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CI/SfB (52.7)	

ACO Water Management:

Civils + Infrastructure



ACO Q-Brake Vortex
Vortex flow controls

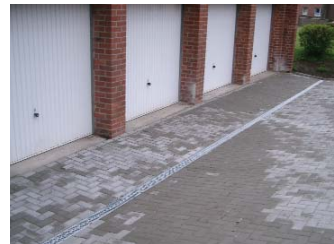


Introduction to the ACO Group

Throughout the world, the ACO brand is recognised as a leading supplier in the design, development and manufacture of surface water drainage systems.

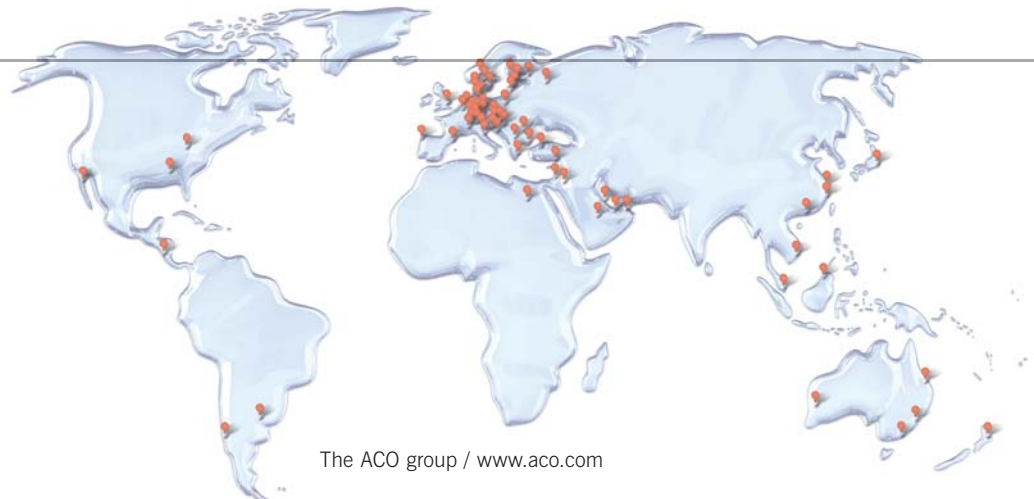
An extensive portfolio offers the market quality solutions for every application, including internal and building drainage, landscaping, sport facilities, retail, distribution centres, highways and airports as well as solutions for environmentally sensitive projects.

The ACO Group has been manufacturing and selling market leading drainage systems for over 40 years. During this time the group has made extensive investment in global research and development and manufactures products world wide at 31 modern environmentally-sensitive production sites.



Designed with applications in mind, ACO Group surface water drainage systems are manufactured using a diverse range of materials including:

- Vienite®, ACO's high strength recycled material
- Polymer concrete
- Steel
- Plastic
- Ductile iron



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Introduction to ACO Q-Brake Vortex

ACO Q-Brake Vortex is a vertical vortex flow control designed to regulate stormwater flow before it discharges into watercourses or sewer networks. Unlike more conventional methods e.g. orifice plates or sized pipework, ACO Q-Brake Vortex is less prone to blockage and permits higher flow at a lower head of water, as a vortex flow control allows an outlet orifice 4-6 times larger in cross-sectional area to be used.

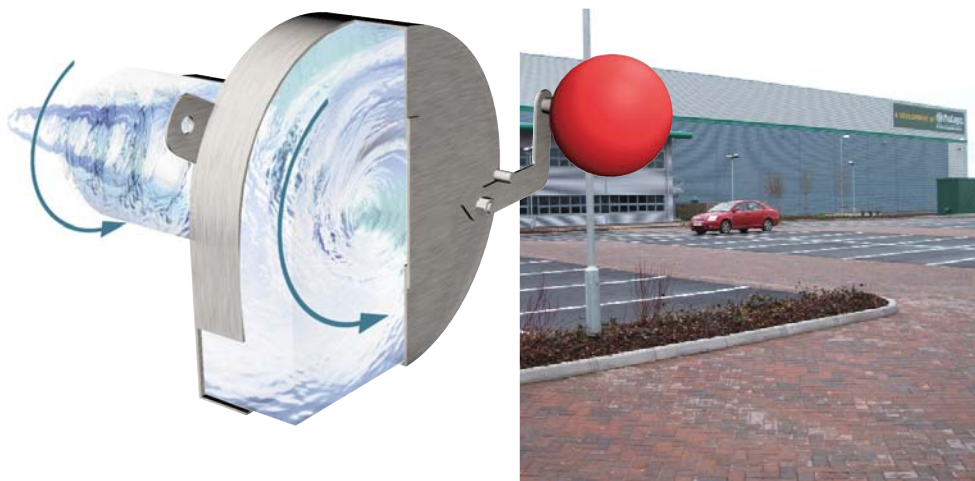
What is ACO Q-Brake Vortex?

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.

ACO Q-Brake Vortex is fitted with an integral bypass door which in the event of a blockage can be opened so the unit can be drained of water. A stainless steel wire attached to the bypass door is run to cover level and provides control of the bypass door. Once the water level within the manhole subsides the unit can be cleared.

Manufactured from grade 304 stainless steel, each ACO Q-Brake Vortex is individually configured to suit specific performance criteria. All seams are continuously welded in accordance with BS 4872 for maximum strength.



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Why choose ACO Q-Brake Vortex?

The mechanism employed within ACO Q-Brake Vortex provides superior hydraulic performance in comparison to traditional flow control systems. An example of the comparative performance between the two types of systems can be found on page 5. ACO Q-Brake Vortex also allows more flow at lower heads, reducing storage volume requirements and lowering cost.

ACO Q-Brake Vortex has clear openings larger than traditional methods of flow control, which makes the system 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.

The drain down facility is operated by pulling the wire cable fixed to the bypass door. The bypass facility will automatically close once the wire cable is released. Building Regulations 2000 Section H discourages direct man access to sewer manholes.

When used with other ACO Water Management products, ACO Q-Brake Vortex can complete a fully integrated stormwater control system

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

Typical applications

ACO Q-Brake Vortex is suitable for a wide variety of SUDS (Sustainable Urban Drainage) applications and can be used in a range of building applications including:

- ▶ Commercial and retail developments
- ▶ Hard landscaping
- ▶ Public and private parking areas
- ▶ Residential developments
- ▶ Distribution yards
- ▶ Industrial estates



Key features and benefits

- ▶ Controls discharge flow into watercourses or sewer networks
- ▶ Provides predictable control performance
- ▶ Self activating system
- ▶ Minimises the risk of blockage
- ▶ Reduces the need for maintenance
- ▶ Removes the need for unnecessary man access
- ▶ Simple installation
- ▶ Fits a range of manhole designs
- ▶ Durable and corrosion resistant system
- ▶ Individually configured to suit specific performance criteria



If you need help with specification, design or installation, or just wish to learn more about this and other Surface Water Management products from ACO, contact our free, no obligation ACO Water Management Design Services Team who can provide advice and dedicated design support for your project – 01462 816666 or visit www.aco.co.uk.

Typical stormwater control installation

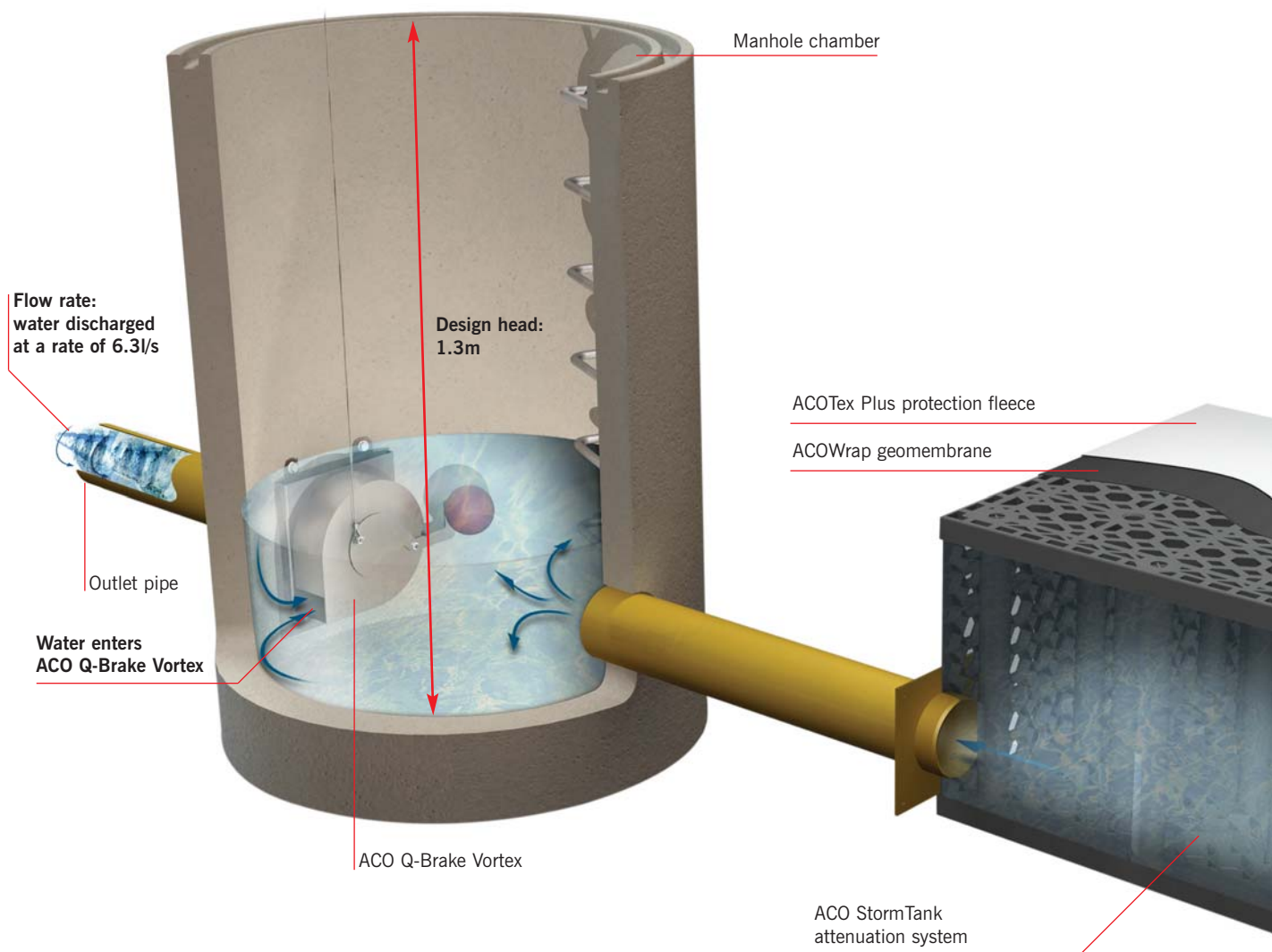
ACO Q-Brake Vortex and ACO StormTank can be used to provide a fully integrated stormwater control system.

The installation below simulates how the ACO StormTank system is used to provide stormwater attenuation, whilst the ACO Q-Brake Vortex is used to regulate the rate of discharge from the development into the watercourse or sewer network.

The benefits of using the stormwater control system are best demonstrated in the example shown on the opposite page. The conclusion of the example means that upstream storage can be reduced by 11m³ compared to using a traditional flow control system.

Further water management systems are also available and can be tailored to meet many urban drainage schemes and surface water management requirements.

A short overview on a number of these products is provided towards the back of this brochure. For full details of our complete ACO Water Management product range visit www.aco.co.uk.



Graphic illustration of project example opposite.

ACO Q-Brake Vortex: How does it compare to a traditional flow regulator?

Example:

There is a project in Bedford, England with a catchment area of 13,000m². 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.

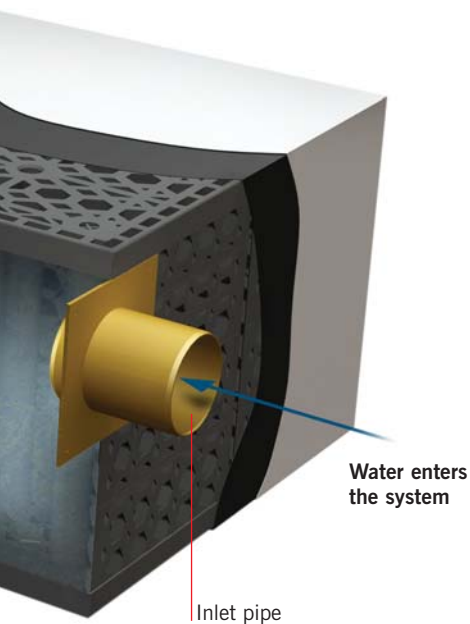
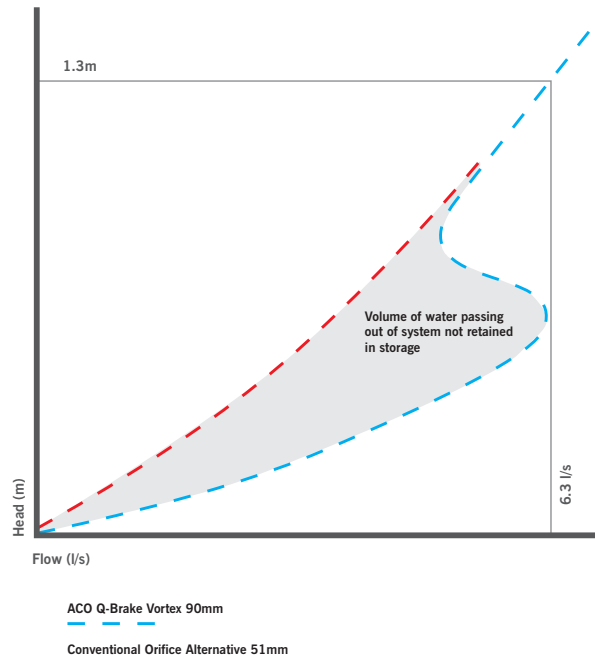
Results:

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 402m³.
- ▶ Orifice plate size required Ø 51mm. Upstream attenuation required 413m³.

ACO Q-Brake Vortex reduces upstream attenuation by 11m³ 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.

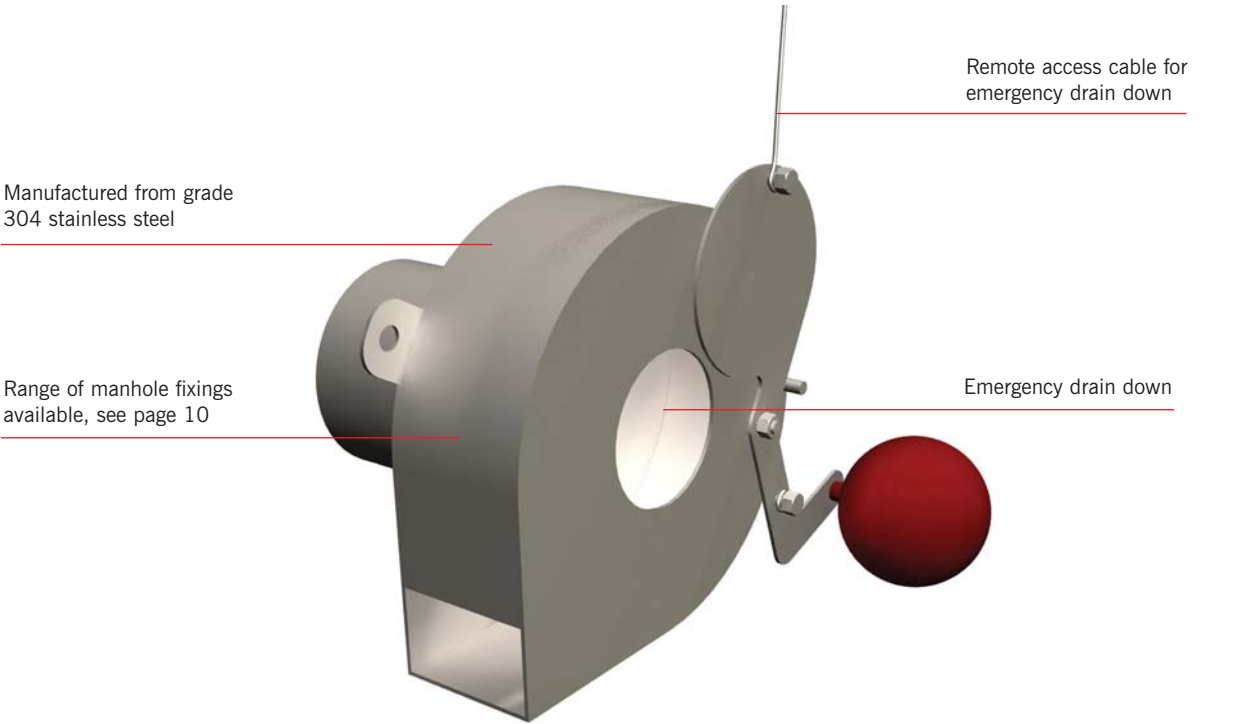
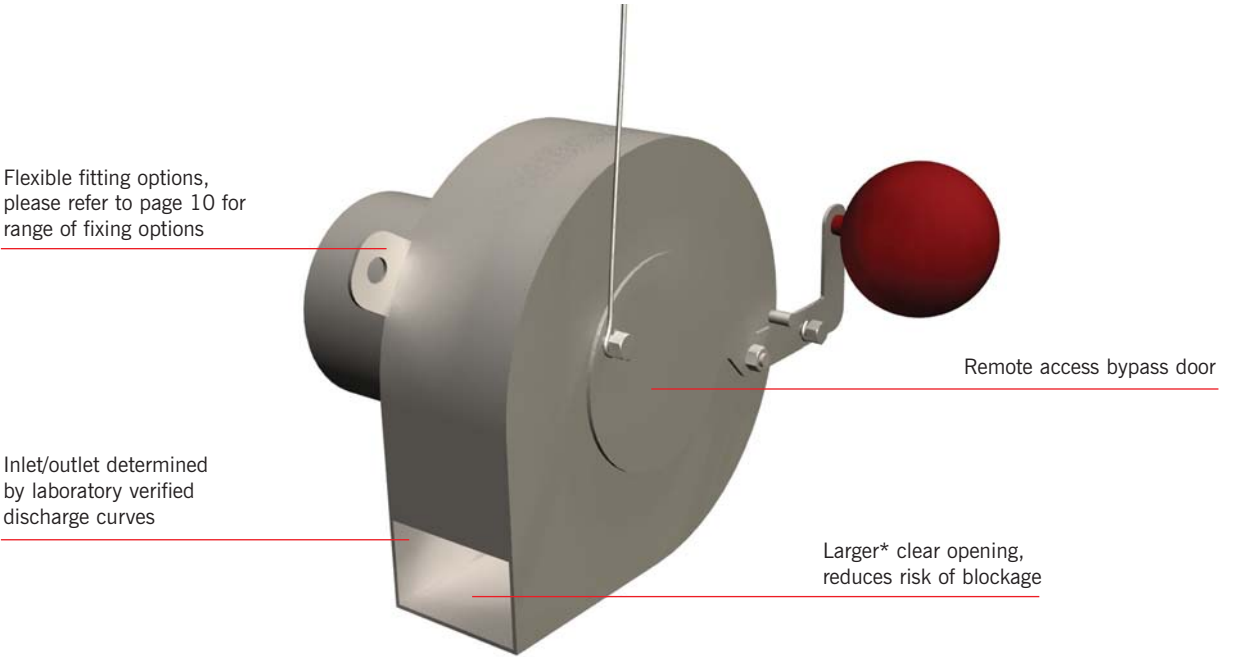
Discharge characteristics



ACO StormTank attenuation system with ACO Q-Brake Vortex flow control

ACO Q-BRAKE VORTEX FEATURES OVERVIEW

- 1 ACO Q-Brake Vortex allows a control equal to an orifice plate having a cross section area 4 to 6 times smaller
- 2 All parts are welded to BS 4872



*Larger than traditional orifice plate controls

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 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



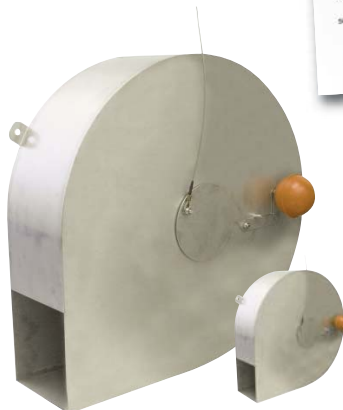
Head Discharge Table ACO Q-Brake Vortex	
Design Point:	
Head (mm):	1350
Flow (l/s):	6.30
Head (mm):	Flow (l/s):
0	0.00
100	1.76
200	3.95
300	6.10
400	5.85
600	4.22
800	4.86
1000	5.44
1200	5.96
1400	6.43
1600	6.88
1800	7.29
2000	7.69
2500	8.60
3000	9.42
3500	10.17

Finished product

From this information we 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



DESIGNING THE SCHEME - 'VALUE ENGINEERING'

Getting the drainage specification right is crucial and with many issues to consider, it is important to assess all the different variables in order to reduce any potential risk and to comply with planning and design requirements.

At ACO, we recognise these challenges and offer a free of charge technical and design advice service to assist the Specifier and Contractor in designing and installing any ACO product.

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.

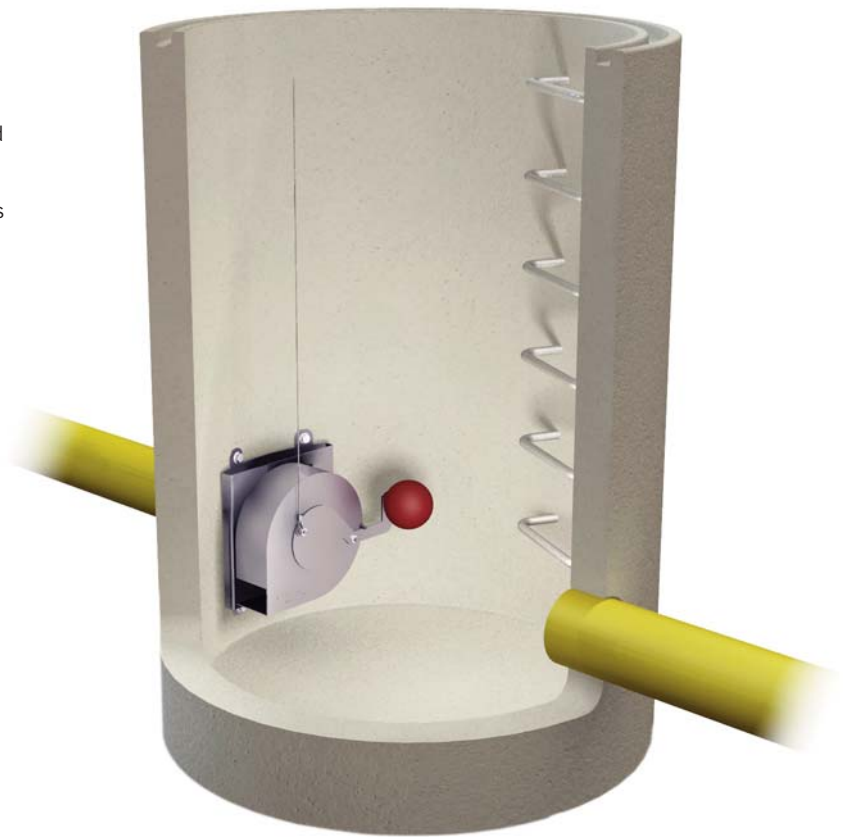


If you need help with specification, design or installation, or just wish to learn more about this and other Water Management products from ACO, contact our free, no obligation ACO Water Management Design Services Team who can provide advice and dedicated design support for your project – 01462 816666 or visit www.aco.co.uk.

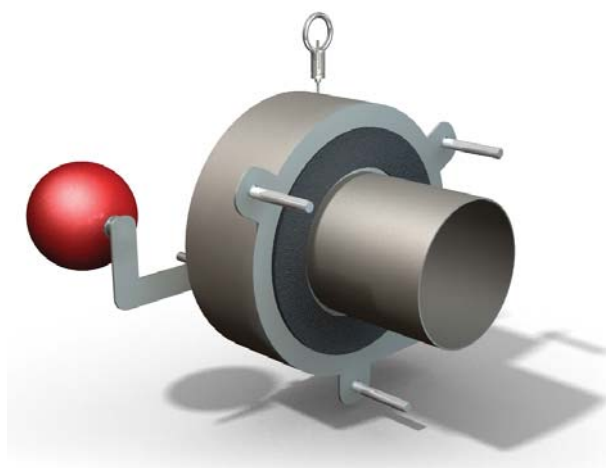
ACO Q-Brake Vortex chamber fixing accessories

ACO Q-Brake Vortex flow control has a selection of fixing options that can be used to secure the unit to flat sided or round manhole chambers.

The type of manhole chamber to be used will need to be specified as part of the design process for the ACO Q-Brake Vortex flow control. See page 7 for ACO's specification requirements.



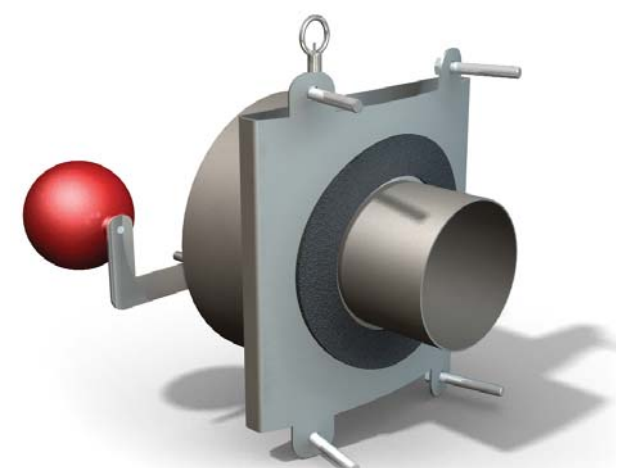
Fixing accessory for flat sided chamber



Fixing option for flat side chamber or weir walls
Unit consists of:

- ▶ Sealing gasket
- ▶ 3 Fixing bolts

Fixing accessory for round chamber

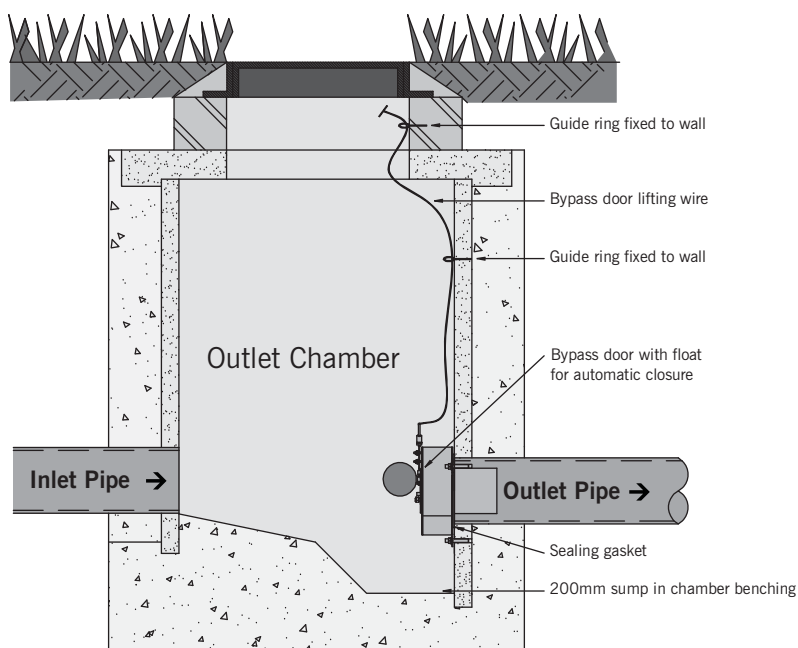


Fixing option for round chamber suitable for 900mm diameter to 3000mm

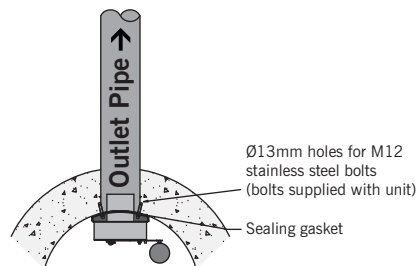
Unit consists of:

- ▶ Sealing gasket
- ▶ 4 Fixing bolts
- ▶ Curved plate to suit manhole radius

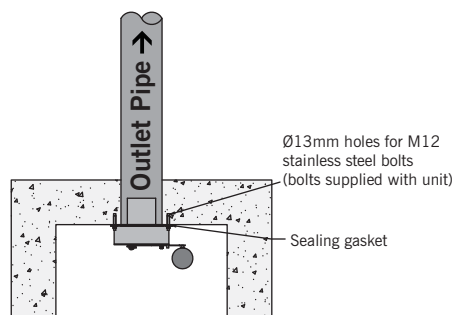
Installation detail



Fixing installation detail for round manhole chambers



Fixing installation detail for flat sided manhole chambers



Guide to installing ACO Q-Brake Vortex flow control regulator

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 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. 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 M12 bolts supplied with the unit. (Note bolts are Rawlbolt R-XPT-S stainless steel M12 bolts requiring a hole 13mm 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.



An electronic version of the ACO Q-Brake Vortex installation detail is available to download from the ACO website. Visit www.aco.co.uk.

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.

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.

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).

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

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.

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.

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.

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 or www.aco.co.uk

ACO Water Management Systems

ACO Water Management has a broad range of surface water management systems designed to provide the optimum solution in stormwater control and sustainable drainage systems.

Suitable for a range of applications including parking areas, retail and commercial developments, highways and residential developments, the product range includes oil separators, stormwater attenuation and infiltration systems, and high capacity drainage systems.

A brief overview of these products is provided below. For further detailed information on these product ranges please visit www.aco.co.uk.



ACO Qmax®

ACO Qmax® is the first, award-winning, continuous slot drainage system for high capacity and attenuation.

Manufactured from recycled MDPE, the lightweight material makes the product easy to install. ACO Qmax® is available in a variety of depths, four channel sizes, and has a range of accessories including the ACO Qmax® Access Chamber which is designed to provide fast and simple connectivity between any channel sizes within the range.



ACO StormTank

ACO StormTank offers the latest technology in stormwater infiltration and attenuation. The lightweight modular cell system is designed for use in a variety of applications including distribution parks, car parks, and commercial and residential developments.



ACO Q-Ceptor oil separators

ACO Q-Ceptor oil separators are an innovative range of bypass and full retention separators. These high performance systems are fully compliant with BS EN 858:2002 parts 1 & 2 and exceed the requirements of the Environment Agency's PPG 3 guidelines. The compact polyethylene chambers are quick to install and simple to operate and maintain. The robust material also increases service life and improves durability over GRP units. Class 1 and Class 2 separators are available.



ACO Channel Drainage Systems

ACO Water Management has the largest range of surface water drainage systems currently on the market. These systems are designed for almost any application ranging from domestic car parking through to heavy duty warehouse applications.

Designed with applications in mind, ACO channel drainage systems are manufactured using a diverse range of materials including Vienite® polymer concrete, iron, steel, plastic and composite, providing a wide product choice and also specific benefits including appearance, ease of installation, fluid handling performance and environmental impact.

ACO KerbDrain®

An award-winning one-piece combined kerb and drainage system manufactured from Vienite®, ACO's high strength recycled polymer concrete, ACO KerbDrain® carries the BSI Kitemark to ensure full compliance for motorways and major trunk roads and is ideal for use in many highway, car parking and SUDS applications.



ACO GroundGuard

ACO GroundGuard is manufactured from 100% recycled polyethylene and provides a lightweight ground reinforcement system for grass or gravel stabilisation. In addition, ACO GroundGuard is over 90% porous, reducing the rate of surface water runoff and saving cost on unnecessary drainage installation.

ACO Wildlife

ACO Wildlife is dedicated to the development of wildlife conservation products including amphibian fencing and tunnels, nest boxes and wildlife kerbs.

Notes

Notes

ACO Technologies plc

- ACO Water Management
Civils + Infrastructure
Urban + Landscape
- ACO Building Drainage
- ACO Technic
- ACO Sport
- ACO Wildlife

ACO Water Management: Civils + Infrastructure

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

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