BHARAT INSTITUTE OF ENGGINEERING AND TECHNOLOGY

(Approved by AICSTE Affiliated to SCTE & VT)

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BIET, MOHADA, BERHAMPUR

LECTURE NOTES

ON

ESTIMATING AND COST EVALUATION- I

CIVIL, 3RD SEMESTER

PREPARED BY

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DEPARTMENT OF CIVIL ENGINEERING

ESTIMATION

What is estimation. →

i) It is defined as the process of calculating the quantities and cost of various items required in connection with the work.

ii) It is prepared by calculating the quantities from the dimensions on the drawings from the various items required to complete the project and multiplied by unit cost of the item.

iii) To prepare an estimate drawing consisting the plan, elevation and section to important points along with details specification giving specification description of all workmanship properties and proportion of material are required.

iv) It is therefore necessary to prepare an estimate for the purpose to work from it's plan and specification.

Purpose of Estimation →

Estimation for a work a project is necessary mainly for the following purpose →

i) To obtain necessary amount of money required by the owner to complete the purpose work.

ii) For public construction works estimates are required in order to obtain administrative approval sanction of bounds and technical sanction.

iii) To calculation the different number of categories of workers that are to be employed to complete the work within the schanduled time.

iv) To access the requirement of tools plants and equipments require to complete the work.

v) To fix the completion period from volume of work obtain.

vi) To justified the investment from benefit cost ratio.

vii) To invite tenders and prepare for payment.

viii) An estimate form on existing property is required for ~~valution~~ Valuation.

Types of estimating →

There are different types of estimates and they are as follows →

1) A detailed estimate.
2) A preliminary or approximate or rough Estimate
3) A Quantity Estimate or Quantity Survey.
4) Revised Estimate.
5) A Supplementary Estimate.
6) A complete Estimate.
7) Annual maintenance or repair Estimate.
Maintaince

1) A Detailed estimate →

i) This includes the detailed particular for the quantities, rates and costs of all the items involved for satisfactory completion of a proje

ii) Quantity of all items of work are calculated from their respective dimensions on the drawing on a measurement sheet.

iii) multiplying these quantities by their respective rates in a separate sheet, the cost of all item of work are worked out individually and then (summarised.)

iv) This is the best and most accurate estimate that can be prepare.

v) A detailed estimate is accompained by
   i) Report
   ii) Specification.
   iii) Detailed drawing showing plans, different sections, key or index plan etc
   iv) Design date and calculations.
   v) Basic of rates adopted in the estimate.

2) A Preliminary or approximate or rough estimate

→ This is an approximate estimate to find out an approximate cost in a short time and thus enables the authority concerned to consider the financial aspect of the scheme.

→ Such an estimates is framed after knowing the rate of similar works and from Pratical knowledge in various ways for various types of works such as →

i) Plinth area or square-metre method.
ii) cubic rate or Cubic metre Method.
iii) Service unit or unit rate method.
iv) Bay Method v) Approximate quantities with bill method vi) Cost ~~comparision~~ Comparison Method.
vii) cost from materials and labour.

3) A Quantity Estimate or Quantity ~~Survey~~

→ This is Complete estimate or list of quantites for all items of work required to complete the concerned project.

→ The quantity of each individual item of work is worked out from respective dimensions on the drawing of the structure.

→ To find out the cost of an item it's quantity is multiplied by the rate per unit for that item.

Revised Estimate :-

A revised estimate is a detailed estimate for the revised quantities and rates of items of works originally provided in the estimate without material without material deviations of a structural nature from the design originally approved for a project.

A revised estimate is prepared and submitted for fresh technical sanction.

A Supplementary Estimate (add more in something)

while a work is in progress, some changes or additional works due to material deviation of a structural nature form the design originally approved may be through may be thought necessary for the development of a project.

An estimate is then prepared to include all such works. This is know as a supplementary estimate.

A Complete estimate

This is an estimated cost ob all items which are related to work in addition to the detail estimate.

Repair estimate →

Often complete ob work it is necessary to maintain the same for its proper function and for items which require renewable, replacement, repair etc. Thus this estimate is known as a repair estimate.

Comparison between revise and supplement estimate →

Revised estimate	Supplement estimate
i) This is required when the sanctioned amount is exceeded due to change of rates or addition of works, fairly dependent on the work at first sanctioned.	i) This is required due to supplementary works which are fairly independent of the work at first sanctioned.
ii) So, a revised estimate is due to material deviation from the original proposal.	ii) So, supplementary estimate is due to material deviation of a structure nature form the design originally approve
iii) It is accompanied with a comparative statement abstract form showing the probable variations for quantity, rate and amount against each item of work involved in the project.	iii) No comparative abstract form is required this is an estimate for additional works only. The abstract shows the original estim and the total amount of the sanction required including supplementary amount.
iv) Revised estimate is required due to change of rate or quantity of materials, so no additions revisions of drawings is necessary.	iv) Supplementary estimate is required due to some new works or due to change of design, so additional revisions of drawings may be necessary.

Methods of Estimating for Building

Plinth area or Square meter method →

To prepare an estimate by this method the pl
area of a building (shall be determined fir
but plinth area only also have to be worked
Form Floor area or Carpet area of a buildin
(two walls area of floor area)

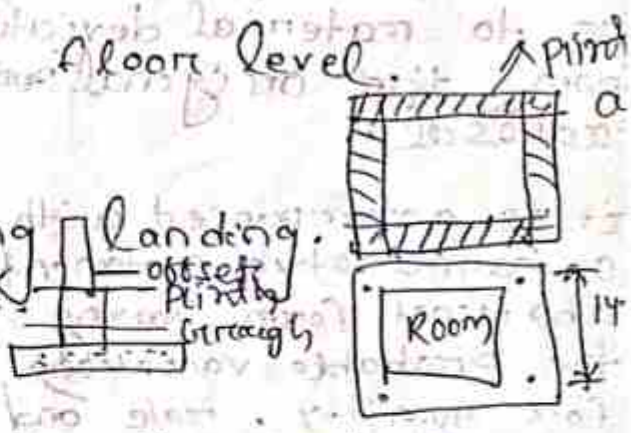
Plinth area (base or foundation of a building
or structure)

→ The plinth area of built up cover area
measured at floor level of the basement.

→ This can be calculated by taking (the outs
dimension of the building) excluding plinth
offsets.

→ Therefore calculation of plint area includes
the blowing.

i) Area of the floor level.
ii) Stair cover
iii) lift including landing.
iv) Internal Shaft
v) mechine room.
vi) Area of Porth other then Cantilever.



Floor area →

The floor area of the plinth area (less
the area of the walls. In the calculation
wall area the thickness of the wall shal
be inclusive of finishing and (dado)
finishing

if the height of such finish is more than 1 metre from floor finish.

Carpet area →

The carpet area is the floor area less the area of the following portions →

i) verandah. ii) corridor and passage iii) Entrance hall and Porch iv) staircase and stair - cover v) Bathroom and lavatory vi) kitchen vii) store viii) canteen ix) machine room x) Air condition.

Cubic rate or cubic metre method

i) This method of estimating can be done by calculating the volume of a structure.

ii) by cubic metre volume is more accurate in general, than the method of estimating cost by plinth area, because the cost of a building.

iii) This method of estimating is more accurate then the plinth area method because the cost of a building depends not only on it's plinth area but also on the volume of the building.

iv) The preparation of cubic rate estimate depends

-> Determination of total volume of the purposed building.

-> Determination of the present rate for cubic metre of similar buildings recently constructed in that locality.

Units of measurements and materials →
Various items of works

S.l No	Particulars of items	unit of measurements in mks	unit of payment in mks
	Earthwork →		
1	earthwork is a excavation in ordinary soil earthwork is mixed soil in kankar, bajri etc. earthwork in hard soil	Cubic meter (cum)	Per cum
2)	Earthing in excavation in foundation	Cubic meter	Per cum.
3)	Sand filling	Cum	Per cum.
4)	**Concrete →**		
	lime concrete in foundation	Cum	Per cum.
	Cement concrete in foundation	Cum.	Per Cum.
5)	**DPC**		
	DPC cement concrete rich cement mortar, asphat etc.	Square meter	Per Square meter
	Brick work		
6)	Honey comb brick work thickness specify (may also be involve basis as practice in UP.	Square meter	Per Square meter.
	Thin Partition wall		
	String Courge, drip Courge, Coping etc	meter	Per meter
	Cornice (projection and time specified)	meter	Per meter

7) Wood work →		
↳ wood work . door , window frame or chowkat , rafters , roof , trusses etc	Cum	per cum.
↳ Door and window fitting such as hinge , tower bolts , sliding bolts , handle etc.	Numbers	per numbers
↳ wood work partition (Ply wood)	Square mt	per square meter
8) ~~Rolling~~ Steel work — Rolled steel , Joist , Channels , angles , T-irons etc. Reinforcement	quantal	per quintal
8) Roofing → RCC , RB slab (excluding steel)	Cum	per Cum
9) Plastering , Pointing and finishing →		
→ Plastering - (Thickness & proportion specified lime mortar , mud etc.	Square meter	per sq mt
→ Pointing - struck weather etc.	Square meter	per sq mt
→ Dado (Thickness & type specified)	Square meter	per sq mt.
→ white washing , colour washing , cement washing.	Square meter	per sq mt.
→ Distempering (No. of coat specified)	Square meter	per sq mt.
→ Painting varnishing (No. of coat specified)	Square meter	per sq mt.
10 Flooring → 2.54 cm (1 inch) c.c where 7.5 cm (approximately 3 inch) LC floor (grading). LC	Square meter	per sq mt.

Use of standard estimating form →

→ Details of measurement and calculating of quantities.

→ Abstract estimate etc.

Details of Measurement form →

Item No	Description	No	length	breadth	height	Quantities

Abstract of estimate form

Item No	Description or Particulars.	Quantity	unit	Rate unit	Amount

MAIN ITEMS of work

Earth work in excavation →

→ Earth is excavated for foundation trenches to the exact width and depth of foundation with vertical sides.

→ Earth work in excavation in foundation is calculated by taking the dimensions of each trench i.e length x breadth x height / depth.

→ Filling in trenches after the construction of foundation masonary is ordinary with neglected

→ If the trench filling is accounted, this must be calculated by deducting the masonry from excavation seperately.

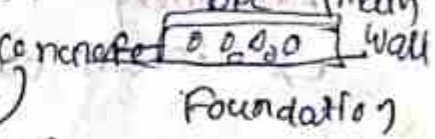
LIME concrete foundation →

The concrete is calculated in cubic meter (length × breadth × thickness) usually length breadth in foundation concrete is same for excavation only the thickness different.

→ The thickness of concrete varies from 20 cm to 45 cm (9 inch to 18 inch) usually 30 cm The proportion of cement concrete in foundation may be 1:4:8 or 1:5:10.

DPC (Damp proof course) (Below all masonry walls) (basement levels)

DPC is usually of 2.5 cm (1 inch) thick rich cement of proportion 1:1½:3 or 2 cm (¾)' thick rich cement mortar of proportion 1:2 mixed with standard water proofing material is provided at the plinth level to full width of plint wall and the quantities are computed in square meter. (length × breadth). Usually DPC is not provided at the sills of doors and veranda openings for which deduction are made.



MASONRY (made of stone work)

Masonry is computed in cum (length × Breadth × Height). Foundation and plinth Masonary is taken under one item, and masonry in superstructure is taken under a seperate item.

→ In storeyed building the masonry in each storey as ground floor above plinth level 1st floor, 2nd floor etc.

are calculated separately.

→ In taking out quantities the walls are measured as solid and then deductions are made for opening as doors, windows etc, and such other portions as necessary. masonry of different types of bricks, masonry with different mortar etc.

P.C.C & R.B work (Road & building)

P.C.C and R.B work may be in roof or floors, in beams, lintels, columns, foundation etc.

→ The quantities are calculated in cubic metre. Length, breadth and thickness are found correctly from the plan, elevation and section or from other detailed drawings.

→ Beamings are added with the clear span to get the dimensions.

→ Generally 1% of volume of R.C.C and R.B work is taken for steel.

3) Flooring and Roofing

i) Ground floor →

The base lime concrete or floor finish of C.C or stone or marble, mozaic etc.

are usually taken as one items, and the quantity is calculated, from the area, which is obtain by taking the inside dimensions between two walls.

ii) First floor, second floor etc :-

Supporting structure is taken seperately in cubicmeter as R.C.C and R.B and the floor finishing is taken seperately in Squaremeter.

iii) Roof →

Supporting structure is taken seperately in cum and the lime concret terracing is computed in Squaremeter with thickness specified under a seperate item.

Floor of door sills and sills of opening

These should also be taken into account. In the case of ground floor sills should be taken seperately as there is no lime concret sills.

Plastering

Plastering usually 12mm thick and is calculated in Squaremetere. For works the measurements are taken for the whole face of the wall for both sides as solids and deductions for opening are mades.

Pointing →  → pointing

Pointing in walls is calculated in square meter for whole surface and deduction similar to plastering are made.

Wood work →

Wooden beams, burgahs, posts, wooden roof trusses, chowkhats, etc. come under this item and the quantities are computed in cu.m. the dimensions of finished work shall be taken.

Iron work →

This is computed in weight and the quantities are calculated in correctly by multipeying the weights per running meter by the leng The weight for running meter can be obtain from the steel work.

Colour-washing or Distempering

The quantities per distemering can be calcu ated in square-meter. The inside quantit in same as for inside plaster and the ot quantity is same as for the outside pla

Painting

Painting or varnishing of doors and windows are computed in sq.m and the dimensions a

be taken for outer dimensions can be taken for outer dimensions of the chowkhats.

→ For iron bars, grills etc. the area of clear opening inside the chowkhat is taken.

Electrification and sanitary and water-supply works →

For sanitary and water supply work 8% and for electrification 8% of the estimated cost of the building works are usually provided in estimate.

Degree of Accuracy in Estimating →

The accuracy is absorb preparing a estimate depends on the rate of item and the unit of payment. The higher the rates the greater should be the accuracy with which the quantities are calculated where rates are high and paid for units dimensions should be absolute correct. The quantity in such cases should be worked out to atleast two places of decimal but the rates are low such extreme accuracy is no required.

Contigencies →

The term contigencies indicates the incidentally expenses of a miscellaneous character which can not be reasonable predictate during preparation of estimate. Thus to meet such unforeseen expenses an additional amount of 3% according expen

P.W.D and 5% according to P.W.D of the estimate cost of works is provided with the total estimate.

Work charge establishment →

The work charge establishement include so temeprary establishments as are employed b excavation or the immediate technical supervision or department store and maintenance in connection with a specific work.

Lump - sum Item →

Sometimes a lump - sum rate is provided for certain small items for which detailed quantities cannot be taken out easily or it takes sufficient time to find the detail, as front architectural or decoration work of a building, fire - place, site cleaning and dressing, etc.

Sold their house & Received the entire sale price in lumpsum.

Other Items →

For other items the units of different works given in pages 14 to 23 may be consulted. The units being known, it will not be difficult to estimate the quantities of different items of work.

Actual size
Standard modular brick = (19×9×9)cm
Nominal size = (20×10×10)cm

Standard modular brick = (19×9×4)cm
tile
Nominal size = (20×10×5)cm

100

Total brick : 18843.101 942.15

19785-[illegible]55

23.02.15 METHODS OF BUILDING ESTIMATE

→ The dimensions, length, breadth and height or depth are to be taken out from the drawing plan, elevation & Sec

→ From the study of the drawings, the building is to be imagined and picture in the mind and the dimensions are to be taken out correctly.

→ There are no hard and fast rule for finding out dimensions from the drawing but the dimensions are to be taken out accurately.

→ For symmetrical foundation which is the usual case earthwork in excavation, foundation concrete, brick work in foundation and plinth, and brickwork in superstructure may be estimated by either of following two methods

i) Short wall & long wall method

ii) Centre Line method.

Calculation

Short wall → Centre to centre length - one breath

Long wall → Centre to centre length + one breath

Centre line method → 12/03/15

→ In this method total length of centre lines of long walls and short wall as to be found out.
→ The total length of centre lines of long walls and shortwall of same type and having same type of foundations and footing as to be calculated and to this and by multiplying the total centre length with respective breadth & height
- The total quantity is determine.
→ In this method the length will be more in same for excavation in foundation, for concrete in foundation and for all footing also the length will be more same for super structure but the length can also very in upper structure when there co-
→ This is a quick method but required specifically special abbation at junction are Preabing point of partitions wall and outlogs walls.
→ building having same line rectangular, circular, hexgonal, oxtealgonal, etc. with are having no interwalls & partitions partition wall this method can frecunty used.
→ but building having partitions wall required specific consideration i.e for each junction the half breath of the respective thom of footing to be dreducted from the total centre length.
→ thus to the case of a building having to does not for earth coard in foundation. and foundation concrete dedut half breath for each junction form the total centre length this is also applicable for footing and superstructure.
→ for building having different types of wall.

... shall need to be calculated separately.

→ For those of two types of wall in a building then taking type one wall the centre length to determine & multiplying respective breadth & height. the quantity of type one wall is obtain. above procedure should be following for type two wall and the quantity should be calculated.

→ if the height & breath of both wall are same then after calculating the length for each wall the to Length of wall obtain and then the quantitue calc by multiplied the total length with breath, leng

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Supply of reinforcement	quintal.
Brick on edge flooring	sq.m
Pointing	sq.m
Arch work	sq.m
D.P.C	sq.m
String course	metre
Skirting of dado	metre
Reinforcement	quintal.

For 10 cum Cement Concrete → 15.2 to 15.4 cum dry material required.

For 100 m^2 Cement Mortar → 1.92 cum dry material.

1) Calculate the dry material for cement Plaster of 100m^2 in mortar (1:6)

→ Area of Plaster : 100m^2

Proportion of Cement mortar (1:6)

Solution → [for 100m^2 Cement + Plaster, dry Material 1.92 cum]

Now a Proportion : 1:6

Total number : 7

Cement → $\frac{1.92}{7}$: 0.274 Cum

→ 0.274 × 1440

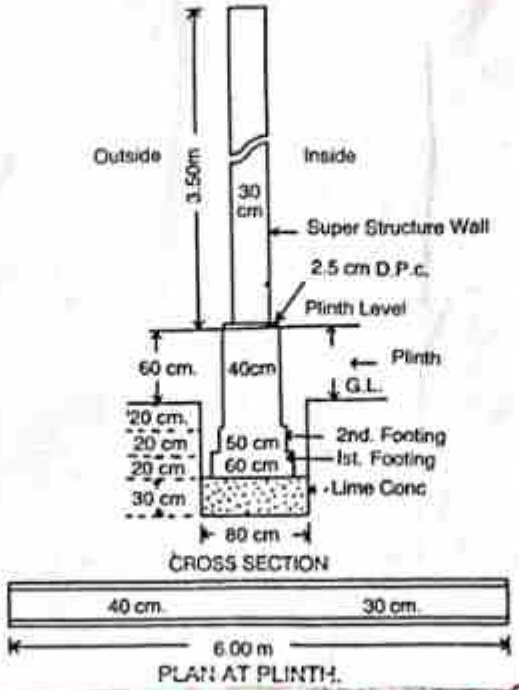
~~0.274 × 30~~ : → 394.56 kg

→ 7.89 ≃ 8 bags

→ 3.94 quintal

Sand : 0.274 × 6 = 1.644 Cum

WALL WITH STANDARD MODULAH BRICKS.



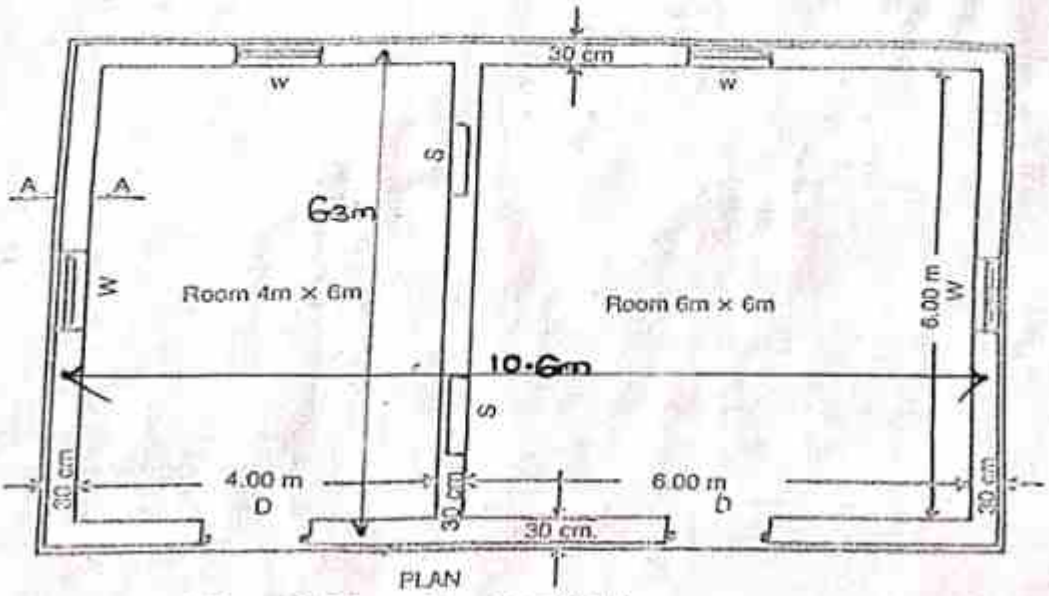
DETAILS OF MEASUREMENT AND CALCULATION OF QUANTITIES

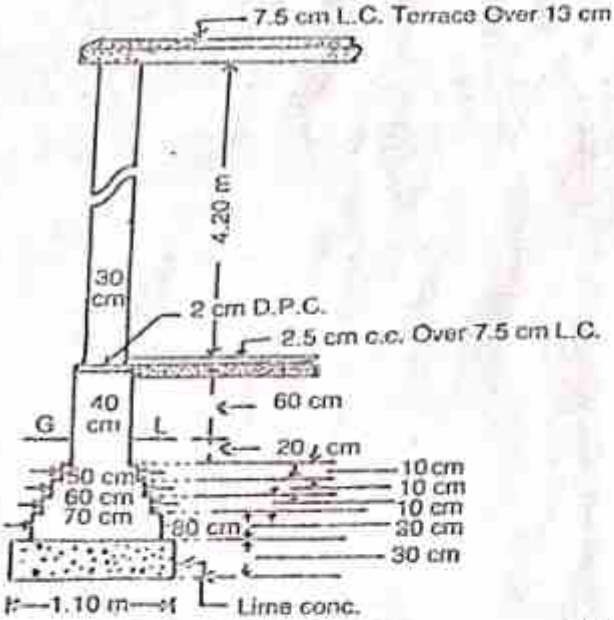
Item No	Description of items of work	No	Dimensions Length	Breadth	Depth height or	Quantities or contents	Total quantities.
1	Earthwork in excavation in foundation.	1	6.0m	0.80m	0.90m	4.32	4.32 cum
2	Lime concrete in foundation	1	6.0m	0.80m	0.30	1.44	1.44 cum
3	1st class brickwork in lime mortar in foundation & plinth :-						
	1st footing ..	1	6.0m	0.60m.	0.20m	0.72 ←	3.24 cum
	2nd footing ..	1	6.0m	0.50m	0.20m	0.60 ←	
	Plinth wall upto G.L	1	6.0m	0.40m	0.20m	0.48 ←	
	Plinth wall above to G.L	1	6.0m	0.40m	0.60m	0.144 ←	
4	2.5mm cm 1:1½:3 with water proofing Compound.	1	6.0m	0.40m	–	2.4	2.4 sq.m.
5	1st class brickwork in lime mortar in plinth portion of Super structure →	1	6.0m	0.30m	3.5m	6.3	6.3 sq.m

Example 4(a). — Estimate the quantities of the following items of a two roomed building from the given plan and section (Fig. 2-6) :

(1) Earthwork in excavation in foundation, (2) Lime concrete in foundation, (3) 1st class brickwork in cement mortar 1 : 6 in foundation and plinth, (4) 2.5 cm c.c. damp proof course, and (5) 1st class brickwork in lime mortar in superstructure.

TWO ROOMED BUILDING





CROSS SECTION OF WALL ON AA

All Walls are of same section
Lintels over Doors, Windows and Shelves are 15 cm thick R.B.

Doors D-1.20 m × 2.10 m
Windows W-1.00 × 1.50 m
Shelves S-1.00 m × 1.50 m
L h

Fig. 2-6

Note : — *No beam has been shown in the plan as the object of this example is to explain the method of estimating the walls only.*

2) Long wall(length) $4 + 6 + 0.30 + \left[2 \times \left(\frac{0.30}{2}\right)\right]$

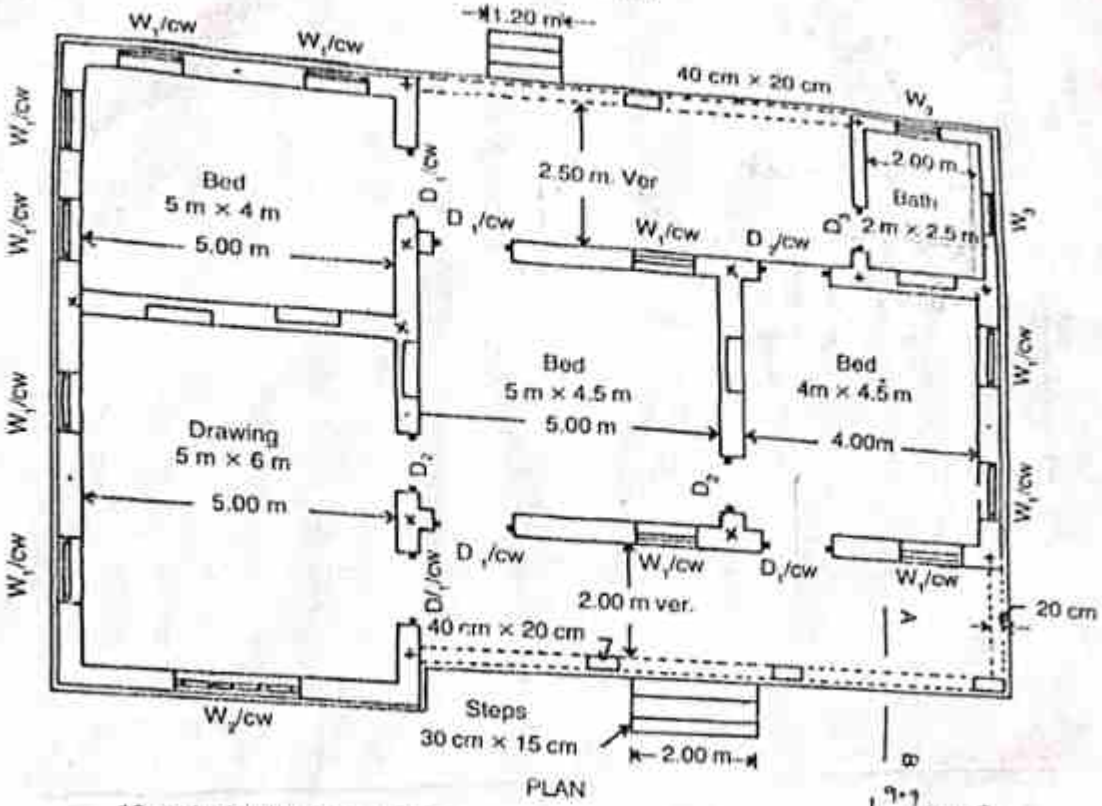
$\Rightarrow 10.60$ m

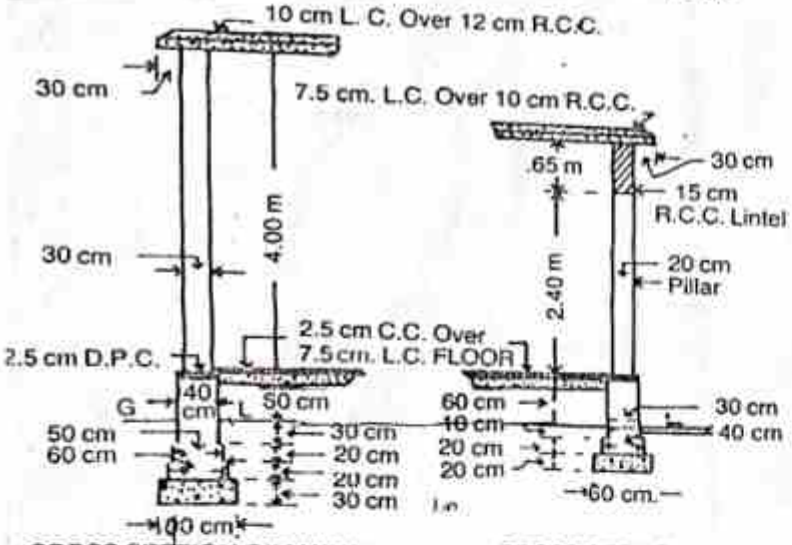
3) Short wall(length) $6 + \left[2 \times \left(\frac{0.30}{2}\right)\right] = 6.3$ m

Item NO	Particular of Item Description	NO	length	breath	height	quality	Explanatory note
1	Earthwork in excavation in foundation						
	long wall -	2	11.70m	1.10m	1.0m	25.74	→ 10.60 + 1.10 = 11.70m
	Short wall -	3	5.20m	1.10m	1.0m	17.16	→ 6.30 - 1.10 = 5.20m
					Total	42.90 Cum	
2	lime concrete in foundation.						
	(l.w)	2	11.70m	1.10m	0.30m	7.72	
	(s.w)	3	5.20m	1.10m	0.30m	5.15	
					Total	12.87	
3	1st class brickwork in 1:6 cement mortar in foundation and plint-						
	Long wall						
	1st footing	2	11.4	0.8	0.2	3.64	→ 10.6 + 0.8 = 11.4
	2nd footing	2	11.3	0.7	0.1	1.58	→ 10.6 + 0.7 = 11.3
	3rd footing	2	11.2	0.6	0.1	1.34	→ 10.6 + 0.6 = 11.2
	4th footing	2	11.1	0.5	0.1	1.11	→ 10.6 + 0.5 = 11.1

Plinth wall below the g.l	2	11	0.4	0.2	1.76	→ 10.60 + 0.4 = 11
			0.4	0.6	5.28	→ 10.60 + 0.4 = 11
Plinth wall above the g.l	2	11				
Short wall						
1st footing	3	5.5	0.8	0.2	2.64	6.3 - 0.8 = 5.5
2nd footing	3	5.6	0.7	0.1	1.176	6.3 - 0.7 = 5.6
3rd footing	3	5.7	0.6	0.1	1.026	6.3 - 0.6 = 5.7
4th footing	3	5.8	0.5	0.1	0.87	6.3 - 0.5 = 5.8
Plinth wall below the g.l	3	5.9	0.4	0.2	1.416	6.3 - 0.4 = 5.9
Plinth wall above the g.l.	3	5.9	0.4	0.6	4.248	6.3 - 0.4 = 5.9
				Total →	26.086	
(1) D.P.C						
(long wall)	2	11	0.4	-	8.8	→ 10.6 + 0.4
(short wall)	2	5.9	0.4	-	7.08	5.9 - 0.4
					15.88 cum	

1st class brick work in the Super Structure							
(L.w)	—	2	10.90	0.30	4.20	27.47	10.6 + 0.3 + 10.09
(S.w)	—	3	6.00	0.30	4.20	22.68	6.3 - 0.3 - 6.00
Deduct door size	→	2	1.20m	.40m	-	50.15 cum 15.88 0.96 cum	
						14.928 cum	
Deduct							
Door opening	-	2	1.2	0.3	2.1	1.51	
window opening	-	4	1	0.3	1.5	1.80	
Shelves	—	2	1	0.3	1.5	0.60	
Lintels over door	..	2	1.2	0.3	0.15	0.108	
L.O. window		4	1	0.3	0.15	0.18	
Lintel over Shelves		2	1	0.3	0.15	0.09	
					Total	4.288	





CROSS SECTION OF MAIN WALLS

CROSS SECTION AB OF VERWALL

Doors:-
D_1 – 120 cm × 210 cm (1.20 m × 2.10 m)
D_2 – 100 cm × 200 cm (1.00 m × 2.00 m)
D_3 – 75 cm × 180 cm (.75 m × 1.80 m).

Windows:-
W_1 – 100 cm × 150 cm (1.00 m × 1.50 m)
W_2 – 200 cm × 150 cm (2.00 m × 1.50 m)
W_3 – 75 cm × 120 cm (.75 m × 1.20 m)
C.W. – 75 cm × 60 cm (.75 m × .60 m).

Shelves:-
S – 100 cm × 150 cm (1.00 m × 1.50 m)
Lintel Over Doors, Windows Etc.
15 cm R.B.

All walls of Drawing Rooms and Bed Rooms have same section

Bath Room walls have similar section.

Note—*No beam has been shown in the plan.*

Fig. 2-7

1) Estimate the quantities of the following item of a residential building from the given drawing.
i) Earthwork in excavation in foundation ii) Lime con in foundation 3) First class brick work in 1:6 cement Sand mortar in foundation and plinth.

4) 2.5 cm Damp proof Course.

5) First Class brick work in lime mortar in Superstructure

→ l.w = Centre to Centre length + 1 breath.

S.w = Centre to Centre length + 1 breath.

Drawing room and Bed room of the left side →

⇒ Long wall = 10.6m / S.w = 5.3 m

Bed room of the right side →

long wall = 9.6m / Short wall = 4.8m

Front Verandah

long wall → 9.65 m / Short wall → 2.25 m

Back Verandah

L.Wall → 9.65 m / S.w = 2.75 m

Item No	Decription	No	length	breath	height	quality	Remark
1	Earthwork in excavation foundation						
	U.1						
	l.w	2	11.5m	0.9m	1 m	20.7 cum	10.6+0.9 = 11.50m
	S.w	3	4.40m	0.9m	1m	11.88 cum	5.3 - 0.9 = 4.40m
	U.2						
	l.w	2	9.6m	0.90m	1m	17.28	9.6 - 0.90/2 + 0.90/2
	S.w	2	3.9m	0.90m	1m	7.02	4.8 - 0.90/2 - 0.90/2 = 3.9
	U.3						
	l.w	1	9.5m	0.60m	0.5m	0.85	9.65 - 0.90/2 + 0.60/2
	S.w	1	1.5m	0.60m	0.5m	0.45	2.25 - 0.90/2 - 0.60/2
	U.4						
	l.w	1	9.5m	0.60m	0.5m	2.85	9.65 - 0.90/2 + 0.60/2 = 9.5
	S.w	2	2m	0.60m	0.5m	1.20	2.75 - 0.90/2 - 0.60/2 = 2
					707 cl	64.22 cum	

Item No	Description	No	(L)	(B)	(D)	Quantity	Remark
	Lime concrete in foundation - Drawing and left bed room						
	Long walls...	2	11.50m	0.90 m	0.30 m	6.21	
	Short walls....	3	4.40 m	0.90m	0.30m	3.56	
	Bed room right side						
	Long walls	2	9.60m	0.90m	0.30m	5.18	
	Short walls	2	3.90m	0.90 m	0.30m	2.11	
	Front verandah						
	Front long wall	1	9.70m	0.60m	0.20m	1.16	$L = 9.65 - \frac{0.50}{2} + \frac{0.60}{2} = 9.70$ m
	Side short wall	1	1.70m	0.60m	0.20m	0.20	$L = 2.25 - \frac{0.50}{2} - \frac{0.60}{2} = 1.70$ m
	Back verandah including bath room						
	Long wall in cloging bath	1	9.70m	0.60m	0.20m	1.16	$L = 9.65 - \frac{.50}{2} + \frac{0.60}{2} = 9.7$
	Shortwall (remaining walls of bath)	1	2.20m	0.60m	0.20m	0.52	$L = 2.75 - \frac{0.50}{2} - \frac{0.60}{2}$ 2.20 m.
					Total	20.11 cm	
	1st class brickwork in foundation and plinth in 1:6 cement mortar. Drawing and left bed room long walls						

1st footing	2	11.20m				
and footing	2	11.10m	0.60m	0.20m	2.69	L = 10.60 + 0.60 = 11.20m
			0.50m	0.20m	2.22	L = 11.20 - 2x.05 = 11.10m.
Plint wall above footing ...	2	11.00m	0.40m	0.90m	7.92	L = 11.10 - 0.10 = 11.00 m
Short wall →						
1st footing ...	3	4.70 m	0.60m	0.20m	1.69	L = 5.30 - 0.60 = 4.70m
and footing ...	3	4.80 m	0.50m	0.20 m	1.44	L = 4.70 + 2x.05 = 4.80 m.
Plinthwall above footing	3	4.90m	0.40m	0.90 m	5.29	L = 4.80 + 0.10 = 4.90m.
Bed rooms right sides →						
Long wall →						
1st footing	2	9.60m	0.60m	0.20m	2.31	L = 9.60 - $\frac{0.60}{2}$ + $\frac{0.60}{2}$ = 9.60m
and footing	2	9.60 m	0.50m	0.20m	1.92	L = 9.60 - $\frac{0.50}{2}$ + $\frac{0.50}{2}$ = 9.60m
Plinthwall above footing	2	9.60 m	0.40m	0.90m	6.91	L = 9.60 - $\frac{0.40}{2}$ + $\frac{0.40}{2}$ = 9.60m
Short wall						
1st footing	2	4.20m	0.60m	0.20m	1.01	L = 4.80 - 0.60 = 4.20m
2nd footing	2	4.30m	0.50m	0.20m	0.86	L = 4.20 + 2x.05 = 4.30m.

Plint wall above footing	2	4.40 m	0.40m	0.90m	3.17	
Front verandah						
Front wall → Footing	1	9.65m	0.40m	0.20m	0.77	$L = 9.65 - \frac{0.40}{2} + \frac{0.40}{2} = 9.65$ m
Plinth wall above footing	— 1	9.60m	.30 m	.70 m	2.02	$L = 9.65 - \frac{.40}{2} + \frac{.30}{2} = 9.60$ m
Side short wall footing.	— 1	1.85m	.40 m	.20m	0.15	$L = 2.25 - \frac{.40}{2} - \frac{.40}{2} = 1.85$ m.
Plinth wall above footing	— 1	1.90m	.30 m	.70 m	0.40	$L = 2.25 - \frac{.40}{2} - \frac{.30}{2} = 1.90$ m
Back varandah including bath room - Long wall - footing	— 1	9.65 m	.40 m	.20m	0.77	Length same as for front verandah long wall.
Plinth wall above footing	— 1	9.60 m	.30m	.70 m	2.02	
short walls (remaining walls of bath) footing	— 2	2.35 m	.40 m	.20 m	.0.38	$L = 2.75 - \frac{.40}{2} - \frac{.40}{2} = 2.35$ m
Plinth wall above footing	— 2	2.40 m	.30 m	.70 m	1.01	$L = 2.75 - \frac{.40}{2} - \frac{.30}{2} = 2.40$ m
				total	44.95	cu m

2.5cm D.P.C

Drawing and left bed rooms						
Long wall	2	11.00 m	0.40 m	–	8.80	
short wall	2	4.90 m	0.40 m	–	5.88	
Bed rooms inner side.						
Long walls ...	2	9.60 m	0.40 m	–	7.68	
short walls ...	2	4.40 m	0.40 m	–	3.52	
Verandah Pillars	4	0.50 m	0.30 m	–	0.60	
Bath room						
Rear weall	1	2.50 m	0.30 m	–	0.75	L = 2.20 + 2 × 0.15 = 2.50 m
side and enter walls ...	2	2.40 m	0.30 m	–	1.44	
				Total:	28.67 89.m.	
Deduct ... →						
Door sills D_1 ...	6	1.20 m	0.40 m	–	2.88	
Door sills D_2	2	1.00 m	0.40 m	–	0.80	
Door sills D_3 :	1	0.75	0.30 m	–	0.23	
				Total of deduction	3.91 89.10	

5) 1st clas brick work in superstructure in lime mortar - Drawing and left bed room						
Long wall	2	10.90m	0.30m	4.00m	26.16	L = 10.60 + 0.30 = 10.90m
Short walle	3	5.00m			18.00	L = 5.30 - 0.30 = 5.00m.
Bed room right side						
long wall ...	2	9.60 m	0.30 m	4.00 m	23.04	L = 9.60 - 0.30/2 + 0.30/2 = 9.60m
Shorter wall ...	2	4.50 m	0.30 m	4.00 m	10.80	L = 4.80 - 0.30 = 4.50 m,
Front verendah →						
Front wall as Solid ...	1	9.60 m	0.20m	3.05 m	5.86	L = 9.65 - 0.30/2 + 0.20/2 = 9.60m
Side wall as Solid. ...	1	2.50 m	0.20 m	3.05 m	1.22	
Back verendah including bath room →						
Back long wall as solid ...	1	9.60m	0.20m	3.05 m	5.86	
Side and inter wall s of bath	1	2.50 m	0.20m	3.05 m	3.05	L same as front verendah.
				Total	93.99 cum	

Deduct						
Door openings						
D. openings D_1	— 6	1.20 M	.30 m	2.10 m	4.54	
D. opening D_2	— 2	1.00 m	.30 m	2.00 m	1.20	
D. opening D_3	— 1	0.75 m	.20 m	1.80 m	0.27	
window openings						
W. openings W_1 —	11	1.00 m	.30 m	1.50 m	0.90	
W. openings W_2 —	1	2.00m	.30 m	1.50 m	0.90	
W. openings W_3 —	2	0.75 M	.20 m	1.20 m	0.36	
clerestory window (C.W) opening —	18	0.75 m	.30 m	0.60 m	2.43	
Shelves opening —	5	1.00 m	.20 m	1.50 m	1.50	Back of Shelves 10 cm thick wall.
Front Verandah opening in between pillars —	1	8.40m	.20m	2.40 m	4.03	L = 9.60 - 3x.40 = 8.40 m
Front verandah opening side —	1	2.00m	.20m	2.40 m	0.96	
Back verandah opening —	1	6.30m	.20m	2.40 m	3.26	L = 9.60 - 2.40 - .40 = 6.80m.
Lintals —						
over doors						
D. Doors D_1 —	6	1.50 m	.30 m	.15 m	0.405	Bearing 15 cm.
D. Doors D_2	2	1.30 m	.30 m	.15 m	0.117	Bearing 15 cm.
D. Doors D_3	1	.95 m	.20 m	.15 m	0.029	Bearing 10 cm.

over windows						
W. windows W_1	— 11	1·30 m	·30 m	0·644	0·644	Bearing 15 cm.
W. windows W_2	— 1	2·30 m	·30 m	·15 m	0·103	Bearing 15 cm
O. windows W_3	— 2	·95 m	·20 m	·15 m	0·057	Bearing 10 cm
over C. W	— 18	·95 m	·30 m	·15 m	0·770	Bearing 10 cm.
over Shelves	— 5	1·30 m	·30 m	·15 m	0·293	Bearing 15 cm.
Verandah lintels						
front	— 1	9·75 m	·20 m	·15m	0·293	L = 9·60 + ·15 = 9·75 m.
Side	— 1	2·15 m	·20 m	·15m	0·065	L = 2·00 + ·15 = 2·15 m.
Back	— 1	7·50 m	·20 m	·15 m	0·225	L = 9·60 − 2·40 + 2 × ·15 = 7·50 m.
		Total of	deduction		27·401	cu m
		Net	total		66·59	cu m

...afe Analysis:—

How to calculate cement, sand and aggregate for m20 concrete?

Ans) M20

↙ Mark ↘ Characteristics ~~Stress~~ compressive strength

m20 = 1 : 1.5 : 3

Assume find materials calculation of 1cum. wet volume.

Dry volume = wet volume x 1.54 to 1.57 times wet volume of concrete

Sum of ratio for m20 = 1+1.5+3 = 5.5

Dry volume = 1x1.57 = 1.57 cum

Now find the volume of cement

Cement volume = $\left(\frac{1}{5.5}\right)$ 1.57

= 0.285 m^3 (V x 1)

m = (V x 1)

Volume of cement in kg = 0.285 x 1440 kg/m^3

= 411kg

Density of cement = 1440kg (m = V x 1)

No. of cement bags = $\frac{411}{50}$ = 8.108

Volume of sand = 1600kg/m^3

Aggregate = 1450—

Volume of sand = $\left(\frac{1.5}{5.5}\right)$ x 1.57

0.471 m^3

= 1600 x 0.471 = 753.6kg

2) Calculate the dry materials required for cement concrete of 1 : 5 : 10 for 25 cumic

→ Given data

Quantity 25 cumic

Proportion = 1 : 5 : 10

For 25 cumic of cement = $\frac{1.54}{1+5+10} \times 2.5$

= 2.4 cumic

Amount of sand = 2.4×5 = 12 cum

Amount of aggregate = 2.4×10 = 24 cum

For 1 cumic = 30 bag

2.4 cum = 30×2.4 = 72 bag

3) Calculate the dry material required for cement mortar of proportion 1:3 for 20 cumic

→ Given data

Quantity = 20 cum

Proportion = 1:3.

For 10 cumic cement = $\frac{3}{1+3}$

= $\frac{3}{4}$ = 0.75

For 20 cumic cement = 2×0.75

= 1.5 cumic

For 20 cumic amount of sand = 3×1.5

= 4.5 cumic

For 1 cumic = 30 bag

1.5 cumic = 1.5×30 = 45 bag

4) Prepare a rate analysis of cement concrete work at 1:2:4. Consider here calculate for 10 cumic.

→ Dry material calculation

Quantity = 10 cumic

Proportion = 1:2:4

For 10 cumic amount of cement = $\frac{1.54}{1+2+4} \times 10$

= 2.2 cumic

2.2 x 30 = 66 bag

Amount of sand = 2.2 x 2 = 4.4 cumic

Amount of aggregate = 2.2 x 4 = 8.8 cumic

Sr. no.	Particular	Quantity	Rate	Amount
1.	Dry Material			
	Cement	66 bag	300/bag	19800.00/-
	Sand	4.4 cumic	250/bag	1100.00/-
	Aggregate	8.8 cumic	770/cumic	6776.00/-
2)	Labour			
	Head mason	$\frac{1}{2}$ No.	700/day	350.00/-
	Mason	1	500/day	500.00/-
	Mazdoor	20 No.	350/day	7000.00/-
				35526.00/-
3)	Tools & plants	@ 1%		355.26/-
4)	Water Charges	@ 1%		355.26/-
				36236.52/-
5)	Dep. Departmental charge	@ 12%		4348.3824/-
				40584.9024/-

5) Prepare a rate analysis of plastering of proportion 1:3 for 10 cumic.

→ Dry material calculation

For 10 cumic of mortar = $\frac{3}{1+3}$

= 0.75 cumic

Cement bag required = 0.75 x 30

= 22.5 bag ≃ 23 bag

For 10 cumec amount of sand = 0.75 x 3
= 2.25 cumec

Sr no.	Particular	Quantity	Rate	Amount
1.	Dry material			
	Cement	23 bag	300/-	6900.00/-
	Sand	2.25 cum	250/-	562.5/-
2)	Labour			
	Head mason	½ No.	700/day	350.00/-
	Mason	1	500/day	500.00/-
	Mazdoor	17 No.	350/day	5950.00/-
				14262.5/-
3)	Tools and plants	@ 1%		142.625/-
4)	Water charges	@ 1%		142.625/-
				14547.75/-
5)	Departmental charge.	@ 12%		1745.73/-
				16293.48/-