B.Tech II yr II SEM
Subject- Building Construction and Cost Estimation
Topic- Numericals on Detailed Estimation

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DETAIL ESTIMATION OF BUILDINGS

Building Estimate:

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

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

Long wall-short wall method

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

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

Partly center line and partly cross wall method

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

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 which 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.

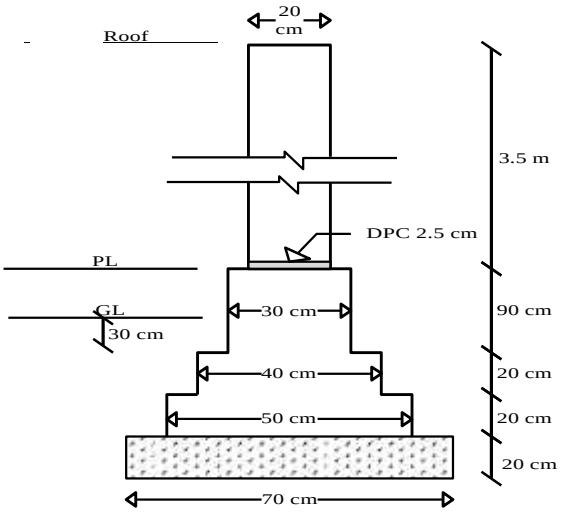
8	Flooring	Sqm/ Cum	For grounds floor, cement concrete and floor finishing of stone, marble or mosaic tiles taken under one item and quantity is calculated in square meter. For upper floors, bed of R.C.C. is taken cubic meter and other member is calculated in cubic meter.
9	Roof	Cum/ Sqm	In case of roof, 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/ Squm	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.

Example 1: (Quantity estimation of a symmetrical wall)

The plan and cross section of a wall is given in Fig. 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. *1st class brick work in superstructure wall*

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



(Fig. 1)

<u>Answer</u>

(i) Earthwork in excavation (Length × Breadth × Height) = 1 × 0.7 × 0.9 = 0.63 cum

(ii) Lime concrete in foundation (L × B × H) = 1 × 0.7 × 0.2 = 0.14 cum

(iii) 1st class brickwork in foundation and plinth:

i. 1st footing (L × B × H) = 1 × 0.5 × 0.2 = 0.10 cum

ii. 2nd footing (L × B × H) = 1 × 0.4 × 0.2 = 0.08 cum

iii. Plinth wall (L × B × H) = <u>1 × 0.3 × 0.9 = 0.27 cum</u>

Total = 0.45 cum

(iv) 1st class brickwork in superstructure (L × B × H) = 1 × 0.2 × 3.5 = 0.70 cum

(v) 2.5 cm thick DPC (L × B) = 1 × 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.

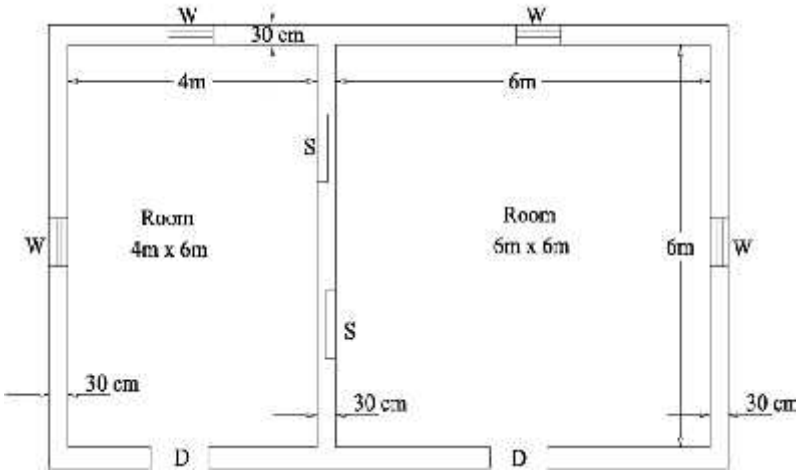
<u>Detail Measurement and Calculation of Quantities</u>

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	1st class brickwork (1:4) in foundation and plinth	cum					
	1st footing		1	1	0.5	0.2	0.10
	2nd footing		1	1	0.4	0.2	0.08
	Plinth wall		1	1	0.3	0.9	0.27
		Total =					0.45
4	1st 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

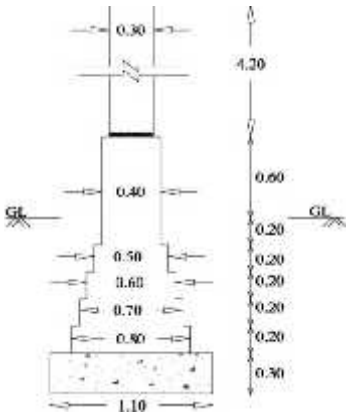
Example on long wall - short wall method

Estimate the quantities of following items of a two roomed building given in Fig 2.

a. *Earthwork in excavation in foundation trench*
b. *Lime concrete in foundation*
c. *First class brick work in 1:6 cement mortar in foundation and plinth*
d. *2.5 cm thick DPC (1:2:4) with water proofing compound*
e. *1st class brick work in cement mortar superstructure*



(a) Plan



(b) Details of footing

(Fig. 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=5.20m
						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							
	1st footing		2	11.40	0.80	0.20	3.65	L=10.60+.80=11.40m
	2nd footing		2	11.30	0.70	0.10	1.58	L=10.60+.70=11.30m
	3rd footing		2	11.20	0.60	0.10	1.34	L=10.60+.60=11.20m
	4th footing		2	11.10	0.50	0.10	1.11	L=10.60+.50=11.10m
	Plinth wall above footing		2	11.00	0.40	0.80	7.04	L=10.60+.40=11.00m
	Short wall							
	1st footing		3	5.50	0.80	0.20	2.64	L=6.30-.80=5.50m
	2nd footing		3	5.60	0.70	0.10	1.18	L=6.30-.70=5.60m
	3rd footing		3	5.70	0.60	0.10	1.03	L=6.30-.60=5.70m
	4th footing		3	5.80	0.50	0.10	0.87	L=6.30-.50=5.80m
	Plinth wall above footing		3	5.90	0.40	0.80	5.66	L=6.30-.40=5.90m
						Total =	26.10	

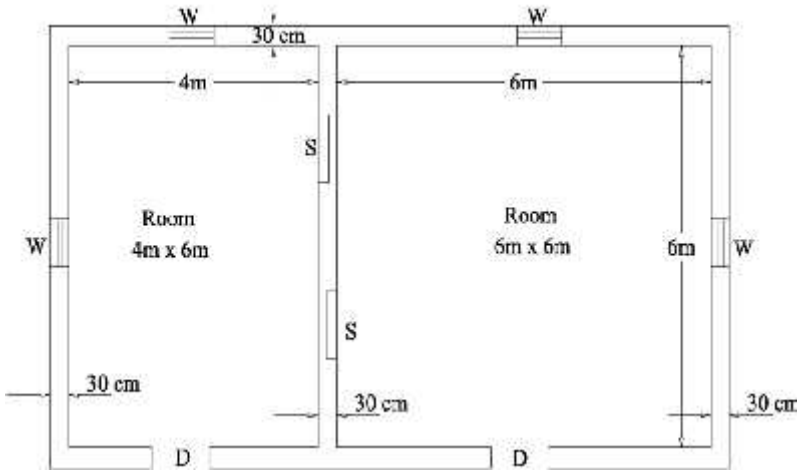
Detail Measurement and Calculation of Quantities

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	1st 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	

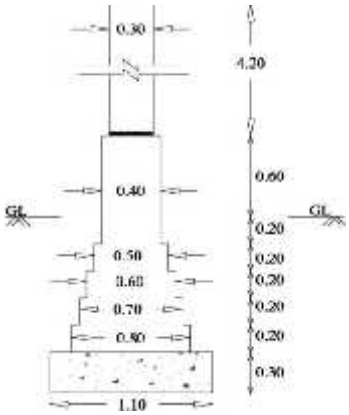
Example on center line method

Estimate the quantities of following items of a two roomed building given in Fig 3.

a. *Earthwork in excavation in foundation trench*
b. *Lime concrete in foundation*
c. *First class brick work in 1:6 cement mortar in foundation and plinth*
d. *2.5 cm thick DPC (1:2:4) with water proofing compound*
e. *1st class brick work in cement mortar superstructure*



(a) Plan



(b) Details of footing

(Fig. 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

<u>Ans:</u>

Total center length of the wall = 2 × c/c of long wall + 3 × c/c of short wall
= 2 × 10.60 m + 3 × 6.30 m = 40.10 m

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						
	1st footing		1	39.30	0.80	0.20	6.29	—
	2nd footing		1	39.40	0.80	0.10	2.76	—
	3rd footing		1	39.50	0.60	0.10	2.37	—
	4th 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	1st 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	