Design of the overspilling section

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Task 2: Determine the design of spillway section to safely evacuate flood with a 100-year return period downstream

Our spillway design must be design to propagate $Q_{100} = 400$ m³/s while one of the four overspilling sections is blocked. The spillway is constructed with a Creager shape and the overspilling section are 6 m wide.

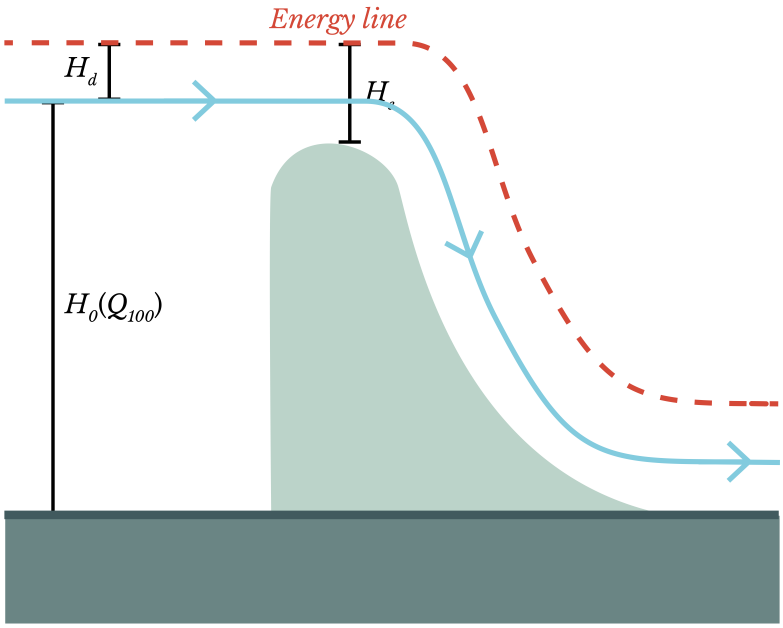


Figure 3 : Sideview of Creager spillway

Where :

- H_d is overspilling height of the water,
- H_e is the energy height.

Spilway equations

$$Q = m.b.\sqrt{2g}.H_e^{\frac{3}{2}}$$

Where :

- $m = m_0(\frac{H_e}{H_d})^{0,16}$, the spillway coeficient for a Creager spillway ($m_0 = 0,4956$),
- $b = 6$m the width of the spillway,
- $H_e = H_d + \frac{v_0^2}{2}$, with tow cases : $\begin{cases} \frac{H_0}{H_d} > 1,33 \Rightarrow v_0 = 0 \\ \frac{H_0}{H_d} \leq 1,33 \Rightarrow v_0 \neq 0 \end{cases}$

For our design : $H_0 \gg H_d$ so $v_0 = 0$, then $H_e = H_d$ and $m = m_0$.

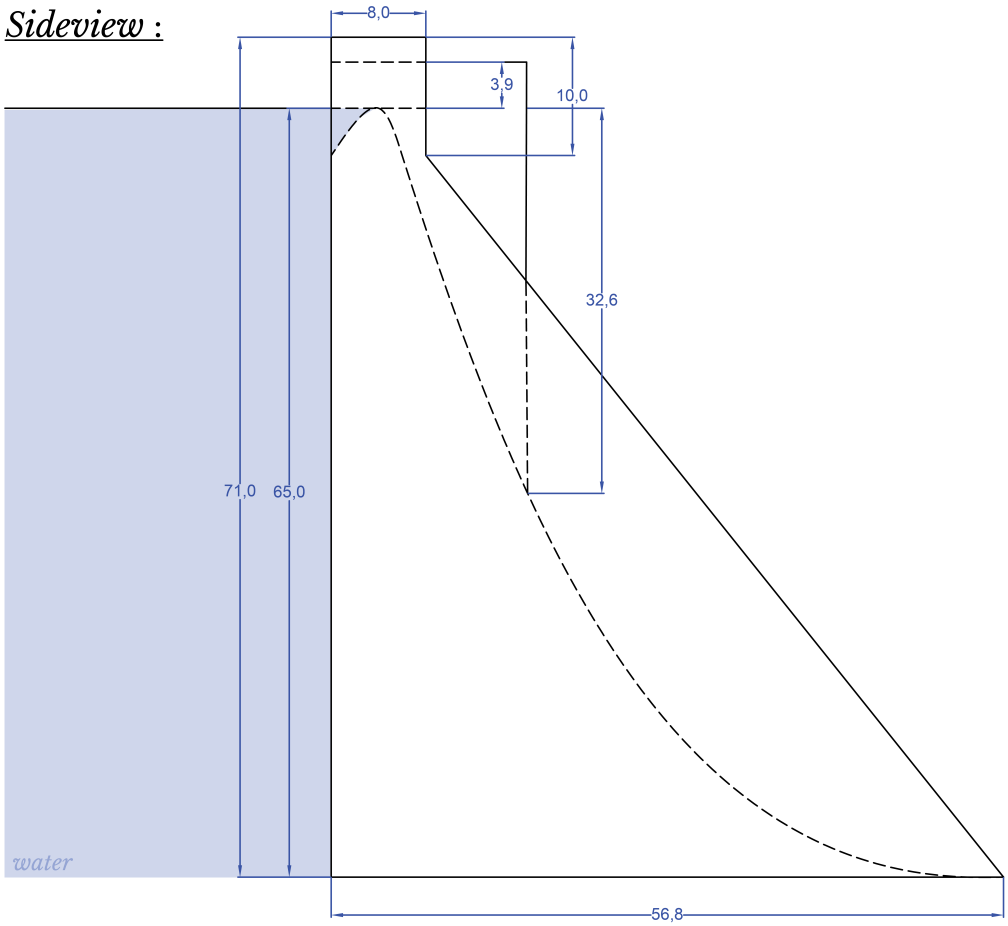
Whe can rewrite the spillway equation as $Qp = m_0.b.\sqrt{2g}.H_d^{\frac{3}{2}}$

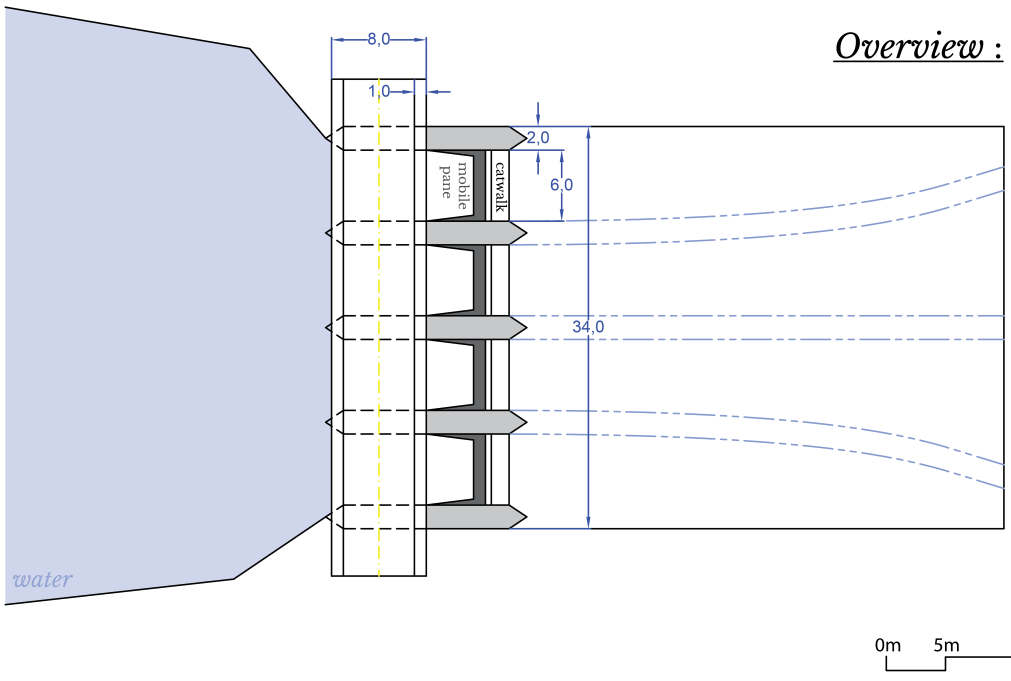
$$H_d = \left(\frac{Q_p}{m_0.b.\sqrt{2g}}\right)^{\frac{2}{3}} = \left(\frac{400/3}{0,4956.6.\sqrt{2.9,81}}\right)^{\frac{2}{3}} = 4,68 \text{ m}$$

As we want $H_d \leq 4$ m, we can calculate $b_{min} = \frac{Q_p}{m_0.\sqrt{2g}.H_d^{\frac{3}{2}}} = 7,6$ m, and we roud it up at $b_{min} = 8$ m.

Using the same formula, we obtain : $H_d(b_{min}) = 3,9$ m.

Technical drawing at scale





0m 5m 15m