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StormBrake™ Vortex Flow Control System

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Through the use of vortex flow technology, FP McCann's StormBrake™ provides the solution to a variety of stormwater management problems.

A new force in vortex flow technology

Vortex Flow Controls (VFCs) are commonly used in drainage schemes to regulate the stormwater run-off from urban areas. Through the use of vortex flow technology, FP McCann's StormBrake™ provides solutions to a variety of stormwater management problems. These include accurately controlling stormwater flow, minimising upstream storage requirements and reducing the risk of blockages compared to traditional orifice plates.

What is Vortex Flow Technology?

Vortex flow technology is based on the principle of a forced vortex, where under sufficiently high upstream water levels a vortex is induced in the flow by the device. The vortex motion results in significant energy loss, creating a pressure drop across the device and restricting the discharge leaving the outlet. The geometric properties of the device control the amount of flow restriction and can be tailored to suit the design conditions for a specific site.

Low water level in the flow control chamber

Benefits

- Minimal maintenance required after installation. FP McCann's StormBrake™ is self-activating and functions without any mechanical components
- Outlet areas of up to 6 times larger than an equivalent orifice plate, significantly reducing the risk of blockages and the associated maintenance costs
- Reduces the amount of upstream storage required, minimising the cost of providing attenuation facilities
- Contains a bypass door which can be manually opened at ground level using a pull cable to allow easy access for inspection or blockage removal
- Provides minimal flow restriction at low upstream heads to allow fast discharge of water during the initial stages of a storm

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Design

FP McCann's StormBrake™ is manufactured using grade 304L stainless steel for increased durability, strength and resistance to corrosion and chemical damage. It consists of 3 main parts: an inlet section, a vortex chamber and an outlet. Each part can be configured to provide the most efficient solution to specific site requirements.

Each StormBrake™ is fitted with a pivoting bypass door on the front face at the same level as the outlet pipe. A stainless steel wire cable is attached to the bypass door and extends to the top of the manhole chamber. Upon pulling the cable the bypass door rotates and moves upwards, revealing a clear straight-through channel between the manhole and the outflow pipe. In the event of the StormBrake™ inlet becoming blocked by debris, the bypass door allows fast discharge of water out of the chamber for maintenance.

StormBrake™ flow control system under low flow conditions

StormBrake™ flow control system during storm event

FP McCann Launches StormBrake™ Design Portal

FP McCann's new StormBrake™ calculator lets drainage engineers determine the StormBrake™ performance characteristics and overall flow chamber specifications. To gain access to FP McCann's new StormBrake™ calculator, simply register online to create an account. Once registered, users can quickly login to the online portal where they are asked to enter the head of water in metres and the flow of water in litres/second. The StormBrake™ calculator then identifies performance points against the design criteria including flush flow and kickback points. The full characteristic performance curve is provided for easy adoption into drainage software. The recommended minimum chamber and outlet pipe diameters and the geometric properties of the vortex flow control are determined by the calculator. A typical chamber layout is then drafted to provide the designer with the complete installation package to the specification required.

To set up your account and login to the StormBrake™ Design Portal, type the link below into your browser and follow the simple registration instructions.
https://orders.fpmccann.co.uk/StormBrakeWeb/

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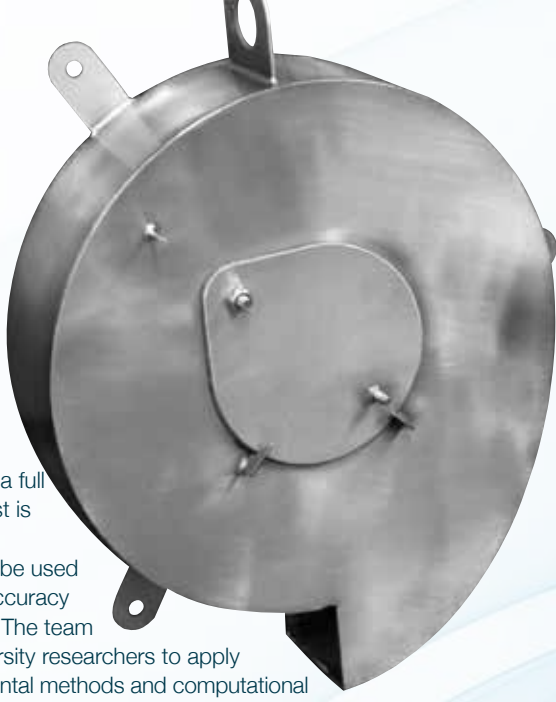


Flow Stages

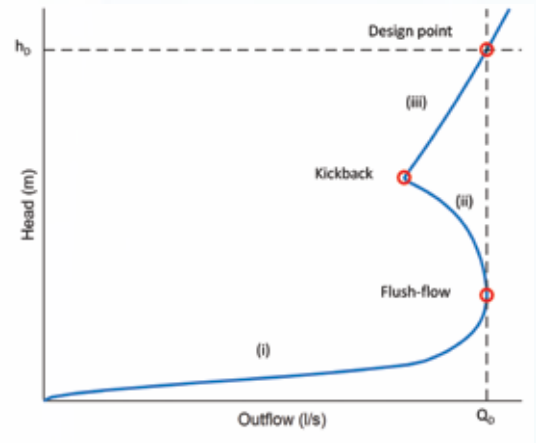
The performance of FP McCann's StormBrake™ is determined by relating the upstream head to the outflow leaving the device. Its performance is characterised by a head-flow curve, which produces a unique 'S'-shape, corresponding to the following three phases of flow:

(i) Pre-vortex phase – hydrodynamics governed by orifice flow. The flow generated by the upstream head is not large enough to induce a vortex in the StormBrake™. This phase occurs until the flush-flow point is reached.

(ii) Transition phase – flow throttling initiated. Vortex continually forms and collapses, resulting in significant energy loss and lower flow rates despite increasing upstream head. This phase is bounded by the flush-flow and kickback points.

(iii) Vortex phase – vortex fully formed with central air core. The air core imposes a quasi-physical flow restriction, reducing the available area in the pipe for outflow.

By changing the geometry of the StormBrake™, the positions of the flush-flow and kickback points can be tailored to suit the clients' needs. For example, the curve below is ideal for situations where upstream storage capacity is limited. The flush-flow point occurs at the design flow, allowing for maximum discharge of water during the early stages of a storm, therefore minimising upstream storage requirements.



Testing

FP McCann's in-house development team test the StormBrake™ using a full scale test facility. The test is constructed of the same components that would be used on site, increasing the accuracy and realism of the tests. The team works closely with university researchers to apply state-of-the-art experimental methods and computational analysis to the development process. To date, over 3.6 million litres of water has been used to characterise the performance of the StormBrake™. This volume is constantly increasing, due to consistent development and rigorous testing, ensuring the best performance to meet the requirements of each specific site.

Installation

1) Position the StormBrake™ so that the inlet is at the bottom and the device outlet is in line with the chamber outlet pipe. If the StormBrake™ is fitted with an outlet surround it should rest on the bottom inside wall of the outlet pipe. Mark the locations of the mounting points on the chamber/mounting wall.

2) Using the marked locations, drill holes to the required thickness and depth for the supplied masonry anchors. Fit the bolts to the holes.

3) Attach the StormBrake™ to the anchor points, ensuring the neoprene gasket is flush with the chamber wall, and fasten the device by tightening the bolts. This will compress the neoprene gasket to provide a watertight seal between the StormBrake and the wall.

4) Fix the stainless steel wire cable from the bypass door to the underside of the manhole cover, vertically above the device. A secondary bracket is supplied and should be fitted halfway up the chamber to guide the bypass door cable to the top.

5) Adjust the length of the bypass cable accordingly, so that it reaches the ground level whilst ensuring the bypass door can open if required.

By applying the DFMA principles, FP McCann's design engineers are able to evaluate individual precast concrete products part by part, in addition to documenting the assembly process step by step. This allows them to generate the cost, part count and assembly time to provide a benchmark to measure its success and identify the parts and process improvement opportunities. In turn, this has allowed FP McCann to design and manufacture more cost-effective and efficient high-quality precast concrete products with less wastage and greater on-site recycling. As a result, increased productivity, combined with a reduction in production time and costs, allows FP McCann to be more competitive within the marketplace.

For further information on StormBrake™ please contact:
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