

PumpCalc

Help and Operating Instructions

Overview

The programme is designed to allow the user to design a pumping station and pumped discharge main for submersible pumps. The programme can also be used to check the sizing of an existing system. Once a drawing of the discharge piping has been prepared the network should be divided into sections. Each section should be identified with a start and finish number and the length of each section should be measured. It is likely that only a few sections will be required for the pumped discharge main depending on the number of pumps used in the pumping sump. Having identified the pipe sections that join the pumps to the discharge point the user should input the pipe sizes proposed for each section, the length of each section and the number and type of fittings. On the "Pumping Station" sheet the user should input the total incoming flow and the flow rate for each pump in litres per second. The user should also input the cover level of the sump the pump stop level and the pumping main discharge level. The user should further input the proposed maximum number of pump starts per hour required.

This number should be no greater than the maximum proposed by the selected pump manufacturer. The user should input the maximum number of pumps that can operate simultaneously. (This may not be the same as the total number of pumps in the sump). The user should then input the proposed or existing size of the pumping sump. The height of the sump should be the distance between the start level of the first pump and the stop level of the pumps. The programme will calculate the minimum size of pumping sump required and calculate the actual number of pump starts per hour per pump. The proposed or existing sump must be larger than the calculated sump and the actual number of pump starts per hour must be less than the calculated number of pump starts per hour.

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Worksheet tabs

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

'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.

'Pumping Main' tab - The 'Pumping Main' sheet tab contains the main part of the programme.

'Pumping Station' tab - The 'Pumping Station' tab contains a sub programme that allows the user to input various features of the pumping station and the programme automatically calculates the minimum size of the pumping sump.

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Inputting data

Only place data in boxes marked in green

Fluid Type - The fluid type should be selected from the drop down menu. Where foul water is selected the water velocity should not be less than 1.5 metres per second for horizontal piping and 2.5 metres per second for vertical piping. In the case of storm water or clean water there is no minimum water velocity but a velocity of around 0.8 metres per second should provide an economic solution.

Pipe Reference No. - In the pipe reference number column the user should input the start and end numbers for the pipe section being described. These numbers should match the numbers shown on the drawing that indicates the pumping network.

Pipe Material - The pipe material for the section of the pump discharge network should be selected from the drop down menu. The programme allows the user to select a different pipe material for each section of the system. This can be particularly useful when checking an existing system or a when the user is adding to or modifying an existing system. Once the pipe material has been selected the programme automatically selects the correct friction coefficient for the material.

Pipe diameter - The pipe size for the section of the pump discharge network should be selected from the list that is presented to the user. The list presented will be automatically selected by the programme based on the pipe material that is selected. The programme will automatically select an internal pipe diameter based on the nominal diameter that is selected by the user. The programme uses the internal pipe diameter to calculate the pipe friction and water velocity.

Pipe flow direction - The pipe flow direction should be selected from the drop down menu. This feature is particularly important for a foul water service as it defines the minimum flow velocity in the foul water piping.

Flow rate - The user should input the flow rate in litres per second.

Velocity - The programme will automatically calculate the water velocity in metres per second. If the calculated velocity is too low the colour of the velocity text will automatically change from black to red.

Pipe length - The user should input the length of the section as measured from the network drawing.

Fittings Length - The fittings length is automatically generated by the programme and represents the equivalent length of each fitting multiplied by the number of each type of fitting. The figure also includes the equivalent length of each type and number of valves included in the length.

Total pipe Length - The total pipe length is automatically generated by the programme and represents the total of the measured pipe length and the equivalent length of the fittings and valves included in the section.

Head Loss - The head loss is automatically generated by the programme and represents the loss of head due to friction along the section of pipe and through any valves and fittings.

Total Head Loss - The total head loss is automatically generated by the programme and represents the sum of the head losses in each section of the pump discharge network to that point.

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Static Head Required - The static head required should be input by the user for the first section only. The programme will show the static head required for all other pipe sections.

Type of elbow - The user should select the type of elbow or bend from the drop down list. Mitre fabricated bends will only be necessary if larger diameter glass fibre bends are required. Generally if copper or polybutylene pipes are specified standard bends should be selected.

Number of elbows - The user should input the number of elbows in the section of the network.

Type of Tee - The user should select the type of tee from the drop down list. Where a increasing size tee is required a standard tee should be specified together with an enlargement that represents the change in pipe diameter.

Number of tees - The user should input the number of tees in the section of the network.

Enlargements & Contractions -

The user should select the type of enlargement from a drop down list. The 3/4, 1/2 and 1/4 figures represent the increase in pipe diameters. For example if a 150mm diameter pipe increases to 200mm diameter this will be represented by a 3/4 enlargement.

Type of valve - The user should select the type of valve from the drop down list. A globe valve should not be proposed unless flow control is required and under no circumstances should be proposed in a sewage discharge pipe.

Number of valves - The user should input the number of valves in the section of the network.

Number of gate valves - The user should input the number of gate valves in the section of the network. Where ball valves are specified these should be considered to be similar to gate valves and input as such for head loss purposes.

Number of check valves - The user should input the number of check valves in the section of the network.

Residual Head Required - The user should input the residual head required in the first pipe section. The programme will indicate the residual head required for all the other pipe sections. The residual head required can be regarded as a factor of safety and should be normally set at 10% of the static head.

Total Head Required - The programme automatically generates the total head required. This figure represents the minimum pump head required to operate the pumped discharge network correctly.

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Creating an additional section

To create an additional section press the "Add Row" button this activates a macro which will add a new line below the existing line. To add a further line press the "Add Row" button again.

Removing a section

To remove a section press the "Delete Last Row" button this activates a macro which will remove the last section To remove a further section press "Delete Last Row" again. The programme will not allow the user to remove the first two lines of the first pumping main.

Creating an additional Pumping Station

Where a project has a number of pumping stations it will be necessary to create additional pumping station pages. To create an additional pumping station press the "Add New Pumping Station" button this activates a macro, which will add a further Pumping Station below the first pumping station. The user can create as many pumping stations as necessary in this way.

Deleting a Pumping Station

Where the user wishes to remove a pumping station press the "Delete Last Pumping Station" button, this activates a macro, which will delete the last pumping station that was created. The user can delete as many pumping stations as necessary. The programme will not allow the user to delete the first pumping station template.

Creating an additional Pumping Main

Where a project has a number of pumping stations it will be necessary to create additional pumping mains. To create an additional pumping main press the "Add New Pumping Main" button, this activates a macro, which will add two blank lines and then copy the first two rows of the initial pumping main. The user can create as many pumping mains as necessary in this way.

Deleting an additional Pumping Main

Where the user wishes to remove an additional Pumping Main press the "Delete Last Pumping Main" button, this activates a macro, which will delete the last pumping main that was created. The user can delete as many pumping mains as necessary in this way. The programme will not allow the user to delete the first two rows of the pumping main template sheet.

Setting the print area for the "Pumping Main"

To set the print area for the "Pumping_Main" sheet the user should press the "Set Print Area" button, this activates a macro, which will fix the print area for the sheet and show the print preview.

Setting the print area for the "Pumping Station"

To set the print area for the "Pumping Station" sheet the user should press the "Set Print Preview" button, this activates a macro, which will fix the print area for the sheet and show the print preview.

