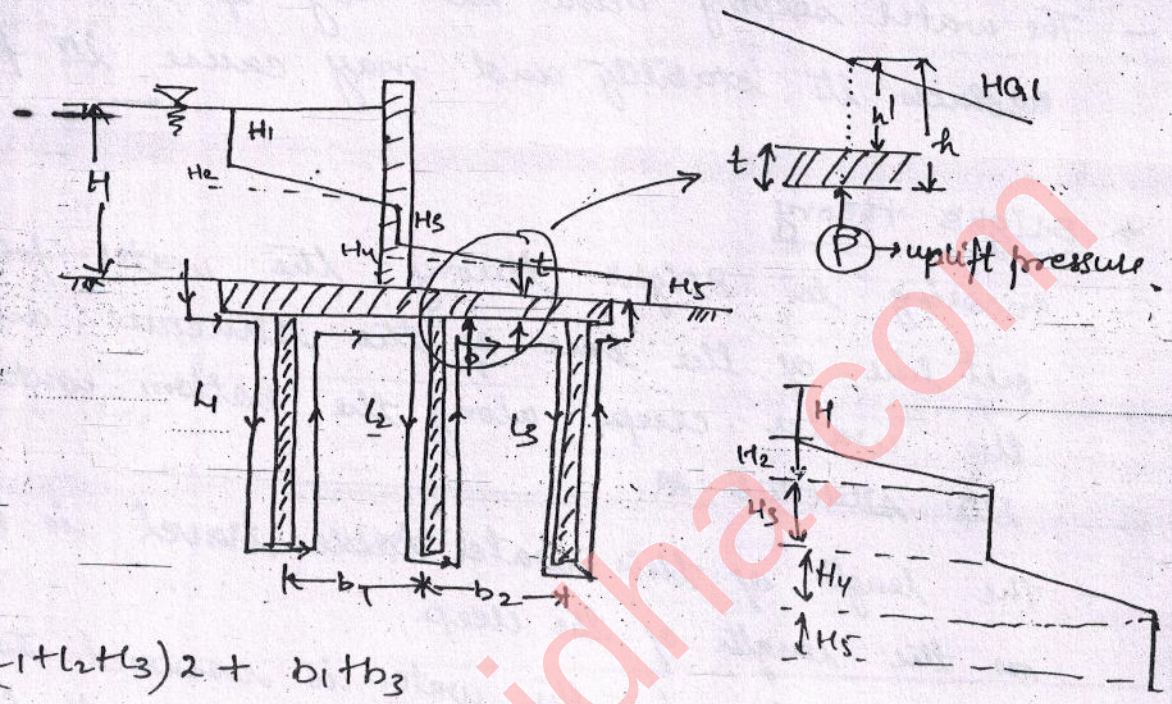
⇒ THEORY OF SEEPAGE :-

1st

BLIGH'S THEORY OF SEEPAGE :-



$$L = (L_1 + L_2 + L_3)2 + b_1 + b_3$$

$$\ell = \frac{H}{L}$$

$$H_1 = \frac{H}{L} \times 2L_1$$

$$H_2 = \frac{H}{L} \times b_1$$

$$H_3 = \frac{H}{L} \times 2L_2$$

$$H_4 = \frac{H}{L} \times b_2$$

$$H_5 = \frac{H}{L} \times 2L_3$$

$$\Sigma H_i = H_1 + H_2 + H_3 + H_4 + H_5$$

$$= \frac{H}{L}[2L_1 + 2L_2 + 2L_3 + b_1 + b_3]$$

Total head loss $= H$.

⇒ for safety against creep

$$\boxed{L = \frac{H}{\ell}} \Rightarrow \boxed{L = CH} \quad \text{where} \quad C = \frac{1}{\ell}$$

- Hydraulic structures such as dams, weirs, cross drainage works are subject to water pr. beneath the structure in addition to the other forces.

- The water seeping below the body of the structure reduces its stability and may cause its failure.

→ Bligh's theory

- According to Bligh's theory the water follows the out line of the base of the structure and hence the water creeps along the bottom contour of the structure.

- The length of this water ~~table~~ travel is known as the length of the creep.

- The head loss in the water is assumed to be directly proportional to the creep length (L)

$$L = (2h_1 + 2h_2 + 2h_3 + b_1 + b_2)$$

- for safety against creep (piping) sufficient length must be ensured which is given by the

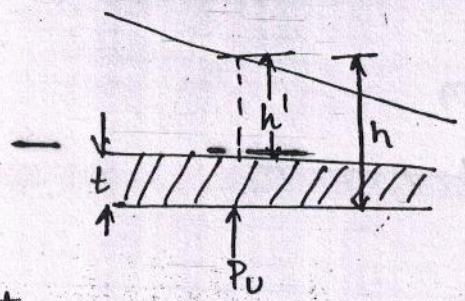
$$L = \frac{H}{C} = C \cdot H \Rightarrow \underline{L = CH}$$ where C = 1/i

C = 5 to 15

and depends on type of soil.

- for no failure due to uplift the submerged wt. of the structure should be sufficient to counteract the uplift pressure.

Thickness of the structure at bottom to safe gaurd against uplift pressur.



h' = ordinate of the HGL above the floor

h = ordinate of the HGL above the point of application of uplift pressur.

$h' = h - t$

$P_u = W$

$\gamma.h = \gamma_{structure} \times Volume$

$\gamma.h = G.\gamma_w.t$ {considering area to be $1m^2$}

$h = G.t$

imp $\boxed{t = \frac{h}{G}}$

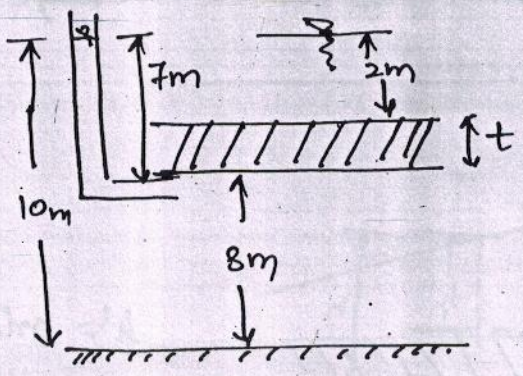
or $h - t = Gt - t$

$h' = t(G-1)$

imp $\boxed{t = \frac{h'}{(G-1)}}$

Q While designing a hydraulic str. the piezometric head at the bottom of the floor is computed as 10m. the datum is 3m below the floor bottom. The assured standing water depth above the floor is 2m. The floor thickness should be —?
Specific gravity of material = 2.5.

Sol^{n}



piezometric head
= pressure head + datum head.

$10 = P.H + 3$

$PH = 7$.

$\Rightarrow h = 7$

$t = \frac{h}{G} = \frac{7}{2.5}$ do $\frac{5}{1.5}$