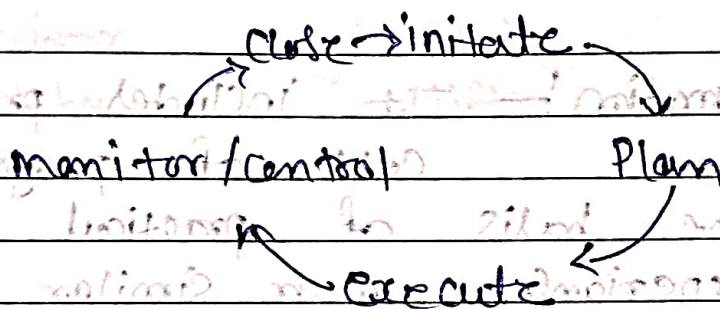


SPECIFICATION AND APPROXIMATE ESTIMATE

 Date _____
 Page _____

★ **Project**:- A complex non routine one time effort limited by time, budget resources and performance specification designed to meet customer needs.

★ **Element of Project**:-



★ **Process**:-

- 1) Planning and scheduling.
- 2) Project Study
- 3) Preparation of method statement.
- 4) Assessing output of selected resources.
- 5) Calculation of direct cost of each item.
- 6) Calculation of the site overhead.
- 7) Estimation report.

★ **Types of Estimation**:-

- 1) Rough estimation
- 2) Detailed estimation.

1) ROUGH ESTIMATION

Preliminary Estimation Plinth Area Cubic Content Typicality Method.

i) Preliminary Estimation:- It includes probable cost of project prepared on the basis of practical knowledge or technical experience over similar construction.

ii) Plinth Area:- This estimation is based on plinth area.

Estimation cost = Plinth Area $\times$ Rate of plinth area

Type of Area

Plinth Area

→ Total Cover area or roof area

Floor Area

→ It is based on internal dimensions.

Floor Area = Plinth Area - Area of wall

Types of Floor Area

Circulation Area

Complete Area

→ Usable area is

Complete area.

Horizontal area

Vertical area

Complete Area = Total floor area

eg: - corridor, verandah, passage.

eg: - Stair, lift

circulating area - non-usable area

(ii) Cubic Rate Cubic Estimation:-

This estimation is based on volumetric content of building

estimation cost = Volume of building $\times$ Rate / m Cub

Work

Percentage Estimation

i) Departmental Charges	10% - 15%
ii) Contractor Charge	10%
iii) Labourer Charge	25%
iv) Electrification Charge	8%
v) Sanitary & water supply Charge	8%
vi) Contingencies Charge	3% - 5%
vii) Work Charge establishment	1.5% - 2%
viii) Tool and plan	1 - 1.5%

- Question Prepare estimate of approximate estimate of a building project of with total plinth area of 500m^2 and from the data given below.
- i) Cost of water supply the rate 7% of the building cost.
 - ii) Plinth area rate $3000/\text{m}^2$
 - iii) Cost of Sanitary and electric installation each at the rate 7% of the building cost.
 - iv) Cost of architecture feature at the rate 1% of building cost.
 - v) Cost of roads and lawn at the rate 5% of the building cost.
 - vi) Cost of Contingencies at the rate 4% of the building cost.
 - vii) Find the total building cost.

Solution

Plinth area = 500m^2 .

- (i) Water Supply rate = 7% of building cost
- (ii) Plinth area rate = $3000/\text{m}^2$
- (iii) Cost of Sanitary = 7% of building cost
- (iv) Cost of electricity = 7% of building cost
- (v) Cost of architecture = 1% of building cost
- (vi) Cost of Roads = 5% of building cost
- (vii) Cost of Contingencies = 4% of building cost
- (viii) Total building cost = ?

$$\text{Building Cost} = \text{Plinth Area} \times \text{Rate} \quad (iv)$$

$$= 500 \times 3000$$

$$= 15,00,000 \text{ Rupees}$$

i) Cost of water supply

$$= \text{Building Cost} \times \text{Rate}$$

$$= 15,00,000 \times 7\%$$

$$= 10,50,000 \text{ Rupees}$$

ii) Cost of Sanitary

$$= \text{Building Cost} \times \text{Rate}$$

$$= 15,00,000 \times 7\%$$

$$= 10,50,000 \text{ Rupees}$$

iii) Cost of electricity

$$= \text{Building Cost} \times \text{Rate}$$

$$= 15,00,000 \times 7\%$$

$$= 10,50,000 \text{ Rupees}$$

iv) Cost of architecture

$$= \text{Building Cost} \times \text{Rate}$$

$$= 15,00,000 \times 10\%$$

$$= 15,00,000 \text{ Rupees}$$

v) Cost of roads

$$= \text{Building Cost} \times \text{Rate}$$

$$= 15,00,000 \times 5\%$$

$$= 7,50,000 \text{ Rupees}$$

vi) Cost of Contingencies

$$= \text{Building Cost} \times \text{rate} \\ = 180000 \times 4\% \\ = 60000 \text{ Rupees}$$

vii) Total building cost = 1965000 Rupees

Ques Prepare rough estimate of multiple comparison of building with following detail.

- i) Plinth Area 500 m^2
- ii) Height of one story = 3.5 m
- iii) Cubic content rate = $5000/\text{m}^3$
- iv) Number of story = 2
- v) Water supply and Sanitary = 8%
- vi) Electrification = 7%
- vii) Contractors profit = 10%
- viii) Super vision Contingencies charge = 5%
- xi) Fluctuation of Rate = 5%

Solution

Given detail:-

one story

Building height = 3.5 m

Plinth Area = 500 m^2

Cubic content rate = $5000/\text{m}^3$

Number of story = 2

Water supply and Sanitary = 8%

Electrification = 7%

Contractor profit = 10%
Supervisor Contingencies = 5%
Plaster rate = 5%

$$\text{Total building height} = 3.5 \times 3 = 10.5 \text{ m.}$$

$$\text{Plinth area} = 500 \text{ m}^2.$$

$$\begin{aligned} \text{Volume of building} &= \text{plinth area} \times \text{height} \\ &= 500 \times 10.5 \\ &= 5250 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} \text{Building Cost} &= \text{Volume of building} \times \text{cubic rate} \\ &= 5250 \times 5000 \\ &= 26250000 \text{ Rupees.} \end{aligned}$$

1) Water Supply & Sanitary

$$\begin{aligned} &= \text{Building Cost} \times \text{Rate} \\ &= 26250000 \times 8\% \end{aligned}$$

$$= 2100000 \text{ Rupees.}$$

1) Electrification

$$= \text{Building Cost} \times \text{Rate}$$

$$= 26250000 \times 7\%$$

$$= 1837500 \text{ Rupees.}$$

iii) Contractor Profit

$$= \text{Building Cost} \times \text{Rate}$$

$$= 26250000 \times 10\%$$

$$= 2625000 \text{ Rupees.}$$

iv) Supervision & Contingencies.

$$= \text{Building Cost} \times \text{Rate}$$

$$= 26250000 \times 5\%$$

$$= 1312500 \text{ Rupees.}$$

v) Fluctuation Rate.

$$= \text{Building Cost} \times \text{Rate}$$

$$= 26250000 \times 5\%$$

$$= 1312500 \text{ Rupees.}$$

$$\text{Total Building Cost} = 35437500 \text{ Rupees.}$$

Question A residential building is proposed to be constructed in which following rooms and structure are to be constructed.

- i) 2 bedroom = $3.3\text{m} \times 3.6\text{m}$
- ii) Drawing room = $3.6\text{m} \times 3.6\text{m}$
- iii) living room = $3.6\text{m} \times 4.2\text{m}$
- iv) Kitchen = $2.7\text{m} \times 3\text{m}$
- v) Bathroom = $1.2\text{m} \times 1.8\text{m}$
- vi) w/c = $1.2\text{m} \times 1.8\text{m}$

Prepare plinth preliminary estimate of the building if plinth area rate is 1200/m²

Solution

$$\begin{aligned} \text{i) 2 Bedroom} &= 2 \times (3.3 \times 3.6) \\ &= 23.76 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{ii) Drawing room} &= 3.6 \times 3.6 \\ &= 12.96 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{iii) living Room} &= 3.6 \times 4.2 \text{ m} \\ &= 15.12 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{iv) kitchen} &= 2.7 \times 3 \\ &= 8.1 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{v) Bathroom} &= 2.1 \times 1.8 \\ &= 3.78 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{vi) w/c} &= 1.2 \times 1.5 \\ &= 1.8 \text{ m}^2 \end{aligned}$$

$$\text{Total} = 65.52 \text{ m}^2$$

Floor Area = Carpet Area + Circulation Area

Circulation Area is Assumed 30% of the Carpet Area

$$\begin{aligned} &= 65.52 \times 30\% \\ &= 19.65 \text{ m}^2 \end{aligned}$$

1st floor Area = $65.52 \times 1.9 = 124.49$
 Surface of floor = 95.17 m^2

Plinth Area = Floor Area + 10% of Floor Area
 $(1.0 \times 95.17) = 95.17$

Plinth area = $95.17 + 9.51$
 104.68 m^2

Total Cost = Plinth Area $\times$ Rate
 $104.68 \times 1200 = 1,25,616$ Rupees
 $\approx 1,25,500$ Rupees.

UNIT MEASUREMENT

Sl. No.	Particulars of items	Unit of measurements in MKS
	Earthwork -	
1.	Earthwork in excavation in ordinary soil, earthwork in mixed soil with kankar, bajri etc. earthworks in hard soil	Cum.
2.	Rock excavation	Cum.
3.	Earth filling in excavation in foundation	Cum.
4.	Earth filling in foundation trenches	Cum.

5.	Earth filling in plinth	Cum
6.	Earthwork in banking, cutting in road and irrigation channel	Cum
7.	Surface dressing and levelling cleaning etc.	Sqm
8.	Cutting of trees	No.
9.	Puddling, Puddle Clay Core	Cum
10.	Sand filling	Cum
11.	Quarrying of stone or boulder	Cum
12.	Blasting of rock	Cum

Note:- For earthwork normal lead is 30m & normal lift is 1.5m.

UNIT 5

Sl. No.	Particular of items	Unit of measurement in mks
---------	---------------------	----------------------------

Concrete:-

1.	Lime Concrete in foundation	Cum
2.	Lime Concrete in roof terraceing. thickness specific	Sqm
3.	Cement Concrete (C.C.)	Cum
4.	Reinforced Cement Concrete (R.C.C.)	Cum
5.	C.C. or R.C.C. chajja Sun shade	Cum
6.	Precast C.C. or R.C.C.	Cum
7.	Jali work or Jaffri work or C.C. tracery panels.	Sqm
8.	Cement Concrete bed	Cum

★ DETAILED ESTIMATION:-

- It is an accurate estimate and consist of working out of the quantities each item of work and working the cost.
- The dimension length, breadth and height of each item are taken out correctly from drawing and quantities are calculated and billing are done.

Types of detailed estimate:-

i) Item rate estimation

Description of item	length	breadth	height	quantity	rate

Estimated Cost = quantity of that item $\times$ Rate of item

ii) Revised Estimate

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

- i) When the original sanctioned estimate is exceed or lightly to exceed by more than 5%.
- ii) When the expenditure on a work exceed or lightly to exceed the amount sanctioned by more than 10%.
- iii) When there are material deviation from the original proposal even though the cost may be not from the sanctioned amount.
- iv) The revised estimate should be accompanied by a comparative statement showing the deviation of each item of work, with quantity rate and cost under original and revised site by site the excess and revision of variation.
- iii) Supplementary Estimation:-
 → It is detailed estimation.
 → It is prepared when the additional work are required to supplement the original work or when further development is required during the process of work.
 → This is a fresh detailed estimate of the additional work in addition to original estimate.
- iv) Annual Repair and maintenance estimate:-
 It is prepared to maintained the structure or work in proper order and safe condition.

v) Extension & Estimation:-
Often construction when some construction work is to be done the extension estimate is carried out.

★ Contingencies:-

Contingencies indicate accidental expenses of miscellaneous character which cannot be classified under any distinct item.

★ Administration Sanctioned:-

- Administration approval denotes the formal acceptance by the department concerned at the proposal.
- After the administration approval is given the engineer department take up the work and prepare detailed design, plan and estimate and then execute the work.
- The engineer department prepare approximate estimate and preliminary plan and submit to the department concerned. administration approval.

★ Technical Sanctioned:-

The sanctioned of the detailed estimate design calculation, quantities of work, rate and cost of the work by the authority

of engineering department.

★ Financial Sanctioned!—

It is meant that, Concurrence of the government on the expenditure propose and represent by allotment of the money to mean the expenditure.

★ Types of rough estimate!—

i) Service unit method!—

In Service unit method number of service unit is decided by calculating approximate estimate.

Building	Service unit
----------	--------------

- | | |
|----------------------------|----------------|
| i) School | Per classroom. |
| ii) Hospital | Per bed. |
| iii) Theatre / stadium | Per seat |
| iv) Hotel or office | Per Room |
| v) Bridge | Per span |
| vi) Road | Per length |
| vii) water tank, Reservoir | Per liter |

→ If the cost of construction and number of service unit is known then, cost of construction per service unit is calculated.

Approximate estimate = Rate / Service unit $\times$ Number of service unit.

Ques:- The Cost of Construction govt. poly.
is 2cr for a capacity of 500 student
and area of Construction about 2000 m²
Prepare approximate estimate of a newly
proposed of govt. polytechnic building for
1200 students with the area 5000 m²

Given data:-

2cr for 500 Stu: area 2000 m²

$$500 \times 2000 = 2cr$$

$$5000 \times 1200 = ?$$

$$5000 \times 2000 = 20000000$$

$$4000 \times 1200$$

$$= 48000000$$

$$\text{Ans} \rightarrow 48000000 / \rightarrow \text{Rupees}$$

✓ Prepare prepare a estimate for 3span
bridge of 40m each. The cost of
existing bridge is 40.000/- per meter

Number of Span - 3
Length of one Span - 40 meter.

$$\begin{aligned} & 4000 \times 40 \\ & 1600000 \times 3 \\ & \underline{4800000} \end{aligned}$$

Ans = Rs. 4800000/- per year

Approximate Estimate of water supply project:-

- ① Area Served by the project: The total area covered by the project is worked out in hectare or in square kilometer.
 → Then to prepare approximate estimate the project area in hectare or square kilometer is multiplied by existing rate of similar project per hectare or square kilometer.
 - ② Population Served by the project:
 → Prepare approximate estimation total project population is multiplied by the existing cost per capita for similar type of project.
- ★ Prepare approximate estimate of a building using following data.
- i) Proposed area of building = $150m^2$
 - ii) Similar type of building is recently constructed in near by locality having

buildup area 110 m^2 and the total
Cost of Constultion is 1200000

Sol

$$\frac{1200000}{110} = 10909.09$$

$$10909.09 \times 150 = 1636363.63$$

$$= 1700000$$

$$= 16,40,000 \text{ Rupees}$$

★ Approximate quantity method! —

i) In this method various quantity are work out with the help of many short cut.

→ In this method the structure is generally divided into two parts.

i) foundation

ii) Super structure

→ The running meter cost for foundation and super structure should be calculated first and then running meter rate should be multiply by total length of wall.

→ For this method plan of building must be available.

* Approximate estimate for road and highway

→ For preparation of approximate estimate of highway service unit is adopted.

→ Service unit adopted for new proposed highway is per kilometer or per mile.

→ The cost of road per kilometer depends upon the nature of road, width of road, thickness of mediating pavement surface, temporary and permanent acquisition, of length, topography and cross drainage work.

→ Done by knowing the cost of construction per kilometer length of similar road approximate estimate of proposed road can be repair.

Q. Prepare approximate estimate of a bridge having 4 span of 50m each. using following data.

- i) Cost of existing bridge 150000000.
- ii) existing bridge having 3.3 span of 60m.

given data:-

No. of Span₁ = 4

Each length = 50m

Cost = 150000000 Rupees

of existing bridge

existing bridge

No. of Span₂ = 3.3

Each length = 60m

Total length of

~~existing~~ bridge :-

$$60 \times 3.3 \quad 4 \times 50$$

with fixed 200m.

Total length of

existing

$$= 3.3 \times 60$$

$$= 198 \text{ m.}$$

Total cost of

existing bridge

$$= \frac{150000000}{198}$$

$$198$$

$$= 757575.75 \text{ Rupees}$$

Approximate cost of bridge

$$= 757575.75 \times 200$$

$$= 151515150 \text{ /— Rupees}$$

* A Residential building C+4 has been constructed in pune. and having plinth area of 1200 m^2 , height of building is 16.5 m above ground. The cost of construction of building is 60000000 .
Used method cube rate estimate
prepare an estimate of building 12 m height and area at plinth 2900 m^2 if it has 4 floor.

Solution

given data

Const. building Volume $= 1200 \times 16.5$
 $= 19800 \text{ m}^3$

Rate of Const. building $= \frac{60000000}{19800}$
in cubic

3030.30 Rupees

Volume of building = 2900×12
= 34800 m^3

Cost = 34800×3036.30

Ans = 106000000 / — Rs

* Prepare approximated estimate of town hall building having plinth area 1500 m^2 .

- i) Plinth area rate = $4000 / \text{m}^2$
- ii) water supply and Sanitary cost = 5% of cost of building.
- iii) Electric installation = 10% of cost of building.
- iv) other services = 5% of cost of building.
- v) Contingencies = 3% of overall cost of building.
- vi) Super vision charges = 2% of overall cost of building.

Solution given data -

Plinth area = 1500 m^2

Plinth area rate = $4000 / \text{m}^2$

water supply & Sanitary = 5% of cost of building

Electrification = 10% of cost of building

other services = 5%

Contingencies = 3% over all cost

Super vision = 2% over all cost

1. Cost of building

$$= \text{Plinth area} \times \text{Rate}$$

$$= 1500 \times 4000$$

$$= 6000000 \text{ Rupees}$$

Water Supply & Sanitary

$$= \text{Building Cost} \times \text{Rate}$$

$$= 6000000 \times 5\%$$

$$= 300000 \text{ Rupees}$$

Electrification = Building Cost $\times$ Rate

$$= 6000000 \times 10\%$$

$$= 600000 \text{ Rupees}$$

Other Services = Building Cost $\times$ Rate

$$= 6000000 \times 5\%$$

$$= 300000 \text{ Rupees}$$

Total building Cost = 7200000 Rupees

Contingency Cost

$$= \text{Total building cost} \times \text{Rate}$$

$$= 7200000 \times 3\%$$

$$= 216000 \text{ Rupees}$$

Supervision Cost

$$= \text{Total building cost} \times \text{Rate}$$

$$= 7200000 \times 8\%$$

$$= 576000 \text{ Rupees}$$

Overall Cost = ₹ 53,20,000 Rupees.

Ques Prepare preliminary estimate of a building project with a total plinth area of building 1400 m^2

- i) Plinth area rate = $3800/\text{m}^2$
- ii) Special architectural treatment = 1.5% of building cost
- iii) water supply and Sanitary = 5% of building cost
- iv) Internal electrification = 14% of Building
- v) other services = 6% of Building
- vi) Contingencies = 3%
- vii) Supervision = 8%

Soln given data:

Plinth area = 1400 m^2

Plinth area rate = $3800/\text{m}^2$

architecture treatment = 1.5% of building cost

water & Sanitary = 5% of building cost

Internal service = 14% of building cost

Contingencies = 3%

Supervision = 8%

Other services = 6%

Building Cost = 1400×3800

= ₹ 53,20,000 Rupees

Other Servicing = 319200 Rupees

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Architecture & Treatment

= Building cost x Rate

= 53,20,000 x 1.5%

= 79800 Rupees

Water & Sanitary

= Building cost x Rate

= 5320000 x 5%

= 266000 Rupees

Internal Services

= Building cost x Rate

= 5320000 x 14%

= 744800 Rupees

Total building cost = 6410600 Rupees

Contingencies

Total building cost x Rate

= 6410600 x 3%

= 192318 Rupees

Super & Boring

Total building cost x Rate

= 6410600 x 8%

= 512848 Rupees

Total Cost of building . 747000

*** Purpose of Estimation :-

- Estimation give an idea about the material required for the work.
- Estimation give an idea about the time required for the completion of work.
- Estimation give an idea about money required for the work.
- Estimation gives an idea about the time of completion of project.
- Estimation is required for inviting the tenders.
- It is required to arrange fund required for the project.
- It is required to find
- To understand the number of skill & unskill labour required to completion of work.
- For technical section of the project

UNIT - 02

TAKING OUT QUANTITIES

Date _____
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★ Data Required for detailed Estimation.

- i) Drawing
- ii) Specification
- iii) Rate book
- iv) mode of measurement

★ Factors to be Considered during preparation of detailed estimate.

- i) Nature of work.
- ii) Quantity & availability of material.
- iii) Transportation of material.
- iv) Location of site.
- v) Local labour charges.

★ Procedure of preparing detailed estimate.

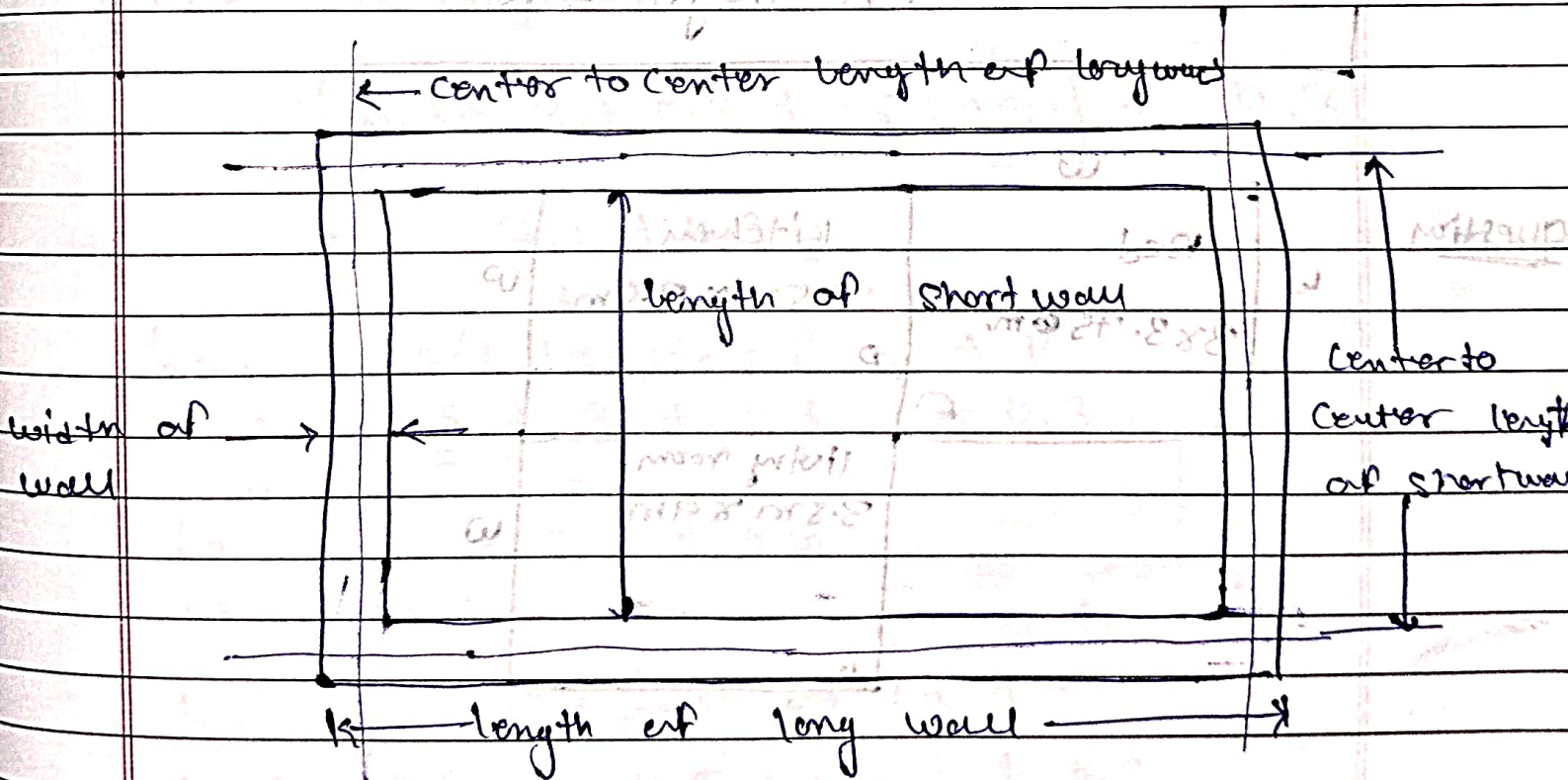
- Divide the whole project in various items.
- Divide the various items and group them under different sub-head.
- Taking out quantities → enter the details of measurement each item of work in measurement sheet and calculate the total quantity of each. If any correction is done it must be cross check.
- Abstracting → This the last step in preparing detailed estimate the cost of item

at work multiply with quantities

if a wall is 10' long & 4' high then the area is 40 sq ft

★ Long Wall & Short Wall method
(out to out & in to in method)

- First prepare the foundation plan showing center line.
- Determine center to center length of wall from plan.
- Considered long wall which is measure outer to outer and short wall which is measure inner to inner.



$$\text{length of long wall} = \frac{C}{\text{length of long wall}} + \frac{B}{2} + \frac{B}{2}$$

$$= \frac{C}{\text{length of long wall}} + B$$

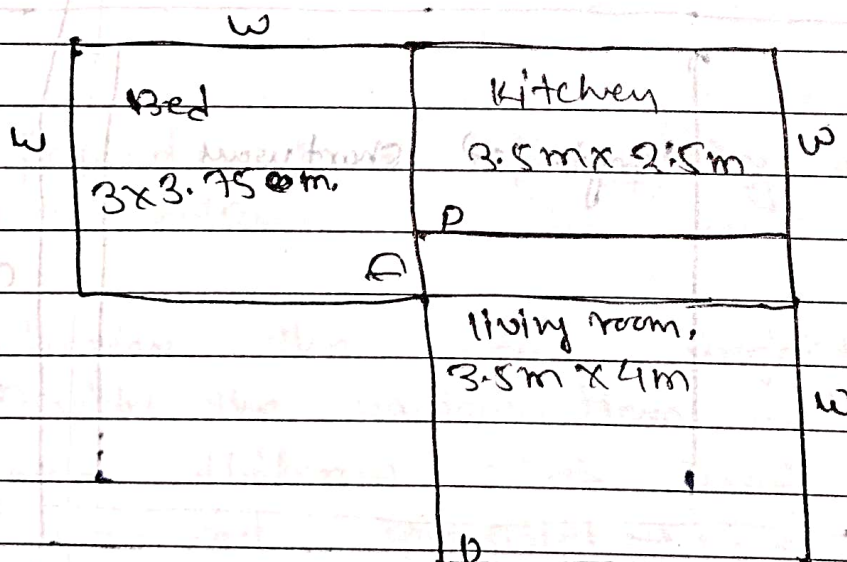
$$\text{length of short wall} =$$

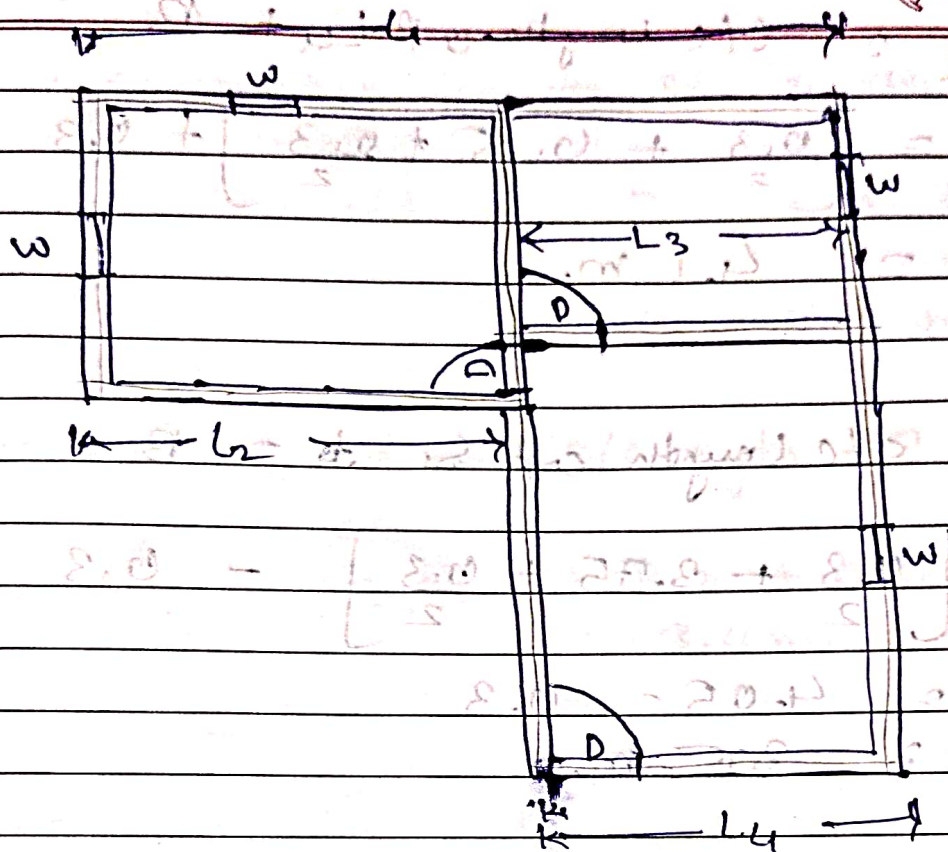
$$\text{Center to center length of short wall} = \frac{B}{2} - \frac{B}{2}$$

or

$$= C - B$$

Question





$$L_1 = \text{c/c length of } L_1 + B$$

$$= \left[\frac{0.3 + 3 + 0.3 + 3.5 + 0.3}{2} \right] + 0.3$$

$$= \frac{7.1 + 0.3}{2}$$

$$= 3.7 \text{ m.}$$

$$L_2 = \text{c/c length of } L_2 + B$$

$$L_2 = \frac{0.3 + 3 + 0.3}{2} + 0.3$$

$$L_2 = \frac{3.3 + 0.3}{2}$$

$$L_2 = 1.8 \text{ m.}$$

$$L_3 = \text{c/c length of } L_3 + B$$

$$L_3 = \left[\frac{0.3 + 3.5 + 0.3}{2} \right] + 0.3$$

$$= \frac{3.6 + 0.3}{2}$$

$$= 1.95 \text{ m.}$$

~~Ch 2: The height of Cat B~~

$$L_4 = \left[\frac{0.3}{2} + 0.35 + \frac{0.3}{2} \right] + 0.3$$

$$= 4.1 \text{ m.}$$

$S_1 = \text{c/c length of } S_1 \text{ to } B$

$$\left[\frac{0.3}{2} + 3.75 + \frac{0.3}{2} \right] - 0.3$$

c. 4.05 - 0.3

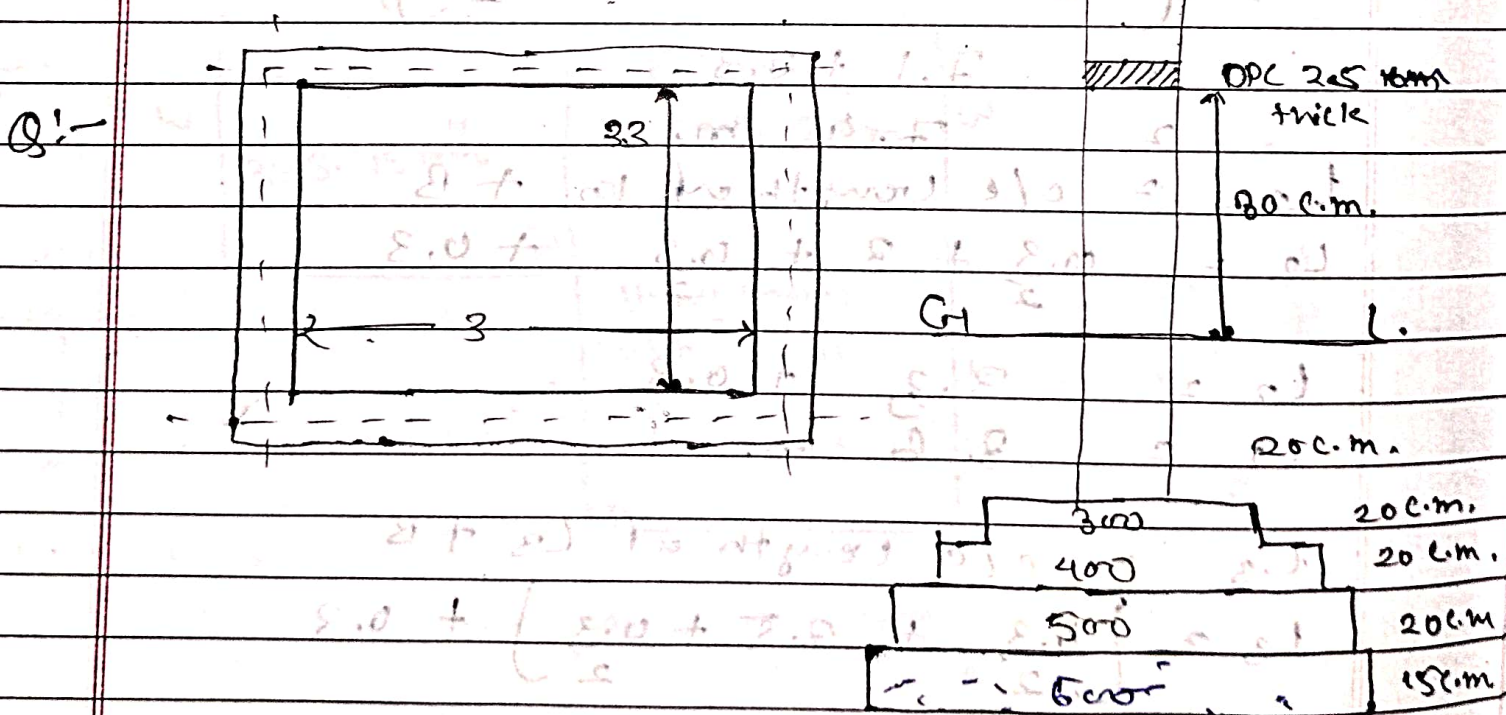
∴ 3.75 m

$$S_2 = 2.5 \text{ m.}$$

S3 = 2.5 m. at center of column 1/2 = 1.1

Su = 4 m.

$$S_6 = 4m \cdot 2.75 = 11m$$



$$\begin{aligned} \text{C/C length of long wall} &= \text{e/e length} + \frac{B}{2} + \frac{B}{2} \\ &= 3 + \frac{0.2}{2} + \frac{0.2}{2} \\ &= 3.2 \text{ m.} \end{aligned}$$

$$\text{length of long wall} = \text{C/C length} + B$$

$$\begin{aligned} &= 3.2 + 0.2 \\ &= 3.4 \text{ m.} \end{aligned}$$

$$\text{C/C length of short wall} =$$

$$\begin{aligned} &= \text{length of wall} + \frac{B}{2} + \frac{B}{2} \\ &= 3.3 + \frac{0.2}{2} + \frac{0.2}{2} \end{aligned}$$

$$= 3.5 \text{ m.}$$

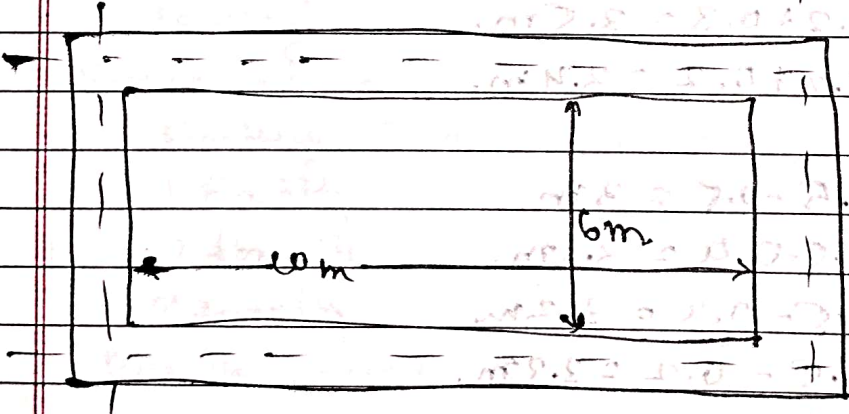
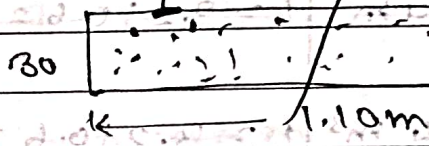
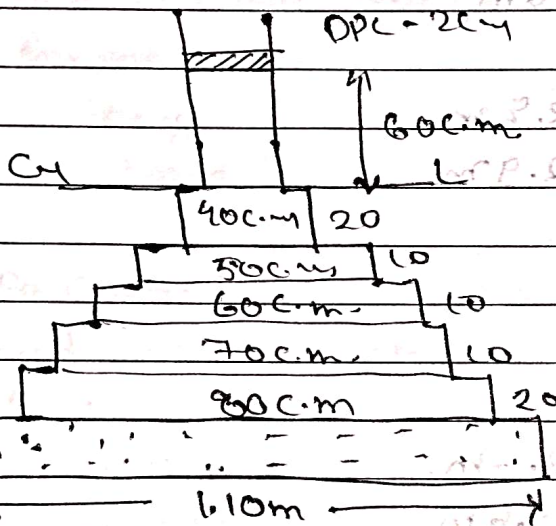
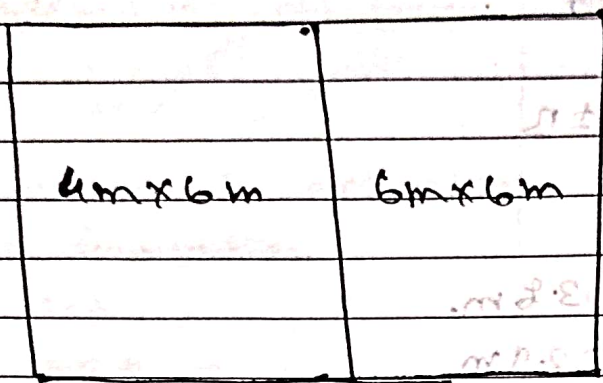
$$\text{length of short wall} = \text{C/C length of wall} - B$$

$$= 3.5 - 0.2$$

$$= 3.3 \text{ m.}$$

No. of Item	Description of item	Alt.	Length	Breadth	Height	Quantity	Remarks
1.	Earthwork in excavation in foundation						$L = 4 \times \text{width} \pm 1$
	Long	2	3.8 m	0.6 m	0.95 m	4.322 m ³	$L = 3.2 + 0.6 = 3.8 \text{ m}$
	Short	2	2.9 m	0.6 m	0.95 m	3.806 m ³	$L = 3.5 - 0.6 = 2.9 \text{ m}$
					Total	4.628 m ³	
2.	Base Concrete work in foundation	2	3.8 m	0.6 m	0.15	0.684 m ³	$L = 3.2 + 0.6 = 3.8 \text{ m}$
	Long	2	3.8 m	0.6 m	0.15 m	0.584 m ³	$L = 3.2 + 0.6 = 3.8 \text{ m}$
	Short	2	2.9 m	0.6 m	0.15 m	0.522 m ³	$L = 3.5 - 0.6 = 2.9 \text{ m}$
					Total	1.206 m ³	
3.	Brickwork in foundation and plinth level						
	Long						
	1 Footing	2	3.7 m	0.5 m	0.2 m	0.74 m ³	$L = 3.2 + 0.5 = 3.7 \text{ m}$
	2 Footing	2	3.6 m	0.4 m	0.2 m	0.576 m ³	$L = 3.2 + 0.4 = 3.6 \text{ m}$
	3 Footing	2	3.5 m	0.3 m	0.2 m	0.420 m ³	$L = 3.2 + 0.3 = 3.5 \text{ m}$
	Short Plinth level	2	3.4 m	0.2 m	0.5 m	0.680 m ³	$L = 3.2 + 0.2 = 3.4 \text{ m}$
	1 Footing Short	2					
	1 Footing	2	3 m	0.5 m	0.2 m	0.6 m ³	$L = 3.5 - 0.5 = 3 \text{ m}$
	2 Footing	2	3.1 m	0.4 m	0.2 m	0.496 m ³	$L = 3.5 - 0.4 = 3.1 \text{ m}$
	3 Footing	2	3.2 m	0.3 m	0.2 m	0.384 m ³	$L = 3.5 - 0.3 = 3.2 \text{ m}$
	Plinth level	2	3.3 m	0.2 m	0.5 m	0.66 m ³	$L = 3.5 - 0.2 = 3.3 \text{ m}$
					Total =	4.556 m ³	
4.	D.P.C						
	Long	2	3.4 m	0.2 m	-	1.36 m ²	$L = 3.2 + 0.2 = 3.4 \text{ m}$
	Short	2	3.3 m	0.2 m	-	1.32 m ²	$L = 3.5 - 0.2 = 3.3 \text{ m}$
						2.68 m ²	

question



S.S c/c length of long wall = length + $\frac{B}{2}$ + $\frac{B}{2}$

$= 12 + \frac{0.3}{2} + \frac{0.3}{2}$

$= 12.3 \text{ m}$

Length of long wall = c/c length + B

$= 12.3 + 0.3$

$= 12.6 \text{ m}$

c/c length of short wall =

$\frac{\text{c/c length} + \frac{B}{2} + \frac{B}{2}}$

$= 6 + \frac{0.3}{2} + \frac{0.3}{2}$

$= 6.3 \text{ m}$

Length of short wall = c/c length + B

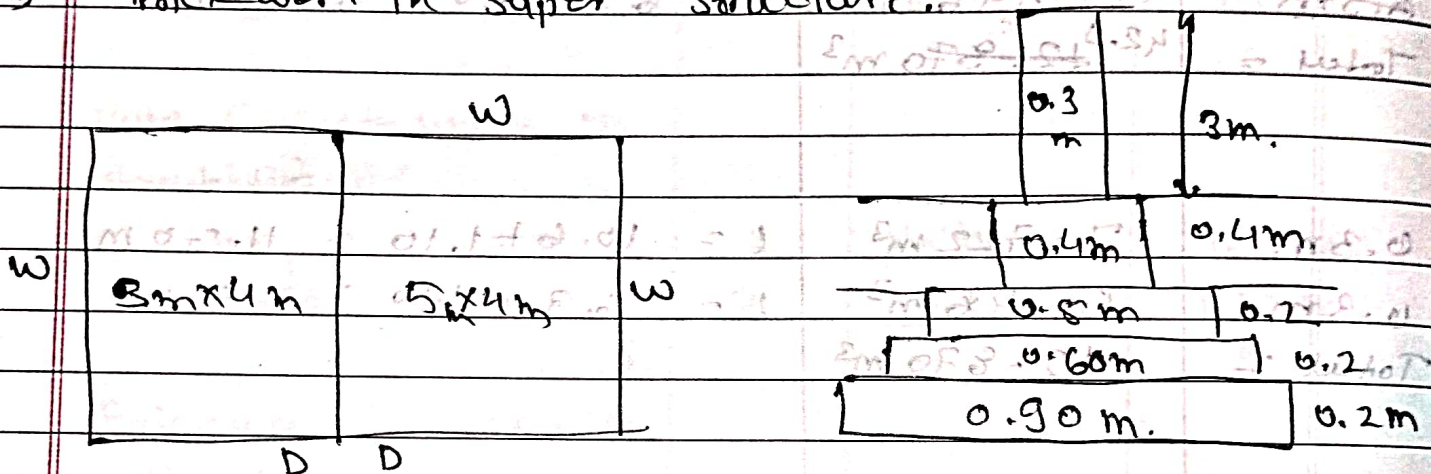
$= 6.3 + 0.3$

$= 6.6 \text{ m}$

No. of Item	Description of Item	Unit	Length	Breadth	Height	Quantity	Remarks
1.	Earthwork in excavation in foundation	m ³	11.70 m.	1.10 m.	0.2 m	25.44 m ³	L = 10.6 + 1.10 = 11.70 m
	long		11.70 m.			25.44 m ³	
	short		6.2 m.	1.10 m.	0.2 m	13.16 m ³	L = 6.3 - 0.10 = 6.2 m
	Total					42.90 m ³	
2.	Base Concrete work in foundation	m ³	11.70 m.	1.10 m.	0.3 m	42.90 m ³	L = 10.6 + 1.10 = 11.70 m
	long		11.70 m.			42.90 m ³	
	short		6.2 m.	1.10 m.	0.3 m	13.16 m ³	L = 6.3 - 0.10 = 6.2 m
	Total					56.06 m ³	
3.	Brickwork in foundation and plinth level	m ³	11.4 m.	0.8 m.	0.2 m	18.11 m ³	L = 10.6 + 0.8 = 11.4 m
	long		11.4 m.			18.11 m ³	
	1 footing		11.4 m.	0.8 m.	0.2 m	18.11 m ³	
	2 footing		11.3 m.	0.7 m.	0.1 m	1.562 m ³	L = 10.6 + 0.7 = 11.3 m
	3 footing		11.2 m.	0.6 m.	0.1 m	1.344 m ³	L = 10.6 + 0.6 = 11.2 m
	4 footing		11.1 m.	0.5 m.	0.1 m	1.11 m ³	L = 10.6 + 0.5 = 11.1 m
	Plinth level		11.0 m.	0.4 m.	0.2 m	7.04 m ³	L = 10.6 + 0.4 = 11.0 m
	1 footing short		5.5 m.	0.8 m.	0.2 m	2.64 m ³	L = 6.3 - 0.8 = 5.5 m
	2 footing 1 footing		5.6 m.	0.7 m.	0.1 m	1.176 m ³	L = 6.3 - 0.7 = 5.6 m
	3 footing		5.7 m.	0.6 m.	0.1 m	1.026 m ³	L = 6.3 - 0.6 = 5.7 m
	4 footing		5.8 m.	0.5 m.	0.1 m	0.890 m ³	L = 6.3 - 0.5 = 5.8 m
	Plinth		6.9 m.	0.4 m.	0.2 m	5.664 m ³	L = 6.3 - 0.4 = 5.9 m
	Total					26.136 m ³	
4.	D.P.C.	m ²	11 m.	0.4 m.		4.64 m ²	L = 10.6 + 0.4 = 11 m
	long		11 m.			4.64 m ²	
	short		5.9 m.	0.4 m.		7.06 m ²	L = 6.3 - 0.4 = 5.9 m
	Total					11.70 m ²	

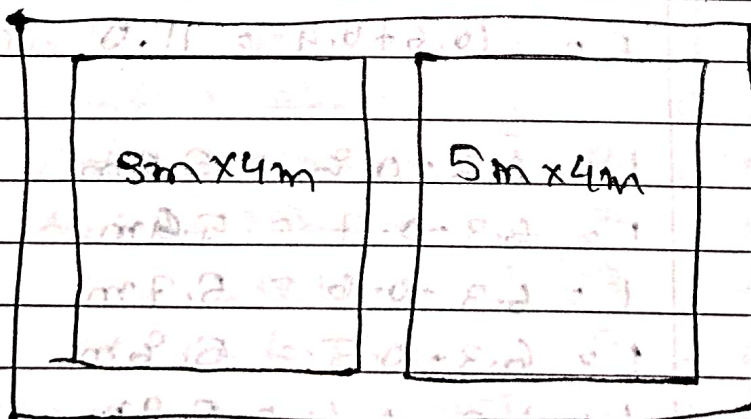
Questn Estimate the quantity

- (1) Earthwork in excavations in foundations
- (ii) Cement concrete in foundations
- (iii) Brickwork in foundations and plinth
- (iv) Brickwork in Super structure.



$$b = 1.10 \times 2.10$$

$$w = 1.20 \times 1.40$$



c/c length of long wall =

$$\text{inner length} + \frac{B_1}{2} + \frac{B_2}{2}$$

$$= \frac{0.3}{2} + 3.4 + \frac{0.3}{2} + 5.4 + \frac{0.3}{2}$$

$$= 9.6 \text{ m.}$$

c/c length short wall =

$$\text{inner wall} + \frac{B_1}{2} + \frac{B_2}{2}$$

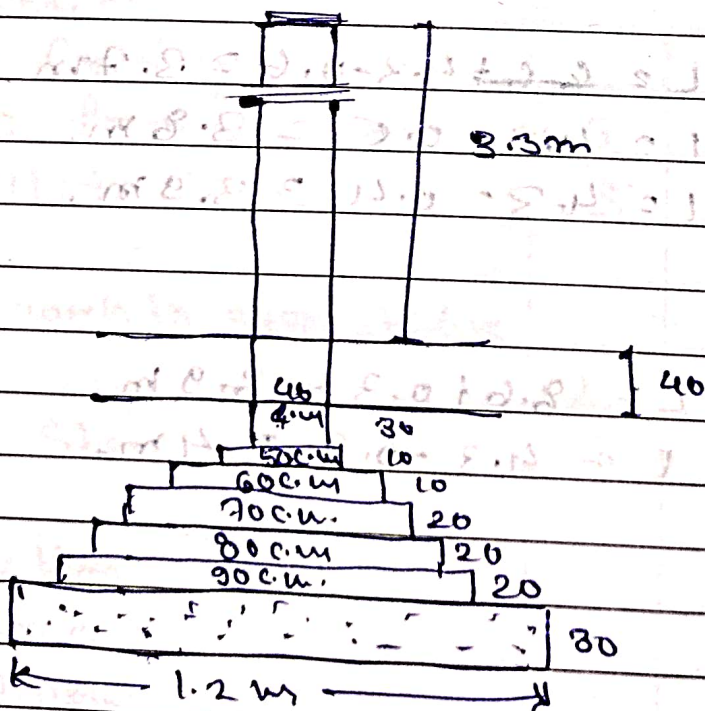
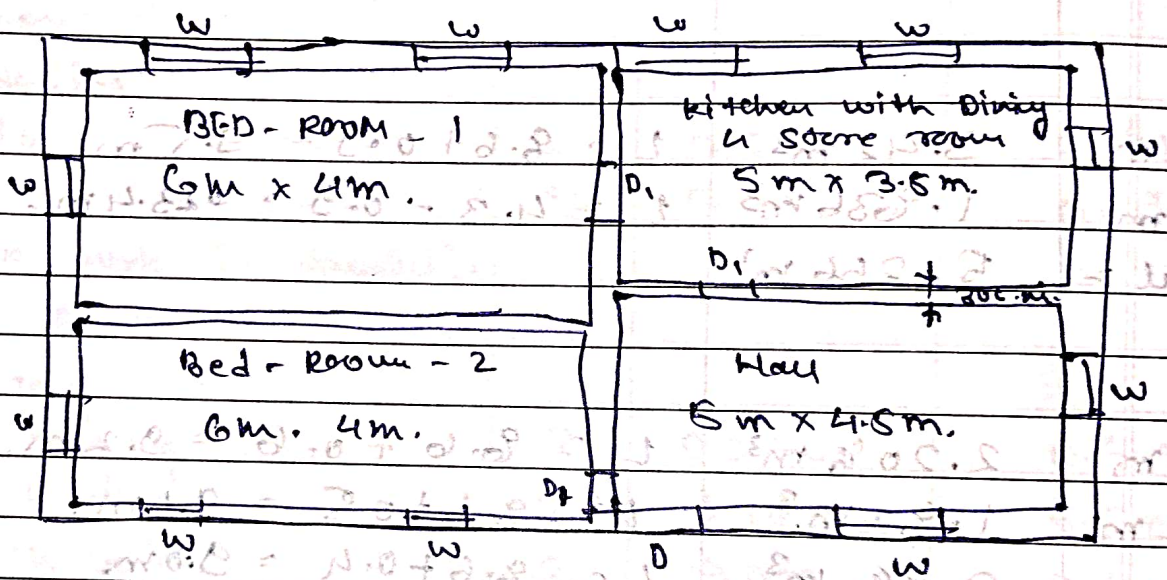
$$= \frac{0.3}{2} + 4 + \frac{0.3}{2}$$

$$= 4.3 \text{ m.}$$

No. of Item	Description of Item	No.	Length	Breadth	Height	Quantity	Remark
1.	Earthwork in excavation in foundation	2	9.5m	6.9m	0.6m	10.26 m ³	$L = 8.6 + 0.9 = 9.5m$
	long	3	3.4m	6.8m	0.6m	5.500 m ³	$L = 4.3 - 0.9 = 3.4m$
	short				Total =	15.76 m ³	
2.	Cement Concrete in foundation	2	9.5m	0.9m	0.2m	3.42 m ³	$L = 8.6 + 0.9 = 9.5m$
	long	3	3.4m	0.9m	0.2m	1.836 m ³	$L = 4.3 - 0.9 = 3.4m$
	short				Total =	5.256 m ³	
3.	Brick work in foundation and plinth level	2	9.2m	0.6m	0.2m	2.208 m ³	$L = 8.6 + 0.6 = 9.2m$
	long	2	9.1m	0.8m	0.2m	1.82 m ³	$L = 8.6 + 0.5 = 9.1m$
	1 footing	2	9.0m	0.4m	0.4m	2.88 m ³	$L = 8.6 + 0.4 = 9.0m$
	2 footing				Total =	11.252 m ³	
4.	Plinth level	3	3.9m	0.6m	0.2m	1.332 m ³	$L = 4.3 - 0.6 = 3.7m$
	short	3	3.8m	0.8m	0.2m	1.14 m ³	$L = 4.3 - 0.5 = 3.8m$
	1 footing	3	3.9m	0.4m	0.4m	1.872 m ³	$L = 4.3 - 0.4 = 3.9m$
	2 footing				Total =	16.02 m ³	$L = 8.6 + 0.3 = 8.9m$
	Brickwork in super structure	2	8.9m	0.3	0.3	10.8 m ³	$L = 4.3 - 0.3 = 4m$
	long	3	4m	0.3	0.3	26.82 m ³	
	short				Total =	2.896 m ³	
	deduction	2	1.10m	0.3m	0.3m	3.40 m ³	
	door	3	1.20m	0.3m	0.3m	1.40 m ³	
	window				Total =	2.896 m ³	
					Grand total	26.82 + 2.896	

Question

- Earthwork in excavation in foundation
- line covered in foundations
- brick masonry in sub & super structure
- 2.5 c.m. thick DPC in C.C. [1:1:5/2]
- Abstract of work



center to center length of long wall is 20m

$$= \frac{0.3}{2} + 6 + 0.3 + 5 + \frac{0.3}{2}$$

$$= 11.6 \text{ m} \times 3$$

$$= 34.8$$

clc length of short wall

$$\frac{0.3}{2} + 4 + \frac{0.3}{2} + 0.3 + 4$$

$$= 9.6 \text{ m} \times 3$$

$$= 28.8 \text{ m}$$

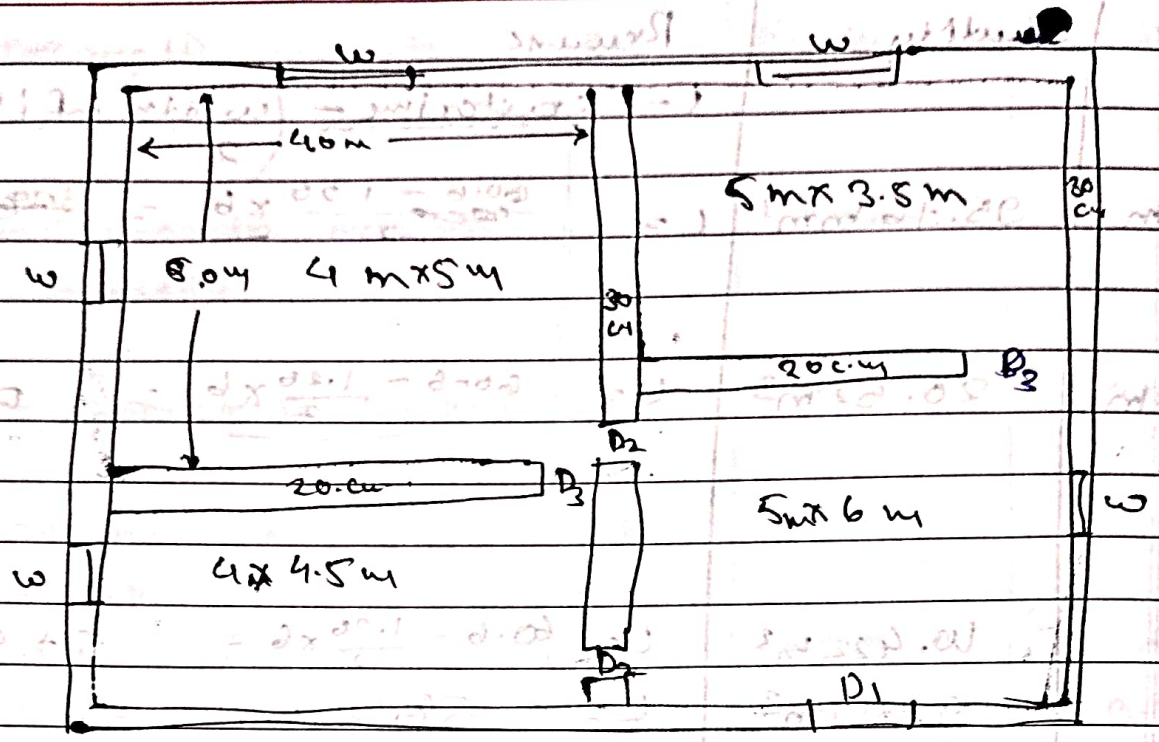
length

Total center to center length of structure.
= 60.6 m.

Number of T junction = 6

No of item	Description of item	No	Length	Breadth	Height	Quantity	Remarks
1.	Centerwork in excavation in foundation	1	54m	1.20 m	1.40 m	95.76 m ³	$(1 = 1 \text{ Centerline} - \text{width of item} \times \text{Length})$ $60.6 - 1.20 \times 6 = 54 \text{ m}$
2.	line concrete in foundation	1	54m	1.20 m.	0.3m	20.52 m ³	$60.6 - \frac{1.20 \times 6}{2} = 54 \text{ m}$
3	Brick masonry in Sub structure	6					
	footing 1.	1	53.9m	0.9 m.	0.2	10.422 m ³	$60.6 - \frac{1.20 \times 6}{2} = 54.9 \text{ m}$
	2nd	2	56.2m	0.8m.	0.2	9.812 m ³	56.2 m
	3rd	1	58.8m	0.4m	0.2	8.19 m ³	56.5 m
	4th	1	58.8m	0.6 m	0.1m	3.528 m ³	58.6 m
	5th	1	59.1m.	0.8 m	0.1m	2.955 m ³	59.1 m
	Plinth level	1	59.4m.	0.4m.	0.1m	16.632 m ³	59.4 m
4.	Brick masonry in Super structure	1	59.7m	0.3 m	3.3m	59.103 m ³	59.7 m
5.	deduction	1	1.5	0.8	2.1m	0.945 m ³	
	door	3	1.2	0.3	2.1m.	2.268 m ³	
	windows	11	1	0.5	1.2 m	3.96 m ³	
6	DPC				deduction	7.1873 m ³	
6	DPC	1	59.4m	0.4	-	61.03 m ³	
						23.94 m ²	59.4 m

Question

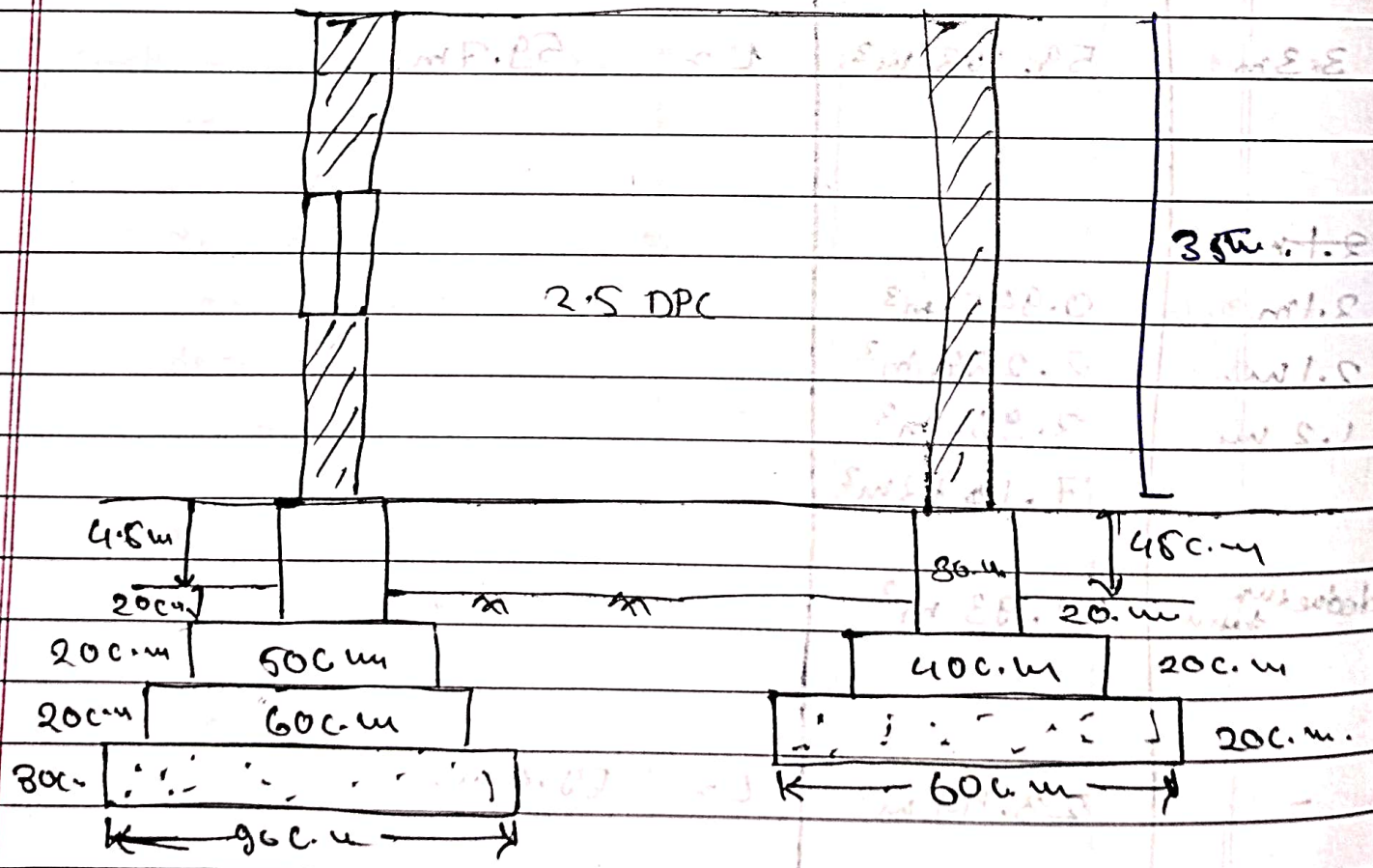


$$D_1 = 1.2 \times 2.1$$

$$D_2 = 1.0 \times 2.1$$

$$D_3 = 0.9 \times 2.1$$

$$w = 1.2 \times 1.2$$



300mm thick wall section

200mm thick wall section

CLC length of bay wall:

$$= \frac{0.3}{2} + 4 + 0.3 + 5 + 0.3$$

$$= 9.6 \text{ m}$$

$$= 9.6 \text{ m}$$

CLC length of short wall:

$$= \frac{0.3}{2} + 8.5 + 0.2 + 0.3$$

$$= 10 \text{ m}$$

$$= 30 \text{ m}$$

Total CLC length of structure = 56.6 m

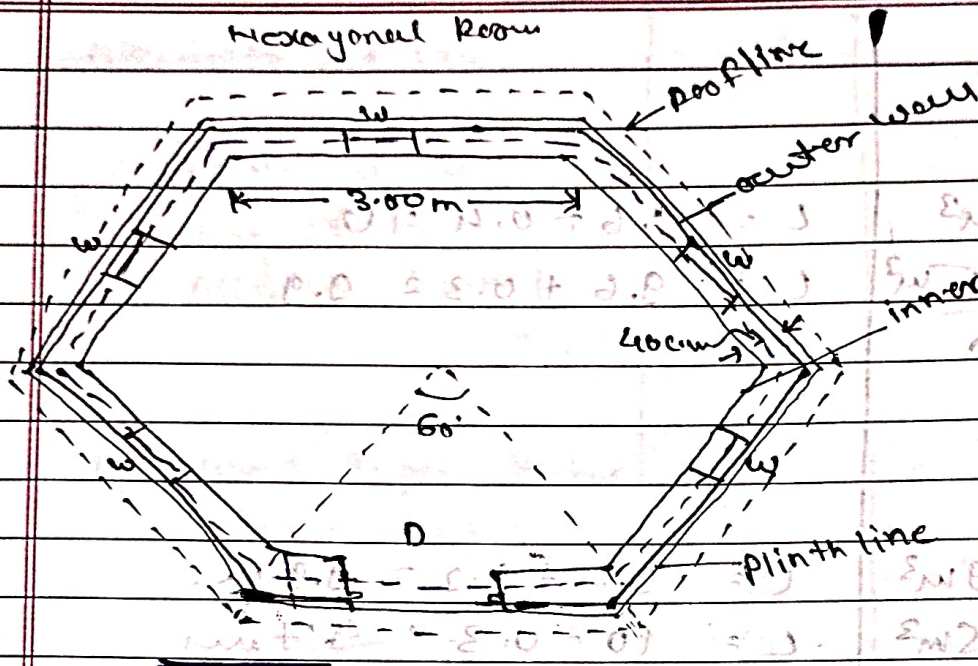
It is given that = 6

C.C length of wall (200 cm) = 9.6 m

$$= 9.6 \text{ m}$$

No of item	Description of item	No.	Length	Breadth	Height	Quantity	Remarks
1.	Length waste section in foundation						
a)	30 cm wall	2	10.5 m	0.9 m	0.9 m	17.01 m ³	$L = 9.6 + 0.9 = 10.5 \text{ m}$
	long wall						
	short wall	3	9.1 m	0.9 m	0.9 m	22.113 m ³	$L = 10 - 0.9 = 9.1 \text{ m}$
b)	20 cm wall	1	9.10 m	0.6	0.6	3.67 m ³	$L = 9.6 + 0.6 = 10.2 \text{ m}$
	long						
	short					42.793 m ³	
2)	Concrete in foundation						
	30 cm wall	2	10.5 m	0.9	0.3	5.67 m ³	$L = 9.6 + 0.9 = 10.5$
	long						
	short	3	9.1 m	0.9	0.3	7.391 m ³	$L = 10 - 0.9 = 9.1 \text{ m}$
	20 cm wall						
	long	1	10.2	0.6	0.2	12.24 m ³	$L = 9.6 + 0.6 = 10.2$
	short					15.765 m ³	
3)	Brick work sub structure						
	30 cm.						
	long wall	2					
	1 footing	2	10.2	0.6	0.2	2.448 m ³	$L = 9.6 + 0.6 = 10.2$
	2 feet	2	10.1 m	0.5	0.2	2.02 m ³	$L = 9.6 + 0.5 = 10.1$
	Plinth level	2	10	0.4	0.65	5.2 m ³	$L = 9.6 + 0.4 = 10$
	short						
	1 footing	3	9.4	0.6	0.2	3.456 m ³	$L = 10 - 0.6 = 9.4 \text{ m}$
	2 footing	3	9.5	0.5	0.2	2.85 m ³	$L = 10 - 0.5 = 9.5 \text{ m}$
	plinth level	3	9.6	0.4	0.65	7.488 m ³	$L = 10 - 0.4 = 9.6 \text{ m}$

Item	Description of the work	Quantity	Unit	Rate	Amount	Remarks
1	300mm wall	1	10	0.4	0.2	0.8 m ³
2	long partition	1	2.9	0.3	0.65	1.8305 m ³
3	plaster level	1	2.9	0.3	0.65	1.8305 m ³
4	Brickwork Super Structure	1	2.9	0.3	0.65	1.8305 m ³
5	300mm wall	2	2.9	0.3	0.65	1.8305 m ³
6	long	1	2.9	0.3	0.65	1.8305 m ³
7	deduction	1	2.9	0.3	0.65	1.8305 m ³
8	Door 1	1	2.9	0.3	0.65	1.8305 m ³
9	Door 2	2	2.9	0.3	0.65	1.8305 m ³
10	Door 3	2	2.9	0.3	0.65	1.8305 m ³
11	windows	5	2.9	0.3	0.65	1.8305 m ³
12	5'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
13	1'0" x 2'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
14	2'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
15	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
16	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
17	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
18	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
19	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
20	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
21	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
22	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
23	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
24	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
25	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
26	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
27	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
28	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
29	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
30	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
31	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
32	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
33	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
34	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
35	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
36	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
37	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
38	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
39	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
40	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
41	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
42	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
43	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
44	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
45	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
46	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
47	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
48	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
49	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
50	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
51	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
52	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
53	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
54	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
55	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
56	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
57	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
58	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
59	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
60	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
61	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
62	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
63	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
64	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
65	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
66	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
67	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
68	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
69	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
70	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
71	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
72	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
73	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
74	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
75	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
76	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
77	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
78	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
79	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
80	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
81	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
82	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
83	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
84	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
85	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
86	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
87	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
88	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
89	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
90	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
91	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
92	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
93	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
94	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
95	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
96	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
97	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
98	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
99	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³
100	3'0" x 3'0" x 3'0"	1	2.9	0.3	0.65	1.8305 m ³

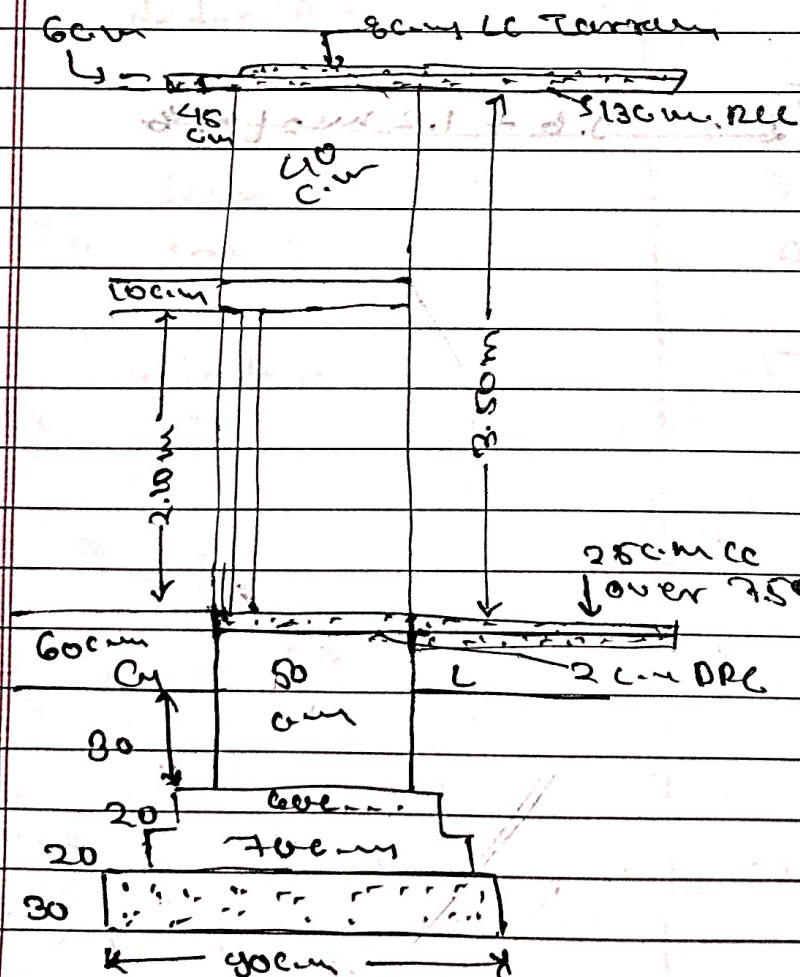


Plan

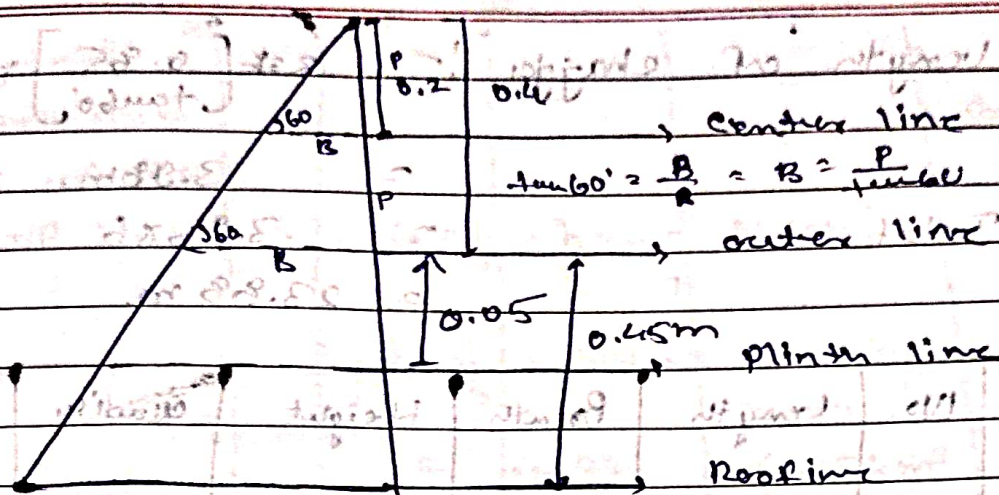
Schedule:-

D-120C.m. x 210C.m (1.20m x 2.10m)

w-110C.m x 150C.m (1.10 m x 1.50m)



$$\tan 60^\circ = \frac{P}{B} = B = \frac{P}{\tan 60^\circ}$$



i) length of center line of one side = $3 + \left[\frac{0.2}{\tan 60^\circ} \right] \times 2$
= 3.23 m.

Total length of center line = 3.23×6

= 19.38 m.

ii) length of outer wall = $3 + \left[\frac{0.4}{\tan 60^\circ} \right] \times 2$
= 3.46 m.

Total length of outer line = $3.46 \times 6 = 20.76$ m.

iii) length of plinth line (wall) = $3 + \left[\frac{0.45}{\tan 60^\circ} \right] \times 2$
= 3.51 m.

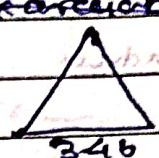
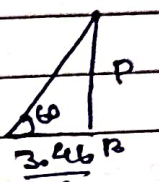
Total outer length of plinth wall = 3.51×6
= 21.06 m.

3.96m.

Total = 3.96 x 6

$$= 23.86 \text{ m}$$

No of item	Description of item	No.	Length	Breadth	Height	Quantity	Remarks
1.)	Earthwork in excavation in Foundation	1	19.38m	0.9	1	17.442 m ³	
2.	Concrete work in foundation	1	19.38	0.9	0.3	5.2326 m ³	
3)	Brick work in Sub Structure						(-)
	1) Plating	1	19.38	0.7	0.2	2.7132 m ³	
	2) Plating	1	19.38	0.6	0.2	2.3256 m ³	
	Plinth level	1	19.38	0.5	0.9	8.721 m ³	
						13.7598	(+)
	Brick work in Super Structure	1	19.38	0.4	3.80	27.132	
4)	Deduction						
	Door	1	1.2	0.4	2.1	1.008 m ³	
	Win door	5	1.1	0.4	1.5	3.3	
						4.308	
	Lintre over door	1	1.40	0.4	0.10	0.056	10 c.m Bear ing
	Lintre over window	5	1.80	0.4	0.10	0.26	10 c.m Bearing
	Total deduction					22.824 m ³	

a) RCC work					6 x area of one triangle of side of outer wall x thickness	
Complete with steel reinforcement					Area of triangle	
a) ROOF Slab	6	$6 \times \frac{1}{2} \times b \times h \times \text{thickness}$				
		$6 \times \frac{1}{2} \times 3.46 \times 2.94 \times 0.13$				
		= 4.034		Quantity	4.034 m³	
b) Chajja					Per meter length x Breadth x Thickness	
	6	$6 \times 3.98 \times 0.45 \times 0.6$			0.602	
		$6 \times 3.46 + 3.98 \times 0.45 \times 0.6$			0.056	
					0.26	
					0.316	
c) Liner	Same as above				4.952 m³	
d) 8 cm lime concrete in roof top slabs	6	$\frac{1}{2} \times 3.46 \times 3.46 \times 1.732$			31.10 m³	
e) 2.4 cm. ci over and including 7.5 cm lime concrete	6	$\frac{1}{2} \times 3 \times \frac{3}{2} \times 1.732$			23.382 m³	
f) 12 mm cement plastering 1:6 in walls	6	3		3.5	63 m²	
g) Inside						
h) outside above plinth	6	3.46		3.5	72.66 m²	
i) outside plinth wall	6	3.51		3.5	14.44 m²	

each 10 cm Benty

Deduction

Door

Window

5

1.2

1.50

2.1

1.5

Deduction

Net total

150.4

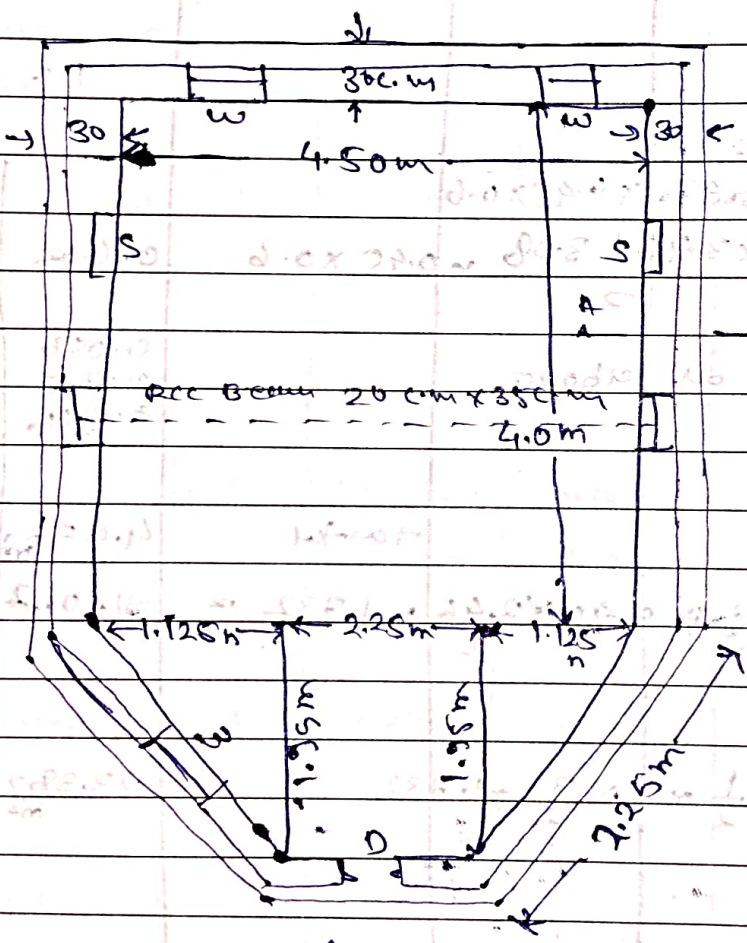
2.52 m²

8.25 m²

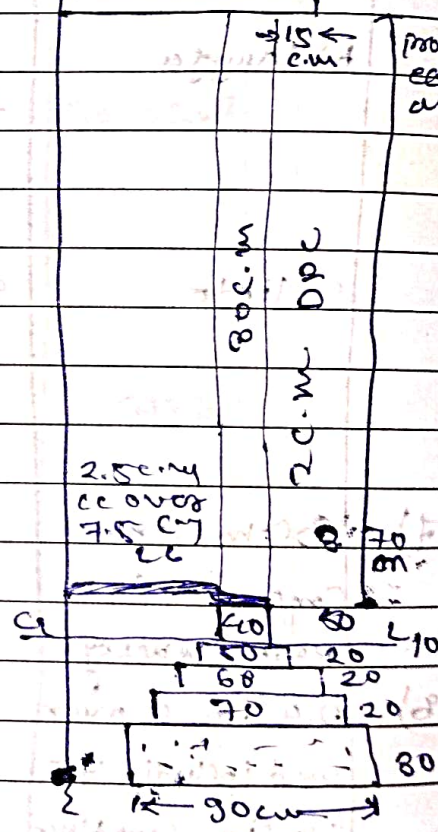
10.77 m²

139.67 m²

gypsum



7.5 cm
12 cm Rec



Section of AA

D - 120 cm x 220 cm

W - 100 cm x 180 cm

S - 100 cm x 180 cm

- 1) Earthwork in foundation
- 2) Concrete in foundation
- 3) Brickwork sub structure
- 4) 2 c.m. DPC at plinth level
- 5) Brickwork in Super structure
- 6) 2.5 c.m. c.c over 7.5 cm L.C floor

Solution

c/c length of Horizontal wall =

$$= 4.50 + 0.15 + 0.15$$

$$= 4.80 \text{ m}$$

c/c length of vertical wall =

$$= 4 + 0.15 + 0.15$$

$$= 4.30 \text{ m}$$

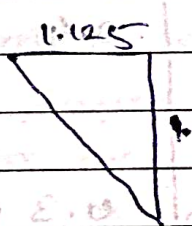
c/c length of inclined wall =

$$= \sqrt{(1.125 + 0.15)^2 + (1.125 + 0.15)^2}$$

$$= 2.456 \text{ m} \times 2$$

$$= 4.91 \text{ m}$$

$H = \sqrt{P^2 + B^2}$



Total length of center line =

$$4.80 + 4.30 \times 2$$

$$4.91 + 2.25$$

$$= 20.26 \text{ m}$$

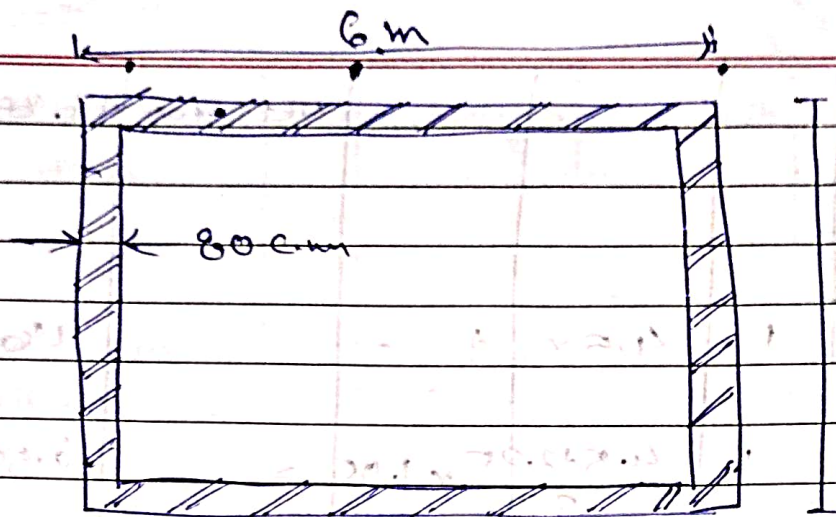
No. of item	Description	No.	Length	Breadth	Height	Quantity	Unit
i)	Earthwork in foundation	1	20.26m	0.9m	0.9m	18.240m ³	
ii)	Concrete in foundation	1	20.26m	0.9m	0.3m	5.470m ³	
iii)	Brickwork in sub structure						
	1 footing	1	20.26 m	0.7 m	0.2 m	2.836m ³	
	2 footing	1	20.26m	0.6 m	0.2 m	2.431 m ³	
	3 footing	1	20.26m	0.5 m	0.2 m	2.026 m ³	
	Plinth level	1	20.26m	0.4m	0.6 m	4.8624m ³	
						12.155m ³	
iv)	20mm DPC at plinth level	1	20.26m	0.4	—	8.104m ²	
	Deduct door	1	1.20	0.4	—	0.48m ²	
	Sill	—	—	—	deduction	7.62m ²	
v)	Brickwork in super structure	1	20.26 m	0.3 m	3.70m	22.488m ³	
	Deduction						
a)	door	1	1.20m	0.3m	2.20m	0.792m ³	
b)	windows	6	1	0.3 m	1.80m	2.7 m ³	
c)	skelp	2	1	0.20m	1.90m	0.76 m ³	
	linthe over door	1	1.44m	0.3	0.10	0.048 m ³	loc. w
	linthe over window	6	1.24m	0.3 m	0.10m	0.223 m ³	Rein
	linthe over skelp	2	1.24 m	0.30	0.10 m	0.074	
					Total deduction	4.59 m ³	

					Net total	17.89 m ³
6)	2.5 c.m. c.c over 7.5 c.m l.c. floor					
d)	Rec. portion	1	4.5 x 4 =			18.0 m ²
b)	Foot half hexagonal portion	1	$\frac{4.5 + 2.25}{2} \times 1.95 =$			6.56 m ²
	Door sill	1	1.20 x 0.35 =			0.42 m ²
						25 m ²

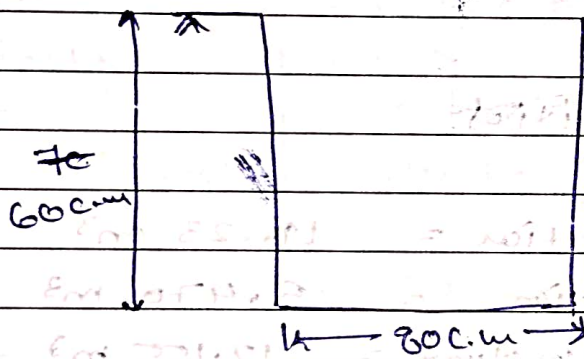
Abstracts of quantities

- i) Earthwork in foundation = 18.23 m³
- ii) Concrete in foundation = 5.470 m³
- iii) Brickwork in sub structure = 12.155 m³
- iv) 2 c.m. DPC at plint level = 7.62 m²
- v) Brickwork in super structure = 17.89 m³
- vi) 2.5 c.m. c.c over 7.5 c.m l.c. floor = 12.5 m²

★ Plan & Section of trench which is 80 cm wide and 60 cm deep is shown in figure. Calculate the volume of earthwork for the trench by long wall and short wall end center line.



center



i) long & short wall method.

$$\text{C.C length of long wall} = \frac{0.8}{2} + 6 + \frac{0.8}{2}$$

$$6 - 0.8 = 5.2 \text{ m}$$

$$5.2 \text{ m}$$

$$\text{C.C length of short wall} = \frac{0.8}{2} + 4 + \frac{0.8}{2}$$

$$4 - 0.4 = 3.6 \text{ m}$$

$$3.6 \text{ m} = 4.6 \text{ m}$$

No. of Items	Description	No.	Length	Breadth	Height	Area	Volume
1.	Excavation in trench						
	Long	2	7.6 m	0.6 m	0.6 m	2.286 m ²	L = 7.6
	Short	2	4 m	0.6 m	0.6 m	2.304 m ²	L = 4
			2.4 m				
					Total =	4.590 m ²	
						0.064	

ii) Center line method -

C.C. length of long wall = 16.8 m
 $2 \times 5.2 \text{ m} = 10.4$

C.C. length of short wall = 4.8 m
 $2 \times 3.2 \text{ m} = 6.4$

∴ Junction = 0

∴ Total C.C. length of wall = $16.8 + 10.4 + 6.4 = 33.6 \text{ m}$

No. of Items	Description	No.	Length	Breadth	Height	Area	Volume
	Excavation in trench	1	16.8 m	0.6	0.6	4.032 m ²	L = C.C. length - Breadth of trench
	Long					0.064 m ³	$\frac{4.032}{2} \times 7 = 14.112 \text{ m}^3$
	Short	1					

★ What are the unit of measurement for the following item.

- 1) Heavy Comb brick work = Sqm
(thickness Speelfide)
- 2) Rolling Shutter = Sqm
- 3) DPC = Sqm
- 4) Rain water pipe = meter
- 5) Boring holes in the iron = Number
- 6) Jaffor work = Sqm
- 7) Coping = meter
- 8) Collapsible Shutter = Sqm

UNIT - 04

SCHEDULE OF RATE AND ANALYSIS OF RATE

Date _____
Page _____

* Schedule of rate:-

- Schedule of rate or list of rate of different item is made after the analysis of rate of this item.
- This type of document is called schedule of rate [SOR].
- It is made by large concern or public bodies.
- A Schedule of rate of each kind of work is maintained by the various engineering department or authorised organization in the form of printed book called schedule of rate book.

* Properties of schedule of rate:-

- Schedule of rates includes the rate of wages of labor, rate per unit of different item of work and material and rate of transport and it consist of group of item like excavation item, demolishing item, brick work item, concrete item work item etc.
- In the schedule of rate required analysis of rate for the different condition should be provided.
- Generally transport of material up to distance of 5 km is added in the rates.

* Analysis of Rate:-

- The determination of rate per unit particular item of work from the cost of quantities of material, the cost of labor and other miscellaneous expenses required for its completion is known as rate of analysis.

★ Components of rate of analysis: —

- Cost of material.
- Cost of labour
- Transportation charge considered for more than 8 km.
- Tools and plants [Rs 2.5 - 3%] of the labour cost.
- Water charges 1.5 - 2% of the total cost
- Contractor's profit 10% of the overall cost.

M 5 - 1:1.5:10 | M 7.5 - 1:1.4:9

M 10 - 1:1.3:6

M 15 - 1:1.2:4

M 20 - 1:1.5:3

M 25 - 1:1.1:2

Volume of 1 bag Cement = 35 liters
 $= 1 \times 10^{-3} \text{ for meter}^3$

q Find the quantity of material required for a beam [R.C.C.] of 400 mm x 600 mm having length 5 m.

sol volume of beam

$$0.4 \times 0.6 \times 5$$

$$= 1.2 \text{ m}^3$$

Added 52% extra for wastage or shrinkage

$$1.6 + 1.6 \times 52\%$$

$$= 2.432 \text{ m}^3$$

for assumption $M = 20$ (1:1.5:3)

$$\# \text{ For Cement} = \frac{2.432}{1+1.5+3} \times 1 = 0.442 \text{ m}^3$$

$$\text{Number of bag of cement} = \frac{0.442}{0.035} \approx 12.6 \approx 13 \text{ bag}$$

$$\# \text{ For sand} = \frac{2.432}{1+1.5+3} \times 1.5 = 0.663 \text{ m}^3$$

$$\# \text{ For Aggregate} = \frac{2.432}{1+1.5+3} \times 3 = 1.326 \text{ m}^3$$

Reinforcement assume 3% of final volume

$$1.6 \times 3\% = 0.048 \text{ m}^3$$

Unit weight $\gamma_{\text{steel}} = 7850 \text{ KN/m}^3$
 $= 7850 \text{ in kg/m}^3$

$$\text{weight} = 7850 \times 0.048 = 376.8 \text{ kg/m}^3$$

$$\text{for changing kg in quintal} = \frac{376.8}{100} = 3.768 \text{ quintal}$$

Note! -

- i) Reinforcement for beam - 2 - 3%.
- ii) Reinforcement for Column - 5%.
- iii) Reinforcement for Slab - 1 - 2%.

* Analysis of rate of Concrete M-15 use
10 m³ for calculation purpose.

Solution

Volume - 10 m³
for Shrinkage & wastage 5%.

$$10 \times 5\% + 10$$

$$15.2 \text{ m}^3$$

M-15

for Cement

$$\frac{15.2 \times 1}{1+2+4} = 2.171 \text{ m}^3$$

$$\text{Number of bag of Cement} = \frac{2.171}{0.035} = 62.0$$

63 bags

for Sand

$$\frac{15.2 \times 2}{1+2+4} = 4.342 \text{ m}^3$$

for Aggregate

$$\frac{15.2 \times 4}{1+2+4} = 8.685 \text{ m}^3$$

	Material	Quantity (m ³)	Rate	Cost in Rs
1.	Cement	2.171 m ³	7655 / m ³	16608.15 Rs
2.	Sand	4.342 m ³	1500 / m ³	6513 Rs.
3	Aggregate	8.685 m ³	2200 / m ³	19107 Rs.
			Total	42228.15
	Labour	No.	Rate	Cost
1)	mistri (head mason)	3/4 1/3	350 / day	116.66 Rs
2+7)	Amason	2	300 / day	600 Rs
3	mazdoor	12	220 / day	2640 Rs
4	boig / woman Coolie	20	200 / day	4000 Rs
5	Bhishti	6	200 / day	1200 Rs
6	form work	lump sum	1000 / day	1000 Rs
7	Sundries	lump sum	500 / day	500 Rs
			Total	10056.66

Grand Total = 52284.81

i) Water charges:

$$52284.81 \times 1.5\%$$

$$= 784.27 \text{ Rs}$$

ii) Contractor profit

$$52284.81 \times 10\%$$

$$= 5228.48 \text{ Rs}$$

iii) Total

$$52284.81 + 784.27 + 5228.48$$

$$= 58297.57 \text{ Rs}$$

For per m^3

$$\frac{58297.57}{100}$$

$$= 582.9757/\text{m}^3$$

★

Analysis the rate for M-20 Cement Concrete m^3

assume suitable rates for material & labour.

$$V = 10 \text{ m}^3$$

$$\text{Volume} = 10 \text{ m}^3$$

Shrinkage & wastage added 52%

$$10 \times 52\% + 10$$

$$= 15.2 \text{ m}^3$$

M-20

for Cement = $\frac{15.2}{1+1.5+3} \times 1 = 2.763 \text{ m}^3$

No. of bag of cement = $\frac{2.763}{0.035} = 78.94$
= 79 bags

for Sand = $\frac{15.2}{1+1.5+3} \times 1.5 = 4.145 \text{ m}^3$

for aggregate = $\frac{15.2}{1+1.5+3} \times 3 = 8.290 \text{ m}^3$

Material	Quantity (m ³)	Rate	Cost
1. Cement	2.763 m ³	7650/m ³	21136.95 Rs
2. Sand	4.145 m ³	1500/m ³	6217.5 Rs
3. Aggregate	8.290 m ³	2200/m ³	18238 Rs
		Total	45592.95 Rs
→ → → → →			
Labour	(No. of men)	Rate	Cost
1. Mistril (head mason)	112	350/day	175 Rs
2. mason	2	300/day	600 Rs
3. mazzdoor	12	220/day	2640 Rs
4. bay hoomen coolie	20	200/day	4000 Rs
5. Bhiskti	6	200/day	1200 Rs
6. form work	lumpsum	1000/day	1000 Rs
7. sun dried	lumpsum	500/day	500 Rs
		Total =	10115 Rs
		Grand total =	55707.95 Rs

i) water charge

$$39677.74 \times 1.5\% = 595.16 \text{ Rs}$$

$$55707.45 \times 1.5\% = 835.61 \text{ Rs}$$

ii) Contractor profit

$$55707.45$$

$$39677.74 \times 10\% = 3967.77 \text{ Rs}$$

$$5570.74$$

iii) Total = $39677.74 + 595.16 + 3967.77$

$$= 44240.67 \text{ Rs}$$

for per m^3

$$\frac{44240}{10} = 4424 \text{ Rs}$$

★ Calculate quantity of required material for following proportion of cement concrete for $10 m^3$

i) M-20 Cement Concrete

ii) M-15 Cement Concrete

Qty Volume = $10 m^3$

Shrinkage or wastage factor 52% Added

$$10 \times 52\% = 5.2 m^3$$

M-20 1:1.5:3

For cement $\frac{15.2}{1+1.5+3} \times 1 = 2.763 \text{ m}^3$

No. of bag of cement = $\frac{2.763}{0.035} = 78.94$
79 bag

for sand $\frac{15.2}{1+1.5+3} \times 1.5 = 4.145 \text{ m}^3$

for aggregate = $\frac{15.2}{1+1.5+3} \times 3 = 8.290 \text{ m}^3$

For M-15 Concrete (1:2:4)

For cement = $\frac{15.2}{1+2+4} \times 1 = 2.171 \text{ m}^3$

No. of bag of cement $\frac{2.171}{0.035} = 62.02$
63 bag

for sand $\frac{15.2}{1+2+4} \times 2 = 4.342 \text{ m}^3$

for aggregate = $\frac{15.2}{1+2+4} \times 4 = 8.685 \text{ m}^3$

ques 1 12 mm thick plastering 1:3 cement and mortar surface need Cement finished unit 1 m^2 take 100 m^2 for calculation.

qun. 2.5 c.m. cement concrete floor 1:1.5:3 unit 1 m^2 take 100 m^2 for calculation.

★ Plastering

- 1) For 12 mm thick plaster cement = 2
Proportion of mortar
- 2) For 20 mm thick plastering cement = 3
Proportion of mortar
- 3) For 12 mm thick ceiling plastering = 1:8
Proportion of mortar
- 4) For 6 mm thick plastering R.C.C. ceiling = 1
Proportion of mortar

$$\left[\frac{0.2 \text{ m}^3}{6 \text{ bag}} \right]$$

→ quantity of cement = $\frac{2}{1+3} \times 1 = 0.5 \text{ m}^3$

No. of bag = $\frac{0.5}{0.035} = 14.28$

quantity of sand = $\frac{2}{1+3} \times 3 = 1.5 \text{ m}^3$

cement for
finishing 6 bag

Sl. No.	Material	Quantity (m ³)	Rate	Cost
1.	Cement	0.5 m ³	7650/m ³	3825 Rs
2.	Sand	1.5 m ³	1500/m ³	2250 Rs
				6075 Rs
	labours	No.	Rate	Cost
1.	mishti (head mason)	1/3	350	116.66 Rs
2.	mason	12	300	3600 Rs
3.	mazdoor	4-15	220	3300 Rs
4.	bag / women codi			
5.	ghishti	1	200	200 Rs
6.	form work			
7.	Sundries + scaffolding	lump sum	200	200
				7416.66 Rs
				grand total = 13491.66 Rs

i) water charge -

$$13491.66 \times 1.5\%$$

$$= 202.37 \text{ Rs}$$

ii) Contractor -

$$13491.66 \times 10\%$$

$$1349.16 \text{ Rs}$$

iii)

total =

$$13491.66 + 202.37 + 1349.16$$

$$= 15043.19 \text{ Rs}$$

For 1 m³

$$\frac{15043.19}{100}$$

$$150.43 \text{ Rs}$$

★ Cement Concrete floor:-

1. for 2.5 c.m thick Cement Concrete floor
of 1:2:4 proportion of cement = 4.125

2) For 2 c.m. thick Cement Concrete floor of
1:1.5:3 proportion of cement = 4.125

proportion of
Cement

③ For 40 m. thick cement concrete floor
of 1:2:4 proportion of cement = 6.6
proportion of
concrete

④ for neat cement flooring = 0.12 m^2
(6 bay)

quantity of cement = $\frac{4.125}{1+1.5+3} \times 1 = 0.91 \text{ m}^3$

No. of bay = $\frac{0.91}{0.035} = 26 \text{ bay}$

quantity of sand = $\frac{4.125}{1+1.5+3} \times 1.5 = 1.125 \text{ m}^3$

quantity for aggregate = $\frac{4.125}{1+1.5+3} \times 3 = 2.25 \text{ m}^3$

Cement for finishing 6 bay

No.	materials	quantity (m^3)	rate	cost
1.	Cement	0.91 m^3	7650 / m^3	6961.5 Rs
2.	sand	1.125 m^3	1500 / m^3	1687.5 Rs
3.	aggregate	2.25 m^3	2200 / m^3	4950 Rs
			total =	13599 Rs

No.	Labour	Qo.	Rate	Cost (Rs)
1.	mistri	113	350	116.66 Rs
2.	maiden	10	300	3000 Rs
3.	marbhar	5	220	1100 Rs
4.	big (waste) work	5	200	1000 Rs
5.	blisht	2	200	1000 Rs
6.	sandite	lumpsum	200 90	90 Rs
7.	benam	lumpsum	200 200	200 Rs
Total				6506.66

grand total = 20105.66

i) water charge = 20105.66 x 1.5
= 301.586 Rs

ii) Contractor = 20105.66 x 10%.

= 2010.566 Rs

iii) Total = 20105.66 + 301.586 + 2010.566
= 22417.74 Rs



D.P.C.

2 cm thick D.P.C. with Cement mortar 1:2

unit = 1 m² take 100 m²

quantity of cement

$$\frac{32.7}{1+2} \times 1 = 10.66$$

No. bags = $\frac{0.9}{0.035} = 26 \text{ bags}$

quantity of sand = $\frac{2.7}{1+2} \times 2 = 1.8 \text{ m}^3$

Cement seal 1 kg / bag of cement = 26 kg

No.	material	quantity	Rate	Cost
1.	Cement	0.9 m ³	7650/m ³	6885 Rs
2.	sand	1.8 m ³	1500/m ³	2700 Rs
3.	Cement seal	26 kg	40 / kg	1040 Rs
				<u>10625</u>
	Labour	No	Rate	Cost
1.	mistri	1/2	350	175 Rs
2.	masen	5	300	1500 Rs
3.	mazdhar	5	220	1100 Rs
4.	bhishti	1	200	200 Rs
5.	form work	1 impian	200	200 Rs
6.	Sundhar	1 impian	75	75 Rs
Total:				3250 Rs
Grand total:				13875 Rs

i) water charge

$$= 13875 \times 1.5$$

$$= 20812.5 \text{ Rs}$$

ii) Contractor profit 2800

$$= 13875 \times 10$$

$$= 138750 \text{ Rs}$$

(iii)

$$\text{Total} =$$

$$13875 + 20812.5 + 138750$$

$$= 154706.25 \text{ Rs}$$

$$\text{Per } 1 \text{ m}^2 = \frac{154706.25}{100} = 1547.06$$

★ 2.5 C.m. thick Cement Concrete 1:1.5:3
d.p.c. unit 1 m² rate 100 m²

quantity of cement = $\frac{4.125}{1+1.5+3} \times 1.25 \times 10.75 \text{ m}^3$

$$\text{N. of bag} = \frac{0.75}{0.035} = 21.42 = 22 \text{ bag}$$

$$\text{quantity of sand} = \frac{4.125}{1+1.5+3} \times 1.5 = 1.125 \text{ m}^3$$

quantity of aggregate = $4.125 \times 3 = 12.375 \text{ m}^3$

Cem Seal 1 kg / bag of cement = 22 kg

No.	material	quantity	Rate	Cost
1.	Cement	0.75	7680	5737.5 Rs
2.	Sand	1.125	1800	1687.5 Rs
3.	aggregate	2.25	2200	4950 Rs
				Total = 12375 Rs

No	Labour	No	Rate	Cost
1.	mistri	112	13500	175
2.	men	5	300	1500
3.	maadars	5	220	1100
4.	brishi	1	200	200
5.	form work	lumpsum	200	200
6.	surbed	lumpsum	75	75
				Total = 3250 Rs
				Grand Total = 15625 Rs

ii) water charge = $15625 \times 1.5\% = 234.37 \text{ Rs}$

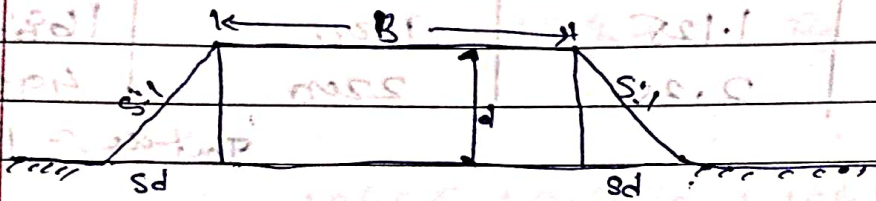
(i) Contractor = $15625 \times 10\% = 1562.5 \text{ Rs}$

(ii) Total = 17421.87 Rs

for $1 \text{ m}^2 = \frac{17421.87}{100} = 174.21 \text{ Rs}$

→ Cross-section of earth work of road banking or in cutting is usually in the form of trapezium and the quantity of earth work may be calculated by the following method

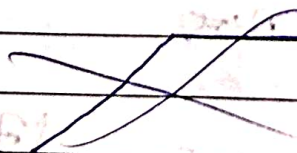
→ Quantity or Volume = Sectional area $\times$ length

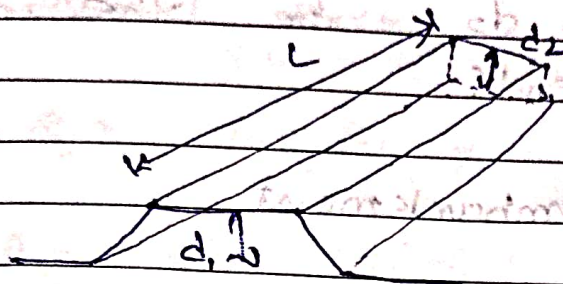


$$\begin{aligned} Q &= \text{Area of Rec} + \text{area of triangle} \times \text{length} \\ &= Bd + 2 \left[\frac{1}{2} sd \times d \right] \times L \\ &= (Bd + sd^2) \times L \end{aligned}$$

⇒ S:1 is the ratio of Side Slope as horizontal : vertical, for one vertical horizontal is S, for d vertical, horizontal is sd

→ When the ground is in a longitudinal slope the height of bank or depth of cutting will be different at the two ends





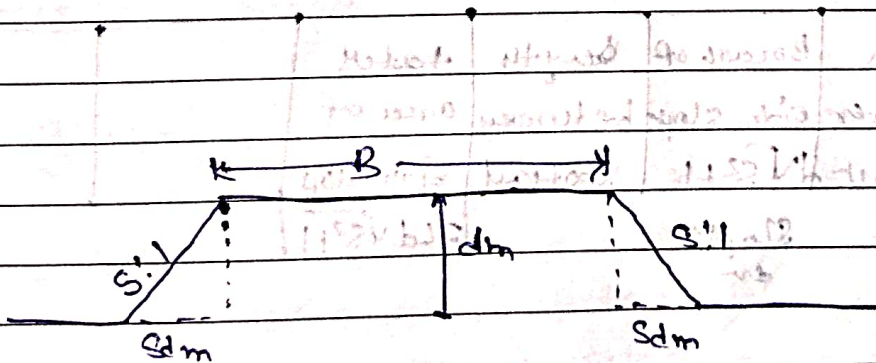
mean width $d_1 + d_2$

* Lead & lift

→ Normally earthwork is estimated for 30m lead, for distance and 1.5 m. lift for height or depth and these distance and height are known as normal lead and lift.

* Method of Road estimating earthwork:-

i) Mean Sectional area method:-



$$Q = \text{Area of mean section} \times \text{length}$$

- Let d_1 and d_2 be the height of bend at 2 ends.
- Portion of embankment
- L = Length of the section
- B = Formation width
- $S:1$ = Side slope

$$Q = [Bd_m + Sd_m^2] \times L$$

Station or Chainage	Depth or height	mean depth or height	area of central portion	Area of sides Sd^2	Total Sectional area $Bd + Sd^2$	Length between section	Quantity ($Bd + Sd^2$) Banking cut
---------------------------	-----------------------	----------------------------	-------------------------------	----------------------------	--	------------------------------	---

~~Area~~ Area of Side sloping surface

Station or Chainage	Depth or height	mean depth or height	Base width side slope $\sqrt{S^2+1}$ Sloping or	Length between section	Total area of side slope $2Ld\sqrt{S^2+1}$	
---------------------------	-----------------------	----------------------------	---	------------------------------	---	--

ii) Mean Sectional Area method:-

$$Q = \frac{A_1 + A_2}{2} \times L$$

$$A_1 = Bd_1 + Sd_1^2$$

$$A_2 = Bd_2 + Sd_2^2$$

iii) Prismoidal method ^{formula}

$$Q = \frac{L}{6} [A_1 + A_2 + 4A_m]$$

$$A_m = Bd_m + Sd_m^2$$

$$d_m = \frac{d_1 + d_2}{2}$$

questy Calculate the quantity of earthwork for 200 m length for a portion of a road in an uniform ground the height of bank at two ends being 1 m. and 1.6 m. The formation width is 10 m. and side slope 2:1. Assume there is no traverse slope.

Sol given data :-

$$L = 200 \text{ m}$$

$$B = 10 \text{ m.}$$

$$d_1 = 1.0 \text{ m.}$$

$$d_2 = 1.6 \text{ m.}$$

$$S:1 = 2:1$$

metu section

$$i) Q = [Bd_m + Sd_m^2] \times L$$

$$d_m = \frac{d_1 + d_2}{2} = \frac{1 + 1.6}{2} = \frac{2.6}{2} = 1.3$$

$$Q = [10 \times 1.3 + 2 \times 1.3^2] \times 200$$

$$Q = [3.276 \text{ m}^3]$$

ii) metu mean sectional

$$Q = \frac{A_1 + A_2}{2} \times L$$

$$A_1 = Bd_1 + Sd_1^2$$

$$= 10 \times 1 + 2 \times 1^2$$

$$A_1 = 12 \text{ m}^2$$

$$A_2 = Bd_2 + Sd_2^2$$

$$= 10 \times 1.6 + 2 \times 1.6^2$$

$$= 21.12 \text{ m}^2$$

$$Q = \frac{12 + 21.12}{2} \times 200$$

$$Q = 3312 \text{ m}^3$$

(14)

prismoidal

$$Q = \frac{L}{6} \times [A_1 + A_2 + 4A_m]$$

$$A_m = 10 \times 1.3 + 2 \times 1.3^2$$

$$= 16.38 \text{ m}^2$$

$$Q = \frac{200}{6} \times [12 + 21.12 + 4 \times 16.38]$$

$$Q = 32.88 \text{ m}^3$$

Ques - Reduce level of ground along the center line of a proposed road from chainage 10 - 20 are given below. The formation level at the 10th chainage is 107 & the road is in downward gradient 1:150 up to the chainage 14 and then the gradient change to 1:100 downward. formation width of road is 10 m. and side slope of banking are 2:1. length of the chain is 20 m.

Draw the longitudinal sectional of the road and a typical cross section and prepare a estimate of earthwork at the rate of Reppet 275% m³.
→ 275/1000

Find also the area of side slope and the cost of turfing the side slope at the

rate of 60 Super 2. m²

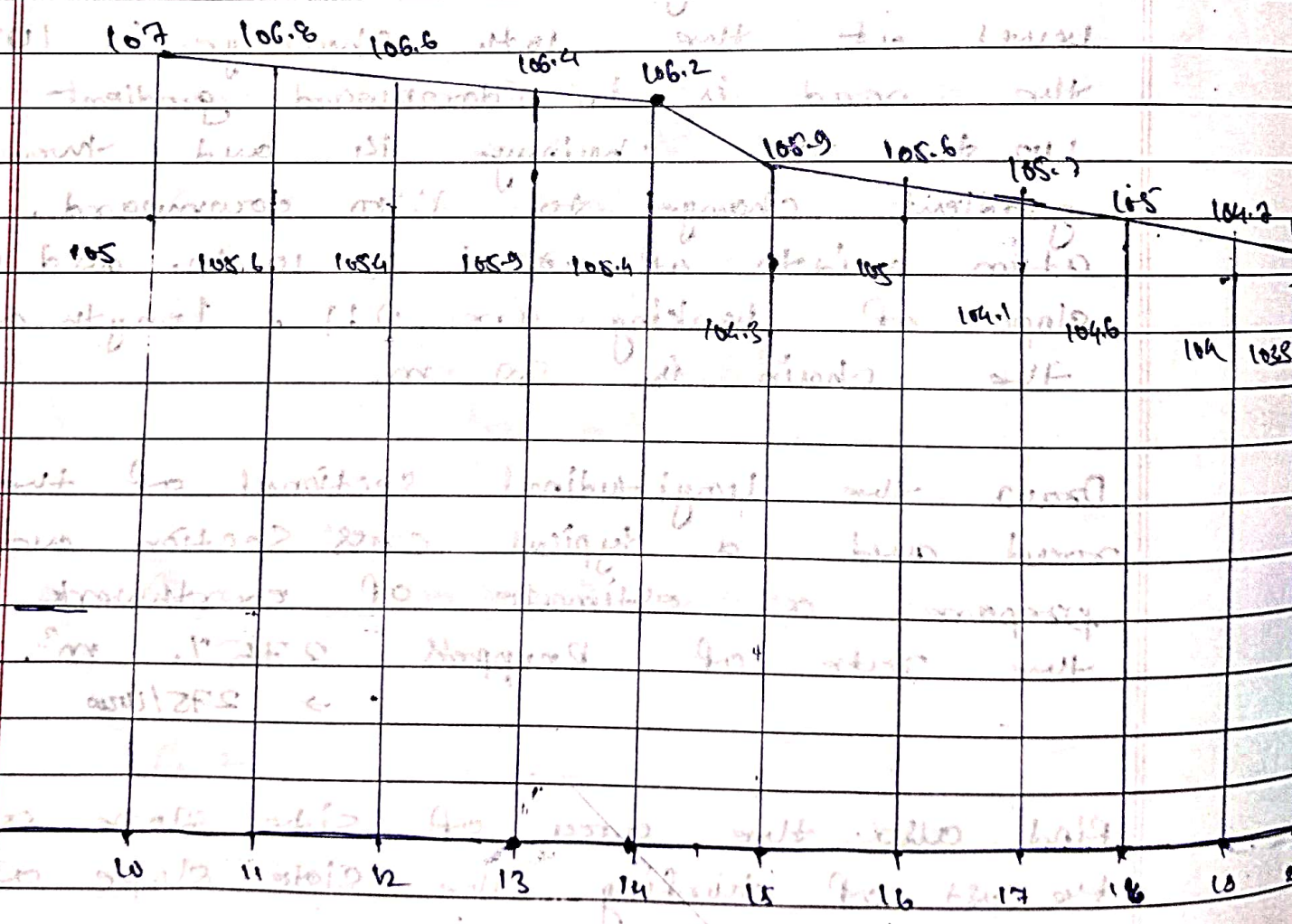
chainage	10	11	12	13	14	15	16	17	18	19	20
D.L	105	105.6	105.44	105.90	105.42	104.30	105.0	104.10	104.62	104	103.3

RL of formation 107

Solved

Chainage	10	11	12	13	14	15	16	17	18	19	20
Reduce L.	105	105.6	105.4	105.9	105.42	104.30	105	104.10	104.62	104	103.3
formation L.	107	106.8	106.6	106.4	106.2	105.9	105.6	105.3	105.0	104.7	104.4
Height of Band	2	1.2	1.26	0.5	0.78	1.6	0.6	1.2	0.38	0.7	1.1

↑
downward gradient
1 in 100
↓
downward gradient



0121 24512 | 25th Nov 150

$$FL = 30 \times 1 = 0.3$$
$$\text{Height of bend} = \frac{80 \cdot AL - RL}{RL - FL}$$

22410

2.42.2

252.1

212.

2020

0251

[illegible]

Abstract of 18th century

1894	Sept 4	Thurs	at home	Sept 10	at home
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70 00298 WMO 0-6-872 Wisconsin to New York

$$= 4 \ln 2$$

1. 11/11/2018 11:11 AM

10. 1944-1945

32. 17101 - Lot 4 - 2000

B = 10'
S = 2



Station	Depth or height at foot of RL & RL	mean depth or height	Area of Central portion (B ²)	Area of sides (Sd ²)	Total section Area (Bd + Sd)	Length in blue	Quantity Banking	Quantity Cutting
10	2	-	-	-	-	-	-	-
11	1.2	1.60	10 x 1.6 = 16	2 x 1.6 ² = 5.12	16 + 5.12 = 21.12	30	633.6	
12	1.16	1.18	11.6	2.784	14.384	30	437.52	
13	0.80	0.83	6.30	1.377	7.677	30	290.31	
14	0.75	0.64	6.40	0.819	7.219	30	216.57	
15	1.6	1.19	11.90	2.832	14.732	30	447.96	
16	0.6	1.10	11	2.420	13.420	30	402.6	
17	1.2	0.9	9	1.620	10.620	30	318.6	
18	0.38	0.79	7.9	1.248	9.148	30	274.44	
19	0.7	0.54	5.40	0.583	5.983	30	179.49	
20	1.1	0.90	9	1.620	10.620	30	318.6	

Adding of Banking = 60519.674 - 3513.69

Abstract of Estimated Cost

Particular of item	Quantity	Unit	Rate Rs/P	Per	Cost
Earthwork of banking	3513.69	Cum	27500	1/100	9668.14

Total = 9668.14

Add 5% (3% for contingencies and 2% for work charge) = 483.40

Grand total = 10151.54

For prepare a detailed estimate for earth work for a portion of road from the following data.

Dist in m	0	100	200	300	400	500	600	700	800	900
El of ground	114.5	114.95	115.25	115.20	115.10	115.85	116.20	116.25	116.10	117.20

1000	1100	1200
117.25	117.40	117.50

RI of formation 115, upward gradient (1:200)
1 in 200 up to 600 m, down ward

gradient 1 in 100

Formation width of road is 10 m. Side Slope 2:1 in banking and 1.5:1 in cutting.
adapte suitable rates.

Sol

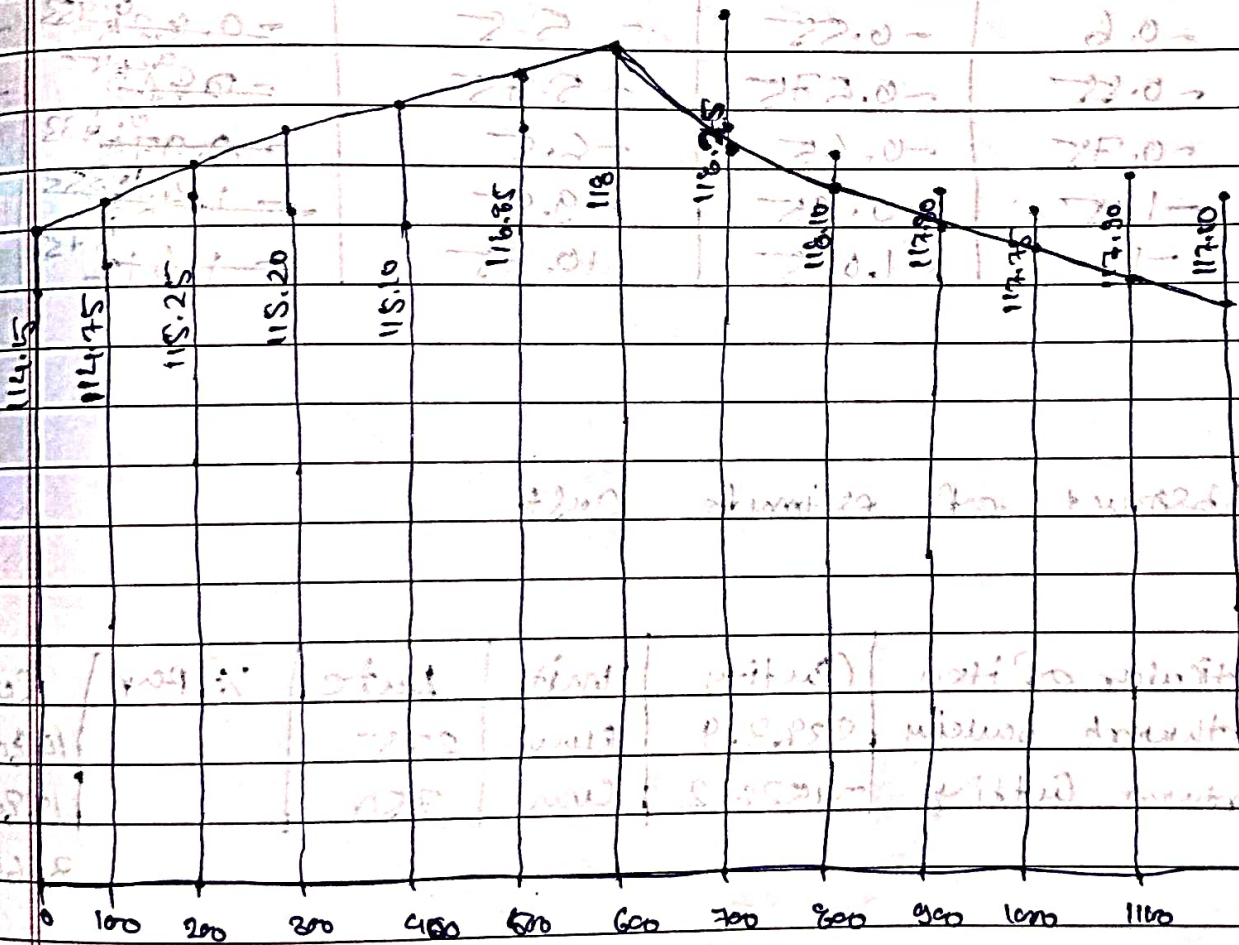
Chainage	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
RL.	114.5	114.75	115.25	115.20	116.10	116.85	117	117.25	118.10	117.80	117.75	117.9	117.50
F.L.	115	115.5	116	116.5	117	117.5	118	117.75	117.5	117.25	117	116.75	116.5
HOB	0.5	0.75	0.75	1.3	0.9	0.65	0	0.5	0.85	0.55	0.75	1.15	-1

$$FL = 100 \times \frac{1}{200} = 0.5 \text{ (upward)} (+)$$

$$FL = 100 \times \frac{1}{400} = 0.25 \text{ (downward)} (-)$$

Height of bank = $RL - FL$ / $FL - RL$

$\frac{0.1}{0.1}$
 (0.1) 0.1
 (0.1) 0.1



$$S = \frac{10 \times 10}{2} = 50 \text{ (boundary line)}$$

$$S = 2 \text{ (boundary line)}$$

$$S = 1.5 \text{ (boundary line)}$$

Station	Depth or height of	encore depth or height (ft)	Area of Central section (ft ²)	Area of side (ft ²)	Total area (ft ²)	Perimeter (ft)	Quantity = (Bd + Cut) x C
0	0.5	-	-	-	-	-	-
100	0.75	0.625	6.25	0.761	7.031	100	703.1
200	0.75	0.75	7.5	1.125	8.625	100	862.5
300	1.3	1.025	10.25	2.101	12.351	100	1235.1
400	0.9	1.1	11	2.42	13.42	100	1342.0
500	0.65	0.775	7.75	1.201	8.951	100	895.1
600	0	0.325	3.25	0.21	3.461	100	346.1
700	0.5	0.25	2.5	0.245	2.745	100	274.5
800	0.6	0.55	5.5	0.625	6.125	100	612.5
900	0.55	0.575	5.75	0.662	6.412	100	641.2
1000	0.75	0.65	6.5	0.975	7.475	100	747.5
1100	1.15	0.95	9.5	1.425	10.925	100	1092.5
1200	1	1.075	10.75	1.612	12.362	100	1236.2

Abstract of estimate Cost

S.No	Particulars of item	Quantity	Unit	Rate	% Per	Cost
①	Earthwork basem	5383.9	cum	275		1480572.5
②	Return cutting	4526.2	cum	350		1584170
						3064742.5

5% = 153237.125

Grand total = 3217979.62 /-