

Volume by Prismoidal Formula

This method is used to determine more exact volumes than those computed by average end area.

Formula:

$$V_p = \frac{L}{6} (A_0 + 4M + A_1) = Ft^3$$

M = area of middle section, not the mean of the two end sections.

This formula is correct for determining the volume of prisms, pyramids, wedges, and prismoidals that have triangular end sections, and sides with warped surfaces.

Methods of Computation to Determine (M)

- (1) Take cross section on the ground.
- (2) Compute area of a section having dimensions equal to the means of the corresponding dimensions of the two end sections

Example:

Given: (2) three level sections, bases (b) = 24 ft., fill slopes 1½:1

TABLE 17-3. Computation of Volume of Earthwork by Prismoidal Formula

STATION	L	C	R	AREA
15 + 00	$\frac{-8.6}{24.9}$	$\frac{-6.4}{0.0}$	$\frac{-4.2}{18.3}$	$\frac{1}{2} \times 12 \times 12.8 + \frac{1}{2} \times 6.4 \times 43.2 = 215.04 \text{ ft}^2$
16 + 00	$\frac{-4.6}{18.9}$	$\frac{-2.8}{0.0}$	$\frac{-1.4}{14.1}$	$\frac{1}{2} \times 12 \times 6.0 + \frac{1}{2} \times 2.8 \times 33.0 = 82.20 \text{ ft}^2$
M	$\frac{-6.6}{21.9}$	$\frac{-4.6}{0.0}$	$\frac{-2.8}{16.2}$	$\frac{1}{2} \times 12 \times 9.4 + \frac{1}{2} \times 4.6 \times 38.1 = 144.03 \text{ ft}^2$
$V_p = \frac{100}{6} \times (215.04 + 4 \times 144.03 + 82.2) = 14,556.0 \text{ ft}^3 = 539.1 \text{ yd}^3$				

Volume by end area:  $V_e = \left(\frac{100}{54}\right)(215.04 + 82.20) = 550.4 \text{ yd}^3$

The end area formula is 11.3 yd<sup>3</sup> or approximately 2% error.