

# Connections

**Connections** are links between two elements of the site. They allow a Connection Type to be specified, which will impact the Time of Travel along the Connection and therefore impact the analysis.

The flow routing calculations done during the Analysis are described in [Analysis of Junctions and Connections](#).

The connections form allows all of the available connections in the phase to be viewed as a table. The spreadsheet then allows the Connection Type and other physical dimensions to be adjusted as required.

The columns displayed are effected by the Connection Types shown and can also be filtered using the [spreadsheet preferences](#) .

Name	Length (m)	Connection Type	Slope (1:x)	Manning's n	Colebrook-White Roughnes	Diameter / Base Width (m)	Upstream Cover Level (m)	Upstream Invert Level (m)	Downstream Cover Level (m)	Downstream Invert Level (m)
Standard Pipe	41.04	Pipe	18.516		0.6	375	569.23	567.510	567.02	565.293
Standard Pipe (2)	53.74	Pipe	18.913		0.6	375	567.02	565.293	564.18	562.452
Standard Pipe (3)	41.72	Pipe	50.171		0.6	525	564.18	562.452	563.35	561.620
Standard Pipe (4)	8.71	Pipe	33.769		0.6	525	563.35	561.620	563.18	561.362
Lagged Flow	94.41	No Delay								

**Change Template** - Provides you with the option to change the currently assigned templates for Connections.

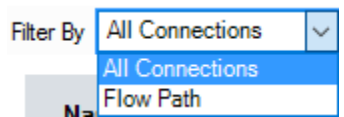
**Add To Templates** - Provides you with the option to add the currently selected Connection to the **Object Templates** library.

**Clear The Current Row** - Clears data in the current row and deletes the selected Connection.

**Clear All Connections** - Clears all data and deletes all Connections.

## Filtering the tables

The Filter By drop-down list allows the connections shown to be filtered:



- **All Connections** - Shows all connections.
- **Flow Path** - Shows the connections that make up the selected **Flow Paths**, and its associated **network** , in the order of flow. This view also allows the **Network Design** of the pipes and channels in that network.

## Spreadsheet Preferences

Fields can be turned on or off using the Spreadsheet Preferences form, which is accessed from the toolbar at the top of the form. The full set of columns available on both the Input and the Results spreadsheet are shown and can be turned on or off using the check boxes. These settings will be remembered between sessions.

## Network Design Criteria

Allows you to specify the network design criteria to be used to size the pipe/channels along the [Flow Path](#) and its [network](#).

## Network Design Wizard

When a [Flow Path](#) has been selected on the Filter, it is then possible to perform an Auto Sizing of the pipe/channels that form the [network](#) along the flow path. The calculations are completed based on the specified Network Design Criteria when the 'Auto Size' option is clicked. Full details can be found in the [Network Design](#) page.

## Network Design Report Pipe Sizing Report

A table displaying the results of an auto sizing calculation for a given flow path can be displayed, see [Network Design Report](#) for more information.

## Audit Audit

Toggling the audit button will highlight design errors for hydraulic connections.

**Slope** outside of the min and max slopes provided in the network design criteria are highlighted. This only occurs if the slopes are not locked in the network design criteria, and the slope limit being used is valid.

**Backdrops** outside of the min and max backdrops provided in the network design criteria are highlighted. This only occurs if the backdrop limit being used is valid, and the backdrop is non-zero. This is highlighted on the upstream end of the outgoing connection and the downstream end of the incoming connection.

**Downstream Invert Levels** less than the minimum of the connection is highlighted. This only occurs if the minimum is valid.

**Levels** that break cover will be highlighted. This only occurs if the Min cover depth option is checked in the [Network Design Criteria](#) and the minimum cover depth used is valid. The minimum cover depth used is the value in the network design criteria by default, this can be changed on a per connection basis within the connection form.

## Bypass Connections

These work like a standard hydraulic connection, but allow the flow not entering an inlet to be routed to an inlet on another Junction/SWC. Note: A bypass connection will not permit reverse flow as it is connected to an inlet.

These will be shown in *Italics* on the Connections form to highlight the fact they are a bypass connection.

## Inputs

### Name (Always Shown)

Name of the connection as shown on the plan view.

### From

The label of the item at the upstream end of the connection.

### To

The label of the item at the downstream end of the connection.

### Length (Always Shown)

Length of the connection. If in red - the length was defined by the user, otherwise, it was calculated using the Connections coordinates from the plan view.

### Connection Type (Always Shown)

Type of the connection:

- **No Delay** - Imposes no effect on the movement of water.
- **Lagged Flow** - Introduces a time delay on the movement of water based on the Time of Travel value entered. Velocity and Time of Travel columns are shown by default.
- **Pipe Connection** - Allows a pipe, or series of parallel pipes, to be modelled with a Diameter, Longitudinal Slope, and levels. The dimensions can be entered as required or calculated using the [Network Design](#) calculation. Slope, Manning's n, Diameter/Base Width, Upstream Cover Level, Upstream Invert Level, Downstream Cover Level, and Downstream Invert Level columns are shown by default.
- **Box Culvert** - Allows a Box Culvert, or a series of parallel culverts, to be modelled with a Base Width, Height, Corner Splay, Longitudinal Slope, and levels. The dimensions can be entered as required or calculated using the [Network Design](#) calculation. Slope, Manning's N, Diameter/Base Width, Height, Upstream Cover Level, Upstream Invert Level, Downstream Cover Level, and Downstream Invert Level are shown by default.

- **Rectangular Channel** - Allows a Rectangular channel, or series of parallel channels, to be modelled with a Base Width, Height, Longitudinal Slope, and levels. The dimensions can be entered as required or calculated using the [Network Design](#) calculation. Slope, Manning's n, Diameter/Base Width, Height, Upstream Cover Level, Upstream Invert Level, Downstream Cover Level, and Downstream Invert Level columns are shown by default.
- **Trapezoidal Channel** - Allows a Trapezoidal channel, or series of parallel channels, to be modelled with a Base Width, Side Slope, Height, Longitudinal Slope, and levels. The dimensions can be entered as required or calculated using the [Network Design](#) calculation. Slope, Manning's n, Diameter/Base Width, Height, Side Slope, Upstream Cover Level, Upstream Invert Level, Downstream Cover Level, and Downstream Invert Level columns are shown by default.
- **Triangular Channel** - Allows a non-symmetrical Triangular channel, or series of parallel channels, to be modelled with a Side Slope, Height, Longitudinal Slope, and levels. The dimensions can be entered as required or calculated using the [Network Design](#) calculation. Slope, Manning's n, Height, Side Slope, Upstream Cover Level, Upstream Invert Level, Downstream Cover Level, and Downstream Invert Level columns are shown by default.
- **Custom Connection** - Allows a custom connection, or series of parallel connections, to be modelled with a Custom Cross Section, Longitudinal Slope, and levels. The dimensions can be entered as required or calculated using the [Network Design](#) calculation. Slope, Manning's n, Upstream Cover Level, Upstream Invert Level, Downstream Cover Level, Downstream Invert Level, and the [Cross Section](#) columns are shown by default.

### Slope

Longitudinal slope of the connection. This is calculated based on the fall, between the upstream & downstream invert levels, along the length of the connection. Entering a value for the slope will therefore adjust the downstream invert level.

### Manning's n

Manning's coefficient for the connection, which will be used in velocity and flow/capacity calculations.

### Colebrook-White Roughness

Colebrook-White roughness for the connection, which will be used in velocity and flow/capacity calculations.

### No. of Barrels

Number of barrels/channels laid in parallel.

### Diameter/Base Width

Diameter of the connection if a Pipe, or base width of a Rectangular or Trapezoidal channel.

### Height

Height of a Rectangular, Trapezoidal or Triangular channel.

### Cross Section

Clicking this button allows the cross section of a custom connection to be defined.

### Corner Splay

Introduced into a Box Culvert for pipe strengthening purposes. This value cannot be greater than half the current Width or half the current Height. The default value is 0 and will not be automatically adjusted.

### Side Slope

Slope of the sides of a Trapezoidal or Triangular channel.

### Upstream Cover Level

The cover/exceedence level at the upstream end of the connection. Levels may be set automatically if sufficient data exists, see individual connection type pages for more details.

### Upstream Invert Level

The invert level at the upstream end of the connection. Levels may be set automatically if sufficient data exists, see individual connection type pages for more details.

### Downstream Cover Level

The cover/exceedence level at the downstream end of the connection. Levels may be set automatically if sufficient data exists, see individual connection type pages for more details.

### Downstream Invert Level

The invert level at the downstream end of the connection. Levels may be set automatically if sufficient data exists, see individual connection type pages for more details.

### Minimum Downstream Invert Level

The minimum invert level at the downstream end of the connection. This is not required but may be set in order to inform network design/positioning.

### Minimum Cover Depth

The minimum cover depth of the connection. This is not required but may be set and will overwrite a global value if set. See Network Design summary wizard page for more details.

#### Flow Restriction

The base flow used in network design calculations if Use Flow Restrictions is checked in the **Network Design** criteria. This value is automatically calculated as the discharge rate of the upstream outlet with a water level equal to the free-board level for **Stormwater Controls**, or the cover level for **Manholes**.



**Simple Junctions** do not have a cover level so a nominal 1 m depth is used.

#### Auto Size

Lock the padlock to exclude the given connection from **Network Design** calculations.

#### Velocity

Velocity of the flow in the connection - **Lagged Flow** only.

#### Time Of Travel

Time of travel of the flow through the connection - **Lagged Flow** only.