

NON-UNIFORM FLOW THROUGH OPEN CHANNELS

Whereas in uniform flow the gravity force on the flowing liquid just balances the frictional force between the flowing liquid and that inside surface of the channel which is in contact with this liquid, the friction force and gravity force are not in balance in case of a steady non-uniform flow.

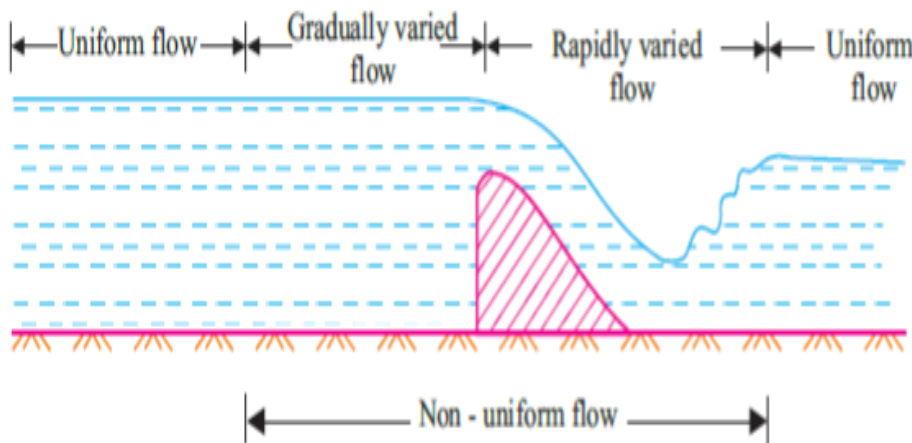
Non-uniform flow may be caused by:

- (i) The change in width, depth, bed slope etc. of a channel;
- (ii) An obstruction, constructed across a channel of uniform width.

Waves and surges in open channel produce unsteady non-uniform flow.

Non-uniform flow is also known as the flow of varying depth or, the varied flow. The varied flow may be:

- (i) Gradually varied flow (G.V.F.). In this case of flow the depth of flow increases or decreases gradually in the direction of flow; this change from one depth of to another occurs gradually in a distance of appreciable length.
- (ii) Rapidly varied flow (R.V.F.). In this case a sudden change of depth occurs at a particular point of a channel and the change from one depth to another takes place in a distance of very short length.



(i) When $Fr < 1$

(or $V < \sqrt{gD}$): The flow is described as subcritical (or tranquil or streaming)

(ii) When $Fr = 1$: The flow is said to be in a critical state.

(iii) When $Fr > 1$: The flow is said to be supercritical (or rapid or shooting or torrential) Some of the types of channel flow are shown in Fig