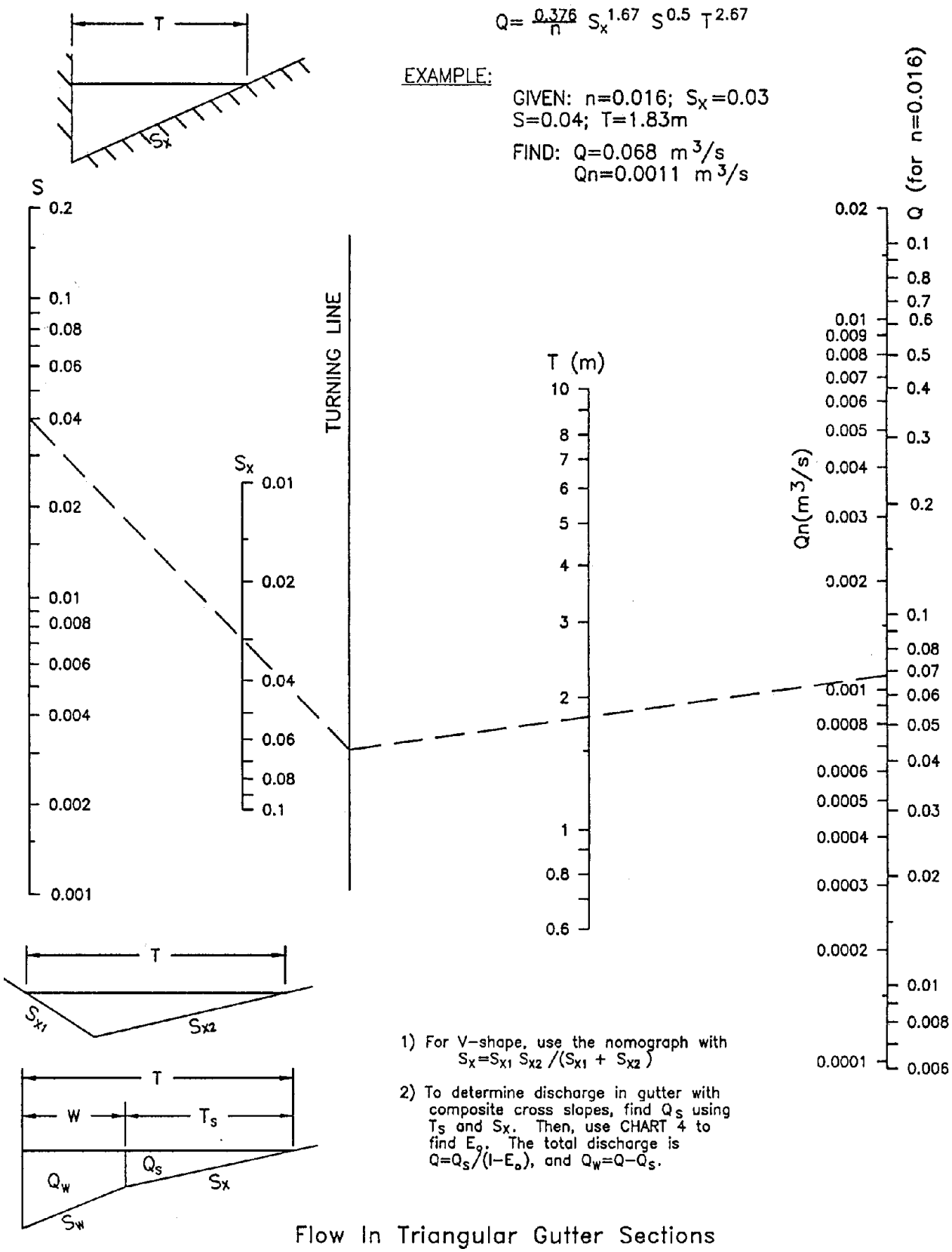
APPENDIX B

LIST OF CHARTS

CHART 1A

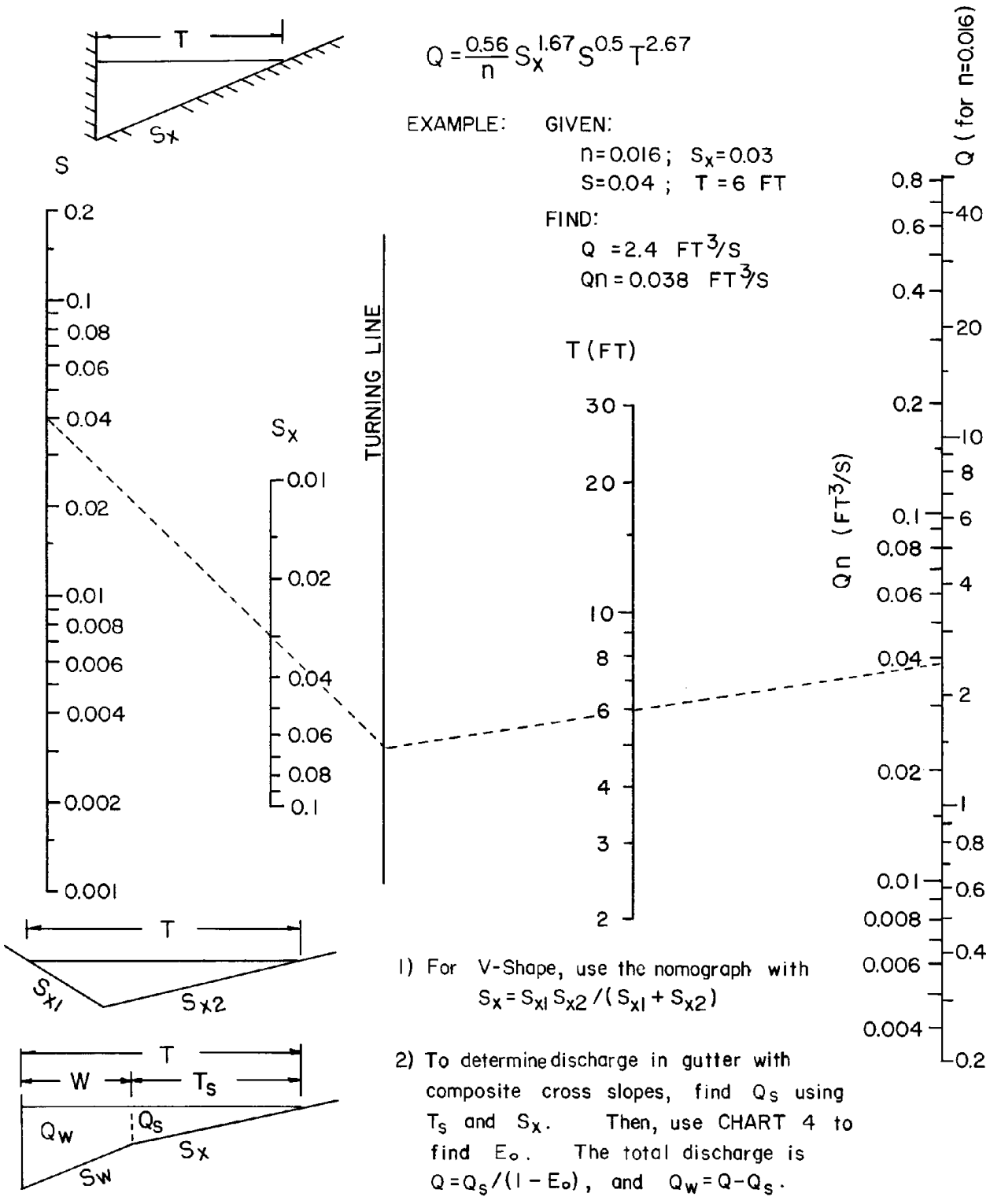


1) For V-shape, use the nomograph with $S_x = S_{x1} S_{x2} / (S_{x1} + S_{x2})$

2) To determine discharge in gutter with composite cross slopes, find Q_s using T_s and S_x. Then, use CHART 4 to find E_o. The total discharge is $Q = Q_s/(1-E_o)$, and $Q_w = Q - Q_s$.

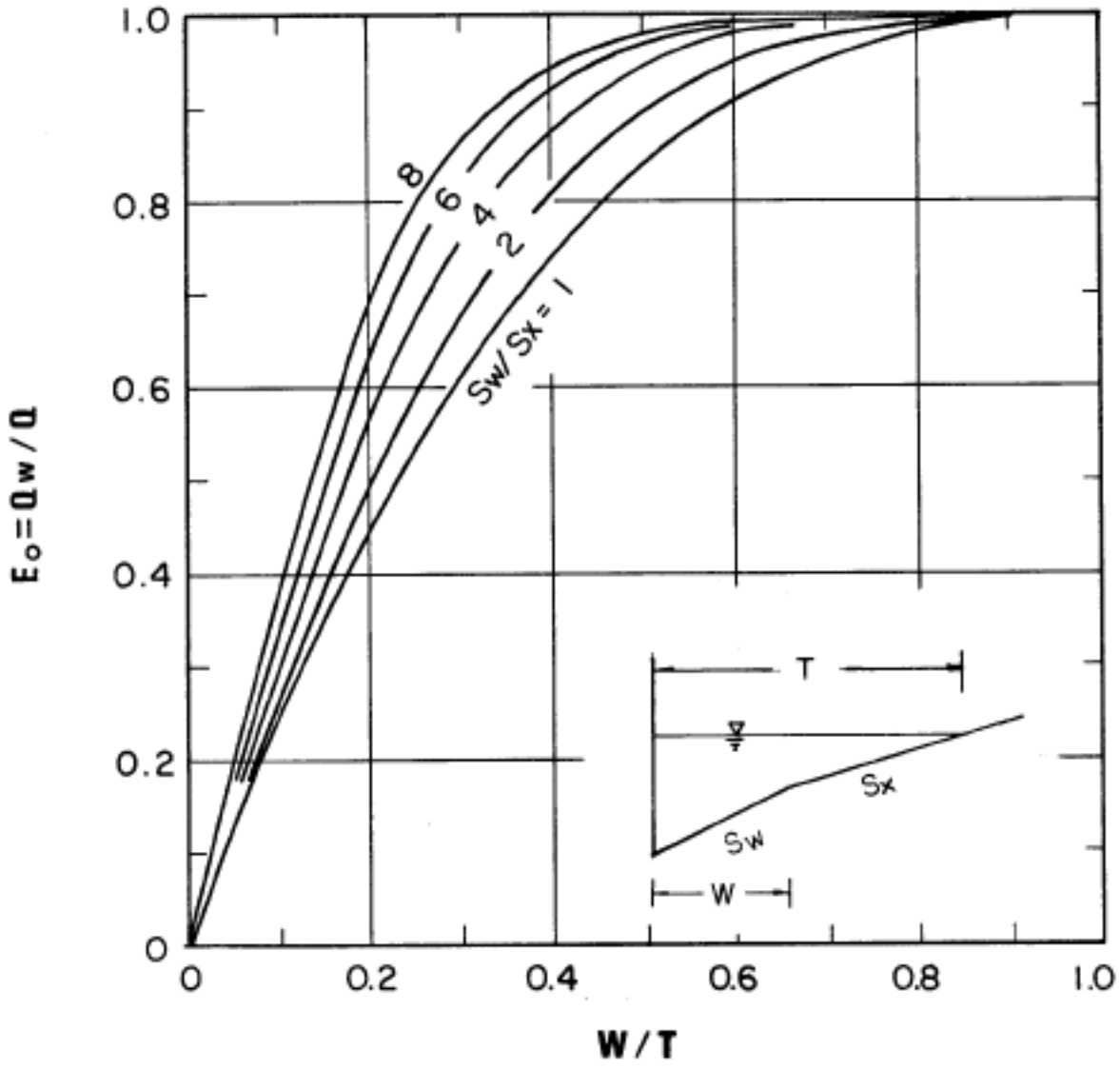
Flow In Triangular Gutter Sections

CHART 1B



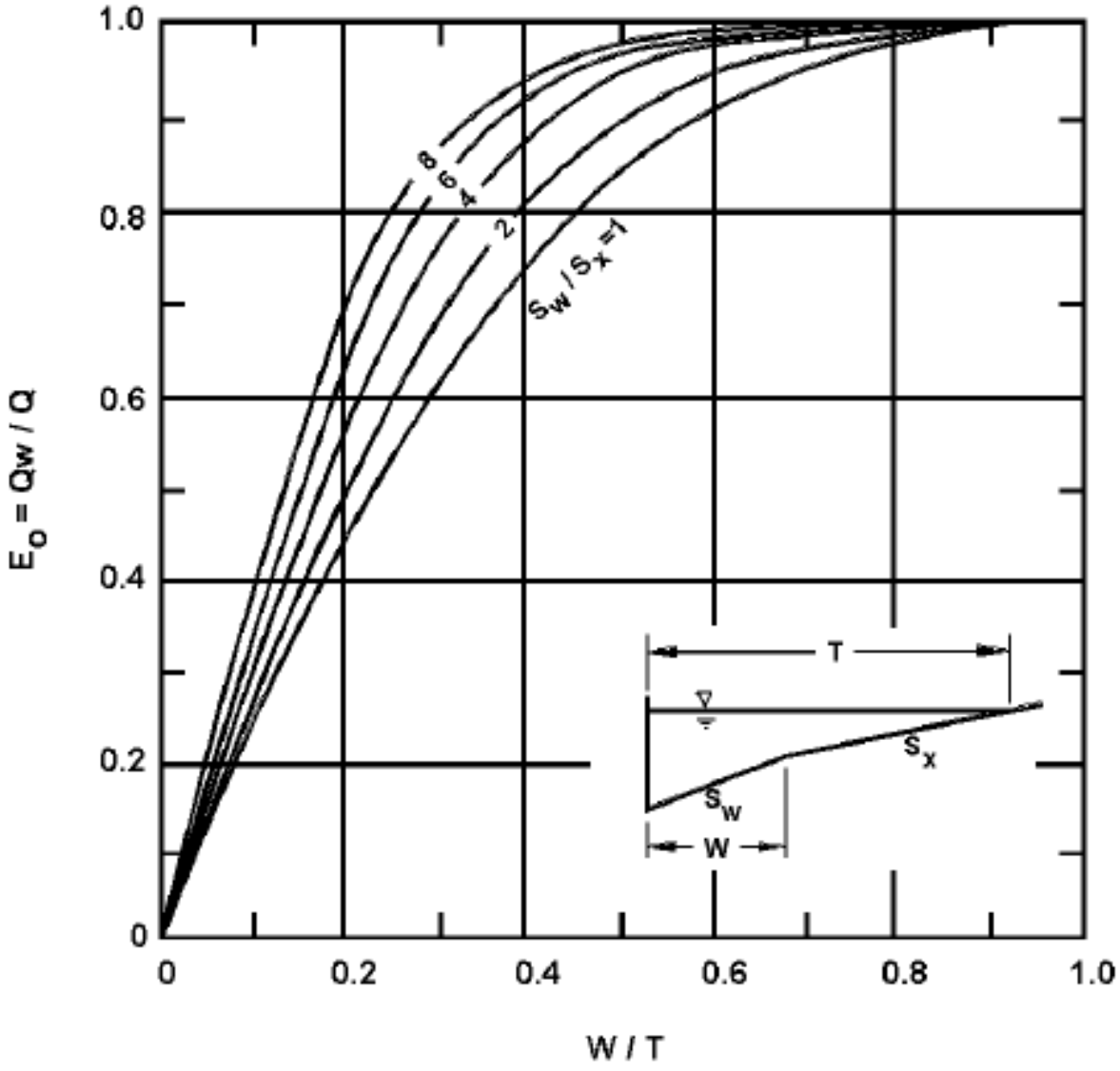
Flow in Triangular Gutter Sections - English Units

CHART 2A



Ratio of frontal flow to total gutter flow.

CHART 2B



Ratio of Frontal Flow to Total Gutter Flow

CHART 3A

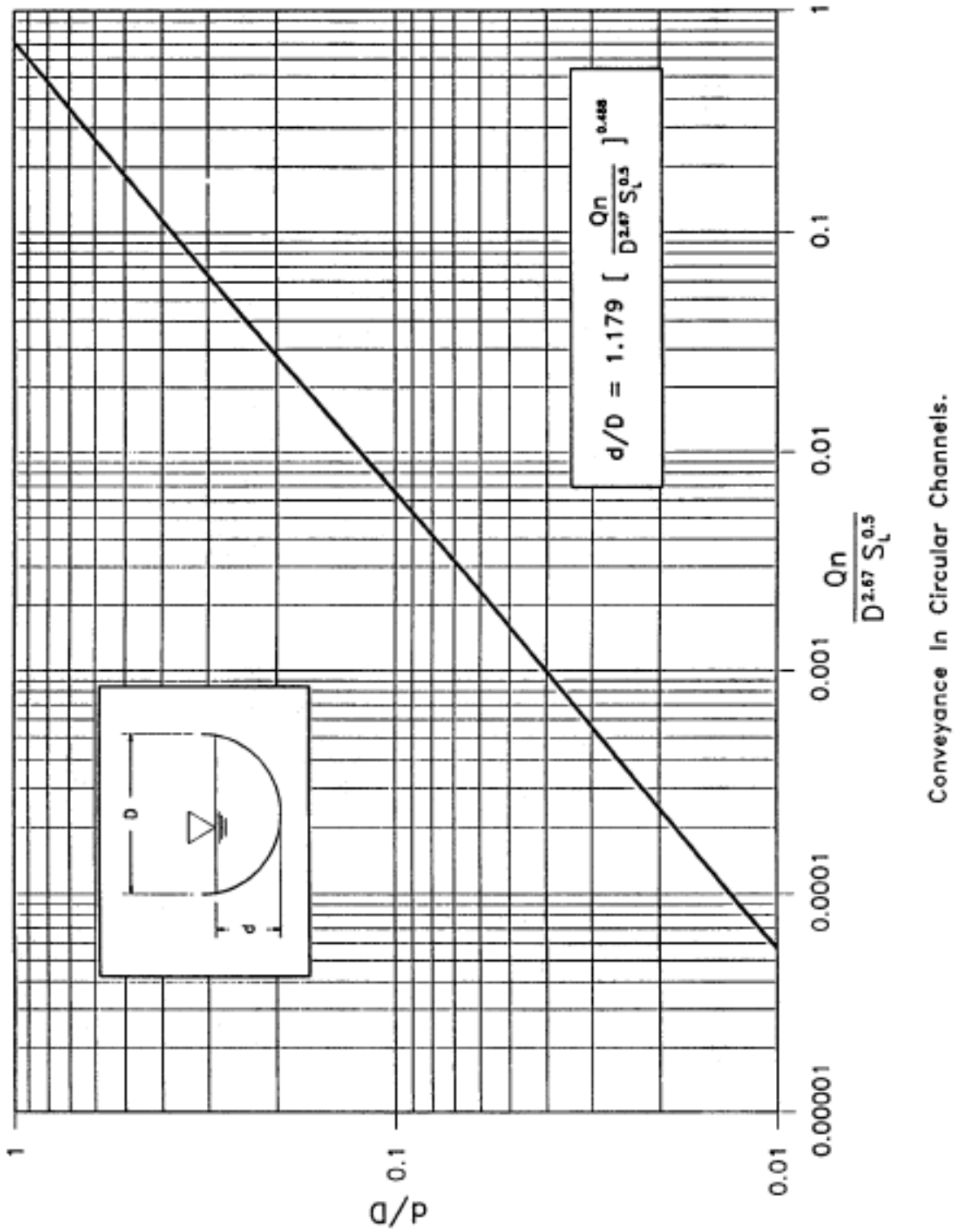
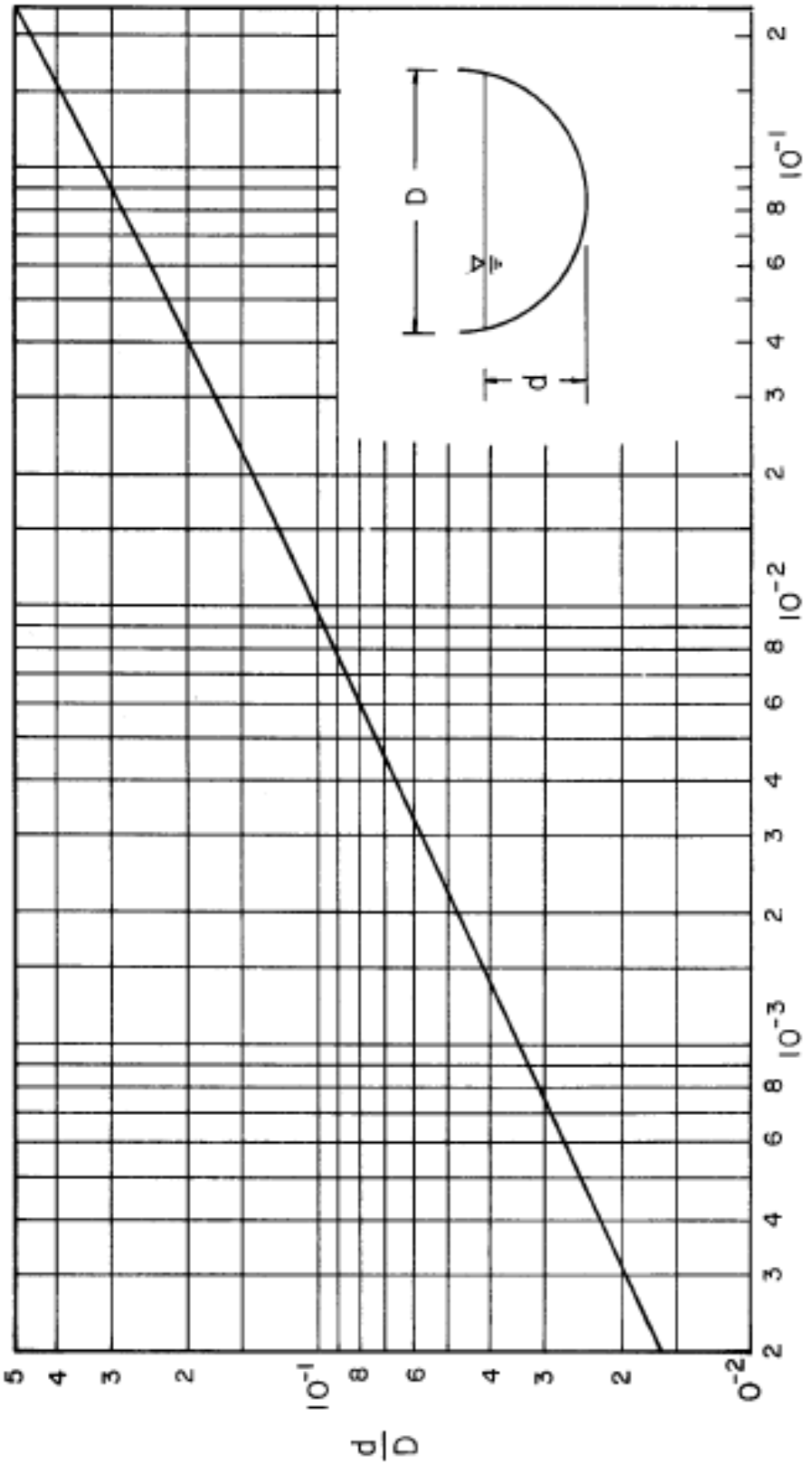

d/D = 1.179 [Qn / D^2.67 S_L^0.5]^0.488
D
d
1
0.1
0.01
d/D
1
0.1
0.01
0.001
0.0001
0.00001
Qn / D^2.67 S_L^0.5
Conveyance In Circular Channels.

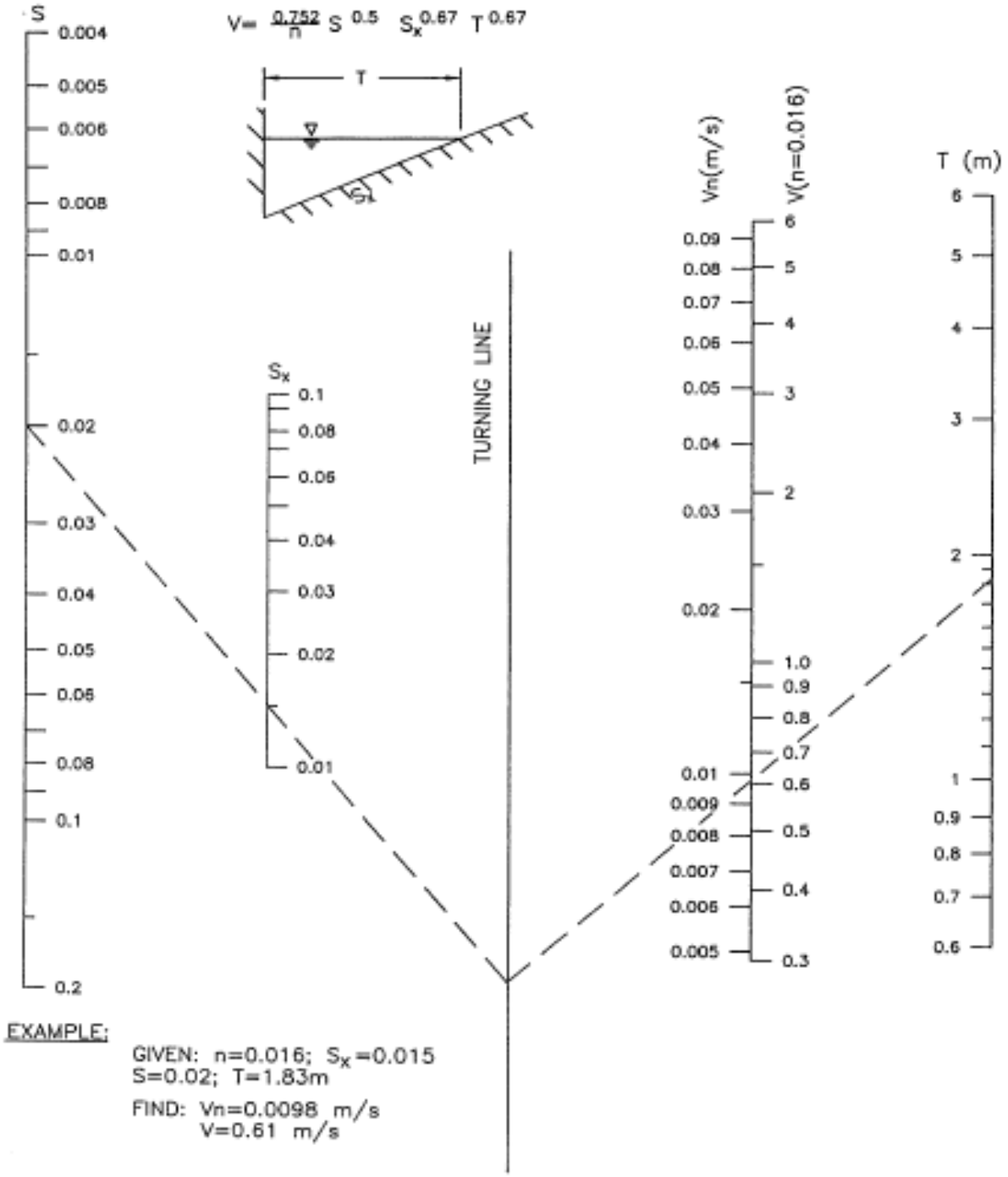
CHART 3B



Conveyance in Circular Channels - English Units

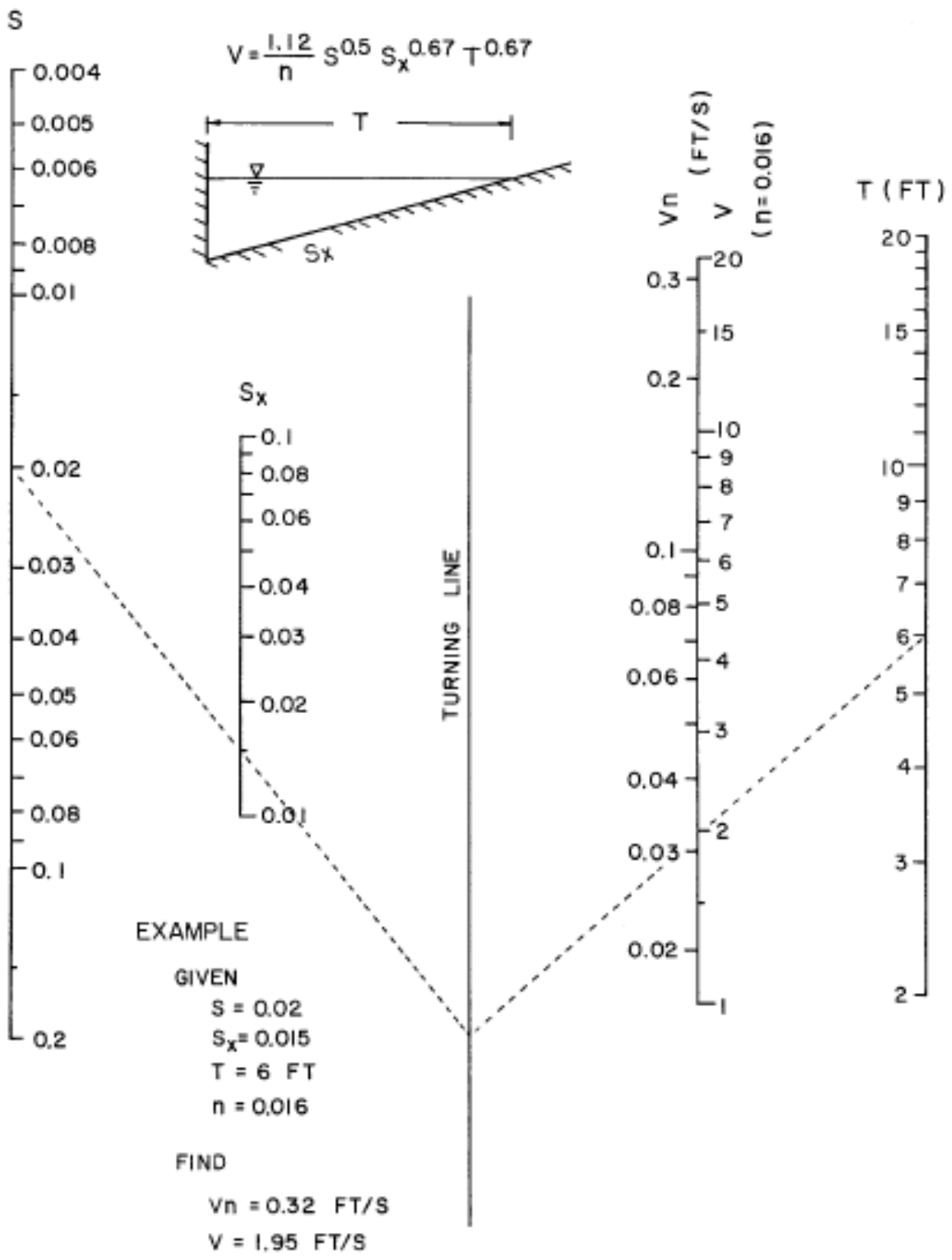
$$\frac{Q\,n}{D^{8/3}S^{1/2}}$$

CHART 4A



Velocity in Triangular Gutter Sections

CHART 4B



Velocity in Triangular Gutter Sections - English Units

CHART 5A

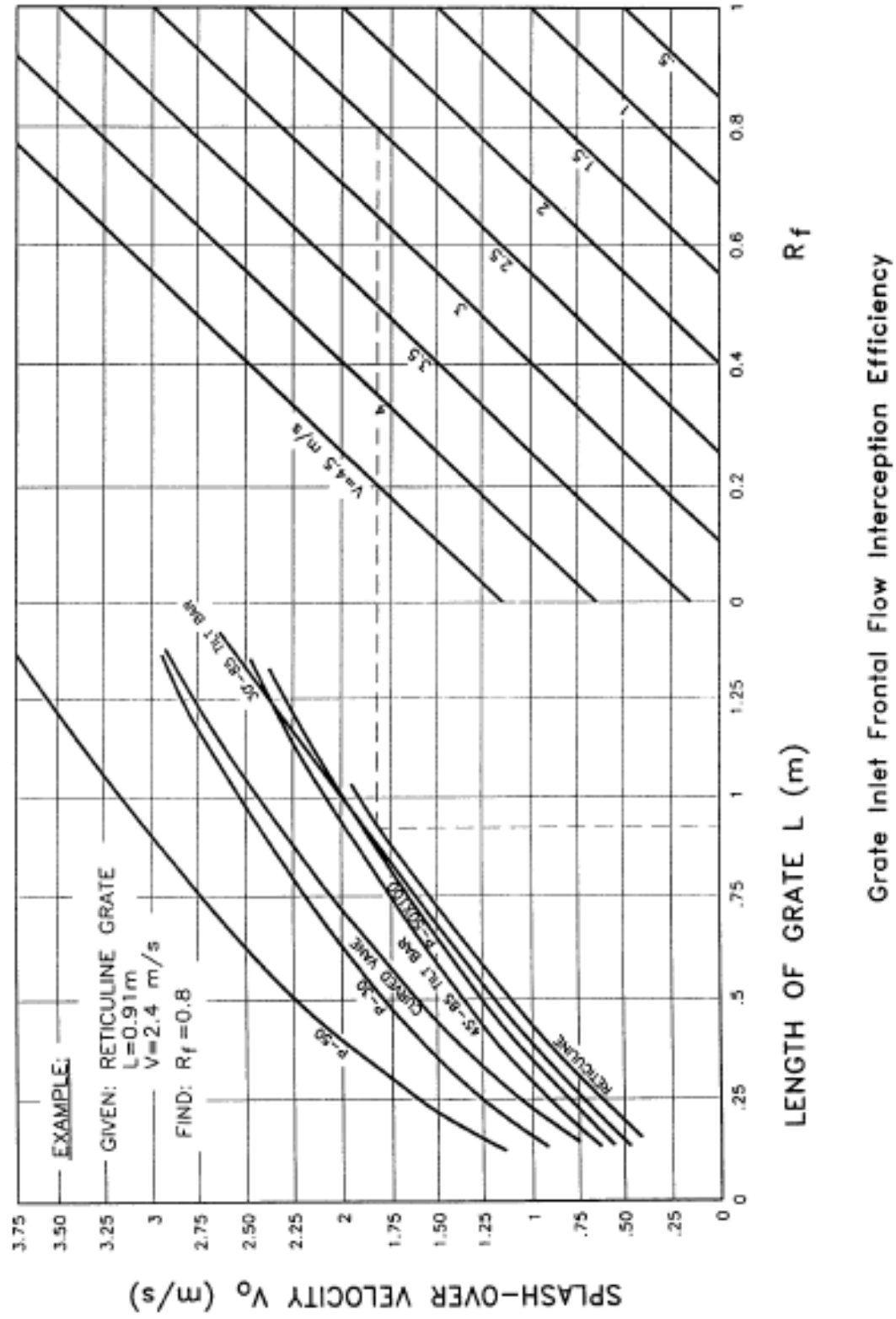

SPLASH-OVER VELOCITY V_o (m/s)
LENGTH OF GRATE L (m)
R_f
Grate Inlet Frontal Flow Interception Efficiency
EXAMPLE:
GIVEN: RETICULINE GRATE
L=0.91m
V=2.4 m/s
FIND: R_f =0.8
P-50
P-30 CURVED VANE
45°-85° TILT BAR
P-50/CV30
30°-85° TILT BAR
RETICULINE
V_o=4.5 m/s
4
3.5
3
2.5
2
1.5
1
.5

CHART 5B

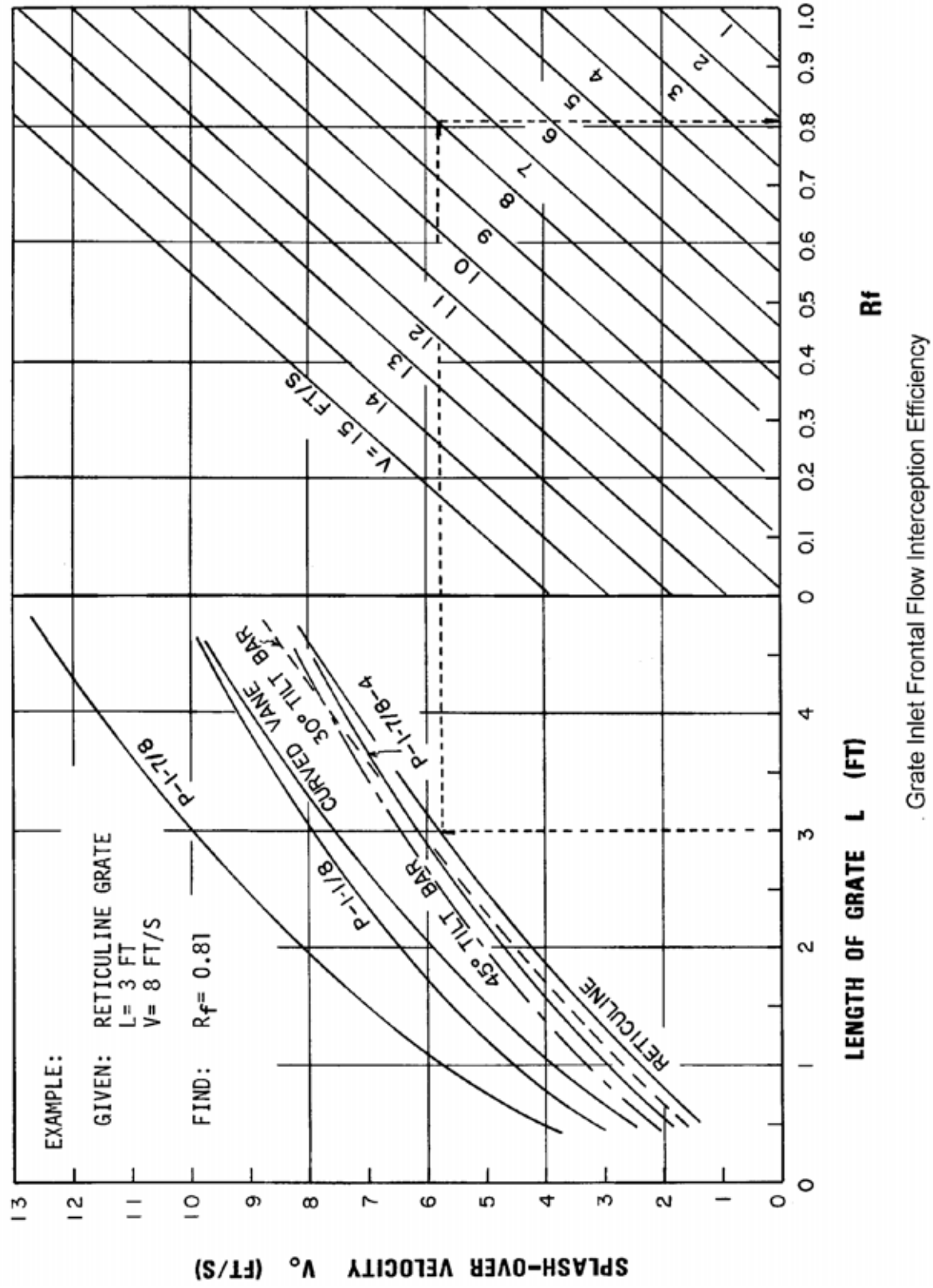
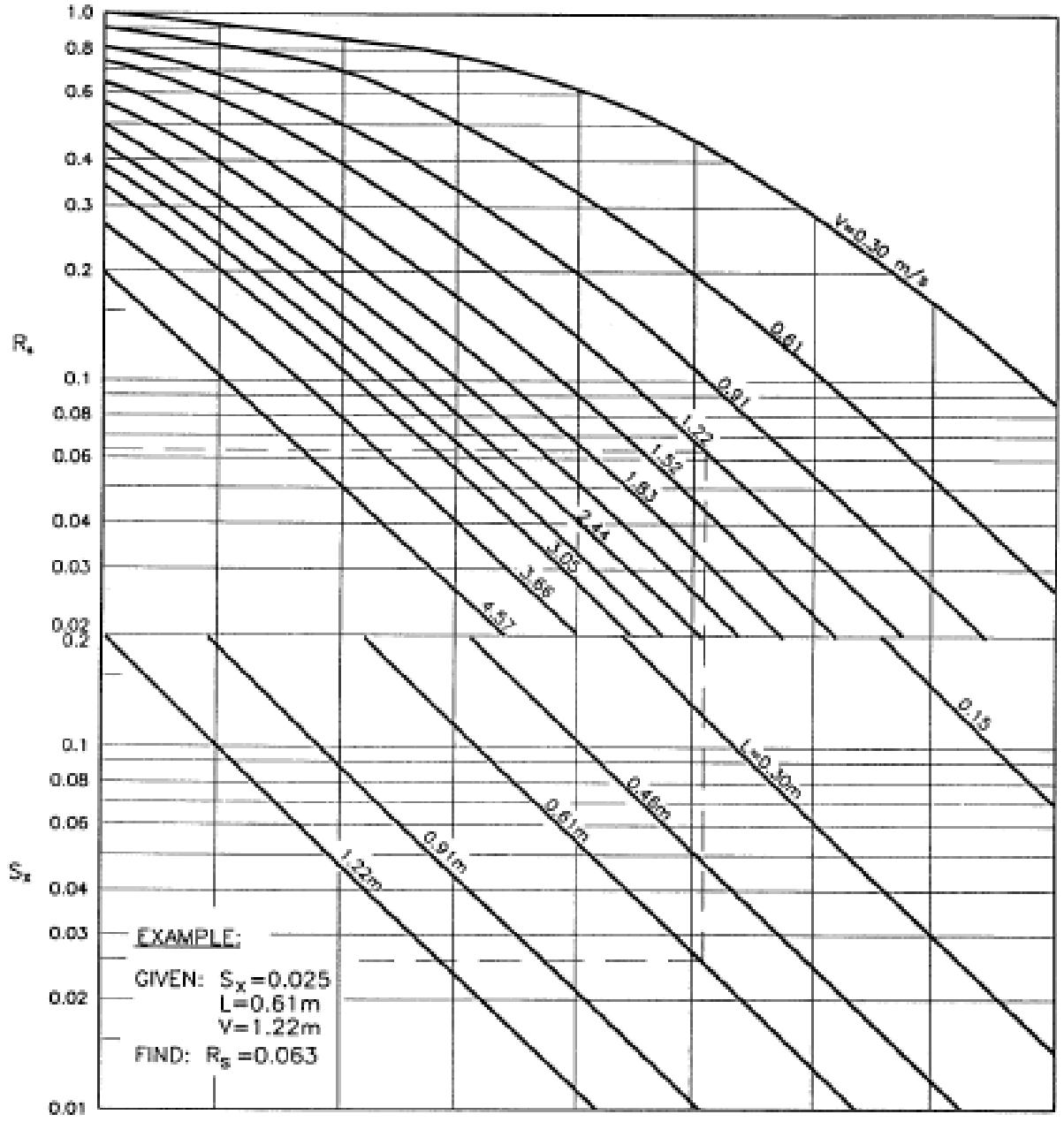
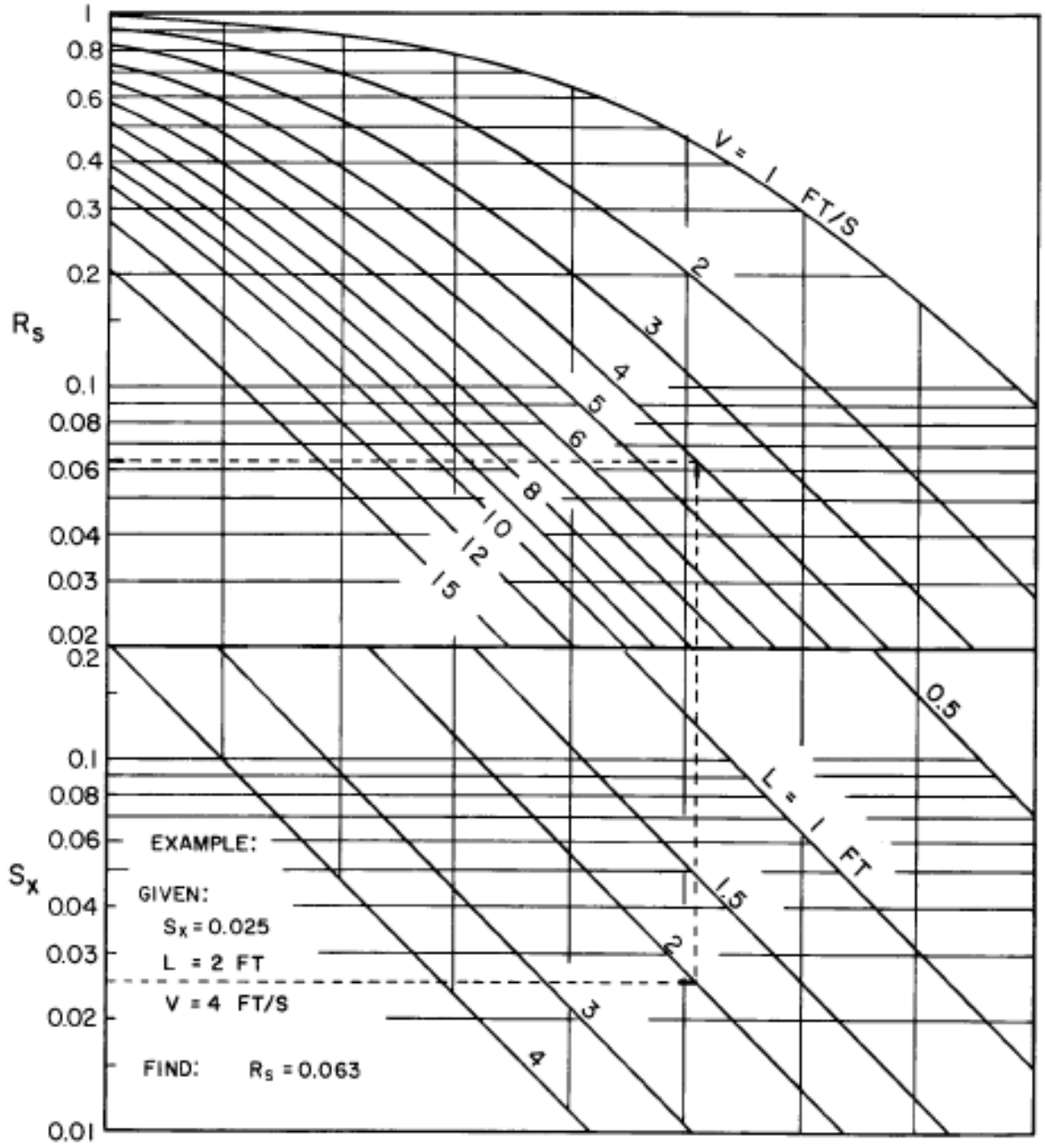

SPLASH-OVER VELOCITY V° (FT/S)
LENGTH OF GRATE L (FT)
Rf
Grate Inlet Frontal Flow Interception Efficiency
EXAMPLE:
GIVEN: RETICULINE GRATE
L= 3 FT
V= 8 FT/S
FIND: Rf= 0.81
P-1-7/8
P-1-1/8
CURVED VANE
30° TILT BAR
P-1-7/8-4
45° TILT BAR
RETICULINE
V= 15 FT/S

CHART 6A



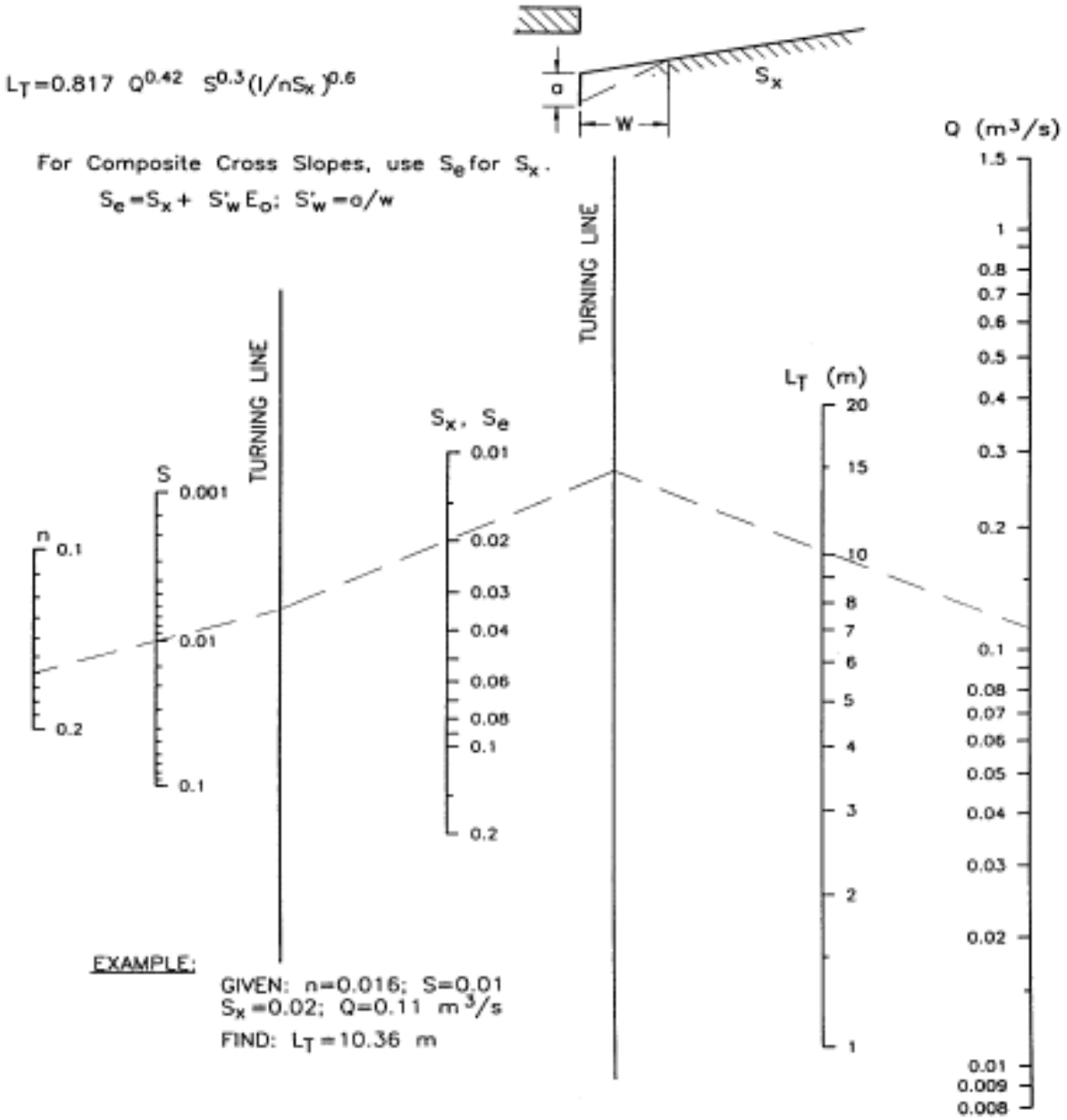
Grate Inlet Side Flow Intercept Efficiency.

CHART 6B



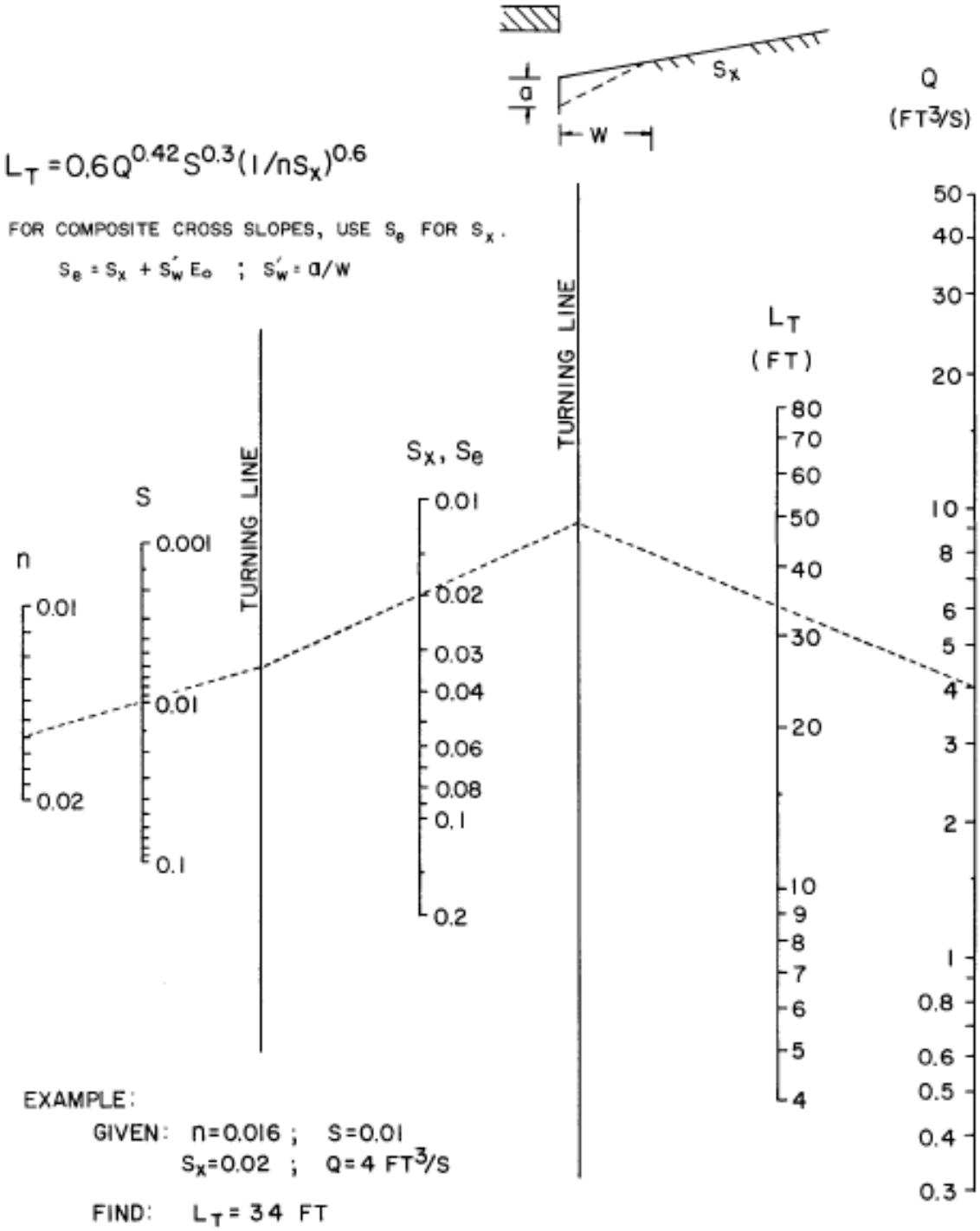
Grate Inlet Side Flow Intercept Efficiency

CHART 7A



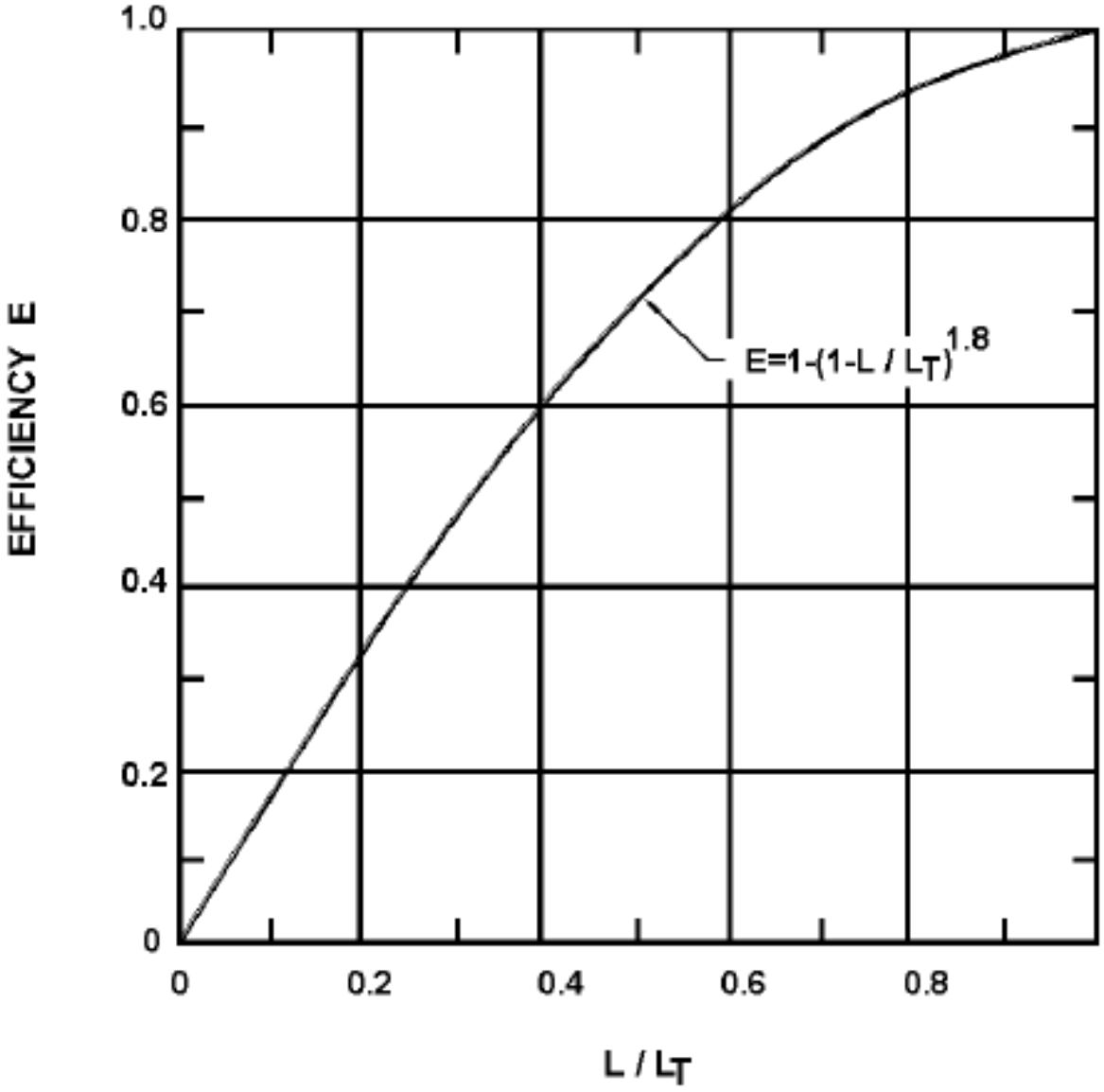
Curb Opening & Slotted Drain Inlet Length for Total Interception

CHART 7B



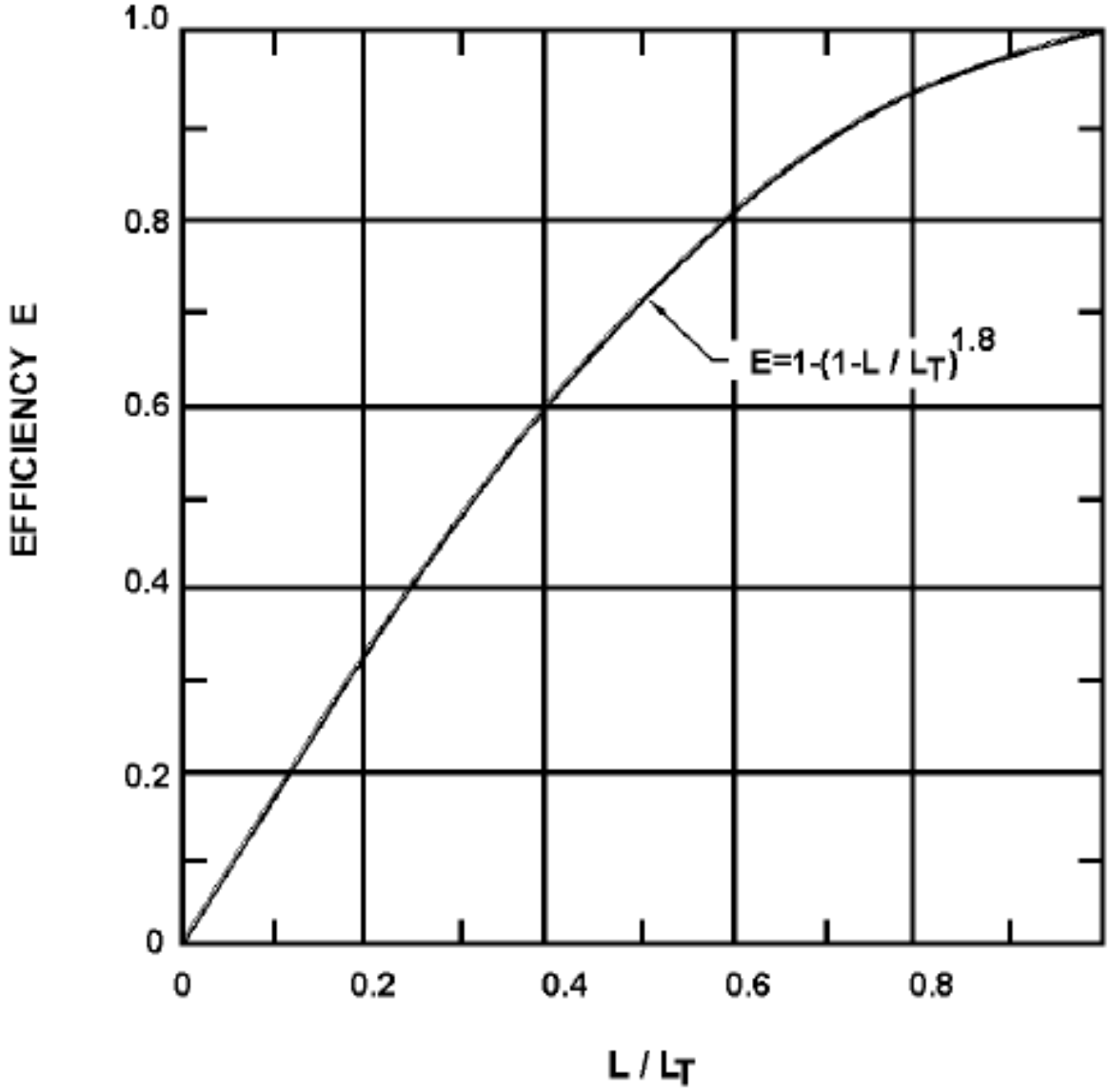
Curb-opening & Slotted Drain Inlet Length for Total Interception - English Units

CHART 8A



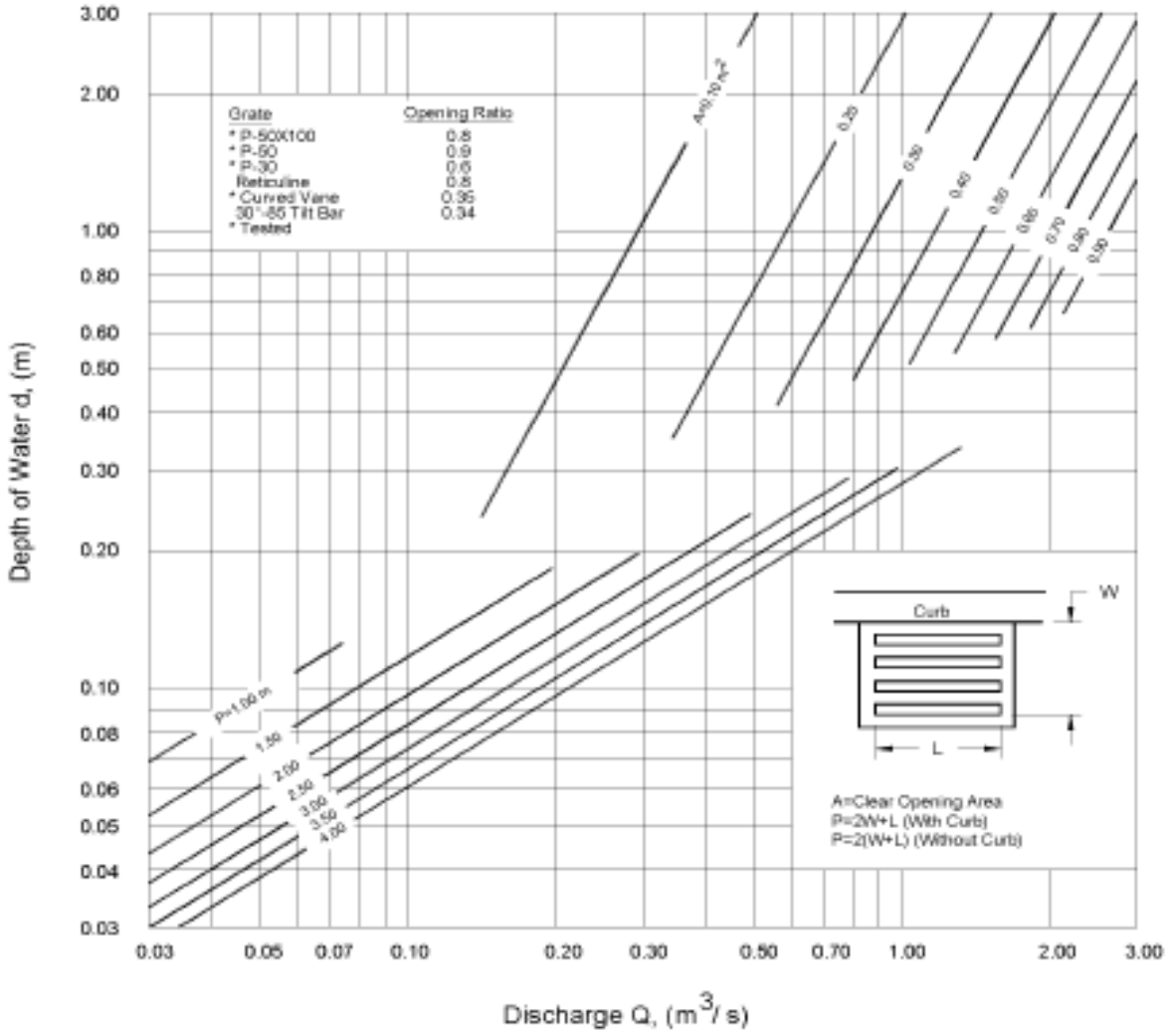
Curb-opening and Slotted Drain Inlet Interception Efficiency.

CHART 8B



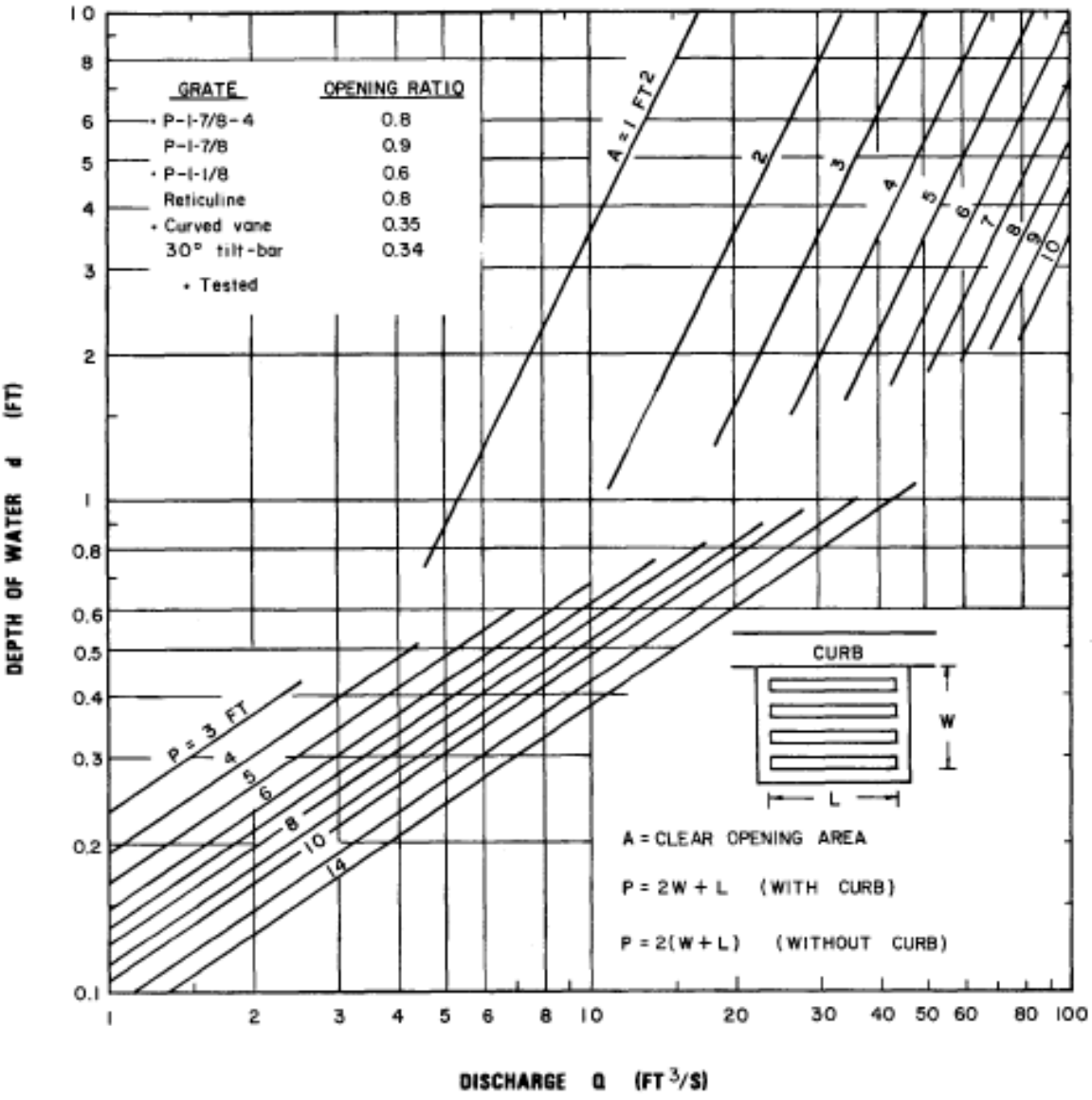
Curb-opening and Slotted Drain Inlet Interception Efficiency.

CHART 9A



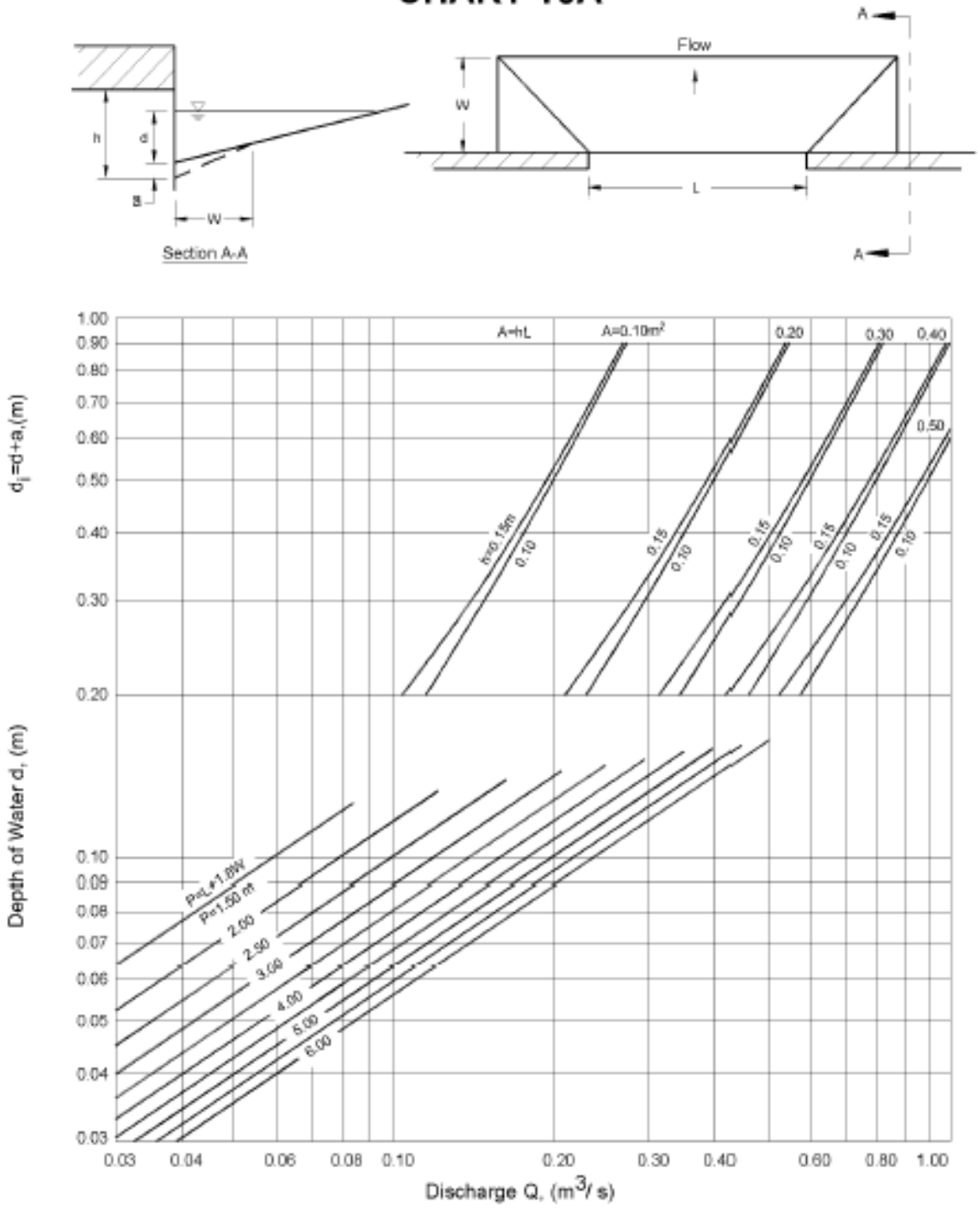
Grate Inlet Capacity in Sump Conditions.

CHART 9B



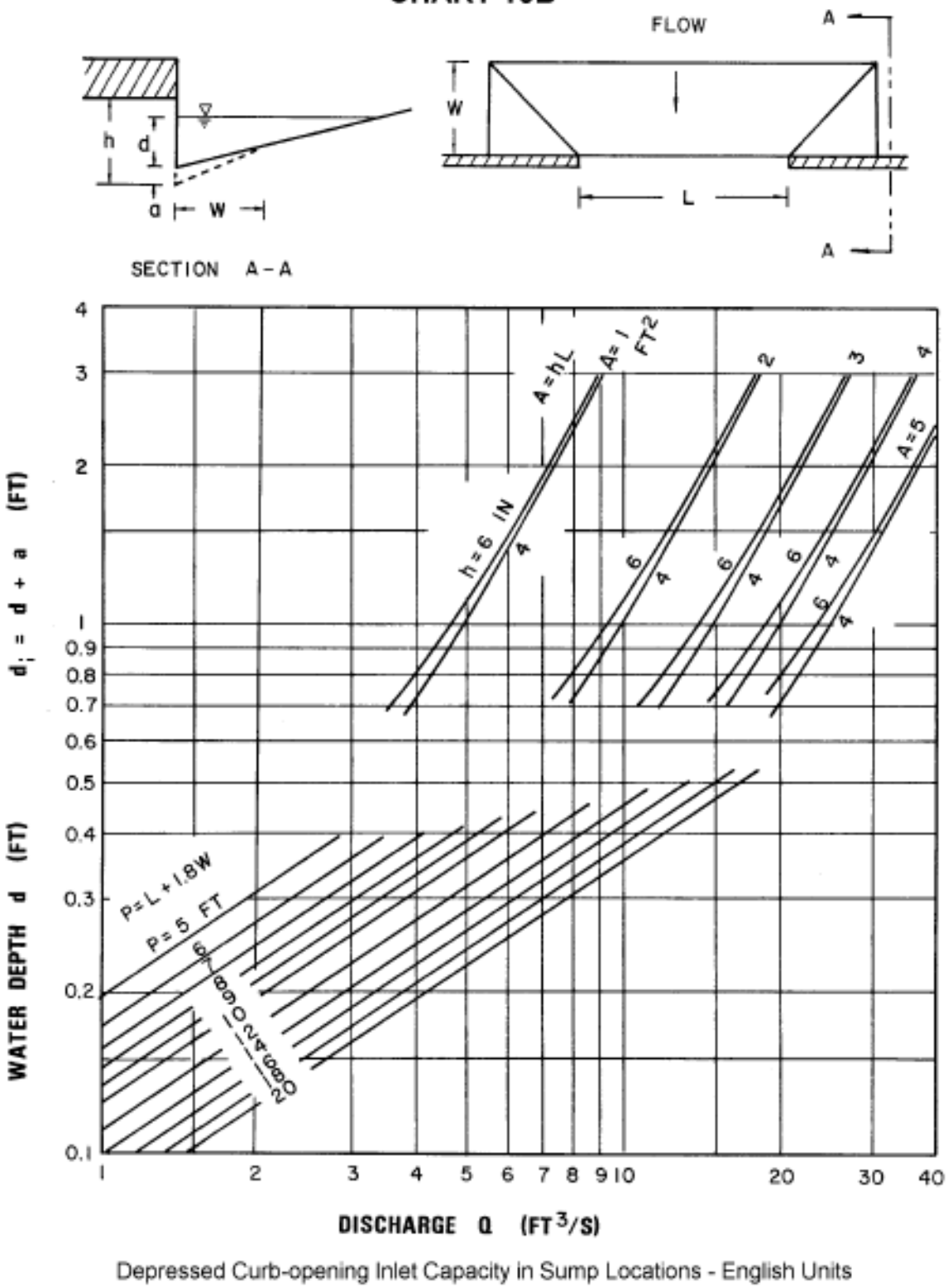
Grate Inlet Capacity in Sump Conditions - English Units

CHART 10A



Depressed Curb-opening Inlet Capacity in Sump Locations

CHART 10B



Depressed Curb-opening Inlet Capacity in Sump Locations - English Units

CHART 11A

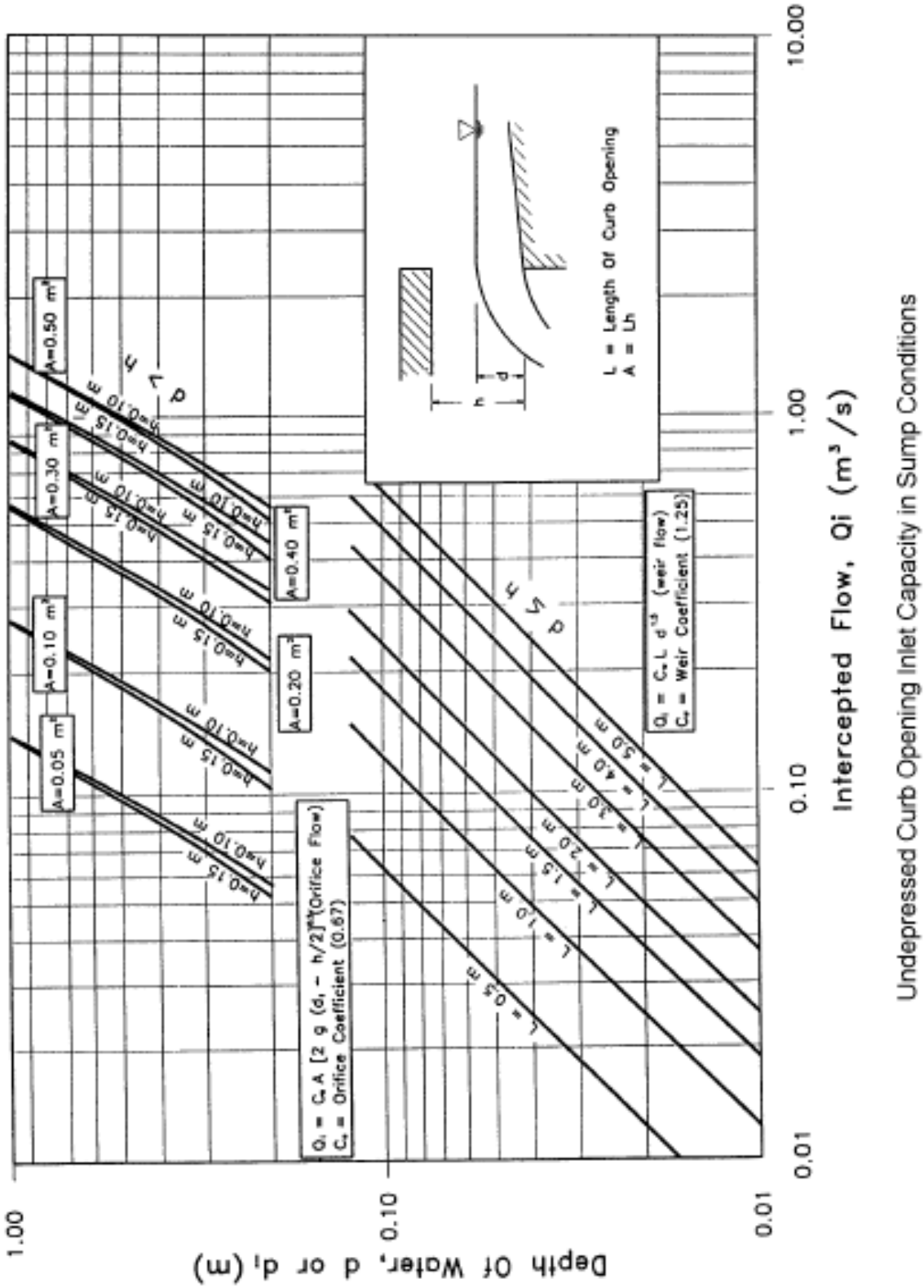

Undepressed Curb Opening Inlet Capacity in Sump Conditions
Intercepted Flow, Qi (m³/s)
10.00
1.00
0.10
0.01
Depth of Water, d or di (m)
1.00
0.10
0.01
L = Length Of Curb Opening
A = Lh
Qi = Cw L d^1.5 (weir flow)
Cw = Weir Coefficient (1.25)
Qi = Co A [2 g (di - h/2)]^0.5 (Orifice Flow)
Co = Orifice Coefficient (0.67)
A=0.50 m²
A=0.30 m²
A=0.40 m²
A=0.10 m²
A=0.20 m²
A=0.05 m²
h=0.10 m
h=0.15 m
L = 0.5 m
L = 1.0 m
L = 1.5 m
L = 2.0 m
L = 3.0 m
L = 4.0 m
L = 5.0 m

CHART 11B

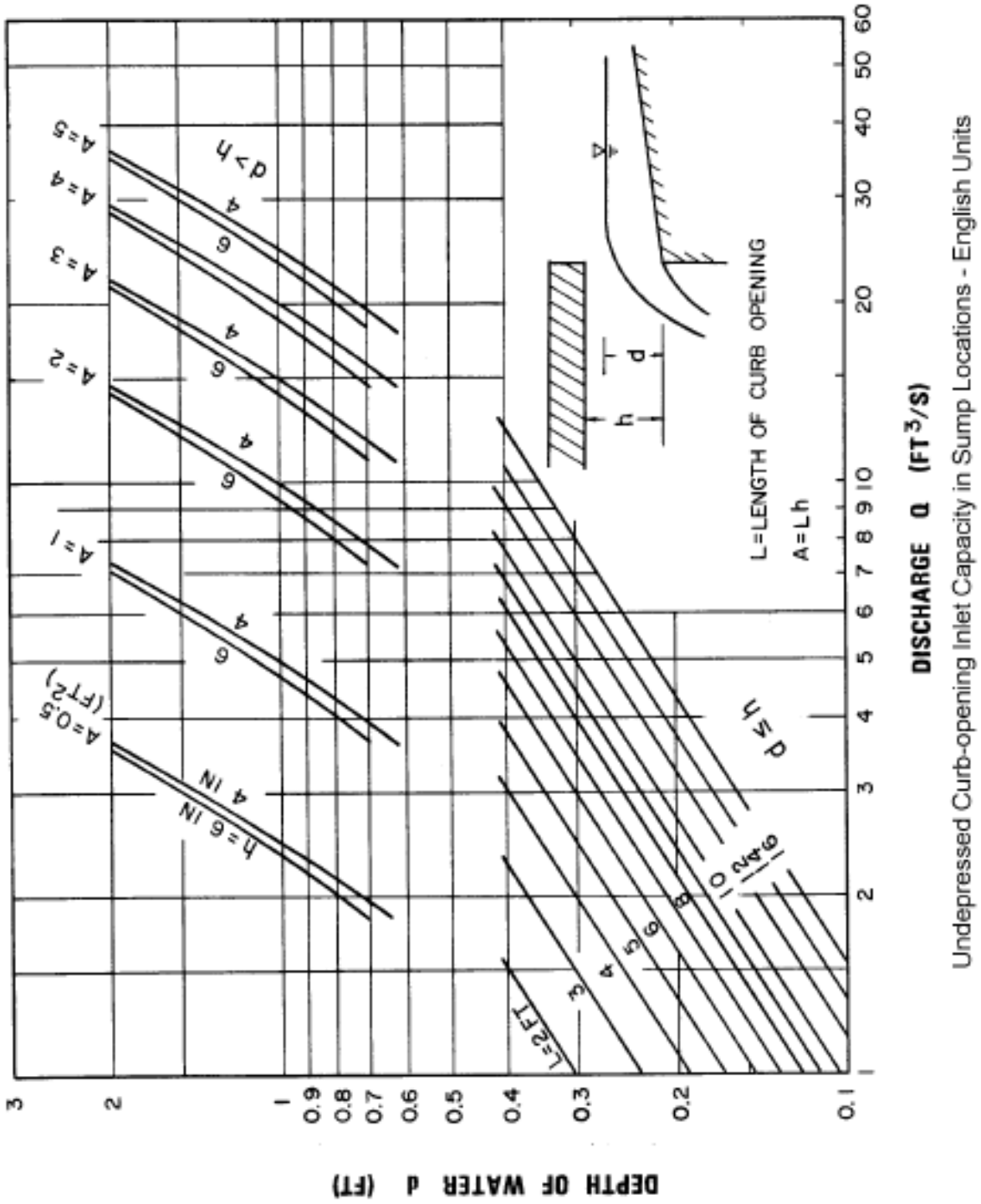
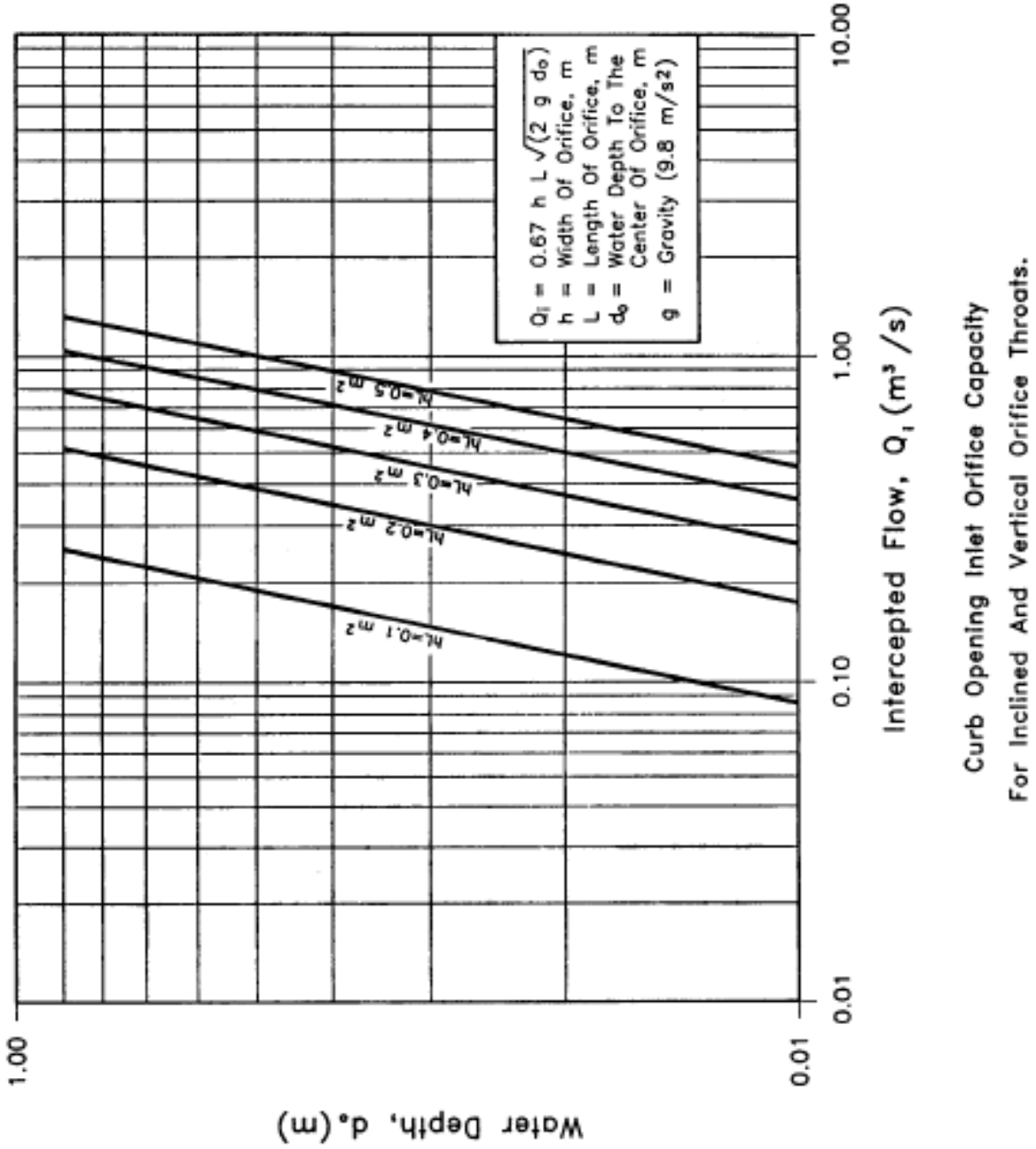
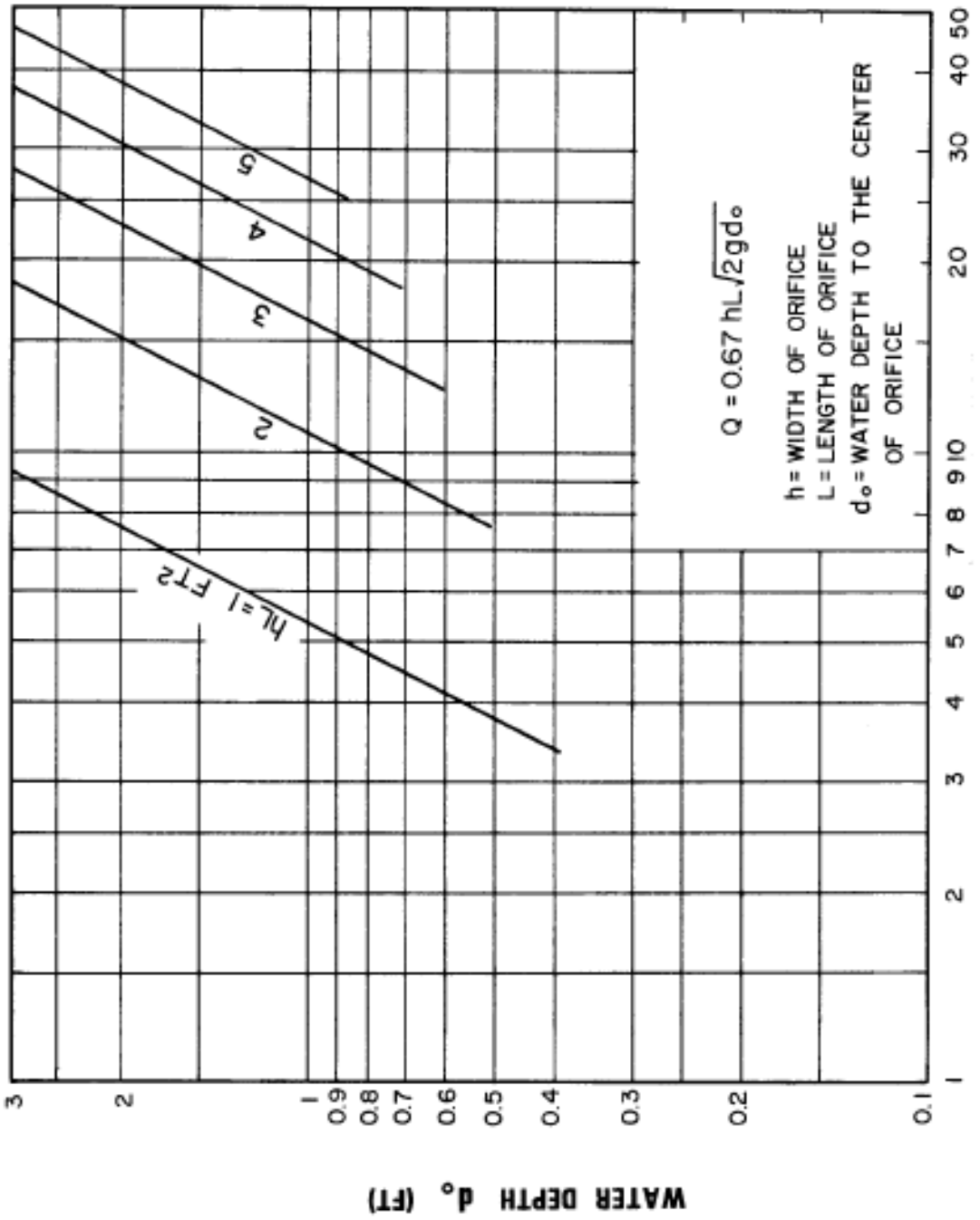

DEPTH OF WATER d (FT)
DISCHARGE Q (FT³/S)
Undepressed Curb-opening Inlet Capacity in Sump Locations - English Units
L=LENGTH OF CURB OPENING
A=Lh
d>h
d≤h
h=6 IN
4 IN
A=0.5 (FT²)
A=1
A=2
A=3
A=4
A=5
L=2 FT

CHART 12A



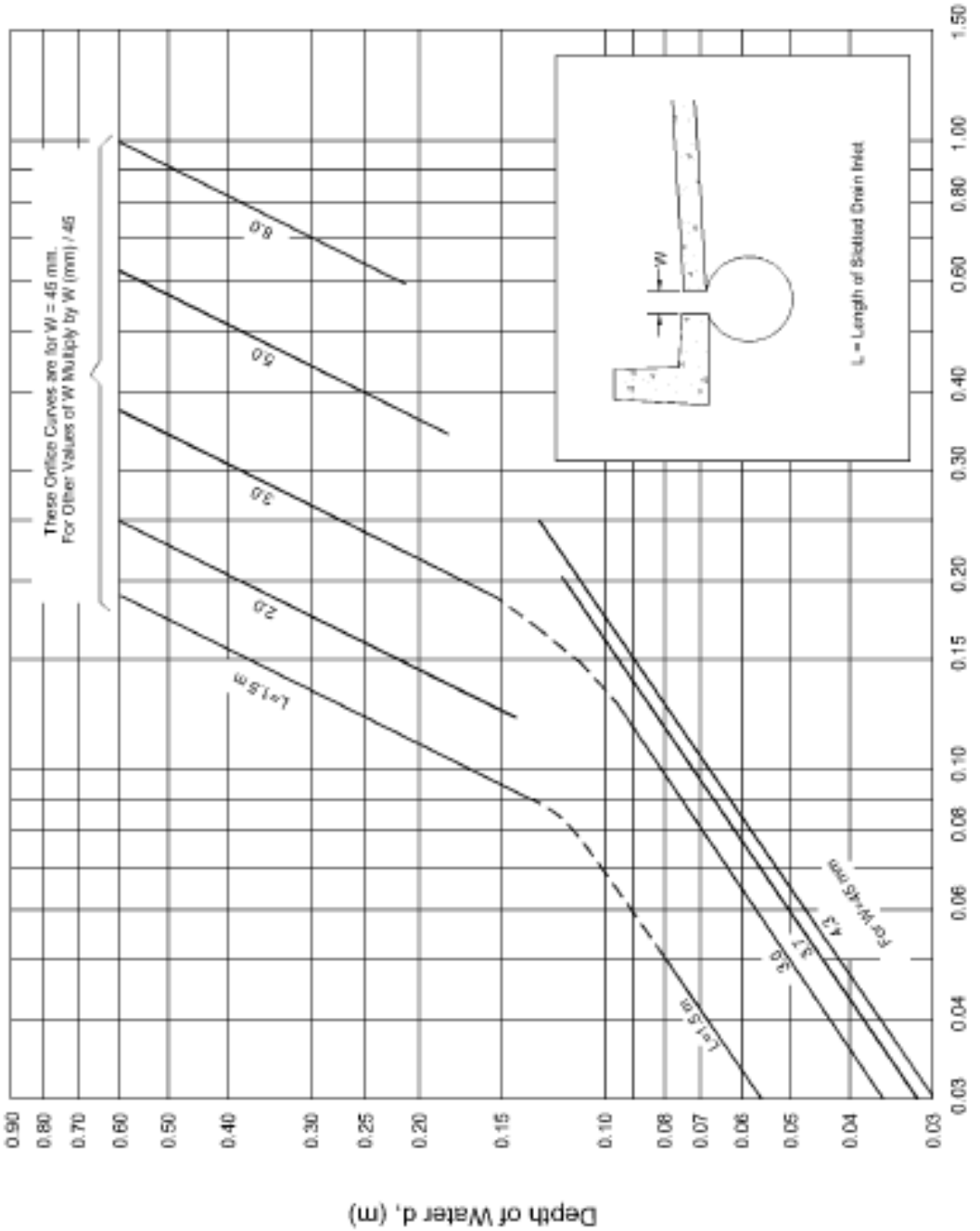
Curb Opening Inlet Orifice Capacity
For Inclined And Vertical Orifice Throats.

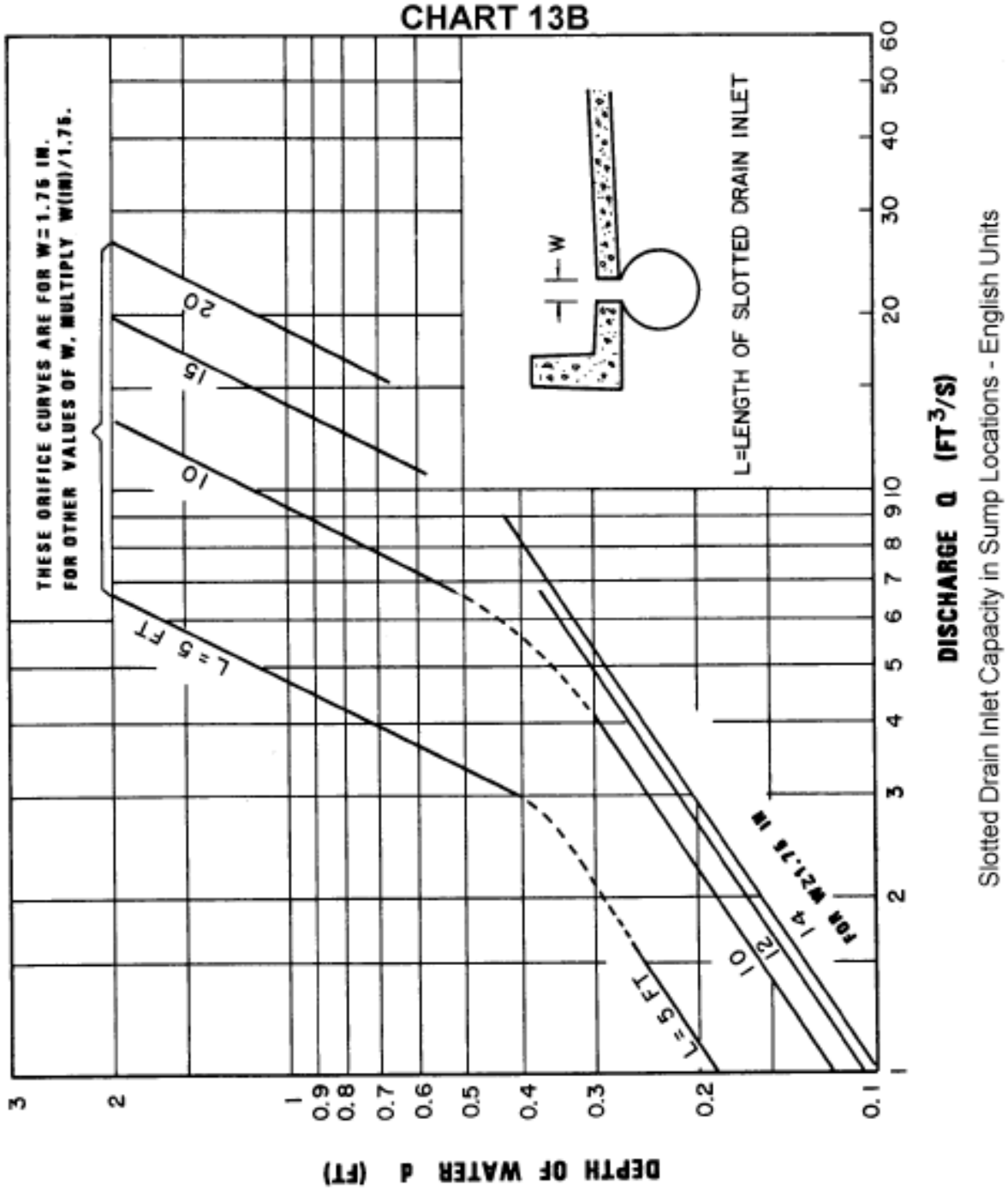
CHART 12B



Curb-opening Inlet Orifice Capacity for Inclined and Vertical Orifice Throats - English Units

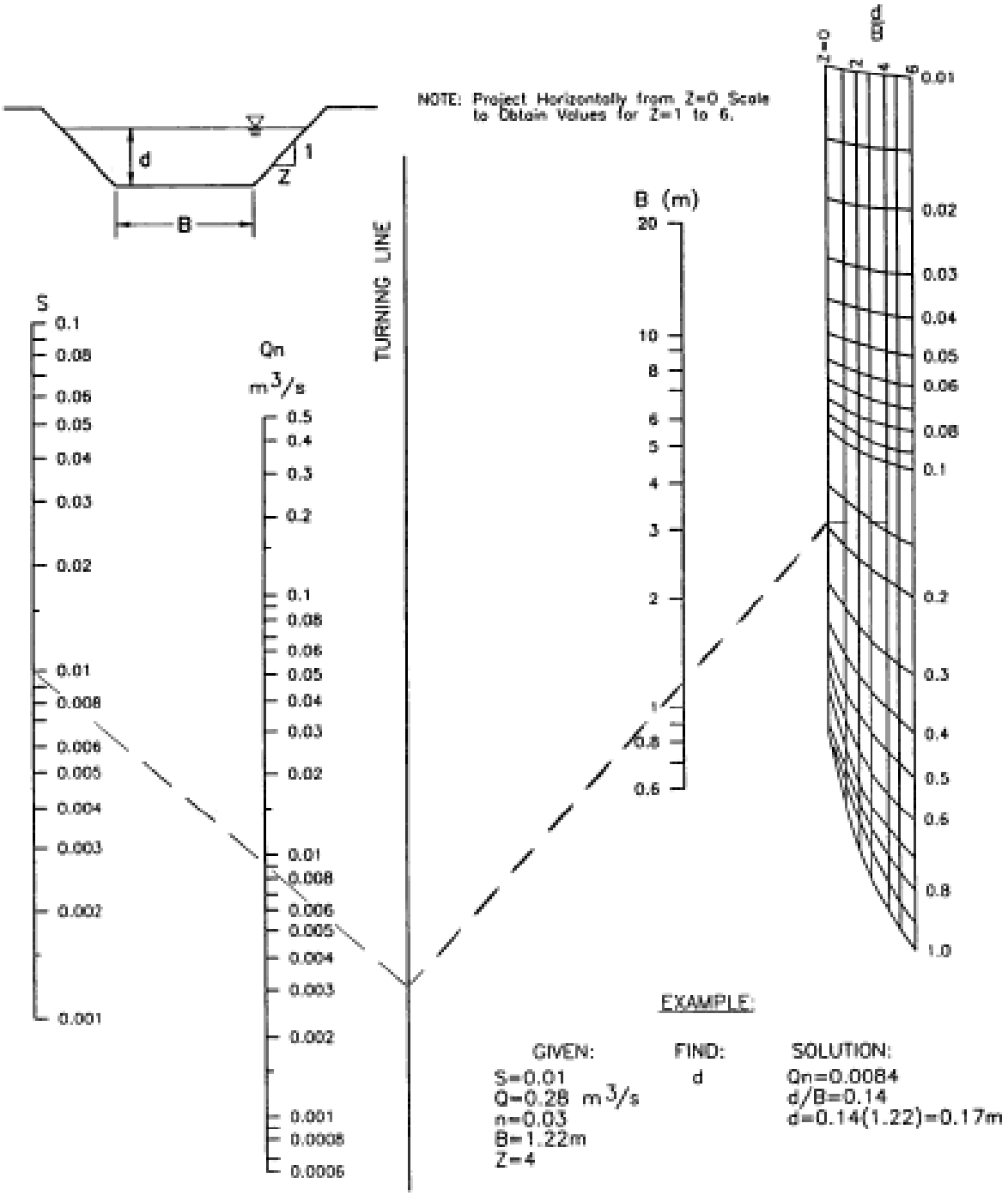
CHART 13A


Slotted Drain Inlet Capacity in Sump Locations.
Discharge Q, (m³/s)
Depth of Water d, (m)
L = Length of Slotted Drain Inlet
W
These Orifice Curves are for W = 45 mm.
For Other Values of W Multiply by W (mm) / 45
8.0
5.0
3.0
2.0
L=1.5m
For W=45 mm
4.3
3.7
3.0
L=1.5m
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.25
0.20
0.15
0.10
0.08
0.07
0.06
0.05
0.04
0.03
0.03
0.04
0.06
0.08
0.10
0.15
0.20
0.30
0.40
0.60
0.80
1.00
1.50



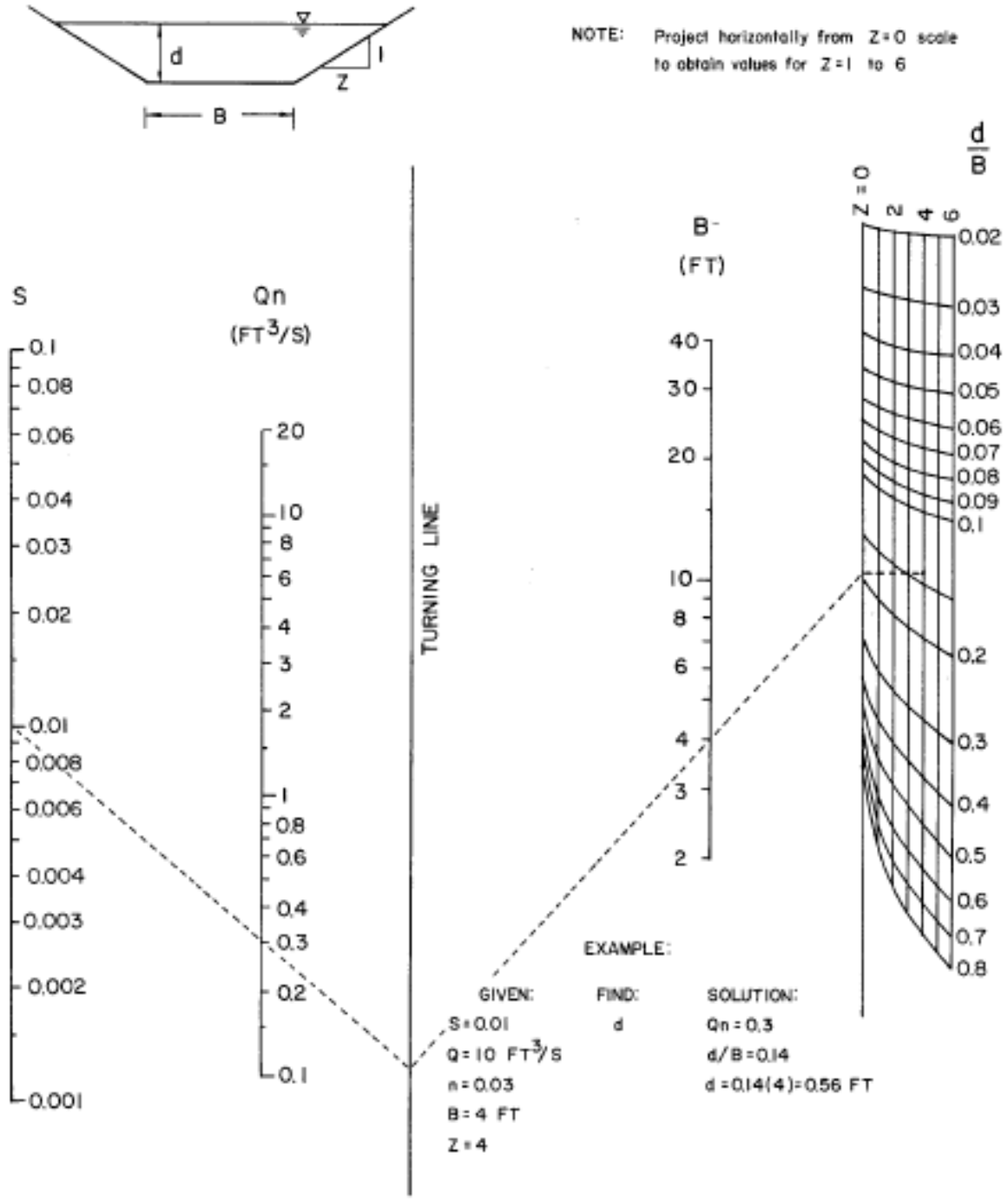
Slotted Drain Inlet Capacity in Sump Locations - English Units

CHART 14A



Solution to Manning's Equation for Channels of Various Side Slopes.

CHART 14B



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

CHART 15A

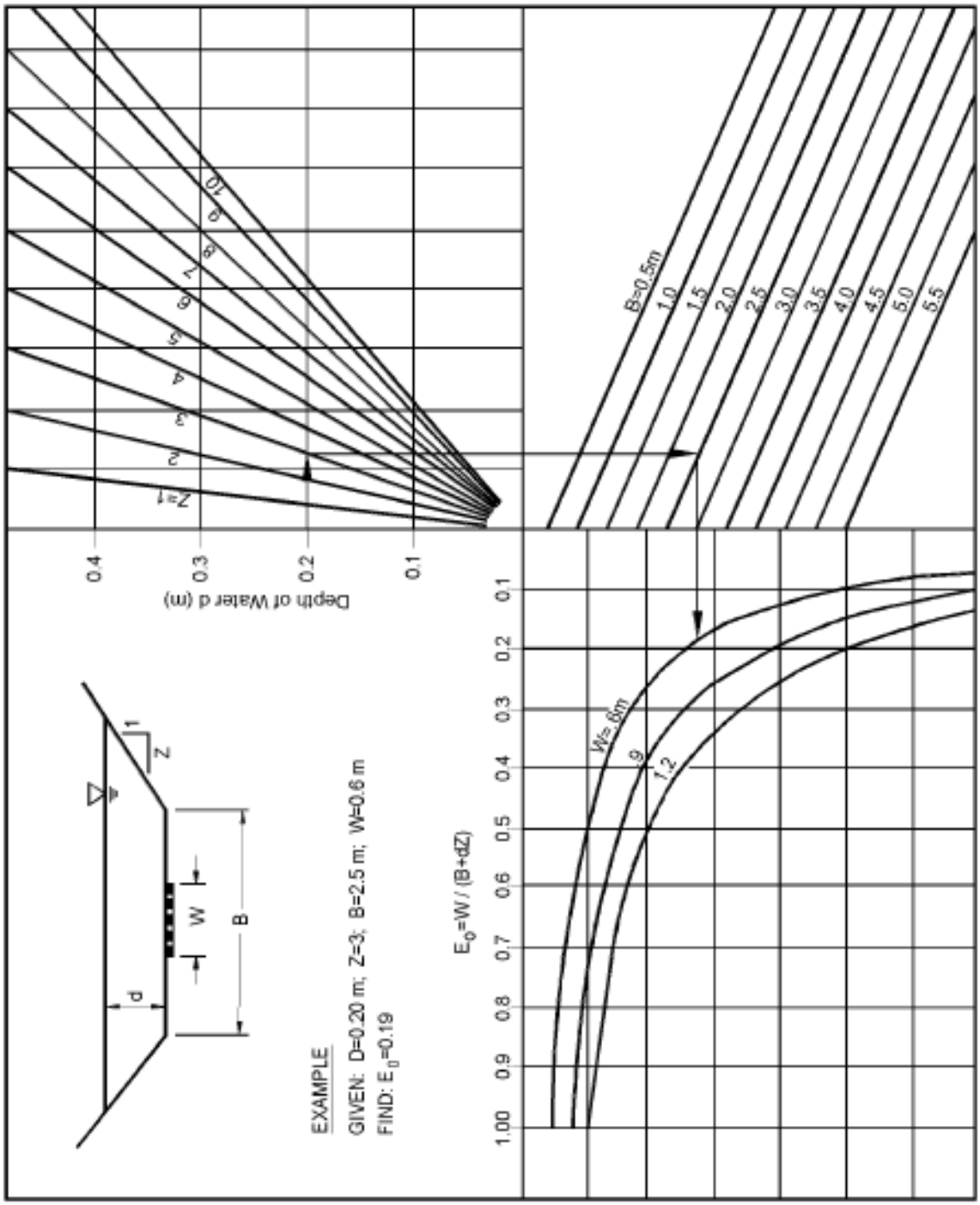
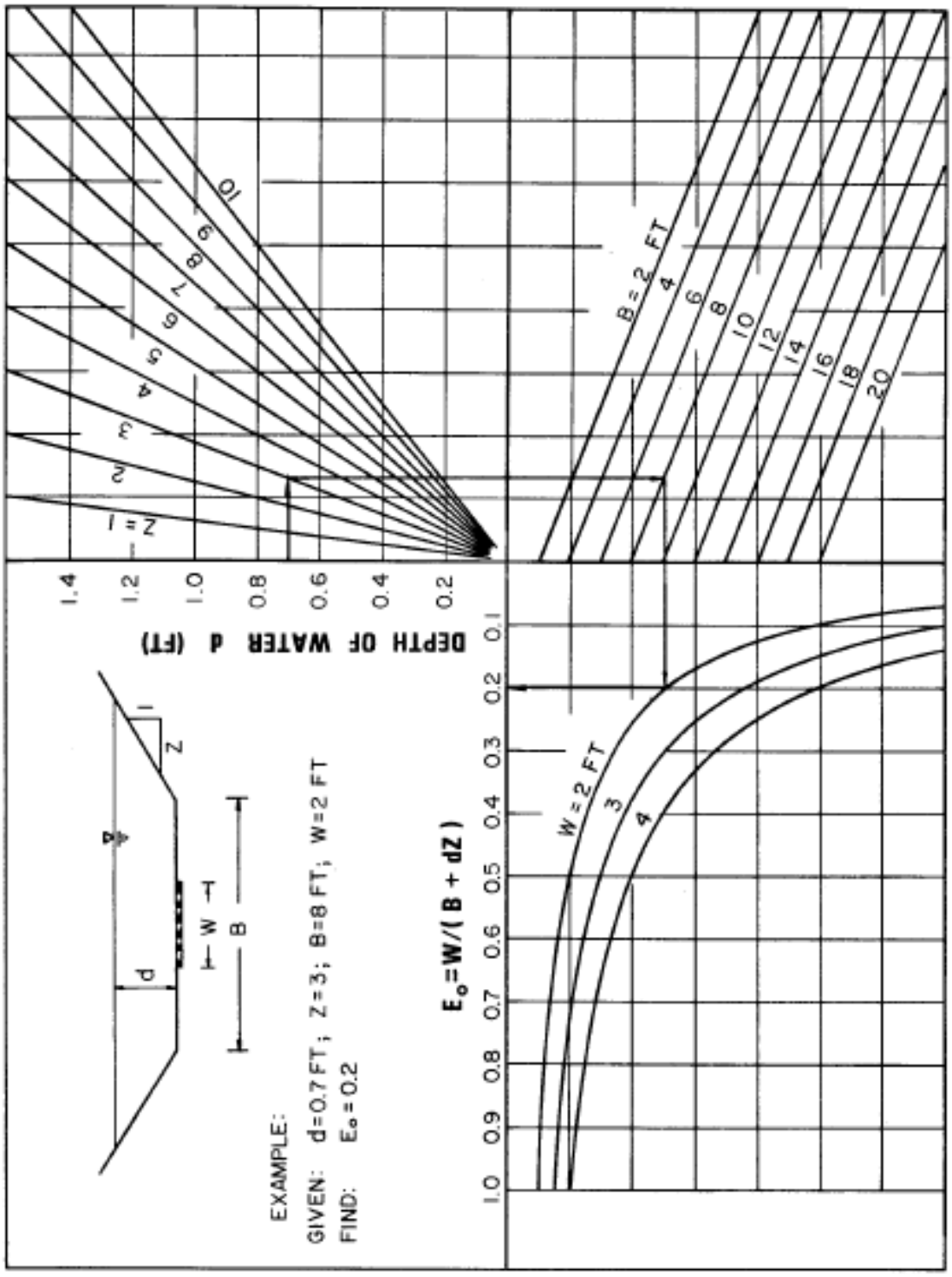
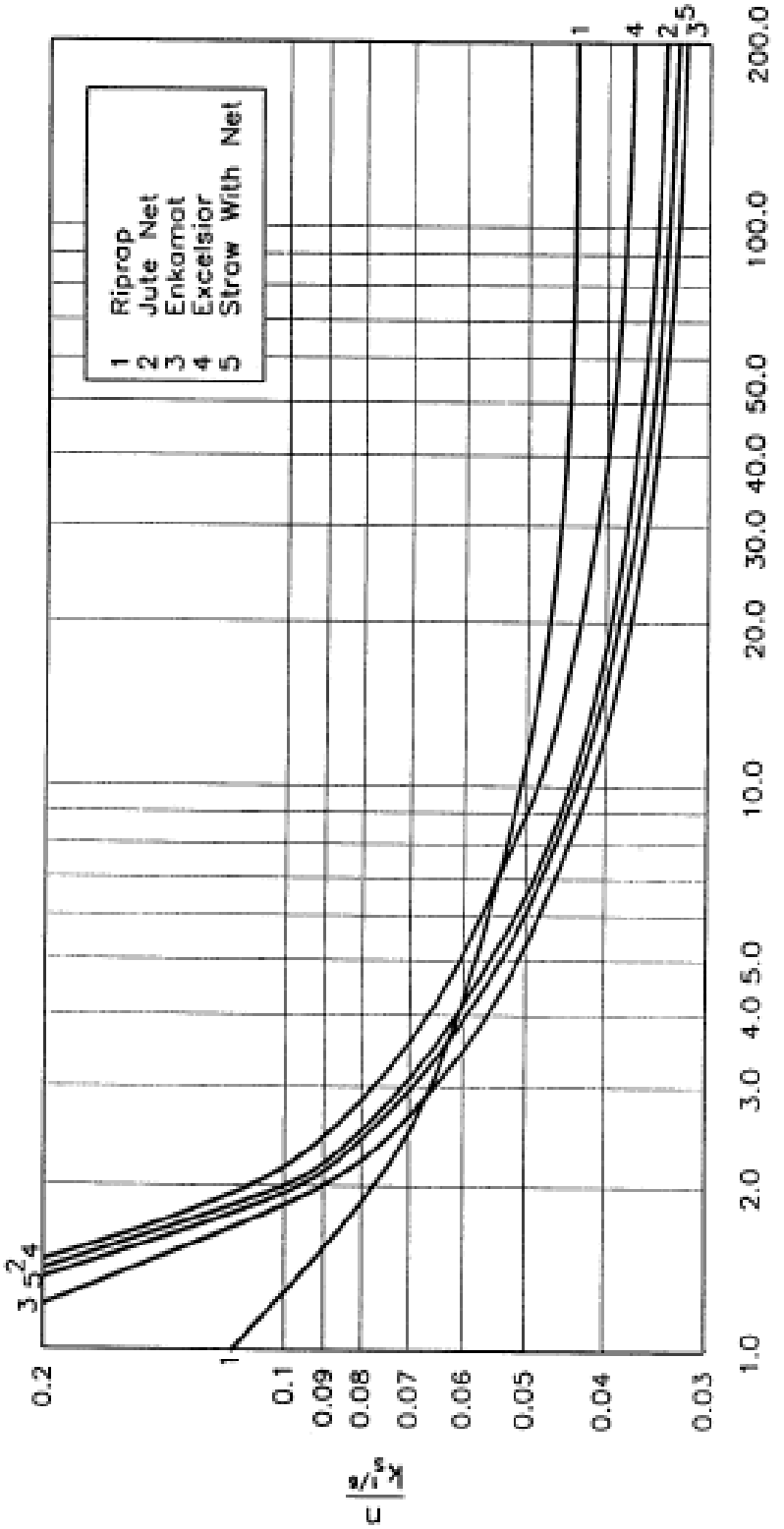

Depth of Water d (m)
0.4
0.3
0.2
0.1
Z=1
2
3
4
5
6
7
8
10
B=0.5m
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
E_0=W / (B+dZ)
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.00
Vf= 6m
9
1.2
Ratio of Frontal Flow to Total Flow in a Trapezoidal Channel.
1
Z
W
B
d
EXAMPLE
GIVEN: D=0.20 m; Z=3; B=2.5 m; W=0.6 m
FIND: E_0=0.19

CHART 15B



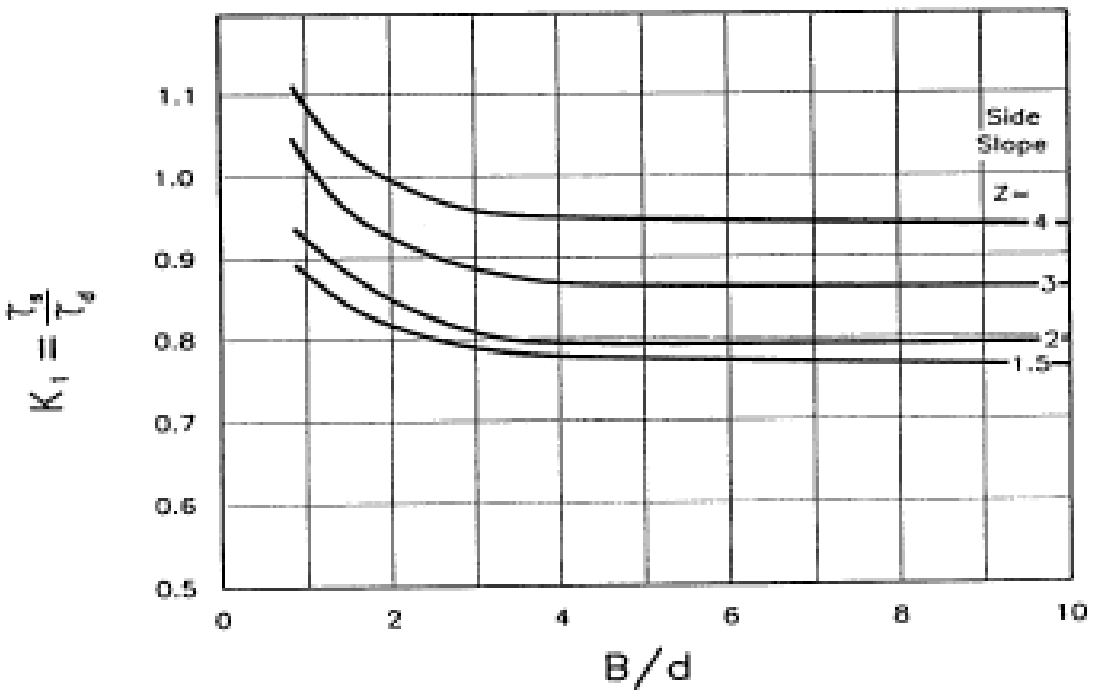
Ratio of Frontal Flow to Totl Flow in a Trapezoidal Channel - English Units

CHART 16



Manning's n Versus Relative Roughness
For Selected Lining Types

CHART 17



Channel Side Shear Stress To Bottom Shear Stress Ratio, K_1.

CHART 18

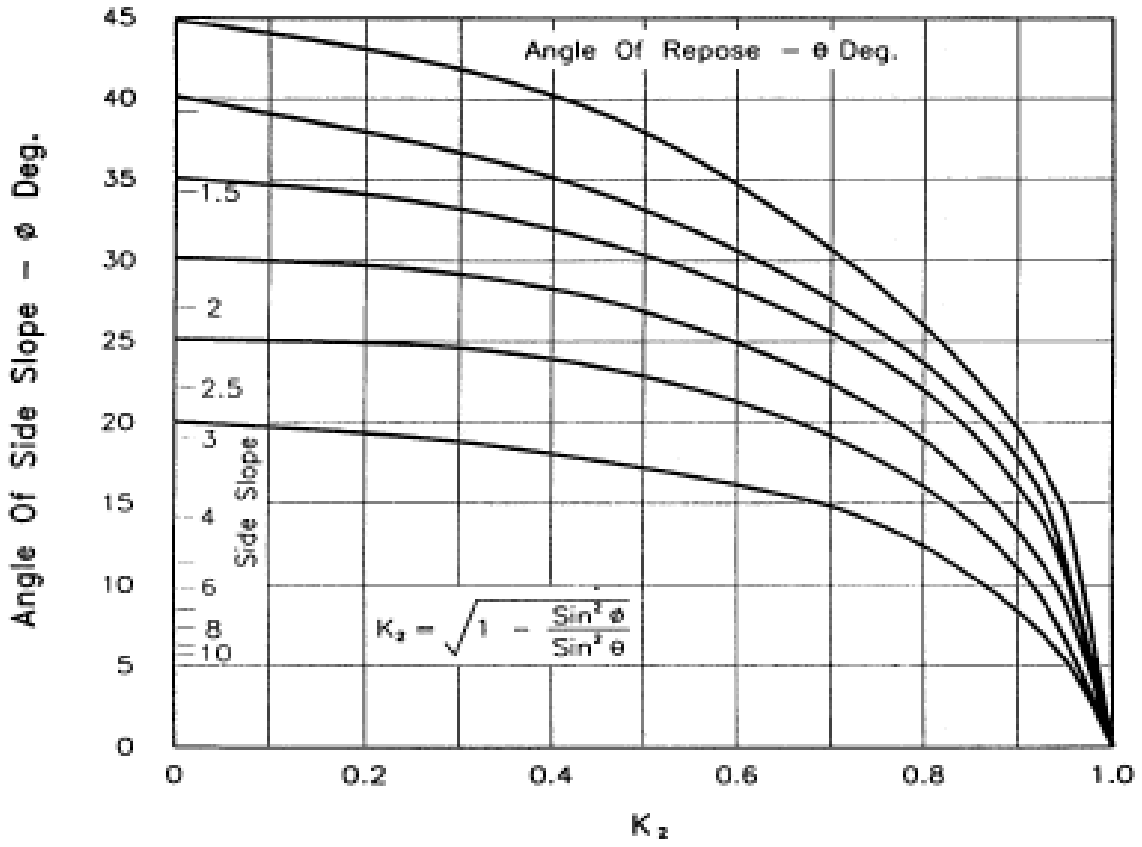
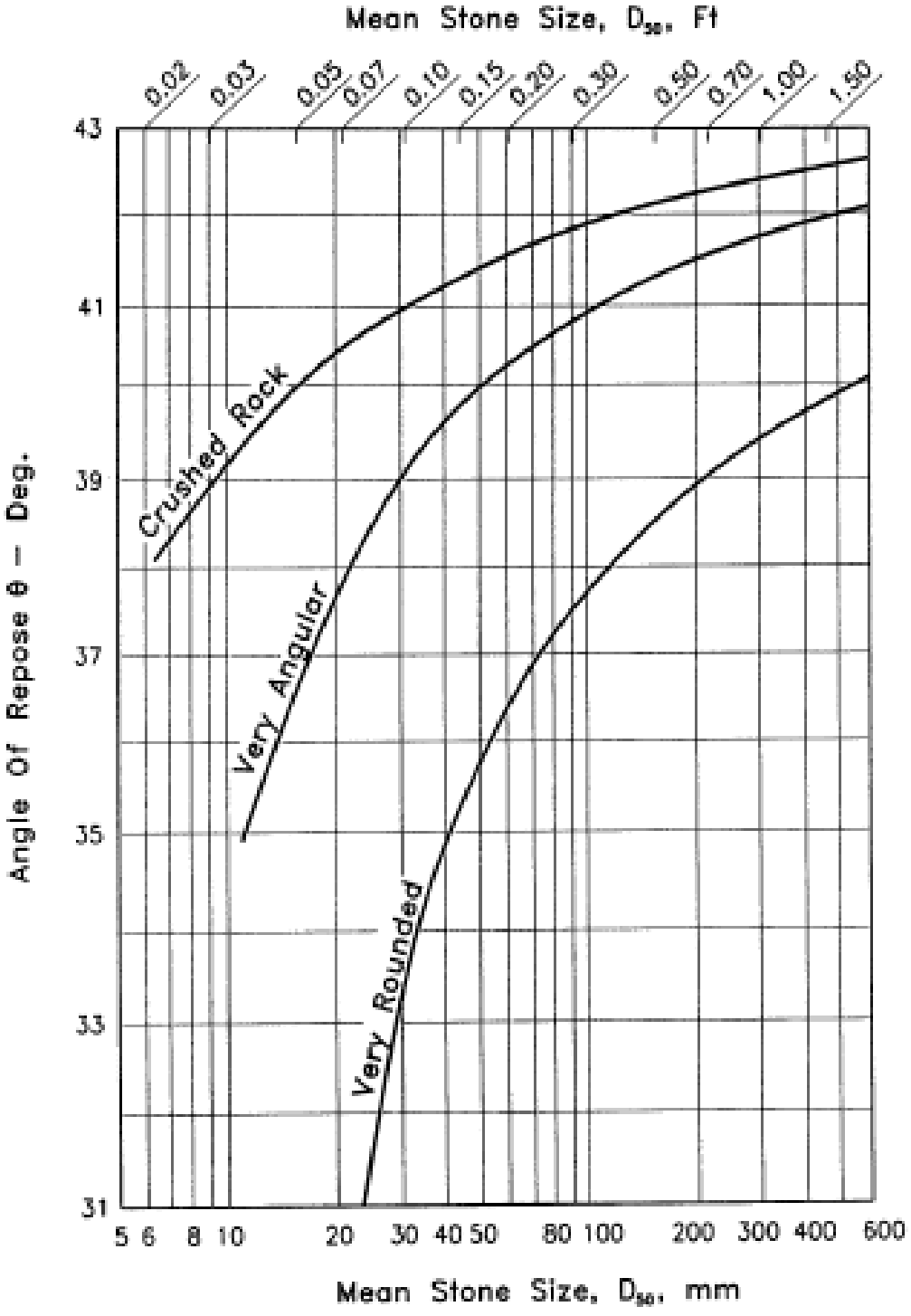


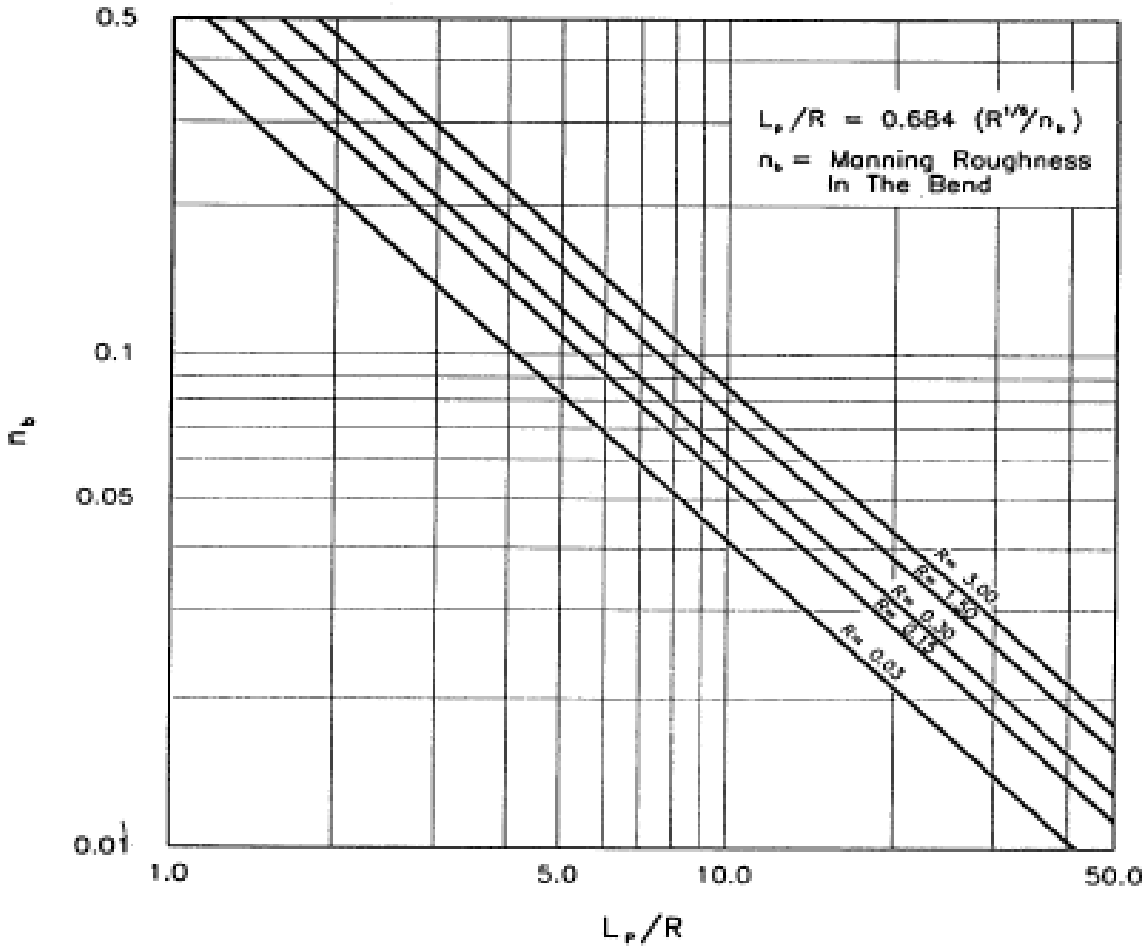
Chart 18. Tractive Force Ratio, K_2.

CHART 19



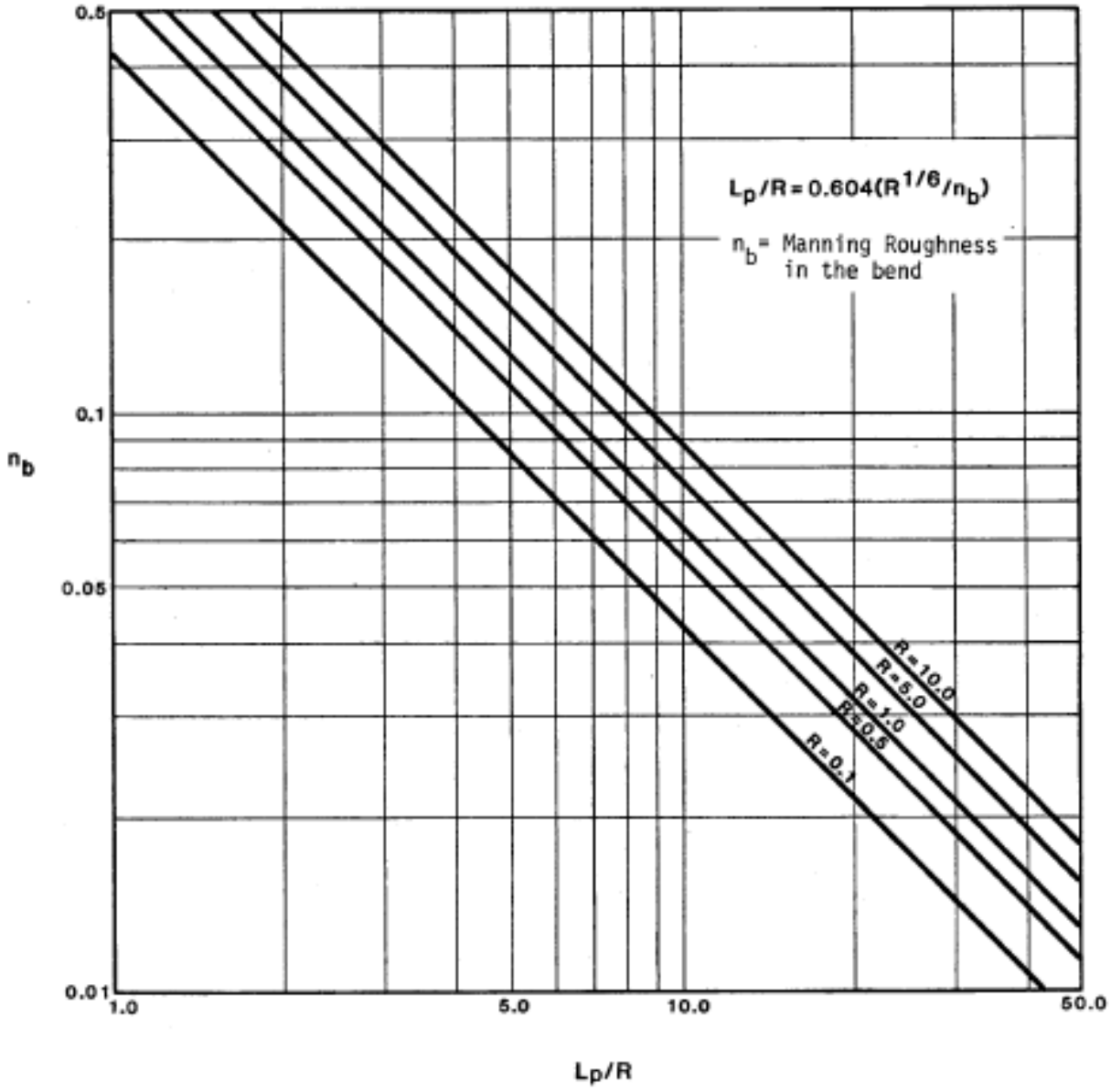
Angle Of Repose Of Riprap In Terms Of Mean Size And Shape Of Stone.

CHART 20A



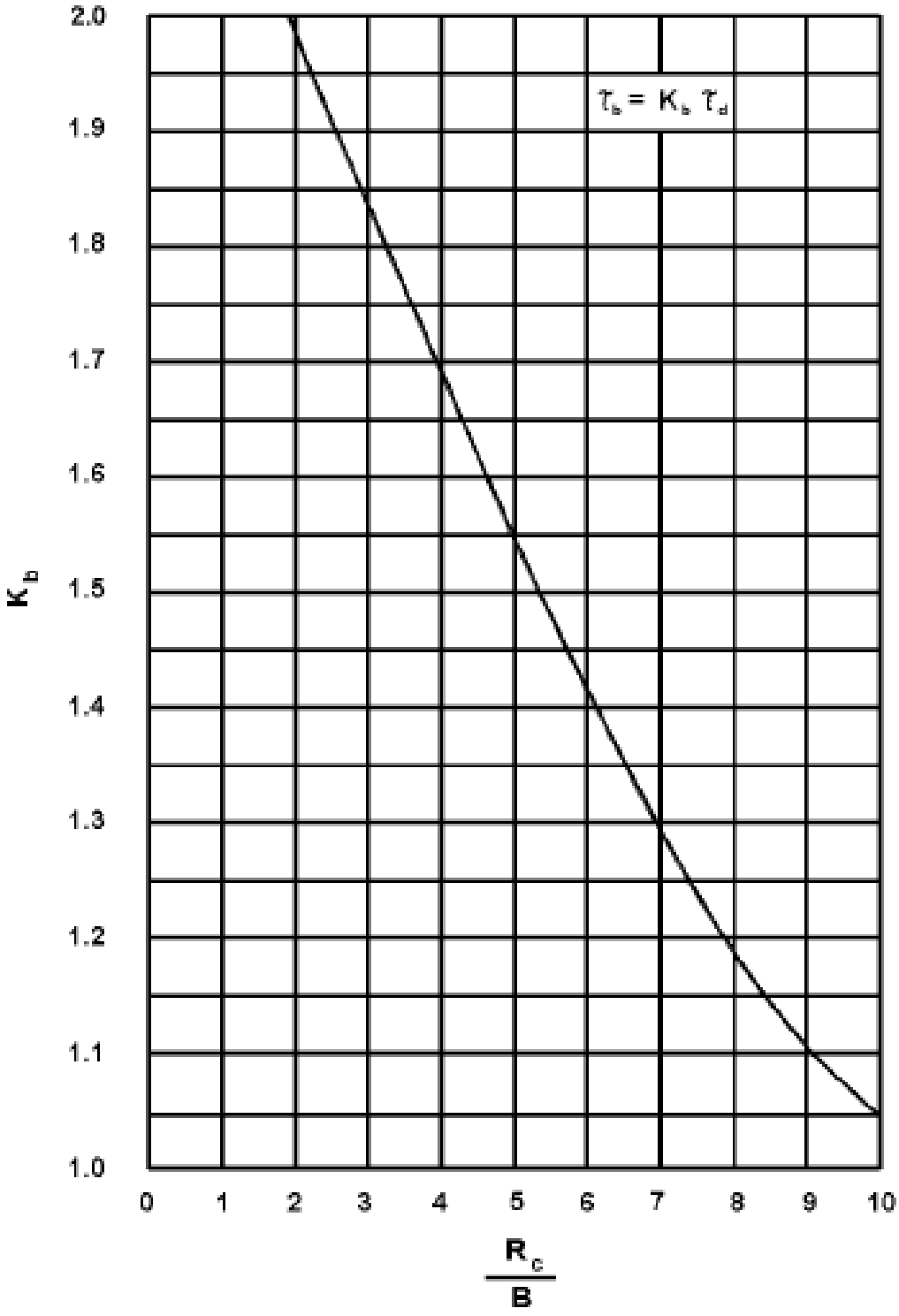
Protection Length, Lp, Downstream Of Channel Bend (11)

CHART 20B



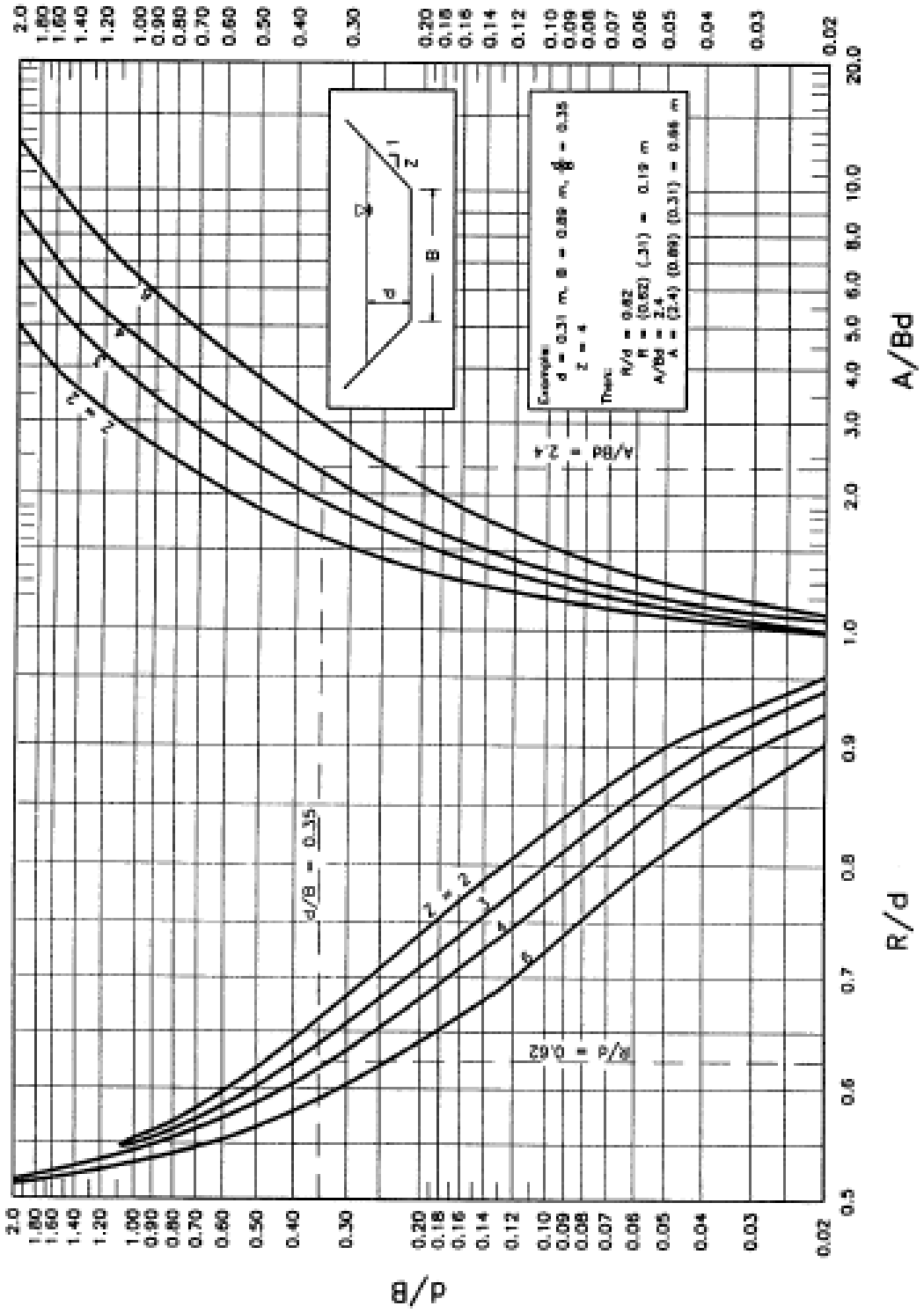
Protection Length, L_p, Downstream of Channel Bend[11] - English Units

CHART 21



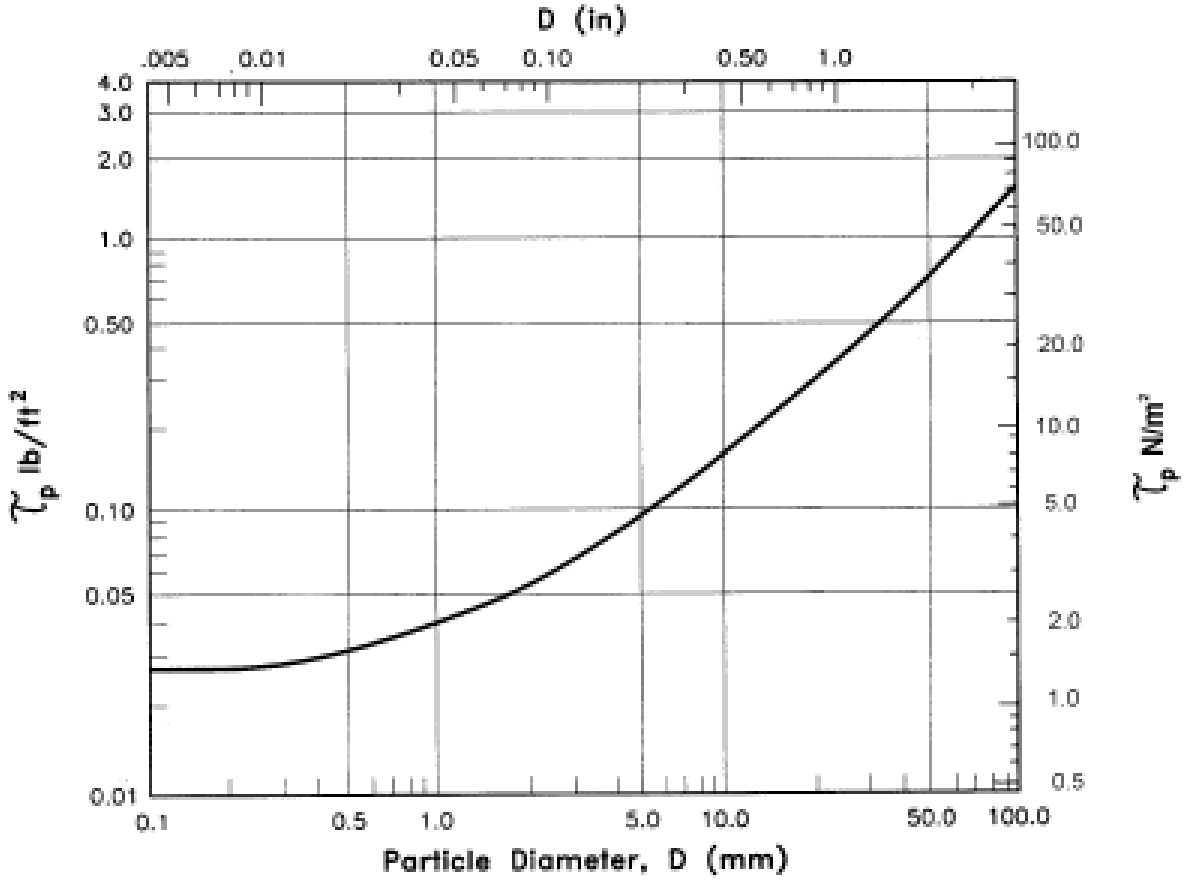
K_b Factor For Maximum Shear Stress On Channel Bends. (12)

CHART 22



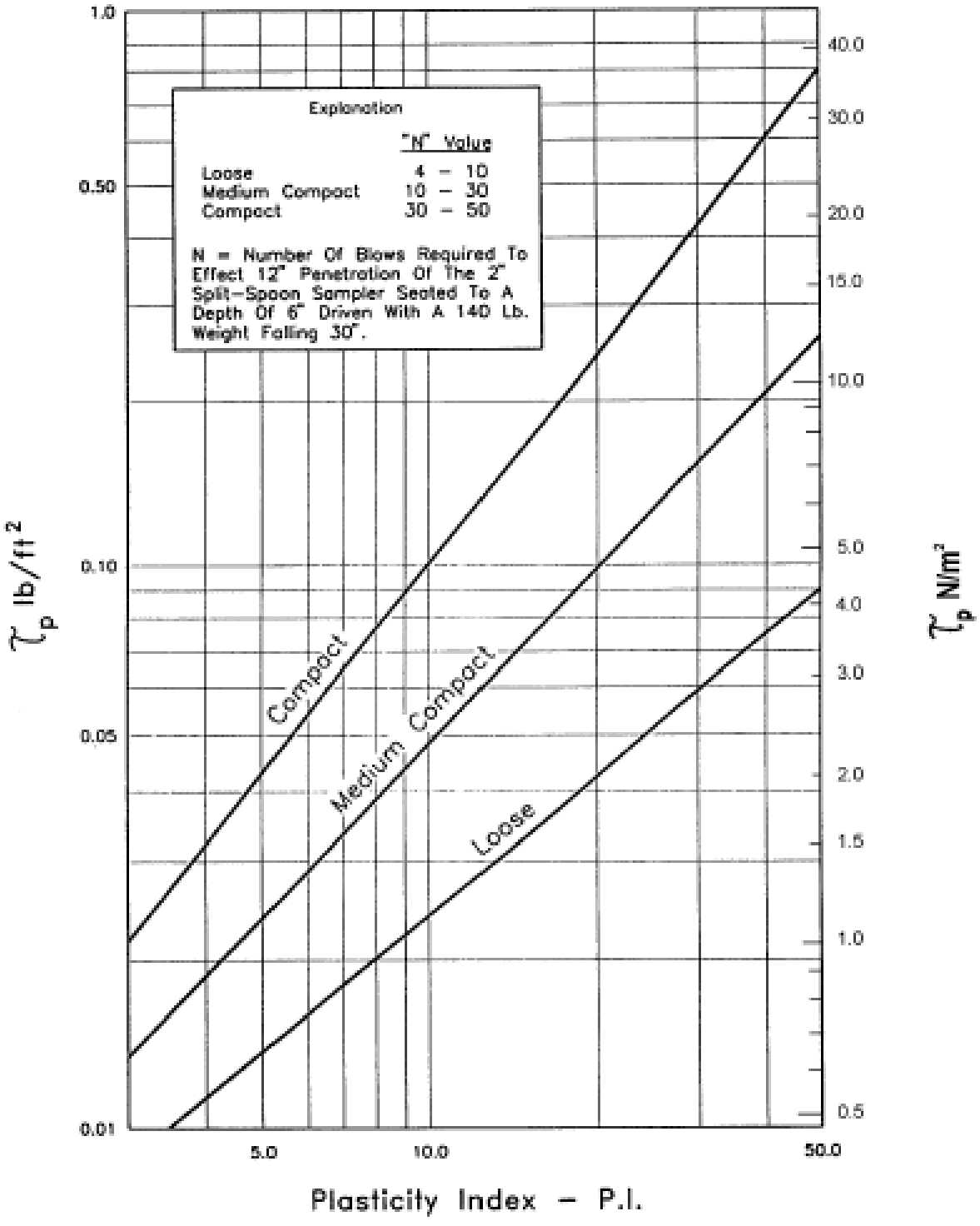
Geometric Design Chart For Trapezoidal Channels.

CHART 23



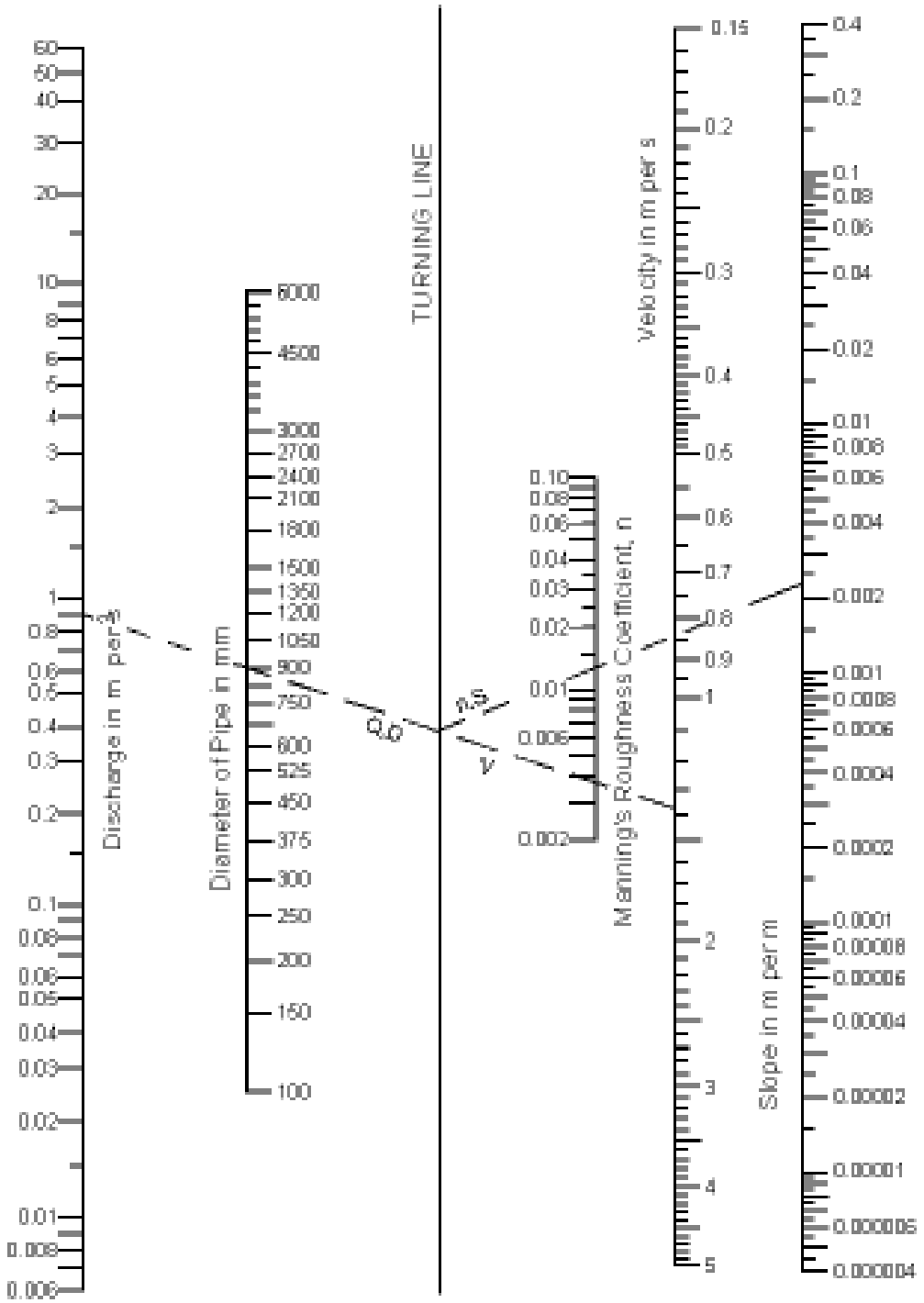
Permissible Shear Stress For Non-cohesive Soils. (After 15)

CHART 24



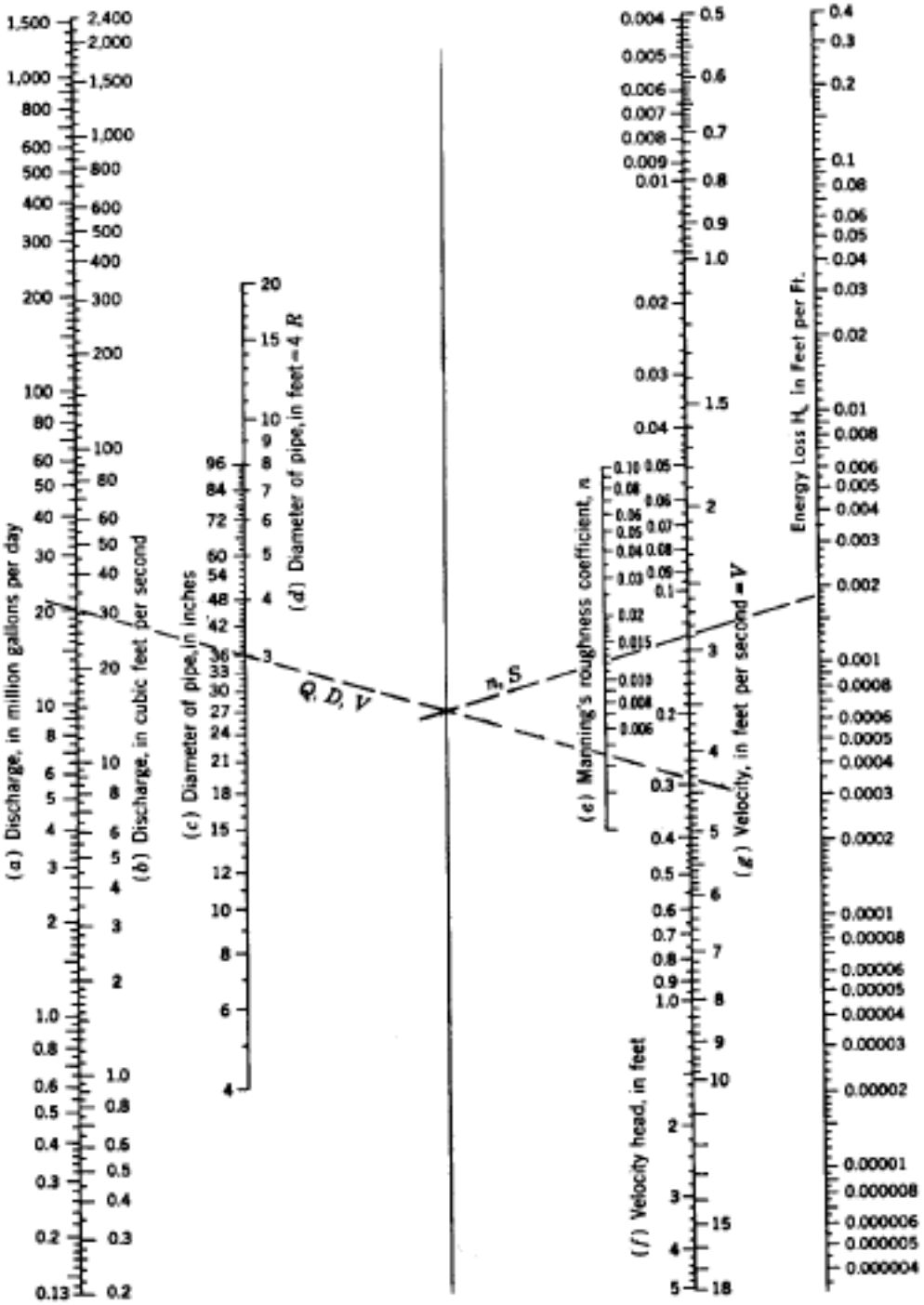
Permissible Shear Stress For Cohesive Soils.

CHART 25A



Solution of Manning's Equation for flow in Strom Drains.

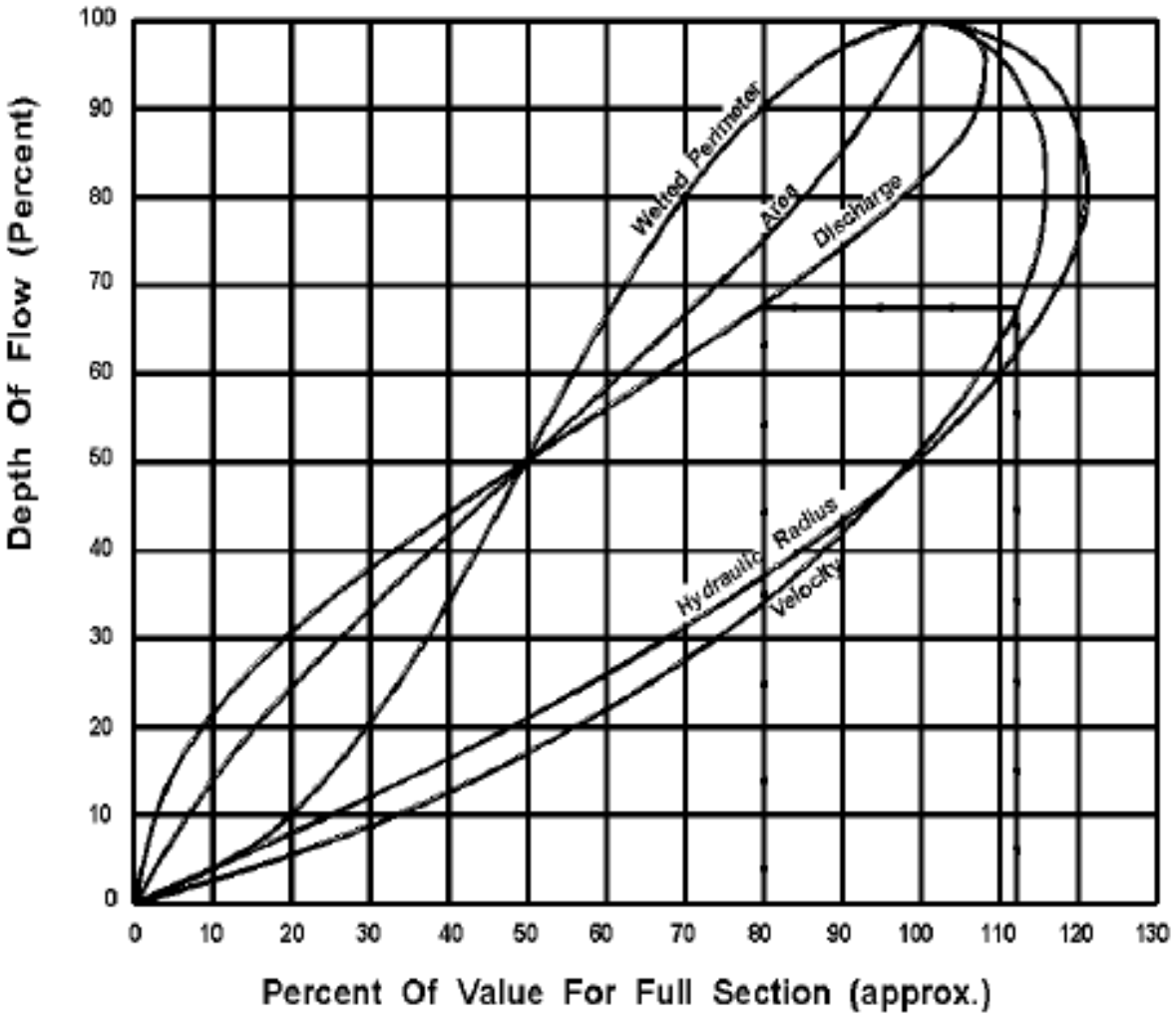
CHART 25B



Alignment chart for energy loss in pipes, for Manning's formula.
Note: Use chart for flow computations, $H_L = S$

Solution of Manning's Equation for Flow in Storm Drains - English Units
(Taken from "Modern Sewer Design" by American Iron and Steel Intitute)

CHART 26



Hydraulic Elements Chart

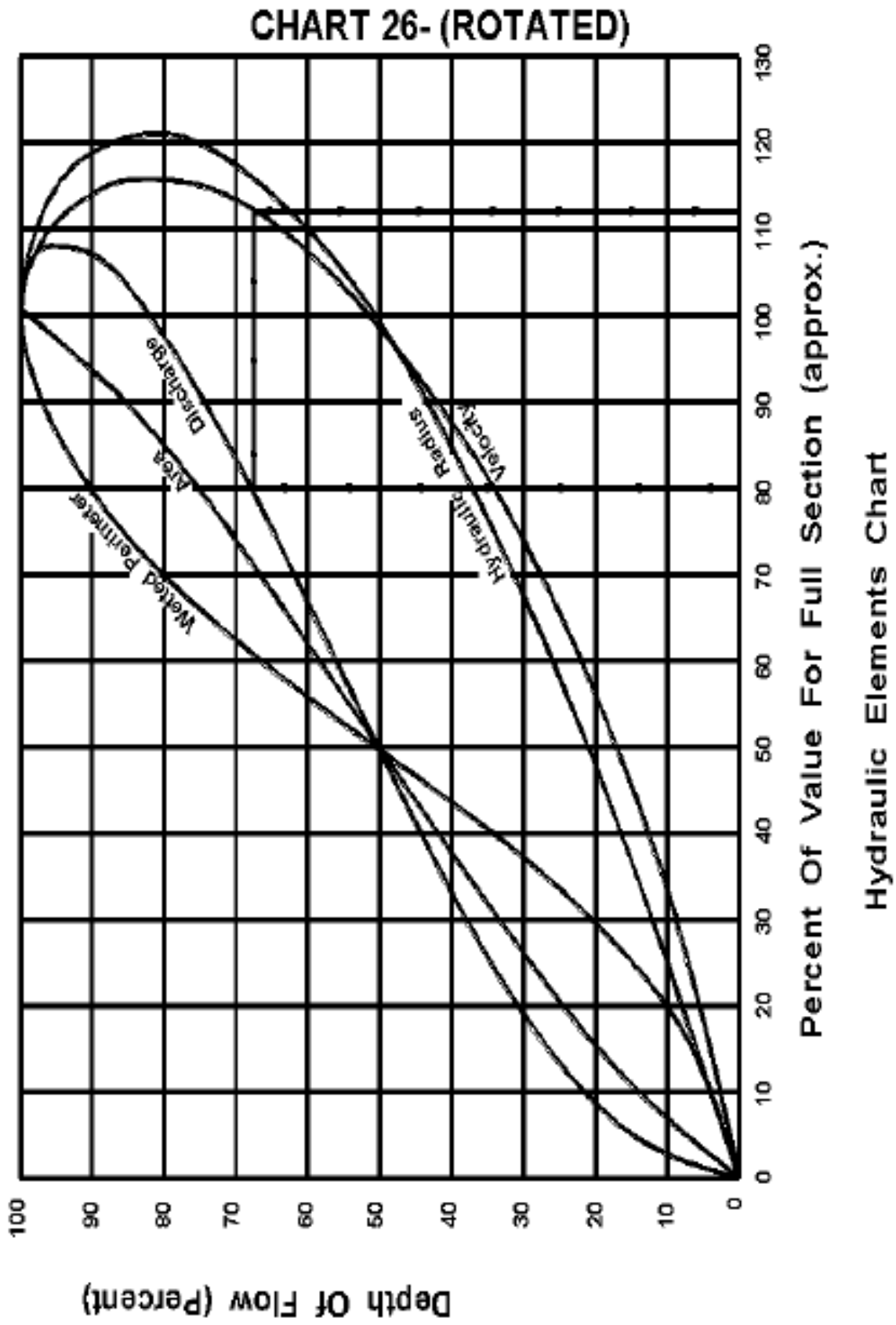
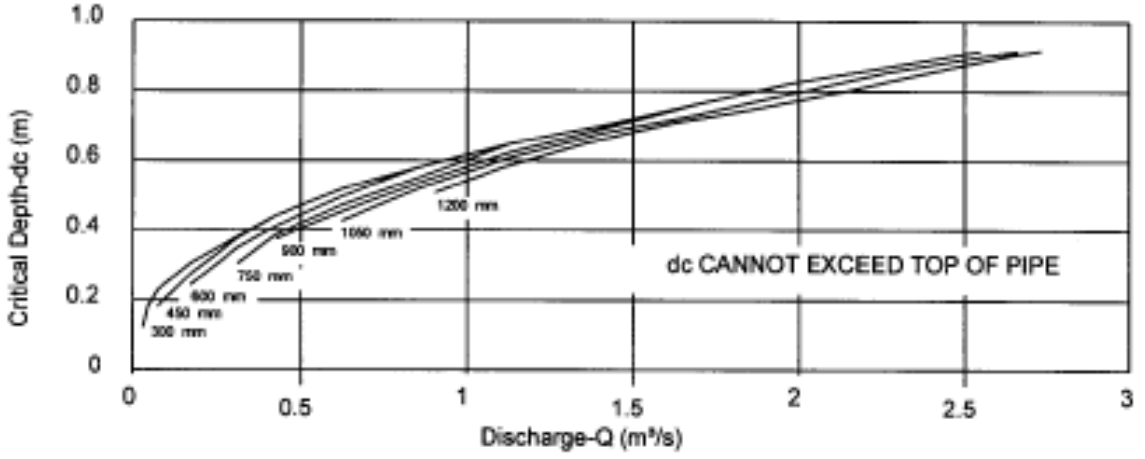
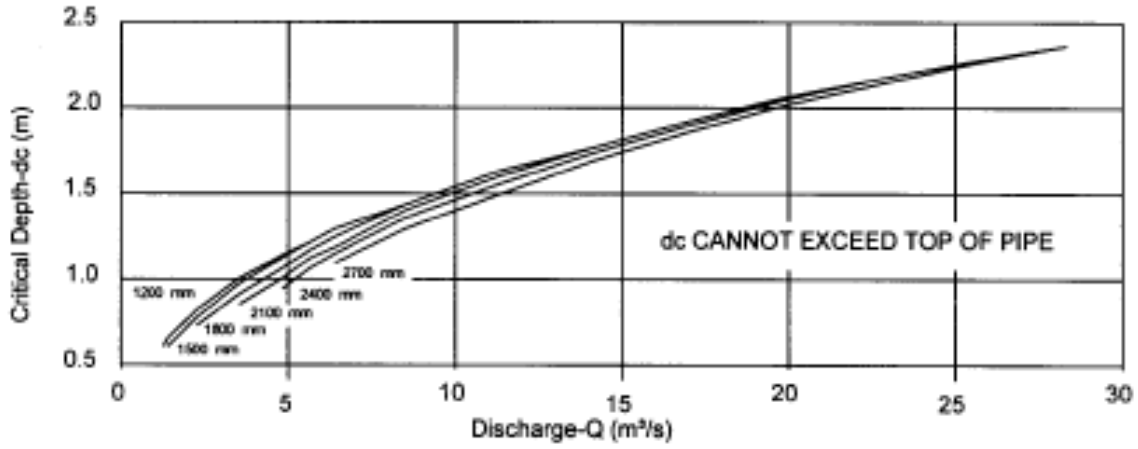
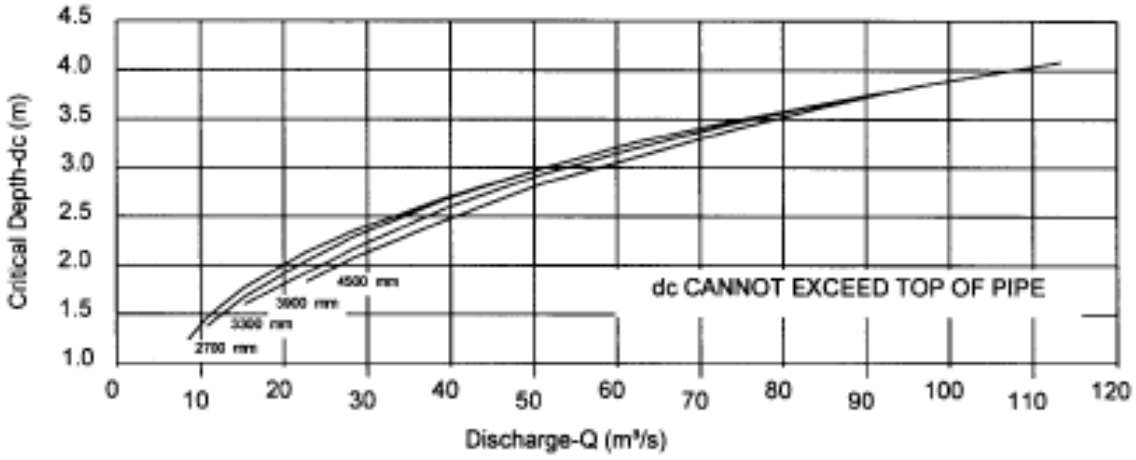


CHART 26- (ROTATED)
Depth Of Flow (Percent)
100
90
80
70
60
50
40
30
20
10
0
Wetted Perimeter
Area
Discharge
Hydraulic Radius
Velocity
0
10
20
30
40
50
60
70
80
90
100
110
120
130
Percent Of Value For Full Section (approx.)
Hydraulic Elements Chart

CHART 27A







Adapted from Bureau of Public Roads

Critical Depth-Circular Pipe

CHART 27B

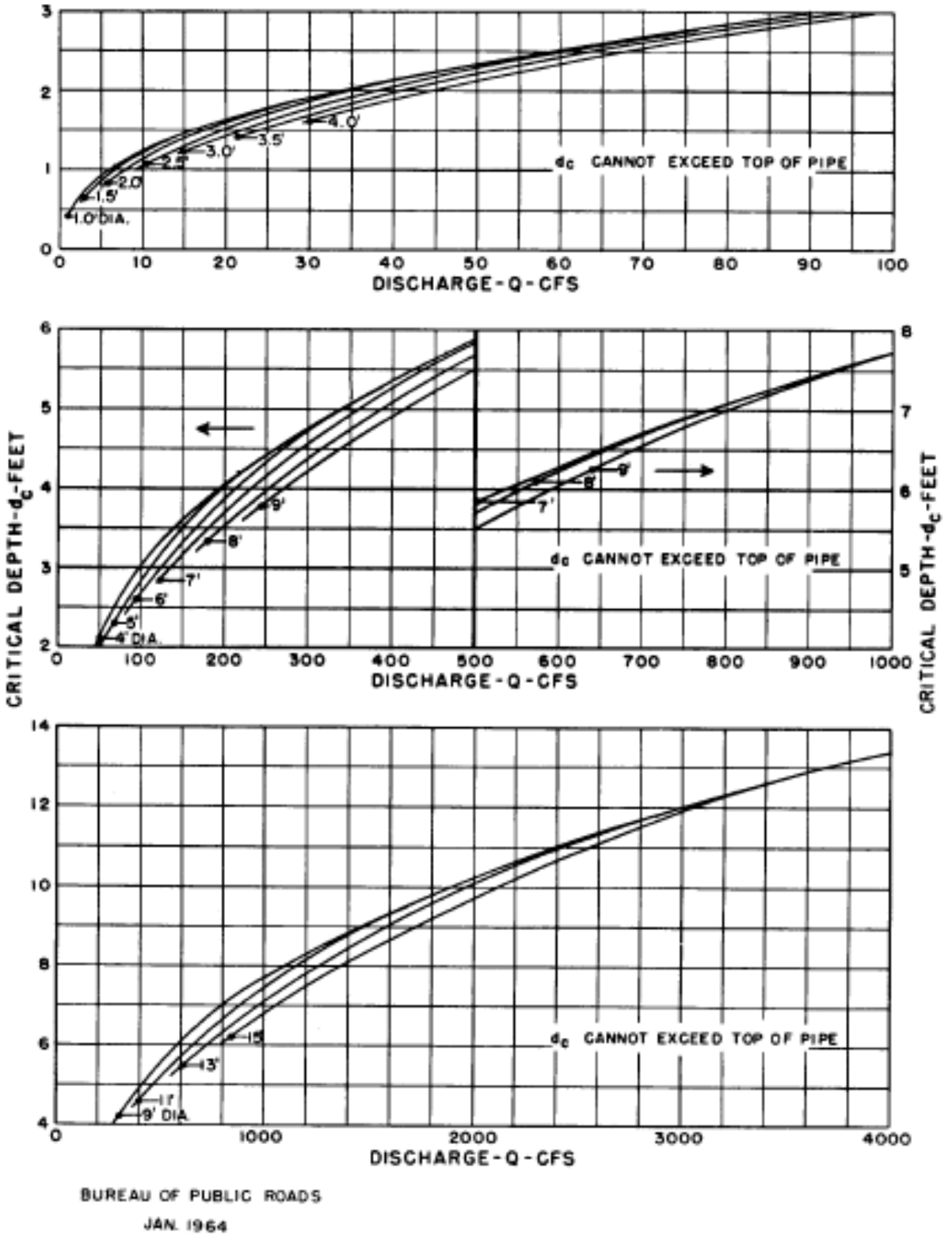
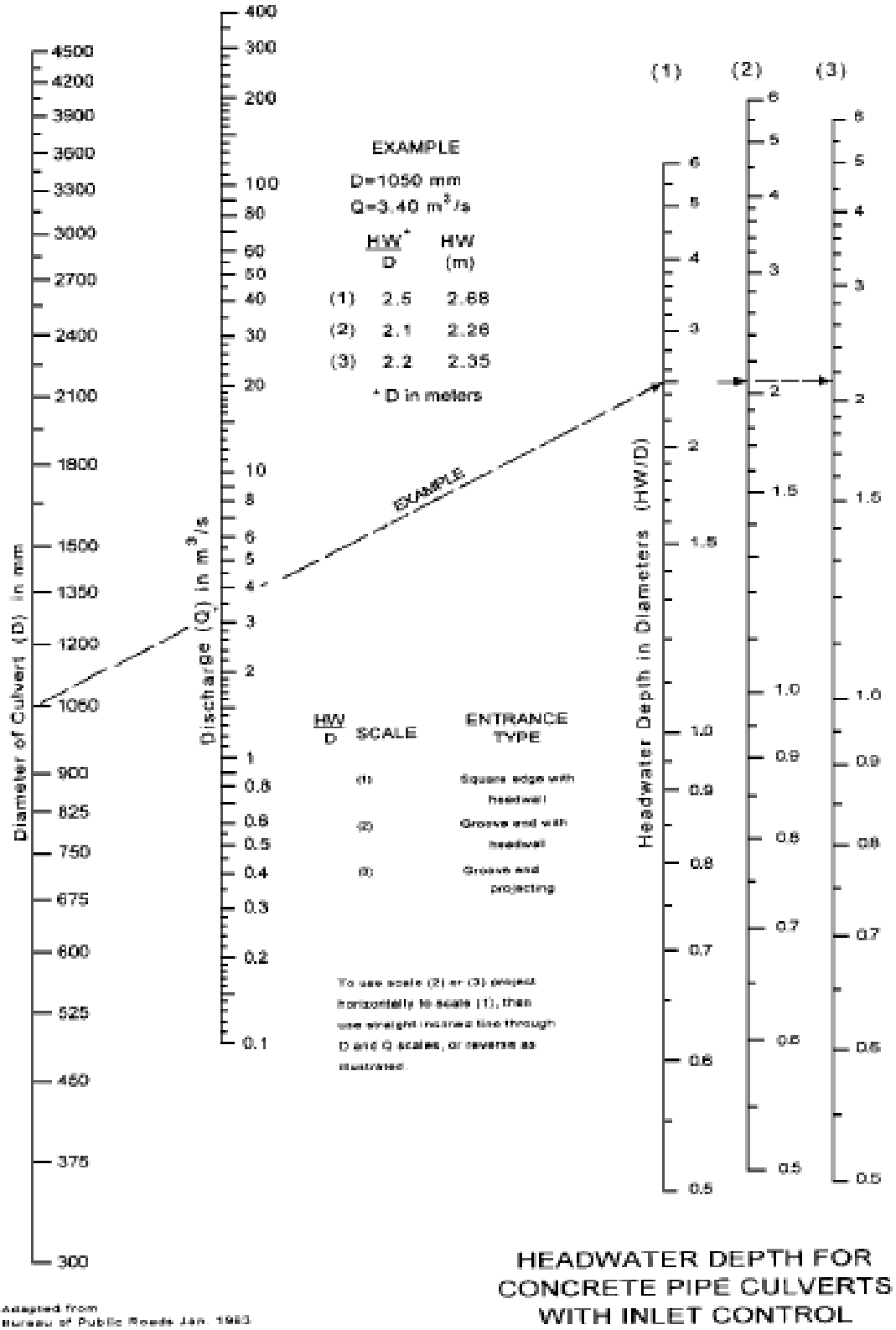


Chart 27B. Critical Depth in Circular Pipe - English Units

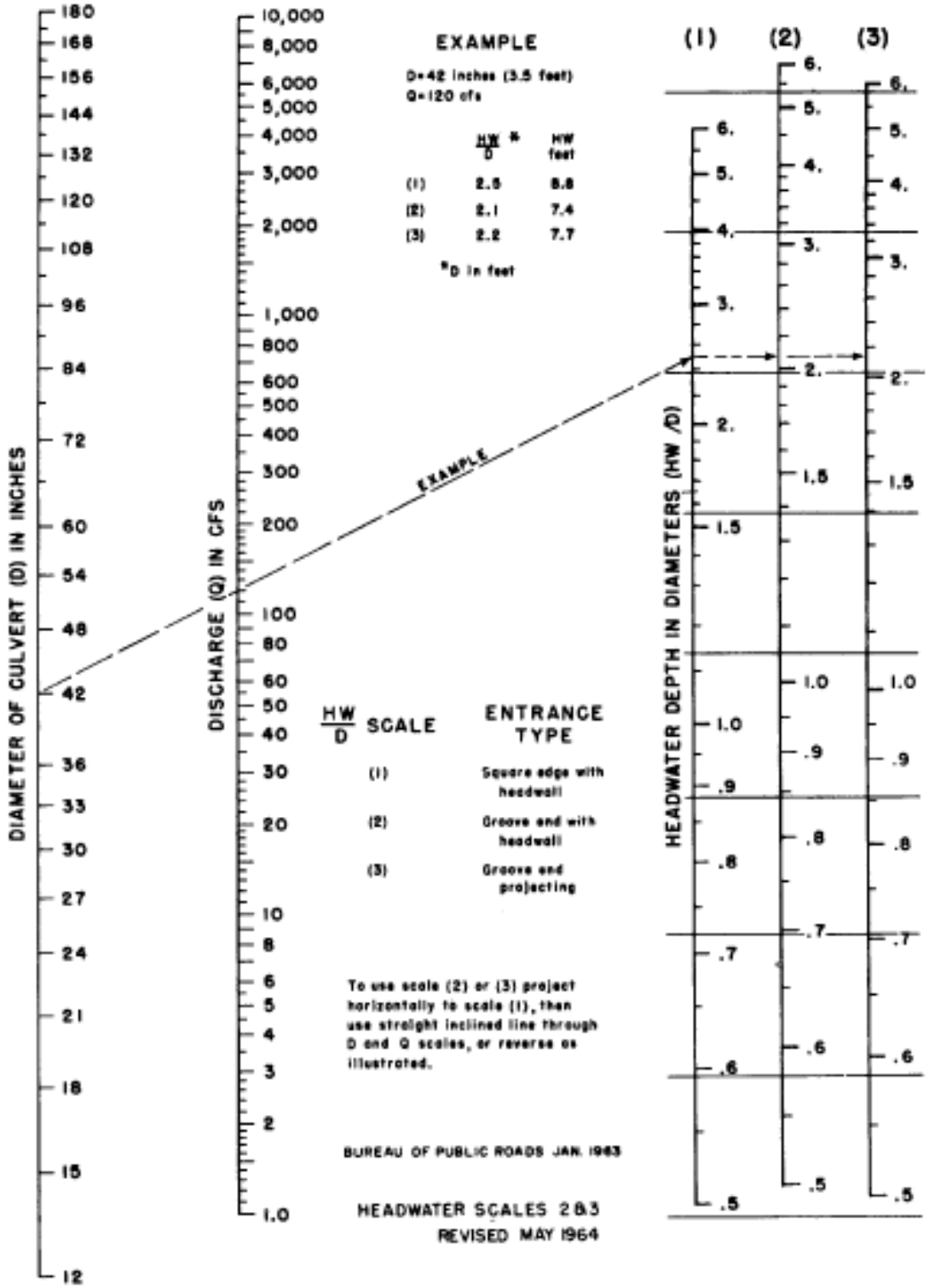
CHART 28A



Adapted from
Bureau of Public Roads Jan. 1963

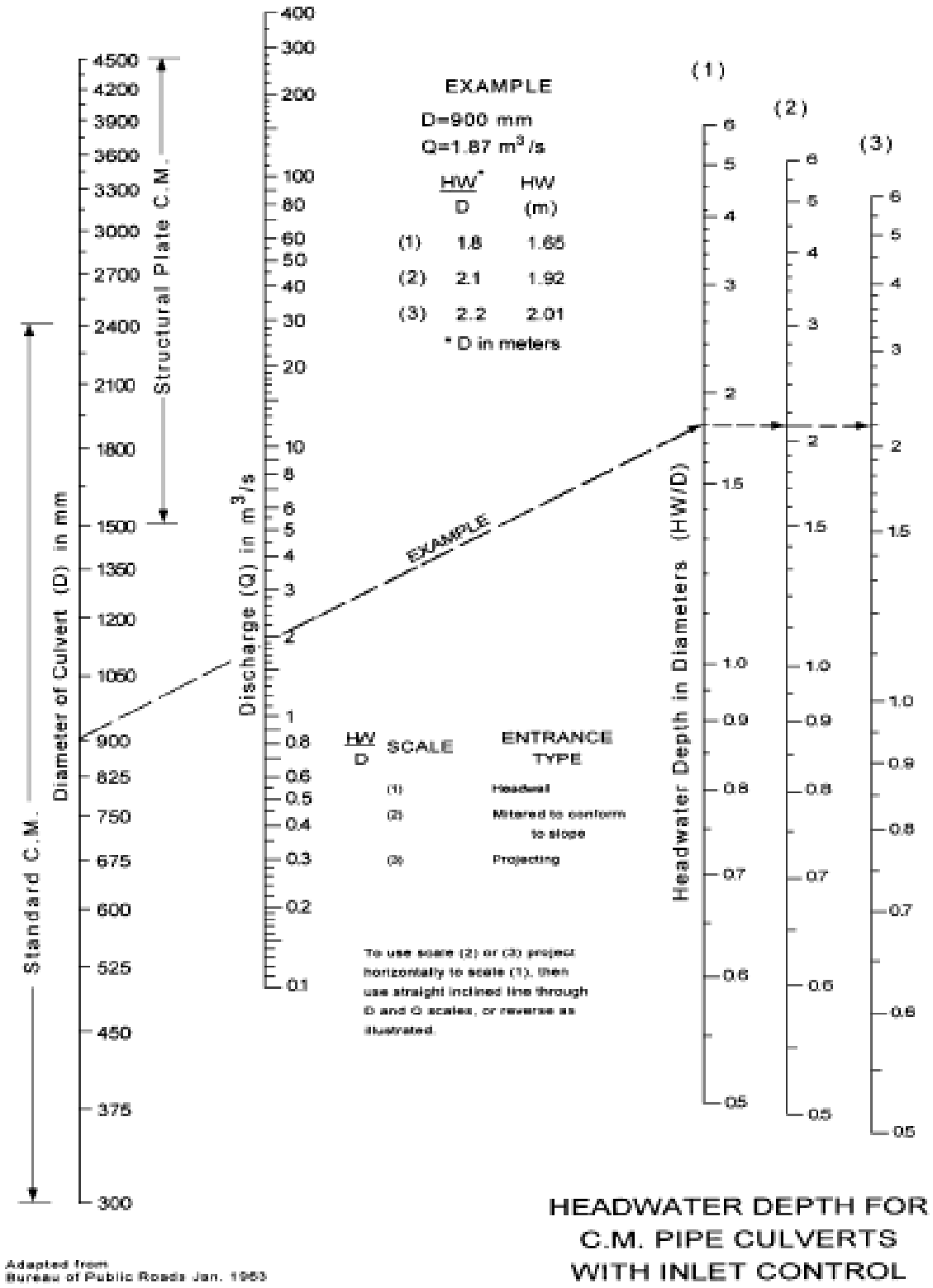
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

CHART 28B



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

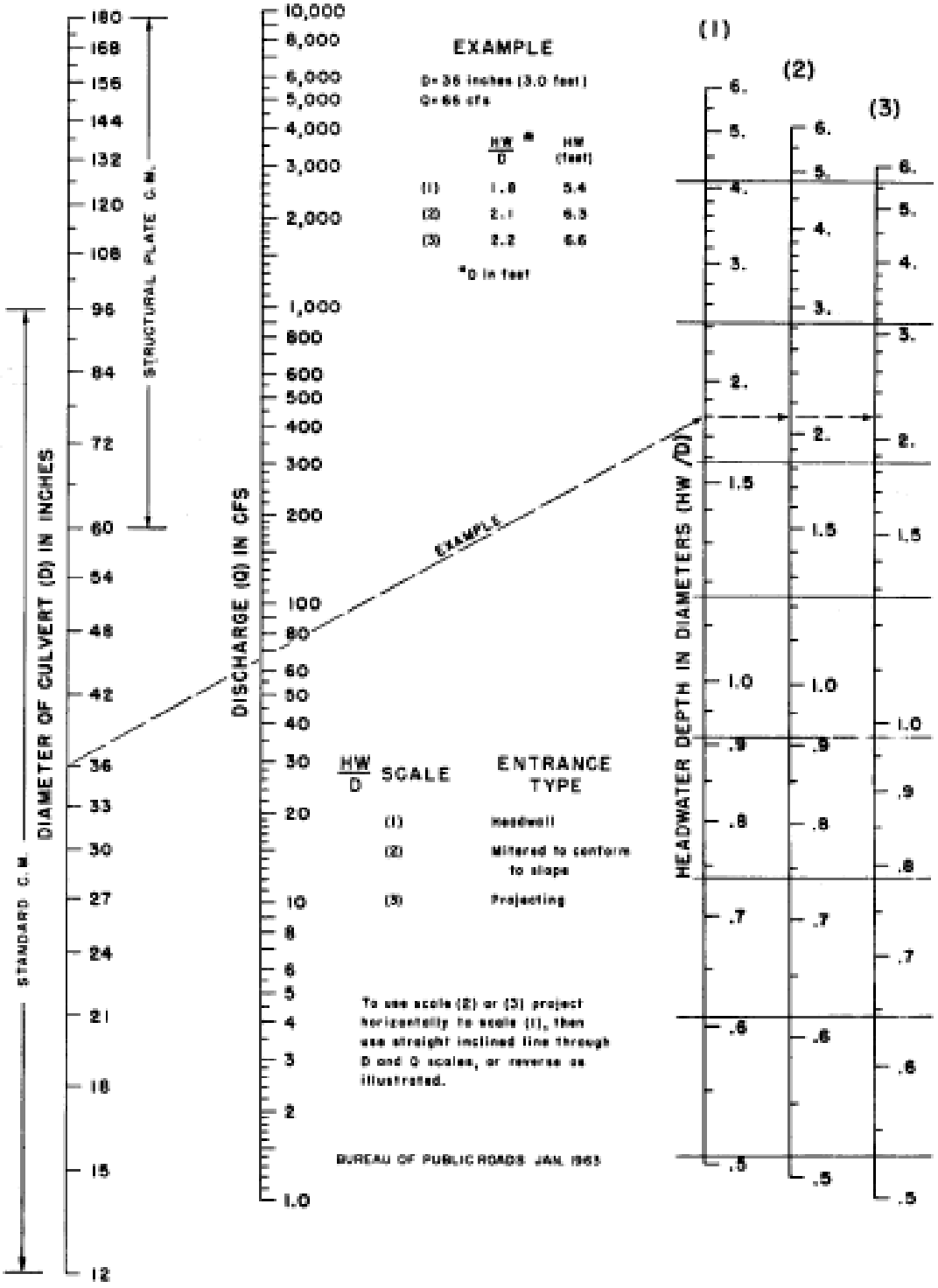
CHART 29A



Adapted from
Bureau of Public Roads Jan. 1963

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

CHART 29B



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