



Project: Dentholme, Cragg Road, Cleator Moor, CA25 5PR	Job No. 0010121	Sheet No. FHD - 01 A
Title: New Flats And Houses Below Ground Drainage Design	Prepared: MRV	Date: Jan. 2022
	Checked:	Date:

1.0 - Rainwater Drainage

1.1 - DESIGN DATA

MAIN ROOF - Pitch - $32\frac{1}{2}^\circ$ - To Second Floor

EXTERNAL - CAR PARK - TARMAC
PAVING - TO REAR OF BUILDINGS

RAINFALL INTENSITY

AD 4 - GUTTERS AND DOWNPIPES - PING. 1 = $0.016 \text{ Lt/Sec./m}^2$
PAVING AND DRAINAGE - " 2 = $0.012 \text{ Lt/Sec./m}^2$
UNITED UTILITIES = $50 \text{ mm/Hr} = 0.0139 \text{ Lt/Sec./m}^2$

1.2 - GUTTERS AND DOWNPIPES

FOR MAIN ROOF - FRONT AND REAR SLOPES

$$\text{Area} = 103.6 \text{ m}^2$$

$$\text{Rainwater Flow} = 103.6 \times 1.33 \times 0.016 = 2.21 \text{ Lt/Sec.}$$

PROVIDE - A 125mm GUTTER FLOWING TO 2ND OUTLET,
75mm ϕ MIN. AT EITHER END OF BUILDING,

FOR ANNEX - REAR ROOF SLOPE

$$\text{Area} = 15.9 \text{ m}^2$$

$$\text{Rainwater Flow} = 15.9 \times 1.58 \times 0.016 = 0.40 \text{ Lt/Sec.}$$

PROVIDE - A 100mm GUTTER FLOWING TO A 63mm ϕ MIN.
OUTLET

FOR ANNEX - FRONT ROOF SLOPE

$$\text{Area} = 45.6 \text{ m}^2$$

$$\text{Rainwater Flow} = 45.6 \times 1.33 \times 0.016 = 0.97 \text{ Lt/Sec.}$$

PROVIDE - A 125mm GUTTER FLOWING TO A 75mm ϕ MIN.
OUTLET



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1.3 - Below Ground Drainage

For Main Roof

$$\text{Flow / Outlet} = 103.6 \times 0.5 \times 1.33 \times 0.0139 = 0.96 \text{ Lt/Sec.} - 4\text{N}^{\circ} \text{ outlets total}$$

For Annex Rear Roof

$$\text{Flow / Outlet} = 15.9 \times 1.58 \times 0.0139 = 0.35 \text{ Lt/Sec.} - 1\text{N}^{\circ} \text{ outlet}$$

For Annex Front Roof

$$\text{Flow / Outlet} = 45.6 \times 1.33 \times 0.0139 = 0.84 \text{ Lt/Sec.} - 1\text{N}^{\circ} \text{ outlet}$$

For Car Park

$$\text{Area} = 238.7 \text{ m}^2$$

$$\text{Rainwater Flow} = 238.7 \times 0.0139 = 3.32 \text{ Lt/Sec.}$$

For Paved Area

$$\text{Area} = 8.40 \text{ m}^2$$

$$\text{Rainwater Flow} = 8.40 \times 0.0139 = 0.12 \text{ Lt/Sec.} - \text{To } 4\text{N}^{\circ} \text{ Areas}$$



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2.0 - FOUL DRAINAGE

2.1 - DESIGN DATA

BASED ON BS EN 752:2008 - SYSTEM III

DISCHARGE RATES	WASH BASIN	= 0.30 Lt/Sec.
	Shower	= 0.40 " "
	BATH	= 1.30 " "
	WC - G/LT	= 1.50 " "
	KITCHEN SINK	= 1.30 " "
	W/MACHINE	= 0.60 " "
	DISH WASHEN	= 0.20 " "

$$\text{Flow Rate} = Q_{\text{DW}} = K\sqrt{ED_0} \quad K = 0.50 - \text{FOR DWELLINGS}$$

2.2 - SVP USAGE

SVP TYPE 1

$$\begin{aligned} \text{BATH} &= 1.30 \\ \text{WC} &= 1.50 \\ \text{BASIN} &= 0.30 \end{aligned}$$

$$= 3.10 \text{ Lt./Sec.}$$

$$\therefore Q_{\text{DW}} = 0.5\sqrt{3.1} = 0.88 \text{ Lt./Sec.}$$

$$\therefore Q_{\text{max}} = 1.50 \text{ Lt./Sec. FOR W.C.}$$

SVP TYPE 2

$$\begin{aligned} 1\text{N}^{\circ} \text{ WC} &= &= 1.50 \\ 1\text{N}^{\circ} \text{ BASIN} &= &= 0.30 \\ 1\text{N}^{\circ} \text{ SHWR} &= &= 0.40 \\ 2\text{N}^{\circ} \text{ KIT. SINK} &= 2 \times 1.30 &= 2.60 \\ 2\text{N}^{\circ} \text{ W. MACHINE} &= 2 \times 0.60 &= 1.20 \\ 2\text{N}^{\circ} \text{ D. WASHEN} &= 2 \times 0.20 &= 0.40 \end{aligned}$$

$$= 6.40 \text{ Lt./Sec.}$$



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$$\therefore Q_{WW} = 0.5 \sqrt{6.40} = 1.27 \text{ Lt/Sec.}$$

$$\therefore Q_{max} = 1.50 \text{ Lt/Sec. For W.C.}$$

SVP TYPE 3

3 ^{NO} WC	=	3 x 1.50	=	4.50
3 ^{NO} BASIN	=	3 x 0.30	=	0.90
2 ^{NO} SINK	=	2 x 0.40	=	0.80
1 ^{NO} BATH	=		=	1.30
1 ^{NO} K. SINK	=		=	1.30
1 ^{NO} W. MACHINE	=		=	0.60
1 ^{NO} D. WASHER	=		=	0.20
				<u>9.60 Lt/Sec.</u>

$$\therefore Q_{WW} = 0.5 \sqrt{9.60} = 1.55 \text{ Lt/Sec}$$

$$Q_{max} = 1.55 \text{ Lt/Sec.}$$

SVP TYPE 4

1 ^{NO} K. SINK	=	1.30
1 ^{NO} W. MACHINE	=	0.60
1 ^{NO} D. WASHER	=	0.20
		<u>2.10 Lt/Sec.</u>

$$Q_{WW} = 0.5 \sqrt{2.10} = 0.73 \text{ Lt/Sec.}$$

$$Q_{max} = 1.30 \text{ Lt/Sec - For Kitchen Sink}$$



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3.0 - PIPE SIZING - SURFACE WATER

From RWP1 to RWP2 - Max. Flow = 0.84 Lt/Sec.

" RWP2 to RWP3 - Max. Flow = 0.84 + 0.96 = 1.80 Lt/Sec

" RWP3 to IC2 & MH1 - Max Flow = 0.84 + (2 x 0.96) = 2.76 Lt/Sec -

" RWP4 to IC3 - Max. Flow = 0.35 Lt/Sec.

" IC3/RWPS to IC4/RWPG - Max. Flow = 0.35 + (2 x 0.96) + (4 x 0.12) = 2.75 Lt/Sec.

" IC4 to MH1 - Max. Flow = 2.75 Lt/Sec.

" MH1 to MH2 - Max. Flow = 2.76 + 2.75 + 3.32 = 8.83 Lt/Sec.

Provide - An OSMIA DRAIN 110φ FOR ALL FLOW RATES LESS THAN 6.52 Lt/Sec. FOR A 1:100 FALL AND 160φ FOR A 1:150 FALL FOR GREATER FLOW RATES.

4.0 - PIPE SIZING - FOUL WATER

For SVP TO FIRST IC - Max. Flow = 1.55 Lt/Sec. - 110φ OSMIA DRAIN @ 1:80 FALL

From IC5 TO IC7 - Max. Flow = 1.55 + 1.30 = 2.85 Lt/Sec. - 110φ OSMIA DRAIN @ 1:80 FALL

" IC7 TO IC8 - " " " = 2.85 + 1.50 + 1.50 = 5.85 Lt/Sec. - 110φ " " "

" IC8 TO IC9 - " " " = 5.85 + 1.50 + 1.50 = 8.85 Lt/Sec - 160φ OSMIA DRAIN @ 1:80 FALL

" IC9 TO IC10 - " " " = 8.85 + 1.50 = 10.35 Lt/Sec - 160φ " " "

" IC10 TO IC11 - " " " = 10.35 + 1.50 + 1.50 = 13.35 Lt/Sec. - 160φ " " "

" IC11 TO IC12 - " " " = 13.35 + 1.5 = 14.85 Lt/Sec - 160φ " " "

" IC12 TO IC13 - " " " = 14.85 + 1.5 + 1.5 = 17.85 Lt/Sec - 160φ " " "

" IC13 TO MH2 - " " " = 17.85 + 1.5 + 1.5 = 20.85 Lt/Sec - 225φ ULTRARIB 1:150 FALL

" MH2 TO EXTG - " " " = 20.85 + 8.83 = 29.68 Lt/Sec - 225φ " " "

Provide - EITHER 160φ OSMIA DRAIN AT 1:80 FALL OR 225φ ULTRARIB AT 1:150 FALL AS NOTED