Sample 1 - Sewage Discharge

1 Design Calculation for Sewage Discharge

(i). Sewage Discharge Quantity – Discharge from the Lavatories

(a)

Sanitary Fixture	Nos.
Water Closet	22
Basin	27
Urinal	12

(b) Total Discharge Unit
= (22 x 14) + (27 x 3) + (12 x 0.3)
= **392.6 Du**

(c) From IOP Graph C2 Line B, Discharge flow rate
= **3.6 l/s**

(ii) Discharge from Sewage Sump Pit "1" = 3.5 l/s

(iii) Discharge from Sewage Sump Pit "2" = 3 l/s

(iv) Discharge from Sewage Sump Pit "3" = 3 l/s

(v) Discharge from Lift Pit = 1.5 l/s (each)

(vi) Total Sewage Discharge from the building
= (3.6 + 3.5 + 3 + 3 + 1.5 x 3) l/s
= **17.6 l/s**

(vii) Calculation for Sewage Pipe Size

(a) Formula Used: (Based on the Design Guide issued by the "Institute of Plumbing" of U.K.)

$Q = V \times A$
$V = C \times R^{0.667} \times S^{0.5}$
$R = A/P$

Where: Q = Discharge Quantity(m^3/s)
V = Velocity (m/s)
C = Coefficient = 84
R = Hydraulic Meandepth (m)
P = Perimeter of Pipe (m)
S = Gradient (based on connection point)

(b) Drainage connection SA from Terminal Manhole F2

Total discharge quantity = 17.6 l/s
Assume use of 150mm dia. Pipe with gradient 1: 70

$$R = \frac{A}{P}$$

$$= \frac{\pi \times r^2}{2 \times \pi \times r}$$

$$= \frac{p \times (0.075)^2}{2 \times p \times (0.075)}$$

= **0.0375**

V = C x $R^{0.667}$ x $S^{0.5}$

= 84 x $0.0375^{0.667}$ x $(1/70)^{0.5}$

= **1.1236 m/s**

Q = V x A

= 1.1236 x 3.14 x (0.15^2/4)

= 0.01984 m^3/s

= **19.86 l/s**

As 19.86l/s > 17.6 l/s

Sewer connection "SA" of 150mm diameter pipe with gradient of 1 : 70 is adopted.