MUNGER STATION POST OFFICE

DRAINAGE CONCEPT

FEBRUARY 16, 1984

DEC. 82
MUNGER STA. P.O.

STORM SEWER CALCULS.

① DETERMINE DIFFERENCE BETWEEN HIGH POINT (H) AND LOW POINT. (H)
② GREATEST DISTANCE WITHIN THE DRAINAGE AREA THAT SURFACE WATER WOULD FLOW, (L)
③ DETERMINE INLET CONCENTRATION IN MINS..

$$T_c = \frac{(L)^{1.155}}{128\,(H)^{0.385}}$$

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 SEELYES, 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'

$$t_c = \frac{(250)^{1.155}}{128(1.25)^{0.385}} = 4.23 \text{ MIN.}$$ THIS IS LESS THAN 15 MIN. SO USE I = 5.21

A = .89 ACRES C = .90
Q = (.90)(5.21)(.89) = 4.17 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 MIN. SO USE I = 5.21

A = 1.03 ACRES C = .90
Q = (.90)(5.21)(1.03) = 4.83 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 MIN. SO USE I = 5.21

A = .42 ACRES C = .90
Q = (.90)(5.21)(.42) = 1.97 CFS.

AREA (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 MIN, SO USE I = 5.21

A = .21 ACRES C = .90
Q = (.90)(5.21)(.21) = .98 CFS.

DETERMINE PIPE SIZE;
① ADD ALL THE AREAS TOGETHER THAT COLLECT INTO THAT PIPE,
② USE SEELYES, PAGE 18-72

PIPE A = AREA A
(CB#1 to CB#2) = 4.17 CFS. use .75% slope ∴ 15" DIA. PIPE

PIPE B = AREA A + AREA C
(CB#2 to CB#3) = 4.17 + 1.97 = 6.14 CFS. use .5% slope ∴ 18" DIA. PIPE

PIPE C = AREA B
(CB#3 to CB#4) = 4.83 CFS. use .4% slope
∴ 18" 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 ∴ 24" DIA. PIPE

Sec. 553

Storm run-off Post Office

undeveloped area

- longest run 420' — seelyes 18-01
- av. grass surface
- .9 percent of slope $\frac{4.5}{420}$ ∴ 29 min. for overland flow time

Rainfall intensity 29 min 100 yr storm 6.95
.2 coeff, clay & vegetation
2.155 acres
Q = (.2)(6.95)(2.155) = 3.54 cfs.

Cu ft. of water 3.54 X 60 X 29 = 659

developed area

$PT = \frac{\text{Length of pipe}}{\text{velocity of flow per sec} \times 60}$

Pipe B $\frac{194}{5.60 \times 60} = .71$
~~Pipe C $\frac{274}{4.00 \times 60} = 1.14$~~
Pipe D $\frac{20}{5.51 \times 60} = .09$
Pipe A $\frac{305}{3.17 \times 60} = .92$
Area A $t_c = 4.23$
5.95 less than 15 min.

100 yr. intensity
Q = (.9)(8.98)(2.555) = 20.61 cfs
cu ft. of water 20.61 X 60 X 15 = 18549

Total to detain 18549 - 6159 = 12,390

developed area 20.61
undeveloped area − 3.54
17.07 cfs .490 = 24" pipe
or
20.61 cfs .490 = 30" pipe

3.54 cfs .59% = 15" pipe

RAINFALL INTENSITY TABLE for SEDGWICK COUNTY KANSAS

I₁ - Residential
I₂ - Industrial
I₃ - Heavy Industrial & Downtown

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40.

DURATION IN MINUTES	RETURN PERIODS OF 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	13.39
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	8.89	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	8.69	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	3.13	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	3.92	4.56	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	3.13	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