

Specific Energy – Depth Relations

The specific energy (head relative to the channel bed) is given by

$$E = h + \frac{u^2}{2g}$$

For a rectangular channel,

$$q = uh$$

$$E = h + \frac{q^2}{2gh^2} \quad (*)$$

The critical depth and specific energy (minimum E for a given q) are given by

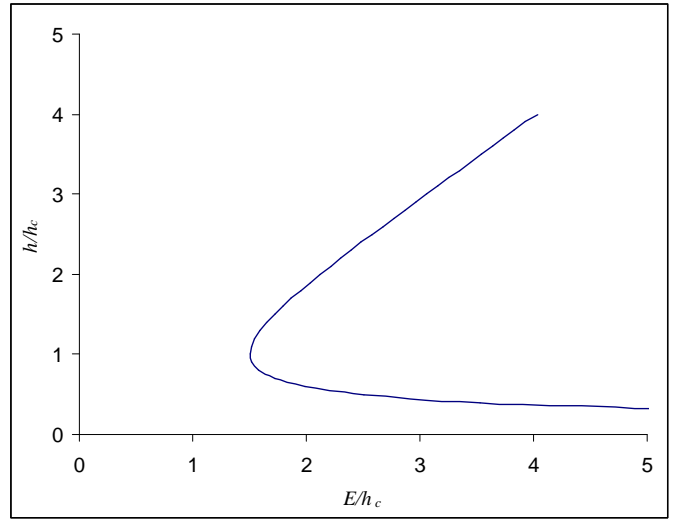
$$h_c = \left(\frac{q^2}{g} \right)^{1/3}$$

$$E_c = \frac{3}{2} h_c$$

For all $E > E_c$ there are two solutions of (*), one subcritical ($Fr < 1$), the other supercritical ($Fr > 1$).

Froude numbers are given by

$$Fr = \frac{u}{\sqrt{gh}}$$



Nomenclature

b = channel width;

E = specific energy;

Fr = Froude number;

h = water depth;

Q = volumetric flow rate;

q = flow rate per unit width ($= Q/b$);

u = velocity;

z_b = height of weir.

Subscript c denotes critical conditions.