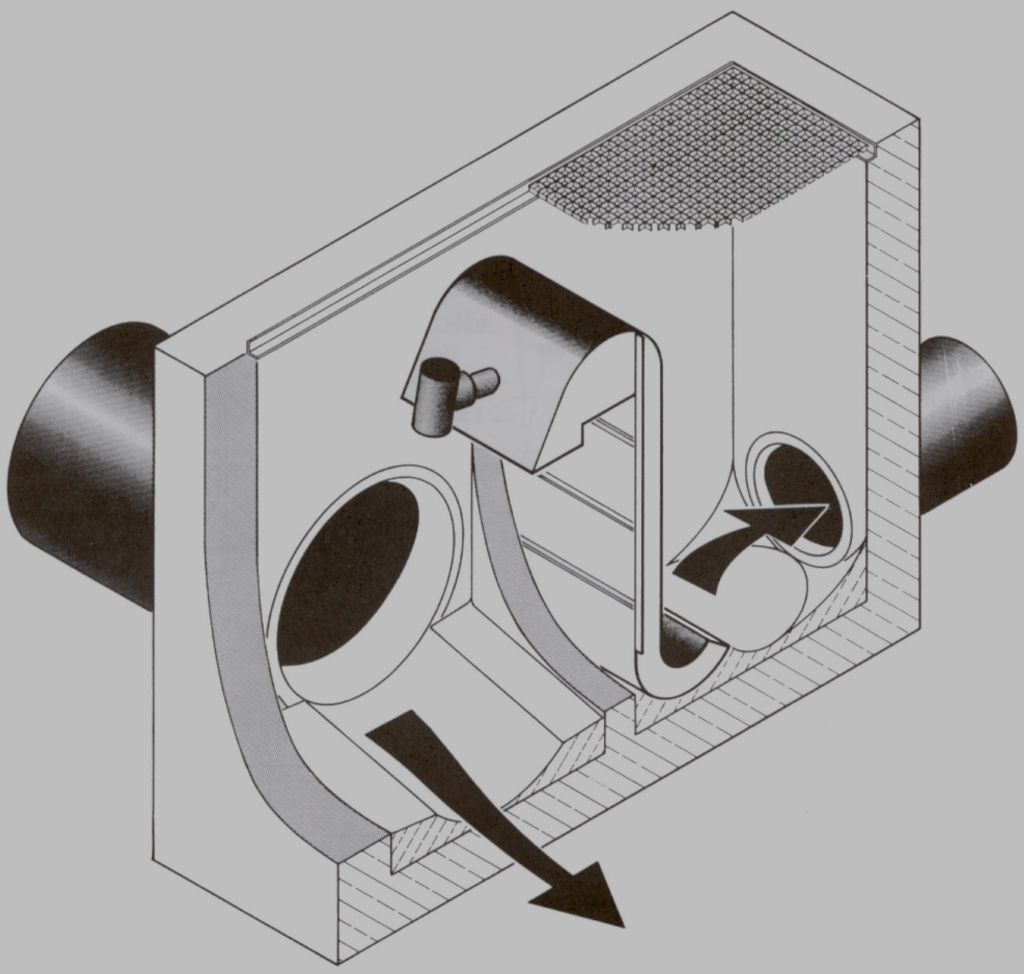

VEOLIA

HYDROVEX® ARS Air Regulated Siphon

CSO, SSO, Stormwater Management

WATER TECHNOLOGIES

HYDROVEX® ARS Air Regulated Siphon

Application

A frequent problem encountered during a combined sewer overflow is the rise in water surface elevation. Overflow weirs are often used to limit the amount of water backing up, but large structures are required for large overflow rates.

The HYDROVEX® ARS Air Regulated Siphon offers an excellent alternative to conventional overflow weirs. Storm overflow outfalls, using air-regulated siphons, are much smaller in size than those using conventional weirs, thereby providing a considerable saving in costs.

Operation

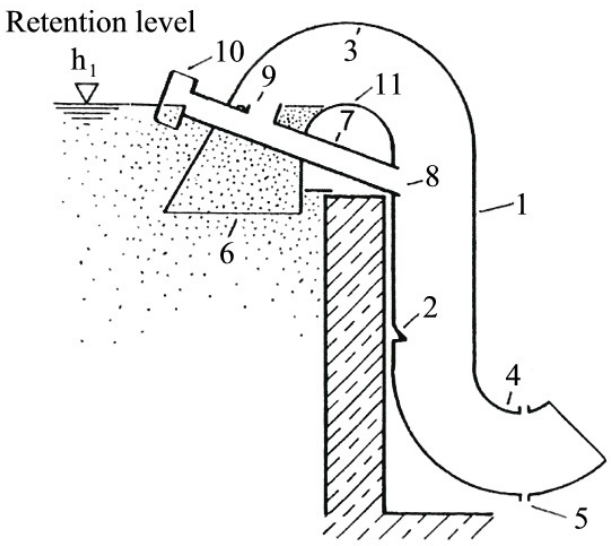

Figure 1: The HYDROVEX® ARS Air Regulated Siphon

1. *Vertical downstream leg*
2. *Flow deflector*
3. *Siphon crown*
4. *Outlet bend*
5. *Water drain*
6. *Siphon inlet*
7. *Air intake pipe*
8. *Air opening into downstream leg*
9. *Air opening into upstream leg*
10. *Siphon crest*
11. *Retention level*

As the water level rises above the siphon crest by only a slight amount, the flow rate increases sufficiently for the water jet to form at the flow deflector (Figure 2a). This produces a reduction of pressure in the siphon, which raises the water level over the crest. A mixture of air and water is fed to both the underside and the upper side of the discharging water stream.

When the water level rises approximately 55% of the reference siphon size above the crest, the air intake becomes completely submerged and cuts-off the air supply. All the air is evacuated at the outlet from the siphon, which then runs at full capacity (Figure 2c).

With decreasing water level, partial aeration takes place, thus de-priming the siphon. Overflow ceases when the level reaches the siphon crest, and the vertical leg empties itself.

The bend at the siphon outlet is designed to give good priming when discharging to atmosphere. Once primed, the downstream water level may be permitted to rise sufficiently to submerge the outlet without interfering with the operation of the siphon. However, the full flow or “backwater” flow rate will be reduced because of the reduction in effective head across the siphon. To restrict this reduction of full flow rate to about 15% and to ensure correct air-partialized behaviour, it is recommended that the submergence of the outlet should not exceed 1/3 of the siphon height (H/3).

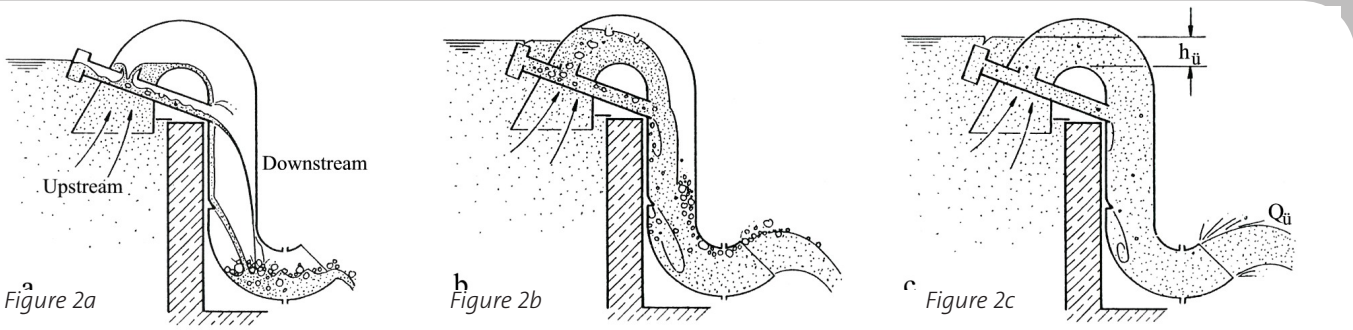

Figure 2: Operation of the HYDROVEX® ARS Air Regulated Siphon

Advantages

- No requirement for auxiliary power
- Minimum maintenance cost
- Flow rates up to 11 times greater than an overflow weir of the same construction width
- Linear flow characteristics without hysteresis
- The unit can accept submergence at the outlet and overtopping at the inlet
- Rigid construction with vertical downstream leg
- Inlet shaped to retain floating solids in the storm water chamber
- All models and sizes have been tested and their flow characteristics are known
- Civil works reduced to a minimum
- May easily be installed over existing weirs to enhance their capacity
- All stainless steel construction

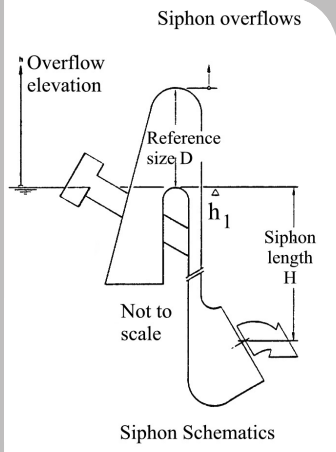

Figure 5: Typical discharge rating curve for HYDROVEX® ARS Air Regulated Siphon

Selection

The HYDROVEX® ARS Air Regulated Siphon is available in various models. The maximum design flow (Q) and corresponding head (h) for each model is indicated in the following table.

Model	Reference Size (D) mm [in]	Siphon Width (B) mm [in]	Siphon Length (H) mm [in]	Flow Rate (Q) L/s [MGD]	Head (h) mm [in]
ARS-50-S	50 [2]	250 [10]	250 [10]	17 [0.388]	28 [1.1]
ARS-50-L	50 [2]	250 [10]	500 [20]	23 [0.525]	28 [1.1]
ARS-100-S	100 [4]	500 [20]	500 [20]	94 [2.15]	55 [2.2]
ARS-100-L	100 [4]	500 [20]	1000 [40]	130 [2.97]	55 [2.2]
ARS-150-S	150 [6]	750 [30]	750 [30	259 [5.91]	83 [3.3]
ARS-150-L	150 [6]	750 [30]	1500 [60]	357 [8.15]	83 [3.3]
ARS-200-S	200 [8]	1000 [40]	1000 [40]	532 [12.14]	110 [4.3]
ARS-200-L	200 [8]	1000 [40]	2000 [80]	734 [16.75]	110 [4.3]
ARS-250-S	250 [10]	1250 [50]	1250 [50]	929 [21.20]	138 [5.4]
ARS-250-L	250 [10]	1250 [50]	2500 [100]	1281 [29.24]	138 [5.4]
ARS-300-S	300 [12]	1500 [60]	1500 [60]	1466 [33.46]	165 [6.5]
ARS-300-L	300 [12]	1500 [60]	3000 [120]	2021 [46.13]	165 [6.5]
ARS-350-S	350 [14]	1750 [70]	1750 [70]	2155 [49.19]	193 [7.6]
ARS-350-S	350 [14]	1750 [70]	3500 [140]	2972 [67.84]	193 [7.6]
ARS-400-S	400 [16]	2000 [80]	2000 [80]	3009 [68.68]	220 [8.7]
ARS-400-L	400 [16]	2000 [80]	4000 [160]	4149 [94.70]	220 [8.7]
ARS-500-S	500 [20]	2500 [100]	2500 [100]	5257 [119.00]	275 [10.8]
ARS-500-L	500 [20]	2500 [100]	5000 [200]	7248 [165.43]	275 [10.8]

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