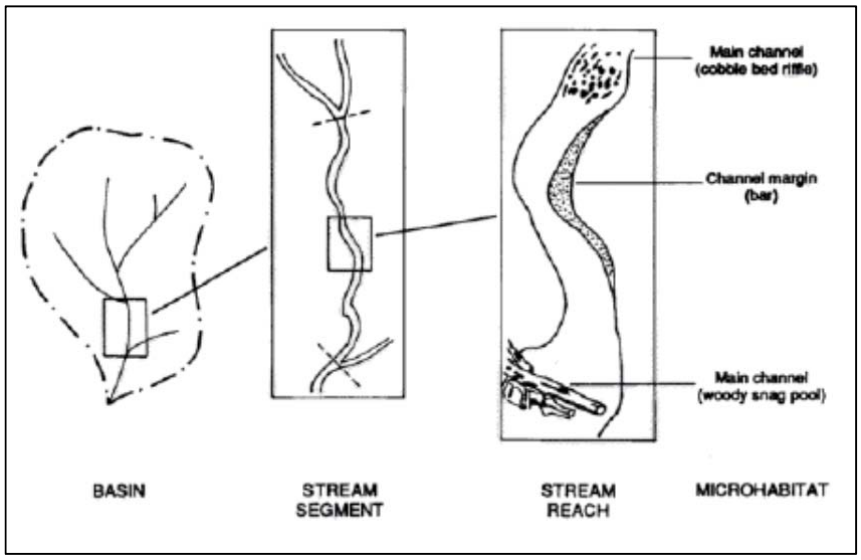
Streamflow measurement

- Streamflow / stream discharge: quantity of water flowing in a stream.
- Discharge is expressed in terms of volume per unit time passing any given point in the stream.
- Unit: m3/s (comics).
- A stream reach: a section of stream with relatively constant bed slope, cross section & discharge.
- Stream discharge varies with time & season e.g. dry & wet season.

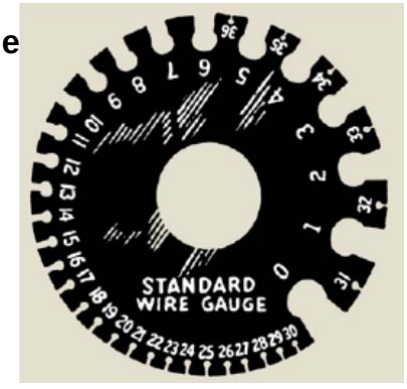


River stage

Defined as the river water surface elevation measured above a datum (MSL or any arbitrary level chosen for convenience). Measured using non-recording gauges or recording gauges:

- Non-recording gauges: (Staff gauge, wire gauge)
- Recording gauges: (Float-gauge recorder, bubble gauge)

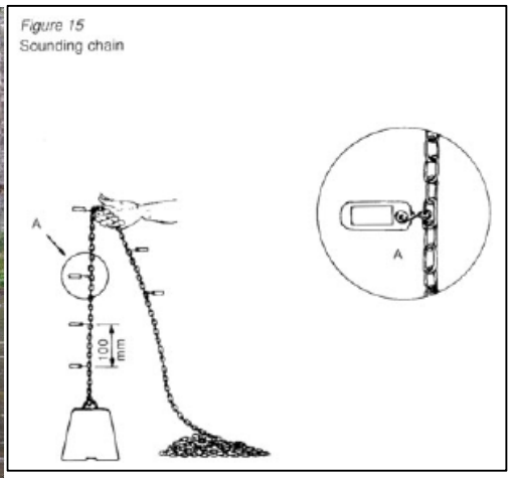
Wire gauge

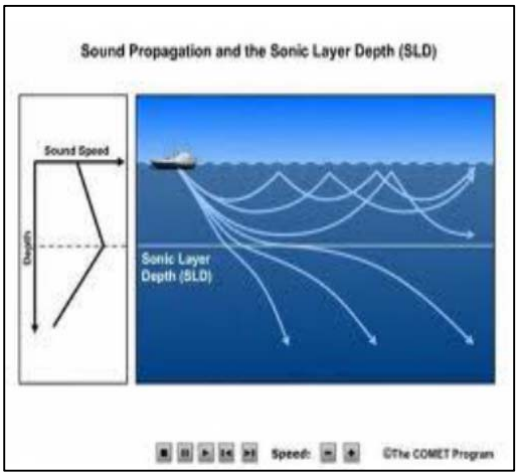


Measurement of depth

There are three methods to measure a depth:

1. Wading rod
2. Sounding weight
3. Sonic sounder





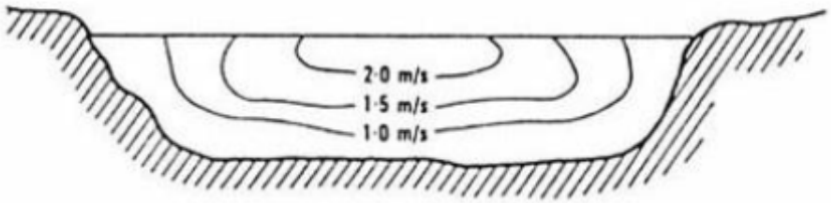
Measurement of Discharge

A. Direct method: include;
    1. Velocity area method
    2. Dilution gauging method
B. Indirect method: include;
    1. Control structures
    2. Chezy/ Manning eqn.

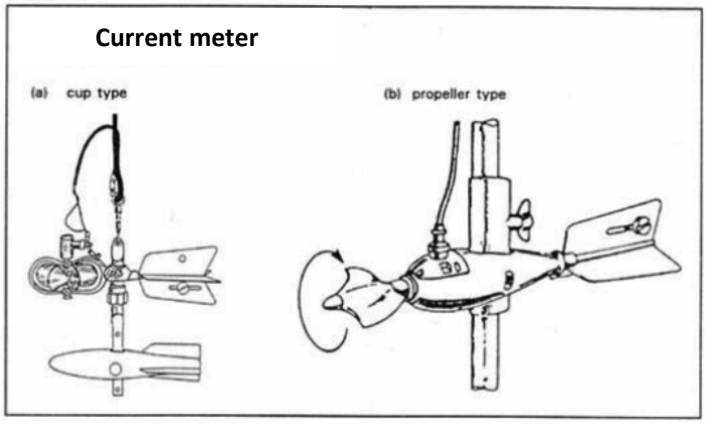
Velocity area method

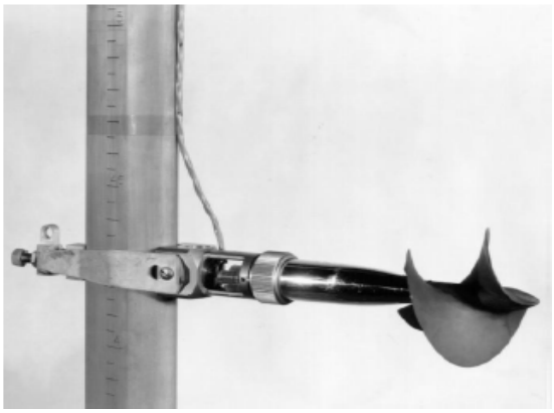
- Normally velocity is measured and multiplied to the cross-sectional area to get the discharge.
- Velocity is measured by using float or current meter.
- Floats: surface velocity & requires correction factor to get the average velocity over a depth.
- Current meter: cup type & propeller. Both need to be calibrated to get the relationship between rate of revolutions of the cup or propeller & velocity.

Variation of Velocity in a stream



Current meter





Mean section method

$$Q = \sum \frac{v_{i-1} + v_i}{2} \times \frac{d_{i-1} + d_i}{2} \times \frac{b_{i-1} + b_i}{2}$$

v_{i-1} = mean velocity of preceding vertical

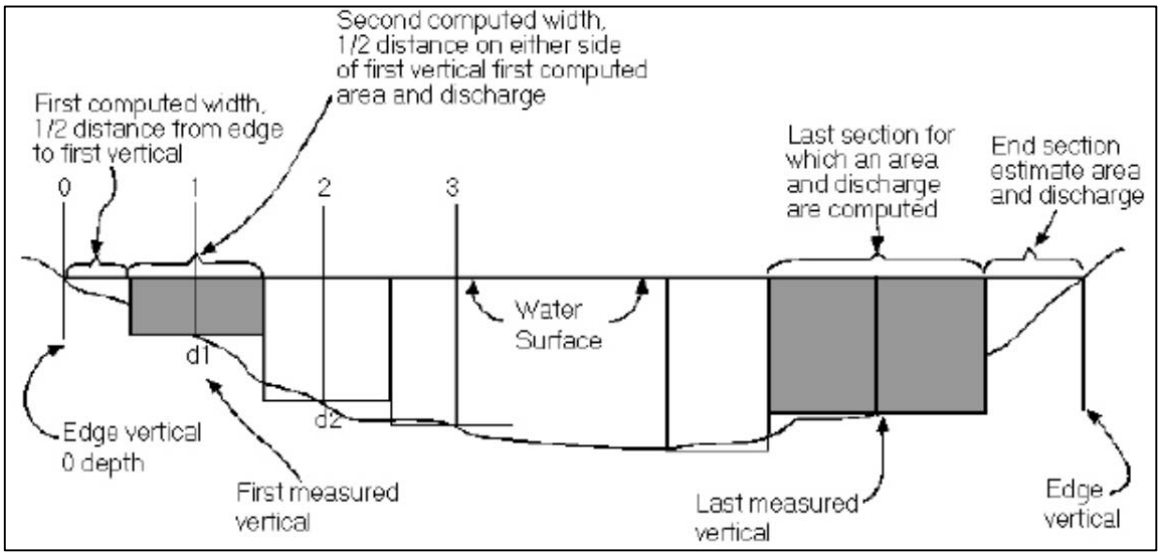
v_i = mean velocity of vertical

d_{i-1} = depth of preceding vertical

d_i = depth of vertical

b_{i-1} = distance of preceding vertical

b_i = distance of vertical

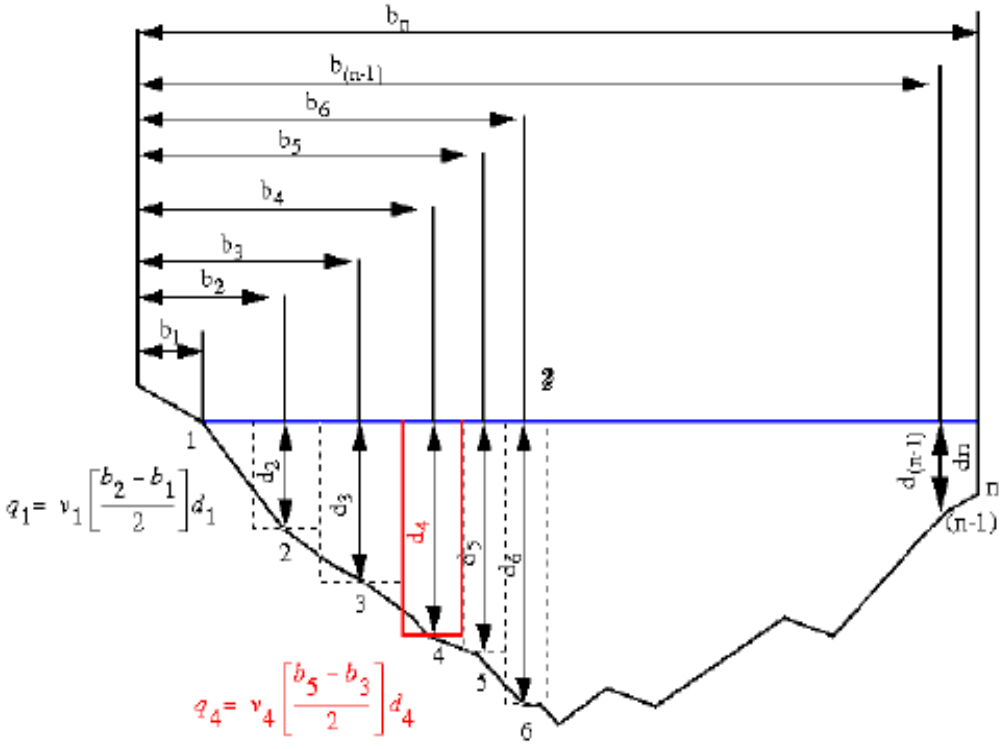


Mid-section method

$$Q = \sum (v_i d_i) \frac{(b_{i+1} - b_{i-1})}{2}$$

b_{i+1} = distance of the following vertical

Sketch of midsection method for computing discharge



Explanation

1,2,3 .....n --Observation verticals

$b_1, b_2, b_3, ...b_n$ --Distance from initial point to observation vertical

$d_1,d_2,d_3,.....d_n$ --Depth of water at observation vertical

Dashed lines --Boundaries of subsections