

SUB: QUANTITY SURVEYING & CONTRACT MANAGEMENT

SUB CODE: 21CV71

TECHNICAL TERMS

- Estimate
- Quantity Survey
- Specifications
- Rates
- Site Plan
- Line Plan
- Index Plan
- Detailed Plan
- Centre Line Plan
- Supplementary Estimate
- Administrative Approval
- Technical Sanction
- Competent Authority
- Ordinary Measurement Book

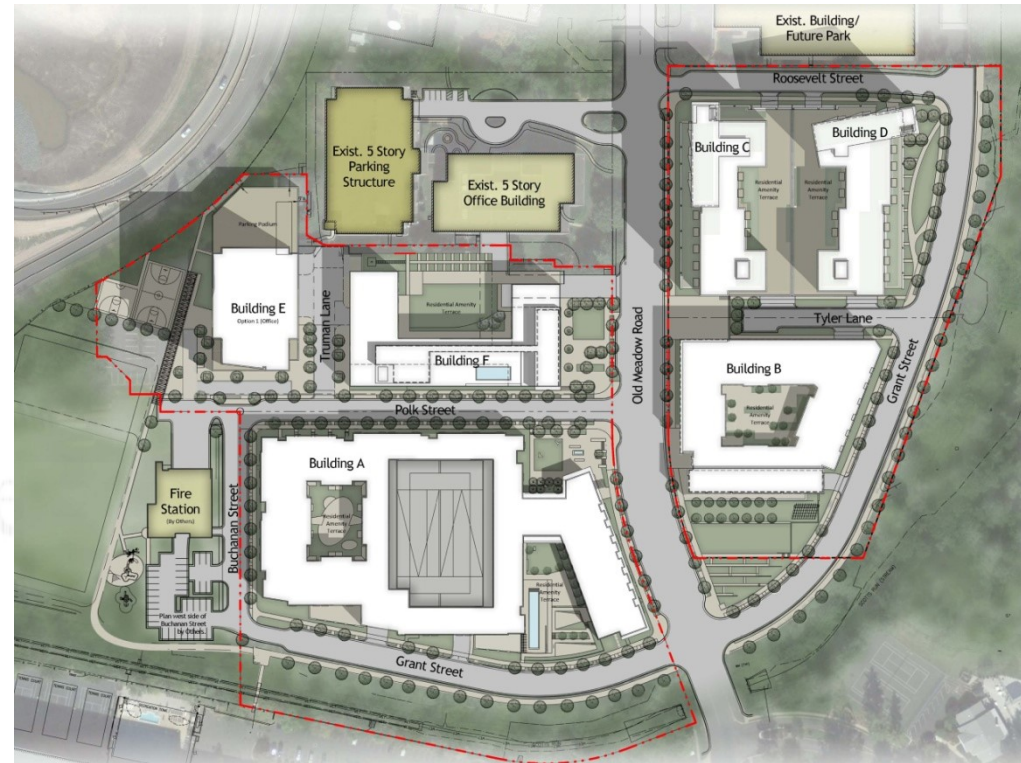
TECHNICAL TERMS



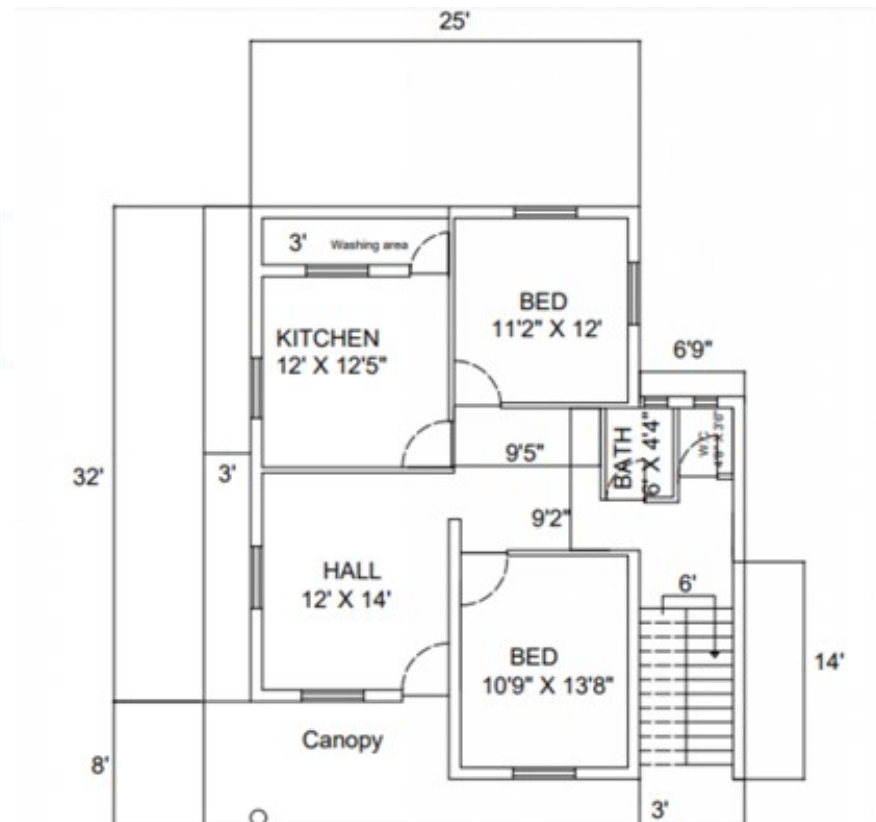
1. **ESTIMATE**: An estimate is the anticipated or probable cost of work and is usually prepared before the construction is taken up. It is indeed calculations or computations of various items of an engineering work.
2. **QUANTITY SURVEY**: It is the schedule of all items of work in a building. These quantities are calculated from the drawing of the building. Thus quantity survey gives quantities of work done in case of each items, when priced gives the total cost. In short, quantity survey means calculations of quantities of materials required to complete the work concerned

3. **SPECIFICATIONS:** Detailed specifications gives the nature, quality and class of work, materials to be used in the various parts of work , quality of the material, their proportions, method of preparation, workmanship and description of execution of work are required.
4. **RATES:** The rates of various items of works, materials to be used in the construction and the wages of different categories of labor (skilled and unskilled) should be available for preparing an estimate. The cost of transportation charges should also be known. As far as possible sanctioned “Schedule of Rates” shall be followed or the rates may be worked out by the “Analysis of Rates” method.

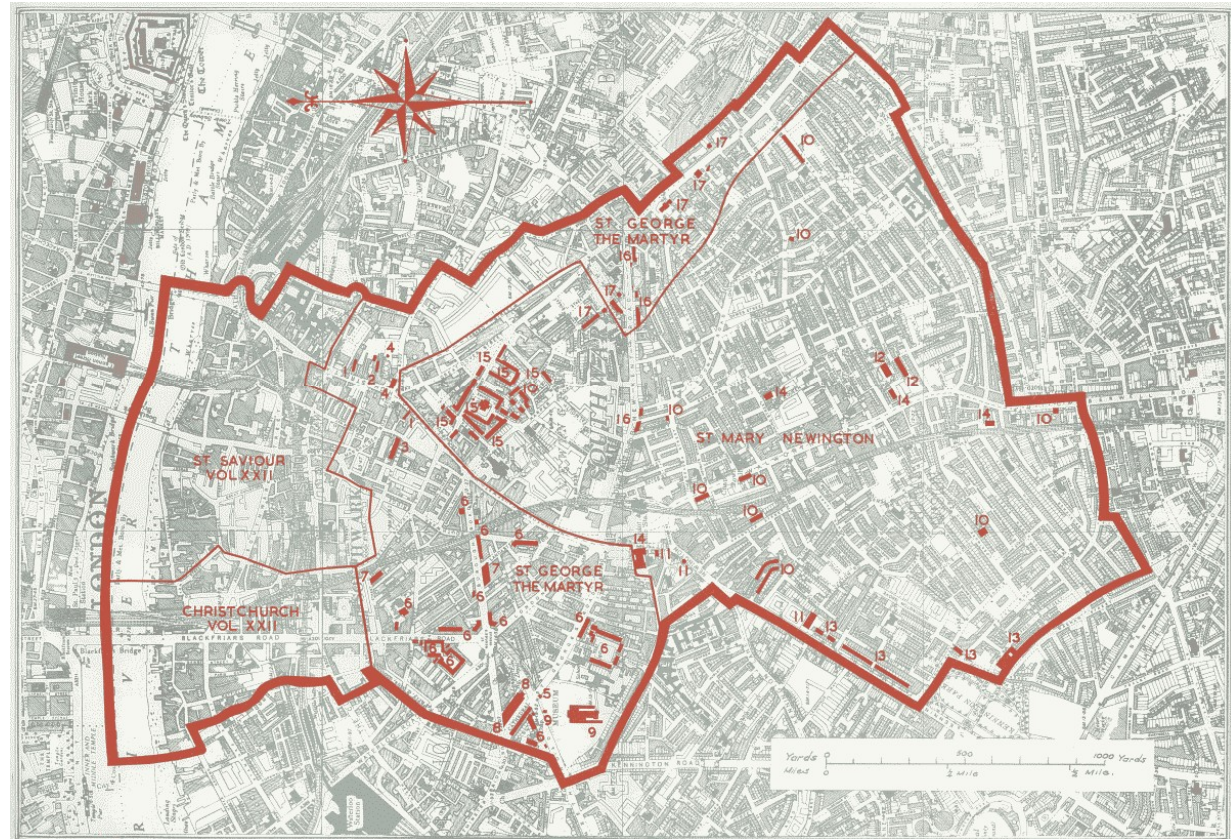
5. SITE PLAN: It is the plan drawn for a particular construction showing its position with respect to approaching roads, main bazars, markets and other permanent features in a populated area. It shows the location of the area under construction with respect to the other areas and on it generally the names of the owners of areas or property holders adjoining to it are also denoted. North line is also clearly marked on it.



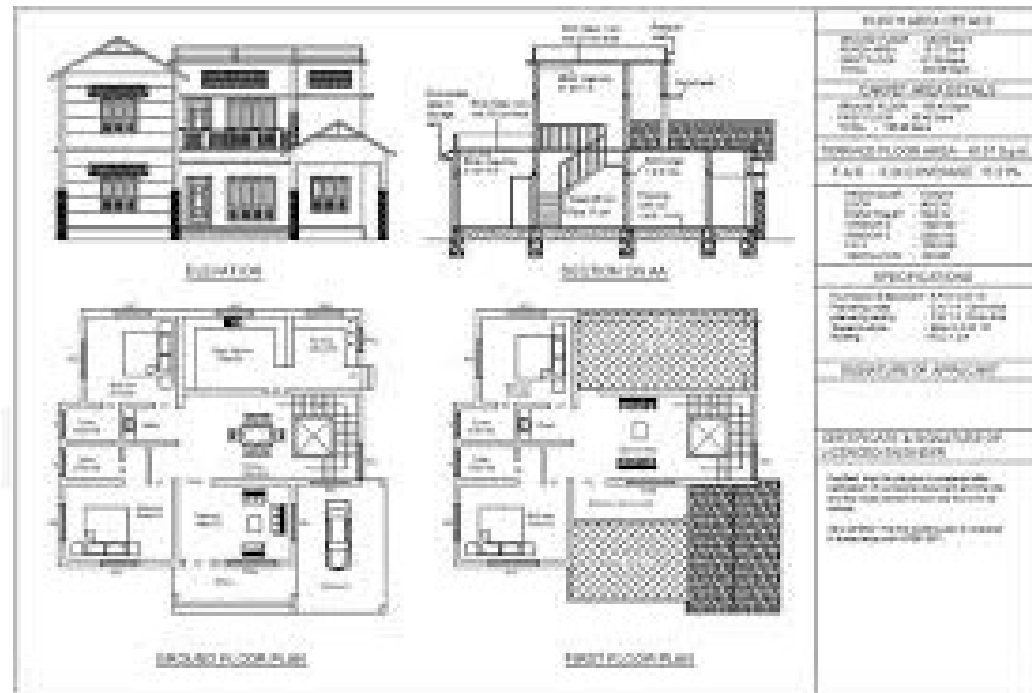
6. LINE PLAN: Line plan can be defined as the plan of a particular construction simply showing main features with the help of the single lines of different portions of the constructions. Details of constructions are not generally shown on this plan. This inside and outside dimensions shown on this plan should necessarily be corresponding to actual dimensions.



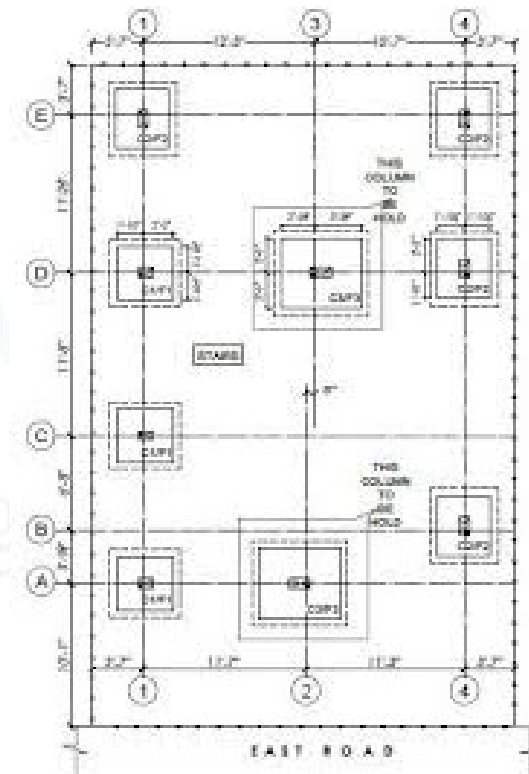
7. INDEX PLAN: This is the plan of a particular colony showing the positions of different houses in single lines their number if any position of roads, schools, market, hospitals and other features etc. this plan is generally fixed on the entrance, or at exit or in the central place of the colony, for the guidance of the inhabitants and outsiders.



8. DETAILED PLAN: This plan indicates a plan of a construction drawn to a definite scale, showing all detailed information required for its execution. Various sections and elevations are clearly drawn on this plan.



9. CENTRE LINE PLAN: This is actually a layout plan drawn to facilitate the laying out of foundation lines and other features. It is generally fixed on the entrance or at exit in the central place of the colony for the guidance of the inhabitants and outsiders.



- 10. SUPPLEMENTARY ESTIMATE:** When some additions are done in the original work, a fresh detailed estimate is prepared to supplement the original work. This estimate is called supplementary estimate. It is also accompanied by all the papers as required in thru detailed estimate.
- 11. ADMINISTRATIVE APPROVAL:** For any project required by the department an approval so sanction of the competent authority with respect to the cost and work is necessary at the first instance. Thus administrative approval denotes the formal acceptance by the administrative department concerned of the proposals for incurring expenditure.
- 12. TECHNICAL SANCTION:** It means the sanction and order by the competent authority of the department for the detailed estimate design calculations quantities of work rates and cost of work.

13. COMPETENT AUTHORITY: An officer or any other authority in the department to whom relevant powers are delegated by the government (Financial Department).

14. ORDINARY MEASUREMENT BOOK: It is measured book in which entries regarding the work done or supplies made and services performed are recorded for the purpose of making payments to the contractors or the labor. Entries in the M.B are generally recorded by the sectional officers or by any other officers deputed for the purpose

15. LUMPSUM ITEMS: Sometimes while preparing estimate for the certain small items like front architecture or decoration work of a building it is not possible to workout detailed quantities so far such lump sum items a lump sum rate is provided.

16. PLINTH AREA: The built up covered area of a building measured at floor level of any storey is called plinth area.

- Estimating is the technique of calculating or computing the various quantities and the expected Expenditure to be incurred on a particular work or project.
- In case the funds available are less than the estimated cost the work is done in part or by reducing it or specifications are altered, the following requirements are necessary for preparing an estimate.
 - Drawings like plan, elevation and sections of important points.
 - Detailed specifications about workmanship & properties of materials etc.
 - Standard schedule of rates of the current year.

UNITS OF MEASUREMENTS

- The units of measurements are mainly categorized for their nature, shape and size and for making payments to the contractor and also. The principle of units of measurements normally consists the following:
 - ❑ Single units work like doors, windows, trusses etc., is expressed in numbers.
 - ❑ Works consists linear measurements involve length like cornice, fencing, hand rail, bands of specified width etc., are expressed in running meters (RM).
 - ❑ Works consists a real surface measurements involve area like plastering, white washing, partitions of specified thickness etc., and are expressed in square meters (m²)
 - ❑ Works consists cubical contents which involve volume like earth work, cement concrete, Masonry etc are expressed in Cubic metres.



A T M E

College of Engineering



Sl. No.	Particulars of item	Units of Measurement	Units of payment
I	Earth work:		
	1. Earth work in Excavation	cum	Per%cum
	2. Earthwork in filling in foundation trenches	cum	Per%cum
II	3. Earth work in filling in plinth	cum	Per%cum
	Concrete:		
	1. Lime concrete in foundation	cum	percum
	2. Cement concrete in Lintels	cum	percum
	3. R.C.C in slab	cum	percum
	4. C.C. or R.C.C. Chujja, Sunshade	cum	percum
	5. L.C. in roof terracing (thickness specified)	sqm	persqm

	6. Cement concrete bed	cum	per cum
	7. R.C. Sunshade (Specified Width & Hight)	cum	lm

III	Damp Proof Course (D.P.C) (Thickness should be mentioned)	sqm	persqm
IV	Brick work:		
	1. Brickwork in foundation	cum	percum
	2. Brick work in plinth	cum	percum
	3. Brick work in super structure	cum	percum
	4. Thin partition walls	sqm	percum
	5. Brick work in arches	cum	percum
	6. Reinforced brick work (R.B. Work)	cum	percum

V	Stone Work:		
	Stone masonry	cum	percum
VI	Wood work:		
	1. Door sand windows frames or chowkhats, rafters beams	cum	percum
	2. Shutters of doors and windows (thickness specified)	sqm	persqm
	3. Doors and windows fittings (like hinges, tower bolts, sliding bolts, handles)	Number	per number
VII	Steel work		
	1. Steel reinforcement bars etc in R.C.C. and R.B.work. quintal	Quintal	per quintal
	2. Bending, binding of steel Reinforcement	Quintal	per quintal
	3. Rivets, bolts, & nuts, Anchor bolts, Lewis bolts, Holding down bolts.	Quintal	per quintal
	4. Iron hold fasts	Quintal	per quintal
	5. Iron railing (height and types specified)	Quintal	per quintal
	6. Iron grills	sqm	per sqm

VIII	Roofing		
	1. R.C.C. and R.B.Slab roof (excluding steel)	cum	per cum
	2. L.C. roof over and inclusive of tiles or brick or stone slab etc (thickness specified)	sqm	per sqm
	3. Centering and shuttering form work	sqm	per sqm
	4. A.C.Sheet roofing	sqm	per sqm
IX	Plastering, points&finishing		
	1. Plastering-Cement or Lime Mortar (thickness and proportion specified)	sqm	per sqm
	2. Pointing	sqm	per sqm
	3. White washing, colour washing, cement wash (number of coats specified)	sqm	per sqm
	4. Distempering (number of coats specified)	sqm	per sqm
	5. Painting, varnishing (number of coats specified)	sqm	per sqm
X	Flooring		
	1. 25mm cement concrete over 75mm lime concrete floor (including L.C.)	sqm	per sqm
	2. 25mm or 40mm C.C. floor	sqm	per sqm
	3. Doors and window sills (C.C. or cement mortar plain)	sqm	per sqm
XI	Rain water pipe /Plain pipe	1RM	per RM
XII	Steel wooden trusses	1No	per 1No
XIII	Glass pannels(supply)	sqm	per sqm
XIV	Fixing of glass panels or cleaning	No	per no.

RULES FOR MEASUREMENT

- ❖ The rules for measurement of each item are invariably described in IS- 1200. However some of the general rules are listed below:
1. Measurement shall be made for finished item of work and description of each item shall include materials, transport, labor, fabrication tools and plant and all types of overheads for finishing the work in required shape, size and specification.
 2. In booking, the order shall be in sequence of length, breadth and height or thickness.
 3. All works shall be measured subject to the following tolerances.
 - Linear measurement shall be measured to the nearest 0.01m.
 - Areas shall be measured to the nearest 0.01 sq.m.
 - Cubic contents shall be worked-out to the nearest 0.01 cum

REQUIREMENTS OF ESTIMATION & COSTING

1. Estimate gives an idea of the cost of the work & hence its feasibility can be determined i.e. whether the project could be taken up with in the funds available or not.
2. Estimate gives an idea of time required for the completion of the work.
3. Estimate is required to invite the tenders and Quotations and to arrange contract.
4. Estimate is also required to control the expenditure during the execution of work.
5. Estimate decides whether the proposed plan matches the funds available or not.

PROCEDURE OF ESTIMATING OR METHOD OF ESTIMATING



- Estimating involves the following operations
 1. Preparing detailed Estimate.
 2. Calculating the rate of each unit of work
 3. Preparing abstract of estimate

DATA REQUIRED TO PREPARE AN ESTIMATE



1. Drawings i.e. plans, elevations, sections etc.
2. Specifications.
3. Rates.

- **DRAWINGS:** If the drawings are not clear and without complete dimensions the preparation of estimation become very difficult. So, it is very essential before preparing an estimate.
- **SPECIFICATIONS**
 - a) General Specifications: This gives the nature, quality, class and work and materials in general terms to be used in various parts of work. It helps to form a general idea of building.
 - b) Detailed Specifications: These give the detailed description of the various items of work laying down the Quantities and qualities of materials, their proportions, the method of preparation workmanship and execution of work.

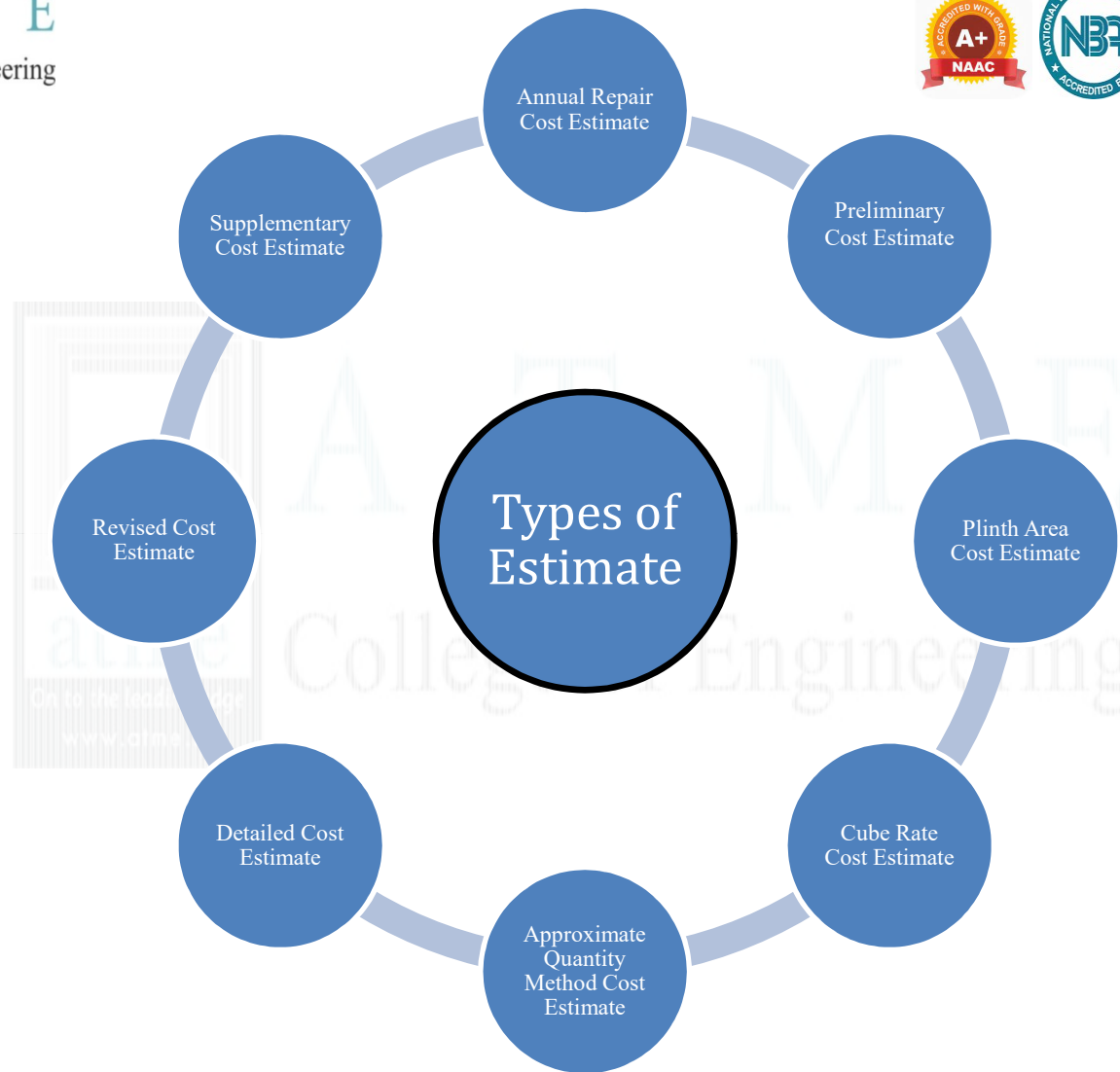
➤ **RATES:** For preparing the estimate the unit rates of each item of work are required.

1. For arriving at the unit rates of each item.
2. The rates of various materials to be used in the construction.
3. The cost of transport materials.
4. The wages of labor, skilled or unskilled of masons, carpenters, Amador, etc.,

TYPES OF ESTIMATE



- A cost estimate is predicted expenditure of a project which is generally prepared before the project is taken up. It is prepared in different types based on the requirement of project.
- The construction cost estimates can be prepared either in a detailed manner by taking into consideration item by item or can be calculated approximately without going much into the details.



Preliminary Cost Estimate

- The preliminary cost estimate is also called an **abstract cost estimate or approximate cost estimate or budget estimate**.
- This estimate is generally prepared in initial stages to know the approximate cost of the project. By this estimate, the competent sanctioning authority can decide the financial position and policy for the administration section.
- Preliminary estimates are prepared with reference to the cost of similar type projects in a practical manner.
- In this estimate, the approximate cost of each important item of work is displayed individually to know the necessity and utility of each item of work.
- The items of work include the cost of lands, cost of roads, electrification, water supply costs, cost of each building, etc.

Plinth Area Cost Estimate

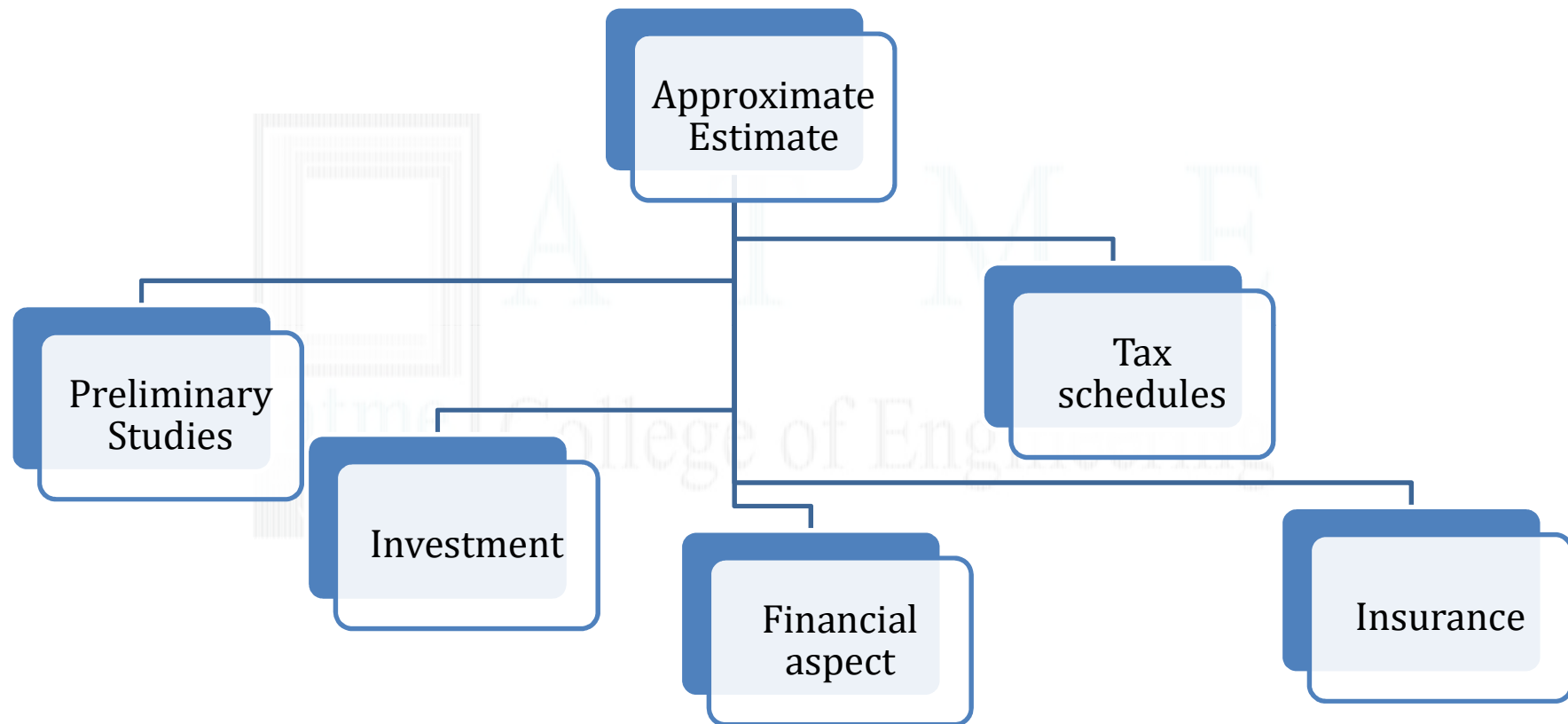
- Plinth area cost estimate is prepared on the basis of plinth area of building which is the area covered by external dimensions of building at the floor level and plinth area rate of building which is the cost of similar building with specifications in that locality.
- Plinth area estimate is obtained by multiplying plinth area of building with plinth area rate. For example if we require plinth area estimate of 100 sq.m in a particular locality and plinth area rate of a building in same locality is 2000 per sq.m then plinth area estimate is $100 \times 2000 = 200000$.
- Open areas, courtyards, etc. are not included in the plinth area. If the building is multi-storied, the plinth area estimate is prepared separately for each floor level.

Cube Rate Cost Estimate

- Cube rate cost estimate of a building is obtained by multiplying plinth area with the height of building. Height of building should be considered from floor level to the top of the roof level. It is more suitable for multi storied buildings.
- This method of estimation is accurate than plinth area method. The rate per cubic meter is taken into consideration based on the costs of similar type of buildings situated in that location. Foundation, plinth and parapet above the roof level are not considered in this type of estimate.

Approximate Quantity Method Cost Estimate

- In approximate quantity method cost estimate, the total wall length of the structure is measured and this length is multiplied by the rate per running meter which gives the cost of the building.
- The rate per running meter is calculated separately for the foundation and superstructure.
- In case of foundation, rate per running meter is decided by considering quantities such as excavation cost, brick work cost up to plinth.
- While in case of superstructure quantities like brickwork for wall, wood works, floor finishing etc. are considered for deciding rate per running meter.

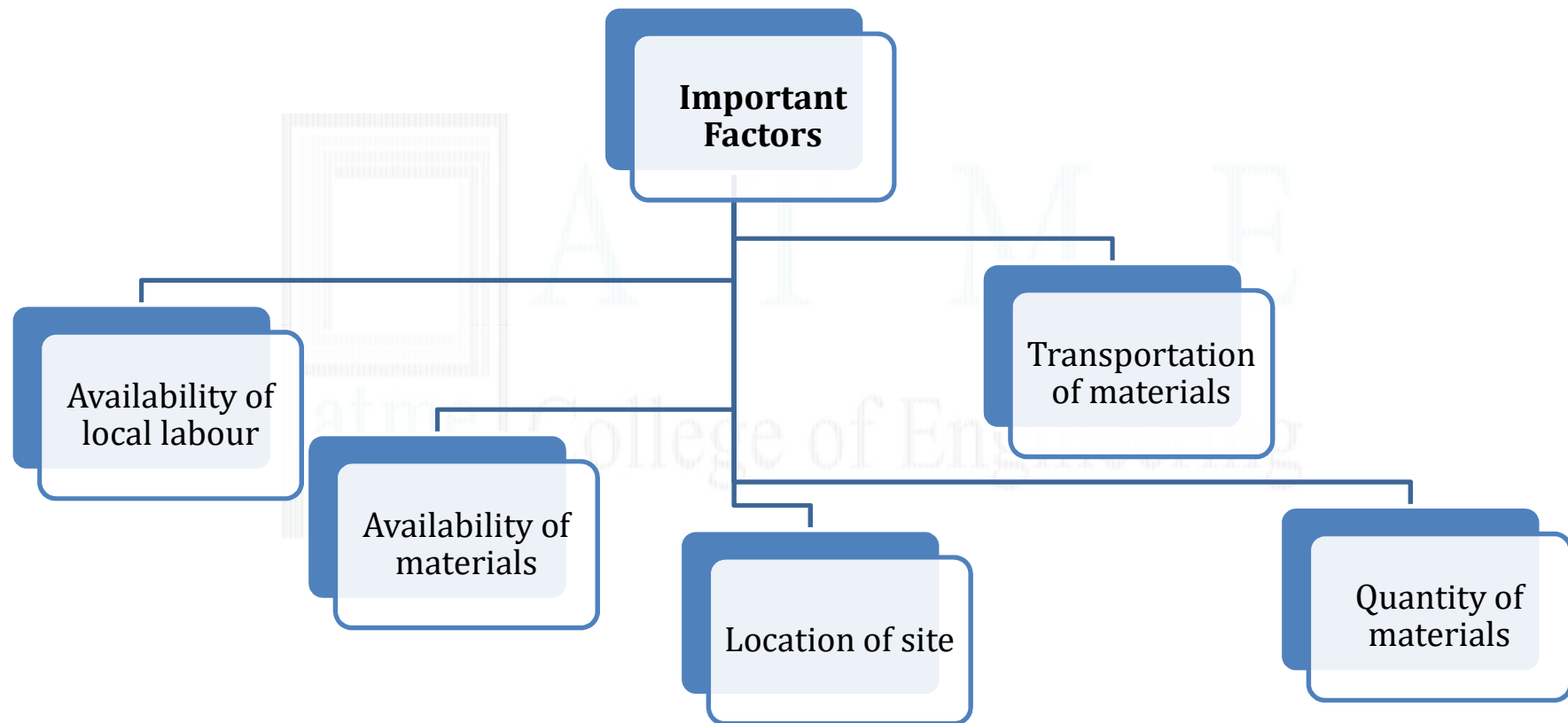


Detailed Cost Estimate

- Detailed cost estimate is prepared when competent administrative authority approved the preliminary estimates.
- This is very accurate type of estimate. Quantities of items of work are measured and the cost of each item of work is calculated separately.
- The rates of different items are provided according to the current workable rates and total estimated cost is calculated.
- 3 to 5 % of estimated cost is added to this for contingencies as miscellaneous expenditure.

The detailed Estimated should consist following details and documents:

- Report
- General Specifications
- Detailed Specifications
- Drawings/plans – layout plans, elevation, sectional views, detailed drawings etc.
- Designs and calculations – In case of buildings design of foundations, beams, slab etc.
- Schedule of rates



Revised Cost Estimate

- Revised cost estimate is a detailed estimate and it is prepared when the original sanctioned estimate value is exceeded by 5% or more.
- The increase may be due to sudden increase in cost of materials, cost of transportation etc. The reason behind the revision of estimate should be mentioned on the last page of revised estimate.

Supplementary Cost Estimate

- Supplementary cost estimate is a detailed estimate and it is prepared freshly when there is a requirement of additional works during the progress of original work.
- The estimate sheet should consists of cost of original estimate as well as the total cost of work including supplementary cost of work for which sanction is required.

Annual Repair Cost Estimate

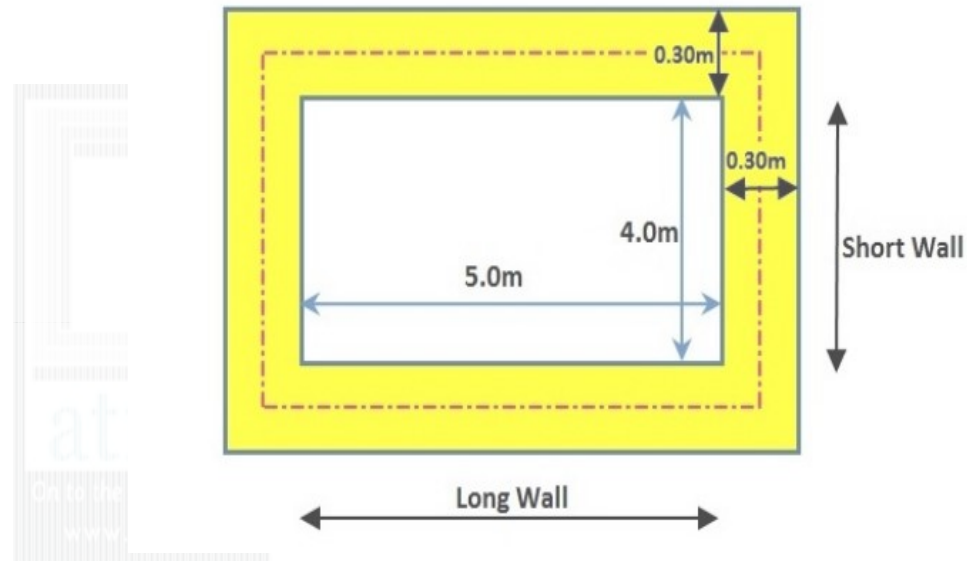
- The annual repair cost estimate is also called as **annual maintenance estimate** which is prepared to know the maintenance costs of the building which will keep the structure in safe condition.
- Whitewashing, painting, minor repairs, etc. are taken into consideration while preparing annual repair estimate for a building.

Estimation of building

- Short wall and long wall method
- Centre line method.

Long Wall and Short Wall Method of Estimation

- For the calculating quantity of various construction item, long wall and short wall method is used.
- For measuring the long wall and short wall the external out-to-out length of walls running in the longitudinal direction generally is considered as “long wall” while the in-to-in internal length of walls running in the transverse direction is called as “short wall” or “cross wall”.
- For calculating quantity multiply the length into the breadth and height of the wall.



Length of Long Wall = Center to Center Length of wall + Half Breadth on One Side + Half Breadth on the Other Side

Length of Short Wall = Centre to Centre Length – One breadth

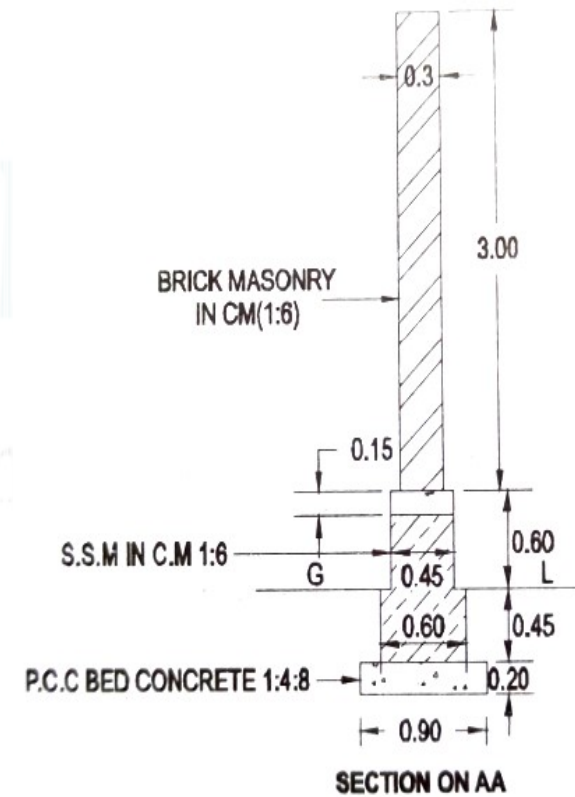
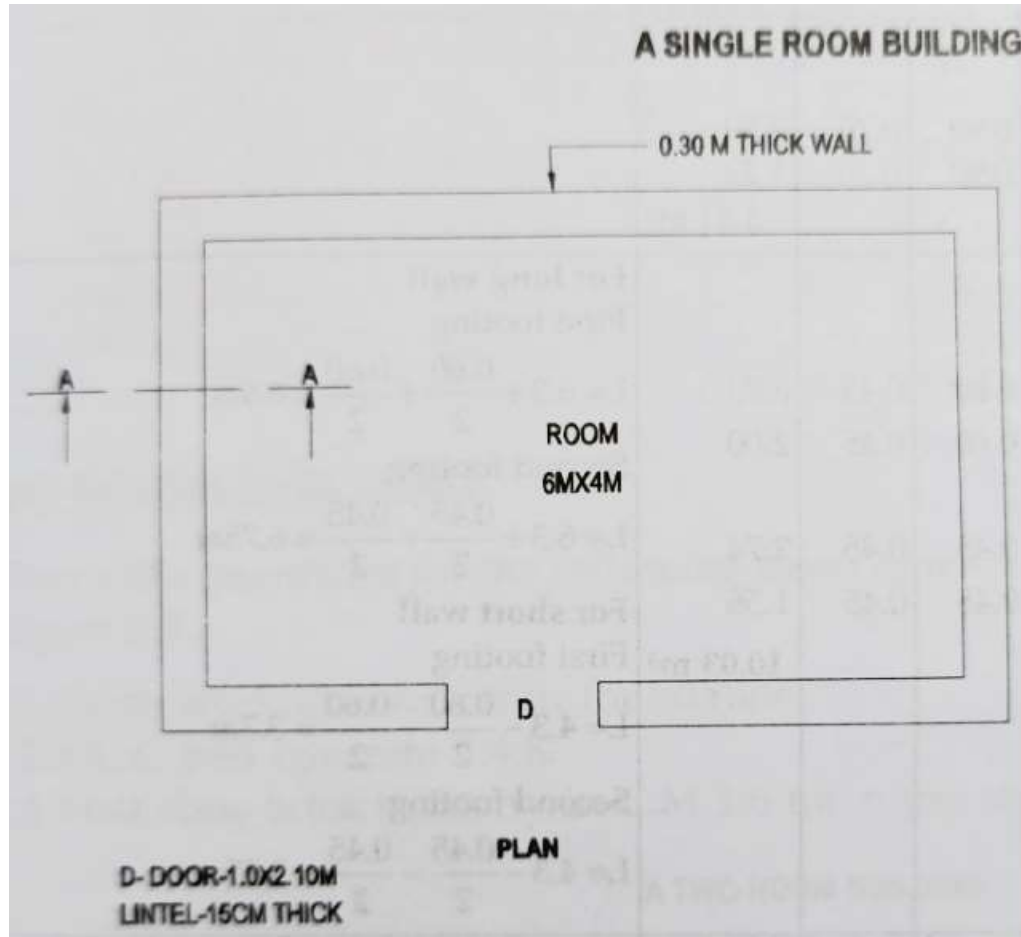
Center Line Method



- Centre line method is adopted for walls of similar cross sections.
- In centre line method, total centre line length of all the walls is first measured, provided walls are of same type, long and short having same cross section and same type of footings.
- After the calculation of centre line length, it is multiplied with the breadth and depth correspondingly to find the total quantity.
- Using centre line method provides an edge with higher work pace; however, extra attention must be paid at junctions, meeting points of partition or cross walls, etc.

PROBLEM 1

- Estimate the quantities for the following items of work for a single room building:
1. Earthwork excavation in foundation
 2. P.C.C bed concrete 1:4:8
 3. S.S.M in C.M 1:6
 4. Burnt brick masonry in C.M 1:6



All dimensions are in metre

Long wall & Short wall method



(a) Centre to Centre of long wall

$$= (\text{Wall thickness}/2) + \text{Inner to Inner distance of wall} + (\text{Wall thickness}/2)$$

$$= (0.3/2) + 6 + (0.3/2) = 6.3$$

(b) Centre to Centre of short wall

$$= (\text{Wall thickness}/2) + \text{Inner to Inner distance of wall} + (\text{Wall thickness}/2)$$

$$= (0.3/2) + 4 + (0.3/2) = 4.3$$

CALCULATIONS



Sl no	Particulars of Item	No	Length	Breadth	Depth	Quantity	Remarks
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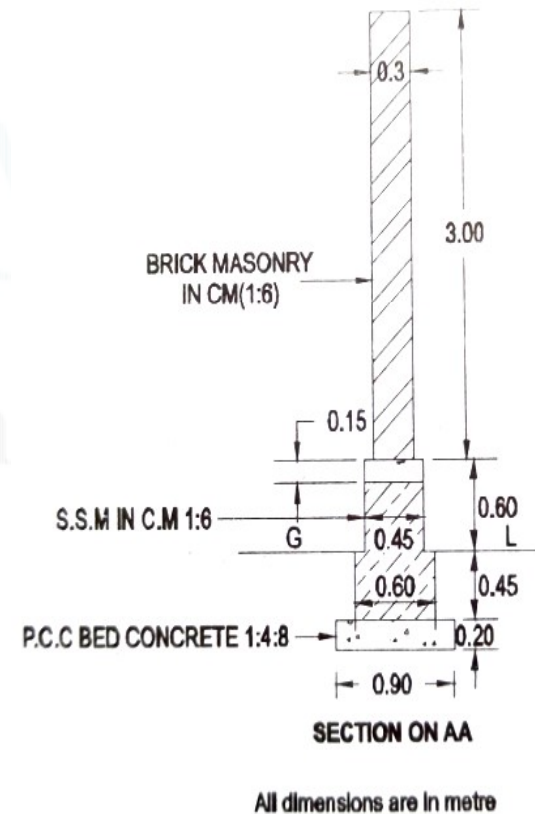
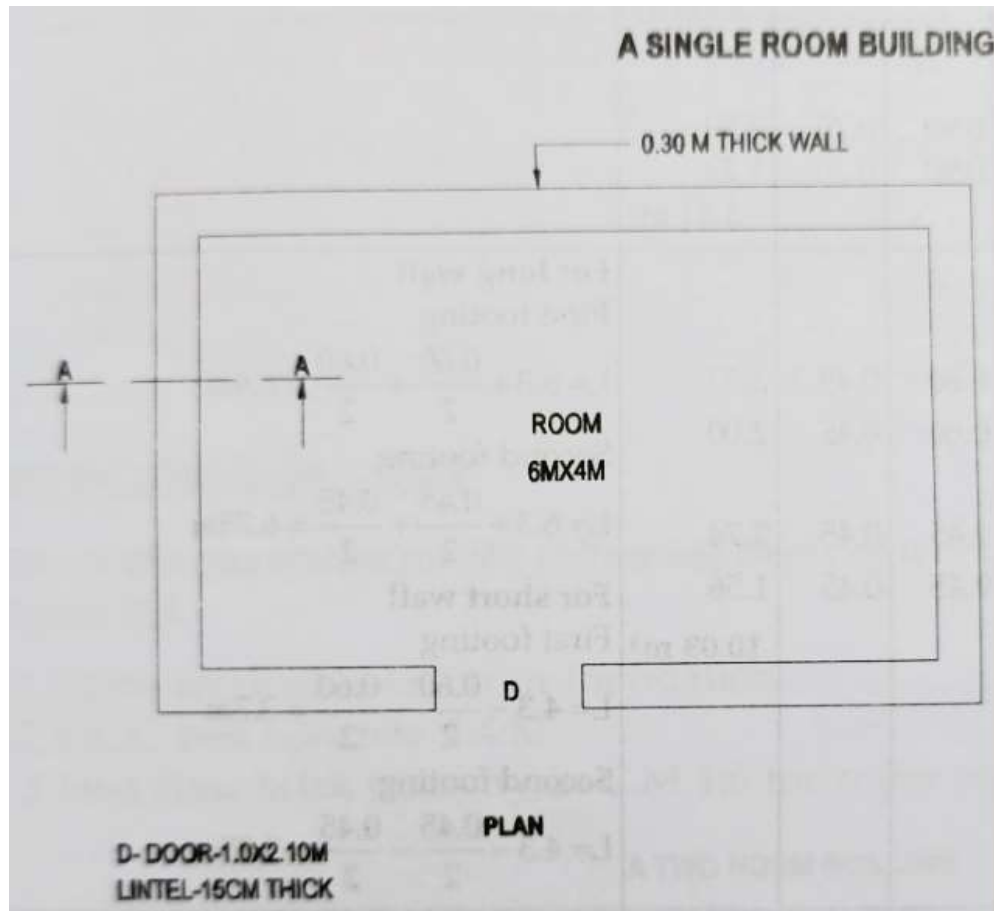
Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
1	Earth work Excavation						For Long Wall $6.3 + (0.9/2) + (0.9/2)$ $= 7.2 \text{ m}$
	(a) Long Wall	2	7.2	0.9	0.65	8.42	
	(b) Short wall	2	3.4	0.9	0.65	3.98	For short wall $= 4.3 - 0.9$ $= 3.4 \text{ m}$
=						12.40 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
2	P.C.C bed Concrete (1:4:8)						
	(a) Long Wall	2	7.2	0.9	0.20	2.59	<u>For Long Wall</u> $6.3 + (0.9/2) + (0.9/2)$ $= 7.2 \text{ m}$
	(b) Short wall	2	3.4	0.9	0.20	1.22	<u>For short wall</u> $= 4.3 - 0.9 = 3.4 \text{ m}$
=						3.81 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
3	S.S.M in CM 1:6						<u>For Long Wall</u>
	First footing						First footing
	(a) Long Wall	2	6.9	0.60	0.45	3.73	$L = 6.3 + (0.6/2) + (0.6/2) = 6.9 \text{ m}$
	(b) Short wall	2	3.7	0.60	0.45	2.00	Second footing
	Second footing						$L = 6.3 + (0.45/2) + (0.45/2) = 6.75 \text{ m}$
	(a) Long Wall	2	6.75	0.45	0.45	2.74	<u>For short wall</u>
	(b) Short wall	2	3.85	0.45	0.45	1.56	First footing
							$L = 4.3 - (0.6) = 3.7 \text{ m}$
							Second footing
							$L = 4.3 - (0.45) = 3.85 \text{ m}$
=						10.03 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
4	Burnt brick masonry in CM 1:6						For Long Wall $L = 6.3 + (0.3/2) + (0.3/2) = 6.6 \text{ m}$
	(a) Long Wall	2	6.6	0.30	3.0	11.88	For short wall
	(b) Short wall	2	4	0.30	3.0	7.20	$L = 4.3 - (0.3) = 4.0 \text{ m}$
	Total					19.08 m³	
	Deduction						For Lintel
	For Door	1	1	0.3	2.1	0.63	$L = \text{Opening size} + \text{bearing}$
	For Lintel	1	1.30	0.3	0.15	0.059	$L = 1 + 0.15 + 0.15 = 1.30 \text{ m}$
=						18.39 m³	

Centre line method



Centre line method

- **Total length of centre line**

$$= (2 \times 6.3) + (2 \times 4.3)$$

$$= 12.6 + 8.6$$

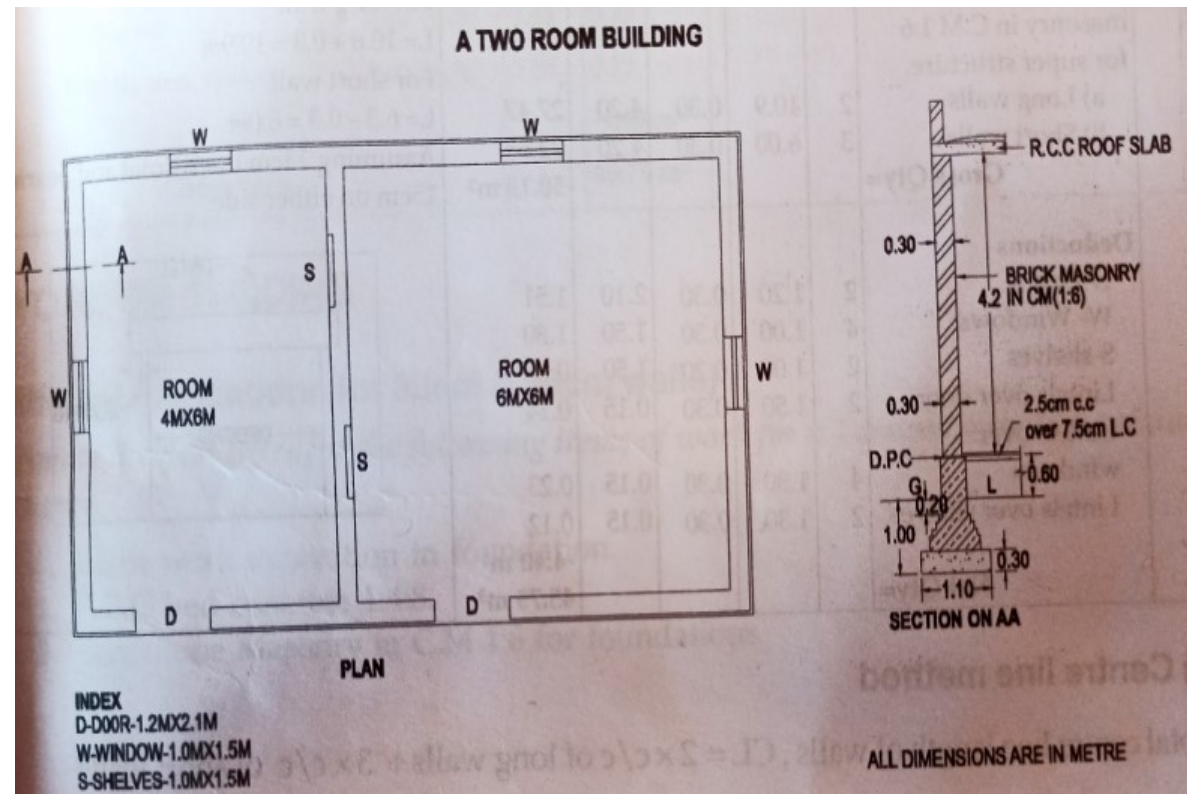
$$= 21.2 \text{ m}$$

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity	Remarks
1	Earth work excavation	1	21.2	0.90	0.65	12.40 m ³	
2	P.C.C bed concrete 1:4:8	1	21.2	0.90	0.20	3.81 m ³	
3	S.S.M in C.M 1:6						
	First footing	1	21.2	0.60	0.45	5.72	
	Second footing	1	21.2	0.45	0.45	4.29	
	Total=					10.01 m ³	
4	Burnt brick masonry in C.M 1:6	1	21.2	0.30	3	19.08 m ³	
	Deduction for Door	1	1	0.30	2.1	0.63 m ³	
	Deduction for Lintel	1	1.3	0.30	0.15	0.059 m ³	
	Total =					18.39 m ³	

PROBLEM 2

- Estimate the quantities for the following items of work for a two room building shown in fig.
1. Earthwork excavation in foundation
 2. P.C.C bed concrete 1:4:8
 3. First class brick masonry in C.M 1:6 for super structure

Long wall & Short wall method



Long wall & Short wall method



(a) Centre to Centre of long wall

$$= 0.15 + 4 + 0.15 + 0.15 + 6 + 0.15$$

$$= 10.6$$

(b) Centre to Centre of short wall

$$= 0.15 + 6 + 0.16$$

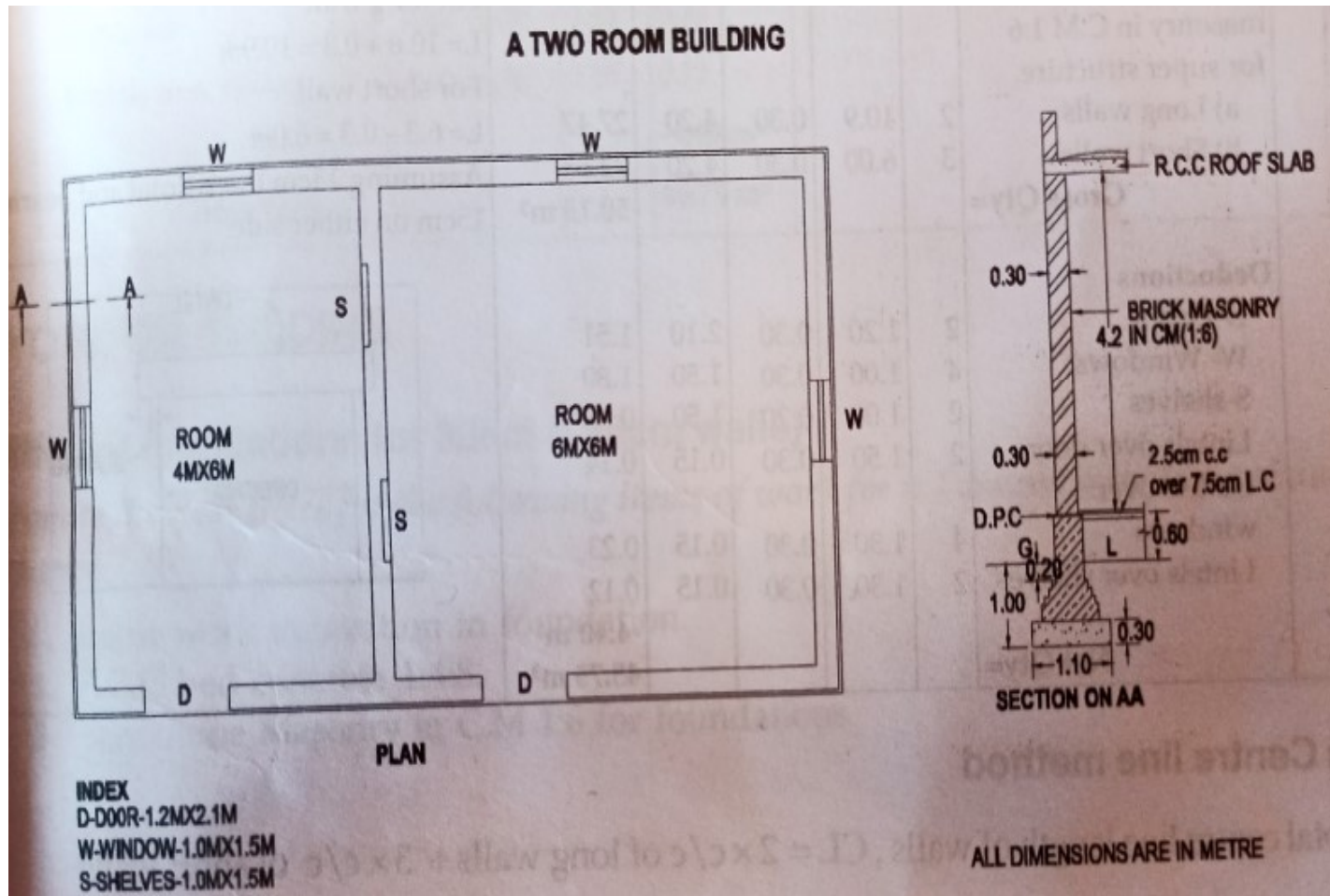
$$= 6.3$$

Sl no	Particulars of Item	No	Length h m	Breadth h m	Depth m	Quantity m ³	Remarks
1	Earth work Excavation						
	(a) Long Wall	2	11.7	1.10	1.00	25.74	For Long Wall $10.6 + 1.1$ $= 11.7 \text{ m}$
	(b) Short wall	3	5.20	1.10	1.00	17.16	For short wall $= 6.3 - 1.1$ $= 5.20 \text{ m}$
=						42.90 m³	

Sl no	Particulars of Item	No	Length h m	Breadth h m	Depth m	Quantity m ³	Remarks
2	P.C.C bed Concrete (1:4:8)						
	(a) Long Wall	2	11.7	1.1	0.30	7.722	For Long Wall 10.6 + 1.1 = 11.7 m
	(b) Short wall	3	5.20	1.1	0.30	5.18	For short wall = 6.3 – 1.1 = 5.20 m
=						12.87 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
3	First class brick masonry in CM 1:6 for super structure						For Long Wall $10.6 + 0.3 = 10.9 \text{ m}$ For short wall $= 6.3 - 0.3 = 6.0 \text{ m}$
	(a) Long Wall	2	10.9	0.30	4.2	27.47	
	(b) Short wall	3	6	0.30	4.2	22.68	
	Total					50.15 m³	
	Deductions						
	For Door	2	1.20	0.3	2.1	1.51	For Lintel
	For Windows	4	1	0.3	1.5	1.8	L = Opening size + bearing
	S – Shelves	2	1	0.2	1.5	0.6	L = 1 + 0.15 + 0.15 = 1.30 m
	Lintels over Doors	2	1.5	0.3	0.15	0.14	
	Lintels over windows	4	1.3	0.3	0.15	0.23	
	Lintels over shelves	2	1.3	0.3	0.15	0.12	
						-4.4 m³	
=						45.75 m³	

Centre line method



Centre line method



- **Total length of centre line**
$$= (2 \times 10.6) + (3 \times 6.3)$$
$$= 21.2 + 18.9$$
$$= 40.1 \text{ m}$$
- Number of junctions as per drawing (T – Junctions) , $N = 2$ No's
- Length, $L = \text{Total Centre length} - N \times (\text{Breadth}/2)$

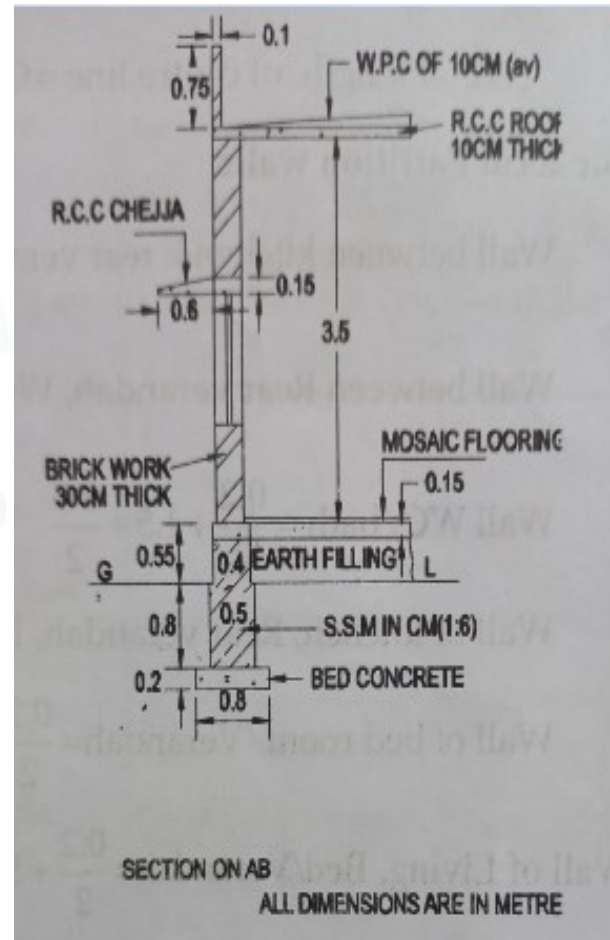
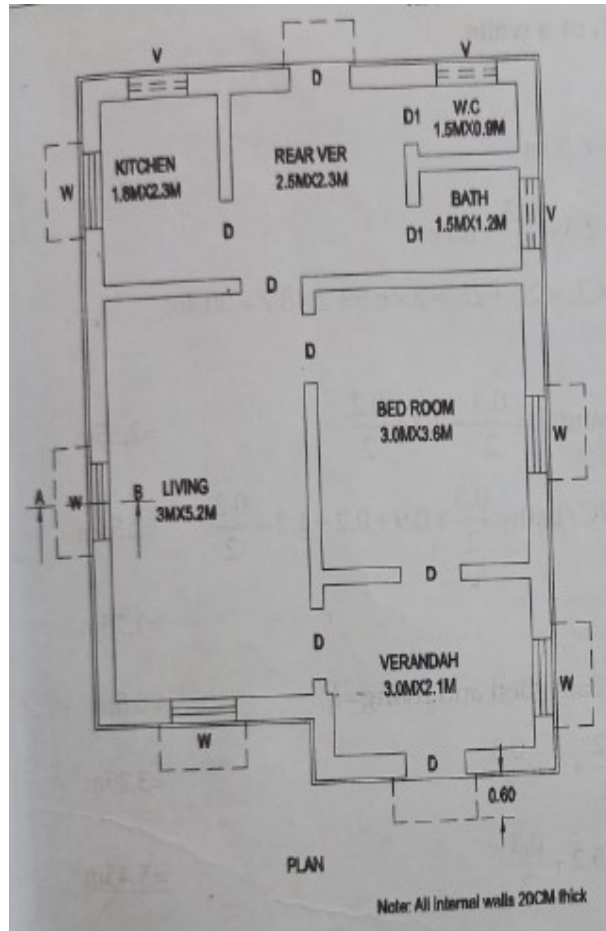
Sl No.	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity	Remarks
1	Earth work excavation	1	39.0	1.10	1	42.90 m³	$L = 40.1 - ((2 \times 1.1)/2) = 39.0 \text{ m}$
2	P.C.C bed concrete 1:4:8	1	39.0	1.10	0.30	12.87 m³	$L = 40.1 - ((2 \times 1.1)/2) = 39.0 \text{ m}$
3	First class brick masonry in CM 1:6 for super structure Total	1	39.8	0.30	4.2	50.15 m³	$L = 40.1 - ((2 \times 0.3)/2) = 39.8$
	Deductions						
	For Door	2	1.20	0.3	2.1	1.51	For Lintel
	For Windows	4	1	0.3	1.5	1.8	$L = \text{Opening size} + \text{bearing}$
	S – Shelves	2	1	0.2	1.5	0.6	$L = 1 + 0.15 + 0.15 = 1.30 \text{ m}$
	Lintels over Doors	2	1.5	0.3	0.15	0.14	
	Lintels over windows	4	1.3	0.3	0.15	0.23	
	Lintels over shelves	2	1.3	0.3	0.15	0.12	
						-4.4 m³	
						45.75 m³	

PROBLEM 3

- The dimensions of a residential building is shown in fig with the following details:
1. Foundation concrete : bed width = 0.8m , depth = 0.2m
 2. Foundation S.S Masonry, width = 0.5m, depth = 0.8m
 3. Basement: width = 0.4m, depth = 0.15m
 4. Plinth concrete, D.P.C (1:2:4) : width = 0.4m, depth = 0.15m
 5. External walls are 30cm & partition walls are 20cm thick
 6. All-round lintel (1:2:4) : depth = 0.15m

7. Height of roof from plinth = 3.5m
 8. Roof: R.C.C roof slab of 10cm thick
 9. R.C.C Chejja: 0.6m width projected outside the wall
 10. Flooring: Mosaic tile flooring is provided
 11. Parapet wall: 0.75m height, 10cm thick parapet wall constructed over the R.C.C roof
 12. 10 cm (Average) thick waterproof course over the R.C.C roof provided.
- Work out the various quantities of item of work and prepare an abstract estimate cost of a building using prevailing rates in your locality.

RESIDENTIAL BUILDING PLAN



SCHEDULE OF OPENING	
D	- 0.9MX2.1M
D1	- 0.75MX2.0M
W	- 1.0MX1.2M
V	- 0.9MX0.6M

To find the centre to centre length of a walls

- **For 30cm wall – Main walls**

➤ $L1 = (0.3/2) + 3.0 + 0.2 + 3.0 + (0.3/2) = 6.5\text{m}$

➤ $L2 = (0.3/2) + 2.1 + 0.2 + 3.6 + 0.2 + 2.3 + (0.3/2) = 8.7\text{m}$

Total length of centre line = $(2 \times L1) + (2 \times L2)$

= $(2 \times 6.5) + (2 \times 8.7)$

= **30.4 m**

- **For 20cm Partition walls**

1. Wall b/w kitchen & rear verandah = $(0.3/2) + 2.3 + (0.3/2) = 2.55\text{m}$
2. Wall b/w rear verandah, W.C/bath = $(0.3/2) + 0.9 + 0.2 + 1.2 + (0.2/2) = 2.55\text{m}$
3. Wall WC/bath = $(0.2/2) + 1.5 + (0.3/2) = 1.75\text{m}$
4. Wall of kitchen, rear verandah, Bath/Bed and living
$$= (0.3/2) + 3.0 + 0.2 + 3.0 + (0.3/2) = 6.5\text{m}$$
5. Wall of bed room/verandah = $(0.2/2) + 3 + (0.3/2) = 3.25\text{m}$
6. Wall of living, bed/Verandah = $(0.2/2) + 5.2 + (0.3/2) = 5.45$

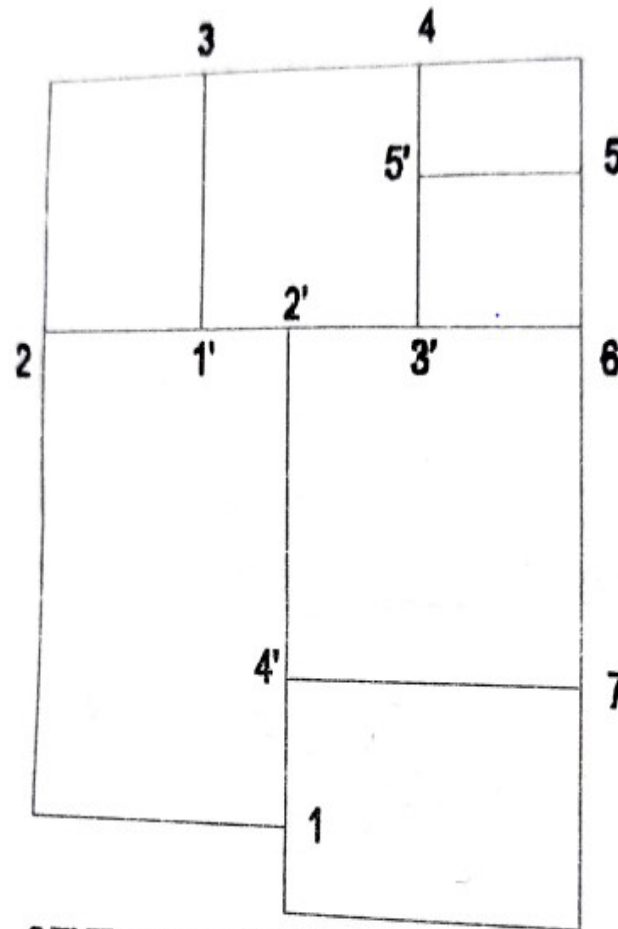
Total length of centre line = **22.05m**

- **Number of Junctions**

1. 30cm to 30cm wall = Nil
2. 20cm to 30cm wall = 7 No's
3. 20cm to 20cm wall = 5 No's



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**CENTRE LINE DIAGRAM SHOWING
NUMBER OF JUNCTIONS**

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
1	Earth work Excavation						
	(a) For 30cm Wall	1	30.4	0.80	1.00	24.32	
	(b) For 20cm wall	1	17.25	0.80	1.00	13.80	Length of 20cm wall $L = 22.05 - 7 \times (0.8/2)$ $- 5 \times (0.8/2) = 17.25\text{m}$
=						38.12 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
2	P.C.C bed concrete (1:4:8)						
	(a) For 30cm Wall	1	30.4	0.80	0.20	4.86	
	(b) For 20cm wall	1	17.25	0.80	0.20	2.76	Length of 20cm wall $L = 22.05 - 7 \times (0.8/2) - 5 \times (0.8/2) = 17.25\text{m}$
=						7.62 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
3	S.S.M in CM 1:6 (i) First foundation course (Below G.L) (a) 30cm wall (b) 20cm wall (ii) For basement course (a) 30cm wall (b) 20cm wall	1 1 1	30.4 30.4 19.65	0.50 0.40 0.40	0.80 0.40 0.40	12.16 4.86 3.14	First footing – 20cm wall $L = 22.05 - 7 \times (0.5/2) - 5 \times (0.5/2) = 19.05\text{m}$ Second footing – 20cm wall $L = 22.05 - 7 \times (0.4/2) - 5 \times (0.4/2) = 19.65\text{m}$
=						27.78 m³	

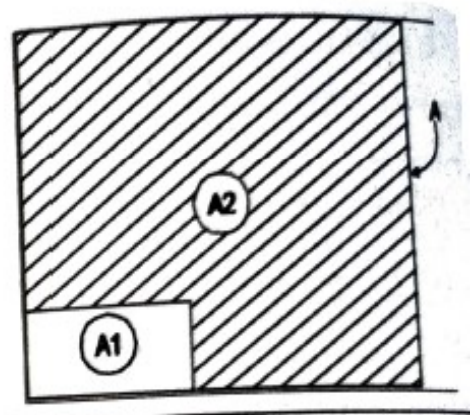
Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
4	Plinth concrete 1:2:4						
	(a) 30cm wall	1	30.4	0.40	0.15	1.824	
	(b) 20cm wall	1	19.65	0.40	0.15	1.179	20cm wall $L = 22.05 - 7 \times (0.4/2) - 5 \times (0.4/2)$ $= 19.65\text{m}$
=						3.00 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
5	Earth filling						
	(a) Foundation trenches					7.62 m ³	$Q = (1/5) \times \text{Excavation Quantity} = (38.12/5)$ $L = \text{c/c distance} - (0.4/2) - (0.4/2)$
	(b) For plinth						
1.	Living	1	2.85	5.05	0.55	7.92	
2.	Kitchen	1	1.65	2.15	0.55	1.95	Living
3.	Rear Verandah	1	2.30	2.15	0.55	2.72	$L = 3.25 - (0.4/2) - (0.4/2) = 2.85\text{m}$
4.	W.C	1	1.35	0.75	0.55	0.56	$B = 5.45 - (0.4/2) - (0.4/2) = 5.05\text{m}$
5.	Bath	1	1.35	1.00	0.55	0.74	
6.	Bedroom	1	2.85	3.4	0.55	5.33	
7.	Verandah	1	2.85	1.95	0.55	3.06	
=						29.90 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
6	Brick masonry in C.M 1:6						Length of 20 cm wall B1 = 0.3m, B2 = 0.2m $L = 22.05 - (7 \times (0.3/2)) - (5 \times (0.2/2)) = 20.5 \text{ m}$
	(a) 30cm walls	1	30.4	0.30	3.50	31.92	
	(b) 20cm walls	1	20.5	0.20	3.50	14.35	Length of parapet wall,
	(c) Parapet walls	1	31.2	0.10	0.75	2.34	$L1 = 6.8 - (0.1/2) - (0.1/2) = 6.7$ $L2 = 9.0 - (0.1/2) - (0.1/2) = 8.9$ $L = (2 \times 6.7) + (2 \times 8.9) = 31.2 \text{ m}$
=						48.61 m³	

enings					
r 30					
	2	0.9	0.3	2.10	1.13
W	5	1	0.3	1.20	1.80
V	3	0.9	0.3	0.6	0.49
20					

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
6	Deduction for Lintels						
	1. All round lintel	1	30.4	0.30	0.15	1.37	
	2. Lintels over internal walls:						
	For D	5	1.20	0.20	0.15	0.18	
	For D1	2	1.05	0.20	0.15	0.063	
$= 48.61 - 7.523 = 41.09 \text{ m}^3$						41.09 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
7	R. C.C works 1:2:4 (a) Roof Slab						<div> <p> $Q = \text{Area of roof slab} \times \text{Thickness area}$ $\text{Area of roof } A_2 = A - A_1$ $A = 6.80 \times 9.0 = 61.20 \text{ sqm}$ $A_1 = 3.30 \times 0.70 = 2.31 \text{ sqm}$ $A_2 = 61.2 - 2.31 = 58.89 \text{ sqm}$ $Q = 58.89 \times 0.10 = 5.889 \text{ cum}$ </p> </div> <div>  </div>

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
7	R.C.C Works 1:2:4						
	1. All round lintel	1	30.4	0.30	0.15	1.37	
	2. Lintels over internal walls:						
	(i) D	5	1.20	0.20	0.15	0.18	
	(ii) D1	2	1.05	0.20	0.15	0.063	
	3. RC.C Chejja						
	(i) over door (Front & Rear)	2	1.20	0.60	0.125	0.180	For Chejja L = 0.9 + 0.15 + 0.15 = 1.2 B = 0.6 (Projected Length)
	(ii) Over Window	5	1.20	0.60	0.125	0.45	Depth = Average thickness = (0.15 + 0.10)/2 = 0.125m
= 5.889 + (1.37+0.18+0.063+0.180+0.45)						8.132 m³	

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
8	Steel Reinforcement (Assuming 1.5%)		$Q = (1.5/100) \times 8.132 \times 7850 = 957.54 \text{ Kgs} = 0.957 \text{ MT}$ R.C.C Volume = 8.132 cum Density of steel = 7850 Kg/cum				Normally assume 1.0 to 3.0% of R.C.C Volume for residential buildings
9	Weather Proof course		W.P.C area = Roof area – Parapet wall area = 58.89 – (31.2×0.10) = 55.77 sq.m				

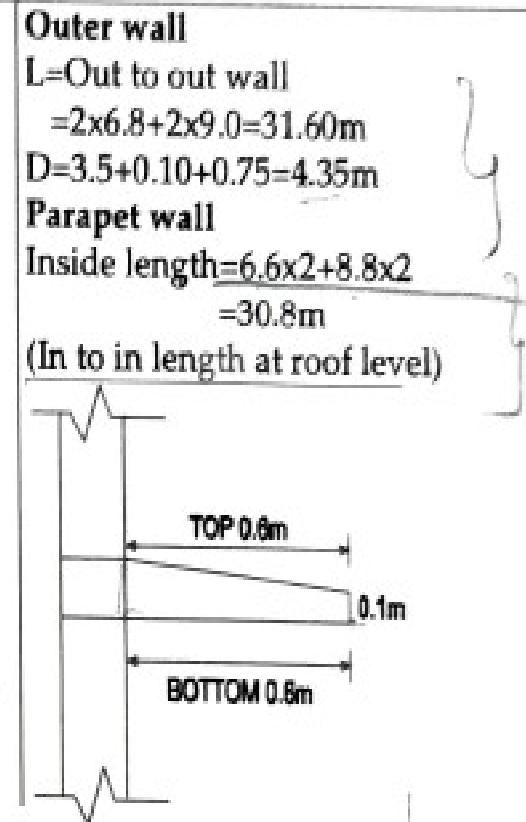


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10	Cement plastering in C.M 1:6						
	a) External plastering						
	i) External walls	1	31.6		4.35	137.46	
	ii) Parapet walls (Top)	1	31.2	0.10		3.12	
	Inside parapet wall	1	30.8		0.75	23.10	
	iii) Chejja plastering						
	1. Over doors - D						
	Top & bottom of chejja	2	1.20	1.30		3.12	
	B = 0.6 + 0.1 + 0.6 = 1.30						
	Sides of chejja	2x2	0.60		0.125	0.30	
	2. Over windows - W						
	Top & bottom of chejja	5	1.20	1.30		7.80	
	Sides of chejja	2x5	0.60		0.125	0.75	
	Gross total (a) =					175.65m²	





b) Internal plastering						
1.Walls						
Kitchen	1	8.2	3.5	28.70	Area=Perimeter x height A=2(L+B) x D L=2(1.8+2.3) =8.20m L=2(2.5+2.3) =9.6m L=2(1.5+0.9) =4.8m L=2(1.5+1.2) =5.4m L=2(3.0+3.6) =13.2m L=2(3.0+2.1) =10.2m L=2(3.0+5.2) =16.4m	
Rear verandah	1	9.6	3.5	33.60		
W.C	1	4.8	3.5	16.80		
Bath	1	5.4	3.5	18.90		
Bed room	1	13.2	3.5	46.20		
Verandah	1	10.2	3.5	35.70		
Living	1	16.4	3.5	57.40		
2.Ceiling plastering						
Kitchen	1	1.8	2.3	4.14		
Rear verandah	1	2.5	2.3	5.75		
W.C	1	1.5	0.9	1.35		
Bath	1	1.5	1.2	1.80		
Bed room	1	3.0	3.6	10.80		
Verandah	1	3.0	2.1	6.30		
Living	1	3.0	5.2	15.60		
Gross total (b) =				283.04 m ²		
Deductions for openings						
D	7	0.9	2.1	13.23	Deductions for openings: 50% deduction done for openings. (one time for two measurements, i.e. external & internal) . external & internals). Net qty=Gross (a) +Gross (b) - Deductions	
D1	2	0.75	2.0	3.00		
W	5	1.0	1.2	6.00		
V	3	0.9	0.6	1.62		
Total deductions=				23.85 m ²		
Net quantity=				434.84 m ²		



11	External wall painting. Gross quantity= Deductions D W V Net quantity=	0.5x2 0.5x5 0.5x3	0.90 1.00 0.90	2.10 1.20 0.60	175.65 m ² 1.89 3.00 0.81 -5.70 m ² 169.95 m ²	Gross quantity same as external plastering
12	Internal walls painting. Gross quantity= Deductions D(External) D D1 W V Net quantity=	0.5x2 5 2 0.5x5 0.5x3	0.90 0.90 0.75 1.00 0.90	2.10 2.10 2.00 1.20 0.60	283.04m ² 1.89 9.45 3.00 3.00 0.81 -18.15 m ² 264.89 m ²	Gross quantity same as internal plastering (ceiling+walls)
13	Enamel painting to doors, windows and ventilators D D1 W V	Painting area = Nos. × P.A.C × 2sides × Opening size P.A.C = Painting Area Co-efficient $7 \times 1.30 \times 2 \times 0.90 \times 2.10 = 34.40 \text{sqm}$ $2 \times 1.30 \times 2 \times 0.75 \times 2.00 = 7.8 \text{sqm}$ $5 \times 1.0 \times 2 \times 1.00 \times 1.20 = 12 \text{sqm}$ $3 \times 1.0 \times 2 \times 0.90 \times 0.60 = 3.24 \text{sqm}$ Total quantity = 57.44sqm				P.A.C P.A.C=1.30 for fully paneled door P.A.C=1.0 for partly paneled and partly glazed windows, ventilators.

Estimates of different R.C.C Structures

- The concrete work excluding centering and shuttering is measured in cubic metre and paid separately.
- The centering and shuttering or formwork is measured in square metre and paid separately.
- Steel reinforcement including cutting, bending, binding and placing in position is measured in quintal and paid separately.

Steel Reinforcements used in R.C.C

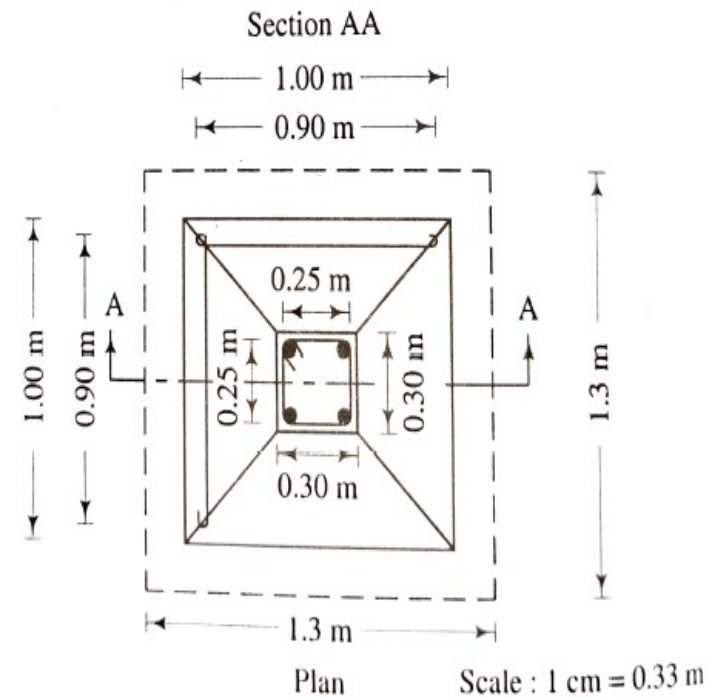


- Mild steel & Tor-steel (HYSD – High Yield strength deformed).
- In Conventional R.C.C the mild steel bars have been replaced by HYSD.

Diameter of bar in mm	Weight in kg per metre	Diameter of bar in mm	Weight in kg per metre
6	0.22	16	1.58
8	0.39	18	2
9	0.50	20	2.46
10	0.62	22	2.98
12	0.89	25	3.85

Problem – R.C.C Column & it's footing (1:1.5:3)

- Prepare a detailed estimate with abstract sheet of R.C.C column with footing as shown in Drawing.
- Also work out the following:
 1. Percentage volume of reinforcement.
 2. Prepare bar bending schedule.



Measurements

Sl no	Particulars of Item	No	Length m	Breadth m	Depth m	Quantity m ³	Remarks
5	Earth filling						
	(a) Foundation trenches					7.62 m ³	$Q = (1/5) \times \text{Excavation Quantity} = (38.12/5)$ $L = \text{c/c distance} - (0.4/2) - (0.4/2)$ Living
	(b) For plinth	1	2.85	5.05	0.55	7.92	$L = 3.25 - (0.4/2) - (0.4/2) = 2.85\text{m}$ $B = 5.45 - (0.4/2) - (0.4/2) = 5.05\text{m}$
	1. Living	1	1.65	2.15	0.55	1.95	
	2. Kitchen	1	2.30	2.15	0.55	2.72	
	3. Rear Verandah	1	1.35	0.75	0.55	0.56	
	4. W.C	1	1.35	1.00	0.55	0.74	
	5. Bath	1	2.85	3.4	0.55	5.33	
	6. Bedroom	1	2.85	1.95	0.55	3.06	
	7. Verandah						
=						29.90 m ³	

Measurements

No.	Item	No.	L	B	D	Qty.	Total
1.	Cement concrete (1:1.5:3) i.e., M20 without reinforcement Base area of footing = A_1 $= 1 \times 1 = 1 \text{ m}^2$ Column Top area of footing = A_2 $= 0.3 \times 0.3$ Footing without slope $= 0.09 \text{ m}^2$ Sloping part of footing $V = \frac{h}{3} (A_1 + A_2 + \sqrt{A_1 \times A_2})$	1 1 $\frac{0.5}{3}$	3.50 1.00 $(1 + 0.09 + \sqrt{1 \times 0.09})$	0.30 1.00 0.30	0.30 0.30 0.23	0.32 0.30 0.23	0.85 cu m
2.	P.C.C. (1:4:8) below column footing	1	1.30	1.30	0.15	0.25	0.25 cu m

HYSD steel bars

Note: 5 cm cover is provided on each side.

Column main steel:

4 bars of 16 mm diameter:

$$\begin{aligned}
 L &= 3.5 + 0.5 + 0.3 + 0.3 \\
 &\quad + 2 \times 9 \times 0.016 \text{ (hook)} \\
 &\quad - 2 \times 0.05 \text{ (cover)} - 2 \times 0.012 \\
 &\quad \text{(bottom bars)} = 4.76 \text{ m}
 \end{aligned}$$

4

$$\frac{4.76}{19.04}$$

@

1.58
kg/m

30.08

Footing:

12 mm diameter bars @ 10 cm c/c:

$$L = 1.0 - 2 \times 0.05 \text{ (cover)} + 2 \times 9 \times 0.012 \text{ (hook)} = 1.12 \text{ m}$$

$$\text{No. of bars} = \left(\frac{0.9}{0.1} \right) + 1 = 10$$

$$\text{For bothways nos.} = 2 \times 10 = 20$$

20

$$\frac{1.12}{22.40}$$

@

0.89
kg/m

$$\frac{19.94}{19.94}$$

50.02
kg

Mild steel reinforcement

8 mm diameter lateral ties

@ 15 cm c/c in column:

$$l = b = 0.25 - 2 \times 0.008 = 0.234 \text{ m}$$

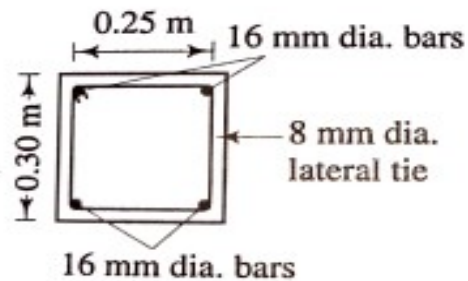
$$L = 2(l + b) + 24d \text{ (hook)}$$

$$= 2(0.234 + 0.234) + 24 \times 0.008$$

$$= 1.13 \text{ m}$$

$$\text{Length of column} = 3.5 + 0.5 + 0.3 - 2 \times 0.05 \text{ (cover)} = 4.2 \text{ m}$$

$$\text{No. of bars} = \left(\frac{4.2}{0.15} \right) + 1 = 28.84, \\ \text{say 29 nos.}$$



29

$$\frac{1.13}{32.77}$$

@

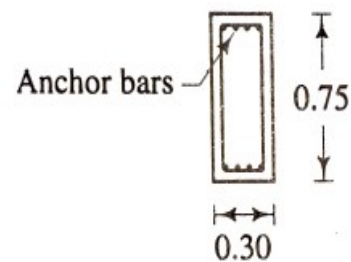
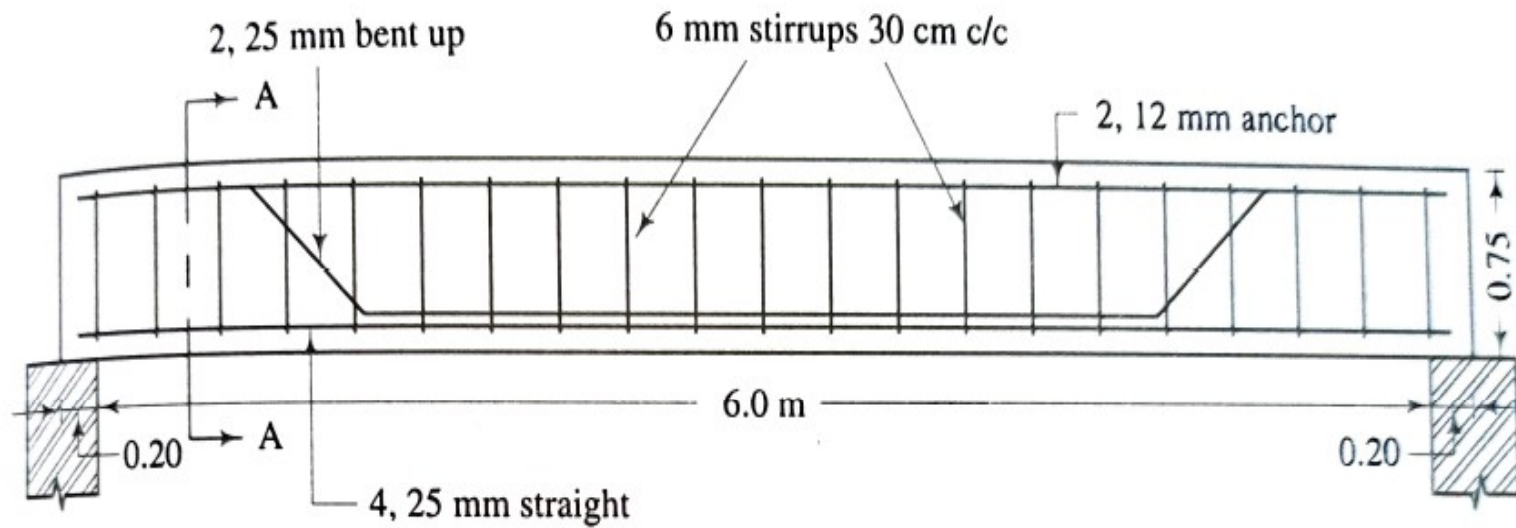
0.39
kg/m

$$\frac{12.78}{}$$

12.78
kg

Problem – R.C.C Beam

- Prepare a detailed estimate with abstract sheet of R.C.C beam as shown in Drawing.
- Also work out the following:
 1. Percentage volume of reinforcement.
 2. Prepare bar bending schedule.



Section A A

Bar dia.	WT (kg/m)
6 mm	0.22
12 mm	0.89
25 mm	3.85



Item	No.	L	B	D	Qty.	Total
Cement concrete (1:1.5:3) i.e., M20 without reinforcement $L = 6.0 + 0.2 + 0.2 = 6.4 \text{ m}$ Beam	1	6.40	0.30	0.75	<u>1.44</u>	1.44 cu m

HYSD steel bars

4 straight bars of 25 mm diameter:

$$L = 6.0 + 0.2 + 0.2 + 2 \times 9 \times 0.025$$

$$(\text{hook}) - 2 \times 0.025 (\text{cover}) = 6.8 \text{ m}$$

4

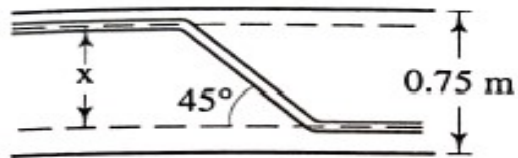
6.80
27.20

@

3.85
kg/m

104.72

2 bent-up bars of 25 mm diameter:



$$x = 0.75 - 2 \times 0.025 \text{ (cover)} - 2 \times 0.006 \text{ (stirrups)} - 2 \times \frac{1}{2} \times 0.025$$

$$= 0.663 \text{ m}$$

Extra length for one bent-up bar
= $0.45x = 0.30 \text{ m}$

$$L = 6.8 + 2 \times 0.30 = 7.4 \text{ m}$$

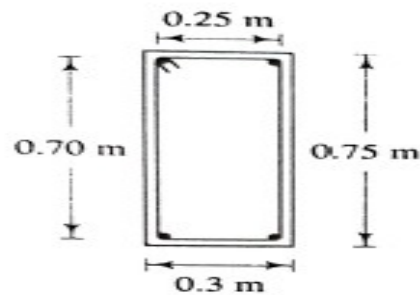
2 Anchor bars of 12 mm diameter:

$$L = 6.0 + 0.2 + 0.2 + 0.3 + 2 \times 9 \times 0.012 \text{ (hook)} - 2 \times 0.025 \text{ (cover)}$$

$$= 6.57 \text{ m}$$

2	$\frac{7.40}{14.80}$	@	3.85 kg/m	56.98	
2	$\frac{6.57}{13.14}$	@	0.89 kg/m	11.69	173.39 kg

Mild steel reinforcement



6 mm diameter stirrups
@ 30 cm c/c in beam:

$$\begin{aligned}
 l &= 0.75 - 2 \times 0.006 \\
 &\quad - 2 \times 0.025 \text{ (cover)} = 0.69 \text{ m} \\
 b &= 0.30 - 2 \times 0.006 \\
 &\quad - 2 \times 0.025 \text{ (cover)} = 0.24 \text{ m} \\
 \text{hook length} &= 24 d = 24 \times 0.006 \\
 &= 0.144 < 0.15 \text{ (min. hook length)} \\
 L &= 2 (l + b) + 0.15 \\
 &= 2 (0.69 + 0.24) + 0.15 = 2.01 \text{ m} \\
 \text{Length of beam} &= 6.0 + 0.2 + 0.2 \\
 &\quad - 2 \times 0.025 \text{ (cover)} = 6.35 \text{ m} \\
 \text{No. of bars} &= \left(\frac{6.35}{0.30} \right) + 1 \\
 &= 22.17, \text{ say } 22 \text{ nos.}
 \end{aligned}$$

22

$\frac{2.01}{44.22}$

@

0.22
kg/m

$\frac{9.73}{}$

9.73
kg

(ii) *Percentage volume of steel reinforcement in beam:*

Note: The weight of 1 cu m of steel is assumed as 7850 kg.

Volume of concrete = 1.44 cu m

Weight of steel = (173.39 + 9.73) = 183.12 kg.

$$\begin{aligned}\text{Percentage of steel} &= \frac{183.12 \times 100}{7850 \times 1.44} \\ &= \text{Rs. } 1.62, \text{ say } \mathbf{1.60 \%}.\end{aligned}$$