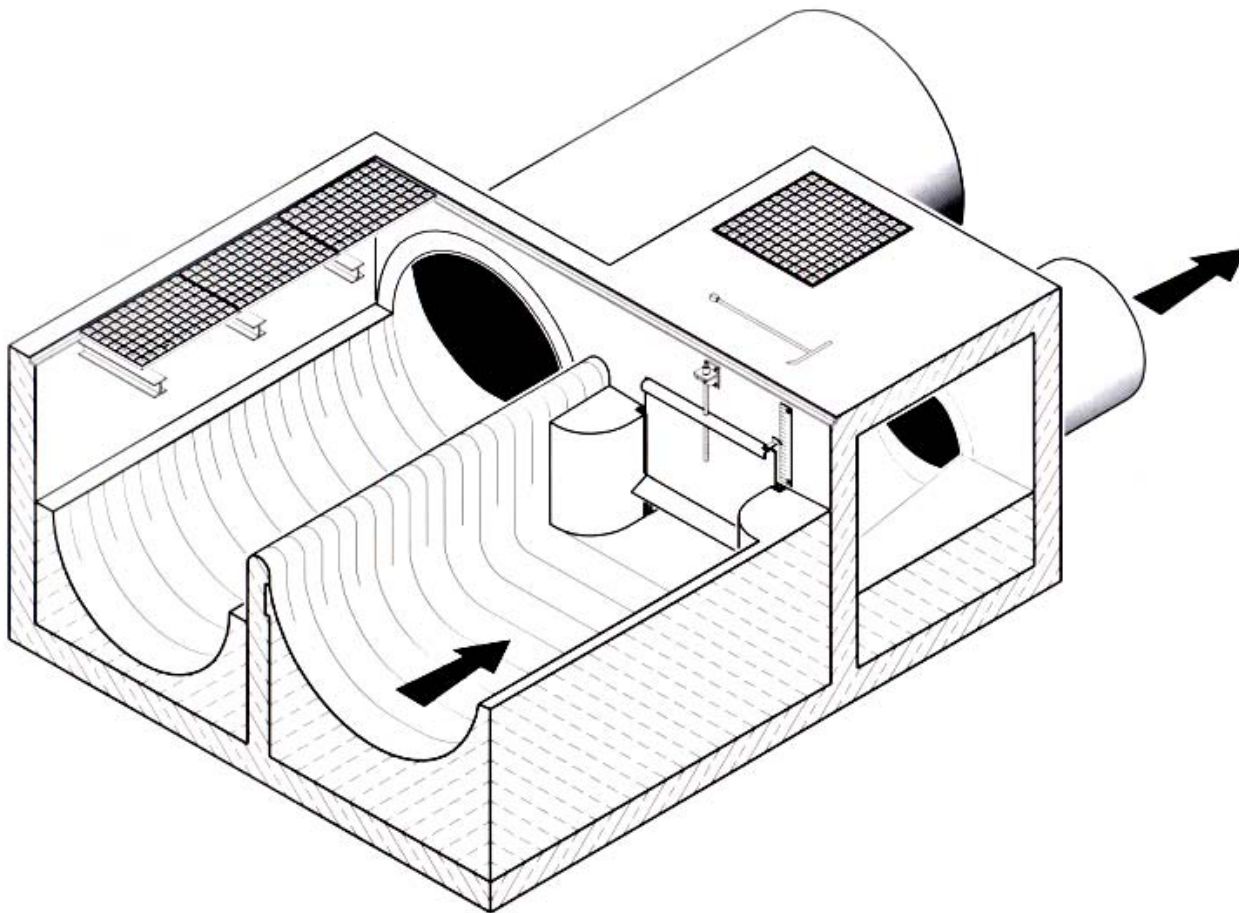


# CSO/STORMWATER MANAGEMENT



**HYDROVEX<sup>®</sup>**

*FluidHook Control Gate Valve*

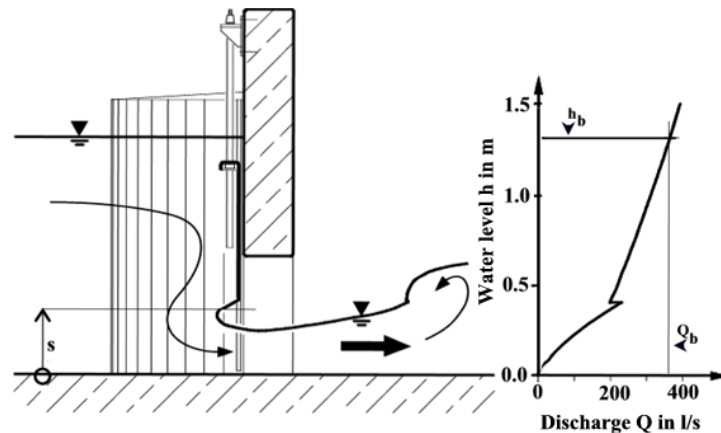


**JOHN MEUNIER**

## APPLICATION

The flow regulation at storm overflows or retention facilities is usually performed with either a flow regulating valve or a calibrated orifice. These methods, unfortunately, do not represent optimal solutions, either from a technical or economic point of view. These flow-regulating systems are not precise and depend mostly on the pipe roughness, which can vary over time. Also, they depend essentially on high upstream water head to operate. These approaches are at a detrimental loss when regulation of low heads is required. In general, such installation precision can drift of  $\pm 15\%$  of the set flow rate over time, due to pipe characteristics variation.

The **HYDROVEX® FluidHook** is specially designed for these kinds of applications in CSO's or storm drains, surface pond reservoirs and retention tanks. It is particularly adapted to regulate large or very large flow discharges with small to middle range upstream water heads.



**Figure 1:** *The outlet flow of the FluidHook presents a strong jet contraction downstream. Figure on the right hand side shows hydraulic characteristics  $Q(h)$ .*

## ADVANTAGES

The adjustable **HYDROVEX® FluidHook** Flow Control Gate Valve can be manufactured over a wide range of widths. Thus the discharge opening remains very shallow, being able to accept very small upstream water heads, while maintaining a very defined hydraulic regulation characteristic. As a result of this optimized configuration, the **FluidHook's** geometry presents a particularly strong throttling effect, while maintaining a large free cross-sectional flow.

The equipment is completely manufactured from plastic and high-grade steel and presents a high stability. It is very simple in the handling.

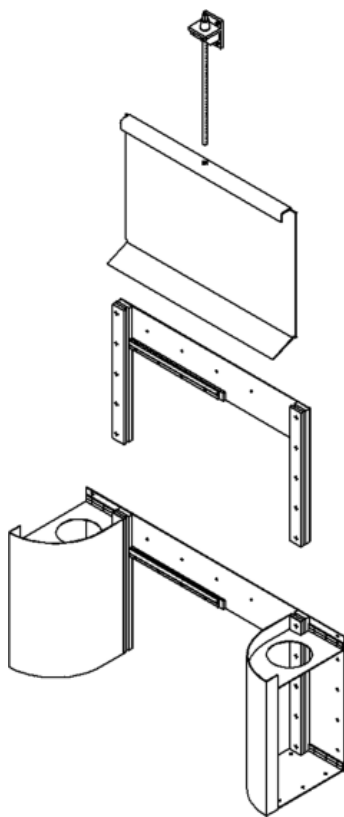
- optimized design for large flow discharge with small upstream head
- large loss factor creating a strong throttling effect
- installation upstream from the outlet wall to insure positive water pressure effect
- precise and direct regulation of the discharge
- opening set-point metering with a scale and pointer arrangement
- compact installation
- no variation of the flow-head relationship over time
- non-corrosive construction from high-grade steel and HDPE
- positioning mechanism located above water level
- accommodates very shallow installations

## DESIGN & OPERATION

The adjustable **Hydrovex® FluidHook** Flow Control Gate Valve has a lower end forward horizontal bend, directed against the flow. The equipment is adjusted to the opening height "s" supplied by John Meunier Inc. The clear opening becomes a broad but low rectangle. This opening shape is desired: it accepts large water flows even for low upstream heads and can still limit the discharge precisely. In general, market available units present small widths and thus require high opening heights. This leads to flow control effect generated by the building dimensions, rather than the slide gate valve position. In extreme cases, large circular slide gate valves, installed in steep slope areas, would never have the sliding plate in contact with the water at any time.

The **Hydrovex® FluidHook** regulator uses a special hydraulic effect. Until reaching the gate set-point elevation, the water flows under the gate without interference. If the water level rises to the gate level, then the effluent jet is restricted by the horizontal "J" cut shape of the gate, accelerated strongly and pressed down by the natural restricted water flow pattern. The water throttles itself by generating a strong backflow wave downstream from the unit, while maintaining a relatively large opening height, highly desirable in the sewage engineering, to limit blocking of the opening.

With large discharges and small upstream head conditions, the design of the chamber plays a very large role in the efficiency of the installation. An important hydraulic back wave develops in the section of the chamber downstream from the gate valve. This back wave makes the flow control independent from the downstream conditions, until completely submerged conditions appear. If the downstream water conditions lead to a submerged output from the gate valve, the calculation is not independent any longer and needs to include intake losses and energy levels need to be considered. If the regulating chamber is constantly operating in submerged conditions on the downstream side, the hydraulic behavior of the **FluidHook** regulator is partially impaired. We can evaluate and include this situation in our calculation of the **FluidHook**. The **FluidHook** regulator remains partially opened in normal operating conditions. In addition, the unit can be closed for inspection purposes or to build up the upstream wastewater head temporarily. Please note that the closing process of the **FluidHook** is slow and that the unit can never be closed completely, always leaving wastewater flow underneath, as the unit is not built with a lower seal.



*Figure 2: Hydrovex® FluidHook with extended thread rod for manual operation*

*Middle view: Standard seat framework to be mounted upstream from a rectangular wall opening.*

*Lower view: Showing the optional hydrodynamic inlet arrangement to optimize the flow. The optional hollow bodies are built of stainless steel sheet metal and are filled with concrete after installation.*

## OPTIONS

For standard version "S", the **FluidHook** is sliding up and down by a threaded rod mechanism located above the water level. The spindle operating square nut is located either on a mounting plate inside the chamber or in a key box located outside the chamber. The slide gate valve position is changed with an operating key handle. If the pit is so low that the installation of a spindle is not possible, then the sliding plate must be moved by hand. This option is called type "SS". When the correct adjustment position is reached, the position is secured by installing a holding block.

## THROTTLE DISCHARGES

In cases where a very important upstream slope is present, the water level may only partially fill the **FluidHook** for a very long period of time. Under these conditions, the water will simply shoot under the gate, without actually being regulated. Depending on the upstream slope, the **FluidHook** discharge curve will show a more or less important peak flow (or rinsing point) exceeding the regulated flow of the unit, despite the small opening height of the **FluidHook** gate valve. For this reason, the upstream slope of the pipes should not be selected at more than 5% gradient. The effect of the peak flow (or rinsing point) is included in our calculation procedure to generate the actual selection.

The **Hydrovex® FluidHook** is manufactured at any width from 400 mm to 2000 mm. The opening height lies between 400 mm and 800 mm. Larger devices can be manufactured upon request.

For selection of the optimal dimensions of the hook gate valve, we use an internal hydraulic calculation procedure. To simplify selection, **Table 1** shows typical discharges with an upstream head of 1 m. The calculation is developed in such a way that the smallest discharge  $Q_{min}$  presents the flow value for a smaller slide gate valve opening "s" no smaller than 100 mm. In combined or sanitary sewage, the minimum nominal diameter should actually never be below 300 mm. However, in the current case, the opening is not circular but a broad rectangular opening. Under these conditions, openings of 100 mm or more do not present a problem.

Width B mm (in.)	Discharge with $h_b = 1\text{m}$ (3.28 ft.)	
	$Q_{min}$ in l/s (cfs)	$Q_{min}$ in l/s (cfs)
400 (16")	92 (3.2)	480 (17.0)
600 (24")	138 (4.9)	720 (25.4)
800 (32")	184 (6.5)	960 (33.9)
1000 (40")	230 (8.1)	1200 (42.4)
1200 (48")	276 (9.7)	1440 (50.9)
1400 (56")	322 (11.4)	1680 (59.3)
1600 (64")	368 (13.0)	1920 (67.8)
2000 (80")	460 (16.2)	2400 (84.8)

*Table 1: Discharge flow with a pressure height of  $HB = 1.0\text{ m}$  (3.28 ft.)*

## MATERIAL

Since all parts of the **FluidHook** contactor are exposed to strong corrosion attack by wastewater and condensed moisture, special attention to the choice of suitable materials was made. The parts coming directly in contact with the wastewater are manufactured either of HDPE and/or Stainless Steel. All mechanical parts, ex: the spindle, the attachments and the screw connection will be manufactured from high-grade steel or bronze.

## ASSEMBLY

The **Hydrovex® FluidHook** Flow Control Gate Valve is delivered ready to be installed. The concrete chamber (supplied by others) must include a large rectangular recess so the **FluidHook** regulator can be installed in it. The mounting wall must be vertical and even.

The assembly takes a few hours and requires only normal preparation. The lateral funnels are to be constructed afterwards, according to our data by others. Optionally, we can supply pre-manufactured funnel shapes to be used as lost forms. These parts are simply set up in the building and filled with concrete afterwards. Also the shaping of the slide gate valve seat and outlet evacuation pit is manufactured by others after the assembly.

A test run or any further control is not required if the correct slide gate valve position "s" is attested by visual inspection. We guarantee an accuracy of the discharge of  $\pm 10\%$ .

## MAINTENANCE

Since the **Hydrovex® FluidHook** Flow Control Gate Valve is directly in the sewer and exposed to all kinds of refuses, site inspection is to be performed occasionally. The operation screw and spindle is to be checked, greased and tested on a regular basis to insure a smooth operation. Any debris before or after the slide gate valve is to be removed. The correct opening "s" is to be controlled at each visit.

## SPECIFICATIONS

### Hydrovex® FluidHook

Adjustable, special gate valve with rectangular flow through open section and horizontal, "J" type bend folded upstream, suitable for wastewater, presenting an optimized geometry for small flow coefficient. The unit is suitable to throttle large discharges with small pressure heads. Suitable for installation in a pre-constructed and prepared rectangular wall opening with continuous, even installation wall. Sliding plate made of 304 stainless steel, lateral guide rails from HDPE. Slide gate valve scale made of high-grade steel. Clevis mounting to and secured to the wall (optional: Key box), drive of the sliding plate with a threaded rod spindle and square nut, all metal parts made of high grade steel or brass. Mounting elements made of 304 stainless steel high-grade steel.

Hydrovex® FluidHook with spindle	Type HS
Calculation pressure height $h_b$	... mWS
Calculation discharge $Q_b$	... l/s
Dry weather discharge	... l/s
Clears opening width B	... m

Opening of the gate valve "s" to be set according to hydraulic calculation. Equipment supply to be ready for installation, ex: factory including hydraulic calculations and data sheet. Site preparation and installation is by others according to our supplied information. The adjustment within the inlet range is to be made by others afterwards, according to our data. Please refer to the technical specs for all elevation and pressure head values.

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Hydrovex® FluidHook with spindle	Type HSS
Calculation pressure height $h_b$	... mWS
Calculation discharge $Q_b$	... l/s
Dry weather discharge	... l/s
Clears opening width B	... m

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### Hydrovex® FluidHook hydrodynamic funnel

Quarter circle, hollow bodies for the organization of a hydrodynamic clean inlet to the **FluidHook** Flow Control Gate Valve. To be installed in the building and subsequent filling with concrete. Sheet metal body made of 304 stainless steel.

Sheet metal body	Hydrovex® FluidHook
Width of the hook contactor	... mm
Installation depth	... mm

### John Meunier Inc.

ISO 9001 : 2000

#### Head Office

4105 Sartelon

Saint-Laurent (Quebec) Canada H4S 2B3

Tel.: 514-334-7230 [www.johnmeunier.com](http://www.johnmeunier.com)

Fax: 514-334-5070 [cs@johnmeunier.com](mailto:cs@johnmeunier.com)

#### Ontario Office

2000 Argenta Road, Plaza 4, Unit 430

Mississauga (Ontario) Canada L5N 1W1

Tel.: 905-286-4846 [www.johnmeunier.com](http://www.johnmeunier.com)

Fax: 905-286-0488 [ontario@johnmeunier.com](mailto:ontario@johnmeunier.com)

#### USA Office

2209 Menlo Avenue

Glenside, PA USA 19038

Tel.: 412-417-6614 [www.johnmeunier.com](http://www.johnmeunier.com)

Fax: 215-885-4741 [astele@johnmeunier.com](mailto:astele@johnmeunier.com)

