

Observation on « Crest flow » in distribution box

No theory or empirical formula that describes the laminar flow on vertical pipes spillway were found. The closest research found is the flow over dam's shaft spillway, where three flow types are described depending on the water height over the spillway shaft. It can be seen from the following figure that when the flow is crest controlled, the discharge is proportional to the shaft radius.

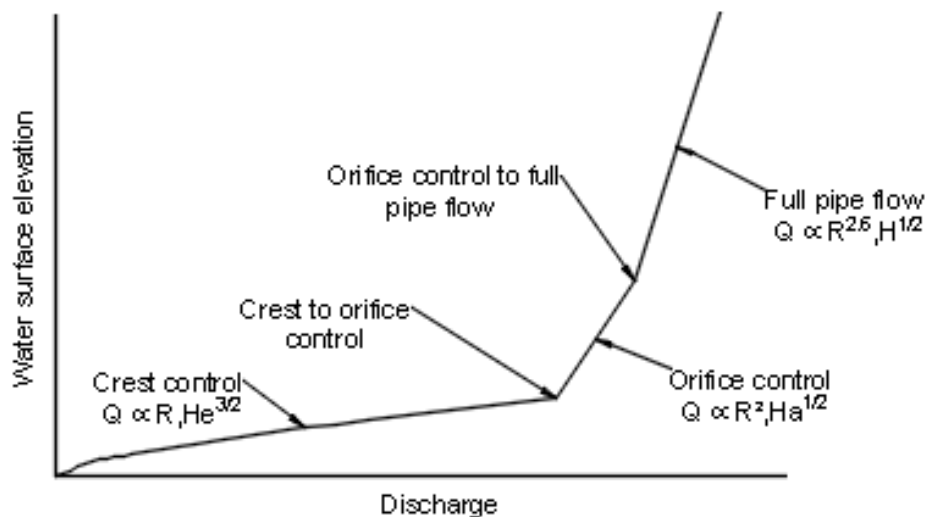


Figure 1: Shaft spillway discharge (from Design of small dams, Bureau of reclamation, 1987)

From the experiment on PVC pipe of small diameter (25, 32 and 50 mm), the crest flow appears to follow the following formula:

$$\text{Discharge (l/s)} = C \times D \times H$$

Where:

C is coefficient depending on the shaft form, in the experiment with PVC pipe C was very close to 1 (0.98 ± 0.15).

D is the pipe external diameter in meter

H is the height of the water above the pipe in meter

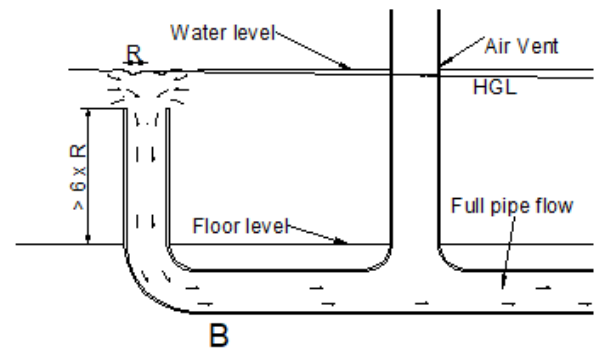
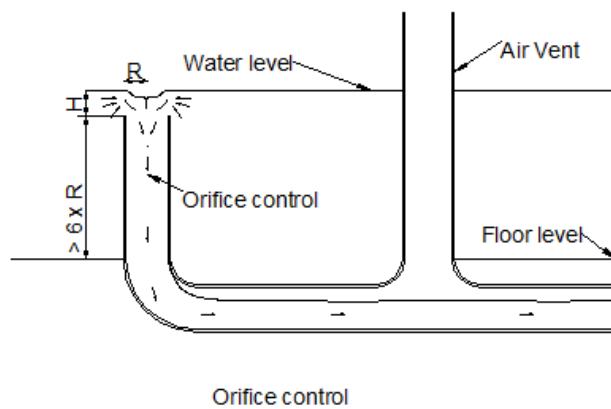
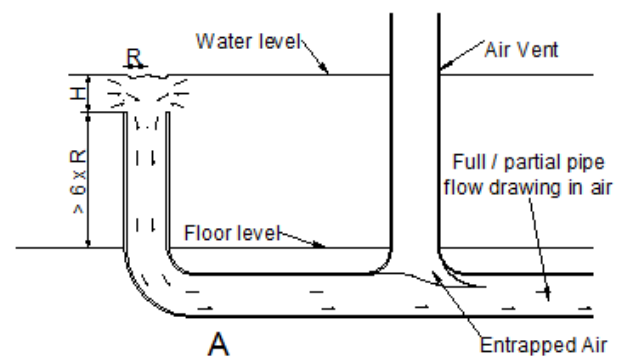
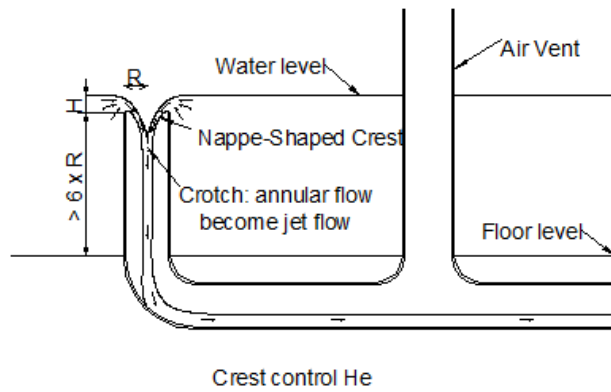
From the observation there was clear crest control (see photo on the right) when $H < 0.2 \times D$.

The following table show the maximal admissible flow to guarantee a crest control and a yield repartition proportional to the pipe diameter with extrapolation after 75mm.



Pipe Diameter (mm)	½ x 25	25	32	50	75	90	110
Max design Flow (l/s)	0.08	0.15	0.25	0.6	1.5	2	3

Description of the evolution of the flow in a distribution box as the inlet yield increases



Full pipe flow : Controlled by chute pipe (A)
or Controlled by downstream pipeline (B)