

CE200 SURVEYING

Lecture 7
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VOLUMES

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In civil engineering calculation of volumes of earthwork is required. Volumes can be calculated in a number of ways.

1. Volumes from cross-sections

In roadworks, railways, canals, and similar 'long' earthworks cross-sections are taken at suitable intervals and the volumes of cut or fill obtained from this together with the measured distances between them.

$V = l_1 \cdot (A_1 + A_2) / 2$ trapezoidal formula

$V = l_1 \cdot (A_1 + 4M + A_2) / 6$ prismatic formula (for more precise calculation)

M: the area of cross section midway between the faces.

2. Volumes from contours

The Second major way to calculate volumes is to calculate areas of contours.

plan of FW 4

$$V = A_{150} \cdot (150 - 148) + A_{151} \cdot (151 - 150) + A_{152} \cdot (152 - 151) + A_{153} \cdot (153 - 152) + A_{154} \cdot (154 - 153)$$

3. Volumes from spot level

This method is particularly useful for large, open excavations such as tanks, borrow pits etc. The area is divided into a grid, and levels obtained at the intersection points. The spacing of the grid depends on the terrain, accuracy required, and resources available. Generally, one surface is horizontal (eg. base of excavation).

151.05	152.10	153.10	154.20
150.70	151.60	152.90	154.10
150.40	151.50	153.00	153.60

$A = 25 \text{ m}^2$

151.05	152.10
150.70	151.60
148.00	148.00
148.60	148.00

V_1

$$V_1 = A \cdot ((151.05 - 148.00) + (152.10 - 148.00) + (151.60 - 148.00) + (150.70 - 148.00)) / 4$$

Officework 3

- ✓ Draw a regular figure on your plan of fieldwork 4.
- ✓ Assume the figure as the base of a building and take a proposed level of the basement of that building.
- ✓ Calculate the volume of the cut for your proposed level of the basement using 2 different methods.
- ✓ Make a comment about 2 different results.

The fieldbooks are due by 9.30 am on the day of the final exam.