

HYDROVEX[®] BW BENDING WEIR

CSO, SSO, Stormwater Management

WATER TECHNOLOGIES

HYDROVEX® BW Bending Weir

Application

All combined sewer systems have overflow points to an outfall. When a defined water level is exceeded in the system, the surplus water is diverted to avoid overloading of the sewer line and the WWTP. Most overflow points are equipped with fixed static weirs. The maximum allowable water height used to set the weir level is defined by the acceptable upstream backflow in the sewer line with a given design flow and weir length. The height of the overflow weir is of paramount importance as it directly affects the sewer retention calculation. In an attempt to maximize in-line retention volume, long static weirs and correspondingly large overflow structures are required.

The HYDROVEX® BW Bending Weir is an optimized overflow weir which is more efficient than a conventional static weir. Due to its proportional overflow characteristics, a bending weir is typically equivalent to a fixed weir which is 2 to 5 times longer for the same overflow rate and water level. The HYDROVEX® BW Bending Weir operates automatically without the aid of auxiliary power, moving bearings, counterweights, pulleys or sliding seals. This results in a highly reliable and efficient equipment with a long service life. Maintenance is minimized due to the weir's low susceptibility to wear.

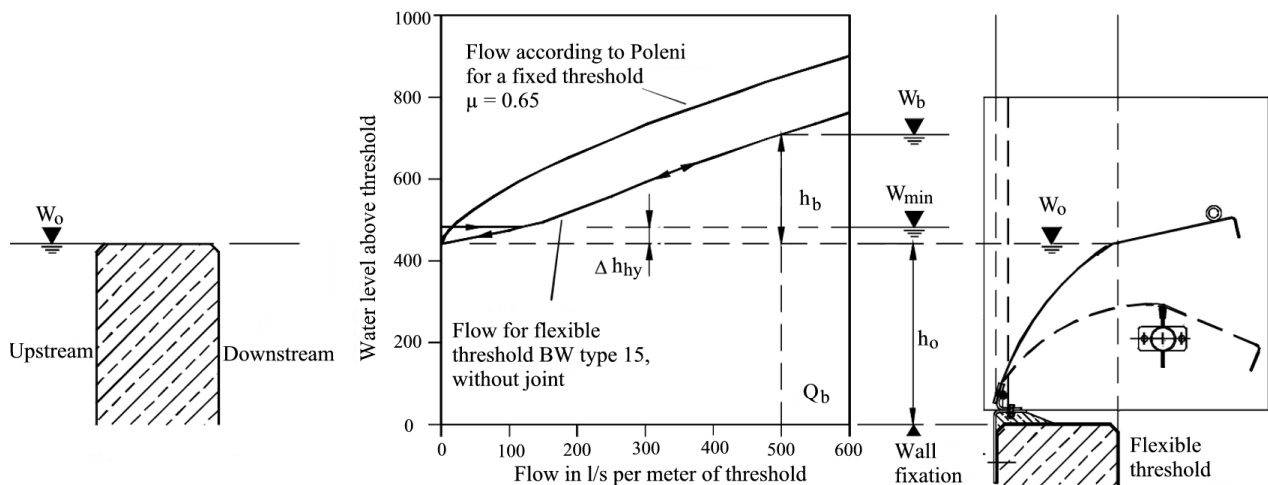


Figure 1: Comparison between a static weir and the HYDROVEX® BW Bending Weir

Operation

The simple design of the bending weir makes it easy to install and highly reliable during operation. The heart of the device is the bending sheet, which is made out of high strength, tempered stainless steel. The shape of the bending sheet and the selection of materials and thicknesses are the result of extensive laboratory tests and calculations. Behind the apparently simple construction of the weir lies a very complex relationship between the effects of static

and dynamic hydraulic forces and the passive restoring forces of the bending sheet. During an overflow event, the HYDROVEX® BW Bending Weir operates as follows:

Start position: The bending weir is in a prestressed state. The bending sheet presses against the stoppers, forming a watertight seal up to water level W_{min} .

Overflow start: As soon as the water level reaches W_{min} , the hydrostatic force causes the bending weir to suddenly bend downwards, which leads to a new balance between the dynamic and bending forces. In this situation, the discharge curve is an almost perfect horizontal line (Figure 1). When the upstream water volume is very small, the overflow volume

and corresponding hydrostatic force drops, and the bending weir sheet begins to move upwards. If the water level falls below W_0 the bending sheet gently snaps back to its idle position. As a result of the sudden downward movement and the gentle snap back of the bending weir, a very minimal hysteresis (h_w) exists.

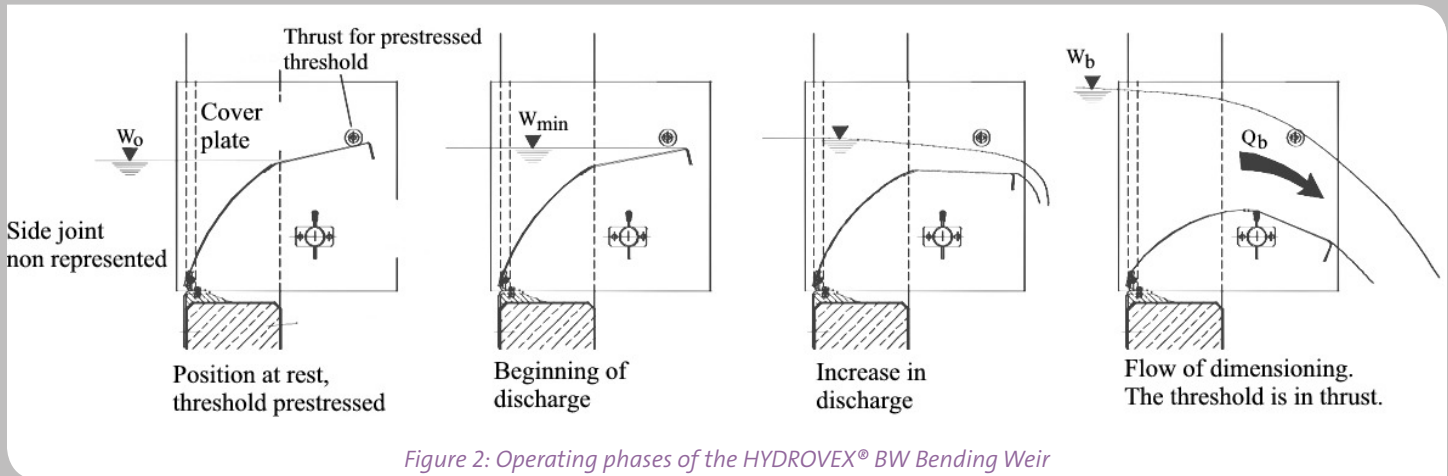


Figure 2: Operating phases of the HYDROVEX® BW Bending Weir

Increasing water level: As the water level rises, the bending sheet bends down further, increasing the amount of area available for water to flow over. At this point, the water level is hysteresis free and corresponds to a certain flow rate.

Maximum bending: To avoid permanent deformation of the unit, a stopper is used to limit the downward travel of the bending sheet. This stopper is in the form of a horizontal pipe, which simultaneously aerates the weir. At this point, the bending weir will act as an optimized static overflow weir, with the capacity to withstand hydraulic overloads and higher water levels. In spite of this, the bending weir is still clearly superior to a fixed weir (Figure 1).

End of overflow: As the water recedes and reaches W_0 , the bending sheet gently snaps back to its idle position.

Backflow Prevention: An upper lip/seal can be supplied with the HYDROVEX® BW Bending Weir to prevent downstream backwater from entering the sewer system.

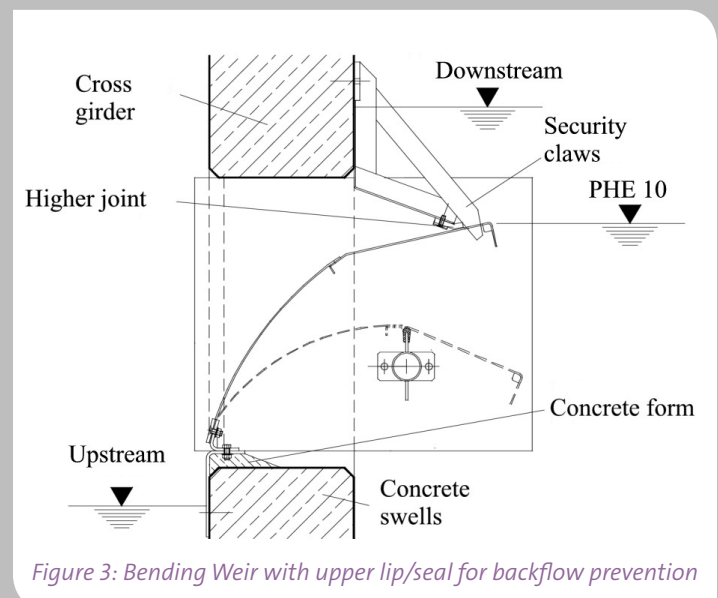


Figure 3: Bending Weir with upper lip/seal for backflow prevention

Selection

Three standard models of the HYDROVEX® BW are available and are represented in the table below. The specific design flow is the point at which the bending weir is at its maximum bent position and most efficient.

Type	Specific Design Flow (Q_b) L/s/m [MGD/ft]	Water Height Variation ($h_b = W_b - W_0$) mm [in]
BW-10	300 [2.09]	187 [7.4]
BW-15	450 [3.13]	239 [9.4]
BW 20	600 [4.17]	286 [11.2]

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