WaterCalc

Help and Operating Instructions

Overview

The programme is designed to allow the user to design a gravity water supply system based on the loading units connected to each branch of the system. The programme can also be used to check the pipe sizing of an existing system. Once a drawing of the piping network 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 measured. The user should then identify the index point of the system, this is normally the furthest point from the supply tank. (The starting point). Having identified the pipe sections that join the tank to the index point the user should input the pipe sizes proposed for each section, the length of each section and the number and type of fittings. The programme will advise the user if there is inadequate head available for any pipe section, allowing the user to increase the pipe size or sizes as necessary. The user will be advised of the residual head at the index point and by adjusting the pipe sizes the user can create the necessary residual head required at

The user should then repeat the exercise for all the other branches in the water supply network.

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Worksheet tabs

The programme contains a number of worksheet tabs, these are named 'Help', 'Cover sheet', 'WaterSupply' and 'Loading unit input'.

'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.

'Water Supply' tab -   The 'Water Supply' sheet tab contains the main part of the programme.

'Loading Unit Input' tab · The 'Loading unit input' sheet tab contains a sub programme that allows the user to calculate the total loading units for a particular section of piping.

Pipework velocities

It is suggested that the following table should be used for selecting the maximum velocities in the pipework. If the velocities are exceeded the type will change from black to red colour.

Location	Noise rating	Pipe material	
	NR	Metal- Copper, S/S, G/S	Plastic- UPVC, ABS, PE, Glass Fibre
Service duct, riser shaft, plant room	50	2.0	2.5
Service enclosure, ceiling void	40	1.5	1.5
Circulation area, entrance corridor	35	1.5	1.5
Seating area, lecture/meeting room	30	1.25	1.25
Bedroom	25	1.0	1.0
Theatre, cinema	20	0.75	0.75
Recording studio	<20	0.5	0.5

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

Water Supply tab -

Service -   The user should identify the type of service that is being calculated.

Water temperature - The user should input the temperature of the service in degrees
The temperature of the water will automatically determine the density of the water and amend the
flow rate figure. 'Hot' water is less dense than 'cold' water and for any given loading unit figure cold

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 water supply network.

Pipe Material -   The pipe material for the section of the water supply network should be
selected from the drop down menu. The progamme 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 size -   The pipe size for the section of the water supply 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.

Type of use -   The type of use is selected from a drop down menu. There is a choice of
3 categories 'Low', 'Medium' and 'High'. Low is used for domestic situations and small offices where
appliance use is infrequent. Medium is used for larger buildings such as hospitals, schools, restaurants
and hotels where appliance use is more frequent. High is used for buildings such as shopping malls,
theatres, concert halls and sports events locations.

Pipe Location -   The pipe location for the selected pipe should be selected from the drop
down menu. The programme allows the user to select a different pipe location for each section of the
system. Each type of location has a suggested maximum velocity based on the table below. If a water
velocity is proposed that exceeds the maximum for the location the figure in the 'velocity' cell will
change from black to red.

Loading Units -   Each appliance is allocated a number of loading units based on the
appliance type, it's capacity, flow rate, period of use and frequency of use characteristics. The user can
use the loading unit input sheet to assist in calculating the number of loading units required for each
section of the network. Once the loading units have been input the programme will automatically
calculate matching flow rate in litres per second and the water velocity in metres per second.

Flow Rate -   The flow rate is automatically calculated by the programme based on the
loading units input.

Velocity -   The water velocity is automatically calculated by the programme and is
based on the loading units and the pipe size.

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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

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 water supply network to that point.

Head Available - The head available should be input by the user for the first section only. The programme generates the head available for all other 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 3/4 tee is specified this represents a tee where the outgoing pipe is reduced to 3/4 of the size of the incoming pipe.Similarly where a 1/2 tee is specified this represents a tee where the outgoing pipe is 1/2 the size of the incoming pipe.

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 or contraction from a drop down list. The 3/4, 1/2 and 1/4 figures should be used in the same way as the figures described above for the tees. The abrupt entrance should be used when water is passing from a tank to a pipe or from a pipe to a tank.

Type of valve - The user should select the type of valve from the drop down list. A globe should not be proposed where limited head is available as there is considerable head loss through a globe valve. Where basin taps are specified these should be considered to be angle valves.

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. Check valves should not be located in pipe sections where limited head is available, as there is considerable head loss through a check valve.

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Start level of section -   The user should input the start level of the pipe section. In this way the user will be able to check that the available head is always above zero. It is very important that the head in the system should never drop below zero as this could lead to air locks and possibility of contamination if there is a pipe leak in a section where the head is below zero.

Static head remaining -   The programme automatically generates the static head remaining at the end of each section. The programme will alert the user if the remaining static head falls below 0.1 metres.

Creating an additional section

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

Removing a section

To remove a section press the "Remove Pipe" button this activates a macro which will remove the last section in both the "WaterSupply" and "Loading unit input" sheets. To remove a further section press the "Remove Pipe" again. The programme will not allow the user to remove the first line in the "Water Supply" and "Loading unit input" sheets.

Creating an additional branch within the network

Where a network has a number of branches it will be necessary to create additional water supply branches. To create an additional branch press the "Add Branch" button. This activates a macro, which will add two blank lines on both the "Water Supply" and "Loading unit input" sheets. The macro will also add the first row of the new branch on both sheets. The user should ensure that a branch has been completed before starting a new branch.

Loading Unit Input

The programme will automatically create a loading unit input line for each pipe length in the "Water Supply" sheet. Where a pipe has no connected appliances the number of appliances should be set to zero in the matching loading unit input line.

Setting the print area

To set the print areas of the "Input" sheets press the "Set Print Area" button. This activates a macro, which will set the print areas ready for printing.