Scupper flow analysis

Summary

Configuration:
500 mm × 150 mm rectangular opening followed by a rectangular duct of the same size.
Applied Equation
Since the water level remains within the opening height and the opening is the controlling hydraulic element, the partially submerged rectangular opening equation is used

Input Data

- Opening width — b = 500 mm = 0.50 m
- Opening height — a = 150 mm = 0.15 m
- Water level — H = 45 mm = 0.045 m
- Discharge coefficient — Cd = 0.62
- Edge radius — R1 mm
- Duct length — 1.0 m
- Duct slope — 2°
- Duct size — 500 mm × 150 mm
- Gravity — g = 9.81 m/s²

Applied Equation

$$Q = (2/3) \cdot Cd \cdot b \cdot \sqrt{(2g)} \cdot H^{(3/2)}$$

Result

Flow rate at 45 mm water level **8,4 l/s**

Note regarding the 2° duct slope and duct length (0.5-1.5 m)
For a rectangular duct with the same cross-section as the opening and a 2° downward slope, changing the duct length between 0.5 m and 1.5 m has a negligible effect on flow rate.
The inlet opening remains the hydraulic control point, while the duct has significantly greater flow capacity than the discharge passing through the opening. Therefore, the system is opening-controlled rather than conduit-controlled, and the flow rate remains approximately 8.4 l/s throughout the examined duct length range.