How to use the ACO InfoDrainage Conduit File

How to use the ACO InfoDrainage Conduit file

1.0 Introduction

ACO Linear Drainage Channels can be modelled in InfoDrainage using the ACO Custom Conduit File excel document for each channel family type.

Modelling linear channels as part of an overall site drainage network can often provide significant value engineering opportunities, especially when using larger capacity systems, typically resulting in reduced attenuation requirements or even eliminating the need for separate attenuation altogether.

Crucially, incorporating channels into the hydraulic model not only enhances the accuracy of the simulation but also ensures a more faithful representation of how water actually behaves within the drainage network.

Unlike point drainage systems, where surface water runoff enters at discrete locations, linear channels receive continuous lateral inflow along their length, a dynamic that significantly influences flow patterns and storage potential. By accounting for this in the model, engineers can make more informed decisions, leading to both technical and economic efficiencies.

2.0 General principles

You can model the channels using these conduits ensuring that the invert levels are entered as a fixed distance below cover levels. Refer to **Section 5.0** for channel invert levels.

ACO channels have flow entering the channel along their entire length which is considered as non-uniform flow. An InfoDrainage model will input flow into the upstream manhole which may lead to localised flooding in the model at this location.

To avoid this and to simulate non uniform flow, the Channel Connections should be subdivided into shorter lengths. Whilst this will vary dependent on the site-specific model, as a guide we would suggest a minimum model length of around 20 to 30 diameters, where practical, to avoid modelling instabilities.

The greater the number of sections per Channel run, the more accurate a representation the InfoDrainage model will provide, spreading the flow more evenly across the connection length, and better utilising all the available capacity within the channel for optimisation and to maximise efficiency of the system.

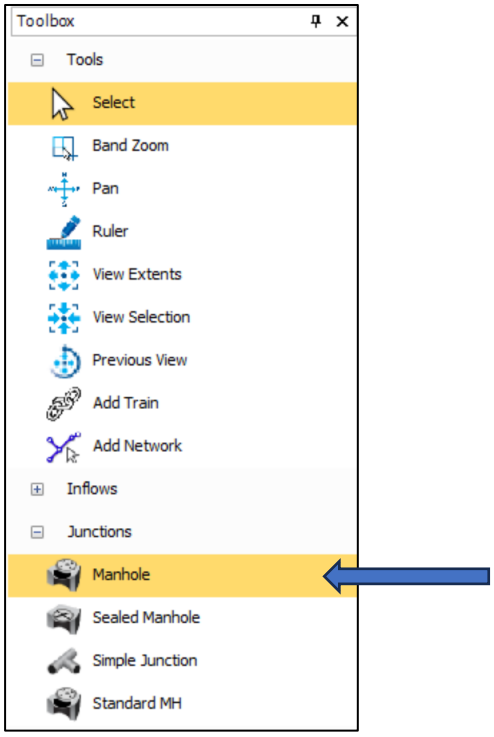
The additional “dummy” junctions should be set as Manholes with the width the same as the channel and length at 500mm to avoid the introduction of any additional storage. Manholes rather than Simple Junctions or Sealed Manholes should be used, as Manholes are allowed to flood in InfoDrainage whereas Simple Junctions and Sealed Manholes are not.

For channel outlets (sumps and gullies) the Manholes should be sized accordingly to match the dimensions of the specific ACO channel outlet to be used, based on the ACO Channel Outlet Table and Diagrams in **Section 4.0**.

3.1 Adding an ACO Custom Conduit to an InfoDrainage network model

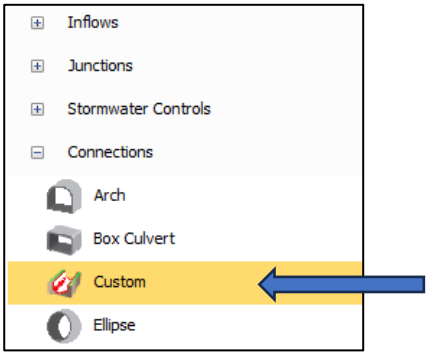
3.1 Save the ACO Custom Conduit excel files in your preferred location and start a new network model in InfoDrainage.

3.2 Select **"Manhole"** from the **"Junctions"** Toolbox on the right-hand side of the screen:



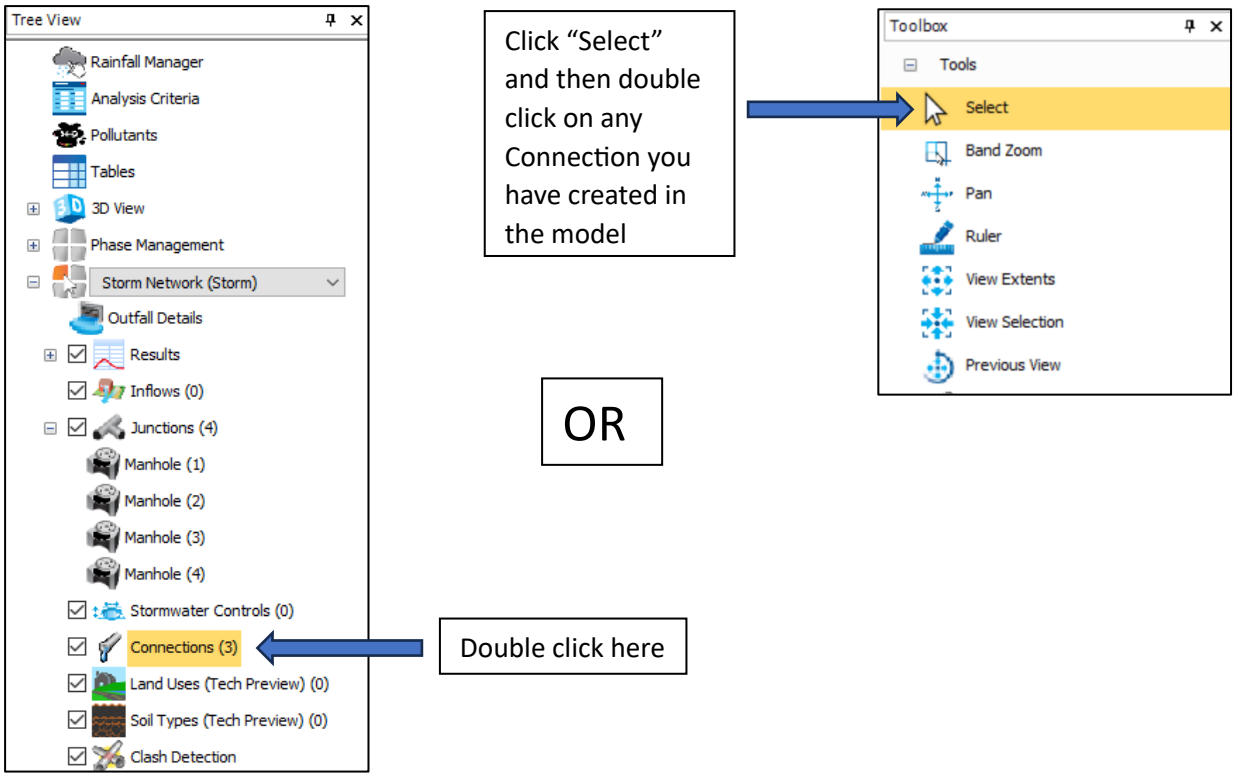
3.3 Set out the manholes in your model as required for your linear channel run by subdividing into appropriate sections accordingly (refer to recommendations in Section 2.0 above).

3.4 Select "Custom" from the "Connections" Toolbox on the right-hand side of the screen:

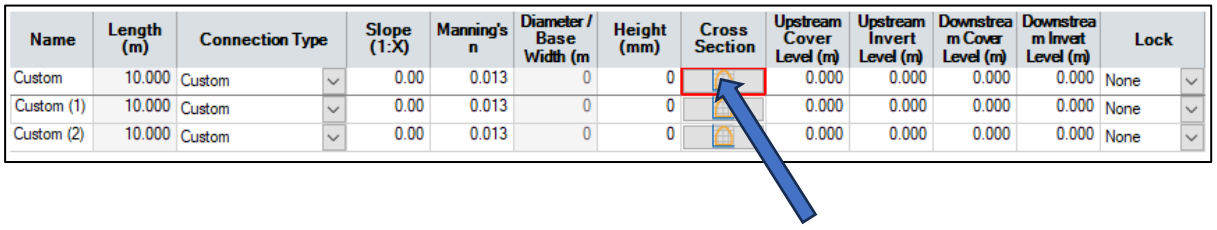


3.5 Connect the manholes together using the selected Custom Connections, making sure to go from upstream to downstream as per standard InfoDrainage design protocol.

3.6 Open the Connections Table, either by clicking "Select" from the "Tools" Toolbox on the right-hand side screen and then double clicking any of the Custom Connections you have just created in the model, or double click the "Connections" box under the Tree View on the left-hand side:

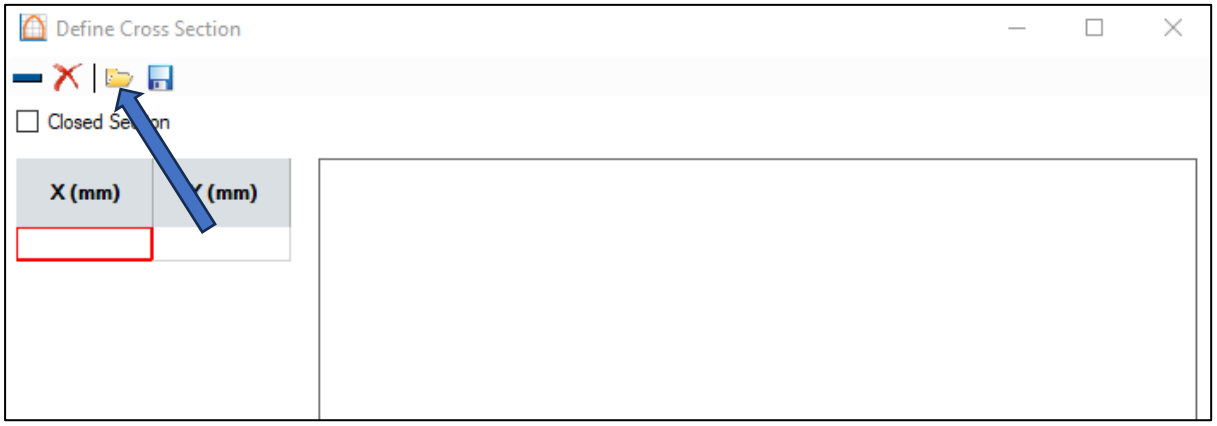


3.7 The Connections Table should now be displayed showing all of the Connection sections you have created. In this table select "Cross Section" for the first channel section:

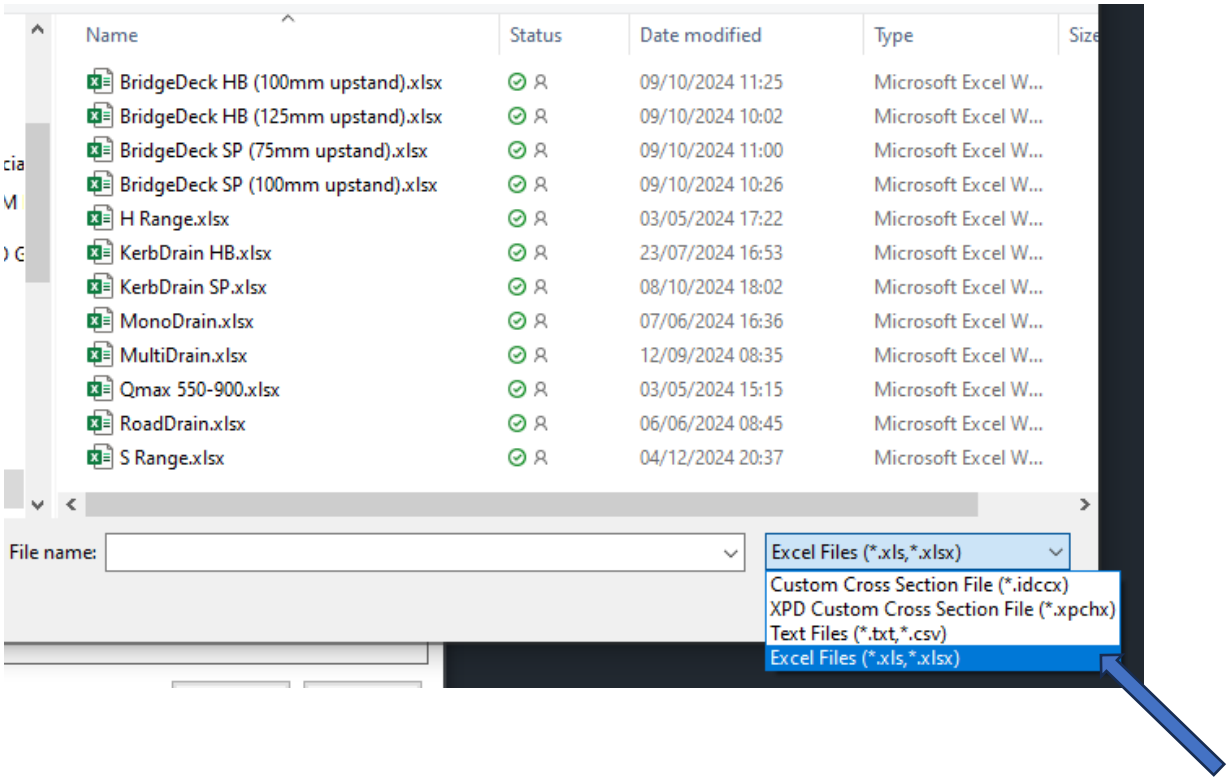


Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Diameter / Base Width (m	Height (mm)	Cross Section	Upstream Cover Level (m)	Upstream Invert Level (m)	Downstream Cover Level (m)	Downstream Invert Level (m)	Lock
Custom	10.000	Custom	0.00	0.013	0	0		0.000	0.000	0.000	0.000	None
Custom (1)	10.000	Custom	0.00	0.013	0	0		0.000	0.000	0.000	0.000	None
Custom (2)	10.000	Custom	0.00	0.013	0	0		0.000	0.000	0.000	0.000	None

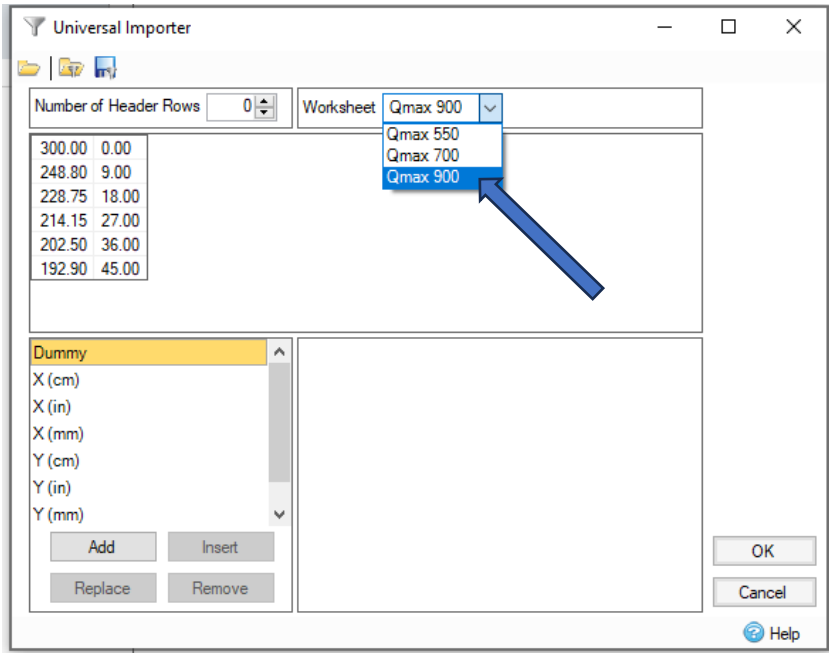
3.8 This will then bring up the "Define Cross Section" box. Click on the "Open File" button:



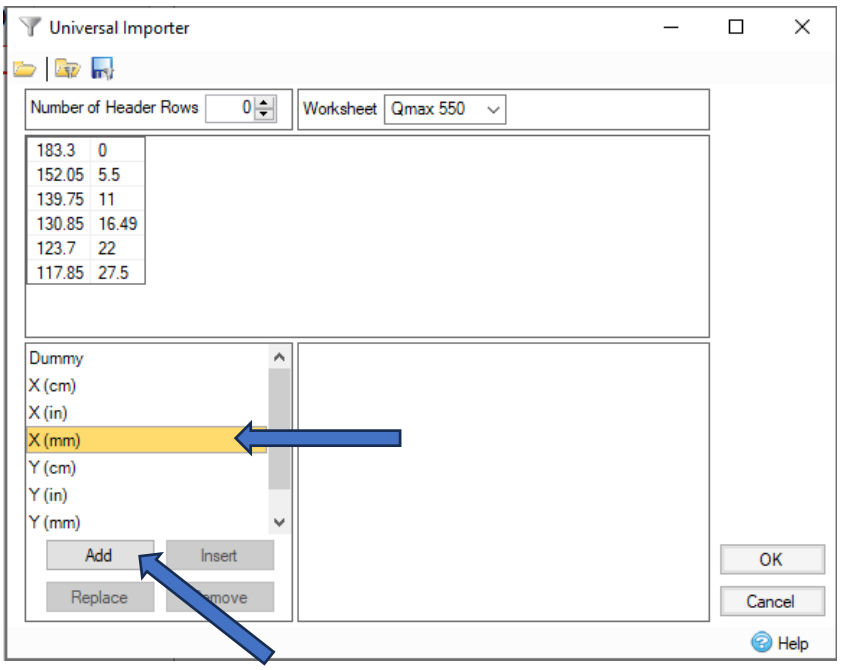
3.9 You can now navigate to your local folder where you have saved the ACO Custom Conduit excel files. Once you have selected the correct file path, choose "Excel files" in the drop-down selection and you will then see all of the ACO Custom Conduit excel files available:



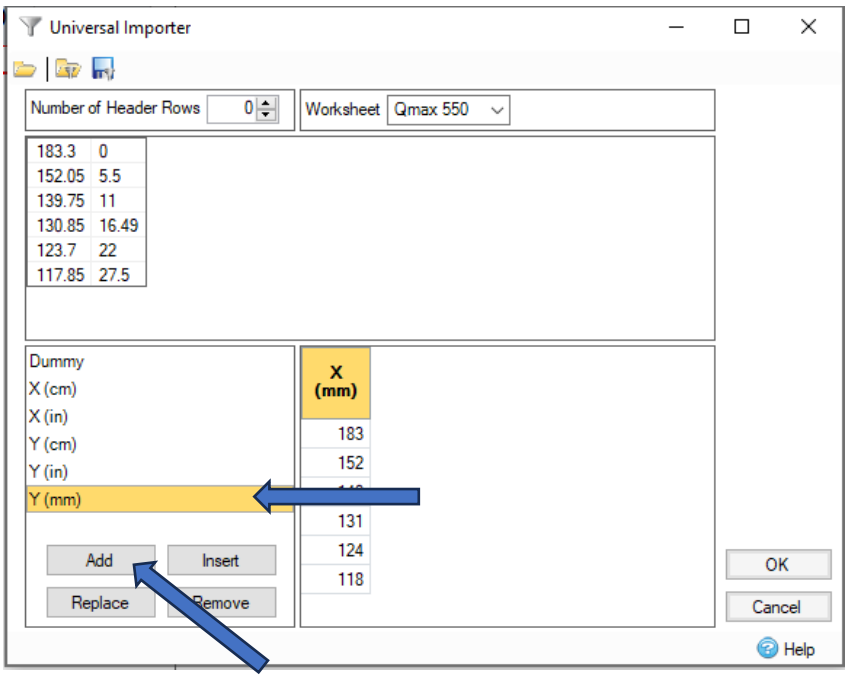
3.10 Select the ACO channel product family you wish to use (in this example we will use ACO Qmax 550-900 file for the ACO Qmax 900 channel). This will open the "Universal Importer" window which allows you to select the specific ACO channel size in the selected product family within the "Worksheet" box:



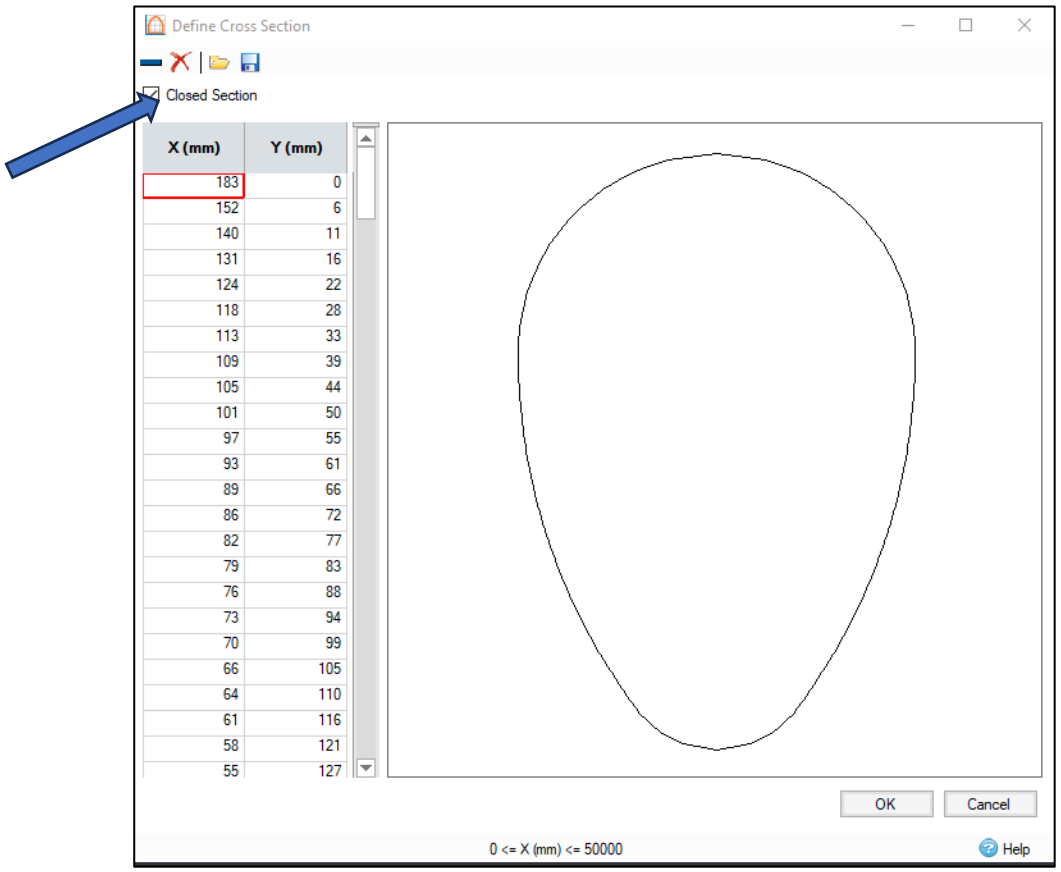
3.11 Firstly choose “X (mm)” and then click **“Add”** to bring in the first column parameters for the chosen channel:



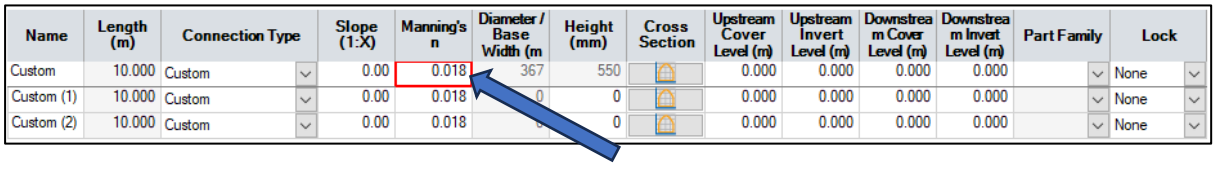
3.12 Then choose “Y (mm)” and then click **“Add”** to bring in the second column parameters:



3.13 Click "OK" to confirm the selection and this will bring up the "Define Cross Section" box again, with the X and Y columns now populated for the chosen ACO channel size. You will also see a visual representation of the channel cross section. To close the conduit tick "Closed Section" in the top left corner:



3.14 Click "OK" to bring you back to the Connections Table. You should now change the "Manning's n" value accordingly. For ACO Qmax only this should be set to 0.018 (to represent ribbed polyethylene). For all other ACO channel conduits this should be set to 0.011 (to represent smooth polymer concrete).



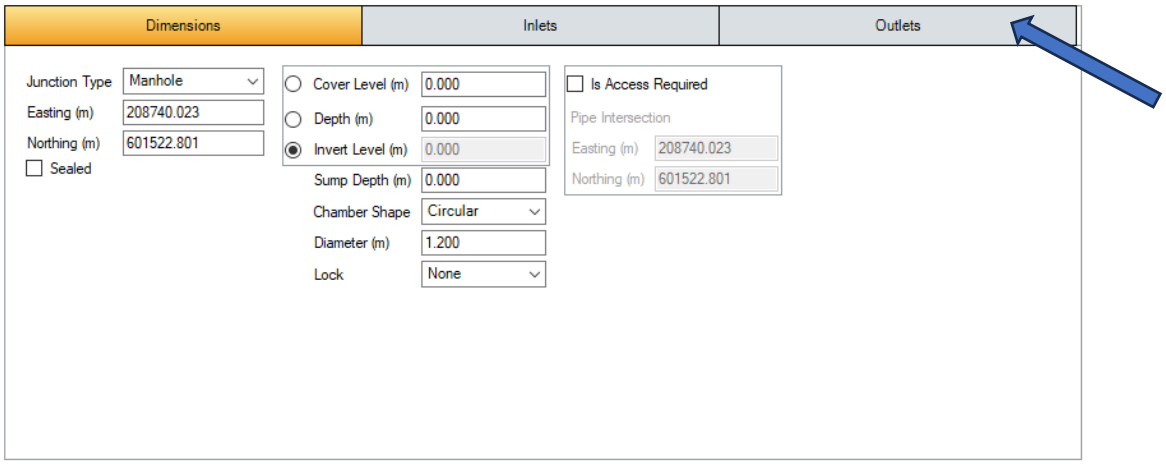
Name	Length (m)	Connection Type	Slope (1:X)	Manning's n	Diameter / Base Width (m	Height (mm)	Cross Section	Upstream Cover Level (m)	Upstream Invert Level (m)	Downstream Cover Level (m)	Downstream Invert Level (m)	Part Family	Lock
Custom	10.000	Custom	0.00	0.018	367	550		0.000	0.000	0.000	0.000		None
Custom (1)	10.000	Custom	0.00	0.018	0	0		0.000	0.000	0.000	0.000		None
Custom (2)	10.000	Custom	0.00	0.018	0	0		0.000	0.000	0.000	0.000		None

3.15 Repeat steps 3.7 to 3.14 for all custom channel connection sections.

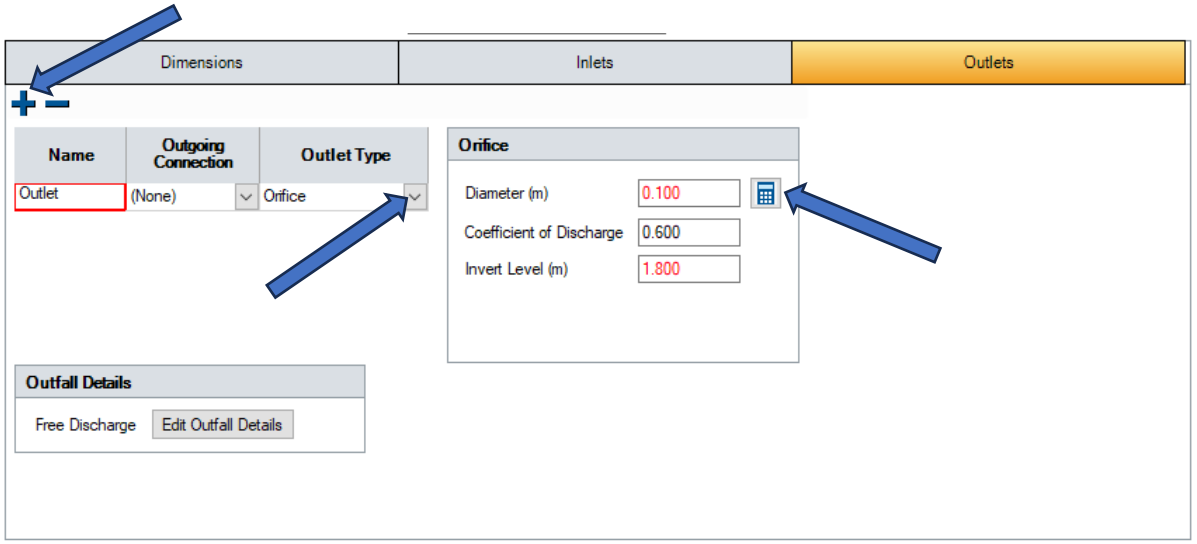
3.16 Set the cover and invert levels to suit for site topography and chosen ACO Channels. Alternatively, enter a specific gradient in the "Slope" field (Refer to Section 5.0 for a table showing the depth to invert for all ACO channel sizes.

3.17 To prevent the autodesign feature from altering your levels and slopes, select "Lock Levels" in the Lock field.

3.18 If utilising channels for storage, it can also be beneficial to place an orifice plate at the downstream end of a channel, as this will limit the discharge rate and potentially maximise the use and capacity of the linear channel system. This can be done by firstly double clicking the downstream manhole for the channel, which will bring up the manhole parameters. You can then select "Outlets":



If you then click on the "+" button in the top left, you can select "Orifice" in the Outlet Type which will then allow you to set the orifice diameter and invert level to achieve the desired restriction:

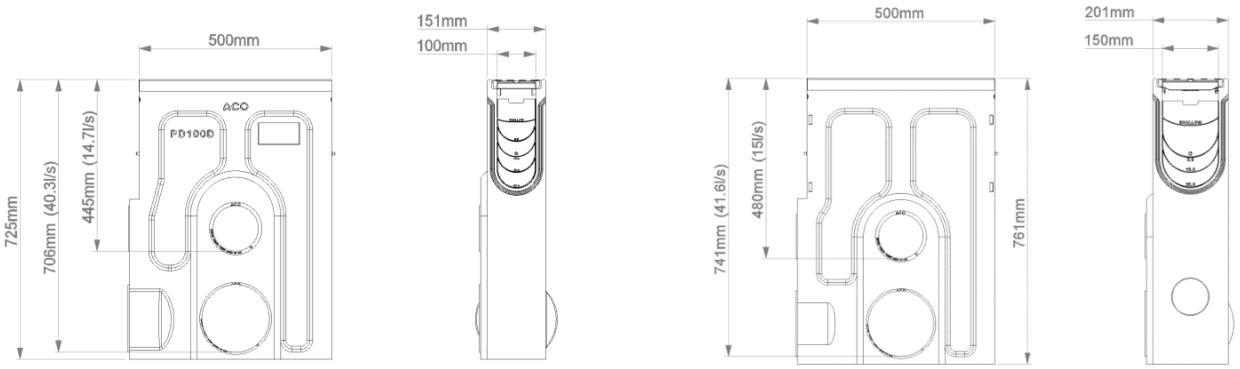


Ensure the upstream channel has sufficient capacity and freeboard to store the backed-up volume. This can then be checked by running simulations to verify that the system performs as intended under the design storm conditions.

4.0 ACO Channel Outlet Table and Diagrams

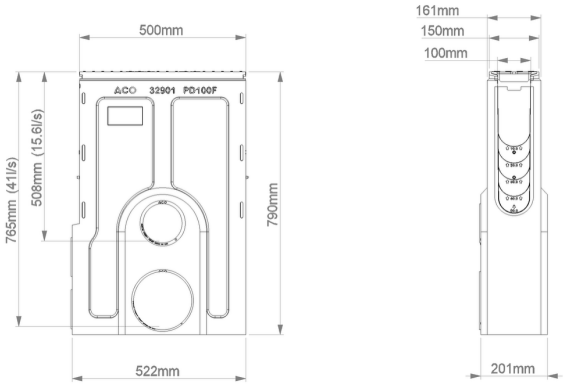
ACO Channel type	ACO Sump/Gully name	ACO Sump/Gully length (mm)	ACO Sump/Gully av width (mm)	ACO Sump/Gully depth (mm)
Qmax (150-350)	Access chamber	480	480	640
Qmax (150-350)	Outlet/Inlet chamber	480	480	1095
Qmax (150-350)	Outlet/inlet/silt chamber	480	480	1600
Qmax (550-900)	Access/silt chamber	700	700	1500
MonoDrain PD100D	PD100D sump	500	100	725
MonoDrain PD150D	PD150D sump	500	150	761
KerbDrain D	KerbDrain D Shallow	500	320	745
KerbDrain D	KerbDrain D Deep	500	320	900
KerbDrain E/E+	KerbDrain E/E+ Shallow	500	320	745
KerbDrain E/E+	KerbDrain E/E+ Deep	500	320	900
MultiDrain M100D	M100D sump	500	100	635
MultiDrain M150D	M150D sump	500	150	735
MultiDrain M200D	M200D sump	500	200	790
RoadDrain PD100F	PD100F sump	500	100	790
Various	ACO Universal Gully	440	440	1320
S Range S100	S100 sump	500	100	635
S Range S150	S150 sump	500	150	900
S Range S300	S300 gully shallow	500	300	750
S Range S300	S300 gully deep	500	300	905
H Range RD100V	RD100V sump	500	100	525
H Range RD150V	RD150V sump	660	150	690
H Range RD200V	RD200V sump	660	200	715
H Range RD300V	RD300V sump	750	300	1320

ACO MonoDrain

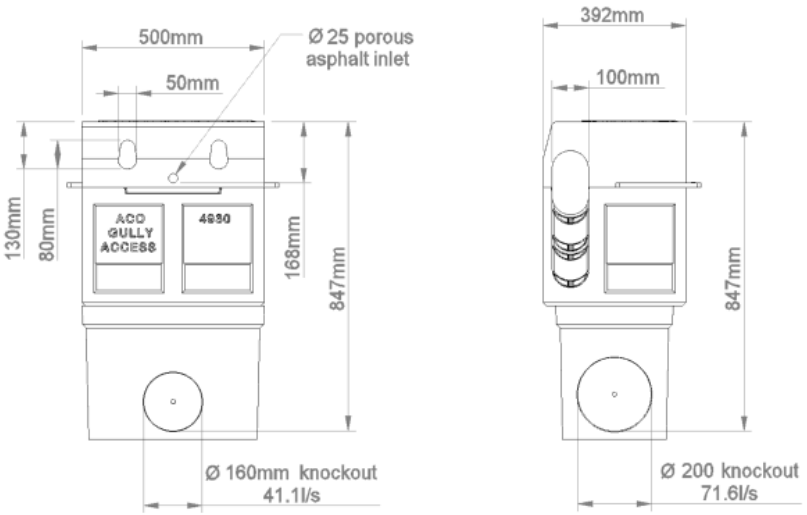


PD100D PD150D

ACO RoadDrain PD100F

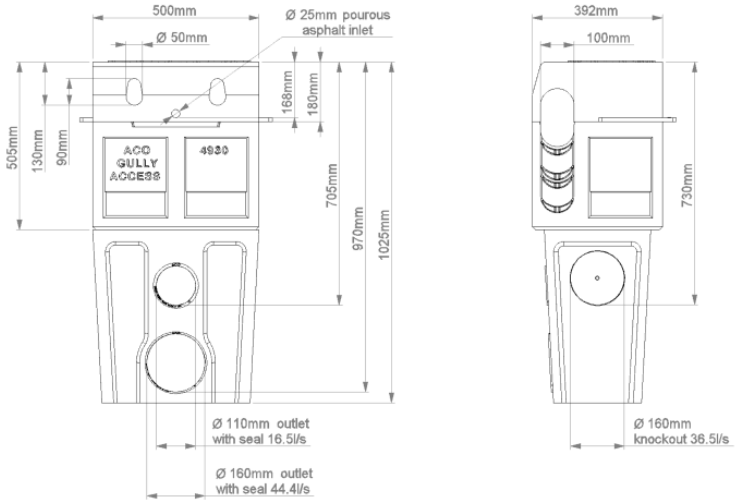


ACO KerbDrain D 400

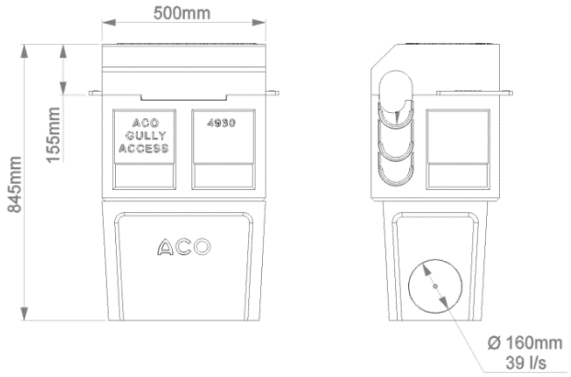


HB Shallow Base

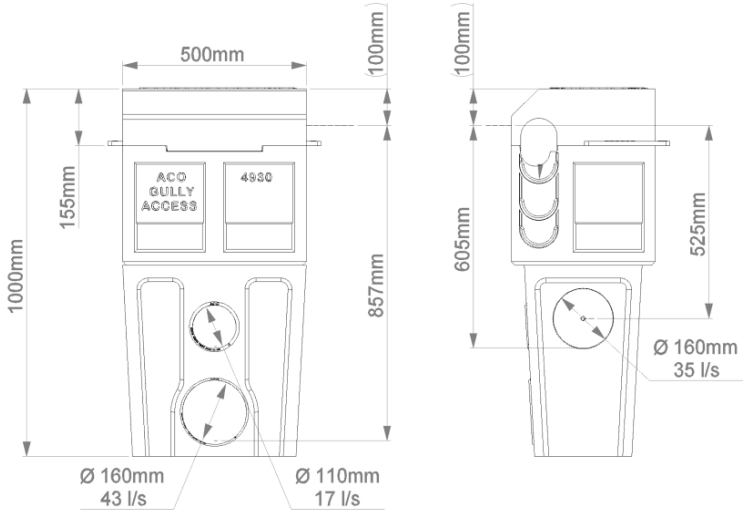
ACO KerbDrain D 400



HB Deep Base

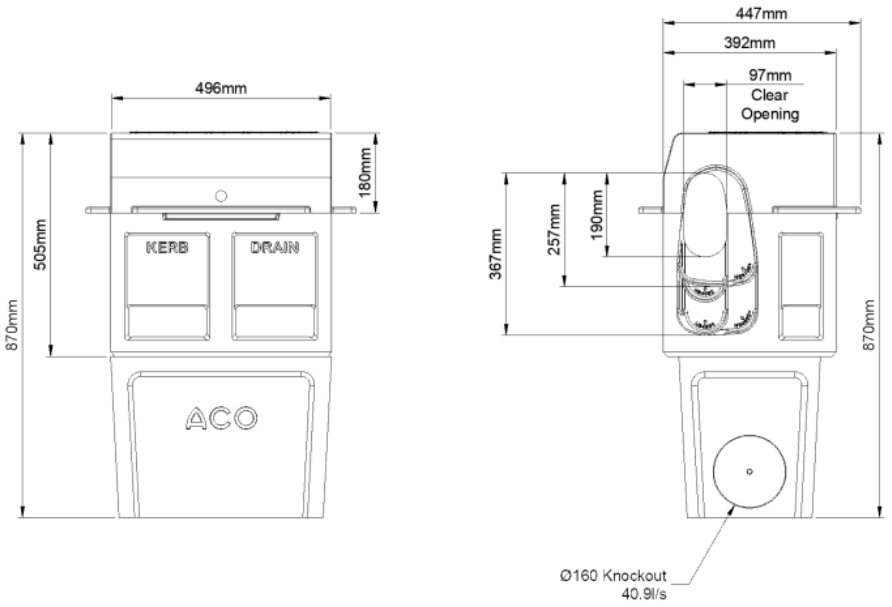


SP Shallow Base

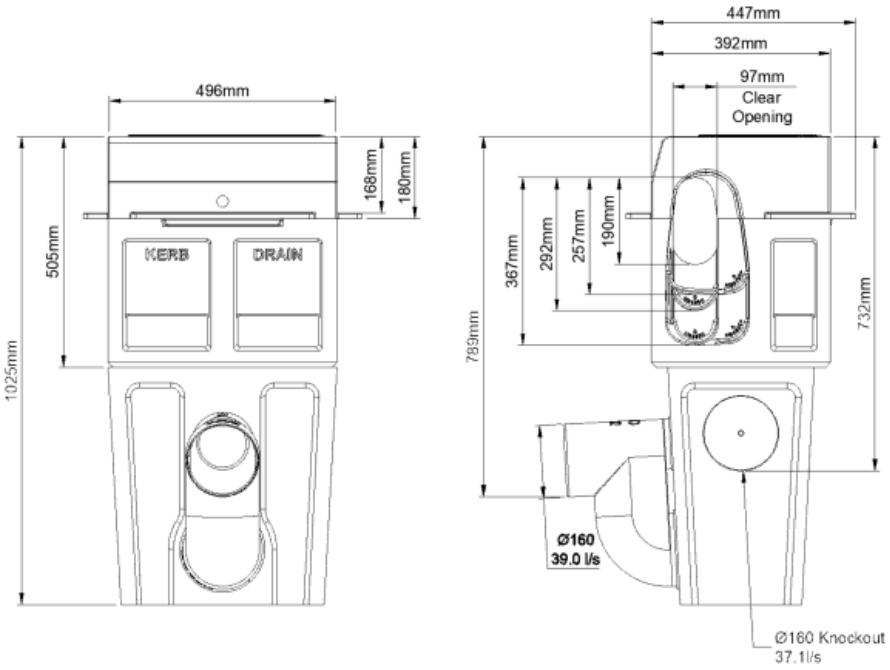


SP Deep Base

ACO KerbDrain E 600

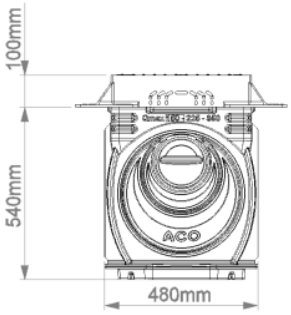


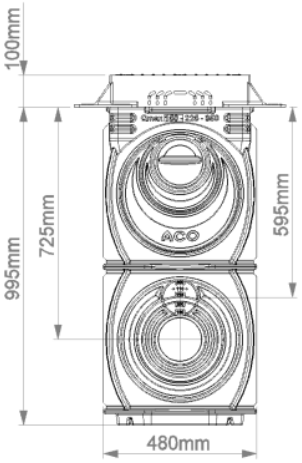
HB Shallow Base

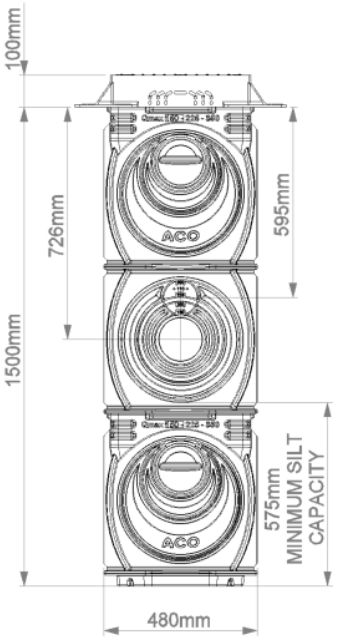


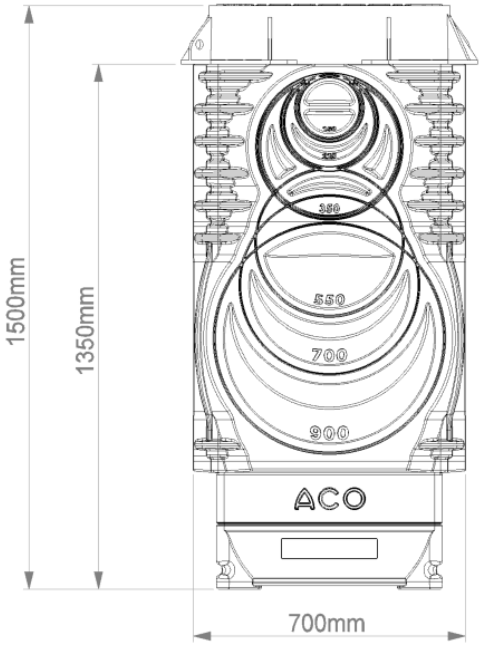
HB Deep Base

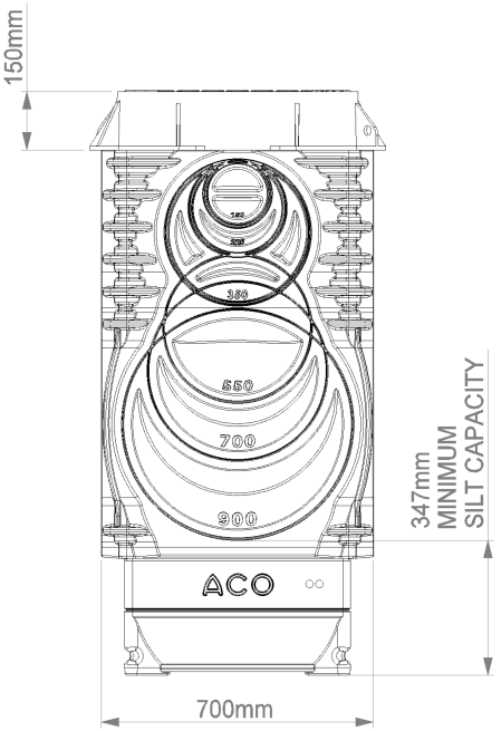
ACO Qmax


100mm
540mm
480mm

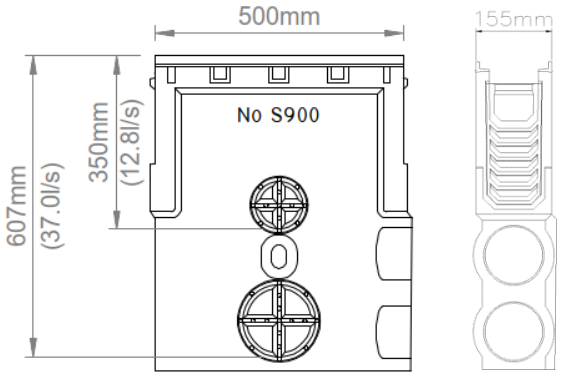

100mm
995mm
725mm
595mm
480mm


100mm
1500mm
726mm
595mm
575mm
MINIMUM SILT
CAPACITY
480mm

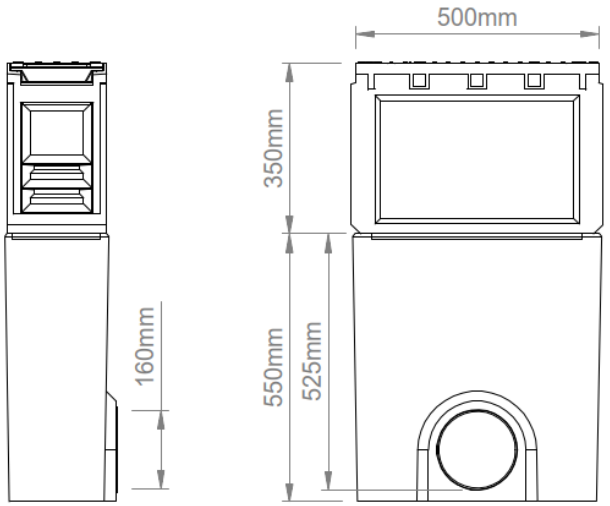

1500mm
1350mm
550
700
900
ACO
700mm


150mm
550
700
900
ACO
347mm
MINIMUM
SILT CAPACITY
700mm

ACO S Range

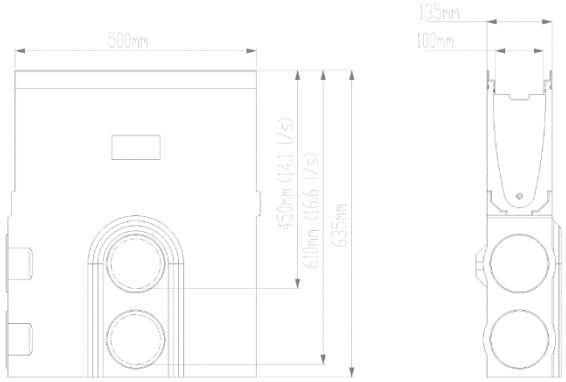


S100



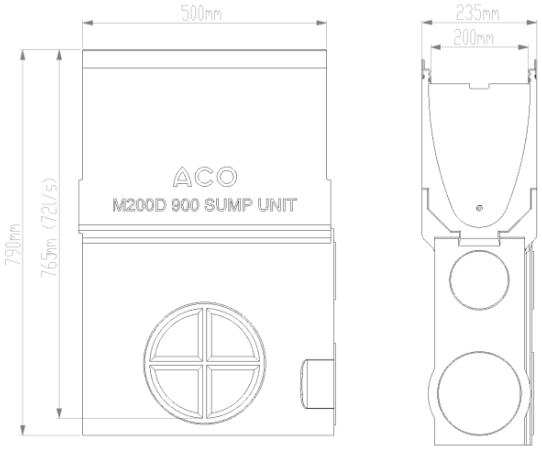
S150

ACO MultiDrain



M100D

M150D



M200D

5.0 ACO Channel Invert depths table

ACO Channel type and size	Depth to invert from finished ground/road level (mm)
Qmax 150	350 (450 with Q-Slot Edge)
Qmax 225	425 (525 with Q-Slot Edge)
Qmax 350	550 (650 with Q-Slot Edge)
Qmax 550	800 (900 with Q-Slot Edge)
Qmax 700	950 (1050 with Q-Slot Edge)
Qmax 900	1155 (1255 with Q-Slot Edge)
MonoDrain PD100D Shallow	110
MonoDrain PD100D 0.0	160
MonoDrain PD100D 10.0	200
MonoDrain PD100D 20.0	240
MonoDrain PD100D 30.0	280
MonoDrain PD150D 0.0	210
MonoDrain PD150D 10.0	250
MonoDrain PD150D 20.0	290
KerbDrain D HB255	110
KerbDrain D HB305 & SP280	155
KerbDrain D HB405 & SP380	255
KerbDrain D SP455	305
KerbDrain D HB480	330
KerbDrain E HB305	155
KerbDrain E HB480	330
KerbDrain E+ HB370	217
KerbDrain E+ HB480	327
BridgeDeck HB (125mm upstand)	93
BridgeDeck HB (100mm upstand)	118
BridgeDeck SP (100mm upstand)	95
BridgeDeck SP (75mm upstand)	120
MultiDrain M100D 075	55
MultiDrain M100D 0100	80
MultiDrain M100D 0.0	130
MultiDrain M100D 10.0	180
MultiDrain M100D 20.0	230
MultiDrain M100D 30.0	280

ACO Channel type and size	Depth to invert from finished ground/road level (mm)
MultiDrain M150D 0100	75
MultiDrain M150D 0.0	185
MultiDrain M150D 10.0	235
MultiDrain M150D 20.0	285
MultiDrain M200D 0100	75
MultiDrain M200D 0.0	240
MultiDrain M200D 10.0	290
MultiDrain M200D 20.0	340
RoadDrain PD100F 10.0	225
RoadDrain PD100F 20.0	275
RoadDrain PD100F 30.0	325
RoadDrain PD100F 40.0	375
RoadDrain PD100F 50.0	425
RoadDrain 200F 10.1	370
RoadDrain 200F 20.1	420
RoadDrain 200F 30.1	470
S Range S100 S01	112
S Range S100 S05	136
S Range S100 S20	226
S Range S100 S30	286
S Range S150 1501	195
S Range S150 1502	245
S Range S150 1503	295
S Range S200	279
S Range S300	360
H Range RD100V	245
H Range RD150V 0.0	255
H Range RD150V 10.0	355
H Range RD150V 20.0	455
H Range RD200V 0.0	300
H Range RD200V 20.0	500
H Range RD300V	545