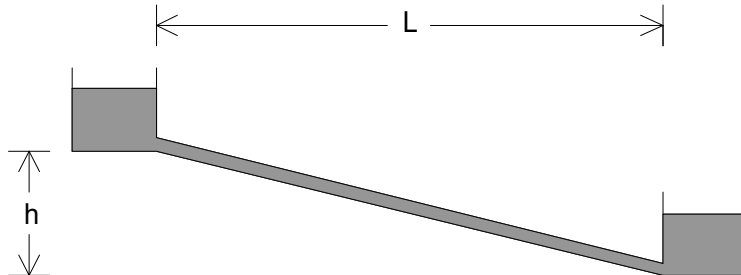


Project 3058 - Church Ave, Middleton				Job no. 3025	
Calcs for SW Sewer				Start page no./Revision 1	
Calcs by WSS	Calcs date 10/07/2026	Checked by CB	Checked date 10/07/2026	Approved by	Approved date

DESIGN OF A SURFACE WATER DRAIN

TEDDS calculation version 1.0.04



Drain design details

Design flow rate $Q_{\text{design}} = 5.00 \times 10^{-3} \text{ m}^3/\text{s}$
 Length of the drain $L = 12.0 \text{ m}$
 Fall along length of drain $h = 0.100 \text{ m}$
 Gradient of drain $i = h / L = 0.008 \text{ (1 in 120)}$

(Library item Drain design details)

Minimum flow velocity $V_{\text{min}} = 0.750 \text{ m/s}$
 Minimum pipe diameter $D_{\text{min}} = 100 \text{ mm}$
 Surface roughness $k_s = 0.6 \text{ mm}$
 Mean hydraulic depth factor $m = 0.25$
 Kinematic viscosity of fluid $\nu = 1.31 \times 10^{-6} \text{ m}^2/\text{s}$

Using the Chezy equation

Constant $c = 56$
 Diameter of pipe required $D = ((Q_{\text{design}}^2 \times 16) / (\pi^2 \times m \times c^2 \times i \times 1 \text{ m/s}^2))^{0.2} = 91 \text{ mm}$
 Nearest pipe diameter $D_{\text{chezy}} = 100 \text{ mm}$
 Flow velocity using Chezy $V_{\text{chezy}} = c \times \sqrt{(m \times D_{\text{chezy}} \times i \times 1 \text{ m/s}^2)} = 0.808 \text{ m/s}$

Using the Eschritt equation

Diameter of pipe required $D = (Q_{\text{design}} \times 1000 \times \sqrt{(1 / i) / 0.00035 \text{ m}^3/\text{s}})^{0.382} \times 1 \text{ mm} = 96 \text{ mm}$
 Nearest pipe diameter $D_{\text{eschritt}} = 100 \text{ mm}$
 Flow velocity using Eschritt $V_{\text{eschritt}} = 26.738 \times (D_{\text{eschritt}} / 1 \text{ mm})^{0.62} \times 1 \text{ m/s} / (\sqrt{(1 / i) \times 60}) = 0.707 \text{ m/s}$

Using the Colebrook-White Equation for pipe running full and partially full

Design pipe diameter $D_{\text{design}} = \max(D_{\text{chezy}}, D_{\text{eschritt}}, D_{\text{min}}) = 100 \text{ mm}$
 Constant $Z = \sqrt{(2 \times (g_{\text{acc}} / 1 \text{ m/s}^2) \times (D_{\text{design}} / 1000 \text{ mm}) \times i)} = 0.128$
 Flow velocity $V_{\text{full}} = -2 \times Z \times \log((k_s / (3.7 \times D_{\text{design}})) + ((2.51 \times \nu) / (D_{\text{design}} \times Z \times 1 \text{ m/s}))) \times 1 \text{ m/s}$
 $V_{\text{full}} = 0.697 \text{ m/s}$
 Flow rate running full $Q_{\text{full}} = V_{\text{full}} \times \pi \times D_{\text{design}}^2 / 4 = 5.47 \times 10^{-3} \text{ m}^3/\text{s}$

PASS - Maximum flow rate is greater than design flow rate

From Hydraulics Research Tables 35 and 36

Depth as proportion of D $x = 0.753$
 Flow velocity at design flow rate $V_{\text{design}} = 0.788 \text{ m/s}$

PASS - Design velocity is greater than 0.750 m/s