

Conservation of Mass, Momentum, and Energy in a Sluice Gate/Hydraulic Jump Flow

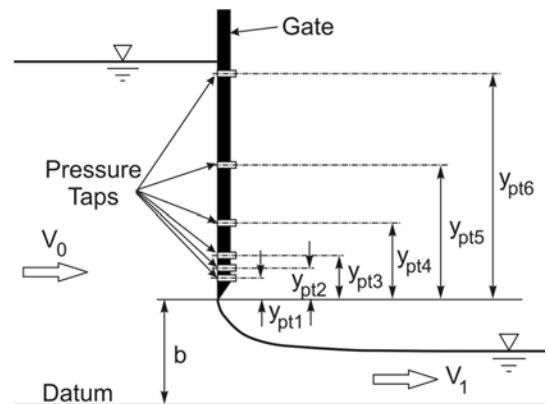
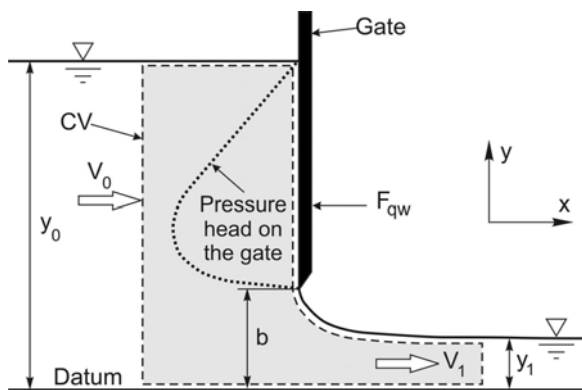
Purpose

To demonstrate conservation of mass, momentum, and energy equations in sluice gate/hydraulic jump flow.

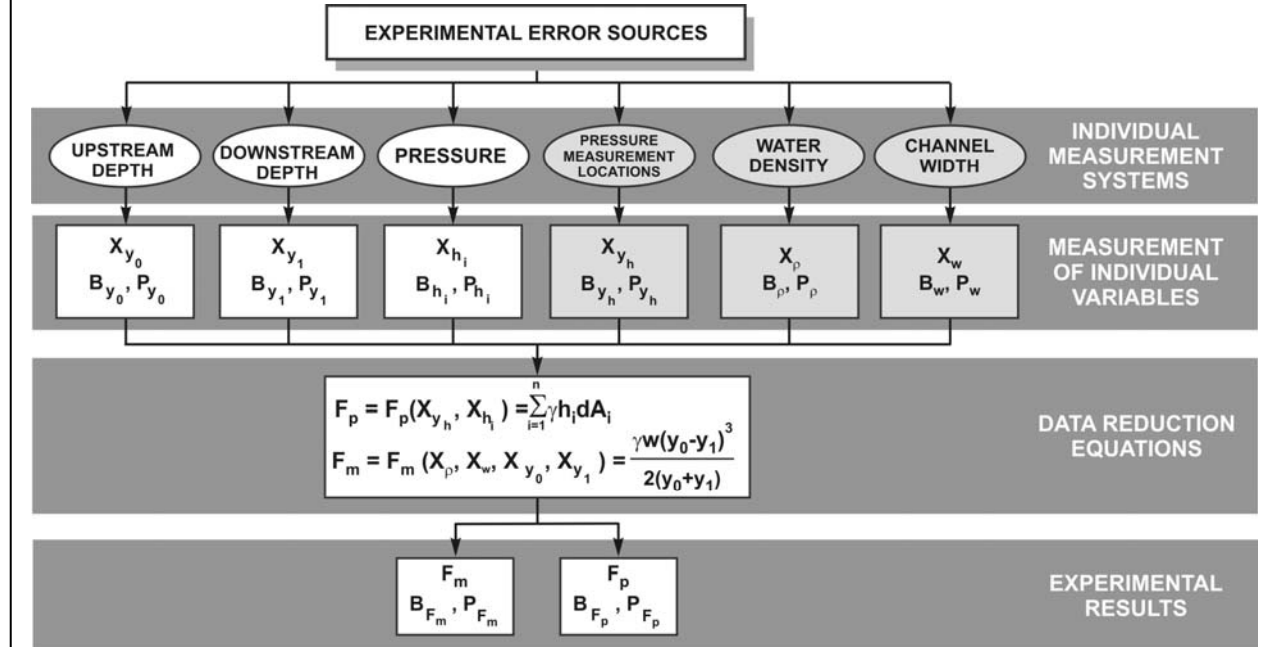
Test Design

The force on a sluice gate in an open channel is determined by two methods:

1. upstream and downstream flow depths are measured and force determined through conservation of mass, momentum, and energy equations
2. pressure distribution over the gate is measured to determine the force



Measurement systems



Block diagram of the experimental forces acting on the sluice gate

Data Analysis

- Calculate the force on the sluice gate using the following data reduction equations

$$F_m = \frac{\gamma w (y_0 - y_1)^3}{2(y_0 + y_1)} \quad (\text{method 1})$$

$$F_p = \sum_{i=1}^n \gamma h_i dA_i \quad (\text{method 2})$$

- Compare the determined forces and discuss the results
- Estimate uncertainties for the results