# MUNGER STATION POST OFFICE

# DRAINAGE CONCEPT

FEBRUARY 15, 1984

DEC. 83
MUNGER ST. P.O.

## STORM SEWER CALCS.

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..

$$T_c = \frac{(L)^{1.155}}{128\,(H)^{0.333}}$$

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'

$$t_c = \frac{(250)^{1.155}}{128(1.25)^{0.333}} = 4.23 \text{ MIN.}$$

THIS IS LESS THAN 15 MIN. SO USE I = 5.21

A = .89 ACRES  C = .90

Q = (.90)(5.21)(.89) = 4.17 CFS.

page 1

### AREA B (CB#2)

H = 1.5'  L = 300'

$$t_c = \frac{(300)^{1.155}}{128(1.5)^{0.333}} = 4.84 \text{ MIN.}$$

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'

$$t_c = \frac{(150)^{1.155}}{128(.75)^{0.333}} = 2.86 \text{ MIN.}$$

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'

$$t_c = \frac{(90)^{1.155}}{128(.45)^{0.333}} = 1.71 \text{ MIN.}$$

THIS IS LESS THAN 15 MIN. SO USE I = 5.21

A = .21 ACRES  C = .90

Q = (.90)(5.21)(.21) = .98 CFS.

page 2

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#4) = 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

page 3

ec. 1.53

## storm run-off Post Office

### undeveloped area

- longest run 480'
- av. grass surface
- .9 percent of slope $\frac{45}{480}$

Seelyes 18-01
∴ 29 min. for overland flow time

Rainfall intensity 29 min 100 yr storm 6.95
.2 coeff. clay ft. vegetation
2.55 acres

Q = (.2)(6.95)(2.55) = 3.54 cfs.

cu. ft. of water 3.54 × 60 × 29 = 6159

### developed area

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

pipe B $\frac{194}{3.6 \times 60}$ = .71
~~pipe C $\frac{25}{3.5 \times 60}$ = .14~~
pipe D $\frac{25}{3.5 \times 60}$ = .09
pipe A $\frac{205}{3.7 \times 60}$ = .92
Area A $t_c$ = 4.23
5.95 less than 15 min.

100 yr. intensity
Q = (.9)(8.98)(2.55) = 20.61 cfs
cu. ft. of water 20.61 × 60 × 15 = 18549

Total to detain 18549 - 6159 = 12,390

page 4

developed area 20.61
undeveloped area − 3.54
17.07 cfs .4% = 27" pipe
or
20.61 cfs .4% = 30" pipe

3.54 cfs .5% = 15" pipe

page 5

Page 1 of 3

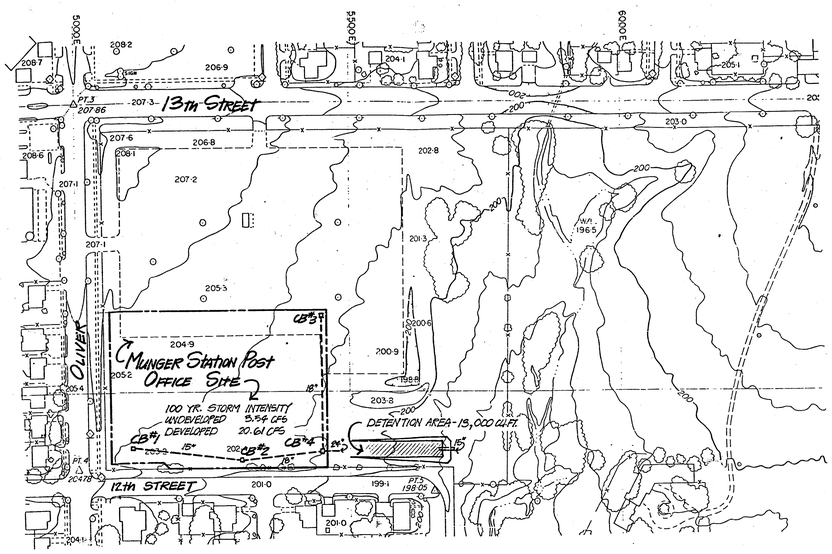
RAINFALL INTENSITY TABLE
for
SEDGWICK COUNTY KANSAS

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 |

page 6




page 7