

Practical No: 1

Design of Contour Bund

Aim: Design of contour bund

Theory:

The design parameters required for contour bunds are

- (1) Vertical interval
- (2) Horizontal interval
- (3) Bund cross-section
- (4) Earth work due to bunding

Height of the contour bund should be enough to store the expected peak runoff for a 10 years recurrence interval. A free board of about 20% should be provided for the settlement of height.

- (1) Calculation of Vertical Interval (V.I) and Horizontal Interval (H.I)

For low rainfall areas

$$VI = 0.15s + 0.6 \quad (m)$$

$$\text{and } \frac{s}{100} = \frac{VI}{HI}$$

$$\text{then, } HI = \frac{VI \times 100}{s} \quad (m)$$

Where,

VI = Vertical interval, m

HI = Horizontal interval, m

S = Original land slope, %

- 2) Calculation of Storage Required for Runoff Volume

$$P_e = P - I \quad (m)$$

$$A = HI \times L \quad (m^2)$$

So, runoff volume to be stored (R_v)

$$R_v = P_e \times A \quad (m^3)$$

Where,

P = Precipitation, m

P_e = Excess rainfall depth or surface runoff, m

I = infiltration depth, m

$H.I$ = Horizontal interval, m

L = Length of bund behind which the runoff is stored, m

A = Area of watershed behind two bunds, m^2 .

R_v = Runoff volume to be stored, m^3 .

(3) Calculation of Storage Volume

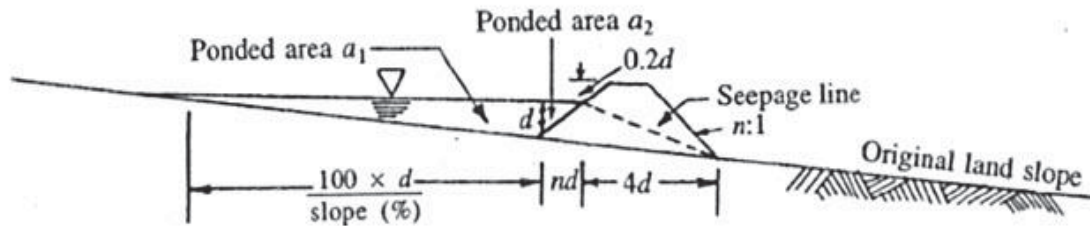


Fig. 1.1. Layout of contour bund. (Source: Das, 2002)

From the above layout of contour bund (Fig. 1.1),

$$\text{Ponded area } (a_1) = \frac{1}{2} \times \frac{100d}{s} \times d \quad (m^2)$$

$$\text{Ponded area } (a_2) = \frac{1}{2} \times nd \times d \quad (m^2)$$

$$\text{Area of water stored behind the bund} = (a_1 + a_2) \quad (m^2)$$

Storage volume (S_v) = area of water stored behind the bund \times length of bund (m^3)

where,

d = depth of water stored behind the bund (m)

$n:1(H:V)$ = side slope of the contour bund

$4:1(H:V)$ = Seepage line slope of the bund

(4) Calculation of Depth of Water Stored Behind Bund

For total runoff absorbed by the bund,

Runoff volume (R_v) = Storage volume (S_v)

Using this relationship, the depth of water stored behind bund is calculated.

(5) Calculation of Bund Cross Section

Total height of the bund (H) = (d + 20% of d as freeboard) (m)

Base width(B) = (nd + 4d) (m)

Top width(T) = (B - 2nH) (m)

(6) Calculation of Earth Work due to Bunding

Length of contour bund per ha (L) = $\frac{10^4}{HI}$ for main bund

= $\frac{10^4}{HI} \times 1.3$ for main bund with side and lateral bund

Earthwork per ha = cross sectional area of bund \times length per ha

$$= \left[\frac{1}{2} \times (B + T) \times H \right] \times L \quad \left(\frac{m^3}{ha} \right)$$

NUMERICAL:

Question

Calculate the height and cross sectional area of contour bund to be constructed on a land slope of 5%. The other details are given as under:

- i) Rainfall excess for 24-hr duration is 80cm
- ii) Horizontal interval=15cm
- iii) Depth of water flow over the weir=30cm

2. Calculate the total length and earthwork of contour bund per hectare, which is constructed on 5% land slope. The bund spacing was maintained as 25cm. the specification of bund is given as under:

i) Top width=50cm

ii) Bottom width=125cm

iii) Height=100cm

lateral and side bunds are also formed in field

