APPENDIX I

APPENDIX I
ROADWAY DESIGN TABLES/CHARTS

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COLLECTOR ROAD

	R/W WIDTH	MINIMUM PAVEMENT WIDTH (FEET)	DESIGN SPEED (MPH)	MIN. RADIUS (FEET)	MAX. GRADE
URBAN	60' (closed) 70' (open)	30' CLOSED SECTION OR 30' OPEN SECTION WITH 4' GRADED SHOULDER AND 5' WIDE SIDEWALKS ON BOTH SIDES	40	750	6%
PARKWAY	80'	30' OPEN SECTION WITH 4' GRADED SHOULDER WITH 8' WIDE HIKER / BIKER TRAIL*	40	750	6%
RURAL					
MAJOR	60'	30' OPEN SECTION WITH 4' GRADED SHOULDER	40	750	8%
MINOR	60'	26' OPEN SECTION WITH 6' GRADED SHOULDER	40	750	8%

* SIDEWALK SHALL BE PROVIDED ALONG BOTH SIDES OF THE ROAD. SIDEWALK ALONG AN OPEN SECTION ROAD SHALL BE PROVIDED BEYOND THE DITCH LINE.

LOCAL ROAD

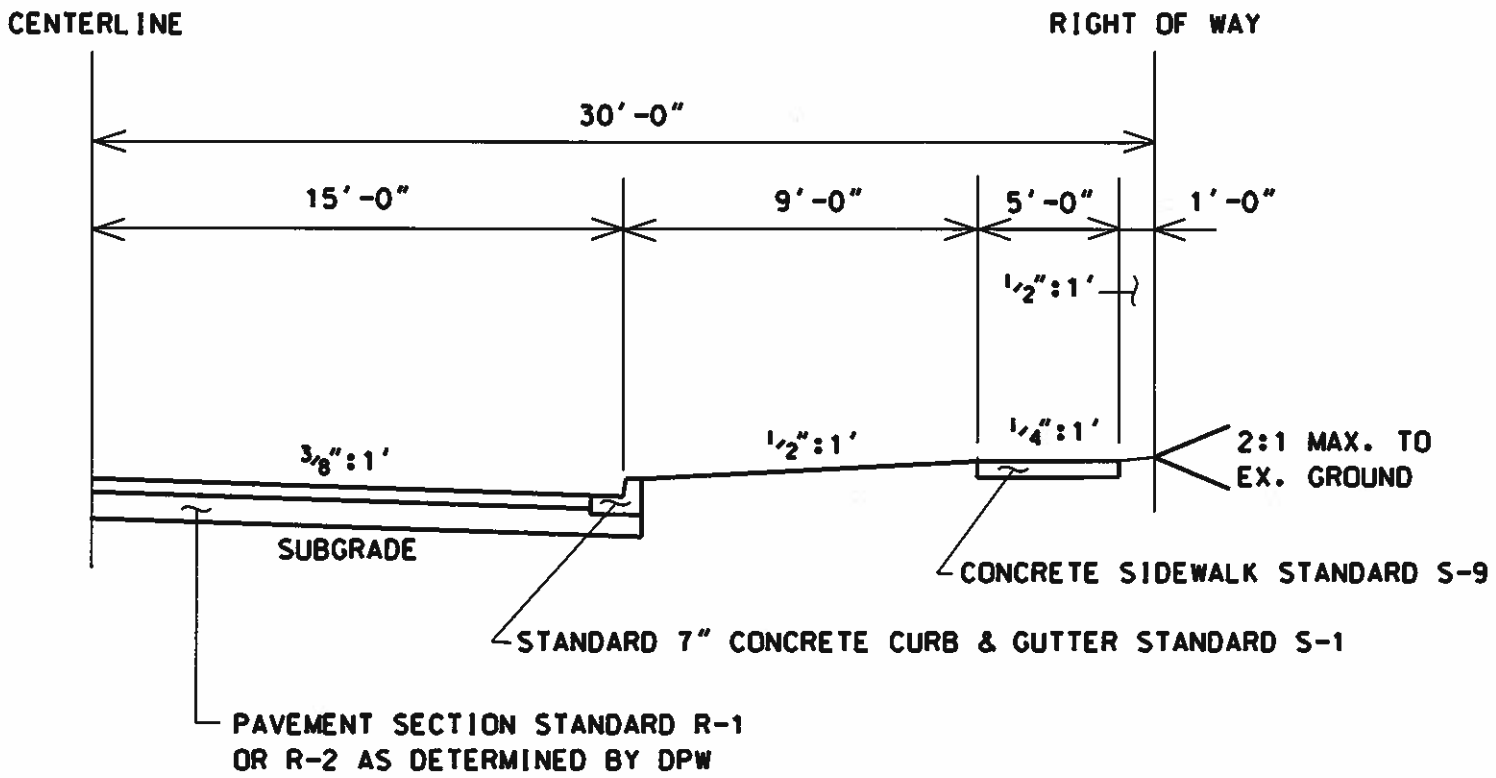
	R/W WIDTH	MINIMUM PAVEMENT WIDTH (FEET)	DESIGN SPEED (MPH)	MIN. RADIUS (FEET)	MAX. GRADE
BUSINESS/ INDUSTRIAL	60'	40' CLOSED SECTION WITH 5' WIDE SIDEWALKS ON BOTH SIDES	30	380	6%
RESIDENTIAL COLLECTOR LOTS > 20,000 SF	60'	24' OPEN SECTION WITH 6' GRADED SHOULDER AND A 4' WIDE SIDEWALK ON ONE SIDE LOCATED OUTSIDE THE DRAINAGE DITCH OR 24' CLOSED SECTION WITH A 4' WIDE SIDEWALK ON ONE SIDE	30	380	8%
	50'	30' CLOSED SECTION WITH A 5' WIDE SIDEWALK ON ONE SIDE	30	380	8%
LOTS ≤ 20,000 SF **	50"		30	380	8%
RESIDENTIAL SUB-COLLECTOR LOTS ≥ 30,000 SF	50'	24' CLOSED SECTION WITH A 4' WIDE SIDEWALK ON AT LEAST ONE SIDE	25	200***	8%
LOTS > 10,000 OR < 30,000 SF	50'	30' CLOSED SECTION WITH 5' WIDE SIDEWALKS ON BOTH SIDES	25	200***	8%
LOTS ≤ 10,000 SF	60'	36' CLOSED SECTION WITH 5' WIDE SIDEWALKS ON BOTH SIDES	25	200***	8%
RESIDENTIAL ACCESS LOTS ≥ 30,000 SF	50'	18' OPEN SECTION WITH 6' GRADED SHOULDER OR 24' CLOSED SECTION	25	200***	10%
LOTS > 10,000 OR < 30,000 SF	50'	24' CLOSED SECTION WITH 5' WIDE SIDEWALKS ON BOTH SIDES	25	200***	10%
LOTS ≤ 10,000 SF	50'	30' CLOSED SECTION WITH 5' WIDE SIDEWALKS ON BOTH SIDES	25	200***	10%

TOWNHOUSE COLLECTOR	50'	30' CLOSED SECTION (5' SIDEWALK MAY BE PROVIDED ON ONLY ONE SIDE)	30	380	10%
TOWNHOUSE ACCESS ROAD	28'	24' CLOSED SECTION WITH 5' – 6' SIDEWALKS ON BOTH SIDES 30' CLOSED SECTION WITH 5' – 6' SIDEWALKS ON BOTH SIDES	25	200****	6%
TOWNHOUSE ACCESS ROAD FOR SCHOOL BUSES	34'		25	200****	6%

** OR WHERE CONNECTED TO NEIGHBORHOODS WITH CLOSED SECTION SUB-COLLECTORS AND ACCESS ROADS.

*** WHERE THE CENTERLINE DEFLECTION ANGLE IS 60 DEGREES OR GREATER, THE DESIGNER MAY DEVIATE FROM THE 25 MPH DESIGN CRITERIA AND USE A MINIMUM RADIUS OF 125 FEET TO CONNECT THE CENTERLINES.

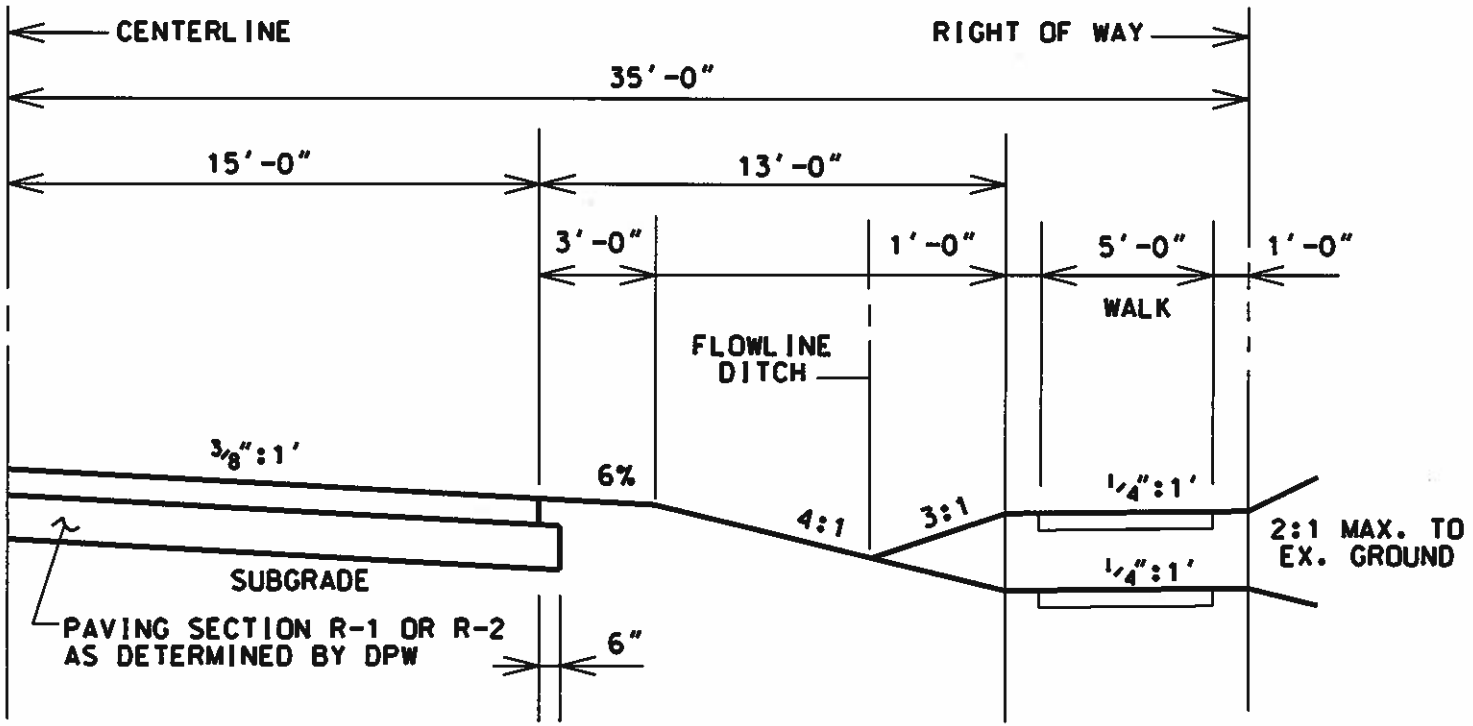
**** WHERE THE CENTERLINE DEFLECTION ANGLE IS 60 DEGREES OR GREATER, THE DESIGNER MAY DEVIATE FROM THE 25 MPH DESIGN CRITERIA AND USE A MINIMUM RADIUS OF 50 FEET TO CONNECT THE CENTERLINES.



NOTES:

1. PAVING SECTION FOR ARTERIAL ROADS SHALL BE DESIGNED.
2. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL. SEED AND MULCH.

HARFORD COUNTY, MD DEPARTMENT OF PUBLIC WORKS	URBAN COLLECTOR - CLOSED SECTION (60' RIGHT OF WAY)	Revised:5/1/07 PLATE 1



NOTES:

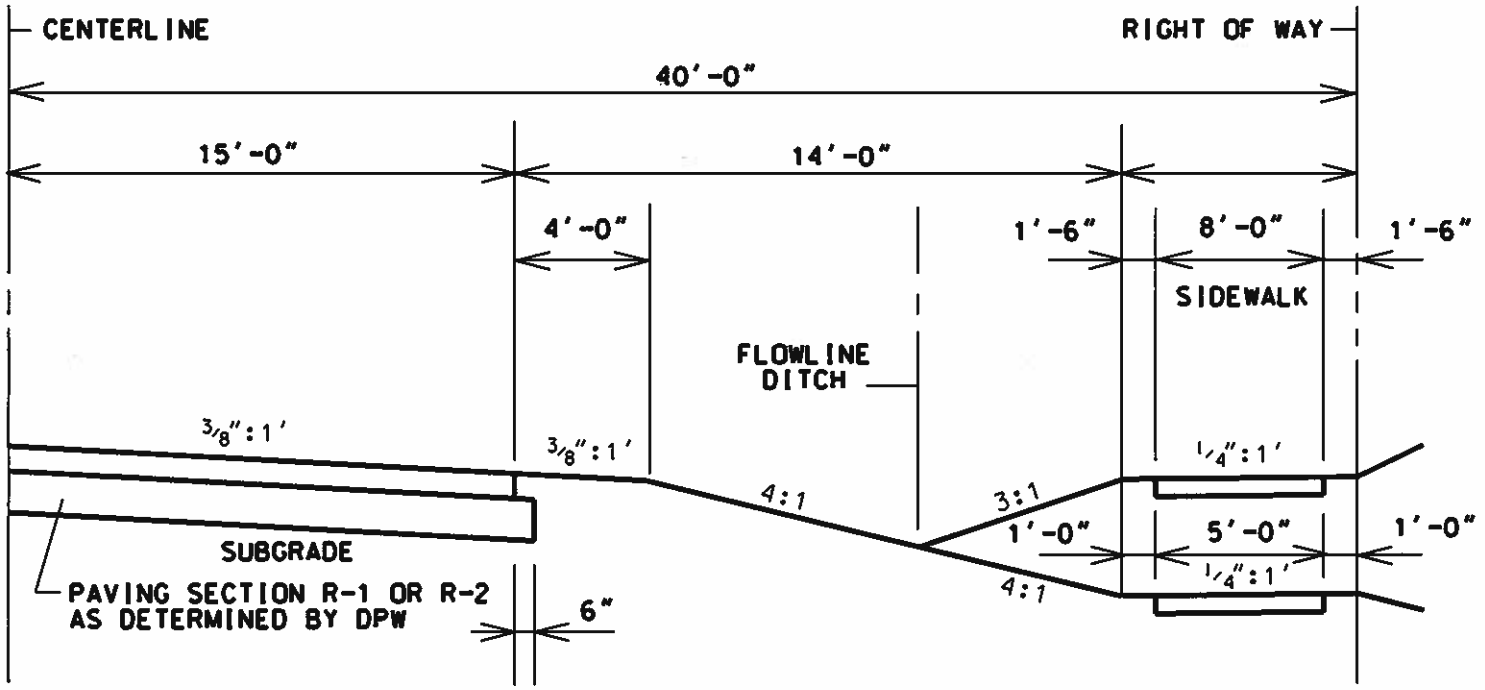
1. PAVING SECTION FOR ARTERIAL ROADS SHALL BE DESIGNED.
2. WIDTH OF RIGHT OF WAY SHALL INCREASE AS WIDTH OF DITCH INCREASES.
3. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL. SEED AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

URBAN COLLECTOR - OPEN SECTION (70' RIGHT OF WAY)

Revised:5/1/07

PLATE 2



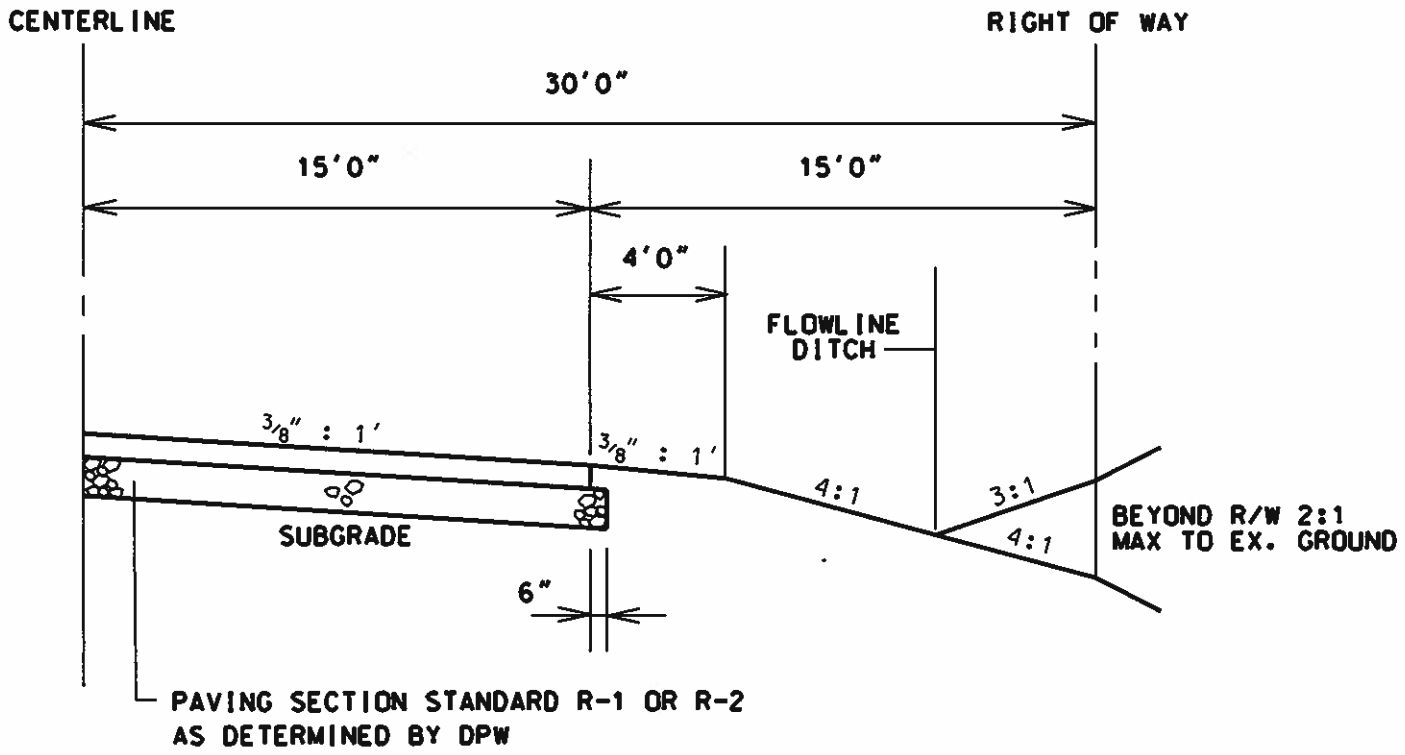
NOTES:

1. PAVING SECTION FOR ARTERIAL ROADS SHALL BE DESIGNED.
2. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL. SEED AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

PARKWAY
(80' RIGHT OF WAY)

PLATE 3



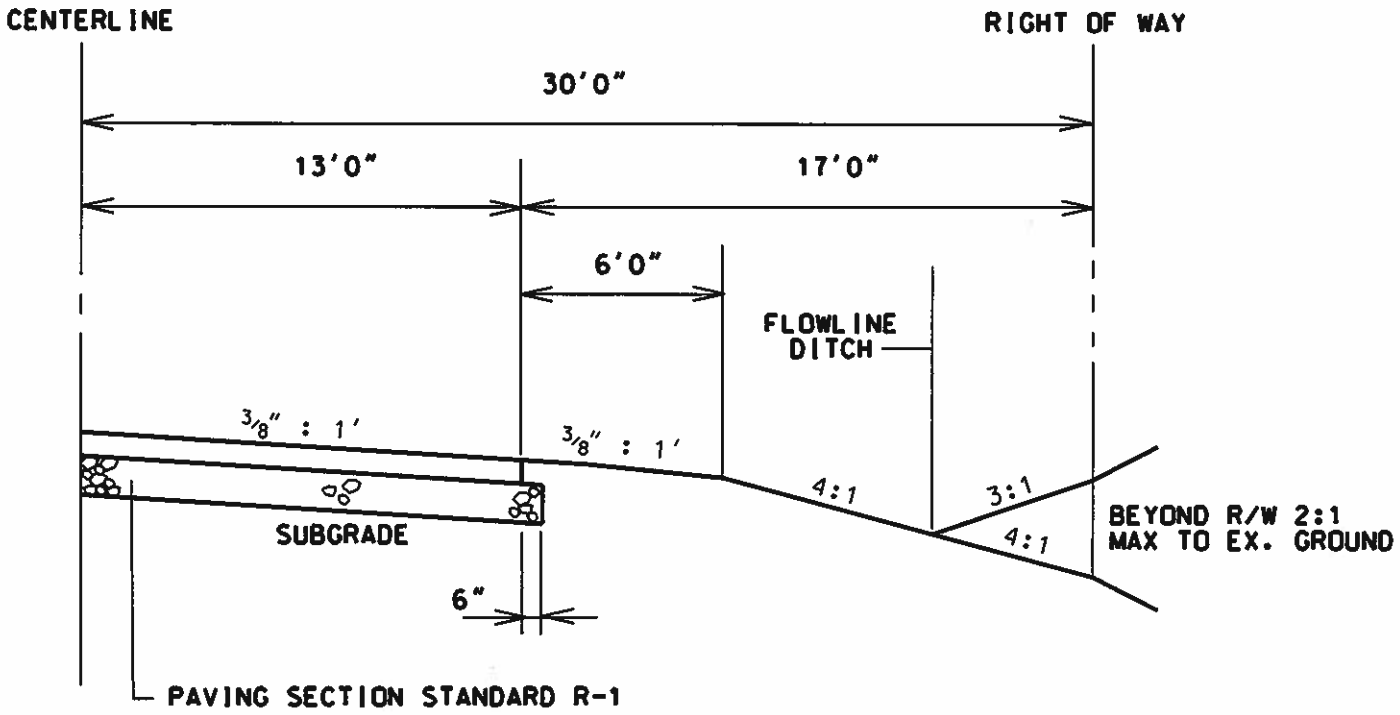
NOTES:

1. PAVING SECTIONS FOR ARTERIAL ROADS SHALL BE DESIGNED.
2. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL. SEED AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

RURAL MAJOR COLLECTOR OPEN SECTION ROAD (60' RIGHT OF WAY)

PLATE 4



NOTES:

1. PAVING SECTIONS FOR ARTERIAL ROADS SHALL BE DESIGNED.
2. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED AND MULCH.

HARFORD COUNTY, MD
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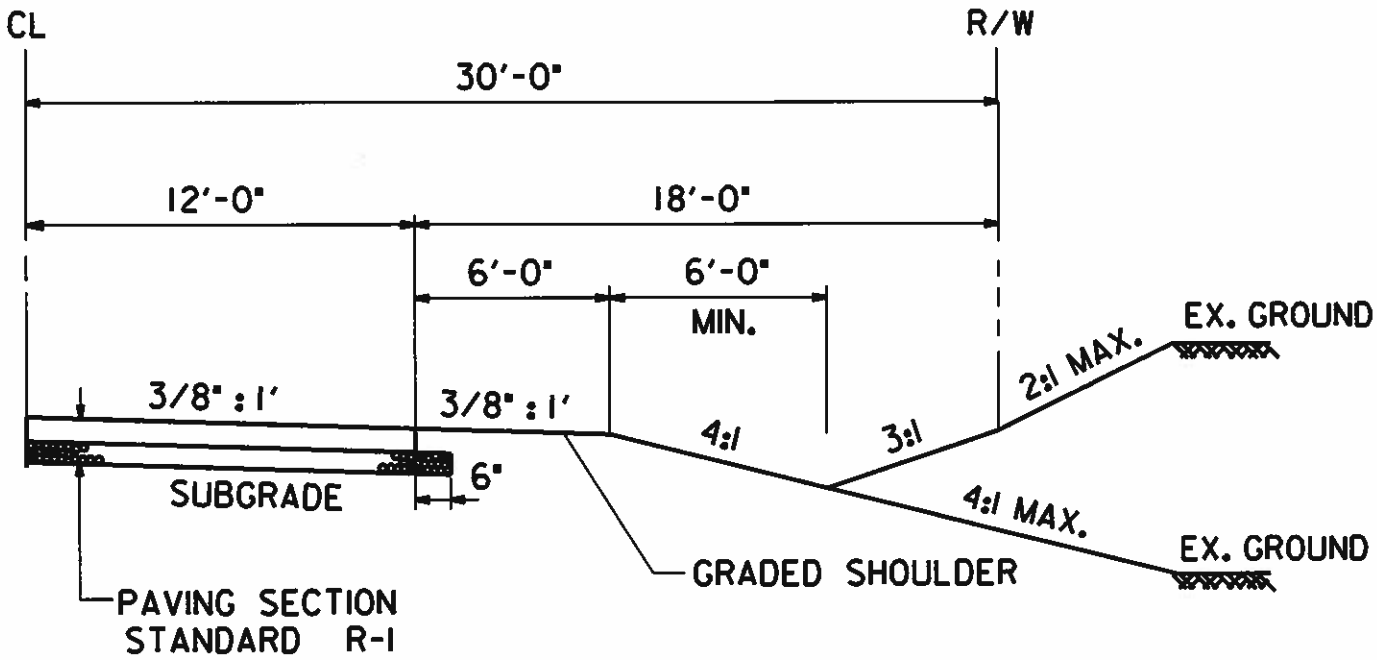
RURAL MINOR COLLECTOR
OPEN SECTION ROAD
(60' RIGHT OF WAY)

PLATE 5

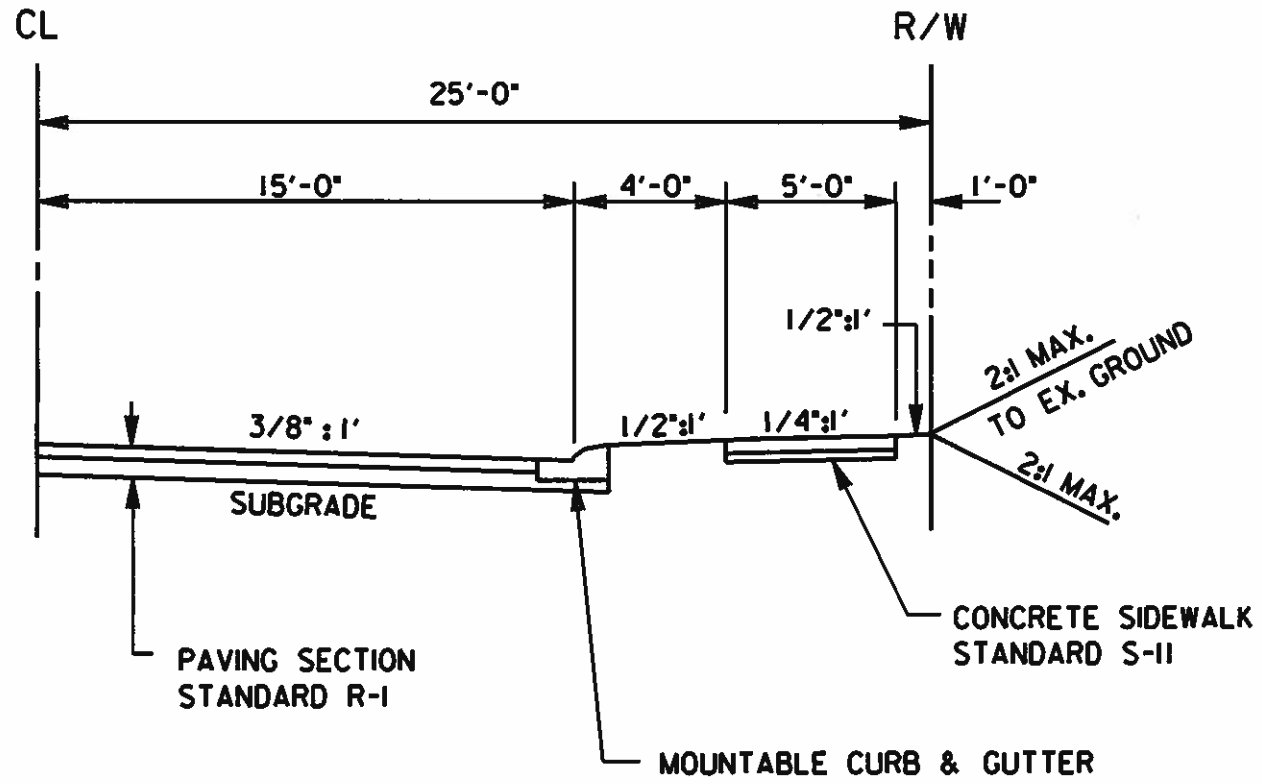


NOTES: 1. FOR COMMUNITIES WHERE LOTS > 20000 SQ. FT.
2. A CONCRETE SIDEWALK (S-11) SHALL BE PLACED ALONG ONE SIDE OF THE ROAD BEYOND THE DITCH LINE.
3. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED, AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

RESIDENTIAL COLLECTOR OPEN SECTION

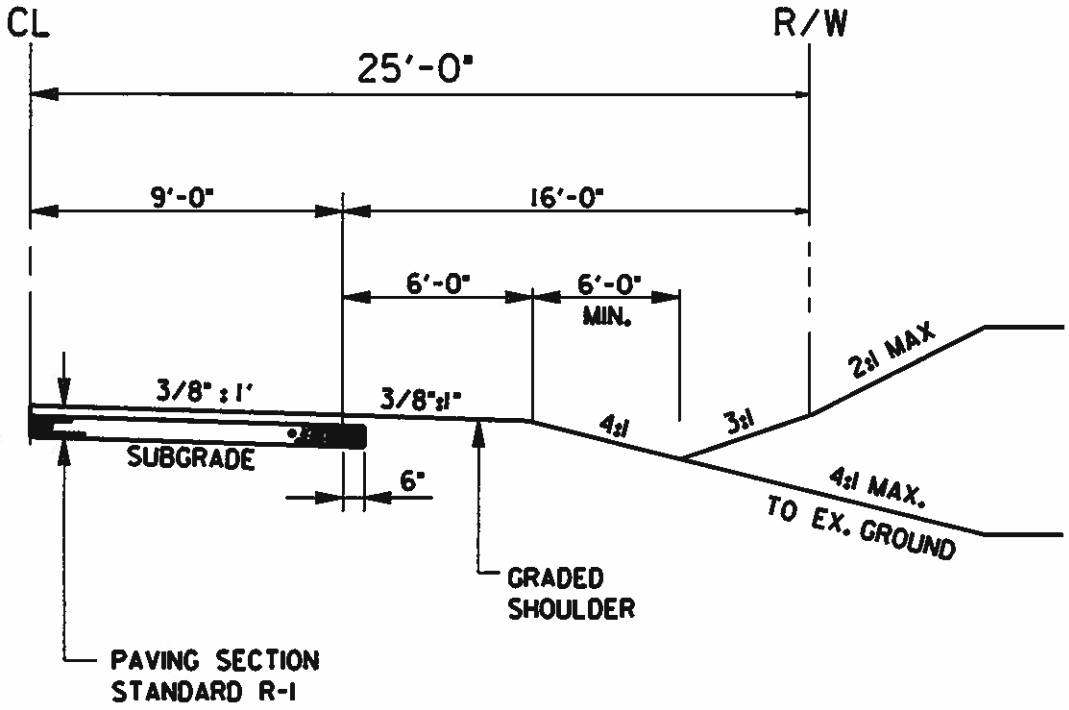
PLATE 6



NOTES:

1. FOR COMMUNITIES WHERE LOT SIZE < 20000 SQ. FT. AND/OR ROAD IS CONNECTED TO NEIGHBORHOOD WITH CLOSED SECTION SUB-COLLECTOR AND ACCESS ROADS. AND AS A TOWNHOUSE COLLECTOR ROAD.
2. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED AND MULCH.

HARFORD COUNTY, MD DEPARTMENT OF PUBLIC WORKS	TOWNHOUSE COLLECTOR RESIDENTIAL COLLECTOR CLOSED SECTION	Revised:5/1/07 PLATE 7



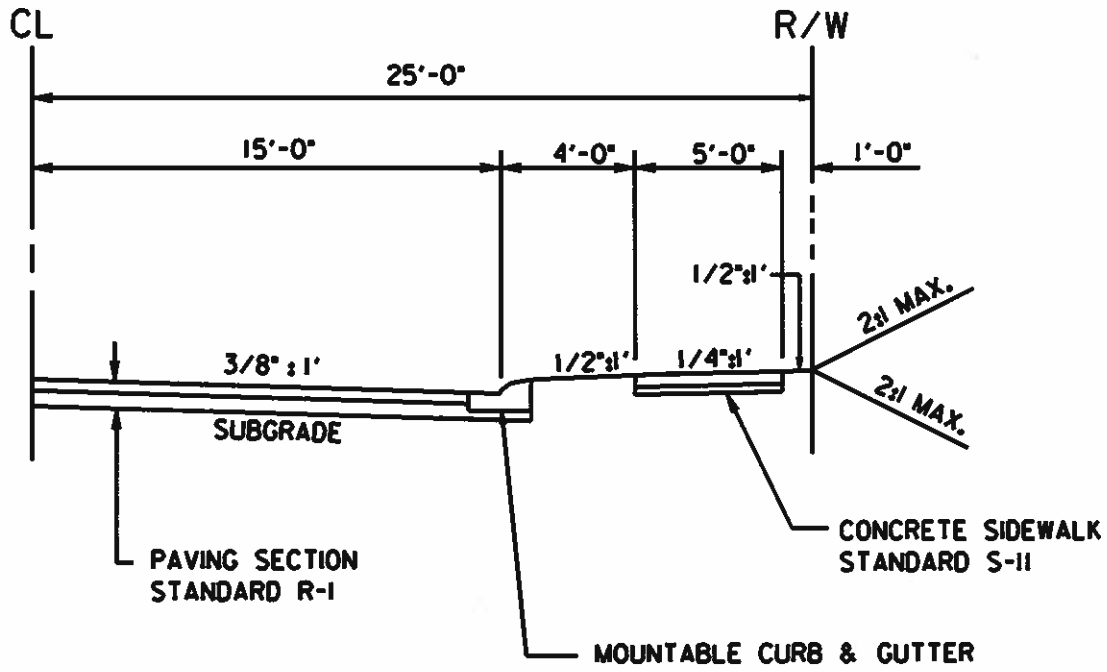
NOTES: 1. FOR COMMUNITIES WHERE LOTS ≥ 30,000 SQ. FT.
2. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

RESIDENTIAL ACCESS
OPEN SECTION

Revised: 2/15/03
Revised: 5/1/07

PLATE 8



NOTES:

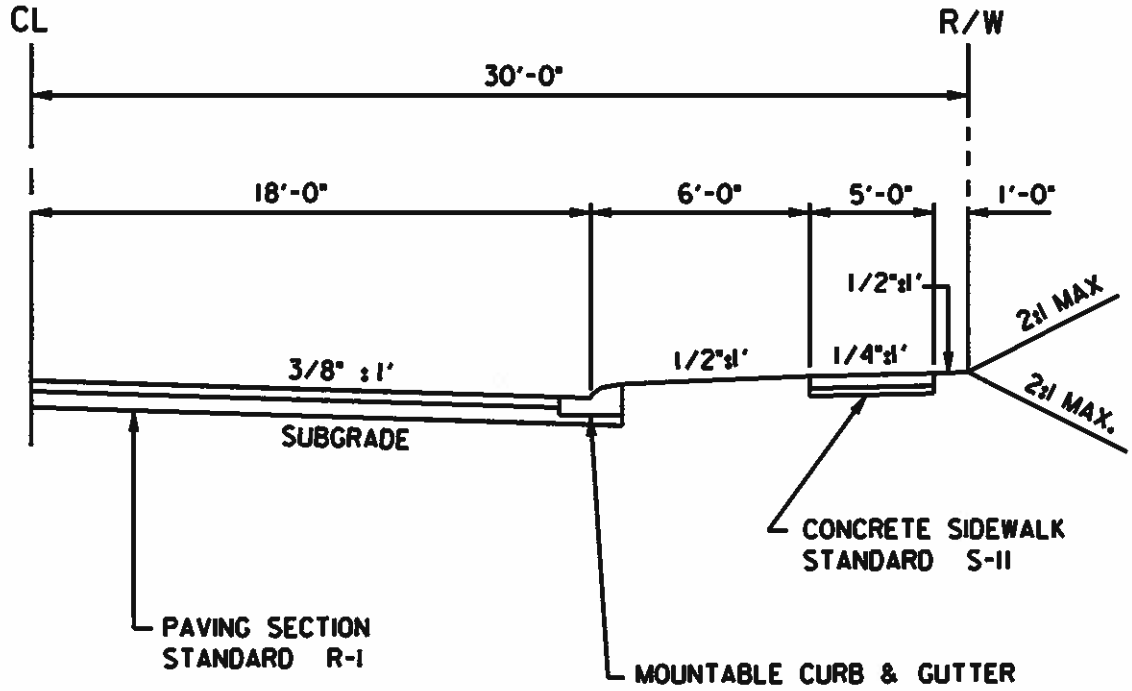
1. SUBCOLLECTOR- 10,000 SQ.FT. < LOTS < 30,000 SQ. FT.
2. RESIDENTIAL ACCESS- FOR COMMUNITIES WHERE LOTS ≤ 10,000 SF
3. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED, AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

SUB-COLLECTOR RESIDENTIAL ACCESS CLOSED SECTION

Revised: 2/15/03
Revised: 5/1/07

PLATE 9



NOTES:

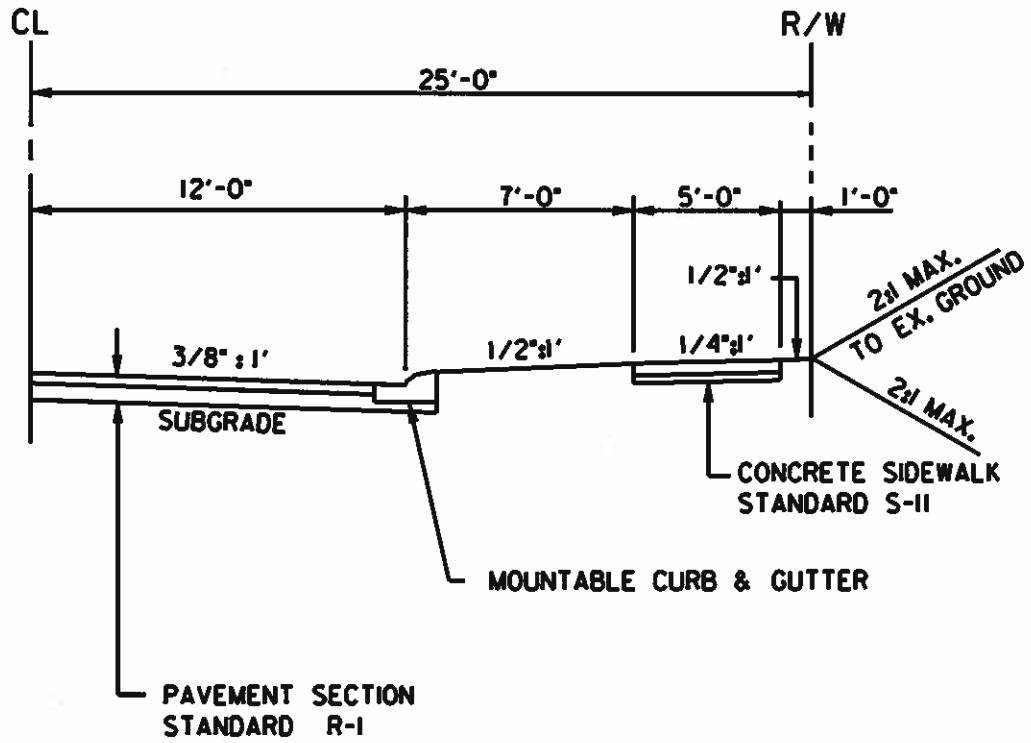
1. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED AND MULCH.
2. RESIDENTIAL SUB-COLLECTOR FOR COMMUNITIES WHERE LOTS $\leq$ 10,000 SF.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

RESIDENTIAL SUB-COLLECTOR CLOSED SECTION

Revised: 2/15/03
Revised: 5/1/07

PLATE 10



NOTES:

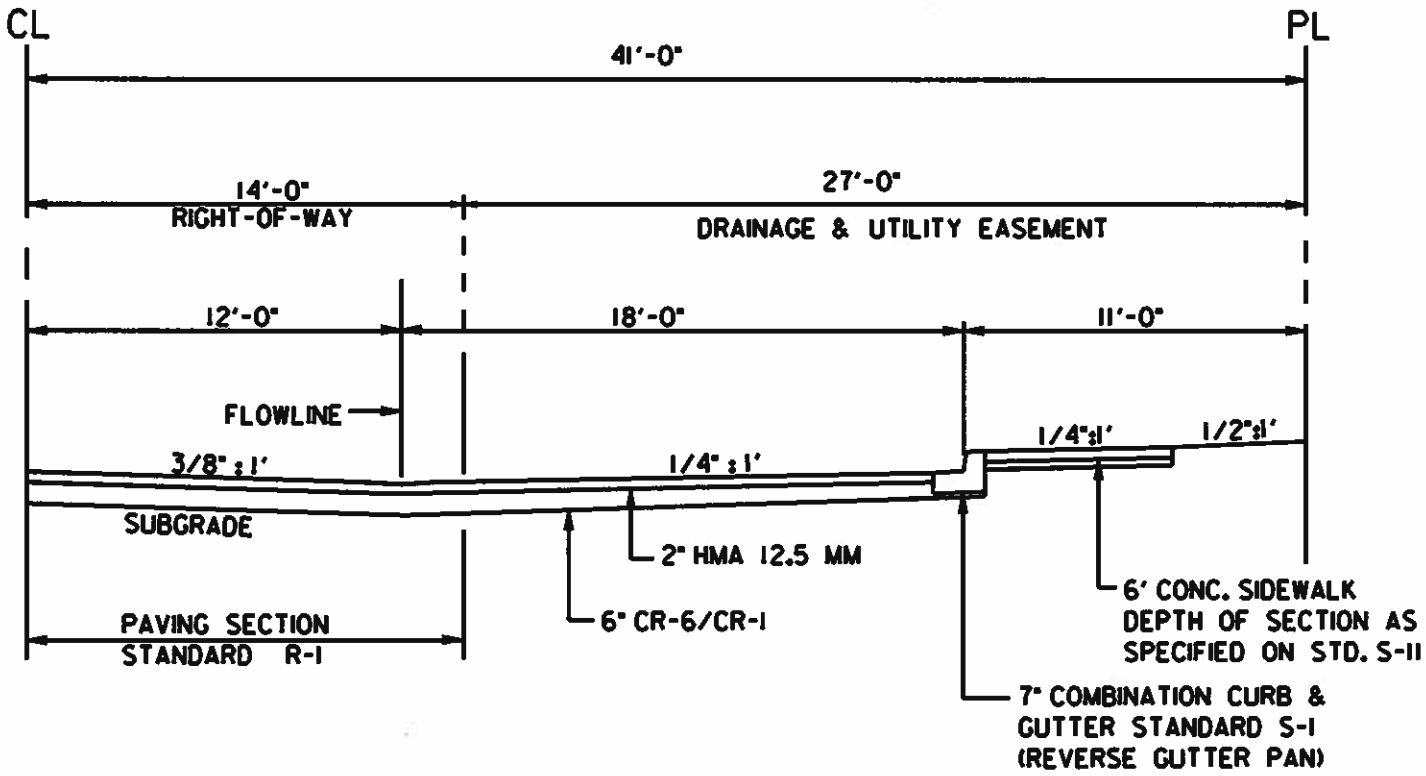
1. RESIDENTIAL SUBCOLLECTER LOTS > 30,000 SF
2. RESIDENTIAL ACCESS LOTS > 10,000 SF
3. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED, AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

RESIDENTIAL SUBCOLLECTOR
RESIDENTIAL ACCESS
CLOSED SECTION

Revised: 2/15/03
Revised: 5/1/07

PLATE 11



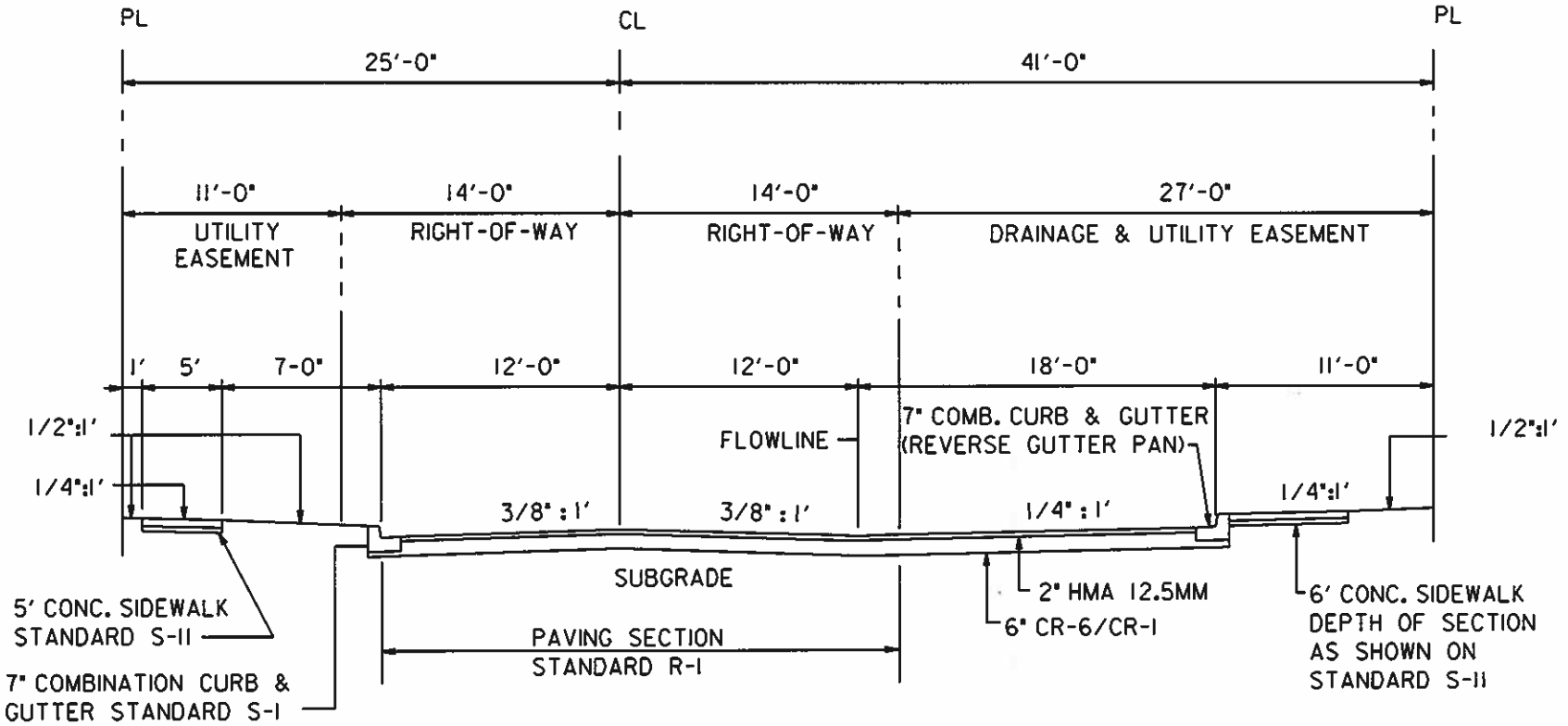
NOTES:
1. CONCRETE SIDEWALKS TO BE BUILT BY OTHERS, EXCEPT AS NOTED.
2. CROSS SECTION NOT TO BE CONSTRUCTED ON A ROAD GRADE EXCEEDING 6%.
3. UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED, AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

TOWNHOUSE ACCESS ROAD
WITH PERPENDICULAR PARKING ON BOTH SIDES

Revised: 5/1/07

PLATE 12



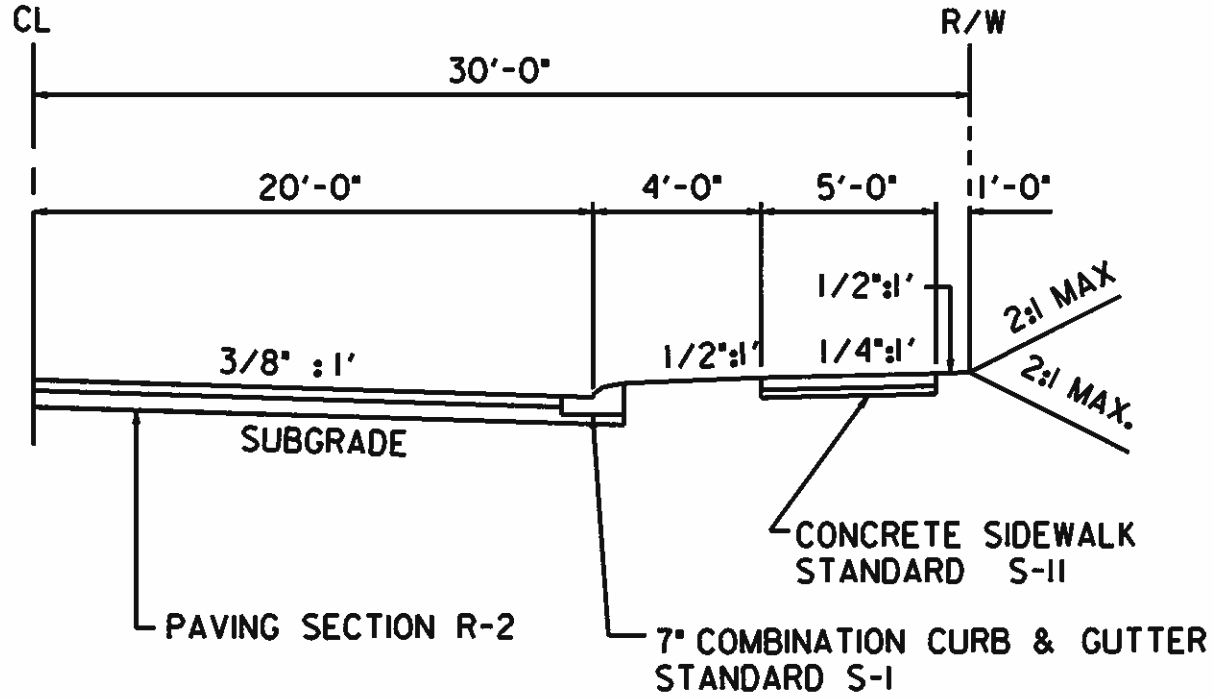
NOTES: 1. CONCRETE SIDEWALKS TO BE BUILT BY OTHERS, EXCEPT AS NOTED.
2. CROSS SECTION NOT TO BE CONSTRUCTED ON A ROAD GRADE EXCEEDING 6%.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

TOWNHOUSE ACCESS ROAD WITH PERPENDICULAR PARKING ON ONE SIDE

Revised:5/1/07

PLATE 13



NOTE: UNSURFACED AREAS WITHIN THE RIGHT-OF-WAY SHALL RECEIVE A MINIMUM SURFACE TREATMENT OF 2" TOPSOIL, SEED AND MULCH.

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

BUSINESS DISTRICT ROAD

Revised: 5/1/07

PLATE 14

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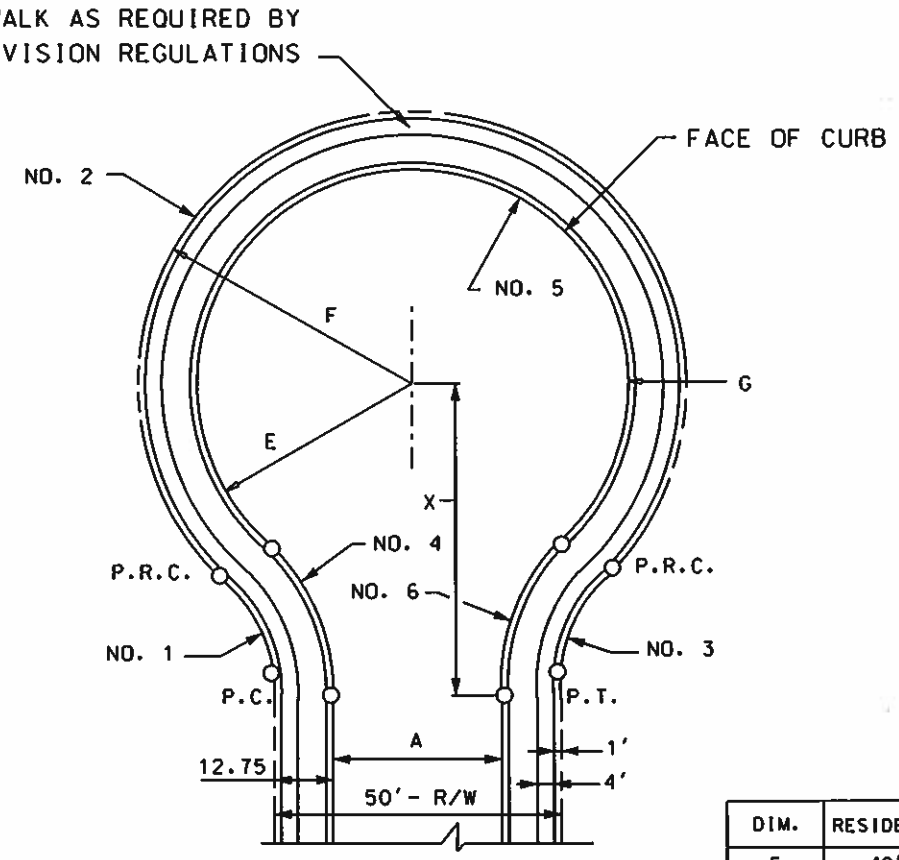


DIM.	RESIDENTIAL
E	40'
F	50'
G	10'
R/W	50'
A	24'/30'

SUGGESTED LAYOUT

RESIDENTIAL (30' APPROACH) X=66.14'				
CURVES				
	1 & 3	2	4 & 6	5
Δ	41°24'35"	262°49'09"	41°24'35"	262°49'09"
R	50.00'	50.00'	60.00'	40.00'
L	36.14'	229.35'	43.36'	183.48'
T	18.90'	-	22.68'	-
LC	35.36'	-	42.43'	-
RESIDENTIAL (24 1/2'APPROACH) X=69.14'				
CURVES				
	1 & 3	2	4 & 6	5
Δ	41°24'35"	262°49'09"	43°44'19'	267°28'39"
R	50.00'	50.00'	60.00'	40.00'
L	36.14'	229.35'	45.80'	186.73'
T	18.90'	-	24.08'	-
LC	35.36'	-	44.70'	-

NOTES:

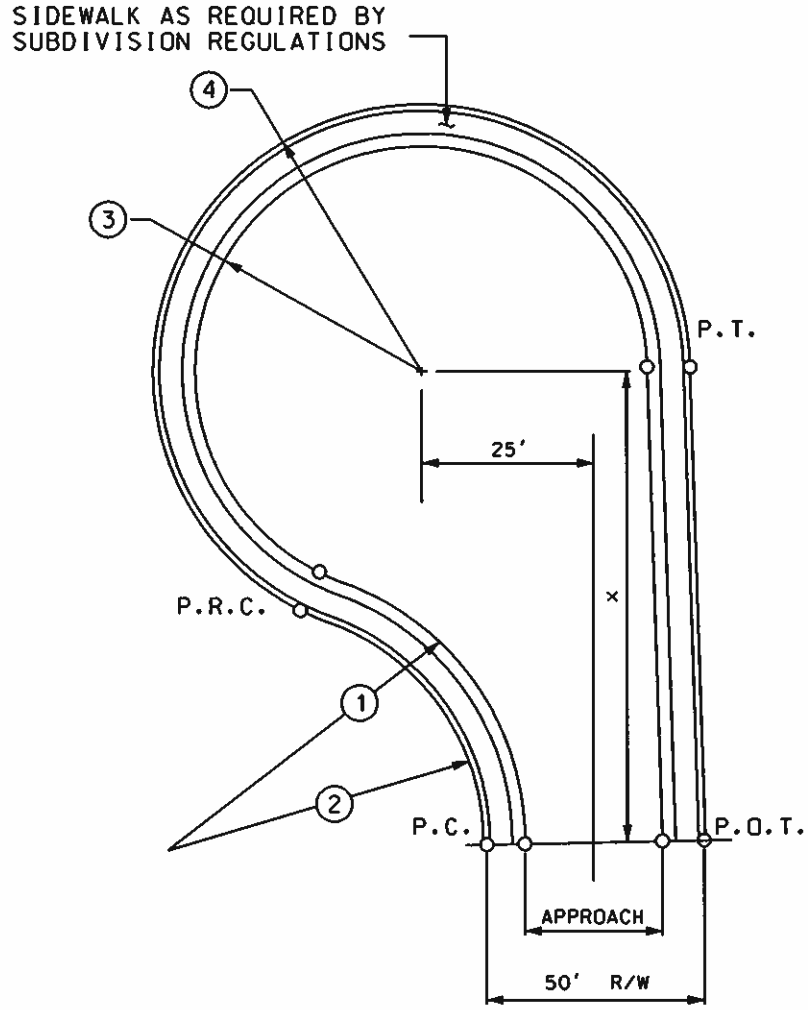
1. Other designs may be used with a minimum curve 1 & 3 radii = 50' and 4 & 6 radii = 60'.
2. Standard mountable curb and gutter shall be used.
3. The maximum grade of the circular area in any direction shall not exceed 6%.
4. A linear profile shall be provided along the top of curb from point P.C. to P.T..

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

40' RADIUS CUL-DE-SAC

PLATE 15

USER\DETAILS\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-15.DGN
8/12/03



NOTES:

1. Other designs may be used with a min. curve 1 radius = 55' and curve 2 radius =50'.
2. Standard mountable curb shall be used.
3. The maximum grade of the circular area shall not exceed 6%.
4. A linear profile shall be provided along the top of curb. point PC to POT.

SUGGESTED LAYOUT

RESIDENTIAL (24 1/2' APPROACH) X= 86.60'				
CURVES				
	1	2	3	4
△	62°41'30"	60°00'00"	242°41'30"	240°00'00"
R	57.46'	50.00'	40.00'	50.00'
L	62.87'	52.36'	169.43'	209.44'
T	35.00'	28.87'	———	———
L.C.	59.78'	50.00'	68.32'	86.60'

RESIDENTIAL (30' APPROACH) X= 86.60'				
CURVES				
	1	2	3	4
△	60°00'00"	60°00'00"	240°00'00"	240°00'00"
R	60.00'	50.00'	40.00'	50.00'
L	62.83'	52.36'	167.55'	209.44'
T	34.64'	28.87'	———	———
L.C.	60.00'	50.00'	69.28'	86.60'

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

OFFSET 40' RADIUS CUL-DE-SAC

PLATE 16

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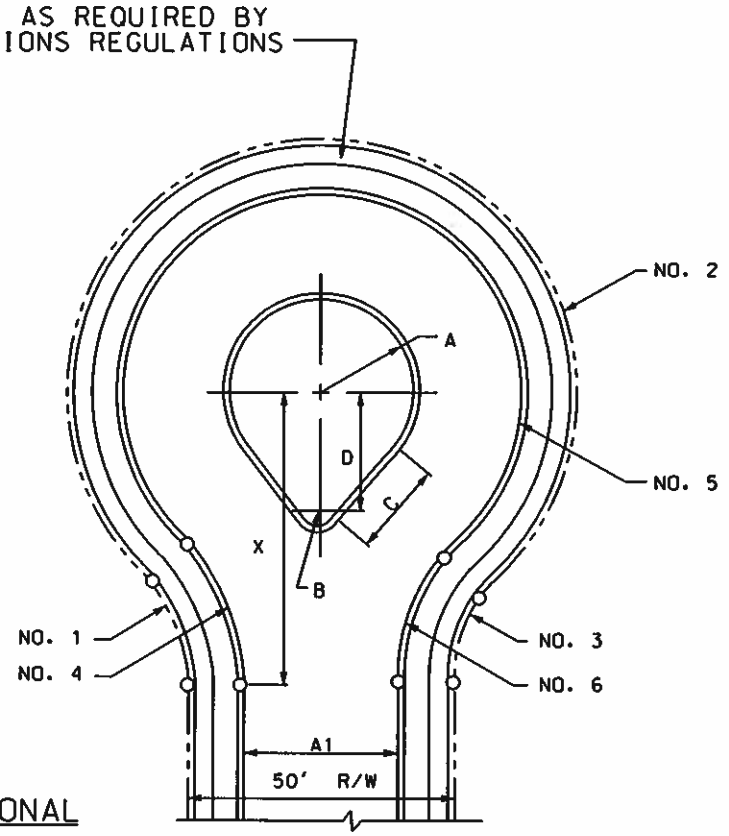
8/12/03



ISLAND OPTIONAL

SUGGESTED LAYOUT

RESIDENTIAL (24 1/2' APPROACH) X=89.47'				
CURVES				
	1 & 3	2	4 & 6	5
△	49°17'39"	278°35'19"	51°04'41"	282°09'22"
R	50.00'	65.00'	60.00'	55.00'
L	43.02'	316.05'	53.49'	270.85'
T	22.94'	-	28.67'	-
LC	41.70'	-	51.74'	-
RESIDENTIAL (30' APPROACH) X= 87.18'				
CURVES				
	1 & 3	2	4 & 6	5
△	49°17'39"	278°35'19"	49°17'39"	278°35'19"
R	50.00'	65.00'	60.00'	55.00'
L	43.02'	316.05'	51.62'	267.43'
T	22.94'	-	27.53'	-
LC	41.70'	-	50.04'	-

ISLAND	
A	25.00'
B	5.00'
C	28.72'
D	35.00'

NOTES:

1. Other designs may be used with a minimum curve 1 & 3 radii = 50' and 4 & 6 radii = 60'.
2. Standard mountable curb and gutter shall be used.
3. The maximum grade of the circular area in any direction shall not exceed 6%.
4. A linear profile shall be provided along the top of curb from point P.C. to P.T..

HARFORD COUNTY, MD
DEPARTMENT OF
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55' RADIUS SCHOOLBUS TURNAROUND

PLATE 17

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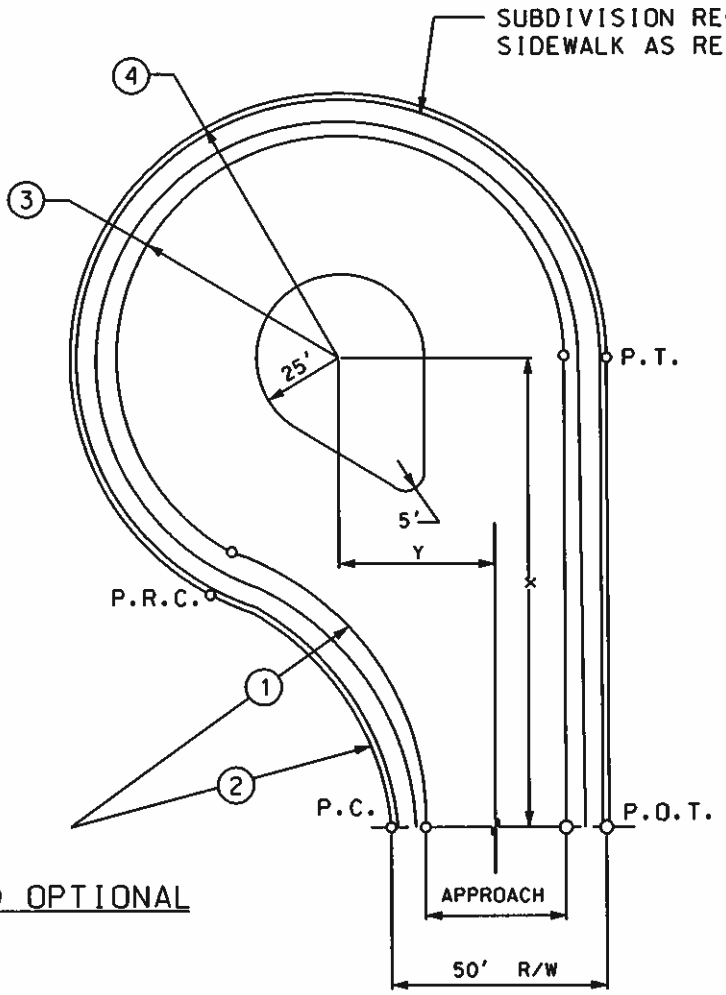
8/12/03



ISLAND OPTIONAL

NOTES:

1. Other designs may be used with a min. curve 2 radius = 50' and curve 1 radius = 60'.
2. Standard mountable curb and gutter shall be used.
3. The maximum grade of the circular area shall not exceed 6%.
4. A linear profile shall be provided along the top of curb. point PC to POT.

SUGGESTED LAYOUT

RESIDENTIAL (30' APPROACH) X= 110.39' Y= 40.00'				
CURVES				
	1	2	3	4
△	71° 51' 54"	71° 51' 54"	251° 51' 54"	251° 51' 54"
R	61.16'	51.16'	55.00'	65.00'
L	76.71'	64.16'	241.77'	285.73'
T	44.33'	37.08'	———	———
L.C.	71.78'	60.04'	89.07'	105.26'

RESIDENTIAL (24 1/2' APPROACH) X= 110.39' Y= 40.00'				
CURVES				
	1	2	3	4
△	73° 42' 50"	71° 51' 54"	253° 42' 50"	251° 51' 54"
R	60.00'	51.15'	55.00'	65.00'
L	77.19'	64.16'	243.55'	285.73'
T	44.18'	37.07'	———	———
L.C.	71.98'	60.04'	88.01'	105.26'

HARFORD COUNTY, MD
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OFFSET 55' RADIUS SCHOOLBUS TURNAROUND

PLATE 18

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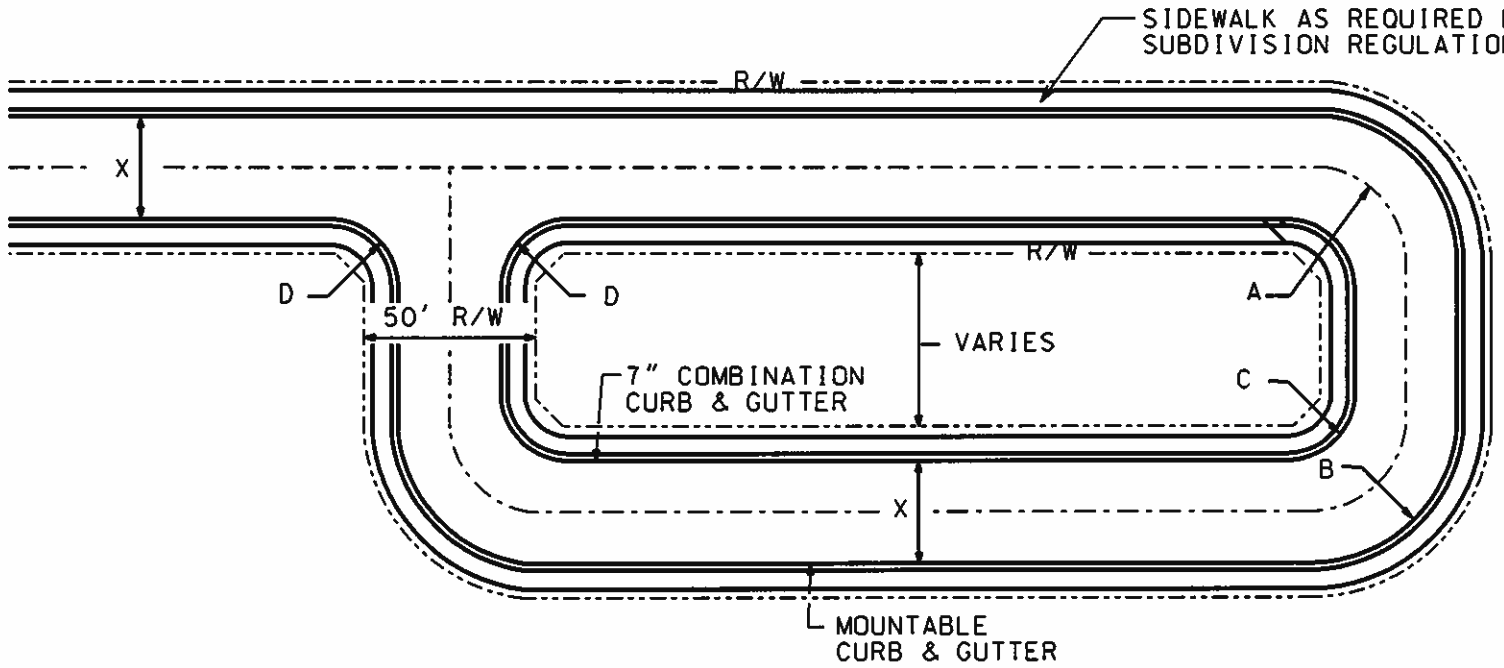
8/12/03



CURVE	RADIUS	L	DELTA
A	33.00	51.83'	90 DEGREES
B	46.00	72.25'	90 DEGREES
C	35.00	54.98'	90 DEGREES
D	20.00	31.41'	90 DEGREES

X = 24.5' FOR LOTS GREATER THAN 65' FRONTAGE

X = 30' FOR LOTS LESS THAN OR EQUAL TO 65' FRONTAGE

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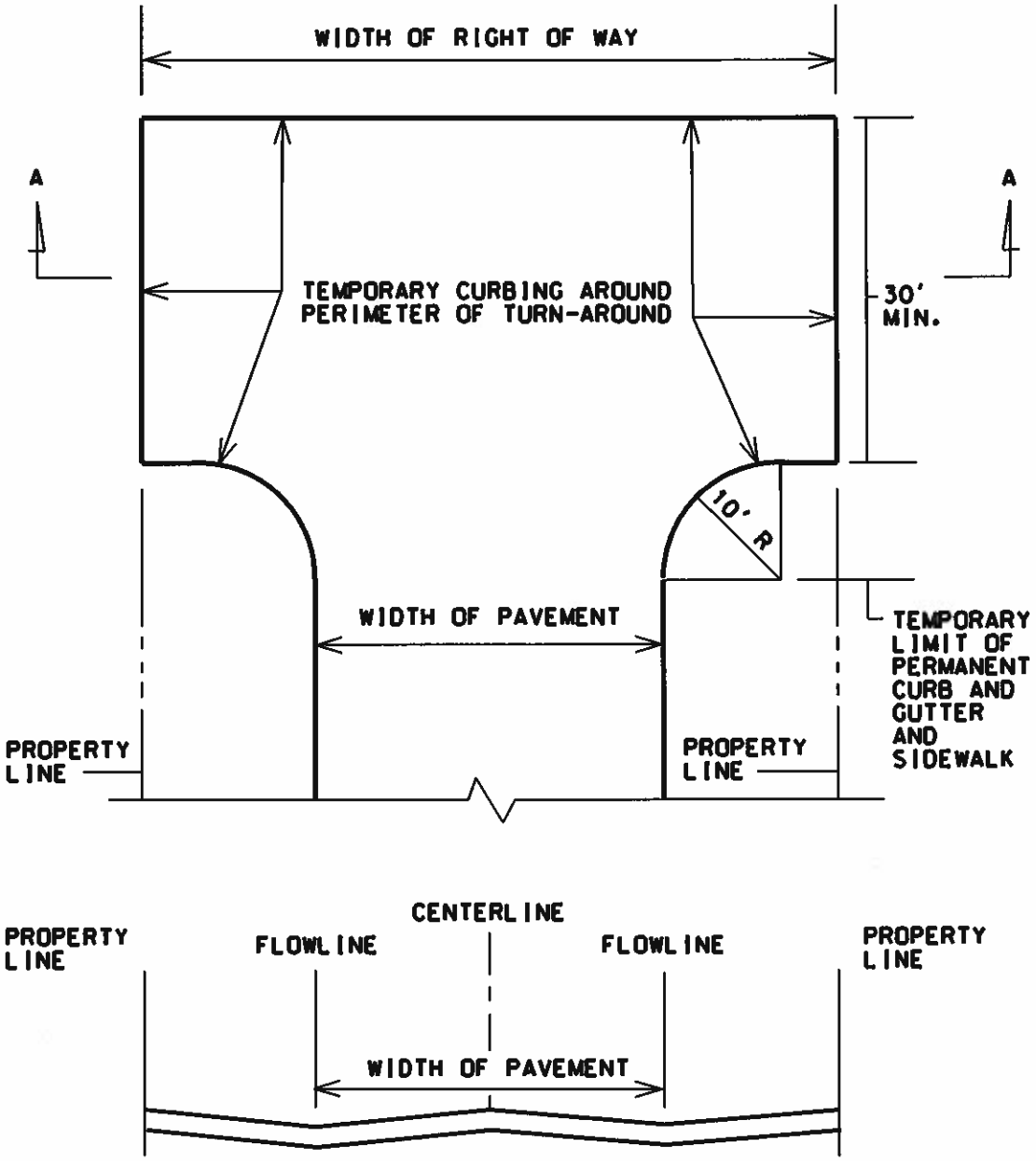
RECTANGULAR CUL-DE-SAC

PLATE 19



SECTION A - A

NOTE:

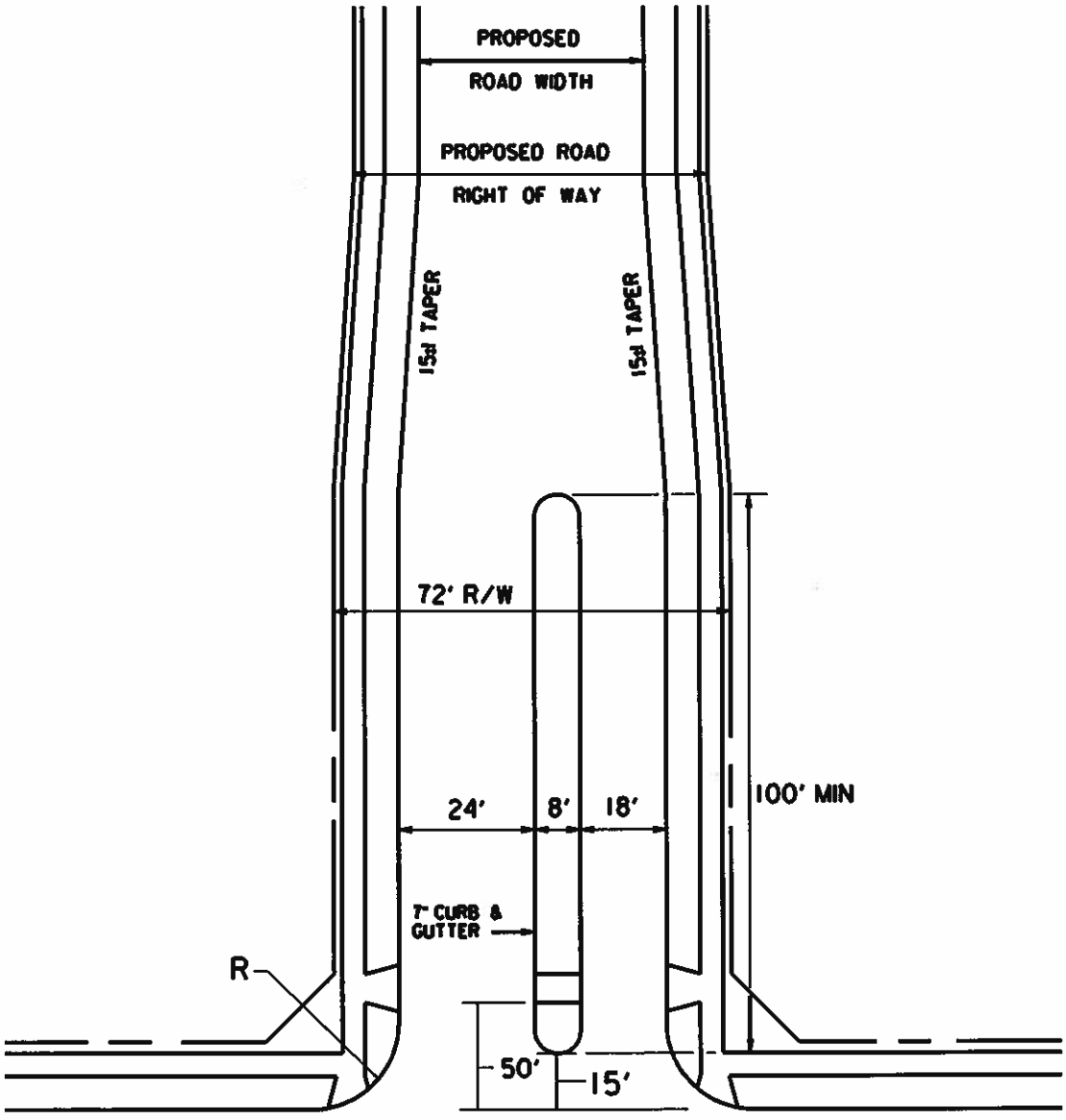
A TEE TURN-AROUND SHALL BE USED IN LIEU OF A CUL-DE-SAC ONLY IF STREET IS TO BE EXTENDED

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

TEE TURN-AROUND (TEMPORARY)

PLATE 20

USER\DETAILS\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-20.DGN
8/12/03



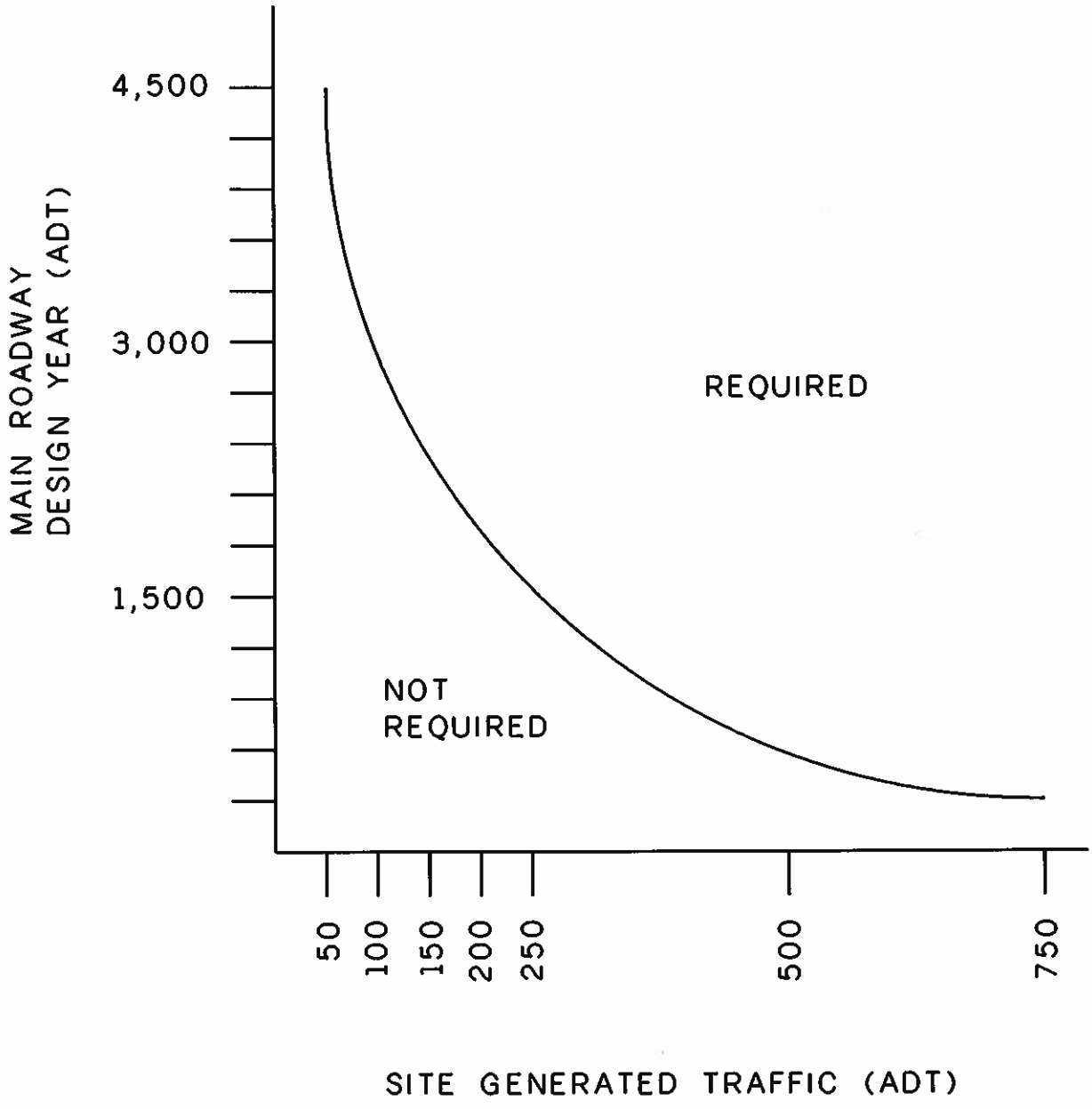
R = 40' RESIDENTIAL ROADS
R = 50' COMMERCIAL/INDUSTRIAL ROADS

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

MONUMENTAL ENTRANCE

PLATE 21

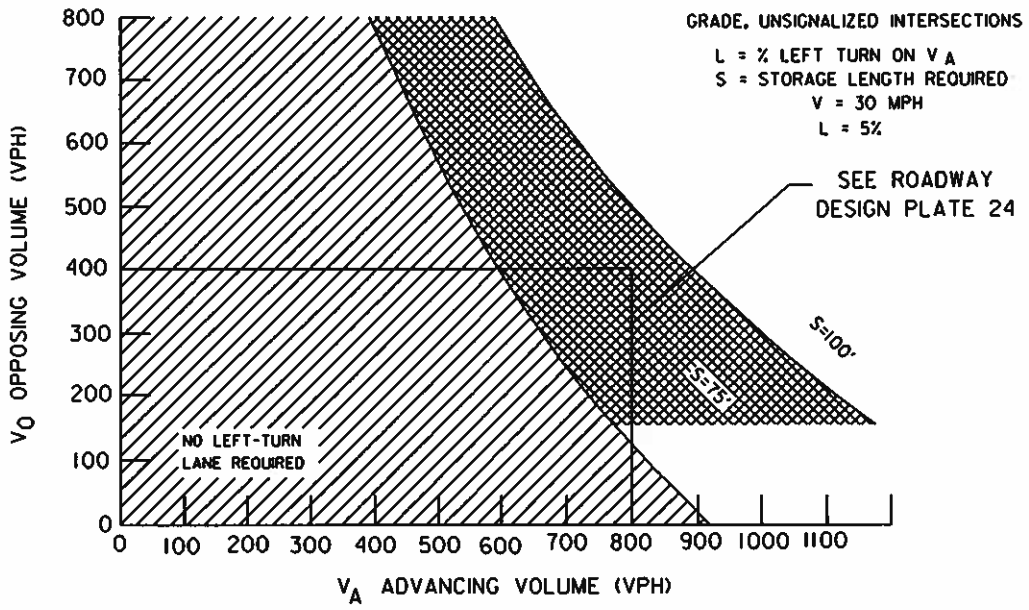
USER\DETAILS\SPEC\ROADCODE\DESIGN\STANDARD\PLATE-21.DGN
8/12/03



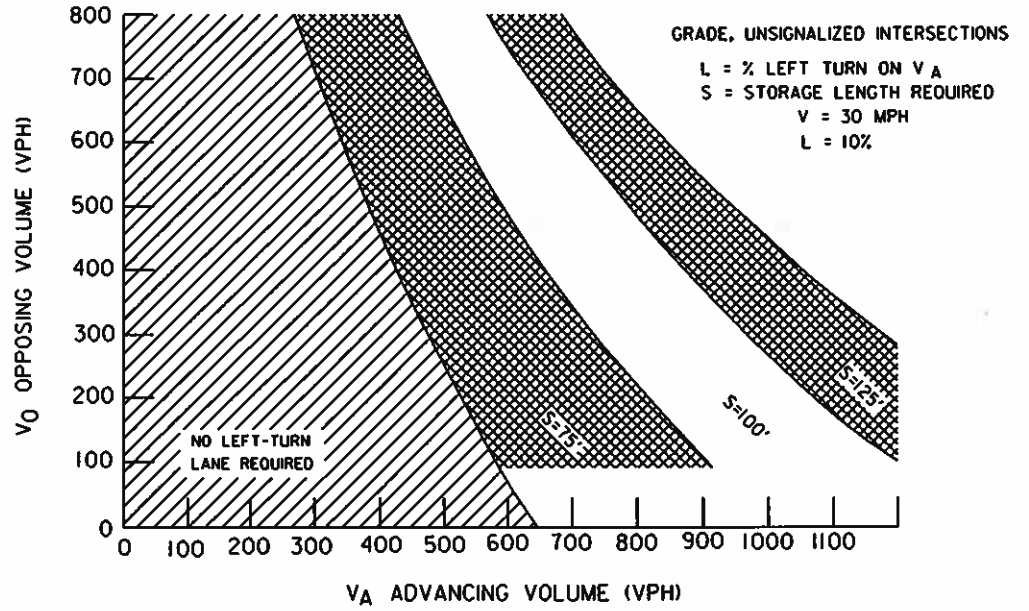
HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

RIGHT - TURN DECELERATION LANE WARRANTS

PLATE 22



WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE HIGHWAYS



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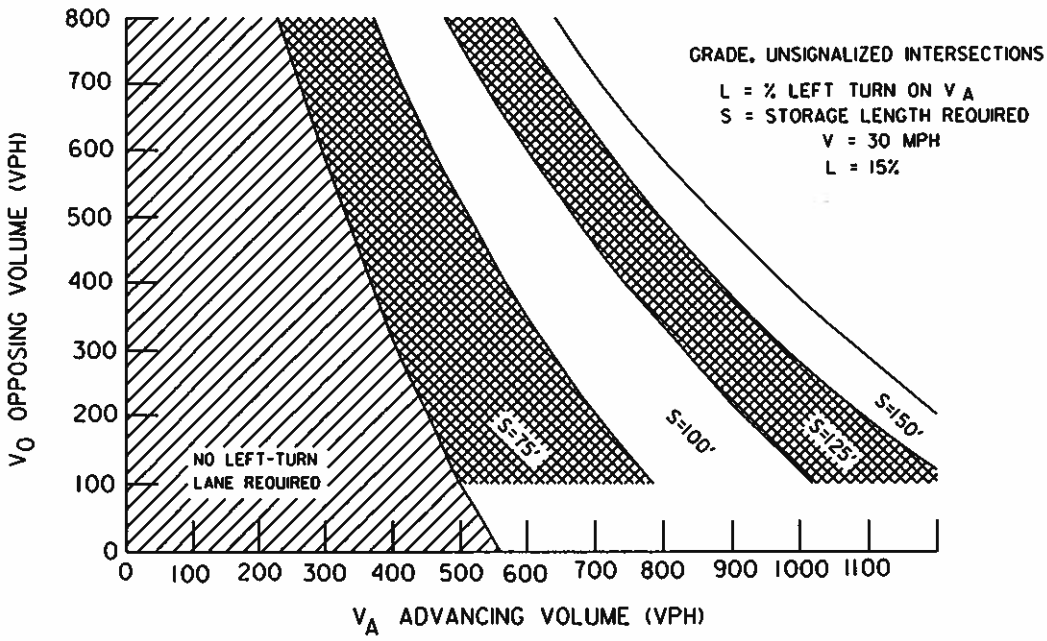
PUBLIC WORKS

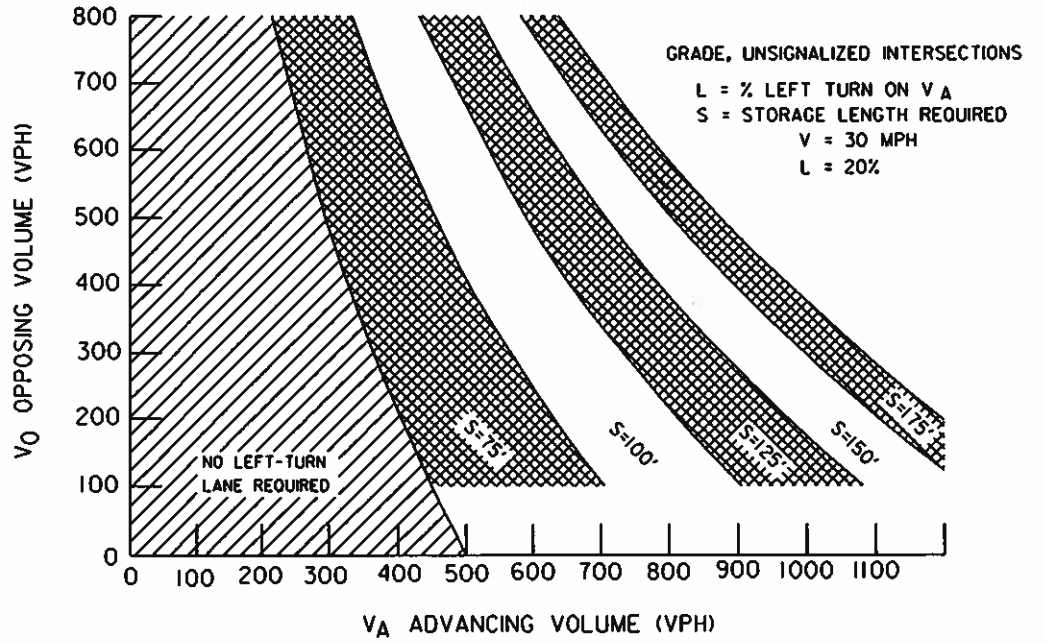
WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE ROADWAYS

PLATE 23

G:\USER\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-23.DGN



WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE HIGHWAYS



HARFORD COUNTY, MD
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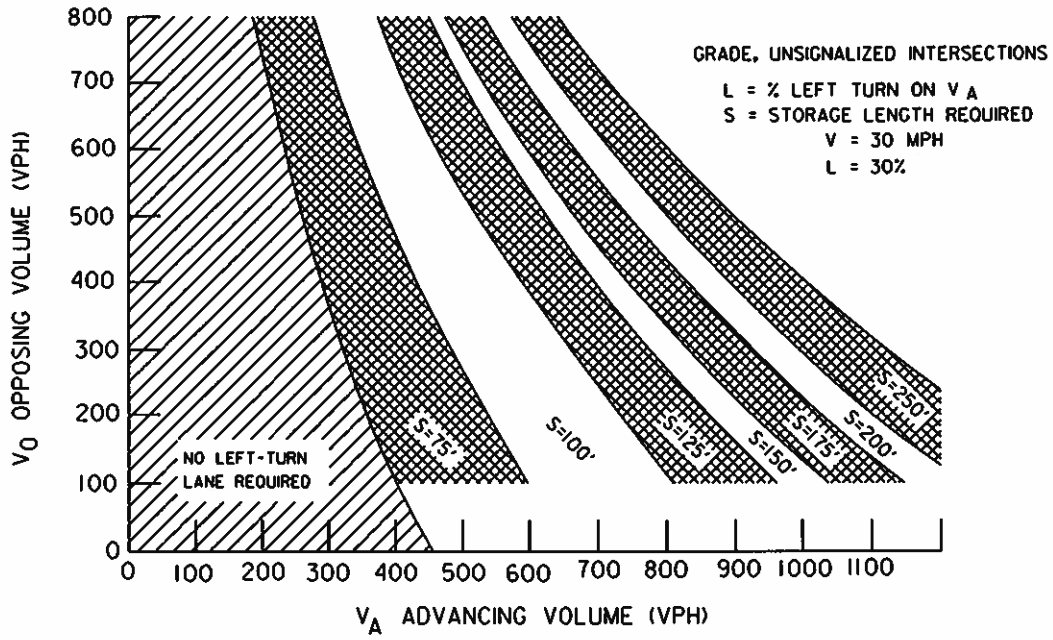
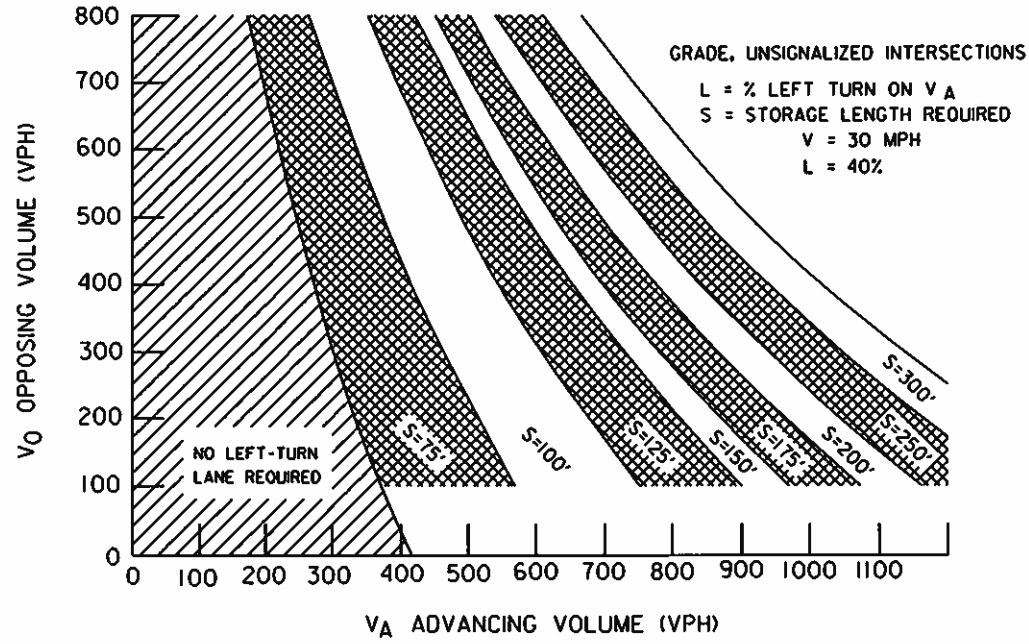
WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE ROADWAYS

PLATE 24

G:\USER\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-24.DGN



WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE HIGHWAYS

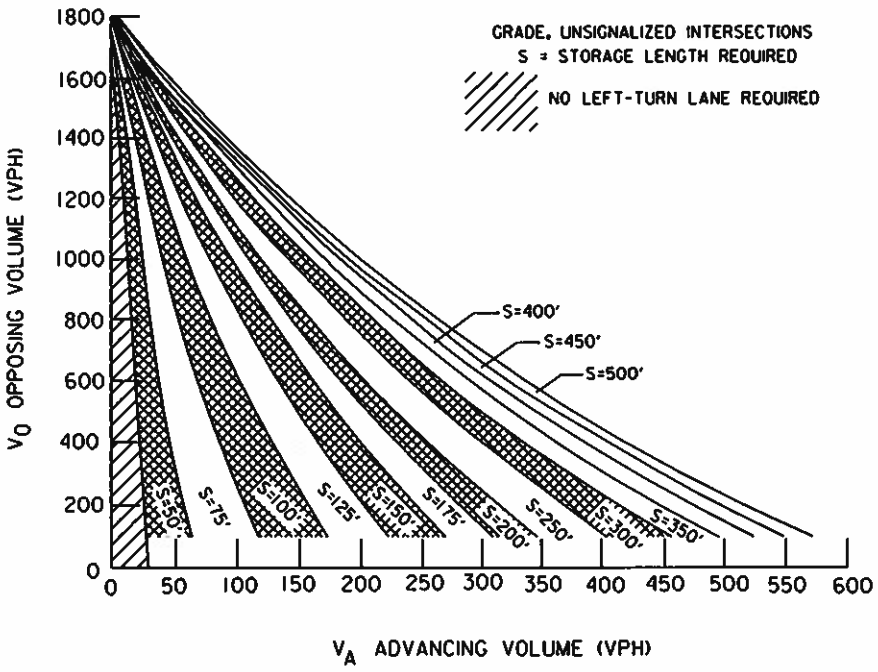


HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

WARRANT FOR LEFT-TURN STORAGE LANES ON TWO-LANE ROADWAYS

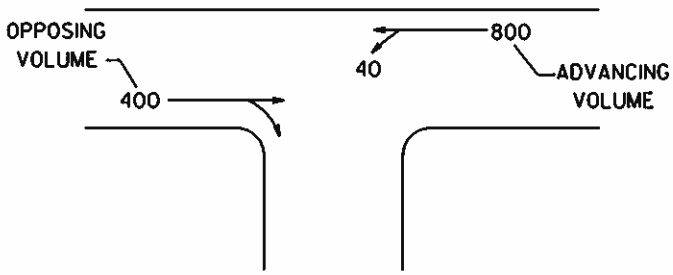
PLATE 25

G:\USER\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-25.DGN



PROBLEM 1: IS A LEFT-TURN LANE REQUIRED WHEN ALLROADS ARE TWO LANED, TWO WAY, AND 30 MPH.

SOLUTION: USE THE "5% LEFT TURN" CHART BY READING UP AND ACROSS. FIND 800 VPH (ADVANCING VOLUME) AND 400 VPH (OPPOSING VOLUME). THE CHART INDICATES THAT A 75' LONG LEFT-TURN LANE IS REQUIRED.

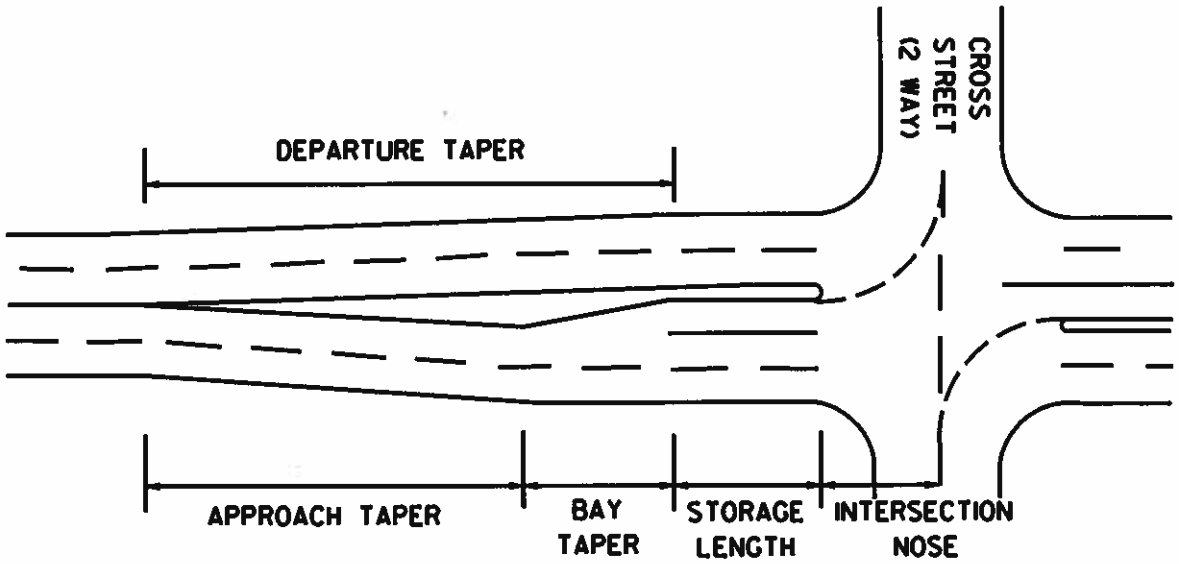


HARFORD COUNTY, MD
DEPARTMENT OF PUBLIC WORKS

WARRANT FOR LEFT-TURN STORAGE LANES ON FOUR-LANE ROADWAYS

PLATE 26

G:\USER\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-26.DGN



FULL SHADOWED LANE

APPROACH TAPER (T_A) = $WS^2/60$

BAY TAPER (T_B) = $WS/2.5$

DEPARTURE TAPER = $T_A + T_B$

W = WIDTH OF WIDENING IN FEET

S = POSTED SPEED + 5 MPH OR 85% SPEED

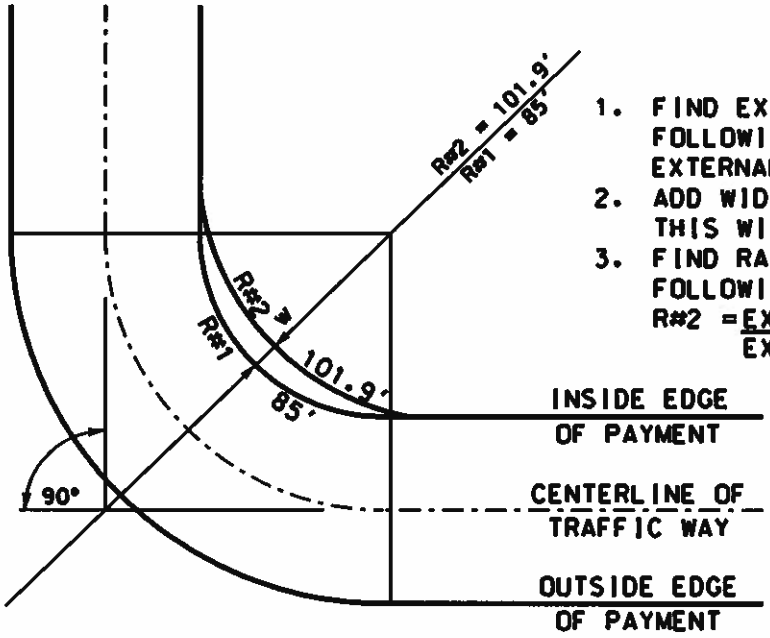
LANE WIDTH (LEFT TURN BAY) = 10' RESIDENTIAL DEVELOPMENTS
12' COMMERCIAL DEVELOPMENTS

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

LANE TAPERS

PLATE 27

USER\DETAILS\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-27.DGN
8/12/03



1. FIND EXTERNAL #1. USING THE FOLLOWING FORMULA:
   EXTERNAL #1 = R#1 X EXSEC 1/2 DELTA
2. ADD WIDENING W TO EXTERNAL #1 THIS WILL BE EXTERNAL #2.
3. FIND RADIUS #2. USING THE FOLLOWING FORMULA:
   $R\#2 = \frac{\text{EXTERNAL \#2}}{\text{EXSEC 1/2 DELTA}}$

EXAMPLE:

GIVEN:
CENTERLINE RADIUS = 100'
DELTA = 90°
NORMAL PAVEMENT WIDTH = 30' (R/W = 50')
REQUIRED WIDENING FOR CENTERLINE RADIUS OF 100' = 7' (TO BE APPLIED AT THE MIDPOINT OF THE INSIDE EDGE OF PAVEMENT)

REQUIRED:
RADIUS OF WIDENING (R#2)

SOLUTION:
RADIUS OF INSIDE EDGE OF PAVEMENT
R#1 = 100'-15' = 85'
EXTERNAL #1 = 85 X EXSEC 1/2 DELTA =
85 X .41421 = 35.21
EXTERNAL #2 = 35.21 + 7 = 42.21
$R\#2 = \frac{\text{EXTERNAL \#2}}{\text{EXSEC 1/2 DELTA}} = \frac{42.21}{.41421} = 101.9'$

CENTERLINE RADIUS OF CURVE	MINIMUM LENGTH CURVE*	WIDENING AT MIDPOINT
500' - 451'	400'	3'
450' - 351'	350'	4'
350' - 251'	300'	5'
250' - 151'	200'	6'
150' - 100'	150'	7'

* CURVES LESS THAN THIS LENGTH WILL NOT REQUIRE WIDENING

NOTE:

THE RADIUS OF THE INSIDE PROPERTY LINE IN THIS EXAMPLE WILL BE 91.9' (101.9-10.0)

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

WIDENING COMPUTATION

PLATE 28

USER\DETAILS\SPEC\ROADCODE\DESIGNSTANDARD\PLATE-28.DGN
8/12/03

APPENDIX II
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RAINFALL, INTENSITY - FREQUENCY - DURATION
(INCHES PER HOUR)

MIN.	10 YR	20 YR	100 YR
5.00	7.00	7.67	9.50
5.10	6.98	7.64	9.48
5.20	6.95	7.61	9.46
5.30	6.93	7.58	9.44
5.40	6.91	7.56	9.42
5.50	6.89	7.53	9.40
5.60	6.86	7.50	9.38
5.70	6.84	7.48	9.36
5.80	6.81	7.45	9.34
5.90	6.79	7.42	9.32
6.00	6.77	7.39	9.30
6.10	6.75	7.37	9.27
6.20	6.72	7.35	9.24
6.30	6.70	7.34	9.21
6.40	6.68	7.32	9.18
6.50	6.66	7.31	9.15
6.60	6.63	7.28	9.12
6.70	6.61	7.27	9.09
6.80	6.59	7.25	9.06
6.90	6.56	7.23	9.03
7.00	6.54	7.21	9.00
7.10	6.52	7.19	8.98
7.20	6.49	7.16	8.96
7.30	6.47	7.14	8.94
7.40	6.45	7.12	8.92
7.50	6.43	7.10	8.90
7.60	6.40	7.07	8.88
7.70	6.38	7.05	8.86
7.80	6.36	6.96	8.84
7.90	6.33	6.95	8.82
8.00	6.31	6.94	8.80
8.10	6.30	6.93	8.78
8.20	6.28	6.92	8.76
8.30	6.27	6.90	8.74
8.40	6.25	6.87	8.72
8.50	6.24	6.85	8.70
8.60	6.23	6.82	8.68
8.70	6.21	6.80	8.66
8.80	6.20	6.77	8.64
8.90	6.18	6.75	8.62

MIN.	10 YR	20 YR	100 YR
9.00	6.17	6.72	8.60
9.10	6.14	6.70	8.57
9.20	6.11	6.67	8.54
9.30	6.08	6.65	8.51
9.40	6.05	6.62	8.48
9.50	6.02	6.60	8.45
9.60	5.98	6.57	8.42
9.70	5.95	6.54	8.39
9.80	5.92	6.52	8.36
9.90	5.89	6.49	9.33
10.00	5.86	6.47	8.30
10.10	5.84	6.45	8.28
10.20	5.83	6.43	8.26
10.30	5.81	6.42	8.24
10.40	5.80	6.40	8.22
10.50	5.78	6.38	8.20
10.60	5.76	6.36	8.18
10.70	5.75	6.34	8.16
10.80	5.73	6.33	8.14
10.90	5.72	6.31	8.12
11.00	5.70	6.29	8.10
11.10	5.68	6.27	8.08
11.20	5.67	6.26	8.06
11.30	5.65	6.24	8.04
11.40	5.64	6.23	8.02
11.50	5.62	6.21	8.00
11.60	5.60	6.19	7.98
11.70	5.59	6.17	7.96
11.80	5.57	6.16	7.94
11.90	5.56	6.14	7.92
12.00	5.54	6.12	7.90
12.10	5.52	6.10	7.88
12.20	5.51	6.08	7.86
12.30	5.49	6.06	7.84
12.40	5.47	6.04	7.82
12.50	5.46	6.03	7.80
12.60	5.44	6.01	7.78
12.70	5.42	5.99	7.76
12.80	5.40	5.97	7.74
12.90	5.39	5.96	7.72

RAINFALL, INTENSITY - FREQUENCY - DURATION
(INCHES PER HOUR)

MIN.	10 YR	20 YR	100 YR
13.00	5.37	5.94	7.70
13.10	5.35	5.92	7.68
13.20	5.34	5.90	7.66
13.30	5.32	5.89	7.64
13.40	5.31	5.87	7.62
13.50	5.29	5.85	7.60
13.60	5.27	5.83	7.58
13.70	5.26	5.81	7.56
13.80	5.24	5.80	7.54
13.90	5.23	5.78	7.52
14.00	5.21	5.76	7.50
14.10	5.19	5.74	7.48
14.20	5.18	5.73	7.46
14.30	5.16	5.71	7.44
14.40	5.15	5.70	7.42
14.50	5.13	5.68	7.40
14.60	5.11	5.66	7.38
14.70	5.10	5.64	7.36
14.80	5.08	5.63	7.34
14.90	5.07	5.61	7.32
15.00	5.05	5.59	7.30
15.10	5.04	5.58	7.28
15.20	5.02	5.56	7.26
15.30	5.01	5.55	7.25
15.40	5.00	5.54	7.23
15.50	4.99	5.53	7.21
15.60	4.97	5.51	7.19
15.70	4.96	5.50	7.17
15.80	4.95	5.49	7.16
15.90	4.93	5.47	7.14
16.00	4.92	5.46	7.12
16.10	4.91	5.45	7.10
16.20	4.89	5.43	7.08
16.30	4.88	5.42	7.06
16.40	4.87	5.40	7.04
16.50	4.86	5.39	7.03
16.60	4.84	5.38	7.01
16.70	4.83	5.36	6.99
16.80	4.82	5.35	6.97
16.90	4.80	5.33	6.95

MIN.	10 YR	20 YR	100 YR
17.00	4.79	5.32	6.93
17.10	4.78	5.31	6.91
17.20	4.76	5.29	6.89
17.30	4.75	5.28	6.88
17.40	4.74	5.27	6.86
17.50	4.73	5.26	6.84
17.60	4.71	5.24	6.82
17.70	4.70	5.23	6.80
17.80	4.69	5.22	6.79
17.90	4.67	5.20	6.77
18.00	4.66	5.19	6.75
18.10	4.65	5.18	6.73
18.20	4.63	5.16	6.71
18.30	4.62	5.15	6.69
18.40	4.61	5.13	6.67
18.50	4.60	5.12	6.66
18.60	4.58	5.10	6.64
18.70	4.57	5.09	6.62
18.80	4.56	5.08	6.60
18.90	4.54	5.06	6.58
19.00	4.53	5.05	6.56
19.10	4.52	5.04	6.54
19.20	4.50	5.02	6.52
19.30	4.49	5.01	6.51
19.40	4.48	5.00	6.49
19.50	4.47	4.99	6.47
19.60	4.45	4.97	6.45
19.70	4.44	4.96	6.43
19.80	4.43	4.95	6.42
19.90	4.41	4.93	6.40
20.00	4.40	4.93	6.38
20.10	4.39	4.92	6.37
20.20	4.38	4.91	6.35
20.30	4.37	4.89	6.34
20.40	4.36	4.88	6.33
20.50	4.35	4.87	6.32
20.60	4.34	4.86	6.30
20.70	4.33	4.85	6.29
20.80	4.32	4.83	6.28
20.90	4.31	4.82	6.26

Drainage Design Plate 1 - B

RAINFALL, INTENSITY - FREQUENCY - DURATION
(INCHES PER HOUR)

MIN.	10 YR	20 YR	100 YR
21.00	4.30	4.81	6.25
21.10	4.29	4.80	6.24
21.20	4.28	4.79	6.23
21.30	4.27	4.78	6.21
21.40	4.26	4.77	6.20
21.50	4.25	4.76	6.19
21.60	4.24	4.75	6.18
21.70	4.23	4.74	6.17
21.80	4.22	4.72	6.15
21.90	4.21	4.71	6.14
22.00	4.20	4.70	6.13
22.10	4.19	4.69	6.12
22.20	4.18	4.68	6.10
22.30	4.17	4.67	6.09
22.40	4.16	4.66	6.08
22.50	4.15	4.65	6.07
22.60	4.14	4.63	6.05
22.70	4.13	4.62	6.04
22.80	4.12	4.61	6.03
22.90	4.11	4.60	6.01
23.00	4.10	4.59	6.00
23.10	4.09	4.58	5.99
23.20	4.08	4.57	5.98
23.30	4.07	4.55	5.96
23.40	4.06	4.54	5.95
23.50	4.05	4.53	5.94
23.60	4.04	4.52	5.93
23.70	4.03	4.51	5.92
23.80	4.02	4.50	5.90
23.90	4.01	4.49	5.89
24.00	4.00	4.48	5.88
24.10	3.99	4.47	5.87
24.20	3.98	4.46	5.85
24.30	3.97	4.44	5.84
24.40	3.96	4.43	5.83
24.50	3.95	4.42	5.82
24.60	3.94	4.41	5.80
24.70	3.93	4.40	5.79
24.80	3.92	4.38	5.78
24.90	3.91	4.37	5.76

MIN.	10 YR	20 YR	100 YR
25.00	3.90	4.36	5.75
25.10	3.89	4.35	5.74
25.20	3.89	4.35	5.73
25.30	3.88	4.34	5.72
25.40	3.88	4.34	5.71
25.50	3.87	4.33	5.70
25.60	3.86	4.32	5.69
25.70	3.86	4.31	5.68
25.80	3.85	4.31	5.67
25.90	3.85	4.30	5.66
26.00	3.84	4.29	5.65
26.10	3.83	4.28	5.64
26.20	3.83	4.27	5.63
26.30	3.82	4.27	5.62
26.40	3.82	4.26	5.61
26.50	3.81	4.25	5.60
26.60	3.80	4.24	5.59
26.70	3.80	4.24	5.58
26.80	3.79	4.23	5.57
26.90	3.79	4.23	5.56
27.00	3.78	4.22	5.55
27.10	3.77	4.21	5.54
27.20	3.77	4.20	5.53
27.30	3.76	4.20	5.52
27.40	3.76	4.19	5.51
27.50	3.75	4.18	5.50
27.60	3.74	4.17	5.48
27.70	3.74	4.16	5.47
27.80	3.73	4.16	5.46
27.90	3.73	4.15	5.45
28.00	3.72	4.14	5.44
28.10	3.71	4.13	5.43
28.20	3.71	4.13	5.42
28.30	3.70	4.13	5.41
28.40	3.70	4.12	5.40
28.50	3.69	4.11	5.39
28.60	3.68	4.10	5.38
28.70	3.68	4.09	5.37
28.80	3.67	4.09	5.36
28.90	3.67	4.08	5.35

RAINFALL, INTENSITY - FREQUENCY - DURATION
(INCHES PER HOUR)

MIN.	10 YR	20 YR	100 YR
29.00	3.66	4.07	5.34
29.10	3.65	4.06	5.33
29.20	3.65	4.06	5.32
29.30	3.64	4.05	5.31
29.40	3.64	4.05	5.30
29.50	3.63	4.04	5.29
29.60	3.62	4.03	5.28
29.70	3.62	4.02	5.27
29.80	3.61	4.02	5.26
29.90	3.61	4.01	5.25
30.00	3.60	4.00	5.24
30.20	3.59	3.99	5.22
30.40	3.58	3.98	5.21
30.60	3.56	3.96	5.19
30.80	3.55	3.95	5.18
31.00	3.54	3.94	5.16
31.20	3.53	3.93	5.14
31.40	3.52	3.91	5.13
31.60	3.50	3.90	5.11
31.80	3.49	3.88	5.10
32.00	3.48	3.87	5.08
32.20	3.47	3.86	5.07
32.40	3.46	3.85	5.05
32.60	3.44	3.83	5.04
32.80	3.43	3.82	5.02
33.00	3.42	3.81	5.01
33.20	3.41	3.80	4.99
33.40	3.40	3.79	4.98
33.60	3.38	3.77	4.96
33.80	3.37	3.76	4.95
34.00	3.36	3.75	4.93
34.20	3.35	3.74	4.91
34.40	3.34	3.73	4.90
34.60	3.32	3.71	4.88
34.80	3.31	3.70	4.87
35.00	3.30	3.69	4.85

MIN.	10 YR	20 YR	100 YR
35.20	3.29	3.68	4.83
35.40	3.28	3.66	4.82
35.60	3.26	3.65	4.80
35.80	3.25	3.63	4.79
36.00	3.24	3.62	4.77
36.20	3.23	3.61	4.75
36.40	3.22	3.60	4.74
36.60	3.20	3.58	4.72
36.80	3.19	3.57	4.71
37.00	3.18	3.56	4.69
37.20	3.17	3.55	4.68
37.40	3.16	3.53	4.66
37.60	3.14	3.52	4.65
37.80	3.13	3.50	4.63
38.00	3.12	3.49	4.62
38.20	3.11	3.48	4.60
38.40	3.10	3.47	4.59
38.60	3.08	3.45	4.57
38.80	3.07	3.44	4.56
39.00	3.06	3.43	4.54
39.20	3.05	3.42	4.52
39.40	3.04	3.41	4.51
39.60	3.02	3.39	4.49
39.80	3.01	3.38	4.48
40.00	3.00	3.37	4.46
40.20	2.99	3.36	4.45
40.40	2.98	3.35	4.43
40.60	2.97	3.34	4.42
40.80	2.96	3.33	4.41
41.00	2.96	3.32	4.39
41.20	2.95	3.31	4.38
41.40	2.94	3.30	4.37
41.60	2.93	3.29	4.35
41.80	2.92	3.28	4.34
42.00	2.91	3.27	4.33

HARFORD COUNTY, MD
DEPARTMENT OF
PUBLIC WORKS

RAINFALL INTENSITY, FREQUENCY, DURATION CURVES

DRAINAGE
DESIGN
PLATE
2

RATIONAL FORMULA COEFFICIENTS

(NOTE: IF IMPERVIOUS SURFACES AND OPEN SPACE ARE USED TO COMPUTE 'c' FACTORS, ALL IMPERVIOUS AREA MUST BE INCLUDED; INCLUDING BUT NOT LIMITED TO SIDEWALKS, DRIVEWAYS, BUILDINGS, SHEDS, CONCRETE PADS, ETC..)

LAND USE*	ZONING CLASSIFICATION	RUNOFF 'c' FOR C SOILS
1 ½ - 2 ACRE LOTS	RR-AG	0.25
1 ACRE LOTS	R	0.30
1/3 -3/4 ACRE LOTS	R1	0.35
1/6 -1/4 ACRE LOTS	VR & R2 SINGLE FAMILY	0.40
	R3 & R4 SINGLE FAMILY	0.45
TOWN HOUSES		0.60
APARTMENTS		0.70
INDUSTRIAL/COMMERCIAL		0.85
IMPERVIOUS SURFACES		0.95
OPEN SPACE		0.24
GRAVEL		0.70
PASTURE		0.30
MEADOW		0.22
WOODS		0.20
ROW CROP		0.70

*** LAND USE SHALL BE FOR ULTIMATE CONDITION.**

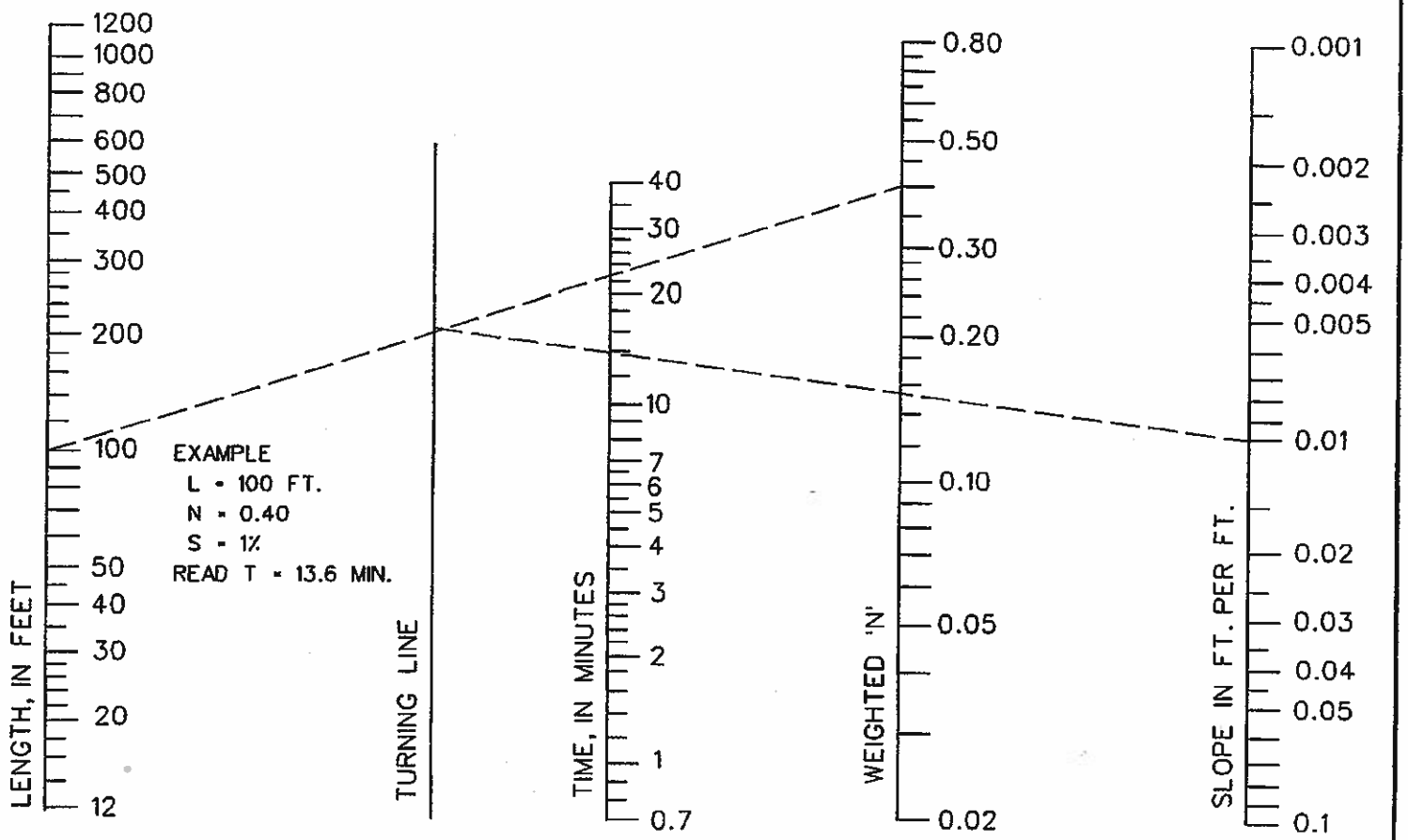
HARFORD COUNTY, MD
DEPARTMENT OF PUBLIC WORKS

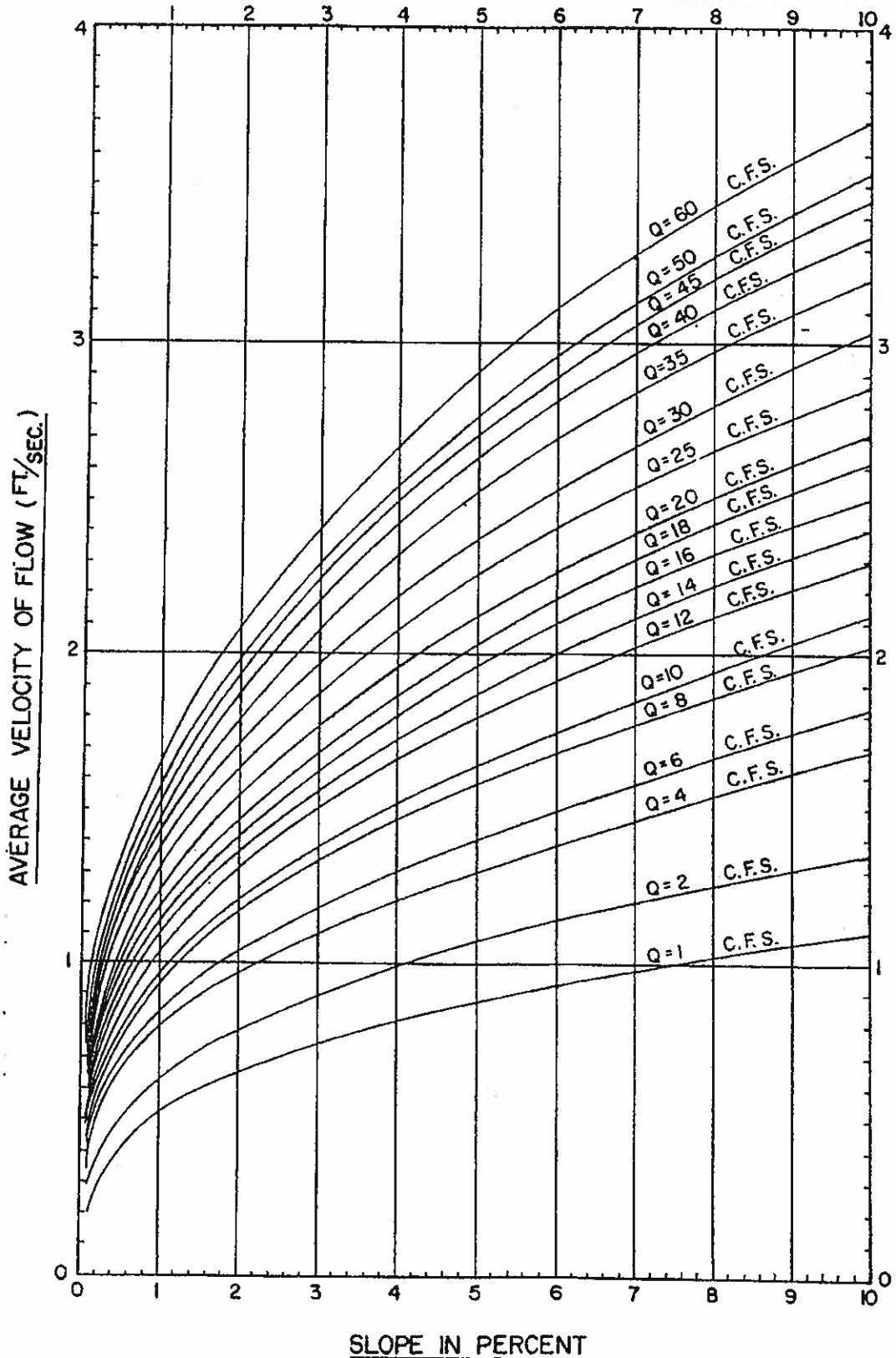
OVERLAND SHEET FLOW

DRAINAGE DESIGN PLATE 4

RECOMMENDED VALUES OF 'N'

RESIDENTIAL = .2	AGRICULTURAL = .3	WOODED = .6
MULT-FAMILY = .1	PASTURE = .4	COMMERCIAL = .05



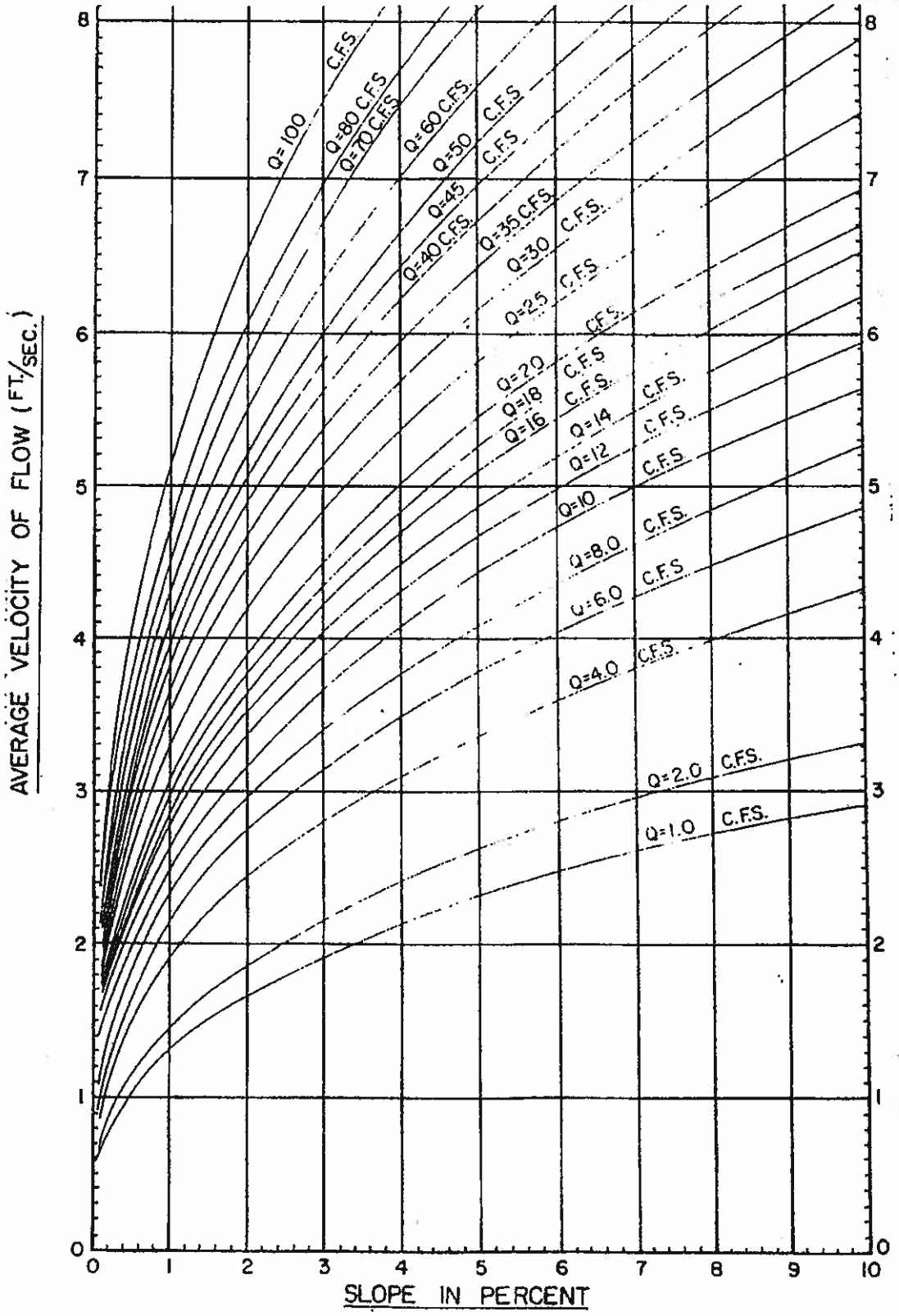


HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

SWALE FLOW VELOCITY

(N = 0.06)

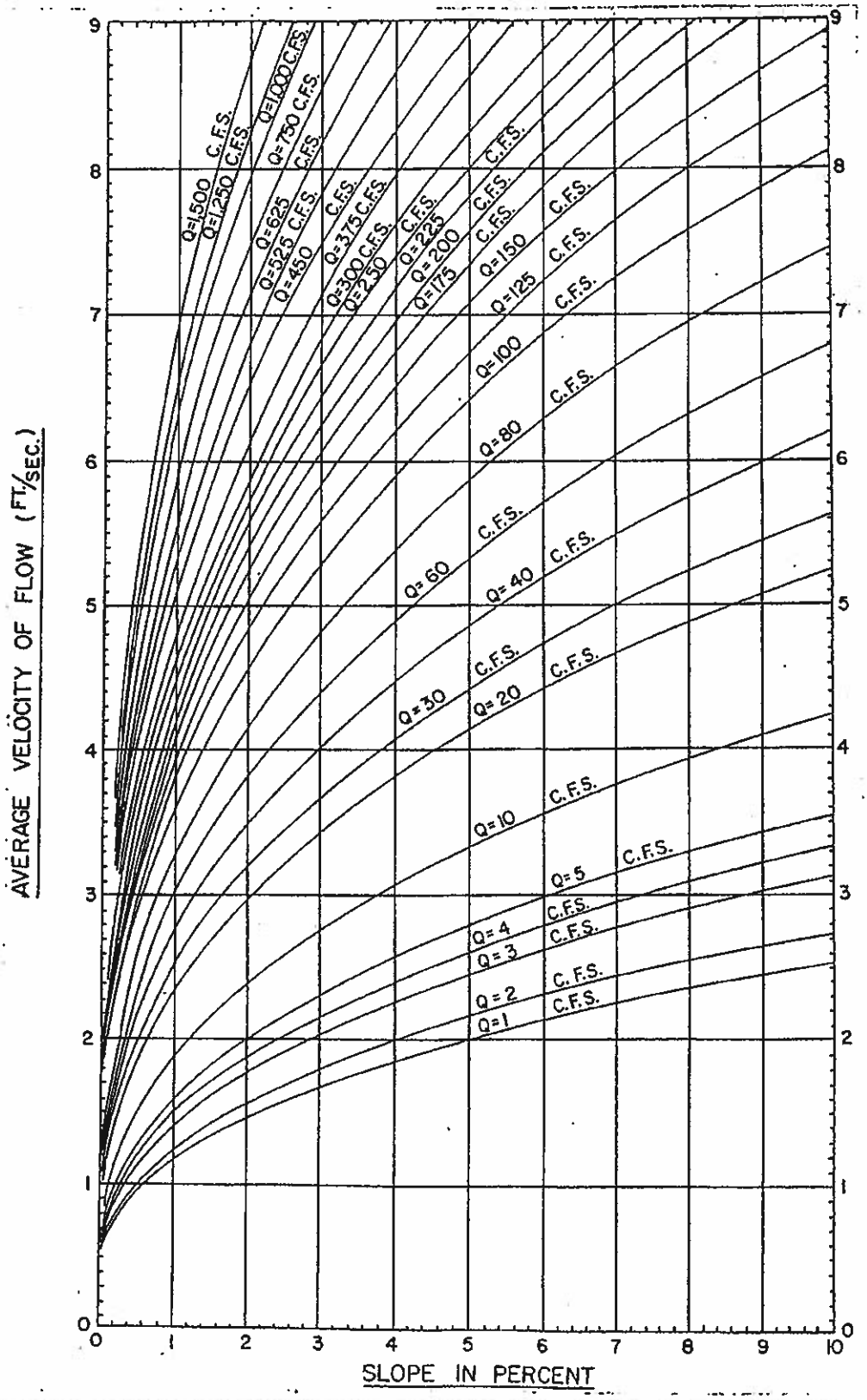
DRAINAGE
DESIGN
PLATE
5



HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

SWALE FLOW VELOCITY
(N = 0.015)

DRAINAGE DESIGN PLATE 6

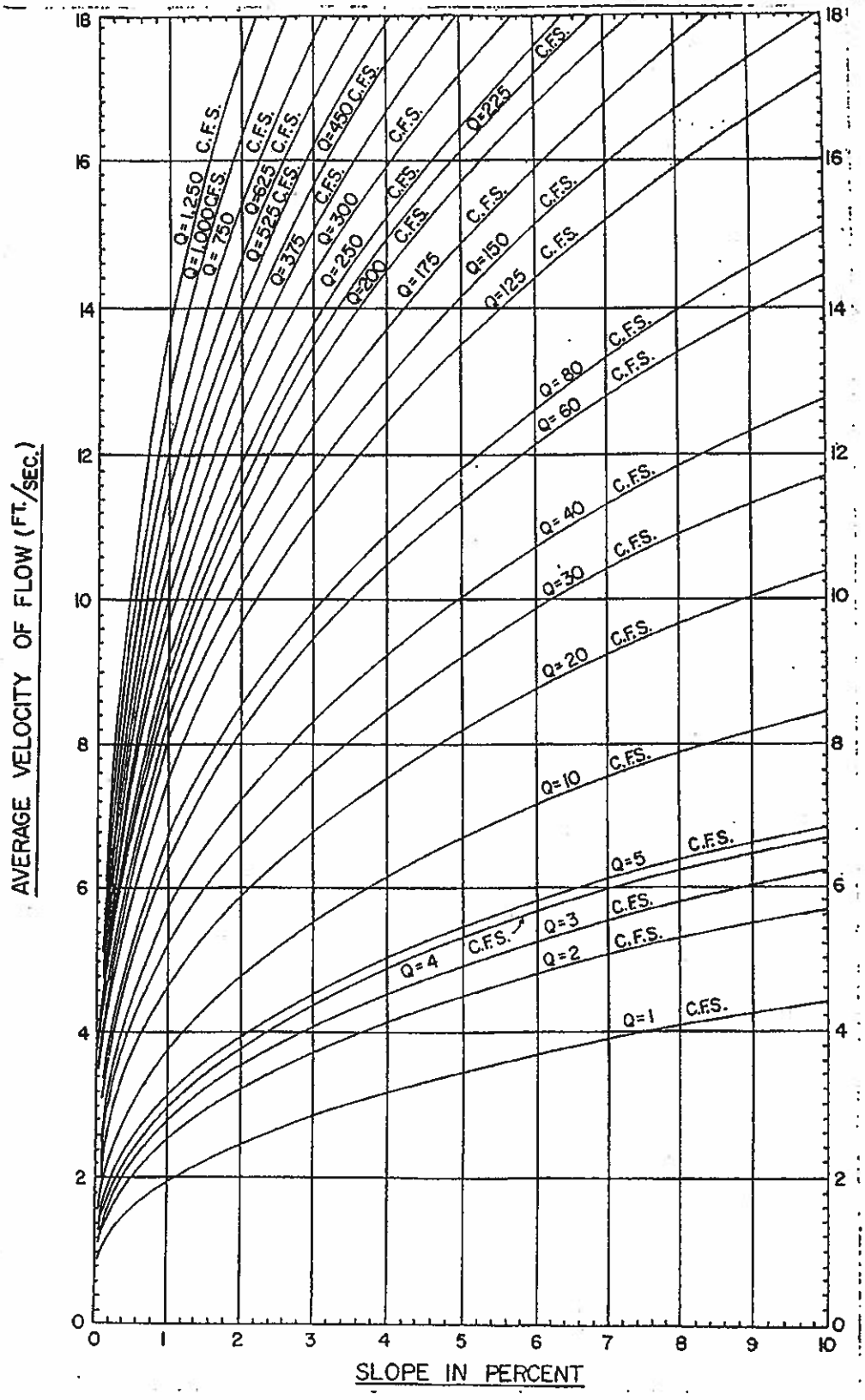


HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

DITCH FLOW VELOCITY

(N = 0.04)

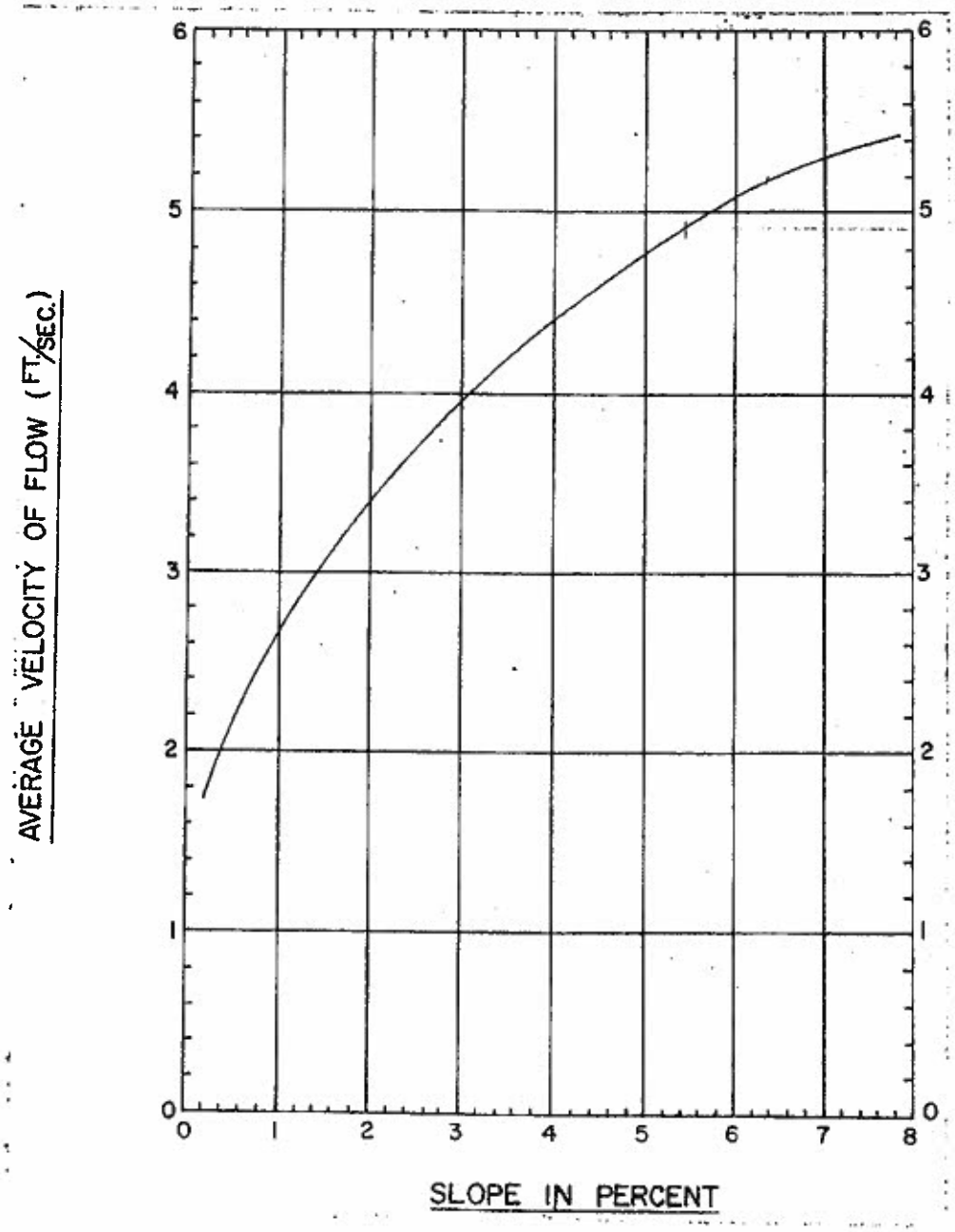
DRAINAGE DESIGN PLATE 7



HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

DITCH FLOW VELOCITY
(N = 0.015)

DRAINAGE DESIGN PLATE 8



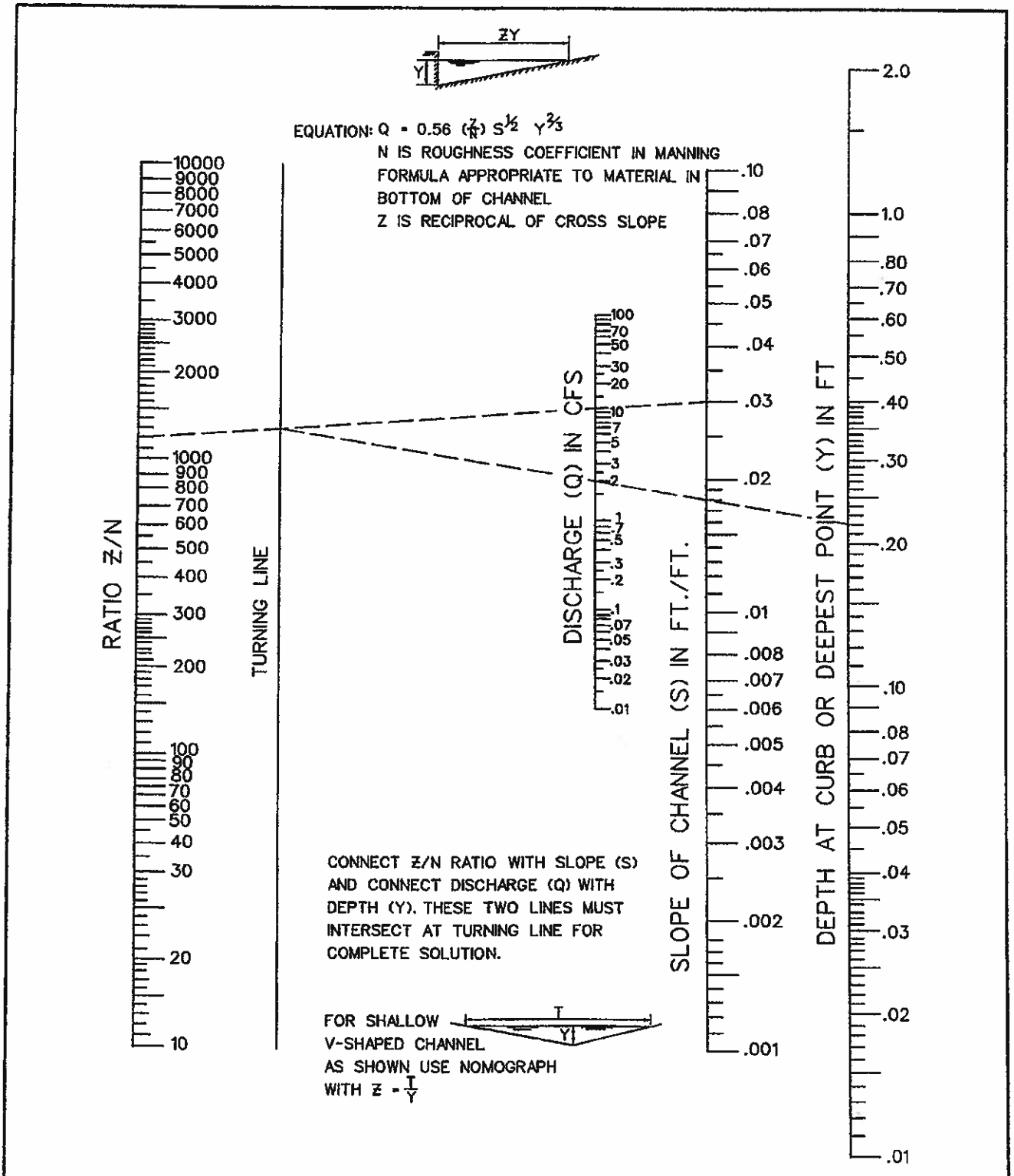
HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

GUTTER FLOW VELOCITY

DRAINAGE
DESIGN
PLATE
9

STREAM VELOCITIES FOR VARIOUS SLOPES
(to be used for computing times of concentration)

Slope, %	Velocity, ft./sec.
0.10	1.7
0.15	1.9
0.20	2.2
0.30	2.5
0.40	2.7
0.50	3.1
0.60	3.4
0.70	4.0
0.75	4.3
0.75	4.5
0.833	4.8
1.00	5.1
1.25	5.5
1.50	6.1
1.75	6.7
2.00	7.3
2.25	7.8
2.75	8.3
3.00	8.7
3.25	9.0



HARFORD COUNTY, MD
DEPARTMENT OF PUBLIC WORKS

NOMOGRAPH FOR TRIANGULAR GUTTERS

DRAINAGE DESIGN PLATE 11

MANNING'S COEFFICIENT OF FRICTION FOR DITCHES AND CHANNELS

Description	Value of `n'
Concrete Gutters, Ditches, Channels	0.015
Bituminous Concrete Surface with Concrete Curb	0.016
Earth Gutters, Ditches	0.025
Seed and Mulch	0.030
Soil Stabilization Matting	0.040
Sod Gutters, Ditches (Flow Depth Greater Than 6")	0.040
Sod Gutters, Ditches (Flow Depth Less Than 6")	0.060
Grouted Rip Rap	0.025
Rip Rap (Stone Slope Protection)	0.035
Natural Stream Channels	0.035 to 0.150
Stone Filled Wire Baskets	0.030

MAXIMUM VELOCITIES FOR DITCHES AND CHANNELS

New Construction Lining	Velocity (fps)
Seed and Mulch	2.5
Solid Sodding	4.0
Soil Stabilization Matting	4.5
Concrete Paving	25.0
Shale or Rock	25.0

Existing Waterways	Velocity (fps)
Earth, without Vegetation	1 to 3
Grains, Stiff Stem Grasses	2 to 3
Bunch Grasses	2 to 4
Stiff Clay or Clay and Gravel	5.0
Fine Gravel	5.0
Meadow Type Grasses, Short Pliant Blades	5.0
Well Established Grasses, Short Pliant Blades	6.0
Coarse Gravel	6.0
Shale or Rock	No Maximum

MANNING'S ROUGHNESS COEFFICIENT `n'

Culverts	Value of `n'
Concrete Pipe, Vitrified Clay Pipe & Cast Iron Pipe	.013
Corrugated Steel/Aluminum Alloy Pipe 2 2/3 x ½ Helical Corrugations, 12" to 36" diameter	.019
Corrugated Steel/Aluminum Alloy Pipe 2 2/3 x ½ Helical Corrugations, 42" to 96" diameter	.014
Corrugated Steel/Aluminum Alloy Pipe 3 x 1 Helical Corrugations, 36" to 84" diameter	.021
Corrugated Steel/Aluminum Alloy Pipe 3 x 1 Helical Corrugations, 96" to 144" diameter	.024
Corrugated Steel/Aluminum Alloy Pipe 2 2/3 x ½ Annular Corrugations	.024
Corrugated Steel/Aluminum Alloy Pipe 3 x 1 Annular Corrugations	.028
Structural Plate Pipe 6 x 2 Corrugations	.034
Corrugated Steel/Aluminum Alloy Pipe Arch	.024
Corrugated Steel/Aluminum Alloy Pipe 25% Paved Invert Full Flow	.021
Corrugated Steel/Aluminum Alloy Pipe Arch 40% Paved Invert Full Flow	.020
Corrugated Steel/Aluminum Alloy Pipe 100% Paved	.013
Tunnel Liner Plate	.04 to .045
Monolithic Concrete Box Culverts	.015
Vitrified Brick (Bends, Junction Chambers, Etc.)	.017
Polyethylene (Lined), Polyvinyl chloride)	.011
P.E. or P.V.C. (Corrugated)	.024

PROPORTIONAL DISCHARGE
CIRCULAR SEWER & PIPES-PARTIALLY FULL

Prop. Depth	Prop. Area	Prop. Discharge
.01	.0017	.00015
.02	.0048	.0007
.03	.0087	.0016
.04	.0134	.0030
.05	.0187	.0048
.06	.0245	.0071
.07	.0308	.0098
.08	.0375	.0130
.09	.0446	.0167
.10	.0520	.0209
.11	.0598	.0255
.12	.0680	.0306
.13	.0764	.0361
.14	.0851	.0421
.15	.0941	.0486
.16	.1033	.0555
.17	.1127	.0629
.18	.1224	.0707
.19	.1323	.0789
.20	.1424	.0876
.21	.1527	.0966
.22	.1631	.1062
.23	.1737	.1160
.24	.1845	.1263
.25	.1955	.1370
.26	.2066	.1480
.27	.2178	.1594
.28	.2292	.1712
.29	.2407	.1834
.30	.2523	.1958
.31	.2640	.2086
.32	.2759	.2217
.33	.2878	.2352
.34	.2998	.2489
.35	.3119	.2629
.36	.3241	.2772
.37	.3364	.2918
.38	.3487	.3066
.39	.3611	.3217
.40	.3735	.3370
.41	.3860	.3525
.42	.3986	.3682
.43	.4112	.3841
.44	.4238	.4003
.45	.4364	.4165
.46	.4491	.4330
.47	.4618	.4495
.48	.4745	.4662
.49	.4873	.4831
.50	.5000	.5000

Prop. Depth	Prop. Area	Prop. Discharge
.51	.5127	.5170
.52	.5255	.5341
.53	.5382	.5513
.54	.5509	.5685
.55	.5636	.5857
.56	.5762	.6030
.57	.5888	.6202
.58	.6014	.6374
.59	.6140	.6546
.60	.6265	.6718
.61	.6389	.6889
.62	.6513	.7060
.63	.6636	.7229
.64	.6759	.7397
.65	.6881	.7564
.66	.7002	.7730
.67	.7122	.7893
.68	.7241	.8055
.69	.7360	.8215
.70	.7477	.8372
.71	.7593	.8527
.72	.7708	.8680
.73	.7822	.8829
.74	.7934	.8976
.75	.8045	.9119
.76	.8155	.9258
.77	.8263	.9394
.78	.8369	.9524
.79	.8473	.9652
.80	.8576	.9775
.81	.8677	.9892
.82	.8776	1.0004
.83	.8873	1.0110
.84	.8967	1.0211
.85	.9059	1.0304
.86	.9149	1.0391
.87	.9236	1.0471
.88	.9320	1.0542
.89	.9402	1.0605
.90	.9480	1.0658
.91	.9554	1.0701
.92	.9625	1.0732
.93	.9692	1.0752
.94	.9755	1.0757
.95	.9813	1.0745
.96	.9866	1.0714
.97	.9913	1.0657
.98	.9952	1.0567
.99	.9983	1.0419
1.00	1.0000	1.0000

CONSTANTS (x) FOR PIPE FLOW

Diameter (inches)	Area square feet	RCP n = 0.013	CMP n = 0.024
15	1.2271	64.57	34.98
18	1.7671	105.04	56.90
21	2.4053	158.45	85.83
24	3.1416	226.22	122.54
27	3.9761	309.70	167.76
30	4.9087	410.17	222.18
33	5.9396	528.87	286.47
36	7.0686	666.99	361.28
39	8.2958	825.68	447.25
42	9.6211	1006.10	544.97
48	12.5664	1436.43	778.07
54	15.9043	1966.49	1065.18
60	19.6350	2604.42	1410.73
66	23.7583	3358.09	1818.97
72	28.2743	4235.08	2294.00
78	33.1831	5242.77	2839.83
84	38.4845	6388.32	3460.34
90	44.1786	7678.72	4159.30
96	50.2655	9120.78	4940.42
102	56.7450	10721.18	5870.30
108	63.6172	12486.44	6763.49
114	70.8822	14422.98	7812.45
120	78.5398	16537.18	8957.58

$Q/S^{1/2} = (0.463/n) \cdot d(ft)^{8/3}$ $\quad$ CAPACITY $= (S_p \cdot x^2)^{1/2}$

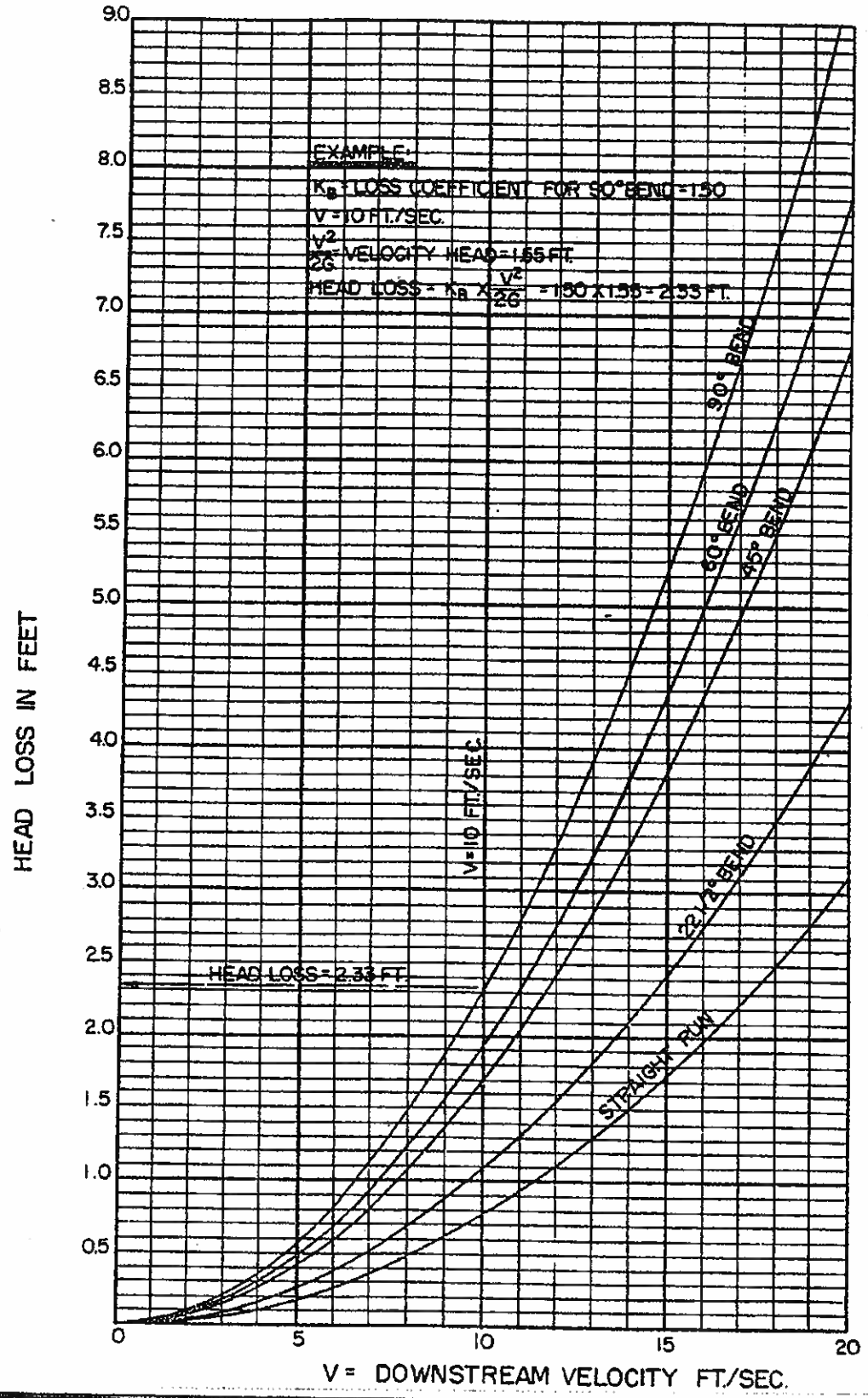
$S_{hg} = (Q/x)^2$ $\quad$ $X = Q/S^{1/2}$ $\quad$ $V_{full} = Q/A$

$$H_b = \frac{K_b V_f^2}{2g}$$

TABLE OF K_b VALUES
HEAD LOSSES IN STRUCTURES

(See Drainage Design Manual Section III-B-4)

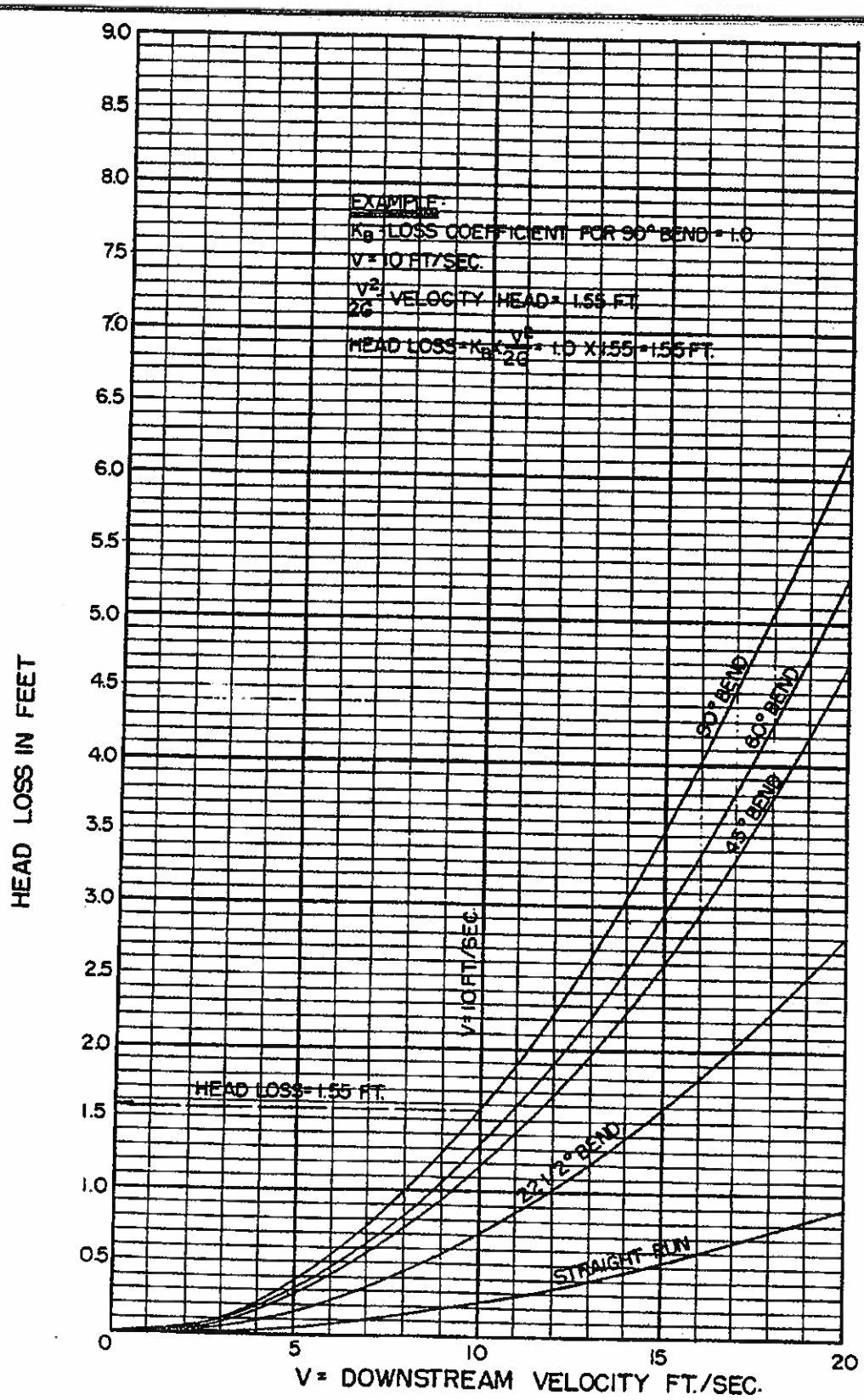
ANGLE	INLET	MANHOLE	BEND	ANGLE	INLET	MANHOLE	BEND
0	.50	.15	0.01	46	1.11	.76	0.18
1	.51	.16	0.01	47	1.12	.76	0.19
2	.52	.18	0.02	48	1.13	.77	0.19
3	.53	.19	0.02	49	1.14	.78	0.19
4	.54	.20	0.03	50	1.15	.78	0.19
5	.54	.22	0.03				
6	.55	.22	0.03	51	1.16	.79	0.19
7	.56	.24	0.04	52	1.17	.80	0.19
8	.57	.26	0.05	53	1.18	.80	0.19
9	.58	.27	0.05	54	1.19	.81	0.20
10	.59	.28	0.06	55	1.20	.82	0.20
				56	1.21	.82	0.20
11	.60	.30	0.06	57	1.22	.83	0.20
12	.61	.31	0.07	58	1.23	.84	0.20
13	.62	.34	0.07	59	1.24	.84	0.20
14	.62	.34	0.07	60	1.25	.85	0.20
15	.63	.35	0.08				
16	.64	.36	0.08	61	1.26	.85	0.20
17	.65	.38	0.09	62	1.27	.86	0.20
18	.66	.39	0.09	63	1.27	.86	0.20
19	.67	.40	0.09	64	1.28	.87	0.20
20	.68	.42	0.10	65	1.29	.87	0.20
				66	1.30	.88	0.21
21	.69	.43	0.10	67	1.31	.88	0.21
22	.70	.44	0.11	68	1.32	.89	0.21
23	.71	.46	0.11	69	1.32	.89	0.21
24	.73	.47	0.11	70	1.33	.90	0.21
25	.74	.48	0.12				
26	.76	.50	0.12	71	1.34	.91	0.21
27	.78	.51	0.13	72	1.35	.91	0.21
28	.80	.52	0.13	73	1.36	.91	0.21
29	.82	.54	0.13	74	1.37	.92	0.22
30	.83	.55	0.14	75	1.37	.92	0.22
				76	1.38	.93	0.22
31	.85	.56	0.14	77	1.39	.93	0.22
32	.87	.58	0.14	78	1.40	.94	0.22
33	.89	.59	0.14	79	1.41	.94	0.22
34	.90	.60	0.14	80	1.42	.95	0.23
35	.92	.62	0.15				
36	.94	.63	0.15	81	1.42	.95	0.23
37	.96	.64	0.16	82	1.43	.96	0.23
38	.98	.66	0.16	83	1.44	.96	0.23
39	.99	.67	0.16	84	1.45	.97	0.24
40	1.01	.68	0.17	85	1.46	.97	0.24
				86	1.47	.98	0.24
41	1.03	.70	0.17	87	1.47	.98	0.24
42	1.05	.71	0.17	88	1.49	.99	0.25
43	1.06	.72	0.17	89	1.49	.99	0.25
44	1.08	.74	0.18	90	1.50	1.00	0.25
45	1.10	.75	0.18				



HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

HEAD LOSSES IN INLETS

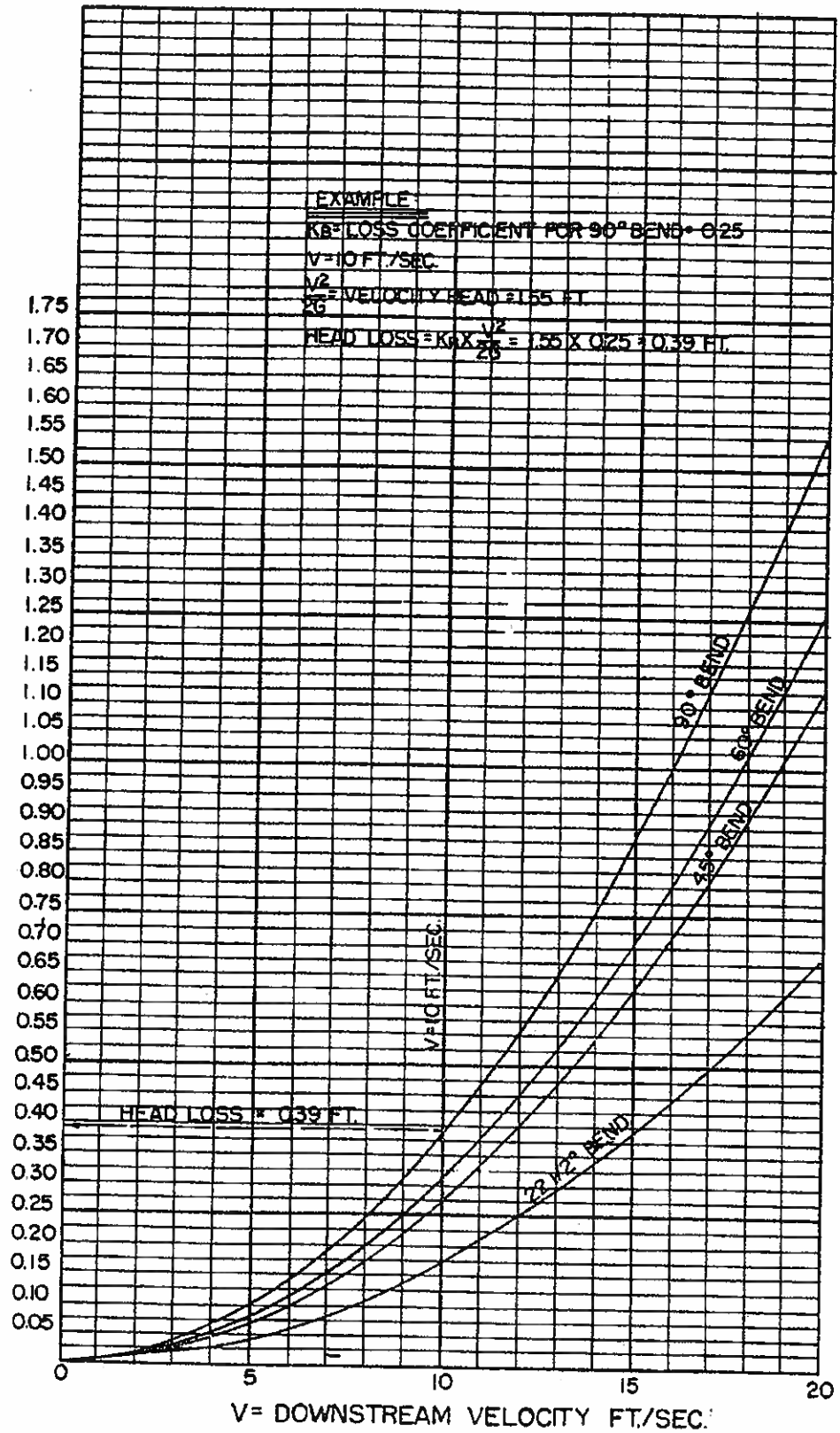
DRAINAGE
DESIGN
PLATE
18



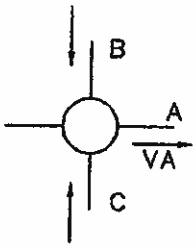
HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

HEAD LOSSES IN MANHOLES

DRAINAGE
DESIGN
PLATE
19

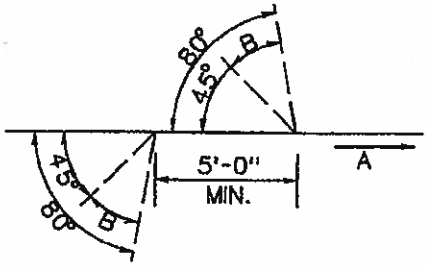


HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEAD LOSSES IN BENDS (R= 2 1/2 X PIPE DIA.)	DRAINAGE DESIGN PLATE 20



MAX. DIA.		
A	B	C
36"	—	—
30"	27"	—
27"	27"	—
30"	18"	15"

TYPE 'A' MANHOLE



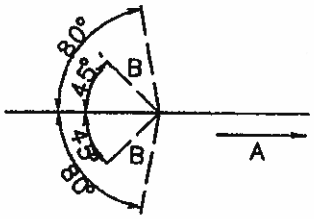
A	B
33" & LARGER	15" & SMALLER
42" & LARGER	18" & SMALLER

CUT-INS

(TO BE USED ONLY FOR INLET CONNECTIONS)

SEE STANDARD DETAILS FOR USE OF TYPE 'B' SHALLOW MANHOLES. USE SAME MAXIMUM DIAMETERS AS SHOWN FOR TYPE 'A' MANHOLES.

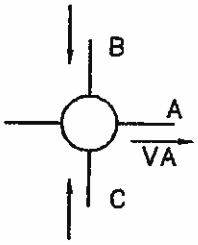
TYPE 'B' MANHOLE



A	B
30" & SMALLER	15" & SMALLER
36" & SMALLER	18" & SMALLER

WYE BRANCHES

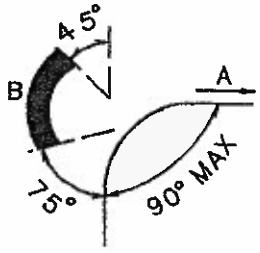
(PREFORMED AND/OR BRICK)



MAX. DIA.		
A	B	C
72"	—	—
72"	18"	15"
72"	21"	—

WHERE A > 42" USE TYPE 'C' MANHOLE

TYPE 'C' MANHOLE



MAX. DIA.	
A	B
30"-33"	15"-21"
36"-42"	15"-24"
48"-54"	15"-27"
60"-72"	15"-36"

BEND STRUCTURE WITH CONNECTION

PERMISSIBLE DEPTH TABLE FOR CONCRETE PIPE

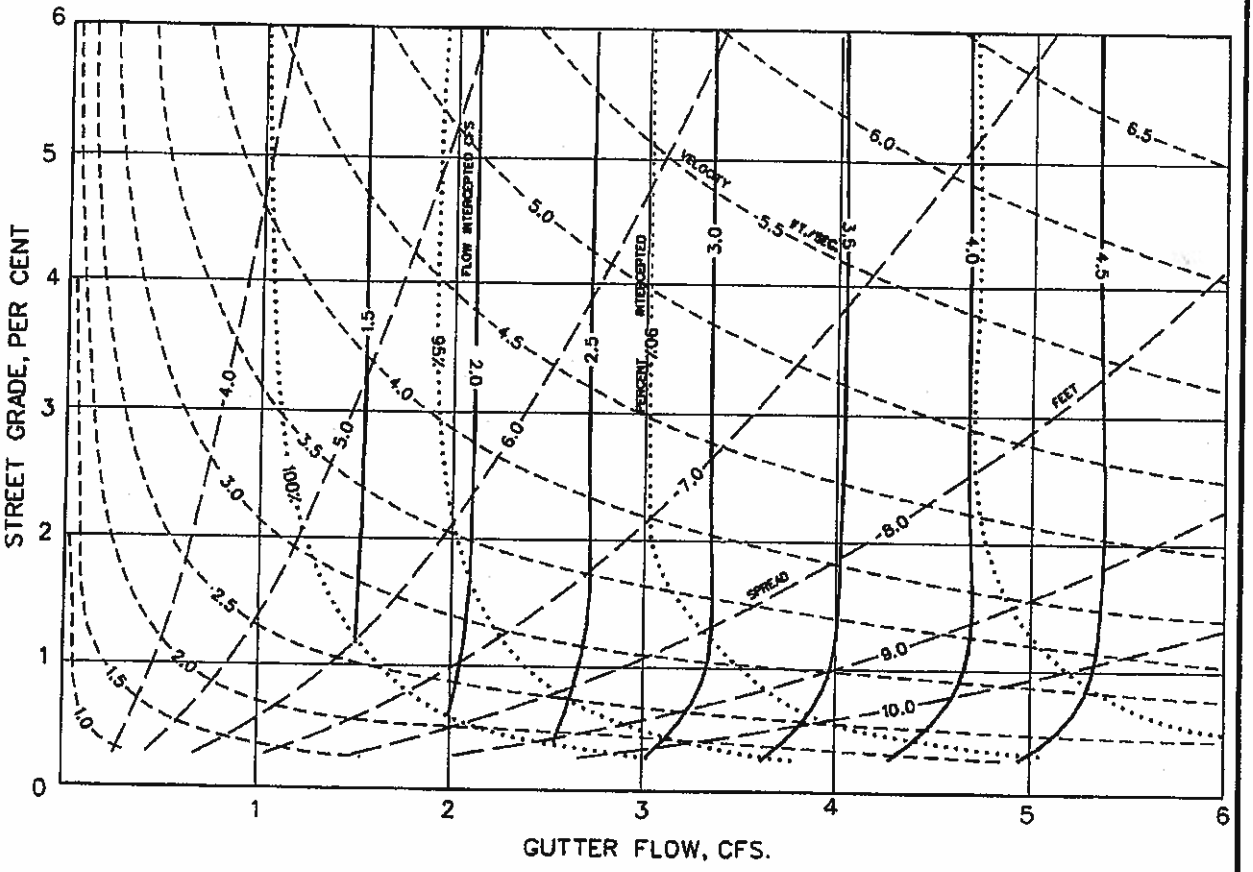
Reinforced Concrete Pipe ASTM - C-76 (**)										
	Class I		Class II		Class III		Class IV		Class V	
Pipe Dia.	Min. Depth	Max. Depth	Min. Depth	Max. Depth	Min. Depth	Max. Depth	Min. Depth	Max. Depth	Min. Depth	Max. Depth
15"					3.5	12	2.5	23	2.5	*
18"					4	12	3	23	3	*
21"					4	12	3	24	3	*
24"					5	13	4	25	4	*
27"					5	13	4	20	4	*
30"					5	13	4	21	4	*
36"			6	9	5	14	5	22	5	*
42"			6	9	5	14	5	21	5	*
48"			6	10	6	13	6	22	6	*
54"			6	11	6	16	6	23	6	*
60"			7	12	7	17	7	23	7	*
66"	8	10	7	13	7	17	7	24	7	*
72"	8	11	8	13	8	17	8	25	8	*

* May be used over thirty feet (30')in depth.
** Measurements are from the invert of the pipe to grade.
NOTE: Pipe shall not be used where there are blank spaces in this table.

COVER REQUIREMENTS FOR CORRUGATED METAL PIPE

Corrugated Metal Pipe										
	16 Gauge		14 Gauge		12 Gauge		10 Gauge		8 Gauge	
Pipe	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
15"	1	50	1	70	1	80				
18"	1	40	1	60	1	80				
21"	1	35	1	50	1	80				
24"	1	15	1	45	1	70	1	80		
27"	1	15	1	40	1	60	1	75		
30"	1	--	1	30	1	45	1	70	1	80
36"	1	--	1	15	1	30	1	45	1	70
42"	1	--	1	--	1	25	1	35	1	60
48"	1	--	1	--	1	20	1	25	1	35
54"	1	--	1	--	1	15	1	20	1	30
60"	1	--	1	--	1	--	1	15	1	25
66"	1.5	--	1.5	--	1.5	--	1.5	15	1.5	20
72"	1.5	--	1.5	--	1.5	--	1.5	10	1.5	15

Note: Measurements are from the crown of the pipe to top of subgrade.
Pipe shall not be used where there are "--" in this table
For pipe placed under flexible pavement see Section III Hydraulics, Subsection 5, General Limitations, Maximum and Minimum measurements are in feet.
Cover requirements are applicable for type 2 aluminized corrugated metal pipe, aluminum corrugated metal pipe and bituminous coated corrugated metal pipe.

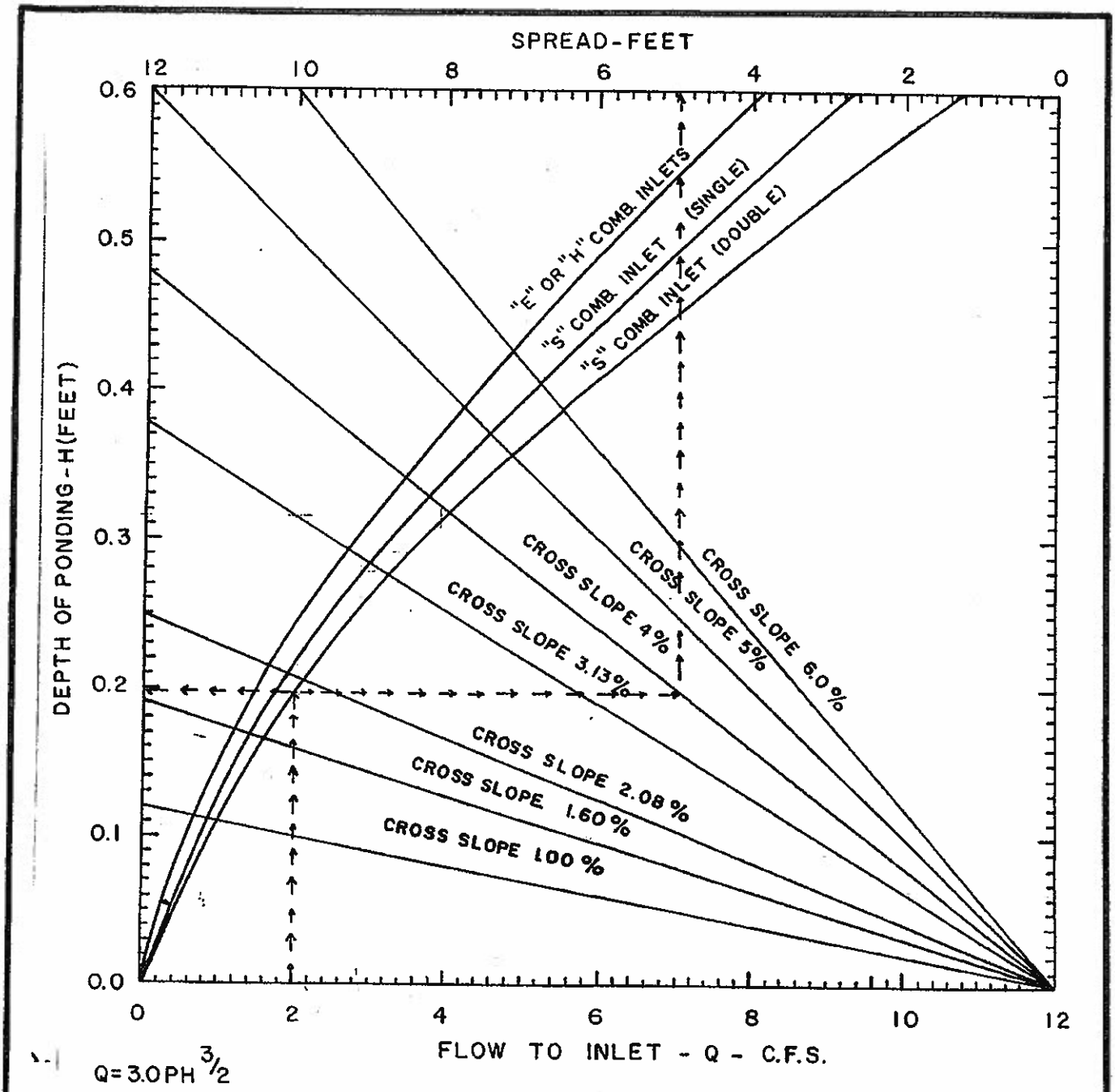


NOTES:

1. GUTTER CAPACITIES DETERMINED USING $Q = 0.56(Z/N)\, S^{1/2}\, Y^{2/3}$; N = .015
2. INLET CAPACITIES BASED ON CHAPTER 4 THE DESIGN OF STORM WATER INLETS, THE JOHNS HOPKINS UNIVERSITY
3. FOR COMBINATION INLETS, UNDEPRESSED GRATES, CROSS SLOPE 1:32(3/8":1') ONLY

INLET CAPACITY CURVES
'S' COMBINATION INLET - DOUBLE GRATE TANDEM
UNDEPRESSED - CROSS SLOPE 1:32

HARFORD COUNTY, MD DEPARTMENT OF PUBLIC WORKS	INLET CAPACITY CURVES	DRAINAGE DESIGN PLATE 24



$Q = 3.0 P H^{3/2}$

EXAMPLE: → → →

GIVEN:

Q = 2.0 C.F.S.

"S" COMB. INLET (DOUBLE GRATE)

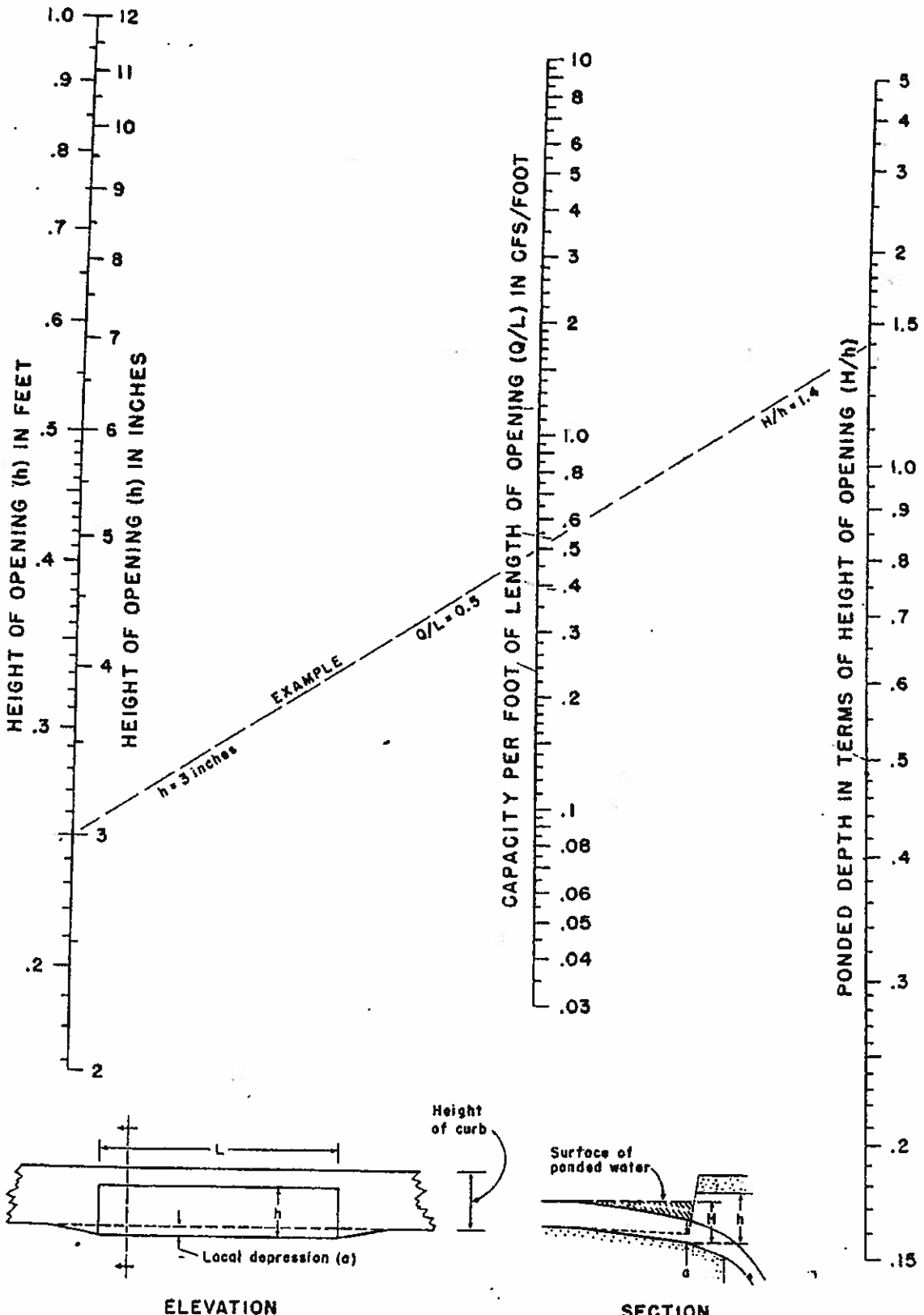
4.0% CROSS SLOPE

FIND:

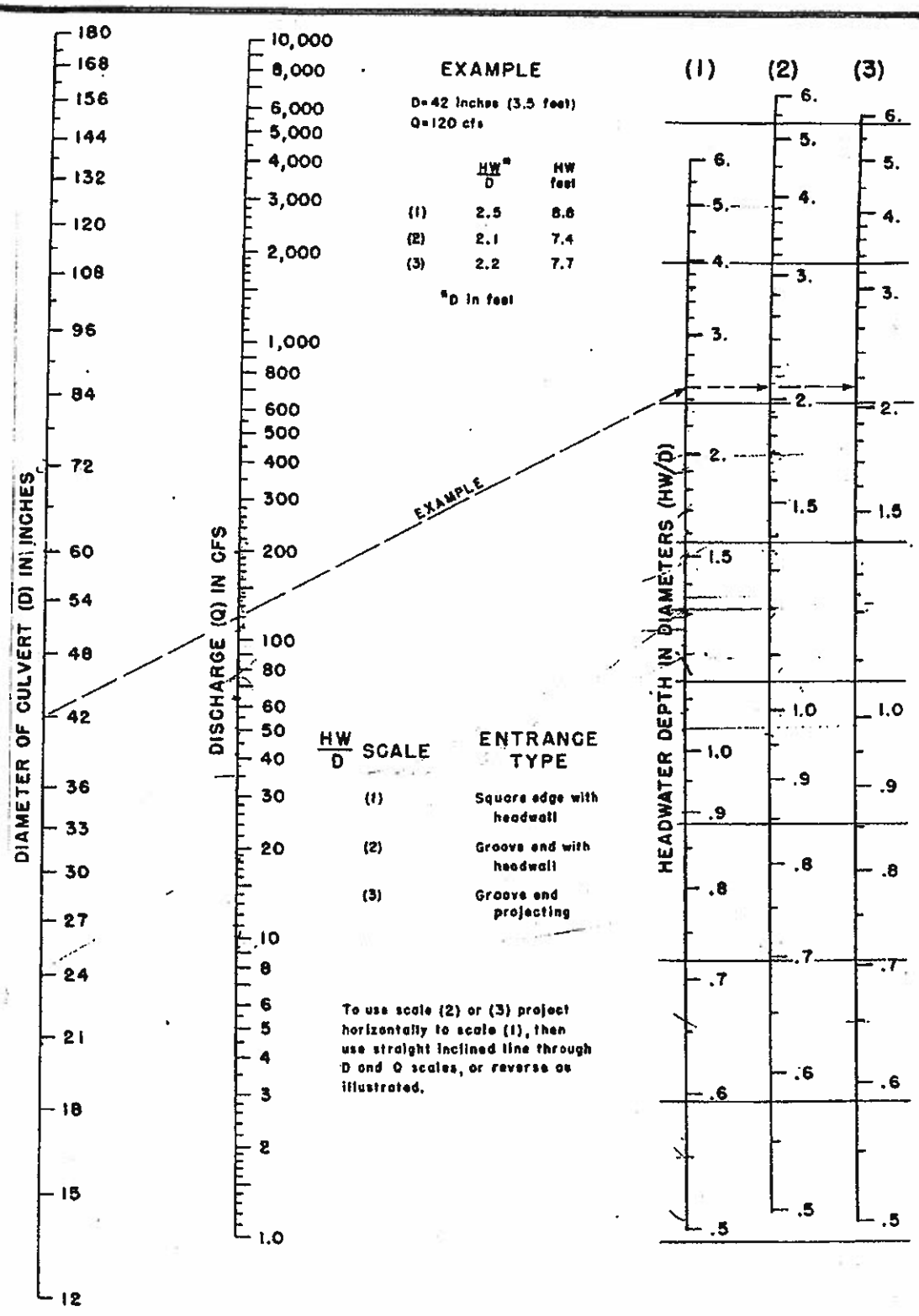
H = 0.197'

SPREAD = 4.92'

HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	"E", "H", SINGLE "S" & DOUBLE "S" COMB. INLETS IN A SUMP	DRAINAGE DESIGN PLATE 25



HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	CAPACITY OF CURB OPENING INLET AT LOW POINT IN GRADE	DRAINAGE DESIGN PLATE 26

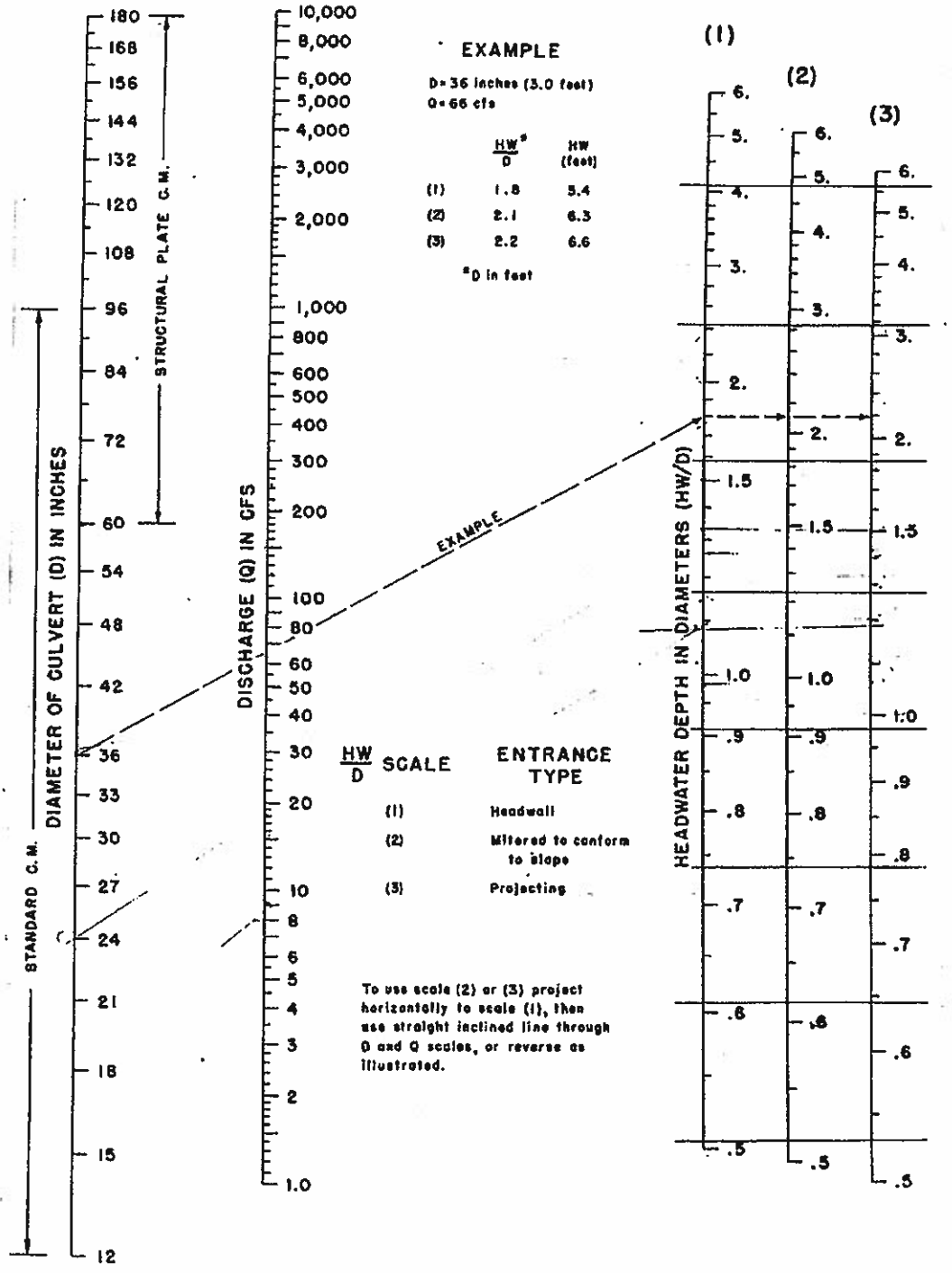


HEADWATER SCALES 2&3
REVISED MAY 1964

HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

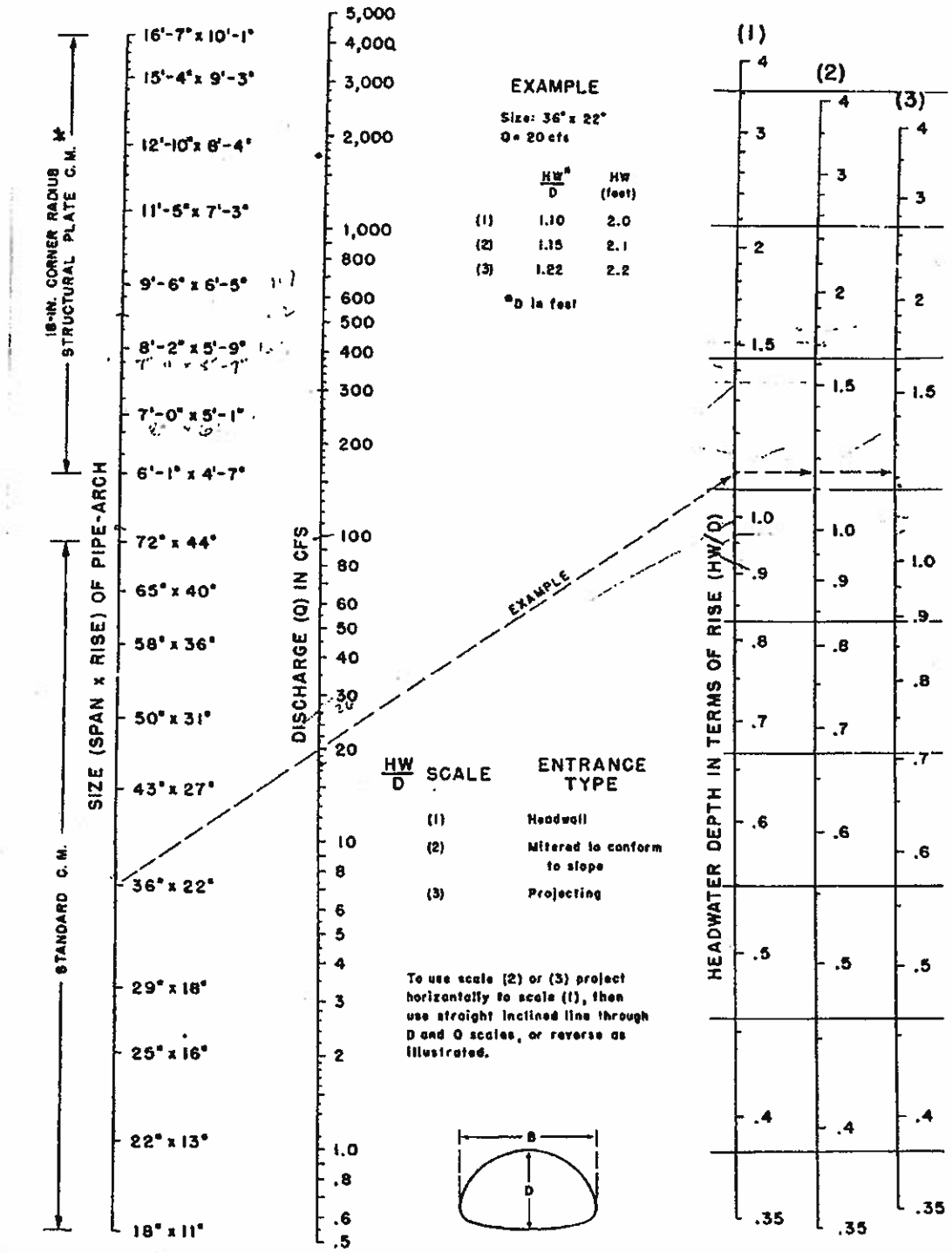
DRAINAGE
DESIGN
PLATE
27



HARFORD COUNTY, MD.
DEPARTMENT OF PUBLIC WORKS

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

DRAINAGE DESIGN PLATE 28

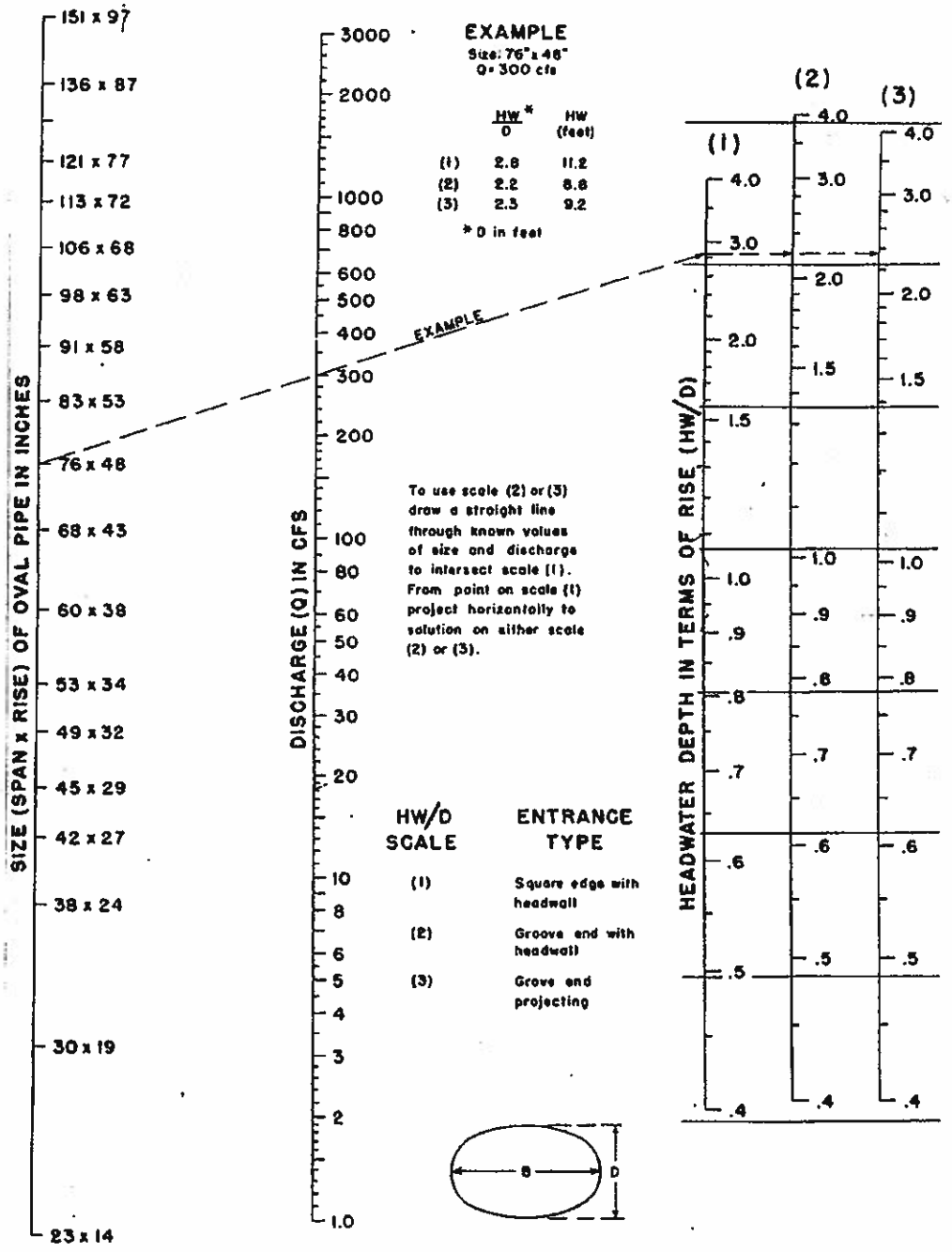


FOR ADDITIONAL SIZES THAT ARE NOT DIMENSIONED REFER TO CHARTS 442.00 AND 443.00

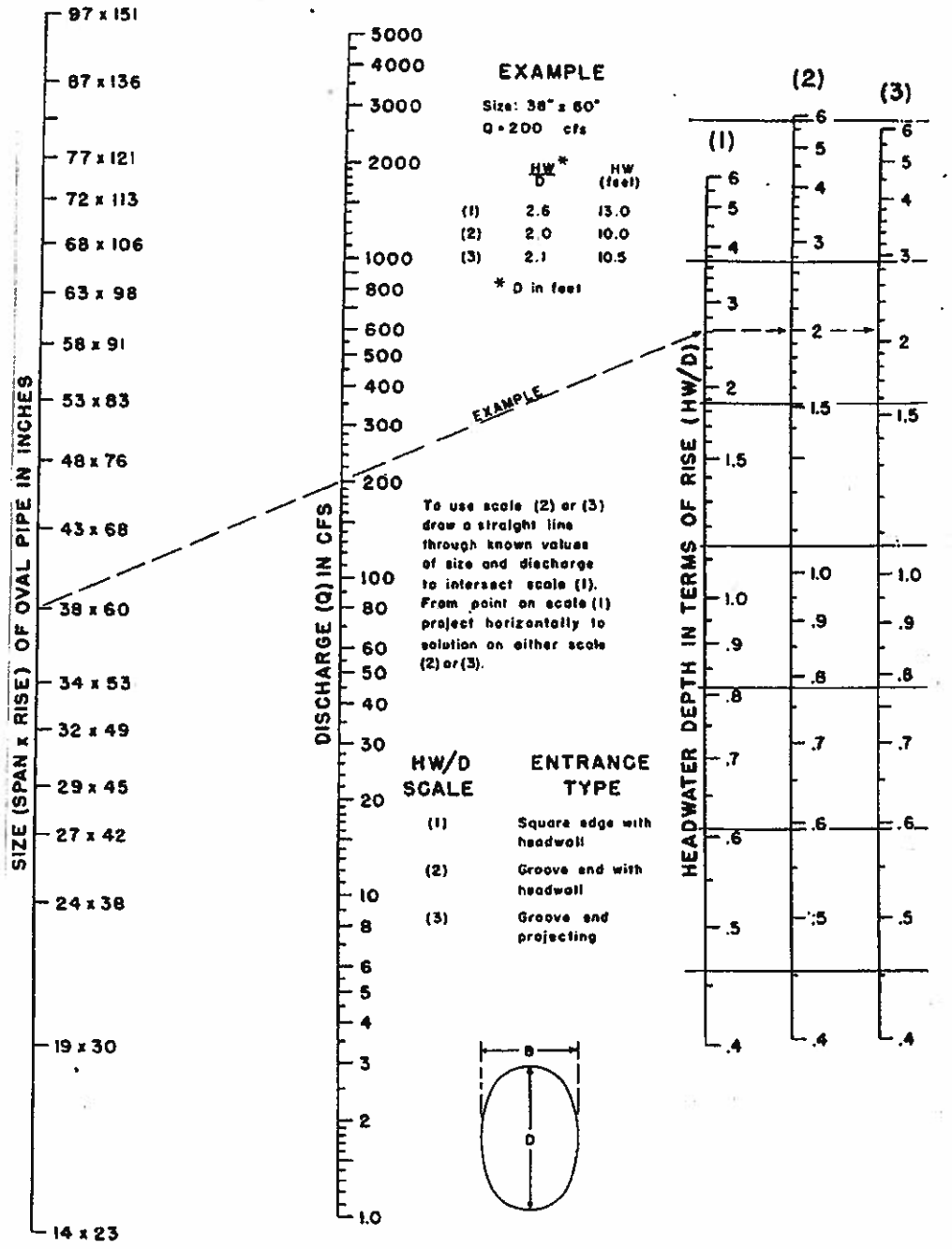
HARFORD COUNTY, MD.
DEPARTMENT OF PUBLIC WORKS

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

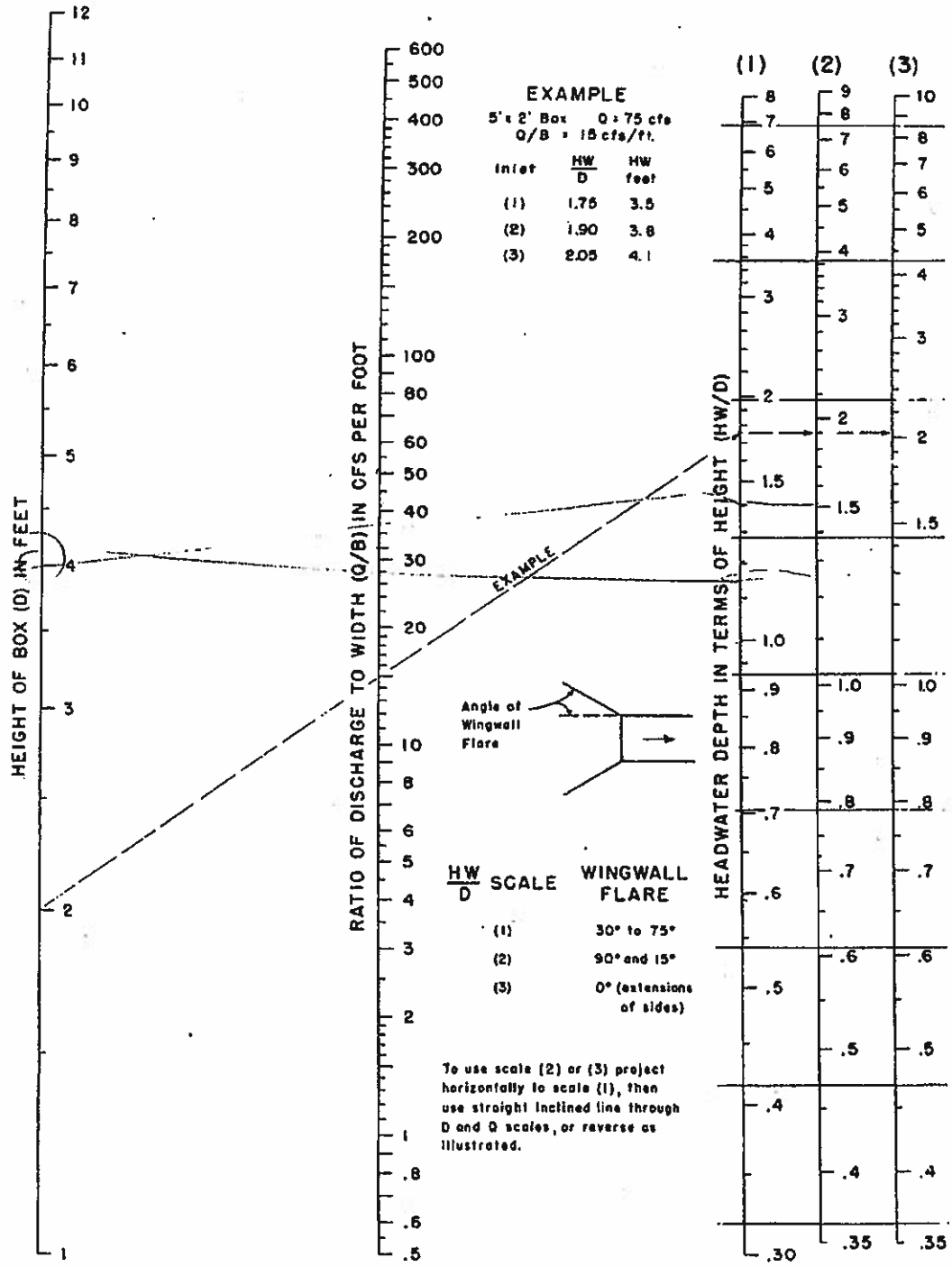
DRAINAGE DESIGN PLATE 29



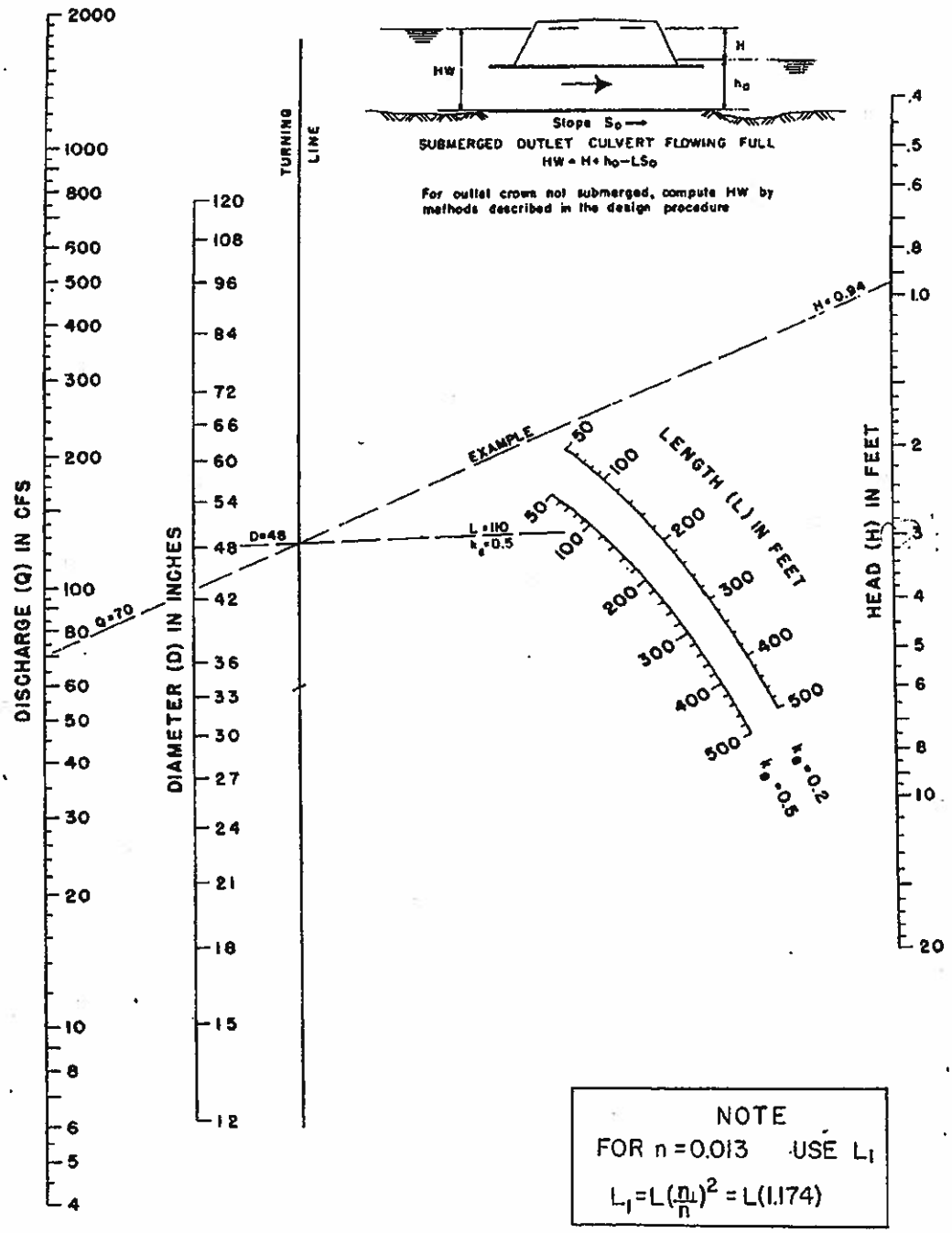
HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEADWATER DEPTH FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS HORIZONTAL WITH INLET CONTROL	DRAINAGE DESIGN PLATE 30



HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEADWATER DEPTH FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS VERTICAL WITH INLET CONTROL	DRAINAGE DESIGN PLATE 31



HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL	DRAINAGE DESIGN PLATE 32

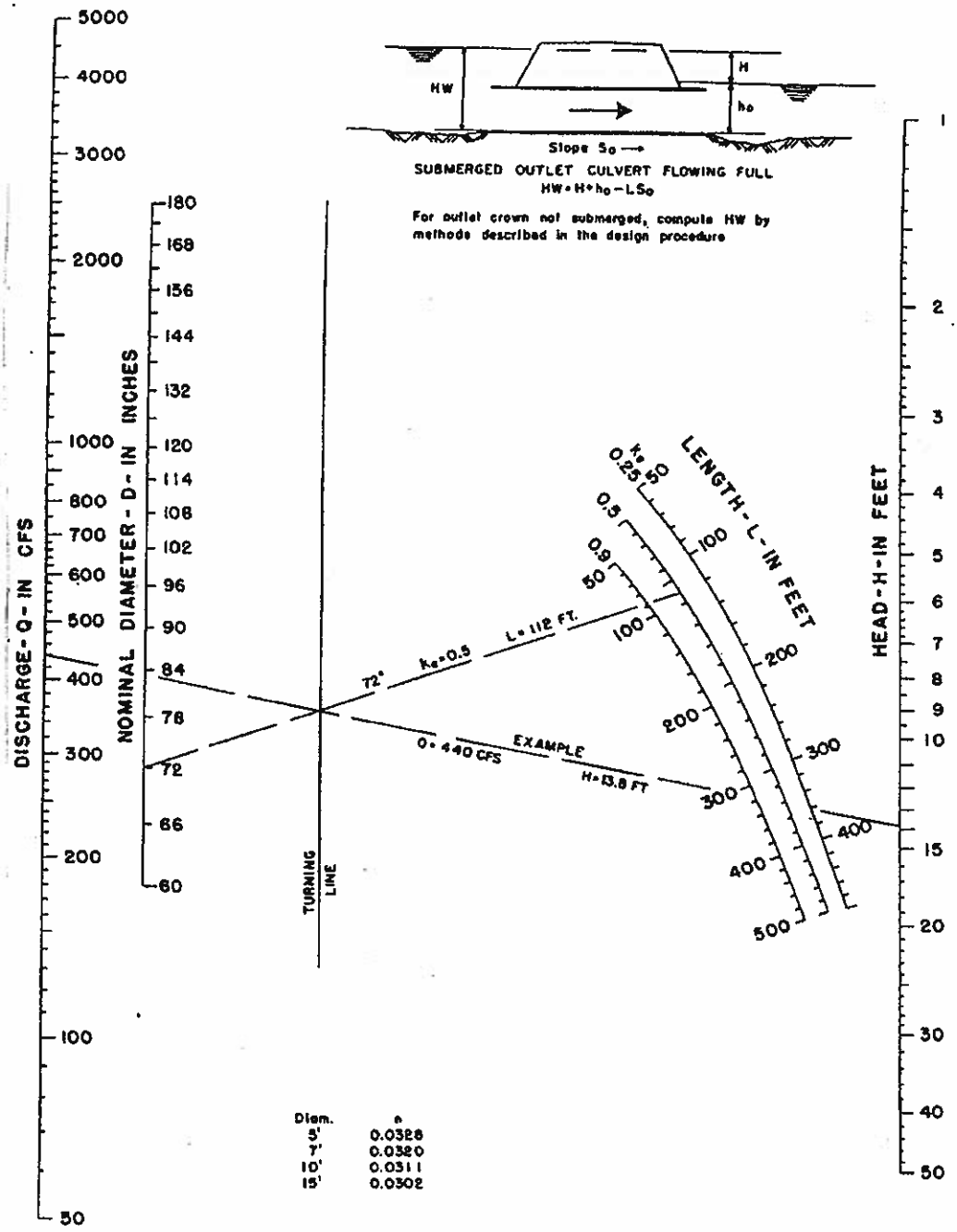


NOTE

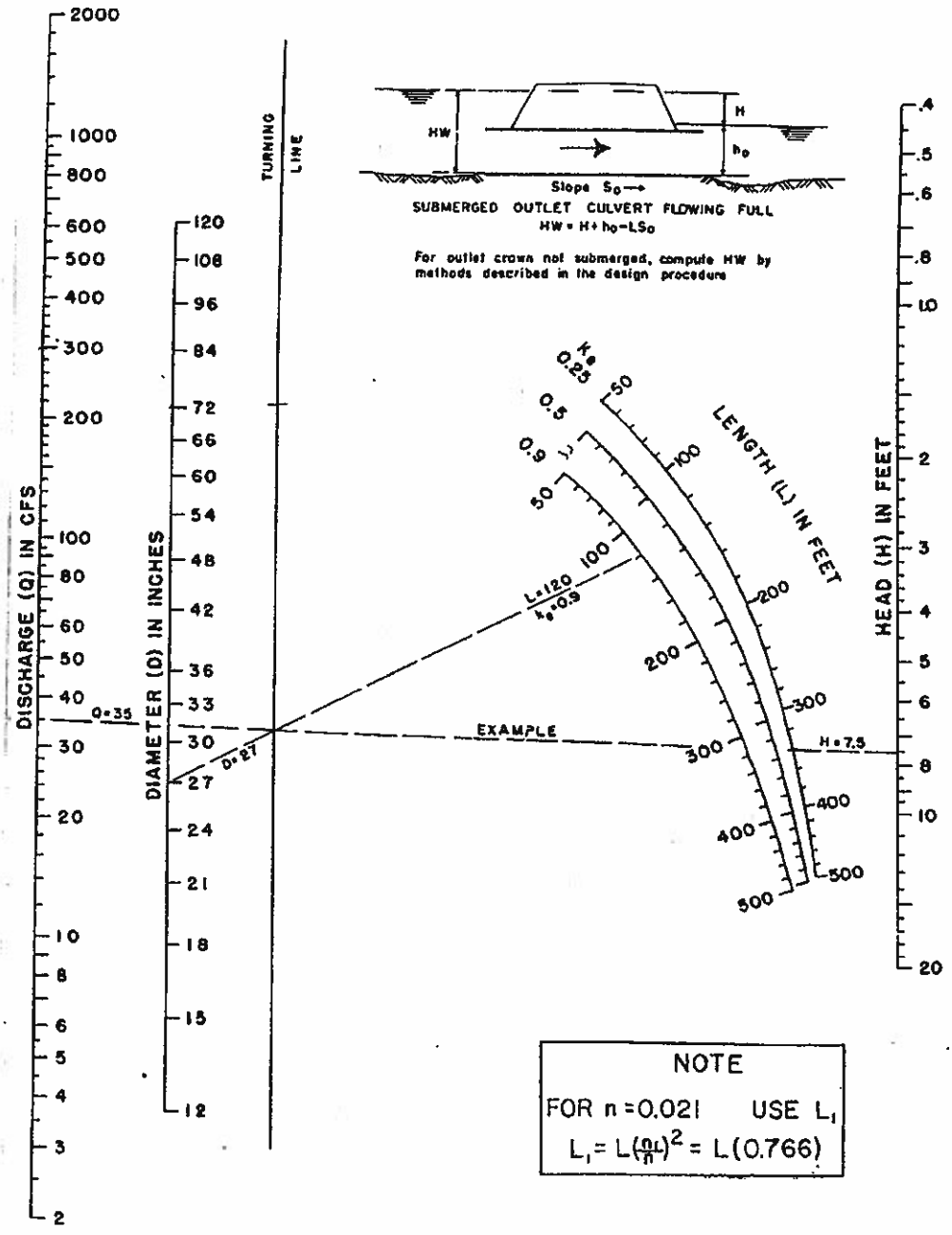
FOR n = 0.013 USE L_1

$L_1 = L\left(\frac{n_1}{n}\right)^2 = L(1.174)$

HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL n = 0.012	DRAINAGE DESIGN PLATE 33



HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEAD FOR STRUCTURAL PLATE CORR. METAL PIPE CULVERTS FLOWING FULL n = 0.0328 TO 0.0302	DRAINAGE DESIGN PLATE 34



NOTE

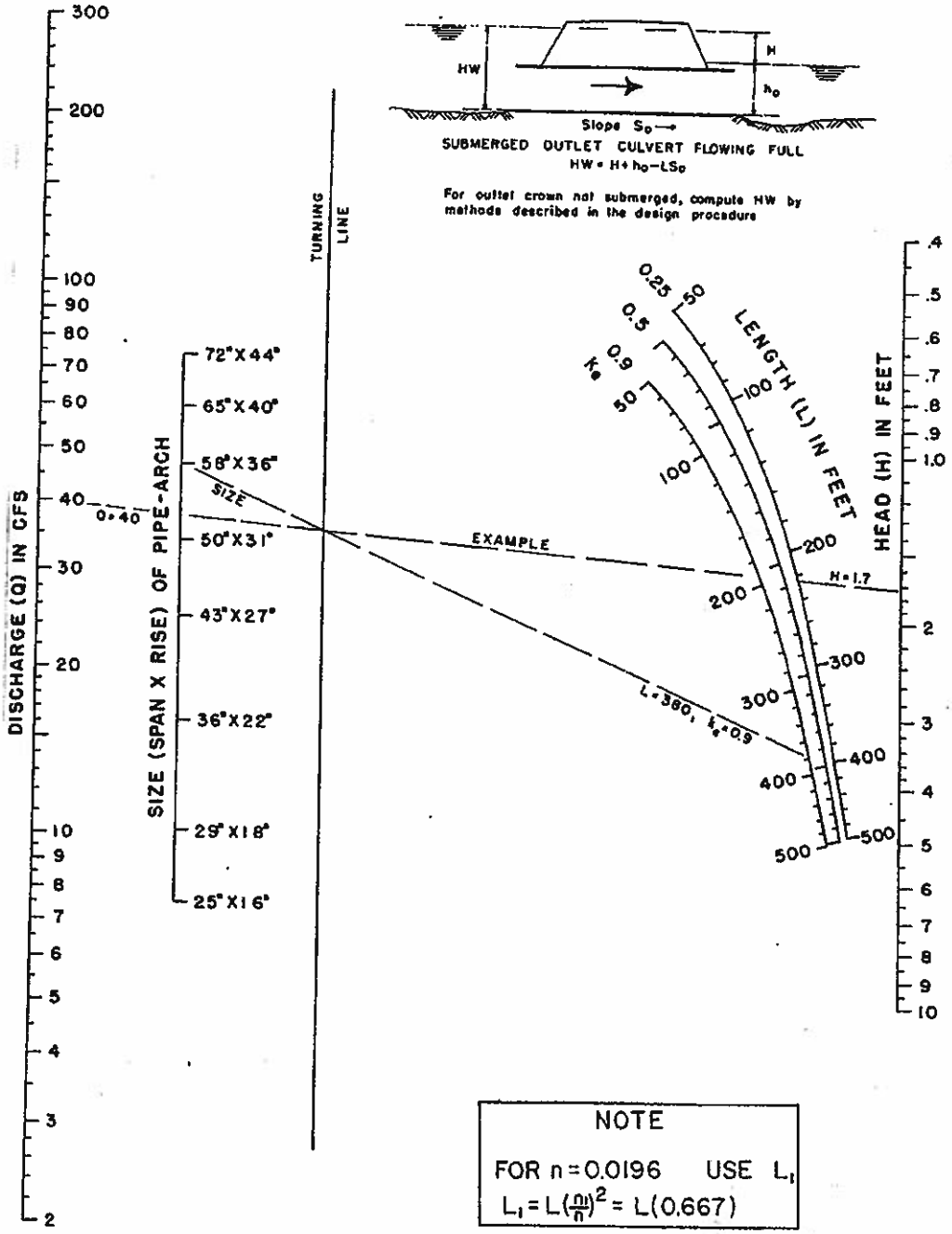
FOR n = 0.021 USE L_1

$L_1 = L\left(\frac{n_1}{n}\right)^2 = L(0.766)$

HARFORD COUNTY, MD.
DEPARTMENT OF PUBLIC WORKS

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

DRAINAGE DESIGN PLATE 35

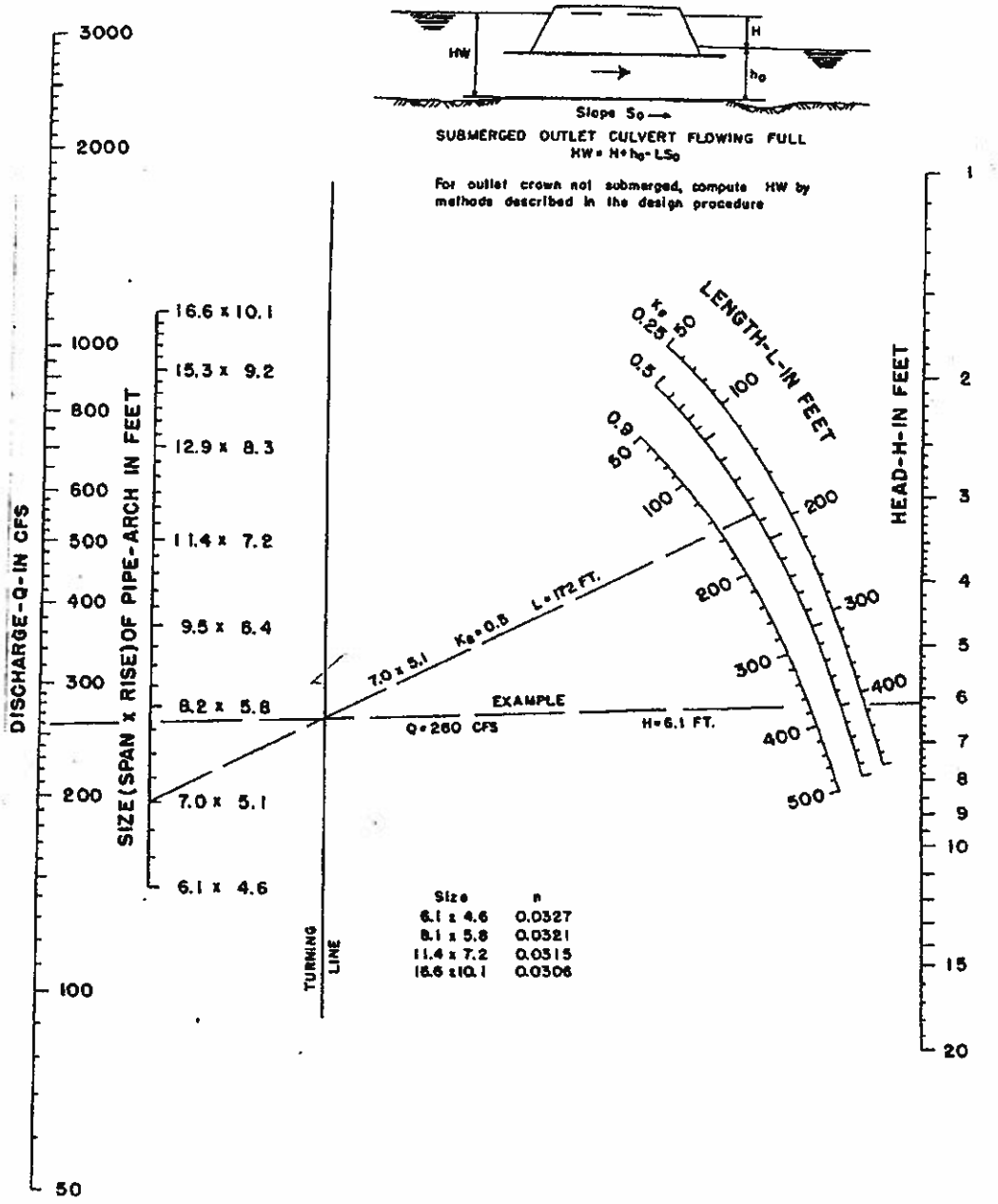


NOTE

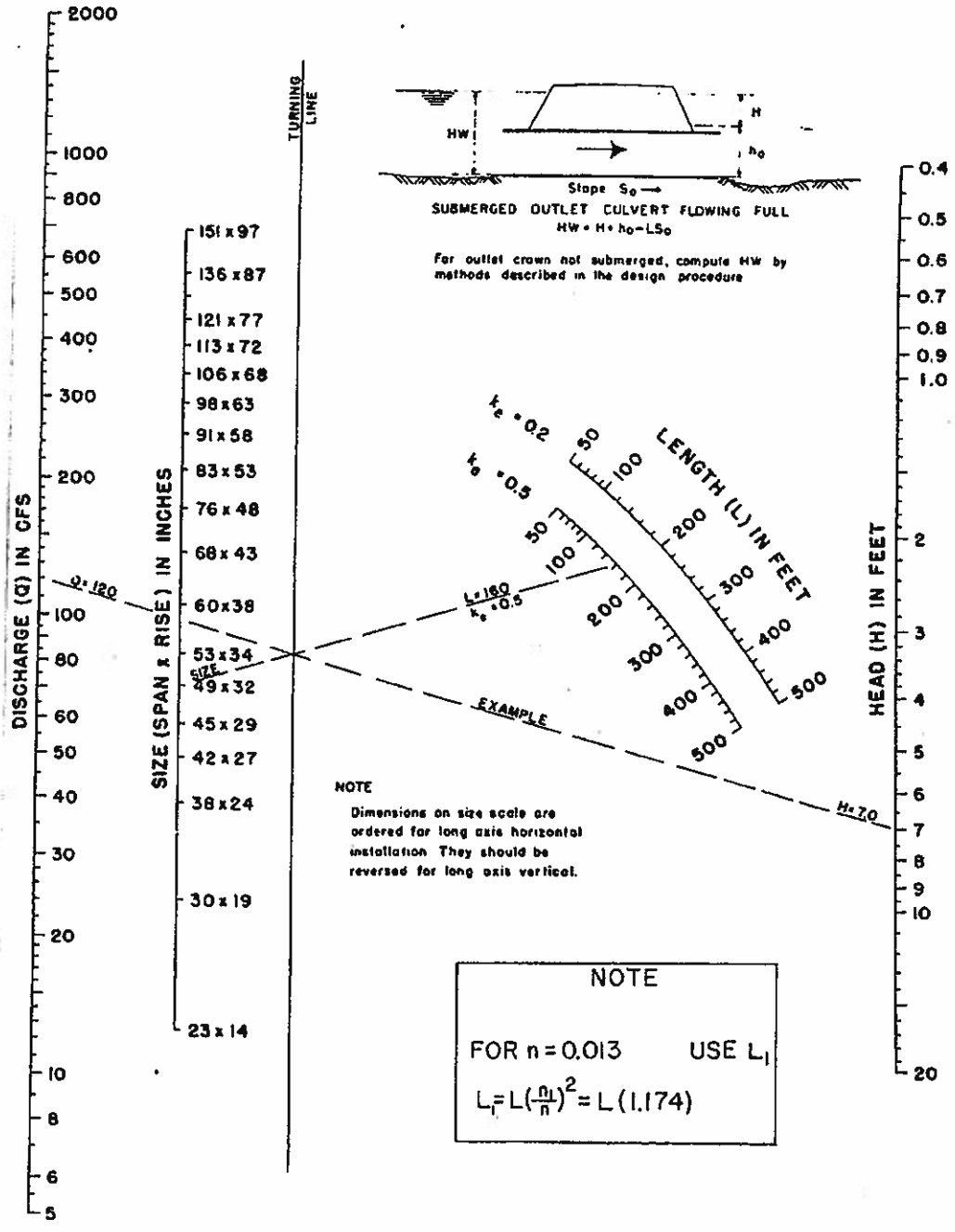
FOR n = 0.0196 USE L_1

$L_1 = L\left(\frac{n_1}{n}\right)^2 = L(0.667)$

HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEAD FOR STANDARD C. M. PIPE-ARCH CULVERTS, FLOWING FULL n=0.024	DRAINAGE DESIGN PLATE 36



HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEAD FOR STRUCTURAL PLATE CORRUGATED METAL PIPE ARCH CULVERTS 18 IN. CORNER RADIUS FLOWING FULL n = 0.0327 TO 0.0306	DRAINAGE DESIGN PLATE 37



NOTE

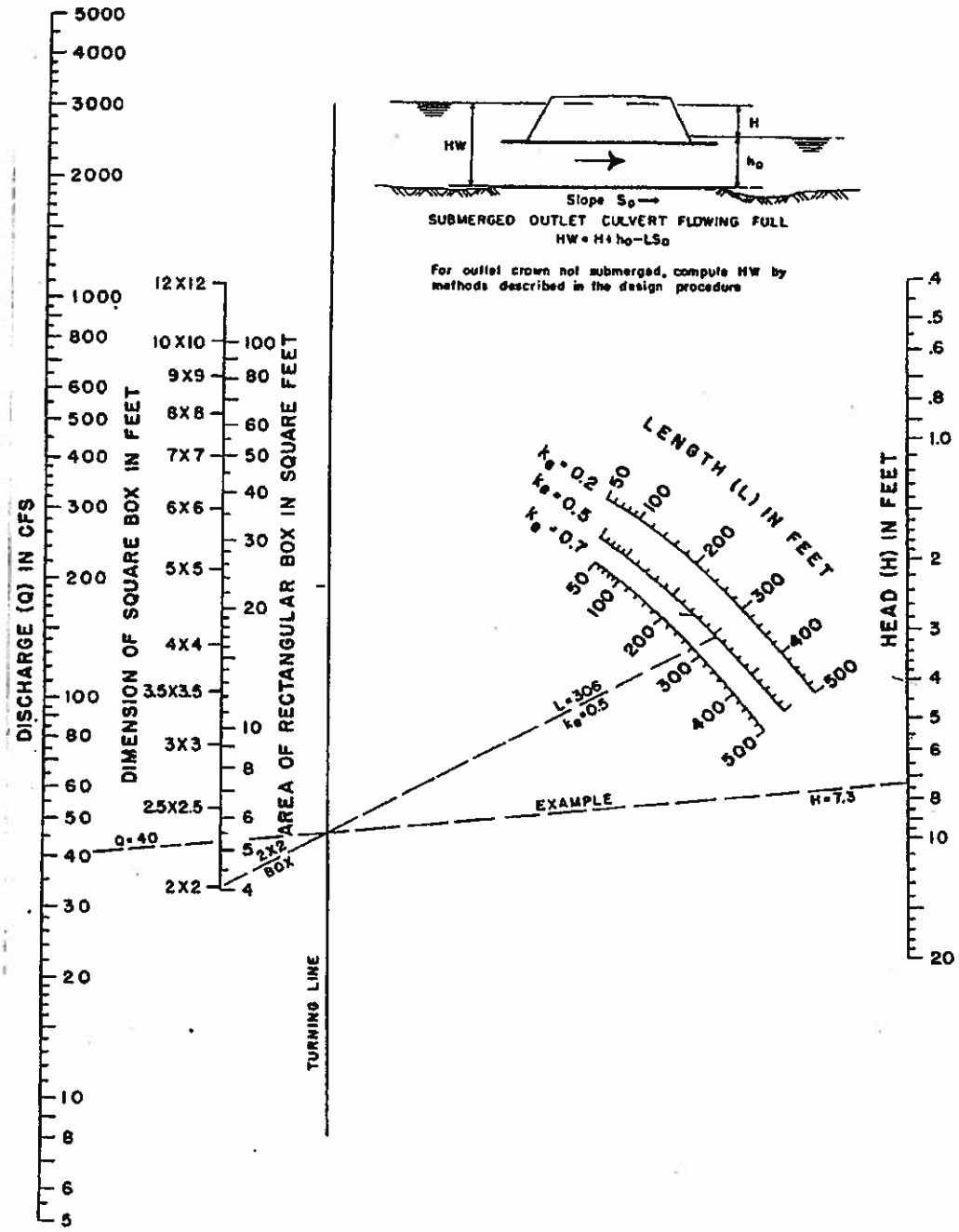
Dimensions on size scale are ordered for long axis horizontal installation. They should be reversed for long axis vertical.

NOTE

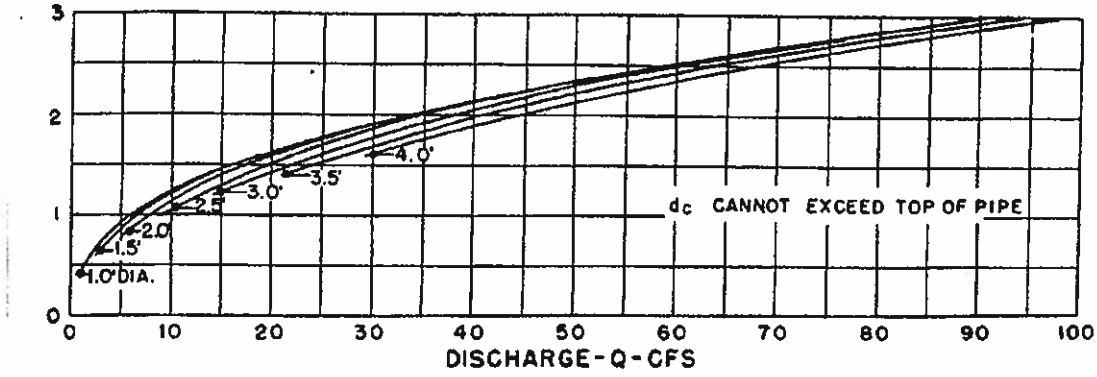
FOR n = 0.013 USE L_1

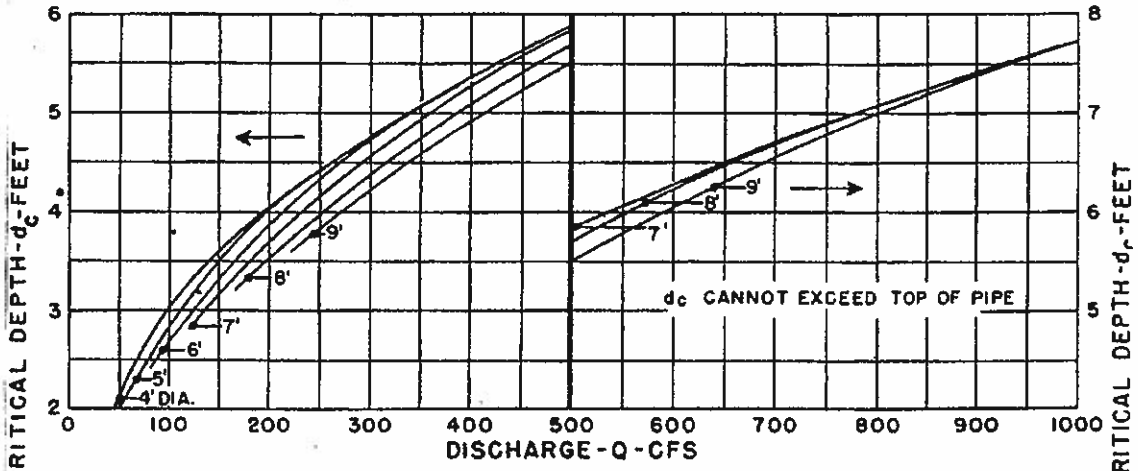
$L_1 = L\left(\frac{n_1}{n}\right)^2 = L(1.174)$

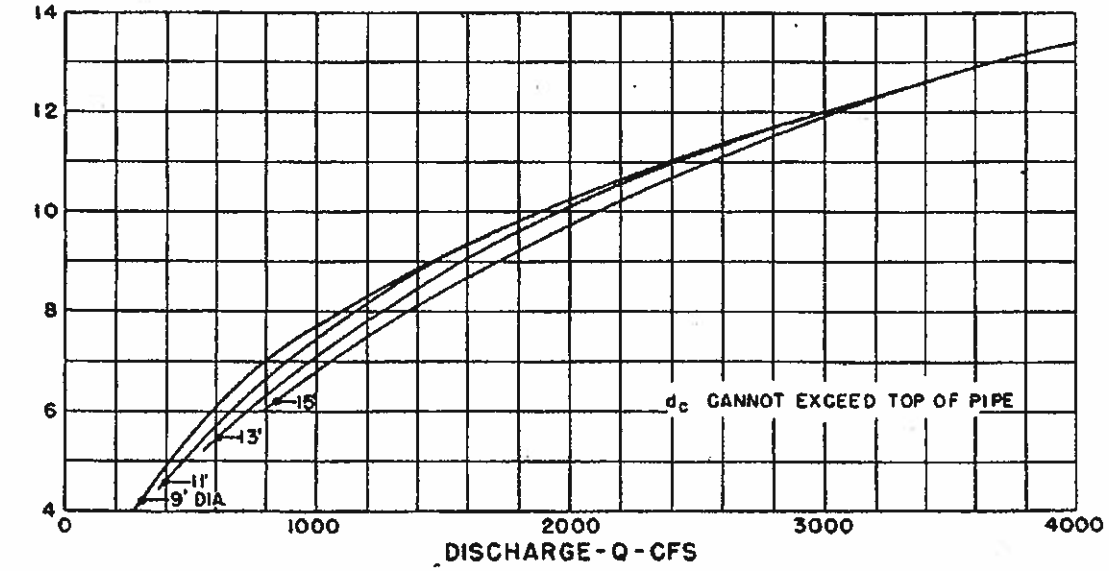
HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEAD FOR OVAL CONCRETE PIPE CULVERTS LONG AXIS HORIZONTAL OR VERTICAL FLOWING FULL n = 0.012	DRAINAGE DESIGN PLATE 38



HARFORD COUNTY, MD. DEPARTMENT OF PUBLIC WORKS	HEAD FOR CONCRETE BOX CULVERTS FLOWING FULL n = 0.012	DRAINAGE DESIGN PLATE 39



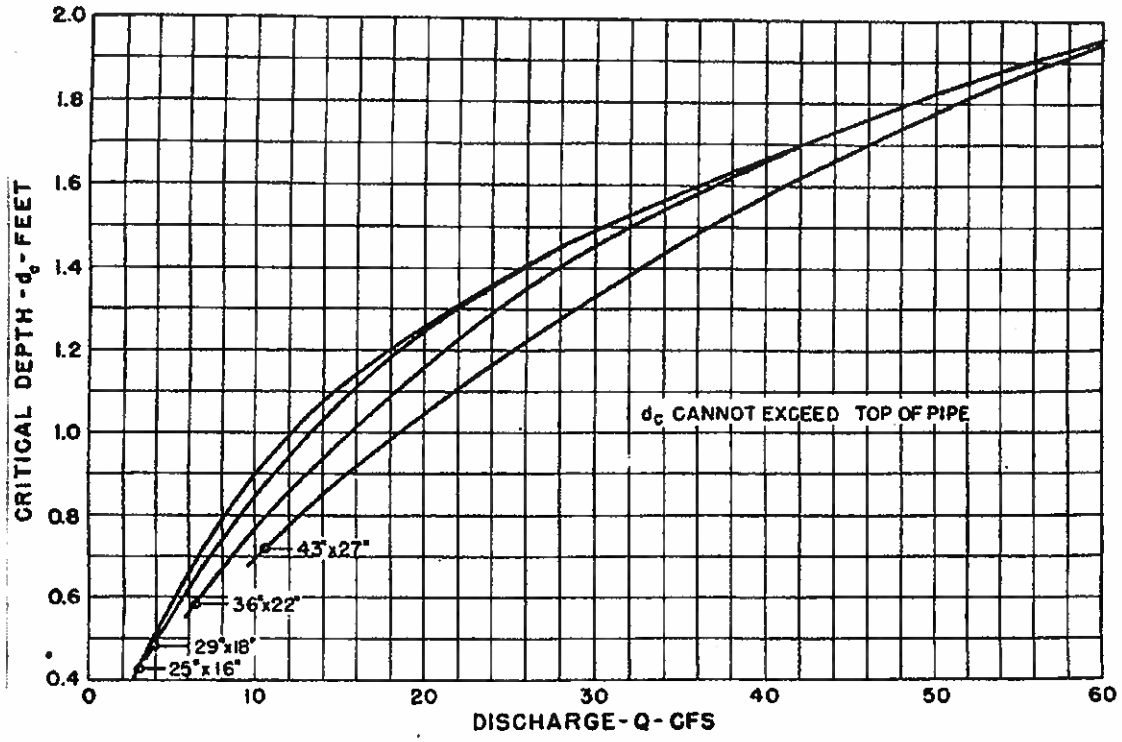


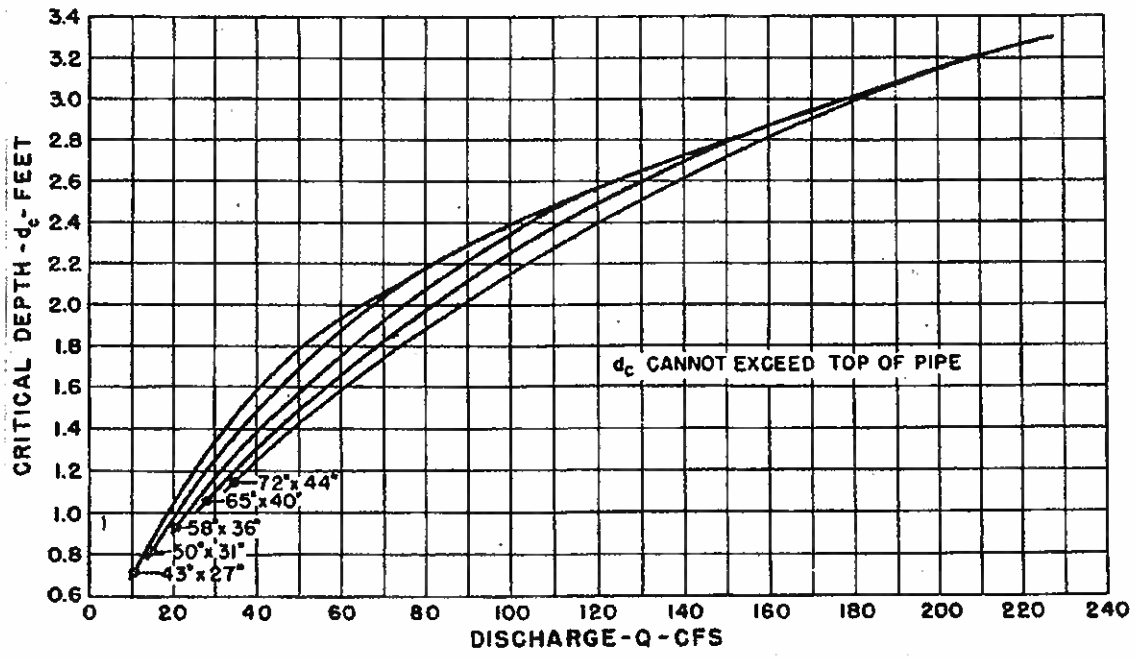


HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

CRITICAL DEPTH
CIRCULAR PIPE

DRAINAGE
DESIGN
PLATE
40

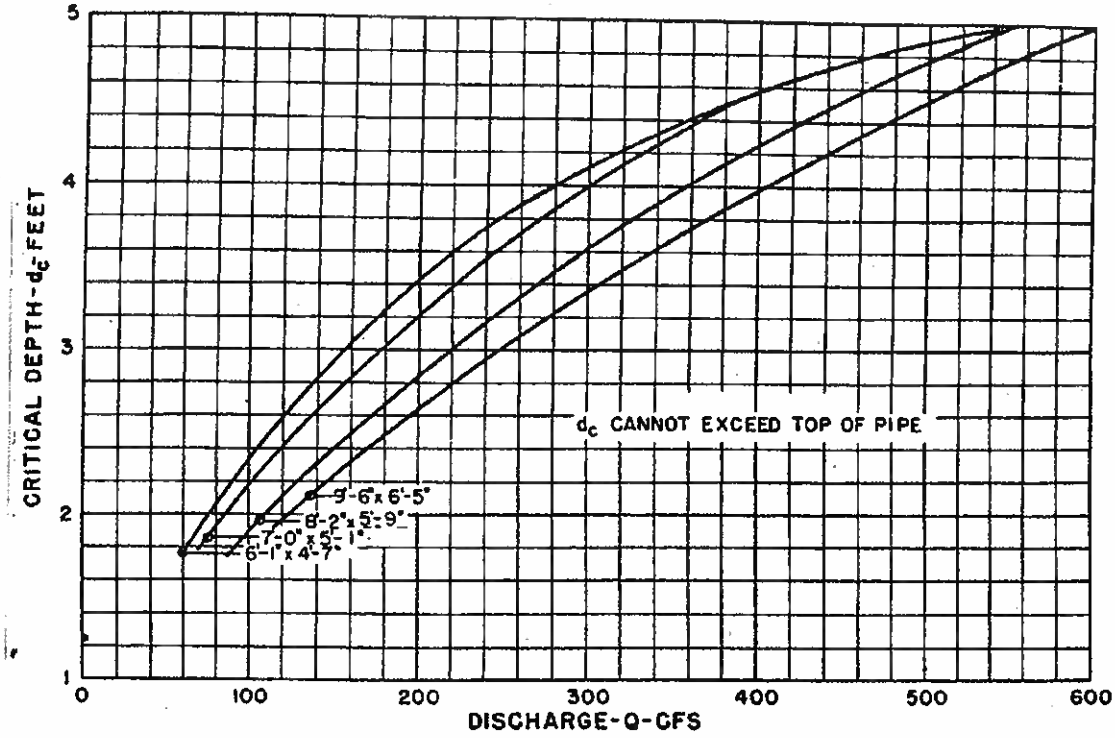


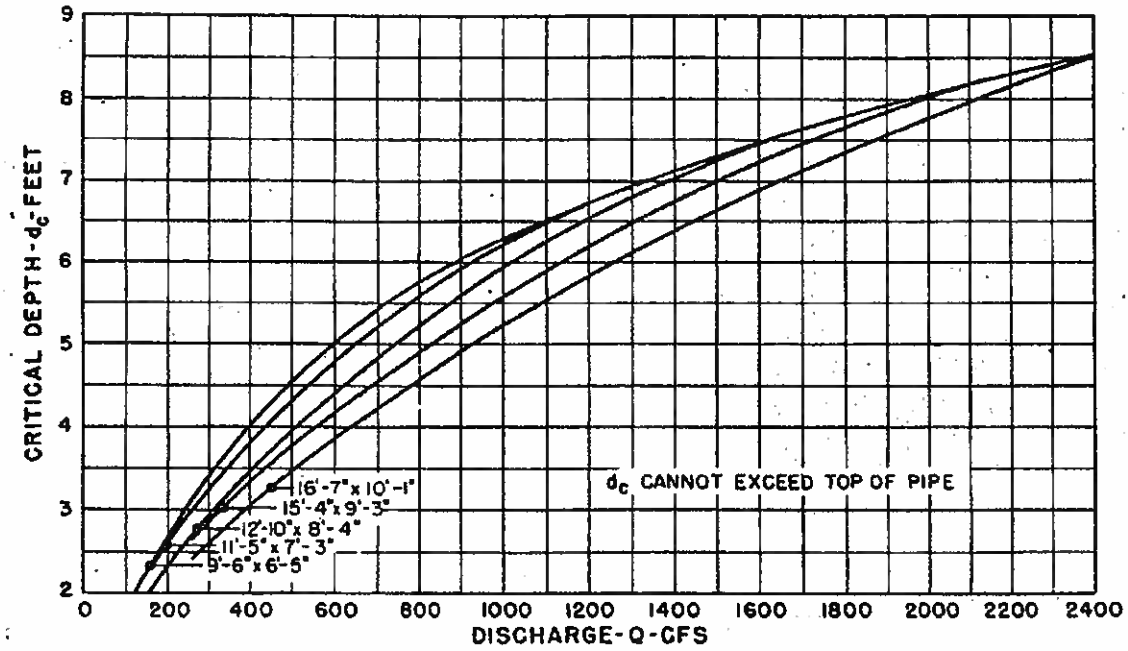


HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

CRITICAL DEPTH
STANDARD C.M. PIPE-ARCH

DRAINAGE
DESIGN
PLATE
41

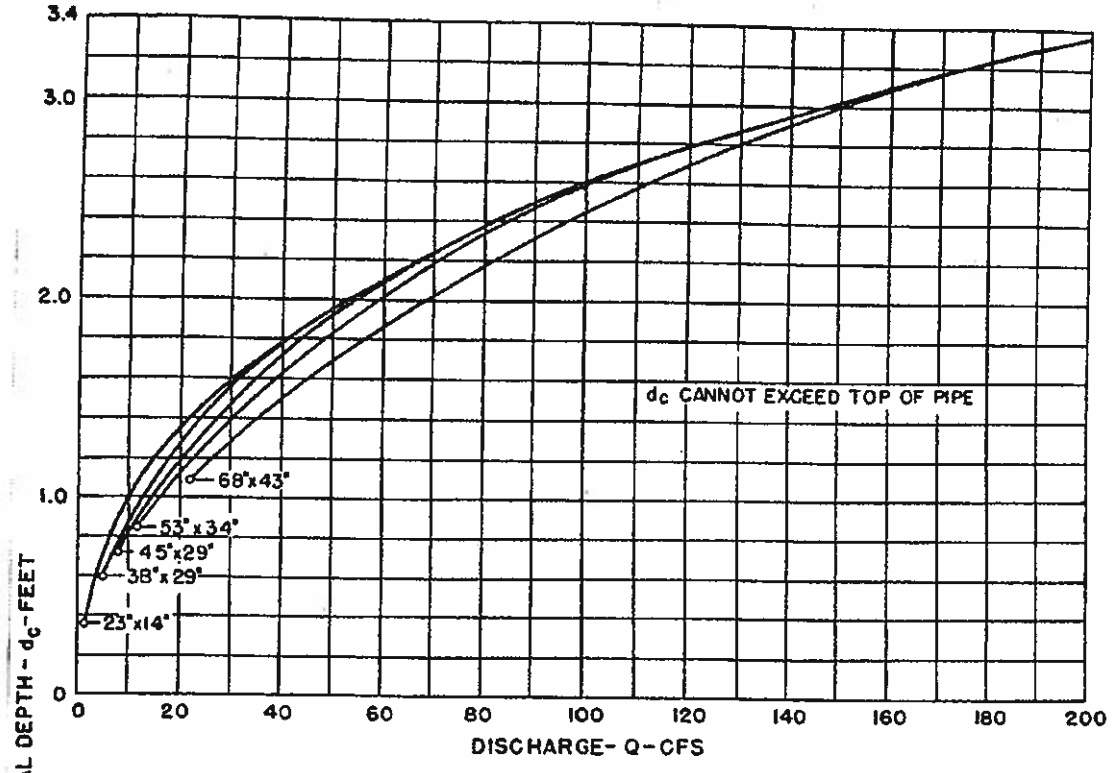


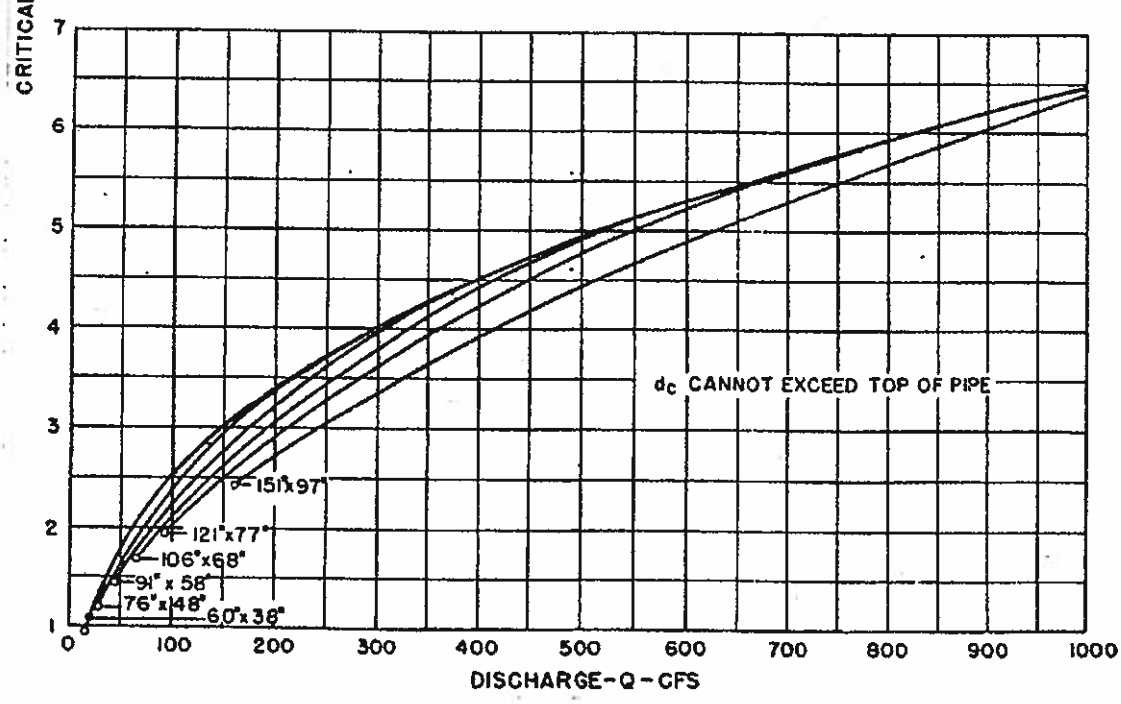


HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

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

DRAINAGE
DESIGN
PLATE
42

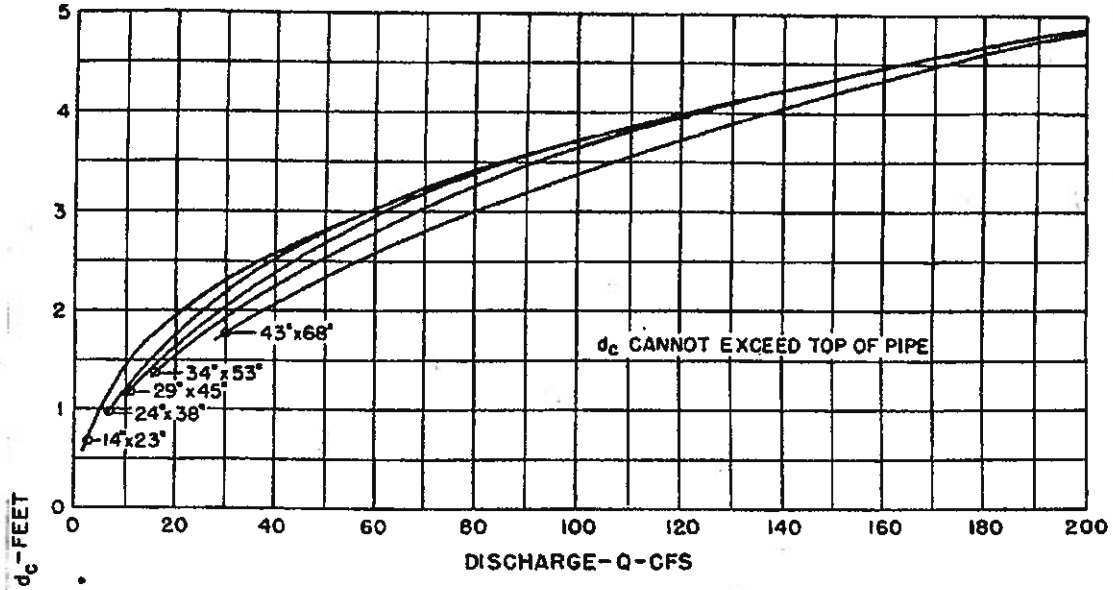


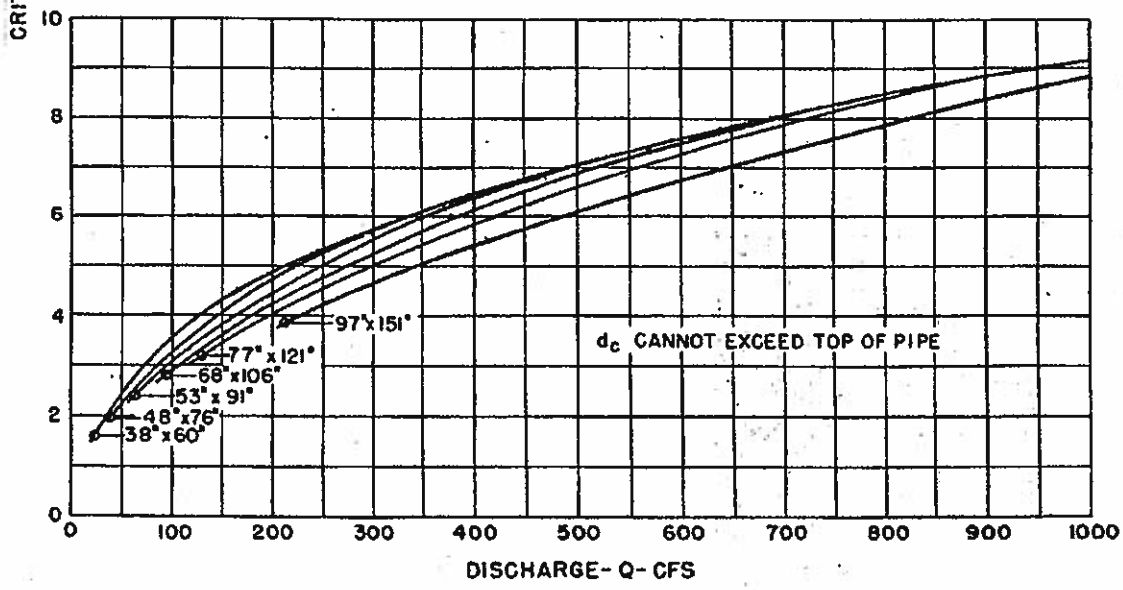


HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

CRITICAL DEPTH
OVAL CONCRETE PIPE
LONG AXIS HORIZONTAL

DRAINAGE
DESIGN
PLATE
43

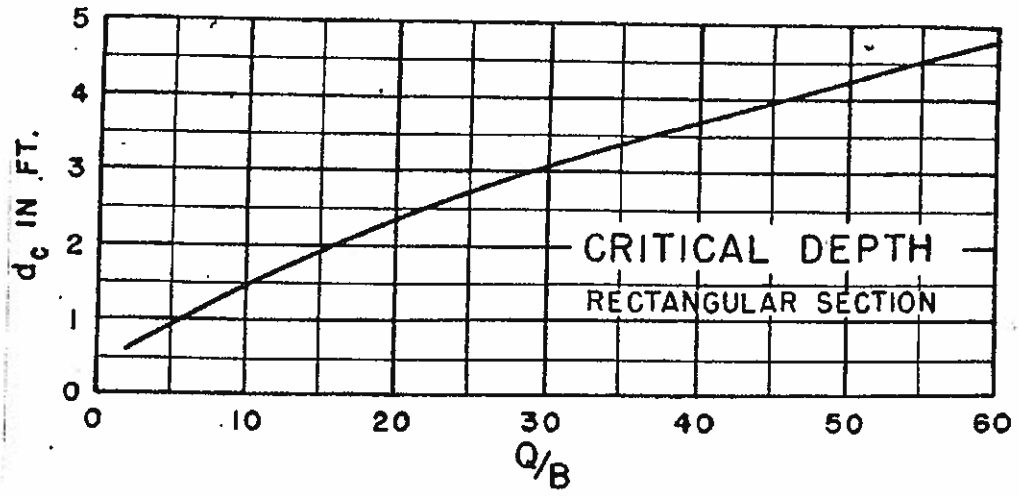


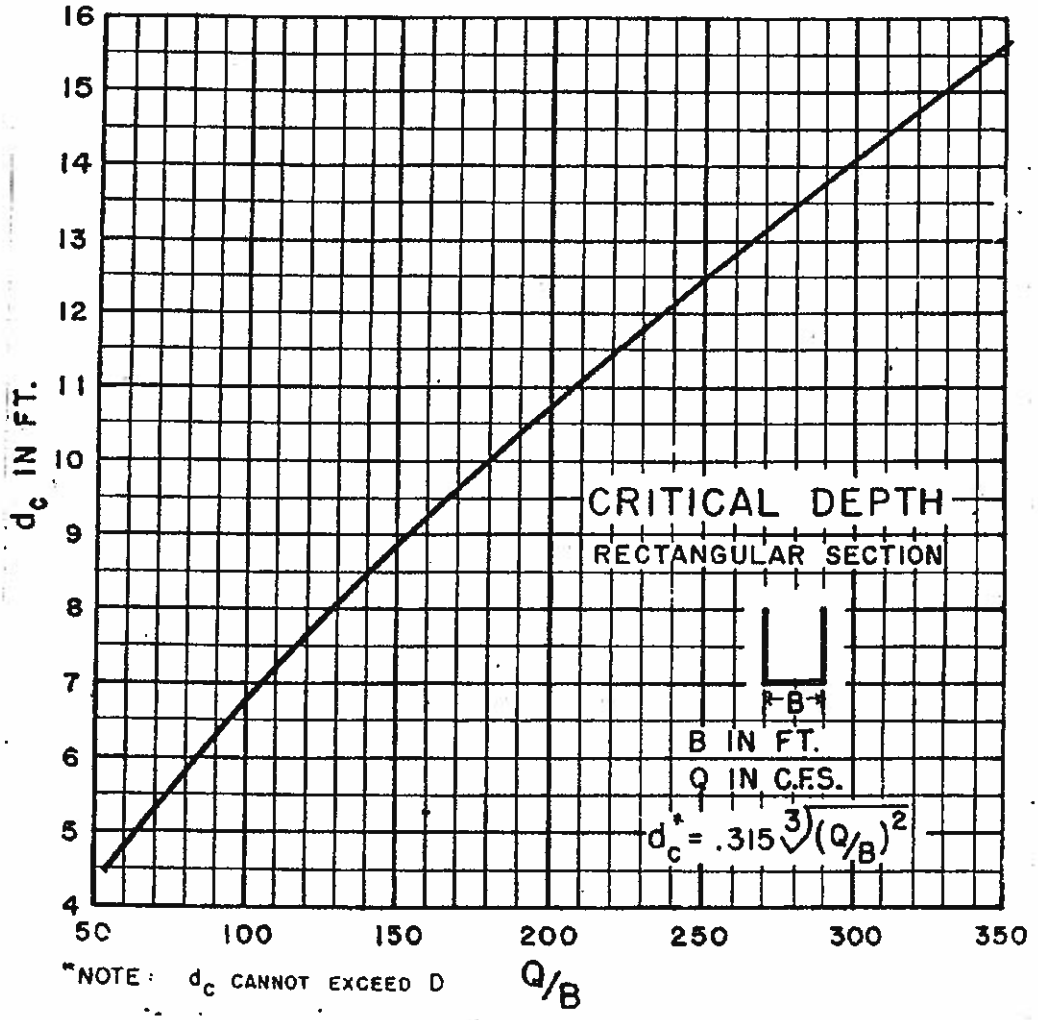


HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

CRITICAL DEPTH
OVAL CONCRETE PIPE
LONG AXIS VERTICAL

DRAINAGE
DESIGN
PLATE
44





HARFORD COUNTY, MD.
DEPARTMENT OF
PUBLIC WORKS

CRITICAL DEPTH
RECTANGULAR SECTION

DRAINAGE
DESIGN
PLATE
45

ENTRANCE LOSS COEFFICIENTS

TYPE OF STRUCTURE AND DESIGN OF ENTRANCE	COEFFICIENT K_e
Pipe, Concrete	
Projecting from fill, socket end (groove end)	0.2
Projecting from fill, square cut end	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove end)	0.2
Square edge	0.5
Rounded (radius = 1/12 D)	0.2
Mitered to conform to fill slope	0.7
End section (*) conforming to fill slope	0.5
Pipe or Pipe-Arch, Corrugated Metal	
Projecting from fill (no headwall)	0.9
Headwall or headwall and wingwalls square edge	0.5
Mitered to conform to fill slope	0.7
End section (*) conforming to fill slope	0.5
Box, Reinforced Concrete	
Headwall parallel to embankment (no wingwalls) Square edged on three edges	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension	0.2
Wingwalls at 30 to 75 to barrel square edged at crown	0.4
Crown edge rounded to radius of 1/12 barrel dimension	0.2
Wingwalls at 10 to 25 to barrel square edged at crown	0.5
Wingwalls parallel (extension of sides) Square edged at crown	0.7

NOTE: End sections conforming to fill slope, made of either metal or concrete, are the sections commonly available from manufacturers. From limited hydraulic tests, they are equivalent in operation to headwall in both inlet and outlet control.

DESIGNED BY: _____
CHECKED BY: _____

SHEET ____ OF ____
DATE: _____

Harford County
SAMPLE DITCH CHART

PROJECT: _____

DITCH SECTION		CONTRIBUTING AREA					RUNOFF				DITCH						
FROM	TO	AREA		'C'	CA	SUM CA	YR	'Tc'	'I'	'Q'	'n'	LENGTH	V	Df	DEPTH	SLOPE %	REMARKS

PLATE 47

DESIGNED BY: _____

CHECKED BY: _____

SHEET ___ OF ___

DATE: _____

Harford County

SAMPLE INLET SPACING CHART

PROJECT: _____

INLET NO.	AREA AC.	C	CA	BYPASS CA	TOTAL CA	Tc MIN	I	Q CFS	INLET TYPE	CROSS SLOPE	STREET GRADE	SPREAD FEET	PICKUP %	BYPASS CA	TO INLET NO.	REMARKS

PLATE 48

DESIGNED BY: _____
CHECKED BY: _____

SHEET ____ OF ____
DATE: _____

Harford County
SAMPLE STORM DRAIN CHART

PROJECT: _____

LOCATION			ACRES					TIME CONC. MIN.					PIPE n =				
FROM	TO	AREA	SUB.	TOTAL	COEFF 'C'	CA	SUM CA	INLET	DRAIN	TOTAL	INTEN 'I'	Q=CIA CFS	SIZE	SLOPE	VEL	LGTH	REMARKS

PLATE 49

DESIGNED BY: _____
CHECKED BY: _____

SHEET ____ OF ____
DATE: _____

HARFORD COUNTY
SAMPLE CULVERT DESIGN

PROJECT: _____ STATION: _____

HYDROLOGICAL DATA

SEE ADD'L. SHTS.

☐ METHOD: _____

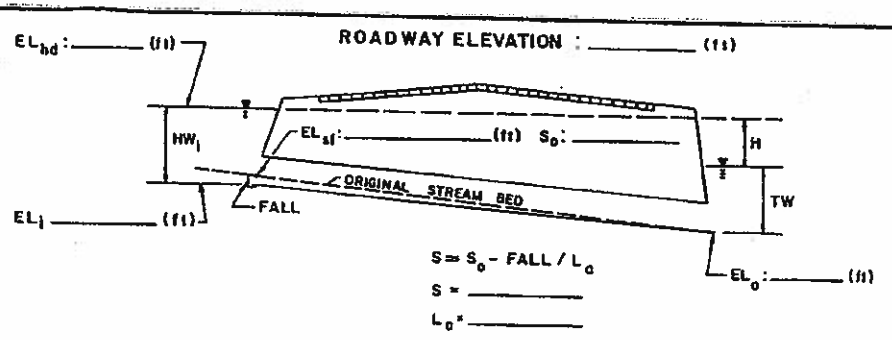
☐ DRAINAGE AREA: _____ ☐ STREAM SLOPE: _____

☐ CHANNEL SHAPE: _____

☐ ROUTING: _____ ☐ OTHER: _____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)



CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	k_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HW_i/D = HW /D OR HW_i/D FROM DESIGN CHARTS

(3) FALL = $HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) h_o = TW or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + k_e + (29n^2 L)/R^{1.33}\right] v^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS :

- a. APPROXIMATE
- f. CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho. HEADWATER IN OUTLET CONTROL
- i. INLET CONTROL SECTION
- o. OUTLET
- sf. STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION :

CULVERT BARREL SELECTED :

SIZE: _____

SHAPE: _____

MATERIAL: _____ n: _____

ENTRANCE: _____

PLATE 50

APPENDIX III

STANDARD ABBREVIATIONS AND SYMBOLS

STANDARD ABBREVIATIONS & SYMBOLS

STANDARD ABBREVIATIONS:

Above Finished Floor	AFF	Ductile Iron	DI
Adjustable	ADJ	Each	EA
Air Conditioning	A/C	Each Face	EF
Alternate	ALT	Each Way	EW
Aluminum	ALUM	East	E
Angle (Structural)	∠	East Bound Roadway	EBR
Approximately	APPROX	Elbow	ELL
Asbestos	ASB	Electric	ELEC
Asphalt	ASPH	Elevation	EL
At (measurements)	@	Equipment	EQUIP
Average	AVG	Existing	EXIST
Building	BLDG	Expansion Joint	EXPJT
Cast Iron	CI	Exterior	EXT
Catch Basin	CB	Feet	FT or ‘
Cellar	C	Finish	FIN
Center Line	℄	Flanged	FLG
Centimeter	cm	Finish Grade	FIN GR
Ceiling	CLG	Fire Hydrant	FHY
Channel (Structural)	⊏	First Floor	FF
Chemical	CHEM	Floor	FL
Chlorine	CHL	Floor Drain	FD
Coefficient	COEF	Footing	FTG
Cold Water	CW	Gallons Per Minute	GPM
Column	COL	Galvanized	GALV
Concrete	CONC	Galvanized Iron	GI
Concrete Masonry Unit	CMU	Gauge	GA
Connection	CONN	Grade	GR
Construction Joint	CJ	High Water Alarm	HWA
Continuous	CONT	High Water Level	HWL
Countersink (Countersunk)	CSK	Horizontal	HOR
Cubic	CU	Horizontal Bend	HB
Cubic Feet per Minute	CFM	Hot Water	HW
Cubic Feet per Second	CFS	Hour	HR
Degree	DEG or °	Inch	IN or “
Diagonal	DIAG	Inside Diameter	ID
Diameter	DIA or	Insulated	INSUL
Dimension	DIM	Interior	INT
Drain	DR	Invert	INV
Drawing	DWG	Joint	JT

STANDARD ABBREVIATIONS:

Kilogram	KG
Kilowatt	KW
Kilowatt Hour	KWH
Longitudinal	LONG
Low Water Alarm	LWA
Manhole	MH
Manufacturer	MFR
Material	MATL
Maximum	MAX
Mechanical	MECH
Meter	M
Mile	MI
Minimum	MIN
Not to Scale	NTS
North	N
North Bound Roadway	NBR
Normal Water Level	NWL
Number	NO or #
Opening	OPNG
Outside Diameter	OD
Partition	PTN
Perpendicular	PERP
Poly Vinyl Chloride	PVC
Pressure Control Valve	PCV
Pressure Reducing Valve	PRV
Profile Grade Line	PGL
Property Line	PL
Radius	R or RAD
Reinforcing	REINF
Reinforcing Bar	REBARS
Required	REQD
Revision	REV
Room	RM
Schedule	SCHED
Second	SEC
Section	SECT
Sheet	SH
South	S
South Bound Roadway	SBR
Specification	SPEC
Square	SQ
Square Feet	SQ FT
Square Inches	SQ IN
Stainless Steel	SST
Standard	STD
Station	STA
Steel	STL
Structural	STRL
Symmetrical	SYMM
Thick	THK
Threaded	THD
Typical	TYP
Vertical	VERT
Volume	VOL
Water Level	WL
West	W
West Bound Roadway	WBR
Wide Flange	WF
With	W/
Without	W/O
Yard	YD

PIPE

Sewer	SEW
Water	WTR
Gas	G
Drain	DR
Storm Drain	ST DR
Blank Connection in Manholes with Stopper	Conn
Unglazed Clay Pipe Extra Strength	UCPX
Vitrified Clay Pipe	VCP
Vitrified Clay Pipe Extra Strength	VCPX
Reinforced Concrete Pipe Extra Strength	RCPX
Galvanized Corrugated Metal Pipe	CMP
Reinforced Concrete Culvert Pipe	RCCP
Bituminous Coated Corrugated Metal Pipe	BCCMP

STANDARD ABBREVIATIONS:

Galvanized Iron	GI
Wrought Iron	WI
Prestressed Concrete Cylinder Pipe	PCCP
Cast Iron Pipe	CIP
Ductile Iron Pipe	DIP
Asbestos Cement Pipe	ACP
Cast Iron Soil Pipe Extra Strength	CISPX
Bituminous Coated Corrugated Metal Pipe Arch	BCCMPA
Reinforced Concrete Sewer Pipe	RCSP
Butterfly Valve	BV
Plug Valve	PV
Gate Valve	GV
Check Valve	CV

Horizontal Curves

Point of Curvature	PC
Point of Tangent	PT
Point of Intersection	PI
Point of Reverese Curvature	PRC
Point of Compund Curvature	PCC
Degree of Curve	DC
Radius	R

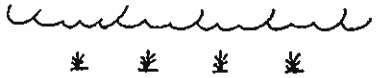
Vertical Curves

Point of Vertical Curve	PVC
Point of Vertical Tangent	PVT
Point of Vertical Intersection	PVI
Point on Curve	POC
Point of Vertical Reverse Curve	PVRC
Point of Vertical Compound Curve	PVCC
Middle Ordinate	MO

STANDARD SYMBOLS

A. Existing Topography

Woods, Undergrowth and Brush.....



Marsh.....

Trees, Deciduous.....

Trees, Evergreen.....

Streams (note direction of flow).....

Ditches (note direction of flow).....

Gulleys and Wet Weather Water Courses...

Rock (describe by note and state whether outcrop or loose rock).....

Fences, wood.....

Fences, wire, barb and smooth.....

Hedge.....

Stone, brick, concrete; walls.....

Poles: G & E, C & P or Street Light (line indicates direction of wires).....

Cellar Elevation.....

Contour lines (numbered lines heavy [brown]).....

Earth, sand, gravel, shell and broken stone roads.....

Paved Road.....

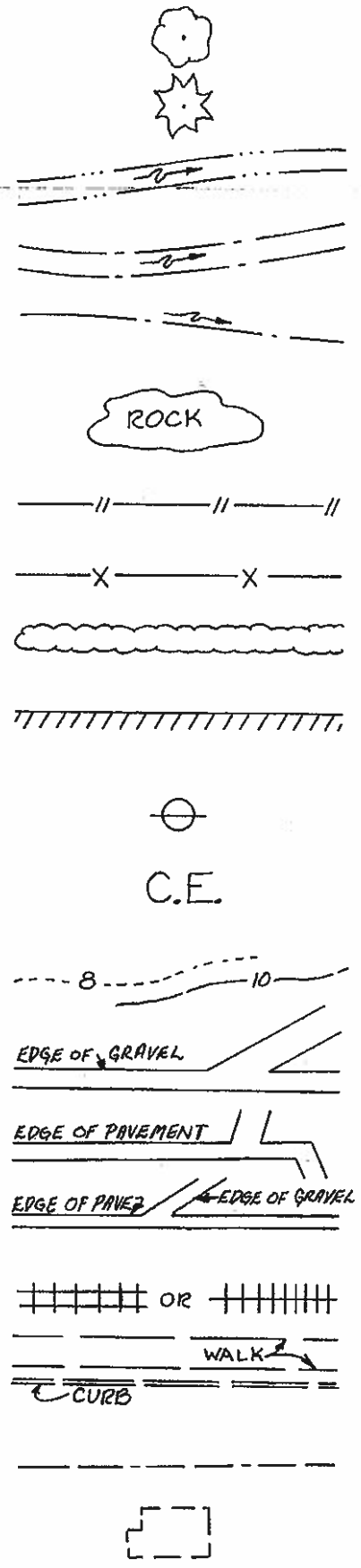
Combination Roads.....

Railways.....

Curb & Sidewalk lines.....

Drains, Culverts, etc. existing (show size of culvert).....

Ruins or Foundations.....



STANDARD SYMBOLS

B. Surveying

Property Line.....

Property & Boundary Stones.....

Right of Way Line.....

Traverse Hub.....

Stake with Tack Center.....

Stake without Tack Center.....

Wood Hub.....

Iron Pipe or Metal Hub.....

Bench Mark.....

Nail or Spike for Baseline Station (Label)....

Nail or Spike for Traverse Station (Label)....

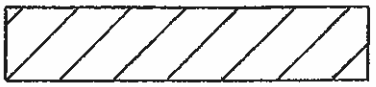
Rebar or Rebar with Cap.....

Concrete Monument.....

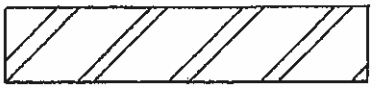
Fee Simple Area.....

Drainage and Utility Easement.....

Temporary Construction Easement.....



Revertible Slope Easement.....



STANDARD SYMBOLS

C. Architectural and Structural Symbols

Masonry.....

Brick.....

Concrete.....

Metal.....

Wood.....

Gravel.....

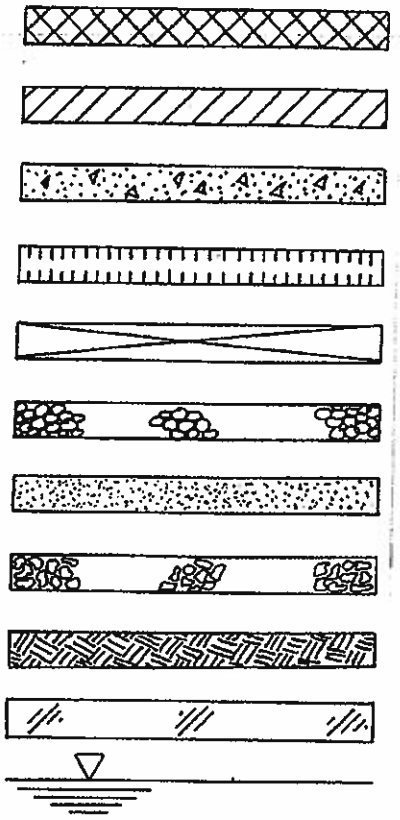
Sand.....

Riprap.....

Earth.....

Glazing.....

Water Surface.....



STANDARD SYMBOLS

D. Existing Utilities

Sanitary Sewer.....

Sanitary Sewer Manhole.....

Sanitary Sewer Terminal MN.....

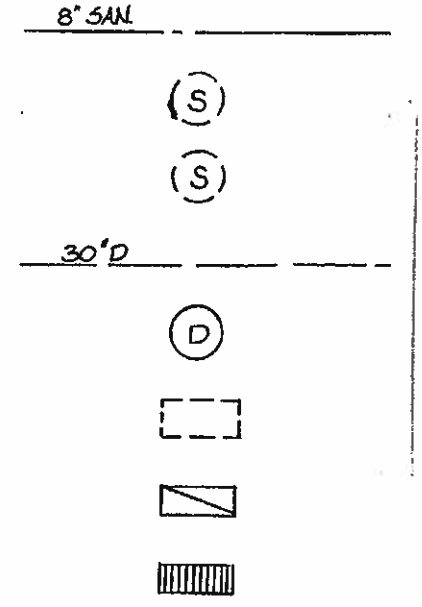
Storm Water Drains.....

Storm Water Manhole.....

Rectangular MH.....

Inlets, Curb Type.....

Inlets, Grating Type.....



STANDARD SYMBOLS

D. **Existing Utilities (continued)**

Water Main (Indicate Size).....	6"W
Water Main Valve.....	Ⓦ
Water Main Meter.....	Ⓜ
Fire Hydrant.....	
Gas Mains (Indicate Size).....	4"GAS
Gas Drip, Gas Valve, Drip Pot.....	□
Gas Meter.....	Ⓖ
Gas Stop or Plug.....	□
Existing Lampholes.....	Ⓛ

APPENDIX IV

APPENDIX IV

Sheet

Roads and Stormdrain Review Checklist 1-3

HARFORD COUNTY
DEPARTMENT OF PUBLIC WORKS
220 SOUTH MAIN STREET
BEL AIR, MARYLAND 21014
638-3507, 879-2000

ENGINEERING FIRM/PHONE NO.

ENGINEER ASSIGNED

ROADS & STORM DRAIN PLAN REVIEW CHECKLIST

SUBMITTAL DATE

REVIEW DATE & INITIALS

✓ - COMPLETE
NC - INCOMPLETE
N/A - NOT APPLICABLE

_____
_____
ACCEPTED DESIGN:

JOB TITLE:
PRELIMINARY PLAN / SITE PLAN APPROVAL DATE:
(NOTE that plans will not be accepted for review until the preliminary plan / site plan has been approved.)

YOUR SUBMISSION FOR ROADS AND STORM DRAIN PLAN APPROVAL HAS BEEN REVIEWED. THE REVIEW WAS MADE PER THE FOLLOWING MINIMUM ACCEPTABLE CRITERIA CHECKLIST.

1ST 2ND 3RD SUBMITTAL

I. **TITLE SHEET**

___ ___ ___ SUBDIVISION NAME, SECTION, PHASE, & ELECTION DISTRICT
___ ___ ___ LOCATION MAP (SCALE, NORTH ARROW, EXISTING & PROPOSED STREETS, BENCH MARK LOCATION & DESCRIPTION)
___ ___ ___ GENERAL NOTES
___ ___ ___ INDEX OF SHEETS (TITLE SHEET, FOLLOWED BY TYPICAL ROAD SECTION & DETAILS, ROAD PLANS, ROAD PROFILES, STORM DRAIN PROFILES, STORM DRAIN COMPS & SCHEDULES & MAP)
___ ___ ___ OWNER/DEVELOPER SIGNATURE
___ ___ ___ ENGINEER SIGNATURE AND SEAL
___ ___ ___ COUNTY SIGNATURE BLOCKS
___ ___ ___ APPLICABLE PERMIT NUMBERS (SHA, WRA, SEDIMENT CONTROL, USAGE, PUBLIC WORKS AGREEMENT, MUNICIPAL REVIEW / STORMWATER MANAGEMENT PROJECT NUMBER)
___ ___ ___ LEGEND

II. **TYPICAL SECTIONS & DETAILS**

___ ___ ___ SCALES
___ ___ ___ TYPICAL SECTIONS (PAVING WIDTHS, R/W, PAVING SECTION, SIDEWALK WIDTH & SECTION, SLOPES, DITCHES, CURB, 2" TOPSOIL, SEED AND MULCH MINIMUM IN DISTURBED AREAS OF RIGHT OF WAY, P.G.L. IDENTIFIED)
___ ___ ___ PEDESTRIAN RAMP DETAIL
___ ___ ___ 7" COMBINATION CURB & GUTTER DETAIL
___ ___ ___ MOUNTABLE CURB DETAIL
___ ___ ___ EXTRUDED CURB DETAIL (TEMPORARY INSTALLATIONS ONLY)
___ ___ ___ CURB INLET TRANSITION DETAIL
___ ___ ___ ESTIMATE OF QUANTITIES

III. **PLAN SHEET**

___ ___ ___ NORTH ARROW
___ ___ ___ SCALE (PREFERABLY 1"=50')
___ ___ ___ COORDINATE TICS (250' FEET, MINIMUM OF THREE)
___ ___ ___ EXISTING AND/OR PROPOSED STREETS LABELED WITH NAME, PAVING WIDTH, RIGHT OF WAY WIDTH, POINTS OF INTERSECTION, AND CENTERLINE STATIONS (MINIMUM 50' INTERVALS), BEARINGS & DISTANCE, CURVE DATA (DELTA, RADIUS, ARC LENGTH, TANGENT LENGTH, CHORD BEARING & DISTANCE)
___ ___ ___ CUL-DE-SAC LINEAR STATIONING, MOUNTABLE CURB
___ ___ ___ PROPERTY LINES, PROPERTY OWNERS, LOT NUMBERS, TAX MAP, LIBER/FOLIO, DRAINAGE & UTILITY EASEMENTS, ADDRESSES OF EXISTING HOUSES
___ ___ ___ CURB TYPE AND LIMITS, RADIUS OF CURB FILLET
___ ___ ___ SIDEWALKS AND PEDESTRIAN RAMPS
___ ___ ___ EXISTING TOPOGRAPHY (TYPE AND SIZE OF EXISTING UTILITIES, MAILBOXES, SHRUBS, TREES, ETC.)
___ ___ ___ SURFACE FLOW INDICATED
___ ___ ___ DRAINAGE STRUCTURES IDENTIFIED AND LOCATED RIGHT AND LEFT OF CENTERLINE ROAD STATIONS
___ ___ ___ STORM DRAIN PIPES SIZE, LOCATION, DIRECTION OF FLOW
___ ___ ___ SIDE DITCHES (DIRECTION OF FLOW), STATION AND OFFSET, SURFACE TREATMENT
___ ___ ___ TRAFFIC CONTROL (TRAFFIC CONTROL PLAN)
___ ___ ___ 200' FEET OF ADDITIONAL TOPO (TIE-IN TO EXISTING AND FUTURE ROADWAYS)
___ ___ ___ SUBDIVISION LIMITS WITH SUBDIVISION NAME AND SECTION IDENTIFIED
___ ___ ___ BENCH MARK REFERENCE, DESCRIPTION, ELEVATION
___ ___ ___ TRAFFIC BARRIER LOCATION (STATION TO STATION, OFFSET)
___ ___ ___ BORINGS
___ ___ ___ EXISTING ENTRANCES

THE FOLLOWING NOTE SHALL BE ON THE PLAN SHEET WHEN PRIVATE STORM DRAIN SYSTEMS ARE SHOWN: THE LIMIT OF ALL HARFORD COUNTY STORM DRAIN MAINTENANCE RESPONSIBILITY SHALL BE AT THE POINT OF INTERSECTION BETWEEN THE CENTERLINE OF THE STORM DRAIN AND THE ROAD RIGHT OF WAY LINE. THE HARFORD COUNTY DEPARTMENT OF PUBLIC WORKS WILL NOT IMPROVE NOR MAINTAIN PRIVATE ROADWAYS NOR PRIVATE STORM DRAINAGE SYSTEMS.

IV. **ROAD PROFILES**

___ ___ ___ SCALE (PREFERABLY HORIZONTAL 1"=50', VERTICAL 1"= 5')
___ ___ ___ EXISTING PROFILE (AT PROPOSED CENTERLINE, RIGHT AND LEFT OF CENTER AT RIGHT OF WAY LINE) 200' BEYOND LIMITS OF WORK
___ ___ ___ STATIONS WITH EXISTING AND PROPOSED ELEVATIONS
___ ___ ___ HORIZONTAL INTERSECTION STATIONS IDENTIFIED
___ ___ ___ PROPOSED CENTERLINE OR TOP OF CURB GRADES, VERTICAL CURVE DATA (PVC, PVI, AND PVT STATION AND ELEVATION, SUMP AND CREST ELEVATION AND STATION, LENGTH OF CURVE, CORRECTION, SIGHT DISTANCE) AND GRADES TO TWO DECIMAL PLACES (MINIMUM .5%, P.G.L. IDENTIFIED)
___ ___ ___ EXISTING AND PROPOSED UTILITY CROSSINGS
___ ___ ___ EXISTING AND PROPOSED PARALLEL UTILITIES

THE FOLLOWING NOTE SHALL BE ON THE PROFILE SHEET IN AREAS OF FILL: FILL MATERIAL IS TO BE CONTROLLED AND COMPACTED AS CERTIFIED BY AN APPROVED SOILS ENGINEER. FILL MATERIAL IS TO BE PLACED IN NO GREATER THAN 8" LIFTS AND ROLLED TO 95 PER CENT COMPACTION WITHIN THE TOP 1' OF SUBGRADE (SEC 206.02 + 206.03 HARFORD COUNTY STANDARDS).

V. **STORM DRAINS** - ATTACH HYDRAULIC GRADIENT & HEAD LOSS COMPS

___ ___ ___ SCALE

___ ___ ___ CROSSING WITH EXISTING AND PROPOSED UTILITIES

___ ___ ___ PIPE SIZE (MINIMUM 15"), TYPE (ACCMP, CAP OR CLASS IV RCCP WITHIN THE ROAD R/W), SLOPE, Q(CFS), VELOCITY (FPS), MIN. COVER 18" FROM PIPE CROWN TO FINISHED GRADE AND 12" TO BOTTOM OF SUB-GRADE UNDER PAVEMENT

___ ___ ___ HGL -10 YEAR STORM PLOTTED

___ ___ ___ CROSS CULVERTS (WHEN APPROVED) DESIGNED ON 25 YEAR STORM, SHOW 2, 10, & 100 YEAR FLOOD ELEV., CLASS I RIP RAP UPSTREAM, CLASS I & II RIP RAP WITH TOEWALL DOWNSTREAM PER DESIGN CALCULATIONS.

___ ___ ___ OUTFALL PROTECTION AT ALL ENDWALLS/HEADWALLS INTO EXISTING SYSTEMS

___ ___ ___ RECEIVING STRUCTURES OF VELOCITIES GREATER THAN 20 FPS OR DROP > 6 FEET W/ GRANITE INVERTS

___ ___ ___ DRAINAGE AREA MAP (NORTH ARROW & SCALE, EXISTING AND FUTURE SYSTEMS)

___ ___ ___ STRUCTURE SCHEDULE (TYPE, Q, INVERT IN, INVERT OUT, TOP ELEVATION, COMMENTS)

___ ___ ___ STORM DRAIN COMPS (PIPE `N', LOCATION, AREA, COEFFICIENT, TIME OF CONCENTRATION, INTENSITY, Q=CIA, SIZE, SLOPE, VELOCITY, LENGTH REMARKS)

___ ___ ___ DITCH DETAILS (FLOW TABULATION FORM)

___ ___ ___ SPECIAL DRAINAGE DETAILS

THE FOLLOWING NOTES MUST BE ON THE PLAN SHEET WHEN PRIVATE STORM DRAIN SYSTEMS ARE SHOWN: THE LIMIT OF ALL HARFORD COUNTY STORM DRAIN MAINTENANCE RESPONSIBILITY SHALL BE AT THE POINT OF INTERSECTION BETWEEN THE CENTERLINE OF THE STORM DRAIN AND THE RIGHT OF WAY LINE. THE HARFORD COUNTY DEPARTMENT OF PUBLIC WORKS WILL NOT IMPROVE NOR MAINTAIN PRIVATE ROADWAYS NOR PRIVATE STORM DRAIN SYSTEMS.

VI. **CROSS-SECTIONS**

___ ___ ___ TITLE BLOCK (PROJECT TITLE, LIMITS OF CROSS SECTIONS ON EACH SHEET, HORIZONTAL AND VERTICAL SCALE)

___ ___ ___ CENTERLINE OF CONSTRUCTION, BASELINE OF SURVEY, EXISTING SECTION (DASHED), PROPOSED TEMPLATE (SOLID)

___ ___ ___ CENTERLINE ELEVATION; EXISTING AND PROPOSED

___ ___ ___ LABELS: EXISTING AND PROPOSED EDGE OF ROAD, R/W, DITCHLINE ELEVATION, UNDERGROUND UTILITIES, ETC.

___ ___ ___ ADDITIONAL SECTIONS AT DRIVEWAYS

___ ___ ___ ROADWAY CROSS SLOPE

___ ___ ___ STATION AND DATUM INDICATED ON EACH SECTION

COMMENTS:

APPENDIX V

	Sheet
Rules and Regulations for Road Access Permits	1-5

RULES AND REGULATIONS FOR ROAD ACCESS PERMITS

Pursuant to Sections 157-1, 157-19.D., and 225-5.E. of the HARFORD COUNTY CODE, the following Rules and Regulations are established for the purpose of regulating the construction of residential and non-residential entrances (hereinafter referred to as "road access"), entering onto all public roads owned or maintained by the Department of Public Works of Harford County, Maryland, or onto any future road to be taken into and maintained by the Department of Public Works of Harford County, Maryland.

1.00 DEFINITIONS

1.01 Director – Director of Public Works or designee.

1.02 Department – Department shall mean the Department of Public Works.

1.03 Non-residential Road Access – Any access to a County Road except for a Residential Road Access defined in Section 1.04 below.

1.04 Residential Road Access – Any access to a County Road from a property used primarily for residential and/or agricultural purposes, excluding an access serving more than five (5) residences or residential units.

1.05 Permittee – The owner of the property to which access is requested from an existing or proposed County Road or his agent, if such delegation is made in a writing and filed as a part of the permit application pursuant to Section 2.00 below.

1.06 Access Permit – A permit issued in accordance with these Rules and Regulations regulating the construction of private, residential, and non-residential entrances onto Harford County public roads, rights-of-way and easements.

1.07 Work Site – The location of construction activities described in the permit.

2.00 PERMIT APPLICATIONS

2.01 Each applicant shall complete and file with the Department of Public Works an access permit application.

3.00 DRAWINGS TO BE FILED WITH PERMIT APPLICATION

3.01 The following drawings shall accompany each application in accordance with the type of access:

a. Applications for Non-residential Road Access Permits—One (1) copy of a drawing to an appropriate scale, folded to 8-1/2" x 11" in size, with a scale of no less then one inch (1") equals one hundred feet (100') or more than one inch (1") equals thirty feet (30') showing clearly the following information:

i. Property lines;
ii. Building locations;
iii. Road name;
iv. Road right-of-way boundaries;
v. Road widths;
vi. Type and Location of Curbing;
vii. Sidewalks and handicapped ramps;
viii. Street address number and building lot numbers;
ix. Proposed driveway location and driveway dimensions including radii and width.
x. All existing and proposed utilities.

b. Applications for Residential Road Access Permit – One (1) copy of a drawing, folded to 8-1/2" x 11" in size, with a scale of no less than one inch (1") equals one hundred feet (100') or more than one inch (1") equals thirty feet (30') showing clearly the following information:

i. Property lines;
ii. Building locations;
iii. Road name;
iv. Road right-of-way boundaries;
v. Road widths;
vi. Type and Location of Curbing;
vii. Sidewalks and handicapped ramps;
viii. Street address number and building lot numbers;
ix. Proposed driveway location and driveway dimensions including radii and width.

3.02 During the review of the application, the Director may request that additional information be submitted including, but not limited to, location of adjacent driveways, site distances, and a traffic control plan to enable the Director to make a determination of the impact of the proposed access on adjacent areas.

Unless otherwise required by the Department, accesses within commercial/industrial subdivisions are considered to have acceptable sight distances and may forego a formal sight distance analysis. All other commercial/industrial accesses shall perform a sight distance anaylsis as stipulated in Section III.E.2.b. of the Harford County Road Code.

The need for a sight distance analysis for residential driveways will be determined on a case-by-case basis by the Utility and Access Permit personal in the Department.

3.03 Upon completion of the application, the Department of Public Works will approve or disapprove the application as submitted. The Applicant will be notified of the status of the application, either by receipt of the permit (approved or disapproved) or by request for additional information.

3.04 The approved access permit shall be valid for a period of one year from the date of issuance.

4.00 GENERAL REQUIREMENTS

4.01 All work described in the permit shall be subject to inspection by the Director.

4.02 The Permittee shall maintain at the work site a copy of the permit, together with a copy of any drawings and other documents required in accordance with the permit.

4.03 The Permittee shall erect and maintain all necessary signs, barricades, detour signs, and warning devices required to safely direct traffic over or around the part of the highway where permitted operations are to be done, so long as the work does not interfere with traffic, in accordance with the Federal Highway Administration's Manual on Uniform Traffic Control Devices, adopted by the State Highway Administration pursuant to the Annotated Code of Maryland, Transportation Article, Title 25, Section 104.

4.04 All activities under the permit must conform to the Harford County Road Code.

4.05 If construction under the permit requires the alteration or removal of all or part of any existing structure within the County road right-of-way which is not addressed in the permit, the Permittee shall not perform such alteration or removal without first obtaining the written approval of the Director, which approval shall be an amendment to the permit.

4.06 No permanent, non-breakaway structures (to include monumental mailboxes) are permitted to be constructed in the County's right-of-way unless they meet the standards established by the Department of Public Works, the United States Postal Service and the Department of Planning & Zoning; or, are otherwise explicitly permitted (in writing) by the Department of Public Works.

4.07 The Director may develop Policies and Procedures to establish procedural activities pursuant to these Rules & Regulations.

5.00 NOTIFICATIONS

5.01 Permittee shall notify the Utilities and Road Access Section of the Harford County Department of Public Works ("Department"), telephone number 410-638-3420, weekdays between the hours of 8:00 a.m. and 5:00 p.m. prior to engaging in any construction under the permit and shall provide the Department with the name and telephone number of its representative at the work site.

5.02 The Permittee shall notify "Miss Utility", phone number 1-800-257-7777, forty-eight (48) hours in advance of any work under the permit.

5.03 The Permittee shall notify the Department of Public Works upon completion of permitted work by calling 410-638-3420, as the Department of Public Works will complete the permit review and work completion documents as necessary.

5.04 Failure to notify the Department of Public Works of the completion of the permitted road access may result in a delay of the issuance of the corresponding "Use and Occupancy" permit. Such notice shall be made in a timely manner to allow the scheduling of a final inspection of the road access.

6.00 SPECIAL CONDITIONS FOR NON-RESIDENTIAL ROAD ACCESS PERMITS

6.01 Applicants for a Non-Residential Road Access Permit may be required to execute a Public Works Agreement if the size and scope of the access and its relationship to other development activities adjacent to the work site create an actual or potential threat to the public health and safety of highway users, adjacent property owners, or the public in general.

6.02 The Director may, as a condition of the Non-Residential Road Access Permit, require that the Permittee initiate a traffic control plan depending upon the size and scope of the access and its impact upon traffic.

7.00 PERMIT FEES AND EXPENSES

7.01 Pursuant to Section 157-19 of the Code of Harford County, Maryland, a fee of Thirty-Five dollars shall be paid to Harford County with the application for an Access Permit. This fee shall be paid to Harford County Government (212 S. Bond Street) at the time the application is filed, pursuant to Section 2.00 above. These fees will cover plan and field review, and inspection costs.

7.02 As the permit fee includes applications, plan, and field review of the proposed work site, as well as any required inspections, such fees will not be refunded once the review process has begun.

7.03 Inspection Fees: Normal inspection fees are covered by the Application Fee. This includes one initial site permit inspection, one pre-paving inspection, and one final inspection – as may be required by the Department. Subsequent additional inspections or site visits, requested by the applicant, or agent, may be charged additional fees.

8.00 PENALTIES

8.01 The Director may fine any Permittee who has violated any provision, restriction, or requirement of any permit issued pursuant to these Rules and Regulations and the Code of Harford County and/or may suspend or revoke any permit issued hereunder.

8.02 In addition to the penalty which may be assessed under Section 8.01 above, the Director may issue a "Stop Work Order" if the Permittee violates any provision issued hereunder. Should such a Stop Work Order be issued, the Department of Inspections, Licenses, and Permits may refuse to issue to the Permittee any other licenses or permits pursuant to Section 157-16 through Section 157-24 of the Code of Harford County, Maryland.

8.03 In the event that construction is not in accordance with Code of Harford County, Maryland and appropriate notice has been given in writing by certified mail, Harford County may make all necessary corrections and the cost of such corrections may be adjudicated toward future work or business with Harford County.

8.04 In the event that final construction completion is delayed at a time when the "Use and Occupancy" approval is needed by the applicant, Harford County may choose to allow the applicant or agent to post an "Access Cash Performance Bond" in the amount of the outstanding work as established by the Department of Public Works. The cash bond is provided for the anticipated short term, successful completion of the requirements of the access permit, not to exceed six (6) months. Cash bonds which exceed six (6) months shall be forfeited, unless extensions for unusual circumstances are approved prior to the expiration of the aforementioned six (6) months. Forfeited funds shall be used by the Department of Public Works to construct and/or correct the deficiencies in the accesses construction or required road improvements. Upon successful completion of the requirements of the Access Permit and Cash Bond, the Department will refund the posted monies to the applicant.

9.00 EFFECTIVE DATE

9.01 These Rules and Regulations for Road Access Permits shall become effective on the date of the adoption of the Road Code.

Revised: June 3, 1988

May 1, 1999
December 29, 1999
March 1, 2007

APPENDIX VI

Sheet

Rules and Regulations for Utility Construction Permits 1-4

RULES AND REGULATIONS FOR UTILITY CONSTRUCTION PERMITS

Pursuant to Sections 157-1, 157-19.D., and 225-5.E. of the HARFORD COUNTY CODE, the following Rules and Regulations are established for the purpose of regulating the construction of utility work performed in rights-of-way and/or easements owned and/or maintained by the Department of Public Works of Harford County, Maryland.

1.00 DEFINITIONS

1.01 Director – Director of Public Works or designee.

1.02 Department – The Department of Public Works.

1.03 Utility – Any utility company, contractor, subcontractor or representative.

1.04 Applicant – A Utility which completes a permit application.

1.05 Permittee – An applicant which has received an approved permit.

1.06 Work Site – The location of construction activities described in the permit.

1.07 Contractor – The name of the company actually performing the work. This includes any subcontracting company link in the chain between the Applicant/Utility and the crew actually performing the work.

1.08 Contact – The responsible person(s) to whom the Director may contact to discuss work site activities and direct corrective measures as necessary.

1.09 M.U.T.C.D. – Manual on Uniform Traffic Control Devices (Federal).

1.10 Utility Construction Permit – A permit issued in accordance with these Rules and Regulations regulating the construction of utilities within Harford County owned and/or maintained rights-of-way and/or easements.

2.00 PERMIT APPLICATIONS

2.01 Each applicant shall complete and file with the Department a current Utility Permit application which contains the following information:

i. Applicant (Utility Company) name, address, city, state, zip code
ii. Applicant contact name, telephone number

iii. Utility job number and application date
iv. Contractor name, address, city, state, zip code
v. Contractor contact name, telephone number
vi. Signature of applicant and printed (or typed) name
vii. Proposed location of work and ADC map grid
viii. Complete description of work and begin construction date.

2.02 The "Applicant" portion of the application must be completed in full before review of the application can begin.

2.03 Utility Permit Applications shall not exceed 5,000 linear feet of proposed utility construction. Additional Utility Permit Applications may be filed for utility projects in excess of this limit.

3.00 DRAWINGS TO BE FILED WITH PERMIT APPLICATIONS

3.01 Each applicant shall have attached drawings as follows: two (2) copies drawn to an appropriate scale, folded to 8 ½" by 11" in size, showing clearly the following information:

i. Property lines
ii. Road right-of-way
iii. Road names
iv. Road features (i.e., width, curbing, sidewalks)
v. Other utility lines and structures
vi. Street addresses, pole, pedestal and box numbers
vii. All proposed utility work
viii. Proposed disturbed areas, staging areas
ix. Proposed sediment controls
x. Traffic Control Plan (as required)

3.02 During review of the application the Director may request that additional information be submitted in order to make determinations on impacts on other utility or road improvements, and for further clarifications as necessary.

3.03 Upon completion of the application, the Department of Public Works will approve or disapprove the application as submitted. The applicant will be notified of the status of the application, either by receipt of the permit (approved or disapproved) or by request for additional information.

3.04 The approved access permit shall be valid for a period of one year from the date of issuance.

4.00 GENERAL REQUIREMENTS

4.01 All work described in the permit shall be subject to inspection by the Director.

4.02 The Permittee shall maintain at the work site a copy of the permit, together with a copy of the drawings and other documents required in accordance with the permit.

4.03 The Permittee shall erect and maintain all necessary signs, barricades, detour signs, and warning devices required to safely direct traffic over or around the part of the highway where permitted operations are to be performed, so long as work does not interfere with traffic, in accordance with the latest edition of the Federal Highway Administration's M.U.T.C.D.., pursuant to the Annotated Code of Maryland, Transportation Article, Title 25, Section 104.

4.04 All activities under the permit, where applicable, must conform to the Harford County Road Code and the book of Standard Details for Design and Construction.

4.05 Any open cutting within the paved portion of the roadway shall comply to a detail in the Book of Standard Details, or, as modified in writing by Harford County. At the time construction is completed, a one (1) year maintenance bond period will be in effect.

4.06 No trench will be allowed to remain open after the normal workday. If a trench is to remain open, steel plates and proper traffic control signs for the maintenance of traffic shall be installed in accordance with the MUTCD.

4.07 After completion of utility work, all materials and debris shall be cleared from County roadways and right-of-way and Utility Company (Permittee) shall be responsible for as good or better restoration of the site.

4.08 Harford County shall not be held responsible for any accidents or damages resulting from any unsafe condition during the construction, or, as a result of the constuction.

4.09 If construction under the permit requires the alteration or removal of all or part of any existing structure within the County road right-of-way which is not addressed in the permit, the Permittee shall not perform this work without first obtaining the written approval of the Director, which approval shall be an amendment to the permit.

4.10 The Director may develop Policies and Procedures to establish procedural activities pursuant to these Rules & Regulations.

5.00 NOTIFICATIONS

5.01 Permittee shall notify the Harford County Department of Public Works, Road Access and Utilities Section twenty-four (24) hours prior to engaging in any work under the permit and shall provide the Department with the name and telephone number of its representative or agent at the work site.

5.02 The Permittee shall notify "Miss Utility" at 1-800-257-7777, forty-eight (48) hours in advance of any work under the permit.

5.03 The Permittee shall notify the Department of Public Works, Road Access and Utilities Section, within twenty-four (24) hours after completion of the work under the permit, as the Department will make a final inspection of the work and process any required documents.

5.04 Failure to notify the Department of Public Works prior to construction or completion of the permitted work shall result in: a delay in work until such notice is provided, a delay in the issuance of permits being reviewed, or the suspension of all work permitted.

6.00 BLANKET PERMITS

6.01 May be issued to a Utility company currently in good standing with Harford County for the following purposes:

i. Emergency repairs to restore existing service on weekends, holidays and evenings when Harford County offices are closed.

ii. Emergency repairs to restore existing service during normal Harford County business hours when situations arise which do not allow for the timely execution of a permit application.

6.02 Utility companies which are issued this permit shall submit, on a monthly basis, a report of all work which was done the previous month. This report shall be submitted no later than the fifteenth (15th) day of the following month. Failure to supply the report to Harford County in the time specified shall result in the Blanket Permit being suspended until the report is received.

7.00 PERMIT FEES AND EXPENSES

7.01 An application fee (established by the County Administration), shall be paid for each utility permit. . The permit fee includes application, plan and field review of the proposed work site, and any required inspections. Project length applications greater than 10,000 feet shall require additional permit applications for each additional length of 10,000 feet, or any part thereof. Such fees will not be refunded once the review process has begun. Additional fees may be assessed if, at the discretion of the Director, the work performed under the permit is not completed in a timely manner or is not in compliance with the Harford County Road Code. Permits issued under this section expire one year from date of issuance. The County reserves the right to correct any hazardous conditions and charge the Permittee.

7.02 An annual fee will be charged for the Blanket Permit which will be billed during January of each year. This fee will be determined based on the volume of work permitted during the previous year. The Director shall maintain a fee schedule for this purpose.

8.00 PENALTIES

8.01 The Director may fine any Permittee who has violated any provision, restriction or requirement of any permit issued pursuant to these Rules and Regulations and the Code of Harford County and/or may suspend or revoke any permit issued hereunder. Any Permittee whose privileges have been suspended or revoked shall forfeit and return any and all permits to the Harford County Department of Public Works.

8.02 In addition to the fine which may be assessed under Section 8.01 above, the Director may issue a "Stop Work Order" if the Permittee violates any provision issued hereunder. Should a Stop Work Order be issued, the Department of Public Works and/or the Department of Inspections, Licenses and Permits may refuse to issue any other licenses or permits pursuant to the Code of Harford County. Additionally, failure to comply with any Federal, State or Local Laws, including, but not limited to the M.U.T.C.D.; will result in penalties as stated above,

8.03 In the event that construction is NOT in accordance with the Code of Harford County and appropriate notice has been given in writing by certified mail, Harford County may make all necessary corrections and the cost of such corrections may be adjudicated toward future work or business with Harford County, including, but not limited to, property tax assessments to cover all correction costs.

9.00 EFFECTIVE DATE

9.01 These Rules and Regulations for Utility Permits shall become effective on the date of the adoption of the Road Code.

Appendix VII

Sight Distance Requirements

Note that the following requirements are as of the 2004 AASHTO Road Design Guide and are provided here for reference only. Any updates to the Roadside Design Guide or the Harford County Road Code shall take supersede these distances.

STOPPING SIGHT DISTANCE UNDIVIDED ROADS	
	AASHTO - 2004 Roadside Design Guide
25	155'
30	200'
35	250'
40	305'
45	360'
50	425'

INTERSECTION SIGHT DISTANCE	
	AASHTO - 2004 Roadside Design Guide
25	280'
30	335'
35	390'
40	445'
45	500'
50	555'