

Estimation and Contract management



Course Co-ordinator
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COURSE OBJECTIVES

- The objective of this course is to make students to learn:
- Estimate the quantities of work, develop the bill of quantities and arrive at the Cost of civil engineering Project
- Understand and apply the concept of Valuation for Properties
- Understand, Apply and Create the Tender and Contract document



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SYLLABUS

MODULE 1: Quantity Estimation for Building: study of various drawing attached with estimates, important terms, units of measurements, abstract, Types of estimates. Estimation of building by Short wall and long wall method - centre line method. Estimate of R.C.C structures including Slab, beam, column, footings

MODULE 2:

Estimate of Steel truss, manhole and septic tanks and slab culvert. Quantity Estimation for Roads: Computation of volume of earthwork fully in banking, cutting, partly cutting and partly Filling by mid-section, trapezoidal and Prismoidal Methods



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MODULE 3: Specification for Civil Engineering Works: Objective of writing specifications essentials in specifications, general and detail specifications of different items of works in buildings and roads. Analysis of Rates : Factors Affecting Cost of Civil Works , Concept of Direct Cost , Indirect Cost and Project Cost Rate analysis and preparation of bills, Data analysis of rates for various items of Works, Sub-structure components, Rate analysis for R.C.C. slabs, columns and beams

MODULE 4: Contract Management-Tender and its Process: Invitation to tender, Prequalification, administrative approval & Technical sanction. Bid submission and Evaluation process. Contract Formulation: Letter of intent, Award of contract, letter of acceptance and notice to proceed. Features / elements of standard Tender document (source: PWD / CPWD / International Competitive Bidding – NHAI / NHEPC / NPC). Law of Contract as per Indian Contract act 1872, Types of Contract,



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- **MODULE5:**Contract Management-Post award :Basic understanding on definitions, Performance security, Mobilization and equipment advances, Secured Advance, Suspension of work, Time limit for completion, Liquidated damages and bonus, measurement and payment, additions and alterations or variations and deviations, breach of contract, Escalation, settlement of account or final payment, claims, Delay's and Compensation, Disputes & its resolution mechanism, Contract management and administration. Valuation: Definitions of terms used in valuation process, Purpose of valuation, Cost, Estimate, Value and its relationship, Capitalized value. Freehold and lease hold and easement, Sinking fund, depreciation–methods of estimating depreciation, Outgoings, Process and methods of valuation: Rent fixation, valuation for mortgage, valuation of lan:



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- **MODULE 2:**

- Estimate of Steel truss, manhole and septic tanks and slab culvert.
Quantity Estimation for Roads: Computation of volume of earthwork fully in banking, cutting, partly cutting and partly Filling by mid-section, trapezoidal and Prismoidal Methods

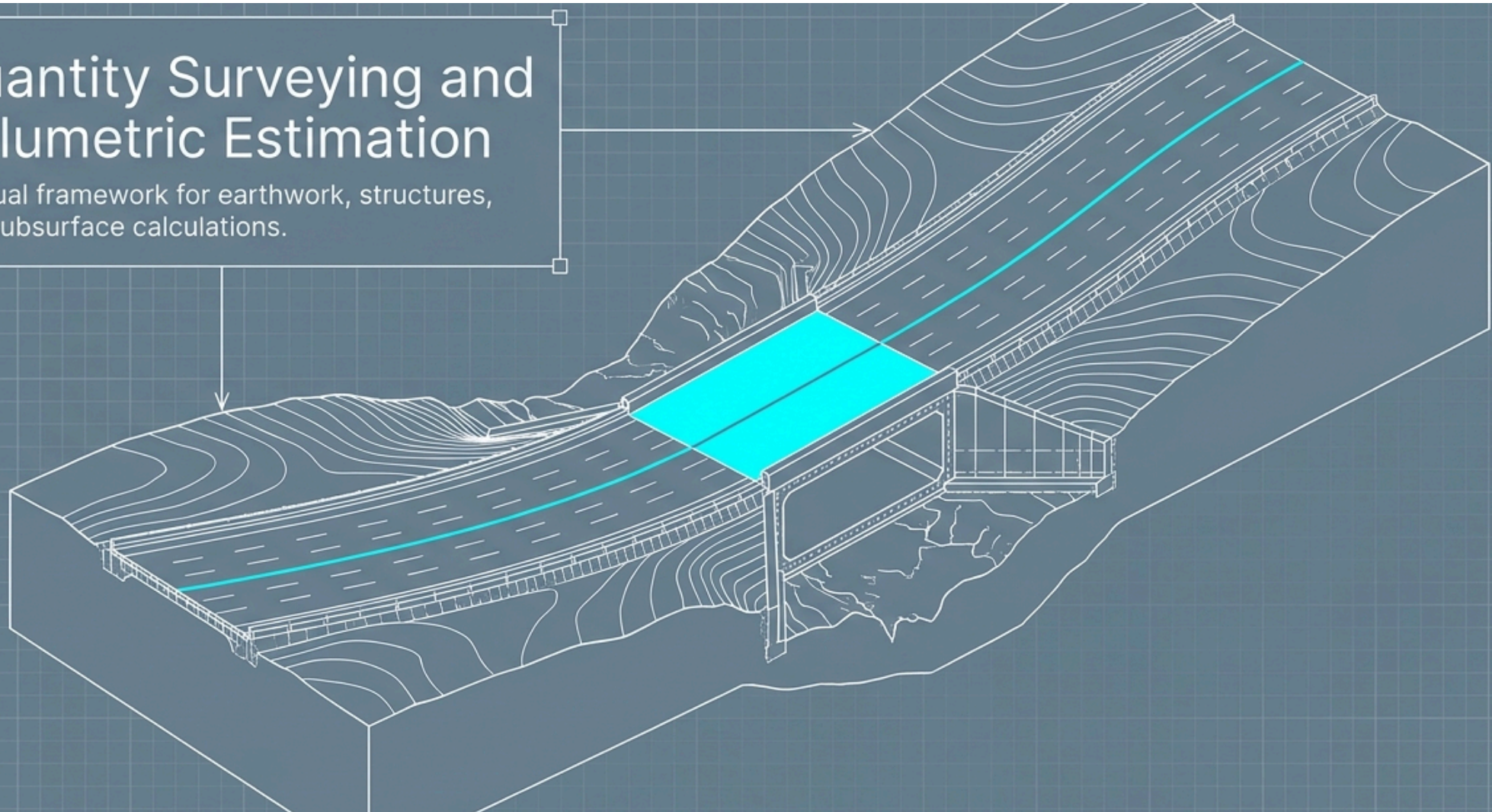


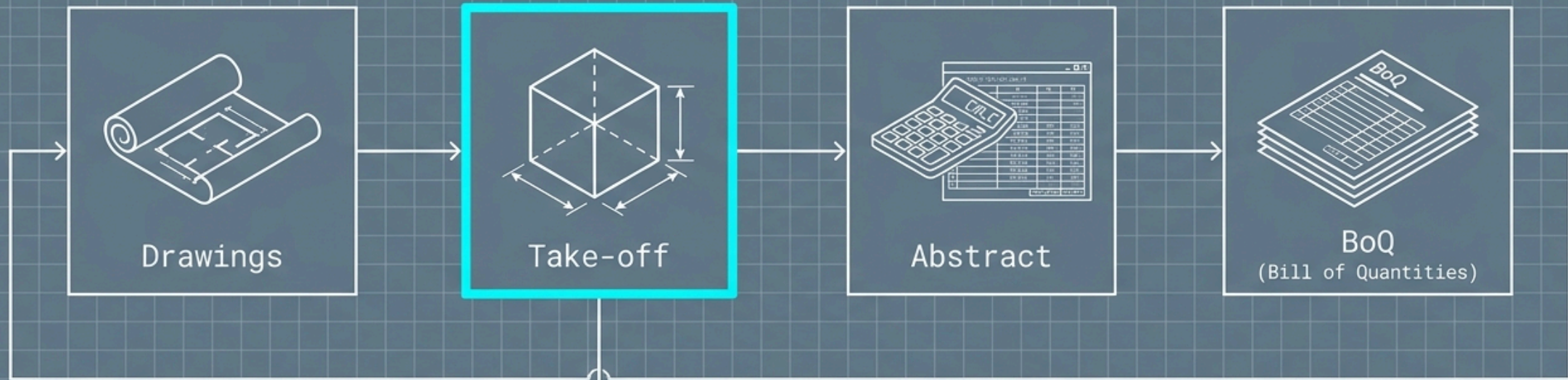
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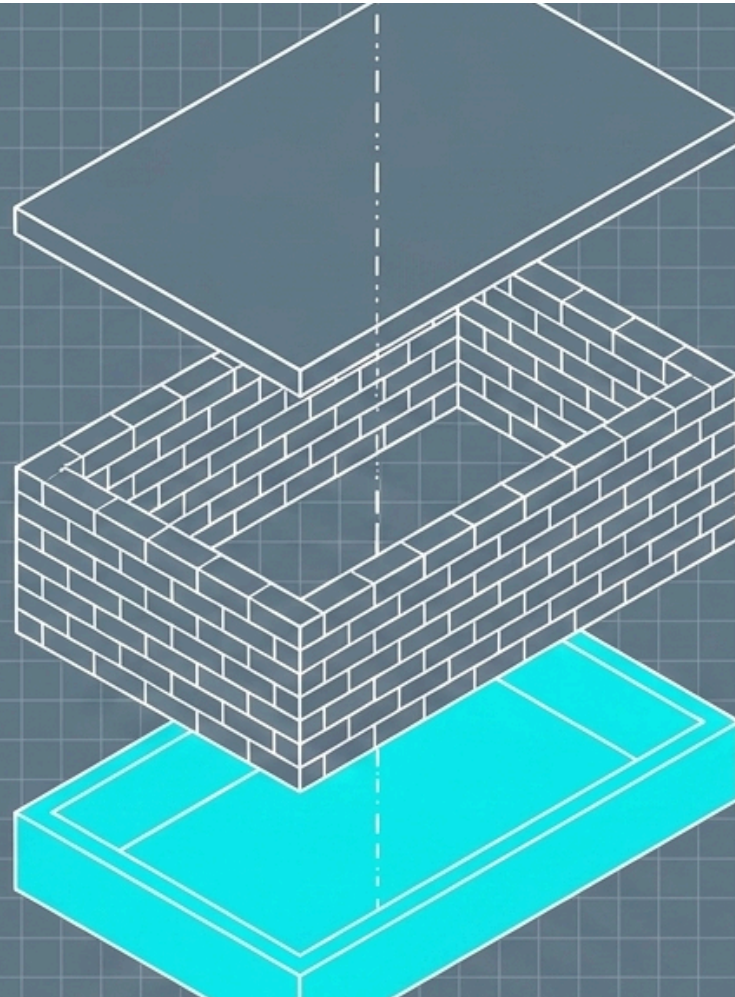
Quantity Surveying and Volumetric Estimation

A visual framework for earthwork, structures, and subsurface calculations.





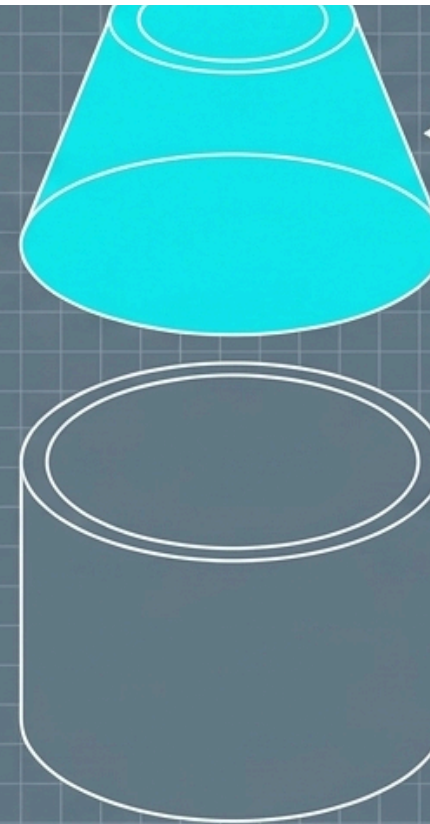
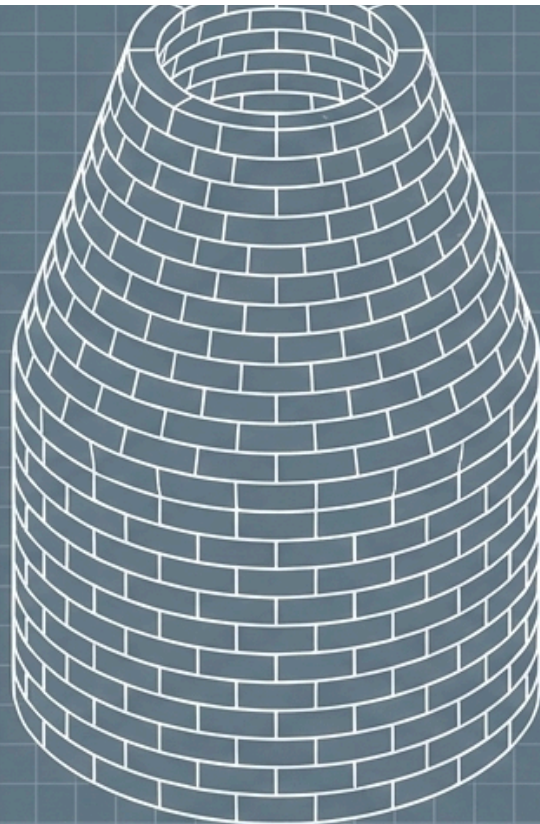
Focus Area: **2D Extraction -> 3D Volume Computation**. The mathematical foundation of the BoQ.



RCC Cover
 $L \times B \times \text{Thickness}$

Brickwork
Centerline Method applied to
perimeter $\times$ Height $\times$ Thickness

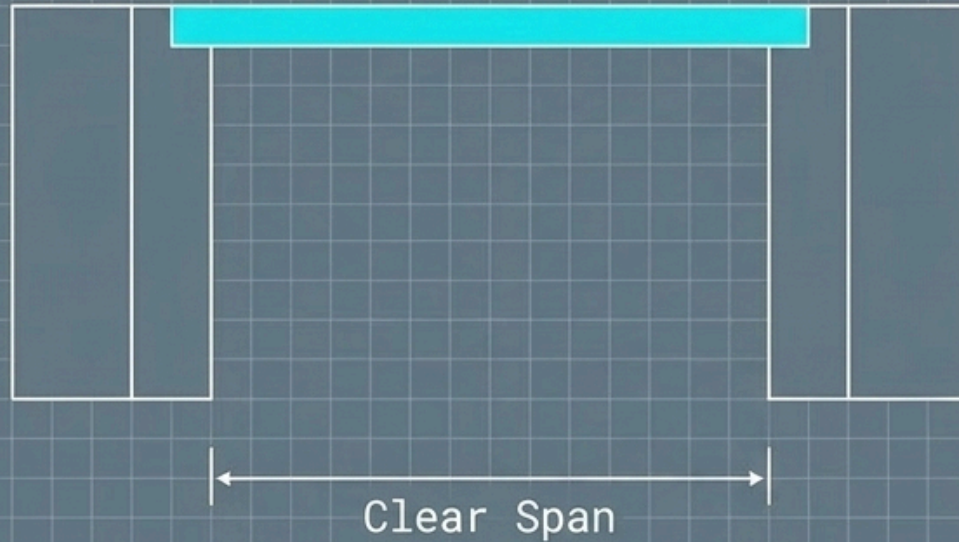
Excavation
 $(\text{Outer } L + \text{Working Space}) \times$
 $(\text{Outer } B + \text{Working Space}) \times$
Total Depth



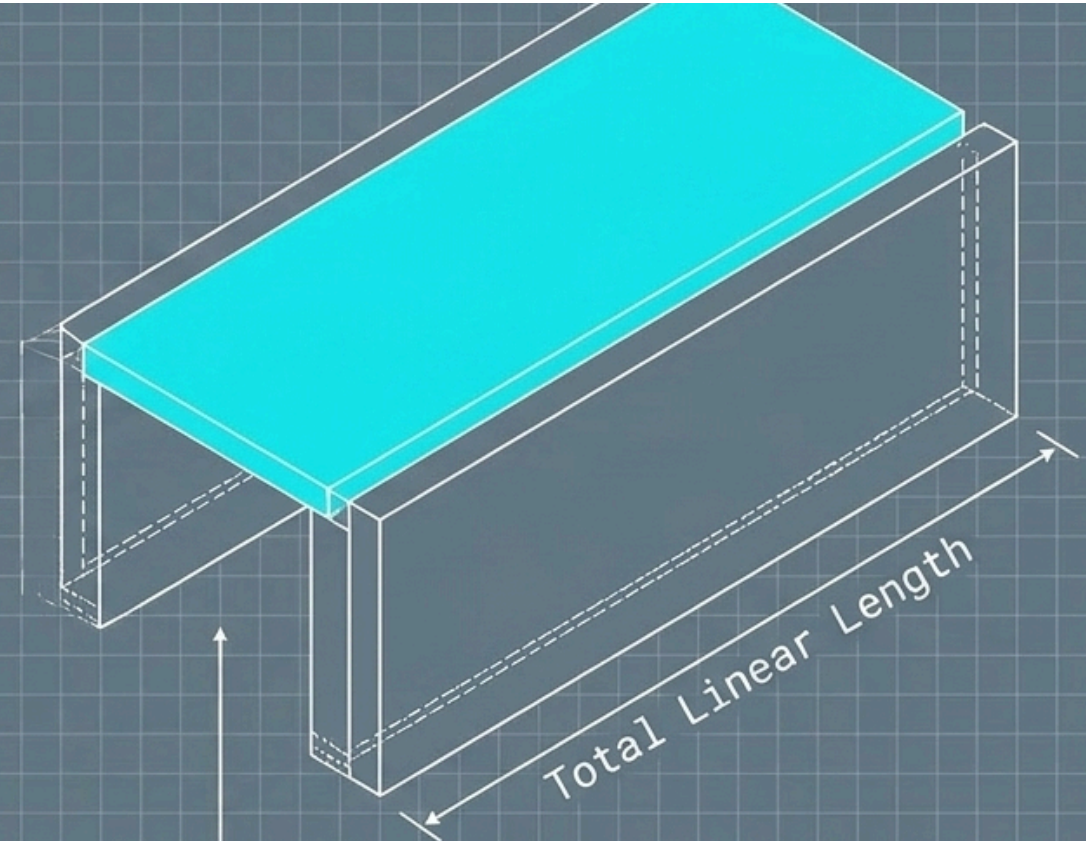
Frustum of a Cone:
Adapts chamber to
cover size.

Cylindrical Base:
 $V = \pi r^2 h$

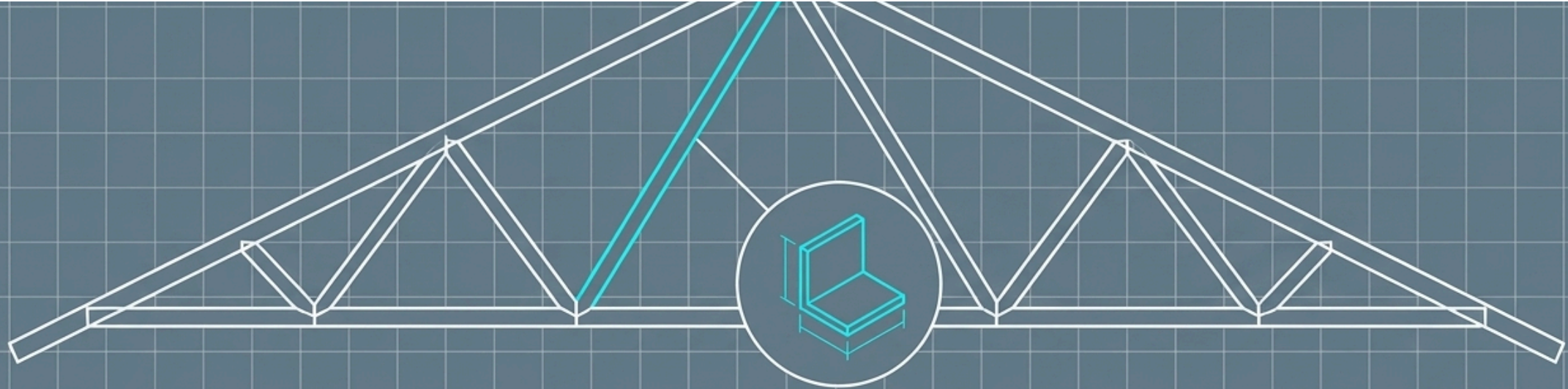
Volumetric Strategy: Do not memorize a single 'manhole formula'. Isolate the



Deck Slab Concrete = Clear Span



Abutment Volume = Cross-sectional



Core Principle: Steel is estimated by Weight, not Volume.

1. Calculate True Length (using trigonometry from the grid).

2. Multiply by Standard Unit Weight (kg/m) from steel tables.



Volume of Cut

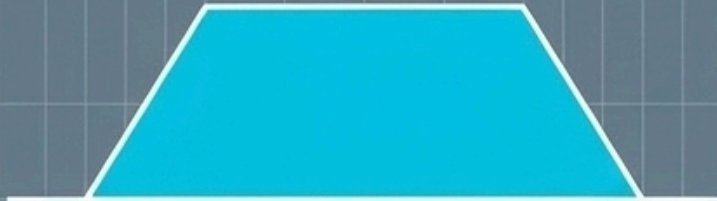
Formation Level (FL)

Volume of Fill
(Banking)

The core objective of linear road estimation is to balance Cutting and Banking volumes, minimizing the need to import or

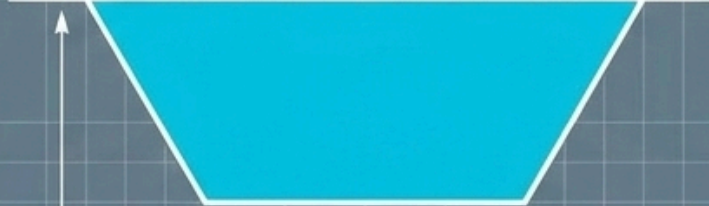


Fully Banking



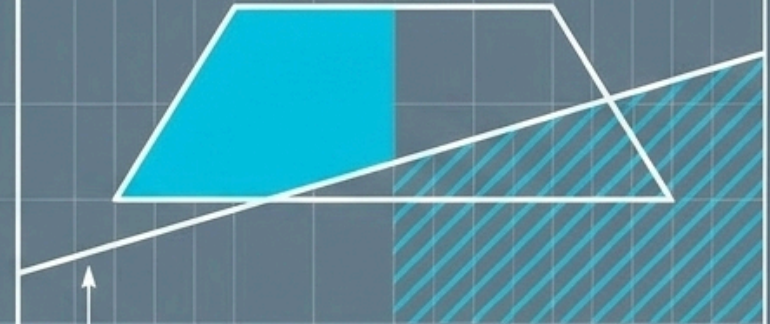
Condition:
 $FL > OCL$

Fully Cutting



Condition:
 $OCL > FL$

Partly Cutting and
Partly Filling



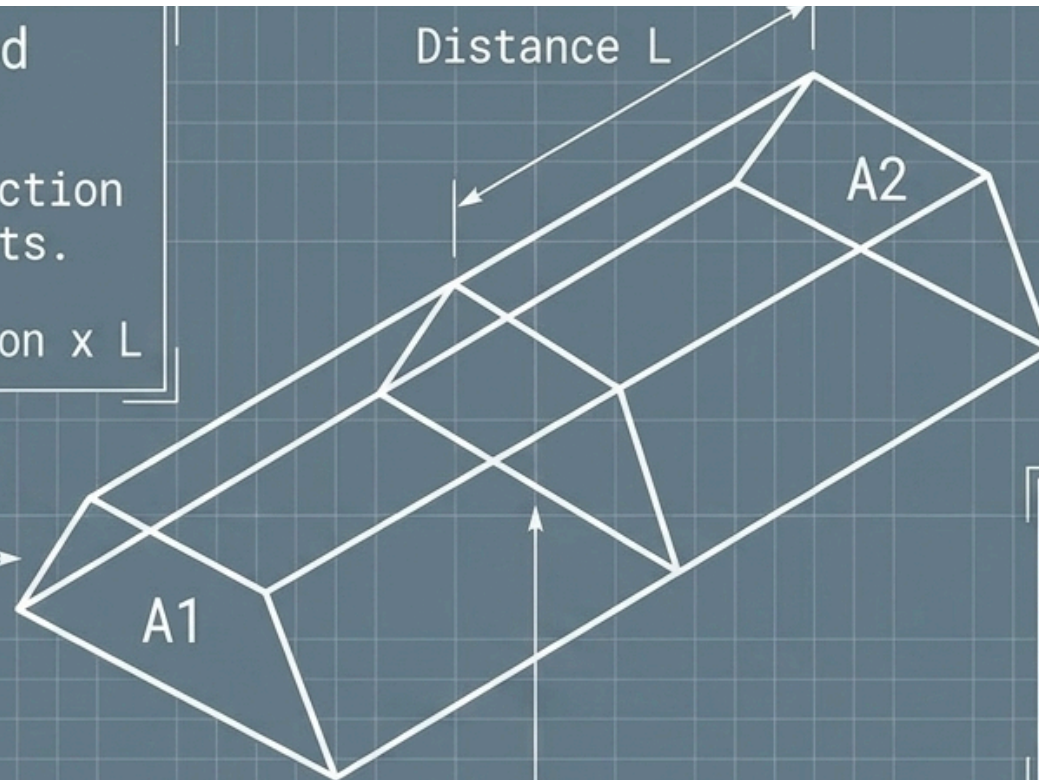
Condition:
 $OCL \text{ intersects } FL$



Mid-Section Method

Calculates a new theoretical cross-section halfway between points.

$$V = \text{Area of Mid-Section} \times L$$



Trapezoidal Method
Averages the areas of the two end sections.

$$V = [(A1 + A2) / 2] \times L$$

Assumption

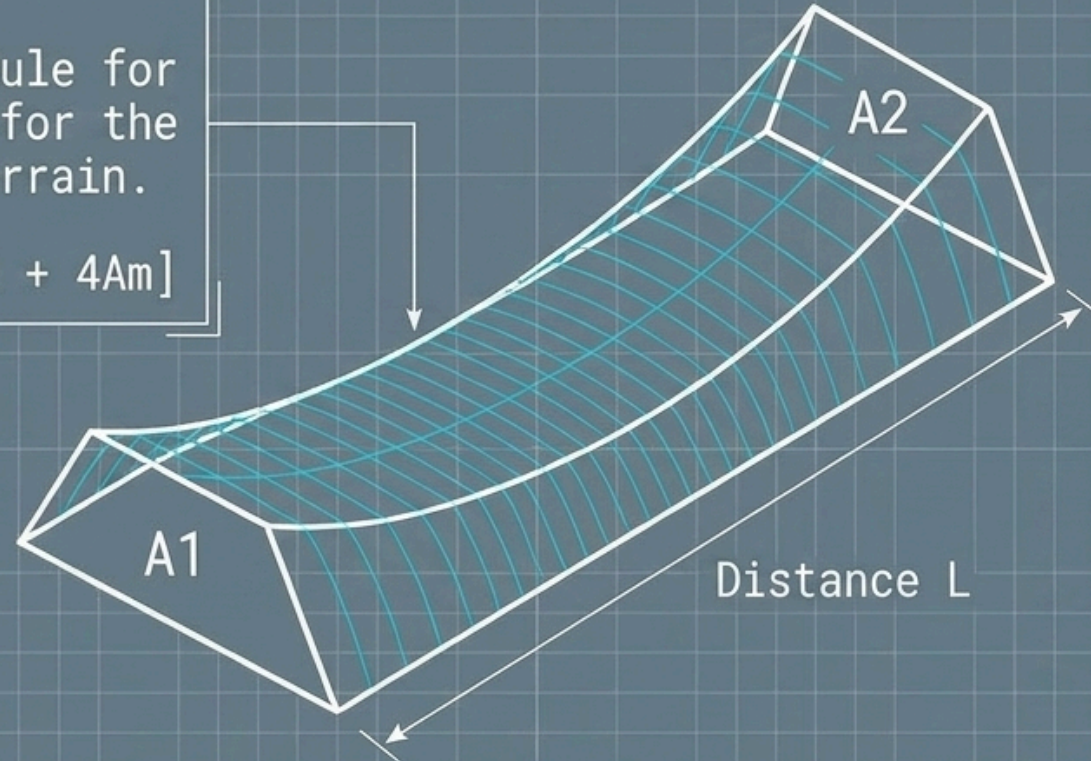
Both methods assume linear, straight-line transitions between cross-



Prismoidal Method

Utilizes Simpson's Rule for volumes, accounting for the natural bowing of terrain.

$$V = (L / 6) [A1 + A2 + 4A_m]$$



Reality is curved. By applying a parabolic mathematical model rather than a linear one, the Prismoidal method yields the most accurate real world earthwork estimation.



Method	Mathematical Assumption	Relative Accuracy	Ideal Use Case
Mid-Section	Linear / Average Depths	Moderate	Flat, uniform terrain. Quick approximations.
Trapezoidal	Linear / Average Areas	Moderate (Often overestimates)	Long, continuous projects with minimal slope variance.
Prismoidal	Parabolic / Curved Profile	High (Most precise)	Undulating terrain, highly variable slopes, strict cost-control projects.