LECTURE NOTE
ESTIMATION & COST EVALUATION -1
3TH SEMETER
Diploma (Civil Engineering)

Miss Dipti Bibhar
Department of Civil Engineering

GANDHI INSTITUTE OF ADVANCED COMPUTER & RESEARCH
Prajukti Vihar, Aurobindo Marg, Rayagada- 765002, Odisha

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Introduction

Estimate -

An estimate is the probable cost of a work and is usually prepared before the construction is taken up.

→ Before undertaking any work or project it is necessary to know its probable cost which is obtained or derived by estimating.

→ The estimate is prepared by computing or calculating the quantities required and then calculating the cost at suitable rates, to get the expenditure for the construction of the work or structure.

Data for estimate -

To make out an estimate for a work the following data are necessary-

(i) Drawing (Plan, section)
(ii) Specification
(iii) Rate

(i) Drawing -

Plan, sectional elevation and detailed drawing to scale, fully dimensioned are required.

The plan, elevation and sectional elevation are usually drawn to a scale of 1 cm = 1m (1 inch = 8 feet) (1" = 8').

(1) Specification -

(a) General specification or brief specification -

These gives the nature, quality and class of work and material. In general terms to be used in the various parts of the wall. General specification help to form a general idea of the whole building or structure and are useful in preparing the detailed estimate.

(b) Detailed specification -

These give the detailed description of the various items of work laying down the quantities and qualities of materials. their proportion the methods of preparation, workmanship and execution of work.

(3) Rate -

The rate per unit of various item of work the rate of various material to be used in the construction and the uses of different categories of labour, skilled or unskilled as masol carpenter etc. available for preparing estimate.

Types of estimate —

(I) Preliminarey estimate or approxmate or abstract estimate or rough cost estimate

(II) Plinth area estimate

(III) Cube reate estimate or cubical content estimate

(IV) Approximate quantity method estimate

(V) Detailed estimate or item rate estimate.

(VI) Revised estimate

(VII) Supplimentary estimate

(VIII) Supplimentary and revised estimate

(IX) Annual repair or maintenance estimate

Plinth area estimate -

Plinth area is the built up covered area of a building measured at floor level of a ~~deed~~ any storey.

Plinth area is calculated by taking the external dimension of the building at the floor level excluding plinth offset if any.

(II) Balcony, courtyared, ~~eq~~ open area, cantilever projection are not included in the plinth area.

Supported porches are included in the plinth area.

Floor area -

Floor area of a building is the total area of floor in between walls and consist of floor of all rooms, verandah, passages, corridors, staircase room, entrance hall, Kitchen, store, bathroom etc. Sills of doors and opening are not included in the floor area.

(II) ~~Floor area is equal to plinth area.~~

Floor area = plinth area - area occupied by walls.

(III) The floor of each storey and different types of floor should be measured and taken separately.

Carpet area -

Carpet area of building is the useful area or lettable area. This is the total floor area — The (minus) circulation area.

Circulation area, verandah, corridors, passages, staircase, lift, entrance hall etc. and - other non useble area as sanitary accommodations, air conditioning room etc.

(11) For office building carpet area is the useful area and for residential building carpet area is the liveable area and should exclude kitchen, storage and similare other room which are not useful for living purposes.

Degree of accuracy in estimating

The accuracy, to be observed in preparing an estimate depends on the rate of the 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 per unit, dimensions should be absolutely correct, through taking dimensions to the nearest 1 cm to 5 cm may be allowed for practical purposes. The quantities in such cases should be worked out to at least two places of decimal. But where rates are low and paid for % to % unit such extreme accuracy is not required.

In general, dimensions should be measured to the nearest 1 cm (.01 m), areas should be worked out to the nearest 0.01 sqm and cubic contents should be worked out to the nearest to 0.01 cum. Thickness of slabs, partitions, etc. and sectional dimensions of columns, pillars, beams, etc - should be taken to the nearest half centimetre (.005 m)

Units of measurements in metric system

The principle for dimensions and measurements is to use milimetre (mm) for minute dimensions, centimetre (cm) for small dimensions and metre (m) for big dimensions. Distances are measured in kilometre (km).

Units

Sl No.	Item	Units of measurement in MKS	Units of payment in MKS	Units of payment in FPS
1.	Lime concrete (L.C) in foundation	cu m	per cu m	% cu ft
2.	Lime concrete (L.C) in roof terracing, thickness specified	sq m	per sq m	% sq ft
3.	Cement concrete (C.C)	cu m	per cu m	per cu ft
4.	Reinforced cement concrete	cu m	per cu m	per cu ft
5.	C.C or R.C.C chujja, sun shade	cu m	per cu m	per cu ft
6.	Precast C.C or R.C.C.	cu m	per cu m	per cu ft
7.	Jaliwork or jaffriwork or C.C. tracery panels	sq m	per sq m	per sq ft
8.	Cement concrete bed	cu m	per cu m	per cu ft
9.	D.P.C Damp proof course - cement concrete, Rich concrete mortar, Asphalt, etc.	sq m	per sq. m	% sq. ft
	Brickwork			
1.	Brickwork in foundation and plinth, in superstructure, in arches, etc, in cement, lime or mud mortar	cu m	per cu m	% cu ft

(2) Sun dried brickwork	cum	per cum	% cuft
(3) Honey-comb brickwork, thickness specified	sqm	per sqm	% sqft
(4) Brickwork in jack arches, if measured separately	cum	per cum	% cuft
(5) Jack arch roofing including top finishing	sqm	per sqm	% sqft
(6) Brickwork in well steining	cum	per cum	% cuft
(7) Half-brickwork with or without reinforcement	sqm	per sqm	% sqft
(8) Thin partition wall	sqm	per sqm	% sqft
(9) Reinforced brickwork	cum	per cum	% cuft
(10) String course, drip course, weather course, coping etc.	metre	per m	per rft
(11) Cornice	metre	per m	per rft
(12) Brickwork in fireplace, Chulla, chimney	cum	per cum	% cuft
(13) Pargetting chimney, fire place flue	metre	per m	per rft
(14) Brick edging	metre	per m	per rft

Stonework —

(1) Stone masonry, Random Rubble masonry, Coursed Rubble masonry, Ashlar masonry in walls, in arches, etc.	cum	per cum	% cuft
(2) Cut stone work in lintel, beam, etc.	cum	per cum	per cuft
(3) Stone slab in roof, shelve, etc, stone chujjas, stone sun shed, etc.	sqm	per sqm	% sqft
(4) Stone work in wall facing or lining	sqm	per sqm	per sqft

Wood work –

(1) Wood work, door & window frame on chaukhat, rafters beams, roof trusses etc.	cu m / sq m	per cum / per sq m	per cft / per sq ft
(2) Door and window shutters on leaves, panelled, battened, glazed, part panelled and part glazed, wire gauged, etc.	sq m	per sq m	per sq ft
(3) Door & window fittings as hinges tower bolts, sliding bolts, handles, etc.	no.	per no.	per
(4) Timbering, boarding	sq m	per sq m	per sq ft
(5) Timbering of trenches	sq m	per sq m	per sq ft
(6) Sawing of timber	sq m	per sq m	per sq ft
(7) Woodwork in partition, ply wood, etc.	sq m	per sq m	per sq ft
(8) Ballies	metre	per m	per rft

Steel work –

(1) Rolled steel joints, channels; Angles; T-irons, Flats, Squares, Rounds, etc.	quintal	per q	per cwt
(2) Steel reinforcement bars, etc. in R.C.C, R.B work.	quintal	per q	per cwt
(3) Bending, binding of steel reinforcement	quintal	per q	per cwt
(4) Fabrication and hoisting of steel work	quintal	per q	per cwt
(5) Expended Metal, (X.P.M) Size specified	sq m	per sqm	per sq ft
(6) Fabric reinforcement, wire netting	sq m	per sq m	per sq ft
(7) Iron work in struss	quintal	per q	per sq ft
(8) Gusset plate (min rectangular size from which cut	quintal	per q	per cwt

(9) Cutting of Iron joists, channels.	~~quintal~~	per cm	per
(10) Cutting, Angles, Tees, plate	sq cm	per sq cm	per sq inch
(11) Threading in iron	~~sq~~ cm	per cm	per inch
(12) Welding, soldering of sheets, plates	cm	per cm	per inch
(13) Boring holes in iron	~~sq~~ no.	per no.	per no.
(14) Cast Iron pipe, Dia. specified	~~metre~~	per m	per ft
(15) Rivets, Bolts and nuts, Anchor bolts, Lewis bolts, Holding down bolts, etc.	~~metre~~ quintal	per q	per cwt
(16) Barbed wire fencing	metre	per m	% n ft
(17) Iron gate	~~quintal~~ sq. m ~~metre~~	per sq m.	per sq ft
(18) Iron hold fast	quintal ~~metre~~	per q	per cwt
(19) Iron railing	metre	per m	per n ft
(20) Iron grill, collapsible gate	sq m	per sq m	per sq ft
(21) Rolling shutter	sq m	per sq m	per sq f
(22) Steel doors & windows	sq m	per sq m	per sq ft

Roofing —

(1) Tiled roof - Allahabad tile, Faizabad tile, Mangalore tile, etc. including battens	sq m	per sq m	% sq ft
(2) Country tile roof including bamboo jaffri	sq m	per sq m	% sq ft
(3) Corrugated iron roof, Asbestos cement sheet roof	sq m	per sq m	% sq ft
(4) Slate roofing, timber roofing	sq m	per sq m	% sq ft
(5) Thatch roofing including bamboo jaffri	sq m	per sq m	% sq ft
(6) Eave board	sq m	per sq m	per sq ft
(7) R.C.C, R.B slab roof	cum	per cum	per cuft

(8) Lime concrete roof over and inclusive of tiles or brick, or stone slab, etc.	sq m	per sq m	% sq
(9) Mud roof over and inclusive of tiles, or bricks, or stone slab, etc.	sq m	per sq m	% sq ft
(10) Ridges, valleys, gutters,	metre	per m	per m ft
(11) Tar felting, Bituminous painting	sq m	per sq m	% sq ft
(12) Insulating layer in roof of sand and clay, asphalt, etc.	sq m	per sq m	% sq ft
(13) Expansion, contraction or construction joint	metre	per m	per m ft
(14) Ceiling - Timber, A.C. sheet plain, cloth, cement plaster on XPM, Paste board, etc.	sq m	per sq m	per sq ft
(15) Centering and shuttering, Form work - surface area of R.C.C. or R.B. work supported	sq m	per sq m	% sq ft

Plastering, Pointing and Finishing —

(1) Plastering - Cement mortar, Lime mortar, mud etc.	sq m	per sq m	% sq ft
(2) Pointing - struck, Flush, Weathen, etc.	sq m	per sq m	% sq ft
(3) Dado -	sq m	per sq m	% sq ft
(4) Skirting	metre	per m	per m ft
(5) Cement mortar or Lime mortar rubbing	sq m	per sq m	% sq ft
(6) White washing, Colour washing, Cement washing	sq m	per sq m	% sq ft
(7) Distempering	sq m	per sq m	% sq ft
(8) Snow Cement washing or finishing	sq m	per sq m	% sq ft

(9) Painting, Varnishing	sq m	per sq m	% sq ft
(10) Polishing of wood work	sq m	per sq m	% sq. ft
(11) Painting letters and figures	no.	per no.	per no.
(12) Oiling and cleaning of doors & windows	sq. m	per sq m.	% sq ft
(13) Coal tarring	sq m	per sq m	% sq ft
(14) Removing of paint or varnish	sq m	per sq m	% sq ft
(15) Gobri Lepping	sqm	per sq m	% sq ft

Flooring –

(1) 2.5 cm (1") C.C. over 7.5 cm (3") L.C. Floor (including L.C.)	sq m	per sq m	% sq ft
(2) Conglomercate floor, artificial patent stone floor 2.5 cm (1") C.C. over 7.5 cm (3") L.C.	sq m	per sq m	% sq ft
(3) 4 cm (1½") thick stone flag stone floor over 7.5 cm (3") L.C.	sq m	per sq m	% sq ft
(4) 2.5 cm (1") marble flooring over 7.5 cm (3") L.C.	sq m	per sq m	per sq ft
(5) Mosaic or terrazo or granolithic floor over 7.5 cm (3") L.C.	sq m	per sq m.	per sq ft
(6) Brick flat floor over 7.5 cm (3") L.C.	sq m	per sq m	% sq ft
(7) Brick on edge floor over 7.5 cm (3") L.C.	sq m	per sq m	% sq ft
(8) 2.5 cm (1") or 4 cm (1½") C.C., floor	sq m	per sq m	% sq ft
(9) Mud flooring finished gobri lepping	sq m	per sq m	% sq ft
(10) Apron or Plinth protection	sq m	per sq m	% sq ft

(11) Door and window sill	sq m	per sq m.	%
Miscellaneous Items –			
(1) Ornamental cornice (projection, type specified)	metre	per m	
(2) Moulding String course, Drip course, Beading, Throating, etc.	metre	per m	
(3) Ornamental pillar caps, pillar base, Flowers, Brackets, etc.	no.	per no.	
(4) Railing (Height & type specified)	metre	per m	
(5) Surface drain small	metre	per m	
(6) Surface drain large – (item wise)	cu m	per cum	%
(i) Masonry			
(ii) Plastering	sq m	per sq m	%
(7) Pipe – rainwater, sanitary, water pipe, etc.	metre	per m	
(8) Laying pipe line – sanitary, water pipe, etc.	metre	per m	
(9) Jungle clearance (May also be per km for road and irrigation channel)	sq m or hectare	per sqm or per acre	%
(10) Silt clearance in irrigation channels (similar to earthwork) (For thin layer upto 5cm may be on area basis)	cu m	per cum	%
(11) Trestle, Crate etc.	no.	per no	
(12) Cleaning flues	no.	per no	
(13) Cotton cords in sky light	no.	per no	
(14) Easing doors & windows	no.	per no	
(15) Fixing doors & windows	no.	per no	
(16) Supply and fixing of Hinges, Tower bolts, Hasp and staples Handles, Hardwares, etc.	no.	per no	

(17) Glazing	sq m	per sq m.	per sq. ft
(18) Glass panes	sq m	per sq m.	per sq ft
(19) Fixing of glass panes on cleaning	no.	per no.	per no.
(20) Renewing of glass panes	no.	per no.	per no
(21) Well sinking (masonry or tubewell)	metre	per m.	per m ft
(22) Pile driving or sinking	metre	per m	per m ft
(23) furnitures chairs, tables, etc.	no.	per no	per no.
(24) Painting furnitures	no	per no	per no.
(25) Caning chairs	no	per no	per no
(26) Pitching of brick, stone, kankar, etc.	cu m	per cum	% cuft
(27) Lining of Irrigation channel, Tunnel, etc. Materials, thickness specified	sq m	per sq m	% sq ft
(28) kankar quarrying, kankar supply	cu m	per cum.	% cuft
(29) kankar consolidation, road metal consolidation	cu m	per cum	% cuft
(30) Dag-belling	metre	per m	% m ft
(31) Bituminous road surfacing	sq m	per sq m	% sq ft
(32) Dismantling	same as for Different items	Same as for different items	Same as for diff items
(33) Dismantling of brickmasonry	cu m	per cum	% cuft
(34) Grouting (Bituminous grouting of road metal, Cement grouting of concrete)	sq m	per sq m	% sq ft
(35) Grouting of cracks, joints, etc.	metre	per m	per m ft
(36) Electric Wiring or Electrification. Light, fan, plug points	point	per point	per point
(37) Water closet (W.C.), wash hand basin, Manhole, etc.	no.	per no.	per no

Materials –

(1) Supply of bricks	% nos.	per % nos.	% nos.
(2) Supply of sand, surkhi, Cinder, etc.	cum	per cum	% cum
(3) Supply of cement	bag of 50 kg	per bag or per quintal or per tonne	per cum or per ton
(4) Supply of lime unslaked	quintal	per q	per mau
(5) Supply of lime slaked	quintal	per q	per mau
(6) Supply of Brick ballast, stone ballast, Aggregate, etc.	cum	per cum	% cu
(7) Broken bricks, kankar, etc.	cum	per cum	% cu
(8) Supply of Timber	cum	per cum	% cu
(9) Supply of steel	quintal	per q	per cu
(10) Supply of Bitumen, Tar	tonne	per ton	per to
(11) Supply of coal	tonne	per ton	per ton
(12) Supply of A.C. sheets	sq m	per sq m	sq ft
(13) Supply of G.I sheet	quintal	per q	per cwt
(14) Supply of switches, plugs, ceiling roses, bulbs, brackets, etc.	no.	per no.	per no.
(15) Supply of insulated electric wire	quintal	per q	per cwt
(16) Supply of bare electric wire	quintal	per q	per cwt
(17) Tents, sholdaries	no.	per no.	per no.
(18) Supply of water closet, W.C.	no.	per no.	per no
(19) Supply of Wash hand basin	no.	per no.	per no
(20) Supply of cowl, Mica valve, Intercepting trap, etc.	no.	per no.	per no

(21) Supply of Bib cock, Stop cock, Ball cock, etc.	no.	per no.	per no.
(22) Supply of ferrule, C.I. Tank, Water meter, etc.	no.	per no.	per no.
(23) Supply of pipe, C.I. pipe, S.W. pipe, Hume pipe, A.C. pipe, G.I. pipe etc.	metre	per m.	per rft
(24) Supply of lead, lead wool	kg or quintal	per kg or per q	per cwt
(25) Spun yarn	kg	per kg	per lb
(26) Supply of varnish, oil etc.	litre	per litre	per gl
(27) Supply of paint ready mix	litre	per litre	per gl
(28) Supply of stiff paint	kg	per kg	per lb
(29) Explosive for blasting	kg	per kg	per lb

Method of estimating -

(1) Estimate

(2) Actual cost

(3) Detailed estimate

(a) Details of measurement & Calculation of quantities

Details of measurement form:-

Item No.	Particulars	No.	Length	B	H/D	Quantity L×B×H

(b) Abstract of estimate cost

Item No.	Particulars	Quty	Unit	Rate	Amount

Main item of work -

1. Earth-work
2. Concrete in foundation
3. Soling
4. D.P.C (Damp proof course)
5. Masonry (Deduction for opening, bearing etc)
6. Arch masonry work
7. Lintel over opening
8. RCC work
9. Flooring & Roofing
10. Plastering & pointing
11. Corenice
12. Pillars
13. Door, window (Door frame, Door shutter)
14. Wood work
15. Iron work
16. White washing or colour washing or distempering
17. Painting

Q) Estimate the quantities of brick work and plastering required in a wall 4m Long 3m height and thickness 30cm. Calculate the cost if the rate of brick work is Rs 320/- per ~~cu~~ m^3. and plastering is 8.50 per sq. m.

L = 4m

H = 3m

B = 30cm = 0.3 m

Quantity = $4 \times 3 \times 0.3 = 3.6\ m^3$

~~Total~~ Rs = $3.6 \times 320 = 1152/-$

Cost of brickwork

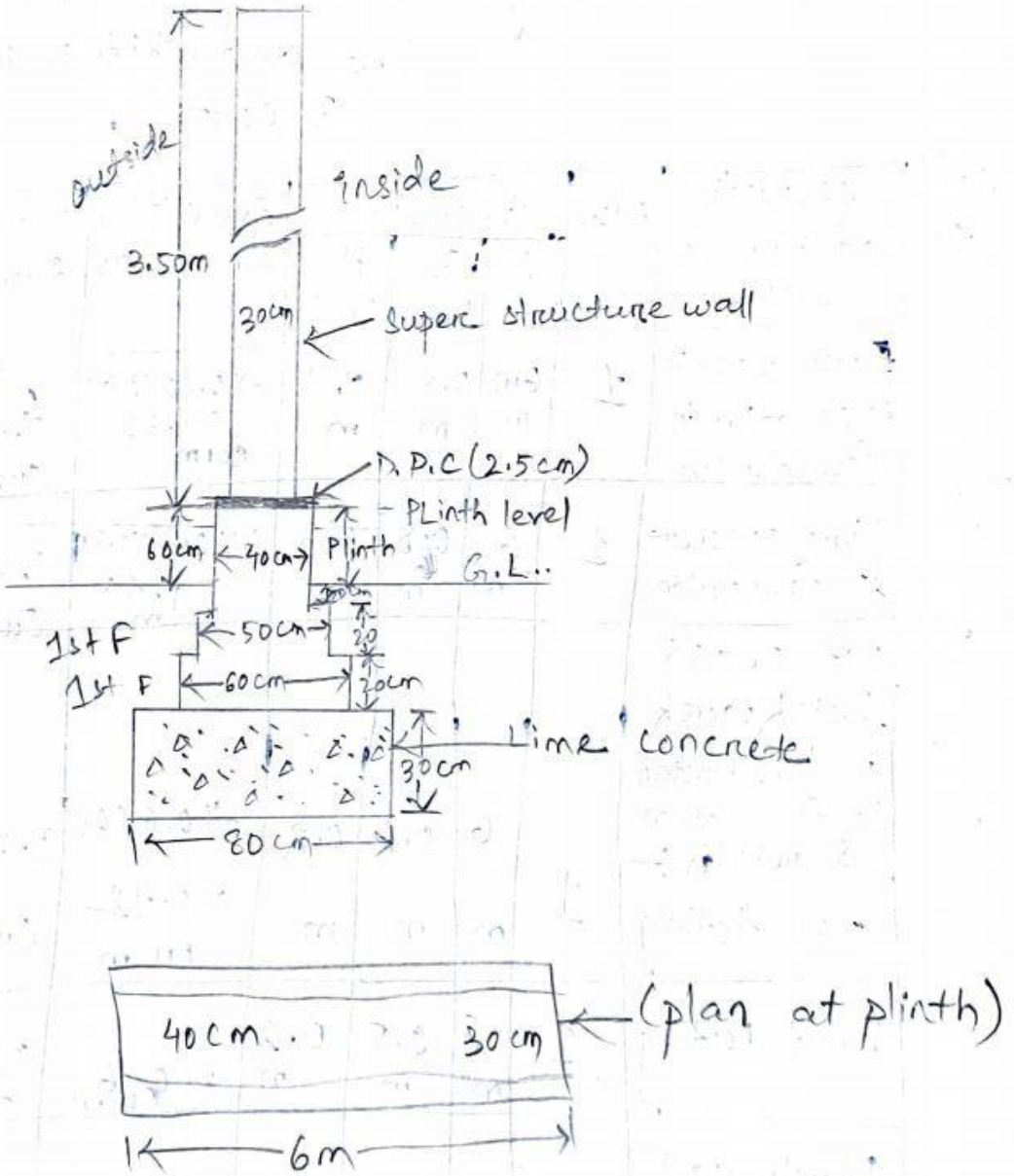
For plastering

$2 \times L \times H = 2 \times 4 \times 3 = 24$ sq m.

Cost of plastering $= 24 \times 8.50 = 204/-$

Total cost $= 1152 + 204 = 1356/-$

2. Prepare a detailed estimate of part of a wall of a building from the given plan & section & general specification.



Specification :—

(1) Foundation concrete shall be of lime concrete

(2) foundation and plinth shall be of 1st class brick work in lime mortar.

(3) D.P.C – 2.5 cm (C.C)
1 : 1½ : 3

(4) Super structure – 1st class brick work in lime mortar

(5) Wall finishing — Inside wall 12 mm 1:6 and white washed 3 coats.

Item No.	Description of item of work	No.	Dimensions L (m)	B (m)	H (m)	Quantities or contents	Total Quantities
1	Earth work in excavation in foundation	1	6 m	0.8 m	0.9 m	6×0.80×0.9×1 = 4.32 cum	4.32 Cum
2	Lime concrete in foundation	1	6 m	0.8 m	0.3 m	6×0.8×0.3×1 = 1.44 cum	1.44 Cum
3	1st class brick work in lime mortar in foundation & plinth :— 1st footing	1	6 m	0.6 m	0.2 m	6×0.6×0.2 = 0.72 cu m	0.72 Cum
	2nd footing	1	6 m	0.5 m	0.2 m	= 0.6 cu m	0.6 cum
	Plinth wall upto ground level	1	6 m	0.4 m	0.2 m	= 0.48 cu m	0.48 cum

	above ground level	1	6 m	0.4 m	0.6 m	1.44 cu m	0.72 ~~+6+0.4~~ +1.44 =3.24 cum
4	D.P.C. (2.5cm)	1	6 m	0.4m		6X 0.4 =2.4 sq m	2.4 sq m
5	(For Super structure) 1st class brick work in lime mortar.	1	6m	0.3m	3.5m	6X0.3X3.5 =6.3 cu m	6.3 cum
6	~~Plaster~~ 12mm plaster of cement sand 1:6						
	→Inside	1	6m	—	3.5m	6X3.5 =21 sq m	21+25.2 =46.2 sq m
	→Out side including 10 cm below G.L	1	6m	—	4.2m	6X4.2 =25.2 sq m	
7	white washing 3 coats (inside)	1	6 m	—	4.2 m	6X4.2 =25.2 sq m	25.2
8	colour washing 2 coats over one coat of white washing outside whole G.L	1	6 m	—	4.1 (3.5 +6) m	6X4.1 =24.6 sq m/m²	24.6

Abstract of Estimated cost

Item No.	Description of item of work	Quantity	Unit	Rate Rs	Per	Amount Rs
1	Earthwork in excavation in foundation	4.32	Cum	350.00	% cum	15.12
2	Lime concrete in foundation	1.44	Cum	220.00	per cum	3,16.8
3	1st class brick work in lime mortar in foundation & Plinth	3.24	Cum	300.00	per cum	9,72
4	D.P.C.(2.5cm)	2.4	Sq m	20.00	per sq m	48
5	1st class brickwork in lime mortar (for superstructure)	6.3	Cu.m	320.00	per cu m	20,16
6	12mm plaster of cement sand 1:6	46.2	sq m	8.50	per sq m	3,92.7
7	whitewashing 3 coats	25.2	sq m	0.75	per sq m	18.9
8	Colour washing 2 coats over one coat	24.6	sq m	0.82	Per sq m	20.172
				Total	=	3749.692
				Add for contingencies	3% =	113.99
				Add for workcharged Establishment	2% =	75.99
						3989.672

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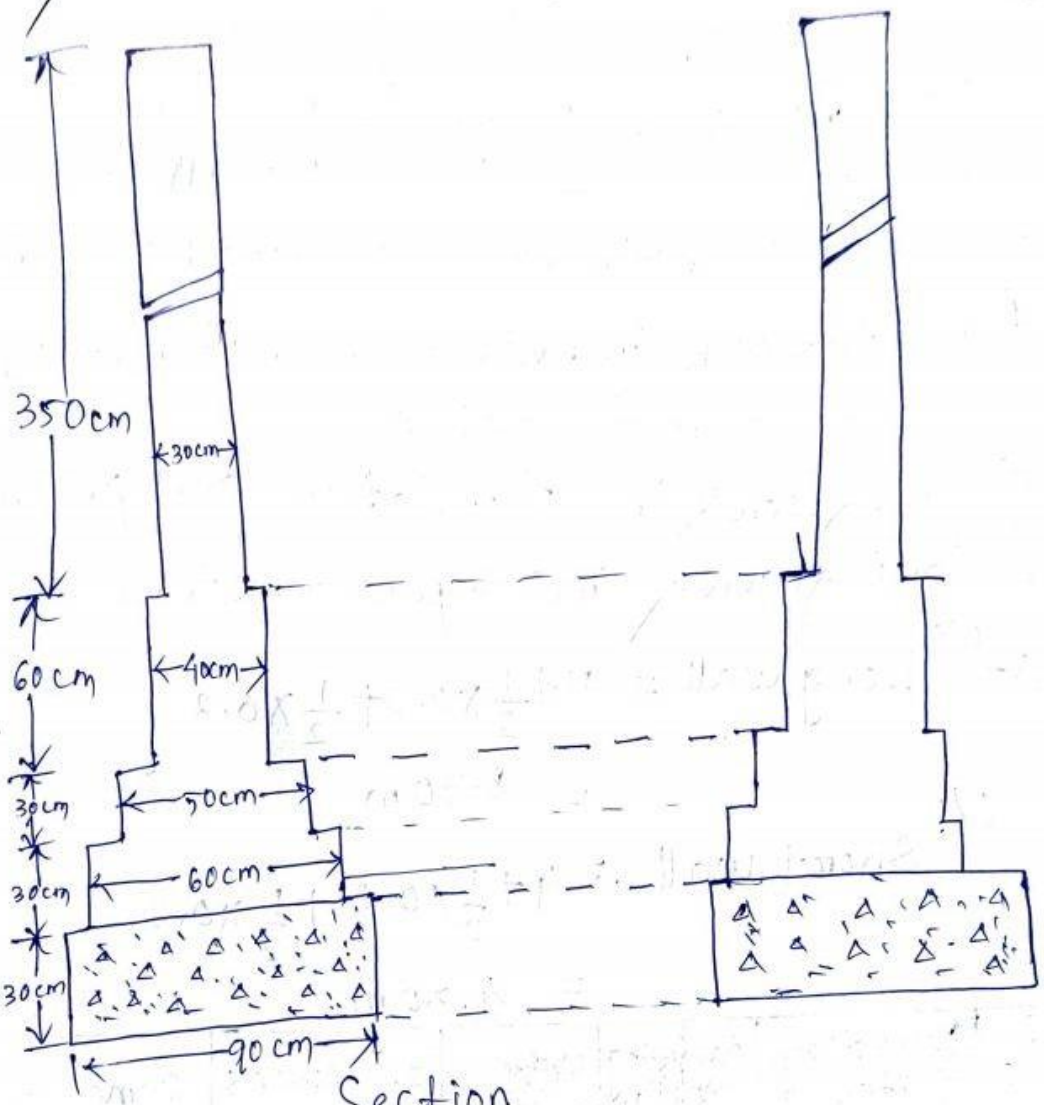

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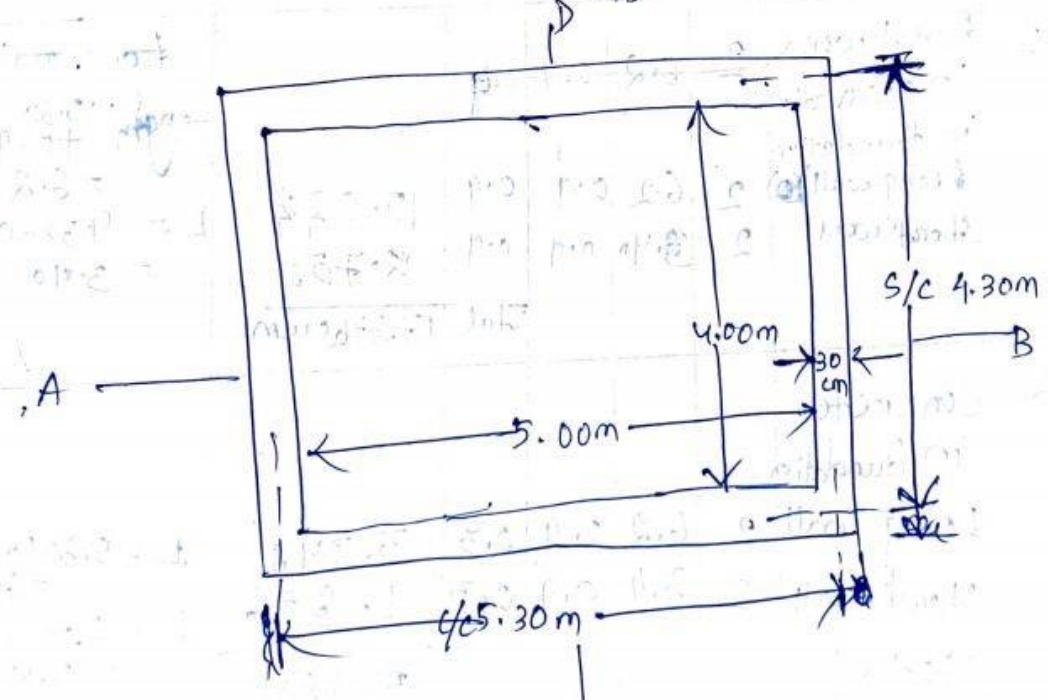


Plan of super structure wall

The plan of super structure wall of single room building of room size 5m X4m and section represent the cross section of the wall with foundation. Estimate the quantities of

(I) Earthwork in excavation in foundation
(II) Concrete in foundation
(III) Brickwork in foundation and plinth
(IV) Brickwork in super structure

Ans- c/c Long wall = $5+\frac{1}{2}\times0.3+\frac{1}{2}\times0.3$

$= 5.30\,m$

c/c Short wall $= 4+\frac{1}{2}\times0.3+\frac{1}{2}\times0.3$

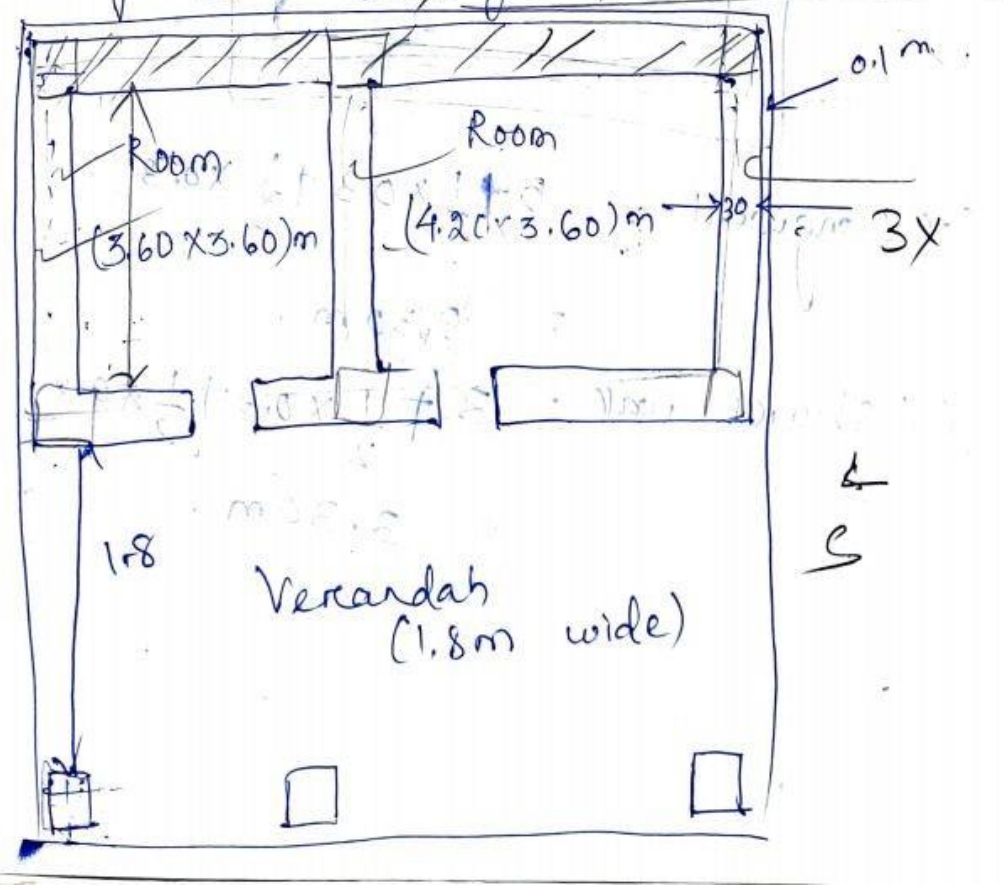
$= 4.30\,m$

Item No.	Description of item of work	~~Quantity~~ No	Dimensions L	B	H	Quantities	Remark
1	Earthwork in excavation in foundation	~~2~~	~~6.2~~	~~0.9~~	~~0.9~~		~~Long wall~~ Length: 5.30 +0.9 =6.2
	Long wall	2	6.2	0.9	0.9	10.044	L = 4.30-0.9 = 3.40
	Short wall	2	3.40	0.9	0.9	5.508	
					Total	15.552 cum	
	Concrete in foundation						
	Long wall	2	6.2	0.9	0.3	3.348	L = 5.30+0.9 =6.2
	Short wall	2	3.4	0.9	0.3	1.836	L = 4.30-0.9 = 3.4
	Total					5.184 cu m	

3	Brickwork in foundation & Plinth – Long wall						
	1st footing	2	5.9	0.6	0.3	2.124	L = 5.3+0.6 = 5.9
		2	5.8	0.5	0.3	1.74	L = 5.3+0.5 = 5.8
		2	5.7	0.4	0.6	2.736	L = 5.3+0.4 = 5.7
	Shorest wall						
		2	3.7	0.6	0.3	1.332	L = 4.3-0.6 = 3.7
		2	3.8	0.5	0.3	1.14	L = 4.3-0.5 = 3.8
		2	3.9	0.4	0.6	1.872	L = 4.3-0.4 = 3.9
					Total	10.944 cu m	
4	Brickwork in superstructure						
	Longwalls.	2	5.6	0.3	3.5	11.76	L = 5.3+0.3 = 5.6
	Short walls	2	4.0	0.3	3.5	8.4	L = 4.3-0.3 = 4.0
					Total	20.16 cu m	

Pb-1

Calculate the plinth area of the building in the diagram. 3.6+.4.20 + 3x.60



Long wall = 3.60 + 4.20 + 3(0.3)

= 8.7 m

short wall = 3.60 + 2(0.3)

= 4.2 m

~~Plinth area = 8.7 X 6.0~~ L = 0.1 + 0.3 + 3.6 + 0.3 + 4.20 + 0.3 + 0.1

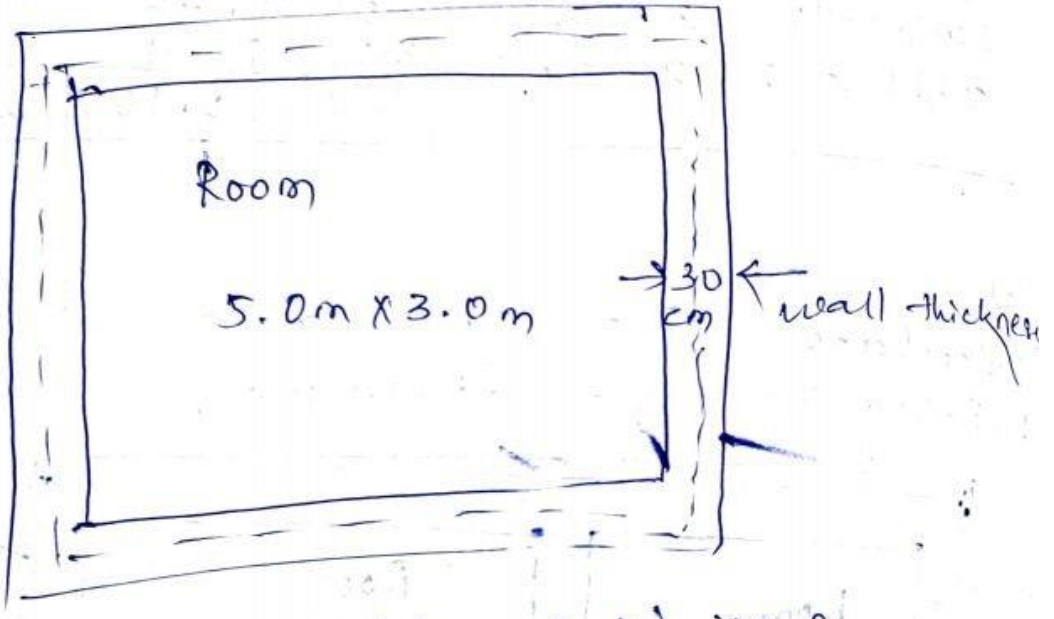
= 8.9 m

~~= 52.2 m²~~

Plinth area

Total A (LXB) = ~~52.2~~ 37.55 sq m. B = 0.1 + 0.3 + 3.6 + 0.3 + 1.8 + 0.3 + 0.1 = 6.7

Pr.2 In a room of size 5.0 X 3.0 m with wall thickness 30 cm, calculate the length of long wall & shoretwall for construction of manwork.

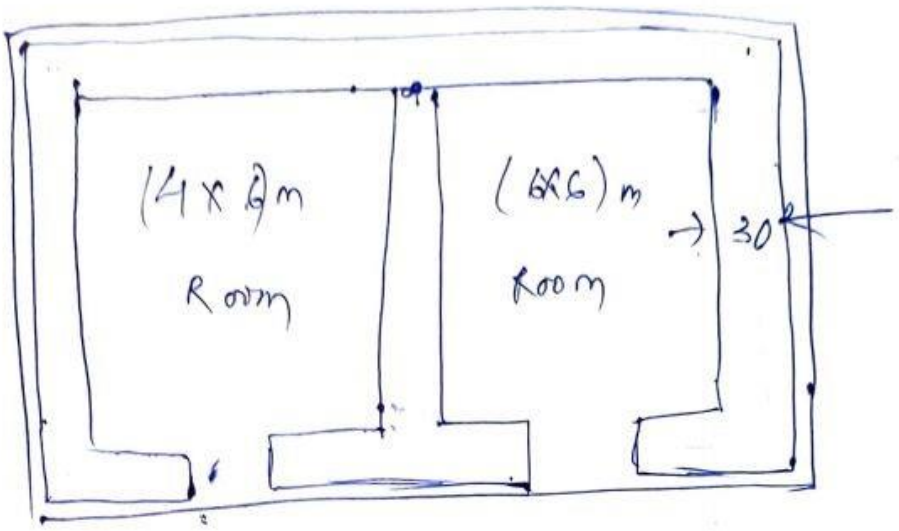


C-C Longwall = $5 + \frac{1}{2} \times 0.3 + \frac{1}{2} \times 0.3$

= 5.30 m.

C-C short wall = $3 + \frac{1}{2} \times 0.3 + \frac{1}{2} \times 0.3$

= 3.30 m.

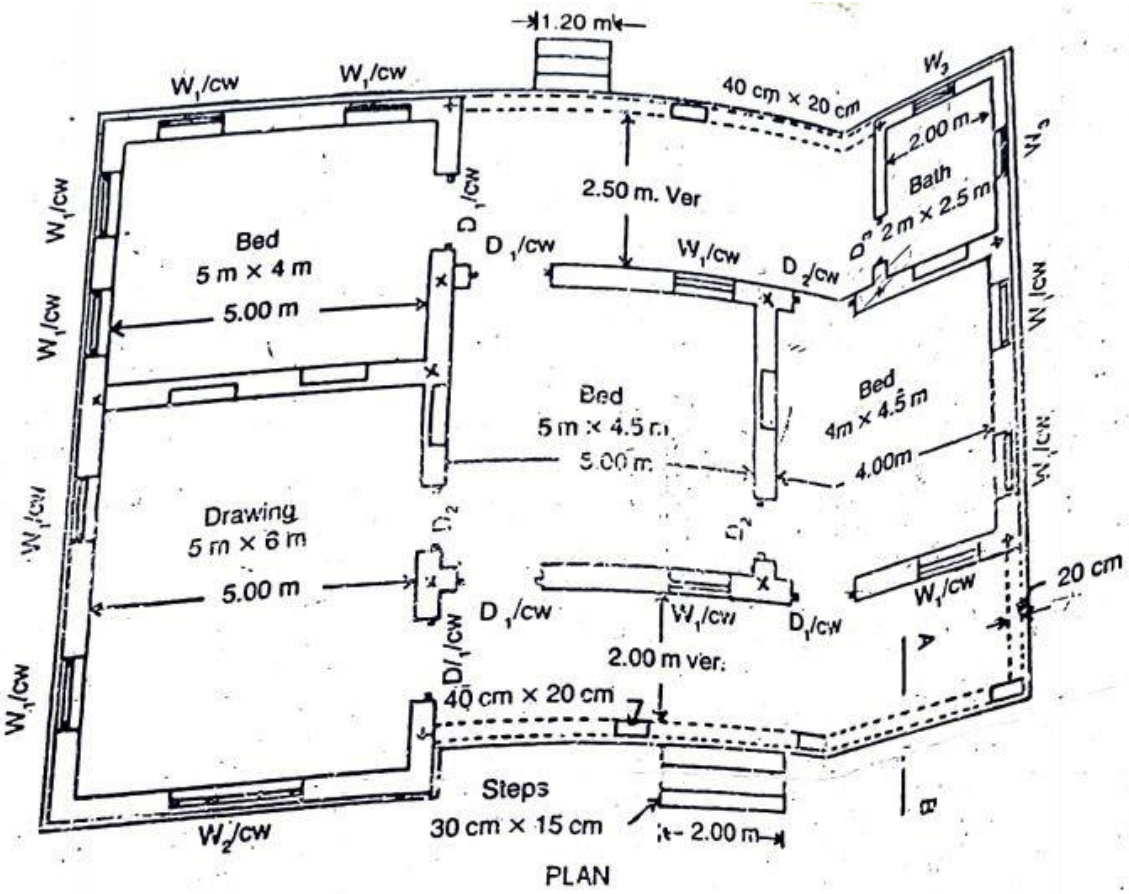


c/c Long wall = $4 + 6 + 2\left(\frac{0.3}{2}\right) + 0.3$

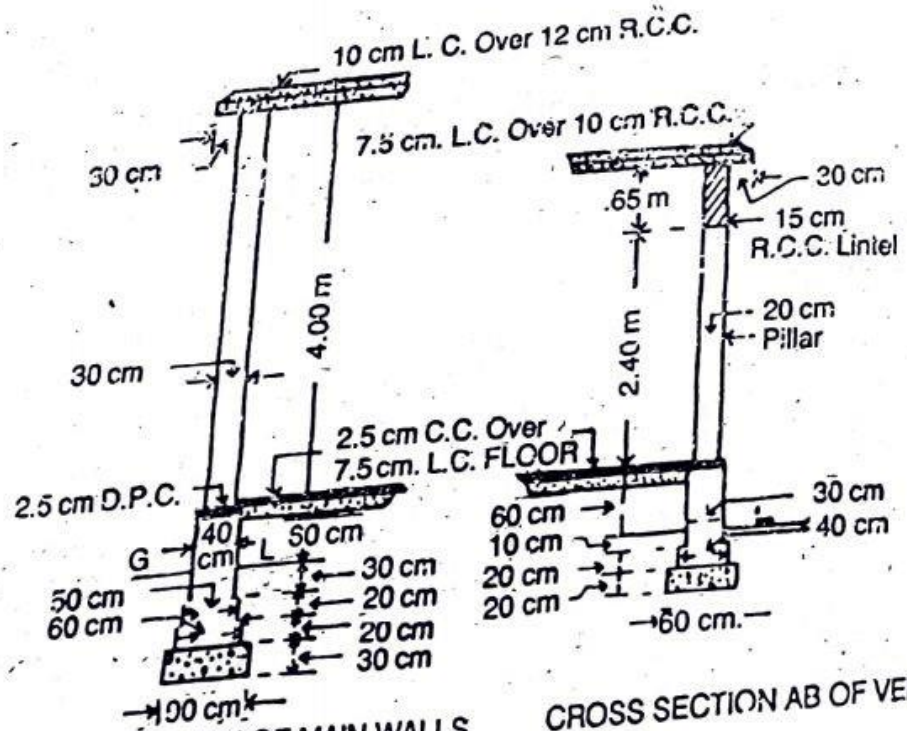
$= 10.6\text{m}$

c/c Short wall $= 6 + 2\left(\frac{0.3}{2}\right)$

$= 6.30\text{m}$.



PLAN



CROSS SECTION OF MAIN WALLS

CROSS SECTION AB OF VER.WALL

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.

Fig. 2-7

Note—No beam has been shown in the plan.

) Estimate the quantities of the following items of a residential building from the given drawings

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

Ans- Drawing and left hand side bed room combined :-

C.to C. Long walls = $6+4+0.3+2\times\frac{0.3}{2}$

= 10.60 m

C.to.C. Short walls = $5+2\times\frac{0.3}{2}$ = 5.30.

Bed room right side (both combined)

C. to C. Long wall = $5+4+0.3+2\times\frac{(0.3)}{2}$

= 9.60 m.

C. to C. short wall = $4.5+2\times\frac{0.3}{2}$ = 4.80

Front verandah :-

Front wall c.to.c. length = $5+4+2\times0.3+\frac{0.3}{2}-\frac{0.2}{2}$

= 9.65 m.

Side wall c.to.c. length = $2+\frac{0.3}{2}+\frac{0.2}{2}$

= 2.25 m.

Back verandah including bath room -

c. to c. long wall $= 5 + 4 + 2 \times 0.3 + \frac{0.3}{2} - \frac{0.2}{2}$

$5 + 4 + 0.3 + \frac{0.3}{2} + 0.4 + \frac{0.2}{2} = 9.65$ m.

c. to c. length of side wall of bath room $= 2.5 + \frac{0.3}{2} + \frac{0.2}{2} = 2.75$ m.

Item No.	Particulars of Items	No.	L	B	H	Quantity	Remarks
1	Earthwork in excavation in foundation						
	Drawing room & Left bed room —						
	Long walls	2	11.5	0.9	1.0	20.70 cu m	L = 10.6 + 0.9 = 11.5
	Short walls -	3	4.4	0.9	1.0	11.88 cu m	L = 5.3 - 0.9 = 4.4
	Bed rooms (right side (both) —						
	Long walls	2	9.6	0.9	1.0	17.28 cu m	L = 9.6 $\frac{0.9}{2}$ + $\frac{0.9}{2}$ = 9.6 m
	Short walls	3	3.9	0.9	1.0	7.02	L = 4.8 - 0.9 = 3.9
	Front verandah						
	Front long wall	1	9.65	0.6	0.5	2.85	L = 9.65 - $\frac{0.9}{2}$ + $\frac{0.9}{2}$ = 9.6
	side short wall	1	2.25	0.6	0.5	0.45	L = 2.25 - $\frac{0.9}{2}$ + $\frac{0.9}{2}$ = 2.25
	Back verandah including bath room.						
	Long wall (rear wall including bath)	1	9.50	0.6	0.5	2.85	L = 9.65 - $\frac{0.9}{2}$ + $\frac{0.6}{2}$ = 9.5
	short walls (remaining walls of bath)	2	2.00	0.6	0.5	1.20	L = 2.75 - $\frac{0.9}{2}$ - $\frac{0.6}{2}$ = 2
					Total =	64.23 cu m	

2. Line concrete in foundation - Drawing and left bed room

Long walls	2	11.50	0.9	0.3	6.21	L = 10.60 + 0.9 = 11.50 m
Short walls	3	4.40	0.9	0.3	3.56	L = 5.30 − 0.9 = 4.40 m
Bedroom right side (both) -						
Long walls	2	9.60m	0.9 m	0.3	5.18	L = 9.6 − 0.9/2 + 0.9/2 = 9.6 m
Short walls	2	3.90m	0.9 m	0.3	2.11	L = 4.8 − 0.9 = 3.9 m
Front Verandah						
Front Long wall	1	9.7m	0.6m	0.2	1.16	L = 9.65 − 0.5/2 + 0.6/2 = 9.7
Side short wall	1	1.7 m	0.6 m	0.2	0.20	L = 2.25 − 0.5/2 − 0.6/2 = 1.7 m
Back verandah, including bathroom						
Long wall including bath	1	9.7	0.6	0.2	1.16	L = 9.65 − 0.5/2 + 0.6/2 = 9.7m
Short wall (remaining walls of bath)	2	2.2	0.6	0.2	0.53	L = 2.75 − 0.5/2 − 0.60/2 = 2.20
				Total	20.44	

3	1st class brick work in foundation and plinth in 1:6 cement mortar Drawing and left bed room Long walls -							
	1st footing	2	11.20	0.6	0.2	2.69	L = 10.6 + 0.6 = 11.20 m	
	2nd footing	2	11.10	0.5	0.2	2.22	L = 10.60 + 0.5 = 11.10 m	
	Plinth wall above footing	2	11.00	0.4	0.9	7.92	L = 10.6 + 0.4 = 11.00 m	
	Short walls -							
	1st footing	3	4.7	0.6	0.2	1.69	L = 5.30 - 0.6 = 4.70	
	2nd footing	3	4.8	0.5	0.2	1.44	L = 5.30 - 0.5 / 4.70 + 2 x 0.5 = 4.80	
	Plinth wall above footing	3	4.9	0.4	0.9	5.29	L = 5.30 - 0.4 / 4.80 x 0.1 = 4.90 m	
	Bed rooms right side (both) Long walls -							
	1st footing	2	9.6	0.6	0.2	2.31	L = 9.60 - 0.6/2 + 0.6/2 = 9.6 m	
	2nd footing	2	9.6	0.5	0.2	1.92	L = 9.6 - 0.5/2 + 0.5/2 = 9.6 m	
	Plinth wall above footing	2	9.6	0.4	0.9	6.91	L = 9.6 - 0.4/2 + 0.4/2 = 9.6 m	

: Short walls –						
1st footing	2	4.2	0.6	0.2	1.01	L = 4.8 – 0.6 = 4.2
2nd footing	2	4.3	0.5	0.2	0.86	L = 4.8 – 0.5 = 4.3
Plinth wall above footing.	2	4.4	0.4	0.9	3.17	L = 4.8 – 0.4 = 4.4
Front verandah						
· Front wall –						
Footing	1	9.65	0.4	0.2	0.77	L = 9.65 – $\frac{0.4}{2}$ + $\frac{0.4}{2}$ = 9.6
Plinth wall above footing	1	9.60	0.3	0.7	2.02	L = 9.65 – $\frac{0.4}{2}$ + $\frac{0.3}{2}$ = 9.60
Side short wall footing	1	1.85	0.4	0.2	0.15	L = 2.25 – $\frac{0.4}{2}$ – $\frac{0.4}{2}$ = 1.85
Plinth wall above footing	1	1.9	0.3	0.7	0.40	L = 2.25 – $\frac{0.4}{2}$ – $\frac{0.3}{2}$ = 1.90 m

Back verandah including bath room –						
Long wall.						
Footing	1	9.65	0.4	0.2	0.77	$L = 9.65 - \frac{0.4}{2} + \frac{0.4}{2} = 9.65$
Plinth wall above footing	1	9.60	0.3	0.7	2.02	$L = 9.65 - \frac{0.4}{2} + \frac{0.3}{2} = 9.60$
Short walls (remaining walls of bath)						
Footing	2	2.35	0.4	0.2	0.38	$L = 2.75 - \frac{0.4}{2} - \frac{0.4}{2} = 2.35$
Plinthwall above footing	2	2.40	0.3	0.7	1.01	$L = 2.75 - \frac{0.4}{2} - \frac{0.3}{2} = 2.40$
				total =	44.95 cum	
4 2.5 cm Damp proof Course						
Drawing and left bed rooms –						
Long walls	2	11.00	0.4	—	8.80	$L = 10.6 + 0.4 = 11.00$
Short walls	3	4.90	0.4	—	5.88	$L = 5.3 - 0.4 = 4.9$

Bed rooms innerside.

Long walls	2	9.6	0.4	—	7.68
Short walls	2	4.4	0.4	—	3.52
Verandah pillars	4	0.5	0.3	—	0.60
Bathroom —					
Rear wall	1	2.5	0.3	—	0.75
Side and Inter walls	2	2.4	0.3	—	1.44
				Total	28.67 sq m

L = 9.6 − 0.4/2 + 0.4/2 = 9.6

L = 4.2 + 2X0.5 = 4.3

5 cm extra on all sides

L = 2.20 + 2X0.15 = 2.50m

Deduct —

Door sills D_1	6	1.20	0.4	—	2.88
Door sills D_2	2	1.00	0.4	—	0.80
Door sills D_3	1	0.75	0.3	—	0.23
Total deduction					3.91 sq m

Net Total = 24.76

5	1st class brick work in superstructure in lime mortar -					
	Drawing & left bed room -					
	Long walls	2	10.90	0.3	4.00	26.16	L = 10.6 + 0.3 = 10.90 m
	short walls	3	5.00	0.3	4.00	18.00	L = 5.30 - 0.3 = 5.00 m
	Bed room right side					
	Long walls	2	9.6	0.3	4.00	23.04	L = 9.6 - 0.3/2 + 0.3/2 = 9.6
	short walls	2	4.5	0.3	4.00	10.80	L = 4.8 - 0.3 = 4.5
	Front verandah						
	Front wall as solid	1	9.6	0.2	3.05	5.86	L = 9.65 - 0.3/2 + 0.2/2 = 9.1
	side wall as solid	1	2.0	0.2	3.05	1.22	
	Back verandah including bath room:						

Back long wall as as solid.	1	9.6	0.2	3.05	5.86
Side and inter walls of bath	2	2.5	0.2	3.05	3.05
				Total	93.99 cum
Deduct –					
Door openings					
D. openings D_1	6	1.2	0.3	2.1	4.54
D. openings D_2	2	1.00	0.3	2.00	1.20
D. openings D_3	1	0.75	0.2	1.80	0.27
Window openings					
W. opening W_1	11	1.00	0.3	1.50	4.95
W. opening W_2	1	2.00	0.3	1.50	0.90
W. opening W_3	2	0.75	0.2	1.20	0.36
Clerestory window (C.W.) opening	18	0.75	0.3	0.60	2.43
Shelves opening	5	1.00	0.2	1.50	1.50

$L = 9.65 - \frac{0.3}{2} + \frac{0.2}{2} = 9.6\,m$

Front verandah opening between pillars	1	8.40	0.2	2.40	4.03	L = 9.6 − 3x 0.4 = 8.4m
Front verandah opening side	1	2.00	0.2	2.40	0.96	
Back verandah opening side	1	6.80	0.2	2.40	3.26	L = 9.6 − 2.40 − 0.4 = 6.80
Lintels - over door						
D. doors D_1	6	1.50	0.3	0.15	0.405	Bearing 15cm
D- doors D_2	2	1.30	0.3	0.15	0.117	Bearing 15cm
D. doors D_3	1	0.95	0.2	0.15	0.029	Bearing 15cm
Over windows						
W. windows W_1	11	1.30	0.3	0.15	0.644	Bearing 15cm
W. windows W_2	1	2.30	0.3	0.15	0.103	Bearing 15 cm
D. windows W_3	2	0.95	0.2	0.15	0.057	Bearing 10 cm
over C.W.	18	0.95	0.3	0.15	0.770	Bearing 10 cm
Over shelves	5	1.30	0.3	0.15	0.293	Bearing 15 cm
verandah lintels					0.293	L = 9.6 + 0.15 = 9.75
Front	1	9.75	0.2	0.15	0.065	L = 2.00 + 0.15 = 2.15
side	1	2.15	0.2	0.15	0.225	L = 9.6 − 2.40 + 2x0.15 = 7.5
Back	1	7.50	0.2	0.15		
		Total	de duction		27.401 cum	
			Net total		66.59cum	

Schedule of rate or Analysis of rate -

It is a booklet which contains the following
(i) Rate of material
(ii) Royality
(iii) Transportation or conveyance
(iv) Wedges of labourers
(v) Rate of different items
(vi) ~~Inflate~~ Inflation

Analysis of rate -

It is a booklet which contains the following.
(i) The quantity of different item
(ii) Quantity of different materials.
(iii) Different category of labour involve in the work
(iv) Water charges (1½ %)
(v) Tools and plans work charge establishment
(vi) Contractors profit - (10 - 15%)

> What do you mean by task or outturn

The capacity of wing wall by a skilled labourcien in the form of quantity of work per day is known as task or out turn of that labour.

The outturn may varies up to ~~of~~ extent according to the nature, size of work situation, location etc.

→ What is the minimum lead and lift.

For the calculation of earthwork in a road or building or balast work in railway the quantity is estimated in the form of lead & lift. A length of 30m. is called as lead. A depth of 1.5 m is called as lift.

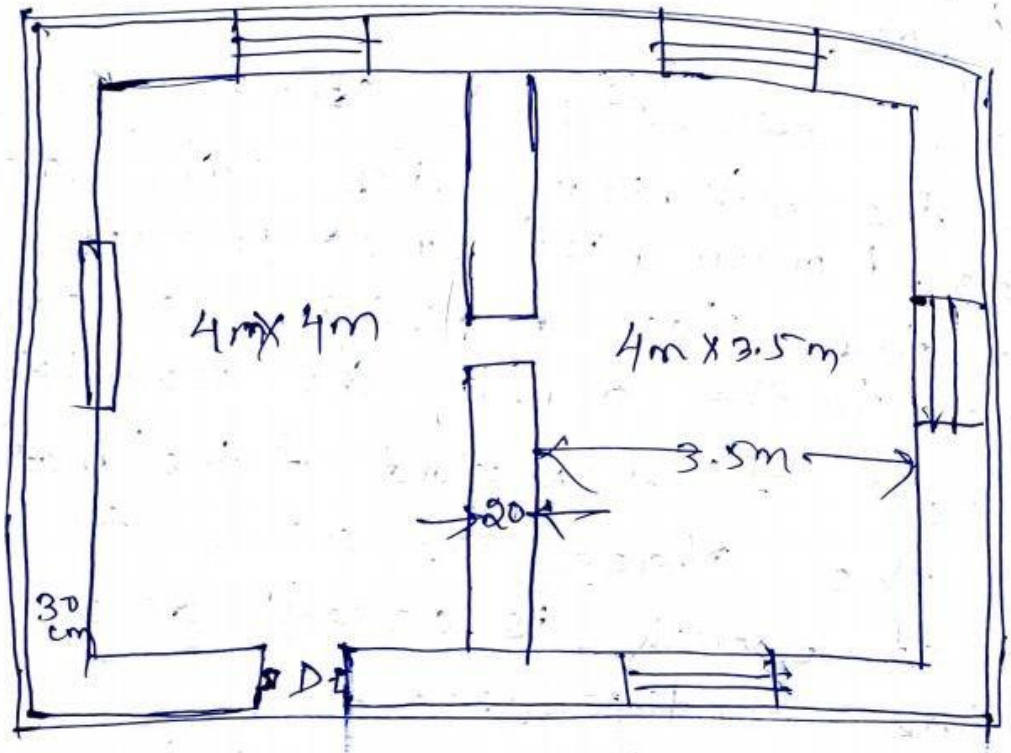
→ Define Royality & conveyance.

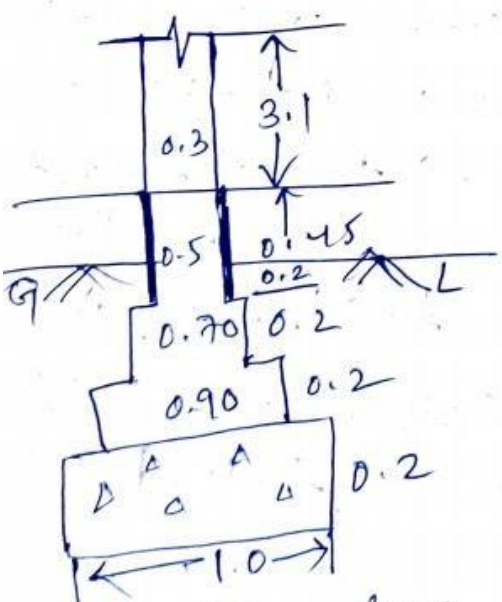
When the materials like sand, aggregate stones, Morum, soil are procured from the place of origin a cost is given to the owner as royality. The cost of transport of the material from the place of origin to the site of work is called as conveyance.

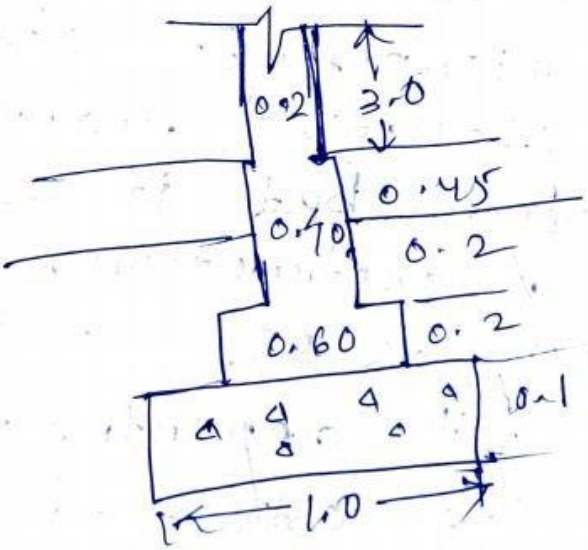
→ Define contigencies

It is defined as incidental expanses of miscellaneous character which can't be classified under any particular surveyor but it added to the cost of construction. It is generally taken as 5% of the estimated cost in P.W.D department, Odisha and 3% of the estimated cost C.P.W.D, Odisha

(1) Earthwork in excavation
(2) Lime concrete in foundation
(3) 2nd class brick masonry 1:6 in foundation
(4) 2.5 cm thick DPC cement concrete (1:2
(5) 1st class brick masonry (1:3) cement mortar in superstructure.







C/C long wall = $0.15 + 4 + 0.2 + 3.5 + \frac{0.15}{8} = 8$

C/C short wall = $4 + 2 \times \frac{0.3}{2} = 4.3$

Sl No.	Description or Item Name	NO	L	B.	H	Quantity	Remark
1	Earthwork in excavation in foundation						
	30 cm wall						
	Long wall	2	9	1.0	0.8		$L = 8 + 2 \times \frac{1.0}{2} = 9$
	Short wall	2	3.3	1.0	0.8		$L = 4.3 - 2 \times \frac{1.0}{2} = 3.3$
	20 cm wall						
	Short wall	1	3.3	1.0	0.5		$L = 4.3 - 2 \times \frac{1.0}{2} = 3.$
2	Line concrete in foundation 30 cm wall						
	Long wall	2	9	1.0	0.2		
	Short wall	2	3.3	1.0	0.2		
	20 cm wall						
	Short wall	1	3.3	1.0	0.1		

3 2nd class brickwork masonary 1:6 in foundation

Long wall					
1st footing	2	8.9	0.9	0.2	L = 8 + 0.9 = 8.9
2nd footing	2	8.7	0.7	0.2	L = 8 + 0.7 = 8.7
3rd footing with plinth	2	8.5	0.5	0.65	L = 8 + 0.5 = 8.5
Short wall					
1st footing	2	3.4	0.9	0.2	L = 4.3 − 0.9 = 3.4
2nd footing	2	3.6	0.7	0.2	L = 4.3 − 0.7 = 3.6
3rd footing with plinth	2	3.8	0.5	0.65	L = 4.3 − 0.5 = 3.8
20 cm wall					
Short wall					
1st footing	1	3.4	0.6	0.2	L = 4.3 − 0.9 = 3.4
2nd footing	1	3.6	0.4	0.2	L = 4.3 − 0.7 = 3.6
~~3rd footing with plinth~~					

4	DPC	30 cm							
		Long wall	2	8.5	0.5	–	8.5	L = 8 + 0.5 = 8.5	
		short wall	2	3.8	0.5	–	3.8	L = 4.3 − 0.5 = 3.8	
		20 cm							
		short wall	1	3.9	0.4	–	1.56	L = 4.3 − 0.4 = 3.9	
						Total			
		Deduct				–	0.72		
		Door	2	1.2	0.3	1			
						Total			
5	1st class brickwork in								
	super structure 30 cm wall								
		Long wall	2	8.3	0.3	3.1		L = 8 + 0.3 = 8.3	
		short wall	2	4.0	0.3	3.1		L = 4.3 − 0.3 = 4.0	
		20 cm wall							
		short wall	1	4.1	0.2	3.0		L = 4.3 − 0.2 = 4.1	
		Deduction							
		Door							
		30 cm wall	1	1.2	0.3	2.1			
		20 cm wall	1	1.2	0.2	2.1			

Window					
Cobboard	4	1.1	0.3	1.3	
	1	1.5	0.2	1.2	
Lintel					
Door (1)	1	1.5	0.3	0.1	$L = 1.2 + 0.15 + 0.15$
Door (2)	1	1.5	0.2	0.1	$= 1.5$
window	4	1.4	0.3	0.1	
Cobboard					

* What is work charge ?

During the construction of a big work or big project of a building or a road, no of skilled supervison, moulds, chowkidar etc are employed to help the existing staff & they are called as work charged establishment. For their salarey & amount of 2% is provided based on estimated cost.

* What is the meaning of tools plants & sundries (T,P & sundries)

T & P are known as tools & plants. For the smooth execution of the work there is provision for the hear of the masonaries from the out side. The masonaries are concrete mixture, Vibreator, roller, transporting pan etc. It is taken as 2% estimated cost are provided.

Sundries is defined as the provision which is made to meet the cost of tools & plants.

Analysis of rates.

Is determination of rate per unit of a particular item of work, the cost of quantity of material, cost of labour and other miscellaneous work required for its completion is known as analysis of rates.

A reasonable profit usually 10% for the contractor is also included in the analysis of rate.

Rate of Labour —

1. Head Mason
2. Mason
3. Mazdoor
4. Cookie
5. Bhisti (watermen)

1. Unskilled
2. skilled
3. Semiskilled
4. High skilled

Administrative approval

For any work or project required by a department an approval or sanction of the compitant authority of the department. The approval authorities the engineering department to take off the work. Arithmatic approvals denote the formal acceptance by the department concerned of the proposal and after the administative approval is give the engineering department to take off the work and execute the work.

Estimate the quantity of the following item

(1) Earthwork in excavation in foundation
(2) Lime concrete in foundation
(3) 1st class brickwork in foundation in plinth.
(4) Damp proof course.
(5) 1st class brick work in superstructure including parapet.
(6) RCC work in Roofwork sunset, lintel.
(7) Steel Reinforcement bar in RCC work.

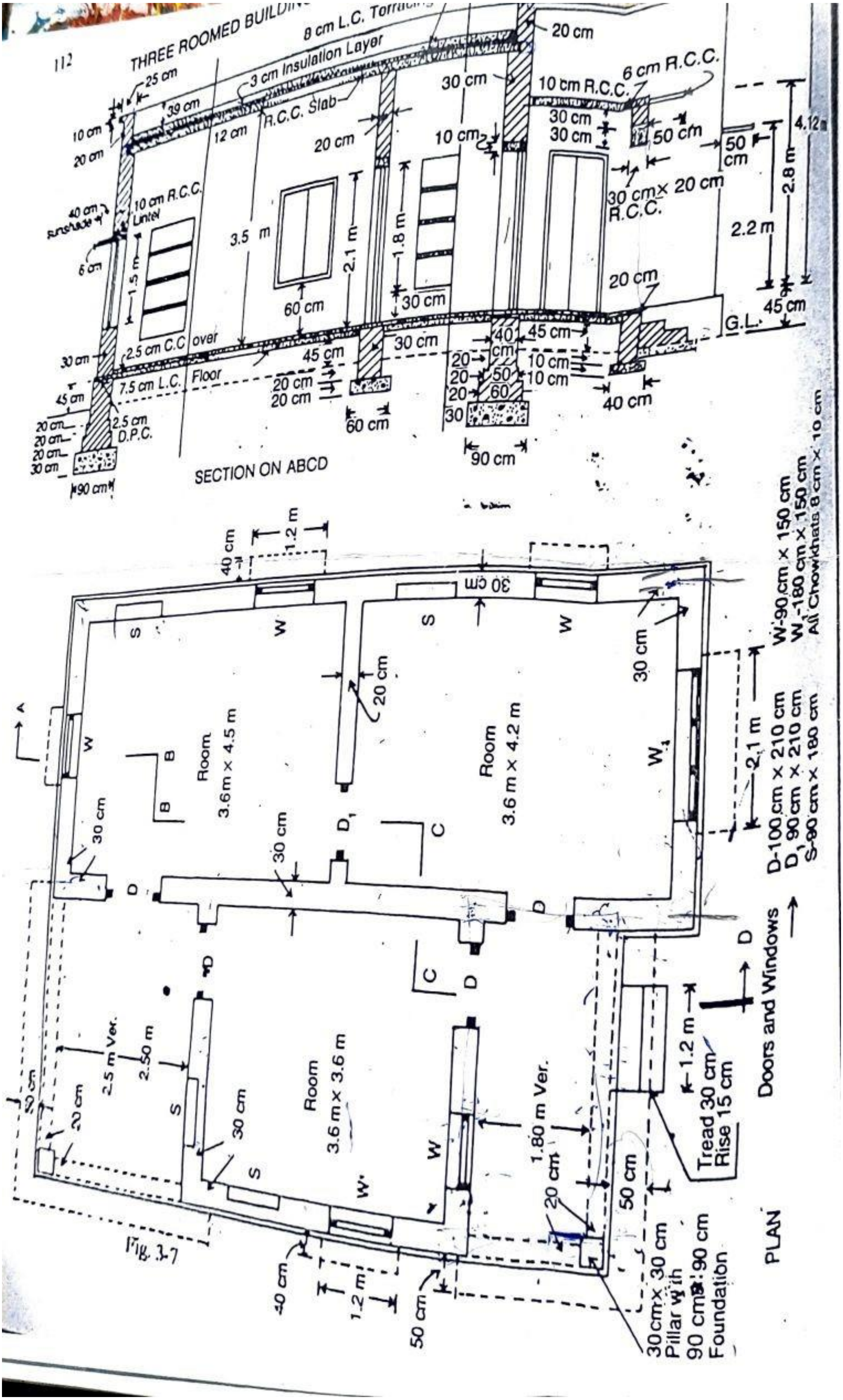
c/c longwall for top two rooms

$= 4.5 + 4.2 + 0.2 + 2 \times \frac{(0.3)}{2}$

$= 9.2$

Short wall $= 3.6 + 2\left(\frac{0.3}{2}\right)$

$= 3.9$


112
THREE ROOMED BUILDING
8 cm L.C. Terracing
3 cm Insulation Layer
R.C.C. Slab
10 cm R.C.C. Lintel
40 cm sunshade
2.5 cm C.C over
7.5 cm L.C. Floor
2.5 cm D.P.C.
10 cm R.C.C.
6 cm R.C.C.
30 cm× 20 cm R.C.C.
G.L.
SECTION ON ABCD
Room 3.6 m × 4.5 m
Room 3.6 m × 4.2 m
Room 3.6 m× 3.6 m
2.5 m Ver.
1.80 m Ver.
Tread 30 cm
Rise 15 cm
30 cm× 30 cm Pillar with 90 cm × 90 cm Foundation
D-100 cm × 210 cm
D1 90 cm × 210 cm
S-90 cm × 180 cm
W-90 cm × 150 cm
W1-180 cm × 150 cm
All Chowkhats 8 cm × 10 cm
Doors and Windows
PLAN
Fig. 3.7

Square room -

C/C Long wall = $3.6 + 2\left(\frac{0.3}{2}\right) = 3.9$

C/C Short wall = $3.6 + 2\left(\frac{0.3}{2}\right) = 3.9$

Front verandah -

Long wall = $3.6 + \frac{0.2}{2} + \frac{0.3}{2} + (0.3 - 0.2) = 3.95$

Short wall = $1.8 + \frac{0.3}{2} + \frac{0.2}{2} = 2.05$

Back verandah -

Long wall = $3.6 + (0.3 - 0.2) + \frac{0.3}{2} + \frac{0.2}{2}$

$= 3.95$

short wall = $2.5 + \frac{0.3}{2} + \frac{0.2}{2}$

$= 2.5 + 0.15 + 0.1$

$= 2.75$

Item No.	Description or Item Name	No	L	B	H	Quantity	Remark
1	Earthwork in excavation in foundation						
	two rooms combined						
	Long walls	2	10.1	0.9	0.9	16.362	L = 9.2+0.9 = 10.1
	Short walls	2	3.0	0.9	0.9	4.86	L = 3.9 − 0.9 = 3.0
	Infen 20cm wall	1	3.0	0.6	0.4	0.72	L = 3.9 − 0.9 = 3.0
	Square rooms						
	Long walls	1	4.8	0.9	0.9	3.888	L = 3.9+0.9 = 4.8
	short walls	2	3.0	0.9	0.9	4.86	L = 3.9 − 0.9 = 3.0
	verandah pillars	2	0.9	0.9	0.9	1.458	
	front Long wall	2	3.05	0.4	0.2	0.488	L = 3.95 − 0.9/2 − 0.9/2 = 3.05
	Short wall						
	front verandah	1	1.15	0.4	0.2	0.092	L = 2.05 − 0.9 = 1.15
	back verandah	1	1.85	0.4	0.2	0.148	L = 2.75 − 0.9 = 1.85
	Step	1	1.2	0.7 (0.6+1)	0.15	0.126	
					Total	33.002	

2 Lime concrete in foundation.

two combined rooms					
Long wall	2	10.1	0.9	0.3	5.454
short wall	2	3.0	0.9	0.3	1.62
Inter 20cm wall	1	3.4	0.6	0.2	0.408
Square room					
Long wall	1	4.8	0.9	0.3	1.296
short wall	2	3.0	0.9	0.3	1.62
verandah pillars	2	0.9	0.9	0.3	0.486
front long wall	2	3.55	0.4	0.1	0.284
short wall	1	1.65	0.4	0.1	0.066
front verandah	1	2.35	0.4	0.1	0.094
back verandah	1	1.2	0.7	0.1	0.084
step.				total =	11.412

L = 9.2 + 0.9 = 10.1

L = 3.9 - 0.9 = 3.0

L = 3.9 - 0.5 = 3.4

L = 3.9 + 0.9 = 4.8

L = 3.9 - 0.9 = 3.0

L = 3.95 - 0.4 = 3.55

L = 2.05 - 0.4 = 1.65

L = 2.75 - 0.4 = 2.35

3 1st class brickwork in lime mortar in foundation & plinth

combined rooms						
Long walls :-						
1st footing	2	9.8	0.6	0.2	2.352	L = 9.2+0.6 = 9.8
2nd footing	2	9.7	0.5	0.2	1.94	L = 9.2+0.5 = 9.7
3rd footing with plinth	2	9.6	0.4	0.65	4.992	L = 9.2+0.4 = 9.6
short walls :-						
1st footing	2	3.3	0.6	0.2	0.792	L = 3.9-0.6 = 3.3
2nd footing	2	3.4	0.5	0.2	0.68	L = 3.9-0.5 = 3.4
3rd footing with plinth	2	3.5	0.4	0.65	1.82	L = 3.9-0.4 = 3.5
Inter 20cm wall						
plinth wall	1	3.5	0.3	0.65	0.68	

Square room in betn verandah						
Long wall						
1st footing	1	4.5	0.6	0.2	0.54	L = 3.9 + 0.6 = 4.5
2nd footing	1	4.4	0.5	0.2	0.44	L = 3.9 + 0.5 = 4.4
3rd footing with plinth	1	4.3	0.4	0.65	1.12	L = 3.9 + 0.4 = 4.3
Short wall						
1st footing	2	3.3	0.6	0.2	0.792	L = 3.9 − 0.6 = 3.3
2nd footing	2	3.4	0.5	0.2	0.68	L = 3.9 − 0.5 = 3.4
3rd footing with plinth	2	3.5	0.4	0.65	1.82	L = 3.9 − 0.4 = 3.5
Verandah pillars						
1st footing	2	0.6	0.6	0.2	0.144	
2nd footing	2	0.5	0.5	0.2	0.1	
3rd footing with plinth	2	0.4	0.4	0.65	0.208	
Verandah dwarf walls —						
Long walls front & back	2	3.55	0.2	0.55	0.781	[illegible] 4.4 = 3.55
Short side wall (front)	1	1.65	0.2	0.55	0.181	[illegible] 4 = 1.65
Short side wall (back)	1	2.35	0.2	0.55	0.[illegible]	[illegible] = 2.35

	Step - 1st step	1	1.2	0.6	0.15	0.108	
	2nd steps	1	1.2	0.3	0.15	0.054	
					total	20.482	
4	2.5cm damp proof course-						
	combined rooms.						
	Long walls	2	9.6	0.4	—	7.68	L=9.2+0.4=9.6
	short walls	2	3.5	0.4	—	2.8	L=3.9-0.4=3.5
	Inter 20cm wall	1	3.5	0.3	—	1.05	L=3.9-0.4=3.5
	square room						
	Long wall	1	4.3	0.4	—	1.72	
	short wall	2	3.5	0.4	—	2.8	L=3.9+0.4=4.3 L=3.9-0.4=3.5
	verandah pillares	2	0.4	0.4	—	0.32	
					Total	16.37	
	Deduct Door sills.						
	D	4	1.00	0.4	—	1.6	
	D_1	1	0.9	0.3	—	0.27	

5	1st class brickwork in 1:6 cement mortar in superstructure						
	Combined room -						
	long wall	2	9.5	0.3	3.5	19.95	L = 9.2 + 0.3 = 9.
	short wall	2	3.6	0.3	3.5	7.56	L = 3.9 - 0.3 = 3.6
	Inter 20 cm wall	1	3.6	0.2	3.5	2.52	L = 3.9 - 0.3 = 3.6
	Square room long wall	1	4.2	0.3	3.5	4.41	L = 3.9 + 0.3 = 4.2
	short wall	2	3.6	0.3	3.5	7.56	L = 3.9 - 0.3 = 3.6
	verandah pillars	2	0.3	0.3	2.8	0.504	
	verandah Lintel						
	long wall (front & back)	2	3.65	0.2	0.3	0.438	L = 3.95 - 0.3 = 3.65
	short wall (front)	1	1.75	0.2	0.3	0.105	L = 2.05 - 0.3 = 1.75
	short wall (Back)	1	2.45	0.2	0.3	0.147	L = 2.75 - 0.3 = 2.45
	Parapet combined rooms						
	long wall	1	9.5	0.2	0.5	0.95	Lt of parapet
	short wall	2	4.0	0.2	0.5	0.8	0.39 + 0.8 + 0.03 = 3.50
	4						

front verandah side	1	2.4	0.2	0.5	0.24	L = 1.6+0.2 … 6.3+0.3 … 2.6+0.2 = 2.8
Back verandah side	1	2.5	0.2	0.5	0.25	
Square room outer wall						L = 9.5(4.2+2.7) = 2.4
	1	4.2	0.2	0.5	0.42	L = 3.9+0.3 = 4.2
walls in bet^n verandah & room	2	3.9	0.2	0.5	0.78	L = 3.6+0.3 = 3.9
					46.634	
Deduction –						
Door openings D	4	1.00	0.30	2.10	2.52	
D1	1	0.90	0.20	2.10	0.378	
window openings W	5	0.90	0.3	1.5	2.025	
W1	1	1.8	0.3	1.5	0.8..	

	Shelves	4	0.90	0.2	1.8	1.296	0.15 bearing either side. L = 1 + 0.15 + 0.15 = 1.3
	Lintels over doors D_2	4	1.3	0.3	0.10	0.156	
	D_1	1	1.2	0.2	0.10	0.024	L = 0.9 + 0.3 = 1.2
	Lintels over windows W	5	1.2	0.3	0.10	0.18	L = 0.9 + 0.3 = 1.2
	W_1	1	2.1	0.3	0.10	0.063	L = 1.8 + 0.3 = 2.1
	Lintels over Shelves S	4	1.2	0.2	0.10	0.096	L = 0.9 + 0.3 = 1.2
				Total deduction =		7.548	
						46.634	
					−	7.548	
					Total /=	39.086	
6:	RCC work in roof work Sunset lintel (1:2:4) excluding steel and its bending including centring and shuttering and binding steel.						
	Roof slab – Combine of room.	1	4.2	3.9	0.12	1.966	

Square room	1	3.9	3.9	0.12	1.[illegible]	
Verandah front	1	4.05				
Verandah back	1	[illegible]	2.15	0.10	0.8[illegible]	
Verandah chajja front & back	1	4.05	2.85	0.10	1.154	3.6+0.1+0.18+0.1 = 3.95
Long side (front)	2	4.55	0.5	0.06	0.27[illegible]	
Side (back)	1	2.15	0.5	0.06	0.0[illegible]	3.6+0.15+0.1+0.2+0.5 = 4.55
Sunshades over window W	1	2.85	0.5	0.06	0.085	
W_1	4	1.2	0.4	0.06	0.115	
Lintel over doors D_1	1	2.1	0.7	0.06	0.0[illegible]	
D_1	4	1.3	0.3	0.1	0.156	L=1+0.15+0.15 = 1.3
Lintels over window W	1	1.2	0.2	0.1	0.024	L=0.9+0.3 = 1.2
W_1	5	1.2	0.3	0.1	0.18	
Shelves S	1	1.2	0.3	0.1	0.036	
	4	1.2	0.4	0.1	0.096	
					0.144	

verandah lintels front and back	2	4.1	0.2	0.3	0.492	bearing L = 3.6 + 0.2 + 0.2 = 4.1
long				0.3	0.12	
side (front)	1	2.0	0.2	0.3	0.162	L = 1.8 + 0.2 + 0.15 = 2.15
side (back)	1	2.7	0.2			
					10.054 − 0.02	
					10.021 cum	
7) steel reinforcement bars including bending at 1%	10.021 × $\frac{1}{100}$		= 0.10021		cum.	
	@ 78.5 q/cum.					
	= 0.10021		X 78.5			
	=		7.87 q	X 100 = 787 kg		

Dry material calculations for different items –

① Cement concrete –

It has been observed that 10 cum of wet concrete = 15.2 cum dry concrete

For example,

M_{15} concrete (1:2:4) amount of cement

$$= \frac{15.2}{1+2+4} = 2.17 \text{ cum}$$

0.035 cum = 1 bag of cement / 50 kg

$$2.17 \text{ cum} = \frac{2.17}{0.035} = 62 \text{ bags cement}$$

(ii) Amount of sand = 2×2.17

$= 4.34$ cum

(iii) Amount of coarse agg = 4×2.17

$= 8.68$

Q) Find out the quantity of dry material for 46.8 cum of concrete in foundation (1:3:6) 1/10.

$$\frac{15.2}{1+3+6} = 1.52$$

$1.52 \times 46.8 = 71.14$

$1+3+6 = 10$

0.035 cum = 1 bag cement

$$1.52 \text{ cum} = \frac{71.14}{0.035} = 1331.$$

10 cum wet = 15.2 dry.

1 cum wet $= \frac{15.2}{1+3+6} = 1.52$ cum.

16.8 cum $= 1.52 \times 46.8 = 71.14$ cum.

Amount of cement

$M_{10} = \frac{71.14}{1+3+6} = 7.114$ cum.

0.035 cum = 1 bag of cement

7.114 cum $= \frac{7.114}{0.035} = 203.25$

(ii) Amount of sand $= 2 \times 7.114$
$= 14.228$

(iii) Amount of Agg $= 4 \times 7.114$
$= 28.456$

(3) Brick masonry (1:4)

10 cum brick masonry of (1:4) mortar.

1 cum of brick masonry contains 500 nos. of bricks.

10 cum of brick masonry contains 5000 nos. of bricks.

Normal size of brick = (19 x 9 x 9) cm

volume of 5000 bricks will be $= 5000 \times 0.19 \times 0.09 \times 0.09$

$= 7.695 \text{ cum}$

$= 7.70 \text{ cum}$

∴ So volume of wet mortar $= 10 - 7.70$ cum

$= 2.30$ cu m.

Adding 15% extra for filling of the frogs wastage. so that

So that volume of wet mortar

= 2.3 * 15% 2.3

= 2.645 cum = 2.65 cum

To get the total volume of dry mortar and we will add 25% extra of the volume of dry mortar

= 2.65 + 25% of 2.65

= 3.31 cum. = 3.32 cum.

Amount of cement = $\frac{3.32}{1+4}$ = 0.66 cum

0.66 cum = $\frac{0.66}{0.035}$ = 18.8

= 19 bags.

Amount of sand = 4 X 0.66 = 2.64 cum.

Q) Find out the quantity of dry material for 33.8 cum of brick masonry in foundation using (1:5) cement concrete.

1 cum = 500 No: of bricks

33.8 cum = 500 X 33.8 = 16900

Volume of 16900 bricks

= 16900 X 0.19 X 0.09 X 0.09

= 26 cum.

volume of wet mortar = 33.8 - 26.

= 7.8 cum

Adding 15% extra for filling the frog & wastage.

So that volume of weight mortar

$= 7.8 + 15\% \, 7.8$

$= 8.97$ cum.

To get the total volume of dry mortar and we will add 25% extra of the volume of dry mortar

$= 8.97 + 25\% \, 8.97$

$= 11.21$ cum.

Amount of cement $= \frac{11.21}{1+5} = 1.87$ cum.

1.87 cum $= \frac{1.87}{0.035} = 53.43$

$= 54$ bags.

Amount of sand $= 5 \times 1.87 = 9.35$ cum.

③ PCC in flooring - (1:2:4) :-

2.5 cum of PCC of 100 sqm.

volume of cement concrete $= \frac{2.5}{100} \times 100$

$= 2.5$ cum.

10% extra will be added for filling the unevenness of base concrete.

So total volume of wet concrete

$= 2.5 + 10\% \, 2.5 = 2.75$ cum.

To get the volume of dry concrete one 50% extra.

Total volume of dry concrete

$= 2.75 + 50\% \text{ of } 2.75$

$= 4.125$ cu m.

① Amount of cement $= \frac{4.125}{1+2+4}$

$= 0.589$ cum

0.589 cum $= \frac{0.589}{0.035} = 16.82$

$= 17$ bags.

② Amount of sand $= 0.589 \times 2$

$= 1.18$ cu m.

③ Amount of Agg. $= 0.589 \times 4 = 2.36$ cum.

Q) Find out the amount of dry material having flooring 3 cm thickness 153.30 sq m. area the concrete used in (1 : 1½ : 3).

Ans- volume of cement concrete

$= \frac{3}{100} \times 153.30$

$= 4.6$ cum.

10% extra will be added for filling

So total

$= 4.6 + 10\% \, 4.6 = 5.06$ cum.

To get the volume of dry concrete are 50% extra.

So total volume of dry concrete

$= 5.06 + 50\% \, 5.06$

$= 7.6$ cum.

① Amount of cement $= \frac{7.6}{1+1.5+3}$

$= 1.38$ cum.

1.38 cum $= \frac{1.38}{0.035} = 39.43$

$= 40$ bags.

② Amount of sand $= 1.38 \times 1.5$

$= 2.07$ cum.

③ Amount of Agg $= 1.38 \times 3 = 4.14$ cum.

④ Dry material calculation for plastering.

12 mm thick cement plastering of 1:4 ratio.

Amount of 100 sqm wet mortar

$= \frac{12}{1000} \times 100 = 1.2$ cum

30% or 20% extra will be added to fill the joints in bricks and wastage.

So the volume of wet mortar

= 1.2 + 30% of 1.2

= 1.56 cu m.

To get the total volume of dry mortar 25% extra will be added

so total volume of dry mortar

= 1.56 + 25% 1.56

= 1.95 cu m.

① Amount of cement = $\frac{1.95}{1+4}$

= 0.39 cum.

0.39 cum = $\frac{0.39}{0.035}$ = 11.14

= 12 bags.

Amount of sand = 0.39 X 4

= 1.56 cum.

) Find out the quantity of dry material for 140.5 sqm of plastering of 12 mm thickness in a building (1:5) proportion.

Dry material calculation for masonry.

A random rubble masonry (10 cum)

(a) The volume of R.R masonry = 12.5 cum

(b) volume of dry mortar = 5 cum.

(B) Coarsed rubble masonry (10 cum)

(a) volume of coarsed rubble masonry = 8 cum

(b) volume of dry mortar = 4.20 cum.

(C) For Ashlar masonry (10 cum)

(a) volume of Ashlar masonry = 12.5 cum.

(b) volume of dry mortar = 2.5 cum.

Q) Find out the quantity of dry materials for a random rubble stone masonry work having volume 37 cu m. in mortar 1:6 proportion.

Ans- For 10 cum random rubble masonry

The volume of R.R = 12.5 cu m.

So for 1 cum volume of R.R. = $\frac{12.5}{10}$ = 1.25 cum.

for 37 cum = 37 X 1.25 = 46.25 cum volume of R.R.

for 10 cum R.R masonry the volume of dry mortar = 5 cum.

for 1 cum = $\frac{5}{10}$ = 0.5 cum.

for 37 cum = 37 X 0.5 = 18.5 cum.

Amount of cement = $\frac{18.5}{1+6}$ = 2.64 cum.

2.64 cum = $\frac{2.64}{0.035}$ = 75.42

= 76 bags.

Amount of sand = 2.64 X 6 = 15.84 cum.

Lead & Lift

A 300 m length is called as 10 unit of lead.

A depth of 3m is called as 2 unit of lift.

But for large works a different lead & lift are taken.

① If the lift is 3.6 m. then lead is lift X 10.

② If the lift is 3.6-6 m then lead = $\frac{(\text{lift})^2}{3.6}$ X 3.25

③ If the lift is greater than 60m. then lead = lift X 20.

Q) For a given road work in cutting and filling as shown in fig. Find out the corresponding lead & lift.

lift = $\frac{1.5 + 1.2}{2} = \frac{2.7}{2} = 1.35$ m

lead = $1.35 \times 10 = 13.5$ m.

Duty of overseers -

The overseers are directly incharge of works.

They are to look after the execution and management of all works in their section and their required to do all works connecting with stores, accounts and the execution of work. In general the duty of overseers may be classified under 3 heads.

(I) Works
(II) Store
(III) Accounts

Duty of overseers on works —

The overseers is in immediate and direct charge of all work in each section.

He has to supervise and to execute all works according to the specification departmental procedure & the rules instructions etc.

The overseers has to prepare estimate for maintenance & repair work.

Overseer has to take proper step for the preservation of all government building. The overseers has to make 'immediate report to the nearest police station as well as to the assistant engineer & Executive engineer giving the particular of any incident.

Duty of overseers regarding stores

The overseer is entirely responsible for all stock and tools and plans in his chart. He has to maintain the accounts of stock and tools and plans correctly upto date. The overseer has to see the materials and

articles are properly stacked and store in such a way that there no possibility of any damage or loss.

Duty of overseen regarding accounts:

Accounts & documents which the overseen has to maintain should be kept correctly. The overseen has to keep day to day accounts of receipts and issue of stock materials and tools & plans in prescribed form. And he has to prepare monthly, half-yearly & yearly resisten and return & to submit them in due paids.

Though overseers has to maintain accounts of expenditure of all work in his charge and has to keep check on the expenditure. so that the section and alongment succeed.

→ Analyse the rate of different materials & labour.

Material

(I) 1000 bricks = 2900/- or 3000/- 1 brick = 2.90/-
(II) 1 cum of sand = 60/-
(III) 1 cum of coarse aggregate/chips = 1130/-
(IV) 1 bag of cement = 250/-
(V) 1 quintal of steel rod = 5400/-

Labour

(I) Head Mason - 430/day
(II) Mason - 370/day
(III) Mazdoor - 320/day
Unskilled - 280/-
Semi skilled - 320/-
Skilled - 370/-
Highly skilled - 430/-
} As per PWD Department Code 2019.
(IV) Coolie - 280/-
(V) Bhisti - 280/-

- Analyse the rate of following items with suitable rate of materials in labour as per Odisha PWD rule.

1) 1st class brick work in cement mortar (1:6) in foundation & plinth with standard bricks.

2) 12 mm thick plastering in 1:4 in cement mortar. Assume standard volume 100 cum

3) RCC work for 30cm with 1:2:4 in roof slab.

Ans:-
1 cum brick masonry contains 500 nos of bricks.
10 cum of brick masonry contains = 500 × 10 = 5000 nos of bricks.

Normal size of brick = (19 × 9 × 9) cm

Volume of 5000 brick will be
= 5000 × 19 × 0.09 × 0.09
= 7.695 cum
= 7.7 cum

∴ So volume of wet mortar
= 10 − 7.70 = 2.30 cum

Adding 15% extra for filling of the voids & wastage.

So the volume of wet mortar
= 2.3 + 15% of 2.3
= 2.645 cum
= 2.65 cum.

To get the total volume of dry mortar, and we will add 25% extra of the volume of dry mortar.
= 2.65 + 25% of 2.65
= 3.31 cum = 3.32 cum.

Amount of cement = $\frac{3.32}{1+6}$ = 0.47 cum.

0.47 cum = $\frac{0.47}{0.035}$ = 13.43 bag
= 14 bags

Amount of sand = 0.47 X 6 = 2.82 cum

no of Bricks = 5000

Material	Quantity	cost	Rate
Bricks	5000 nos.	3000/-	3000 X 5 = 15000
cement	14 bags	250/-	3500/-
sand	2.82 cum	60/-	169.2/-

Labour	Quantity	cost	Rate
Head mason	1/2	430/-	215/-
Mason	7	370/-	2590/-
Mazdoor	7	320/-	2240/-
Coolie	7	280/-	1960/-
Bhisti	2	280/-	560/-

Total of material & labour = 26234.2/-

Add 1.5% or 1½% water charges
26234.2 + 1.5% of 26234.2
= 26627.7

~~1% Tools & plants 26234.2 + 1% of 26234.2~~
=
~~4% of establishment of~~

10% contractors profit
= 26234.2 + 10% 26234.2

Grand = ~~30 69 33~~ 28857.6

Total cost = 26234.2 + 26627.7 + 28857.6 = 81719.5
= 81720/-

Labour	Quantity	cost	Rate
Head mason	1/2	430/-	215/-
mason	10	370/-	3700/-
Mazdoor	15	320/-	4800/-
Bhisti	1	280/-	280

Total of materials & Labour = 12088.6

Add 1.5% water chareges

= 12088.6 + 1.5% of 12088.6

= 12269.93/-

10% contractors profit

= 12088.6 + 10% of 12088.6

= 13297.46/-

Grand total cost

= 12088.6 + 12269.93 + 13297.46

= 37655.99/-

= 37656/-

② RCC work for 30 cum with 1:2:4 roof slab.

2.5 cm RCC of 30 cum volu

cement concrete = $\frac{2.5}{100} \times 30 = 0.7$

10% extra will be added for fill the unevenness of base concrete

So, volume of wet concrete = 0.75 + 10

= 0.8

To get the volume of dry concre are 15% extra.

So, total volume of dry concrete

= 0.825 + 15% of 0.825

= 0.95

) Amount of cement = $\frac{0.95}{1+2+4} = \frac{0.95}{7}$

= 0.135

0.135 cum = $\frac{0.135}{0.035} = 3.8 = 4$ bags.

) Amount of sand = 0.135 × 2 = 0.27 cum

) Amount of Aggregate = 0.135 × 4 = 0.54 cum

Material	Quantity	cost	rate
Cement	4 bags	250/-	1000
Sand	0.27 cum	60/-	16.2
Aggregate	0.54 cum	1130/-	610.2

Labour	Quantity	Cost	Rate
Head mason	1/2	430/-	215/-
Mason	2	370/-	740/-
Mazdoor	12	320/-	3840/-
Bhisti	6	280/-	1680/-
coolie	20	280/-	5600/-

Total of materials & Labour = 12075/-

Add 1.5% water charges

= 12075 + 1.5% of 12075

= 12256.125/-

10% contractors profit

= 12075 + 10% of 12075

= 13282.5/-

Grand total cost

= 12075 + 12256.125 + 13282.5

= 37613.625/-

= 37614/-

Duty & responsibility of officers of PWD department -

① Chief engineer -

- The chief engineer is the administrative and professional head of a department.
- There may be one & more chief engineers in one department and in that case chief engineer submits annually per person of the budget estimate relating to the works under each works to the government.
- The chief engineer will accord administrative approval for works for the government.
- He will give technical sanction for works value beyond the power of superintendent engineer.
- He will sanction the purchase of materials, tool & plants and live stock articles beyond the power of a superintendent engineer in connection with works according to the

rules and already administrating the sanction by the government and also fund is placed for the same.

(2) Superintending engineer -

It is the duty of the superintending engineer to check up items and rates of the estimate of works submitted by his executive engineer before forwarding the same to his chief engineer.

→ He should give technical sanction to estimates within his power.
→ He should invite tender for works sanction administratively aswell as technically and fund is placed against the work.
→ He should inspect the divisional office atleast once a year and record the results of such inspection in the prescribed form.
→ The superintending engineer is required to make in his duty during which tour and the measurements are properly recorded and the

check the measurements in percentage as per rule.

(3) Divisional officer & Executive engineer

→ The executive unit of the department in the division and engineer incharge is the executive engineer, who is responsible through the superintending engineer for efficient execution & management of all works within his division. It is the duty of the executive engineer to prepare estimates of proposed works through its subordinates and submit the same to his superintending engineer.

→ It is his duty to invite tender for works value within his power. after it has administratively approved and technically sanctioned and fund is placed for its execution.

→ His duty is to prevent enclosemen on the government land under his division.

→ He should submit monthly accounts after examining the books, vouchers and papers from which the same are compiled.

→ It is his duty to see that the accounts are posted from day to day that the accountant carries out his duty regularly & punctually.

(4) Assistant engineer, & SDO →

Chief engineer
↓
Superintending engineer
↓
Executive engineer
↓
Assistant engineer
↓
Junior engineer.

→ He is responsible for the management and efficient execution of works with in jurisdiction.

→ His duty is to maintain the initial accounts records of cash & tools under incharge.

→ He should see that initial records of the measurem books, the muster roll are written up neatly in order to avoid all doubts about th authenticity.

→ His duty is to check (a certa percentage of measurement b recorded in measurement book by his junior engineer.

→ He should give a control over the expenditure against the sanction estimate and to report the monthly progress of work.

→ His duty is to check stores atleast twice a year and tools & plants once in a year.