

## FLOW MEASUREMENT TECHNIQUES

### 1) Trajectory Method For Tubewells

This method is used to measure the discharge or flow for rate of tubewells. It is very simple and easy method. It has three essential requirement/condition for discharge determination



Inside diameter of pipe



Measurement of X-coordinate of flow (Horizontal distance measured from the end of pipe)



Measurement of Y-coordinate of flow (Vertical distance measured down from the horizontal point to the top of the water jet)

#### Formula used For Full Flowing Pipe

$$Q = 0.0174 D^2 x X/\sqrt{Y}$$

where

$$Q = \text{lbs}$$

$$D = \text{inside diameter of pipe (cm)}$$

$$X = \text{X-coordinate (cm)}$$

$$Y = \text{Y-coordinate (cm)}$$

#### Formula used For Partial Flowing Pipe

$$Q = [0.0174 D^2 x X (a/A)]/\sqrt{Y}$$

where

$$Q = \text{lbs}$$

$$a = \text{Area of jet}$$

$$A = \text{Area of pipe}$$

$$D = \text{inside diameter of pipe (cm)}$$

$$X = \text{X-coordinate (cm)}$$

$$Y = \text{Y-coordinate (cm)}$$

#### LIMITATIONS

- Pipe should be straight
- Discharging in air
- Length of pipe  $> 6 D$
- Error upto 10 %

## 2 -FLOAT METHOD

Float method is used to measure discharge in open channels where accuracy is not of important. It is based on velocity- area relationship.

Discharge = Area x Velocity

$$Q = A \times V$$

$$Q = \text{m}^3/\text{sec}$$

$$V = S/t \text{ ( m/sec)}$$

$$A = \text{Cross Section Area of flow (m}^2\text{)}$$

Cross sections of water channels vary, i.e Rectangular Section, Trapezoidal or Parabolic Section

- Take 30 meter straight and long section of watercourse, and mark A and B points.
- Put float 1 m before point A.
- Float e.g. round wooden block, wooden sphere, orange, long necked bottle partly filled & capped
- Note time taken by float for distance from point A to B.
- Find Velocity (v)
- Repeat 3 to 4 times
- Measure average depth of flow (d), not of w/c
- Measure width of flow (b) Calculate area (A)
- Calculate discharge  **$Q = 0.9 \times A \times V$  for lined watercourse**