INSTITUTE OF AERONAUTICAL ENGINEERING
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ESTIMATION AND COSTING

(A70138) JNTUH-R15
B.Tech IV YEAR I SEM

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UNIT-I

GENERAL ITEMS OF WORK IN BUILDING

DEFINITION OF ESTIMATING AND COSTING

- 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 avilable are less than the estimated cost the work is done in part or by reducing it or specifications are altered, the following require-ment are necessary for preparing an estimate.
- a) Drawings like plan, elevation and sections of important points.

PROCEDURE OF ESTIMATING OR METHOD OF ESTIMATING.

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

DATA REQUIRED TO PREPARE AN ESTIMATE

- Drawings i.e.plans, elevations, sections etc.
- Specifications.
- Rates.

NEED FOR ESTIMATION AND COSTING

- Estimate give an idea of the cost of the work and hence its feasibility can be determined i..e whether the project could be taken up with in the funds available or not.
- Estimate gives an idea of time required for the completion of the work.
- Estimate is required to invite the tenders and Quotations and to arange contract.
- Estimate is also required to control the expenditure during the execution of work.

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- Rates.

RATES:

- For preparing the estimate the unit rates of each item of work are
- re-quired.
- For arriving at the unit rates of each item.
- The rates of various materials to be used in the construction.
- The cost of transport materials.
- The wages of labour, skilled or unskilled of masons, carpenters, Mazdoor, etc.,

LUMPSUM:

- While preparing an estimate, it is not possible to workout in detail in case of petty items. Items other than civil engineering such items are called lumpsum items or simply L.S.Items.
- The following are some of L.S. Items in the estimate.
  - Water supply and sanitary arrangements.
  - Electrical installations like meter, motor, etc.,
  - Architectural features.
  - Contingencies and unforeseen items.

WORK CHARGED ESTABLISHMENT:

- During the construction of a project considerable number of skilled su-pervisors, work assistance, watch men etc., are employed on temporary basis. The salaries of these persons are drawn from the L.S. amount alloted towards the work charged establishment. that is, establishment which is charged directly to work. an L.S.amount of 1½ to 2% of the estimated cost is provided towards the work charged establishment.

DETAILED ESTIMATES OF BUILDINGS

UNITS OF MEASUREMENTS:

- The units of measurements are mainly categorised 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., are expressed in numbers.
  - Works consists linear measurements involve length like cornice, fencing, hand rail, bands of specified width etc., are expressed in running metres (RM)

- Works consists areal surface measurements involve area like plastering, white washing, partitions of specified thickness
- etc., are expressed in square meters (m^2)
- Works consists cubical contents which involve volume like earth work, cement concrete, Masonry etc are expressed in Cubic metres.

METHODS OF TAKING OUT QUANTITIES:

The quantities like earth work, foundation concrete, brickwork in plinth and super structure etc., canbe workout by any of following two methods:

- Long wall - short wall method
- Centre line method.

a) Long wall-short wall method:

- In this method, the wall along the length of room is considered to be long wall while the wall perpendicular to long wall is said to be short wall.

Measurement of Materials and Works

length of long wall or short wall, calculate first the centre line lengths of individual walls. Then the length of long wall, (out to out) may be calculated after adding half breadth at each end to its centre line length. Thus the length of short wall measured into in and may be found by deducting half breadth from its centre line length at each end. The length of long wall usually decreases from earth work to brick work in super structure while the short wall increases. These lengths are multiplied by breadth and depth to get quantities.

b)Centre line method:

- This method is suitable for walls of similar cross sections. Here the total centre line length is multiplied by breadth and depth of respective item to get the total quantity at a time. When cross walls or partitions or verandah walls join with mainall, the centre line length gets reduced by half of breadth for each junction. such junction or joints are studied caefully while calculating total centre line length.The estimates prepared by this method are most accurate and quick.

MEASUREMENT OF MATERIALS AND WORKS

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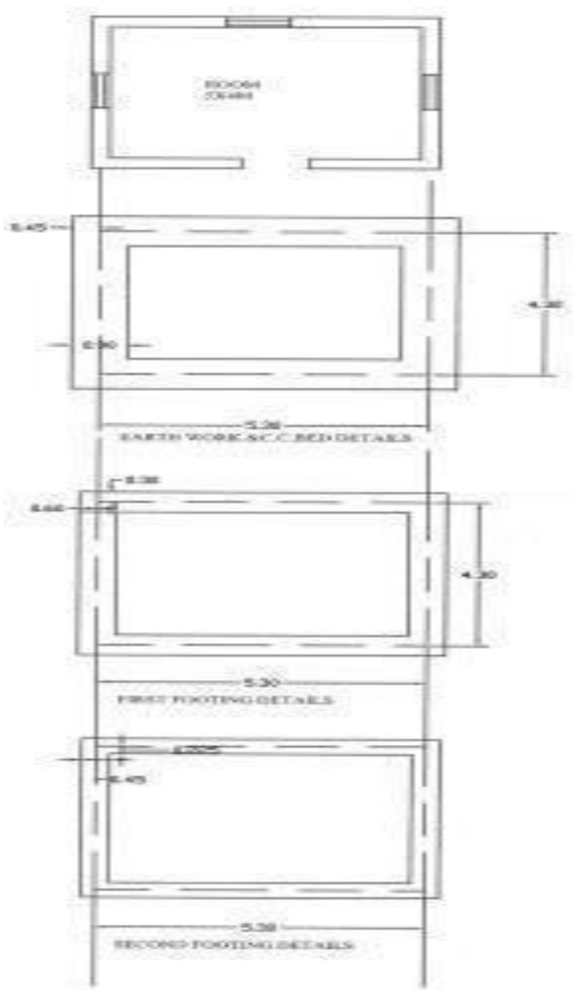
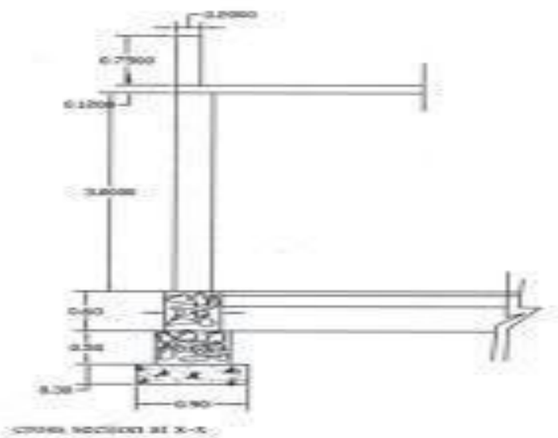
3.Works consists areal surface measurements involve area like plastering, white washing, partitions of specified thickness etc., are expressed in square meters (m^2)

From the Drawing given below determine (a) Earth work excavation (b) CC (1:5:10) Bed (c) R.R.Masonry in C.M. (1:6) (d) Brick Work in C.M.(1:6).

- **Single Roomed Building**





Note: All Dimensions are in 'M'

D=1X2.1M

W=1.5X1.2M

TYPES OF ESTIMATION

DETAILED ESTIMATE:

- The preparation of detailed estimate consists of working out quantities of various items of work and then determine the cost of each item. This is prepared in two stages.

Details of measurements and calculation of quantities:

- The complete work is divided into various items of work such as earth work concreting, brick work, R.C.C. Plastering etc., The details of measure-ments are taken from drawings and entered in respective columns of prescribed proforma. the quantities are calculated by multiplying the values that are in num-bers column to Depth column as shown below:

Details of measurements form

S.No.	Description of Item	No	Length (L) m	Breadth (B) m	Depth/ Height (D/H)m	Quantity	Explanatory Notes

Abstract of Estimated Cost :

- The cost of each item of work is worked out from the quantities that already computed in the detals measurement form at workable rate. But the total cost is worked out in the prescribed form is known as abstract of estimated form. 4%of estimated Cost is allowed for Petty Supervision, contingencies and Unforeseen items.

ABSTRACT OF ESTIMATE FORM

Item No.	Description / Particulars	Quantity	Unit	Rate	Per (Unit)	Amount

Factors to be consisdered While Preparing Detailed Esti-mate:

- **Quantity and transportation of materials:** For bigger project, the re-quirement of materials is more. such bulk volume of mateials will be pur-chased and transported definitely at cheaper rate.
- ***Location of site:*** The site of work is selected, such that it should reduce damage or in transit during loading, unloading, stocking of mateirals.

- **Local labour charges:** The skill, suitability and wages of local laboures are consideed while preparing the detailed

FIXING OF RATE PER UNIT OF AN ITEM:

The rate per unit of an item includes the following:

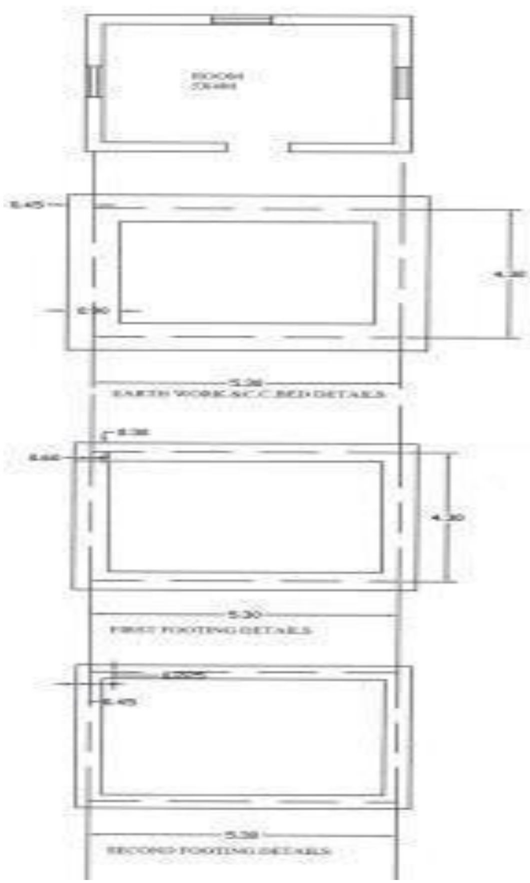
- **Quantity of materials & cost:** The requirement of mateials are taken strictly in accordance with standard data book(S.D.B). The cost of these includes first cost, freight, insurance and transportation charges.
- **Cost of labour:** The exact number of labourers required for unit of work and the multiplied by the wages/ day to get of labour for unit item Work.

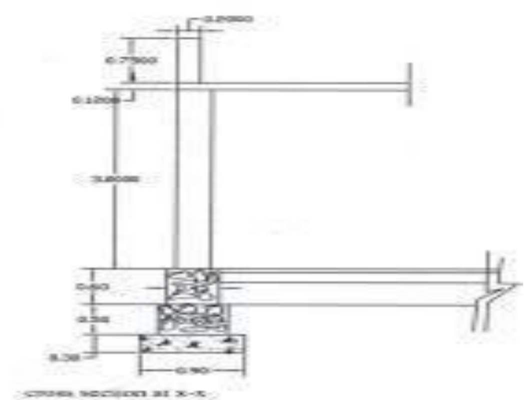
- ***Cost of equipment (T&P):*** Some works need special type of equip-ment, tools and plant. In such case, an amount of 1 to 2% of estimated cost is provided.
- ***Overhead charges:*** To meet expenses of office rent, depreciation of equipment salaries of staff postage, lighting an amount of 4% of estimate cost is allocated.

DETAIL & ABSTRACT ESTIMATES

From the given figure below calculate the detailed and abstract estimate for the single roomed building (Load bearing type structure) by

a) long wall & short wall method (b) Centre Line Method





Note: All Dimensions are in 'M'

D=1X2.1M

W=1.5X1.2M

Single Roomed Building

(Load Bearing type structure)

a) Long wall - Short Method

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1.	**Earth Work excavation for foundation**						
	a) Long walls	2	6.2	0.9	1.4	15.264	L=5.3+.45+.45 =6.2 D= 0.3+0.5+0.6 = 1.4
	b) Short walls	2	3.4	0.9	1.4	8.568	L= 4.3-0.45-0.45= 3.4
					Total	**24.192**	**m^3**
2.	**C.C.(1:4:8) bed for foundation**						
	a) Long walls	2	6.2	0.9	0.3	3.348	
	b) Short walls	2	3.4	0.9	0.3	1.836	
					Total	**5.184**	**m^3**
3.	**R.R.Masonry in CM (1:6) for**						
	a) Footings						
	i) Long walls	2	5.9	0.6	0.5	3.54	L= 5.3+0.3+0.3=5.9
	ii) Short walls	2	3.7	0.6	0.5	2.22	L=4.3-0.3-0.3 = 3.7
					Total	**5.76**	**m^3**
	b) Basement						
	i) Long walls	2	5.75	0.45	0.6	3.105	L= 5.3+0.225+0.225=5.75
	ii) Short walls	2	3.85	0.45	0.6	2.079	L= 4.3-0.225-0.225=3.85
					Total	**5.184**	**m^3**
	Total R.R. Masonry for footings and Basement = 5.76+5.184=10.94 m^3						
4.	**Brick masonary** with CM (1:6) for super structure						
	a) Long Walls	2	5.6	0.30	3.00	10.08	L=5.3+0.15+0.15=5.6
	b) Short walls	2	4.0	0.30	3.00	7.20	L=4.3-0.15-0.15=4.0
	c) for parapet wall 5.6 4.6						

o.	Particulars of Items	No.	L	B	H	Q	Explanation
	Deductions for openings						
	a) Doors	1	1.0	0.3	2.1	0.63	
	b) Windows	3	1.5	0.3	1.2	1.62	
					Total	**(-)2.25**	**m^3**
	Net Brick Masonry	**= 20.28 - 2.25 = 18.03m^3**					
5.	**R.C.C. (1:2:4) for**						
	a) Roof slab	1	5.6	4.6	0.12	3.090	
	b) Lintels over						
	i) Doors	1	1.2	0.3	0.15	0.054	
	ii) Windows	3	1.5	0.3	0.15	0.202	
	c) Beams						
	i) Long beams	2	5.6	0.3	0.3	1.008	
	ii) short beams	2	4.0	0.3	0.3	0.720	
					Total	**5.074**	**m^3**
6.	**Sandfilling for basement**	1	4.85	3.85	0.48	8.96	L=5.0-0.075-0.075=4.85
7	**C.C.(1:4:8) for flooring**	1	4.85	3.85	0.1	1.86	B= 4.0-0.075-0.075=3.85
8	**Flooring with Mosaic tiles**	1	5.0	4.0	--	20.0	**m^2**
9	**Plastering with CM (1:6)for super structure <u>Inside</u>**						

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
10	Plastering for Ceiling with CM(1:5)	1	5.0	4.0	--	20.0	m²
11	White Washing with two coats with Janatha cement						
	Same as quantity of plastering for walls and ceiling					151.18	(= 131.18+20= 151.18)
12.	Colour washing with two coats						
	Same as quantity of plastering for walls and ceiling					151.18	(=131.18+20)151.18)
13	Supply & Fixing of best country wood for						
	a) Doors	1				1 No.	
	b) Windows	3				3No.	
14	Painting with ready mixed synthetic enamil paits with two coats over primary coat for new wood for						
	a) Doors	2¼x1	1.0	---	2.1	4.725	
	b) Windows	2¼x3	1.5	---	1.2	12.15	
					Total	**16.875**	m²
15	Petty supervision and contingencies at 4% and rounding off.						

b) Centre Line Method

S.N	Particulars of Items	No.	L	B	H	Q	Explanation
1.	**Earth Work exevation** for foundation	1	19.2	0.9	1.4	24.192	m^3
	5.3 / 4.3						L=2(5.3+4.3)=19.2
2.	**C.C.(1:4:8) bed for** foundation	1	19.2	0.9	0.3	5.184	m^3
3.	**R.R.Masonry in CM (1:6) for**						
	a) Footings	1	19.2	0.6	0.5	5.76	
	b) Basement	1	19.2	0.45	0.6	5.184	
					Total	**10.944**	
4.	**Brick masonry with** CM(1:6)forsuperstructure	1	19.2	0.3	3.0	17.28	m^3
	For parapet wall	1	20.0	0.2	0.75	3.00	
	Deductions foropenings						
	a)Doors	1	1.0	0.3	2.1	0.63	
	b) Windows	3	1.5	0.3	1.2	1.62	
					Total 2.25		m^3
	Net Brick Masonry =		**17.28**	**+3.0-**	=		m^3
5.	**R.C.C. (1:2:4) for**						
	a) roof slab	1	5.6	4.6	0.12		
	b) Lintels over						
	i) Doors	1	1.2	0.3	0.15		
	ii) Windows	3	1.5	0.3	0.15		
	c) beams	1	19.2	1.3	0.3		
					Total		m^3
6.	**Sandfilling for basement**	1	4.85	3.85	0.48		L=5.0-0.075-0.075=4.85
7	**C.C.(1:4:8) for flooring**	1	4.85	3.85	0.1		B= 4.0-0.075-0.075=3.85

8. **flooring with Mosaic tiles**	1	5.0	4.0	--	20.0	
9 Plastering with CM (1:6)for super structure						
<u>Inside</u>						
For walls	1	18.0	--	3.0	54.0	
Out side						
For walls	1	20.4	--	3.87	61.2	
Basement outside	1	21.6	--	0.6	12.96	
Parapet wall						
a) Inside	1	18.8	--	0.75	14.1	
b) top	1	19.6	0.2	---	3.92	
Deductions for opeinings				Total	**146.18**	**m²**
Doors	1x2	1.0	--	2.1	4.2	L=5.0-0.075-0.075=4.85
Windows	3x2	1.5	--	1.2	10.8	B= 4.0-0.075-0.075=3.85
					15.0	**m²**
Net Plastering= 146.18-15 =					**131.18**	**m²**
10 Plastering for Ceiling with CM(1:5)	1	5.0	4.0	--	20.0	**m²**
11 White Washing with two coats with Janatha cement						
Same as quantity of plastering for wallsand ceiling					**151.18**	**m²** (131.18+20=151.18)
12. Colour washing with two coats						
Same as quantity of plastering for walls and 151.18 **m²** ceiling						

S.No.	Particulars of Items	No.	L	B		Q	Explanation
14	Painting with ready mixed synthetic enamil paints with two coats over primary coat for new wood for						
	a) Doors	2¼x1	1.0	---	2.1	4.725	
	b) Windows	2¼x3	1.5	---	1.2	12.15	
					Total	**16.875**	m^2
15	Petty supervision and contingencies at 4% and rounding off.						

Abstract estimate of single roomed building (load bearing structure)

S.No.	Description of item	Quantity	Unit	Rate	Per	Amount
1	Earth work excaation	24.192	m^3	465	$10m^3$	1125.00
2.	Cement concrete(1:4:8)	5.184	m^3	4545	$1m^3$	8009.30
3.	RR.masonry in C.M.(1:5)	10.94	m^3	1391	m^3	15217.50
4.	Sand filling in basement	8.96	m^3	195.20	$10m^3$	175.00
5.	Brick masonry in country bricks of standard size in CM(1:8)	18.03	m^3	2291	m^3	41306.73
6.	R.C.C. (1:2:4) for lintels, beams etc.	1.984	m^3	6030	m^3	11963.52
7.	R.C.C.(1:2:4) for slabs,	3.09	m^3	6030	m^3	18633.00
8.	Cement concrete (1:5:10) for flooring	1.86	m^3	1452	m^3	2700.72
9.	Supplying and fixing of country wood for doors.	2.1	m^2	1650	m^2	3465.00
10.	Supplying and fixing of country wood for windows and ventilators.	5.4	m^2	2300	m^2	12420.00
11	Plastering to all exposed surfaces of brickwork and basement with C.M (1:5)	151.18	m^2	582	$10m^2$	8798.70
12	White washing with best shell lime	151.18	m^2	116	$10m^2$	1753.68
13	Flooring with spartek tiles set in C.M (1:3)	20	m^2	4230	$10m^2$	8460.00
14	Painting with ready mixed	16.875	m^2	335	$10m^2$	565.31

Calculate the quantities of items of the stair case of the figure shown in below.

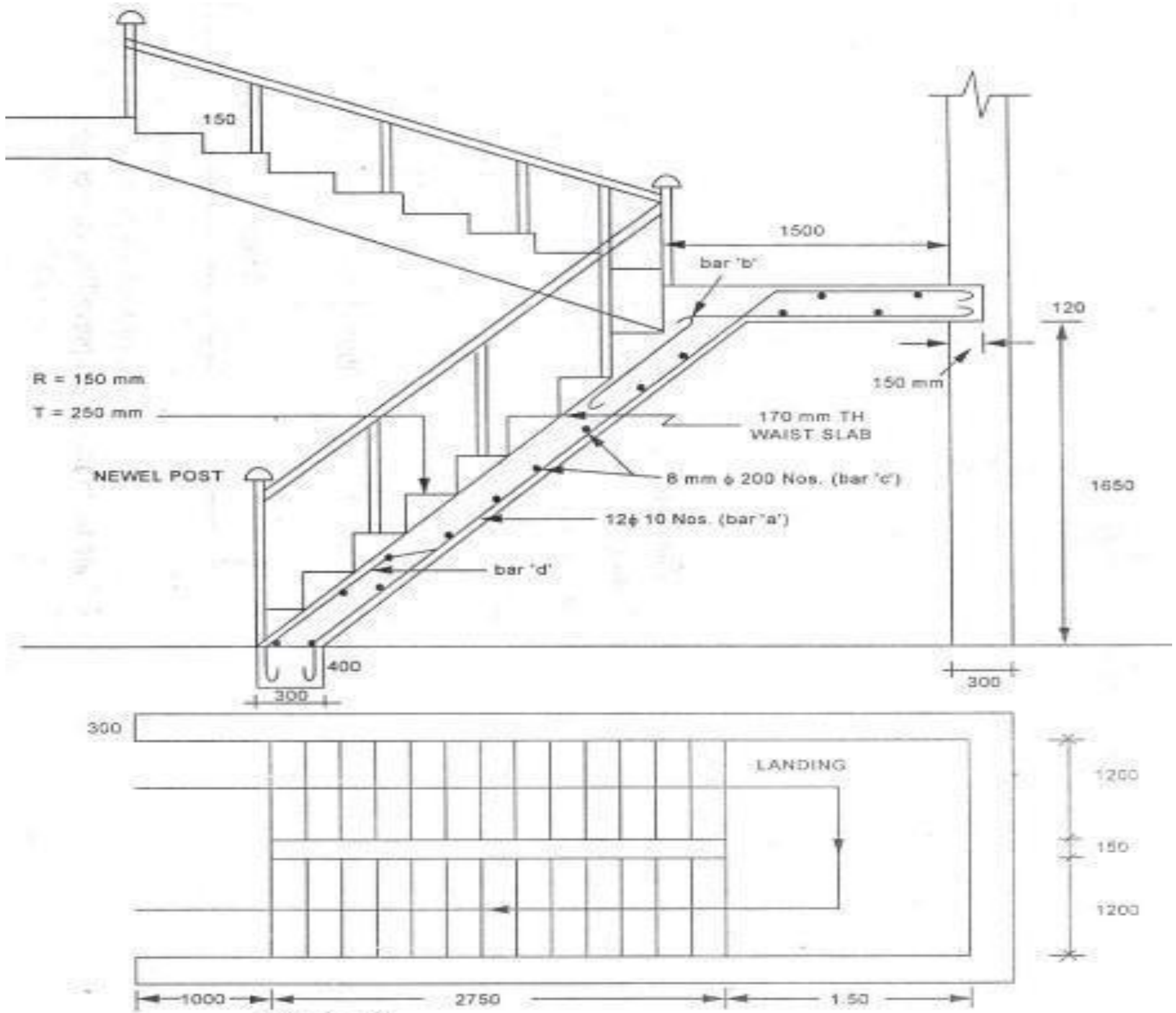


Fig. 4.12

R.C.C. Stair Case

S.No.	Particulars of Items	No.	L	B	H	Q	Explanation
1	R.C.C. (1:2:4) excluding steel and its fabrication but including centering and shultering and binding wire.						
	a) Toe wall	1x1	3.15	0 3	0.4	0.38	m^3 L= (1.2+0.15+1.2+2x0.3)
	b)Waistslabfor1andII flights $L=\sqrt{2.75^2+1.65^2}=3.21m$	1x2	3.21	1.2	0.17	1.31	
	c) Landing Middle and first floor	1x2	2.85	1.65	0.17	1.60	L= (1.2+0.15+1.2+2x0.15)
					Total	**3.29**	m^3
2.	Ist class brick work in C.M. (1:4) for steps	2x11	1.2	½x(0.25+1.5)		0.495	
3.	20mm. thick cement plastering (1:5) for steps finished neat						
	a) Treads & Rises	2x11	1.2	x (0.25 +0.15)		10.56	
	b) ends of steps	2x11		½x(0.25+1.5)		0.41	
					Total	**10.97**	m^2
4.	2.5cm Nosing in steps	2x12	1.2	--	--	28.8RM	
5.	2.5cm. C.C. flooring finished neat cement floating in middle and first floor landing.	1x2	2.55	1.2	--	6.12	m^2
6.	Supplying and fixing of best teak wood hand rail finished smooth	1x1	6.67	--	--	6.67RM	
7.	supply and fixing of best teak wood newel posts & finished smooth	1x2	1.0	0.1	0.1	0.02	m^3
8.	Cap of Newel post	1x2	---	--	---	2Nos.	

UNIT - II

EARTHWORKS FOR ROADS AND CANALS.

- Generally all the Civil Engineering projects like roads, railways, earth dams, canal bunds, buildings etc. involves the earth work.This earth work may be either earth excavation or earth filling or Some times both will get according to the desired shape and level. Basically the volume of earthwork is computed from length, breadth, and depth of excavation or filling.
- In this chapter the various methods of calculating the earth work quantities shall be discussed.

- **Lead and Lift:**

<u>Lead:</u>

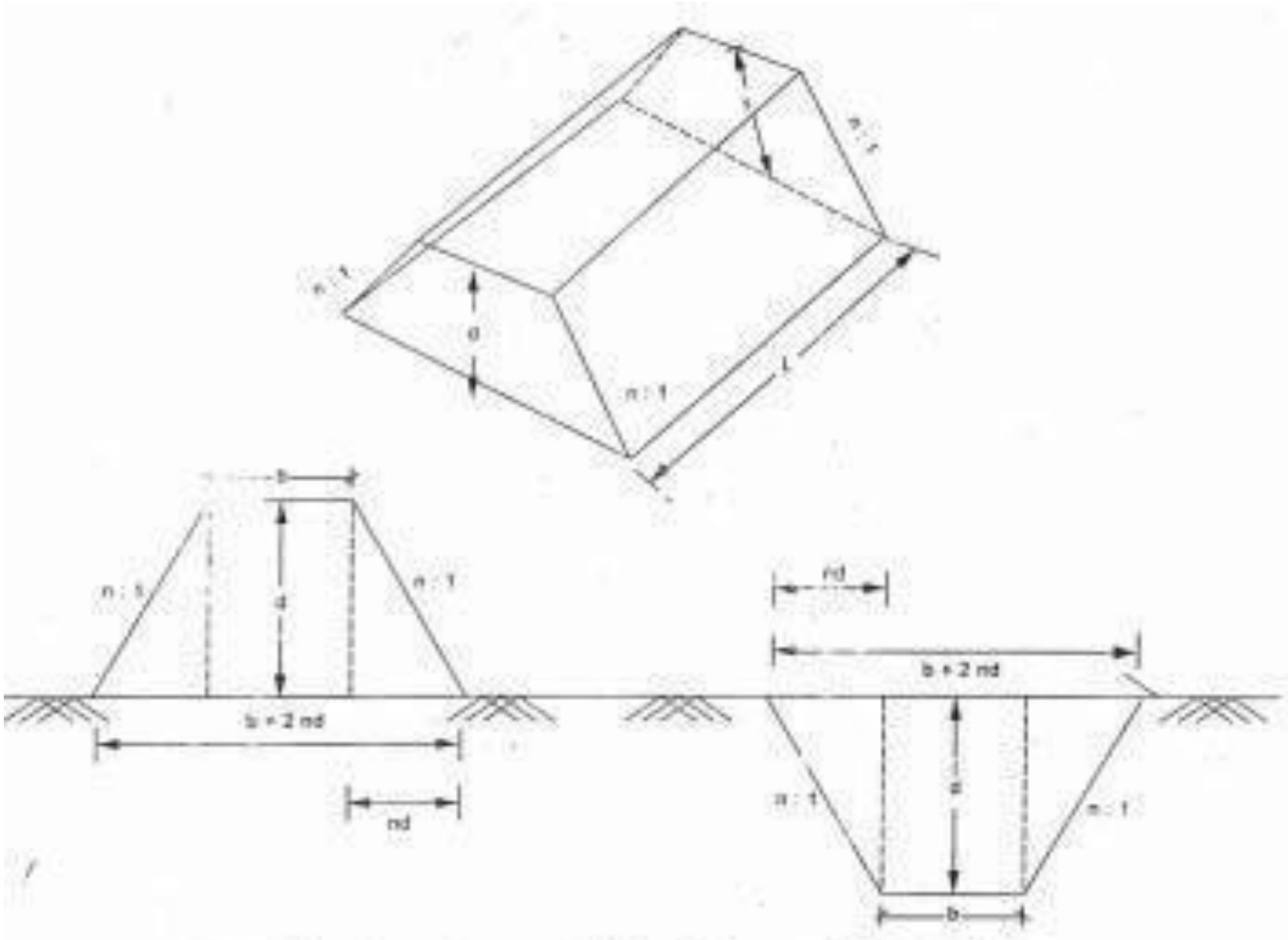
- It is the average horizontal distance between the centre of excavation to the centre of deposition. The unit of lead is 50m.

<u>Lift :</u>

- It is the average height through which the earth has to be lifted from source to the place of spreading or heaping. The unit of lift is 2.00m for first lift and one extra lift for every 1.0m. for example when earth is to be lifted for 4.5m, Four lifts are to be paid to the contractor.

Calculation of earth work for Roads:

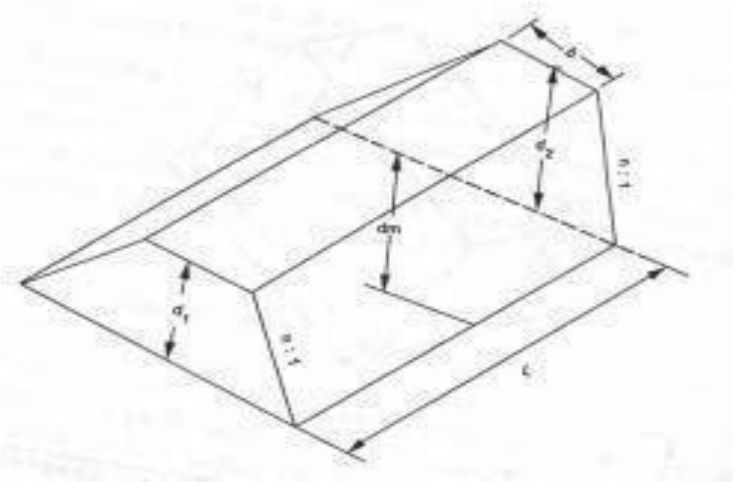
- $V = (bd+2\times 1/2\times nd\times d)L$ $V = (bd+nd^2)L$



(a) C/S of Embankment (b) Cross Section of a Canal in Cutting

- **Case2:**
  $V = (bd+2x1/2x\ ndx\ d)L$ $V = (bd+nd^2)L$
  When the ground is in longitudinal slope or the formation has uniform gradi- ent for a length the earth work may be calculated by the following methods.

<u>By Mid Section or Mid ordinate method.</u>



Where d_1, d_2 = depth of banks at two ends

Mid ordinate (or) Average depth (d_m) $= \frac{d_1+d_2}{2}$

Area of mid section (Am) = $(bd_m + nd_m^2)$

volume of earth work (v) = A x L = $(bd_m + nd_m^2) \times L$

I)Trepezoidal formula: (for twosections)

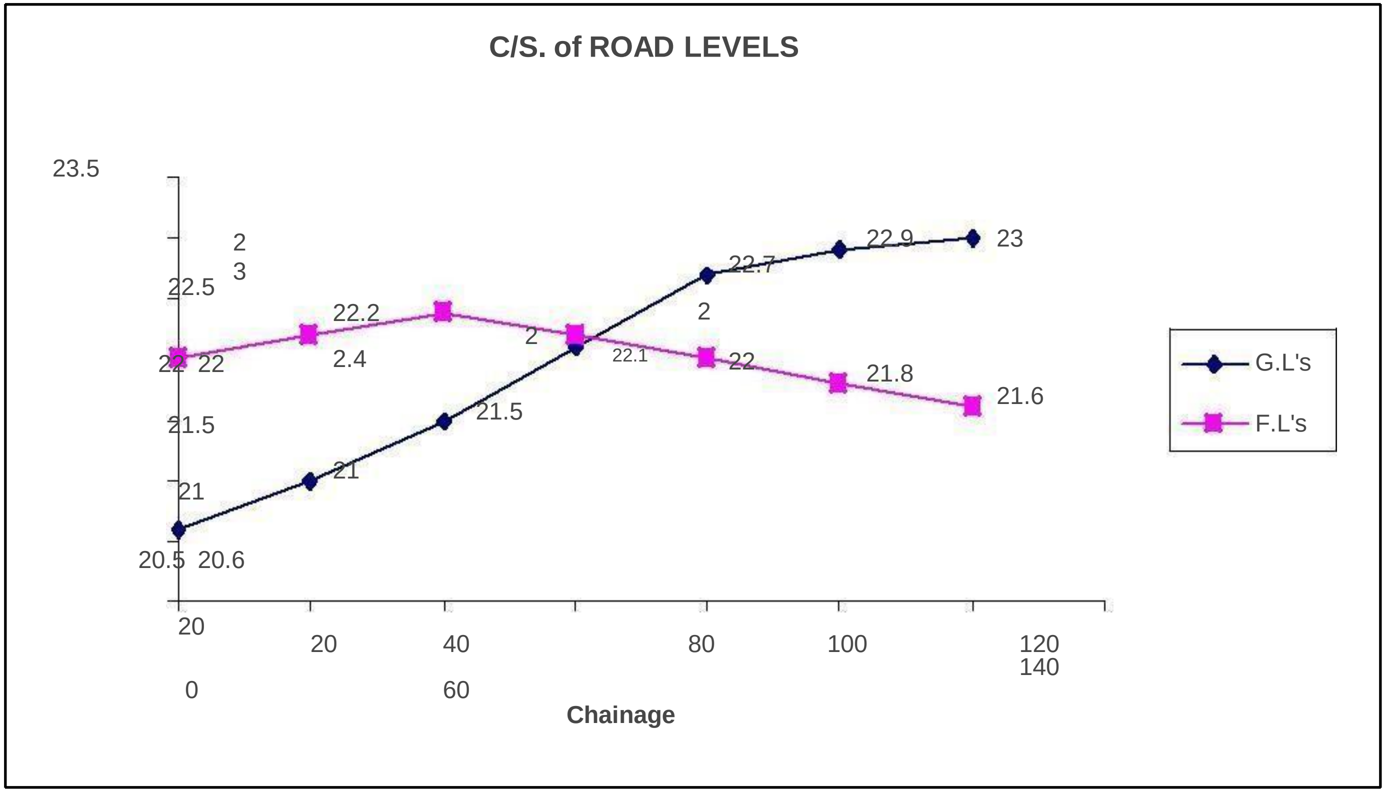
In this method also called mean sectional area method

Let A_1 & A_2 be two areas at two ends. $A_1 = (bd_1 + nd_1^2)$, $A_2 = (bd_2 + nd_2^2)$

$A_m = \frac{A_1+A_2}{2}$

Volume of earth work (v) = Am ×L

From the problem 7.5 if the gradient is 1 in 100 raising upto 40th chainage and 1 in 100 falling ragient from 40th Chainage to 120th chainage. Calculate the vol of earth work by using the formulas.



UNIT-III
ANALYSIS OF RATES

Definition : In order to determine the rate of a particular item, the factors affecting the rate of that item are studied carefully and then finally a rate is de-cided for that item. This process of determining the rates of an item is termed as analysis of rates or rate analysis.

The rates of particular item of work depends on the following.

- Specifications of works and material about their quality, proportion and con-structional operation method.
- Quantity of materials and their costs.
- Cost of labours and their wages.
- Location of site of work and the distances from source and conveyance charges.
- Overhead and establishment charges
- Profit

- **Lead statement:** The distance between the source of availability of material and construction site is known as "Lead " and is expected in Km. The cost of convenayce of material depends onlead.
- This statement will give the total cost of materials per unit item. It in-cludes first cost, convenayce loading, unloading stacking, charges etc.
- The rate shown in the lead statement are for mettalled road and include loading and staking charges . The environment lead on the metalled roads are

Cost of materials at source and at site of construction.

The costs of materials are taken as delivered at site inclusive of the transport local taxes and other charges.

Purpose of Analysis of rates:

To work out the actual cost of per unit of the items.

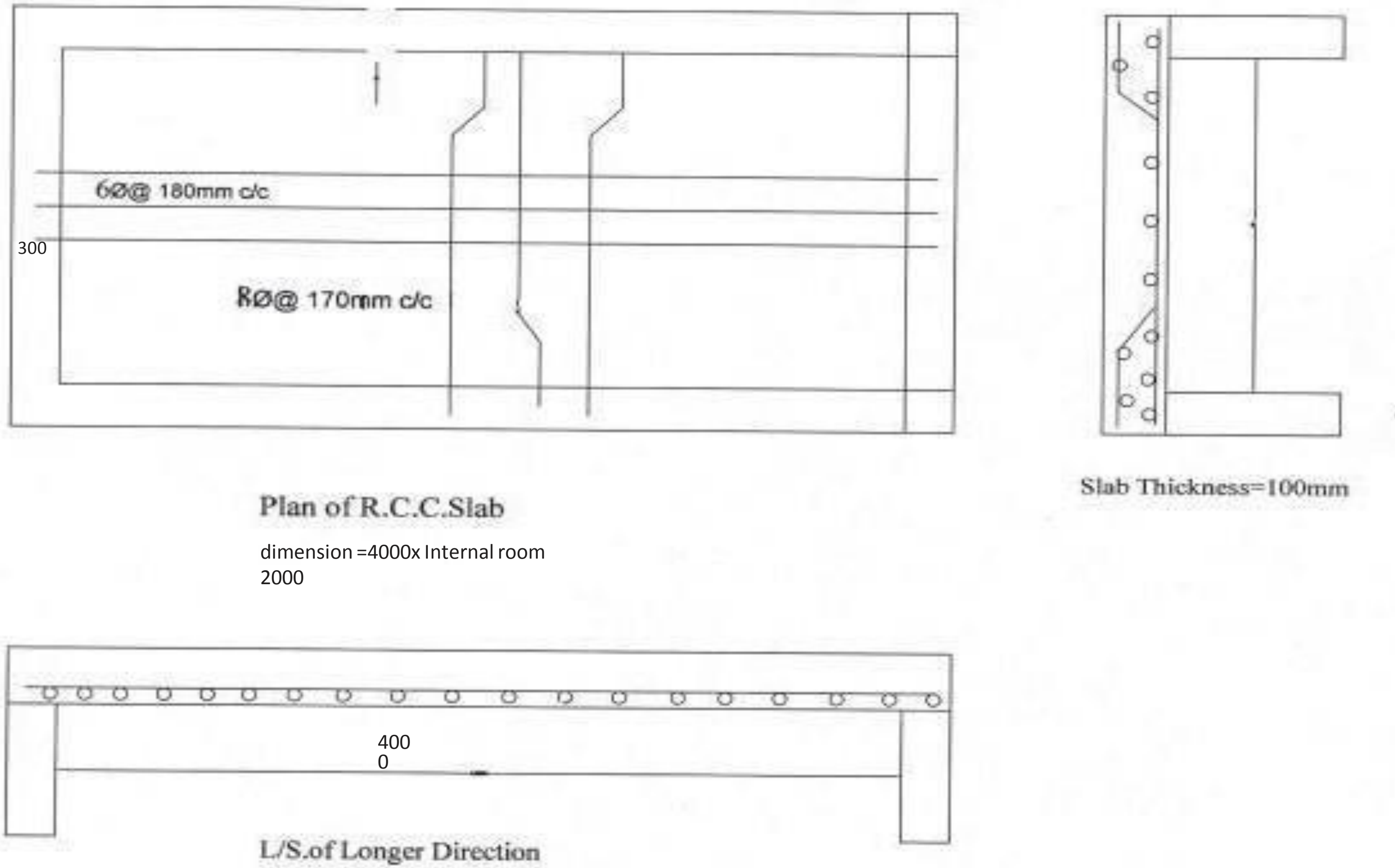
To work out the economical use of materials and processes in completing the particulars item.

To work out the cost of extra items which are not provided in the contract bond, but are to be done as per the directions of the department.

To revise the schedule of rates due to increase zin the cost of material and labor or due to change in technique

Name.	Shape	Dia.	No.	Length in m	TotalLength inm	Self weight in kg /m
B E A M	main bars 4000+2x230-2x32=4396	16	2	4396+2x(9x16) = 4684mm = 4.684m	4.684 x 2 = 9.368m	$\frac{\pi}{4}\times\left(\frac{16}{1000}\right)^2\times 7860$ = 1.58
	Anchor bars 4000+2x230-2x32=4396	12	2	4396+2x(9x12) = 4612mm = 4.612m	4.612 x 2 = 9.224m	$\frac{\pi}{4}\times\left(\frac{12}{1000}\right)^2\times 7860$ = 0.89
	Cranked bars 500-2x25-16= 434 798 798 2800	16	2	4396+2x(9x16)+ 2(0.414x434) = 5043mm =5.043m Additional length for each crank = 0.414d	5.04 x 2 = 10.08	$\frac{\pi}{4}\times\left(\frac{16}{1000}\right)^2\times 7860$ = 1.58
	450 180 Height = 500-2x25=450 Width =230-2x25 =180	6	17	2(450+180) + 2x9x6 = 1368mm = 1.368m	1.368x17 = 23.256	$\frac{\pi}{4}\times\left(\frac{6}{1000}\right)^2\times 7860$ = 0.22
				No. ofstirups=((798/210)+1)x2 +(2800/400) = 17 Nos		

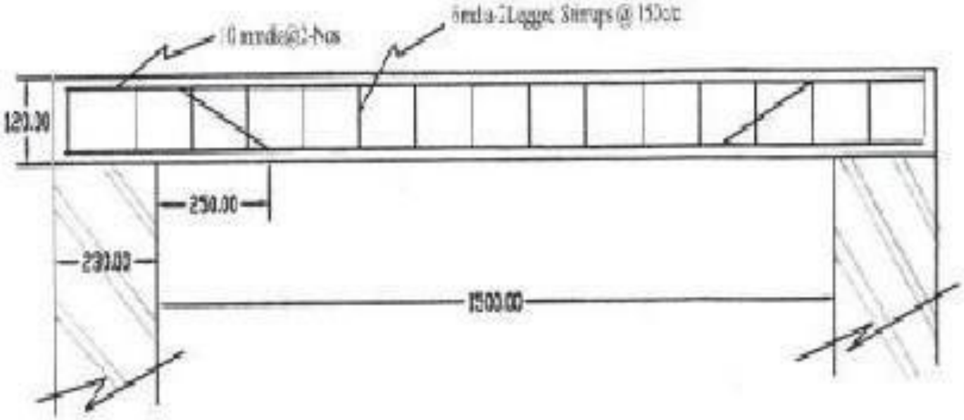
Prepare the bar bending schedule of the given figure for R.C.C. Lintel



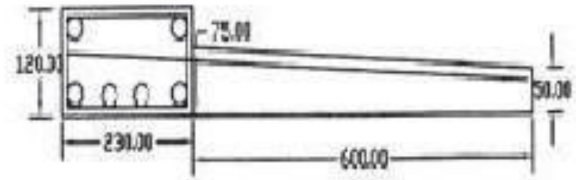
Name.	Shape	Dia.	No.	Length in m	TotalLength inm	Self weight in kg /m
B E A M	main bars 4000+2x230-2x32=4396	16	2	4396+2x(9x16) = 4684mm = 4.684m	4.684 x 2 = 9.368m	$\frac{\pi}{4}\times\left(\frac{16}{1000}\right)^2\times7860$ = 1.58
	Anchor bars 4000+2x230-2x32=4396	12	2	4396+2x(9x12) = 4612mm = 4.612m	4.612 x 2 = 9.224m	$\frac{\pi}{4}\times\left(\frac{12}{1000}\right)^2\times7860$ = 0.89
	Cranked bars 500-2x25-16= 434 798 798 2800	16	2	4396+2x(9x16) + 2(0.414x434) = 5043mm =5.043m Additional length for each crank = 0.414d	5.04 x 2 = 10.08	$\frac{\pi}{4}\times\left(\frac{16}{1000}\right)^2\times7860$ = 1.58
	450 180 Height = 500-2x25=450 Width =230-2x25 =180	6	17	2(450+180) + 2x9x6 = 1368mm = 1.368m	1.368x17 = 23.256	$\frac{\pi}{4}\times\left(\frac{6}{1000}\right)^2\times7860$ = 0.22
				No. ofstirups=((798/210)+1)x2 +(2800/400) = 17 Nos		

Prepare the bar bending schedule of the given figure for R.C.C. Lintel

R.C.C.LINTEL

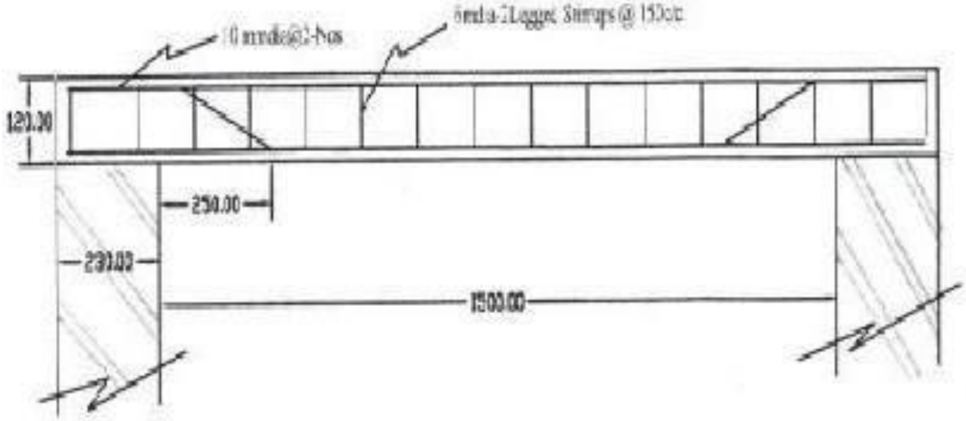


LONGITUDINAL SECTION OF R.C.C.LINTEL

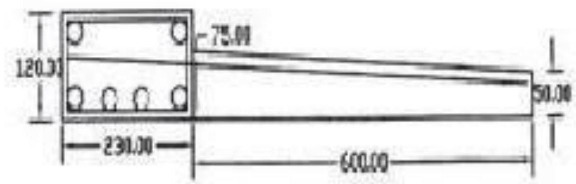


C/S OF LINTEL CUM SUNSHADE

R.C.C.LINTEL



LONGITUDINAL SECTION OF R.C.C.LINTEL



C/S OF LINTEL CUM SUNSHADE

Gravel Road

A gravel road comprising of a gravel of thickness 100mm compacted thickness and compacted by hand roller. A gravel is placed over an earthern formation which is compacted by a 2 tonne roller.

The estimate of gravel road consists of determining the folloiwng quantities.

- Earth work excavation and depositing on bank andcompaction
- collection ofgravel
- spreading compacting gravel toOMC

Example 8.1:- Find the estamation of a gravel road for the fig shown below. for a proposed road from 0km to 12km.

	S.No. ParticularsofItems	No.	L		B	H	Q	Explanation

1a)Earthworkexcavationanddepositingonbarkwithanintialleadandliftofsoilforformationandfilingofpits,pot holes etc.

Area of C/s at O km (A) = $10x1.2+2x1.2^2 = 14.88m^2$ Area of C/s at 6 Km (A2) = $10x0.8+2x0.8^2 = 9.28m^2$

Area of C/s. at 12 km (A3) = $10x\ 0.6+2x0.6^2 = 6.72m^2$

Vol of earth work = 600 $\left(\frac{14.88 + 6.72}{2} + 9.28\right)$ = 12048m3

b) Add extra for pits &potholes LS = 52m3

Total 12100 m3

Deduct for gravel = 1 x 1200 x 5 x 0.1 = 600 m^3

Net Earth work = 12100-600=11,500m^3

2.	Collectionofgravelin- cluding cost & convey- anceetccomplete50% allowance is given for OMC compaction.	1	1200	5.00	0.15	900m^3	
3	Spreadingofgraveland watering	1	1200	5.00	---	6000m^2	
4.	Unforceanitems@2%					L.S.	
5.	Tools and plant @1%					L.S	
6.	P.S.andcontinsecis@ 4%					L.S	

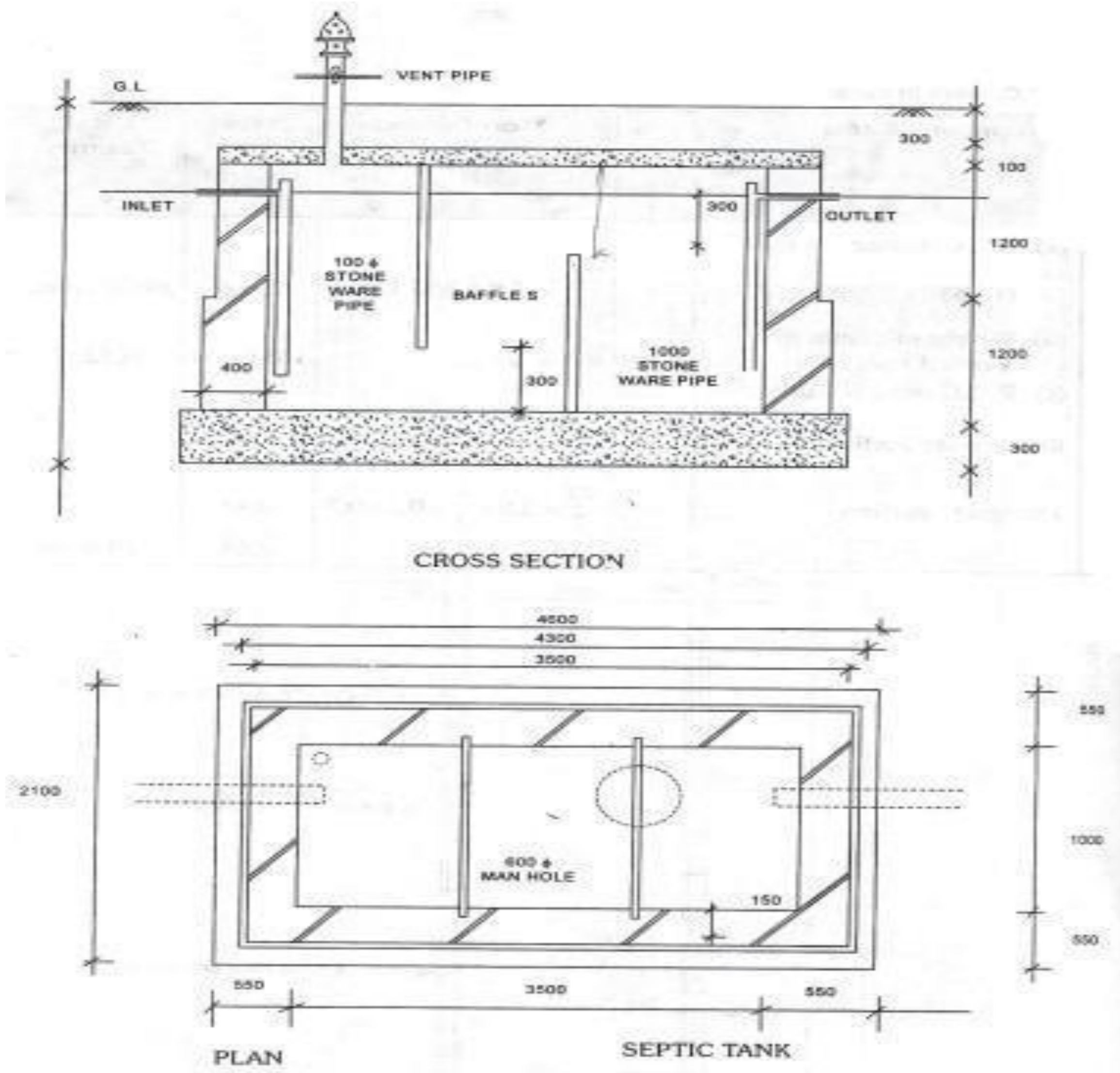
Cement concrete road

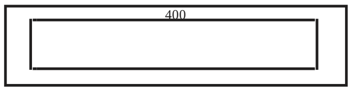
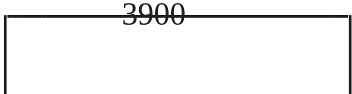
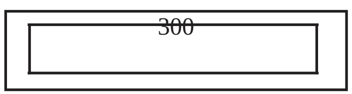
C.C. road is laid over an existing W.B.M road, In certain cases. It is laid over a prepared sub grade and a base course is provided. The concrete used for roads is M15 grade using 20mm H.B.G. metal while for base course a concrete of 1:4:8 using 40mm HBGmetal the stages of Estimations of a C.C.road is

- Earth work excavation and deposting on thebank
- Cement concrete (1:4:8) for basecourse
- Cement concrete (1:2:8) for wearingcourse.

:- Calculate the quantities of different items of the figure shown in below

SEPTIK TANK

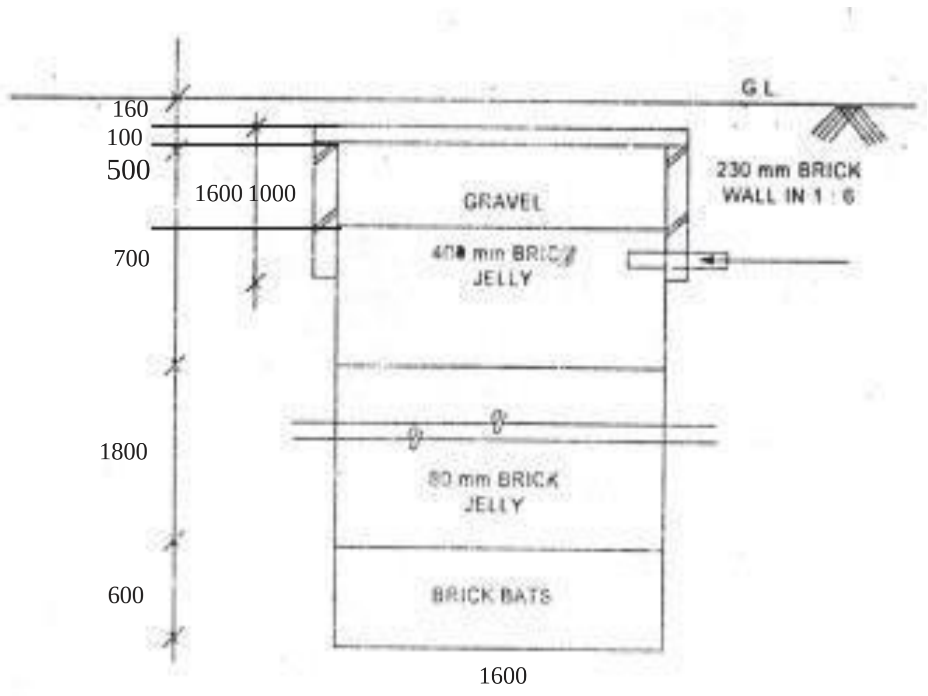


S.N	o. Particulars of Items	No.	L	B	H	Q	Explanation
1.	Earth work excavation uptoG.L.						
2.	C.C.(1:4:8) bed for foundation		1 4.60	2.10	3.1	29.9	5
3.	Brick masonary in CM 1:4 for side walls	1	4.6	2.10	0.30	2.89	8
	a) Upto first step (400th) 4300						
	 1800						
	centre line method		1 10.	60 0.4	0 1.20	5.088	
	3900  1400						
	totalcentre linelength = (3900+1400)2=10600 b)fromIsttoIIstep(300th) 4100 1600						
							
	Centre line method 3800 1300 Total centre line length (3800+1300)2=10200						
	Total Brick Masonry						
	R.C.C. (1:2:4) using 20mm HBG metal	1	10.20	0.3	1.20	3.672	
			= 5.088+3		**.672 =**	**8.76**	
4.	•RCC roofslab						
	•Bafflewall						
	•8cumward	1	4.10	1.60	0.1	0.656	(Assure projection
		1	1.20	0.10	1.80	0.216	100mm inside the
		1	1.20	0.10	2.10	0.252	wall)
					Total	**1.124**	

S.N	. Particulars of Items	No.	L	B	H	Q	Explanation
5.	lastering with CM(1:4) with 20mm thick						
	a) Inner surface ofseptic tank	1	9.0	--	2.4	21.6	L=2(3.5+1.0)=9.0
	b) flooring						
	c) sidesofscumboard	1	3.5	1.0	--	3.15	
	d) Bottom of scumboard						
	e) sides of bafflewall						
	f) Top of bafflewall						
	g) deduction for Pipe opening						
	Earth filling with excavated soil around the brick work	1x2	1.0	--	2.1	4.2	
	a) upto first step						
	4750						
	225	1	1.0	0.1	---	0.1	
	150						
	4450						
	195						
	Total length = (4.45+1.95)2						
	= 12.8 12.80 0.151.2	1x2	1.0	---	1.8	3.6	
	to						
	Ground Level	1	1.0	0.1	--	0.10	
	4600						
	2100						
	250	2	$\frac{\pi\times(0.1)^2}{4}$			-0.015	
	4350		Net	Plast	ring=	**33.08**	m2
	185						
6.	Total Centre Linelength						
	=2(4.35+1.85) = 12.4					to up	
						4.96	
		0		1.60			
		2.30	4 b) from1		t step		
				1x2			
				1x1			
				1x1			
		1	12.4	0 0.2	1.60		

Calculate the quantities of different items of the figure shown in below

SOAK PIT



THANK YOU