

Estimation and Contract management



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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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TARGET 1: METHODOLOGY (THE ENGINE)

MASTER THE MATHEMATICAL MECHANICS OF BUILDING ESTIMATION, SPECIFICALLY THE LONG WALL-SHORT WALL AND CENTRE LINE METHODS.

[CALCULATION: $L_{WALL} = L_{IN} + 2 * T_{WALL}$ |
 $C_{LINE} = L_{IN} + T_{WALL}$ | $SHORT_WALL = L_{IN}$]

DATA: 156.3M ESTIMATE BASIS

TARGET 2: STANDARDS (THE RULES)

DECODE AND APPLY IS 1200 GUIDELINES TO ENSURE UNIVERSAL ACCURACY IN UNITS OF MEASUREMENT.

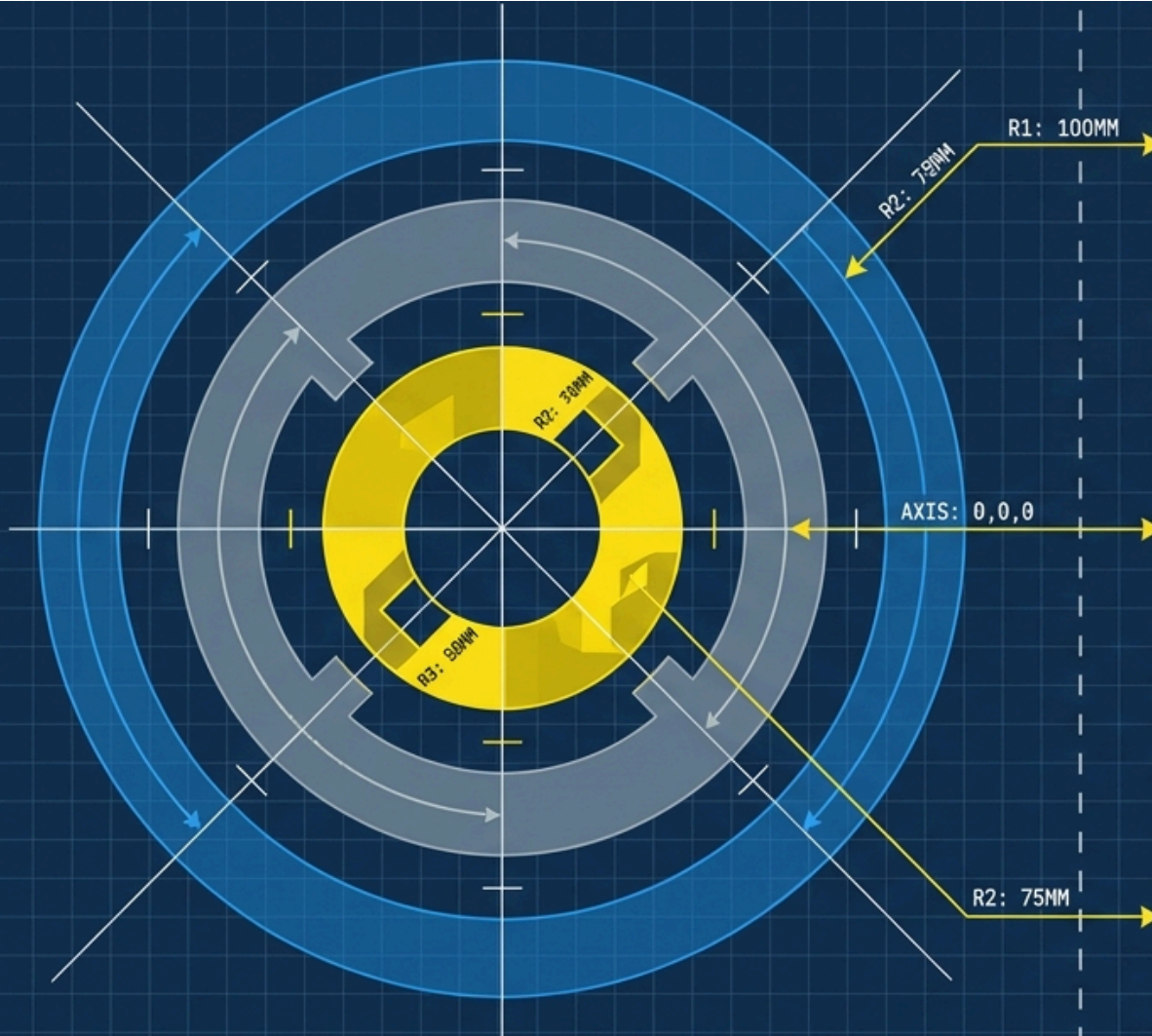
[CODE: IS-1200-PART-1 | UNIT: CUBIC METERS (M³),
SQUARE METERS (M²), RUNNING METERS (M)]

DATA: 99.9% COMPLIANCE RATE

TARGET 3: APPLICATION (THE OUTPUT)

TRANSLATE RAW DRAWINGS INTO A FINALIZED ABSTRACT OF ESTIMATE, OPTIMIZED FOR REAL-WORLD SITE EXECUTION AND VTU EXAMINATIONS.

[OUTPUT: ABSTRACT_OF_ESTIMATE.PDF |
EXECUTION_READY: YES | VTU_FORMAT: APPROVED]



[illegible]

Provides Length and Width dimensions. Crucial for wall perimeters and floor areas.

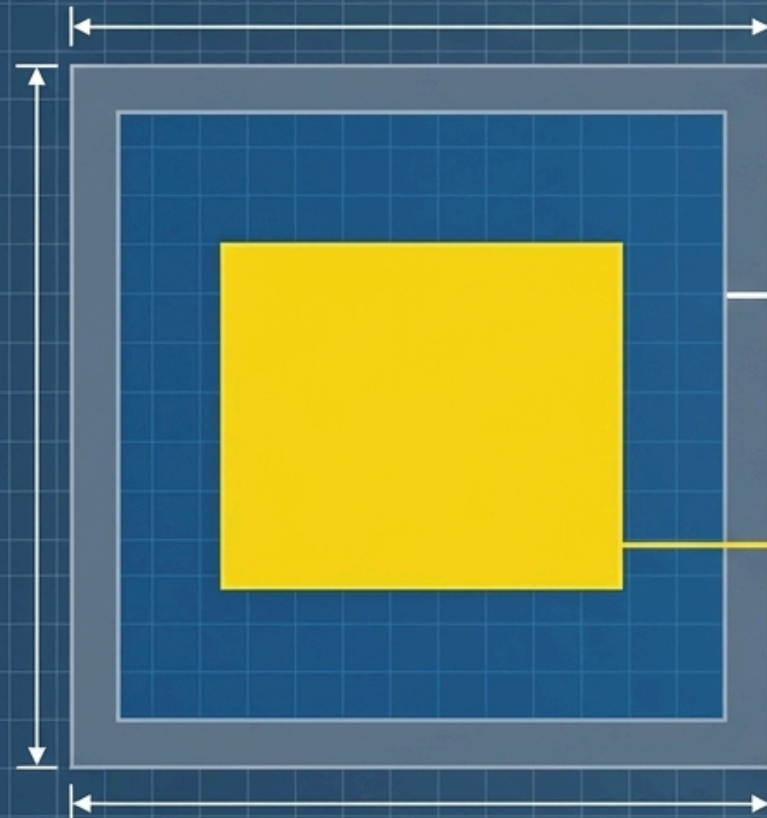
Provides Depth and Height dimensions. Crucial for earthwork, foundation concrete, and lintel levels.

Provides exterior profiles.
Crucial for facade plastering
and external finishes.



Spatial & Financial Vocabulary

Blueprint



Outer Box (Plinth Area):
Total built-up area measured at floor level, including the thickness of external walls.

Middle Box (Floor Area):
Plinth area minus the area occupied by the walls. The total usable floor space.

Inner Box (Carpet Area):
Floor area minus circulation spaces (corridors, staircases). The space where you can literally lay a carpet.

Ledger

Ledger - Contingencies

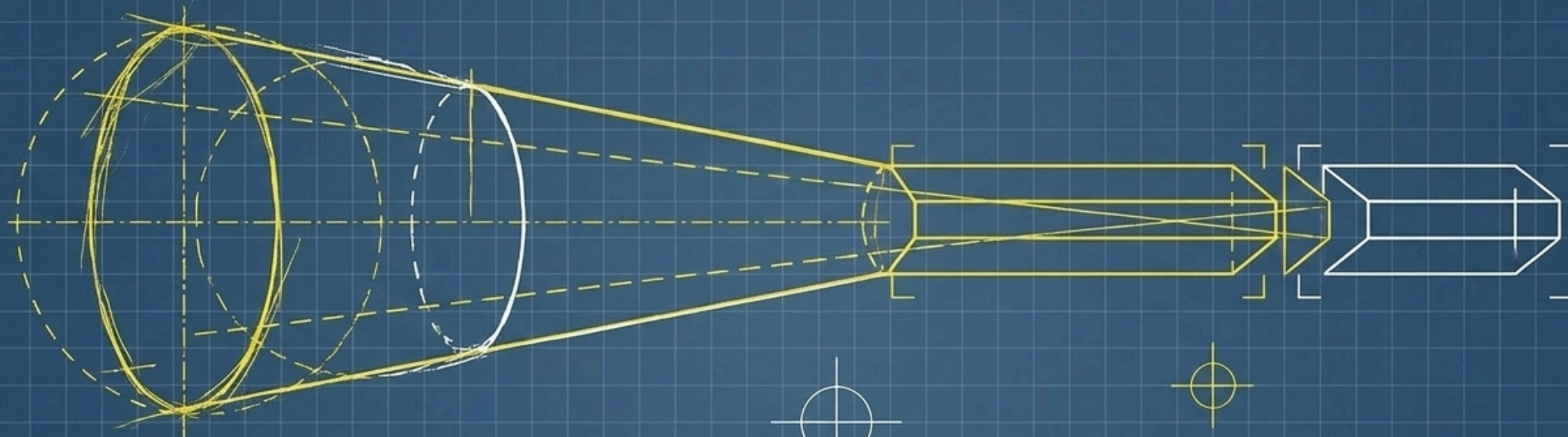
Incidental expenses of miscellaneous character (Typically 3% to 5% of estimated cost).

Ledger - Work Charged Establishment

Temporary staff salaries (supervisors, watchmen) charged directly to the specific project (Typically 1.5% to 2%).



THE ESTIMATION Lifecycle



Phase 1: Preliminary Estimate

Purpose: Feasibility and administrative approval.

Method: Rough cost based on plinth area or similar past projects.

Phase 2: Detailed Estimate

Purpose: Technical sanction and contractor bidding.

Method: Itemized calculation of quantities based on exact drawing

Phase 3: Supplementary Estimate

Purpose: Accounting for additional works not originally scoped in the detailed estimate.

Phase 4: Revised Estimate

Purpose: Correction. Triggered when the original sanctioned estimate is exceeded by >5% due to rate changes or material



IS 1200: The Dimensional Matrix

Panel 1 (1D - Length)

[RM / m]

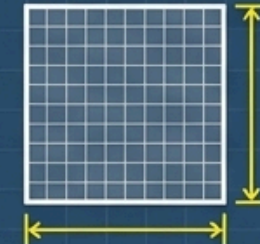
Running Meters.
Applies to: Cornices, skirting,
pipelines, handrails.



Panel 2 (2D - Area)

[m²]

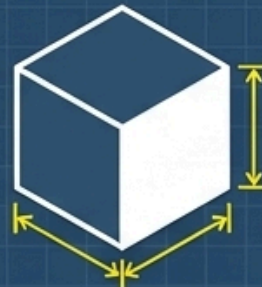
Square Meters.
Applies to: Plastering, pointing,
whitewashing, flooring,
doors/windows shutter area.



Panel 3 (3D - Volume)

[m³]

Cubic Meters.
Applies to: Earthwork excavation,
concrete foundation (PCC/RCC),
brickwork/masonry.



Panel 4 (Count)

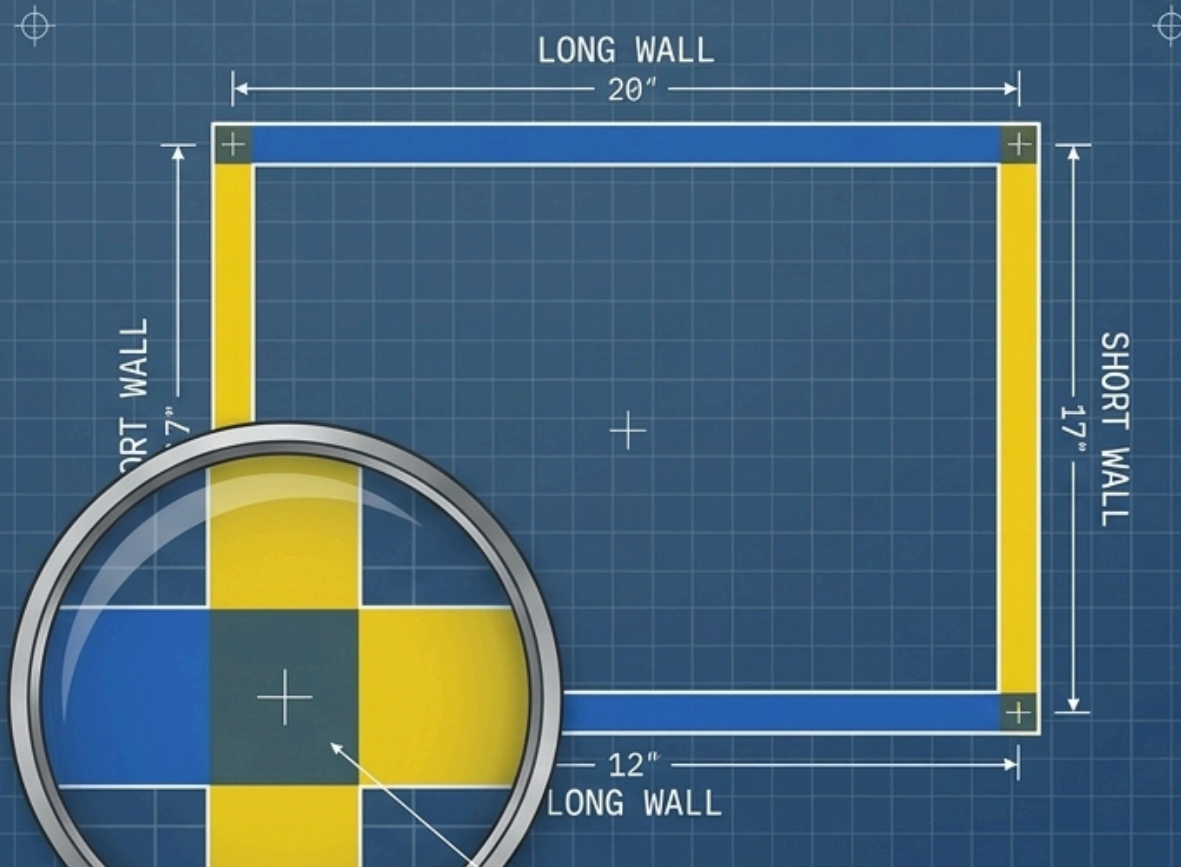
[Nos]

Numbers.
Applies to: Hardware fittings,
doors/windows frames, electrical
points.





Blueprint



Ledger

The Principle

Measurements are taken **Out-to-Out** for Long Walls, and **In-to-In** for Short Walls.

The Problem

If you measure both walls end-to-end, the corners are counted twice.

The Solution (The Math)

Long Wall Length = Centre-to-Centre Length
+ One Breadth

Short Wall Length = Centre-to-Centre Length -
One Breadth

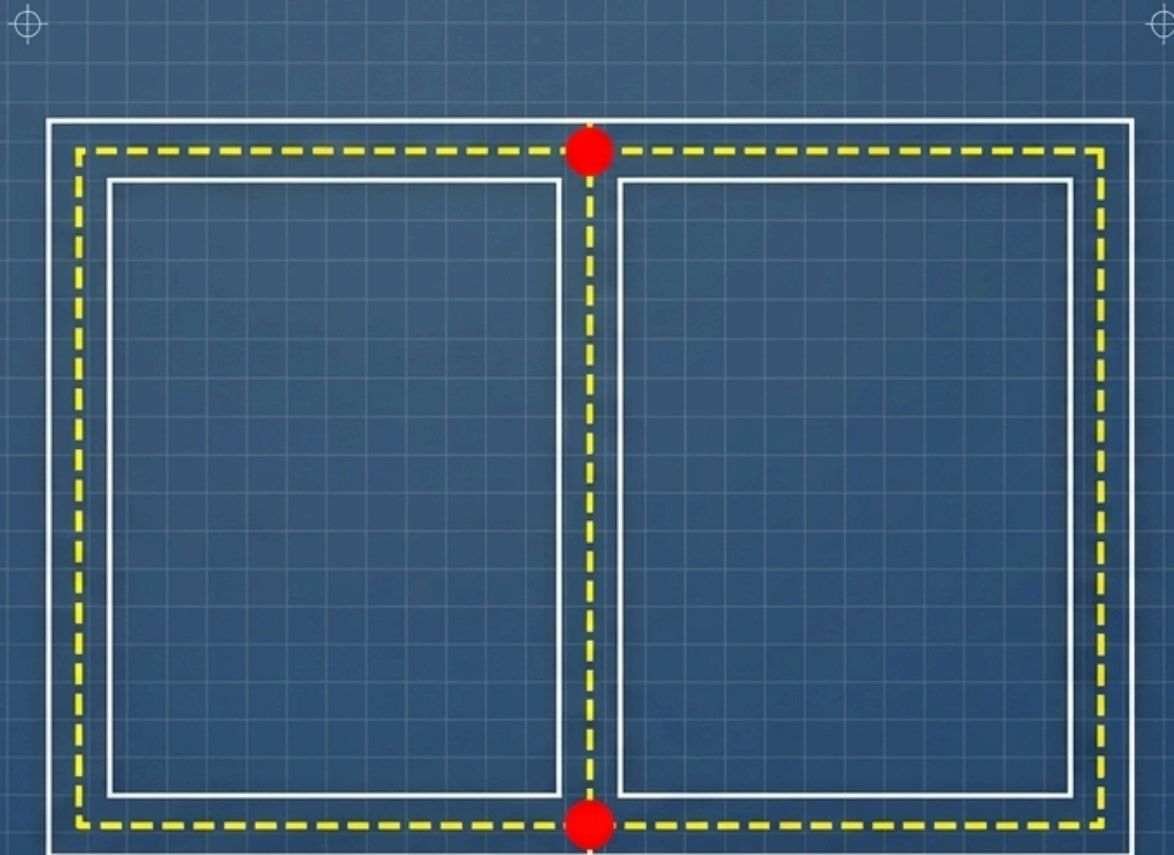
Takeaway

Highly accurate, but requires calculating every junction meticulously to avoid double counting.



Mechanics: The Centre Line Method

Blueprint



Ledger

The Principle

Calculate the total continuous length of the center line of all walls, regardless of orientation, in one single sweep.

The Speed Advantage

$$\text{Total Quantity} = \text{Total Centre Line Length} \times \text{Breadth} \times \text{Height}$$

Massively reduces calculation time for symmetrical structures.

The Catch (T-Junctions)

At every partition or cross-wall (T-Junction), the center lines overlap. You must mathematically intervene.

The Math

$$\text{Effective Length} = \text{Total Centre Line Length} - (\text{Number of T-Junctions} \times \text{Half Breadth})$$



Diagnostic Matrix: Selecting the Right Method

	Long/Short Wall	Centre Line
Core Concept	Individual wall isolation.	Continuous perimeter string.
Calculation Speed	Slow & methodical 	Highly rapid 
Accuracy Level	Pinpoint accurate, step-by-step.	Accurate, but heavily reliant on correct junction deductions.
Handling Junctions	Deductions built into wall lengths.	Requires manual half-breadth deduction at T-junctions.
Best Suited For	Complex, asymmetrical layouts with varying wall thicknesses.	Symmetrical, repeating layouts with uniform wall thickness.



Step 1: The Base Cost

$$\begin{array}{c} \text{Total Quantity [m}^3\text{]} \\ \text{(from mechanics)} \end{array} \times \begin{array}{c} \text{Unit Rate [₹]} \\ \text{(from Schedule of Rates)} \end{array} = \begin{array}{c} \text{Estimated} \\ \text{Base Cost} \end{array}$$

Step 2: The Additives

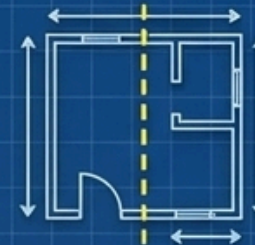
+ Contingencies (3%)
+ Work Charged Establishment (2%)

Step 3: The Bottom Line

The Abstract of Estimate is the final document presented for technical sanction. It converts raw engineering geometry into actionable financial capital.



Synthesis: The Solved Estimation Workflow



Phase 1: Extract (Drawings)

Read trench dimensions from Cross-Section: Length, Width, Depth.

Phase 2: Standardize (IS 1200)

Identify Earthwork excavation as a 3D volumetric task [m³].

Phase 3: Calculate (Mechanics)

Apply Centre Line method to find Total Effective Length.

Multiply by Width and Depth to get Total Volume.

Phase 4: Monetize (Abstract)

Multiply Total Volume by the prevailing Schedule of Rates.
Add 5% for contingencies/ establishment to finalize the estimate.

EXECUTION: VTO EXAMINATION & ORT PRACTICE

Red Flags (Common Pitfalls)



Forgetting to deduct half-breadth for partition wall T-Junctions in the Centre Line method.



Mixing up IS 1200 units (e.g., calculating plastering in m^3 instead of m^2).



Failing to add the 3-5% contingencies to the final abstract.

Gold Standard Presentation Format

Always draw the standard tabular ledger for your answers. Examiners grade the structured logic, not just the final number.

[illegible]



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Methods Summary

L/S Wall = Highly accurate, requires junction math.

Centre Line = Extremely fast, **deduct half-breadth at T-Junctions.**

IS 1200 Quick-Check

RM (Pipes) | **m²** (Plaster/Flooring) | **m³** (Concrete/Earthwork) | **Nos** (Hardware)

Workflow Rule

Dimensions (Drawings) → Quantities (Methods) → Rates (Schedule) → Final Cost + Contingencies (Abstract)

Precision in estimation eliminates cost overruns and material waste