

Introduction:-

Types of Estimates:-

Plinth Area:-

Plinth area is built of up covered area of a building measured at floor level of any storey. Plinth area is ~~calculating~~ calculated by taking the external dimensions of the building at the ~~floor~~ floor level excluding plinth of sets if any courtyard, open areas, balconies and cantilever projections are not including in the plinth area. Supported porches (other than cantilevered) are included in the plinth area.

The following shall be included in the plinth area.

- i) All floors, area of walls at the floor level excluding plinth offsets, if any.
- ii) Internal shafts for sanitary installations provide these do not ~~exceed~~ exceed 25 sqm in ~~are~~ air condition ducts, lifts etc.
- iii) The area of Baisati and the area of maturity at terrace level.
- iv) Area of porches other than cantilevered.

The following are not included in the plinth area.

- i) Area of lift.
- ii) Internal sanitary shafts provided these are more than 25 sqm. in area.
- iii) Under closed balconies.
- iv) Towers, purrels, damps etc projecting above terrace level not forming a story at the ~~at~~ terrace level.
- v) Architectural bonds, carries etc.
- vi) Sunshades, vertical air breakers or box lower projecting out.

Floor area/ carpet area:-

Floor area of a building is the total area of floor area in between walls and consists of floor of all rooms, verandah, passages, corridors, staircase room, entrance halls, kitchen stores, bathroom and latrine (wc) etc. Sills of doors and opening are not included in the floor area. Areas occupied by walls, pillars, plaster and other intermediate supports are not included in the floor area. In short floor area is equal to plinth area and minus area occupied by walls.

For deduction of walls area from plinth area to obtain floor area shall include.

- i) Door and other opening in wall.
- ii) Intermediate pillars and supports.
- iii) Plaster along walls excluding 200 sq. m. in area.
- iv) Plugs which are within walls, but the following shall be excluded from the walls area.

- ⇒ Pilaster along walls not excluding 200 sq. m. in area.
- ⇒ Fire place projecting beyond the face of walls in living room.
- ⇒ Chulaplat form projecting beyond the face of wall in kitchen.

The unit of measurement and payment for various items of works and materials:-

Principle of units for various items of works

- i) Mass, voluminous and thick works shall be taken in cubic unit or volume.
- ii) Shallow, thin and surface work shall be taken in cubic unit or in area.

iii) long and thin works shall be taken in linear or running unit, and linear measurement shall be taken.

iv) Piece work, job work etc. shall be taken in number.

Types of estimate:-

1) Preliminary estimate of approximate of abstract estimate or rough cost estimate:-

It is only required for preliminary studies of various aspects of a work or project, to decide the financial position and policy for administrative sanctions by the complete administrative authority. It is prepared from practical knowledge and cost of the similar work. This estimate is prepared showing separately the approximate cost of all important items of work as cost of land, earth building, roads, water supply, sanitary works, electrification etc. The estimate is accompanied by a brief report explaining the necessity and utility of the project and showing how the cost of separate items have been arrived.

2) Plinth area estimate for building:-

3) Cube rate estimate for building:-

This is calculated by finding the cubical ^{content} ~~content~~ of building ($\text{Length} \times \text{breadth} \times \text{thickness}$) and multiplied it's by cube rate.

Cube rate estimate is most accurate as compared to the plinth area estimate.

4) Approximate quantity method estimate:-

In this method approximate total length of walls is found in running meter and this total length multiplied by the rate per running meter of wall gives a fairly accurate cost. In the method instruction may be divided into two parts.

i) Foundation including plinth

ii) Super structure

The running meter cost for foundation and super structure found be estimated calculation. First and these running meter rate should be multiplied by the total length to wall.

5) Detailed estimate or item rate estimate:-

A detailed estimate is prepared after its complete set of drawing are ready. The quantity of various items of works are worked out from such drawings and are multiplied by the parent rate of items of work to arrive at the estimate cost of the work.

6) Revised estimate:-

Revised estimate is a detailed estimate and is required to be prepared under any one of the following circumstances.

i) When the original estimate is excluded or likely to exceed by more than 5%.

ii) When the expenditure on a work exceed or likely to exceed the amount of adm administrative sanction by more than 10%.

iii) When there are material deviation from the original proposal even though the cost may be met from the sanction amount.

It should be accompanied by a comparative estimate showing the variations of each items of works. Its quantity, rate and cost under original and revised side by side the excess or saving and reason for variation.

7) Supplementary estimate:-

It is a detailed estimate and prepared when additional works are required and supplement the original works or when further development required during the programmes of work.

8) Supplementary and revised estimate:-

When a work is partially abandoned and the estimated cost of the repairing work is less than 95% of the original work or when there are material deviation and changes in the design which may cause substantial saving in the estimate. Then the cost of the original estimate is revised by the complete authority. A supplementary and revised estimate is then prepared and fresh technical sanction of the complete authority is obtained.

9) Annual repair and maintenance estimate:-

It is a detailed estimate and is prepared to maintaining the structure of work in proper order and safe condition.

10) Contingencies:-

It indicates incidental expenses of miscellaneous character which can not be classified under any definite items sub-head.

A certain amt in the form of contingencies of 3% to 5% of estimated cost is provided for contingencies.

ii) work charged establishment:-

It is the established which is charged to work directly. During the construction of a building or a projection a certain no. of work supervisors, chaurickers, mates etc are required to be employed and their salaries are paid from the am to work charged established for this a percentage of $1\frac{1}{2}$ to 2% of the estimate cost is included.

Sl. No	Particulars of items	Unit of measurement in MRS	Unit of payment in M.X.S
01	Earth work	CUM	Per CUM
	only for surface dressing and leveling and clearing etc.	Square meter (Sq.m)	Per Sq.m
02	Cutting of trees	No	Per no
03	Concrete → For lime concrete (L.C) m roof tracing thickness specified. → Jalli work or Jalli work or c.c Tracery panel.	Cubic meter (Cum) Sq.m / cum Sq.m	
04	DPC	Sq.m	
05	Brick work → Brick work in foundation and Plinth in super structure, in arches, etc in cement lines of mud-mortar sun-dried brick-work (BW) in jack arches, well staining; reinforced BW, Bwin fire place, chula chimney.	Sq.m Cub.m / mt Sq.mt Sq.mt	

	→ Honey comb Bw, Jack arch roofing, half Bw withcur or with reinf; Thin partition wall	Sq.mt	
	→ Strain course, drip course, weather course, coping etc. course, Brick edging (By road side)	meter (cm.l)	
06	Stone work	cub.m / Sq.m / mt	
07	Wood work	cub.m / Sq.m / mt / no	
08	Steel work	kg / m / Sq.m / mt / no	
09	Roofing	Sq.m	
	→ RCC, RB slab roof	Sq.m	
10	Plaster, painting, Finishing	Sq.m / m.t	
11	Flooring	Sq.m	
12	Miscellaneous items	cub.m / Sq.m / mt / no	

Method of estimating:-

Estimate:-

Before undertaking the construction of a project, it is necessary to know its probable cost which worked out by estimating. An estimate is a compilation or calculation of the quality required and expenditure likely to be incurred in the construction of work. The estimate is the probable cost of a work and is determined theoretically by mathematical calculation based on the plans and drawing and current rates. Approx estimate may be prepared by various method but accurate estimate is prepared by detailed estimate method.

Actual cost:-

The actual cost is of work a work is known as completion of the work.

→ Detailed estimate consists of working out the quantities of different items of work and ~~then~~ man working out of the cost i.e. 2-stages

Detailed measurement of calculation of quantities. The whole work is divided into different items of work as earth work, concrete, brickwork etc and the items are classified the grouped under different sub head and difference and measurement of each items of work are taken out.

Detailed of measurement form:-

Item no	Description of perpendiculars Particulars	No	Length	Breadth	Height or depth	Content of quantity
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Abstract of estimate cost:-

The cost of under item of work is calculated from the quantities all ready computed at workable rate and the total cost is worked out in a prescribed form.

Abstract of estimate form:-

Item no	Description of Particulars	no Quantity	Unit rate	Amount
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Main items of work:-

- | | |
|---|-----------------------------|
| 1) Earth work | 10) Plastering and painting |
| 2) Concrete in foundation | 11) cornice |
| 3) Soiling | 12) Pillars |
| 4) Damp proof course | 13) Doors and window |
| 5) Masonary | 14) Wood work |
| 6) Arch masonary work | 15) Iron work |
| 7) Lintel Lintels over opening | 16) White washing |
| 8) Concrete R.C.C & R.B work | 17) Painting |
| 9) Flooring and Roofing | |

Electrification 8-10% estimate cost

Water supply 8-10% estimate cost

Degree of accuracy in building:-

Depend on the rate of items and the unit of payment higher rate than greater accuracy.

General rules:-

i) Measurement shall be item wise for the finished item of work and the description of each item shall be held to include materials, Transport, Labour, Fabrication, hoisting tools and plants over loads and other residential charges for finishing the work to the required shape, size, design, and specification.

ii) In booking dimension the order shall be in the sequence of length, breadth and height and depth or thickness.

iii) All work shall be measured net subject to following tolerance unless otherwise stated.

a) Dimension shall be measured to the nearest 0.1m i.e. 1cm (1/2%)

b) All shall be measured to the nearest ~~0.01 cum.~~ ~~(0.01 cu ft)~~
0.01 sq.m (0.1 sq.ft)

c) Cubic cost shall be worked up to the nearest 0.01 cum (0.1 cu ft)

iv) Some type of work, under different condition and nature shall be separately under separate items.

v) The bills of quantities shall fully describe the materials proportion and workmanship and accurately represent the work to be executed.

vi) In case of structural concrete, brickwork or stone masonry the work under the following categories shall be measured separately and height shall be described

- a) From foundation to plinth level
- b) From plinth level to first floor level
- c) From first floor to second floor level and so on.

Method of building estimate:-

1) Separate or individual wall method:-

- In this method, - measure or find out the external length of walls running in the longitudinal direction generally the long walls out to out and the internal long wall of lengths of long walls running in the transverse direction in to in i.e. short walls core should be taken to note the difference in directions at different height due to offset or footings.

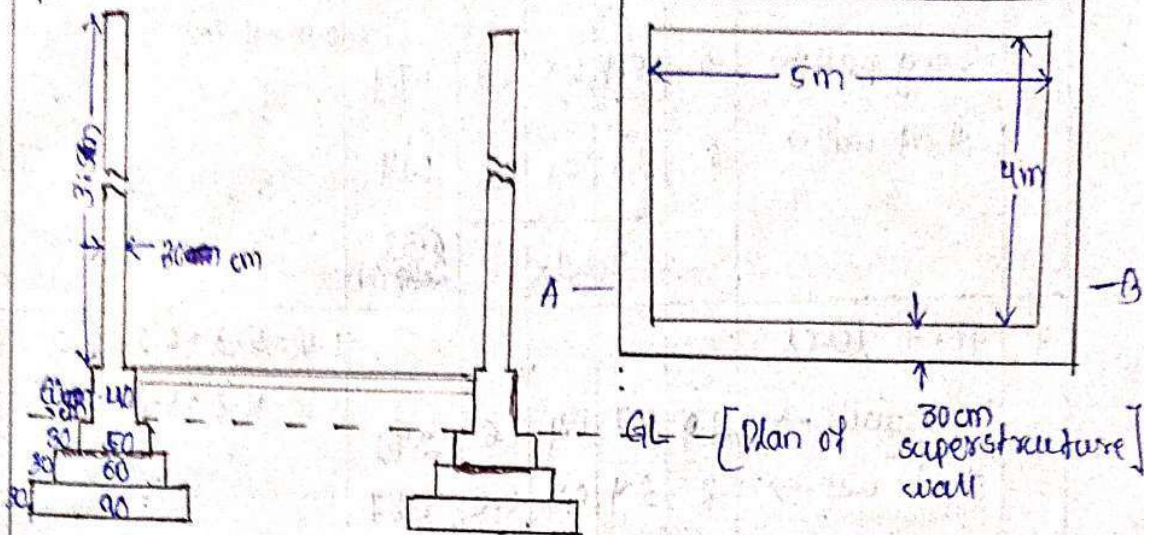
* Long wall length out to out = centre to centre length +
half breadth one side +
half breadth on the other side
= centre to centre length + one breadth

Question:-

Represents the plan of superstructure walls of a single room building of 5m x 4m and sections represents. Represent the c/s of the walls with foundation. Estimate the quantities of

- ① Earth work in excavation in foundation
- ② Concrete in foundation
- ③ Brick work in foundation and plinth
- ④ Brick work in super structure

Solution



[Section of AB]

Sl. No	Particulars of items	N	L	B	H or D	Quantity	Notes
1	Earth work in excavation in found ⁿ						L.W = $5.3 + 0.45 + 0.45 = 6.2$
	Long wall →	2	6.2	0.9	0.9	10.04	S.W = $4.3 - 0.45 - 0.45 = 3.4$
	Short wall →	2	3.4	0.9	0.9	5.50	
2	Concrete in foundation					Total = 15.54 cum	L.W = $5.3 + 0.45 + 0.45 = 6.2$
	Long wall →	2	6.2	0.9	0.3	3.34	S.W = $4.3 - 0.45 - 0.45 = 3.4$
	Short wall →	2	3.4	0.9	0.3	1.83	
						Total = 5.17 cum	
3	Brick work in foundation and plinth (First footing)						L.W = $5.3 + 0.3 + 0.3 = 5.9$
	Long wall →	2	5.9	0.6	0.3	2.12	S.W = $4.3 - 0.3 - 0.3 = 3.7$
	First footing →	2	5.9	0.6	0.3	2.12	
	Second footing →	2	5.9	0.6	0.3	2.12	
	Short wall →	2	3.7	0.6	0.3	1.33	
	First footing →	2	3.7	0.6	0.3	1.33	
	Second footing →	2	3.7	0.6	0.3	1.33	

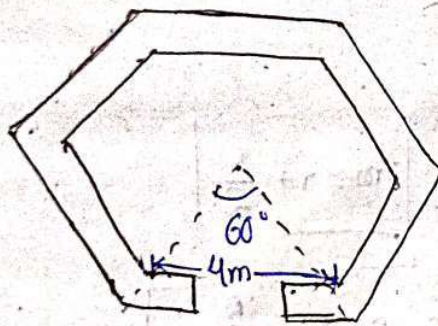
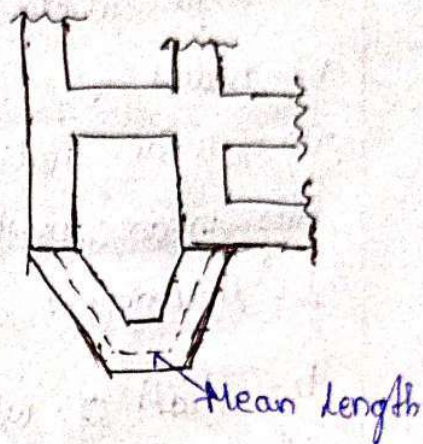
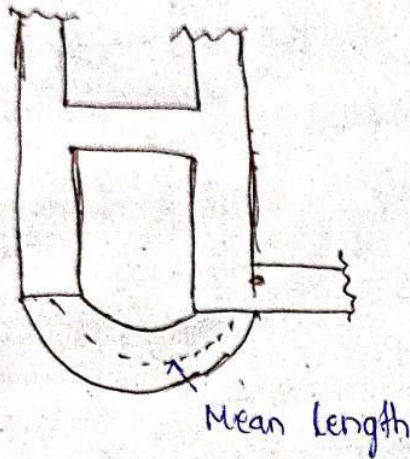
second footing						$L.W = 5.3 + 0.25 + 0.25 = 5.8$ $S.W = 4.3 - 0.25 - 0.25 = 3.8$
Long wall →	2	5.8	0.5	0.3	1.74	
short wall →	2	3.8	0.5	0.3	1.14	
Total =					2.88 6.33	cum
4 Plinth level						$L.W = 5.3 + 0.2 + 0.2 = 5.7$ $S.W = 4.3 - 0.2 - 0.2 = 3.9$
Long wall →	2	5.7	0.4	0.6	2.73	
short wall →	2	3.9	0.4	0.6	1.87	
Total =					4.6	cum
5 Brickwork in super-structure						$L.W = 5.3 + 0.15 + 0.15 = 5.6$ $S.W = 4.3 - 0.15 - 0.15 = 4.0$
Long wall →	2	5.6	0.3	3.5	11.76	
short wall →	2	4.0	0.3	3.5	8.4	
Total =					20.16	cum

2) centre line method:-

In this centre line method sum total length of the centre lines of walls, long and short has to be found out. Find out the total length of the centre lines of walls of same type, long and short having same type of foundation and footings and then find the quantities by multiplying the total centre length by the respective breadth and height. The method is quick but requires special attention and consideration at the junctions, meeting pts. of partition or cross walls, etc. here length will remain same for excavation in foundation, for concrete in foundation, for all footings and for super structure.

* Circular, semi circular, hexagonal, half hexagonal etc rooms.

For these type of rooms the total centre line length of all walls may be found out and quantities may be calculated by multiplying respective breadth and length.



Line

Length of centre line of one side,

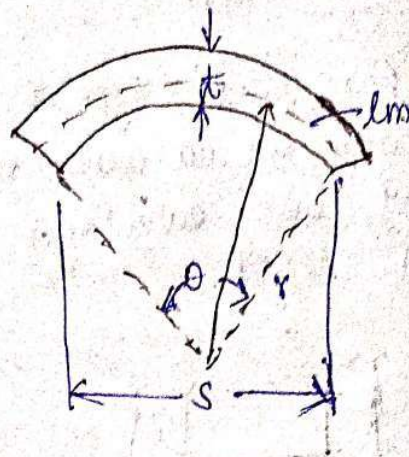
$$l_m = 4 + 2 \times \frac{0.15}{\tan 60^\circ} = 4 + 2 \times \frac{0.15}{1.732}$$

$$\text{Total centre line} = 6 \times l_m$$

Arch masonry calculation:-

Case - 1

Segmental arch with span and angle given:-



S = span

θ = angle at the centre

r = radius

rm = mean radius

lm = mean length

t = thickness of arch

b = breadth of wall

$$S \sin \frac{\theta}{2} = \frac{S/2}{r}$$

$$\Rightarrow r = \frac{S}{2} \times \frac{1}{\sin \frac{\theta}{2}}, \quad rm = r + \frac{b}{2}$$

$$\frac{lm}{2\pi rm} = \frac{\theta}{360} \Rightarrow lm = 2\pi rm \times \frac{\theta}{360}$$

Quantity of arch masonry work (Q) = mean length of arch × breadth of wall × thickness etc

$$\Rightarrow Q = lm \times b \times t$$

Case-2

Segmental arch of 60° :-

$$r = S \text{ and } r_m = r + \frac{1}{2}$$

(above figure)

$$\frac{lm}{2\pi r_m} = \frac{60^\circ}{360} = \frac{1}{6}$$

$$lm = \frac{1}{6} \times 2\pi r_m = \frac{1}{3} \pi r_m$$

$$Q = lm \times b \times t \Rightarrow \boxed{lm = \frac{1}{3} \pi r_m}$$

Case-3

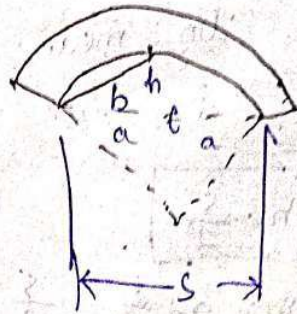
Segmental arch with span and rise given

r = radius of arch i.e. of intrados

r_m = radius of mean arch

t = length of arch of intrados

lm = length of mean arch



From similar figure

$$\frac{lm}{t} = \frac{r_m}{r} \text{ or } lm = t \times \frac{r_m}{r}$$

To find 'r'

$$a^2 = h(d-h), \text{ where } d = \text{diameter of intrados}$$

$$a = \text{semi-chord} = \frac{1}{2} \times \text{span} = \frac{S}{2},$$

$$h = \text{rise of arch (given)}$$

Hence, 'd' can be found

$$\boxed{r = \frac{h}{2} + \frac{S^2}{8h}}$$

$$r_m = r + \frac{t}{2}$$

$$L = \frac{8b - 2a}{3}$$

$$b = \sqrt{a^2 + h^2}, \quad a = \frac{1}{2} \times S$$

$$l_m = L \times \frac{r_m}{r}$$

$$Q = l_m \times b \times t$$

Case-4

Semi circular arches:-

S = span

r = radius of arch

r_m = mean radius

l_m = mean length of arch

h = rise

$$h = \frac{S}{2}$$

$$r_m = r + \frac{t}{2} = \frac{S}{2} + \frac{t}{2}$$

$$l_m = \pi r_m = \frac{22}{7} \times \left(\frac{S}{2} + \frac{t}{2} \right)$$

$$Q = l_m \times b \times t \Rightarrow \boxed{l_m = \pi \times \left(\frac{S}{2} + \frac{t}{2} \right)}$$

Case-5

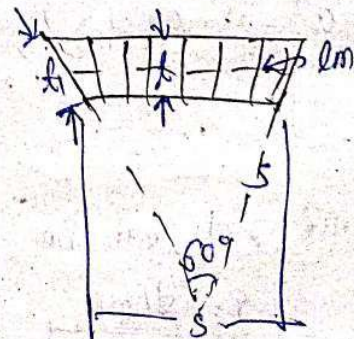
Flat arches:-

usually subtends 60°

$$f_1 = \frac{t}{\sin 60} = \frac{t}{0.866} = 1.15t$$

$$l_m = S + \frac{f_1}{2}$$

$$Q = l_m \times b \times t$$



Q. An arch of 2.5m span subtends an angle of 80° at the centre. The thickness of arch is 30cm and the breadth of wall is 40cm. Calculate the quantity of arch masonry work.

Ans

Given that

Span (S) = 2.5m , angle (θ) = 80° , Thickness (t) = 30cm
= 0.3m

Breadth (b) = 40cm = 0.4m

$$\sin \frac{\theta}{2} = \frac{S/2}{r}$$

$$\Rightarrow r = \frac{S}{2} \times \frac{1}{\sin \frac{\theta}{2}}$$

$$= \frac{2.5}{2} \times \frac{1}{0.74}$$

$$= 1.25 \times 1.35$$

$$\Rightarrow r = 1.68$$

$$r_m = r + \frac{t}{2}$$

$$= 1.68 + \frac{0.3}{2}$$

$$= 1.68 + 0.15$$

$$\Rightarrow r_m = 1.83$$

$$lm = 2\pi r_m \times \frac{\theta}{360}$$

$$= 2 \times 3.14 \times 1.83 \times \frac{80}{360}$$

$$= 2 \times 3.14 \times 1.83 \times 0.22$$

$$\Rightarrow lm = 2.52$$

$$\text{Quantity of arch masonry work} = l \times b \times t$$

$$= 2.52 \times 0.4 \times 0.3$$

$$= 0.30 \text{ m}^3$$

Q) Calculate the quantity of BQ in a segmental arch of 2.2m span, 50 cm rise and 30 cm thick. The breadth of the wall is 30 cm.

Ans

Given that

$$\text{Span (s)} = 2.2 \text{ m}$$

$$\text{Rise (h)} = 50 \text{ cm} = 0.5 \text{ m}$$

$$\text{Thickness (t)} = 30 \text{ cm} = 0.3 \text{ m}$$

$$\text{Breadth (b)} = 30 \text{ cm} = 0.3 \text{ m}$$

$$a = \frac{1}{2} \times s$$

$$= \frac{2.2}{2}$$

$$\Rightarrow a = 1.1$$

$$b = \sqrt{a^2 + h^2} = \sqrt{(1.1)^2 + (0.5)^2}$$

$$= 1.21 \text{ m}$$

$$r = \frac{h}{2} + \frac{s^2}{8h}$$

$$= \frac{0.5}{2} + \frac{(2.2)^2}{8 \times 0.5}$$

$$= 0.25 + \frac{4.84}{4}$$

$$= 0.25 + 1.21$$

$$\Rightarrow r = 1.46 \text{ m}$$

$$\therefore r_m = r + \frac{b}{2}$$

$$= 1.46 + \frac{0.3}{2}$$

$$= 1.46 + 0.15$$

$$\Rightarrow r_m = 1.61 \text{ m}$$

$$L = \frac{8b - 2a}{3}$$

$$= \frac{8 \times 1.21 - 2 \times 1.01}{3}$$

$$\Rightarrow L = 2.49$$

$$l_m = L \times \frac{r_m}{b}$$

$$= 2.49 \times \frac{1.61}{1.46}$$

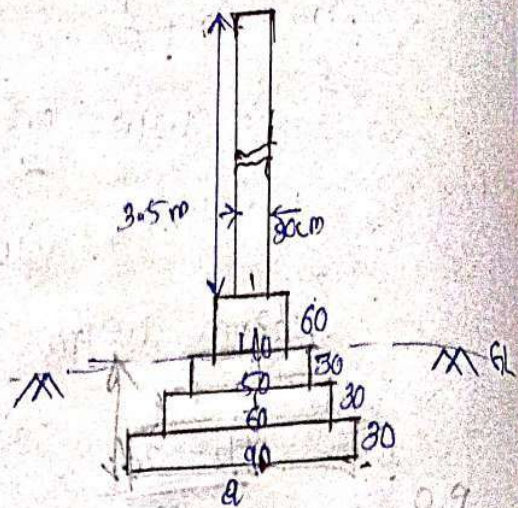
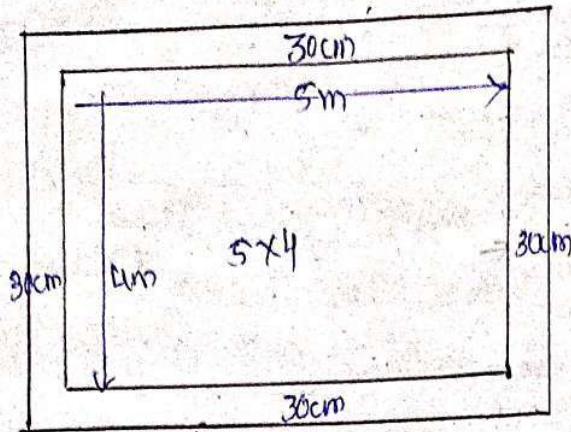
$$\Rightarrow l_m = 2.75 \text{ m}$$

$$\text{Quantity} = l_m \times b \times t$$

$$= 2.75 \times 0.3 \times 0.3$$

$$= 0.247 \text{ m}^3$$

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S. No	Particulars	N	L	B	H/D	Quantity	Remarks
1	Earth work in excavation in foundation						Long wall = $5.3 + 0.45 + 0.45 = 6.2$ Short wall = $4.3 - 0.45 - 0.45 = 3.4$
	Long wall $\rightarrow$	2	6.2	0.9	0.9	10.04	
	Short wall $\rightarrow$	2	3.4	0.9	0.9	5.5	
						<u>Total = 15.54 cum</u>	
2	Concrete in foundation						Long wall = $5.3 + 0.45 + 0.45 = 6.2$ Short wall = $4.3 - 0.45 - 0.45 = 3.4$
	Long wall $\rightarrow$	2	6.2	0.9	0.3	3.34	
	Short wall $\rightarrow$	2	3.4	0.9	0.3	1.83	
						<u>Total = 5.17 cum</u>	
3	Brick work in foundation (first footing)						Long wall = $5.3 + 0.3 + 0.3 = 5.9$ Short wall = $4.3 - 0.3 - 0.3 = 3.7$
	Long wall $\rightarrow$	2	5.9	0.6	0.3	2.12	
	Short wall $\rightarrow$	2	3.7	0.6	0.3	1.35	
						<u>Total = 3.45 cum</u>	

Second footing

Long wall →	2	5.8	0.5	0.3	1.74
Short wall →	2	3.8	0.5	0.3	1.14

Long wall =
 $5.3 + 0.25 + 0.25 = 5.8$
 Short wall =
 $4.3 - 0.25 - 0.25 = 3.8$

Total = 2.88 cum

4 Plinth level

Long wall →	2	5.7	0.4	0.6	2.73
Short wall →	2	3.9	0.4	0.6	1.87

Long wall =
 $5.3 + 0.2 + 0.2 = 5.7$
 Short wall =
 $4.3 - 0.2 - 0.2 = 3.9$

Total = 4.60 cum

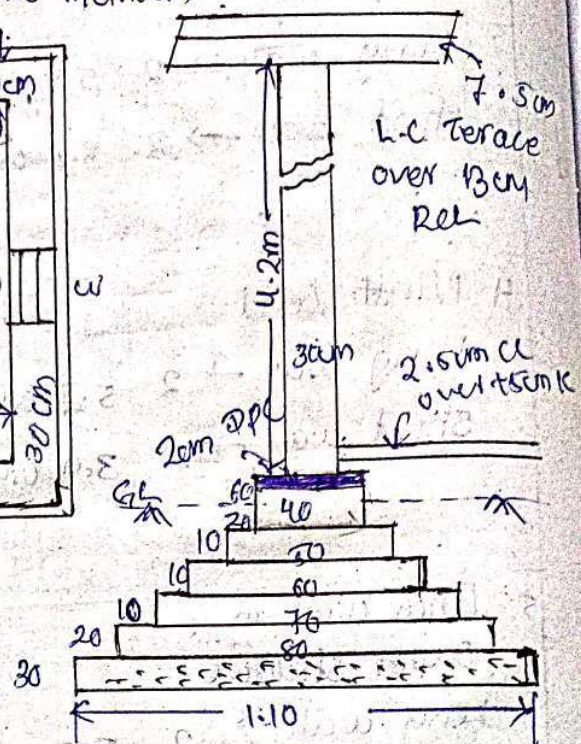
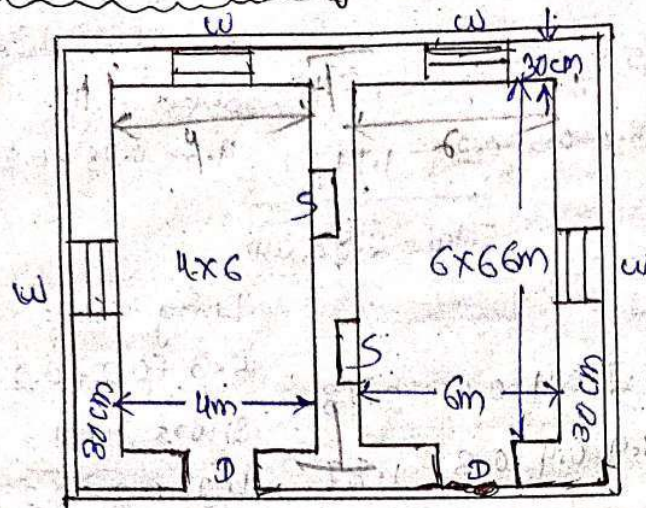
5 Brick work in super structure

Long wall →	2	5.6	0.3	3.5	11.76
Short wall →	2	4	0.3	3.5	8.4

Long wall =
 $5.3 + 0.15 + 0.15 = 5.6$
 Short wall =
 $4.3 - 0.15 - 0.15 = 4$

Total = 20.16 cum

2) Two room building (Center line method)



$$D = 1.2m \times 2.1m$$

$$W = 1.0m \times 1.5m$$

$$S = 1.0m \times 1.5m$$

All walls are of same section Lintels over door, windows, shelves are 15cm thick R.B.

$$\text{C.C. length of long wall} = 10.6m$$

$$\text{Long walls} = 2 \times 10.6 = 21.2m$$

$$\text{C.C. length of short wall} = 6.3m$$

$$\text{Short wall} = 3 \times 6.3 = 18.9m$$

$$\therefore \text{Total centre length of the wall} = 21.2m + 18.9m = 40.10m$$

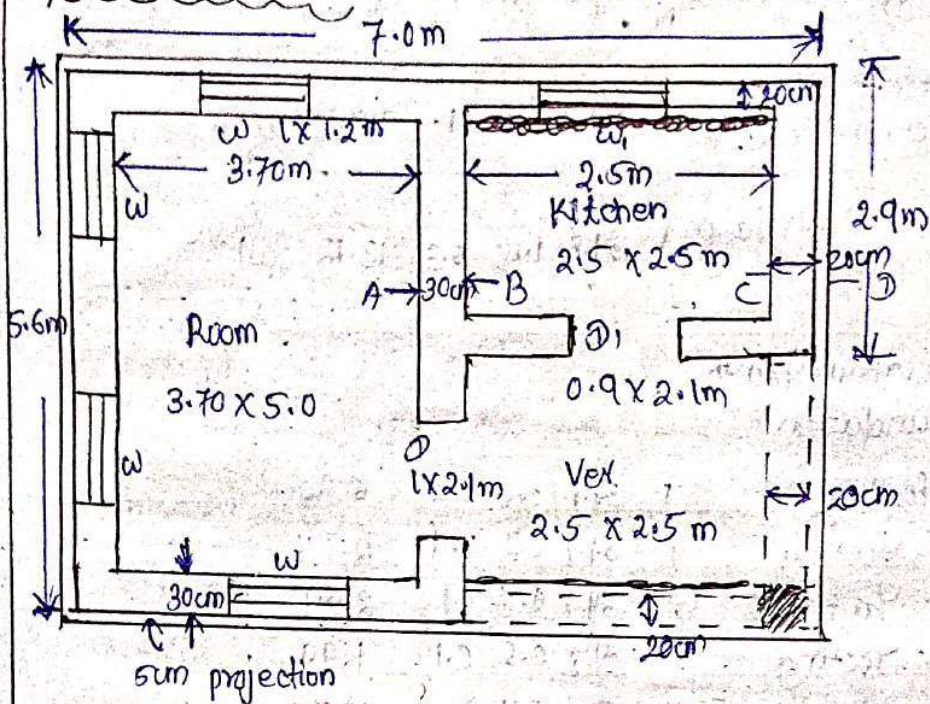
$$\text{Net centre line length} = 40.10 - (2 \times 0.5 \times 0.3)$$

$$= 39.8m \quad [\text{As there are two T-junctions}]$$

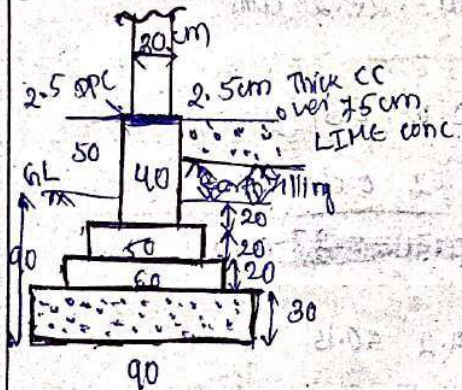
Sl No	Particulars	N	L	B	H ₆	Quantity	Remarks
1	Earth work in excavation in foundation	1	39.8	1.10	1	43.78 cum	
2	concrete in foundation	1	39.8	1.10	0.3	13.12 cum	
3	Brick work in Plinth and foundation						
	first footing	1	39.8	0.8	0.2	6.36	
	second footing	1	39.8	0.7	0.1	2.79	
	Third footing	1	39.8	0.6	0.1	2.39	
	Fourth footing	1	39.8	0.5	0.1	1.99	
	Plinth	1	39.8	0.4	0.8	12.73	
	Total = 26.26 cum						
4	OPC	1	39.8	0.4	0.02	0.31	
	Deduction doors	2	1.2	0.4	0.02	0.02	
	Total = 0.33 cum						
5	Brick work in super structure	1	39.8	0.3	4.2	50.15	
	Deduction Door opening	2	1.2	0.3	2.1	1.85	
	Window opening	4	1	0.3	1.5	1.8	
	Selves opening	2	1	0.2	1.5	0.6	
	Lintel over doors	2	1.5	0.3	0.15	0.14	$L = 1.2 + 0.15 + 0.15 = 1.5$
	Lintel over window	4	1.3	0.3	0.15	0.23	$L = 1 + 0.3 = 1.3$
	Lintel over selves	2	1.3	0.3	0.15	0.12	$L = 1 + 0.3 = 1.3$
	Total = 4.40 cum						

Net total = $50.15 - 4.40 = 45.75 \text{ cum}$

3) Single room Quater:



PLAN



Section AB

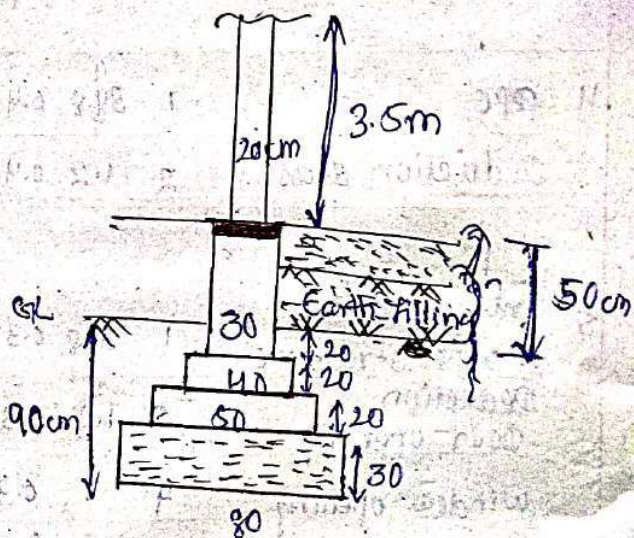
Long wall c to c length = 5.3m

Short wall c to c length = 4.0m

w = 1 x 1.2m

D = 1 x 2.1m

D1 = 0.9 x 2.1m



Section on CD

Kitchen and Veranda

Long wall c to c length = 5.4m

Short wall c to c length = 2.75m

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
1	Earth work in excavation in foundation						
	<u>Rooms</u>						
	along wall →	2	6.2	0.9	0.9	10.04	$L = 5.3 + 0.9 = 6.2$
	Short wall →	2	3.1	0.9	0.9	5.02	$L = 4.0 - 0.9 = 3.1$
	<u>Kitchen & Veranda</u>						
	along wall →	2	6.2	0.8	0.9	4.46	$L = 5.4 + 0.8 = 6.2$
	Short wall →	3	1.9	0.8	0.9	4.10	$L = 2.75 - 0.45 - 0.4 = 1.9$
						Total = 23.62 cum	
2	Concrete in foundation						
	<u>Room</u>						
	along wall →	2	6.2	0.9	0.3	3.53	$L = 5.3 + 0.9 = 6.2$
	Short wall →	2	3.1	0.9	0.3	1.67	$L = 4.0 - 0.9 = 3.1$
	<u>Kitchen & Veranda</u>						
	along wall →	1	6.2	0.8	0.3	1.49	$L = 5.4 + 0.8 = 6.2$
	Short wall →	3	1.9	0.8	0.3	1.37	$L = 2.75 - 0.45 - 0.4 = 1.9$
						Total = 7.88 cum	
3	Brick work in foundation						
	<u>Room</u>						
	along wall →						
	Short wall →						
	First footing	2	5.9	0.6	0.2	1.42	$L = 5.3 + 0.6 = 5.9$

Second Footing	2	5.8	0.5	0.2	1.16	$L = 5.3 + 0.5 = 5.8$
Plinth	2	5.7	0.4	0.7	3.19	$L = 5.3 + 0.5 = 5.7$
b) Short wall						
First Footing	2	3.4	0.6	0.2	0.82	$L = 4.0 - 0.6 = 3.4$
Second Footing	2	3.5	0.5	0.2	0.70	$L = 4.0 - 0.5 = 3.5$
Plinth	2	3.6	0.4	0.7	2.02	$L = 4.0 - 0.4 = 3.6$

Kitchen & Veranda

a) Long wall						
First Footing	1	5.9	0.5	0.2	0.59	$L = 5.4 + 0.5 = 5.9$
Second Footing	1	5.8	0.4	0.2	0.46	$L = 5.4 + 0.4 = 5.8$
Plinth	1	5.7	0.3	0.7	1.20	$L = 5.4 + 0.3 = 5.7$

b) Short wall						
First Footing	3	2.2	0.5	0.2	0.66	$L = 2.7 - 0.3 - 0.25 = 2.2$
Second Footing	3	2.3	0.4	0.2	0.55	$L = 2.7 - 0.2 - 0.25 = 2.3$
Plinth	3	2.4	0.3	0.7	1.51	$L = 2.7 - 0.2 - 0.15 = 2.4$

Total = 14.28 cum

4 DPC
Room

a) Long wall	2	5.7	0.4		4.56	$L = 5.3 + 0.4 = 5.7$
b) Short wall	2	3.6	0.4		2.88	$L = 4.0 - 0.4 = 3.6$

Kitchen & Veranda

a) Long wall $\rightarrow$ 1 5.7 0.3 1.71 $L = 5.4 + 0.3 = 5.7$

b) Short wall $\rightarrow$ 3 2.4 0.3 2.16 $L = 2.75 - 0.2 - 0.15 = 2.4$

Total = 11.31 sqm

Deduction

Door D 1 1 0.4 0.4

Door D1 1 0.9 0.3 0.27

opening veranda 2 2.5 0.3 1.5

Total = 2.17 sqm

Net total = 11.31 - 2.17 = 9.14 sqm

5 Brick work in superstructure

Rooms

a) Long wall $\rightarrow$ 2 5.3 0.3 3.5 11.13

b) Short wall $\rightarrow$ 2 4.0 0.3 3.5 8.4

Kitchen & veranda

a) Long wall $\rightarrow$ 1 5.4 0.2 3.5 3.78

b) Short wall $\rightarrow$ 3 2.75 0.2 3.5 5.77

Total = 29.08 cum

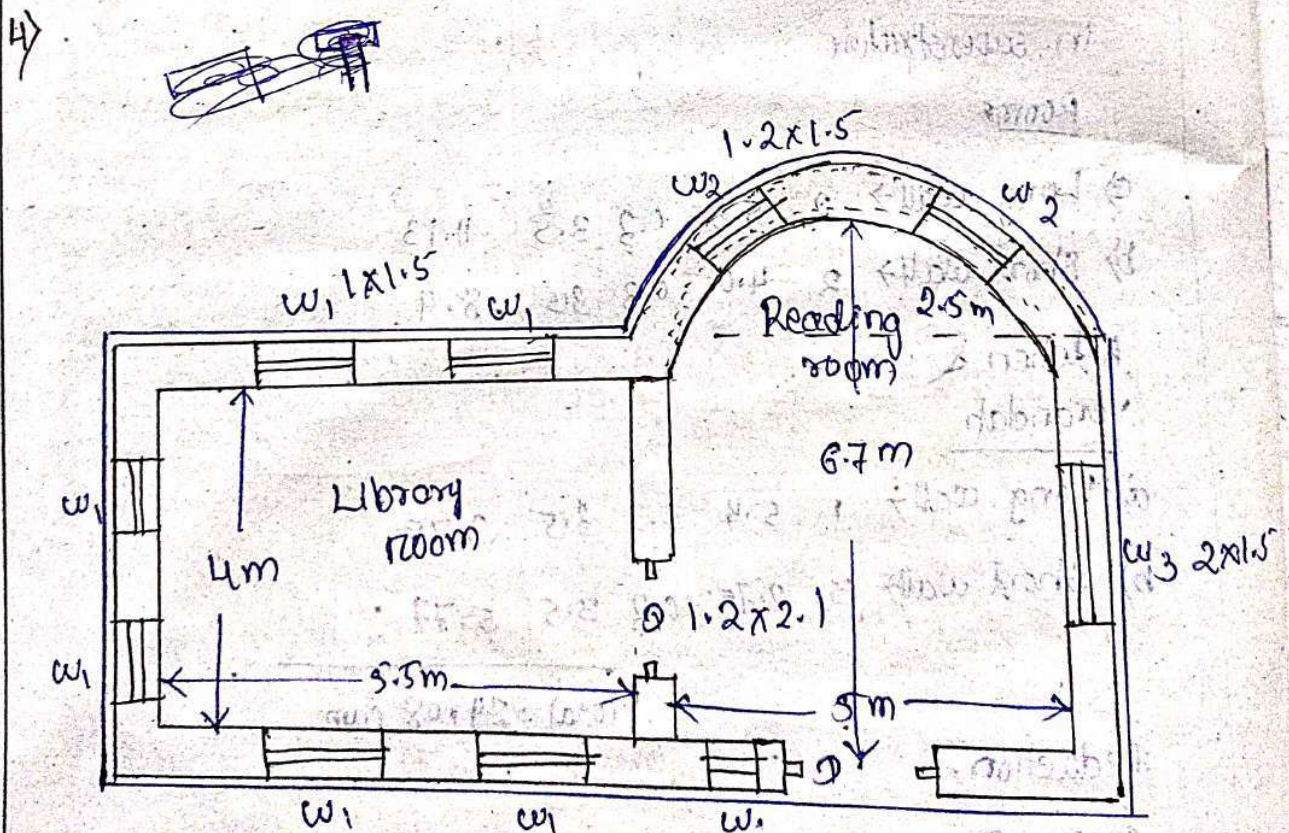
Deduction

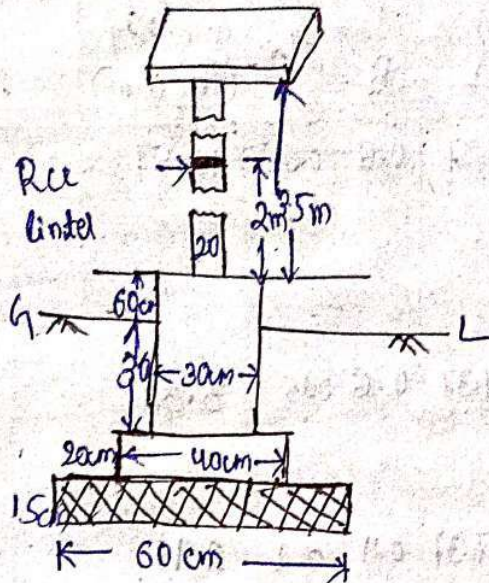
Door D 1 1 0.3 2.1 0.63

Door D1 1 0.9 0.2 2.1 0.37

Window, w	4	1	0.3	1.2	1.94	
Window, w ₁	1	1	0.2	1.2	0.24	
Opening Veranda	2	2.5	0.2	3.5	3.5	
Lintel over Door, D	1	1.3	0.3	0.15	0.05	$L = 1 + 0.3 = 1.3$
Lintel over Door, D ₁	1	1.1	0.2	0.15	0.03	$L = 0.9 + 0.2 = 1.1$
Lintel over window, w	4	1.3	0.3	0.15	0.23	$L = 1 + 0.3 = 1.3$
Lintel over window, w ₁	1	1.3	0.2	0.15	0.04	$L = 1 + 0.3 = 1.3$

Total = 6.53 cum

$$\text{Net total} = 29.08 - 6.53 = 22.55 \text{ cum}$$




$$\begin{aligned} D &= 1.2 \times 2.1 \\ W_1 &= 1 \times 1.5 \\ W_2 &= 1.2 \times 1.5 \\ W_3 &= 2 \times 1.5 \end{aligned}$$

$$r_m = r + \frac{t}{2} = 2.5 + \frac{0.2}{2} = 2.5 + 0.1 = 2.6$$

$$L_m = \pi \times r_m = \frac{22}{7} \times 2.6 = 8.17m$$

$$\text{Total centre line length} = (4.2 \times 3) + (5.7 \times 2) + 5.2 + 8.17 + 0.2$$

$$= 12.6 + 11.4 + 5.2 + 8.17 + 0.2$$

$$= 37.57m$$

$$\text{So net centre line length} = 37.57 - (2 \times 0.5 \times 0.2)$$

$$= 37.57 - 0.2$$

$$= 37.37 \text{ [As two 'T' junctions]}$$

Sl No	Particulars	N	L	B	H/O	Quantity (in cum)	Notes
1	Earth work in excavation in foundation	1	37.37	0.6	0.65	14.57	
2	Concrete in foundation	1	37.37	0.6	0.15	3.36	
3	Brick work in foundation	1	37.37	0.4	0.2	2.98	
4	Plinth	1	37.37	0.3	0.9	10.08	
5	Brick work in super structure	1	37.37	0.2	3.5	26.15	

Deduction →

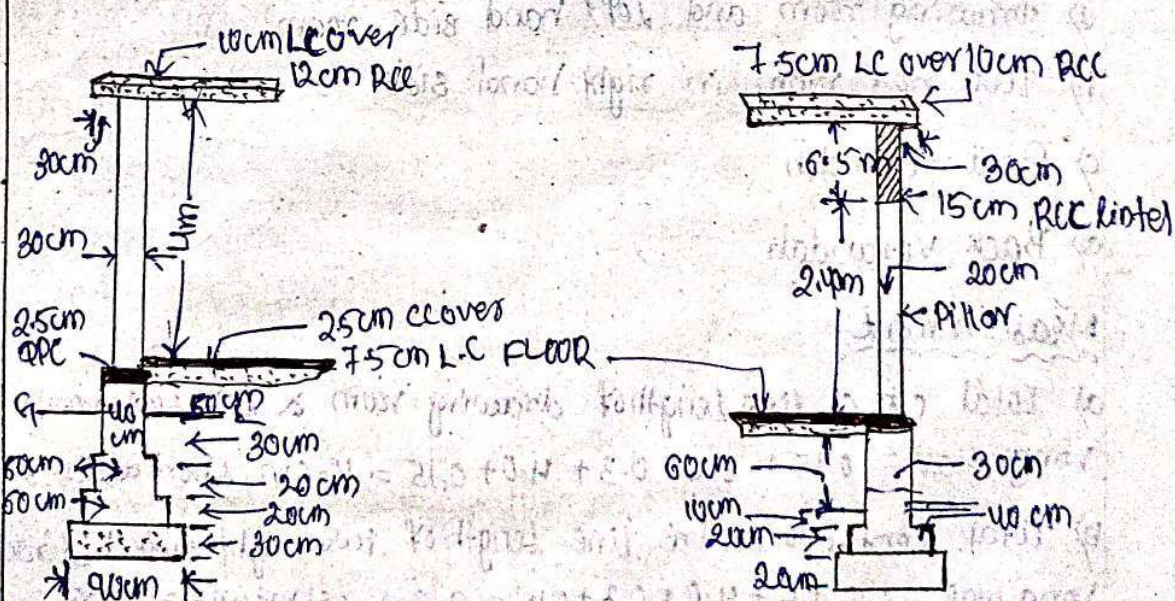
Door (D)	2	1.2	0.2	2.1	1.1
Window (W ₁)	7	1.0	0.2	1.5	2.1
Window (W ₂)	2	1.2	0.2	1.5	0.72
Window (W ₃)	1	2.0	0.2	1.5	0.6
Rec lintel	1	37.37	0.2	0.15	1.12

Total = 5.64

Net total = 26.15 - 5.64 = 20.51 cum

A hand-drawn floor plan of a house with the following details:

- Overall Dimensions:** 12.0m wide by 14.0m x 20.0m deep.
- Rooms and Dimensions:**
 - Bed (Top Left):** 5m x 4m
 - Bed (Bottom Left):** 5m x 4.5m
 - Drawing Room:** 5m x 6m
 - Bed (Center):** 5m x 4.5m
 - Bed (Right):** 4m x 4.5m
 - Bath:** 2m x 2.5m
- Other Features:**
 - Steps:** Located at the bottom center, with a width of 3.0m x 1.5m and a height of 2m.
 - Doorways:** Marked with 'D1/CW' and 'D2/CW'.
 - Windows:** Marked with 'W1/CW' and 'W2/CW'.
 - Other Labels:** '2.50m ver', '2m ver', '1A', '1B', '20m'.



Doors

$$D_1 = 1200 \text{ cm} \times 210 \text{ cm} (1.20 \text{ m} \times 2.10 \text{ m})$$

$$D_2 = 100 \text{ cm} \times 200 \text{ cm} (1.0 \text{ m} \times 2.0 \text{ m})$$

$$D_3 = 75 \text{ cm} \times 180 \text{ cm} (0.75 \text{ m} \times 1.80 \text{ m})$$

Windows

$$W_1 = 100 \text{ cm} \times 150 \text{ cm} (1.0 \text{ m} \times 1.50 \text{ m})$$

$$W_2 = 200 \text{ cm} \times 150 \text{ cm} (2.0 \text{ m} \times 1.50 \text{ m})$$

$$W_3 = 75 \text{ cm} \times 120 \text{ cm} (0.75 \text{ m} \times 1.20 \text{ m})$$

$$C.W = 75 \text{ cm} \times 80 \text{ cm} (0.75 \text{ m} \times 0.80 \text{ m})$$

Shelves

$$S = 100 \text{ cm} \times 150 \text{ cm} (1.0 \text{ m} \times 1.5 \text{ m})$$

Lintel over Doors, windows etc

15 cm RB

The given building plan let us divided into

four parts -

a) Drawing room and left hand side room

b) Two bed room in right hand side

c) Front verandah

d) Back verandah

Measurement

a) Total c to c line length of drawing room & left side room -
Long wall = $0.15 + 6.0 + 0.3 + 4.0 + 0.15 = 10.6 \text{ m}$, short wall = 5.3 m

b) Total centre to centre line length of two right side bed room -
Long wall = $0.15 + 5 + 4.0 + 0.3 + 0.15 = 9.6 \text{ m}$, short wall = 4.8 m

c) Total c to c line length of front verandah - Lw = 9.65 m , Sw = 2.25 m

d) Total c to c " " " " back " - Lw = 9.6 m , Sw = 2.75 m

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
1	Earth work in excavation in foundation						
	a) Drawing room and left hand side bed room:-						
	Long wall	2	11.5	0.9	1	20.70	$L = 10.6 + 0.9 = 11.5$
	Short wall	3	4.4	0.9	1	11.88	$L = 5.3 - 0.9 = 4.4$
	b) Two bed room in right side:-						
	Long wall	2	9.6	0.9	1	17.28	$L = 9.6 - 0.45 + 0.45 = 9.6$
	Short wall	2	3.9	0.9	1	7.02	$L = 4.8 - 0.45 - 0.45 = 3.9$
	c) Front verandah:-						
	Long wall	1	9.5	0.6	0.5	2.85	$L = 9.65 + 0.3 - 0.45 = 9.5$
	Short wall	1	2.0	0.6	0.5	0.45	$L = 2.25 - 0.45 = 2.0$
	d) Back verandah:-						
	Long wall	1	9.5	0.6	0.5	2.85	$L = 9.65 + 0.3 - 0.45 = 9.5$
	Short wall	2	2.6	0.6	0.5	1.20	$L = 2.75 - 0.3 - 0.45 = 2.6$
Total = 64.23 cum							

2	Lime concrete in foundation						
	a) Drawing room and left hand side bed room:-						
	Long wall	2	11.5	0.9	0.3	6.21	$L = 10.6 + 0.9 = 11.5$
	Short wall	3	4.4	0.9	0.3	3.56	$L = 5.3 - 0.9 = 4.4$
	b) Two bed room in right side:-						
	Long wall	2	9.6	0.9	0.3	5.18	$L = 9.6 - 0.45 + 0.45 = 9.6$
	Short wall	3	3.9	0.9	0.3	2.11	$L = 4.8 - 0.45 - 0.45 = 3.9$

S.No	Particulars	N	L	B	H/D	Quantity	Remarks
	c) Front verandah:-						
	Long wall	1	9.7	0.6	0.2	1.16	$L = 9.65 - \frac{0.5}{2} + \frac{0.6}{2} = 9.7$
	Short wall	1	1.7	0.6	0.2	0.20	$L = 2.25 - \frac{0.5}{2} - \frac{0.6}{2} = 1.7$
	d) Back verandah:-						
	Long wall	1	9.7	0.6	0.2	1.16	$L = 9.65 - \frac{0.5}{2} + \frac{0.6}{2} = 9.7$
	Short wall	2	2.2	0.6	0.2	0.53	$L = 2.75 - \frac{0.5}{2} - \frac{0.6}{2} = 2.2$
Total = 20.11 cum							

3 First class Bw in Foundation and Plinth.

First Footing

a) Drawing room and left hand side room:-

Long wall 2 11.2 0.6 0.2 2.69 $L = 10.6 + 0.6 = 11.2$

Short wall 3 4.7 0.6 0.2 1.69 $L = 5.3 - 0.6 = 4.7$

b) Two room in right side:-

Long wall 2 9.6 0.6 0.2 2.30 $L = 9.6 - \frac{0.6}{2} + \frac{0.6}{2} = 9.6$

Short wall 2 4.2 0.6 0.2 1.0 $L = 4.8 - \frac{0.6}{2} - \frac{0.6}{2} = 4.2$

c) Front verandah:-

Long wall 1 9.65 0.4 0.2 0.76 $L = 9.65 - \frac{0.4}{2} + \frac{0.4}{2} = 9.65$

Short wall 1 1.85 0.4 0.2 0.37 $L = 2.25 - \frac{0.4}{2} - \frac{0.4}{2} = 1.85$

d) Back verandah:-

Long wall 1 9.65 0.4 0.2 0.76 $L = 9.65 - \frac{0.4}{2} + \frac{0.4}{2} = 9.65$

Short wall 2 2.35 0.4 0.2 0.18 $L = 2.75 - \frac{0.4}{2} - \frac{0.4}{2} = 2.35$

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
	<u>Second footing</u>						
	a) Drawing room and left hand side room:-						
	Long wall	2	11.1	0.5	0.2	2.22	$L = 10.6 + 0.5 = 11.1$
	Short wall	3	4.8	0.5	0.2	1.44	$L = 5.3 - 0.5 = 4.8$
	b) Two room in right side:-						
	Long wall	2	9.6	0.5	0.2	1.92	$L = 9.6 - \frac{0.5}{2} + \frac{0.5}{2}$
	Short wall	2	4.3	0.5	0.2	0.86	$L = 4.8 - \frac{0.5}{2} - \frac{0.5}{2}$
	c) Front verandah:-						
	Long wall	1	9.6	0.4	0.2	0.76	$L = 9.65 - \frac{0.4}{2} + \frac{0.3}{2}$
	Short wall	1	1.85	0.4	0.2	0.14	$L = 2.25 - \frac{0.4}{2} - \frac{0.3}{2}$
	d) Back verandah:-						
	Long wall	1	9.6	0.4	0.2	0.76	$L = 9.65 - \frac{0.4}{2} + \frac{0.3}{2}$
	Short wall	2	1.9	0.4	0.2	0.36	$L = 2.75 - \frac{0.4}{2} - \frac{0.3}{2}$
	Plinth wall above footing						
	a) Drawing and left hand side room:-						
	Long wall	2	11	0.4	0.9	7.9	$L = 10.6 + 0.4 = 11$
	Short wall	3	4.9	0.4	0.9	12.58	$L = 5.3 - 0.4 = 4.9$
	b) Two room in right side:-						
	Long wall	2	9.6	0.4	0.9	6.91	$L = 9.6 - \frac{0.4}{2} + \frac{0.4}{2}$
	Short wall	2	4.4	0.4	0.9	3.16	$L = 4.8 - \frac{0.4}{2} - \frac{0.4}{2}$
	c) Front verandah:-						
	Long wall	1	9.6	0.3	0.7	2.01	$L = 9.65 - \frac{0.4}{2} + \frac{0.3}{2}$
	Short wall	1	1.9	0.3	0.7	0.39	$L = 2.25 - \frac{0.4}{2} - \frac{0.3}{2}$

Sl No	Particulars	N	L	B	H/D	quantity	Remarks
	a) Back verandah:-						
	Long wall	1	9.6	0.3	0.7	2.01	$L = 9.65 - \frac{0.4}{2} + \frac{0.9}{2}$
	Short wall	2	2.4	0.3	0.7	1.00	$L = 2.75 - \frac{0.4}{2} - \frac{0.3}{2}$

Total = 44.98 cum

4 2.5 cm OPC

a) Drawing room & left hand side bed room:-

Long wall

2

11

0.4

2.5

8.80

$L = 10.6 + 0.4 = 11$

Short wall

3

4.9

0.4

2.5

5.88

$L = 5.3 - 0.4 = 4.9$

b) Bed room inner side:-

Long wall

2

9.6

0.4

2.5

7.68

$L = 9.6 - \frac{0.4}{2} + \frac{0.4}{2}$

Short wall

2

4.4

0.4

2.5

3.52

$L = 4.8 - \frac{0.4}{2} - \frac{0.4}{2}$

c) Verandah both front and back:-

Pillars -

4

0.5

0.3

2.5

0.60

$L = 0.4 + 0.1 + 0.5$

d) Both room:-

1

2.5

0.3

2.5

0.75

$L = 2.20 + 0.15 + 0.5 = 2.85$

e) Side and inner wall

2

2.4

0.3

2.5

1.44

Deduction

Door skill, D₁

6

1.20

0.4

2.88

Door skill, D₂

2

1.0

0.4

0.88

Door skill, D₃

10

0.75

0.3

0.23

Total = 28.76 sqm

Total = 3.91 sqm

Net total = 28.76 - 3.91 = 24.76 sqm

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
5	First class Bu in superstructure						
	in lime mortar in lime mortar - drawing and left bed room :-						
	Long wall	2	10.9	0.3	4.0	26.16	$L = 10.6 + 0.3 = 10.9$
	Short wall	3	5	0.3	4.0	18.0	$L = 5.3 - 0.3 = 5$
	⇒ Bed room in right side :-						
	Long wall	2	9.6	0.3	4.0	23.4	$L = 9.6 - \frac{0.3}{2} + \frac{0.3}{2}$
	Short wall	2	4.5	0.3	4.0	10.8	$L = 4.8 - \frac{0.3}{2} - \frac{0.3}{2}$
	⇒ Front Verandah:-						
	Front wall solid	1	9.6	0.2	3.05	5.86	
	Side wall solid	1	2.0	0.2	3.05	1.22	
	⇒ Back verandah:-						
	Back long wall solid		9.6	0.2	3.05	5.86	
	Side interval & both		2.50	0.2	3.05	3.05	
	both						
	<u>Deduction</u>						
	Door opening:-						
	Door opening D ₁	6	1.2	0.3	2.1	4.54	
	Door opening D ₂	2	1.0	0.3	2.0	1.20	
	Door opening D ₃	1	0.75	0.2	1.80	-0.27	
	<u>Window opening:-</u>						
	Window opening w ₁	11	1.20	0.3	1.50	4.95	
	Window opening w ₂	1	2.0	0.3	1.5	0.90	
	Window opening w ₃	2	0.75	0.2	1.2	0.36	
	Total = 93.99 cum						

The given plan is divided into two parts

1) Rooms

2) Verandah

1) Room

Total c to c length of long wall = $0.15 + 3.5 + 0.3 + 4 + 0.15 = 8.1\text{m}$

Total c to c length of short wall = $0.15 + 4 + 0.15 = 4.3\text{m}$

2) Verandah

Total c to c length of long^{wall} = $8.1 + 0.5 + 0.5 = 8.2\text{m}$

Total c to c length of short wall = $2.5 + 0.15 + 0.1 = 2.75\text{m}$

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
01	Earth work in excavation in foundation						
1)	Room						
	a) Long wall	2	9.0	0.9	0.9	14.58	$L = 8.1 + 0.45 + 0.45 = 9.0$
	b) Short wall	3	3.4	0.9	0.9	8.26	$L = 4.3 - 0.45 - 0.45 = 3.4$
ii)	Verandah						
	a) Long wall	1	8.9	0.7	0.9	5.61	$L = 8.2 + 0.7 = 8.9$
	b) Short wall	2	1.95	0.7	0.9	2.46	$L = 2.75 - \frac{0.9}{2} - \frac{0.7}{2} = 1.95$
	Front stairs	1	2.9	1	0.15	0.43	$L = 2.7 + 0.2 = 2.9$
						Total = 31.34 cum	
02	Earth work in filling						
	Room - 1	1	3.4	3.4	0.54	6.24	
	Room - 2	1	3.9	3.9	0.54	8.21	
	Verandah	1	7.9	2.4	0.54	10.23	
						Total = 25.61 cum	
03	Concrete in foundation						
1)	Room						
	a) Long wall	2	9.0	0.9	0.3	4.56	$L = 8.1 + 0.45 + 0.45 = 9.0$
	b) Short wall	3	3.4	0.9	0.3	2.75	$L = 4.3 - 0.45 - 0.45 = 3.4$
ii)	Verandah						
	a) Long wall	1	8.9	0.7	0.3	1.87	
	b) Short wall	2	1.95	0.7	0.3	0.82	
	Steps	1	2.9	1	0.15	0.44	
						Total = 10.74 cum	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
4	BW in Foundation & Plinth ROOM →						
a) Long wall							
1st Footing	2	8.8	0.7	0.2	2.46	$L = 8.1 + 0.7 = 8.8$	
2nd Footing	2	8.7	0.6	0.1	1.04	$L = 8.1 + 0.6 = 8.7$	
3rd Footing	2	8.6	0.5	0.1	0.86	$L = 8.1 + 0.5 = 8.6$	
Plinth	2	8.5	0.4	0.8	5.44	$L = 8.1 + 0.4 = 8.5$	
b) Short wall							
1st Footing	3	3.6	0.7	0.2	1.51	$L = 4.3 - 0.7 = 3.6$	
2nd Footing	3	3.7	0.6	0.1	0.67	$L = 4.3 - 0.6 = 3.7$	
3rd Footing	3	3.8	0.5	0.1	0.57	$L = 4.3 - 0.5 = 3.8$	
Plinth	3	3.9	0.4	0.8	3.74	$L = 4.3 - 0.4 = 3.9$	
VCRANDAH →							
a) Long wall							
1st Footing	1	8.7	0.5	0.2	0.87	$L = 8.2 + 0.5 = 8.7$	
2nd Footing	1	8.6	0.4	0.1	0.34	$L = 8.2 + 0.4 = 8.6$	
Plinth	1	8.5	0.3	0.9	2.30	$L = 8.2 + 0.3 = 8.5$	
b) Short wall							
1st Footing	2	2.15	0.5	0.2	0.43	$L = 2.75 - \frac{0.5}{2} - \frac{0.1}{2} = 2.15$	
2nd Footing	2	2.25	0.4	0.1	0.18	$L = 2.75 - \frac{0.4}{2} - \frac{0.6}{2} = 2.25$	
Plinth wall 10cm above footing	2	2.35	0.3	0.1	0.14	$L = 2.75 - \frac{0.3}{2} - \frac{0.5}{2} = 2.35$	
Plinth wall remaining Projection	2	2.4	0.3	0.8	1.15	$L = 2.75 - \frac{0.3}{2} - \frac{0.4}{2} = 2.4$	
steps →							
1st step	1	2.7	0.9	0.15	0.36		
2nd step	1	2.1	0.6	0.15	0.19		
3rd step	1	1.5	0.3	0.15	0.07		
Total =					22.33 cum		
5	DPC (2.5 cm) ROOM →						
Long wall	2	8.5	0.4		6.8		
Short wall	3	3.9	0.4		4.68		
Deduction:-					Total = 11.48 sqm		
Doors	2	1.2	0.4		0.96		
Total =					0.96		
Net total = DPC - Deduction					= 11.48 - 0.96		
					[10.52 sqm]		

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
6	1st class BW in super structure						
	Rooms →						
	Long wall	2	8.4	0.3	4.0	20.16	$L = 8.1 + 0.3 = 8.4$
	Short wall	3	4.0	0.3	4.0	14.4	$L = 4.3 - 0.3 = 4.0$
	Verandah above (Lintel Cover pillars)						
	Long wall	1	8.4	0.2	0.3	0.504	$L = 8.2 + 0.2 = 8.4$
	Short wall	2	2.5	0.2	0.3	0.3	$L = 2.75 - \frac{0.2}{2} - \frac{0.2}{2} = 2.5$
	Parapet over rooms						
	Long wall	2	8.4	0.2	0.6	2.02	$L = 8.4, H = 0.47 + 0.1 + 0.03 = 0.6$
	Short wall	2	4.2	0.2	0.6	1.01	$L = 4.3 + 0.3 - 0.2 - 0.2 = 4.2$
	VERANDAH →						
	Long wall	1	8.4	0.2	0.4	0.67	$H = 0.27 + 0.1 + 0.03 = 0.4$
	Short wall	2	2.5	0.2	0.4	0.40	$L = 2.75 - \frac{0.2}{2} - \frac{0.2}{2} = 2.5$
						Total = 39.46 cum	
	Deduction →						
	Door opening	2	1.2	0.3	2.1	1.51	
	Window opening	10	1	0.3	1.5	4.50	
	CS window opening	12	1	0.3	0.5	1.80	
	Shelves opening	2	1	0.2	1.5	0.60	Back of self 10 cm
	RB Lintel over						
	Door	2	1.4	0.3	0.1	0.08	10 cm. bearing
	Window	10	1.2	0.3	0.1	0.36	
	CS window	12	1.2	0.3	0.1	0.43	
	Shelves	2	1.2	0.3	0.1	0.07	
						Total = 9.36 cum	
						Net total = 39.46 - 9.36	
						Net total = 30.10 cum	
7	RB work in Lintel excluding steel and its bending but including centring & shuttering and bending steel						
	Over doors, windows, shelves and also same as for item no-6 marked as 'a'					0.095	
	Over verandah pillar						
	Long wall	1	8.4	0.2	0.3	0.50	
	Short wall	2	2.8	0.2	0.3	0.34	
						Total = 1.79 cum	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
8	RCC work in Verandah column excluding steel and its bending but including form work and binding steel complete					0.19	
						Total = 0.19 cum	
9	RCC work excluding steel and its bending but including centering and shuttering and bending fair finished.						
	Roof slab of rooms	1	8.64	4.84	0.12	5.018	12 cm projection - 10 cm bending
	Roof slab of verandah	1	8.4	2.8	0.1	2.352	excluding chajja
	Chajja projection						
	Verandah front	1	9.3	0.45	0.08	0.335	$L = 8.4 + 0.45 + 0.45 = 9.3$
	Verandah side window	2	2.7	0.45	0.08	0.194	Avg thickness
	Top	4	2.5	0.45	0.05	0.225	
	Bottom	4	2.5	0.15	0.05	0.075	Sem insertion
	Sides	8	1.5	0.325	0.05	0.195	
	Shelf slab	6	1.1	0.2	0.05	0.066	
						Total = 8.460 cum	
10	Mild steel bar including bending reinforcement 1% of RB and RCC work					8.19	1% of total of items 7-8 & 9
						Total = 8.19 kg	
11	10 cm lime concrete in roof terracing complete with surface finishing						
	Rooms	1	8	4.2	0.1	33.6	clear roof area in between
	Verandah	1	8	2.5	0.1	20	Parapet
						Total = 53.6 sqm	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
12	3cm thick insulation layer of sand & clay						
	Rooms	1	8	4.2		33.6	
	Verandah	1	8	2.5		20	
						Total = 53.6 sqm	
13	Sal wood work in chowkhat wrought framed & fixed doors (3cm insertion into floor)	2	5.46	0.12	0.08	0.105	$L = 2 \times 2.1 + 1.2 = 5.46$
	Windows	10	5	0.1	0.08	0.400	$L = 2 \times 1.5 + 2 \times 1 = 5$
	CS windows	12	3	0.08	0.08	0.230	$L = 2 \times 0.5 + 2 \times 1 = 3$
						Total = 0.735 cum	
14	4-cm thick Indian teak wood glazed shutter including fitting parallel doors and window shutters including fitting						
	Doors	2	1.07			2.035	
	Windows	10	0.87			1.37	
						Total = 16.274 sqm	
15	4 cm thick Indian teak wood glazed shutter including fitting						
	CS window	12	0.87			0.37	
						Total = 3.863 sqm	
16	Iron work (milled steel) in hold fasts and window gratings						
	Hold fast in doors	2x6				12 nos	
	Hold fast in windows	10x4				40 nos	
	Hold fast in CS windows	12x2				24 nos	
						Total = 76 kg	
	Window bars 10mm diameter @ 1.58 kg/m						
	Windows	10x8	1.5			120	vertical bars at 10 cm c/c
	CS windows	12x2	1			24	2 horizontal bars
						Total = 144m	
						@ 1.58 kg/m	
						Total = 227.52 kg	
						Net total = 227.52 + 76 = 303.52 kg = 3.0352	

Sl No	Particulars	N	HL	B	HD	Quantity	Remarks
17	12 mm thick plastering in walls (1:1:6 cement sand lime mortar)						
	INSIDE →						
	ROOMS						
	Room - i	2	3.5		4	28	
	Room - i	2	4		4	32	
	Room - ii	4	4		4	64	
	Verandah inner wall	1	8.4		3	25.2	
	Verandah front above column inner face	1	8		0.6	4.8	
	Verandah side above column inner face	2	2.5		0.6	3	
	Jamb, sills, soffits of shelves	2	5	0.2		2	$L = 2 \times 1 + 2 \times 1.5 = 5$
	soffits of verandah lintel →						
	Front	1	8.4	0.2		1.68	
	Sides	2	2.5	0.2		1	
						Total = 161.68	sqm
	Deduction →						
	Opening doors and window in between rooms and verandah						
	Door opening	2	1.2		2.1	5.04	
	Window opening	2	1		1.5	3	
						Total = 8.04	sqm
						Net total = 161.68 - 8.04 = 153.64	sqm
	OUT SIDE →						
	ROOMS -						
	Back plinth including 10 cm GL	1	8.5		0.72	6.12	$L = 8.4 + 0.65 + 0.5 = 8.5$
	Back super structure including 10 cm below GL	1	8.4		4	33.6	
	Side plinth including 10 cm below GL	2	4.65		0.72	6.70	
	Side super structure	2	4.6		4	36.80	
	VERANDAH →						
	Above columns front outer face	1	8.4		0.6	5.04	
	Above columns side outer face	2	2.7		0.6	3.24	
	Plinth front including 10 cm below GL	1	8.5		0.72	6.12	

Sl No	Particulars	N	L	B	H	Quantity	Remarks
	Plinth sides including 10cm below GL	2	2.75		0.72	3.96	
	Wall above verandah roof	1	8.4		0.77	6.47	$H = 4 - 3.23 = 0.77$
	Parapet → ROOM						
	Long wall outer face	2	8.4		0.6	10.08	
	Long wall inner face	2	8		0.47	7.52	$L = 8.4 - 2 \times 0.2 = 8$
	Long wall top face	2	8.4	0.2		3.36	
	Short wall outer face	2	4.6		0.6	5.52	
	Short wall inner face	2	4.2		0.47	3.95	
	Short wall top face	2	4.2	0.2		1.68	
	VERANDAH						
	Front wall outer face	1	8.4		0.4	3.36	
	Front wall inner face	1	8		0.27	2.16	
	Front wall top face	1	8.4	0.2		1.68	
	Side wall outer face	2	2.7		0.4	2.16	
	Side wall inner face	2	2.5		0.27	1.35	
	Side wall top face	2	2.5	0.2		1	
						Total = 151.86	sqm
	Deduction						
	window opening	8	1		1.5	12	
	CS window opening	12	1		0.5	6	
	Steps from plinth wall	1	2.7		0.7	1.89	
	Ends of verandah side wall and lintel above column level	2		0.2	0.6	0.24	
	Ends of verandah parapet wall from wall above verandah roof level	2		0.2	0.27	0.11	

Total = 20.24 sqm

Net total = 151.86 - 20.24 = 131.62 sqm

Grand total inside & out side plastering =

= 153.64 + 131.62

= **285.26 sqm**

Sl No	Particulars	N	L	B	H/D	quantity	Remarks
18	20 mm thick plaster 1:3 in step finished cement						
	1st riser	1	4.5		0.15	0.68	$L = 2.7 + 0.9 + 0.9 = 4.5$
	2nd riser	1	3.3		0.15	0.50	$L = 2.1 + 0.6 + 0.6 = 3.3$
	3rd riser	1	2.1		0.15	0.32	$L = 1.5 + 0.3 + 0.3 = 2.1$
	1st step tread	1	3.9		0.3	1.17	$L = 2.7 - 0.3 + 0.9 + 0.9 - 0.3$
	2nd step tread	1	2.7		0.3	0.81	$L = 2.1 - 0.3 + 0.6 + 0.6 - 0.3$
	3rd step tread	1	1.5		0.3	0.45	
	Plinth wall above 1st step	2	0.3		0.45	0.27	
	Plinth wall above 2nd step	2	0.3		0.3	0.18	
	Plinth wall above 3rd step	1	1.5		0.15	0.23	
						Total = 4.59 sqm	
19	2.5 cm thick cc 1:2:4 over and including 8 cm lime concrete floor						
	Room - 1	1	4	3.5		14	
	Room - 2	1	4	4		16	
	Verandah	1	8	2.5		20	
						Total = 50 sqm	
20	2.5 cm thick cc 1:2:4 floor in bills						
	Door bills	2	1.2			0.72	
	Sills over verandah opening front	1	8.5			2.13	
	Sills over verandah opening sides	2	2.5			1.25	
						Total = 4.10 sqm	
	Deduct pillars	4	$\frac{3.14}{4}$			$\times 0.15 \times 0.15 = 0.07$	
						Total = 0.07 sqm	
						Net total = 4.10 - 0.07 = 4.03 sqm	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
21	White washing 3 coats inside						
	Same as item no - 17 = 153.64						
	Walls						
	Celling of room - 1	1	4	3.5		14	
	Celling of room - 2	1	4	4		16	
	Celling of verandah	1	8	2.5		20	
						Total = 203.64 sqm	
22	Colour washing 2-coat over one coat white washing out side						
	Same as for outside wall plastering item no - 11					131.62	
	Wall						
	Chajja ver. front	1	9.3	0.96		8.93	$B = 0.45 + 0.45 + 0.6 = 0.91$
	Chajja ver side	2	2.7	0.96		5.18	
	Sunshade and sun breakers in windows						
	Top	4	2.5	0.95		9.50	$B = 0.45 + 0.45 + 0.05$
	Bottom	4	2.5	0.25		2.50	$B = 0.1 + 0.1 + 0.05$
	Side	16	1.5	0.325		7.80	
	Edges of sides	8	1.5	0.05		0.6	
	outer projection of roof slab	1	26	0.36		4.36	$L = 8.4 + 8.4 + 4.6 + 4.6$ $B = 0.12 + 0.12 + 0.12$
	Pillars	4	$\frac{3.14 \times 2.4}{4}$	2.4		4.52	circumference of circle
						Total = 180.01 sqm	
	Reduction -						
	Projection below G/L	1	29.1		0.1	2.91	$L = 2(8.5 + 7.4) = 2.7$
						Total = 2.91 sqm	
						Net total = 180.01 - 2.91 = 177.10 sqm	
23	Painting doors and window 2 coats over one coats of priming						
	Doors panelled	$2(\frac{1}{4}) \times \frac{1}{2}$	1.2		2.1	11.34	$2(\frac{1}{4}) = 9/4$ fine one surface for both side
	Window Panelled	$2(\frac{1}{4}) \times \frac{1}{10}$	1		1.5	33.75	
	CS window	1×12	1		0.5	1.13	
	Window Bars	10	0.84		1.34	11.26	
	CS window Bars	12	0.84		0.34	3.43	
						Total = 60.90 sqm	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
24	Solingnum painting 2 coats in back of chawkhat.						
	Doors	2	5.46	0.12		1.31	
	Windows	10	5	0.1		5.00	
	CS windows	12	3	0.08		2.88	
						Total	9.19 sqm
25	CI pipe 10cm diameter (Rain water post complete with painting)	4	1			4	
						Total	4m

ABSTRACT OF ESTIMATED CAST

Item No	Particulars	Quantity	Unit	Rate	Per	Amount
1	Earth work in excavation in foundation	31.34	cum	350	per cum	109.69
2	Earth work in filling	25.61	cum	275	per cum	70.42
3	Concrete in foundation	10.74	cum	220	per cum	2362.8
4	BW in foundation and plinth	22.33	cum	320	per cum	7145.6
5	DPC	10.52	sqm	18	per sqm	189.36
6	1st class BW in super structure	30.10	cum	320	per cum	9632
7	RB work in lintels excluding steel and its bending but including centering and shuttering and binding steel	1.79	cum	520	per cum	930.8
8	RCC work in verandah column excluding steel and its bending but including form work and binding steel complete fair finished	0.19	cum	590	per cum	112.1
9	RCC work excluding steel and its bending but including centering and shuttering and binding steel fair finished	8.460	cum	775	per cum	6556.5
10	Mild steel bars including bending in reinforcement @ 1% of RB and RCC works	8.19	kg	515	per kg	4217.85
11	10 cm lime concrete in roof terracing complete with surface finishing	53.6	sqm	12	per sqm	643.2

Item No	Particulars	Quantity	Unit	Rate	Per	Amount
12	3cm thick insulation layer of sand clay	53.6	sqm	1.5	Per sqm	80.4
13	Eal wood work in chawkhat wrought framed and fixed	0.735	cum	4700	Per cum	3454.5
14	4cm thick Indian teak wood panelled door and window shutters including fittings	16.274	sqm	225	Per sqm	3661.65
15	4cm thick Indian teak wood glazed shutters including fittings	3.863	sqm	200	Per sqm	772.6
16	Iron work (mild steel) in hold fasts and window gratings	3.035	2	700	Per 2	2124.5
17	12 cm thick plastering in walls 1:1:6 cement sand lime mortar	285.26	sqm	2.9	Per sqm	827.25
18	20 mm thick plaster 1:3 in step finished cement	4.59	sqm	16	Per sqm	73.44
19	2.5 cm thick cc 1:2:4 over and including 8cm lime concrete floor	50	sqm	18.65	Per sqm	932.5
20	2.5 cm thick cc 1:2:4 floor in sills	4.03	sqm	18	Per sqm	72.54
21	White washing 3 coats inside	203.64	sqm	0.75	Per sqm	152.73
22	Colours washing 2 coats over the coat of white washing outside	177.10	sqm	0.82	Per sqm	145.22
23	Painting doors and window 2 coats over one coat of priming	60.90	sqm	10.4	Per sqm	633.36
24	Solignum painting 2 coat in back of chawkhat	9.19	sqm	3.5	Per sqm	32.165
25	CI pipe 10cm diameter (rainwater spout) complete with painting	4	m	27	Per m	108

Total = 45041.175

$$\text{Add 3\% for contingencies} = \frac{45041.175}{100} \times 3$$

$$= 450.41 \times 3$$

$$= 1351.23$$

$$\text{Add 2\% for work charged establishment} = \frac{45041.175}{100} \times 2$$

$$= 450.41 \times 2$$

$$= 900.82$$

$$\text{Grand total} = 45041.175 + 1351.23 + 900.82 = 47293.225$$

Lead and Lift:-

Normally earth work is estimated for 50mm lead for distance 1.5m lift for height or depth and this distance of 50mm and height of 1.5m are known as normal lead and lift. The lead and lift will be different for every unit of 50mm lead and for every unit of 1.5m lift.

Lead:-

It is the distance ~~for~~ from the material transport to the build up area.

Lift:-

It is the distance from pt to construction.

Royalty	Materials
cement	Manufactured
Sand	Natural
clip	Natural
Bricks	Manufactured
Metal	Natural
Red	Manufactured
Lime	Manufactured
Wood	Natural

E.g:- If 1m^3 sand rate is 200 then ± 40 is royalty charged royalty is a fee collected by government on natural resources.

The rate of particular items of work depends upon the following:-

- Specification of work and materials, equality of materials proportion of mortar method of constructional operation etc.
- Quantity of materials and their rates, no. of different types of labour and their rates.
- Location of site of work and its distances from the sources of materials and the rate of transport availability of water.
- Profit and miscellaneous and over head expenses of contractor.

Over load costs:-

It included general office expenses rent, forance, supervision and other costs which are indirect expenses and not productive expenses on the job.

The miscellaneous - expenses may be under the following load site -

A) General overheads:-

- i) Establishment (office staff)
- ii) Stationary, printing, postages etc.
- iii) Travelling expenses
- iv) Rent and taxes

B) Job overhead:-

- i) Supervision (Salary of Engineers, overseers, supervision etc)
- ii) Handling of materials
- iii) Repairing, carriage and development of T & P & D.
- iv) Ammenities of labour.
- v) Workmans co-operation insurances etc.
- vi) ~~Ante~~ Interest on investment
- vii) Losses on advances.

T & P:-

For big work or project a % are of 1% to 1 1/2% of the estimated cost is provided in the estimate for the % of T & P which will be required for the execution of the work.

Centage or charges or developmental charges:-

With the Engineering department takes of the work of other department a % are of 10% to 15% of the estimated cost is charged to most the expenses of percentage charge is known as centage charges.

Electrification similarly and water supply work:-

- For sanitary and water supply work → 8% of the ^{estimate} cost building
- For electrification → 8% of the estimate cost building
- For electrification → " " " " " " " "

⇒ To the attention of his AE in charge for any irregularity of contract, specification of storage departmental materials or any other difficulties misbehaviour for efficient execution finally completion of the work.

⇒ Outline the duties and responsibility for maintenance of stock and store when you are assigned with the charge. The JE entirely responsible for all stock and store in his charge. He is to maintain the accurate of store and stock plant correctly upto date.

He has to submit all returns of stock and stored to the authorised. He looks after the materials and articles are properly stocked and stored in such a way that at time is no possibility of any damage or loss. He is maintain the proper and equal securities of the store and stock. There should be verification according to the rate of regular interval and take necessary action and all storage and supply of the stored detected as a result of check. Any twist or detected should be reported to the AE or EE for guidance and to police etc. He is to ensure that there is no dangerous in the floor and there is no leakage in the roof of the store or godown.

Duties and responsibility of assistant Engineer:-

Each division is divided into numbers of sub division, each under charges of SDO or AE. AE is are directly in charges work facing under their charger and have to execute supervisor the manager, the work and have to maintain the quality and progress of work. There may be more AE in a subdivision, if the work is heavy. who are directly responsible for the execution engineers with respect to the work. The SDO has the power of disbursement (payment) and has to maintain initial accurate and has to submit accurate monthly to the DO. The work load of SDO or AE is 10 to 15 lakh. Before preparing a bill the JE must satisfy him self,

that the work has accurately been executed in accordance with the detailed measurement recorded and personally inspect all works of any magnitude before recommending final payment. The AE take measurement of the all important works and we must satisfy himself about the correctness of all the measurement recorded.

Duty and responsibility of a Junior Engineer in respect of quality control :-

⇒ To supervise day-to-day progress of work under his control to check up whether the materials, proportion of mix, details of items, workmanship etc. are provided as per specification and drawing for the work. The first shape of the responsibility for quality of works, lies on time.

⇒ To take detailed measurement of work during progress and enter the same in the measurement book and preparation of timely bills for payment.

⇒ To maintain accounts to materials, tools, and plant used for the work and to make timely recovery of the same from the bills for payment of the contractor. To maintain account of labours for work done through muster roll.

Contingencies :-

- It indicates incidental expenses of miscellaneous character which can't be classified under any direct item sub-head.

A certain amount is provided for contingencies of 3% - 5% of estimated cost.

Work-charged Establishment :-

- It is the establishment which is charged to work directly during the construction of a building project, a certain no. of work supervisors, chaudhris, mates, etc. are required to be employed and their salaries are paid from the am of work-charged establishment for this a percent of 1½ to 2% of the estimated cost and is included.

Sundries:-

~~It is the establishment which is charged~~

It is the item of work which can't be measured but it is required in the work and site. A lumpsum amount is kept as provision to meet sundary expenditure, such as during work period anything unhappen things held.

E.g → Breaking of handle of any tools purchase of medicines for use of labour etc.

Department:-

- 1) Water resources → Govt. organization
- 2) Minor irrigation → UPSC, S-S-C
- 3) Public work department → Housing board org.
- 4) RWSS → PWD, Irr. dept, NIPCC, R&D
- 5) PHED (Public Health Engineering Department) → Public sector org.
- 6) Rural work → Public sector org.
- 7) Permanent work and inspector → Group-II → Indian Oil
- 8) Inspector of work → Group-III → JINDAL, TATA, ONGC
- 9) OPWD → OPTCL, NALCO, SAIL
- 10) Block JE → HAL, ETC
- 11) Hindusthan cons. corp →

Item	Particulars	N	L	B	H/D	Quantity	Remarks
01	GCI Sheet roof in verandah						
	Front	1	$\frac{9.85+6.7}{2}$	3.37		27.80	Total = 49.62 sqm
	Side	1	$\frac{8.05+4.9}{2}$			21.82	
02	Sall wood work						
	Main rafter	7	3.47	0.1	0.15	0.36	
	Hip rafter	1	4.73	0.1	0.15	0.07	
	Tack rafter	2	2.85	0.1	0.15	0.08	
	Purlin front	4	$\frac{9.5+6.7}{2}$	0.05	0.15	0.52	Total = 1.37 cum
	Purlin side	4	$\frac{8.05+4.9}{2}$	0.05	0.08	0.10	
	Bressumer front	1	9.3	0.01	0.08	0.13	
	Bressumer side	1	7.5	0.1	0.15	0.11	
03	16mm diameter H.D bolts 40cm long	10			10		Total = 10 pic
04	GI - Ridge	01	4.08			4.08	Total = 4.08m
05	Painting two coats of wood work over one coat of						
	Main rafter	7	3.47	0.5		12.14	
	Hip rafter	1	4.73	0.5		2.36	
	Tack rafter	2	2.85	0.5		2.85	
	Purlin front	4	$\frac{9.5+6.7}{2}$	0.26		8.60	
	Purlin side	4	$\frac{8.05+4.9}{2}$	0.28		6.72	
	Bressumer front	1	9.3	0.5		4.65	
	Bressumer side	1	7.5	0.5		3.5	

Total = 40.82 sqm

ABSTRACT FORM

Item	Particulars	Quantity	Unit	Rate	Per	Amount
01	GCI Sheet roof in verandah	49.62	sqm	24	sqm	1190.88
02	Sall wood work	1.37	cum	4700	cum	6439
03	16mm diameter bolts 40cm long	10	each	3	each	30
04	GI Ridge	4.08	m	13.05	m	55.08
05	Painting	40.82	sqm	10.4	sqm	424.52

Total = 8139.48

$$\text{Total amount} = 8139.48$$

$$\begin{aligned} \text{Add 5\% of contingencies and worked charged} \\ \text{establishment} &= \frac{8139.48}{100} \times 5 = 406.974 \\ &= 407. \end{aligned}$$

$$\begin{aligned} \text{Grand total} &= 8139.48 + 407 \\ &= 8546.48 \end{aligned}$$

Calculation of dry materials - for different items of work.
1) Cement concrete:-

Sum - total quantity of determining the quantity of materials for 10 cum concrete is to divided 15.2 by the sum of numerals of the proportion of the materials which gives the quantity of cement in cum.

Add 5% of handling and transportation charges (losses)

E.g:- Calculate the dry materials required for 10 cum cement concrete of ratio 1:4:8.

Solⁿ

For 10 cum cement concrete take 15.2 cum dry volume

Now,

$$\text{Quantity of cement} = \frac{15.2}{1+4+8} = \frac{15.2}{13} = 1.17 \text{ cum}$$

$$1 \text{ bag cement} = 50 \text{ kg} = 0.034 \text{ cum}$$

$$\text{Number of bags of cement} = \frac{1.17}{0.034} = 34.41 = 35 \text{ bags}$$

$$\text{Quantity of fine aggregate (sand)} = 4 \times 1.17 = 4.68 \text{ cum}$$

$$\text{Quantity of coarse aggregates} = 8 \times 1.17 = 9.36 \text{ cum}$$

2) Ex - Calculate the dry materials required for 10 cum cement concrete of ratio 1:3:6.

Soln

For 10 cum cement concrete take 15.2 cum dry volume
Now

$$\text{Quantity of cement} = \frac{15.2}{1+3+6} = \frac{15.2}{10} = 1.52 \text{ cum}$$

$$1 \text{ bag cement} = 50 \text{ kg} = 0.034 \text{ cum}$$

$$\text{No of bags of cement} = \frac{1.52}{0.034} = 44.70 = 45 \text{ bags}$$

$$\text{Quantity of fine aggregates} = 3 \times 1.52 = 4.56 \text{ cum}$$

$$\text{Quantity of coarse aggregate} = 6 \times 1.52 = 9.12 \text{ cum}$$

2) Brick work:-

a-Ex - Consider a wall $1\frac{1}{2}$ bricks thick 30cm nominal thickness of 20m length and height is 5m.

Soln

$$\text{Nominal Volume} = 20 \times 5 \times 0.3 = 30 \text{ cum}$$

Here 1cm mortar joint is there so actual thickness is 29cm

$$\text{Hence actual volume} = 20 \times 5 \times 0.29 = 29 \text{ cum}$$

Number of standard bricks of 20cm x 10cm x 10cm (nominal size)

$$= \frac{29}{0.2 \times 0.1 \times 0.1} = 14500 \text{ Nos}$$

Therefore number of bricks required for per cum (nominal)

$$= \frac{14500}{30} = 484 \text{ nos}$$

Considering 5% of breakages wastages etc, the numbers may be taken as 500 Nos of bricks.

$$\text{For 10 cum BW no of bricks required} = 500 \times 10 = 5000 \text{ Nos}$$

Q. Mortar :-

$$\boxed{\text{Mortar requirement} = \text{Total vol. of BW} - \text{Net volume of BW}}$$

$$\begin{aligned}\text{Mortar requirement} &= 29 - (0.19 \times 0.09 \times 0.09 \times 14500) \\ &= 29 - 22.315 \\ &= 6.685 \text{ cum}\end{aligned}$$

Now for frog filling, for use of cut bricks for uniform joints, wastage, etc. 15% extra mortar may be required.

$$\therefore \text{Volume of mortar will be} = 1.15 \times 6.685 = 7.688 \text{ cum}$$

For dry volume increase more 25%.

$$\therefore \text{Dry volume of mortar will be} = 1.25 \times 7.688 = 9.61 \text{ cum}$$

$$\begin{aligned}\text{For 10 cum of BW, dry volume of mortar} &= 9.61 \times (10/30) \\ &= 3.2 \text{ cum}\end{aligned}$$

* In practice for BW in cement mortar we take ~~3~~ 3.5 cum as dry volume mortar and for lime water (mortar), we take 3.5 as dry volume of mortar.

E.g :- 1:3 so for 10 cum BW what is the quantity of cement and sand?

Soln

we know for 10 cum BW of dry material for mortar is 3 cum.

$$\text{Quantity of cement} = \frac{3}{1+3} = \frac{3}{4} = 0.75 \text{ cum}$$

$$\text{No of bags of cement} = \frac{0.75}{0.034} = 22.19 = 23 \text{ bags}$$

$$\text{Quantity of sand} = 3 \times 0.75 = 2.25 \text{ cum}$$

BW with traditional bricks = $29.9 \times 11.4 \times 7.6$ (9" x 4.5")

As volume of almost same, therefore the same quantity of bricks and mortar will be used, as for standard bricks.

3) Plastering

Area $\times$ thickness gives the quantity of mortar for uniform thickness.

Add 30% of to fill the joints and to make up an ununiform surface, This will gives the wet volume of mortar.

To get the total dry volume of mortar, the wet volume is further increased by 25%.

Materials for 12mm thick plastering in wall for 100sqm.

wet mortar for uniform layer = $0.012 \times 100 = 1.2 \text{ cum}$

Add 30% = $1.3 \times 1.2 = 1.56 \text{ cum}$

increase it by 25% = $1.25 \times 1.56 = 1.95 \text{ cum}$

So take 2 cum for dry volume of 12mm thick plastering for 100 sqm.

* 100mm thick plastering for 100sqm $\rightarrow 3 \text{ cum}$

* 12mm thick plastering for 100sqm $\rightarrow 2 \text{ cum}$

LABOUR REQUIREMENT FOR DIFFERENT ITEMS OF WORK

UP PWD 2006 rates:-

1) 1st class BW for 10 cum -

Labour	No	Rate
Mistri	0.5	150
Mason	3	125
Mazdoor	12	60
Boy or woman (coolie)	20	50
Bhisti (curing)	06	50
Sundries T&P	Lumpsum	RS-45
Add 15% of water charge		
Add 10% of contractor profit		

2) 20cm thick plastering for 100sqm -

Labour	Nos	Rate
Mistri (Head Mason)	0.33	150
Mason	12	125
Mazdoor	15	60
Bhisti (curing)	1	50
Sundries (T&P)	Lumpsum	RS-70
Add 1% of water charge		
Add 10% of contractor profit		

3) Cement concrete using 20mm aggregates -

Labour	Nos	Rate
Mistri (Head Mason)	0.5	150
Mason	3	125
Mazdoor	12	60
Boy or woman (coolie)	20	50
Bhisti (curing)	06	50
Sundries (T&P)	Lumpsum	RS-45/-
Add 1.5% of water charge		
Add 10% of contractor profit		

4) Cement concrete using 40mm aggregates for 10 cum—

Labour	Nos	Rate
Mistri (Head mason)	0.5	150
Mason	1.5	125
Mazdoor	12	60
coolie (boy or woman)	18	50
Bhisti (curing)	4	50
Sundries (T&P)	Lumpsum	RS-40/-
Add 1.5% of water charge		
Add 10% of contractor profit		

5) 12mm thick plastering for 100 sqm

Labour	No	Rate
Mistri (Head Mason)	0.33	150
Mason	10	125
Mazdoor	15	60
Bhisti (curing)	0.75	50
Sundries (T&P)	Lumpsum	RS-70/-
Add 1.5% of water charge		
Add 10% of contractor profit		

Question

Find the unit rate of 12mm thick cement plastering (1:6) on new BW per sqm as per up PWD code assuming market rate.

Ans

Finding dry material required for 100 sqm.

Dry material for 12mm thick plastering for 100 sqm is 2 cum

$$\text{Quantity of cement} = \frac{2}{1+6} = 0.286 \text{ cum}$$

$$\text{No of bags of cement} = \frac{0.286}{0.034} = 9 \text{ bags}$$

$$\text{Quantity of sand} = 0.286 \times 6 = 1.716 \text{ cum}$$

S/No	Particulars	Quantity	Unit	Rate	Cost
1	Material				
	cement	9	Bags	180	1620
	sand	1.716	cum	120	205.92
	Total =				1825.92 (A)
2	Labour				
	Mistri	0.33	Nos	150	49.50
	Mason	10	Nos	125	1250
	Mazdoor	15	Nos	60	900

Bhisti (Curing)	0.75	No. 5	50	37.50
Sandite (TSP)	Lumpsum	15		70
Total = 2307 [B]				

$$\text{Total (A+B)} = \cancel{1825.92} + 2307$$

$$= 4132.92 \text{ (C)}$$

$$\text{Add 1% of water charge of A+B} = \frac{4132.92}{100} \times 1 = 41.33 \text{ (D)}$$

$$\text{Total (A+B+C)} = 4132.92 + 41.33 = 4174.25$$

$$\text{Add 10% of contractor profit of (A+B+C)} = \frac{4174.25}{100} \times 10$$

$$= 417.42 \text{ (E)}$$

$$\text{Grand total (A+B+C+D)} = 4174.25 + 417.42$$

$$= 4591.67$$

$$\text{For 12mm thick plastering of 100 sqm cost} = 4591.67$$

$$\text{For 12mm thick plastering of 150 sqm cost} = 45.91$$

Dry material calculation:-

10 cum cement concrete 1:5:10

Soln

For 10 cum cement concrete 15.2 cum volume

$$\text{Quantity of cement} = \frac{15.2}{1+5+10} = \frac{15.2}{16} = 0.95 \text{ cum}$$

$$\text{One bag cement} = 50 \text{ kg} = 0.034 \text{ cum}$$

$$\text{Number of bags of cement} = \frac{0.95}{0.034} = 27.95 = 28 \text{ bags}$$

$$\text{Quantity of fine aggregate} = 5 \times 0.95 = 4.75 \text{ cum}$$

$$\text{Quantity of coarse aggregate} = 0.95 \times 10 = 9.5 \text{ cum}$$

<u>Sl NO</u>	<u>Material Particulars</u>	<u>Unit</u>	<u>Quantity</u>	<u>Rate</u>	<u>Cost</u>
1	cement	bags	28	350	9800
2	Sand	cum	4.75	175	831.25
3	Aggregate	cum	9.5	485	4607.5
Total					15238.75

Calculate the dry material for
12 cum cement concrete 1:4:8

Soln

For 10 cum cement concrete 15.2 cum volume

$$\text{Quantity of cement} = \frac{15.2}{1+4+8} = \frac{15.2}{13} = 1.17 \text{ cum}$$

$$\text{For 1 cum cement concrete, Quantity of cement} = \frac{1.17}{10} = 0.117 \text{ cum}$$

$$\text{For 12 cum cement concrete, quantity of cement} = 12 \times 0.117 = 1.404 \text{ cum}$$

$$1 \text{ bag cement} = 50 \text{ kg} = 0.034 \text{ cum}$$

$$\text{No of bags of cement} = \frac{1.404}{0.034} = 41.29 = 42 \text{ bags}$$

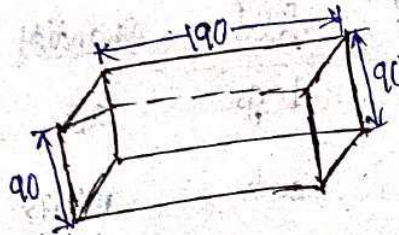
$$\text{Quantity of fine aggregate} = 1.404 \times 4 = 5.616 \text{ cum}$$

$$\text{Quantity of coarse aggregate} = 1.404 \times 8 = 11.232 \text{ cum}$$

Sl. No	Material	Unit	Quantity	Rate	Cost
1	cement	bags	42	350	14700
2	sand	cum	5.616	175	982.8
3	Aggregate	cum	11.232	485	5447.52

Total = 21130.32

- ⇒ Standard size of brick = $190 \text{ mm} \times 90 \text{ mm} \times 90 \text{ mm} = (19 \times 9 \times 9) \text{ cm}$
 ⇒ Nominal size of brick = $200 \text{ mm} \times 100 \text{ mm} \times 100 \text{ mm} = (20 \times 10 \times 10) \text{ cm}$



- ⇒ Volume of standard bricks = $190 \times 90 \times 90 = 1539000 \text{ mm}^3$
 $0.19 \times 0.09 \times 0.09 = 0.1539 \text{ m}^3$
 ⇒ Volume of nominal brick = $200 \times 100 \times 100 = 2000000 \text{ mm}^3$
 $= 0.2 \times 0.1 \times 0.1 = 2 \times 10^{-3} \text{ m}^3$

Brick work:-



$$\text{No of bricks} = \frac{1 \text{ m}^3}{2000000 \text{ mm}^3}$$

$$= \frac{1 \text{ m}^3}{2 \times 10^{-3} \text{ m}^3}$$

$$= \frac{1}{1/500}$$

⇒ No of bricks = 500 Nos

$$1\text{m}^3 = \text{Brick (m}^3) + \text{Mortar (m}^3)$$

$$= 500 \times 0.19 \times 0.09 \times 0.09 + \text{Mortar}$$

$$= 0.7695 \text{ m}^3 + \text{Mortar}$$

$$\Rightarrow \text{Volume of mortar} = 1 - 0.7695$$

$$= 0.2305 \text{ m}^3$$

- ~~Imp~~ ~~Q~~ ~~Ans~~
- 1) Earth work in excavation, 2) PCC, 3) Plastering, 4) Super structure
 - 5) Brick work in foundation, 6) Brick work in Super structure
 - 7) RCC in slab or beam, 8) Colouring

Classification of works according to their nature:-

Classified in 2 types

1) Original work

2) Repair work

Original work:-

The original work may be of following types

- a- New construction of building, bridge, road.
- b- Addition and alteration, existing works will increase the value of the property. Addition of rooms, conversion of verandah into room, dividing of big room into two small rooms.

Repair works:-

The repair work may be of following types -

- a- The repairs required to maintain the work in proper condition.
- b- Minor additions and alterations which will not increase the value of property. Opening of doors, providing of sun set.
- c- Special repairs, monsoon damage repairs etc.

Valuation :-

Valuation is the technique of estimating or determining the fair price or value of a property. Such as a building, a factory, other engineering structures, land etc.

Cost:- Cost is original cost of construction or purchase.

Scrap value:-

It is the value of dismantled material for a building, when the life is over at the end of its utility period the dismantled materials are in steel, bricks, timber etc. will fetch a certain amount which is the scrap value of the building.

Salvage value:-

It is the value at the end of the utility period with out being dismantled.

Market value:-

The market value of a property is the amount which can be obtained at any particular time from the open market if the property is put for sale.

Book value:-

Book value is the amount shown in the accounts book after allowing necessary depreciation.

Obsolescence:-

The value of property or structure becomes less by its becoming out of date in style, in structure, in design, etc. and this is termed as obsolescence.

Sinking fund:-

The fund which is gradually accumulated by way of annual deposits for the replacement of the building at the

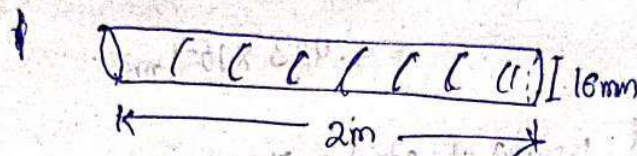
end of its useful life, is termed as sinking fund.

Deficiation :-

Deficiation is the gradual exhaustion of the usefulness of a property. It may be defined as the decrease or loss in the value of a property due to structural deterioration use life wear and tear, decay and obsolescence.

Q) calculate the standard weight in kg of a 16mm diameter Bar having 2m length.

Soln



Crosssectional area of the bar = $\frac{\pi}{4} d^2$

$$= \frac{\pi}{4} \times (0.016)^2$$

$$= 2.010 \times 10^{-4} \text{ m}^2$$

Volume of the bar = $A \times L$

$$= 2.010 \times 10^{-4} \times 2$$

$$= 4.021 \times 10^{-4} \text{ m}^3$$

Unit weight of steel = 7850 kg/m³

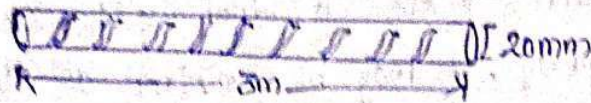
$$\text{Weight of 2m bar} = 7850 \times 4.021 \times 10^{-4}$$

$$= 3.156 \text{ kg}$$

∴ The weight of 2m bar is 3.156 kg.

Q) Calculate the standard weight of 20mm diameter bar having 3m length

Sol



$$\begin{aligned} \text{Cross sectional area of bar} &= \frac{\pi}{4} \times (0.020)^2 \\ &= 3.141 \times 10^{-4} \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume of bar} &= A \times L \\ &= 3.141 \times 10^{-4} \times 3 \\ &= 9.423 \times 10^{-4} \text{ m}^3 \end{aligned}$$

$$\text{Unit weight of steel} = 7850 \text{ kg/m}^3$$

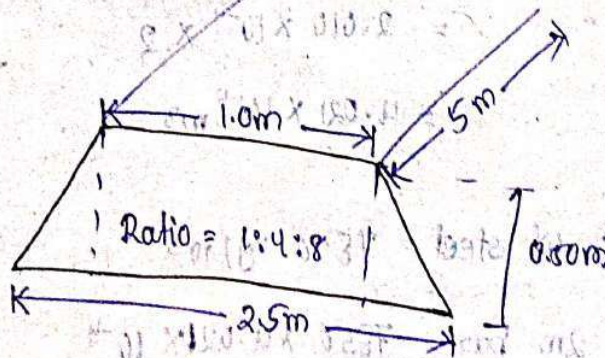
$$\text{Weight of 3m bar} = 7850 \times 9.423 \times 10^{-4}$$

$$7.398 \text{ kg}$$

$\therefore$ The weight of 3m steel bar is 7.398 kg.

* Standard unit weight of steel = 7850 kg/m³

Q)



Calculate the dry material required cement concrete for given trapezium.

Soln

Length of work is 5m

Area of trapezium = $\frac{\text{Top area} + \text{Bottom area}}{2}$

Area of rectangle shape = $1 \times 0.5 = 0.5 \text{ m}^2$

Area of triangle shape = $\frac{1}{2} \times b \times h$

$$= \frac{1}{2} \times 0.75 \times 0.5 \quad \left[\because \frac{2.5-1}{2} = 0.75 \right]$$
$$= 0.187 \text{ m}^2$$

Area of two triangle shape = $0.187 \times 2 = 0.374 \text{ m}^2$

Total area of trapezium = $0.5 + 0.374 = 0.875$

Volume of trapezium = $0.875 \times 5 = \underline{4.375 \text{ m}^3}$

~~1m~~ $- 1 \text{ m}^3 = 1.52$

Qty material required for $4.375 \text{ m}^3 = 4.375 \times 1.5 = 6.56 \text{ m}^3$

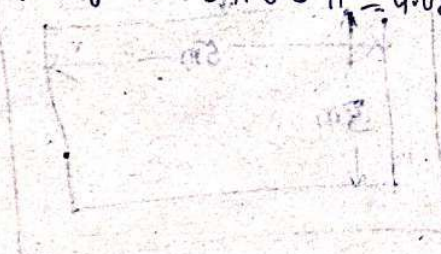
Quantity of cement = $\frac{6.65}{1+4+8} = \frac{6.65}{13} = 0.511 \text{ m}^3$

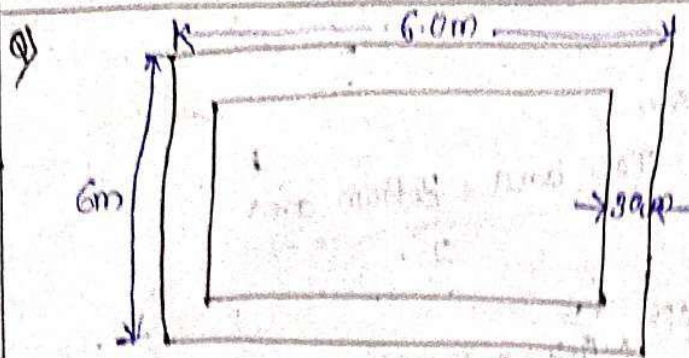
1 bag of cement = 0.034 cum

No of bags of cement = $\frac{0.511}{0.034} = 15.02 = 16 \text{ bags}$

Quantity of sand = $4 \times 0.511 = 2.044 \text{ m}^3$

Quantity of aggregate = $8 \times 0.511 = 4.088 \text{ m}^3$





Q) Calculate the earth work in excavation.

Soln

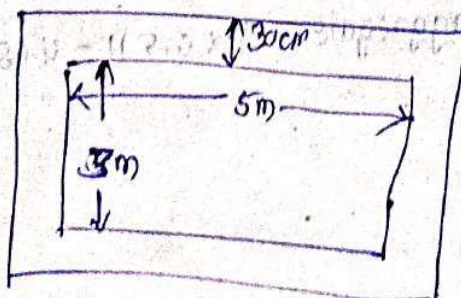
centre to centre length of ^{one} ~~long~~ wall = $6.0 - \frac{0.3}{2} - \frac{0.3}{2} = 5.7m$

Total c/c of ~~long~~ wall = $4 \times 5.7 = 22.8m$

Sl. No	Particulars	N	L	B	H/D	Quantity	Remarks
Q.C. $\Rightarrow$	Earth work in excavation	1	22.8	0.8	0.6	10.94 m ³	
	OR						
L.S. $\Rightarrow$	EW in excavation						
	Long wall $\rightarrow$	2	6.5	0.8	0.6	6.24	$5.7 + 0.4 + 0.4 = 6.5$
	Short wall $\rightarrow$	2	4.9	0.8	0.6	4.70	$5.7 - 0.4 - 0.4 = 4.9$
Total = 10.94 m ³							

Q) In a room size ^{inner to inner} 5.0m x 3.0m, wall thick 30cm. Calculate the length of long wall, short wall & centre to centre length.

Soln



Length of long wall = ~~5 + 0.3 + 0.3~~ $5 + 0.3 + 0.3 = 5.6\text{m}$

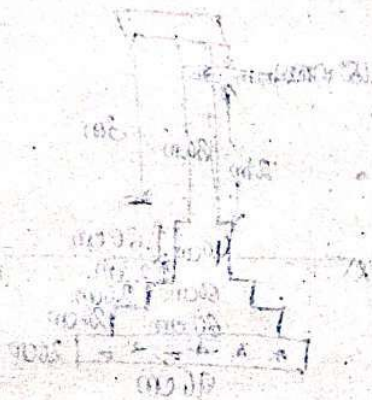
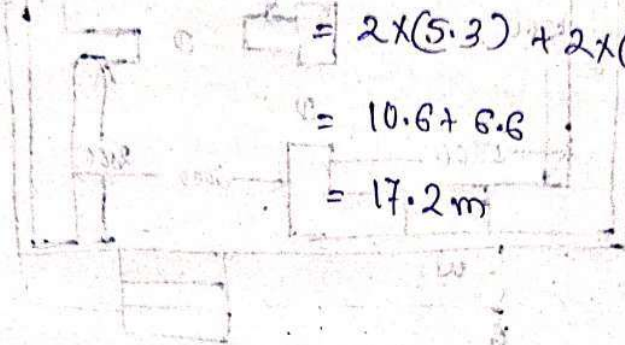
Length of short wall = 3m

~~Length~~ centre to centre length = $2 \times (5 + \frac{0.3}{2} + \frac{0.3}{2}) + 2 \times (3 + \frac{0.3}{2} + \frac{0.3}{2})$

$= 2 \times (5.3) + 2 \times (3.3)$

$= 10.6 + 6.6$

$= 17.2\text{m}$



Perimeter = $2 \times (5.6 + 3.3) = 17.8\text{m}$

Area = $5.6 \times 3.3 = 18.48\text{m}^2$

Volume = $18.48 \times 0.3 = 5.544\text{m}^3$

Cost of work, including all materials

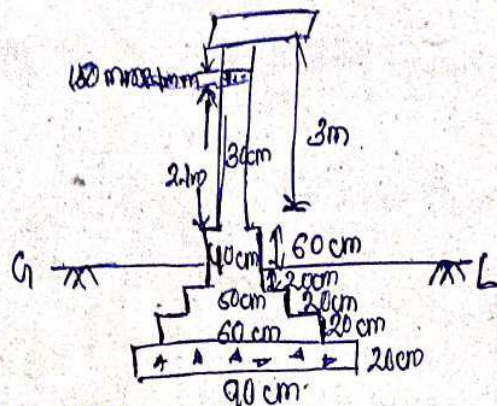
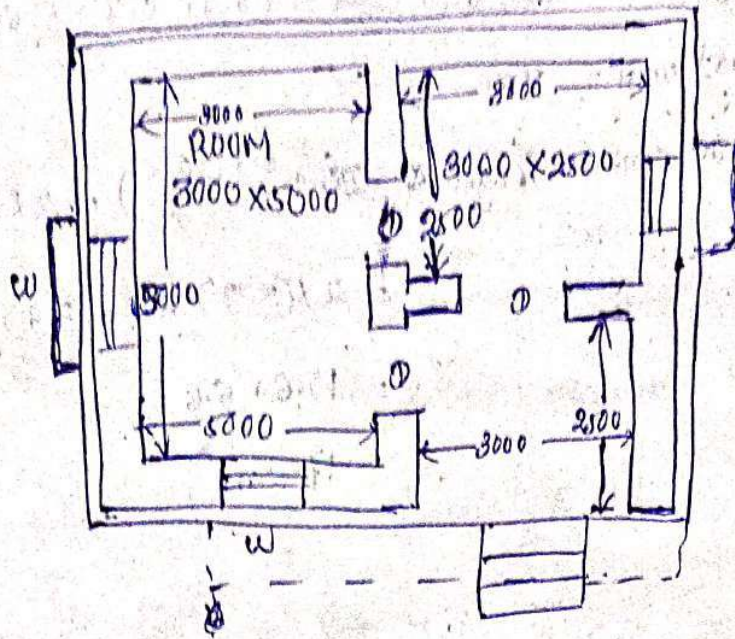
if you are excavating in foundation

if concrete is used in foundation (1:2:4)

if you are using bricks in wall

if you are using stones in wall

if you are using (1:2:4) concrete in wall



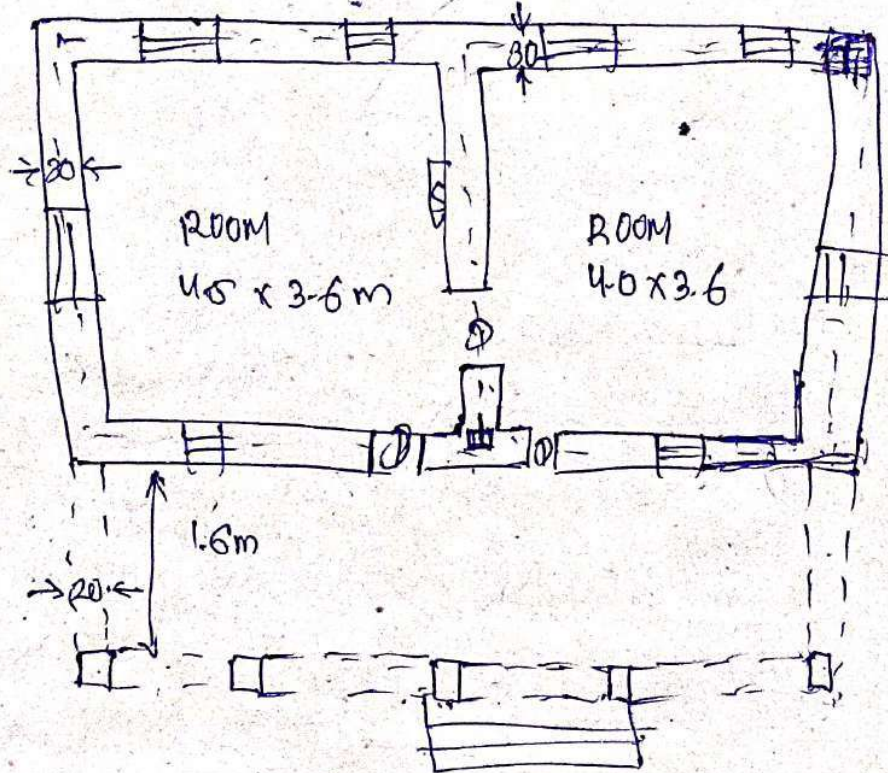
Assume $\phi = 1200 \times 2100$ mm

$w = 1000 \times 1200$ mm

width of chajja = 450 mm

Calculate the following items of work

- i) Ew in excavation in foundation
- ii) Cement concrete in foundation (1:2:4)
- iii) Bw in foundation & plinth
- iv) Bw in super structure
- v) Inside plastering (1:4) 12 mm thick.



Veranda

Room
L.W = 9.1

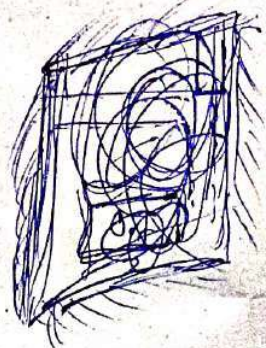
$$9.1 + 3.9 + 1.85 + 0.2 + 1.85 + 3.9 = 29.8$$

$$\frac{0.2 + 4.5 + 0.3 + 4.0 + 0.2}{2} = 0.1 + 4.5 + 0.3 + 4.0 + 0.1 = 9m$$

Veranda

$$L.W = 9.4 - \frac{0.2}{2} - \frac{0.2}{2} = 9.2m$$

$$SW = \frac{0.3}{2} + 1.6 + \frac{0.2}{2} = 0.15 + 1.6 + 0.1 = 1.85m$$



30m

$$L.W = (9.1 \times 2) = 18.2$$

$$SW = (3.9 \times 3) = 11.7$$

Total =

$$11.7 + 18.2 = 29.9m$$

$$= 29.9 - \left(2 \times \frac{0.2}{2}\right) = 29.5$$

20cm

$$\text{total} = 9.2 + (1.85 \times 2) =$$

$$= 9.2 + 3.7 = 12.9 \text{ m} = 12.9 - 2 \times \frac{0.9}{2} = 12.0$$

$$\text{Total} = 42.8$$

S.No	Particulars	N	L	B	H/D	Quantity	Remarks
1	Excavation in foundation <u>Two room combine</u> a) Long wall & Short wall						
	Long wall	2	10	0.9	0.9	16.2	$9.1 + \frac{0.9}{2} + \frac{0.9}{2} = 10$
	Short wall	3	3	0.9	0.9	7.29	
						23.49 m ³	
	<u>Verandah</u>						
	Long wall	1	9.9	0.7	0.9	6.24	$9.2 + 0.7 =$
	Short wall	2	1.05	0.7	0.9	1.32	$1.85 - \frac{0.7}{2} = \frac{0.7}{2}$
						7.56 m ³	$= 1$
						Total = 31.05 m ³	
	<u>b) Cloc method</u>						
	Room 1 & 2	1	29.9	0.9	0.9	23.49	$29.9 - 2 \times 0.45$
	<u>Verandah</u>	1	12.9	0.7	0.9	7.56	$12.9 - 2 \times \frac{0.7}{2}$
						31.05 m ³	
2	Concrete in Foundation						
	a) <u>L & S method</u>						
	<u>Two room combine</u>						
	LW →	2	10	0.9	0.3	5.4	
	SW →	3	3	0.9	0.3	2.43	
						7.83	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
	<u>Verandah</u>						
	LW → 1	9.9	0.7	0.9		2.08	
	SW → 2	1.05	0.7	0.9		0.44	
						<u>2.52</u>	
						<u>10.35 cum</u>	
	b) <u>C.T.C method</u>						
	<u>Room 1 & 2 combine</u> → 1	29	0.9	0.3		7.83	
	<u>Verandah</u> → 1	12	0.7	0.3		2.52 2.52	
						<u>10.35 cum</u>	
3	Bw in foundation and plinth						
	<u>Two room combine</u>						
	a) <u>Long wall & short wall method</u>						
	<u>First footing</u>						
	LW → 2	9.7	0.6	0.2		2.33	
	SW → 3	3.3	0.6	0.2		1.19	$9.1 + 0.3 + 0.3 = 9.7$
	<u>second footing</u>						$3.9 - 0.3 - 0.3 = 3.3$
	LW → 2	9.6	0.5	0.2		1.92	$9.1 + 0.25 + 0.25 = 9.6$
	SW → 3	3.4	0.5	0.2		1.02	$3.9 - 0.25 - 0.25 = 3.4$
	<u>Plinth</u>						
	LW → 2	9.5	0.4	0.8		6.08	$9.1 + 0.2 + 0.2 = 9.5$
	SW → 3	3.5	0.4	0.8		3.36	$3.9 - 0.2 - 0.2 = 3.5$
						<u>15.9 cum</u>	

Sl No	Particulars	N	L	B	H/D	Quantity	Remarks
	b) Centre line method						
	First						
	<u>Verandah</u>						
	<u>First footing</u>						
	LW →	1	9.6	0.4	0.2	0.77	
	SW →	2	1.35	0.4	0.2	0.22	$0.2 + 0.2 + 0.2 = 0.6$
	<u>Second footing</u>						$1.85 - 0.2 - 0.3 = 1.35$
	LW →	1					
	SW →						
	<u>Plinth</u>						
	LW →	1	9.5	0.3	1.0	2.85	
	SW → Lower →	2	1.45	0.3	0.2	0.17	$0.2 + 0.15 + 0.15 = 0.5$
	Upper →	2	1.5	0.3	0.8	0.72	$1.85 - 0.15 - 0.2 = 0.8$
						4.73	
						20.63	cu
	b) <u>Centre line method</u>						
	<u>Two room combine</u>						
	<u>First footing</u>	1	29.3	0.6	0.2	3.52	$29.9 - 2 \times \frac{0.6}{2}$
	<u>2nd footing</u>	1	29.4	0.5	0.2	2.94	$= 29.3$
	<u>Plinth</u>	1	29.5	0.4	0.8	9.44	$29.9 - 0.25 \times 2 \times \frac{0.5}{2}$
	<u>Verandah</u>						$29.9 - 2 \times \frac{0.4}{2} = 29.5$
	<u>First footing</u>	1	12.3	0.4	0.2	0.98	$12.9 - 0.2 \times 0.3 = 12.8$
	<u>Plinth Lower</u>	1	12.4	0.3	0.2	0.75	$12.9 - 0.25 - 0.25 = 12.4$
	<u>Upper</u>	1	12.5	0.3	0.8	2.00	$12.9 - 0.2 - 0.2 = 12.5$

Sl	Particulars	N	L	B	H/D	Qty	Remarks
4	DPC Long wall & Short wall method Two room combine Two room						
	Long wall →	2	9.4	0.3	-	5.64	$9.1 + 0.15 + 0.15 = 9.4$
	Short wall → veranda	3	3.6	0.3	-	3.24	$3.9 - 0.15 - 0.15 = 3.6$
	Pillars →	5	0.2	0.2	-	0.2	
						9.08 sqm	

~~Deduction~~

centre line method

Two room →

→ 1 29.6 0.3 - 8.88 ~~29.9~~ ~~pillars~~

Pillars → 5 0.2 0.2 - 0.2 $29.9 - 2 \times \frac{0.2}{2}$

9.08 sqm = 29.6

Deduction →

Doors → 3 1.2 0.3 - 1.08

Net total = $9.08 - 1.08$
= 8 sqm

5 Bw in superstructure

Long wall Short wall
method

Two room combine

Long wall → 2 9.4 0.3 3.6 20.30 $9.1 + 0.15 + 0.15 = 9.4$

SW → 3 3.6 0.3 3.6 11.67 $3.9 - 0.15 - 0.15 = 3.6$

Sl	Particulars	N	L	B	H/D	Quantity	
	<u>Verandah</u> over lintel						
	LW →	1	9.4	0.2	0.9	1.69	$9.2 + 0.1 + 0.1 = 9.4$
	SW →	3	1.6	0.2	0.9	0.58	$1.85 - \frac{0.3}{2} - \frac{0.2}{2}$
	Pillars →	5	0.2	0.2	2.70	0.54	
						34.78 cum	= 1.6
	<u>centreline method</u>						
	Two room combine →	1	29.6	0.3	3.6	31.97	$29.9 - 2 \times \frac{0.3}{2}$
	Above the pillar →	1	12.6	0.2	0.9	2.27	= 29.6
	Pillar →	5	0.2	0.2	2.70	0.54	$12.9 - 2 \times \frac{0.3}{2} = 12.6$
						34.78 cum	
	<u>Deduction</u>						
	Door opening →	3	1.2	0.3	2.1	2.27	
	Window & U →	8	1.1	0.3	1.5	3.96	
	Lintel for						
	Two main wall →	1	29.6	0.3	0.15	1.33	
	Verandah →	1	12.6	0.2	0.15	0.38	
	Shelves open →	1	1.10	0.2	0.15	0.03	
						7.97 cum	
	Net total any method					34.78 - 7.97	= 26.81 cum

6) Plastering

Inside
Two room combine

Long side →	2	4.5	3.6	32.4
→	2	4.0	3.6	28.8
Short sides →	4	3.6	3.6	51.84

Sl	Particulars	N	L	B	H/D	Quantity	Price
	Jambes, gills & soffits of shelf	1	5.2	0.2		1.04	
	(iv) Verandah						
	Room side up to verandah opening	1	4.4		2.7	25.38	
	Room side above opening	1	4.0		0.9	8.10	
	Verandah front above opening	1	4.0		0.9	8.10	
	Verandah sides above openings	2	1.6		0.9	2.88	
	(v) Pillars	5x4	0.2		2.7	10.80	
	Top portion of openings						
	Front	1	8.4	0.2		1.68	
	Sides	2	1.6	0.2		0.64	
	<u>Deduction</u>					171.66	SSM
	Doors	1x3	1.2		2.1	7.56	
	Windows	1x2	1.1		1.5	3.3	
	<u>Net total</u>					160.8	(A)
	<u>Out side</u>						
	Entire back sides of room	1	4.4		3.7	34.78	
	Verandah front	1	4.4		1.0	9.4	
	Verandah sides	2	1.8		1.0	3.6	

Parapet outside -

Back & front →	2	9.4	0.7	13.16
side →	2	6.0	0.7	8.4

Parapet inside →

Back & front	2	9.2	0.6	11.04
sides	2	5.8	0.6	6.96

Top back & front -	2	9.4	0.1	1.88
sides	2	5.8	0.1	1.16

Deduction

out side window	6	1.1	1.5	9.9
-----------------	---	-----	-----	-----

121.46 sqm

Net total = 111.56 sqm

Net total (A+B) = 272.36 sqm

7

BW in parapet

~~Long wall & short wall method~~

Over Two rooms combine

LW →	2	9.4	0.3	0.6
SW →	3	3.6	0.3	0.6

Over verandah

LW →

1	29.8	0.1	0.6	1.79 cum
---	------	-----	-----	----------

$$9.1 + 0.3 = 9.4$$

$$3.9 - 0.3 = 3.6$$

$$9.2 + 0.3$$

D.2-10/03/2021

salt

~~For vacuum Bed of any material of mortar is vacuum~~

~~Quantity of cement = $\frac{6}{1+6} = \frac{6}{7}$~~

~~For 10 cum of brick dry volume of m~~

For 10 cum. Bar, the dry material of mortar is 6 cum

For 10 cum BW dry material of mortar is 8.2 cum

For 1 cum dry volume of mortar = $\frac{3.2}{10} = 0.32 \text{ cum}$

For 15 cum dry volume of mortar = $15 \times 0.32 = 4.8$

Quantity of cement = $\frac{4.8}{1.76} = \frac{4.8}{7} = 0.68$

we know the wages of bw ~~are~~ 5000 units and 3.4 am

1 ccm of brick required = 500 bricks
15 " " " "

$$= 15 \times 500 = 7500 \text{ b.Neg}$$

For 10 cum Bw dry material mortar is 3 cum

For 1. cum) it " " " " " 0.3 cum

For 15 " " " " " " " " 0.3 NIS = 4.5

Quantity of cement = $\frac{4.5}{7} = 0.64$

1-1000

$$1 \text{ bag of cement} = 0.034 \text{ cum}$$

$$\text{No of bags of cement} = \frac{0.64}{0.034} = 18.8 = 19 \text{ bags}$$

$$\text{Quantity of sand} = 6 \times 0.64 = \del{3.84} 3.84 \text{ cum}$$

Expt-3.

ECE Practice

D.2.10/03/2021

Q) Detailed of a 2 room building using Ms Excel software

i) GW in excavation

ii) Lime concrete in foundation

iii) First class BW in foundation & Plinth

iv) 25 cm thick DPC

v) First class BW in super structure

Abstract of estimate:-

$$\text{C to C length of long wall} = 6.60 - 0.1 - 0.1 = 6.40$$

$$\text{C to C length of short wall} = 4.4 - 0.01 - 0.1 = 4.20$$

$$\text{Centre to centre length} = (2 \times 6.40) + (3 \times 4.20)$$

$$= 12.8 + 12.6$$

$$= 25.4$$

S.L. No.	Particulars	N	L	B	H/O	Quantity	Remarks
1)	SW in excavation						
	Long SW →	2	7.1	0.7	0.9	8.95	$6.4 + 0.7 = 7.1$
	SW →	3	3.5	0.7	0.9	6.62	$4.2 - 0.7$
						15.56 cum	
2)	lime concrete in foundation						
	Long →	2	7.1	0.7	0.2	1.99	$6.4 + 0.7 = 7.1$
	SW →	3	3.5	0.7	0.2	1.47	$4.2 - 0.7 = 3.5$
						3.46 cum	
3)	1st class. BCC in foundation and plinth						
	Long →	2	6.9	0.5	0.2	1.38	$6.4 + 0.5 = 6.9$
	SW →	3	3.7	0.5	0.2	1.11	$4.2 - 0.5 = 3.7$
						2.49 cum	
	2nd footing						
	Long →	2	6.8	0.4	0.2	1.09	$6.4 + 0.4 = 6.8$
	SW →	3	3.8	0.4	0.2	0.91	$4.2 - 0.4 = 3.8$
						2.0	
	Plinth						
	Long →	2	6.7	0.3	0.5	2.01	$6.4 + 0.3 = 6.7$
	SW →	3	3.9	0.3	0.5	1.76	$4.2 - 0.3 = 3.9$
						3.77 cum	
						8.25 cum	
4)	2.5 cm thick DPC						
	Long →	2	6.4	0.2		2.48	$6.4 + 0.2 = 6.7$
	SW →	3	3.9	0.2		2.4	$4.2 - 0.2 = 3.9$

QMP

VJP

- 1) Detailed estimate of building $\rightarrow$ 80, fig-3.4 $\rightarrow$ B.N. Datta
- 2) Page-94, fig-3.5 & 3.6 $\rightarrow$ B.N. Datta
- 3) Page-135, fig-3.14 & 3.15 $\rightarrow$ B.N. Datta
- 4) Page-112, fig-3.7 $\rightarrow$ B.N. Datta
- 5) Page-92, fig-4.25 $\rightarrow$ M. Chakrabartee
- 6) Page-110, fig-5.2 $\rightarrow$ M. Chakrabartee
- 7) Page-121, fig-5.3 $\rightarrow$ M. Chakrabartee

- a) Earth work in excavation
- b) PCC in foundation
- c) BW in foundation & Plinth
- d) OPC
- e) BW in super structure
- f) RCC in super structure
- g) BW in parapet
- h) 12mm thick plastering inside & outside wall

- QMP
- Q) Calculate the quantity of dry material required for
- 16 cum BW with cement mortar 1:6
 - 8 cum cement concrete 1:1.5:3
 - 81.75 sqm plastering of 12mm thick cement mortar (1:3)
 - 40.52 sqm plastering of 20mm thick cement mortar (1:3)

QMP Revised & supplementary estimate

For 10 cum BW = 500 bricks and 3 cum mortar required

1 cum Bricks required = 500

10 cum bricks required = $10 \times 500 = 5000$

For 10 cum BW dry material required 3 cum

" 1 cum " " " " 0.3 cum

For 16 cum " " " " $0.3 \times 16 = 4.8$ cum

Quantity of cement = $\frac{4.8}{7} = 0.68$

1 bag cement = 0.034 cum

No of bags of cement = $\frac{0.68}{0.034} = 20$ bags

Quantity of sand = $6 \times 0.68 = 4.08$ cum

ii) 12mm thick plastering for 100 sqm dry mortar required - 2 cum

~~For 100 sqm dry mortar required =~~

~~Volume of = $75 \times 100 \times 0.012 = 0.9$ cum~~

12mm thick for 1 sqm dry mortar required, 0.02

" For 75 sqm " " = $75 \times 0.02 = 1.5$ cum

~~For~~ ①

* ~~For~~ bag

$$\text{quantity of cement} = \frac{1.5}{4} = 0.37 \text{ cum}$$

$$\text{No of bags of cement} = \frac{0.37}{0.034} = 10.88 \approx 11 \text{ bag}$$

$$\text{Quantity of sand} = 0.37 \times 3 = 1.11 \text{ cum}$$

No2
d)

For 10 cum cement concrete take 15.2 cum,

For 1 cum cement concrete $\frac{15.2}{10} = 1.52$ cum.

$$\text{Quantity of cement} = \frac{1.52}{1+2+4} = \frac{1.52}{7} = 0.217 \text{ cum}$$

$$\text{No of bags of cement} = \frac{0.217}{0.034} = 6.38 = 7 \text{ bags}$$

$$\text{Quantity of sand} = 0.217 \times 2 = 0.434 \text{ cum}$$

$$\text{Quantity of coarse aggregate} = 0.217 \times 4 = 0.868 \text{ cum.}$$

3RD SEM/ CIVIL / 2020(W) NEW
Th4 Estimation & Cost Evaluation- I

Full Marks: 80

Time: 3 Hrs

Answer any five Questions including Q No. 1 & 2
Figures in the right hand margin indicates marks

1. Answer All questions

2 x 10

- Define Depreciation and Obsolescence.
- Write down the volume and weight of one bag of cement.
- Write down the unit of following items.
(i) Earthwork in filling (ii) lime concrete terracing
- Define floor area of a building.
- What do you mean by lead and lift?
- Calculate the standard weight of 20mm diameter bar of 1 meter length.
- What do you mean by sinking fund?
- What do you mean by AR estimate?
- Draw the details of measurement form used in estimate.
- Classify the labours as per OPWD and also mention their rates.

2. Answer Any Six Questions

6 x 5

- Write the duties of Junior Engineer.
- Calculate the dry materials required for 500m² of cement plaster (1:6) of 12mm thickness.
- Describe briefly about different types of values of a structure.
- Calculate the cost of construction of 8 m³ of brickwork (1:4) using standard bricks of size 19c.m x 9c.m x 9c.m. Use latest OPWD rates
- Differentiate between Plinth area estimate and cube rate estimate.
- Calculate the quantity of woodwork in frames of 2 doors and 3 windows having following specifications
Size of door = 1.2m x 2m, size of window = 1 x 1.5m
Size of chowkath = 10 c.m x 8 c.m.

What do you mean by analysis of rate? Write the purpose of analysis of rates.

Prepare the quantity estimate for the following items from the given drawing in Fig-1.

- Earthwork in excavation in foundation 5
- 1st class brickwork in foundation and plinth (1:3). 5

Prepare the quantity estimate for the following items from the given drawing in Fig-1.

- First class brickwork in superstructure (1:3) 7
- 2.5 c.m dpc work (1:2:4) 3

(a) Calculate the dry materials required for the quantity of items calculated for Q 4 (b). 5

(b) Analyse the rate of materials and labours as per OPWD for Q 4 (a). 5

Write the role of following persons.

- Divisional accountant 5
- Executive engineer 5

Describe briefly about different types of estimates. 10

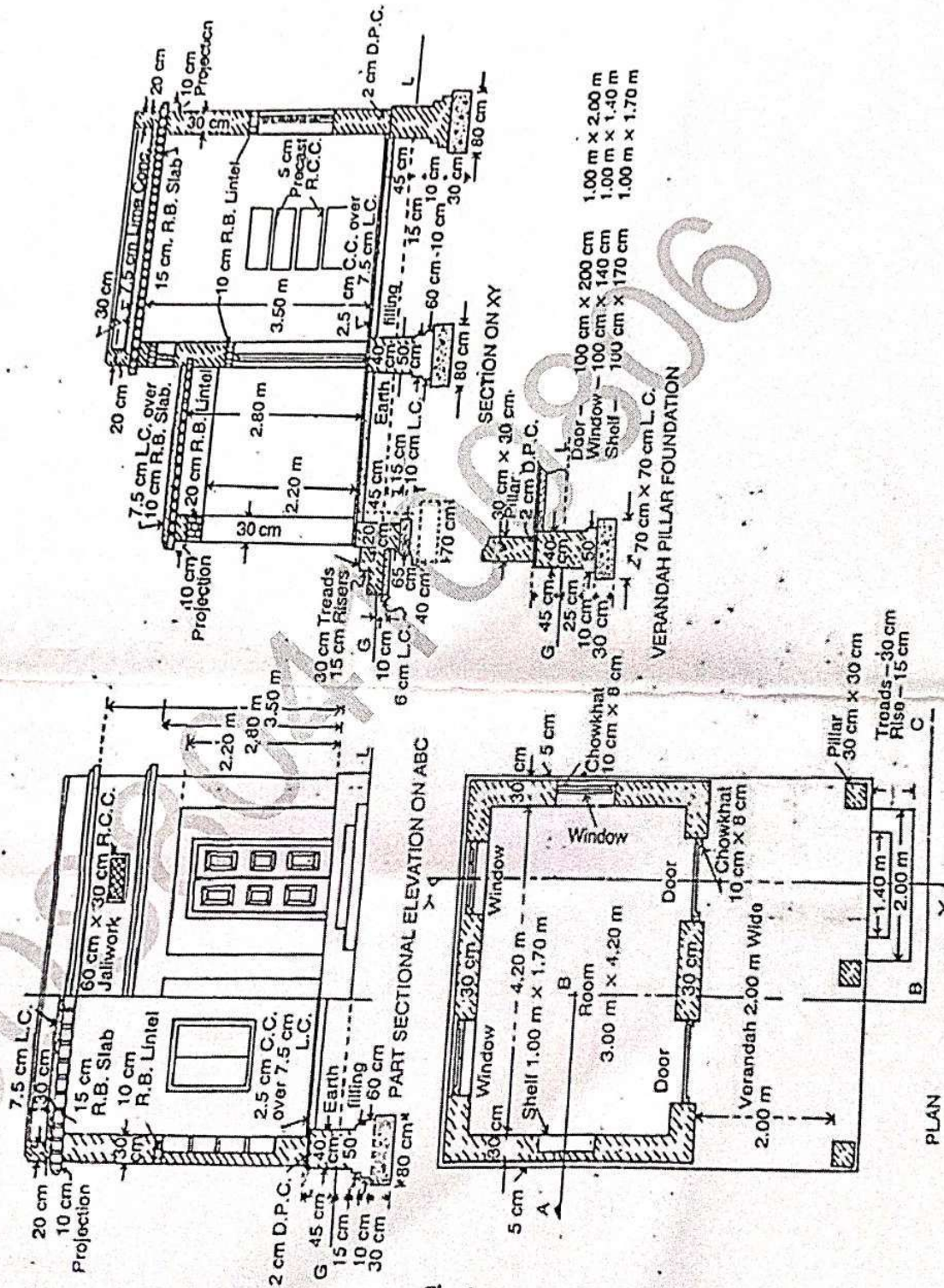


Fig. 1