INVESTIGATION OF DIVIDING STREAMLINE IN LATERAL INTAKE OF U-SHAPE CHANNELS

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Diversion flows appear naturally in rivers as braiding or meander cut-offs or alternatively can be developed by man at intakes from rivers or irrigation canals. Intake location and diversion angle as well as flow regime seem to influence dividing streamline in bend channels, this is because diversion flow pattern is three dimensional and non-uniform. The dividing streamline plays a significant role in the rate of diversion flow and sediment transport into the intake channel, while this shows a noticeable variation of flow division from near bed to the surface. Therefore, study of dividing streamline is of importance to hydraulic engineers and researchers being involved in intake design channels.

By this means, a rectangular U-shape flume with an intake channel of fixed bed and banks was constructed to carry out experiments. Flume dimensions are: 0.6 m wide (B), 0.6 m high and 2.6 m radius of curvature to the centerline (R) with a ratio of (R/B) equals 4.3. A straight rectangular channel with dimension of 0.6 m wide, 0.6 m high and 7.2 m long is located upstream of the bend section. In addition, to remove gate effect on the water level in bend channel, a straight rectangular channel built with the same cross section and 3.5 m long downstream of the bend section.

Raudkivi (1993) suggested the width ratio of diversion channel to the main channel to be in the range of 0.4-0.5. Therefore, horizontal diversion channel designed with rigid bed rectangular cross section of 0.25 m wide (b), 0.35 m high and 1.1 m long.

Discharge of main channel is measured by ultrasonic flow meter and a triangular sharp crested weir was used to measure the flow in diversion channel.

To investigate, the effects of intake location (θ) on the dividing streamline, three locations were selected, two in first half of the bend , $\theta = 40^{\circ}$ & 75°) and one in the second half ($\theta = 115^{\circ}$).

Four diversion angles ($\phi = 45^{\circ}$, 60°, 75° and 90°) are also considered at each intake location, for sub-critical flow conditions in the main channel. This was carried out for a constant depth of 0.15 m and three different flow discharge values of $Q_m = 30$, 45, and 60 lit/sec (Froude Numbers= 0.27, 0.41 and 0.55).

In the main channel, flow pattern was drawn near the bed and the surface in the vicinity of the intake by measuring flow velocity in two dimensions. Then dividing streamlines lower (B_d) and upper (S_d) boundaries were measured near the bed and the surface,

respectively. This is to observe the impact of intake location, diversion angle and flow regime on dividing streamline. On the other hand, flow, in the main channel, is influenced by pressure gradient as it approaches diversion channel, which leads to be diverted into the lateral intake. In the main channel, diverted flow pattern into the lateral intake is significant. B_d/B and S_d/B are decreased as Fr values are increased. Increasing Fr values leads to a decrease in flow pattern diversion towards the lateral intake in the main channel and vice-versa. Diversion flow is decreased with increase in Fr values.

REFERENCE

Raudkivi, A. J. (1993). *Sedimentation, Exclusion and Removal of Sediment from Diverted Water*, IAHR, Balkema, The Netherlands, pp. 63-87.