

MUNGER STATION POST OFFICE

DRAINAGE CONCEPT FEBRUARY 15, 1984

STORM SEWER CALCUS.

1. DETERMINE DIFFERENCE BETWEEN HIGH POINT (HP) AND LOW POINT (LP).
2. GREATEST DISTANCE WITHIN THE DRAINAGE AREA THAT SURFACE WATER WOULD FLOW, (L).
3. DETERMINE INLET CONCENTRATION IN MINS.
 $T_c = \frac{L}{1.48}$
4. CITY REQUIRES USE OF A 5 YR. RETURN PERIOD. WITH A 15 MIN. DURATION RAINFALL INTENSITY IN INCHES PER HOUR WOULD BE 5.21. (I) SEE ATTACHED CHART. USE WHICHEVER IS GREATER THE 15 MIN. FIGURE OF T_c FROM THE ABOVE FORMULA.
5. DETERMINE AREA OF RUNOFF IN ACRES (A).
6. USE THE COEFFICIENT OF RUNOFF (C) FROM SEELEY'S, PAGE 18-02, FOR PAVED SURFACES.
7. QUANTITY OF RUNOFF (Q)
 $Q = C \times I \times A$

AREA A (CB#1)
H = 1.25' L = 250'
 $T_c = \frac{(250)^{1.155}}{128(1.25)^{0.385}} = 4.25 \text{ MIN. THIS IS LESS THAN } 15 \text{ MIN. SO USE } I = 5.21$
A = .89 ACRES C = .90
 $Q = (.90)(5.21)(.89) = 4.17 \text{ CFS.}$

AREA B (CB#2)
H = 1.15' L = 300'
 $T_c = \frac{(300)^{1.155}}{128(1.15)^{0.385}} = 4.84 \text{ MIN. THIS IS LESS THAN } 15 \text{ MIN. SO USE } I = 5.21$
A = 1.03 ACRES C = .90
 $Q = (.90)(5.21)(1.03) = 4.83 \text{ CFS.}$

AREA C (CB#3)
H = .75' L = 150'
 $T_c = \frac{(150)^{1.155}}{128(.75)^{0.385}} = 2.86 \text{ MIN. THIS IS LESS THAN } 15 \text{ MIN. SO USE } I = 5.21$
A = .42 ACRES C = .90
 $Q = (.90)(5.21)(.42) = 1.97 \text{ CFS.}$

AREA D (CB#4)
H = .45' L = 90'
 $T_c = \frac{(90)^{1.155}}{128(.45)^{0.385}} = 1.71 \text{ MIN. THIS IS LESS THAN } 15 \text{ MIN. SO USE } I = 5.21$
A = .21 ACRES C = .90
 $Q = (.90)(5.21)(.21) = .98 \text{ CFS.}$

DETERMINE PIPE SIZE!
ADD ALL THE AREAS TOGETHER THAT COLLECT INTO THAT PIPE.
USE SEELEY'S, PAGE 18-72

PIPE A = AREA A
(CB#1 to CB#2) = 4.17 CFS. USE .75% SLOPE $\therefore 15" \text{ DIA. PIPE}$
PIPE B = AREA A + AREA C
(CB#2 to CB#4) = 4.17 + 1.97 = 6.14 CFS. USE .5% SLOPE $\therefore 18" \text{ DIA. PIPE}$
PIPE C = AREA B
(CB#3 to CB#4) = 4.83 CFS. USE .4% SLOPE $\therefore 18" \text{ DIA. PIPE}$
PIPE D = AREA A + AREA C + AREA D + AREA B
(CB#4 to Detention Area) = 4.17 + 1.97 + .98 + 4.83 = 11.95 CFS. USE .4% SLOPE $\therefore 24" \text{ DIA. PIPE}$

storm run-off Post Office
undeveloped area
- largest run 480'
- av. grass surface
- .9 percent of slope $\frac{4.5}{480}$
221.183
22.9 min. for overland flow time

Rainfall intensity 29 min 100yr storm 6.95
.2 coeff. dry ft. vegetation
2.155 acres
 $Q = (.2)(6.95)(2.155) = 3.54 \text{ cfs.}$
Cu. ft. of water $3.54 \times 60 \times 29 = 659$

developed area
 $PT = \frac{L \times \text{width of pipe}}{\text{velocity of flow per sec} \times 60}$
Pipe B $\frac{154}{3.07 \times 60} = .71$
Pipe C $\frac{20}{3.07 \times 60} = .114$
Pipe D $\frac{20}{3.07 \times 60} = .109$
Pipe A $\frac{154}{3.07 \times 60} = .92$
Area A $T_c = 4.25$
5.95 less than 15 min.
100yr. intensity
 $Q = (.9)(6.95)(2.155) = 20.61 \text{ cfs}$
Cu. ft. of water $20.61 \times 60 \times 15 = 18549$
Total to detain $18549 - 659 = 12,390$

developed area 20.61
undeveloped area 3.54
17.07 cfs $\therefore 12" \text{ pipe}$
OR
20.61 cfs $\therefore 18" \text{ pipe}$
3.54 cfs $\therefore 15" \text{ pipe}$

RAINFALL INTENSITY TABLE
for SEDGWICK COUNTY KANSAS
The following tabulation contains rainfall intensity in inches per hour as derived from NOAA Weather Bureau Technical Paper 40.

DURATION IN MINUTES	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.67	6.23	8.00	9.34	10.67	12.23	13.79
6	4.35	5.80	7.45	8.70	9.94	11.39	12.84
7	4.09	5.46	7.02	8.19	9.36	10.72	12.09
8	3.88	5.18	6.66	7.77	8.88	10.18	11.48
9	3.71	4.95	6.36	7.43	8.49	9.72	10.96
10	3.56	4.75	6.11	7.13	8.15	9.33	10.52
11	3.43	4.58	5.89	6.87	7.85	8.99	10.14
12	3.32	4.43	5.69	6.64	7.59	8.62	9.80
13	3.21	4.29	5.51	6.43	7.35	8.42	9.50
14	3.12	4.17	5.36	6.25	7.14	8.18	9.23
15	3.04	4.06	5.21	6.08	6.95	7.97	8.98
16	2.96	3.96	5.09	5.93	6.78	7.77	8.76
17	2.90	3.86	4.97	5.79	6.62	7.59	8.55
18	2.83	3.78	4.86	5.67	6.48	7.42	8.37
19	2.77	3.70	4.76	5.55	6.34	7.27	8.19
20	2.72	3.63	4.66	5.44	6.22	7.12	8.03
21	2.67	3.56	4.57	5.34	6.10	6.99	7.88
22	2.62	3.49	4.49	5.24	5.99	6.86	7.74
23	2.57	3.43	4.41	5.15	5.89	6.74	7.60
24	2.53	3.38	4.34	5.07	5.79	6.63	7.48
25	2.49	3.32	4.27	4.99	5.70	6.53	7.36
26	2.45	3.23	4.21	4.91	5.61	6.43	7.25
27	2.42	3.18	4.15	4.84	5.53	6.33	7.14
28	2.38	3.05	4.09	4.77	5.45	6.25	7.04
29	2.35	2.97	4.02	4.68	5.38	6.16	6.95
30	2.32	2.89	3.96	4.61	5.31	6.08	6.79
31	2.29	2.82	3.82	4.44	5.19	6.00	6.62
32	2.26	2.75	3.73	4.33	5.07	5.87	6.45
33	2.24	2.68	3.64	4.23	4.95	5.73	6.30
34	2.19	2.62	3.55	4.13	4.83	5.60	6.16
35	2.14	2.57	3.47	4.04	4.73	5.47	6.02
36	2.09	2.51	3.40	3.95	4.62	5.35	5.89
37	2.05	2.46	3.33	3.87	4.52	5.23	5.76
38	2.00	2.41	3.26	3.79	4.43	5.13	5.64
39	1.96	2.36	3.19	3.71	4.34	5.02	5.53
40	1.92	2.32	3.12	3.64	4.26	4.92	5.42
41	1.89	2.27	3.07	3.57	4.18	4.83	5.32
42	1.85	2.23	3.01	3.51	4.10	4.74	5.22
43	1.82	2.19	2.96	3.44	4.02	4.65	5.13
44	1.78	2.15	2.91	3.38	3.95	4.56	5.03
45	1.75	2.11	2.86	3.32	3.88	4.48	4.95

