LFOM sutro weir research

Sutro Weir Research

Introduction

Definition of Weir : A type of small overflow dam that can be used for flow measurement. The Linear Flow Orifice Meter is a mimic of this weir.
Definition of Sutro Weir : The discharge (flow) through the weir is proportional to the head (water depth above a reference plane located at one third of the depths of the crest of the base weir).
Development : The linear-proportional weir was developed by Stout in 1897 and was theoretically based, the design stipulated the width at the base as infinite. In 1908 Sutro modified the design to create a practical linear-proportional weir. The weir has a rectangular base and the flow through the weir is proportional to the height of the water through the curved portion of the weir plus

$\frac{2}{3}$

of the height of the rectangular base ie.

$Q = ch + \frac{2}{3}s$

Equations Page Here

Source 1: Prof. B.S. Thandaveswara from the Indian Institute of Technology Madras website

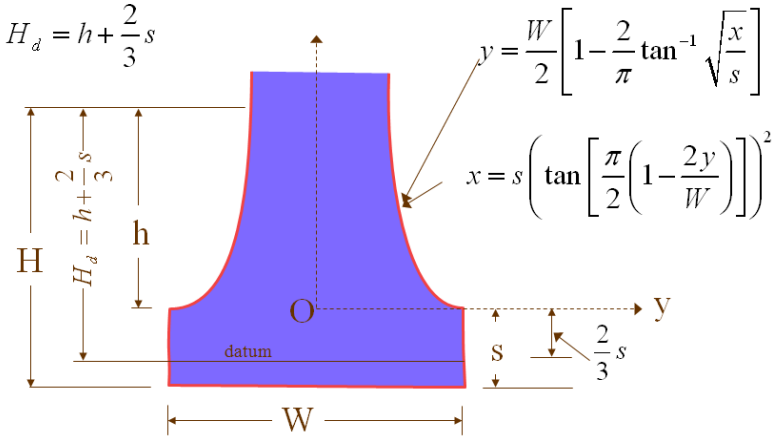

Figure 1: Sutro weir with constraining equations.

- Note: The rectangular base is present in the design merely to simplify evaluation and analysis. Flow proportional to water height begins above the rectangular weir.

Variables

W = base of rectangular weir
s = height of rectangular weir
h = weir height above rectangular weir
c = constant of proportionality

C_d

= coefficient of discharge, ranges from 0.0597 to 0.619

Q_s

= Flow through rectangular weir

Q_h

= Flow through upper portion of weir,Important Parameter
Q = Total Discharge

C_d

= vena contracta area ratio, average value is 0.62
g = acceleration due to gravity

Source 2: Practical Constant-Accuracy Linear Weir K. Keshava Murthy and M. N. Shesha Prakash, Journal Irrigation and Drainage Engineering 120, 550 (1994)

- the text is available here, and access to the text is available at the following link

Summary:

The paper explores a different weir design that also results a discharge that is proportional to the depths of head. The design has two parts, one is the outside edge of part of a circle and the rest of the weir is a sloped straight line. The redesign was tested because the changes would make construction easier. The results showed a high level of accuracy, +/- 1% in the head range 0.5R <= h <= 7.9R (R is the radius of sector of circle, the coefficient of discharge was experimentally shown to be 0.619. Figure 1 is a visual representation of the design.

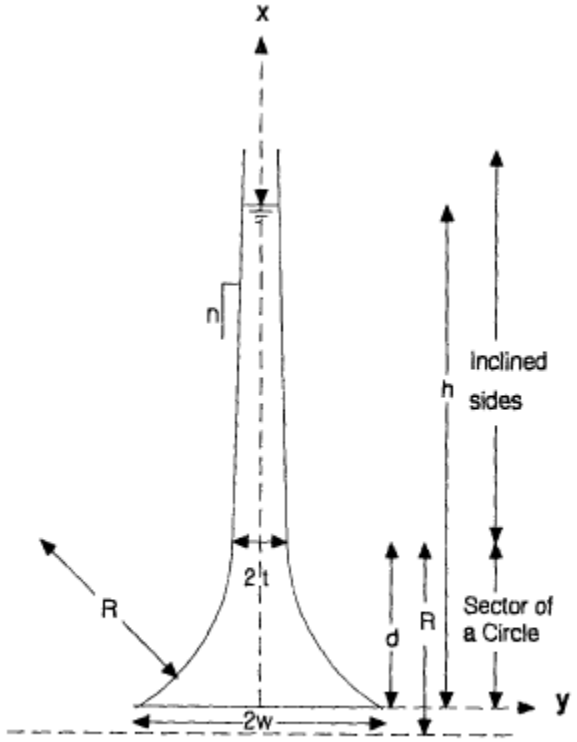

FIG. 1. Definition: Practical Constant-Accuracy Linear Weir

Source 3: Geometrically Simple Logarithmic Weir K. Keshava Murthy, H. S. Ramesh, and M. N. Shesha Prakash, Journal Irrigation and Drainage Engineering 121, 419 (1995)

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Note sources 2 and 3 were found through the ASCE research library at http://scitation.aip.org/hyo/