VEOLIA

HYDROVEX® Flap Spring Loaded Weir
CSO, SSO, Stormwater Management

HYDROVEX® Flap Spring Loaded Weir

Application

Sewer systems typically have overflow points to avoid overload of the sewer line and the WWTP. When a defined water level is exceeded in the system, the surplus water is overflowed to the receiving waters. Most overflow points are equipped with fixed static weirs. The crest of the static weir is set using 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® Flap Spring Loaded Weir is an optimized overflow weir which is more efficient than a conventional static weir. Due to its proportional overflow characteristics, a spring loaded weir is on average 4 to 10 times shorter than a fixed weir for the same overflow rate and water level. The HYDROVEX® Flap Spring Loaded 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.
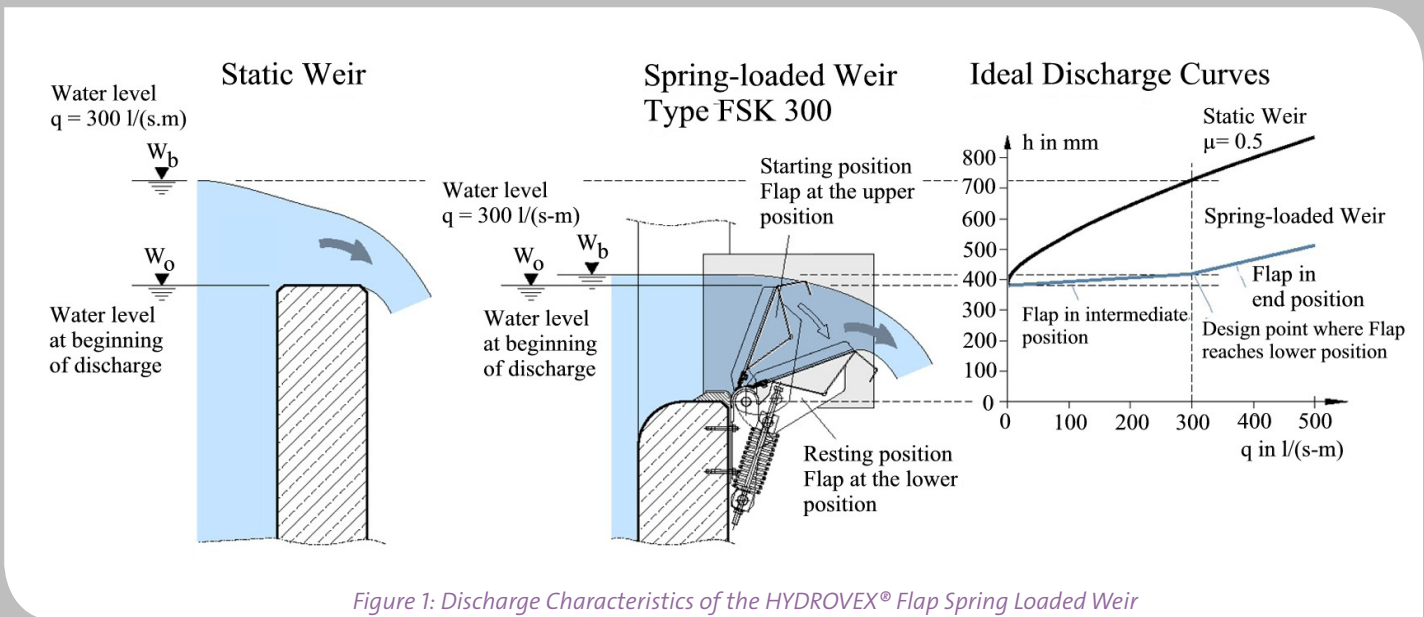

Figure 1: Discharge Characteristics of the HYDROVEX® Flap Spring Loaded Weir

Operation

The simple design of the HYDROVEX® Flap Spring Loaded Weir makes it easy to install and highly reliable during operation. The form of the weir, material selection and the return mechanism design, are the result of numerous laboratory tests and calculations. Behind this very simple construction is a very complex relationship between the static and dynamic hydraulic forces and the passive compression load of the springs in each position of the weir.

Start position: The pre-stressed springs are at full extension and the weir forms a watertight seal up to water level Wo.

Overflow start: When the upstream water level reaches the activation water level Wo, the hydrostatic forces of water make the weir bend forward. The dynamic forces involved compress the spring mechanism to a new balance position.

Increasing water level: As the water level increases, the HYDROVEX® Flap Spring Loaded Weir will bend further. The discharge curve is practically horizontal meaning the discharged volume increases rapidly with practically no water level increase.

Maximum flow: Once the design flow of the spring loaded weir is reached, the springs are at maximum compression and the unit will not bend any further. At this point, the spring loaded weir will act as an optimized static overflow weir, with the capacity to withstand hydraulic overloads and higher water levels. In spite of a reduction in effectiveness, the unit is still more efficient than a fixed weir (Figure 1).

Decreasing water level: When the flow decreases, the water level drops slowly and the hydrostatic forces on the weir are reduced. The weir progressively returns to its idle position. When the idle position is reached, the overflow stops.

Backwash prevention: An upper lip/seal can be supplied with the HYDROVEX® Flap Spring Loaded Weir to prevent backwater from the outfall entering the sewer system (Figure 3).
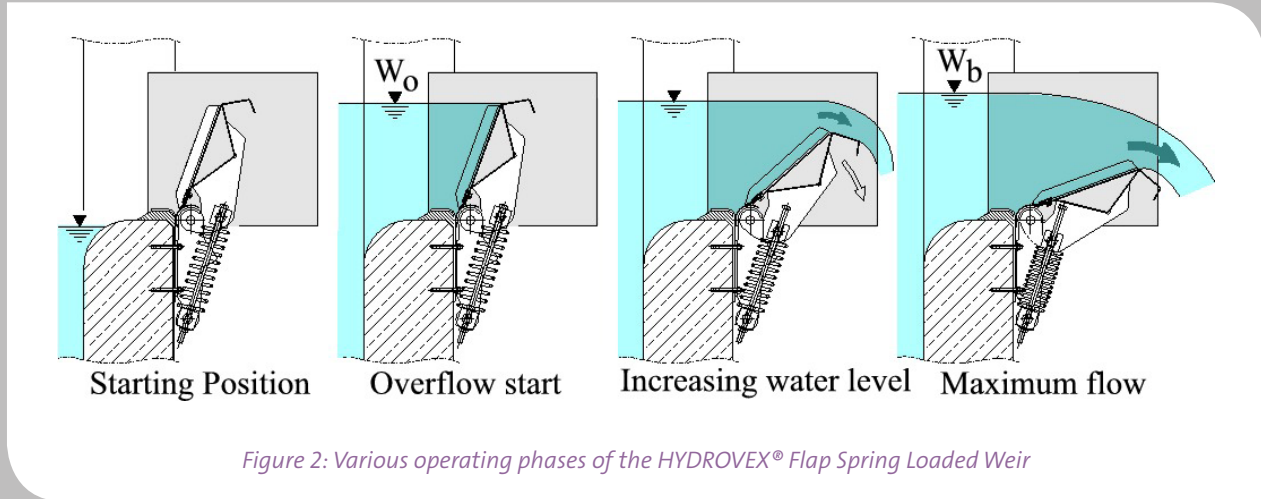

Figure 2: Various operating phases of the HYDROVEX® Flap Spring Loaded Weir

Overflow Measurement

Overflow duration, frequency and volume can be calculated using the relationship between the bending angle of the weir and the upstream water height. To accomplish this, the HYDROVEX® Flap Spring Loaded Weir can be supplied with an optional inclinometer fixed to the bending plate and an ultrasonic level transmitter.

Selection

Three standard models of HYDROVEX® Flap are available. The specific design flow is the point at which the weir reaches its maximum compressed position. Water level variation is for designs at the specific design flow.
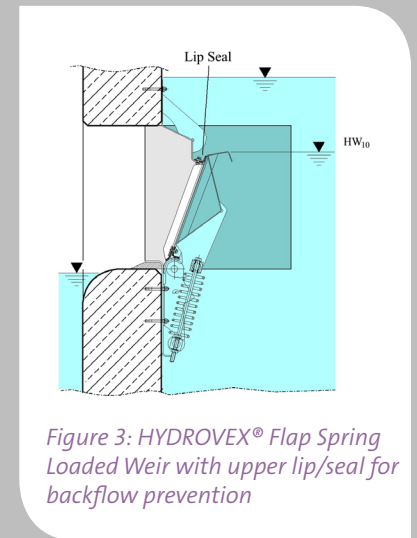

Figure 3: HYDROVEX® Flap Spring Loaded Weir with upper lip/seal for backflow prevention

Type	Specific Design Flow (Qb)	Water Height Variation ($h_b = W_b - W_o$)
	L/s/m [MGD/ft]	mm [in]
FSK-300	300 [2.10]	48 [1.9]
FSK-465	465 [3.25]	65 [2.6]
FSK-700	700 [4.87]	85 [3.3]

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