

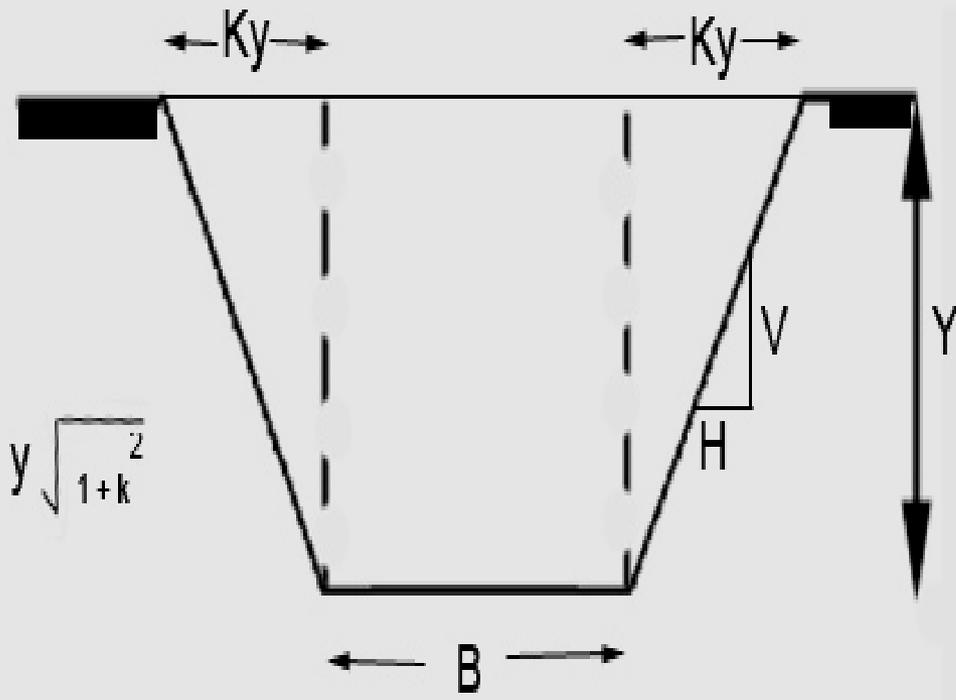
# Earth work calculation

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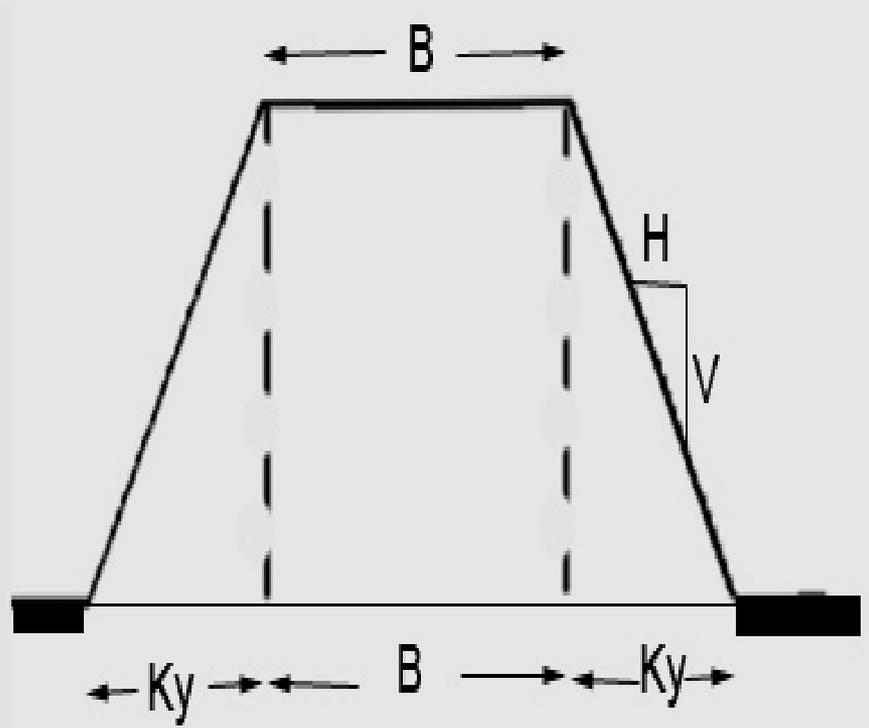
# Earth work calculation

- Earthworks are engineering works created through the moving and/or processing of massive quantities of soil or unformed rock.
- Earthwork is done to reconfigure the topography of a site to achieve the design levels.
- Earthwork involves cutting and filling to achieve the required topography.
- Cutting is the process of excavating earth material from a work location to achieve the desired topography.

- Filling is the process of moving the excavated material or additional earth material to a work location to achieve the desired topography.
- **Longitudinal slope and cross slope**
- The slope of the ground along a given line is known as the longitudinal slope.
- On the other hand slope of the ground perpendicular to the given line is known as the cross slope or transverse slope.
- A ground having a cross slope is also known as side long ground.
- In flat country the cross slope is usually negligible. In a hilly terrain the cross slope is usually significant.
- *Unless otherwise specified we should always assume that cross slope is zero.*



In cutting



In filling

$$A = BY + KY^2$$

Where,

A = Area of the section

B = Width of the section

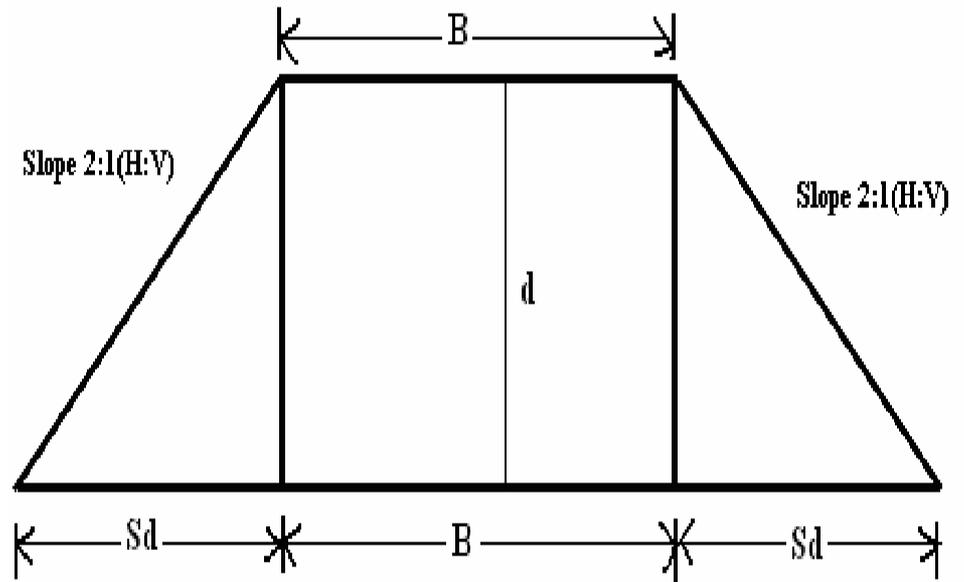
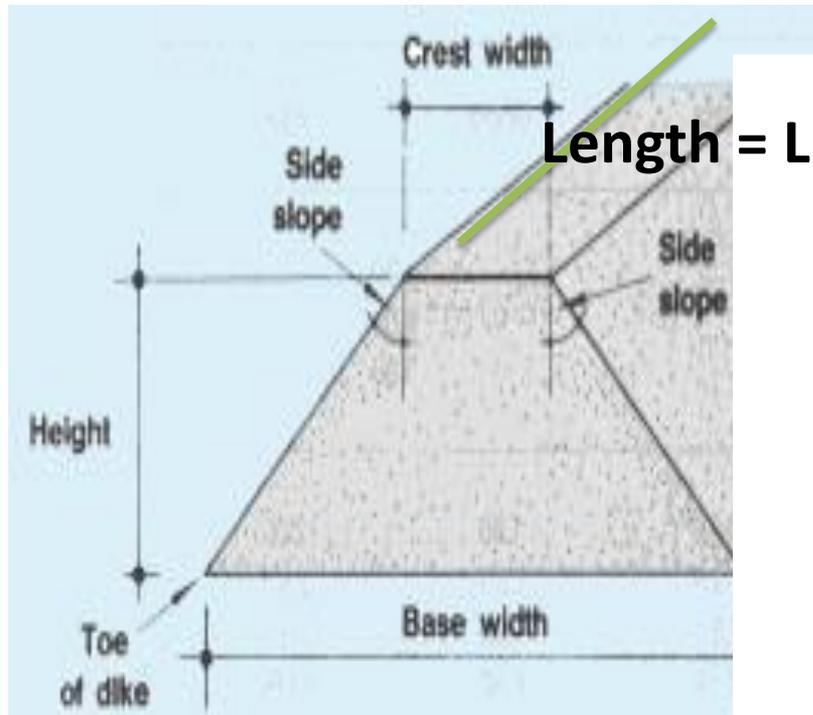
Y = Depth of cut or height of bank

K = Slope of the section

Usually slope of the section is considered only horizontal to vertical. When ever the side slope is not clearly specified we shall assume the given side slope has horizontal to vertical.

For instance a side slope is 2:1 i.e., H = 2 V=1 . . . K=2

Side Slope is 3:2 means H=3 V=2 K = 1.5. . . . 1.5 H =1V



$$A = Bd + Sd^2$$

Where,

A = Cross sectional area in Sq.meters

B = Top Width (Crest)

d = Depth

s = Slope (H:V)

The quantity of earthwork required in the construction of an embankment is calculated by using following equation.

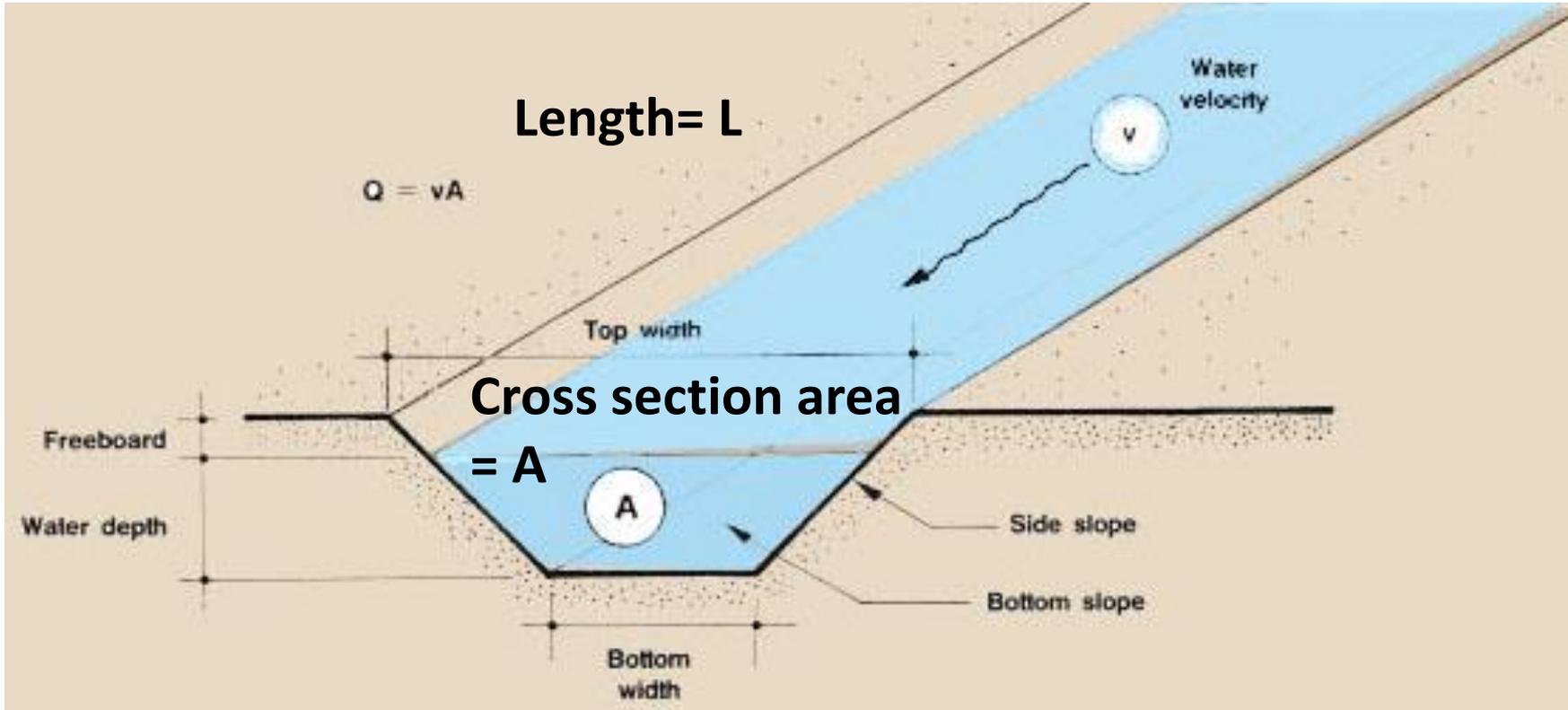
$$Q = L \times A$$

Where,

L = Length of an embankment.

A = Cross sectional area.

In same we can calculate earth work for channel also



- **Methods of computing the volume of earth work**
- **Mean sectional area method**
- Let  $A_1$  and  $A_2$  be the cross sectional areas of earth work at two given sections, which are at a distance “D” apart.

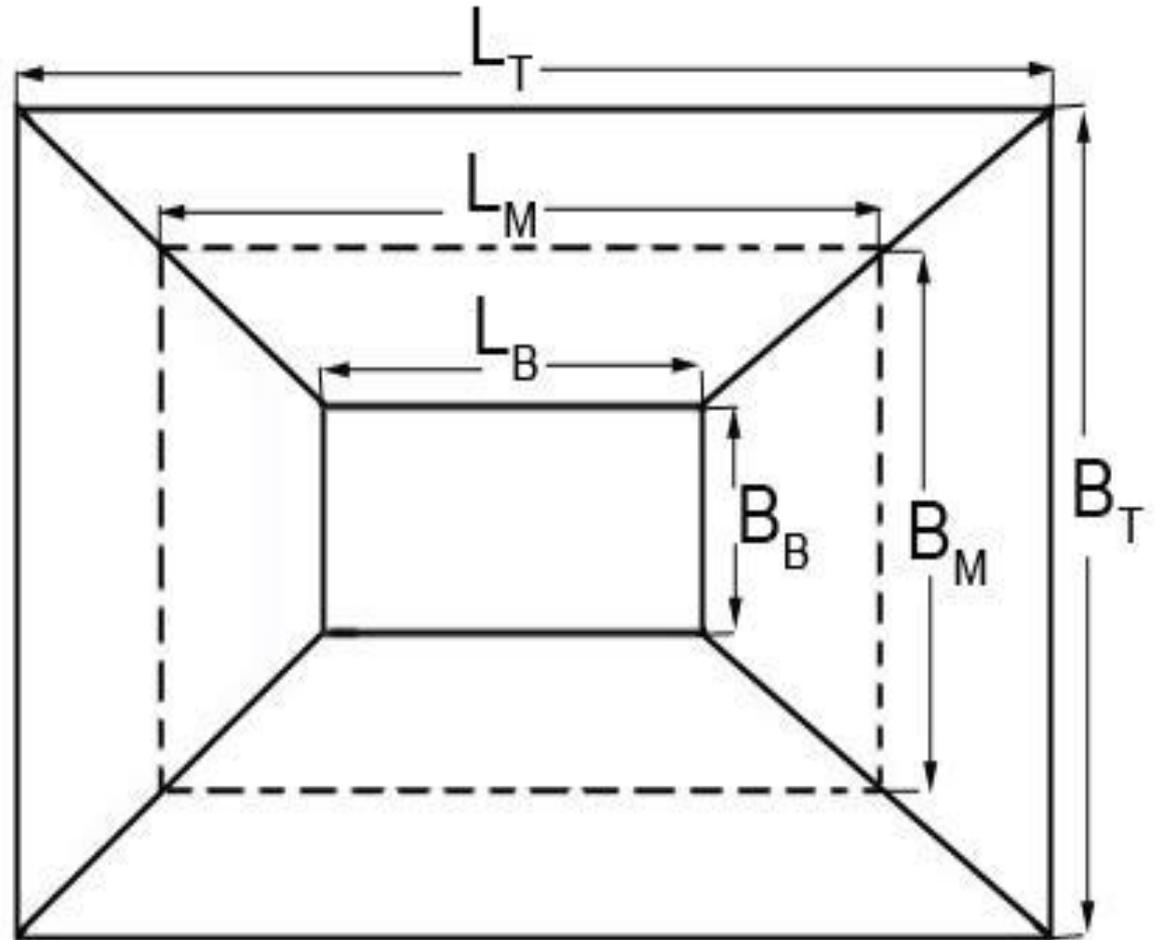
$$A = \frac{A_1 + A_2}{2}$$

- Then the volume of earth work between the two sections is computed from the relation
- $V = A \times D$ .
- **Trapezoidal formula method**  
This formula provides an extension of mean sectional area method. In other words the trapezoidal formula method and mean sectional area methods are one and the same. Let  $A_1, A_2, A_3 \dots \dots \dots A_n$  be the cross sectional area of earth work at the section along the given line.

- Let “D” be the distance between any two adjacent sections. Then the total volume of earth work along the given section can be computed from the relation.

$$V = D/2 (A_0 + A_n + 2(A_1 + A_2 + A_3 + \dots + A_{n-1}))$$

- Earth work for a pond



The volume of earth work is done in pond excavation may be calculated from the following formula.

$$V = D/6 (A_T + 4A_m + A_B)$$

Where,

$$V = \text{Volume of earth work} = \text{m}^3$$

$$D = \text{Depth of pond} = \text{m}$$

$$A_T = \text{Area of the pond at the top portion} = \text{m}^2$$

$$A_B = \text{Area of the pond at the bottom} = \text{m}^2$$

$$A_M = \text{Mid-sectional area of the pond} = \text{m}^2$$