

Water surface profile behind a dam

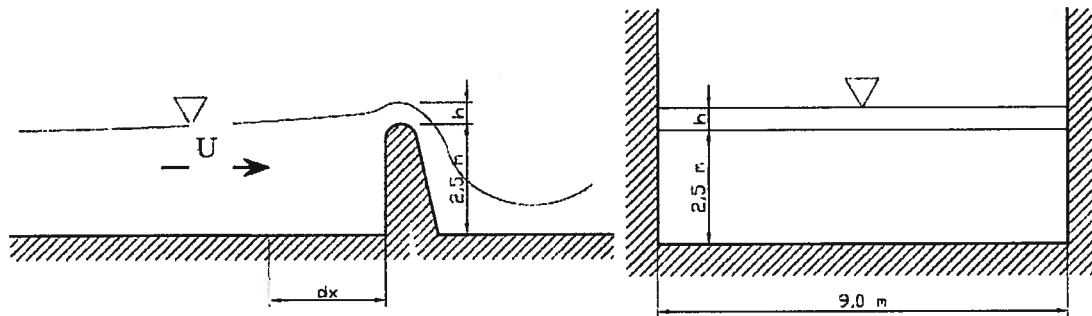
A weir is built in a river, which runs in a rectangular channel. Find the points of the water surface in the upstream direction in 300 m steps for 6000 m total length. It is recommended to solve the problem in tabular form.

Given data:

Slope	$I = 1/2500$
Manning's number	$M = 40$
Discharge	$Q = 11 \text{ m}^3/\text{s}$
Channel width	$B = 9 \text{ m}$
Weir coefficient	$C = 2.0$
Calculation length	$\Delta x = 300 \text{ m}$
Number of calculation steps	$i = 1..20$
Total length	$\Sigma x = 6000 \text{ m}$

The weir coefficient can be used to calculate water depth above the crest (see figure):

$$Q = C \cdot B \cdot h^{\frac{3}{2}}$$



Use the following equations to calculate

$$\frac{dy}{dx} = \frac{I_f - I_b}{1 - Fr^2}$$

$$Fr = \frac{U}{\sqrt{g \cdot y}}$$

$$I_f = \frac{U^2}{M^2 \cdot R^{\frac{4}{3}}}$$