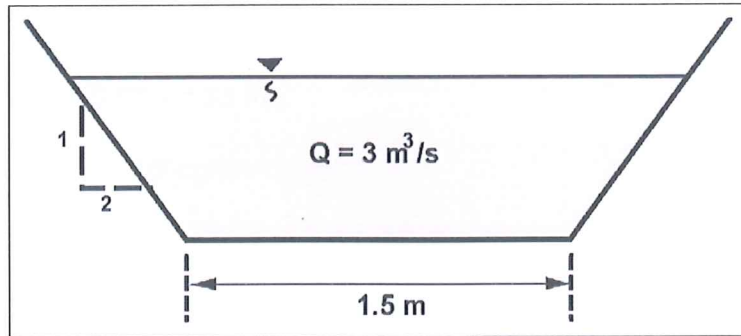


EXAMPLE PROBLEM 4.2 (SI Units)

Given: A concrete trapezoidal channel $B = 1.5$ m, sideslopes = 1V:2H, $n = 0.013$, slope = 0.002, $Q = 3$ m³/s



Find: Depth (y) and velocity (v)

Solution:

1. Use Manning's equation

$$Q = \frac{K_u}{n} A R^{2/3} S^{1/2}$$

where $K_u = 1$ and relationships for A and R are

$$A = By + Zy^2 = 1.5y + 2y^2$$

$$R = \frac{By + Zy^2}{B + 2y\sqrt{1+Z^2}} \quad R = \frac{1.5y + 2y^2}{1.5 + 4.47y}$$

substitute A and R into Manning's equation

$$Q = \left(\frac{1}{0.013} \right) (1.5y + 2y^2) \left(\frac{1.5y + 2y^2}{1.5 + 4.47y} \right)^{2/3} (0.002)^{1/2}$$

2. Trial and error solution for y to find a depth where $Q = 3$ m³/s

$$\text{Try } y = 0.70; \quad Q = \left(\frac{1}{0.013} \right) (1.05 + 0.98) \left(\frac{1.05 + 0.98}{4.629} \right)^{2/3} (0.002)^{1/2} = 4.03 \text{ m}^3/\text{s}$$

Since $4.03 > 3.0$, the assumed value for y is too large. Try a smaller value such as 0.60.