APPENDIX C

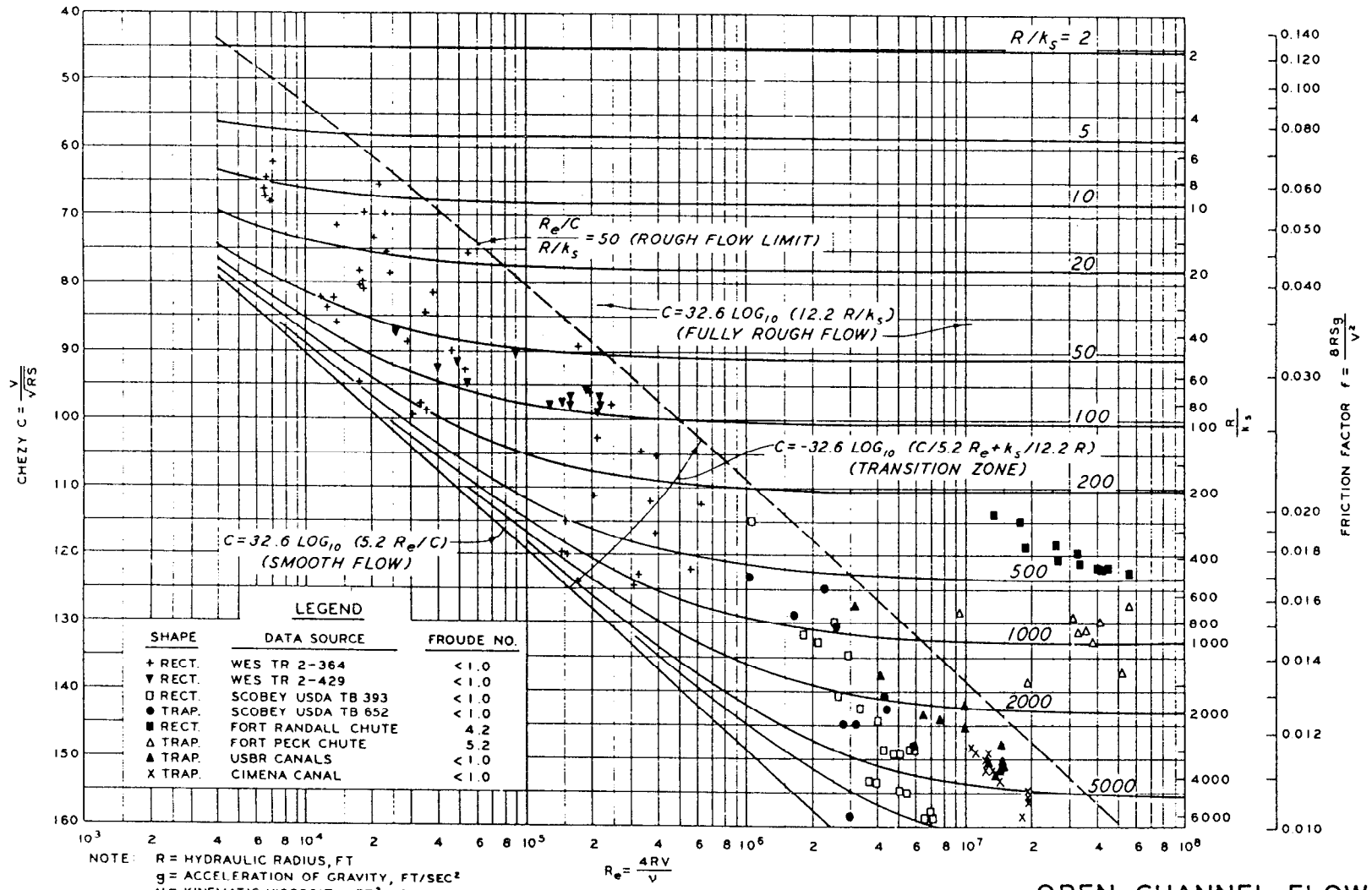
PLATES

Plate No.	Title	Paragraphs in Which Plate is Mentioned
2-1	Open Channel Flow Resistance Coefficients	2-l0b
2-2	Unit Horsepower in Stilling Basins	2-12b
2-3	Hydraulic Jump Velocity Distribution	2-13
2-4	Force Acting on Stilling Basin Sidewall	2-14
2-5	Stilling Basin Force Moment Arm	2-14
2-6	Cavitation Characteristics Square Edge Offset into Flow	2-16
2-7	Cavitation Characteristics Offsets Away from Flow	2-16
2-8	Cavitation Characteristics Rounded Corners into Flow	2-16
2-9	Cavitation Characteristics Into Flow Chamfers	2-16
3-l	Weir Profiles Downstream from Crest Line	3-3a
3-2	Elliptical Crest Spillway Coordinates Coordinate Coefficients	3-3a,d
3-3	Elliptical Crest Spillway Discharge Coefficients 1:l Upstream Face	3-4a
3-4	Elliptical Crest Spillway Discharge Coefficients Vertical Upstream Face	3-4a
3-5	Submerged Crest Coefficients Overflow Crests	3-4b
3-6	High Gated Overflow Crests Pier Contraction Coefficients I	3-6, 3-10
3-7	High Gated Overflow Crests Pier Contraction Coefficients II	3-6

Plate No.	Title	Paragraphs in Which Plate is Mentioned
3-8	High Gated Overflow Crests Pier Contraction Coefficients III	**3-6**
3-9	Low Gated Ogee Crests Pier Contraction Coefficients	**3-6**
3-10	Elliptical Crest Spillway Pier Contraction Coefficients Type 3-Pier	**3-6**
3-11	Overflow Spillway Crest with Adjacent Concrete Sections Abutment Contraction Coefficient	**3-6,** 3-8a, **3-8c**
3-12	Overflow Spfllway Crest with Adjacent Embankment Sections Abutment Contraction Coefficient	**3-6, 3-8b**
3-13	Elliptical Crest Spillway Cavitation Safety Curves With Piers	3-9
3-14	Elliptical Crest Spillway Cavitation Safety Curves No Piers	3-9
3-15	Overflow Spillway Crest Upper Nappe Profiles Without Piers	3-12a
3-16	Overflow Spillway Crest Upper Nappe Profiles Center Line of Pier Bay	3-12a
3-17	Overflow Spillway Crest Upper Nappe Profiles Along Piers	3-12a
3-18	Water Surface Profiles Controlled Crest $P/H_d = 1.0$	3-12b
3-19	Water Surface Profiles Controlled Crest $P/H_d = 0.50$	3-12b
3-20	Water Surface Profiles Controlled Crest $P/H_d = 0.25$	3-12b

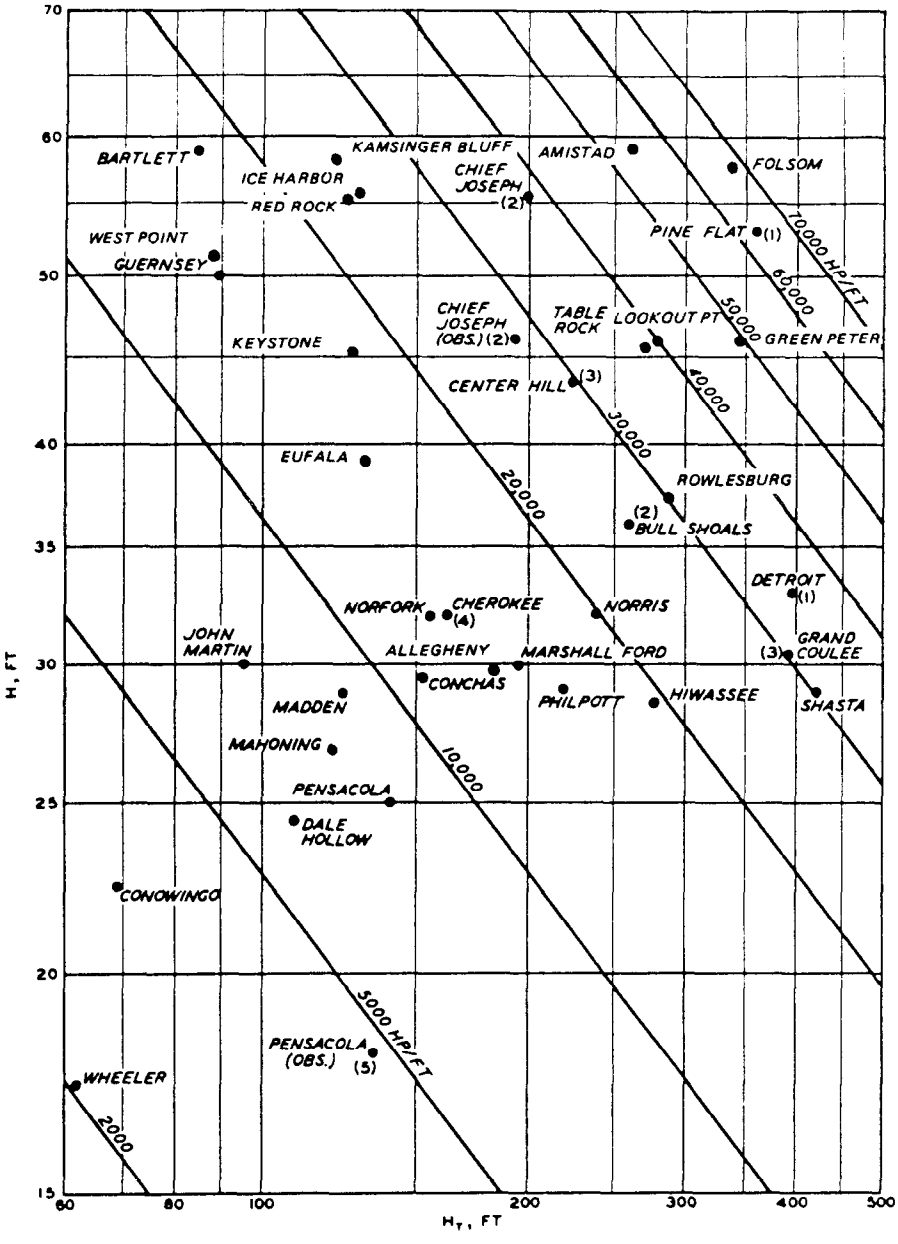
Plate No.	Title	Paragraphs in Which Plate is Mentioned
4-l	Air Entrainment	4-2c
5-l	Side Channel Spillways	5-l
5-2	Side Channel Spillways L-Shaped Crests Effective Length	5-2
5-3	Morning-Glory Spillways	5-9
5-4	Labyrinth Weir Spillway	5-10
5-5	Box Inlet Drop Spillway	5-lla
5-6	Elevated Box Drop Spillway	5-llb
5-7	Box Inlet Drop Spillway Calibration Curves	5-llb
5-8	Box Inlet Drop Spillway Chute Width vs Discharge	5-llb
6-1	Tainter Gates on Spillway Crests Discharge Coefficients	6-2c
6-2	Tainter Gates on Spillway Crests Effect of Gate Seat Location on Crest Pressures for H_e = l.00H_d	6-2d
6-3	Tainter Gates on Spillway Crests Effect of Gate Seat Location on Crest Pressures for H_e = 1.3H	6-2d
6-4	Vertical Lift Gates on Spillways Discharge Coefficients	6-3c
7-l	Sloping Floor Stilling Basins Continuous Slope Length of Hydraulic Jump	7-6
7-2	Sloping Floor Stilling Basins Noncontinuous Slope Jump Length on Slope	7-6
7-3	Standard-Shape Baffle	7-7b
7-4	Baffle Height and Location	7-7c, 7-7d

Plate No.	Title	Paragraphs in Which Plate is Mentioned
7-5	Roller Bucket Maximum Tailwater Depth	7-14
7-6	Roller Bucket Minimum Tailwater Depth	7-14
7-7	High Overflow Dams Bucket-Type Energy Dissipator Roller Depth	7-14
7-8	High Overflow Dams Bucket-Type Energy Dissipator Surge Height	7-14
7-9	Little Goose Dam Slotted Bucket	7-15
7-10	Flip Bucket Pressure	7-21
7-11	Impact Basin	7-24
7-12	(Proposed) Libby Reregulating Dam Baffled Chute Spillway	7-25



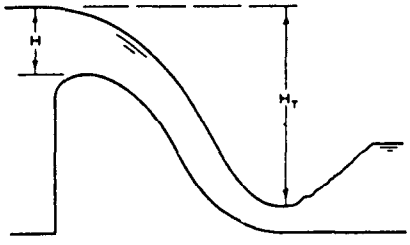
NOTE: R = HYDRAULIC RADIUS, FT
g = ACCELERATION OF GRAVITY, FT/SEC²
ν = KINEMATIC VISCOSITY, FT²/SEC
k_s = EFFECTIVE ROUGHNESS HEIGHT, FT
V = VELOCITY, FT/SEC
S = ENERGY GRADIENT SLOPE
R_e = REYNOLDS NUMBER

OPEN CHANNEL FLOW
RESISTANCE COEFFICIENTS
FROM HDC 631



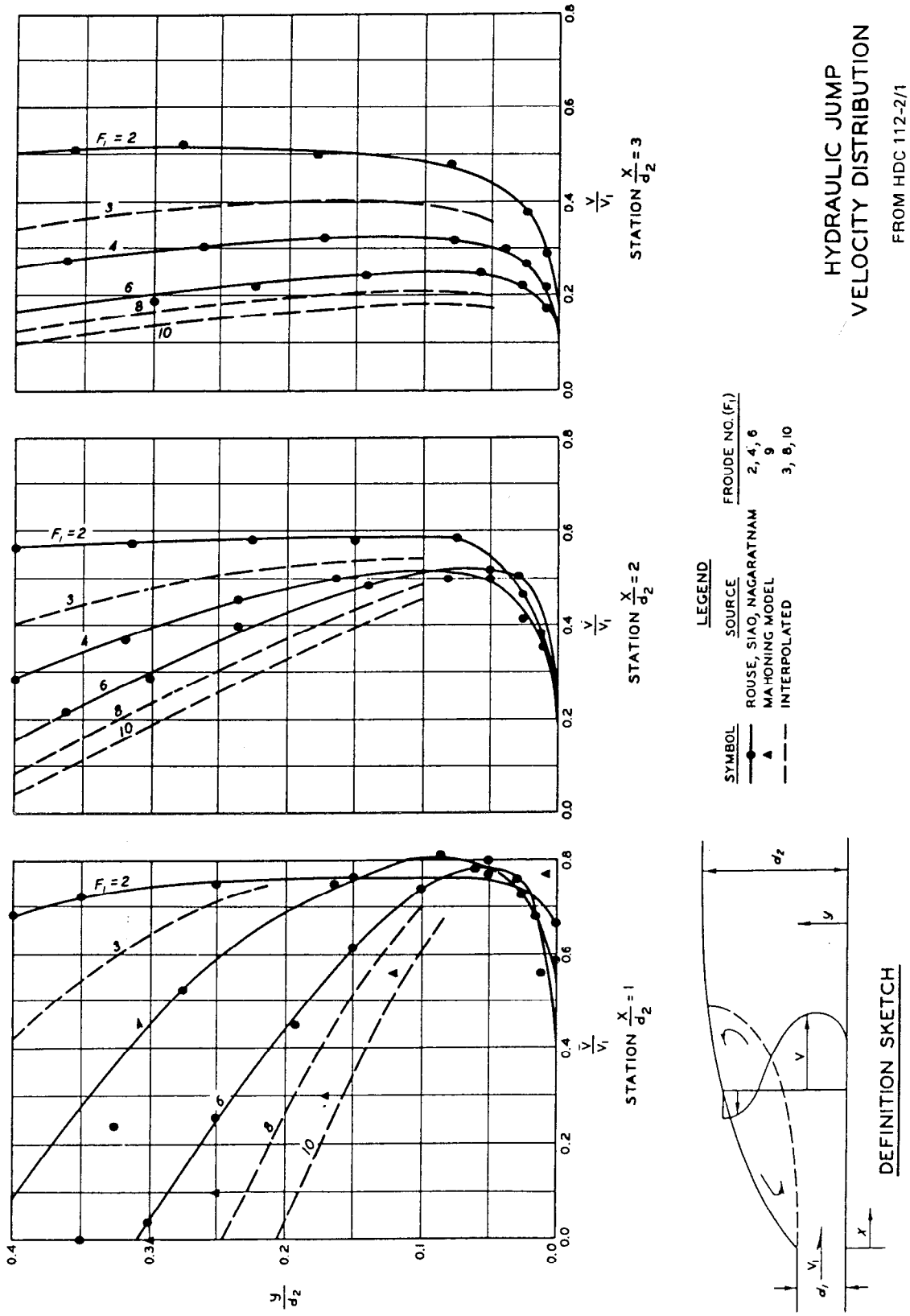
(1) NO HEAVY FLOWS OBSERVED
(2) SEVERE BASIN DAMAGE (REF 31 & 32)
(3) SEVERE BUCKET DAMAGE (REF 30 & 32)
(4) BASIN DAMAGE
(5) SEVERE EROSION DOWNSTREAM FROM APRON

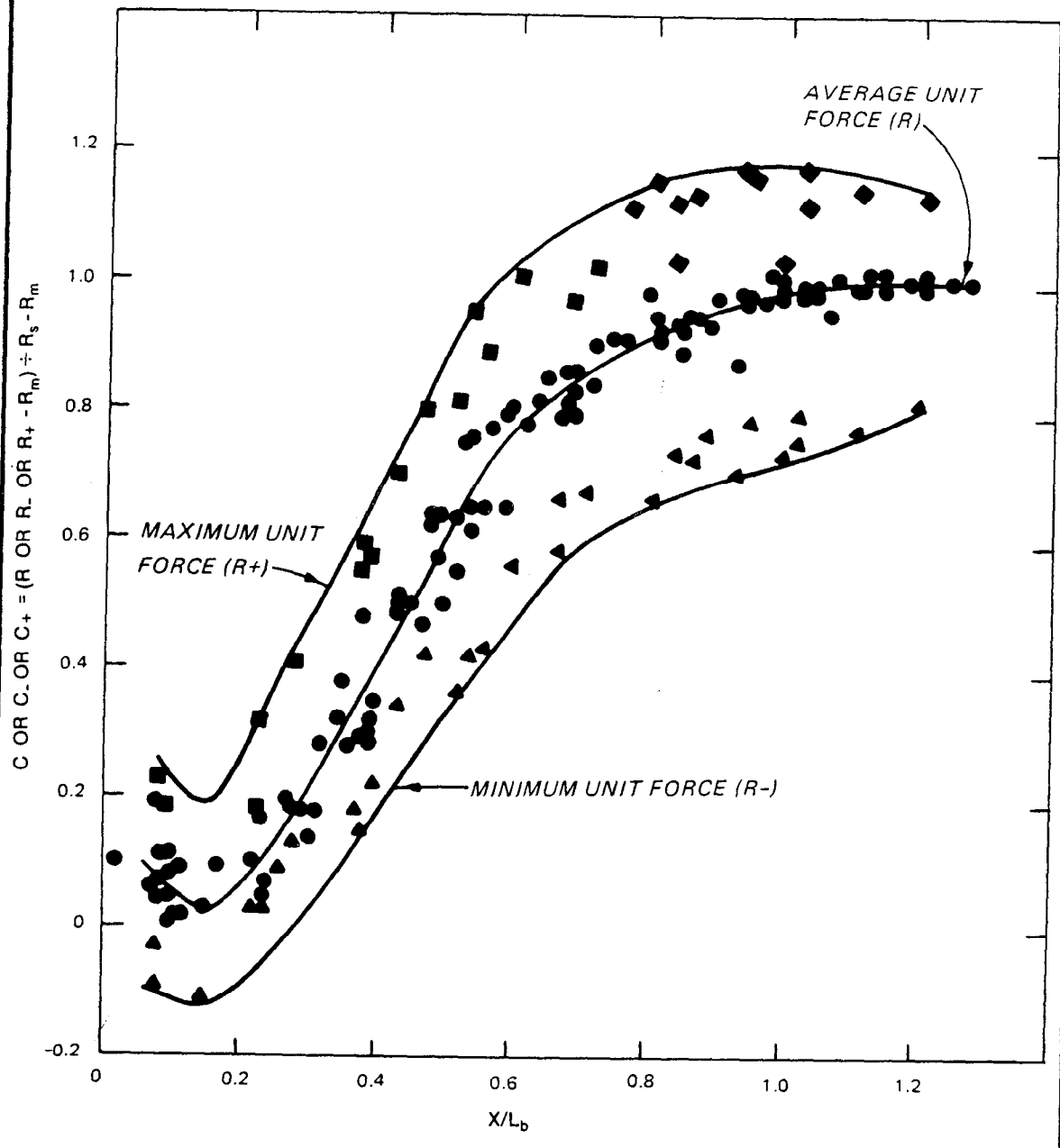
$$\frac{HP}{FT} = \frac{\bar{\sigma}_q H_T}{550} = \frac{CH^{3/2} H_T}{8.8}$$



DEFINITION SKETCH

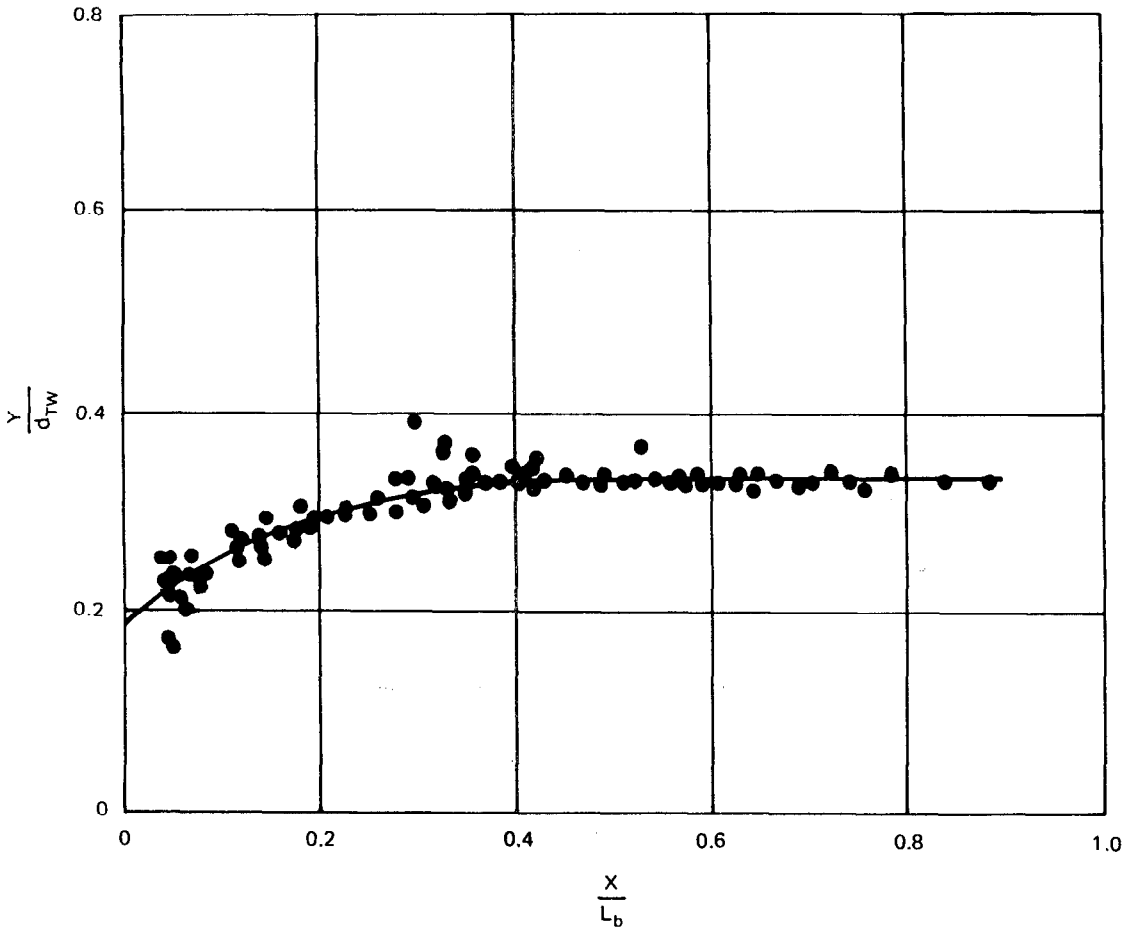
UNIT HORSEPOWER IN STILLING BASINS


HYDRAULIC JUMP
VELOCITY DISTRIBUTION
FROM HDC 112-2/1
STATION $\frac{x}{d_2} = 3$
STATION $\frac{x}{d_2} = 2$
STATION $\frac{x}{d_2} = 1$
$\frac{v}{V_1}$
$\frac{y}{d_2}$
$F_1 = 2$
3
4
6
8
10
LEGEND
SYMBOL
SOURCE
FROUDE NO. (F_1)
ROUSE, SIAO, NAGARATNAM 2, 4, 6
MAHONING MODEL 9
INTERPOLATED 3, 8, 10
DEFINITION SKETCH



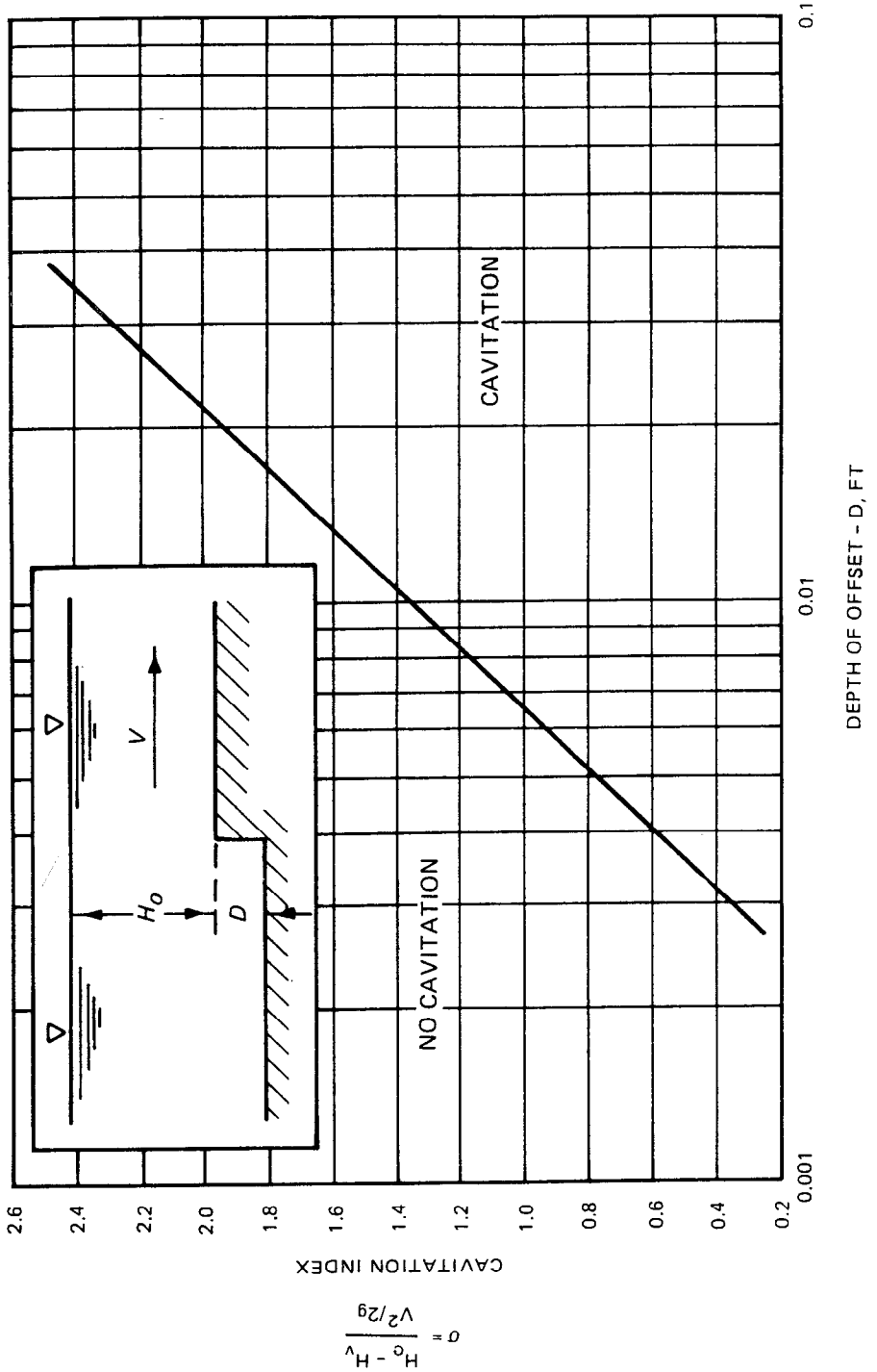
VARIATION IN UNIT RESULTANT FORCE WITH DISTANCE FROM PI WHEN TAILWATER DEPTH IS EQUAL TO OR LESS THAN THE THEORETICAL SEQUENT DEPTH AND WALL HEIGHT'

FORCE ACTING ON
STILLING BASIN SIDEWALL

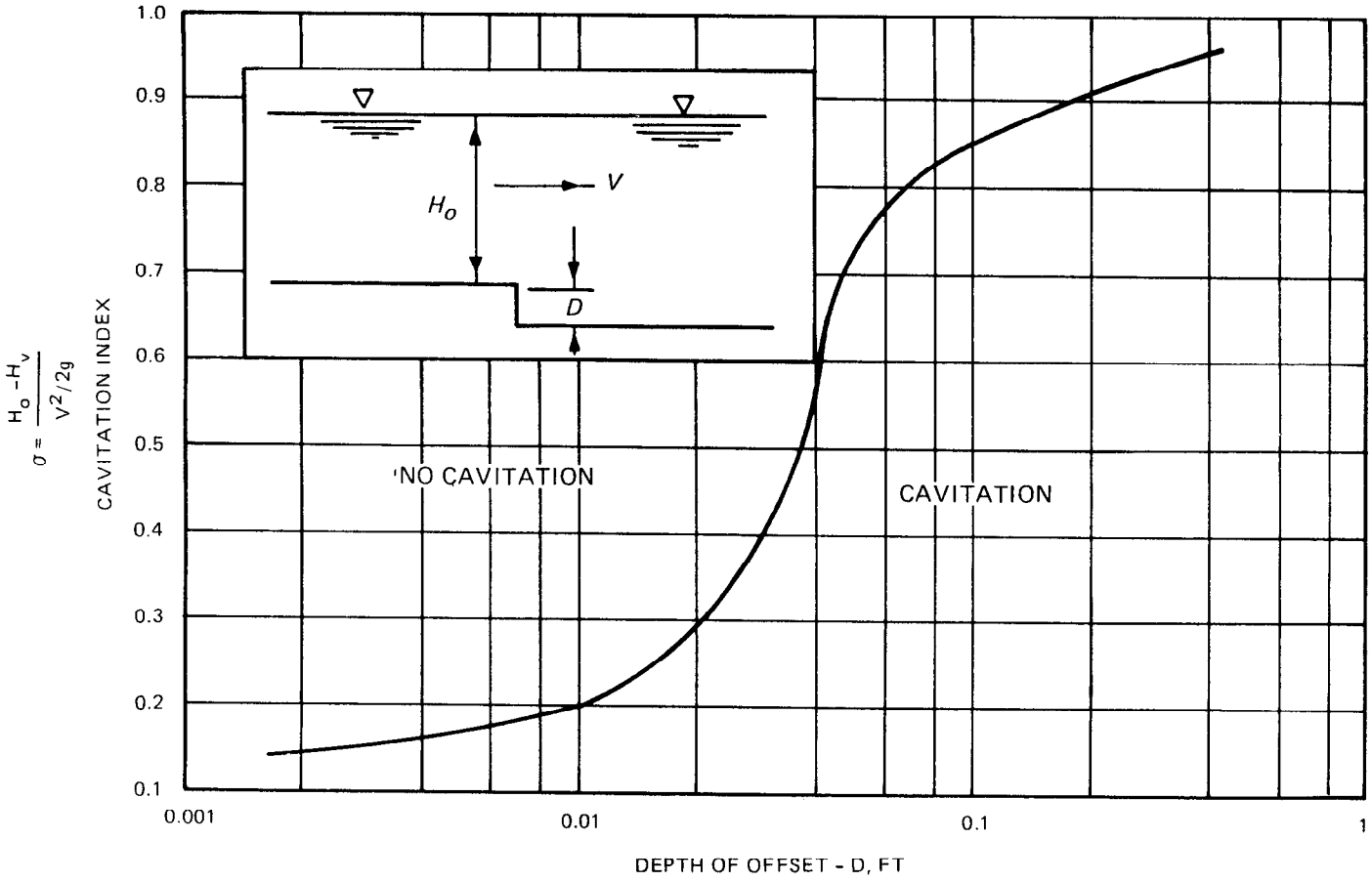


MOMENT ARM VS DISTANCE FROM PI

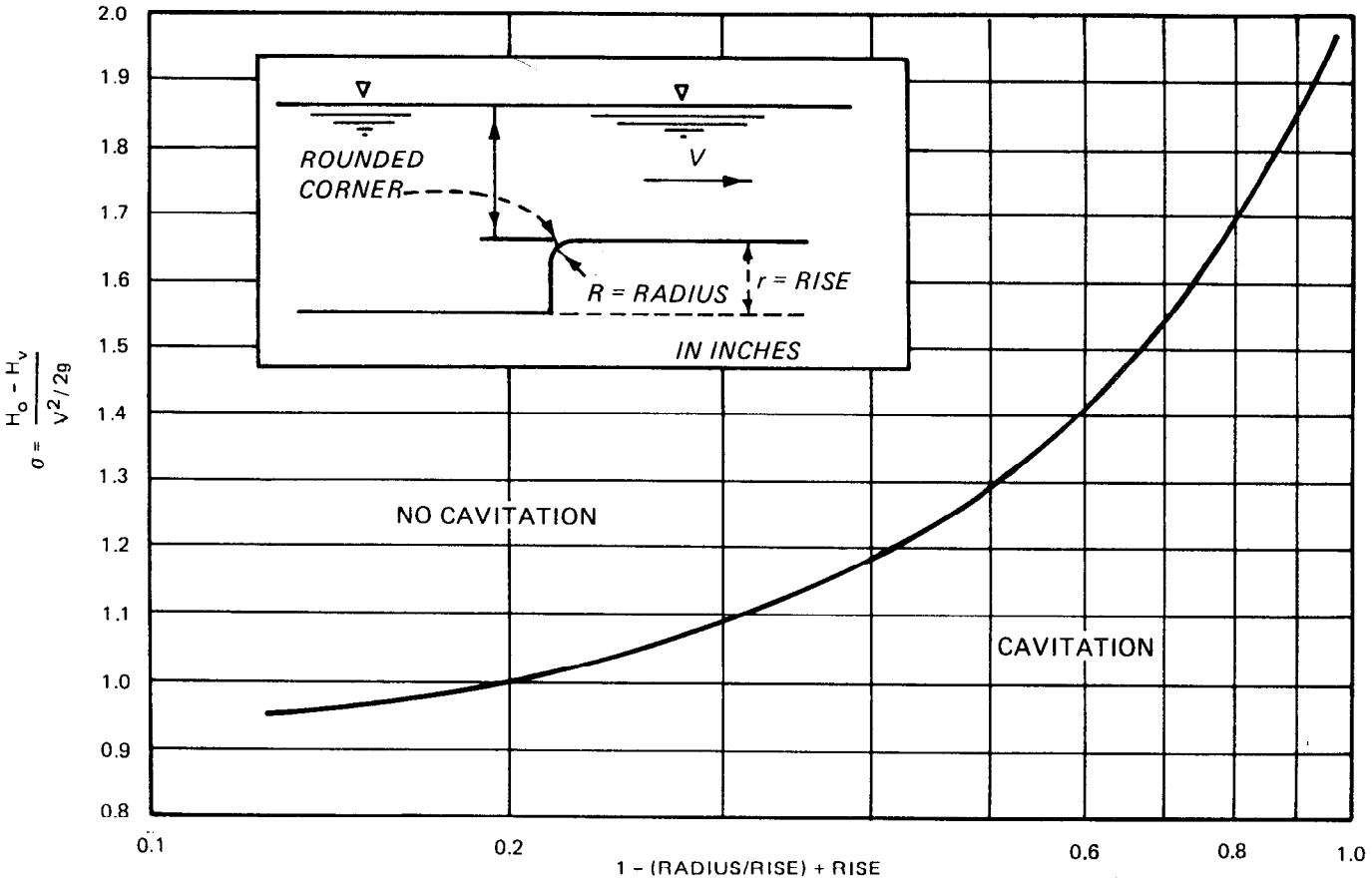
STILLING BASIN FORCE
MOMENT ARM



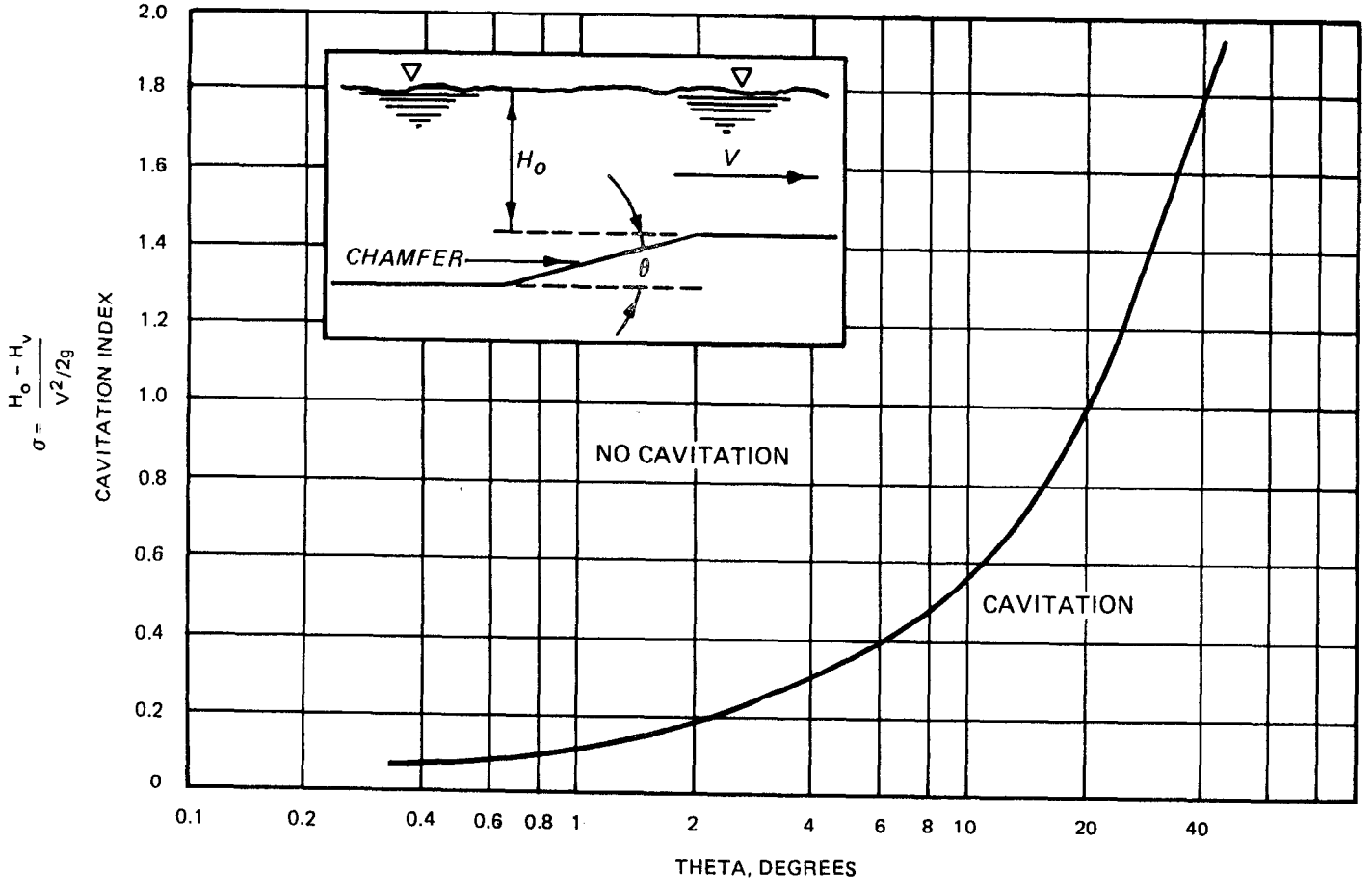
CAVITATION CHARACTERISTICS - SQUARE EDGE OFFSET INTO FLOW



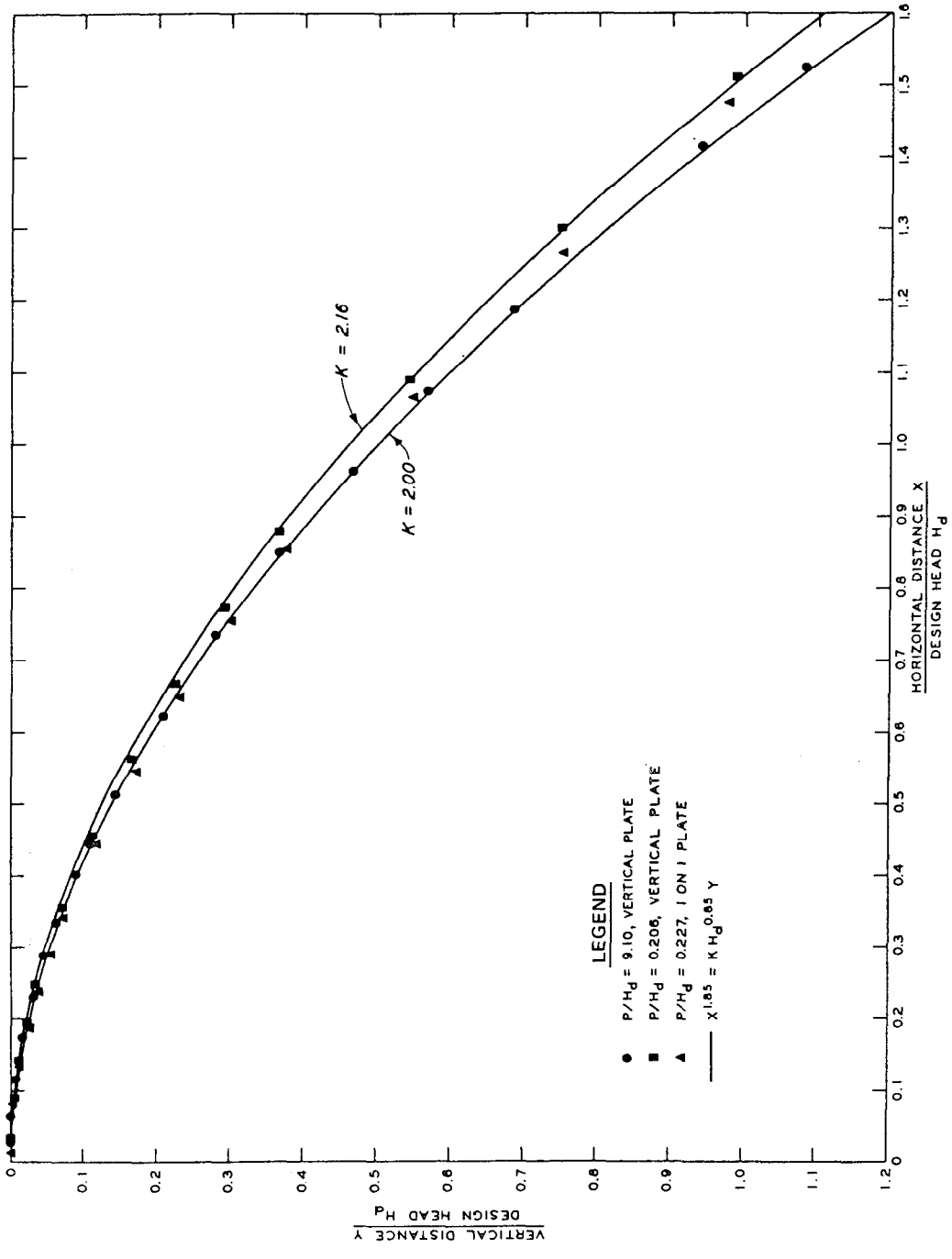
CAVITATION CHARACTERISTICS - OFFSETS AWAY FROM FLOW



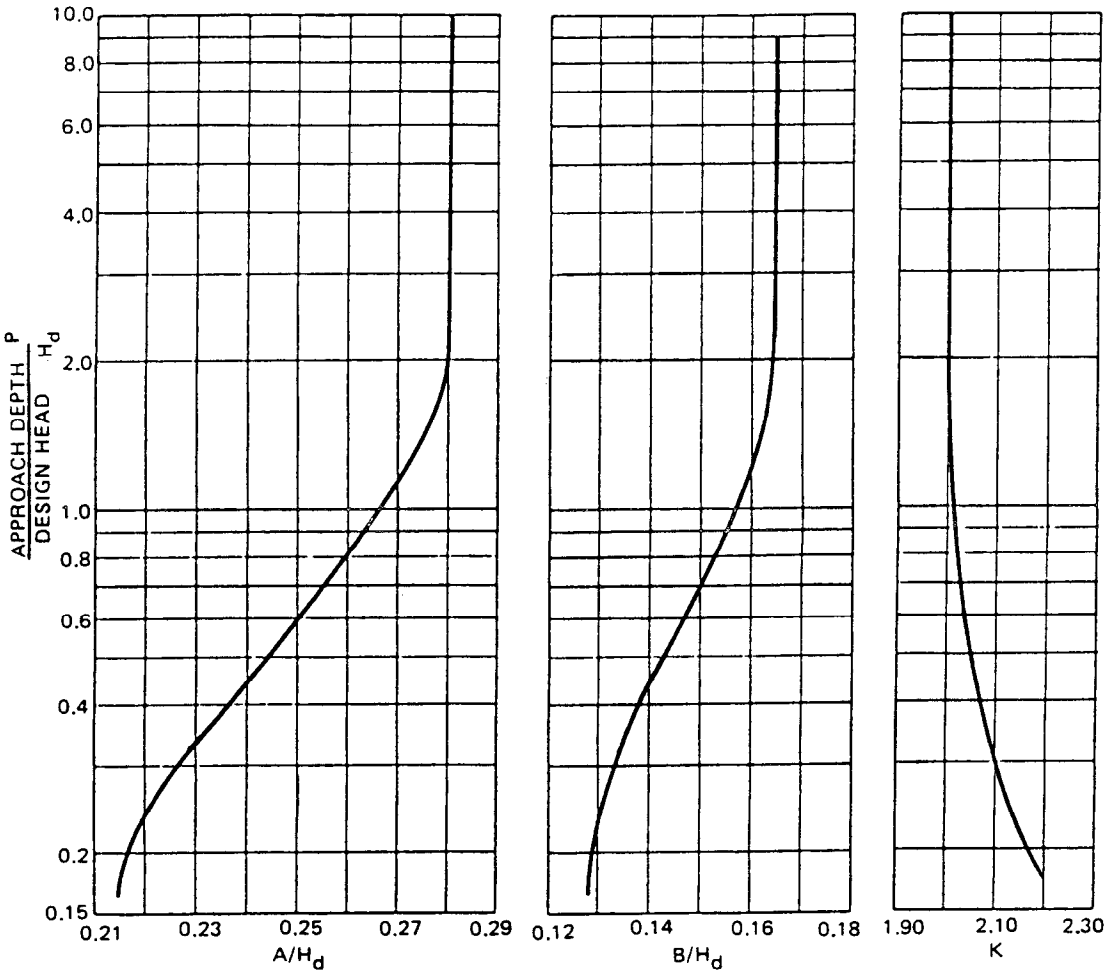
CAVITATION CHARACTERISTICS - ROUNDED CORNERS INTO FLOW

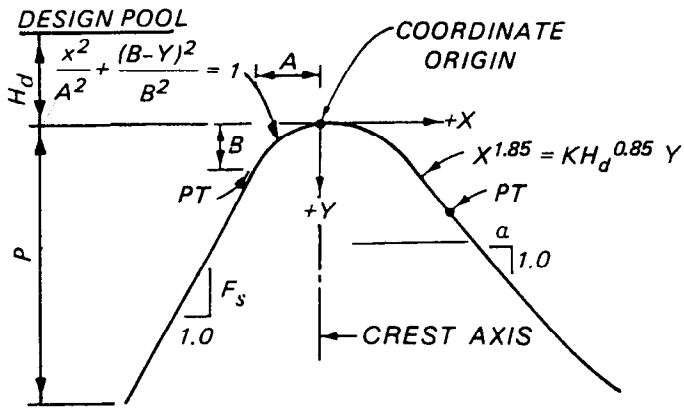


CAVITATION CHARACTERISTICS - INTO FLOW CHAMFERS



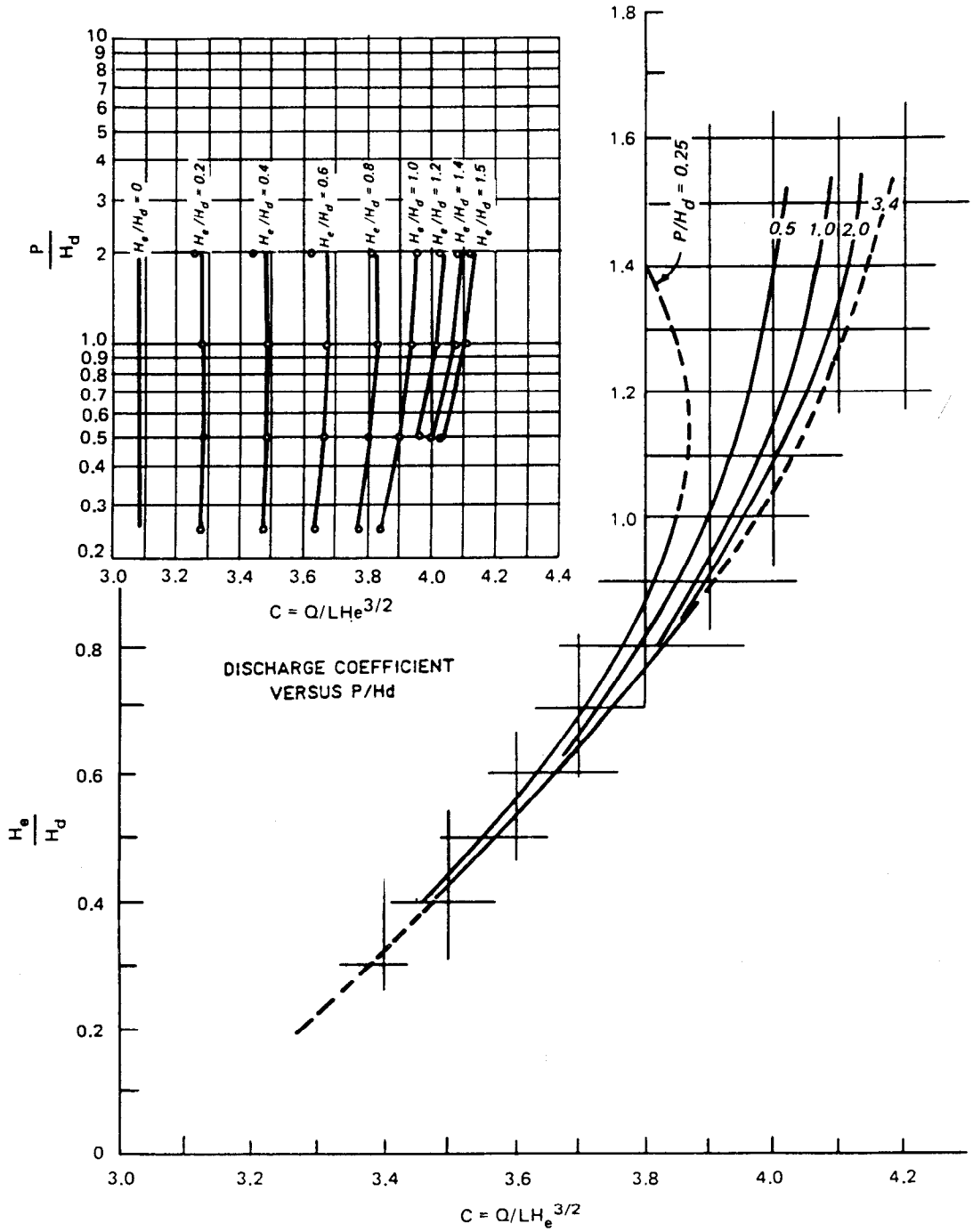
WEIR PROFILES
DOWNSTREAM FROM CREST LINE



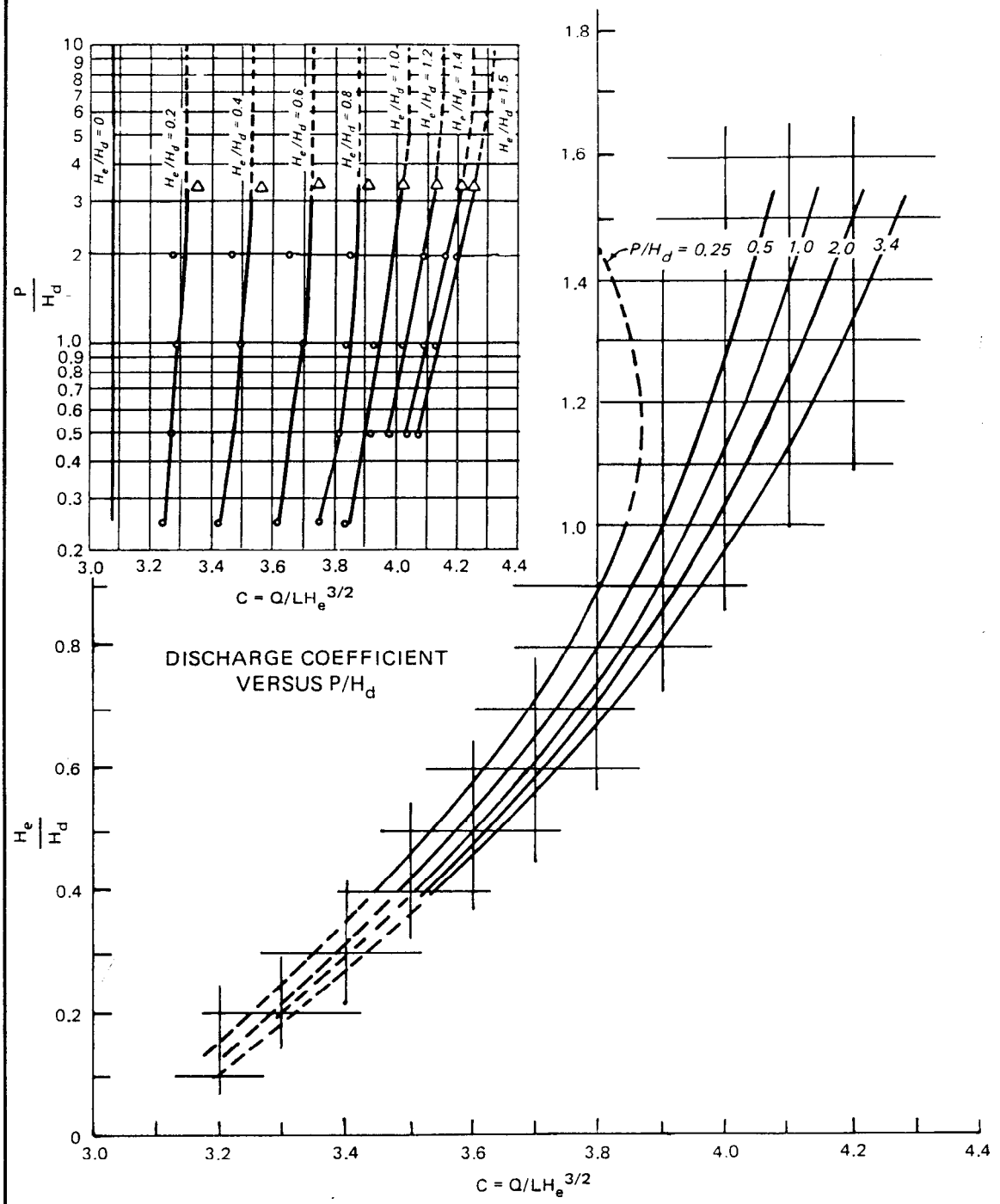


DEFINITION SKETCH

ELLIPTICAL CREST SPILLWAY
COORDINATES
COORDINATE COEFFICIENTS
FROM HDC 111-20

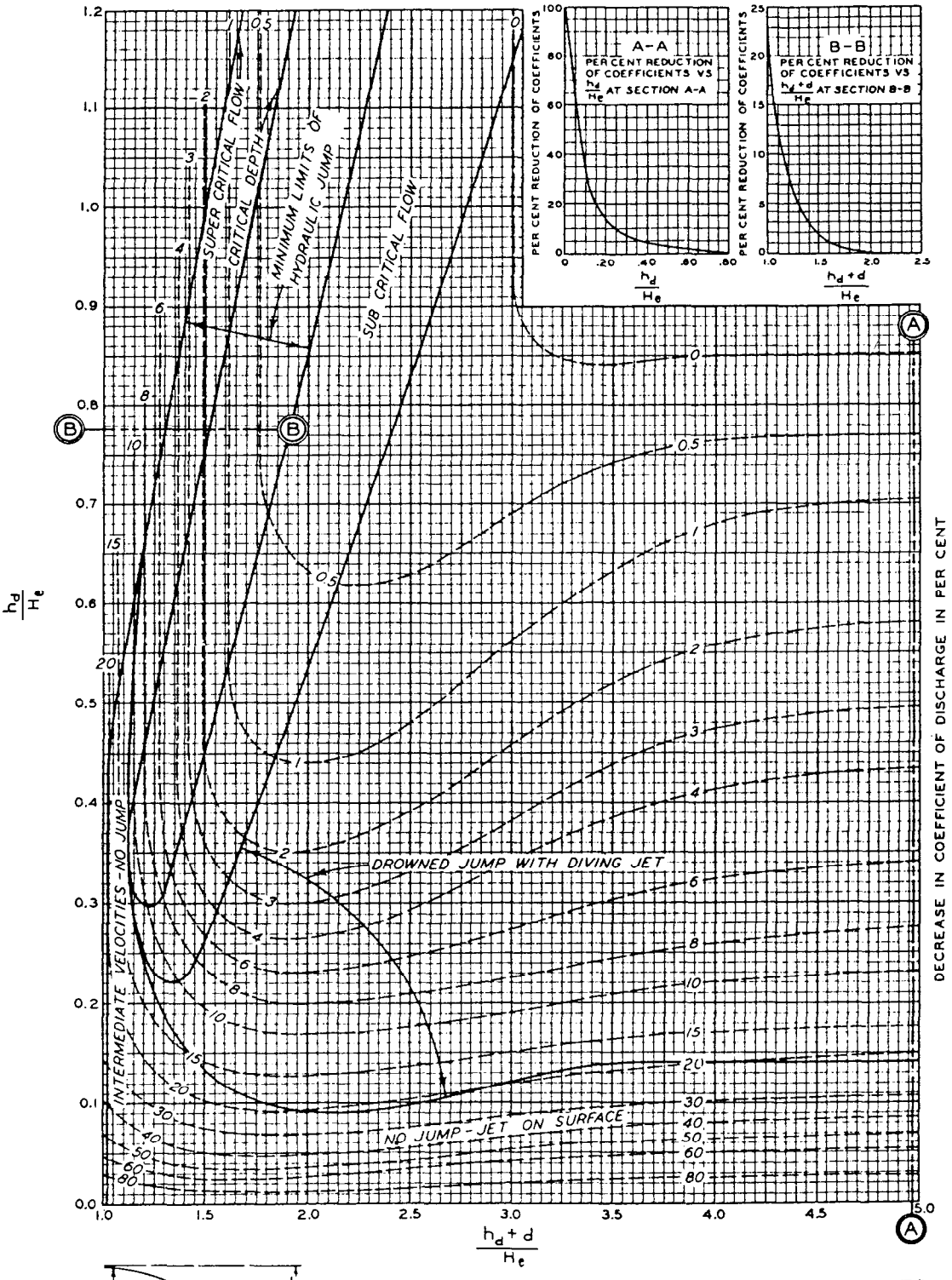


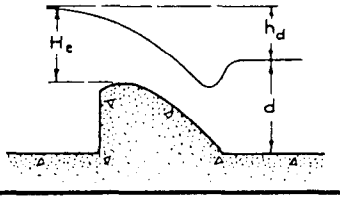
ELLIPTICAL CREST
SPILLWAY
DISCHARGE COEFFICIENTS
1:1 UPSTREAM FACE
FROM HDC 111-21/1



ELLIPTICAL CREST
SPILLWAY
DISCHARGE COEFFICIENTS
VERTICAL UPSTREAM FACE

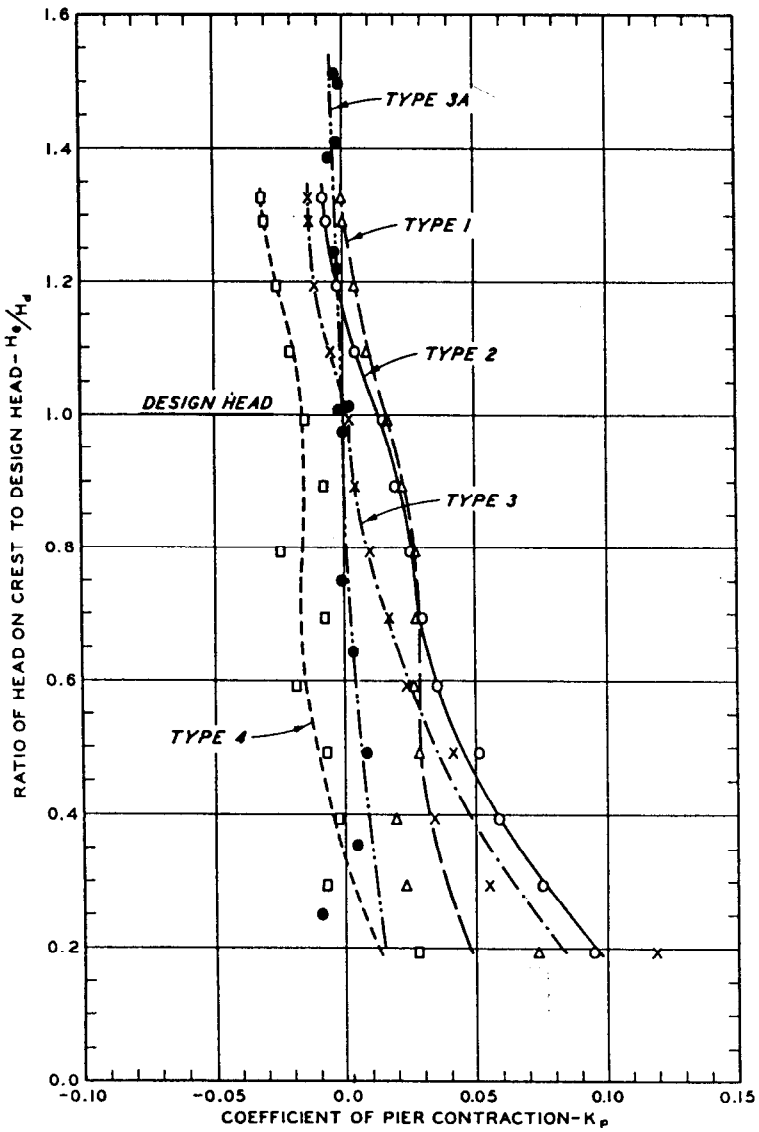
FROM HDC 111-21

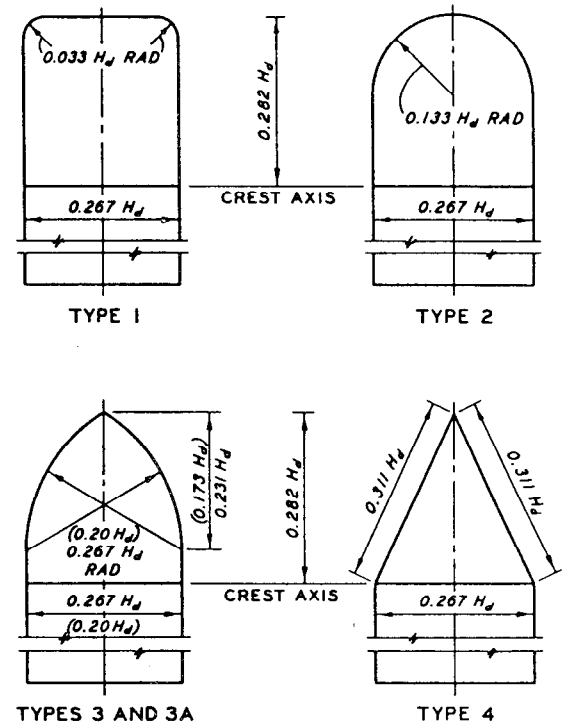




SUBMERGED CREST COEFFICIENTS
OVERFLOW CRESTS

FROM HDC 111-4





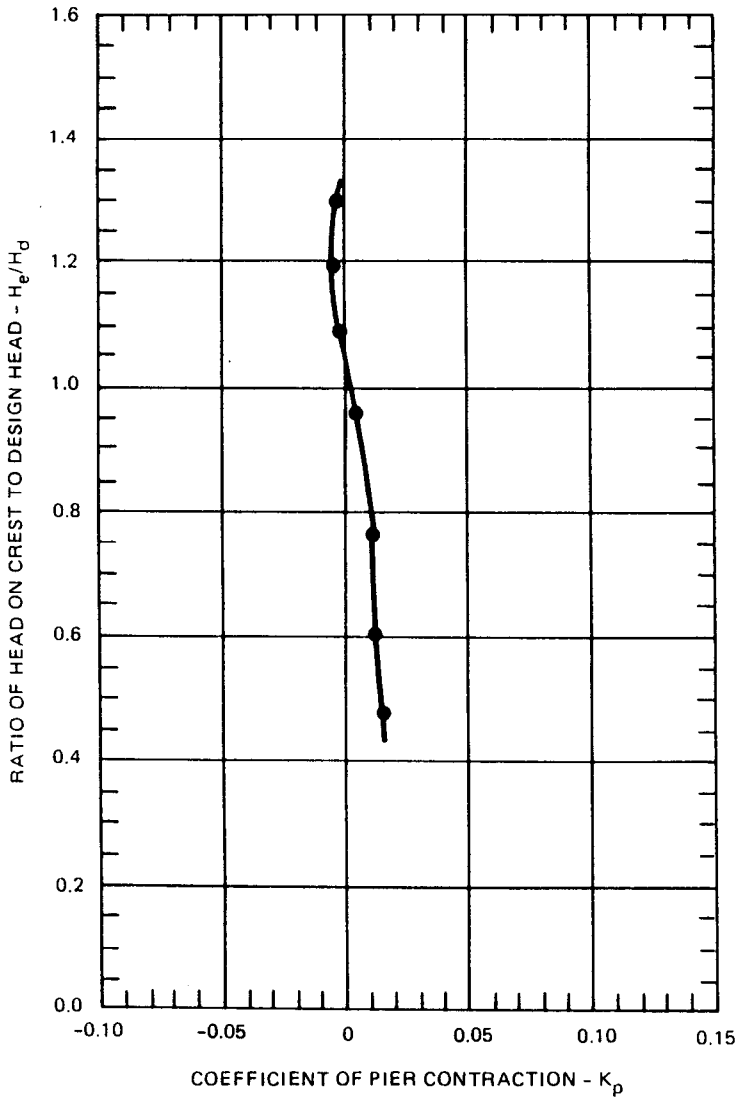
PIER NOSE SHAPES

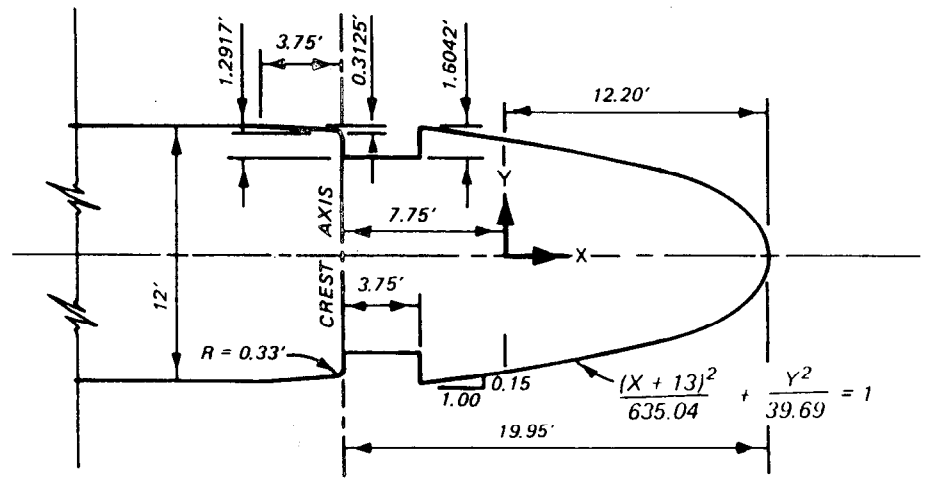
NOTE: PIER NOSE LOCATED IN SAME PLANE AS UPSTREAM FACE OF SPILLWAY.

DIMENSIONS IN PARENTHESES ARE FOR TYPE 3A.

HIGH GATED OVERFLOW CRESTS PIER CONTRACTION COEFFICIENTS I

FROM HDC 111-5



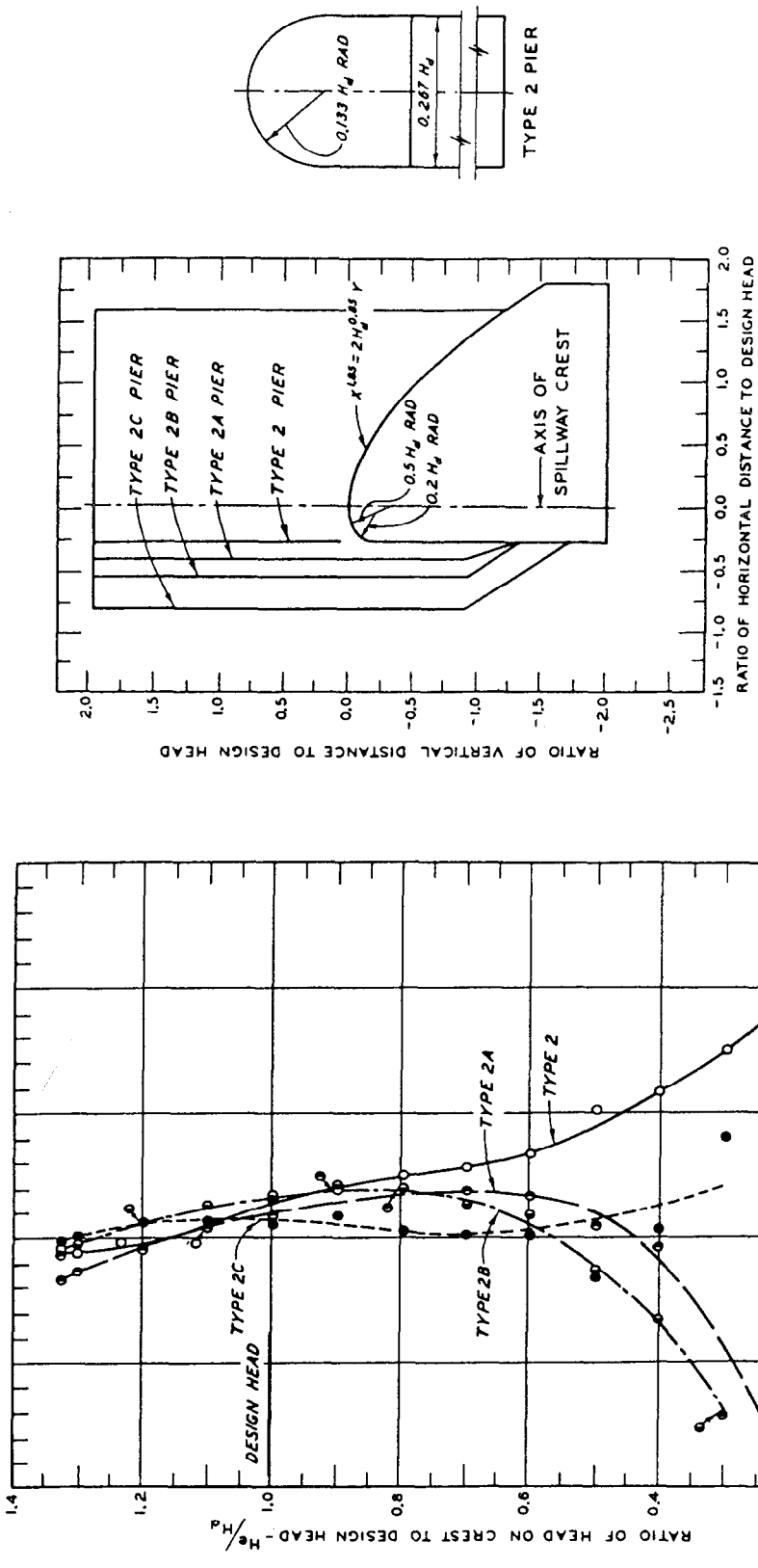


PIER NOSE SHAPES

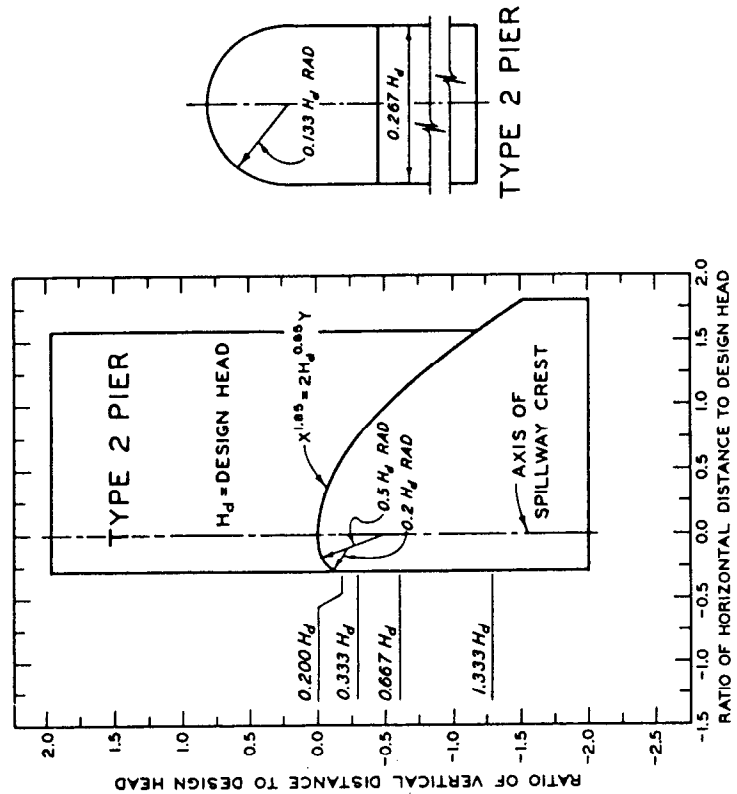
NOTE: PIER NOSE LOCATED IN SAME PLANE AS UPSTREAM FACE OF SPILLWAY.

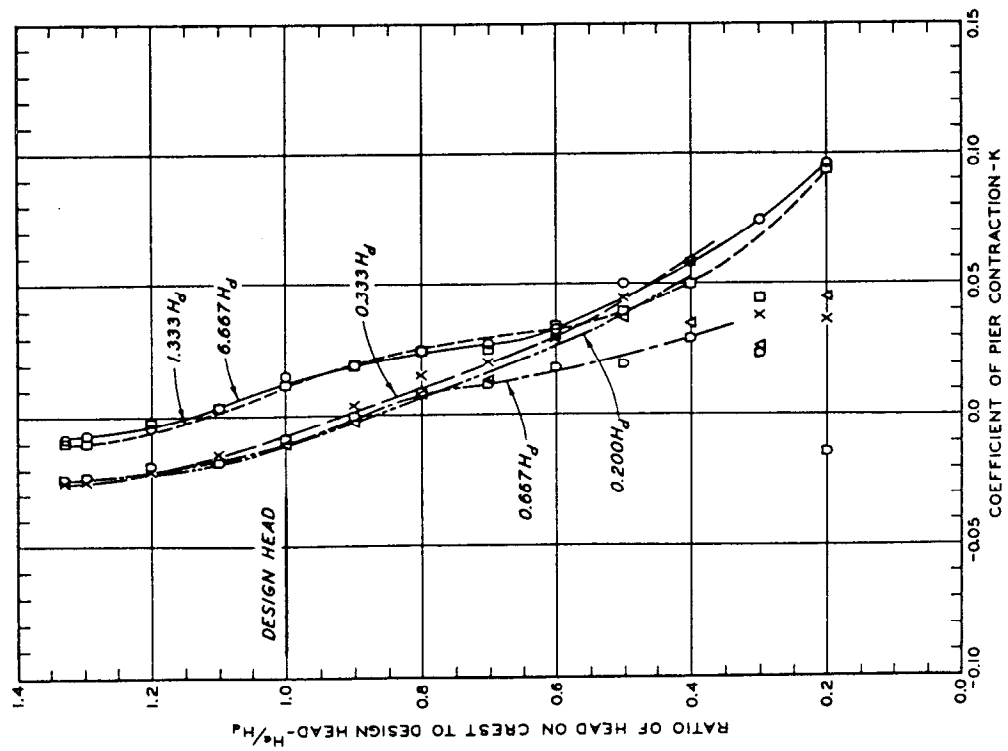
REFERENCE JOHN DAY DAM (ITEM 33)

HIGH GATED OVERFLOW CRESTS
PIER CONTRACTION COEFFICIENTS II

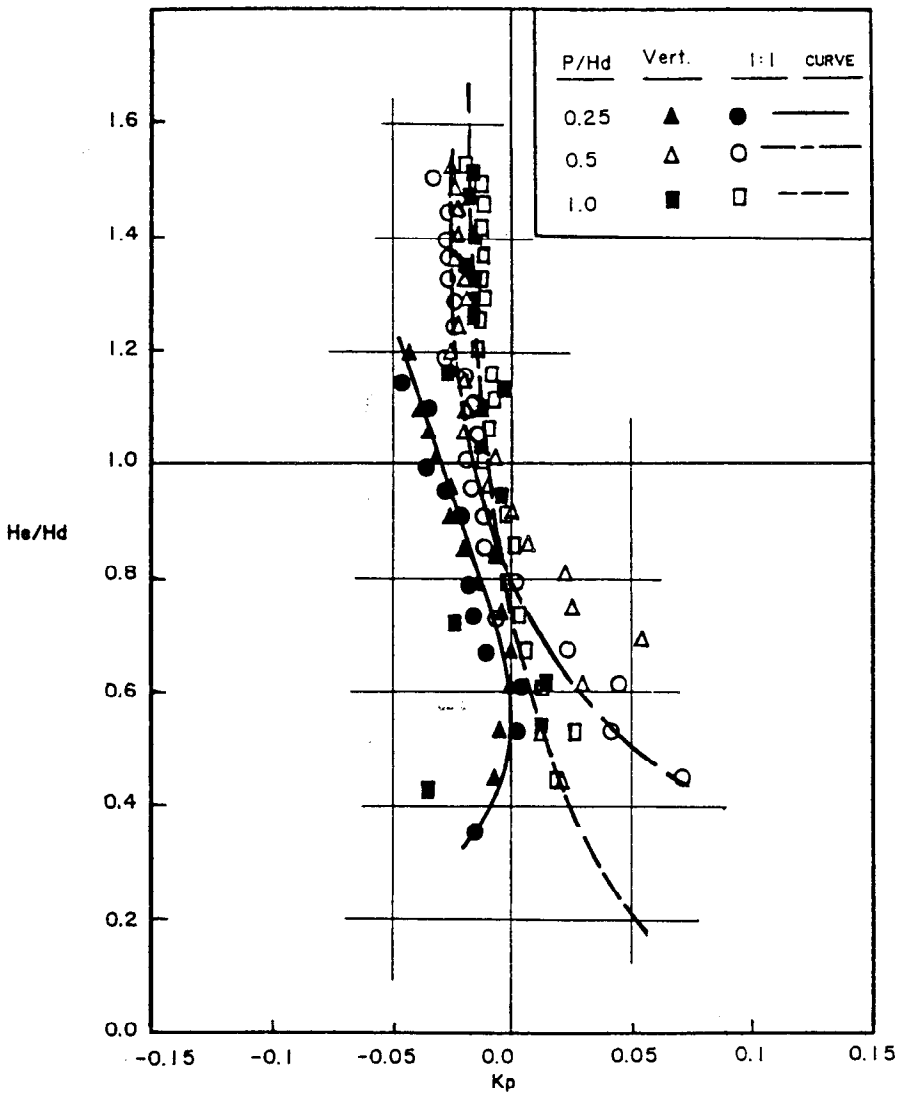


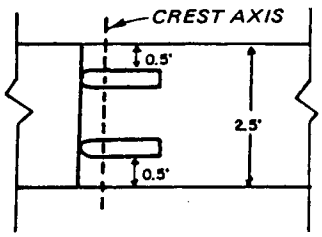
HIGH GATED OVERFLOW CRESTS
PIER CONTRACTION COEFFICIENTS III
FROM HDC 111-6





LOW GATED OGEE CRESTS
PIER CONTRACTION COEFFICIENTS
FROM HDC 122-2

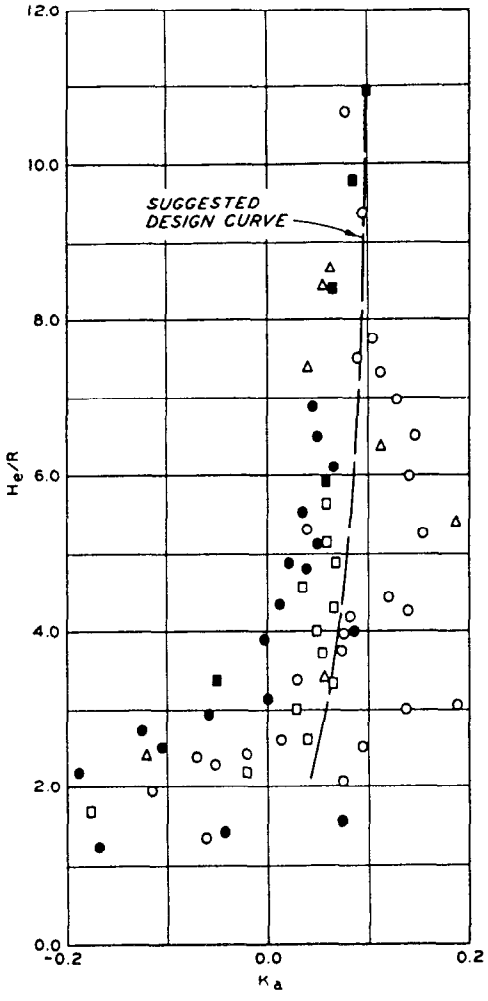




DEFINITION SKETCH
TYPE 3 PIERS
SEE PLATE 3-6

ELLIPTICAL CREST SPILLWAY

PIER CONTRACTION COEFFICIENTS
TYPE 3 PIER
FROM HDC 111-22



BASIC EQUATION

$$Q = C[L' - 2(NK_p + K_a)H_e]H_e^{3/2}$$

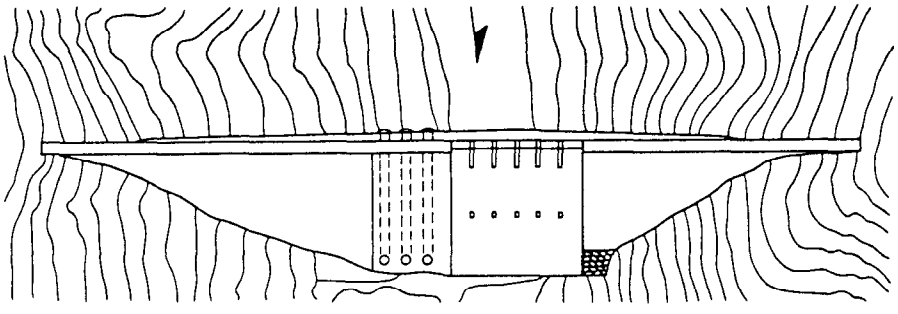
WHERE:
- Q = DISCHARGE, CFS.
- C = DISCHARGE COEFFICIENT.
- L' = NET LENGTH OF CREST, FT.
- N = NUMBER OF PIERS.
- K_p = PIER CONTRACTION COEFFICIENT.
- K_a = ABUTMENT CONTRACTION COEFFICIENT.
- H_e = TOTAL HEAD ON CREST, FT.

LEGEND

SYMBOL	PROJECT	R	W/L	W/H
○	CW 801	4	1.55	0.96
●	FOLSOM	8	2.10	3.77
□	PHILPOTT	5	2.67	1.42
■	PINE FLAT*	4	2.12	1.77
△	CENTER HILL*	5	3.83	9.48

*GATED SPILLWAY WITH PIERS

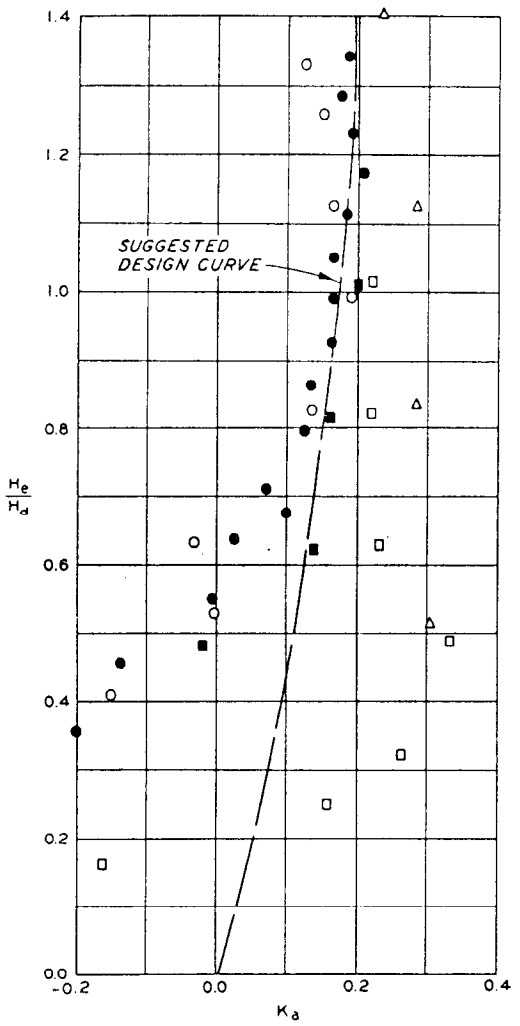
NOTE: R = RADIUS OF ABUTMENT, FT.
W = WIDTH OF APPROACH REPRODUCED IN MODEL, FT.
L = GROSS WIDTH OF SPILLWAY, FT.
H = DEPTH OF APPROACH IN MODEL, FT.



OVERFLOW SPILLWAY CREST WITH ADJACENT CONCRETE SECTIONS

ABUTMENT CONTRACTION COEFFICIENT

FROM HDC 111-3/1



BASIC EQUATION

$$Q = C\left[L' - 2(NK_p + K_a)H_e\right]H_e^{3/2}$$

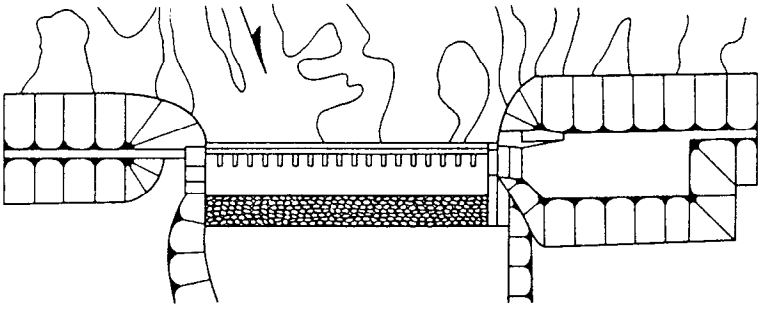
WHERE:
- Q = DISCHARGE, CFS
- C = DISCHARGE COEFFICIENT
- L' = NET LENGTH OF CREST, FT
- N = NUMBER OF PIERS
- K_p = PIER CONTRACTION COEFFICIENT
- K_a = ABUTMENT CONTRACTION COEFFICIENT
- H_e = ENERGY HEAD ON CREST, FT

LEGEND

SYMBOL	PROJECT	R	W/L	W/H
□	DORENA	2	5.60	10.7
■	DORENA	4	5.60	10.7
○	RED ROCK*	7.8	3.42	16.5
●	CARLYLE*	9	8.44	75.5
△	WALTER F. GEORGE*	4	5.44	55.3

*GATED SPILLWAY WITH PIERS

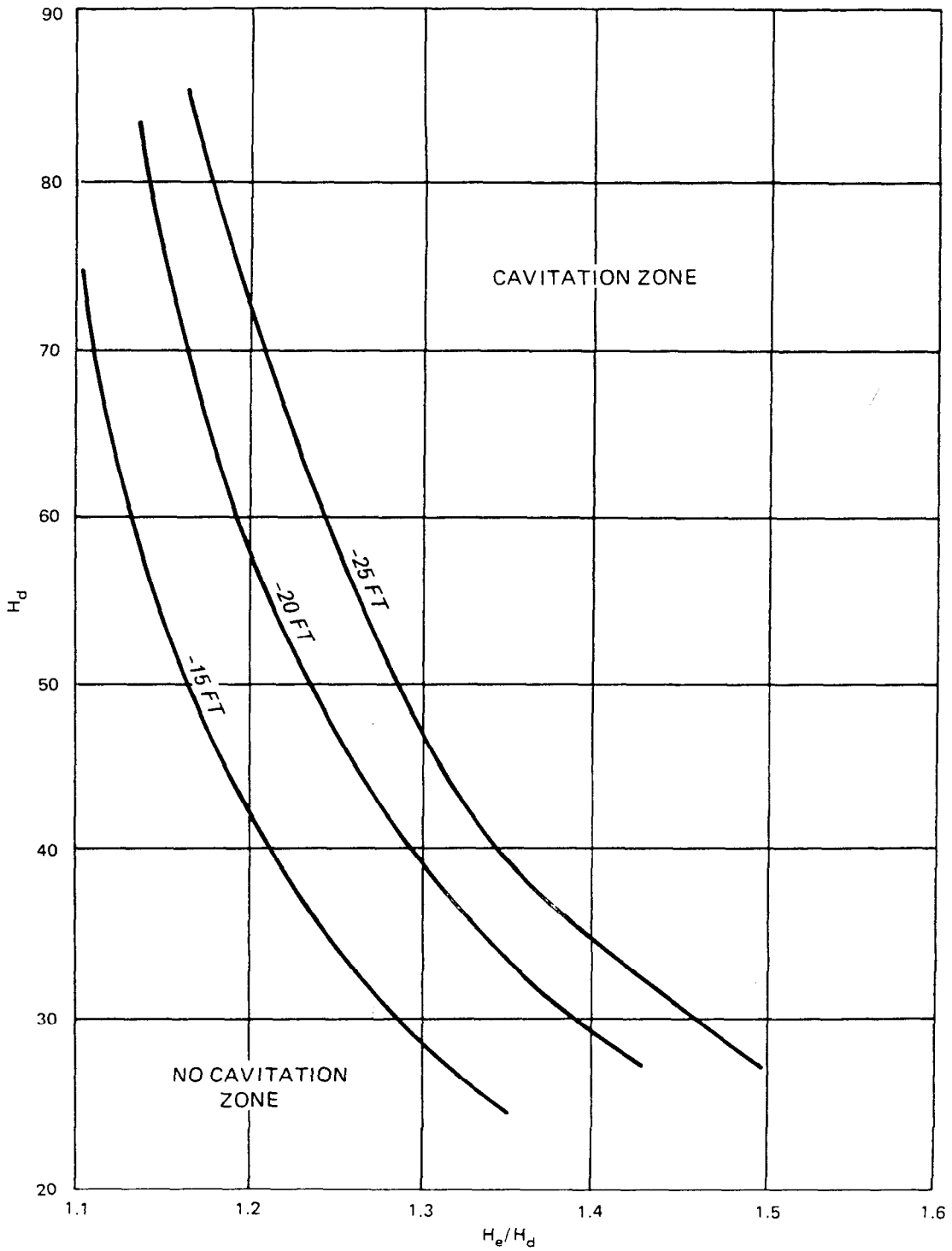
NOTE: R = RADIUS OF ABUTMENT, FT
W = WIDTH OF APPROACH REPRODUCED IN MODEL, FT
L = GROSS WIDTH OF SPILLWAY, FT
H = DEPTH OF APPROACH IN MODEL, FT
H_d = DESIGN HEAD ON CREST, FT



OVERFLOW SPILLWAY CREST WITH ADJACENT EMBANKMENT SECTIONS

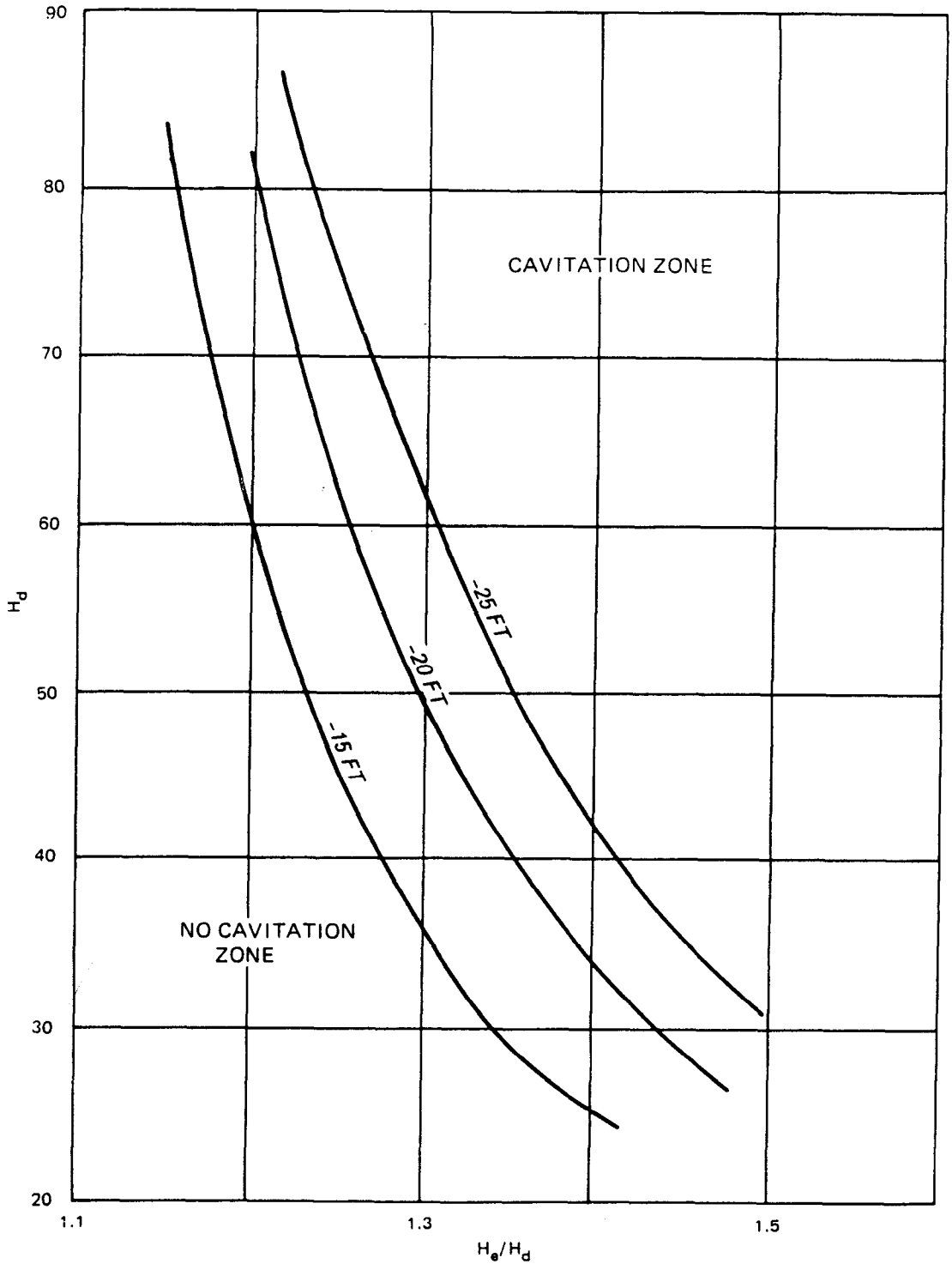
ABUTMENT CONTRACTION COEFFICIENT

FROM HDC 111-3/2



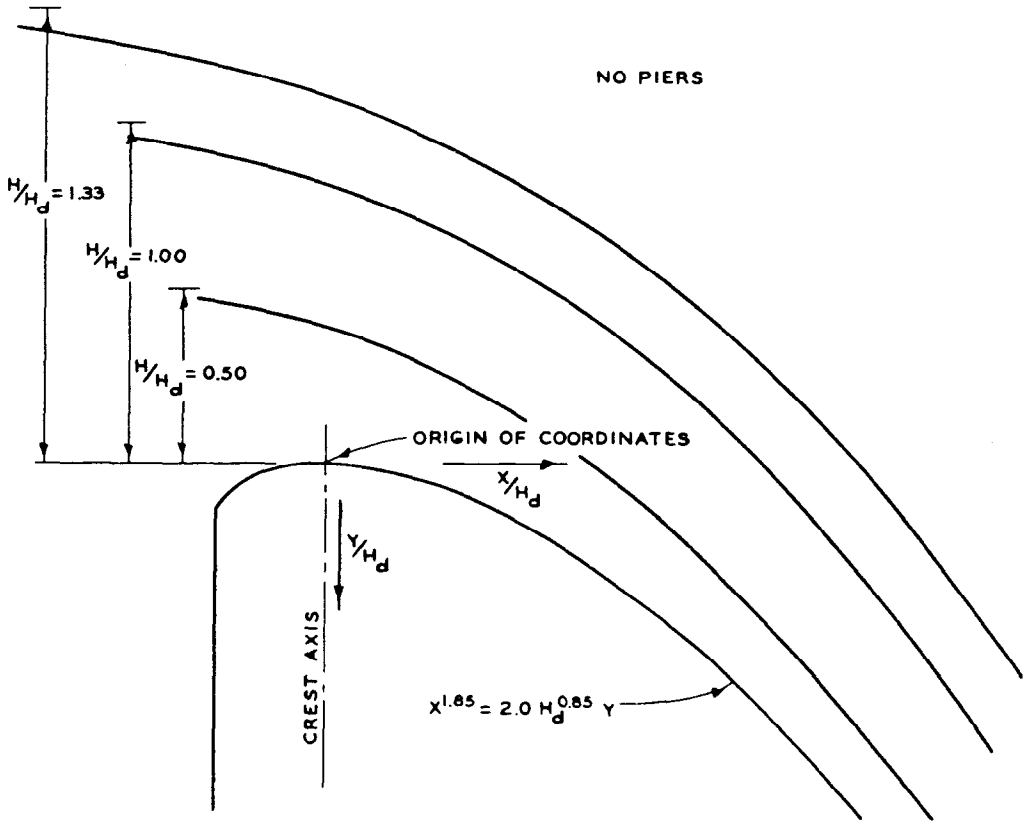
NOTE: H_d = DESIGN TOTAL HEAD, FT
H_e = ACTUAL TOTAL HEAD, FT

ELLIPTICAL CREST SPILLWAY
CAVITATION SAFETY CURVES
WITH PIERS
FROM HDC 111-25/1



NOTE: H_d = DESIGN TOTAL HEAD, FT
H_e = ACTUAL TOTAL HEAD, FT

ELLIPTICAL CREST SPILLWAY
CAVITATION SAFETY CURVES
NO PIERS
FROM HDC 111-25



COORDINATES FOR UPPER NAPPE WITH NO PIERS*

$H/H_d = 0.50$		$H/H_d = 1.00$		$H/H_d = 1.33$	
X/H_d	Y/H_d	X/H_d	Y/H_d	X/H_d	Y/H_d
-1.0	-0.490	-1.0	-0.933	-1.0	-1.210
-0.8	-0.484	-0.8	-0.915	-0.8	-1.185
-0.6	-0.475	-0.6	-0.893	-0.6	-1.151
-0.4	-0.460	-0.4	-0.865	-0.4	-1.110
-0.2	-0.425	-0.2	-0.821	-0.2	-1.060
0.0	-0.371	0.0	-0.755	0.0	-1.000
0.2	-0.300	0.2	-0.681	0.2	-0.919
0.4	-0.200	0.4	-0.586	0.4	-0.821
0.6	-0.075	0.6	-0.465	0.6	-0.705
0.8	0.075	0.8	-0.320	0.8	-0.569
1.0	0.258	1.0	-0.145	1.0	-0.411
1.2	0.470	1.2	0.055	1.2	-0.220
1.4	0.705	1.4	0.294	1.4	-0.002
1.6	0.972	1.6	0.563	1.6	0.243
1.8	1.269	1.8	0.857	1.8	0.531

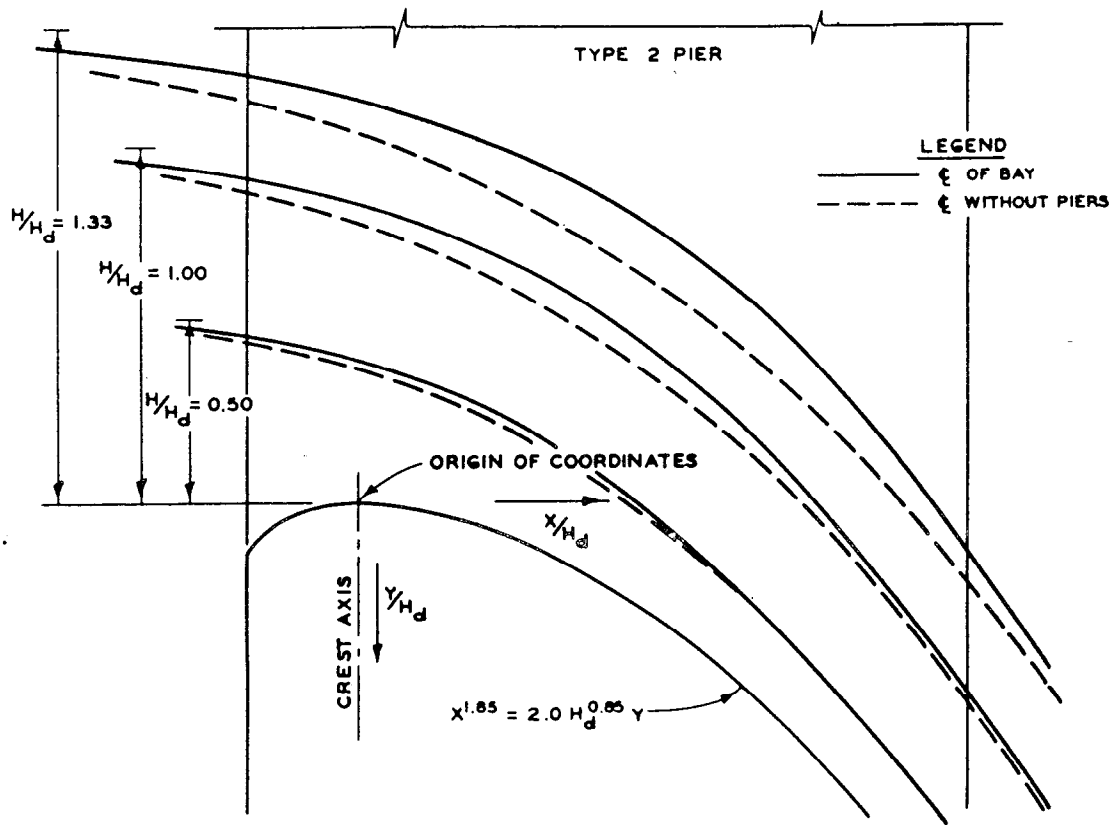
NOTE: $H = H_e$

*BASED ON ES 801 TESTS FOR NEGLIGIBLE VELOCITY OF APPROACH

OVERFLOW SPILLWAY CREST

UPPER NAPPE PROFILES WITHOUT PIERS

FROM HDC 111-11



COORDINATES FOR UPPER NAPPE AT ℄ OF BAY WITH TYPE 2 PIERS*

$H/H_d = 0.50$		$H/H_d = 1.00$		$H/H_d = 1.33$	
X/H_d	Y/H_d	X/H_d	Y/H_d	X/H_d	Y/H_d
-1.0	-0.482	-1.0	-0.941	-1.0	-1.230
-0.8	-0.480	-0.8	-0.932	-0.8	-1.215
-0.6	-0.472	-0.6	-0.913	-0.6	-1.194
-0.4	-0.457	-0.4	-0.890	-0.4	-1.165
-0.2	-0.431	-0.2	-0.855	-0.2	-1.122
0.0	-0.384	0.0	-0.805	0.0	-1.071
0.2	-0.313	0.2	-0.735	0.2	-1.015
0.4	-0.220	0.4	-0.647	0.4	-0.944
0.6	-0.088	0.6	-0.539	0.6	-0.847
0.8	0.075	0.8	-0.389	0.8	-0.725
1.0	0.257	1.0	-0.202	1.0	-0.564
1.2	0.462	1.2	0.015	1.2	-0.356
1.4	0.705	1.4	0.266	1.4	-0.102
1.6	0.977	1.6	0.521	1.6	0.172
1.8	1.278	1.8	0.860	1.8	0.465

NOTE: $H = H_e$

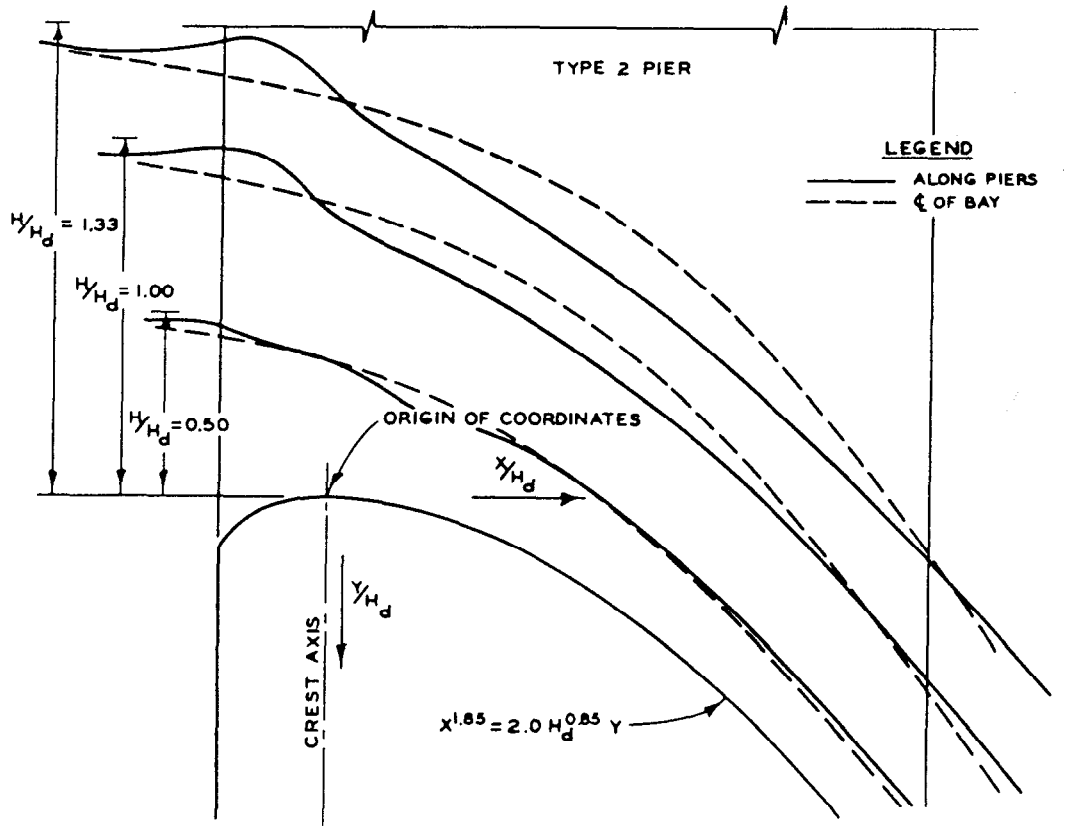
*BASED ON CW 801 TESTS FOR NEGLIGIBLE VELOCITY OF APPROACH

OVERFLOW SPILLWAY CREST

UPPER NAPPE PROFILES

CENTER LINE OF PIER BAY

FROM HDC 111-12



COORDINATES FOR UPPER NAPPE ALONG PIERS*

$H/H_d = 0.50$		$H/H_d = 1.00$		$H/H_d = 1.33$	
X/H_d	Y/H_d	X/H_d	Y/H_d	X/H_d	Y/H_d
-1.0	-0.495	-1.0	-0.950	-1.0	-1.235
-0.8	-0.492	-0.8	-0.940	-0.8	-1.221
-0.6	-0.490	-0.6	-0.929	-0.6	-1.209
-0.4	-0.482	-0.4	-0.930	-0.4	-1.218
-0.2	-0.440	-0.2	-0.925	-0.2	-1.244
0.0	-0.383	0.0	-0.779	0.0	-1.103
0.2	-0.265	0.2	-0.651	0.2	-0.950
0.4	-0.185	0.4	-0.545	0.4	-0.821
0.6	-0.076	0.6	-0.425	0.6	-0.689
0.8	0.060	0.8	-0.285	0.8	-0.549
1.0	0.240	1.0	-0.121	1.0	-0.389
1.2	0.445	1.2	0.067	1.2	-0.215
1.4	0.675	1.4	0.286	1.4	0.011
1.6	0.925	1.6	0.521	1.6	0.208
1.8	1.177	1.8	0.779	1.8	0.438

NOTE: $H = H_e$

*BASED ON ES 801 TESTS FOR NEGLIGIBLE VELOCITY OF APPROACH

OVERFLOW SPILLWAY CREST

UPPER NAPPE PROFILES ALONG PIERS

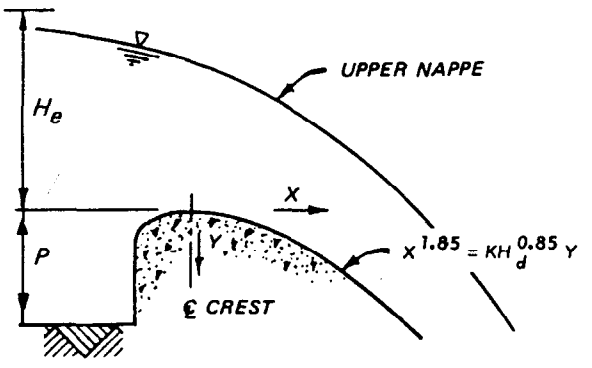
FROM HDC 111-12/1

CENTER LINE OF GATE BAY

$\frac{H_e}{H_d}$	0.50	1.0	1.5
$\frac{X}{H_d}$	$\frac{Y}{H_d}$		
-1.0	-0.494	-0.939	-1.311
-0.8	-0.488	-0.925	-1.300
-0.6	-0.483	-0.913	-1.275
-0.4	-0.476	-0.888	-1.248
-0.2	-0.445	-0.855	-1.210
0.0	-0.403	-0.808	-1.162
0.2	-0.335	-0.743	-1.102
0.4	-0.240	-0.666	-1.029
0.6	-0.116	-0.573	-0.938
0.8	+0.029	-0.454	-0.833
1.0	0.201	-0.291	-0.707
1.2	0.403	-0.086	-0.562
1.4	0.626	+0.150	-0.395

ALONG PIERS

$\frac{H_e}{H_d}$	0.50	1.0	1.5
$\frac{X}{H_d}$	$\frac{Y}{H_d}$		
-1.0	-0.489	-0.933	-1.311
-0.8	-0.483	-0.925	-1.300
-0.6	-0.475	-0.918	-1.280
-0.4	-0.488	-0.931	-1.313
-0.2	-0.463	-0.935	-1.375
-0.15	-0.438	-0.915	-1.383
0.0	-0.369	-0.829	-1.315
0.2	-0.264	-0.695	-1.171
0.4	-0.170	-0.571	-1.023
0.6	-0.063	-0.441	-0.882
0.8	0.069	-0.298	-0.730
1.0	0.234	-0.128	-0.555
1.2	0.431	0.065	-0.362
1.4	0.651	0.278	-0.140



DEFINITION SKETCH

WATER SURFACE PROFILES

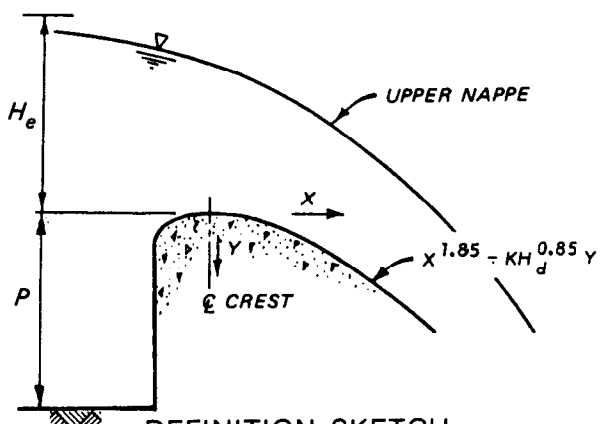
CONTROLLED CREST
$P/H_d = 1.0$

CENTER LINE OF GATE BAY

$\frac{H_e}{H_d}$	0.50	1.0	1.5
$\frac{X}{H_d}$	$\frac{Y}{H_d}$		
-1.0	-0.483	-0.894	-1.254
-0.8	-0.479	-0.886	-1.244
-0.6	-0.471	-0.871	-1.229
-0.4	-0.454	-0.851	-1.208
-0.2	-0.429	-0.824	-1.183
0.0	-0.388	-0.783	-1.149
0.2	-0.329	-0.728	-1.099
0.4	-0.241	-0.655	-1.034
0.6	-0.123	-0.570	-0.951
0.8	+0.019	-0.458	-0.856
1.0	+0.198	-0.300	-0.753
1.2	+0.394	-0.104	-0.631
1.4	+0.613	+0.119	-0.426

ALONG PIERS

$\frac{H_e}{H_d}$	0.50	1.0	1.5
$\frac{X}{H_d}$	$\frac{Y}{H_d}$		
-1.0	-0.483	-0.889	-1.257
-0.8	-0.481	-0.880	-1.248
-0.6	-0.477	-0.869	-1.233
-0.4	-0.480	-0.880	-1.243
-0.2	-0.467	-0.917	-1.338
-0.15	-0.450	-0.910	-1.373
0.0	-0.356	-0.825	-1.324
0.2	-0.252	-0.677	-1.176
0.4	-0.159	-0.541	-1.029
0.6	-0.055	-0.414	-0.885
0.8	0.081	-0.258	-0.735
1.0	0.256	-0.089	-0.566
1.2	0.477	0.105	-0.383
1.4	0.672	0.319	-0.188



DEFINITION SKETCH

WATER SURFACE PROFILES

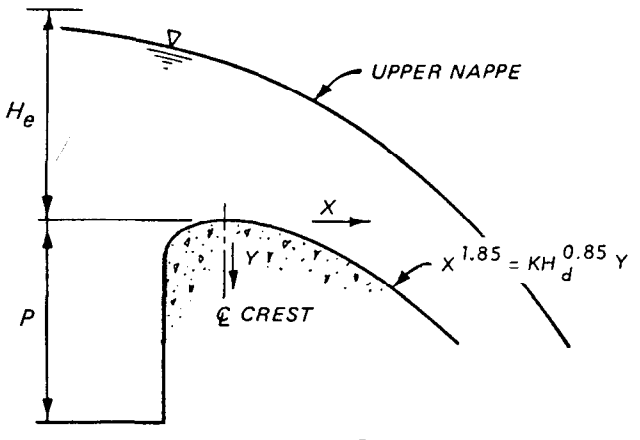
CONTROLLED CREST
$P/H_d = 0.50$

CENTER LINE OF GATE BAY

$\frac{H_e}{H_d}$	0.50	1.0
$\frac{X}{H_d}$	$\frac{Y}{H_d}$	
-1.0	-0.469	-0.850
-0.8	-0.469	-0.848
-0.6	-0.464	-0.839
-0.4	-0.454	-0.823
-0.2	-0.438	-0.796
0.0	-0.405	-0.758
0.2	-0.358	-0.715
0.4	-0.260	-0.640
0.6	-0.151	-0.553
0.8	-0.018	-0.448
1.0	0.135	-0.303
1.2	0.315	-0.135
1.4	0.528	+0.045

ALONG PIERS

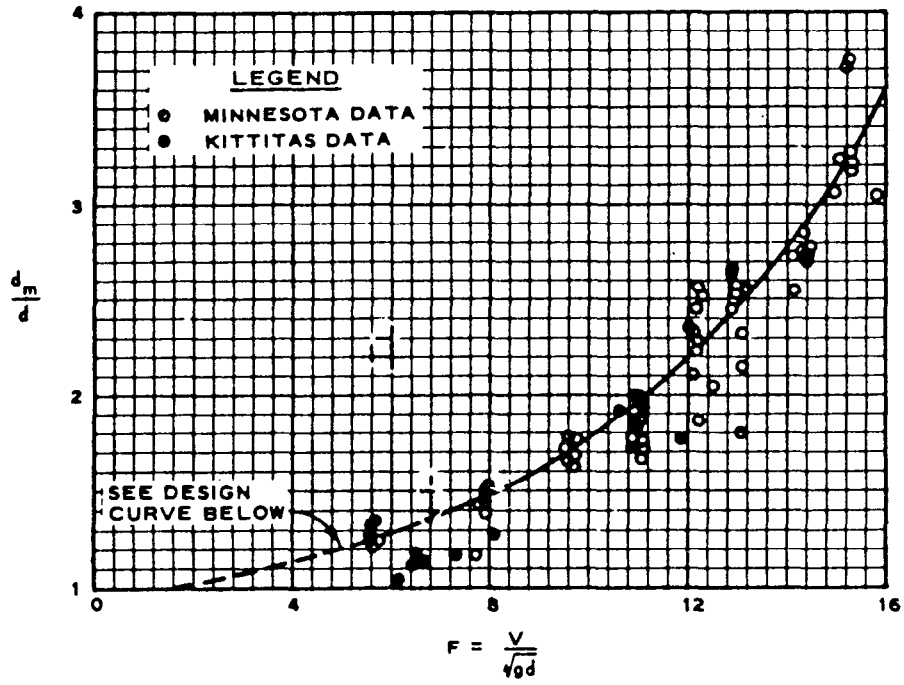
$\frac{H_e}{H_d}$	0.50	1.0
$\frac{X}{H_d}$	$\frac{Y}{H_d}$	
-1.0	-0.469	-0.838
-0.8	-0.469	-0.835
-0.6	-0.466	-0.833
-0.4	-0.469	-0.835
-0.2	-0.488	-0.894
0.0	-0.414	-0.900
0.2	-0.286	-0.756
0.4	-0.175	-0.615
0.6	-0.066	-0.471
0.8	+0.061	-0.311
1.0	+0.209	-0.139
1.2	+0.378	+0.044
1.4	+0.577	+0.250



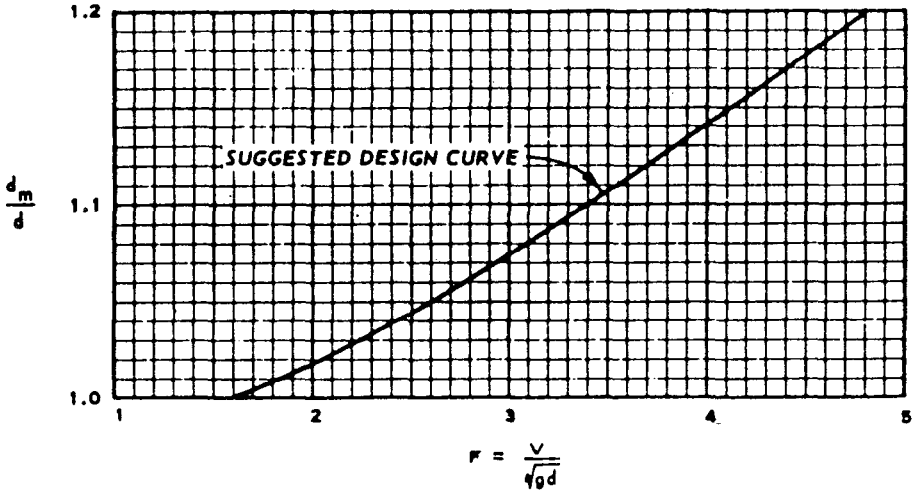
DEFINITION SKETCH

WATER SURFACE PROFILES

CONTROLLED CREST
$P/H_d = 0.25$



a. EXPERIMENTAL DATA



b. DESIGN CURVE

NOTE: d_m = DEPTH OF WATER AND AIR MIXTURE

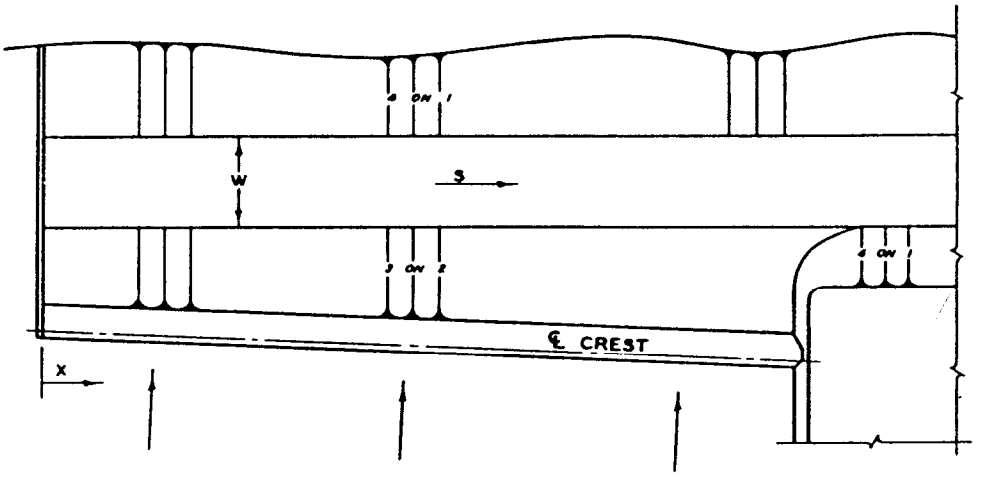
d = COMPUTED DEPTH FOR NON-AERATED FLOW

V = COMPUTED VELOCITY FOR NON-AERATED FLOW

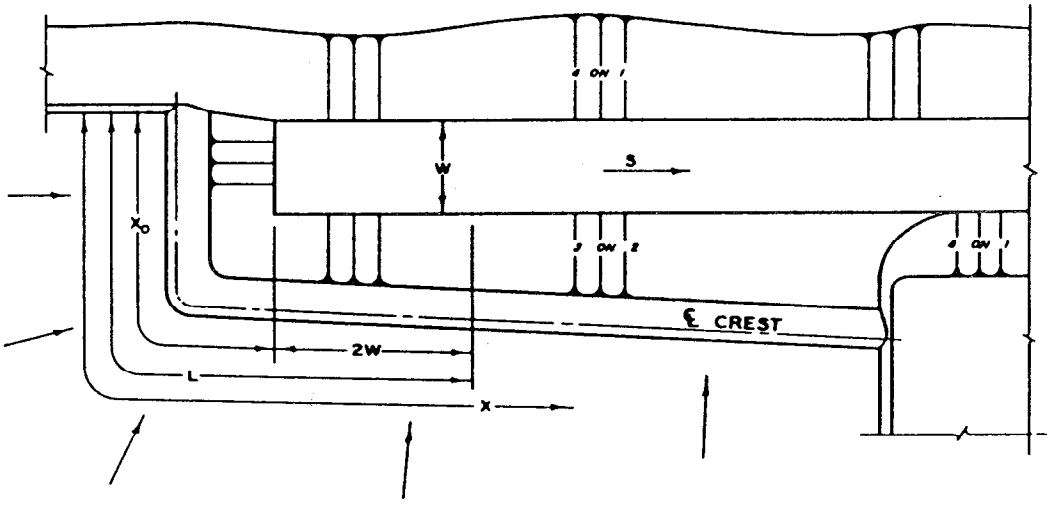
g = GRAVITATIONAL ACCELERATION

F = FROUDE NUMBER FOR NONAERATED FLOW

AIR ENTRAINMENT

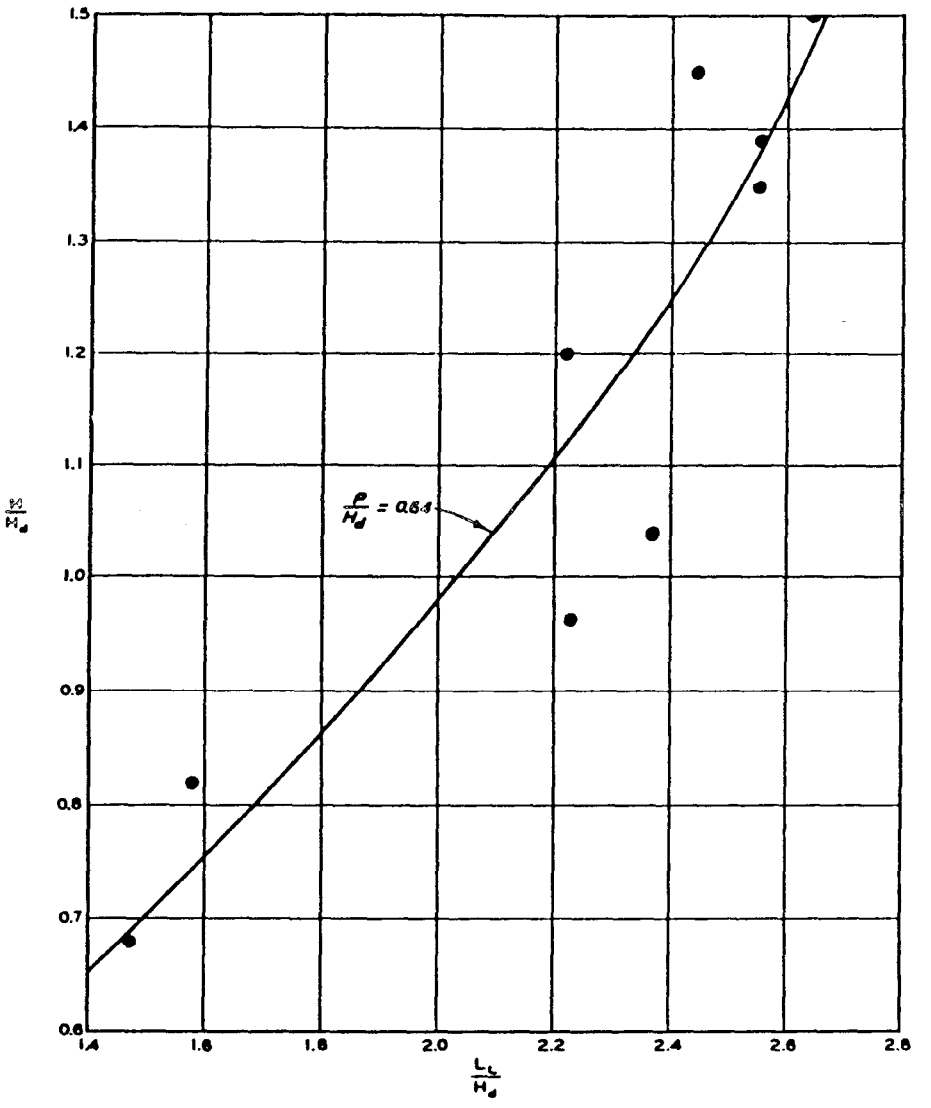


a. CONVENTIONAL SIDE CHANNEL SPILLWAY



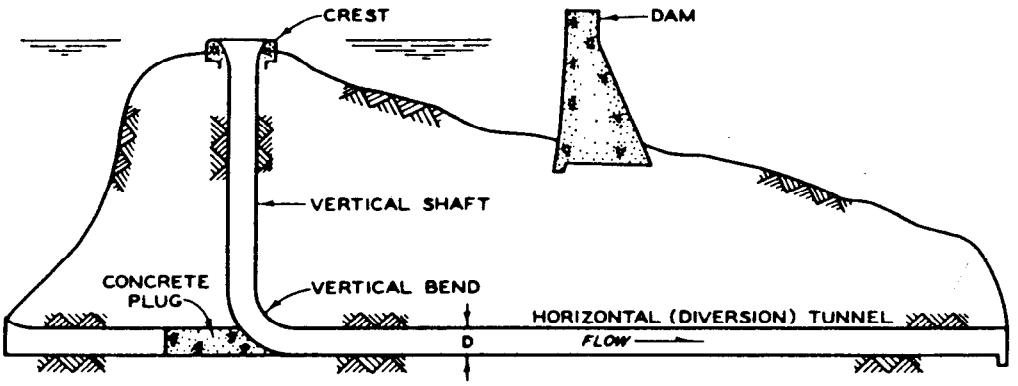
b. L-SHAPED SIDE CHANNEL SPILLWAY

SIDE CHANNEL SPILLWAYS

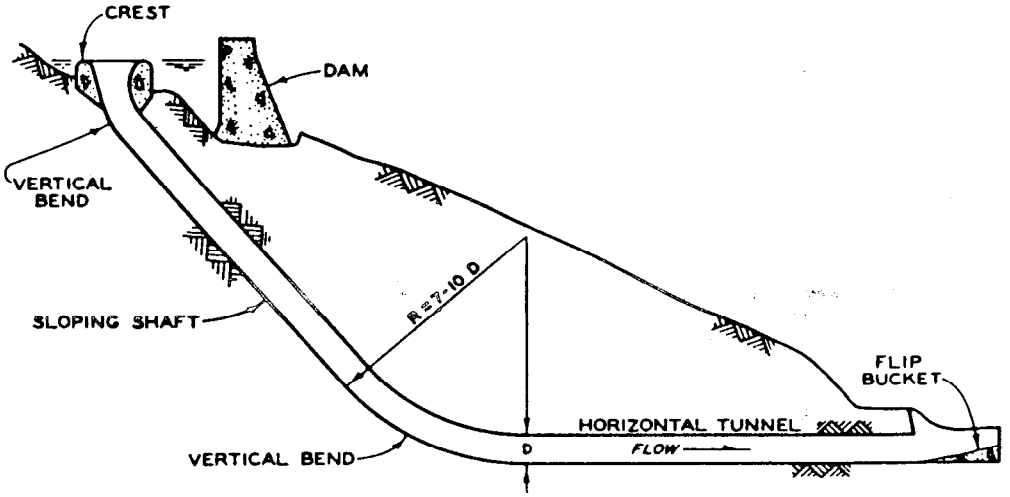


NOTE: H = HEAD ON CREST.
H_d = DESIGN HEAD.
L_L = LOSS OF EFFECTIVE CREST LENGTH.
P = APPROACH DEPTH.

SIDE CHANNEL SPILLWAYS
L-SHAPED CRESTS
EFFECTIVE LENGTH

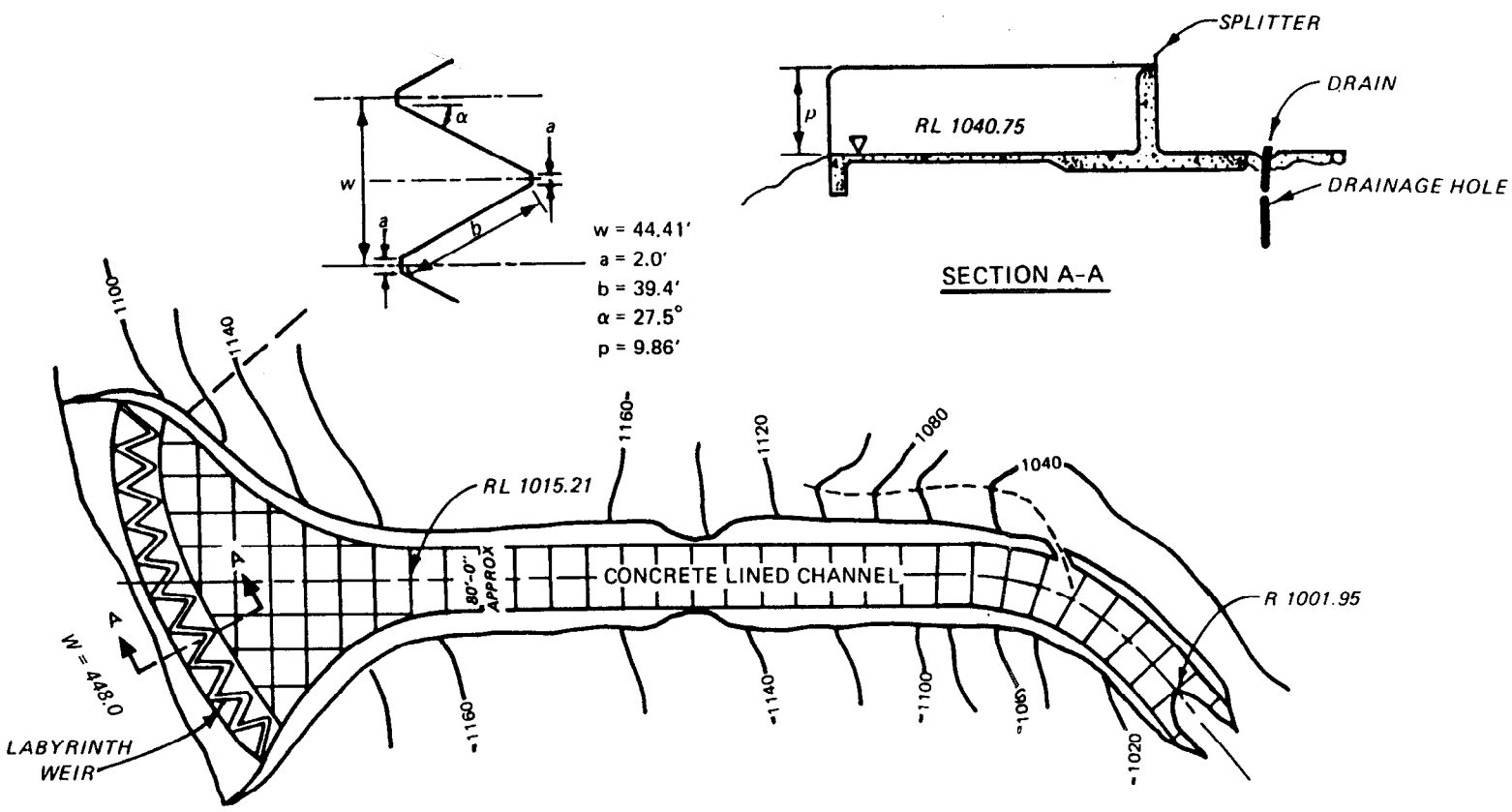


VERTICAL SHAFT SPILLWAY



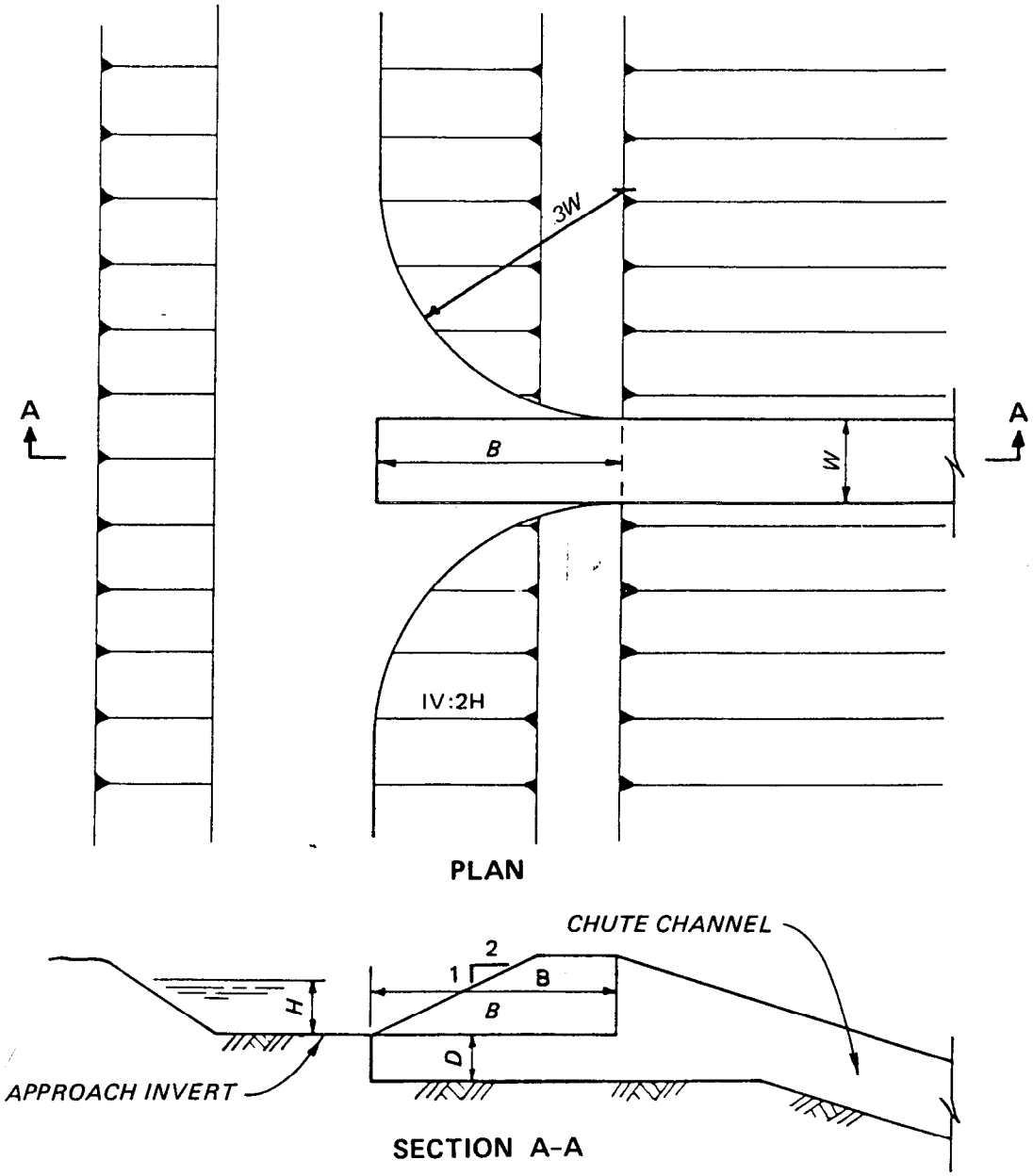
SLOPING SHAFT SPILLWAY

MORNING GLORY SPILLWAYS



PLAN OF AVON SPILLWAY

LABYRINTH WEIR SPILLWAY

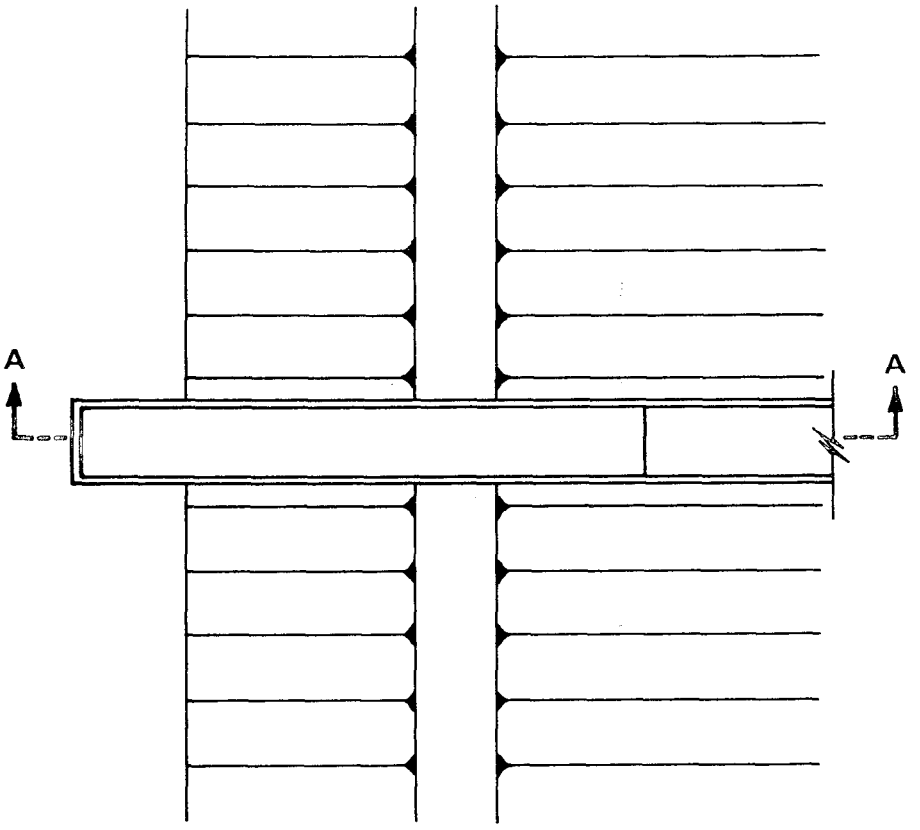


LEGEND:

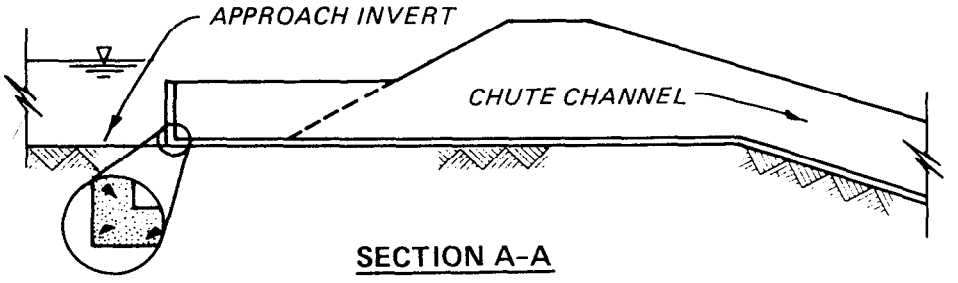
B = LENGTH OF DROP FEET
D = DEPTH OF DROP FEET
W = CHUTE WIDTH, FEET
H = UPSTREAM, HEADWATER DEPTH, FT.
Q = DISCHARGE, CFS

BOX INLET DROP SPILLWAY

FROM HDC CHART 625-1

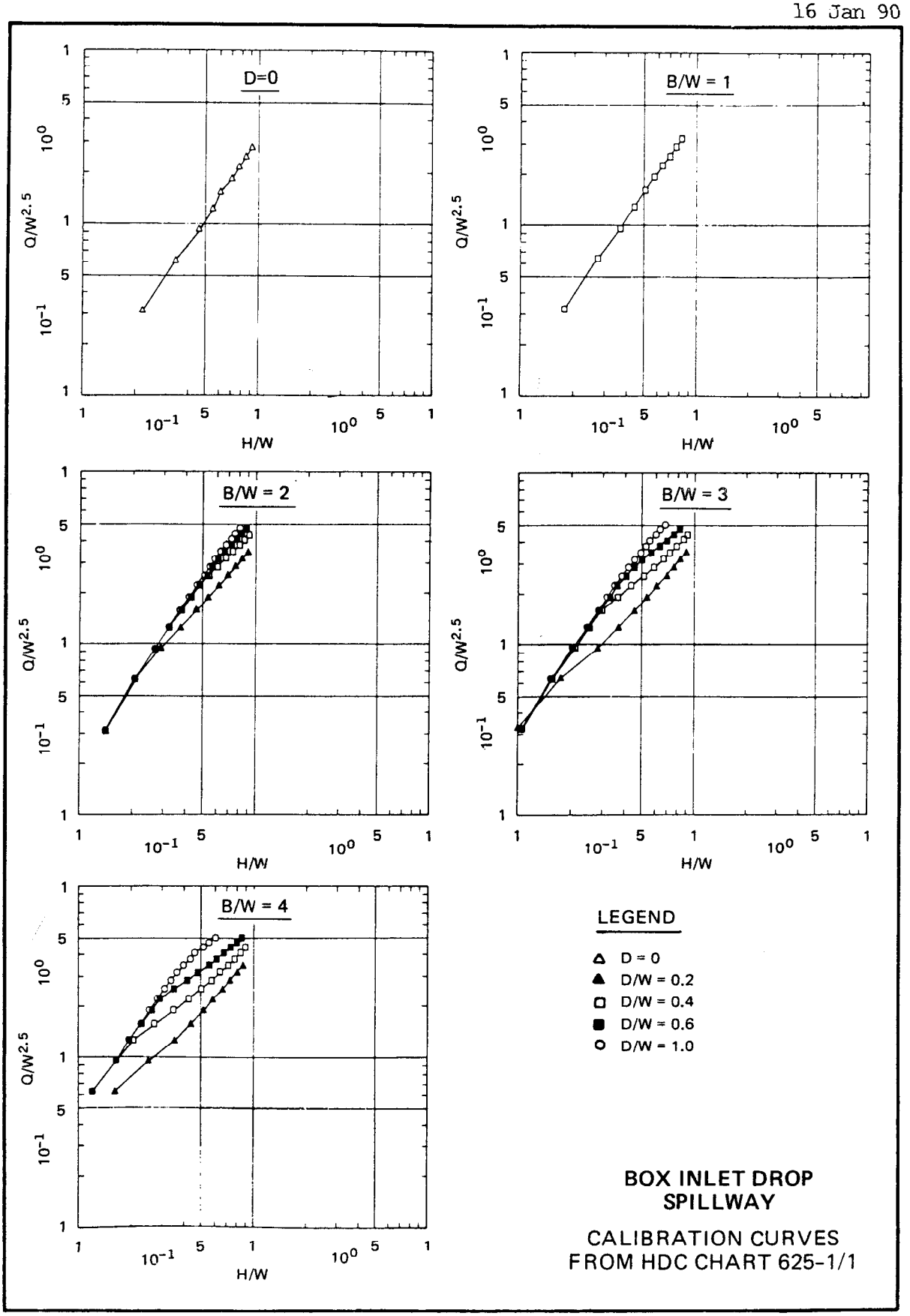


PLAN



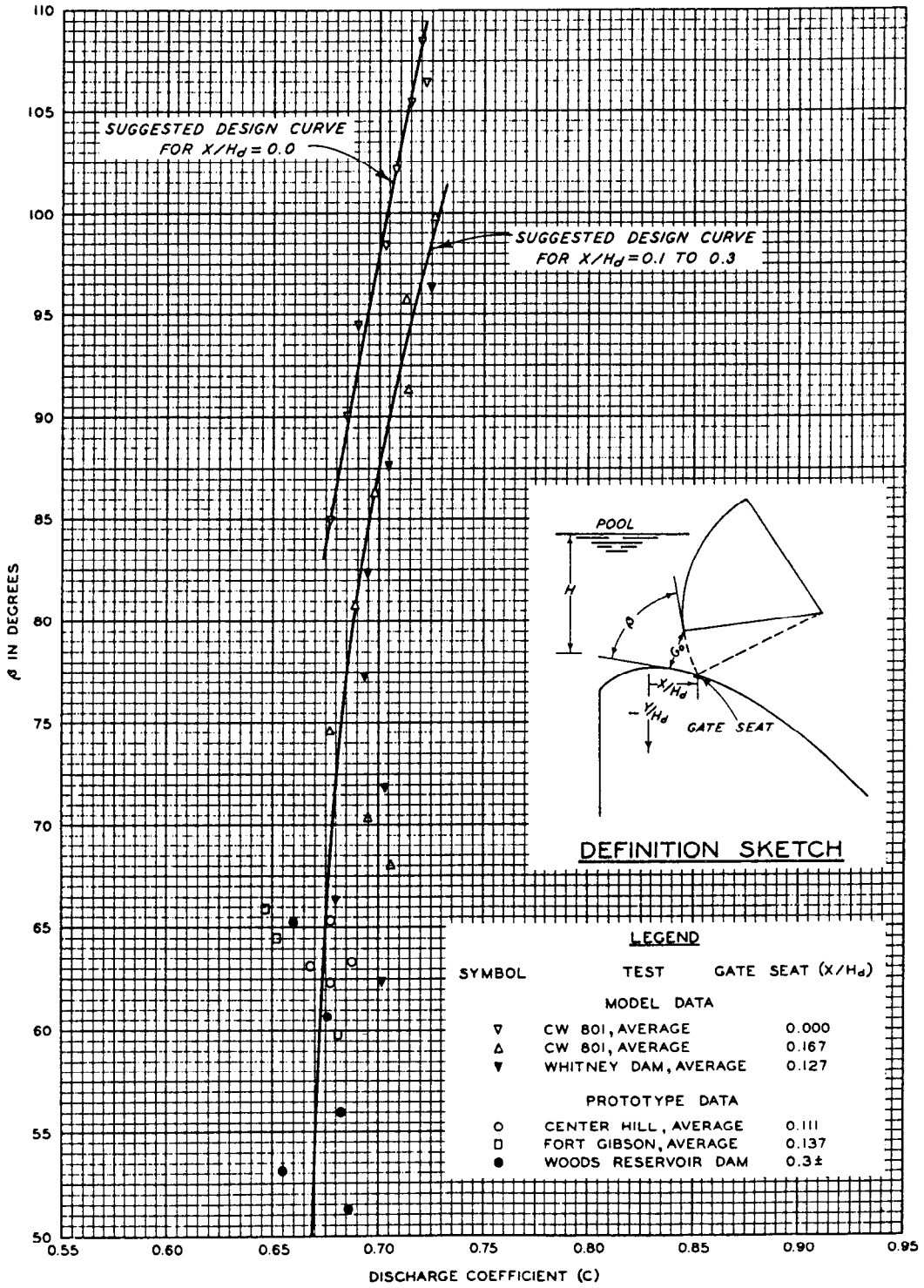
SECTION A-A

ELEVATED BOX
DROP SPILLWAY



BOX INLET DROP SPILLWAY

CALIBRATION CURVES FROM HDC CHART 625-1/1



FORMULA

$Q = CG_oB\sqrt{2gH}$

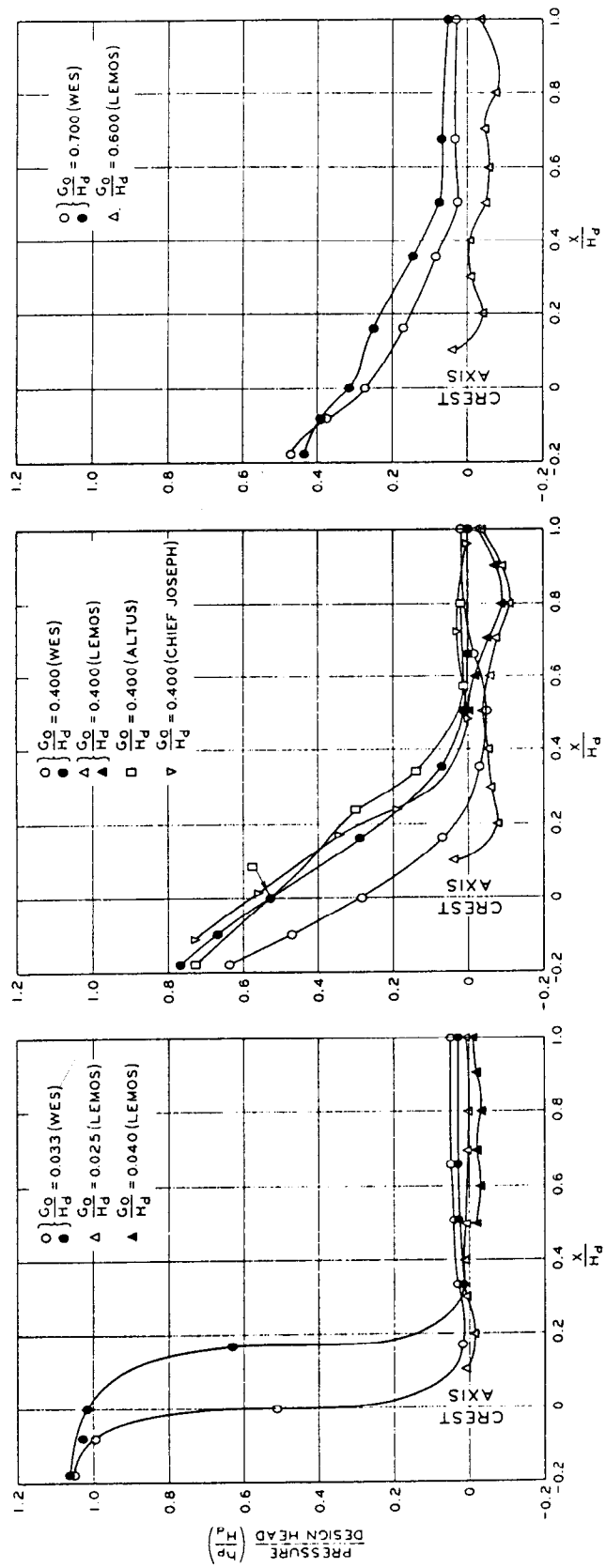
WHERE:

G_o = NET GATE OPENING
B = GATE WIDTH
H = HEAD TO CENTER OF GATE OPENING

TAINTER GATES ON SPILLWAY CRESTS

DISCHARGE COEFFICIENTS

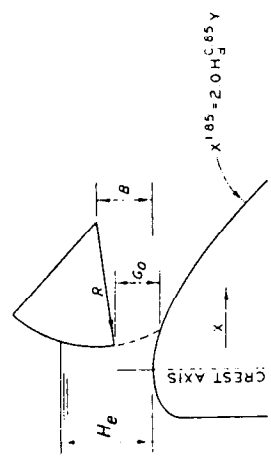
FROM HDC 311-1



LEGEND

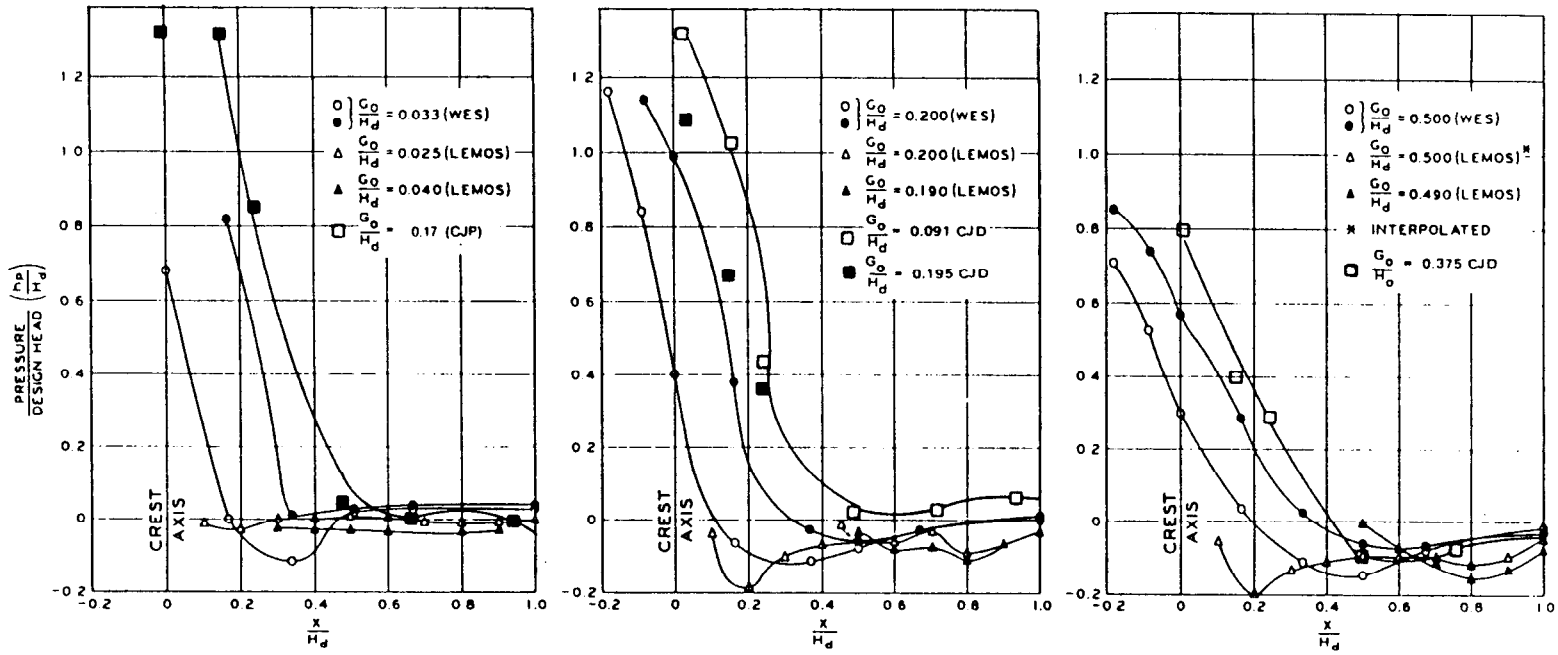
SYMBOL	TEST	GATE SEAT (X/Hd)	R/Hd	B/Hd
○	CW 801 (M)	0.000	1.27	0.385
●	CW 801 (M)	0.167	1.27	0.367
△	LEMOS (M)	0.000	1.25	0.560
▲	LEMOS (M)	0.400	1.25	0.520
▽	CHIEF JOSEPH (P) (INTERPOLATED)	0.258	1.00	0.444
□	ALTUS (M) (INTERPOLATED)	0.342	1.27	0.500

(M) MODEL
(P) PROTOTYPE



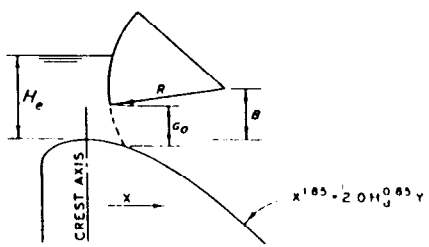
TAINTER GATES ON SPILLWAY CRESTS
EFFECT OF GATE SEAT LOCATION ON CREST PRESSURES FOR H_e = 1.00 H_d

FROM HDC 311-6

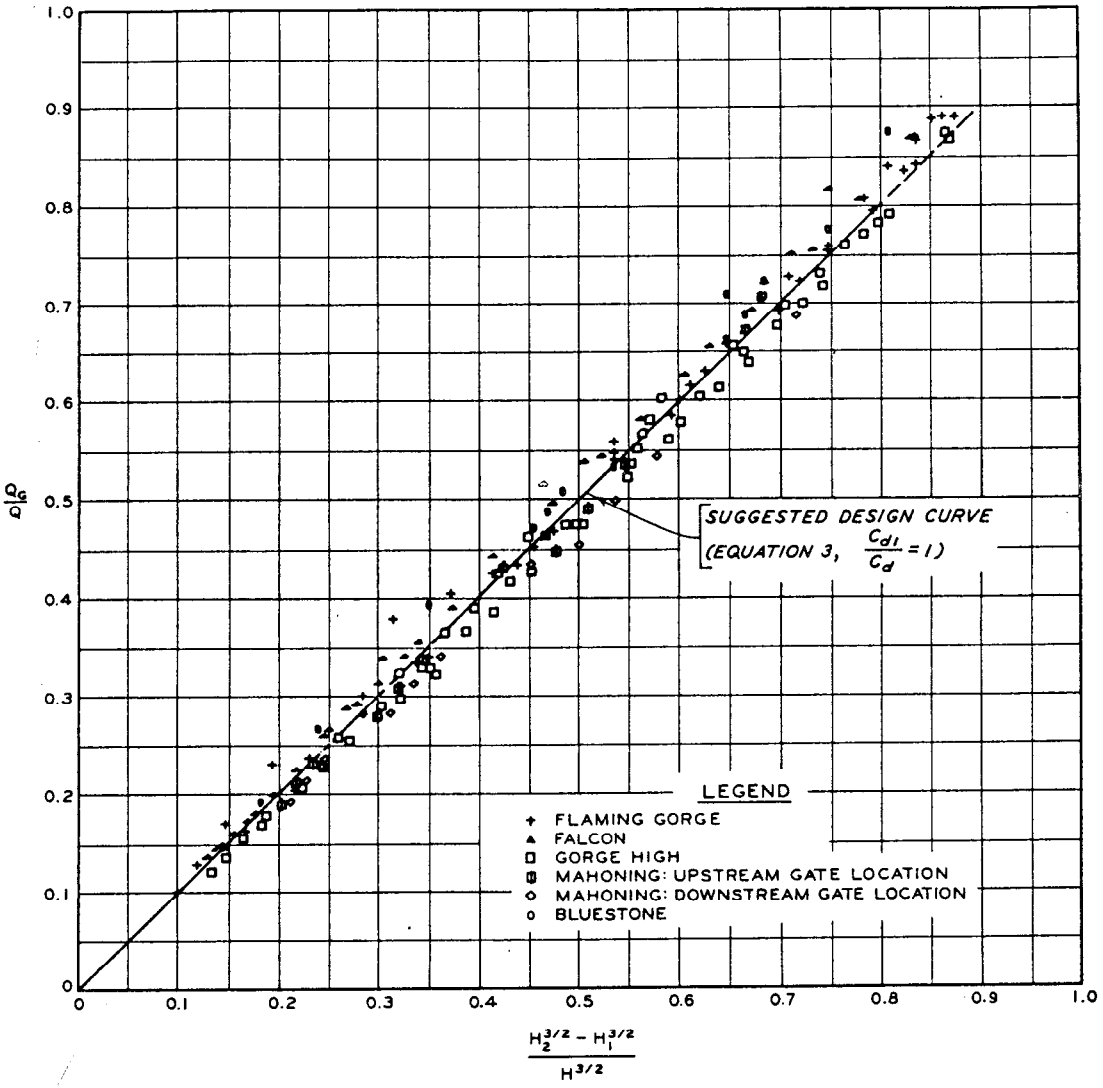


LEGEND

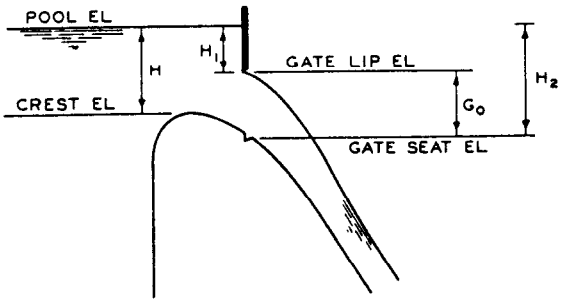
SYMBOL	TEST	GATE SEAT (X/H_d)	R/H_d	B/H_d	H/H_d
	CW 801(M)	0.000	1.27	0.385	1.33
	CW 801(M)	0.167	1.27	0.367	1.33
	LEMOS (M)	0.000	1.25	0.560	1.25
	LEMOS (M)	0.400	1.25	0.520	1.25
	CH JOSEPH DAM CJD	0.258	1.00	0.444	1.33



TAINTER GATES ON SPILLWAY CRESTS
EFFECT OF GATE SEAT LOCATION ON CREST PRESSURES FOR H_e = 1.3H
FROM HDC 311-6/1



NOTE: Q = FREE-FLOW DISCHARGE AT HEAD H
Q_G = DISCHARGE AT HEAD H AND GATE OPENING G_O
$H_1 = H_2 - G_O$

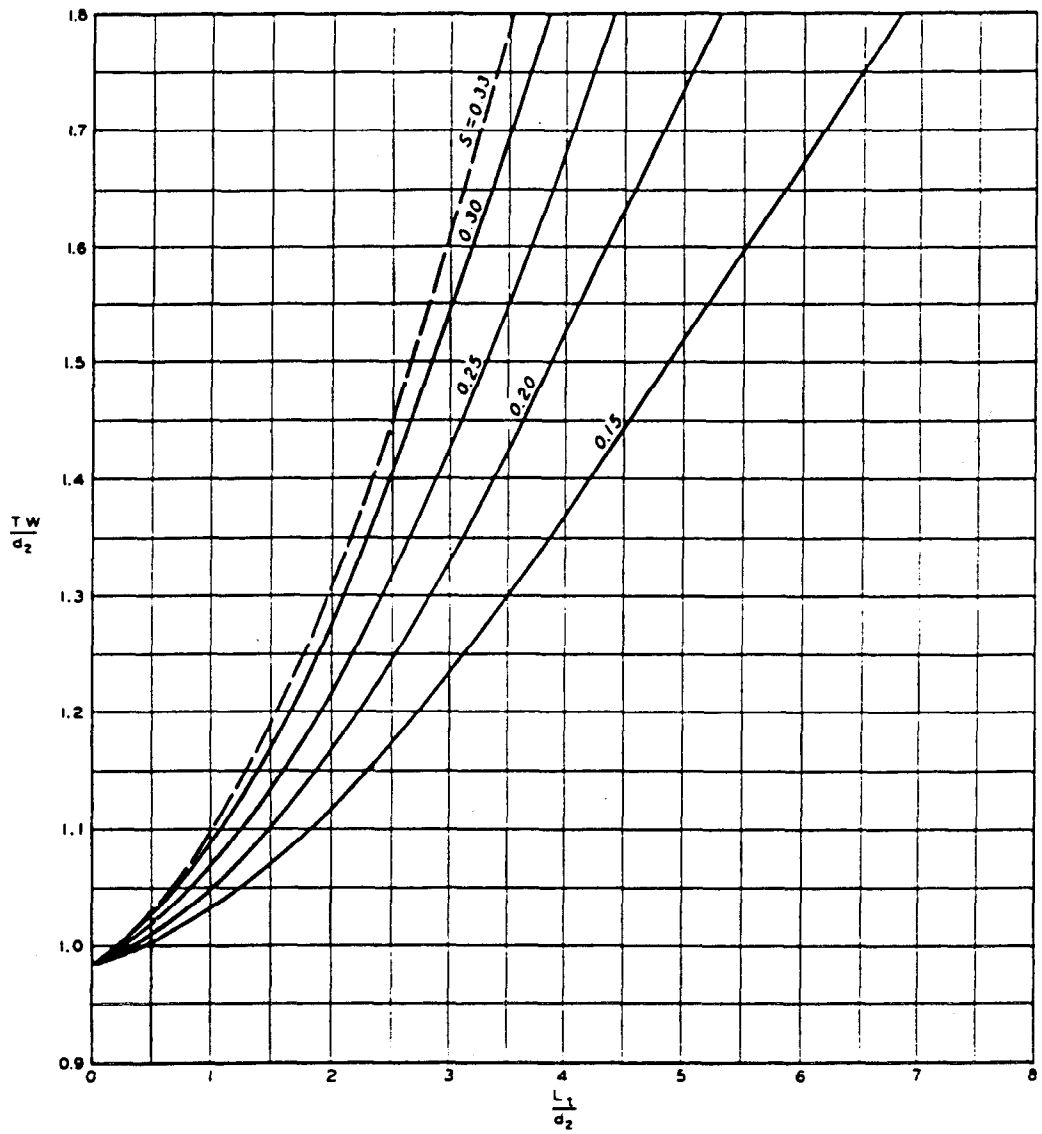


DEFINITION SKETCH

VERTICAL LIFT GATES ON SPILLWAYS

DISCHARGE COEFFICIENTS

FROM HDC 312

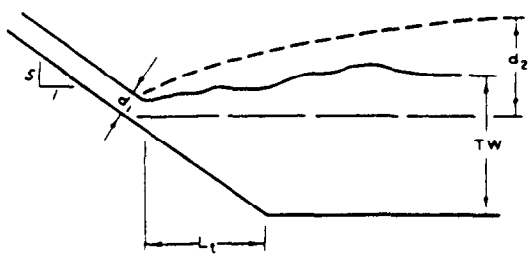


$$\frac{d_2}{d_1} = \frac{1}{2}\left(\sqrt{1 + 8F_1^2} - 1\right)$$

$$F_1 = \frac{V_1}{\sqrt{g d_1}}$$

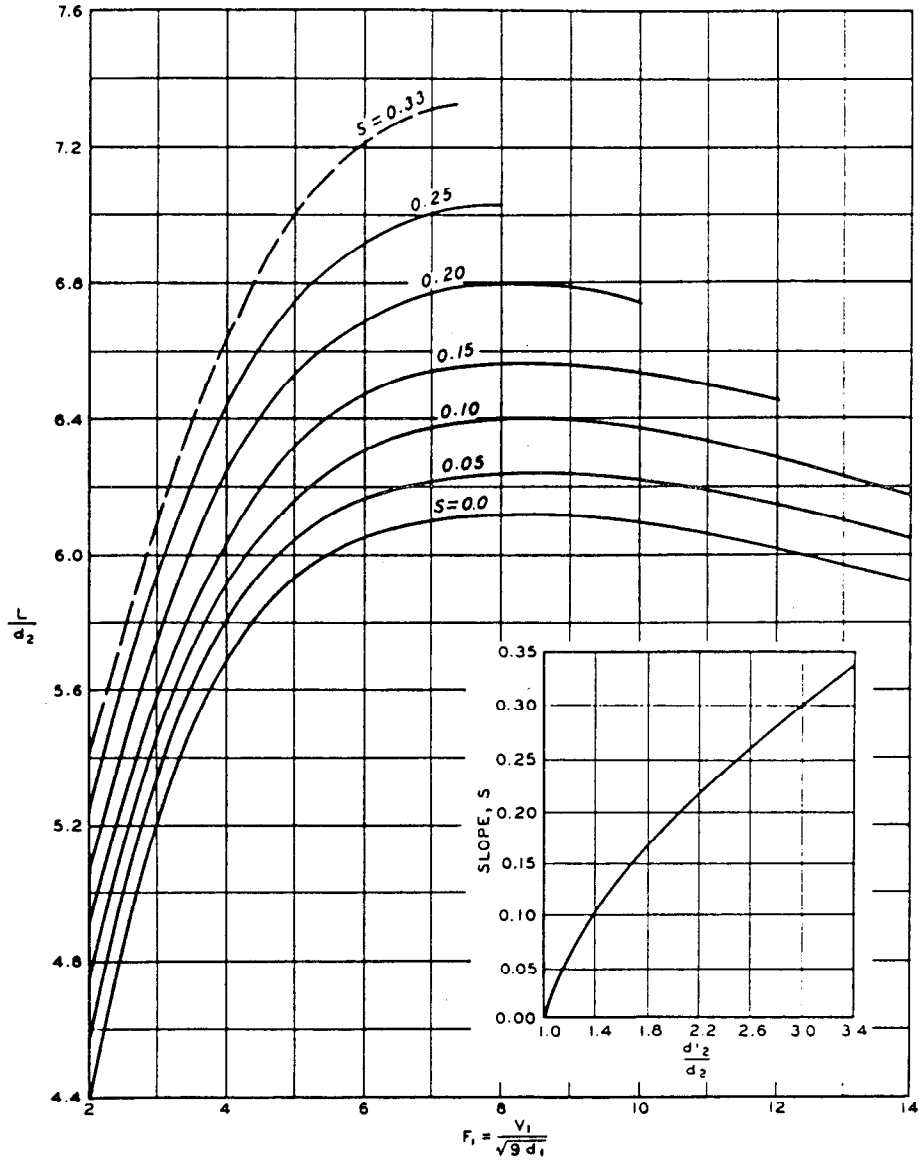
NOTE: CURVES DEVELOPED BY BRADLEY AND PETERKA FROM EXPERIMENTAL DATA.

CURVE FOR S = 0.33 EXTRAPOLATED



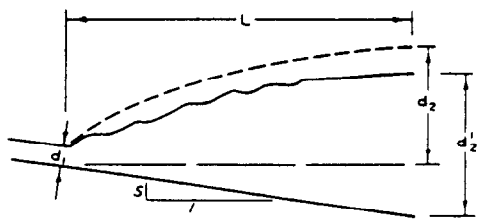
DEFINITION SKETCH

SLOPING FLOOR STILLING BASINS
NONCONTINUOUS SLOPE
JUMP LENGTH ON SLOPE
FROM HDC 124-1/1



$$\frac{d_2}{d_1} = \frac{1}{2}\left(\sqrt{1 + 8F_1^2} - 1\right)$$

NOTE: CURVES DEVELOPED BY BRADLEY AND PETERKA FROM EXPERIMENTAL DATA. DATA POINTS OMITTED TO SIMPLIFY CHART.
CURVE FOR S=0.33 EXTRAPOLATED



DEFINITION SKETCH

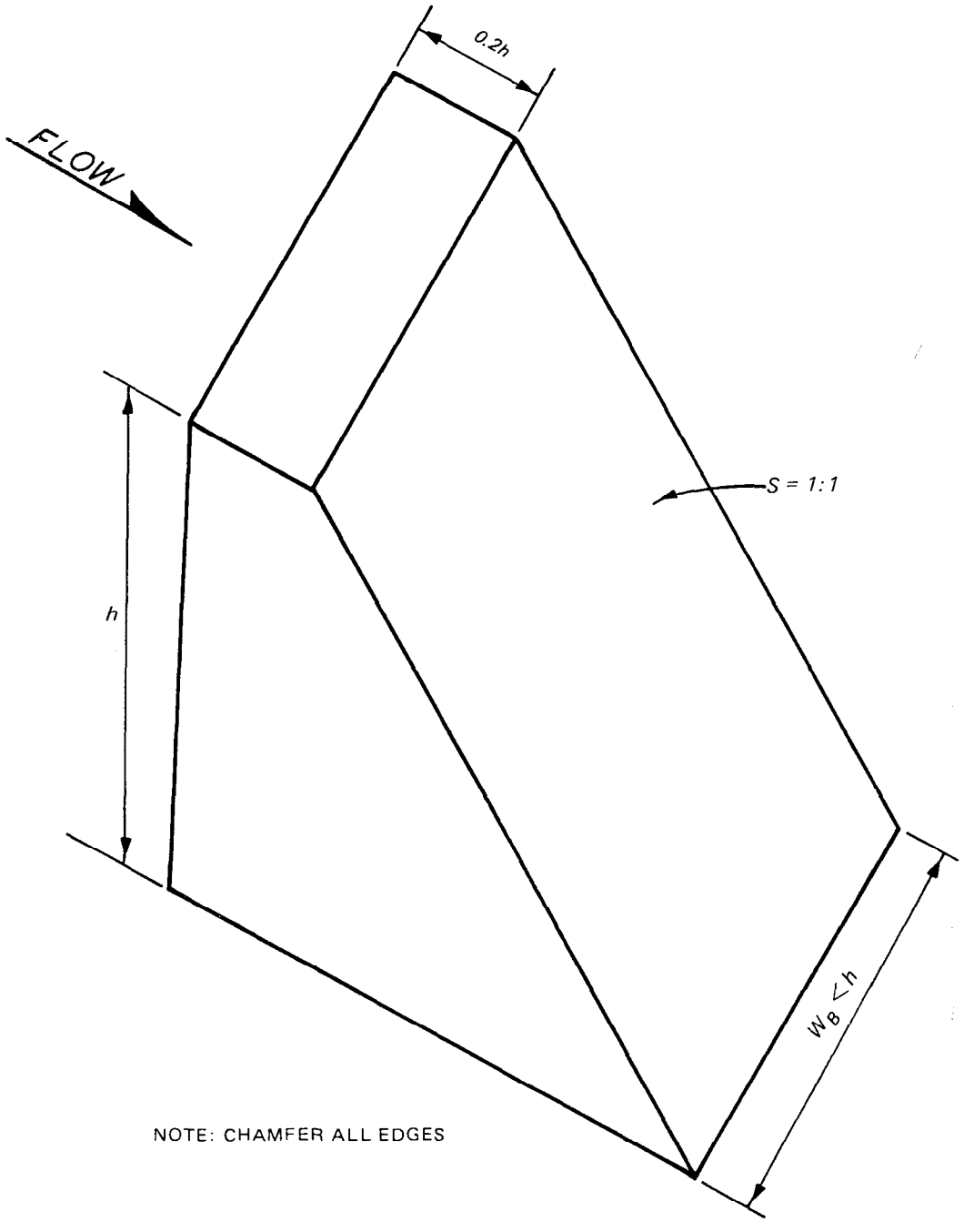
SLOPING FLOOR

STILLING BASINS

CONTINUOUS SLOPE

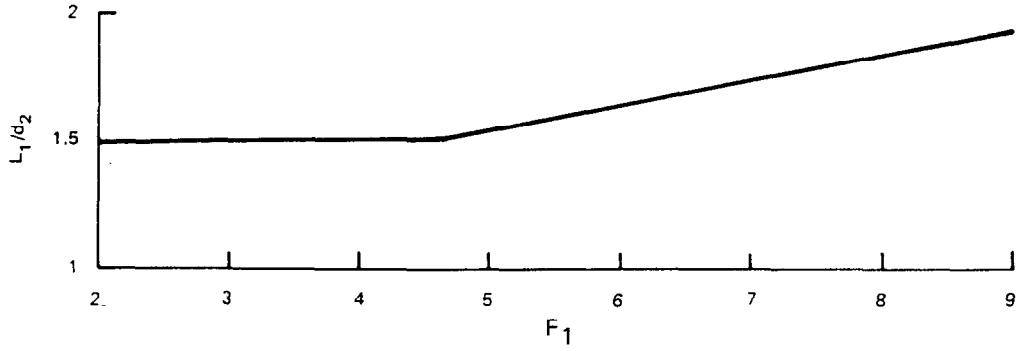
LENGTH OF HYDRAULIC JUMP

FROM HDC 124-1

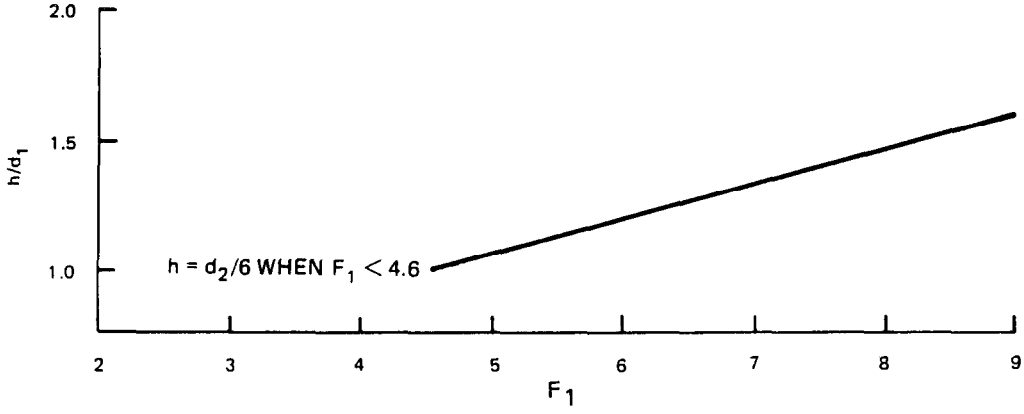


NOTE: CHAMFER ALL EDGES

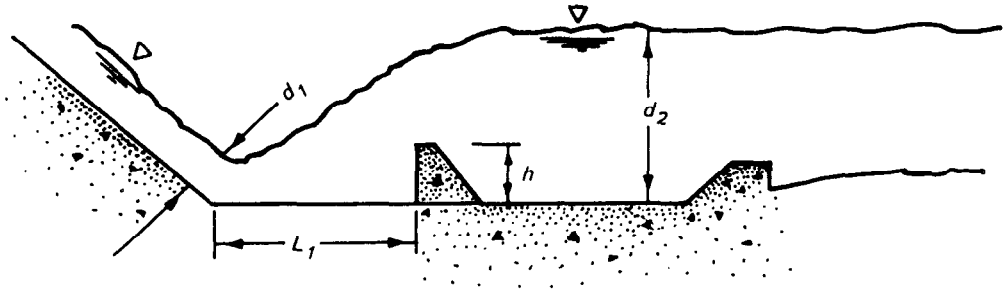
STANDARD-SHAPE BAFFLE



BAFFLE LOCATION

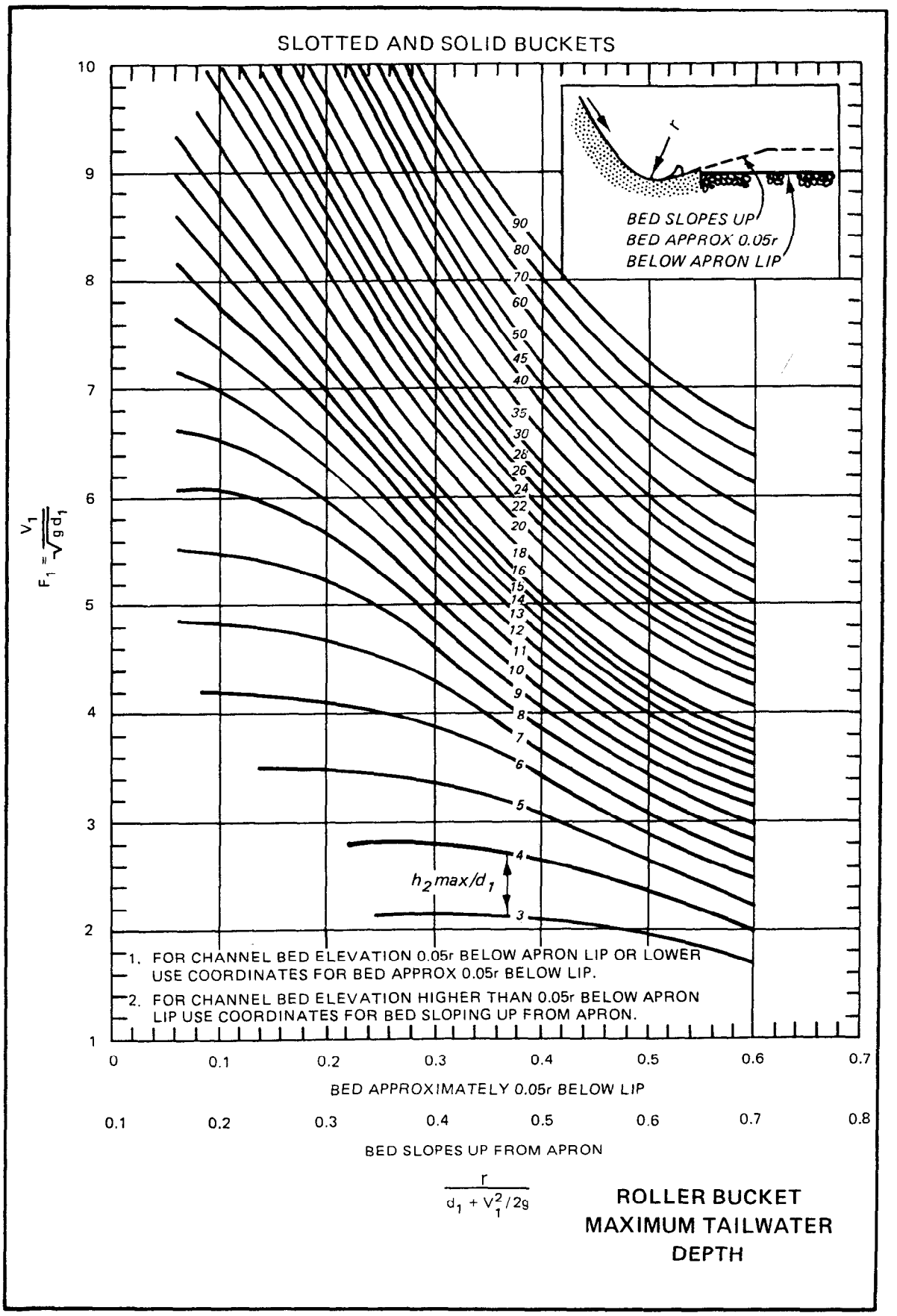


BAFFLE HEIGHT



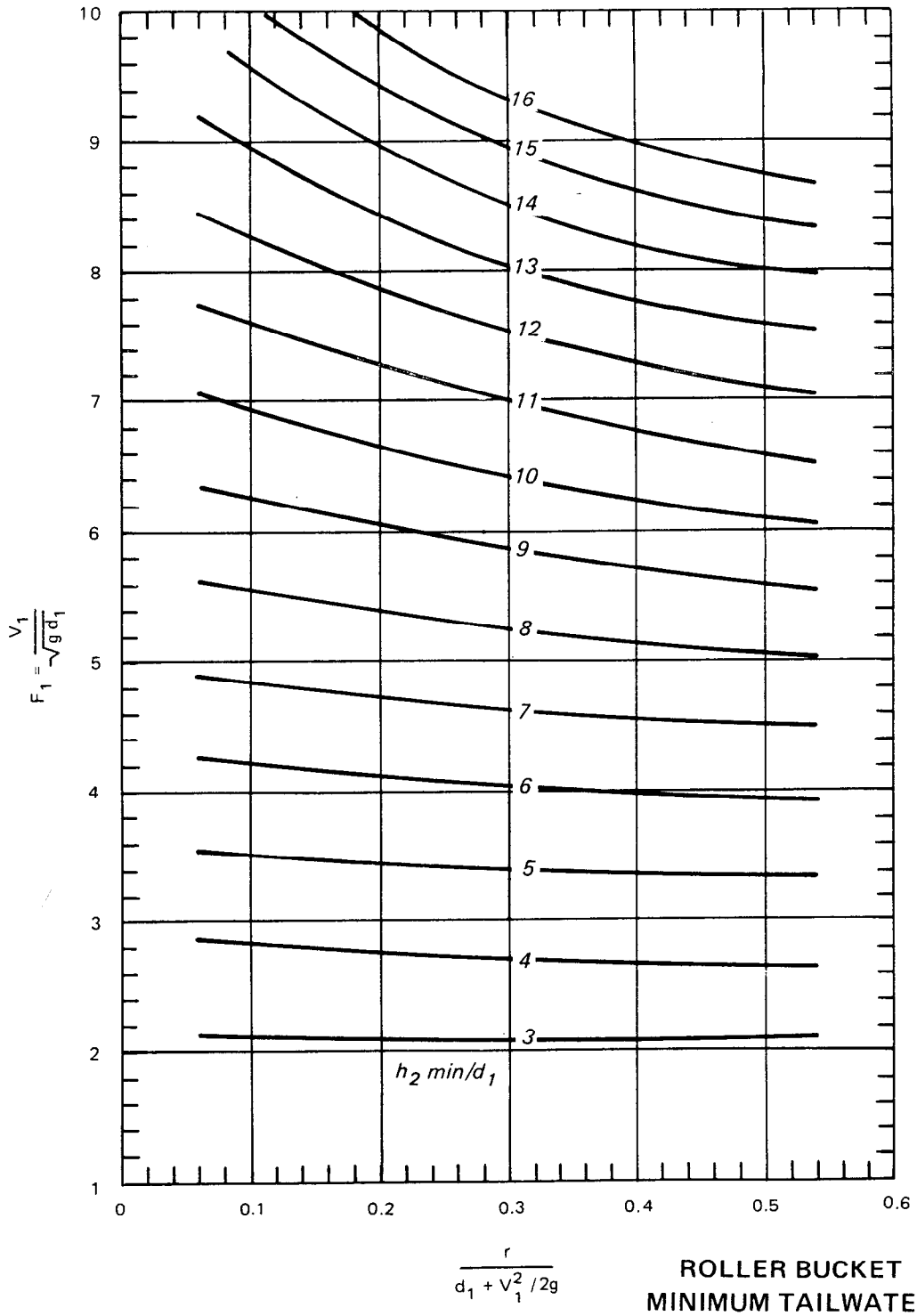
DEFINITION SKETCH

BAFFLE HEIGHT AND LOCATION

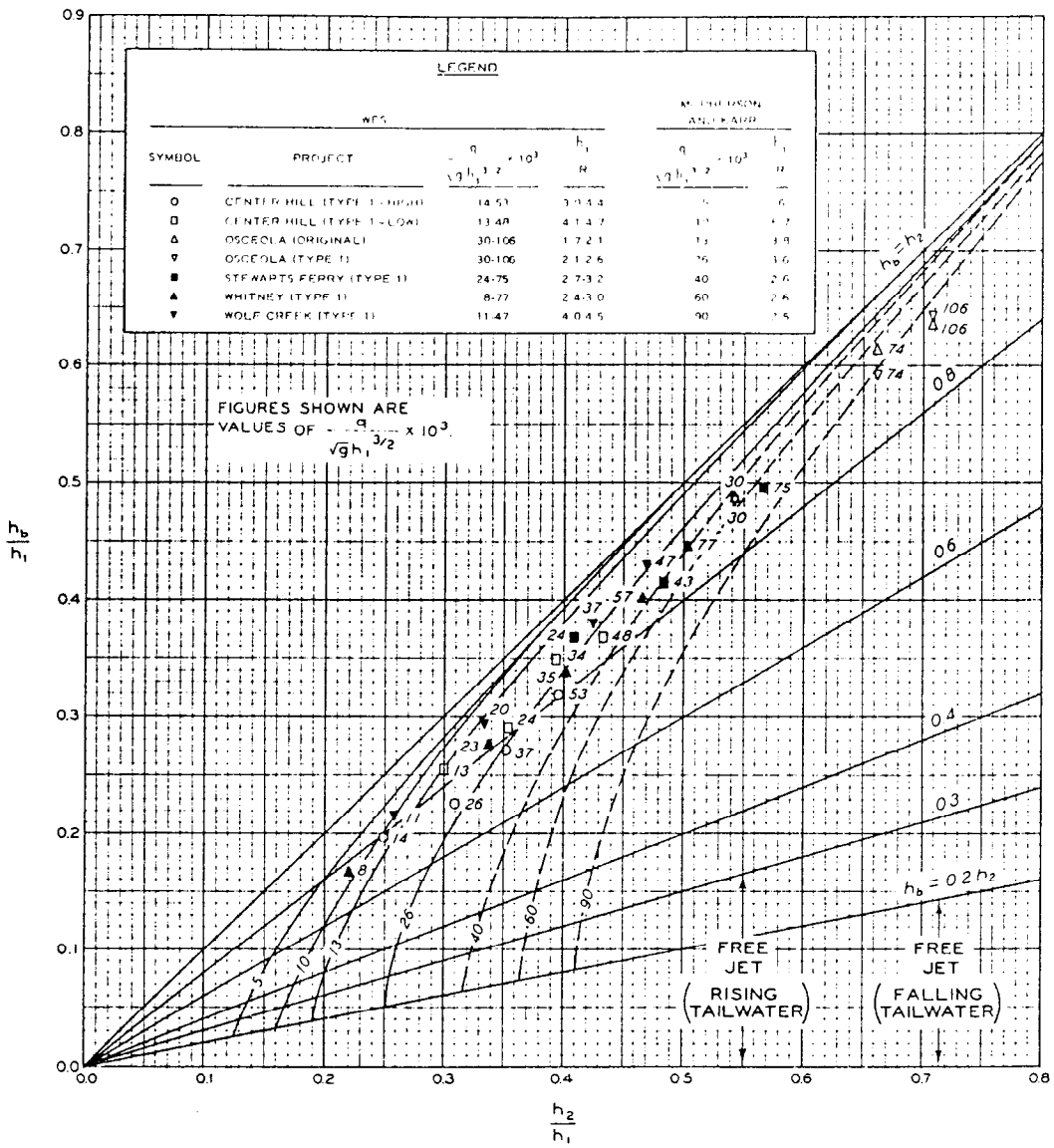


ROLLER BUCKET MAXIMUM TAILWATER DEPTH

HYDRAULIC DESIGN OF STILLING BASINS AND ENERGY DISSIPATORS



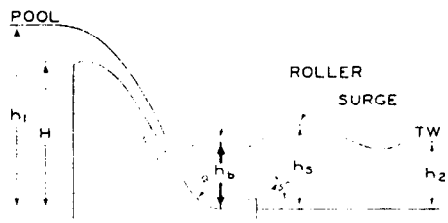
ROLLER BUCKET MINIMUM TAILWATER DEPTH



NOTE DESIGN CURVES SHOWN DEVELOPED BY McPHERSON AND KARR FROM EXPERIMENTAL DATA. THESE DATA OMITTED TO SIMPLIFY CHART.

RANGES OF VARIABLES

	WES	McPHERSON AND KARR
SPILLWAY SLOPE	1.41-1.67:1	1:1
LIP ANGLE	45°	45°
H/h_1	0.68-0.93	>0.75
h_1/R	SEE LEGEND	
$q/\sqrt{g}h_1^{3/2} \times 10^3$	SEE LEGEND	

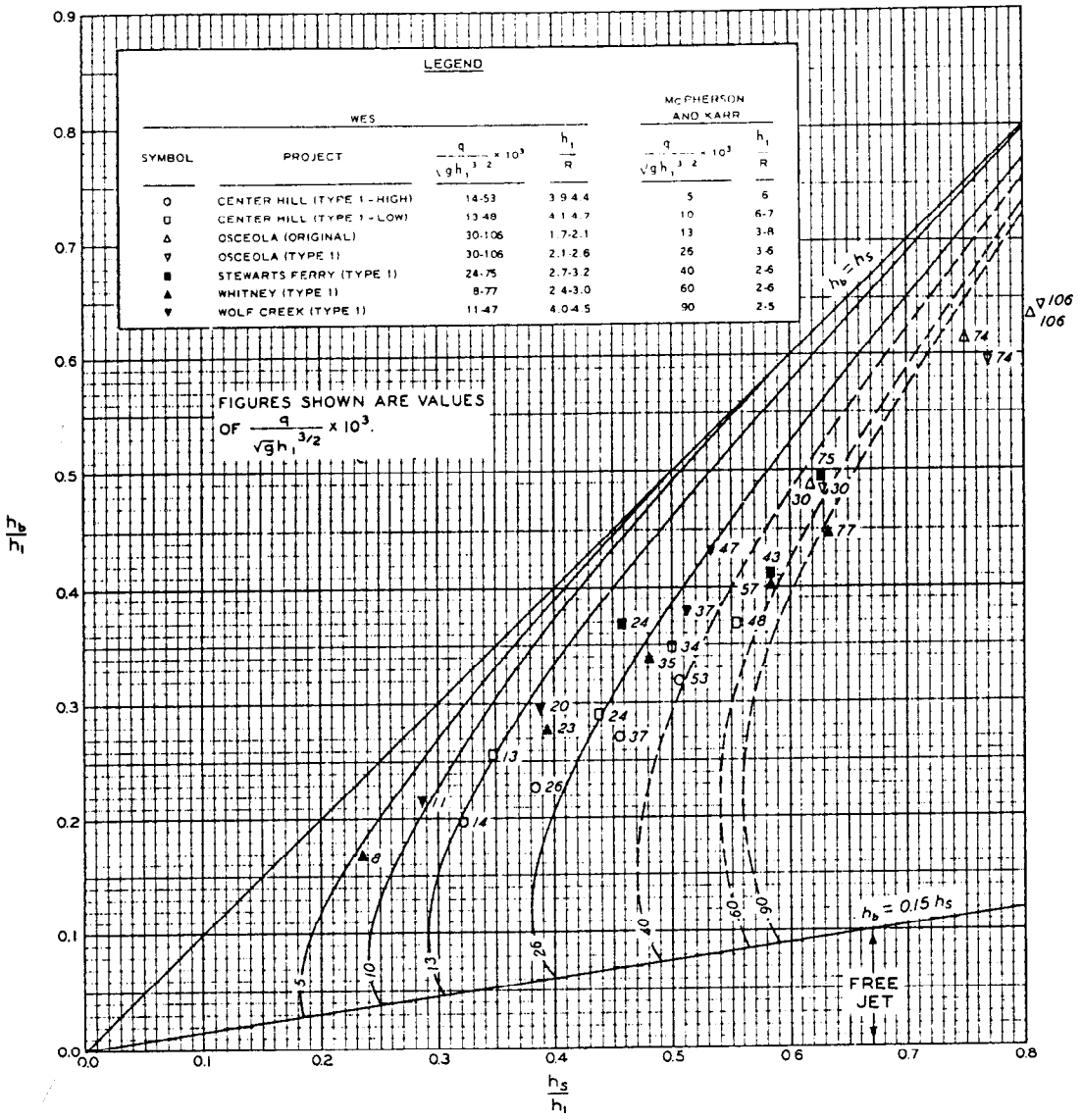


DEFINITION SKETCH

HIGH OVERFLOW DAMS

BUCKET-TYPE ENERGY DISSIPATOR ROLLER DEPTH

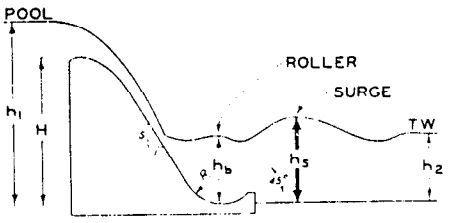
FROM HDC 112-6



NOTE: DESIGN CURVES SHOWN DEVELOPED BY McPHERSON AND KARR FROM EXPERIMENTAL DATA. THESE DATA OMITTED TO SIMPLIFY CHART

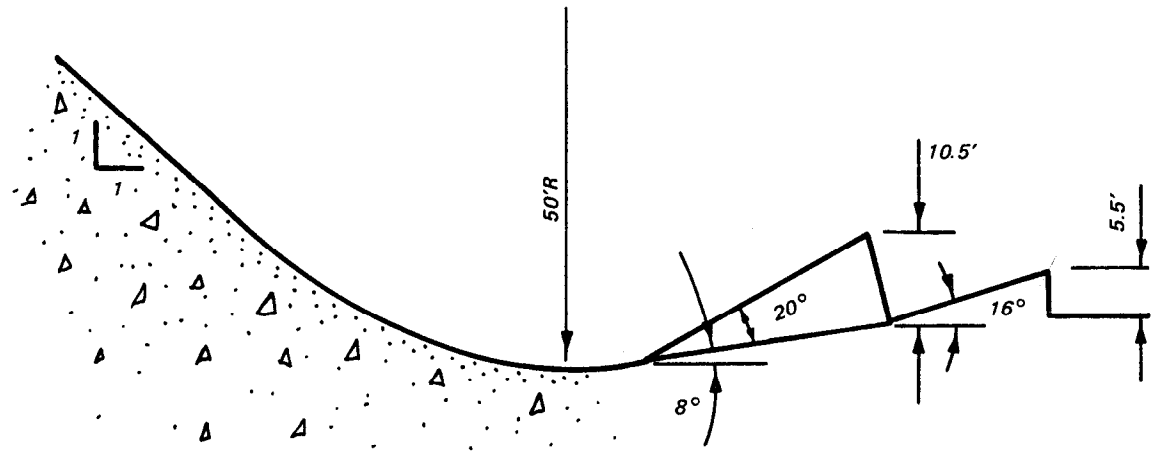
RANGES OF VARIABLES

	WES	McPHERSON AND KARR
SPILLWAY SLOPE	1.41-1.67:1	1:1
LIP ANGLE	45°	45°
H/h_1	068-0.93	>0.75
h_1/R	SEE LEGEND	
$q/\sqrt{g}h_1^{3/2} \times 10^3$	SEE LEGEND	

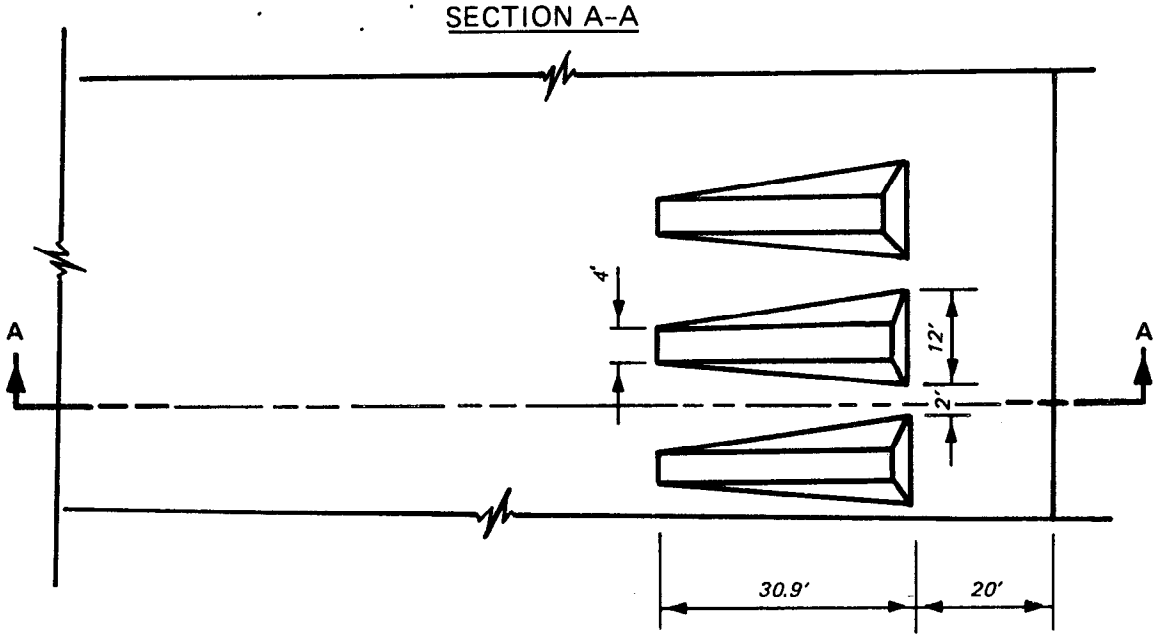


DEFINITION SKETCH

HIGH OVERFLOW DAMS
BUCKET-TYPE ENERGY DISSIPATOR
SURGE HEIGHT
FROM HDC 112-6/1

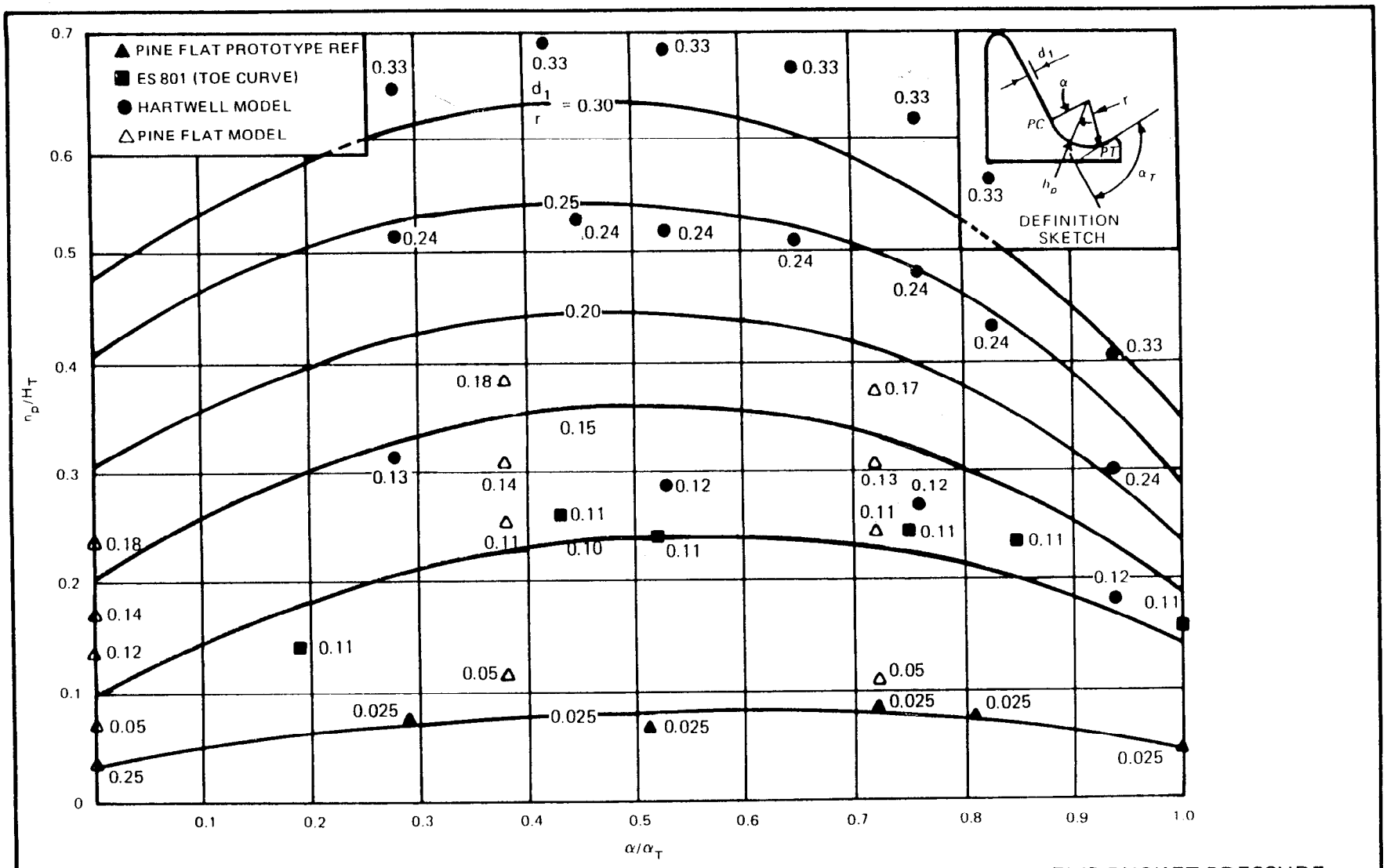


SECTION A-A

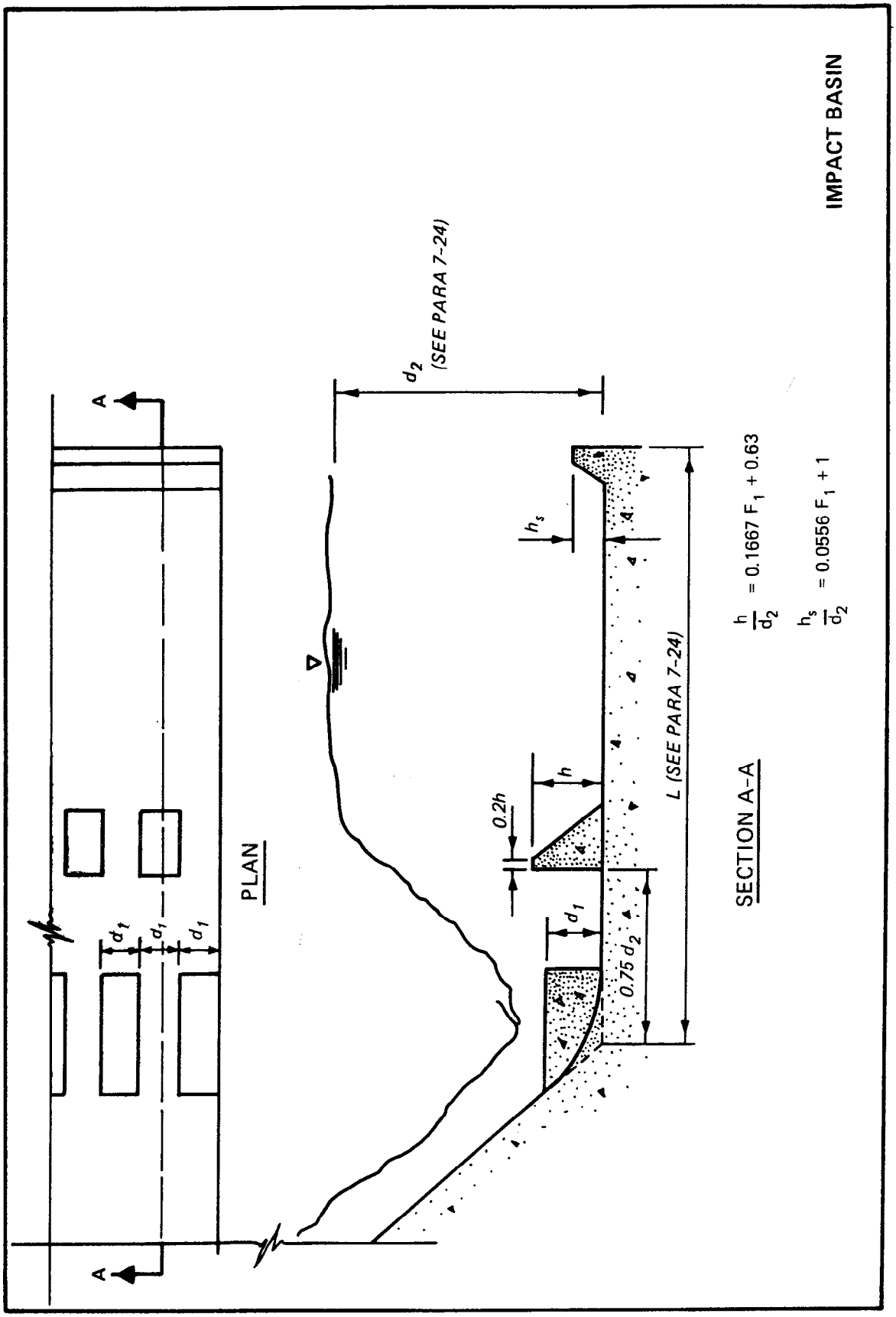


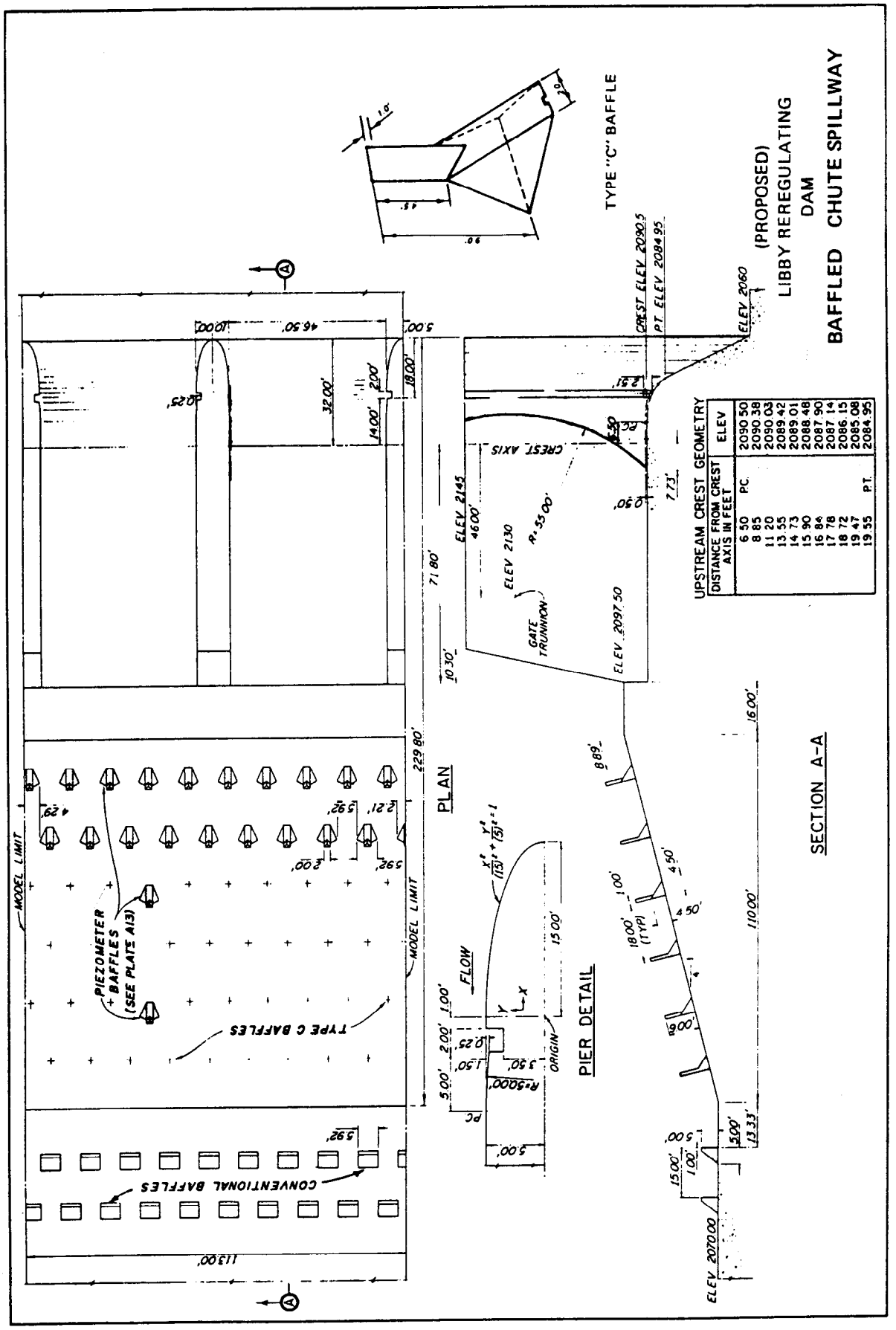
PLAN

LITTLE GOOSE DAM
SLOTTED BUCKET



FLIP BUCKET PRESSURE


IMPACT BASIN
A
A
d_t
d_1
d_1
PLAN
d_2 (SEE PARA 7-24)
h_s
h
$0.2h$
d_1
$0.75\,d_2$
L (SEE PARA 7-24)
SECTION A-A
$\frac{h}{d_2} = 0.1667\,F_1 + 0.63$
$\frac{h_s}{d_2} = 0.0556\,F_1 + 1$



UPSTREAM CREST GEOMETRY

DISTANCE FROM CREST AXIS IN FEET		ELEV
6.50	P.C.	2090.50
8.85		2090.38
11.20		2090.03
13.55		2089.42
14.73		2089.01
15.90		2088.48
16.84		2087.90
17.78		2087.14
18.72		2086.15
19.47		2085.08
19.55	P.T.	2084.95