

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

ADDENDUM TO
DRAINAGE PLAN

FOR
BARRINGTON CORNER
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
ENGINEERS
WICHITA, KANSAS

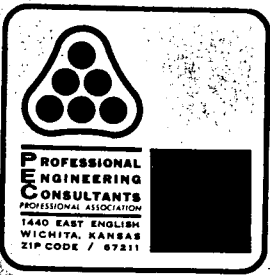
SEPTEMBER 12, 1988

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Project Barrington Corner

Item Revised Drainage Plan

Drainage Plan for Barrington Corner Addition
to be revised as follows:

1. Extend existing 42" SWS westward to west side of culvert #1
2. Revise ditch and culvert designs at various locations due to revised Q in ditch.



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Project Barrington Corner

Item Revised Drainage Plan

DITCH CAPACITIES

Location - W.L. Plat to Culvert #1

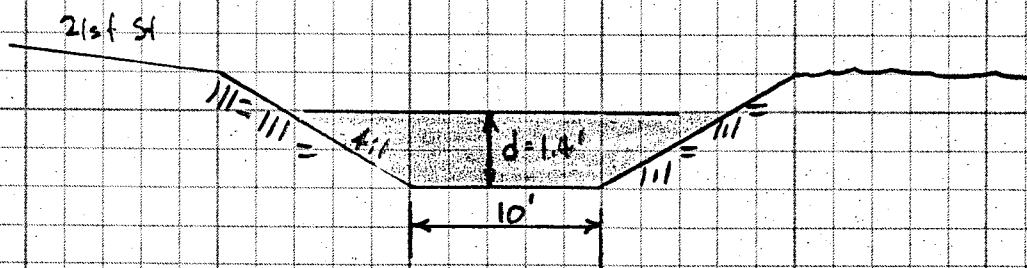
$Q_{100} = 102$ cfs (See Original Drainage Plzn - Reach #1)

$Q_{\text{pipe}} = 0$

$Q_{\text{ditch}} = 102$ cfs

This section has not changed.

Ditch section req'd:





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Project Barrington Corner

Item Revised Drainage Plan

DITCH CAPACITY

Location - Reach #2

$$Q_{100} = 128 \text{ cfs}$$

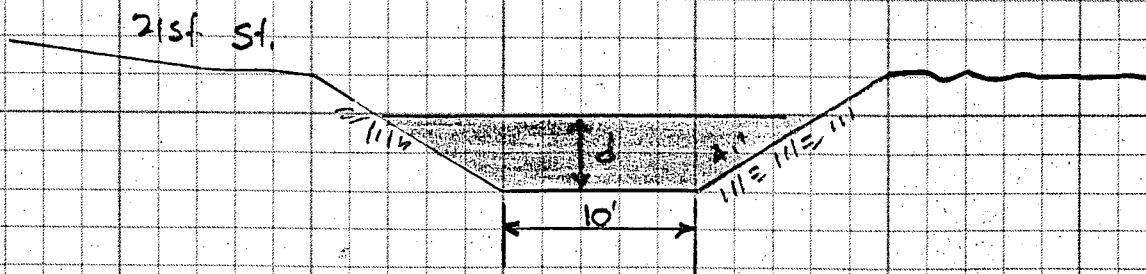
$$Q_{\text{pipe}} = 42" @ 0.35\% = 60 \text{ cfs}$$

$$Q_{\text{ditch}} = Q_{100} - Q_{\text{pipe}} = 128 - 60 = 68 \text{ cfs}$$

$$Q = 1.486/n \cdot AR^{2/3} \cdot S^{1/2}$$

$$68 = 1.486/0.03 \cdot AR^{2/3} \cdot (0.01)^{1/2}$$

$$AR^{2/3} = \frac{68 \times 0.03}{1.486 \times 0.1} = \frac{2.04}{0.1486} = 13.73$$



<u>d</u>	<u>A</u>	<u>p</u>	<u>R</u>	<u>R^{2/3}</u>	<u>AR^{2/3}</u>
1.3	19.76	20.72	0.95	0.97	19.14
1.2	17.76	19.89	0.89	0.93	16.47
1.1	15.84	19.07	0.83	0.88	14.00 ← USE d = 1.1
1.0	14.00	18.25	0.77	0.84	11.73

$$V = Q/A = 68/15.84 = 4.3 \text{ OK}$$



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Project Barrington Corner

Item Revised Drainage Plan

DITCH CAPACITY

Location: Reach #3

$$Q_{100} = 155 \text{ cfs}$$

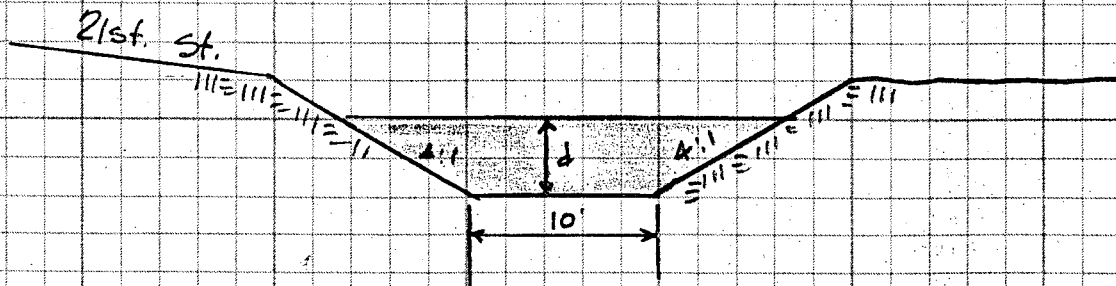
$$Q_{\text{pipe}} = 60$$

$$Q_{\text{ditch}} = Q_{100} - Q_{\text{pipe}} = 155 - 60 = 95 \text{ cfs}$$

$$Q = 1.486/n \ A R^{2/3} \ S^{1/2}$$

$$95 = 1.486/0.03 \ A R^{2/3} \ 0.01^{1/2}$$

$$A R^{2/3} = \frac{95 \times 0.03}{1.486 \times 0.1} = \frac{2.85}{0.1486} = 19.18$$



$\frac{d}{\text{ft}}$	A	P	R	$R^{2/3}$	$AR^{2/3}$	
1.3	19.76	20.72	0.95	0.97	19.14	← USE d=1.3'

$$V = Q/A = 95/19.76 = 4.81 \text{ fps OK}$$



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Project Barrington Corner

Item Revised Drainage Plan

CULVERTS

Culvert #1

Located in Lot 3 between Lots 1 + 2.

Use Q_{100} developed for Reach #, less Q in extended
 42" RCP $Q_{100 \text{ culvert}} = 102 - 60 = 42 \text{ cfs}$

Inlet Control $HW_{allow.} = 4' \pm$

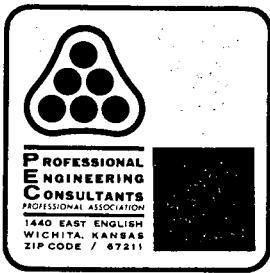
<u>Alt.</u>	<u>HW/D</u>	<u>Q_{allow}</u>	<u>Comment</u>
3'x3'RCB	1.33	53	OK
36" RCP	1.33	50	OK
30" RCP	1.6	37	too small
45"x29"HERCP	1.65	58	OK
42"x27"HERCP	1.78	50	OK
36" CMP	1.33	48	OK

Outlet Control

$HW = 4$ $h_0 = 1.1$ $L = 90' S_0 = 1\%$
 $HW = H + h_0 - LS_0$
 $4 = H + 1.1 - (90 \times 0.01)$
 $4 = H + 1.1 - 0.9$
 $H = 3.8'$

<u>Alt.</u>	<u>K_e</u>	<u>Q_{allow}</u>	
3'x3'RCB	0.7	95	OK
36" RCP	0.5	78'	OK
42"x27"HERCP	0.5	68	OK
36" CMP	0.7	55	OK

Recommend 36" RCP Culvert



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Project Barrington Corner

Item Revised Drainage Plan

Culvert #2

Located just west of Lot 4

Use Q_{100} developed for Ditch Reach #3
less Q_{in} extended 42" SWS

$$Q_{culvert} = 155 - 60 = 95 \text{ cfs.}$$

Inlet Control

$$H_{Wallow} = 4.0' \pm$$

<u>Alt.</u>	<u>Hw/D</u>	<u>Q_{allow}</u>	<u>Comment</u>
6'x3'RCP	1.33	108	OK
5'x3'RCP	1.33	92	too small
2-36" RCP	1.33	100	OK
54" RCP	0.88	80	too small
60" RCP	0.80	90	too small
2-30" RCP	1.60	74	too small
60" x 38" HERCP	1.26	90	too small
68" x 42" HERCP	1.12	108	OK
2-36" CMP	1.33	94	OK



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Project Barrington Corner

Item Revised Drainage Plan

Culvert #2 (Continued)

Outlet Control

$$HW = 4.0'$$

$$h_o = 1.3'$$

$$L = 90'$$

$$S_o = 1\%$$

$$HW = H + h_o - LS_o$$

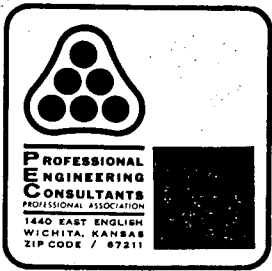
$$4.0 = H + 1.3 - (90 \times 0.01)$$

$$4.0 = H + 1.3 - 0.9$$

$$H = 3.6'$$

<u>Alt.</u>	<u>Ke</u>	<u>Q_{all.}</u>	<u>Comment</u>
6'x3'RCB	0.7	190	OK
2-36"RCP	0.5	75x2=150	OK
68"x43"HERCP	0.5	190	OK
2-36"CMP	0.7	54x2=108	OK

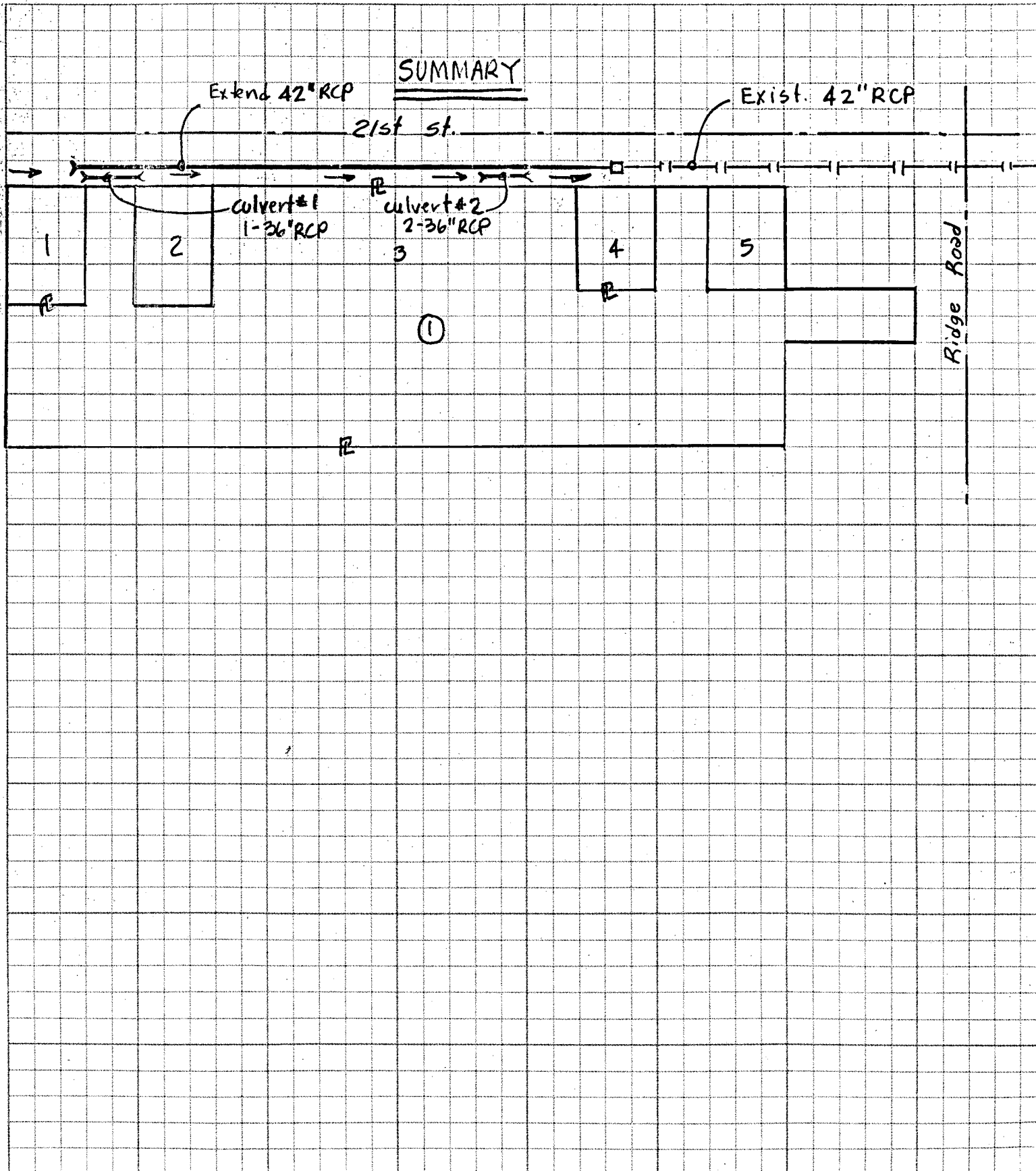
Recommend 2-36" RCP culverts.



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Project Barrington Corner

Item Revised Drainage Plan



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

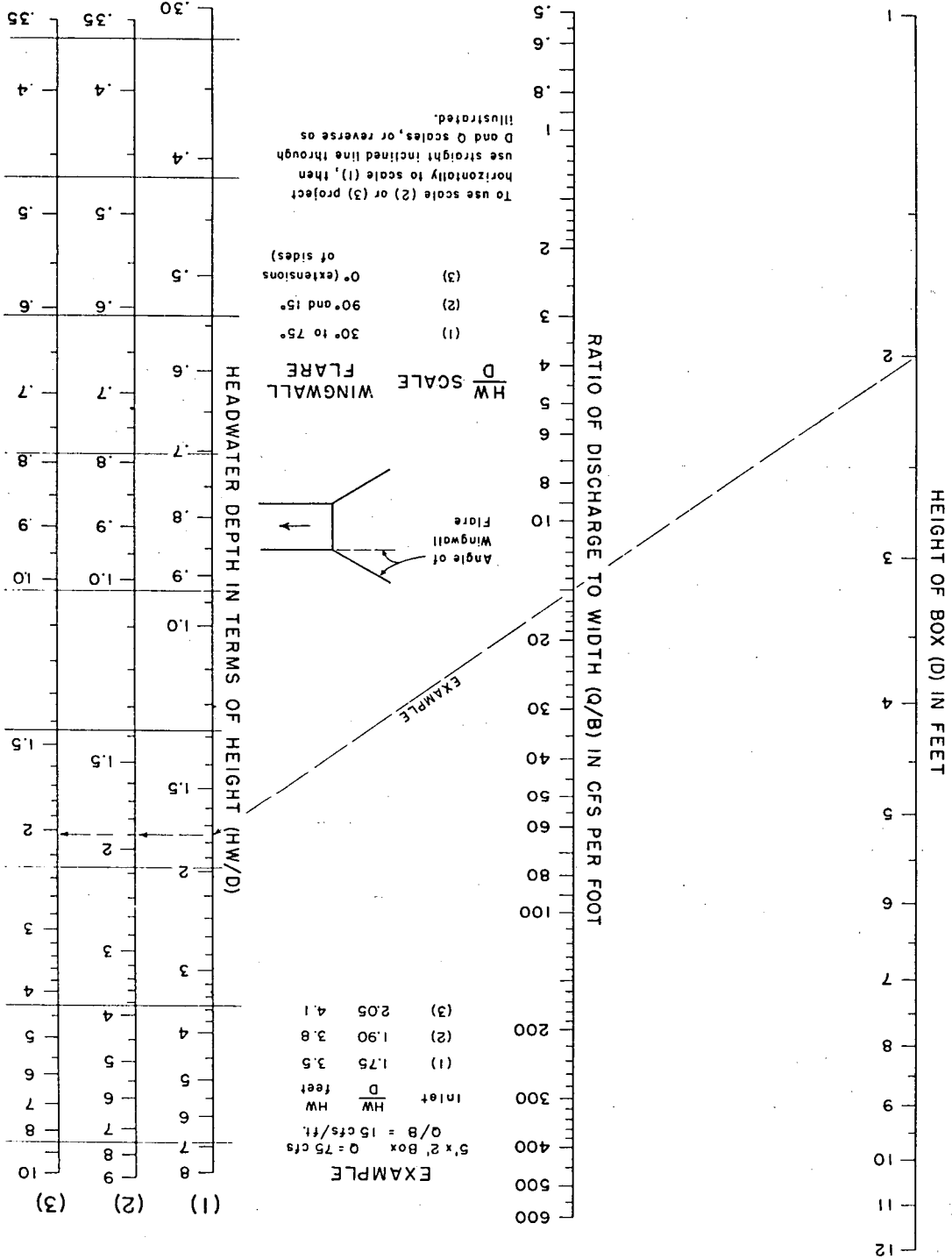


CHART I

HEADWATER DEPTH FOR
CONCRETE PIPE CULVERTS
WITH INLET CONTROL

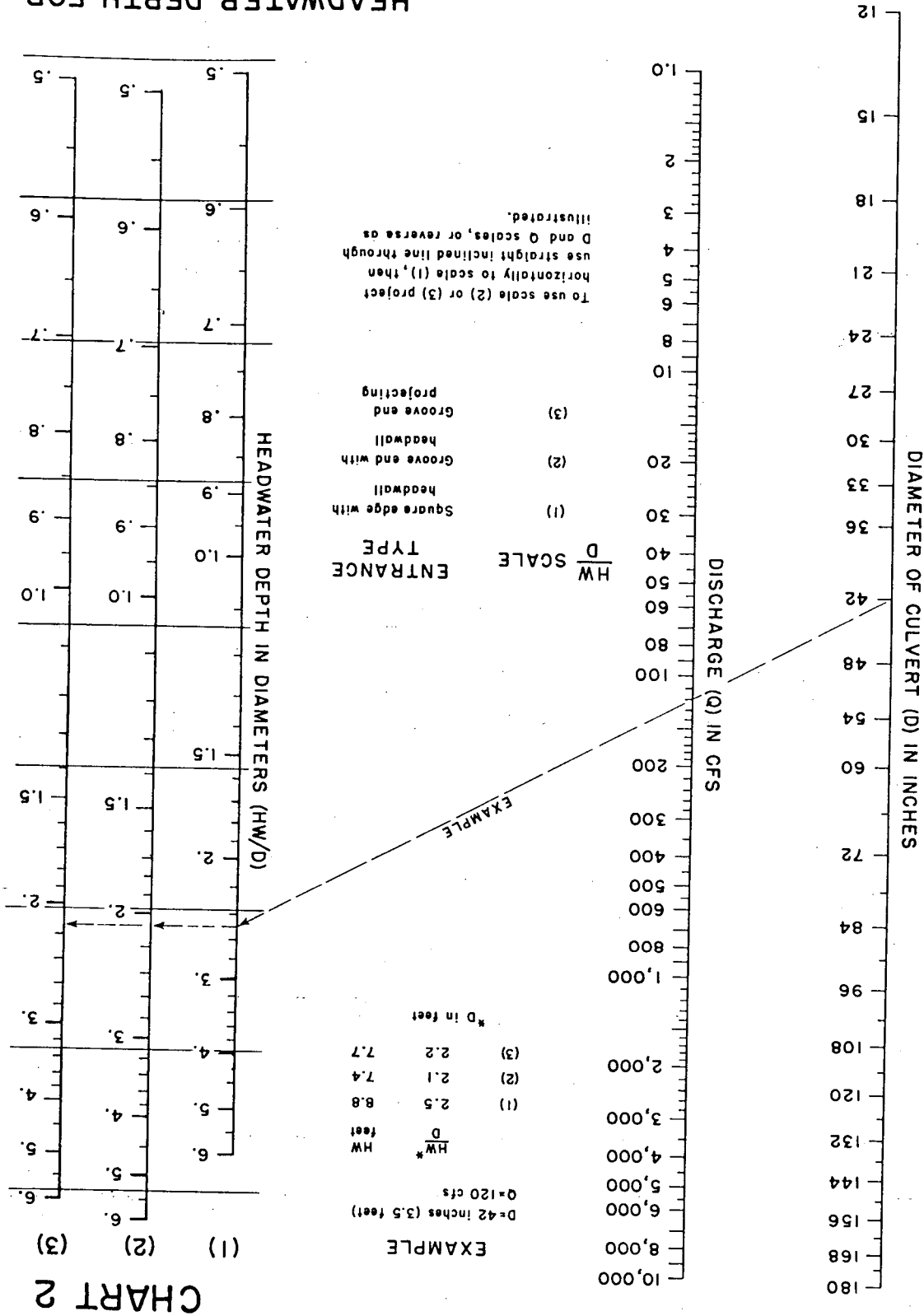


CHART 2

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

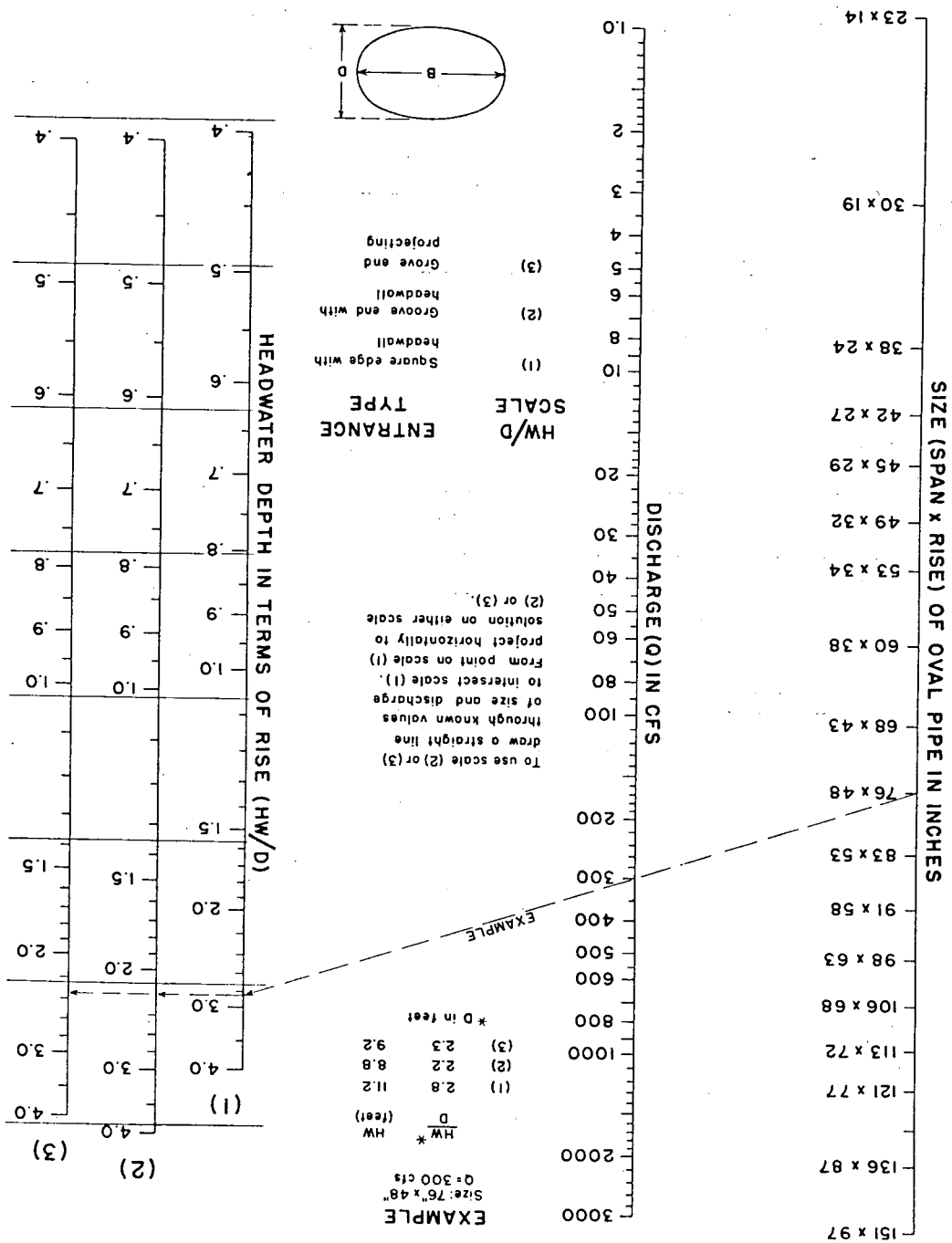
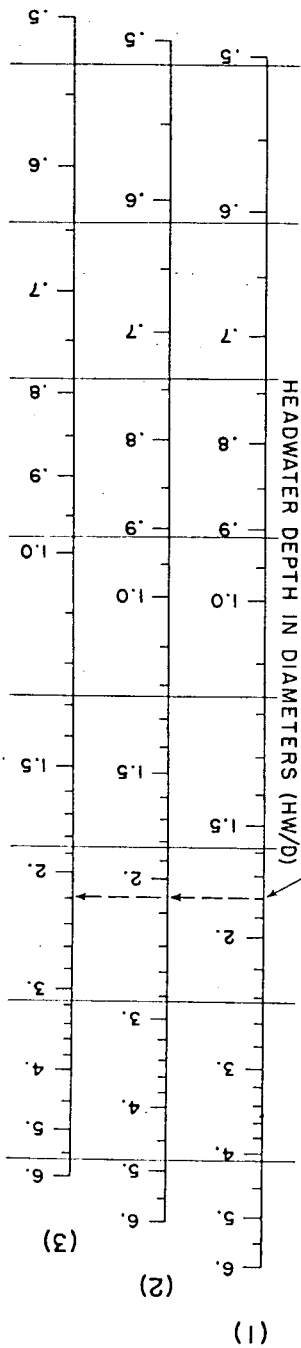


CHART 3

CHART 5

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



To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.

ENTRANCE TYPE

- (1) Headwall
- (2) Mitered to conform to slope
- (3) Projecting

EXAMPLE

HW/D (feet)	D (feet)	Q (cfs)
1.8	5.4	1,000
2.1	6.3	2,000
2.2	6.6	3,000

D = 36 inches (3.0 feet)
Q = 66 cfs

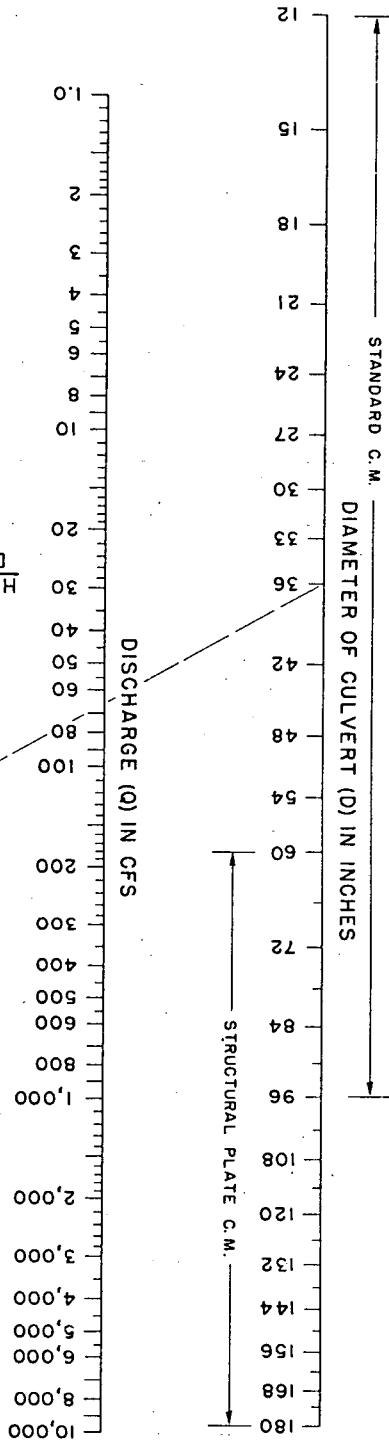


CHART 8

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

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BUREAU OF PUBLIC ROADS JAN. 1963

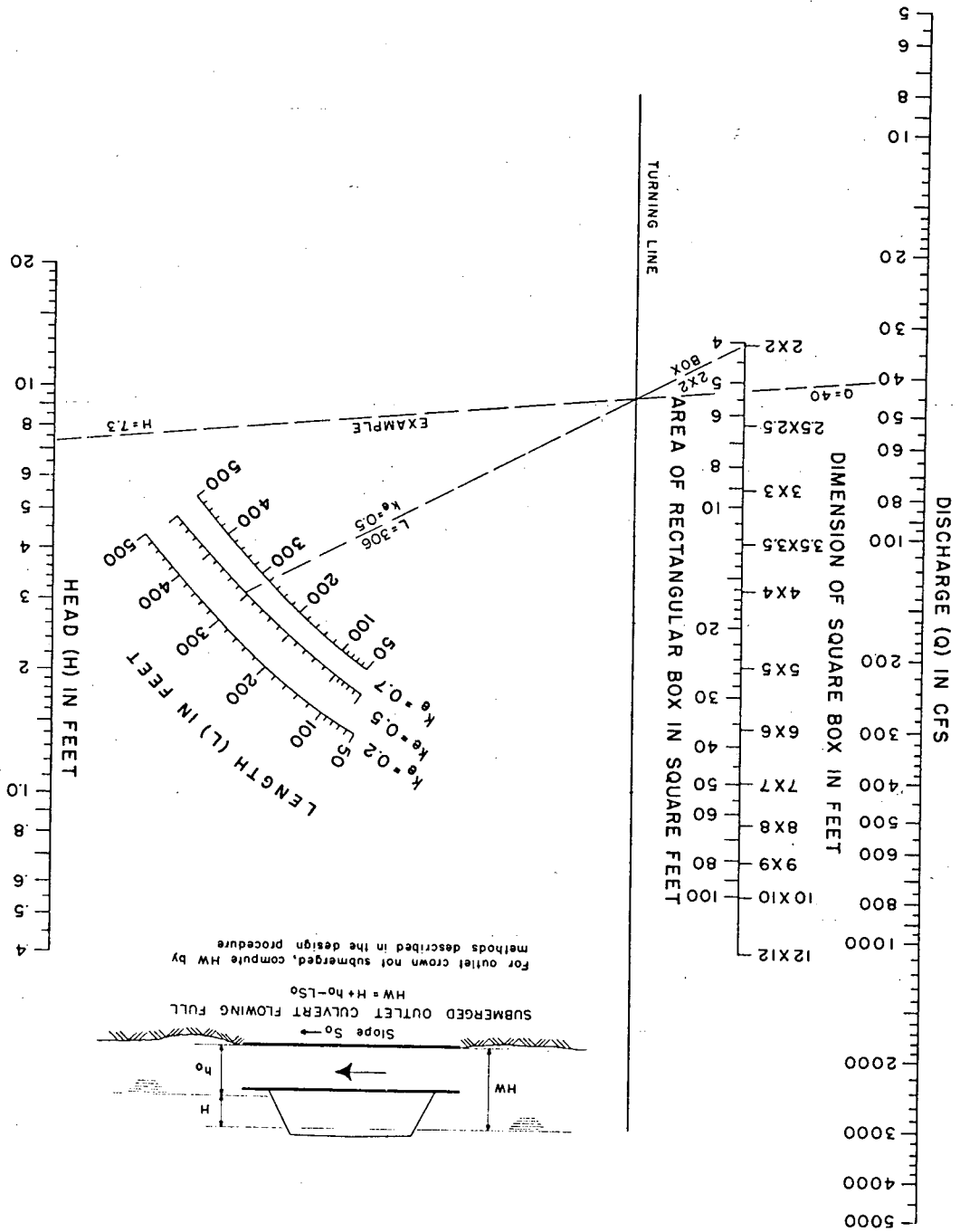


CHART 9

HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL

$n = 0.012$

BUREAU OF PUBLIC ROADS JAN. 1963

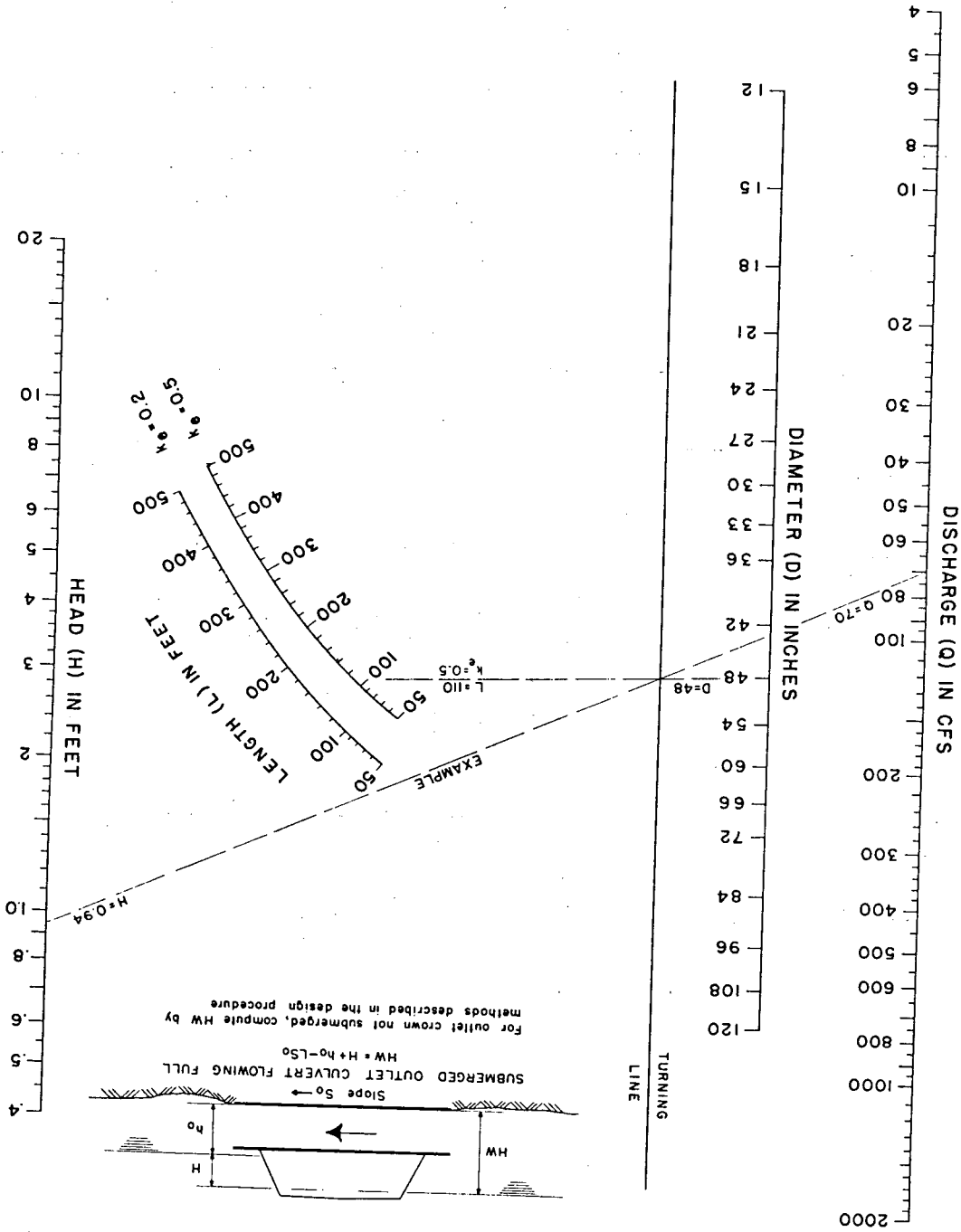
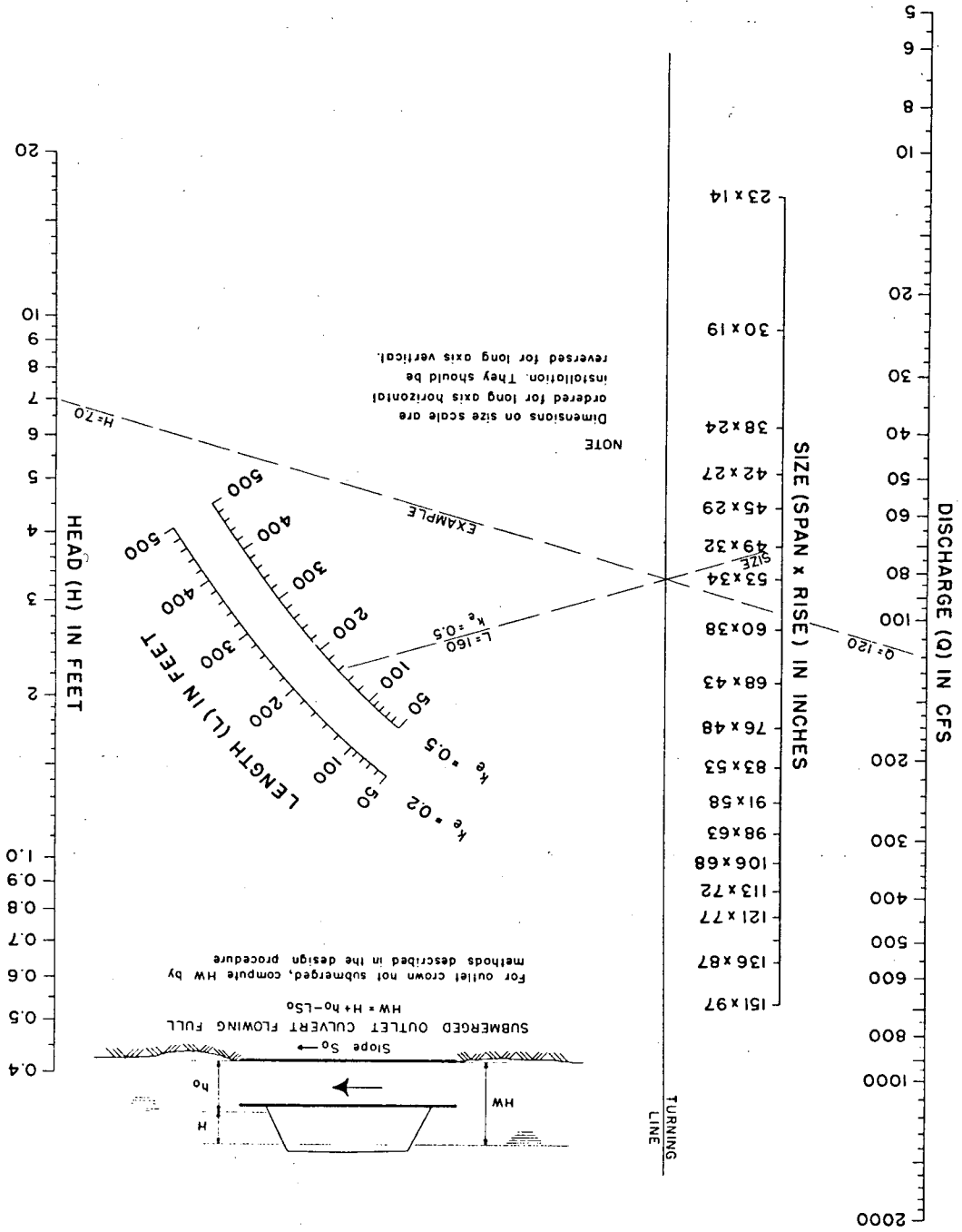


CHART 10



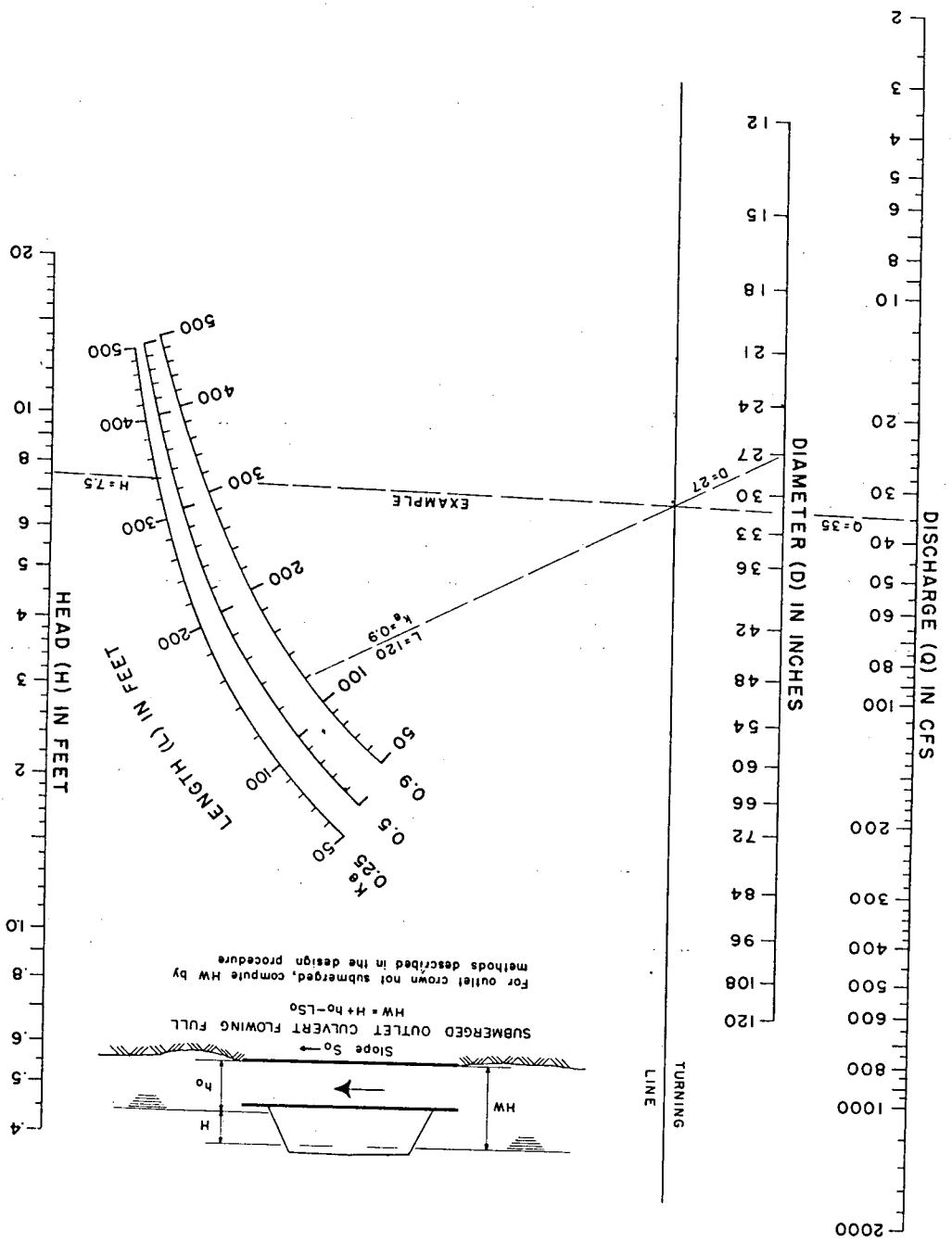
HEAD FOR
 OVAL CONCRETE PIPE CULVERTS
 LONG AXIS HORIZONTAL OR VERTICAL
 FLOWING FULL
 $n = 0.012$

BUREAU OF PUBLIC ROADS JAN. 1963

5-33

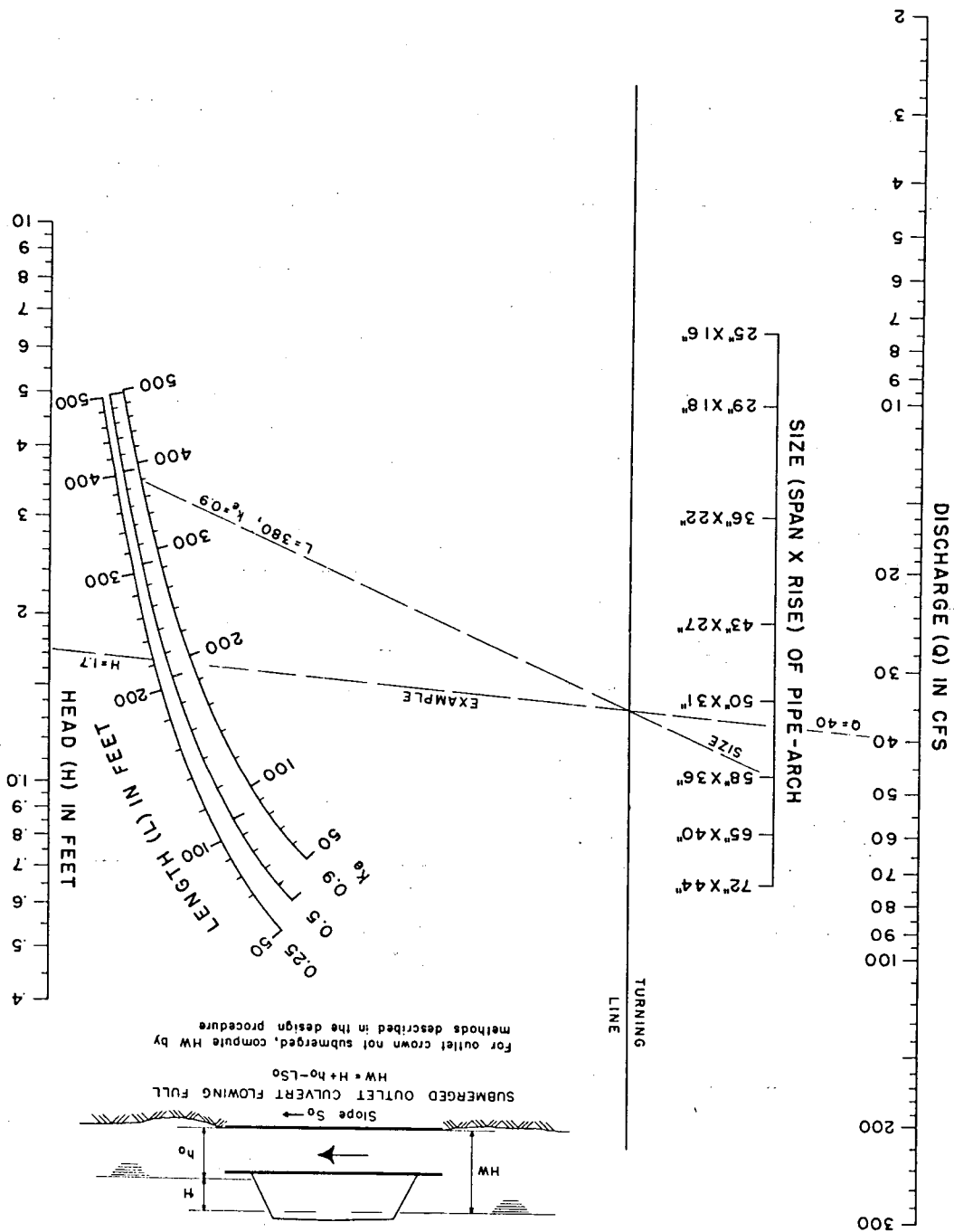
NOTE
 Dimensions on size scale are
 ordered for long axis horizontal
 installation. They should be
 reversed for long axis vertical.

CHART II



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

CHART 12



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

BUREAU OF PUBLIC ROADS JAN. 1963

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