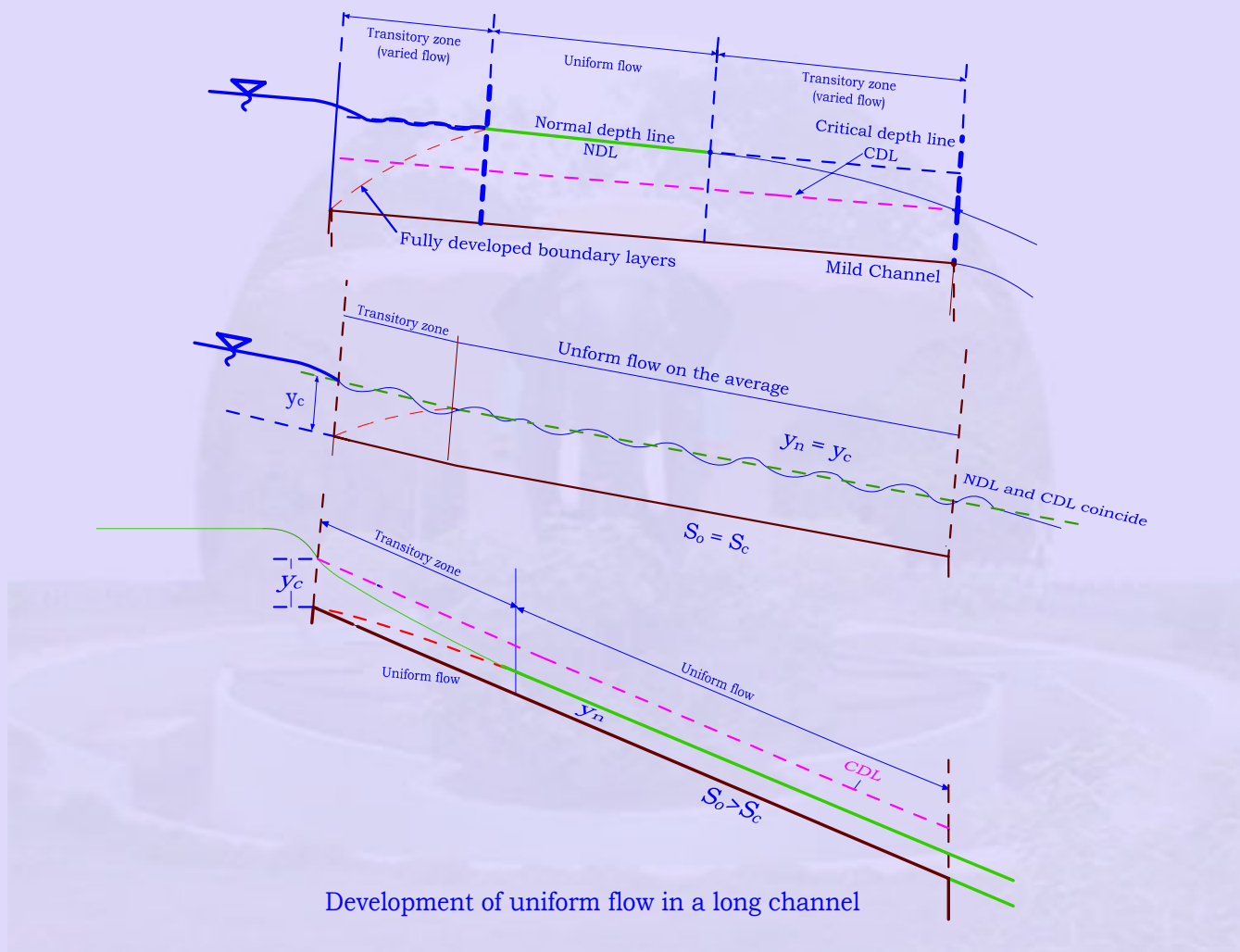


## 16.1 Concept of Uniform Flow

1. The depth average flow velocity (integrated over depth), area of flow cross-sections are everywhere constant along the channel.
2. The energy grade line  $S_f$ , water surface slope  $S_w$  and channel bed slope  $S_0$  are all parallel, i.e.  $S_f = S_w = S_0$

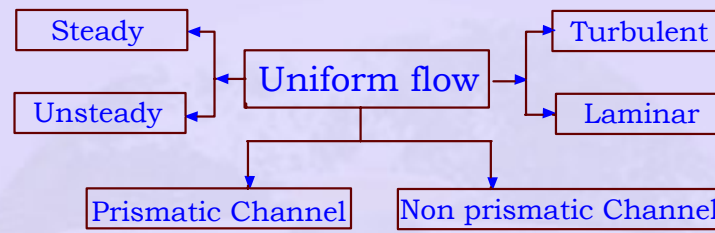
Figure shows Boundary layer growth in open channel with an ideal entry condition.



When the flow enters into a channel, the boundary layer grows up to free surface. The region for a mild channel can be divided into three zones viz., initial transitory zone in the entrance. Flow changes from the uniform flow to critical flow in the transitory zone at exit in mild channel. The boundary layer as it grows along the channel at the entrance emerges to the free surface at a certain distance from the entry point. This zone is called entry transition zone.

If the bed slope is critical slope, then the transitory zone in the entrance only exists. The uniform flow extends till the flow terminates and exits as a jet at critical depth. This flow is known as critical uniform flow. The free surface will be undulating with waves moving at  $C = \sqrt{gy}$ .

In the case of steep channel, the flow enters either through a hydraulic drop or at uniform flow depth. This has an initial transitory zone with an S2 type of varied flow curve. The flow emerges from the steep slope at uniform flow depth ( $y_n > y_c$ ).



### Likely uniform flow situations

Ultra rapid or hyper rapid flow occurs when flow surface becomes instable and air is insufflated into it.

