

# SoakCalc (SW)

## **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. The user may then size a suitable soakaway for the predicted flows.

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.

As the programme is designed mainly for sizing soakaways only 10 lengths of drainage are permitted between the head of the drain and the soakaway.

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Once the drainage has been sized based upon an initial 5 minute time of concentration a 600 minute time of concentration should be entered into the programme. This much longer time of concentration will give a far more severe test of the soakaway capability. (A shorter time should be used if required by the local authority or authority having jurisdiction.) Once the new time of concentration has been entered into the programme the user may transfer the necessary data to the 'soakaway' tab by use of a

The 'soakaway' sheet may be used by the user to select the type of soil in the area of the soakaway and the size of soakaway proposed. Multiple soakaways may also be used and the spacing of the soakaways may be selected from a drop down menu. Three different types of soakaway may be sized using this programme.

If a 'domestic' rubble filled soakaway is proposed the user can select the percentage of voids in the rubble fill and the programme will automatically indicate the size of soakaway necessary.

If a 'commercial' or 'local authority' soakaway is proposed the user can select the number, diameter and depth (below invert) of the soakaway. The programme will automatically calculate the time to 'half empty' the soakaway, this should be less than 24 hours.

Where the ground near the surface of the project has low porosity a third type of soakaway may be necessary. In this type of soakaway a bore hole is created below the soakaway. The purpose of the borehole is to allow the water to soak into a more porous layer of soil at a greater depth. This type of soakaway should only be used where it is permitted by the water authority (or authority having jurisdiction).

The programme allows the user to set the diameter of the borehole from a drop down list. The user can further set the soil type and permeability surrounding the borehole. The user can also set the depth of the permeable part of the borehole liner.

The programme is designed to comply with Building Research Digest 365.

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## **Worksheet tabs**

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

**'Soakaway'** The 'Soakaway' tab contains one of the two main parts of the programme. In this section of the programme the user can size the soakaway.

**'SW' tab -** The 'SW' sheet tab contains the second main part of the programme. This section of the programme is used to size the drain from the collection area to the soakaway and to set the incoming flow rate for the soakaway.

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## **Inputting data**

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

### **SW tab**

**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 1.00 for a roof to 0.15 for permeable surfaces such as sandy soils.

**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 0.7 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 0.7 a warning message will pop-up as the user moves along the row and the text will change to red.

**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.

To establish the size of the soakaway the time of concentration should be set to 600 minutes (or shorter if required by the authority having jurisdiction). This time will provide a long duration low intensity storm which is a severe test for a soakaway.

**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.

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**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.

**Infiltration -** The programme automatically accounts for infiltration based on the pipe length and diameter.

**Total infiltration -** The programme automatically calculates the total infiltration for the

### **Soakaway tab**

**Project -** The user should input the name of the project.

**Location -** The user should input the project location.

**No. of soakaways -** The user should input the number soakaways proposed.

**Spacing of soakaways -** The user should input the spacing of the soakaways from the drop down list. Where only one soakaway is proposed the spacing should be set to 0.

**Water inflow -** The programme automatically transfers the water inflow data to the soakaway sheet when the macro is activated.

**Soil type -** The user should select the soil type from the drop down menu.

**Soil permeability -** The user should select the soil permeability from the drop down menu. The soil permeability range offered to the user is based upon the soil type previously selected.

**Safety factor -** The programme uses a safety factor of 2.

**Proposed diameter -** The user should select the proposed soakaway diameter from the drop down list.

**Proposed depth -** The user should input the soakaway depth (below the invert) in metres.

**Cap. reduction factor -** The programme automatically selects the capacity reduction factor based upon the spacing of the soakaways. Where only one soakaway is proposed the factor will be 1.

**Storage vol. provided -** The programme automatically calculates the storage volume provided.

**Storm duration -** The programme automatically inserts the storm duration from the 'SW' sheet.

**Storage vol. required -** The programme automatically calculates the storage volume required.

**% voids -** The user should input the percentage of soakaway voids based upon the type of hardcore or aggregate proposed. The percentage of voids should normally be in the range 20 to 30 percent.

**Soakaway vol. required -** The programme automatically calculates the soakaway volume required.

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**Empty soakaway time -** The programme automatically calculates the time required to half empty the soakaway. This is an important factor as it allows the soakaway to have sufficient capacity to hold storms on two successive days. This is a requirement of BRE Digest 365. This figure should be less than 24 hours. If it is any longer the text will change from black to red.

**Borehole liner dia. -** The user should select the borehole liner diameter from the drop down list. Where no borehole is proposed the diameter should be set to 0.

**Borehole perm. length -** The user should input the permeable length of borehole liner to suit the ground conditions.

**Soil type -** The user should select the soil type from the drop down menu.

**Soil permeability -** The user should select the soil permeability from the drop down menu. The soil permeability range offered to the user is based upon the soil type previously selected.

### **Creating an additional branch**

To create an additional branch on the 'SW' sheet press the "Add Branch" button this activates a macro, which will add a new line below the existing line. To add a further line press the "Add Branch" button again. As this programme is for designing soakaways and not surface water drainage networks the programme will only allow 10 branches to be connected to the soakaway. If a larger network is required this programme should be used in conjunction with a copy of the 'StormCalc' programme.

### **Removing a branch**

To remove a branch on the 'SW' sheet press the "Remove Branch" button. This activates a macro, which will remove the last branch. To remove a further branch press the "Remove Branch" button again. The macro will not permit the removal of the first two lines on the sheet. If the user attempts to remove the first two lines a message will appear stating that the rows should not be removed.

### **Transferring data from the 'SW' sheet to the 'Soakaway' sheet.**

When the connecting pipework has been sized using the 'SW' sheet the user should press the "Transfer Data" button. This activates a macro that transfers the necessary data from the 'SW' sheet to the 'Soakaway' sheet. Where the project contains more than one soakaway system a further soakaway can be created. Each time the "Transfer Data" button is activated it will transfer the relevant data to the lowest line on the 'Soakaway' sheet.

### **Creating an additional soakaway**

To create an additional soakaway on the 'Soakaway' sheet press the "Add Soakaway" button. This activates a macro which will add a new line below the existing line. Before creating any further soakaways the user should always transfer the necessary data from the 'SW' sheet.

### **Removing a soakaway**

To remove a soakaway on the 'Soakaway' sheet press the "Delete Soakaway" button. This activates a macro which will remove the last line on the 'soakaway' sheet. The macro will not permit the user to remove the first line and a message will appear stating that the row should not be removed.

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## **Setting the print areas**

To set the print area of the "SW" sheet press the "Set Print Area" button. This activates a macro, which will set the print area ready for printing.

To set the print area of the "Soakaway" sheet press the "Set Print Area" button. This activates a macro which will set the print area ready for printing.