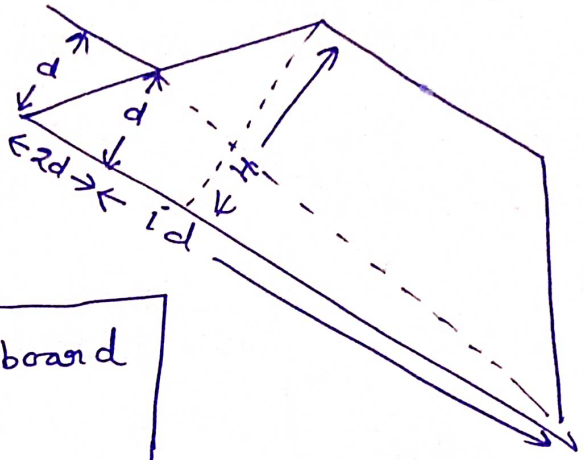
Bunding

d = depth of water impounding

$$\frac{S}{100} = \frac{VI}{HI}$$

$$d = \sqrt{2 R_e \, VI} \quad m$$

R_e : Rainfall excess of 24-hr (m)



H = $H_{Bund} = d + h_{water\ above\ crest} + \text{free board}$

if h is not given then take it as zero.

T = Top width

B = Bottom width

$$B = (z + i)\, d$$

$$T = B - 2 z H$$

Runoff Rate = $(i - f) \times L \times HI$

Volume $V_{storage} = (a_1 + a_2) \times L$

storage area $(a_1 + a_2) = \frac{1}{2} d^2 \left[\frac{100}{S} + z\right]$

Design of Bund

Runoff = storage volume

$$(i - f) \times L \times HI = \frac{1}{2} d^2 \left[\frac{100}{S} + Z\right] \times L$$

take time = 1 hr

Design of weir

Runoff Rate

$$\frac{m}{hr} \frac{(i - f)}{3600} \times L \times HI = 1.77\, L\, h^{3/2}$$

h → water above crest

same

$$H = d + h + \text{freeboard}$$

H = bund Height; h = water above crest

	Z	
clay	1:1	Z = 1
Loam	1.5:1	Z = 1.5
sandy	2:1	Z = 2

Area lost

$$L = \frac{10000}{HI}$$

↓

Length of bund per ha

$A_L = B \times L$ (without side bunds)

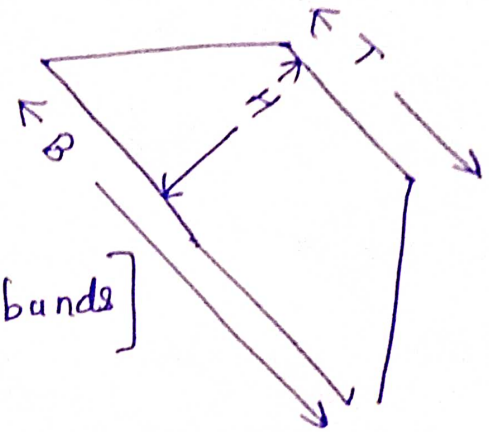
$A_L = \left(\frac{130S}{VI}\right) \times B$ (with side Bunds)

$$\% A_L = \frac{A_L}{\text{total area}} \times 100$$

Earthwork

$E_w = A \times L \times 1.3$ [with side bunds]

$A = \frac{1}{2} H(T+B)$



H = Bund Height

T = Top width

B = Bottom width.

Graded Bund

- Uniform Grade
- Variable Grade

$Q = CiA$

Design

$i = \frac{P}{t_c}$, $A = L \times HI$

$Q = CiA$

$i = \frac{P}{t_c}$, $A = L \times HI$

$t_c = 0.0195\, L^{0.77}\, S^{-0.385}$

t_c: min; L: m

$S = \frac{\text{Total drop}}{\text{total length}}$

$S = \frac{\text{drop}}{\text{length}}$

$$S = \frac{VI + \Delta h_1 + \Delta h_2 + \Delta h_3}{(L + HI)}$$

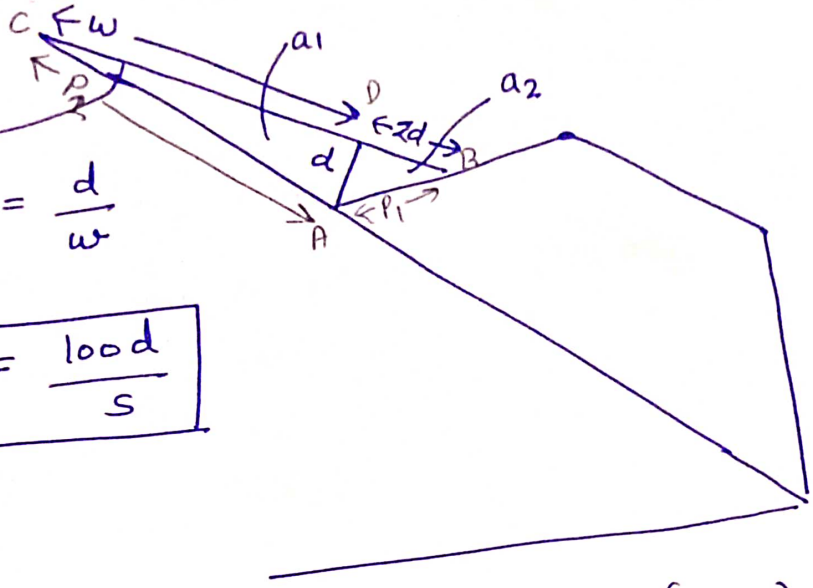
$Q = A \times V$

Computed

$Q_{computed} > Q_{design}$

$$q_1 + q_2 = \frac{1}{2} d^2 \left[2 + \frac{100}{S}\right]$$

$$P_1 + P_2 = d\left[\sqrt{1^2 + z^2} + \sqrt{1^2 + \left(\frac{100}{S}\right)^2}\right]$$



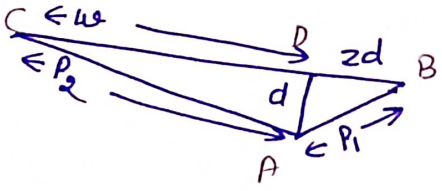
$$\text{slope} = \frac{s}{100} = \frac{d}{w}$$

$$\boxed{w = \frac{100d}{s}}$$

$$a_1 = \frac{1}{2} \times d \times w = \frac{1}{2} \times d \times \frac{100d}{s} = \frac{1}{2} d^2 \left(\frac{100}{s}\right)$$

$$a_2 = \frac{1}{2} d \times 2d = \frac{1}{2} 2 d^2$$

$$(a_1 + a_2) = \text{storage area} = \frac{1}{2} d^2 \left[2 + \frac{100}{s}\right]$$



Δ ABD

$$P_1^2 = d^2 + (2d)^2$$

$$P_1 = \sqrt{d^2 + 2^2 d^2}$$

Δ ACD $\quad P_2^2 = d^2 + w^2 = d^2 + \left(\frac{100d}{s}\right)^2$

$$P_2 = d\sqrt{\left(\frac{100}{s}\right)^2 + 1}$$

$$R = \frac{A}{P}$$

$$R = \frac{\frac{1}{2} d^2 \left[z + \frac{100}{S} \right]}{d \left[\sqrt{1 + z^2} + \sqrt{\left(\frac{100}{S} \right)^2 + 1} \right]}$$