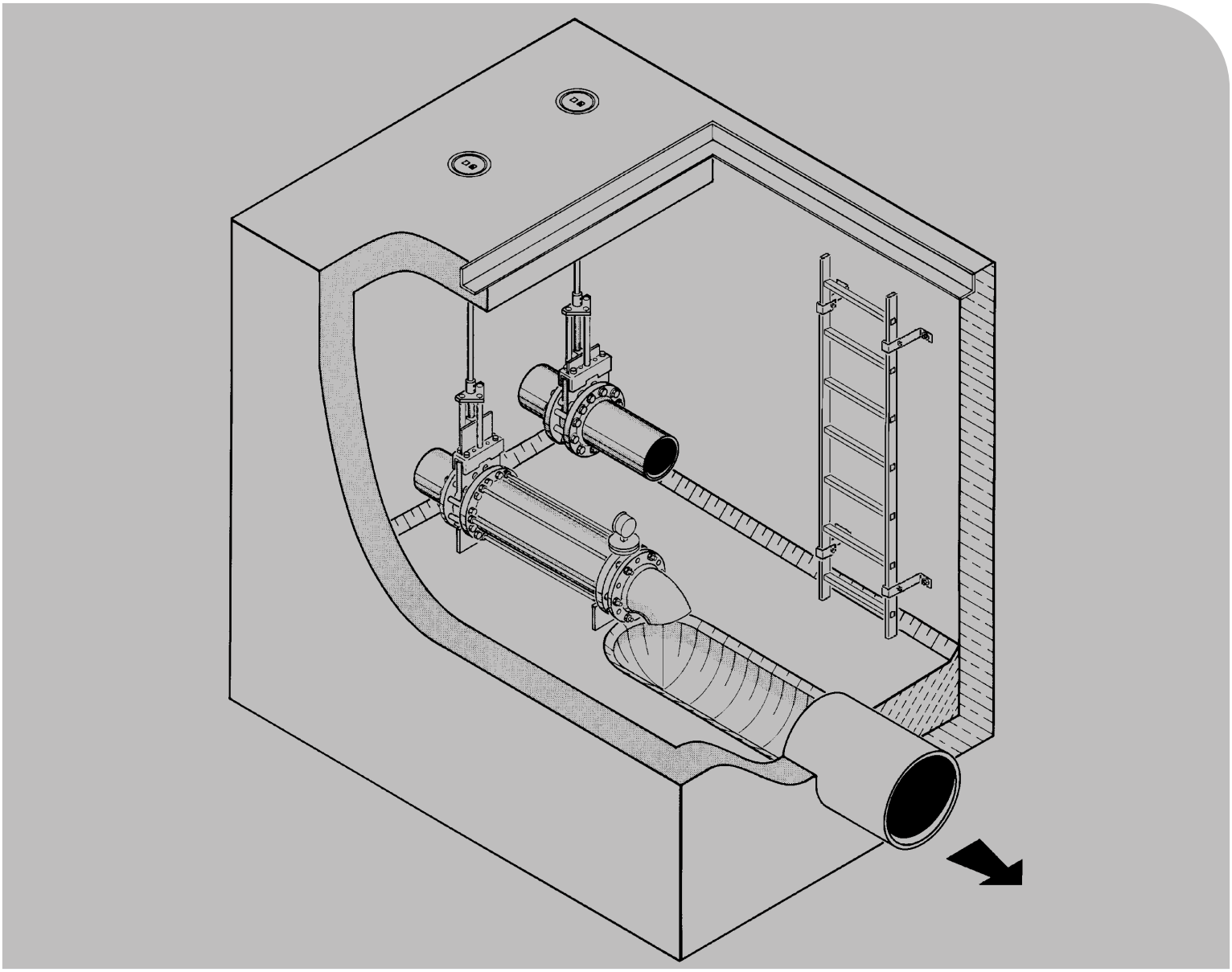

VEOLIA

HYDROVEX® TTT

Membrane Flow Regulator

CSO, SSO, Stormwater Management

WATER TECHNOLOGIES

HYDROVEX® TTT Membrane Flow Regulator

Application

Small storm drains often require flow regulators which must be able to operate under low flow conditions. Orifice plates big enough to prevent blockage, usually do not offer an appropriate level of flow control. Solutions requiring electrically activated components usually involve large investments and are not particularly adaptable for small storm water catchments. The HYDROVEX® TTT was designed to master such low storm water flows.

The HYDROVEX® TTT controls flow under a variable pressure head, while the discharge remains almost constant. This equipment operates without the use of moving parts or external energy, and works solely under the effects of the flow. Some of the advantages of the HYDROVEX® TTT include:

- Constant discharge
- Simple construction
- Passive device - no moving parts
- Corrosion resistant design
- Minimal head loss
- Fast and easy installation
- No adjustments required

Figure 1: Typical Installation, HYDROVEX® TTT

Operation

The operation of the HYDROVEX® TTT is based on the flow phenomenon better known as the Bernoulli principle. A pre-stressed rubber membrane is fitted on a plastic pipe with two oval cut-outs on it. When the water level rises in the reservoir above the crown of the plastic pipe, there is an increase in water pressure on the exterior of the rubber membrane. As water flows through the regulator, an increase in the water velocity causes the pressure to drop in the pipe. The pressure difference across the rubber membrane causes the rubber membrane to collapse around the two oval cut-outs, thus reducing the available open area.

The elasticity of the rubber membrane, as well as the precise form of the oval cut-outs, allows for an effective throttling action. As a result, the discharge flow remains constant under any water pressure. When the reservoir empties, the membrane returns to its original position and form.

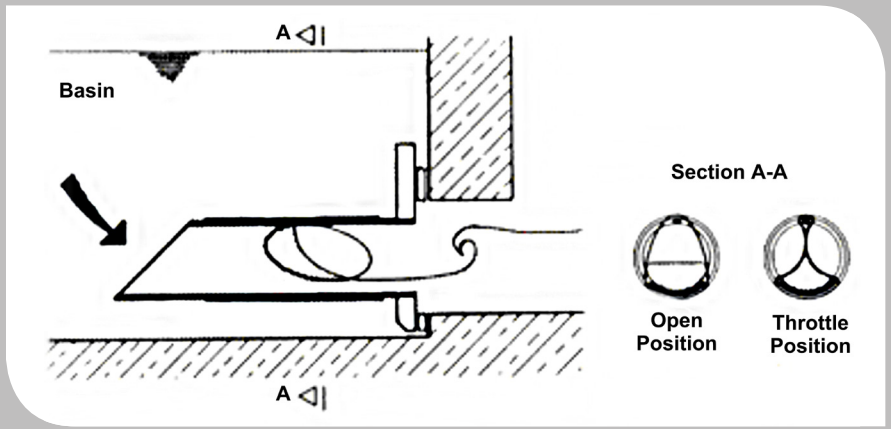

Figure 2: Different Throttle Positions

Selection

The HYDROVEX® TTT is available in two types.

Type I: Designed to be installed directly in the retention basin (Figure 2). The regulator is installed on a sliding plate and supported by a back plate which is anchored to the concrete wall. In the event of a blockage, the sliding plate can be easily lifted from the operating floor using a pull cable, thus creating a full pipe bypass. A sump underneath the regulator serves as a collector for debris and sediments.

Type U: Designed to be installed in a dry chamber directly connected to the retention reservoir. The design consists of two pipes fitted inside each other (Figure 1). The exterior pipe is transparent and sealed from the ambient air, and the throttling pipe centered within. The throttling pipe is fitted with two openings that are covered with a screening filter. When the reservoir is filling up, the flow enters and fills the space between the pipes through the openings, and applies pressure on the rubber membrane. As the pre-stressed membrane has a diameter smaller than the pipe with the two cut-outs, the throttling begins.

Each type is available in four standard sizes. The flow range for each size, as well as the maximum allowable head each HYDROVEX® TTT can perform under is indicated in the following table:

Model	Nominal Diameter mm [in]	Min. Flow L/s [gmp]	Max. Flow L/s [gmp]	Maximum Allowable Upstream Head m [ft]
Type I				
100 TTT - I	100 [4]	2.5 [40]	7.5 [119]	5 [16.4]
150 TTT - I	150 [6]	6 [95]	18 [285]	5 [16.4]
200 TTT - I	200 [8]	10 [159]	30 [475]	4 [13.1]
250 TTT - I	250 [10]	16 [254]	48 [761]	3.5 [11.5]
Type U				
100 TTT - U	100 [4]	3 [48]	9 [143]	5 [16.4]
150 TTT - U	150 [6]	7 [111]	21 [333]	5 [16.4]
200 TTT - U	200 [8]	12 [190]	36 [571]	4 [13.1]
250 TTT - U	250 [10]	19 [301]	57 [903]	3.5 [11.5]

Flow Characteristics

The flow characteristics of a HYDROVEX® TTT are determined by the size of the lateral openings and the characteristics of the membrane. The flow characteristics may be changed, should the need arise, by replacing the throttle tube and/or membrane.

Figure 3 illustrates the flow range covered by all the HYDROVEX® TTT models. The curves are almost vertical for upstream water levels equal to or greater than twice the nominal inlet diameter (DN). Hysteresis effects are almost negligible. In addition, the maximum discharge occurs at very low heads, resulting in a faster draining time of the retention reservoir.

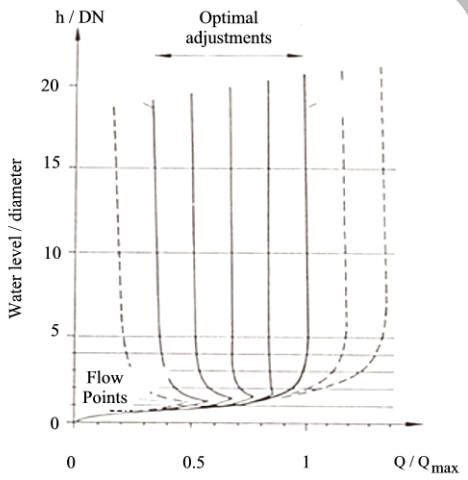

Figure 3: Hydrovex® TTT Typical flow curve for Types I and U

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