

Network Design

The **Network Design Wizard option** allows a network of Pipes and or Channels to be given an initial sizing to ensure that they meet the requirements specified at the Network Design Criteria stage. In addition to this, Manholes can also be sized during this process.



Use of Auto Size is optional, if the levels and sizes are known they can be entered directly.

Initiating a Network Design

The Network Design Wizard can be accessed in one of three ways:

- Using the button on the Preliminary Sizing Ribbon
- Right clicking a Flow Path in the tree view and selecting Network Design Wizard
- Clicking the Network Design Wizard button in the Connections form.

Network Design is done using the Network Design Wizard, which allows you to complete the sizing in a series of simple steps as seen below. The results of the network design will not be applied until the end of the wizard; the user can cancel out at any time to discard the changes.

Select Flow Path

Here you can specify which flow path you wish to size using the drop down box. The connections within that path will be shown in a table. Final edits can be made here before the sizing continues.

Additionally, if the current flow paths are not suitable (or none are available), a new **Flow Path** can be created using the Add Flow Path button. This will allow you to create a path as usual; when complete, the sizing wizard will re-open with the new path.

Some validation will be performed when the Next button is clicked, to ensure the connections can be sized. If any errors are found during this step, suitable warnings will be presented within the grid, and can be corrected before continuing. Any changes made at this step will be committed only if the wizard is completed successfully.

Inflows leading into the selected path (including Branch lines) will also have some validation performed on them. Warnings generated from this will be present in the Name column of the table. The wizard must be closed in order to resolve any errors on Inflows.

Network Design Wizard

Select Flow Path

Specify the flow path you wish to complete the network design on. The Connections within the path will be shown below for reference.

Select Flow Path:

Name	Length (m)	Connection Type	Slope (1:x)	Manning's n	Colebrook-White Roughness	Diameter / Base Width (m)	Upstream Cover Level (m)	Upstream Invert Level (m)	Downstream Cover Level (m)	Downstream Invert Level (m)	Auto Size
Standard Pipe	41.04	Pipe	18.516		0.6	375	569.23	567.510	567.02	565.293	<input type="checkbox"/>
Standard Pipe (2)	53.74	Pipe	18.913		0.6	375	567.02	565.293	564.18	562.452	<input type="checkbox"/>
Standard Pipe (3)	41.72	Pipe	50.171		0.6	525	564.18	562.452	563.35	561.620	<input type="checkbox"/>
Standard Pipe (4)	8.71	Pipe	33.769		0.6	525	563.35	561.620	563.18	561.362	<input type="checkbox"/>

Enter Flow Criteria

The **Flow Criteria** is the set of parameters describing the flow into and along the network.

Enter Flow Criteria

Specify the flow criteria to be used to size the flow path and its network.

Peak Flow Calculation: Rational Method

Create New From Library

FSR

Type	FSR
M5-60	18.0
Ratio R	0.400
Return Period (years)	25.0
Min. Time of Concentration (mins)	5
Max. Travel Time (mins)	30

Previous Next Cancel

Method [Help](#)

Peak Flow Calculation

Select the calculation method to be used when sizing the pipes/channels. Choose from:

Rational Method : Flow = Rainfall Intensity x Total Area + Total Base Flow

(UK) Modified Rational Method: Flow = Rainfall Intensity x Total Area * Cr(1.3) + Total Base Flow

Methode de Caquot: Flow is calculated via the Methode de Caquot equations which are considerably more involved than the Rational Method or (UK) Modified Rational Method equations. The method's inputs are the Caquot (Base and Advanced) parameters, selected Desbordes rainfall parameters and the Runoff Path Length and Catchment Slope of the inflows upstream of the pipes belonging to the auto-sized Flow Path. Further information can be found on the [Methode de Caquot](#) page.

Rainfall Source

When Rational Method or (UK) Modified Rational Method is selected from the Peak Flow Calculation list box the Rainfall Source list box lists the currently configured IDF curves and FEH, FSR, ARR and Desbordes rainfalls in the [Rainfall Manager](#). When autosizing pipes / channels the rainfall intensity will be retrieved from the selected rainfall source based upon the Travel Time for the pipe/channel.

When Methode de Caquot is selected from the Peak Flow Calculation list box the Rainfall Source list box lists only the Desbordes rainfalls configured in the Rainfall Manager.

In either case the parameters of the selected Rainfall Source are displayed below the Rainfall Source list box. In addition, if the Methode de Caquot is selected from the Peak Flow Calculation list box the Caquot Base Parameters and Use Shape Correction checkbox are displayed below the parameters of the selected Rainfall Source. To the right of the Base Parameters is a calculation button. Clicking on this displays a separate form which allows the user to modify the Advanced Caquot parameters which in turn recalculates the Base Caquot parameters shown on the Network Design Criteria form.

Minimum Time of Concentration

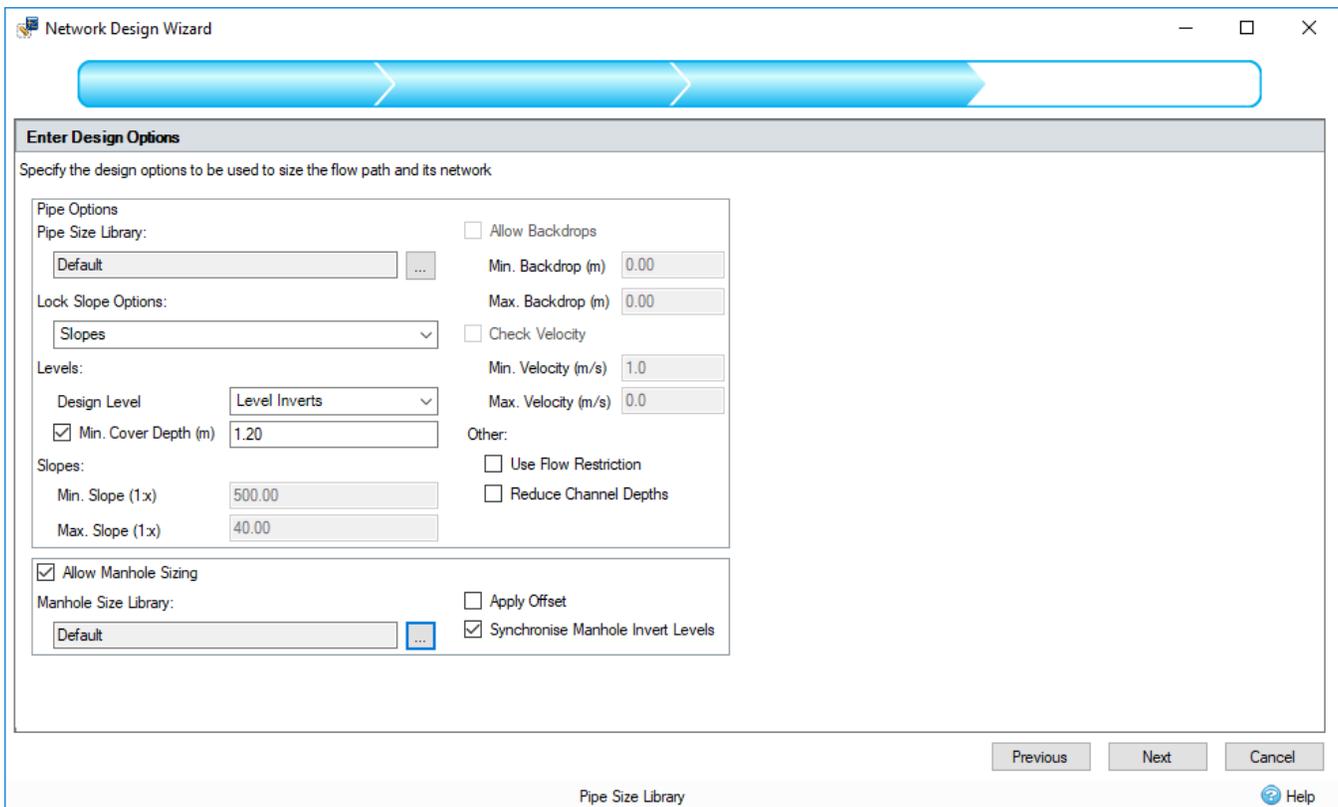
This is the minimum time that should be applied to each pipe's time of concentration. This is in effect applied to the head of each branch line to give an initial time of entry for the inflows.

Maximum Travel Time

This allows the maximum travel time down the system to be capped at the given value. This prevents the Intensity being used to size the pipe/channel reducing to low.

Enter Network Design Criteria

The **Network Design Criteria** is the set of parameters required to size pipes/channels along a given network.



Pipes Size Library

The **Pipe Size Library** is a sequential list of pipe diameters. New pipe libraries can be defined by clicking on the button next to the box.

Lock Slope Options:

None

Selecting this will not apply any locks to the Network Design beyond the Minimum and Maximum slope set further down.

Slope

This option will stop the Network Design from adjusting the slopes of the connections in the current path. This is useful for a mostly complete site, which only requires the diameters and levels of the pipes to be changed.

Slopes and Invert/Soffit Levels

These options will disallow the Slopes and the Invert or Soffit levels to be changed by the Network Design. Only the pipe sizes can be adjusted; the unlocked level will be adjusted as needed. i.e. for Slopes and Invert Levels, the soffits will adjust to accommodate any pipe size adjustments.

Levels:

Design Level

Choose Level Soffits (Crowns) or Level Inverts from the list box to design the system with Level Soffits (Crowns) or Level Inverts respectively.

Note: Level Soffits only applies to Pipes as Channel soffits are already aligned to the cover level.

Minimum Cover Depth

The desired depth from the pipe soffit/channel top to the cover level. When ground levels have already been input the program will warn the user when the desired cover to ground level has not been achieved.

When the option is turned on the auto size calculation will attempt to redesign the system and achieve the above cover where it is feasible. If individual connections have a Minimum Cover Depth value set, then these individual values take precedence for those connections. If this option is not turned on then the individual Minimum Cover Depth values per connection are ignored.

Note: Level Soffits only applies to Pipes as Channel soffits are already aligned to the cover level.

Slopes:

Minimum Slope

The minimum slope for a pipe/channel. This is desirable when the ground is flat or is sloping away from the pipes and minimum slopes are required to reduce excavation. This value is always used if limits are not set in the [Pipe Size Library](#) .

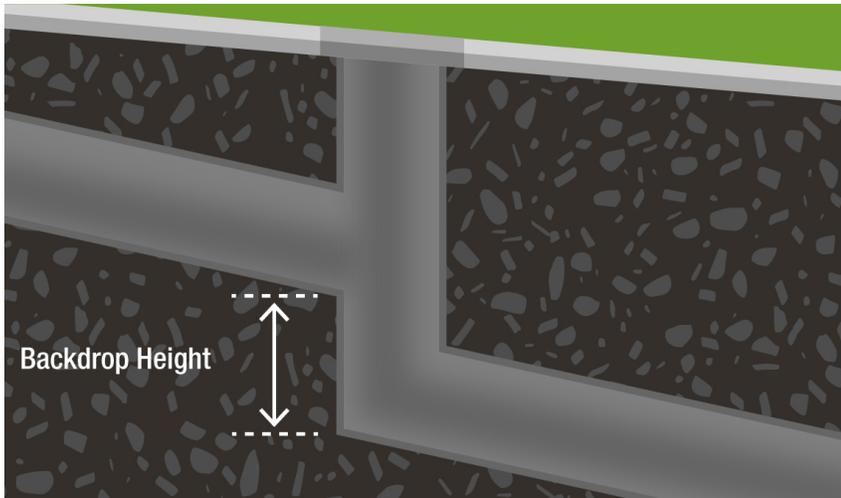
Maximum Slope

The desired maximum slope for a pipe/channel. This can be desirable to ensure that the pipes in place cannot become insensibly steep. This value is used if limits are not set in the [Pipe Size Library](#) but may be broken to meet other criteria, such as cover depths. In this case a warning is given at the end of the wizard.

Allow Backdrops:

When the option is turned on the auto size calculation will allow backdrops to be introduced where the backdrop is within the Min/Max range. A backdrop may be introduced when downstream connections are lower than an incoming pipe. A backdrop may also be introduced where a downstream cover level causes a steeper slope than is needed, in this scenario a backdrop is introduced only if the pipe size doesn't need to be increased.

A backdrop is measured from the desired connection level of the two connections, which be governed by the Design Level and then the connections type. I. e. Level soffits will mean soffits levels are considered unless one of the sections is a Channel, at which point the software would assume Level Inverts.



Minimum Backdrop

The minimum backdrop between two incoming pipes/channels. The program will remove any backdrop below this value when the Allow Backdrops option is turned on.

Maximum Backdrop

The desired maximum backdrop between two incoming pipes/channels. The program will reduce any backdrop greater than this value to the maximum when the Allow Backdrops option is turned on.

Check Velocity:

When the option is turned on the auto size calculation will attempt to redesign the system and achieve a velocity in the given range where it is feasible.

Minimum Velocity

The minimum velocity for a pipe/channel. The program will then choose a size and slope with sufficient capacity to give the required Full Bore Velocity.

Maximum Velocity

The desired maximum velocity for a pipe/channel. The program will attempt to select a size and slope with sufficient capacity that does not exceed the suggested Full Bore Velocity but this may be broken to meet other criteria, such as cover depths. In this case a warning is given at the end of the wizard.

Other:

Use Flow Restriction

When this checkbox is checked, the Network Design will use any non-zero design flows as the base flow for the corresponding connection.

Reduce Channel Depths

Checking this option allows the Network Design to reduce channel depth and height by considering incoming connections to the channel.

Allow Manhole Sizing:

When this option is turned on the Network Design will also attempt to size the junctions and the below fields will be enabled to configure this.

Manhole Size Library

The [Manhole Size Library](#) is a list of multiple categories relating to the size of the manholes in relation to the connection and depth. As well as being used to determine the ladder protrusion, landing and benching width needed for offsetting.

Apply Offset

Checking this option determines that offsets are required on any junction that meets the requirements. See [Manhole Auto Size Calculations](#) for more information on offsets and their requirements.

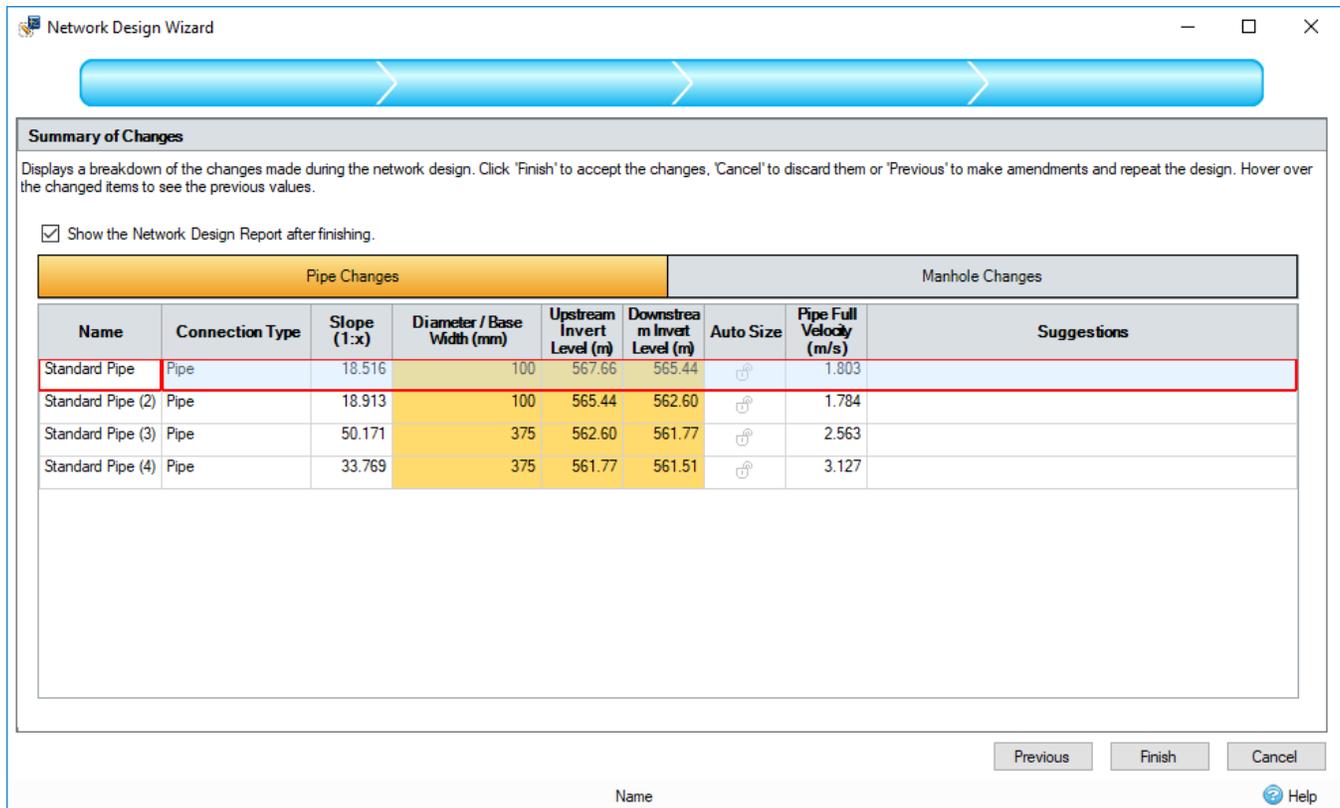
Synchronise Manhole Invert Levels

Checking this option will cause the program to automatically align the invert levels of the manholes in the selected Path with their lowest connection (incoming or outgoing). See [Synchronise Manhole Invert Levels](#) for more information.

Clicking Next then performs the [Auto Size Calculations](#) routine and if selected the [Manhole Auto Size Calculations](#) routine as well.

Summary of Changes

Once the Network Design has been completed, a summary screen will be displayed showing all the changes made.



Two Tabs will be visible, Pipe Changes displays the changes made to the Pipes and Manhole Changes displays the changes made to the manholes.

All changed values will be highlighted in the current highlight colour to easily distinguish them. Hovering over the highlighted cells will display the previous value in a tool tip.

From here, the changes can either be discarded by clicking on Cancel, Accepted by clicking Finish, or The sizing can be undone by clicking Previous, allowing the user to change the flow path or Network Design Criteria. After the user clicks Finish, the [Network Design Report](#) window may be opened, depending on the state of the relevant checkbox.