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WICHITA, KANSAS
ZIP CODE / 67202

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Project HORSESHOE LK.

Item HYDROLOGY

BASIN	AREA (Ac.)	C_2	C_{100}	i_2	i_{100}	Q_2	Q_{100}
1A	1.1	0.58	0.72	3.80	7.36	2.4	5.8
1B	0.8	0.58	0.72			1.8	4.2
2A	1.15	0.58	0.72			2.5	6.1
2B	1.6	0.58	0.72			3.5	8.5
3A	2.8	0.48	0.68			5.1	14.0
3B	2.8	0.48	0.68			5.1	14.0
4A	1.6	0.48	0.68			2.9	8.0
4B	2.8	0.48	0.68			5.1	14.0

Hydrologic Calculations for Lots 10 thru 14, Block 2, have been omitted due to the unknown nature of how these lots will be developed. It is assumed that further drainage computation and analysis will be performed at such time as the lots are to be developed, and will be done so on an individual basis.

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Item STREET FLOW

2-Year

Q	Basin	Slope	d	dmax	
0.7×5.1 = 3.6	70% of 3A	0.43%	0.32'	0.30'	OK
0.6×5.1 = 3.1	60% of 4B	0.36%	0.31'	0.30'	OK

BY INSPECTION, ROLL-TYPE CAN BE USED FOR ALL LOTS.

100-YR.

Basin	Q	Slope	Qmax	
3A - 70%	0.7×14 = 9.8	0.43%	27.8	OK

Note: Above Street width uses 29' BK-BK, not 35'. Used to show that most conservative conditions are more than adequate.

By Inspection, 0.3' WK-Gd is OK for all streets.

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Item Inlet/Pipe Sizing

Node	Q_2	Location	Size	d	dmax	
301	5.1	Sump	5'	0.4'	0.55'	OK

By Inspection, all inlets will be 5' - Type 1A curb inlets.

Pipes

Node	Q_2	T_c	
100	∅		
101	2.4	15	STARTING HGL = 130
102	1.8	15	
103	42.0	23	
200	∅		
201	2.5	15	starting HGL = 130
202	3.5	15	
300	∅		
301	5.1	15	Starting HGL = 133
302	5.1	15	

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Node	Q2	Tc
400	∅	
401	2.9	15
402	5.1	15

Starting HGL = 133.0

Date: 07-24-1995
Time: 10:12:15

Input File: horssys1.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #1
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
103	102	.00	.00	.00	.0	23.00	3.10	42.00	23.00	3.10	42.00	42.00	42"	4.37	120.00	.46	23.46
102	101	.00	.00	.00	.0	15.00	3.83	1.80	23.46	3.07	1.44	43.44	42"	4.52	30.00	.11	23.57
101	100	.00	.00	.00	.0	15.00	3.83	2.40	23.57	3.06	1.92	45.36	42"	4.71	160.00	.57	24.13

Date: 07-24-1995
Time: 10:12:15

Input File: horssys1.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #1
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
100	.00000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	130.0000	130.0000	.00
101	.00203	.3252	.0000	.0029	.0000	.0000	.0670	.3950	130.3951	139.0000	8.60
102	.00186	.0559	.0000	.0021	.0000	.0000	.0504	.1084	130.5035	139.0000	8.50
103	.00174	.2091	.0000	.0000	.0000	.0000	.0000	.2091	130.7126	135.1000	4.39

Date: 07-24-1995
Time: 10:28:12

Input File: horssys2.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #2
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
202	201	.00	.00	.00	.0	15.00	3.83	3.50	15.00	3.83	3.50	3.50	15"	2.85	50.00	.29	15.29
201	200	.00	.00	.00	.0	15.00	3.83	2.50	15.29	3.80	2.48	5.98	15"	4.87	50.00	.17	15.46

Date: 07-24-1995
Time: 10:11:12

Input File: horssys2.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #2
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDRAULICS* * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
200	.00000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	130.0000	130.0000	.00
201	.00856	.4282	.0000	.0242	.0000	.0000	.5140	.9665	130.9665	139.0000	8.03
202	.00294	.1468	.0000	.0000	.0000	.0000	.0000	.1468	131.1133	139.0000	7.89

Date: 07-24-1995
Time: 10:20:27

Input File: horssys3.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #3
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
302	301	.00	.00	.00	.0	15.00	3.83	5.10	15.00	3.83	5.10	5.10	15"	4.16	50.00	.20	15.20
301	300	.00	.00	.00	.0	15.00	3.83	5.10	15.20	3.81	5.07	10.17	18"	5.75	50.00	.14	15.35

Date: 07-24-1995
Time: 10:20:27

Input File: horssys3.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #3
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDRAULICS* * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
300	.00000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	133.0000	133.0000	.00
301	.00937	.4686	.0000	.0246	.0000	.0000	.8147	1.3080	134.3080	139.5000	5.19
302	.00623	.3117	.0000	.0000	.0000	.0000	.0000	.3117	134.6196	139.5000	4.88

Date: 07-24-1995
Time: 10:24:59

Input File: horssys4.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #4
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
402	401	.00	.00	.00	.0	15.00	3.83	5.10	15.00	3.83	5.10	5.10	15"	4.16	50.00	.20	15.20
401	400	.00	.00	.00	.0	15.00	3.83	2.90	15.20	3.81	2.88	7.98	15"	6.50	50.00	.13	15.33

Date: 07-24-1995
Time: 10:24:59

Input File: horssys4.stm

HORSESHOE LAKE DRAINAGE PLAN
SYSTEM #4
DRC 7-24-95

Storm Frequency = 2-Year

* * * HYDRAULICS* * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
400	.00000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	133.0000	133.0000	.00
401	.01527	.7635	.0000	.0389	.0000	.0000	.8329	1.6353	134.6353	139.5000	4.86
402	.00623	.3117	.0000	.0000	.0000	.0000	.0000	.3117	134.9470	139.5000	4.55

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Lots in Blocks 1, 3, and 4 and Lots 1 thru 9, Block 2, lie within an area defined as Floodplain by FEMA's FIRM map, Panel 200328 0005B. Based on a restudy of the Big Slough by Baughman Co., Les Eck's Lake (west of Northshore Blvd.) has a B.F.E. of 1323.0 or 136.0 City Datum. Horseshoe Lake (east of North Shore Blvd) has a lower BFE, but because the only outlet is a 30" CMP in 21st St., & the emergency overflow for the Lake is to be 21st St. at elev. 1323.0 (136.0 City), the min. opening and low floor for both lakes will be the same; 137.0.

Additionally, the three proposed ponds will be provided a 36" equalizer pipe to maintain elevations equal to the larger lakes.

C values

(3 pages)

ATTACHMENT D

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
Single-Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or face Characteristics	Percent Impervious	Frequency 2	5	10	100
Single Family (Soil Group A)					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
Multi-Family (Soil Group A)					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:	15	0.33	0.35	0.42	0.55
5. Schools:	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:	30	0.43	0.45	0.50	0.62
Undeveloped Urban Areas: Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
10. Roofs:	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
Soil Group A					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
Soil Group B					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
Soil Group C					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Soil Group D					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for basins 320 acres or larger.

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:05	4.77	5.52	6.56	7.32	8.44	9.32	10.20
0:06	4.53	5.26	6.27	7.02	8.11	8.96	9.81
0:07	4.33	5.04	6.03	6.76	7.82	8.65	9.48
0:08	4.16	4.85	5.82	6.52	7.55	8.36	9.17
0:09	4.00	4.67	5.61	6.30	7.30	8.09	8.87
0:10	3.85	4.50	5.42	6.08	7.06	7.82	8.58
0:11	3.71	4.34	5.23	5.88	6.83	7.56	8.30
0:12	3.58	4.19	5.06	5.69	6.60	7.32	8.04
0:13	3.45	4.05	4.90	5.51	6.40	7.10	7.79
0:14	3.34	3.92	4.75	5.34	6.21	6.89	7.57
0:15	3.23	3.80	4.61	5.19	6.04	6.70	7.36
0:16	3.13	3.69	4.48	5.05	5.88	6.53	7.17
0:17	3.03	3.58	4.36	4.92	5.73	6.37	7.00
0:18	2.94	3.48	4.25	4.80	5.60	6.22	6.84
0:19	2.86	3.39	4.14	4.69	5.47	6.09	6.70
0:20	2.78	3.30	4.05	4.58	5.35	5.96	6.56
0:21	2.70	3.21	3.95	4.48	5.24	5.84	6.43
0:22	2.63	3.14	3.87	4.39	5.14	5.72	6.30
0:23	2.56	3.06	3.78	4.30	5.04	5.61	6.19
0:24	2.50	2.99	3.71	4.21	4.94	5.51	6.07
0:25	2.44	2.93	3.63	4.13	4.85	5.41	5.97
0:26	2.38	2.86	3.56	4.05	4.76	5.31	5.86
0:27	2.33	2.80	3.49	3.98	4.68	5.22	5.76
0:28	2.28	2.75	3.43	3.91	4.59	5.13	5.66
0:29	2.23	2.69	3.36	3.84	4.52	5.04	5.57
0:30	2.19	2.64	3.30	3.77	4.44	4.96	5.48
0:31	2.14	2.59	3.24	3.71	4.37	4.88	5.39
0:32	2.10	2.54	3.19	3.64	4.30	4.80	5.31
0:33	2.06	2.50	3.14	3.58	4.23	4.73	5.22
0:34	2.02	2.45	3.08	3.53	4.16	4.65	5.14
0:35	1.99	2.41	3.03	3.47	4.10	4.58	5.07
0:36	1.95	2.37	2.99	3.42	4.03	4.51	4.99
0:37	1.92	2.33	2.94	3.36	3.97	4.45	4.92
0:38	1.89	2.30	2.89	3.31	3.91	4.38	4.84
0:39	1.86	2.26	2.85	3.27	3.86	4.32	4.77
0:40	1.83	2.23	2.81	3.22	3.80	4.26	4.71
0:41	1.80	2.19	2.77	3.17	3.75	4.20	4.64
0:42	1.77	2.16	2.73	3.13	3.70	4.14	4.58
0:43	1.75	2.13	2.69	3.08	3.65	4.08	4.52
0:44	1.72	2.10	2.65	3.04	3.60	4.03	4.46
0:45	1.70	2.07	2.62	3.00	3.55	3.97	4.40

RAINFALL INTENSITY TABLE

SEDGWICK COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0:46	1.67	2.04	2.58	2.96	3.50	3.92	4.34
0:47	1.65	2.01	2.55	2.92	3.46	3.87	4.29
0:48	1.63	1.98	2.51	2.88	3.41	3.82	4.23
0:49	1.60	1.96	2.48	2.85	3.37	3.78	4.18
0:50	1.58	1.93	2.45	2.81	3.33	3.73	4.13
0:51	1.56	1.91	2.42	2.78	3.29	3.68	4.08
0:52	1.54	1.88	2.39	2.74	3.25	3.64	4.03
0:53	1.52	1.86	2.36	2.71	3.21	3.60	3.98
0:54	1.50	1.84	2.33	2.68	3.17	3.55	3.94
0:55	1.48	1.81	2.30	2.65	3.13	3.51	3.89
0:56	1.46	1.79	2.28	2.62	3.10	3.47	3.85
0:57	1.45	1.77	2.25	2.59	3.06	3.43	3.80
0:58	1.43	1.75	2.23	2.56	3.03	3.40	3.76
0:59	1.41	1.73	2.20	2.53	3.00	3.36	3.72
1:00	1.39	1.71	2.18	2.50	2.96	3.32	3.68
1:05	1.32	1.62	2.06	2.37	2.81	3.15	3.49
1:10	1.25	1.53	1.96	2.25	2.67	3.00	3.33
1:15	1.18	1.46	1.87	2.15	2.55	2.86	3.17
1:20	1.13	1.39	1.78	2.05	2.44	2.74	3.04
1:25	1.07	1.33	1.70	1.97	2.34	2.63	2.91
1:30	1.03	1.27	1.63	1.89	2.24	2.52	2.80
1:35	0.98	1.22	1.57	1.81	2.16	2.43	2.69
1:40	0.94	1.17	1.51	1.75	2.08	2.34	2.60
1:45	0.91	1.13	1.46	1.69	2.01	2.26	2.51
1:50	0.87	1.09	1.41	1.63	1.94	2.18	2.42
1:55	0.84	1.05	1.36	1.57	1.88	2.11	2.35
2:00	0.81	1.02	1.32	1.52	1.82	2.05	2.28
2:05	0.79	0.98	1.28	1.48	1.76	1.99	2.21
2:10	0.76	0.95	1.24	1.43	1.71	1.93	2.14
2:15	0.74	0.92	1.20	1.39	1.67	1.88	2.08
2:20	0.72	0.90	1.17	1.36	1.62	1.82	2.03
2:25	0.70	0.87	1.14	1.32	1.58	1.78	1.98
2:30	0.68	0.85	1.11	1.29	1.54	1.73	1.93
2:35	0.66	0.83	1.08	1.25	1.50	1.69	1.88
2:40	0.64	0.81	1.05	1.22	1.46	1.65	1.83
2:45	0.62	0.79	1.03	1.19	1.43	1.61	1.79
2:50	0.61	0.77	1.00	1.17	1.40	1.57	1.75
2:55	0.59	0.75	0.98	1.14	1.37	1.54	1.71
3:00	0.58	0.73	0.96	1.12	1.34	1.51	1.68

RAINFALL INTENSITY TABLE

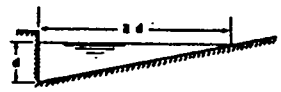
SEDGWICK COUNTY
KANSAS

THIS TABLE CONTAINS AVERAGE RAINFALL INTENSITIES
IN INCHES PER HOUR.

DURATION, HR:MIN	RETURN PERIOD 1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
3:15	0.54	0.69	0.90	1.05	1.26	1.42	1.58
3:30	0.51	0.65	0.85	0.99	1.19	1.34	1.49
3:45	0.48	0.61	0.80	0.94	1.12	1.27	1.41
4:00	0.46	0.58	0.76	0.89	1.07	1.21	1.34
4:15	0.44	0.55	0.73	0.85	1.02	1.15	1.28
4:30	0.42	0.53	0.70	0.81	0.98	1.10	1.23
4:45	0.40	0.51	0.67	0.78	0.94	1.06	1.18
5:00	0.38	0.49	0.64	0.75	0.90	1.02	1.13
5:15	0.37	0.47	0.62	0.72	0.87	0.98	1.09
5:30	0.35	0.45	0.60	0.70	0.83	0.94	1.05
5:45	0.34	0.44	0.58	0.67	0.81	0.91	1.01
6:00	0.33	0.42	0.56	0.65	0.78	0.88	0.98
6:30	0.31	0.40	0.52	0.61	0.73	0.83	0.92
7:00	0.30	0.38	0.50	0.58	0.69	0.78	0.87
7:30	0.28	0.36	0.47	0.55	0.66	0.74	0.83
8:00	0.27	0.34	0.45	0.52	0.62	0.70	0.78
8:30	0.26	0.33	0.43	0.50	0.60	0.67	0.75
9:00	0.25	0.31	0.41	0.48	0.57	0.64	0.72
9:30	0.24	0.30	0.39	0.46	0.55	0.62	0.69
10:00	0.23	0.29	0.38	0.44	0.52	0.59	0.66
10:30	0.22	0.28	0.36	0.42	0.50	0.57	0.63
11:00	0.21	0.27	0.35	0.41	0.49	0.55	0.61
11:30	0.21	0.26	0.34	0.39	0.47	0.53	0.59
12:00	0.20	0.25	0.33	0.38	0.45	0.51	0.57
13:00	0.19	0.24	0.31	0.36	0.43	0.48	0.53
14:00	0.18	0.22	0.29	0.34	0.40	0.45	0.50
15:00	0.17	0.21	0.27	0.32	0.38	0.43	0.47
16:00	0.16	0.20	0.26	0.30	0.36	0.40	0.45
17:00	0.15	0.19	0.25	0.29	0.34	0.38	0.43
18:00	0.15	0.18	0.24	0.27	0.33	0.37	0.41
19:00	0.14	0.18	0.23	0.26	0.31	0.35	0.39
20:00	0.14	0.17	0.22	0.25	0.30	0.34	0.37
21:00	0.13	0.16	0.21	0.24	0.29	0.32	0.36
22:00	0.13	0.16	0.20	0.23	0.28	0.31	0.34
23:00	0.12	0.15	0.19	0.22	0.27	0.30	0.33
24:00	0.12	0.15	0.19	0.22	0.26	0.29	0.32

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

Z = 32
n = .016
Z/n = 2000



EQUATION: $Q = 0.56\left(\frac{Z}{n}\right) S^{\frac{1}{2}} d^{\frac{8}{3}}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

Z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1948, PAGE 190, EQUATION (14)

EXAMPLE (SEE DASHED LINES)

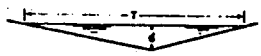
GIVEN: S = 0.03
Z = 24
n = .02
Z/n = 1200
d = 0.22

FIND: Q = 2.0 CFS

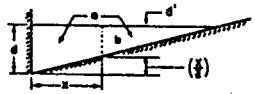
INSTRUCTIONS

1. CONNECT Z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH DEPTH (d). THESE TWO LINES MUST INTERSECT AT TURNING LINE FOR COMPLETE SOLUTION.

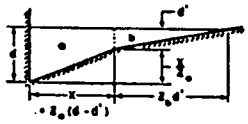
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH WITH $Z = \frac{T}{d}$



3. TO DETERMINE DISCHARGE Q_a IN PORTION OF CHANNEL HAVING WIDTH x: DETERMINE DEPTH d FOR TOTAL DISCHARGE IN ENTIRE SECTION a. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION b FOR DEPTH $d' = d - \left(\frac{x}{Z}\right)$



4. TO DETERMINE DISCHARGE IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE IN SECTION a AT ASSUMED DEPTH d; OBTAIN Q_b FOR SLOPE RATIO Z_b AND DEPTH d'. THEN $Q_T = Q_a + Q_b$



RATIO Z/n: 10000, 9000, 8000, 7000, 6000, 5000, 4000, 3000, 2000, 1000, 900, 800, 700, 600, 500, 400, 300, 200, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10

TURNING LINE

DISCHARGE (Q) IN CFS: 100, 70, 50, 30, 20, 10, 7, 5, 3, 2, 1, .7, .5, .3, .2, .1, .07, .05, .03, .02, .01

SLOPE OF CHANNEL (S) IN FT./FT.: .10, .08, .07, .06, .05, .04, .03, .02, .01, .008, .007, .006, .005, .004, .003, .002, .001

DEPTH AT CURB OR DEEPEST POINT (d) IN FT.: 2.0, 1.0, .80, .70, .60, .50, .40, .30, .20, .10, .08, .07, .06, .05, .04, .03, .02, .01

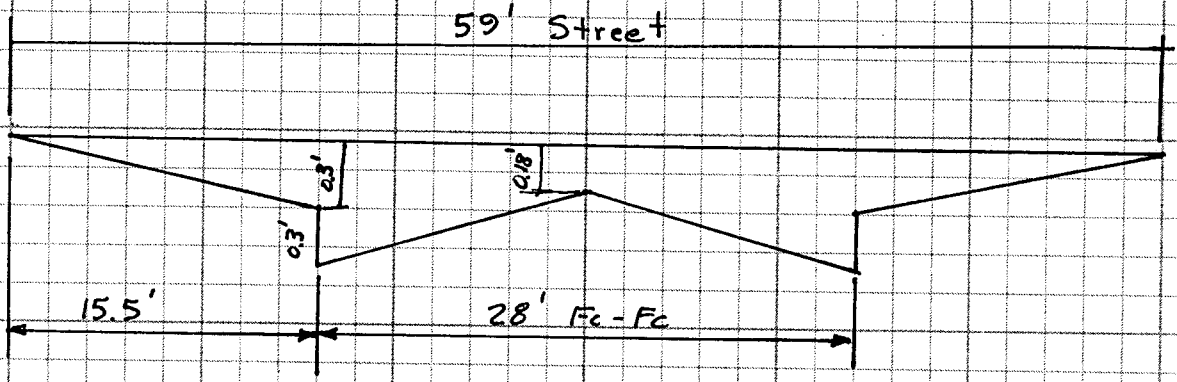
One foot is 0.3048m
One cubic foot is 0.0283m^3

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
303 S. TOPEKA
WICHITA, KANSAS
ZIP CODE / 67202

Date _____ Page _____ of _____

Project _____

Item _____



$$n = \frac{2(.03 \times 15) + 2(.013 \times 2.8) + 2(.016 \times 12)}{2(2.8 + 15 + 12)} = 0.02277$$

$$A = (0.18 \times 28) + 2\left(\tfrac{1}{2} \times 0.3 \times 15.5\right) + 2\left(\tfrac{1}{2} \times 0.42 \times 14\right)$$

$$= 15.57$$

$$P = 2(2.8 + 15 + 12) = 59.6$$

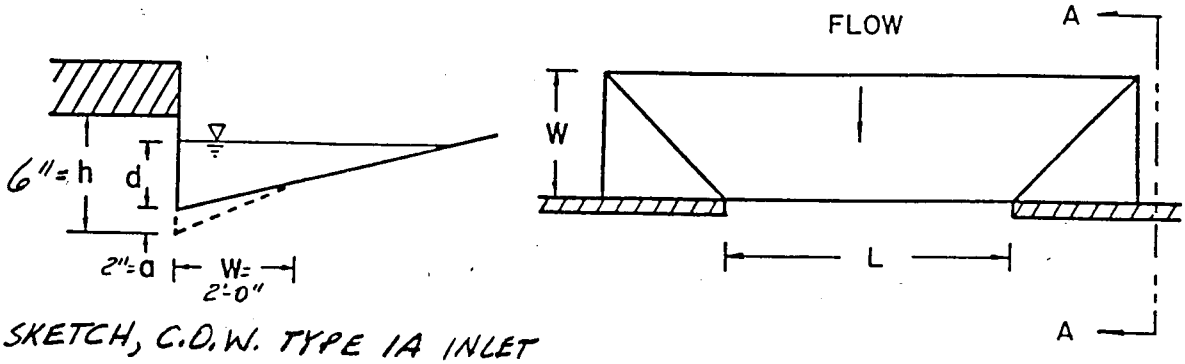
$$R = \frac{A}{P} = \frac{15.57}{59.6} = 0.26$$

$$R^{2/3} = 0.41$$

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

$$Q = \frac{1.486}{.02277} \times 15.57 \times 0.41 \times S^{1/2}$$

$$Q = 416\sqrt{S}$$



DEF. SKETCH, C.O.W. TYPE 1A INLET

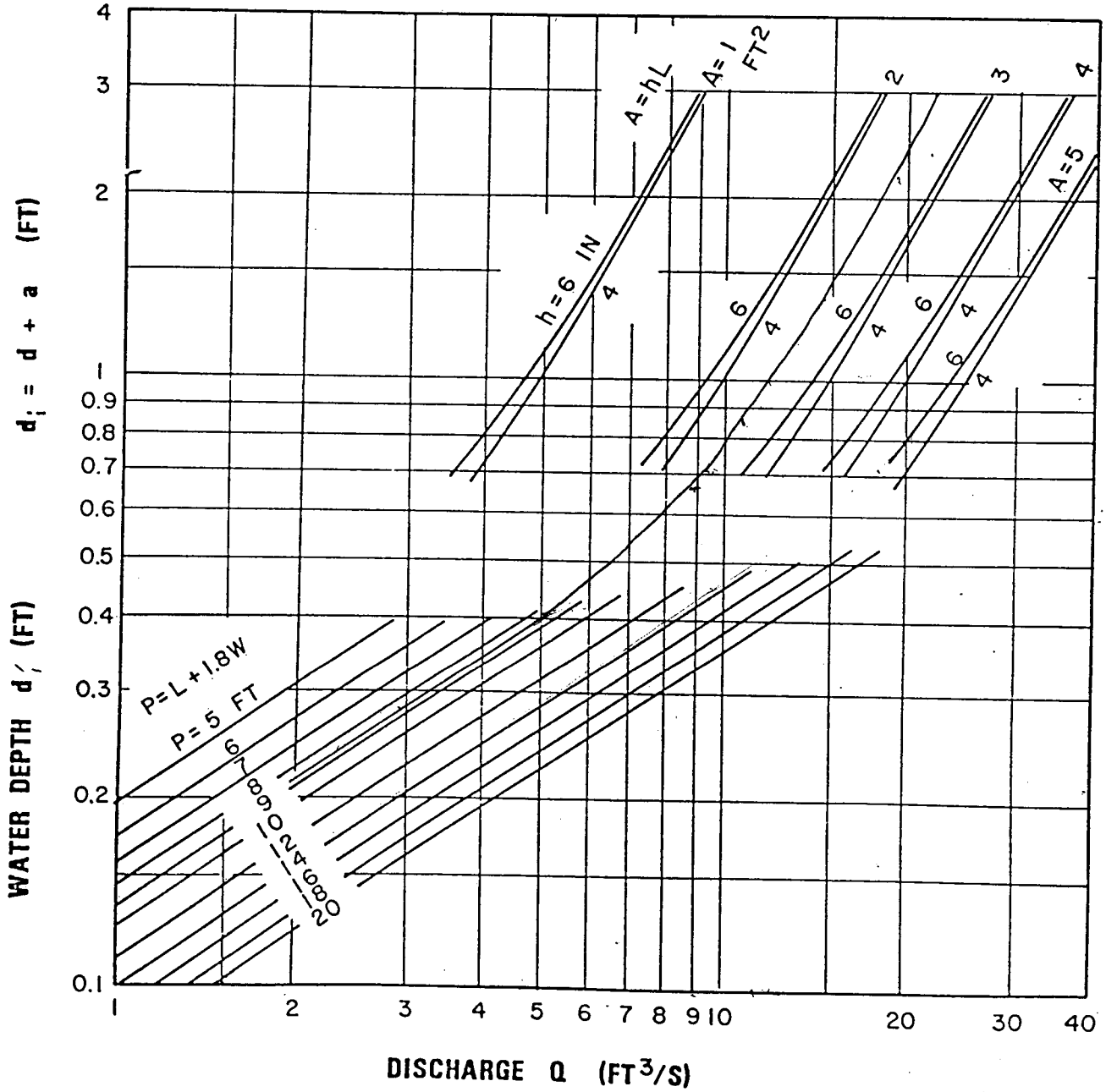


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR., 1984