

Lecture 30

Earthwork: Mid & Mean Sectional Area Methods

Estimation & Costing

Agenda

- 1. Introduction to Earthwork
- 2. Cross Section of Embankment
- 3. Mid Sectional Area Method
- 4. Mean Sectional Area Method
- 5. Summary

Introduction to Earthwork

Earthwork calculation is essential for estimating the cost of roads, railways, and canals.

The earthwork is typically classified into two types: **cutting** and **banking (embankment)**.

Key terminology:

- **Formation Width (B):** Top width of embankment or bottom width of cutting.
- **Side Slope (S:1):** Ratio of horizontal to vertical slope.
- **Depth/Height (d):** Vertical distance from ground level to formation level.

Mid Sectional Area Method

In this method, the mean depth (d_m) is calculated first from depths d_1 and d_2 at the ends.

Formulae

Mean Depth, $d_m = \frac{d_1 + d_2}{2}$

Area of mid-section, $A_m = B \cdot d_m + S \cdot d_m^2$

Volume, $V = A_m \times L$

Where L is the length of the section.

This method assumes the profile between the two sections is a straight line.

Mean Sectional Area Method

Here, the areas of the two end sections are calculated first, and then their mean is taken.

Calculation Steps

1. Calculate Area at section 1: $A_1 = B \cdot d_1 + S \cdot d_1^2$
2. Calculate Area at section 2: $A_2 = B \cdot d_2 + S \cdot d_2^2$
3. Mean Area, $A_{mean} = \frac{A_1 + A_2}{2}$
4. Volume, $V = A_{mean} \times L$

Generally, Mean Sectional Area method gives a slightly larger volume compared to Mid Sectional Area method.

Summary

Earthwork involves cutting and banking.
Mid Sectional Area uses average depth.
Mean Sectional Area uses average of end areas.
Next class: Prismoidal and Trapezoidal rules.

Cross Section of Embankment

