

Appendix 1

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TABLE 1
Coefficients of Runoff and Minimum Inlet Times

Land Use	Runoff Coefficient, C	Minimum Inlet Time (Min.)
Residential		
Duplex/Patio Home	0.6	15
Single Family	0.5	15
Greater than 1 acre lots	0.4	15
Commercial	0.9	10
Industrial	0.9	10
Multiple Unit Dwelling	0.8	10
Parks and Cemeteries	0.4	15
Undeveloped Open Areas	0.3	20
Shopping Centers	0.9	10
Paved Areas	0.95	10
Schools	0.6	15
Patio Homes	0.6	15

TABLE 2
Roughness Coefficients for Closed Conduits*

Material of New Construction	Recommended Roughness Coefficient, n
Concrete Pipe Storm Sewer	0.013
Corrugated Metal Pipe Culverts	0.024

Material of Existing Systems	Recommended Roughness Coefficient, n
Concrete Pipe Storm Sewer	
Fair Alignment, Ordinary Joints	0.015
Poor Alignment, Poor Joints	0.017
Concrete Pipe Culverts	0.012
Corrugated Metal Pipe Culverts	0.030

***Note: For materials other than those listed here, use manufacturer's suggestion and/or City of Arkadelphia's recommendations.**

TABLE 3
Rainfall Depths for Clark County

THESE NUMBERS ASSUME EVEN DISTRIBUTION FOR SMALL AREAS
REFER TO FIGURE 15 IN TP-40 FOR LARGE AREAS (OVER 20 SQUARE MILES)

Information Obtained From Hydro-35:

2 YEAR	5	0.5	100 YEAR	5	0.84
	15	1.05		15	1.83
	60	1.9		60	3.72

TP-40 INPUT			HYDRO-35 INPUT		
FREQUENCY	DURATION	SOURCE	RAINFALL INCHES	DURATION MINUTE	RAINFALL INCHES
2-Year	30MIN	TP-40	1.50	5	0.50
	1HR	HYDRO-35	1.90	15	1.05
	2HR	TP-40	2.30	60	1.90
	3HR	TP-40	2.60		
	6HR	TP-40	3.10		
	12HR	TP-40	3.70		
5-Year	24HR	TP-40	4.25		
	30MIN	TP-40	1.90	5	0.57
	1HR	HYDRO-35	2.31	15	1.22
	2HR	TP-40	2.90	60	2.31
	3HR	TP-40	3.25		
	6HR	TP-40	3.95		
10-Year	12HR	TP-40	4.70		
	24HR	TP-40	5.50		
	30MIN	TP-40	2.12	5	0.63
	1HR	HYDRO-35	2.61	15	1.34
	2HR	TP-40	3.35	60	2.61
	3HR	TP-40	3.70		
25-Year	6HR	TP-40	4.60		
	12HR	TP-40	5.50		
	24HR	TP-40	6.50		
	30MIN	TP-40	2.50	5	0.71
	1HR	HYDRO-35	3.05	15	1.53
	2HR	TP-40	3.80	60	3.05
50-Year	3HR	TP-40	4.40		
	6HR	TP-40	5.40		
	12HR	TP-40	6.45		
	24HR	TP-40	7.50		
	30MIN	TP-40	2.70	5	0.77
	1HR	HYDRO-35	3.38	15	1.68
100-Year	2HR	TP-40	4.30	60	3.38
	3HR	TP-40	4.90		
	6HR	TP-40	5.90		
	12HR	TP-40	7.00		
	24HR	TP-40	8.10		
	30MIN	TP-40	3.05	5	0.84
100-Year	1HR	HYDRO-35	3.72	15	1.83
	2HR	TP-40	4.80	60	3.72
	3HR	TP-40	5.40		
	6HR	TP-40	6.50		
	12HR	TP-40	7.90		
	24HR	TP-40	9.10		

TABLE 4
Roughness Coefficients for Open Channels*

Channel Description	Recommended Roughness Coefficients			Maximum Velocity (ft/s)
	Minimum	Normal	Maximum	
Minor Natural Streams				
Moderately Well Defined Channel				
Grass and Weeds, Little Brush	0.025	0.030	0.033	8
Dense Weeds, Little Brush	0.030	0.035	0.040	8
Weeds, Light Brush on Banks	0.030	0.035	0.040	8
Weeds, Heavy Brush on Banks	0.035	0.050	0.060	8
Weeds, Dense Willow on Banks	0.040	0.060	0.080	8
Irregular Channel With Pools and Meanders				
Grass and Weeds, Little Brush	0.030	0.036	0.042	8
Dense Weeds, Little Brush	0.036	0.042	0.048	8
Weeds, Light Brush on Banks	0.036	0.042	0.048	8
Weeds, Heavy Brush on Banks	0.042	0.060	0.072	8
Weeds, Dense Willow on Banks	0.048	0.072	0.096	8
Floodplain, Pasture				
Short Grass, No Brush	0.030	0.035	0.040	8
Tall Grass, No Brush	0.035	0.040	0.050	8
Floodplain, Cultivated				
No Crops	0.030	0.035	0.040	8
Mature Crops	0.035	0.045	0.050	8
Floodplain, Uncleared				
Heavy Weeds, Light Brush	0.050	0.060	0.070	8
Medium to Dense Brush	0.070	0.100	0.160	8
Trees with Flood Stage below Branches	0.080	0.100	0.120	8
Major Natural Streams				
<i>The roughness coefficient is less than that for minor streams of similar description because banks offer less effective resistance.</i>				
Moderately Well Defined Channel	0.025		0.060	8
Irregular Channel	0.035		0.100	8
Unlined Vegetated Channels				
Mowed Grass, Clay Soil	0.025	0.030	0.035	8
Mowed Grass, Sandy Soil	0.025	0.030	0.035	6
Unlined Non-Vegetated Channels				
Clean Gravel Section	0.022	0.025	0.030	8
Shale	0.025	0.030	0.035	10
Smooth Rock	0.025	0.030	0.035	15
Earth Lined, Sandy	0.028	0.035	0.040	6
Earth Lined, Clay	0.028	0.035	0.040	8
Lined Channels				
Smooth Finished Concrete	0.013	0.015	0.020	15
Riprap (rubble)	0.030	0.040	0.050	12
Gabion	0.028	0.032	0.035	15
Pavement				
Concrete	-	0.015	-	-
Asphalt	-	0.017	-	-

* Note: Deviations from these values must be approved by the City of Arkadelphia.

TABLE 5A
Velocity Head Loss Coefficients for Closed Conduits

Description of Conditions	Kj
Inlet on Main Line	0.5
Inlet on Main Line with Branch Lateral	0.25
Manhole on Main Line with bend at:	
90 degrees	0.25
60 degrees	0.35
45 degrees	0.5
22.5 degrees	0.95
Wye Connection or Cut In	
60 degrees	0.6
45 degrees	0.75
22.5 degrees	0.95
Inlet or Manhole at the Beginning of Line	1.25
Conduit Curves for 90 degrees*	
Curve Radius	
2 to 8 times the diameter **	0.4
8 to 20 times the diameter	0.25
Greater than 20 times the diameter	0
Bends where the radius is equal to the Diameter	
90 degree bend	0.05
60 degree bend	0.43
45 degree bend	0.35
22.5 degree bend	0.2

The values of the coefficient "Kj" for determining the loss of head due to obstructions in pipes are shown in Table 6-B and the coefficients are used in the following equation to calculate the head loss at the obstruction:

$$H_j = K_j (V^2/2 \cdot g)$$

* Where deflection other than 90 degrees are used, the 90 degree deflection coefficient can be used with the following percentage factors:

60 degree bend = 0.85

45 degree bend = 0.70

22.5 degree bend = 0.40

**The diameter is the inside diameter of the pipe.

TABLE 5B
Head Loss Coefficients Due to Sudden
Enlargements and Contractions

D2/D1*	Sudden Enlargements, K_j	Sudden Contractions, K_j
1.2	0.1	0.08
1.4	0.23	0.18
1.6	0.35	0.25
1.8	0.44	0.33
2	0.52	0.36
2.5	0.65	0.4
3	0.72	0.42
4	0.8	0.44
5	0.84	0.45
10	0.89	0.46
> then 10	0.91	0.47

***D2/D1 = Ratio of larger to smaller diameter**

TABLE 6
Velocity Requirements for Closed Conduits*

Material of New Construction	Velocity	
	Minimum	Maximum
Storm Sewers	2.500	15
Inlet Laterals	2.500	15
Culverts	2.500	10

**For velocity requirements in Open Channels see Table 4. Storm Sewers shall discharge into open channels at a maximum velocity of 6 feet per second.*

TABLE 7
Design Criteria for the Design of Roads, Culverts, and Channels*

Road Classification	Design Return Period**	Design Spreads
Major Thoroughfare		
Principal Arterial	10-Year	Two Lanes Open Ea. Direction
	100-Year	Top of Curb
Minor Arterial	10-Year	One Lane Open Ea. Direction
	100-Year	Top of Curb
Collector	10-Year	Allow 1 Lane Open
	100-Year	Top of Curb
Local	10-Year	Top of Curb
	100-Year	Contained within the Right of Way
Rural Road w/ Bar Ditches	10-Year	One Foot Below Pavement
	100-Year	Contained within the Right of Way

Other Drainage Structures	Design Return Period
Enclosed Storm Sewer System	25-Year
Culvert or Bridge Along a Creek, River, or other Watercourse	25-Year
Culvert or Bridge not Located on a Creek River or other Watercourse	10-Year
Channel Improvements	25-Year***

**Note: The City Engineer may reserve the right to require more stringent requirements depending on the location of a specific project. All deviations from what is shown must be approved by the City of Arkadelphia.*

*** All design periods are based on Fully Urbanized conditions. Flows for channels and channel crossings may be obtained from the City of Arkadelphia.*

****Note: For Channel Improvements the 25-year storm should be contained within the channel. Adjacent structures and lots must be a minimum of one foot above the 100-year fully urbanized floodplain.*

Appendix 2

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8	Silt Fence Inlet Sediment Filter
9	Vegetated Buffer Strip
10	Description of Inlet Types
11	Description of Inlet Types

FIGURE 1
Rainfall Intensity and Duration Curves
for Clark County Arkansas

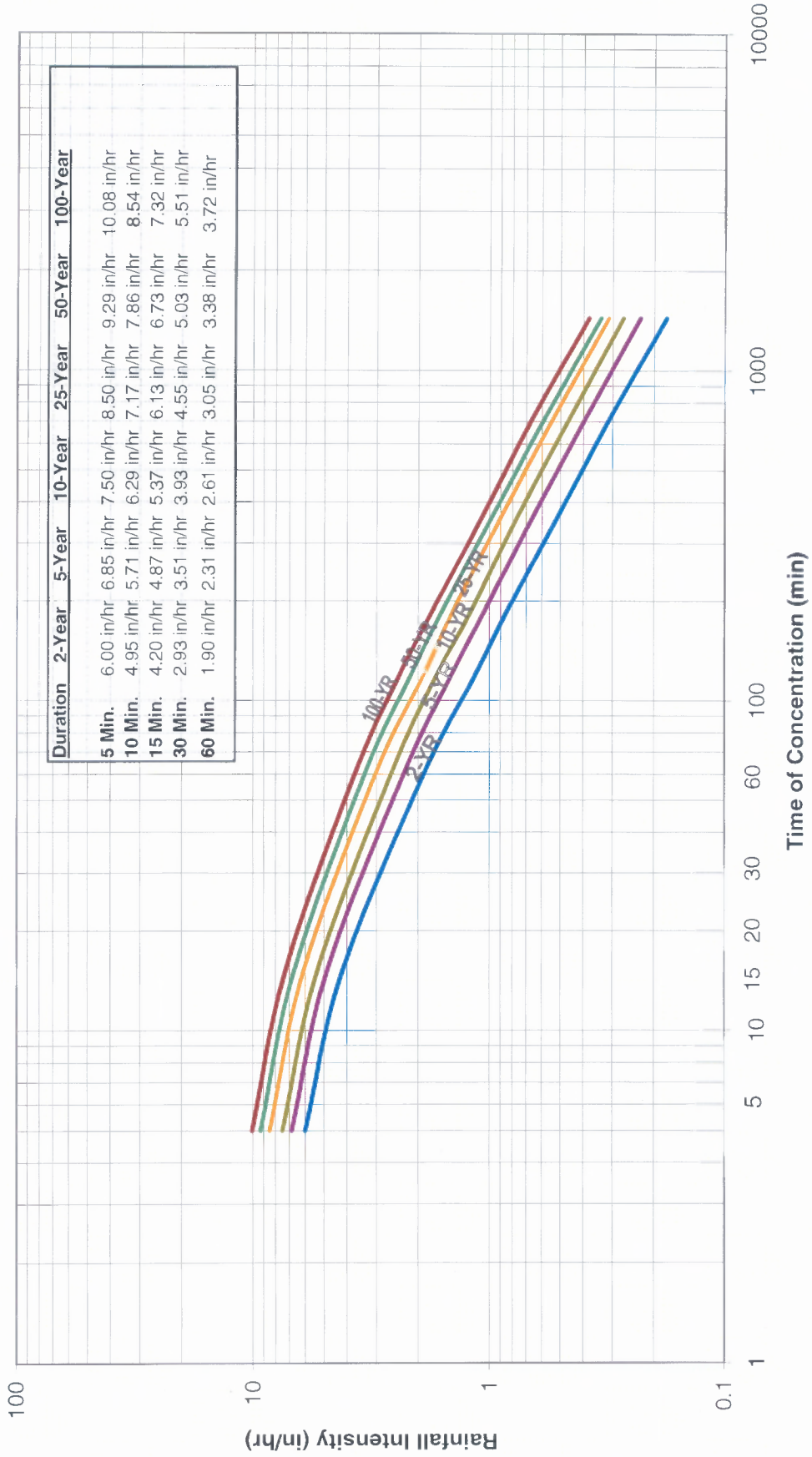
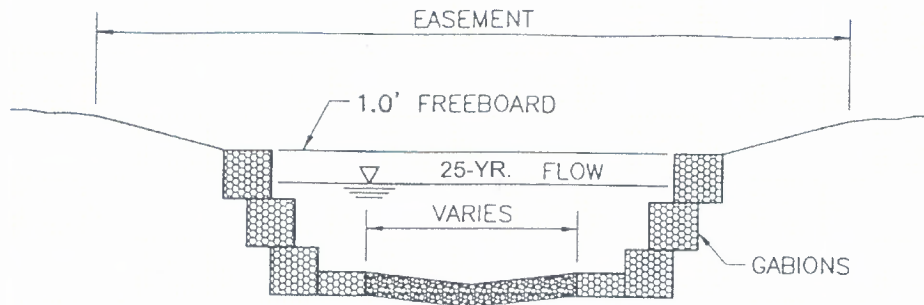
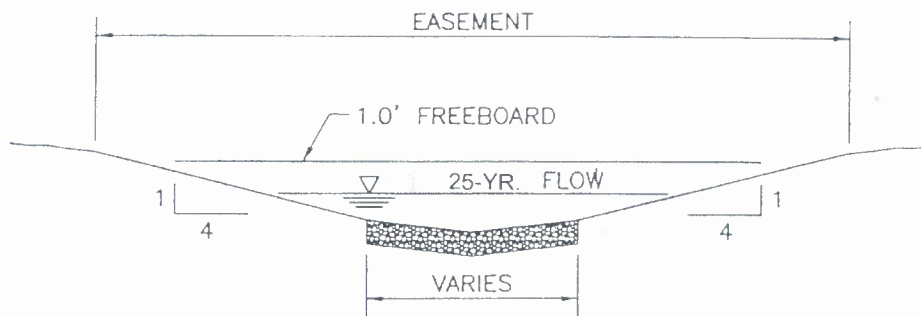


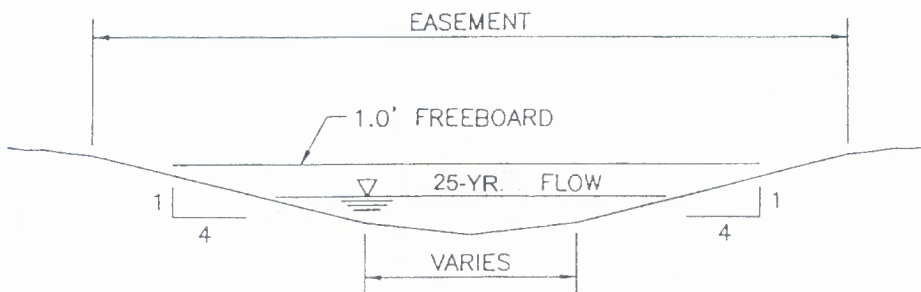
Figure 2
Open Channel Types



TYPICAL CHANNEL IMPROVEMENT WITH GABION LINING
NOT TO SCALE

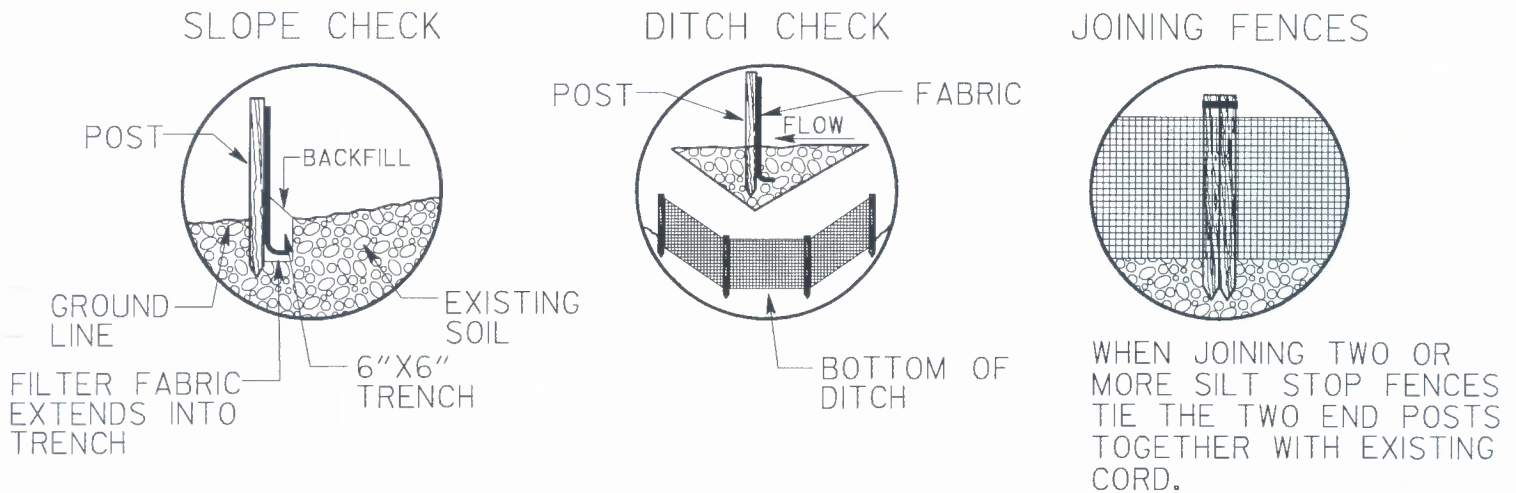


TYPICAL IMPROVED CHANNEL WITH
ROCK PILOT CHANNEL LINING
NOT TO SCALE



TYPICAL IMPROVED UNLINED CHANNEL SECTION

FIGURE 3 SILT FENCE DETAIL



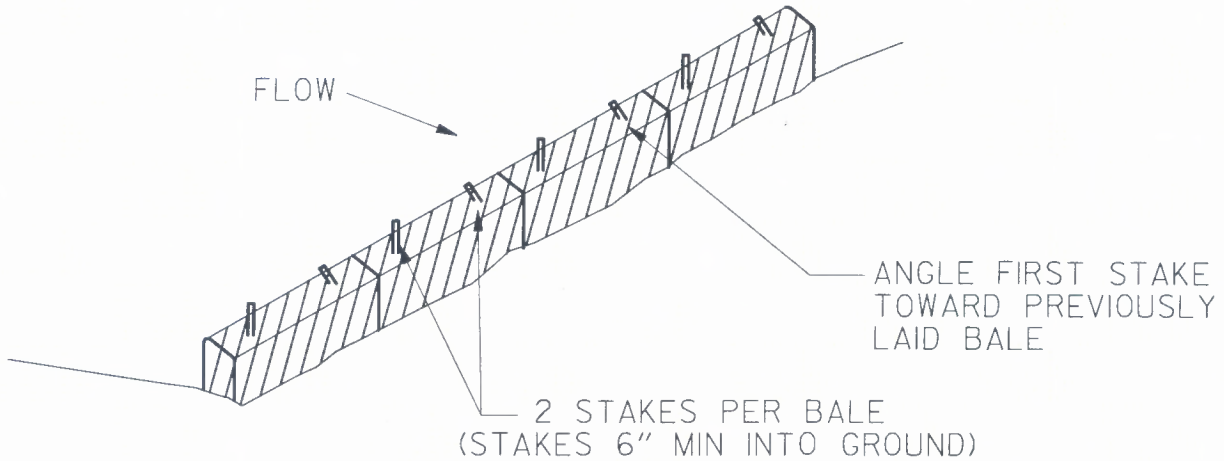
NOTE:

- 1.) SILT FENCE FABRIC SHALL BE MIRAFI 100 X OR EQUAL.
- 2.) INSTALL SILT FENCES AND HAY BALES AT LOCATIONS DIRECTED BY OWNER.
- 3.) FENCE POSTS SHALL BE GALVANIZED STEEL AND MAY BE ROLLED, FORMED OR TUBULAR IN SECTION. "T" POSTS MAY BE USED WHEN IN CONFORMANCE WITH SPECIFICATION.

(NOT TO SCALE)

FIGURE 4

HAY BALE DETAIL

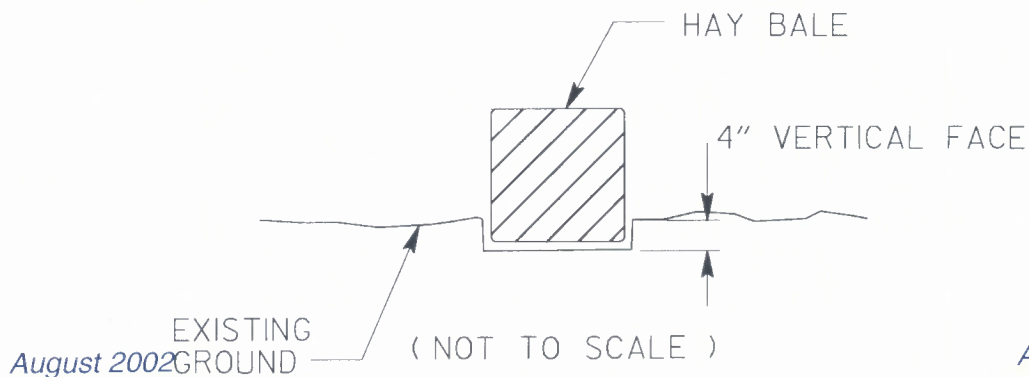


(NOT TO SCALE)

NOTE:

HAY BALES SHALL BE EMBEDDED A MINIMUM OF FOUR (4) INCHES AND SECURELY ANCHORED USING $\frac{3}{8}$ " DIAMETER STEEL STAKES OR 2" x 2" WOOD STAKES DRIVEN THROUGH THE BALES INTO THE GROUND A MINIMUM OF SIX (6) INCHES.

EMBEDDING DETAIL



EXISTING
August 2002 GROUND

(NOT TO SCALE)

Figure 4
Appendix 2

FIGURE 5
CONSTRUCTION ENTRANCE DETAIL

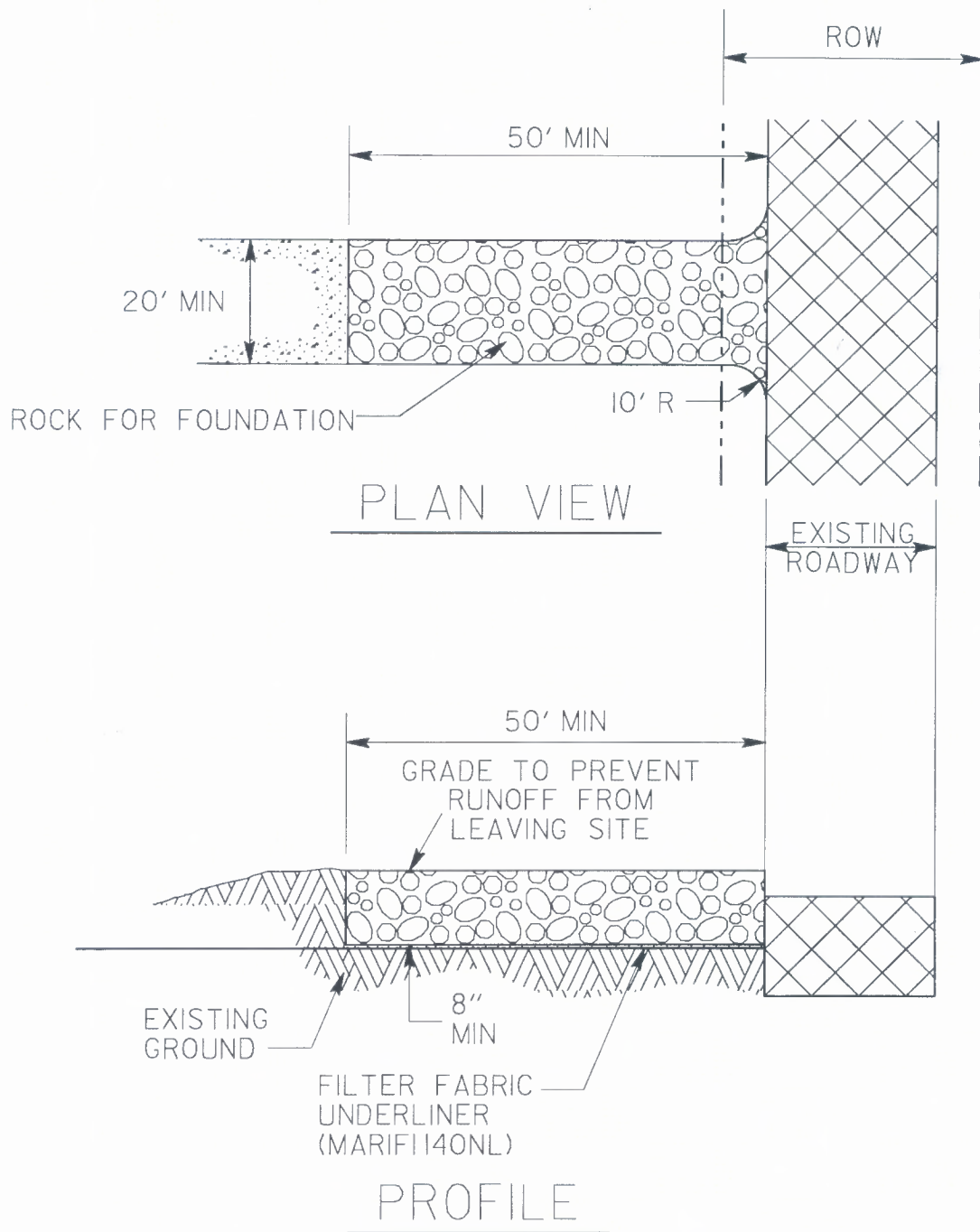
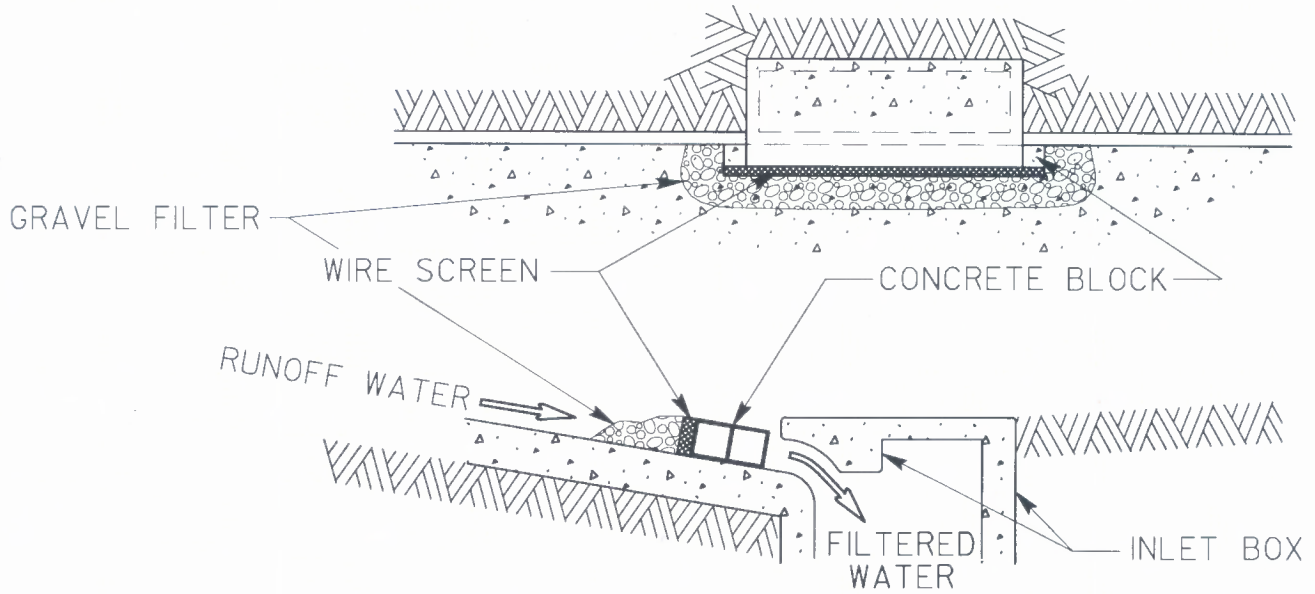


FIGURE 6

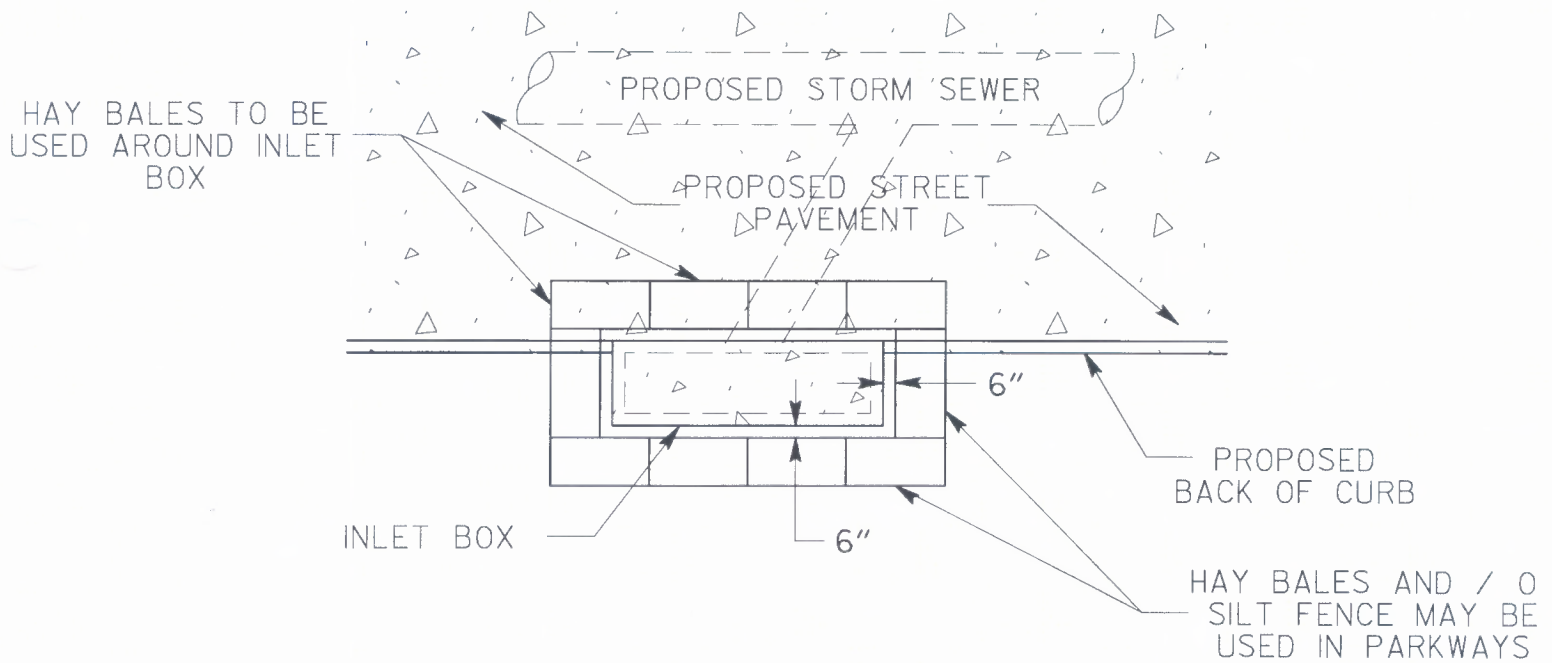
SEDIMENT BARRIER AT INLETS



(NOT TO SCALE)

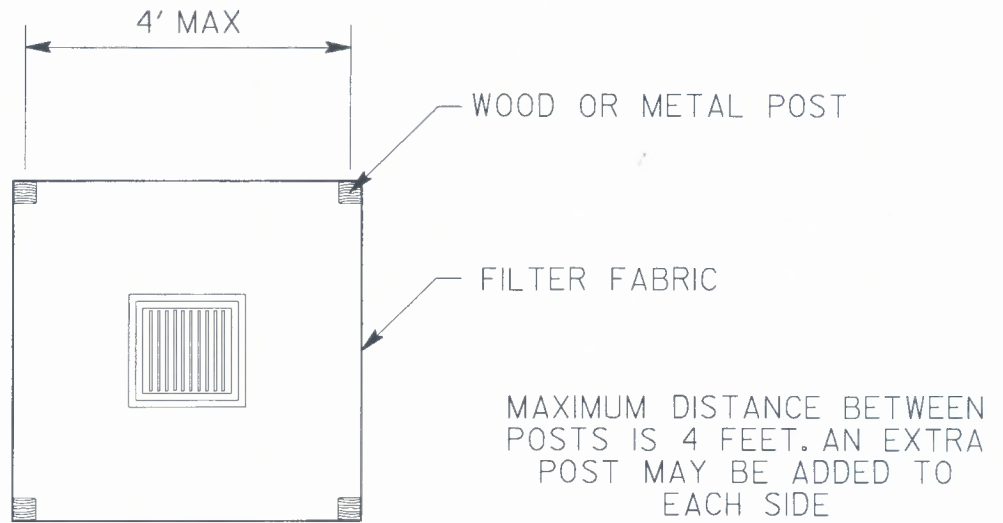
FIGURE 7

TYPICAL DETAIL OF EROSION
CONTROL AROUND INLETS



DURING UTILITY CONSTRUCTION
(NOT TO SCALE)

FIGURE 8
SILT FENCE INLET SEDIMENT FILTER

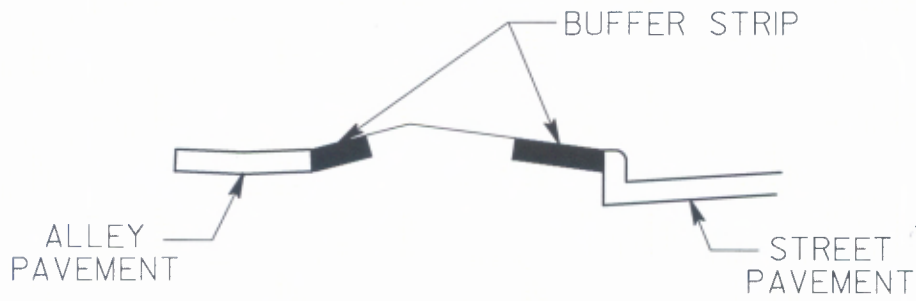


NOTE:
BOTTOM OF THE FILTER FABRIC IS BURIED IN TRENCH
THE SAME AS WHEN IT IS INSTALLED AS A SILT FENCE
SEE SILT FENCE DETAIL, THIS SHEET

(NOT TO SCALE)

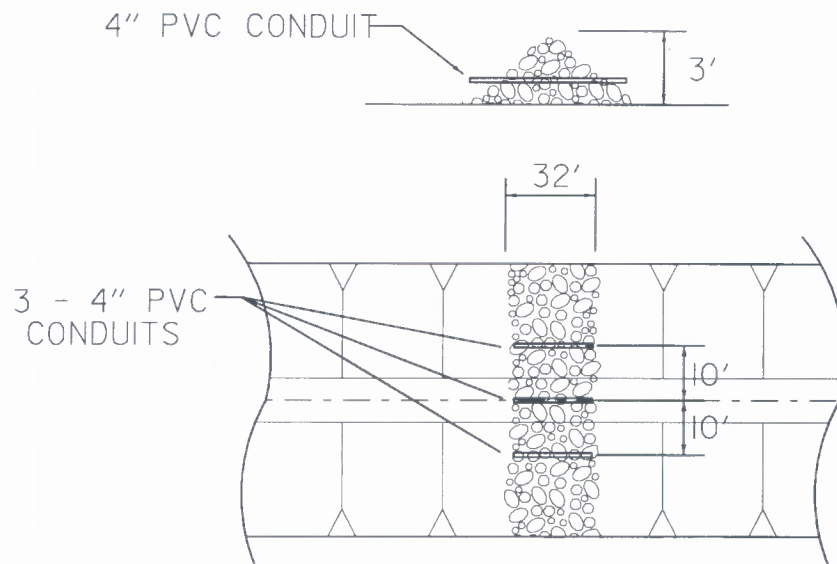
FIGURE 9

VEGETATED BUFFER STRIP



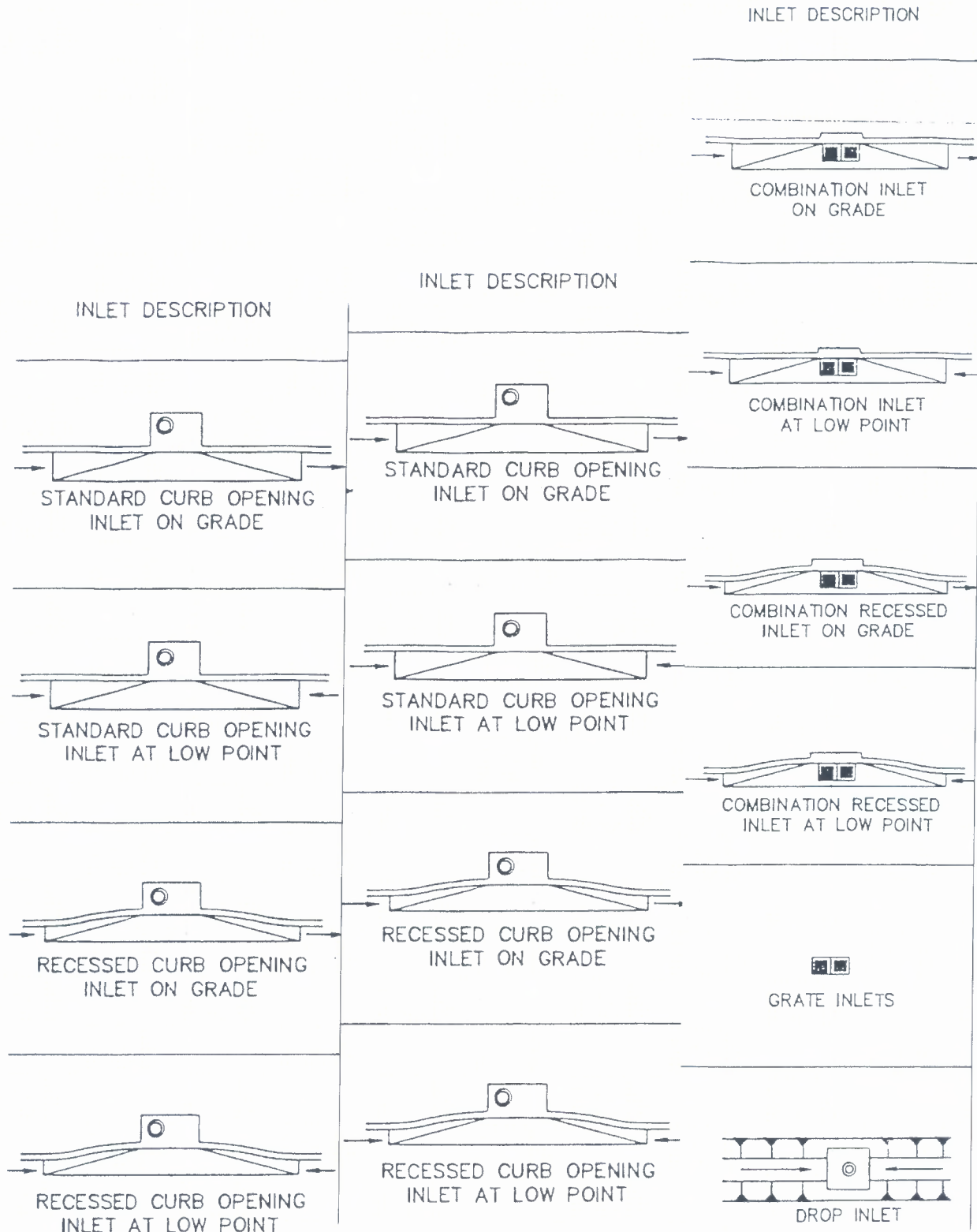
(NOT TO SCALE)

FIGURE 10 ROCK FILTER DAM



(NOT TO SCALE)

Figure 11
Description of Inlet Types



STORM SEWER CALCULATIONS FORMS

Column 1	Upstream station of the section conduit being designed. Normally, this would be the point of a change in quantity of flow, such as inlet or a change in grade.
Column 2	Downstream station of the section of conduit being designed.
Column 3	Distance in feet between the upstream and downstream stations.
Column 4	Drainage sub-area designation from which flow enters the conduit at the upstream station.
Column 5	Area in acres of the drainage sub-area entering the conduit.
Column 6	Runoff coefficient, obtained from Tab 1, Appendix 1 based on the characteristics of the subdrainage area.
Column 7	Column 5 multiplied by Column 6.
Column 8	Obtained by adding the value shown in Column 7 to the value shown immediately above in Column 8.
Column 9	This time in minutes is transposed from Column 19 on the previous line of calculations. The original time shall be equal to the time of concentration as shown on Table 1 Appendix 1
Column 10	Design Storm Frequency.
Column 11	Using the time at the upstream station shown in Column 10.
Column 12	Column 8 multiplied by Column 11.
Column 13	This slope should be computed from the profile of the ground surface. Normally, the hydraulic gradient will have a slope approximately the same as the proposed conduit and will be located above the inside crown of the conduit.
Column 14	Utilizing the values in Column 12 and 13, a conduit size should be selected.
Column 15	Velocity in the selected conduit based on the values in Columns 12, 13 and 15.
Column 16	Friction head loss is the product of Column 3 times Column 13.
Column 17	Calculation is made utilizing the values of Columns 15 and 16.
Column 18	Calculation is based on the values of Column 3 and 15
Column 19	Sum of Columns 9 and 18.
Column 20	Special design comments may be entered here.

Inlet Design Calculation Form

- Column 1 Inlet number or designation. The first inlet shown is the most upstream.
- Column 2 Construction plan station of the inlet.
- Column 3 Design Storm Frequency is the same as the Design Storm Frequency of the sewer.
- Column 4 Time of concentration for each inlet is taken from Table 1 in Appendix 1.
- Column 5 Using the time of concentration and the Design Storm Frequency, rainfall intensity is taken from Figure 1 in Appendix 2.
- Column 6 Runoff Coefficient is taken from Table 1 Appendix 1 according to the zoning of the drainage area.
- Column 7 Area drained by the specific inlet. Care should be taken to keep the drainage area flow separate into the appropriate street gutters.
- Column 8 Product of Column 5 multiplied by Column 6 and 7.
- Column 9 If there is any flow which was not fully intercepted by an upstream inlet, it should be entered her.
- Column 10 Sum of Columns 8 and 9.
- Column 11 Capacity of the street in which the inlet is located, from either Figures 7, 8 or 9 in Appendix 4. If the total gutter flow shown in column 10 is in excess of the value in Column 11, the inlet should be moved upstream. If it is substantially less than the value in Column 11, an investigation should be made to see if the inlet can be moved downstream.
- Column 12 Street gutter slope to be used in selecting the proper size inlet.
- Column 13 Crown type of the street on which the inlet is located.
- Column 14 Selected size of the inlet taken from Figures in Appendix 4.
- Column 15 Inlet type taken from Figure 11 in Appendix 2.
- Column 16 If the selected inlet does not intercept all of the gutter flow, the difference between the two values should be entered here and in Column 9 of the inlet which will intercept the flow.

COMPUTATION SHEET

DETENTION POND DESIGN

POND ELEV	STORAGE		OUTFLOW (cfs)
	DEPTH (ft)	VOLUME (ac-ft)	
1	2	3	4

PRINCIPLE SPILLWAY : _____

Description : _____

Elevation : _____

EMERGENCY SPILLWAY : _____

Description : _____

Elevation : _____

DESIGN FREQUENCY	HYDROGRAPH DATA						POND ELEVATION (ft MSL)	POND STORAGE (ac-ft.)
	PRESENT WATERSHED DEVELOPMENT		ULTIMATE WATERSHED DEVELOPMENT		PROPOSED POND OUTFLOW			
	TIME TO PEAK (min)	PEAK FLOW (cfs)	TIME TO PEAK (min)	PEAK FLOW (cfs)	TIME TO PEAK (min)	PEAK FLOW (cfs)		
5-YR	5	6	7	8	9	10	11	12
10-YR								
25-YR								
50-YR								
100-YR								
-PMF*								

* Refer to TAC Chapter 299 for requirements for using the Probable Maximum Flood (PMF).

***APPENDIX 3
FORM 7***

**AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE
ELIMINATION SYSTEM AND THE ARKANSAS WATER AND AIR POLLUTION CONTROL ACT**

In accordance with the provisions of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended, Ark. Code Ann. 8-4-101 et seq.), and the Clean Water Act (33 U.S.C. 1251 et seq.),

**Owners or operators of Facilities Discharging Storm Water Associated With Industrial
Activity from Construction Sites Located in the State of Arkansas**

are authorized to discharge

to all receiving waters

in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I through VIII herein.

This permit shall become effective on July 1, 1998.

This permit and the authorization to discharge shall expire at midnight, June 30, 2003.

Owners or operators within the State of Arkansas who fail to submit a written Notice of Intent to the Director to be covered by this general permit are not authorized to discharge under this general permit.

Signed this 31st day of May 1998.

Chuck Bennett
Chief, Water Division
Arkansas Department of Pollution Control
and Ecology

PART I
COVERAGE UNDER THIS PERMIT

- A. Permit Area. This permit includes all areas within the State of Arkansas.
- B. Eligibility.
1. General. Except for storm water discharges identified under paragraph I.B.3 below, this permit shall authorize all discharges of storm water associated with industrial activity from construction sites (those areas that will result in the disturbance of **five or more acres of total land area**), (henceforth referred to as storm water discharges from construction activities) occurring after the effective date of this permit (including discharges occurring after the effective date where the construction activity commenced before the effective date).
 2. **This permit also authorizes storm water discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, materials storage areas, excavated material disposal areas, borrow areas) provided.**
 - a. **The support activity is directly related to a construction site that is required to have NPDES permit coverage for discharges of storm water associated with construction activity;**
 - b. **The support activity is not a commercial operation serving multiple unrelated construction projects by different operators, and does not operate beyond the completion of the construction activity at the last construction project it supports; and**
 - c. **Appropriate controls and measures are identified in a storm water pollution prevention plan covering the discharges from the support activity areas.**
 3. Limitations on Coverage. The following storm water discharges associated with industrial activity are not covered by this permit:
 - a. storm water discharges associated with industrial activity that originate from the site after construction activities have been completed and the site has undergone final stabilization.
 - b. discharges that are mixed with sources of non-storm water other than discharges identified in Part III.A of this permit and in compliance with Part III.C.5 of this permit.
 - c. storm water discharges associated with industrial activity from facilities with an

existing NPDES individual or general permit for storm water discharges or which are issued a permit in accordance with paragraph I.C. of this permit. Such discharges may be authorized by this permit after an existing permit expires provided the expired permit did not establish numeric effluent limitations for such discharges; and

- d. storm water discharges from construction sites that the Director has determined to be or may reasonably be expected to be contributing to a violation or a water quality standard.
 - e. storm water discharges from construction sites if the discharge or clearing activities are likely to adversely effect a listed endangered or threatened species or its critical habitat.
6. Discharges which are not in compliance with the Endangered Species Act (ESA). In order to obtain coverage, the applicant must certify to meeting one of the criteria detailed in the permit.

The criteria are as follows:

(1) The storm water discharge(s), and the construction and implementation of Best Management Practices (BMPs) to control storm water runoff, are not likely to adversely affect species or critical habitat for a listed species; or (2) the applicant's activity has received previous authorization under section 7 or section 10 of the Endangered Species Act and that authorization addressed storm water discharges and/or BMPs to control storm water runoff (e.g. developer included impact of the entire project in consultation over a wetlands dredge and fill permit under Section 7 of the Endangered Species Act); or (3) the applicant's activity was considered as part of a larger, more comprehensive assessment of impacts on endangered and threatened species under section 7 or section 10 of The Endangers Species Act that which accounts for storm water discharges and BMPs to control storm water runoff (e.g., where an area wide habitat conservation plan and section 10 permit is issued which addresses impacts from construction activities including those from storm water, or a National Environmental Policy Act (NEPA) review is conducted which incorporates ESA section 7 procedures); or (4) consultation under section 7 of the Endangered Species Act is conducted for the applicant's activity which results in either a no jeopardy opinion or a written concurrence on a finding of a no likelihood of adverse effects: or (5) the applicant's activity was considered as part of a larger, more comprehensive site-specific assessment of impacts on endangered and threatened species by the owner or other operator of the site and that owner or operator certified eligibility under item (1), (2), (3), or (4) above (e.g., owner was able to certify no adverse impacts for the project as a whole under item (1), so the contractor can the certify under item (5).

The State of Arkansas notes that it is requiring all applicants to follow directions to ensure protection of the listed species and critical habitat when applying for permit coverage. Those directions require that applicants assess the impacts of their "storm water discharges" and "BMPs to control storm

water run off” on listed species and critical habitat that are located “proximity” to those discharges and BMPs are planned or are to be constructed. This definition reflects the purpose of this permit which regulates storm water discharges and measures (i.e., BMPs) to control those discharges. For a list of endangered or threatened species contact Arkansas Natural Heritage Commission or the U.S. Fish and Wildlife Service.

C. Requiring an Individual NPDES Permit or an Alternative General Permit.

1. The Director may require any person authorized by this permit to apply for and obtain either an individual NPDES permit or an alternative NPDES general permit. Any interested person may petition the Director to take action under this paragraph. The Director may require any owner or operator authorized to discharge under this permit to apply for an individual NPDES permit only if the owner or operator has been notified in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a deadline for the owner or operator to file the application, and a statement that on the effective date of the individual NPDES permit or the alternative general permit as it applies to the individual owner or operator, coverage under this general permit shall automatically terminate. The Director may grant additional time to submit the application upon request of the applicant. However, coverage under this permit will be terminated, if a owner or operator, fails to submit the Individual NPDES permit in a timely manner, as required by the Director.
2. Any owner or operator authorized by this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator shall submit an individual application in accordance with the requirements of 40 CFR 122.26(c)(1)(ii), with reasons supporting the request to the Director. The request may be granted by issuance of any individual permit or an alternative general permit if the reasons cited by the owner or operator are adequate to support the request.
3. When an individual NPDES permit is issued to a discharger otherwise subject to this permit, or the discharger is authorized to discharge under an alternative NPDES general permit, the applicability of this permit to the individual NPDES owner or operator is automatically terminated on the effective date of the individual permit or the date of authorization for coverage under the alternative general permit, whichever the case may be. When an individual NPDES permit is denied to an owner or operator otherwise subject to this permit, or the owner or operator is denied for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES owner or operator remains in effect, unless otherwise specified by the Director.

D. Authorization.

1. A owner or operator of a construction site must submit a Notice of Intent (NOI) in accordance with the requirements of Part II of this permit in order for storm water discharges

from construction sites to be authorized to discharge under this general permit. **An initial permit fee of \$100.00 must accompany the NOI under the provisions of ADPCE Regulation No.9. Subsequent annual fees of \$100.00 per year will be billed by the Department.** Failure to remit the required permit fee may be grounds for the Director to deny coverage under this general permit.

2. Where a new operator is selected after the submittal of an NOI under Part II, a new Notice of Intent must be submitted by the operator in accordance with Part II.
3. Unless notified by the Director to the contrary, dischargers who submit a Notice of Intent in accordance with the requirements of this permit are authorized to discharge storm water from construction sites under the terms and conditions of this permit 48 hours after the date the NOI is postmarked. Upon review of the NOI and other available information, the Director may deny coverage under this permit and require submittal of an application for an individual NPDES permit.
4. Facilities within the State of Arkansas discharging from outfalls described in this permit must be authorized to discharge by either this general permit or an individual NPDES permit.

PART II
NOTICE OF INTENT REQUIREMENTS

A. Deadlines for Notification.

1. Except as provided in paragraphs II.A.2 and II.A.3 individuals who intend to obtain coverage for storm water discharges from a construction site under this general permit, shall submit a Notice of Intent (NOI) in accordance with the requirements of this Part at least 48 hours prior to the commencement of construction at any site that will result in the disturbance of **five (5)** or more acres total land area.
2. For storm water discharges from construction sites where the operator changes, (including projects where an operator is selected after a NOI has been submitted under Part II.A.1 above), a NOI shall be submitted at least 48 hours prior to the operator beginning work at the site; and
3. A discharger is not precluded from submitting a NOI in accordance with the requirements of this part after the dates provided in Parts II.A.1 or II.A.2 of this permit. In such instances, the Director may bring an enforcement action for failure to submit a NOI in a timely manner or for any unauthorized discharges of storm water associated with industrial activity that have occurred on or after the dates specified in Parts II.A.1 and II.A.2.

B. Failure to Notify. Owner or operator who fail to notify the Director of their intent to be covered under this permit, and who discharge pollutants to waters of the State without a NPDES permit, are in violation of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended)

C. Contents of the Notice of Intent.

1. The Notice of Intent form must be the form obtained from ADPCE unless written approval is received for an optional form.
2. All Notices of Intent for coverage under this general permit must be signed in accordance with the provisions of 40 CFR 122.22, as adopted by reference in ADPCE Regulation No. 6, and Part V.H of this permit, and submitted to the Department by certified mail.
3. Owners and operators shall notify the Director upon permanent termination of discharge from their facilities. (See Part II.G)

D. Where to Submit.

1. Facilities which discharge storm water associated with industrial activity at construction sites

must submit signed original of the Notice of Intent to the Department at the following address:

NPDES Permits/Storm Water
Department of Pollution Control and Ecology
P.O. Box 8913
Little Rock, AR 72219-8913

2. **A copy of the NOI or other indication that storm water discharge from the site are covered under a NPDES permit, and a brief description (shall include permit number) of the project shall be posted at the construction site in a prominent place for public viewing (such as alongside a building permit).**
- E. Additional Notification. Facilities which are operating under approved State or local sediment and erosion plans, grading plans, local storm water permits, or storm water management plans, in addition to filing copies of the Notice of Intent in accordance with paragraph II.D, shall submit signed copies of the Notice of Intent to the State or local agency approving such plans in accordance with the deadlines in Part II.A. of this permit (or sooner if required by State or local rules).
- F. Reaffirmation of Permit Coverage. Upon reissuance of a new general permit, the owner or operator is required to notify the Director of his/her intent to be covered by the new general permit.
- G. Notice of Termination (NOT). Where a site has been finally stabilized and all storm water discharges from construction activities authorized by this permit are eliminated, the operator of the facility may submit a Notice of Termination to the Director at the address in Part II.D that is signed in accordance with Part V.H of this permit. Final stabilization is not required if the land is returned to its pre-construction agriculture use. **If Notice of Termination is not submitted when project in completed, owners and contractors will be responsible for annual fees due.**

PART III
SPECIAL CONDITIONS, MANAGEMENT PRACTICES, AND OTHER
NON-NUMERIC LIMITATIONS

A. Prohibition of Non-storm Water Discharges.

1. Except as provided in paragraphs I.B.2 and III.A.2, all discharges covered by this permit shall be composed entirely of storm water;
2. a. Except as provided in paragraph III.A.2.(b), discharges of material other than storm water must be in compliance with a NPDES permit (other than this permit) issued for the discharge.

b. The following non-storm water discharges may be authorized by this permit: discharges from fire fighting activities; fire hydrant flushings; water used to wash vehicles or control dust in accordance with Part III.C.4.b.(3)(b); potable water sources including waterline flushings; irrigation drainage; routine external building wash down which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled materials have been removed) and where detergents are not used; air conditioning condensate; springs; uncontaminated ground water; and foundation or footing drains where flows are not contaminated with process materials such as solvents.

B. Releases in Excess of Reportable Quantities.

1. The discharge of hazardous substances or oil in the storm water discharge(s) from a facility shall be prevented or minimized in accordance with the applicable storm water pollution prevention plan for the facility. This permit does not relieve the owner or operator of the reporting requirements of 40 CFR Parts 110, 117 and 302. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reporting quantity established under either 40 CFR 110, 40 CFR 117, or 40 CFR 302, occurs during a 24-hour period, the following action shall be taken:
 - a. Any person in charge of the facility is required to notify the National Response Center (NRC) (800-424-8802) in accordance with the requirements of 40 CFR 110, 40 CFR 117, or 40 CFR 302 as soon as he/she has knowledge of the discharge;
 - b. The Owner or operator shall submit within 14 calendar days of knowledge of the release a written description of the release (including the type and estimate of the amount of material released), the date that such release

occurred, the circumstances leading to the release, and steps to be taken in accordance with Part III.B.1.c of this permit to ADPCE at the address provided in Part II.D of this permit.

c. The storm water pollution prevention plan described in Part III.C of this permit must be modified within 14 calendar days of knowledge of the release to:

(1) provide a description of the release and the circumstances leading to the release;

(2) the date of the release;

d. Additionally, the plan must be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan must be modified where appropriate. The modified plan must be sent to this Department for review.

2. Spills. This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill.

C. Responsibilities of operators

Permittees with operational control are responsible for compliance with all applicable terms and conditions of this permit as it relates to their activities on the construction site, including protection of endangered species and implementation of BMPs and other controls required by the SWPPP.

D. Storm Water Pollution Prevention Plans.

A storm water pollution prevention plan shall be developed for each construction site covered by this permit. Storm water prevention plans shall be prepared in accordance with good engineering practices. The plan shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with industrial activity from the facility. In addition, the plan shall describe and ensure the implementation of practices which are to be used to reduce pollutants in storm water discharges associated with industrial activity at the facility and to assure compliance with the terms and conditions of this permit. Facilities must implement the provisions of the storm water pollution prevention plan required under this part as a condition of this permit.

1. Deadlines for Plan Preparation and Compliance. The plan shall:

a. Be completed prior to the submittal of a NOI to be covered under this permit and updated as appropriate.

2. Signature and Plan Review.

- a. The plan shall be signed in accordance with Part V.H, and be retained on-site at the facility which generates the storm water discharge in accordance with Part IV (retention of records) of this permit.
- b. The owner or operator shall make plans available upon request to the Director, to a State or local agency approving sediment and erosion plans, grading plans, or storm water management plans, or, in the case of a storm water discharge associated with industrial activity which discharges through a municipal separate storm sewer system with a NPDES permit, to the municipal operator of the system.
- c. The Director, or authorized representative, may notify the owner or operator at any time that the plan does not meet one or more of the minimum requirements of this Part. Within 7 days of such notification from the Director, (or as otherwise provided by the Director), or authorized representative, the owner or operator shall make the required changes to the plan and submit to the Director a written certification that the requested changes have been made.

3. Keeping Plans Current. The owner or operator shall amend the plan whenever there is a change in design, construction, operation, or maintenance which has a significant affect on the potential for the discharge of pollutants to the waters of the State and which has not otherwise been addressed in the plan or if the storm water pollution prevention proves to be ineffective in eliminating or significantly minimizing pollutants from sources identified under Part III.C.4.b of this permit, or in otherwise achieving the general objectives of controlling pollutants in storm water discharges associated with industrial activity. Amendments to the plan may be reviewed by ADPCE in the same manner as Part III.C.2 above.

4. Contents of Plan. The storm water pollution prevention plan shall include the following items:

- a. Site Description. Each plan shall provide a description of the following:
 - (1) a description of the nature of the construction activity;
 - (2) a description of the intended sequence of major activities which disturb soils for major portions of the site (e.g. grubbing, excavation, grading);
 - (3) estimates of the total area of the site and the total area of the site that is expected to be disturbed by excavation, grading or other activities;
 - (4) an estimate of the runoff coefficient of the site after construction activities are

completed and existing data describing the soil or the quality of any discharge from the site;

- (5) a site map indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of soil disturbance, the location of major structural and nonstructural controls identified in the plan, the location where stabilization practices are expected to occur, surface waters (including wetlands), and locations where storm water is discharged to a surface water; and
- (6) the name of the receiving water(s), or if the discharge is to a municipal separate storm sewer, the name of the operator of the municipal system, the ultimate receiving water(s), and the extent of wetland acreage at the site.
- (7) **Endangered Species**

Information on endangered and threatened species including whether any endangered species are in proximity of the storm water discharge and BMPs to be constructed to control storm water runoff.

- b. **Controls.** Each plan shall include a description of appropriate controls and measures that will be implemented at the construction site. The plan will clearly describe for each major activity identified in Part III.C.4.a.(2) appropriate control measures and the timing during the construction process that the measures will be implemented. (For example, perimeter controls for one portion of the site will be installed after the clearing and grubbing necessary for installation of the measure, but before the clearing and grubbing for the remaining portions of the site. Perimeter controls will be actively maintained until final stabilization of those portions of the site upward of the perimeter control. Temporary perimeter controls will be removed after final stabilization). The description and implementation of controls shall address the following minimum components:

- (1) **Erosion and Sediment Controls.**

- (a) **Stabilization practices.** A description of interim and permanent stabilization practices, including site-specific scheduling of the implementation of the practices. Site plans should ensure that existing vegetation is preserved where attainable and that disturbed areas are stabilized. Stabilization practices may include: temporary seeding, permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, and preservation of mature vegetation and other appropriate measures. A record of the dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site,

and when stabilization measures are initiated shall be included in the plan. Except as provided in paragraphs III.C.1.b.(1)(a)(i)and(ii)below, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

- (i) where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceases is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.
- (ii) where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.
- (iii) in arid regions (areas with an average annual rainfall of 0-10 inches) and semi-arid regions (areas with an average annual rainfall of 10-20 inches), where the initiation of stabilization measures by the 14th day after construction activity has been temporarily or permanently ceased is precluded by seasonal arid conditions, stabilization measures shall be initiated as soon as practicable thereafter.

(b) structural practices.

- (i) A description of structural practices to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site to the degree attainable. Such practices may include:
 - silt fences
 - earth dikes
 - drainage swales
 - check dams
 - subsurface drains
 - pipe slope drains
 - level spreaders
 - storm drain inlet protection
 - rock outlet protection

- sediment traps
- reinforced soil retaining systems
- gabions
- temporary or permanent sediment basins.

Structural practices should be placed on upland soils to the degree attainable. The installation of these devices may be subject to Section 404 of the Clean Water Act.

- (ii) For common drainage locations that serve an area with 10 or more disturbed acres at one time, a temporary or permanent detention basin based on either the smaller of 3600 cubic feet per area, or a size based on the runoff volume of a 10 year, 24 hour storm, shall be provided where attainable until stabilization of the site. This does not apply to flows from offsite areas and flows from onsite areas and flows from onsite areas that are either undisturbed or have undergone final stabilization where such flows are diverted around the sediment basin. For drainage locations which serve 10 or more disturbed acres at one time and where a temporary sediment basin based on either the smaller of 3600 cubic feet per acres, or a size based on the runoff volume of a 10 year storm, is not attainable, sediment traps, silt fences, or equivalent sediment controls are required for all side slope and down slope boundaries of the construction area.
 - (iii) For drainage locations serving less than 10 acres, sediment traps, silt fences, or equivalent sediment controls are required for all side slope and down slope boundaries of the construction area unless a sediment basin providing storage based on either the smaller of 3600 cubic feet per area, or a size based on the run off volume of a 10 year, 24 hour storm is provided.
- (2) Storm Water Management. A description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed. Structural measures should be place on upland soils to the degree attainable. The installation of these devices may be subject to Section 404 of the Clean Water Act. This permit only addresses the installation of storm water management measures, and not the ultimate operation and maintenance of such structures after the construction activities have been completed and the site has undergone final stabilization. Owner or operators are only responsible for the installation and maintenance of storm water management

measures prior to final stabilization of the site, and are not responsible for maintenance after storm water discharges associated with industrial activity have been eliminated from the site.

(a) Such practices may include:

- infiltration of runoff onsite
- flow attenuation by use of open vegetated swales and natural depressions
- storm water retention structures
- storm water detention structures (including wet ponds)
- sequential systems, which combine several practices

A goal of 80 percent removal of total suspended solids from these flows which exceed predevelopment levels should be used in designing and installing storm water management controls (where practicable). Where this goal is not met, the owner or operator shall provide justification for rejecting each practice listed above based on site conditions.

(b) Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.

(3) Other Controls.

- (a) waste disposal. No solid materials, including building materials, shall be discharged to waters of the United States, except as authorized by a Section 404 permit.
- (b) Off-site vehicle tracking of sediments and the generation of dust shall be minimized.
- (c) The plan shall ensure and demonstrate compliance with applicable State or local waste disposal, sanitary sewer or septic system regulations.

(4) Approved State or Local Plans.

- (a) Facilities which discharge storm water associated with industrial activity from construction activities must include in their storm water pollution prevention plan procedures and requirements specified in

applicable sediment and erosion site plans, site permits or storm water management plans approved by State or local officials. Requirements specified in sediment and erosion plans, site permits or storm water management plans approved by State or local officials that are applicable to protecting surface water are, upon submittal of an NOI for coverage under this permit, incorporated by reference and are enforceable under this permit even if they are not specifically included in a storm water pollution prevention plan required under this permit. This provision does not apply to provisions of master plans, comprehensive plans, non-enforceable guidelines or technical guidance documents that are not identified in a specific plan or permit that is issued for the construction site.

(b) dischargers seeking alternative permit requirements shall submit an individual permit application in accordance with Part I.C of this permit to the Director, along with a description of why requirements in approved State or local plans or permits should not be applicable as a condition of an NPDES permit.

(5) Maintenance. A description of procedures to maintain in good and effective operating condition vegetation, erosion and sediment control measures and other protective measures identified in the site plan.

(6) Inspections. Qualified personnel (provided by the discharger) shall inspect disturbed areas of the construction site and areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, structural control measures and locations where vehicles enter or exit the site at least once every seven (7) calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater. Where sites have been finally stabilized, or during seasonal arid periods in arid areas (areas with an average rainfall of 0-10 inches) and semi-arid areas (areas with an average rainfall of 10-20 inches) such inspection shall be conducted at least once every month.

(a) disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the plan shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of offsite sediment tracking.

(b) based on the results of the inspection, the site description identified in

the plan in accordance with paragraph III.C.4.a of this permit and pollution prevention measures identified in the plan in accordance with paragraph III.C.4.b of this permit shall be revised as appropriate, but in no case more than 7 calendar days following the inspection. Such modifications shall provide for timely implementation of any changes to the plan within 7 calendar days following the inspection.

- (c) A report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the storm water pollution prevention plan, and actions taken in accordance with paragraph III.C.4.b.(6)(b) of the permit shall be made and retained as part of the storm water pollution prevention plan for at least three (3) years from the date the site is finally stabilized. The report shall be signed in accordance with Part V.H of this permit.

- 5. Non-storm water discharges. Except for flows from fire fighting activities, sources of non-storm water listed in Part III.A.2 of this permit that are combined with storm water discharges associated with industrial activity must be identified in the plan. The plan shall identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

E. Contractors.

- 1. The storm water pollution prevention plan must clearly identify for each measure identified in the plan, the contractor(s) that will implement the measure. All contractors identified in the plan must sign a copy of the certification statement required by Part III.D.2 below in accordance with Part V.H. of this permit. All certifications must be included in the storm water pollution prevention plan.
- 2. Certification statement. All contractors identified in the storm water pollution prevention plan in accordance with Part III.D.1 of this permit shall sign a copy of the following certification statement before conducting any professional service at the site identified in the storm water pollution prevention plan:

"I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification."

The certification must include the name and title of the person providing the signature in accordance with Part V.H of this permit; the name, address, and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification is made.

PART IV
RETENTION OF RECORDS

- A. The owner or operator shall retain records of all storm water pollution prevention plans and all reports required by this permit, and records of all data used to complete the Notice of Intent to be covered by this permit, for a period of at least three years from the date the site is finally stabilized. This period may be extended by request of the Director at any time.

- B. The owner or operator shall retain a copy of the storm water pollution prevention plan required by this permit at the construction site from the date of project initiation to the date of final stabilization.

PART V
STANDARD PERMIT CONDITIONS

- A. Duty to Comply. The owner or operator must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the federal Clean Water Act and the Arkansas Water and Air Pollution Control Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.
- B. Penalties for Violations of Permit Conditions. The Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended) provides that any person who violates any provisions of a permit issued under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject to imprisonment for not more than one (1) year, or a fine of not more than twenty five thousand dollars (\$25,000) or by both such fine and imprisonment for each day of such violation. Any person who violates any provision of a permit issued under the Act may also be subject to civil penalty in such amount as the court shall find appropriate, not to exceed ten thousand dollars (\$10,000) for each day of such violation. The fact that any such violation may constitute a misdemeanor shall not be a bar to the maintenance of such civil action.
- C. Continuance of the Expired General Permit. An expired general permit continues in force and effect until a new general permit is issued.
- D. Need to Halt or Reduce Activity Not a Defense. It shall not be a defense for a owner or operator in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
- E. Duty to Mitigate. The owner or operator shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has reasonable likelihood of adversely affecting human health or the environment.
- F. Duty to Provide Information. The owner or operator shall furnish to the Director, an authorized representative of the Director, a State or local agency approving sediment and erosion plans, grading plans, or storm water management plans, or in the case of a storm water discharge associated with industrial activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the municipal operator of the system, within a reasonable time, any information which is requested to determine compliance with this permit.
- G. Other Information. When the owner or operator becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the Notice of Intent or in any other report to the Director, he or she shall promptly submit such facts or information.
- H. Signatory Requirements. All Notices of Intent, reports, or information submitted to the

Director or the operator of a large of medium municipal separate storm sewer system shall be signed and certified.

1. All Notices of Intent shall be signed as follows:
 - a. For a corporation: by a responsible corporate officer. For purposes of this section, a responsible corporate officer means:
 - (1) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or
 - (2) the manager or one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding \$25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
 - b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
 - c. For a municipality, State, Federal or other public agency: By either a principal executive or ranking elected official. for purposes of this section, a principal executive officer of a Federal agency includes:
 - (1) the chief executive officer of the agency; or
 - (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
2. All reports required by the permit and other information requested by the Director shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:
 - a. the authorization is made in writing by a person described above and submitted to the Director;
 - b. the authorization specifies either an individual or a person having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility, or position of equivalent responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

- c. changes to authorization. If an authorization under this Part is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the above requirements must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.
- I. Certification. Any person signing a document under this section shall make the following certification:
- "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."
- J. Penalties for Falsification of Reports. The Arkansas Water and Air Pollution Control Act provides that any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained under this permit shall be subject to civil penalties specified in Part V.B of this permit and/or criminal penalties under the authority of the Arkansas Water and Air Pollution Control Act (Act 472 of 1949, as amended).
- K. Penalties for Tampering. The Arkansas Water and Air Pollution Control act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under the Act shall be guilty of a misdemeanor and upon conviction thereof shall be subject of imprisonment for not more than one (1) year or a fine of not more than twenty five thousand (\$25,000) or by both such fine and imprisonment.
- L. Oil and Hazardous Substance Liability. Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the owner or operator from any responsibilities, liabilities, or penalties to which the owner or operator is or may be subject under Section 311 of the Clean Water Act or Section 106 of CERCLA.
- M. Property Rights. The issuance of this permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.
- N. Severability. The provisions of this permit are severable. If any provisions of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the

application of such provisions to other circumstances, and the remainder of this permit, shall not be affected thereby.

- O. Transfers. This permit is not transferable to any person except after notice to the Director. The Director may require the operator to apply for and obtain an individual permit or alternative general permit as stated in Part I.C.
- P. Proper Operation and Maintenance. The owner or operator shall at all times:
1. properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the owner or operator to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a owner or operator only when the operation is necessary to achieve compliance with the conditions of the permit.
 2. provide an adequate operating staff which is duly qualified to carry out operation, maintenance and testing functions required to insure compliance with the conditions of this permit.
- Q. Inspection and Entry. The owner or operator shall allow the Director or an authorized representative, or, in the case of a construction site which discharges to a municipal separate storm sewer, an authorized representative of the municipal operator of the separate sewer system receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:
- a. enter upon the owner or operator's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
 - b. have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 - c. inspect at reasonable times any facilities or equipment (including monitoring and control equipment);
- R. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:
- a. violation of any terms or conditions of this permit; or
 - b. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or

- c. a change in any conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge; or
- d. a determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination; or
- e. failure of the owner or operator to comply with the provisions of ADPCE Regulation No. 9 (Permit Fees). Failure to promptly remit all required fees shall be grounds for the Director to initiate action to terminate this permit under the provisions of 40 CFR 122.64 and 124.5(d), as adopted by reference in ADPCE Regulation No. 6, and the provisions of ADPCE Regulation No. 8.

PART VI
REOPENER CLAUSE

- A. If there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with industrial activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or an alternative general permit in accordance with Part I.C. of this permit or the permit may be modified to include different limitations and/or requirements.

- B. Permit modification or revocation will be conducted in accordance with the provisions of 40 CFR 122.62, 122.63, 122.64 and 124.5, as adopted by reference in ADPCE Regulation No. 6.

PART VII DEFINITIONS

"Best Management Practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

"Commencement of Construction" means the initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

"CWA" means the Clean Water Act or the Federal Water Pollution Control Act.

"Dedicated portable asphalt plant" means a portable asphalt plant that is located on or contiguous to a construction site that provides asphalt only to the construction site on which the plant is located or adjacent to. The term does not include facilities that are subject to the asphalt emulsion effluent guideline limitations at 40 CFR Part 443.

"Dedicated portable concrete plant" means a portable concrete plant that is located on or contiguous to a construction site and that provides concrete only to the construction site on which the plant is located on or adjacent to.

"Director" means the Director, Arkansas Department of Pollution Control and Ecology, or a designated representative.

"Final stabilization" means that either:

- (i) All soil disturbing activities at the site have been completed and a uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover with a density of 70% of the native background vegetation cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed. In some parts of the country, background native vegetation will cover less than 100% of the ground (e.g., arid areas, beaches). Establishing at least 70% of the natural cover of native vegetation meets the vegetative cover criteria for final stabilization (e.g., if the native vegetation covers 50% of the ground, 70% of 50% would require 35% total cover for final stabilization; on a beach with no natural vegetation, no stabilization is required); or
- (ii) For construction projects on land used for agricultural purposes (e.g., pipeline across crop or range land), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not

previously used for agricultural activities, such as buffer strips immediately adjacent to "water of the United States", and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization criteria in (i) or (ii) above.

"Flow-weighted composite sample" means a composite sample consisting of a mixture of aliquot collected at a constant time interval, where the volume of each aliquot is proportional to the flow rate of the discharge.

"Large and Medium municipal separate storm sewer system" means all municipal separate storm sewers that are either:

- (i) located in an incorporated place with a population of 100,000 or more as determined by the latest Decennial Census by the Bureau of Census: or
- (ii) located in the counties with unincorporated urbanized populations of 100,000 or more, except municipal, separate storm sewers that are located in the incorporated places, townships or towns within such counties; or
- (iii) owned or operated by a municipality other than those described in paragraphs (i) or (ii) and that are designated by the Director as part of the large or medium municipal separate storm sewer system.

"NOI" means Notice of Intent to be covered by this permit (see Part II of this permit).

"NOT" means Notice of Termination (see Part II.G of this permit).

"Point Source" means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

"Runoff coefficient" means the fraction of total rainfall that will appear at the conveyance as runoff.

"Storm Water" means storm water runoff, snow melt runoff, and surface runoff and drainage.

"Storm Water Associated with Industrial Activity from Construction Sites" means the discharge from any conveyance which is used for collecting and conveying storm water and which is directly related to manufacturing, processing or raw materials storage areas at an industry. Discharges of storm water associated with industrial activity from construction sites (those areas that will result in the disturbance of five (5) or more acres of total land area),(henceforth referred to as storm water discharges from construction activities) occurring after the effective date where the construction activity commenced before the effective date).

***APPENDIX 3
FORM 8***



ARKANSAS
Department of Environmental Quality

**NOTICE OF INTENT
FOR DISCHARGES OF STORM WATER
ASSOCIATED WITH CONSTRUCTION ACTIVITY
AUTHORIZED UNDER NPDES GENERAL PERMIT ARR10A000**

The enclosed form may be used to obtain coverage under NPDES general permit ARR10A000 for discharges of storm water associated with construction activity at any site or common plan of development or sale, that will result in the disturbance of five (5) acres or more total land area.

Return the completed form to:

Arkansas Department of Environmental Quality
NPDES Branch, Water Division
P. O. Box 8913
Little Rock, AR 72219

The following facilities are required to submit the Notice of Intent:

- (1) Except as provided in paragraphs (2) and (3) below, individuals who intend to obtain coverage for storm water discharges from a construction site shall submit a Notice of Intent at least 48 hours prior to commencement of construction;
- (2) Upon a pending transfer of ownership of a construction operation with a storm water discharge covered by this general permit, the new owner/operator must submit a Notice of Intent at least 48 hours prior to the new operator beginning work at the site;
- (3) A discharger is not precluded from submitting a Notice of Intent at a later date as provided above. In such instances, the Director may bring an enforcement action for failure to submit a Notice of Intent in a timely manner or for any unauthorized discharges of storm water that have occurred on or after the dates specified in paragraphs (1) or (2) above.

Unless notified otherwise by the Director within 48 hours after the Notice of Intent is postmarked, owners and operators are authorized to discharge storm water associated with construction activity under the terms and conditions of the general permit

As required by ADEQ Regulation No. 9, you will be billed an initial permit fee of \$200.00 . Do not send any money with this NOI. Subsequent annual fees of \$200.00 per year will be billed by the Department. Failure to remit the required permit fee may be grounds for the Director to deny coverage under this general permit, and to require the owner or operator to apply for an individual NPDES permit.

NOTE: DO NOT LEAVE BLANK SPACES IN THE NOTICE OF INTENT. IF ANY QUESTION DOES NOT APPLY, MARK "N/A" IN THE PROVIDED SPACE. ALSO, A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE PREPARED PRIOR TO SUBMITTAL OF THIS NOI PER PART III.D.1 OF THE PERMIT (DO NOT SUBMIT PLANS WITH NOI).

WATER DIVISION
8001 NATIONAL DRIVE / POST OFFICE BOX 8913 / LITTLE ROCK, ARKANSAS 72219-8913 / PHONE 501-682-2199 / FAX 501-682-0910
www.adeq.state.ar.us

Construction NOI / Revision date 1/28/2000

Arkansas Department of Environmental Quality
NPDES Branch, Water Division
P. O. Box 8913
Little Rock, AR 72219
(501) 682-2199

NOTICE OF INTENT
FOR DISCHARGES OF STORM WATER RUNOFF
ASSOCIATED WITH CONSTRUCTION ACTIVITY
AUTHORIZED UNDER NPDES GENERAL PERMIT ARR10A000

I. PERMITTEE INFORMATION

Permittee Name: _____

Permittee Type:

PRIVATE

STATE

Permittee Address: _____

FEDERAL

CORPORATION

City: _____

PUBLIC

OTHER

State: _____ Zip: _____

Permittee Telephone Number: _____

II. COGNIZANT OFFICIAL (Person having responsibility for overall operation of project)
see Part V.H.1.a.(2), page 23 of permit.

Name: _____

Telephone: _____

Title: _____

III. CONTRACTOR, IF DIFFERENT FROM PERMITTEE (Operator with day to day operational control):

Name: _____

State: _____ Zip: _____

Address: _____

Telephone: _____

City: _____

IV. CONSTRUCTION SITE INFORMATION

Project Name: _____

Project Contact Person: _____

Project Location: _____

Project Address: _____

Project County: _____

Project City: _____

Section: _____

Zip: _____

Township: _____

Telephone Number: _____

Range: _____

Total amount of soil to be disturbed: _____
(estimate in Acres)

Facility Latitude: _____

Project Start Date: _____

Facility Longitude: _____

Project End Date: _____

V. DISCHARGE INFORMATION

Name of Receiving Stream (for discharges to surface waters): _____

Name of Receiving Municipality (for discharges to municipal storm sewer system): _____

Name of Ultimate Receiving Water: _____

NOTE: A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE PREPARED PRIOR TO SUBMITTAL OF THIS NOI PER PART III. D. 1 OF THE PERMIT (DO NOT SUBMIT PLANS WITH NOI).

VI. CERTIFICATION OF PERMITTEE (See Part V.I, page 24 of the Permit)

"I certify that, if this facility is a corporation, it is registered with the Secretary of the State of Arkansas."

"I certify that a storm water pollution prevention plan has been prepared for this facility in accordance with Part III D of this permit, which provides for, or will provide for, compliance with approved state or local sediment and erosion plans, local storm water permits or storm water management plans, in accordance with Part III D. 4. (b)(4) of this permit."

"I certify that the cognizant official designated in this Notice of Intent is qualified to act as a duly authorized representative under the provisions of 40 CFR 122.22(b). If no cognizant official has been designated, I understand that the Department will accept reports signed only by the applicant. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." **Also, I certify that as a whole the storm water discharge(s), and the construction and implementation of Best Management Practices (BMP's) to control storm water runoff, are not likely to adversely affect species of critical habitat for a listed species."**

Typed or Printed Name: _____

Title: _____

Signature: _____

Date: _____

Initial fee of \$200.00 will be billed by ADEQ effective 7/1/2001.

Check Number: _____

**APPENDIX 3
FORM 9**

Arkansas Department of Environmental Quality
NPDES Branch, Water Division
P. O. Box 8913
Little Rock, AR 72219
(501) 682-2199

NOTICE OF TERMINATION
FOR DISCHARGES OF STORM WATER RUNOFF ASSOCIATED WITH CONSTRUCTION ACTIVITY
AUTHORIZED UNDER NPDES GENERAL PERMIT ARR10A000

Permit Tracking Number to be Terminated: ARR10 _____

I. PERMITTEE INFORMATION

Permitee Name: _____ Permitee Type:
Permitee Address: _____ Private State
City: _____ Federal Corporation
State: _____ Zip: _____ Public Other
Telephone Number: _____

II. CONSTRUCTION SITE INFORMATION

Project Name: _____ Contact Person: _____
Physical Location: _____ Project Address: _____
Project County: _____ Project City: _____
Telephone Number: _____ State: _____ Zip: _____
Is the Contractor the same as permittee? yes no If no, write in appropriate information.
Name: _____ City: _____
Address: _____ State: _____ Zip: _____
Telephone: _____

III. PERMITTEE CERTIFICATION

"I certify under penalty of law that disturbed soils at the identified facility have been finally stabilized (at least 70 % of the disturbed soil has a perennial cover growing) and temporary erosion and sediment control measures have been removed or will be removed at an appropriate time, or that all storm water discharges associated with construction activities from the identified site that are authorized by an NPDES general permit have been eliminated. I understand that by submitting this Notice of Termination that I am no longer authorized to discharge storm water by the general permit, and that discharging pollutants in storm water associated with construction activity to waters of the United States is unlawful under the Clean Water Act and the Arkansas Water and Air Pollution Control Act where the discharge is not authorized by an NPDES permit."

Typed or Printed Name: _____ Title: _____
Signature: _____ Date: _____

Appendix 3

Table of Contents

Chart Number	Title
1	Storm Water Runoff Calculations
2	Open Channel Flow Calculations
3	Hydraulic Design of Culverts
4	Storm Sewer Calculations
5	Inlet Design Calculations
6	Detention Pond Design
7	ADEQ Permit No. ARR10A000
8	ADEQ Notice of Intent
9	ADEQ Notice of Termination

Open Channel Calculations Form

- Column 1 Downstream limit of the section of channel under consideration.
Column 2 Upstream limit of the section of channel under consideration.
Column 3 Type of channel as shown in Figure 2, Appendix 2 is entered here.
Column 4 Flow in the section of channel under consideration.
Column 5 Roughness coefficient of the channel cross-section taken from Table 4 in Appendix 1.
Column 6 slope of the channel which is most often parallel to the slope of the hydraulic gradient.
Column 7 Square root of Column 6.
Column 8 Calculation is made using the values in Columns 4,5 and 7.
Column 9 Assumed width of the bottom width of the channel.
Column 10 Assumed depth of flow.
Column 11 Assumed slope of the sides of the channel.
Column 12 Areas of flow which is calculated based on Columns 9,10 and 11.
Column 13 Wetted perimeter calculated from Columns 9,10, and 11.
Column 14 Value is calculated from the Columns 12 and 13.
Column 15 Column 14 raised to the 2/3 power.
Column 16 Product of Column 13 times Column 15.
When the value of Column 16 equals the value of Column 8, the channel has been adequately sized. When the value of Column 16 exceeds the value of Column 8 by more than 5%, then the channel width or depth should be decreased and another trial section analyzed.
Column 17 Calculation is based on the values of Columns 4 and 12.
Column 18 Calculation is based on Column 17.
Column 19 Remarks concerning the channel section analyzed may be entered.

Note: This form should not be used to calculate stream profiles.

Hydraulic Design of Culvert Form

INFORMATION ON UPPER RIGHT OF FORM:

Culvert Location

This is a work description of the physical location.

Length

The actual length of the culvert.

Total Discharge, QT

This is the flow computed on the Storm Water Runoff form.

Design Storm Frequency

Obtained from Table 1 and used on the Storm Water Runoff Form

Roughness Coefficient, n

Obtained from Table 2 in Appendix 1

Maximum Velocity

Obtained from Table 4 Appendix 1

Tailwater

This is the design depth of water in the downstream channel and is obtained in connection with the channel design performed on the Open Channel Calculations Form or by water surface profile calculations.

D.S. Channel Width

This is the bottom width of the downstream channel. The culvert should be approximately this width whenever possible.

Entrance Description

This is a listing of the actual condition as shown in the "Culvert Entrance Date" shown on the calculation sheet.

Roadway Elevation

The elevation of the top of curb at the upstream end of culvert.

U.S. Culvert F.L.

The flow line of the culvert at the upstream end.

Difference

The difference in elevations of the roadway and the upstream flow line.

Required Freeboard

The vertical distance required for safety between the upstream design water surface and the roadway elevation or such other requirements which may occur because of particular physical conditions.

Allowable Headwater

This is obtained by subtracting the freeboard from the difference shown immediately above.

D.S. Culvert F.L.

The flow line elevation of the downstream end of the culvert.

Culvert Slope, S_o

This is the physical slope of the structure calculated as indicated

Columns 1-10 Deal with selection of trial culvert size and are explained as follows:

- Column 1 Total design discharge, Q , passing through the culvert divided by the allowable maximum velocity gives trial total area of culvert opening.
- Column 2 Culvert width should be reasonably close to the channel bottom width, W , downstream of the culvert.
- Column 3 Lower range for choosing culvert depth is trial area of culvert opening, Column 1, divided by channel width, Column 2.
- Column 4 Allowable headwater obtained from upper right of sheet.
- Column 5 Trial depth, D , of culvert corresponding to available standard sizes and between the numerical values of Columns 3 and 4.
- Columns 6-8 Are solved simultaneously based on providing a total area equivalent to the trial area of opening in Column 1.
- Column 6 Number of culvert openings.
- Column 7 Inside width of one opening.
- Column 8 Inside depth of one opening if culvert is box structure or diameter if culvert is pipe.
- Column 9 Column 6 multiplied by Column 7 and Column 8.
- Columns 11-15 (Inlet Control) and 16-27 (Outlet Control) deal with Headwater Calculations which verify hydraulics of trial culvert selected and are explained as follows:
- Column 11 Obtained from the upper right of sheet.
- Column 12 When the allowable headwater is equal to or less than the value in Column 8, enter Case I. When the allowable headwater is more than the value in Column 8, enter Case II.
- Column 13 Column 10 divided by Column 7.
- Column 14 Obtained from Figure 16 for box culverts or Figure 17 for pipe culverts.
- Column 15 Column 14 multiplied by column by 8.
- Column 16 Obtained from upper right of sheet
- Column 17 Obtained from Figure 18 for box culverts and Figure 19 for pipe culverts.
- Column 18 Tailwater depth from upper right of sheet.

- Column 19 S, culvert slope, multiplied by culvert length, both obtained from upper right of sheet.
- Column 20 Sum of columns 17 and 18 minus Column 19.
- Column 21 Obtained from Figure 18 for box culverts and Figure 19 for pipe culverts.
- Column 22 Critical depth obtained from Figure 20 for box culverts and figure 21 for pipe culverts.
- Column 23 Sum of Columns 22 and 8 divided by two.
- Column 24 Tailwater depth from the upper right of sheet.
- Column 25 Enter the larger of the two values shown in Column 23 or Column 24.
- Column 26 Previously calculated in Column 19 and be transposed.
- Column 27 The sum of Columns 21 and 25 minus Column 26.
- Column 28 Enter the larger of the values from either Column 15, 20 or 27. This determines the controlling hydraulic conditions of the particular size culvert investigated.
- Column 29 When the Engineer is satisfied with the hydraulic investigations various culverts and has determined which would be the most economical selection. This description should be entered.

Appendix 4**Table of Contents**

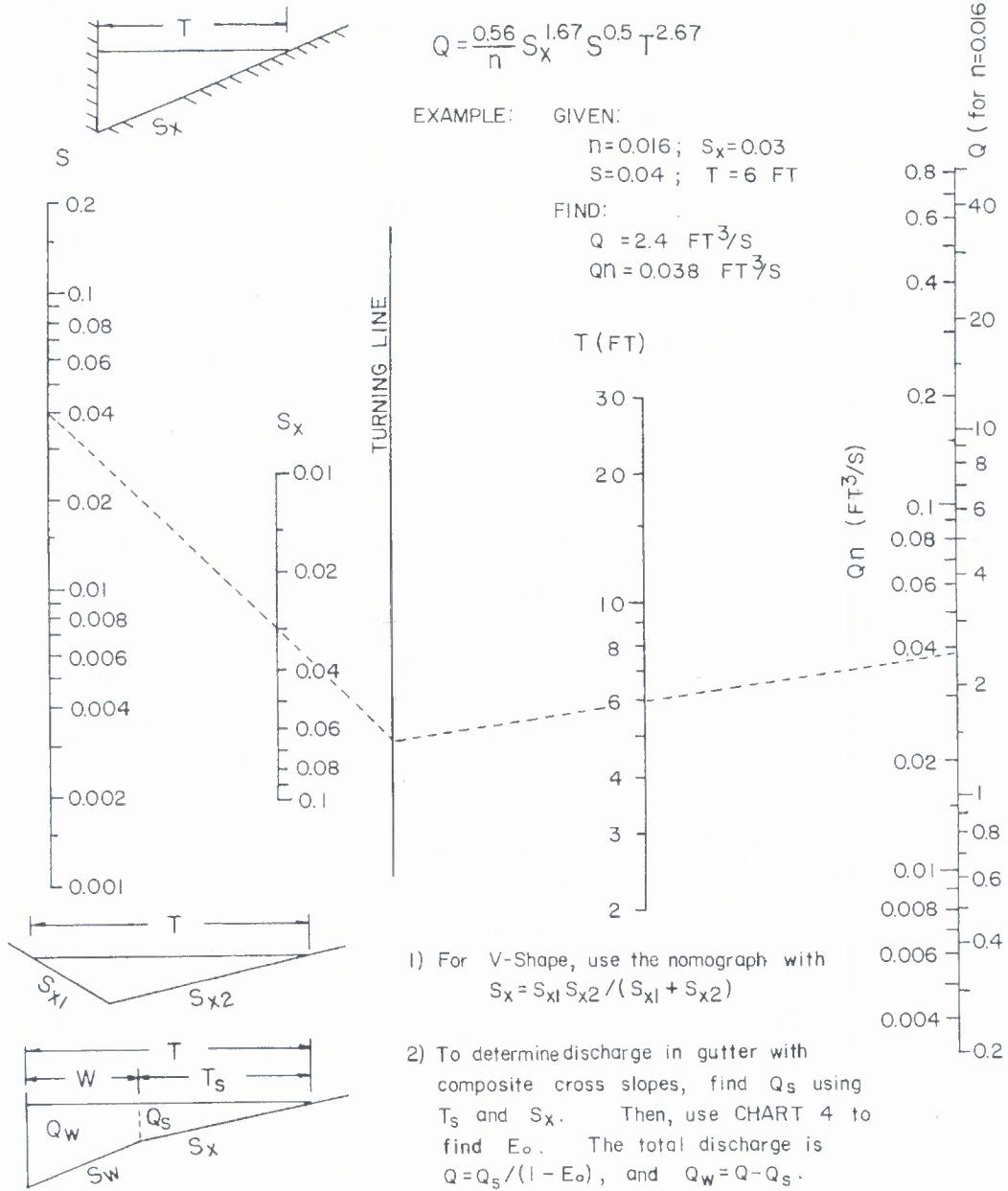
Chart Number	Title
1	Flow in Triangular Gutter Sections
2	Ratio of Frontal Flow to Total Gutter Flow
3	Conveyance in Circular Channels
4	Velocity in Triangular Gutter Sections
5	Grate Inlet Frontal Flow Interception Efficiency
6	Grate Inlet Side Flow Intercept Efficiency
7	Curb-opening & Slotted Drain Inlet Length for Total Interception
8	Curb-opening and Slotted Drain Inlet Interception Efficiency
9	Grate Inlet Capacity in Sump Conditions
10	Depressed Curb-opening Inlet Capacity in Sump Locations
11	Undepressed Curb-opening Inlet Capacity in Sump Locations
12	Curb-opening Inlet Orifice Capacity for Inclined and Vertical Orifice Throats

CHART 1B

$$Q = \frac{0.56}{n} S_x^{1.67} S^{0.5} T^{2.67}$$

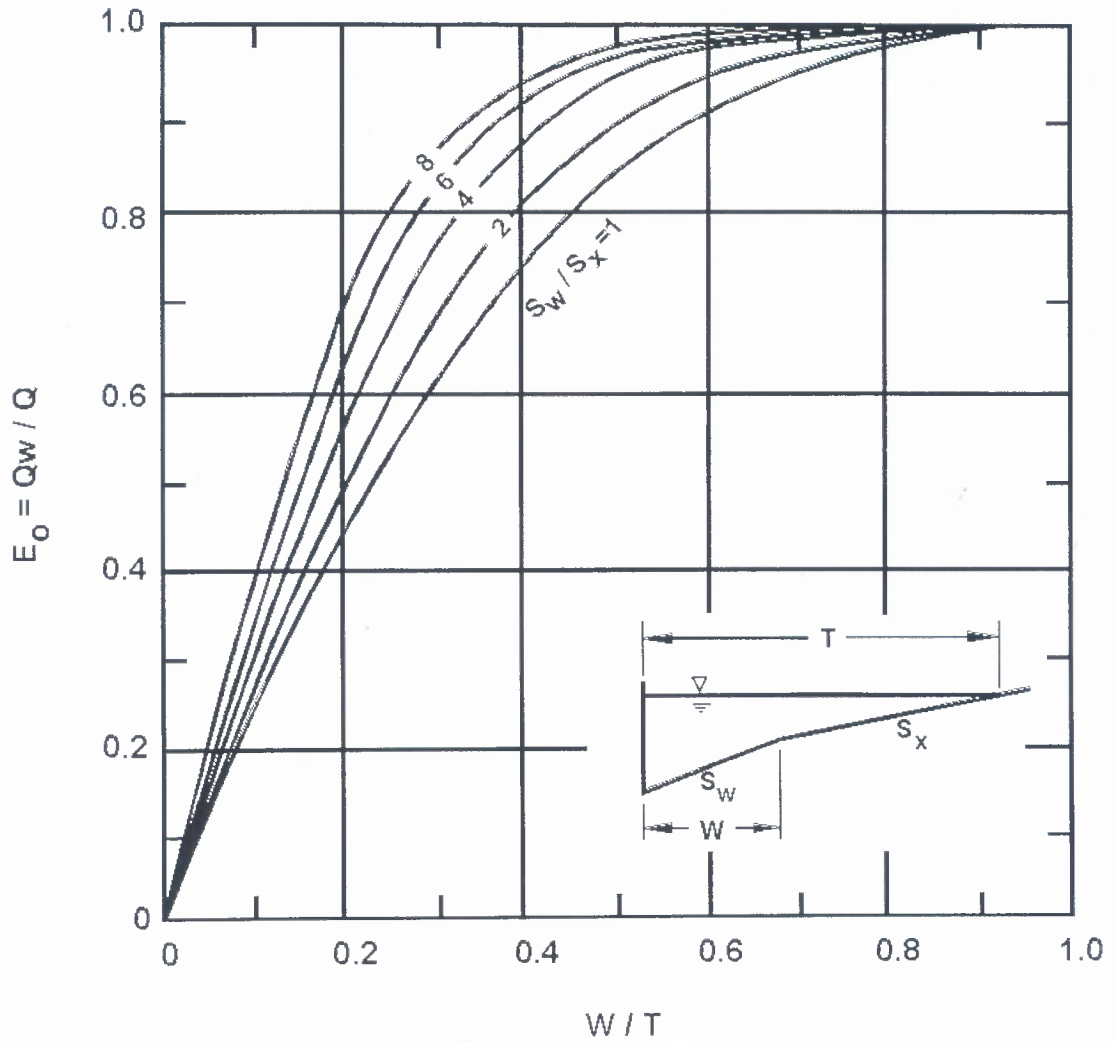
EXAMPLE: GIVEN:
 $n=0.016$; $S_x=0.03$
 $S=0.04$; $T=6$ FT

FIND:
 $Q = 2.4$ FT³/S
 $Qn = 0.038$ FT³/S



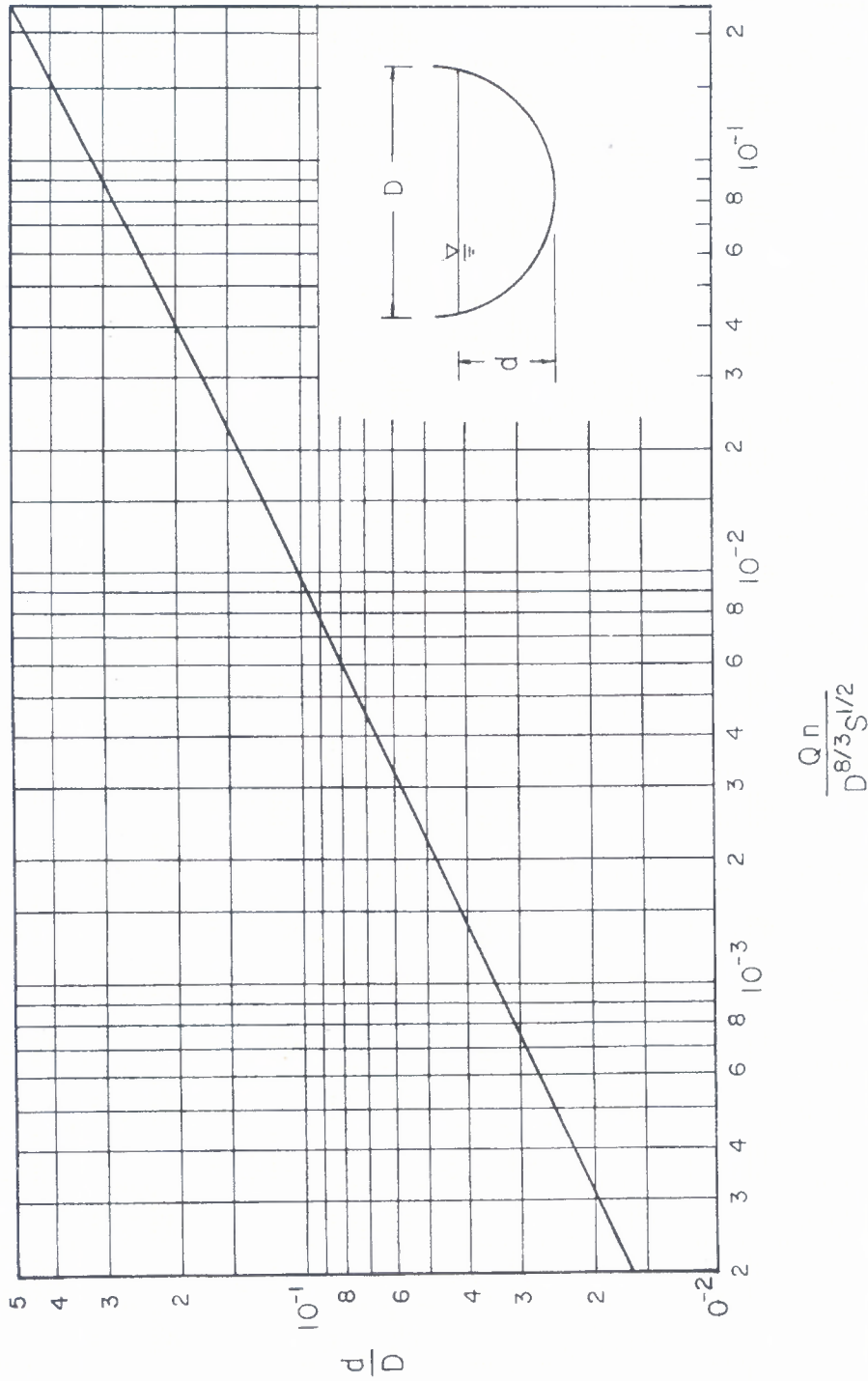
Flow in Triangular Gutter Sections - English Units

CHART 2B



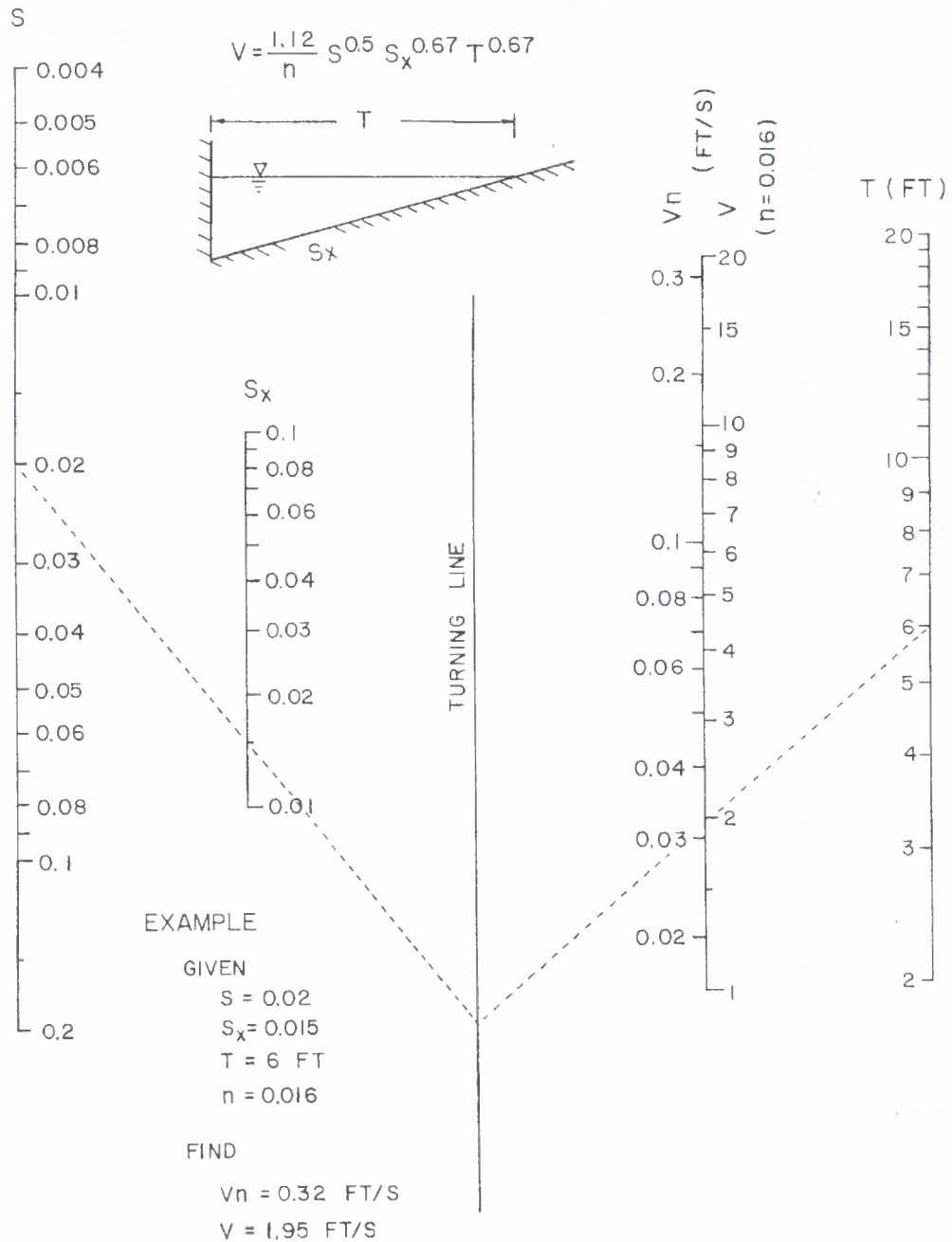
Ratio of Frontal Flow to Total Gutter Flow

CHART 3B



Conveyance in Circular Channels - English Units

CHART 4B



Velocity in Triangular Gutter Sections - English Units

CHART 5B

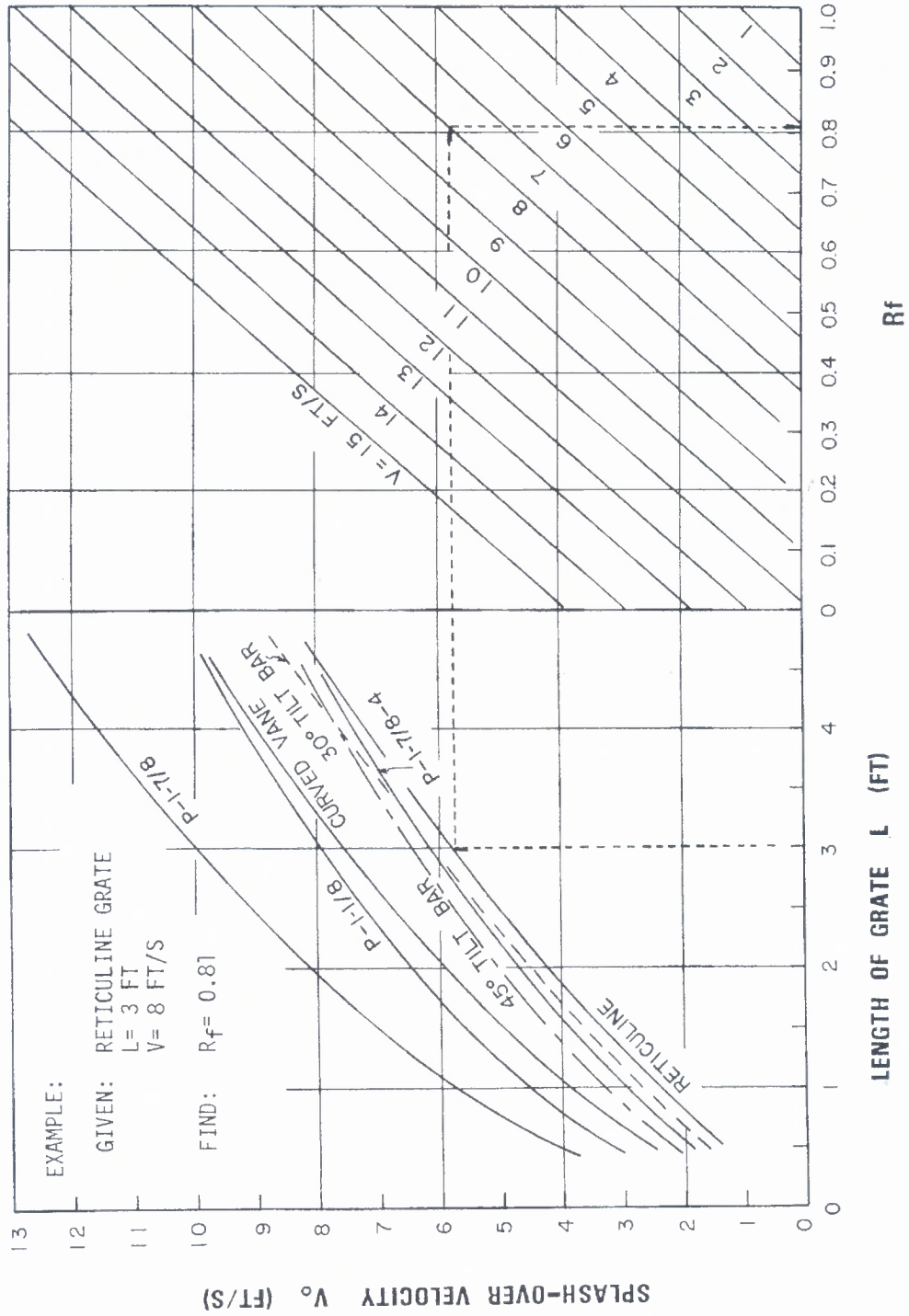
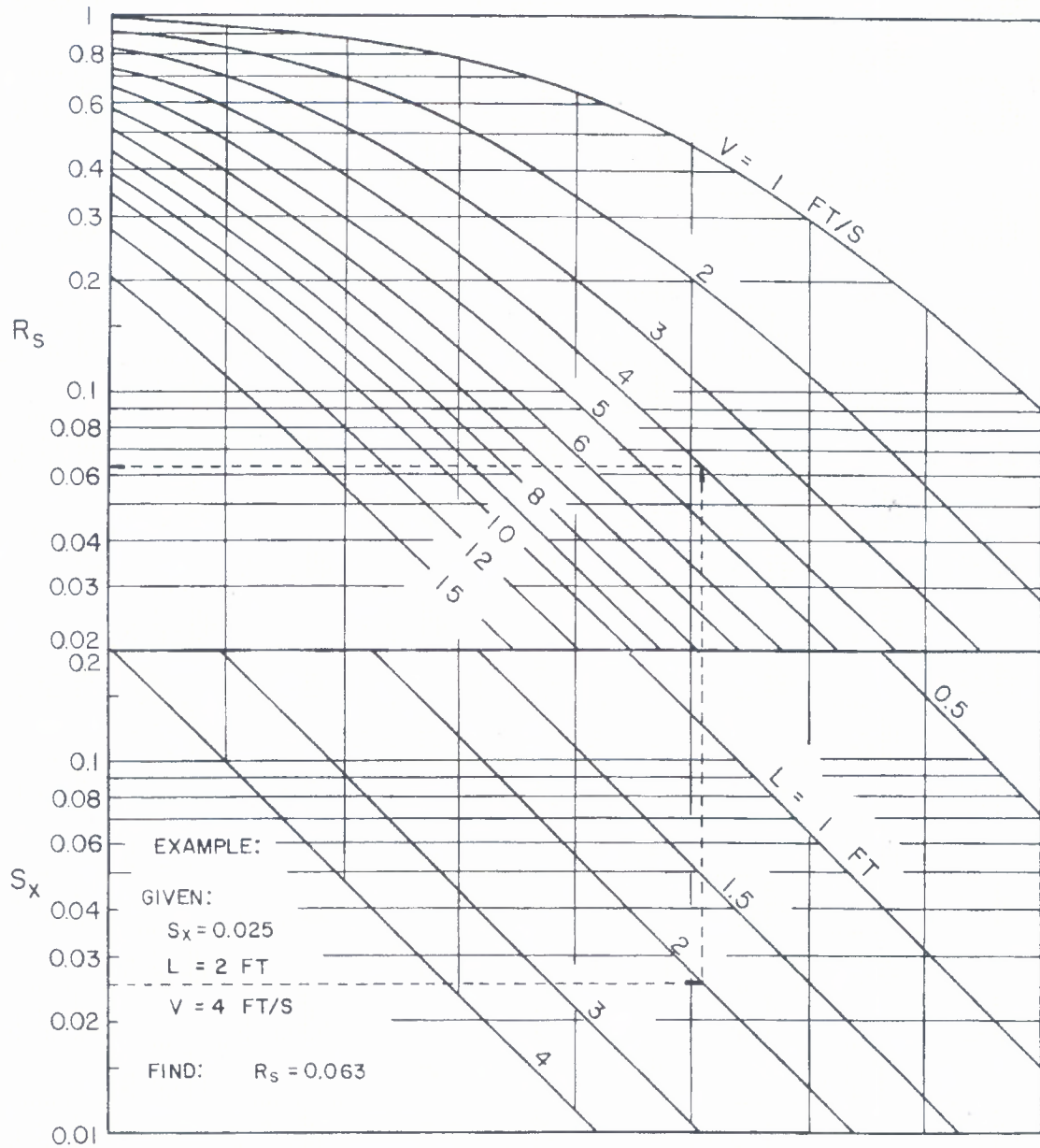
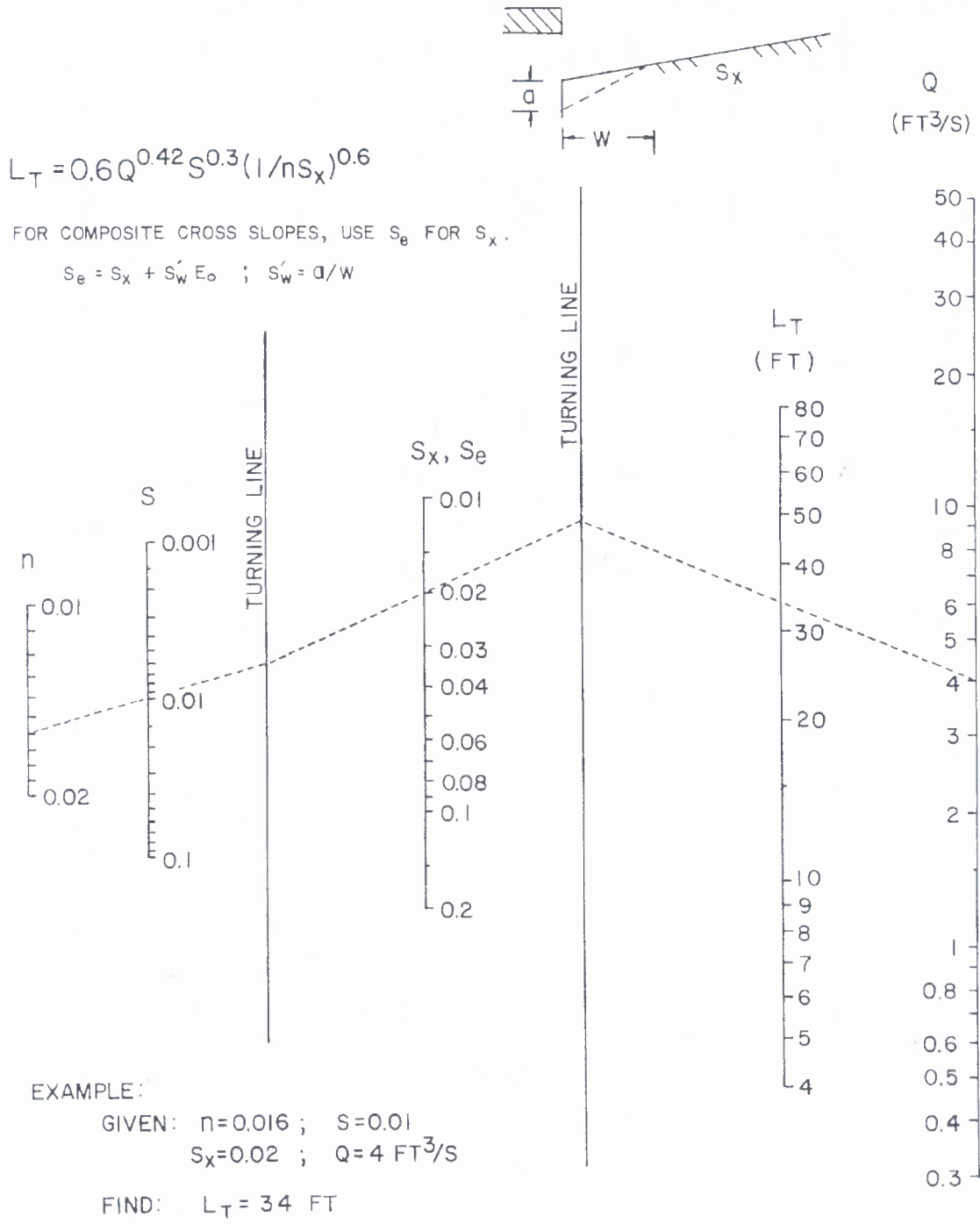


CHART 6B

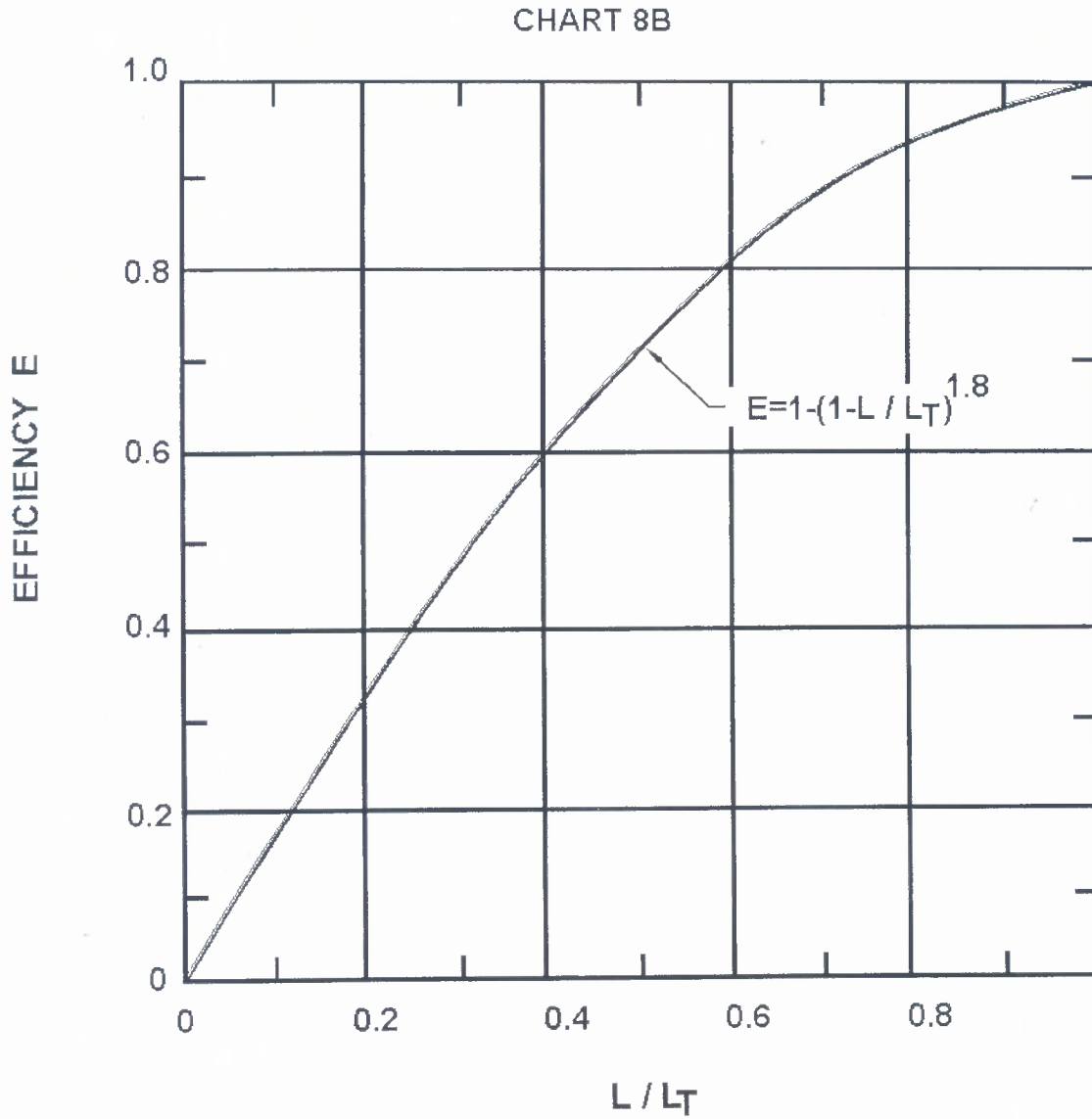


Grate Inlet Side Flow Intercept Efficiency

CHART 7B

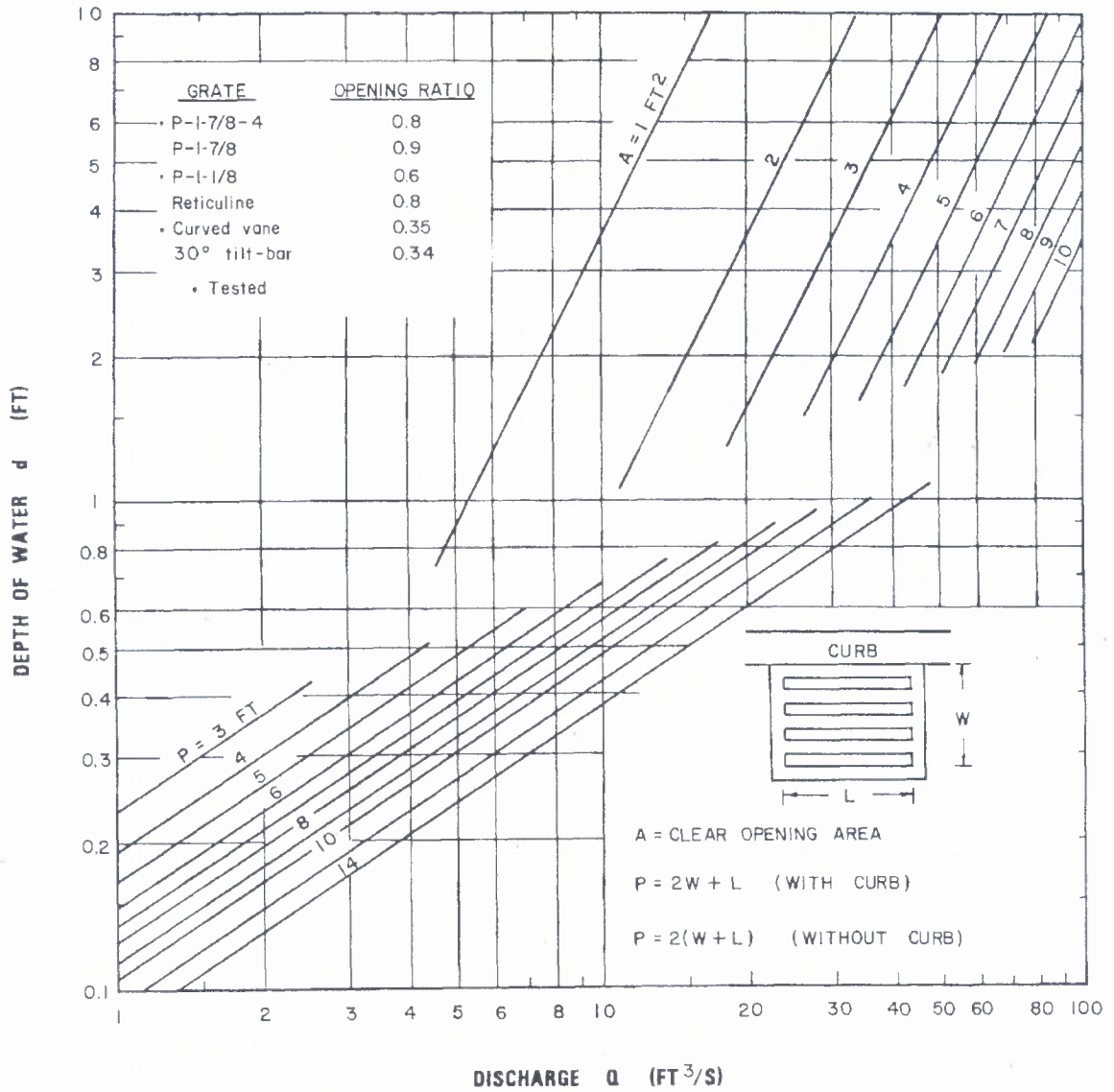


Curb-opening & Slotted Drain Inlet Length for Total Interception - English Units



Curb-opening and Slotted Drain Inlet Interception Efficiency.

CHART 9B



Grate Inlet Capacity in Sump Conditions - English Units

CHART 10B

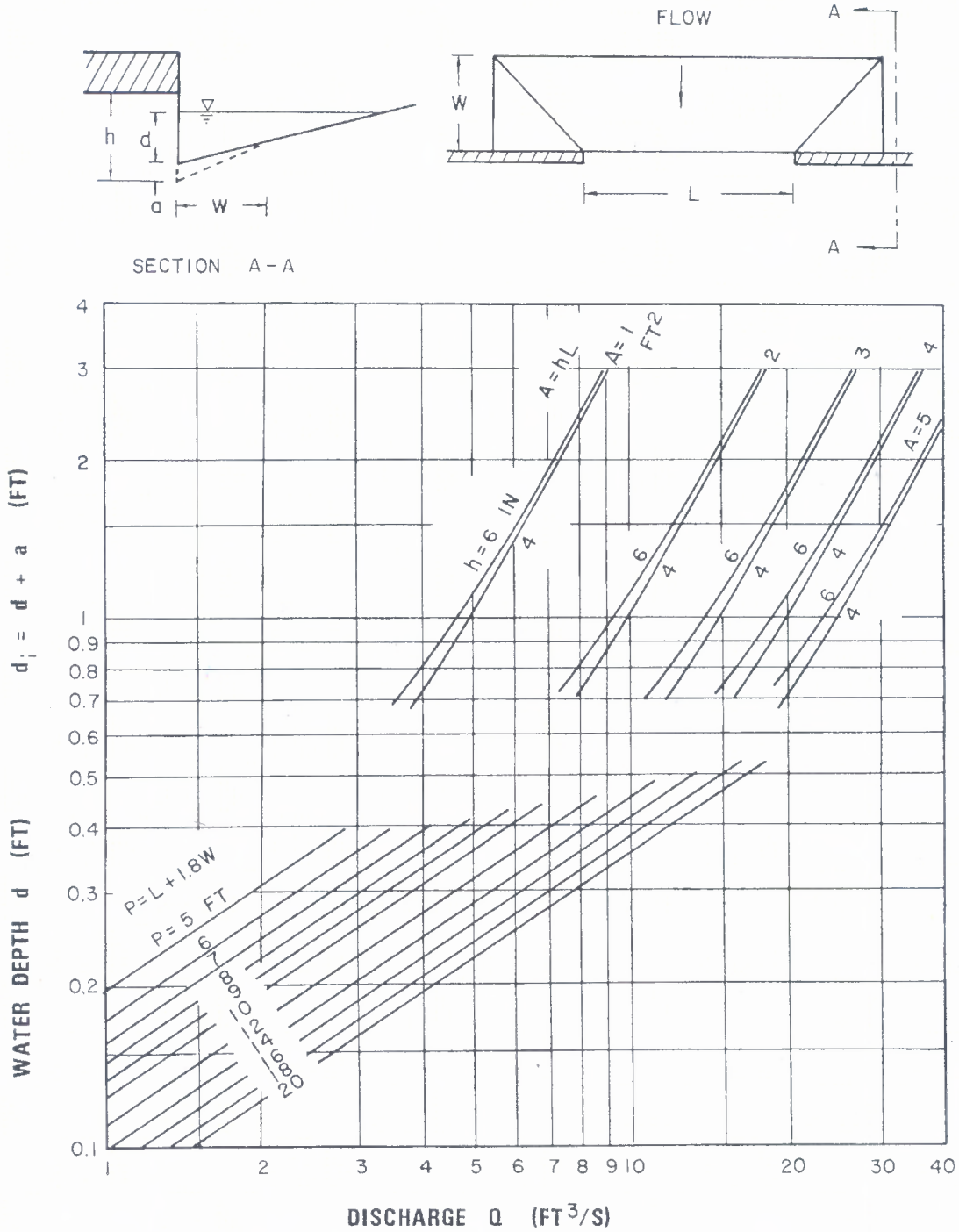
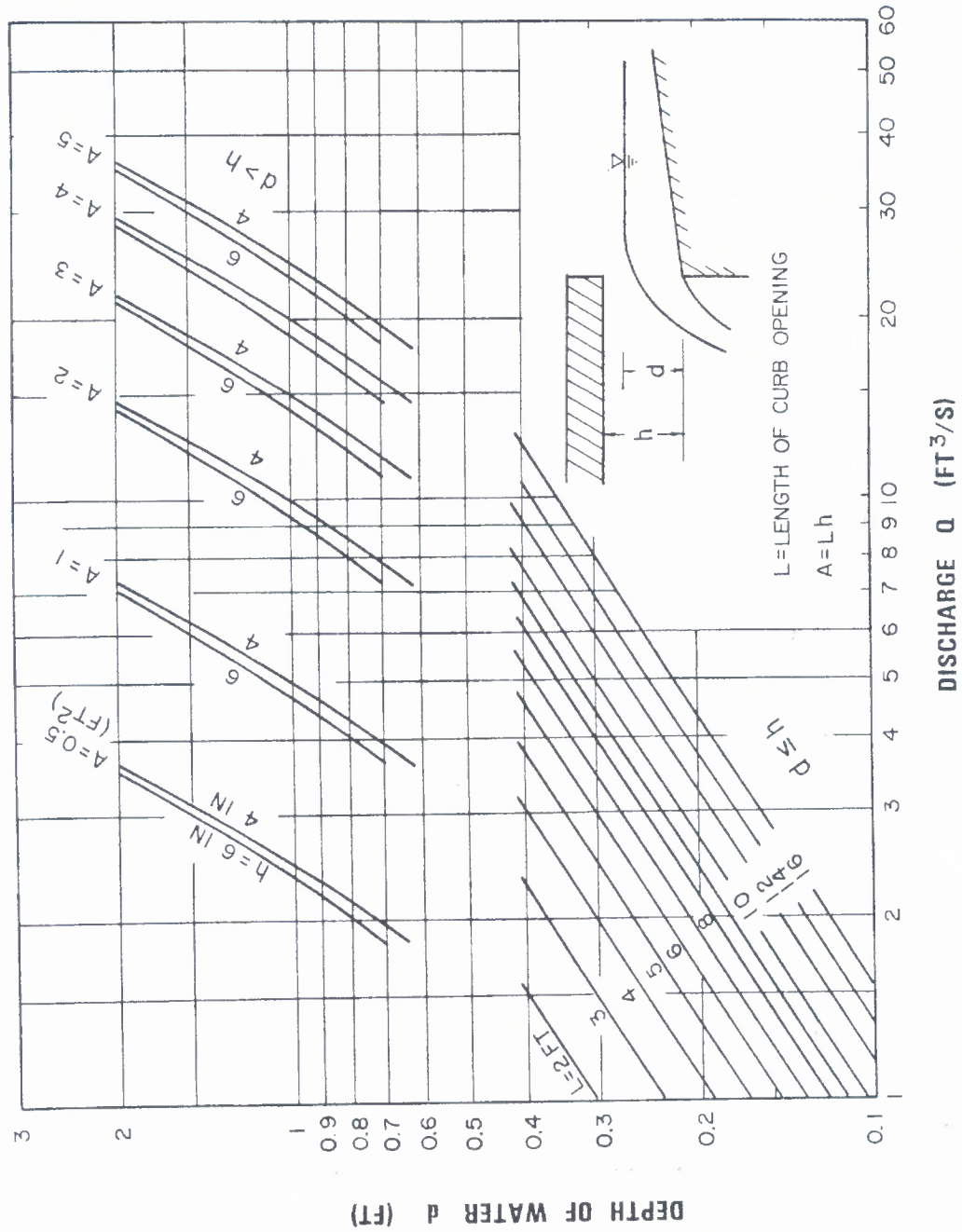


CHART 11B



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

APPENDIX 5**Table of Contents****Chart****Circular Culverts**

- 1B Headwater Depth for Concrete Pipe Culverts With Inlet Control
- 2B Headwater Depth for C. M. Pipe With Inlet Control
- 3B Headwater Depth for Circular Pipe Culverts with Beveled Ring Control
- 4B Critical Depth - Circular Pipe
- 5B Head for Concrete Pipe Culverts Flowing Full, $n = 0.012$
- 6B Head for Standard C.M. Pipe Culverts Flowing Full, $n = 0.0245$
- 7B Head for Structural Plate Corrugated Metal Pipe Culverts Flowing Full, $n = 0.0328$ to 0.302

Concrete Box Culverts

- 8B Headwater Depth for Box Culverts with Inlet Control
- 9B Headwater Depth for Inlet Control Rectangular Box Culverts, Flared Wingwalls 18° to 33.7° and 45°
- 28B Head for Corrugated Metal Box Culverts Flowing Full with Corrugated Bottom Rise/Span > 0.5

Elliptical Culverts

- 29B Headwater for Oval Concrete Pipe Culverts Long Axis Horizontal with Inlet Control
- 30B For Oval Concrete Pipe Culverts Long Axis Vertical with Inlet Control
- 31B Critical Depth - Oval Concrete Pipe Long Axis Horizontal
- 32B Critical Depth - Oval Concrete Pipe Long Axis Vertical
- 33B Head for Oval Concrete Pipe Culverts Long Axis Horizontal or Vertical Flowing Full, $n = 0.012$

Pipe/Arch Culverts

- 34B Headwater Depth for C.M. Pipe-Arch Culverts with Inlet Control
- 35B Headwater Depth for Inlet Control Structural Plate Pipe-Arch Culverts,
35A - 457 mm (18-inch - 35B) Radius Corner Plate, Projecting or Headwall
Inlet, Headwall with or without Edge Bevel
- 36B Headwater Depth for Inlet Control Structural Plate Pipe-Arch Culverts,
787 mm (Chart 36A (31-inch - Chart 36B) Radius Corner Plate, Projecting or
Headwall Inlet, Headwall with or without Edge Bevel
- 37B Critical Depth - Standard Corrugated Metal Pipe-Arch
- 38B Critical Depth - Structural Plate Corrugated Metal Pipe-Arch
- 39B Head for Standard C.M. Pipe-Arch Culverts Flowing Full, $n = 0.024$
- 40B Head for Structural Plate Corrugated Metal Pipe-Arch Culverts, 457 mm - 40A
(18-inch - 40B) Corner Radius Flowing Full, $n = 0.0327$ - 0.0306

Circular Tapered Inlet

- 55B Throat Control for Side-Tapered Inlets to Pipe Culvert (Circular Section Only)
- 56B Face Control for Side-Tapered Inlets to Pipe Culverts (Non-Rectangular Section Only)

Chart**Rectangular Tapered Inlets**

- 57B Throat Control for Box Culverts with Tapered Inlets
- 58B Face Control for Box Culverts with Side-Tapered Inlets
- 59B Face Control for Box Culverts with Slope-Tapered Inlets

CHART 1B

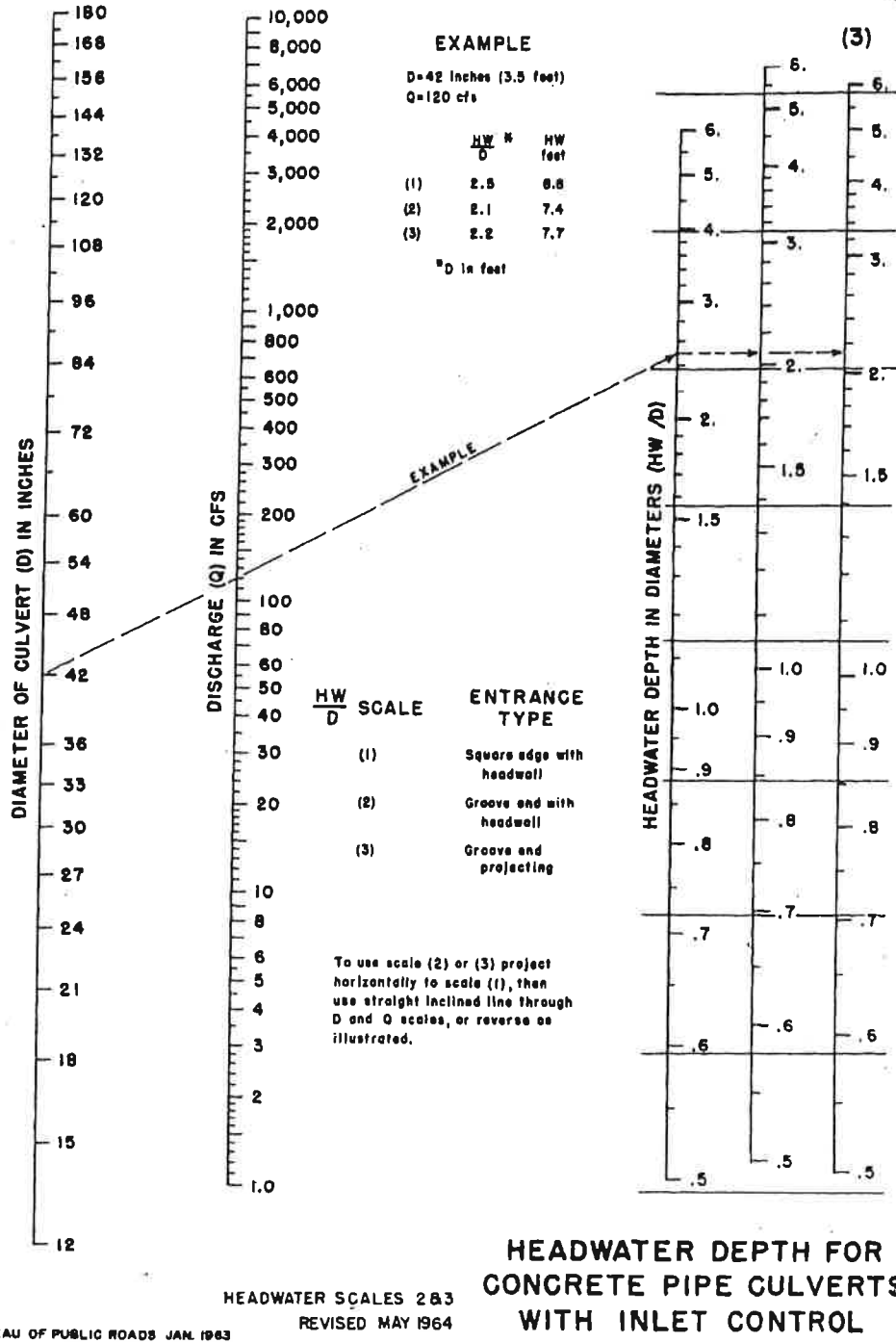
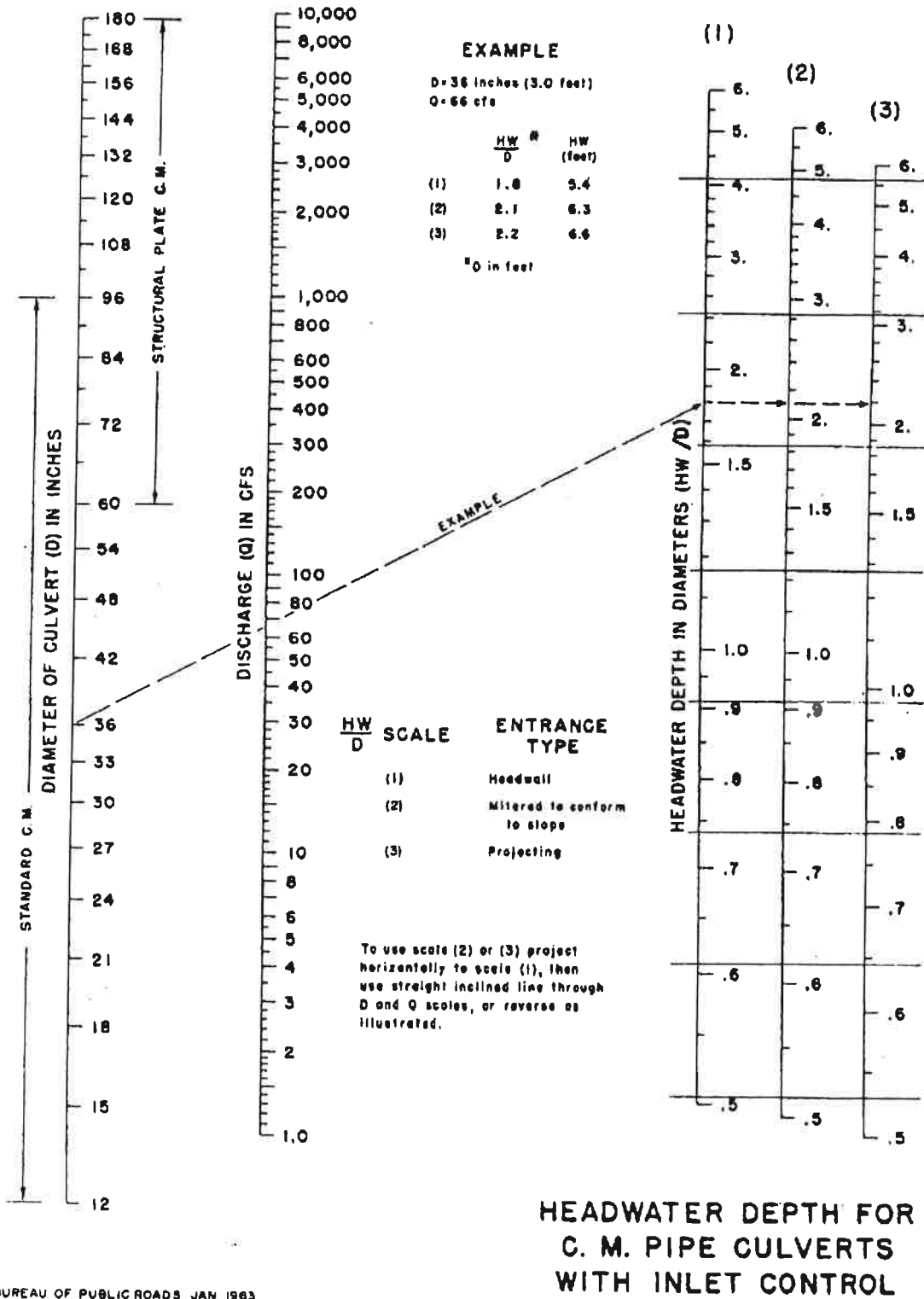
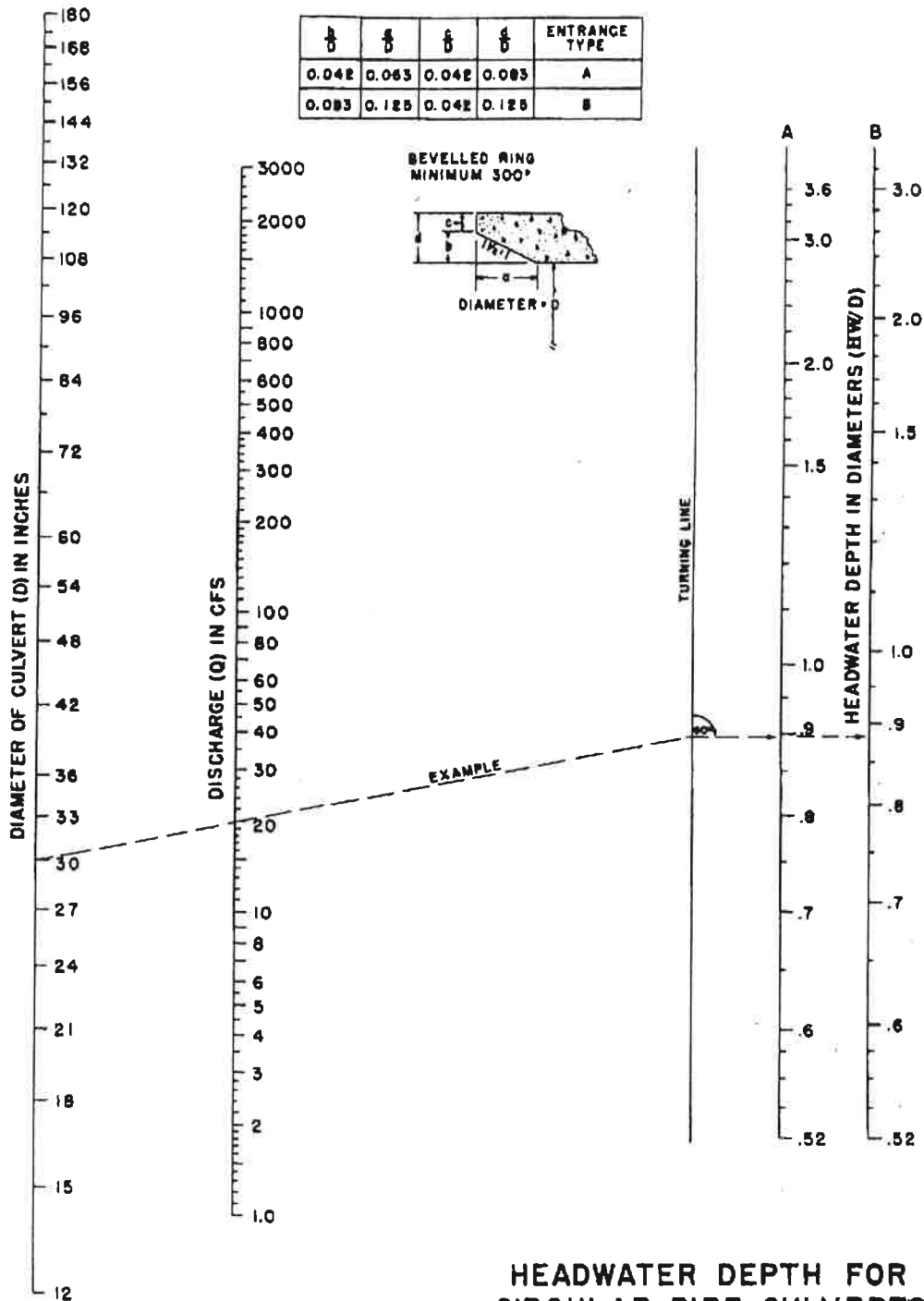


CHART 2B



BUREAU OF PUBLIC ROADS JAN. 1963

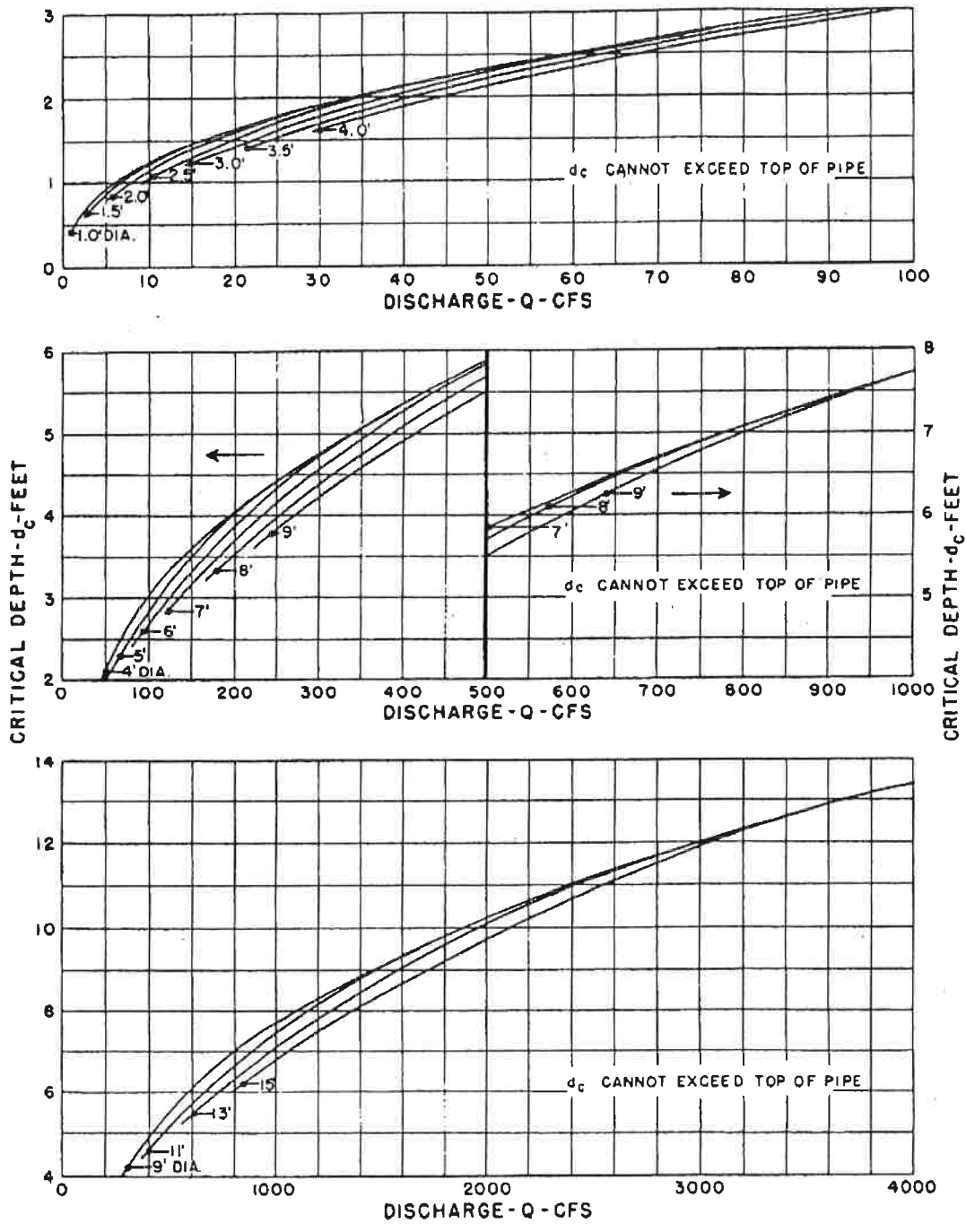
CHART 3B



FEDERAL HIGHWAY ADMINISTRATION
MAY 1973

**HEADWATER DEPTH FOR
CIRCULAR PIPE CULVERTS
WITH BEVELED RING
INLET CONTROL**

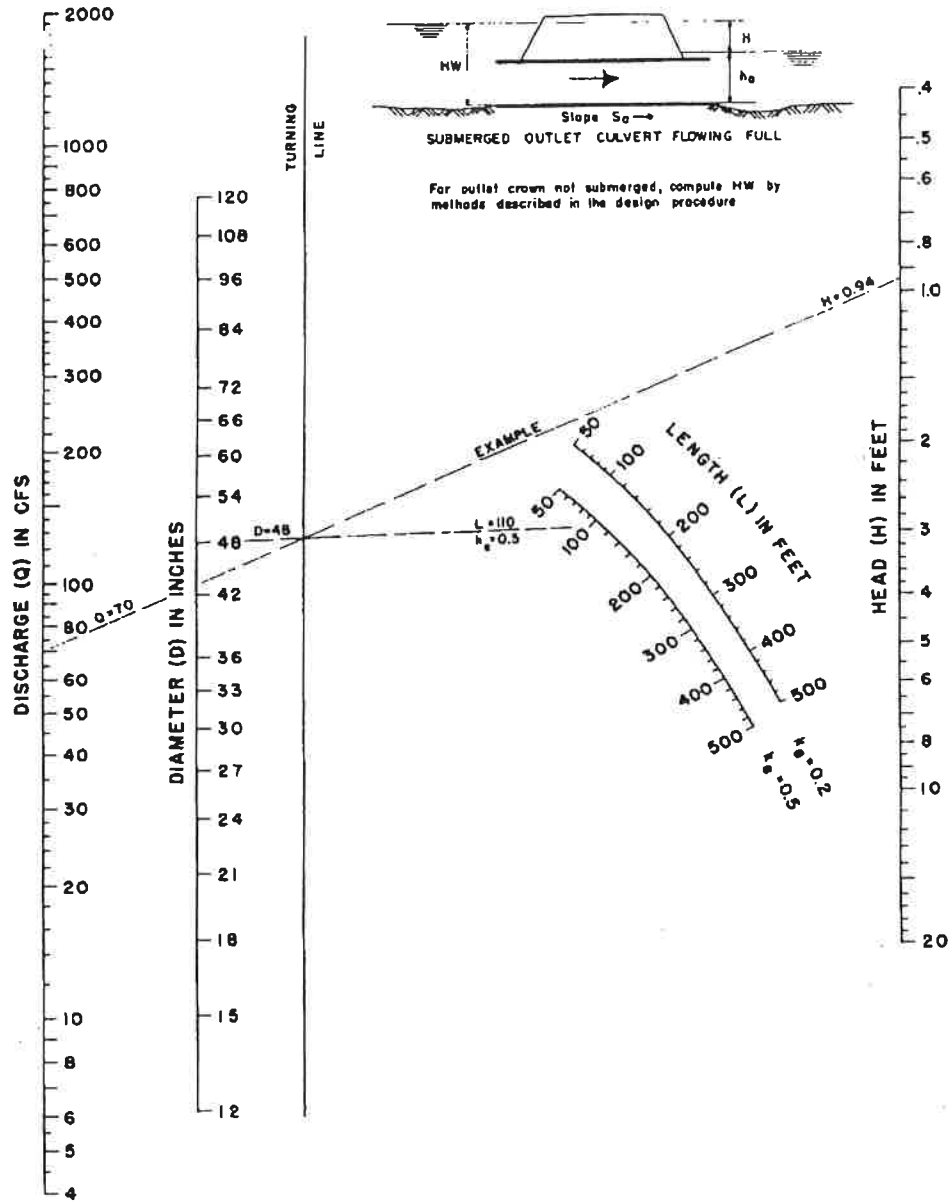
CHART 4B



BUREAU OF PUBLIC ROADS
JAN. 1964

CRITICAL DEPTH CIRCULAR PIPE

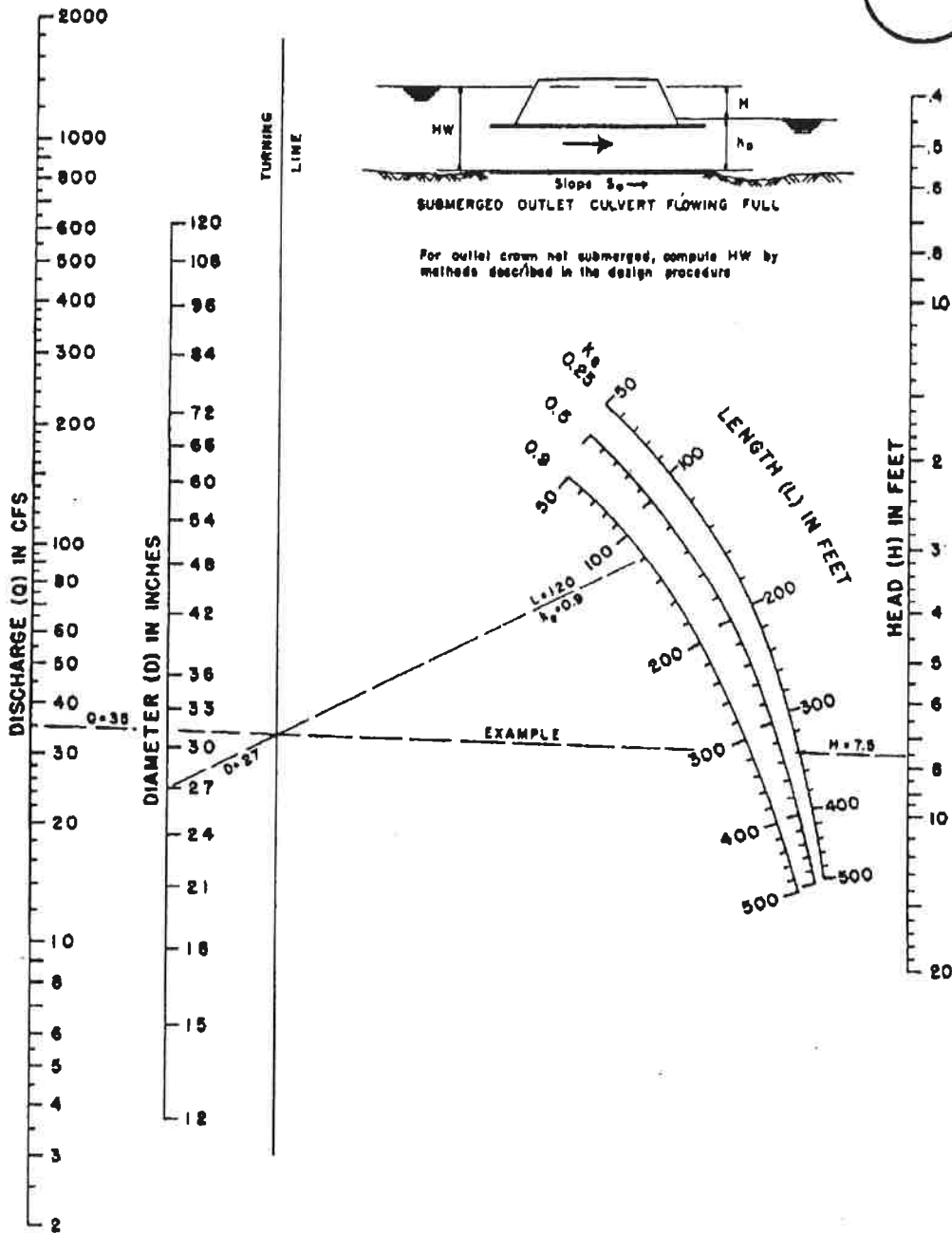
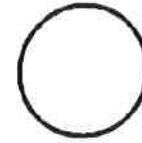
CHART 5B



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
 $n = 0.012$

BUREAU OF PUBLIC ROADS JAN. 1963

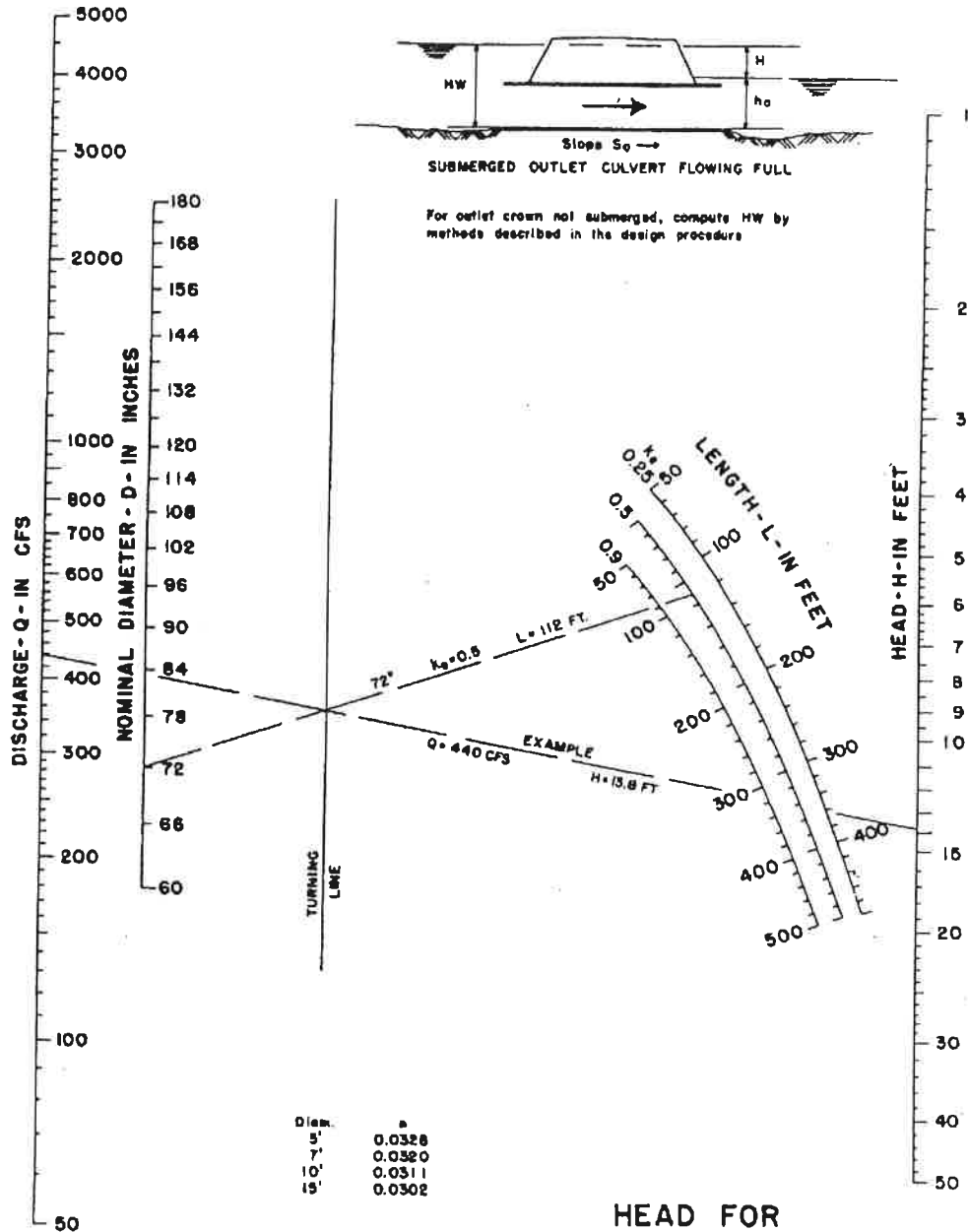
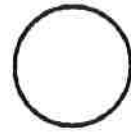
CHART 6B



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

BUREAU OF PUBLIC ROADS JAN 1963

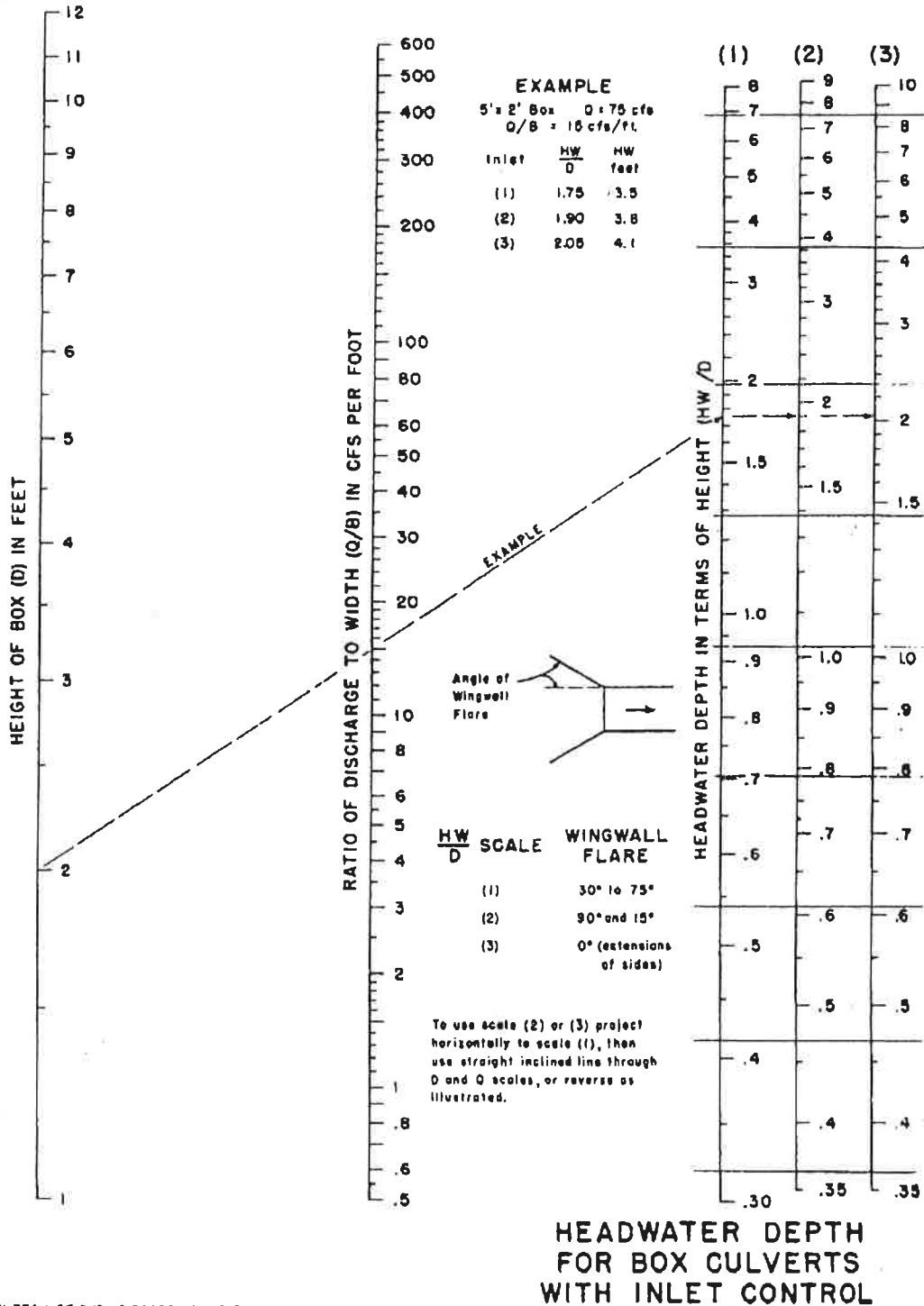
CHART 7B



**HEAD FOR
STRUCTURAL PLATE
CORR. METAL PIPE CULVERTS
FLOWING FULL
n = 0.0328 TO 0.0302**

BUREAU OF PUBLIC ROADS JAN. 1963

CHART 8B



BUREAU OF PUBLIC ROADS JAN. 1963

CHART 9B

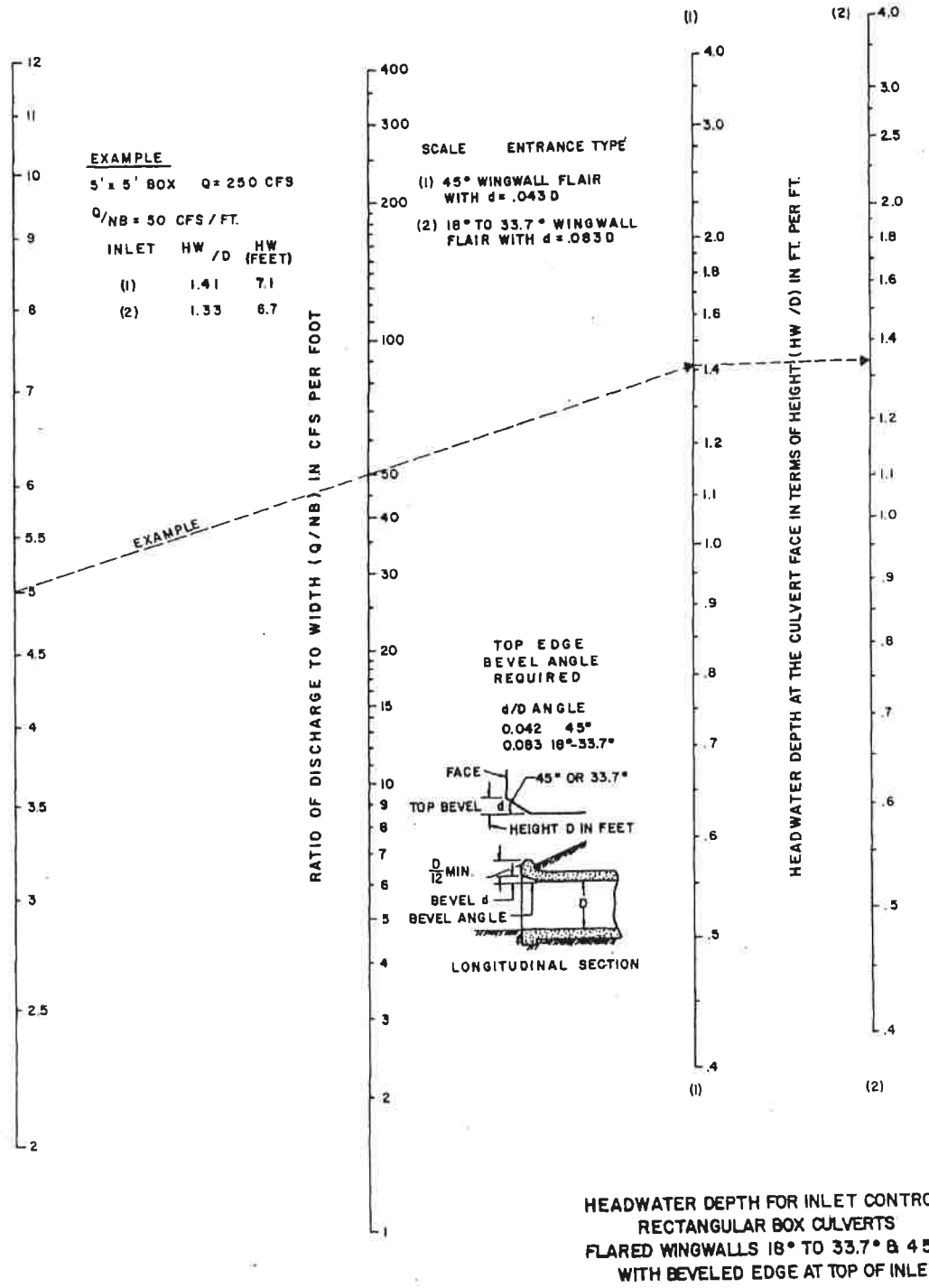


CHART 10B

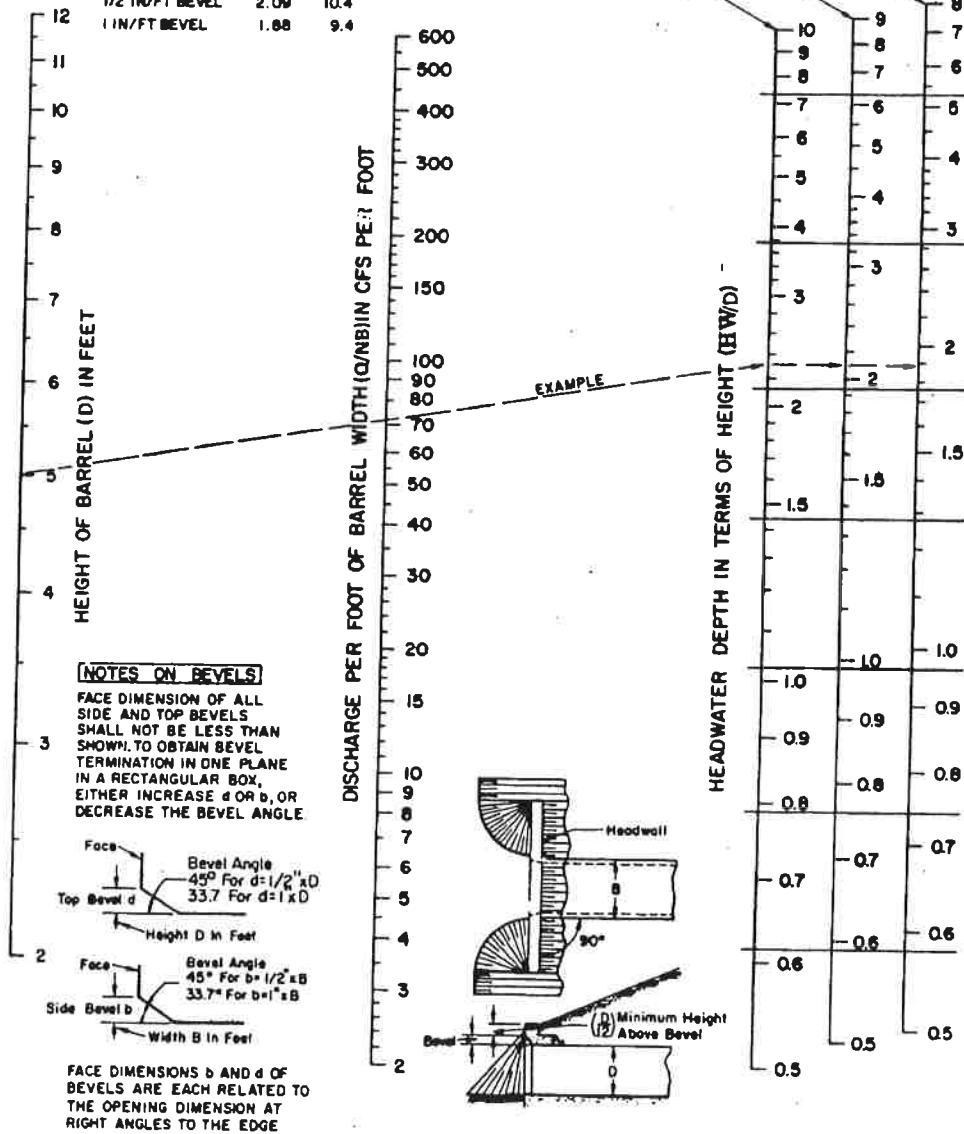
EXAMPLE

B = 7 FT. D = 5 FT. Q = 500 CFS Q/NB = 71.5

ALL EDGES	HW D	HW feet
CHAMFER 3/4"	2.31	11.5
1/2 IN/FT BEVEL	2.09	10.4
1 IN/FT BEVEL	1.88	9.4

INLET FACE—ALL EDGES:

- 1 IN/FT BEVELS 33.7° (1:1.6)
- 1/2 IN/FT BEVELS 45° (1:1)
- 3/4 INCH CHAMFERS



**HEADWATER DEPTH FOR INLET CONTROL
RECTANGULAR BOX CULVERTS
90° HEADWALL
CHAMFERED OR BEVELED INLET EDGES**

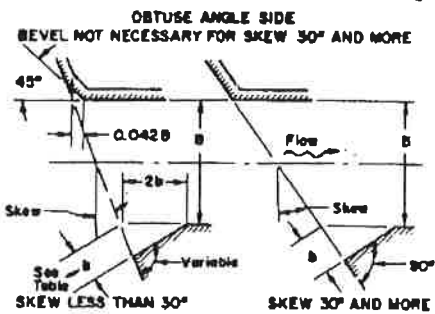
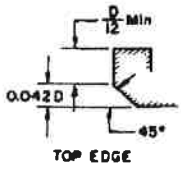
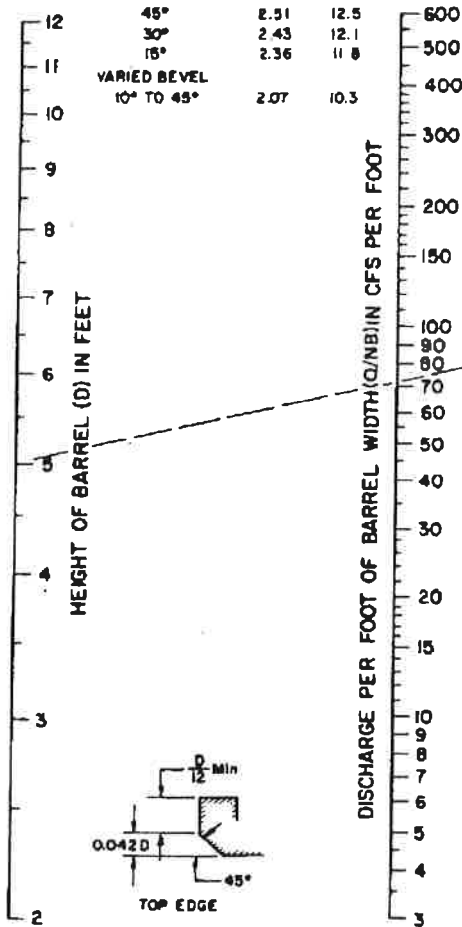
FEDERAL HIGHWAY ADMINISTRATION
MAY 1973

CHART 11B

EXAMPLE

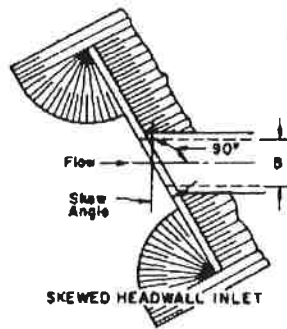
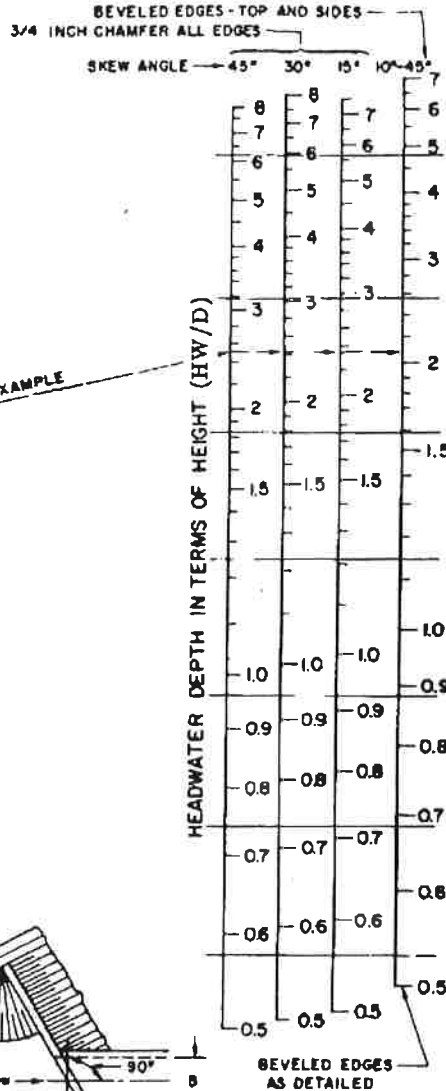
B=7 FT. D=5 FT. Q=500 CFS

EDGE & SKEW	HW D	HW feet
45° 3/4" CHAMFER	2.31	12.5
30°	2.43	12.1
15°	2.36	11.8
VARIABLE BEVEL 10° TO 45°	2.07	10.3



BEVEL NOT NECESSARY FOR SKEW 30° AND MORE
DESIGNED FOR SAME CAPACITY AT ANY SKEW

FEDERAL HIGHWAY ADMINISTRATION
MAY 1973



BEVELED EDGES AS DETAILED

SKEW ANGLE	SIDE BEVEL b
10°	3/4" x B (N1)
15°	1" x B
22-1/2°	1-1/4" x B
30°	1-1/2" x B
37-1/2°	2" x B
45°	2-1/2" x B

HEADWATER DEPTH FOR INLET CONTROL
SINGLE BARREL BOX CULVERTS
SKEWED HEADWALLS
CHAMFERED OR BEVELED INLET EDGES

CHART 12B

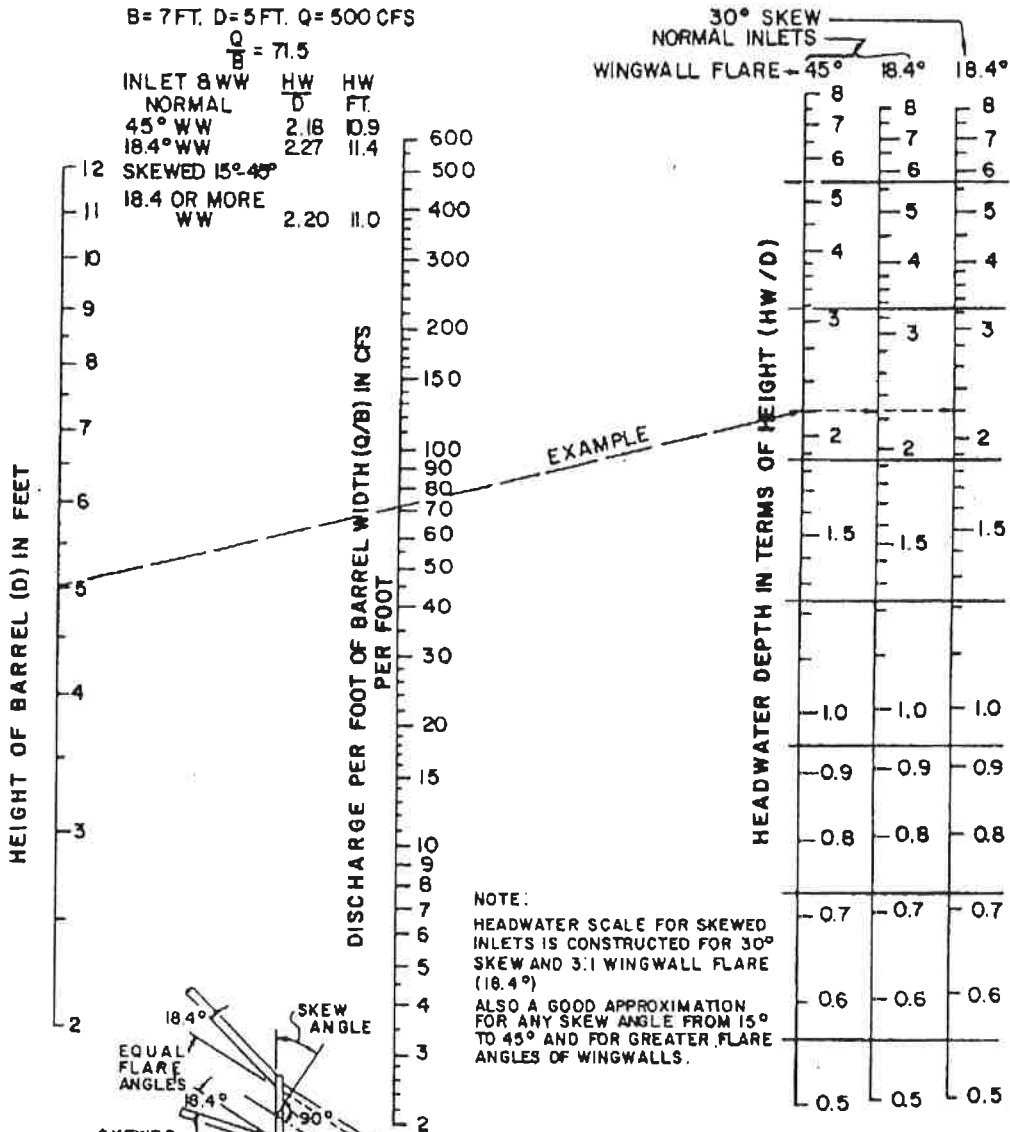


EXAMPLE

B = 7 FT. D = 5 FT. Q = 500 CFS

$$\frac{Q}{B} = 71.5$$

INLET & WW	HW D	HW FT.
NORMAL	D	D
45° WW	2.18	10.9
18.4° WW	2.27	11.4
SKEWED 15°-45°		
18.4 OR MORE WW	2.20	11.0



NOTE:
HEADWATER SCALE FOR SKEWED
INLETS IS CONSTRUCTED FOR 30°
SKEW AND 3:1 WINGWALL FLARE
(18.4°)
ALSO A GOOD APPROXIMATION
FOR ANY SKEW ANGLE FROM 15°
TO 45° AND FOR GREATER FLARE
ANGLES OF WINGWALLS.

WINGWALL INLETS
BUREAU OF PUBLIC ROADS
OFFICE OF R & D AUGUST 1968

**HEADWATER DEPTH FOR INLET CONTROL
RECTANGULAR BOX CULVERTS
FLARED WINGWALLS
NORMAL AND SKEWED INLETS
3/4" CHAMFER AT TOP OF OPENING**

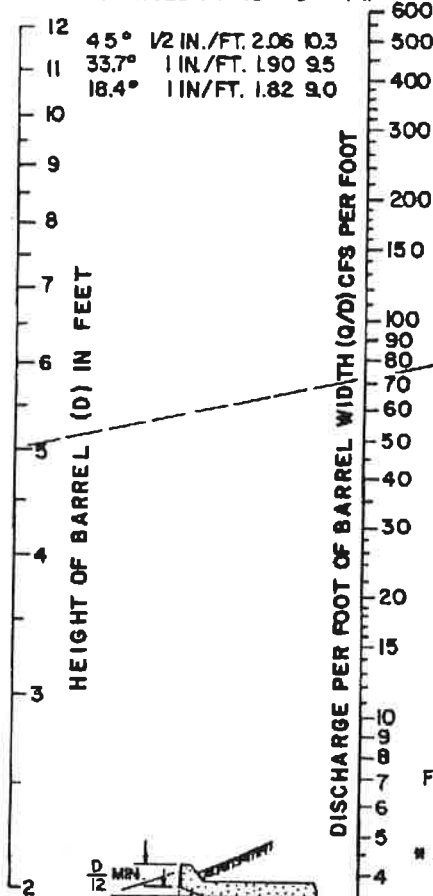
CHART 13B

EXAMPLE

B = 7 FT. D = 5 FT. Q = 600 C.F.S.

$$\frac{Q}{B} = 71.5$$

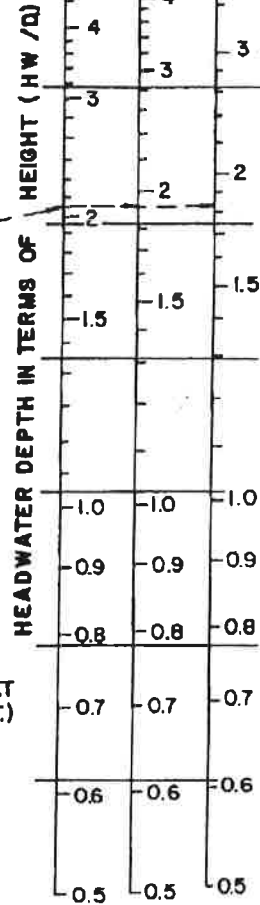
WINGWALL TOP EDGE
FLARE ANGLE BEVEL HW HW
D D FT.



18.4° WW & d = 0.083D
33.7° WW & d = 0.083D
45° WW & d = 0.042D

TOP EDGE
BEVEL ANGLE
REQUIRED

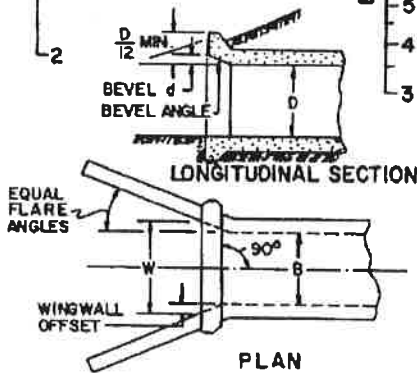
d	ANGLE
0.042	45°
0.083	33.7°



WINGWALLS

FLARE ANGLE	MIN. OFFSET
1:1 45°	3/4" x B (FT.)
1:1.5 33.7°	1" x B
1:2 26.6°	1-1/4" x B
1:3 18.4°	1-1/2" x B

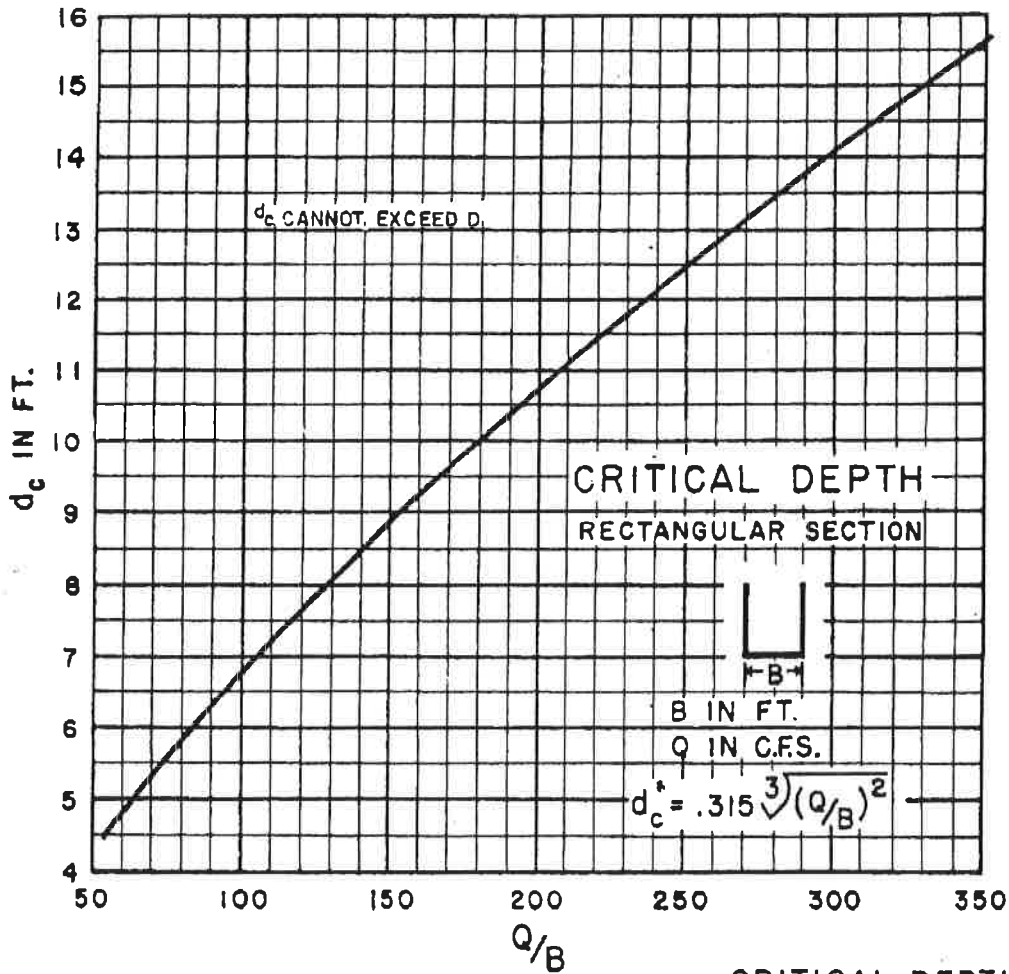
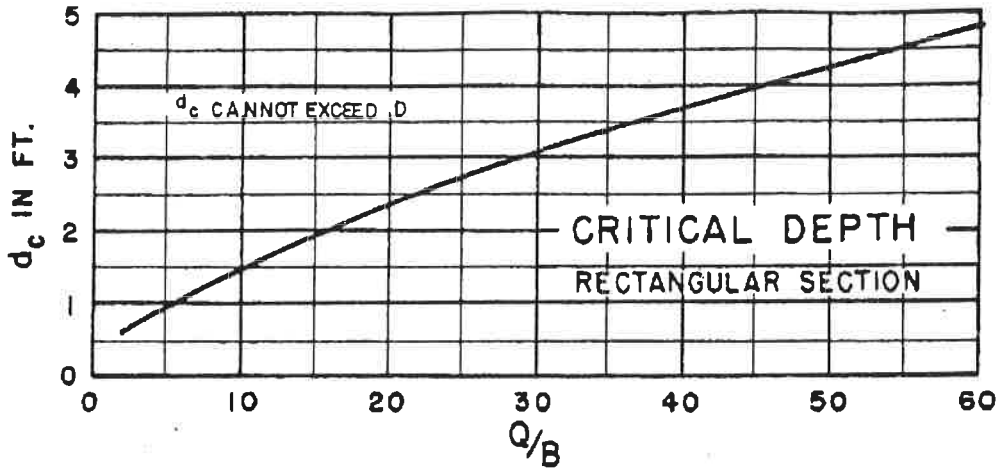
* USE 33.7° x 0.0083D TOP
EDGE BEVEL AND READ
HW ON SCALE FOR 18.4°
WW



BUREAU OF PUBLIC ROADS
OFFICE OF R & D AUGUST 1968

HEADWATER DEPTH FOR INLET CONTROL
RECTANGULAR BOX CULVERTS
OFFSET FLARED WINGWALLS
AND BEVELED EDGE AT TOP OF INLET

CHART 14B

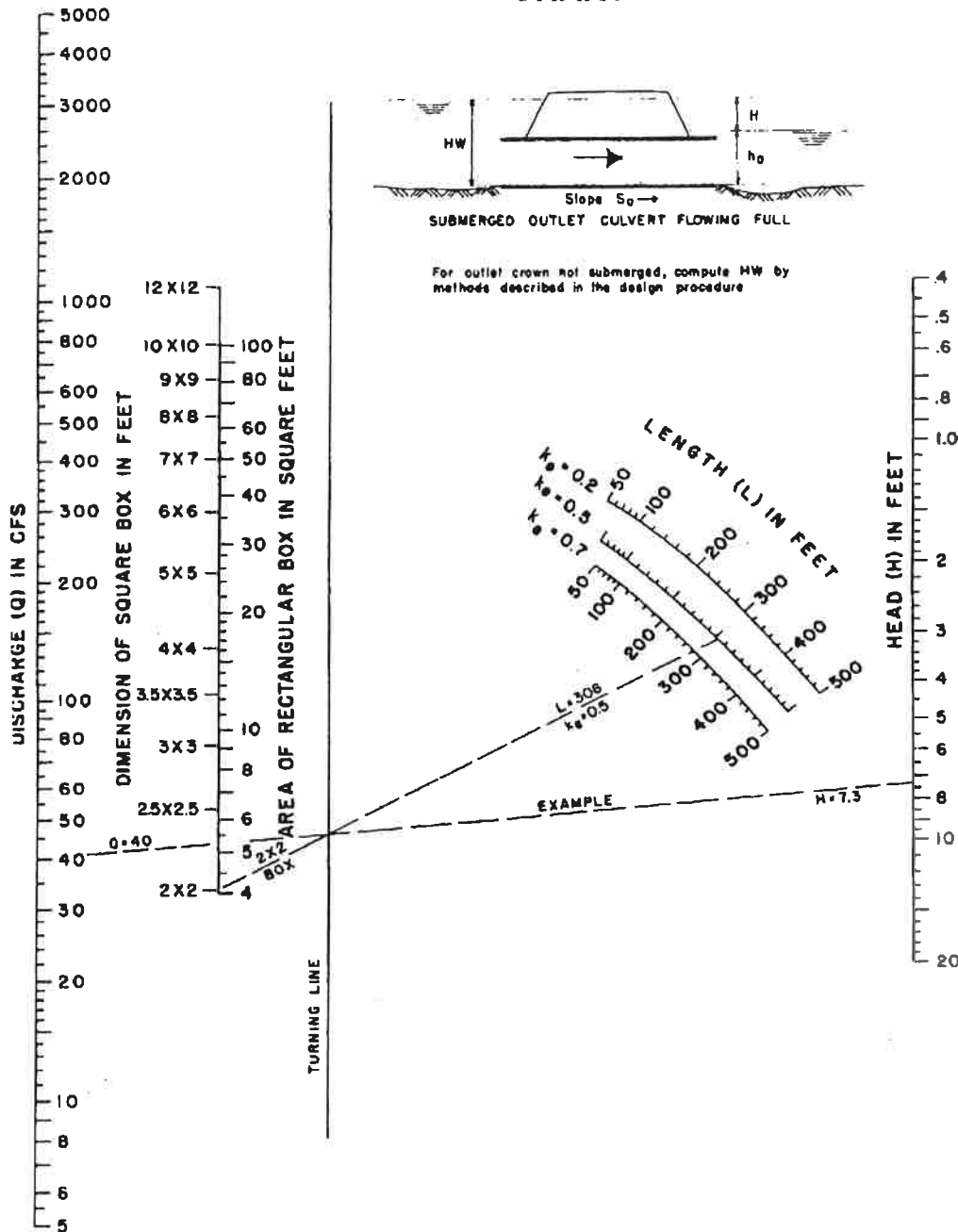


BUREAU OF PUBLIC ROADS, JAN 1963

CRITICAL DEPTH
RECTANGULAR SECTION



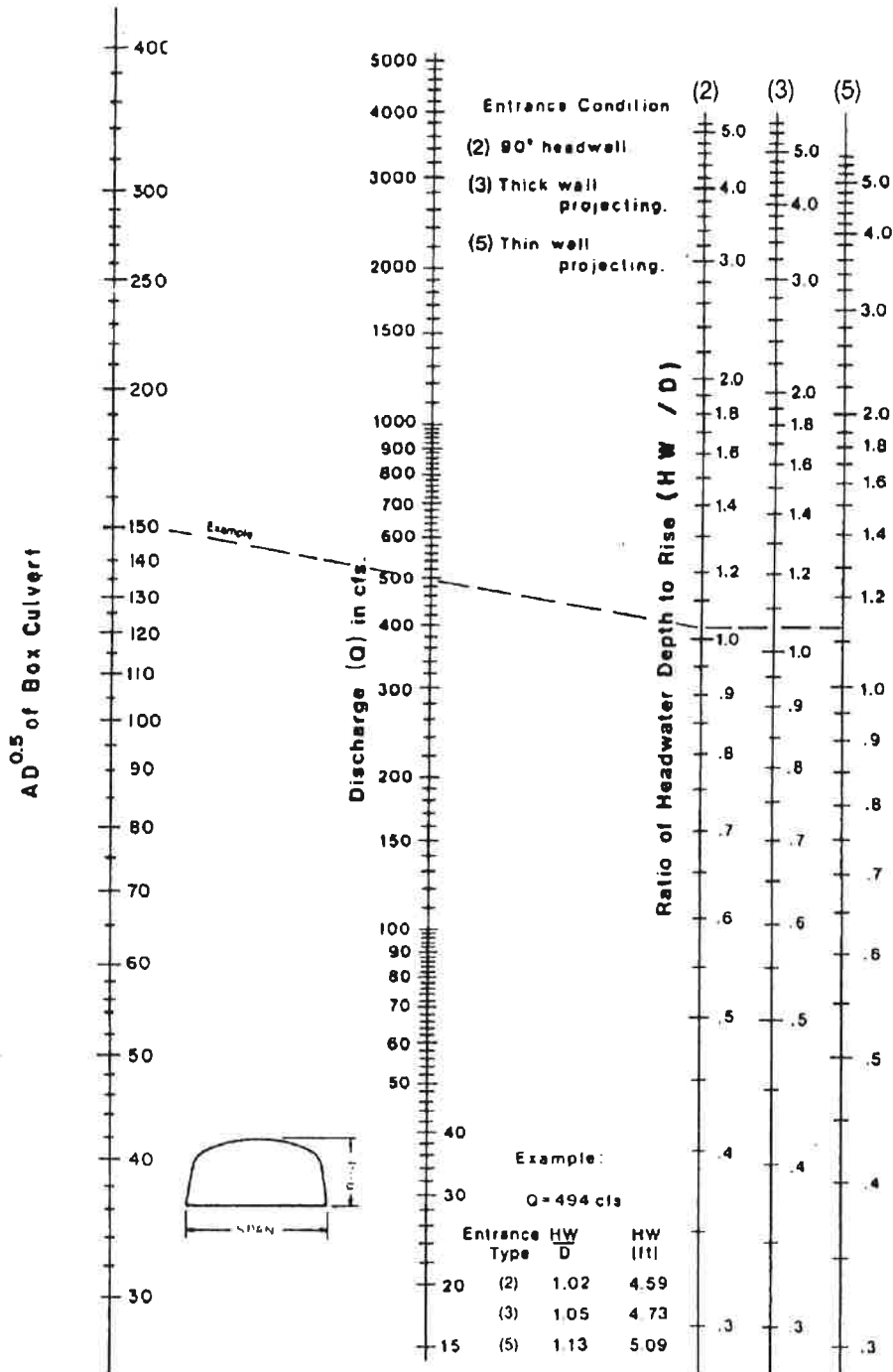
CHART 15B



HEAD FOR
CONCRETE BOX CULVERTS
FLOWING FULL
 $n = 0.012$

AJ OF PUBLIC ROADS JAN. 1963

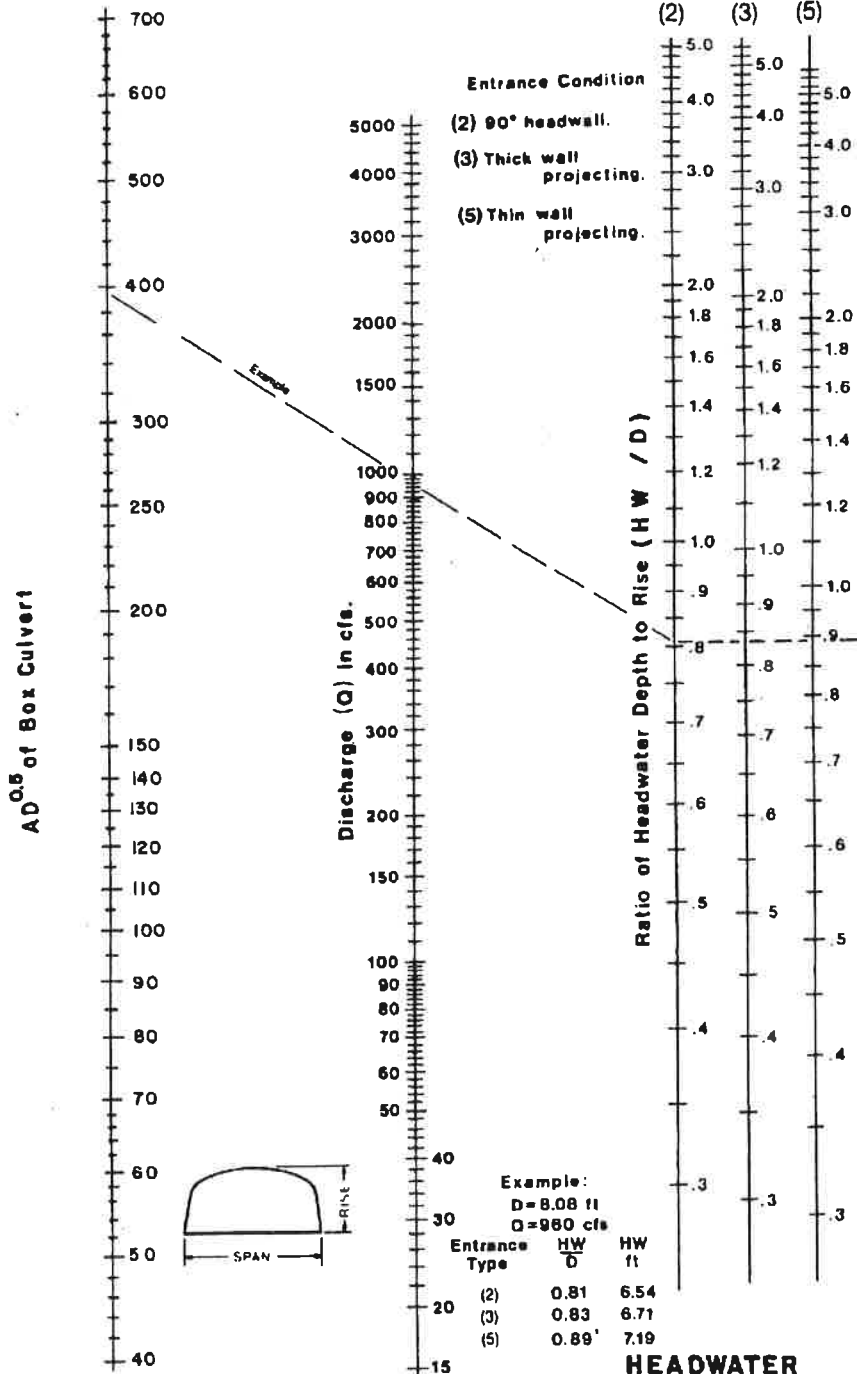
CHART 16B



Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

HEADWATER DEPTH
FOR C.M. BOX CULVERTS
RISE / SPAN < 0.3
WITH INLET CONTROL

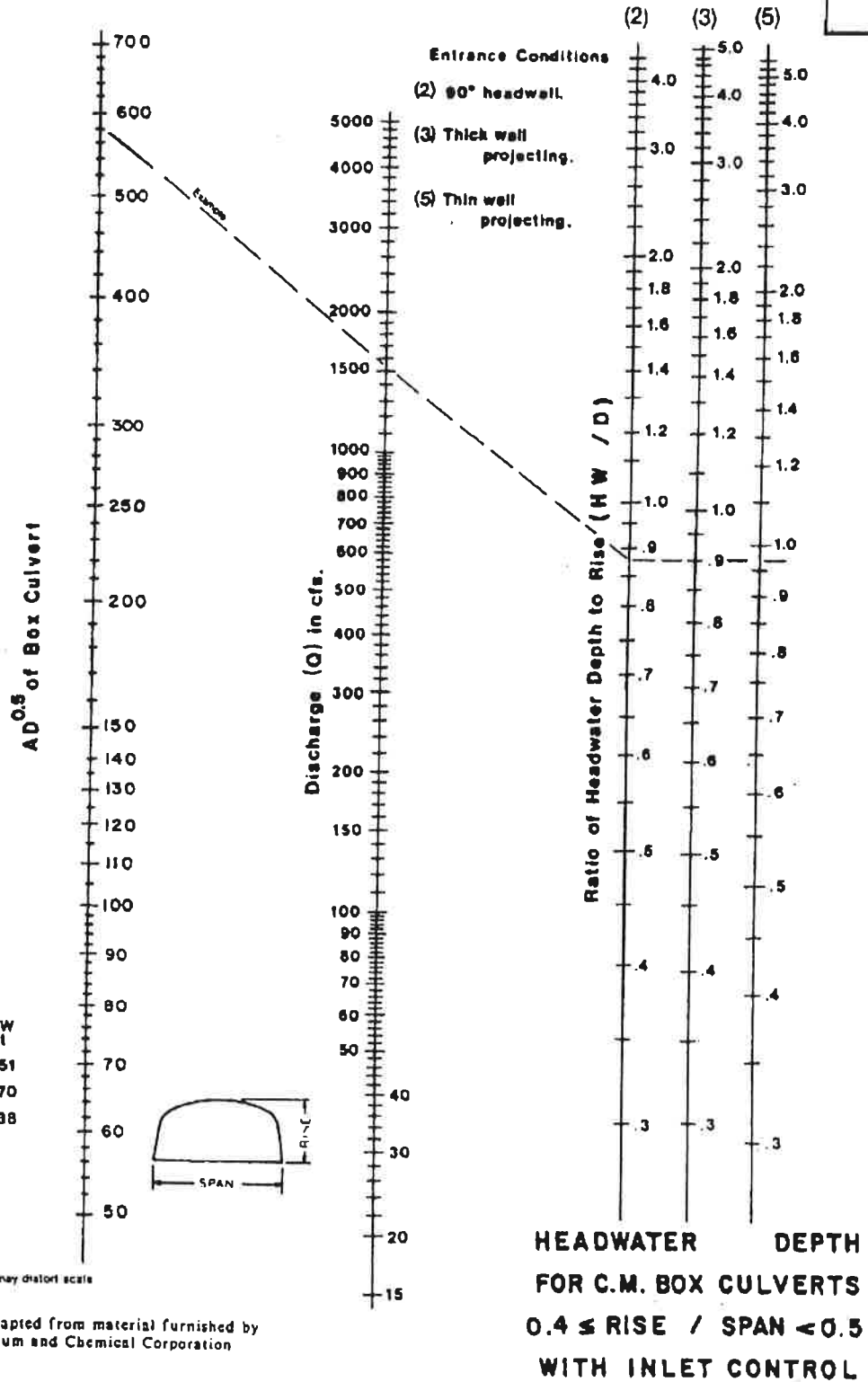
CHART 17B



Duplication of this nomograph may distort scale

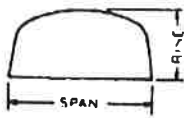
Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

CHART 18B



Example:
D = 9.67 ft
Q = 1520 cfs

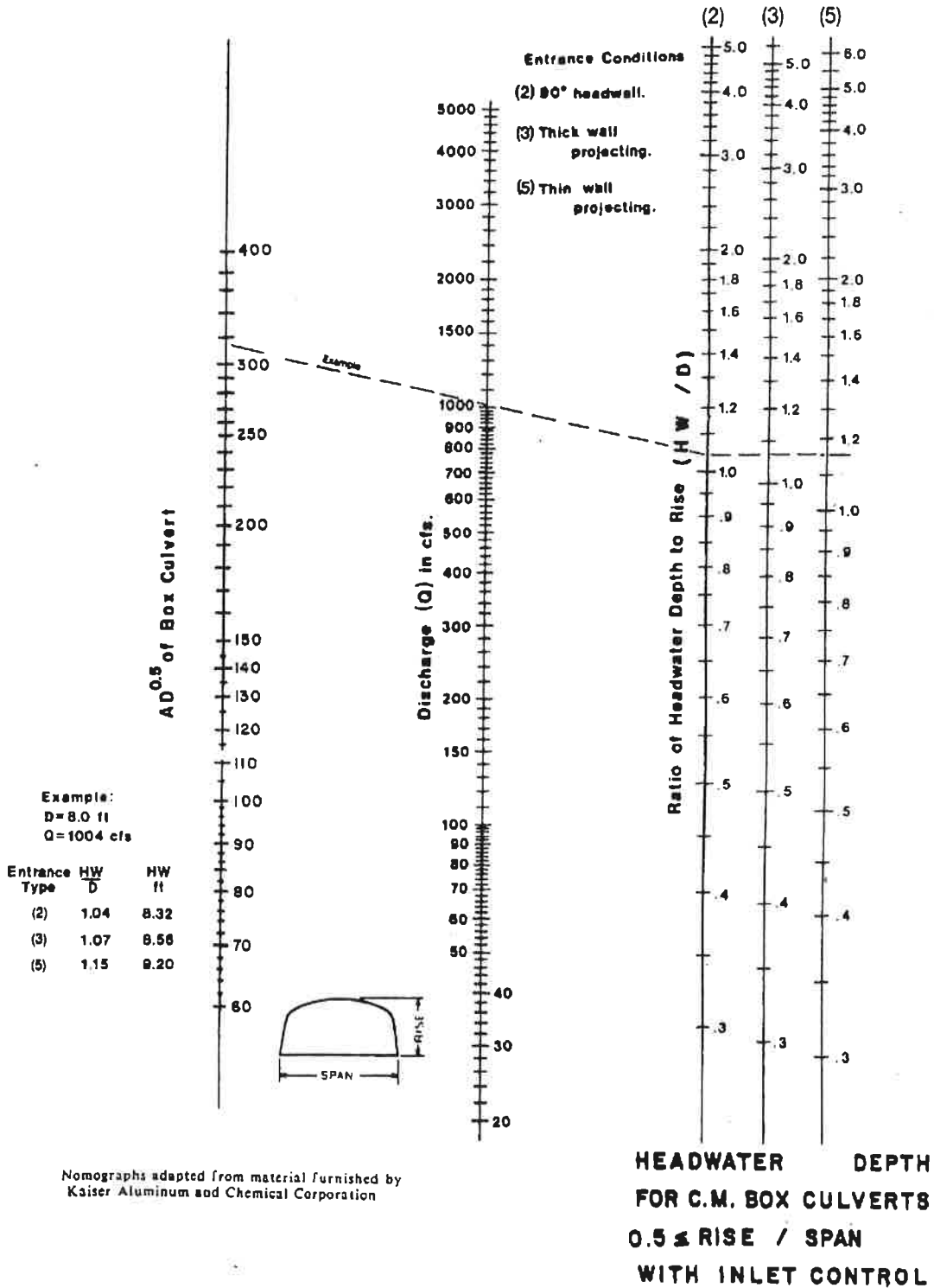
Entrance Type	H W / D	HW ft
(2)	0.88	8.51
(3)	0.90	8.70
(5)	0.97	9.38



Duplication of this nomograph may distort scale

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

CHART 19B



Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

CHART 20B

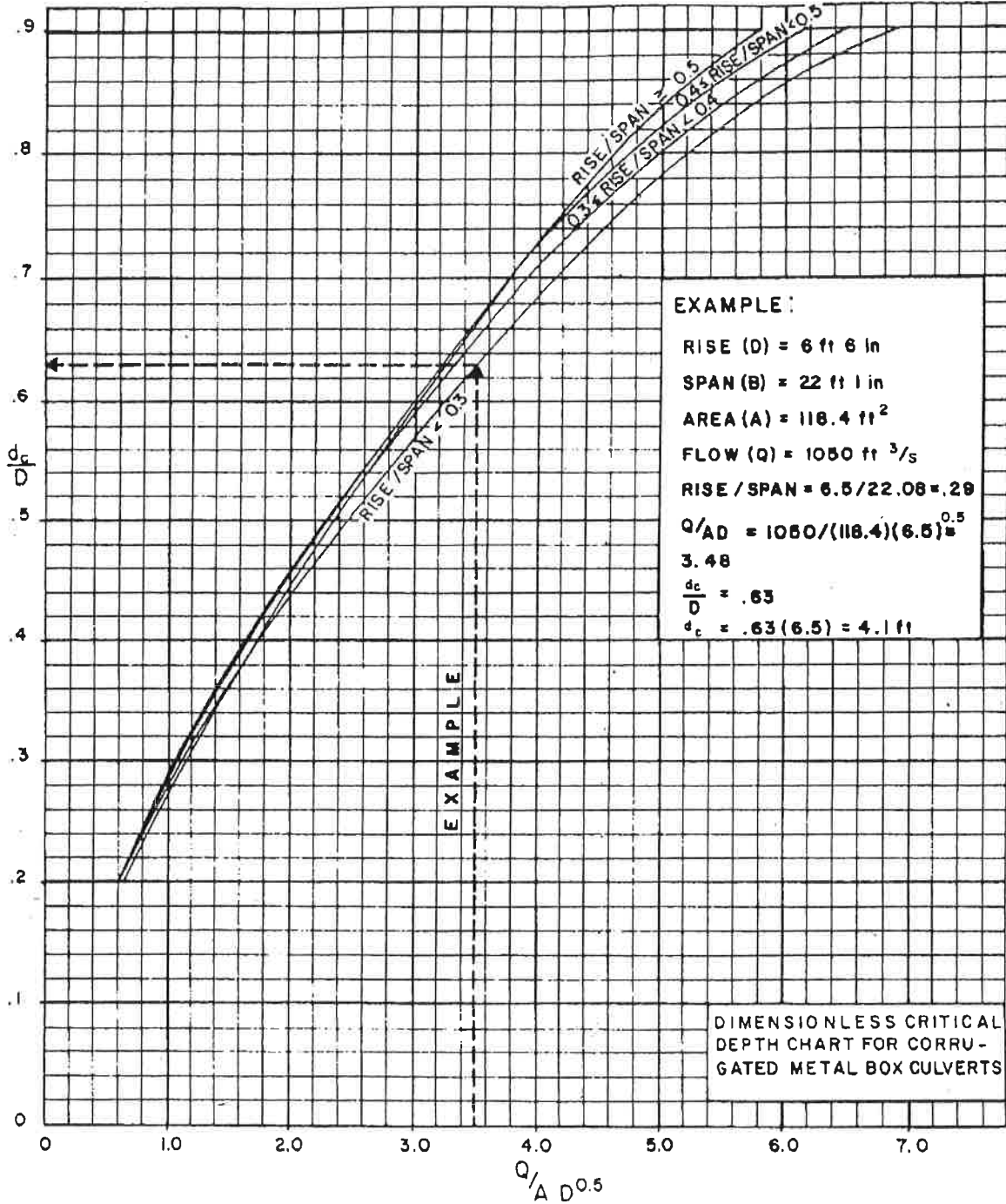
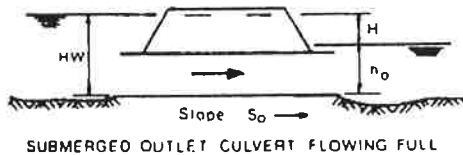
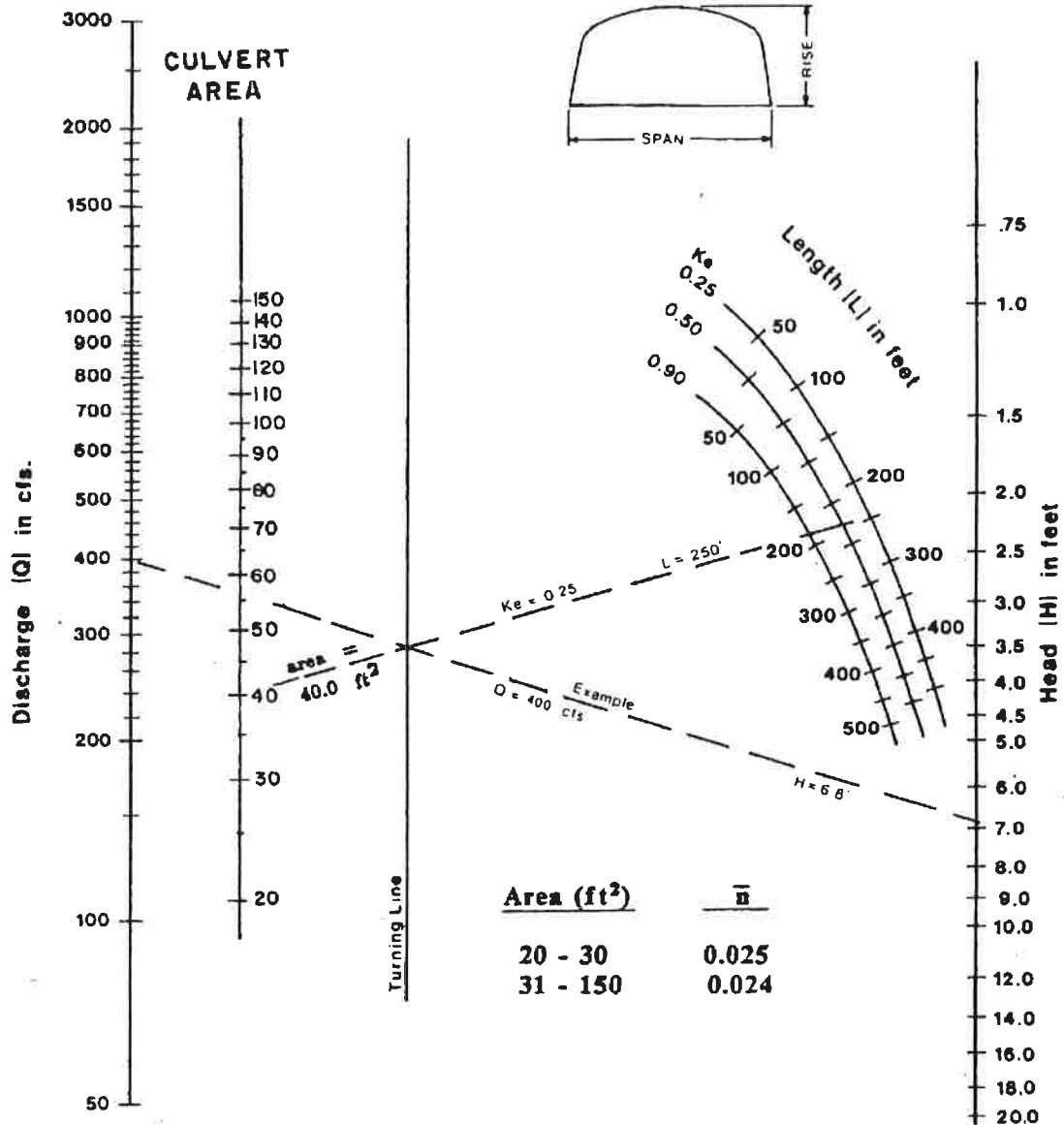


CHART 21B

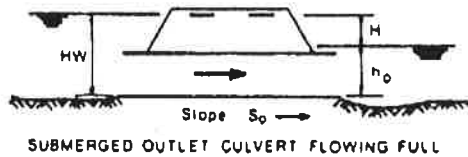
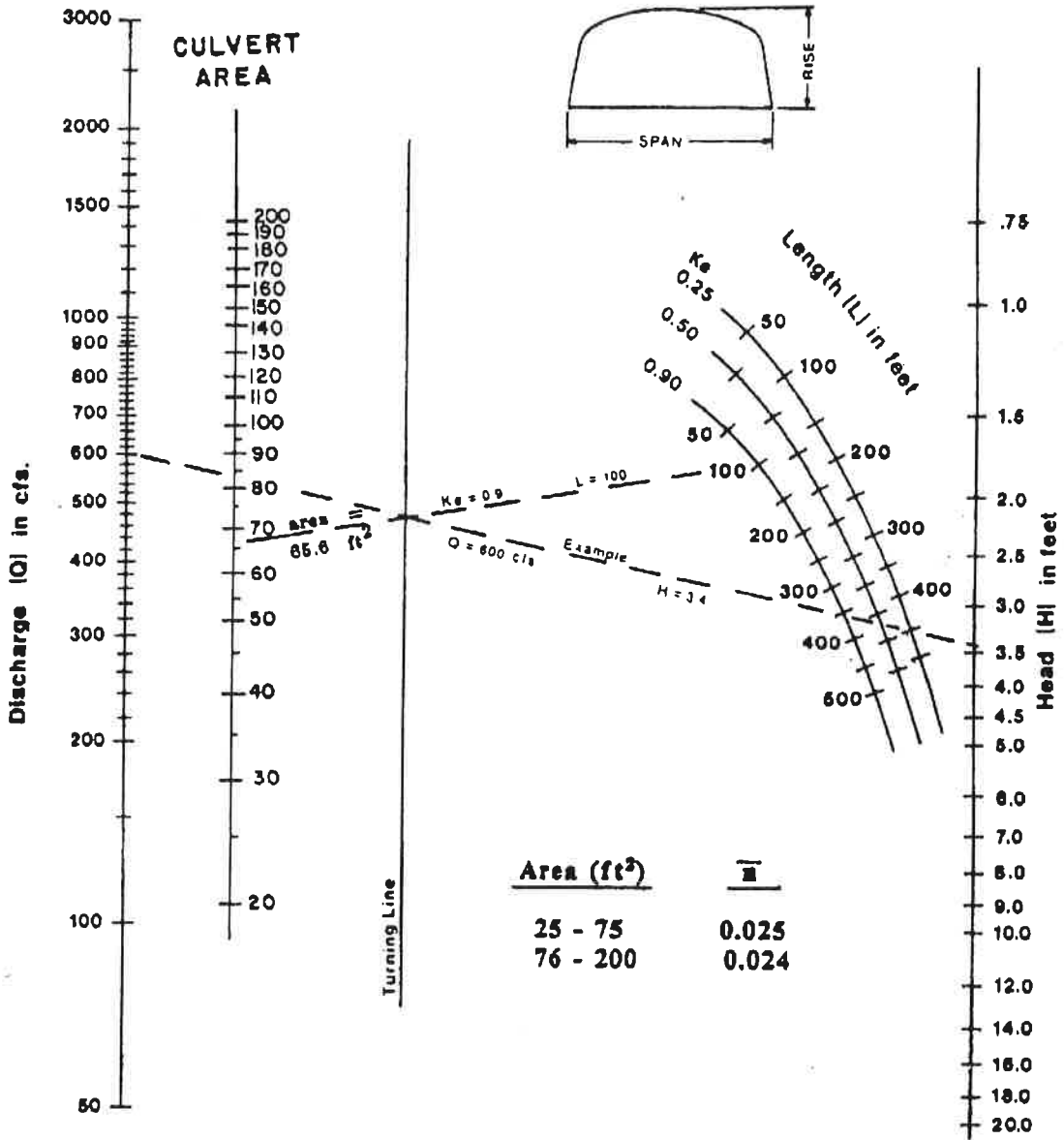


**HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CONCRETE BOTTOM
RISE / SPAN < 0.3**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale

CHART 22B

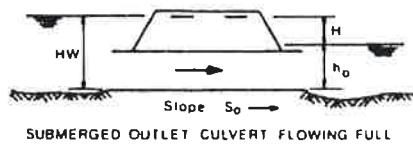
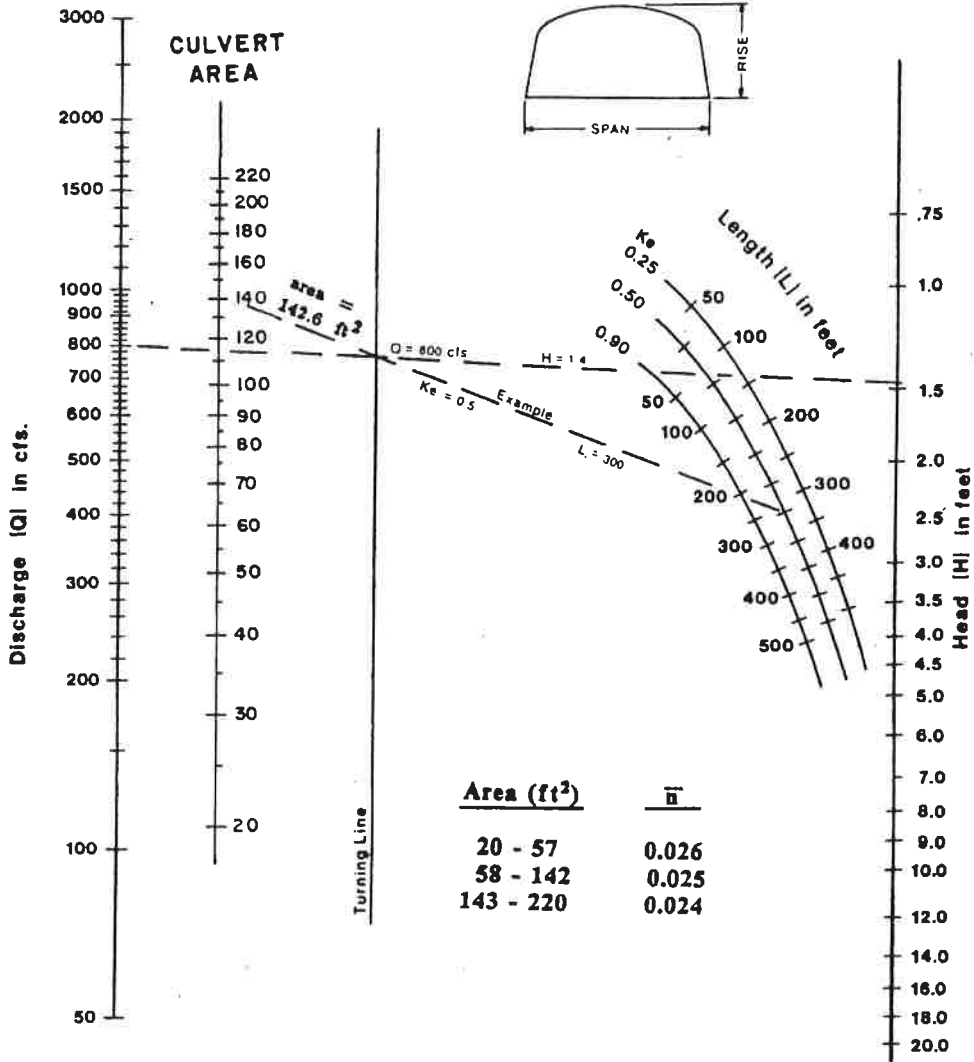


**HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CONCRETE BOTTOM
 $0.3 \leq \text{RISE} / \text{SPAN} < 0.4$**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale

CHART 23B

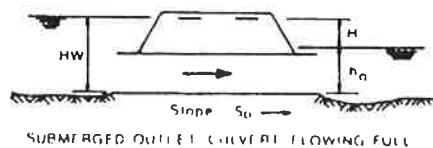
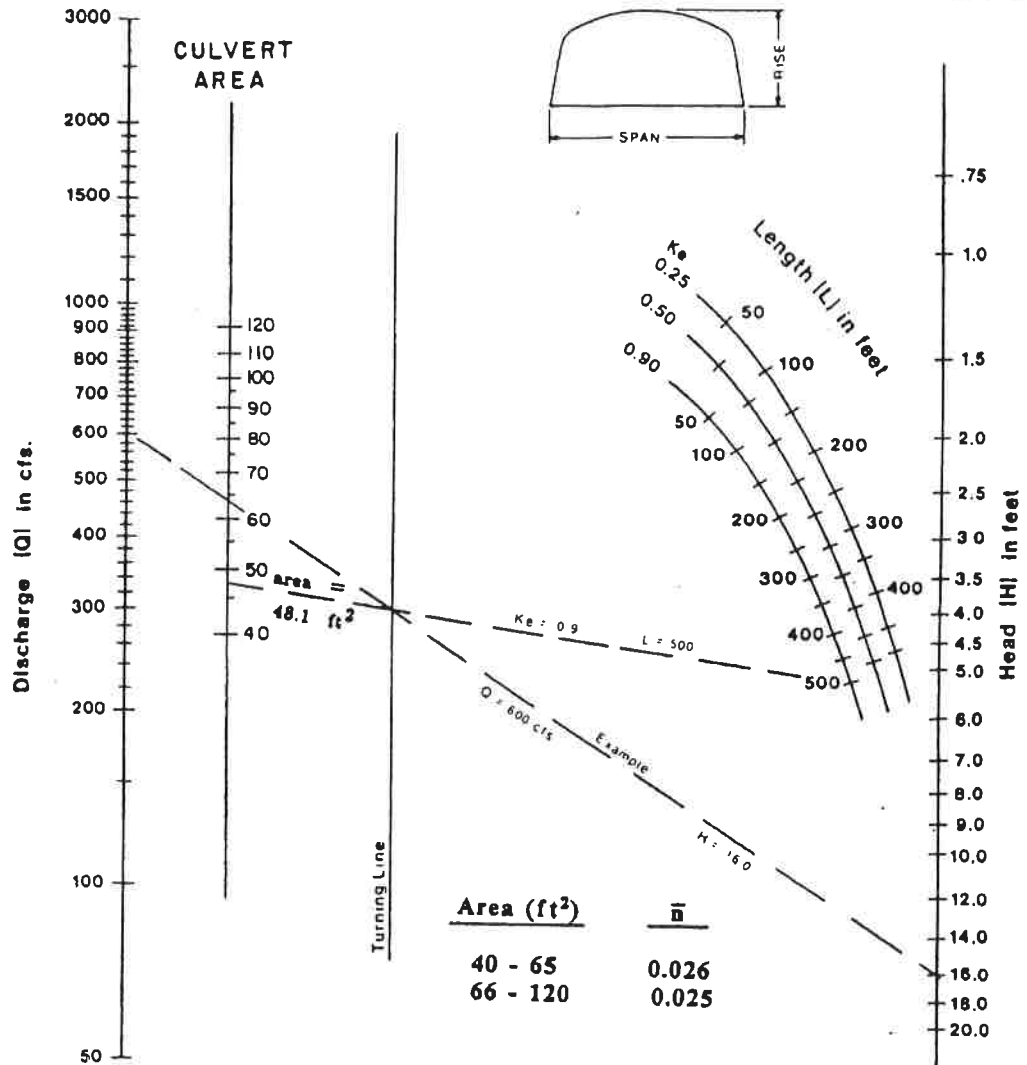


**HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CONCRETE BOTTOM
 $0.4 \leq \text{RISE} / \text{SPAN} < 0.5$**

Nomographs adapted from material furnished by
Kaiser Aluminium and Chemical Corporation

Duplication of this nomograph may distort scale

CHART 24B



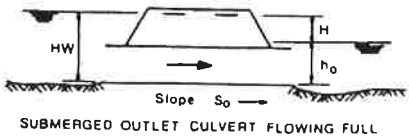
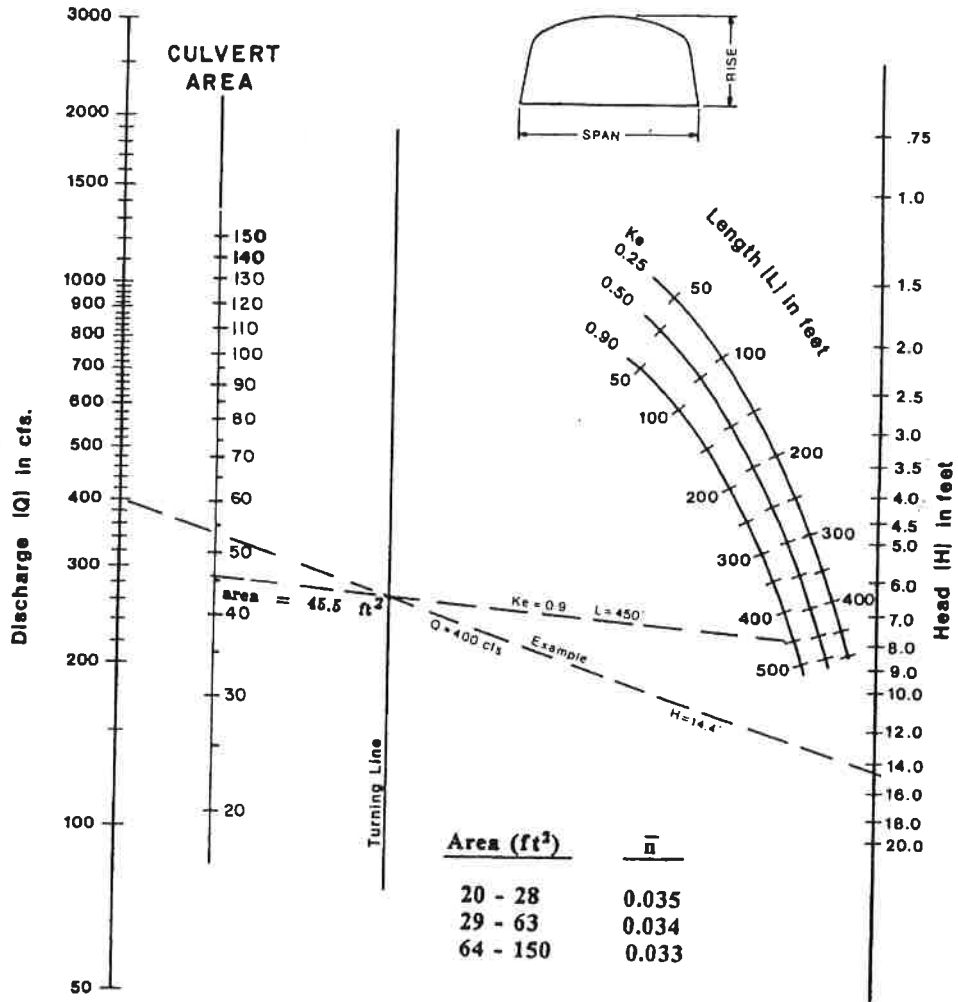
HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CONCRETE BOTTOM
 $0.5 \leq \text{RISE} / \text{SPAN}$

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale



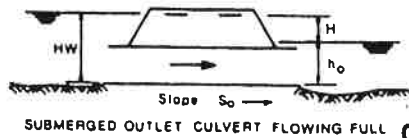
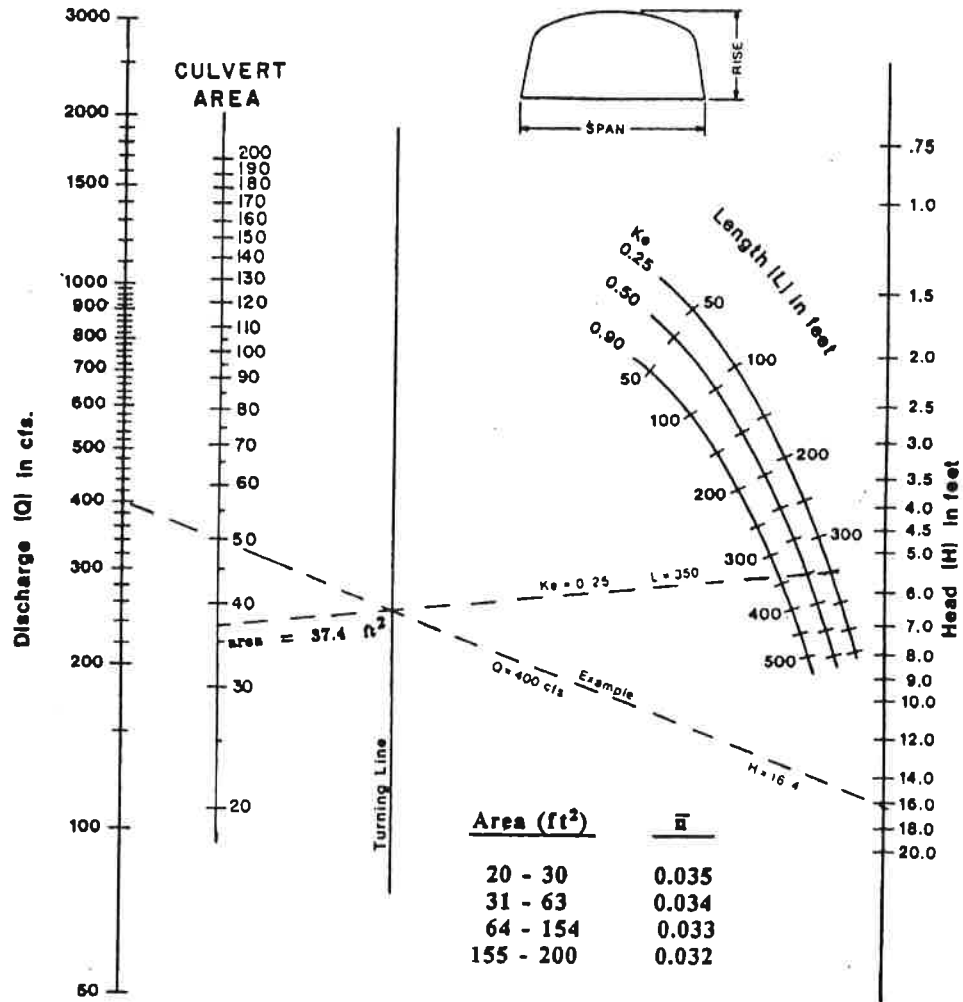
CHART 25B



**HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CORRUGATED METAL BOTTOM
RISE / SPAN < 0.3**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation
Duplication of this nomograph may distort scale

CHART 26B

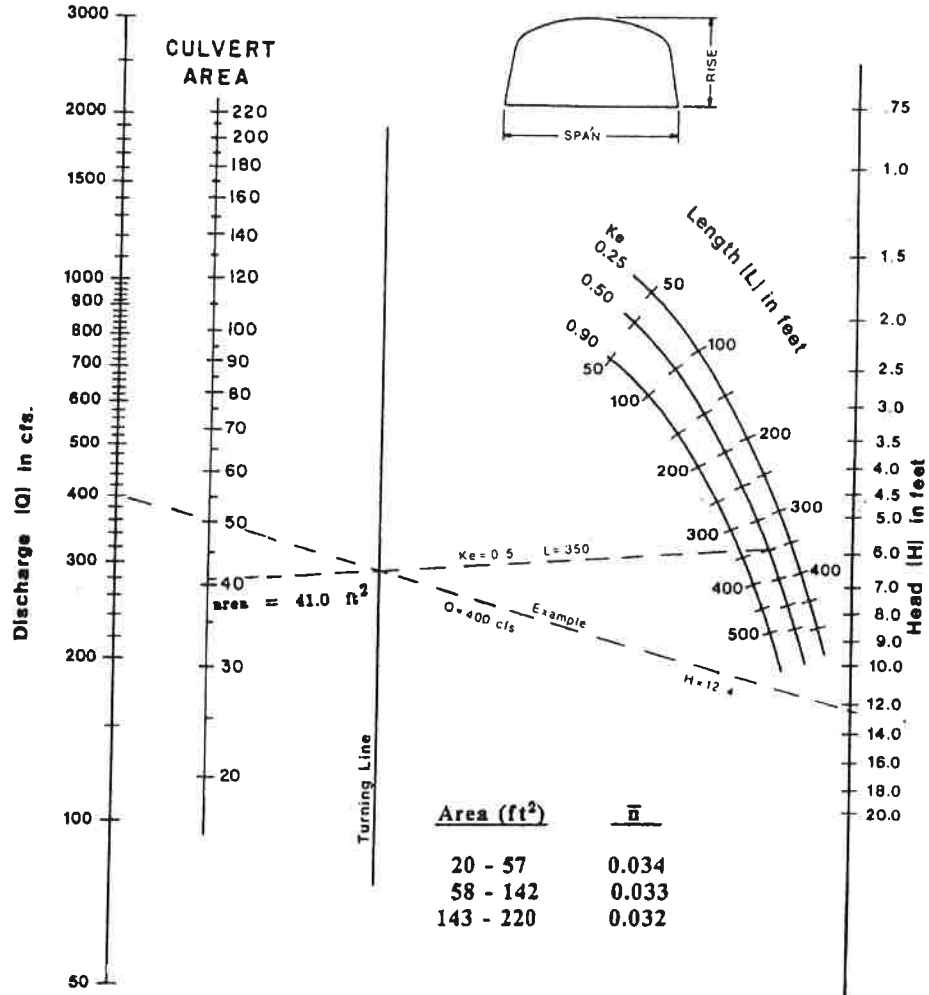


**HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CORRUGATED METAL BOTTOM
0.3 ≤ RISE / SPAN < 0.4**

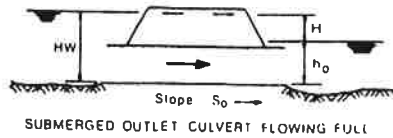
Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale

CHART 27B



Area (ft ²)	\bar{n}
20 - 57	0.034
58 - 142	0.033
143 - 220	0.032



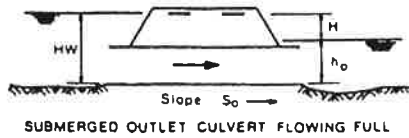
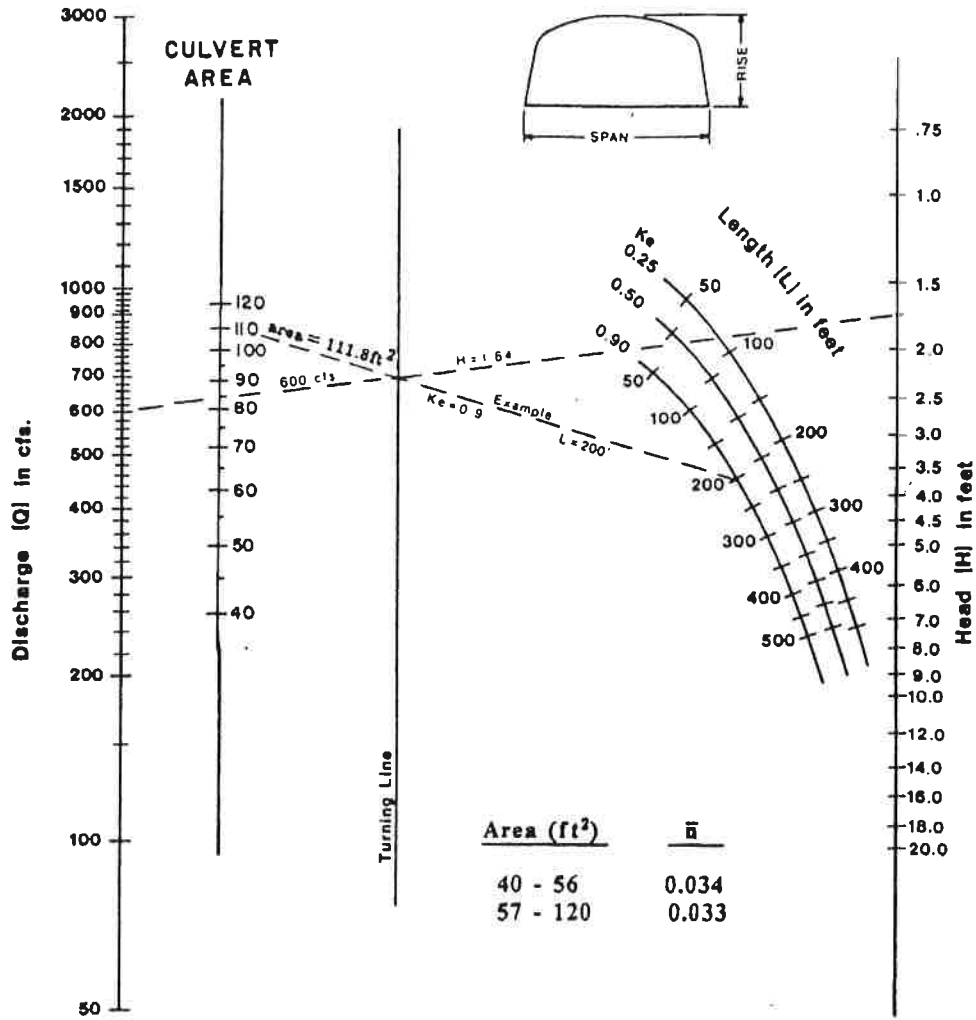
**HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CORRUGATED METAL BOTTOM
0.4 ≤ RISE / SPAN < 0.5**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale



CHART 28B

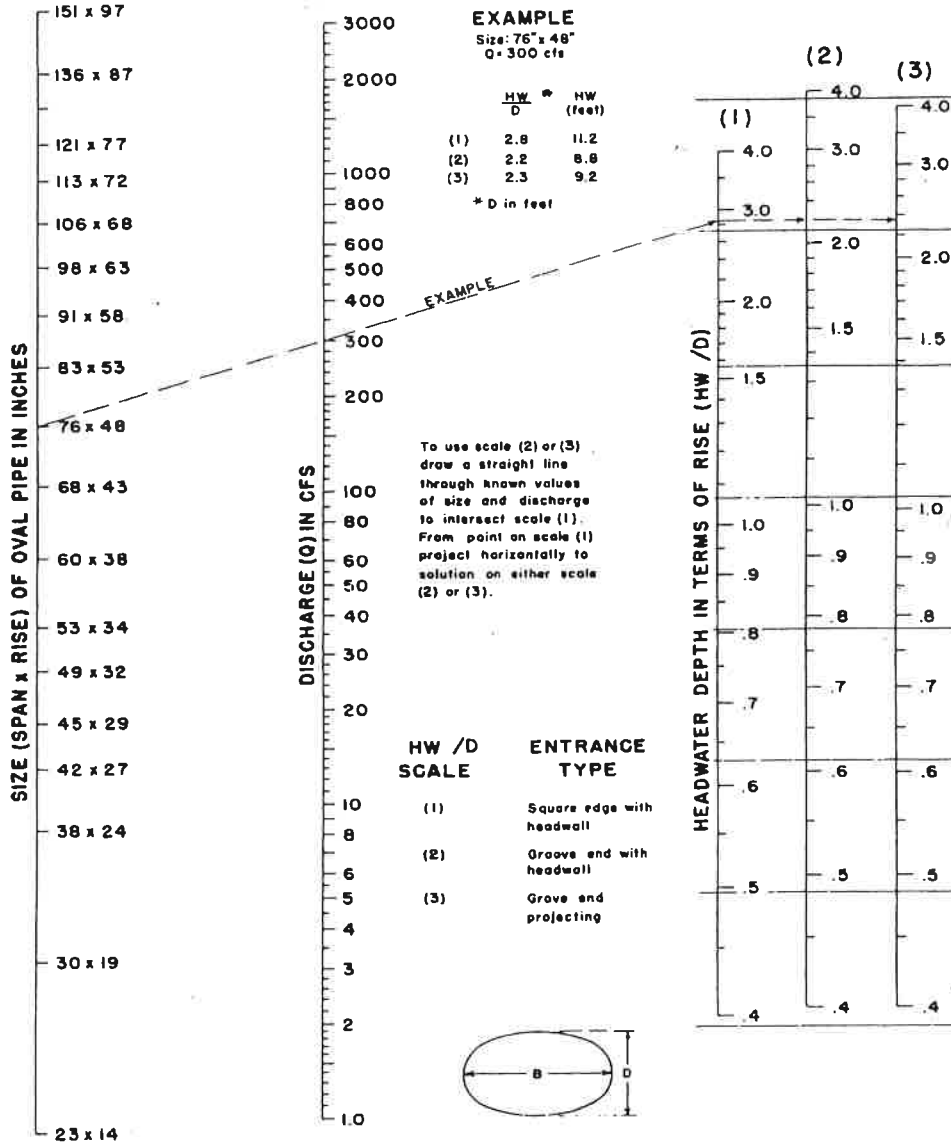


HEAD FOR
C. M. BOX CULVERTS
FLOWING FULL
CORRUGATED METAL BOTTOM
0.5 ≤ RISE / SPAN

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale

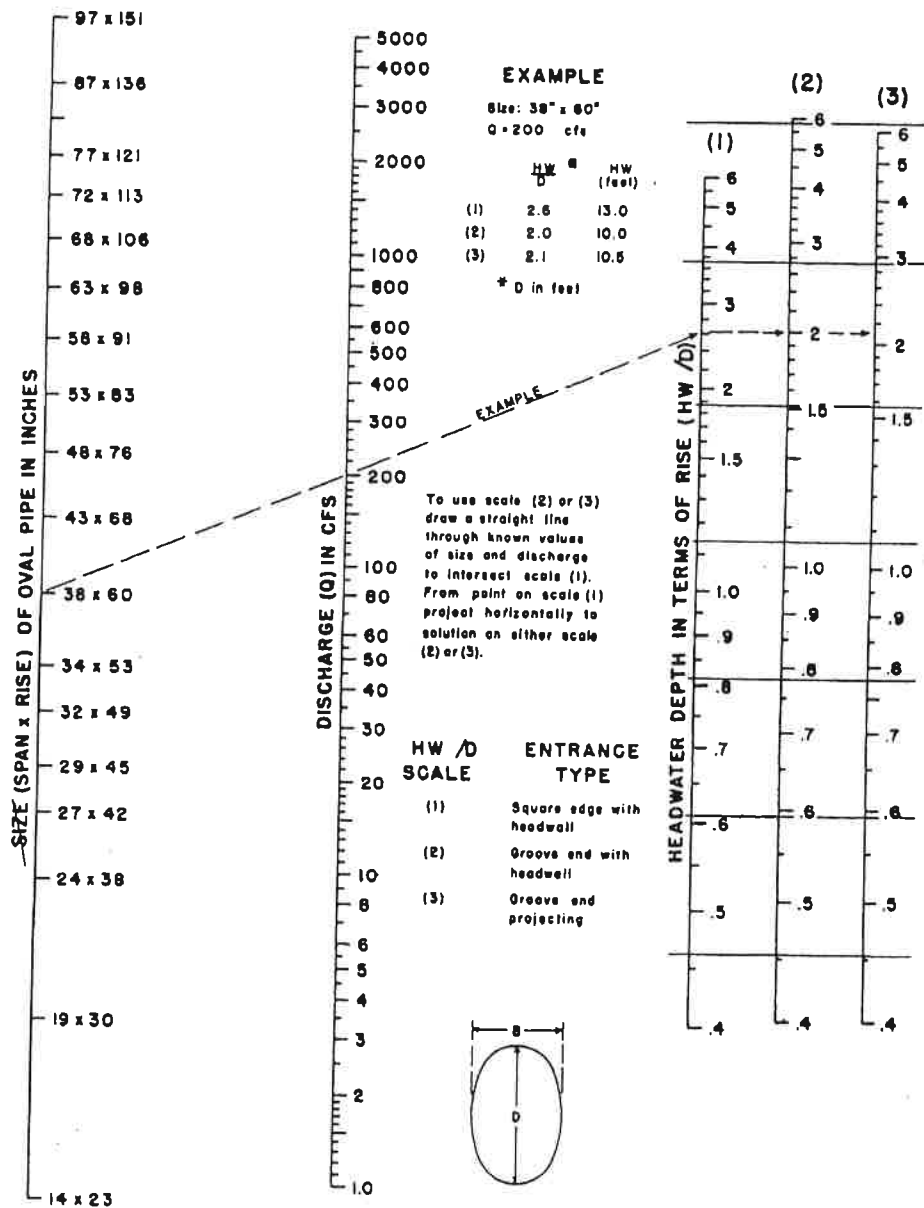
CHART 29B



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

BUREAU OF PUBLIC ROADS JAN. 1963

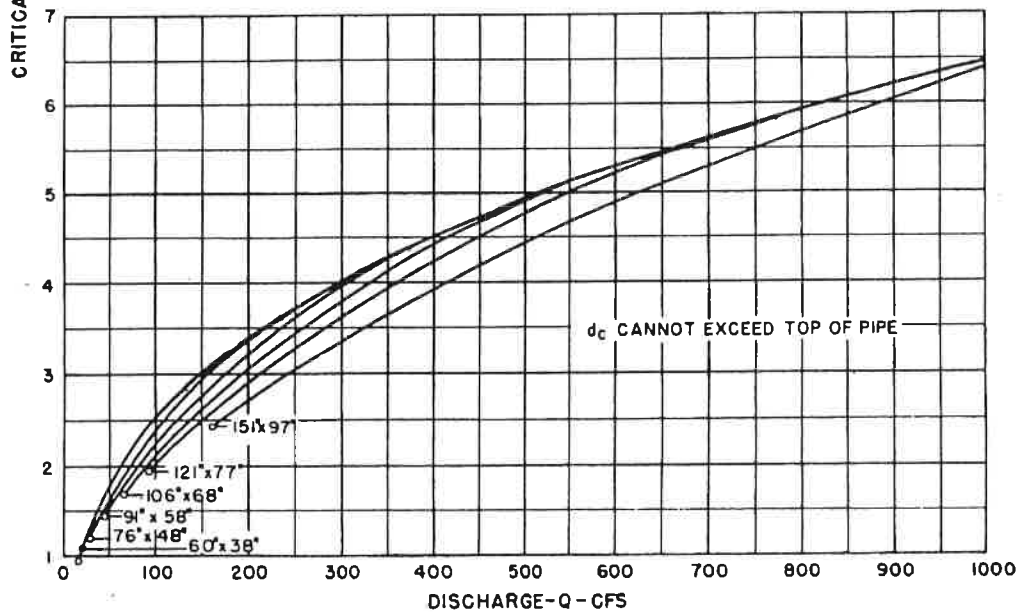
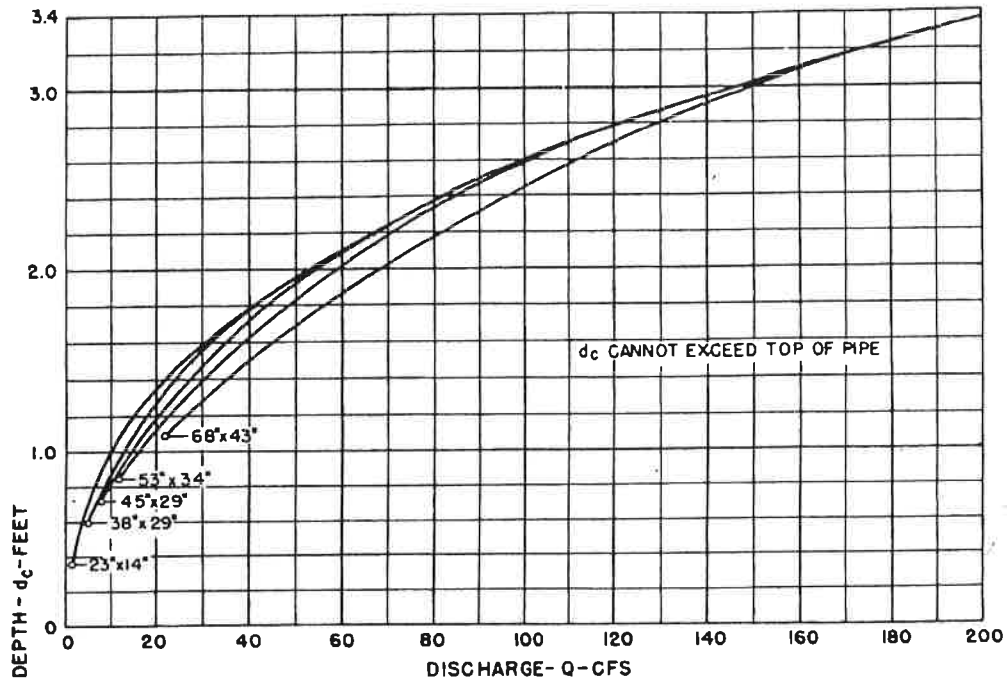
CHART 30B



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

BUREAU OF PUBLIC ROADS JAN. 1963

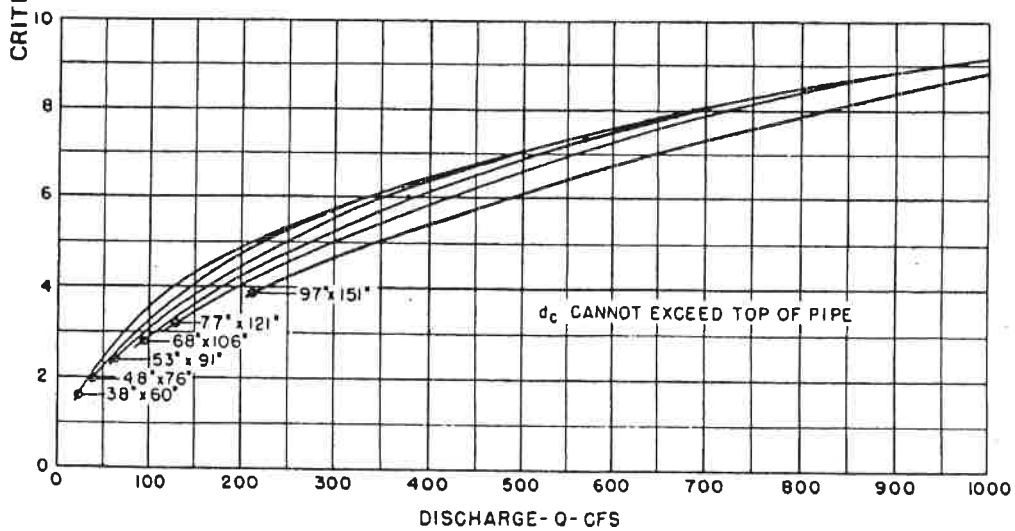
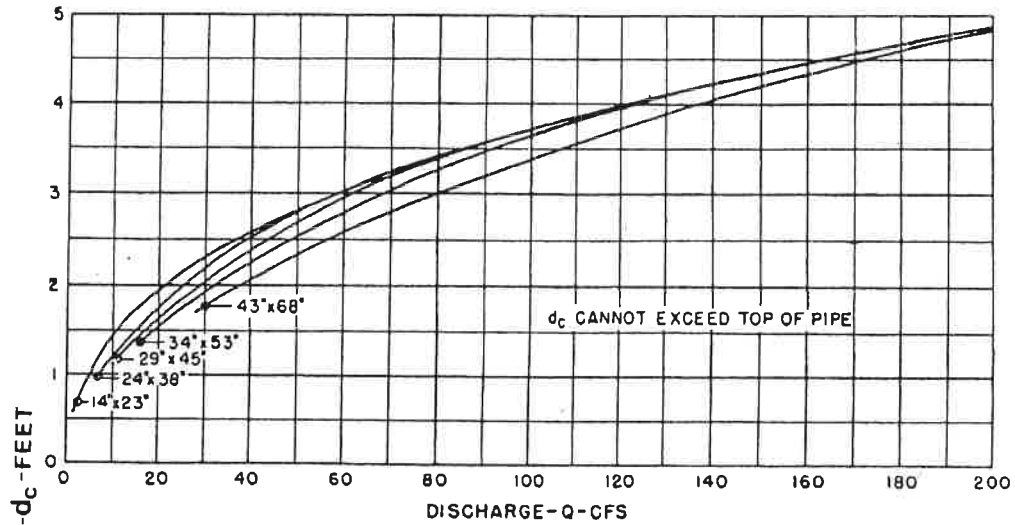
CHART 31B



BUREAU OF PUBLIC ROADS
JAN. 1964

**CRITICAL DEPTH
OVAL CONCRETE PIPE
LONG AXIS HORIZONTAL**

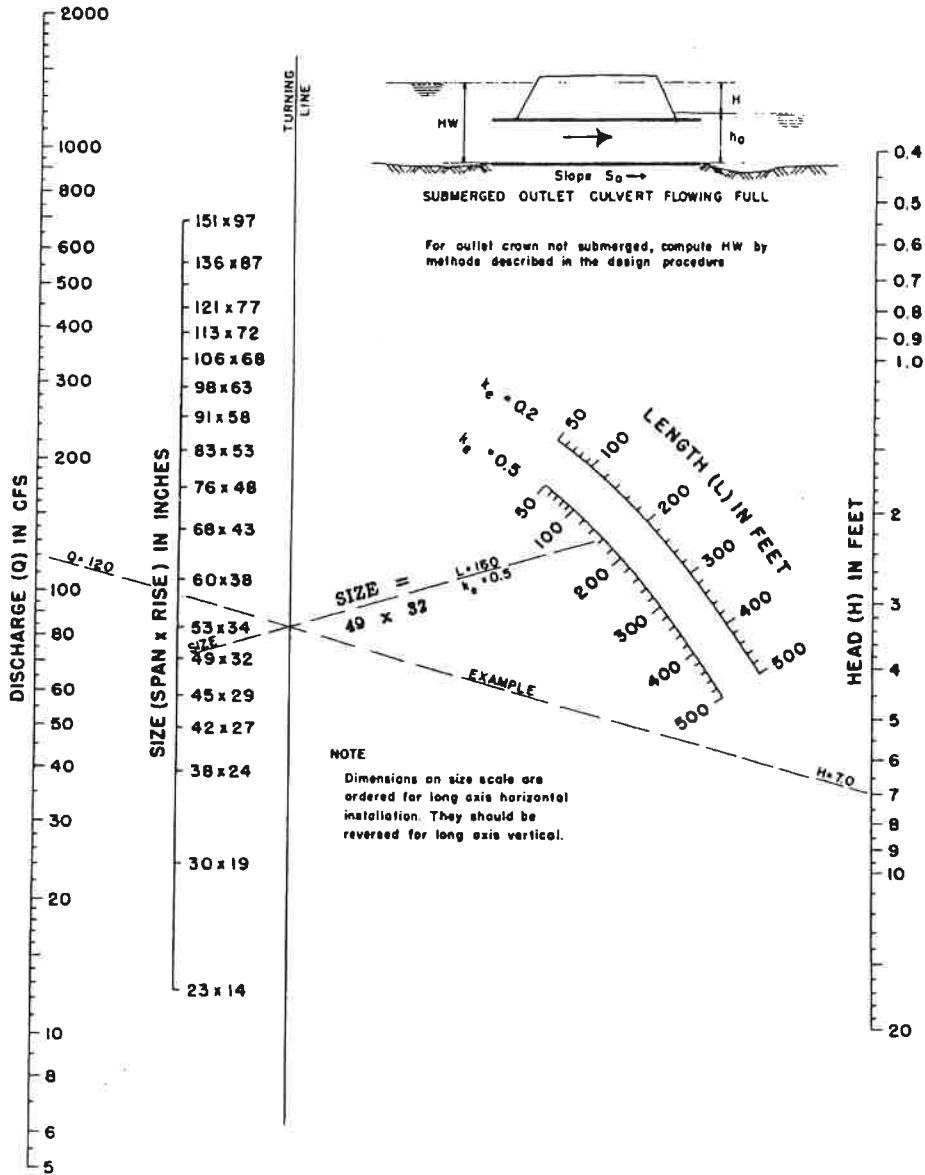
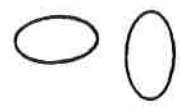
CHART 32B



BUREAU OF PUBLIC ROADS
JAN. 1964

CRITICAL DEPTH
OVAL CONCRETE PIPE
LONG AXIS VERTICAL

CHART 33B



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

BUREAU OF PUBLIC ROADS JAN. 1963

CHART 34B

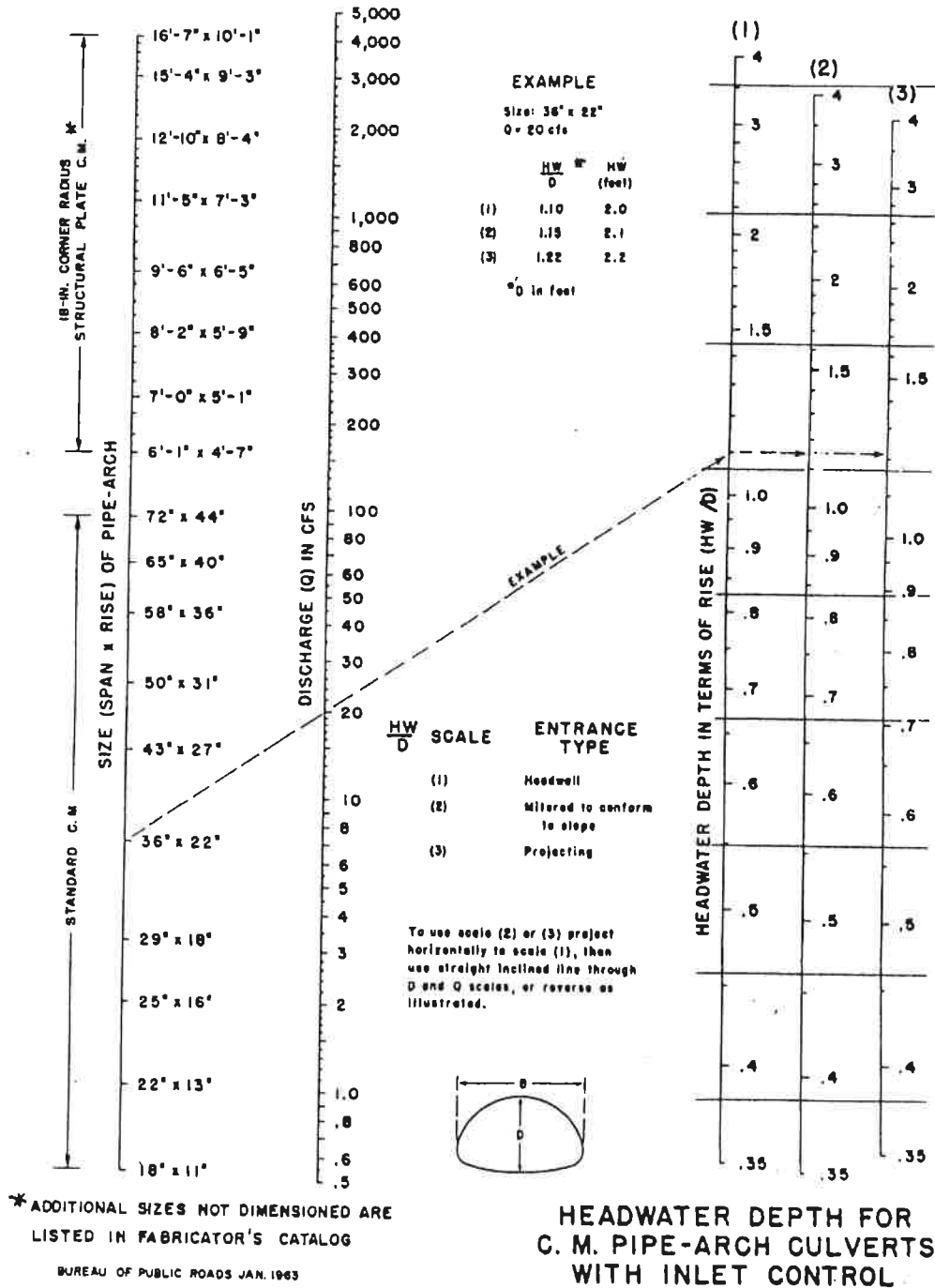


CHART 35B

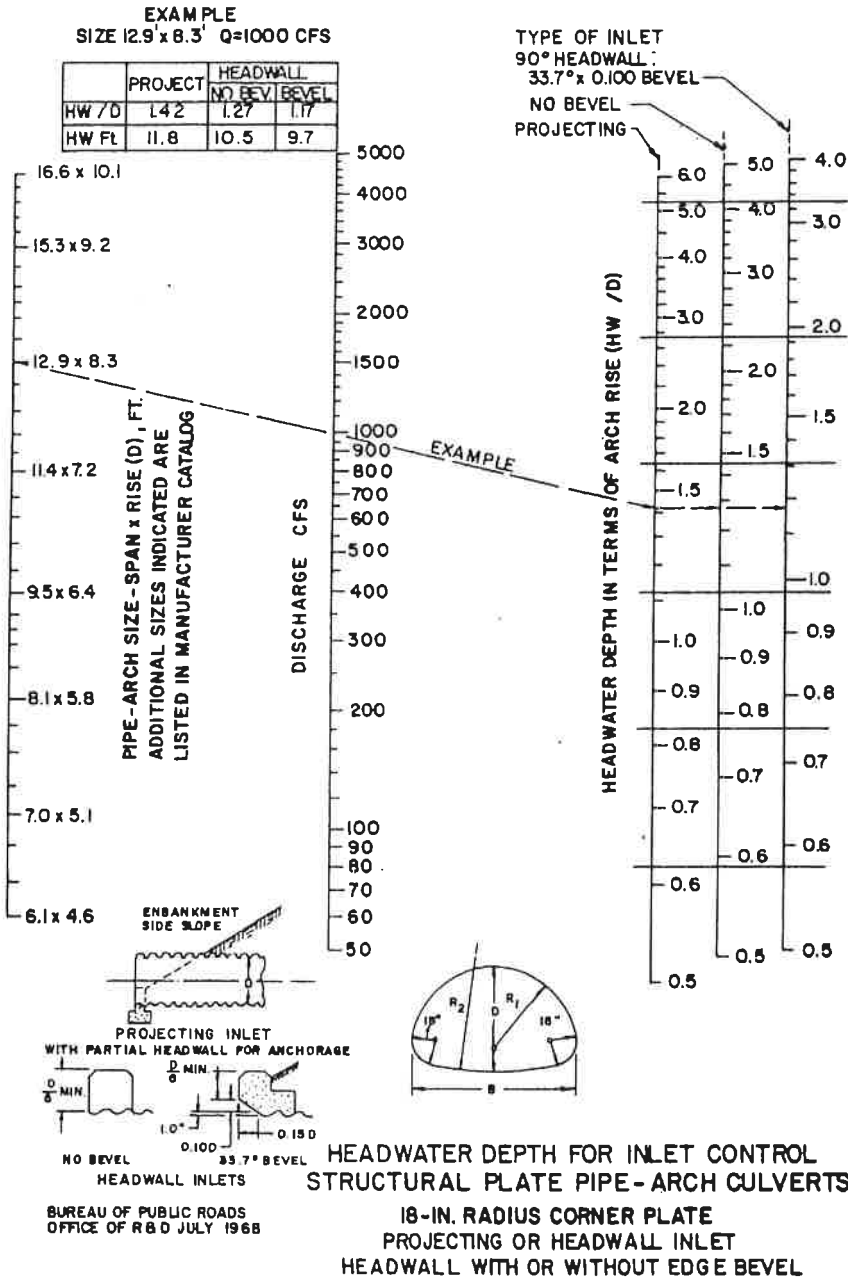


CHART 36B

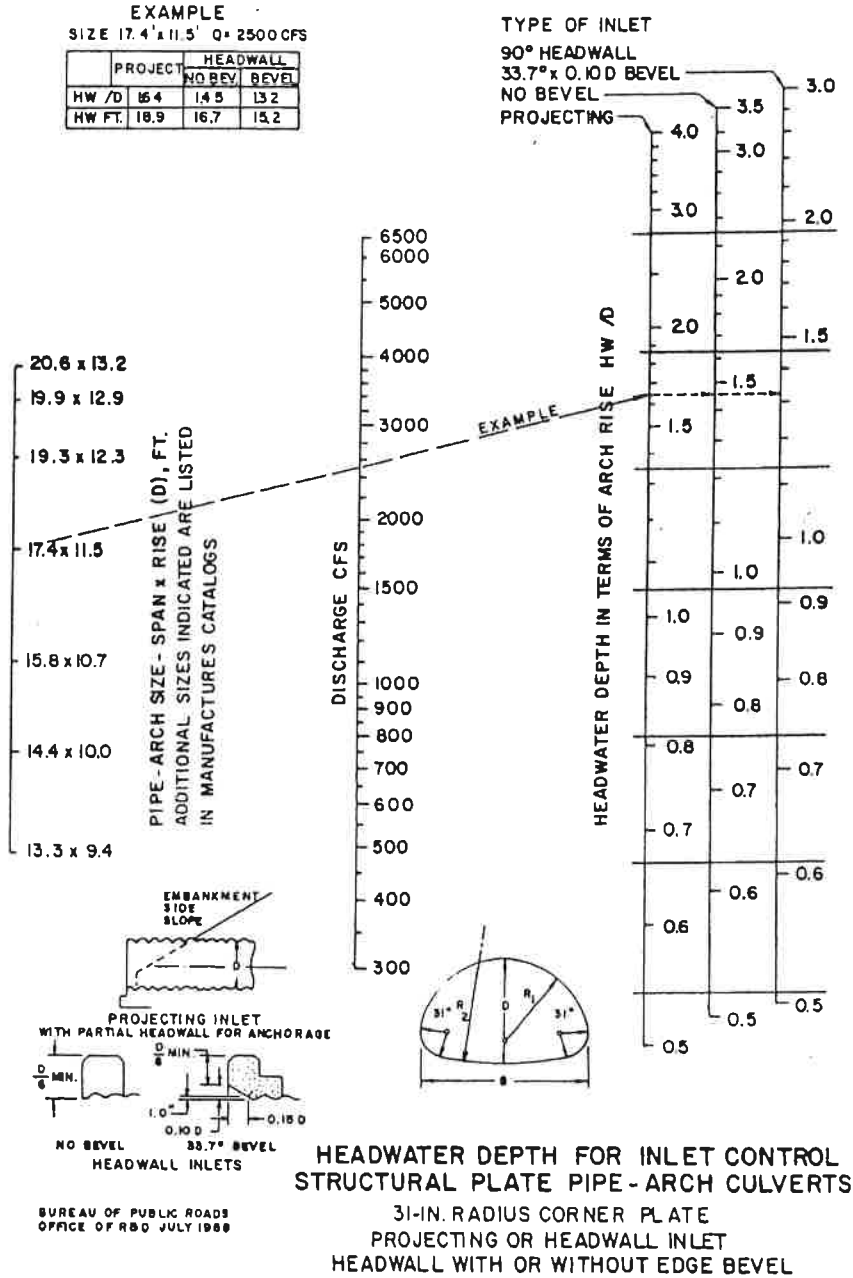
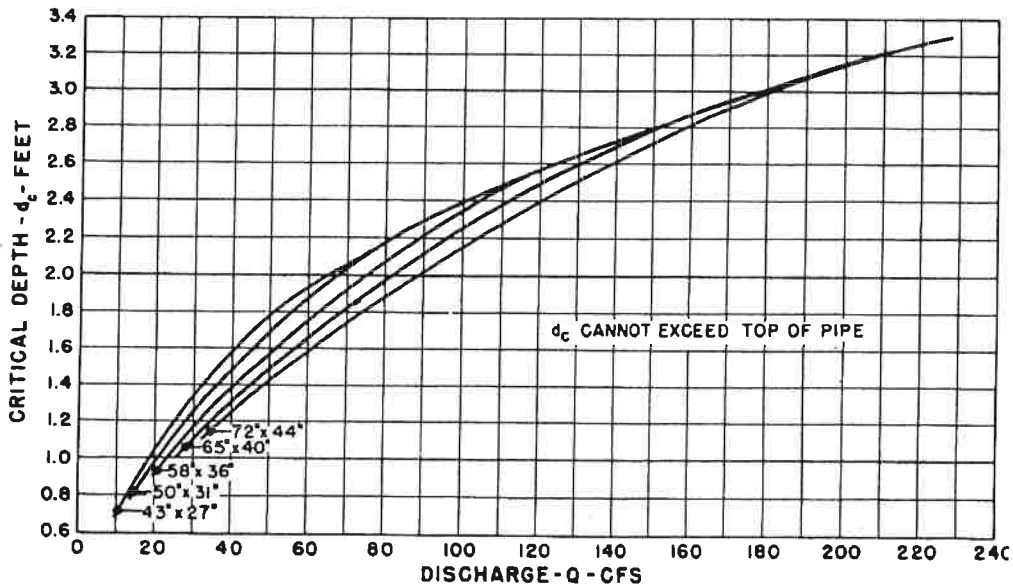
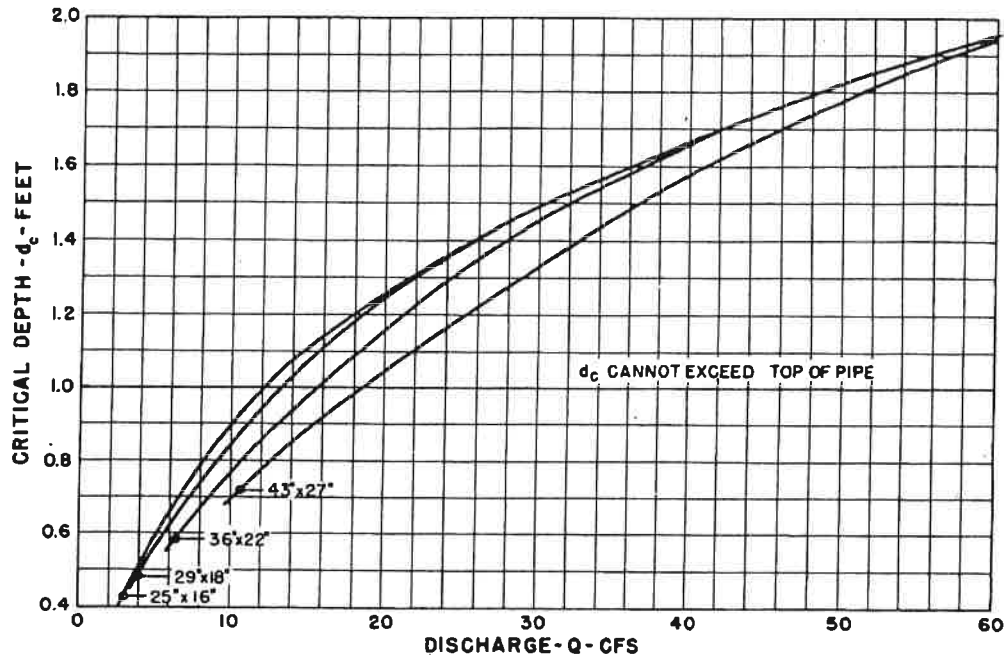


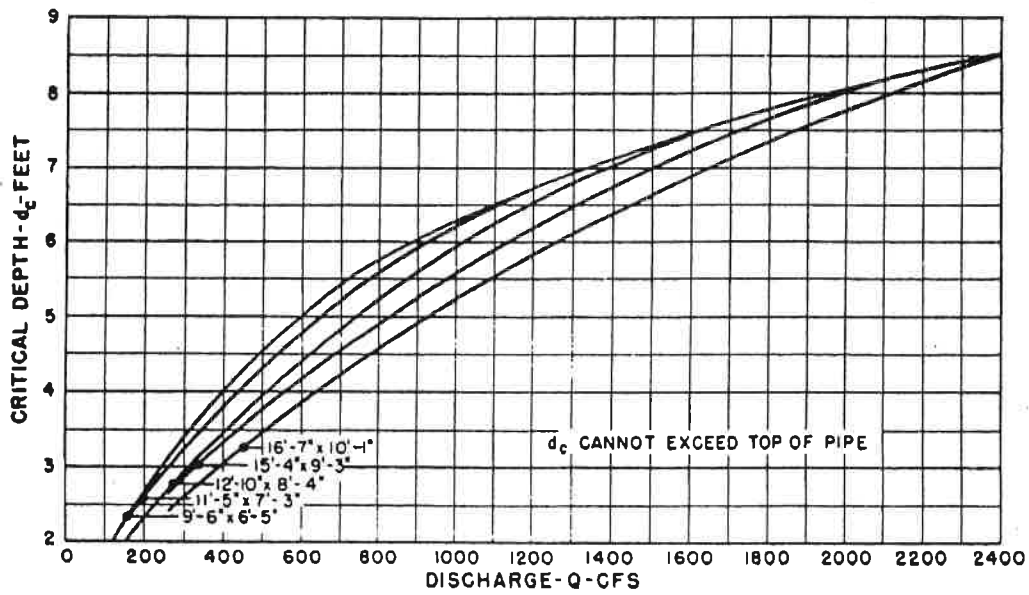
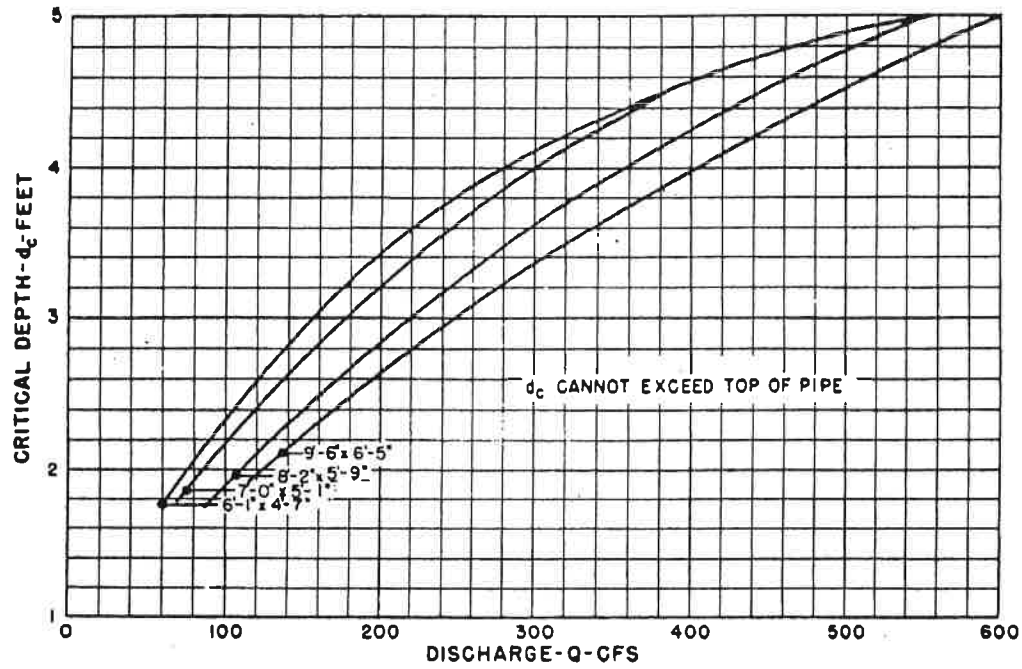
CHART 37B



BUREAU OF PUBLIC ROADS
JAN. 1964

CRITICAL DEPTH
STANDARD G.M. PIPE-ARCH

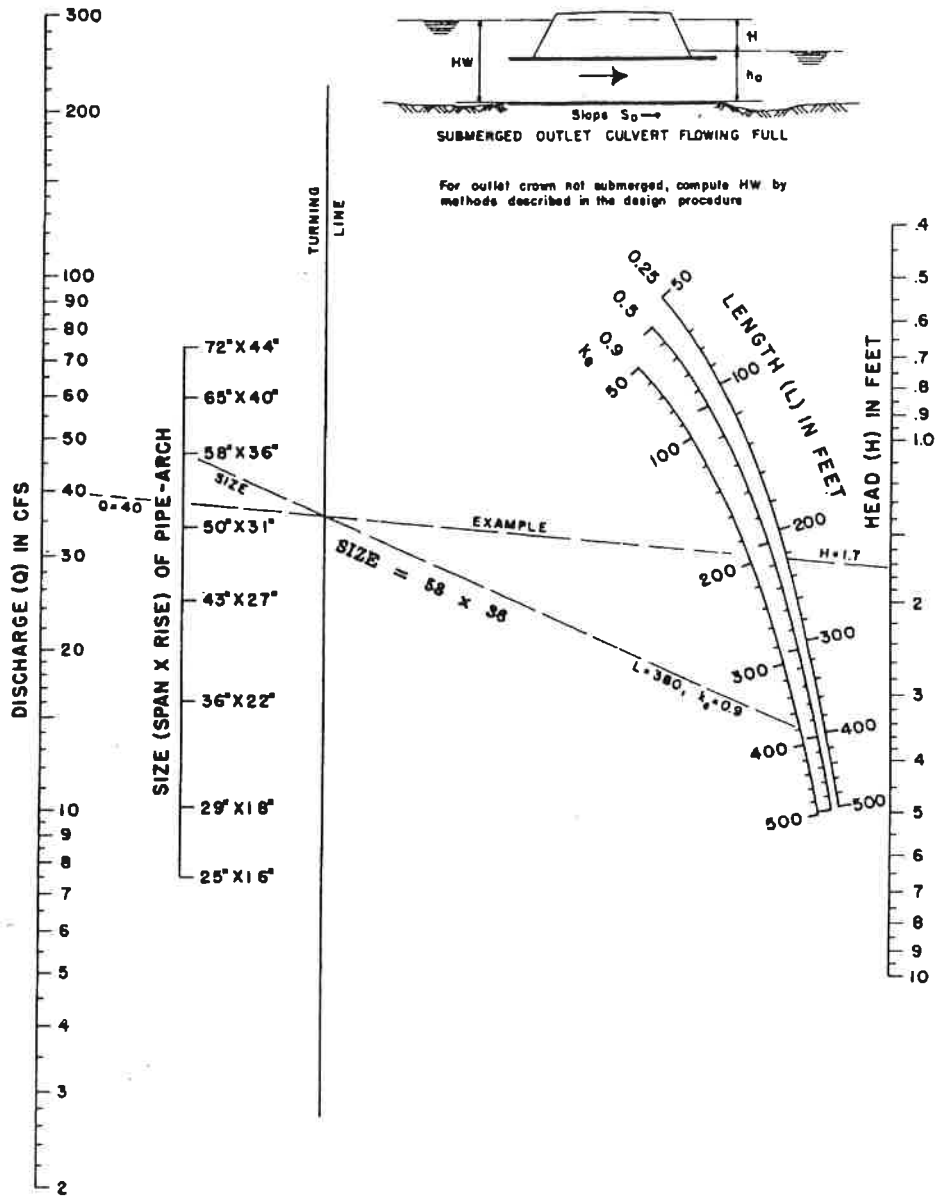
CHART 38B



BUREAU OF PUBLIC ROADS
JAN. 1964

CRITICAL DEPTH
STRUCTURAL PLATE
C. M. PIPE-ARCH
18 INCH CORNER RADIUS

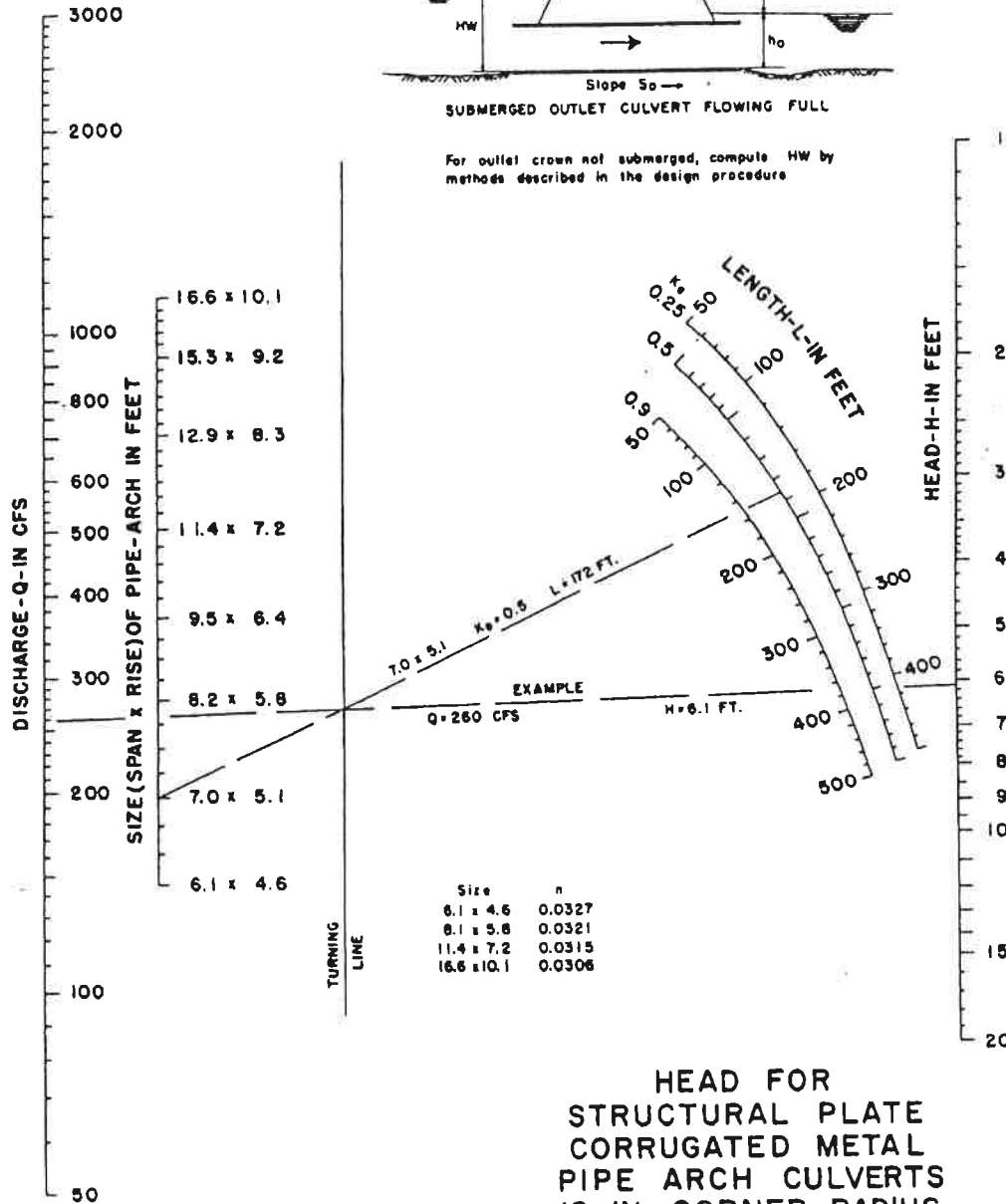
CHART 39B



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

BUREAU OF PUBLIC ROADS JAN. 1963

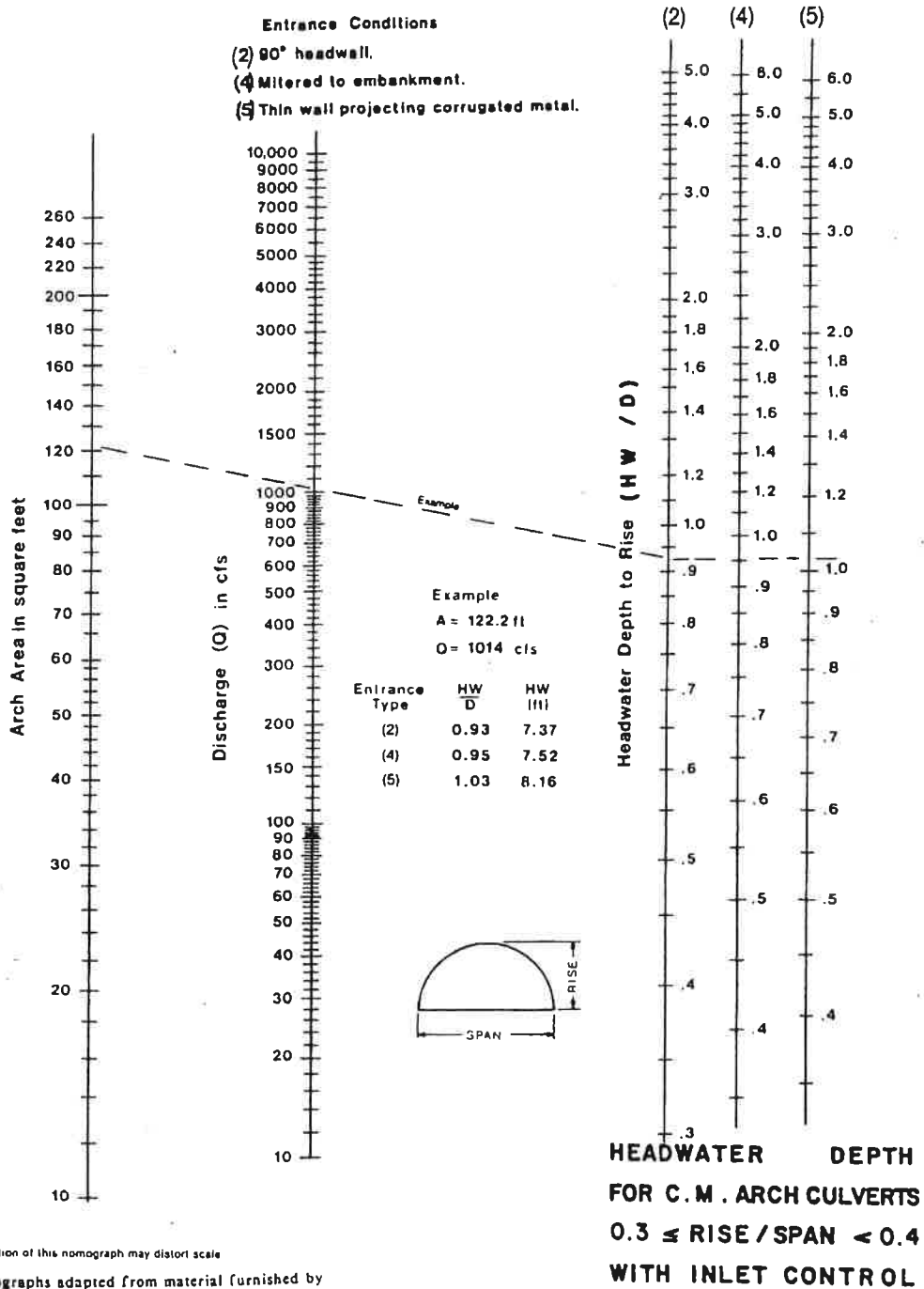
CHART 40B



BUREAU OF PUBLIC ROADS JAN. 1963

HEAD FOR
STRUCTURAL PLATE
CORRUGATED METAL
PIPE ARCH CULVERTS
18 IN. CORNER RADIUS
FLOWING FULL
n = 0.0327 TO 0.0306

CHART 41B



Duplication of this nomograph may distort scale

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation



CHART 42B

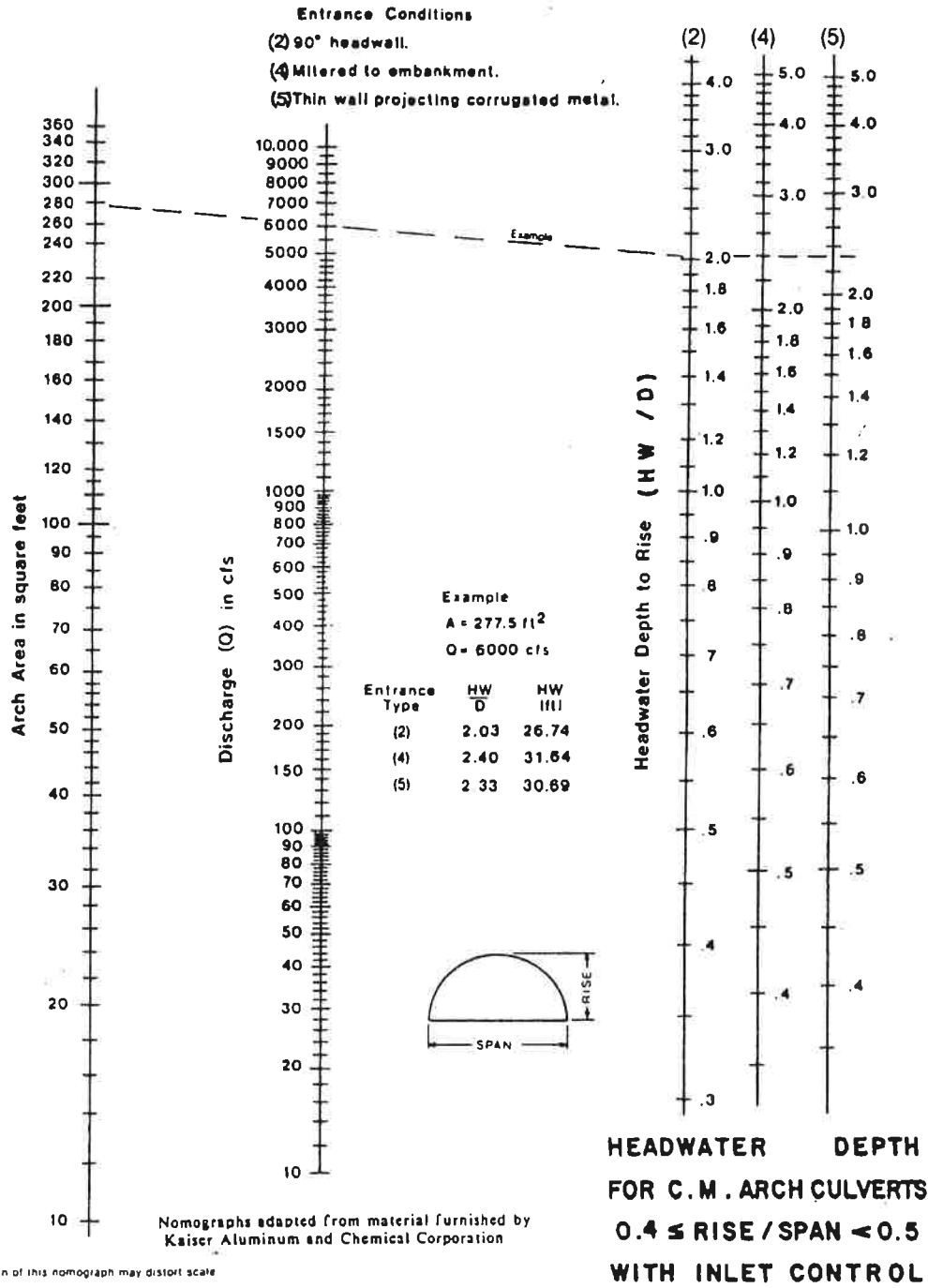


CHART 43B

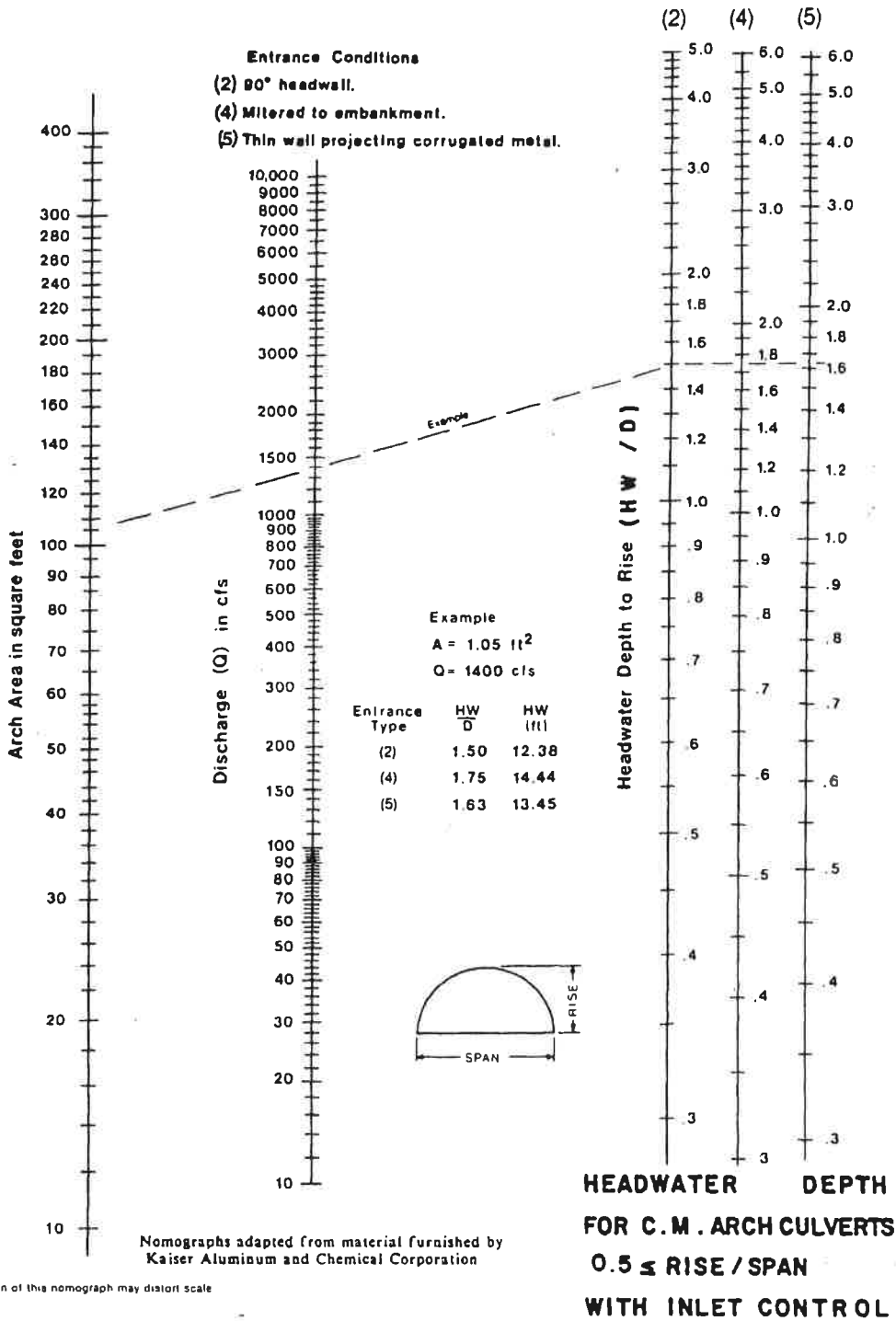




CHART 44B

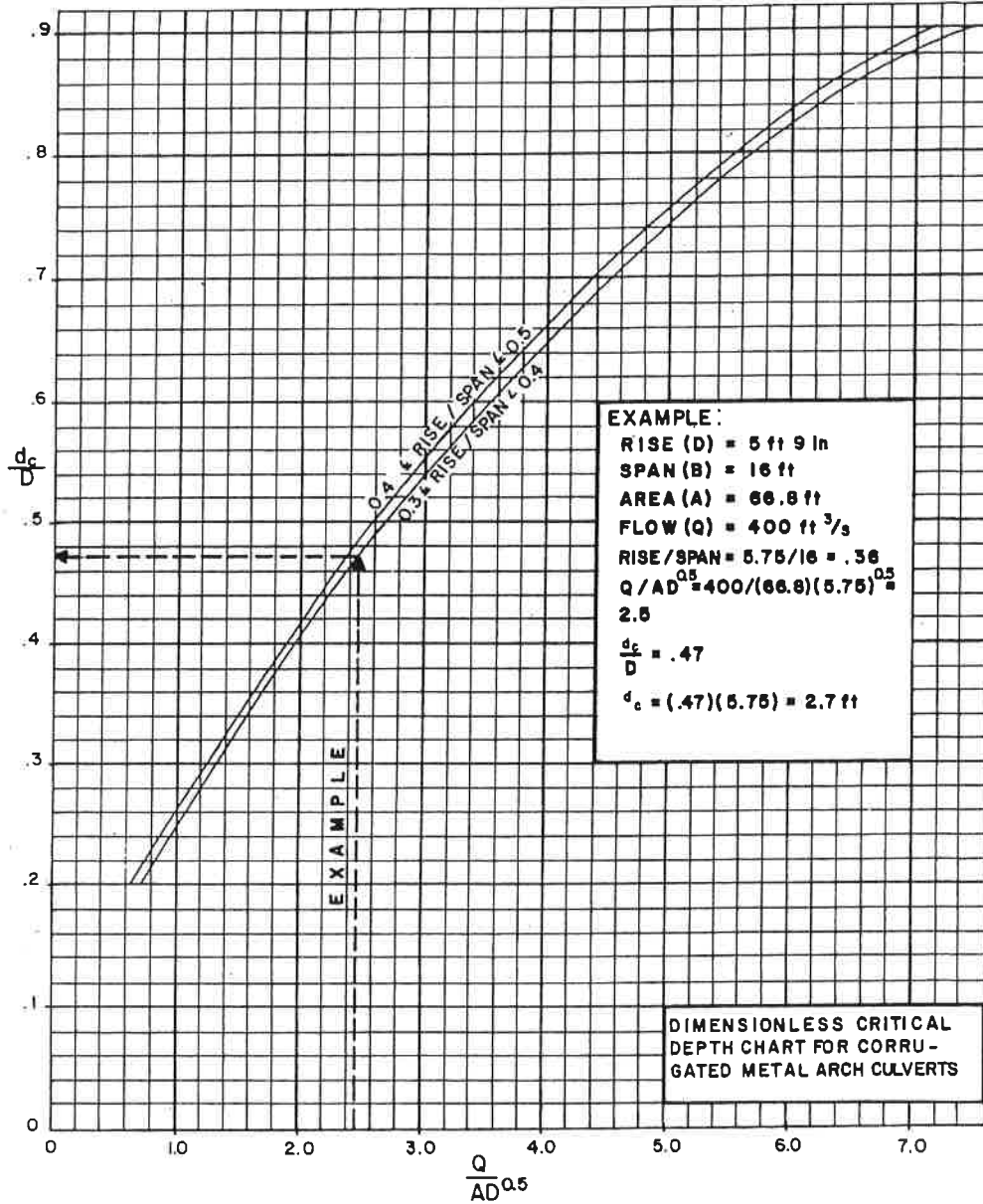
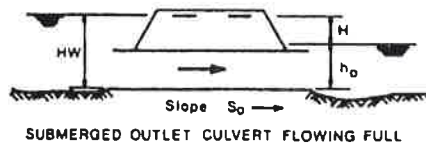
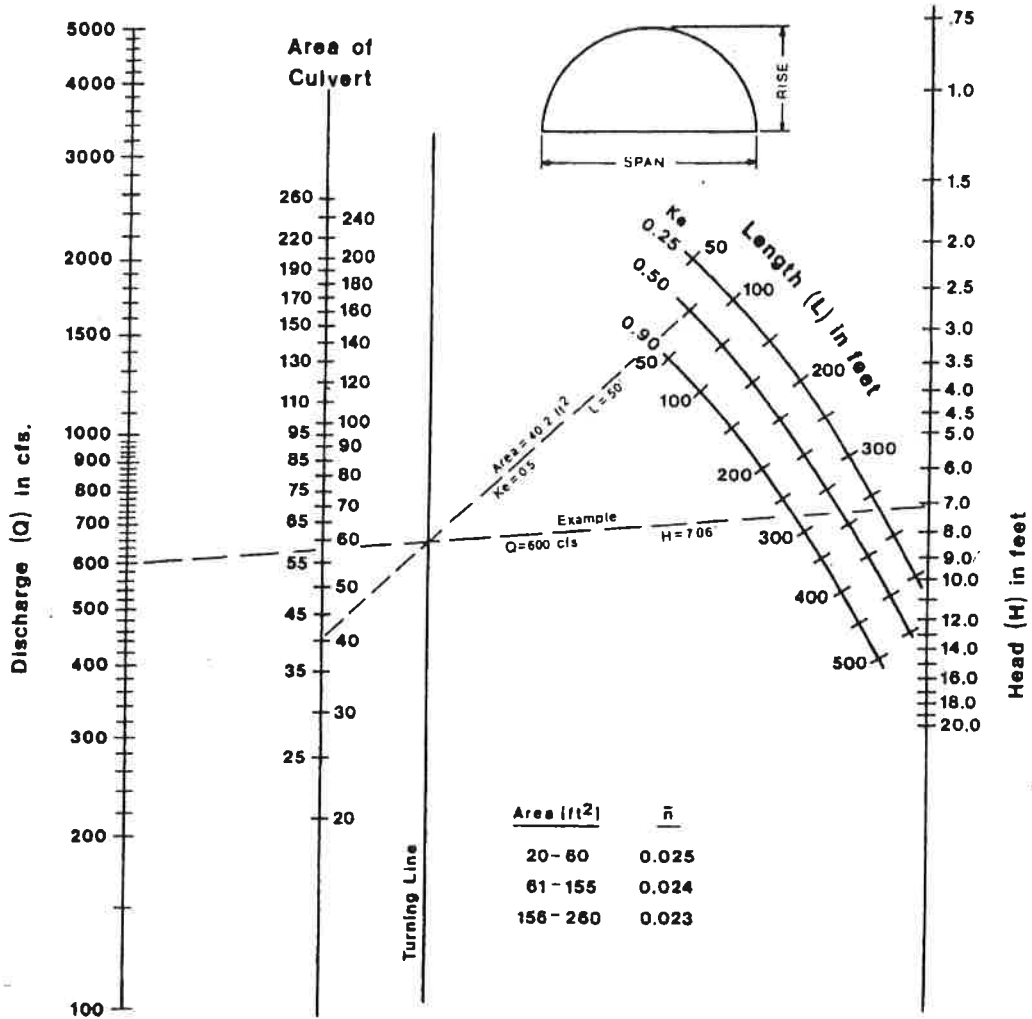


CHART 45B



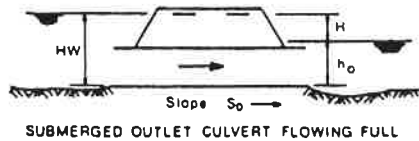
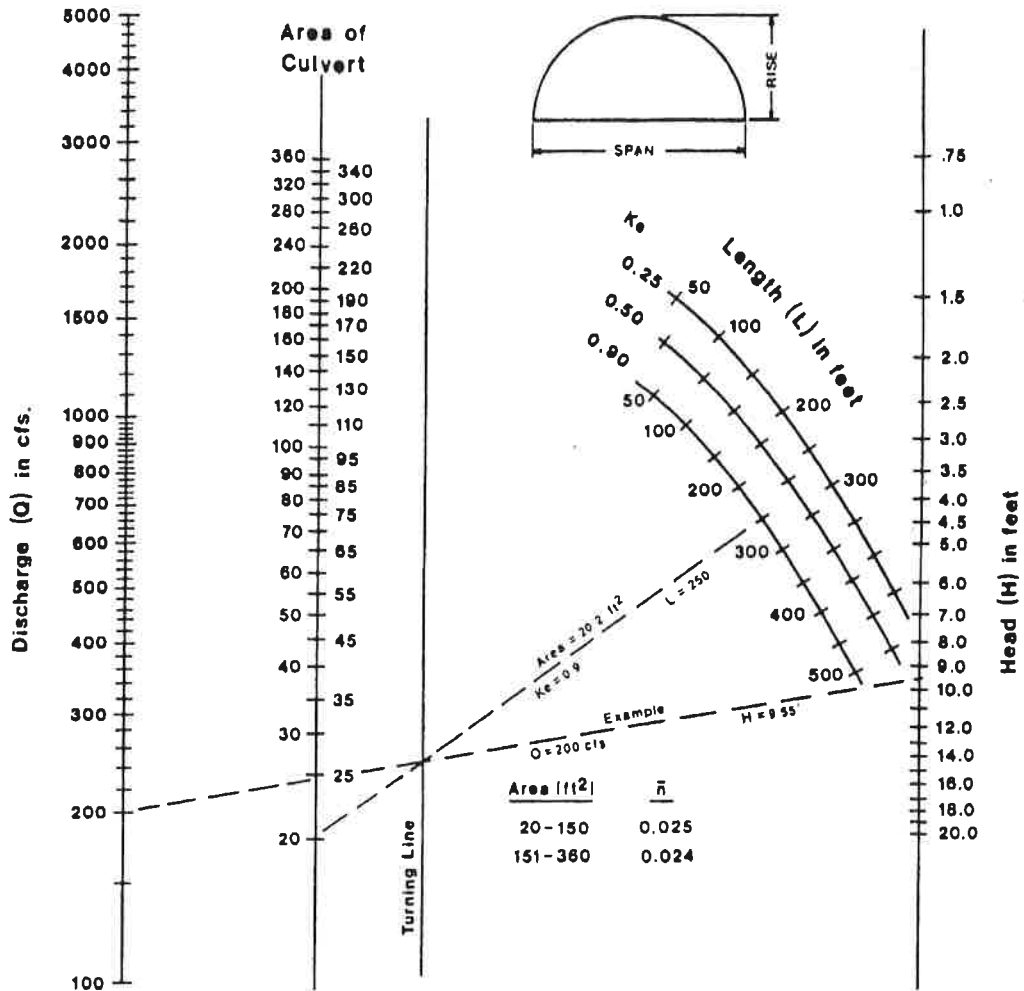
**HEAD FOR
C. M. ARCH CULVERTS
FLOWING FULL
CONCRETE BOTTOM
 $0.3 \leq \text{RISE} / \text{SPAN} < 0.4$**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale



CHART 46B



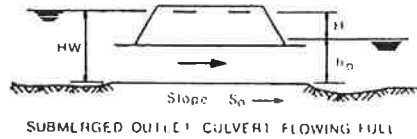
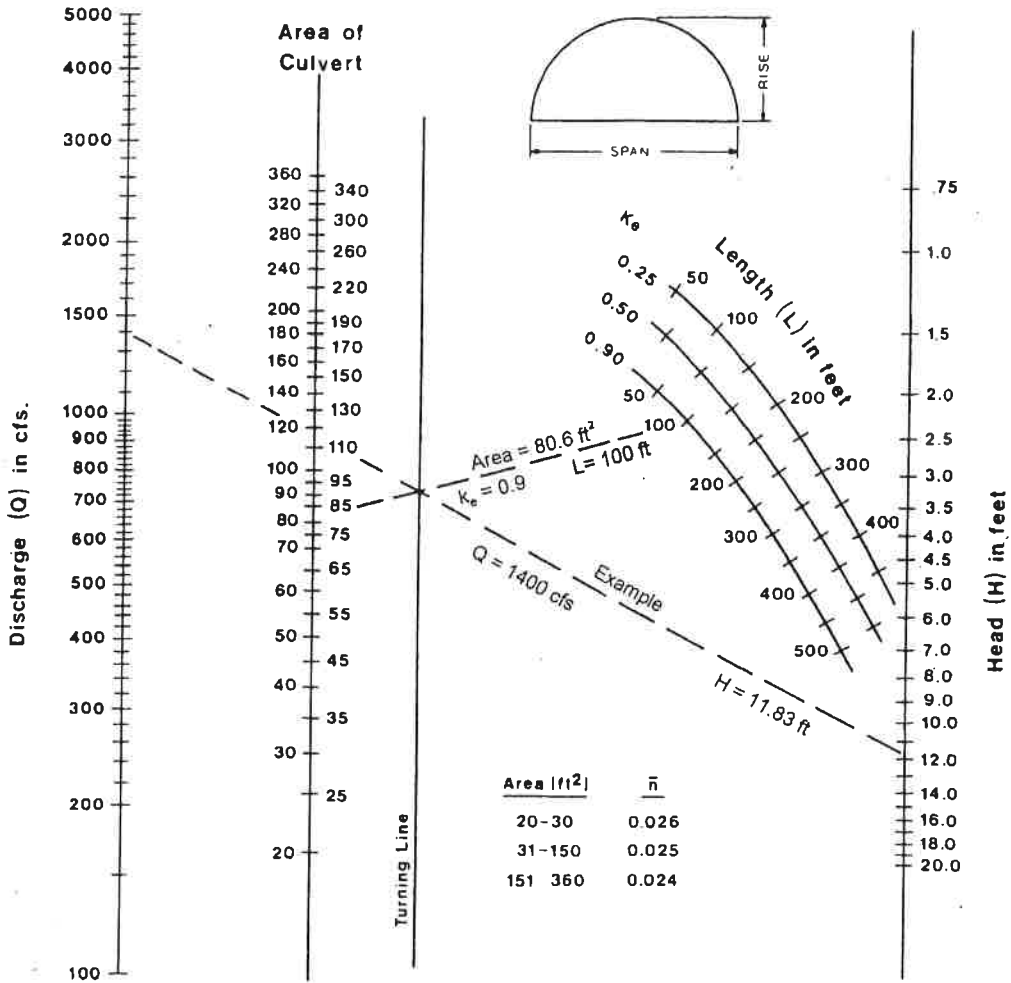
**HEAD FOR
C. M. ARCH CULVERTS
FLOWING FULL
CONCRETE BOTTOM
0.4 ≤ RISE / SPAN < 0.5**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale



CHART 47B

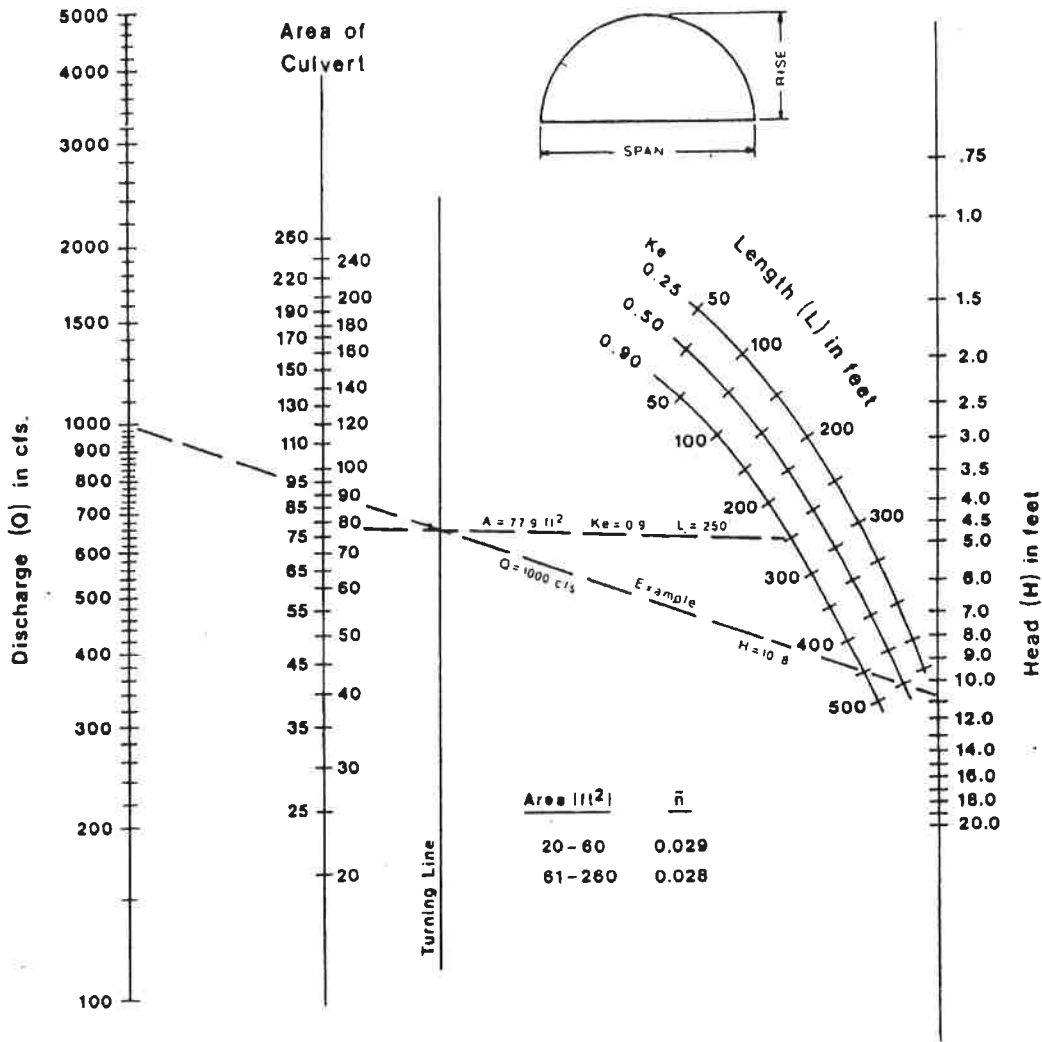


**HEAD FOR
C.M. ARCH CULVERTS
FLOWING FULL
CONCRETE BOTTOM
 $0.5 \leq \text{RISE} / \text{SPAN}$**

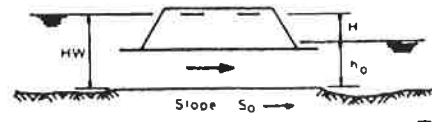
Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale

CHART 48B



Area (ft ²)	\bar{n}
20-60	0.029
61-260	0.028



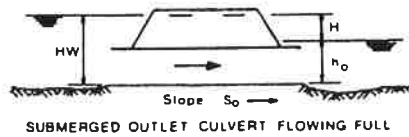
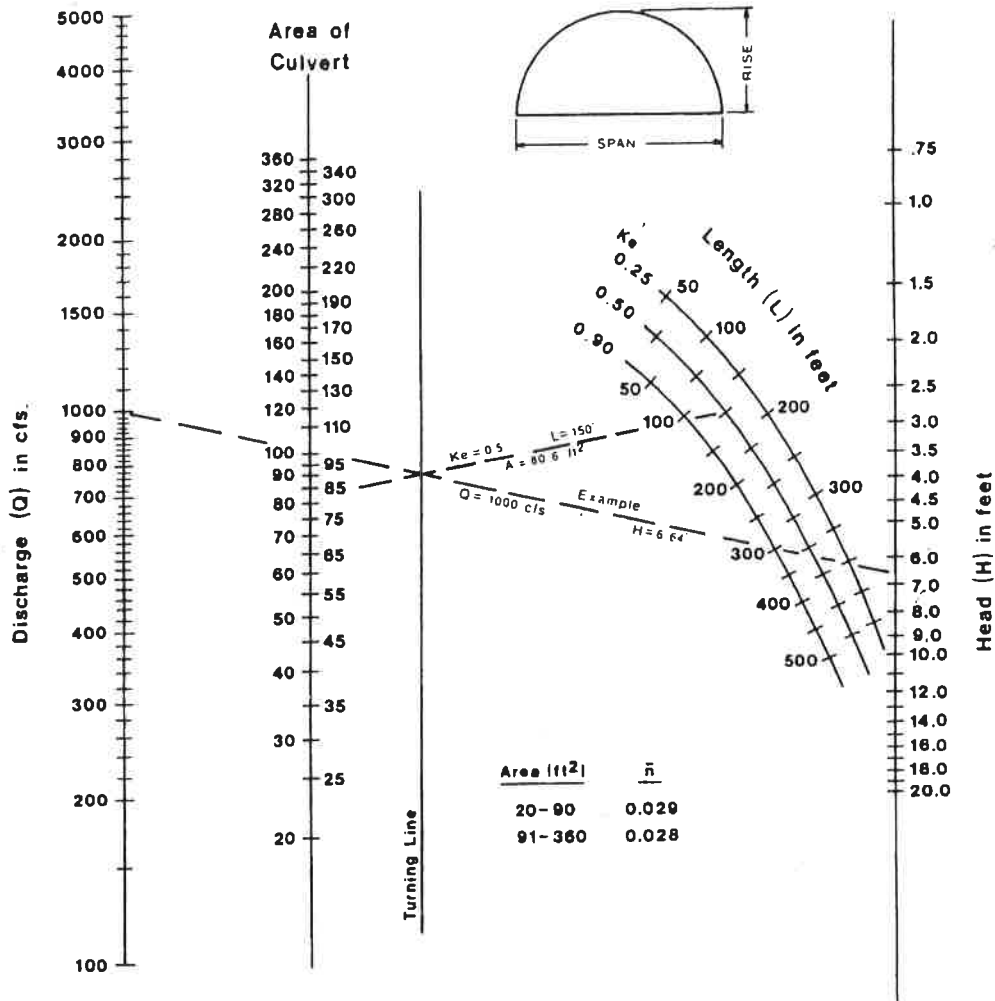
SUBMERGED OUTLET CULVERT FLOWING FULL

**HEAD FOR
C.M. ARCH CULVERTS
FLOWING FULL
EARTH BOTTOM ($n_b = 0.022$)
 $0.3 \leq \text{RISE} / \text{SPAN} < 0.4$**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale

CHART 49B



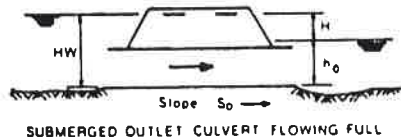
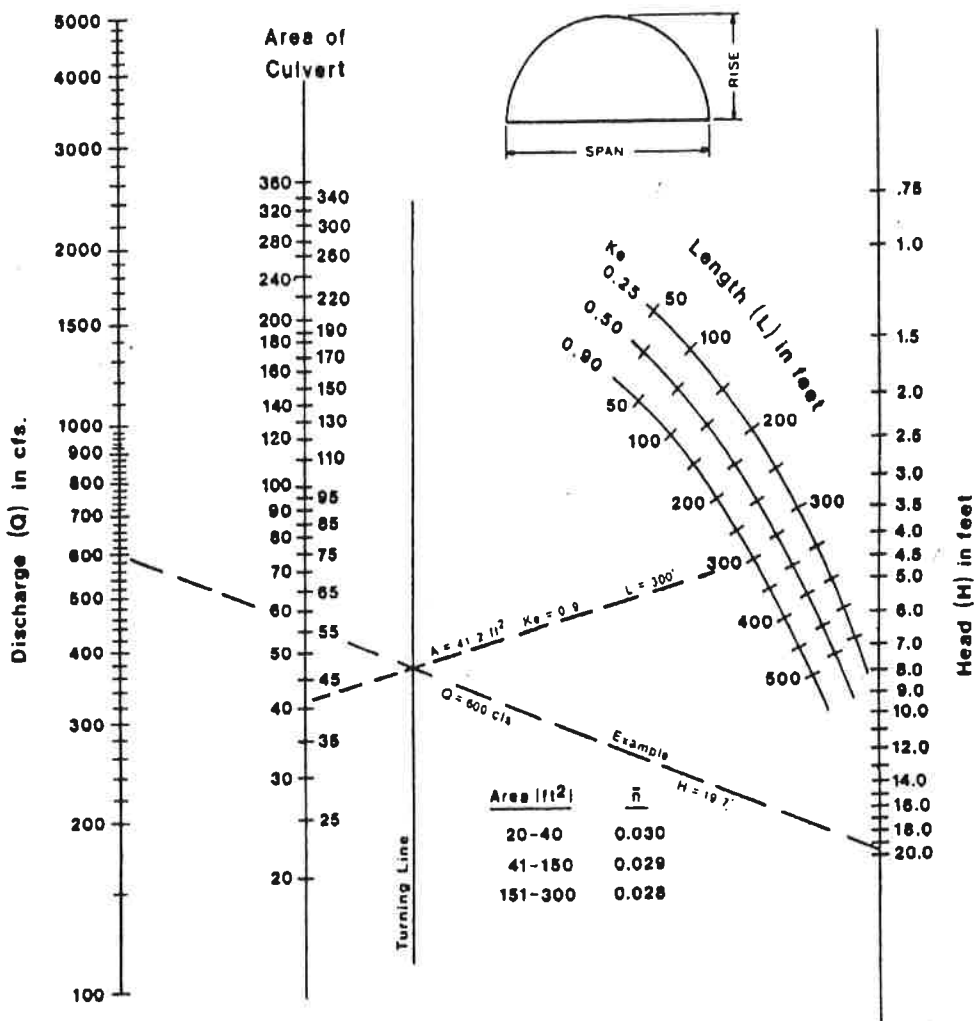
**HEAD FOR
C.M. ARCH CULVERTS
FLOWING FULL
EARTH BOTTOM ($n_b = 0.022$)
 $0.4 \leq \text{RISE} / \text{SPAN} < 0.5$**

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale



CHART 50B



HEAD FOR
C.M. ARCH CULVERTS
FLOWING FULL
EARTH BOTTOM ($n_b = 0.022$)
 $0.5 \leq \text{RISE} / \text{SPAN}$

Nomographs adapted from material furnished by
Kaiser Aluminum and Chemical Corporation

Duplication of this nomograph may distort scale

CHART 51B
(English Units)

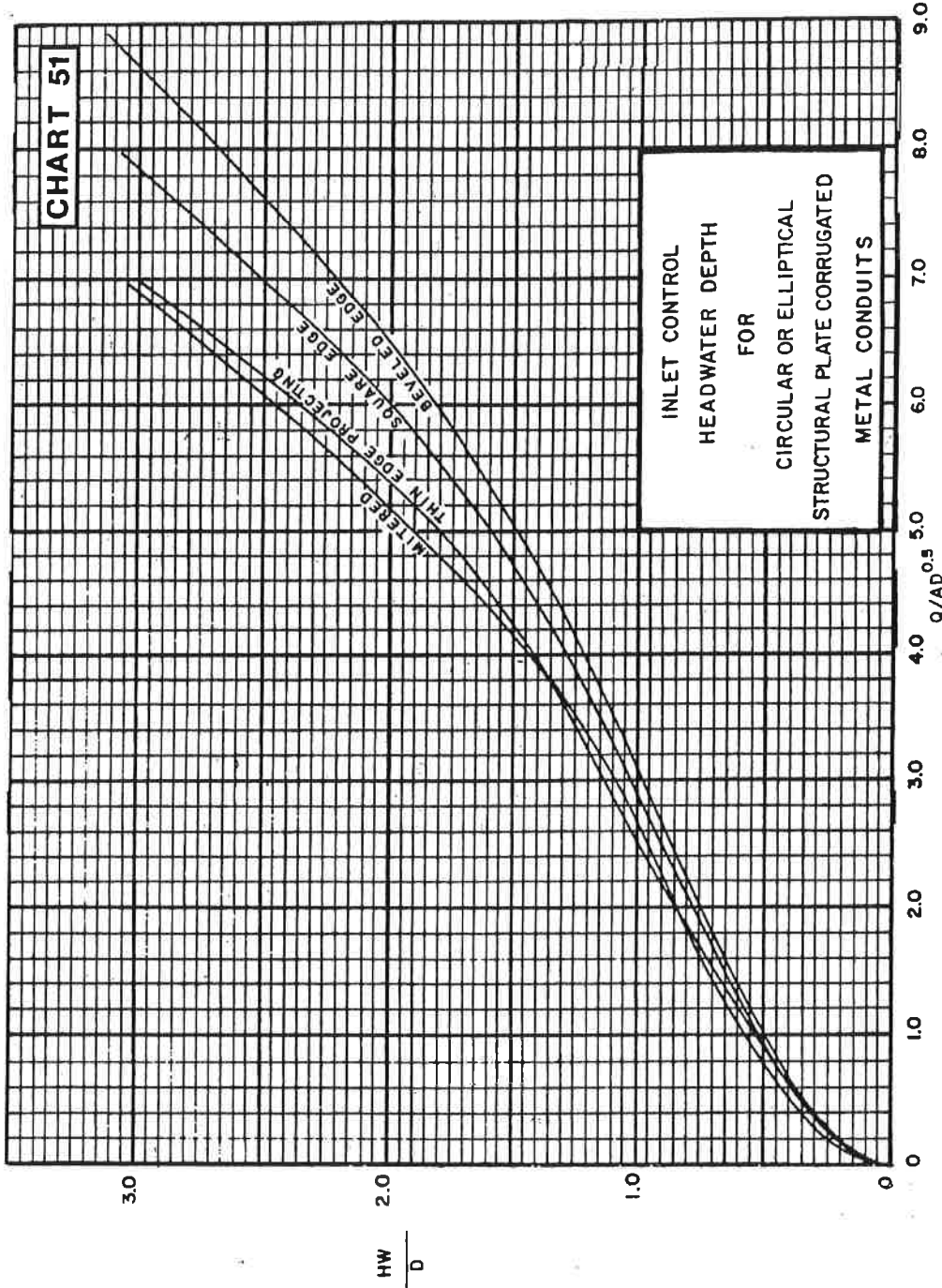
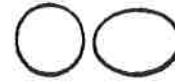


CHART 52B
(English Units)

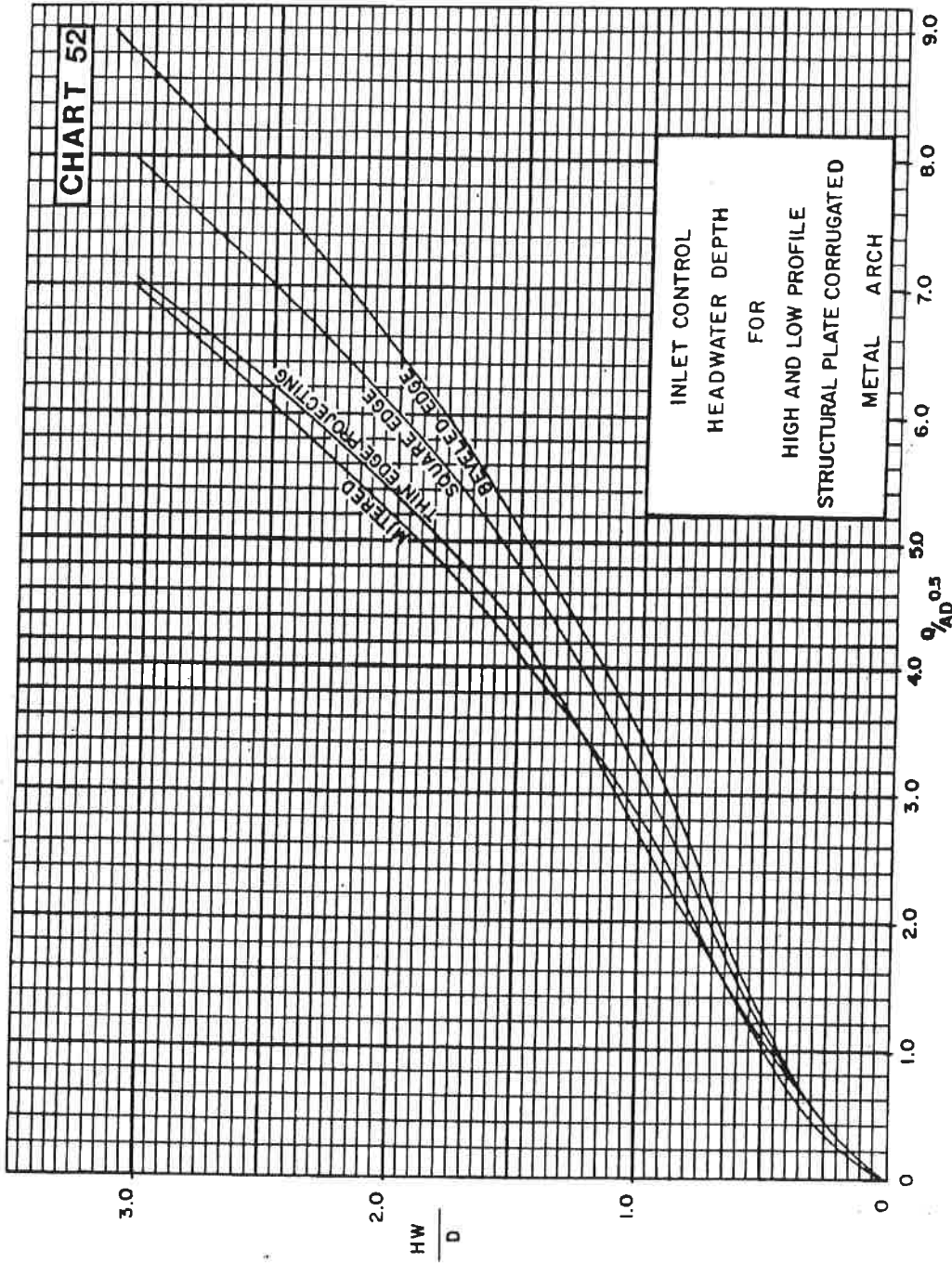
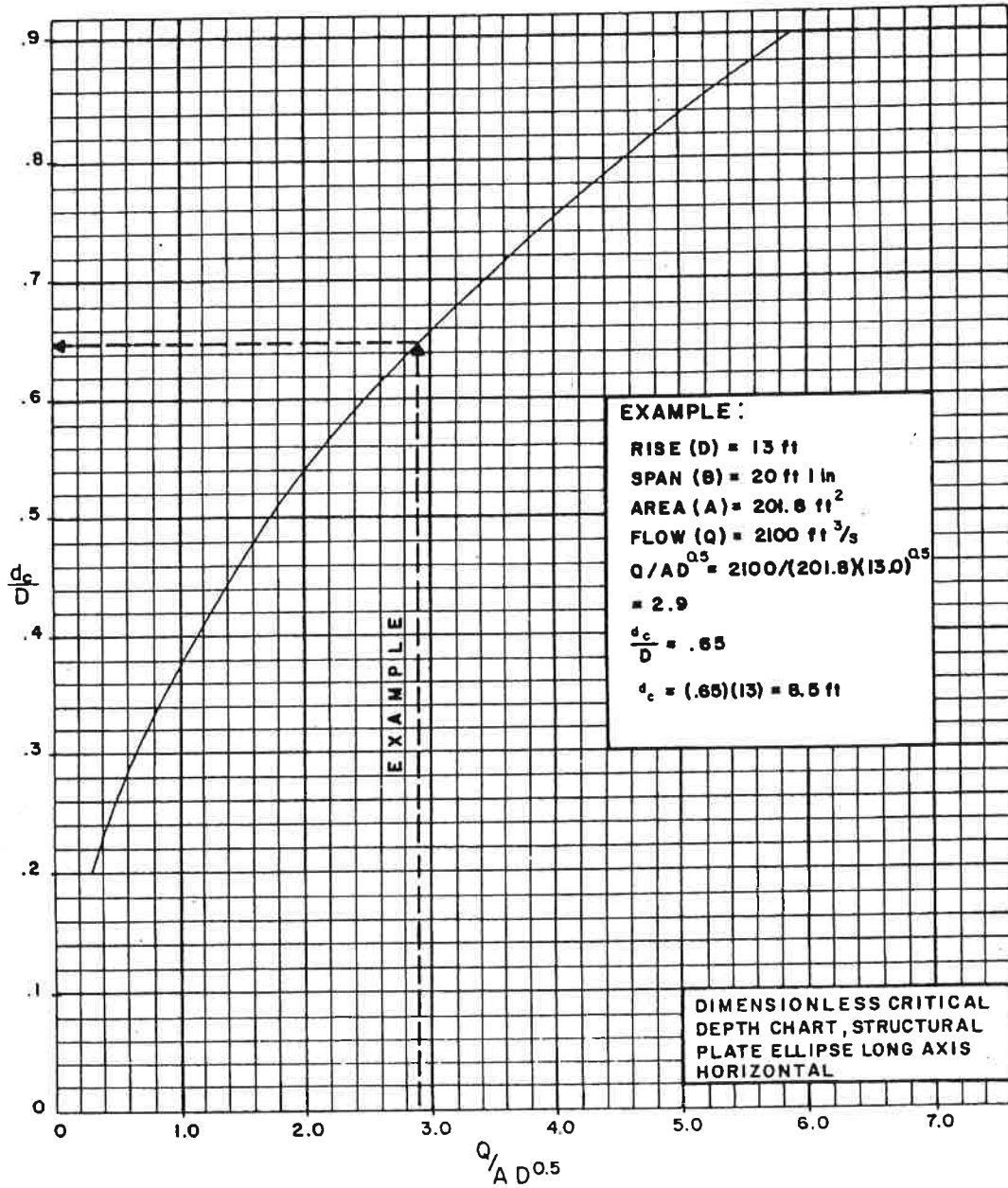
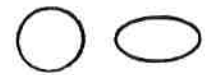


CHART 53B



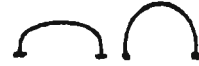


CHART 54B

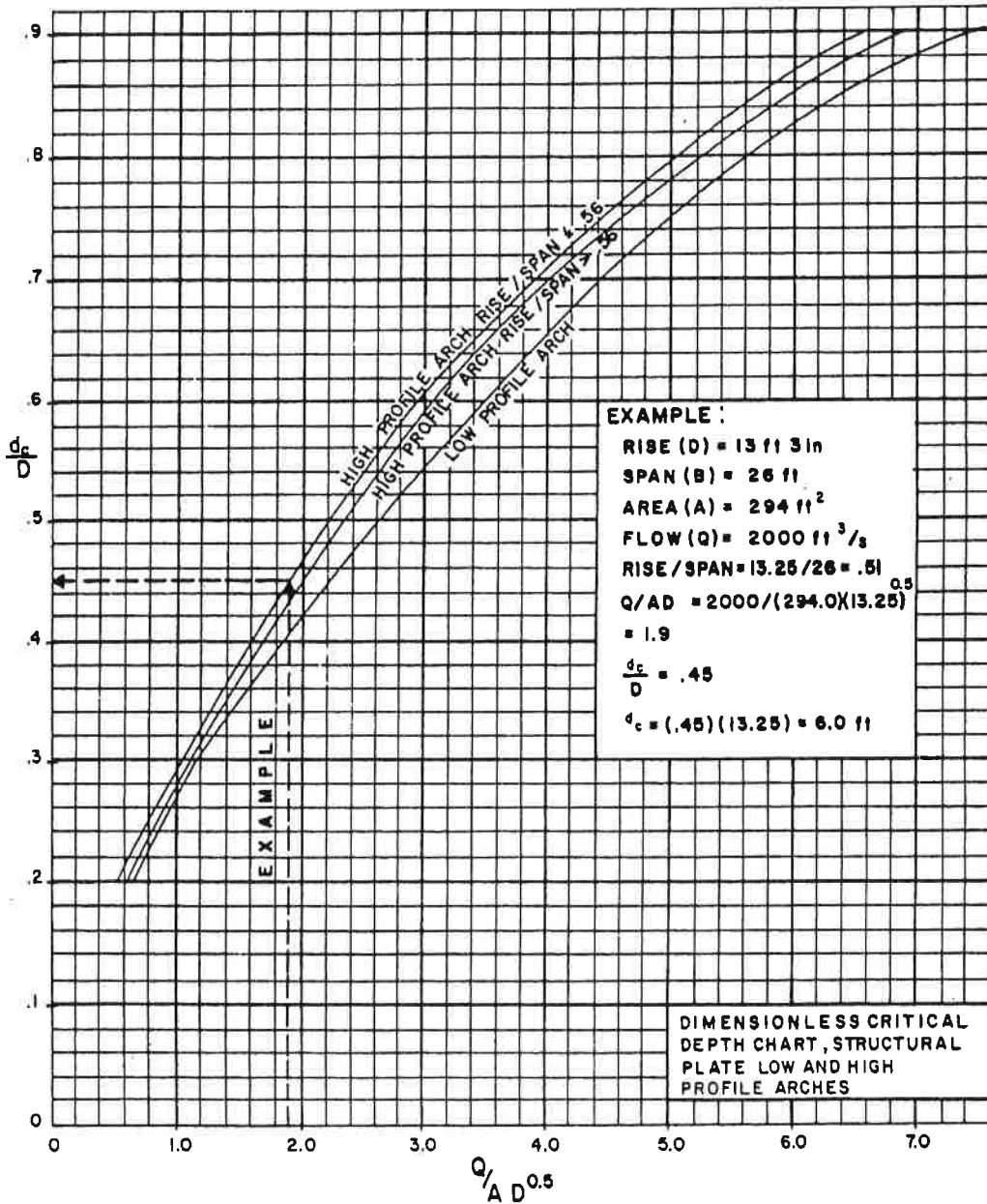
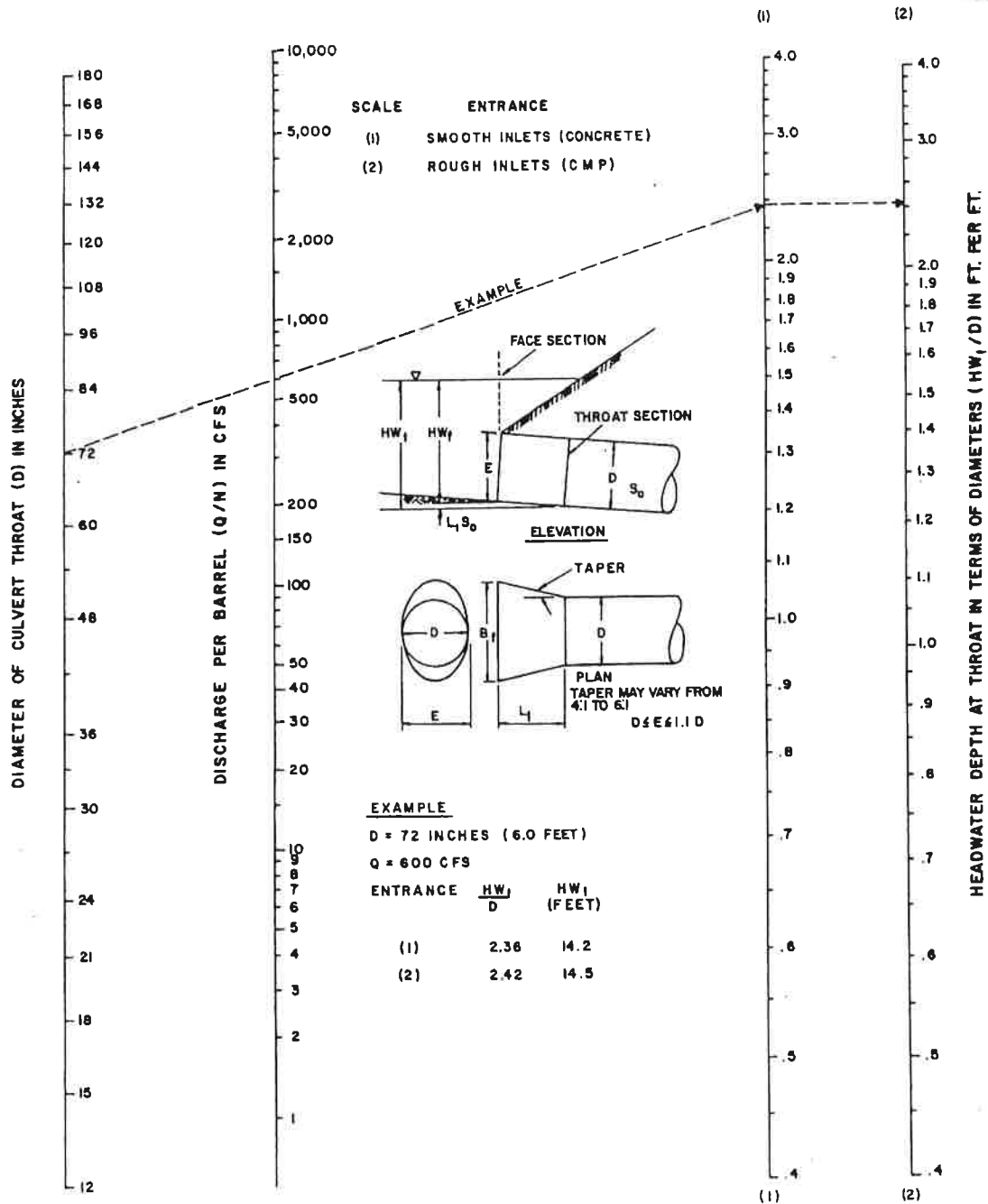
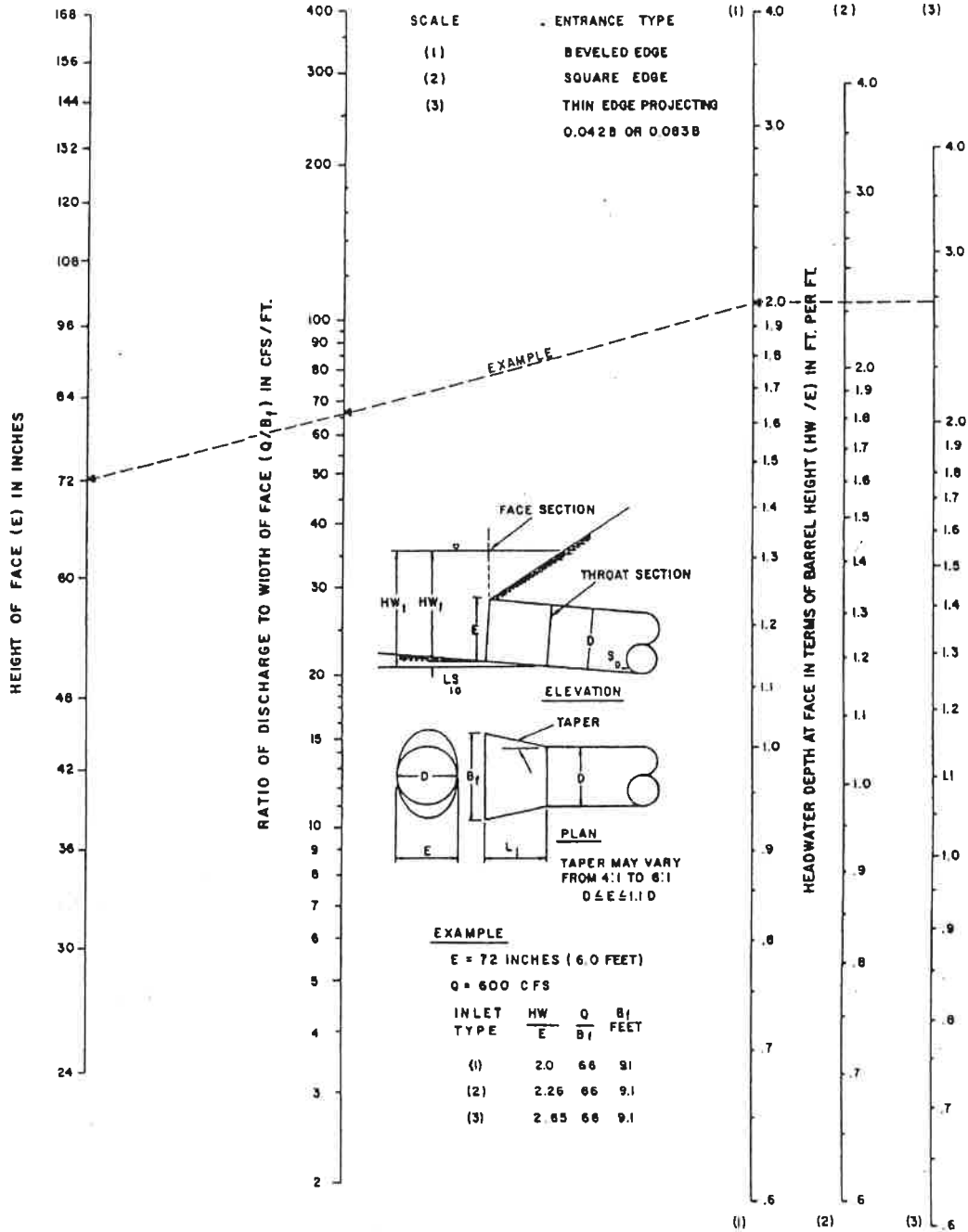


CHART 55B



THROAT CONTROL
FOR SIDE-TAPERED INLETS TO PIPE CULVERT
(CIRCULAR SECTION ONLY)

CHART 56B



FACE CONTROL FOR SIDE-TAPERED
INLETS TO PIPE CULVERTS
(NON-RECTANGULAR SECTIONS ONLY)

CHART 57B

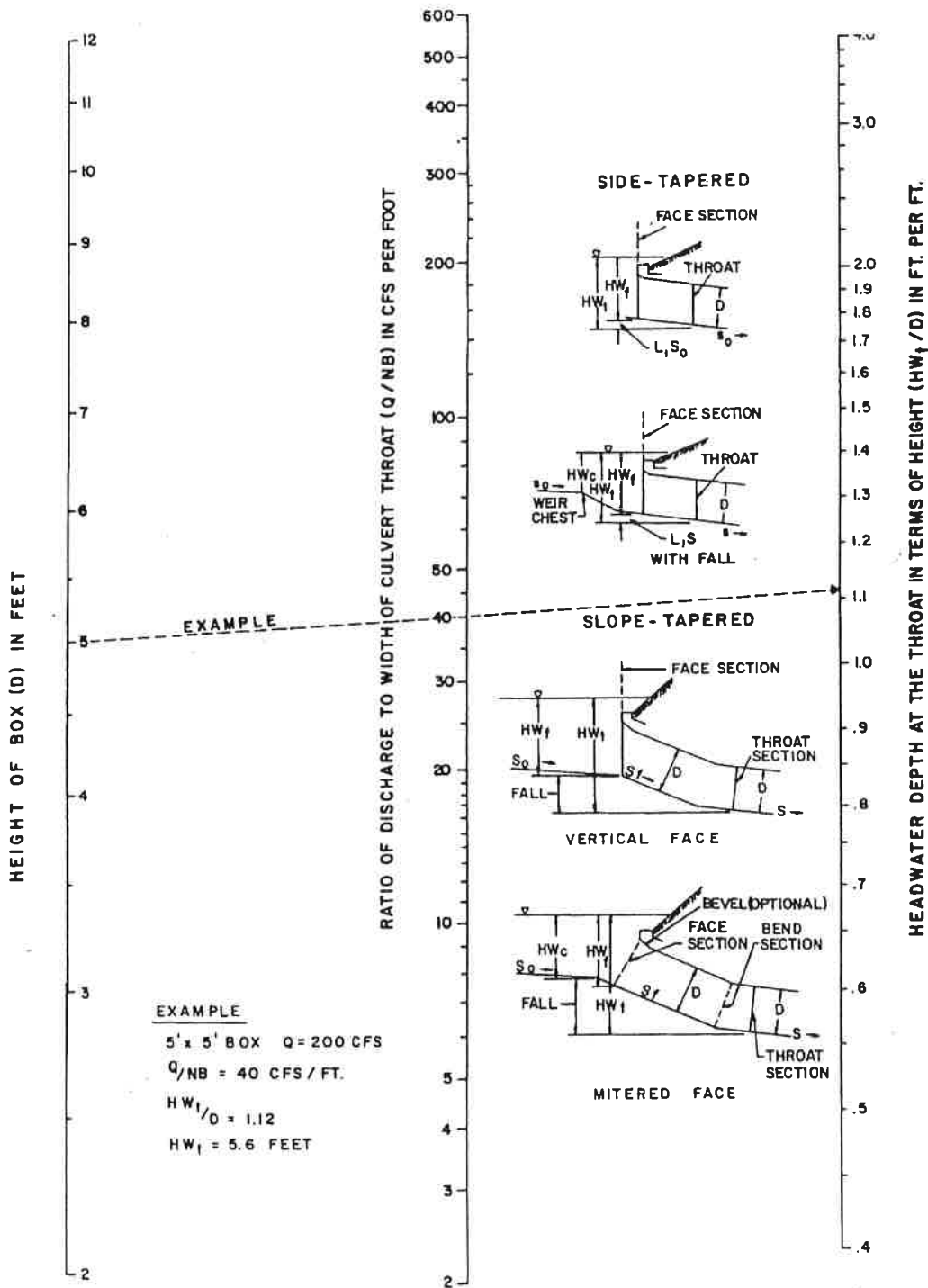
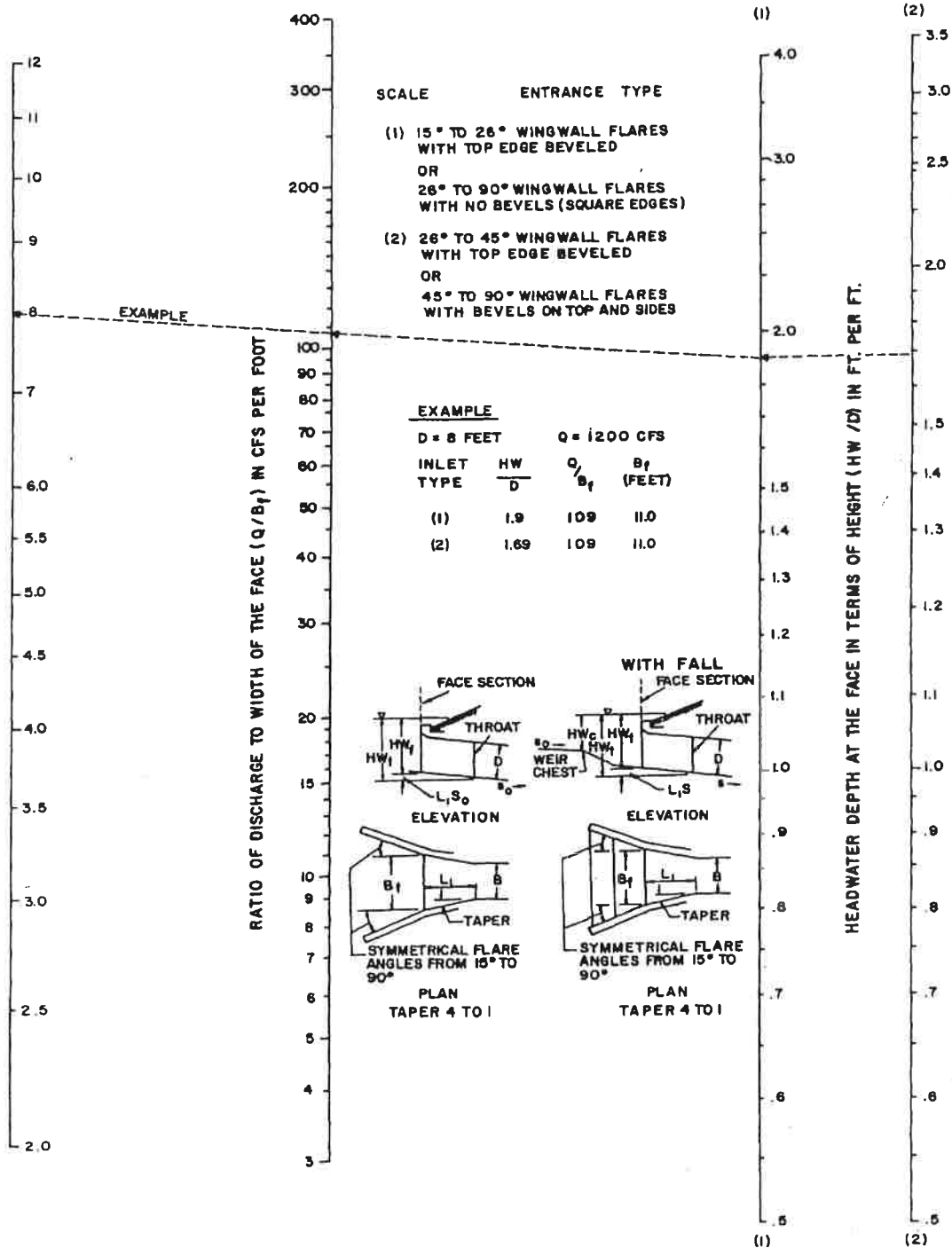


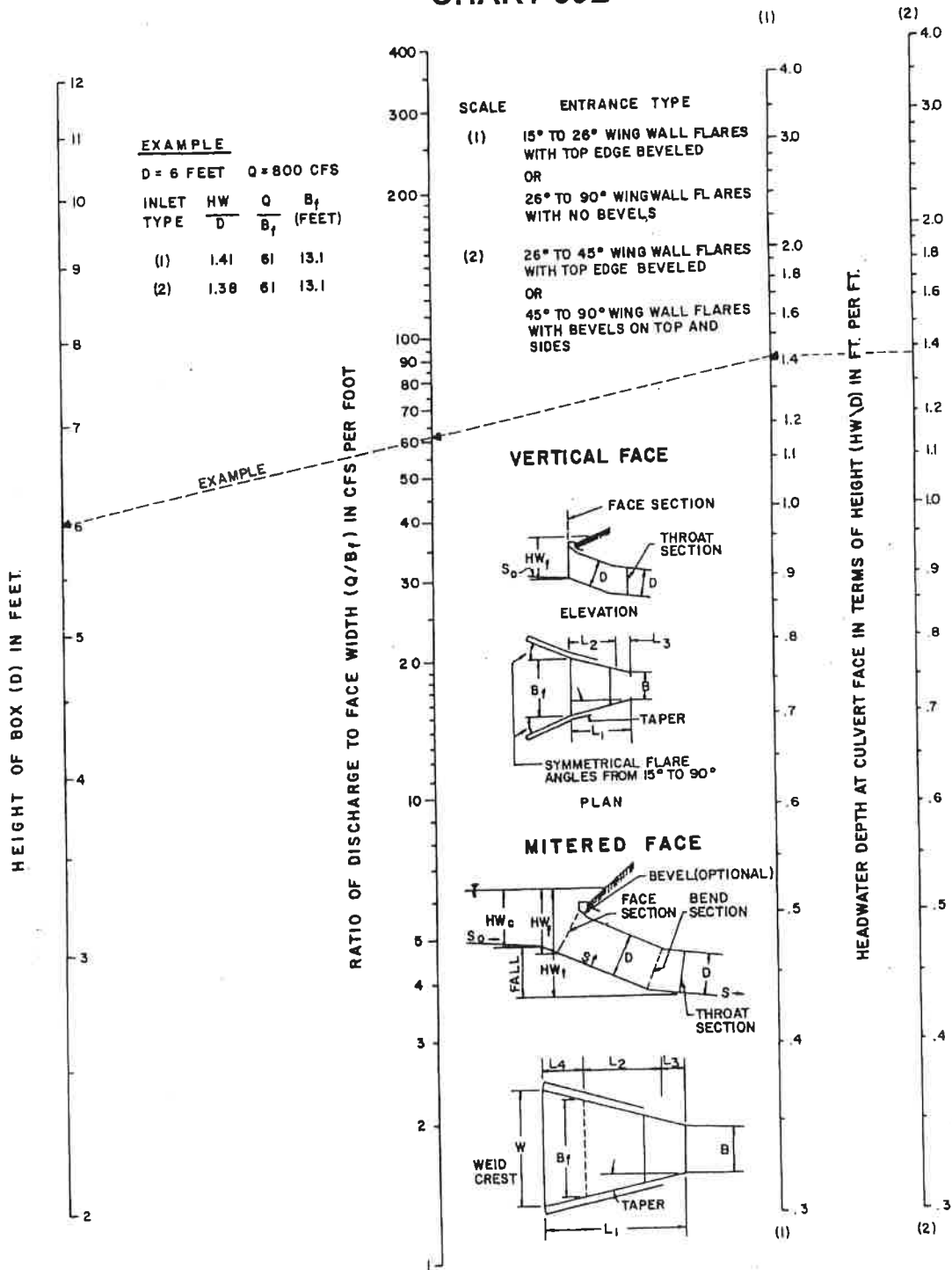


CHART 58B



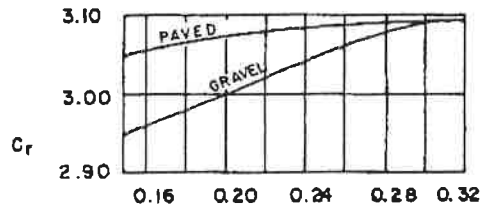
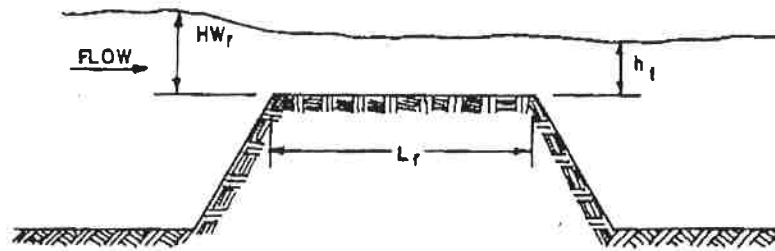
FACE CONTROL FOR BOX CULVERTS WITH SIDE TAPERED INLETS

CHART 59B

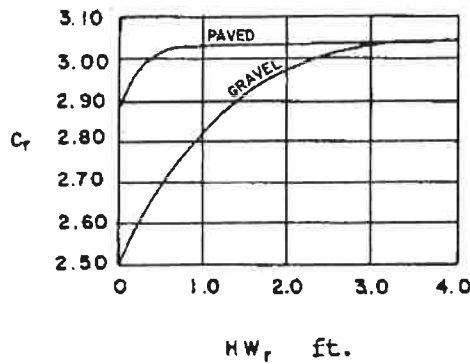


FACE CONTROL FOR BOX
CULVERTS WITH SLOPE
TAPERED INLETS

CHART 60B



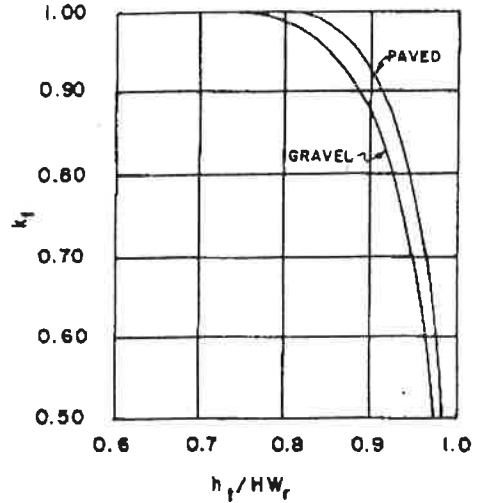
A) DISCHARGE COEFFICIENT FOR
 $HW_r/L_r > 0.15$



B) DISCHARGE COEFFICIENT FOR
 $HW_r/L_r \leq 0.15$

$$C_d = k_f C_r$$

$$Q_r = C_d L H W_r^{1.5}$$



C) SUBMERGENCE FACTOR

English Discharge Coefficients
for Roadway Overtopping

Appendix 6

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