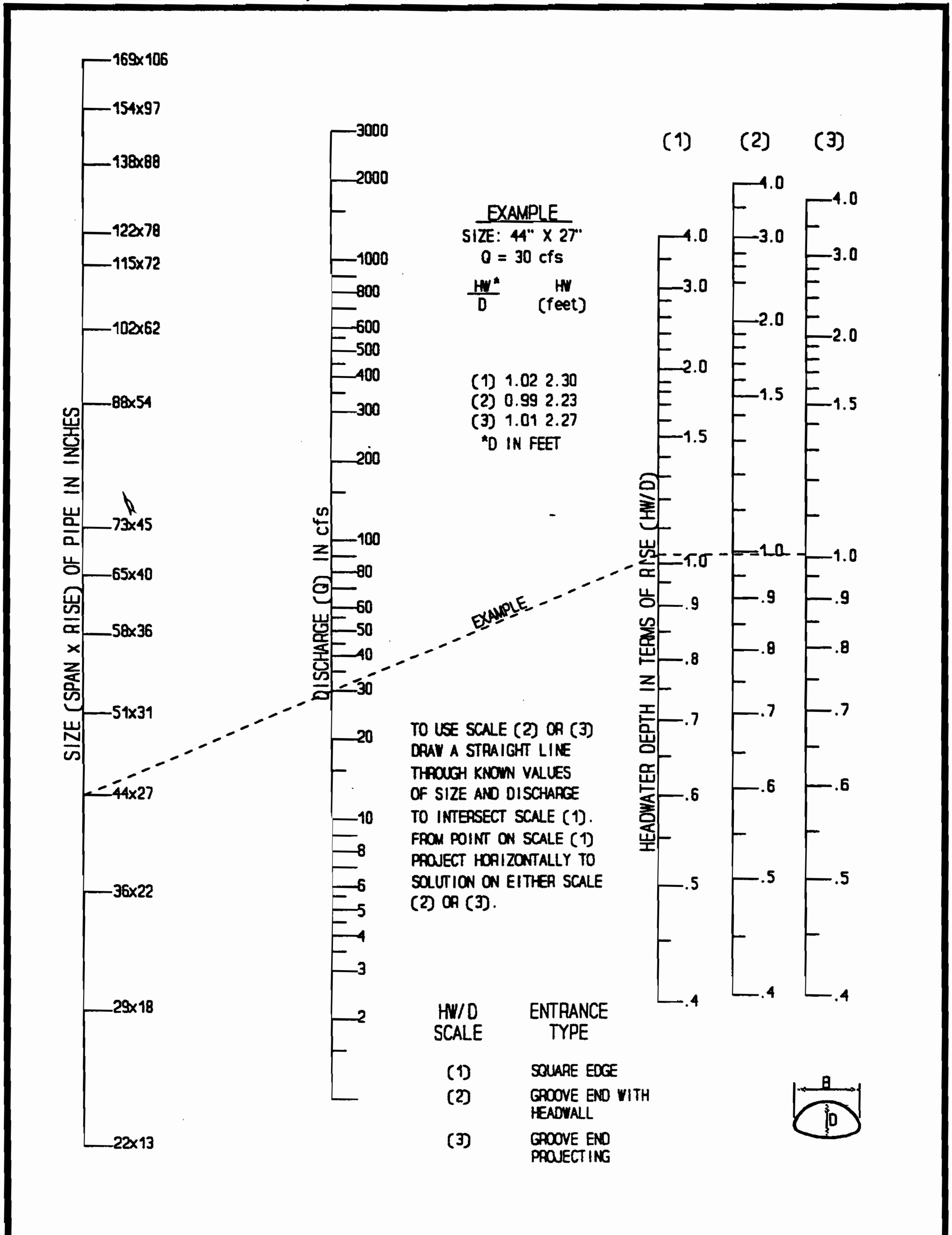


Figure 6-68
Head for Concrete Arch Culverts Flowing Full

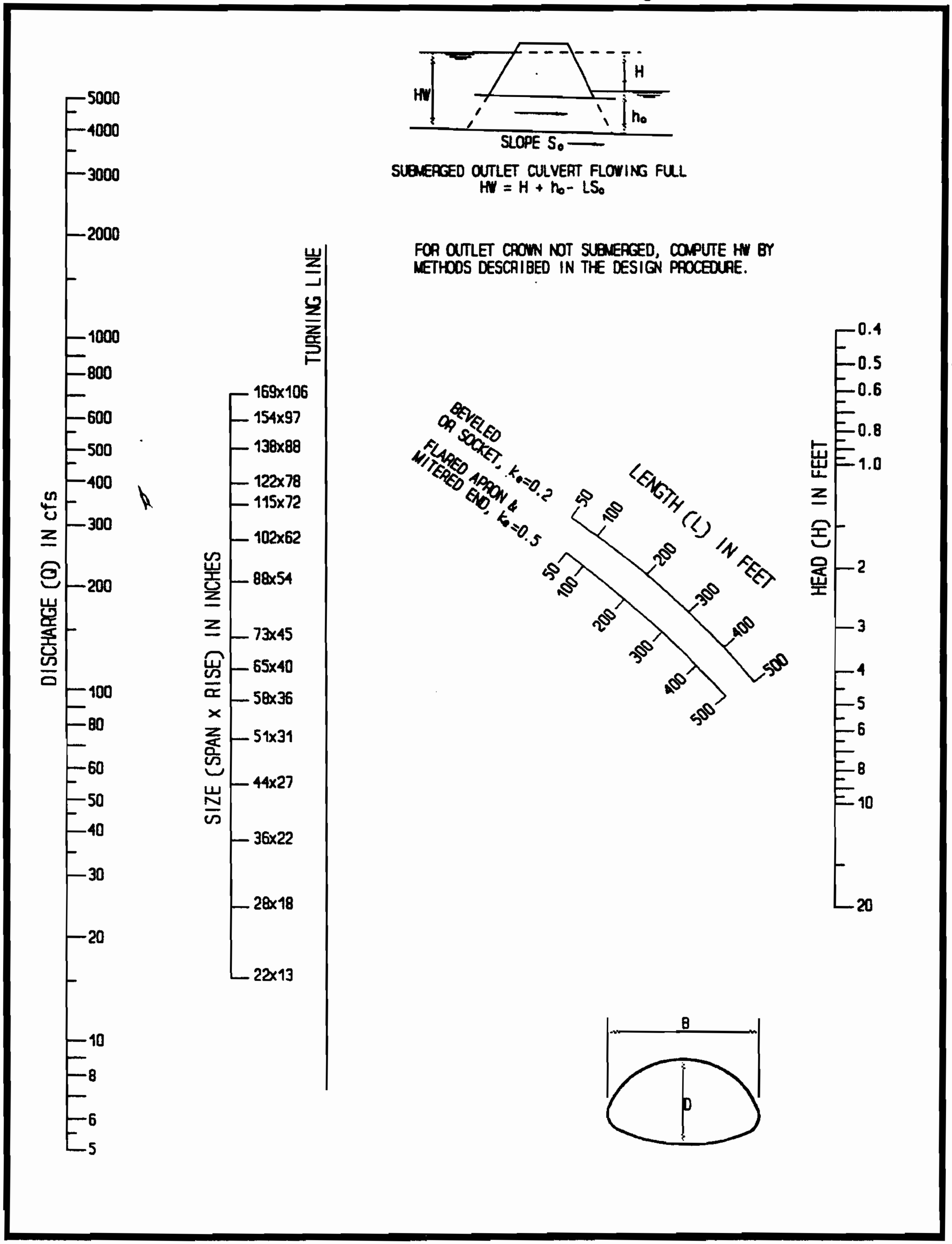
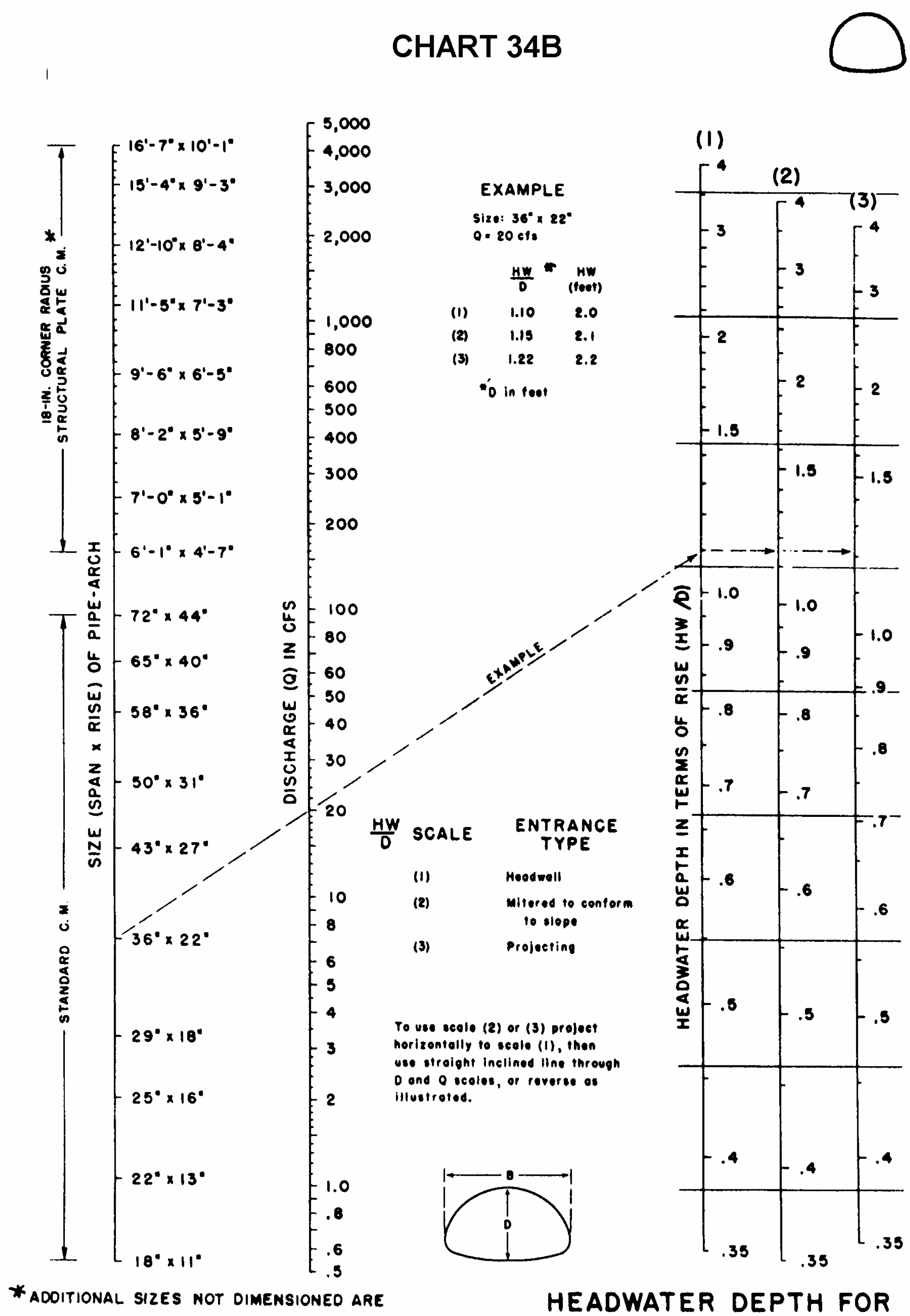


CHART 34B



*ADDITIONAL SIZES NOT DIMENSIONED ARE LISTED IN FABRICATOR'S CATALOG

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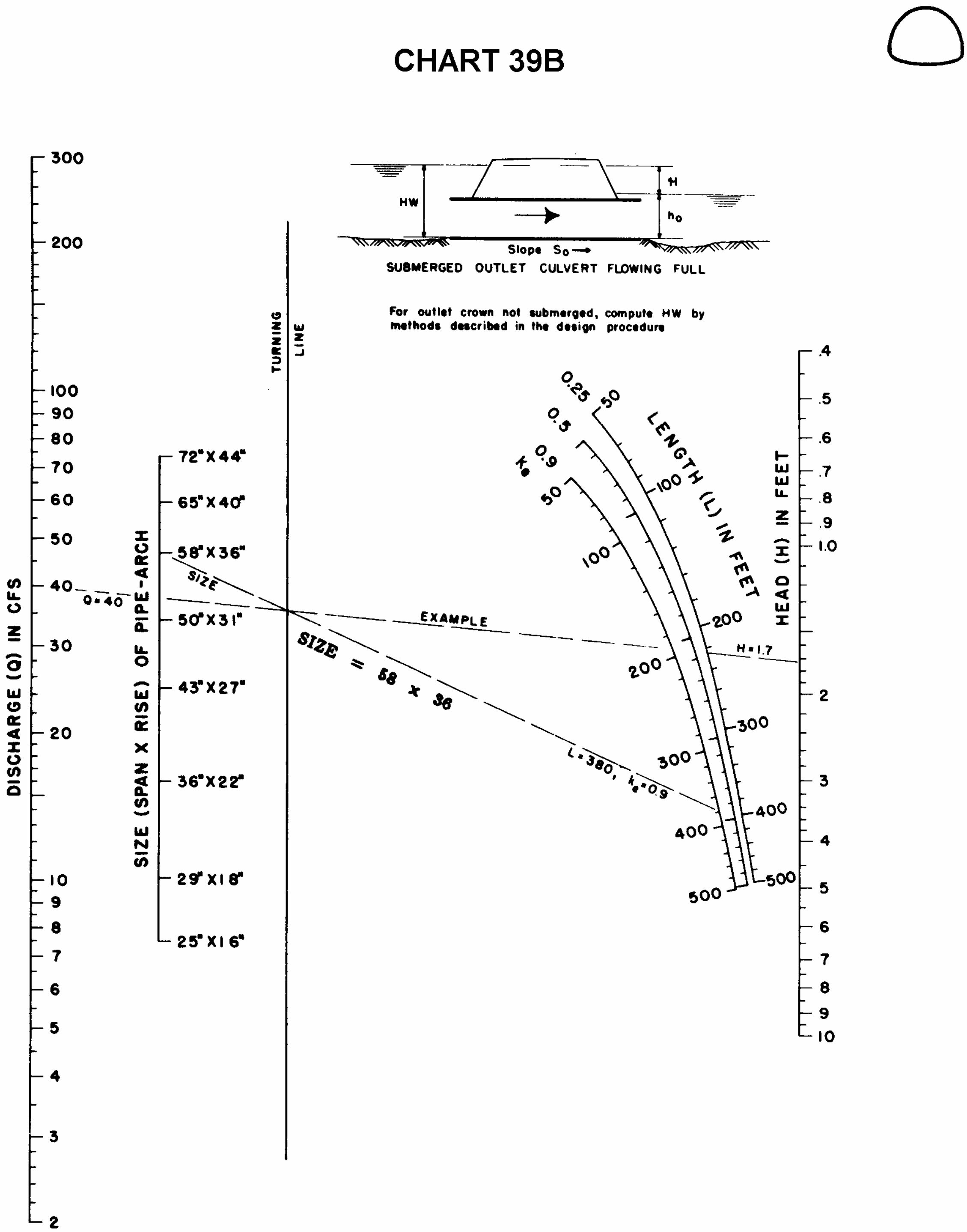
HEADWATER DEPTH FOR C. M. PIPE-ARCH CULVERTS WITH INLET CONTROL

CHART 39B



HEAD FOR STANDARD C. M. PIPE-ARCH CULVERTS FLOWING FULL
n=0.024

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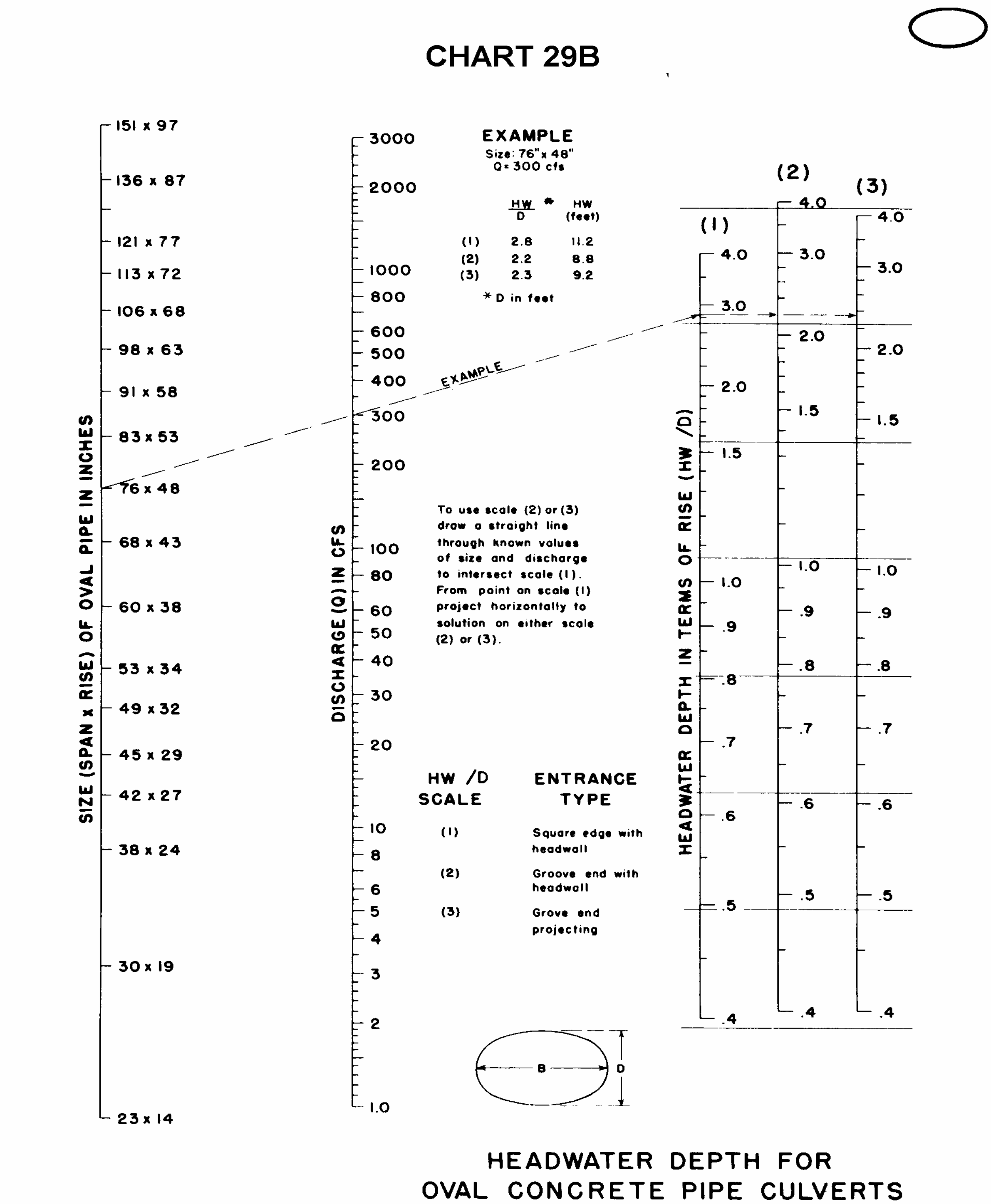
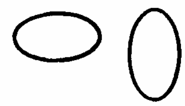
CHART 29B

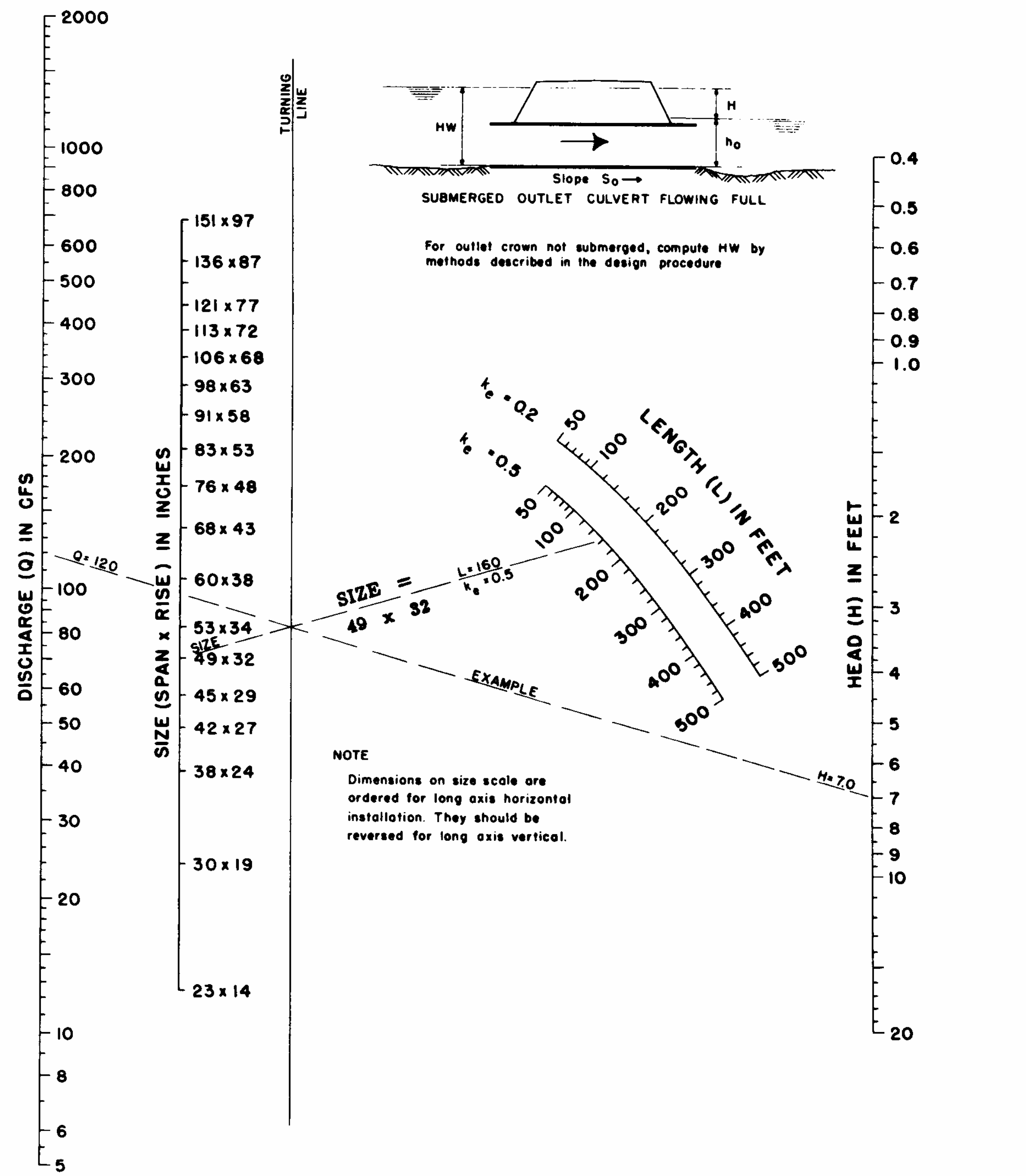


HEADWATER DEPTH FOR
OVAL CONCRETE PIPE CULVERTS
LONG AXIS HORIZONTAL
WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

CHART 33B





HEAD FOR
OVAL CONCRETE PIPE CULVERTS
LONG AXIS HORIZONTAL OR VERTICAL
FLOWING FULL
n = 0.012

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Figure 6-77
Allowable Fill Heights for
Reinforced Circular Concrete Pipe

Pipe Diameter (Inches)	Allowable Fill height (Ft.)					
	Class III		Class IV		Class V	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
12	1.50	10	1.00	18	0.50	25
15	1.50	10	1.00	18	0.50	25
18	1.50	10	1.00	18	0.50	25
21	1.50	10	1.00	18	0.50	25
24	1.50	10	1.00	18	0.50	25
27	1.50	10	1.00	18	0.50	25
30	1.50	10	1.00	18	0.50	25
36	1.50	12	1.00	20	0.50	30
42	1.50	12	1.00	20	0.50	30
48	1.50	12	1.00	20	0.50	30
54	1.50	12	1.00	20	0.50	30
60	1.50	12	1.00	20	0.50	30
72	1.50	12	1.00	20	0.50	30

NOTES

1. Beddings: Class C for Class III pipes
   Class B for Class IV and Class V pipes

2. Minimum fill height represents the minimum cover from top of the pipe to the subgrade top elevation. When the cover is further restricted, ductile iron pipe with Class A bedding may be used with a minimum cover of 3 inches to top of subgrade.

3. Maximum fill height is measured from the finished grade.

Figure 6-78
Allowable Fill Heights for Round Corrugated Steel Pipe
Plain Galvanized

EQUIVALENT ROUND PIPE DIAMETER (IN.)	AREA (FT.^{2})	MINIMUM COVER (FT.)	MINIMUM METAL THICKNESS (IN.)	MINIMUM METAL THICKNESS (GAGE)	MAXIMUM FILL HEIGHTS (FT.)
2 2/3" x 1/2" CORRUGATIONS					
12	0.8				124
15	1.2		0.064	16	100
18	1.8				83
24	3.1				62
30	4.8				62
36	7.1		0.079	14	51
42	9.6				44
48	12.6	1.0			54
54	15.9		0.109	12	46
60	19.6		0.138	10	51
66	23.8				43
72	28.3				44
78	33.2		0.168	8	~~50~~ 37
84	38.5				~~41~~ 30
90	44.2				~~33~~ 25
96	50.3				~~27~~ 20
3" x 1" AND 5" x 1" CORRUGATIONS					
36	7.1				60
42	9.6				51
48	12.6				45
54	15.9		0.079	14	40
60	19.6				36
66	23.8				33
72	28.3	1.0			30
78	33.2				38
84	38.5				35
90	44.2		0.109	12	33
96	50.3				31

NOTE: THE GAGE SHOWN ABOVE ARE INDUSTRY STANDARD. ONLY THE GAGE SHOWN FOR EACH PIPE SIZE MAY BE USED.

Figure 6-79
Allowable Fill Heights for Corrugated Steel Pipe Arches
Plain Galvanized

EQUIVALENT ROUND PIPE DIAMETER (IN.)	SPAN AND RISE (IN.)	AREA (FT.²)	MINIMUM COVER (FT.)	MINIMUM METAL THICKNESS (IN.)	MINIMUM METAL THICKNESS (GAGE)	MAXIMUM FILL HEIGHTS (FT.)
2 2/3" x 1/2" CORRUGATIONS						
15	17 x 13	1.2				22
18	21 x 15	1.7				21
21	24 x 18	2.3		0.079	14	19
24	28 x 20	2.9				18
30	35 x 24	4.4				18
36	42 x 29	6.5				15
42	49 x 33	8.4	1.0	0.109	12	14
48	57 x 38	11.3		0.138	10	14
54	64 x 43	14.4				14
60	71 x 47	17.4				14
66	77 x 52	21.3		0.168	8	14
72	83 x 57	25.6				15
3" x 1" AND 5" x 1" CORRUGATIONS						
36	40 x 31	7.0		0.079	14	23
42	46 x 31	9.4				22
54	53 x 41	12.3				~~21~~
60	60 x 46	15.6				~~21~~ 31
66	66 x 51	19.3	1.0			28
72	73 x 55	23.2		0.109	12	26
78	81 x 59	27.4				24
84	87 x 63	32.1				22
90	95 x 67	37.0				20
96	103 x 71	42.4	1.5			18

NOTE: THE GAGE SHOWN ABOVE ARE INDUSTRY STANDARD. ONLY THE GAGE SHOWN FOR EACH PIPE SIZE MAY BE USED.

Figure 6-80
Allowable Fill Heights for Round Corrugated Aluminum Pipe

EQUIVALENT ROUND PIPE DIAMETER (IN.)	AREA ($FT.^2$)	MINIMUM COVER (FT.)	MINIMUM METAL THICKNESS (IN.)	MINIMUM METAL THICKNESS (GAGE)	MAXIMUM FILL HEIGHTS (FT.)
2 2/3" x 1/2" CORRUGATIONS					
12	0.8				116
15	1.2		0.075	14	90
18	1.8				75
24	3.1				56
30	4.8	1.0			63
36	7.1		0.105	12	52
42	9.6				58
48	12.6		0.135	10	50
54	15.9				45
60	19.6				49
66	23.8	1.5			44
72	28.3				40
78	33.2		0.164	8	37
84	38.5				34
90	44.2	2.0			N.A.
96	50.3				N.A.
3" x 1" AND 5" x 1" CORRUGATIONS					
36	7.1				42
42	9.6	1.0	0.075	14	36
48	12.6				31
54	15.9				39
60	19.6		0.105	12	35
66	23.8				32
72	28.3	1.5			38
78	33.2				35
84	38.5		0.135	10	32
90	44.2				30
96	50.3	2.0	0.164	8	34

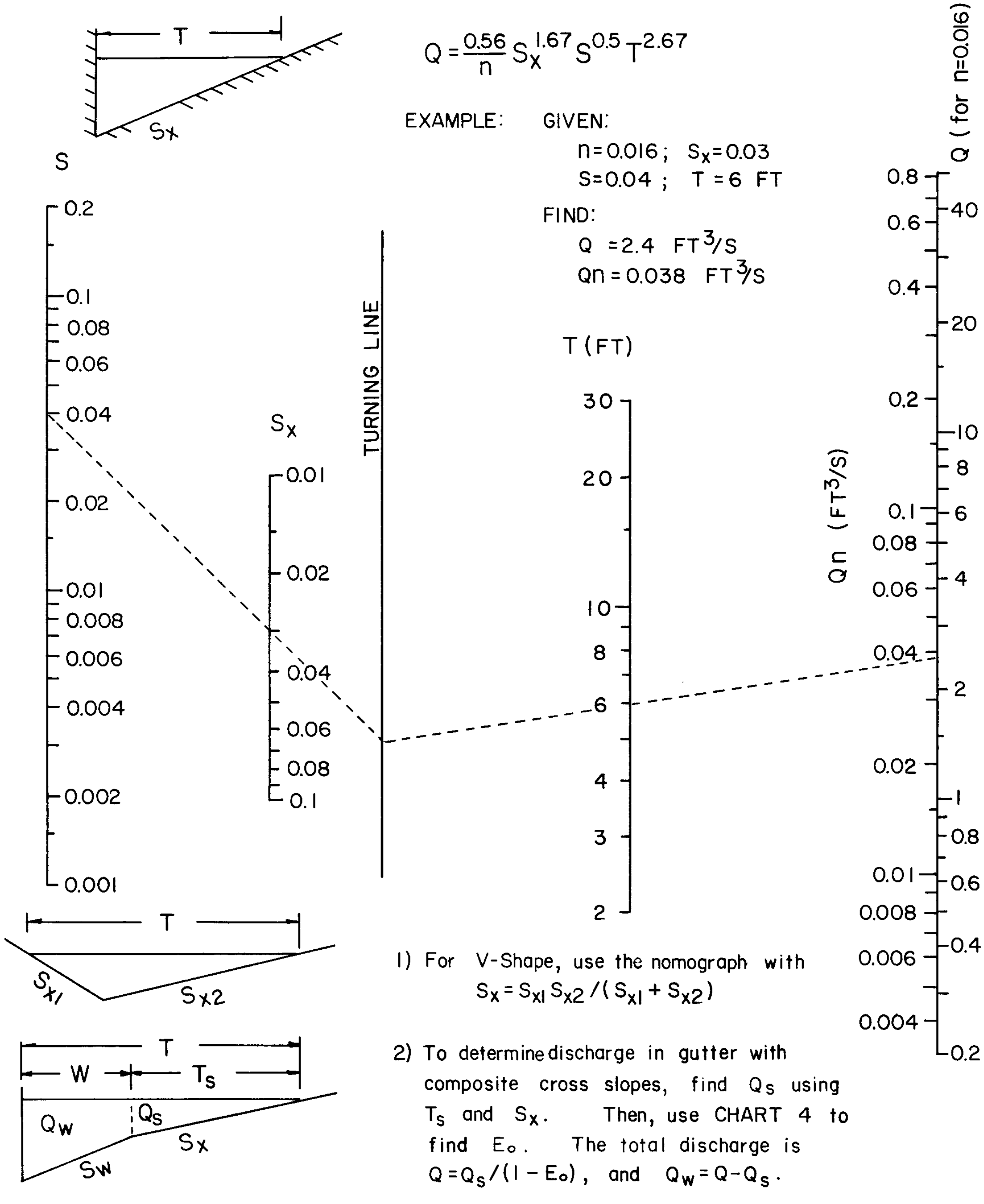
NOTE: THE GAGE SHOWN ABOVE ARE INDUSTRY STANDARD. ONLY THE GAGE SHOWN FOR EACH PIPE SIZE MAY BE USED.

Figure 6-81
Allowable Fill Heights for Corrugated Aluminum Pipe Arches

EQUIVALENT ROUND PIPE DIAMETER (IN.)	SPAN AND RISE (IN.)	AREA (FT.^{2})	MINIMUM COVER (FT.)	MINIMUM METAL THICKNESS		MAXIMUM FILL HEIGHTS (FT.)
				(IN.)	(GAGE)	
2 2/3" x 1/2" CORRUGATIONS						
15	17 x 13	1.2				15
18	21 x 15	1.7		0.105	12	15
21	24 x 18	2.3	1.25			14
24	28 x 20	2.9				14
30	35 x 24	4.4		0.134	10	13
36	42 x 29	6.5				13
42	49 x 33	8.4	1.50			12
48	57 x 38	11.3				8
54	64 x 43	14.4		0.164	8	7
60	71 x 47	17.4				7
66	77 x 52	21.3	2.00			7
72	83 x 57	25.6				7
3" x 1" AND 5" x 1" CORRUGATIONS						
36	40 x 31	7.0				29
42	46 x 31	9.4	1.50	0.105	12	25
54	53 x 41	12.3				29
60	60 x 46	15.6				29
66	66 x 51	19.3	1.75			25
72	73 x 55	23.2		0.135	10	22
78	81 x 59	27.4				29
84	87 x 63	32.1	2.00			26
90	95 x 67	37.0				24
96	103 x 71	42.4	2.25			34

NOTE: THE GAGE SHOWN ABOVE ARE INDUSTRY STANDARD. ONLY THE GAGE SHOWN FOR EACH PIPE SIZE MAY BE USED.

CHART 1B



Flow in Triangular Gutter Sections - English Units

A - 3

Figure 6-96

Average Width of Water Spread in a Triangular Gutter Section

T_1/T_2	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8
T_a/T_2	0.65	0.66	0.68	0.70	0.74	0.77	0.82	0.86	0.90

Figure 6-98
Curb, Gutter and Inlet Selection

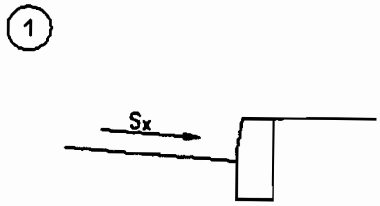
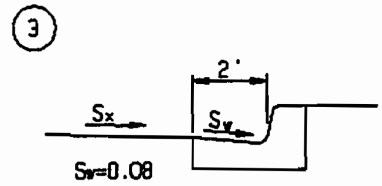
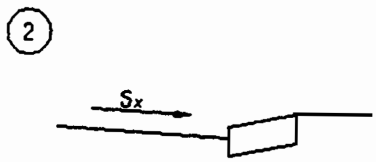
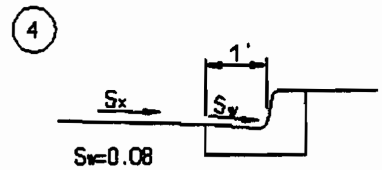
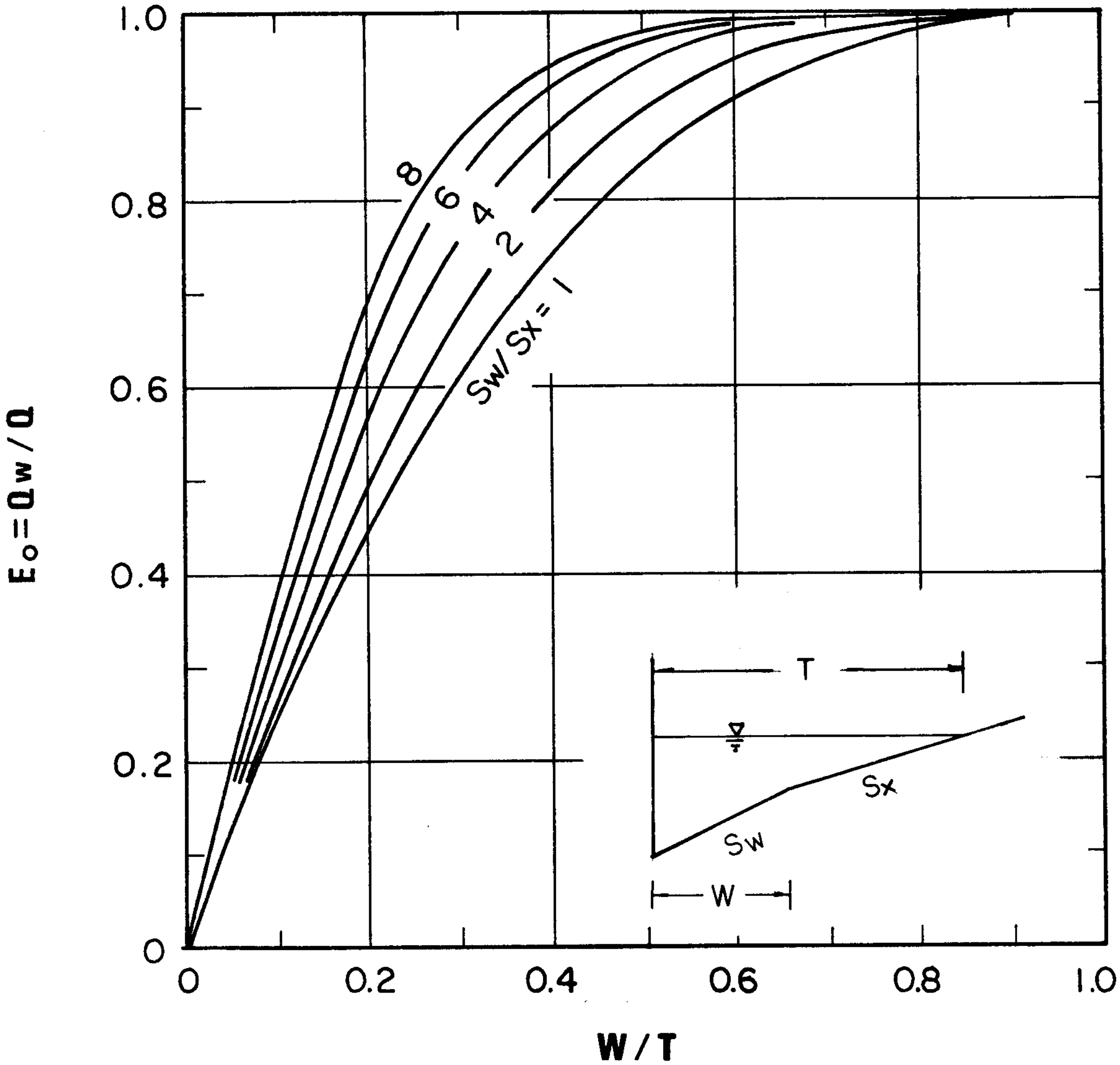
UNIFORM CROSS SLOPE		COMPOSITE CROSS SLOPE	
TYPICAL SECTION		TYPICAL SECTION	
CURB TYPE	P.C.C. CURB, TYPE 1, TYPE 2	CURB & GUTTER TYPE	INT. P.C.C. CURB & GUTTER, TYPE 1
INLET TYPE	CATCH BASIN A, A-A	INLET TYPE	CATCH BASIN J, J MODIFIED
TYPICAL SECTION		TYPICAL SECTION	
CURB TYPE	P.C.C. PARKWAY CURB, TYPE 1, TYPE 2	CURB & GUTTER TYPE	INT. P.C.C. CURB & GUTTER, TYPE 3
INLET TYPE	CATCH BASIN B, P.W.B.D.	INLET TYPE	CURB OPENING INLET

CHART 2A



Ratio of frontal flow to total gutter flow.

A - 4

Figure 6-101
Flow in Composite Gutter Sections

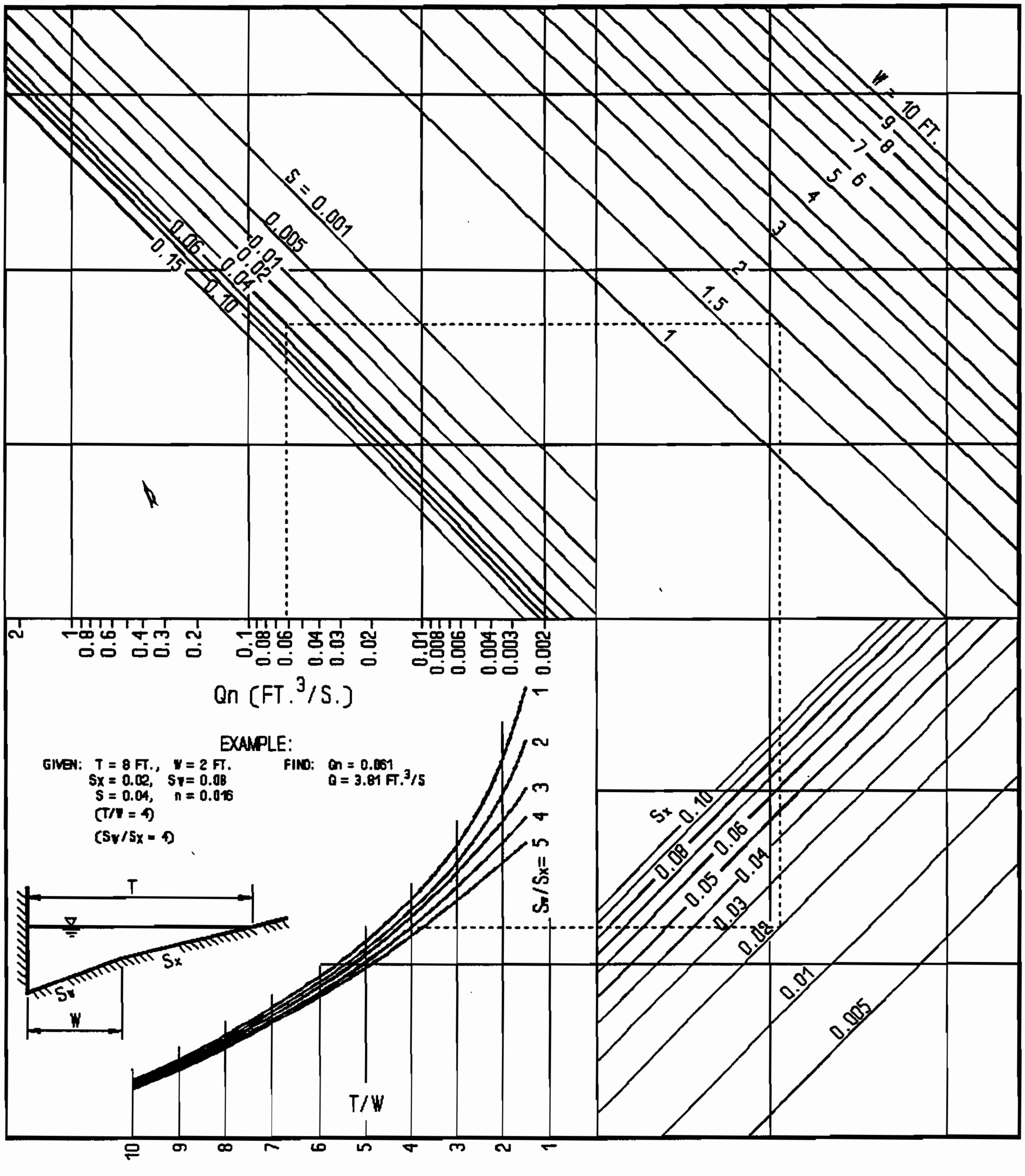


Figure 6-102

Gutter Flow Rate Q on Uniform Cross Slope (cfs)

$n = 0.016$ & $S_x = 0.02$

	Longitudinal Slope, S x 100 (%)														
Spread T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.01	0.02	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.08
3	0.05	0.06	0.09	0.11	0.13	0.15	0.16	0.18	0.19	0.20	0.21	0.22	0.23	0.24	0.25
4	0.11	0.14	0.20	0.25	0.29	0.32	0.36	0.38	0.41	0.44	0.46	0.48	0.50	0.52	0.55
5	0.20	0.26	0.37	0.46	0.52	0.58	0.65	0.70	0.75	0.79	0.84	0.88	0.92	0.96	0.99
6	0.33	0.43	0.61	0.75	0.86	0.96	1.05	1.14	1.22	1.30	1.37	1.43	1.50	1.56	1.62
7	0.50	0.65	0.92	1.13	1.30	1.46	1.60	1.73	1.84	1.96	2.06	2.16	2.26	2.34	2.44
8	0.72	0.93	1.32	1.61	1.86	2.08	2.28	2.47	2.64	2.80	2.95	3.09	3.23	3.36	3.49
9	0.99	1.27	1.80	2.21	2.55	2.85	3.13	3.38	3.61	3.83	4.04	4.23	4.42	4.60	4.78
10	1.31	1.69	2.39	2.93	3.38	3.78	4.14	4.46	4.78	5.07	5.35	5.61	5.86	6.10	6.33

Figure 6-103

Gutter Flow Rate Q on Uniform Cross Slope (cfs)

$n = 0.016$ & $S_x = 0.04$

Spread, T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.06	0.07	0.10	0.12	0.14	0.16	0.18	0.19	0.21	0.22	0.22	0.24	0.25	0.26	0.27
3	0.16	0.22	0.30	0.38	0.43	0.48	0.53	0.57	0.61	0.65	0.68	0.71	0.75	0.78	0.81
4	0.36	0.46	0.66	0.81	0.93	1.04	1.13	1.23	1.32	1.40	1.47	1.55	1.61	1.68	1.74
5	0.65	0.84	1.19	1.46	1.69	1.88	2.07	2.23	2.39	2.53	2.67	2.80	2.93	3.05	3.16
6	1.06	1.37	1.94	2.38	2.75	3.06	3.37	3.64	3.89	4.13	4.35	4.56	4.76	4.96	5.15
7	1.60	2.07	2.93	3.59	4.14	4.64	5.08	5.48	5.87	6.23	6.56	6.88	7.19	7.48	7.76
8	2.29	2.96	4.19	5.13	5.93	6.62	7.26	7.84	8.38	8.89	9.37	9.83	10.26	10.68	11.09
9	3.14	4.05	5.74	7.02	8.11	9.07	9.94	10.73	11.48	12.17	12.83	13.45	14.05	14.63	15.18
10	4.16	5.37	7.60	9.30	10.74	12.00	13.16	14.21	15.20	16.11	16.99	17.82	18.61	19.37	20.1

Figure 6-104

Gutter Flow Rate Q on Uniform Cross Slope (cfs)

$n = 0.016$ & $S_x = 0.06$

	Longitudinal Slopes x 100 (%)														
Spread T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.11	0.14	0.20	0.25	0.28	0.32	0.35	0.38	0.40	0.43	0.45	0.47	0.50	0.52	0.54
3	0.33	0.42	0.60	0.73	0.85	0.95	1.04	1.12	1.20	1.27	1.34	1.47	1.47	1.53	1.59
4	0.71	0.91	1.29	1.58	1.83	2.05	2.24	2.42	2.59	2.75	2.90	3.04	3.17	3.30	3.43
5	1.28	1.66	2.34	2.88	3.32	3.72	4.07	4.40	4.69	4.98	5.26	5.51	5.76	5.99	6.22
6	2.08	2.70	3.82	4.67	5.41	6.04	6.62	7.15	7.65	8.10	8.55	8.97	9.37	9.75	10.12
7	3.16	4.08	5.77	7.06	8.16	9.12	9.99	10.79	11.54	12.24	12.90	13.53	14.13	14.71	15.26
8	4.51	5.82	8.22	10.09	11.6	13.0	14.27	15.41	16.46	17.46	18.42	19.32	20.18	21.00	21.79
9	6.17	7.97	11.27	13.81	15.9	17.8	19.53	21.10	22.55	23.92	25.22	26.45	27.62	28.75	29.84
10	8.18	10.56	14.93	18.29	21.1	23.6	25.87	27.94	29.87	31.69	33.40	35.03	36.59	38.08	39.5

Figure 6-105

Gutter Flow Rate Q on Composite Section (cfs)

$n = 0.016$, $S_x = 0.02$, $S_w = 0.08$ & $W = 2$ Feet

Spread T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.18	0.23	0.33	0.40	0.46	0.52	0.57	0.61	0.66	0.70	0.73	0.77	0.80	0.84	0.87
3	0.24	0.32	0.45	0.55	0.64	0.72	0.78	0.85	0.91	0.96	1.01	1.05	1.11	1.16	1.20
4	0.34	0.44	0.62	0.76	0.88	0.98	1.07	1.16	1.24	1.32	1.39	1.46	1.52	1.58	1.64
5	0.46	0.58	0.84	1.03	1.19	1.33	1.46	1.57	1.68	1.79	1.88	1.97	2.06	2.15	2.23
6	0.61	0.79	1.12	1.38	1.59	1.78	1.95	2.10	2.25	2.39	2.52	2.64	2.76	2.87	2.98
7	0.81	1.04	1.48	1.82	2.09	2.34	2.57	2.78	2.97	3.15	3.32	3.48	3.64	3.79	3.93
8	1.04	1.36	1.92	2.35	2.72	3.04	3.33	3.60	3.85	4.08	4.31	4.52	4.71	4.91	5.10
9	1.06	1.73	2.45	3.01	3.47	3.88	4.25	4.59	4.91	5.21	5.49	5.76	6.02	6.26	6.50
10	1.69	2.18	3.08	3.77	4.36	4.78	5.34	5.77	6.17	6.54	6.90	7.23	7.55	7.86	8.16

Figure 6-106

Gutter Flow Rate Q on Composite Section (cfs)

$n = 0.016$, $S_x = 0.04$, $S_w = 0.08$ & $W = 2$ Feet

	Longitudinal Slope, S x 100 (%)														
Spread T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.18	0.23	0.33	0.40	0.46	0.52	0.56	0.61	0.66	0.69	0.73	0.77	0.81	0.83	0.87
3	0.33	0.42	0.60	0.74	0.85	0.96	1.05	1.13	1.21	1.28	1.35	1.42	1.48	1.54	1.60
4	0.55	0.72	1.02	1.25	1.44	1.61	1.77	1.91	2.04	2.16	2.29	2.39	2.50	2.61	2.71
5	0.88	1.14	1.61	1.98	2.29	2.56	2.80	3.03	3.23	3.43	3.62	3.80	3.97	4.13	4.28
6	1.32	1.71	2.42	2.96	3.42	3.83	4.20	4.54	4.87	5.14	5.42	5.68	5.93	6.18	6.41
7	1.89	2.45	3.46	4.25	4.90	5.47	5.72	6.49	6.93	7.35	7.75	8.13	8.50	8.84	9.16
8	2.61	3.38	4.77	5.84	6.75	7.55	8.26	8.93	9.54	10.13	10.67	11.19	11.69	12.17	12.63
9	3.49	4.50	6.36	7.79	9.00	10.06	11.02	11.91	12.73	13.5	14.23	14.93	15.59	16.23	16.85
10	4.53	5.85	8.27	10.13	11.70	13.08	14.33	15.48	16.55	17.55	18.50	19.41	20.27	21.10	21.89

Figure 6-107

Gutter Flow Rate Q on Composite Section (cfs)

n = 0.016, S_x = 0.06, S_w = 0.08 & W = 2 Feet

	Longitudinal Slope, S x 100 (%)														
Spread T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.18	0.23	0.33	0.40	0.46	0.52	0.57	0.61	0.66	0.70	0.73	0.77	0.80	0.84	0.87
3	0.42	0.55	0.77	0.95	1.10	1.23	1.35	1.45	1.55	1.65	1.74	1.82	1.90	1.98	2.06
4	0.83	1.07	1.51	1.86	2.14	2.40	2.63	2.84	3.03	3.22	3.39	3.56	3.72	3.87	4.01
5	1.43	1.84	2.61	3.20	3.69	4.13	4.52	4.89	5.22	5.54	5.84	6.13	6.40	6.66	6.91
6	2.25	2.91	4.12	5.05	5.83	6.52	7.14	7.71	8.24	8.74	9.22	9.67	10.10	10.51	10.91
7	3.34	4.31	6.10	7.47	8.63	9.64	10.57	11.4	12.2	12.95	13.65	14.31	14.95	15.56	16.15
8	4.71	6.08	8.60	10.54	12.17	13.60	14.90	16.1	17.2	18.25	19.24	20.18	21.08	21.94	22.77
9	6.39	8.25	11.67	14.30	16.51	18.45	20.21	21.8	23.3	24.77	26.11	27.38	28.60	29.77	30.84
10	8.41	10.86	15.36	18.82	21.73	24.29	26.61	28.5	30.7	32.59	34.36	36.04	37.64	39.18	40.66

Figure 6-108

Average Gutter Flow Velocity V ~~(cfs)~~ (fps)

Uniform Cross Slope, $S_x = 0.02$, $n = 0.016$

	Longitudinal Slope, S x 100 (100%)														
Spread T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.01	0.02	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.08
3	0.04	0.05	0.08	0.10	0.12	0.14	0.15	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23
4	0.10	0.13	0.18	0.22	0.26	0.28	0.31	0.33	0.36	0.38	0.40	0.41	0.43	0.45	0.47
5	0.18	0.23	0.31	0.38	0.43	0.47	0.52	0.55	0.59	0.62	0.65	0.68	0.71	0.74	0.76
6	0.29	0.36	0.48	0.57	0.64	0.70	0.76	0.81	0.86	0.92	0.96	1.00	1.04	1.08	1.12
7	0.42	0.51	0.67	0.79	0.88	0.97	1.05	1.12	1.18	1.25	1.31	1.36	1.42	1.47	1.52
8	0.57	0.69	0.89	1.04	1.16	1.27	1.37	1.46	1.55	1.63	1.71	1.78	1.85	1.91	1.98
9	0.75	0.89	1.13	1.32	1.47	1.60	1.73	1.84	1.94	2.05	2.14	2.23	2.32	2.40	2.48
10	0.95	1.12	1.41	1.62	1.80	1.96	2.11	2.25	2.38	2.50	2.61	2.72	2.83	2.93	2.98

Figure 6-109

Average Gutter Flow Velocity V ~~(cfs)~~ (fps)

Uniform Cross Slope, $S_x = 0.04$, n = 0.016

Spread T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	0.70	0.92	1.29	1.58	1.84	2.05	2.25	2.43	2.60	2.76	2.90	3.05	3.18	3.31	3.43
3	0.93	1.20	1.70	2.08	2.40	2.69	2.94	3.19	3.40	3.61	3.80	3.99	4.16	4.34	4.50
4	1.13	1.45	2.06	2.52	2.92	3.25	3.57	3.85	4.12	4.37	4.61	4.84	5.05	5.26	5.46
5	1.30	1.69	2.39	2.93	3.38	3.79	4.14	4.47	4.78	5.07	5.34	5.60	5.86	6.10	6.33
6	1.47	1.90	2.70	3.31	3.82	4.27	4.68	5.03	5.40	5.73	6.04	6.34	6.62	6.89	7.14
7	1.64	2.11	2.99	3.66	4.23	4.73	5.18	5.60	5.99	6.35	6.69	7.02	7.33	7.63	7.92
8	1.79	2.32	3.27	4.00	4.63	5.18	5.67	6.12	6.54	6.95	7.32	7.68	8.02	8.34	8.66
9	1.93	2.50	3.53	4.33	5.01	5.43	6.13	6.62	7.08	7.51	7.91	8.31	8.67	9.03	9.37
10	2.08	2.68	3.80	4.65	5.37	6.00	6.58	7.11	7.59	8.05	8.49	8.91	9.30	9.68	10.05

(fps)

Figure 6-110

Average Gutter Flow Velocity V ~~(cfs)~~

Uniform Cross Slope, $S_x = 0.06$, $n = 0.016$

Spread T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	0.93	1.20	1.70	2.08	2.40	2.69	2.94	3.18	3.40	3.61	3.80	3.99	4.17	4.34	4.50
3	1.22	1.57	2.23	2.73	3.15	3.52	3.86	4.17	4.46	4.73	4.98	5.23	5.46	5.68	5.90
4	1.48	1.91	2.70	3.31	3.82	4.27	4.67	5.05	5.40	5.73	6.04	6.33	6.62	6.89	7.15
5	1.71	2.21	3.13	3.84	4.42	4.96	5.43	5.86	6.27	6.65	7.01	7.35	7.68	7.99	8.29
6	1.94	2.50	3.54	4.33	5.00	5.60	6.13	6.62	7.08	7.51	7.92	8.30	8.67	9.03	9.37
7	2.15	2.77	3.92	4.80	5.55	6.20	6.79	7.34	7.85	8.32	8.77	9.20	9.60	10.00	10.38
8	2.34	3.03	4.29	5.25	6.06	6.78	7.43	8.02	8.58	9.10	9.59	10.06	10.51	10.94	11.35
9	2.54	3.28	4.64	5.68	6.56	7.33	8.03	8.68	9.28	9.84	10.37	10.88	11.37	11.83	12.28
10	2.72	3.52	4.96	6.09	7.04	7.87	8.62	9.31	9.95	10.56	11.13	11.67	12.19	12.69	13.17

Figure 6-111

Average Gutter Flow Velocity V ~~(cfs)~~ (fps)

Composite Section, $S_x = 0.02$, $n = 0.016$, $s_w = 0.08$ & $W = 2$ Feet

Spread T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	1.12	1.45	2.06	2.52	2.91	3.26	3.57	3.85	4.12	4.37	4.61	4.83	5.05	5.25	5.45
3	1.17	1.53	2.17	2.65	3.06	3.43	3.75	4.06	4.34	4.60	4.85	5.08	5.31	5.53	5.74
4	1.21	1.57	2.22	2.72	3.14	3.51	3.85	4.16	4.44	4.71	4.96	5.21	5.45	5.67	5.88
5	1.24	1.61	2.28	2.79	3.22	3.60	3.95	4.26	4.56	4.83	5.10	5.35	5.58	5.81	6.03
6	1.28	1.66	2.34	2.88	3.32	3.71	4.07	4.40	4.69	4.98	5.26	58.51	5.76	5.99	6.22
7	1.33	1.72	2.43	2.98	3.44	3.85	4.21	4.56	4.87	5.17	5.45	5.71	5.97	6.21	6.45
8	1.38	1.79	2.53	3.10	3.58	4.01	4.39	4.73	5.07	5.38	5.67	5.94	6.21	6.46	6.71
9	1.44	1.86	2.64	3.23	3.73	4.17	5.47	4.94	5.28	5.60	5.91	6.19	6.47	6.73	6.99
10	1.50	1.94	2.75	3.37	3.89	4.35	4.77	5.15	5.51	5.84	6.16	6.46	6.74	7.02	7.29

(fps)

Figure 6-112

Average Gutter Flow Velocity V ~~(cfs)~~

Composite Section, $S_x = 0.04$, $n = 0.016$, $s_w = 0.08$ & $W = 2$ Feet

Spread T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	1.12	1.45	2.06	2.52	2.92	3.25	3.57	3.85	4.13	4.37	4.61	4.84	5.05	5.26	5.46
3	1.28	1.64	2.33	2.85	3.29	3.68	4.04	4.36	4.66	4.94	5.21	5.47	5.71	5.94	6.17
4	1.40	1.81	2.56	3.13	3.62	4.05	4.43	4.79	5.12	5.43	5.73	6.01	6.27	6.53	6.78
5	1.53	1.97	2.79	3.42	3.95	4.42	4.84	5.22	5.59	5.93	6.24	6.55	6.84	7.13	7.39
6	1.66	2.14	3.03	3.72	4.28	4.79	5.25	5.67	6.06	6.43	6.78	7.11	7.43	7.13	8.02
7	1.79	2.31	3.26	4.00	4.62	5.17	5.66	6.11	6.53	6.94	7.31	7.67	8.01	8.33	8.65
8	1.92	2.48	3.51	4.29	4.96	5.54	6.08	6.56	7.01	7.44	7.85	8.23	8.60	8.94	9.28
9	2.04	2.64	3.74	4.58	5.30	5.92	6.49	7.00	7.49	7.94	8.37	8.78	9.17	9.54	9.91
10	3.11	2.83	3.98	4.87	5.63	6.29	6.89	7.43	7.95	8.44	8.89	9.33	9.74	10.13	10.52

Figure 6-113

Average Gutter Flow Velocity V ~~(cfs)~~ (fps)

Composite Section, $S_x = 0.06$, $n = 0.016$, $s_w = 0.08$ & $W = 2$ Feet

Spread T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	1.12	1.45	2.06	2.52	2.91	3.26	3.57	3.85	4.12	4.37	4.61	4.83	5.06	5.25	5.45
3	1.37	1.77	2.51	3.08	3.55	3.97	4.35	4.69	5.03	5.33	5.62	5.89	6.16	6.41	6.65
4	1.60	2.06	2.92	3.57	4.13	4.61	5.05	5.46	5.84	6.19	6.53	6.85	7.15	7.44	7.72
5	1.81	2.33	3.30	4.05	4.67	5.23	5.73	6.19	6.61	7.02	7.39	7.76	8.10	8.43	8.75
6	2.01	2.60	3.68	4.51	5.20	5.82	6.37	6.88	7.36	7.81	8.22	8.63	9.02	9.38	9.74
7	2.21	2.85	4.04	4.94	5.71	6.39	7.00	7.56	8.08	8.57	9.04	9.47	9.89	10.30	10.69
8	2.40	3.10	4.39	5.37	6.20	6.94	7.60	8.21	8.78	9.31	9.81	10.29	10.75	11.19	11.61
9	2.58	3.34	4.71	5.79	6.68	7.47	8.18	8.84	9.45	10.02	10.57	11.08	11.58	12.05	12.50
10	2.76	3.57	5.05	6.19	7.14	7.99	8.75	9.45	10.10	10.72	11.30	11.85	12.38	12.88	13.37

Figure 6-114
Frontal Flow Interception Factor, R_f

V (fps)	6.8 or Less	7	8	9	10	11	12	13	14	15
R_f	1.00	0.92	0.84	0.74	0.65	0.56	0.47	0.39	0.30	0.20

Figure 6-115
Side Flow Interception Factor, R_s

V (fps)	S_x (Feet/foot)				
	0.02	0.03	0.04	0.05	0.06
1	0.63	0.71	0.77	0.81	0.83
2	0.32	0.42	0.49	0.55	0.59
3	0.19	0.26	0.32	0.37	0.41
4	0.12	0.17	0.22	0.26	0.29
5	0.08	0.12	0.16	0.19	0.22
6	0.06	0.09	0.12	0.14	0.17
7	0.05	0.07	0.09	0.11	0.13
8	0.04	0.06	0.07	0.09	0.11
9	0.03	0.05	0.06	0.07	0.09
10	0.03	0.04	0.05	0.06	0.07
11	0.02	0.03	0.04	0.05	0.06
12	0.02	0.03	0.04	0.05	0.05
13	0.02	0.02	0.03	0.04	0.05
14	0.01	0.02	0.03	0.03	0.04
15	0.01	0.02	0.02	0.03	0.04

Figure 6-116

Gutter Flow Intercepted by Standard Grate, Q_i (cfs)

Uniform Cross Slope S_x = 0.02 & n = 0.016

	Longitudinal Slope, S x 100 (%)														
Spread, T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.01	0.02	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.08
3	0.04	0.05	0.08	0.10	0.12	0.14	0.15	0.17	0.18	0.19	0.20	0.21	0.22	0.22	0.23
4	0.10	0.13	0.18	0.22	0.26	0.28	0.31	0.33	0.36	0.38	0.40	0.41	0.43	0.45	0.47
5	0.18	0.23	0.31	0.38	0.43	0.47	0.52	0.55	0.59	0.62	0.65	0.68	0.71	0.74	0.76
6	0.29	0.36	0.48	0.57	0.64	0.70	0.76	0.81	0.86	0.92	0.96	1.00	1.04	1.08	1.12
7	0.42	0.51	0.67	0.79	0.88	0.97	1.05	1.12	1.18	1.25	1.31	1.36	1.42	1.47	1.52
8	0.57	0.69	0.89	1.04	1.16	1.27	1.37	1.46	1.55	1.63	1.71	1.78	1.85	1.91	1.98
9	0.75	0.89	1.13	1.32	1.47	1.60	1.73	1.84	1.94	2.05	2.14	2.23	2.32	2.40	2.48
10	0.95	1.12	1.41	1.62	1.80	1.96	2.11	2.25	2.38	2.50	2.61	2.72	2.83	2.93	2.98

Figure 6-117

Gutter Flow Intercepted by Standard Grate, Q_i (cfs)

Uniform Cross Slope S_x = 0.04 & n = 0.016

Spread, T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	0.06	0.07	0.11	0.13	0.15	0.17	0.19	0.20	0.22	0.23	0.24	0.26	0.27	0.28	0.29
3	0.15	0.21	0.29	0.37	0.43	0.47	0.52	0.57	0.61	0.64	0.68	0.71	0.75	0.78	0.81
4	0.33	0.43	0.61	0.75	0.85	0.96	1.04	1.12	1.20	1.27	1.34	1.41	1.47	1.53	1.58
5	0.57	0.73	1.02	1.24	1.41	1.57	1.72	1.84	1.97	2.08	2.19	2.29	2.36	2.40	2.43
6	0.87	1.11	1.53	1.84	2.09	2.32	2.52	2.71	2.88	3.04	3.11	3.16	3.21	3.24	3.26
7	1.24	1.57	2.13	2.54	2.87	3.17	3.44	3.69	3.84	3.92	3.98	4.02	4.05	4.07	4.07
8	1.66	2.08	2.80	3.32	3.76	4.14	4.49	4.65	4.75	4.81	4.85	4.87	4.88	4.86	4.84
9	2.16	2.67	3.56	4.20	4.74	5.22	5.46	5.58	5.66	5.70	5.71	5.69	5.66	5.60	5.54
10	2.72	3.34	4.39	5.16	5.82	6.26	6.41	6.51	6.56	6.56	6.52	6.46	6.37	6.26	6.17

Figure 6-118

Gutter Flow Intercepted by Standard Grate, Q_i (cfs)

Uniform Cross Slope S_x = 0.06 & n = 0.016

	Longitudinal Slope, S x 100 (%)														
Spread, T (Feet)	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	0.11	0.14	0.20	0.25	0.28	0.32	0.35	0.38	0.40	0.43	0.45	0.47	0.50	0.52	0.54
3	0.32	0.41	0.58	0.70	0.82	0.91	1.00	1.07	1.15	1.21	1.28	1.34	1.40	1.46	1.51
4	0.67	0.85	1.17	1.42	1.63	1.81	1.97	2.11	2.26	2.39	2.51	2.58	2.62	2.66	2.69
5	1.16	1.46	1.98	2.36	2.68	2.97	3.22	3.46	3.63	3.71	3.77	3.82	3.85	3.87	3.88
6	1.80	2.23	2.96	3.50	3.96	4.36	4.73	4.86	4.92	5.01	5.05	5.07	5.07	5.05	5.02
7	2.59	3.15	4.12	4.83	5.45	5.95	6.12	6.23	6.29	6.32	6.31	6.27	6.20	6.12	6.01
8	3.49	4.20	5.42	6.34	7.11	7.39	7.54	7.60	7.60	7.55	7.47	7.34	7.18	7.00	6.79
9	4.53	5.40	6.88	8.01	8.67	8.88	8.96	8.94	8.85	8.71	8.51	8.26	7.97	7.66	7.31
10	5.70	6.72	8.48	9.83	10.21	10.35	10.34	10.22	10.01	9.72	9.37	8.98	8.53	8.03	7.51

Figure 6-119

Gutter Flow Intercepted by Standard Grate, Q_i (cfs)

Composite Section $S_x = 0.02$, $S_w = 0.08$, W = 2 Feet & n = 0.016

	Longitudinal Slope, S x 100 (%)														
Spread, T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.18	0.23	0.33	0.40	0.46	0.52	0.57	0.61	0.66	0.70	0.73	0.77	0.80	0.84	0.87
3	0.23	0.31	0.44	0.54	0.63	0.71	0.77	0.84	0.90	1.94	1.01	1.04	1.09	1.14	1.18
4	0.33	0.42	0.59	0.72	0.84	0.93	1.02	1.10	1.18	1.25	1.32	1.38	1.44	1.50	1.55
5	0.43	0.55	0.76	0.93	1.07	1.19	1.31	1.40	1.50	1.60	1.68	1.76	1.83	1.91	1.98
6	0.55	0.70	0.96	1.17	1.34	1.49	1.63	1.76	1.87	1.98	2.52	2.18	2.28	2.37	2.44
7	0.70	0.88	1.19	1.44	1.64	1.82	1.98	2.14	2.28	2.41	2.53	2.65	2.77	2.86	2.90
8	0.87	1.08	1.45	1.74	1.97	2.18	2.37	2.55	2.72	2.87	3.02	3.16	3.28	3.33	3.37
9	1.06	1.30	1.73	2.06	2.33	2.58	2.80	3.00	3.20	3.38	3.55	3.70	3.76	3.81	3.85
10	1.28	1.56	2.04	2.41	2.72	3.00	3.26	3.49	3.71	3.92	4.11	4.18	4.25	4.30	4.34

Figure 6-120

Gutter Flow Intercepted by Standard Grate, Q_I (cfs)

Composite Section $S_x = 0.04$, $S_w = 0.08$, W = 2 Feet & n = 0.016

	Longitudinal Slope, S x 100 (%)														
Spread, T (Feet)	**0.30**	**0.50**	**1.00**	**1.50**	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**	**4.50**	**5.00**	**5.50**	**6.00**	**6.50**	**7.00**
2	0.18	0.23	0.33	0.40	0.46	0.52	0.57	0.61	0.66	0.70	0.73	0.77	0.80	0.84	0.87
3	0.32	0.41	0.59	0.72	0.83	0.93	1.02	1.10	1.18	1.25	1.31	1.38	1.44	1.50	1.55
4	0.53	0.68	0.95	1.16	1.32	1.48	1.62	1.74	1.87	1.97	2.08	2.18	2.25	2.28	2.32
5	0.81	1.03	1.41	1.70	1.95	2.16	2.35	2.53	2.70	2.85	2.97	3.03	3.08	3.12	3.14
6	1.16	1.45	1.96	2.35	2.67	2.95	3.21	3.45	3.67	3.78	3.85	3.90	3.95	3.98	3.99
7	1.58	1.96	2.60	3.08	3.50	3.86	4.19	4.49	4.61	4.69	4.76	4.80	4.83	4.84	4.84
8	2.08	2.53	3.32	3.92	4.42	4.87	5.27	5.47	5.56	5.63	5.68	5.69	5.70	5.68	5.65
9	2.64	3.18	4.11	4.82	5.43	5.96	6.27	6.41	6.49	6.54	6.56	6.55	6.52	6.46	6.38
10	3.27	3.89	4.99	5.82	6.53	7.08	7.26	7.38	7.45	7.46	7.43	7.37	7.29	7.18	7.05

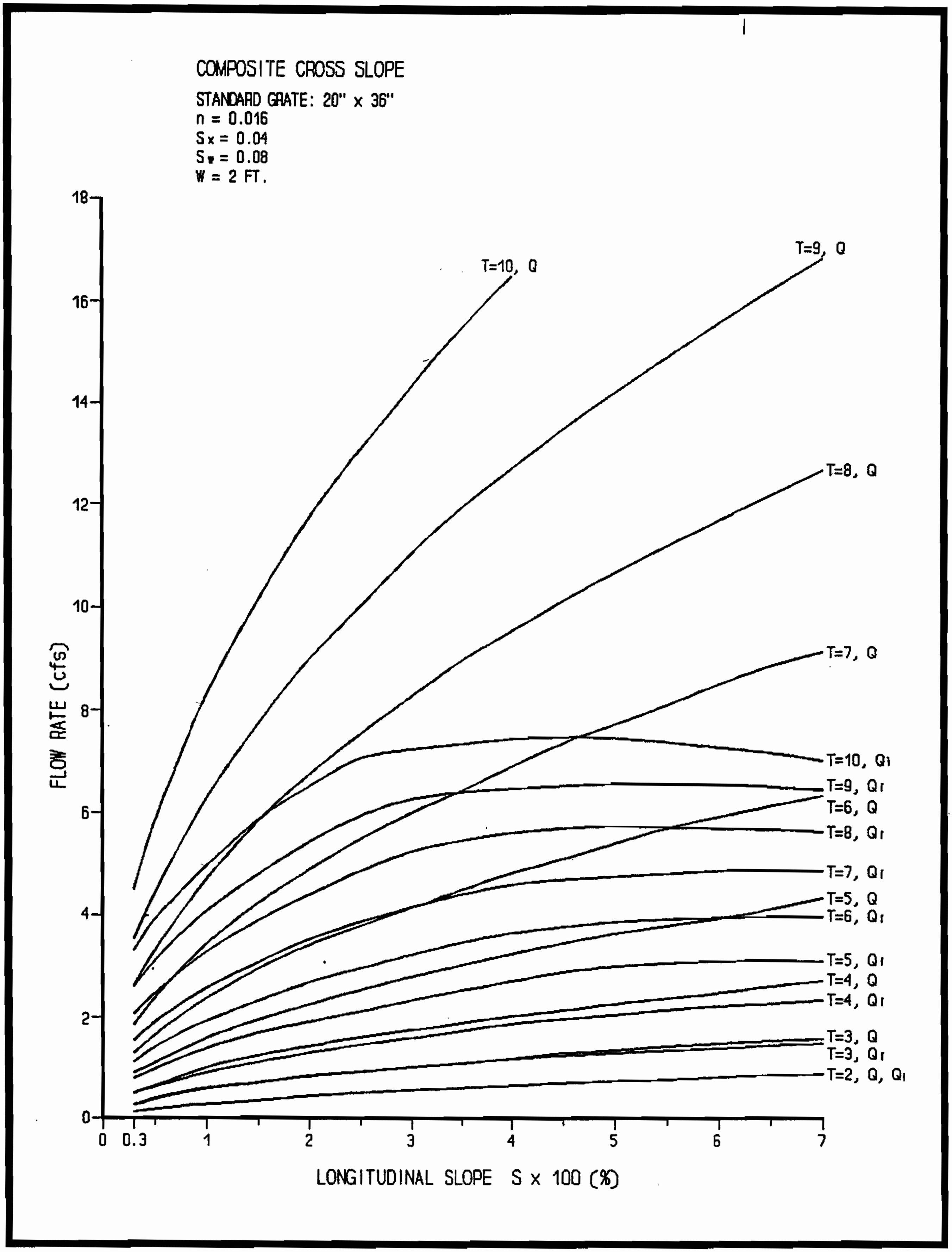
Figure 6-121

Gutter Flow Intercepted by Standard Grate, Q_i (cfs)

Composite Section $S_x = 0.06$, $S_w = 0.08$, W = 2 Feet & n = 0.016

Spread, T (Feet)	Longitudinal Slope, S x 100 (%)														
	0.30	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00
2	0.18	0.23	0.33	0.40	0.46	0.52	0.57	0.61	0.66	0.70	0.73	0.77	0.80	0.84	0.87
3	0.41	0.54	0.75	0.92	1.06	1.19	1.30	1.40	1.49	1.65	1.68	1.82	1.82	1.86	1.89
4	0.79	1.00	1.39	1.69	1.93	2.15	2.35	2.52	2.69	2.84	2.89	2.94	2.98	3.01	3.03
5	1.30	1.63	2.22	2.67	3.03	3.36	3.66	3.92	4.01	4.09	4.14	4.18	4.20	4.21	4.21
6	1.95	2.42	3.24	3.85	4.36	4.82	5.13	5.25	5.33	5.39	5.42	5.42	5.40	5.37	5.31
7	2.75	3.36	4.42	5.21	5.89	6.35	6.52	6.62	6.67	6.68	6.65	6.58	6.50	6.39	6.26
8	3.68	4.44	5.76	6.76	7.57	7.80	7.94	8.00	7.89	7.91	7.80	7.64	7.45	7.23	6.99
9	4.73	5.65	7.24	8.46	9.08	9.28	9.36	9.32	9.21	9.04	8.79	8.51	8.18	7.82	7.44
10	5.90	6.98	8.87	10.27	10.63	10.76	10.73	10.59	10.33	10.01	9.62	9.18	8.67	8.14	7.55

Figure 6-122
Interception Capacity of Standard Grate
On Continuous Grade



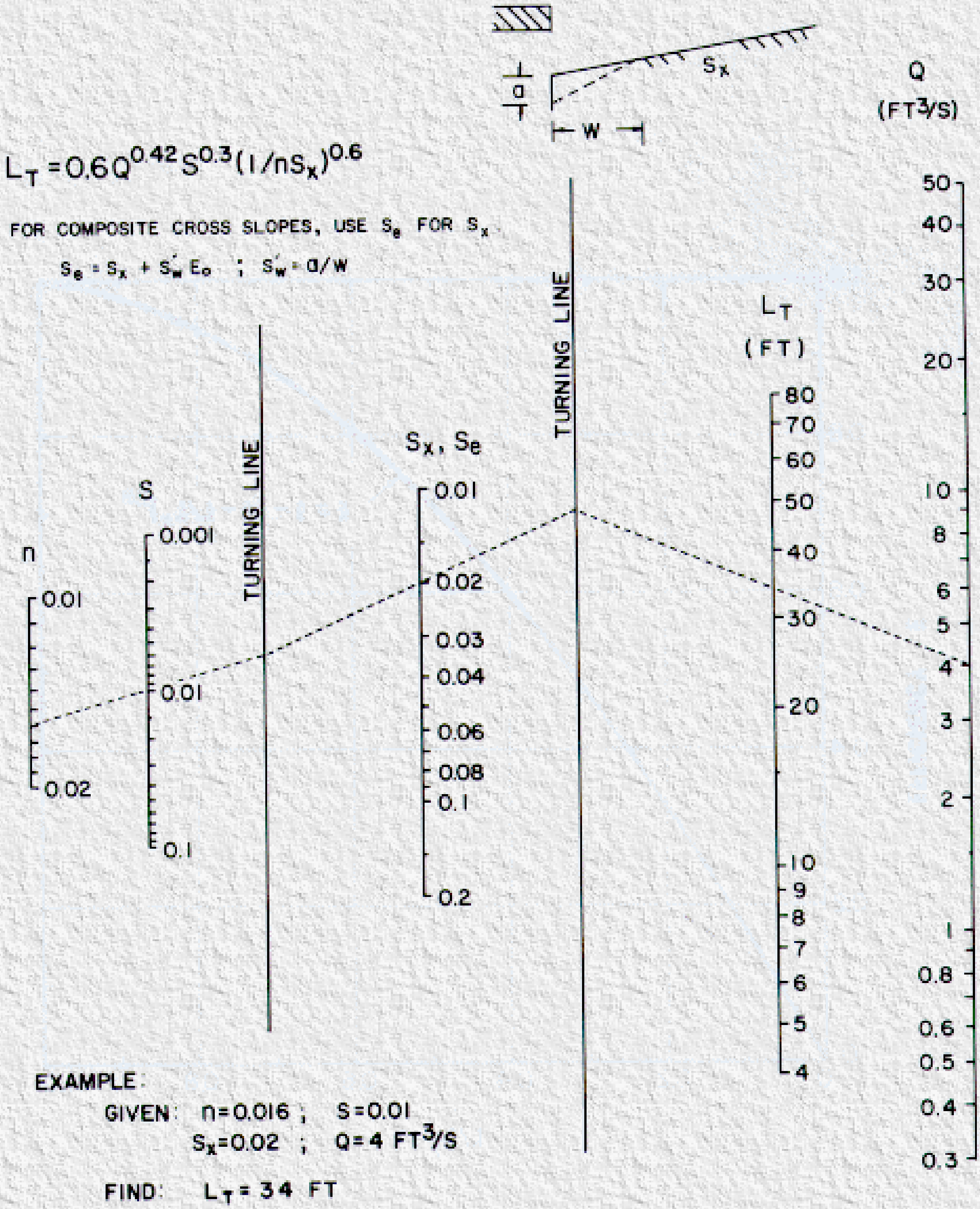
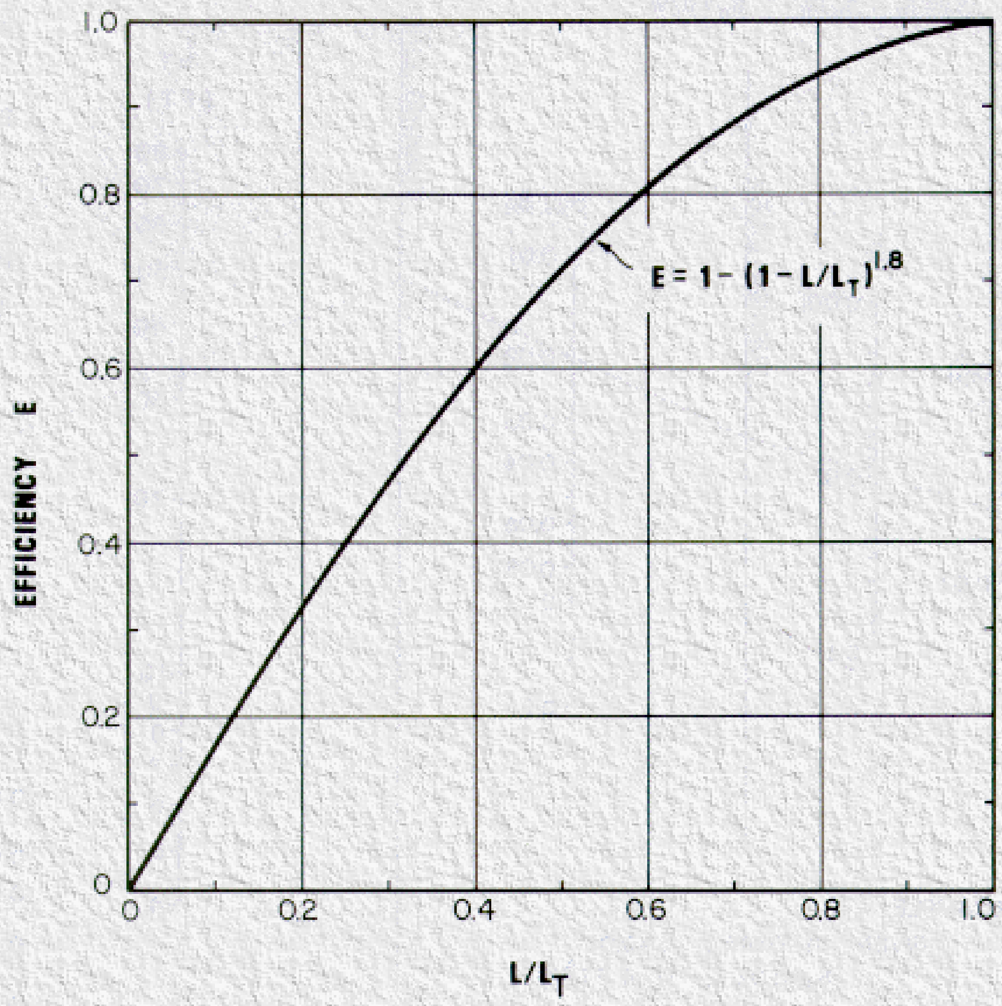
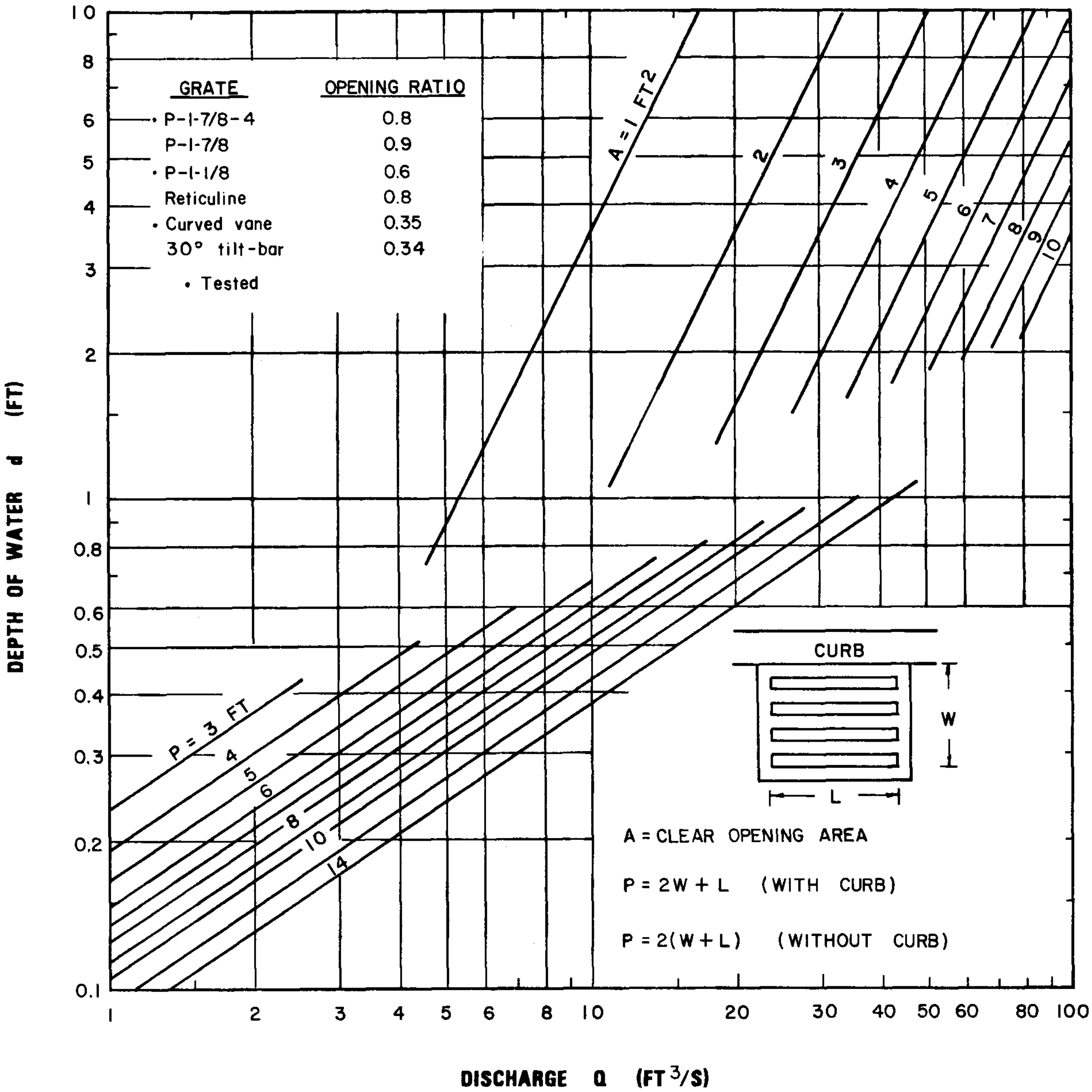


Chart 9. Curb-opening and slotted drain inlet length for total interception.



Curb-Opening and Slotted Drain Inlet Interception Efficiency

CHART 9B



Grate Inlet Capacity in Sump Conditions - English Units

A - 19

Figure 6-126
Depressed Curb-Opening Inlet Capacity in Sump Conditions

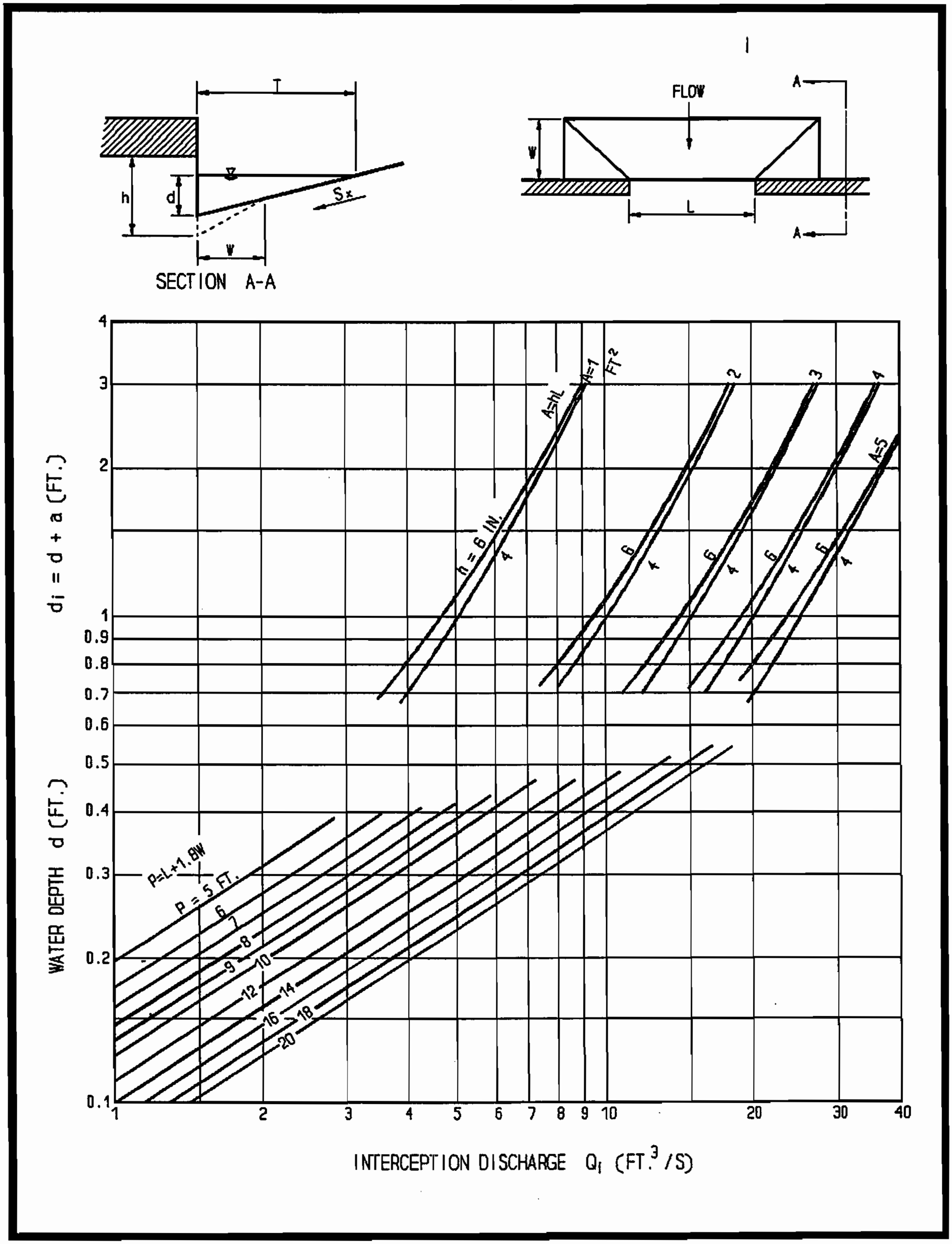
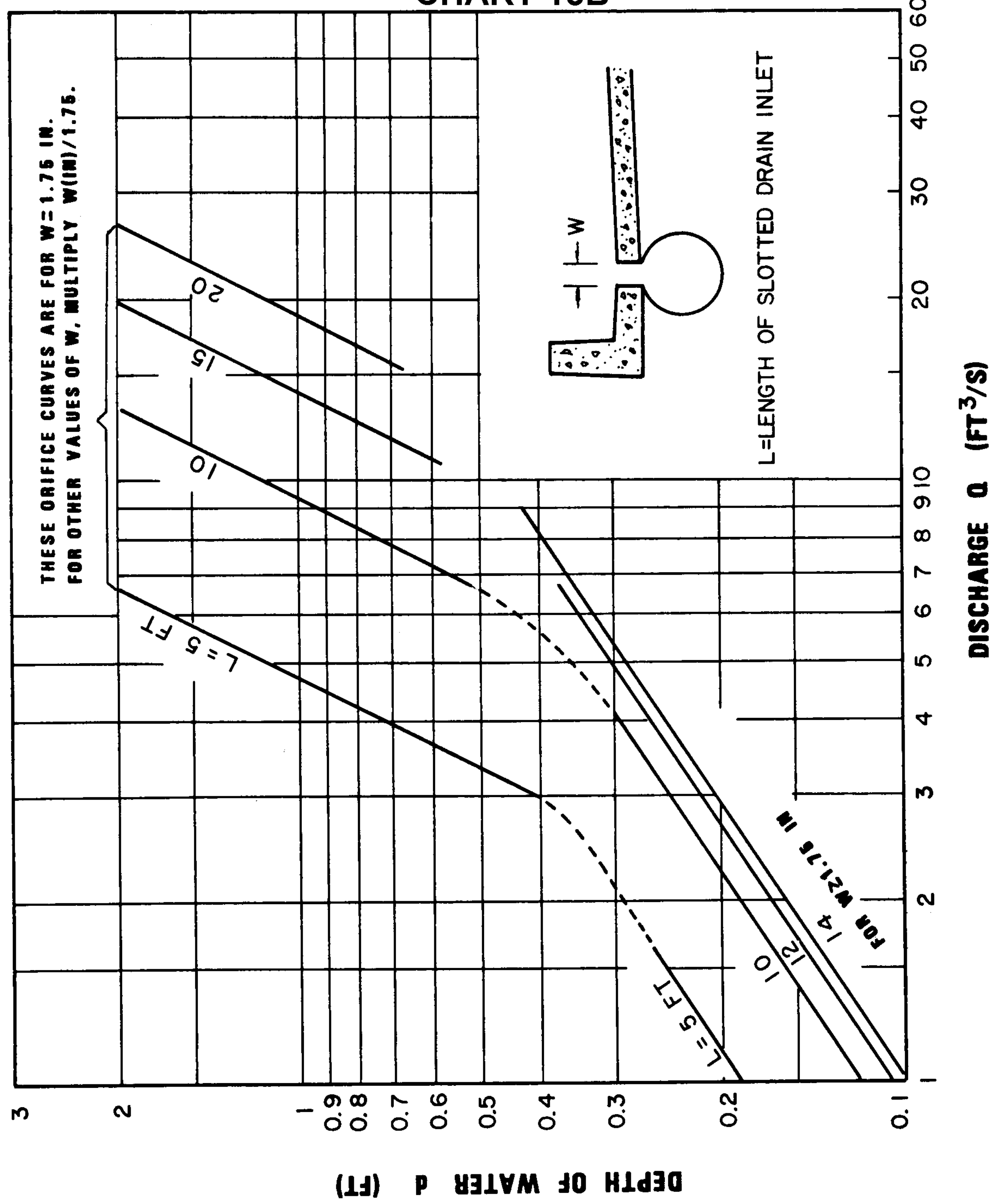


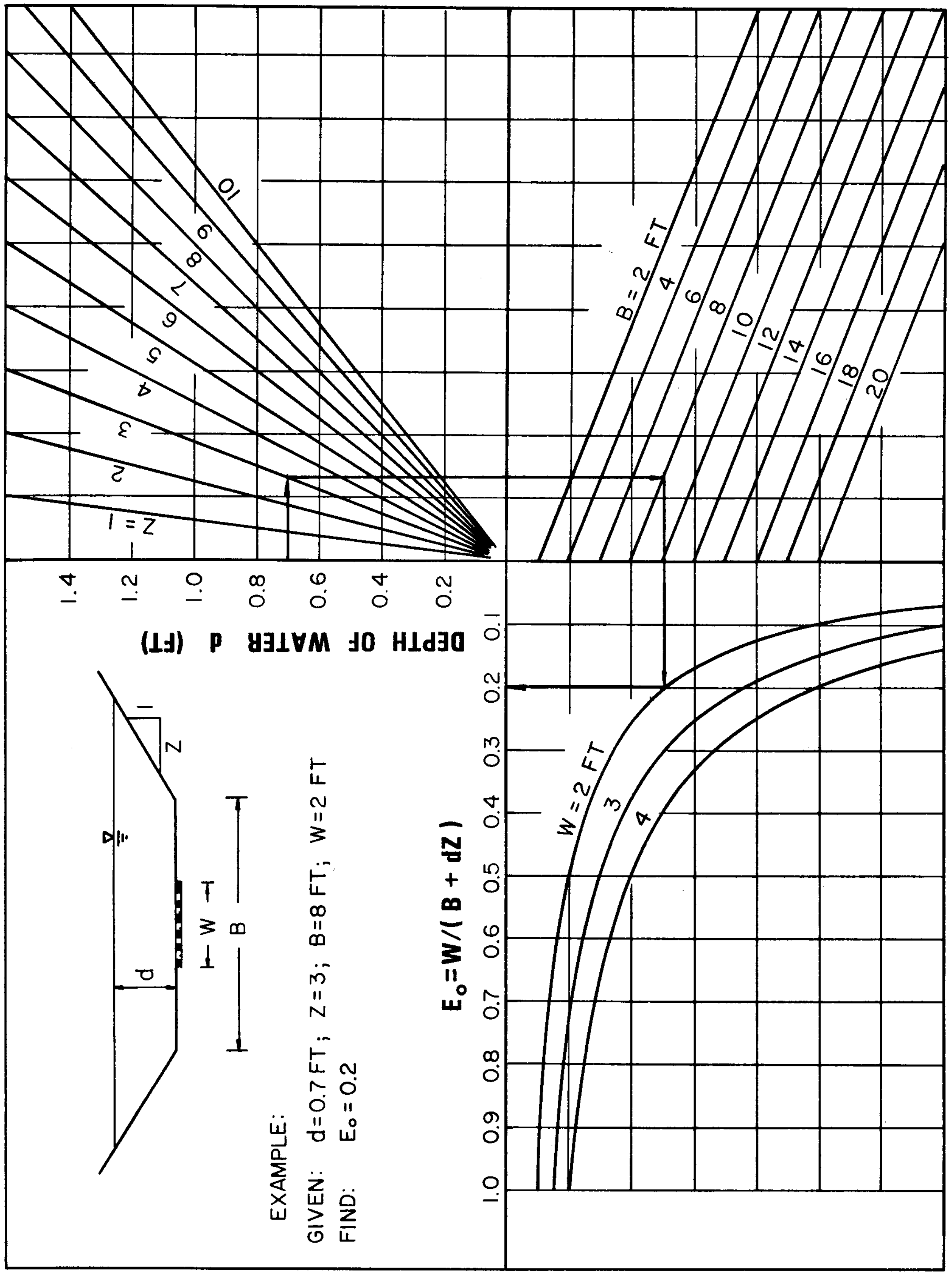
CHART 13B



Slotted Drain Inlet Capacity in Sump Locations - English Units

A - 27

CHART 15B



Ratio of Frontal Flow to Totl Flow in a Trapezoidal Channel - English Units

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Figure 6-130
Safety Factors for Grate Inlets

Condition	Factor of Safety
Curb on one side	1.50
No curb, i.e.: the interception takes place from all four sides	2.00