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Comparision on Co-Efficient of Discharge of 30^0 V-Notch with Multiple Segments

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***Abstract*— This paper represents the hydraulic experiment performed on "notch apparatus" to determine the effect of notch shape on notch flow characteristics. In the recent time, flood control has been a major concern, thus, it is necessary to design a head of notch. In this paper it is the comparative analysis of Vnotch with multiple segments. Prototype model has been designed in AutoCAD and Sketchup software. A water channel was constructed and calibrated at the upstream so as to determine the head, H of water flowing over the notch. There are 3 slots of flat plate is inserted the on upstream towards the downstream. It was discovered experimentally that shape and water height over the notch has effect on coefficient of discharge and volume discharged. The coefficient of discharge obtained are: 0.62,0.6,0.7,0.68 for v-notch of segments 1,2,3 and 4. Thus, V-notch of three segments gives better results compared to different segments.**

***Keywords*— Notches, V-notch, Discharge, Segments**.

I. GENERAL INTRODUCTION

A 30-degree V-notch weir is a flow measurement device commonly used in hydraulic engineering to measure low flow rates in open channels. Its design features a triangular opening with a 30-degree angle, making it particularly sensitive and accurate for small discharges. In certain applications, compound or multi-segmented V-notch weirs are employed to enhance measurement accuracy across a broader range of flow rates. These weirs combine multiple V-notch sections with varying angles or configurations within a single structure, allowing for more precise flow measurements under varying conditions. A notch is a geometric cut or indentation, often used in engineering, manufacturing, and scientific applications, serving various functional and analytical purposes. Notches come in different shapes, such as V-notches, U-notches, or rectangular notches, depending on their intended use. They are integral in areas like fluid mechanics, material testing, structural analysis, and even welding processes. In fluid flow measurement, notches are used in devices like weirs, where the notch's shape helps regulate and measure the discharge of fluids accurately. For example, a V-notch weir, characterized by its triangular shape, is widely used in open channels to measure low flow rates with precision. The fluid's height above the notch correlates directly with the flow rate, enabling engineers to calculate discharge using established formulas.

II. SCOPE & OBJECTIVES OF THE STUDY

It helps in understanding how variations in the multiple segments influence the flow characteristics and discharge capacity and also helps in determining the accurate flow rate of water passing through the notches, which is crucial for applications such as weirs, spillways and other flow measuring devices. Engineers and designers can use the cd value to optimize the design of flow control structures, ensuring that they meet specific discharge requirements while minimizing flow errors.

1. To prepare prototype laboratory model.
2. To investigate the effect of notch geometry.
3. To measure the flow rate through with segments A, B, C & D. 30^0 V-notch.
4. To determine the Cd for different Segments of 30^0 V-notch.
5. To compare values of Cd of different Segments of 30^0 V-notch.

III. METHODOLOGY

A. Literature Review

We refer some papers and journals which are related to our project. How to compare our project and how to represent Our Cd, Aim, objective tabulations in our report and what they actually do in their project and results etc.

B. Software Designs

We decided 30-degree angle for our v notch and designed multiple segments such as 1, 2, 3, 4 actual channel design like length of channel and width and height and collecting tank in auto CADD software. The above figures show the AutoCAD drawing model, designed by us.

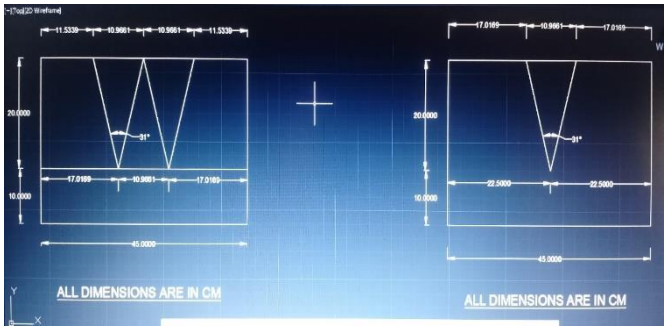

Fig 3.1 The above figure shows the Auto CAD drawing of segments 1, 2 of v notch

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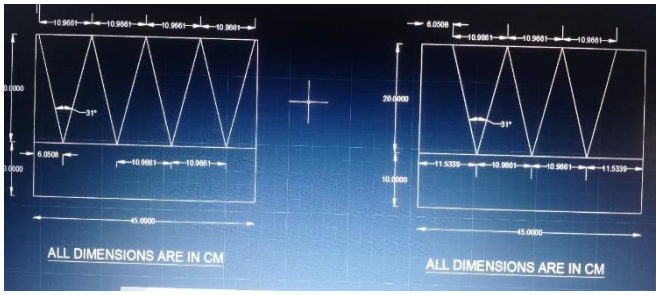

Fig 3.2 The above figure shows the AutoCAD drawing of segments 3, 4 of v-notch

Fig 3.3 The above figure shows the Sketchup drawing of v notch

C. Experimental Setup Stand/Framework

Description: A rigid support structure for mounting all components in position such as wooden table, stool, low height table for collecting tank also for pumping motor.

Function: Ensures stability and alignment of the V-notch and the approach channel during the experiment.

Fig 3.4 The above figure shows the experimental Setup Stand/Framework

IV. RESULTS AND CONCLUSIONS

Trail no	No of segment	Qth (m^3/sec)	Qact (m^3/sec)	Cd	Avg Cd
1	1	5.12 x10^-4	3.23 x10^-4	0.63	0.62
2		3.20 x10^-4	2.13 x10^-4	0.66	
3		9.06 x10^-5	5.20 x10^-5	0.57	
1	2	5.14 x10^-4	3.08 x10^-4	0.59	0.60
2		3.33 x10^-4	2.18 x10^-4	0.65	
3		1.23 x10^-4	7.08 x10^-5	0.57	
1	3	4.66 x10^-4	3.04 x10^-4	0.65	0.70
2		3.76 x10^-4	2.81 x10^-4	0.74	
3		1.52 x10^-4	1.08 x10^-4	0.71	
1	4	4.63 x10^-4	3.24 x10^-4	0.70	0.68
2		3.32 x10^-4	2.30 x10^-4	0.69	
3		1.26 x10^-4	8.06 x10^-5	0.64	

1. From the results it is found that, the actual flow rate through a given opening is closer to the theoretical flow rate, indicates less energy loss due to friction and turbulence.
2. From the results it is found that, the higher discharge co-efficient signifies better flow performance with less resistance.
3. From the results it is observed that V-notch with 3 segments gives better results compared to other segments.
4. From the results it is observed that increase in number of segments also increases the discharge co-efficient.
5. Provision of notch with multiple segments can also prevent river disaster.
6. Increase in number of segments, reduces flow rate on D/S ide of a V-notch.
7. Increase in number of segments can also control floods in village areas.
8. As the discharge over a notch is directly proportional to the height of the water level on U/S of the notch, Lowering the U/S water level reduces the flow rate over the notch.

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