

## 1.1 Detailed Estimate:

Detailed estimate is prepared by working out the quantities of different items of work and then working out the cost by multiplying the quantities by their respective rates. The unit-quantity method is followed to prepare a detailed estimate where, the rates per unit work of one item including profit are estimated first and the total cost for the item is found, by multiplying the cost per unit of rate by the quantity of items. In detailed estimate provisions for any other expenses like contingencies, T&P, work-charged establishment etc. are added to the above cost to calculate the total amount required for project completion. The procedure for the preparation of a detailed estimate is divided into 2 parts:

- a) Details of measurement and calculation of quantities
- b) Abstract of estimated cost

### 1.9.1. Details of measurement and calculation of quantities

Representative measurements for dimensions of all individual items involved in the whole work are taken off from the drawing of the work and entered in respective columns of a standard measurement form as shown below. Then multiplying, item wise respective dimensions of the quantities of all items are worked out in the measurement form.

*Details of measurement form:*

Item No.	Description	Nos.	Length	Breadth	Height/Depth	Quantity	Remark

### 1.9.2. Abstract of estimated cost

The cost of each item is calculated by multiplying the quintiles computed in the measurement form with a specific rate in a tabular form known as abstract form as shown below:

### *Abstract of estimate form*

<b>Item No.</b>	<b>Descriptions</b>	<b>Unit</b>	<b>Quantity</b>	<b>Rate</b>	<b>Amount</b>

A percentage of 3% to 5% is added for contingencies, to allow for petty expenditures, unforeseen expenditures due to changes in design, changes in rate, etc. which may occur during execution of the work. Further, a percentage of 2.0% to 2.5% is also added to meet expenditure of the work charged establishment. For big projects an amount of 1% to 1.5% of the estimated cost is also provided to purchase special tools & plants for specific purpose.

The main functions of an abstract of estimate are as follows:

- The total estimated cost and the different items of works required to complete project can be known.
- Basis on which percentage rate tenders are called after excluding the amount for contingency and work-charged establishment.
- A part of tender document and a contractor can arrive at his own rates from the schedule of work described in the description column.
- This is the basis on which bills are prepared for payment.
- Comparative costs of different items of works can be known.

## **1.2 Data Required for Detailed Estimate**

Following data are required for calculation of detailed estimate:

- **Drawing:** The quantities of various items are taken off from the drawings mainly: plans, sections, and other relevant details for the works.
- **Specifications:** The specification of the work describes the nature, class, workmanship, method of preparation etc. which are required to calculate the cost of various items.
- **Rates:** The rates for different items of work are derived from schedule of rates or from rate analysis. The estimated cost is calculated by multiplying the rates with the quantities of various items.
- **Standing circulars:** The taxes and insurance etc. prevailing at the locality of the work is required to fix up rates of various items.

## **1.3 Steps in Detailed Estimate**

A detailed estimate can be analyzed in five distinct steps:

- Divide the whole project or work in various items.

- Divide the various items and group them under different sub heads.
- Enter the detailed of measurement of each item of work in measurements form and calculate the total quantity of each of them.
- After the quantities are taken off, the numbers, length, area or volumes are estimated and entered in last two columns of measurements sheet. All these values must be checked by different persons by tick-mark in other color ink. If any correction is done it must be cross checked.
- Finally, the cost under item of work is calculated from the quantities computed at workable rates. These costs along with rates are entered in '*Abstract Form*'. Therein, expenditures towards contingencies, work charge establishment and tools and plants are added to the estimated cost and then totaled. This grand total gives the estimated cost of work.

#### **1.4 Factors Affecting the Cost of a Project**

- **Quantity of materials:** For a large project, the quantity of materials required is large and thus it can be procured at a lower price.
- **Availability of materials:** The cost of materials, which are easily available, is comparatively lower.
- **Transportation of materials:** The cost of transportation is added to the cost of the material at site. Thus more is the transportation cost; the more is the cost of material.
- **Location of Site:** If the site is located at an odd place for which loading, unloading, staking and restacking of materials are necessary for several times. Thus, apart from cost incurred by such operations the possibility of damage or loss in transit is more which affects the cost.
- **Labor charges:** The skill and daily wage of the local labor affects the rate of a item.

#### **1.5 Documents Accompanying Detailed Estimate**

The detailed estimate is generally accompanied by following supporting documents:

- a. Report on the design
- b. Specifications
- c. Working drawing (Plans, section, elevation and other details)
- d. Design charts and calculations
- e. Particulars of scheduled rates or rate analysis



#### **2.1. Building Estimate:**

The quantities like earth work, foundation concrete, brickwork in plinth and super structure etc., can be worked out by any of the following three methods:

- a. Long wall - short wall method
- b. Centre line method.
- c. Partly center line and partly cross wall method

#### **2.3.1. Long wall-short wall method**

In this method, the wall along the length of the room is considered to be the long wall while the wall perpendicular to the long wall is said to be the short wall. To get the measurement of materials and works, the length of the long wall or short wall is calculated first by the center line lengths of individual walls. Then the length of the long wall, (out to out) may be calculated after adding half the breadth at each end to its center line length. Thus the length of the short wall measured into the room and may be found by deducting half the breadth from its center line length at each end. The length of the long wall usually decreases from earth work to brick work in super structure while the short wall increases. These lengths are multiplied by breadth and depth to get quantities.

#### **2.3.2. Center line method**

This method is suitable for walls of similar cross sections. Here the total center line length is multiplied by breadth and depth of the respective item to get the total quantity at a time. When cross walls or partitions or verandah walls join with the main wall, the center line length gets reduced by half the breadth for each junction. Such junctions or joints are studied carefully while calculating the total center line length. The estimates prepared by this method are the most accurate and quick.

#### **2.3.3. Partly center line and partly cross wall method**

This method is adopted when the external (*i.e.*, around the building) wall is of one thickness and the internal walls have different thicknesses. In such cases, the center line method is applied to external walls and the long wall-short wall method is used for internal walls. This method suits for different thicknesses of walls and different levels of foundations. Because of this reason, all Engineering departments are practicing this method.

## 2.2. Main items in building work:

Main items of work are given below:

Sl. No.	Particulars	Unit	Remarks
1	Earthwork	Cum	Earthwork in excavation and in filling should be taken out separately under different types. Foundation trenches are usually dug to the exact width of foundation with vertical sides.
2	Bed concrete in foundation	Cum	It is calculated by taking length, breadth and thickness of concrete bed.
3	Soiling	sqm	When the soil is soft, one layer of brick or stone is laid below the bed concrete.
4	Damp proof course	Cum	It is a course provided at the plinth level under the wall for the full width of plinth wall. It is not provided at the sill of door and verandah openings for which deduction is made while calculating length of D.P.C.
5	Masonry		Masonry for foundation and plinth is taken under one item and masonry for superstructure is taken under separate item. In case of wall footing, masonry for steps is calculated separately and added together. In buildings having more one floor, the masonry for superstructure for each floor is computed separately. Deductions for openings like lintels, doors, windows, cupboards, etc. is done. Thin partition walls of thickness less than 10 cm, honeycomb brickwork is taken under separate item in square meter and no deduction for holes is done.
6	R. C. C. works	Cum	R.C.C. Work is calculated for beams, lintels, columns, footing, slabs etc. No deduction for steel is done while calculating the quantity of concrete, which includes centering, shuttering and fixing of reinforcement in position. Reinforcement (quantity of steel) is taken under separate item.
7	Reinforcement	Ton	The reinforcement quantity is taken off from detail drawing and bar bending schedule. If detail drawings are not available 0.8 to 3% of concrete may be taken by volumes as a quantity of steel which is further multiplied by density.

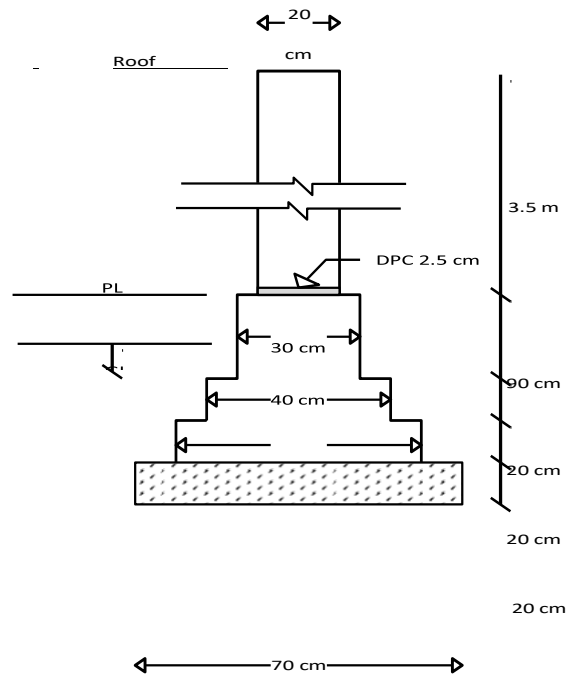
8	Flooring	Sqm/ Cum	For grounds floor, cement concrete and floor finishing of stone, marble or mosaic tiles taken under one item and quantity is calculated in square meter. For upper floors, bed of R.C.C. is taken cubic meter and other member is calculated in cubic meter.
9	Roof	Cum/ Sqm	In case of roof, flat roofs are calculated in cubic meter like slab and for pitched roof. Quantity of trusses and other members is calculated in cubic meter. In case of roofing material tiles, G.I. sheets or A.C. sheets are measured in square meter. Tiles on hip and valley are measured running meter.
10	Plastering and pointing	Sqm	Plastering is expressed with specified thickness. For masonry the measurements are taken for whole face of wall for both sides as solid and deduction for openings are made. External and internal plastering for building are taken out separately, under different items.
11	Doors and Windows	Cum/ Sqm	It consists of frame and shutter. Doors and windows framers are calculated in cubic meter. Quantity is obtained by calculating length including jamb, head and sill and multiplied by cross-section of frame. Doors and window shutters are calculated in square meter. Shutter of different types should be taken separately because the rates differ. Hold-fast are taken as a separate item.
12	Painting, Varnishing, white washing and distempering	Sqm	-
13	Electrification	LS	Generally 8% of estimated cost of building works is taken for this item.
14	Sanitary and water supply works	LS	Generally 8% of estimated cost of building works is taken for this item.

### 2.3. Example 1: (Quantity estimation of a symmetrical wall)

The plan and cross section of a wall is given in Fig. 2.1. Estimate the quantities of following items per meter length of the wall.

- a. Earthwork in excavation in foundation trench
- b. Lime concrete in foundation
- c. First class brick work in 1:4 mortar mix in foundation and plinth
- d. 1<sup>st</sup> class brick work in superstructure wall

e. 2.5 cm thick DPC (1:2:4) with water proofing compound



(Fig. 2.1)

**Answer**

- (i) Earthwork in excavation (Length  $\times$  Breadth  $\times$  Height) =  $1 \times 0.7 \times 0.9 = 0.63$  cum
- (ii) Lime concrete in foundation (L  $\times$  B  $\times$  H) =  $1 \times 0.7 \times 0.2 = 0.14$  cum
- (iii) 1<sup>st</sup> class brickwork in foundation and plinth:
  - i. 1<sup>st</sup> footing (L  $\times$  B  $\times$  H) =  $1 \times 0.5 \times 0.2 = 0.10$  cum
  - ii. 2<sup>nd</sup> footing (L  $\times$  B  $\times$  H) =  $1 \times 0.4 \times 0.2 = 0.08$  cum
  - iii. Plinth wall (L  $\times$  B  $\times$  H) =  $1 \times 0.3 \times 0.9 = 0.27$  cum

Total = 0.45 cum
- (iv) 1<sup>st</sup> class brickwork in superstructure (L  $\times$  B  $\times$  H) =  $1 \times 0.2 \times 3.5 = 0.70$  cum
- (v) 2.5 cm thick DPC (L  $\times$  B) =  $1 \times 0.2 = 0.20$  sqm

Quantities can be estimated as above. But to denote the respective length, breadth and height against the dimensions estimates are prepared after ruling out measurement sheets as below.

Detail Measurement and Calculation of Quantities

Item No	Description	Unit	No.	L	B	H	Quantity
1	Earthwork in excavation	cum	1	1	0.7	0.9	0.63
2	Lime concrete in foundation	cum	1	1	0.7	0.2	0.14
3	1 <sup>st</sup> class brickwork (1:4) in foundation and plinth	cum					
	1 <sup>st</sup> footing		1	1	0.5	0.2	0.10
	2 <sup>nd</sup> footing		1	1	0.4	0.2	0.08
	Plinth wall		1	1	0.3	0.9	0.27

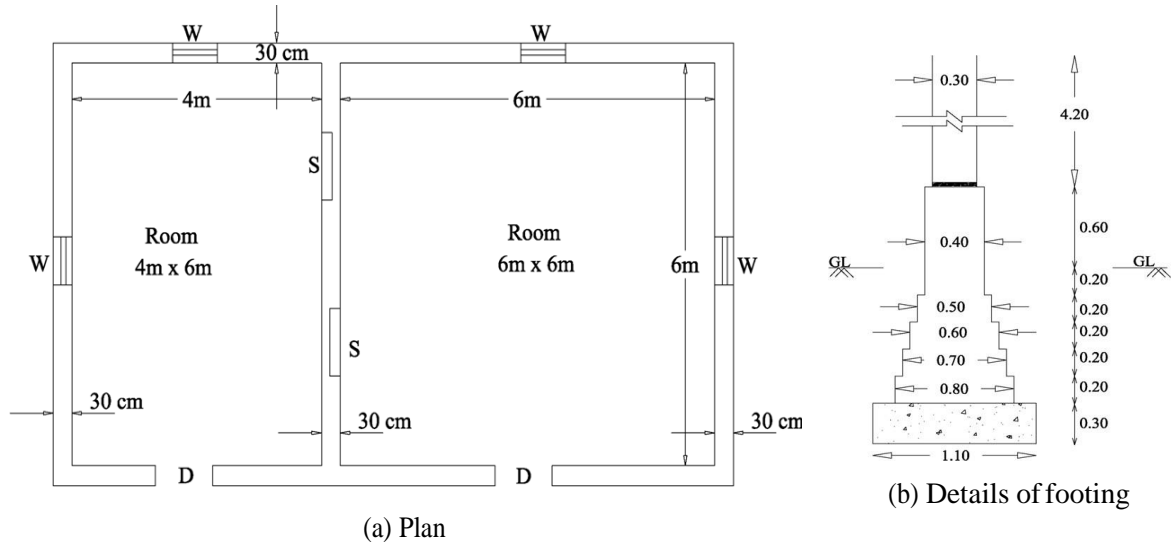


		Total =					0.45
4	1 <sup>st</sup> class brickwork in superstructure	cum	1	1	0.2	3.5	0.70
5	2.5 cm thick DPC	sqm	1	1	0.2	-	0.20

## 2.4. Example on long wall - short wall method

Estimate the quantities of following items of a two roomed building given in Fig 2.2.

- Earthwork in excavation in foundation trench
- Lime concrete in foundation
- First class brick work in 1:6 cement mortar in foundation and plinth
- 2.5 cm thick DPC (1:2:4) with water proofing compound
- 1<sup>st</sup> class brick work in cement mortar superstructure



(Fig. 2.2)

The dimensions of doors, windows and selves are

Door D = 1.20 m × 2.10 m.

Windows W = 1.00 m × 1.50 m

Shelves S = 1.00 m × 1.50 m

**Answer:** Given in next page

## Detail Measurement and Calculation of Quantities

Item No.	Description	Unit	No.	L	B	H	Quantity	Explanation
1	Earthwork in excavation in foundation	cum						Long wall, c/c. length
	Long wall		2	11.70	1.10	1.00	25.74	$L = 10.60 + 1.10 = 11.70$
	Short wall		3	5.20	1.10	1.00	17.16	$L = 6.30 - 1.10 = 5.20\text{m}$
							Total = 42.90	
2	Lime concrete in foundation	cum						Length same for excavation
	Long wall		2	11.70	1.10	0.30	7.72	
	Short wall		3	5.20	1.10	0.30	5.15	
							Total = 12.87	
3	First class Brickwork in 1:6 cement mortar in foundation and plinth	cum						
	Long wall							
	1 <sup>st</sup> footing		2	11.40	0.80	0.20	3.65	$L = 10.60 + .80 = 11.40\text{m}$
	2 <sup>nd</sup> footing		2	11.30	0.70	0.10	1.58	$L = 10.60 + .70 = 11.30\text{m}$
	3 <sup>rd</sup> footing		2	11.20	0.60	0.10	1.34	$L = 10.60 + .60 = 11.20\text{m}$
	4 <sup>th</sup> footing		2	11.10	0.50	0.10	1.11	$L = 10.60 + .50 = 11.10\text{m}$
	Plinth wall above footing		2	11.00	0.40	0.80	7.04	$L = 10.60 + .40 = 11.00\text{m}$
	Short wall							
	1 <sup>st</sup> footing		3	5.50	0.80	0.20	2.64	$L = 6.30 - .80 = 5.50\text{m}$
	2 <sup>nd</sup> footing		3	5.60	0.70	0.10	1.18	$L = 6.30 - .70 = 5.60\text{m}$
	3 <sup>rd</sup> footing		3	5.70	0.60	0.10	1.03	$L = 6.30 - .60 = 5.70\text{m}$
	4 <sup>th</sup> footing		3	5.80	0.50	0.10	0.87	$L = 6.30 - .50 = 5.80\text{m}$
	Plinth wall above footing		3	5.90	0.40	0.80	5.66	$L = 6.30 - .40 = 5.90\text{m}$
							Total = 26.10	

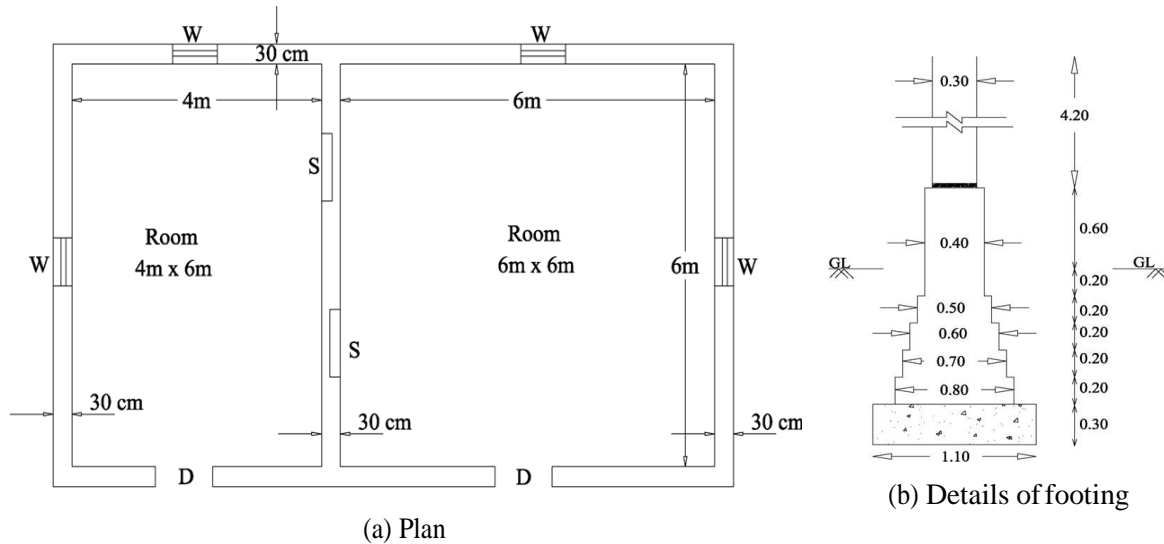
*Detail Measurement and Calculation of Quantities*

Item No.	Description	Unit	No.	L	B	H	Quantity	Explanation
4	2.5 mm thick DPC	sqm						
	Long Walls		2	11.00	0.40	--	8.80	L=10.60+.40=11.00m
	Short wall		3	5.90	0.40	--	7.08	L=6.30-.40=5.90m
	Deduct door sills		(-) 2	1.20	0.40	--	(-) 0.96	
							Total =	14.92
5	1 <sup>st</sup> class brick work in lime mortar in superstructure	cum						
	Long Walls		2	10.90	0.30	4.20	22.47	L=10.60+.30=10.90m
	Short wall		3	6.00	0.30	4.20	22.68	L=6.30-.30=6.00m
	Deduct for door opening		(-) 2	1.20	0.30	2.10	(-) 1.51	
	Deduct for windows opening		(-) 4	1.00	0.30	1.50	(-) 1.80	
	Deduct for shelves		(-) 2	1.00	0.20	1.50	(-) 0.60	Back of shelves 10 cm thick wall
	Deductions for lintel over doors		(-) 2	1.50	0.30	0.15	(-) 0.14	Bearing 15 cm
	Deductions for lintel over windows		(-) 4	1.30	0.30	0.15	(-) 0.23	Bearing 15 cm
	Deductions for lintel over shelves		(-) 2	1.30	0.30	0.15	(-) 0.12	Bearing 15 cm
							Total =	45.75

## 2.5. Example on center line method

Estimate the quantities of following items of a two roomed building given in Fig 2.3.

- Earthwork in excavation in foundation trench
- Lime concrete in foundation
- First class brick work in 1:6 cement mortar in foundation and plinth
- 2.5 cm thick DPC (1:2:4) with water proofing compound
- 1<sup>st</sup> class brick work in cement mortar superstructure



(Fig. 2.3)

The dimensions of doors, windows and selves are

Door D = 1.20 m × 2.10 m.

Windows W = 1.00 m × 1.50 m

Shelves S = 1.00 m × 1.50 m

**Ans:**

$$\begin{aligned} \text{Total center length of the wall} &= 2 \times \text{c/c of long wall} + 3 \times \text{c/c of short wall} \\ &= 2 \times 10.60 \text{ m} + 3 \times 6.30 \text{ m} = 40.10 \text{ m} \end{aligned}$$

It may be noted that, the above length includes some over lapped portions at the joints and these excess quantities shall have to be deducted. This is accomplished by reducing the center length by half breadth for each junction. The same principle applies to foundation concrete, to footings, plinth wall and superstructure wall. At every stage deduction of half breadth of the main wall at that particular level shall have to be made per junction from the total Centre length, and this net Centre length after deduction shall be multiplied by the respective breadth and height or depth to get quantities.

*Detail Measurement and Calculation of Quantities*

Item No.	Description	Unit	No.	L	B	H	Quantity	Explanation
1	Earthwork in excavation in foundation	cum	1	39.00	1.10	1.00	42.90	( ) —
2	Lime concrete in foundation	cum	1	39.00	1.10	0.30	12.87	Length same for excavation
3	First class Brickwork in 1:6 cement mortar in foundation and plinth	cum						
	1 <sup>st</sup> footing		1	39.30	0.80	0.20	6.29	—
	2 <sup>nd</sup> footing		1	39.40	0.80	0.10	2.76	—
	3 <sup>rd</sup> footing		1	39.50	0.60	0.10	2.37	—
	4 <sup>th</sup> footing		1	39.60	0.50	0.10	1.98	—
	Plinth wall above footing		1	39.70	0.40	0.80	12.70	—
							Total = 26.10	

*Detail Measurement and Calculation of Quantities*

Item No.	Description	Unit	No.	L	B	H	Quantity	Explanation
4	2.5 mm thick DPC	sqm	1	39.70	0.40	--	15.88	—
	Deduct door sills		(-) 2	1.20	0.40	--	(-) 0.96	
	Total =						14.92	
5	1 <sup>st</sup> class brick work in lime mortar in superstructure	cum	1	39.80	0.30	4.20	50.15	—
	Deduct for door opening		(-) 2	1.20	0.30	2.10	(-) 1.51	
	Deduct for windows opening		(-) 4	1.00	0.30	1.50	(-) 1.80	
	Deduct for shelves		(-) 2	1.00	0.20	1.50	(-) 0.60	Back of shelves 10 cm thick wall
	Deductions for lintel over doors		(-) 2	1.50	0.30	0.15	(-) 0.14	Bearing 15 cm
	Deductions for lintel over windows		(-) 4	1.30	0.30	0.15	(-) 0.23	Bearing 15 cm
	Deductions for lintel over shelves		(-) 2	1.30	0.30	0.15	(-) 0.12	Bearing 15 cm
	Total =						45.75	

