

# StormCalc

## Help and Operating Instructions

### Overview

The programme is designed to allow the user to input surface water drainage flows based on the location of the project. Other sundry flows can also be input to any branch of the system.

The system automatically adds an allowance for infiltration based upon the branch diameter and branch length. The user can select the country location and county location from drop down lists. The storm return period is also selected from a drop down list. The combination of county location and return period automatically provides the user with the rainfall intensity for any given time period from 5 minutes to 10 hours. The initial time of entry is set at 5 minutes and the time of concentration for all the following manholes is calculated automatically based on the time of flow from manhole to manhole. This time is based on the velocity of the flow, which in turn is based on the pipe size, pipe gradient and quantity of water in the pipe.

The flow into a manhole is automatically calculated when the user inputs the length and width of the area that discharges into the manhole. This combined with the time of concentration creates the water flow into the manhole in litres per second.

Pipe materials can be selected from a list for each branch of the system together with the pipe condition. From these two user defined selections a pipe roughness coefficient is automatically generated. Selecting the pipe type automatically controls the pipe conditions applicable to the selected pipe material.

The user can select the manhole numbering system they require and input a manhole number for the start of each branch. The manhole shape can be selected by the user and based upon the pipe diameter and the pipe depth a minimum manhole size will be automatically selected. The user can select the manhole cover level and the invert level of the first manhole in the system. The invert level of all other manholes will be selected automatically based on the branch gradients and pipe sizes. The system is designed as a level soffit system.

The distance between the manholes is input by the user together with the branch gradient. The gradient is input as a percentage and a '1 in ?' gradient is automatically generated. The fall between the manholes is also automatically generated together with the invert level of the downstream manhole in the system.

In addition the full bore capacity of the pipe is automatically generated together with the full bore velocity in the pipe. Using the probable flow that has been generated the depth of flow is automatically generated together with the proportional capacity and the probable flow velocity.

By adjusting the pipe gradients and the pipe diameters the user can maintain a probable flow velocity above the minimum self cleansing velocity and maintain a probable depth of flow below the maximum recommended for surface water drainage systems.

# Help and Operating Instructions

## Worksheet tabs

The programme contains a number of worksheet tabs, these are named 'Help', 'Cover sheet' and 'SW'

**'Help' tab -** 'Help' tab contains the Help and Operating instructions for the programme

**'Cover Sheet' tab -** The 'Cover Sheet' tab contains the cover sheet template for the programme print out.

**'SW' tab -** The 'SW' sheet tab contains the main part of the programme.

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## **Inputting data**

**Only place data in boxes marked in green**

**Runoff Material -** The runoff material is selected by the user from a drop down list. By selecting a runoff material the user generates a runoff factor which is applied to the water flow. This factor varies from around 0.85 for hard surfaces such as asphalt to 0.15 for permeable surfaces such as sandy soils.

**Sundry flows -** If the drainage system is a combined system any foul flows can be calculated using a foul drainage programme and input into the combined system using the sundry flows section of this programme.

**Length -** The user should input the length that forms one side of the area connected to the manhole.

**Width -** The user should input the width that forms the other side of the area connected to the manhole.

**Pipe material -** The pipe material for each branch can be selected from a drop down menu. Where the pipe material is unknown a pipe should be selected such that when the pipe condition is selected a roughness coefficient of 1.5 is generated.

**Pipe condition -** The pipe condition for each branch can be selected from a drop down menu. When the pipe material and pipe condition have been selected the roughness coefficient will be generated automatically. The available pipe conditions vary automatically depending on the type of pipe selected. The total options are 'Adopted', 'Good', 'Normal' and 'Poor'. Where the network is to be adopted by an authority the 'Adopted' condition shall be selected.

**MH No. -** The user can input manhole numbers to suit their own requirements. The manhole number is a text field allowing a combination of letters and numbers to be input.

**MH shape -** The manhole shape for each branch can be selected from a drop down menu. The manhole shape can either be circular or rectangular.

**MH size -** The minimum manhole size is generated automatically by the programme based upon the branch pipe size and the manhole depth.

**Cover level -** The manhole cover level is user input and is defined in metres. The level can be defined in upto three decimal places.

**Invert level -** Only the first manhole invert level should be input by the user. All other invert levels are automatically generated by the programme.

**Manhole depth -** The manhole depth is automatically generated by the programme. If the manhole depth is too shallow ie the pipe cover is less than 600mm a warning message will automatically pop-up when the user moves on to the next input cell.

**Distance to next MH -** The distance to the next manhole is input by the user and is defined in metres. The distance can be defined in upto three decimal places.

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**Gradient -** The gradient is user input as a percentage. The programme automatically generates an 'Imperial' type gradient in a 1 in ? format. If the gradient input creates a velocity that is too low (below 0.75 metres per second) a warning message will pop-up when the user moves along the row. Similarly if the gradient is too slack and the depth of flow becomes more than 0.5 a warning message will pop-up as the user moves along the row.

**Fall -** The fall is generated automatically by the programme and is the difference in the invert levels between the upstream and downstream manholes on the branch.

**Probable delivery -** The probable delivery is automatically generated by the programme. The probable delivery is created from the various flow inputs described above.

**Pipe diameter -** The pipe diameter is user input from a drop down menu for each branch. The pipe diameters available for selection in the menu are based on the pipe material that was previously selected.

**Full bore capacity -** The full bore capacity is automatically generated by the programme.

**Proportional discharge -** The proportional discharge is automatically generated by the programme.

**Full bore velocity -** The full bore velocity is automatically generated by the programme.

**Proportional depth -** The proportional depth is automatically generated by the programme. If the proportional depth increases to above 0.5 a warning message will automatically pop-up.

**Design flow velocity -** The design flow velocity is automatically generated by the programme. If the design velocity drops below 0.65 metres per second a warning message will pop up.

**Backdrop -** The user should select whether or not the manhole requires a Backdrop. The selection is made from a drop down menu.

**Backdrop depth -** The backdrop depth is defined by the user in metres. The level can be defined in upto three decimal places. The backdrop should be measured from the upstream pipe soffit to the outgoing downstream soffit.

**Time of Concentration -** The time of concentration is the time it takes for the water flow to reach any manhole in the system, including the initial time of entry. The time of concentration is based on the initial time of entry plus the time of the flow down the system to the manhole in question. The initial time of entry is selectable from a drop down menu. The initial time of entry is dependant on the surface area to be drained, the gradient of the drained area and the intensity of the storm. With a more intense storm there will be a shorter initial time of entry.

**Rainfall Intensity -** The rainfall intensity varies with storm duration. The shorter the duration of the storm the more intense the storm. The rainfall intensity also varies with the frequency of the storm. When the water flow first enters the drainage system the rainfall intensity will be at its greatest.

**Storm frequency -** The more frequent the storm the less intense will be the storm. The programme includes data on storm frequencies varying from once per year to once in 100 years. The storm frequency is decided at the start of each project by the governing authority.

# **Help and Operating Instructions**

## **Creating an additional branch**

To create an additional branch press "Control+C" this activates a macro which will add a new line below the existing line. To add a further line press "Control+C" again.

## **Removing a branch**

To remove a branch press "Control+D" this activates a macro which will remove the last branch. To remove a further branch press "Control+D" again. It is not possible to remove the first 2 lines of the programme and a message will appear stating 'Do not remove this row' if the user tries to remove the first two rows using the "Control+D" macro.

## **Creating an additional sub-branch system**

Where a system has a number of branches that are connected to the main system via a number of sub-branches it will be necessary to create additional branch systems.

To create a sub-branch system the user should press "Control+A". This activates a macro which will add a further two blank lines to the 'SW' sheet and then copy the first two lines of the programme to create the start of a new sub branch system. Always complete a branch system before starting a new section in the network. Extra branches can be added to the new sub-branch system by using the "control+C" macro as above. The "control+D" macro can be used to remove the blank lines between sub-branch systems as well as removing rows within a branch system.

## **Setting the print area**

To set the print area of the "SW" sheet press "Control+P" this activates a macro which will set the print area ready for printing.