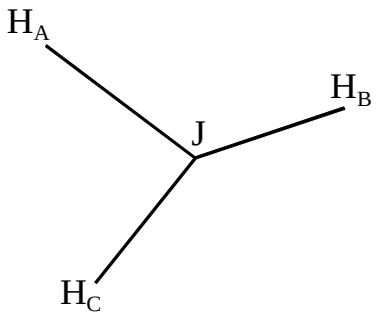
The Three-Reservoir Problem



This is the simplest junction problem for pipe networks. The task is to calculate the flow in three pipes connected by a single junction J, the heads at the other ends of the junctions (A, B and C) being fixed (hence "reservoirs").

The head-loss relationship for each pipe is of the form:

$$h = (\lambda \frac{L}{D} + K) \frac{V^2}{2g}$$

where h is the absolute difference in head, K is the sum of all minor loss coefficients, λ is the Darcy friction factor (assumed constant), L is the length of pipe, D is the pipe diameter, g is the acceleration due to gravity and V is the bulk velocity. The direction of flow is from high to low head.

In terms of the discharge, Q,

$$h = \alpha Q^2$$

where

$$\alpha = (\lambda \frac{L}{D} + K) \frac{8}{\pi^2 g D^4}$$

The problem is solved by adjusting the head at the junction, H_J, until the net flow out of the junction is zero:

$$Q_{JA} + Q_{JB} + Q_{JC} = 0$$

where Q_{JR} is the flow *from* J *to* R (with the appropriate sign).