

# Surface Water Flow Control Systems

ACO Q-Brake Vortex and ACO Q-Plate  
**Interactive digital brochure**



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# Introduction to ACO's Surface Water Flow Control Systems

ACO's range of flow control systems are designed to regulate storm water flow before it discharges into the watercourse or sewer networks. ACO Q-Brake Vortex flow controls and ACO Q-Plate orifice plates are capable of regulating any flow for surface water applications and can be used in conjunction with retention and attenuation systems, such as [ACO StormBrixx](#), as an integrated sustainable urban drainage (SuDS) scheme.

## What is ACO Q-Brake Vortex?

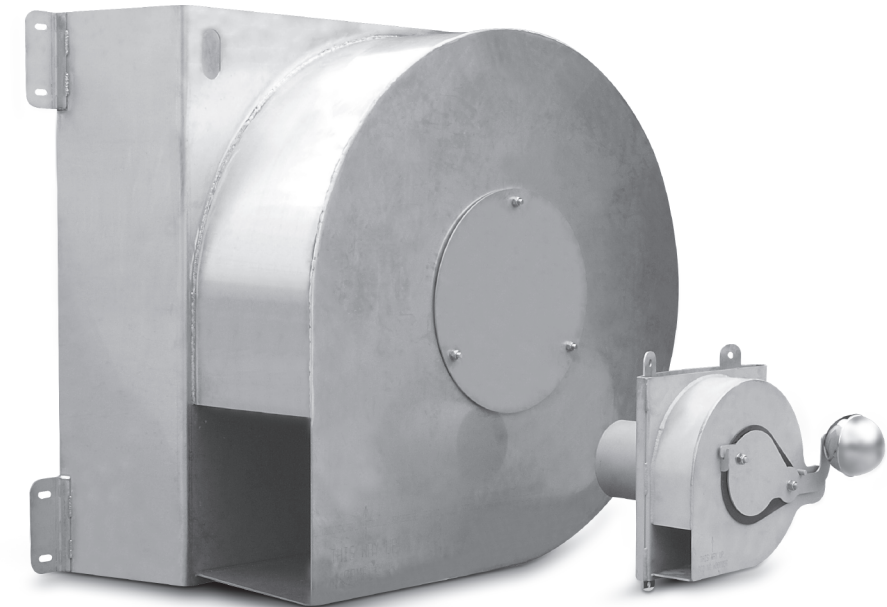
ACO Q-Brake Vortex is a horizontal vortex flow control designed to regulate storm water flows from 1-100 litres per second. Manufactured from grade 304 stainless steel, each ACO Q-Brake Vortex is individually configured to suit specific performance criteria.

The design of a vortex flow control is based on the fluid mechanics principle of the forced vortex, which permits flow regulation without any moving parts.

ACO Q-Brake Vortex utilises the upstream head and discharge to generate a 'vortex' within the structure of the unit. The water is then released at a pre-determined controlled rate preventing downstream flooding. [Click here for a short demonstration.](#)

Unlike more conventional methods, ACO Q-Brake Vortex is less prone to blockage, and permits higher flow at a lower head of water, as a vortex control allows an outlet 4-6 times larger in cross sectional area to be used.

ACO Q-Brake Vortex can form part of the design of any integrated drainage scheme for a wide range of infrastructure, industrial and other SuDS applications.



## Why choose ACO Q-Brake Vortex?

### ► Planning and connection

ACO Q-Brake Vortex addresses the planning and connection requirements set out in the Floods and Water Management Act. Where a discharge restriction is in place, ACO Q-Brake Vortex regulates the surface water flow to the specified rate.

### ► Tailored performance

Each ACO Q-Brake Vortex is tailored to the specific performance requirements of the application providing optimum efficiency within the system.

### ► Optimum hydraulic efficiency

The mechanism employed within ACO Q-Brake Vortex provides superior hydraulic performance in comparison to traditional flow control systems.

### ► Water Authorities Approval

ACO Q-Brake Vortex has been approved for use by a number of water authorities including Severn Trent, Anglian and Scottish Water.

### ► Proven performance

ACO Q-Brake Vortex is UK manufactured and has been independently laboratory tested to verified discharge rates.

### ► Simplified access and maintenance

ACO Q-Brake Vortex has large clear openings making it less prone to blockage. The absence of any loose parts also reduces maintenance requirements.

The patented bypass door and emergency drain down facility allows ACO Q-Brake Vortex to be remotely accessed from the surface to allow the upstream system to be independently drained, completely bypassing the inlet. Building Regulations 2000 Section H discourages direct man access to sewer manholes.

### ► Reduces total installed cost

ACO Q-Brake Vortex allows more flow at lower heads, reducing the need for on-site storage volume requirements lowering installation costs.

### ► Ease of installation

Each ACO Q-Brake Vortex unit is custom built to suit the profile of the chamber. Radius fixing options remove the need for additional benching - simplifying installation and reducing cost.

### ► WinDes

ACO Q-Brake Vortex can be sized and modelled on the latest version of the design software and can be incorporated into the overall hydraulic drainage design.

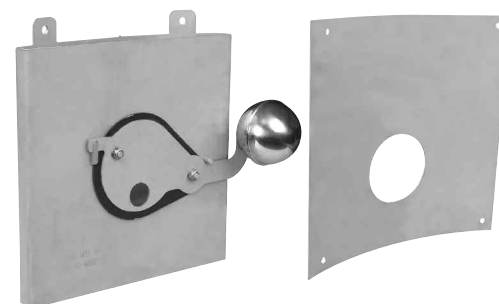


## What is ACO Q-Plate?

ACO Q-Plate orifice plates are designed for use where an ACO Q-Brake vortex is not the most effective solution.

To suit application requirements, the range is available with or without remote bypass and drain down and is designed to match a variety of manhole configurations.

Information regarding the specification of the ACO Q-Plates can be [found here](#).



ACO Q-Plates with and without draindown





## Benefits of using a surface water flow control system

Storage and the controlled release of clean water into the natural environment is an important aspect of managing surface water in the SuDS approach. The Floods and Water Management Act now gives overall responsibility to the local regulatory body to impose, where appropriate, the discharge rate of a surface water flow control system.

ACO's range of flow control systems can be used in conjunction with ACO's award-winning attenuation and infiltration system, ACO StormBrixx, to provide a fully integrated storm water control system meeting the requirements of the regulations.

This diagram simulates how the ACO StormBrixx system is used to provide storm water attenuation, whilst the ACO Q-Brake Vortex is used to regulate the rate of discharge from the development into the watercourse or sewer network.

Compared to the use of traditional flow control systems, the combination of ACO StormBrixx and ACO Q-Brake Vortex can reduce the need for additional upstream storage lowering overall installation and maintenance costs.

This benefit is best demonstrated in the example opposite. The conclusion of the example means that upstream storage can be reduced by 11m<sup>3</sup> compared to using a traditional flow control system.



For more information on ACO's award winning attenuation and infiltration system, ACO StormBrixx, please [click here](#).

### Example:

There is a project in Bedford, England with a catchment area of 13,000m<sup>2</sup>. The project has design criteria of a 1 in 30 year storm and the runoff from the site must not exceed 6.3l/s at a design head of 1.3m.

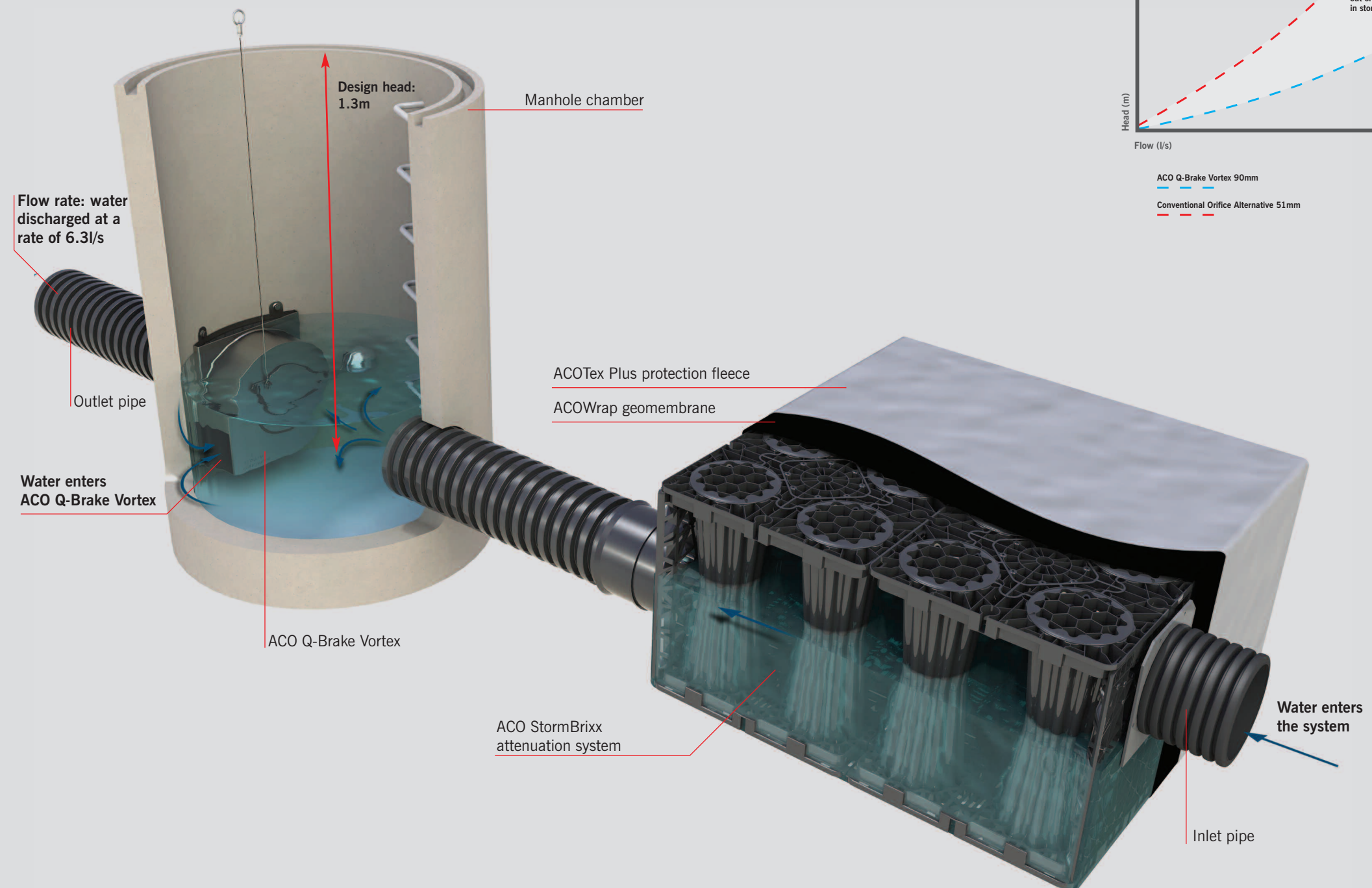
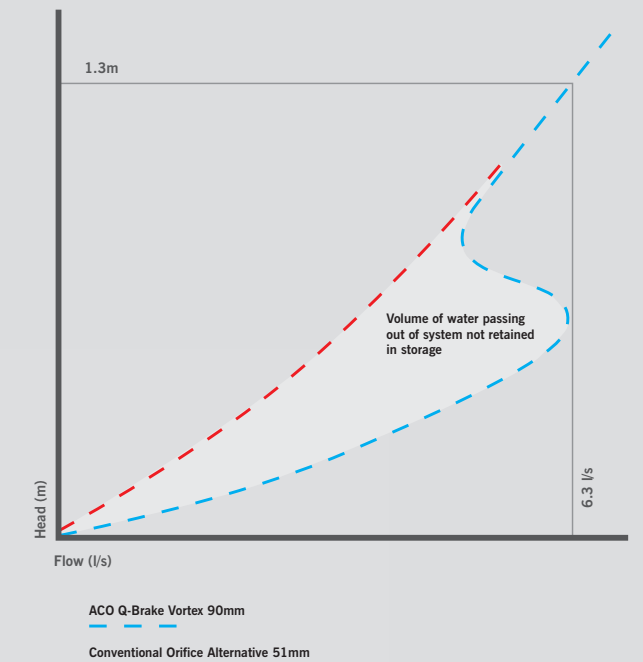
### Results:

Using MicroDrainage® software, ACO has compared the upstream storage requirements using ACO Q-Brake Vortex and a traditional orifice plate. The results are summarised below:

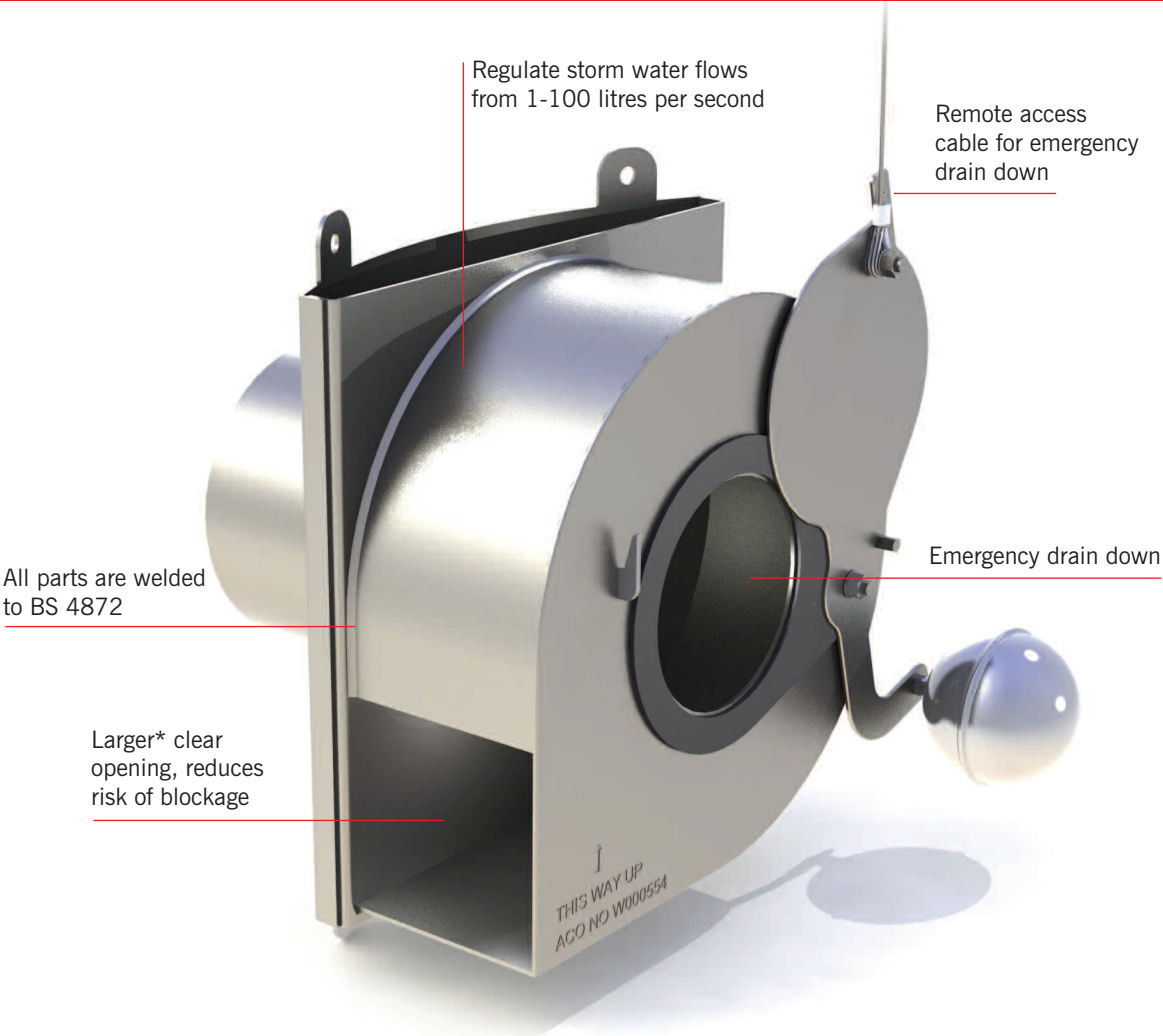
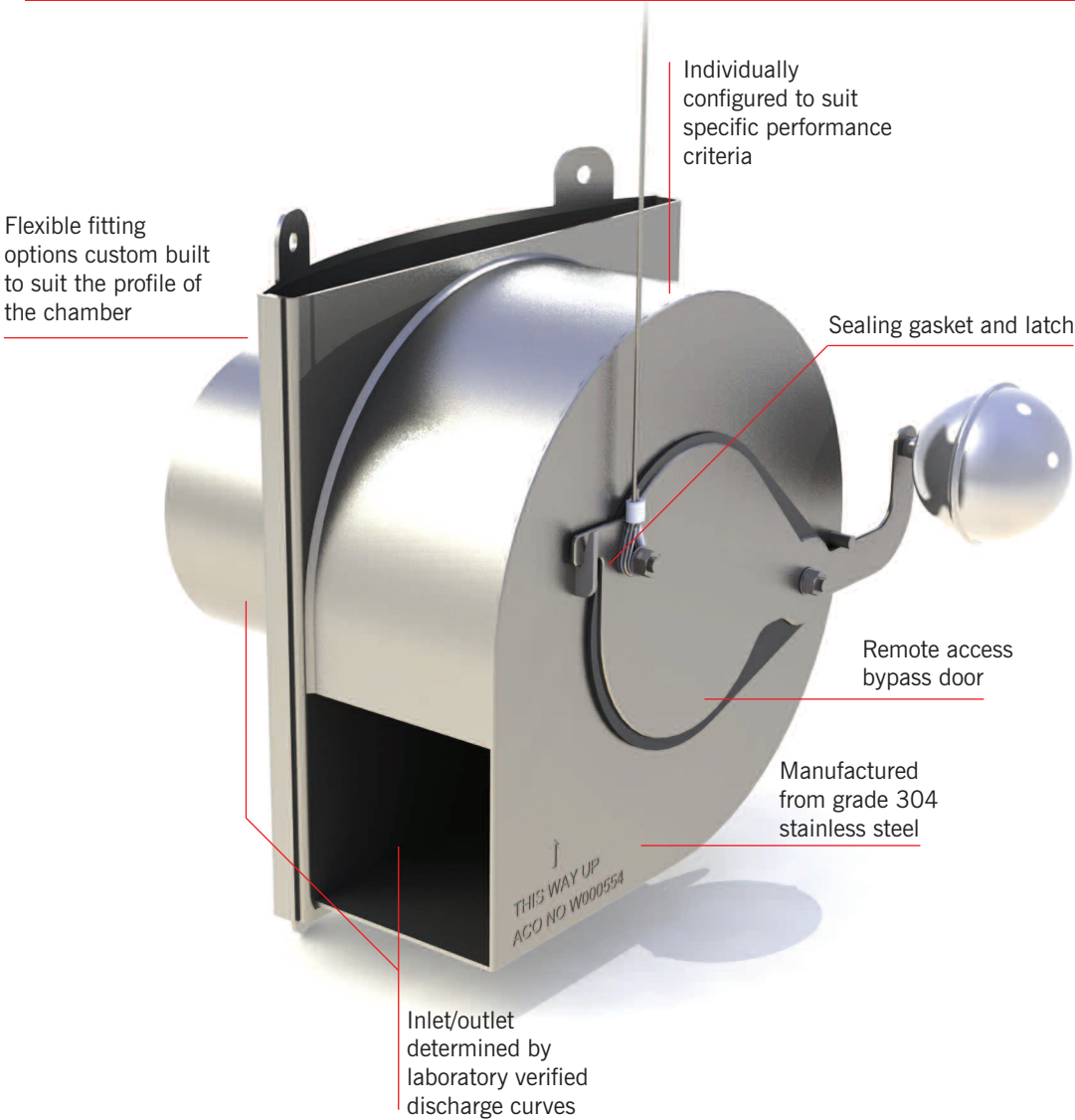
- ▶ ACO Q-Brake Vortex required Ø90mm. Upstream attenuation required 402m<sup>3</sup>.
- ▶ Orifice plate size required Ø 51mm. Upstream attenuation required 413m<sup>3</sup>.

ACO Q-Brake Vortex reduces upstream attenuation by 11m<sup>3</sup> whilst having an orifice over three times the area of the traditional orifice plate and making ACO Q-Brake Vortex more efficient and far less prone to blockage.

### Discharge characteristics

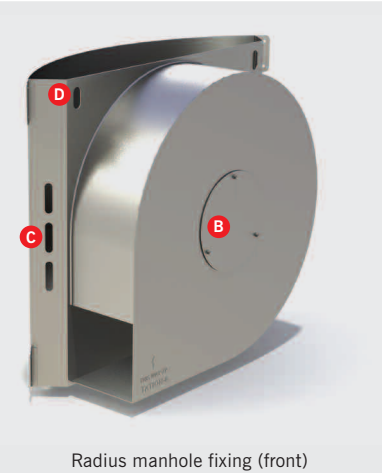
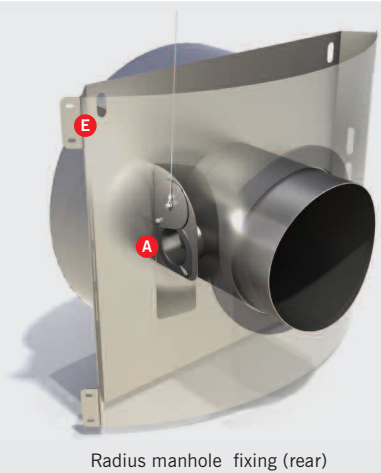
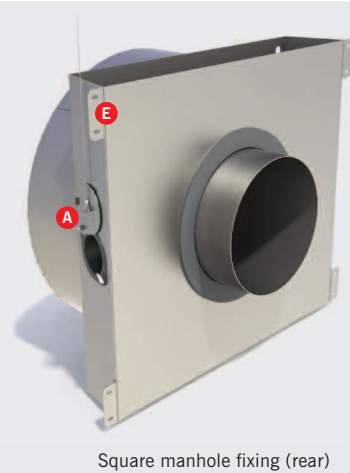


ACO Q-BRAKE FLOW CONTROL FEATURES OVERVIEW



Additional and varying features for ACO Q-Brake Vortex >40l/s

- A Remote access bypass door and emergency draindown. Located in a different position to ACO Q-Brake Vortex units <40l/s
- B Removable maintenance cover
- C Side vents to aid draindown on units with radius fixing
- D Lifting eyes
- E Fixing locators



\*Larger than traditional orifice plates



## ACO Q-Brake Vortex specification and design process

Manufactured from grade 304 stainless steel, each ACO Q-Brake Vortex is individually configured to suit specific performance criteria. Our engineers will use industry standard drainage software and hydraulic design calculations to ensure the system is correctly sized for any project requirement.

In order to complete this process and deliver the product options available, please provide the ACO engineers with the following information:

- ▶ The proposed design flow – maximum allowable discharge
- ▶ The proposed design head – invert of outlet pipe to top water level
- ▶ The proposed outlet pipe diameter
- ▶ The proposed type and size of outlet manhole

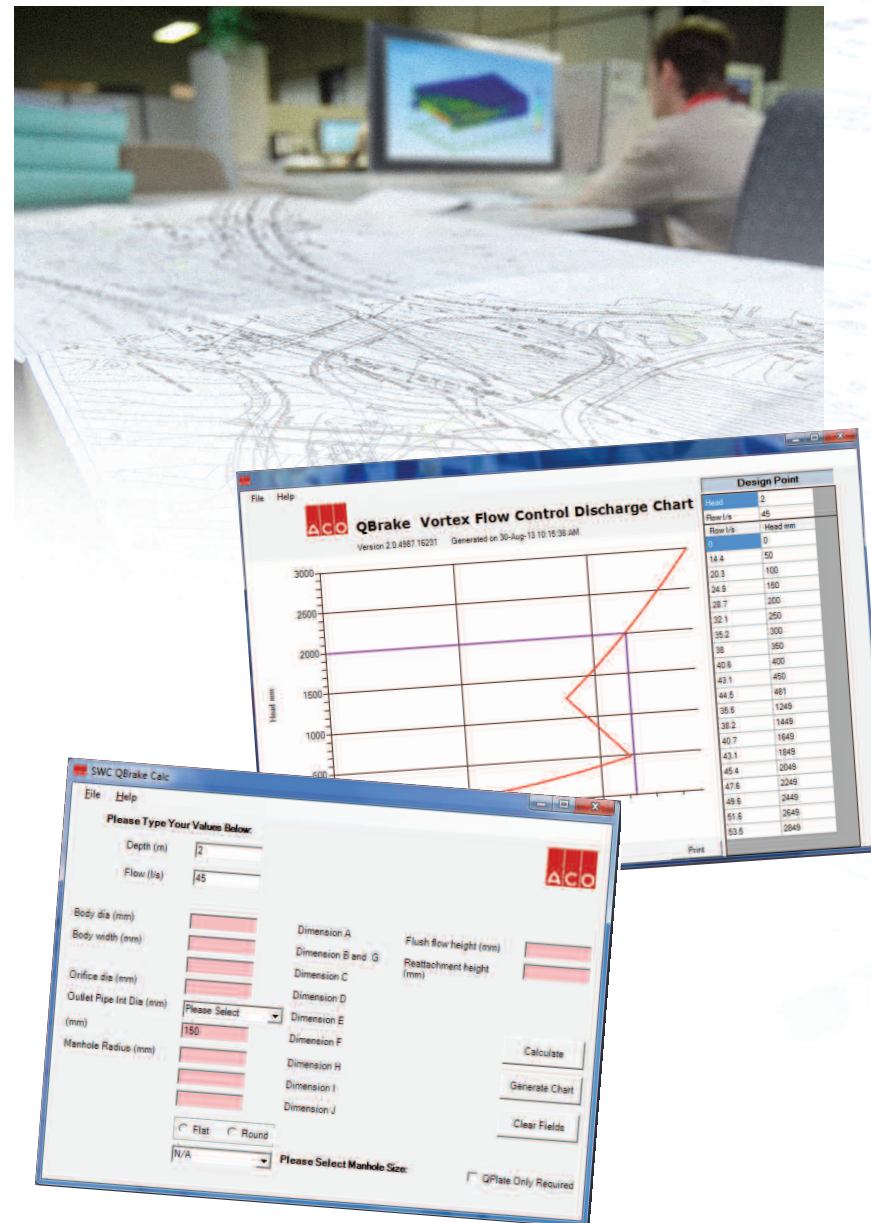
Before production can commence, ALL of the above information must be verified on ACO's Contract Review Document issued at the time of order placement.

### Finished product

From this information ACO will size and design the ACO Q-Brake Vortex to meet the design criteria and to suit the proposed surface water application.

ACO will supply:

- ▶ Head discharge table & graph
- ▶ ACO Q-Brake Vortex installation details
- ▶ Information for manhole sizing



### ACO Water Management Design Services Team

ACO has embraced the concept of 'value engineering' – a totally new approach to on-site construction that saves both time and money. ACO will review any design to minimise the total scheme and life cost of a proposal.

By utilising ACO's portfolio of products, it is often possible to remove the need for conventional underground drainage.

**ACO Water Management Design Services Team**

Tel: 01462 816666  
Email: technical@aco.co.uk



### Micro Drainage Modelling

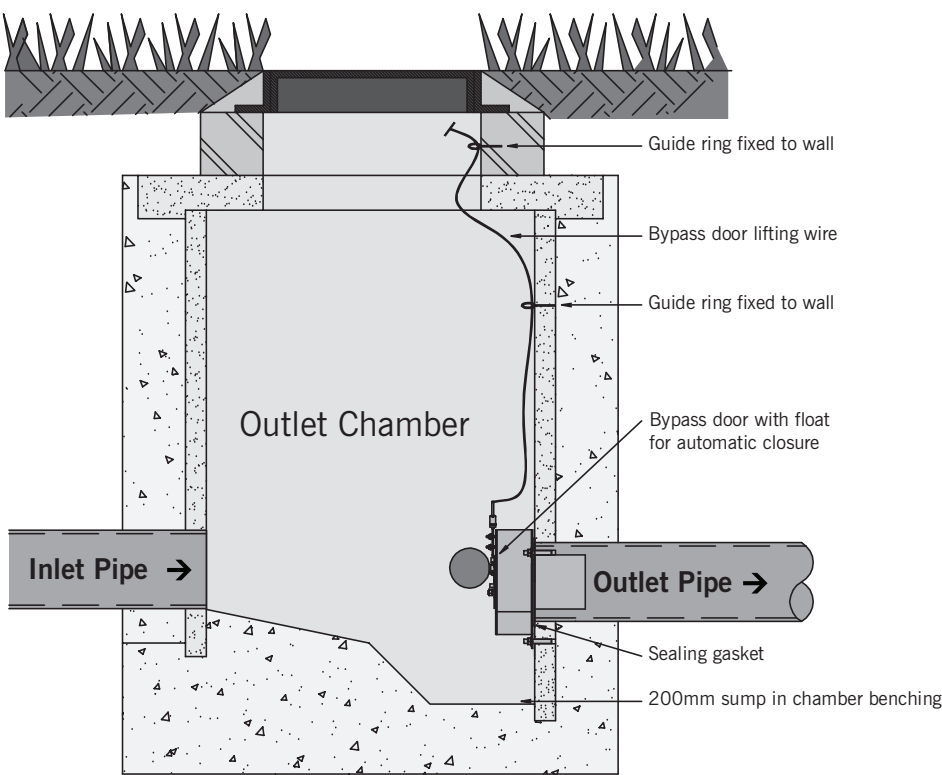
ACO Q-Brake Vortex can be sized and modelled on the latest version of Micro Drainage.



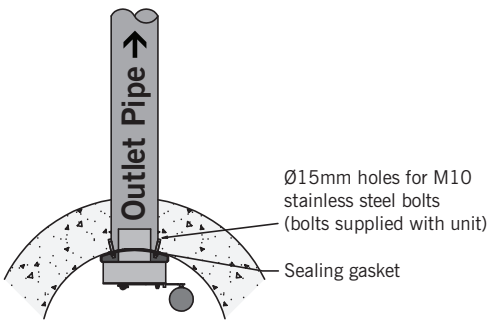


# Installation detail

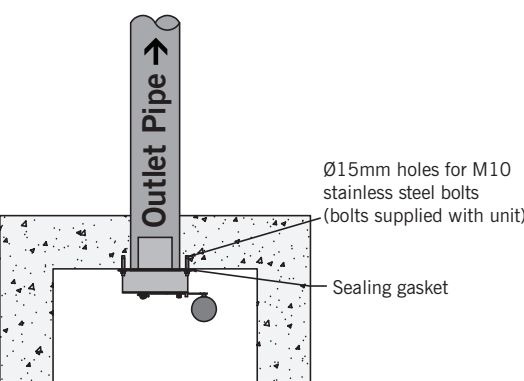
## Installation instructions



## Fixing installation detail for round manhole chambers



## Fixing installation detail for flat sided manhole chambers



## Guide to installing an ACO Q-Brake Vortex

### Step 1:

Construct the chamber that is to house the ACO Q-Brake Vortex flow control. Note that if the chamber has a curved wall (e.g. a concrete ring manhole), the diameter of the chamber should be specified on the order and Contract Review Document for the ACO Q-Brake Vortex flow control unit.

### Step 2:

The base of the chamber must be at a level 200mm below the bottom of the ACO Q-Brake Vortex flow control. When the chamber base is benched, there must be a 200mm deep sump below the bottom of the unit as shown on the sketch.

### Step 3:

Offer the ACO Q-Brake Vortex flow control unit up to the outlet pipe using the lifting eyes where appropriate. Ensure the unit is upright (arrow pointing vertically up). Mark the position of the fixing holes on the chamber wall. Remove the unit and drill fixing holes to suit the M10 bolts supplied with the unit. (Note bolts are Rawlbolt R-XPT-S stainless steel M10 bolts requiring a hole 15mm diameter).

### Step 4:

Place bolts into the drilled holes. Locate the ACO Q-Brake Vortex flow control onto the bolts (again check it is upright). Ensure that the gasket is flat against the wall. Fit the nuts and tighten them to pull the unit against the gasket and seal it against the wall.

### Step 5:

Fix the two wire guide rings (supplied) to the chamber wall, one approx mid height and one just under the access cover. Thread the bypass door lifting wire through the rings. Adjust the length of the wire by fixing the handle in the correct position and cut to length if necessary.



# Operation and maintenance recommendations

## Commissioning the product

Before the product is commissioned, the chamber containing the ACO Q-Brake Vortex should be inspected in line with normal practice. Any debris or silt should be removed. Any visible fixing bolts should be checked.

If an internal blockage is suspected, the control can be inspected internally and cleaned out by opening the inspection bypass door on the upstream end. The bypass door must be returned to the closed position before the control becomes operational or bolted shut.

## Manual handling

ACO Q-Brake Vortex flow controls should be handled in accordance with current legislation and regulations:

- The Health and Safety at Work Act 1974
- The Management of Health and Safety at Work Regulations 1999
- The Manual Handling Operations Regulations 1992

## Frequency of inspection / maintenance

Inspections should be carried out at frequent and regular intervals (approximately every 3-6 months). The frequency will depend upon the location and the environment, and should be based on local knowledge. Action is only required in the event of a blockage or suspected blockage.

## Service life

ACO Q-Brake Vortex flow controls have no moving parts to wear or fail. Manufactured from grade 304 stainless steel plate they will resist scour, degradation and chemical attack. The unit is designed to easily outlast the drainage system in which it is installed.

## Maintenance plan

ACO Q-Brake Vortex flow controls require no routine maintenance although inspections should be carried out at regular intervals (See frequency of inspection / maintenance section).

## COSHH

ACO Q-Brake Vortex flow controls are manufactured from grade 304 stainless steel. This material is not regarded as hazardous to health and demonstrates no chemical hazard when used for the stated applications.



## Product Testing

Through ACO's continual product development and refinement programme has led to an enhanced range of ACO Q-Brake Vortex flow controls. The range has been independently tested and complex software written to ensure that the best possible characteristics and curves are achieved to help reduce upstream storage requirements and installation costs.

## MODEL SPECIFICATION CLAUSE

The vortex flow control device shall be supplied by ACO Technologies plc; all materials and components within the scope of this system shall be obtained from this manufacturer.

All units shall be manufactured from grade 304 stainless steel incorporating rear mounted remote access bypass and emergency drain down door complete with stainless steel cable and fixings.

ACO Q-Brake Vortex is a vortex flow control device designed to suit a design head of #mm and design flow of # litres per second.

# Insert information as appropriate

## NBS Specification

ACO Q-Brake Vortex should be specified in section R12. Assistance in completing this clause can be found in the ACO Water Management entry in NBS Plus, or please contact the ACO Water Management Design Services Team.

**Note:** A specification in NBS format is available to download from [www.thenbs.com](http://www.thenbs.com) or [www.aco.co.uk](http://www.aco.co.uk)

## RECYCLED CONTENT

ACO Technologies aims to incorporate as much recycled material or waste material as is practicable in its manufactured products.



Typically steel products contain between 25% and 33% recycled content by weight. Therefore the total recycled content of the ACO Brake Vortex will contain be at minimum approximately 25% by weight recycled material.

ACO Q-Brake Vortex is intended for a long life with low maintenance, to reduce the need to recycle, but when eventually the product is no longer needed, much of its content can be readily recycled with a very low risk of pollution to the environment.



# What is ACO Q-Plate?

ACO Q-Plate orifice plates are designed for use where an ACO Q-Brake vortex is not the most effective solution. To suit application requirements, the range is available with or without remote bypass and drain down and is designed to match a variety of manhole configurations. A neoprene sealing gasket and fixing holes are featured on each unit.



ACO Q-Plate with remote draindown and bypass recommended for all orifice apertures less than 100mm

ACO Q-Plate

### ACO Q-Plate Bypass features

- ▶ Manufactured from 304 stainless steel
- ▶ Orifice aperture up to 150mm
- ▶ Sealing pipe gasket
- ▶ Emergency drain-down and access cable
- ▶ Bypass door (with improved seal) and latch
- ▶ Flat or curved radius to suit manhole diameter
- ▶ Manhole fixings

### ACO Q-Plate features

- ▶ Manufactured from 304 stainless steel
- ▶ Four fixing positions
- ▶ Pipe sealing gasket
- ▶ Manhole fixings
- ▶ Flat or curved radius to suit manhole diameter

### ACO Q-Plate Specification and design process

To suit project requirements, two options of ACO Q-plate are available:

#### ACO Q-Plate Bypass

< 100mm orifice with remote drain-down and bypass (also available up to 150mm)

#### ACO Q-Plate

> 100mm orifice without remote drain-down and bypass

In order to complete this process and deliver the product options available, please provide the ACO engineers with the following information:

- ▶ The proposed design flow – maximum allowable discharge
- ▶ The proposed design head – invert of outlet pipe to top water level
- ▶ The proposed outlet pipe diameter
- ▶ The proposed type and size of outlet manhole

Before production can commence, ALL of the above information must be verified on ACO's Contract Review Document issued at the time of order placement.

### Finished product

From this information ACO will size and design the ACO Q-Plate to meet the design criteria and to suit the proposed surface water application.

#### ACO will supply:

- ▶ Head discharge table & graph
- ▶ ACO Q-Plate installation details
- ▶ Information for manhole sizing

### Guide to installing an ACO Q-Plate

#### Step 1:

Construct the chamber that is to house the ACO Q-Plate orifice control. Note that if the chamber has a curved wall (e.g. a concrete ring manhole), the diameter of the chamber should be specified on the order and Contract Review Document for the ACO Q-Plate Orifice control unit.

#### Step 2:

There should be a small sump under the outlet to ensure the orifice control does not easily block, ideally there should be upstream sediment and debris traps. When the chamber base is benched, there should be a minimum 200mm deep sump below the bottom of the unit as shown on the sketch.

#### Step 3:

Offer the ACO Q-Plate orifice control unit up to the outlet pipe. Ensure the unit is upright (arrow pointing vertically up) and that the orifice is correctly positioned at the invert of the outlet pipe.

Check there is a good seal between the orifice plate and the outlet pipe. Mark the position of the fixing holes on the chamber wall. Remove the unit and drill fixing holes to suit the bolts supplied with the unit.

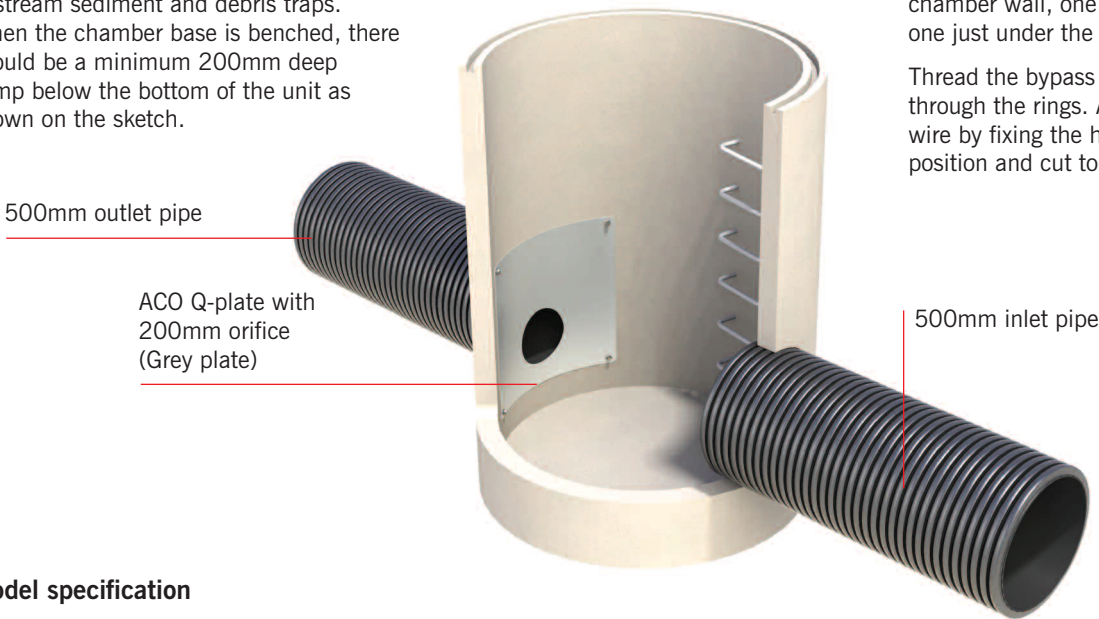
#### Step 4:

Place bolts into the drilled holes. Locate the ACO Q-Plate orifice control onto the bolts (again check it is correctly aligned). Ensure that the gasket is flat against the wall. Fit the nuts and tighten them to pull the unit against the gasket and seal it against the wall.

#### Step 5:

If you have been supplied the Q-Plate with the drain down and bypass door fix the two wire guide rings (supplied) to the chamber wall, one approx mid height and one just under the access cover.

Thread the bypass door lifting wire through the rings. Adjust the length of the wire by fixing the handle in the correct position and cut to length if necessary.



### Model specification

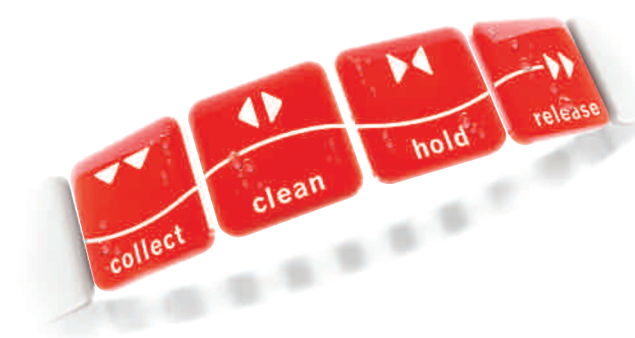
ACO Q-Plate orifice control \*with remote drain down and bypass (delete as appropriate), ##mm orifice designed to suit a pipe outlet size of ###mm, a design head of ## mm and design flow of # litres per second.

#insert information as appropriate.



# ACO's sustainable water management system

To help architects, designers and contractors meet the legal requirements that now tightly control the way surface water is managed, ACO has created its unique 'Surface Water Management Cycle' – Collect, Clean, Hold, Release – the four core processes required for the complete and sustainable management of surface water drainage. [Click here](#) for more information.

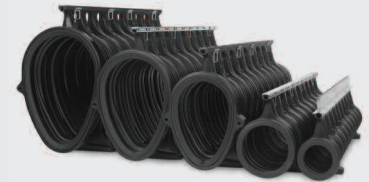


## Collect



The point at which run-off enters the surface water management system. Drainage channels can be used individually or in combination to ensure optimal removal of all surface water.

With the most comprehensive range of channels available, ACO systems are manufactured from a variety of materials and are suitable for load bearing in domestic applications through the car park, highway, dock and airport applications.



ACO Qmax® – New sizes available



ACO MultiDrain™ MD



ACO KerbDrain®

## Hold



Storage for controlled discharge or infiltration into the immediate environment is an important aspect of managing surface water in the SuDS approach. ACO StormBrixx provides an ideal method of delivering effective management of surface water where swales and ponds are not possible.

ACO StormBrixx has been awarded the BCIA Product Innovation Award 2012.



ACO StormBrixx



## Clean



Run-off that picks up surface pollutants and silt will need to be treated before discharge.

Oil separators such as ACO Q-Ceptor offer an effective solution providing full or bypassed treatment of oil polluted surface water.



ACO Q-Ceptor

## Release



Controlling the release of clean surface water into the natural environment requires appropriate upstream controls which culminate in an appropriately managed flow. This can be achieved via a flow controller such as ACO Q-Brake Vortex or through a soakaway.



ACO Q-Brake Vortex



## The ACO Group: A strong family you can depend on.



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### Contact us

If you need further product, design or installation advice on the ACO Q-Brake Vortex or any other ACO system, please [click here](#) for a list of our key contacts.

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### Standards & Accreditations

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